ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
ENVIRONMENTAL RESOURCE PERMIT APPLICATION

HARTWOOD MARSH ROAD
PHASE II

From 1500 feet east of Hancock Road to County Line

February 2009

Prepared For:

LAKE COUNTY
FLORIDA

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

Prepared By:

HNTB

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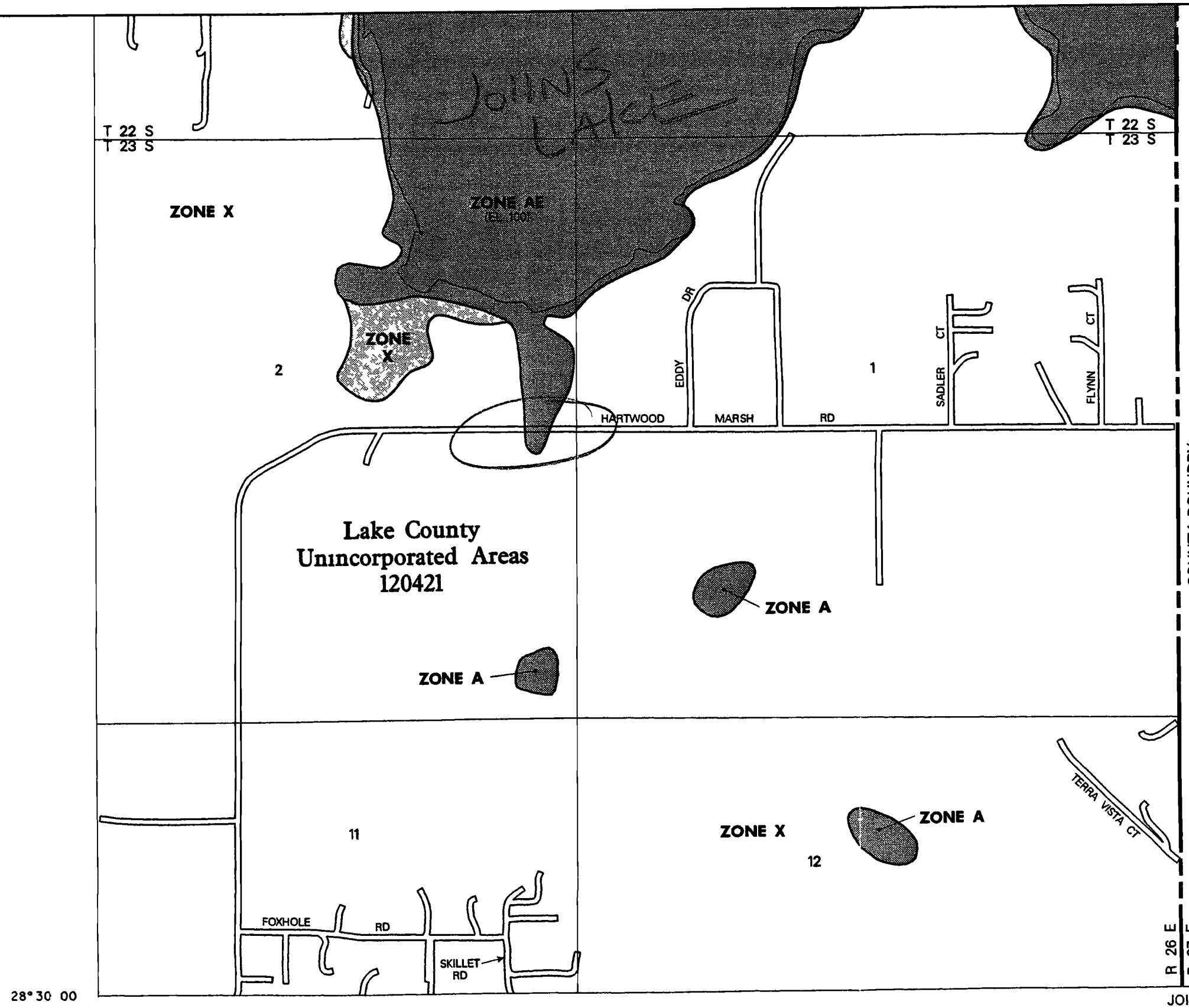


APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

LAKE COUNTY,
FLORIDA
AND INCORPORATED AREAS

PANEL 570 OF 725

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE COUNTY	120421	0570	D

Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.

MAP NUMBER
12069C0570 D

EFFECTIVE DATE
JULY 3, 2002

Federal Emergency Management Agency

Table 1

Water Table Elevations (NAVD)		
Pond	Encountered Groundwater Surface (ft)	Estimated Seasonal High Groundwater Surface (ft)
3A & 3B	95 86	103 86
5	84 22	87 22
6	103 90	108 40
7	135 39	140 39

4 0 DESIGN CRITERIA

The conveyance and storm water management systems for this project are designed in accordance with the Lake County Drainage Standards and the applicable design and performance criteria established by the St Johns River Water Management District (SJRWMD) in the Applicants Handbook (December 2006)

5 0 FEMA INFORMATION

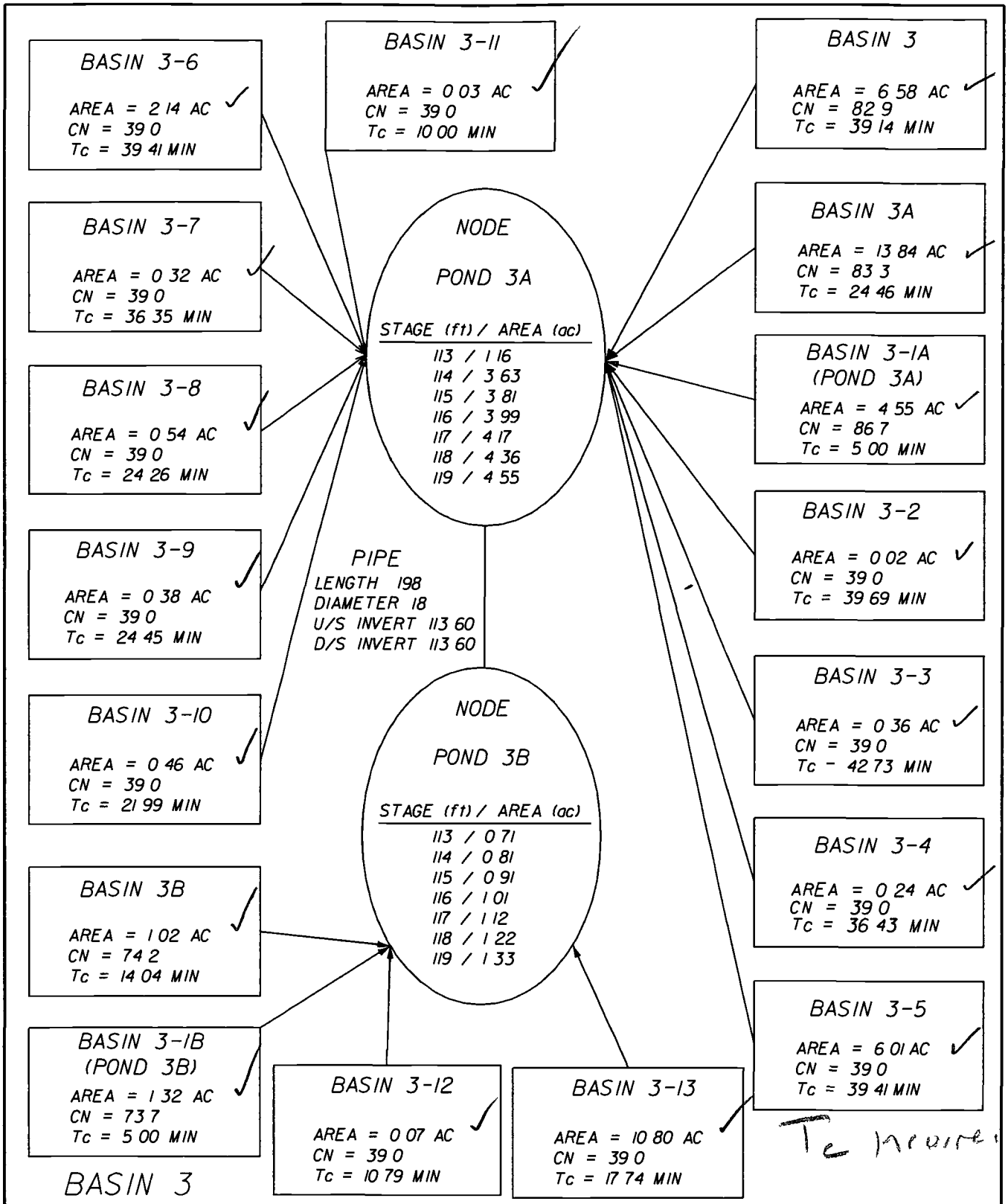
A small portion of the roadway and part of Pond 5 are located within a 100 year floodplain as indicated on the Federal Emergency Management Agency s (FEMA) 2002 Flood Insurance Rate Map Panel Number 12069C0650D and 12069C0570D Copies of the maps are provided Appendix A

6 0 EXISTING ROADWAY DRAINAGE

There is currently no formal drainage system on Hartwood Marsh Road The existing basin data is not applicable since the proposed stormwater system is designed for total retention

Table 2

Basin 3 Post Development Drainage Basin Data					
Basin Name	**Outfall Location**	**Area (Ac)**	**Impervious Area (Ac)**	**Curve Number**	**Time of Concentration (min)**
3 (Road)	Pond 3A	6 58	4 90	82 9	39 14
3A (Road)	Pond 3A	13 84	10 39	83 3	24 46
3B (Road)	Pond 3B	1 02	0 61	74 2	14 04
3 1A (Pond 3A)	Pond 3A	4 55	~~3 52~~	86 7	5 00
3 1B (Pond 3B)	Pond 3B	1 32	~~0 75~~	73 7	5 00
3 2 (Offsite)	Pond 3A	0 02	0	39 0	39 69
3 3 (Offsite)	Pond 3A	0 36	0	39 0	42 73
3 4 (Offsite)	Pond 3A	0 24	0	39 0	36 43
3 5 (Offsite)	Pond 3A	6 01	0	39 0	39 41
3 6 (Offsite)	Pond 3A	2 14	0	39 0	39 41
3 7 (Offsite)	Pond 3A	0 32	0	39 0	36 35
3 8 (Offsite)	Pond 3B	0 54	0	39 0	24 26
3 9 (Offsite)	Pond 3A	0 38	0	39 0	24 45
3 10 (Offsite)	Pond 3A	0 46	0	39 0	21 99
3 11 (Offsite)	Pond 3A	0 03	0	39 0	23 59
3 12 (Offsite)	Pond 3B	0 07	0	39 0	10 79
3 13 (Offsite)	Pond 3B	~~10 80~~	0	39 0	17 74
Total		~~47 35~~ 48 68	~~19 41~~ 20 17		



LOCATION LAKE COUNTY SEC 1 2 3 10 & 11 T23S R26E HARTWOOD MARSH ROAD RECONSTRUCTION 1500 FT EAST OF S HANCOCK ROAD TO ORANGE COUNTY LINE	COUNTY LAKE STATE FLORIDA DATE 12 08	DATUM NAVD 88 PURPOSE POST DEVELOPMENT NODAL DIAGRAM
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	LAKE COUNTY FLORIDA	LAKE COUNTY HARTWOOD MARSH ROAD

2 3 20 8 Mw00\pmw 56 56 10000 \d nag \WOD D G po

RUNOFF CURVE NUMBER

		DATE
MADE BY	msf	24 Sep 08
CHKED BY	BJS	10 Jan 09

HNTB

PROJECT HARTWOOD MARSH ROAD PHASE II

LOCATION BASIN 3 1A (POND 3A)

UNDERLINE ONE EXISTING **PROPOSED**

Soil Name and Hydrologic group (Appendix A)	Cover Description (Cover type treatment and hydrologic condition percent impervious unconnected / connected impervious area ratio)	CN Tab 2 2	CN Fig 2 3	CN Fig 2 4	Area acres	Product of CN x Area
	IMPERVIOUS AREA Propose Pond Site at NWL	100			3 52	352 00
Astatula Sand (A)	GRASS Proposed Pond Site (Good condition)	39			1 03	40 17
				Totals =	4 55	392 17

Use CN = **86 2**

REFERENCE *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

POND INCLUDED AS IMPERVIOUS

TIME OF CONCENTRATION CALCULATIONS

HNTB

		DATE
MADE BY	MSF	14 Oct 08
CHECKED BY	BJS	10 Jan 09

PROJECT HARTWOOD MARSH ROAD PHASE II

LOCATION BASIN 3 2

UNDERLINE ONE EXISTING **PROPOSED**

UNDERLINE ONE Tc Tt **Through subarea**

SHEET FLOW

1	SURFACE DESCRIPTION	SHORT GRASS				
2	MANNING S COEFFICIENT n	0 150				
3	FLOW LENGTH L (< 300)	97		FT		
4	2 YR/ 24 HR RAINFALL P	4 70		IN		
5	LAND SLOPE S	0 010				
6	Tt = (0 007 (nL)^0 8) / (P^0 5 * S^0 4)	0 171		HR OR	10 28	MIN

SHALLOW CONCENTRATED FLOW

7	SURFACE DESCRIPTION (PAVED OR UNPAVED)					
8	FLOW LENGTH L			L F		
9	WATERCOURSE SLOPE S			FT / FT		
10	AVERAGE VELOCITY V			FT /SEC		
11	Tt = L / (3600 * V)			HR OR		MIN

CHANNEL FLOW

12	CROSS SECTIONAL FLOW AREA A			S F		
13	WETTED PERIMETER Pw			L F		
14	HYDRAULIC RADIUS R = (A / Pw)			L F		
15	CHANNEL SLOPE S			FT /FT		
16	MANNING S ROUGHNESS COEFFICIENT n					
17	VELOCITY V = (1 49 * R ^0 667 * S ^0 5) / n			FT /SEC	Pipe flow from E 300	
18	FLOW LENGTH L			L F	to pond (ASAD)	
19	Tt = L / (3600 V)			HR OR	29 41	MIN
20	Watershed or subarea Tc or Tt (add Tt in steps 6 11 and 19)					

TOTAL Tc = 39 69 MIN X

(IF < 10 MIN THAN ASSUME 10 MIN)

Reference *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

DA-C-

TIME OF CONCENTRATION CALCULATIONS

HNTB

		DATE
MADE BY	MSF	14 Oct 08
CHECKED BY	BJS	10 Jan 09

PROJECT HARTWOOD MARSH ROAD PHASE II

LOCATION BASIN 3 3

UNDERLINE ONE EXISTING **PROPOSED**

UNDERLINE ONE Tc Tt **Through subarea**

SHEET FLOW

1	SURFACE DESCRIPTION	SHORT GRASS				
2	MANNING S COEFFICIENT n	0 150				
3	FLOW LENGTH L (< 300)	300		FT		
4	2 YR/ 24 HR RAINFALL P	4 70		IN		
5	LAND SLOPE S	0 043				
6	Tt = (0 007 (nL)^0 8) / (P^0 5 * S^0 4)	0 238		HR	OR	14 29 MIN

SHALLOW CONCENTRATED FLOW

7	SURFACE DESCRIPTION (PAVED OR UNPAVED)					
8	FLOW LENGTH L			L F		
9	WATERCOURSE SLOPE S			FT / FT		
10	AVERAGE VELOCITY V			FT /SEC		
11	Tt = L / (3600 * V)			HR	OR	MIN

CHANNEL FLOW

12	CROSS SECTIONAL FLOW AREA A			S F		
13	WETTED PERIMETER Pw			L F		
14	HYDRAULIC RADIUS R = (A / Pw)			L F		
15	CHANNEL SLOPE S			FT /FT		
16	MANNING S ROUGHNESS COEFFICIENT n					
17	VELOCITY V = (1 49 * R ^0 667 * S ^0 5) / n			FT /SEC		Pipe flow from S 306
18	FLOW LENGTH L			L F		to pond (ASAD)
19	Tt = L / (3600 V)			HR	OR	28 44 MIN
20	Watershed or subarea Tc or Tt (add Tt in steps 6 11 and 19)					

TOTAL Tc = 42 73 MIN X

(IF < 10 MIN THAN ASSUME 10 MIN)

Reference *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

TIME OF CONCENTRATION CALCULATIONS

HNTB

		DATE
MADE BY	MSF	14 Oct 08
CHECKED BY	BJS	10 Jan 09

PROJECT HARTWOOD MARSH ROAD PHASE II

LOCATION BASIN 3-4

UNDERLINE ONE EXISTING **PROPOSED**

UNDERLINE ONE **Tc** **Tt Through subarea**

SHEET FLOW

1	SURFACE DESCRIPTION	SHORT GRASS				
2	MANNING S COEFFICIENT n	0 150				
3	FLOW LENGTH L (< 300)	112		FT		
4	2 YR/ 24 HR RAINFALL P	4 70		IN		
5	LAND SLOPE S	0 036				
6	Tt = (0 007 (nL) 0 8) / (P 0 5 S^0 4)	0 117		HR OR	7 02	MIN

SHALLOW CONCENTRATED FLOW

7	SURFACE DESCRIPTION (PAVED OR UNPAVED)					
8	FLOW LENGTH L			L F		
9	WATERCOURSE SLOPE S			FT / FT		
10	AVERAGE VELOCITY V			FT /SEC		
11	Tt = L / (3600 * V)			HR OR		MIN

CHANNEL FLOW

12	CROSS SECTIONAL FLOW AREA A			S F		
13	WETTED PERIMETER Pw			L F		
14	HYDRAULIC RADIUS R = (A / Pw)			L F		
15	CHANNEL SLOPE S			FT /FT		
16	MANNING S ROUGHNESS COEFFICIENT n					
17	VELOCITY V = (1 49 R 0 667 S 0 5) / n			FT /SEC	Pipe flow from S 309	
18	FLOW LENGTH L			L F	to pond (ASAD)	
19	Tt = L / (3600 V)			HR OR	29 41	MIN
20	Watershed or subarea Tc or Tt (add Tt in steps 6 11 and 19)					

TOTAL Tc = 36 43 MIN X

(IF < 10 MIN THAN ASSUME 10 MIN)

Reference *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

DA 0.21 ac

TIME OF CONCENTRATION CALCULATIONS

HNTB

		DATE
MADE BY	MSF	14 Oct 08
CHECKED BY	BJS	10 Jan 09

PROJECT **HARTWOOD MARSH ROAD PHASE II**

LOCATION **BASIN 3 7**

UNDERLINE ONE **EXISTING** **PROPOSED**

UNDERLINE ONE **Tc** **Tt Through subarea**

SHEET FLOW

		SHORT GRASS	SMOOTH SURFACE			
1	SURFACE DESCRIPTION					
2	MANNING S COEFFICIENT n	0 150	0 011			
3	FLOW LENGTH L (< 300)	165	42	FT		
4	2 YR/ 24 HR RAINFALL P	4 70	4 70	IN		
5	LAND SLOPE S	0 036	0 112			
6	Tt = (0 007 (nL) 0 8) / (P 0 5 S 0 4)	0 158	0 004	HR	OR	9 75 MIN

SHALLOW CONCENTRATED FLOW

7	SURFACE DESCRIPTION (PAVED OR UNPAVED)					
8	FLOW LENGTH L			L F		
9	WATERCOURSE SLOPE S			FT / FT		
10	AVERAGE VELOCITY V			FT /SEC		
11	Tt = L / (3600 V)			HR	OR	MIN

CHANNEL FLOW

12	CROSS SECTIONAL FLOW AREA A			S F		
13	WETTED PERIMETER Pw			L F		
14	HYDRAULIC RADIUS R = (A / Pw)			L F		
15	CHANNEL SLOPE S			FT /FT		
16	MANNING S ROUGHNESS COEFFICIENT n					
17	VELOCITY V = (1 49 R 0 667 S 0 5) / n			FT /SEC		Pipe flow from S 321
18	FLOW LENGTH L			L F		to pond (ASAD)
19	Tt = L / (3600 V)			HR	OR	26 60 MIN
20	Watershed or subarea Tc or Tt (add Tt in steps 6 11 and 19)					

TOTAL Tc = 36 35 MIN X

(IF 10 MIN THAN ASSUME 10 MIN)

DA - 0 32 ac

Reference *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

TIME OF CONCENTRATION CALCULATIONS

HNTB

		DATE
MADE BY	MSF	14 Oct 08
CHECKED BY	BJS	10 Jan 09

PROJECT HARTWOOD MARSH ROAD PHASE II

LOCATION BASIN 3 8

UNDERLINE ONE EXISTING **PROPOSED**

UNDERLINE ONE Tc Tt **Through subarea**

SHEET FLOW

1	SURFACE DESCRIPTION	SHORT GRASS				
2	MANNING S COEFFICIENT n	0 150				
3	FLOW LENGTH L (< 300)	291		FT		
4	2 YR/ 24 HR RAINFALL P	4 70		IN		
5	LAND SLOPE S	0 034				
6	Tt = (0 007 (nL) 0 8) / (P 0 5 S 0 4)	0 255		HR OR	15 30	MIN

SHALLOW CONCENTRATED FLOW

7	SURFACE DESCRIPTION (PAVED OR UNPAVED)					
8	FLOW LENGTH L			L F		
9	WATERCOURSE SLOPE S			FT / FT		
10	AVERAGE VELOCITY V			FT /SEC		
11	Tt = L / (3600 V)			HR OR		MIN

CHANNEL FLOW

12	CROSS SECTIONAL FLOW AREA A			S F		
13	WETTED PERIMETER Pw			L F		
14	HYDRAULIC RADIUS R = (A / Pw)			L F		
15	CHANNEL SLOPE S			FT /FT		
16	MANNING S ROUGHNESS COEFFICIENT n					
17	VELOCITY V = (1 49 * R 0 667 S 0 5) / n			FT /SEC	Pipe flow from S 353	
18	FLOW LENGTH L			L F	to pond (ASAD)	
19	Tt = L / (3600 V)			HR OR	8 96	MIN
20	Watershed or subarea Tc or Tt (add Tt in steps 6 11 and 19)					

TOTAL Tc = 24 26 MIN X

(IF < 10 MIN THAN ASSUME 10 MIN)

Reference *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

DA = 0 SA ac

TIME OF CONCENTRATION CALCULATIONS

HNTB

		DATE
MADE BY	MSF	14 Oct 08
CHECKED BY	BJS	10 Jan 09

PROJECT HARTWOOD MARSH ROAD PHASE II

LOCATION BASIN 3 9

UNDERLINE ONE EXISTING **PROPOSED**

UNDERLINE ONE Tc Tt **Through subarea**

SHEET FLOW

1	SURFACE DESCRIPTION	SHORT GRASS				
2	MANNING S COEFFICIENT n	0 150				
3	FLOW LENGTH L (< 300)	172		FT		
4	2 YR/ 24 HR RAINFALL P	4 70		IN		
5	LAND SLOPE S	0 035				
6	Tt = (0 007 (nL) 0 8) / (P 0 5 S 0 4)	0 166		HR OR	9 99	MIN

SHALLOW CONCENTRATED FLOW

7	SURFACE DESCRIPTION (PAVED OR UNPAVED)					
8	FLOW LENGTH L			L F		
9	WATERCOURSE SLOPE S			FT / FT		
10	AVERAGE VELOCITY V			FT /SEC		
11	Tt = L / (3600 V)			HR OR		MIN

CHANNEL FLOW

12	CROSS SECTIONAL FLOW AREA A			S F		
13	WETTED PERIMETER Pw			L F		
14	HYDRAULIC RADIUS R = (A / Pw)			L F		
15	CHANNEL SLOPE S			FT /FT		
16	MANNING S ROUGHNESS COEFFICIENT n					
17	VELOCITY V = (1 49 R 0 667 S 0 5) / n			FT /SEC	Pipe flow from S 369	
18	FLOW LENGTH L			L F	to pond (ASAD)	
19	Tt = L / (3600 V)			HR OR	14 46	MIN
20	Watershed or subarea Tc or Tt (add Tt in steps 6 11 and 19)					

TOTAL Tc = 24 45 MIN

(IF 10 MIN THAN ASSUME 10 MIN)

X

Reference *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

DA = 0.38 ac

TIME OF CONCENTRATION CALCULATIONS

HNTB

		DATE
MADE BY	MSF	14 Oct 08
CHECKED BY	BJS	10 Jan 09

PROJECT HARTWOOD MARSH ROAD PHASE II

LOCATION BASIN 3 10

UNDERLINE ONE EXISTING **PROPOSED**

UNDERLINE ONE **Tc** Tt Through subarea

SHEET FLOW

		SHORT GRASS	SMOOTH SURFACE			
1	SURFACE DESCRIPTION					
2	MANNINGS COEFFICIENT n	0 150	0 011			
3	FLOW LENGTH L (< 300)	90	210	FT		
4	2 YR/ 24 HR RAINFALL P	4 70	4 70	IN		
5	LAND SLOPE S	0 033	0 033			
6	Tt = (0 007 (nL) 0 8) / (P 0 5 S 0 4)	0 101	0 025	HR OR	7 53	MIN

SHALLOW CONCENTRATED FLOW

7	SURFACE DESCRIPTION (PAVED OR UNPAVED)					
8	FLOW LENGTH L			L F		
9	WATERCOURSE SLOPE S			FT / FT		
10	AVERAGE VELOCITY V			FT /SEC		
11	Tt = L / (3600 V)			HR OR		MIN

CHANNEL FLOW

12	CROSS SECTIONAL FLOW AREA A			S F		
13	WETTED PERIMETER Pw			L F		
14	HYDRAULIC RADIUS R = (A / Pw)			L F		
15	CHANNEL SLOPE S			FT /FT		
16	MANNINGS ROUGHNESS COEFFICIENT n					
17	VELOCITY V = (1 49 R 0 667 S 0 5) / n			FT /SEC	Pipe flow from S 377	
18	FLOW LENGTH L			L F	to pond (ASAD)	
19	Tt = L / (3600 V)			HR OR	14 46	MIN
20	Watershed or subarea Tc or Tt (add Tt in steps 6 11 and 19)					

X no ? ...

TOTAL Tc = 21 99 MIN

(IF 10 MIN THAN ASSUME 10 MIN)

Reference *Urban Hydrology for Small Watersheds*
Technical Release 55 Soil Conservation Service
U S Department of Agriculture June 1986

H two d Ma h R ad Ph e II
P t D v l pm nt
P nd 3A & 3B Ha tw d
I put R po t
12 11 08

B n

```
        Nam   BASIN 3                N d   POND 3A                St tu   On  t
       G oup  BASE                   Typ   SCS U  t Hyd  g  ph CN

       Un t Hyd og aph  Uh484                  P  k  g Fa t    484 0
         Ra nf ll F l   Sjrwmd96          St rm Du at  n(h  )  96 00
   Ra nfall Am unt( n)  11 300              T m   f Con (m n)  39 41
            A ea(a )    6 580                 T m  Sh ft(h  )  0 00
          C  v  Numb    82 90             Max All w bl  Q( f )  999999 000
               DCIA(%)  0 00
```

R ad Ba n 3

```
        Nam   BASIN 3 10             N d   POND 3A                St tu   On  t
       G  up  BASE                   Typ   SCS U  t Hyd og  ph CN

       Un t Hyd  g aph  Uh484                  P ak ng Fa t    484 0
         Ra nf ll F l   Sjrwmd96          St  m Du at  n(h  )  96 00
   R   fall Am unt( n)  11 300              T me  f C n (m  )  21 99
            A  a(  )    0 460                 T m  Sh ft(h  )  0 00
          Cu v  Numbe   39 00             Max All wabl  Q( f )  999999 000
               DCIA(%)  0 00
```

Off te to ad

```
        Nam   BASIN 3 11             N d   POND 3A                Statu   On  t
       G  up  BASE                   Typ   SCS U  t Hyd  g aph CN

       Un t Hyd  g aph  Uh484                  P  k ng Fa t    484 0
         Ra nfall F l   Sjrwmd96          St  m Du at   (h  )  96 00
   Ra  fall Am unt( n)  11 300              T m   f C n (m n)  23 59
            A ea(  )    0 030                 T m  Sh ft(h  )  0 00
          Cu v  Numbe   39 00             Max All wabl  Q( f )  999999 000
               DCIA(%)  0 00
```

R ad Ba n 3B

```
        Nam   BASIN 3 12             N d   POND 3B                St tu   On  t
       G  up  BASE                   Typ   SCS U  t Hyd  g  ph CN

       Un t Hyd  g  ph  Uh484                  P ak  g Fa t    484 0
         Ra nfall F l   Sjrwmd96          St  m D   t  n(h  )  96 00
   R   fall Am unt( n)  11 300              T me  f C n (m n)  10 79
            A  a(a )    0 070                 T m  Sh ft(h  )  0 00
          Cu v  Numbe   39 00             Max All wabl  Q( f )  999999 000
               DCIA(%)  0 00
```

Off t to ad

```
        Nam   BASIN 3 13             N d   POND 3B                Statu   O   t
       Gr up  BASE                   Typ   SCS U  t Hyd  g  ph CN

       Un t Hyd og aph  Uh484                  P ak ng Fa t    484 0
         Ra nf ll F l   Sjrwmd96          St rm Du  t   (h  )  96 00
   Ra  fall Am unt( n)  11 300              T m   f C n (m n)  17 74
            A ea(a )    10 800                T m  Sh ft(h  )  0 00
          Cu v  Numbe   39 00             M x All wabl  Q( f )  999999 000
               DCIA(%)  0 00
```

R ad Ba n 3B

```
        Nam   BASIN 3 1A             N d   POND 3A                Statu   On  t
       Gr up  BASE                   Typ   SCS U  t Hyd  g aph CN

       Un t Hyd  g aph  Uh484                  P  k ng Fa t    484 0
         R  nf ll F l   Sj wmd96           St  m Du at   (h  )  96 00
   R   fall Am  nt( n)  11 300              T m   f C n (m n)  5 00
            A  a(a )    4 550                 T m  Sh ft(h  )  0 00
          Cu v  Numbe   83 30             M x All w bl  Q( f )  999999 000
               DCIA(%)  0 00
```

D y T t l R t nt n Pond 3A

OK

H tw d Ma h R d Ph e II
P t D v lopment
P nd 3A & 3B H tw d
Hyd l gy T m S R p t
12 11 08

S mulat n	N d	T m h	V lum ft3	V lum n	Rate f
25Y96H	POND 3A	57 25	162049 531	1 260	5 120
25Y96H	POND 3A	57 50	166679 500	1 296	5 169
25Y96H	POND 3A	57 75	171350 844	1 332	5 212
25Y96H	POND 3A	58 00	176062 563	1 369	5 258
25Y96H	POND 3A	58 25	181601 703	1 412	7 051
25Y96H	POND 3A	58 50	188663 125	1 467	8 641
25Y96H	POND 3A	58 75	196744 000	1 529	9 316
25Y96H	POND 3A	59 00	205268 125	1 596	9 626
25Y96H	POND 3A	59 25	215477 500	1 675	13 061
25Y96H	POND 3A	59 50	228775 438	1 778	16 490
25Y96H	POND 3A	59 75	268710 813	2 089	72 255
25Y96H	POND 3A	60 00	357484 344	2 779	125 019
25Y96H	POND 3A	60 25	457312 344	3 555	96 821
25Y96H	POND 3A	60 50	526483 563	4 092	56 893
25Y96H	POND 3A	60 75	567445 250	4 411	34 133
25Y96H	POND 3A	61 00	593149 750	4 611	22 988
25Y96H	POND 3A	61 25	610933 688	4 749	16 532
25Y96H	POND 3A	61 50	624220 125	4 852	12 994
25Y96H	POND 3A	61 75	635272 875	4 938	11 568
25Y96H	POND 3A	62 00	645486 625	5 017	11 129
25Y96H	POND 3A	63 00	678040 188	5 271	6 956
25Y96H	POND 3A	64 00	702942 625	5 464	6 879
25Y96H	POND 3A	65 00	722968 438	5 620	4 247
25Y96H	POND 3A	66 00	738145 813	5 738	4 185
25Y96H	POND 3A	67 00	753236 125	5 855	4 198
25Y96H	POND 3A	68 00	768365 125	5 973	4 207
25Y96H	POND 3A	69 00	781066 188	6 071	2 849
25Y96H	POND 3A	70 00	791265 250	6 151	2 817
25Y96H	POND 3A	71 00	801409 750	6 230	2 819
25Y96H	POND 3A	72 00	811560 375	6 308	2 820
25Y96H	POND 3A	73 00	819349 563	6 369	1 507
25Y96H	POND 3A	74 00	824709 813	6 411	1 471
25Y96H	POND 3A	75 00	830007 813	6 452	1 472
25Y96H	POND 3A	76 00	835310 813	6 493	1 474
25Y96H	POND 3A	77 00	840639 563	6 534	1 487
25Y96H	POND 3A	78 00	845994 938	6 576	1 488
25Y96H	POND 3A	79 00	851355 625	6 618	1 490
25Y96H	POND 3A	80 00	856721 125	6 659	1 491
25Y96H	POND 3A	81 00	862070 250	6 701	1 481
25Y96H	POND 3A	82 00	867402 250	6 742	1 482
25Y96H	POND 3A	83 00	872738 438	6 784	1 483
25Y96H	POND 3A	84 00	878079 125	6 825	1 484
25Y96H	POND 3A	85 00	883424 250	6 867	1 485
25Y96H	POND 3A	86 00	888774 000	6 909	1 487
25Y96H	POND 3A	87 00	894128 125	6 950	1 488
25Y96H	POND 3A	88 00	899486 938	6 992	1 489
25Y96H	POND 3A	89 00	904871 250	7 034	1 502
25Y96H	POND 3A	90 00	910281 938	7 076	1 504
25Y96H	POND 3A	91 00	915697 625	7 118	1 505
25Y96H	POND 3A	92 00	921117 750	7 160	1 506
25Y96H	POND 3A	93 00	926520 688	7 202	1 496
25Y96H	POND 3A	94 00	931906 000	7 244	1 496
25Y96H	POND 3A	95 00	937295 000	7 286	1 498
25Y96H	POND 3A	96 00	942679 438	7 328	1 494
25Y96H	POND 3A	97 00	945438 000	7 349	0 039
25Y96H	POND 3A	98 00	945507 750	7 350	0 000
25Y96H	POND 3A	99 00	945507 750	7 350	0 000
25Y96H	POND 3A	100 00	945507 750	7 350	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

Pond3A
Total Volume
= 21 64ac-ft ✓

21 71

S mu1at on	Nod	T m h	V 1um ft3	V 1um n	Rat f
25Y96H	POND 3B	64 00	110666 445	2 356	1 673
25Y96H	POND 3B	65 00	115520 969	2 459	1 024
25Y96H	POND 3B	66 00	119225 734	2 538	1 035
25Y96H	POND 3B	67 00	122969 422	2 618	1 045
25Y96H	POND 3B	68 00	126749 664	2 698	1 055
25Y96H	POND 3B	69 00	129923 477	2 766	0 708
25Y96H	POND 3B	70 00	132481 688	2 820	0 713
25Y96H	POND 3B	71 00	135054 516	2 875	0 716
25Y96H	POND 3B	72 00	137639 625	2 930	0 720
25Y96H	POND 3B	73 00	139612 016	2 972	0 376
25Y96H	POND 3B	74 00	140967 938	3 001	0 377
25Y96H	POND 3B	75 00	142328 016	3 030	0 378
25Y96H	POND 3B	76 00	143692 250	3 059	0 380
25Y96H	POND 3B	77 00	145066 203	3 088	0 384
25Y96H	POND 3B	78 00	146449 906	3 118	0 385
25Y96H	POND 3B	79 00	147837 719	3 147	0 386
25Y96H	POND 3B	80 00	149229 625	3 177	0 387
25Y96H	POND 3B	81 00	150619 938	3 207	0 385
25Y96H	POND 3B	82 00	152008 609	3 236	0 386
25Y96H	POND 3B	83 00	153401 234	3 266	0 387
25Y96H	POND 3B	84 00	154797 797	3 296	0 388
25Y96H	POND 3B	85 00	156198 250	3 325	0 390
25Y96H	POND 3B	86 00	157602 594	3 355	0 391
25Y96H	POND 3B	87 00	159010 813	3 385	0 392
25Y96H	POND 3B	88 00	160422 844	3 415	0 393
25Y96H	POND 3B	89 00	161844 500	3 446	0 397
25Y96H	POND 3B	90 00	163275 750	3 476	0 398
25Y96H	POND 3B	91 00	164710 828	3 507	0 399
25Y96H	POND 3B	92 00	166149 656	3 537	0 400
25Y96H	POND 3B	93 00	167586 406	3 568	0 398
25Y96H	POND 3B	94 00	169021 016	3 598	0 399
25Y96H	POND 3B	95 00	170459 297	3 629	0 400
25Y96H	POND 3B	96 00	171898 953	3 660	0 400
25Y96H	POND 3B	97 00	172618 547	3 675	0 000
25Y96H	POND 3B	98 00	172618 563	3 675	0 000
25Y96H	POND 3B	99 00	172618 563	3 675	0 000
25Y96H	POND 3B	100 00	172618 563	3 675	0 000

Pond 3B
Total Volume = 3.75 ac-ft ✓
3 9U

H tw d M h R d Ph II
P t D v 1 pm nt
P d 3A & 3B H tw d
N d M n/M x R p t
12 11 08

Nam	G up	S mul t n	Max T m Stag h	M x St g ft	Wa n ng M x D 1t St g ft	M x Su f A ft2	Max T m Infl w h	M x Infl w f	M x T m Outfl w h	M x Outfl w f
POND 3A	BASE	25Y24H	27 02	116 496	118 000	0 0050	177920	12 00	92 481	13 39	5 298
POND 3B	BASE	25Y24H	26 02	116 496	118 000	0 0036	46382	12 00	14 514	0 00	0 000

POND 3B @ 119

POND 3A + 3B ARE HYDRAULICALLY CONNECTED

POLLUTION ABATEMENT VOLUME

HNTB

		DATE
MADE BY	MSF	15 Oct 08
CHCK BY	BJS	10 Jan 09

PROJECT **HARTWOOD MARSH ROAD**

LOCATION **BASIN 3**

BASIN LIMITS STA 152+39 00 to STA 226+00 00 CL CONST HARTWOOD MARSH ROAD

TOTAL TREATMENT AREA 27 51 AC x 4868 ac per DA MAP

IMPERVIOUS AREA 15 14 AC (excludes pond) 15 90 ✓ x

POND AREA = 4 37 ac

UNDERINE ONE RETENTION DETENTION

UNDERINE ONE DRY WET

UNDERINE ONE ONLINE OFFLINE NOTE TOTAL RETENTION OF RUNOFF

REQUIRED TREATMENT VOLUME

1) COMPUTE FIRST 0 5 INCH OF RUNOFF FROM PROJECT

(0 5 /12) x 27 51 AC = **1 15** AF

FOR ONLINE TREATMENT ADD 0 5 INCH OF RUNOFF

(0 5 /12) x 27 51 AC = **1 15** AF

TOTAL **2 29** AF

2) COMPUTE 1 25 INCHES TIMES IMPERVIOUS AREA

(1 25 /12) x 15 14 AC = **1 58** AF

FOR ONLINE TREATMENT ADD 0 5 INCH OF RUNOFF

(0 5 /12) x 27 51 AC = **1 15** AF

TOTAL **2 72** AF ✓

CONTROLLING CRITERIA **2**

REQUIRED TREATMENT VOLUME **2 72** AF

NOT LAKE APOPKA BASIN

STAGE / STORAGE CALCULATIONS

HNTB

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

PROJECT **HARTWOOD MARSH ROAD**

POND **3A & 3B**

Pond 3A = 3.52 ac
Pond 3B = 0.75 ac > total = 4.27

Boring	Approx	Depth to	Estimated	Average	Depth to	Estimated	Average
AB P8	123 25	25 0	98 3	95 86	17	106 25	103 86
AB P9	118 47	25 0	93 5		17	101 47	

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

AVG SHWT ELEVATION 103 9 Ft (NAVD)

AVG GROUND WATER TABLE ELEVATION 95 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

Cumulative Volume

STAGE Ft (NAVD)	AREA AC	AVERAGE AREA AC	INCREMENTAL VOL AF
113 0	4 17		0 00
	4.27 ac	4 30	
114 0	4 44		4 30
		4 58	
115 0	4 72		4 58
		4 86	
116 0	5 00		4 86
		5 15	
117 0	5 30		5 15
		5 44	
118 0	5 59		5 44
		5 73	
119 0	5 88		5 73
TOTAL			**30 06**

0 ← TV
4 3

24.33
30.06

REQUIRED TREATMENT VOLUME 2 72 AF

TOP EL OF TREATMENT VOLUME 113 63 Ft ✓

PERCOLATION RATE 40 Ft /Day or 20 Inches/Hr

FACTOR OF SAFTEY 2 = 10 Inches/Hr

El Vol
113 0
x 2.72
114 4.3
✓ 113 63 min req'd

El Vol
118 24.33
x 35.59
119 30.06
x = 118.82

3A

12C
98 MW

3B

12C
121 MW

SWL @ 15' BLS

Calaveras @ Bottom =
Borings AB-P8, AB-P9

SWL = 15' BLS

Bot = 20' BLS

AB-P8 { K_h = 40 ft/d measured
K_v = 40/1.5 = 26.67 } NO FS

C

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	12 11 2008

Aquifer Data

Base Of Aquifer Elevation [B] (ft datum)	103 00
Water Table Elevation [WT] (ft datum)	104 00
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)	187743 6

Geometry Data

Equivalent Pond Length [L] (ft)	1062 0
Equivalent Pond Width [W] (ft)	300 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	243500 4
118 00	256132 8

Scenario Input Data

Scenario 1 Water Quality

Hydrograph Type Slug Load
Modflow Routing Routed with infiltration

Treatment Volume (ft^3) 98881 2 = 2.27 X

Initial ground water level (ft datum) default 104 00

Time After Storm Event (days)	Time After Storm Event (days)
0 100	2 000
0 250	2 500
0 500	3 000
1 000	3 500
1 500	4 000

Detailed Results *Scenario 1* *Water Quality*

Elapsed Time (hours)	Inflow Rate (ft /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft /s)	Overflow Discharge (ft /s)	Cumulative Inflow Volume (ft)	Cumulative Infiltration Volume (ft)	Cumulative Discharge Volume (ft)	Flow Type
0 000	16480 2000	0 0000	104 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	16480 2000	0 0000	113 534	28 00520	0 00000	98881 2	168 1	0 0	U/P
2 400	0 0000	0 0000				98881 2	98881 2	0 0	dry
6 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
12 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
24 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
36 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
48 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
60 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
72 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
84 000	0 0000	0 0000				98881 2	98881 2	0 0	dry
96 000	0 0000	0 0000				98881 2	98881 2	0 0	dry

=> Recovery < 24 hr

Scenario Input Data

25.67 MG d

Scenario 1 25 year/96 hour

Hydrograph Type Slug Load
Modflow Routing Routed with infiltration

Treatment Volume (ft³) 1114578 = 25.59 ac-ft (INFLOW FOR 3A+3B AT NOV 96)

Initial ground water level (ft datum) default 104 00

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	

Detailed Results

Scenario 1 25 year/96 hour

Elapsed Time (hours)	Inflow Rate (ft /s)	Outside Recharge (ft/day)	Stage Elevat on (ft datum)	Infiltration Rate (ft /s)	Overflow Discharge (ft /s)	Cumulative Inflow Volume (ft)	Cumulat ve Infiltration Volume (ft)	Cumulative Discharge Volume (ft)	Flow Type
0 000	185763 0000	0 0000	104 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	185763 0000	0 0000	118 138	28 03264	0 00000	1114578 0	168 1	0 0	U/P
2 400	0 0000	0 0000	116 767	35 38176	0 00000	1114578 0	341356 1	0 0	U/P
6 000	0 0000	0 0000	115 039	19 31791	0 00000	1114578 0	719463 0	0 0	U/S
12 000	0 0000	0 0000	114 734	2 48472	0 00000	1114578 0	781877 5	0 0	S
24 000	0 0000	0 0000	114 372	1 44443	0 00000	1114578 0	854239 3	0 0	S
36 000	0 0000	0 0000	114 105	1 09097	0 00000	1114578 0	906676 3	0 0	S
48 000	0 0000	0 0000	113 889	0 89073	0 00000	1114578 0	948498 7	0 0	S
60 000	0 0000	0 0000	113 705	0 75953	0 00000	1114578 0	983635 1	0 0	S
72 000	0 0000	0 0000	113 544	0 66581	0 00000	1114578 0	1014122 0	0 0	S
84 000	0 0000	0 0000	113 399	0 59490	0 00000	1114578 0	1041161 0	0 0	S
96 000	0 0000	0 0000	113 268	0 53903	0 00000	1114578 0	1065522 0	0 0	S
108 000	0 0000	0 0000	113 147	0 49364	0 00000	1114578 0	1087733 0	0 0	S
120 000	0 0000	0 0000	113 035	0 31070	0 00000	1114578 0	1108172 0	0 0	S
132 000	0 0000	0 0000	112 915	0 07414	0 00000	1114578 0	1114578 0	0 0	S
144 000	0 0000	0 0000	112 796	0 00000	0 00000	1114578 0	1114578 0	0 0	S
156 000	0 0000	0 0000	112 685	0 00000	0 00000	1114578 0	1114578 0	0 0	S
168 000	0 0000	0 0000	112 582	0 00000	0 00000	1114578 0	1114578 0	0 0	S
180 000	0 0000	0 0000	112 485	0 00000	0 00000	1114578 0	1114578 0	0 0	S
192 000	0 0000	0 0000	112 393	0 00000	0 00000	1114578 0	1114578 0	0 0	S
204 000	0 0000	0 0000	112 306	0 00000	0 00000	1114578 0	1114578 0	0 0	S
216 000	0 0000	0 0000	112 223	0 00000	0 00000	1114578 0	1114578 0	0 0	S
228 000	0 0000	0 0000	112 144	0 00000	0 00000	1114578 0	1114578 0	0 0	S
240 000	0 0000	0 0000	112 069	0 00000	0 00000	1114578 0	1114578 0	0 0	S
252 000	0 0000	0 0000	111 997	0 00000	0 00000	1114578 0	1114578 0	0 0	S
264 000	0 0000	0 0000	111 928	0 00000	0 00000	1114578 0	1114578 0	0 0	S
276 000	0 0000	0 0000	111 862	0 00000	0 00000	1114578 0	1114578 0	0 0	S
288 000	0 0000	0 0000	111 798	0 00000	0 00000	1114578 0	1114578 0	0 0	S
300 000	0 0000	0 0000	111 736	0 00000	0 00000	1114578 0	1114578 0	0 0	S
312 000	0 0000	0 0000	111 677	0 00000	0 00000	1114578 0	1114578 0	0 0	S
324 000	0 0000	0 0000	111 620	0 00000	0 00000	1114578 0	1114578 0	0 0	S
336 000	0 0000	0 0000	111 565	0 00000	0 00000	1114578 0	1114578 0	0 0	S
348 000	0 0000	0 0000	111 511			1114578 0	1114578 0	0 0	N A

← Recover <b day

S mulat n	N d	T m h	V lum ft3	V lum n	Rat f
25Y96H	POND 5	57 25	116805 016	1 848	3 496
25Y96H	POND 5	57 50	119958 313	1 898	3 511
25Y96H	POND 5	57 75	123124 891	1 948	3 526
25Y96H	POND 5	58 00	126307 703	1 999	3 547
25Y96H	POND 5	58 25	130222 695	2 061	5 153
25Y96H	POND 5	58 50	135309 547	2 141	6 151
25Y96H	POND 5	58 75	140937 219	2 230	6 355
25Y96H	POND 5	59 00	146691 484	2 321	6 433
25Y96H	POND 5	59 25	153819 594	2 434	9 408
25Y96H	POND 5	59 50	163236 109	2 583	11 518
25Y96H	POND 5	59 75	195314 453	3 091	59 767
25Y96H	POND 5	60 00	262901 719	4 160	90 427
25Y96H	POND 5	60 25	326456 125	5 166	50 805
25Y96H	POND 5	60 50	360202 313	5 700	24 186
25Y96H	POND 5	60 75	377484 063	5 973	14 218
25Y96H	POND 5	61 00	388525 469	6 148	10 319
25Y96H	POND 5	61 25	396677 188	6 277	7 796
25Y96H	POND 5	61 50	403129 906	6 379	6 543
25Y96H	POND 5	61 75	408930 938	6 471	6 348
25Y96H	POND 5	62 00	414628 063	6 561	6 312
25Y96H	POND 5	63 00	433071 844	6 853	3 934
25Y96H	POND 5	64 00	447241 000	7 077	3 938
25Y96H	POND 5	65 00	458614 531	7 257	2 381
25Y96H	POND 5	66 00	467190 125	7 392	2 383
25Y96H	POND 5	67 00	475773 938	7 528	2 386
25Y96H	POND 5	68 00	484363 531	7 664	2 386
25Y96H	POND 5	69 00	491524 094	7 777	1 592
25Y96H	POND 5	70 00	497255 656	7 868	1 593
25Y96H	POND 5	71 00	502987 125	7 959	1 592
25Y96H	POND 5	72 00	508714 844	8 050	1 590
25Y96H	POND 5	73 00	513068 125	8 118	0 828
25Y96H	POND 5	74 00	516049 156	8 166	0 828
25Y96H	POND 5	75 00	519030 938	8 213	0 828
25Y96H	POND 5	76 00	522013 656	8 260	0 829
25Y96H	POND 5	77 00	525009 313	8 307	0 836
25Y96H	POND 5	78 00	528018 000	8 355	0 836
25Y96H	POND 5	79 00	531027 313	8 403	0 836
25Y96H	POND 5	80 00	534037 625	8 450	0 836
25Y96H	POND 5	81 00	537036 500	8 498	0 830
25Y96H	POND 5	82 00	540023 875	8 545	0 830
25Y96H	POND 5	83 00	543012 000	8 592	0 830
25Y96H	POND 5	84 00	546001 063	8 639	0 830
25Y96H	POND 5	85 00	548990 688	8 687	0 831
25Y96H	POND 5	86 00	551981 125	8 734	0 831
25Y96H	POND 5	87 00	554972 188	8 781	0 831
25Y96H	POND 5	88 00	557964 188	8 829	0 831
25Y96H	POND 5	89 00	560969 000	8 876	0 838
25Y96H	POND 5	90 00	563986 813	8 924	0 838
25Y96H	POND 5	91 00	567005 250	8 972	0 839
25Y96H	POND 5	92 00	570024 375	9 020	0 839
25Y96H	POND 5	93 00	573032 063	9 067	0 832
25Y96H	POND 5	94 00	576028 125	9 115	0 832
25Y96H	POND 5	95 00	579024 938	9 162	0 833
25Y96H	POND 5	96 00	582015 063	9 209	0 829
25Y96H	POND 5	97 00	583506 500	9 233	0 000
25Y96H	POND 5	98 00	583506 500	9 233	0 000
25Y96H	POND 5	99 00	583506 500	9 233	0 000
25Y96H	POND 5	100 00	583506 500	9 233	0 000

Total Volume
= 13.36 ac-ft X

13.39

STAGE / STORAGE CALCULATIONS

HNTB

		DATE
MADE BY	msf	24 Sep 08
CHCK BY	BJS	8 Jan 09

PROJECT HARTWOOD MARSH ROAD PHASE II

POND 5

Boring	Approx Existing Ground Elevation	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	GNE	17	92 49	
AB P62	104 27	GNE	17	87 27	87 215
AB P63	101 15	GNE	17	84 15	
AB P64	101 95	GNE	17	84 95	

96.77 = 87

83 ??

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

X 100.95

AVG SHWT ELEVATION 87 2 Ft (NAVD)

AVG GROUND WATER TABLE ELEVATION GNE Ft (NAVD)

AVG EXIST GROUND ELEVATION AT BORING LOCATIONS 104 2 Ft (NAVD)

Cumul' ne
Vol ne

0
0 86

STAGE Ft (NAVD)	AREA AC	AVERAGE AREA AC	INCREMENTAL VOL. AF
90 0	0 83		0 00
		0 86	
91 0	0 90		0 86
		1 00	
92 0	1 02		1 00
		1 06	
93 0	1 11		1 06
		1 19	
94 0	1 19		1 19
		1 24	
95 0	1 28		1 24
		1 33	
96 0	1 38		1 33
		1 42	
97 0	1 47		1 42
		1 52	
98 0	1 56		1 52
		1 61	
99 0	1 66		1 61
		1 71	
100 0	1 76		1 71
		1 81	
101 0	1 86		1 81
		2 03	
102 0	2 20		2 03
TOTAL			**16 80**

12 96 ≈ 13.36
14.77
16 8

TOP EL OF TREATMENT VOLUME 101 27 Ft

AVE PERCOLATION RATE 21 Ft /Day or 10 5 Inches/Hr

FACTOR OF SAFTEY 2 = 5 25 Inches/Hr

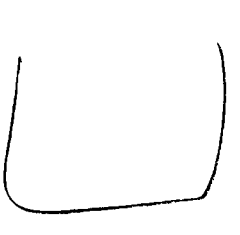
EL	VOL
100	12 96
X	13.36
101	14 77

X = 100 + ?

101

Grade @ Bottom = 105 MS

(Burns MB-PG1, MB-PG2, MB-PG3, MB-PG4
W/R Pond Footprint



88 SWT = 17' BLS

85.4 BOA = 19.6 BLS

1.1 Ratio per Geotech Report

- Ka = (17+25)/2 = 21
- Kw = 21/15 = 1.4

} No Fs

C-

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 5 Water Quality Recovery
Project Number	41561 1
Engineer	MSF
Supervising Engineer	
Date	12 11 2008

Aquifer Data

Base Of Aquifer Elevation [B] (ft datum)	86 00
Water Table Elevation [WT] (ft datum)	87 00
Horizontal Saturated Hydraulic Conductivity [Kh] (ft/day)	21 00
Fillable Porosity [n] (%)	25 00
Unsaturated Vertical Infiltration Rate [Iv] (ft/day)	14 0
Maximum Area For Unsaturated Infiltration [Av] (ft²)	84942 0

Based on Gindes each boring location

Check Recovery for 1/2 time

Geometry Data

Equivalent Pond Length [L] (ft)	424 0
Equivalent Pond Width [W] (ft)	255 0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
90 00	29131 0
91 00	32636 0
92 00	36285 0
93 00	40078 0
94 00	45865 0
95 00	50550 0
96 00	55346 0
97 00	60253 0
98 00	65271 0
99 00	70400 0
100 00	75640 0
101 00	80991 0
102 00	96044 0

Scenario Input Data

Scenario 1 Water Quality

Hydrograph Type Slug Load
Modflow Routing Routed with infiltration

Treatment Volume (ft^3) 81457 = 1.87 ac-ft

Initial ground water level (ft datum) default 87 00

Time After Storm Event (days)	Time After Storm Event (days)
0 100	2 000
0 250	2 500
0 500	3 000
1 000	3 500
1 500	4 000

Detailed Results *Scenario 1 Water Quality*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
0 000	13576 1700	0 0000	87 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	13576 1700	0 0000	92 433	4 72129	0 00000	81457 0	28 3	0 0	U/P
2 400	0 0000	0 0000	90 923	3 68858	0 00000	81457 0	53092 2	0 0	U/P
6 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
12 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
24 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
36 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
48 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
60 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
72 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
84 000	0 0000	0 0000				81457 0	81457 0	0 0	dry
96 000	0 0000	0 0000				81457 0	81457 0	0 0	dry

← Recovery <6hrs

Scenario Input Data

Scenario 1 25 year/96 hour

Hydrograph Type Slug Load
Modflow Routing Routed with infiltration

Treatment Volume (ft^3) 582015 ≈ 13,36

Initial ground water level (ft datum) default 87 00

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	2 500	6 500	9 500	12 500
0 250	3 000	7 000	10 000	13 000
0 500	3 500	7 500	10 500	13 500
1 000	4 000	8 000	11 000	14 000
1 500	4 500	8 500	11 500	14 500
2 000	6 000	9 000	12 000	

Detailed Results

Scenario 1 25 year/96 hour

Elapsed Time (hours)	Inflow Rate (ft /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft /s)	Overflow Discharge (ft /s)	Cumulative Inflow Volume (ft)	Cumulative Infiltration Volume (ft)	Cumulative Discharge Volume (ft)	Flow Type
0 000	97002 5000	0 0000	87 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	97002 5000	0 0000	100 279	5 86314	0 00000	582015 0	35 2	0 0	U/P
2 400	0 0000	0 0000	98 821	10 81897	0 00000	582015 0	108994 9	0 0	U/P
6 000	0 0000	0 0000	97 280	5 48814	0 00000	582015 0	214175 3	0 0	U/S
12 000	0 0000	0 0000	96 908	0 95089	0 00000	582015 0	238124 1	0 0	S
24 000	0 0000	0 0000	96 471	0 54555	0 00000	582015 0	265563 7	0 0	S
36 000	0 0000	0 0000	96 150	0 40827	0 00000	582015 0	285259 3	0 0	S
48 000	0 0000	0 0000	95 891	0 33064	0 00000	582015 0	300838 1	0 0	S
60 000	0 0000	0 0000	95 671	0 27982	0 00000	582015 0	313826 2	0 0	S
72 000	0 0000	0 0000	95 479	0 24355	0 00000	582015 0	325014 3	0 0	S
84 000	0 0000	0 0000	95 308	0 21615	0 00000	582015 0	334868 8	0 0	S
96 000	0 0000	0 0000	95 152	0 19459	0 00000	582015 0	343689 5	0 0	S
108 000	0 0000	0 0000	95 010	0 17586	0 00000	582015 0	351681 4	0 0	S
144 000	0 0000	0 0000	94 661	0 14060	0 00000	582015 0	370917 5	0 0	S
156 000	0 0000	0 0000	94 551	0 13348	0 00000	582015 0	376878 7	0 0	S
168 000	0 0000	0 0000	94 447	0 12500	0 00000	582015 0	382449 8	0 0	S
180 000	0 0000	0 0000	94 349	0 11753	0 00000	582015 0	387678 6	0 0	S
192 000	0 0000	0 0000	94 257	0 11089	0 00000	582015 0	392604 2	0 0	S
204 000	0 0000	0 0000	94 168	0 10494	0 00000	582015 0	397259 2	0 0	S
216 000	0 0000	0 0000	94 084	0 09958	0 00000	582015 0	401671 1	0 0	S
228 000	0 0000	0 0000	94 003	0 09473	0 00000	582015 0	405863 3	0 0	S
240 000	0 0000	0 0000	93 926	0 09032	0 00000	582015 0	409855 9	0 0	S
252 000	0 0000	0 0000	93 852	0 08628	0 00000	582015 0	413666 7	0 0	S
264 000	0 0000	0 0000	93 781	0 08258	0 00000	582015 0	417310 8	0 0	S
276 000	0 0000	0 0000	93 712	0 07917	0 00000	582015 0	420801 6	0 0	S
288 000	0 0000	0 0000	93 646	0 07601	0 00000	582015 0	424150 7	0 0	S
300 000	0 0000	0 0000	93 583	0 07308	0 00000	582015 0	427368 7	0 0	S
312 000	0 0000	0 0000	93 521	0 07036	0 00000	582015 0	430464 8	0 0	S
324 000	0 0000	0 0000	93 461	0 06781	0 00000	582015 0	433447 5	0 0	S
336 000	0 0000	0 0000	93 404	0 06544	0 00000	582015 0	436324 1	0 0	S
348 000	0 0000	0 0000	93 348			582015 0	439101 4	0 0	N A

After 14 days 75% Recovered

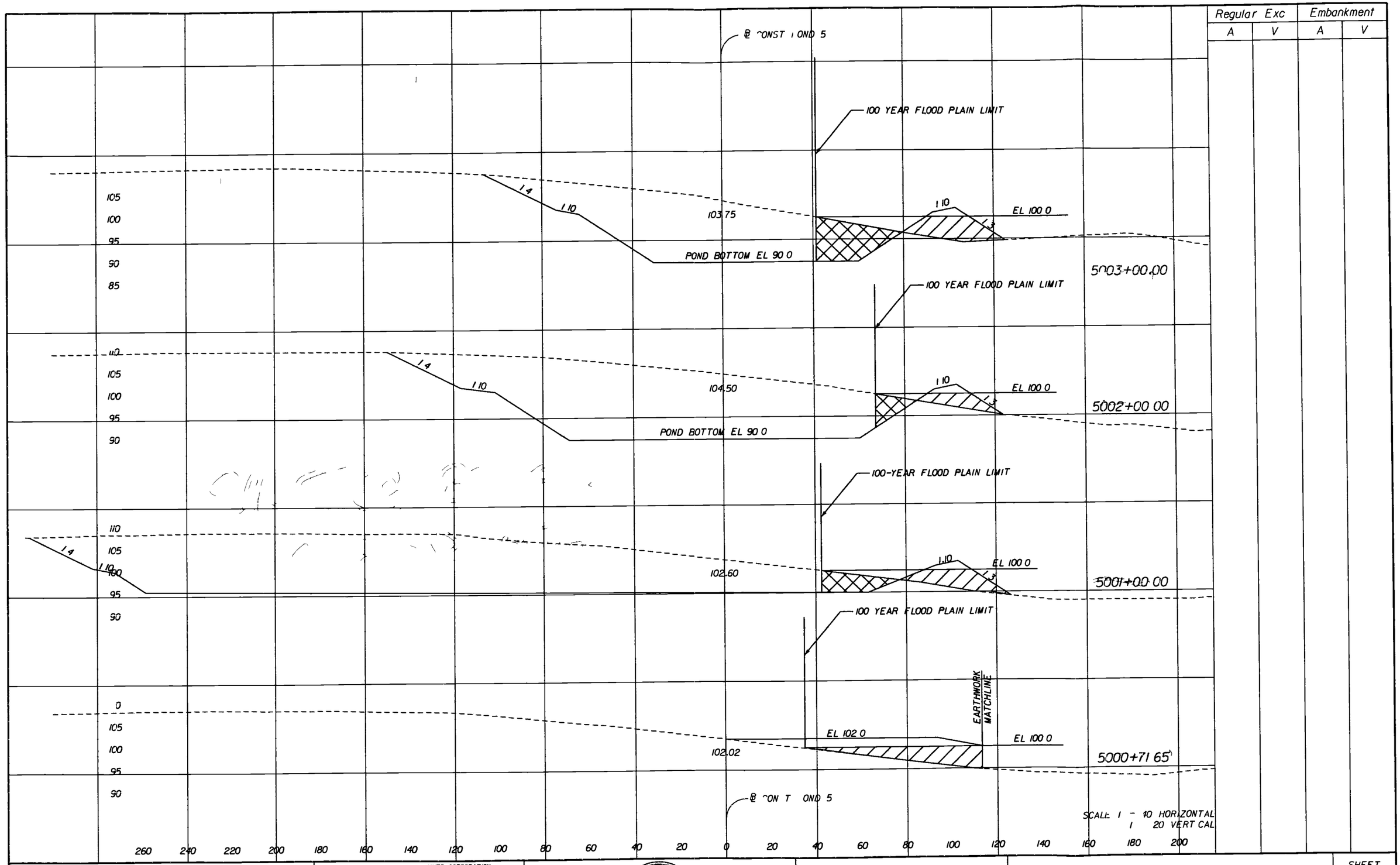
Remaining Volume in Pond 3 34 ac-ft
Add 2nd Storm 13 36 ac-ft
16 70 ac-ft

equates to El 101 91 ft in pond

Pond will not overTOP

top of BANK @ 102 Ft

Regular Exc		Embankment	
A	V	A	V



REVISIONS		
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

LAKE COUNTY
FLORIDA

HARTWOOD MARSH ROAD - PHASE II

CROSS SECTIONS FLOOD PLAIN

SHEET NO

Regular Exc		Embankment	
A	V	A	V

℄ CONST HARTWOOD MARSH ROAD

100 YEAR FLOOD PLAIN LIMIT

110

100

106 66

Exist R/W

106 66

EASEMENT

Exist R/W

1:2

ELEV 100 0

104.32

Prop R/W

EASEMENT

268+00 00

1:3

90

58

100 YEAR FLOOD PLAIN LIMIT

110

100

104 63

Exist R/W

104 63

ELEV 100 0

102 61

EASEMENT

Exist R/W

1:2

266+52
GNE

267+38
GNE

Prop R/W

EASEMENT

267+00.00

1:3

80

59

80

SCALE 1 = 20 HORIZONTAL
1 = 10 VERTICAL

℄ CONST HARTWOOD MARSH ROAD

140 120 100 80 60 40 20 0 20 40 60 80 100

REVISIONS		
DATE	BY	DESCRIPTION

HNTB

HNTB CORPORATION
300 PR MERA 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

LAKE COUNTY
FLORIDA

HARTWOOD MARSH ROAD - PHASE II

CROSS SECTIONS FLOOD PLAIN

SHEET NO

mf /1/2009 07 P \LK 00\prnw j b 56 56 0000 d g \RD SRD0 f S G

H tw d M h R d Ph II
P t D v lopm nt
P d 6 H tw d
Hyd l gy T m S 25y/96h
09 15 08

S mul t n	N d	T m h	V lum ft3	V lum n	R te f
25Y96H	POND 6	57 50	42109 719	1 231	1 444
25Y96H	POND 6	57 75	43414 898	1 270	1 456
25Y96H	POND 6	58 00	44732 000	1 308	1 471
25Y96H	POND 6	58 25	46462 363	1 359	2 375
25Y96H	POND 6	58 50	48719 566	1 425	2 641
25Y96H	POND 6	58 75	51122 242	1 495	2 698
25Y96H	POND 6	59 00	53566 742	1 567	2 734
25Y96H	POND 6	59 25	56811 637	1 661	4 477
25Y96H	POND 6	59 50	61094 000	1 787	5 040
25Y96H	POND 6	59 75	79021 328	2 311	34 799
25Y96H	POND 6	60 00	114716 914	3 355	44 525
25Y96H	POND 6	60 25	142269 641	4 161	16 704
25Y96H	POND 6	60 50	154244 031	4 511	9 906
25Y96H	POND 6	60 75	161262 859	4 716	5 691
25Y96H	POND 6	61 00	165999 406	4 855	4 835
25Y96H	POND 6	61 25	169715 641	4 963	3 424
25Y96H	POND 6	61 50	172657 906	5 049	3 115
25Y96H	POND 6	61 75	175444 359	131	3 077
25Y96H	POND 6	62 00	178211 922	5 212	3 073
25Y96H	POND 6	63 00	187202 594	5 475	1 922
25Y96H	POND 6	64 00	194135 063	5 677	1 929
25Y96H	POND 6	65 00	199712 703	5 840	1 170
25Y96H	POND 6	66 00	203926 953	5 964	1 172
25Y96H	POND 6	67 00	208150 781	6 087	1 175
25Y96H	POND 6	68 00	212383 734	6 211	1 177
25Y96H	POND 6	69 00	215918 000	6 314	0 787
25Y96H	POND 6	70 00	218751 375	6 397	0 787
25Y96H	POND 6	71 00	221586 750	6 480	0 788
25Y96H	POND 6	72 00	224422 922	6 563	0 788
25Y96H	POND 6	73 00	226580 953	6 626	0 411
25Y96H	POND 6	74 00	228060 250	6 669	0 411
25Y96H	POND 6	75 00	229539 703	6 713	0 411
25Y96H	POND 6	76 00	231020 328	6 756	0 411
25Y96H	POND 6	77 00	232508 172	6 800	0 415
25Y96H	POND 6	78 00	234003 219	6 843	0 415
25Y96H	POND 6	79 00	235499 484	6 887	0 416
25Y96H	POND 6	80 00	236996 844	6 931	0 416
25Y96H	POND 6	81 00	238489 281	6 974	0 413
25Y96H	POND 6	82 00	239976 813	7 018	0 413
25Y96H	POND 6	83 00	241465 391	7 062	0 414
25Y96H	POND 6	84 00	242955 125	7 105	0 414
25Y96H	POND 6	85 00	244445 906	7 149	0 414
25Y96H	POND 6	86 00	245937 750	7 192	0 415
25Y96H	POND 6	87 00	247430 688	7 236	0 415
25Y96H	POND 6	88 00	248924 688	7 280	0 415
25Y96H	POND 6	89 00	250425 813	7 324	0 419
25Y96H	POND 6	90 00	251934 078	7 368	0 419
25Y96H	POND 6	91 00	253443 422	7 412	0 419
25Y96H	POND 6	92 00	254953 781	7 456	0 420
25Y96H	POND 6	93 00	256459 016	7 500	0 417
25Y96H	POND 6	94 00	257959 172	7 544	0 417
25Y96H	POND 6	95 00	259460 313	7 588	0 417
25Y96H	POND 6	96 00	260956 672	7 632	0 414
25Y96H	POND 6	97 00	261703 250	7 653	0 001
25Y96H	POND 6	98 00	261704 313	7 653	0 000
25Y96H	POND 6	99 00	261704 313	7 653	0 000
25Y96H	POND 6	100 00	261704 313	7 653	0 000

Total Volume
601 ac-ft ✓

Base of Bottom = 120 (Avg)
Borings AB-P15 & AB-P13 (proximity)
(EL 130±, EL 117.8)

105 SMT = 15' BLS

102.5' BOA = (30+15)/2 BLS = 17.5' BLS

K_h = 30 fpd
K_v = 30/15 = 2.0
C =

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	12 10 2008

Aquifer Data

Base Of Aquifer Elevation [B] (ft datum)	97 00
Water Table Elevation [WT] (ft datum)	98 00
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)	50699 5

Geometry Data

Equivalent Pond Length [L] (ft)	265 0
Equivalent Pond Width [W] (ft)	183 0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
112 00	47916 0
113 00	50094 0
114 00	55321 2
115 00	59241 6
116 00	63597 6
117 00	67518 0

Scenario Input Data

Scenario 1 Water Quality

Hydrograph Type Slug Load
Modflow Routing Routed with infiltration

Treatment Volume (ft³) 35283 6 = 0 81 ✓

Initial ground water level (ft datum) default 98 00

Time After Storm Event (days)	Time After Storm Event (days)
0 100	2 000
0 250	2 500
0 500	3 000
1 000	3 500
1 500	4 000

Detailed Results *Scenario 1* *Water Quality*

Elapsed Time (hours)	Inflow Rate (ft /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft /s)	Overflow Discharge (ft /s)	Cumulative Inflow Volume (ft)	Cumulative Infiltration Volume (ft)	Cumulative D scharge Volume (ft)	Flow Type
0 000	5880 6000	0 0000	98 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	5880 6000	0 0000	112 724	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 <24hrs

Detailed Results

Scenario 1

Elapsed Time (hours)	Inflow Rate (ft /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft /s)	Overflow Discharge (ft /s)	Cumulative Inflow Volume (ft)	Cumulative Infiltration Volume (ft)	Cumulative Discharge Volume (ft)	Flow Type
0 000	43617 3900	0 0000	98 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	43617 3900	0 0000	116 636	5 54709	0 00000	261704 3	33 3	0 0	U/P
2 400	0 0000	0 0000	115 645	7 28929	0 00000	261704 3	63586 7	0 0	U/P
6 000	0 0000	0 0000	114 060	6 31231	0 00000	261704 3	156664 3	0 0	U/P
12 000	0 0000	0 0000	111 272	3 24198	0 00000	261704 3	261704 3	0 0	U/S
24 000	0 0000	0 0000	109 708	0 00000	0 00000	261704 3	261704 3	0 0	S
36 000	0 0000	0 0000	108 789	0 00000	0 00000	261704 3	261704 3	0 0	S
48 000	0 0000	0 0000	108 137	0 00000	0 00000	261704 3	261704 3	0 0	S
60 000	0 0000	0 0000	107 633	0 00000	0 00000	261704 3	261704 3	0 0	S
72 000	0 0000	0 0000	107 222	0 00000	0 00000	261704 3	261704 3	0 0	S
84 000	0 0000	0 0000	106 877	0 00000	0 00000	261704 3	261704 3	0 0	S
96 000	0 0000	0 0000	106 579			261704 3	261704 3	0 0	N A

← Recovery <24hrs

B n

Nam BASIN 7 — N d POND 7 — St t On t
G p BASE — Typ SCS U t Hyd g ph CN

Un t Hyd g aph Uh484 — P k g F t 484 0
R nf 11 F 1 Sjrwmd96 — St rm Du t n(h) 96 00
R f 11 Am unt(n) 11 300 — T m f Con (m n) 67 28
A e (a) 5 600 — T m Sh ft(h) 0 00
C v Numb 87 10 — M All w ble Q(f) 999999 000
DCIA(%) 0 00

R d B n

Nam BASIN 7 1 — N d POND 7 — St tu On te
G up BASE — Typ SCS Un t Hyd g ph CN

Un t Hyd og aph Uh484 — P k ng F t 484 0
R nf 11 F 1 Sjrwmd96 — St rm Du t n(h) 96 00
R nf 11 Am unt(n) 11 300 — T m f Con (m n) 5 00
A ( ) 2 540 — T m Sh ft(hr) 0 00
Cu v Numb 61 80 — M x All w ble Q(f) 999999 000
DCIA(%) 0 00

Dry T t 1 Retent n P nd 7

Nam BASIN 7 2 — N d POND 7 — St t On t
G up BASE — Typ SCS U t Hyd g ph CN

Un t Hyd g aph Uh484 — P k ng F t 484 0
R nf 11 F 1 Sjrwmd96 — St rm D t on(h) 96 00
R nf 11 Am nt(n) 11 300 — T m f Con (m n) 65 76
A ( ) 2 520 — T m Sh ft(h) 0 00
C v Numb 39 00 — M All wable Q(f) 999999 000
DCIA(%) 0 00

Off te t d

Nam BASIN 7 3 — N d POND 7 — St t O t
G o p BASE — Typ SCS U t Hyd g ph CN

Un t Hyd g ph Uh484 — P k ng F t 484 0
R f 11 F 1 Sjrwmd96 — St rm D t (h) 96 00
R f 11 Am unt(n) 11 300 — T m f Co (m n) 60 32
A (a) 3 450 — T m Sh ft(h) 0 00
C v Numb 39 00 — M All w ble Q(f) 999999 000
DCIA(%) 0 00

Off te t d

Nod

Nam POND 7 — B Fl w(f) 0 000 — In t St g (ft) 153 000
Gr p BASE — W n St g (ft) 160 000
Typ St g /A

D y T t 1 R t nt P nd 7

St ge(ft)	A (a)
153 000	0 8300
154 000	0 9100
155 000	0 9800
156 000	1 0600
157 000	1 1500
158 000	1 2300
159 000	1 3200
160 000	1 4100
161 000	1 5100

Hyd 1 gy S m 1 t n

H tw d M h R d Ph II
P t D v l pm nt
P nd 7 H tw d
Hyd l gy T m S e
10/18/08

S mul t n	N d	T m h	V lum ft3	V lum n	R t f
25Y96H	POND 7	57 50	47235 340	0 922	1 490
25Y96H	POND 7	57 75	48593 387	0 949	1 528
25Y96H	POND 7	58 00	49982 023	0 976	1 558
25Y96H	POND 7	58 25	51523 414	1 006	1 867
25Y96H	POND 7	58 50	53293 449	1 040	2 066
25Y96H	POND 7	58 75	55282 699	1 079	2 354
25Y96H	POND 7	59 00	57524 402	1 123	2 627
25Y96H	POND 7	59 25	60230 223	1 176	3 386
25Y96H	POND 7	59 50	63504 840	1 240	3 891
25Y96H	POND 7	59 75	72030 313	1 406	15 054
25Y96H	POND 7	60 00	89064 477	1 739	22 799
25Y96H	POND 7	60 25	109252 148	2 133	22 062
25Y96H	POND 7	60 50	130488 875	2 548	25 131
25Y96H	POND 7	60 75	151346 469	2 955	21 220
25Y96H	POND 7	61 00	168156 656	3 283	16 136
25Y96H	POND 7	61 25	180657 234	3 527	11 643
25Y96H	POND 7	61 50	189846 406	3 707	8 778
25Y96H	POND 7	61 75	196856 328	3 843	6 800
25Y96H	POND 7	62 00	202427 359	3 952	5 580
25Y96H	POND 7	63 00	217736 234	4 251	2 925
25Y96H	POND 7	64 00	227478 844	4 441	2 488
25Y96H	POND 7	65 00	235083 641	4 590	1 737
25Y96H	POND 7	66 00	240950 500	4 704	1 522
25Y96H	POND 7	67 00	246401 203	4 811	1 506
25Y96H	POND 7	68 00	251831 203	4 917	1 511
25Y96H	POND 7	69 00	256599 000	5 010	1 138
25Y96H	POND 7	70 00	260496 297	5 086	1 027
25Y96H	POND 7	71 00	264176 063	5 158	1 017
25Y96H	POND 7	72 00	267839 625	5 229	1 018
25Y96H	POND 7	73 00	270850 750	5 288	0 655
25Y96H	POND 7	74 00	273008 594	5 330	0 544
25Y96H	POND 7	75 00	274947 500	5 368	0 533
25Y96H	POND 7	76 00	276867 438	5 406	0 534
25Y96H	POND 7	77 00	278795 313	5 443	0 538
25Y96H	POND 7	78 00	280733 625	5 481	0 539
25Y96H	POND 7	79 00	282676 656	5 519	0 540
25Y96H	POND 7	80 00	284622 688	5 557	0 541
25Y96H	POND 7	81 00	286565 500	5 595	0 538
25Y96H	POND 7	82 00	288503 313	5 633	0 538
25Y96H	POND 7	83 00	290441 844	5 671	0 539
25Y96H	POND 7	84 00	292382 813	5 708	0 540
25Y96H	POND 7	85 00	294326 406	5 746	0 540
25Y96H	POND 7	86 00	296272 625	784	0 541
25Y96H	POND 7	87 00	298221 375	5 822	0 542
25Y96H	POND 7	88 00	300172 781	5 861	0 542
25Y96H	POND 7	89 00	302132 656	5 899	0 546
25Y96H	POND 7	90 00	304102 875	5 937	0 548
25Y96H	POND 7	91 00	306077 625	5 976	0 549
25Y96H	POND 7	92 00	308055 063	6 014	0 550
25Y96H	POND 7	93 00	310029 063	6 053	0 547
25Y96H	POND 7	94 00	311997 688	6 091	0 547
25Y96H	POND 7	95 00	313966 781	6 130	0 547
25Y96H	POND 7	96 00	315934 344	6 168	0 546
25Y96H	POND 7	97 00	317142 438	6 192	0 125
25Y96H	POND 7	98 00	317390 125	6 197	0 012
25Y96H	POND 7	99 00	317412 844	6 197	0 000
25Y96H	POND 7	100 00	317413 438	6 197	0 000

Total Volume = 7.29 ac-ft

POLLUTION ABATEMENT VOLUME

HNTB

		DATE
MADE BY	MSF	28 Jun 08
CHCK BY	BJS	10 Jan 09

PROJECT **HARTWOOD MARSH ROAD PHASE II**

LOCATION **BASIN 7**

BASIN LIMITS STA 299+91 00 to STA 322+95 00 CL CONST HARTWOOD MARSH ROAD

TOTAL TREATMENT AREA 15 72 AC 14 11?

IMPERVIOUS AREA 4 53 AC ✓

UNDERINE ONE RETENTION DETENTION

UNDERINE ONE DRY WET

UNDERINE ONE ONLINE OFFLINE NOTE TOTAL RETENTION OF RUNOFF

REQUIRED TREATMENT VOLUME

1) COMPUTE FIRST 0 5 INCH OF RUNOFF FROM PROJECT

(0 5 /12) x 15 72 AC = **0 66** AF

FOR ONLINE TREATMENT ADD 0 5 INCH OF RUNOFF

(0 5 /12) x 15 72 AC = **0 66** AF

TOTAL **1 31** AF

2) COMPUTE 1 25 INCHES TIMES IMPERVIOUS AREA

(1 25 /12) x 4 53 AC = **0 47** AF

FOR ONLINE TREATMENT ADD 0 5 INCH OF RUNOFF

(0 5 /12) x 15 72 AC = **0 66** AF

TOTAL **1 13** AF

CONTROLLING CRITERIA **1**

REQUIRED TREATMENT VOLUME **1 31** AF ✓

Grade C Bottom = 162.5 (Avg)
Boring HAB-P19 w/in Bottom -
(EL 160.4)

147.5' SLMT = 15' BGS

142.5' BLA = 20' BGS

Ka -
KJ
C -
} no perm

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 7 Water Quality Recovery
Project Number	41561 1
Engineer	MSF
Supervising Engineer	
Date	12 09 2008

Aquifer Data

Base Of Aquifer Elevation [B] (ft datum)	139 00
Water Table Elevation [WT] (ft datum)	140 00
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)	58370 4

Geometry Data

Equivalent Pond Length [L] (ft)	264 0
Equivalent Pond Width [W] (ft)	154 0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
153 00	36244 0
154 00	39483 0
155 00	42849 7
156 00	46344 4
157 00	49967 1
158 00	53717 9
159 00	57596 7
160 00	61603 6
161 00	65631 0

Detailed Results

Scenario 1 *Water Quality*

Elapsed Time (hours)	Inflow Rate (ft /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft /s)	Overflow Discharge (ft /s)	Cumulative Inflow Volume (ft)	Cumulative Infiltration Volume (ft)	Cumulative Discharge Volume (ft)	Flow Type
0 000	9510 6000	0 0000	140 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	9510 6000	0 0000	154 476	5 59233	0 00000	57063 6	33 6	0 0	U/P
2 400	0 0000	0 0000	153 063	3 80426	0 00000	57063 6	54761 6	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 < 6hrs

Detailed Results

Scenario 1

Elapsed Time (hours)	Inflow Rate (ft /s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft /s)	Overflow Discharge (ft /s)	Cumulative Inflow Volume (ft)	Cumulative Infiltration Volume (ft)	Cumulative Discharge Volume (ft)	Flow Type
0 000	52902 2300	0 0000	140 000	0 00000	0 00000	0 0	0 0	0 0	N A
0 002	52902 2300	0 0000	159 634	5 59453	0 00000	317413 4	33 6	0 0	U/P
2 400	0 0000	0 0000	158 216	9 06959	0 00000	317413 4	82094 1	0 0	U/P
6 000	0 0000	0 0000	156 056	6 75348	0 00000	317413 4	191178 3	0 0	U/P
12 000	0 0000	0 0000	154 060	2 94736	0 00000	317413 4	277167 0	0 0	U/S
24 000	0 0000	0 0000	153 061	0 46581	0 00000	317413 4	315190 6	0 0	S
36 000	0 0000	0 0000	151 878	0 02573	0 00000	317413 4	317413 4	0 0	S
48 000	0 0000	0 0000	151 026	0 00000	0 00000	317413 4	317413 4	0 0	S
60 000	0 0000	0 0000	150 384	0 00000	0 00000	317413 4	317413 4	0 0	S
62 400	0 0000	0 0000	150 263	0 00000	0 00000	317413 4	317413 4	0 0	S
64 800	0 0000	0 0000	150 148	0 00000	0 00000	317413 4	317413 4	0 0	S
67 200	0 0000	0 0000	150 038	0 00000	0 00000	317413 4	317413 4	0 0	S
69 600	0 0000	0 0000	149 934	0 00000	0 00000	317413 4	317413 4	0 0	S
72 000	0 0000	0 0000	149 834	0 00000	0 00000	317413 4	317413 4	0 0	S
74 400	0 0000	0 0000	149 739	0 00000	0 00000	317413 4	317413 4	0 0	S
76 800	0 0000	0 0000	149 647	0 00000	0 00000	317413 4	317413 4	0 0	S
79 200	0 0000	0 0000	149 559	0 00000	0 00000	317413 4	317413 4	0 0	S
81 600	0 0000	0 0000	149 475	0 00000	0 00000	317413 4	317413 4	0 0	S
84 000	0 0000	0 0000	149 393	0 00000	0 00000	317413 4	317413 4	0 0	S
96 000	0 0000	0 0000	149 042	0 00000	0 00000	317413 4	317413 4	0 0	S
108 000	0 0000	0 0000	148 734	0 00000	0 00000	317413 4	317413 4	0 0	S
120 000	0 0000	0 0000	148 462	0 00000	0 00000	317413 4	317413 4	0 0	S
132 000	0 0000	0 0000	148 218	0 00000	0 00000	317413 4	317413 4	0 0	S
144 000	0 0000	0 0000	147 997	0 00000	0 00000	317413 4	317413 4	0 0	S
156 000	0 0000	0 0000	147 796	0 00000	0 00000	317413 4	317413 4	0 0	S
168 000	0 0000	0 0000	147 611	0 00000	0 00000	317413 4	317413 4	0 0	S
180 000	0 0000	0 0000	147 441	0 00000	0 00000	317413 4	317413 4	0 0	S
192 000	0 0000	0 0000	147 283	0 00000	0 00000	317413 4	317413 4	0 0	S
204 000	0 0000	0 0000	147 136	0 00000	0 00000	317413 4	317413 4	0 0	S
216 000	0 0000	0 0000	146 999	0 00000	0 00000	317413 4	317413 4	0 0	S
228 000	0 0000	0 0000	146 870	0 00000	0 00000	317413 4	317413 4	0 0	S
240 000	0 0000	0 0000	146 749	0 00000	0 00000	317413 4	317413 4	0 0	S
252 000	0 0000	0 0000	146 635	0 00000	0 00000	317413 4	317413 4	0 0	S
264 000	0 0000	0 0000	146 527	0 00000	0 00000	317413 4	317413 4	0 0	S
276 000	0 0000	0 0000	146 424	0 00000	0 00000	317413 4	317413 4	0 0	S
288 000	0 0000	0 0000	146 327	0 00000	0 00000	317413 4	317413 4	0 0	S
300 000	0 0000	0 0000	146 235	0 00000	0 00000	317413 4	317413 4	0 0	S
312 000	0 0000	0 0000	146 146	0 00000	0 00000	317413 4	317413 4	0 0	S
324 000	0 0000	0 0000	146 062	0 00000	0 00000	317413 4	317413 4	0 0	S
336 000	0 0000	0 0000	145 981	0 00000	0 00000	317413 4	317413 4	0 0	S
348 000	0 0000	0 0000	145 904	0 00000	0 00000	317413 4	317413 4	0 0	S
360 000	0 0000	0 0000	145 830			317413 4	317413 4	0 0	N A

← Recovery < 2 days

TABLE 1

Laboratory Test Results
Hartwood Marsh Road
from US 27 to Lake/Orange County Line
Lake County Florida

Boring No	Approx Station	Approx Offset (ft)	Approx Sample Depth (ft)	Stratum No	Natural Moisture Content (%)	Percent Passing Sieve Size (/)					Organic Content (/)	Atterberg Limits		AASHTO Class
						#10	#40	#60	#100	#200		LL	PI	
AB 11	21+51	29R	7 11	1	7					9				A 3
AB 11	21+51	29R	18 20	1	4					8				A 3
AB 14	24+34	24R	0 5 2	1	6					4				A 3
AB 26	36+26	23R	12 17	1	4					7				A 3
AB 38	48+29	17R	0 1 5	1	7					6				A 3
AB 39	49+26	28L	1 5 2 5	2	6	100	84	44	17	14				A 2 4
AB 45	55+26	34L	2 5	1	3	100	51	12	3	2				A 3
AB 51	61+24	55L	0 5	1	4					3				A 3
AB 64	74+18	11R	0 2	1	8	100	86	51	23	5				A 3
AB 76	85+16	588R	0 2	1	10					5				A 3
AB 86	143+82	8R	2 7	1	3					2				A 3
AB 96	154+20	18R	0 2	1	2	100	81	30	4	1				A 3
AB 121	179+21	40R	14 19	2	10					16				A 2-4
AB 121	179+21	40R	19 20	2	11					18				A 2-4
AB 136	194+24	44R	13 18	1	6					6				A 3
AB 144	202+39	4L	0 1	2	7	100	90	55	24	14				A 2 4
AB 156	214+17	2L	3 8	1	4	100	84	38	8	2				A 3
AB 168	226+15	3R	3 4	1	8					10				A 3
AB 171	229+44	43R	14 19	1	4					4				A 3
AB P1	128+56	853R	18 20	1	5					10				A 3
AB P2	130+10	726R	6 10	1	3					2				A 3
AB P3	150+88	1245R	0 5	1	12					3				A 3
AB P8	173+51	196R	5 9	1	4					9				A 3
AB P12	265+73	239R	0 5	1	2					3				A 3
AB P14	268+83	523R	13 5 18 5	1	11					19				A 2-4
AB P15	281+35	632L	0 5	1	3	100	78	33	8	3				A 3
AB P16	282+77	1092L	11 5 12 5	1	16					34				A 2 4
AB P18	287+10	1041L	14 17	1	5					13				A 2-4
AB P20	309+28	722L	0 5	1	3	100	83	34	8	3				A 3

TABLE 2

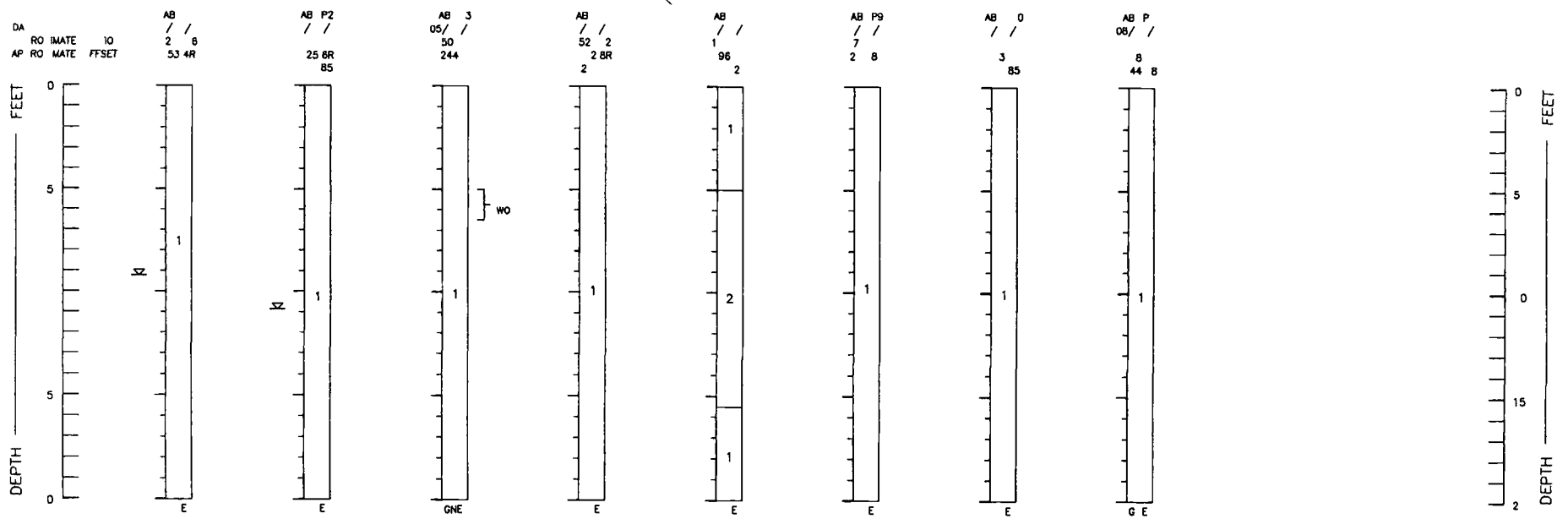
Falling Head Permeability Test Results
Hartwood Marsh Road Ponds
From US 27 to Lake/Orange County Line
Lake County Florida

(K_h)

Test Location	Test Depth (feet)	Measured Permeability (inches/hour)
AB P2	4 5	12
AB P3	3 4	15
AB P8	3 4	20 40 fpd
AB P10	4 5	6
AB P14	3 4	18
AB P15	4 5	15
AB P17	4 5	20
AB P20	4 5	20

Ponds 6

POND 3B



LEGEND

GSE APPROXIMATE GROUND SRUFACE ELEVATION

GNE GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED
ESHWL MORE THAN 15 FEET BELOW GROUND SURFACE

▽ ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL

NOTES 1 BORING STATIONS AND OFFSETS ARE REFERENCED FROM THE CENTERLINE OF SURVEY PROVIDED ON A PLAN VIEW BY THE PROJECT SURVEYOR SOUTHEASTERN SURVEYING THESE STATIONS AND OFFSETS WERE ESTIMATED FROM THE PLAN VIEW BY ARDAMAN MORE ACCURATE STATIONS AND OFFSETS SHOULD BE AVAILABLE FROM SOUTHEASTERN SURVEYING

2 GROUND SURFACE ELEVATIONS AT THE BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR SOUTHEASTERN SURVEYING

REVISIONS								
No.	By	Description	No.	By	Description		Name	Date
						Drn.		05/
						Checks by		
						Drn. grad		
						Checked		
						Approved		

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ENG. AUTH NO 50

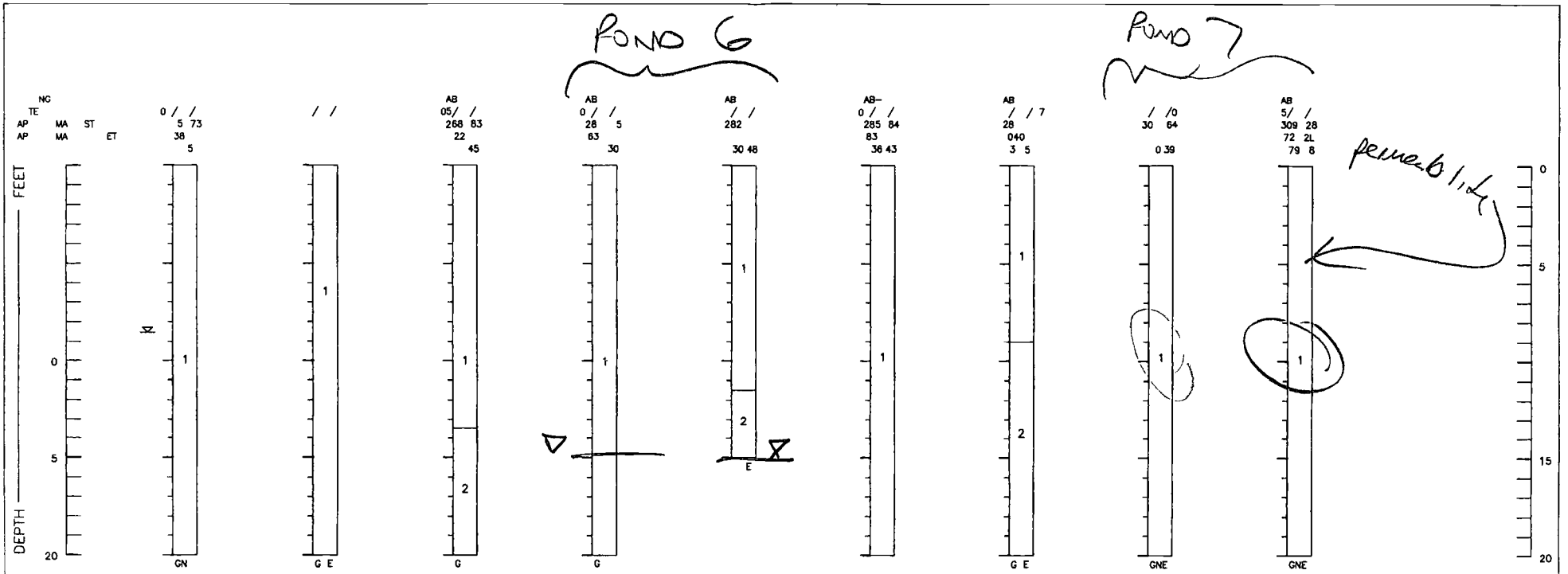
Admn & A o i te l

LAKE COUNTY

BORING PROFILES
HARTWOOD MARSH ROAD PONDS
FROM US27 TO LAKE/ORANGE COUNTY LINE
LAKE COU TY FLOR DA

NO

FIGURE 21



LEGEND

GSE APPROXIMATE GROUND SRUFACE ELEVATION

GNE GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED

ESHWL BELOW BOTTOM OF BORING

ESHWL MORE THAN 15 FEET BELOW GROUND SURFACE

ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL

NOTES 1 BORING STATIONS AND OFFSETS ARE REFERENCED FROM THE CENTERLINE OF SURVEY PROVIDED ON A PLAN VIEW BY THE PROJECT SURVEYOR SOUTHEASTERN SURVEYING THESE STATIONS AND OFFSETS WERE ESTIMATED FROM THE PLAN VIEW BY ARDAMAN MORE ACCURATE STATIONS AND OFFSETS SHOULD BE AVAILABLE FROM SOUTHEASTERN SURVEYING

2 GROUND SURFACE ELEVATIONS AT THE BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR SOUTHEASTERN SURVEYING

RE S ONS

				Dra	None
				Checke	
				gned	
				Checked by	
				Approved	

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FL R

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LANDO FL 32858 3003
EN AUTH 5950

A d m &
A t I

LAKE COUNTY

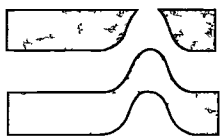
BORING PROFILES
HARTWOOD MARSH ROAD PO DS
FR US27 TO LAKE/ORANGE CO NTY E
LA OU TY O DA

HE NO

FIGURE 22

Addition Subsurface Soil Exploration and
Geotechnical Engineering Evaluation
Hartwood Marsh Road Pond 6
Lake County Florida

Note:
This is Pond 5
in the design
& calculations
-msf



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MEMBERS
A S F E
America Concrete Institute
American Society for Testing and Materials
Florida Inst tute of Consult ng Engineers

Ardaman & Associates, Inc

Geotechnical Environmental and
Materials Consultants

June 24 2008
File No 05 6844

HNTB
300 Primera Boulevard Suite 200
Lake Mary Florida 32746

actually Pond 5

Attention Mr William Umlauf P E

Subject Additional Subsurface Soil Exploration and Geotechnical Engineering Evaluation
Hartwood Marsh Road Pond 6
Lake County Florida

Dear Mr Umlauf

As requested and authorized we have completed additional Subsurface Soil Exploration for the Hartwood Marsh Road project specifically for Pond 6 The purpose of performing this additional exploration was to explore the soil stratigraphy in the Pond 6 area In addition we have estimated the normal seasonal high groundwater level at the boring locations This report documents our findings

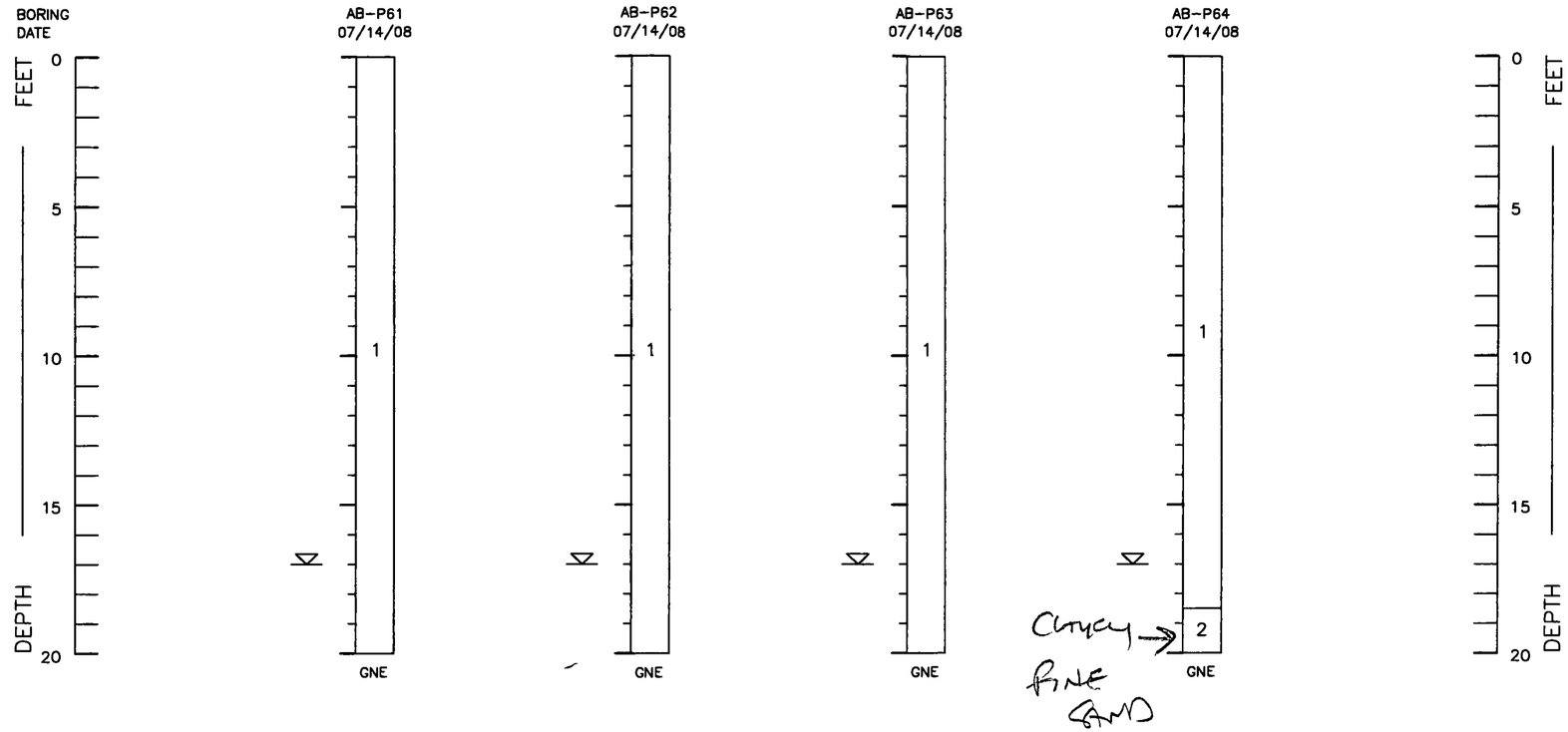
We note that Ardaman & Associates previously performed a Subsurface Soil Exploration relative to the Hartwood Marsh Road project and submitted the results in a report dated September 6 2007 (A&A File No 05 6844) The Roadway Soil Survey summary sheet from our previous exploration is included in Appendix II and should be referred to when reviewing the soil stratigraphy information presented on Figure 2

FIELD EXPLORATION

The additional field exploration program for Pond 6 consisted of performing four auger borings at selected locations inside the proposed pond footprint They were drilled using a truck mounted 4 inch diameter continuous flight auger to a depth of 20 feet below the ground surface A summary of this field procedure is included in Appendix I Representative soil samples were recovered from the auger borings and transported to our laboratory for further analysis

The approximate locations of the borings are schematically illustrated on a site plan shown on Figure 1 These locations were determined in the field using a hand held GPS unit and coordinates obtained from Google Earth The locations should be considered accurate only to the degree implied by the method of measurement used

The results of the auger borings indicate a general soil profile consisting of fine sand to fine sand with silt (A 3) to the boring termination depth of 20 feet This is with the exception of the boring designated AB P64 which encountered clayey fine sand between an approximate depth of 18½ feet and the boring termination depth of 20 feet



LEGEND

AB AUGER BORING LOCATION

GNE GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED

▽ ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL = 17' BLS

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED

REVISIONS					
Dat	By	Descr pt	Date	By	De cr pt on

	Name	D t
Dr wn by	CD	07/08
Checked by	CTJ	07/08
De gned by		
Check d by		
Approv d by		

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Ardaman & Associates Inc

SEAL

LAKE COUNTY

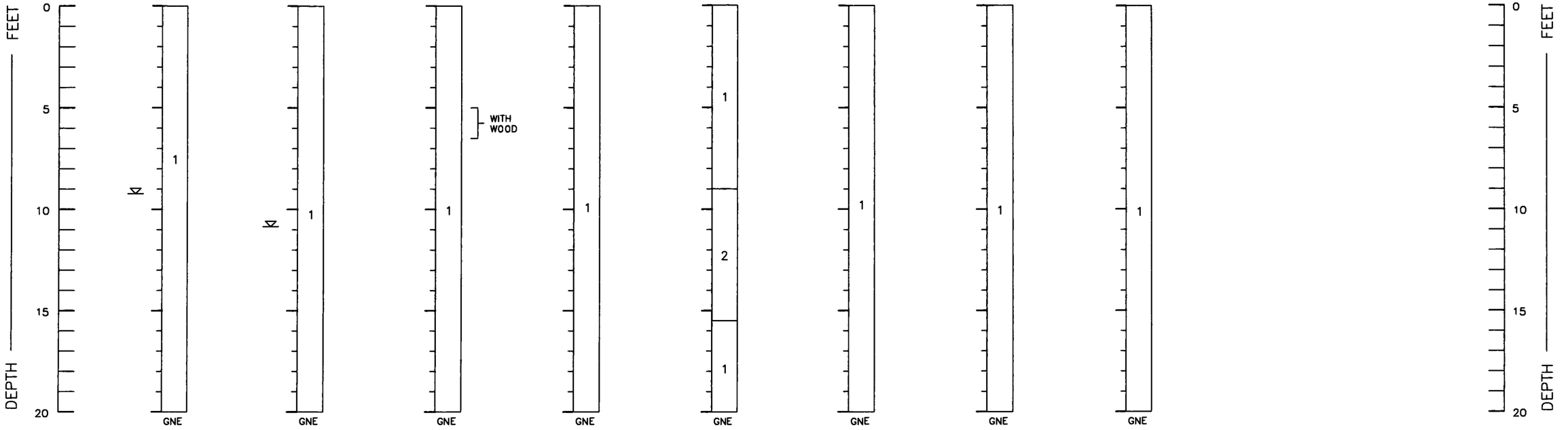
BORING PROFILES
HARTWOOD MARSH ROAD-POND 6
FROM US 27 TO LAKE/ORANGE COUNTY LINE
LAKE COUNTY FLORIDA

SHEET NO

T \0 l d \05\05-6844\056844-6 dwg 7/21/2008 6 18 03 PM h d w

Pond 3B

BORING	AB–P1	AB–P2	AB–P3	AB–P4	AB–P8	AB–P9	AB–P10	AB–P11
DATE	08/16/07	08/16/07	05/14/07	05/14/07	05/14/07	05/14/07	08/17/07	08/17/07
APPROXIMATE STATION	128+56	130+10	150+88	152+82	173+51	175+54	228+49	231+39
APPROXIMATE OFFSET	853 4R	725 6R	1244 6R	1092 8R	196 4R	267 8R	143 0L	118 3L
GSE	101 23	102 85	115 92	127 84	123 25	118 47	150 85	144 08



LEGEND

GSE APPROXIMATE GROUND SRUFACE ELEVATION

GNE GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED

** ESHWL MORE THAN 15 FEET BELOW GROUND SURFACE

▽ ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL

NOTES 1 BORING STATIONS AND OFFSETS ARE REFERENCED FROM THE CENTERLINE OF SURVEY PROVIDED ON A PLAN VIEW BY THE PROJECT SURVEYOR SOUTHEASTERN SURVEYING THESE STATIONS AND OFFSETS WERE ESTIMATED FROM THE PLAN VIEW BY ARDAMAN MORE ACCURATE STATIONS AND OFFSETS SHOULD BE AVAILABLE FROM SOUTHEASTERN SURVEYING

2 GROUND SURFACE ELEVATIONS AT THE BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR SOUTHEASTERN SURVEYING

REVISIONS							Name	Date
Date	By	Descr pt on	Date	By	D cr pt on	Dr wn by	CD	05/07
						Checked by		
						De gned by		
						Check d by		
						Approv d by		

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Ardaman & Associates Inc

SEAL

LAKE COUNTY

BORING PROFILES
HARTWOOD MARSH ROAD PONDS
FROM US27 TO LAKE/ORANGE COUNTY LINE
LAKE COUNTY FLORIDA

SHEET NO

FIGURE 21

T \0 l d \05\05-6844\056844-4 dwg 9/02/2008 2 44 28 PM h d