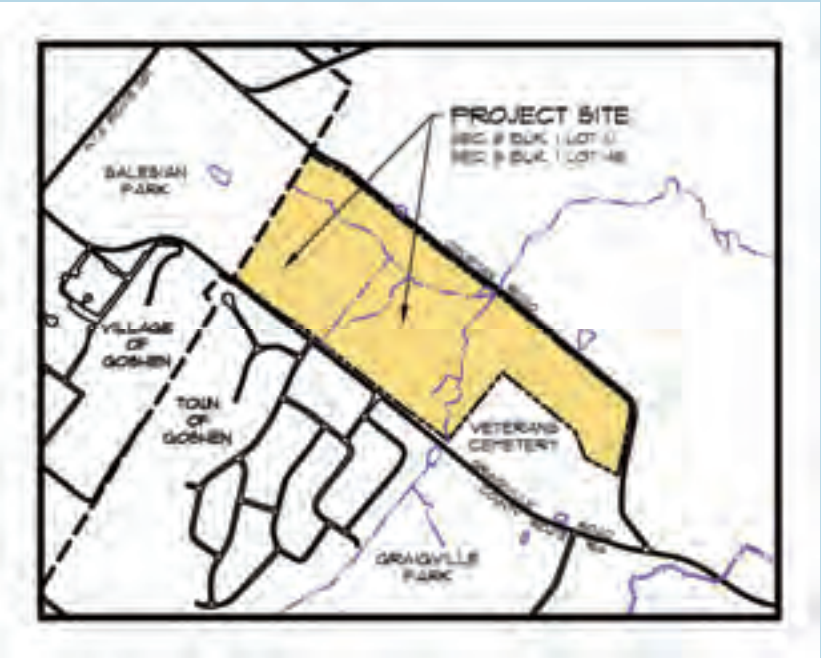
Maplewood Village At Goshen



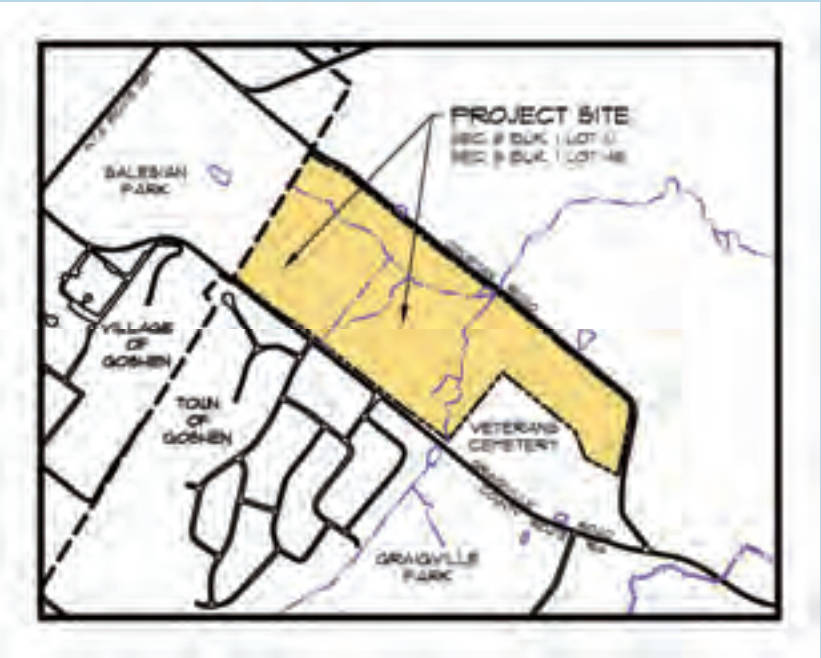
Draft Environmental Impact Statement

Town of Goshen
Orange County, New York

Volume II

May 2008

Maplewood Village At Goshen



Draft Environmental Impact Statement

Town of Goshen
Orange County, New York

Volume II

May 2008

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Maplewood Village at Goshen

COLEMAN ROAD AND CRAIGVILLE ROAD
TOWN OF GOSHEN
ORANGE COUNTY, NEW YORK

Tax Map Designation: Section 8, Block 1, Lot 1.1
Section 8, Block 1, Lot 48

Volume 2 of 3

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Submitted: August 2007
First Revised: January 2008
Final Revision: May 2008

Lead Agency Acceptance Date: May 1, 2008

Public Hearing Date: June 19, 2008 @ 7:30 p.m.

Deadline Date for Comments on the DEIS: July 3, 2008 @ 5:00 p.m.

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Appendix C

Well Testing Program

ADC ORANGE, INC.
SALESIAN PROPERTY-MAPLEWOOD
TOWN OF GOSHEN, NEW YORK

Prepared For:

ADC Orange, Inc.

December 2006

Prepared By:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
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FIGURE
(at end of report)

Figure

1	Site Location Map

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Plate

1	Site Map
2	Key Hydrogeologic Features
3	Well Monitoring Network

HYDROGEOLOGIC SETTING

The 95-acre parcel is located in the Town of Goshen as shown in figure 1. The parcel is undeveloped with adjacent properties developed for residential and recreational use. A cemetery is a subdivided outparcel of the study site. The site is characterized by gently rolling hillsides and it bisects an intermittent stream and wetland feature on the northwestern half of the study parcel.

Surficial Soils

No significant sand and gravel aquifers have been mapped within the immediate area of the study parcel.

The overburden material reported during onsite drilling generally consisted of silty, clayey material interbedded with sand and gravel, consist with till material. Till is not suitable for the development of high-yielding wells.

Bedrock Aquifer

The study parcel and region is underlain by sedimentary bedrock and a significant amount of data is available on the aquifer known as the Martinsburg Formation.

Martinsburg Formation (On)

The name of the dark-gray shale unit underlying the central region of Orange County was reported to be the Normanskill Formation by Offield (1967). Re-evaluation of the characteristics of the unit by Jaffe (1973) identified the prevalent shale unit Orange County as the Martinsburg Formation (On) (Landing, 1994). According to the later interpretation, the Martinsburg Formation consists of the following (Jaffe, 1973):

- Penn Argyl Member – shale (Offield's Snake Hill Member)
- Ramseyburg Member – greywacke and sandstone (Offield's Austin Glen Member)
- Bushkill Member – shale and siltstone – (Offield's Mt. Merino Member)

The Penn Argyl Member, consists of dark gray to grayish-black calcareous shale. The Ramseyburg Member comprises greywacke and sandstone. The Bushkill Member consists of

dark gray calcareous shale and siltstone. These On bedrock units occur in the central region (Plate 2) of Orange County and underlie the study parcel. There is a significant amount of data presently inventoried on the yield potential of the bedrock aquifer.

The fractures exhibited in the fine-grained bedrock units are few and mostly closed fractures. These units are resistant to weathering. The unit likely exhibits low permeability based on the porosity of the bedrock unit, and secondary permeability caused by the presence of interconnected fractures can be low to moderate. Water is contained in fractures, joints, bedding planes, contacts and other secondary openings in the bedrock units. Four wells drilled on the study parcel property yielded between 8 and 250 gpm. Three successful wells drilled for the Orange County Correctional Facility yielded 50 to 130 gpm and are completed in the On bedrock unit in the study region. Three successful wells for the Lone Oak Estates Project in the Town yielded between 15 and 65 gpm. Several other high-yielding wells (50 to 200 gpm) are completed in the On bedrock unit in the study region. The yield of the onsite wells reported at completion of drilling is noted above.

Wells drilled at favorable well sites would likely yield between 25 and 100 gpm. The average and median yields of 56 gpm and 30 gpm, respectively, with yields ranging from 3 to 225 gpm for this unit. Higher yields would likely result from moderately to highly fractured units with a relatively high degree of interconnection (GWRS. LBG 1995).

Local Recharge/Discharge Estimates

A ground-water balance compares the available recharge to a property with the estimated water-supply demand of a proposed development. This comparison determines if the property is self-sufficient in providing the water that will be required by the proposed development, or whether the proposed water demand exceeds the available recharge. If the projected demand exceeds the estimated available recharge, periodically ground-water recharge would have to be drawn from beyond the property boundaries. For sites with tight water balances, water availability within the watershed becomes important to determine if the proposed demand would oversubscribe the available resource. If onsite recharge meets or exceeds the proposed demand, the water supply should be reliable and not adversely affect the aquifer in offsite areas. Although water-budget analyses are useful in estimating available ground water resources,

drilling and testing supply wells is the only definitive indicator of ground water availability from the aquifer source and any potential impacts to neighboring water supplies.

Recharge is generally related to precipitation, but the amount of rainfall, which becomes ground-water recharge is difficult to measure directly. In Orange County, the average precipitation is about 43 inches per year (LBG, 2003). About half this amount is lost to evaporation and transpiration processes; the remainder is available to become surface-water and ground-water runoff. Ground-water recharge results from the portion of total rainfall and snowmelt that infiltrates the soil and overburden materials. The sand and gravel aquifers are recharged from precipitation which falls directly on the surface of the aquifer, from ground-water flow from surrounding hills and mountains and, most importantly, from significant streams or overlying surface-water bodies. A portion of the total runoff that infiltrates into the soil and overburden materials (including sand and gravel aquifers) eventually recharges the bedrock fracture system and is available for capture by bedrock wells.

LBG has conducted extensive reviews of several published studies to develop estimates of ground-water recharge to aquifers in Orange County for the Orange County Water Authority (LBG 1995, LBG 2003).

The most appropriate study to apply to the subject area is the 1980 report developed for the Fishkill-Beacon area (Snavely, 1980) which indicates that recharge to the till-covered metasedimentary bedrock is approximately 400,000 gpd/sq. mi. or about 8 inches annually. This recharge to bedrock represents approximately 19 percent of the average annual local precipitation. Recharge directly to the 95 acre study parcel would indicate recharge to the bedrock aquifer to be about 59,375 gpd. The average one-year-in-30 drought record for Orange County indicates average precipitation of 29.5 inches (LBG, 2003). The average drought precipitation is approximately 69 percent of the average annual precipitation in Orange County which indicates recharge would be reduced to about 40,968 gpd for the study parcel. The average recharge is less than the estimated water demands (65,800 gpd) for the proposed residential/commercial developments under normal and drought conditions. As discussed above, although the water-budget analyses are useful in estimating available ground-water resources, drilling and testing supply wells is the only definitive indicator of ground-water availability from the aquifer source and any potential impacts to neighboring water supplies.

Local discharge estimates from the study parcel from an unnamed tributary, wetland features and underflow from the site would be difficult to estimate.

Ground Water Withdrawals Within 2,500 feet of Well 3

An inventory of public ground water supply wells within 2,500 feet from Well 3 only finds the Hambletonian wells, with the exception of a low density of individual homeowner wells.

Existing Bedrock Test Wells

Three 8-inch diameter test wells (Wells 1, 2 and 3) were drilled on the study parcel in June 2002 by Tompkins under the supervision of LBG. Well 4 was drilled in 1998 by Ken Drilling, Inc. as part of a ground-water investigation program conducted by the Village of Goshen. The wells are shown on Plate 1. The well completion reports are provided in Appendix J. The Wells 1, 2 and 3 are artesian and flow at rates between 2 to 15 gpm and Well 4 had an estimated yield of 75 gpm at the completion of drilling. The well construction details are summarized in table 3.

Well permits for Wells 1, 2 and 3 were issued by the NYSDEC #03902 (June 10, 2002). Well 4 was drilled prior to the New York State Department of Environmental Conservation regulation.

PUMPING TEST PROGRAM

The pumping test program proposed the completion of an individual 72-hour pumping test on Well 3. The goal of the test was to pump Well 3 at maximum yield for a minimum of 72 hours, demonstrating stabilized yield and drawdown during the last 6 hours of the test.

In October 2006, Tompkins installed a 40-hp (horsepower) submersible pump in Well 3 at a depth of 340 feet. A 1-inch diameter steel access tube for manual measurements of water levels was installed with the pump. The flow rate was measured with a clean, calibrated 55-gallon drum and stopwatch. The discharge water from Well 3 was run through a 4-inch diameter fire hose to divert the water toward a stream flowing off the site.

A malfunctioning generator caused delays in the execution of the test. Three attempts to start the test were made between October 3 and 4, 2006:

ADC ORANGE, INC.
SALESIAN PROPERTY
TOWN OF GOSHEN, NEW YORK

INTRODUCTION

Leggette, Brashears & Graham, Inc. (LBG), Professional Ground-Water & Environmental Engineering Services Consultants, has been retained by ADC Orange, Inc. to conduct a ground-water exploration program of the Salesian property. Three test wells were completed on the property on June 5, 2002 by David H. Tompkins and Sons, Inc. (Tompkins). Wells 1, 2 and 3 had preliminary yield estimates of 300, 8 and 150 gpm (gallons per minute), respectively, at completion of drilling. The wells are shown on Plate 1. LBG's pumping test plan, dated August 24, 2006, was submitted to the Town of Goshen in accordance with the Town's ordinance (Article II - Well Testing, Section 96-9 - Application; notification; liability: Adopted 6-12-1997 by L.L. No.5-1997). The plan was subsequently approved by the Town.

ESTIMATED WATER DEMAND

The water demand estimate approved by the Orange County Department of Health (OCDOH) for the proposed mixed residential and commercial development at full build-out is approximately 65,800 gpd (gallons per day) or 45.7 gpm. Tables 1 and 2 summarize the breakdown of residence type and the water demand estimate for the study parcel.

The New York State Department of Health (NYSDOH) requires that the water-supply development shall equal or exceed two times the design maximum daily demand (twice the average water demand estimate). Therefore, the water supply must have the capacity to produce a minimum of about 91.4 gpm. The NYSDOH requires proof of this supply with the best well out of service.

- October 3, 2006 start time 0934 hours/stop time 1441 hours
- October 3, 2006 start time 1517 hours/stop time 0134 hours
- October 4, 2006 start time 0819 hours/stop time 1503 hours

Following the last failed attempt, the malfunctioning generator was replaced. The 72-hour pumping test on Well 3 was successfully conducted from October 7, 2006 to October 10, 2006.

Well 3

The pumping test on Well 3 began at 0939 hours on October 7, 2006. The initial pumping rate of the well was 112 gpm. At 17 minutes into the test, the water-level had declined from a pre-test flowing water-level to 219.01 feet. At this time the pumping rate was reduced to 92 gpm. The pumping rate of Well 3 was maintained at 92 gpm for the remainder of the test.

Just prior to shutdown of the well, the pumping water-level was 276.95 feet. Well 3 showed both stabilized yield and drawdown for the last 12 hours of the test. The total drawdown at the end of the test from the top of casing was 276.95 feet. Well 3 was shutdown at 1003 hours on October 10, 2006. A table of water-level measurements collected during the test and a graph of the data for Well 3 is located in Appendix II.

Water-level recovery measurements were collected from Well 3 following the shutdown of the pump. The water-level graph (Appendix II) shows the water-level in Well 3 recovered rapidly. Well 3 was fully recovered to its artesian flowing condition within 14 hours of shutdown of the test.

WELL MONITORING PROGRAM

During the 72-hour pumping test completed on Well 3 in October 2006, a well monitoring program was conducted which included adjacent domestic wells, one of the closer wells from the Hambletonian Water District and onsite monitoring wells. The purpose of the monitoring program was to determine if the pumping of Well 3 for 72 hours at a maximum pumping rate would significantly affect water levels and/or yields of existing neighboring wells. LBG also installed a piezometer (P7-A) in the onsite stream adjacent to Well 3 to determine any

hydraulic connection with the bedrock aquifer and wetlands/surface-water bodies under pumping conditions.

Between September 28 and October 13, 2006, a water-level interference study was conducted on 17 offsite domestic wells and 3 onsite monitoring wells to determine the magnitude of water-level drawdown induced by the pumping of Well 3, if any. The offsite and onsite monitoring wells in the vicinity of the study parcel are shown on Plate 3. The hydrographs for the onsite and offsite monitoring wells are located in Appendix III.

As part of the monitoring program, a weather station was set-up in the vicinity of the site. Temperature, precipitation and barometric pressure measurements were collected during the testing period. A graph of the data is located in Appendix IV. In addition, Appendix IV presents the precipitation record for the 30 day period prior to the start of the test. The NOA-Montgomery New York weather station resported a total of 3.44 inches for the 30 day period prior to the start of the test. No precipitation occurred during the test event. According to the Town of Goshen Pumping Test Protocol, precipitation for 30 days prior to the start of a pumping test may not exceed 3.7 inches.

Offsite Impacts

The table located in Appendix III summarizes the water-level interference observed as a result of pumping Well 3 on the study parcel from October 7 to 10, 2006.

Hydrographs for many of the residential wells indicated minor fluctuations in water levels from their domestic use. An example of fluctuation from domestic water use (i.e., showering, laundry, etc.) is a rapid decline (drawdown) in the water level from the pumping of the well for domestic use followed by a rapid rise in the water level from the pump turning off. The 142 Craigville Road hydrograph shows a good example of water-level fluctuations from domestic usage.

Hydrographs of six offsite wells indicate water-level interference as follows:

Recreation Park Well	7.0 feet
Veteran's Cemetery Well	7.5 feet
79 Coleman Road	5.0 feet
47 Coleman Road	31.0 feet
49 Coleman Road	28.0 feet
11 Coleman Road	4.0 feet

The hydrographs for these wells show an immediate decline resulting from the start up of Well 3 on October 7, 2006. In addition, the water-level recovery also coincides with the shutdown of Well 3 on October 10, 2006. The reported water-level interference effects observed did not impair the normal performance of these wells during the test.

The remaining offsite wells listed on the table in Appendix III showed no discernible drawdown interference effects from pumping Well 3 during the October 2006 pumping test.

Onsite Impacts

During the test, three onsite monitoring wells (Wells 1, 2 and 4) and one piezometer (PZ-) were included in the monitoring program. The piezometer was installed in the stream bed of the adjacent surface water body to determine any hydraulic connection with the bedrock aquifer and the surface-water body under pumping conditions.

The hydrograph for PZ-A indicates no discernible water-level interference effects from pumping Well 3. The data for PZ-A from October 7 to 10, 2002 presented on the hydrograph indicate a relatively stable water level which continues its trend 24-hour (10/11/06) after the shutdown of Well 3. The data shows a rise in water-level on October 11, 2006 which coincides with the start of a rain event of 1.10 inches in magnitude.

The hydrographs for the three onsite monitoring wells and piezometer indicate water-level interference as follows:

Well 1	9.0 feet
Well 2	Not discernible
Well 4	16.0 feet
PZ-A	Not discernible

WATER QUALITY

Ground-water quality in the shale bedrock units of Orange County is generally good. The water is often moderately hard and relatively high in dissolved solids.

Near the end of the 72-hour pumping test of Well 3, ground-water samples were collected from the well. The samples were analyzed for parameters specified in the New York State

[illegible] of Health (NYSDOH) Sanitary Code, Part 5, Subpart 5-1. Samples were taken after [illegible] days of pumping, to ensure that the samples were clear and representative of the [illegible] water from the formation in which the wells are completed. The results of these analyses are included in Appendix V.

The water quality for Well 3 meets all New York State drinking water standards and [illegible] with the exception of the presence of total coliform. Toluene was detected at a [illegible] of 0.6 ppb (parts per billion). The MCL (maximum concentration limit) for [illegible] ppb. The presence of toluene was most likely caused by Tompkins' use of electrical [illegible] the electrical wiring to the pump's discharge pipe in the well. The adhesive on the [illegible] contains small amounts of toluene.

The MPA (microparticulate analysis) report indicated non-detection of constituents of [illegible]. Additionally, during the test, temperature, conductivity and pH measurements were [illegible] from the well's discharge water and compared to measurements collected from the [illegible]. The measurements, located in table 4, show no direct correlation between the [illegible] water. Both the MPA and physical parameter measurements collected indicate [illegible] risk of direct influence of surface water.

The well's discharge water exhibited a mild hydrogen sulfide odor which is not [illegible] the shale bedrock unit in Orange County. The hydrogen sulfide odor can be [illegible] and economically with an aeration unit incorporated in the water treatment [illegible] the well.

Well 1 Completion Report

The Well 1 completion report is provided in Appendix VI of this report. The report was [illegible] submitted to the Town in June of 2003.

CONCLUSIONS AND RECOMMENDATIONS

The water demand for the proposed mixed residential and commercial development at [illegible] build-out is estimated to be 65,800 gpd or 45.7 gpm.

The NYSDOH requires that the water supply for the development meet or exceed twice the average water demand estimate. Therefore the water supply for the property must have the capacity to produce 131,6000 gpd or 91.4 gpm, with the best well out of service.

- Data from pumping tests completed on Wells 1 and 3 indicate the individual yields of the wells to be 250 gpm and 92 gpm, respectively. Both Wells are capable of independently meeting twice the average water demand estimate of 91.4 gpm. Well 1 indicates a surplus water supply of about 158 gmp, or about 227,520 gpd. This surplus water can remain in reserve for the onsite service area; or be utilized to augment existing Town Water Districts within the study region.

- The water samples collected from Well 3 indicate all parameters meet NYSDOH drinking water standards, with the exception of total coliform which was found to be present in the well. Toluene was also detected in trace amounts, below the MCL (maximum concentration limit). The presence of toluene was most likely due to the presence of tape adhesive used in securing the pump wiring to the discharge pipe in the well.

  LBG recommends Well 3 be disinfected and resampled for total coliform before being put into production. Additionally, all remnants of tape should be removed from the well when the temporary pump used for the test is removed.

- The discharge water from Well 3 exhibited a mild hydrogen sulfide odor which is not uncommon in the shale bedrock unit in Orange County. The sulfide odor can be removed easily and economically with an aeration unit incorporated in the water treatment design of the well.

- Well 3 is located within 200 feet of a surface water body which required the well be sampled for MPA. The surface water treatment rule is applied to any well under the direct influence of surface water. The MPA reported no detections of constituents of concern for Well 3. Physical parameters of pH, temperature and conductivity collected

during the test also indicated that Well 3 is at low risk for groundwater under direct influence of surface water.

- The maximum water-level drawdown effect observed in a neighboring well caused by the pumping of Well 3 at twice the average water demand was 31.0 feet. Water-level interference effects would be significantly less during the normal operation of the well which would include 18-hour pumping cycles and rotational use of the supply wells.

- It should be noted that any groundwater supply development for the proposed ADC project must be received and approved by the Town of Goshen, NYSDEC, NYSDOH and the OCDOH.

- LBG has drafted a Complaint Response and Remediation Plan, which is located in Appendix V of the well completion report for Well 1. This report is presented in Appendix VI of this report. Surplus water is available from Wells 1 and 3 to connect neighboring homeowner wells, if required.

LEGGETTE, BRASHEARS & GRAHAM, INC.

Stacy Stieber (KD)

Stacy Stieber
Hydrogeologist II

Reviewed By:

Thomas P. Cusack, LPG
Vice President

SS:kd
December 13, 2006
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AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
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7843
AIPG
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CERTIFIED PROFESSIONAL GEOLOGIST

TABLES

TABLE I

SALESIAN PROPERTY-MAPLEWOOD
GOSHEN, NEW YORK

Density Calculation and Bedroom Count Estimate

Unit Type	Density (units)	Bedroom	Number of Bedrooms
Estate Lots (RU Zone)	12	4	48
Estate Lots (HR Zone)	4	4	16
55' x 100' Units	41	4	164
45 x 110' Rear Units	12	4	48
24' x 80' Townhouse Units	22	2	44
	22	3	66
Multifamily Units	108	2	216
Mixed Use Apartment Units	8	2	16
Total Units	229		**618**

- [illegible] Bedrooms = 618
- [illegible] Units in RU Zone = 194

[illegible]\Bedroom Count Table.doc

TABLE 2

SALESIAN PROPERTY-MAPLEWOOD
GOSHEN, NEW YORK

Water Demand Estimate

Residential Unit	Bedroom Count	Gallons per day per bedroom	Total Gallons per day
Total unit 229	618	100	61,800
Commercial Component		gpd per sq. ft.	
30,000 sq. feet		0.10	3,000-4,000
		Total	65,800* gpd

* Assumes 4,000 gpd for commercial component.

H:\ADC\2005\Orange\Water Demand table.doc

TABLE 3

SALESIAN PROPERTY - MAPLEWOOD
GOSHEN, NEW YORK

Summary of Well Completion Information

	Well Diameter (inches)	Depth to Bedrock (feet)	Casing Length (feet)	Preliminary Well Yield (gpm)	Well Depth (feet)	Open Borehole	Bedrock Unit
Well 1	8	9	42	300	450	275	Shale
Well 2	8	7	42	8	425	340	Shale
Well 3	8	7	42	150	500	400	Shale
Well 4	6	18.5	39	75	600	499	Shale

gpm Gallons per minute

H:\ADC\2006\Change\Well completion table.doc

TABLE 4

ADC ORANGE, INC.
MAPLEWOOD-SALESIAN PORPERTY
GOSHEN, NEW YORK

Summary of pH, Conductivity and Temperature Measurements Collected during 72-Hour Pumping Test of Well 3, October 7, 2006 Through October 10, 2006

Date	Time	pH	Conductivity (mS/cm)	Temperature (degrees Celsius)
Discharge				
10/3/2006	10:43	6.18	0.588	13.63
	12:00	6.31	0.561	14.14
	13:02	6.74	0.541	15.12
	14:10	6.41	0.587	14.81
	16:20	6.89	0.560	14.39
	18:10	7.05	0.574	14.15
	20:22	7.14	0.563	13.40
	22:19	7.28	0.554	13.49
10/4/2006	24:18	7.21	0.552	12.95
	9:06	7.35	0.555	13.13
	10:40	7.41	0.542	13.74
	13:36	7.58	0.563	14.61
10/7/2006	10:50	5.45	0.634	13.08
	12:45	6.48	0.566	12.75
	14:30	6.65	0.577	12.90
	16:44	7.08	0.562	13.02
	18:58	7.15	0.563	11.88
	21:05	7.28	0.568	11.25
	23:05	7.35	0.568	10.80
10/8/2006	1:05	7.36	0.571	10.23
	3:07	7.44	0.569	10.29
	5:05	7.38	0.569	9.79
	7:50	7.40	0.567	9.68
	9:50	7.46	0.561	11.13
	12:20	7.41	0.561	13.33
	14:17	7.66	0.560	14.41
	16:10	7.70	0.562	13.84
	18:05	7.82	0.553	13.24
	20:06	7.75	0.556	11.99
	22:06	7.65	0.556	11.30
10/9/2006	0:05	7.57	0.563	10.14
	2:06	7.55	0.561	10.99
	4:06	7.55	0.559	10.28
	6:09	7.52	0.561	10.53
	8:00	7.57	0.557	10.88
	10:05	7.62	0.549	12.83
	13:05	7.70	0.583	14.98
	14:55	7.84	0.574	14.86
	17:00	7.87	0.565	14.90
	18:39	7.92	0.555	13.59
	21:12	7.70	0.544	12.35
	23:06	7.77	0.553	11.90
10/10/06	1:02	7.76	0.555	11.48

TABLE 4

ADC ORANGE, INC.
MAPLEWOOD-SALESIAN PORPERTY
GOSHEN, NEW YORK

Summary of pH, Conductivity and Temperature Measurements Collected during 72-Hour Pumping Test of Well 3, October 7, 2006 Through October 10, 2006

Date	Time	pH	Conductivity (mS/cm)	Temperature (degrees Celsius)
10/10/2006 (cont.)	3:04	7.78	0.555	10.87
	5:04	7.74	0.561	10.87
	7:10	7.80	0.554	10.35
	8:50	7.80	0.556	11.04
Stream				
10/3/2006	10:43	6.27	0.614	12.93
	12:00	6.44	0.596	13.86
	13:02	7.07	0.596	14.91
	14:10	6.56	0.553	15.02
	16:20	6.79	0.597	15.75
	18:10	7.10	0.604	15.40
	20:22	7.13	0.611	15.16
	22:19	7.40	0.610	14.49
10/4/2006	24:18	7.23	0.609	14.39
	9:06	7.31	0.610	13.96
	10:40	7.38	0610	14.37
	13:36	7.48	0.615	15.85
10/7/2006	10:50	6.00	0.647	11.95
	12:45	6.63	0 643	12.11
	14:30	6.75	0.638	12.46
	16:44	7.06	0.642	12.71
	18:58	7.22	0.647	12.07
	21:05	7.26	0.658	10.73
	23:05	7.36	0.655	10.73
10/8/2006	1:05	7.37	0.653	9.90
	3:07	7 38	0.661	9.30
	5:05	7.42	0.660	8.71
	7:50	7.41	0.656	9,23
	9:50	7.50	0.654	10.21
	12:20	7 36	0.652	12.17
	14:17	7.57	0.655	13.05
	16:10	7.65	0.656	13.47
	18:05	7.74	0.654	13 04
	20:06	7.68	0.660	12 23
	22:06	7.63	0.657	11.57
10/9/2006	2:06	7.56	0.659	10.99
	4:06	7.53	0.664	9.85
	6:09	7.51	0.664	10.44
	8:00	7.56	0.659	10.60
	10:05	7.61	0.658	12.06
	13:05	7.60	0.658	14.50
	14:55	7.69	0.660	15.34
	17:00	7.07	0.673	15.09
	18:39	7 81	0.659	14.59

TABLE 4

ADC ORANGE, INC.
MAPLEWOOD-SALESIAN PORPERTY
GOSHEN, NEW YORK

Summary of pH, Conductivity and Temperature Measurements Collected during 72-Hour Pumping Test of Well 3, October 7, 2006 Through October 10, 2006

Date	Time	pH	Conductivity (mS/cm)	Temperature (degrees Celsius)
10/9/2006	21:12	7.67	0.668	12.35
(cont.)	23:06	7.69	0.663	13.01
10/10/06	1:02	7.71	0.665	12.21
	3:04	7.76	0.667	11.61
	5:04	7.73	0.673	11.05
	7:10	7.78	0.663	10.40
	8:50	7.71	0.661	10.99

mS/cm Microsiemen per centimeter

H:\ADC\2006\Orange\Table pH cond temp.doc

FIGURE

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721

Phone: 845-733-1557
Fax: 845-733-1944

Serving The Hudson Valley For Over Sixty Years

Printed:10/26/2006

Leggette, Brashears & Graham, Inc.
4 Research Drive
Suite 301
Shelton CT 06484

Client Code: LBG

Fed ID :

OCL Sample No: **211562**

System Name : **Maplewood**

Exact Location : **Well 3**

Date/Time Collected : **10/10/2006 8:00**

Date Received : **10/10/2006**

Submit By : **S. Stieber**

Microbiological Results

Analysis	Result	Units	Method	Lab	Date	Time	By	Remarks
Total Coliform(ONPG)	presence	C100	92235	10510	10/10/06	11:30	HH	Fail
E.coli(ONPG)	absence	C100	92239	10510	10/10/06	11:30	HH	

Remarks :

PASS = Passes NYSDOH and EPA Drinking Water Standards
FAIL = Fails NYSDOH and EPA Drinking Water Standards
GT = Greater Than
LT = Less Than
C1 = Colonies per milliliter
C100 = Colonies per 100 milliliters

Microbiology Department

ELAP#10510

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721

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Fax: 845-733-1944

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4 Research Drive
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Client Code : **LBG**

Fed ID :

OCL Sample No : **211562**

System Name : **Maplewood**

Exact Location : **Well 3**

Date/time Collected : **10/10/2006 8:00**

Date Received : **10/10/2006**

Submit By : **S. Stieber**

Analytical Results

Analysis		Result	Units	MCL	DL	Method	Lab	Date	Time	By	Remarks
Alkalinity as CaCO3		148	mg/L		Manu	2320B	10510	10/12/06		LM	
Chloride		69	mg/L	250	4.0	4500CL-C	10510	10/12/06		LM	
Color	LT	5			5	2120B	10510	10/10/06	14:30	LM	
Fluoride	LT	0.20	mg/L	2.2	0.20	340.2	10510	10/16/06		LM	
Hardness as CaCO3, Calcium		156	mg/L		10	3500 Ca-D	10510	10/11/06	12:30	CW	
Nitrate as N	LT	0.20	mg/L	10	0.2	Lachat	10510	10/12/06		DK	
Nitrite as N	LT	0.01	mg/L	1	0.01	EPA354.1	10510	10/11/06	15:40	CW	
Odor		1				2150	10510	10/11/06	16:15	CW	
pH		7.03				4500H+B	10510	10/10/06	12:30	LM	
Solids, Dissolved Total		345	mg/L			2540C	10510	10/17/06		CW	
Sulfate		34	mg/L	250	5	375.4	10510	10/16/06		CW	
Turbidity	LT	0.10	ntu		0.10	2130B	10510	10/10/06	14:45	LM	
Corrosivity(Langelier Index)		-0.63					10510	10/20/06		LM	

Copies to:

GT = greater than.
LT = less than.
ND = not detected

MCL = maximum contaminant level
DL = detection level

Inorganic Chemistry Department
ELAP#10510

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721

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Printed: 10/26/2006

Leggette, Brashears & Graham, Inc.
4 Research Drive
Suite 301
Shelton CT 06484

Client Code : **LBG**

Fed ID :

OCL Sample No : 211562

System Name : **Maplewood**
Exact Location : **Well 3**

Date/Time Collected : **10/10/2006 8:00**
Date Received : **10/10/2006**
Submitted By : **S. Stieber**

Analytical results are shown on the pages following this cover page

Notes

Remarks:

Cover Page

Reviewed by David M. Kennedy - Director

ELAP#10510

Hazen Research, Inc.
4501 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

DATE	October 18, 2006
HRI PROJECT	009-456
HRI SERIES NO	J163/06
DATE REC'D.	10/11/2006
CUST. P.O.#	None Rec'd

OC [illegible] Services
David [illegible]
35 [illegible]
W[illegible] Park West
[illegible] 12721

REPORT OF ANALYSIS

[illegible]

[illegible] 211562 - Leggette, Brashears & Graham, Inc., Shelton, CT
Maplewood Well 3 - sampled on 10/10/2006 @ 0800 by Stacy Stieber

[illegible]	RESULT	DETECTION LIMIT	METHOD	ANALYSIS DATE	ANALYST
[illegible] (T)	85(+-16)	12	SM 7500-Rn B	10/11/2006 @ 1030	EDF

[illegible] active decay process (counting error) at the 95% confidence level, 1.96 sigma.
[illegible] CO00708; CT PH-0152; KY 90079; KS E-10265; NH 232805-A;
[illegible] RI LAO00284; WI 998376610

Re[illegible] discrete samples submitted by the client. Hazen Rese[illegible] the results are representative of anything other than the sam[illegible] laboratory

CO[illegible] (S) = Suspended (R) = Total Recoverable
[illegible] = Less Than

By: [signature]
Robert Rostad
Laboratory Manager

An Employee-Owned Company

AB ID # 11827

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

Work Order: 06100989

END DATA TO:

AME. David Kennedy
OMPANY: OCL Analytical Services
DDRESS: 35 Goshen Turnpike
Wallkill Park West
Bloomingburg, NY 12721

HONE: (845) 733-1557
AX: (845) 733-1944

WO#: 06100989
PAGE: 1 of 1
PO#:
PWS ID#

TEST REPORT

eggette, Brashears & Graham #211562

ECEIVED FOR LAB BY: TJM DATE: 10/18/2006 11:50 Page 1 of 1

SAMPLE: Maplewood Well 3 Lab ID: 06100989-001A Grab
SAMPLED BY: Client Sample Time 10/10/2006 8:00

Test	Result	Uncert.	MDA	Units	Method	Analysis Start	Analysis End	Analyst
Gross Alpha	2.28	± 0.97	2.62	pCi/L	EPA 900.0	10/19/06 8:00	10/24/06	BH
Gross Beta	1.89	± 3.87	2.77	pCi/L	EPA 900.0	10/19/06 8:00	10/24/06	BH

SAMPLE: Maplewood Well 3 Lab ID: 06100989-001B Grab
SAMPLED BY: Client Sample Time 10/10/2006 8:00

Test	Result	Uncert.	MDA	Units	Method	Analysis Start	Analysis End	Analyst
Radium-228	0.38	± 0.13	0.47	pCi/L	EPA 903.0	10/19/06 12:00	10/30/06	JRA

SAMPLE: Maplewood Well 3 Lab ID: 06100989-001C Grab
SAMPLED BY: Client Sample Time 10/10/2006 8:00

Test	Result	Uncert.	MDA	Units	Method	Analysis Start	Analysis End	Analyst
Radium-228	-0.03	± 0.35	0.54	pCi/L	EPA 904.0	10/26/06 7:55	10/30/06	DTG

REMARKS:
The above test results meet all the requirements of NELAC and relate only to these samples.

ANAGER: Chris Meli DATE: 11-01-2006

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721

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Fax: 845-733-1944

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Printed: 10/26/2006

Leggette, Brashears & Graham, Inc.
4 Research Drive
Suite 301
Shelton CT 06484

Client Code : LBG

Fed ID :

OCL Sample No : **211562**

System Name : **Maplewood**

Exact Location : **Well 3**

Date/Time Collected : **10/10/2006 8:00**

Date Received : **10/10/2006**

Submitted By : **S. Stieber**

Analytical results are shown on the pages following this cover page

Notes

Remarks:

Cover Page

Reviewed by David M. Kennedy - Director

ELAP#10510

FLI
FRIEND LABORATORY INC

32 ITHACA STREET
TELEPHONE (607) 565-3500

WAVERLY, NY 14892 - 1532
FAX (607) 565 - 4083

NY 10252 NJ 73168
PA 68180 EPA NY00033

Certificate of Analysis

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721
Attn: Todd Zeilinski

Order Number: 0610-00529
Date Reported: 10/23/2006
Date Received: 10/11/2006
Invoice Number: 36432
Customer Number: O003
Customer PO:
Certification Date: 10/23/2006

Subject:
MPA,Giarda/Crypo

MP	Analysis Performed	Result	Units	Detection Limit	Method	Analysis Information
01	**Maplewood Well 3 211562 Composite**	**10/10/2006 7:28**	**Client**			
	MPA					10/12/06, 10:00, OBW
	Cryptosporidium	U	/100 L		ICR USEPA	10/12/06, 10:00, OBW
	Giardia	U	/100 L		ICR USEPA	10/12/06, 10:00, OBW
	Algae	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Diatoms	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Rotifers	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Rotifer Eggs	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Plant Matter	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Pollen	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Insects	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Insect Parts	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Nematodes	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Nematode Eggs	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Crustaceans	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Crustacean Parts	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Protozoa	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Fine Debris	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Large Debris	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Particle Size of 5-15 uM	3.0x10^7	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Particle Size of 15-100 uM	8.3x10^6	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Particle Size of 100-200 uM	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW
	Particle Size of >200 uM	ND	/100 L		EPA 910/9-92-029	10/12/06, 10:00, OBW

Approved By: [signature]
Richard Hammer, Managing Director

E = estimated value
ND or U = analyte not detected
B = analyte was detected at the method or mp blank
< = less than the indicated value
ug/L = micrograms per liter (equivalent to parts per billion)
mg/L = milligrams per liter (equivalent to parts per million)
mg/Kg = milligrams per kilogram (equivalent to parts per million)

Information in this report is accurate to the best of our knowledge and ability. In no event shall our liability exceed the cost of these services. Your sample will be discarded when its own safety we are advised otherwise.

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721

Phone: 845-733-1557
Fax: 845-733-1944

Serving The Hudson Valley For Over Sixty Years

Printed: 10/31/2006

Leggette, Brashears & Graham, Inc.
4 Research Drive
Suite 301
Shelton CT 06484

Client Code : **LBG**

Fed ID :

OCL Sample No : **211562**

System Name : **Maplewood**
Exact Location : **Well 3**

Date/Time Collected : **10/10/2006. 8:00**
Date Received : **10/10/2006**
Submitted By : **S. Stieber**

Analytical results are shown on the pages following this cover page

Notes

QC*	Analysis performed by NYS DOH #11223, PA DEP#68-131
BIOCH*	Analysis performed by PA DEP#68-401, NY DOH#11627
FCCL*	Analysis performed by NYS DOH#10552, PA DEP#20-073
a	Absence
QC	Quality Control Standard
TB	Trip Blank not analyzed - sample results did not exceed the MDL for this method.

Cover Page

Reviewed by David M. Kennedy - Director

ELAP#10510

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, New York 12721

Analytical Results

OCL Sample No: 211562

Method: EPA 200.7

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
Barium	0.079	mg/l	2	0.0020	CMD		10/21/2006 00:00	10/26/2006 02:13
Cadmium	ND	mg/l	0.005	0.0020	CMD		10/21/2006 00:00	10/26/2006 02:13
Chromium	ND	mg/l	0.1	0.0050	CMD		10/21/2006 00:00	10/26/2006 02:13
Copper	ND	mg/l	1.3	0.25	CMD		10/21/2006 00:00	10/26/2006 02:13
Iron	ND	mg/l	0.3	0.050	CMD		10/21/2006 00:00	10/26/2006 02:13
Manganese	0.062	mg/l	0.05	0.0050	CMD		10/21/2006 00:00	10/26/2006 02:13
Nickel	ND	mg/l	0.1	0.0020	CMD		10/21/2006 00:00	10/26/2006 02:13
Silver	ND	mg/l	0.1	0.0010	CMD		10/21/2006 00:00	10/26/2006 02:13
Sodium	22	mg/l		5.0	CMD		10/21/2006 00:00	10/27/2006 12:51
Zinc	0.013	mg/l	5	0.010	CMD		10/21/2006 00:00	10/26/2006 02:13

Method: EPA 200.8

Analyte	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
Antimony	ND	mg/l	0.006	0.0020			QC*	10/24/2006 18:56	10/24/2006 18:56
Arsenic	ND	mg/l	0.01	0.0020			QC*	10/24/2006 18:56	10/24/2006 18:56
Beryllium	ND	mg/l	0.004	0.0020			QC*	10/24/2006 18:56	10/24/2006 18:56
Lead	ND	mg/l	0.015	0.0020			QC*	10/24/2006 18:56	10/24/2006 18:56
Selenium	ND	mg/l	0.05	0.0020			QC*	10/24/2006 18:56	10/24/2006 18:56
Thallium	ND	mg/l	0.002	0.002			QC*	10/24/2006 18:56	10/24/2006 18:56

Method: EPA 245.1

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
Mercury	ND	mg/l	0.002	0.0002	JD		10/18/2006 00:00	10/19/2006 11:01

GT = greater than
LT = less than
ND = not detected
MCL = maximum contaminant level
DL = detection level
ELCD = Electrolytic Conductivity Detector (QC)
PID = Photoionization Detector (QC)
Analysis by Eastern Lab Services #11216 (unless otherwise noted)

Printed on: 10/31/2006

Method: EPA 335.4

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
Cyanide (total)	ND	mg/l	0.2	0.010	RN		10/20/2006 15:30	10/23/2006 08:00

Method: EPA 502.2

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
1,1,1,2-Tetrachloroethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,1,1-Trichloroethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,1,2,2-Tetrachloroethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,1,2-Trichloroethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,1-Dichloroethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,1-Dichloroethene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,1-Dichloropropene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,2,3-Trichlorobenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,2,3-Trichloropropane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,2,4-Trichlorobenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,2,4-Trimethylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,2-Dichlorobenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,2-Dichloroethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,2-Dichloropropane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,3,5-Trimethylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,3-Dichlorobenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,3-Dichloropropane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
1,4-Dichlorobenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
2,2-Dichloropropane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
2-Chlorotoluene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
4-Chlorotoluene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Benzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Bromobenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Bromochloromethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Bromomethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Carbon tetrachloride	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Chlorobenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Chloroethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Chloromethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Dibromomethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Dichlorodifluoromethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Ethylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Hexachlorobutadiene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Isopropylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00

Method: EPA 502.2

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
Methyl tert-butyl ether	ND	ug/l	10	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Methylene chloride	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Styrene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Tetrachloroethene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Toluene	0.6	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Trichloroethene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Trichlorofluoromethane	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
Vinyl chloride	ND	ug/l	2	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
cis-1,2-Dichloroethene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
cis-1,3-Dichloropropene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
m,p-Xylene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
n-Butylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
n-Propylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
o-Xylene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
p-Isopropyltoluene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
sec-Butylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
tert-Butylbenzene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
trans-1,2-Dichloroethene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00
trans-1,3-Dichloropropene	ND	ug/l	5	0.5	KS		10/18/2006 00:00	10/18/2006 00:00

Analyte	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
Chlorofluorobenzene (ELCD)	9.70	ug/l			KS		QC	10/18/2006 00:00	10/18/2006 00:00
Chlorofluorobenzene (PID)	9.60	ug/l			KS		QC	10/18/2006 00:00	10/18/2006 00:00

Method: EPA 504.1

Analyte	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
1,2-Dibromo-3-chloropropane	ND	ug/l	0.2	0.01	PDB		TB	10/13/2006 00:00	10/14/2006 09:12
1,2-Dibromoethane (EDB)	ND	ug/l	0.05	0.01	PDB		TB	10/13/2006 00:00	10/14/2006 09:12

Analyte	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
Tetrachloro-meta-xylene	0.184	ug/l			PDB		TB, QC	10/13/2006 00:00	10/14/2006 09:12

Method: EPA 504.1

Method: EPA 508

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
Chlordane (tech)	ND	ug/l	2	0.10	PDB		10/17/2006 00:00	10/24/2006 16:28
PCBs as Aroclors (screen)	Absence	ug/l	0.1	0.00	PDB		10/17/2006 00:00	10/24/2006 16:28
Toxaphene	ND	ug/l	3	0.25	PDB		10/17/2006 00:00	10/24/2006 16:28

Analyte	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
beta-BHC	0.102	ug/l			PDB		QC	10/17/2006 00:00	10/24/2006 16:28

Method: EPA 515.3

Analyte	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
2,4,5-TP (Silvex)	ND	ug/l	50	0.3			BNCH*	10/18/2006 08:30	10/19/2006 00:00
2,4-D	ND	ug/l	70	0.5			BNCH*	10/18/2006 08:30	10/19/2006 00:00
Dalapon	ND	ug/l	200	3.0			BNCH*	10/18/2006 08:30	10/19/2006 00:00
Dicamba	ND	ug/l	50	0.3			BNCH*	10/18/2006 08:30	10/19/2006 00:00
Dinoseb	ND	ug/l	7	0.5			BNCH*	10/18/2006 08:30	10/19/2006 00:00
Pentachlorophenol	ND	ug/l	1	0.3			BNCH*	10/18/2006 08:30	10/19/2006 00:00
Picloram	ND	ug/l	500	0.3			BNCH*	10/18/2006 08:30	10/19/2006 00:00

Method: EPA 525.2

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
Alachlor	ND	ug/l	2	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Aldrin	ND	ug/l	5	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Atrazine	ND	ug/l	3	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Benzo (a) pyrene	ND	ug/l	0.2	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Butachlor	ND	ug/l	50	2.00	RJH		10/19/2006 00:00	10/19/2006 00:00
Di(2-ethylhexyl)adipate	ND	ug/l	400	2.00	RJH		10/19/2006 00:00	10/19/2006 00:00
Di(2-ethylhexyl)phthalate	ND	ug/l	6	2.00	RJH		10/19/2006 00:00	10/19/2006 00:00
Dieldrin	ND	ug/l	5	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00

Method: EPA 525.2

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
Endrin	ND	ug/l	2	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
HCH-gamma (Lindane)	ND	ug/l	0.2	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Heptachlor	ND	ug/l	0.4	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Heptachlor epoxide	ND	ug/l	0.2	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Hexachlorobenzene	ND	ug/l	1	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Hexachlorocyclopentadiene	ND	ug/l	50	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Methoxychlor	ND	ug/l	40	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00
Metolachlor	ND	ug/l	50	2.00	RJH		10/19/2006 00:00	10/19/2006 00:00
Metribuzin	ND	ug/l	50	1.00	RJH		10/19/2006 00:00	10/19/2006 00:00
Propachlor	ND	ug/l	50	1.00	RJH		10/19/2006 00:00	10/19/2006 00:00
Simazine	ND	ug/l	4	0.10	RJH		10/19/2006 00:00	10/19/2006 00:00

Analyte	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
1,3-Dimethyl-2-nitrobenzene	4.75	ug/l			RJH		QC	10/19/2006 00:00	10/19/2006 00:00
Perylene-d12	4.83	ug/l			RJH		QC	10/19/2006 00:00	10/19/2006 00:00
Triphenyl phosphate	4.64	ug/l			RJH		QC	10/19/2006 00:00	10/19/2006 00:00

Method: EPA 531.1

Analyte	Result	Units	MCL	DL	By	Notes	Prepared	Analyzed
3-Hydroxycarbofuran	ND	ug/l		1.0	IC		10/24/2006 00:00	10/24/2006 00:00
Aldicarb	ND	ug/l	3	1.0	IC		10/24/2006 00:00	10/24/2006 00:00
Aldicarb sulfone	ND	ug/l	2	1.0	IC		10/24/2006 00:00	10/24/2006 00:00
Aldicarb sulfoxide	ND	ug/l	4	1.0	IC		10/24/2006 00:00	10/24/2006 00:00
Carboxyl	ND	ug/l		1.0	IC		10/24/2006 00:00	10/24/2006 00:00
Carbofuran	ND	ug/l	40	1.0	IC		10/24/2006 00:00	10/24/2006 00:00
Methomyl	ND	ug/l		1.0	IC		10/24/2006 00:00	10/24/2006 00:00
Oxamyl	ND	ug/l	200	1.0	IC		10/24/2006 00:00	10/24/2006 00:00

[illegible]

[illegible]	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
[illegible]	ND	mg/l	700	6.0	IC			10/24/2006 00:00	10/24/2006 00:00

[illegible]

[illegible]	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
[illegible]	ND	mg/l	0.1	0.05			FCOL*	10/16/2006 15:10	10/18/2006 15:50

[illegible]

	Result	Units	MCL	DL	By	Notes		Prepared	Analyzed
[illegible]	ND	mg/l	20	0.0008	IC			10/17/2006 00:00	10/18/2006 00:00

CHAIN OF CUSTODY

OCL Analytical Services
35 Goshen Turnpike, Bloomingburg, NY 12721
Phone (845)733-1557 Fax (845)733-1944

Client:
Name: Stacy S' Tom Cusack Leggette, Brashears & Graham Inc.
Address: 4 Research Dr. Suite 325
City, State, Zip: Shelton, CT 06484
Phone: 203-929-8555

Samples should be brought to the lab on ice with a receiving temp of 2 to 6 C.

Sample Temp (c): 11.9
Sample rec'd on ice?
Sample set up in 6 hr?
Properly preserved? /
Within holding times? /
Reviewed by

OCL#	Matrix	Collection Date	Collection Time	comp	grab	Sample Description/Location	Containers No/type	Preservative	rec'd	Analysis Required Full Part 5: Metals, Organics & Inorganics	Results
211562	H2O	10/6/06	800		X	Maplewood Well 3	125 mL	none		Total Coliform	
					X		500ml - P	none		Alkalinity	
					X		500ml - P	none		Nitrate, nitrite	
					X		1L Plastic	none		pH, odor, turbidity, color, fluoride,	
					X					chloride, TDS, sulfate, Ca hardness,	
										corrosivity	
					X		1L Plastic	HNO3		As, Ba, Cd, Cr, Pb, Hg, Se, Ag, Cu,	
										Fe, Mn, Na, Zn, Sb, Be, Ni, Ti	
					X		1L Plastic	NaOH		Cyanide	
	V	V	V		X	V	2-40ml vial	HCl		VOC + MTBE	
IN ADDITION TO ABOVE TESTING, COMPLETE SOC AND RADIOLOGICALS ARE REQUIRED											

Comments/Special Instructions:

Rush Requested? Client Code: Prepaid? NO

Sampled By:	print	Stacy Shriver	date: 10/6/06	Received By:	print		date: 10/7/06
	sign		time: 800		sign		time: 9:30
Relinquished By:	print		date:	Received By:	print		date:
	sign		time		sign		time:
Relinquished By:	print		date:	Received By:	print		date:
	sign		time:		sign		time:

CHAIN OF CUSTODY

OCL Analytical Services

35 Goshen Turnpike, Bloomingburg, NY 12721
Phone (845)733-1557 Fax (845)733-1844

Client:

Name: Leggette, Brashears & Graham, Inc.
Address: 4 Research Dr. Suite 301
City, State, Zip: Shelton, CT 06484
Phone: 203-929-8555

Samples should be brought to the lab on ice with a receiving temp of 2 to 6 C.

Sample Temp (c): 11.9
Sample rec'd on Ice?:
Sample set up in 6 hr?:
Properly preserved?: ✓
Within holding times?: ✓
Reviewed by:

OCLs	Matrix	Collection Date	Collection Time	comp	grab	Sample Description/Location	Containers No/type	Preservative	dmsld	Analysis Required Complete SOC Testing	Results
	H2O	10/6/06	800		X	Hopkinwood well 3	2 40ml G	hcl		EPA 504	
21562					X		2 1L G	hcl		EPA 508	
					X		1 250ml G	hcl		EPA 515.3	
					X		2 1L G	sulfite		EPA 525.2	
					X		2 40ml G	hcl		EPA 531.1	
					X		1 1L G	hcl		extra sample	
					X		3 40ml G	hcl		EPA 547 Glyphosate	
					X		1 250ml G	none		EPA 548 Endothall	
					X		1 1L G	hcl		EPA 549 Diquat	

Comments/Special Instructions:

Rush Requested?

Client Code:

Prepaid? NO

Sampled By:	print	Steve Stelzer	date: 10/6/06	Received By:	print		date: 10/10
	sign		time: 800		sign		time: 8:50
Relinquished By:	print		date:	Received By:	print		date:
	sign		time:		sign		time:
Relinquished By:	print		date:	Received By:	print		date:
	sign		time:		sign		time:

CHAIN OF CUSTODY

OCL Analytical Services

35 Goshen Turnpike, Bloomingburg, NY 12721
Phone (845)733-1557 Fax (845)733-1944

Client:

Name: Laguette, Brashears & Graham, Inc.
Address: 14 Research Dr. Suite 301
City, State, Zip: Shelton, CT 06484
Phone: 203-929-8555

Samples should be brought to the lab on ice with a receiving temp of 2 to 6 C.

Sample Temp (c): 11.9
Sample rec'd on ice? _____
Sample set up in 8 hr? _____
Properly preserved? Y
Within holding times? Y
Reviewed by _____

OCL#	Matrix	Collection Date	Collection Time	comp	grab	Sample Description/Location	Container No/type	Preservative	Field Filt	Analysis Required	Results
21562	H2O	10/6/06	800		X	Maplewood Well 3	1 L P	HNO3		Gross Alpha	
					X		1 L P	HNO3		Gross Beta	
					X		1 L P	HNO3		Radium 226	
					X		1 L P	HNO3		Radium 228	
					X		2 40ml vials	none		Radon in Water	

Comments/Special Instructions:

Rush Requested? _____ Client Code: _____ Prepaid? Y

Sampled By:	print	Steve Stephen	date: 10/6/06	Received By:	print		date: 10/10
	sign		time: pm		sign		time: 8:50
Relinquished By:	print		date:	Received By:	print		date:
	sign		time:		sign		time:
Relinquished By:	print		date:	Received By:	print		date:
	sign		time:		sign		time:

CHAIN OF CUSTODY

OCL Analytical Services
35 Goshen Turnpike, Bloomingburg, NY 12721
Phone (845)733-1557 Fax (845)733-1944

Client:
Name: Leggette, Brashears & Graham, Inc.
Address: 4 Research Dr. Suite 301
City, State, Zip: Shelton, CT 06484
Phone: 203-929-8555

Samples should be brought to the lab on ice with a receiving temp of 2 to 6 C.

Sample Temp (c): 11.9
Sample rec'd on ice?
Sample set up in 6 hr?
Properly preserved? ✓
Within holding times? ✓
Reviewed by

OCL#	Matrix	Collection Date	Collection Time	comp	grab	Sample Description/Location	Containers No/type	Preservative	chlorid	Analysis Required	Results
211562	#20	10/10/06	7:25	X		Maplewood Wells	Filter			MPA - Giardia/Cryptosporidium	

Comments/Special Instructions:

Rush Requested? Client Code: Prepaid? No

Sampled By:	print: Stacy Stieber	date: 10/10/06	Received By:	print:		date: 10/10	
	sign: [signature]	time: 8:00		sign:		time: 8:50	
Relinquished By:	print:	date:	Received By:	print:		date:	
	sign:	time:		sign:		time:	
Relinquished By:	print:	date:	Received By:	print:		date:	
	sign:	time:		sign:		time:	

OCL Analytical Services

35 Goshen Turnpike • Bloomingburg, NY 12721
Phone (845) 733-1557 • Fax (845) 733-1944

Municipal Water Sampling Instructions
Giardia/Cryptosporidium or Microscopic Particulate Analysis

1. READ INSTRUCTIONS COMPLETELY before starting to collect samples.
2. Select a cold water faucet with a male thread, such as the washing machine faucet, outdoor faucet or the kitchen faucet. Flush the faucet for three minutes.
3. Screw the garden hose connection into the filter apparatus and adjust the water flow to no more than one gallon per minute. Pressure gauge should not read above 30 psi. If pressure gauge reads greater than 30 psi adjust pressure regulator.
4. Flush the sampling apparatus for twenty minutes. Turn the water off and disassemble the filter housing. Pour out the water.
5. Place the filter into the filter housing. Save the one gallon plastic bag for collection purposes.
6. Screw the housing into the head of the unit. Be sure that the filter and the housing are secure, or it will leak. Again, adjust the flow to not more than one gallon per minute and pressure gauge at 30 psi or lower.
7. Filter a minimum of 300 gallons of water through the unit. Record the following:

   Start Time: 12:58 PM **Stop Time:** 7:28 PM

   Initial meter reading: 3996 **Final meter reading:** 2296.3

   Final – Initial meter reading = Total volume of water sampled = 300.3 gallons
8. Turn water off. **Put on plastic gloves.** Open the filter and pour the water in the housing unit into the one gallon plastic bag. Carefully remove the filter from the housing by sliding it into the plastic bag it was originally received in. Seal the bag and place in another bag. Place the double bagged filter with water into a cooler with plenty of ice to keep the sample cold.
9. If you are sampling more than one site, the sampling apparatus must be cleaned between each sample, by washing the filter housing and the inlet hose with warm soapy water. Rinse thoroughly with tap water.
10. Complete the form below and return the bagged filter sample on ice, to the laboratory the same day it is taken.

Client Name: Leggette, Brashears & **Bill to:**

Address: 41 Research Dr. Suite 301 Graham, Inc **Address:**
Shelton, CT 06484

SAMPLING LOCATION: Hazelwood Wells

SAMPLING DATE: 10/10/03 **SAMPLING TIME:** 7:28

Total Volume of Water Sampled: 300.3 gallons **Sampled By:** Stacy Sieker / Dave Paskansky

APPENDIX VI

ADC ORANGE, INC.
SALESIAN PROPERTY
TOWN OF GOSHEN, NEW YORK

Prepared For

ADC Orange, Inc.

May 2003

Prepared By:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
126 Monroe Turnpike
Trumbull, CT 06611

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ADC ORANGE, INC.
SALESIAN PROPERTY
TOWN OF GOSHEN, NEW YORK

INTRODUCTION

Leggette, Brashears & Graham, Inc. (LBG), Professional Ground-Water & Environmental Engineering Services Consultants, has been retained by ADC Orange, Inc. to conduct a ground-water exploration program of the Salesian property. Three of the four proposed test wells locations have been drilled to date. The three wells were completed on June 5, 2002 by David H. Tompkins and Sons, Inc. (Thompkins). Wells 1, 2 and 3 have preliminary yield estimates of 300, 8 and 200 gpm (gallons per minute), respectively, at completion of drilling. The wells are shown on figure 1 and plate I. LBG's pump test plan, dated October 4, 2002, was submitted to the Town of Goshen for approval and in accordance with the Town's ordinance (Article II - Well Testing, Section 96-9 - Application; notification; liability: Adopted 6-12-1997 by L.L. No.5-1997) and subsequently approved by the Town.

GROUND-WATER EXPLORATION PROGRAM

Fracture-Trace Analysis

One of the techniques employed in evaluating the potential for developing high-yield water wells from the bedrock aquifers in the study region is a fracture-trace analysis. The fracture-trace maps include the delineation of faults, fracture-trace joint systems, old river and stream courses and major unconformities. These features frequently are indications of fractured or weathered zones within the bedrock and their identification is a useful tool in selecting favorable well sites for bedrock wells. The locations for Wells 1, 2 and 3 were chosen utilizing the fracture-trace analysis conducted by LBG.

Fracture zones can sometimes be located by inspecting geologic and topographic maps and by studying stereographic aerial photographs of the study area. The surface expressions of bedrock fractures often appear on aerial photographs as linear feature (less than one mile long) and lineaments which are significant linear traces longer than one mile. Many streams, valleys and topographic depressions tend to follow the faults, fracture zones and similar geologic

to the developer of the proposed ADC Subdivision/ADC Orange, Inc. (or future owner/operator) would include restoration of disturbed land or plantings. The Developer/ADC Orange, Inc. (or future owner/operator) would select the most efficacious remediation that is economically warranted. If connection to the onsite public water-supply system is selected, the well owner would be given one year of free water service and would thereafter pay for metered water use.

cmp
May 20, 2003

WATER-SUPPLY DEVELOPMENT

Three 8-inch diameter test wells (Wells 1, 2 and 3) were drilled on the study parcel in June 2002 by Tompkins under the supervision of LBG. The wells are shown on Plate 1 and figure 1. The well completion reports for Wells 1, 2 and 3 are provided in Appendix I. The wells (1, 2 and 3) are artesian and flow at rates between 2 to 15 gpm.

Well 1

Well 1 was drilled and constructed with 42 feet of 8-inch diameter casing installed into competent rock and grouted in place for a watertight seal. The well was completed as an 8-inch diameter borehole in bedrock. Significant water-bearing zones were encountered at 191 and 346 feet. The well was reported to yield about 300 gpm at the completed depth of 450 feet.

Well 2

Well 2 was drilled and constructed with 42 feet of 8-inch diameter casing installed into competent rock and grouted in place for a watertight seal. The well was completed as a 6-inch diameter borehole in bedrock. No significant water-bearing zones were encountered during the drilling and the well was reported to yield about 8 gpm at the completed depth of 500 feet.

Well 3

Well 3 was drilled and constructed with 42 feet of 8-inch diameter casing installed into competent rock and grouted in place for a watertight seal. The well was completed as an 8-inch diameter borehole in bedrock. Significant water-bearing zones were encountered at 193 and 318 feet during drilling. The well was reported to yield about 200+ gpm at the completed depth of 425 feet.

Well 4

Well 4 was completed on the study parcel for a ground-water investigation program conducted for the Village of Goshen in 1998. The well was drilled by Ken Drilling, Inc. and was constructed with 39 feet of 6-inch diameter installed in competent rock. A significant water-

103.4 feet at 710 minutes. At this time, the rate was increased to 250 gpm and the water-level declined to a depth of 121.6 feet at 1500 minutes into the test. At this time, about 25 hours into the test, water-level interference effects observed in neighboring offsite wells within close proximity of Well 1 presented concerns and it was determined at this time not to start up the pump in Well 3 which may potentially increase the magnitude of the offsite water-level interference effects.

The rate in Well 1 was maintained at 250 gpm for the remainder of the test and the pumping water-level stabilized at 134.2 feet just prior to shutdown of the 72-hour test. The total drawdown at the end of the test from the top of the casing was 134.2 feet. Substantial yield and drawdown stabilization was achieved for the last 7 hours of the test. Water-level data measured during the test and plots of the data for Well 1 are given in Appendix II.

After the test was terminated, recovery measurements were made in Well 1 for a period of about 145 minutes. The water-level plot given in Appendix II shows the water level in Well 1 recovered rapidly from the final pumping water level of 134.2 feet to 62.5 depth in about 145 minutes. Recovery continued and in about three days, the water level was reported to be at 4.6 feet, about 96 percent of full recovery.

Long-Term Yield of Well 1

The data from the pumping test indicate Well 1 can be pumped at rates up to 250 gpm or about 360,000 gpd, respectively.

WELL MONITORING PROGRAM

During the 72-hour pumping test conducted on Well 1 in October 2002, a well monitoring program was conducted including adjacent domestic wells, the closest well for the Hambletonian Water District and onsite monitoring wells. The purpose of the monitoring program was to determine if the pumping of Well 1 for 72 hours at a maximum pumping rates would significantly affect water levels and/or yields of existing neighboring wells. LBG also installed piezometers (PZ-1 and PZ-2) in the onsite wetlands adjacent to Wells 1 and 3 to determine any hydraulic connection with the bedrock aquifer and wetlands/surface-water bodies under pumping conditions.

completed with the exception of the well depths for 49 and 79 Coleman Road which reported the well depth at 187 and 174 feet, respectively.

The remaining offsite wells listed on table 1 showed no discernible drawdown interference effects from pumping onsite wells during the October 2002 pumping test on Well 1.

Onsite Impacts

During the test, three onsite monitoring wells (Wells 2, 3 and 4) and two piezometers (PZ-1 and PZ-2) were monitored in the program. The piezometers were completed in saturated overburden material adjacent to the respective surface-water bodies to determine any hydraulic connection with the bedrock aquifer and adjacent surface-water bodies under pumping conditions.

The hydrographs for PZ-1 and PZ-2 indicate no discernible water-level interference effects from pumping Well 1. The data for PZ-1 and PZ-2 from October 21 to 24, 2002 presented on the hydrograph indicate a gradual decline in the water level which continues its trend 24-hour (10/25/02) after the shutdown of Well 1. It is likely that if the gradual decline of the water level in PZ-1 and PZ-2 was a result of pumping Well 1, the water level in PZ-1 and PZ-2 would have rose slightly to reflect water recovery from the shutdown of Well 1 during the 24-hour period from October 24 to 25, 2002. The data for PZ-1 and PZ-2 presented on the hydrograph indicates a rise in water level on October 18 and October 27 to 28, 2002, from rain events.

The hydrographs for the three onsite monitoring wells indicate water-level interference as follows:

Well 2	No detection
Well 3	25.4 feet
Well 4	69.9 feet

about 23.5 gpm. This assumes 4.5-persons per home at 75 gpd per person. The Town of Goshen is presently revising the Town's Master Plan so a formal site plan has not been presented to the Town Planning Board to date.

For new community water supplies, the NYSDOH requires a minimum of two sources of supply, each capable of delivering the average daily demand (23.5 gpm). The NYSDOH guideline would require development of double the daily demand, with the best out of service if the well yields are less than 50 gpm. The yield of both successful wells exceeds 50 gpm so elimination of the best well will not apply. Therefore, the proposed project is likely to require the development of a water supply of about 47.0 gpm, which is the sum of twice the average demand of the housing units from two sources.

- The data from the pumping test indicate Well 1 can be pumped independently at rates up to 250 gpm, or about 360, 000 gpd. Assuming a conservative use of the well up to a 18-hour daily pumping cycle, the long-term yield of the well would be up to 270,000 gpd. Although a pumping test program has not been conducted on Well 3 to date, the well yielded 200 gpm at completion of drilling. LBG assumes a test on Well 3 would confirm a yield of between 150 to 250 gpm. Additional testing of either Wells 1 or 3 will not be conducted until additional discussion with Town officials following adoption of the revised Master Plan by the Town.

- Data are considerably favorable for the development of an onsite potable water supply system to meet the estimated water demands of up to 100 sample family units (23.5 gpm) on the study parcel 1 with surplus water for use by the Town/Village of Goshen within the study region. Surplus water would be available for example to mitigate the historical water supply deficiencies of the Town of Goshen's, Hambletonian Water District, or to augment the adjacent water supply for the adjacent Village of Goshen.

- The water sample collected from Well 1 indicates all parameters meet NYSDOH Drinking Water Standards. The discharge water exhibited a mild hydrogen sulfide odor which is not uncommon from the shale bedrock unit in Orange County. The hydrogen

(October 2002) to determine any significant impacts, if any, under normal operation of the proposed well source to meet the water demands of the project. The future monitoring program may be continued until two years following full build-out of the proposed project.

- If ADC or other municipal entities require Wells 1 and 3 be developed at maximum well yield potential of up to 250 gpm to service water to existing or future Water Districts a mitigation plan will be require to mitigate potential damaging water-level interference to adjacent homeowner which indicate potential damaging water-level interference effects during present and future pump test programs.

LBG has drafted a Complaint Response and Remediation Plan, which is located in Appendix V. Surplus water is available from Wells 1 and 3 to connect neighboring residence(s) to the onsite public water supply system if this is to be considered as part of the Remediation Plan.

LEGGETTE, BRASHEARS & GRAHAM, INC.

Thomas P. Cusack, CPG
Senior Associate

Reviewed by:

R.G. Slayback, CPG
Chairman

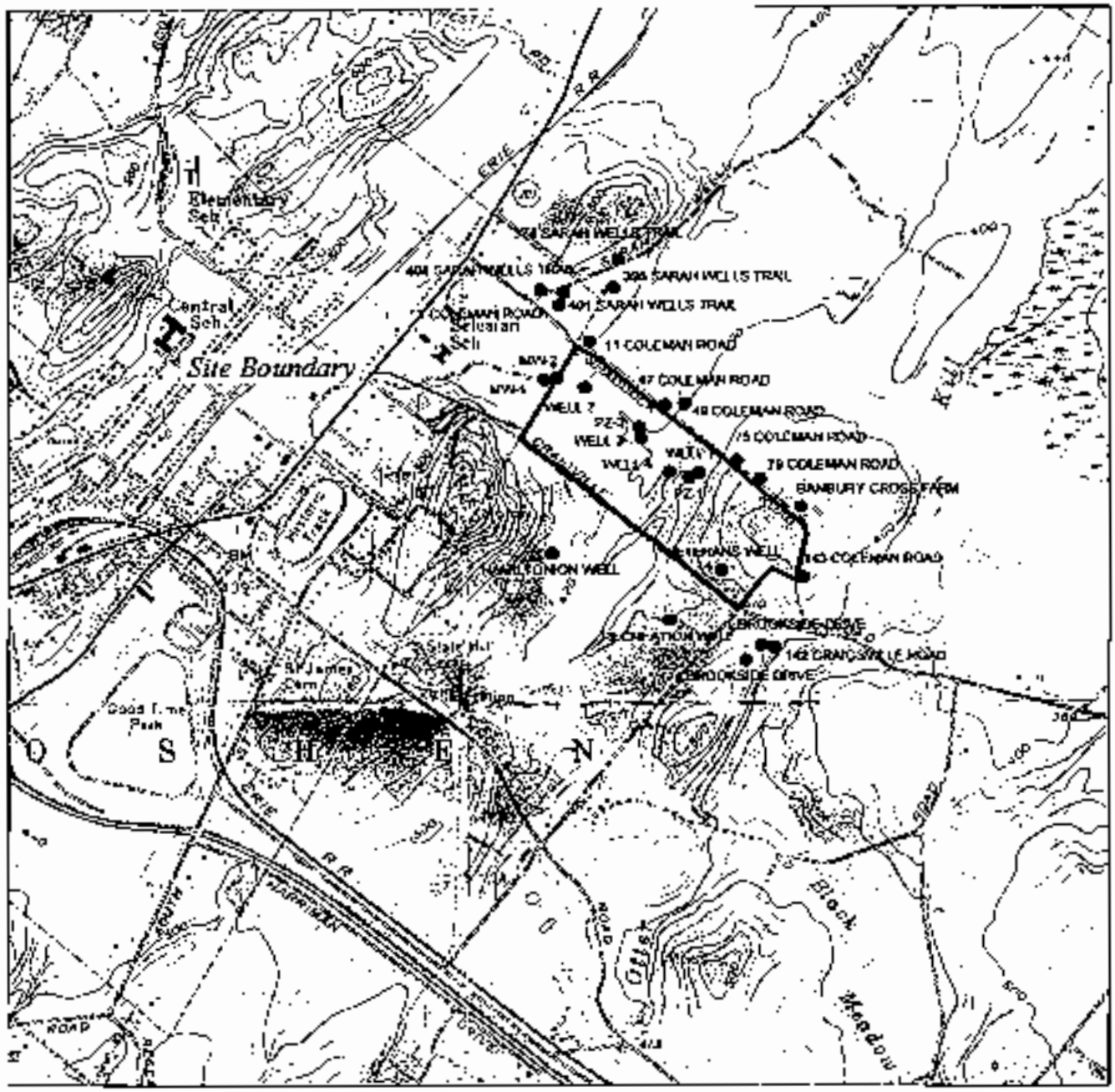
tpg
May 21, 2003
H:\ADC\2003\Salcsian Rpt.doc

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Observed Water-Level Interference Effects In Wells Monitored During the October 21-24, 2002 72-Hour Pumping Test of Well 1

Well	Approximate Distance from Well 1 (feet)	Observed water-level interefernce effects as a result of pumping Well 1 (drawdown in feet)
Well 1	0	135
Well 2	1300	ND
Well 3	350	25.4
Well 4	200	69.9
PZ-1	50	ND
PZ-2	675	ND
Recreation Park Well	1500	55.1
Veteran's Cemetary Well	1000	62.5
79 Coleman Road	550	49.2
75 Coleman Road	425	80
47 Coleman Road	725	35.2
49 Coleman Road	725	43.6
3 Coleman Road	2000	ND
11 Coleman Road	1600	ND
Banbury Cross Farm	1000	ND
143 Colemand Road	1375	ND
142 Craigsville Road	1700	ND
1 Brookside Drive	1700	ND
4 Brookside Drive	1775	ND
Hamiltonian Park Well 1	1550	ND
374 Sarah Wells Trail	2200	ND
395 Sarah Wells Trail	2100	ND
401 Sarah Wells Trail	2050	ND
404 Sarah Wells Trail	2200	ND
MW-1	1650	ND
MW-2	1600	0.93

ND= None Detected



LEGEND

WELL 1 — WELL LOCATION

QUADRANGLE LOCATION

0 2000

SCALE IN FEET

N

ADC ORANGE, INC.
SALESIAN PROPERTY
(T) GOSHEN, NEW YORK

SITE LOCATION MAP

DATE	REVISED	PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC. Professional Ground-Water and Environmental Engineering Services 126 Monroe Turnpike Trumbull, CT 06611 (203) 452-3100

DRAWN:	TLC	CHECKED:	TPC	DATE:	5/21/03	FIGURE:	1

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK
2001-2002 MONITORING DATA

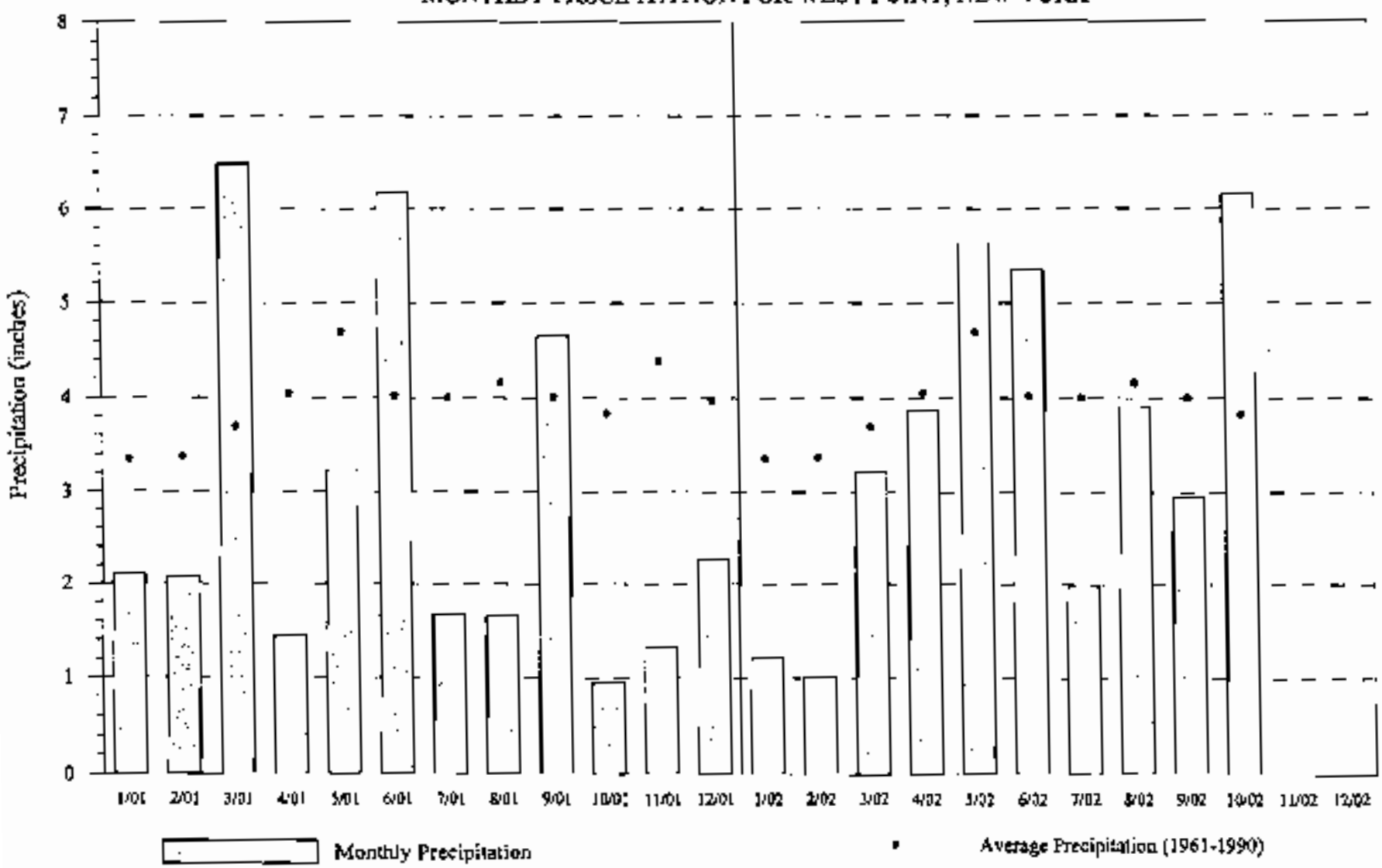


FIGURE 3

B:\SPREADSHEET\ADC ORANGE\SALESIAN PROPERTY\WESTPOINT PRECIP.GRF

LEGGETTE, BRASHEARS & GRAHAM, INC.

Drillers Lane
Montgomery, New York 12549

Phone: 457-3811
Fax: 457-4058

WELL LOG

David H. Tompkins & Sons, Inc.

Name BOC of Orange. Town Goshen

Address _____ County Orange.

Location of Property Test Well # 1 Gleman Road

WELL DIAGRAM

Depth (feet)	Formations Penetrated Type, Thickness, Water Bearing
Grade	0-9 Clays Gravel mix
	9 Bedrock.
25	42' Well Casing 8" Grouted
50	into Bedrock with
	Well Shoe.
75	42-450 medium To
	Hard State.
100	
	191 First water in
125	Brown Seam Est 100GPM
	346 - water in White
150	Quartz. Est 50+GPM
175	
	450 Well Bottom
200	

General

Type of Well Test

Drilling Method Air Hammer

Well Depth 450'

Static Water Level Flowing

Well Diameter 8"

Depth Casing 42'

PUMP TEST

Method Air Lift

Pumping Rate(GPM) 100+GPM

Duration 4 Hours

Pumping Level 445'

Water Quality at End of Test

Clear.

Comments: well Cap

Plug Type.

Was Well Disinfected NO

Yes / No

Show Cross Section of Well and Formations Penetrated

Drilling Started 6/13/02

Completed 6/14/02

Well Driller David H. Tompkins & Sons, Inc.

New York State Registered Driller #10118

Drillers Lane
Montgomery, New York 12549

Phone: 457-3611
Fax: 457-4058

WELL LOG

David H. Tompkins & Sons, Inc.

Name AAC of Orange Town Goshen.

Address _____ County Orange.

Location of Property Test Well #3 off Craigville Road

WELL DIAGRAM

Depth (feet)	Formations Penetrated Type, Thickness, Water Bearing
Grade	0-6 Gravel & Sand > bedrock.
25	42' well Casing 8"
50	Grouted into bed rock in 12" Hole.
75	42-485 medium to hard State.
100	193 - 10cm white & quartz seam
125	318 - Major Source in seam of brown slate 150+ GPM.
150	
175	485' well bottom.
200	

Show Cross Section of Well and Formations Penetrated

General

Type of Well Domestic
Drilling Method Air Hammer
Well Depth 425'
Static Water Level Flowing
Well Diameter 8"
Depth Casing 42'

PUMP TEST
Method Air Lift
Pumping Rate(GPM) 150+
Duration 4 hours
Pumping Level 422'
Water Quality at End of Test: Clear
Comments: Well Cap Plug Type

Was Well Disinfected NO
Yes / No

Drilling Started 6/13/02
Completed 6/14/02
Well Driller David H. Tompkins & Sons, Inc.
New York State Registered Driller #10118

APPENDIX II

ADC ORANGE, INC.
SALESIAN PROPERTY
(T) GOSHEN, NEW YORK

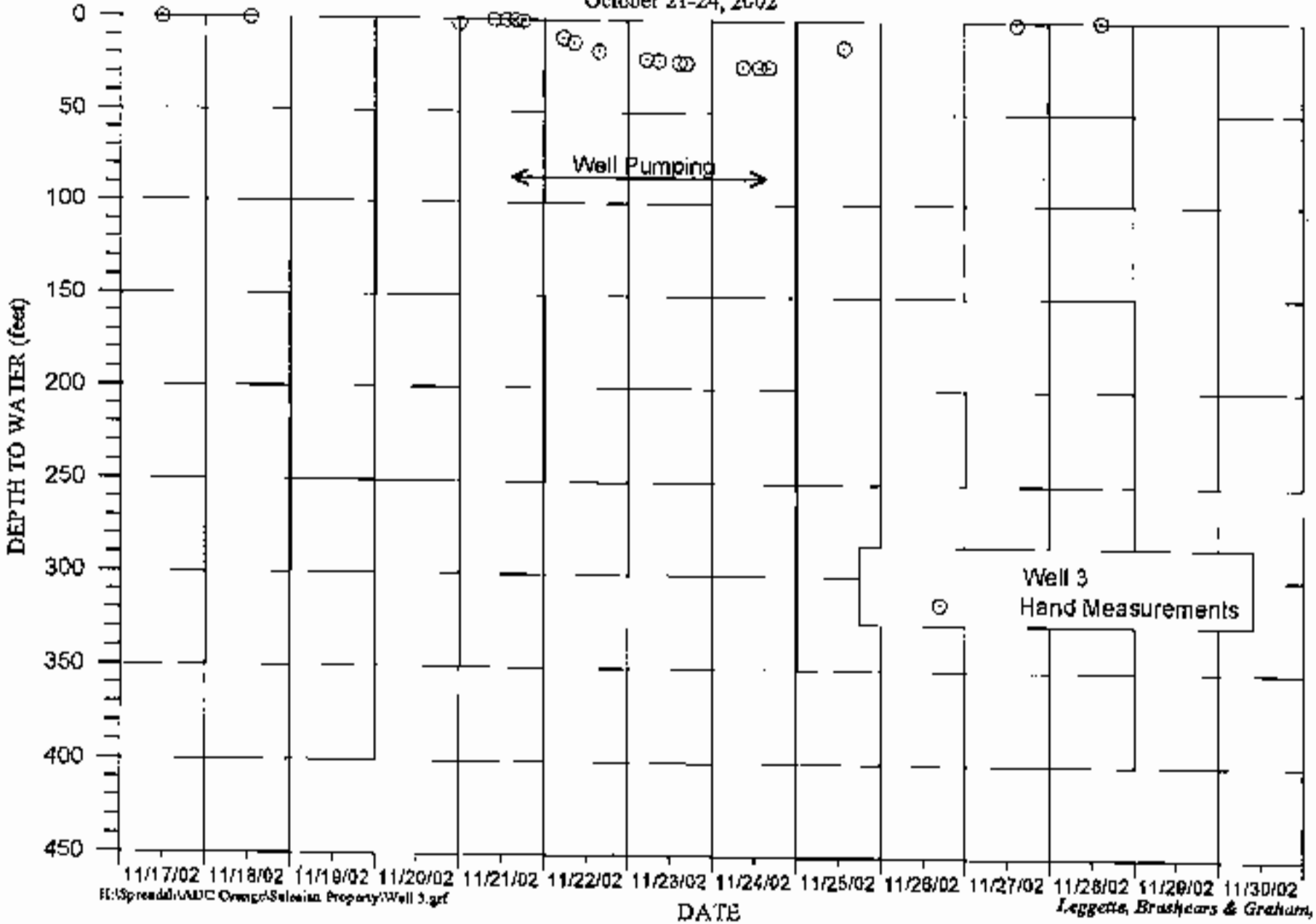
Water-Level Readings and Pumping Rates During the 72-Hour Pumping Test
On Well 1 from October 21-October 24, 2002

Date	Time	DTW (feet)	Drawdown (feet)	Elapsed Time (minutes)	Remarks
10/22/02	13:55	120.4	-120.4	1375.00	
10/22/02	15:00	121.6	-121.6	1500.00	
10/22/02	17:00	122.04	-122.04	1560.00	
10/22/02	16:00	122.5	-122.5	1620.00	
10/22/02	18:35	122.73	-122.73	1655.00	
10/22/02	19:36	123.16	-123.16	1716.00	
10/22/02	20:40	123.68	-123.68	1780.00	
10/22/02	21:42	124.11	-124.11	1842.00	
10/22/02	22:43	124.41	-124.41	1903.00	
10/22/02	23:36	124.7	-124.7	1956.00	
10/23/02	1:00	125.11	-125.11	2040.00	
10/23/02	2:00	125.53	-125.53	2100.00	
10/23/02	2:59	125.84	-125.84	2159.00	
10/23/02	3:58	126.06	-126.06	2218.00	
10/23/02	5:12	126.41	-126.41	2292.00	
10/23/02	6:05	126.7	-126.7	2345.00	
10/23/02	7:00	127.04	-127.04	2400.00	
10/23/02	8:00	127.37	-127.37	2460.00	
10/23/02	9:00	127.6	-127.6	2520.00	
10/23/02	10:00	127.85	-127.85	2580.00	
10/23/02	11:00	128.05	-128.05	2640.00	
10/23/02	12:00	128.26	-128.26	2700.00	
10/23/02	13:00	128.42	-128.42	2760.00	
10/23/02	14:05	128.67	-128.67	2825.00	
10/23/02	15:05	128.87	-128.87	2885.00	
10/23/02	16:00	129.15	-129.15	2940.00	
10/23/02	17:03	129.39	-129.39	3003.00	
10/23/02	18:25	129.32	-129.32	3085.00	
10/23/02	19:29	129.95	-129.95	3149.00	
10/23/02	20:31	130.19	-130.19	3211.00	
10/23/02	21:41	130.45	-130.45	3281.00	
10/23/02	22:45	130.65	-130.65	3345.00	
10/23/02	23:52	130.97	-130.97	3412.00	
10/24/02	0:57	131.15	-131.15	3477.00	
10/24/02	1:56	131.32	-131.32	3536.00	
10/24/02	3:30	131.71	-131.71	3630.00	
10/24/02	4:34	131.96	-131.96	3694.00	
10/24/02	5:33	132.22	-132.22	3753.00	
10/24/02	6:30	132.45	-132.45	3810.00	
10/24/02	6:55	132.57	-132.57	3835.00	
10/24/02	8:00	132.82	-132.82	3900.00	
10/24/02	9:10	133.11	-133.11	3970.00	
10/24/02	10:00	133.32	-133.32	4020.00	
10/24/02	11:00	133.54	-133.54	4080.00	
10/24/02	12:00	133.7	-133.7	4140.00	
10/24/02	12:45	133.82	-133.82	4185.00	
10/24/02	14:10	134	-134	4270.00	
10/24/02	15:03	134.18	-134.18	4323.00	250 gpm
10/24/02	15:05	134.19	-134.19	4325.00	Pump Off
10/24/02	15:06	92.1	-92.1	4326.00	Recovery
10/24/02	15:07	86.7	-86.7	4327.00	
10/24/02	15:08	83.8	-83.8	4328.00	
10/24/02	15:09	81.86	-81.86	4329.00	

APPENDIX III

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Well 3
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002



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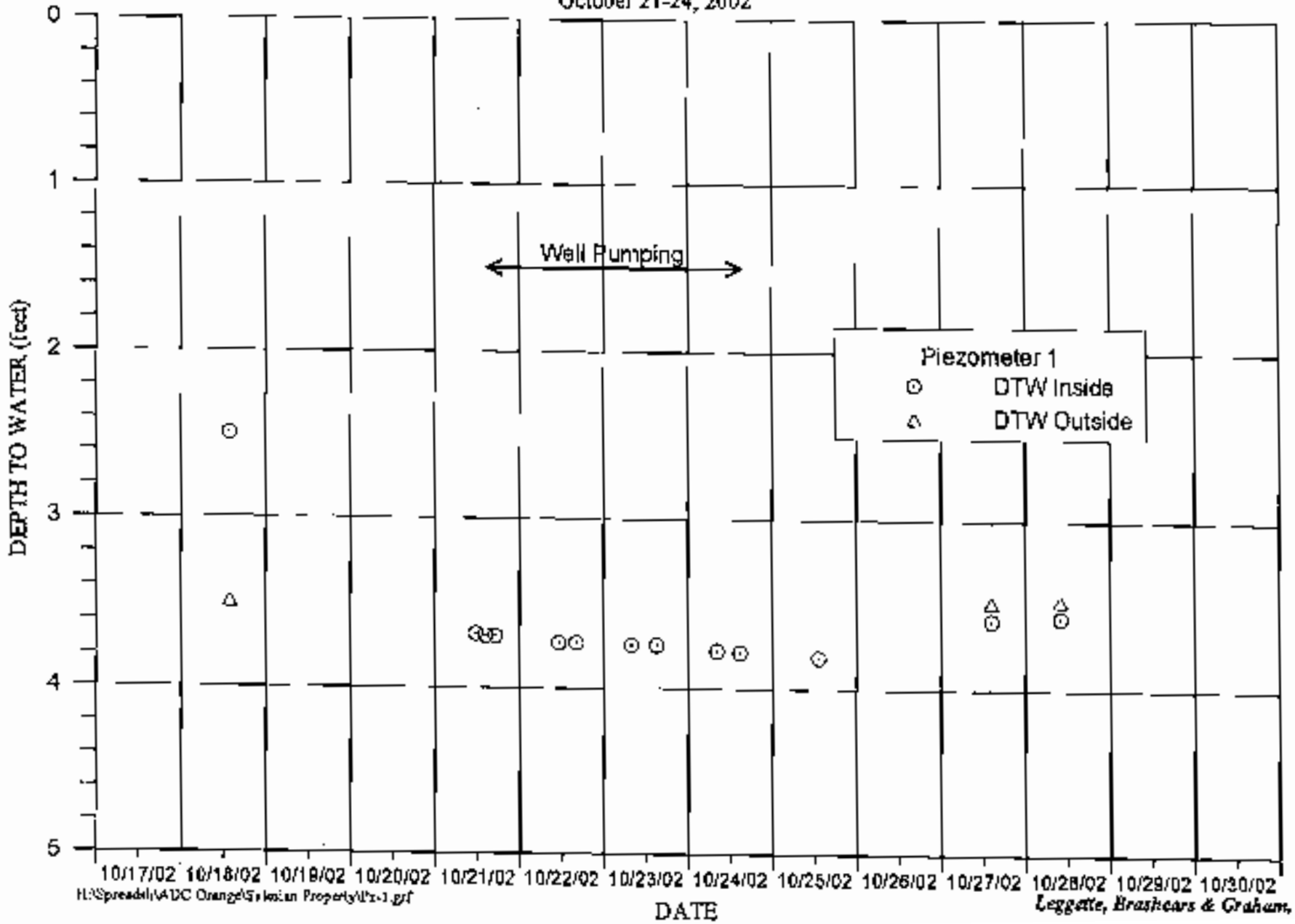
Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Piezometer 1
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002



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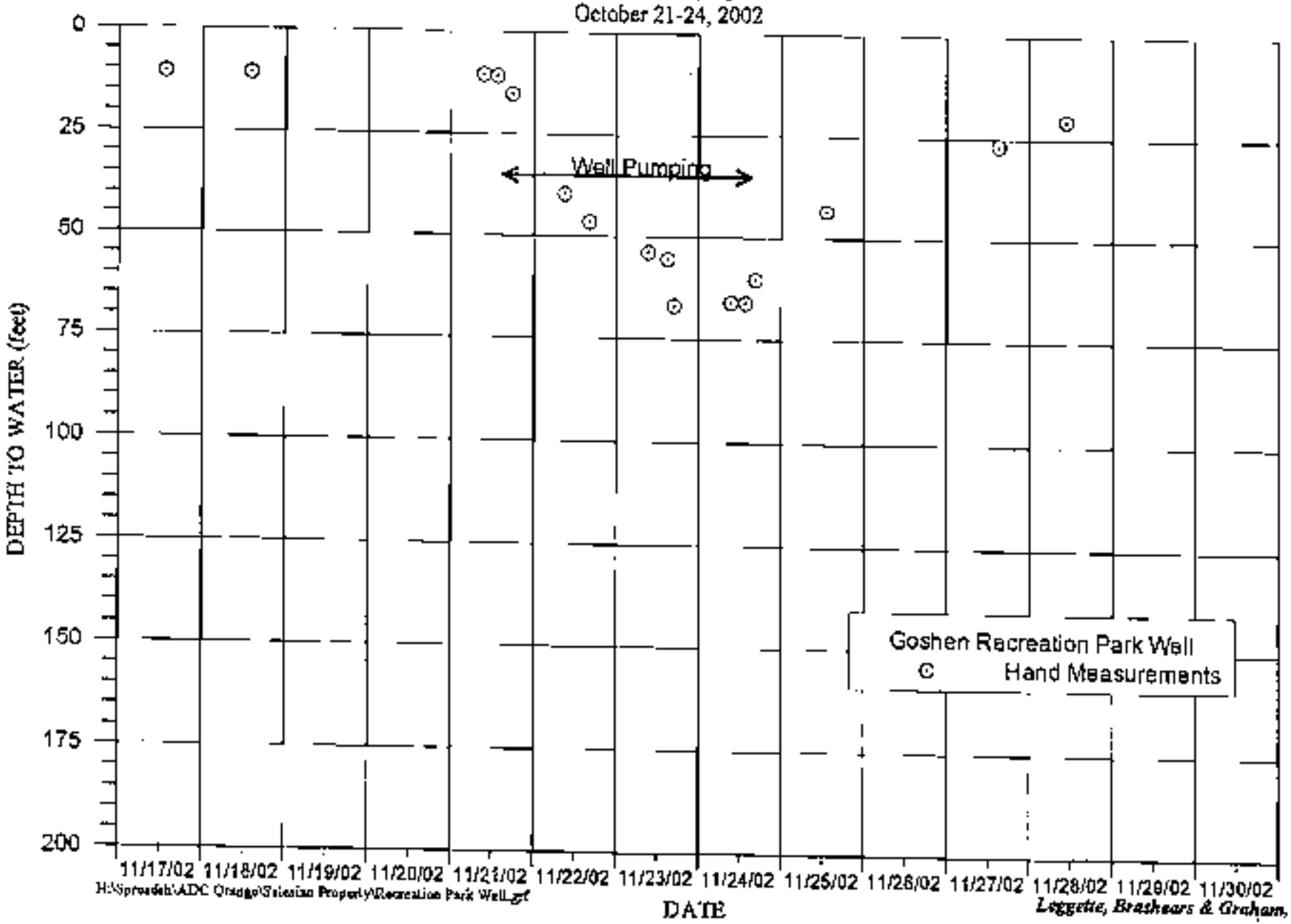
Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Goshen Recreation Park Well
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002



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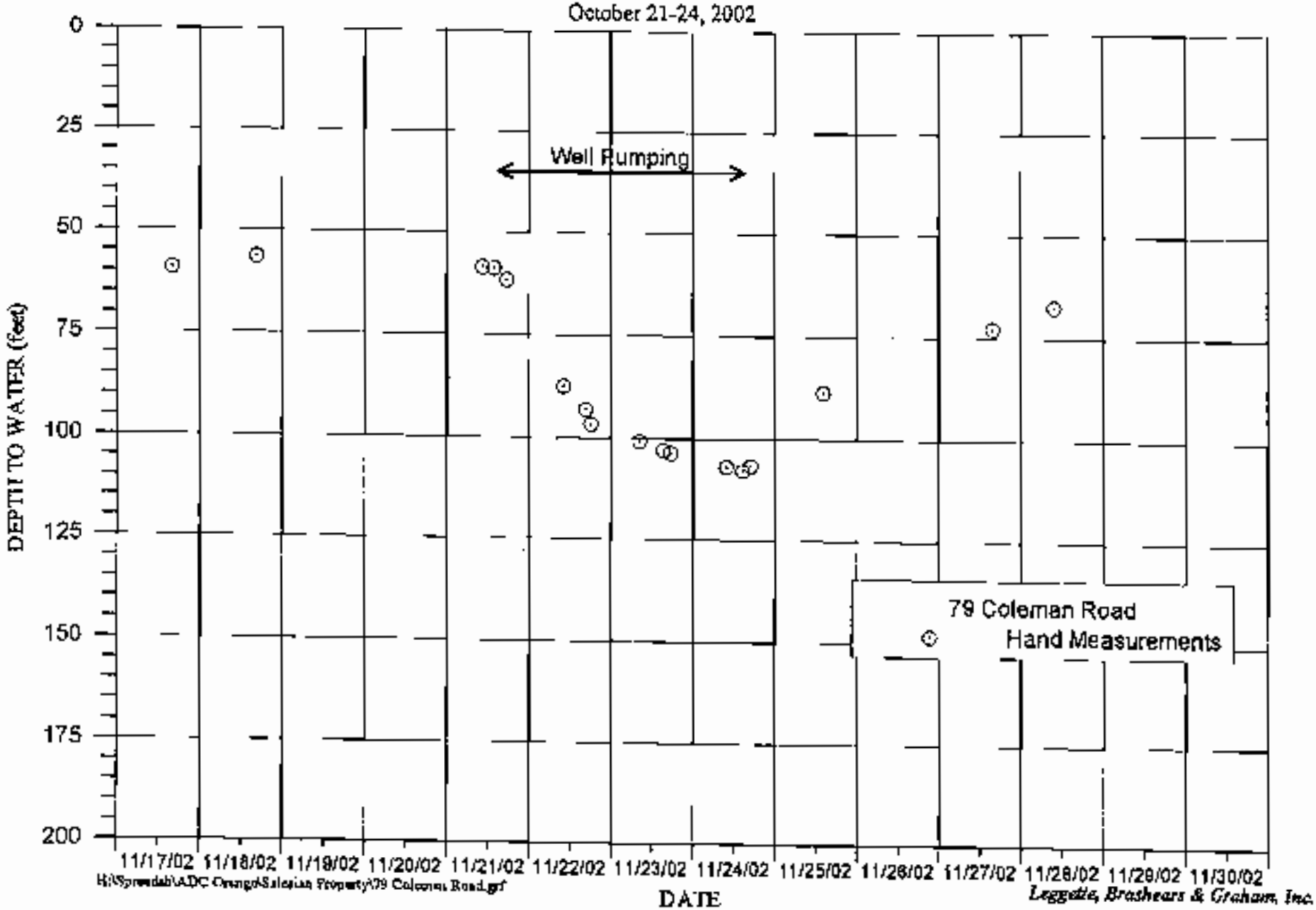
Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Johnson Residence, 79 Coleman Road
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002

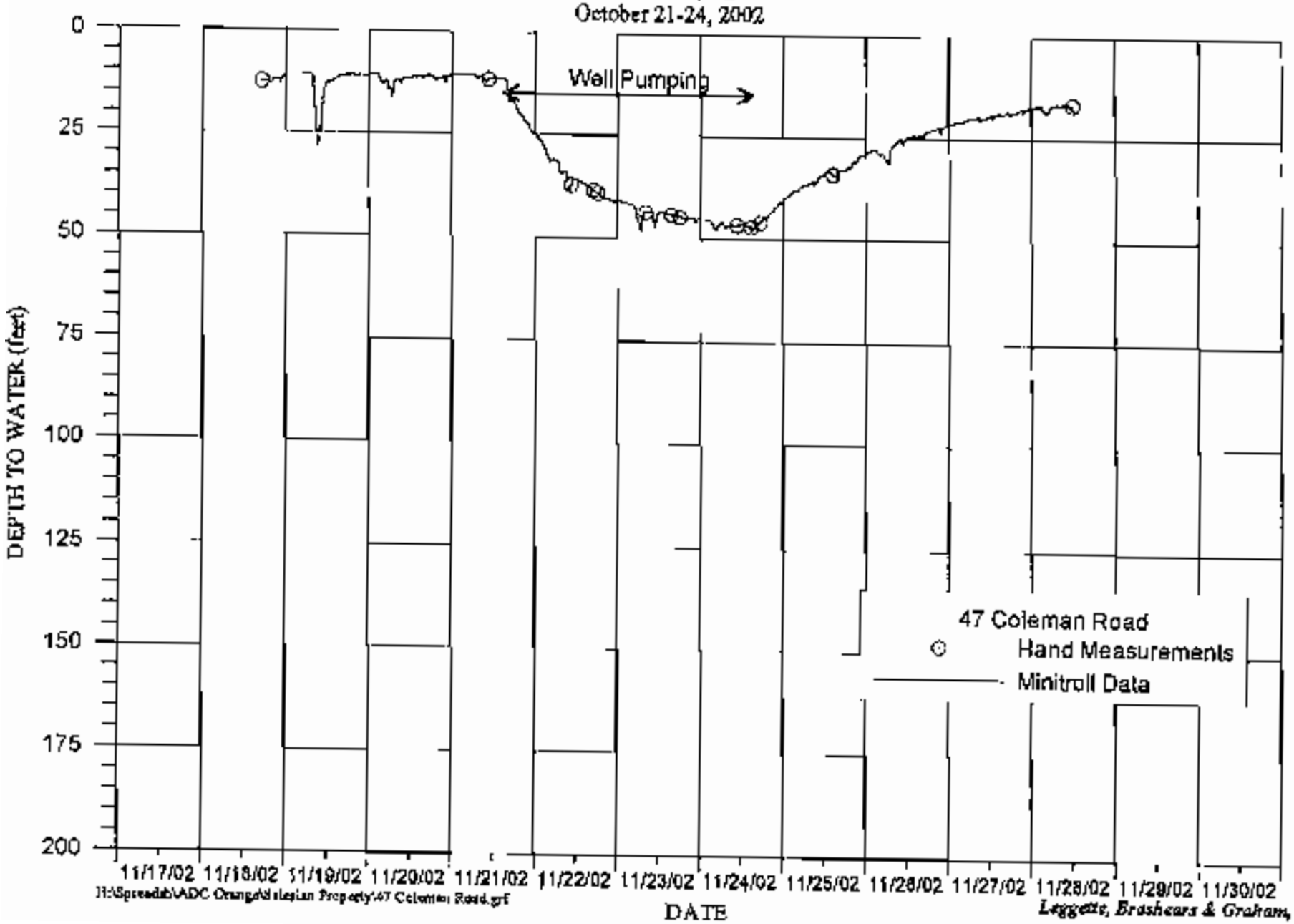


H:\Spreadsh\ADC Orange\Salesian Property\79 Coleman Road.grf

Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Tomosivitch Residence, 47 Coleman Road
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002



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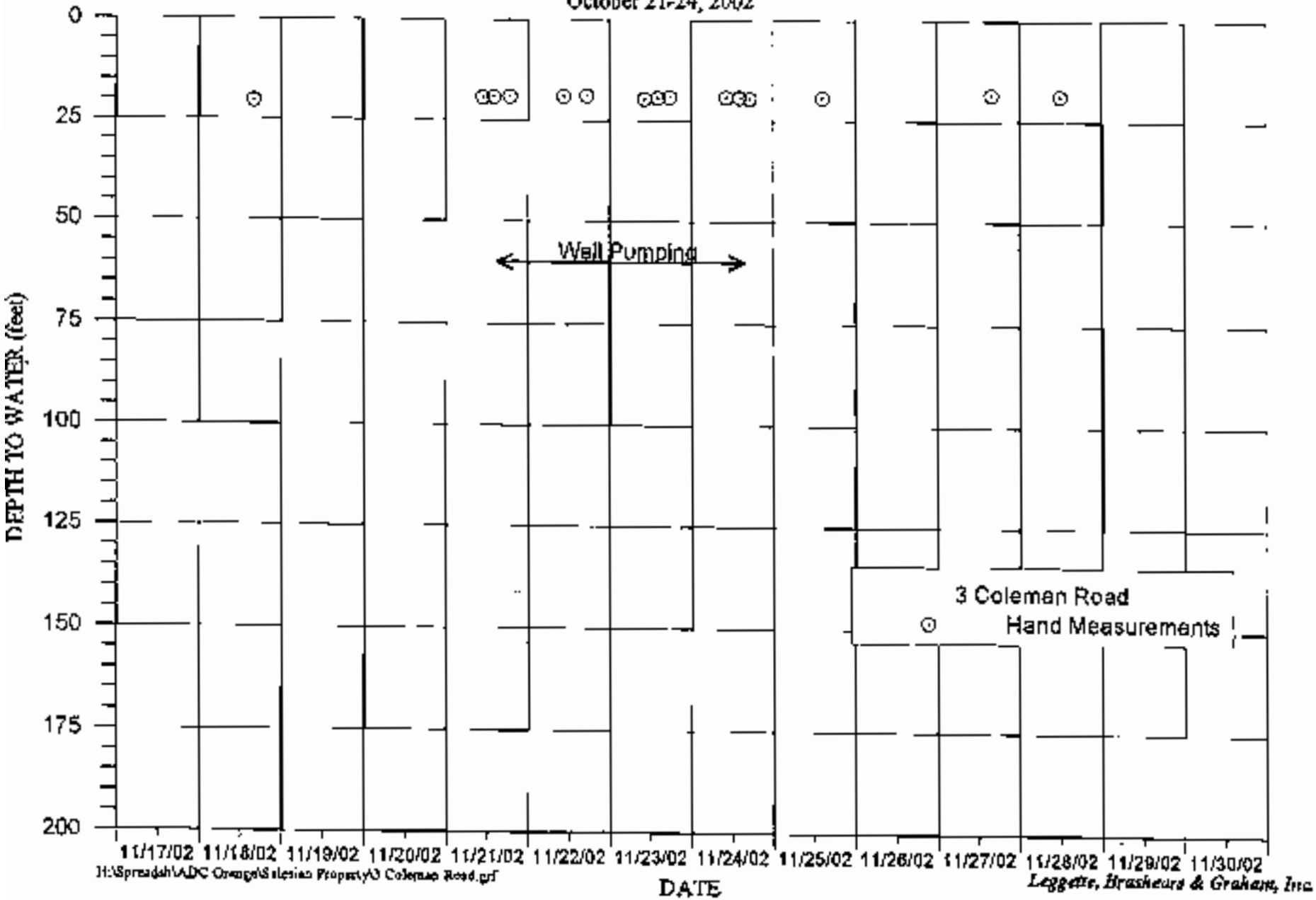
Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of English Residence, 3 Coleman Road
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002

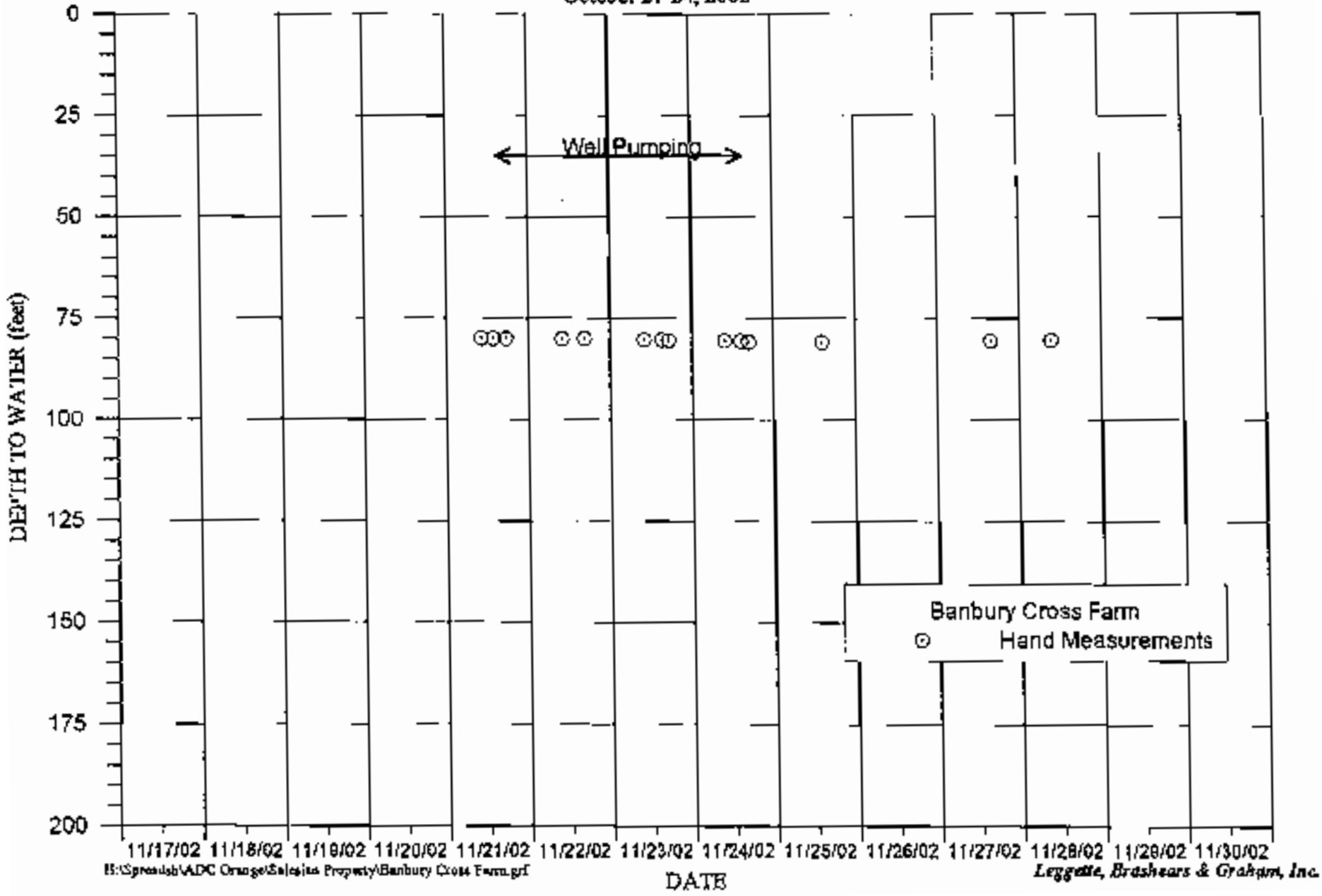


H:\Spreadsh\ADC Orange\Salesian Propert\3 Coleman Road.grf

Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Banbury Cross Farm Well
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002

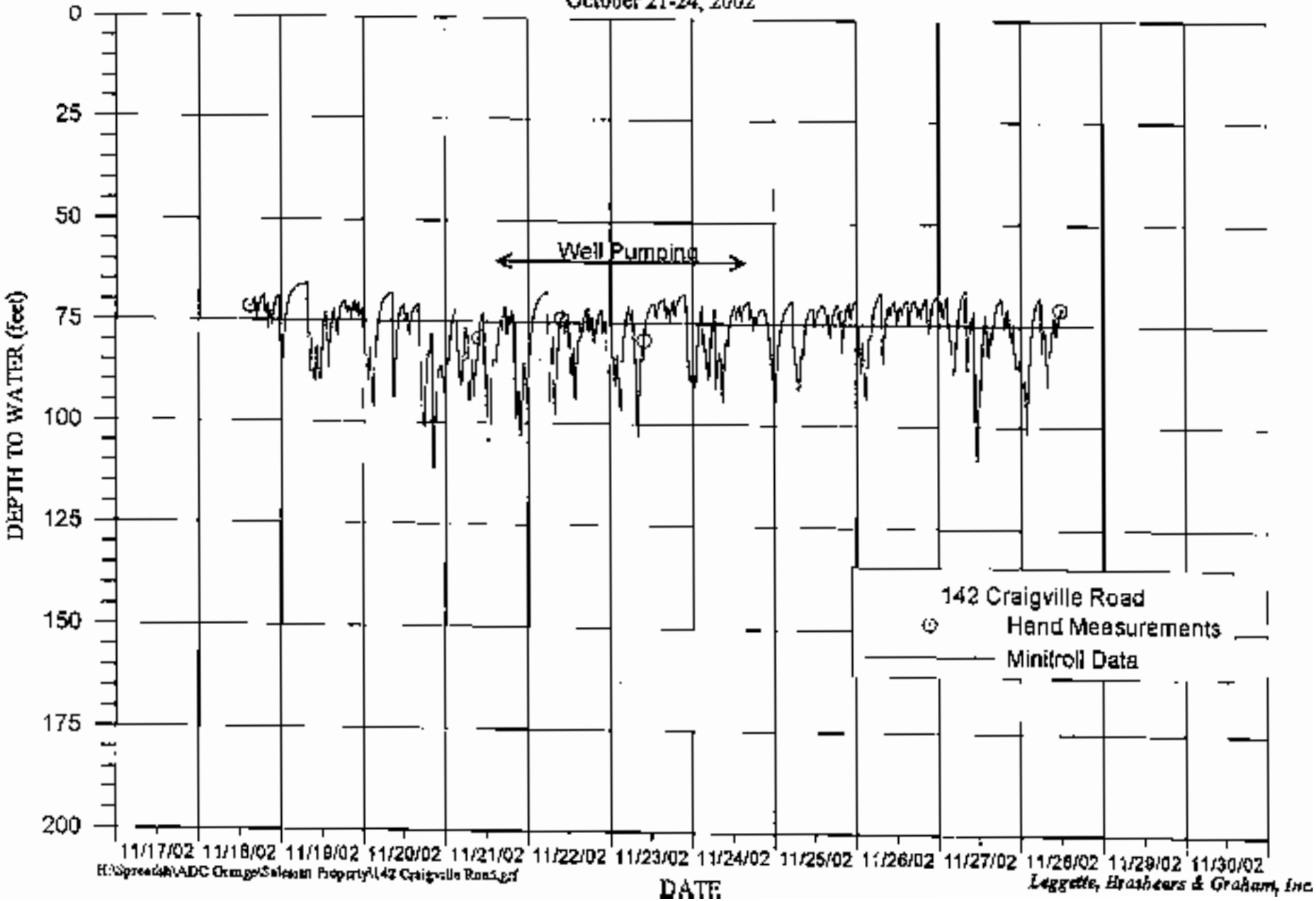


B:\Spreadsh\ADC Orange\Salesian Property\Banbury Cross Farm.grf

Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Schlegel Residence, 142 Craigville Road
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002

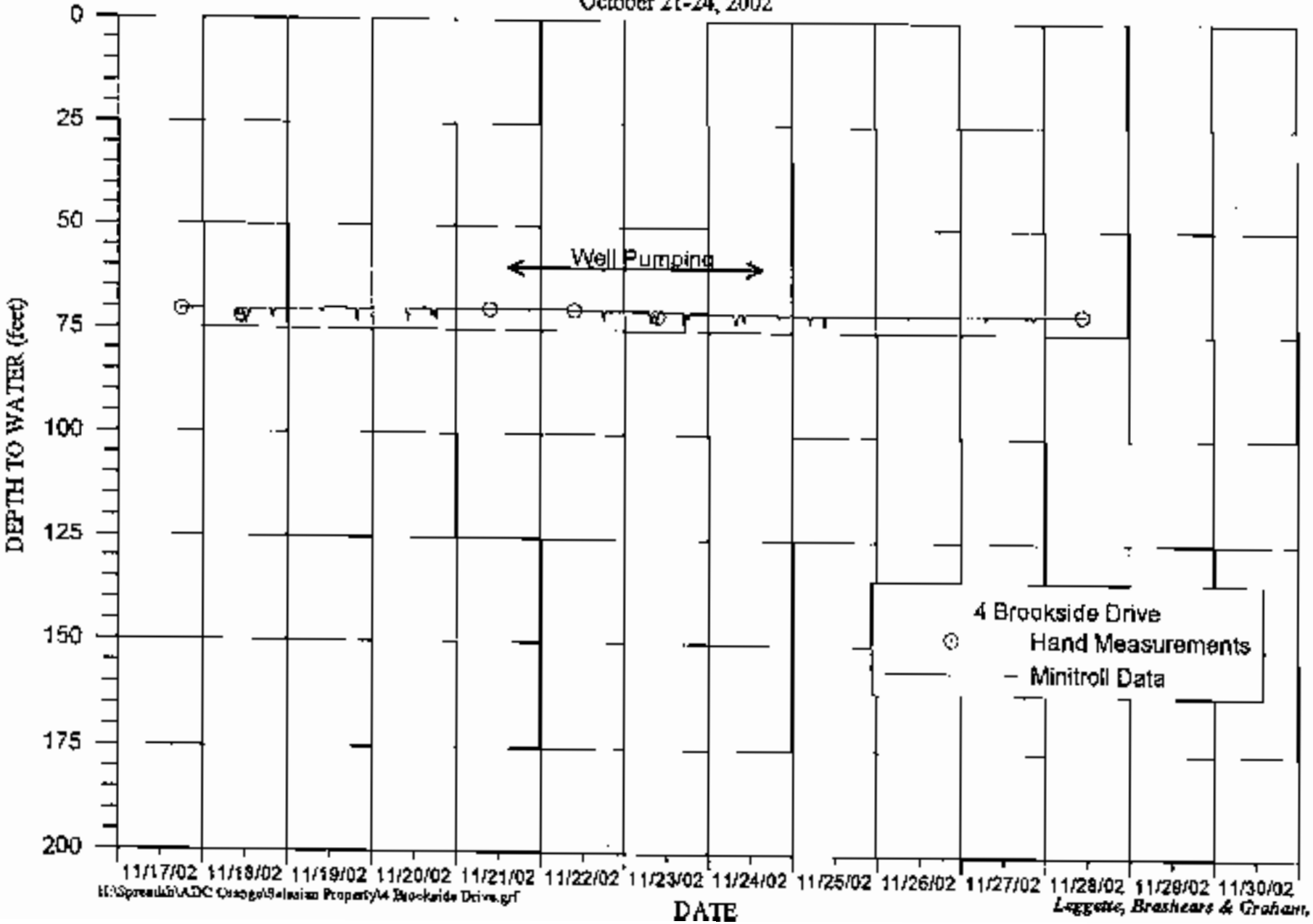


H:\Spreadsh\ADC Orange\Salesian Property\142 Craigville Road.grf

Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Poplaski Residence, 4 Brookside Drive
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002



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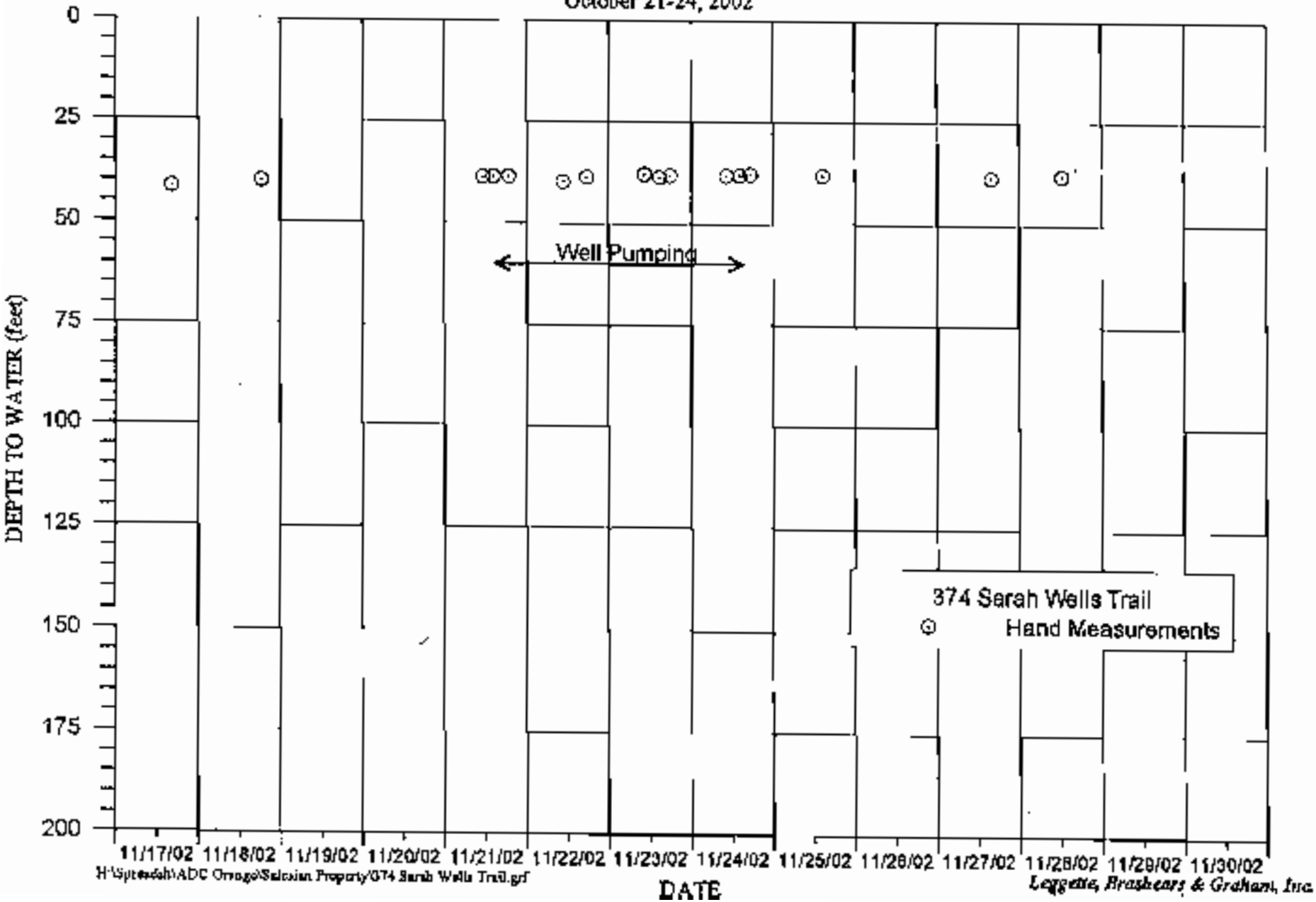
Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Roberts Residence, 374 Sarah Wells Trail
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002

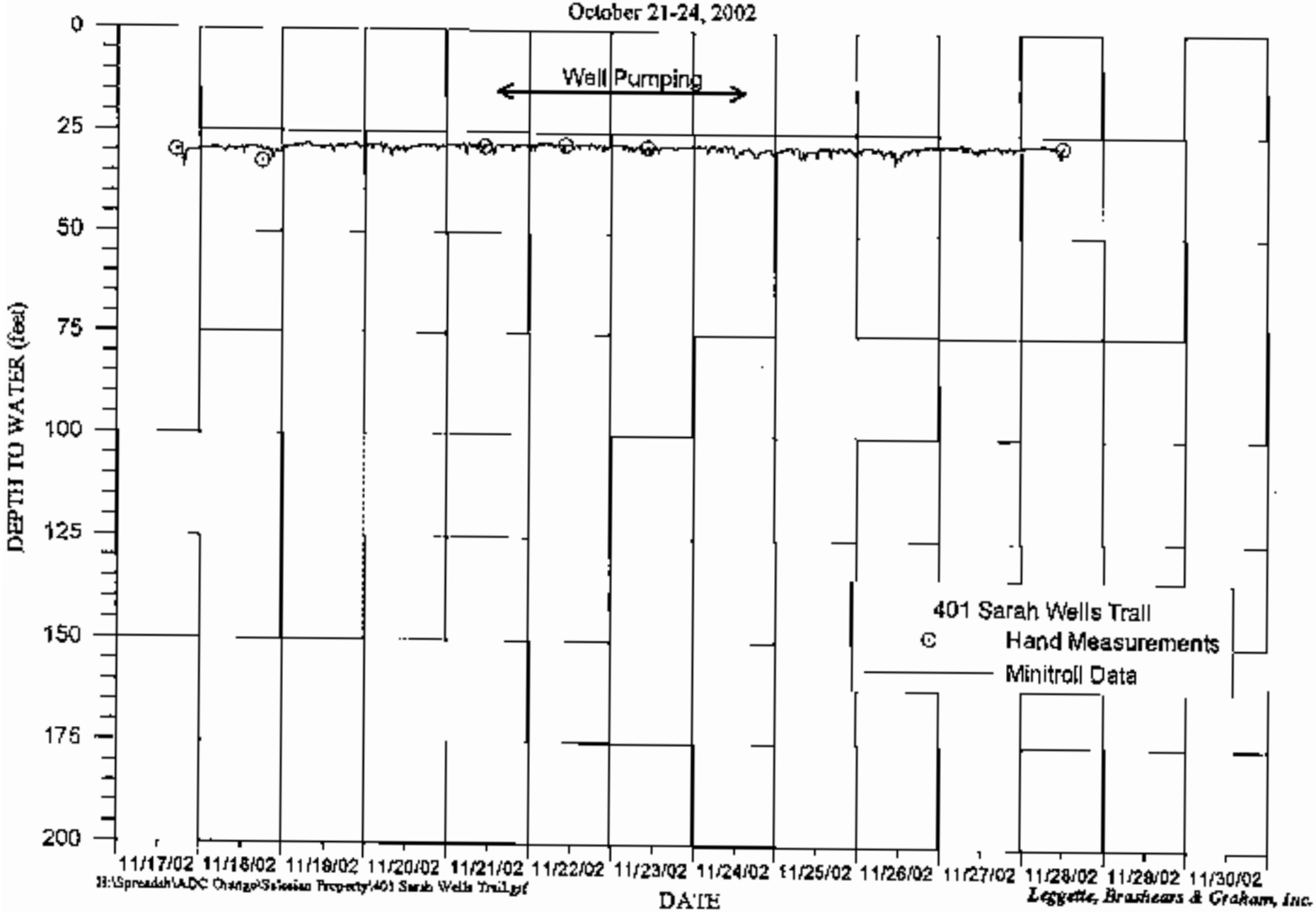


H:\Spreadsh\ADC Orange\Salesian Property\374 Sarah Wells Trail.grf

Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of Hopkins Residence, 401 Sarah Wells Trail
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002

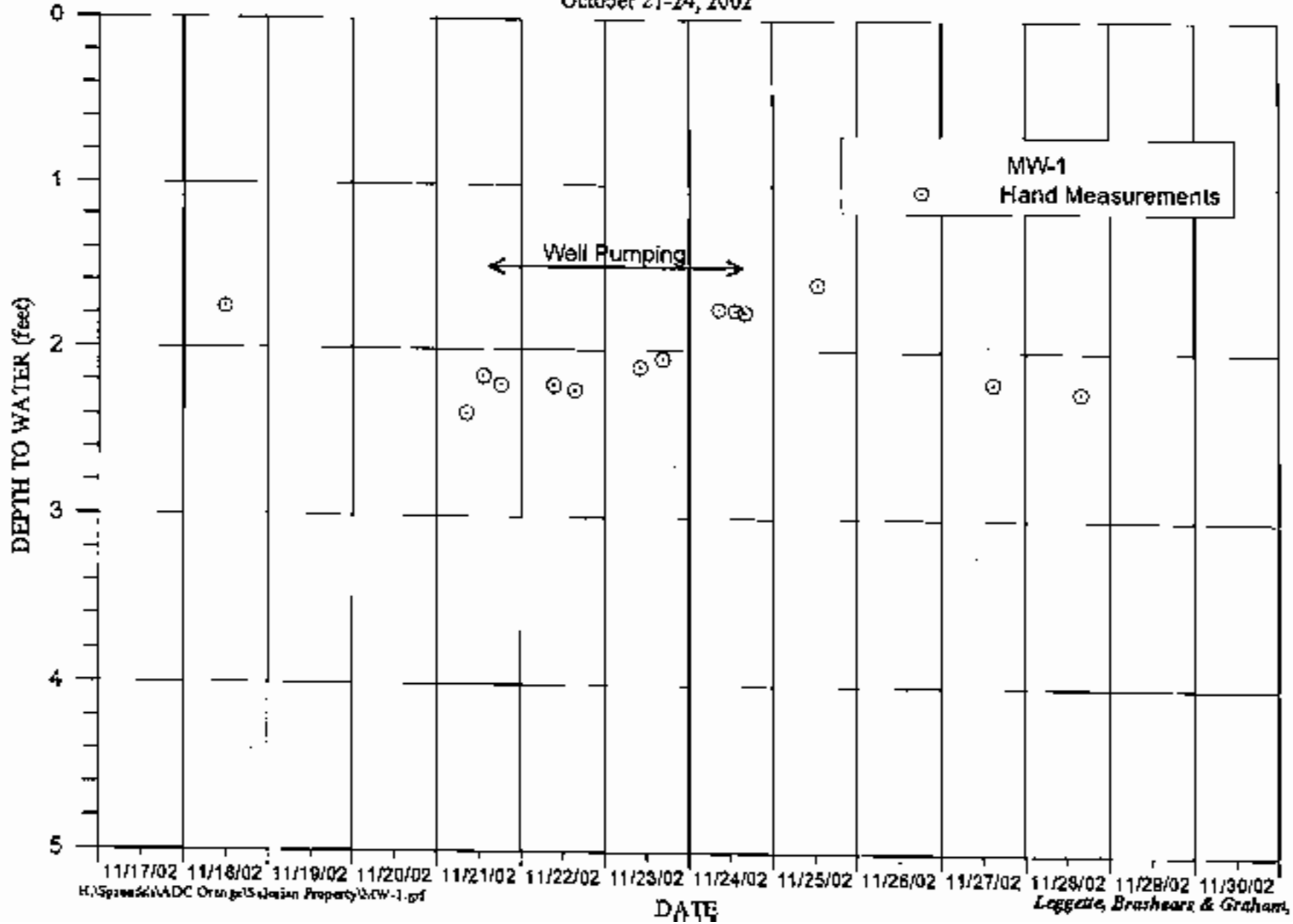


H:\Spreadsh\ADC Orange\Salesian Property\401 Sarah Wells Trail.gf

Leggette, Brashears & Graham, Inc.

ADC ORANGE, INC.
SALESIAN PROPERTY
GOSHEN, NEW YORK

Hydrograph of MW-1
During the 72-Hour Pumping Test of Well 1
October 21-24, 2002



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Leggette, Brashears & Graham, Inc.

APPENDIX IV

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721

(845) 733-1557 Fax: (845)733-1844

ELAP#10510

OCL
Analytical Services

Tuesday, October 29, 2002
Page Number : 1
OCL Sample No: 136736

Leggett, Brashears, Graham Inc.
126 Monroe Turnpike
Trumbull CT 06611

Client Code : **LBG**

OCL Sample No : **136736**

System Name : **Leggett,Brashears,Graham Inc.**
Exact Location : **Well # 1**

Date Collected : **10/24/2002**
Time Collected : **12:30**
Date Received : **10/24/2002**

Submit By : **Client**

Type Descr : SID : **000** Fed ID :

Analysis		Result	Units	MCL/DL		Method	Time	Lab	Date	By	Rem
Alkalinity as CaCO3		157	mg/L			2320B		10510	10/28/02	KG	
Chloride		40	mg/L	250	MCL	4500Cl-C		10510	10/29/02	KG	
Color	LT	5				2120B	15:45	10510	10/24/02	KG	
Fluoride		0.23	mg/L	2.2	MCL	340.2		10510	10/29/02	LM	
Hardness as CaCO3, Calcium		148	mg/L			3500 Ca-D	15:00	10510	10/24/02	KG	
Nitrate as N	LT	0.20	mg/L	10	MCL	Lachat		10510	10/25/02	LM	
Nitrite as N	LT	0.01	mg/L	1	MCL	EPA354.1	14:00	10510	10/25/02	LM	
Odor		10				2150	15:50	10510	10/24/02	KG	
pH		7.56				4500H+B	15:00	10510	10/24/02	LM	
Solids, Dissolved Total		268	mg/L			2540C		10510	10/24/02	LM	
Sulfate		27	mg/L	250	MCL	375.4		10510	10/29/02	LM	
Turbidity	LT	0.10	ntu			2130B	15:10	10510	10/24/02	KG	
Corrosivity(Langelier Index)		0.12						10510	10/29/02	KG	

Remarks :

Copies to: Fax: (203)452-3111

Paula M. Montague
Inorganic Chemistry Department

GT = greater than
LT = less than
ND = not detected
MCL = maximum contaminant level
DL = detection level

OCL Analytical Servi---
35 Goshen Turnpike
Bloomingburg, New York 12721

NELAP # 10510

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 200.7	Barium	0.053	0.050	10/29/2002 03:27	mg/l		
	Beryllium	ND	0.0010	10/29/2002 03:27	mg/l		
	Cadmium	ND	0.0030	10/29/2002 03:27	mg/l		
	Chromium	ND	0.0030	10/29/2002 03:27	mg/l		
	Copper	ND	0.0050	10/29/2002 03:27	mg/l		
	Iron	ND	0.050	10/29/2002 03:27	mg/l		
	Lead220	ND	0.0080	10/29/2002 03:27	mg/l		
	Manganese	0.11	0.0050	10/29/2002 03:27	mg/l		
	Nickel	ND	0.020	10/29/2002 03:27	mg/l		
	Silver	ND	0.0050	10/29/2002 03:27	mg/l		
	Sodium	29	1.0	10/29/2002 03:27	mg/l		
	Zinc	ND	0.0050	10/29/2002 03:27	mg/l		

Lab: Eastern Laboratory Services, Ltd.

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 200.9	Antimony	ND	0.0050	11/04/2002 00:00	mg/l		
	Thallium	ND	0.002	11/05/2002 00:00	mg/l		

Lab: Eastern Laboratory Services, Ltd.

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 245.1	Mercury	ND	0.0002	11/05/2002 11:52	mg/l		

Lab: Eastern Laboratory Services, Ltd.

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 335.4	Cyanide (total)	ND	0.015	11/01/2002 09:41	mg/l		

Lab: Eastern Laboratory Services, Ltd.

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 376.1	Sulfide	7.80	1.00	10/29/2002 13:30	mg/l		

ND = Not Detected

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 502.2	tert-Butylbenzene	ND	0.5	11/05/2002 00:00	ug/l		
	trans-1,2-Dichloroethene	ND	0.5	11/05/2002 00:00	ug/l		
	trans-1,3-Dichloropropene	ND	0.5	11/05/2002 00:00	ug/l		

Lab: Eastern Laboratory Services, Ltd.

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 504.1	1,2-Dibromo-3-chloropropar	ND	0.01	11/07/2002 16:13	ug/l		
	1,2-Dibromoethane (EDB)	ND	0.01	11/07/2002 16:13	ug/l		

Lab: Eastern Laboratory Services, Ltd.

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 508	Chlordane (tech)	ND	0.10	11/06/2002 17:13	ug/l		
	PCB-1016	ND	0.10	11/06/2002 17:13	ug/l		
	PCB-1221	ND	0.10	11/06/2002 17:13	ug/l		
	PCB-1232	ND	0.10	11/06/2002 17:13	ug/l		
	PCB-1242	ND	0.10	11/06/2002 17:13	ug/l		
	PCB-1248	ND	0.10	11/06/2002 17:13	ug/l		
	PCB-1254	ND	0.10	11/06/2002 17:13	ug/l		
	PCB-1260	ND	0.10	11/06/2002 17:13	ug/l		
	Toxaphene	ND	0.50	11/06/2002 17:13	ug/l		

Lab: Eastern Laboratory Services, Ltd.

OCL Sample No: 136736

Method	Analyte	Result	Detection Limit	Analysis Date	Units	LNote	ANote
EPA 525.2	Alachlor	ND	0.31	11/05/2002 00:00	ug/l		
	Aldrin	ND	1.10	11/05/2002 00:00	ug/l		
	Atrazine	ND	0.03	11/05/2002 00:00	ug/l		
	Benzo (a) pyrene	ND	0.03	11/05/2002 00:00	ug/l		
	Butachlor	ND	2.00	11/05/2002 00:00	ug/l		
	Di(2-ethylhexyl)adipate	ND	5.00	11/05/2002 00:00	ug/l		
	Di(2-ethylhexyl)phthalate	ND	2.00	11/05/2002 00:00	ug/l		
	Dieldrin	ND	2.00	11/05/2002 00:00	ug/l		
	Endrin	ND	0.26	11/05/2002 00:00	ug/l		
	HCH-gamma (Lindane)	ND	0.02	11/05/2002 00:00	ug/l		
	Heptachlor	ND	0.06	11/05/2002 00:00	ug/l		
	Heptachlor epoxide	ND	0.02	11/05/2002 00:00	ug/l		HLFB
	Hexachlorobenzene	ND	0.13	11/05/2002 00:00	ug/l		
	Hexachlorocyclopentadiene	ND	1.00	11/05/2002 00:00	ug/l		HLFB
	Methoxychlor	ND	0.11	11/05/2002 00:00	ug/l		
	Metolachlor	ND	0.04	11/05/2002 00:00	ug/l		
	Metribuzin	ND	2.00	11/05/2002 00:00	ug/l		

ND = Not Detected

OCL Analytical Services
35 Goshen Turnpike
Bloomingburg, NY 12721

(845) 733-1557 Fax: (845)733-1944

ELAP#10510

OCL
Analytical Services

Wednesday, November 27, 2002
Page Number : 1
OCL Sample No: 136736

Leggett, Brashears, Graham Inc.
126 Monroe Turnpike
Trumbull CT 06611

Client Code : **LBG**

OCL Sample No : **136735**

System Name : **Leggett,Brashears,Graham Inc.**
Exact Location : **Well #1**

Date Collected : 10/24/2002
Time Collected : 12:30
Date Received : 10/24/2002

Submit By : **Client**

Type Descr : SID : 000 Fed ID :

LNote	
AA	Surrogate (DCAA) was 109 %
LCCV	Continuing Calibration Verification was below acceptance limits. Results may be biased low.
HCCV	Continuing Calibration Verification was above acceptance limits. Results may be biased high.
LLFB	LFB % Recovery below acceptance limits. The result may be biased low.

David M. Kennedy - Director

GT = greater than
LT = less than
ND = not detected
MCL = maximum contaminant level
DL = detection level
Analyzed by Eastern Lab Services NELAP 11216

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

DATE	November 15, 2002
HRI PROJECT	009-456
HRI SERIES NO.	J424/02
DATE RECD	10/31/2002
CUST. P.O.#	None Rec'd

OCL Analytical Services
David Kennedy
35 Goshen Turnpike
Bloomingburg, NY 12721

REPORT OF ANALYSIS

SAMPLE NO: J424/02-1

SAMPLE IDENTIFICATION: 136736 - LBG, Trumbull, CT - Well 1 - sampled on 10/24/2002 @ 1230

PARAMETER	RESULT	DETECTION LIMIT	METHOD	ANALYSIS DATE	ANALYST
Gross Alpha (+-Precision*), pCi/l (T)	1.4(+-2.1)	1.7	EPA 900.0	11/04/2002 @ 1622	LH
Gross Beta (+-Precision*), pCi/l (T)	0.1(+-2.6)	2.6	EPA 900.0	11/04/2002 @ 1622	LH
Radium-226 (+-Precision*), pCi/l (T)	0.7(+-0.4)	0.1	SM 7500-Ra B	11/05/2002 @ 1812	LH
Radium-228 (+-Precision*), pCi/l (T)	0.2(+-0.6)	0.6	EPA Ra-05	11/11/2002 @ 1316	SMS

*Variability of the radioactive decay process (counting error) at the 95% confidence level, 1.96 sigma.
Certification ID's: CO/EPA - CO00008; CT - PH-0152; KY - 90076; KS - E-10265; NH - 232601-A;
NY ELAP - 11417; PA DEP 68551; WI - 998376610

CODES:
(T) = Total (D) = Dissolved
(S) = Suspended (R) = Total Recoverable
(PD) = Potentially Dissolved
< = Less Than

By: _____
Robert Roslad
Laboratory Manager

FLI
FRIEND LABORATORY INC

32 ITHACA STREET WAVERLY, NY 14892-1532
TELEPHONE (607) 565-3500 FAX (607) 565-4083

Date: 08-NOV-2002

Lab Sample ID: L95881-1

OCL Analytical Services
Todd Zilinsky
35 Goshen Turnpike
Bloomingburg, NY 12721

Sample Source: LBG
Origin: 136/56 WELL 1
Description: FILTER
Sampled On: 24-OCT-02 12:30 by CLIENT
Date Received: 25-OCT-02 10:09
P.O. No: N/A

Analysis Performed	Result	Units	Detection Limit	Date Analyzed	Method	Notebook Reference
Algae	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Diatoms	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Rotifers	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Rotifer Eggs	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Plant Matter	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Pollen	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Insects	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Insect Parts	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Nematodes	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Nematode Eggs	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Crustaceans	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Crustacean Parts	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Protozoa	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Fine Debris	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Large Debris	ND	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Particle Size of 5-15 uM	1.0E+06	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Particle Size of 15-100 uM	6.1E+05	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Particle Size of 100-200 uM	4.0E+03	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101
Particle Size of > 200 uM	5.0E+02	/100 L		08-NOV-02 10:22	EPA 910/9-92-029	99-170-101

Analysis Comment: Giardia <0.3/100 L Cryptosporidium <0.3/100 L

Approved by: Lab Director

NY 10252 NJ 73168 PA 68180 EPA NY 00033

DC

KEY: ND or U = None Detected < = less than ug/L = micrograms per liter (equivalent to parts per billion)
mg/L = milligrams per liter (equivalent to parts per million) mg/kg = milligrams per kilogram (equivalent to parts per million)
B = analyte was detected in the method or prep blank J = result estimated below the quantitation limit

The information in this report is accurate to the best of our knowledge and ability. In no event shall our liability exceed the cost of these services. Your samples will be discarded after 14 days unless we are advised otherwise.

CHAIN OF CUSTODY/ANALYSIS REQUEST

Page 1 of 5

OCL Analytical Services
35 Goshen Turnpike, Bloomingburg, NY 12721
(845)733-1557 Fax (845)733-1844

Client Name: LBG

Address: 126 Monroe Turnpike
Trumbull, CT 06611

Phone: (203)452-3100

Bill to: Mr Dan Gueran
AOC Orange, Inc.
1185 Broadway, Suite 1600 NY, NY 10023

For NYDOH Compliance - Federal ID No:

Lab Use Only	Collection				Sample Description	Container No/Type	Pres.	Analysis Required		Lab Use
OCL#	Matrix	Date	Time	Grab				Complete Synthetic Organic testing		Results
B6736		10/24	12:30		well 1	2-40ml-G	None	EPA 504	SOC's-NY Compliance	
						2-1L-G	Na2S2O3	EPA 508	SOC's-NY Compliance	
						1-250ml-G	Na2S2O3	EPA 515.3	SOC's-NY Compliance	
						2-1L-G	Na2S2O3	EPA 525.2	SOC's-NY Compliance	
						2-40ml-G	Na2S2O3	EPA 531.1	SOC's-NY Compliance	
						1-1L-G	Na2S2O3	extra sample		
						3-40ml-G	Na2S2O3	EPA 547 Glyphosate		
						3-40ml-G	None	EPA 548 Endothall		
						1-1L-G	Na2S2O3	EPA 549 Diquat		
B6736						1-1L-G	Na2S2O3	[redacted]		

Comment ADDITIONAL TESTING MAY INCLUDE PART 5, IOC AND RADIOLOGICALS

(Client Copy) Prepaid?

1. Relinquished By:	print:	date:	1. Received By:	print:			
	sign:	time:		sign:		10/24	
2. Relinquished By:	print:	date:	2. Received By:	print:		1230	
	sign:	time:		sign:			
3. Relinquished By:	print:	date:	3. Received By:	print:			
	sign:	time:		sign:			

CHAIN OF CUSTODY/ANALYSIS REQUEST

OCL Analytical Services
35 Goshen Turnpike, Bloomingburg, NY 12721
(845)733-1557 Fax (845)733-1944

Page ____ of ____

Client Name & Address: LBG
169 Monroe Tpk
Trumbull, CT 06611

Phone:

Bill to: Mr Dan Gleeson
HDC Orange Inc.
1995 Broadway Suite 1200
NY, NY 10023

LAB USE ONLY OCL#	Matrix	Collection Date	Collection Time	comp	grab	Sample Description	Containers No/Type	Preservative	Analysis Required
36736	W	10/24	1230			well 1	2-L-P	None	Gross Alpha, Gross Beta
							2-L-P	None	Radium 226, Radium 228
							2 Vials	None	Radon in Water

Rush Request:

Lab Use Only — Client Code: ____ Prepaid? ____ Lab Dest. ____

1. Relinquished By:	print: Andrew Ginton	date: 10/24	1. Received By:	print:	date: 10/24
	sign:	time: 1330		sign:	time: 1:30
2. Relinquished By:	print:	date:	2. Received By:	print:	date:
	sign:	time:		sign:	time:
3. Relinquished By:	print:	date:	3. Received By:	print:	date:
	sign:	time:		sign:	time:

Comments:

APPENDIX V

There are three (3) large format drawings after this page that need to be printed and inserted into pockets.

REMOVE THIS PAGE FROM THE FINAL DOCUMENT

LEGEND

- DISCHARGE LOCATION
- PZ-A — PIEZOMETER LOCATION
- WELL-1 — ONSITE WELL LOCATION
- PROPERTY BOUNDARY

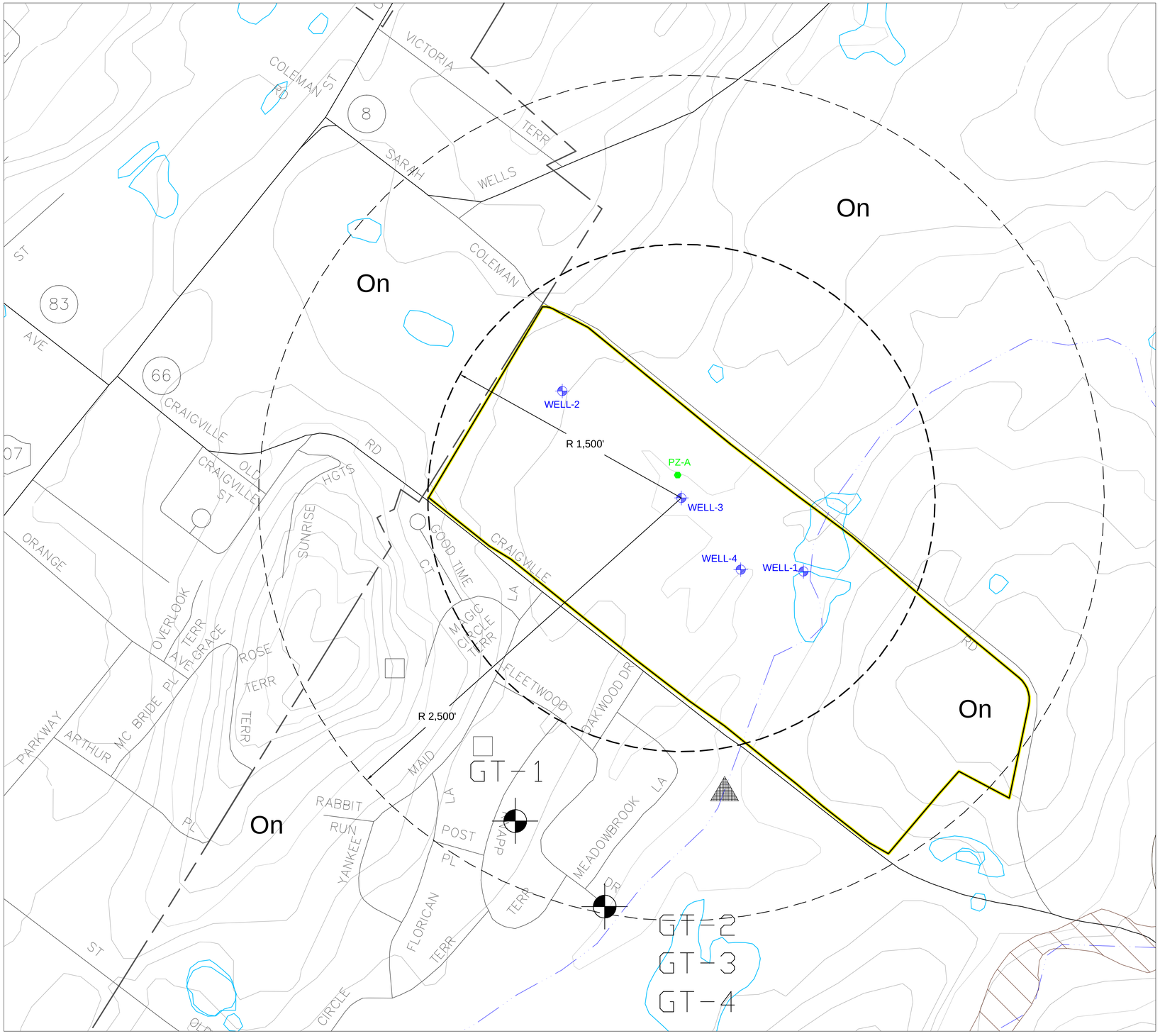
ADC ORANGE, INC.
SALESIAN PROPERTY-MAPLEWOOD
(T) GOSHEN, NEW YORK

SITE MAP

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

DRAWN:	MRV	CHECKED:	TPC	DATE:	10/27/06	PLATE:	1



ONSITE LEGEND

WELL-1 — ONSITE WELL LOCATION

PZ-A — PIEZOMETER LOCATION

LEGEND

STRATIFIED SAND AND GRAVEL AT LAND SURFACE, VERTICAL THICKNESS UNKNOWN

BG-8 — MUNICIPAL/COMMUNITY BEDROCK SUPPLY WELL – IN SERVICE

BG-10 — MUNICIPAL/COMMUNITY BEDROCK SUPPLY WELL – NOT IN SERVICE

1 — MUNICIPAL/COMMUNITY SAND AND GRAVEL SUPPLY WELL – IN SERVICE

16 — MUNICIPAL/COMMUNITY SAND AND GRAVEL SUPPLY WELL – NOT IN SERVICE

EXISTING GROUND-WATER CONTAMINATION SITE *

POTENTIAL GROUND-WATER CONTAMINATION SITE *

FAULT

GEOLOGIC CONTACT

WETLAND NYSDEC (STATE)

WETLAND FEDERAL

* LOCATIONS APPROXIMATE, FIELD VERIFICATION REQUIRED.

BEDROCK GEOLOGY

On — MARTINSBURG FORMATION – SHALE, SILTSTONE, SANDSTONE AND GRAYWACKE

0 300
SCALE IN FEET

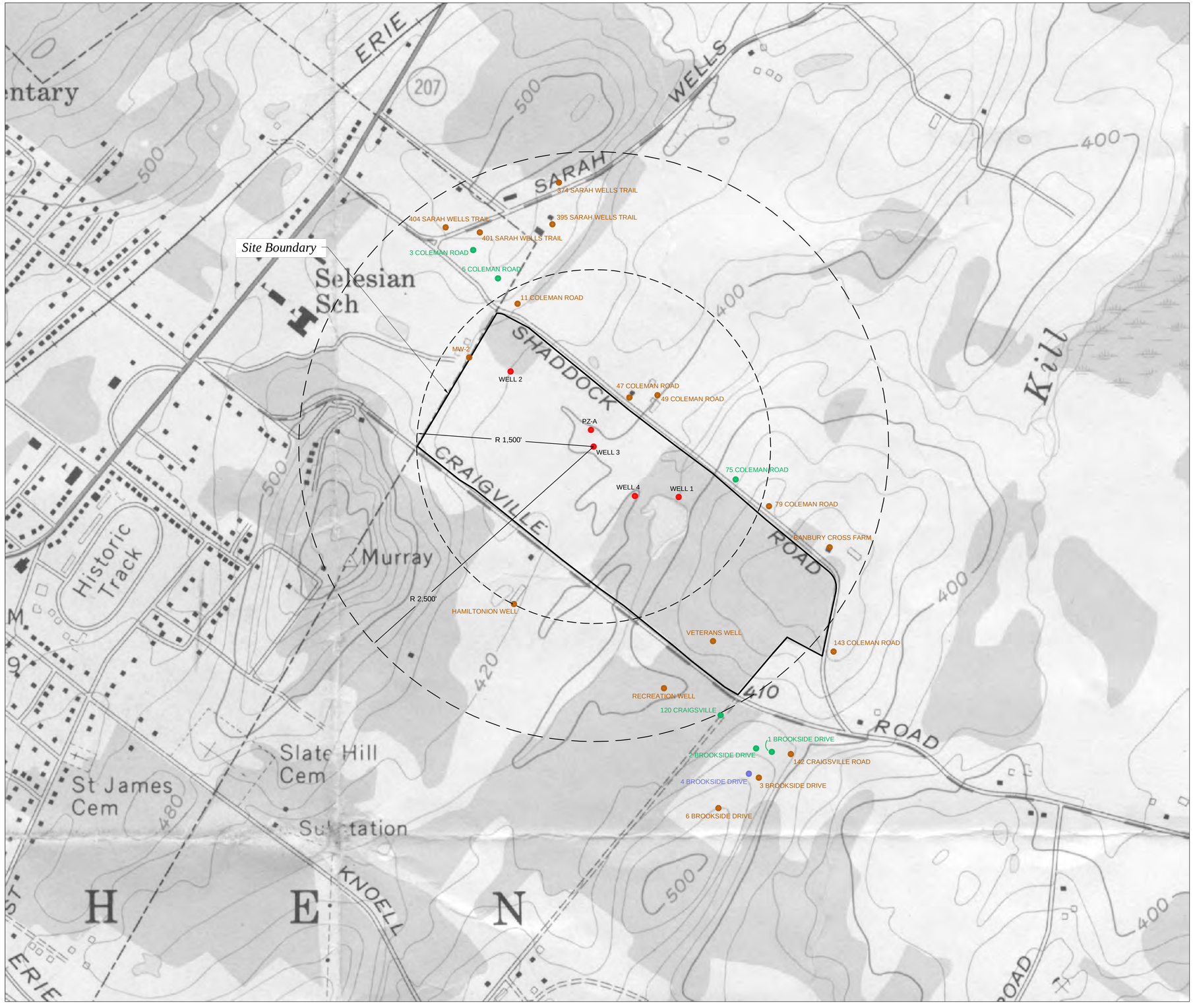
ADC ORANGE, INC.
SALESIAN PROPERTY-MAPLEWOOD
(T) GOSHEN, NEW YORK

KEY HYDROGEOLOGIC FEATURES

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

DRAWN:	CHECKED:	DATE:	PLATE:
MRV	TPC	12/12/06	2



LEGEND

- WELL INCLUDED IN OFFSITE WELL MONITORING NETWORK
- RESIDENT DECLINE TO PARTICIPATE IN OFFSITE WELL MONITORING NETWORK
- NO RESPONSE RECEIVED FROM RESIDENT FOR PARTICIPATION IN OFFSITE WELL MONITORING NETWORK

0 400
SCALE IN FEET

ADC ORANGE, INC.
SALESIAN PROPERTY-MAPLEWOOD
(T) GOSHEN, NEW YORK

WELL MONITORING NETWORK

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

DRAWN:	FCS	CHECKED:	TPC	DATE:	12/08/06	PLATE:	3

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Appendix D

Water System to Serve Maplewood Village

Based on the expected flow, the water system on site will need to provide twice the average flow with the largest well out of service. The resulting flow will therefore be 91.38 GPM. Four wells have been drilled on the property, with adequate water being found in wells #1 & #3. Well #1 can provide as much as 250 GPM and Well #3 can provide 92 GPM. With an adequate supply of water being identified the design of the water can be considered. When reviewing the needs of the project various requirements must be taken into account.

- The system must provide adequate pressure to all points of distribution.
- The system must consider proper chlorination and required detention volumes for proper disinfection.
- A minimum of one full-day's storage volume of water must be provided to meet the state requirements for a public water supply.
- The system must provide for fire flows at adequate volumes and pressure throughout the property.

In review of the project several options can be considered.

Option # 1

Install a water storage tank at the highpoint within the project site, at the upper most portion of the estate section in the area of proposed Lot #9. In order to provide the pressures needed to deliver water throughout the proposed project, the water tank would need to be a stand pipe about 95' high with a 30-foot diameter. This configuration would ensure that a static pressure of 35 psi operating pressure and a 20 psi pressure under fire flow conditions is provided for all units within the proposed service area. The tank would provide a storage volume of approximately 465,000 gallons with the majority of the storage being below the level where minimum allowable operating pressure is achieved. The pump required to maintain the level in the tank would need to 5 hp and be capable of providing 92 gpm against a head of 95 feet. Due to the height and size of the tank, it may create a visual impact on nearby homes in the estate section as well as neighboring properties. Operating and maintenance costs associated with the proposed water supply and distribution system include wages, utilities and gas, repairs and maintenance, and other soft costs such as office supplies, accounting, and legal services. The maintenance and operating costs are estimated as follows:

Electrical Consumption	$5,000 per year
Operator Cost:	$40,000 per year
Chemical Costs:	$10,000 per year
Miscellaneous:	$10,000 per year
Maintenance & Repairs	$10,000 per year
Estimated Total	**$75,000 per year**

Option # 2

A hydropneumatic system can be installed, which will require a storage tank and a pressure tank. A pressure tank system would be installed at a single location within the project site, to which each well would pump. The storage tank would need to be sized to provide adequate supply to ensure proper fire flow volumes and proper detention times for disinfection. This option will be more costly to build and maintain but would be less visually intrusive than Option #1. The requirements for pumps and tanks to meet the project requirements will create an elaborate arrangement which, as a private system, can require more maintenance than that associated with the other options. The operation and maintenance costs are estimated as follows:

Electrical Consumption	$10,000 per year
Operator Cost:	$40,000 per year
Chemical Costs:	$10,000 per year
Miscellaneous:	$10,000 per year
Maintenance & Repairs	$20,000 per year
Estimated Total	**$90,000 per year**

Option # 3 – (Preferred)

This option would be to locate a 250,000 gallon storage tank on the hill along side the existing water tank for the Hambletonian Park Development. This option offers several benefits due to its location and distance from the well sources. The elevation will provide a minimum static pressure of 53 psi and a maximum static pressure of 90 psi. The tank will be located next to an existing tank and will be painted to match the existing tank which will minimize visual impacts. At this location there currently exist two abandoned storage tanks, both of which are in a state of disrepair and are unsightly. Removing these abandoned tanks and replacing them with new tank that matches the existing 250,000 gallon tank in appearance will serve as an improvement to this location. Adequate volumes and pressures can be provided to ensure that the 1,500 gpm fire flow can be provided throughout the project. Additionally due to the length of pipe needed to deliver the water from the wells to tank adequate detention time can be provided within the raw water piping for proper disinfection.

Option # 3 will also allow for the system that would be more desirable to the Town of Goshen, should the Town of Goshen wish to accept ownership and maintenance of the facilities. The system can provide water to this project and supplement water to the Hambletonian Park development if need be. Due to potential impacts on neighboring wells from the pumping of the project wells, the dedication of the water system to the Town of Goshen would allow for water to be provided to the affected homes to mitigate any negative impact. Each well will

be equipped with alarms and warning lights as required by the regulatory agencies having jurisdiction. Additionally a remote monitoring system will be provided and installed to allow for remote monitoring of each pump system. A chlorination and generation building will be required at the Well# 3 site. The well controls and telemetry systems will also be housed at this location. Operation and maintenance costs may vary depending upon who owns and operates the facilities. Should the ownership and maintenance responsibility of the facilities be accepted by the Town of Goshen, there may be some savings associated with a single operator maintaining a combined system which would make maintenance, paperwork, chemical and equipment purchases, etc.., more efficient. As summarized below, the estimates assume that an operator would maintain the new facilities without being responsible for the maintenance of the existing water supply and storage facilities located in Hambletonian Park:

Electrical Consumption	$7,500 per year
Operator Cost:	$40,000 per year
Chemical Costs:	$10,000 per year
Miscellaneous:	$10,000 per year
Maintenance & Repairs	$15,000 per year
Estimated Total	**$82,500 per year**

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Appendix E

Sanitary Facilities
to
Serve
Maplewood Village

Maplewood Village - Sewer System

Based on the current layout the project can be divided into two service areas. The first and largest area, Service Area No.1 will involve the following:

Service Area No.1

Residential Portion

13 Estates Lots considered at 4 bedrooms each		52 Bedrooms
12 units on 55' x 100' lots at 4 bedrooms each		48 Bedrooms
12 Rear Units on 45' X 110' lots at 4 bedrooms each		48 Bedrooms
12 Town house units:	6 - 2 bedroom units	12 Bedrooms
	6 - 3 bedroom units	18 Bedrooms
72 Multifamily Units at 2 bedrooms each		216 Bedrooms
8 Mixed use apartments at 2 bedrooms each		16 Bedrooms
Total expected number of bedrooms		338 Bedrooms

Resulting Flow:

338 Bedrooms X 100 GPD/ Bedroom = 33,800 GPD

Commercial Portion

30,000 Sq.ft. of Commercial space

Assume 0.10 GPD/Sq.ft. to 0.13 GPD/Sq.ft.

30,000 Sq.ft. X 0.13 GPD/Sq.ft. 4,000 GPD

Total Expected flow into Service Area # 1 37,800.GPD

Based on the current layout the service area for Service Area #2 will be somewhat smaller and will only receive flows for residential areas; all of the commercial buildings will be associated with Service Area No.1. Therefore, Service Area No. 2 will involve the following:

Service Area No.2

3 Estates Lots considered at 4 bedrooms each		12 Bedrooms
29 Units on 55' x 100' lots at 4 bedrooms each		116 Bedrooms
32 Town house units:	16 - 2 bedroom units	32 Bedrooms
	6 - 3 bedroom units	48 Bedrooms
36 Multifamily Units at 2 bedrooms each		72 Bedrooms
Total expected number of bedrooms		280 Bedrooms
Resulting Flow:		
228 Bedrooms X 100 GPD/ Bedroom =		28,000 GPD
Total Expected flow for Service Area No.2		**28,000.GPD**

If it is proposed to convey wastewater to the Village of Goshen sewer collection system (Option 2 below), a pump station (P.S.#2) will be needed. A pump station for Service Area #1 (P.S.#1) is needed for both options discussed below. Based on 1988 New York State Department of Environmental Conservation (NYSDEC) Design Standards each pump system is to be designed for 4 times the average flow, or what would be considered "Peak" flow. This will translate into a flow requirement for P.S. # 1 of 105 GPM and for P.S. #2 a flow of 78 GPM. Based on information obtained from a local pump supplier it appears that P.S.#1 will require a 14 hp ABS grinder pump and P.S.# 2 will require a 9 hp grinder pump. The flows and potential head pressures were reviewed to ensure that the pumps will provide the desired flow under all pumping conditions. With the flows defined for each of the two service areas options for waste treatment and disposal must be considered.

Option # 1- On-Site Sewage Treatment Facility

An onsite Sewage Treatment Facility is a viable option. Ownership of the facility may be by either a homeowner's association or by the Town of Goshen. Several types of systems are commercially available and normally involve some type of biological system and activated sludge. The stream running through the property is a tributary to the Otterkill and carries a "C" Classfication. In accordance with correspondence received from the New York State DEC, the following effluent limits are to be used:

BOD5 = 5 mg/l
TSS = 10 mg/l
D.O. = >= 7 mg/l
NH3 = 1.5 mg/l (June-Oct.)
NH3 = 2.2 mg/l (Nov.-May)
pH = 6.5 – 8.5
Settleable Solids = 0.1 ml/l
Phosphorus = 0.5mg/l (Total) Per TOGS 1.3.6 and downstream ponded waters

Additionally, disinfection may be required after consultation with the New York State DEC and Orange County Department of Health. The proposed discharge will also be required to meet the Regulations for Criteria Governing Thermal Discharges (Part 704) of the New York State Department of Environmental Conservation. These regulations include limits on the changes in the temperature of the receiving waters as a result of the discharge of the sewage treatment plant. It is anticipated that the limits will be in accordance with those for trout waters which prohibits discharge at a temperature over 70 degrees Fahrenheit at any time, and that the discharge will not raise or lower the temperature of the receiving stream by more than 2 degrees from June through September and by more than 5 degrees from October through May. If needed, the discharge may be mixed with raw water to raise/lower the temperature of the discharge in order to meet these requirements.

An on-site sewage treatment plant would be located on the southwest side of Coleman Road, approximately 150 feet east of the stream. A single on-site pump station (P.S.#1) will be needed to convey wastewater from the low point of the project site to the location of the proposed sewage treatment plant. Crossing of the on-site wetlands will be needed to convey wastewater from the portion of the development site north of the main wetland area (Service Area 2) to the central portion of the project site. The elevation of PS # 1 is estimated to be 388 feet with the based of the station to be at 380 feet. The elevation of the proposed sewage treatment plant is estimated to be at an elevation of about 390, resulting in a static difference of 10 feet. An emergency generator would be required at the pump station to ensure operation in the event of a power outage.

Construction costs of the on-site sewage treatment plant are estimated to be approximately $800,000 and approximately $200,000 for the pump station. Operation and maintenance costs of the sewage treatment plant and pump station are estimated to be about $82,000 annually. Privately operated facilities will be carefully reviewed by the NYSDEC and operational assurances and contracts will need to be established with the Town, NYSDEC, HOA and the contracted operator. Operation and maintenance of the facilities are summarized as follows:

Electrical Consumption	$15,000 per year
Operator Cost:	$40,000 per year
Chemical Costs:	$15,000 per year
Miscellaneous:	$10,000 per year
Maintenance & Repairs	$10,000 per year
Estimated Total	**$90,000 per year**

Option # 2 – Connection to Village of Goshen Sewage Collection System

This option will require that the waste waters be pumped to the closest accessible manhole within the Village of Goshen sewage collection system. The village manhole

under consideration is located on Old Craigsville Road being some 1,680 feet from the closest project entrance. The elevation of the manhole is estimated to be 501' with the invert estimated to be 496'. The elevation of P.S.# 1 is to be 388' with the base of the station to be at 380' resulting in a static difference of 116'. The elevation at P.S. #2 is estimated to be 413.25' with the base of the station to be set at 405.25' resulting in a static difference of 90.75'.

The sewage would be conveyed to the Village via a 4" force main from each pump station to a common 6" force main. The two smaller force mains would tie together into the larger 6" force main located at the entrance to service area for P.S.#2. This 6" force main will then run approximately 1,600 feet to the nearest Manhole located on Old Craigsville Road in the Village of Goshen. The pump systems would be owned and operated by the Town of Goshen. The pump station would be designed to the town requirements for the purposes of dedication. The pumps will need to overcome static pressure as well line friction resulting from both stations operating simultaneously. Each station will be equipped with alarms and warning lights as required by the regulatory agencies having jurisdiction. Additionally, a remote monitoring system will need to be installed which is to be provided to Town of Goshen Department of Public Works (DPW) to allow for remote monitoring of each pump system. Emergency generators would be provided at each pump station to ensure operation in the event of a power outage. Construction costs of the pump stations are estimated to be $200,000 each and the 1,600 lineal feet of forcemain needed alongside Craigville Road is estimated at $55,000. Operation and maintenance of the pump station facilities is summarized as follows:

Electrical Consumption	$7,000 per year
Operator Cost:	$15,000 per year
Miscellaneous:	$5,000 per year
Maintenance & Repairs	$3,500 per year
Estimated Total	**$30,500 per year**

This option would require the approval of the Village of Goshen allowing connection of the project into the Village's existing sewer collection system. As correspondence has been received from the attorney for the Village of Goshen indicating that the Village is not interested in entertaining any applications for users beyond the Village territorial limits at this time, this option is not currently feasible.

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FINAL DOCUMENT

Appendix F

Stormwater Pollution Prevention Plan

LANC & TULLY
ENGINEERING AND SURVEYING, P.C.

STORMWATER POLLUTION PREVENTION PLAN
MAPLEWOOD VILLAGE
TOWN OF GOSHEN, ORANGE COUNTY, NY

APRIL 26, 2007

I. Introduction

The proposed project, situated in the Town of Goshen, consists of the development of a mostly wooded 95-acre parcel into a development of townhouses, single-family residences, multiple-family residences, mixed-use apartments and some commercial space. The development will be serviced with public water and sewer. Stormwater collection systems are proposed as well as drainage swales, stormwater ponds, underground off-line water quality facilities, and bioretention facilities. The purpose of this study is to evaluate the impacts associated with the proposed development and to propose mitigation for these impacts to ensure minimal impact on the existing stormwater drainage patterns. The mitigation must also ensure treatment of the water quality volume and no increases in the peak discharge from the proposed construction.

II. Current Regulations

Stormwater runoff and its subsequent impact to receiving water bodies led Federal, State and local officials to set new standards on stormwater discharge to attempt to restore stream water quality. Through years of study, certain criteria were identified to be reducing water quality. These include sediment, nutrients (phosphorus and nitrogen), organic carbon, bacteria, and hydrocarbons and trace metals. According to 40 CFR, Part 122 prohibits point source discharges of stormwater to waters of the United States without a permit issued under the National Pollutant Discharge Elimination System (NPDES). As New York State is approved by the EPA to administer the program, the SPDES regulations are currently in effect. Current regulations require that five days prior to construction a Notice of Intent (NOI) form be submitted to the New York State Department of Environmental Conservation Bureau of Water Permits located at 625 Broadway, Albany, New York. This NOI requires, if appropriate, a Stormwater Pollution Plan be developed. This consists of water quality control, water quantity control and the preparation of an erosion and sediment control plan.

The SPDES regulations basically outline four distinct criteria to be addressed in the development of the Stormwater Pollution Prevention Plan. Three of the four relate to stormwater quantity (specifically channel protection, overbank flooding and extreme storm events), and the fourth addresses water quality.

III. Methodology

The analysis presented in this report was developed by use of the Haestad Methods computer software program PondPack. PondPack is based upon and implements the Soil Conservation Service Technical Release 55 (SCS TR-55) "Urban Hydrology for Small Watersheds Methodology" for computing CN, Tc, Runoff values and hydrographs for the development of drainage and hydraulic calculations. For purposes of this report and in accordance with the regulations set forth by the New York State Department of Conservation as part of a SPDES Permit for Stormwater Discharges From Construction Activities, the 1-(Channel Protection), 10-(Overbank Flood), and 100-year (Extreme Storm) storm events were analyzed.

A downstream analysis has been conducted for this site. It shows how the project site drainage functions in the context of the overall area drainage patterns. Two analyses were done, one without detaining flows and one with large detention ponds to detain developed flows on site. The analysis shows that it is preferable not to detain flows since this results in the lowest peak flow at the study point (See Downstream Analysis).

The peak flow rates for both the pre- and post-development analysis were developed using the TR-55 Method, developed by the Soil Conservation Service and the U.S. Department of Agriculture, published in their "Urban Hydrology for Small Watersheds". Haestad Methods' PondPack software package, which makes use of the TR-55 Method, was employed to model the site hydrology and determine pre- and post-development hydraulic rates of runoff (See Appendices A, B and C). Described below are all assumptions made within each model.

V. Pre-Development Conditions

The site is located in the Town of Goshen between Craigville Road and Coleman Road, east of Route 207. The drainage area of the site and associated watershed area has been determined using a combination of the topographic survey completed for the subdivision plan, the Orange County Water Authority two-foot topographic data and the Goshen U.S.G.S. Quadrangle map. The soil boundaries and types shown are based upon the Orange County Soil Survey as documented by the Soil Conservation Service. All of the soil types within the boundaries of the drainage area are Hydrologic Group C and D soils. The hydrologic group C soils include Erie, Mardin and Bath Nassau; The D soils include Madalin and Rock Outcrop – Nassau complex soils. The site drains into wetlands which join a stream network eventually leading to the Otter Kill and Moodna Creek. Based upon the topography, the drainage occurring on and through the project site has been divided into three watershed areas which all drain north to a 4' X 20' arch culvert under Coleman Road. The watershed areas and study point are shown on the Pre-development drainage map provided in Appendix A.

- Area A, the watershed on the west side of the property is approximately 33 acres and consists of woods and brush. About half the area is wetland. Soil types are hydrologic group C and D. The area drains north and east toward the arch culvert under Coleman Road.

- Area B in the center of the site, a 43-acre wooded area which drains north to the culvert under Coleman Road. Soils are hydrologic soil group C and D. This area includes a major stream which flows under Craigville Road at the entrance to the Town of Goshen park.

- Area C is the eastern part of the site, a 21-acre wooded area which drains south and west eventually draining to the culvert under Coleman Road. Soils are mostly hydrologic group C.

	Pre-Development (cfs)	Detained Post-Development (cfs)	% increase	Undetained Post-Development (cfs)	% increase
Overbank Protection (10-Year Storm)	655.14	649.75	-0.8%	643.58	-1.8%
Extreme Flood Protection (100-Year Storm)	1100.96	1091.46	-0.8%	1079.94	-1.9%

Table 2: Comparison of Pre- and Post-Development Peak Discharges for the site watershed

The analysis shows that the watershed which includes the site is best served by not detaining the stormwater runoff on site. From a comparison of the post-development peak discharges to pre-development peak discharges, there is a decrease in the rate of the 10-year storm runoff and 100-year storm runoff, which therefore meets the 5% maximum increase allowed in the DEC requirements. If flows are detained on site, the model also shows a decrease in maximum flows though a smaller decrease than if flows are undetained. Again, the best scenario is not to detain flows on site since there is no benefit to detention.

According to the guidelines the downstream analysis should include an analysis of the effects of the site runoff on the downstream channel. Since the peak flow from the watershed is reduced by not detaining flows on the Maplewood Village site there will be no significant impact to the areas north of the site. In addition after flowing under Coleman Road, the stormwater enters a large wetland system which is also fed by Black Meadow Creek and several other small streams. This wetland is at least 500 acres in area. Due to the size and nature of this area, there are no significant impacts anticipated to existing buildings or downstream structures due to the proposed development, and the downstream analysis meets the NYSDEC criteria for waivers of detention of the overbank and extreme flood protection flows.

VII. Post-Development Conditions

The proposed development consists of townhouses, multi-family units, mixed-use apartments, estate homes and some commercial development. Post-development conditions were analyzed at the site to establish the requirements for detaining the 1-year channel protection flows and meeting water quality goals. The development causes changes in the watershed due to conversion of existing cover types and paths of flow. All soil types are hydrologic soil group C and D and have been taken into account in the Curve number development. The discharge point and watersheds used for the post-development analysis are consistent with pre-development conditions. The areas are as follows:

- Area C1, approximately 8.1 acres includes the drainage from the estate lots that will be diverted into a pond to the south (Pond C1). After treatment, this drainage follows pre-existing patterns to the outfall.
- Area C2, approximately 12.3 acres includes the remaining area of pre-development Area C. The drainage from this area follows pre-development patterns to the outfall.

Table 3 below provides a summary of the flows from the post-development analysis.

Watershed Area	Area (Ac.)	CN	Tc (hrs.)	Peak Runoff (cfs) 1 year
Area A1	2.2	88	.12	3.75
Area A2	4.4	92	.16	8.37
Area A3	1.8	94	.08	3.97
Area A4	25.8	77	.61	14.01
Area B1	3.3	94	.35	5.43
Area B2	5.2	92	.08	10.76
Area B3	1.0	95	.08	2.26
Area B4	33.5	76	.72	16.44
Area C1	8.1	79	.29	7.05
Area C2	12.3	73	.28	7.44
Outfall*	—	—	—	40.19

Table 3: Post-Development Conditions

* Peak Runoff values are shown for the site only and are not in the context of the watershed (see downstream analysis). The Peak Runoff considers detention in on-site facilities.

For a depiction of the delineated watershed areas please refer to Appendix C for post-development conditions and planned development.

VIII. Water Quality

The water quality volume denoted as WQv is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume. The WQv is directly related to the amount of impervious cover created at a site. New York State Department of Environmental Conservation has developed the following equation to determine the water quality storage volume. Below are calculations developed specifically for Maplewood Village.

construction schedule for implementing stormwater management is proposed. (See Appendix G for construction and maintenance inspection forms.)

1. Pre-Construction Meeting: Before construction activities commence, a site evaluation of the site will be performed with site contractor and Town personnel, including mark-out areas of special concerns (i.e.: trees, wetlands, wells, etc.)

2. Protect Existing Wetlands: Place erosion control device (siltation fence) upstream of wetlands outside construction area, prior to any construction.

3. Install slope stabilization as shown on Erosion Control Plan.

4. Construction Entrance/Siltation Controls: A stabilized construction entrance will be installed along existing Craigville Rd and Coleman Road. During wet weather it may necessary to wash vehicle tires at these locations. Therefore, these entrances are to be graded so that runoff is directed onto the construction site. In additional siltation control devices, as shown on the erosion control plan are to be installed.

5. Land Grading: Minor grading will be required in the vicinity of the proposed roadway. This will be the area of the first construction activity. Earthen dikes and swales will direct all drainage from these areas.

6. Stormwater Management Facilities: The proposed temporary stone outlet sediment traps shall be installed. Then, the proposed ponds and bioretention basins shall be installed in their respective locations. All proposed culvert crossings shall then be installed. Once these items are completed, grading of the site for road construction can commence.

7. Access Drive Construction: With all erosion control devices in place, construction of access road to be completed at the entrance location to construction site.

8. Remaining Building Locations: Upon conclusion of all road construction, building construction will commence. Drainage is to be directed to recently installed storm system swales. Additional precautions/sediment controls at the entrances to storm system are to be utilized, including siltation and haybale fencing, catch basin protection and rip rap outfall structures.

9. Landscaping and Final Stabilization: All open areas to be stabilized topsoil and seeded. Removal of all temporary measures, remove and dispose of all trapped sediment.

B. Maintenance

1. Construction: The property owner will be responsible for the maintenance and operation of all site related storm water management facilities during construction. Maintenance shall be carried out in accordance with the following notes:

viable conditions to stabilize the soil and to prevent soil erosion. Restore all site planting and/or seeding which has been damaged to a viable condition.

(2) If vegetative stabilization has been damaged from storm water erosion, correct upstream conditions that caused the erosion. Check dams may be required in drainage ways and stone outfall aprons may be required to be repaired on storm water outfall sites.

2. Long-Term: The permanent stormwater management structures are to be maintained by the property owner. These structures include catch basins and pipe throughout the drainage network, stormwater basins and any other constructed acceptable stormwater practice (Bioretention Areas & Swales). The long-term maintenance of the on-site drainage structures will include periodic inspections of various structures and their inlet/outlet devices, including pipes and spillways, to insure proper operation and good equipment condition. In addition, periodic removal of deposited sediment in catch basins, pipes and stormwater basins will be necessary on an infrequent basis.

XI. Conclusions

The downstream Analysis for the site watershed concluded that it was preferable not to detain 10- and 100-year flows. Table 4 shows that there is a reduction of about 2 percent in these flows in the post-developed conditions. The hydraulic analysis provided meets all of the requirements necessary for the exemption of water quantity control.

With the proposed on-site detention and water quality facilities, the post-development 1-year peak discharge has been reduced to less than the pre-development rate (See Table 5 below). Water quality facilities will be used in accordance with NYSDEC Regulations to provide for treatment. Based upon the results of this analysis, the site has demonstrated the ability to meet all requirements for stormwater quantity and quality and an impact to the existing watershed is negligible. Final design of the stormwater facilities and network shall be completed prior to any Site Plan approvals and filing of the NOI with the NYSDEC.

Tables 4 and 5 below summarize the pre- and post- development discharges for the development. Please refer to Appendices A, B and C for a model analysis of the watershed areas.

Culvert at Coleman Road	Peak Runoff 10-year	Peak Runoff 100-year
Pre-Development	655.14 cfs	1100.96 cfs
Post-Development	643.58 cfs	1079.94 cfs
Percent Change	- 1.8%	- 1.9%

Table 4: Comparison of Pre and Post Development Conditions for watershed drainage

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POST DEVELOPMENT WATERSHED MAP

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PRE AND POST-DEVELOPMENT DOWNSTREAM
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STORMWATER FACILITY COMPUTATIONS
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APPENDIX F: STANDARD EROSION AND SEDIMENT CONTROL
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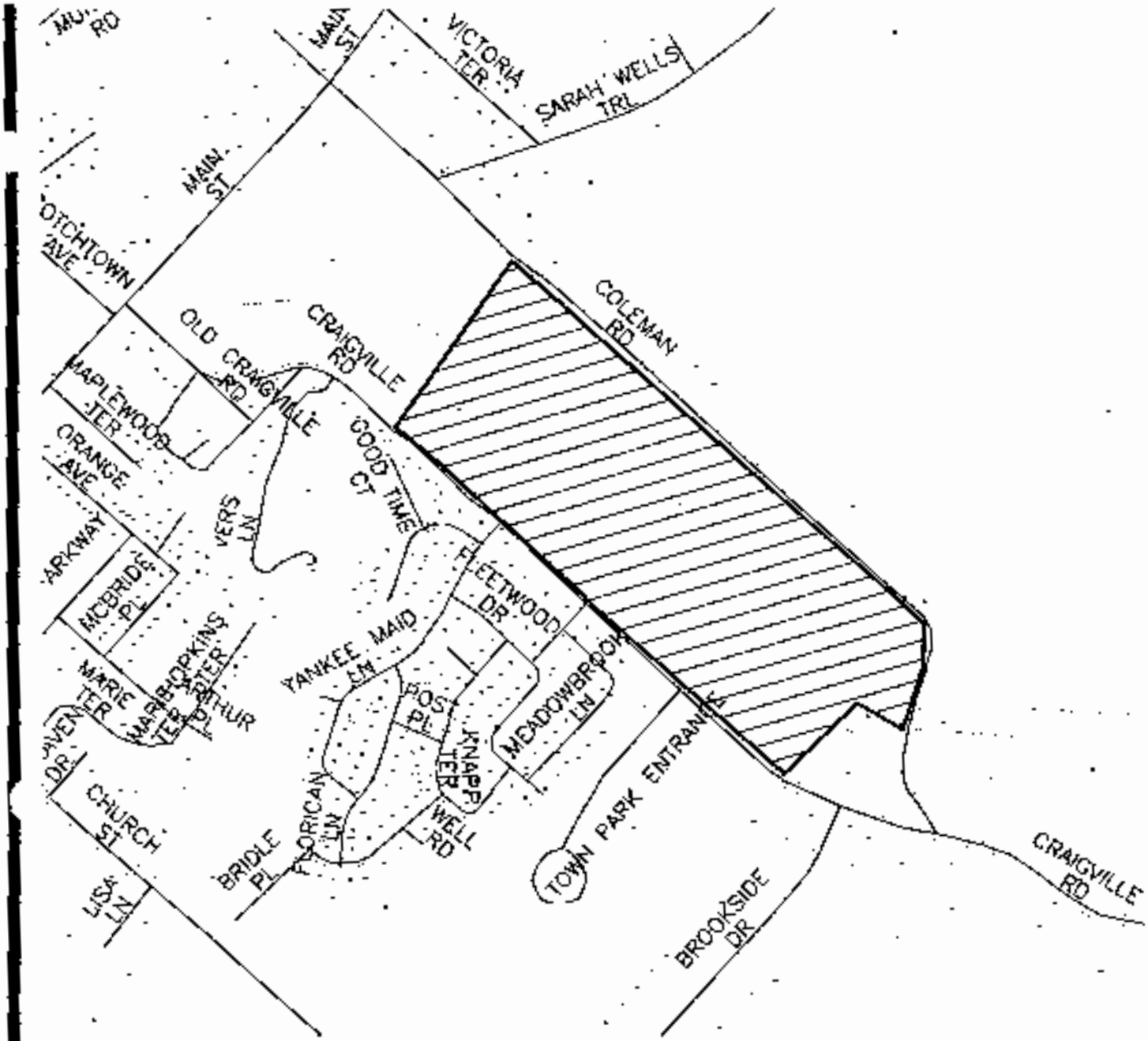
APPENDIX G: STANDARD CONSTRUCTION INSPECTION FORMS
OF STORMWATER FACILITIES
STANDARD MAINTENANCE FORMS
OF STORMWATER FACILITIES

APPENDIX H: NOTICE OF INTENT (BLANK)
NOTICE OF TERMINATION (BLANK)
CONTRACTOR'S CERTIFICATION STATEMENT (BLANK)

APPENDIX I: SITE PLANS



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LOCATION MAP

Date: FEBRUARY 6, 2007

Revisions:

MAPLEWOOD VILLAGE

TOWN OF GOSHEN
ORANGE COUNTY, NEW YORK

CAD File: DRAINAGE.DWG
Layout: LOCATION MAP
Sheet No.: 1 OF 1

Drawn By:	Checked By:	Scale:	Tax Map No.:	Drawing No.:
LMC		1" = 1000'	8-1-48 & 8-1-1.1	F - 00 - 0157 - 00

File.... T:\Land Projects 02\000167sal\PONDPACK\
Title... Project Date: 1/31/2007
Project Engineer: David Higgins
Project Title: Watershed
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = Orange County

Storm Tag Name = 2

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 2.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.6000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File..... T:\Land Projects RZ\0001670a1\PONDPACK\PRE-DVLPMT - 5YR ONLY.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000
Hydraulic Length	150.00 ft
2yr, 24hr P	3.5000 in
Slope	.040000 ft/ft
Avg.Velocity	.12 ft/sec

Segment #1 Time: .3587 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	170.00 ft
Slope	.130000 ft/ft
Unpaved	
Avg.Velocity	5.82 ft/sec

Segment #2 Time: .0081 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	2010.00 ft
Slope	.022000 ft/ft
Unpaved	
Avg.Velocity	2.39 ft/sec

Segment #3 Time: .2356 hrs

Total Tc: .6025 hrs

File..... T:\Land Projects AZ\000167aal\PONDPACK\PRE-DEV1.PNT - SITE ONLY.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000
Hydraulic Length	150.00 ft
2yr, 24hr P	3.5000 in
Slope	.007000 ft/ft
Avg.Velocity	.06 ft/sec

Segment #1 Time: .7204 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	1637.00 ft
Slope	.014000 ft/ft
Unpaved	
Avg.Velocity	1.91 ft/sec

Segment #2 Time: .2182 hrs

Total Tc: .9585 hrs

File.... T:\Land Projects R2\000167xA1\PONDPACK\PRE-DVLPMT - SITE ONLY.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000	
Hydraulic Length	150.00	ft
2yr, 24hr P	3.5000	in
Slope	.020000	ft/ft
Avg.Velocity	.09	ft/sec

Segment #1 Time: .4733 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	1617.00	ft
Slope	.058000	ft/ft
Unpaved		
Avg.Velocity	3.89	ft/sec

Segment #2 Time: .1156 hrs

Total Tc: .5889 hrs

File..... T:\Land Projects A2\000167sa3\PONDPACK\PRE-DVLPMT - SITE ONLY.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Fair woods - D soils	79	13.700			79.00
Fair woods - C soils	77	19.300			73.00
COMPOSITE AREA & WEIGHTED CN --->		33.000			75.49 (75)

File.... T:\Land Projects 2\300162\sal\PONDPACK\PRE-DVLPMT - SITE ONLY.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %I	%UC	Adjusted CN
fair woods C soils	73	20.200			73.00
Paved parking lots, roofs, driveway	98	.200			98.00
fair woods D soils	79	.200			79.00

COMPOSITE AREA & WEIGHTED CN ---> 20.600 73.30 [73]

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A 10
Tc = .6025 hrs
Drainage Area = 33.000 acres Runoff CN= 75

Computational Time Increment = .08033 hrs
Computed Peak Time = 12.4511 hrs
Computed Peak Flow = 56.79 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4500 hrs
Peak Flow, Interpolated Output = 56.78 cfs

DRAINAGE AREA
ID:SUBAREA A
CN = 75
Area = 33.000 acres
S = 3.3333 in
0.2S = .6667 in

Cumulative Runoff
2.8605 in
7.866 ac-ft

HYG Volume... 7.866 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .60747 hrs (for SUBAREA A)
Computational Incr, Tm = .08033 hrs = 0.20000 Tp

Unit Hyd Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 62.06 cfs
Unit peak time, Tp = .40165 hrs
Unit receding limb, Tr = 1.60659 hrs
Total unit time, Tb = 2.00823 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A 100
Tc = .6025 hrs
Drainage Area = 33.000 acres Runoff CN= 75

Computational Time Increment = .08033 hrs
Computed Peak Time = 12.4513 hrs
Computed Peak Flow = 96.18 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4500 hrs
Peak Flow, Interpolated Output = 96.17 cfs

DRAINAGE AREA

ID:SUBAREA A
CN = 75
Area = 33.000 acres
S = 3.3333 in
0.20 S = .6667 in

Cumulative Runoff

4.8616 in
13.369 ac-ft

HYG Volume... 13.369 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .60247 hrs (ID: SUBAREA A)
Computational Incr, Tm = .08033 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 687.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 62.00 cfs
Unit peak time, Tp = .40165 hrs
Unit receding limb, Tr = 1.60659 hrs
Total unit time, Tb = 2.00823 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167aa1\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167aa1\PONDPACK\
HYG File - ID = - SUBAREA B 10
Tc = .9585 hrs
Drainage Area = 63.000 acres Runoff CN= 75

Computational Time Increment = .12781 hrs
Computed Peak Time = 12.6528 hrs
Computed Peak Flow = 57.89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.6500 hrs
Peak Flow, Interpolated Output = 57.82 cfs

DRAINAGE AREA
ID:SUBAREA B
CN = 75
Area = 63.000 acres
S = 3.3333 in
0.2S = .6667 in

Cumulative Runoff
2.8605 in
10.250 ac-ft

HYG Volume... 10.251 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .55855 hrs (TC: SUBAREA B)
Computational Incr, Tm = .12781 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.472 (37.469 under rising limb)
X = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 50.83 cfs
Unit peak time Tp = .63503 hrs
Unit receding limb, Tr = 2.56612 hrs
Total unit time, Tb = 3.19515 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File ID = - SUBAREA B 100
Tc = .9585 hrs
Drainage Area = 43.000 acres Runoff CN= 75

Computational Time Increment = .1278) hrs
Computed Peak Time = 12.6528 hrs
Computed Peak Flow = 99.60 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.6500 hrs
Peak Flow, Interpolated Output = 98.51 cfs

DRAINAGE AREA
ID:SUBAREA B
CN = 75
Area = 43.000 acres
S = 3.3333 in
0.2S = .6667 in

Cumulative Runoff
4.8616 in
17.421 ac-ft

HYG Volume... 17.421 ac-ft (Area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .95855 hrs (ID: SUBAREA B)
Computational Incr, Tm = .1278) hrs = 0.20000 Tp

Unit Hyd, Shape Factor = 483.432 (37.468 under rising limb)
k = 483.42/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 50.81 cfs
Unit peak time Tp = .63903 hrs
Unit receding limb, Tr = 2.55612 hrs
Total unit time, Tb = 3.19515 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sa1\PONDPACK\
Rain File - ID = - TypeIII 24hr
Crit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sa1\PONDPACK\
HYG File - ID = - SUBAREA C 10
Tc = .5899 hrs
Drainage Area = 20.600 acres Runoff CN= 73

Computational Time Increment = .07852 hrs
Computed Peak Time = 12.4089 hrs
Computed Peak Flow = 33.37 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4000 hrs
Peak Flow, Interpolated Output = 33.23 cfs

DRAINAGE AREA
ID:SUBAREA C
CN = 73
Area = 20.600 acres
S = 3.6986 in
0.2S = .7397 in

Cumulative Runoff
2.6788 in
4.599 ac-ft

HYG Volume... 4.599 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .5889 hrs (ID: SUBAREA C)
Computational Incr, Tp = .07852 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.06% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 39.63 cfs
Unit peak time Tp = .39262 hrs
Unit receding limb, Tr = 1.57049 hrs
Total unit time, Tb = 1.96312 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration - 24.0000 hrs Rain Depth - 7.8000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA C 100
Tc = .5889 hrs
Drainage Area = 20.600 acres Runoff CN= 73

Computational Time Increment = .07852 hrs
Computed Peak Time = 12.4069 hrs
Computed Peak Flow = 58.07 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.4000 hrs
Peak Flow, Interpolated Output = 57.88 cfs

DRAINAGE AREA
ID:SUBAREA C
CN = 73
Area = 20.600 acres
S = 3.6986 in
0.2S = .7397 in

Cumulative Runoff
4.6031 in
7.954 ac-ft

HYG Volume... 7.954 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .58893 hrs (ID: SUBAREA C)
Computational Incr, Tp = .07852 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 39.63 cfs
Unit peak time, Tp = .39262 hrs
Unit receding limb, Tr = 1.57049 hrs
Total unit time, Tb = 1.96312 hrs

TOTAL NODE INFLOW...
NYG file =
NYG ID = OUTFALL -PRE
NYG Tag = 1

Peak Discharge = 40.42 cfs
Time to Peak = 12.5500 hrs
NYG Volume = 7.042 ac ft

HYDROGRAPH ORDINATES (cfs)
Output Time Increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
10.7500	.00	.00	.00	.01	.02
11.0000	.03	.05	.07	.10	.14
11.2500	.19	.26	.34	.42	.54
11.5000	.67	.84	1.03	1.27	1.61
11.7500	2.02	2.61	3.36	4.38	5.87
12.0000	7.78	10.38	13.76	17.59	22.06
12.2500	26.46	30.60	34.18	37.07	39.02
12.5000	40.10	40.42	39.92	39.11	37.57
12.7500	35.97	34.20	32.21	30.37	28.41
13.0000	26.57	24.86	23.26	21.79	20.46
13.2500	19.24	18.12	17.15	16.24	15.45
13.5000	14.74	14.08	13.53	13.01	12.54
13.7500	12.11	11.70	11.35	11.01	10.70
14.0000	10.41	10.13	9.89	9.64	9.41
14.2500	9.21	9.00	8.82	8.64	8.47
14.5000	8.32	8.18	8.04	7.91	7.79
14.7500	7.67	7.56	7.45	7.35	7.24
15.0000	7.14	7.04	6.94	6.85	6.76
15.2500	6.67	6.58	6.49	6.40	6.31
15.5000	6.23	6.14	6.06	5.97	5.89
15.7500	5.80	5.71	5.63	5.54	5.45
16.0000	5.37	5.28	5.19	5.11	5.02
16.2500	4.94	4.86	4.78	4.71	4.64
16.5000	4.57	4.51	4.45	4.39	4.34
16.7500	4.29	4.24	4.19	4.14	4.09
17.0000	4.05	4.00	3.96	3.92	3.87
17.2500	3.83	3.79	3.75	3.71	3.67
17.5000	3.63	3.59	3.54	3.50	3.46
17.7500	3.42	3.38	3.34	3.30	3.26
18.0000	3.22	3.18	3.14	3.10	3.06
18.2500	3.02	2.99	2.95	2.92	2.89

SUMMARY FOR HYDROGRAPH ADDITION
at Node: OUTFALL -PRE

HYG Directory: T:\Land Projects R2\000167sal\PONDPACK\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ADDLINK 10	SUBAREA A		SUBAREA A	10
ADDLINK 20	SUBAREA D		SUBAREA D	10
ADDLINK 30	SUBAREA C		SUBAREA C	10

INFLOWS TO: OUTFALL -PRE

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	SUBAREA A	10	7.866	12.4500	56.78
	SUBAREA D	10	10.251	12.4500	57.02
	SUBAREA C	10	4.599	12.4000	33.23

TOTAL FLOW INTO: OUTFALL -PRE

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
	OUTFALL -PRE	10	22.716	12.5000	140.72

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
16.1000	13.52	13.29	13.06	12.84	12.63
16.3500	12.42	12.22	12.03	11.85	11.68
16.6000	11.52	11.37	11.22	11.07	10.94
16.8500	10.81	10.68	10.55	10.43	10.31
17.1000	10.19	10.09	9.98	9.85	9.74
17.3500	9.63	9.52	9.41	9.30	9.19
17.6000	9.08	8.99	8.87	8.76	8.66
17.8500	8.55	8.44	8.34	8.23	8.12
18.1000	8.02	7.91	7.81	7.71	7.62
18.3500	7.53	7.44	7.37	7.29	7.22
18.6000	7.16	7.10	7.05	6.99	6.94
18.8500	6.90	6.85	6.81	6.77	6.73
19.1000	6.69	6.65	6.61	6.58	6.54
19.3500	6.51	6.47	6.44	6.41	6.37
19.6000	6.34	6.31	6.27	6.24	6.21
19.8500	6.18	6.14	6.11	6.08	6.05
20.1000	6.02	5.98	5.95	5.92	5.89
20.3500	5.86	5.83	5.80	5.78	5.75
20.6000	5.72	5.70	5.67	5.64	5.62
20.8500	5.59	5.56	5.54	5.51	5.49
21.1000	5.47	5.44	5.42	5.39	5.37
21.3500	5.35	5.32	5.30	5.27	5.25
21.6000	5.22	5.20	5.18	5.15	5.13
21.8500	5.10	5.08	5.06	5.03	5.01
22.1000	4.99	4.96	4.94	4.91	4.89
22.3500	4.87	4.84	4.82	4.79	4.77
22.6000	4.74	4.72	4.70	4.67	4.65
22.8500	4.62	4.60	4.58	4.55	4.53
23.1000	4.50	4.48	4.45	4.43	4.41
23.3500	4.38	4.36	4.33	4.31	4.28
23.6000	4.26	4.24	4.21	4.19	4.16
23.8500	4.14	4.12	4.09	4.06	4.00
24.1000	3.93	3.82	3.66	3.45	3.21
24.3500	2.93	2.65	2.36	2.08	1.83
24.6000	1.60	1.39	1.22	1.06	.91
24.8500	.79	.68	.59	.51	.43
25.1000	.38	.33	.28	.25	.21
25.3500	.19	.16	.14	.12	.10
25.6000	.09	.08	.07	.06	.05
25.8500	.04	.04	.03	.03	.03
26.1000	.02	.02	.02	.01	.01
26.3500	.01	.01	.01	.01	.01
26.6000	.00	.00	.00	.00	.00
26.8500	.00	.00			

TOTAL NODE INFLOW...
HYG file =
HYG ID = OUTFALL -PRE
HYG Tag = 25

Peak Discharge	103.52 cfs
Time to Peak	12.5000 hrs
HYG Volume	29.532 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
7.6000	.00	.00	.00	.01	.01
7.8500	.02	.03	.05	.07	.09
8.1000	.12	.16	.20	.24	.29
8.3500	.34	.40	.47	.54	.62
8.6000	.70	.79	.89	.98	1.09
8.8500	1.20	1.31	1.43	1.56	1.69
9.1000	1.82	1.96	2.10	2.25	2.41
9.3500	2.57	2.73	2.90	3.07	3.25
9.6000	3.43	3.62	3.82	4.01	4.22
9.8500	4.42	4.64	4.85	5.08	5.30
10.1000	5.53	5.70	6.02	6.20	6.55
10.3500	6.82	7.12	7.43	7.75	8.09
10.6000	8.44	8.81	9.18	9.57	9.98
10.8500	10.40	10.84	11.28	11.74	12.22
11.1000	12.71	13.24	13.81	14.41	15.11
11.3500	15.85	16.68	17.61	18.60	19.81
11.6000	21.22	22.90	25.17	27.97	31.73
11.8500	36.44	42.43	50.62	60.55	73.25
12.1000	88.85	105.79	124.42	141.96	159.29
12.3500	169.43	178.40	182.70	182.52	181.20
12.6000	175.72	169.39	160.44	151.61	142.42
12.8500	132.64	123.65	114.52	106.06	98.28
13.1000	91.14	84.63	78.82	73.53	68.71
13.3500	64.54	60.69	57.33	54.31	51.53
13.6000	49.21	47.00	45.04	43.28	41.67
13.8500	40.13	38.73	37.45	36.31	35.19
14.1000	34.21	33.26	32.36	31.55	30.75
14.3500	30.04	29.36	28.72	28.14	27.58
14.6000	27.06	26.58	26.10	25.66	25.23
14.8500	24.82	24.43	24.03	23.66	23.29
15.1000	22.94	22.59	22.25	21.93	21.61

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
26.6000	.01	.00	.00	.00	.00
26.8500	.00	.00	.00		

TOTAL NODE INFLOW...
HYG file =
HYG ID = OUTFALL -PRE
HYG Tag - 100

Peak Discharge = 240.54 cfs
Time to Peak = 12.5000 hrs
HYG Volume = 38.744 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time Increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
6.8500	.00	.00	.01	.01	.02
7.1000	.03	.04	.07	.09	.12
7.3500	.15	.19	.23	.28	.33
7.6000	.39	.45	.52	.59	.66
7.8500	.74	.82	.91	1.00	1.09
8.1000	1.18	1.28	1.38	1.49	1.60
8.3500	1.71	1.83	1.96	2.09	2.22
8.6000	2.37	2.51	2.67	2.83	2.99
8.8500	3.17	3.35	3.53	3.72	3.92
9.1000	4.12	4.33	4.54	4.76	4.99
9.3500	5.22	5.46	5.70	5.95	6.20
9.6000	6.46	6.73	7.00	7.28	7.57
9.8500	7.86	8.15	8.45	8.76	9.07
10.1000	9.39	9.72	10.06	10.41	10.76
10.3500	11.16	11.56	11.90	12.43	12.89
10.6000	13.36	13.87	14.39	14.92	15.48
10.8500	16.04	16.61	17.23	17.85	18.49
11.1000	19.15	19.86	20.63	21.44	22.38
11.3500	23.39	24.50	25.76	27.10	28.74
11.6000	30.64	32.93	36.01	39.80	44.90
11.8500	51.25	59.30	70.23	83.41	100.16
12.1000	120.60	142.67	166.70	189.34	208.85
12.3500	224.09	235.18	243.11	240.54	236.93
12.6000	229.27	220.58	208.58	196.79	184.58
12.8500	171.66	159.00	147.81	136.73	126.54
13.1000	117.22	108.71	101.15	94.26	87.99
13.3500	82.58	77.57	73.21	69.28	65.67
13.6000	62.67	59.81	57.27	54.98	52.77
13.8500	50.91	49.10	47.45	45.97	44.53
14.1000	43.27	42.05	40.89	39.85	38.82
14.3500	37.91	37.05	36.22	35.48	34.76

HYDROGRAPH ORDINATES (cfs)
Output Time Increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
25.8500	.07	.06	.05	.04	.04
26.1000	.03	.03	.03	.02	.02
26.3500	.02	.01	.01	.01	.01
26.6000	.01	.01	.00	.00	.00
26.8500	.00	.00	.00		

There is one (1)
large format drawings
after this page that need
to be printed and inserted
into pockets.

REMOVE THIS
PAGE FROM THE
FINAL DOCUMENT

LEGEND:

- WATERSHED BOUNDARY
- TIME OF CONCENTRATION PATH
- SITE PROPERTY LINE

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P.O. Box 687, Rt. 207
Goshen, N.Y. 10924
(845) 294-3700

PRE-DEVELOPMENT DOWNSTREAM ANALYSIS MAP PREPARED FOR

MAPLEWOOD VILLAGE AT GOSHEN

TOWN OF GOSHEN
ORANGE COUNTY, NEW YORK

Date:	FEBRUARY 8, 2007
Revisions:	
CAD File:	EXT-AREA.DWG
Layout:	PRE-DEV DA
Sheet No.:	1 OF 1
Drawn By:	TH
Checked By:	
Scale:	1" = 500'
Tax Map No.:	8-1-48 & 8-1-1.1
Drawing No.:	A - 00 - 0167 - 01

APPENDIX B

POST-DEVELOPMENT MODEL AND ANALYSIS

POST-DEVELOPMENT WATERSHED MAP

Job File: T:\Land Projects 02\0001G7sa1\PONDPACK\POST DEV. SITE ONLY FINAL.PPW
Rain Dir: T:\Land Projects 02\0001G7sa1\PONDPACK\

JOB TITLE

Project Date: 4/26/2007
Project Engineer: Lucy Conley
Project Title: Watershed
Project Comments:

Table of Contents (continued)

A2..... Runoff CN-Area 4.02

A3..... Runoff CN Area 4.03

A4..... Runoff CN-Area 4.04

B1..... Runoff CN-Area 4.05

B2..... Runoff CN-Area 4.06

B3..... Runoff CN-Area 4.07

B4..... Runoff CN-Area 4.09

C1..... Runoff CN-Area 4.09

C2..... Runoff CN-Area 4.10

********** RUNOFF HYDROGRAPHS **********

A1..... 1
Unit Hyd. Summary 5.01

A2..... 1
Unit Hyd. Summary 5.02

A3..... 1
Unit Hyd. Summary 5.03

A4..... 1
Unit Hyd. Summary 5.04

B1..... 1
Unit Hyd. Summary 5.05

B2..... 1
Unit Hyd. Summary 5.06

B3..... 1
Unit Hyd. Summary 5.07

B4..... 1
Unit Hyd. Summary 5.08

C1..... 1
Unit Hyd. Summary 5.09

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Orange County 1

Return Event	Total Depth in	Rainfall Type	RMF ID
1	2.9000	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
A1	AREA	1	.317		12.1000	3.75		
A2	AREA	1	.758		12.1500	8.37		
A3	AREA	1	.338		12.1000	3.97		
A4	AREA	1	2.055		12.5000	14.01		
B1	AREA	1	.619		12.2500	5.43		
B2	AREA	1	.896		12.1000	10.76		
B3	AREA	1	.190		12.1000	2.26		
B4	AREA	1	2.647		12.5500	16.44		
C1	AREA	1	.753		12.2000	7.05		
C2	AREA	1	.830		12.2500	7.64		
JUNC 13	JCT	1	.667		12.6500	1.17		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

[*Node=Outfall; +Node=Diversion;]
(Trunk HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA B	AREA	1	3.211		12.7500	16.76		
SUBAREA C	AREA	1	1.367		12.5000	9.04		

DESIGN STORMS SUMMARY

Design Storm File,ID = Orange County 1

Storm Tag Name = 1

Data Type, File, ID	= Synthetic Storm	TypeIII 24hr
Storm Frequency	= 1 yr	
Total Rainfall Depth	= 2.9000 in	
Duration Multiplier	= 1	
Resulting Duration	= 24.0000 hrs	
Resulting Start Time	= .0000 hrs Step= .1000 hrs	End= 24.0000 hrs

File.... T:\Land Projects R2\0CD167sal\PONDPACK\POST DEV. SITE ONLY FINAL.PZW

Tc Equations used...

---- SCS TR 55 Sheet Flow ----

Tc = [1.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4)]

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Main depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File..... T:\Land Projects R2\00016tsal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings A
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

Type..... Tc Calcs
Name..... A3

File..... T:\Land Projects 82\030167sal\PONDPACK\POST DEV, SITE ONLY FINAL.PPW

Tc Equations used...

---- SCS TR 55 Sheet Flow ----

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects A2\00016\sal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = [.007 * ((n * Lf)**0.8)] / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings A
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects R2\000107sa1\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects A2\000167sal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

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------------ ------------ ------------------------------------------
Tc Equations used...
------ ------------------------------------ ------------------ -----


---- SCS TR 55 Sheet Flow ==================================================

     Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

     Where:  Tc = Time of concentration, hrs
             n  = Mannings n
             Lf = Flow length, ft
             P  = 2yr, 24hr Rain depth, inches
             Sf = Slope, %


---- SCS TR-55 Shallow Concentrated Flow ------------------------------

     Unpaved surface:
     V  = 16.1345 * (Sf**0.5)

     Paved surface:
     V  = 20.3282 * (Sf**0.5)

     Tc = (Lf / V) / (3600sec/hr)

     Where:  V  = Velocity, ft/sec
             Sf = Slope, ft/ft
             Tc = Time of concentration, hrs
             Lf = Flow length, ft
```

File.... T:\Land Projects R2\000167983\PONDPACK\POST DEV. SITE ONLY FINAL.2PW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects R2\000.67sal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

$$Tc = (.007 * ((n * Lf)^{0.8})) / ((P^{.5}) * (Sf^{.4}))$$

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
$V = 16.1345 * (Sf^{0.5})$

Paved surface:
$V = 20.3282 * (Sf^{0.5})$

$Tc = (Lf / V) / (3600sec/hr)$

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects R2\00016)sal\PONDPACK\POST DEV, SITE ONLY FINAL.PPW

Tc Equations Used...

---- SCS TR-55 Sheet Flow ----

Tc = [1.00] * [(n * Lf)**0.8)] / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR 55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = [Lf / V] / [3600sec/hr]

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

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Tc Equations used...

==== SCS TR-55 Sheet Flow ====

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ====

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects N2\00316?sal\PONDPACK\POST DEV, SITE ONLY FINAL.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
High Density Residential - C soils	94	3.800			94.00
Fair condition: grass cover 50% to	79	.600			79.00
COMPOSITE AREA & WEIGHTED CN --->		4.400			91.95 (92)

File.... T:\Land Projects RZ\D00367sal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area Acres	Impervious Adjustment %C	%UC	Adjusted CN
residential - 1 acre - D soils	84	3.000			84.00
woods - fair , D soils	79	10.700			79.00
woods - fair , C soils	73	10.900			73.00
COMPOSITE AREA & WEIGHTED CN --->		24.600			76.95 (77)

File.... T:\Land Projects R2\0D0167sa1\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area Acres	Impervious Adjustment IC	Impervious Adjustment UC	Adjusted CN
Urban Residential - C soils	94	3.500			94.00
Urban Residential - D soils	95	1.000			95.00
Good condition: grass cover > 75%	74	.700			74.00
COMPOSITE AREA & WEIGHTED CN --->		5.200			91.50 (92)

File.... T:\Land Projects RZ\D0116tsal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
woods fair C soils	73	19.700			73.00
1 acre residential	79	1.500			79.00
woods fair B soils	79	11.300			79.00
water	100	1.000			100.00
COMPOSITE AREA & WEIGHTED CN --->		33.500			76.10 (76)

File.... T:\Land Projects 92\000167sa1\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Paved parking lots, roofs, driveway	98	.200			98.00
Fair woods - D soils	79	.200			79.00
Fair woods - C soils	73	12.100			73.00
COMPOSITE AREA & WEIGHTED CN --->		12.500			73.50 (73)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\00016?sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\00016?sal\PONDPACK\
HYG File - ID = work_pad.hyg - A2)
Tc = .1574 hrs
Drainage Area = 4.400 acres Runoff CN= 92

Computational Time Increment = .02099 hrs
Computed Peak Time = 12.1337 hrs
Computed Peak Flow = 8.52 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 8.37 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%

DRAINAGE AREA
ID:A2
CN = 92
Area = 4.400 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff
2.0669 in
.758 ac-ft

HYG Volume... .758 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .15744 hrs (ID: A2)
Computational Incr, Tm = .02099 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.66 cfs
Unit peak time Tp = .10496 hrs
Unit receding limb, Tr = .91985 hrs
Total unit time, Tb = .52483 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\000167sa1\PONDPACK\
Rain File - ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sa1\PONDPACK\
HYG File - ID = work_pad.hyg - A4 1
Tc = .6124 hrs
Drainage Area = 24.600 acres Runoff CN= 77

Computational Time Increment = .08165 hrs
Computed Peak Time = 12.4932 hrs
Computed Peak Flow = 14.07 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.5000 hrs
Peak Flow, Interpolated Output = 14.01 cfs

DRAINAGE AREA

)D:A4
CN = 77
Area = 24.600 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff

1.0023 in
2.055 ac-ft

HYG Volume... 2.055 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .61241 hrs (ID: A4)
Computational Incr, Tm = .08165 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 45.51 cfs
Unit peak time, Tp = .40827 hrs
Unit receding limb, Tr = 1.63310 hrs
Total unit time, Tb = 2.04137 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9800 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = work_pad.hyg - B2)
Tc (Min. Tc) = .0833 hrs
Drainage Area = 5.200 acres Runoff CN= 92

Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1063 hrs
Computed Peak Flow = 10.77 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 10.76 cfs

DRAINAGE AREA
ID:B2
CN = 92
Area = 5.200 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff
2.0668 in
.896 ac-ft

HYG Volume... .896 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: B2)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+Tr/Tp))
Receding/Rising, Tr/Tp = 1.6690 (solved from K = .7491)

Unit peak, qp = 70.73 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = I:\Land Projects R2\000167sal\PONDPACK\
Rain File - ID = TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = I:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = mock_pad.hyg - B4 1
Tc = .7231 hrs
Drainage Area = 33.500 acres Runoff CN= 76

Computational Time Increment = .09642 hrs
Computed Peak Time = 12.5344 hrs
Computed Peak Flow = 16.50 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.5500 hrs
Peak Flow, Interpolated Output = 16.44 cfs

DRAINAGE AREA
ID:B4
CN = 76
Area = 33.500 acres
S = 3.1579 in
0.2S = .6316 in

Cumulative Runoff
.9483 in
2.647 ac-ft

HYG Volume... 2.647 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .72314 hrs (ID: B4)
Computational Incr, Tm = .09642 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.468 under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 52.49 cfs
Unit peak time Tp = .48209 hrs
Unit receding limb, Tr = 1.92837 hrs
Total unit time, Tb = 2.41046 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.900D in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = work pad.hyg - C2 1
Tc = .2752 hrs
Drainage Area = 12.500 acres Runoff CN= 73

Computational Time Increment = .03669 hrs
Computed Peak Time = 12.2175 hrs
Computed Peak Flow = 7.50 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = 7.44 cfs

DRAINAGE AREA
ID:C2
CN = 73
Area = 12.500 acres
S = 3.6986 in
0.2S = .7397 in

Cumulative Runoff
.7965 in
.830 ac-ft

HYG Volume... .830 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .27517 hrs (ID: C2)
Computational Incr, Tp = .03669 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .749)

Unit peak, qp = 51.47 cfs
Unit peak time Tp = .18345 hrs
Unit receding limb, Tr = .33378 hrs
Total unit time, Tb = .91723 hrs

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Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
415.50	-----	.2000	.0000	.000	.000
416.00	-----	.2000	.6000	.100	.100
418.00	-----	.2000	.6000	.400	.500
420.00	-----	.2000	.6000	.400	.900

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File..... T:\Land Projects R2\DO0167sal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

Elevation (Ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
395.50	--	.1700	.0000	.000	.000
398.00	--	.1700	1.1100	.925	.925

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... T:\Land Projects R2\00D167sa1\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
425.00	.00	Free Outfall		(no Q: W,OR,CV)
425.10	.02	Free Outfall		OR,CV (no Q: W)
425.20	.06	Free Outfall		OR,CV (no Q: W)
425.30	.10	Free Outfall		OR,CV (no Q: W)
425.40	.12	Free Outfall		OR,CV (no Q: W)
425.50	.14	Free Outfall		OR,CV (no Q: W)
425.60	.16	Free Outfall		OR,CV (no Q: W)
425.70	.18	Free Outfall		OR,CV (no Q: W)
425.80	.19	Free Outfall		OR,CV (no Q: W)
425.90	.21	Free Outfall		OR,CV (no Q: W)
426.00	.22	Free Outfall		OR,CV (no Q: W)
426.10	.23	Free Outfall		OR,CV (no Q: W)
426.20	.24	Free Outfall		OR,CV (no Q: W)
426.30	.26	Free Outfall		OR,CV (no Q: W)
426.40	.27	Free Outfall		OR,CV (no Q: W)
426.50	.28	Free Outfall		OR,CV (no Q: W)
426.60	.29	Free Outfall		OR,CV (no Q: W)
426.70	.30	Free Outfall		OR,CV (no Q: W)
426.80	.31	Free Outfall		OR,CV (no Q: W)
426.90	.31	Free Outfall		OR,CV (no Q: W)
427.00	.32	Free Outfall		OR,CV (no Q: W)
427.10	.65	Free Outfall		W,OR,CV
427.20	1.22	Free Outfall		W,OR,CV
427.30	1.96	Free Outfall		W,OR,CV
427.40	2.82	Free Outfall		W,OR,CV
427.50	3.78	Free Outfall		W,OR,CV
427.60	4.83	Free Outfall		W,OR,CV
427.70	5.96	Free Outfall		W,OR,CV
427.80	7.15	Free Outfall		W,OR,CV
427.90	8.41	Free Outfall		W,OR,CV
428.00	9.72	Free Outfall		W,OR,CV

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***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes	
		Converge	
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
419.30	18.72	Free Outfall		W,OR,CV
419.40	19.98	Free Outfall		W,OR,CV
419.50	21.23	Free Outfall		W,OR,CV
419.60	22.49	Free Outfall		W,OR,CV
419.70	23.70	Free Outfall		W,OR,CV
419.80	24.67	Free Outfall		W,OR,CV
419.90	25.55	Free Outfall		W,OR,CV
420.00	26.35	Free Outfall		W,OR,CV

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***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Convergence		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
399.80	21.89	Free Outfall		O1,W1,CV
399.90	23.05	Free Outfall		O1,W1,CV
400.00	24.04	Free Outfall		O1,W1,CV

File.... T:\Land Projects 2\000167sal\PONDPACK\POST DEV. SITE ONLY FINAL.PPW

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev.	Total Q	Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/- ft	Contributing Structures
394.00	.00	Free Outfall		(no Q: W,OR,CV)
394.10	.02	Free Outfall		OR,CV (no Q: W)
394.20	.06	Free Outfall		OR,CV (no Q: W)
394.30	.10	Free Outfall		OR,CV (no Q: W)
394.40	.12	Free Outfall		OR,CV (no Q: W)
394.50	.14	Free Outfall		OR,CV (no Q: W)
394.60	.16	Free Outfall		OR,CV (no Q: W)
394.70	.18	Free Outfall		OR,CV (no Q: W)
394.80	.19	Free Outfall		OR,CV (no Q: W)
394.90	.21	Free Outfall		OR,CV (no Q: W)
395.00	.22	Free Outfall		OR,CV (no Q: W)
395.10	.23	Free Outfall		OR,CV (no Q: W)
395.20	.24	Free Outfall		OR,CV (no Q: W)
395.30	.26	Free Outfall		OR,CV (no Q: W)
395.40	.27	Free Outfall		OR,CV (no Q: W)
395.50	.28	Free Outfall		OR,CV (no Q: W)
395.60	.29	Free Outfall		OR,CV (no Q: W)
395.70	.30	Free Outfall		OR,CV (no Q: W)
395.80	.31	Free Outfall		OR,CV (no Q: W)
395.90	.31	Free Outfall		OR,CV (no Q: W)
396.00	.32	Free Outfall		OR,CV (no Q: W)
396.10	.75	Free Outfall		W,OR,CV
396.20	1.52	Free Outfall		W,OR,CV
396.30	2.50	Free Outfall		W,OR,CV
396.40	3.66	Free Outfall		W,OR,CV
396.50	4.96	Free Outfall		W,OR,CV
396.60	6.38	Free Outfall		W,OR,CV
396.70	7.91	Free Outfall		W,OR,CV
396.80	9.54	Free Outfall		W,OR,CV
396.90	11.25	Free Outfall		W,OR,CV
397.00	13.05	Free Outfall		W,OR,CV
397.10	14.93	Free Outfall		W,OR,CV
397.20	16.87	Free Outfall		W,OR,CV
397.30	18.88	Free Outfall		W,OR,CV
397.40	20.95	Free Outfall		W,OR,CV
397.50	23.07	Free Outfall		W,OR,CV
397.60	25.24	Free Outfall		W,OR,CV
397.70	27.45	Free Outfall		W,OR,CV

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
Inflow HYG file = work_pad.hyg - POND A2 IN 1
Outflow HYG file = work_pad.hyg POND A2 OUT 1

Pond Node Data = POND A2
Pond Volume Data = POND A2
Pond Outlet Data = A2

Infiltration = .2500 in/hr

INITIAL CONDITIONS

Starting WS Elev = 415.50 ft.
Starting Volume = .000 ac-ft.
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
415.50	.00	.000	.2000	.00	.00	.00
415.60	.02	.020	.2000	.05	.07	9.95
415.70	.09	.040	.2000	.05	.14	19.90
415.80	.19	.060	.2000	.05	.24	29.29
415.90	.31	.080	.2000	.05	.36	39.09
416.00	.47	.100	.2000	.05	.52	48.92
416.10	.56	.120	.2000	.05	.61	58.69
416.20	.63	.140	.2000	.05	.68	68.45
416.30	.70	.160	.2000	.05	.75	78.19
416.40	.76	.180	.2000	.05	.81	87.93
416.50	.82	.200	.2000	.05	.87	97.67
416.60	.87	.220	.2000	.05	.92	107.40
416.70	.92	.240	.2000	.05	.97	117.13
416.80	.97	.260	.2000	.05	1.02	126.86
416.90	1.01	.280	.2000	.05	1.06	136.58
417.00	1.06	.300	.2000	.05	1.11	146.31
417.10	1.10	.320	.2000	.05	1.15	156.03
417.20	1.14	.340	.2000	.05	1.19	165.75
417.30	1.18	.360	.2000	.05	1.23	175.47
417.40	1.21	.380	.2000	.05	1.26	185.18

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
Inflow HYG file = work_pad.hyg - POND A2 IN 1
Outflow HYG file = work_pad.hyg - POND A2 OUT 1

Pond Node Data = POND A2
Pond Volume Data = POND A2
Pond Outlet Data = A2

Infiltration = .2500 in/hr

INITIAL CONDITIONS

Starting WS Elev = 415.50 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
419.50	21.23	.800	.2000	.05	21.28	408.48
419.60	22.49	.820	.2000	.05	22.54	419.43
419.70	23.70	.840	.2000	.05	23.75	430.31
419.80	24.67	.860	.2000	.05	24.72	440.96
419.90	25.55	.880	.2000	.05	25.60	451.52
420.00	26.35	.900	.2000	.05	26.40	462.00

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sal\POND2ACK\
Inflow HYG file = work_pad.hyg - POND B1 IN 1
Outflow HYG file = work_pad.hyg - POND B1 OUT 1

Pond Node Data = POND B1
Pond Volume Data = POND B1
Pond Outlet Data = B1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 396.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
396.00	.56	.438	.2680	.00	.56	212.30
396.10	.89	.464	.2630	.00	.89	225.34
396.20	1.47	.490	.2675	.00	1.47	238.78
396.30	2.21	.517	.2713	.00	2.21	252.56
396.40	3.08	.545	.2751	.00	3.08	266.65
396.50	4.04	.572	.2790	.00	4.04	281.03
396.60	5.10	.600	.2829	.00	5.10	295.68
396.70	6.23	.629	.2868	.00	6.23	310.60
396.80	7.44	.658	.2907	.00	7.44	325.77
396.90	8.70	.687	.2947	.00	8.70	341.20
399.00	10.02	.717	.2987	.00	10.02	356.88
399.10	11.39	.747	.3027	.00	11.39	372.80
399.20	12.80	.777	.3067	.00	12.80	388.96
399.30	14.25	.808	.3108	.00	14.25	405.36
399.40	15.74	.839	.3149	.00	15.74	421.99
399.50	17.27	.871	.3190	.00	17.27	438.86
399.60	18.82	.903	.3231	.00	18.82	455.95
399.70	20.41	.936	.3273	.00	20.41	473.28
399.80	21.89	.969	.3315	.00	21.89	490.70
399.90	23.05	1.002	.3357	.00	23.05	508.01

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects 82\000167sal\PONDPACK\
Inflow HYG file = work_pad.hyg - POND B2 IN 1
Outflow HYG file = work_pad.hyg - POND B2 OUT 1

Pond Node Data = POND B2
Pond Volume Data = POND B2
Pond Outlet Data = B2

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	395.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Outf	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
395.50	.00	.000	.3700	.00	.00	.00
395.60	.02	.037	.3700	.00	.02	17.93
395.70	.07	.074	.3700	.00	.07	35.89
395.80	.14	.111	.3700	.00	.14	53.86
395.90	.18	.148	.3700	.00	.18	71.82
396.00	.21	.185	.3700	.00	.21	89.79
396.10	.24	.222	.3700	.00	.24	107.69
396.20	.27	.259	.3700	.00	.27	125.63
396.30	.30	.296	.3700	.00	.30	143.56
396.40	.32	.333	.3700	.00	.32	161.49
396.50	.34	.370	.3700	.00	.34	179.42
396.60	.37	.407	.3700	.00	.37	197.36
396.70	.39	.444	.3700	.00	.39	215.29
396.80	.41	.481	.3700	.00	.41	233.21
396.90	.42	.518	.3700	.00	.42	251.14
397.00	.44	.555	.3700	.00	.44	269.06
397.10	.46	.592	.3700	.00	.46	286.99
397.20	.48	.629	.3700	.00	.48	304.92
397.30	.49	.666	.3700	.00	.49	322.84
397.40	.51	.703	.3700	.00	.51	340.76

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\00016?sal\PONDPACK\
Inflow HYG file = work_pad.hyg - POND C IN 1
Outflow HYG file = work_pad.hyg - POND C OUT 1

Pond Node Data = POND C
Pond Volume Data = POND C
Pond Outlet Data = C

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 394.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Outf= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
394.00	.00	.000	.2200	.00	.00	.00
394.10	.02	.022	.2254	.00	.02	10.79
394.20	.06	.045	.2308	.00	.06	21.87
394.30	.10	.068	.2361	.00	.10	33.22
394.40	.12	.092	.2419	.00	.12	44.82
394.50	.14	.117	.2476	.00	.14	56.69
394.60	.16	.142	.2533	.00	.16	68.83
394.70	.18	.167	.2590	.00	.18	81.24
394.80	.19	.194	.2649	.00	.19	93.93
394.90	.21	.220	.2708	.00	.21	106.91
395.00	.22	.248	.2767	.00	.22	120.17
395.10	.23	.276	.2828	.00	.23	133.73
395.20	.24	.304	.2889	.00	.24	147.57
395.30	.26	.334	.2950	.00	.26	161.71
395.40	.27	.363	.3013	.00	.27	176.15
395.50	.28	.394	.3076	.00	.28	190.90
395.60	.29	.425	.3139	.00	.29	205.95
395.70	.30	.457	.3203	.00	.30	221.31
395.80	.31	.489	.3268	.00	.31	236.97
395.90	.31	.522	.3334	.00	.31	252.96

There is one (1)
large format drawings
after this page that need
to be printed and inserted
into pockets.

REMOVE THIS
PAGE FROM THE
FINAL DOCUMENT

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\00016?sal\PONDPACK\
Inflow HYG file = work_pad.hyg POND C IN 1
Outflow HYG file = work_pad.hyg - POND C OUT 1

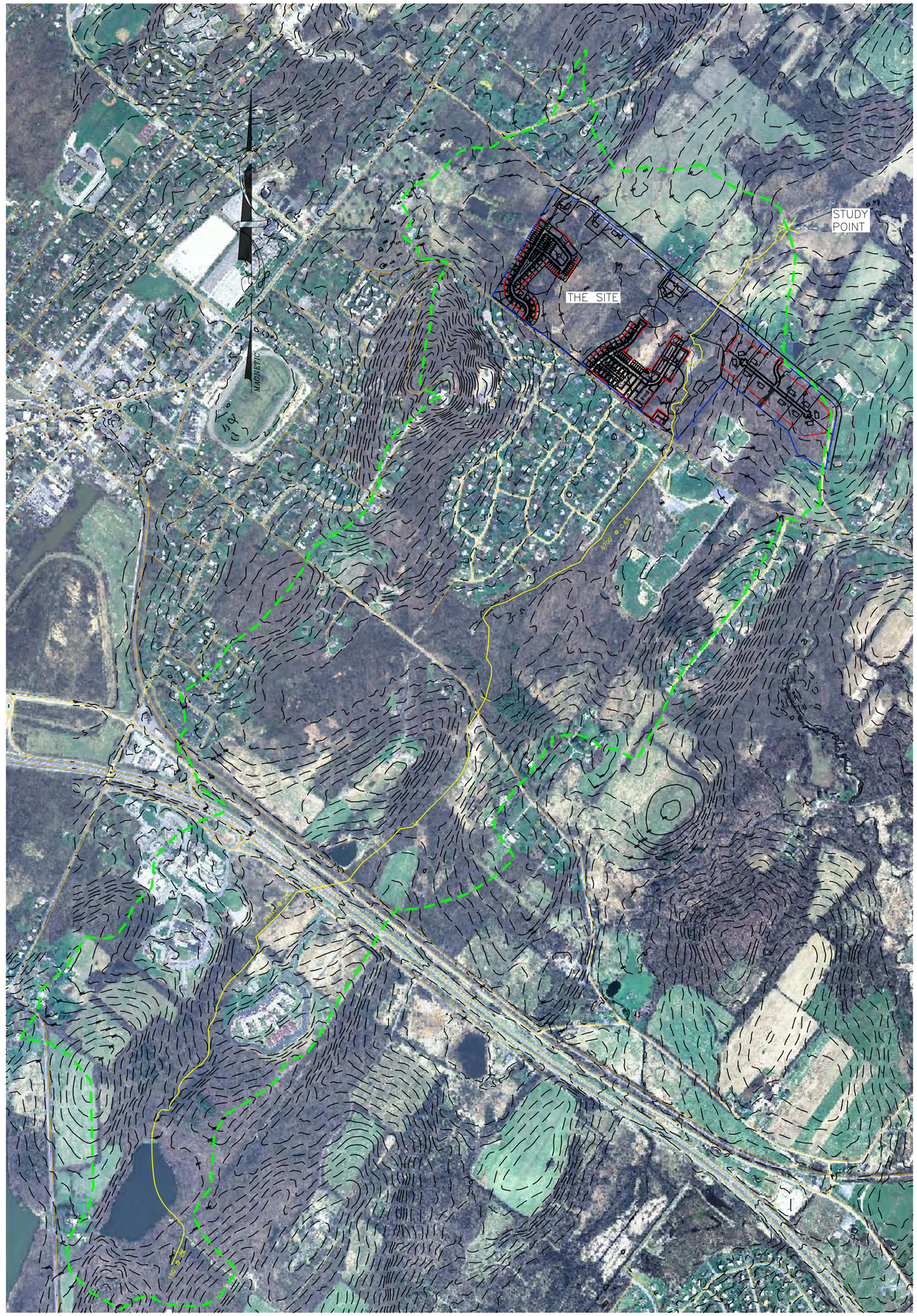
Pond Node Data = POND C
Pond Volume Data = POND C
Pond Outlet Data = C

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 394.30 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Outf = .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infiltr. cfs	Q Total cfs	2S/t + O cfs
398.00	34.21	1.343	.4500	.00	34.21	696.27



LEGEND:

- WATERSHED BOUNDARY
- TIME OF CONCENTRATION PATH
- SITE PROPERTY LINE

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P.O. Box 687, Rt. 207
Goshen, N.Y. 10924
(845) 294-3700

POST-DEVELOPMENT DOWNSTREAM ANALYSIS MAP PREPARED FOR

MAPLEWOOD VILLAGE AT GOSHEN

TOWN OF GOSHEN
ORANGE COUNTY, NEW YORK

Date:	FEBRUARY 8, 2007
Revisions:	
CAD File:	EXT-AREA.DWG
Layout:	PRE-DEV DA
Sheet No.:	1 OF 1
Drawn By:	TH
Checked By:	
Scale:	1" = 500'
Tax Map No.:	8-1-48 & 8-1-1.1
Drawing No.:	A - 00 - 0167 - 01

APPENDIX C

DOWNSTREAM ANALYSIS

DOWNSTREAM ANALYSIS WATERSHED MAPS

DOWNSTREAM ANALYSIS

PRE- DEVELOPMENT

Job File: T:\Land Projects R2\000167sal\PONDPACK\DA - PRE DVLPMT.PPW
Rain Dir: T:\Land Projects R2\000167sal\PONDPACK\

JOB TITLE

Project Date: 2/1/2007
Project Engineer: David Higgins
Project Title: WATERSHED ANALYSIS - PRE DEVELOPMENT
Project Comments:

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********** DESIGN STORMS SUMMARY **********

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Orange County... 1
Design Storms 2.02

********** TC CALCULATIONS **********

AREA DA..... Tc Calcs 3.01

********** CN CALCULATIONS **********

AREA DA..... Runoff CN-Area 4.01

********** RUNOFF HYDROGRAPHS **********

AREA DA..... 1
Unit Hyd. Summary 5.01

AREA DA..... 10
Unit Hyd. Summary 5.02

AREA DA..... 25
Unit Hyd. Summary 5.03

Table of Contents (continued)

AREA DA..... 100
Unit Hyd. Summary 5.04

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Orange County

Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.9000	Synthetic Curve	TypeIII 24hr
10	5.5000	Synthetic Curve	TypeIII 24hr
25	6.5000	Synthetic Curve	TypeIII 24hr
100	7.8000	Synthetic Curve	TypeIII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
[Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt]

Node ID	Type	Return Event	HYG Vol ac ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AREA DA	AREA	1	80.087		14.2500	203.05		
AREA DA	AREA	10	243.415		13.9000	655.14		
AREA DA	AREA	25	313.150		13.9000	846.42		
AREA DA	AREA	100	406.790		13.8500	1100.96		
*PRE - DA	JCT	1	80.087		14.2500	203.05		
*PRE - DA	JCT	10	243.415		13.9000	655.14		
*PRE - DA	JCT	25	313.150		13.9000	846.42		
*PRE - DA	JCT	100	406.790		13.8500	1100.96		

File.... T:\Land Projects R2\000167sal\PONDPACX\
Title... Project Date: 2/1/2007
Project Engineer: David Higgins
Project Title: WATERSHED ANALYSIS - PRE DEVELOPMENT
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = Orange County

Storm Tag Name = 1
Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10
Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25
Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100
Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = Orange County

Storm Tag Name = 1

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... T:\Land Projects 82\00016\sat\PONDPACK\DA - PAB DVLPMT.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR 55 Sheet

Mannings n	.4000
Hydraulic Length	150.00 ft
2yr, 24hr P	3.5000 in
Slope	.020000 ft/ft

Avg.Velocity .09 ft/sec

Segment #1 Time: .4739 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	7610.00 ft
Slope	.020000 ft/ft
Unpaved	

Avg.Velocity 2.28 ft/sec

Segment #2 Time: .9264 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	6700.00 ft
Slope	.006000 ft/ft
Unpaved	

Avg.Velocity 1.79 ft/sec

Segment #3 Time: 1.0892 hrs

Total Tc: 2.0889 hrs

File.... P:\Land Projects R2\00J167sal\PONDPACK\DA - PRE DVLPMT.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = [1.007 * ((n * Lf)**0.8)] / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects R2\000167sal\PONDPACK\DA - PRE DVLPMT.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
1/2 acre - D soils	85	10.000			85.00
Parks/cemeteries etc. C soils	74	20.200			74.00
2 acre C soils	77	50.300			77.00
1/2 acre - C soils	80	99.300			80.00
Rte 17, Chester & Craigville Road	98	12.000			98.00
Hospital/ Glen Arden - C soils	90	48.000			90.00
fair woods - D soils	79	172.000			79.00
Park - D soil	80	10.000			80.00
Park - A soil	49	2.800			49.00
fair woods - C soils	73	516.800			73.00
Water	100	19.000			100.00
COMPOSITE AREA & WEIGHTED CN -->		958.800			76.85 (77)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - AREA DA 1
Tc = 2.6089 hrs
Drainage Area - 958.800 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 14.2520 hrs
Computed Peak Flow = 203.06 cfs

Time Increment for HYG File = .3500 hrs
Peak Time, Interpolated Output = 14.2500 hrs
Peak Flow, Interpolated Output = 203.05 cfs

DRAINAGE AREA

ID:AREA DA
CN = 77
Area = 958.800 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff

1.0023 in
80.086 ac-ft

HYG Volume... 80.087 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.08893 hrs (ID: AREA DA)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/[1+(Tr/Tp)])
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 376.94 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 7.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File ID = - TypeIII 24hr
Unit Hyd Type - Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - AREA DA 10
Tc = 2.8889 hrs
Drainage Area = 958.800 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 13.8669 hrs
Computed Peak Flow = 656.54 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.9000 hrs
Peak Flow, Interpolated Output = 655.14 cfs

DRAINAGE AREA

ID:AREA DA
CN = 77
Area = 958.800 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff

3.0065 in
240.413 ac-ft

HYG Volume... 240.415 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88893 hrs (ID: AREA DA)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor - 403.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 3.6698 (solved from K = .7491)

Unit peak, qp = 376.04 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 7.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeTII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - AREA DA 25
Tc = 2.8889 hrs
Drainage Area = 956.800 acres Runoff CN= 77

Computational Time Increment = .30519 hrs
Computed Peak Time = 13.8669 hrs
Computed Peak Flow = 948.64 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.9000 hrs
Peak Flow, Interpolated Output = 946.42 cfs

DRAINAGE AREA
ID:AREA DA
CN = 77
Area = 956.800 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
3.9193 in
313.149 ac-ft

HYG Volume... 313.150 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88893 hrs (ID: AREA DA)
Computational Incr. Tm = .30519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 306.04 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects R2\D00167sal\PONDPACK\
Rain File - ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\D00167sal\PONDPACK\
HYG File - ID = - AREA DA 100
Tc = 2.9889 hrs
Drainage Area = 958.800 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 13.8669 hrs
Computed Peak Flow = 1103.99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.8500 hrs
Peak Flow, Interpolated Output = 1100.96 cfs

DRAINAGE AREA
ID:AREA DA
CN = 77
Area = 958.800 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
5.0912 in
406.787 ac-ft

HYG Volume... 406.790 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88893 hrs (ID: AREA DA)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 376.04 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.70381 hrs
Total unit time, Tb = 9.62976 hrs

Index of Starting Page Numbers for ID Names

-- - A -----
AREA DA... 3.01, 4.01, 5.01, 5.02,
5.03, 5.04

----- O -----
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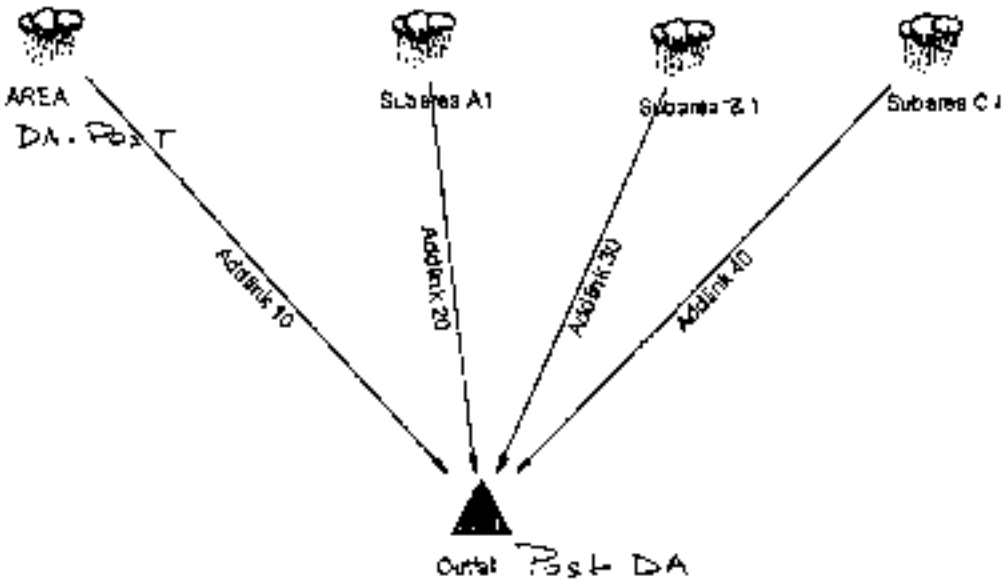
----- W -----
Watershed... 1.01



DOWNSTREAM ANALYSIS

POST - UNDETAINED

JOB TITLE

Project Date: 2/1/2007
Project Engineer: David Higgins
Project Title: WATERSHED ANALYSIS - POST DEVELOPMENT
Project Comments:

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SUBAREA B1..... Tc Calcs 3.05

SUBAREA C1..... Tc Calcs 3.07

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Unit Hyd. Summary 5.03

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Unit Hyd. Summary 5.05

SUBAREA A1..... 10
Unit Hyd. Summary 5.06

SUBAREA A1..... 25
Unit Hyd. Summary 5.07

SUBAREA A1..... 100
Unit Hyd. Summary 5.08

SUBAREA B1..... 1
Unit Hyd. Summary 5.09

SUBAREA B1..... 10
Unit Hyd. Summary 5.10

SUBAREA B1..... 25
Unit Hyd. Summary 5.11

SUBAREA B1..... 100
Unit Hyd. Summary 5.12

SUBAREA C1..... 1
Unit Hyd. Summary 5.13

SUBAREA C1..... 10
Unit Hyd. Summary 5.14

SUBAREA C1..... 25
Unit Hyd. Summary 5.15

SUBAREA C1..... 100
Unit Hyd. Summary 5.16

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Orange County

Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.9000	Synthetic Curve	TypeIII 24hr
10	5.5000	Synthetic Curve	TypeIII 24hr
25	6.5000	Synthetic Curve	TypeIII 24hr
100	7.8000	Synthetic Curve	TypeIII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trunc HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AREA DA-POST	AREA	1	77.539		14.2500	106.59		
AREA DA-POST	AREA	10	235.672		13.9000	634.30		
AREA DA-POST	AREA	25	303.189		13.9000	819.49		
AREA DA-POST	AREA	100	393.850		13.8500	1065.94		
*POST - DA	JCT	1	81.618		14.2500	209.28		
*POST - DA	JCT	10	245.695		13.9000	643.58		
*POST - DA	JCT	25	315.611		13.8000	830.70		
*POST - DA	JCT	100	409.434		13.8500	1079.94		
SUBAREA A1	AREA	1	1.293		12.3500	9.86		
SUBAREA A1	AREA	10	2.979		12.3500	22.96		
SUBAREA A1	AREA	25	3.615		12.3500	26.72		
SUBAREA A1	AREA	100	4.516		12.3500	32.74		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA B1		AREA	1	1.735		12.3000	16.17		
SUBAREA B1		AREA	10	3.997		12.3000	31.69		
SUBAREA B1		AREA	25	4.889		12.3000	38.38		
SUBAREA B1		AREA	100	6.058		12.3000	47.03		
SUBAREA C1		AREA	1	1.351		12.3000	8.78		
SUBAREA C1		AREA	10	3.047		12.3000	26.11		
SUBAREA C1		AREA	25	3.898		12.3000	33.18		
SUBAREA C1		AREA	100	5.011		12.3000	42.46		

File.... T:\Land Projects R2\0301-07sal\PONDPACK\
Title... Project Date: 2/8/2007
Project Engineer: David Higgins
Project Title: WATERSHED ANALYSIS - POST
DEVELOPMENT
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File.ID = Orange County

Storm Tag Name = 1
Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10
Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25
Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100
Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = Orange County

Storm Tag Name = 1

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... T:\Land Projects R2\000167sal\PONDPACK\DA - POST DVLPMTREV.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000	
Hydraulic Length	150.00	ft
2yr, 24hr P	3.5000	in
Slope	.020000	ft/ft
Avg.Velocity	.39	ft/sec

Segment #1 Time: .4733 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	7610.00	ft
Slope	.020000	ft/ft
Unpaved		
Avg.Velocity	2.28	ft/sec

Segment #2 Time: .9264 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	6700.00	ft
Slope	.006000	ft/ft
Unpaved		
Avg.Velocity	1.25	ft/sec

Segment #3 Time: 1.4892 hrs

Total Tc: 2.8889 hrs

File..... T:\Land Projects R2\000167sdl\PONDPACK\DA - POST OVLPMTREV.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects RZ\B00167aa1\PONDPACK\DA - POST DVLPMTREV.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	100.00 ft
2yr, 24hr P	3.5000 in
Slope	.040000 ft/ft
Avg.Velocity	.16 ft/sec

Segment #1 Time: .1023 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	1400.00 ft
Slope	.017000 ft/ft
Paved	
Avg.Velocity	2.65 ft/sec

Segment #2 Time: .1467 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	1780.00 ft
Slope	.022000 ft/ft
Unpaved	
Avg.Velocity	2.39 ft/sec

Segment #3 Time: .2066 hrs

Total Tc: .5257 hrs

File.... T:\Land Projects 82\000161a1\PONDPACK\DA - POST DVLPMTREV.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = [1.007 * (n * Lf**0.8)] / (P**.5) * (Sf**.4)

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects R2\00016\sal\PONDPACK\DA - POST DVLPMTREV.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400	
Hydraulic Length	100.00	ft
2yr, 24hr P	3.5000	in
Slope	.010000	ft/ft

Avg.Velocity .09 ft/sec

Segment #1 Time: .3001 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	500.00	ft
Slope	.026000	ft/ft
Paved		

Avg.Velocity 3.28 ft/sec

Segment #2 Time: .0424 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	1030.00	ft
Slope	.028000	ft/ft
Unpaved		

Avg.Velocity 2.70 ft/sec

Segment #3 Time: .1060 hrs

Total Tc: .4484 hrs

File..... T:\Land Projects A2\00016Tsai\PONDPACK\DA - POST DVLPMTREV.PPW

Tc Equations Used...

---- SCS TR-55 Sheet Flow ----

Tc = [.007 * ((n * Lf)**0.8)] / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects 2\00016?sal\PONDPACK\DA - POST DVLPMTNEW.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR 55 Sheet

Mannings n	.2400
Hydraulic Length	100.00 ft
2yr, 24hr P	3.5000 in
Slope	.010000 ft/ft

Avg.Velocity .09 ft/sec

Segment #1 Time: .3001 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	325.00 ft
Slope	.048000 ft/ft
Unpaved	

Avg.Velocity 3.53 ft/sec

Segment #2 Time: .0098 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	420.00 ft
Slope	.043000 ft/ft
Paved	

Avg.Velocity 4.22 ft/sec

Segment #3 Time: .0277 hrs

File.... T:\Land Projects R2\000167sal\PONDPACK\DA - POST DVLPMTREV.PPW

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 995.00 ft
Slope .070000 ft/ft
Unpaved

Avg.Velocity 4.27 ft/sec

Segment #4 Time: .0647 hrs

Total Tc: .1023 hrs

File..... T:\Land Projects R2\060167sal\PONDPACK\DA - POST DVLPMTREV.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = [1.00] * [(n * Lf)**0.8)] / [(P**.5) * (Sf**.4)]

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = [Lf / V] / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects 82\0001.67sal\PONDPACK\DA - POST DVLPMTREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %I	%C	Adjusted CN
1 acre - D soils	84	3.000			84.00
1/2 acre - D soils	85	10.000			85.00
Paths/Cemeteries etc. C soils	74	20.200			74.00
2 acre C soils	77	50.000			77.00
1/2 acre C soils	80	99.000			80.00
Rte 17, Chester & Craigville Road	98	12.000			98.00
Hospital/ Glen Arden - C soils	90	49.000			90.00
Fair woods - B soils	79	167.500			79.00
Park - D soil	80	10.000			80.00
Park - A soil	69	2.800			69.00
Fair woods - C soils	73	187.800			73.00
Water	100	19.000			100.00
COMPOSITE AREA & WEIGHTED CN --->		928.300			76.98 (77)

File.... I:\Land Projects 82\C00167sa1\PONDPACK\8A - POST DVLPMTREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
1/8 acre |town houses|, C soils	90	8.200			90.00
COMPOSITE AREA & WEIGHTED CN ->		8.200			90.00 |(SD)

File.... T:\Land Projects N2\000167sal\PONDPACK\DA - POST DVLPMTREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
1/8 Acre (town houses), C soils	90	9.500			90.00
1/8 Acre (town houses), D soils	92	1.500			92.00
COMPOSITE AREA & WEIGHTED CN --->		11.000			90.27 [90]

File.... T:\Land Projects 82\000167sa1\PONDPACK\DA - POST DVLPMTREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
1 acre , C soils	79	11.300			79.00
COMPOSITE AREA & WEIGHTED CN --->		11.300			79.00 (79)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - AREA DA-POST 1
Tc = 2.8803 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 14.2520 hrs
Computed Peak Flow = 196.60 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 14.2500 hrs
Peak Flow, Interpolated Output = 196.59 cfs

DRAINAGE AREA
ID:AREA DA-POST
CN = 77
Area = 928.300 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
1.0023 in
77.539 ac-ft

HYG Volume... 77.539 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88803 hrs (ID: AREA DA-POST)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
X = 483.43/645.333, X = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 364.08 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - AREA DA-POST 10
Tc = 2.8889 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 13.9669 hrs
Computed Peak Flow = 635.65 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.9000 hrs
Peak Flow, Interpolated Output = 634.30 cfs

DRAINAGE AREA
ID:AREA DA-POST
CN = 77
Area = 928.300 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
3.0469 in
235.670 ac-ft

HYG Volume... 235.672 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88893 hrs (ID: AREA DA-POST)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 364.08 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.70381 hrs
Total unit time, Tb = 5.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIIT 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - AREA DA-POST 25
Tc = 2.8889 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 13.8669 hrs
Computed Peak Flow = 821.64 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.9000 hrs
Peak Flow, Interpolated Output = 819.49 cfs

DRAINAGE AREA
ID:AREA DA-POST
CN = 77
Area = 928.300 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
3.9193 in
303.189 ac-ft

HYG Volume... 303.189 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88893 hrs (ID: AREA DA-POST)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 364.08 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.10381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects 82\000167sal\PONDPACK\
Rain File ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects 82\000167sal\PONDPACK\
HYG File - ID = - AREA DA-POST 100
Tc = 2.8889 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 13.8569 hrs
Computed Peak Flow = 1068.87 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.8500 hrs
Peak Flow, Interpolated Output = 1065.94 cfs

DRAINAGE AREA
ID:AREA DA-POST
CN = 77
Area = 928.300 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
5.0912 in
393.847 ac-ft

HYG Volume... 393.850 ac ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88893 hrs (ID: AREA DA-POST)
Computational Incr, Tm = .38519 hrs = 0.23000 Tp

Unit Hyd. Shape Factor = 483.632 (37.46% under rising limb)
X = 483.63/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 364.08 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\000167sa1\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvalinear
HYG Dir = T:\Land Projects R2\000167sa1\PONDPACK\
HYG File - ID = - SUBAREA A1 1
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07009 hrs
Computed Peak Time = 12.3360 hrs
Computed Peak Flow = 9.97 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 9.86 cfs

DRAINAGE AREA
ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
1.8925 in
1.293 ac-ft

HYG Volume... 1.293 ac ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .52566 hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.25000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/665.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.48182 hrs
Total unit time, Tb = 1.75228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration - 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir - T:\Land Projects A2\000167sal\PONDPACK\
Rain File ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects A2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A1 10
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07009 hrs
Computed Peak Time = 12.3360 hrs
Computed Peak Flow = 22.13 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 22.06 cfs

DRAINAGE AREA
ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
4.3599 in
2.979 ac-ft

HYG Volume... 2.979 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .52568 hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.40182 hrs
Total unit time, Tb = 1.75228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sa1\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sa1\PONDPACK\
HYG File - ID = - SUBAREA A1 25
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07309 hrs
Computed Peak Time = 12.3360 hrs
Computed Peak Flow = 26.81 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 26.72 cfs

DRAINAGE AREA
ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
5.3338 in
3.645 ac-ft

HYG Volume... 3.645 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .52568 hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.461 under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+|Tr/Tp|)
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.40182 hrs
Total unit time, Tb = 1.75228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8300 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File - ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A1 100
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07009 hrs
Computed Peak Time = 12.3360 hrs
Computed Peak Flow = 32.86 cfs

Time Increment for HYG file = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 32.74 cfs

DRAINAGE AREA

ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

6.6088 in
4.516 ac-ft

HYG Volume... 4.516 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .52568 hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.20000 Tp

Unit Hyd. Shape factor = 483.432 (37.464 under rising limb)
K = 483.43/645.333, K = .7491 (Also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 37.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.40182 hrs
Total unit time, Tb = 1.75220 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 1
Tc = .4484 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 14.27 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 14.17 cfs

DRAINAGE AREA
ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
1.8925 in
1.735 ac-ft

HYG Volume... 1.735 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .44842 hrs (ID: SUBAREA B1)
Computational Incr, Tp = .05979 hrs - 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29895 hrs
Unit receding limb, Tr = 1.1958O hrs
Total unit time, Tb = 1.49475 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 ID
Tc = .4484 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 31.84 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 31.69 cfs

DRAINAGE AREA
ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
4.3599 in
3.997 ac-ft

HYG Volume... 3.997 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .44842 hrs (ID: SUBAREA B1)
Computational Incr, Tm = .05979 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .749: (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6638 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29895 hrs
Unit receding limb, Tr = 1.19580 hrs
Total unit time, Tb = 1.49475 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 25
Tc = .4484 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 38.54 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 39.38 cfs

DRAINAGE AREA
ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
5.3338 in
4.889 ac-ft

HYG Volume... 4.889 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .44842 hrs (ID: SUBAREA B1)
Computational Incr, Tm = .05979 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29895 hrs
Unit receding limb, Tr = 1.19580 hrs
Total unit time, Tb = 1.49475 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 100
Tc = .4484 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 47.20 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 47.03 cfs

DRAINAGE AREA
ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
6.6088 in
6.058 ac-ft

HYG Volume... 6.058 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .44842 hrs (ID: SUBAREA B1)
Computational Incr, Tm = .05979 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
X = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29895 hrs
Unit receding limb, Tr = 1.19580 hrs
Total unit time, Tb = 1.49475 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.3000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA C1 1
Tc = .4023 hrs
Drainage Area = 11.300 acres Runoff CN= 79

Computational Time Increment = .05364 hrs
Computed Peak Time = 12.2843 hrs
Computed Peak Flow = 8.79 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 8.78 cfs

DRAINAGE AREA
ID:SUBAREA C1
CN = 79
Area = 11.300 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff
1.1159 in
1.051 ac-ft

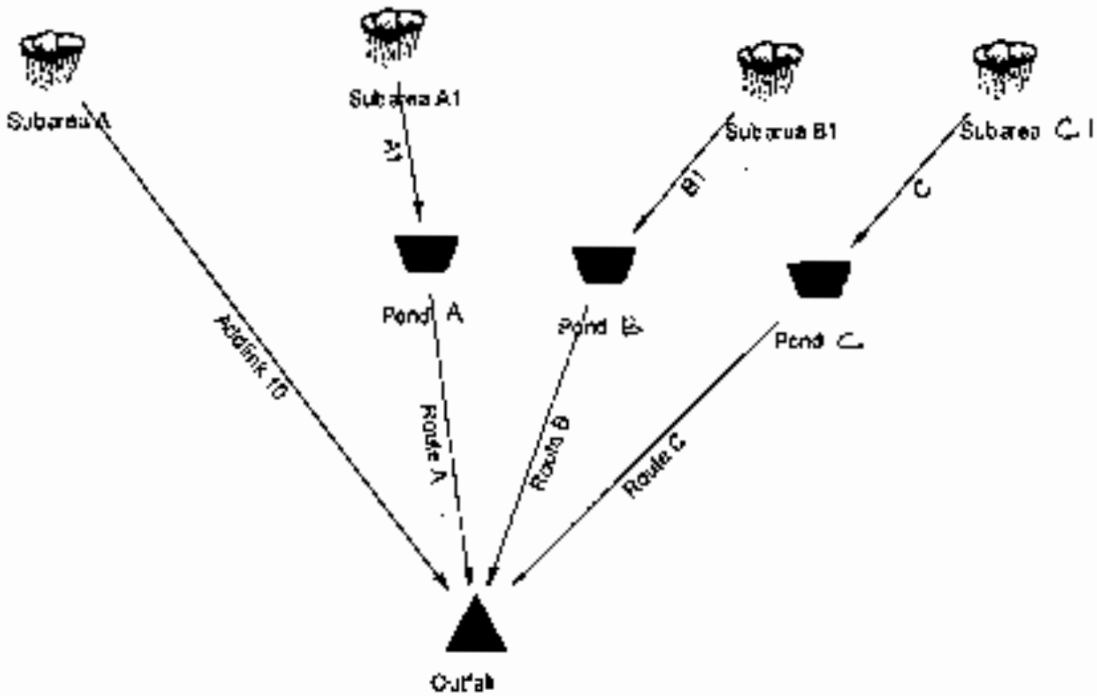
HYG Volume... 1.051 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .40232 hrs (ID: SUBAREA C1)
Computational Incr, Tm = .05364 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/605.333, K = .7491 (also, K = 2/[1+(Tr/Tp)])
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.82 cfs
Unit peak time Tp = .25822 hrs
Unit receding limb, Tr = 1.07286 hrs
Total unit time, Tb = 1.34130 hrs



DOWNSTREAM ANALYSIS

Post. Detained

Job File: T:\Land Projects 2\C00167a1\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW
Rain Dir: T:\Land Projects 2\C00167a1\PONDPACK\

JOB TITLE

Project Date: 2/1/2007
Project Engineer: David Higgins
Project Title: WATERSHED ANALYSIS - POST DEVELOPMENT DETAINED
Project Comments:

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MASTER DESIGN STORM SUMMARY

Network Storm Collection: Orange County

Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.9000	Synthetic Curve	TypeIII 24hr
10	5.5000	Synthetic Curve	TypeIII 24hr
25	6.5000	Synthetic Curve	TypeIII 24hr
100	7.8000	Synthetic Curve	TypeIII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

|*Node=Outfall; +Node=Diversion;|
|Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt|

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUTFALL		JCT	1	81.680		14.2500	230.91		
*OUTFALL		JCT	10	245.674		13.9000	649.75		
*OUTFALL		JCT	25	315.590		13.8500	839.66		
*OUTFALL		JCT	100	409.613		13.8500	1091.66		
POND A	IN	POND	1	1.293		12.3500	9.86		
POND A	IN	POND	10	2.979		12.3500	22.06		
POND A	IN	POND	25	3.645		12.3500	26.72		
POND A	IN	POND	100	4.516		12.3500	32.74		
POND A	OUT	POND	1	1.288		13.6000	1.44	396.84	.700
POND A	OUT	POND	10	2.974		12.8500	9.43	397.55	1.351
POND A	OUT	POND	25	3.639		12.7500	13.50	397.74	1.531
POND A	OUT	POND	100	4.511		12.7000	18.92	397.97	1.767

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation; Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
POND B	IN	POND	1	1.735		12.3000	14.17		
POND B	IN	POND	10	3.997		12.3000	31.69		
POND B	IN	POND	25	4.889		12.3000	38.38		
POND B	IN	POND	100	6.058		12.3000	47.03		
POND B	OUT	POND	1	1.727		13.7000	1.63	396.99	.992
POND B	OUT	POND	10	3.966		13.0000	7.58	398.03	2.115
POND B	OUT	POND	25	4.878		12.8500	12.00	398.32	2.438
POND B	OUT	POND	100	6.046		12.8000	18.20	398.66	2.836
POND C	IN	POND	1	1.051		12.3000	8.78		
POND C	IN	POND	10	3.047		12.3000	26.11		
POND C	IN	POND	25	3.888		12.3000	33.18		
POND C	IN	POND	100	5.011		12.3000	42.46		
POND C	OUT	POND	1	1.046		13.7500	1.27	396.70	.499
POND C	OUT	POND	10	3.043		12.7000	11.52	397.65	1.224
POND C	OUT	POND	25	3.883		12.6500	17.59	397.91	1.438
POND C	OUT	POND	100	5.006		12.6000	25.69	398.23	1.695
SUBAREA A		AREA	1	77.539		14.2500	196.59		
SUBAREA A		AREA	10	235.672		13.9000	634.30		
SUBAREA A		AREA	25	303.189		13.9000	819.49		
SUBAREA A		AREA	100	393.850		13.8500	1065.94		
SUBAREA A1		AREA	1	1.293		12.3500	9.86		
SUBAREA A1		AREA	10	2.979		12.3500	22.06		
SUBAREA A1		AREA	25	3.645		12.3500	26.72		
SUBAREA A1		AREA	100	4.516		12.3500	32.74		
SUBAREA B1		AREA	1	1.735		12.3000	14.17		
SUBAREA B1		AREA	10	3.997		12.3000	31.69		
SUBAREA B1		AREA	25	4.889		12.3000	38.38		
SUBAREA B1		AREA	100	6.056		12.3000	47.03		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; >Node=Diversion;)
(Trun= HYG Truncation; Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA C1	AREA	1	1.051		12.3000	8.78		
SUBAREA C1	AREA	10	3.067		12.3000	26.11		
SUBAREA C1	AREA	25	3.888		12.3000	33.18		
SUBAREA C1	AREA	100	5.011		12.3000	42.46		

File.... I:\Land Projects 2\000167sa1\PONDPACK\
Title... Project Date: 2/1/2007
Project Engineer: David Riggins
Project Title: WATERSHED ANALYSIS - POST
DEVELOPMENT DETAINED
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = Orange County

Storm Tag Name = 1

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = Orange County

Storm Tag Name = 1

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.9000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeIII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 7.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Type.... Tc Calcs
Name.... SUBARI

File.... T:\Land Projects R2\00016?sal\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000
Hydraulic Length	150.00 ft
2yr, 24hr P	3.5000 in
Slope	.020000 ft/ft
Avg.Velocity	.09 ft/sec

Segment #1 Time: .4733 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	7610.00 ft
Slope	.020000 ft/ft
Unpaved	
Avg.Velocity	2.28 ft/sec

Segment #2 Time: .9264 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	6700.00 ft
Slope	.006000 ft/ft
Unpaved	
Avg.Velocity	1.25 ft/sec

Segment #3 Time: 1.4892 hrs

Total Tc: 2.8889 hrs

File.... T:\Land Projects A2\000167sa1\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

Tc Equations Used...

---- SCS TR-55 Sheet Flow ----

Tc = [1.007 * (n * Lf)**0.8)] / [(P**.5) * (Sf**.4)]

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File..... T:\Land Projects 02\030163\a1\PONDPACK\EA - POST DVLPMT-DETAILED85V.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	100.00 ft
2yr. 24hr P	3.5000 in
Slope	.040000 ft/ft

Avg.Velocity .16 ft/sec

Segment #1 Time: .1723 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	1400.00 ft
Slope	.017000 ft/ft
Paved	

Avg.Velocity 2.65 ft/sec

Segment #2 Time: .1467 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	1780.00 ft
Slope	.022000 ft/ft
Unpaved	

Avg.Velocity 2.39 ft/sec

Segment #3 Time: .2066 hrs

Total Tc: .5257 hrs

File..... T:\Land Projects R2\000167sal\PONDPACK\DA - POST DVLPMT DETAINEDRSV.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = [1.007 * ((n * Lf)**0.8)] / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects R2\00016\cal\PONDPACK\DA - POST DVLPMT-DETAINEDSEV.PPW

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	100.00 ft
7yr, 24hr P	3.5000 in
Slope	.010000 ft/ft
Avg.Velocity	.89 ft/sec

Segment #1 Time: .3004 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	500.00 ft
Slope	.026000 ft/ft
Paved	
Avg.Velocity	3.28 ft/sec

Segment #2 Time: .0424 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	1030.00 ft
Slope	.029000 ft/ft
Unpaved	
Avg.Velocity	2.70 ft/sec

Segment #3 Time: .1060 hrs

Total Tc: .4488 hrs

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = (.007 * (n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, ft

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	300.00 ft
2yr, 24hr P	3.5000 in
Slope	.010000 ft/ft
Avg.Velocity	.09 ft/sec

Segment #1 Time: .3001 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	125.00 ft
Slope	.048000 ft/ft
Unpaved	
Avg.Velocity	3.53 ft/sec

Segment #2 Time: .0098 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	420.00 ft
Slope	.043000 ft/ft
Paved	
Avg.Velocity	4.22 ft/sec

Segment #3 Time: .0277 hrs

File.... T:\Land Projects 62\000167sd\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 995.00 ft
Slope .070000 ft/ft
Unpaved

Avg.Velocity 4.77 ft/sec

Segment #4 Time: .0647 hrs

Total Tc: .6023 hrs

File..... I:\Land Projects R2\000167sal\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

Tc Equations used...

---- SCS TR-55 Sheet Flow ----

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

---- SCS TR-55 Shallow Concentrated Flow ----

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

File.... T:\Land Projects N2\0D016Tgal\PONDPACK\3A - POST DVLPMT-DETAINEDREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
1 acre - D soils	84	3.000			84.00
1/2 acre - D soils	85	10.000			85.00
Parks/cemeteries etc. C soils	74	20.200			74.00
2 acre - C soils	77	50.000			77.00
1/2 acre - C soils	80	98.000			80.00
Rte 17, Chester & Craigville Road	98	12.000			98.00
Hospital/ Glen Arden - C soils	90	48.000			90.00
fair woods - D soils	79	162.500			79.00
Park - D soil	80	10.000			80.00
Park - A soil	45	2.800			45.00
fair woods - C soils	73	487.800			73.00
Water	100	19.000			100.00
COMPOSITE AREA & WEIGHTED CN --->		928.300			76.98 (77)

File..... T:\Land Projects R2\000167sa1\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
1/8 acre (town houses), C soils	90	8.200			90.00
COMPOSITE AREA & WEIGHTED CN ->		8.200			90.00 (90)

File.... I:\Land Projects A2\000167$all\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
1/8 acre (town houses), C soils	90	9.500			90.00
1/8 acre (town houses), D soils	92	1.500			92.00
COMPOSITE AREA & WEIGHTED CN --->		11.000			90.27 (90)

Type..... Runoff CN-Area
Name..... SUBAREA C1

File..... T:\Land Projects 82\000167sal\PONDPACK\DA - POST DVL2MT-DETAINEDREV.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
1 acre , C soils	79	11.300			79.00
COMPOSITE AREA & WEIGHTED CN --->		11.300			79.00 (79)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9080 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A 1
Tc = 2.8089 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 14.2520 hrs
Computed Peak Flow = 156.60 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 14.2500 hrs
Peak Flow, Interpolated Output = 196.59 cfs

DRAINAGE AREA
ID:SUBAREA A
CN = 77
Area = 928.300 Acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
1.0023 in
77.549 ac-ft

HYG Volume... 77.549 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.80893 hrs (ID: SUBAREA A)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 304.08 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.70361 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A 10
Tc = 2.8883 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 13.8669 hrs
Computed Peak Flow = 631.65 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.9000 hrs
Peak Flow, Interpolated Output = 534.30 cfs

DRAINAGE AREA
ID:SUBAREA A
CN = 77
Area = 928.300 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
3.0465 in
235.670 ac-ft

HYG Volume... 235.672 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88893 hrs ((D: SUBAREA A)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+|Tr/Tp|)
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 364.08 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 7.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A 25
Tc = 2.8889 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .30519 hrs
Computed Peak Time = 13.8669 hrs
Computed Peak Flow = 821.64 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.9000 hrs
Peak Flow, Interpolated Output = 819.49 cfs

DRAINAGE AREA
ID:SUBAREA A
CN = 77
Area = 928.300 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
3.9193 in
303.187 ac-ft

HYG Volume... 303.189 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88693 hrs (ID: SUBAREA A)
Computational Incr, Tm = .30519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 764.08 cfs
Unit peak time Tp = 1.92595 hrs
Unit receding limb, Tr = 3.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A 100
Tc = 2.8889 hrs
Drainage Area = 928.300 acres Runoff CN= 77

Computational Time Increment = .38519 hrs
Computed Peak Time = 13.8669 hrs
Computed Peak Flow = 1069.87 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 13.8500 hrs
Peak Flow, Interpolated Output = 1065.94 cfs

DRAINAGE AREA
ID:SUBAREA A
CN = 77
Area = 928.300 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff
5.0912 in
393.847 ac-ft

HYG Volume... 393.850 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 2.88889 hrs (ID: SUBAREA A)
Computational Incr, Tm = .38519 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.464 under rising lamb)
K = 483.43/645.337, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 364.09 cfs
Unit peak time, Tp = 1.92595 hrs
Unit receding lamb, Tr = 7.70381 hrs
Total unit time, Tb = 9.62976 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.3000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A1 1
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07009 hrs
Computed Peak Time = 12.3361 hrs
Computed Peak Flow = 9.87 cfs

Time Increment for HYG file = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 9.86 cfs

DRAINAGE AREA
ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
1.8925 in
1.293 ac-ft

HYG Volume... 1.293 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .52568 hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.13300 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 13.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.40182 hrs
Total unit time, Tb = 1.75228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5300 in
Rain Dir = T:\Land Projects R2\D00167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\D00167sal\PONDPACK\
HYG File - ID = - SUBAREA A1 10
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07009 hrs
Computed Peak Time = 12.3360 hrs
Computed Peak Flow = 22.13 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 22.06 cfs

DRAINAGE AREA
ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
4.3599 in
2.979 ac-ft

HYG Volume... 2.979 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .52569 hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.468 under rising limb)
K = 483.43/645.333, K = .749: (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6656 (solved from K = .7491)

Unit peak, qp = 17.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.40182 hrs
Total unit time, Tb = 1.75229 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -TC = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA A1 25
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07009 hrs
Computed Peak Time = 12.3360 hrs
Computed Peak Flow = 26.81 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 26.72 cfs

DRAINAGE AREA
ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
5.3338 in
3.645 ac-ft

HYG Volume... 3.645 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .5256# hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.2000 Tp

Unit Hyd. Shape factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+|Tr/Tp|)
Receding/Rising, Tr/Tp = 1.6693 (solved from K = .7491)

Unit peak, qp = 17.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.40182 hrs
Total unit time, Tb = 1.75228 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curv;linear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = SUBAREA A1 100
Tc = .5257 hrs
Drainage Area = 8.200 acres Runoff CN= 90

Computational Time Increment = .07009 hrs
Computed Peak Time = 12.5368 hrs
Computed Peak Flow = 32.86 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.5500 hrs
Peak Flow, Interpolated Output = 32.74 cfs

DRAINAGE AREA
ID:SUBAREA A1
CN = 90
Area = 8.200 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
6.6068 in
4.516 ac-ft

HYG Volume... 4.516 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .52568 hrs (ID: SUBAREA A1)
Computational Incr, Tm = .07009 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.66% under rising limb)
K = 483.43/645.333, K = .7491 (Also, K = 2/(1+|Tr/Tp|)
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.67 cfs
Unit peak time Tp = .35046 hrs
Unit receding limb, Tr = 1.40182 hrs
Total unit time, Tb = 1.75229 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 1
Tc = .4484 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 14.27 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 14.17 cfs

DRAINAGE AREA
ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
1.8925 in
1.735 ac-ft

HYG Volume... 1.735 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .44842 hrs (ID: SUBAREA B1)
Computational Incr, Tm = .05979 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/[1+(Tr/Tp)])
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29895 hrs
Unit receding limb, Tr = 1.19580 hrs
Total unit time, Tb = 1.49475 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 10
Tc = .4484 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 31.84 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 31.69 cfs

DRAINAGE AREA
ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
4.3599 in
3.997 ac ft

HYG Volume... 3.997 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .44842 hrs (ID: SUBAREA B1)
Computational Incs, Tm = .05979 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.464 under rising limb)
K = 483.43/645.333, X = .7491 (also, K = 3/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29895 hrs
Unit receding limb, Tr = 1.19580 hrs
Total unit time, Tb = 1.49475 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File - ID = - TypeIIF 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 25
Tc = .4484 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 38.54 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 38.38 cfs

DRAINAGE AREA

ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

5.3338 in
4.889 ac-ft

HYG Volume... 4.889 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .44842 hrs (ID: SUBAREA B1)
Computational Incr, Tm = .05979 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.461 under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29895 hrs
Unit receding limb, Tr = 1.19580 hrs
Total unit time, Tb = 1.49475 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects 82\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects 82\000167sal\PONDPACK\
HYG File - ID = - SUBAREA B1 100
Tc = .0494 hrs
Drainage Area = 11.000 acres Runoff CN= 90

Computational Time Increment = .05979 hrs
Computed Peak Time = 12.3167 hrs
Computed Peak Flow = 47.20 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 47.03 cfs

DRAINAGE AREA
ID:SUBAREA B1
CN = 90
Area = 11.000 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff
6.0088 in
6.058 ac ft

HYG Volume... 6.056 ac ft (Area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .04842 hrs (ID: SUBAREA B1)
Computational Incr, Tp = .05979 hrs - 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.79 cfs
Unit peak time Tp = .29896 hrs
Unit receding limb, Tr = 1.19580 hrs
Total unit time, Tb = 1.49476 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.9000 in
Rain Dir = T:\Land Projects R2\000167aa1\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167aa1\PONDPACK\
HYG File - ID = - SUBAREA C1 1
Tc = .4023 hrs
Drainage Area = 11.300 acres Runoff CN= 79

Computational Time Increment = .05364 hrs
Computed Peak Time = 12.2043 hrs
Computed Peak Flow = 8.79 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 8.70 cfs

DRAINAGE AREA
ID:SUBAREA C1
CN = 79
Area = 11.300 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff
1.9159 in
1.051 ac-ft

HYG Volume... 1.051 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .40232 hrs (ID: SUBAREA C1)
Computational Incr, Tm = .05364 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 [37.468 under rising limb]
K = 483.43/665.333, X = .7491 (also, K = 2/[1+(Tr/Tp)])
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.87 cfs
Unit peak time, Tp = .26822 hrs
Unit receding limb, Tr = 1.07286 hrs
Total unit time, Tb = 1.34108 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File -ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA C1 10
Tc = .4023 hrs
Drainage Area = 11.300 acres Runoff CN= 79

Computational Time Increment = .05364 hrs
Computed Peak Time = 12.7863 hrs
Computed Peak Flow = 26.31 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 26.41 cfs

DRAINAGE AREA
ID:SUBAREA C1
CN = 79
Area = 11.300 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff
3.2366 in
3.048 ac-ft

HYG Volume... 3.047 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .40232 hrs (ID: SUBAREA C1)
Computational Incr, Tm = .05364 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.82 cfs
Unit peak time Tp = .26822 hrs
Unit receding limb, Tr = 1.07286 hrs
Total unit time, Tb = 1.34108 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.5000 in
Rain Dir = T:\Land Projects R2\000167sal\PONDPACK\
Rain File - ID = - TypeIII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
HYG File - ID = - SUBAREA C1 25
Tc = .4023 hrs
Drainage Area = 11.300 acres Runoff CN= 79

Computational Time Increment = .05364 hrs
Computed Peak Time = 12.2843 hrs
Computed Peak Flow = 33.47 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 33.18 cfs

DRAINAGE AREA
ID:SUBAREA C1
CN = 79
Area = 11.300 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff
4.1292 in
3.888 ac-ft

HYG Volume... 3.888 ac ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .40232 hrs (ID: SUBAREA C1)
Computational Incr, Tm = .05364 hrs = 0.23000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.33, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.82 cfs
Unit peak time Tp = .26822 hrs
Unit receding limb, Tr = 1.07296 hrs
Total unit time, Tb = 1.34108 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 7.8000 in
Rain Dir = T:\Land Projects R2\00016?sal\PONDPACK\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = T:\Land Projects R2\00016?sal\PONDPACK\
HYG File - ID = - SUBAREA C1 100
Tc = .4023 hrs
Drainage Area = 11.300 acres Runoff CN= 79

Computational Time Increment = .05364 hrs
Computed Peak Time = 12.2849 hrs
Computed Peak Flow = 42.87 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 42.46 cfs

DRAINAGE AREA
ID:SUBAREA C1
CN = 79
Area = 11.300 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff
5.3220 in
5.012 ac-ft

HYG Volume... 5.011 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .40232 hrs (ID: SUBAREA C1)
Computational Incr, Tm = .05364 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.33), K = .7491 (also, K = 2/(1+1Tr/Tp))
Receding/Rising, Tr/Tp = 1.6598 (solved from K = .7491)

Unit peak, qp = 31.82 cfs
Unit peak time Tp = .26822 hrs
Unit receding limb, Tr = 1.07786 hrs
Total unit time, Tb = 1.34108 hrs

File.... T:\Land Projects R2\000167sal\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
356.00	-----	.0200	.0000	.000	.000
358.00	-----	.9600	2.6572	1.778	1.778
403.00	-----	1.1200	3.1169	2.078	3.856

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

File.... T:\Land Projects R2\000167sal\PONDPACK\DA - POST DVLPMT-DETAINED&V.PPW

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
396.00	-----	.9600	.9030	.300	.300
398.00	--	1.1200	3.1169	2.078	2.378
400.00	-----	1.2800	3.5913	2.398	4.476

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume - Incremental volume between EL1 and EL2

File.... T:\Land Projects R2\D00167sa1\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
396.00	-----	.6400	.0000	.000	.000
398.00	-----	.8200	2.2622	1.508	1.508
400.00	-----	.9600	2.6672	1.778	3.286

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Type..... Pond E-V-Q Table
Name..... POND A
File..... T:\Land Projects R2\000167sal\PONDPACK\DA - POST DVLPMT-DETAINEDREV.PPW

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
Inflow HYG file = NONE STORED - POND A IN 1
Outflow HYG file = NONE STORED - POND A OUT 1

Pond Node Data = POND A
Pond Volume Data = POND A
Pond Outlet Data = Outlet A

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	396.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
396.00	.00	.000	.8700	.00	.00	.00
396.10	.05	.082	.8267	.00	.05	39.90
396.20	.18	.165	.8335	.00	.18	80.21
396.30	.38	.249	.8403	.00	.38	120.91
396.40	.63	.333	.8471	.00	.63	161.99
396.50	.95	.418	.8540	.00	.95	203.48
396.60	1.12	.504	.8608	.00	1.12	245.16
396.70	1.27	.591	.8677	.00	1.27	287.14
396.80	1.40	.678	.8747	.00	1.40	329.43
396.90	1.52	.766	.8816	.00	1.52	372.06
397.00	1.64	.854	.8886	.00	1.64	415.02
397.10	2.32	.943	.8956	.00	2.32	458.88
397.20	3.47	1.033	.9027	.00	3.47	503.55
397.30	4.91	1.124	.9097	.00	4.91	548.86
397.40	6.59	1.215	.9168	.00	6.59	594.73
397.50	8.47	1.307	.9240	.00	8.47	641.16
397.60	10.50	1.400	.9311	.00	10.50	688.08
397.70	12.60	1.493	.9383	.00	12.60	735.42
397.80	14.85	1.588	.9455	.00	14.85	783.25
397.90	17.23	1.683	.9527	.00	17.23	831.57

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
Inflow HYG file = NONE STORED - POND A IN 1
Outflow HYG file = NONE STORED - POND A OUT 1

Pond Node Data = POND A
Pond Volume Data = POND A
Pond Outlet Data = Outlet A

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	396.00	ft
Starting Volume	=	.000	ac-ft
Starting Outflow	=	.00	cfs
Starting Infiltr.	=	.00	cfs
Starting Total Qout	=	.00	cfs
Time Increment	=	.0500	hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infiltr. cfs	Q Total cfs	2S/t + O cfs
398.00	19.74	1.778	.9600	.00	19.74	880.37
398.10	22.35	1.875	.9677	.00	22.35	929.64
398.20	25.04	1.972	.9754	.00	25.04	979.35
398.30	27.56	2.070	.9832	.00	27.56	1029.26
398.40	29.96	2.168	.9910	.00	29.96	1079.44
398.50	32.34	2.268	.9988	.00	32.34	1129.98
398.60	34.79	2.368	1.0067	.00	34.79	1180.97
398.70	37.21	2.469	1.0146	.00	37.21	1232.30
398.80	39.52	2.571	1.0225	.00	39.52	1283.90
398.90	41.89	2.674	1.0305	.00	41.89	1335.95
399.00	44.39	2.777	1.0385	.00	44.39	1388.53
399.10	46.83	2.881	1.0465	.00	46.83	1441.42
399.20	49.09	2.986	1.0545	.00	49.09	1494.53
399.30	51.62	3.092	1.0626	.00	51.62	1548.28
399.40	53.91	3.199	1.0707	.00	53.91	1602.20
399.50	56.28	3.306	1.0788	.00	56.28	1656.59
399.60	58.88	3.415	1.0870	.00	58.88	1711.61
399.70	61.27	3.524	1.0952	.00	61.27	1766.81
399.80	63.51	3.634	1.1034	.00	63.51	1822.25
399.90	65.93	3.745	1.1117	.00	65.93	1878.27

LEVEL POOL ROUTING DATA

HYG Dir - T:\Land Projects R2\000167sa1\PONDPACK\
Inflow HYG file = NONE STORED - POND A IN 1
Outflow HYG file = NONE STORED - POND A OUT 1

Pond Node Data = POND A
Pond Volume Data = POND A
Pond Outlet Data = Outlet A

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 396.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
400.00	68.32	3.856	1.1200	.00	68.32	1934.68

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
Inflow HYG file = NONE STORED - POND A IN 1
Outflow HYG file = NONE STORED - POND B OUT 1

Pond Node Data = POND B
Pond Volume Data = POND B
Pond Outlet Data = Outlet B

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	396.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
396.00	.00	.000	.9600	.00	.00	.00
396.10	.05	.096	.9677	.00	.05	46.70
396.20	.18	.194	.9754	.00	.18	93.86
396.30	.38	.291	.9832	.00	.38	141.44
396.40	.63	.390	.9910	.00	.63	189.47
396.50	.95	.490	.9988	.00	.95	237.95
396.60	1.32	.590	1.0067	.00	1.32	286.66
396.70	1.27	.691	1.0146	.00	1.27	335.73
396.80	1.40	.793	1.0225	.00	1.40	385.15
396.90	1.52	.896	1.0305	.00	1.52	434.96
397.00	1.64	.999	1.0385	.00	1.64	485.14
397.10	1.74	1.103	1.0466	.00	1.74	535.70
397.20	1.84	1.208	1.0545	.00	1.84	586.65
397.30	1.94	1.314	1.0626	.00	1.94	637.97
397.40	2.03	1.421	1.0707	.00	2.03	689.69
397.50	2.11	1.528	1.0788	.00	2.11	741.79
397.60	2.62	1.637	1.0870	.00	2.62	794.71
397.70	3.46	1.746	1.0952	.00	3.46	848.37
397.80	4.51	1.856	1.1034	.00	4.51	902.61
397.90	5.73	1.966	1.1117	.00	5.73	957.45

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects 82\000167aa1\PONDPACK\
Inflow HYG file = NONE STORED - POND B IN 1
Outflow HYG file = NONE STORED - POND B OUT 1

Pond Node Data = POND B
Pond Volume Data = POND B
Pond Outlet Data = Outlet B

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 396.00 ft
Starting Volume = .000 ac ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout = .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
398.00	7.09	2.018	1.1700	.00	7.09	1012.82
398.10	8.57	2.190	1.1277	.00	8.57	1068.69
398.20	10.08	2.304	1.1355	.00	10.08	1124.98
398.30	11.70	2.417	1.1433	.00	11.70	1181.73
398.40	13.40	2.532	1.1511	.00	13.40	1238.96
398.50	15.17	2.648	1.1590	.00	15.17	1296.64
398.60	17.02	2.764	1.1669	.00	17.02	1354.79
398.70	18.94	2.881	1.1748	.00	18.94	1413.38
398.80	20.93	2.999	1.1827	.00	20.93	1472.40
398.90	22.97	3.118	1.1907	.00	22.97	1531.88
399.00	25.06	3.237	1.1987	.00	25.06	1591.79
399.10	27.20	3.357	1.2067	.00	27.20	1652.15
399.20	29.23	3.478	1.2147	.00	29.23	1712.78
399.30	31.15	3.600	1.2228	.00	31.15	1773.69
399.40	32.97	3.723	1.2309	.00	32.97	1834.87
399.50	34.76	3.846	1.2390	.00	34.76	1896.44
399.60	36.63	3.971	1.2471	.00	36.63	1958.48
399.70	38.35	4.096	1.2553	.00	39.35	2020.76
399.80	40.07	4.222	1.2635	.00	40.07	2083.42
399.90	41.88	4.349	1.2717	.00	41.88	2146.59

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects 82\00016?sal\PONDPACK\
Inflow HYG file = NONE STORED - POND B IN)
Outflow HYG file = NONE STORED - POND B OUT)

Pond Node Data = POND B
Pond Volume Data = POND B
Pond Outlet Data = Outlet B

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	396.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Outf	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area Acres	Infilt. cfs	O Total cfs	2S/t + O cfs
400.00	43.55	4.476	1.2804	.00	43.55	2210.01

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sal\PONDPACK\
Inflow HYG file = NONE STORED - POND C IN 1
Outflow HYG file = NONE STORED - POND C OUT 1

Pond Node Data = POND C
Pond Volume Data = POND C
Pond Outlet Data = Outlet A

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	396.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Outf	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
396.00	.00	.000	.6900	.00	.00	.00
396.10	.05	.069	.6952	.00	.05	33.54
396.20	.18	.139	.7025	.00	.18	67.58
396.30	.38	.210	.7088	.00	.38	101.92
396.40	.63	.281	.7151	.00	.63	136.63
396.50	.95	.353	.7214	.00	.95	171.72
396.60	1.12	.425	.7278	.00	1.12	206.96
396.70	1.27	.498	.7342	.00	1.27	242.50
396.80	1.40	.572	.7407	.00	1.40	278.31
396.90	1.52	.647	.7471	.00	1.52	314.44
397.00	1.64	.722	.7536	.00	1.64	350.87
397.10	2.32	.797	.7603	.00	2.32	388.19
397.20	3.47	.874	.7667	.00	3.47	426.29
397.30	4.91	.951	.7732	.00	4.91	464.99
397.40	6.59	1.028	.7798	.00	6.59	504.26
397.50	8.47	1.107	.7864	.00	8.47	544.04
397.60	10.50	1.186	.7931	.00	10.50	584.30
397.70	12.60	1.265	.7998	.00	12.60	624.94
397.80	14.85	1.345	.8065	.00	14.85	666.06
397.90	17.23	1.426	.8132	.00	17.23	707.64

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\000167sa1\PONDPACK\
Inflow HYG file = NONE STORED - POND C IN 1
Outflow HYG file = NONE STORED - POND C OUT 1

Pond Node Data = POND C
Pond Volume Data = POND C
Pond Outlet Data = Outlet A

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 396.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Outf = .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
398.00	19.74	1.508	.8209	.00	19.74	749.67
398.10	22.35	1.590	.8267	.00	22.35	792.14
398.20	25.04	1.673	.8335	.00	25.04	835.31
398.30	27.56	1.757	.8403	.00	27.56	878.02
398.40	29.96	1.842	.8471	.00	29.96	921.26
398.50	32.34	1.927	.8540	.00	32.34	964.81
398.60	34.79	2.012	.8608	.00	34.79	1009.77
398.70	37.21	2.099	.8677	.00	37.21	1053.01
398.80	39.52	2.186	.8747	.00	39.52	1097.49
398.90	41.89	2.274	.8816	.00	41.89	1142.36
399.00	44.29	2.362	.8886	.00	44.29	1187.70
399.10	46.83	2.451	.8956	.00	46.83	1233.32
399.20	49.09	2.541	.9027	.00	49.09	1279.10
399.30	51.62	2.632	.9097	.00	51.62	1325.48
399.40	53.91	2.723	.9168	.00	53.91	1371.98
399.50	56.28	2.815	.9240	.00	56.28	1418.90
399.60	58.88	2.908	.9311	.00	58.88	1466.40
399.70	61.27	3.002	.9383	.00	61.27	1514.03
399.80	63.51	3.096	.9455	.00	63.51	1561.95
399.90	65.93	3.191	.9527	.00	65.93	1610.20

LEVEL POOL ROUTING DATA

HYG Dir = T:\Land Projects R2\00016?sal\PONDPACK\
Inflow HYG file = NONE STORED - POND C IN 1
Outflow HYG file = NONE STORED - POND C OUT 1

Pond Node Data = POND C
Pond Volume Data = POND C
Pond Outlet Data = Outlet A

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	396.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
400.00	68.32	3.286	.9600	.00	68.32	1658.89

Index of Starting Page Numbers for ID Names

----- O -----
Orange County... 2.01, 2.02

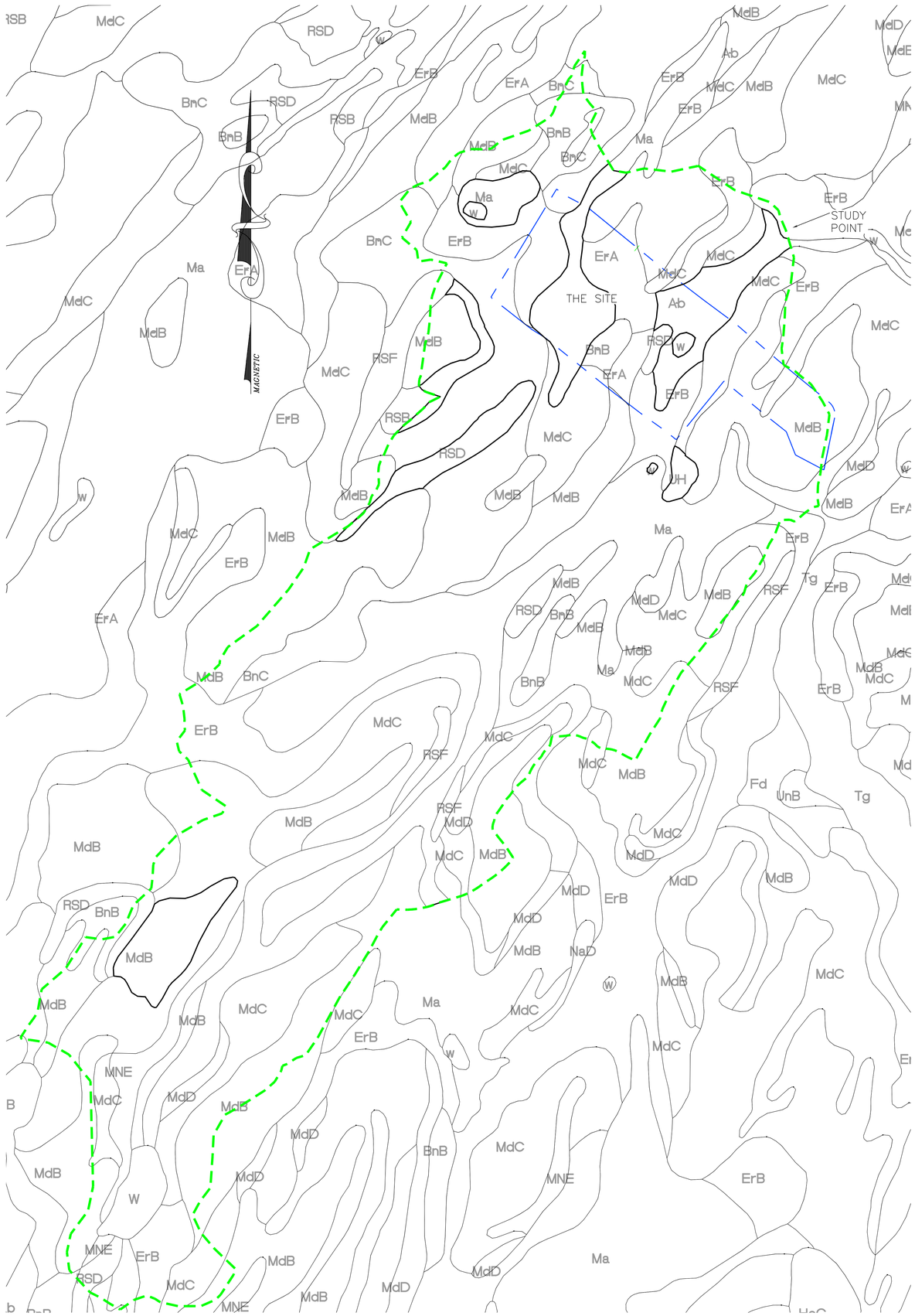
----- P -----
POND A... 6.01, 7.01
POND B... 6.02, 7.04
POND C... 6.03, 7.07

----- S -----
SUBAREA A... 3.01, 4.01, 5.01, 5.02,
5.03, 5.04
SUBAREA A1... 3.01, 4.02, 5.05,
5.06, 5.07, 5.08
SUBAREA B1... 3.05, 4.03, 5.09,
5.10, 5.11, 5.12
SUBAREA C1... 3.07, 4.04, 5.13,
5.14, 5.15, 5.16

----- W -----
Watershed... 1.01

There are three (3) large format drawings after this page that need to be printed and inserted into pockets.

REMOVE THIS PAGE FROM THE FINAL DOCUMENT



LEGEND:

- WATERSHED BOUNDARY
- SOIL TYPE BOUNDARY
- SITE PROPERTY LINE
- MdB — SOIL TYPE

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P.O. Box 687, Rt. 207
Goshen, N.Y. 10924
(845) 294-3700

WATERSHED SOILS MAP PREPARED FOR

MAPLEWOOD VILLAGE AT GOSHEN

TOWN OF GOSHEN
ORANGE COUNTY, NEW YORK

Date:	FEBRUARY 7, 2007
Revisions:	
CAD File:	EXT-AREA.DWG
Layout:	WATERSHED SOILS
Sheet No.:	1 OF 1
Drawn By:	LC
Checked By:	
Scale:	1" = 500'
Tax Map No.:	8-1-48 & 8-1-1.1
Drawing No.:	A - 00 - 0167 - 01

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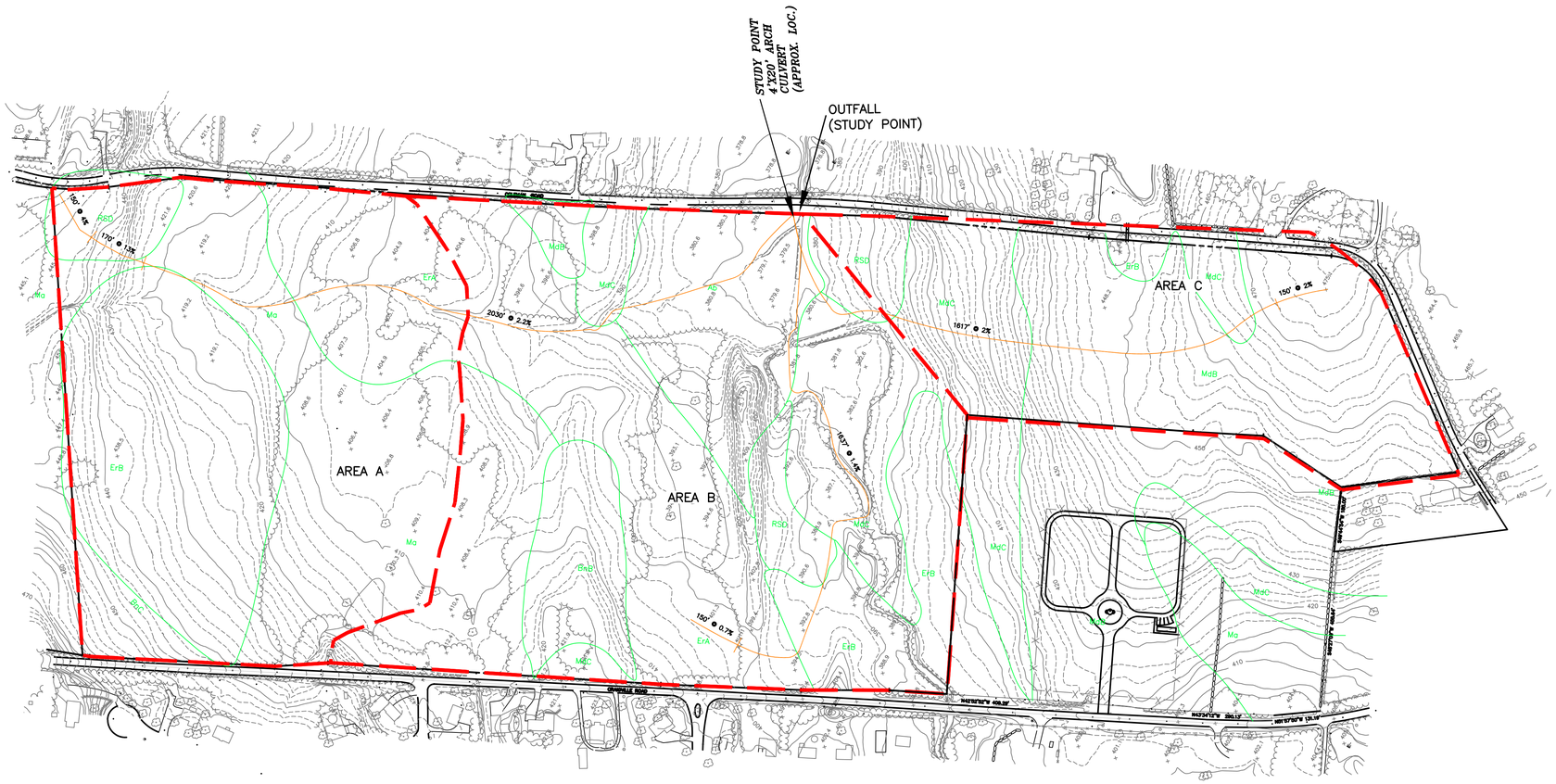

LEGEND:

- TIME OF CONCENTRATION PATH
- WATERSHED BOUNDARY
- SOILS TYPE BOUNDARY
- PROPERTY LINE

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Goshen, N.Y. 10924
(845) 294-3700

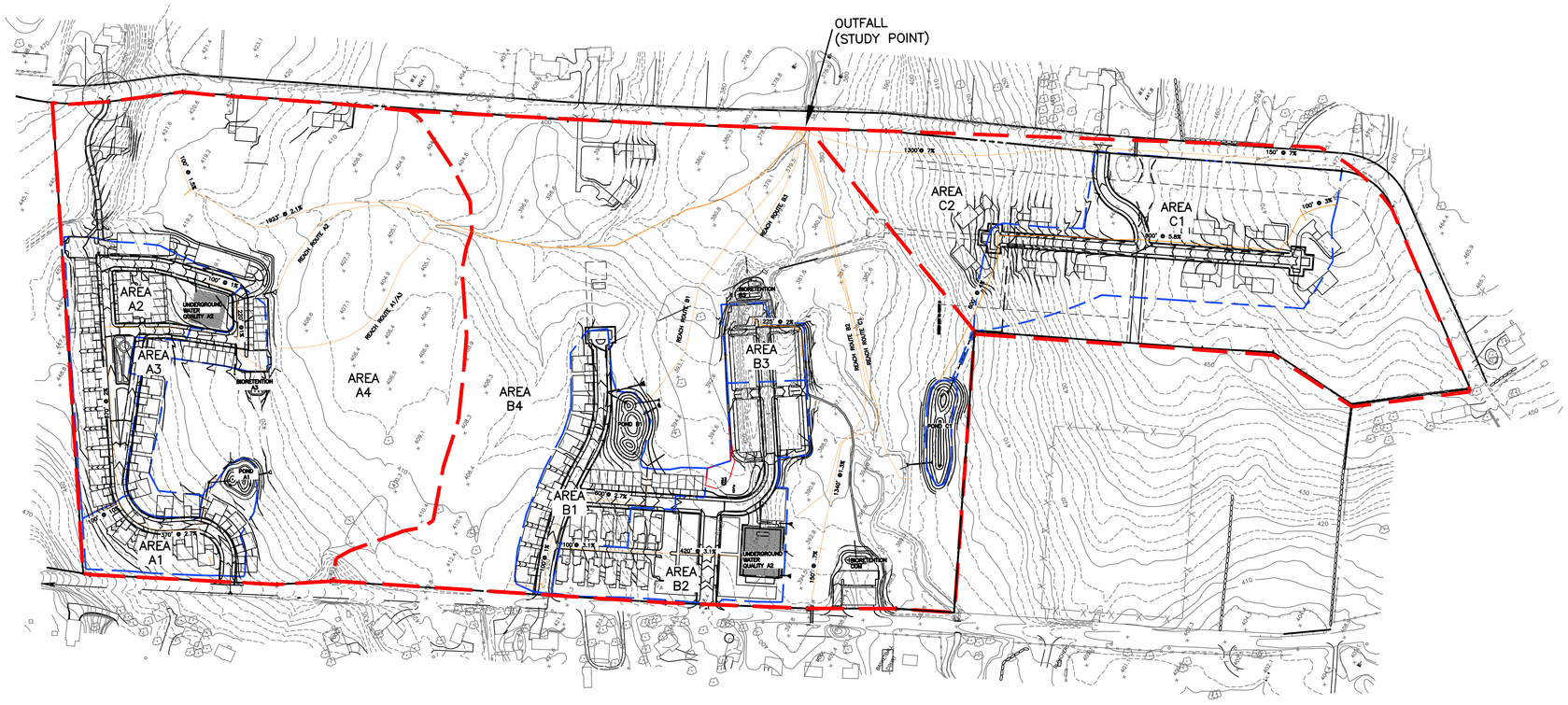
PRE-DEVELOPMENT SITE WATERSHED MAP FOR

MAPLEWOOD VILLAGE AT GOSHEN

TOWN OF GOSHEN
ORANGE COUNTY, NEW YORK

Date:	APRIL 20, 2007
Revisions:	
CAD File:	WATERSHED BASEMAP.DWG
Layout:	SITE - PRE DVLPMT
Sheet No.:	1 OF 2
Drawing No.:	B - 00 - 0167 - 00

Drawn By:	Checked By:	Scale:	Tax Map No.:
LC		1" = 200'	8-1-48 & 8-1-1.1



LEGEND:

- TIME OF CONCENTRATION PATH
- WATERSHED BOUNDARY
- STORMWATER FACILITY DRAINAGE BOUNDARY
- PROPERTY LINE

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POST DEVELOPMENT SITE WATERSHED MAP FOR

MAPLEWOOD VILLAGE AT GOSHEN

TOWN OF GOSHEN
ORANGE COUNTY, NEW YORK

Date:	APRIL 20, 2007
Revisions:	
CAD File:	WATERSHED BASEMAP.DWG
Layout:	SITE - POST DEVELOPMENT
Sheet No.:	2 OF 2
Drawn By:	LC
Checked By:	
Scale:	1" = 200'
Tax Map No.:	8-1-48 & 8-1-1.1
Drawing No.:	B - 00 - 0167 - 00

APPENDIX D

WATER QUALITY COMPUTATIONS

STORMWATER FACILITY COMPUTATIONS

STORMWATER SPECIFICATIONS SHEETS

LANC & TULLY, P.C.
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Tel (845) 294-3700
Fax (845) 294-8609
www.lanctully.com

JOB Maplewood Village
SHEET NO ____ OF ____
CALCULATED BY LMC DATE 4/20/2007
CHECKED BY ____ DATE ____
SCALE ____

Water Quality Volume

1. Calculate impervious area

Area A - Developed area 8 acres @ 85% impervious
= 6.8 acres

Area B - Developed area 9.5 acres @ 85% imp.
= 8.1 acres

Area C - include 16 estate lots

16 homes + driveways = 1.4 acres
Access Road = 0.6 acres
> 2 acres.

Commercial area @ Gaisville = 0.3 acres
Total imp. area = 17.2 acres
Total site area = 95 acres ∴ % I = 18

2. Calculate Water Quality Volume required

$R_v = 0.05 + 0.009(I)$
$= 0.21$

$WQ_v = (P)(R_v)(A)/12$

$= \frac{(1.25\text{ in})(0.21)(95\text{ acres})}{12\text{ in/ft}}$

$= 21\text{ ac-ft}$

3. Water Quality Volume will be provided as follows:

Area A: Pocket pond, Underground WQ facility, and Bioretention facility
Area B: Pocket Pond, Underground WQ facility, and Bioretention
Area C: Stormwater Pond. Commercial Area: bioretention

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Water Quality Volume

A1 - Area = 2.2 acres 50% imp.

$R_v = 0.05 + 0.009(50) = 0.5$

$WQ_v = \frac{(1.25)(.5)(2.2)}{12} = 0.115$ Ac. Ft.

= 5000 cu. ft.

Pond forebay $\forall$ = 900 cu. ft.
Required Vol = 500 cu. ft. ok
Pond Pool $\forall$ = 2600 cu. ft
Required Vol = 2500 cu. ft ok
WQ_v in extended det. pool (from Pond pack model)
≈ 12.00 cu. ft.

Total WQ_v Pond A1 0.11 Ac. Ft.

A2 - Area 4.4 acres 73% imp.
WQ_v = 0.32 Ac Ft (14,200 cu. ft)

Underground WQ facility. 0.20 Ac. Ft. ± (95½ x 95½)

Using 'Storm Trap' there will be 14 rows of cells. Each row will include a 3'10" ± band of surface area for the sand filter.

Approx. area = $90' \times \frac{46"}{12"} \times 14$ rows = 4800 sq. ft.

$WQ_v = (A_f)(k)(H_f + D_f)(T_f)/D_f$

$= (4800)(3.5)(2.5)(1.67)/1.5 = 1.07$ ac. ft.

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SCALE ____

A3 Bioretention Area for parking area

D.A = 0.25 AC 100% impervious

$WQ_v = \frac{(1.25)(0.95)(0.25)}{12} = .1078$ ac ft.

A_f = 1000 sq. ft.

WQ_v treated 0.025 ac. ft.

Dry Swale = add'l water quality

B1 Area = 3.3 acres 85% impervious WQ_v = 0.28 ac ft
= 12,200 cu ft

Pond forebay 1 V = 4,000 cu ft.
required WQ_v = 12,00 cu ft ✓
Pond forebay 2 V = 3000 cu ft
requ. WQ_v = 1200 cu ft ✓
Permanent pool = 10,000 cu ft
required = 6,100 cu ft ✓
ED volume = 0.101 ac ft

Total WQv Pond 0.48 ac. ft.

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CALCULATED BY GMC DATE 4/25/2007

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SCALE _____

B2 WQ underground facility

Area = 0.37 ac. 120' x 3'10" x 19 rows = 8700 sq. ft.

∴ WQv = 1.95 ac ft

B3 Bioretention facility provides 3700 ft³

C1 8.1 ares % impervious 20

WQv = 0.19 ac ft 8453 cu ft.

forebay requ'd WQv = 845

provided ..... 6500 cu ft

Perm. pool requ. .... 4200 cu ft

prov. 12000 cu ft

ED (from pondpack) .054 2300 cu ft.

C1 WQv provided 0.48 AC ft.

Total WQv Provided

	ac ft
A1	0.11
A2	1.07
A3	0.025
B1	0.48
B2	1.95
B3	0.085
C1	0.42

+ bioret. on commercial area and dry swale in Area A

Total WQv provided = in excess of 4.2 ac ft

WQv required = 2.1 ac ft

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CALCULATED BY I.C. DATE 4/20/2007
CHECKED BY ____ DATE ____
SCALE ____

Bioretention Facilities

1. Commercial area off of Craigville Road

$WQ_v = (1.25)(R_v)(A)/12$

Lot area = 0.4 acres. $I = 75\%$
Impervious area = 0.3 acres ±
$R_v = .073$
WQ_v = 0.03 ac. ft = 1325 cu. ft.

$A_f = (WQ_v)(d_f) / [k\,(h_f + d_f)(t_f)]$

$= (1325\ ft^3)(5') / [0.5\ \frac{ft}{day}\ (5' + 5')(2\ days)]$

$= 6625\ ft^4 / 5.5\ ft^2$

$= 1205\ ft^2$ ✓

2. Area B3 $R_v = (0.05 + 1.009)(85)$
$= 0.815$
$WQ_v = 0.085$ ac-ft $= 3698\ ft^3$

$A_f = 33.62\ ft^2$ ✓

3. Area A3 area = 1.8 acres
about ⅓ of this area will be treated with a dry swale (lots 17 to 25)

A_f for 1.2 acres of 85% imp. area

$= 4034\ ft^2$ ✓

UNDERGROUND WATER QUALITY FACILITY A2

WQv= (P)(Rv)(A)/12		
One Year Rainfall Event Inches	P	1.25
Area Impervious (Acres)	Ai	3.2
Area Total (At)	At	4.4
% Impervious I=(Ai/At)x100; min. 20%	I	72.73
Rv= .05+.009(I)	Rv	0.70
Water Quality Volume Required (ac-ft)	WQv=	0.32

Treatment Method: Surface Sand Filter (F-1)
Af= (WQv)(Df) / ((k)(Hf+Df)(Tf))

Sand Filter Media Depth (ft)	Df	1.5
Average Height of Water Above Filter Bed (ft)	Hf	1
Filtration Time Days (Max. 1.67 days recommended)	Tf	1.67
Coefficient of Permeability Media (ft/day)	k	3.5
Sand Filter Surface Area Required (square feet)	Af=	1444
Sand Filter Area Provided (square feet)	Af=	4800
Water Quality Volume provided (Ac.ft.)		1.07

UNDERGROUND WATER QUALITY FACILITY B2

WQv= (P)(Rv)(A)/12		
One Year Rainfall Event Inches	P	1.25
Area Impervious (Acres)	Ai	4.5
Area Total (At)	At	5.2
% Impervious I=(Ai/At)x100; min. 20%	I	87
Rv= .05+.009(I)	Rv	0.83
Water Quality Volume Required (ac-ft)	WQv=	0.45

Treatment Method: Sand Filter

Af= (WQv)(Df) / ((k)(Hf+Df)(Tf))

Sand Filter Media Depth (ft)	Df	1.5
Average Height of Water Above Filter Bed (ft)	Hf	1
Filtration Time Days (Max. 1.67 days recommended)	Tf	1.67
Coefficient of Permeability Media (ft/day)	k	3.5
Sand Filter Surface Area Required (square feet)	Af=	2008
Sand Filter Area Provided in Storm Trap units(square feet)	Af=	8700
Water Quality Volume Provided (ac. ft.)		1.95

Stormwater Ponds

Description:
Constructed stormwater retention basin that has a permanent pool (or micropool). Runoff from each rain event is detained and treated in the pool through settling and biological uptake mechanisms.

Design Options:
Micropool Extended Detention (P-1), Wet Pond (P-2), Wet Extended Detention (P-3), Multiple Pond (P-4), Pocket Pond (P-5)

KEY CONSIDERATIONS

FEASIBILITY
- Contributing drainage area greater than 10 acres for P-1, 25 acres for P-2 to P-4.
- Follow DEC Guidelines for Design of Dams.
- Provide a minimum 2' separation from the groundwater in sole source aquifers.
- Do not locate ponds in jurisdictional wetlands.
- Avoid directing hotspot runoff to design P-5.

CONVEYANCE
- Forebay at each inlet, unless the inlet contributes less than 10% of the total inflow, 4' to 6' deep.
- Stabilize the channel below the pond to prevent erosion.
- Sizing basin at the outlet to reduce velocities.

PRETREATMENT
- Forebay volume at least 10% of the WQ$_v$.
- Forebay shall be designed with non-erosive outlet conditions.
- Provide direct access to the forebay for maintenance equipment.
- In sole source aquifers, provide 100% pretreatment for hotspot runoff.

TREATMENT
- Provide the water quality volume in a combination of permanent pool and extended detention (Table 6.1 in manual provides limitations on storage breakdown).
- Minimum length to width ratio of 1.5:1
- Minimum surface area to drainage area ratio of 1:100

LANDSCAPING
- Provide a minimum 10' and preferably 15' safety bench extending from the high water mark, with a maximum slope of 6%.
- Provide an aquatic bench extending 15 feet outward from the shoreline, and a maximum depth of 18" below normal water elevation.
- Develop a landscaping plan.
- Provide a 25' pond buffer.
- No woody vegetation within 15 feet of the toe of the embankment, or 25 feet from the principal spillway.

STORMWATER MANAGEMENT SUITABILITY

[X]	Water Quality
[X]	Channel Protection
[X]	Overbank Flood Protection
[X]	Extreme Flood Protection
	Accepts Hotspot Runoff
	Recommended separation distance required to water table (feet)

FEASIBILITY CONSIDERATIONS

[L]	Cost
[L]	Maintenance Burden

Key: L=Low, M=Moderate, H=High

Residential Subdivision Use: Yes

High Density/Ultra-Urban: Yes

Soils: *Hydrologic group A soils may require pond liner.*
Hydrologic group D soils may have compaction constraints.

Other Considerations:
- *Thermal effects*
- *Outlet clogging*
- *Safety bench*

MAINTENANCE REQUIREMENTS

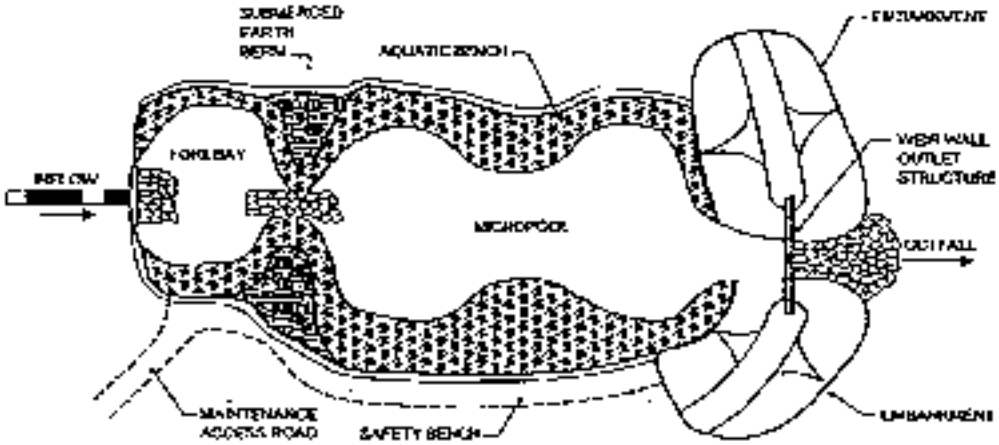
- Legally binding maintenance agreement
- Sediment removal from forebay every five to six years or when 50% full.
- Provide a maintenance easement and right-of-way.
- Removable trash rack on the principal spillway.
- Non-clogging low flow orifice
- Riser in the embankment.
- Pond drain required, capable of drawing down the pond in 24 hours.
- Notification required for pond drainage.
- Provide an adjustable gate valve on both the WQ$_v$-ED pipe, and the pond drain.
- Side Slopes less than 3:1, and terminate at a safety bench.
- Principal spillway shall not permit access by small children, and endwalls above pipes greater than 48" in diameter shall be fenced.

POLLUTANT REMOVAL

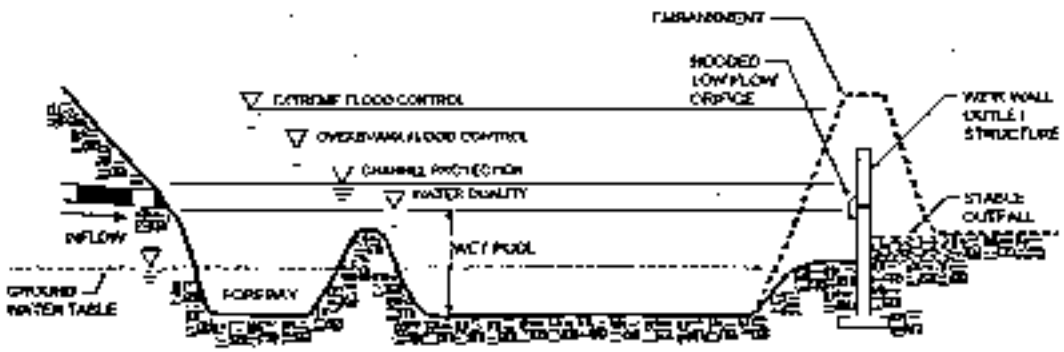
G	**Phosphorus**
G	**Nitrogen**
G	**Metals** - Cadmium, Copper, Lead, and Zinc removal
G	**Pathogens** - Coliform, E.Co5, Streptococci removal

Key: G=Good, F=Fair, P=Poor

Figure 6.5 Pocket Pond (P-5)



PLAN VIEW



PROFILE

H.1 Ponds and Wetlands

For areas that are to be planted within a stormwater pond, it is necessary to determine what type of hydrologic zones will be created within the pond. The following six zones describe the different conditions encountered in stormwater management facilities. Every facility does not necessarily reflect all of these zones. The hydrologic zones designate the degree of tolerance the plant exhibits to differing degrees of inundation by water.

Table H.5 at the end of this appendix designates appropriate zones for each plant. There may be other zones listed outside of these brackets. The plant materials may occur within these zones, but are not typically found in them. Plants suited for specific hydrologic conditions may perish when those conditions change, exposing the soil, and therefore, increasing the chance for erosion.

Each zone has its own set of plant selection criteria based on the hydrology of the zone, the stormwater functions required of the plant and the desired landscape effect. The hydrologic zones are as follows:

Table H.1 Hydrologic Zones

Zone #	Zone Description	Hydrologic Conditions
Zone 1	Deep Water Pool	1-6 feet deep Permanent Pool
Zone 2	Shallow Water Bench	6 inches to 1 foot deep
Zone 3	Shoreline Fringe	Regularly inundated
Zone 4	Riparian Fringe	Periodically inundated
Zone 5	Floodplain Terrace	Infrequently inundated
Zone 6	Upland Slopes	Seldom or never inundated

Zone 1: Deep Water Area ***(1- 6 Feet)***

Ponds and wetlands both have deep pool areas that comprise Zone 1. These pools range from one to six feet in depth, and are best colonized by submergent plants, if at all.

This pondscaping zone has not been routinely planted for several reasons. First, the availability of plant materials that can survive and grow in this zone is limited, and it is also feared that plants could clog the stormwater facility outlet structure. In many cases, these plants will gradually become established through natural recolonization (e.g., transport of plant fragments from other ponds via the feet and legs of waterfowl). If submerged plant material becomes more commercially available and clogging concerns are addressed, this area can be planted. The function of the planting is to reduce resedimentation and improve oxidation while creating a greater aquatic habitat.

- Plant material must be able to withstand constant inundation of water of one foot or greater in depth.
- Plants may be submerged partially or entirely.
- Plants should be able to enhance pollutant uptake.
- Plants may provide food and cover for waterfowl, desirable insects, and other aquatic life.

Zone 2: Shallow Water Bench ***(Normal Pool To 1 Foot)***

Zone 2 includes all areas that are inundated below the normal pool to a depth of one foot, and is the primary area where emergent plants will grow in a stormwater wetlands. Zone 2 also coincides with the aquatic bench found in stormwater ponds. This zone offers ideal conditions for the growth of many emergent wetland species. These areas may be located at the edge of the pond or on low mounds of earth located below the surface of the water within the pond. When planted, Zone 2 can be an important habitat for many aquatic and nonaquatic animals, creating a diverse food chain. This food chain includes predators, allowing a natural regulation of mosquito populations, thereby reducing the need for insecticidal applications.

- Plant material must be able to withstand constant inundation of water to depths between six inches and one foot deep.
- Plants will be partially submerged.
- Plants should be able to enhance pollutant uptake.
- Plants may provide food and cover for waterfowl, desirable insects and other aquatic life.

Plants will stabilize the bottom of the pond, as well as the edge of the pond, absorbing wave impacts and reducing erosion, when water level fluctuates. Plant also slow water velocities and increase sediment deposition rates. Plants can reduce resuspension of sediments caused by the wind. Plants can also soften the engineered contours of the pond, and can conceal drawdowns during dry weather.

Zone 3: Shoreline Fringe ***(Regularly Inundated)***

Zone 3 encompasses the shoreline of a pond or wetland, and extends vertically about one foot in elevation from the normal pool. This zone includes the safety bench of a pond, and may also be periodically inundated if storm events are subject to extended detention. This zone occurs in a wet pond or shallow marsh and can be the most difficult to establish since plants must be able to withstand inundation of water during storms, when wind might blow water into the area, or the occasional drought during the summer. In order to stabilize the soil in this zone, Zone 3 must have a vigorous cover.

- Plants should stabilize the shoreline to minimize erosion caused by wave and wind action or water fluctuation.
- Plant material must be able to withstand occasional inundation of water. Plants will be partially submerged at this time.
- Plant material should, whenever possible, shade the shoreline, especially the southern exposure. This will help to reduce the water temperature.

- Plants should be able to enhance pollutant uptake.
- Plants may provide food and cover for waterfowl, songbirds, and wildlife. Plants could also be selected and located to control overpopulation of waterfowl.
- Plants should be located to reduce human access, where there are potential hazards, but should not block the maintenance access.
- Plants should have very low maintenance requirements, since they may be difficult or impossible to reach.
- Plants should be resistant to disease and other problems which require chemical applications (since chemical application is not advised in stormwater ponds).

Zone 4: Riparian Fringe ***(Periodically Inundated)***

Zone 4 extends from one to four feet in elevation above the normal pool. Plants in this zone are subject to periodic inundation after storms, and may experience saturated or partly saturated soil conditions. Nearly all of the temporary ED area is included within this zone.

- Plants must be able to withstand periodic inundation of water after storms, as well as occasional drought during the warm summer months.
- Plants should stabilize the ground from erosion caused by run-off.
- Plants should shade the low flow channel to reduce the pool warming whenever possible.
- Plants should be able to enhance pollutant uptake.
- Plant material should have very low maintenance, since they may be difficult or impossible to access.
- Plants may provide food and cover for waterfowl, songbirds and wildlife. Plants may also be selected and located to control overpopulation of waterfowl.
- Plants should be located to reduce pedestrian access to the deeper pools.

Zone 5: Floodplain Terrace ***(Infrequently Inundated)***

Zone 5 is periodically inundated by flood waters that quickly recedes in a day or less. Operationally, Zone 5 extends from the maximum two year or Cpv water surface elevation up to the 10 or 100 year maximum water surface elevation. Key landscaping objectives for Zone 5 are to stabilize the steep slopes characteristic of this zone, and establish a low maintenance, natural vegetation.

- Plant material should be able to withstand occasional but brief inundation during storms, although typical moisture conditions may be moist, slightly wet, or even swing entirely to drought conditions during the dry weather periods.
- Plants should stabilize the basin slopes from erosion.
- Ground cover should be very low maintenance, since they may be difficult to access on steep slopes or if frequency of mowing is limited. A dense tree cover may help reduce maintenance and discourage resident geese.
- Plants may provide food and cover for waterfowl, songbirds, and wildlife.

- Placement of plant material in Zone 5 is often critical, as it often creates a visual focal point and provides structure and shade for a greater variety of plants.

Zone 6: **Upland Slopes** ***(Seldom or Never Inundated)***

The last zone extends above the maximum 100 year water surface elevation, and often includes the outer buffer of a pond or wetland. Unlike other zones, this upland area may have sidewalks, bike paths, retaining walls, and maintenance access roads. Care should be taken to locate plants so they will not overgrow these routes or create hiding places that might make the area unsafe.

- Plant material is capable of surviving the particular conditions of the site. Thus, it is not necessary to select plant material that will tolerate any inundation. Rather, plant selections should be made based on soil condition, light, and function within the landscape.
- Ground covers should emphasize infrequent mowing to reduce the cost of maintaining this landscape.
- Placement of plants in Zone 6 is important since they are often used to create a visual focal point, frame a desirable view, screen undesirable views, serve as a buffer, or provide shade to allow a greater variety of plant materials. Particular attention should be paid to seasonal color and texture of these plantings.

Bioretention Areas (F-5)

Description: Shallow stormwater basin or landscaped area which utilizes engineered soils and vegetation to capture and treat runoff. The practice is often located in parking lot islands, and can also be used to treat residential areas.

KEY CONSIDERATIONS

CONVEYANCE

- Provide overflow for the 10-year storm to the conveyance system.
- Conveyance to the system is typically overland flow delivered to the surface of the system, typically through curb cuts or over a concrete lip.

PRETREATMENT

- Pretreatment consists of a grass channel or grass filter strip, a gravel diaphragm, and a mulch layer, sized based on the methodologies described in Section 6.4.2.

TREATMENT

- Treatment area should have a four foot deep planting soil bed, a surface mulch layer, and a 6" ponding layer.
- Size the treatment area using equations provided in Chapter 6.

LANDSCAPING

- Detailed landscaping plan required.

MAINTENANCE

- Inspect and repair/replace treatment area components
- Stone drop (at least 6") provided at the inlet
- Remulch annually

POLLUTANT REMOVAL

G	Phosphorus
G	Nitrogen
G	Metals - Cadmium, Copper, Lead, and Zinc removal
F	Pathogens - Coliform, Streptococci, E.Coli removal

Key: G=Good F=Fair P=Poor

STORMWATER MANAGEMENT SUITABILITY

- [X] Water Quality
- [ ] Channel Protection
- [ ] Overbank Flood Protection
- [ ] Extreme Flood Protection

Accepts Hotspot Runoff: *Yes (requires impermeable liner)*

IMPLEMENTATION CONSIDERATIONS

- [M] Capital Cost
- [M] Maintenance Burden

Residential Subdivision Use: Yes

High Density/Ultra Urban: Yes

Drainage Area: 10 acres

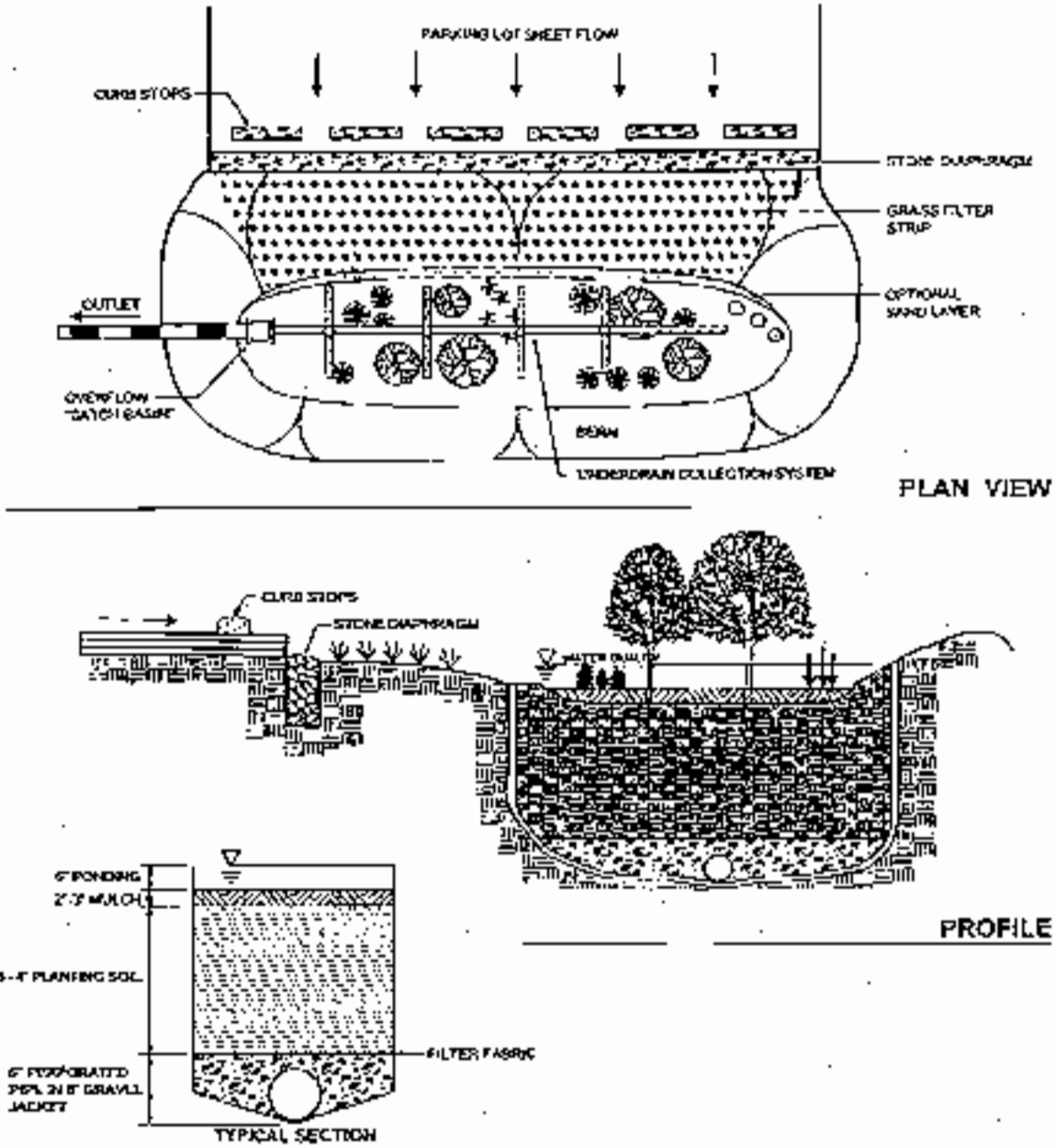
Soils: Planting soils must meet specific criteria. No restrictions on surrounding soils.

Other Considerations:

- *Use of native plants is recommended*

Key: L=Low M=Medium H=High

Figure 6.19 Bioretention (F-5)



Specifications for Bioretention

Material Specifications

The allowable materials to be used in bioretention area are detailed in Table C.2.

Planting Soil

The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the bioretention area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. The planting soil shall be free of noxious weeds.

The planting soil shall be tested and shall meet the following criteria:

pH range	5.2 - 7.0
organic matter	1.5 - 4%
magnesium	35 lb./ac
phosphorus P_2O_5	75 lb./ac
potassium K_2O	85 lb./ac
soluble salts	not to exceed 500 ppm

All bioretention areas shall have a minimum of one test. Each test shall consist of both the standard soil test for pH, phosphorus, and potassium and additional tests of organic matter, and soluble salts. A textural analysis is required from the site stockpiled topsoil. If topsoil is imported, then a texture analysis shall be performed for each location where the top soil was excavated.

Since different labs calibrate their testing equipment differently, all testing results shall come from the same testing facility.

Should the pH fall out of the acceptable range, it may be modified (higher) with lime or (lower) with iron sulfate plus sulfur.

Compaction

It is very important to minimize compaction of both the base of the bioretention area and the required backfill. When possible, use excavation hoes to remove original soil. If bioretention areas are excavated using a loader, the contractor should use wide track or marsh track equipment, or light equipment with turf type tires. Use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high pressure tires will cause excessive compaction resulting in reduced infiltration rates and storage volumes and is not acceptable. Compaction will significantly contribute to design failure.

Compaction can be alleviated at the base of the bioretention facility by using a primary tilling operation such as a chisel plow, ripper, or subsoiler. These tilling operations are to refracture the soil profile through the 12 inch compaction zone. Substitute methods must be approved by the engineer. Rototillers typically do not till deep enough to reduce the effects of compaction from heavy equipment.

Rototill 2 to 3 inches of sand into the base of the bioretention facility before back filling the required sand layer. Pump any ponded water before preparing (rototilling) base.

When back filling the topsoil over the sand layer, first place 3 to 4 inches of topsoil over the sand, then rototill the sand/topsoil to create a gradation zone. Backfill the remainder of the topsoil to final grade.

When back filling the bioretention facility, place soil in lifts 12" or greater. Do not use heavy equipment within the bioretention basin. Heavy equipment can be used around the perimeter of the basin to supply soils and sand. Grade bioretention materials by hand or with light equipment such as a compact loader or a dozer/loader with marsh tracks.

Plant Installation

Mulch around individual plants only. Shredded hardwood mulch is the only accepted mulch. Pine mulch and wood chips will float and move to the perimeter of the bioretention area during a storm event and are not acceptable. Shredded mulch must be well aged (6 to 12 months) for acceptance.

The plant root ball should be planted so 1/8th of the ball is above final grade surface.

Root stock of the plant material shall be kept moist during transport and on-site storage. The diameter of the planting pit shall be at least six inches larger than the diameter of the planting ball. Set and maintain the plant straight during the entire planting process. Thoroughly water ground bed cover after installation.

Trees shall be braced using 2" X 2" stakes only as necessary and for the first growing season only. Stakes are to be equally spaced on the outside of the tree ball.

Grasses and legume seed shall be tilled into the soil to a depth of at least one inch. Grass and legume plugs shall be planted following the non-grass ground cover planting specifications.

The topsoil specifications provide enough organic material to adequately supply nutrients from natural cycling. The primary function of the bioretention structure is to improve water quality. Adding fertilizers defeats, or at a minimum, impedes this goal. Only add fertilizer if wood chips or mulch is used to amend the soil. Rototill urea fertilizer at a rate of 2 pounds per 1000 square feet.

Underdrains

Under drains to be placed on a 3'-0" wide section of filter cloth. Pipe is placed next, followed by the gravel bedding. The ends of under drain pipes not terminating in an observation well shall be capped.

The main collector pipe for underdrain systems shall be constructed at a minimum slope of 0.5%. Observation wells and/or clean-out pipes must be provided (one minimum per every 1000 square feet of surface area).

Miscellaneous

The bioretention facility may not be constructed until all contributing drainage area has been stabilized.

Table C.2 Materials Specifications for Bioretention

Parameter	Specification	Size	Notes
Plantings	see your local NRCS Standards and Specifications guidance.	n/a	plantings are site-specific
Planting Soil [4= deep]	sand 35 - 60% silt 30 - 55% clay 10 - 25%	n/a	USDA soil types loamy sand, sandy loam or loam
Mulch	shredded hardwood		aged 6 months, minimum
pea gravel diaphragm and curtain drain	pea gravel: ASTM D 448 ornamental stone: washed cobbles	pea gravel: No. 6 stone: 2" to 5"	
Geotextile	Class "C" apparent opening size (ASTM-D-4751) grab tensile strength (ASTM-D-4632) burst strength (ASTM-D-4833)	n/a	for use as necessary beneath underdrains only
underdrain gravel	AASHTO M-43, No. 67.	0.25" to 0.75"	
underdrain piping	ASTM D 1785 or AASHTO M-278	6" rigid schedule 40 PVC	3/8" perf. @ 6" on center, 4 holes per row; minimum of 3" of gravel over pipes; not necessary underneath pipes
poured in place concrete (if required)	See local DOT Standards and Specs.; f=c = 3500 psi. @ 28 days, normal weight, air-entrained; re-inforcing to meet ASTM 615-60	n/a	on-site testing of poured-in-place concrete required; 28 day strength and slump test; all concrete design (cast-in-place or pre-cast) *not using previously approved State or local standards* requires design drawings sealed and approved by a licensed professional structural engineer.
sand [1= deep]	AASHTO M-6 or ASTM C-33	0.02" to 0.04"	Sand substitutions such as Diabase and Graystone #10 are not acceptable. No calcium carbonated or dolomitic sand substitutions are acceptable. No "rock dust" can be used for sand.

H.2 Bioretention

Planting Soil Bed Characteristics

The characteristics of the soil for the bioretention facility are perhaps as important as the facility location, size, and treatment volume. The soil must be permeable enough to allow runoff to filter through the media, while having characteristics suitable to promote and sustain a robust vegetative cover crop. In addition, much of the nutrient pollutant uptake (nitrogen and phosphorus) is accomplished through adsorption and microbial activity within the soil profile. Therefore, the soils must balance soil chemistry and physical properties to support biotic communities above and below ground.

The planting soil should be a sandy loam, loamy sand, loam (USDA), or a loam/sand mix (should contain a minimum 35 to 60% sand, by volume). The clay content for these soils should by less than 25% by volume. Soils should fall within the SM, or ML classifications of the Unified Soil Classification System (USCS). A permeability of at least 1.0 feet per day (0.5"/hr) is required (a conservative value of 0.5 feet per day is used for design). The soil should be free of stones, stumps, roots, or other woody material over 1" in diameter. Brush or seeds from noxious weeds. Placement of the planting soil should be in lifts of 12 to 18", loosely compacted (tamped lightly with a dozer or backhoe bucket). The specific characteristics are presented in Table H.2.

Table H.2 Planting Soil Characteristics

Parameter	Value
PH range	5.2 to 7.00
Organic matter	1.5 to 4.0%
Magnesium	35 lbs. per acre, minimum
Phosphorus (P_2O_5)	75 lbs. per acre, minimum
Potassium (K_2O)	85 lbs. per acre, minimum
Soluble salts	≤ 500 ppm
Clay	10 to 25%
Silt	30 to 55%
Sand	35 to 60%

Mulch Layer

The mulch layer plays an important role in the performance of the bioretention system. The mulch layer helps maintain soil moisture and avoid surface sealing which reduces permeability. Mulch helps prevent erosion, and provides a micro-environment suitable for soil biota at the mulch/soil interface. It also serves as a pretreatment layer, trapping the finer sediments which remain suspended after the primary pretreatment.

The mulch layer should be standard landscape style, single or double, shredded hardwood mulch or chips. The mulch layer should be well aged (stockpiled or stored for at least 12 months), uniform in color, and free of other materials, such as weed seeds, soil, roots, etc. The mulch should be applied to a maximum depth of three inches. Grass clippings should not be used as a mulch material.

Planting Plan Guidance

Plant material selection should be based on the goal of simulating a terrestrial forested community of native species. Bioretention simulates an ecosystem consisting of an upland-oriented community dominated by trees, but having a distinct community, or sub-canopy, of understory trees, shrubs and herbaceous materials. The intent is to establish a diverse, dense plant cover to treat stormwater runoff and withstand urban stresses from insect and disease infestations, drought, temperature, wind, and exposure.

The proper selection and installation of plant materials is key to a successful system. There are essentially three zones within a bioretention facility (Figure H.1). The lowest elevation supports plant species adapted to standing and fluctuating water levels. The middle elevation supports a slightly drier group of plants, but still tolerates fluctuating water levels. The outer edge is the highest elevation and generally supports plants adapted to dryer conditions. When using Table A.5 to identify species, use the following guideline:

Lowest Zone: Zones 2-3

Middle Zone: Zones 3-4

Outer Zone: Zones 5-6

The layout of plant material should be flexible, but should follow the general principals described in Table H.3. The objective is to have a system which resembles a random and natural plant layout, while maintaining optimal conditions for plant establishment and growth.

Figure H.1 Planting Zones for Bioretention Facilities

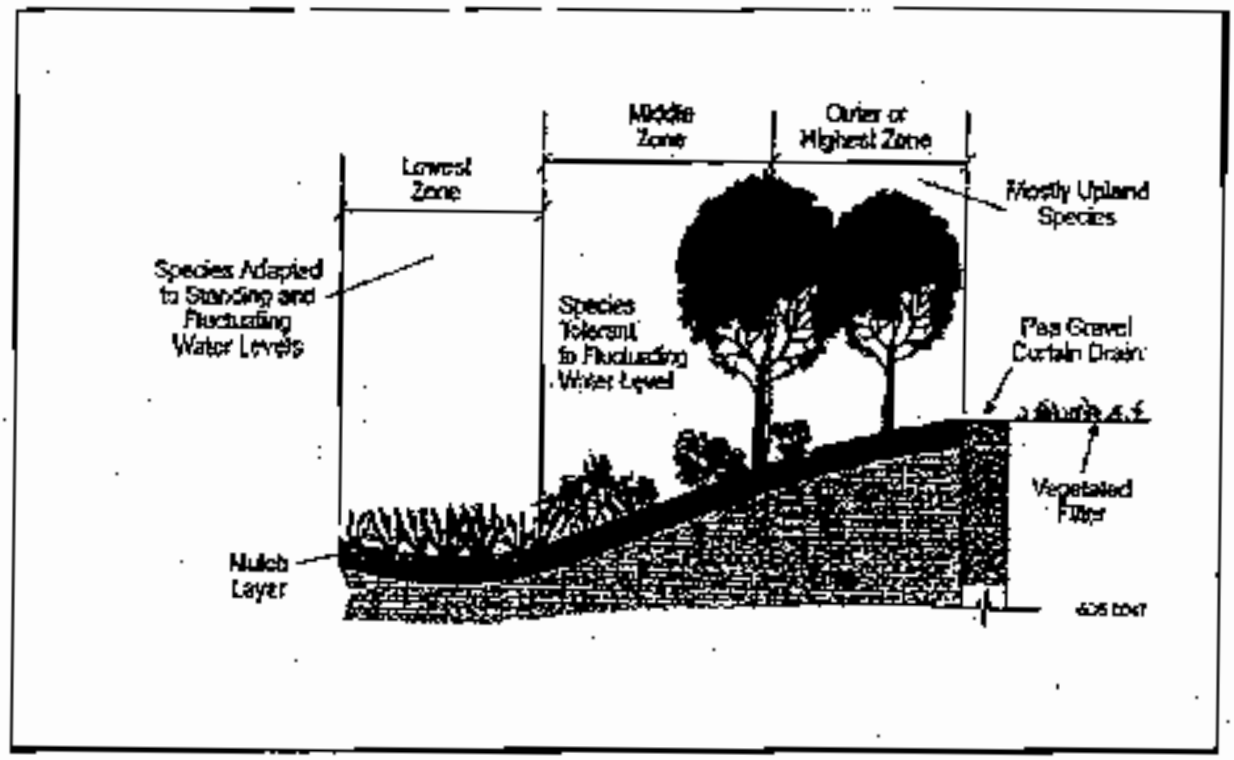


Table H.3 Planting Plan Design Considerations
Native plant species should be specified over exotic or foreign species.
Appropriate vegetation should be selected based on the zone of hydric tolerance (see Figure H.1).
Species layout should generally be random and natural.
A canopy should be established with an understory of shrubs and herbaceous materials.
Woody vegetation should not be specified in the vicinity of inflow locations.
Trees should be planted primarily along the perimeter of the bioretention area.
Urban stressors (e.g., wind, sun, exposure, insect and disease infestation, drought) should be considered when laying out the planting plan.
Noxious weeds should not be specified.
Aesthetics and visual characteristics should be a prime consideration.
Traffic and safety issues must be considered.
Existing and proposed utilities must be identified and considered.

Plant Material Guidance

Plant materials should conform to the American Standard Nursery Stock, published by the American Association of Nurserymen, and should be selected from certified, reputable nurseries. Planting specifications should be prepared by the designer and should include a sequence of construction, a description of the contractor's responsibilities, a planting schedule and installation specifications, initial maintenance, and a warranty period and expectations of plant survival. Table H.4 presents some typical issues for planting specifications.

Table H.4 Planting Specification Issues for Bioretention Areas

Specification Element	Elements
Sequence of Construction	Describe site preparation activities, soil amendments, etc.; address erosion and sediment control procedures; specify step-by-step procedure for plant installation through site clean-up.
Contractor's Responsibilities	Specify the contractors responsibilities, such as watering, care of plant material during transport, timeliness of installation, repairs due to vandalism, etc.
Planting Schedule and Specifications	Specify the materials to be installed, the type of materials (e.g., B&B, bare root, containerized); time of year of installations, sequence of installation of types of plants; fertilization, stabilization seeding, if required; watering and general care.
Maintenance	Specify inspection periods; mulching frequency (annual mulching is most common); removal and replacement of dead and diseased vegetation; treatment of diseased trees; watering schedule after initial installation (once per day for 14 days is common); repair and replacement of staking and wires.
Warranty	Specify the warranty period, the required survival rate, and expected condition of plant species at the end of the warranty period.

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Trees and Shrubs						
American Elm *(Ulmus americana)*	4,5,6	Dec Tree	yes	Irregular-seasonal saturation	High. Food (seeds,browsing), cover, nesting for birds & mammals	Susceptible to disease (short-lived). Sun to full shade, tolerates drought and windfire damage.
Arrowwood Viburnum *(Viburnum dentatum)*	3,4	Dec Shrub	yes	yes	High. Songbirds and mammals	Grows best in sun to partial shade
Bald Cypress *(Taxodium distichum)*	3,4	Dec Tree	yes	yes	Little food value, but good perching site for waterfowl	Forested Coastal Plain. North of normal range. Tolerates drought.
Bayberry *(Myrica pensylvanica)*	4,5,6	Dec Shrub	yes	yes	High. Nesting, food, cover. Berries last into winter	Coastal Plain only. Roots fix N_2. Tolerates slightly acidic soils.
Black Ash *(Fraxinus nigra)*	3,4,5	Dec Tree	yes	Irregular-seasonal saturation	High. Food (seeds, sap), cover, nesting for birds & mammals. Fruit persists in winter	Rapid growth. Requires full sun. Susceptible to windfire damage & disease. Tolerates drought and infrequent flooding by salt water.
Black Cherry *(Prunus serotina)*	5,6	Dec Tree	yes	no	High. Food	Moist soils or wet bottomland areas
Blackgum or Sourgum *(Nyssa sylvatica)*	4,5,6	Dec Tree	yes	yes	High. Songbirds, egrets, herons, raccoons, owls	Can be difficult to transplant. Prefers sun to partial shade
Black Willow *(Salix nigra)*	3,4,5	Dec Tree	yes	yes	High. Browsing and cavity nesters.	Rapid growth, stabilizes stream-banks. Full sun
Buttonbush *(Cephalanthus occidentalis)*	2,3,4,5	Dec Shrub	yes	yes	High. Ducks and shorebirds. Seeds, nectar and nesting.	Full sun to partial shade. Will grow in dry areas.
Common Spice Bush *(Lindera benzoin)*	3,4,5	Dec Shrub	yes	yes	Very high. Songbirds	Shade and rich soils. Tolerates acidic soils. Good understory species

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Eastern Cottonwood *(Populus deltoides)*	4,5	Dec Tree	yes	yes	Moderate. Cover, food.	Shallow rooted, subject to windthrow. Invasive roots. Rapid growth.
Eastern Hemlock *(Tsuga canadensis)*	5,6	Conif Tree	yes	yes	Moderate. Mostly cover and some food	Tolerates all sun/shade conditions. Tolerates acidic soil.
Eastern Red Cedar *(Juniperus virginiana)*	4,5,6	Conif Tree	yes	no	High. Fruit for birds. Some cover.	Full sun to partial shade. Common in wetlands, shrub bogs and edge of stream
Elderberry *(Sambucus canadensis)*	3,4,5,6	Dec Shrb	yes	yes	Extremely high. Food and cover, birds and mammals	Full sun to partial shade.
Green Ash, Red Ash *(Fraxinus pennsylvanica)*	4,5	Dec Tree	yes	yes	Moderate. Songbirds.	Rapid growing streambank stabilizer. Full sun to partial shade.
Hackenberry *(Celtis occidentalis)*	5,6	Dec Tree	yes	some	High. Food and cover	Full sun to partial shade.
Larch, Tamarack *(Larix laricina)*	3,4	Conif Tree	no	yes	Low. Nest tree and seeds.	Rapid initial growth. Full sun, acidic boggy soil.
Pin Oak *(Quercus palustris)*	3,4,5,6	Dec Tree	yes	yes	High. Tolerates acidic soil	Gypsy moth target. Prefers well drained, sandy soils.
Red Choke Berry *(Pyrus arbutifolia)*	3,4,5	Dec Shrub	no	yes	Moderate. Songbirds.	Bank stabilizer. Partial sun
Red Maple *(Acer rubrum)*	3,4,5,6	Dec Tree	yes	yes	High seeds and browse. Tolerates acidic soil.	Rapid growth.
River Birch *(Betula nigra)*	3,4,5	Dec Tree	yes	yes	Low. Good for cavity nesters.	Bank erosion control. Full sun.
Shadowbush, Serviceberry *(Amelanchier*	4,5,6	Dec Shrub	yes	yes	High. Nesting, cover, food. Birds and	Prefers partial shade. Common in forested

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
canadensis)					mammals.	wetlands and upland woods.
Silky Dogwood *(Cornus amomum)*	3,4,5	Dec Shrub	yes	yes	High. Songbirds, mammals.	Shade and drought tolerant. Good bank stabilizer.
Slippery Elm *(Ulmus rubra)*	3,4,5	Dec Tree	rare	yes	High. Food (seeds, buds) for birds & mammals (browse). Nesting	Rapid growth, no salinity tolerance. Tolerant to shade and drought.
Smooth Alder *(Alnus serrulata)*	3,4,5	Dec Tree	no	yes	High. Food, cover	Rapid growth. Stabilizes streambanks.
Speckled Alder *(Alnus rugosa)*	3,4	Dec Shrub	yes	yes	High. Cover, browse for deer, seeds for bird.	
Swamp White Oak *(Quercus bicolor)*	3,4,5	Dec Tree	yes	yes	High. Mast	Full sun to partial shade. Good bottomland tree.
Swamp Rose *(Rosa Palustris)*	3,4	Dec Shrub		Irregular, seasonal, or regularly saturated	High. Food (hips) for birds including turkey, ruffed grouse and mammals. Fox cover.	Prefers full sun. Easy to establish. Low salt tolerance.
Sweetgum *(Liquidambar styraciflua)*	4,5,6	Dec Tree	yes	yes	Moderate. Songbirds	Tolerates acid or clay soils. Sun to partial shade.
Sycamore *(Platanus occidentalis)*	4,5,6	Dec Tree	yes	yes	Low. Food, cavities for nesting.	Rapid growth. Common in floodplains and alluvial woodlands.
Tulip Tree *(Liriodendron tulipifera)*	5,6	Dec Tree	yes	no	Moderate. Seeds and nest sites	Full sun to partial shade. Well drained soils. Rapid growth.
Tupelo *(Nyssa sylvatica var biflora)*	3,4,5	Dec Tree	yes	yes	High. Seeds and nest sites	Ornamental

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
White Ash *(Fraxinus americana)*	5,6	Dec Tree	yes	no	High. Food	All sunlight conditions. Well drained soils.
Winterberry *(Ilex verticillata)*	3,4,5	Dec Shrub	yes	yes	High Cover and fruit for birds. Holds berries into winter	Full sun to partial shade. Seasonally flooded areas
Witch Hazel *(Hamamelis virginiana)*	4,5	Dec Shrub	yes	no	Low. Food for squirrels, deer, and ruffed grouse.	Prefers shade Ornamental.
Herbaceous Plants						
Arrow arum *(Peltandra virginica)*	2,3	Emergent	yes	up to 1 ft.	High. Berries are eaten by wood ducks.	Full sun to partial shade.
Arrowhead, Duck Potato *(Sagittaria latifolia)*	2,3	Emergent	yes	up to 1 ft	Moderate. Tubers and seeds eaten by ducks.	Aggressive colonizer.
Big Bluestem *(Andropogon gerardi)*	4,5	Perimeter	yes	Irregular or seasonal inundation.	High. Seeds for songbirds. Food for deer	Requires full sun.
Birdfoot deervetch *(Lotus Corniculatus)*	4,5,6	Perimeter	yes	Infrequent inundation	High. Food for birds.	Full sun. Nitrogen fixer.
Blue Flag Iris *(Iris versicolor)*	2,3	Emergent	yes	Regular or permanently, up to ½ ft or saturated	Moderate. Food muskrat and wildfowl, Cover, marshbirds	Slow growth. Full sun to partial shade. Tolerates clay. Fresh to moderately brackish water.
Blue Joint *(Calamagrostis canadensis)*	2,3,4	Emergent	yes	Regular or permanent inundation up to 0.5 ft.	Moderate. Food for game birds and moose.	Tolerates partial shade
Broomsedge *(Andropogon virginicus)*	2,3	Perimeter	yes	up to 3 in.	High. Songbirds and browsers. Winter food and cover.	Tolerant of fluctuation water levels & partial shade.
Bushy Beardgrass *(Andropogon glomeratus)*	2,3	Emergent	yes	up to 1 ft		Requires full sun.
Cardinal flower *(Lobelia cardinalis)*	4,5,6	Perimeter	yes	Some. Tolerates saturation up to 100% of season.	High. Nectar for hummingbird, oriole, butterflies.	Tolerates partial shade

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Cattail *(Typha sp.)*	2,3	Emergent	yes	up to 1 ft.	Low. Except as cover	Aggressive. May eliminate other species. Volunteer. High pollutant treatment
Coontail *(Ceratophyllum demersum)*	1	Submergent	no	yes	Low food value. Good habitat and shelter for fish and invertebrates.	Free floating SAV. Shade tolerant. Rapid growth.
Common Three-Square *(Scirpus pungens)*	2	Emergent	yes	up to 6 in.	High. Seeds, cover. Waterfowl and fish.	High metal removal.
Duckweed *(Lemna sp.)*	1,2	Submergent Emergent	yes	yes	High. Food for waterfowl and fish.	High metal removal.
Fowl mannagrass *(Glyceria striata)*	4,5	Perimeter	yes	Irregular or seasonal inundation	High. Food for waterfowl, muskrat, and deer.	Partial to full shade
Hardstem Bulrush *(Scirpus acutus)*	2	Emergent	yes	up to 3 ft.	High. Cover, food (arthenes, rhizomes) ducks, geese, muskrat, fish. Nesting for bluegill and bass.	Quick to establish, fresh to brackish. Good for sediment stabilization and erosion control.
Giant Burreed *(Sparganium eurycarpum)*	2,3	Emergent	yes	Regular to permanently inundated up to 1 ft.	High. Food (seeds, plant) waterfowl, beaver & other mammals. Cover for marshbirds, waterfowl.	Rapid spreading. Tolerates partial sun. Good for shoreline stabilization. Salinity <0.5 ppt
Lizard's Tail *(Saururus cernuus)*	2	Emergent	yes	up to 1 ft.	Low, except wood ducks.	Rapid growth. Shade tolerant
Long-leaved Pond Weed *(Potamogeton nodosus)*	1,2	Rooted submerged aquatic	yes	up to 1-6 ft. depending on turbidity	High. Food (seeds, roots) waterfowl, aquatic fur-bearers, deer, moose. Habitat for fish	Rapid spread. Salinity <0.5 ppt. Flowers float on surface, Aug.-Sept.

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Marsh Hibiscus *(Hibiscus moscheutos)*	2,3	Emergent	yes	up to 3 in.	Low. Nectar.	Full sun. Can tolerate periodic dryness.
Pickerelweed *(Pontederia cordata)*	2,3	Emergent	yes	up to 1 ft.	Moderate. Ducks. Nectar for butterflies.	Full sun to partial shade.
Pond Weed, Sago *(Potamogeton pectinatus*	1	Submergent	yes	yes	Extremely high. Waterfowl, marsh and shorebirds.	Removes heavy metals.
Redtop *(Agrostis alba)*	3,4,5	Perimeter	yes	Up to 25% of season	Moderate. Rabbits and some birds.	Quickly established but not highly competitive.
Rice Cutgrass *(Leersia oryzoides)*	2,3	Emergent	yes	up to 3 in.	High. Food and cover	Full sun although tolerant of shade. Shoreline stabilization.
Sedges *(Carex spp.)*	2,3	Emergent	yes	up to 3 in.	High waterfowl, songbirds.	Many wetland and upland species.
Tufted Hairgrass *(Deschampsia caespitosa)*	3,4,5	Perimeter	yes	Regular to irregular inundation	High.	Full sun. May become invasive.
Soft-stem Bulrush *(Scirpus validus)*	2,3	Emergent	yes	up to 1 ft.	Moderate. Good cover and food.	Full sun. Aggressive colonizer. High pollutant removal.
Smartweed *(Polygonum spp.)*	2,3,4	Emergent	yes	up to 1 ft.	High. Waterfowl, songbirds. Seeds and cover.	Fast colonizer. Avoid weedy aliens such as *P. perfoliatum*.
Soft Rush *(Juncus effusus)*	2,3,4	Emergent	yes	up to 3 in	Moderate.	Tolerates wet or dry conditions.
Spatterdock *(Nuphar luteum)*	2	Emergent	yes	up to 3 ft.	Moderate for food but high for cover.	Fast colonizer. Tolerant of fluctuating water levels.
Switchgrass *(Panicum virgatum)*	2,3,4,5,6	Perimeter	yes	up to 3 in.	High. Seeds, cover for waterfowl, songbirds.	Tolerates wet/dry conditions.

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Sweet Flag *(Acorus calamus)*	2,3	Submerged	yes	up to 3 in.	Low.	Tolerant of dry periods. Not a rapid colonizer. Tolerates acidic conditions.
Waterweed *(Elodea canadensis)*	1	Submerged	yes	yes	Low.	Good water oxygenator. High nutrient, copper, manganese and chromium removal.
Wild Celery *(Vallisneria americana)*	1	Submerged	yes	yes	High. Food for waterfowl. Habitat for fish and invertebrates	Tolerant of murkey water and high nutrient loads.
Wild Rice *(Zizania aquatica)*	2	Emergent	yes	up to 1 ft.	High. Food for birds.	Prefers full sun
Wool Grass *(Scirpus cyperinus)*	2,3	Emergent	yes	Irregularly to seasonally inundated	Moderate. Cover, Food.	Requires full sun. Can tolerate acidic soils, drought. Colonizes disturbed areas, moderate growth.

Open Channels

Description: Vegetated channels that are explicitly designed and constructed to capture and treat stormwater runoff within dry or wet cells formed by check dams or other means.

Design Options:
Dry Swale (O-1), Wet Swale (O-2)

KEY CONSIDERATIONS

FEASIBILITY

- Maximum longitudinal slope of 4%

CONVEYANCE

- Non-erosive (3.5 to 5.0 fps) peak velocity for the 2-year storm.
- Safe conveyance of the ten-year storm with a minimum of 6 inches of freeboard.
- Side slopes gentler than 2:1 (3:1 preferred).
- The maximum allowable temporary ponding time of 48 hours

PRETREATMENT

- 10% of the WQ_v in pretreatment, usually provided using check dams at culverts or driveway crossings.

TREATMENT

- Temporary storage the WQ_v within the facility to be released over a minimum 30 minute duration.
- Bottom width no greater than 8 feet, but no less than two feet.
- Soil media as detailed in Appendix H.

MAINTENANCE

- Removal of sediment build up within the bottom of the channel or filter strip when 25% of the original WQ_v volume has been exceeded.
- Maintain a grass height of 4" to 6" in dry swales.

MANAGEMENT CAPABILITY

G	Phosphorus
F	Nitrogen
G	Metals - Cadmium, Copper, Lead, and Zinc removal
P	Pathogens - Coliform, Streptococci, E Coli removal

Key: G=Good F=Fair P=Poor

STORMWATER MANAGEMENT SUITABILITY

X	Water Quality
	Channel Protection
	Overbank Flood Protection
	Extreme Flood Protection

Accepts Hotspot Runoff: Yes *(requires impermeable liner)*

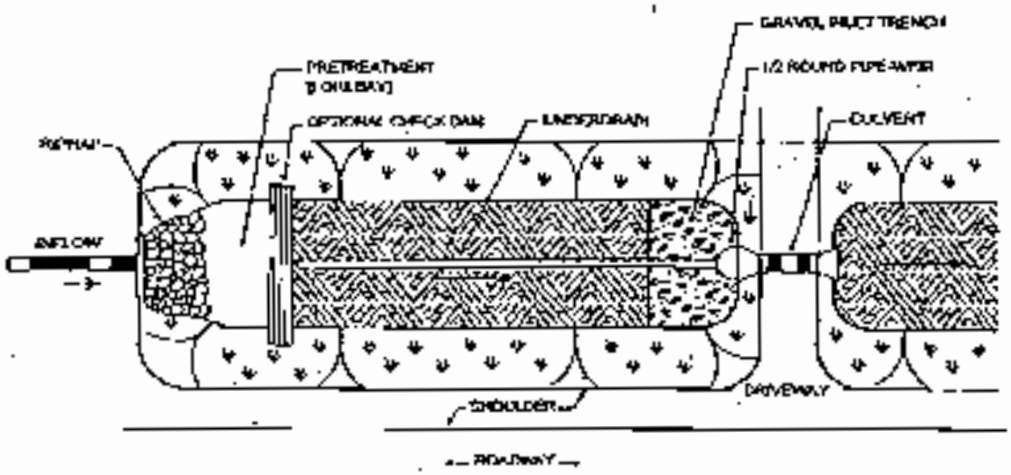
IMPLEMENTATION CONSIDERATIONS

L	Capital Cost
L	Maintenance Burden

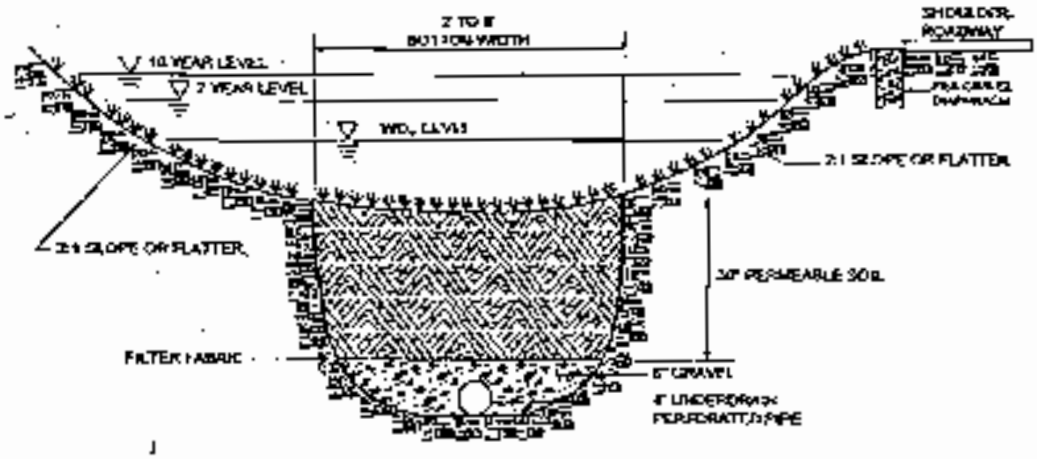
Residential Subdivision Use: Yes
High Density/Ultra-Urban: No
Drainage Area: 5 acres max
Soils: *No restrictions*
Other Considerations:
- *Permeable soil layer (dry swale)*
- *Wetland plants (wet swale)*

Key: H=High M=Medium L=Low

Figure 6.20 Dry Swale (O-1)



PLAN VIEW



SECTION

Table C.3 Open Vegetated Swale and Filter Strip Materials Specifications

Parameter	Specification	Size	Notes
Dry swale soil	USCS: ML, SM, SC	n/a	soil with a higher percent organic content is preferred
Dry Swale sand	ASTM C-33 fine aggregate concrete sand	0.02" to 0.04"	
Check Dam (pressure treated)	AWPA Standard C6	6" by 6" or 8" by 8"	*do not* coat with creosote; embed at least 3= into side slopes
Check Dam (natural wood)	Black Locust, Red Mulberry, Cedars, Catalpa, White Oak, Chestnut Oak, Black Walnut	6" to 12" diameter; notch as necessary	*do not* use the following, as these species have a predisposition towards rot: Ash, Beech, Birch, Elm, Hackberry, Hemlock, Hickories, Maples, Red and Black Oak, Pines, Poplar, Spruce, Sweetgum, Willow
Filter Strip sand/gravel pervious berm	sand: per dry swale sand gravel; AASHTO M-43 No. 57	sand: 0.02" to 0.04" gravel: 2" to 1"	mix with approximately 25% loan soil to support grass cover crop; see Bioretention planting soil notes for more detail.
pea gravel diaphragm and curtain drain	ASTM D 448	varies (No. 6) or (3/8" to 3/8")	use clean bank-run gravel
under drain gravel	AASHTO M-43 No. 67	0.25" to 0.75"	
under drain	ASTM D -1785 or AASHTO M-278	6" rigid Schedule 40 PVC	3/8" perf. @ 6" o.c.; 4 holes per row
Geotextile	See local DOT Standards and Specs	n/a	
rip rap	per local DOT criteria	size per New York State DOT requirements based on 10-year design flows	

Specifications for Open Channels and Filter Strips

Material Specifications
The recommended construction materials for open channels and filter strips are detailed in Table G.3.

Dry Swales

Roto-till soil/gravel interface approximately 6" to avoid a sharp soil/gravel interface.

Permeable soil mixture (20" to 30" deep) should meet the bioretention planting soil specifications.

Check dams, if required, shall be placed as specified.

System to have 6" of freeboard, minimum.

Side slopes to be 3:1 minimum; (4:1 or greater preferred).

No gravel or perforated pipe is to be placed under driveways.

Bottom of facility to be above the seasonably high water table.

Seed with flood/drought resistant grasses; see your local NRCS Standards and Specifications guidance.

Longitudinal slope to be 1 to 2%, maximum [up to 5% with check dams].

Bottom width to be 8'= maximum to avoid braiding; larger widths may be used if proper berming is supplied. Width to be 2'= minimum.

Wet Swales
Follow above information for dry swales, with the following exceptions: the seasonally high water table may inundate the swale; but not above the design bottom of the channel [NOTE: if the water table is stable within the channel; the WQv storage may start at this point]

Excavate into undisturbed soils; do not use an underdrain system.

Filter Strips

Construct pea gravel diaphragms 12" wide, minimum, and 24" deep minimum.

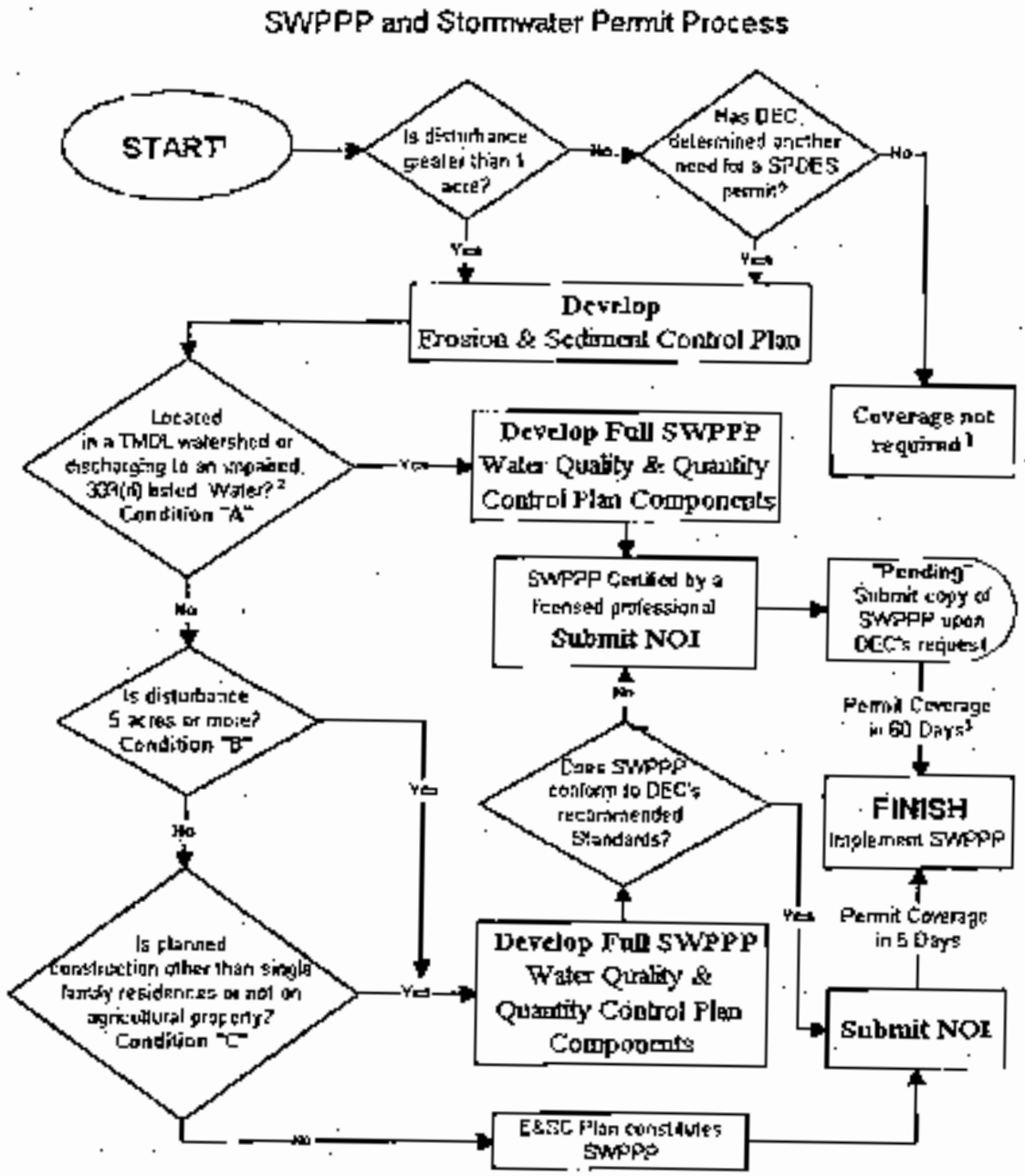
Pervious berms to be a sand/gravel mix (35-60% sand, 30-55% silt, and 10-75% gravel). Berms to have overflow weirs with 6 inch minimum available head.

Slope range to be 2% minimum to 6% maximum.

APPENDIX E

EXCERPTS FROM NEW YORK STATE STORMWATER DESIGN MANUAL

Figure 3.1 Stormwater Pollution Prevention Plan Component Requirements



NOTES:

1. Under any of the above conditions other environmental permits may be required. DEC may require permit for construction disturbance < 1 acre on a case by case basis.
2. and the following exists: construction and/or stormwater discharges from the construction or post construction site contain the pollutant of concern identified in the TMDL or 303(d) listing.
3. After receipt by DEC of completed application

Table 5.1 Stormwater Management Practices Acceptable for Water Quality

Group	Practice	Description
Pond	Micropool Extended Detention Pond (P-1)	Pond that treats the majority of the water quality volume through extended detention, and incorporates a micropool at the outlet of the pond to prevent sediment resuspension.
	Wet Pond (P-2)	Pond that provides storage for the entire water quality volume in the permanent pool.
	Wet Extended Detention Pond (P-3)	Pond that treats a portion of the water quality volume by detaining storm flows above a permanent pool for a specified minimum detention time.
	Multiple Pond System (P-4)	A group of ponds that collectively treat the water quality volume.
	Pocket Pond (P-5)	A stormwater wetland design adapted for the treatment of runoff from small drainage areas that has little or no baseflow available to maintain water elevations and relies on ground water to maintain a permanent pool.
Wetland	Shallow Wetland (W-1)	A wetland that provides water quality treatment entirely in a wet shallow marsh.
	Extended Detention Wetland (W-2)	A wetland system that provides some fraction of the water quality volume by detaining storm flows above the marsh surface.
	Pond/ Wetland System (W-3)	A wetland system that provides a portion of the water quality volume in the permanent pool of a wet pond that precedes the marsh for a specified minimum detention time.
	Pocket Wetland (W-4)	A shallow wetland design adapted for the treatment of runoff from small drainage areas that has variable water levels and relies on groundwater for its permanent pool.
Infiltration	Infiltration Trench (I-1)	An infiltration practice that stores the water quality volume in the void spaces of a gravel trench before it is infiltrated into the ground.
	Infiltration Basin (I-2)	An infiltration practice that stores the water quality volume in a shallow depression, before it is infiltrated it into the ground.
	Dry Well (I-3)	An infiltration practice similar in design to the infiltration trench, and best suited for treatment of rooftop runoff.
Filtering Practices	Surface Sand Filter (F-1)	A filtering practice that treats stormwater by settling out larger particles in a sediment chamber, and then filtering stormwater through a sand matrix.
	Underground Sand Filter (F-2)	A filtering practice that treats stormwater as it flows through underground settling and filtering chambers.
	Perimeter Sand Filter (F-3)	A filter that incorporates a sediment chamber and filter bed as parallel vaults adjacent to a parking lot.
	Organic Filter (F-4)	A filtering practice that uses an organic medium such as compost in the filter, in the place of sand.
	Bioretention (F-5)	A shallow depression that treats stormwater as it flows through a soil matrix, and is returned to the storm drain system.
Open Channels	Dry Swale (O-1)	An open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff into the soil media.
	Wet Swale (O-2)	An open drainage channel or depression designed to retain water or intercept groundwater for water quality treatment.

Table 7.1 Land Use Selection Matrix

SMP Group	SMP Design	Rural	Residential	Roads and Highways	Commercial/ High Density	Hotspots	Ultra Urban
Pond	Micropool ED	○	○	○	◗	①②	●
	Wet Pond	○	○	○	◗	①	●
	Wet ED Pond	○	○	○	◗	①②	●
	Multiple Pond	○	○	◗	◗	①	●
	Pocket Pond	○	◗	○	◗	●	●
Wetland	Shallow Wetland	○	○	◗	◗	②	●
	ED Wetland	○	○	◗	◗	②	●
	Pond/Wetland	○	○	●	◗	①	●
	Pocket Wetland	○	◗	○	◗	●	●
Infiltration	Infiltration Trench	◗	◗	○	○	●	◗
	Shallow I-Basin	◗	◗	◗	◗	●	◗
	Dry Well[1]	◗	○	●	◗	●	◗
Filters	Surface Sand Filter	●	◗	○	○	②	○
	Underground SF	●	●	◗	○	○	○
	Perimeter SF	●	●	◗	○	○	○
	Organic SF	●	◗	○	○	②	○
	Bioretention	◗	◗	○	○	②	○
Open Channels	Dry Swale	○	◗	○	◗	②	◗
	Wet Swale	○	●	○	●	●	●

○: Yes. Good option in most cases.
◗: Depends. Suitable under certain conditions, or may be used to treat a portion of the site.
●: No. Seldom or never suitable.
①: Acceptable option, but may require a pond liner to reduce risk of groundwater contamination.
②: Acceptable option, if not designed as an exfilter.
1: The dry well can only be used to treat rooftop runoff

Table 7.2 Physical Feasibility Matrix

SMP Group	SMP Design	Soils	Water Table	Drainage Area (acres)	Site Slope	Head (ft)
Pond	Micropool ED	HSG A soils may require pond liner.	2 foot separation if hotspot or aquifer	10 min[1]	No more than 15%	6 to 8 ft
	Wet Pond			25 min[1]		
	Wet ED Pond					
	Multiple Pond					
	Pocket Pond	OK	below WT	5 max[2]		4 ft
Wetland	Shallow Wetland	HSG A soils may require liner	2 foot separation if hotspot or aquifer	25 min	No more than 8%	3 to 5 ft
	ED Wetland					
	Pond/Wetland					
	Pocket Wetland	OK	below WT	5 max		2 to 3 ft
Infiltration	Infiltration Trench	$f_c > 0.5$ inch/hr, additional pretreatment required over 2.0 in/hr (See Section 6.3.3)	3 feet, 4 feet if sole source aquifer.	5 max	No more than 15%	1 ft[4]
	Shallow I-Basin			10 max[3]		3 ft
	Dry Well			1 max[4]		1 ft
Filters	Surface SF	OK	2 feet[5]	10 max[2]	No more than 6%	5 ft
	Underground SF			2 max[2]		5 to 7ft
	Perimeter SF			2 max[2]		2 to 3 ft
	Organic SF			5 max[2]		2 to 4 ft
	Bioretention			5 max[2]		5 ft
Open Channels	Dry Swale	Made Soil	2 feet	5 max	No more than 4%	3-5 ft
	Wet Swale	OK	below WT	5 max		1 ft

Notes:

1: Unless adequate water balance and anti-clogging device installed
2: Drainage area can be larger in some instances
3: May be larger in areas where the soil percolation rate is greater than 5.0 in/hr
4: Designed to treat rooftop runoff only
5: If designed with a permeable bottom, must meet the depth requirements for infiltration practices.
6: Required ponding depth above geotextile layer.

Lakes. Lakes are of particular concern in New York, which has many natural lake systems and borders on two Great Lakes. The information in this matrix focuses on phosphorous removal, which is an important concern in most lake systems. It is important to note, however, that many lakes in New York State have other important issues to address. Some lakes, such as Onondaga Lake, have other specific concerns, such as toxics and metals. Each community should also take these goals into consideration when reviewing site plans.

Table 7.3a Watershed/ Regional Selection Matrix-1

SMP Group	Sensitive Stream	Aquifer	Lakes
Ponds	Emphasize channel protection. Restrict in-stream practices. In trout waters, minimize permanent pool area, and encourage shading.	May require liner if HSG A soils are present. Pretreat 100% of WQ_v from hotspots. Provide a 2' separation distance to water table.	Encourage the use of a large permanent pool to improve phosphorus removal.
Wetlands	Require channel protection. Restrict in-stream practices. Restrict use in trout waters.		
Infiltration	Strongly encourage use for groundwater recharge. Combine with a detention facility to provide channel protection.	Provide 100' horizontal separation distance from wells and 4' vertical distance from the water table.	OK. Provides high phosphorus removal.
Filtering Systems	Combine with a detention facility to provide channel protection.	Excellent pretreatment for infiltration or open channel practices.	OK, but designs with a submerged filter may result in phosphorus release.
Open Channels	Combine with a detention facility to provide channel protection.	OK, but hotspot runoff must be adequately pretreated	OK. Moderate Premoval.

Table 7.3b Watershed/Regional Selection Matrix-2

SMP Group	Reservoir	Estuary/Coastal	Cold Climates
Ponds	Encourage the use of a large permanent pool to improve sediment and phosphorous removal. Promote long detention times to encourage bacteria removal.	Encourage long detention times to promote bacteria removal. Provides high nitrogen removal. In flat coastal areas, a pond drain may not be feasible.	Incorporate design features to improve winter performance.
Wetlands			Encourage the use of salt-tolerant vegetation.
Infiltration	Provide a separation distance from bedrock and water table Pretreat runoff prior to infiltration practices.	OK, but provide a separation distance to seasonally high groundwater. In the sandy soils typical of coastal areas, additional pretreatment may be required (See Section 6.3.3)	Incorporate features to minimize the risk of frost heave. Discourage infiltration of chlorides.
Filtering Systems	Excellent pretreatment for infiltration or open channel practices. Moderate to high coliform removal	Moderate to high coliform removal Designs with a submerged filter bed appear to have very high nitrogen removal	Incorporate design features to improve winter performance.
Open Channels	Poor coliform removal for wet swales.	Poor coliform removal for grass wet swales.	Encourage the use of salt-tolerant vegetation.

Table 7.4 Stormwater Management Capability Matrix

SMP Group	SMP Design	Water Quality			Channel Protection	Flood Control
		Nitrogen	Metals	Bacteria		
Pond	Micropool ED	○	○	○	○	○
	Wet Pond				○	○
	Wet ED Pond				○	○
	Multiple Pond				○	○
	Pocket Pond				○	○
Wetland	Shallow Wetland	○	◗	○	○	○
	ED Wetland				○	○
	Pond/Wetland				○	○
	Pocket Wetland				○	❶
Infiltration	Infiltration Trench	○	○	○	●	●
	Shallow I-Basin				❷	❷
	Dry Well				●	●
Filters	Surface Sand Filter	○	○	◗	❶	●
	Underground SF				●	●
	Perimeter SF				●	●
	Organic SF				●	●
	Bioretention				❶	●
Open Channels	Dry Swale	◗	○	●	●	●
	Wet Swale				●	●

○: Good option for meeting management goal
Good pollutant removal (>30% TN, >60% Metals, >70% Bacteria)

◗: Fair pollutant removal (15-30% TN, 30-60% Metals, 35-70% Bacteria)

●: Cannot meet management goal.
Poor pollutant removal (<15% TN, <30 Metals, <35% Bacteria)

❶: In most cases, cannot meet this goal, but the design may be adapted to add storage.

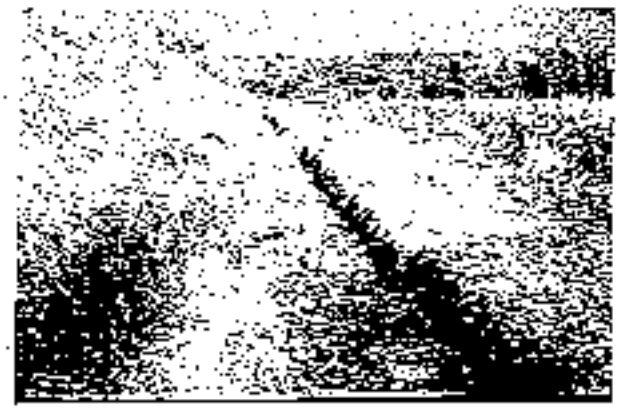
❷: Generally cannot meet this goal, except in areas with soil percolation rates greater than 5.0 in/hr

Table 7.5 Community and Environmental Factors Matrix

SMP Group	SMP List	Ease of Maintenance	Community Acceptance	Affordability	Safety	Habitat
Ponds	Micropool ED	◗	◗	○	○	◗
	Wet Pond	○	○	○	●	○
	Wet ED Pond	○	○	○	●	○
	Multiple Pond	○	○	◗	●	○
	Pocket Pond	●	◗	○	◗	●
Wetlands	Shallow Wetland	◗	○	◗	○	○
	ED Wetland	◗	◗	◗	◗	○
	Pond/Wetland	○	○	◗	●	○
	Pocket Wetland	●	●	○	○	◗
Infiltration	Infiltration Trench	●	○	◗	○	●
	Shallow I-Basin	●	●	◗	○	●
	Dry Well	●	◗	◗	○	●
Filters	Surface SF	◗	◗	●	○	●
	Underground SF	●	○	●	◗	●
	Perimeter SF	●	○	●	○	●
	Organic SF	◗	○	●	○	●
	Bioretention	◗	◗	◗	○	◗
Open Channels	Dry Swale	○	○	◗	○	●
	Wet Swale	○	◗	○	○	◗

Note: ● Low, ○ High, ◗ Moderate

STANDARD AND SPECIFICATIONS FOR STRAW BALE DIKE



Definition

A temporary barrier of straw, or similar material, used to intercept sediment laden runoff from small drainage area of disturbed soil.

Purpose

The purpose of a bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Conditions Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainage way above the barrier.
3. Erosion would occur in the form of sheet erosion.
4. Length of slope above the straw bale dike does not exceed these limits.

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
3:1	33	50
4:1	25	75

Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage areas in this instance shall be less than one quarter of an acre per 100 feet of fence and the length of slope above the dike shall be less than 200 feet.

Design Criteria

The above table is adequate, in general, for a one-inch rainfall event. Larger storms could cause failure of this practice. Use of this practice in sensitive areas for longer than one month should be specifically designed to store expected runoff. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5A-7 on page 5A-18 or details.

Figure 4.4 One-Year Design Storm

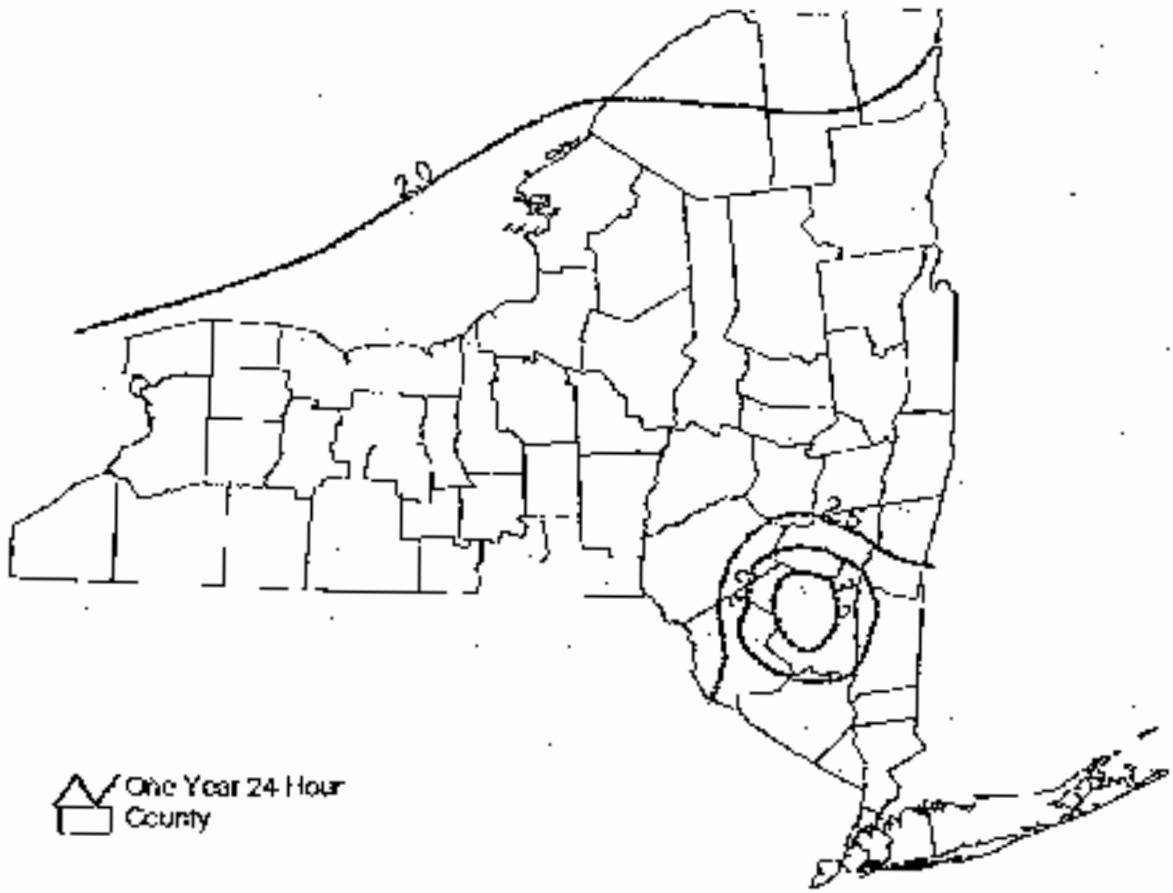
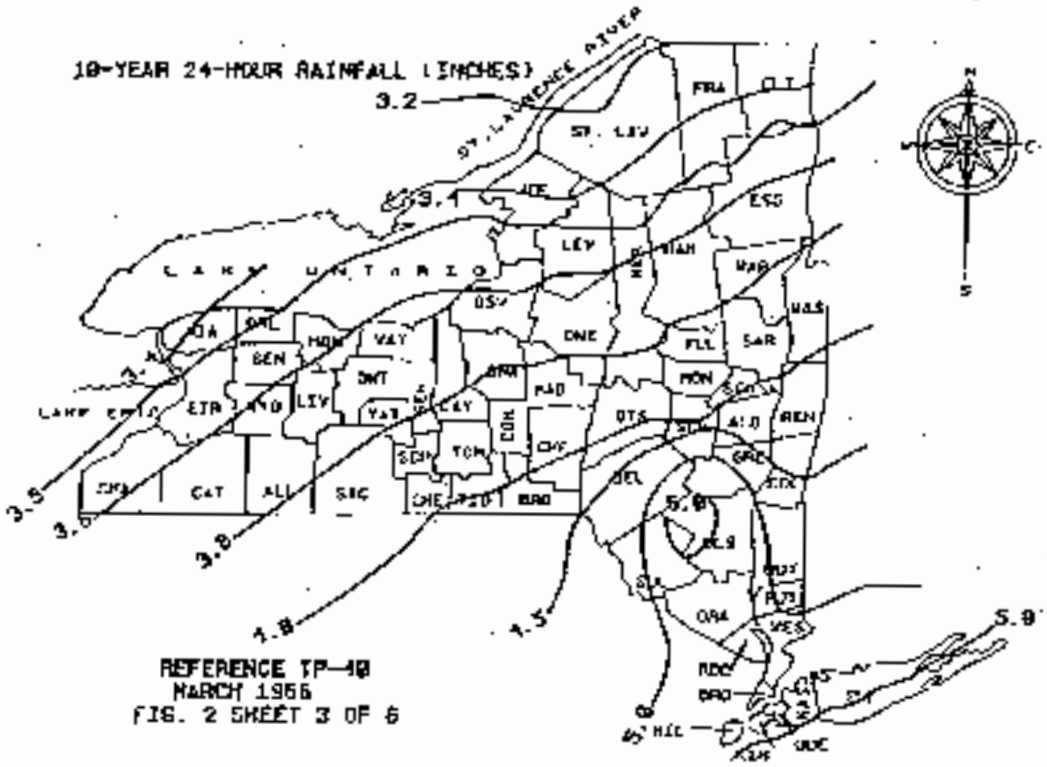
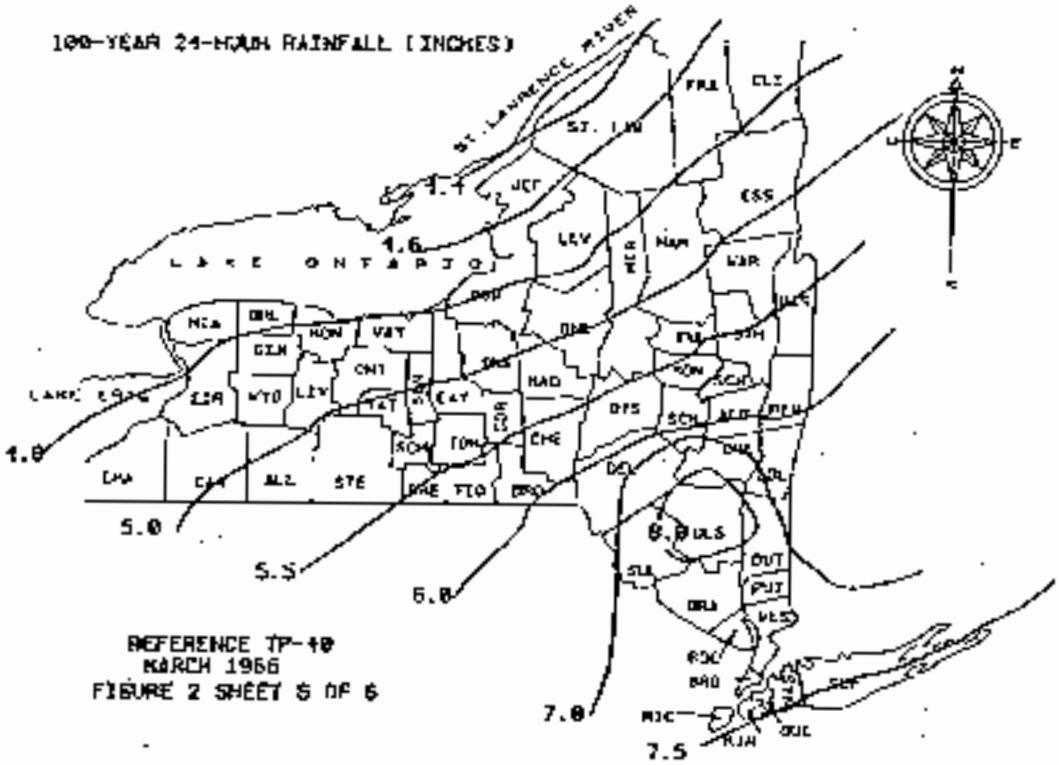


Figure 4.5 10-Year Design Storm



- When determining storage required to safely pass the 100-year flood, model off-site areas under ultimate conditions.

Figure 4.6 100-Year Design Storm



APPENDIX F

STANDARD EROSION AND SEDIMENT CONTROL DETAILS
UTILIZED ON SITE
EROSION AND SEDIMENT CONTROL PLAN

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ENTRANCE

Definition

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area.

Purpose

The purpose of stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction entrance shall be used at all points of construction ingress and egress.

Design Criteria

See Figure SA-35 on page SA-76 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile

The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[5]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 modified
Equivalent Opening Size	40-80	40-80	US Std Sieve CW-02215
Aggregate Depth	6	10	–

[1]Light Duty Roads: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Roads: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

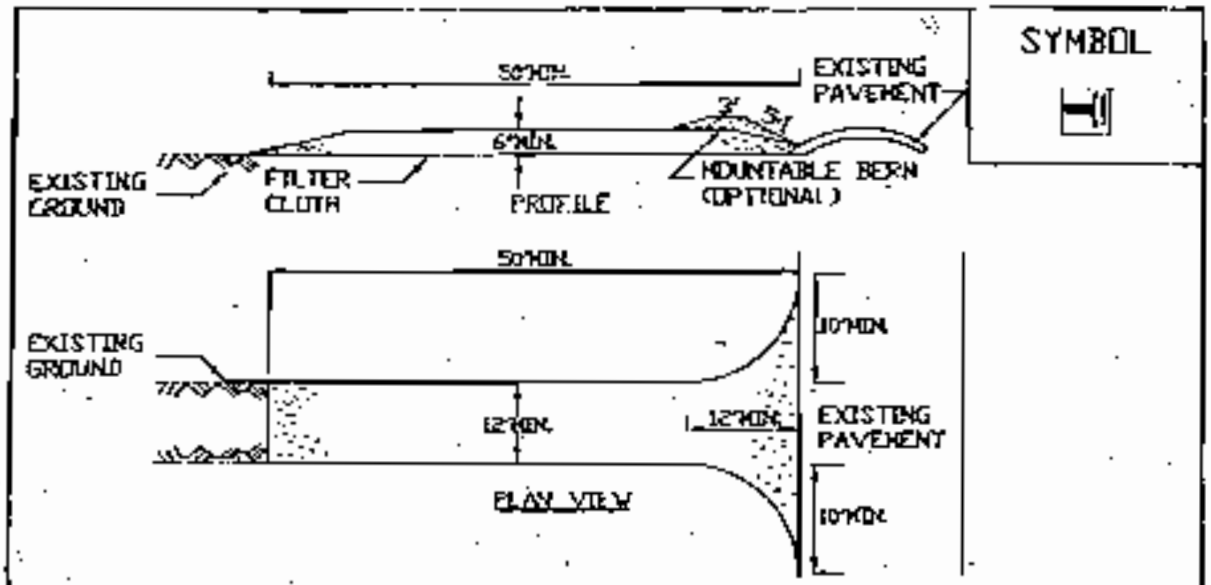
[5]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The entrance shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 5A.35
Stabilized Construction Entrance



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE, IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STABILIZED CONSTRUCTION ENTRANCE

STANDARD AND SPECIFICATIONS FOR CHECK DAM

Definition

Small barriers or dams constructed of stone, bagged sand or gravel, or other durable material across a drainage way.

Purpose

To reduce erosion in a drainage channel by reducing the velocity of flow in the channel.

Condition Where Practice Applies

This practice is used as a temporary or emergency measure to limit erosion by reducing velocities in small open channels that are degrading or subject to erosion and where permanent stabilization is impractical due to short period of usefulness and time constraints of construction.

Design Criteria

Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.

Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.

Side Slopes: Shall be 2:1 or flatter.

Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore,

$$S = h/s$$

Where:

S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft./ft.)

Example:

For a channel with a 4% slope and 2 ft. high stone check dams, they are spaced as follows:

$$S = \frac{2\ \text{ft}}{.04\ \text{ft/ft}} = 50\ \text{ft.}$$

Stone size: Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).

The overflow of the check dams will be stabilized to resist erosion that might be caused by the check dam. See Figure 5A.9 on page 5A.24 for details.

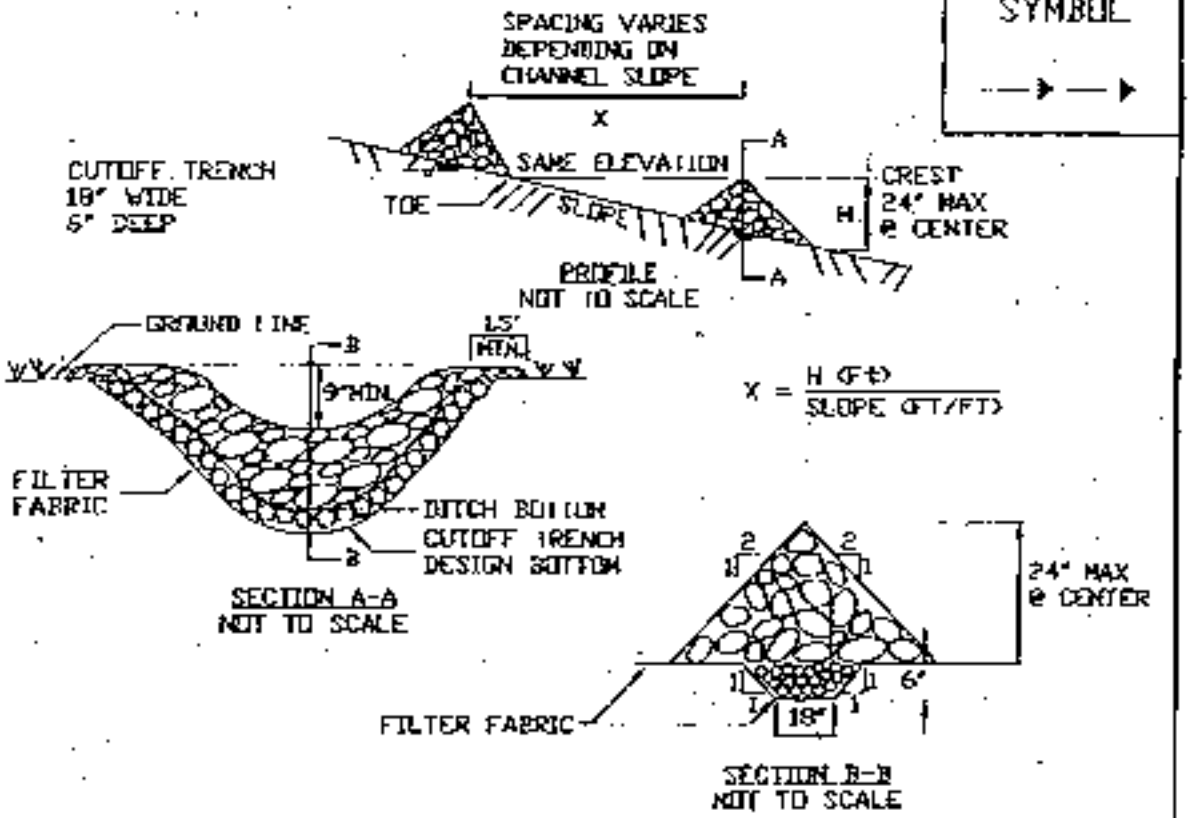
Check dams should be anchored in the channel by a cutoff trench 1.5 ft. wide and 0.5 ft. deep and lined with filter fabric to prevent soil migration.

Maintenance

The check dams should be inspected after each runoff event. Correct all damage immediately. If significant erosion has occurred between structures, a liner of stone or other suitable material should be installed in that portion of the channel.

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam. Replace stones as needed to maintain the design cross section of the structures.

Figure 5A.9
Check Dam



CONSTRUCTION SPECIFICATIONS

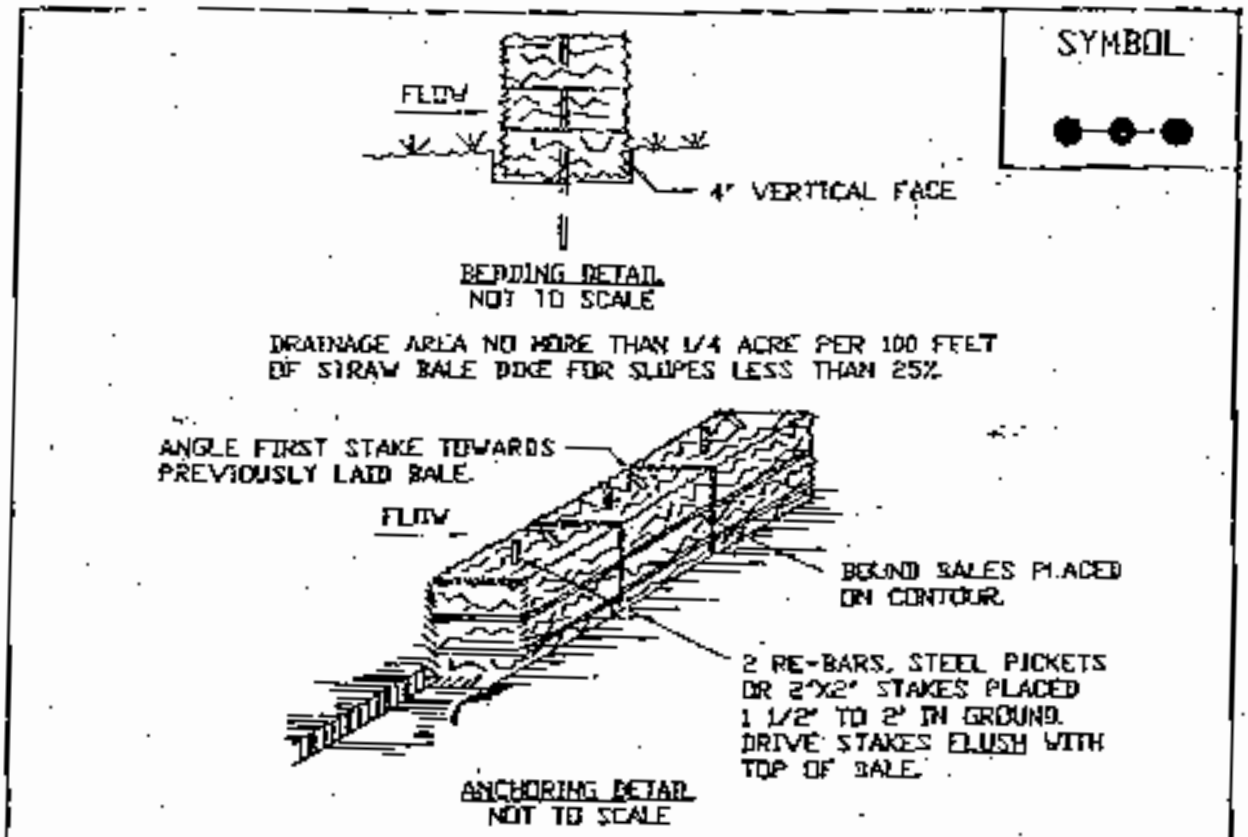
1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN ON THE PLANS.
2. SET SPACING OF CHECK DAMS TO ASSURE THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 15 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

CHECK DAM

Figure 5A.7
Straw Bale Dike



CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STRAW BALE DIKE

STANDARD AND SPECIFICATIONS FOR SILT FENCE

Definition

A temporary barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence placed on a slope are:

Slope Steepness	Maximum Length (ft.)
2:1	25
3:1	50
4:1	75
5:1 or flatter	100

2. Maximum drainage area for overland flow to a silt fence shall not exceed ¼ acre per 100 feet of fence, with minimum ponding depth of 1.5 feet behind the fence; and

3. Erosion would occur in the form of sheet erosion; and

4. There is no concentration of water flowing to the barrier.

Design Criteria

Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff. All silt fences shall be placed as close to the areas as possible, but at least 10 feet from the toe of a slope to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.

Sensitive areas to be protected by silt fence may need to be reinforced by using heavy wire fencing for added support to prevent collapse.

Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. A detail of the silt fence shall be shown on the plan. See Figure SA-8 on page SA-21 for details.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682

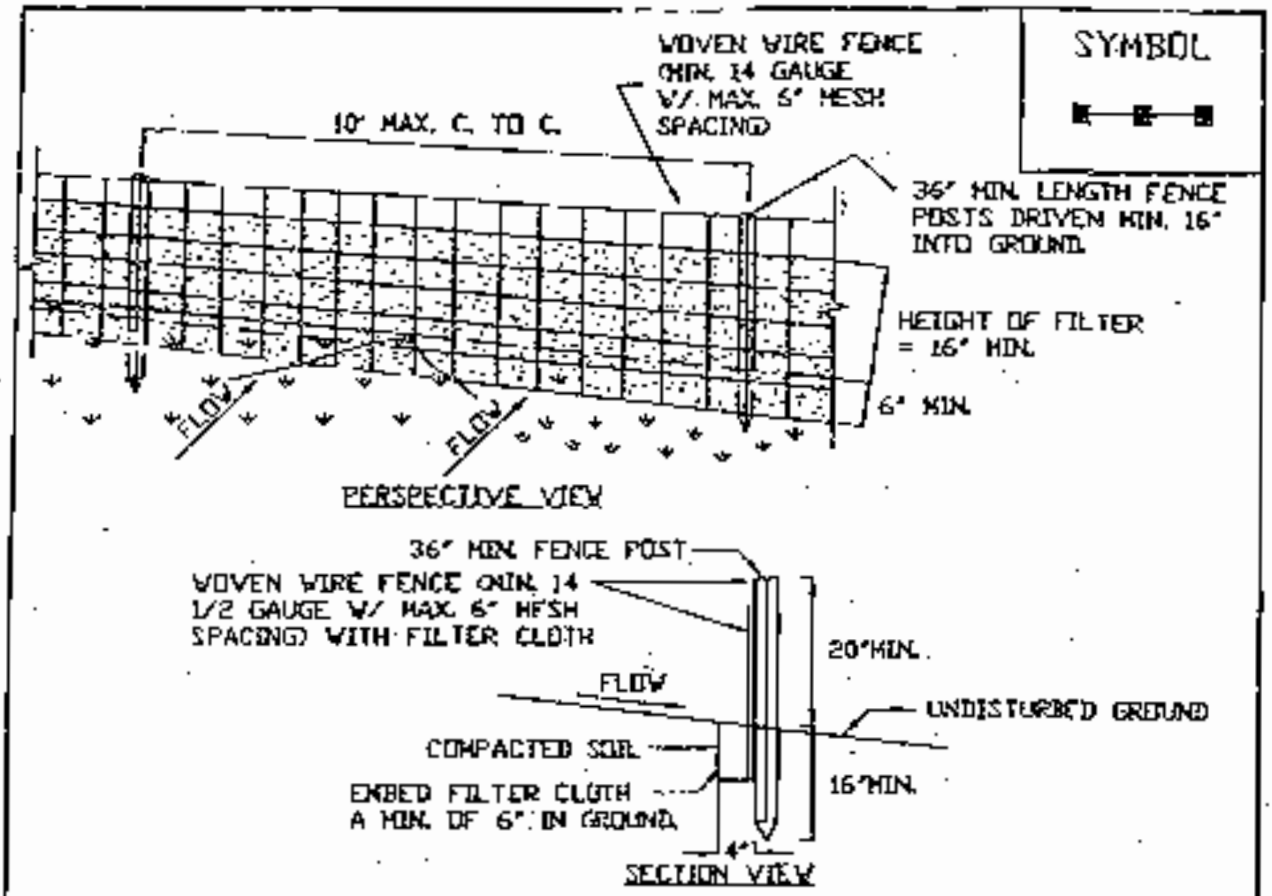
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Slurry Flow Rate (gal/min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM G-26

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel posts will be standard T and U sections weighing not less than 1.00 pound per linear foot.

3. Wire fence (for fabricated units): Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated Units: Envirofence, Geolab, or approved equal, may be used in lieu of the above method providing the unit is installed per details shown in Figure 5A.8.

Figure 5A.8
Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

SILT FENCE

STANDARD AND SPECIFICATIONS FOR LEVEL SPREADER

Definition

A temporary non-erosive outlet for concentrated runoff, constructed to disperse flow uniformly across a slope.

Purpose

To convert concentrated flow to sheet flow and release it uniformly over a stabilized area.

Conditions Where Practice Applies

Where sediment-free storm runoff can be released in sheet flow down a stabilized slope without causing erosion; where a level lip can be constructed without filling; where the area below the level lip is uniform with a slope of 10% or less and the runoff will not re-concentrate after release; and where no traffic will be allowed over spreader.

Design Criteria

The design capacity shall be determined by estimating the peak flow from the 10-year storm. The drainage area shall be restricted to limit the maximum flows into the spreader to 30 cfs. The level spreader shall have the following minimum dimension:

Design Flow (cfs)	Minimum Entrance Width (ft.)	Depth (ft.)	End Width (ft.)	Length (ft.)
0-10	10	0.5	3	10
10-20	16	0.6	3	20
20-30	24	0.7	3	30

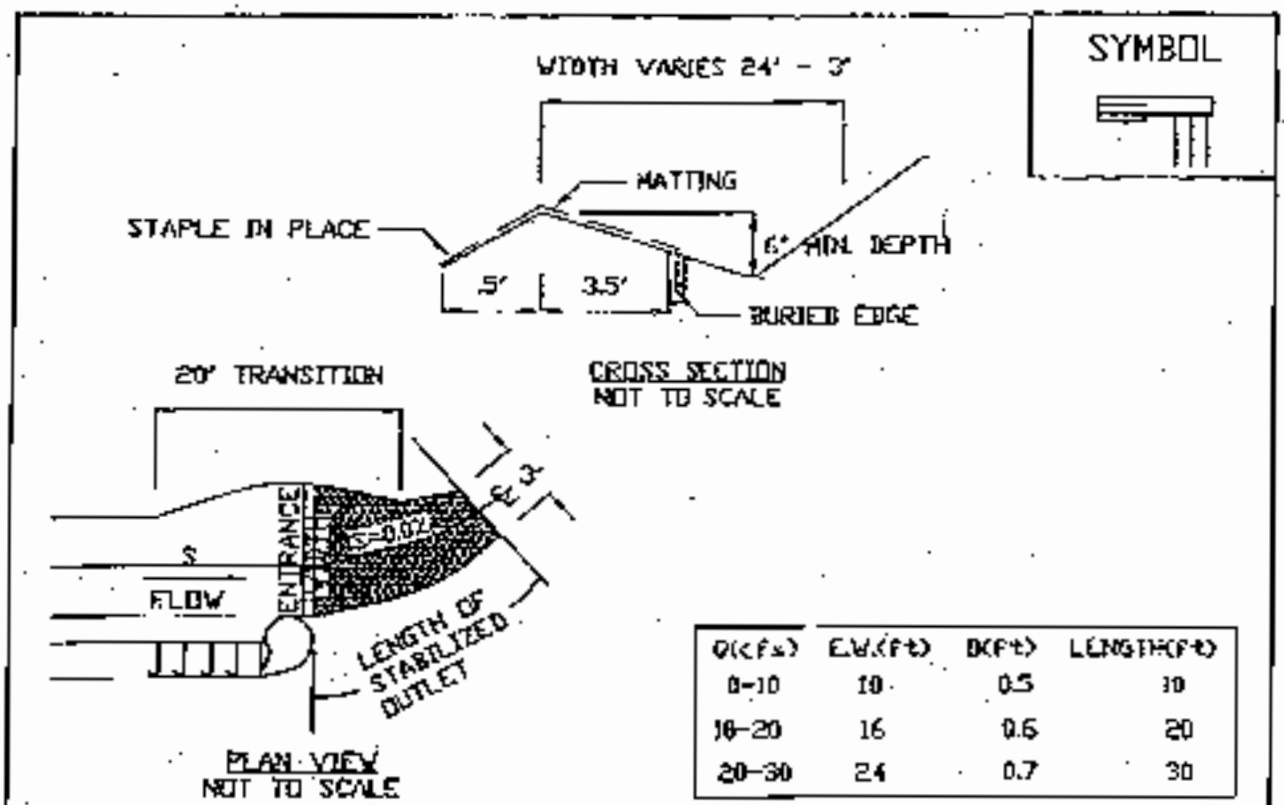
A transition section 20 feet in length shall be constructed from the width of the diversion or channel to the width of the spreader to ensure uniform outflow. This last transition section will blend the diversion grade to zero grade at the beginning of the spreader.

Construct the level lip in undisturbed soil to a uniform height and zero grade over the length of the spreader. Protect the lip with an erosion resistant material or mat to prevent erosion and allow vegetation to become established.

The outlet area should be a generally smooth, well-vegetated area no steeper than 10 percent.

See Figure 5A.5 on page 5A.14 for details.

Figure 5A.5
Level Spreader



Q(cfs)	E.W.(Ft)	D(Ft)	LENGTH(Ft)
0-10	10	0.5	10
10-20	16	0.6	20
20-30	24	0.7	30

CONSTRUCTION SPECIFICATIONS

1. THE MATTING SHOULD BE A MINIMUM OF 4FT. WIDE EXTENDING 6 INCHES OVER THE LIP AND BURIED 6 INCHES DEEP IN A VERTICAL TRENCH ON THE LOWER EDGE. THE UPPER EDGE SHOULD BUTT AGAINST SMOOTHLY CUT SOD AND BE SECURELY HELD IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES AT LEAST 12 INCHES IN LENGTH.
2. ENSURE THAT THE LIP IS LEVEL TO UNIFORMLY SPREAD DISCHARGE.
3. THE LIP SHALL BE CONSTRUCTED ON UNDISTURBED SOIL NOT FILL.
4. A 20 FOOT TRANSITION SECTION WILL BE CONSTRUCTED FROM THE DIVERSION CHANNEL TO THE SPREADER TO SMOOTHLY BLEND THE DIFFERENT DIMENSION AND GRADES.
5. THE RUNOFF DISCHARGE WILL BE OUTLETED ONTO A STABILIZED VEGETATED SLOPE NOT EXCEEDING 10%.
6. SEED AND MULCH THE DISTURBED AREA IMMEDIATELY AFTER CONSTRUCTION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS.
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

LEVEL SPREADER

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP

Definition

A temporary sediment control device formed by excavation and/or embankment to intercept sediment laden runoff and retain the sediment.

Purpose

The purpose of the structure is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties, and rights-of-way below the sediment trap from sedimentation.

Conditions Where Practice Applies

A sediment trap is usually installed in a drainage way, at a storm drain inlet, or other points of collection from a disturbed area.

Sediment traps should be used to artificially break up the general drainage area into smaller sections where a larger device (sediment basin) would be less effective.

Design Criteria

If any of the design criteria presented here cannot be met, see Standard and Specification for Sediment Basin on page 5A.49.

Drainage Area

The drainage area for sediment traps shall be in accordance with the specific type of sediment trap used (Type I through V).

Location

Sediment traps shall be located so that they can be installed prior to grading or filling in the drainage area they are to protect. Traps must not be located any closer than 20 feet from a proposed building foundation if the trap is to function during building construction. Locate traps to obtain maximum storage benefit from the terrain and for ease of cleanout and disposal of the trapped sediment.

Trap Size

The volume of a sediment trap as measured at the elevation of the crest of the outlet shall be at least 3,600 cubic feet per acre of drainage area. The volume of a constructed trap shall be calculated using standard mathematical procedures. The volume of a natural sediment trap may be approximated by the equation: Volume (cu.ft.) = 0.4 x surface area (sq.ft.) x maximum depth (ft.).

Trap Cleanout

Sediment shall be removed and the trap restored to the original dimensions when the sediment has accumulated to ½ of the design depth of the trap. Sediment removed from the trap shall be deposited in a protected area and in such a manner that it will not erode.

Embankment

All embankments for sediment traps shall not exceed five (5) feet in height as measured at the low point of the original ground along the centerline of the embankment. Embankments shall have a minimum four (4) foot wide top and side slopes of 2:1 or flatter. The embankment shall be compacted by traversing with equipment while it is being constructed. The embankment shall be stabilized with seed and mulch as soon as it is completed.

The elevation of the top of any dike directing water to any sediment trap will equal or exceed the maximum height of the outlet structure along the entire length of the trap.

Excavation

All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Excavated portions of sediment traps shall have 1:1 or flatter slopes.

Outlet

The outlet shall be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion at or below the outlet does not occur.

Sediment traps must outlet onto stabilized (preferable undisturbed) ground, into a watercourse, stabilized channel, or into a storm drain system. Distance between inlet and outlet should be maximized to the longest length practicable.

Trap Details Needed on Erosion and Sediment Control Plans

Each trap shall be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan shall indicate all the information necessary to properly construct and maintain the structure. If the drawings are such that this information cannot be delineated on the drawings, then a table shall be developed. If a table is developed, then each trap on a plan shall have a number and the numbers shall be consecutive.

The following information shall be shown for each trap in a summary table format on the plans.

1. Trap number
2. Type of trap
3. Drainage area
4. Storage required
5. Storage provided (if applicable)
6. Outlet length or pipe sizes
7. Storage depth below outlet or cleanout elevation
8. Embankment height and elevation (if applicable)

Type of Sediment Traps

There are five (5) specific types of sediment traps which vary according to their function, location, or drainage area.

I. Pipe Outlet Sediment Trap
II. Grass Outlet Sediment Trap
III. Catch Basin Sediment Trap
IV. Stone Outlet Sediment Trap
V. Riprap Outlet Sediment Trap

I. Pipe Outlet Sediment Trap

A Pipe Outlet Sediment Trap consists of a trap formed by embankment or excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The outlet pipe and riser shall be made of steel, corrugated metal or other suitable material. The top of the embankment shall be at least 1 ½ feet above the crest of the riser. The top 2/3 of the riser shall be perforated with one (1) inch nominal diameter holes or slits spaced six (6) inches vertically and horizontally placed in the concave portion of the corrugated pipe.

No holes or slits will be allowed within six (6) inches of the top of the horizontal barrel. All pipe connections shall be watertight. The riser shall be wrapped with ½ to ¾ inch hardware cloth wire then wrapped with filter cloth with a sieve size between #40-80 and secured with strapping or connecting band at the top and bottom of the cloth. The cloth shall cover an area at least six (6) inches above the highest hole and six (6) inches below the lowest hole. The top of the riser pipe shall not be covered with filter cloth. The riser shall have a base with sufficient weight to prevent flotation of the riser. Two approved bases are:

1. A concrete base 12 in. thick with the riser embedded 9 in. into the concrete base, or

2. One quarter inch, minimum, thick steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or earth placed on it to prevent flotation. In either case, each side of the square base measurement shall be the riser diameter plus 24 inches.

Pipe outlet sediment traps shall be limited to a five (5) acre maximum drainage area. Pipe outlet sediment traps may be interchangeable in the field with stone outlet or riprap sediment traps provided that these sediment traps are constructed in accordance with the detail and specifications for that trap.

Select pipe diameter from the following table:

Minimum Sizes

Barrel Diameter[1] (in.)	Riser Diameter[1] (in.)	Maximum Drainage Area (ac.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

[1] Barrel diameter may be same size as riser diameter.

See details for Pipe Outlet Sediment Trap ST-I in Figure 5A.16 (1) and 5A.16 (2) on pages 5A.38 and 5A.39.

II. Grass Outlet Sediment Trap

A Grass Outlet Sediment Trap consists of a trap formed by excavating the earth to create a holding area. The trap has a discharge point over natural existing grass. The outlet crest width (feet) shall be equal to four (4) times the drainage area (acres) with a minimum width of four (4) feet. The outlet shall be free of any restrictions to flow. The outlet lip must remain undisturbed and level. The volume of this trap shall be computed at the elevation of the crest of the outlet. Grass outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Grass Outlet Sediment Trap ST-II in Figure 5A.17 on page 5A.40.

III. Catch Basin Sediment Trap

A Catch Basin Sediment Trap consists of a basin formed by excavation on natural ground that discharges through an opening in a storm drain inlet structure. This opening can either be the inlet opening or a temporary opening made by omitting bricks or blocks in the inlet.

A yard drain inlet or an inlet in the median strip of a dual highway could use the inlet opening for the type outlet. The trap should be out of the roadway so as not to interfere with future compaction or construction. Placing the trap on the opposite side of the opening and diverting water from the roadway to the trap is one means of doing this. Catch basin sediment traps shall be limited to a three (3) acre maximum drainage area. The volume of this trap is measured at the elevation of the crest of the outlet (invert of the inlet opening).

See details for Catch Basin Sediment Trap ST-III in Figure 5A.18 on page 5A.41.

IV. Stone Outlet Sediment Trap

A Stone Outlet Sediment Trap consists of a trap formed by an embankment or excavation. The outlet of this trap is over a stone section placed on level ground. The minimum length (feet) of the outlet shall be equal to four (4) times the drainage area (acres).

Required storage shall be 3,600 cubic feet per acre of drainage area.

The outlet crest (top of stone in weir section) shall be level, at least one (1) foot below top of embankment and no more than one (1) foot above ground beneath the outlet. Stone used in the outlet shall be small riprap (4 in. x 8 in.). To provide more efficient trapping effect, a layer of filter cloth should be embedded one (1) foot back into the upstream face of the outlet stone or a one (1) foot thick layer of two (2) inch or finer aggregate shall be placed on the upstream face of the outlet.

Stone Outlet Sediment Traps may be interchangeable in the field with pipe or riprap outlet sediment traps provided they are constructed in accordance with the detail and specifications for those traps. Stone outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Stone Outlet Sediment Trap ST-IV in Figure 5A.19 on page 5A.42.

V. Riprap Outlet Sediment Trap

A Riprap Outlet Sediment Trap consists of a trap formed by an excavation and embankment. The outlet for this trap shall be through a partially excavated channel lined with riprap. This outlet channel shall discharge onto a stabilized area or to a stable watercourse. The riprap outlet sediment trap may be used for drainage areas of up to a maximum of 15 acres.

Design Criteria for Riprap Outlet Sediment Trap

1. The total contributing drainage area (disturbed or undisturbed either on or off the developing property) shall not exceed 15 acres.
2. The storage needs for this trap shall be computed using 3600 cubic feet of required storage for each acre of drainage area. The storage volume provided can be figured by computing the volume of storage area available behind the outlet structure up to an elevation of one (1) foot below the level weir crest.
3. The maximum height of embankment shall not exceed five (5) feet.
4. The elevation of the top of any dike directing water to a riprap outlet sediment trap will equal or exceed the minimum elevation of the embankment along the entire length of this trap.

Riprap Outlet Sediment Trap ST-V
(for Stone Lined Channel)

Contributing Drainage Area (ac.)	Depth of Channel (a) (ft.)	Length of Weir (b) (ft.)
1	1.5	4.0
2	1.5	5.0
3	1.5	6.0
4	1.5	10.0
5	1.5	12.0
6	1.5	14.0
7	1.5	16.0
8	2.0	10.0
9	2.0	10.0
10	2.0	12.0
11	2.0	14.0
12	2.0	14.0
13	2.0	16.0
14	2.0	16.0
15	2.0	18.0

See details for Riprap Outlet Sediment Trap ST-V on Figures 5A.20(1) and 5A.20(2) on pages 5A.43 and 5A.44.

Optional Dewatering Methods

Optional dewatering devices may be designed for use with sediment traps. Included are two methods, which may be used. See Figure 5A.21 on page 5A.45 for details.

Figure 5A.16(2)
Pipe Outlet Sediment Trap: ST-I—Construction Specifications

SYMBOL

CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
4. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
5. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
7. THE STRUCTURE SHALL BE REMOVED AND AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
8. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER; CUT SLOPES 1:1 OR FLATTER.
9. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
10. THE TOP 2/3 OF THE RISER SHALL BE PERFORATED WITH ONE (1) INCH DIAMETER HOLES OR SLITS SPACED SIX (6) INCHES VERTICALLY AND HORIZONTALLY AND PLACED IN THE CONCAVE PORTION OF PIPE. NO HOLES WILL BE ALLOWED WITHIN SIX (6) INCHES OF THE HORIZONTAL BARREL.
11. THE RISER SHALL BE WRAPPED WITH 1/4 TO 1/2 INCH HARDWARE CLOTH WIRE THEN WRAPPED WITH FILTER CLOTH HAVING AN EQUIVALENT SIEVE SIZE OF 40-80. THE FILTER CLOTH SHALL EXTEND SIX (6) INCHES ABOVE THE HIGHEST HOLE AND SIX (6) INCHES BELOW THE LOWEST HOLE. WHERE ENDS OF THE FILTER CLOTH COME TOGETHER, THEY SHALL BE OVER-LAPPED, FOLDED AND STAPLED TO PREVENT BYPASS.
12. STRAPS OR CONNECTING BANDS SHALL BE USED TO HOLD THE FILTER CLOTH AND WIRE FABRIC IN PLACE. THEY SHALL BE PLACED AT THE TOP AND BOTTOM OF THE CLOTH.
13. FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE HAND COMPACTED IN FOUR (4) INCH LAYERS. A MINIMUM OF TWO (2) FEET OF HAND COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
14. THE RISER SHALL BE ANCHORED WITH EITHER A CONCRETE BASE OR STEEL PLATE BASE TO PREVENT FLOTATION. FOR CONCRETE BASED THE DEPTH SHALL BE TWELVE (12) INCHES WITH THE RISER EMBEDDED NINE (9) INCHES. A 1/4 INCH MINIMUM THICKNESS STEEL PLATE SHALL BE ATTACHED TO THE RISER BY A CONTINUOUS WELD AROUND THE BOTTOM TO FORM A WATERTIGHT CONNECTION AND THEN PLACE TWO (2) FEET OF STONE, GRAVEL, OR TAMPED EARTH ON THE PLATE.

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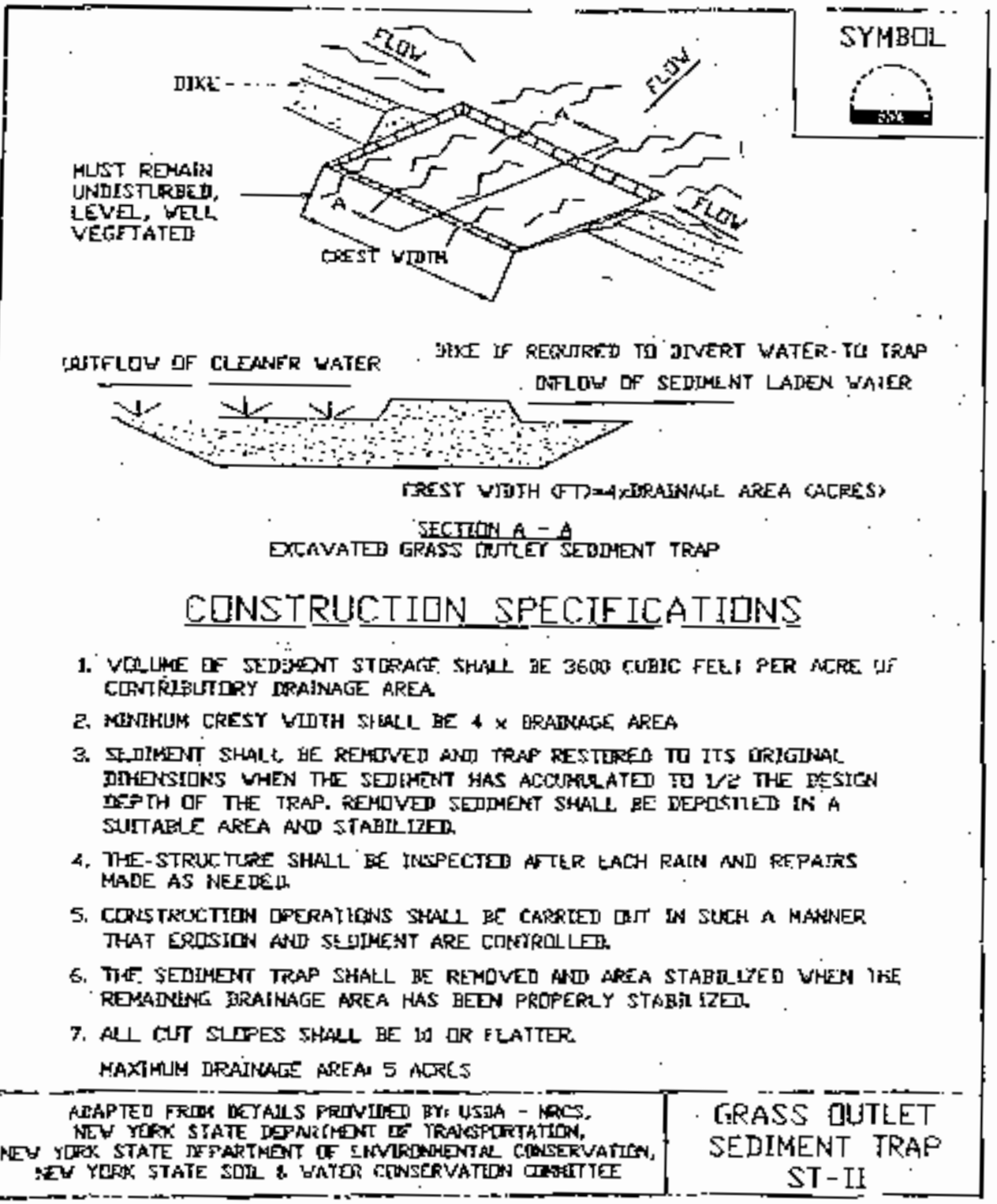
PIPE OUTLET
SEDIMENT TRAP
ST-I

Figure 5A.17
Grass Outlet Sediment Trap: ST-II



CONSTRUCTION SPECIFICATIONS

1. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE AREA.
2. MINIMUM CREST WIDTH SHALL BE 4 x DRAINAGE AREA
3. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
4. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
5. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
6. THE SEDIMENT TRAP SHALL BE REMOVED AND AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
7. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.

MAXIMUM DRAINAGE AREA: 5 ACRES

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GRASS OUTLET SEDIMENT TRAP ST-II

STANDARD AND SPECIFICATIONS FOR EARTH DIKE

Definition

A temporary berm or ridge of compacted soil, located in such a manner as to channel water to a desired location.

Purpose

The purpose of an earth dike is to direct runoff to a sediment trapping device, thereby reducing the potential for erosion and off site sedimentation. Earth dikes can also be used for diverting clean water away from disturbed areas.

Conditions Where Practice Applies

Earth dikes are often constructed across disturbed areas and around construction sites such as graded parking lots and subdivisions. The dikes shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 5A.1 on page 5A.2 for details.

General

	Dike A	Dike B
Drainage Area	<5 Ac	5-10 Ac
Dike Height	18 in.	36 in.
Dike Width	24 in.	36 in.
Flow Width	4 ft.	6 ft.
Flow Depth in Channel	8 in	15 in.
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 20% Max.	0.5% Min. 20% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specifications for Diversion on page 5B.1.

Stabilization

Stabilization of the dike shall be completed within 7 days of installation in accordance with the standard and specifications for seed and straw mulch or straw mulch only if not in seeding season and flow channel shall be stabilized as per the following criteria:

Type of Treatment	Channel Grade[1]	Flow Channel A (≤5 Ac)	Flow Channel B (5-10 Ac)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP, sod, or lined with plastic or 2 in. stone
3	5.1-8.0%	Seed and cover with RECP, Sod, or line with plastic or 2 in. stone	Line with 4-8 in. stone or, Recycled Concrete Equivalent[2] or geotextile
4	8.1 20%	Line with 4-8 in. stone or Recycled Concrete Equivalent[2] or geotextile	Site Specific Engineering Design

[1] In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.
[2] Recycled Concrete Equivalent shall be concrete broken into the required size, and shall contain no steel reinforcement.

Outlet

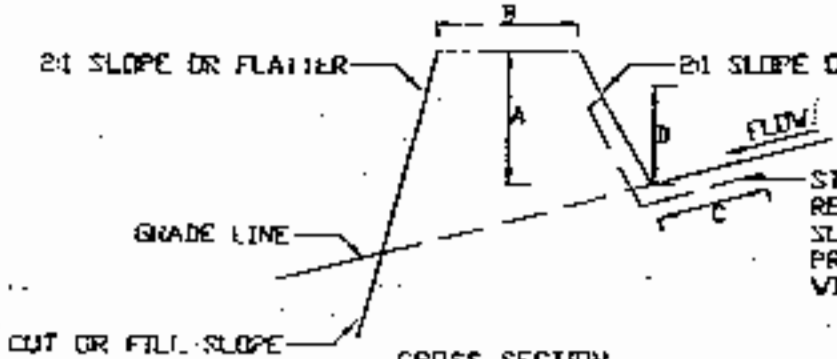
Earth dikes shall have an outlet that functions with a minimum of erosion.

Runoff shall be conveyed to a sediment trapping device until the drainage area above the dike is adequately stabilized.

The on site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 5A.1
Earth Dike

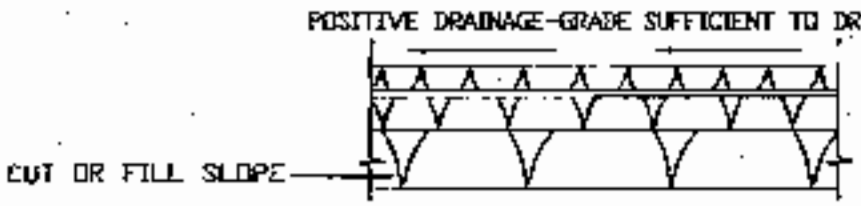
SYMBOL



CROSS SECTION

NOT TO SCALE

	DIKE A (5 AC. OR LESS)	DIKE B (5-10AC.)
A - DIKE HEIGHT	18"	36"
B - DIKE WIDTH	24"	36"
C - FLOW WIDTH	48"	68"
D - FLOW DEPTH	8"	15"



CONSTRUCTION SPECIFICATIONS

1. ALL DIKES SHALL BE COMPACTED BY EARTH-MOVING EQUIPMENT.
2. ALL DIKES SHALL HAVE POSITIVE DRAINAGE TO AN OUTLET.
3. TOP WIDTH MAY BE WIDER AND SIDE SLOPES BE FLATTER IF DESIRED TO FACILITATE CROSSING BY CONSTRUCTION TRAFFIC.
4. FIELD LOCATION SHOULD BE ADJUSTED AS NEEDED TO UTILIZE A STABILIZED SAFE OUTLET.
5. EARTH DIKES SHALL HAVE AN OUTLET THAT FUNCTIONS WITH A MINIMUM OF EROSION. RUNOFF SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE SUCH AS A SEDIMENT TRAP OR SEDIMENT BASIN WHERE EITHER THE DIKE CHANNEL OR THE DRAINAGE AREA ABOVE THE DIKE ARE NOT ADEQUATELY STABILIZED.
6. STABILIZATION SHALL BE: (A) IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR SEED AND STRAW MULCH IF NOT IN SEEDING SEASON, (B) FLOW CHANNEL AS PER THE CHART ON THE PREVIOUS PAGE.

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EARTH DIKE

STANDARD AND SPECIFICATIONS FOR TEMPORARY SWALE

Definition

A temporary excavated drainage way.

Purpose

The purpose of a temporary swale is to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet or to intercept sediment laden water and divert it to a sediment trapping device.

Conditions Where Practice Applies

Temporary swales are constructed:

1. to divert flows from entering a disturbed area.
2. intermittently across disturbed areas to shorten overland flow distances.
3. to direct sediment laden water along the base of slopes to a trapping device.
4. to transport offsite flows across disturbed areas such as rights-of-way.

Swales collecting runoff from disturbed areas shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 5A.2 on page 5A.5 for details.

	Swale A	Swale B
Drainage Area	<5 Ac	5-10 Ac
Bottom Width of Flow Channel	4 ft	6 ft
Depth of Flow Channel	1 ft	1 ft
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 20% Max.	0.5% Min. 20% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specification for Waterbars on page 5A.11.

Stabilization

Stabilization of the swale shall be completed within 7 days of installation in accordance with the appropriate standard and specifications for vegetative stabilization or stabilization with mulch as determined by the time of year. The flow channel shall be stabilized as per the following criteria:

Type of Treatment	Channel Grade[1]	Flow Channel A (≤5 Ac)	Flow Channel B (5-10 Ac)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP, Sod, or lined with plastic or 2 in. stone
3	5.1-8.0%	Seed and cover with RECP, Sod, or line with plastic or 2 in. stone	Line with 4-8 in. or stone or Recycled Concrete Equivalent[2] or geotextile
4	8.1-20%	Line with 4-8 in. stone or Recycled Concrete Equivalent[2] or geotextile	Site Specific Engineering Design

[1] In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.
[2] Recycled Concrete Equivalent shall be concrete broken into the required size, and shall contain no steel reinforcement.

Outlet

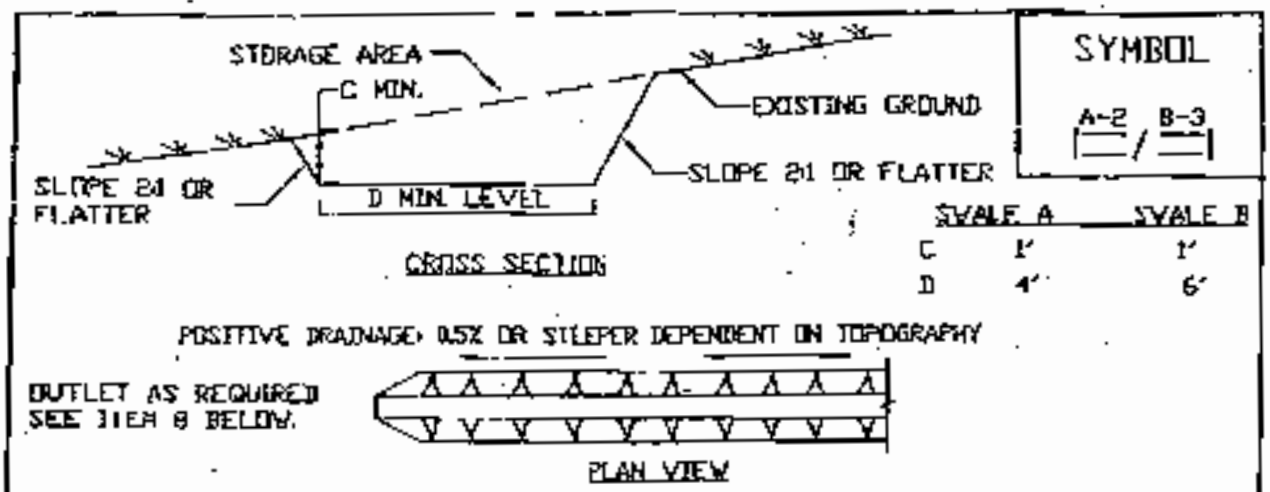
Swale shall have an outlet that functions with a minimum of erosion, and dissipates runoff velocity prior to discharge off the site.

Runoff shall be conveyed to a sediment trapping device such as a sediment trap or sediment basin until the drainage area above the swale is adequately stabilized.

The on site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet condition.

If a swale is used to divert clean water flows from entering a disturbed area, a sediment trapping device may not be needed.

Figure 5A.2
Temporary Swale



CONSTRUCTION SPECIFICATIONS

1. ALL TEMPORARY SWALES SHALL HAVE UNINTERUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILLS SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE SWALE.
8. STABILIZATION SHALL BE AS PER THE FLOW CHANNEL STABILIZATION CHART BELOW:

TYPE OF TREATMENT	CHANNEL GRADE	ACS AC OR LESS)	ACS AC -10AC)
1	0.5-3.0%	SEED AND STRAW MULCH	SEED AND STRAW MULCH
2	3.1-5.0%	SEED AND STRAW MULCH	SEED AND COVER USING NECP
3	5.1-8.0%	SEED AND COVER WITH NECP	LINED WITH 4 0" RIP-RAP OR GEOTEXTILE
4	8.1-20%	LINED WITH 4-8" RIP-RAP OR GEOTEXTILE	ENGINEERED DESIGN

9. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

TEMPORARY SWALE

APPENDIX G

STANDARD CONSTRUCTION INSPECTION FORMS OF STORMWATER FACILITIES

STANDARD MAINTENANCE FORMS OF STORMWATER FACILITIES

Stormwater/Wetland Pond Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
Pre-Construction/Materials and Equipment		
Pre-construction meeting.		
Pipe and appurtenances on-site prior to construction and dimensions checked		
1. Material (including protective coating, if specified)		
2. Diameter		
3. Dimensions of metal riser or pre-cast concrete outlet structure		
4. Required dimensions between water control structures (orifices, weirs, etc.) are in accordance with approved plans		
5. Barrel stub for prefabricated pipe structures at proper angle for design barrel slope		
6. Number and dimensions of prefabricated anti-seep collars		
7. Watertight connectors and gaskets		
8. Outlet drain valve		
Project benchmark near pond site		
Equipment for temporary de watering		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
2. Subgrade Preparation		
Area beneath embankment stripped of all vegetation, topsoil, and organic matter		
3. Pipe Spillway Installation		
Method of installation detailed on plans		
A. Bed preparation		
Installation trench excavated with specified side slopes		
Stable, uniform, dry subgrade of relatively impervious material (If subgrade is wet, contractor shall have defined steps before proceeding with installation)		
Invert at proper elevation and grade		
B. Pipe placement		
Metal / plastic pipe		
1. Watertight connectors and gaskets properly installed		
2. Anti-seep collars properly spaced and having watertight connections to pipe		
3. Backfill placed and tamped by hand under "haunches" of pipe		
4. Remaining backfill placed in max. 8 inch lifts using small power tamping equipment until 2 feet cover over pipe is reached		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
3. Pipe Spillway Installation		
Concrete pipe		
1. Pipe set on blocks or concrete slab for pouring of low cradle		
2. Pipe installed with rubber gasket joints with no spalling in gasket interface area		
3. Excavation for lower half of anti-seep collar(s) with reinforcing steel set		
4. Entire area where anti-seep collar(s) will come in contact with pipe coated with mastic or other approved waterproof sealant		
5. Low cradle and bottom half of anti-seep collar installed as monolithic pour and of an approved mix		
6. Upper half of anti-seep collar(s) formed with reinforcing steel set		
7. Concrete for collar of an approved mix and vibrated into place (protected from freezing while curing, if necessary)		
8. Forms stripped and collar inspected for honeycomb prior to backfilling. Parge if necessary.		
C. Backfilling		
Fill placed in maximum 8 inch lifts		
Backfill taken minimum 2 feet above top of anti-seep collar elevation before traversing with heavy equipment		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
4. Riser / Outlet Structure Installation		
Riser located within embankment		
A. Metal riser		
Riser base excavated or formed on stable subgrade to design dimensions		
Set on blocks to design elevations and plumbed		
Reinforcing bars placed at right angles and projecting into sides of riser		
Concrete poured so as to fill inside of riser to invert of barrel		
B. Pre-cast concrete structure		
Dry and stable subgrade		
Riser base set to design elevation		
If more than one section, no spalling in gasket interface area; gasket or approved caulking material placed securely		
Watertight and structurally sound collar or gasket joint where structure connects to pipe spillway		
C. Poured concrete structure		
Footing excavated or formed on stable subgrade, to design dimensions with reinforcing steel set		
Structure formed to design dimensions, with reinforcing steel set as per plan		
Concrete of an approved mix and vibrated into place (protected from freezing while curing, if necessary)		
Forms stripped & inspected for "honeycomb" prior to backfilling; parge if necessary		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
5. Embankment Construction		
Fill material		
Compaction		
Embankment		
1. Fill placed in specified lifts and compacted with appropriate equipment		
2. Constructed to design cross-section, side slopes and top width		
3. Constructed to design elevation plus allowance for settlement		
6. Impounded Area Construction		
Excavated / graded to design contours and side slopes		
Inlet pipes have adequate outfall protection		
Forebay(s)		
Pond benches		
7. Earth Emergency Spillway Construction		
Spillway located in cut or structurally stabilized with riprap, gabions, concrete, etc.		
Excavated to proper cross-section, side slopes and bottom width		
Entrance channel, crest, and exit channel constructed to design grades and elevations		

Construction Sequence	Satisfactory / Unsatisfactory	Comments
8. Outlet Protection		
A. End section		
Securely in place and properly backfilled		
B. Endwall		
Footing excavated or formed on stable subgrade, to design dimensions and reinforcing steel set, if specified		
Endwall formed to design dimensions with reinforcing steel set as per plan		
Concrete of an approved mix and vibrated into place (protected from freezing, if necessary)		
Forms stripped and structure inspected for "honeycomb" prior to backfilling; parge if necessary		
C. Riprap apron / channel		
Apron / channel excavated to design cross-section with proper transition to existing ground		
Filter fabric in place		
Stone sized as per plan and uniformly place at the thickness specified		
9. Vegetative Stabilization		
Approved seed mixture or sod		
Proper surface preparation and required soil amendments		
Excelsior mat or other stabilization, as per plan		

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
10. Miscellaneous		
Drain for ponds having a permanent pool		
Trash rack / anti-vortex device secured to outlet structure		
Trash protection for low flow pipes, orifices, etc.		
Fencing (when required)		
Access road		
Set aside for clean-out maintenance		
11. Stormwater Wetlands		
Adequate water balance		
Variety of depth zones present		
Approved pondscaping plan in place		
Reinforcement budget for additional plantings		
Plants and materials ordered 6 months prior to construction		
Construction planned to allow for adequate planting and establishment of plant community (April-June planting window)		
Wetland buffer area preserved to maximum extent possible		

Comments:

Stormwater Pond/Wetland Operation, Maintenance and Management Inspection Checklist

Project
Location:
Site Status:

Date:
Time:

Inspector:

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
1. Embankment and emergency spillway (Annual, After Major Storms)		
1. Vegetation and ground cover adequate		
2. Embankment erosion		
3. Animal burrows		
4. Unauthorized planting		
5. Cracking, bulging, or sliding of dam		
a. Upstream face		
b. Downstream face		
c. At or beyond toe		
downstream		
upstream		
d. Emergency spillway		
6.Pond, toe & chimney drains clear and functioning		
7.Seeps/leaks on downstream face		
8.Slope protection or riprap failure		
9. Vertical/horizontal alignment of top of dam "As-Built"		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
10. Emergency spillway clear of obstructions and debris		
11. Other (specify)		
2. Riser and principal spillway (Annual)		
Type: Reinforced concrete Corrugated pipe Masonry		
1. Low flow orifice obstructed		
2. Low flow trash rack a. Debris removal necessary		
b. Corrosion control		
3. Weir trash rack maintenance a. Debris removal necessary		
b. corrosion control		
4. Excessive sediment accumulation inside riser		
5. Concrete/masonry condition riser and barrels a. cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebars exposed)		
d. Joint failures		
e. Water tightness		
6. Metal pipe condition		
7. Control valve a. Operational/exercised		
b. Chained and locked		
8. Pond drain valve a. Operational/exercised		
b. Chained and locked		
9. Outfall channels functioning		
10. Other (specify)		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
3. Permanent Pool (Wet Ponds) (monthly)		
1. Undesirable vegetative growth		
2. Floating or floatable debris removal required		
3. Visible pollution		
4. Shoreline problem		
5. Other (specify)		
4. Sediment Forebays		
1.Sedimentation noted		
2. Sediment cleanout when depth < 50% design depth		
5. Dry Pond Areas		
1. Vegetation adequate		
2. Undesirable vegetative growth		
3. Undesirable woody vegetation		
4. Low flow channels clear of obstructions		
5. Standing water or wet spots		
6. Sediment and / or trash accumulation		
7. Other (specify)		
6. Condition of Outfalls (Annual , After Major Storms)		
1. Riprap failures		
2. Slope erosion		
3. Storm drain pipes		
4.Endwalls / Headwalls		
5. Other (specify)		
7. Other (Monthly)		
1. Encroachment on pond, wetland or easement area		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
2. Complaints from residents		
3.Aesthetics a. Grass growing required		
b. Graffiti removal needed		
c. Other (specify)		
4. Conditions of maintenance access routes.		
5. Signs of hydrocarbon build-up		
6. Any public hazards (specify)		
8. Wetland Vegetation (Annual)		
1. Vegetation healthy and growing Wetland maintaining 50% surface area coverage of wetland plants after the second growing season. (If unsatisfactory, reinforcement plantings needed)		
2. Dominant wetland plants: Survival of desired wetland plant species Distribution according to landscaping plan?		
3. Evidence of invasive species		
4. Maintenance of adequate water depths for desired wetland plant species		
5. Harvesting of emergent plantings needed		
6. Have sediment accumulations reduced pool volume significantly or are plants "choked" with sediment		
7. Eutrophication level of the wetland.		
8. Other (specify)		

Comments:

Bioretention Operation, Maintenance and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Bioretention and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Monthly)		
Plant height not less than design water depth		
Fertilized per specifications		
Plant composition according to approved plans		
No placement of inappropriate plants		
Grass height not greater than 6 inches		
No evidence of erosion		
3. Check Dams/Energy Dissipaters/Sumps (Annual, After Major Storms)		
No evidence of sediment buildup		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Sumps should not be more than 50% full of sediment		
No evidence of erosion at downstream toe of drop structure		
4. Dewatering (Monthly)		
Dewaters between storms		
No evidence of standing water		
5. Sediment Deposition (Annual)		
Swale clean of sediments		
Sediments should not be > 20% of swale design depth		
6. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		
7. Integrity of Filter Bed (Annual)		
Filter bed has not been blocked or filled inappropriately		

Bioretention Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
1. Pre-Construction		
Pre-construction meeting		
Runoff diverted		
Facility area cleared		
If designed as exfilter, soil testing for permeability		
Facility location staked out		
2. Excavation		
Size and location		
Lateral slopes completely level		
If designed as exfilter, ensure that excavation does not compact subsoils.		
Longitudinal slopes within design range		

Construction Sequence	Satisfactory / Unsatisfactory	Comments
3. Structural Components		
Stone diaphragm installed correctly		
Outlets installed correctly		
Underdrain		
Pretreatment devices installed		
Soil bed composition and texture		
4. Vegetation		
Complies with planting specs		
Topsoil adequate in composition and placement		
Adequate erosion control measures in place		
5. Final Inspection		
Dimensions		
Proper stone diaphragm		
Proper outlet		
Soil/ filter bed permeability testing		
Effective stand of vegetation and stabilization		
Construction generated sediments removed		
Contributing watershed stabilized before flow is diverted to the practice		

APPENDIX H

NOTICE OF INTENT (BLANK)

NOTICE OF TERMINATION (BLANK)

CONTRACTOR'S CERTIFICATION STATEMENT (BLANK)

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NOTICE OF INTENT

New York State Department of Environmental Conservation

Division of Water

625 Broadway, 4th Floor

Albany, New York 12233-3505

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-02-01

ALL sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required. To properly complete this form, please refer to the Instruction Manual which can be accessed at www.dec.state.ny.us/website/dow/toolbox/instr_man.pdf

-IMPORTANT-

THIS FORM FOR HANDPRINT ONLY

PRINT CAPITAL LETTERS IN BLACK INK AND AVOID CONTACT WITH THE EDGE OF BOXES
FILL IN CIRCLES COMPLETELY AND DO NOT USE CHECKMARKS
OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State Zip

Phone (Owner/Operator) - -

Fax (Owner/Operator) - -

Email (Owner/Operator)

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Location Information

Project Site Information

Project/Site Name

Street Address (NOT P.O. BOX)

City/Town/Village (THAT ISSUES BUILDING PERMIT)

State NY Zip

County DEC Region (if known)

Name of Nearest Cross Street

Distance to Nearest Cross Street (Feet) Direction to Nearest Cross Street

○ North ○ South ○ East ○ West

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you must go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.state.ny.us/website/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site go to the dropdown menu on the left and choose "Get Coordinates". Click on the center of your site and a small window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting) Y Coordinates (Northing)

2. What is the nature of this construction project?

○ New Construction

○ Redevelopment with increase in imperviousness

○ Redevelopment with no increase in imperviousness

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Project Site Information

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use	Post-Development Future Land Use
○ FOREST	○ SINGLE FAMILY HOME
○ PASTURE/OPEN LAND	○ SINGLE FAMILY SUBDIVISION
○ CULTIVATED LAND	○ TOWN HOME RESIDENTIAL
○ SINGLE FAMILY HOME	○ MULTI-FAMILY RESIDENTIAL
○ SINGLE FAMILY SUBDIVISION	○ INSTITUTIONAL/SCHOOL
○ TOWN HOME RESIDENTIAL	○ INDUSTRIAL
○ MULTIFAMILY RESIDENTIAL	○ COMMERCIAL
○ INSTITUTIONAL/SCHOOL	○ ROAD/HIGHWAY
○ INDUSTRIAL	○ RECREATIONAL/SPORTS FIELD
○ COMMERCIAL	○ BIKE PATH/TRAIL
○ ROAD/HIGHWAY	○ SUBSURFACE UTILITY
○ RECREATIONAL/SPORTS FIELD	○ PARKING LOT
○ BIKE PATH/TRAIL	○ OTHER
○ SUBSURFACE UTILITY	OTHER
○ PARKING LOT	
○ OTHER	
OTHER	

4. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law ? ○ Yes ○ No

5. Is this a project which does not require coverage under the General Permit (e.g. Project done under an Individual SPDES Permit, 401 Certification or department approved remediation)? ○ Yes ○ No

6. Is this property owned by a state authority, state agency or local government? ○ Yes ○ No

7. In accordance with the larger common plan of development or sale; enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage)within the disturbed area. Round to the nearest tenth of an acre.

Total Project Site Acreage	Acreage to be Disturbed	Impervious Area within Disturbed

8. Will there be more than 5 acres disturbed at any given time? ○ Yes ○ No

9. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	B	C	D
%	%	%	%

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10. Is this a phased project? (if yes, The SWPPP must address all planned phases) ○ Yes ○ No

11. Enter the planned start and end dates of the disturbance activities — Start Date __/__/____ – End Date __/__/____

Receiving System(s)

12. Provide the name of the surface waterbody(ies) into which construction site runoff will discharge.

For Questions 13 and 14 refer to the Instruction Manual for a subset of 303(d) segments and TMDL watersheds subject to Condition A of the permit. These waterbodies and watersheds have been identified for regulation within the stormwater program due to a pollutant of concern. The Instruction Manual can be accessed at www.dec.state.ny.us/website/dow/toolbox/instr_man.pdf

13. Has the surface waterbody(ies) in question 12 been identified as a 303(d) segment? ○ Yes ○ No

14. Is this project located in a TMDL Watershed? ○ Yes ○ No

*NOTE: If you answered Yes to either question 13 or 14, Pursuant to Part I.D.3.(b) of the permit, you must have your SWPPP prepared and certified by a licensed/certified professional and the SWPPP is subject to a 60-business day review.

15. Does the site runoff enter a separate storm sewer system- including roadside drains, swales, ditches, culverts, etc? (if no, skip question 16) ○ Yes ○ No ○ Unknown

16. What is the name of the municipality/entity that owns the separate storm sewer system?

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ Yes ○ No ○ Unknown

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Stormwater Pollution Prevention Plan (SWPPP)

18. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book) ? ○ Yes ○ No

19. Does this construction activity require the development of a SWPPP that includes Water Quality and Quantity Control components (Post-Construction Stormwater Management Practices) If no, skip question 20 ○ Yes ○ No

20. Have the Water Quality and Quantity Control components of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual ? ○ Yes ○ No

NOTE: If you answered no to question 18 or 20, Pursuant to Part I.D.3.(b) of the permit, you must have your SWPPP prepared and certified by a licensed/certified professional and the SWPPP is subject to a 60-business day review. Please provide further details in the details/comment section on the last page of this form.

21. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

○ Professional Engineer (P.E.)
○ Soil and Water Conservation District (SWCD)
○ Registered Landscape Architect (R.L.A)
○ Certified Professional in Erosion and Sediment Control (CPESC)
○ Owner/Operator
○ Other

SWPPP Preparer Information
(if different from Owner/Operator info)

SWPPP Preparer

Contact Name (Last, Space, First)

Mailing Address

City

State Zip

Phone Fax

Email

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Stormwater Pollution Prevention Plan (SWPPP)

Erosion and Sediment Control Practices

22. Has a construction sequence schedule for the planned management practices been prepared? ○ Yes ○ No

23. Select all of the erosion and sediment control practices that will be employed on the project site.

Temporary Structural

- ○ Check dams
- ○ Construction Road Stabilization
- ○ Dust Control
- ○ Earth Dike
- ○ Level Spreader
- ○ Perimeter Dike/Swale
- ○ Pipe Slope Drain
- ○ Portable Sediment Tank
- ○ Rock Dam
- ○ Sediment Basin
- ○ Sediment Traps
- ○ Silt Fence
- ○ Stabilized Construction Entrance
- ○ Storm Drain Inlet Protection
- ○ Straw/Hay Bale Dike
- ○ Temporary Access Waterway Crossing
- ○ Temporary Stormdrain Diversion
- ○ Temporary Swale
- ○ Turbidity Curtain
- ○ Water bars

Biotechnical

- ○ Brush Matting
- ○ Wattling

Other

Vegetative Measures

- ○ Brush Matting
- ○ Dune Stabilization
- ○ Grassed Waterway
- ○ Mulching
- ○ Protecting Vegetation
- ○ Recreation Area Improvement
- ○ Seeding
- ○ Sodding
- ○ Straw/Hay Bale Dike
- ○ Streambank Protection
- ○ Temporary Swale
- ○ Topsoiling
- ○ Vegetating Waterways

Permanent Structural

- ○ Debris Basin
- ○ Diversion
- ○ Grade Stabilization Structure
- ○ Land Grading
- ○ Lined Waterway (Rock)
- ○ Paved Channel (Concrete)
- ○ Paved Flume
- ○ Retaining Wall
- ○ Riprap Slope Protection
- ○ Rock Outlet Protection
- ○ Streambank Protection

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Stormwater Pollution Prevention Plan (SWPPP)

Water Quality and Quantity Control

Important: Completion of Questions 24-30 is not required if the project:

Disturbs less than 5 acres and is planned for single-family residential homes (including subdivisions) or construction on agricultural property and does not have a discharge to a 303(d) water or is not located within a TMDL watershed.

Additionally, sites where there will be no future impervious area within the disturbed area and that do not have a change (pre to post development) in hydrology do not need to complete questions 24-30.

24. Indicate all the permanent Stormwater Management Practice(s) that will be installed on this site

Post Construction Stormwater Management Practices

Ponds

- ○ Micropool Extended Detention (P-1)
- ○ Wet Pond (P-2)
- ○ Wet Extended Detention (P-3)
- ○ Multiple Pond System (P-4)
- ○ Pocket Pond (P-5)

Filtering

- ○ Surface Sand Filter (F-1)
- ○ Underground Sand Filter (F-2)
- ○ Perimeter Sand Filter (F-3)
- ○ Organic Filter (F-4)
- ○ Bioretention (F-5)
- ○ Other

Wetlands

- ○ Shallow Wetland (W-1)
- ○ Extended Detention Wetland (W-2)
- ○ Pond/Wetland System (W-3)
- ○ Pocket Wetland (W-4)

Infiltration

- ○ Infiltration Trench (I-1)
- ○ Infiltration Basin (I-2)
- ○ Dry Well (I-3)

Open Channels

- ○ Dry Swale (O-1)
- ○ Wet Swale (O-2)

Describe other stormwater management practices not listed above or explain any deviations from the technical standards. If the SWPPP does not conform to the technical standards, the SWPPP must be prepared and certified by a licensed/certified professional and is subject to a 60-business day review.

Has a long term Operation and Maintenance plan for the post construction management practices been developed? ○ Yes ○ No

If Yes, Identify the entity responsible for the long term Operation and Maintenance

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Stormwater Pollution Prevention Plan (SWPPP)
Water Quality and Quantity Control

25 Provide the total water quality volume required and the total provided for the site.

Total Water Quality Volume (WQv)

WQv Required ____ acre-feet

WQv Provided ____ acre-feet

26. Provide the following Onified Stormwater Sizing Criteria for the site.

Total Channel Protection Storage Volume (CPv) - Extended detention of post-developed 1 year, 24 hour storm event

CPv Required ____ acre-feet

CPv Provided ____ acre-feet

The need to provide for channel protection has been waived because:
- ○ Site discharges directly to fourth order stream or larger

Total Overbank Flood Control Criteria (Qp) - Peak discharge rate for the 10 year storm

Pre-Development ____ CFS

Post-development ____ CFS

Total Extreme Flood Control Criteria (Qf) - Peak discharge rate for the 100 year storm

Pre-Development ____ CFS

Post-development ____ CFS

The need to provide for flood control has been waived because:
- ○ Site discharges directly to fourth order stream or larger
- ○ Downstream analysis reveals that flood control is not required

IMPORTANT: For questions 27 and 28 impervious area should be calculated considering the project site and all offsite areas that drain to the post-construction stormwater management practice(s) (Total Drainage Area = Project Site + Offsite areas)

27. Pre-Construction Impervious Area - As a percent of the Total Drainage Area enter the percentage of the existing impervious areas before construction begins. ____ %

28. Post-Construction Impervious Area - As a percent of the Total Drainage Area enter the percentage of the future impervious areas that will be created/remain on the site after completion of construction. ____ %

29. Indicate the total number of permanent stormwater management practices to be installed ____

30. Provide the total number of stormwater discharge points from the site (include discharges to either surface waters or to separate storm sewer systems) ____

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7. Other Permits

31. Select any other DEC permits that are required for this project or ○ None

DEC Permits

○ Air Pollution Control	○ Stream Protection/Article 15
○ Coastal Erosion	○ Water Quality Certificate
○ Hazardous Waste	○ Dam Safety
○ Long Island Wells	○ Water Supply
○ Mined Land Reclamation	○ Freshwater Wetlands
○ Other SPDES	○ Tidal Wetlands
○ Solid Waste	○ Wild, Scenic and Recreational Rivers

Other

If this NOI is being submitted for the purpose of continuing coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned.

NYR

8. Delete/Comments

9. Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I also certify under penalty of law that this document and the corresponding documents were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person(s) who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name

MI

Print Last Name

Owner/Operator Signature

Date

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NOTICE OF TERMINATION for Storm Water Discharges Associated with Construction Activity UNDER SPDES GENERAL PERMIT: ☐ #GP-93-06 or ☐ #GP-02-01

Please indicate your permit identification number: NYR _ _ _ _ _ _ _ _ _ _

I. Permittee Information

1. Owner/Operator Name:

2a. Mailing Address: 2b. City/State/Zip:

3a. Contact Person: 3b. Phone: 3c. E-mail:

II. Site Activity Information

4. Facility/Project Site Name:

5a. Street Address: 5b. City/State/Zip:

6. County:

III. Reason for Termination

7a. ☐ Site has been finally stabilized in accordance with permit and SWPPP. Date site stabilization completed: _____ month/year

7b. ☐ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR _ _ _ _ _ _ _ _ _ _
(Note: Permit coverage can not be terminated by permittee identified in 1. above until new owner/operator obtains coverage under GP-02-01)

IV. Final Site Information

8a. Are there permanent stormwater management practices remaining on the site? ☐ yes ☐ no
If the answer to question 8a. is no, go to question 8c.
If the answer to question 8a. is yes, answer the following questions 8b., 8c., and 8d.:
8b. Is the design and function of each permanent practice described in the final SWPPP? ☐ yes ☐ no
8c. Who will be responsible for long-term operation and maintenance of practice(s)? _____
8d. Has the individual(s) responsible for long-term operation and maintenance been given a copy of the operation and maintenance requirements? ☐ yes ☐ no
8e. Provide the total acreage of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? _____

V. Certification

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person(s) who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name: Title/Position:

Signature: Date:

Reset Button

03/16/06

b. **Operators Certification**

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Name (please print): _____

Title _____ **Date:** _____

Address: _____

Phone: _____ **Email:** _____

Signature: _____

c. **Qualified Professional's Credentials & Certification**

"I hereby certify that I meet the criteria set forth in the General Permit to conduct site inspections for this project and that the appropriate erosion and sediment controls described in the SWPPP and as described in the following Pre-construction Site Assessment Checklist have been adequately installed or implemented, ensuring the overall preparedness of this site for the commencement of construction."

Name (please print): _____

Title _____ **Date:** _____

Address: _____

Phone: _____ **Email:** _____

Signature: _____

APPENDIX I

SITE PLANS

SEE DEIS APPENDIX A