Goff Brook Ponds Study

Town of Wethersfield, Connecticut

1860 Reservoir

Murphy Pond

Griswold Pond

Mill Woods Pond

Bell Pond

April 2007

DD# 51683.00
Prepared by:

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GOFF BROOK PONDS STUDY
Town of Wethersfield, Connecticut

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GOFF BROOK PONDS STUDY
Town of Wethersfield, Connecticut

Introduction

The Town of Wethersfield has requested an assessment of the (five) ponds (1860 Reservoir, Murphy Pond, Griswold Pond, Mill Woods Pond and Bell Pond) in the upper watershed of Goff Brook. See the enclosed Location Plan and USGS Map.

The study has been precipitated by the desire to retain, restore and enhance the ponds, by the desire to implement the Mill Woods Master Plan, and by the desire to reduce or eliminate the required annual controlled herbicide applications to control algae growth and blooms in the ponds.

The purpose of the assessment is to determine the qualitative conditions of the ponds, what improvements may be required, and what priority sequencing for such improvements may be dictated.

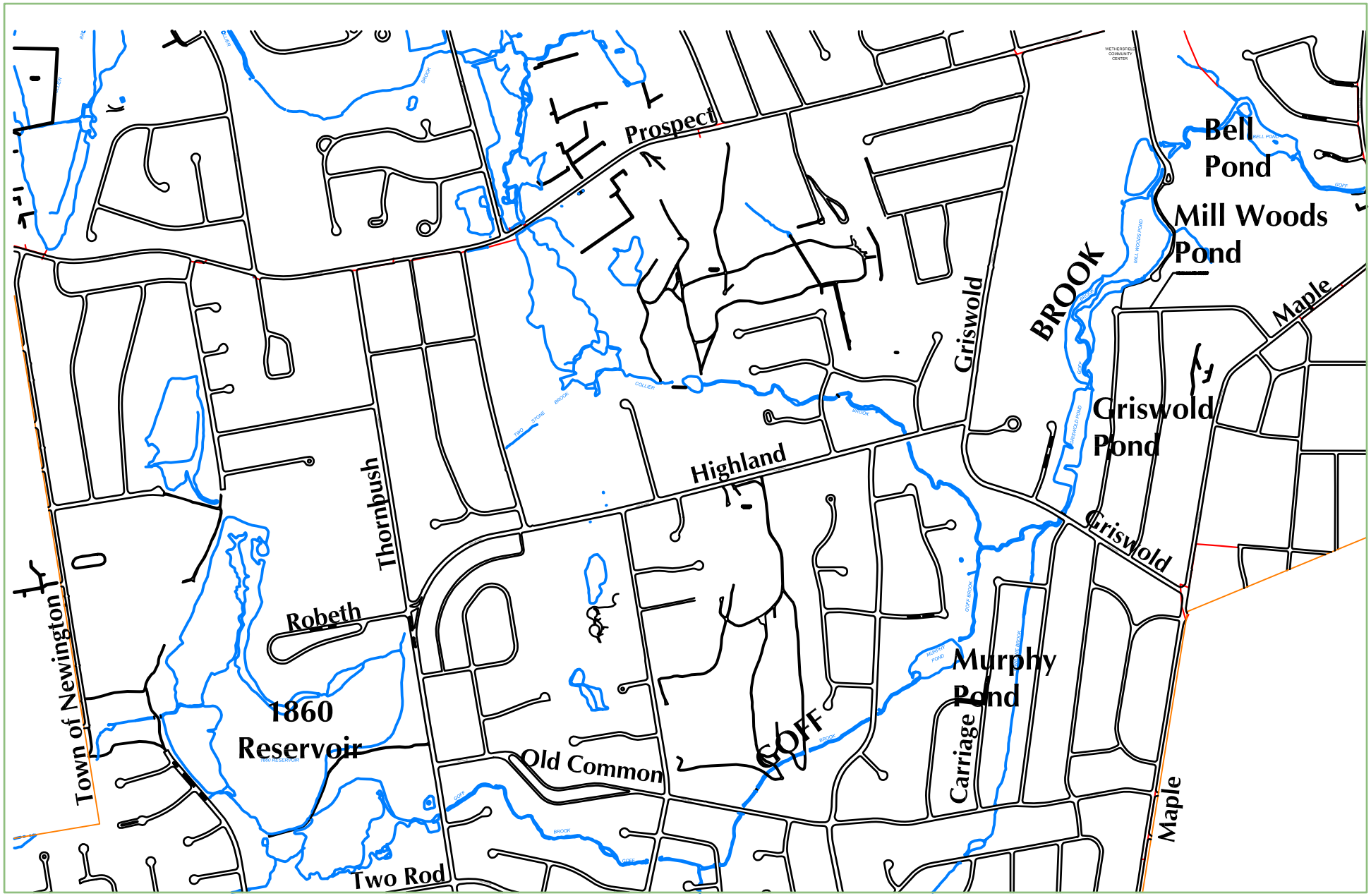
The Goff Brook watershed, to its outlet at Bell Pond, encompasses 3,200 acres, approximately 5 square miles. The primary objective of the watershed study is to determine the optimal environmental balance of the five water bodies (1860 Reservoir, Murphy Pond, Griswold Pond, Mill Woods Pond and Bell Pond) within the watershed.

The optimal environmental balance is attained when the water bodies serve the collective benefits of controlled storm flows, esthetic water quality, vegetative and wildlife enhancements, and passive recreational enjoyment.

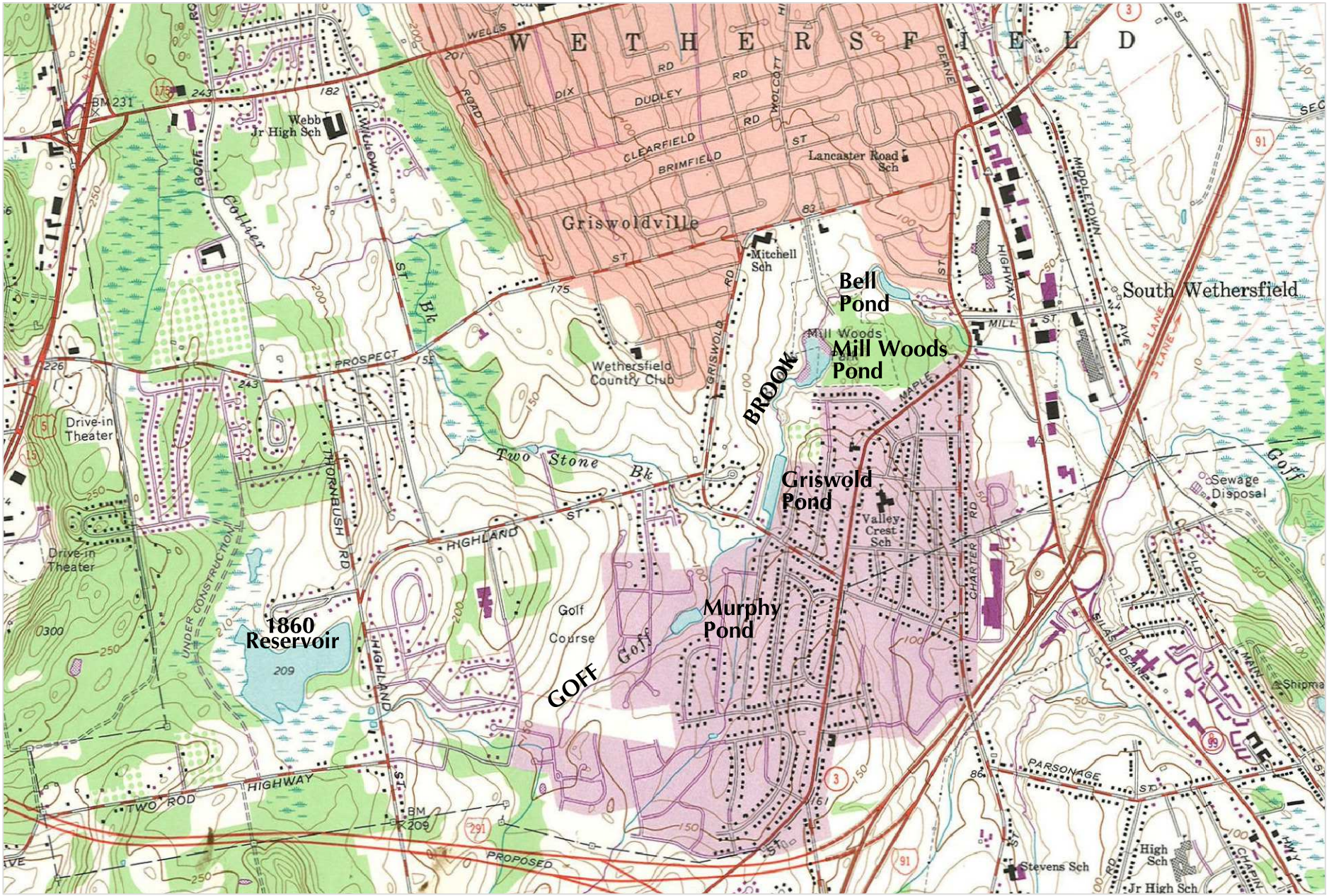
This watershed study evaluates the existing and proposed related parameters, including contributory flows, sediment loads, water quality, vegetative and wildlife environments, and passive recreational opportunities. This also includes identifying related required improvements to reduce or remove sediments, enhance water quality, and control access for appropriate uses.

Site visits, including photographs, to the watershed ponds (5) have been made. Field surveys, to determine the general water and sediment depths, have been performed. Basic water and sediment testing program parameters have been field collected and tested by the laboratory. The field inventory of vegetation and wildlife habitat of the ponds has been completed by the wetlands soil scientist.

Substantial previous dredging (removal of sediment from the bottom of the pond) was performed on two (2) of the ponds; to 5-foot depth in the 1860 Reservoir in 1985, and to 6-foot depth in Griswold Pond in 1990.



Location Map - Goff Brook Ponds Study - Scale: 1" = 1000'



USGS Map - Goff Brook Ponds Study - Scale: 1" = 2000'

Executive Summary

The Goff Brook Watershed and Ponds (1860 Reservoir, Murphy Pond, Griswold Pond, Mill Woods Pond and Bell Pond) are a treasured amenity to the abutting residents and the Town of Wethersfield. They provide a valuable and serene open space-open water environment encompassing diverse vegetation and wildlife.

However, the ponds have experienced marginal to substantial sediment accumulation. In concert with the prevailing shallow depths (less than 5-6 feet), the ponds are considered to be of fairly low rating for pond environment and water quality.

The Goff Brook Watershed and Ponds drain 3,200 acres and provide over 50 acres of open water area. Enclosed is the Ponds Data Summary Table showing pond and drainage areas, depths and volumes of water and sediment, the estimated restoration budget, and priority ranking for each pond.

Conclusions/Recommendations

The estimated cost to restore and enhance the ponds is approximately $2.5 million, of which 80% is for dredging sediment and deepening the ponds.

At present there are no indications that the dredged material would be constrained by environmental contamination. The material, whether by hydraulic or bulk earthwork dredging, could be beneficially reused as fill.

The general collective benefits of controlled storm flows, vegetation, wildlife and passive recreation are essentially in place and well functioning. Recommended vegetation controls consist essentially of removing invasive species, and retaining and enhancing lightly forested borders.

The short-term improvements consist of continuing the necessary annual applications of controlled herbicides, coupled with implementing any partial aspects of the recommended long-term improvements.

The required and recommended long-term improvements consist of four basic elements:

1. Reduce sediment transport to the ponds (Water Quality Control)
2. Remove accumulated sediment deposits from the ponds (Dredging)
3. Deepen portions of the existing ponds (Dredging)
4. Remove invasive species from the pond environs (Vegetation Control)

Of these elements, the lack of deepened areas has most likely been the primary long-term cause of recurring marginal water quality.

It is anticipated that the project would be phased over a two to five year period, depending on the final designs, funding and permitting.

Town of Wethersfield

Summary of Data for Goff Brook Ponds Study

	1860 Reservoir	Murphy Pond	Griswold Pond	Mill Woods Pond	Bell Pond	Totals
Tributory Area acres	*400*	*1,100*	*2,900*	*3,000*	*3,200*	*3,200*
% of Area	*12.5%*	*34.4%*	*90.6%*	*93.8%*	*100.0%*	*100.0%*
Water Elevation	209	107	76	70	60	
Water Depth	3	2	4.5	2.5	2	
Sediment Depth	0.5	3	1.5	2	2	
General Condition	Fair	Poor	Marginal	Marginal	Poor	
Pond Ave Length	*2200*	*500*	*900*	*1000*	*500*	
Pond Ave Width	*650*	*200*	*175*	*300*	*200*	
Pond Area acres	*32.8*	*2.3*	*3.6*	*6.9*	*2.3*	*47.9*
% of Area	*68.5%*	*4.8%*	*7.5%*	*14.4%*	*4.8%*	*100.0%*
Storage Vol-AcFt	*98*	*5*	*16*	*17*	*5*	*141*
% StorVol	*69.8%*	*3.3%*	*11.5%*	*12.2%*	*3.3%*	*100.0%*
Drain/Pond Ratio	*12*	*479*	*802*	*436*	*1,394*	*67*
Annual turn overs	*8*	*479*	*356*	*348*	*1,394*	*45*
Sediment Vol-AcFt	*16.4*	*6.9*	*5.4*	*13.8*	*4.6*	*47.1*
% SedVol	*34.9%*	*14.6%*	*11.5%*	*29.3%*	*9.8%*	*100.0%*
Dredge Factor	*15%*	*70%*	*50%*	*50%*	*70%*	*43%*
Dredge Vol-AcFt	*2.5*	*4.8*	*2.7*	*6.9*	*3.2*	*20.1*
%DredgeVol	*12.3%*	*24.0%*	*13.5%*	*34.3%*	*16.0%*	*100.0%*
Dredge CY	*3,939*	*7,713*	*4,339*	*11,019*	*5,142*	*32,153*
Dredge Budget	*$ 220,000*	*$ 420,000*	*$ 240,000*	*$ 610,000*	*$ 280,000*	*$ 1,770,000*
Vegetation Budget	*$ 60,000*	*$ 30,000*	*$ 20,000*	*$ 50,000*	*$ 20,000*	*$ 180,000*
WQC Budget	*$ 40,000*	*$ 75,000*	*$ 100,000*	*$ 50,000*	*$ 25,000*	*$ 290,000*
Restoration Budget	*$ 350,000*	*$ 580,000*	*$ 400,000*	*$ 780,000*	*$ 360,000*	*$ 2,470,000*
Priority Ranking	**5**	**1**	**4**	**3**	**2**	

Town of Wethersfield

Summary of Data for Goff Brook Ponds Study

	Explanatory Footnotes
Tributory Area acres	Represents cummulative tributory drainage area to respective ponds
% of Area	Represents respective % of total drainage area
Water Elevation	Represents assumed/relative water surface elevation of pond
Water Depth	Represents average existing water depth from surface to top of sediment
Sediment Depth	Represents average existing sediment depths from probes
General Condition	Represents opinion of general relative condition
Pond Ave Length	Represents average length of pond
Pond Ave Width	Represents average width of pond
Pond Area acres	Represents total surface area of pond
% of Area	Represents respective % of total pond areas
Storage Vol-AcFt	Represents existing water storage volume, in acre-feet
% StorVol	Represents respective % of total pond volumes
Drain/Pond Ratio	Represents number of drainage acres per pond area acres
Annual turn overs	Represents annual water volume turn over for 4 Ft Rainfall, 50% run-off factor
Sediment Vol-AcFt	Represents existing sediment deposits volume, in acre-feet
% SedVol	Represents respective % of total pond sediment volumes
Dredge Factor	Represents recommended factor, % of total pond sediment volumes to be removed
Dredge Vol-AcFt	Represents computed total pond sediment volumes to be removed, in acre-feet
%DredgeVol	Represents respective % of total pond sediment volumes to be removed
Dredge CY	Represents computed total pond sediment volumes to be removed, in cubic yard
Dredge Budget	Represents costs, including 10% for deepening, for sediment removal
Vegetation Budget	Represents costs to remove invasives and enhance edge plantings
WQC Budget	Represents costs to add sedimentation control structures to closed drain pipe systems
Restoration Budget	Represents total of above, plus 10% design/contingency factor
Priority Ranking	Represents recommended alternative** phasing to optimize environmental restoration

** Simplest and preferred phasing is from upstream (1860 Reservoir) to down stream (Bell Pond).

Ponds Environment Inventory

Enclosed are the ponds environment inventory plans for each of the ponds:

ENV1 – 1860 Reservoir
ENV2 – Murphy Pond
ENV3 – Griswold Pond
ENV4 – Mill Woods Pond
ENV5 – Bell Pond

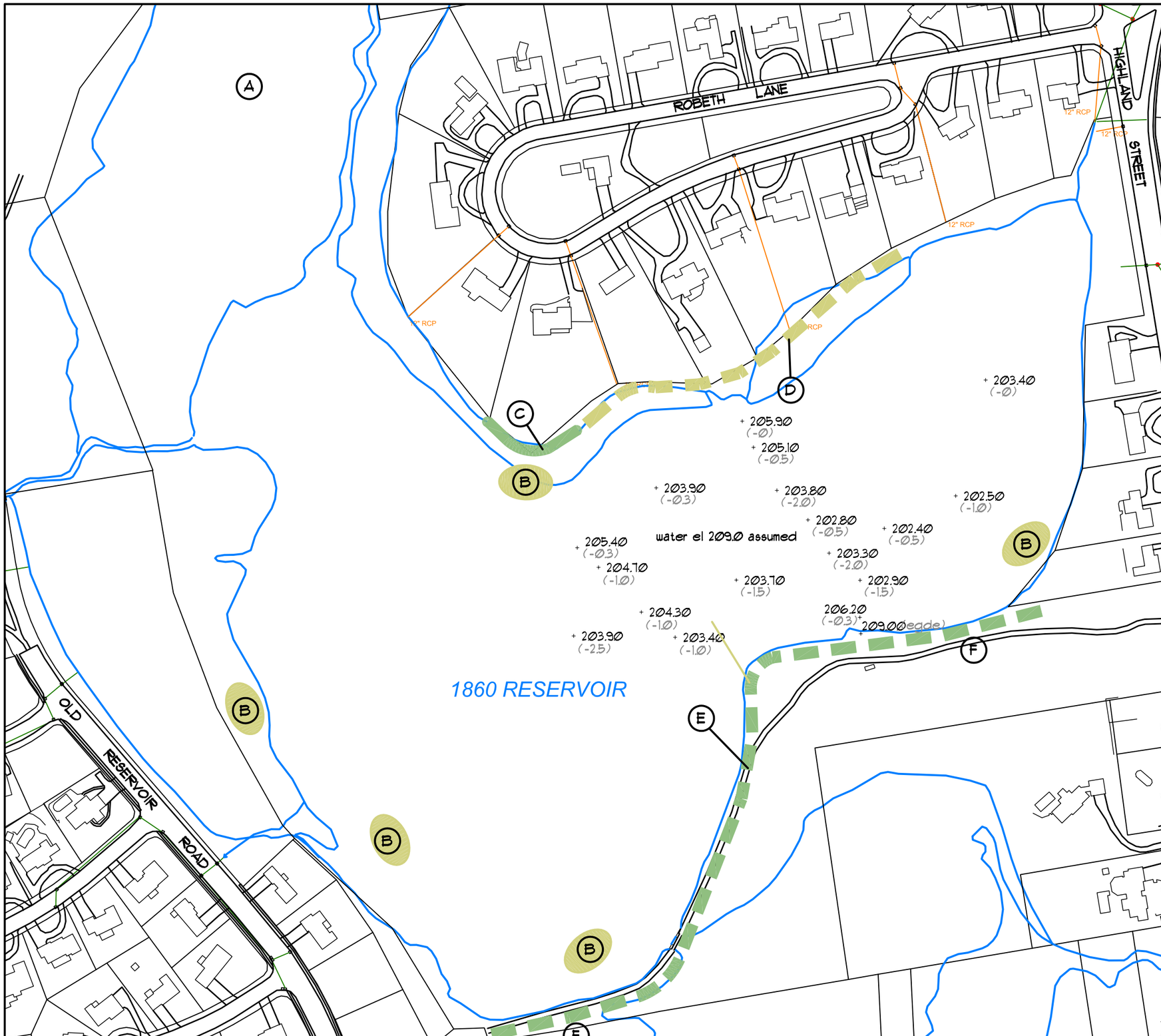
These plans depict the field inventory of observed vegetative and wildlife environments, as well as the field surveyed water and sediment depths for the respective pond.

They reflect and confirm a diversity of vegetation and wildlife, including aquatic species.

Of particular note and concern is the presence of invasive species, including phragmites and purple loosestrife, which should be controlled and removed prior to accelerated growth. By their nature, exotic invasive species are not indigenous and tend to multiply rapidly, excluding natural mixed species and providing a severely limited habitat for wildlife.

Waterfowl, such as geese and swans, are always attracted to open water bodies. Generally they will only stay for extended periods when they have unobstructed access to abutting uplands, particularly open lawn areas. Obstruction of the access way can be as little as a simple fence, wire or plantings arrangement within the first vertical foot along the edge of the water.

Generally all of the town owned ponds are accessible to the public for limited passive recreation, primarily consisting of hiking and small non-powered watercraft, such as canoes or row boats. There are walking trails and/or observation areas. Substantial edges of the ponds are bordered by residential properties. No active recreation such as swimming, power craft, or structure encroachments is presently allowed.



WILDLIFE

Wildlife Observed on 9/5/06:

2 mute swans
9 mallards
2 Great Blue Herons
Green Heron
Eastern Water Snake
Canadian Geese
Muskrat

Pond supports a fishery of large Mouth bass, small mouth bass, Bluegill, Pickeral according to Fisherman.

PLANT LIFE

(A) Scrub-Shrub Marsh

Plants growing in reservoir:

(B) Yellow Pond Lily (sparse)
Duckweed (sparse)
Coontail (sparse)

(C) cattails

(D) phragmites

(E) Vegetation growing along edge of pond:

. Red Maple
. Silky Dogwood
. Willow
. Speckled Alder
. Red Oak
. Gray Birch
. Winterberry
. Jewelweed
. Purple Loostrife (sparse) *
. Japanese Barberry (sparse) *
. Morrowii Honeysuckle (sparse) *
. Asiatic Bittersweet *

(F) wooded area
* exotic invasive plant

+ 113.50 Bottom Elev.
(-1.0) (Depth of Sediment)

NO.	DATE	REVISIONS

DESIGNED BY: SEB
DRAWN BY: SEB
CHECKED BY: RS
APPROVED BY: FTC

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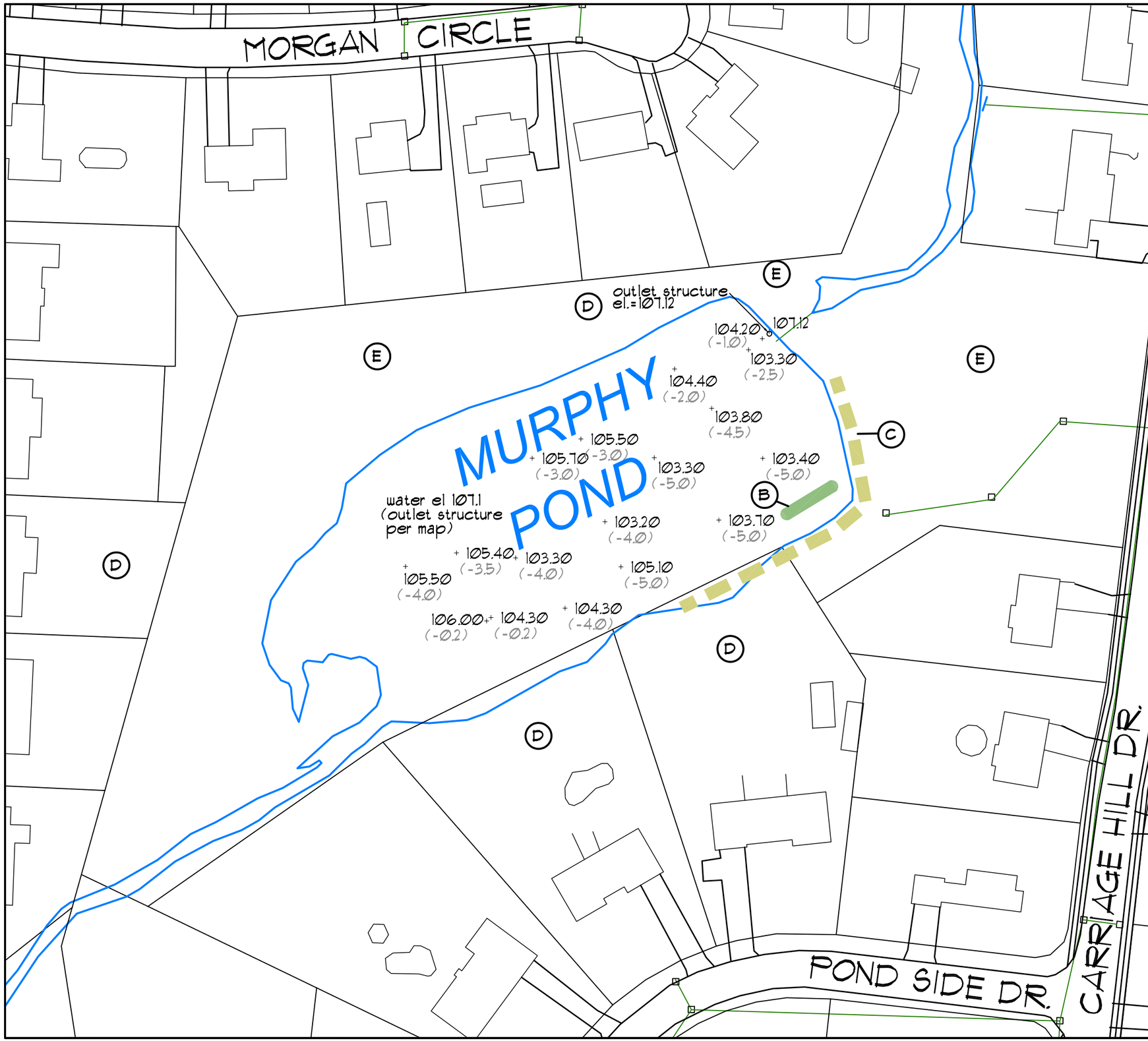
GOFF BROOK PONDS STUDY

1860 RESERVOIR
WETHERSFIELD CONNECTICUT

JOB NO: 51683.00
CADD NO.: EN168301
FILE NO.: -

POND ENVIRONMENT INVENTORY

SCALE: N.T.S.
DATE: 2/5/07
DRAWING NO.: ENV-1



WILDLIFE

Wildlife Observed on 9/5/06:

Great Blue Heron
11 mallards
painted turtles
King Fisher
Canada Geese
snapping turtles

Wildlife observed by neighbor:

raccoon
muskrat
Bullheads

PLANT LIFE

Submerged aquatic plants in Pond:

(A) Duckweed (abundant)
Watermeal (abundant)
Waterpurslane (sparse)
Coontail (sparse)

(B) cattails

(C) Vegetation growing along edge of pond:

. Silver Maple
. Sugar Maple
. Red Maple
. Speckled Alder
. Willow
. Multiflora Rose *
. Purple loostrife *
. Morrowii Honeysuckle *
. New York Ironweed
. Narrowleaf Goldenrod
. Foxgrape
. Asiatic Bittersweet*

*Exotic invasive plant

(D) lawn area

(E) wooded area

+ 113.50 Bottom Elev.
(-1.0) (Depth of Sediment)

NO.	DATE	REVISIONS

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DRAWN BY: SEB
CHECKED BY: RS
APPROVED BY: FTC

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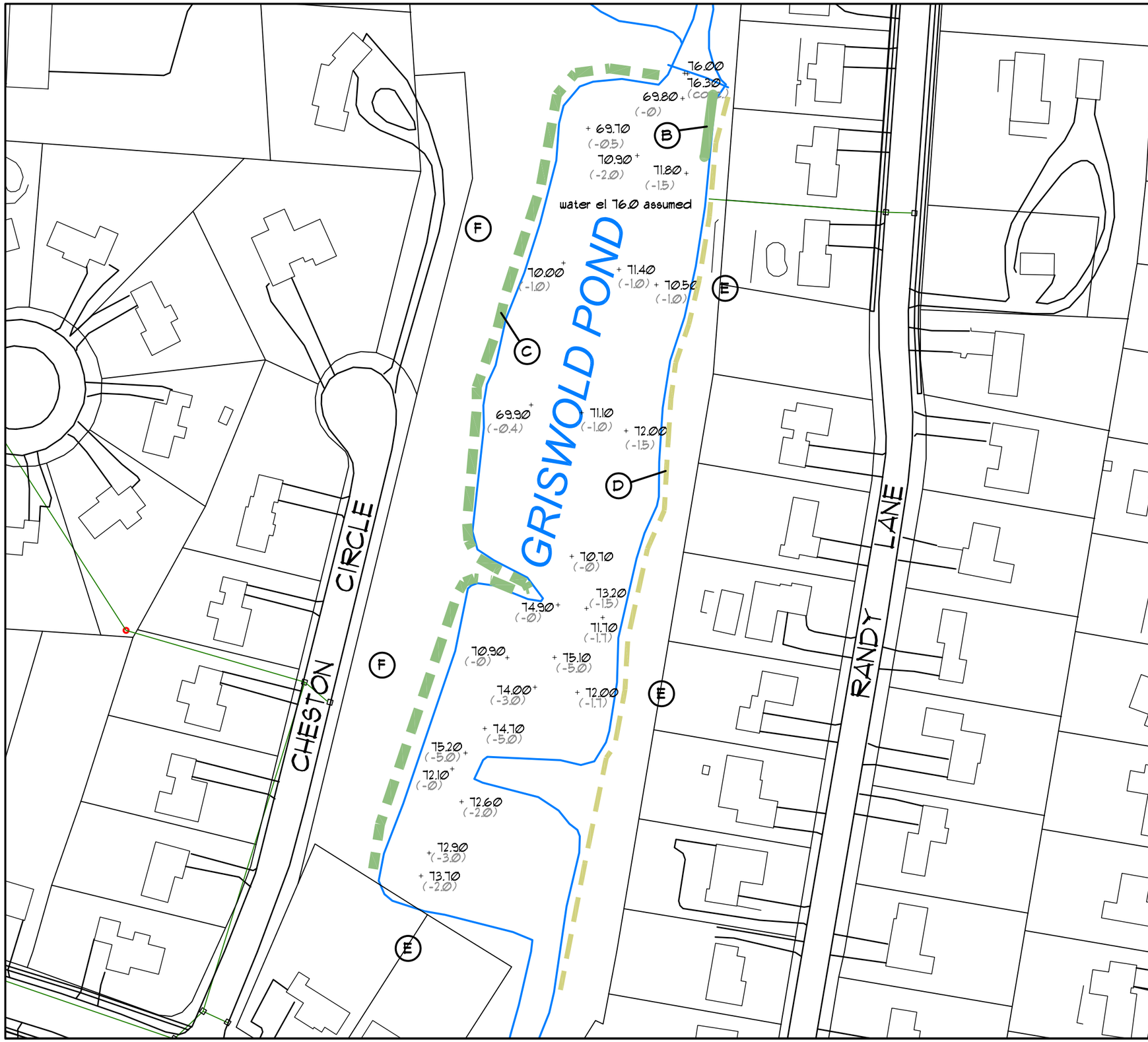
GOFF BROOK PONDS STUDY

MURPHY POND
WETHERSFIELD
CONNECTICUT

JOB NO: 51683.00
CADD NO.: EN168301
FILE NO.: -

POND ENVIRONMENT INVENTORY

SCALE: N.T.S.
DATE: 2/5/07
DRAWING NO.: ENV-2



WILDLIFE

Wildlife Observed on 9/5/06:

Great Blue Heron
8 painted turtles
2 mallards
King Fisher
Green Heron
Canada Geese

PLANT LIFE

Vegetation growing in Pond:

(A) Elodea nutalli (sparse)
Coontail (sparse)
Duckweed (abundant)

(B) cattails

(C) Vegetation growing along edge of pond:

. Red Maple
. Willow
. Silky Dogwood
. Fox Grape
. Silver Maple
. Jewelweed

. Multiflora Rose *

*Exotic invasive plant

(D) Narrow Vegetation Strip Along Edge of Pond:

. Soft stem Bulrush
. Silky Dogweed
. Narrowleaf Goldenrod
. Arrowhead
. Purple loostrife
. Rice Cut Grass
. Jewelweed
. Speckled Alder

(E) lawn area

(F) wooded area

+ 113.50 Bottom Elev.
(-1.0) (Depth of Sediment)

NO.	DATE	REVISIONS

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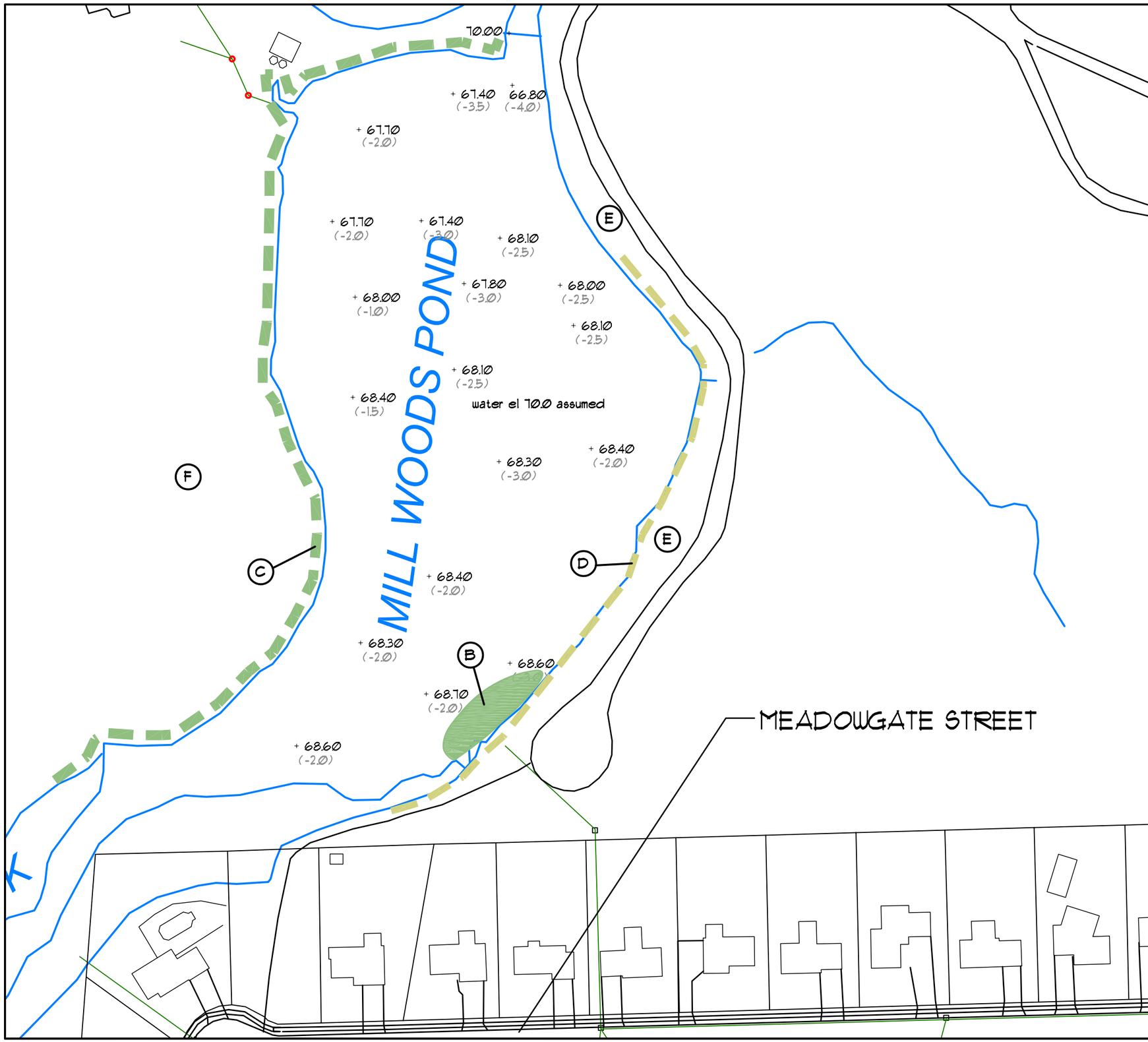
GOFF BROOK PONDS STUDY

GRISWOLD POND
WETHERSFIELD
CONNECTICUT

JOB NO: 51683.00
CADD NO: EN16830I
FILE NO: -

POND ENVIRONMENT INVENTORY

SCALE: N.T.S.
DRAWING NO.: ENV-3
DATE: 2/5/07



WILDLIFE

Wildlife Observed on 9/5/06:

31 mallards
5 Canada Geese
Great Blue Heron
Painted turtles
3 mute swans
Green Frogs

PLANT LIFE

Vegetation growing in Pond:

(A) Duckweed (abundant)
Elodea nutalli (abundant)
Coontail (common)

(B) Marsh:
. cattail
. Rice cut Grass
. Burreed
. Arrowhead
. Speckled Alder

(C) Vegetation growing along edge of pond:

. Silver Maple
. Red Maple
. Silky Dogwood
. Speckled Alder
. Sensitive Fern
. Arrowhead
. Multiflora Rose *
. Tussock Sedge
. Jewelweed

*Exotic invasive plant

(D) 5-12 foot wide Vegetation Strip Along Edge of Pond:

. Silky Dogweed
. Multiflora Rose *
. Morrowii Honey Suckle *(common)
. Red Maple Trees
. Red Oak Trees
. Speckled Alder
. Northern Arrowwood
. Rough stem Goldenrod
. Purple loostrife *(sparse)

*Exotic invasive plant

(E) lawn area

(F) wooded area

+ 113.50 Bottom Elev.
(-1.0) (Depth of Sediment)

NO.	DATE	REVISIONS

DESIGNED BY: SEB
DRAWN BY: SEB
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APPROVED BY: FTC

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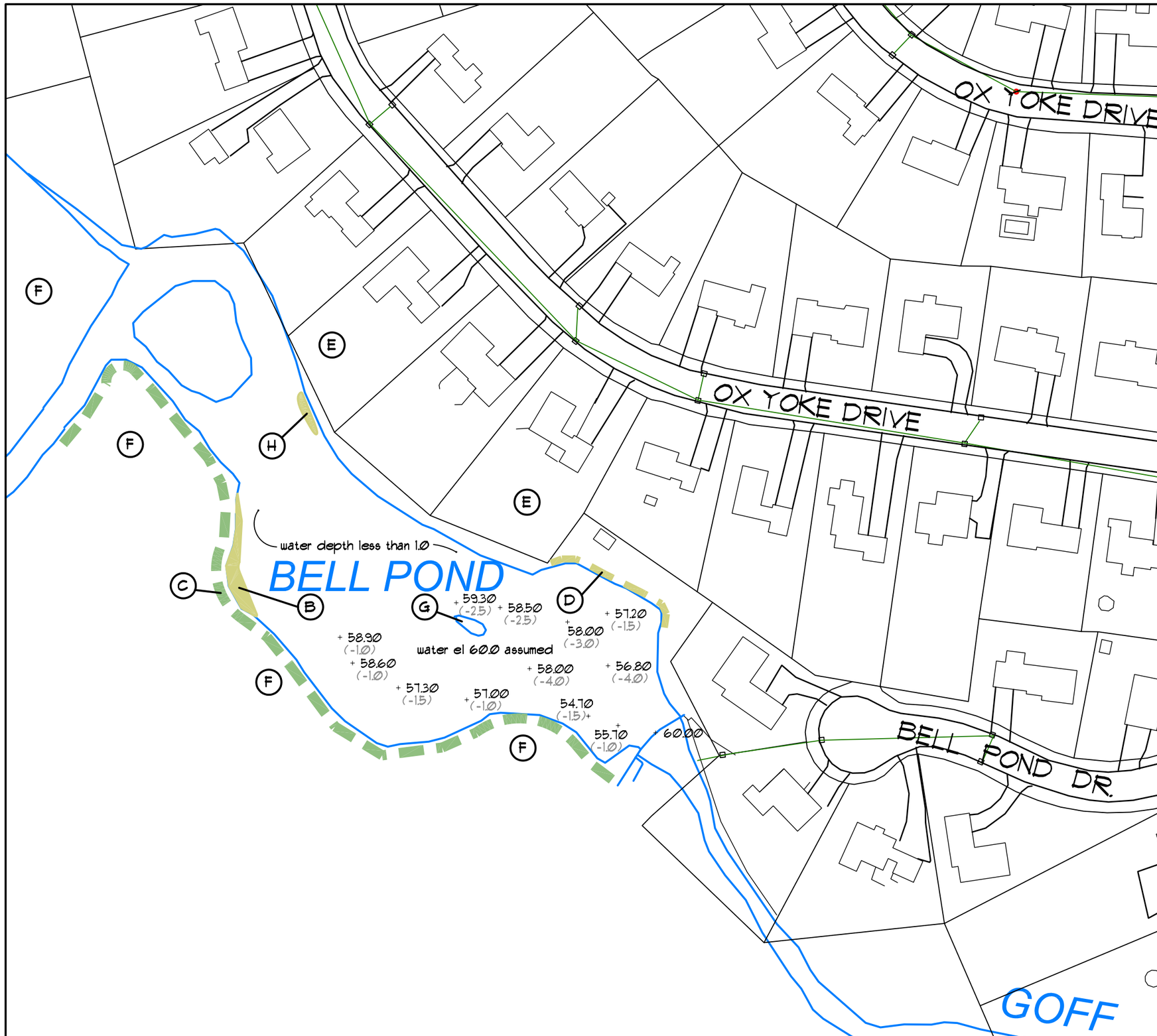
GOFF BROOK PONDS STUDY

MILL WOODS POND
WETHERSFIELD
CONNECTICUT

JOB NO: 51683.00
CADD NO.: EN168301
FILE NO.: -

POND ENVIRONMENT INVENTORY

SCALE: N.T.S.
DRAWING NO.: ENV-4
DATE: 2/5/07



WILDLIFE

Wildlife Observed on 9/5/06:

Night Heron
Great Blue Heron
King Fisher
mallards
Canada Geese
Muskrat
Green Frogs
Painted Turtle
Bull Frogs
Beaver have been in pond but have appeared to have left.

PLANT LIFE

Vegetation growing in Pond:

(A) Yellow Pond Lily (abundant, covers 70% of pond)
Duckweed (abundant)
Water meal (abundant)

(B) Arrowhead

(C) Vegetation growing along edge of pond:

. Red Maple
. Speckled Alder
. Silky Dogwood
. Red Oak
. American Beech
. Japanese Barberry *
. Jewelweed
. Purple loostrife *

*Exotic invasive plant

(D) Vegetation Strip Along Edge of Pond:

. Red Maple
. Silky Dogweed
. Red Oak
. Ash
. Purple loosestrife *

*Exotic invasive plant

(E) lawn area

(F) wooded area

(G) Island

(H) Deepwater Duck Potato

+ 113.50 Bottom Elev.
(-1.0) (Depth of Sediment)

NO.	DATE	REVISIONS

DESIGNED BY: SEB
DRAWN BY: SEB
CHECKED BY: RS
APPROVED BY: FTC

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GOFF BROOK PONDS STUDY

BELL POND
WETHERSFIELD
CONNECTICUT

JOB NO: 51683.00
CADD NO: EN168301
FILE NO: -

POND ENVIRONMENT INVENTORY

SCALE: N.T.S.
DRAWING NO.: ENV-5
DATE: 2/5/07

Sediment Loading & Deposits

There are several hypothetical sediment run-off theoretical models, such as the (Revised) Universal Soil Loss Equation model, equating per acre sediment run-off, which have been developed for crop lands and large-scale evaluation purposes. They tend to yield 2-10 Tons (0.01-0.05 inch or so) per acre per year of sediment run-off. However, no simplified program or studies have been performed or published that address the realities of a variably defined watershed such as Goff Brook.

For this project and purposes, the site specific developed data provides an empirical basis to implement a meaningful premise and program, specifically oriented to a Water Quality Control (WQC) component.

As noted on the enclosed plans and the summary data table, the general depth and volume of sediment deposits have been identified and computed.

The total sediment deposit volume (48 Acre-Feet) equates to approximately 0.2 inches of sediment deposit run-off for the entire drainage basin area (3,200Ac). For a 20-year period, this would net 0.01 inches of sediment run-off per acre per year, or a total annual sediment volume of 2.4 acre-feet per year.

Reducing Sediment Transport

It is proposed, assumed and recommended that 50% of this volume (approximately 1 acre-foot, or 1600CY) is transported through the closed/pipe drainage systems and can and should be captured via Drainage Structures/Sediment Capture Structures (400-800 cf storage volume each).

This would yield and require approximately 40-60 structures throughout the system, which roughly corresponds to the number of pipe discharges to the brooks, streams and ponds within the watershed.

The structures, as with all existing catch basin sumps, would require annual maintenance cleanout of the accumulated sediments. The Town provides annual town-wide cleaning of catch basin sumps (6-8 cf storage volume each), approximately 3,000 each. This equates to approximately 0.5 acre-feet of sediment removal per cleaning.

Dredging

Removal of the sediments and deepening the ponds is paramount in restoring and enhancing the ponds. It is critical to avoid large areas of shallow depth (<4 feet). It is further desirable and beneficial to create portions and areas of deeper (≥8 feet) depths to allow thermal interaction, naturally exchanging warmer water near the surface with cooler water from the groundwater levels.

Dredging is performed either by hydraulic (pipe suctioning) means, as was done at the 1860 Reservoir (in 1985 to nominal 5 foot depths), or by bulk earthwork operations, as was done at Griswold Pond (in 1990 to nominal 6 foot depths).

The prior dredging certainly improved, enhanced and prolonged the life of the ponds, which were in dire condition. Unfortunately, in both prior instances no significant deepening of any areas was incorporated.

Griswold Pond further attempted and incorporated a forebay concept, to isolate and capture sediment, at the westerly entry point of Goff Brook to Griswold Pond. This consisted of constructing a peninsula berm jutting from the southerly edge of the pond, approximately 125 feet from the brook entry. This has served of some limited benefit, retaining the majority of transported sediment in the westerly portion of the pond. However, it does not include provisions for the periodic removal of the sediment, and the transported sediment has been substantially forced around the forebay into the pond proper.

Generally hydraulic dredging would be the preferred means to sediment removal. This method best retains and accommodates the existing water surface and environs during construction. It is the likely approach to the work for Mill Woods Pond and the 1860 Reservoir.

Bulk earthwork operations would be preferred for significant restructuring of the pond configurations and contoured grading. This involves dewatering of the pond and temporary handling of the flows for Goff Brook through or around the work area. It is the likely approach to the work for Murphy Pond, Griswold Pond and Bell Pond.

Either dredging operation would require significant staging and work areas outside the pond. This will likely involve substantial (temporary) easements on abutting properties at each pond, more so at the smaller ponds, less so at the larger ponds which have larger abutting areas of town owned property.

Drainage Basins/Water Budget
Table: Drainage Basin Areas

The Goff Brook watershed drainage basin to Bell Pond encompasses 3,200 acres comprised of 20 cumulative sub basin drainage areas as shown on the enclosed Drainage Basin Areas map and summary table.

There is an abundance of water (rainfall) to fill and support the ponds. As noted on the Ponds Data summary table there are numerous annual volume turnovers for each of the ponds.

However there are two basic problems, how the water gets to the ponds, and what it does upon arrival. It gets there primarily from closed/pipe discharge systems, as shown on the town wide mapping entitled Storm Sewer Master Plan. This consists primarily of street drainage systems carrying substantial sediment. When it gets there, it is constrained to shallow depth laminar flow, allowing sediment deposit and flow-through. The cycle of deterioration, retaining undesirable shallow depth still water continues.

The ponds generally have limited dam structure outlet controls. They provide passage of daily and peak flows, with limited water level controls. None of the outlet controls allows for dewatering of the respective pond without supplemental pumping.

Goff Brook Drainage Basin Areas - Acres

Upper	Basin	Area Acres	Path		Cumulative Area Acres		Lower	
	G1	**400**	to G2		**400**	to G2		**1860 Reservoir**
	DET1	77	to G2					
	DET2	50	to G2					
	G2	129	to G3	*256*	656	to G3		
	G3	122	to G5		939	to G5		
	DET3	126	to G4			to G3		
	G4	36	to G3	***162***		to G5		
	G5	**185**	to G15		**1,124**			**Murphy Pond**
	G5		to G15		2,384			
	G5		**to G15**		2,784			
	G6	256	to G7					
	G7	123	to G9	380		to G9		
	G8	331	to G9	711		to G9		
	G9	112	to G10	823				
	G10	240	to G11	1,063				
	G11	197	to G5		1,261	to G5		Two Stone Brook
	G12	145	to G13					
	G13	111	to G14	256				
	G14	143	to G15	400				Fairlane Brook
	G15	**78**	to G16		**2,861**			**Griswold Pond**
	G16	**102**	to G17		**2,963**			**Mill Woods Pond**
	G17	**233**			**3,197**			**Bell Pond Pond**

GB Ponds Watershed to Bell Pond
3197 Acres

Water Quality & Soils Testing
Table: Lab Results

Basic water (10) and sediment (2) testing program parameters were selected and tested to provide an overview of the existing and potential water quality, and to assess possible dredging constraints.

By historical observation of summertime algae blooms in virtually all of the ponds, it is presumed and acknowledged that the water quality moderately to greatly suffers under low flow and high temperature conditions.

The first round of testing was performed in December 2006 to capture and evaluate a basis of presumed higher quality readings, following the fall time rainfall 'flushing' and temperature changes. The results are shown on the enclosed summary lab results table and included in Appendix C.

The water quality results indicate a moderate to healthy environment with a discerning pervading presence of algae. The sediment testing results indicate moderately coarse sediment not containing hazardous contaminants.

The additional, second round, testing will be performed in late spring/early summer to confirm and verify the water quality and to get more detail (particularly turbidity potential and possible organics) on the sediments subject to dredging.

Goff Brook Upper Watershed

Water Quality & Soil Sample Testing Round # 1 Testing December 2006

Single Rnd/Pond		860 Reservoir	Murphy Pond	Griwold Pond	Mill Pond	Bell Pond
per 100ml	E. coli Count	2	140	120	74	12
	Aerobic Plate Count					
per 1ml	Heterotrophic Plate Count	400	7300	1300	1600	820
per 1ml	Algae Count	48	170	88	140	64
mg/L	Alkilinty	82	146	162	158	154
mg/L	BOD	<3	<3	<3	<3	<3
per 100ml	Coliform Bacteria	TNTC	TNTC	TNTC	TNTC	TNTC
mg/L	Disolved Oxygen	9.6	8.9	8	8.6	9.9
mg/L	Nitrate-Nitrogen	0.09	2	26.3	1.8	0.06
	PH	7.5	7.8	7.3	8	7.6
mg/L	Phosphorus	0.02	0.026	0.04	0.04	0.04
Degree F	Temperature	37	53	50	33	33
Alge	per 1ml	48	168	88	136	64
Diatomaceae						
	Fragilaria			16	8	
	Navicula		88	56	96	48
	Synedra	16	80	16	24	16
Chlorophyceae						
	Scenedesmus	16				
	Staurastrum	16				
Protozoa						
	Euglena				8	

Seive Analysis					
#4	18.0%	8.2%	25.5%	10.3%	6.4%
#6	15.9%	11.9%	23.9%	15.8%	6.4%
#12	14.7%	14.8%	16.7%	19.2%	7.5%
#20	16.8%	15.6%	12.4%	22.6%	9.8%
#30	11.9%	24.4%	14.7%	21.2%	35.3%
#40	12.4%	20.7%	2.8%	4.8%	31.8%
#100	8.3%	2.2%	2.8%	4.1%	1.7%
Pan	2.0%	2.2%	1.2%	2.0%	1.1%
	100.0%	100.0%	100.0%	100.0%	100.0%

Vol & Non-vol Solids					
Non-Volatile	60.8%	11.4%	65.4%	20.7%	14.4%
Volatile	1.8%	1.1%	1.3%	1.6%	0.8%

Permits

The annual application of herbicides (Reward and Captain) requires a CT DEP Permit for each application. The vendor (Lycott Environmental) secures this permit on behalf of the Town.

The proposed restoration will require permits from the Town of Wethersfield Inland Wetlands & Watercourses Commission for activities in the wetlands and watercourses, and from the CT DEP and US Army Corps of Engineers for Dredging.

Summary of Recommended Improvements

The short-term improvements consist of continuing the necessary annual applications of controlled herbicides, coupled with implementing any partial aspects of the recommended long-term improvements.

As noted on the Ponds Data Summary Table, the priority ranking focuses on the respective pond condition as a relative control. The desired sequencing would be from the upper to lower watershed. However, virtually any of the long term improvements can and could be implemented whenever economically feasible to reduce or prevent further deterioration.

The required and recommended long-term improvements consist of four basic elements:

1. Reduce sediment transport to the ponds (Water Quality Control)
    a. Install sediment capture drainage structures on the pipe drainage system outlets to the streams and ponds within the watershed.
    b. Provide a maintenance program for annual monitoring and cleaning of the structures.
2. Remove accumulated sediment deposits from the ponds (Dredging)
3. Deepen portions of the existing ponds (Dredging)
4. Remove invasive species from the pond environs (Vegetation Control)

a. Supplement abutting edge plantings with a mixture of wetland and upland species bushes.

Cost Estimates

The cost estimate/budget for the proposed restoration of the Goff Brook Ponds is provide and summarized on the enclosed Ponds Data Summary Table, including clarifying footnotes. It provides a detailed planning level estimate and budget to accomplish the necessary work, including design and construction.

Appendix A:

Photographs

1860 Reservoir

1860 Reservoir

1860 Reservoir – 9/06

1860 Reservoir – 9/06

Murphy Pond – 8/06

Murphy Pond - 8/06

Griswold Pond – 9/06

Griswold Pond – 9/06

Mill Woods Pond – 8/06

Mill Woods Pond – 8/06

Bell Pond – 9/06

Bell Pond – 9/06

Appendix B:

Laboratory Test Data

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

TELEPHONE: Toll Free (in CT) 800-826-0105 (Outside CT) 800-654-1230
Berlin/Hartford Area: (860) 828-9787 FAX: (860) 829-1050
E-Mail: NELABSCT@AOL.COM www.NortheastLaboratories.com

ACCREDITED IN ACCORDANCE WITH nelac

Report and Invoice Number: N0638471	Printed: 2/5/2007 9:29 AM

Fred Clark
DeCarlo & Doll
1952 Whitney Avenue
Hamden, CT 06517

Sample Site: Wethersfield Ponds #1-#5
Sampled by: Alfred A. Reigins on 12/11-13/2006

Thank you for having called Northeast Labs for your y sampling needs.
I am very sorry that there were delays in getting this report to you. I had most of the data early on but was waiting for the last portion to write the reports in their entirety at one time, at that time there were too may projects to allow ample time to write them until now.

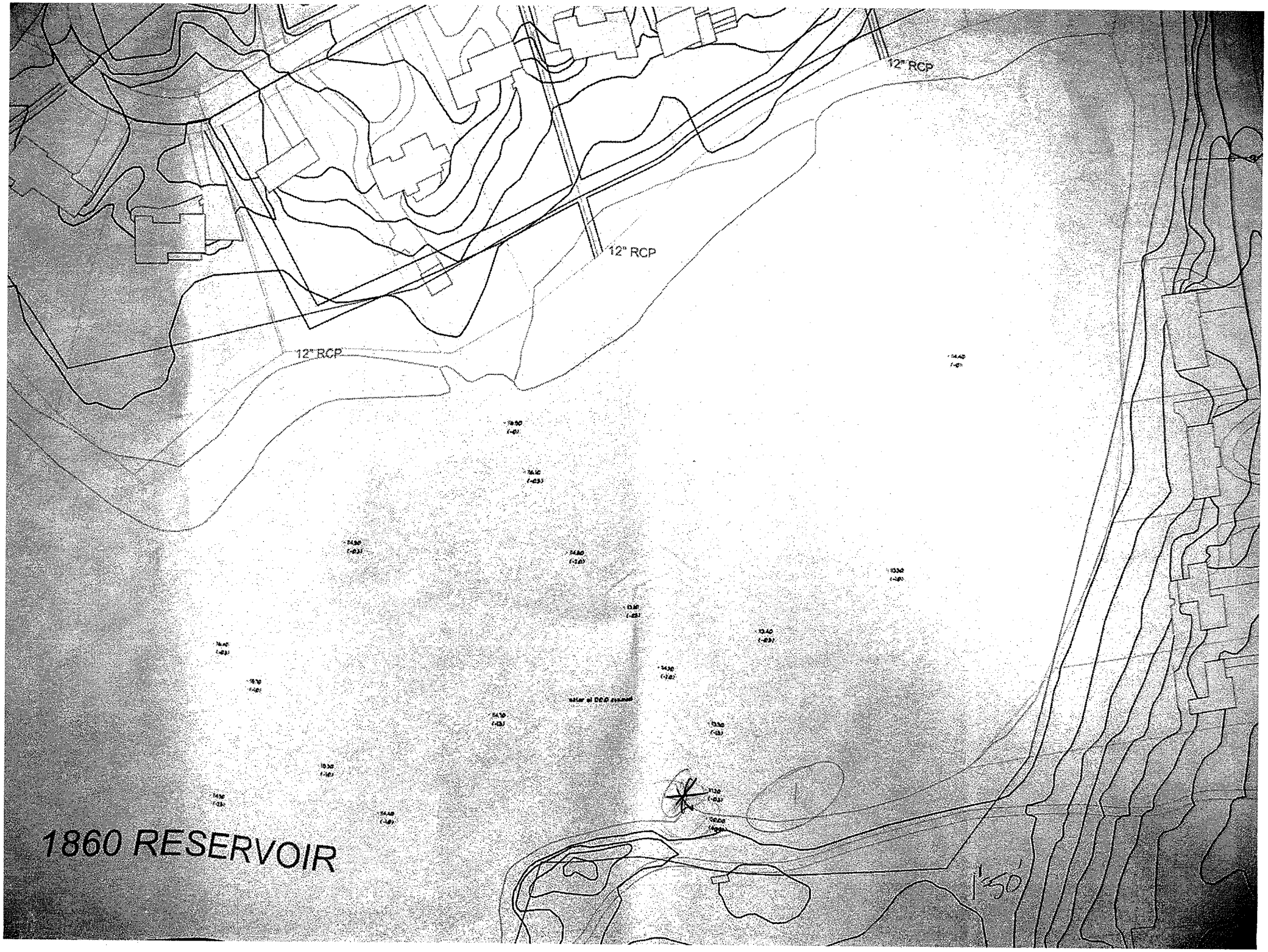
Enclosed are the reports for the 5 ponds that were sampled.

Should you have any further questions about the type of sampling tests or report conclusions and recommendations please contact me at 860-828-9787 ext. 102.

Sincerely,

Northeast Laboratories, Inc.

Alfred Anton Reigins, M.S.
Environmental Engineer


12" RCP
12" RCP
12" RCP
1860 RESERVOIR
1'=50'

NORTHEAST LABORATORIES, INC.

129 MILL STREET – BERLIN CT 06037

[Danbury: Add'l Sample Drop Off Site: (Mon – Thurs. ONLY) Suite 342 – 100 Mill Plain Rd, Danbury CT -6811]

TELEPHONE: Toll Free: (in CT): 800-826-0105 - - (Outside CT): 800-654-1230
Berlin/Hartford Area: (860) 828-9787 Danbury Area: (203) 791-3874
FAX #: (860) 829-1050
E-Mail: NELABSCT@AOL.COM WW Web: NortheastLaboratories.com

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Telephone #: 203 288 4067 FAX #: 203 288 7378

COMPANY NAME: FRED CLARK DECARLO + DOLL INC

Client's Puchase Order #:

ADDRESS: 1952 WHITNEY AVE HAMDEN CT 06517-1209

SAMPLE LOCATION (if DIFFERENT) from Client: WETHERSFIELD PONDS

SAMPLED BY: ACR

REPORT TO: ACR THIS IS 1 IN A SERIES OF 5

ANALYSIS REQUESTED *

* Note: Some testing parameters may be outsourced to a certified laboratory

SAMPLE ID (Description and/or ID#)	Date Collected	Time Collected	SAMPLE TYPE: (well water, municipal water, waste water, etc)	# OF CONTAINERS	TYPE OF CONTAINER	PRESERVATIVES (IF ANY)	STORAGE REQUIREMENTS: (as required, e.g. refrigerate, freeze, retain at room temp, etc.	AEROBIC PC + COLIFORM	ALGAE	BOD	DISSOLVED O2	NITRATE NITROGEN	PH	PHOSPHOROUS	NONVOLATILE VOLATILE SOLIDS	PARTICLE SIZE DIST
POND # 1	Dec		POND SURFACE	1	100 ml	T		(01) X								
1860 Res				1	1L GLASS	Ø		(02) X								
BY BOAT RAMP	11	9:00		1	BOD	Ø			(03) X							
				1	1/2 GAL PLAS	Ø				(04) X	X	X	X			
			BOTTOM	1	1L PLAS	Ø									(05) X	X
			APX 3' FROM SURFACEWATER + 10 FT FROM SHORE													

NO 628471 (01-05)

RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	REMARKS & NOTES:
A. Elgins	Dec 11 9:45		12/11/06 945	Temp = 25 °C
RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	

RECEIVED DEC 11 2006 BY:

NORTHEAST LABORATORIES INC.
129 MILL STREET
BERLIN CT 06037

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

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Laboratory Report for Pond Water Quality

Report and Invoice Number: N0638471	Printed: 2/5/2007 9:32 AM

Fred Clark
DeCarlo & Doll
1952 Whitney Avenue
Hamden, CT 06517
Sample Sites: Wethersfield Ponds #1-#5
Sampled by: Alfred A. Reigins on 12/11-13/2006

Specific Site: POND # 1 1860 Reservoir by Boat Ramp, Dec/11/2006 @9:00 am

PARAMETER	METHOD # (if necessary)	RESULT	UNITS	DATE TESTED	COMMENTS
E. coli count per 100 ml		2	x/100ml	12/11	
Coliform Count per 100 ml		TNTC	x/100ml	12/11	Too numerous to count
Heterotrophic Plate Count per 1ml		400	x/1 ml	12/11	
BOD		<3	mg/L	12/12	
Dissolved Oxygen		9.6	mg/L	12/13	
Nitrate-Nitrogen		0.09	Mg/L	12/13	
pH Sample in Lab		7.5		12/12	
Alkalinity		82	mg/L	12/14	
Total Phosphors		0.02	mg/L	12/29	
Non Volatile Solids		60.8	%	12/29	
Volatile Solids		1.8	%	1/10	
Sieve Test Solids % Retained	#4	18	%	1/10	
	#6	15.9	%	1/10	
	#12	14.7	%	1/10	
	#20	16.8	%	1/10	

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

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E-Mail: NELABSCT@AOL.COM www.NortheastLaboratories.com

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	#30	11.9	%	1/10	
	#40	12.4	%	1/10	
	#100	8.3	%	1/10	
	Pan	2.0	%	1/10	

ALGE, MICROSCOIC EXAMINATION: 12/11/2006

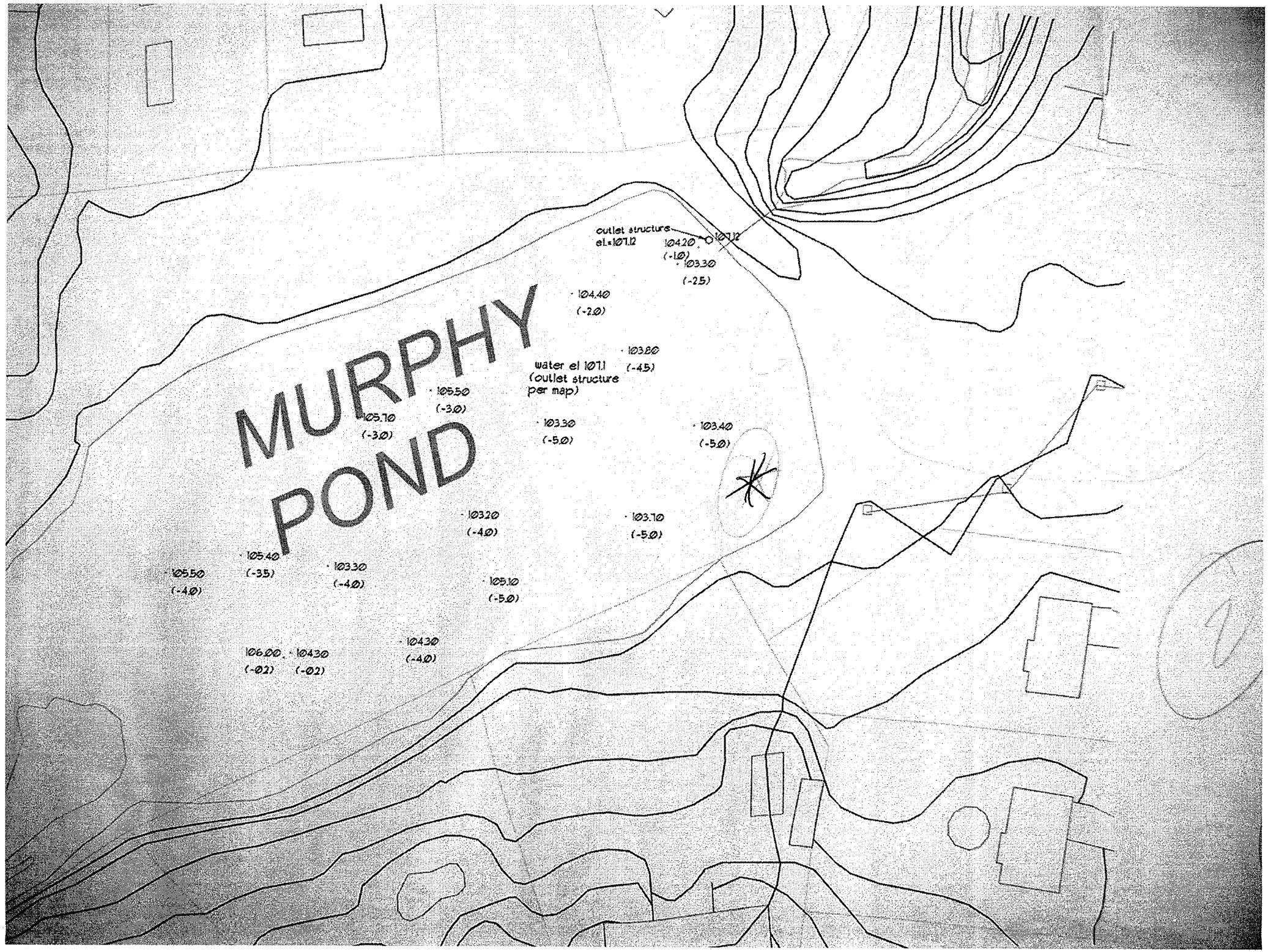
ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml
Diatomaceae		**Chlorophyceae**		**Schizomycetes**		**Protozoa**	
Amphora		Anaoystis		Crenothrix		Actinophrys	
Asterionella*		Ankistrodesmus				Amoeba	
Cyclotella*		Closterium		**Cyanophyceae**		Arcella	
Cymbella		Coelastrum				Bursaria*	
Diatoma*		Cosmarium		Anabaena*		Ceratium	
Fragilaria		Dictyosphaerium*		Aphanizomenon*		Cercomonas	
Gomphonema		Eudorina*		Chroococcus		Chilomonas	
Melosira		Elakatothrix		Clathrocystis*		Chlamydomonas	
Meridion*		Gleocystis		Coelosphaerium*		Codonella	
Navicula		Mougeotia		Gleocapsa		Cryptomonas*	
Nitzschia		Pandorina*		Microcystis		Difflugia	
Pleurosigma		Pediastrum		Merismopedia		Dinobryon*	
Stephanodiscus		Protococcus		Nostoc		Euglena	
Surirella		Quadrigula		Oscillaria		Glenodinium*	
Synedra	16	Scenedesmus	16	Rivularia*		Gonium	
Tabellaria*		Sphaerocystis				Halteria	
		Sphaerozosma		**Miscellaneous**		Mallomonas*	
Rotifera		Spirogyra				Monas	
		Staurastrum	16				
		Tetraspora		Acarina		Peridinium*	
Anuraea		Westella		Anguillula		Synura*	
Asplanchna		Ulothrix		Bosmina		Trachelomonas	
Brachionus		Volvox*		Canthocamptus		Uroglenopsis*	
Conochilus		Xanthidium		Cyclops		Vorticella	
Notholca				Daphnia			
Polyarthra				Diaptomus			
Rotifer							
Synchaeta							

* Odor Producing

48 **Total**

Conclusions:

Report Written by: Alfred A. Reigins, M.S. Environmental Engineer
Report Approved by: Alan C. Johnson, Laboratory Director


MURPHY POND
outlet structure
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107.12
104.20
(-1.0)
103.30
(-2.5)
104.40
(-2.0)
103.80
(-4.5)
water el 107.1
(outlet structure
per map)
105.50
(-3.0)
105.70
(-3.0)
103.30
(-5.0)
103.40
(-5.0)
103.20
(-4.0)
103.70
(-5.0)
105.40
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103.30
(-4.0)
105.10
(-5.0)
106.00
(-0.2)
104.30
(-0.2)
104.30
(-4.0)

NORTHEAST LABORATORIES, INC.

129 MILL STREET – BERLIN CT 06037

[Danbury: Add'l Sample Drop Off Site: (Mon – Thurs. ONLY) Suite 342 – 100 Mill Plain Rd, Danbury CT -6811]

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FAX #: (860) 829-1050
E-Mail: NELABSCT@AOL.COM WW Web: NortheastLaboratories.com

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Telephone #: 203 288 4067 FAX #: 203 288 7378

COMPANY NAME: DeCARLO + DOLL INC

Client's Puchase Order #:

ADDRESS: 1952 WHITNEY AVE HAMDEN CT 06517-1209

SAMPLE LOCATION (if DIFFERENT) from Client: WETHERSFIELD PONDS

SAMPLED BY: ALR

REPORT TO: ALR I CAN WRITE REPORT

ANALYSIS REQUESTED *

* Note: Some testing parameters may be outsourced to a certified laboratory

SAMPLE ID (Description and/or ID#)	Date Collected	Time Collected	SAMPLE TYPE: (well water, municipal water, waste water, etc)	# OF CONTAINERS	TYPE OF CONTAINER	PRESERVATIVES (IF ANY)	STORAGE REQUIREMENTS: (as required, e.g. refrigerate, freeze, retain at room temp, etc.	AEROBIC PC + COLIFORM	ALGAE	BOD	DISSOLVED OXY	NITRATE NITROGEN	PH + ALKALINITY	PHOSPHOROUS	NONVOLATILE VOLATILE SOLIDS	PARTICLE SIZE DIST
POND # 2			POND SURFACE	1	100 ml	T		*								
MURPHY	DEC 13			1	1L GLASS	Ø			*							
POND	2006			1	BOD	Ø				*						
APX 15' FROM SHORE		11:00		1	1L PLAS	Ø					X	X	X	X		
			BOTTOM	1	1L PLAS	Ø										
APX 2 FOOT DOWN FROM SURF							Temp 53									

RECEIVED DEC 13 2006 N0638492

RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	REMARKS & NOTES:
Peigins	Dec 13 2006	11 30		
BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

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E-Mail: NELABSCT@AOL.COM www.NortheastLaboratories.com

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Laboratory Report for Pond Water Quality

Report and Invoice Number: N0638492	Printed: 2/5/2007 9:34 AM

Fred Clark
DeCarlo & Doll
1952 Whitney Avenue
Hamden, CT 06517
Sample Sites: Wethersfield Ponds #1-#5
Sampled by: Alfred A. Reigins on 12/11-13/2006

Specific Site: POND # 2 Murphy Pond, apx 15' from shore, Dec/13/2006 @11:00 am

PARAMETER	METHOD # (if necessary)	RESULT	UNITS	DATE TESTED	COMMENTS
E. coli count per 100 ml		140	x/100ml	12/13	
Coliform Count per 100 ml		TNTC	x/100ml	12/13	Too numerous to count
Heterotrophic Plate Count per 1ml		7,300	x/1 ml	12/13	
BOD		<3	mg/L	12/13	
Dissolved Oxygen		8.9	mg/L	12/13	
Nitrate-Nitrogen		2.0	Mg/L	12/15	
pH Sample in Lab		7.8		12/13	
Alkalinity		146	mg/L	12/14	
Total Phosphors		0.026	mg/L	12/29	
Non Volatile Solids		11.4	%	12/29	
Volatile Solids		1.1	%	1/10	
Sieve Test Solids % Retained	#4	8.2	%	1/10	
	#6	11.9	%	1/10	
	#12	14.8	%	1/10	
	#20	15.6	%	1/10	

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

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E-Mail: NELABSCT@AOL.COM www.NortheastLaboratories.com

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	#30	24.4	%	1/10	
	#40	20.7	%	1/10	
	#100	2.2	%	1/10	
	Pan	2.2	%	1/10	

ALGE, MICROSCOIC EXAMINATION: 12/11/2006

ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml
Diatomaceae		**Chlorophyceae**		**Schizomycetes**		**Protozoa**	
Amphora		Anaoystis		Crenothrix		Actinophrys	
Asterionella*		Ankistrodesmus				Amoeba	
Cyclotella*		Closterium		**Cyanophyceae**		Arcella	
Cymbella		Coelastrum				Bursaria*	
Diatoma*		Cosmarium		Anabaena*		Ceratium	
Fragilaria		Dictyosphaerium*		Aphanizomenon*		Cercomonas	
Gomphonema		Eudorina*		Chroococcus		Chilomonas	
Melosira		Elakatothrix		Clathrocystis*		Chlamydomonas	
Meridion*		Gleocystis		Coelosphaerium*		Codonella	
Navicula	88	Mougeotia		Gleocapsa		Cryptomonas*	
Nitzschia		Pandorina*		Microcystis		Difflugia	
Pleurosigma		Pediastrum		Merismopedia		Dinobryon*	
Stephanodiscus		Protococcus		Nostoc		Euglena	
Surirella		Quadrigula		Oscillaria		Glenodinium*	
Synedra	80	Scenedesmus		Rivularia*		Gonium	
Tabellaria*		Sphaerocystis				Halteria	
		Sphaerozosma		**Miscellaneous**		Mallomonas*	
Rotifera		Spirogyra				Monas	
		Staurastrum		Acarina		Peridinium*	
Anuraea		Tetraspora		Anguillula		Synura*	
Asplanchna		Westella		Bosmina		Trachelomonas	
Brachionus		Ulothrix		Canthocamptus		Uroglenopsis*	
Conochilus		Volvox*		Cyclops		Vorticella	
Notholca		Xanthidium		Daphnia			
Polyarthra				Diaptomus			
Rotifer							
Synchaeta							

* Odor Producing

170 **Total**

Conclusions:

Report Written by: Alfred A. Reigins, M.S. Environmental Engineer
Report Approved by: Alan C. Johnson, Laboratory Director

GRISWOLD PO
90
80
90
80
90
80
3

NORTHEAST LABORATORIES, INC.

129 MILL STREET – BERLIN CT 06037
[Danbury: Add'l Sample Drop Off Site: (Mon – Thurs. ONLY) Suite 342 – 100 Mill Plain Rd. Danbury CT -6811]
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FAX #: (860) 829-1050
E-Mail: NELABSCT@AOL.COM WW Web: NortheastLaboratories.com

CHAIN OF CUSTODY
(Please Print)

Page ____ of ____ Pages

Telephone #: 203 288 4067 FAX #: 203 288 7378

COMPANY NAME: DeCARLO + DOLL INC

Client's Puchase Order #:

ADDRESS: 1952 WHITNEY AVE HAMDEN CT 06517-1209

SAMPLE LOCATION (if DIFFERENT) from Client: WETHERSFIELD PONDS

SAMPLED BY: ALR

REPORT TO: ALR I WILL WRITE REPORT.

ANALYSIS REQUESTED *
* Note: Some testing parameters may be outsourced to a certified laboratory

SAMPLE ID (Description and/or ID#)	Date Collected	Time Collected	SAMPLE TYPE: (well water, municipal water, waste water, etc)	# OF CONTAINERS	TYPE OF CONTAINER	PRESERVATIVES (IF ANY)	STORAGE REQUIREMENTS: (as required, e.g. refrigerate, freeze, retain at room temp, etc.)	AEROBIC PC + COLIFORM	ALGAE	BOD	DISSOLVED O2	NITRATE NITROGEN	pH + ALKALINITY	PHOSPHOROUS	NONVOLATILE VOLATILE SOLIDS	PARTICLE SIZE DIST
POND # 3			POND SURFACE	1	100 ml	T		*								
GRISWALD	DEC 13			1	1L GLASS	Ø			*							
POND	2006			1	BOD	Ø				*						
APX 6 FT FROM SHORE	10:00			1	1L PLAS	Ø					X	X	X	X		
			BOTTOM	1	1L PLAS	Ø									X	X
APX 3 feet Down from surf							Temp 50									

RECEIVED DEC 13 2006 NO 6841

RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	REMARKS & NOTES:
ALR	Dec 13 2006	1130		
RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

TELEPHONE: Toll Free (in CT) 800-826-0105 (Outside CT) 800-654-1230
Berlin/Hartford Area: (860) 828-9787 FAX: (860) 829-1050
E-Mail: NELABSCT@AOL.COM www.NortheastLaboratories.com

ACCREDITED IN ACCORDANCE WITH nelac

Laboratory Report for Pond Water Quality

Report and Invoice Number: N0638491	Printed: 2/5/2007 9:36 AM

Fred Clark
DeCarlo & Doll
1952 Whitney Avenue
Hamden, CT 06517
Sample Sites: Wethersfield Ponds #1-#5
Sampled by: Alfred A. Reigins on 12/11-13/2006

Specific Site: POND # 3 Griswald Pond, apx 6' from shore, Dec/13/2006 @10:00 am

PARAMETER	METHOD # (if necessary)	RESULT	UNITS	DATE TESTED	COMMENTS
E. coli count per 100 ml		120	x/100ml	12/13	
Coliform Count per 100 ml		TNTC	x/100ml	12/13	Too numerous to count
Heterotrophic Plate Count per 1ml		1,300	x/1 ml	12/13	
BOD		<3	mg/L	12/13	
Dissolved Oxygen		8.0	mg/L	12/13	
Nitrate-Nitrogen		26.3	mg/L	12/15	
pH Sample in Lab		7.3		12/29	
Alkalinity		162	mg/L	12/14	
Total Phosphors		0.04	mg/L	12/29	
Non Volatile Solids		65.4	%	12/29	
Volatile Solids		1.3	%	1/10	
Sieve Test Solids % Retained	#4	25.5	%	1/10	
	#6	23.9	%	1/10	
	#12	16.7	%	1/10	
	#20	12.4	%	1/10	

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	#30	14.7	%	1/10	
	#40	2.8	%	1/10	
	#100	2.8	%	1/10	
	Pan	1.2	%	1/10	

ALGE, MICROSCOIC EXAMINATION: 12/11/2005

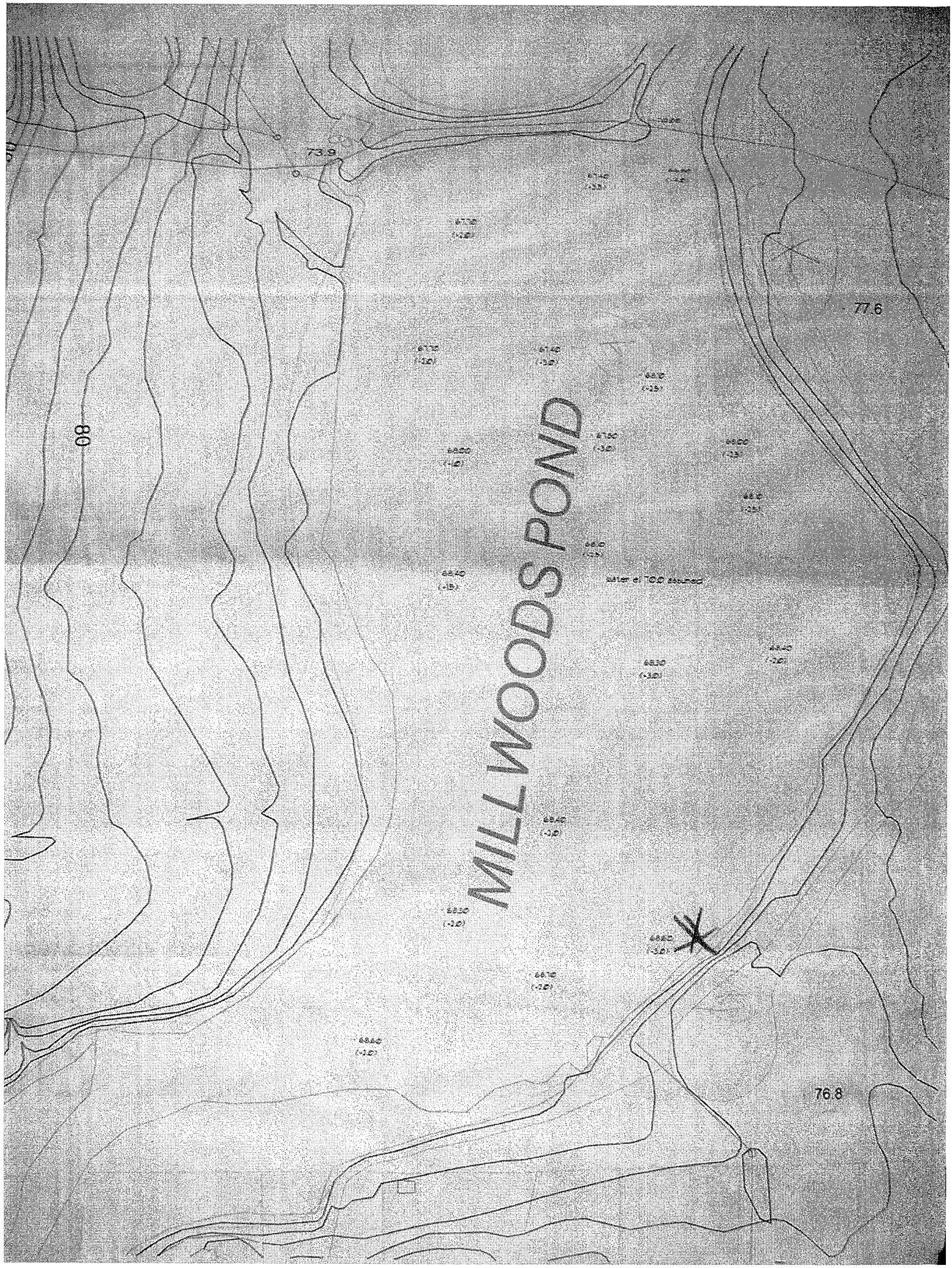
ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml
Diatomaceae		**Chlorophyceae**		**Schizomycetes**		**Protozoa**	
		Anaoystis					
Amphora		Ankistrodesmus		Crenothrix		Actinophrys	
Asterionella*		Closterium				Amoeba	
Cyclotella*		Coelastrum		**Cyanophyceae**		Arcella	
Cymbella		Cosmarium				Bursaria*	
Diatoma*		Dictyosphaerium*		Anabaena*		Ceratium	
Fragilaria	16	Eudorina*		Aphanizomenon*		Cercomonas	
Gomphonema		Elakatothrix		Chroococcus		Chilomonas	
Melosira		Gleocystis		Clathrocystis*		Chlamydomonas	
Meridion*		Mougeotia		Coelosphaerium*		Codonella	
Navicula	56	Pandorina*		Gleocapsa		Cryptomonas*	
Nitzschia		Pediastrum		Microcystis		Difflugia	
Pleurosigma		Protococcus		Merismopedia		Dinobryon*	
Stephanodiscus		Quadrigula		Nostoc		Euglena	
Surirella		Scenedesmus		Oscillaria		Glenodinium*	
Synedra	16	Sphaerocystis		Rivularia*		Gonium	
Tabellaria*		Sphaerozosma				Halteria	
		Spirogyra		**Miscellaneous**		Mallomonas*	
Rotifera		Staurastrum				Monas	
		Tetraspora		Acarina		Peridinium*	
Anuraea		Westella		Anguillula		Synura*	
Asplanchna		Ulothrix		Bosmina		Trachelomonas	
Brachionus		Volvox*		Canthocamptus		Uroglenopsis*	
Conochilus		Xanthidium		Cyclops		Vorticella	
Notholca				Daphnia			
Polyarthra				Diaptomus			
Rotifer							
Synchaeta							

* Odor Producing

88 **Total**

Conclusions:

Report Written by: Alfred A. Reigins, M.S. Environmental Engineer
Report Approved by: Alan C. Johnson, Laboratory Director


MILL WOODS POND
73.9
77.6
76.8
80

NORTHEAST LABORATORIES, INC.

129 MILL STREET – BERLIN CT 06037

[Danbury: Add'l Sample Drop Off Site: (Mon – Thurs. ONLY) Suite 342 – 100 Mill Plain Rd, Danbury CT -6811]

TELEPHONE: Toll Free: (in CT): 800-826-0105 - - (Outside CT): 800-654-1230
Berlin/Hartford Area: (860) 828-9787 Danbury Area: (203) 791-3874
FAX #: (860) 829-1050
E-Mail: NELABSCT@AOL.COM WW Web: NortheastLaboratories.com

CHAIN OF CUSTODY
(Please Print)

Page ____ of ____ Pages

Telephone #: 203 288 4067 FAX #: 203 288 7378

COMPANY NAME: DeCARLO + DOLL INC

Client's Puchase Order #:

ADDRESS: 1952 WHITNEY AVE HAMDEN CT 06517-1209

SAMPLE LOCATION (if DIFFERENT) from Client: WETHERSFIELD PONDS

SAMPLED BY: ALR

REPORT TO: ALR FOR FURTHER DATA

ANALYSIS REQUESTED *

* = Note: Some testing parameters may be outsourced to a certified laboratory

SAMPLE ID (Description and/or ID#)	Date Collected	Time Collected	SAMPLE TYPE: (well water, municipal water, waste water, etc)	# OF CONTAINERS	TYPE OF CONTAINER	PRESERVATIVES (IF ANY)	STORAGE REQUIREMENTS: (as required, e.g. refrigerate, freeze, retain at room temp, etc	AEROBIC PC + COLIFORM	ALGAE	BOD	DISSOLVED OXY	NITRATE NITROGEN	PH	PHOSPHORUS	NONVOLATILE VOLATILE SOLIDS	PARTICLE SIZE DIST
POND # 4	Dec		POND SURFACE	1	100 ml	T		*								
MILL WOODS	12	9:00		1	1L GLASS	Ø			*							
POND				1	BOD	Ø				*						
10' FROM BANK	2006	AM		1	1/2 GAL PLAS	Ø					X	X	X	X		
APX 3 FT DEPTH FROM SURFACE			BOTTOM	1	1L PLAS	Ø									X	X

RECEIVED DEC 12 2006 N06038486

RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	REMARKS & NOTES:
ALR	Dec 12 2006	11:00		POND ICE SURFACE
RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

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E-Mail: NELABSCT@AOL.COM www.NortheastLaboratories.com

ACCREDITED IN ACCORDANCE WITH nelac

Laboratory Report for Pond Water Quality

Report and Invoice Number: N0638486	Printed: 2/5/2007 9:37 AM

Fred Clark
DeCarlo & Doll
1952 Whitney Avenue
Hamden, CT 06517
Sample Sites: Wethersfield Ponds #1-#5
Sampled by: Alfred A. Reigins on 12/11-13/2006

Specific Site: POND # 4 Millwoods Pond, apx 10' from shore, Dec/12/2006 @9:00 am

PARAMETER	METHOD # (if necessary)	RESULT	UNITS	DATE TESTED	COMMENTS
E. coli count per 100 ml		74	x/100ml	12/12	
Coliform Count per 100 ml		TNTC	x/100ml	12/12	Too numerous to count
Heterotrophic Plate Count per 1ml		1,600	x/1 ml	12/12	
BOD		<3	mg/L	12/13	
Dissolved Oxygen		8.6	mg/L	12/13	
Nitrate-Nitrogen		1.8	mg/L	12/14	
pH Sample in Lab		8.0		12/12	
Alkalinity		158	mg/L	12/14	
Total Phosphors		0.04	mg/L	12/29	
Non Volatile Solids		20.7	%	12/29	
Volatile Solids		1.6	%	1/10	
Sieve Test Solids % Retained	#4	10.3	%	1/10	
	#6	15.8	%	1/10	
	#12	19.2	%	1/10	
	#20	22.6	%	1/10	

NORTHEAST LABORATORIES, INC.

129 MILL STREET - BERLIN, CT 06037-9990

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ACCREDITED IN ACCORDANCE WITH nelac

	#30	21.2	%	1/10	
	#40	4.8	%	1/10	
	#100	4.1	%	1/10	
	Pan	2.0	%	1/10	

ALGE, MICROSCOIC EXAMINATION: 12/11/2006

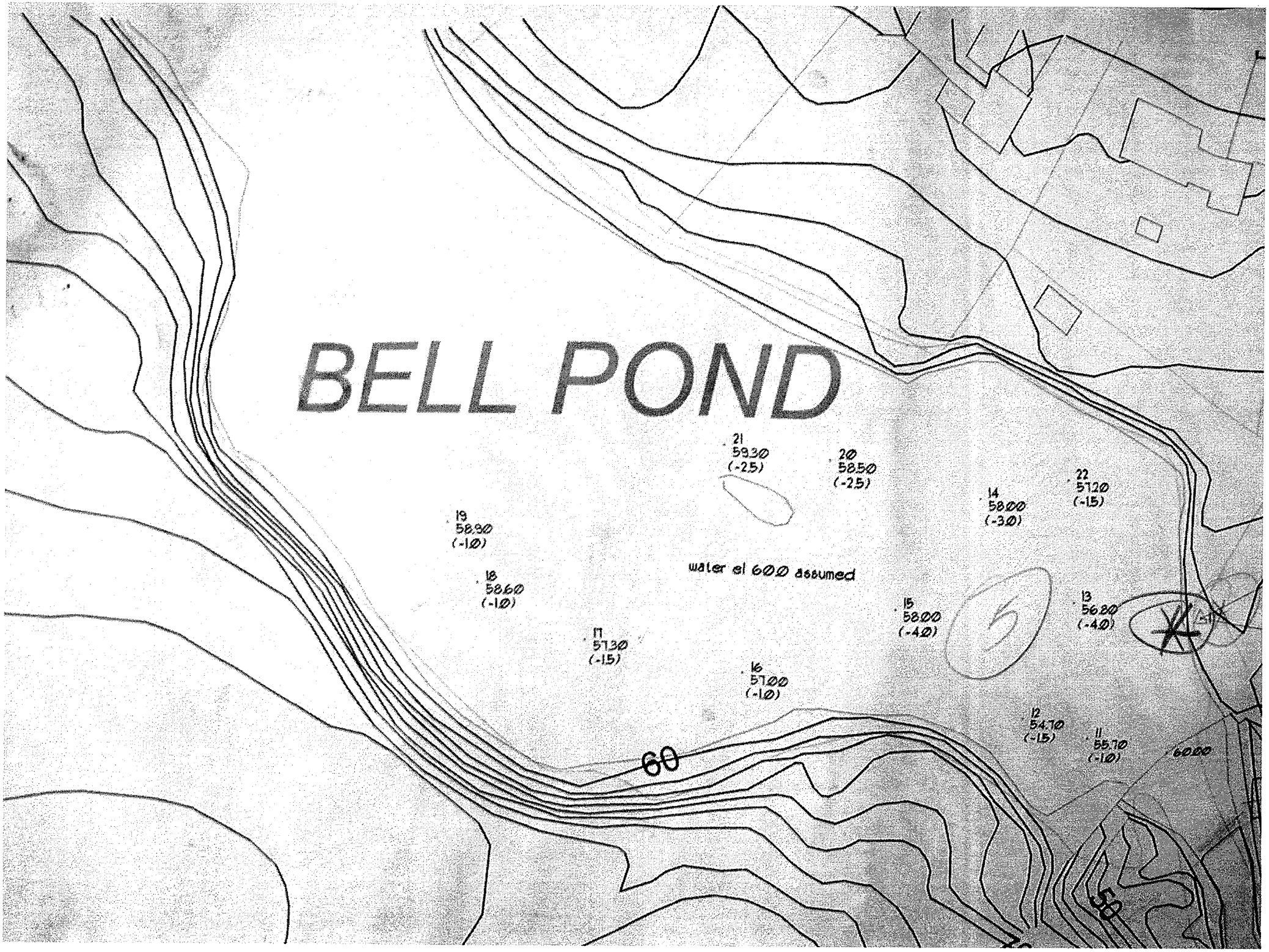
ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml
Diatomaceae		**Chlorophyceae**		**Schizomycetes**		**Protozoa**	
Amphora		Anaoystis		Crenothrix		Actinophrys	
Asterionella*		Ankistrodesmus				Amoeba	
Cyclotella*		Closterium		**Cyanophyceae**		Arcella	
Cymbella		Coelastrum				Bursaria*	
Diatoma*		Cosmarium		Anabaena*		Ceratium	
Fragilaria	8	Dictyosphaerium*		Aphanizomenon*		Cercomonas	
Gomphonema		Eudorina*		Chroococcus		Chilomonas	
Melosira		Elakatothrix		Clathrocystis*		Chlamydomonas	
Meridion*		Gleocystis		Coelosphaerium*		Codonella	
Navicula	96	Mougeotia		Gleocapsa		Cryptomonas*	
Nitzschia		Pandorina*		Microcystis		Difflugia	
Pleurosigma		Pediastrum		Merismopedia		Dinobryon*	
Stephanodiscus		Protococcus		Nostoc		Euglena	8
Surirella		Quadrigula		Oscillaria		Glenodinium*	
Synedra	24	Scenedesmus		Rivularia*		Gonium	
Tabellaria*		Sphaerocystis				Halteria	
		Sphaerozosma		**Miscellaneous**		Mallomonas*	
Rotifera		Spirogyra				Monas	
		Staurastrum					
		Tetraspora		Acarina		Peridinium*	
Anuraea		Westella		Anguillula		Synura*	
Asplanchna		Ulothrix		Bosmina		Trachelomonas	
Brachionus		Volvox*		Canthocamptus		Uroglenopsis*	
Conochilus		Xanthidium		Cyclops		Vorticella	
Notholca				Daphnia			
Polyarthra				Diaptomus			
Rotifer							
Synchaeta							

* Odor Producing

140 **Total**

Conclusions:

Report Written by: Alfred A. Reigins, M.S. Environmental Engineer
Report Approved by: Alan C. Johnson, Laboratory Director


BELL POND
21
59.30
(-2.5)
20
58.50
(-2.5)
22
57.20
(-1.5)
14
58.00
(-3.0)
19
58.90
(-1.0)
water el 60.0 assumed
18
58.60
(-1.0)
15
58.00
(-4.0)
13
56.80
(-4.0)
17
57.30
(-1.5)
16
57.00
(-1.0)
12
54.70
(-1.5)
11
55.70
(-1.0)
60.00
60
50

NORTHEAST LABORATORIES, INC.

129 MILL STREET – BERLIN CT 06037

[Danbury: Add'l Sample Drop Off Site: (Mon – Thurs. ONLY) Suite 342 – 100 Mill Plain Rd, Danbury CT -6811]

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CHAIN OF CUSTODY
(Please Print)

Page ____ of ____ Pages

hold - chainRev.2003

Telephone #: 203 288 4067 FAX #: 203 288 7378

COMPANY NAME: DeCARLO + DOLL INC

Client's Puchase Order #:

ADDRESS: 1952 WHITNEY AVE HAMDEN CT 06517-1209

SAMPLE LOCATION (if DIFFERENT) from Client: WETHERSFIELD PONDS

SAMPLED BY: ALR

REPORT TO: ALR

ANALYSIS REQUESTED *

* Note: Some testing parameters may be outsourced to a certified laboratory

SAMPLE ID (Description and/or ID#)	Date Collected	Time Collected	SAMPLE TYPE: (well water, municipal water, waste water, etc)	# OF CONTAINERS	TYPE OF CONTAINER	PRESERVATIVES (IF ANY)	STORAGE REQUIREMENTS: (as required, e.g. refrigerate, freeze, retain at room temp, etc.	AEROBIC PC + COLIFORM	ALGAE	BOD	DISSOLVED OXY	NITRATE NITROGEN	PH	PHOSPHOROUS	NONVOLATILE VOLATILE SOLIDS	PARTICLE SIZE DIST
POND # 5	Dec		POND SURFACE	1	100 ml	T		*								
BELL POND	12		↓	1	1L GLASS	Ø			*							
	2006			1	BOD	Ø				*						
6 FEET FROM SHORE		9 30 AM	—	1	1/2 GAL PLAS	Ø					X	X	X	X		
APX 5 FT DEPTH FROM SURFACE			BOTTOM	1	1L PLAS	Ø									X	X

RECEIVED DEC 12 2006 N0638487

RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	REMARKS & NOTES:
ALR				POND ICE SURFACE
RELINQUISHED BY:	DATE / TIME:	RECEIVED BY:	DATE / TIME:	

NORTHEAST LABORATORIES, INC.

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ACCREDITED IN ACCORDANCE WITH nelac

Laboratory Report for Pond Water Quality

Report and Invoice Number: N0638487	Printed: 2/5/2007 9:39 AM

Fred Clark
DeCarlo & Doll
1952 Whitney Avenue
Hamden, CT 06517
Sample Sites: Wethersfield Ponds #1-#5
Sampled by: Alfred A. Reigins on 12/11-13/2006

Specific Site: POND # 5 Bell Pond, apx 6' from shore, Dec/12/2006 @9:30 am

PARAMETER	METHOD # (if necessary)	RESULT	UNITS	DATE TESTED	COMMENTS
E. coli count per 100 ml		12	x/100ml	12/12	
Coliform Count per 100 ml		12	x/100ml	12/12	Too numerous to count
Heterotrophic Plate Count per 1ml		820	x/1 ml	12/12	
BOD		<3	mg/L	12/13	
Dissolved Oxygen		9.9	mg/L	12/12	
Nitrate-Nitrogen		0.06	mg/L	12/15	
pH Sample in Lab		7.6		12/12	
Alkalinity		154	mg/L	12/14	
Total Phosphors		0.04	mg/L	12/29	
Non Volatile Solids		14.4	%	12/29	
Volatile Solids		0.76	%	1/10	
Sieve Test Solids % Retained	#4	6.4	%	1/10	
	#6	6.4	%	1/10	
	#12	7.5	%	1/10	
	#20	9.8	%	1/10	

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E-Mail: NELABSCT@AOL.COM www.NortheastLaboratories.com

ACCREDITED IN ACCORDANCE WITH nelac

	#30	35.3	%	1/10	
	#40	31.8	%	1/10	
	#100	1.7	%	1/10	
	Pan	1.1	%	1/10	

ALGE, MICROSCOIC EXAMINATION:

ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml	ORGANISM	#/ml
Diatomaceae		**Chlorophyceae**		**Schizomycetes**		**Protozoa**	
Amphora		Anaoystis		Crenothrix		Actinophrys	
Asterionella*		Ankistrodesmus				Amoeba	
Cyclotella*		Closterium		**Cyanophyceae**		Arcella	
Cymbella		Coelastrum				Bursaria*	
Diatoma*		Cosmarium		Anabaena*		Ceratium	
Fragilaria		Dictyosphaerium*		Aphanizomenon*		Cercomonas	
Gomphonema		Eudorina*		Chroococcus		Chilomonas	
Melosira		Elakatothrix		Clathrocystis*		Chlamydomonas	
Meridion*		Gleocystis		Coelosphaerium*		Codonella	
Navicula	48	Mougeotia		Gleocapsa		Cryptomonas*	
Nitzschia		Pandorina*		Microcystis		Difflugia	
Pleurosigma		Pediastrum		Merismopedia		Dinobryon*	
Stephanodiscus		Protococcus		Nostoc		Euglena	
Surirella		Quadrigula		Oscillaria		Glenodinium*	
Synedra	16	Scenedesmus		Rivularia*		Gonium	
Tabellaria*		Sphaerocystis				Halteria	
		Sphaerozosma		**Miscellaneous**		Mallomonas*	
Rotifera		Spirogyra				Monas	
		Staurastrum		Acarina		Peridinium*	
Anuraea		Tetraspora		Anguillula		Synura*	
Asplanchna		Westella		Bosmina		Trachelomonas	
Brachionus		Ulothrix		Canthocamptus		Uroglenopsis*	
Conochilus		Volvox*		Cyclops		Vorticella	
Notholca		Xanthidium		Daphnia			
Polyarthra				Diaptomus			
Rotifer							
Synchaeta							

* Odor Producing

64 **Total**

Conclusions:

Report Written by: Alfred A. Reigins, M.S. Environmental Engineer
Report Approved by: Alan C. Johnson, Laboratory Director

References:

1. Storm Sewer Master Plan – Wethersfield:

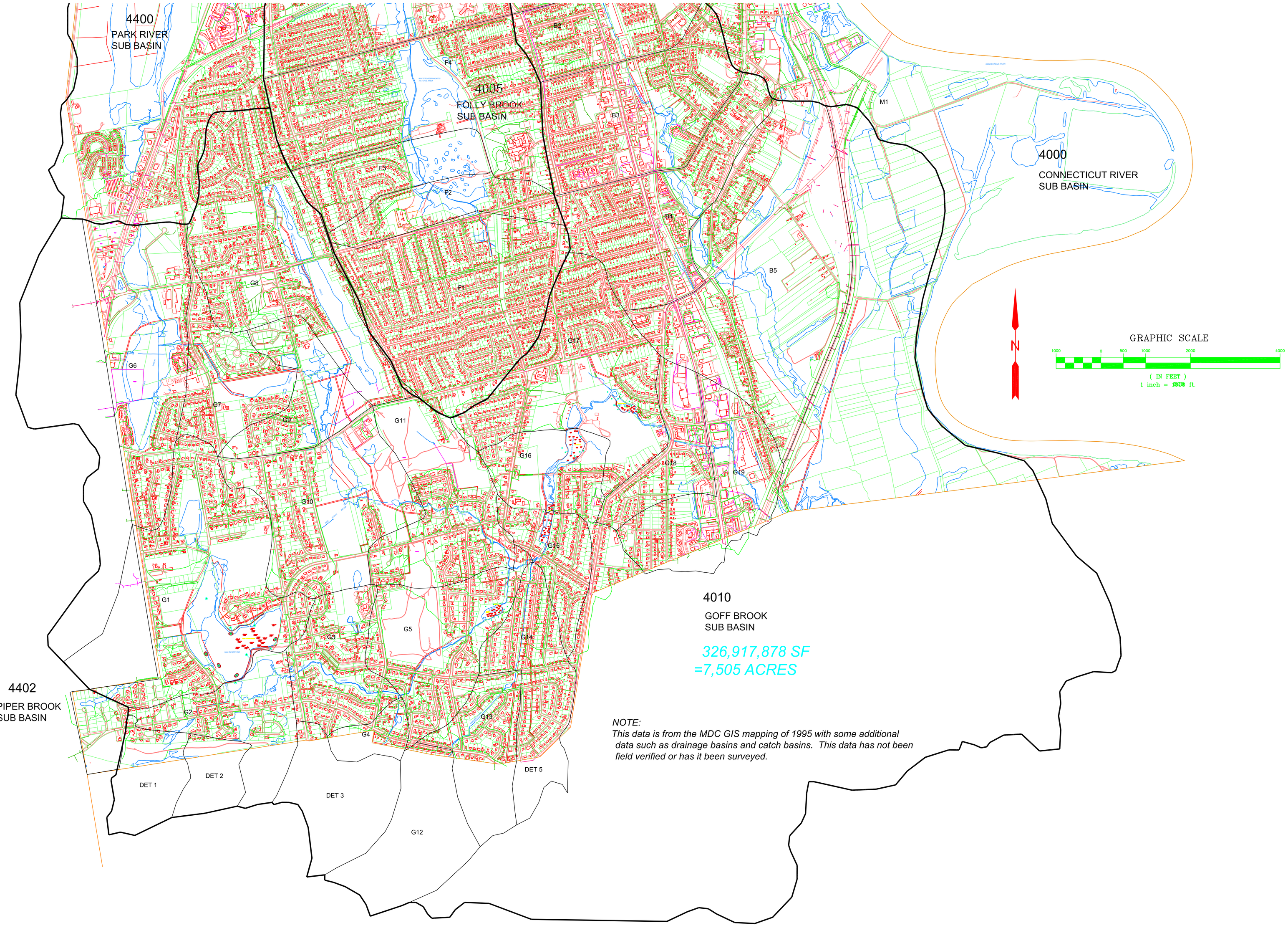
   1860 Reservoir is shown on Plates 304-611 & 304-614
   Murphy Pond is shown on Plates 304-617 & 304-620
   Two Stone Brook is shown on Plate 309-617
   Griswold, Mill Woods and Bell Ponds are shown on Plate 309-620

2. Official Inland Wetlands & Water Courses Map:

   1860 Reservoir is shown on Plates 304-611 (Sheet 2) & 304-614 (Sheet 12)
   Murphy Pond is shown on Plates 304-617 (Sheet 22) & 304-620 (Sheet32)
   Two Stone Brook is shown on Plate 309-617 (Sheet 24)
   Griswold, Mill Woods and Bell Ponds are shown on Plate 309-620 (Sheet 34)

Appendix C:

Drainage Basin Areas Map



DRAINAGE BASIN AREAS

G1 = 17,406,524 SF
G2 = 5,619,307 SF
G3 = 5,302,373 SF
G4 = 1,547,260 SF
G5 = 8,037,443 SF
G6 = 11,171,074 SF
G7 = 5,362,077 SF
G8 = 14,437,799 SF
G9 = 4,880,919 SF
G10 = 10,473,616 SF
G11 = 8,589,075 SF
G12 = 6,334,251 SF
G13 = 4,835,308 SF
G14 = 6,246,643 SF
G15 = 3,375,497 SF
G16 = 4,442,287 SF
G17 = 11,947,214 SF
G18 = 4,216,659 SF
G19 = 7,635,967 SF

det 1 = 3,354,868 SF
det 2 = 2,173742 SF
det 3 = 5,502,637 SF

D. SUPPLEMENT TO REPORT:

GOFF BROOK PONDS STUDY
Town of Wethersfield, Connecticut
Supplement

The second round of water and soil (sediment) testing was performed on July 17 and August 2, 2007. It was performed during the warm to hot summer conditions as contrasted with the cooler to cold late fall to early winter conditions of the first round testing. The summer testing was somewhat tempered, or better than anticipated, due to moderate spring and summer rainfall. The second round testing generally substantiated the presence of moderate biological activity and the moderately organic (volatile) nature of the sediment deposits.

Attached is the combined tabulated data for both the 1st and 2nd round testing. The soils testing was performed on soils at water depths greater than two feet to assure a representation of transported sediment, an appropriate mixture of sediment run-off and cyclically occurring organic breakdown.

The base testing performed supports the overall evaluations and recommendations contained in the subject report furnished in April 2007.

It is noted that no hazardous or contaminated material testing has been performed. It is further noted that such testing was deemed unnecessary and inappropriate at this time, since there is no evidence of environmental contamination or distress that could be attributed to an isolated or wide spread release. The nature of performing this type of testing is premised on known, or suspected related environmental events or occurrences, such as documented spills or releases. There are no known establishments that could or would have been in proximity to the subject ponds.

It is not anticipated that there are any significant areas or volumes of soils, sediments or water that could or would contain hazardous or contaminated elements. The appropriate limited level of testing would be performed on a specific project area basis at the time of anticipated construction.

Goff Brook Upper Watershed
Water Quality & Soil Sample Testing

Round # 1 Testing December 2006
Round # 2 Testing July 17 & August 2, 2007

Single Rnd/Pond		1860 Reservoir	1860 Reservoir	Murphy Pond	Murphy Pond	Griswold Pond	Griswold Pond	Mill Woods Pond	Mill Woods Pond	Bell Pond	Bell Pond
per 100ml	E. coli Count	2		140		120		74		12	
per 1ml	Aerobic Plate Count		33,000		230,000		220,000		220,000		200,000
per 1ml	Heterotrophic Plate Count	400		7,300		1,300		1,600		820	
per 1ml	Algae Count	48	3,800	170	210	88	1,600	140	810	64	570
mg/L	Alkilinty	82		146		162		158		154	
mg/L	BOD	<3	6.3	<3	6	<3	6.3	<3	9	<3	6.9
per 100ml	Coliform Bacteria	TNTC	7,900	TNTC	5,000	TNTC	7,850	TNTC	TNTC	TNTC	TNTC
mg/L	Disolved Oxygen	9.6	5.2	8.9	12.4	8	5.2	8.6	3.1	9.9	3.9
mg/L	Nitrate-Nitrogen	0.09	<0.05	2	<0.05	26.3	<0.05	1.8	<0.05	0.06	<0.05
	PH	7.5	8.1	7.8	7.4	7.3	8.1	8	7.5	7.6	7.4
mg/L	Phosphorus	0.02	<0.01	0.026	0.19	0.04	<0.01	0.04	<0.01	0.04	0.27
Degree F	Temperature	37		53		50		33		33	
Alge	per 1ml	48	3,800	168	210	88	1,590	136	810	64	570
Diatomaceae											
	Cyclotella**		100						30		60
	Cymbella		50								
	Fragilaria		100		30	16	60	8			
	Meridion**										30
	Navicula			88	60	56	180	96	300	48	240
	Surirella				30		60				
	Synedra	16		80	90	16	60	24	60	16	60
Chlorophyceae											
	Ankistrodesmus		700						60		
	Coelastrum		1,800								
	Scenedesmus	16	400				30		30		90
	Staurastrum	16	50								
	Ulothrix		350								60
Protozoa											
	Euglena							8			
	Synura**		250				1,200		330		30
	** Odor Producing										
	Moisture %		24.4%		39.4%		30.8%		37.1%		63.3%
Seive Analysis											
#4		18.0%	60.4%	8.2%	1.0%	25.5%	12.5%	10.3%	11.1%	6.4%	29.8%
#6		15.9%	4.1%	11.9%	1.0%	23.9%	5.3%	15.8%	7.1%	6.4%	4.8%
#12		14.7%	5.7%	14.8%	7.7%	16.7%	7.5%	19.2%	8.2%	7.5%	6.3%
#20		16.8%	2.1%	15.6%	9.7%	12.4%	7.7%	22.6%	12.1%	9.8%	11.1%
#30		11.9%	5.3%	24.4%	12.0%	14.7%	9.5%	21.2%	3.5%	35.3%	4.2%
#40		12.4%	2.5%	20.7%	10.5%	2.8%	11.1%	4.8%	2.6%	31.8%	3.5%
#100		8.3%	7.6%	2.2%	34.2%	2.8%	29.9%	4.1%	7.7%	1.7%	18.3%
Pan		2.0%	12.3%	2.2%	23.9%	1.2%	16.5%	2.0%	47.7%	1.1%	22.0%
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Vol & Non-vol Solids											
Non-Volatile		60.8%	75.6%	11.4%	60.6%	65.4%	69.2%	20.7%	62.9%	14.4%	36.7%
Volatile		1.8%	71.6%	1.1%	70.2%	1.3%	77.2%	1.6%	48.4%	0.8%	34.9%