CONSERVATION POND FINAL REPORT

Presented to:
Cynthia Coffin and the Bourne Board of Health

By Melissa Mills
AmeriCorps~Cape Cod Member Leader 2002-2003
August 2003

INTRODUCTION

Conservation Pond (the Pond) is a coastal brackish pond located in Pocasset, Massachusetts. The Pond is hydraulically linked to Hen Cove via a 12" corrugated metal pipe and through groundwater flow under Circuit Ave. in Pocasset. In the early 1990's, it became apparent that the Pond was being negatively impacted by bacteria. Anecdotal information suggests that the culvert was much larger in the past, particularly before Hurricane Bob caused major damage in the area. The Conservation Pond area may even have housed boats in the past, which would indicate that the Pond has been greatly impacted by sediment in the last 30 to 50 years. The Bourne Board of Health contacted AmeriCorps Cape Cod and a nine-month study of bacteria levels in the Pond was performed. Surface water and suspended sediment samples were taken from the Pond over the course of the winter, spring, and summer months.

To determine the means of contamination of the Pond, three separate influences were considered. First, the possibility of contamination from nearby septic tanks was considered. The tanks were tested in January and then in the summer months to rule out the possibility of an illicit connection to the Pond. Stormwater sampling was also undertaken to determine any impacts from wet weather flow into the pond. Finally, E.Coli samples were taken from the surface water samples and from local animal feces in an attempt to cultivate the bacteria for Polymerase Chain Reaction (PCR) analysis. This effort was undertaken in conjunction with Hemant Chikarmane at Cape Cod Community College (CCCC).

This report is intended to summarize the work done on the Pond both to conclude the current years work and to guide the future work on the Pond.

METHODS

SEPTIC SYSTEM DYE TESTS

To test for the possible connection of a septic system to the Pond, Bright Dyes non-toxic dye tablets were used (see dye information in Appendix A). This dye was chosen because it is certified safe for drinking water supplies and creates less mess in the tablet format than in a large jug of dye, which could easily be spilled. The tests were undertaken at residences surrounding the Pond that did not have record of Title V status. Examples of letters sent to each residence can be found in Appendix B. Many of the homes tested had no information in the Bourne Board of Health's files.

The site visit first involved an inspection of the homeowner's basement to determine that all pipes run to the septic system (or cesspool) in question. After the basement inspection, 10-15 dye tablets were flushed down the toilet. Several flushes were used to get increased water flow into the septic tank. It is important to do a trial flush to make sure the toilet bowl has adequate flushing power. One should also wear gloves because the red powder that comes off the tablets can easily stain hands.

After dye application, the pond was then monitored at intervals that were approximately: immediately, 3 hours, 6 hours, and 24 hours. It was important to get

close to the area where the dye could leach, so a kayak was used to monitor the pond. Possibly good binoculars could have also been used to monitor the pond.

Note: In the winter, I took samples of the water to be looked at under a flurometer, but we were unable to get easy access to one in a timely manner, so a visual inspection only was used after January.

SURFACE WATER AND STORMWATER SAMPLING

The surface water and stormwater sampling were undertaken on Thursdays only to coincide with the AmeriCorps schedule and the schedule of the Barnstable County Laboratory. Samples were taken at locations around the pond corresponding with previous sampling done by the Bourne Selectmen's Pollution Task Force and in additional locations of concern for a comprehensive survey. This included background samples near the boat ramp in Hen Cove and samples at all inflows and outflows of the pond. Both hand drawn and Geographic Information System (GIS) maps shown in Appendix C detail the various sampling locations.

During the time of the winter sampling the Pond was partially or completely frozen at different intervals. This and the lack of an adequate watercraft made sampling in the center of the pond impossible until February (we still had to break a lot of ice in February as well). The sampling involved the placement of water and/or water with suspended sediment in 250 ml plastic bottles provided by the Barnstable County Laboratory. The sediment samples were taken only in the winter months to see if bacteria were surviving in the sediment over the winter. These sediment

samples were difficult for the Lab to analyze, as they clog the sample filters, and should be kept to a minimum.

The samples in the winter were taken by attaching the 250 ml bottle to a pole with two elastics attached to it with duct tape (Note: this set-up should not be used when testing for Volatile Organic Compounds (VOCs) because the duct tape is made with them and could contaminate the sample). The pole is currently outside of the AmeriCorps equipment shed at the Bourne House and could be reused as needed. The pole was rinsed with distilled water between uses to prevent cross-contamination. Blue nitrile gloves were also worn during the sampling to prevent cross contamination and exposure to contaminated water. Unfortunately, we did not have any budget for this project so gloves had to be re-used during the course of later sampling rounds. This could mean that some cross contamination had occurred. In analyzing the data, there was no sign of this contamination and I hope the effect was negligible. Note: I did change gloves at least 4 times per sampling round.

The later samples were taken from a kayak (Melissa's personal kayak). The kayak itself could also have caused some cross contamination, but this is also unlikely due to the range in many of the results for a given sampling day. Several of the samples along the pond shore were difficult to take because it was impossible to stand there due to deep muddy sediments, and it was also difficult to get the kayak in close enough to get a good runoff or groundwater sample. Using the paddle or tree branches to pull one closer is the best option found for this study.

Once the samples were collected, they were placed in a cooler with blue ice packs, provided by the Bourne Board of Health. The samples were then driven as soon as possible to the Barnstable County Lab for analysis. The lab would prefer to receive the samples before 2 p.m. if possible (this wasn't always possible but the holding time is 30 hours so they can stay overnight if need be). The samples were each labeled with duct tape and given a unique sample ID. The Time and place for each sample and sample ID were recorded in a field notebook. This information was all recorded on a chain of custody provided by the Lab and required for sample analysis. The samples are checked in and put in a refrigerator at the Lab as well.

E. COLI PCR ANALYSIS

The PCR analysis portion of this study was added on after conversations with Rick York of the Mashpee shellfish department and Hemant Chikarmane of CCCC. The goal was to assist Hemant with the collection of animal feces to be added to a database of E.Coli DNA and to compare the E. Coli DNA found in the Pond with the database samples. The comparison would aid in determining if the E. Coli came from animal or human origins. To aid in this effort, bird and other animal feces was collected from around the Pond and in Hen Cove at low tide. The E. Coli grown for analysis at the Barnstable County Laboratory was also collected. These samples were then cultivated on a growth media for E. Coli at CCCC. The samples successfully grew, but were unable to be isolated. Unfortunately, only approximately 2-3 hours a week was available for this project and this was not enough time to adequately work on cultivation of the bacteria. (Note: further information on the analysis of the

bacteria can be found in the Conservation Pond field notebook which is located at the Bourne Board of Health – this notebook contains all my onsite notes and research notes from the DNA project. Also some research material dealing with E. Coli studies and research papers can be found in the Pond files located at the Bourne Board of Health office).

RESULTS

SEPTIC SYSTEM DYE TESTING

The results of the dye testing on septic systems showed no direct connections of the surrounding residence's septic systems to the pond. These results do not address the nitrogen loading on the pond and do not completely rule out septic systems' impact on the pond. As will be noted later in this report, the groundwater levels in the Pond were consistently high, which may point to a septic system located within the water table. A septic system located in or under the water table could cause flow of septic wastes with the groundwater. This could possibly allow the septic systems or cesspools at residences near the Pond, to add bacteria to the Pond. Theoretically, Title V systems have a 4 ft separation to groundwater, which would remove bacteria from the effluent.

SURFACE WATER AND STORMWATER SAMPLING

The surface water, sediment, and stormwater sampling provided detailed information on the bacteria populations in the pond over the course of the winter, spring, and summer. Table 1 provides a summary of these sampling results. The

sediment sampling results showed that E. Coli survived in the sediment of the Pond over the course of the particularly harsh winter in 2003. The bacteria population certainly decreased during the winter months, increased in the spring and summer months, and were particularly high during summer rainstorms. The last sampling round in July took place at the end of a hard short rainfall, and there had be very little rain in the weeks preceding. This combination of events caused the results to be extremely high, with impacts on Hen Cove as well. Appendix D shows the results for both E. Coli and enterococcus for each sampling round and for the combined results in the winter, spring, and summer. These figures give a visual representation of the sampling results. The results comparing the stormwater samples to the pond sample show that the runoff on Island Dr. is highly contaminated with bacteria, especially after times of little rain. The stormwater inputs into the Pond were also higher than the levels in the Pond. The levels in Hen Cove were lower than in the Pond as expected since E. Coli does not grow as well in saltwater. The tidal action in the Cove is also able to dilute and flush the bacteria out of the Cove.

The groundwater samples, especially the samples taken at a spring flowing from the direction of Park St. consistently had bacteria present in the spring and summer. At times including the last sampling round the levels were >2000. This is extremely high compared to previous levels.

E. COLI PCR ANALYSIS

The PCR analysis of the E. Coli DNA unfortunately achieved no results at this point in time. It is hoped that this work could be continued with a future

AmeriCorps member working exclusively on the project. Several days a week time commitment would greatly increase the chances of success for this project. The DNA database could be an invaluable tool for analyzing bacteria contamination and help refine remediation strategies and shellfish closures.

DISCUSSION

The results of this study point to several processes impacting the Pond including, stormwater, groundwater, waterfowl, and dog wastes. Many of these are interconnected. For instance, the increase in dogs in the summer in the Pond vicinity, cause increased bacteria levels in stormwater runoff. In this study's sampling results, stormwater had the clearest connection to the Pond problems. High levels on Island Dr. corresponded to higher levels than normal in the Pond.

The groundwater bacteria levels were interesting in that they also seemed tied to rain events. The final sampling round showed levels in the groundwater from Park St. were >2000 which was surprising. Perhaps the rainwater infiltrating in the ground caused the faster movement of bacteria from a septic system to the spring adjacent to the Pond. This seems like a very fast turn around time for this to occur however. Many people have discussed a stream that used to run from the old golf course in Pocasset to the Conservation Pond area. This information is somewhat irrelevant because of the great distances the bacteria would have to travel from across Shore Rd. However as stated above, the general groundwater flow patterns in the area and the potential steep gradients in the localized Island Dr. and Park St. area could have an effect on the flow of bacteria to the Pond.

Waterfowl were present in the Pond over the course of the entire project. The populations increased greatly in the summer when babies ducks were born and when many families began feeding the ducks bread crumbs on a regular basis. Then feeding of the ducks causes unnatural dependence on humans and encourages larger populations than the Pond would normally support. The increased waterfowl populations have increased bacteria levels in the Pond, although to what extent is unknown. The E. Coli project would be a great help in determining the origins of the bacteria and thus pinpoint waterfowl, dogs, or humans as the main culprit in the bacteria problem.

RECOMMENDATIONS

The problem in Conservation is a complex one, with no clear-cut answers. The recommendations here are my personal opinions and do not necessarily reflect the views of the Bourne Board of Health.

The main recommendation I can make is to address the stormwater issues associated with the Pond. This can be achieved in several ways, but my main suggestion is to fix the catchbasin on Island Dr. across from Virginia Ave and then to construct a remediated wetland to deal with both bacteria and nutrient runoff. The wetland area above the Pond (e.g. away from the Cove) is currently impacted by many invasive plants, and a designed wetland could help restore native communities while providing a needed ecological service for the Pond and Cove. I feel this is the best option for stormwater management considering the shallow depth to groundwater in the area. Grants such as the CPR or 319 grants could be obtained to

have a consultant design and implement such a remediation program. For more information on constructed wetlands, please look at the Website links provided below:

http://www.epa.gov/owow/wetlands/construc/content.html

http://ag.arizona.edu/AZWATER/arroyo/094wet.html

http://www.bnl.gov/erd/Peconic/Factsheet/Wetlands.pdf

Another suggestion to help remediate the Pond was to widen the culvert to allow greater flushing from the Pond. This idea has its merits, but I suggest caution when attempting this solution. I believe this solution should be implemented in conjunction with a stormwater solution so that the Pond is address from an input perspective as well as a flushing perspective. The flushing will accomplish little if the bacteria and nitrogen loading are not addresses concurrently. The widening of the culvert should be undertaken in the fall when the waters of Hen Cove are no longer used for swimming. The shellfish beds in this region are already closed, so that issue will not need to be addresses unless the flushing is able to impact Patuisset shellfish areas.

If possible, it would also be helpful to put some sort of cleaning device on the culvert of the Pond. This would help reduce the impact of the bacteria flushing on the Cove. This would require intensive cleaning/maintenance during the first few months of operation and then perhaps only be used in the peak summer months.

In the near term, improvements could be made by erecting signage about water quality and stormwater, leash laws, and feeding of ducks. The Bourne DPW

expressed willingness to create and/or install such signs. It also might be helpful to install a kiosk with Stormwater information and free bags for dog owners to pick up after their pets. The kiosk would include a trashcan for waste. Making it easier for dog owners to pick up after their dogs could have a significant impact on the reduction of E. Coli bacteria in the pond and cove.

ACKNOWLEDGMENTS

I would like to thank Cindy Coffin and the entire staff at the Bourne Board of Health for their guidance and support of this project. They have all been a pleasure to work with. I would also like to thank all the members of the Bourne Selectmen's Pollution Task Force for their interest, help and enthusiasm. Special thanks to both Cindy Coffin and Jim Mulvey for their help sampling in very inclement weather and for their insight and support.

APPENDIX A

Dye Information

BRIGHT DYES
Division of Kingscote Chemicals

WATER TRACING DYE

FLT YELLOW/GREEN PRODUCTS

TECHNICAL DATA BULLETIN

Bright Dyes Yellow/Green products are specially formulated versions of Xanthene dye, certified by NSF International to ANSI/NSF Standard 60 for use in drinking water. This dye is the traditional fluorescent water tracing and leak detection material and has been used for labeling studies from the beginning of the century. It may be detected visually, by UV light and by appropriate fluoremetric equipment. Today it is most often used visually. This dye has been used by the military to mark downed pilots for search and rescue operations over large water bodies. Visually the dye appears yellow/green, depending on its concentration and under UV light as lime green.

Based on biochemical oxygen demand (BOD) studies, the dye is biodegradable with 65% of the available oxygen consumed in 7 days. The dye is resistant to absorption on most suspended matter in fresh and salt water. However, compared to Bright Dyes FWT Red products it is significantly less resistant to degradation by sunlight and when used in fluorometry, stands out much less clearly against background fluorescence. As always the suitability of these products for any specific application should be evaluated by a qualified hydrologist or other industry professional.

General Properties	Tablets	Liquids	Powders
Detectability of active ingredient [1]	Visual <100 ppb	Visual <100 ppb	Visual <100 ppb
Maximum absorbance wavelength [2]	490/520 nm	490/520 nm	490/520 nm
Appearance	Orange convex 1.6cm diameter	Reddish, brown aqueous solution	Orange fine powder
NSF (Max use level in potable water)	6.0 ppb	10.0 ppb	1.0 ppb
Weight	1.35 gms ± 0.05		
Dissolution Time [3]	50% < 3 minutes 95% < 6 minutes		50% < 3 minutes 95% < 6 minutes
Specific Gravity		1.05 ± 0.05 @ 25° C	
Viscosity [4]		1.8 cps	
pH		8.5 ± 0.5 @ 25° C	

Coverage of Products	One Tablet	One Pint Liquid	One Pound Powder
Light Visual	605 gallons	125,000 gallons	1,200,000 gallons
Strong Visual	60 gallons	12,500 gallons	120,000 gallons

Caution: These products may cause irritation and/or staining if allowed to come in contact wit the skin. The use of gloves and goggles is recommended when handling this product, as with any other dye or chemical.

To our best knowledge the information and recommendations contained herein are accurate and reliable. However, this information and our recommendations are furnished without warranty, representation, inducement, or license of any kind, including, but not limited to the implied warranties and fitness for a particular use or purpose. Customers are encouraged to conduct their own tests and to read the material safety data sheet carefully before using.

[1] In deionized water in 100 ml flask. Actual detectability and coverage in the field will vary with specific water conditions.
[2] No significant change in fluorescence between 6 and 11 pH.
[3] (One tablet, 1 gram of powder), in flowing deionized water in a 10 gallon tank.
[4] Measured on a Brookfield viscometer, Model LV, UL adapter, 60 rpm @ 25° C.

Kingscote Chemicals, 3334 S. Tech Blvd., Miamisburg, Ohio 45342
Telephone: (937) 886-9100 Fax: (937) 886-9300 Web: www.brightdyes.com

EXPLOSION HAZARD

SENSITIVITY TO STATIC DISCHARGE	REMOTE POSSIBILITY OF A DUST EXPLOSION. IF MIXED WITH AIR IN THE PROPER PROPORTIONS, IT CAN BE EXPLOSIVE (SIMILAR TO FLOUR OR STARCH).
SENSITIVITY TO MECHANICAL IMPACT	NOT APPLICABLE

REACTIVITY DATA

PRODUCT STABILITY	STABLE
PRODUCT INCOMPATIBILITY	AVOID BROMINE TRIFLUORDE, LITHIUM, STRONG ACIDS, BASES AND OXIDIZERS.
CONDITIONS OF REACTIVITY	NONE KNOWN
HAZARDOUS DECOMPOSITION PRODUCTS	SEE HAZARDOUS COMBUSTION PRODUCTS

TOXICOLOGICAL PROPERTIES

SYMPTOMS OF OVER EXPOSURE FOR EACH POTENTIAL ROUTE OF ENTRY:

INHALLATION, ACUTE	MAY CAUSE IRRITATION IF DUST IS INHALED.
INHALATION, CHRONIC	NONE KNOWN
SKIN CONTACT	MAY BE IRRITATING TO THE SKIN. WILL CAUSE STAINING OF THE SKIN ON CONTACT.
EYE CONTACT	MAY CAUSE IRRITATION
INGESTION	URINE MAY BE A YELLOW/GREEN COLOR UNTIL THE DYE HAS BEEN WASHED THROUGH THE SYSTEM.
EFFECTS OF ACUTE EXPOSURE	DIRECT CONTACT MAY CAUSE IRRITATION TO THE EYES, SKIN, AND RESPIRATORY TRACT.
EFFECTS OF CHRONIC EXPOSURE	NONE KNOWN
THRESHOLD OF LIMIT VALUE	NOT APPLICABLE
CARCINOGENICITY	NOT LISTED AS A KINOWN OR SUSPECTED CARCINOGEN BY IARC, NTP OR OSHA.
TERATOGENICITY	NONE KNOWN
TOXICOLOGY SYNERGISTIC PRODUCTS	NONE KNOWN

PREVENTATIVE MEASURES

PERSONAL PROTECTIVE EQUIPMENT

GLOVES	RUBBER
RESPIRATORY	USE NISOH APPROVED DUST MASK IF DUSTY CONDITIONS EXIST.
CLOTHING	PROTECTIVE CLOTHING SHOULD BE WORN WHERE CONTACT IS UNAVOIDABLE.
OTHER	HAVE ACCESS TO EMERGENCY EYEWASH.

APPENDIX B

Letters sent to the residences to request permission to dye test.

TOWN OF BOURNE
BOARD OF HEALTH

24 Perry Avenue
Buzzards Bay, MA 02532
Phone (508) 759-0615 x513
Fax (508) 759-8026

Cynthia A. Coffin
Health Agent

December 11, 2002

Marjorie J. Lyons
P.O. Box 72
10 Aptucxet Rd.
Bourne, MA 02532-0072

Dear Ms. Lyons,

This letter is to inform you that the Board of Health is currently undertaking an assessment of the health of Conservation Pond near your residence in Pocasset. The concern is that Conservation Pond is currently polluted with fecal coliform bacteria, which in turn affects the health of Hen's Cove and it's shellfish population. In studying the pollution problem in Conservation Pond, we hope to eliminate the possibility that septic systems are negatively impacting the pond by conducting dye tests of septic systems within the pond vicinity. We believe the main issues affecting the pond are stormwater run-off, lack of flushing, and an entrained bacteria population in the pond, and we will focus more on these issues once septic system impacts have been adequately studied.

Your property on 71 Wamsutta Ave. is in the immediate vicinity of Conservation Pond and we would greatly appreciate your permission to test your septic system and inspect your piping. This inspection will help facilitate the cleanup of Conservation Pond, and help us rule out any impact from your system on the pond.

Please find enclosed, a waiver granting permission to the Board of Health and its representatives to inspect your property, and a self-addressed stamped envelope in which to return the waiver to our office. If you agree to the inspection I will be contacting you by phone, upon receipt of the waiver, to coordinate the logistics of the Board of Health visit to your residence.

Thank you very much for your time and for your support of our efforts to remedy the pollution problems in Conservation Pond and Hen's Cove. Please feel free to give me a call at (508) 759-0615 x513 if you have any questions.

Sincerely,

Melissa B. Mills
Volunteer
Bourne Board of Health

TOWN OF BOURNE
BOARD OF HEALTH

24 Perry Avenue
Buzzards Bay, MA 02532

Cynthia A. Coffin
Health Agent

PERMISSION TO INSPECT SEPTIC SYSTEM AND PERFORM DYE TESTING

I _____(your name) give permission for the Town of Bourne Board of Health and its representatives to inspect the property at 71 Wamsutta Ave. Pocasset, MA. This waiver allows for the inspection of pipes in the basement of 71 Wamsutta Ave. and to conduct a dye test of the septic system. This waiver includes access to the house and property of 71 Wamsutta Ave.

Sincerely,

(Please sign above)

Phone Number for Follow Up Phone Conversation:

_____

Correspondence Address (if different from our files):

_____

TOWN OF BOURNE
BOARD OF HEALTH

24 Perry Avenue
Buzzards Bay, MA 02532
Phone (508) 759-0615 x513
Fax (508) 759-8026

Cynthia A. Coffin
Health Agent

April 10, 2003

Marjorie and Thomas Lyons
P.O. Box 72
10 Aptucxet Rd.
Bourne, MA 02532-0072

Dear Mr. & Mrs. Lyons,

The Board of Health would like to update you on the status of the Conservation Pond project in Pocasset. The Board of Health conducted dye testing of several local septic systems and sampled the pond for bacteria on various occasions this winter. The results of these efforts show that bacteria populations in the pond are present year round, even during this particularly cold winter. The pond is fairly shallow with minimal flushing, providing suitable habitat for both enterococcus and e. coli. The septic system dye tests performed this winter showed no direct contribution to the pond, but with the freezing temperatures and sporadic use of houses in the area, we have decided to postpone further septic testing until late spring.

We are still interested in testing the septic system on your property at 71 Wamsutta Ave. These inspections will help facilitate the cleanup of Conservation Pond, and help us rule out any impact from your system on the pond. The process involves flushing non-toxic dye down your toilet and inspecting the pipes in your basement. Our visit to your residence will require only an hour of your time at most.

I will be contacting you in late April to set up an appointment to test your septic system. In the meantime, please feel free to give me a call with any questions or comments on this project. Thank you very much for your time and for your support of our efforts to remedy the pollution problems in Conservation Pond and Hen's Cove.

Sincerely,

Melissa B. Mills
Volunteer
Bourne Board of Health

APPENDIX C

GIS map of sampling locations.


Site Location and Sampling Sites
Conservation Pond
Legend
Surface Water Sampling Locations
Note: Digital Orthophotography
Provided by MassGIS
100
0
100
200 Feet
N

Area for Possible Constructed Wetland

Conservation Pond - Pocasset, MA

Legend

Possible Area for Constructed Wetland Remediation

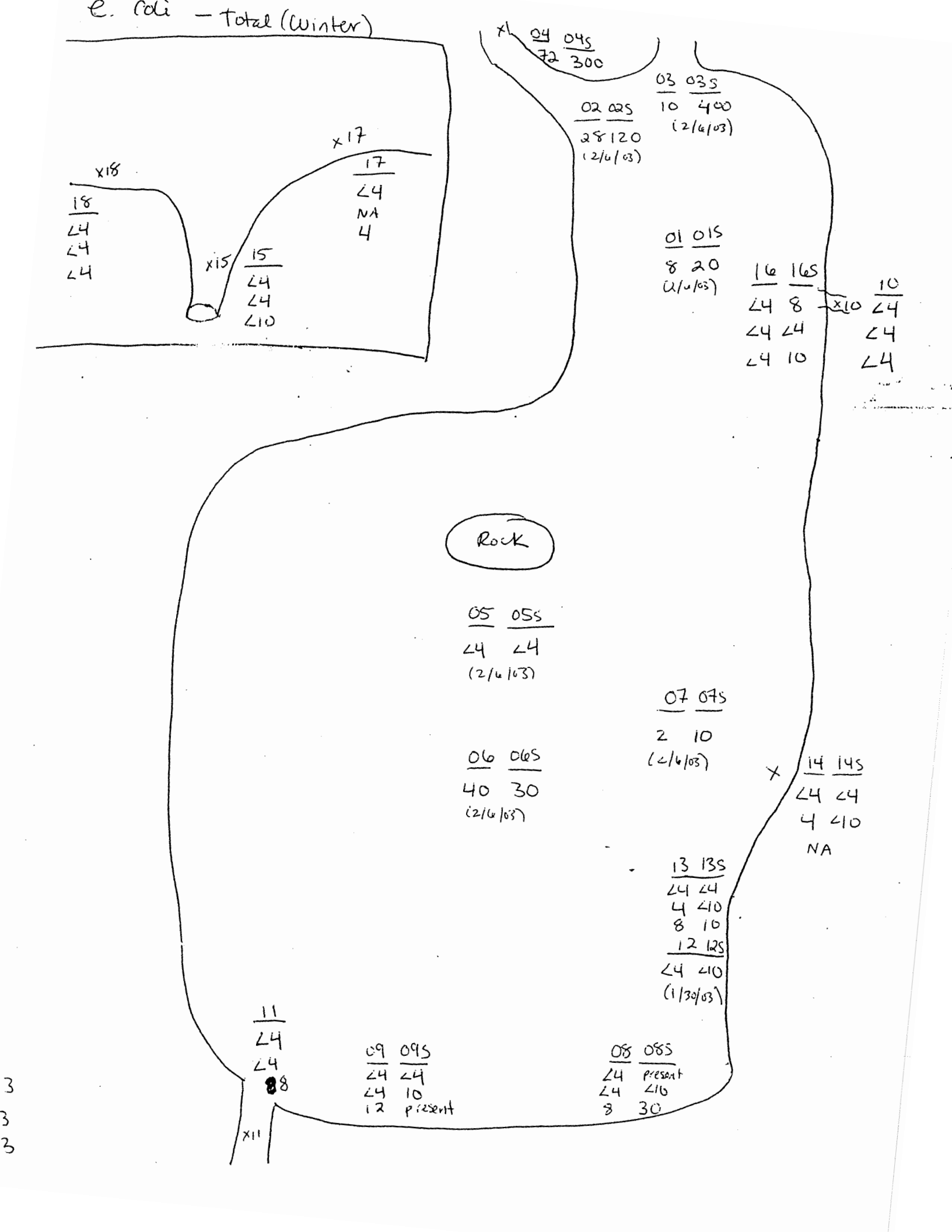
Notes: Digital Orthophotography Provided by MassGIS
Map Created by Melissa Mills AmeriCorps Cape Cod

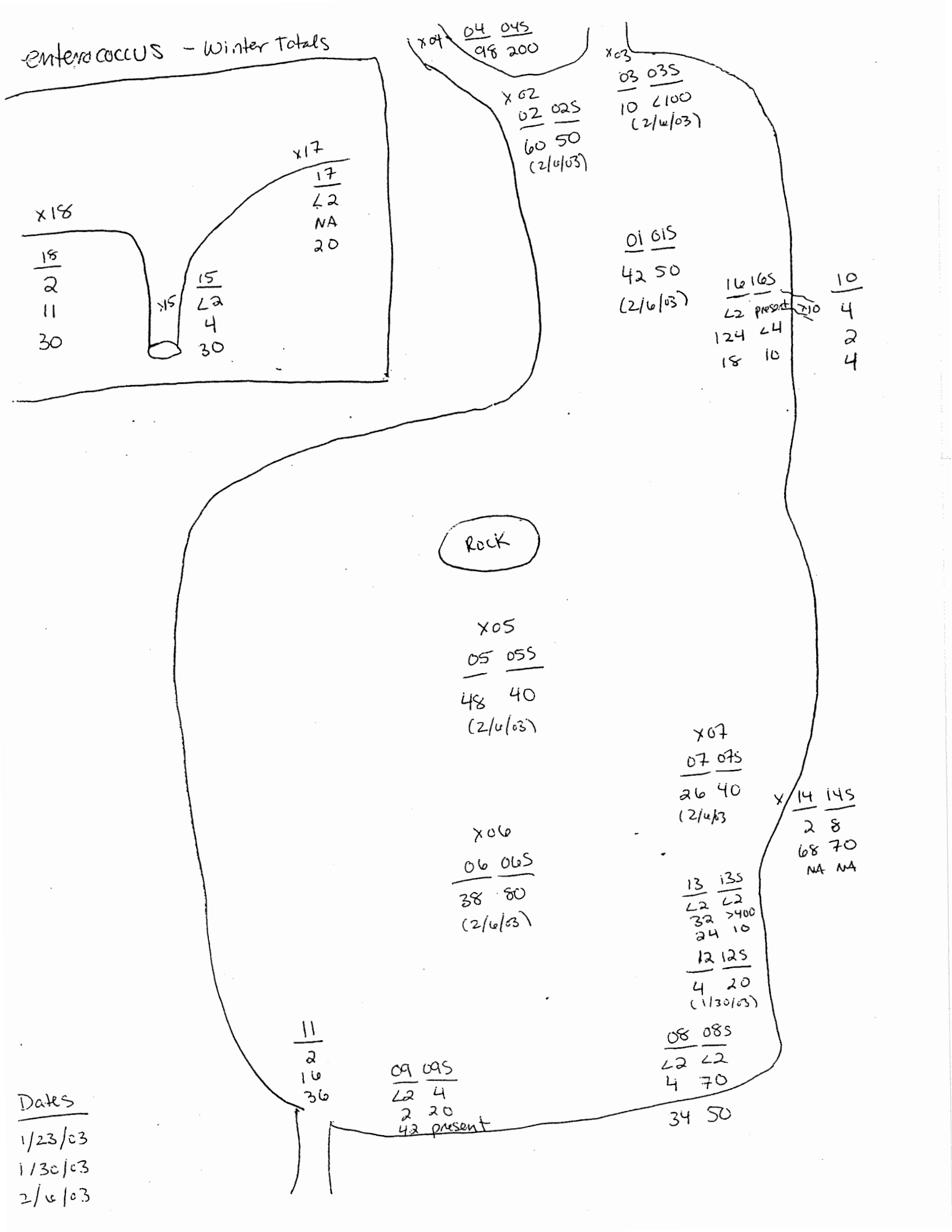
N

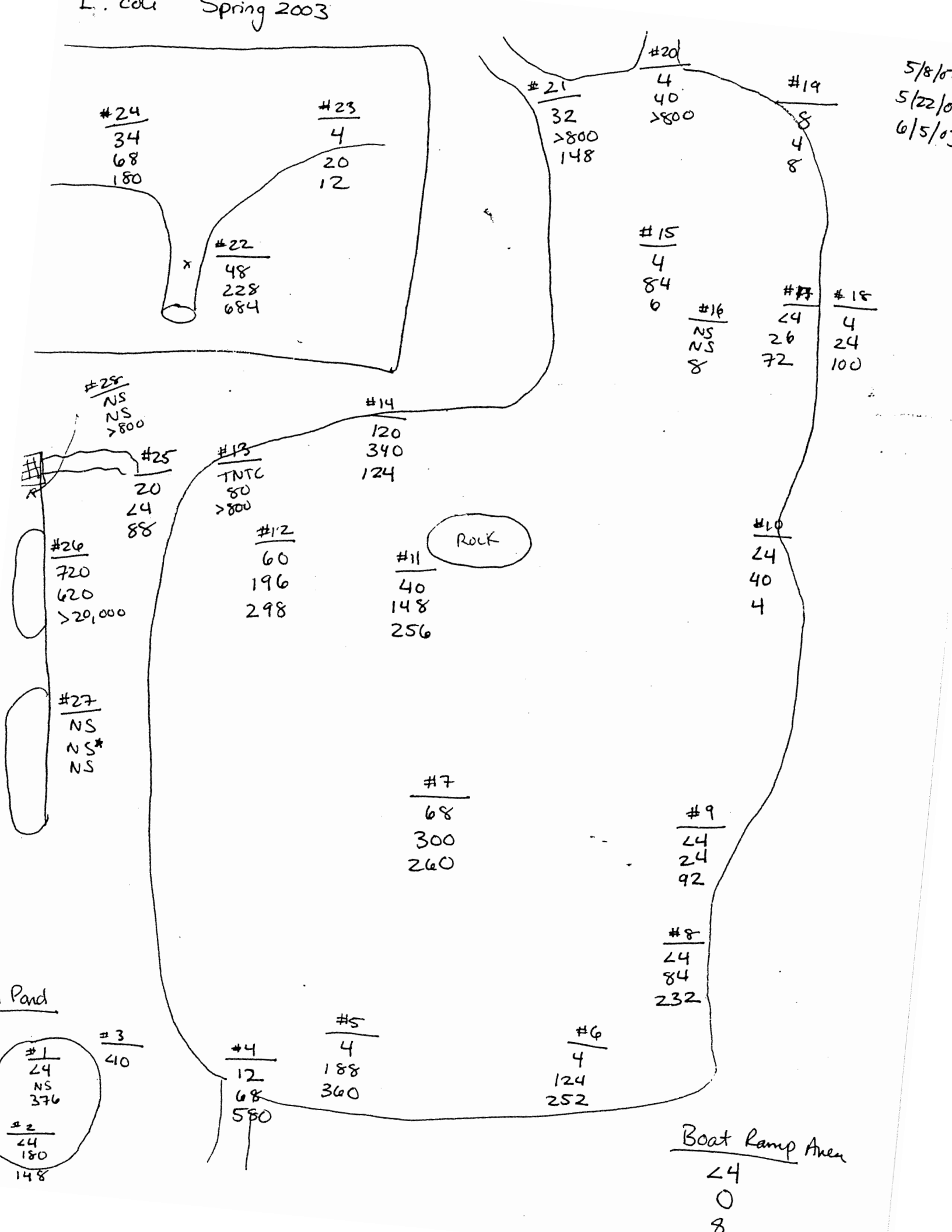
100 0 100 200 Feet

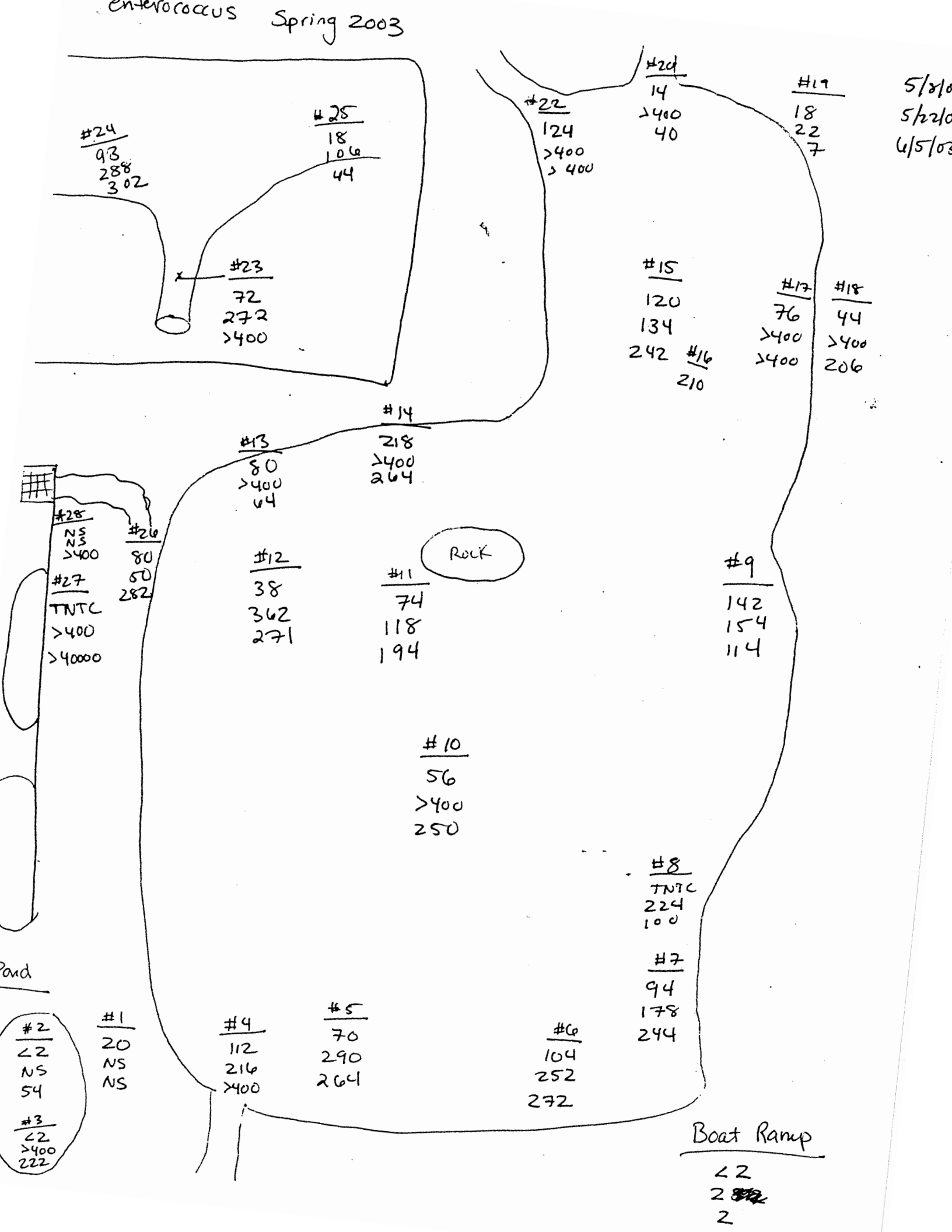
APPENDIX D

Hand drawn figures showing the sampling results for each sampling event and grouped by season.

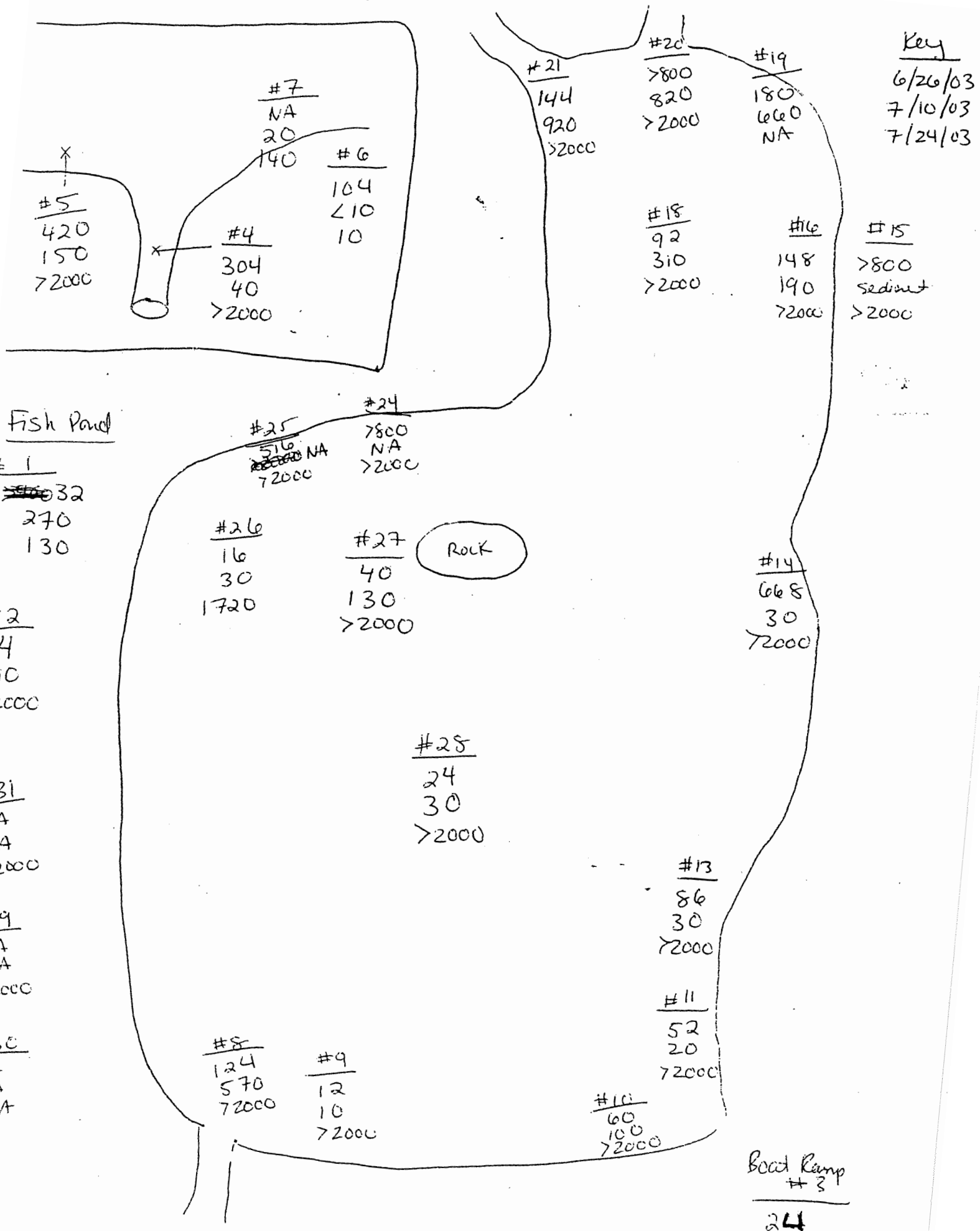

E. coli – Total (Winter)
x1
04 045
72 300
03 035
10 400
(2/6/03)
02 025
28 120
(2/6/03)
x17
17
<4
NA
4
x18
18
<4
<4
<4
x15
15
<4
<4
<10
01 015
8 20
(2/6/03)
16 165
<4 8
<4 <4
<4 10
x10
10
<4
<4
<4
Rock
05 055
<4 <4
(2/6/03)
07 075
2 10
(2/6/03)
06 065
40 30
(2/6/03)
X
14 145
<4 <4
4 <10
NA
13 135
<4 <4
4 <10
8 10
12 125
<4 <10
(1/30/03)
11
<4
<4
8
x11
09 095
<4 <4
<4 10
12 present
08 085
<4 present
<4 <10
8 30

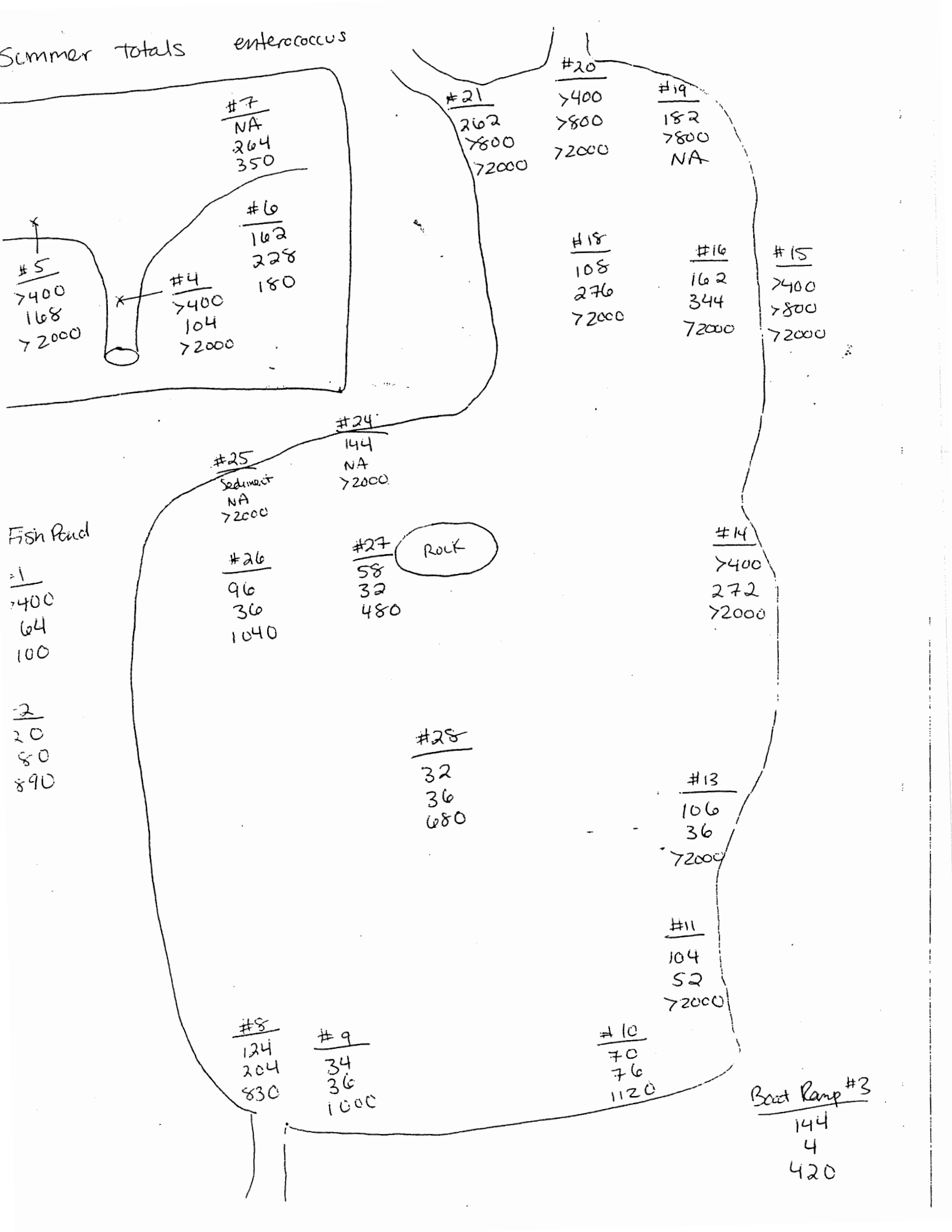

enterococcus - Winter Totals
x04
04 045
98 200
x03
03 035
10 <100
(2/6/03)
x02
02 025
60 50
(2/6/03)
x17
17
<2
NA
20
x18
18
2
11
30
x15
15
<2
4
30
01 015
42 50
(2/6/03)
16 165
<2 present
124 <4
18 10
10
4
2
4
ROCK
x05
05 055
48 40
(2/6/03)
x07
07 075
26 40
(2/4/03
x14 145
2 8
68 70
NA NA
x06
06 065
38 80
(2/6/03)
13 135
<2 <2
32 >400
24 10
12 125
4 20
(1/30/03)
08 085
<2 <2
4 70
34 50
11
2
16
36
09 095
<2 4
2 20
42 present
Dates
1/23/03
1/30/03
2/6/03


E. coli Spring 2003
5/8/0
5/22/0
6/5/0
#20
4
40
>800
#21
32
>800
148
#19
8
4
8
#24
34
68
180
#23
4
20
12
#22
48
228
684
#15
4
84
6
#16
NS
NS
8
#17
<4
26
72
#18
4
24
100
#14
120
340
124
#28
NS
NS
>800
#25
20
<4
88
#13
TNTC
80
>800
#12
60
196
298
#11
40
148
256
ROCK
#10
<4
40
4
#26
720
620
>20,000
#27
NS
NS*
NS
#7
68
300
260
#9
<4
24
92
#8
<4
84
232
Pond
#1
<4
NS
376
#2
<4
180
148
#3
410
#4
12
68
580
#5
4
188
360
#6
4
124
252
Boat Ramp Area
<4
0
8

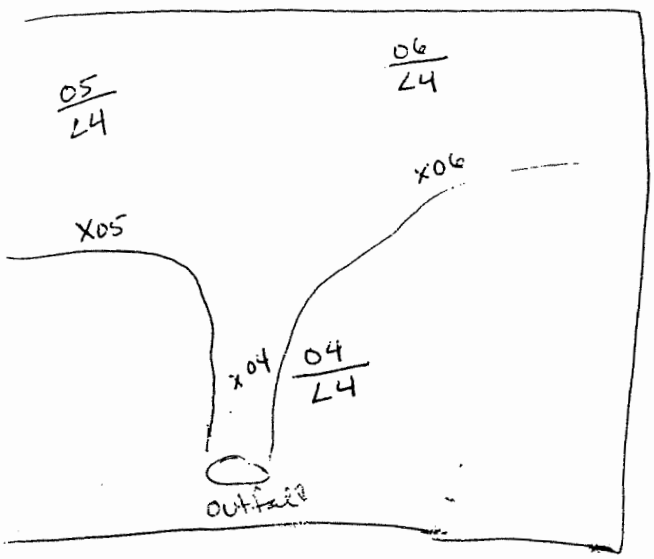

Enterococcus Spring 2003
#24
93
288
302
#25
18
106
44
#23
72
272
>400
#22
124
>400
>400
#21
14
>400
40
#19
18
22
7
5/8/0
5/22/0
6/5/03
#15
120
134
242
#16
210
#17
76
>400
>400
#18
44
>400
206
#14
218
>400
264
#13
80
>400
64
#28
NS
NS
>400
#26
80
50
282
#27
TNTC
>400
>40000
#12
38
362
271
#11
74
118
194
Rock
#9
142
154
114
#10
56
>400
250
#8
TNTC
224
100
#7
94
178
244
#6
104
252
272
#5
70
290
264
#4
112
216
>400
#1
20
NS
NS
#2
<2
NS
54
#3
<2
>400
222
Pond
Boat Ramp
<2
2
2

Summer totals e. Coli




Summer totals enterococcus
#7
NA
264
350
#6
162
228
180
#5
>400
168
>2000
#4
>400
104
>2000
#21
262
>800
>2000
#20
>400
>800
>2000
#19
182
>800
NA
#18
108
276
>2000
#16
162
344
>2000
#15
>400
>800
>2000
#24
144
NA
>2000
#25
Sediment
NA
>2000
Fish Pond
#1
>400
64
100
#2
20
80
890
#26
96
36
1040
#27
58
32
480
ROCK
#14
>400
272
>2000
#28
32
36
680
#13
106
36
>2000
#11
104
52
>2000
#8
124
204
830
#9
34
36
1000
#10
70
76
1120
Boat Ramp #3
144
4
420

E. Coli 1/23/03



X11
11 11S
L4 8
X10 10
L4

Rotic

09S 09 X09
L4 L4

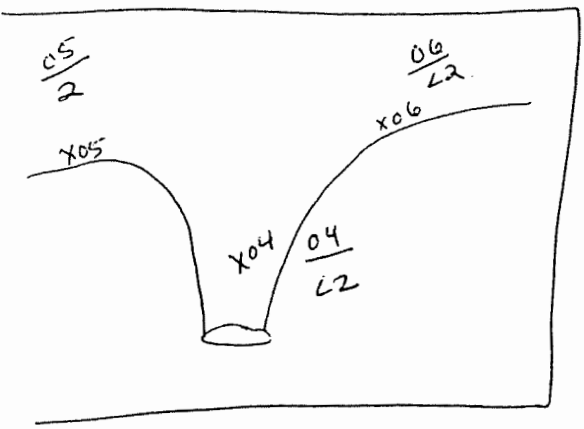
Dup
07 07
L4 L4

03
L4

02 02S
L4 L4

01 01S
L4 Present

enterococcus 1/23/03



11 11S
~~4~~ ~~8~~
<2 present
x10

10
4

09 09S
2 8
x09

07 DUP x07
<2 <2
Trace

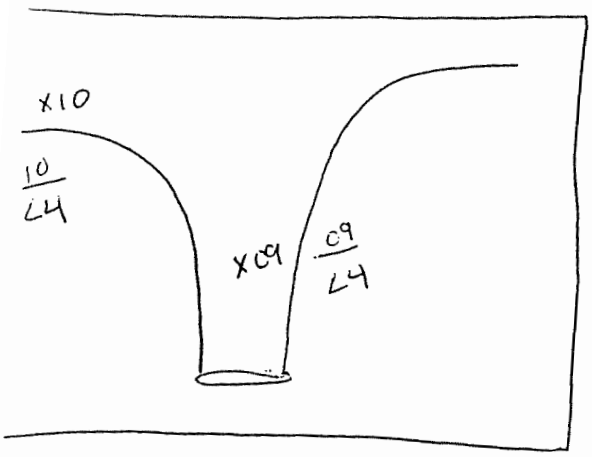
01 01S
<2 <9

03
2

02 02S
<2 ~~4~~

Circuit Arm.

e. coli 1/30/03



02 02S
<4 <4
01
<4

Rock

X03
03 03S
4 <10

04 04S X04
4 <10

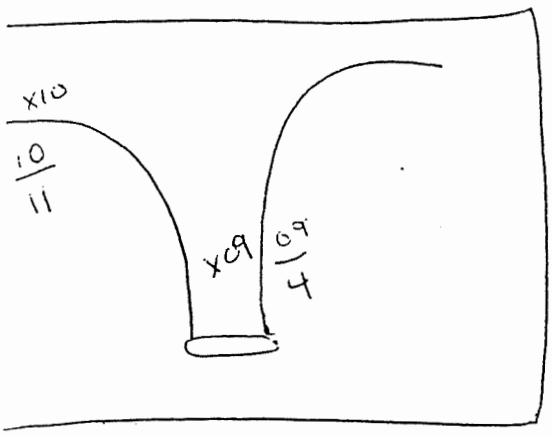
05 05S X05
<4 <10

06 06S
<4 <10

X08
08 08S
<4 10

X07 07
<4

enterococcus 1/30/03



02 025
124 <4
01
2

Rock

x03
03 035
68 70

04 045 x04
32 >400

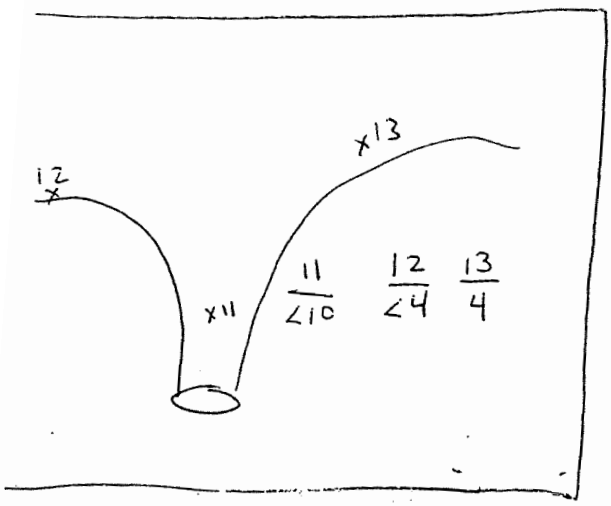
05 055 x05
4 20

06 065
4 70

x08
08 085
2 20

x07 07
16

e.Coli 2/6/03



x04 04 045
72 300

x03
03 035
10 <100

x02
02 025
25 120

x01
01 015
8 20

16 165
<4 10

x16
x15
15
<4

Rock

x05
05 055
<4 <4

x07
07 075
2 10

x06
06 065
40 30

14 145
8 10
x14

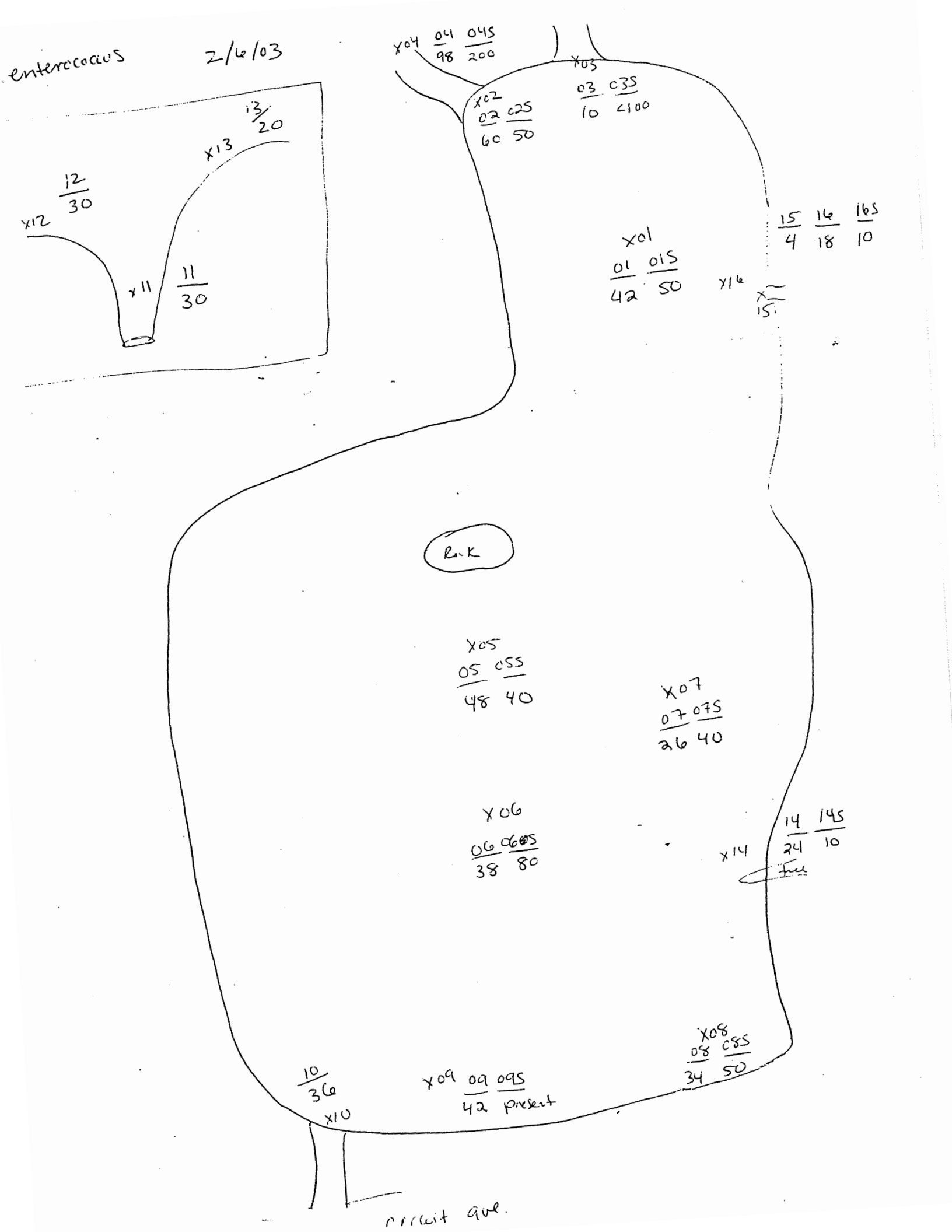
10
8

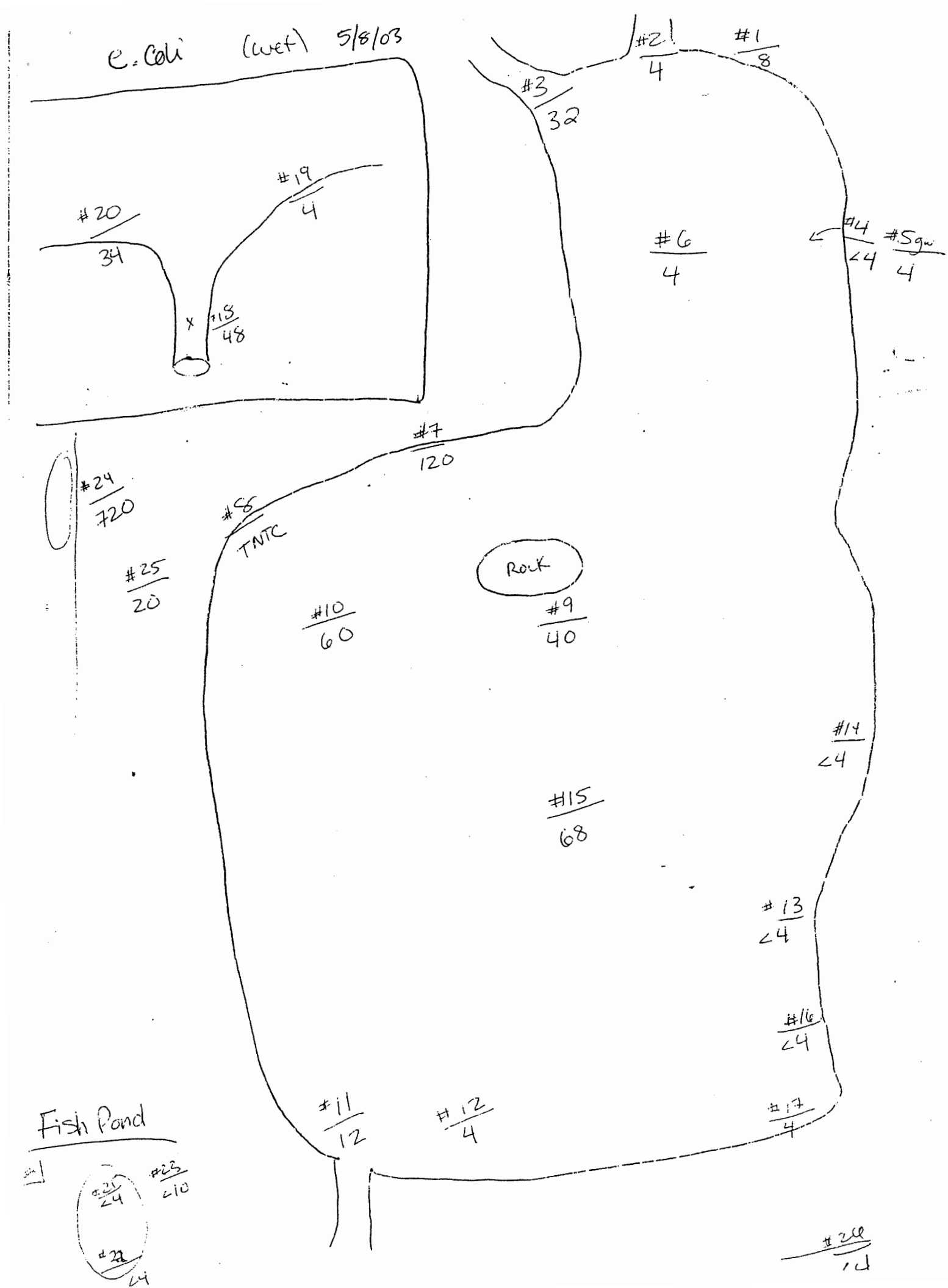
x10

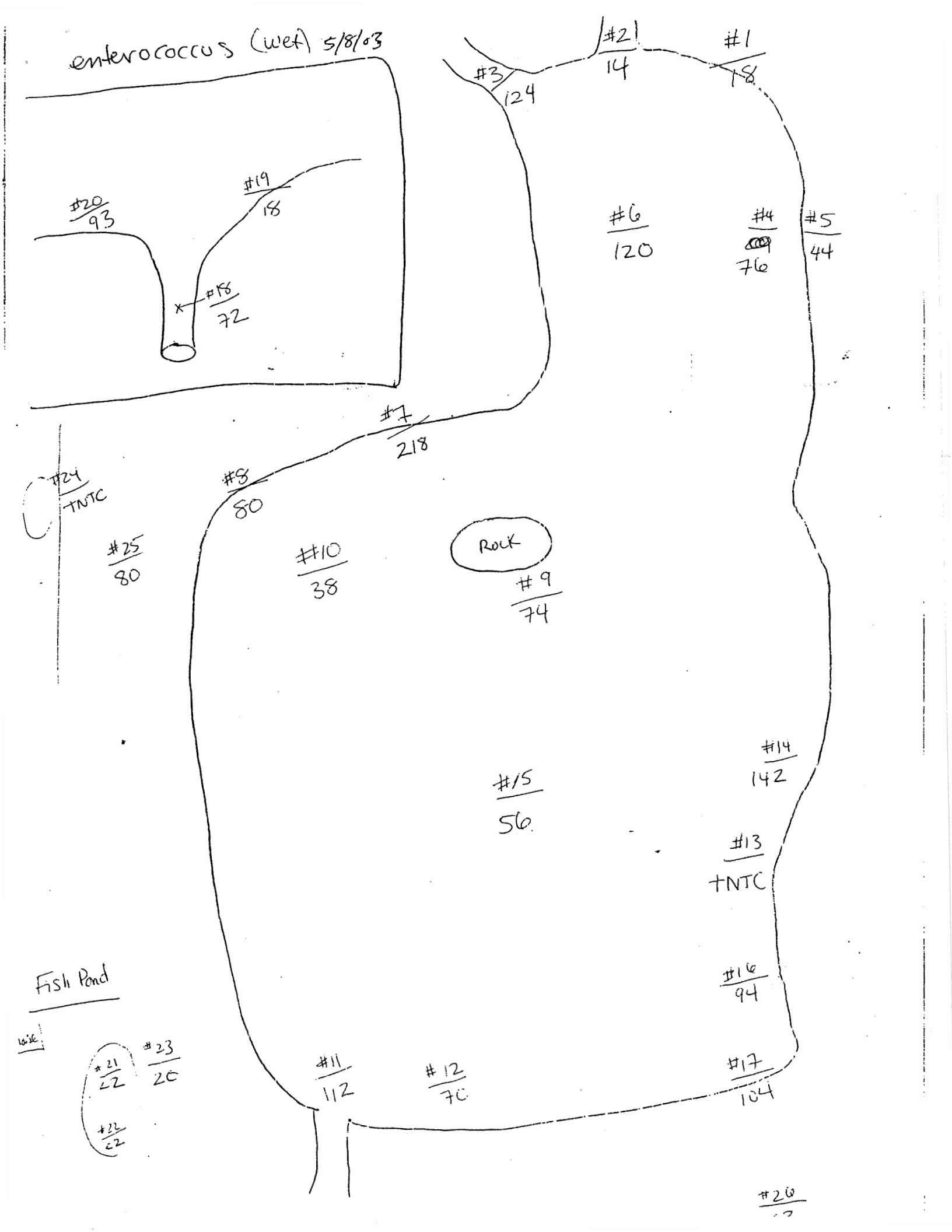
x09
09 095
12 present

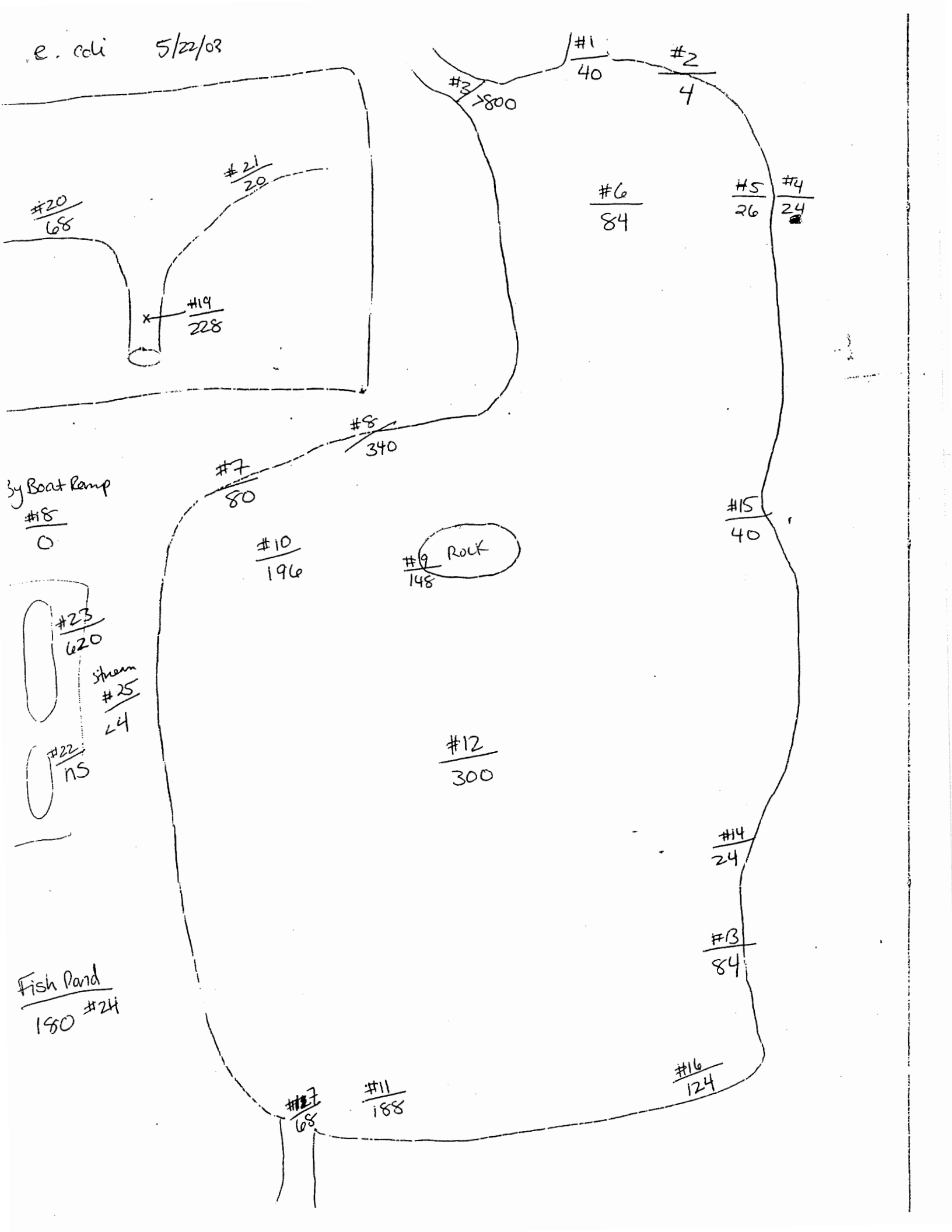
x08
08 085
8 30

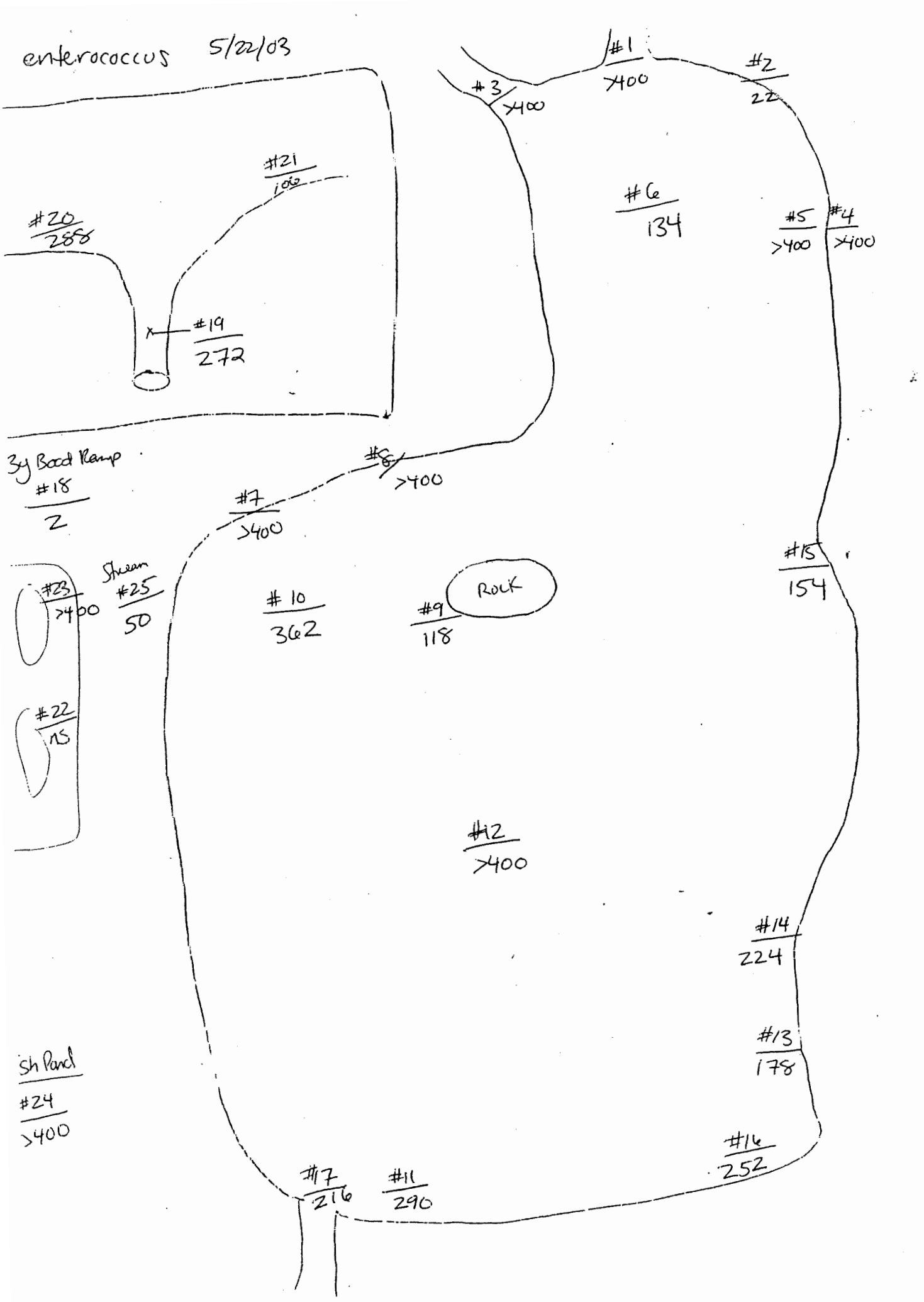
Circuit Ave.

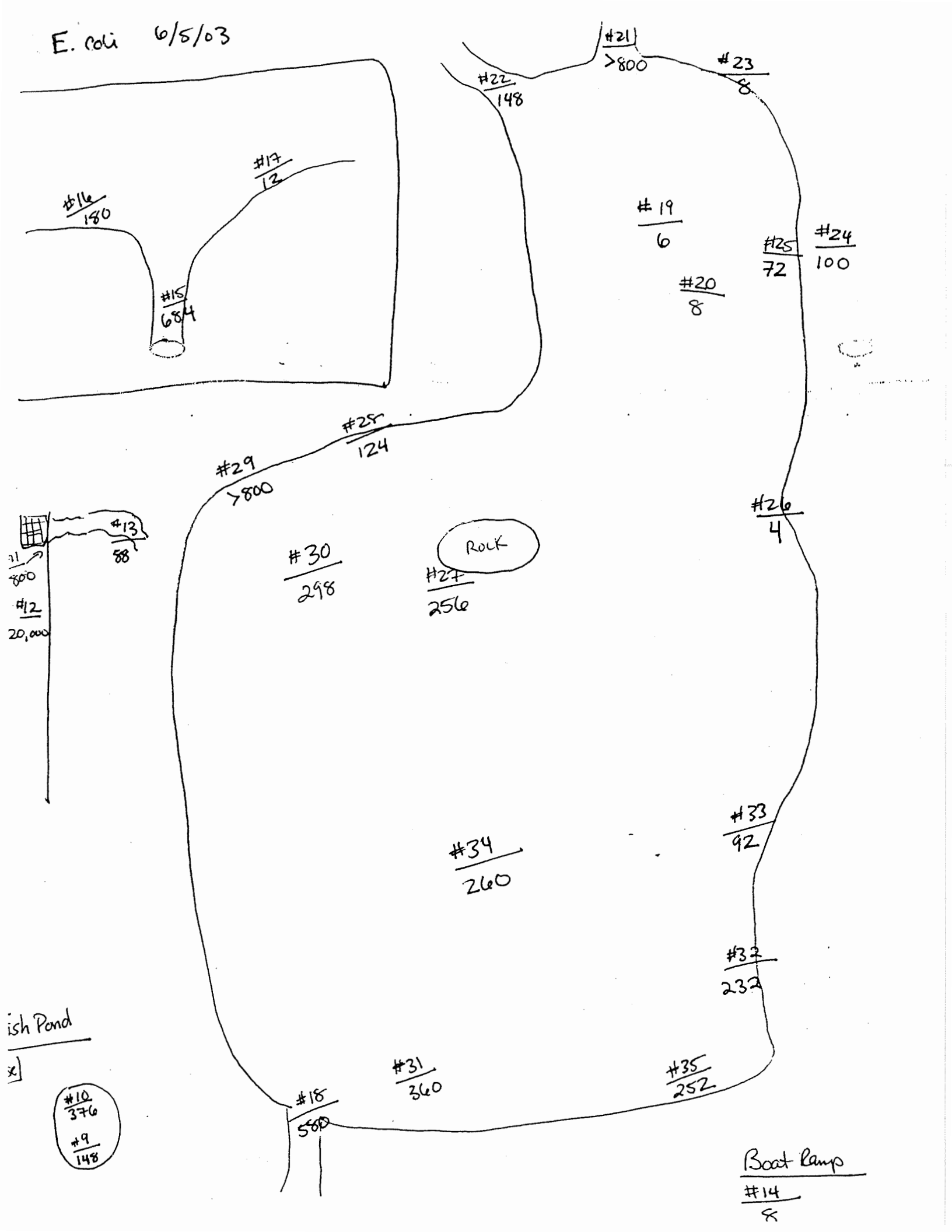

enterococcus 2/6/03
x04 04 045 / 98 200
x03 03 035 / 10 <100
x02 02 025 / 60 50
13/20
x13
12/30
x12
x11 11/30
15/4 16/18 165/10
x01 01 015 / 42 50
x16
x15
R.K
x05 05 055 / 48 40
x07 07 075 / 26 40
x06 06 065 / 38 80
14/24 145/10
x14
free
x08 08 085 / 34 50
10/36
x09 09 095 / 42 present
x10
circuit gel.

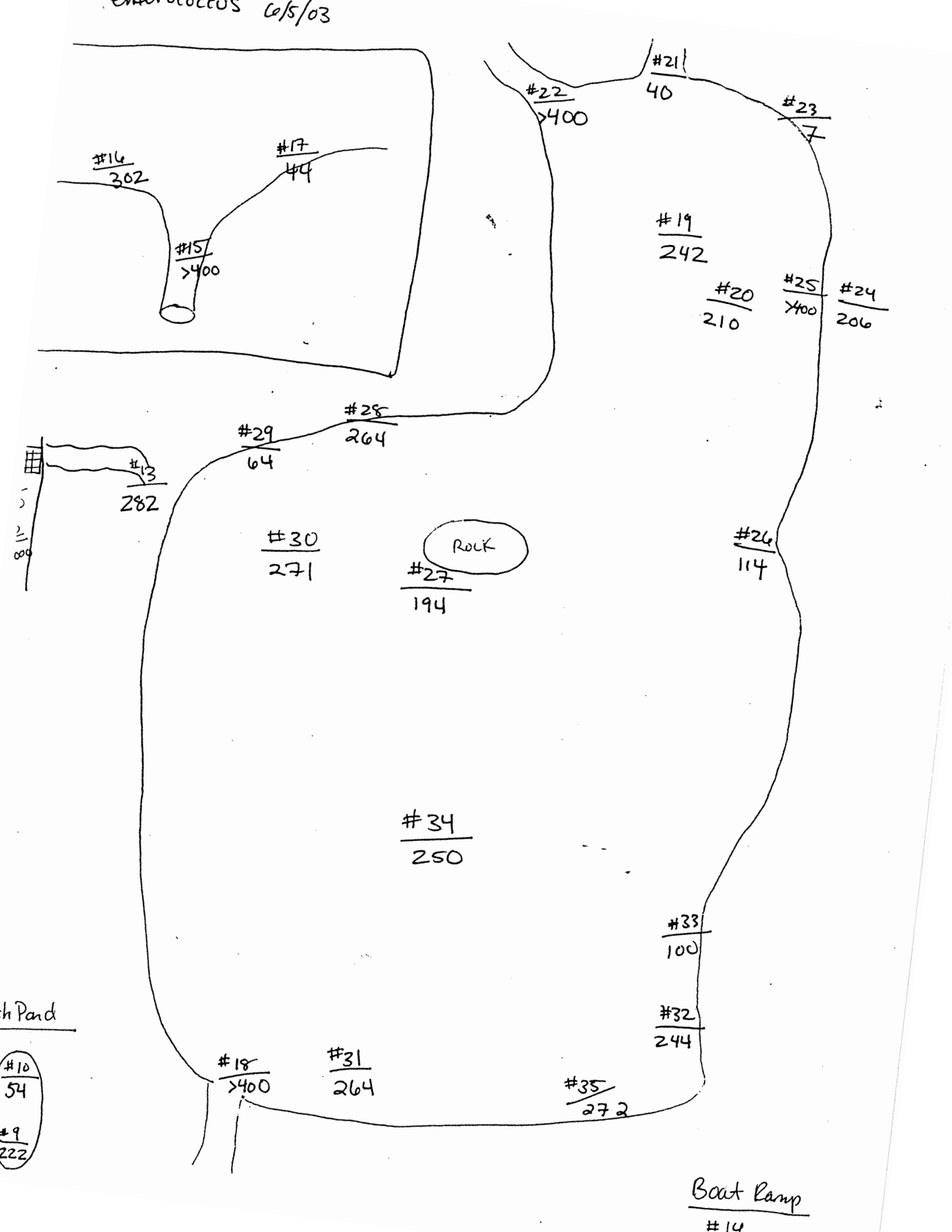

E. Coli (wet) 5/8/03
#2 4
#1 8
#3 32
#19 4
#20 34
#15 48
#4 <4
#5gw 4
#6 4
#7 120
#24 720
#26 TNTC
#25 20
Rock
#9 40
#10 60
#14 <4
#15 68
#13 <4
#16 <4
#11 12
#12 4
#17 4
Fish Pond
#23 <10
#22 <4
#28 1

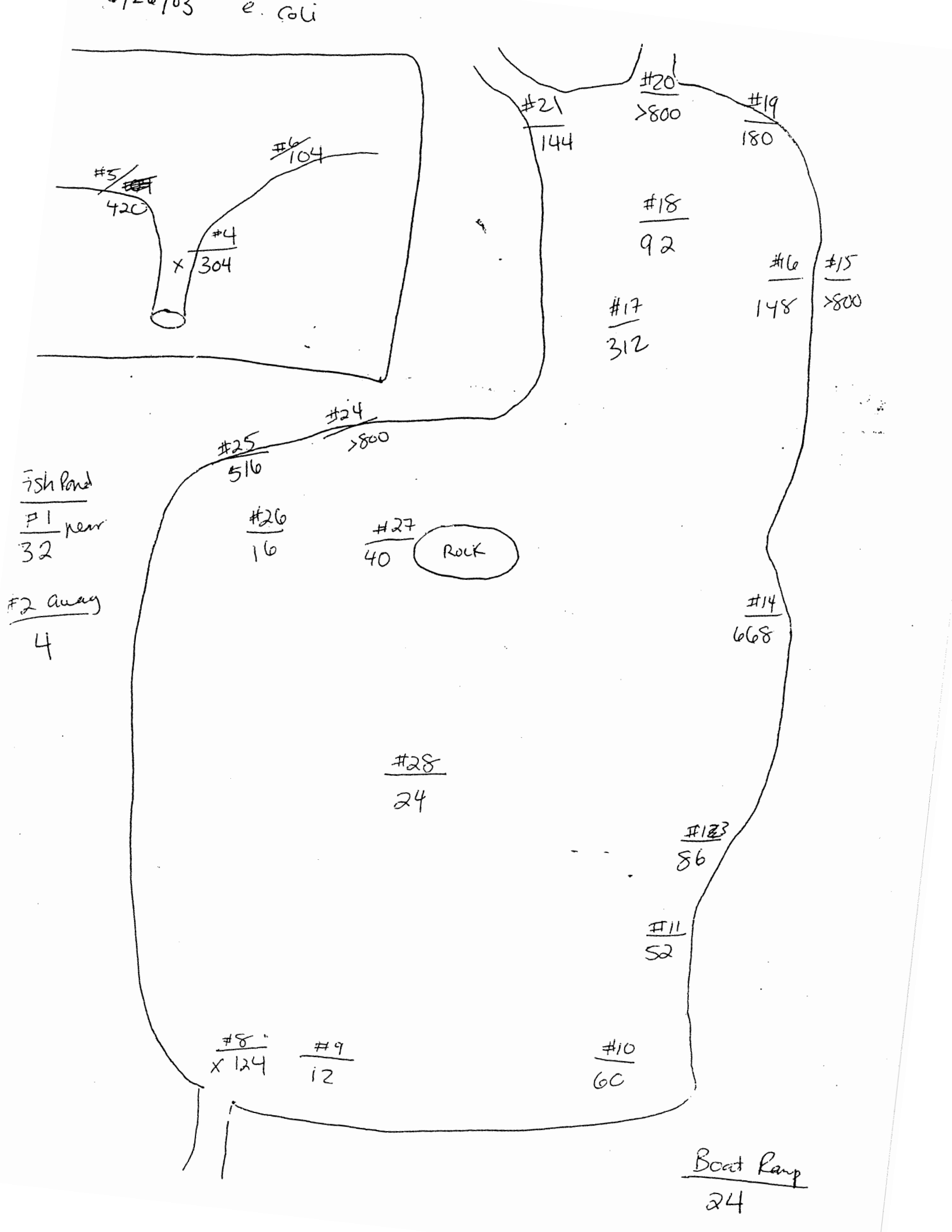

enterococcus (wet) 5/8/03
#21
14
#1
18
#3
124
#19
18
#20
93
#6
120
#4
76
#5
44
#18
72
#7
218
#24
TNTC
#8
80
#25
80
#10
38
ROCK
#9
74
#14
142
#15
56
#13
TNTC
#16
94
Fish Pond
#21
22
#23
20
#22
22
#11
112
#12
70
#17
104
#26

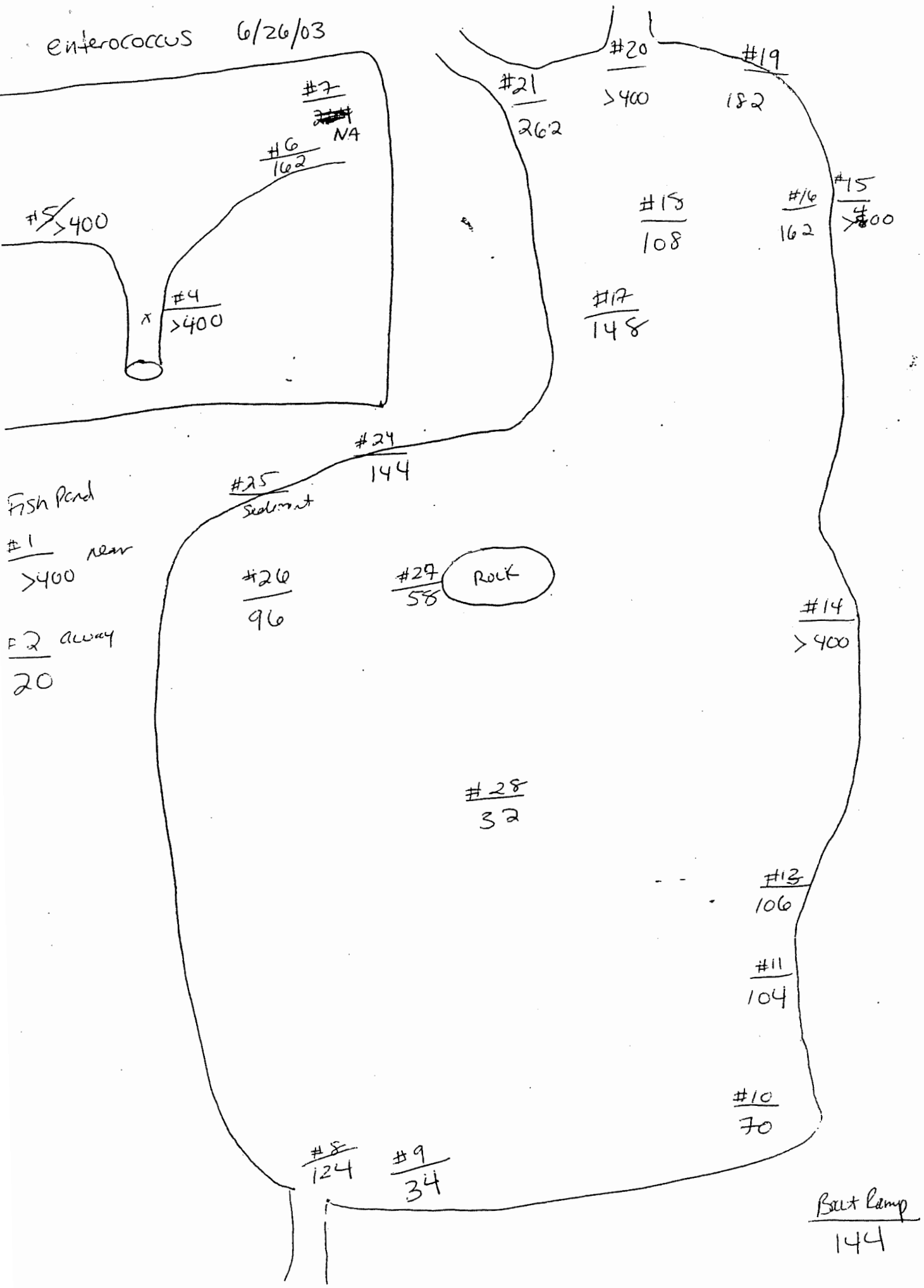

e. coli 5/22/03
#1
40
#2
4
#3
>800
#4
24
#5
26
#6
84
#7
80
#8
340
#9
148
Rock
#10
196
#11
188
#12
300
#13
84
#14
24
#15
40
#16
124
#17
68
#18
0
By Boat Ramp
#19
228
#20
68
#21
20
#22
NS
#23
620
stream
#25
<4
Fish Pond
180
#24

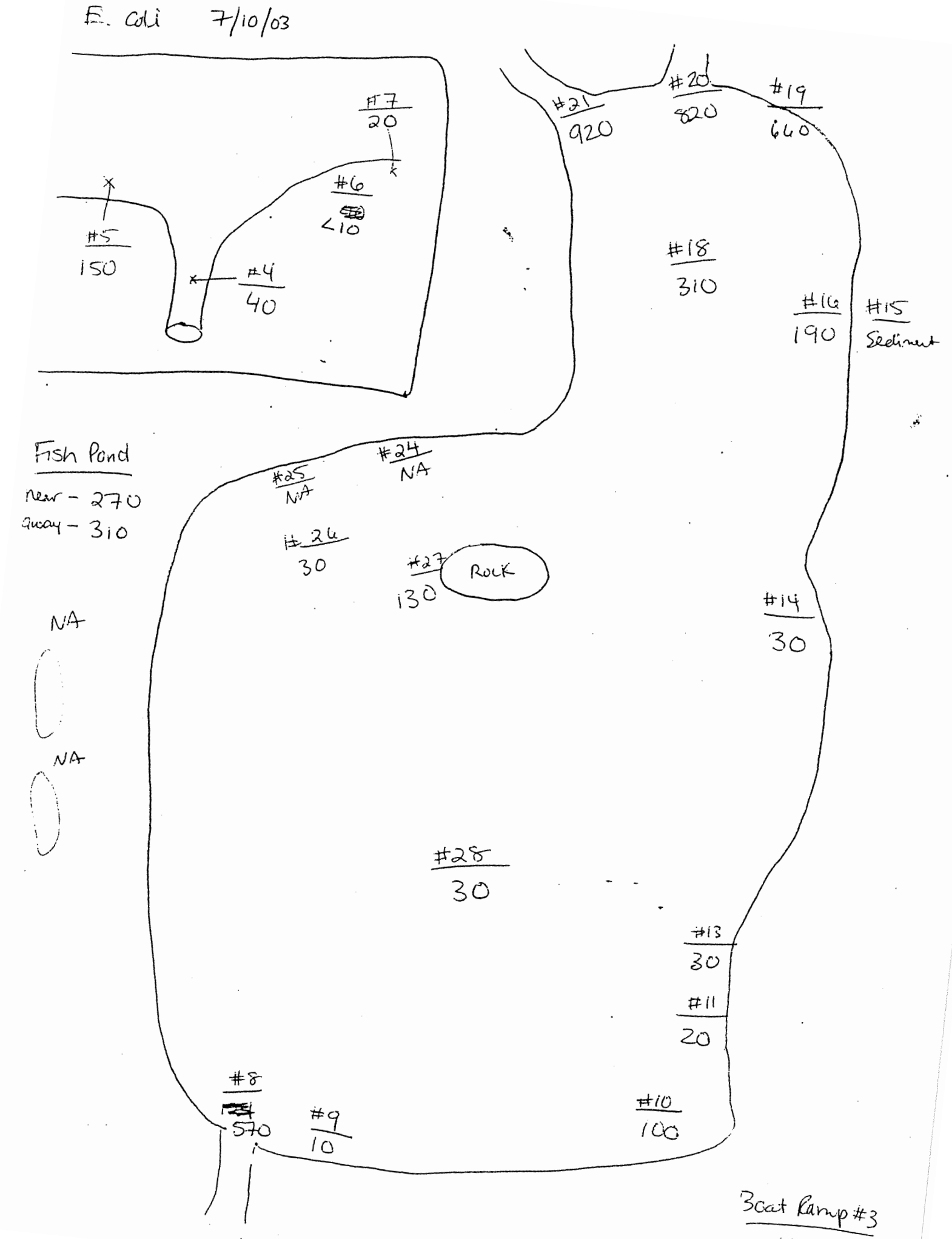

enterococcus 5/22/03
#1
>400
#2
22
#3
>400
#21
102
#20
288
#19
272
#6
134
#5
>400
#4
>400
3y Boat Ramp
#18
2
#8
>400
#7
>400
#23
>400
Stream
#25
50
#22
NS
#10
362
#9
118
ROCK
#15
154
#12
>400
#14
224
#13
178
Sh Pond
#24
>400
#16
252
#17
216
#11
290

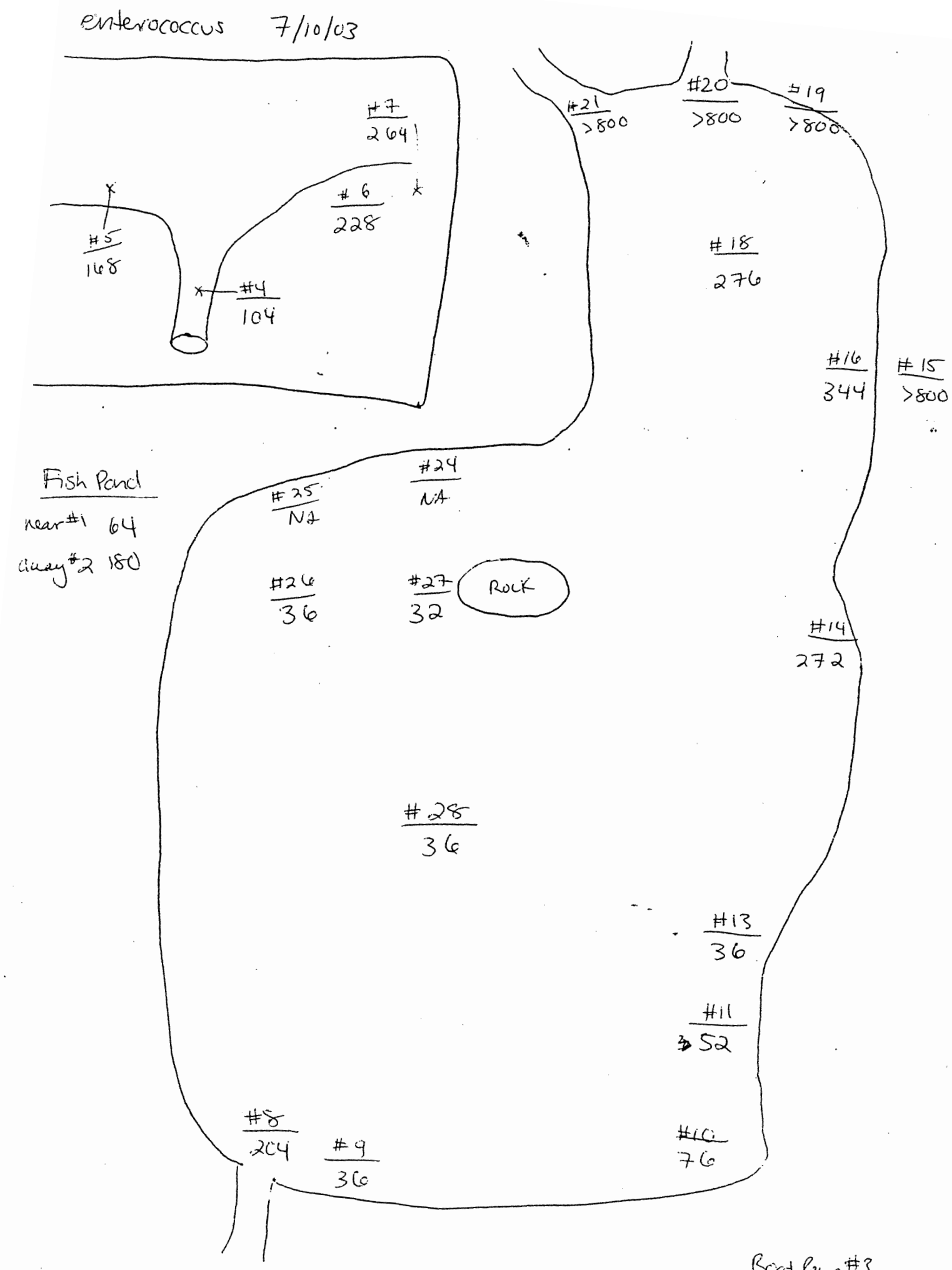

E. coli 6/5/03
#21
>800
#23
8
#22
148
#17
12
#16
180
#15
684
#19
6
#24
100
#25
72
#20
8
#25
124
#29
>800
#26
4
#13
88
#30
298
ROCK
#27
256
#12
20,000
#34
260
#33
92
#32
232
#31
360
#35
252
#18
500
#10
376
#9
148
Boat Ramp
#14
8

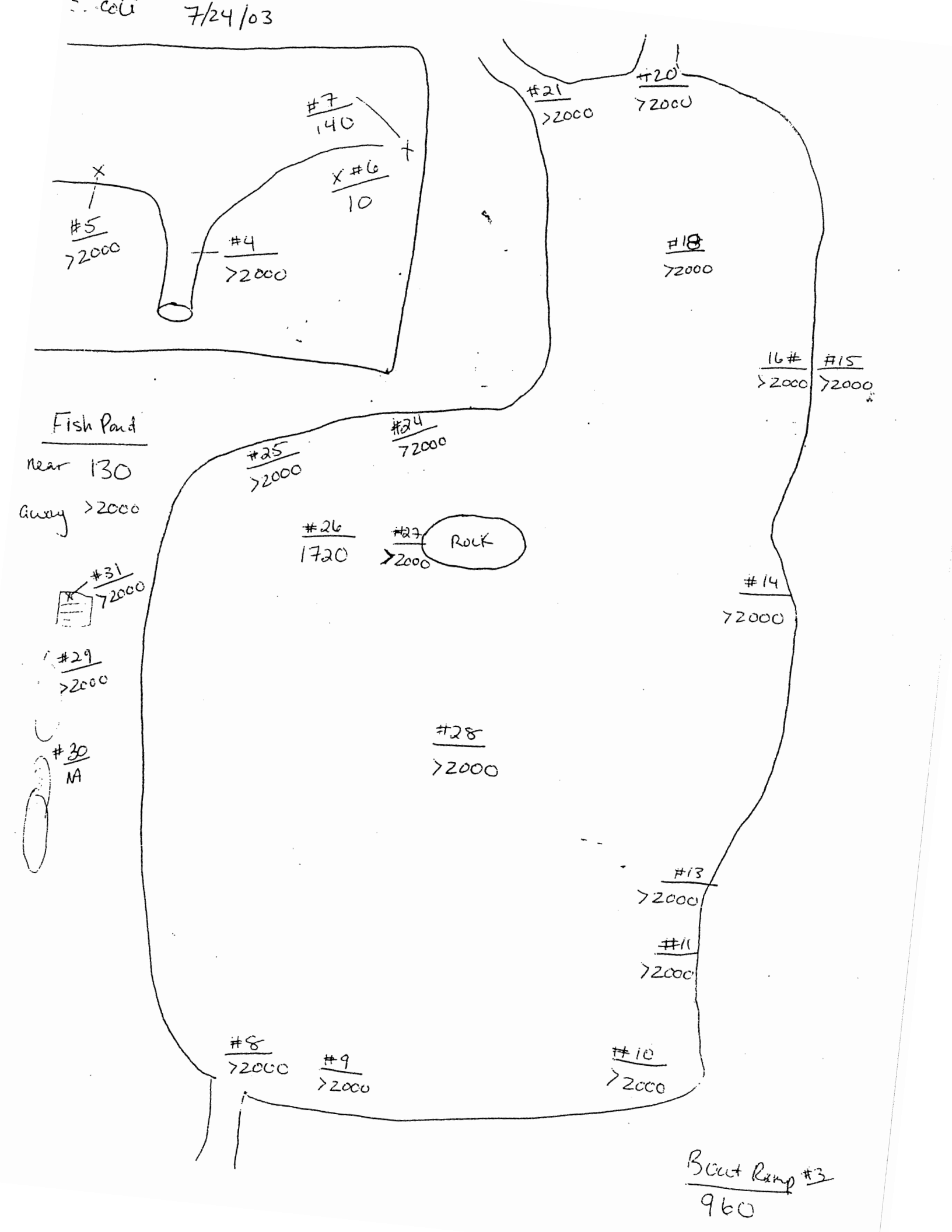

Enterococcus 6/5/03
#16
302
#17
44
#15
>400
#21
40
#22
>400
#23
7
#19
242
#20
210
#25
>400
#24
206
#28
264
#29
64
#13
282
#30
271
ROCK
#27
194
#26
114
#34
250
#33
100
#32
244
#18
>400
#31
264
#35
272
#10
54
#9
222
Boat Ramp
#14


e. Coli
#20
>800
#21
144
#19
180
#6
104
#5
420
#4
304
#18
92
#16
148
#15
>800
#17
312
#24
>800
#25
516
Fish Pond
#1
32
per
#26
16
#27
40
Rock
#2 away
4
#14
668
#28
24
#12
86
#11
52
#8
X 124
#9
12
#10
60
Boat Ramp
24

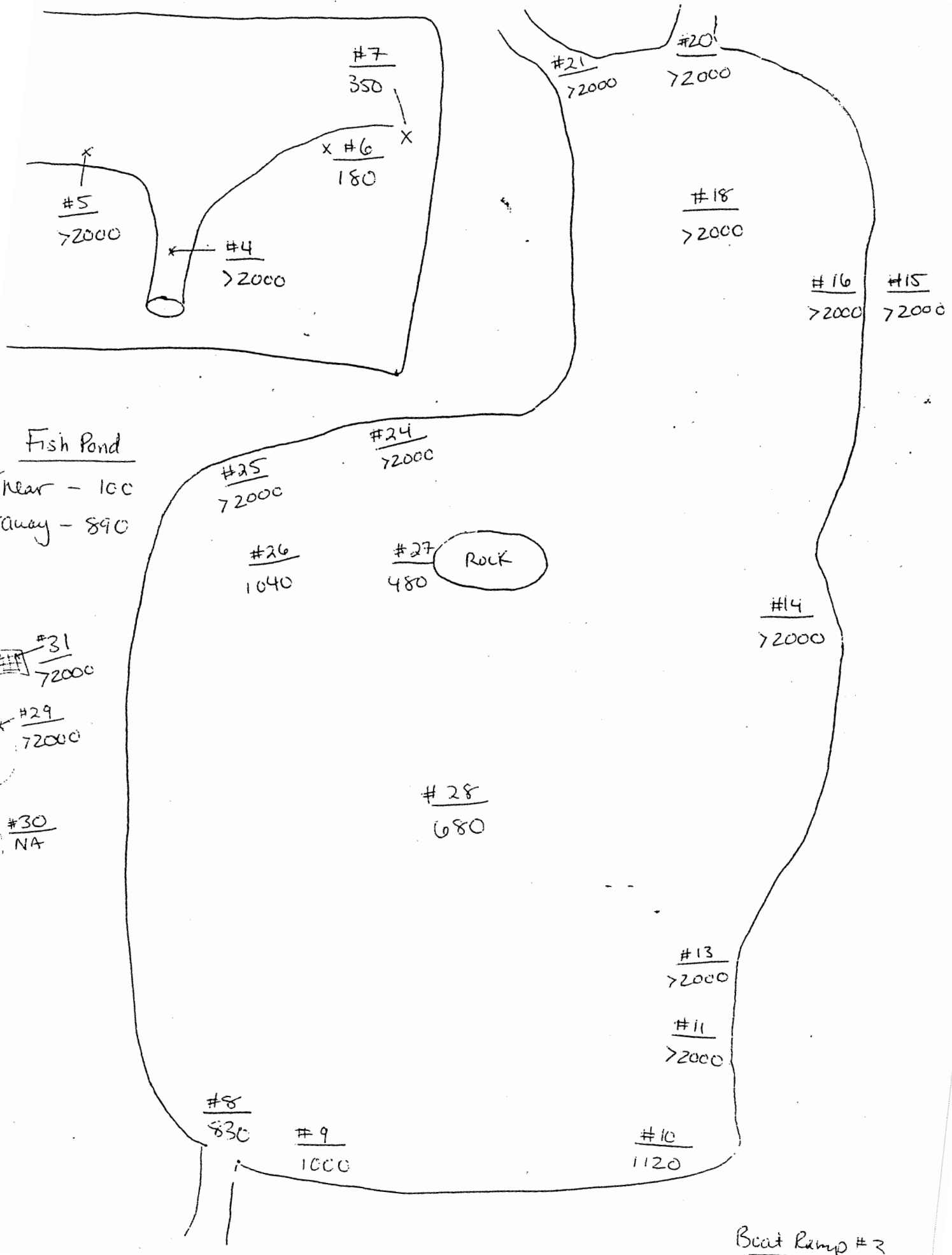

enterococcus 6/26/03
#7
NA
#6
162
#5
>400
#4
>400
#21
262
#20
>400
#19
182
#15
#16
162
#18
108
#17
148
#24
144
#25
Sediment
Fish Pond
#1
>400
near
#2
20
away
#26
96
#27
58
Rock
#14
>400
#28
32
#13
106
#11
104
#10
70
#8
124
#9
34
Boat Ramp
144


E. Coli 7/10/03
#7
20
#6
<10
#5
150
#4
40
#21
920
#20
820
#19
640
#18
310
#16
190
#15
Sediment
Fish Pond
near - 270
away - 310
#25
NA
#24
NA
#26
30
#27
130
ROCK
#14
30
NA
NA
#28
30
#13
30
#11
20
#8
570
#9
10
#10
100
Boat Ramp #3
<10


enterococcus 7/10/03
#7
264
#6
228
#5
168
#4
104
#21
>800
#20
>800
#19
>800
#18
276
#16
344
#15
>800
Fish Pond
near #1 64
away #2 180
#25
NA
#24
NA
#26
36
#27
32
ROCK
#14
272
#28
36
#13
36
#11
52
#8
204
#9
36
#10
76
Boat Ramp #3
4


7/24/03
#7
140
#6
10
#5
>2000
#4
>2000
#21
>2000
#20
>2000
#18
>2000
16#
>2000
#15
>2000
Fish Pond
near 130
Away >2000
#25
>2000
#24
>2000
#26
1720
#27
>2000
Rock
#31
>2000
#29
>2000
#30
NA
#28
>2000
#14
>2000
#13
>2000
#11
>2000
#8
>2000
#9
>2000
#10
>2000
Boat Ramp #3
960

Enterococcus 7/24/03



APPENDIX E: Mashnee Marsh Project Extension

Preliminary sampling of the Mashnee Marsh was undertaken with the help of local resident Dick Conron. Samples were taken on four separate occasions and the results showed very high levels of bacteria, particularly after rainstorms. There is a catchbasin in the area that should be dyed to show connectivity to the Marsh during rain events. In addition, levels of bacteria seemed to increase into the summer months, which would point to the effect of added use in the area, from both septic tank and stormwater impacts. Dye testing of the low-lying non-Title V septic systems should also be performed. Future surface water sampling should take note and possibly coordinate with tide fluctuations in the area.

The inlet area of the Marsh exhibited major algae growth during the spring and summer. These algae should be classified and monitored, but it most likely suggests nitrogen impacts from nearby septic systems.

Future sampling should also focus on more samples in the back Marsh (away from the ocean) to see if there is an area of the Marsh with lower levels of bacteria. A watercraft of some sort would be necessary to get to the other areas. In addition, I would suggest a watercraft to reduce the risk of stirring up mud that would impact the sample. It would also be helpful to have winter background samples for comparison. Testing at the outlet to the ocean would also be important information for the overall assessment.

Education in the area would also be helpful. Signage to encourage owners to pick up after their pets could help reduce the stormwater effects on the marsh.

APPENDIX F:

Data Sheets and Maps for Mashnee Marsh

Mashnee Marsh Sampling Map

Legend

Mashnee Sampling Locations

Catchbasin

Sample ID

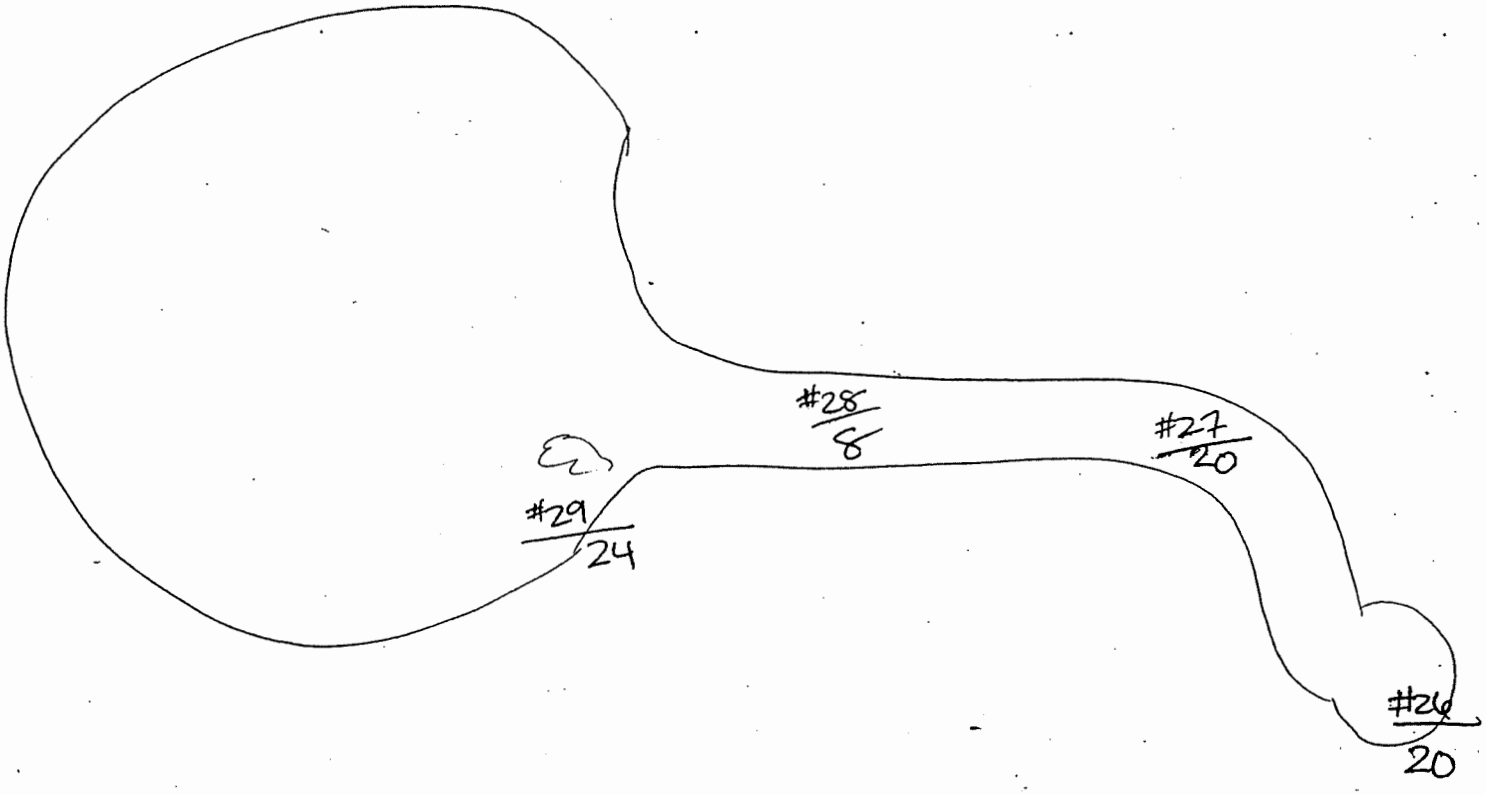
Notes: Digital Orthophotography Provided by MassGIS
Map Created by Melissa Mills AmeriCorps Cape Cod

100 0 100 Feet

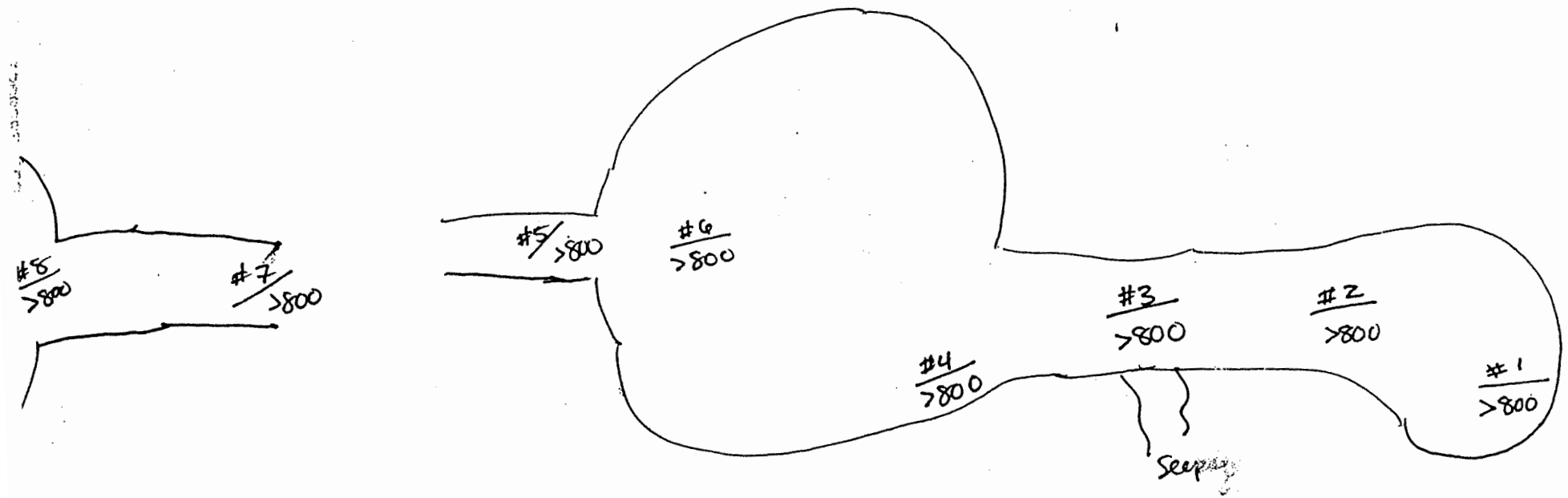
N

Mashnee Marsh 5/22/03

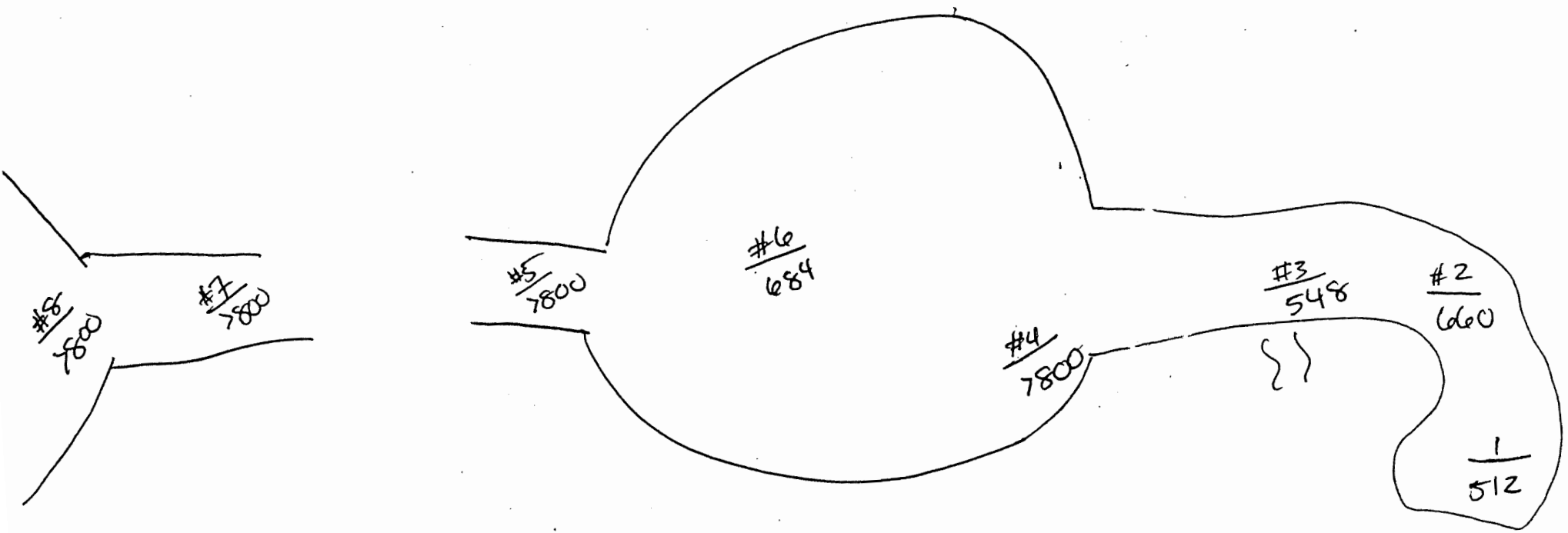
e. coli



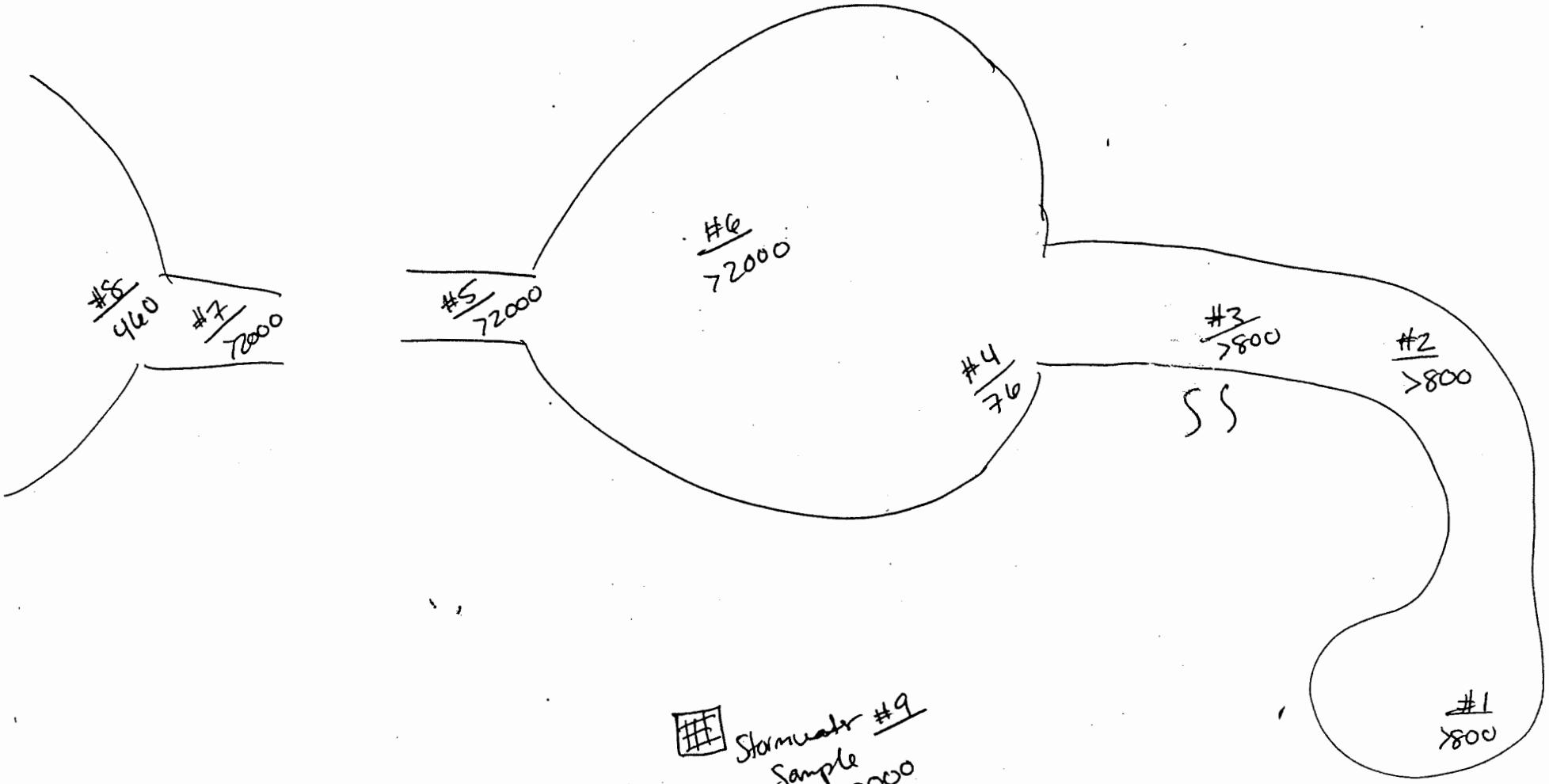
E. Coli 6/5/05



E. coli 6/26/03



E. Coli 7/24/03


#6
460
#7
72000
#5
72000
#6
>2000
#4
76
#3
>800
#2
>800
#1
>800
Stormwater #9
Sample
>2000

E. coli and Enterococcus Data for Conservation Pond

Location Description	Location ID	6/5/03 Enterococcus	6/26/03 E. coli	6/26/03 Enterococcus	7/10/03 E. coli	7/10/03 Enterococcus	7/24/03 E. coli
Fish Pond 1 (near Road)	1	222	32	>400	270	64	130
Fish Pond 2 (Away from Road)	2	54	4	20	310	180	>2000
Next to boat ramp	3	2	24	144	<10	4	960
Outflow from pond (Hen cove side)	4	>400	304	>400	40	104	>2000
GW flow next to outflow (Hen cove side)	5	302	420	>400	150	168	>2000
Area to right of outflow (facing Hen cove)	6	44	104	162	<10	228	140
GW to right of outflow (facing Hen cove)	7	NA	NA	NA	20	264	10
Outflow from pond (pond side)	8	>400	124	124	570	204	>2000
Rocks next to outflow (pond side)	9	264	12	34	10	36	>2000
Corner of pond and #5 Park St. along Circuit Ave.	10	272	60	70	100	76	>2000
Wall along property of #5 Park St. (where rock sticks out).	11	244	52	104	20	52	>2000
Wall along property of #5 Park St. (close to Circuit Ave.).	12	NA	NA	NA	NA	NA	NA
Area below Garage next to #5 Park St.	13	100	84	106	30	36	>2000
Overhanging tree along Park St. side of pond	14	114	668	>400	30	272	>2000
GW flow from Park St. side	15	206	>800	>400	Sediment	>800	>2000
Pond sample next to GW flow	16	>400	148	162	190	344	>2000
GW spring sample	17	210	312	148	NA	NA	NA
Center of shallow area (back of pond)	18	242	92	108	310	276	>2000
GW/SW from #71 Wamsutta	19	>400	180	182	660	>800	NA
GW/SW along bottom of hill below #71 Wamsutta	20	40	>800	>400	820	>800	>2000
SW from Island Dr. (largest stream)	21	7	144	262	920	>800	>2000
Sample in largest stream	22	NA	NA	NA	NA	NA	NA
Stormwater/GW furthest from Island Dr. near large rock	23	NA	Sediment	Sediment	NA	NA	NA
Stormwater/GW from Island Dr. middle area	24	264	>800	144	NA	NA	>2000
Stormwater/GW closest to Island Dr.	25	64	516	Sediment	NA	NA	>2000
Center of area between rock and Island Dr.	26	271	16	96	30	36	1720
Sample along left side of rock (back to cove)	27	194	40	58	130	32	>2000
Sample in center of pond from rock to outlet	28	250	24	32	30	36	>2000
Stormwater pool on Island Dr. closest to catchbasin	29	>100,000	NA	NA	NA	NA	>2000
Stormwater pool on Island Dr. further from catchbasin	30	NA	NA	NA	NA	NA	NA
Sample next to catchbasin or in catchbasin	31	>100,000	NA	NA	NA	NA	>2000
Sample in stream below catchbasin	32	282	NA	NA	NA	NA	NA
Marshy Area next to fish pond	33	NA	NA	NA	NA	NA	NA

Notes: If second number is present, this indicates an additional sediment s
All units are CFU/100ml

Winter Sampling | Spring Sampling | Summer Sampling

E. coli and Enterococcus Data for Conservation Pond

Location Description	Location ID	1/23/03 E. coli	1/23/03 Enterococcus	1/30/03 E. coli	1/30/03 Enterococcus	2/6/03 E. coli
Fish Pond 1 (near Road)	1	NA	NA	NA	NA	NA
Fish Pond 2 (Away from Road)	2	NA	NA	NA	NA	NA
Next to boat ramp	3	NA	NA	NA	NA	NA
Outflow from pond (Hen cove side)	4	<4	<2	<4	4	<10
GW flow next to outflow (Hen cove side)	5	<4	2	<4	11	<4
Area to right of outflow (facing Hen cove)	6	<4	<2	NA	NA	4
GW to right of outflow (facing Hen cove)	7	NA	NA	NA	NA	NA
Outflow from pond (pond side)	8	<4	2	<4	16	8
Rocks next to outflow (pond side)	9	<4 / <4	4 / <2	<4 / 10	2 / 20.	12 / <4
Corner of pond and #5 Park St. along Circuit Ave.	10	<4 / present	<2 / <2	<4	2	8 / 30.
Wall along property of #5 Park St. (where rock sticks out).	11	<4	<2	<4 / <10	4 / 70.	8 / 10.
Wall along property of #5 Park St. (close to Circuit Ave.).	12	NA	NA	<4 / <10	4 / 20.	NA
Area below Garage next to #5 Park St.	13	<4 / <4	2 / 8.	4 / <10	32 / >400	2 / 10.
Overhanging tree along Park St. side of pond	14	NA	NA	4 / <10	68 / 70	NA
GW flow from Park St. side	15	<4	4	<4 / <4	124 / <4	<4
Pond sample next to GW flow	16	<4 / 8	<2 / present	NA	NA	<4 / 10
GW spring sample	17	NA	NA	NA	NA	NA
Center of shallow area (back of pond)	18	NA	NA	NA	NA	8 / 20.
GW/SW from #71 Wamsutta	19	NA	NA	NA	NA	NA
GW/SW along bottom of hill below #71 Wamsutta	20	NA	NA	NA	NA	10 / <100
SW from Island Dr. (largest stream)	21	NA	NA	NA	NA	28 / 120.
Sample in largest stream	22	NA	NA	NA	NA	72 / 300.
Stormwater/GW furthest from Island Dr. near large rock	23	NA	NA	NA	NA	NA
Stormwater/GW from Island Dr. middle area	24	NA	NA	NA	NA	NA
Stormwater/GW closest to Island Dr.	25	NA	NA	NA	NA	NA
Center of area between rock and Island Dr.	26	NA	NA	NA	NA	NA
Sample along left side of rock (back to cove)	27	NA	NA	NA	NA	<4 / <4
Sample in center of pond from rock to outlet	28	NA	NA	NA	NA	40 / 30.
Stormwater pool on Island Dr. closest to catchbasin	29	NA	NA	NA	NA	NA
Stormwater pool on Island Dr. further from catchbasin	30	NA	NA	NA	NA	NA
Sample next to catchbasin or in catchbasin	31	NA	NA	NA	NA	NA
Sample in stream below catchbasin	32	NA	NA	NA	NA	NA
Marshy Area next to fish pond	33	NA	NA	NA	NA	NA

Notes: If second number is present, this indicates an additional sediment sample at this locations

All units are CFU/100ml

Winter Sampling | Spring Sampling | Summer Sampling

E. coli and Enterococcus Data for Conservation Pond

Location Description	Location ID	2/6/03 Enterococcus	5/3/03 E. coli	5/8/03 Enterococcus	5/22/03 E. coli	5/22/03 Enterococcus	6/5/03 E. coli
Fish Pond 1 (near Road)	1	NA	<4	<2	180	>400	148
Fish Pond 2 (Away from Road)	2	NA	<4	<2	NA	NA	376
Next to boat ramp	3	NA	<4	<2	<4	2	8
Outflow from pond (Hen cove side)	4	30	48	72	228	272	684
GW flow next to outflow (Hen cove side)	5	30	34	93	68	288	180
Area to right of outflow (facing Hen cove)	6	20	4	18	20	106	12
GW to right of outflow (facing Hen cove)	7	NA	4	18	NA	NA	NA
Outflow from pond (pond side)	8	36	12	112	68	216	580
Rocks next to outflow (pond side)	9	42 / <2	4	70	188	290	360
Corner of pond and #5 Park St. along Circuit Ave.	10	34 / 50.	4	104	124	252	252
Wall along property of #5 Park St. (where rock sticks out).	11	24 / 10.	<4	94	84	178	232
Wall along property of #5 Park St. (close to Circuit Ave.).	12	NA	NA	NA	NA	NA	NA
Area below Garage next to #5 Park St.	13	26 / 40.	<4	TNTC	24	224	92
Overhanging tree along Park St. side of pond	14	NA	<4	142	40	154	4
GW flow from Park St. side	15	4	4	44	24	>400	100
Pond sample next to GW flow	16	18 / 10	<4	76	26	>400	72
GW spring sample	17	NA	NA	NA	NA	NA	8
Center of shallow area (back of pond)	18	42 / 50.	4	120	84	134	6
GW/SW from #71 Wamsutta	19	NA	8	18	4	22	148
GW/SW along bottom of hill below #71 Wamsutta	20	10 / <100	4	14	40	>400	>800
SW from Island Dr. (largest stream)	21	60 / 50.	32	124	>800	>400	8
Sample in largest stream	22	98 / 200	NA	NA	NA	NA	NA
Stormwater/GW furthest from Island Dr. near large rock	23	NA	NA	NA	NA	NA	NA
Stormwater/GW from Island Dr. middle area	24	NA	120	218	340	>400	124
Stormwater/GW closest to Island Dr.	25	NA	TNTC	80	80	>400	>800
Center of area between rock and Island Dr.	26	NA	60	38	196	362	298
Sample along left side of rock (back to cove)	27	48 / 40.	40	74	148	118	256
Sample in center of pond from rock to outlet	28	38 / 80.	68	56	300	>400	260
Stormwater pool on Island Dr. closest to catchbasin	29	NA	720	TNTC	620	>400	>20,000
Stormwater pool on Island Dr. further from catchbasin	30	NA	NA	NA	sediment	sediment	NA
Sample next to catchbasin or in catchbasin	31	NA	NA	NA	NA	NA	>100,000
Sample in stream below catchbasin	32	NA	20	80	<4	50	88
Marshy Area next to fish pond	33	NA	<10	20	NA	NA	NA

Notes: If second number is present, this indicates an additional sediment s
All units are CFU/100ml

Winter Sampling | Spring Sampling | Summer Sampling

E. coli and Enterococcus Data for Conservation Pond

Location Description	Location ID	1/23/03 E. coli	1/23/03 Enterococcus	1/30/03 E. coli	1/30/03 Enterococcus	2/6/03 E. coli
Fish Pond 1 (near Road)	1	NA	NA	NA	NA	NA
Fish Pond 2 (Away from Road)	2	NA	NA	NA	NA	NA
Next to boat ramp	3	NA	NA	NA	NA	NA
Outflow from pond (Hen cove side)	4	<4	<2	<4	4	<10
GW flow next to outflow (Hen cove side)	5	<4	2	<4	11	<4
Area to right of outflow (facing Hen cove)	6	<4	<2	NA	NA	4
GW to right of outflow (facing Hen cove)	7	NA	NA	NA	NA	NA
Outflow from pond (pond side)	8	<4	2	<4	16	8
Rocks next to outflow (pond side)	9	<4 / <4	4 / <2	<4 / 10	2 / 20.	12 / <4
Corner of pond and #5 Park St. along Circuit Ave.	10	<4 / present	<2 / <2	<4	2	8 / 30.
Wall along property of #5 Park St. (where rock sticks out).	11	<4	<2	<4 / <10	4 / 70.	8 / 10.
Wall along property of #5 Park St. (close to Circuit Ave.).	12	NA	NA	<4 / <10	4 / 20.	NA
Area below Garage next to #5 Park St.	13	<4 / <4	2 / 8.	4 / <10	32 / >400	2 / 10.
Overhanging tree along Park St. side of pond	14	NA	NA	4 / <10	68 / 70	NA
GW flow from Park St. side	15	<4	4	<4 / <4	124 / <4	<4
Pond sample next to GW flow	16	<4 / 8	<2 / present	NA	NA	<4 / 10
GW spring sample	17	NA	NA	NA	NA	NA
Center of shallow area (back of pond)	18	NA	NA	NA	NA	8 / 20.
GW/SW from #71 Wamsutta	19	NA	NA	NA	NA	NA
GW/SW along bottom of hill below #71 Wamsutta	20	NA	NA	NA	NA	10 / <100
SW from Island Dr. (largest stream)	21	NA	NA	NA	NA	28 / 120.
Sample in largest stream	22	NA	NA	NA	NA	72 / 300.
Stormwater/GW furthest from Island Dr. near large rock	23	NA	NA	NA	NA	NA
Stormwater/GW from Island Dr. middle area	24	NA	NA	NA	NA	NA
Stormwater/GW closest to Island Dr.	25	NA	NA	NA	NA	NA
Center of area between rock and Island Dr.	26	NA	NA	NA	NA	NA
Sample along left side of rock (back to cove)	27	NA	NA	NA	NA	<4 / <4
Sample in center of pond from rock to outlet	28	NA	NA	NA	NA	40 / 30.
Stormwater pool on Island Dr. closest to catchbasin	29	NA	NA	NA	NA	NA
Stormwater pool on Island Dr. further from catchbasin	30	NA	NA	NA	NA	NA
Sample next to catchbasin or in catchbasin	31	NA	NA	NA	NA	NA
Sample in stream below catchbasin	32	NA	NA	NA	NA	NA
Marshy Area next to fish pond	33	NA	NA	NA	NA	NA

Notes: If second number is present, this indicates an additional sediment sample at this locations

All units are CFU/100ml

Winter Sampling | Spring Sampling | Summer Sampling

APPENDIX G:

Excel spreadsheets of data collected for Conservation Pond and Mashnee Marsh.

4-Feb-03		Septic System List							
Last Name	Name	Permanent Address	Town	State	Zip	Tel. No.	Summer	Summer Address	Type of System (Cesspool-Septic)
Borman	Helen M.	62 Rocky Pt. Rd.	Bourne	MA	02532	508-759-4555			Title 5
Bruce	William & Katherine Fenn	80 Rocky Pt. Rd.	Bourne	MA	02532	508-759-3374			cp?
Conron	Richard & Judith	29 Mashnee Road	Bourne	MA	02532	508-759-1559			Title 5
Dwyer	Michael & Margaret	29 Acton Street	Arlington	MA	02476	781-643-8387	Yes	73 Mashnee Road	Title 5
Fuller	Sol & Grace	366 Union Ave. Apt. 1	Framingham,	MA	01762	508-626-2424	Yes	66 Mashnee Rd.	cp?
Gallivan	Richard & Terry	69 Mashnee Rd.	Bourne	MA	02532	508-759-5956			cp?
Glennon	Lori & Sean	2 Spindrift Lane	Bourne	MA	02532	508-743-9573			Title 5
Gushue	Edward & Marion	48 Mashnee Road	Bourne	MA	02532	508-759-5262			Title 5
Hakanson	David M. & Mary E.	4 Glen Gery Rd.	Shrewsbury	MA	01545	508-845-1284	Yes	44 Mashnee Rd.	Title 5
Kingsbury	David & Julia Doyle	4 Agawam Pt. Rd.	Bourne	MA	02532	508-759-3245			Title 5
Michienzi	Noreen & Vincent	76 Mashnee Road	Bourne	MA	02532	508-743-4633			Alternative
O'Sullivan	Gerald & Carol	1 Agawam Point Rd	Bourne	MA	02532	508-759-1939			Title 5
Sergio	Maryann & Thomas	8 Lemore Ave	Lakeville	MA		508-947-7527	Yes	25 Mashnee Road	Title 5
Sullivan	Lynda & Bernard	236 Prospect Street	S. Easton	MA		508-238-7402	Yes	68 Mashnee Road	Title 5
Thimas	Lisa & Donald	40 Mashnee Road	Bourne	MA	02532	508-759-6194			Title 5
Wales	Khris	68 Rocky Point Rd	Bourne	MA	02532	508-759-6927			CP?
Bruce	Tom	80 Rocky Pt Rd	Bourne	MA	02533	508-759-3374			CP?
17									

E. coli and Enterococcus Data for Conservation Pond

Location Description	Location ID	7/24/03 Enterococcus
Fish Pond 1 (near Road)	1	100
Fish Pond 2 (Away from Road)	2	890
Next to boat ramp	3	420
Outflow from pond (Hen cove side)	4	>2000
GW flow next to outflow (Hen cove side)	5	>2000
Area to right of outflow (facing Hen cove)	6	180
GW to right of outflow (facing Hen cove)	7	350
Outflow from pond (pond side)	8	830
Rocks next to outflow (pond side)	9	1000
Corner of pond and #5 Park St. along Circuit Ave.	10	1120
Wall along property of #5 Park St. (where rock sticks out).	11	>2000
Wall along property of #5 Park St. (close to Circuit Ave.).	12	NA
Area below Garage next to #5 Park St.	13	>2000
Overhanging tree along Park St. side of pond	14	>2000
GW flow from Park St. side	15	>2000
Pond sample next to GW flow	16	>2000
GW spring sample	17	NA
Center of shallow area (back of pond)	18	>2000
GW/SW from #71 Wamsutta	19	NA
GW/SW along bottom of hill below #71 Wamsutta	20	>2000
SW from Island Dr. (largest stream)	21	>2000
Sample in largest stream	22	NA
Stormwater/GW furthest from Island Dr. near large rock	23	NA
Stormwater/GW from Island Dr. middle area	24	>2000
Stormwater/GW closest to Island Dr.	25	>2000
Center of area between rock and Island Dr.	26	1040
Sample along left side of rock (back to cove)	27	480
Sample in center of pond from rock to outlet	28	680
Stormwater pool on Island Dr. closest to catchbasin	29	>2000
Stormwater pool on Island Dr. further from catchbasin	30	NA
Sample next to catchbasin or in catchbasin	31	>2000
Sample in stream below catchbasin	32	NA
Marshy Area next to fish pond	33	NA

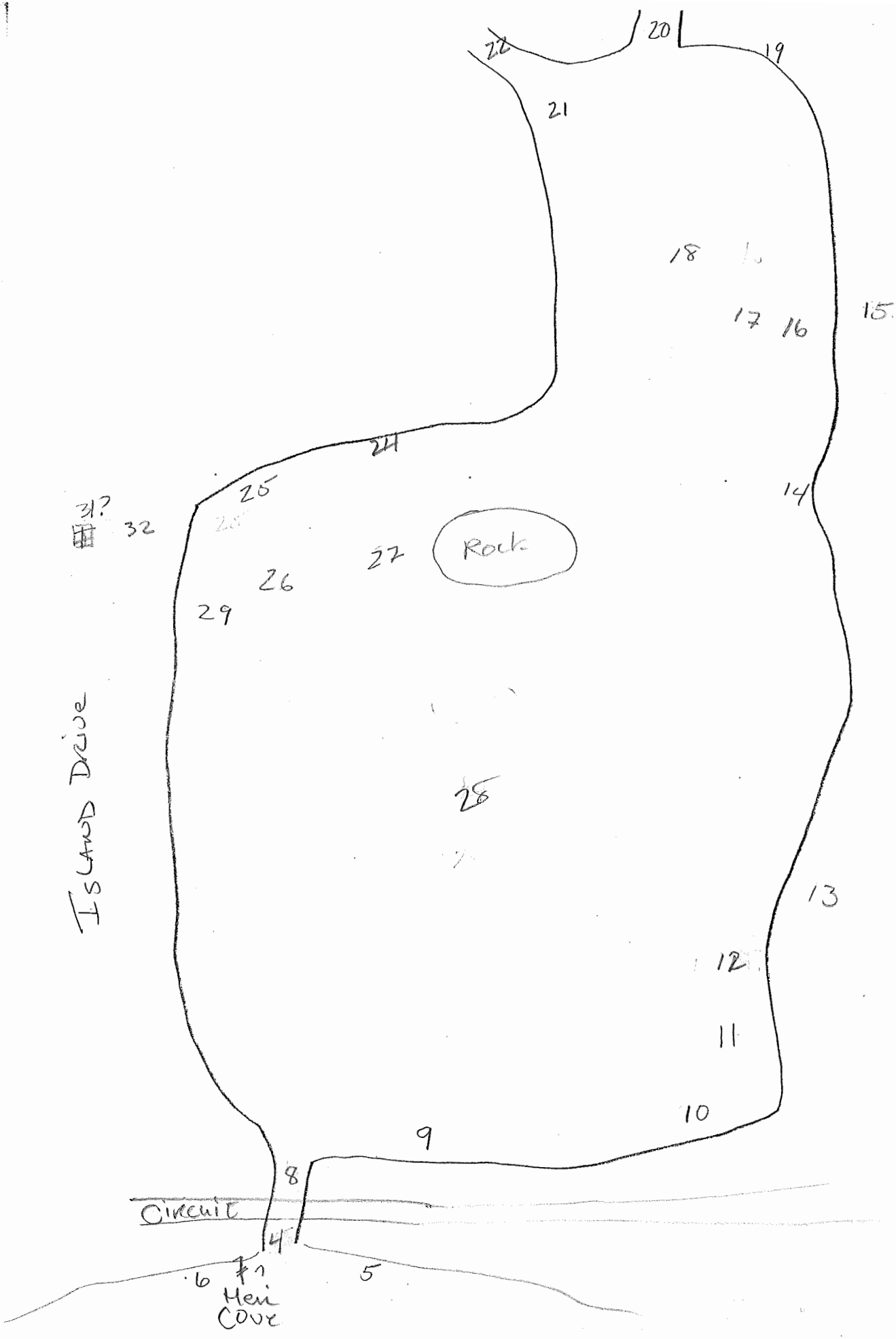
Notes: If second number is present, this indicates an additional sediment s

All units are CFU/100ml

Winter Sampling | Spring Sampling | Summer Sampling

E. coli and Enterococcus Data for Mashnee Marsh

Location Description	Location ID	5/22/03 E. coli	5/22/03 Enterococcus	6/5/03 E. coli	6/5/03 Enterococcus	6/26/03 E. coli	6/26/03 Enterococcus	7/24/03 E. coli	7/24/03 Enterococcus
Culvert Under Mashnee Rd.	1	20	36	>800	>400	512	>400	>800	>800
Corner near culvert under Mashnee Rd.	2	20	162	>800	>400	660	>400	>800	>800
Sample in stream near seepage from direction of Mashnee Rd. and possibly	3	8	74	>800	>400	548	>400	>800	>800
Outlet of Stream into Larger Water area	4	24	6	>800	>400	>800	>400	76	1240
Channel at 69 Mashnee Rd. Ocean side	5	NA	NA	>800	>400	>800	>400	>2000	>2000
Center of Large Pool Ocean side	6	NA	NA	>800	>400	684	>400	>2000	>2000
Channel at 69 Mashnee Rd. Marsh side	7	NA	NA	>800	>400	>800	>400	>2000	>2000
Entrance to Marsh	8	NA	NA	>800	>400	>800	>400	460	1170
Stormwater Sample Corner of Mashnee Rd. and Spindrift Rd.	9	NA	NA	NA	NA	NA	NA	>2000	>2000


20
19
21
18
17
16
15
14
24
25
31?
32
26
27
Rock
29
28
Island Drive
13
12
11
10
9
8
Circuit
4
6
5
Hen
Cove