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**APPENDIX J**  
**BATHYMETRIC ANALYSIS AND RESULTS**

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May 15, 2002

Leo P. Roy  
The Bioengineering Group, Inc.  
16 Commercial Street  
Salem, Massachusetts 01970

**Re: Rippowam River Bathymetric Survey, Sediment Thickness Survey & Sediment Sampling - April 2002**

Dear Mr. Roy,

The following is a letter report describing the methods used and data products produced by CR Environmental, Inc. (CR) of Falmouth, MA for work on the U.S. Army Corps of Engineers' *Rippowam River* dam study conducted for The Bioengineering Group (TBG).

## 1.0 SCOPE OF SERVICES

On April 19, 2002, CR Environmental, Inc., performed bathymetric and sediment thickness surveys of an impounded reach of the Rippowam River located south of West Broad Street and north of Main Street in Stamford, Connecticut. It is important to note that the bathymetric and sediment survey efforts were not designed to meet commonly used pre-dredge survey specifications and should be regarded as preliminary reconnaissance surveys. CR was not tasked with collecting survey data above the water line or as needed to capture the 100-year flood event, or conducting any sediment sample analyses. CR processed the bathymetric and sediment thickness data, generated data tables, and bathymetric and sub-sediment riverbed elevation maps.

## 2.0 MATERIALS AND METHODS

### 2.1 Navigation and Survey Control

Survey tasks were conducted from a 12-foot aluminum boat with multiple 12-volt power supplies, a 40-pound thrust electric motor, and a laptop computer equipped with navigation and data-logging software.

Real-time horizontal position accuracy of less than 1 meter was achieved during the surveys using a Trimble Navigation Pro-XRS Differential Global Positioning System (DGPS). U.S. Coast Guard differential correction beacons were used to provide real-time corrections to satellite data. DGPS signal quality and satellite geometry was continuously monitored during the surveys. Survey operations were paused when less than 5 satellites were received. Any outlying position data observed during data processing were removed from the final data set.

### 2.2 Bathymetric and Sediment Thickness Surveys

CR established twenty-one evenly spaced transects across the river from the concrete dam to the West Broad Street bridge (Locus Map). Five measurements of water depth and sediment thickness were made along each transect. Fewer measurements were made on the northernmost

transects near the bridge because of very shallow depths and obstructions in the water. The bathymetric survey was conducted using a graduated staff because extensive stands of aquatic vegetation precluded the use of echo sounding devices. Sediment thickness was determined by manually driving a 10-foot stainless steel probe into the sediment until first refusal. Measurements of water depth and sediment thickness were recorded on the Trimble TSC1 handset. A total of 107 soundings and sediment measurements were collected during this survey.

### 2.3 Bathymetric and Sediment Thickness Data Processing and Map Production

Soundings were converted to elevations using a benchmark located on the northeastern wall of the pond. The water surface elevation during the survey was 12.41-feet NGVD 29.

Bathymetric data were transformed to XYZ text format. Data were converted to the Connecticut State Plane NAD 27 grid in U.S. ft to match digital drawings provided by TBG. Grids of bottom elevation were produced by importing bathymetric data to Surfer for Windows (V. 8.0, Golden Software, Inc.). Kriging interpolation methods were used to calculate a grid network representing the bottom of the pond. A contour map depicting the bottom elevation at 0.5-foot intervals was produced using the resulting grid (Figure 1). This contour map was exported from Surfer as a 3-dimensional Drawing Exchange Format (DXF) file, which is compatible with ArcView Geographic Information System (GIS) software and most CAD software packages.

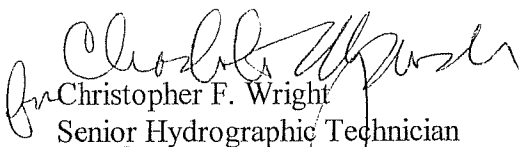
Sub-sediment riverbed elevation maps were produced by importing probe data to Surfer for Windows (V. 7.0, Golden Software, Inc.). Kriging interpolation methods were used to calculate grid node values. Sediment volumes were calculated using Surfer and the kriged grids. A contour map depicting the sub-sediment bed elevation at 0.5-ft intervals was produced using the resulting grid (Figure 2). This contour map was exported from Surfer as a 3-dimensional DXF file for use with GIS and CAD software.

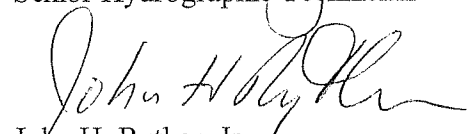
The gridded sediment probe data indicates that this impounded section of the Rippowam River contains approximately 18,600 cubic yards of sediment (i.e. material between the sediment water interface and first refusal).

All digital data is included in a CD-ROM accompanying this letter report, and was electronically mailed to TBG scientists on May 15, 2002.

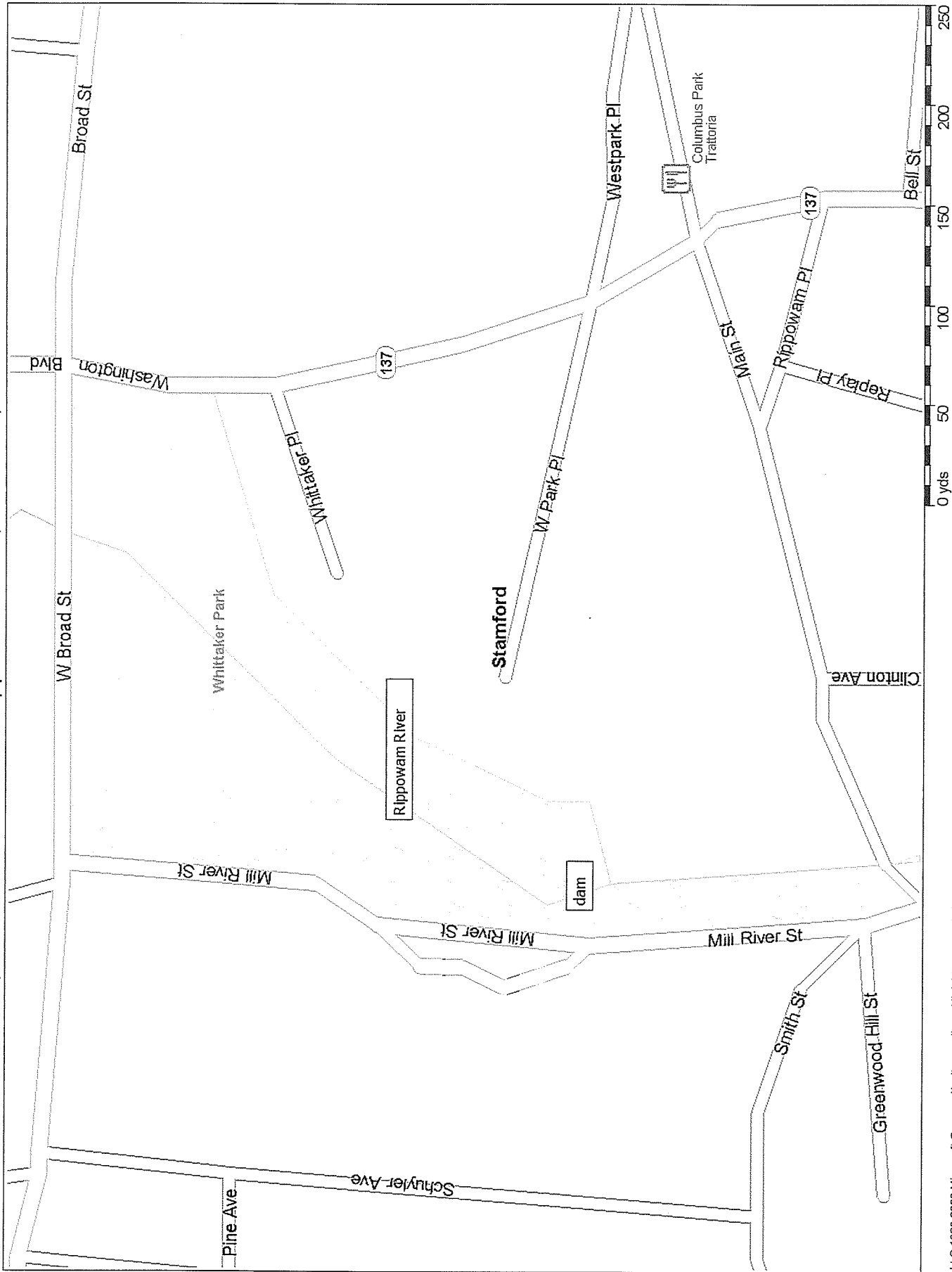
Please call if you have any questions.

Sincerely,  
CR Environmental, Inc.

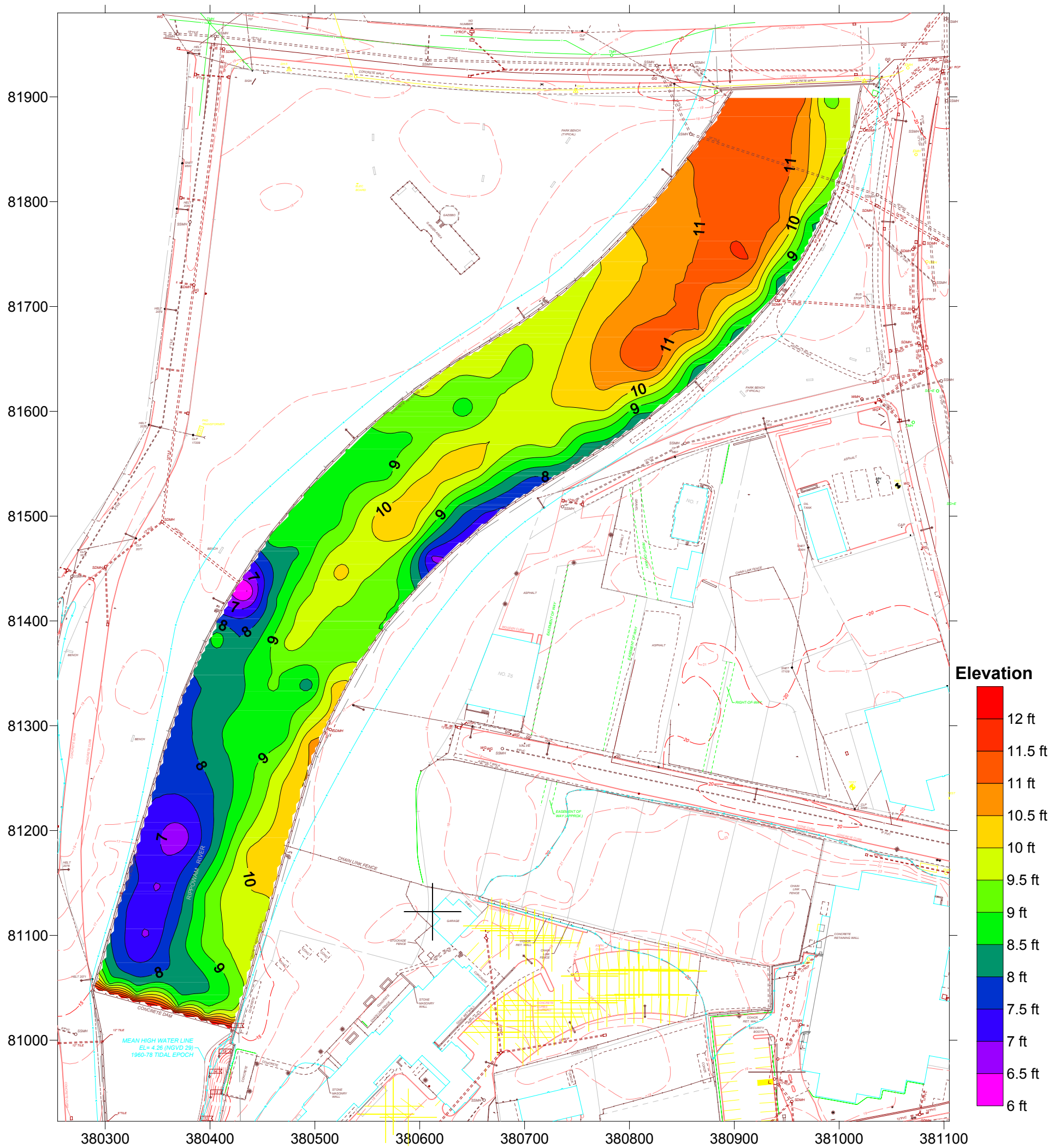
  
Christopher F. Wright  
Senior Hydrographic Technician

  
John H. Ryther, Jr.  
Manager Oceanographic Operations

# Impounded Reach of the Rippowam River, Stamford, Connecticut



**FIGURE 1**  
**BATHYMETRIC CONTOUR MAP**  
**RIPPOWAM RIVER**  
**STAMFORD, CONNECTICUT**  
**0.5 - FOOT CONTOUR INTERVAL**





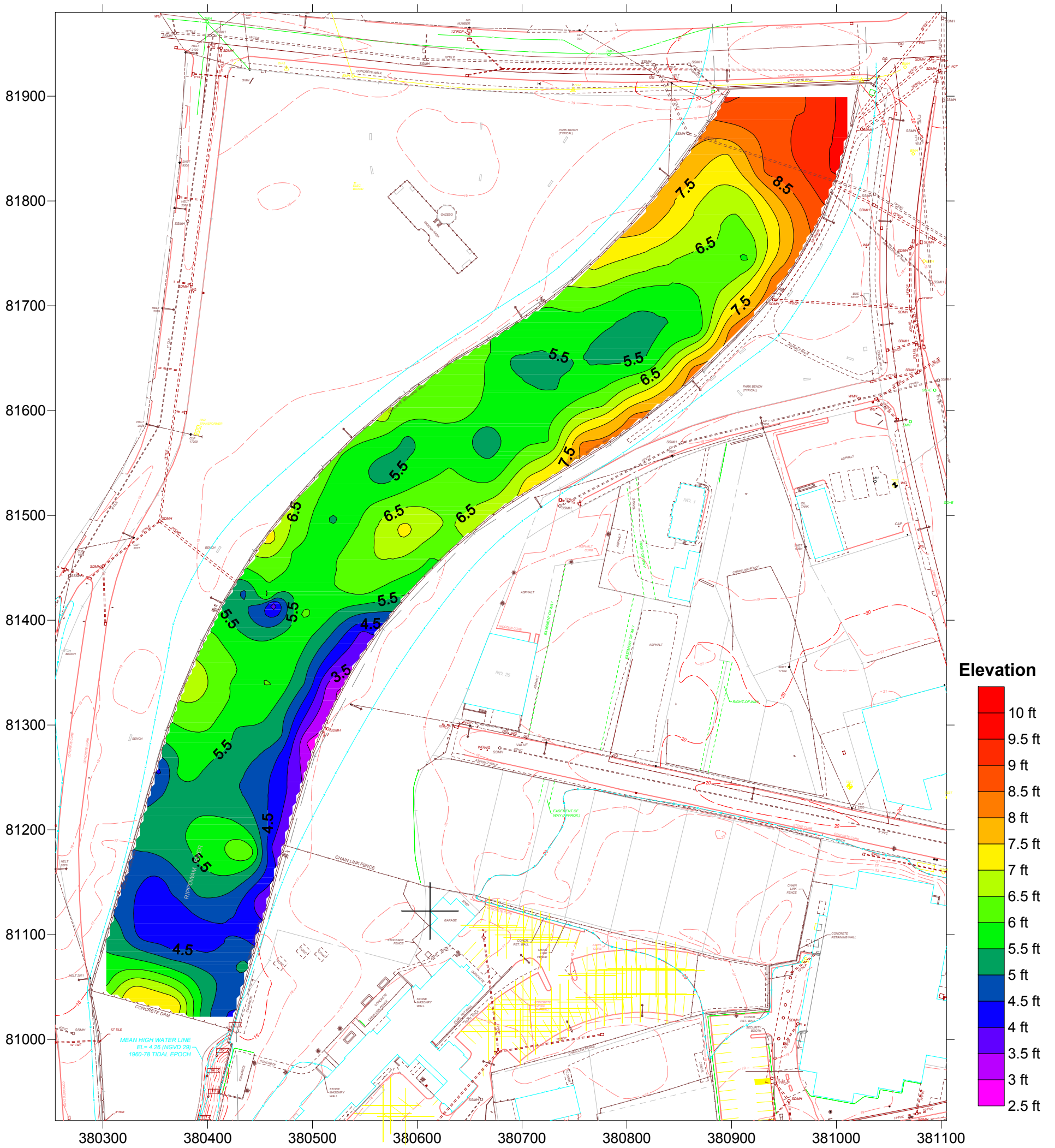

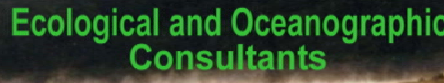
 	
Survey Date: April 19, 2002	Horizontal Grid: NAD 27 CT State Plane, U.S. Survey Foot Vertical Reference: NGVD 29, feet
Survey Vessel: S/V Jonzo	1 inch = 100.0 feet
<ol style="list-style-type: none"> <li>1. Survey conducted for The Bioengineering Group, Inc. (TBG). Land survey provided by TBG.</li> <li>2. All soundings were recorded by staff due to extensive aquatic vegetation and associated echo sounder interference. Sounding locations were recorded using a Trimble ProXRS DGPS and TSC1 datalogger.</li> <li>3. Contours were interpolated using Surfer V. 8.0.</li> <li>4. Not for Navigation.</li> </ol>	

FIGURE 2

MAP OF SUB-SEDIMENT RIVER BED ELEVATIONS  
 RIPPOWAM RIVER  
 STAMFORD, CONNECTICUT  
 0.5 - FOOT CONTOUR INTERVAL



 <p><b>ENVIRONMENTAL, INC.</b></p>		 <p><b>Ecological and Oceanographic Consultants</b></p>	
Survey Date: April 19, 2002		Horizontal Grid: NAD 27 CT State Plane, U.S. Survey Foot Vertical Reference: NGVD 29, feet	
Survey Vessel: S/V Jonzo		1 inch = 100.0 feet	
1. Survey conducted for The Bioengineering Group, Inc. (TBG). Land survey provided by TBG. 2. All measurements were made by manually probing the river bottom and recording the depth to first refusal. Measurement locations were recorded using a Trimble ProXRS DGPS and TSC1 datalogger. 3. Contours were interpolated using Surfer V. 8.0. 4. Not for Navigation.			