MILL RIVER AND MILL POND
HABITAT RESTORATION PROJECT
RIPPOWAM RIVER, STAMFORD, CONNECTICUT

GEOTECHNICAL ANALYSIS

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May 2003

TABLE OF CONTENTS

LIST OF FIGURES

1) INTRODUCTION

a. General

This report presents the bedrock geology, surficial geology and soil types identified at the proposed Mill River and Mill Pond Restoration Project, including the Main Street Dam and in Stamford, Connecticut.

b. Purpose and Scope

The purpose of this study is to identify the general geology and soil conditions at the project site and the need for additional on-site investigations prior to final design of the project. This geotechnical investigation makes emphasis in the Mill Pond area where the majority of the restoration activity and earthwork will take place. The scope of the study is to ascertain the limitations, from the geotechnical engineering standpoint, that each proposed alternative will experience during excavation, regrading and reshaping of the river banks, pond and wetland edges. The three proposed alternatives are: 1) removing the Mill River Dam and channel walls and regrading the affected channel, 2) leaving the dam intact with upstream channel modifications, and 3) no action. The scope of the geotechnical study was limited to reviewing existing geological maps, soils maps and soils reports; no field investigations or data verification were performed.

2) AUTHORITY

This study was performed by The Bioengineering Group, Inc. for the City of Stamford Connecticut, under section 206 of the Water Resources Development Act of 1996 (PL 104-303) entitled "Aquatic Ecosystem Restoration".

3) SITE CONDITIONS

a. Location and Description of the Site

The Rippowam River Basin is 37.5 square miles and is located in South Eastern New York and Southern Connecticut. The river originates in Ridgefield, Connecticut as the Mill River and flows 17 miles to empty into Long Island Sound at the West Branch in Stamford, Connecticut. The Mill River meanders almost unnoticed through the most

densely populated areas of the City. The Mill Pond area stretches from just downstream of Broad Street to Main Street Dam (Figure 1). To the west of the pond is the predominantly residential west side neighborhood. To the east is the Downtown, with its intensely developed commercial core.

The Mill Pond has an area of approximately 3.5 acres (138 feet wide by 1100 feet long) with depths ranging from 1 to 5.5 feet deep. The pond is constrained the full length by concrete walls approximately 15 feet high.

The Main Street Dam is a concrete dam approximately 138 feet across, about 2 feet wide at the top, and 10 feet high. The crest elevation is approximately 12.5 feet NGVD.

b. Bedrock Geology

Soils and surficial geology maps, prepared by the Soil Conservation Service for the Fairfield County and reports from the USACE (1985), indicate that the bedrock beneath the lower Rippowan River, commonly referred to as the Mill River, consists mostly of igneous and metamorphic rocks belonging to the eugeosynclinal assemblage on the east flank of the Green Mountain anticlinorium. The rocks, consisting of gneiss, schist, and pegmatite, have undergone three periods of metamorphism, corresponding to the Taconic, Acadian and Alleghenian orogenies. The bedrock is located at 50 feet below the surface in some locations, however outcroppings of the bedrock are also common.

c. Surficial Geology

As in all of New England, the geologic history of this area shows repeated advances of thick glacial ice. These advances caused complex deformations of the earth's crust. In addition, glacial erosion and deposition caused the present topography. The progressing ice scoured the existing bedrock surface, deepening and widening valleys. These were infilled with a veneer of glacial till and glacial outwash (sand and gravel deposits) from meltwater streams.

Bedrock in the Mill Pond area is covered primarily by glacial till and glacially deposited sand and gravel. Recent deposits of alluvium are found in the Mill River

channel and flood plains. There are two sizable underground rivers or aquifers flowing about 10 feet below the surface in Downtown Stamford. The depth of the aquifers varies but extends to bedrock at 50 feet below the surface in some locations. Technically the underground rivers are Glacial Till Aquifers probably within permeable gravel/cobble deposits (Wormser 2000).

d. General Soils

The upper soil of the Mill River from just upstream of the Mill Pond section to the outlet in the Stamford Harbor is called Udorthents-Urban Land (Figure 2), which is nearly level to moderately steep loamy soils that have been altered, usually located in urbanized areas. Upstream of the Mill Pond the soil is identified as Agawan-Hinckley-Haven (Figure 2), which is nearly level to steep, well drained and excessively drained, loamy and sandy soils formed on glacial outwash plains and terraces.

Udorthents-Urban Land: These soil units are excessively drained to moderately well drained soils that have been cut or filled. Typically, the soils have had more than 2 feet of the upper part of the original soil removed or have more than 2 feet of fill on top of the original soil. The highly variable nature of this soil unit makes onsite investigation necessary to determine its suitability for most uses.

Agawan-Hinckley-Haven: This soil unit is about 25 percent Agawan soils, 25 percent Hinckley soils, 10 percent of Haven soils, and 40 percent of minor extent.

The Agawan soils are well drained. Typically, the soils have a surface layer and subsoil of fine sandy loam and very fine sandy loam. The substratum is fine sand.

The Hinckley soils are excessively drained. Typically, the soils have a surface layer of gravelly sandy loam. The subsoil is gravelly sandy loam and gravelly loamy sand. The substratum is gravelly and very gravelly sand.

The Haven soils are well drained. Typically, the soils have a surface layer of silt loam and fine sandy loam. The substratum is gravelly sand.

The soils of minor extent in this unit are mainly moderately well drained Ninigret soils, poorly drained Scarboro soils on outwash plains and poorly drained Rippowan soils and very poorly drained Saco soils on flood plains (Soil Survey of Fairfield County, USDA, 1981).

4) EXCAVATION

Excavation at the site for re-grading and re-shaping the river channel should not present any unique problems. The soils identified in the project area are mostly sandy loams, sands and gravels. After clearing of brush and small trees, excavation of the sands, silty sands, and gravels to the shallow depths required should proceed without difficulty.

Excavation to remove the Main Street Dam and associated retaining walls should not present any significant geotechnical problem. Granular, easy to excavate, fill material is expected to be encountered behind the retaining walls. However, at a distance away from the fill removal of large cobbles and boulders encountered in any significant quantity will complicate the excavation process.

The excavation and regrading of a proposed wetland at the J.M. Wright Technical School is also feasible from a geotechnical point of view. It is recommended to conduct a water balance analysis and subsoil characterization prior to final design. The subsoil investigation program is outlined in the next section.

5) CONCLUSIONS AND RECOMMENDATIONS

The predominant upper soils identified at the project site are sandy loams, sands and gravels. The main subsoil stratum comprises Sand and Gravel Glacial deposits. The material itself should be easy to excavate, grade and shape, haul, and stockpile. However, due to the geological randomness of many soil formations it is likely that some large cobbles, boulders and rock outcrop formations can be found on this site.

To ascertain the subsurface conditions at the Mill Pond site, specifically on the area adjacent to the concrete walls, at least four boreholes are recommended, two boreholes at each side of the pond. Boreholes should be not more than 15 foot deep where the retaining wall footing is located. The removal of the concrete walls will require deep excavations. It is important to characterize the subsurface soil conditions for stability purpose and to determine the suitability of the existing soils to be used in

the construction of the new channel.

Pond or new channel banks should have a maximum slope of 1V:2H. Stepper slopes (1V:1.5H) can be constructed only if they are stabilized with suitable bioengineering treatments.

It is recommended to conduct a minimum of two soil boreholes at the proposed wetland site in the initial design phase to characterize the subsurface stratrigraphy (soil description, soil infiltration, and depth of water table). The depth of the boreholes should be at least 5 feet below the proposed bottom of the wetland.

6) REFERENCES

Wormser, Eric. M. 2000. Draft Outline for Meeting "All About Water". December 13, 2000. Unpublished Information.

United States Army Corps of Engineers. 1985. USACE 1985 Stamford Local Flood Protection, Rippowam River, Stamford CT - Supporting Documentation for Detailed Project Report.

United States Department of Agriculture, Soil Conservation Service. 1981. Soil Survey of Fairfield County, Connecticut. Washington: GPO.

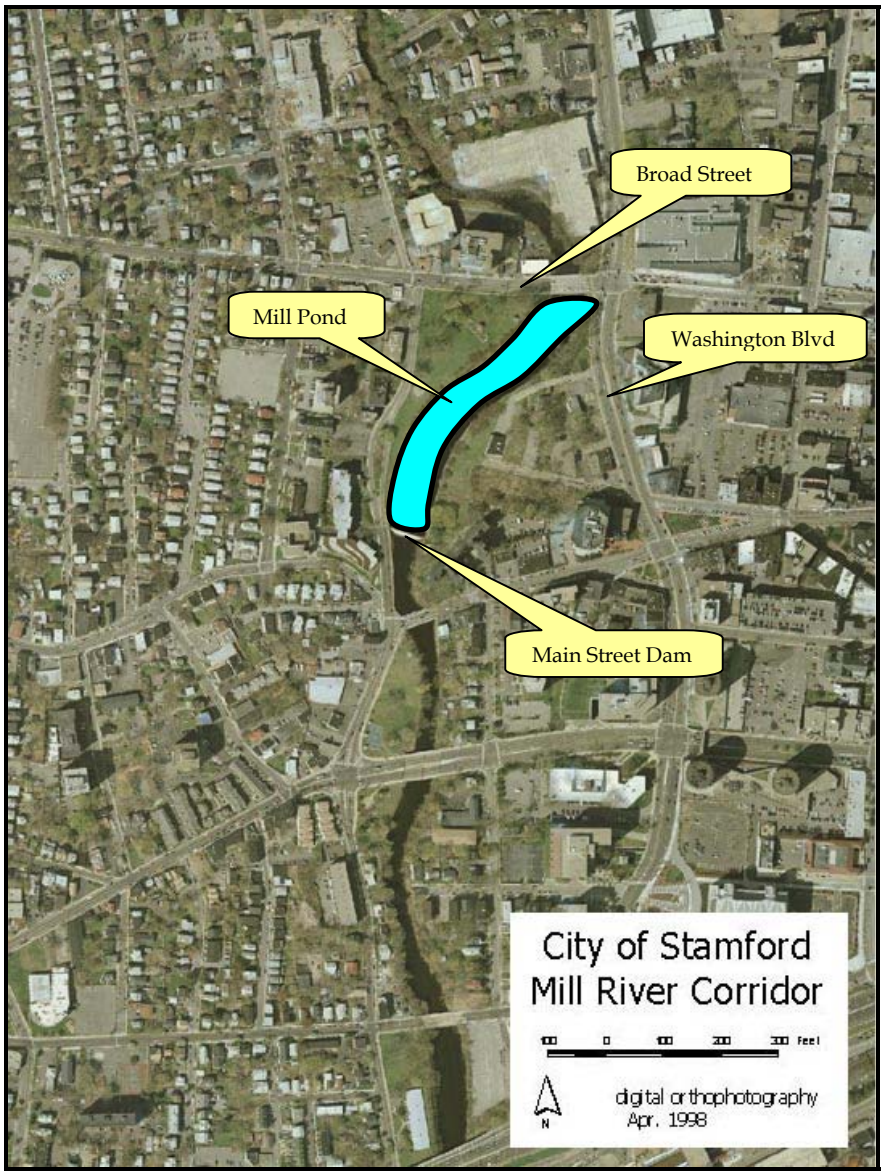

Figure 1. Location Map of Mill Pond in Stamford, Connecticut

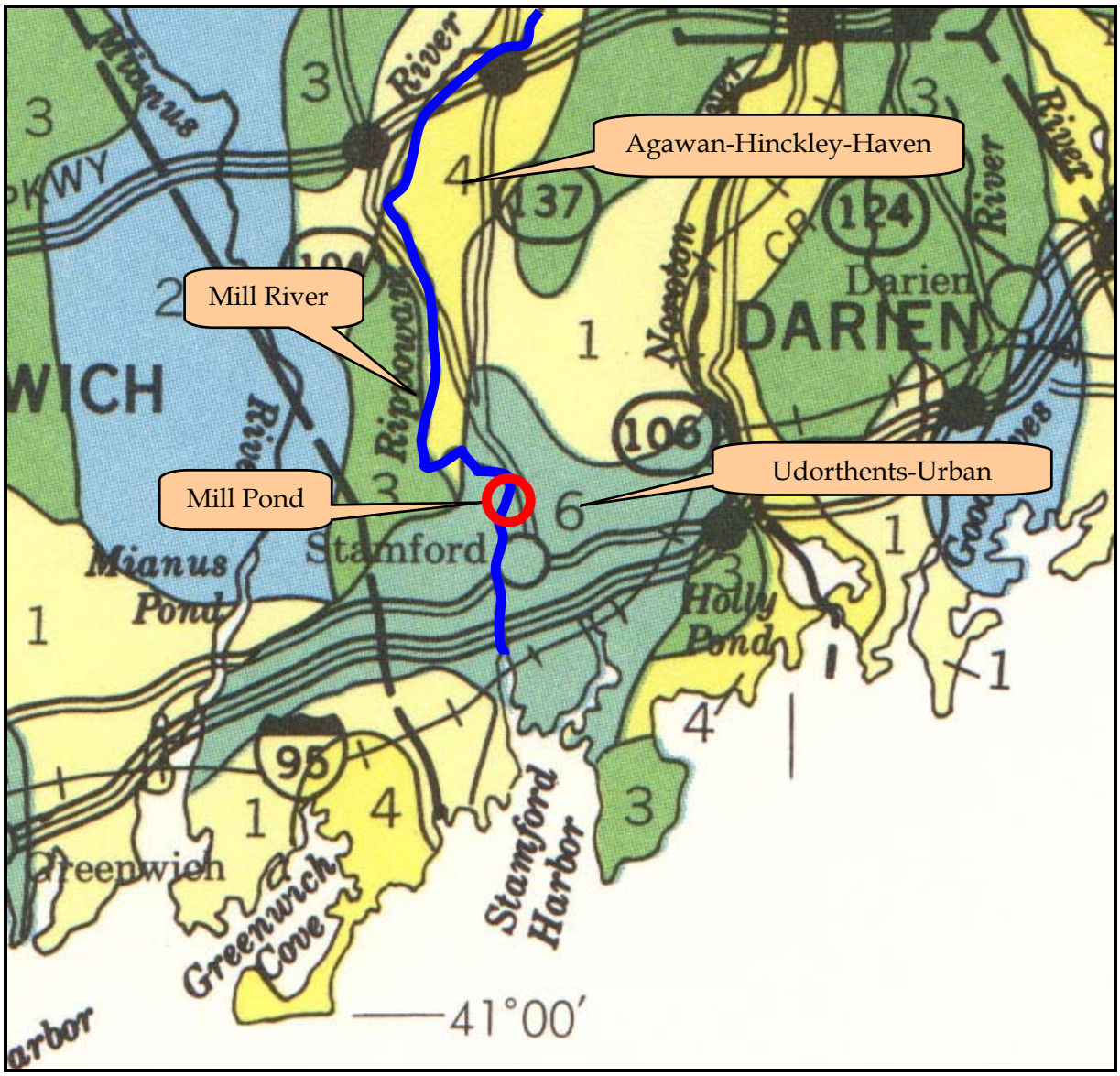

Figure 2. General Soils of Study Area