



534 Boston Post Road,
P.O. Box 438
Wayland, Mass. 01778

617-358-5156
617-899-7066

July 29, 1981

Mrs. Cynthia Shanks, Chairman
Surface Water Quality Study Committee
Town Hall
Wayland, MA 01778

RE: Progress Report No. 2 (May 28 - July 28, 1981) Diagnostic/Feasibility
Study - Dudley Pond

Dear Mrs. Shanks:

In accordance with the terms of our contract, this report will advise the Study Committee and Division of Water Pollution Control as to the status of our ongoing investigations at Dudley Pond. With the exception of the stormwater sampling program (Task 1) the diagnostic portions of the study are proceeding on or ahead of schedule. The storm drains discharging to Dudley Pond have been identified and drainage areas delineated, however, have yet to be sampled.

Task No. 2: Sanitary Survey

The water quality test results for the 26 "suspected plumes" were sent to us by Barbara Notini, DWPC. The results are graphically shown on the attached map and have been summarized in table form. The Study Committee and I, have met with the Wayland Board of Health to discuss the results and to establish criteria for follow-up, on-site visits to residences around the Pond. Mr. William Domey, Sanitary Engineer to the Board of Health, and I, have arranged to inspect a number of sites on Wednesday, August 5th.

Task No. 3: Groundwater Sampling Analyses and Modeling

Thirteen well points were installed on June 20th and 22nd at selective locations around the pond where no sanitary survey "plumes" were found. Domestic well and U.S. Geological Survey Test Well data have been compiled for the Dudley Pond area and are presented on the accompanying table. Well point and pond level elevations were provided by the Town of Wayland Engineer's office on July 9th.

Well point depths range from 3.3 to 6.2 feet below ground surface. All well points are located between 3 and 10 feet from the shoreline. Static water levels vary from 2.3 feet below to 0.5 feet above the static pond elevation of 149.4 feet. A plot of all available water table elevations (see accompanying map) indicates a regional groundwater flow from southeast to northwest.

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Well points located on the north and west shoreline have static levels up to 2.3 feet below pond levels.

Water quality samples were obtained on July 2nd from the 13 well points and two domestic wells (DW-1 and DW-2). The results shown on the enclosed table will be compared with a second round of samples planned for late August.

The surficial geologic map enclosed indicates the types of coarse-grained glacial deposits which underlie Dudley Pond. The permeability and porosity of these stratified sands and gravels will be estimated based on known values for similar deposits, and incorporated into the groundwater model.

The next phase of work will be to quantify the nutrient loading rates from "background" groundwater sources based on the existing regional flow pattern and final water quality sample results.

Task No. 4: Sediment Analyses and Bathymetry

The results of the sediment samples collected on May 22, 1981 are provided in the accompanying table. Although the actual analyses for all samples is complete, Reitzel Laboratories have not yet calculated the numerical concentrations determined for; total phosphorus, iron, copper and arsenic.

Task No. 5: Supplement In-Lake Water Quality and Biological Data

A second round of water samples was collected on June 26, 1981. The Pond was found to be thermally stratified with a thermocline located between 15 and 20 feet. The dissolved oxygen content of the surface waters was surprisingly low, yet the oxygen content near the bottom (20 and 24 feet) was sufficiently high to maintain an aerobic environment, thereby minimizing the release of total phosphorus and ammonia nitrogen from the sediments. In general, the phosphorus (ortho and total P) content of the surface and mid (12 ft.) samples remained quite low. Inorganic nitrogen concentrations and populations of fecal coliform and fecal streptococci bacteria also remained quite low. The transparency (secchi disc reading) actually improved somewhat since spring, measuring 9.9 feet on June 26th. Two members of the Study Committee have been provided with secchi discs and log sheets and are now measuring transparency on a regular basis.

The Chlorophyll-a content of the vertical column sample, collected with a 0.25" diameter plastic tube was 1.7 mg/m³. The total algae count was quite low with unicellular and colonial green algae forms predominant. A third sampling round is scheduled within the next several days, at which time we will also map the growth of aquatic vegetation (macrophyton) within Dudley Pond.



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Other Tasks in Progress

The surficial geology of the Dudley Pond watershed has been mapped from existing data sources and was field checked on July 9th. U.S.G.S. stream-flow data is being collected in order to begin work on the hydrologic budget.

A public participation progress meeting was held on June 23rd. Notice of the meeting was posted at Town Hall and published in the local newspaper "The Town Crier."

Feel free to call me should you have any further questions or if I can provide you with additional information.

Very truly yours,

IEP, Inc.

A handwritten signature in cursive script that reads "Gerald N. Smith".

Gerald N. Smith
Principal
Aquatic Biologist

Well Point and Domestic Well Data

$O.N. = 1$ in all atoms



DUDLEY POND

Temperature/Dissolved Oxygen Profile

Date: June 26, 1981
Cloud Cover: 50%

Time: 11:30 a.m.
Water Surface: Heavy chop, wind
from the west

<u>Depth (ft)</u>	<u>Temperature (°F)</u>	<u>Dissolved Oxygen (mg/l)</u>
surface	71.0	6.3
5	71.0	-
10	70.0	6.6
15	70.0	6.6
20	63.5	2.0
24	59.5	2.3

Secchi Disc: 9.9 ft.

Chlorophyll-a: 1.7 mg/m³

Table . Results of Sediment Analysis
Dudley Pond (May 19, 1981)

	Percent Moisture	Percent Organics	Total Kjeldahl* Nitrogen	Total Phosphorus*	Iron*	Copper*	Arsenic*
Station 1 - deep hole (top 1 foot)	92.8	57.7	21,100	-	-	-	-
Station 2 - deep hole (1-2 feet)	91.6	53.5	21,700	-	-	-	-
Station 2 - southeast cove	86.0	41.5	10,400	-	-	-	-

- Analyses completed, however numerical results not yet calculated

* mg/kg Dry Weight

TABLE 1. RESULTS OF WATER QUALITY ANALYSES, DUDLEY POND

	Sample Station Location and Description		Date of Collection		Temperature (°F)		Dissolved Oxygen*		pH		Total Phosphorus*		Ortho Phosphorus*		Ammonia-N*		Nitrate-N*		Kjeldahl-N*		Silica*		Fecal Coliform Bacteria**		Fecal Streptococci Bacteria**		Iron*		Alkalinity*		Transparency (ft)		Chlorophyll-a (mg/m ³)		Flow (cfs)	
1 - Surface	3/26	41.0	12.5	7.1	0.01	<0.01	0.04	0.35	1.00	1.0	0	0	60	-	-	-	-	9.2	5.54	-	-															
	6/26	71.0	6.3	7.2	0.03	<0.03	0.24	0.03	0.42	-	3	-	-	-	-	-	-	9.9	1.7	-	-															
1 - Middle (12 ft)	3/26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
	6/26	70.0	6.6	7.2	0.02	<0.01	0.21	0.02	0.23	-	-	-	-	-	-	-	-	-	-	-	-															
1 - Bottom (24 ft)	3/26	39.0	5.3	7.4	0.02	<0.01	0.02	0.36	0.90	0.7	-	-	-	-	-	-	-	-	-	-	-															
	6/26	59.5	2.3	6.8	0.07	<0.01	0.14	0.24	1.00	-	-	-	-	-	-	-	-	-	-	-	-															
2 - Inlet (East cove)	3/26	42.5	9.7	6.4	0.02	<0.01	0.01	0.66	1.04	-	10	<10	-	-	-	-	-	-	-	-	-															
	6/26	No Flow	-	Not Sampled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															

* mg/l

** colonies/100 ml. sample (MF)



DUDLEY POND DIAGNOSTIC/FEASIBILITY RESTORATION STUDY

SEPTIC SNOOPER WATER QUALITY RESULTS

SAMPLE NO.	TOTAL KJELDAHL-N MG/L	AMMONIA-N MG/L	NITRATE-N MG/L	CONDUCTIVITY MICROMHOS/CM	TOTAL P MG/L	TOTAL COLIFORM COLONIES/ 100ML	FECAL COLIFORM COLONIES/ 100ML
Plume 1	0.65	0.04	0.2	240	0.06	120	30
Plume 2	1.4	0.08	0.3	240	0.14	160	20
Plume 3	0.80	0.07	0.2	240	0.06	80	< 5
Plume 4	0.83	0.02	0.2	240	0.10	70	10
Plume 5	0.79	0.05	0.1	230	0.08	60	10
Plume 6	0.74	0.02	0.1	240	0.05	20	< 5
Plume 7	0.65	0.01	0.1	240	0.05	10	5
Plume 8	0.76	0.01	0.2	240	0.07	20	< 5
Plume 9	0.80	0.06	0.2	240	0.05	200	100
Plume 10	1.10	0.02	0.2	240	0.10	4000	120
Plume 11	0.80	0.01	0.2	240	0.07	160	100
Plume 12	0.69	0.01	0.2	240	0.05	80	50
Plume 13	0.45	0.01	0.1	240	0.04	40	15
Plume 14	0.76	0.09	0.3	240	0.06	20	5
Plume 15	0.66	0.01	0.2	240	0.06	100	30
Plume 16	0.50	0.02	0.2	240	0.06	150	60
Plume 17	0.74	0.05	0.2	250	0.09	80	20
Plume 18	0.46	0.06	0.2	240	0.05	200	40
Plume 19	0.50	0.04	0.4	240	0.09	60	< 5
Plume 20	0.62	0.01	0.3	240	0.06	90	15
Plume 21	1.60	0.16	0.2	330	0.13	100	5
Plume 22	0.65	0.03	0.2	240	0.06	10	< 5
Plume 23	0.50	0.10	0.2	240	0.04	50	20
Plume 24	0.70	0.02	0.2	240	0.07	200	120
Plume 25	0.44	0.00	0.2	230	0.05	9500	650
Plume 26	0.41	0.01	0.2	240	0.04	500	200
Mean	0.73	0.04	0.2	243	0.07	618	63
S.D.	0.28	0.04	0.06	18.06	0.03	1968.03	129.55

Background Samples

A	0.71	0.18	0.20	250	0.04	10	5
B	0.74	0.03	0.20	240	0.04	50	20
C	0.65	0.01	0.20	240	0.04	20	< 5
Mean	0.70	0.07	0.20	243	0.04	27	9.16
S.D.	0.05	0.09	0.00	5.77	0.00	20.82	9.46

DUDLEY POND WELL SAMPLING
(1st Round Sampled 7/2/81)

<u>Well No.</u>	<u>Conductivity</u>	<u>Total Kjeldahl-N mg/liter</u>	<u>Ammonia-N mg/liter</u>	<u>Nitrate-N mg/liter</u>	<u>Total Phosphorus mg/liter</u>
WP1	295	0.69	0.50	0.99	0.43
WP2	270	0.45	0.29	0.00	0.21
WP3	210	0.75	0.38	0.00	0.55
WP4	130	0.06	0.05	0.90	0.09
WP5	400	1.00	0.83	5.00	0.36
WP6	380	0.32	0.30	0.20	0.18
WP7	380	2.10	1.84	0.00	0.15
WP8	370	1.40	0.14	0.00	0.15
WP9	230	0.65	0.52	0.10	0.15
WP10	260	0.35	0.34	0.00	0.10
WP11	360	0.24	0.18	3.30	0.04
WP12	290	0.50	0.46	0.00	0.07
WP13	280	0.97	0.91	0.00	0.06
DW1	290	0.06	0.05	3.40	0.01
DW2	430	0.06	0.04	6.10	0.08
Median	285	0.67	0.32	0.05	0.15
Mean	305	0.64	0.46	1.33	0.18
S.D.	81.44	0.56	0.46	2.07	0.15