Former Mill Bay Marina
Locust Valley, New York 11560

Nassau County Tax Maps as Section 29 Block 40 Lot Numbers 313-321, 327-345 and 348.

Soil Sampling
Work Plan

Prepared For
The NYSDEC

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INTRODUCTION

J.R. Holzmacher P.E. LLC (JRH) has prepared this work plan, for submittal to the NYSDEC, to conduct soil sampling and analysis prior to remediation of contaminated soils at the former Mill Bay Marina (the site). The site is bordered on the east by Mill Neck Creek and the north, south and west by residential development (Figure 1). The subject property to be investigated is defined in the Nassau County Tax Maps as Section 29 Block 40 Lot Numbers 313-321, 327-345 and 348 (Figure 2).

Review of the historical data revealed that the site had been occupied by a marina at least as far back as the 1950s. The marina reportedly contained boat storage and maintenance areas, and gasoline storage and dispensing facilities. Marina activities continued until abandoned in 2001. Subsequent to abandonment, Mr. Harvey Weisman purchased a portion of the site and removed the building and discarded boats. The site is now vacant.

BACKGROUND

Documents and environmental reports were sent to the NYSDEC. Following is a brief summary of previous investigations.

Phase I ESA-2002

Cashin Associates, P.C. (Cashin) was retained in early 2002 by the Town of Oyster Bay to conduct a Phase I Environmental Site Assessment (ESA) of the site. Based on the review of historical photographs, Cashin determined that the site was developed sometime before 1953 with a large commercial building and was then used for the outdoor storage of boats. The property was expanded sometime between 1953 and 1966, and again modified between 1966 and 1976 with the excavation of an inlet area along Oak Neck Creek.

It is believed that a gasoline underground storage tank was removed in the 1970s. The Nassau County Fire Marshall's Office was contacted, and records there were searched in an effort to find the location of the former gasoline islands. Therefore, no relevant information was uncovered by Cashin.

Information obtained from the Nassau County Department of Health (NCDH) indicated that Mr. Weisman removed the septic system under NCDH supervision in 2001-2002 in conjunction with building demolition.

As part of the Phase I ESA, the specific site history was determined by Cashin based on review of historical aerial photographs; interviews with Mr. Harvey Weisman, owner of most of the subject property; and review of information in the files of the Town of Oyster Bay Building *Division*. The Phase I ESA suggested that the previous site use relating to boat maintenance and storage may have had impacts on the site. However, Cashin uncovered no pertinent data or documents that could bear on this question. Limited sampling data provided at this time by Mr.

Weisman suggested that some impacts might be discovered on the site, but Cashin felt that the documentation associated with the sampling data was not rigorous enough to allow for quantitative use of the information. Therefore, Cashin recommended a Phase II ESA.

Phase II ESA-2004

The purpose of this Phase II ESA was to determine the presence, if any, of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals in soil and groundwater at selected locations across the site. A sampling plan was prepared by Cashin and submitted to the NCDH for approval in March 2004.

Cashin established, an approximate 100' x 100' grid and a total of 16 locations were selected to be sampled. Thirty soil samples and five groundwater samples were collected and analyzed by an ELAP-certified testing laboratory. Some locations within the sampling grid were not sampled because they were outside parcels being considered for acquisition by the Town.

The results of the Phase II ESA were presented in an *Environmental Investigation Report* to the Town of Oyster Bay dated August 5, 2004. Metals were detected in all surface and subsurface soil samples. Eleven metals were reported at detections above NYSDEC Recommended Soil Clean-up Objectives (RSCOs) as listed in NYSDEC TAGM 4046. Metals exceeding RSCOs included arsenic, barium, cadmium, chromium, copper, iron, lead, magnesium, mercury, nickel, and zinc. Thirteen metals were found in subsurface soil samples at concentrations that exceeded NYSDEC RSCOs- arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel, selenium, and zinc.

Elevated concentrations of copper, mercury, arsenic, zinc and lead were detected at multiple soil sample locations. Copper is a primary active component found in most antifouling boat bottom paints, and is the metal most often associated with contaminated marina sediments (Fields, 2003). Elevated levels of mercury may be related to previous marina activities involving boat paint. Mercury has been used as an anti-fouling agent in boat paints to reduce organism growth on the bottom of boats. Boat paint is known to also contain other metals such as copper, mercury, arsenic, or tributytin (TBT). Mercury also serves as the contact for float switches in bilge pumps, shower water storage tanks, and thermostats. One float switch can contain as much mercury as 100 fluorescent lamps. Arsenic is found in paint pigments as wells as in wood preservatives. Arsenic, chromium and copper leach from docks, pilings and other structures constructed of wood treated with chromated copper arsenate. Zinc anodes are used to deter corrosion of metal hulls and other metal boat parts that are exposed to seawater.

Four SVOCs -benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, and benzo (k) fluoanthene- were reported above their respective NYSDEC RSCOs in four surface soil samples. Five SVOCs (chrysene, benzo (a) anthracene, benzo (b) fluoranthene, benzo (k) fluoranthene, and benzo (a) pyrene) were detected above RSCOs in three subsurface samples. One VOC, acetone, was detected in three soil samples but at concentrations below its RSCO.

Laboratory analysis of groundwater samples reported detections of fifteen metals that exceeded NYSDEC Groundwater Standards or Guidance Values. These metals include arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, sodium, and zinc.

All groundwater samples were reported to have multiple detections of metals that exceeded standard values. Groundwater samples were collected directly from soil borings and were unfiltered, so the reported concentrations reflect metals associated with particulates as well as the dissolved fraction.

No SVOCs were detected in the groundwater samples. Acetone was the only VOC detected in groundwater but at concentrations below the New York State Groundwater Standard.
Cashin recommended "additional sampling could be needed to further define the extent of contamination by metals and SVOCs at the site, and to define the scope of needed remedial activities."

Additional Investigation and Sampling-2005

Mr. Weisman retained Berninger Environmental Inc. (BEl) in 2005 to further evaluate the presence of metals in soils relative to the historic use of the subject property as a marina and boat yard.

Twelve soil borings were drilled by BEI across the site using decontaminated manually operated, stainless steel sampling probes. Soil samples were collected on a nominal-continuous basis until groundwater was encountered (ranging in depth between six inches and 3 feet below grade). Groundwater was generally deeper at the southwestern portion of the property (approximately 2.5 to 3 feet below grade) and even shallower at the eastern and northern portions of the subject property. It should be noted that during sampling activities, the local tide level was low indicating that the water table underlying the subject property was similarly "low" and is expected to be shallower during higher tides.

Soil samples were screened for visual and olfactory evidence of contamination. Fill was encountered in all borings to depths ranging from six inches to greater than 2.5 feet. Fill material observed within soil borings included, but was not limited to brick, concrete, glass, metal, etc. Thicker fill material was observed at the northwestern portion of the property extending into groundwater and was consistently observed to the depth of the borings (2.5 feet below grade).

Soil samples were collected in depth intervals from 0 to 3 inches; 6 inches to 1 foot; and 1 to 1.5 feet and all samples were analyzed for the NYSDEC Target Analyte List (TAL) metals.

The results are summarized in a BEI letter report to Mr. Weisman dated November 2, 2005. With the exception of two locations at the southwestern and central western portions of the property, metals were detected in shallow soil samples at concentrations exceeding their applicable RSCOs.

Analysis of deeper soil samples indicated metal concentrations exceeded RSCOs to depths up to 2.5 feet in certain borings especially in the eastern and northwestern portions of the property.

SAMPLING APPROACH

The purpose of these proposed characterization and sampling activities is to determine the extent and volume of metal contaminated soil to be excavated and removed. Previous investigations and data can be used; however, it is not clear where the exact sampling points were. Therefore, additional samples need to be collected at precise locations clearly marked in the field. It is proposed that the sampling be conducted on a lot by lot basis.

The soil containing elevated concentrations of metals is artificial fill derived from the former marina. This layer of fill is visually obvious due the presence of artificially derived debris such as concrete, brick, metal, and wood fragments. The fill is underlain by naturally occurring tidal marsh and channel deposits. The contact between the loose fill containing marina debris/contamination and the underlying native soils is obvious. Previous measurements at the site indicate the fill varies in thickness from a featheredge to three feet throughout the site.

It has been documented that the site soils also contain arsenic, copper, chromium and zinc at elevated concentrations. To address this concern, the eight RCRA metals plus copper and zinc (total ten metals) will be analyzed for in all soil samples collected during this investigation. Extra sample bottles will be filled and retained in the laboratory pending the results of the RCRA metals analyses. TCLP lead analysis would be performed on several samples that contain over 650-ppm lead or any other metal with a similarly elevated concentration.

This sampling plan is intended to document the procedural and analytical requirements for this and any subsequent sampling events performed to collect soil samples and to characterize areas of potential contamination from the former Mill Bay Marina. The individual elements of this plan were compiled after reviewing the draft NYSDEC DER-10 Technical Guidance for Site Investigation and remediation dated December 2002.

SAMPLING METHODOLOGY

Discrete sampling will be used to assess the metal contaminated soils, underlying soils and surrounding soils. The sampling will be conducted by using a systematic sampling protocol on a per lot basis at the locations shown on Figure 2. Authoritative protocol may be used at each grid location allowing the senior and experienced sampler the flexibility to move sampling locations, as necessary, to accommodate unforeseen field conditions.

The following outline describes the proposed sampling:

Sampling Locations-

Samples of surface soil or fill (less than six inches deep) and subsurface soils/fill will be collected as shown in Figure 3 (Sampling Locations). A total of 38 locations will be sampled. Locations were selected on per lot basis focusing on areas visually identified as containing a significant thickness of artificial fill as well as from metals data collected during previous investigations.

A visual inspection for surface waste remnants (broken glass, cans or other debris) will be performed to confirm the areas to be sampled. Trenching will be performed at surface sampling locations to determine if subsurface waste is present. Samples of subsurface soils will be taken based on presence and extent of fill material.

Sample collection-

Each sample will be collected using either decontaminated or designated sampling equipment. Samples will collected into disposable buckets using either decontaminated stainless steel or disposable trowels, homogenized, and then transferred into laboratory-supplied containers. Reusable sampling equipment will be decontaminated between each sampling event. Decontamination will follow the procedures outlined below. Personnel who collect samples will be required to change their gloves between each sampling event.

The following equipment may be necessary to perform the sampling

• Disposable or stainless steel (SS) trowels	• Field log book
• Sealable plastic bags	• Survey lath
• One auger with extensions to reach 5 feet	• First aid kit and eye wash
• Five gallons of deionized/distilled water	• Mailing labels and markers
• 500 mL of 0.1 N nitric acid in a spray bottle	• Cooler and ice or blue ice
• Chain of custody forms and custody seals	• Packing and duct tape
• Health and safety equipment (Tyvex, tape, respirator with HEPA filter)	• Eight-ounce wide mouth glass jars
	• One SS or disposable mixing bowl (s)
Decontamination equipment (2 ½ gallon sprayer, non-phosphate detergent, disposable brush, paper towels, cotton towels, polyethylene sheeting)	

Surface soil samples-

Surface soil samples will be collected at each of the 38 designated locations using either decontaminated or disposable trowels. At each location, soil will be collected within the upper six inches of the apparent ground surface, approximately half the depth of the boring (or authoritative as noted in field notes). To minimize the possibility of cross contamination, soil samples will first be collected in the lots expected to be the least contaminated, proceeding last to areas of suspected or known significant contamination.

Deeper soil samples-

Subsurface sampling in the native soil beneath the fill will not begin until all surface samples are collected. The deeper sampling will focus on areas where the artificial fill is thickest and the documented metals concentrations are highest. A stainless steel hand auger will be used. It is anticipated that ten deeper samples will be collected for analysis for the ten metals.

Subsurface samples will be collected using decontaminated stainless steel or disposable trowels. Upon completion of sampling at a location, the boring will be filled with spoils and compacted.

Sample containers-

After each sample is collected it will be placed in a laboratory-supplied container, labeled, logged on the chain-of-custody document, sealed, and stored in an ice chest that is cooled to 4 degrees Fahrenheit.

At the completion of sampling activities, JRH will deliver the selected samples to a NYSDOH-certified hazardous waste laboratory for analyses using strict chain-of-custody protocols. All samples will be analyzed for the eight RCRA metals plus copper and zinc.

Extra sample bottles will be filled and retained in the laboratory pending the results of the RCRA metals analyses. TCLP analysis would be performed on samples that contain over 650-ppm lead or another metal with a similarly elevated concentration. A minimum of six TCLP analysis will be performed.

Although sampling locations are proposed as shown on Figure 3, exact soil sampling locations will be determined in the field based on accessibility and the presence of unforeseen impedances or other factors. Final soil sample locations will be recorded in the field logbook and staked in the field when sampling is completed. Each sample location will be recorded on the final site map. The map will be provided in the final report.

Decontamination

All equipment that comes into contact with potentially contaminated soil will be decontaminated in a pre- designated area. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment. All sampling devices used, including trowels and augers, will be decontaminated by JRH staff.

The following decontamination procedures for primary contaminant, inorganic (metals):

1. Non-phosphate detergent and tap-water (bottled water) wash, using a brush if necessary
2. Tap-water rinse
3. 0.1 N nitric acid rinse
4. Deionized/distilled water rinse- twice

Pre-cleaned containers will be supplied by the laboratory and will not be rinsed prior to sample collection. No preservative will be added to the containers.

Analytical Methods

Analytical methods will follow standard U.S. Environmental Protection Agency (EPA) procedures as outlined in Test Methods for Evaluating Solid Wastes - Physical/Chemical Methods (SW-846) as updated.

The analytical instrument methods expected for use during this project are as follows:

Parameter	**Instrument Method Summary Soil**
RCRA metals	EPA 6010B
TCLP Lead	EPA 1311 /6010B
Copper/Zinc	EPA 6010B

LABORATORY QUALITY CONTROL

The analytical laboratory will perform Quality Control (QC). The QC will include project specific QC, method blank results, laboratory control spike, and matrix spike results.

1. Project Specific QC – No project specific QC has been requested by the NYSDEC.
2. Method Blank Results – A method blank is a laboratory-generated sample that assesses the degree to which laboratory. The method blank results associated with the samples will be included with the analytical results.
3. Laboratory Control Spike – A Laboratory Control Spike (LCS) is a sample that is spiked with known analyte concentrations, and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The LCS results associate with the samples will be attached on the LCS and LCS Duplicated Analysis Report.
4. Matrix Spike Results – A matrix spike is a sample that is spiked with known analyte concentrations and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The matrix spike results associated with the

samples will be attached on the Matrix Spike and Matrix Spike Duplicate Analysis Report.

5. Accuracy – Accuracy will be measured by percent recovery as defined by:

$$\% \text{ recovery} = \frac{\text{(measured concentration)}}{\text{(Actual concentration)}} \times 100$$

DOCUMENTATION AND REPORTING

Field Notes-

A field logbook will be used to document the vital project and sample information. At a minimum, the following sample information will be recorded:

- Sample location and description
- Site or sample area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Type of sample (soil, sediment or water)
- Type of sampling equipment used
- Field instrument reading, if applicable
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Preliminary sample descriptions
- Sample preservation
- Sample identification numbers and explanatory code
- Name of recipient laboratory

In addition to the sampling information, the following specific information will also be recorded in the logbook:

- Team members and their responsibilities
- Time of arrival and departure
- Deviations from the sampling plan
- Level of health and safety protection

Photographs

Photographs will be taken at the sampling location and at surrounding areas. The photos will verify information entered in the field logbook. Each photo taken will be written in the logbook with the approximate time, date, and location.

Labeling

All samples collected will be labeled in a clear and precise way for proper identification for tracking in the laboratory. Each sample will reference the sample date, the type of sample (S – surface; B – subsurface), and the sample point identification as shown on the pin flag.

Chain-of-Custody

A chain-of-custody record will accompany all sample shipments. Shipped samples will have a custody seal placed across the lid of each sample container. All custody seals will be signed and dated.

Packaging and Shipment

All sample containers will be placed in a strong-outside shipping container and will have the drain plug sealed, if applicable, to prevent melted ice from leaking out of the cooler. If ice is used to cool the samples, the ice will be packed in a double zip-lock bag. Special care will be provided to secure and prevent damage to the sample containers.

Data Validation

Data obtained from the soil sampling will be validated on an expedited basis. Validation is the process by which specific criteria are applied to samples and laboratory measurements by a third-party data validator to determine if the data are unqualified, qualified, or rejected. Data will also be reviewed to check for errors and that all data meet a qualitative standard of reasonableness. Following validation, analytical data will be tabulated using electronic spreadsheets.

A data report of the soil sampling analytical results will be developed for regulatory submittal upon receipt of validated results

Reporting

Within eight weeks of receipt of all soils analytical data, a site characterization report will be prepared. The content of this report will follow the guidance outlined in the December 2002 Draft DER-10 Technical Guidance for Site Investigation and Remediation. This report will contain maps and tables that will clearly identify and delineate the extent of contaminated soils and provide the locations and volumes of soil to be removed during the remediation. Text, figures, maps and data will be submitted in both paper and electronic formats.

Once the report is accepted by the NYSDEC a Remedial Action (RA) work plan will be prepared using Draft DER-10 as an outline. The RA work plan will include a detailed description of the soil remediation, monitoring plans during remediation, a health and safety plan, a cost estimate, a schedule, a description of institutional controls to be implemented and an OM&M plan. All plans will be reviewed and stamped by a JRH professional engineer licensed in the State of New York.

Figures

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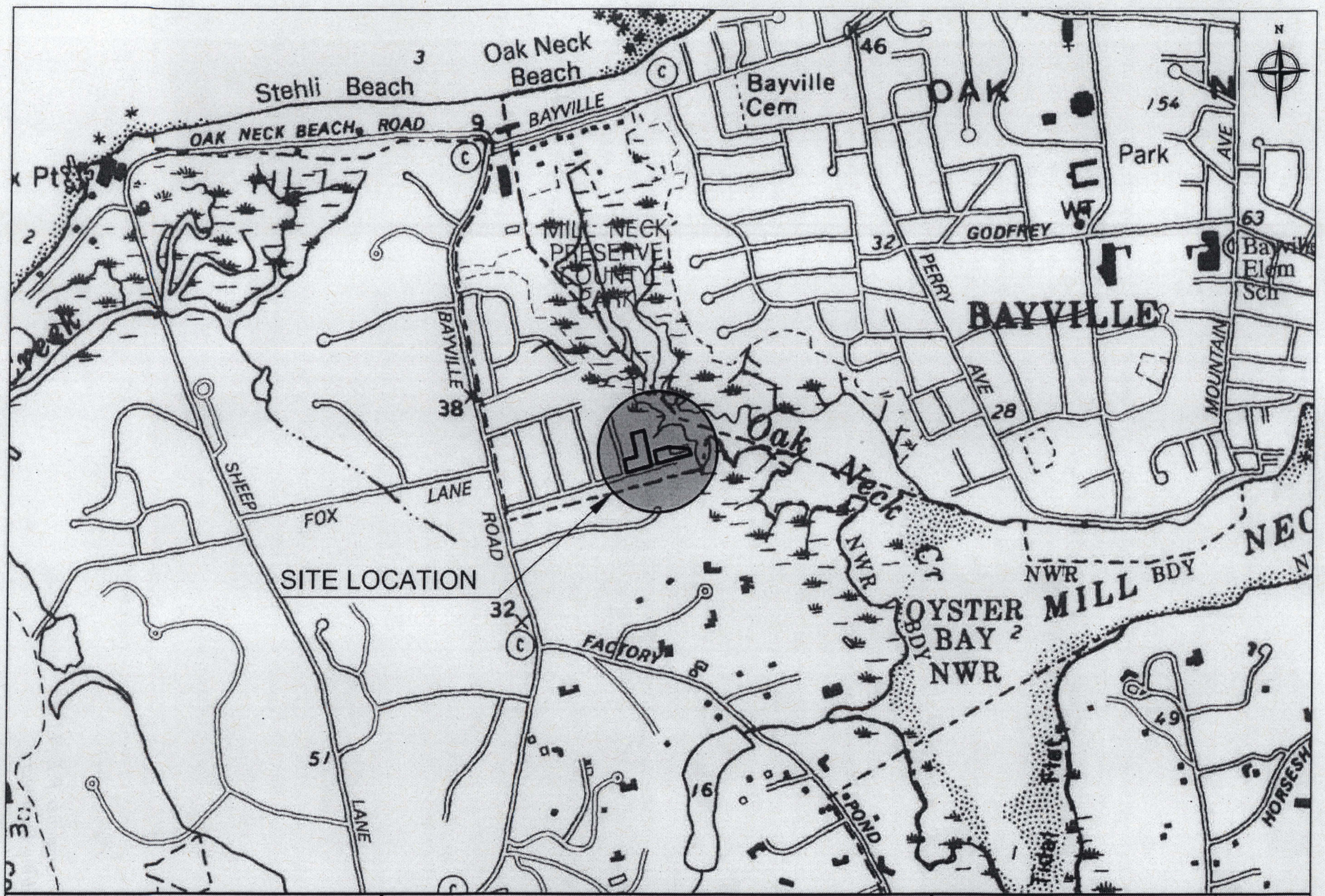

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TITLE:

LOCATION MAP

Former Mill Bay Marina
Locust Valley, NY 11560

DWN: HS	SCALE: 1" = 1000'	DATE: 10/3/08	PROJECT NO.: Weism 08-02
CHKD: JMD	APPD:	REV.:	NOTES: -
FIGURE NO.: 1			