

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
ENVIRONMENTAL RESOURCE PERMIT #40-069-114354-1
RAI Submittal

HARTWOOD MARSH ROAD
PHASE II

From 1500 feet east of Hancock Road
to County Line

August 2009

Prepared For:



Lake County Public Works
Engineering Division
437 Ardice Avenue
Eustis, FL 32726

Prepared By:



HNTB Corporation
300 Primera Boulevard
Suite 200
Lake Mary, Florida 32746

HNTB

August 5, 2009

Ms. Sandra J. Joiner, P.E.
Department of Water Resources
St. Johns River Water Management District
975 Keller Road
Altamonte Springs, FL 32714

Re: Hartwood Marsh Road—Phase II
1500 feet East of Hancock Road to Orange County Line
Application Number 40-069-114354-1
Response to Request for Additional Information

ARRIVED IN
PALATKA

AUG 11 2009

REGULATORY
INFORMATION MGT.

Dear Ms. Joiner:

Please find included the following revised documents to the Hartwood Marsh Road Environmental Resource Permit Application.

- Construction Plans
- Response to Request for Additional Information

We offer the following responses to your comments.

Comment 1: Comment No. 1 of the RAI was not adequately addressed. In demonstrating that Pond 3 (interconnected Ponds 3A and 3B) is designed in accordance with District water quality treatment criteria and land locked criteria, please address the following:

- a. The revised calculations indicate that the basin area and impervious area for Pond 3 are 48.67 acres and 15.89 acres, respectively, which equates to a treatment volume of 4.06 ac-ft. The submitted PONDS recovery analysis; however, was based on a treatment volume of 2.27 ac-ft, which is incorrect. Accordingly, please provide a revised PONDS recovery analysis

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demonstrating that the required treatment volume will be recovered within 72 hours.

- b. The entire runoff volume for the 25-year, 96-hour storm event is 25.66 ac-ft according to the ICPR storm routing analysis included with the initial submittal. The storage capacity in the pond appears to be 24.33 ac-ft based on a weir invert elevation of 118 feet. The submitted PONDS recovery analysis for the storage capacity was based on a volume of 25.56 ac-ft. Accordingly, please clarify the storage capacity for Pond 3. If the intent is to retain the entire runoff volume generated by the 25-year, 96-hour storm event, please provide revisions indicating such.
- c. The base of aquifer (BOA) and seasonal high water table (SHWT) elevations currently assumed in the PONDS recovery analyses are inconsistent with the calculated values shown on page 10 of the report. Accordingly, provide revised recovery analyses for consistency with the calculated values shown.

[40C-4.301(1)(a),(b),(c),(e),(i),(k); 40C-42.026(1) F.A.C.; Sections 10.3, 10.4, A.H.:MSSW]

Response:

- a. *The treatment volume has been corrected in the PONDS analysis and the pond will recover within 72 hours. Please refer to the drainage calculations.*
- b. *The weir invert has been raised to 118.5 feet giving a total volume of 27.20 ac-ft of available storage.*
- c. *The BOA and the SHWT have been corrected in the recovery analysis to match the calculated values. The ponds will recover in the required time. Please refer to the drainage calculations.*

Comment 2: The response to Comment No. 2.c of the RAI is incomplete. Specifically, the flood plain compensating storage calculations were based on a 10-year flood plain elevation of 96.9 feet for John's Lake; however, supporting documentation for this elevation was not included with the submitted information. Accordingly, please provide supporting documentation for the 10-year flood plain elevation for John's Lake and verify whether this elevation is based on a vertical datum of NGVD 1929 or NAVD 1988. The elevation of 96.9 feet currently assumed in the calculations

appears to be inconsistent with District water level elevations for this lake, which are based on vertical datum of NGVD 1929.

In addition, please provide cross-sectional view details for the compensating storage pond demonstrating that the pond is sufficiently sized to compensate for the fill impacts within the 10-year flood plain as shown in the cross-sectional view details on Pages 46 and 47 of the report. Please include supporting documentation for the SHWT elevation for the compensating storage pond, as previously requested, so that the compensating storage volume may be verified. Also, the compensating storage pond must have an open hydraulic connection to the floodplain encroached upon and the storage must be available during the flood event. The construction plans provided are not clear in this regard. Provide plan revisions and details, as necessary, for clarification.

[40C-4.301(1)(a),(b),(c),(i),(k); 40C-42.026(1) F.A.C.; Sections 10.5, A.H.:MSSW]

Response: *The 10-year flood plain elevation of 96.9 feet NAVD for Johns Lake came from the 2002 FEMA Flood Insurance Study. The Summary of Stillwater Elevations table from the study has been included in the drainage calculations for reference. A pond detail sheet has been included for the compensation pond as well as calculations. Please refer to the drainage calculations.*

Comment 3: The response to Comment No. 3.a of the RAI is insufficient. Specifically, the response states that the SHWT and BOA elevations were corrected based on Boring AB-P15; however, the submitted PONDS recovery analyses for Pond 6 were not corrected versions. Likewise, the response to Comment No. 3.c of the RAI states that the SHWT and BOA elevations were corrected based on Boring AB-P19; however, corrected PONDS recovery analyses for Pond 7 were not submitted. Accordingly, please provide revised recovery analyses for Ponds 6 and 7 for consistency with the site-specific information, as previously requested.

[40C-4.301(1)(a),(b),(c),(e),(i),(k); 40C-42.026(1) F.A.C.; Sections 10.3, 10.4, A.H.:MSSW]

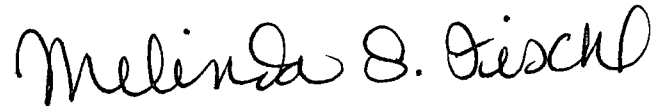
Response: *The BOA and the SHWT have been corrected in the recovery analysis to match the calculated values for ponds 6 and 7. The ponds will recover in the required time. Please refer to the drainage calculations.*

Ms. Sandra J. Joiner, P.E.
August 5, 2009
Page 4

If you have any questions or need further information, please do not hesitate to contact our office.

Sincerely,

HNTB Corporation

A handwritten signature in black ink that reads "Melinda S. Fischl". The signature is written in a cursive, flowing style.

Melinda S. Fischl, P.E.
Project Engineer

cc: Alan Kirkland, P.E. (Lake County Public Works)
William F. C. Umlauf, P.E. (HNTB)

APPENDIX

APPENDIX

HARTWOOD MARSH ROAD - PHASE II
1500 FEET EAST OF HANCOCK ROAD TO COUNTY LINE
DRAINAGE CALCULATIONS

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Melinda Stearns
8/15/09

BASIN 3

Water Quality Treatment and Recovery
Calculations

STAGE / STORAGE CALCULATIONS



DATE
 MADE BY: MSF 30-Sep-08
 CHCK BY: BJS 10-Jan-09

PROJECT: HARTWOOD MARSH ROAD

POND: 3A & 3B

Boring	Approx.	Depth to	Estimated	Average	Depth to	Estimated	Average
AB-P8	123.25	20.0	103.3	100.86	15	108.25	105.86
AB-P9	118.47	20.0	98.5		15	103.47	

Note: Above information per pond boring profiles: Ardaman & Associates, May 2007
 Per Ardaman report groundwater not encountered.

AVG. SHWT ELEVATION: 105.9 Ft. (NAVD)

AVG. GROUND WATER TABLE ELEVATION: 100.9 Ft. (NAVD)

AVG. EXIST. GROUND ELEVATION AT BORING LOCATIONS: 110.0 Ft. (NAVD)

NOTE: ABOVE INFORMATION PER POND BORINGS PROFILES: ARDAMAN & ASSOCIATES JUNE 07.

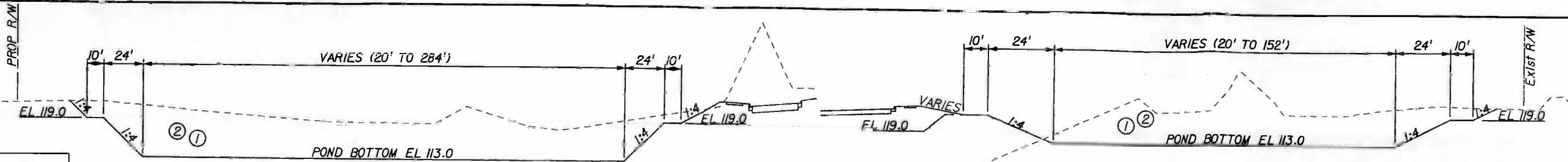
STAGE Ft. (NAVD)	AREA AC.	AVERAGE AREA AC.	INCREMENTAL VOL. AF	CUMULATIVE VOL. AF
113.0	4.17		0.00	0.00
		4.30		
114.0	4.44		4.30	4.30
		4.58		
115.0	4.72		4.58	8.88
		4.86		
116.0	5.00		4.86	13.74
		5.15		
117.0	5.30		5.15	18.89
		5.44		
118.0	5.59		5.44	24.33
		5.73		
119.0	5.88		5.73	30.06
TOTAL:			30.06	

REQUIRED TREATMENT VOLUME: 4.06 AF

TOP EL. OF TREATMENT VOLUME: 113.94 Ft.

PERCOLATION RATE: 40 Ft./Day or 20 Inches/Hr.

FACTOR OF SAFTEY: 2 = 20 Ft./Day



POND 3A	
① 25 YR DHW/24 HR	EL. 116.50
② 25 YR DHW/96 HR	EL. 118.23

POND 3B	
① 25 YR DHW/24 HR	EL. 116.50
② 25 YR DHW/96 HR	EL. 118.23

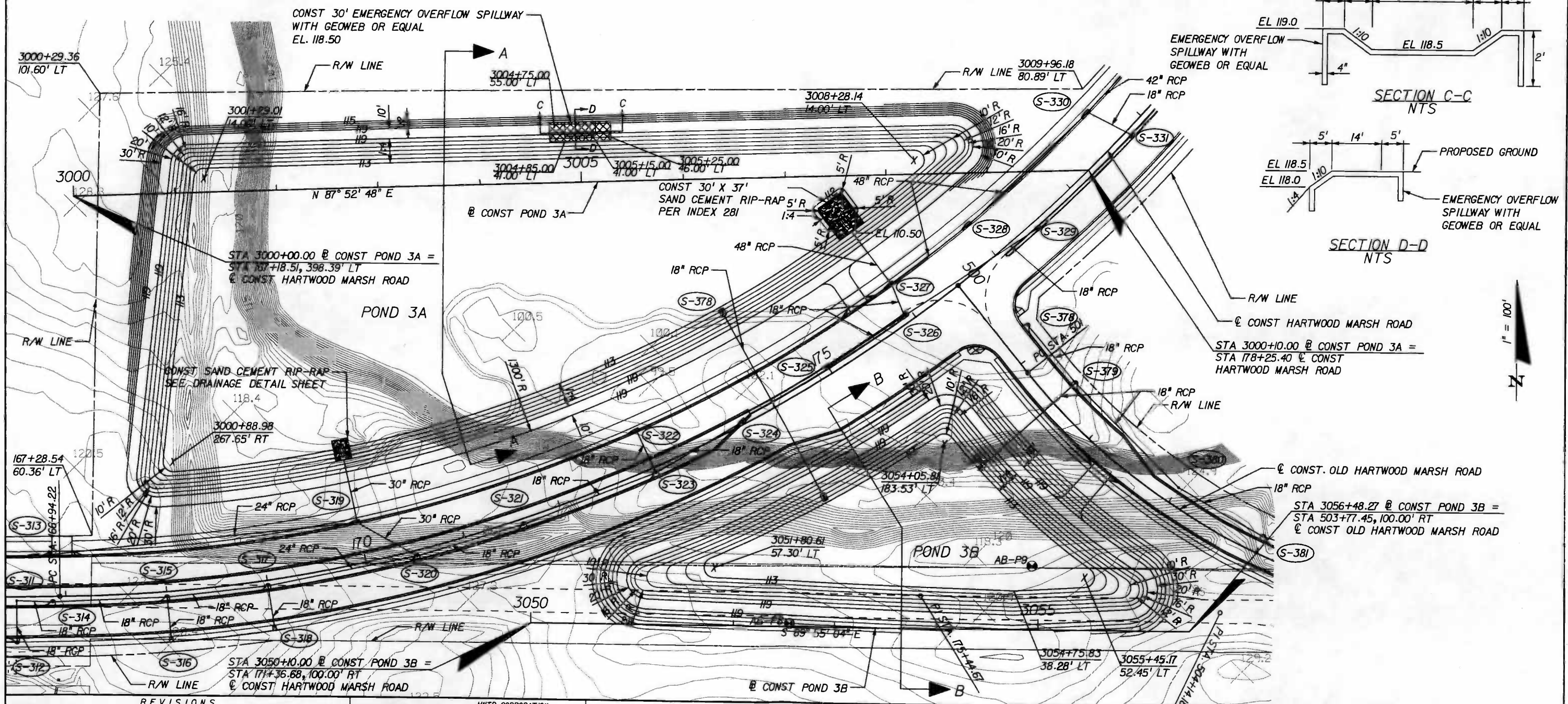
SECTION A-A
NTS

SECTION B-B
NTS

SECTION C-C
NTS

SECTION D-D
NTS

- NOTES:
1. AVERAGE ESTIMATED SEASONAL HIGH WATER TABLE ELEVATION ∇ (EL 103.80)
 2. AVERAGE ENCOUNTERED WATER TABLE \blacktriangledown (GNE)
 3. APPROXIMATE LOCATION OF THE BORING \odot
 4. PRIOR TO SODDING THE POND, REMOVE ALL CONSTRUCTION MATERIAL THAT MAY HAVE DEPOSITED IN THE POND. RAKE AND LOOSEN POND BOTTOM FOR OPTIMAL INFILTRATION.
 5. MUCK GROWN SOD SHOULD NOT BE USED IN THE POND BOTTOM.



DATE	BY	DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMERA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500

ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406

**HARTWOOD MARSH
 ROAD - PHASE II**

**POND DETAIL SHEET
 PONDS 3A & 3B**

SHEET NO.
 103

PONDS Version 3.2.0145
Retention Pond Recovery - Refined Method
Copyright 2000
Devo Seereeram, Ph.D., P.E.

Project Data

Project Name: Hartwood Marsh Road Phase II
Simulation Description: Pond 3 Water Quality Recovery
Project Number: 41561-1
Engineer : MSF
Supervising Engineer:
Date: 07-15-2009

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 104.90
Water Table Elevation, [WT] (ft datum): 105.90
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 20.00
Fillable Porosity, [n] (%): 25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day): 13.33
Maximum Area For Unsaturated Infiltration, [Av] (ft²): 192535.2

Geometry Data

Equivalent Pond Length, [L] (ft): 734.0
Equivalent Pond Width, [W] (ft): 393.0
Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft ²)
113.00	181645.2
114.00	193406.4
115.00	205603.2
116.00	217800.0
117.00	230868.0
118.00	243500.4
119.00	256132.8

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Scenario Input Data

Scenario 1 :: Water Quality

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration
Treatment Volume (ft³) 176854
Initial ground water level (ft datum) default, 105.90

<u>Time After Storm Event (days)</u>	<u>Time After Storm Event (days)</u>
0.100	2.000
0.250	2.500
0.500	3.000
1.000	3.500
1.500	4.000

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Detailed Results :: Scenario 1 :: Water Quality

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	29475.6700	0.0000	105.900	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	29475.6700	0.0000	113.944	28.00520	0.00000	176854.0	168.1	0.0	U/P
2.400	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
6.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
12.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
24.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
36.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
48.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
60.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
72.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
84.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
96.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry

← Recovery < 2.4 hrs

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Project Data

Project Name: Hartwood Marsh Road Phase II
Simulation Description: Pond 3 25yr 96hr Recovery
Project Number: 41561-1
Engineer : MSF
Supervising Engineer:
Date: 07-15-2009

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 104.90
Water Table Elevation, [WT] (ft datum): 105.90
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 20.00
Fillable Porosity, [n] (%): 25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day): 13.33
Maximum Area For Unsaturated Infiltration, [Av] (ft²): 250034.4

Geometry Data

Equivalent Pond Length, [L] (ft): 1174.0
Equivalent Pond Width, [W] (ft): 460.0
Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft ²)
113.00	181645.2
114.00	193406.4
115.00	205603.2
116.00	217800.0
117.00	230868.0
118.00	243500.4
119.00	256132.8

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Scenario Input Data

Scenario 1 :: 25 year/96 hour

Hydrograph Type: Slug Load
 Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 1114479

Initial ground water level (ft datum) default, 105.90

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.100	3.000	7.500	11.000	14.500
0.250	3.500	8.000	11.500	15.000
0.500	4.000	8.500	12.000	15.500
1.000	4.500	9.000	12.500	16.000
1.500	6.000	9.500	13.000	16.500
2.000	6.500	10.000	13.500	17.000
2.500	7.000	10.500	14.000	

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Detailed Results :: Scenario 1 :: 25 year/96 hour

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	185746.5000	0.0000	105.900	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	185746.5000	0.0000	118.221	28.03158	0.00000	1114479.0	168.1	0.0	U/P
2.400	0.0000	0.0000	116.840	30.20145	0.00000	1114479.0	328243.4	0.0	U/P
6.000	0.0000	0.0000	115.759	12.46132	0.00000	1114479.0	567982.6	0.0	U/S
12.000	0.0000	0.0000	115.516	2.06728	0.00000	1114479.0	619812.1	0.0	S
24.000	0.0000	0.0000	115.227	1.21324	0.00000	1114479.0	680413.3	0.0	S
36.000	0.0000	0.0000	115.014	0.92253	0.00000	1114479.0	724635.8	0.0	S
48.000	0.0000	0.0000	114.840	0.75756	0.00000	1114479.0	760119.8	0.0	S
60.000	0.0000	0.0000	114.693	0.64925	0.00000	1114479.0	790088.9	0.0	S
72.000	0.0000	0.0000	114.563	0.57169	0.00000	1114479.0	816214.7	0.0	S
84.000	0.0000	0.0000	114.446	0.51290	0.00000	1114479.0	839483.1	0.0	S
96.000	0.0000	0.0000	114.340	0.46649	0.00000	1114479.0	860529.1	0.0	S
108.000	0.0000	0.0000	114.242	0.42590	0.00000	1114479.0	879787.5	0.0	S
144.000	0.0000	0.0000	113.999	0.34912	0.00000	1114479.0	927250.2	0.0	S
156.000	0.0000	0.0000	113.922	0.33348	0.00000	1114479.0	942086.1	0.0	S
168.000	0.0000	0.0000	113.849	0.31478	0.00000	1114479.0	956063.1	0.0	S
180.000	0.0000	0.0000	113.780	0.29822	0.00000	1114479.0	969282.8	0.0	S
192.000	0.0000	0.0000	113.714	0.28343	0.00000	1114479.0	981828.9	0.0	S
204.000	0.0000	0.0000	113.651	0.27014	0.00000	1114479.0	993771.2	0.0	S
216.000	0.0000	0.0000	113.591	0.25811	0.00000	1114479.0	1005169.0	0.0	S
228.000	0.0000	0.0000	113.533	0.24717	0.00000	1114479.0	1016072.0	0.0	S
240.000	0.0000	0.0000	113.477	0.23717	0.00000	1114479.0	1026524.0	0.0	S
252.000	0.0000	0.0000	113.423	0.22798	0.00000	1114479.0	1036563.0	0.0	S
264.000	0.0000	0.0000	113.371	0.21950	0.00000	1114479.0	1046222.0	0.0	S
276.000	0.0000	0.0000	113.321	0.21166	0.00000	1114479.0	1055528.0	0.0	S
288.000	0.0000	0.0000	113.273	0.20437	0.00000	1114479.0	1064509.0	0.0	S
300.000	0.0000	0.0000	113.226	0.19758	0.00000	1114479.0	1073186.0	0.0	S
312.000	0.0000	0.0000	113.180	0.19124	0.00000	1114479.0	1081580.0	0.0	S
324.000	0.0000	0.0000	113.136	0.18530	0.00000	1114479.0	1089709.0	0.0	S
336.000	0.0000	0.0000	113.093	0.17972	0.00000	1114479.0	1097589.0	0.0	S
348.000	0.0000	0.0000	113.051	0.17448	0.00000	1114479.0	1105237.0	0.0	S
360.000	0.0000	0.0000	113.010	0.10697	0.00000	1114479.0	1112664.0	0.0	S
372.000	0.0000	0.0000	112.961	0.02100	0.00000	1114479.0	1114479.0	0.0	S
384.000	0.0000	0.0000	112.911	0.00000	0.00000	1114479.0	1114479.0	0.0	S
396.000	0.0000	0.0000	112.862	0.00000	0.00000	1114479.0	1114479.0	0.0	S
408.000	0.0000	0.0000	112.816	----	----	1114479.0	1114479.0	0.0	N.A.

After 14 days, 25.20 ac-ft Recovered

Remaining : $25.59 - 25.20 = 0.39$ ac-ft

Add 2nd storm : $25.59 + 0.39 = 25.98$ ac-ft

equates to elev 118.29 ft.

∴ pond will not overtop

Name: BASIN 3-1B	Node: POND 3B	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	
Unit Hydrograph: Uh484	Peaking Factor: 484.0	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.300	Time of Conc(min): 5.00	
Area(ac): 1.020	Time Shift(hrs): 0.00	
Curve Number: 74.20	Max Allowable Q(cfs): 999999.000	
DCIA(%): 0.00		

Dry Total Retention Pond 3B

Name: BASIN 3-2	Node: POND 3A	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	
Unit Hydrograph: Uh484	Peaking Factor: 484.0	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.300	Time of Conc(min): 39.69	
Area(ac): 0.020	Time Shift(hrs): 0.00	
Curve Number: 39.00	Max Allowable Q(cfs): 999999.000	
DCIA(%): 0.00		

Offsite to road

Name: BASIN 3-3	Node: POND 3A	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	
Unit Hydrograph: Uh484	Peaking Factor: 484.0	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.300	Time of Conc(min): 42.73	
Area(ac): 0.360	Time Shift(hrs): 0.00	
Curve Number: 39.00	Max Allowable Q(cfs): 999999.000	
DCIA(%): 0.00		

Offsite to road

Name: BASIN 3-4	Node: POND 3A	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	
Unit Hydrograph: Uh484	Peaking Factor: 484.0	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.300	Time of Conc(min): 36.43	
Area(ac): 0.240	Time Shift(hrs): 0.00	
Curve Number: 39.00	Max Allowable Q(cfs): 999999.000	
DCIA(%): 0.00		

Offsite to road

Name: BASIN 3-5	Node: POND 3A	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	
Unit Hydrograph: Uh484	Peaking Factor: 484.0	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.300	Time of Conc(min): 39.41	
Area(ac): 6.010	Time Shift(hrs): 0.00	
Curve Number: 39.00	Max Allowable Q(cfs): 999999.000	
DCIA(%): 0.00		

Offsite to road

Name: BASIN 3-6	Node: POND 3A	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	
Unit Hydrograph: Uh484	Peaking Factor: 484.0	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.300	Time of Conc(min): 39.41	
Area(ac): 2.140	Time Shift(hrs): 0.00	
Curve Number: 39.00	Max Allowable Q(cfs): 999999.000	
DCIA(%): 0.00		

Offsite to road

Name: BASIN 3-7	Node: POND 3A	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	

Hartwood Marsh Road Phase II
 Post Development
 Pond 3A & 3B Hartwood
 Input Report
 07/09

Rainfall Amount (in): 4.20

Time (hrs)	Print Inc(min)
11.000	60.00
16.000	15.00
40.000	60.00

Name: 25Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y24H.R32

Override Defaults: Yes
 Storm Duration(hrs): 24.00
 Rainfall File: Flmod
 Rainfall Amount (in): 8.30

Time (hrs)	Print Inc(min)
11.000	60.00
16.000	15.00
40.000	60.00

Name: 25Y96H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y96H.R32

Override Defaults: No

Time (hrs)	Print Inc(min)
50.000	60.00
62.000	15.00
100.000	60.00

==== Routing Simulations =====

Name: 100Y24H Hydrology Sim: 100Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\100Y24H.I32

Execute: No Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 150.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time (hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
150.000	60.000

Group	Run
BASE	Yes

Name: 10Y24H Hydrology Sim: 10Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\10Y24H.I32

Execute: No Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 40.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time (hrs)	Print Inc(min)
11.000	60.000

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15.000 15.000
 40.000 60.000

Group Run

 BASE Yes

 Name: 2.3Y24H Hydrology Sim: 2.3Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\2.3Y24H.I32

Execute: No Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 150.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs) Print Inc(min)

 11.000 60.000
 15.000 15.000
 150.000 60.000

Group Run

 BASE Yes

 Name: 25Y24H Hydrology Sim: 25Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y24H.I32

Execute: Yes Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 40.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs) Print Inc(min)

 11.000 60.000
 15.000 15.000
 40.000 60.000

Group Run

 BASE Yes

 Name: 25Y96H Hydrology Sim: 25Y96H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y96H.I32

Execute: Yes Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 97.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs) Print Inc(min)

 55.000 60.000
 65.000 15.000
 97.000 60.000

Group Run

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BASE Yes

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Hartwood Marsh Road Phase II
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Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 3A	0.00	0.000	0.000	0.000
25Y96H	POND 3A	1.00	0.000	0.000	0.000
25Y96H	POND 3A	2.00	0.000	0.000	0.000
25Y96H	POND 3A	3.00	0.000	0.000	0.000
25Y96H	POND 3A	4.00	0.000	0.000	0.000
25Y96H	POND 3A	5.00	0.000	0.000	0.000
25Y96H	POND 3A	6.00	0.000	0.000	0.000
25Y96H	POND 3A	7.00	0.000	0.000	0.000
25Y96H	POND 3A	8.00	0.000	0.000	0.000
25Y96H	POND 3A	9.00	0.000	0.000	0.000
25Y96H	POND 3A	10.00	0.000	0.000	0.000
25Y96H	POND 3A	11.00	0.000	0.000	0.000
25Y96H	POND 3A	12.00	0.000	0.000	0.000
25Y96H	POND 3A	13.00	0.000	0.000	0.000
25Y96H	POND 3A	14.00	0.000	0.000	0.000
25Y96H	POND 3A	15.00	5.938	0.000	0.003
25Y96H	POND 3A	16.00	46.797	0.000	0.019
25Y96H	POND 3A	17.00	148.066	0.001	0.037
25Y96H	POND 3A	18.00	311.249	0.002	0.054
25Y96H	POND 3A	19.00	534.236	0.004	0.070
25Y96H	POND 3A	20.00	814.750	0.006	0.086
25Y96H	POND 3A	21.00	1152.173	0.009	0.102
25Y96H	POND 3A	22.00	1544.872	0.012	0.116
25Y96H	POND 3A	23.00	1989.720	0.015	0.131
25Y96H	POND 3A	24.00	2485.597	0.019	0.145
25Y96H	POND 3A	25.00	3453.832	0.027	0.393
25Y96H	POND 3A	26.00	4994.925	0.039	0.463
25Y96H	POND 3A	27.00	6772.007	0.053	0.524
25Y96H	POND 3A	28.00	8760.788	0.068	0.581
25Y96H	POND 3A	29.00	10984.101	0.085	0.654
25Y96H	POND 3A	30.00	13433.758	0.104	0.706
25Y96H	POND 3A	31.00	16062.897	0.125	0.754
25Y96H	POND 3A	32.00	18857.766	0.146	0.798
25Y96H	POND 3A	33.00	21758.041	0.169	0.813
25Y96H	POND 3A	34.00	24748.160	0.192	0.848
25Y96H	POND 3A	35.00	27863.293	0.216	0.882
25Y96H	POND 3A	36.00	31096.279	0.242	0.914
25Y96H	POND 3A	37.00	34439.734	0.267	0.944
25Y96H	POND 3A	38.00	37886.883	0.294	0.971
25Y96H	POND 3A	39.00	41431.477	0.322	0.998
25Y96H	POND 3A	40.00	45067.805	0.350	1.022
25Y96H	POND 3A	41.00	48852.172	0.379	1.080
25Y96H	POND 3A	42.00	52783.438	0.410	1.104
25Y96H	POND 3A	43.00	56797.805	0.441	1.126
25Y96H	POND 3A	44.00	60889.195	0.473	1.147
25Y96H	POND 3A	45.00	64987.234	0.505	1.130
25Y96H	POND 3A	46.00	69084.852	0.537	1.147
25Y96H	POND 3A	47.00	73242.578	0.569	1.163
25Y96H	POND 3A	48.00	77459.313	0.602	1.179
25Y96H	POND 3A	49.00	82460.641	0.640	1.599
25Y96H	POND 3A	50.00	88278.500	0.686	1.633
25Y96H	POND 3A	50.25	89806.297	0.697	1.762
25Y96H	POND 3A	50.50	91440.938	0.710	1.870
25Y96H	POND 3A	50.75	93144.500	0.723	1.915
25Y96H	POND 3A	51.00	94876.891	0.737	1.935
25Y96H	POND 3A	51.25	96623.141	0.750	1.946
25Y96H	POND 3A	51.50	98378.453	0.764	1.955
25Y96H	POND 3A	51.75	100141.250	0.778	1.963
25Y96H	POND 3A	52.00	101911.266	0.792	1.971
25Y96H	POND 3A	52.25	103779.359	0.806	2.181
25Y96H	POND 3A	52.50	105824.336	0.822	2.364
25Y96H	POND 3A	52.75	107985.344	0.839	2.438
25Y96H	POND 3A	53.00	110193.609	0.856	2.469
25Y96H	POND 3A	53.25	112423.000	0.873	2.485
25Y96H	POND 3A	53.50	114665.195	0.891	2.497
25Y96H	POND 3A	53.75	116917.469	0.908	2.508
25Y96H	POND 3A	54.00	119179.445	0.926	2.519
25Y96H	POND 3A	54.25	121575.039	0.944	2.805
25Y96H	POND 3A	54.50	124209.203	0.965	3.049
25Y96H	POND 3A	54.75	126998.078	0.986	3.148
25Y96H	POND 3A	55.00	129849.789	1.008	3.189
25Y96H	POND 3A	55.25	132729.313	1.031	3.210
25Y96H	POND 3A	55.50	135625.578	1.053	3.226
25Y96H	POND 3A	55.75	138534.922	1.076	3.239
25Y96H	POND 3A	56.00	141458.719	1.099	3.258
25Y96H	POND 3A	56.25	144736.484	1.124	4.026
25Y96H	POND 3A	56.50	148651.719	1.155	4.675
25Y96H	POND 3A	56.75	152979.594	1.188	4.943
25Y96H	POND 3A	57.00	157479.188	1.223	5.056
25Y96H	POND 3A	57.25	162058.844	1.259	5.121

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Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 3A	57.50	166689.672	1.295	5.170
25Y96H	POND 3A	57.75	171361.938	1.331	5.213
25Y96H	POND 3A	58.00	176073.063	1.367	5.256
25Y96H	POND 3A	58.25	181606.938	1.410	7.041
25Y96H	POND 3A	58.50	188663.625	1.465	8.640
25Y96H	POND 3A	58.75	196745.156	1.528	9.319
25Y96H	POND 3A	59.00	205268.656	1.594	9.622
25Y96H	POND 3A	59.25	215465.594	1.673	13.037
25Y96H	POND 3A	59.50	228692.484	1.776	16.356
25Y96H	POND 3A	59.75	268356.938	2.084	71.788
25Y96H	POND 3A	60.00	356941.375	2.772	125.067
25Y96H	POND 3A	60.25	456915.250	3.549	97.098
25Y96H	POND 3A	60.50	526274.250	4.087	57.033
25Y96H	POND 3A	60.75	567325.375	4.406	34.191
25Y96H	POND 3A	61.00	593065.500	4.606	23.009
25Y96H	POND 3A	61.25	610872.625	4.744	16.562
25Y96H	POND 3A	61.50	624175.500	4.848	12.999
25Y96H	POND 3A	61.75	635233.063	4.934	11.573
25Y96H	POND 3A	62.00	645453.000	5.013	11.138
25Y96H	POND 3A	63.00	678030.750	5.266	6.961
25Y96H	POND 3A	64.00	702954.500	5.460	6.886
25Y96H	POND 3A	65.00	722998.250	5.615	4.250
25Y96H	POND 3A	66.00	738187.000	5.733	4.188
25Y96H	POND 3A	67.00	753288.063	5.851	4.201
25Y96H	POND 3A	68.00	768431.250	5.968	4.212
25Y96H	POND 3A	69.00	781144.750	6.067	2.851
25Y96H	POND 3A	70.00	791351.313	6.146	2.819
25Y96H	POND 3A	71.00	801503.250	6.225	2.821
25Y96H	POND 3A	72.00	811663.250	6.304	2.823
25Y96H	POND 3A	73.00	819459.625	6.364	1.508
25Y96H	POND 3A	74.00	824823.625	6.406	1.472
25Y96H	POND 3A	75.00	830125.688	6.447	1.473
25Y96H	POND 3A	76.00	835432.625	6.488	1.475
25Y96H	POND 3A	77.00	840765.375	6.530	1.488
25Y96H	POND 3A	78.00	846124.750	6.572	1.490
25Y96H	POND 3A	79.00	851489.625	6.613	1.491
25Y96H	POND 3A	80.00	856859.250	6.655	1.492
25Y96H	POND 3A	81.00	862212.500	6.696	1.482
25Y96H	POND 3A	82.00	867548.563	6.738	1.483
25Y96H	POND 3A	83.00	872888.813	6.779	1.484
25Y96H	POND 3A	84.00	878233.500	6.821	1.485
25Y96H	POND 3A	85.00	883582.875	6.862	1.487
25Y96H	POND 3A	86.00	888936.750	6.904	1.488
25Y96H	POND 3A	87.00	894295.125	6.946	1.489
25Y96H	POND 3A	88.00	899657.938	6.987	1.490
25Y96H	POND 3A	89.00	905046.500	7.029	1.503
25Y96H	POND 3A	90.00	910461.375	7.071	1.505
25Y96H	POND 3A	91.00	915881.313	7.113	1.506
25Y96H	POND 3A	92.00	921305.625	7.155	1.507
25Y96H	POND 3A	93.00	926712.875	7.197	1.497
25Y96H	POND 3A	94.00	932102.438	7.239	1.498
25Y96H	POND 3A	95.00	937495.625	7.281	1.499
25Y96H	POND 3A	96.00	942887.250	7.323	1.497
25Y96H	POND 3A	97.00	945655.438	7.345	0.041
25Y96H	POND 3A	98.00	945729.813	7.345	0.000
25Y96H	POND 3A	99.00	945729.813	7.345	0.000
25Y96H	POND 3A	100.00	945729.813	7.345	0.000
25Y96H	POND 3B	0.00	0.000	0.000	0.000
25Y96H	POND 3B	1.00	0.000	0.000	0.000
25Y96H	POND 3B	2.00	0.000	0.000	0.000
25Y96H	POND 3B	3.00	0.000	0.000	0.000
25Y96H	POND 3B	4.00	0.000	0.000	0.000
25Y96H	POND 3B	5.00	0.000	0.000	0.000
25Y96H	POND 3B	6.00	0.000	0.000	0.000
25Y96H	POND 3B	7.00	0.000	0.000	0.000
25Y96H	POND 3B	8.00	0.000	0.000	0.000
25Y96H	POND 3B	9.00	0.000	0.000	0.000
25Y96H	POND 3B	10.00	0.000	0.000	0.000
25Y96H	POND 3B	11.00	0.000	0.000	0.000
25Y96H	POND 3B	12.00	0.000	0.000	0.000
25Y96H	POND 3B	13.00	0.000	0.000	0.000
25Y96H	POND 3B	14.00	0.000	0.000	0.000
25Y96H	POND 3B	15.00	0.000	0.000	0.000
25Y96H	POND 3B	16.00	0.000	0.000	0.000
25Y96H	POND 3B	17.00	0.000	0.000	0.000
25Y96H	POND 3B	18.00	0.000	0.000	0.000
25Y96H	POND 3B	19.00	0.000	0.000	0.000
25Y96H	POND 3B	20.00	0.000	0.000	0.000
25Y96H	POND 3B	21.00	0.000	0.000	0.000
25Y96H	POND 3B	22.00	0.000	0.000	0.000

Total Volume
 = 21.65 ac-ft

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Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 3B	23.00	0.000	0.000	0.000
25Y96H	POND 3B	24.00	0.000	0.000	0.000
25Y96H	POND 3B	25.00	3.220	0.000	0.002
25Y96H	POND 3B	26.00	18.204	0.000	0.007
25Y96H	POND 3B	27.00	49.822	0.001	0.011
25Y96H	POND 3B	28.00	97.204	0.002	0.015
25Y96H	POND 3B	29.00	160.886	0.003	0.020
25Y96H	POND 3B	30.00	240.552	0.005	0.024
25Y96H	POND 3B	31.00	334.549	0.007	0.028
25Y96H	POND 3B	32.00	442.140	0.009	0.032
25Y96H	POND 3B	33.00	560.469	0.012	0.034
25Y96H	POND 3B	34.00	688.546	0.015	0.037
25Y96H	POND 3B	35.00	827.617	0.018	0.040
25Y96H	POND 3B	36.00	977.176	0.021	0.043
25Y96H	POND 3B	37.00	1136.745	0.024	0.046
25Y96H	POND 3B	38.00	1305.876	0.028	0.048
25Y96H	POND 3B	39.00	1484.150	0.032	0.051
25Y96H	POND 3B	40.00	1671.170	0.036	0.053
25Y96H	POND 3B	41.00	1869.960	0.040	0.057
25Y96H	POND 3B	42.00	2080.420	0.044	0.060
25Y96H	POND 3B	43.00	2299.054	0.049	0.062
25Y96H	POND 3B	44.00	2525.502	0.054	0.064
25Y96H	POND 3B	45.00	2755.568	0.059	0.064
25Y96H	POND 3B	46.00	2988.745	0.064	0.066
25Y96H	POND 3B	47.00	3228.406	0.069	0.067
25Y96H	POND 3B	48.00	3474.409	0.074	0.069
25Y96H	POND 3B	49.00	3771.176	0.080	0.096
25Y96H	POND 3B	50.00	4120.687	0.088	0.099
25Y96H	POND 3B	50.25	4216.443	0.090	0.114
25Y96H	POND 3B	50.50	4320.427	0.092	0.117
25Y96H	POND 3B	50.75	4425.998	0.094	0.118
25Y96H	POND 3B	51.00	4532.414	0.097	0.119
25Y96H	POND 3B	51.25	4639.618	0.099	0.120
25Y96H	POND 3B	51.50	4747.600	0.101	0.120
25Y96H	POND 3B	51.75	4856.346	0.104	0.121
25Y96H	POND 3B	52.00	4965.867	0.106	0.122
25Y96H	POND 3B	52.25	5087.914	0.109	0.149
25Y96H	POND 3B	52.50	5223.992	0.111	0.153
25Y96H	POND 3B	52.75	5362.605	0.114	0.155
25Y96H	POND 3B	53.00	5502.390	0.117	0.156
25Y96H	POND 3B	53.25	5643.240	0.120	0.157
25Y96H	POND 3B	53.50	5785.138	0.123	0.158
25Y96H	POND 3B	53.75	5928.065	0.126	0.159
25Y96H	POND 3B	54.00	6072.041	0.130	0.161
25Y96H	POND 3B	54.25	6233.436	0.133	0.198
25Y96H	POND 3B	54.50	6414.265	0.137	0.204
25Y96H	POND 3B	54.75	6598.504	0.141	0.206
25Y96H	POND 3B	55.00	6784.327	0.145	0.207
25Y96H	POND 3B	55.25	6971.588	0.149	0.209
25Y96H	POND 3B	55.50	7160.256	0.153	0.210
25Y96H	POND 3B	55.75	7350.371	0.157	0.212
25Y96H	POND 3B	56.00	7544.171	0.161	0.219
25Y96H	POND 3B	56.25	7793.503	0.166	0.335
25Y96H	POND 3B	56.50	8110.673	0.173	0.369
25Y96H	POND 3B	56.75	8453.656	0.180	0.393
25Y96H	POND 3B	57.00	8817.313	0.188	0.415
25Y96H	POND 3B	57.25	9201.026	0.196	0.437
25Y96H	POND 3B	57.50	9604.520	0.205	0.459
25Y96H	POND 3B	57.75	10027.525	0.214	0.481
25Y96H	POND 3B	58.00	10470.031	0.223	0.503
25Y96H	POND 3B	58.25	11082.326	0.236	0.858
25Y96H	POND 3B	58.50	11913.186	0.254	0.988
25Y96H	POND 3B	58.75	12834.042	0.274	1.058
25Y96H	POND 3B	59.00	13815.105	0.295	1.122
25Y96H	POND 3B	59.25	15186.738	0.324	1.926
25Y96H	POND 3B	59.50	17097.533	0.365	2.320
25Y96H	POND 3B	59.75	26234.313	0.560	17.984
25Y96H	POND 3B	60.00	47481.375	1.013	29.232
25Y96H	POND 3B	60.25	67052.469	1.431	14.259
25Y96H	POND 3B	60.50	77048.352	1.644	7.954
25Y96H	POND 3B	60.75	82803.586	1.767	4.836
25Y96H	POND 3B	61.00	86749.453	1.851	3.933
25Y96H	POND 3B	61.25	89831.063	1.917	2.915
25Y96H	POND 3B	61.50	92304.805	1.970	2.582
25Y96H	POND 3B	61.75	94620.195	2.019	2.563
25Y96H	POND 3B	62.00	96933.867	2.068	2.578
25Y96H	POND 3B	63.00	104527.469	2.230	1.640
25Y96H	POND 3B	64.00	110485.961	2.358	1.670
25Y96H	POND 3B	65.00	115330.641	2.461	1.022
25Y96H	POND 3B	66.00	119027.859	2.540	1.032

Hartwood Marsh Road Phase II
 Post Development
 Pond 3A & 3B Hartwood
 Hydrology Node Time Series Report
 07/09

Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 3B	67.00	122763.914	2.620	1.043
25Y96H	POND 3B	68.00	126536.422	2.700	1.053
25Y96H	POND 3B	69.00	129703.727	2.768	0.707
25Y96H	POND 3B	70.00	132256.672	2.822	0.711
25Y96H	POND 3B	71.00	134824.203	2.877	0.715
25Y96H	POND 3B	72.00	137404.000	2.932	0.718
25Y96H	POND 3B	73.00	139372.297	2.974	0.375
25Y96H	POND 3B	74.00	140725.406	3.003	0.376
25Y96H	POND 3B	75.00	142082.688	3.032	0.378
25Y96H	POND 3B	76.00	143444.078	3.061	0.379
25Y96H	POND 3B	77.00	144815.203	3.090	0.383
25Y96H	POND 3B	78.00	146196.031	3.120	0.384
25Y96H	POND 3B	79.00	147580.953	3.149	0.385
25Y96H	POND 3B	80.00	148969.969	3.179	0.386
25Y96H	POND 3B	81.00	150357.391	3.208	0.384
25Y96H	POND 3B	82.00	151743.172	3.238	0.385
25Y96H	POND 3B	83.00	153132.906	3.268	0.387
25Y96H	POND 3B	84.00	154526.547	3.297	0.388
25Y96H	POND 3B	85.00	155924.094	3.327	0.389
25Y96H	POND 3B	86.00	157325.516	3.357	0.390
25Y96H	POND 3B	87.00	158730.766	3.387	0.391
25Y96H	POND 3B	88.00	160139.875	3.417	0.392
25Y96H	POND 3B	89.00	161558.547	3.447	0.396
25Y96H	POND 3B	90.00	162986.797	3.478	0.397
25Y96H	POND 3B	91.00	164418.875	3.508	0.398
25Y96H	POND 3B	92.00	165854.688	3.539	0.399
25Y96H	POND 3B	93.00	167288.422	3.570	0.397
25Y96H	POND 3B	94.00	168720.031	3.600	0.398
25Y96H	POND 3B	95.00	170155.281	3.631	0.399
25Y96H	POND 3B	96.00	171591.906	3.662	0.399
25Y96H	POND 3B	97.00	172310.000	3.677	0.000
25Y96H	POND 3B	98.00	172310.000	3.677	0.000
25Y96H	POND 3B	99.00	172310.000	3.677	0.000
25Y96H	POND 3B	100.00	172310.000	3.677	0.000

Total Volume
 = 3.94 ac-ft

PONDS Version 3.2.0145
Retention Pond Recovery - Refined Method
Copyright 2000
Devo Seereeram, Ph.D., P.E.

Project Data

Project Name: Hartwood Marsh Road Phase II
Simulation Description: Pond 3 Water Quality Recovery
Project Number: 41561-1
Engineer : MSF
Supervising Engineer:
Date: 06-19-2009

minimum permeability for Pond 3A

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 104.90
Water Table Elevation, [WT] (ft datum): 105.90
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 19.50
Fillable Porosity, [n] (%): 27.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day): 18.0
Maximum Area For Unsaturated Infiltration, [Av] (ft²): 192535.2

Geometry Data

Equivalent Pond Length, [L] (ft): 734.0
Equivalent Pond Width, [W] (ft): 393.0
Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft ²)
113.00	181645.2
114.00	193406.4
115.00	205603.2
116.00	217800.0
117.00	230868.0
118.00	243500.4
119.00	256132.8

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Scenario Input Data

Scenario 1 :: Water Quality

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration
Treatment Volume (ft³) 176854
Initial ground water level (ft datum) default, 105.90

<u>Time After Storm Event (days)</u>	<u>Time After Storm Event (days)</u>
0.100	2.000
0.250	2.500
0.500	3.000
1.000	3.500
1.500	4.000

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Detailed Results :: Scenario 1 :: Water Quality

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	29475.6700	0.0000	105.900	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	29475.6700	0.0000	113.944	37.81647	0.00000	176854.0	227.1	0.0	U/P
2.400	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
6.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
12.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
24.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
36.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
48.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
60.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
72.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
84.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry
96.000	0.0000	0.0000	----	----	----	176854.0	176854.0	0.0	dry

← Recovery < 2.4 hrs

PONDS Version 3.2.0145
Retention Pond Recovery - Refined Method
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Devo Seereeram, Ph.D., P.E.

Project Data

Project Name: Hartwood Marsh Road Phase II
 Simulation Description: Pond 3 25yr 96hr Recovery
 Project Number: 41561-1
 Engineer : MSF
 Supervising Engineer:
 Date: 06-19-2009

Minimum permeability for pond 3A total recovery (<14days)

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 104.90
 Water Table Elevation, [WT] (ft datum): 105.90
 Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 19.50
 Fillable Porosity, [n] (%): 27.00
 Unsaturated Vertical Infiltration Rate, [lv] (ft/day): 18.0
 Maximum Area For Unsaturated Infiltration, [Av] (ft²): 250034.4

Geometry Data

Equivalent Pond Length, [L] (ft): 1174.0
 Equivalent Pond Width, [W] (ft): 460.0
 Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
113.00	181645.2
114.00	193406.4
115.00	205603.2
116.00	217800.0
117.00	230868.0
118.00	263500.4
119.00	256132.8

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Retention Pond Recovery - Refined Method
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Scenario Input Data

Scenario 1 :: 25 year/96 hour

Hydrograph Type: Slug Load
 Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 1114479

Initial ground water level (ft datum) default, 105.90

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.100	3.000	6.500	10.000	13.500
0.250	3.500	7.000	10.500	14.000
0.500	4.000	7.500	11.000	14.500
1.000	4.500	8.000	11.500	
1.500	5.000	8.500	12.000	
2.000	5.500	9.000	12.500	
2.500	6.000	9.500	13.000	

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Retention Pond Recovery - Refined Method
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Devo Seereeram, Ph.D., P.E.

Detailed Results :: Scenario 1 :: 25 year/96 hour

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	185746.5000	0.0000	105.900	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	185746.5000	0.0000	118.167	37.85265	0.00000	1114479.0	227.1	0.0	U/P
2.400	0.0000	0.0000	116.299	36.04026	0.00000	1114479.0	449976.4	0.0	U/P
6.000	0.0000	0.0000	115.586	8.36657	0.00000	1114479.0	604824.6	0.0	U/S
12.000	0.0000	0.0000	115.341	2.06411	0.00000	1114479.0	656604.9	0.0	S
24.000	0.0000	0.0000	115.051	1.20803	0.00000	1114479.0	716993.1	0.0	S
36.000	0.0000	0.0000	114.836	0.91701	0.00000	1114479.0	760978.8	0.0	S
48.000	0.0000	0.0000	114.662	0.75203	0.00000	1114479.0	796222.4	0.0	S
60.000	0.0000	0.0000	114.514	0.64378	0.00000	1114479.0	825954.0	0.0	S
72.000	0.0000	0.0000	114.384	0.56630	0.00000	1114479.0	851845.3	0.0	S
84.000	0.0000	0.0000	114.267	0.50757	0.00000	1114479.0	874882.1	0.0	S
96.000	0.0000	0.0000	114.161	0.46123	0.00000	1114479.0	895699.4	0.0	S
108.000	0.0000	0.0000	114.063	0.42354	0.00000	1114479.0	914732.4	0.0	S
120.000	0.0000	0.0000	113.972	0.39217	0.00000	1114479.0	932293.6	0.0	S
132.000	0.0000	0.0000	113.888	0.36556	0.00000	1114479.0	948615.9	0.0	S
144.000	0.0000	0.0000	113.808	0.34263	0.00000	1114479.0	963877.8	0.0	S
156.000	0.0000	0.0000	113.733	0.32264	0.00000	1114479.0	978219.6	0.0	S
168.000	0.0000	0.0000	113.662	0.30502	0.00000	1114479.0	991754.0	0.0	S
180.000	0.0000	0.0000	113.594	0.28935	0.00000	1114479.0	1004573.0	0.0	S
192.000	0.0000	0.0000	113.529	0.27530	0.00000	1114479.0	1016754.0	0.0	S
204.000	0.0000	0.0000	113.467	0.26263	0.00000	1114479.0	1028359.0	0.0	S
216.000	0.0000	0.0000	113.408	0.25113	0.00000	1114479.0	1039445.0	0.0	S
228.000	0.0000	0.0000	113.351	0.24063	0.00000	1114479.0	1050057.0	0.0	S
240.000	0.0000	0.0000	113.296	0.23101	0.00000	1114479.0	1060236.0	0.0	S
252.000	0.0000	0.0000	113.243	0.22216	0.00000	1114479.0	1070017.0	0.0	S
264.000	0.0000	0.0000	113.192	0.21397	0.00000	1114479.0	1079430.0	0.0	S
276.000	0.0000	0.0000	113.142	0.20638	0.00000	1114479.0	1088503.0	0.0	S
288.000	0.0000	0.0000	113.095	0.19931	0.00000	1114479.0	1097261.0	0.0	S
300.000	0.0000	0.0000	113.048	0.19272	0.00000	1114479.0	1105724.0	0.0	S
312.000	0.0000	0.0000	113.003	0.10133	0.00000	1114479.0	1113912.0	0.0	S
324.000	0.0000	0.0000	112.950	0.00656	0.00000	1114479.0	1114479.0	0.0	S
336.000	0.0000	0.0000	112.899	0.00000	0.00000	1114479.0	1114479.0	0.0	S
348.000	0.0000	0.0000	112.850	---	---	1114479.0	1114479.0	0.0	N.A.

← Recovers with 14 days

BASIN 5

Floodplain Encroachment Calculations

LAKE NAME	PANEL NUMBERS	COMMUNITY NAME	STILLWATER ELEVATIONS (feet NAVD)			
			10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
Lake John	359, 367	City of Mt. Dora	79.9	81.4	81.9	82.9
Johns Lake	570	Lake Co.	96.9	99.0	99.7	101.1
Lake Junietta	355	Lake Co., City of Tavares	*	*	67.7	*
Lake Kathryn	125, 150	Lake Co.	40.6	42.1	44.0	46.6
Keene Lake	650	Lake Co.	110.0	110.6	110.8	111.0
Lake 356-1	356	Lake Co., City of Eustis	103.1	103.8	104.1	*
Lake 357-1	220, 357	Lake Co.	73.8	74.0	74.1	*
Lake 530-1	465, 530	Lake Co.	88.6	89.8	90.3	91.5
Leesburg Unnamed Pond	316, 317	Lake Co., City of Leesburg	69.7	70.0	70.1	70.3
Lake Lincoln	357	Lake Co.	73.6	74.0	74.1	*
Little Bluff Lake	510	Lake Co., City of Mascotte	98.6	99.0	99.1	*
Little Grassy Lake	555	Lake Co., Town of Minneola	86.2	88.6	89.6	91.4
Little Lake Harris	460, 470, 480, 500	Lake Co., Town of Howey-in-the-Hills, Town of Astatula	63.4	63.8	63.9	64.1
Lake Louisa	545, 565, 625, 650	Lake Co.	98.4	99.0	99.2	99.5
Lake Louise	358	Lake Co., City of Eustis	78.5	78.9	79.1	*
Lake Lucerne	317	City of Leesburg	*	*	72.1	*
Lake Lucie	395	Lake Co.	61.0	62.8	63.5	65.1
Lake Lulu	235	Lake Co.	46.0	47.1	47.7	49.6
Lake Madge	380	Lake Co.	*	*	80.0	*
Lake Maggie	357	Lake Co., City of Eustis	*	*	154.1	*
Martins Lake	555	Town of Minneola	87.6	88.6	89.1	*
Lake Mary	220	Lake Co., City of Umatilla	*	*	70.5	*
Lake Minnehaha	545, 565	Lake Co., City of Clermont	97.8	98.6	98.8	99.1
Lake Minneola	535, 545	Lake Co., City of Clermont, Town of Minneola	97.4	98.2	98.6	98.9
Minneola Annex Pond 1	535	Town of Minneola	91.4	93.8	94.8	97.2

*Data not available

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY
LAKE COUNTY, FL
AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

2002 Flood Ins. Study

30



FLOOD PLAIN COMPENSATION--10 YEAR

MADE BY: MSF 22-Apr-09
CHECK BY: BJS 25-Apr-09

DATE

PROJECT: HARTWOOD MARSH ROAD PHASE II

EXCAVATION (POND 5, CL CONST. POND 5)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
5000+71.65	0		0	0	0	0
		0				
5001+00.00	0		0	0	0	0
		0				
5002+00.00	0		0	0	0	0
		0				
5003+00.00	0		0	0	0	0
		0				
5004+00.00	0		0	0	0	0
		0				
5005+00.00	0		0	0	0	0
		0				
5005+15.45	0		0	0	0	0

FILL (POND 5, CL CONST. POND 5)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
5000+71.65	0.00235		0	0	0	0
		0.00181				
5001+00.00	0.00128		0.05133	0.05133	2235.97	82.81
		0.00079				
5002+00.00	0.00031		0.07937	0.13071	5693.53	210.87
		0.00164				
5003+00.00	0.00297		0.16406	0.29477	12840.03	475.56
		0.00414				
5004+00.00	0.00531		0.41407	0.70884	30876.88	1143.59
		0.00294				
5005+00.00	0.00056		0.29352	1.00236	43662.74	1617.14
		0.00043				
5005+15.45	0.00030		0.00666	1.00902	43952.75	1627.88

HNTB

FLOOD PLAIN COMPENSATION--10 YEAR

DATE

MADE BY:	MSF	22-Apr-09
CHK BY:	BJS	25-Apr-09

PROJECT: HARTWOOD MARSH ROAD PHASE II

EXCAVATION (ROADWAY, CL CONST. HARTWOOD MARSH ROAD)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
266+00.00	0		0	0	0	0
		0.0051669				
267+00.00	0.010334		0.51669	0.51669	22507.13	833.60
		0.0108103				
268+00.00	0.011287		1.08103	1.59773	69596.93	2577.66
		0.0056434				
269+00.00	0		0.56434	2.16207	94179.59	3488.13

FILL (ROADWAY, CL CONST. HARTWOOD MARSH ROAD)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
266+00.00	0		0	0	0	0
		0.00155				
267+00.00	0.00310		0.15489	0.15489	6747.17	249.90
		0.00270				
268+00.00	0.00230		0.26989	0.42478	18503.54	685.32
		0.00115				
269+00.00	0		0.11500	0.53978	23512.73	870.84

TOTAL EXCAVATION =	3488.13 CY
TOTAL FILL =	2498.72 CY
TOTAL FILL =	0.06 AC-FT

STAGE / STORAGE CALCULATIONS



DATE

MADE BY:	msf	15-Jul-09
CHCK BY:	BJS	16-Jul-09

PROJECT: **HARTWOOD MARSH ROAD PHASE II**

POND: **10 YR FLOOD PLAIN COMPENSATION POND**

Boring	Approx. Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Depth to Encountered Water Surface	Average Estimated Depth to Encountered Water Surface	Depth to Seasonal High Water Surface	Estimated Seasonal High Water Elevation	Average Estimated Seasonal High Water Elevation
AB-P61	109.49	20.0	89.49	84.22	17	92.49	87.22
AB-P62	104.27	20.0	84.27		17	87.27	
AB-P63	101.15	20.0	81.15		17	84.15	
AB-P64	101.95	20.0	81.95		17	84.95	

Note: Above information per pond boring profiles: Ardaman & Associates, June 2008
Per Ardaman report groundwater not encountered.

AVG. SHWT ELEVATION: Ft. (NAVD)

AVG. GROUND WATER TABLE ELEVATION: Ft. (NAVD)

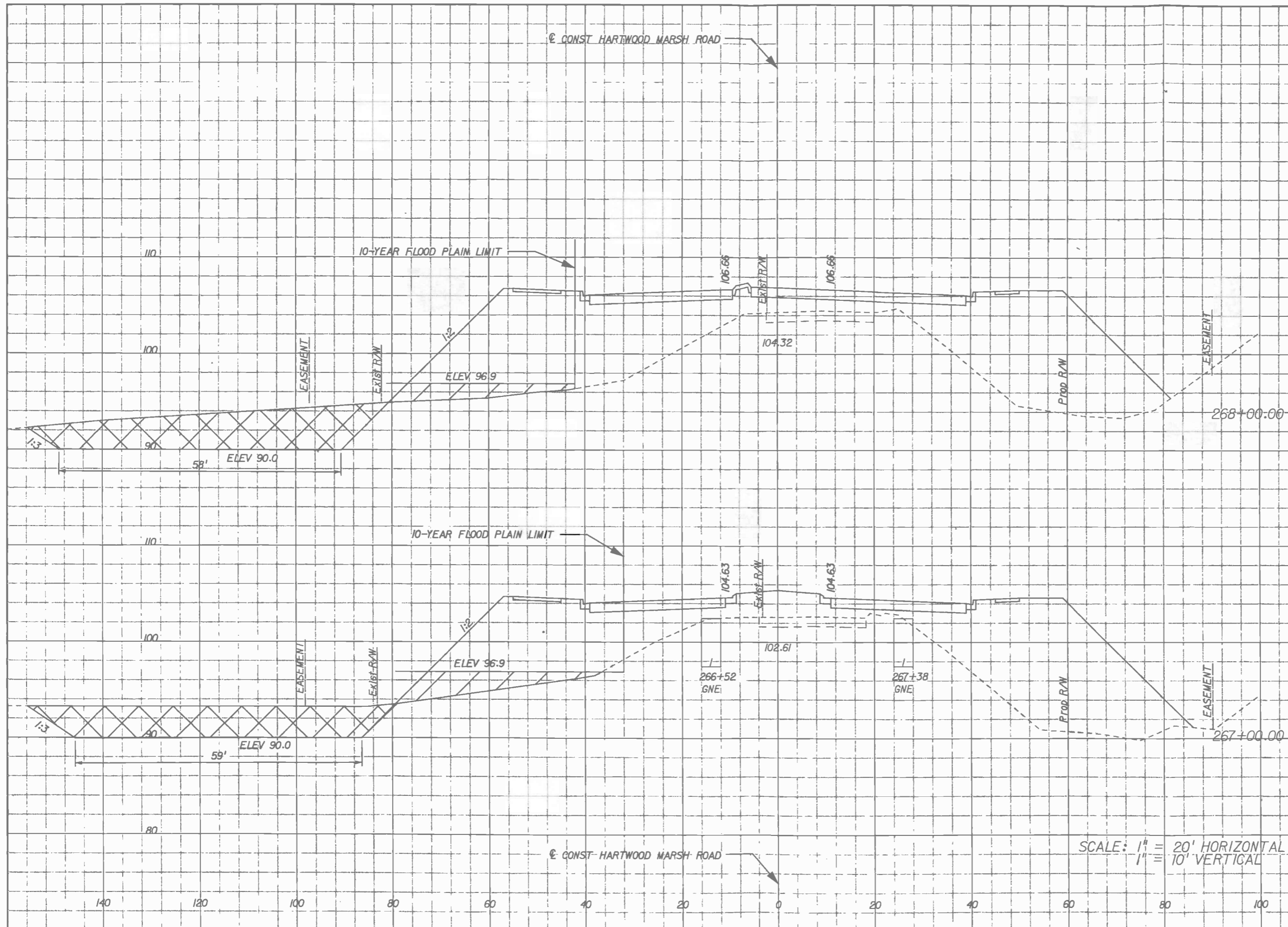
AVG. EXIST. GROUND ELEVATION AT BORING LOCATIONS: Ft. (NAVD)

STAGE Ft. (NAVD)	AREA AC.	AVERAGE AREA AC.	INCREMENTAL VOL. AF	CUMULATIVE VOL. AF
90.0	0.25		0.00	0.00
91.0	0.28	0.26	0.26	0.26
92.0	0.30	0.29	0.29	0.55
TOTAL:			0.55	

TOP EL. OF STORAGE VOLUME: Ft.

AVE. PERCOLATION RATE: Ft./Day or Inches/Hr.

FACTOR OF SAFETY: = Ft./Day



Regular		Exc.		Embankment	
A	V	A	V	A	V

SCALE: 1" = 20' HORIZONTAL
1" = 10' VERTICAL

REVISIONS	
DATE	DESCRIPTION

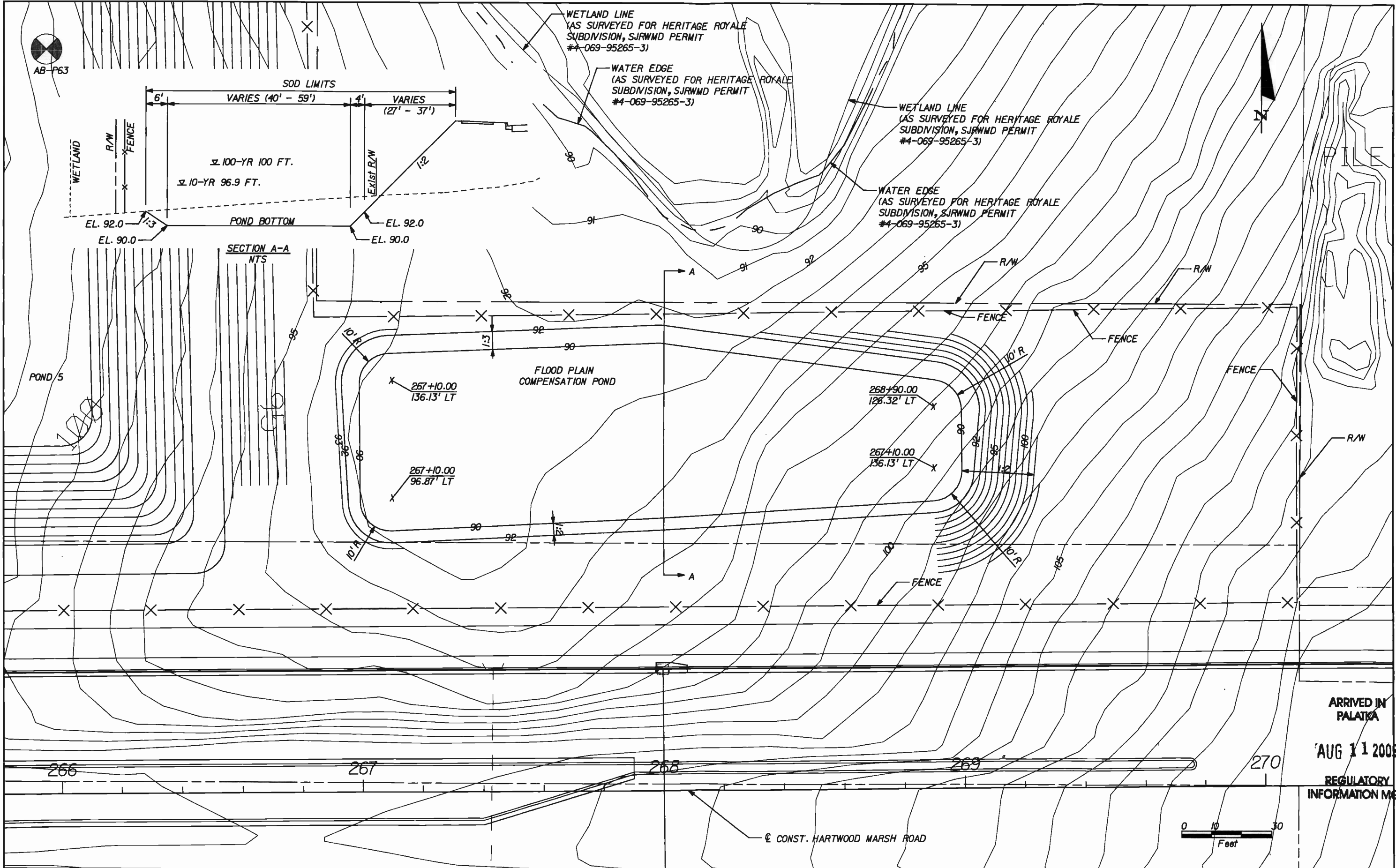
HNTB
 HNTB CORPORATION
 300 PRIMERA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500
 ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406



**HARTWOOD MARSH
 ROAD - PHASE II**

**CROSS SECTIONS
 10-YEAR FLOOD PLAIN**

SHEET NO.
35



ARRIVED IN
PALATKA
AUG 11 2009
REGULATORY
INFORMATION MGT.

REVISIONS	
DATE	DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMERA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500

ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406

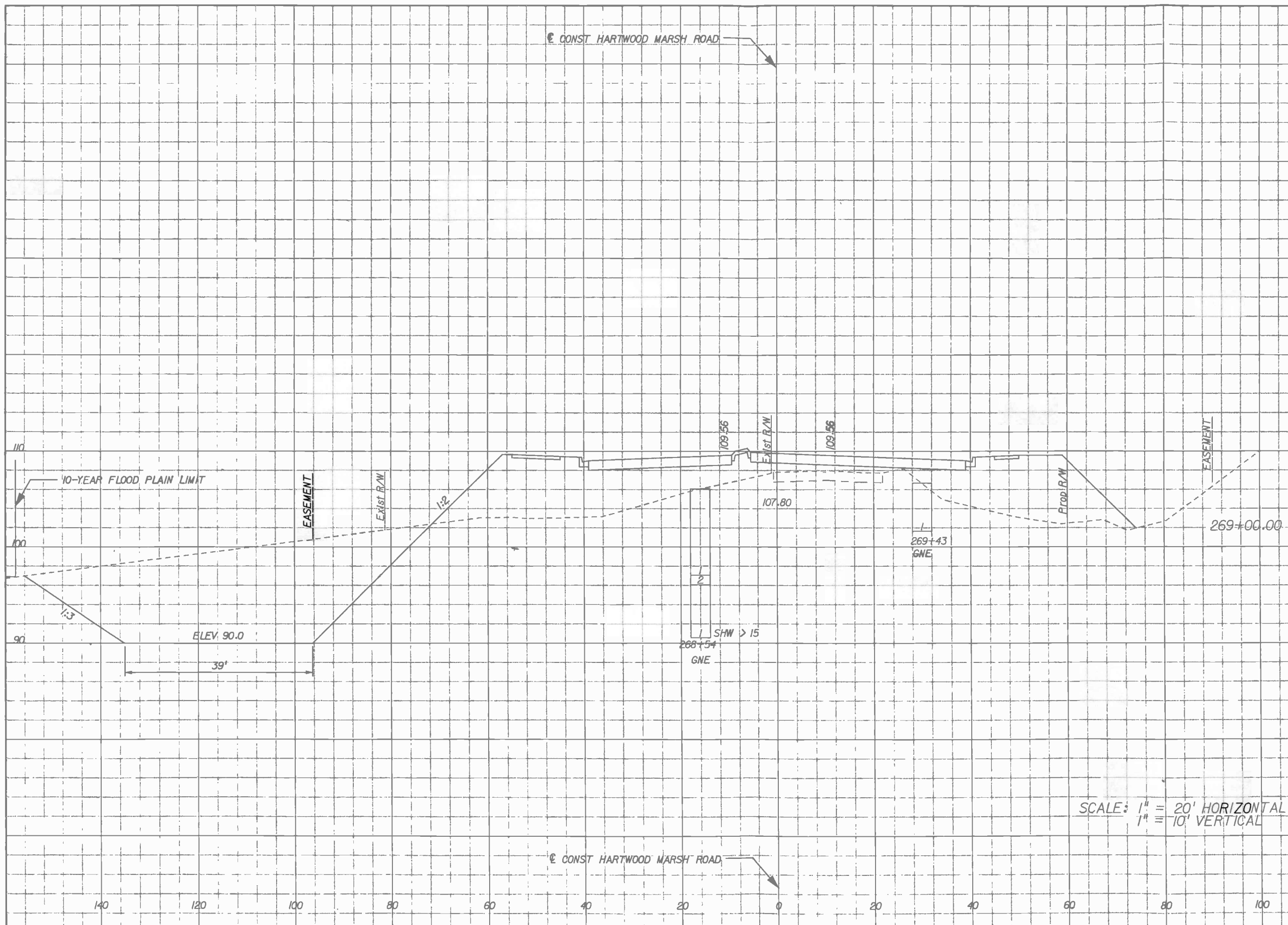


**HARTWOOD MARSH
 ROAD - PHASE II**

**FLOOD PLAIN COMPENSATION
 BASIN 5**

SHEET
 NO.
34

Regular		Exc.		Embankment	
A	V	A	V	A	V



REVISIONS	
DATE	DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMERA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500

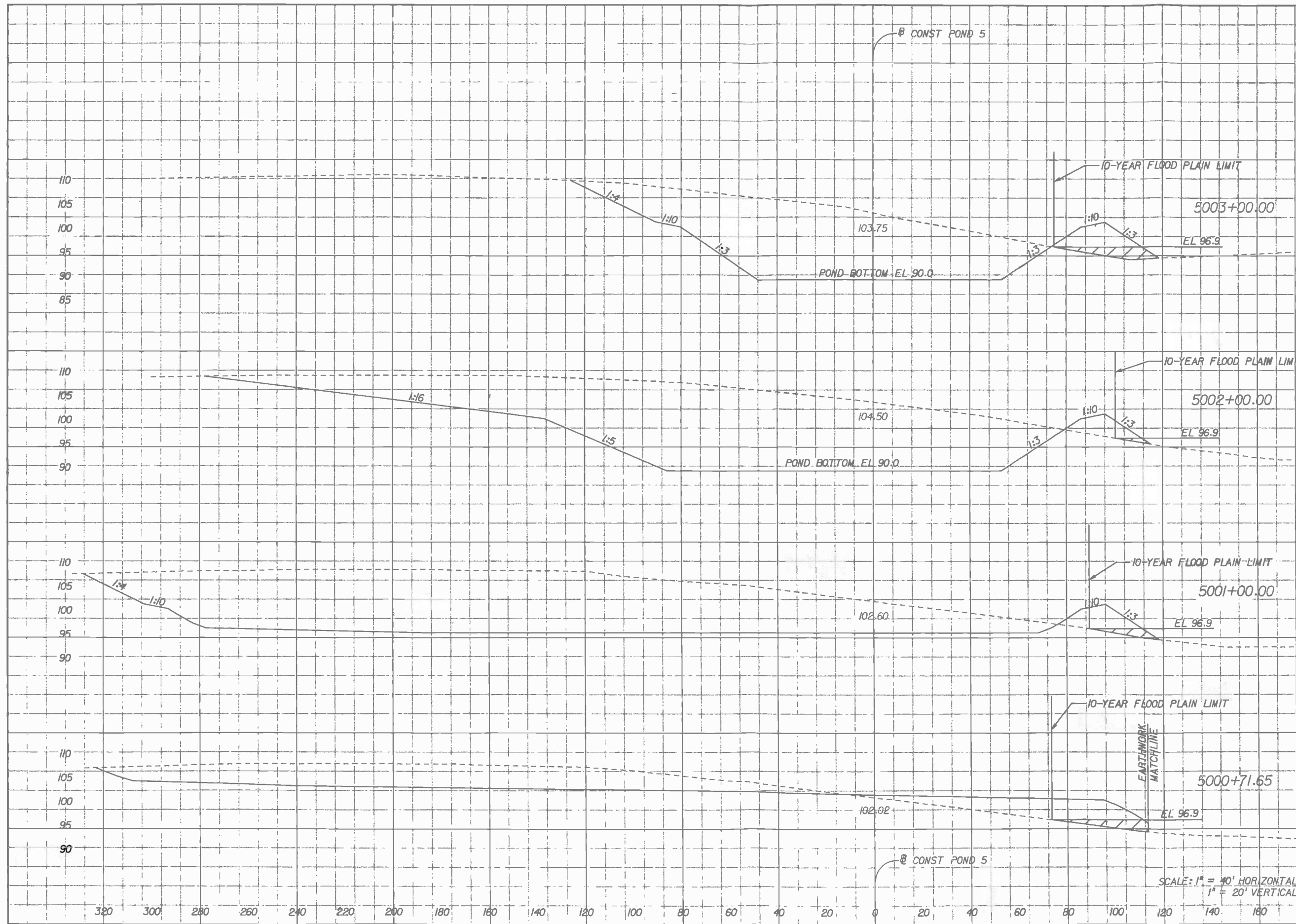
ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406



**HARTWOOD MARSH
ROAD - PHASE II**

**CROSS SECTIONS
10-YEAR FLOOD PLAIN**

SHEET NO.
36



Regular		Exc.		Embankment	
A	V	A	V	A	V

REVISIONS		
DATE	BY	DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500
 ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406

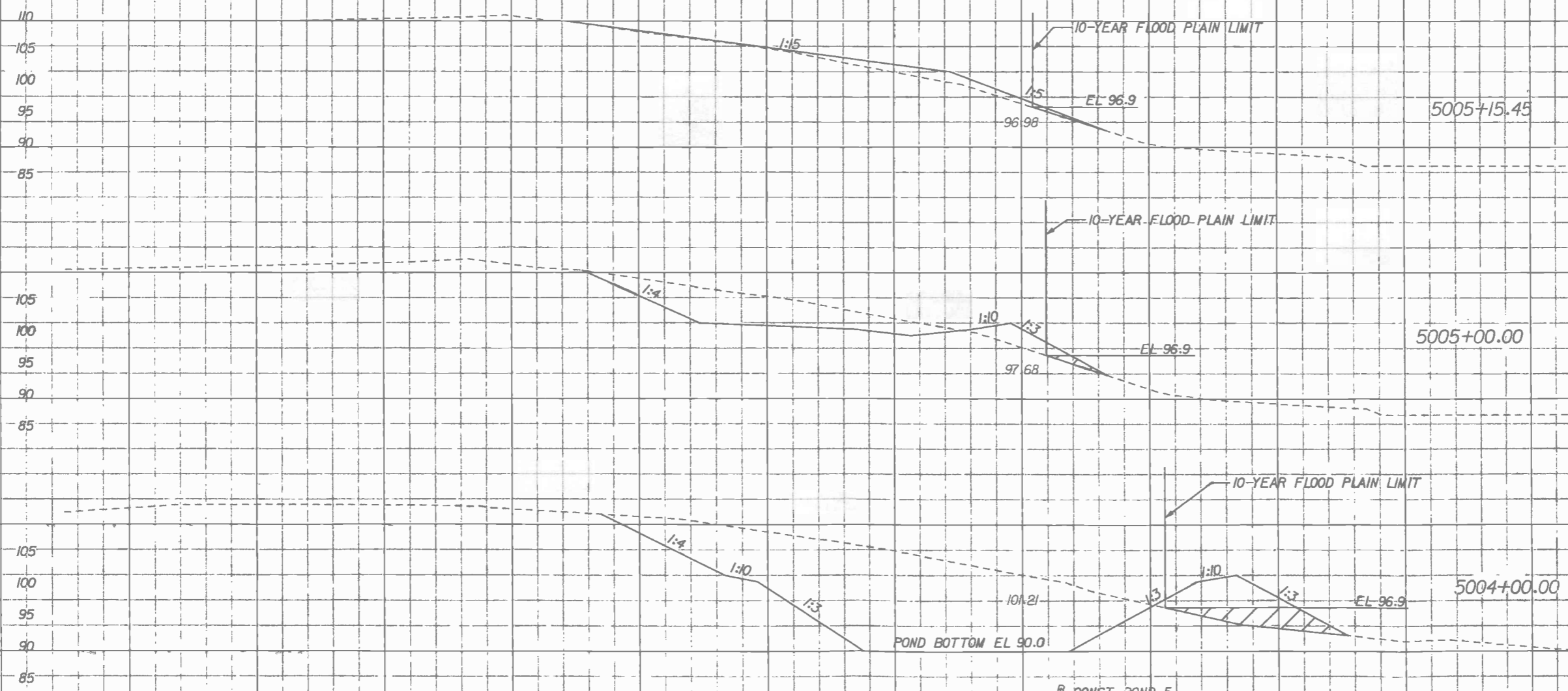


**HARTWOOD MARSH
 ROAD - PHASE II**

**CROSS SECTIONS
 10-YEAR FLOOD PLAIN**

SHEET NO.
37

Regular		Exc.		Embankment	
A	V	A	V	A	V



300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160

SCALE: 1" = 40' HORIZONTAL
1" = 20' VERTICAL

DATE	BY	REVISIONS DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMERA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500
 ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406



**HARTWOOD MARSH
 ROAD - PHASE II**

**CROSS SECTIONS
 10-YEAR FLOOD PLAIN**

SHEET NO.
38



FLOOD PLAIN COMPENSATION--100 YEAR

DATE

MADE BY:	MSF	31-Dec-08
CHCK BY:	BJS	8-Jan-09

PROJECT: HARTWOOD MARSH ROAD PHASE II

EXCAVATION (POND 5, CL CONST. POND 5)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
5000+71.65	0		0	0	0	0
		0.0020938				
5001+00.00	0.004188		0.05936	0.05936	2585.66	95.77
		0.0028589				
5002+00.00	0.001530		0.28589	0.34525	15039.24	557.01
		0.0054250				
5003+00.00	0.009320		0.54250	0.88775	38670.59	1432.24
		0.0074200				
5004+00.00	0.005520		0.74200	1.62975	70992.05	2629.34
		0.0027601				
5005+00.00	0		0.27601	1.90577	83015.25	3074.64
		0				
5005+15.45	0		0	1.90577	83015.25	3074.64

FILL (POND 5, CL CONST. POND 5)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
5000+71.65	0.00851		0	0	0	0
		0.00672				
5001+00.00	0.00494		0.19060	0.19060	8302.45	307.50
		0.00389				
5002+00.00	0.00284		0.38892	0.57952	25243.90	934.96
		0.00492				
5003+00.00	0.00700		0.49197	1.07149	46674.18	1728.67
		0.00983				
5004+00.00	0.01267		0.98315	2.05464	89500.27	3314.82
		0.00806				
5005+00.00	0.00345		0.80575	2.86039	124598.65	4614.76
		0.00227				
5005+15.45	0.00110		0.03513	2.89552	126128.79	4671.44



FLOOD PLAIN COMPENSATION--100 YEAR

DATE

MADE BY:	MSF	31-Dec-08
CHCK BY:	BJS	8-Jan-09

PROJECT: HARTWOOD MARSH ROAD PHASE II

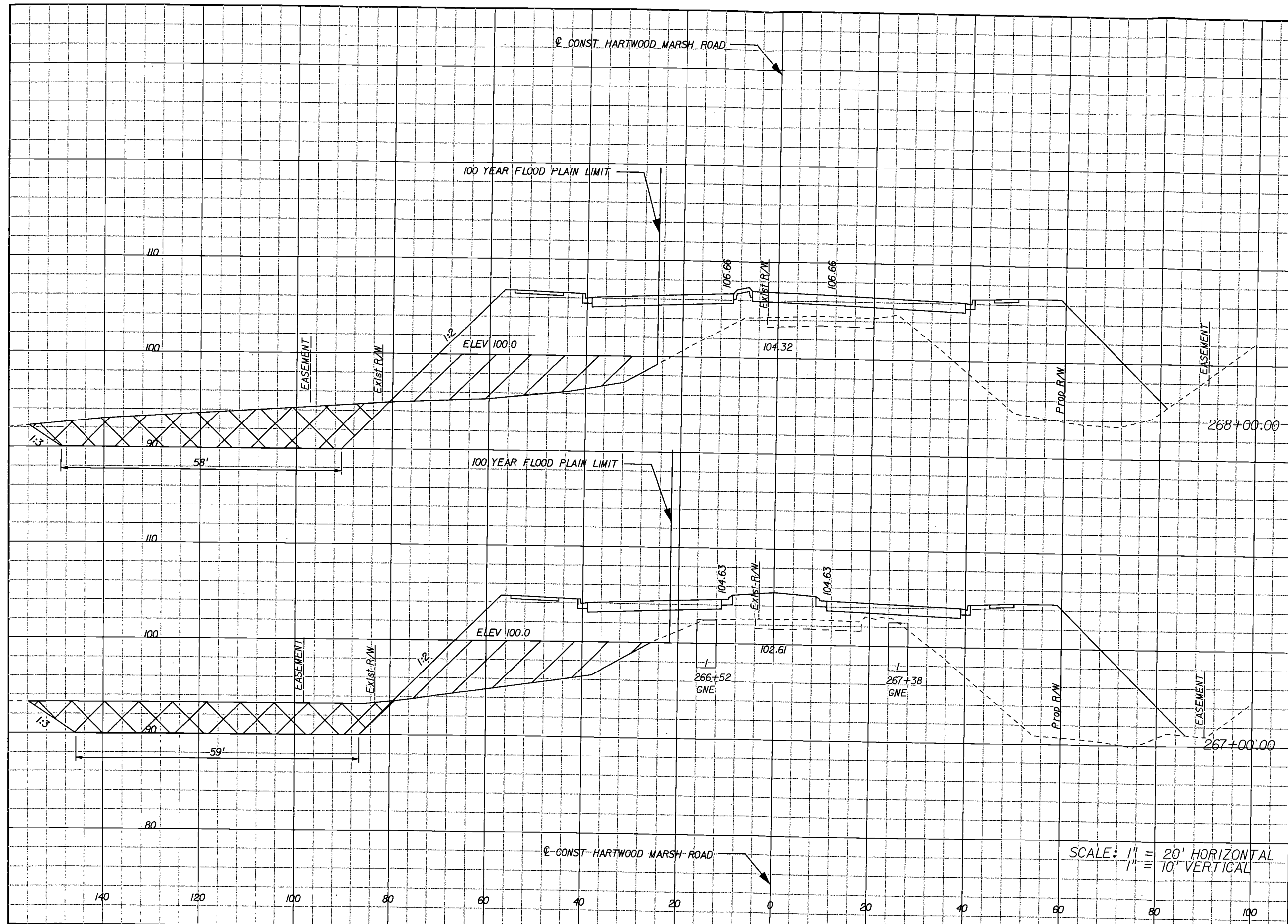
EXCAVATION (ROADWAY, CL CONST. HARTWOOD MARSH ROAD)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
266+00.00	0	0.0051669	0	0	0	0
267+00.00	0.010334	0.0108103	0.51669	0.51669	22507.13	833.60
268+00.00	0.011287	0.0125141	1.08103	1.59773	69596.93	2577.66
269+00.00	0.013741		1.25141	2.84913	124108.29	4596.60

FILL (ROADWAY, CL CONST. HARTWOOD MARSH ROAD)

STATION	AREA (AC.)	AVERAGE AREA (AC.)	INCREMENTAL AREA (AC-FT)	CUMULATIVE VOLUME (AC-FT)	CUMULATIVE VOLUME (FT^3)	CUMULATIVE VOLUME (CY)
266+00.00	0.00078	0.00467	0	0	0	0
267+00.00	0.00856	0.00871	0.46731	0.46731	20356.24	753.93
268+00.00	0.00886	0.00443	0.87118	1.33849	58304.79	2159.44
269+00.00	0.00000		0.44307	1.78157	77605.05	2874.26

TOTAL EXCAVATION = 7671.24 CY
TOTAL FILL = 7545.70 CY
TOTAL FILL = 0.17 AC-FT



Regular		Exc.		Embankment	
A	V	A	V	A	V

SCALE: 1" = 20' HORIZONTAL
1" = 10' VERTICAL

REVISIONS	
DATE	DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500

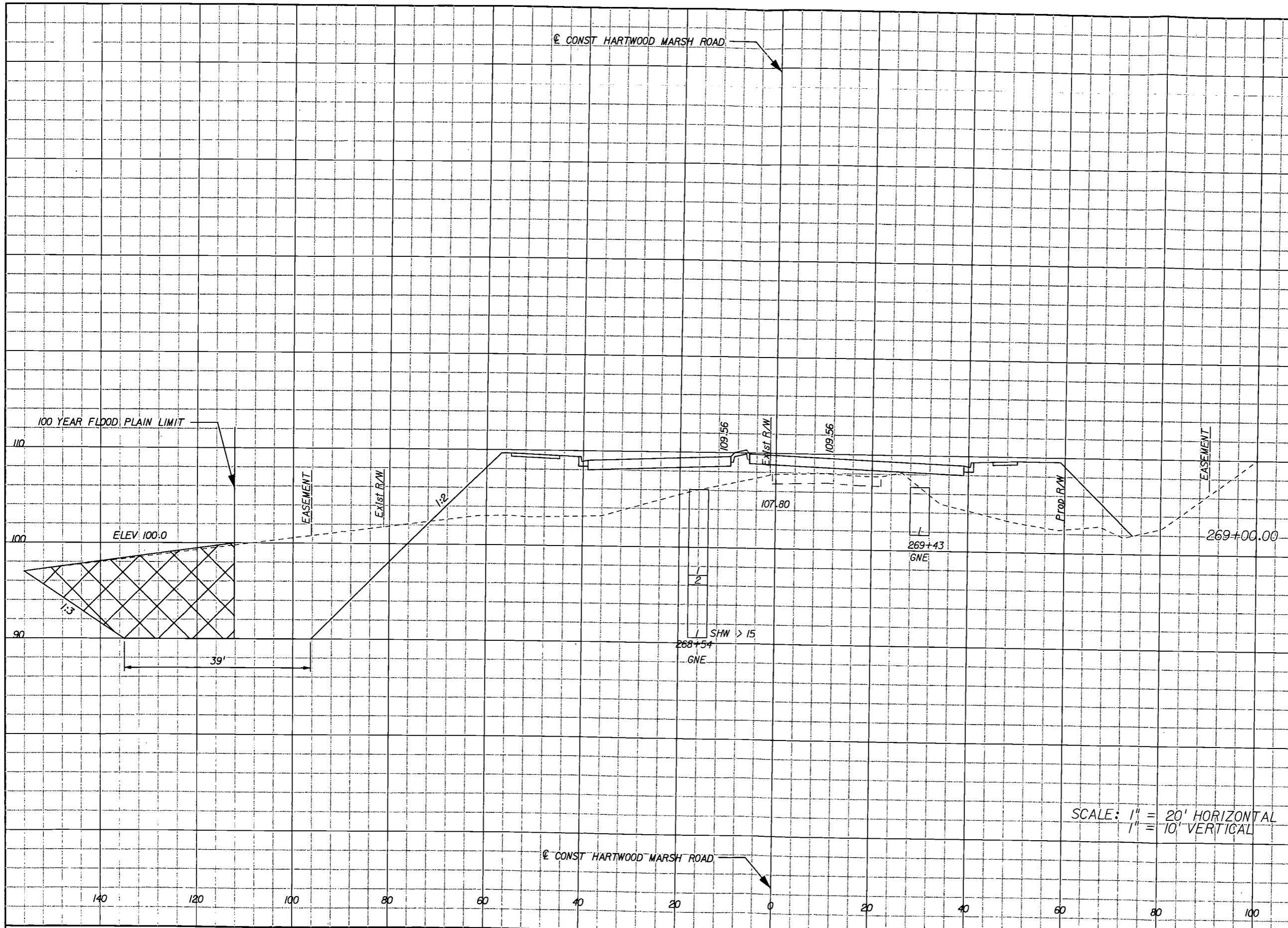
ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406



**HARTWOOD MARSH
ROAD - PHASE II**

**CROSS SECTIONS
100-YEAR FLOOD PLAIN**

SHEET NO.
41



Regular		Exc.		Embankment	
A	V	A	V	A	V

SCALE: 1" = 20' HORIZONTAL
1" = 10' VERTICAL

REVISIONS	
DATE	DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMERA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500
 ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406

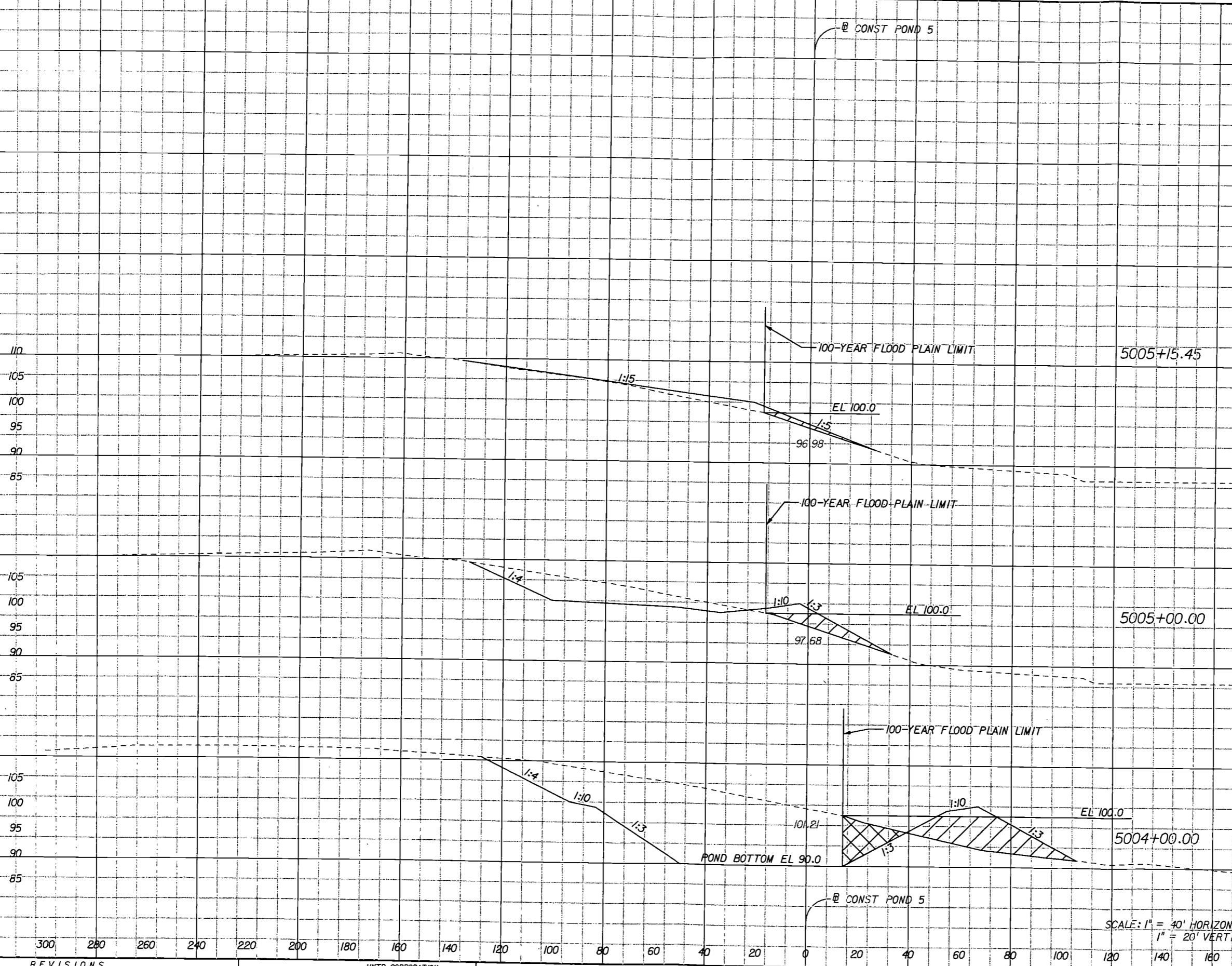


**HARTWOOD MARSH
ROAD - PHASE II**

**CROSS SECTIONS
100-YEAR FLOOD PLAIN**

SHEET NO.
42

Regular		Exc.		Embankment	
A	V	A	V	A	V



300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160

SCALE: 1" = 40' HORIZONTAL
1" = 20' VERTICAL

DATE	BY	DESCRIPTION

HNTB
 HNTB CORPORATION
 300 PRIMERA BLVD,
 SUITE 200
 LAKE MARY, FL 32746
 (407) 805-0355
 CERT. OF AUTH. NO. 6500
 ENGINEER OF RECORD: MELINDA S. FISCHL, P.E.
 FL. REGISTRATION NO. 68406



**HARTWOOD MARSH
ROAD - PHASE II**

**CROSS SECTIONS
100-YEAR FLOOD PLAIN**

SHEET NO.
44

BASIN 6

ARRIVED IN
PALATKA

AUG 11 2009

REGULATORY
INFORMATION MGT.

Water Quality Treatment and Recovery
Calculations

STAGE / STORAGE CALCULATIONS



DATE

MADE BY:	msf	27-Jun-08
CHCK BY:	BJS	10-Jan-09

PROJECT: HARTWOOD MARSH ROAD PHASE II

POND: 6

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Surface Elevation	Depth to Seasonal High Water Surface	Estimated Seasonal High Water Elevation
AB-P15	117.32	20	97	15	102.32

Note: Above information per pond boring profiles: Ardaman & Associates, May 2007
Per Ardaman report groundwater not encountered.

AVG. SHWT ELEVATION: Ft. (NAVD)

AVG. GROUND WATER TABLE ELEVATION: Ft. (NAVD)

AVG. EXIST. GROUND ELEVATION AT BORING LOCATIONS: Ft. (NAVD)

STAGE Ft. (NAVD)	AREA AC.	AVERAGE AREA AC.	INCREMENTAL VOL. AF	CUMULATIVE VOL. AF
113.0	1.10		0.00	0.00
		1.15		
114.0	1.19		1.15	1.15
		1.23		
115.0	1.27		1.23	2.38
		1.32		
116.0	1.36		1.32	3.69
		1.41		
117.0	1.46		1.41	5.10
		1.50		
118.0	1.55		1.50	6.60
		1.67		
119.0	1.79		1.67	8.27
TOTAL:			8.27	

REQUIRED TREATMENT VOLUME: AF

TOP EL. OF TREATMENT VOLUME: Ft.

PERCOLATION RATE: Ft./Day or Inches/Hr.

FACTOR OF SAFTEY: = Ft./Day

PONDS Version 3.2.0145
Retention Pond Recovery - Refined Method
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Project Data

Project Name: Hartwood Marsh Road Phase II
Simulation Description: Pond 6 Water Quality Recovery
Project Number: 41561-1
Engineer : MSF
Supervising Engineer:
Date: 08-05-2009

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 101.30
Water Table Elevation, [WT] (ft datum): 102.30
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 15.00
Fillable Porosity, [n] (%): 25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day): 10.0
Maximum Area For Unsaturated Infiltration, [Av] (ft²): 50529.6

Geometry Data

Equivalent Pond Length, [L] (ft): 273.0
Equivalent Pond Width, [W] (ft): 190.0
Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft ²)
113.00	47916.0
114.00	50094.0
115.00	55321.2
116.00	59241.6
117.00	63597.6
118.00	67518.0
119.00	78027.0

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Scenario Input Data

Scenario 1 :: Water Quality

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 35283.6

Initial ground water level (ft datum) default, 102.30

<u>Time After Storm Event (days)</u>	<u>Time After Storm Event (days)</u>
0.100	2.000
0.250	2.500
0.500	3.000
1.000	3.500
1.500	4.000

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Retention Pond Recovery - Refined Method
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Detailed Results :: Scenario 1 :: Water Quality

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	5880.6000	0.0000	102.300	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	5880.6000	0.0000	113.724	5.54198	0.00000	35283.6	33.3	0.0	U/P
2.400	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
6.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
12.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
24.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
36.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
48.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
60.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
72.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
84.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry
96.000	0.0000	0.0000	----	----	----	35283.6	35283.6	0.0	dry

← Recovery < 2.4 hrs.

=====
Basins
=====

Name: BASIN 6 Node: POND 6 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Sjrwm96 Storm Duration(hrs): 96.00
Rainfall Amount(in): 11.300 Time of Conc(min): 15.74
Area(ac): 5.430 Time Shift(hrs): 0.00
Curve Number: 82.50 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Road Basin

Name: BASIN 6-1 Node: POND 6 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Sjrwm96 Storm Duration(hrs): 96.00
Rainfall Amount(in): 11.300 Time of Conc(min): 5.00
Area(ac): 3.240 Time Shift(hrs): 0.00
Curve Number: 60.30 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Dry Total Retention Pond 2

Name: BASIN 6-2 Node: POND 6 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Sjrwm96 Storm Duration(hrs): 96.00
Rainfall Amount(in): 11.300 Time of Conc(min): 21.69
Area(ac): 0.070 Time Shift(hrs): 0.00
Curve Number: 39.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Offsite to road

Name: BASIN 6-3 Node: POND 6 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Sjrwm96 Storm Duration(hrs): 96.00
Rainfall Amount(in): 11.300 Time of Conc(min): 20.95
Area(ac): 0.140 Time Shift(hrs): 0.00
Curve Number: 39.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Offsite to road

Name: BASIN 6-4 Node: POND 6 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Sjrwm96 Storm Duration(hrs): 96.00
Rainfall Amount(in): 11.300 Time of Conc(min): 23.33
Area(ac): 0.080 Time Shift(hrs): 0.00
Curve Number: 39.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Offsite to road

Name: BASIN 6-5 Node: POND 6 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Sjrwm96 Storm Duration(hrs): 96.00
Rainfall Amount(in): 11.300 Time of Conc(min): 32.76
Area(ac): 0.220 Time Shift(hrs): 0.00
Curve Number: 39.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Offsite to road

Hartwood Marsh Road Phase II
 Post Development
 Pond 6 Hartwood
 Input Report
 05/09

Name: 25Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y24H.R32

Override Defaults: Yes
 Storm Duration(hrs): 24.00
 Rainfall File: Flmod
 Rainfall Amount(in): 8.30

Time(hrs)	Print Inc(min)
11.000	60.00
16.000	15.00
40.000	60.00

Name: 25Y96H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y96H.R32

Override Defaults: No

Time(hrs)	Print Inc(min)
50.000	60.00
62.000	15.00
100.000	60.00

==== Routing Simulations =====

Name: 100Y24H Hydrology Sim: 100Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\100Y24H.I32

Execute: No Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 150.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
150.000	60.000

Group	Run
BASE	Yes

Name: 10Y24H Hydrology Sim: 10Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\10Y24H.I32

Execute: No Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 40.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
40.000	60.000

Group	Run
BASE	Yes

Name: 2.3Y24H Hydrology Sim: 2.3Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\2.3Y24H.I32

Execute: No Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 150.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
150.000	60.000

Group	Run
BASE	Yes

Name: 25Y24H Hydrology Sim: 25Y24H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y24H.I32

Execute: Yes Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 40.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
40.000	60.000

Group	Run
BASE	Yes

Name: 25Y96H Hydrology Sim: 25Y96H
 Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y96H.I32

Execute: Yes Restart: No Patch: No
 Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
 Time Step Optimizer: 10.000
 Start Time(hrs): 0.000 End Time(hrs): 97.00
 Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
 Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
55.000	60.000
65.000	15.000
97.000	60.000

Group	Run
BASE	Yes

Hartwood Marsh Road Phase II
 Post Development
 Pond 6 Hartwood
 Hydrology Time Series Report
 05/09

Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 6	0.00	0.000	0.000	0.000
25Y96H	POND 6	1.00	0.000	0.000	0.000
25Y96H	POND 6	2.00	0.000	0.000	0.000
25Y96H	POND 6	3.00	0.000	0.000	0.000
25Y96H	POND 6	4.00	0.000	0.000	0.000
25Y96H	POND 6	5.00	0.000	0.000	0.000
25Y96H	POND 6	6.00	0.000	0.000	0.000
25Y96H	POND 6	7.00	0.000	0.000	0.000
25Y96H	POND 6	8.00	0.000	0.000	0.000
25Y96H	POND 6	9.00	0.000	0.000	0.000
25Y96H	POND 6	10.00	0.000	0.000	0.000
25Y96H	POND 6	11.00	0.000	0.000	0.000
25Y96H	POND 6	12.00	0.000	0.000	0.000
25Y96H	POND 6	13.00	0.000	0.000	0.000
25Y96H	POND 6	14.00	0.000	0.000	0.000
25Y96H	POND 6	15.00	0.000	0.000	0.000
25Y96H	POND 6	16.00	2.995	0.000	0.002
25Y96H	POND 6	17.00	15.716	0.000	0.005
25Y96H	POND 6	18.00	41.661	0.001	0.009
25Y96H	POND 6	19.00	80.351	0.002	0.012
25Y96H	POND 6	20.00	131.319	0.004	0.016
25Y96H	POND 6	21.00	194.426	0.006	0.019
25Y96H	POND 6	22.00	269.333	0.008	0.022
25Y96H	POND 6	23.00	355.412	0.010	0.025
25Y96H	POND 6	24.00	452.418	0.013	0.028
25Y96H	POND 6	25.00	647.844	0.019	0.080
25Y96H	POND 6	26.00	961.863	0.028	0.094
25Y96H	POND 6	27.00	1325.169	0.039	0.107
25Y96H	POND 6	28.00	1734.099	0.051	0.120
25Y96H	POND 6	29.00	2193.587	0.064	0.136
25Y96H	POND 6	30.00	2701.805	0.079	0.147
25Y96H	POND 6	31.00	3248.837	0.095	0.157
25Y96H	POND 6	32.00	3831.938	0.112	0.167
25Y96H	POND 6	33.00	4438.196	0.130	0.170
25Y96H	POND 6	34.00	5064.519	0.148	0.178
25Y96H	POND 6	35.00	5725.715	0.167	0.189
25Y96H	POND 6	36.00	6427.226	0.188	0.200
25Y96H	POND 6	37.00	7167.223	0.210	0.211
25Y96H	POND 6	38.00	7943.854	0.232	0.221
25Y96H	POND 6	39.00	8755.392	0.256	0.230
25Y96H	POND 6	40.00	9600.263	0.281	0.239
25Y96H	POND 6	41.00	10492.047	0.307	0.256
25Y96H	POND 6	42.00	11430.266	0.334	0.265
25Y96H	POND 6	43.00	12399.423	0.363	0.273
25Y96H	POND 6	44.00	13398.130	0.392	0.281
25Y96H	POND 6	45.00	14408.211	0.421	0.280
25Y96H	POND 6	46.00	15427.699	0.451	0.287
25Y96H	POND 6	47.00	16471.621	0.482	0.293
25Y96H	POND 6	48.00	17539.580	0.513	0.300
25Y96H	POND 6	49.00	18822.826	0.550	0.413
25Y96H	POND 6	50.00	20328.744	0.595	0.424
25Y96H	POND 6	50.25	20736.334	0.606	0.482
25Y96H	POND 6	50.50	21178.443	0.619	0.500
25Y96H	POND 6	50.75	21630.980	0.633	0.505
25Y96H	POND 6	51.00	22087.174	0.646	0.509
25Y96H	POND 6	51.25	22546.346	0.659	0.512
25Y96H	POND 6	51.50	23008.445	0.673	0.515
25Y96H	POND 6	51.75	23473.436	0.686	0.518
25Y96H	POND 6	52.00	23941.387	0.700	0.522
25Y96H	POND 6	52.25	24455.324	0.715	0.620
25Y96H	POND 6	52.50	25027.842	0.732	0.652
25Y96H	POND 6	52.75	25617.686	0.749	0.659
25Y96H	POND 6	53.00	26212.773	0.767	0.663
25Y96H	POND 6	53.25	26811.902	0.784	0.668
25Y96H	POND 6	53.50	27414.998	0.802	0.672
25Y96H	POND 6	53.75	28021.992	0.819	0.677
25Y96H	POND 6	54.00	28632.949	0.837	0.681
25Y96H	POND 6	54.25	29308.277	0.857	0.820
25Y96H	POND 6	54.50	30064.393	0.879	0.861
25Y96H	POND 6	54.75	30843.260	0.902	0.870
25Y96H	POND 6	55.00	31629.205	0.925	0.876
25Y96H	POND 6	55.25	32420.629	0.948	0.882
25Y96H	POND 6	55.50	33217.418	0.971	0.888
25Y96H	POND 6	55.75	34019.465	0.995	0.894
25Y96H	POND 6	56.00	34827.215	1.019	0.901
25Y96H	POND 6	56.25	35808.504	1.047	1.280
25Y96H	POND 6	56.50	37006.965	1.082	1.384
25Y96H	POND 6	56.75	38262.043	1.119	1.406
25Y96H	POND 6	57.00	39532.980	1.156	1.419
25Y96H	POND 6	57.25	40815.633	1.194	1.432

Hartwood Marsh Road Phase II
 Post Development
 Pond 6 Hartwood
 Hydrology Time Series Report
 05/09

Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 6	57.50	42109.695	1.231	1.444
25Y96H	POND 6	57.75	43414.871	1.270	1.456
25Y96H	POND 6	58.00	44731.969	1.308	1.471
25Y96H	POND 6	58.25	46462.309	1.359	2.375
25Y96H	POND 6	58.50	48719.484	1.425	2.641
25Y96H	POND 6	58.75	51122.152	1.495	2.698
25Y96H	POND 6	59.00	53566.637	1.567	2.734
25Y96H	POND 6	59.25	56811.453	1.661	4.476
25Y96H	POND 6	59.50	61093.477	1.787	5.039
25Y96H	POND 6	59.75	79019.609	2.311	34.797
25Y96H	POND 6	60.00	114713.758	3.355	44.524
25Y96H	POND 6	60.25	142268.203	4.161	16.709
25Y96H	POND 6	60.50	154245.344	4.511	9.907
25Y96H	POND 6	60.75	161264.969	4.716	5.692
25Y96H	POND 6	61.00	166002.016	4.855	4.835
25Y96H	POND 6	61.25	169718.484	4.963	3.424
25Y96H	POND 6	61.50	172660.844	5.049	3.115
25Y96H	POND 6	61.75	175447.344	5.131	3.078
25Y96H	POND 6	62.00	178214.953	5.212	3.073
25Y96H	POND 6	63.00	187205.844	5.475	1.922
25Y96H	POND 6	64.00	194138.484	5.677	1.929
25Y96H	POND 6	65.00	199716.266	5.841	1.170
25Y96H	POND 6	66.00	203930.578	5.964	1.172
25Y96H	POND 6	67.00	208154.484	6.087	1.175
25Y96H	POND 6	68.00	212387.547	6.211	1.177
25Y96H	POND 6	69.00	215921.891	6.315	0.787
25Y96H	POND 6	70.00	218755.328	6.397	0.787
25Y96H	POND 6	71.00	221590.750	6.480	0.788
25Y96H	POND 6	72.00	224426.984	6.563	0.788
25Y96H	POND 6	73.00	226585.063	6.626	0.411
25Y96H	POND 6	74.00	228064.391	6.670	0.411
25Y96H	POND 6	75.00	229543.875	6.713	0.411
25Y96H	POND 6	76.00	231024.531	6.756	0.411
25Y96H	POND 6	77.00	232512.406	6.800	0.415
25Y96H	POND 6	78.00	234007.469	6.843	0.415
25Y96H	POND 6	79.00	235503.766	6.887	0.416
25Y96H	POND 6	80.00	237001.156	6.931	0.416
25Y96H	POND 6	81.00	238493.625	6.975	0.413
25Y96H	POND 6	82.00	239981.188	7.018	0.413
25Y96H	POND 6	83.00	241469.797	7.062	0.414
25Y96H	POND 6	84.00	242959.563	7.105	0.414
25Y96H	POND 6	85.00	244450.375	7.149	0.414
25Y96H	POND 6	86.00	245942.250	7.192	0.415
25Y96H	POND 6	87.00	247435.203	7.236	0.415
25Y96H	POND 6	88.00	248929.250	7.280	0.415
25Y96H	POND 6	89.00	250430.391	7.324	0.419
25Y96H	POND 6	90.00	251938.688	7.368	0.419
25Y96H	POND 6	91.00	253448.063	7.412	0.419
25Y96H	POND 6	92.00	254958.453	7.456	0.420
25Y96H	POND 6	93.00	256463.734	7.500	0.417
25Y96H	POND 6	94.00	257963.906	7.544	0.417
25Y96H	POND 6	95.00	259465.078	7.588	0.417
25Y96H	POND 6	96.00	260961.531	7.632	0.414
25Y96H	POND 6	97.00	261708.266	7.653	0.001
25Y96H	POND 6	98.00	261709.422	7.654	0.000
25Y96H	POND 6	99.00	261709.422	7.654	0.000
25Y96H	POND 6	100.00	261709.422	7.654	0.000

Total Volume
 = 5.99 ac-ft

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Retention Pond Recovery - Refined Method
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Project Data

Project Name: Hartwood Marsh Road Phase II
Simulation Description: Pond 6 25 year/96 hour Recovery
Project Number: 41561-1
Engineer : MSF
Supervising Engineer:
Date: 07-15-2009

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 101.30
Water Table Elevation, [WT] (ft datum): 102.30
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 15.00
Fillable Porosity, [n] (%): 25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day): 10.0
Maximum Area For Unsaturated Infiltration, [Av] (ft²): 65775.6

Geometry Data

Equivalent Pond Length, [L] (ft): 301.0
Equivalent Pond Width, [W] (ft): 218.0
Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft ²)
113.00	48071.6
114.00	51708.9
115.00	55475.2
116.00	59369.5
117.00	63391.8
118.00	67434.8
119.00	78027.1

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Scenario Input Data

Scenario 1 :: 25 year - 96 hour

Hydrograph Type: Slug Load
 Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 260961.5

Initial ground water level (ft datum) default, 102.30

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.100	3.000	6.500	10.000	13.500
0.250	3.500	7.000	10.500	14.000
0.500	4.000	7.500	11.000	14.500
1.000	4.500	8.000	11.500	
1.500	5.000	8.500	12.000	
2.000	5.500	9.000	12.500	
2.500	6.000	9.500	13.000	

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Detailed Results :: Scenario 1 :: 25 year - 96 hour

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	43493.5800	0.0000	102.300	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	43493.5800	0.0000	117.598	5.56527	0.00000	260961.5	33.4	0.0	U/P
2.400	0.0000	0.0000	116.567	7.42196	0.00000	260961.5	65763.3	0.0	U/P
6.000	0.0000	0.0000	114.986	5.54570	0.00000	260961.5	158237.0	0.0	U/P
12.000	0.0000	0.0000	113.811	2.13083	0.00000	260961.5	220797.8	0.0	U/S
24.000	0.0000	0.0000	113.293	0.46486	0.00000	260961.5	246709.8	0.0	S
36.000	0.0000	0.0000	112.850	0.16495	0.00000	260961.5	260961.5	0.0	S
48.000	0.0000	0.0000	112.180	0.00000	0.00000	260961.5	260961.5	0.0	S
60.000	0.0000	0.0000	111.672	0.00000	0.00000	260961.5	260961.5	0.0	S
72.000	0.0000	0.0000	111.262	0.00000	0.00000	260961.5	260961.5	0.0	S
84.000	0.0000	0.0000	110.919	0.00000	0.00000	260961.5	260961.5	0.0	S
96.000	0.0000	0.0000	110.625	0.00000	0.00000	260961.5	260961.5	0.0	S
108.000	0.0000	0.0000	110.367	0.00000	0.00000	260961.5	260961.5	0.0	S
120.000	0.0000	0.0000	110.138	0.00000	0.00000	260961.5	260961.5	0.0	S
132.000	0.0000	0.0000	109.933	0.00000	0.00000	260961.5	260961.5	0.0	S
144.000	0.0000	0.0000	109.746	0.00000	0.00000	260961.5	260961.5	0.0	S
156.000	0.0000	0.0000	109.576	0.00000	0.00000	260961.5	260961.5	0.0	S
168.000	0.0000	0.0000	109.420	0.00000	0.00000	260961.5	260961.5	0.0	S
180.000	0.0000	0.0000	109.275	0.00000	0.00000	260961.5	260961.5	0.0	S
192.000	0.0000	0.0000	109.140	0.00000	0.00000	260961.5	260961.5	0.0	S
204.000	0.0000	0.0000	109.014	0.00000	0.00000	260961.5	260961.5	0.0	S
216.000	0.0000	0.0000	108.897	0.00000	0.00000	260961.5	260961.5	0.0	S
228.000	0.0000	0.0000	108.786	0.00000	0.00000	260961.5	260961.5	0.0	S
240.000	0.0000	0.0000	108.681	0.00000	0.00000	260961.5	260961.5	0.0	S
252.000	0.0000	0.0000	108.583	0.00000	0.00000	260961.5	260961.5	0.0	S
264.000	0.0000	0.0000	108.489	0.00000	0.00000	260961.5	260961.5	0.0	S
276.000	0.0000	0.0000	108.400	0.00000	0.00000	260961.5	260961.5	0.0	S
288.000	0.0000	0.0000	108.315	0.00000	0.00000	260961.5	260961.5	0.0	S
300.000	0.0000	0.0000	108.235	0.00000	0.00000	260961.5	260961.5	0.0	S
312.000	0.0000	0.0000	108.157	0.00000	0.00000	260961.5	260961.5	0.0	S
324.000	0.0000	0.0000	108.083	0.00000	0.00000	260961.5	260961.5	0.0	S
336.000	0.0000	0.0000	108.013	0.00000	0.00000	260961.5	260961.5	0.0	S
348.000	0.0000	0.0000	107.945	----	----	260961.5	260961.5	0.0	N.A.

← Recovery <48 hrs

BASIN 7

Water Quality Treatment and Recovery
Calculations

STAGE / STORAGE CALCULATIONS



DATE

MADE BY:	msf	28-Jun-08
CHCK BY:	BJS	10-Jan-09

PROJECT: **HARTWOOD MARSH ROAD PHASE II**

POND: 7

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Surface Elevation	Depth to Seasonal High Water Surface	Estimated Seasonal High Water Elevation
AB-P19	160.39	20	140.4	15	145.39

Note: Above information per pond boring profiles: Ardaman & Associates, May 2007
Per Ardaman report groundwater not encountered.

AVG. SHWT ELEVATION: 145.39 Ft. (NAVD)

AVG. GROUND WATER TABLE ELEVATION: 140.39 Ft. (NAVD)

AVG. EXIST. GROUND ELEVATION AT BORING LOCATIONS: 160.39 Ft. (NAVD)

STAGE Ft. (NAVD)	AREA AC.	AVERAGE AREA AC.	INCREMENTAL VOL. AF	CUMULATIVE VOL. AF
153.0	0.83		0.00	0.00
		0.87		
154.0	0.91		0.87	0.87
		0.95		
155.0	0.98		0.95	1.81
		1.02		
156.0	1.06		1.02	2.84
		1.11		
157.0	1.15		1.11	3.94
		1.19		
158.0	1.23		1.19	5.13
		1.28		
159.0	1.32		1.28	6.41
		1.37		
160.0	1.41		1.37	7.78
		1.46		
161.0	1.51		1.46	9.24
TOTAL:			9.24	

REQUIRED TREATMENT VOLUME: 1.31 AF

TOP EL. OF TREATMENT VOLUME: 154.47 Ft.

PERCOLATION RATE: 40 Ft./Day or 20 Inches/Hr.

FACTOR OF SAFTEY: 2 = 20 Ft./Day

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Project Data

Project Name: Hartwood Marsh Road Phase II
Simulation Description: Pond 7 Water Quality Recovery
Project Number: 41561-1
Engineer : MSF
Supervising Engineer:
Date: 07-15-2009

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 139.40
Water Table Elevation, [WT] (ft datum): 140.40
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 20.00
Fillable Porosity, [n] (%): 25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day): 13.33
Maximum Area For Unsaturated Infiltration, [Av] (ft²): 40946.4

Geometry Data

Equivalent Pond Length, [L] (ft): 265.0
Equivalent Pond Width, [W] (ft): 155.0
Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft ²)
153.00	36154.8
154.00	39639.6
155.00	42688.8
156.00	46173.6
157.00	50094.0
158.00	53578.8
159.00	57499.2
160.00	61419.6
161.00	65775.6

Scenario Input Data

Scenario 1 :: Water Quality

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 57063.6

Initial ground water level (ft datum) default, 140.40

<u>Time After Storm Event (days)</u>	<u>Time After Storm Event (days)</u>
0.100	2.000
0.250	2.500
0.500	3.000
1.000	3.500
1.500	4.000

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Detailed Results :: Scenario 1 :: Water Quality

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	9510.6000	0.0000	140.400	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	9510.6000	0.0000	154.474	5.57856	0.00000	57063.6	33.5	0.0	U/P
2.400	0.0000	0.0000	153.069	3.79144	0.00000	57063.6	54577.1	0.0	U/P
6.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
12.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
24.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
36.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
48.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
60.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
72.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
84.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry
96.000	0.0000	0.0000	----	----	----	57063.6	57063.6	0.0	dry

← RECOVERY < 6 hrs

Hartwood Marsh Road Phase II
Post Development
Pond 7 Hartwood
Input Report
04/09

Name: 100Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\100Y24H.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Flmod
Rainfall Amount(in): 11.50

Time(hrs)	Print Inc(min)
11.000	60.00
16.000	15.00
40.000	60.00

Name: 10Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\10Y24H.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Flmod
Rainfall Amount(in): 6.70

Time(hrs)	Print Inc(min)
11.000	60.00
16.000	15.00
40.000	60.00

Name: 2.3Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\2.3Y24H.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Flmod
Rainfall Amount(in): 4.20

Time(hrs)	Print Inc(min)
11.000	60.00
16.000	15.00
40.000	60.00

Name: 25Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y24H.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Flmod
Rainfall Amount(in): 8.30

Time(hrs)	Print Inc(min)
11.000	60.00
16.000	15.00
40.000	60.00

Name: 25Y96H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y96H.R32

Override Defaults: No

Time(hrs)	Print Inc(min)
50.000	60.00
62.000	15.00
100.000	60.00

==== Routing Simulations =====

Name: 100Y24H Hydrology Sim: 100Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\100Y24H.I32

Execute: No Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500

Hartwood Marsh Road Phase II
Post Development
Pond 7 Hartwood
Input Report
04/09

Time Step Optimizer: 10.000
Start Time(hrs): 0.000
Min Calc Time(sec): 0.5000
Boundary Stages:
End Time(hrs): 150.00
Max Calc Time(sec): 60.0000
Boundary Flows:

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
150.000	60.000

Group	Run
BASE	Yes

Name: 10Y24H Hydrology Sim: 10Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\10Y24H.I32

Execute: No Restart: No Patch: No
Alternative: No
Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 40.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
40.000	60.000

Group	Run
BASE	Yes

Name: 2.3Y24H Hydrology Sim: 2.3Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\2.3Y24H.I32

Execute: No Restart: No Patch: No
Alternative: No
Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 150.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
150.000	60.000

Group	Run
BASE	Yes

Name: 25Y24H Hydrology Sim: 25Y24H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y24H.I32

Execute: Yes Restart: No Patch: No
Alternative: No
Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 40.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Hartwood Marsh Road Phase II
Post Development
Pond 7 Hartwood
Input Report
04/09

Time(hrs)	Print Inc(min)
11.000	60.000
15.000	15.000
40.000	60.000

Group	Run
BASE	Yes

Name: 25Y96H Hydrology Sim: 25Y96H
Filename: W:\JOBS\41561-1\41561100001\DRAINAGE\ICPR\25Y96H.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 97.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
55.000	60.000
65.000	15.000
97.000	60.000

Group	Run
BASE	Yes

Hartwood Marsh Road Phase II
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Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 7	0.00	0.000	0.000	0.000
25Y96H	POND 7	1.00	0.000	0.000	0.000
25Y96H	POND 7	2.00	0.000	0.000	0.000
25Y96H	POND 7	3.00	0.000	0.000	0.000
25Y96H	POND 7	4.00	0.000	0.000	0.000
25Y96H	POND 7	5.00	0.000	0.000	0.000
25Y96H	POND 7	6.00	0.000	0.000	0.000
25Y96H	POND 7	7.00	0.000	0.000	0.000
25Y96H	POND 7	8.00	0.000	0.000	0.000
25Y96H	POND 7	9.00	0.000	0.000	0.000
25Y96H	POND 7	10.00	0.000	0.000	0.000
25Y96H	POND 7	11.00	0.008	0.000	0.000
25Y96H	POND 7	12.00	3.587	0.000	0.002
25Y96H	POND 7	13.00	19.627	0.000	0.007
25Y96H	POND 7	14.00	53.882	0.001	0.012
25Y96H	POND 7	15.00	106.366	0.002	0.017
25Y96H	POND 7	16.00	176.223	0.003	0.022
25Y96H	POND 7	17.00	262.312	0.005	0.026
25Y96H	POND 7	18.00	363.594	0.006	0.030
25Y96H	POND 7	19.00	479.446	0.008	0.034
25Y96H	POND 7	20.00	609.261	0.011	0.038
25Y96H	POND 7	21.00	752.798	0.013	0.042
25Y96H	POND 7	22.00	909.706	0.016	0.045
25Y96H	POND 7	23.00	1079.110	0.019	0.049
25Y96H	POND 7	24.00	1260.284	0.022	0.052
25Y96H	POND 7	25.00	1544.067	0.027	0.106
25Y96H	POND 7	26.00	1991.075	0.035	0.143
25Y96H	POND 7	27.00	2534.070	0.044	0.159
25Y96H	POND 7	28.00	3129.817	0.055	0.172
25Y96H	POND 7	29.00	3776.809	0.066	0.188
25Y96H	POND 7	30.00	4475.433	0.078	0.201
25Y96H	POND 7	31.00	5216.408	0.091	0.211
25Y96H	POND 7	32.00	5993.144	0.105	0.220
25Y96H	POND 7	33.00	6794.970	0.119	0.225
25Y96H	POND 7	34.00	7620.501	0.134	0.234
25Y96H	POND 7	35.00	8479.418	0.149	0.244
25Y96H	POND 7	36.00	9373.370	0.164	0.253
25Y96H	POND 7	37.00	10300.702	0.181	0.262
25Y96H	POND 7	38.00	11259.512	0.197	0.271
25Y96H	POND 7	39.00	12248.039	0.215	0.279
25Y96H	POND 7	40.00	13264.668	0.232	0.286
25Y96H	POND 7	41.00	14319.903	0.251	0.300
25Y96H	POND 7	42.00	15418.153	0.270	0.310
25Y96H	POND 7	43.00	16547.461	0.290	0.317
25Y96H	POND 7	44.00	17701.570	0.310	0.324
25Y96H	POND 7	45.00	18865.486	0.331	0.323
25Y96H	POND 7	46.00	20032.211	0.351	0.325
25Y96H	POND 7	47.00	21212.764	0.372	0.330
25Y96H	POND 7	48.00	22411.496	0.393	0.336
25Y96H	POND 7	49.00	23776.086	0.417	0.423
25Y96H	POND 7	50.00	25369.393	0.445	0.463
25Y96H	POND 7	50.25	25793.520	0.452	0.480
25Y96H	POND 7	50.50	26231.461	0.460	0.493
25Y96H	POND 7	50.75	26684.244	0.468	0.513
25Y96H	POND 7	51.00	27154.098	0.476	0.531
25Y96H	POND 7	51.25	27638.078	0.484	0.544
25Y96H	POND 7	51.50	28131.646	0.493	0.553
25Y96H	POND 7	51.75	28631.586	0.502	0.558
25Y96H	POND 7	52.00	29136.176	0.511	0.563
25Y96H	POND 7	52.25	29655.469	0.520	0.591
25Y96H	POND 7	52.50	30196.555	0.529	0.611
25Y96H	POND 7	52.75	30760.797	0.539	0.643
25Y96H	POND 7	53.00	31352.484	0.549	0.672
25Y96H	POND 7	53.25	31967.033	0.560	0.693
25Y96H	POND 7	53.50	32596.982	0.571	0.707
25Y96H	POND 7	53.75	33236.938	0.582	0.716
25Y96H	POND 7	54.00	33883.984	0.594	0.722
25Y96H	POND 7	54.25	34552.535	0.606	0.763
25Y96H	POND 7	54.50	35251.973	0.618	0.791
25Y96H	POND 7	54.75	35982.719	0.631	0.833
25Y96H	POND 7	55.00	36750.258	0.644	0.873
25Y96H	POND 7	55.25	37548.289	0.658	0.901
25Y96H	POND 7	55.50	38366.797	0.672	0.918
25Y96H	POND 7	55.75	39198.602	0.687	0.930
25Y96H	POND 7	56.00	40040.137	0.702	0.940
25Y96H	POND 7	56.25	40936.508	0.717	1.052
25Y96H	POND 7	56.50	41916.223	0.735	1.125
25Y96H	POND 7	56.75	42980.461	0.753	1.240
25Y96H	POND 7	57.00	44146.582	0.774	1.351
25Y96H	POND 7	57.25	45399.766	0.796	1.433

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Simulation	Node	Time hrs	Volume ft3	Volume in	Rate cfs
25Y96H	POND 7	57.50	46714.711	0.819	1.489
25Y96H	POND 7	57.75	48073.113	0.842	1.530
25Y96H	POND 7	58.00	49465.043	0.867	1.563
25Y96H	POND 7	58.25	51006.141	0.894	1.862
25Y96H	POND 7	58.50	52766.391	0.925	2.050
25Y96H	POND 7	58.75	54744.074	0.959	2.345
25Y96H	POND 7	59.00	56982.809	0.999	2.630
25Y96H	POND 7	59.25	59687.051	1.046	3.379
25Y96H	POND 7	59.50	62947.211	1.103	3.866
25Y96H	POND 7	59.75	71275.359	1.249	14.641
25Y96H	POND 7	60.00	87888.797	1.540	22.277
25Y96H	POND 7	60.25	108068.188	1.894	22.566
25Y96H	POND 7	60.50	130363.445	2.285	26.979
25Y96H	POND 7	60.75	152933.422	2.680	23.176
25Y96H	POND 7	61.00	171317.422	3.002	17.677
25Y96H	POND 7	61.25	184990.766	3.242	12.708
25Y96H	POND 7	61.50	195023.078	3.418	9.586
25Y96H	POND 7	61.75	202671.219	3.552	7.410
25Y96H	POND 7	62.00	208723.609	3.658	6.040
25Y96H	POND 7	63.00	225281.797	3.948	3.159
25Y96H	POND 7	64.00	235774.797	4.132	2.670
25Y96H	POND 7	65.00	243968.531	4.275	1.882
25Y96H	POND 7	66.00	250300.656	4.386	1.636
25Y96H	POND 7	67.00	256159.000	4.489	1.619
25Y96H	POND 7	68.00	261998.766	4.591	1.626
25Y96H	POND 7	69.00	267143.469	4.682	1.232
25Y96H	POND 7	70.00	271353.031	4.755	1.106
25Y96H	POND 7	71.00	275316.188	4.825	1.095
25Y96H	POND 7	72.00	279264.625	4.894	1.098
25Y96H	POND 7	73.00	282524.625	4.951	0.713
25Y96H	POND 7	74.00	284864.688	4.992	0.587
25Y96H	POND 7	75.00	286955.906	5.029	0.575
25Y96H	POND 7	76.00	289025.938	5.065	0.575
25Y96H	POND 7	77.00	291104.813	5.101	0.580
25Y96H	POND 7	78.00	293195.313	5.138	0.582
25Y96H	POND 7	79.00	295291.438	5.175	0.583
25Y96H	POND 7	80.00	297391.125	5.212	0.584
25Y96H	POND 7	81.00	299487.906	5.248	0.581
25Y96H	POND 7	82.00	301579.688	5.285	0.581
25Y96H	POND 7	83.00	303672.469	5.322	0.582
25Y96H	POND 7	84.00	305768.219	5.358	0.583
25Y96H	POND 7	85.00	307867.188	5.395	0.583
25Y96H	POND 7	86.00	309969.313	5.432	0.584
25Y96H	POND 7	87.00	312074.563	5.469	0.585
25Y96H	POND 7	88.00	314182.969	5.506	0.586
25Y96H	POND 7	89.00	316300.813	5.543	0.590
25Y96H	POND 7	90.00	318430.156	5.580	0.592
25Y96H	POND 7	91.00	320564.906	5.618	0.593
25Y96H	POND 7	92.00	322702.969	5.655	0.594
25Y96H	POND 7	93.00	324837.719	5.693	0.592
25Y96H	POND 7	94.00	326967.063	5.730	0.591
25Y96H	POND 7	95.00	329097.094	5.767	0.592
25Y96H	POND 7	96.00	331229.219	5.805	0.592
25Y96H	POND 7	97.00	332579.469	5.828	0.158
25Y96H	POND 7	98.00	332890.688	5.834	0.015
25Y96H	POND 7	99.00	332919.000	5.834	0.000
25Y96H	POND 7	100.00	332919.844	5.834	0.000

Total Volume
 7.60 ac-ft

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Project Data

Project Name: Hartwood Marsh Road Phase II
Simulation Description: Pond 7 25 year/96 hour Recovery
Project Number: 41561-1
Engineer : MSF
Supervising Engineer:
Date: 07-15-2009

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 139.40
Water Table Elevation, [WT] (ft datum): 140.40
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 20.00
Fillable Porosity, [n] (%): 25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day): 13.33
Maximum Area For Unsaturated Infiltration, [Av] (ft²): 60984.0

Geometry Data

Equivalent Pond Length, [L] (ft): 309.0
Equivalent Pond Width, [W] (ft): 199.0
Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft ²)
153.00	36154.8
154.00	39639.6
155.00	42688.8
156.00	46173.6
157.00	50094.0
158.00	53578.8
159.00	57499.2
160.00	61419.6
161.00	65775.6

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Scenario Input Data

Scenario 1 :: 25 year - 96 hour

Hydrograph Type: Slug Load
 Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 331229.2

Initial ground water level (ft datum) default, 140.40

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.100	2.700	3.500	7.500	11.500
0.250	2.800	4.000	8.000	12.000
0.500	2.900	4.500	8.500	12.500
1.000	3.000	5.000	9.000	13.000
1.500	3.100	5.500	9.500	13.500
2.000	3.200	6.000	10.000	14.000
2.500	3.300	6.500	10.500	14.500
2.600	3.400	7.000	11.000	

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Detailed Results :: Scenario 1 :: 25 year - 96 hour

Elapsed Time (hours)	Inflow Rate (ft ³ /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft ³ /s)	Overflow Discharge (ft ³ /s)	Cumulative Inflow Volume (ft ³)	Cumulative Infiltration Volume (ft ³)	Cumulative Discharge Volume (ft ³)	Flow Type
0.000	55204.8700	0.0000	140.400	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	55204.8700	0.0000	159.881	5.58071	0.00000	331229.2	33.5	0.0	U/P
2.400	0.0000	0.0000	158.487	9.06687	0.00000	331229.2	81228.8	0.0	U/P
6.000	0.0000	0.0000	156.332	6.66106	0.00000	331229.2	192174.3	0.0	U/P
12.000	0.0000	0.0000	154.632	2.62375	0.00000	331229.2	267669.3	0.0	U/S
24.000	0.0000	0.0000	153.683	0.72201	0.00000	331229.2	305727.1	0.0	S
36.000	0.0000	0.0000	153.033	0.29516	0.00000	331229.2	330051.1	0.0	S
48.000	0.0000	0.0000	152.080	0.01364	0.00000	331229.2	331229.2	0.0	S
60.000	0.0000	0.0000	151.351	0.00000	0.00000	331229.2	331229.2	0.0	S
62.400	0.0000	0.0000	151.214	0.00000	0.00000	331229.2	331229.2	0.0	S
64.800	0.0000	0.0000	151.085	0.00000	0.00000	331229.2	331229.2	0.0	S
67.200	0.0000	0.0000	150.962	0.00000	0.00000	331229.2	331229.2	0.0	S
69.600	0.0000	0.0000	150.845	0.00000	0.00000	331229.2	331229.2	0.0	S
72.000	0.0000	0.0000	150.734	0.00000	0.00000	331229.2	331229.2	0.0	S
74.400	0.0000	0.0000	150.628	0.00000	0.00000	331229.2	331229.2	0.0	S
76.800	0.0000	0.0000	150.526	0.00000	0.00000	331229.2	331229.2	0.0	S
79.200	0.0000	0.0000	150.429	0.00000	0.00000	331229.2	331229.2	0.0	S
81.600	0.0000	0.0000	150.335	0.00000	0.00000	331229.2	331229.2	0.0	S
84.000	0.0000	0.0000	150.245	0.00000	0.00000	331229.2	331229.2	0.0	S
96.000	0.0000	0.0000	149.859	0.00000	0.00000	331229.2	331229.2	0.0	S
108.000	0.0000	0.0000	149.523	0.00000	0.00000	331229.2	331229.2	0.0	S
120.000	0.0000	0.0000	149.227	0.00000	0.00000	331229.2	331229.2	0.0	S
132.000	0.0000	0.0000	148.962	0.00000	0.00000	331229.2	331229.2	0.0	S
144.000	0.0000	0.0000	148.723	0.00000	0.00000	331229.2	331229.2	0.0	S
156.000	0.0000	0.0000	148.506	0.00000	0.00000	331229.2	331229.2	0.0	S
168.000	0.0000	0.0000	148.307	0.00000	0.00000	331229.2	331229.2	0.0	S
180.000	0.0000	0.0000	148.124	0.00000	0.00000	331229.2	331229.2	0.0	S
192.000	0.0000	0.0000	147.955	0.00000	0.00000	331229.2	331229.2	0.0	S
204.000	0.0000	0.0000	147.797	0.00000	0.00000	331229.2	331229.2	0.0	S
216.000	0.0000	0.0000	147.650	0.00000	0.00000	331229.2	331229.2	0.0	S
228.000	0.0000	0.0000	147.513	0.00000	0.00000	331229.2	331229.2	0.0	S
240.000	0.0000	0.0000	147.384	0.00000	0.00000	331229.2	331229.2	0.0	S
252.000	0.0000	0.0000	147.262	0.00000	0.00000	331229.2	331229.2	0.0	S
264.000	0.0000	0.0000	147.147	0.00000	0.00000	331229.2	331229.2	0.0	S
276.000	0.0000	0.0000	147.038	0.00000	0.00000	331229.2	331229.2	0.0	S
288.000	0.0000	0.0000	146.935	0.00000	0.00000	331229.2	331229.2	0.0	S
300.000	0.0000	0.0000	146.837	0.00000	0.00000	331229.2	331229.2	0.0	S
312.000	0.0000	0.0000	146.743	0.00000	0.00000	331229.2	331229.2	0.0	S
324.000	0.0000	0.0000	146.654	0.00000	0.00000	331229.2	331229.2	0.0	S
336.000	0.0000	0.0000	146.568	0.00000	0.00000	331229.2	331229.2	0.0	S
348.000	0.0000	0.0000	146.487	----	----	331229.2	331229.2	0.0	N.A.

← Recovery < 2.5 days

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INFORMATION MGT.

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AUG 07 2009

REGULATORY
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