Appendix D

STORMWATER POLLUTION
PREVENTION PLAN

YORKTOWN FARMS SUBDIVISION

TOWN OF YORKTOWN
WESTCHESTER COUNTY, NEW YORK

STORMWATER POLLUTION PREVENTION PLAN

July 31, 2007

Prepared For;
37 Croton Dam Road Corp.

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PROJECT: Yorktown Farms
Town of Yorktown, NY

SCOPE: Stormwater Pollution Prevention Plan

DATE: July 31, 2007

INTRODUCTION:

The proposed construction of new twenty two (22) homes on a 43.12-acre site, the construction of approximately 2,000 LF of off site sanitary sewer, and a sewage pump station, requires the study of stormwater as required by the New York State Department of Environmental Conservation (NYSDEC). Additionally, a portion of the proposed construction is within the New York City Department of Environmental Protection (NYCDEP) watershed; therefore, this Stormwater Pollution Prevention Plan (SWPPP) is prepared to comply with both the NYSDEC and NYCDEP standards and regulations.

The technical standards used to prepare erosion and sediment control are contained in the document, *"New York Standards and Specifications for Erosion and Sediment Control"* published by the Empire State Chapter of the Soil and Water Conservation Society. For the design of water quantity and water quality controls (post-construction stormwater control practices**)**, the NYSDEC's technical standards are detailed in the *"New York State Stormwater Management Design Manual"* (NYSSDM). The publication "*Reducing the impacts of Stormwater Runoff from New Development"* (RTISRND) is utilized for pollutant load analysis required by NYCDEP.

SITE DESCRIPTION

The property is located on the easterly edge of the Town of Yorktown, adjacent to the Town of Somers. The Yorktown Farms Subdivision has road frontage along US Route 6; however, primary access will be from Gay Ridge Road. The proposed road connection to US Route 6 will only be for emergency access.

The stormwater runoff is broken into five (5) watersheds. The study points are identified on the Existing Watershed Map. Watersheds 1, 2 and 5 contribute to the Peekskill Hollow Brook, part of the Upper Hudson River Basin. These watersheds are under the jurisdiction of the NYSDEC only. Watersheds 3 and 4 contribute to the Hallocks Mill Brook Basin, part of the Croton River Basin. Therefore, stormwater management practices serving watersheds 3 and 4 will require the approvals of both the NYSDEC and the NYCDEP.

Portions of the property contain agricultural meadows, NYSDEC identified wetlands, Town of Yorktown identified wetlands, and areas of woods. The soil on the property has been primarily classified by the Soil Conservation Service as follows;
(PnB) Paxton fine sandy loam, 2 to 8 percent slopes, Hydrologic Group C
(RdB) Ridgebury loam, 3 to 8 percent slopes, Hydrologic Group C
(RgB) Ridgebury loam, 2 to 8 percent slopes, very stony, Hydrologic Group C
(WdC) Woodbridge loam, 8 to 15 percent slopes, Hydrologic Group C
(WdB) Woodbridge loam, 3 to 8 percent slopes, Hydrologic Group C
(CrC) Charlton Chatlfiled complex, rolling, very rocky, Hydrologic Group B
(Sh) Sun Loam, Hydrologic Group D

The following plans illustrate the proposed improvements:

1. Preliminary Site Plan & Utility Plan, Prepared for Yorktown Farms, Town of Yorktown, NY, dated January 22, 2006, last revised July 23, 2007. (Sheet 1 of 7 sheets)
2. Existing Conditions, Prepared for Yorktown Farms, Town of Yorktown, NY, dated November 5, 2004. (Sheet 2 of 7 sheets)
3. Preliminary Erosion Control Plan, Prepared for Yorktown Farms, Town of Yorktown, NY, dated April 14, last revised July 25, 2007. (Sheet 3 of 7 sheets)
4. Wetland Crossing Along Road 'A', Prepared for Yorktown Farms, Town of Yorktown, NY, dated January 25, 2007. (Sheet 4 of 7 sheets)
5. Road Profiles, Prepared for Yorktown Farms, Town of Yorktown, NY, dated January 25, 2007. (Sheet 5 of 7 sheets)
6. Details, Prepared for Yorktown Farms, Town of Yorktown, NY, dated January 19, 2004. (Sheet 6 of 7 sheets)
7. Erosion Details, Prepared for Yorktown Farms, Town of Yorktown, NY, dated January 19, 2004. (Sheet 7 of 7 sheets)

CONSTRUCTION SEQUENCE

The applicant proposes to construct the project as one (1) phase; however, this phase will be broken down into a sequence that will minimize the potential for erosion. Construction is scheduled to begin in the Fall of 2007. The general sequence of construction operations shall proceed as follows:

1. STAKEOUT/EROSION CONTROL PLACEMENT/CLEARING

The initial fieldwork shall consist of surveying and staking for erosion control placement and disturbance limits. Trees to be preserved shall be marked and protected prior to commencement of clearing operations. The stabilized construction entrance shall be installed in this phase of construction. Erosion controls shall be installed per the erosion control plans and details for the project. Layout and placement of construction trailers, field offices and a construction yard shall commence. Grubbing of stumps shall begin following the installation of an anti-tracking strip at the construction entrance. Tree clearing shall begin prior to the completion of the silt fence installation in order to minimize damage to the silt fence. The clearing operations will proceed concurrently with the installation of the silt fence.

2. SEWER DISTRICT UTILITY WORK IN EXISTING ROADWAYS

Prior to any building construction of the proposed 22 houses, sewer utility work shall be completed in the existing neighborhoods to be served by the proposed sewer district. The proposed pump station and valve connection to the existing force main located in Route 6 shall be completed. Protection from sediment transporting during stormwater runoff events through the existing drainage system shall be performed through standard inlet protection erosion control devices.

3. EARTHWORK/BLASTING/DRAINAGE

Once brush, stumps and other woody materials have been removed, rough grading operations shall commence. Initial earthwork operations involve the installation of some structural erosion control devices. Temporary sediment ponds shall be constructed as soon as practical. The ponds shall be fully stabilized prior to any runoff being directed into them. Once the ponds are stabilized, temporary diversions may be constructed to direct runoff into the ponds.

Topsoil shall be stripped and stockpiled. Re-grading for the proposed roadwork shall proceed along with the stockpiling of materials. Stockpiled topsoil shall be seeded for temporary erosion control purposes. Areas of disturbed soils, remaining disturbed for more than 14 days shall be temporarily controlled with seed and hay. Temporary seeding shall be composed of Ryegrass (annual or perennial) @ 30 lbs per acre (0.7 lbs/1000 sq. ft.) and Certified 'Aroostock' winter rye (cereal rye) @ 100 lbs. per acre (2.5 lbs./100 sq.ft.). Use winter rye if seeding in October/November.

4. GRADING/DRAINAGE/UTILITY INSTALLATION

As the road grade nears finished elevation, utilities for drainage, sewer, water and electric among others shall be installed. Once heavy equipment operations are completed, grading, seeding, sodding, and other soil stabilizing landscaping may be installed.

5. ROADWAY

Utility trenches are backfilled, compacted and prepared for the installation of roadway base materials, curbing and lawn or landscaping treatments.

6. BUILDING CONSTRUCTION

Silt fencing and/or silt fence backed by haybales shall be installed as shown on the erosion control plans for the project. The utilities are installed to the proposed buildings and excavation for footings and foundations commences. The building superstructure construction begins once the foundations have cured. These areas shall be graded and have drainage systems installed, and be stabilized. Houses under construction after the main road has been paved require the installation of a stabilized construction entrances.

7. PAVING

Binder pavement will be installed after the completion of the utility work when possible. Internal roadways, shall receive top course pavement, striping and markings as heavy equipment is no longer required onsite.

8. REMOVAL OF EROSION CONTROL DEVICES

As areas are stabilized, collected sediments shall be removed and erosion control devices shall be discarded. Upon completion of all homes and site improvements, the top course of paving shall be applied.

TEMPORARY EROSION CONTROL BMP'S

The temporary sediment and erosion control devices designed for this project are as follows:

1. Silt Fence: This fabric barrier is proposed to capture suspended sediments and decrease the velocity of the runoff to protect downstream water bodies and wetlands. Details for construction and locations are shown on the plans.

2. Haybales are used in a variety of erosion control devices proposed for the project. At the top of an excavation, haybales spread out concentrated flow to prevent erosion. Haybales are used in conjunction with silt fence to protect wetlands and water bodies from adjacent construction activities. Details for construction and locations are shown on the plans.

3. Temporary sediment basin: The water quality basins proposed for the site shall be used as temporary sediment basins during the construction phase. Temporary sediment pond design methods are as per the publication "New York Guidelines for Urban Erosion and Sediment Control, 1991". Details for construction and locations are shown on the plans.

4. Temporary diversions are designed as temporary swales as described in the publication "New York Guidelines for Urban Erosion and Sediment Control, 1991" Details for construction and locations are shown on the plans.

5. Inlet protection insures that runoff passes through a filter prior to entering a closed drainage system.

6. The Stabilized Construction Entrance shall be a minimum of 25 feet in width and be 50 feet in length. Riprap size shall be 3" crushed stone. The pad shall be 6" thick. Details for construction and locations are shown on the plans.

7. Establish temporary grass to inactive areas. Temporary seeding shall be composed of Ryegrass (annual or perennial) @ 30 lbs per acre (0.7 lbs/1000 sq. ft.) and Certified 'Aroostock' winter rye (cereal rye) @ 100 lbs. per acre (2.5 lbs./100 sq.ft.). Use winter rye if seeding in October/November.

INSPECTION AND MAINTENANCE SCHEDULE OF TEMPORARY FEATURES

SILT FENCE: Inspection of the silt fence shall be performed on a weekly basis and after every major storm event exceeding ½ inch of total rainfall.

HAYBALES: Inspection of the haybales shall be performed on a weekly basis and after every major storm event exceeding ½ inch of total rainfall.

CONSTRUCTION ENTRANCE: Inspection of the stabilized construction entrance shall be performed on a weekly basis and after every major storm event exceeding ½ inch of total rainfall.

TEMPORARY GRASS: Inspection of the temporary grass shall be performed on a weekly basis and after every major storm event exceeding ½ inch of total rainfall

PERMANENT STORMWATER FEATURES

The construction of the twenty two (22) homes at Yorktown Farms will disturb more than one (1) acre, and is tributary to the Croton Reservoir Basin and the Upper Hudson River Basin, as discussed in the SITE DESCRIPTION section of the SWPPP. The Croton Reservoir Basin has a Total Maximum Daily Load (TMDL) program; therefore, the project requires the preparation of a SWPPP which contains water quality and quantity control plan components.

The rainfall amounts required to satisfy the stormwater design criteria for Yorktown are summarized in Table 1.

Table 1:Design Storm Summary Table

		Storm	Rainfall (in.)
Water Quality Volume*	WQ_v	90%	1.3* 3.5 (NYCDEP)
Channel Protection Volume	Cp_v	1 Year	2.8
		2 Year	3.5
		5 Year	4.5
Overbank Flood Protection Volume	Q_p	10 Year	5.0
		25 Year	6.0
		50 Year	7.0
Extreme Flood Protection Volume	Q_f	100 Year	7.5

NYSDEC uses 1.3" for water quality calculations; NYCDEP uses 3.5"(2-year storm) for water quality calculations.

The proposed stormwater practices have been sized based upon the methodology described in the SDM, stormwater sizing criteria is as follows:

- Water Quality (WQ_v) must be captured and treated,
- Channel Protection (Cp_v) must be provided by detaining the post developed 1-year, 24-hour storm event for 24 hours.
- Overbank Flood (Q_p) protection is provided by controlling the peak runoff from the post developed 10-year storm event to the peak runoff from the pre-developed 10-year storm event
- Extreme Storm (Q_f) protection is provided by controlling the peak runoff from the post developed 100-year storm event to the peak runoff from the pre-developed 100-year storm event

For Channel Protection (Cp_v), Overbank Flood Protection (Q_p), Extreme Flood Protection (Q_f) calculations the following methodology was used:

1. The watersheds are divided into subareas, by topography, land use, and SCS soil hydrologic grouping. Tabulations of areas and descriptions are shown on the enclosed maps and tables. A summary of the watershed areas, composite curve numbers, and lag times are provided in Appendix A.

2. The flows from the watersheds in the existing condition are computed to determine undeveloped peak runoff and water elevations in the flood areas.

3. In the post development condition, the flows from the proposed development are computed by using the runoff curve numbers taken from TR-55. The watersheds are adjusted for the proposed grading. The runoff flows are hydraulically routed for updated runoff diversions and new storage structures as necessary. All offsite areas use the same land use and soil conditions for the existing conditions and the proposed conditions since these areas will not change.

4. Maps indicating the existing and the proposed drainage conditions are enclosed in this report. The methods used are those presented in the US Army Corps. of Engineers HEC 1 computer program using a shortened printout for convenience. The 1, 2, 5, 10, 25, 50, and 100-year frequency storms are studied. The SCS type III – 24-hour storm distribution is used throughout. Topographical mapping for the site is taken from the Town of Yorktown topography maps.

Water quality volumes were captured for Watersheds Areas 2, 3 and 5. These three watersheds include the majority of the proposed disturbance.

Stormwater runoff from Watershed 1 is discharged to DP1. There are no control devices for the peak flow rates.

Stormwater runoff from Watershed 2 includes sub areas 2C, 2D, 2E, 2F, 2H, 2J, 2K and 2L. Sub areas 2D, 2F, 2J, and 2K include the majority of the disturbed area and the majority of the impervious areas. Stormwater runoff from the sub areas is treated and discharged through an extended detention basin system. Some of the some of the stormwater runoff originating from impervious surfaces associated with certain homes is discharged to drywell systems. Sub area 2J stormwater runoff is treated with a stormwater filter. Sub area 2A contributes to Pond 'C'. Pond 'A' receives runoff from sub areas 2D and 2H. The disturbed sub areas are captured and discharged into an extended detention basin system. The extended detention basin is controlled by an outlet control structure. The outlet structure includes a low level orifice and a high level overflow weir to control flow and detention times. Flow is system is discharged to DP2.

Stormwater runoff from Watershed 3 includes sub areas 3A, 3A-1, 3B, 3C and 3D. Sub areas 3A, 3A-1, 3B and 3D include the majority of the disturbed area and the majority of the impervious surface created. The disturbed sub areas are captured and discharged into an extended detention basin system. Some of the runoff associated with certain homes is discharged to drywell systems. The extended detention basin is controlled by an outlet control structure. The outlet structure includes a low level orifice and a high level overflow weir to control flow and detention times. Flow from this system is discharged to DP3.

Stormwater runoff from Watershed 4A discharged to DP4. The majority of the stormwater discharge originally associated with watershed 4 is being diverted to watershed 3. This diversion of runoff was made in response to drainage concerns described by Stonewall Court residents during a public hearing.

Stormwater runoff from Watershed 5 includes sub areas 5A and 5B. Sub area 5A includes the majority of the impervious surface area created. Sub area 5a contributes to extended detention Pond 'C' which discharges to DP5. The outlet structure includes a low level orifice and a high level overflow weir to control flow and detention times.

Upland and downland areas which are not disturbed are diverted around the stormwater treatment systems, where reasonable.

Water Quality Volume ($WQ_{v)}$

Water Quality Volume is achieved through extended detention basins and filters. Tables 2a and 2b summarize how the WQ_v criteria are being achieved within each watershed.

Channel Protection (Cp_v)

Channel protection for this project has been achieved by the use of the extended detention basin. Although, NYCDEP water quality criteria of detaining the runoff from the 2-year storm for 24-hours has been met, NYSDEC criteria for channel protection of detaining the 1-year storm for 24-hours must also be met. Since the entire 1 year storm runoff is discharged through the low-level orifices of each extended detention ponds, and the center of mass of the inflow hydrograph and the outlet hydrographs for the 1 year storm have a difference in excess of 24 hours, channel protection has been achieved. To further ensure channel protection, the proposed runoff from the 1-year storm has been maintained or reduced at all the above mentioned design points.

Overbank Flood Protection (Q_p), Extreme Flood Protection (Q_f)

Overbank Flood and Extreme Flood Protection must be provided at the point where the runoff leaves the site, at the property line, which in this case is Design Points 1, 2, 3, 4 and 5.

Overbank flood protection and Extreme storm protection is achieved by the addition of extended detention basins and the filtration system. In conjunction with capturing and treating in excess of the required water quality volume, the proposed basins and filtration system also contribute to Overbank Flood Protection and Extreme Flood Protection.

The effectiveness of the proposed detention basins and organic filter to mitigate peak flows was evaluated utilizing the HEC-1 computer model. Several storms were analyzed, and the results are summarized in Table 3. Table 3 provides a comparison of the existing peak flows to the proposed peak flows.

The provided pretreatment volume exceeds the required pretreatment volume requirements. The provided storage volume requirement exceeds the required storage volume requirements.

NYCDEP Water Quality Volume (WQ_v)

The water quality volume (WQ_v) was calculated by using the following TR-55 runoff formulas:

$Q=[P-0.2(1000/CN-10)]^2 / [P-0.8(1000/CN-10)]$
Q = Runoff (inches)
P = Rainfall (inches)
S = (1000/CN-10)

To find the total volume, the runoff is multiplied by the area of the watershed.

The water quality volumes for this report were calculated using composite curve numbers calculated from TR-55.

Table 2a: Water Quality Volume Summary (NYCDEP)

Watershed Name	Watershed Area (Acres)	Rainfall Amount P (Inches)	Curve Number CN	Runoff Q (Inches)	Total WQv (Cf)
3A	7.47	3.5	73.23	0.73	32359
3A-1	2.48	3.5	73.23	0.73	10743
3B	0.25	3.5	74	0.70	1125
3C	5.88	3.5	71.43	0.80	23226
3C-1	0.17	3.5	71.43	0.80	672
3D	2.22	3.5	80.7	0.48	13592
4A	0.14	3.5	55	1.64	176

NYSDEC Water Quality Volume (WQ_v)

The water quality volume (WQ_v) was calculated by using the following formulas:

$$WQ_v = ((P)(R_v)(A))/12)$$

$R_v = 0.05+0.009(I)$
I = Impervious Cover (percent)
Minimum $R_v = 0.2$
P = 90% Rainfall Event Number (For Westchester use 1.3)
A = Site Area in acres

Table 2b: WQ_v Summary (NYSDEC)

WQ System	Trib. Area	Imperious	Imperious	90% Rainfall	Rv	WQv
	(acres)	(acres)	(%)	(inches)	(min=0.20)	(CF)
1	1.93	0.00	0.00	1.30	0.20	0.00
2C	4.03	0.00	0.00	1.30	0.20	0.00
2D	1.23	0.73	59.27	1.30	0.58	3386.35
2E	17.54	0.00	0.00	1.30	0.20	0.00
2F	7.82	1.02	13.06	1.30	0.20	7384.29
2H	0.26	0.00	0.00	1.30	0.20	0.00
2J	0.19	0.19	100.00	1.30	0.95	869.71
2K	0.13	0.13	100.00	1.30	0.95	587.28
2L	0.16	0.16	100.00	1.30	0.95	699.36
	31.36	**2.23**				**12926.99**
3A	9.95	1.17	11.76	1.30	0.20	9390.81
3B	0.25	0.00	0.00	1.30	0.20	0.00
3C	6.05	0.17	2.84	1.30	0.20	5709.99
3D	2.22	0.66	29.64	1.30	0.32	3318.40
	18.47	**2.00**				**18419.20**
4	0.14	0.00	0.00	1.30	0.20	0.00
5A	3.95	0.54	13.67	1.30	0.20	3728.01
5B	0.65	0.27	40.83	1.30	0.42	1278.61
	4.60	**0.81**				**5006.62**

Table 3- Existing & Post Development Peak Flow Comparison

DESIGN POINT	STORM EVENT	EXISTING PEAK FLOW	PROPOSED PEAK FLOW	NET CHANGE	PERCENTCHANGE OVER PRIOR CONDITION	CHECK
	(YR)	(CFS)	(CFS)	(CFS)		
DP1	100	18.2	6.0	12.1	-66.8%	OK
	50	16.3	5.4	10.9	-66.7%	OK
	25	12.6	4.2	8.4	-66.4%	OK
	10	9.1	3.1	6.0	-66.0%	OK
	5	7.4	2.5	4.9	-65.8%	OK
	2	4.2	1.5	2.8	-64.8%	OK
	1	2.3	0.9	1.5	-63.0%	OK
DESIGN POINT	STORM EVENT	EXISTING PEAK FLOW	PROPOSED PEAK FLOW	NET CHANGE	PERCENTCHANGE OVER PRIOR CONDITION	CHECK
	(YR)	(CFS)	(CFS)	(CFS)		
DP2	100	75.0	74.1	0.9	-1.2%	OK
	50	67.8	66.6	1.2	-1.8%	OK
	25	53.8	52.0	1.8	-3.4%	OK
	10	40.0	37.7	2.3	-5.8%	OK
	5	33.5	31.1	2.4	-7.1%	OK
	2	20.8	18.5	2.4	-11.3%	OK
	1	13.1	10.6	2.5	-18.8%	OK
DESIGN POINT	STORM EVENT	EXISTING PEAK FLOW	PROPOSED PEAK FLOW	NET CHANGE	PERCENTCHANGE OVER PRIOR CONDITION	CHECK
	(YR)	(CFS)	(CFS)	(CFS)		
DP3	100	35.5	21.8	13.7	-38.7%	OK
	50	31.5	19.6	11.9	-37.8%	OK
	25	23.7	15.3	8.4	-35.5%	OK
	10	16.3	11.1	5.2	-31.9%	OK
	5	12.9	9.1	3.8	-29.2%	OK
	2	6.6	5.3	1.2	-18.9%	OK
	1	3.1	3.0	0.1	3.2%	OK
DESIGN POINT	STORM EVENT	EXISTING PEAK FLOW	PROPOSED PEAK FLOW	NET CHANGE	PERCENTCHANGE OVER PRIOR CONDITION	CHECK
	(YR)	(CFS)	(CFS)	(CFS)		
DP4	100	4.4	0.3	4.1	-93.5%	OK
	50	3.8	0.2	3.6	-93.7%	OK
	25	2.8	0.2	2.6	-94.0%	OK
	10	1.8	0.1	1.7	-94.5%	OK
	5	1.4	0.1	1.3	-95.0%	OK
	2	0.7	0.0	0.6	-96.3%	OK
	1	0.3	0.0	0.3	-98.6%	OK

DESIGN POINT	STORM EVENT	EXISTING PEAK FLOW	PROPOSED PEAK FLOW	NET CHANGE	PERCENTCHANGE OVER PRIOR CONDITION	CHECK
	(YR)	(CFS)	(CFS)	(CFS)		
DP5	100	31.5	10.9	20.6	-65.4%	OK
	50	28.2	8.7	19.5	-69.2%	OK
	25	21.9	7.5	14.4	-65.7%	OK
	10	15.8	6.3	9.6	-60.4%	OK
	5	12.9	5.6	7.4	-57.0%	OK
	2	7.5	4.0	3.5	-47.1%	OK
	1	4.2	2.3	1.9	-44.7%	OK

Extended Detention Ponds

The extended detention ponds are designed as described in the NYSSDM. The ponds are designed to provide water quality and peak runoff rate controls. The design of the ponds is summarized in the Table 4.

Table 4 Extended Detention Pond Sizing

WQ System	Required WQv	Provided WQv	Required Pretreatment	Provided Pretreatment	Required Storage	Provided Storage
	cu. Ft.	cu. Ft	cu. Ft.	cu. Ft.	cu. Ft.	cu. Ft.
A	12,927	12,927	3,232	4,170	19,999	31,246
C	5,007	5,007	1,252	5,130	15,333	20,576
D	18,419	44,501	4,605	8,759	70,460	88,601
E					75,233	88601

The provided pretreatment volume exceeds the required pretreatment volume requirements. The provided storage volume requirement exceeds the required storage volume requirements.

POLLUTANT LOAD ANALYSIS

As required by the NYCDEP, we have enclosed computations using the 'Simple Method' for specific non-point source pollutant loads for the predevelopment and post development conditions. The method employed is described in the publication "*Reducing the impacts of Stormwater Runoff from New Development"* (RTISRND)" published by the NYSDEC.

The Pollutant Loading Estimates reflects 8 of the 22 new residential lots, a large portion of open space area and a portion of the Stonewall Court neighborhood contributing to the NYSDEP watershed. The basins are designed based upon capturing and treating the 2 year storm event. Pollutant removal rates for all devices including extended detention basins reflect the median range published by NYSDEC.

METHODOLOGY:

The entire contributing site and adjacent areas are segmented into subareas by land use, watershed design point, and SCS soil hydrologic grouping. The subareas are individually tabulated for nutrients and sediment in the prior, undisturbed condition, and the final condition for disturbed and non-disturbed areas. Mitigating treatment consists of extended detention basins, drywells, organic filters and naturally existing wooded and vegetated areas.

Pollutant loading coefficients are taken from the Terrene Institute 1994 for Total Suspended Solids, Total Phosphorus, Total Nitrogen and Fecal Coliform. The NYSDEC publication "Reducing the impacts of Stormwater Runoff from New Development", dated April 1993, page 40, Table 9 for BOD. The annual exported loads are determined by multiplying the area of each watershed times the coefficient to determine the pollutant loading. The coefficients are in units of lbs/acre/year. The pre development and post development loads used in the analysis are summarized in Table 5

Stormwater devices proposed for the project include extended detention basins, drywells and deep catch basins, and naturally wooded or vegetated areas. Removal efficiencies for these devices are listed in the NYSDEC manual, "Reducing the impacts of Stormwater Runoff from New Development", page 90, Figure`` 15. Removal efficiencies for bacteria have been taken from Table 7.4. A description of the water quality devices and their expected pollutant removal efficiencies follow.

TABLE 5: Pollutant Loads

Pollutant	Reference	Pre Development	Post Development
Nitrogen	NYS DEC RTISRND Table 8	0.78 mg/l (Hardwood Forest)	63.6 mg/l (New Suburban Sites)
Phosphorous	NYS DEC RTISRND Table 8	0.15 mg/l (Hardwood Forest)	0.26 mg/l (New Suburban Sites)
Oxygen Demand	NYS DEC RTISRND Table 8/9	6 lbs/acre/year (Hardwood Forest)	63.6 mg/l (New Suburban Sites)
Sediment	USEPA Fund. Urban Runoff Management Table 2.6	129.9 lbs/acre/year (Forest)	302.6 lbs/acre/year (Single Family Low Density)
Fecal Coliform	NYS Design Manual	6.1 x 10^9 lbs/acre/year	1.4 x 10^10 lbs/acre/year

Table 6: THE SIMPLE METHOD – POLLUTANT LOADING ESTIMATES

L	POLLUTANT LOADING (LBS/YEAR)
P	ANNUAL PRECIPITATION (IN/YEAR)
Pj	CORRECTION FACTOR FOR STORMS PRODUCING NO RUNOFF
Rv	RUNOFF COEFFICIENT = (0.05+0.009*I)
I	PERCENT IMPERVIOUS WITHIN WATERSHED
C	FLOW WEIGHTED MEAN CONCENTRATION OF POLLUTANT (mg/L)
A_T	DEVELOPED AREA TRIBUTARY TO DESIGN POINT (ACRES)
L	[(P)(Pj)(Rv)/12]I(A)(2.72)
12, 2.72	CONVERSION FACTORS

THE SIMPLE METHOD – POLLUTANT LOADING ESTIMATES (Sample Calculation) (without mitigation)			
		Pre Development	Post Development
I		0.00%	63.8%
P	in/yr	42	42
Pj		0.9	0.9
Rv		0.05	0.62
C_{PHOS}	mg/L	0.15	0.26
A_T	acres	2.737	2.737
L_{PHOS}	lb/yr	0.19	1.34

Table 7: TOTAL POLLUTANT LOADS PREDEVELOPMENT

WATERSHED	3A	3A-1	3B	3C	3C-1	3D	4A
$L_{NITROGEN}$	6.3	4.0	0.1	2.0	1.1	4.7	0.0
L_{PHOS}	1.2	0.8	0.0	0.4	0.2	0.9	0.0
L_{BOD}	44.8	14.9	1.5	35.3	1.0	13.3	0.8
L_{TSS}	970.8	321.7	32.5	763.6	22.3	288.4	18.2
L_{BAC} $x10^9$	45.59	34.67	1.52	35.86	1.05	13.54	0.85

Table 8: TOTAL POLLUTANT LOADS POSTDEVELOPMENT (WITHOUT MITIGATION)

WATERSHED	3A	3A-1	3B	3C	3C-1	3D	4A
$L_{NITROGEN}$	6.3	4.0	0.1	2.0	1.1	4.7	0.0
L_{PHOS}	1.2	0.8	0.0	0.4	0.2	0.9	0.0
L_{BOD}	44.8	14.9	1.5	35.3	1.0	13.3	0.8
L_{TSS}	970.8	321.7	32.5	763.6	22.3	288.4	18.2
L_{BAC} $x10^9$	105	34.67	1.53	82.29	2.41	31.08	0.85

Table 9: MINIMUM POLLUTANT LOADS TO BE REMOVED

WATERSHED	3A	3A-1	3B	3C	3C-1	3D	4A
$L_{NITROGEN}$	9.8	6.3	0.1	3.1	1.7	7.4	0.1
L_{PHOS}	0.9	0.6	0.0	0.3	0.2	0.7	0.0
L_{BOD}	52.3	17.3	1.8	41.1	1.2	15.5	1.0
L_{TSS}	1290	427.7	43.2	1015.1	29.7	383.4	24.2
L_{BAC} $x10^9$	59.04	0	0	46.44	1.36	17.54	0

POLLUTANT MITIGATION DEVICES:

Extended Detention Basin

Extended detention basin removal efficiency is based on the volume captured and the detention time of the runoff. Basins for the site are modeled as “Design 3”. This device captures the runoff from the 2-year storm event. This captured volume is detained for a minimum of 24-hours as shown on the hydrographs in the Appendix for the project. Removal efficiencies for the extended detention basins studied in this report are summarized as follows:

	Suspended Sed.	Total Phosphorus	Total Nitrogen	Oxygen Demand	Fecal Coliform
Medium	80%	60%	40%	40%	70%

Extended detention basins are designed for use in watershed 3A, 3B and 3D.

Drywells

Drywells are modeled as “Design 8”. This device captures runoff from the 2-year storm event. The drywells capture and infiltrate runoff from the proposed impervious areas. The removal efficiencies from the drywells are in the low range for expected removal efficiencies. The drywells capture and infiltrate runoff from the proposed impervious areas.

	Suspended Sed.	Total Phosphorus	Total Nitrogen	Oxygen Demand	Fecal Coliform
Drywell	80%	40%	40%	60%	70%

Drywells are proposed for Watershed 3C.

Naturally wooded and vegetated areas

Naturally wooded and vegetated areas provide additional mitigation. These areas are made up of the naturally wooded and vegetated areas outside of the clearing and grading limit line and are modeled as a forested strip. Removal efficiencies from the naturally wooded or vegetated areas are 80% for sediment, 40% for phosphorous, 40% for nitrogen and 60% for BOD.

	Suspended Sed.	Total Phosphorus	Total Nitrogen	Oxygen Demand	Fecal Coliform
Wood/veg Areas	80%	40%	40%	60%	0%

Naturally wooded and vegetated areas are proposed for Watersheds 3A, 3B, 3C, 3D and 4A.

ANALYSIS

Table 10: Removal Efficiency Analysis

			Mitigation Steps	
Watershed 3A	Pre Development (lb/yr)	Post Development (lb/yr)	Pond 1	Pond 2
L (Nitrogen)	6.3	16.1	9.68	5.81
L (Phos)	1.2	2.1	0.84	0.34
L (BOD)	44.8	97.2	58.29	34.98
L (TSS)	970.8	2261.4	452.28	90.46
L(BAC)	45587137282	104626216713	31387865014	9416359504
			Mitigation Steps	
Watershed 3A -1	Pre Development (lb/yr)	Post Development (lb/yr)	Pond 1	Pond 2
L (Nitrogen)	4.0	10.3	6.19	3.71
L (Phos)	0.8	1.3	0.54	0.21
L (BOD)	14.9	32.2	19.32	11.59
L (TSS)	321.7	749.4	149.89	29.98
L(BAC)	34673783287.4	34673783287.4	10402134986	3120640496
			Mitigation Steps	
Watershed 3B	Pre Development (lb/yr)	Post Development (lb/yr)		Pond 2
L (Nitrogen)	0.1	0.2	0.21	0.13
L (Phos)	0.0	0.0	0.03	0.01
L (BOD)	1.5	3.3	3.25	1.95
L (TSS)	32.5	75.7	75.65	15.13
L(BAC)	1525000000	1525000000		457500000
			mitigation steps	
Watershed 3C	Pre Development (lb/yr)	Post Development (lb/yr)		
L (Nitrogen)	2.0	5.0	5.04	5.04
L (Phos)	0.4	0.7	0.65	0.65
L (BOD)	35.3	76.4	76.41	76.41
L (TSS)	763.6	1778.7	1778.68	1778.68
L(BAC)	35855800000	82292000000		822920000000

			Mitigation Steps	
Watershed 3C-1	Pre Development (lb/yr)	Post Development (lb/yr)	Drywell	Swale
L (Nitrogen)	1.1	2.8	1.68	1.01
L (Phos)	0.2	0.4	0.22	0.13
L (BOD)	1.0	2.2	0.89	0.36
L (TSS)	22.3	52.0	10.41	2.08
L(BAC)	1049200000	2408000000		2408000000
			Mitigation Steps	
Watershed 3D	Pre Development (lb/yr)	Post Development (lb/yr)	Pond 1	Pond 2
L (Nitrogen)	7.4	12.1	7.23	4.34
L (Phos)	0.7	2.1	1.26	0.76
L (BOD)	52.3	28.9	17.32	10.39
L (TSS)	383.4	671.8	403.06	241.84
L(BAC)	17538000000	31080000000	9324000000.00	2797200000
			Mitigation Steps	
Watershed 4A	Pre Development (lb/yr)	Post Development (lb/yr)		
L (Nitrogen)	0.0	0.1	0.12	0.12
L (Phos)	0.0	0.0	0.02	0.02
L (BOD)	0.8	1.8	1.82	1.82
L (TSS)	18	42	42.36	42.36
L(BAC)	854000000	854000000		854000000
Watershed Totals	Pre Development (lb/yr)	Post Development (lb/yr)	diff	% diff
L (Nitrogen)	16.8	16.4	-0.4	-2.3%
L (Phos)	2.5	1.9	-0.6	-23.4%
L (BOD)	135.8	125.9	-9.9	-7.3%
L (TSS)	2190.7	2170.6	-20.2	-0.9%
L(BAC)	102409137282	98225059504	-4184077778	-4.1%

Table 11: REMOVAL EFFICIENCY SUMMARY

Watershed Totals	Pre Development (lb/yr)	Post Development (lb/yr)	diff	% diff
L (Nitrogen)	16.8	16.4	-0.4	-2.3%
L (Phos)	2.5	1.9	-0.6	-23.4%
L (BOD)	135.8	125.9	-9.9	-7.3%
L (TSS)	2190.7	2170.6	-20.2	-0.9%
L(BAC)	102409137282	98225059504	-4184077778	-4.1%

INSPECTION/MAINTENANCE SCHEDULE OF PERMANENT STORMWATER FEATURES

EXTENDED DETENTION BASIN: Inspection of the extended detention basin shall be performed on an annual basis, preferably after the spring snow melt, and after a major storm event. Included is an inspection checklist. Sediment shall be removed and the basin restored to the original dimensions when the sediment has accumulated to ½ of the design depth. Sediment removed from the basin shall be disposed of off site in a proper manner.

DRYWELL: Inspection of the pre-treatment chamber and infiltration system shall be performed on an annual basis and after a major storm event. Debris and extensive sediment buildup should be removed and disposed of off site in a proper manner.

FILTER SYSTEM: Inspection of the pre-treatment chamber and infiltration system shall be performed on an annual basis and after a major storm event. Debris and extensive sediment buildup should be removed and disposed of off site in a proper manner.

SUMMARY

The watersheds analyzed for this report all include mitigation measures to reduce pollutant loadings for runoff discharging to the NYC watershed. The sum of all watershed pollutant loading removals exceeds the minimum requirements.

Based on the foregoing analysis, the inclusion of stormwater Best Management Practices (BMP) for treatment of runoff will provide a significant amount of treatment of nutrients and sediment, reducing the pollutant loads to values lower than the pre development loads. This reduction is possible due to the inclusion of stormwater treatment devices in accordance with the NYSDEC guidelines. The decrease in pollutants indicates that there would be no adverse impacts to water quality from the development of this site.

As can be seen in table 3, peak flow is maintained or reduced as compared to existing or pre-construction rates. This is accomplished by directing the heavily developed watersheds to stormwater basins. A few house lots also rely upon drywells to treat and release stormwater runoff attributed from house roofs.

Based on the foregoing analysis, the proposed stormwater management practices have been designed in conformance with the Stormwater Design Manual. The proposed mitigation will provide adequate treatment of the runoff produced by the proposed development. The decrease in pollutants indicates that there would be no adverse impacts to water quality from the development of this site.

Submitted By:

Daniel A. Ciarcia, P.E.

APPENDIX A

Table 12: Watershed Data Summary

WATERSHED	EXISTING AREA (ACRES)	PROPOSED AREA (ACRES)	EXISTING CURVE NUMBERS	PROPOSED CURVE NUMBERS	EXISTING LAG HR	PROPOSED LAG HR
1	5.89	1.93	70.13	72.17	0.22	0.25
2A	13.05		70.58		0.37	0.12
2B	13.19		80.21		0.36	
2C		4.03		71.13		0.33
2D		1.23		88.27		0.31
2E		17.54		70.65		0.45
2F		7.82		74.56		0.36
2H		0.257		74.00		0.01
2J		0.194		98.00		0.20
2K		0.131		98.00		0.20
2L		0.156		98.00		0.20
3	13.29		65.25		0.22	
3A		9.95		73.23		0.24
3B		0.25		74.00		0.01
3C		6.05		71.43		0.14
3D		2.22		80.70		0.16
4A	1.66		55		0.16	
4B	2.45		79.2		0.23	
4		0.14		55		0.01
5	8.95		7096		0.15	
5A		3.95		77.29		0.20
5B		0.65		83.80		0.13

Table 13: Existing Curve Number Calculations:

WATERSHED 1					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.094	WOODS	GOOD	D	77
2	0.009	WOODS	GOOD	C	70
3	0.016	MEADOW	GOOD	D	78
4	0.002	MEADOW	GOOD	D	78
5	2.495	MEADOW	GOOD	C	71
6	3.104	WOODS	GOOD	C	70
7	0.168	WOODS	GOOD	B	55
8	0.000	WOODS	GOOD	C	70
TOTAL	5.89				**70.13**
WATERSHED 2A					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	5.433	WOODS	GOOD	C	70
2	7.612	MEADOW	GOOD	C	71
TOTAL	13.05				**70.58**
WATERSHED 2B					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.378	IMPERVIOUS		C	98
2	0.195	MEADOW	GOOD	C	71
3	0.225	WOODS	GOOD	C	70
4	12.386	RESIDENTIAL	1/2 ACRE	C	80
5	0.003	RESIDENTIAL	1/2 ACRE	C	80
TOTAL	13.19				**80.21**
WATERSHED 3					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	3.578	WOODS	GOOD	B	55
2	1.448	WOODS	GOOD	D	77
3	0.093	WOODS	GOOD	C	70
4	2.478	MEADOW	GOOD	C	71
5	0.172	MEADOW	GOOD	B	58
6	4.186	WOODS	GOOD	C	70
7	1.334	WOODS	GOOD	B	55
TOTAL	13.29				**65.25**

WATERSHED 4A					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	1.664	WOODS	GOOD	B	55
TOTAL	1.66				**55.00**
WATERSHED 4B					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.148	RESIDENTIAL	1/2 ACRE	C	80
2	0.196	RESIDENTIAL	1/2 ACRE	B	70
3	2.104	RESIDENTIAL	1/2 ACRE	C	80
TOTAL	2.45				**79.20**
WATERSHED 5					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	4.677	WOODS	GOOD	C	70
2	0.161	IMPERVIOUS		C	98
3	4.110	MEADOW	GOOD	C	71
TOTAL	8.95				**70.96**

Table 14: Proposed Curve Number Calculations

PROPOSED CURVE NUMBERS					
WATERSHED 1					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.64	LAWN		C	74
2	0.11	WOODS	GOOD	D	77
3	0.85	MEADOW	GOOD	C	71
4	0.33	WOODS	GOOD	C	70
TOTAL	1.93				**72.17**
WATERSHED 2C					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	1.063	LAWN		C	74
2	0.316	MEADOW	GOOD	C	71
3	2.648	WOODS	GOOD	C	70
TOTAL	4.03				**71.13**
WATERSHED 2D					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.729	IMPERVIOUS		C	98
2	0.498	LAWN		C	74
TOTAL	1.23				**88.27**
WATERSHED 2E					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
3	2.035	LAWN		C	74
4	3.177	MEADOW	GOOD	C	71
5	12.326	WOODS	GOOD	C	70
TOTAL	17.538				**70.65**
WATERSHED 2F					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.768	IMPERVIOUS		C	98
2	0.254	IMPERVIOUS		C	98
3	1.081	LAWN		C	74
4	0.690	MEADOW	GOOD	C	71
5	4.527	WOODS	GOOD	C	70
5	0.504	LAWN		C	74
TOTAL	7.824				**74.56**

WATERSHED 2H					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.257	LAWN		C	74
TOTAL	0.257				**74.00**
WATERSHED 2J					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.194	IMPERVIOUS		C	98
TOTAL	0.194				**98.00**
WATERSHED 2K					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.131	IMPERVIOUS		C	98
TOTAL	0.131				**98.00**
WATERSHED 2L					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.156	IMPERVIOUS		C	98
TOTAL	0.156				**98.00**
WATERSHED 3A					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	5.063	LAWN		C	74
2	0.726	LAWN		B	61
3	0.957	WOODS	GOOD	B	55
4	0.631	IMPERVIOUS		C	98
5	0.539	IMPERVIOUS		C	98
6	2.032	WOODS	GOOD	C	70
TOTAL	9.95				**73.23**
WATERSHED 3B					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.252	LAWN		C	74
TOTAL	0.25				**74.00**

WATERSHED 3C					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.172	IMPERVIOUS		C	98
2	0.676	LAWN		C	74
3	1.186	LAWN		B	61
4	2.336	WOODS	GOOD	C	70
5	1.682	WOODS	GOOD	D	77
TOTAL	6.05				**71.43**
WATERSHED 3D					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.658	IMPERVIOUS		C	98
2	1.345	LAWN		C	74
3	0.221	WOODS	GOOD	C	70
TOTAL	2.22				**80.70**
WATERSHED 4					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.137	WOODS	GOOD	B	55
TOTAL	0.14				**55.00**
WATERSHED 5A					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.10	IMPERVIOUS		C	98
2	0.18	IMPERVIOUS		C	98
3	0.26	IMPERVIOUS		C	98
4	3.41	LAWN		C	74
TOTAL	3.95				**77.29**
WATERSHED 5B					
	AREA			SOIL	CURVE
SUBAREA	AC.	LAND USE	CONDITION	GROUP	NUMBERS
1	0.384	LAWN		C	74
2	0.265	IMPERVIOUS		C	98
3	1.095	MEADOW	GOOD	C	71
4	1.262	WOODS	GOOD	C	70
TOTAL	0.649				**83.80**

Table 15: Existing Travel Time/Lag Calculations

WATERSHED 1						
SHEET FLOW (L.T. 150 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
122.00	609.0	604.0	4.098	0.240	3.300	0.206
SHEET FLOW (L.T. 150 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
28.00	604.0	602.1	6.786	0.240	3.300	0.052
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
1375.31	602.1	536.2	4.792			0.108
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1525.31			72.800	1.157		0.366
					LAG	**0.22**
WATERSHED 2A						
SHEET FLOW (L.T. 150 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
150.00	615.0	614.0	0.667	0.240	3.300	0.503
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
177.30	614.0	610.0	2.256			0.020
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
464.90	610.0	594.0	3.442			0.043
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
873.90	594.0	536.0	6.637			0.058
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1666.10			79.000	0.741		0.625
					LAG	**0.37**

WATERSHED 2B						
SHEET FLOW (L.T. 150 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
150.00	615.0	614.0	0.667	0.240	3.300	0.503
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
328.80	614.0	608.0	1.825			0.042
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
190.70	608.0	596.0	6.293			0.013
SHALLOW CONCENTRATED FLOW (PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
69.00	596.0	588.0	11.594			0.003
SHALLOW CONCENTRATED FLOW (PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
96.20	588.0	586.2	1.871			0.010
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
397.00	586.2	548.0	9.622			0.022
SHALLOW CONCENTRATED FLOW (PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
72.20	548.0	545.0	4.155			0.005
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1303.90			70.000	0.607		0.597
					LAG	**0.36**

WATERSHED 3						
SHEET FLOW (L.T. 150 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
150.00	610.4	604.0	4.267	0.240	3.300	0.239
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
80.90	604.0	600.0	4.944			0.006
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
340.60	600.0	563.0	10.863			0.018
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
138.90	563.0	558.0	3.600			0.013
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
136.40	558.0	534.0	17.595			0.006
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
376.70	534.0	532.0	0.531			0.089
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1223.50			78.400	0.917		0.371
					LAG	**0.22**

WATERSHED 4A						
SHEET FLOW (L.T. 150 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
150.00	615.0	607.5	5.000	0.240	3.300	0.225
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
455.76	607.5	596.0	2.523			0.049
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
605.76			19.000	0.614		0.274
					LAG	**0.16**
WATERSHED 4B						
SHEET FLOW (L.T. 150 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
150.00	603.8	601.5	1.533	0.240	3.300	0.360
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
77.60	601.5	601.0	0.644			0.017
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
227.60			2.800	0.168		0.377
					LAG	**0.23**

Table 16: Proposed Travel Time/Lag Calculations

WATERSHED 1						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
200.00	602.0	582.0	10.000	0.400	3.300	0.322
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
1140.00	582.0	538.0	3.860			0.100
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1340.00			64.000	0.882		0.422
					LAG	**0.25**
WATERSHED 2A						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
130.00	584.0	574.0	7.692	0.240	3.300	0.169
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
210.00	564.0	548.0	7.619			0.013
OPEN CHANNEL FLOW - PIPE SECTION						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	DIAMETER	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
185.00	545.0	542.0	1.622	0.040	15.000	0.024
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
525.00			29.000	0.711		0.205
					LAG	**0.12**

WATERSHED 2C						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
300.00	610.0	602.0	2.667	0.240	3.300	0.503
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
540.00	602.0	574.0	5.185			0.041
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
840.00			36.000	0.429		0.544
					LAG	**0.33**
WATERSHED 2D						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
300.00	608.0	600.0	2.667	0.240	3.300	0.503
OPEN CHANNEL FLOW - PIPE SECTION						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	DIAMETER	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
700.00	596.0	552.0	6.286	0.010	15.000	0.011
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1000.00			52.000	0.540		0.514
					LAG	**0.31**
WATERSHED 2E						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
300.00	614.0	602.0	4.000	0.240	3.300	0.427
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
1150.00	602.0	546.0	4.870			0.090
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1450.00			68.000	0.779		0.517

LAG	**0.31**

WATERSHED 2F						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
300.00	608.0	588.0	6.667	0.240	3.300	0.348
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
860.00	588.0	518.0	8.140			0.052
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1160.00			90.000	0.805		0.400
					LAG	**0.24**
WATERSHED 5A						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
180.00	576.0	562.0	7.778	0.240	3.300	0.218
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
110.00	562.0	554.0	7.273	0.400	3.300	0.227
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
765.00	554.0	518.0	4.706			0.061
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1055.00			58.000	1.346		0.218
					LAG	**0.13**

WATERSHED 3A						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
250.00	614.0	604.0	4.000	0.240	3.300	0.369
OPEN CHANNEL FLOW - PIPE SECTION						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	DIAMETER	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
1420.00	602.0	564.0	2.676	0.010	15.000	0.035
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
1670.00			48.000	1.147		0.405
					LAG	**0.24**
WATERSHED 3C						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
160.00	578.0	548.0	18.750	0.400	3.300	0.210
SHALLOW CONCENTRATED FLOW (UN-PAVED PATH)						
LENGTH	ELEV1	ELEV2	SLOPE			TRAVEL
(FT)			PERCENT			TIME
250.00	548.0	532.0	6.400			0.017
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
410.00			46.000	0.502		0.227
					LAG	**0.14**
WATERSHED 3D						
SHEET FLOW (L.T. 300 FT)						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	2 YR PRP	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
175.00	610.0	602.0	4.571	0.240	3.300	0.263
OPEN CHANNEL FLOW - PIPE SECTION						
LENGTH	ELEV1	ELEV2	SLOPE	MANNING	DIAMETER	TRAVEL
(FT)			PERCENT	N	(INCHES)	TIME
385.00	598.0	564.0	8.831	0.010	15.000	0.005
TOTAL			TOTAL	AVERAGE		TOTAL
LENGTH			DELTA Y	VELOCITY		TRAVEL T
(FT)			(FT)	(FPS)		(HRS)
560.00			42.000	0.579		0.269
					LAG	**0.16**

APPENDIX B
HEC-1 OUTPUT

```
1*****************************************                    ****************************************
 *                                       *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1                *                    *         609 SECOND STREET            *
 *  RGMHEC2000              HEC-1.COM    *                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   11JUN07  TIME  12:04:03   *                    *           (916) 756-1104             *
 *                                       *                    *                                      *
 *****************************************                    ****************************************

                                X     X  XXXXXXX   XXXXX           X
                                X     X  X        X     X         XX
                                X     X  X        X                X
                                XXXXXXX  XXXX     X        XXXXX   X
                                X     X  X        X                X
                                X     X  X        X     X          X
                                X     X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                              HEC-1 INPUT                                                PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1           ID     R.G. MASTROMONACO, P.E. - SANTUCCI YORKTOWN FARMS
             2           ID  TOWN OF YORKTOWN
             3           ID     USE SCS TYPE 3 DISTRIBUTION FOR SELECTED STORM RAINFALLS
             4           ID     FILENAME:YORKTOWN FARMS D&H 22 LOT 9-28-05.DAT, DATE:9/28/05
             5           ID     USE SCS LAG
                         *DIAGRAM
             6           IO       5       0
             7           IT       6             000    2000
             8           JR    PREC    .373   0.466    0.60   0.666    0.80   0.933    1.00
             9           IN      06             000

            10           KK   EXDP1
            11           KO                                    21
            12           KM  FLOWS FROM EXISTING WATERSHED 1
            13           PB     7.5
            14           PC   0.000   0.001   0.002   0.003   0.004   0.005   0.006   0.007   0.008   0.009
            15           PC   0.010   0.011   0.012   0.013   0.014   0.015   0.016   0.017   0.018   0.019
            16           PC   0.020   0.021   0.022   0.023   0.024   0.026   0.027   0.028   0.029   0.030
            17           PC   0.031   0.032   0.034   0.035   0.036   0.037   0.038   0.040   0.041   0.042
            18           PC   0.043   0.045   0.046   0.047   0.049   0.050   0.051   0.053   0.054   0.055
            19           PC   0.057   0.058   0.060   0.061   0.063   0.064   0.066   0.067   0.069   0.070
            20           PC   0.072   0.074   0.075   0.077   0.079   0.080   0.082   0.084   0.085   0.087
            21           PC   0.089   0.091   0.093   0.095   0.097   0.100   0.103   0.106   0.109   0.112
            22           PC   0.115   0.118   0.121   0.124   0.127   0.130   0.134   0.137   0.140   0.144
            23           PC   0.148   0.151   0.155   0.159   0.163   0.167   0.171   0.176   0.180   0.185
            24           PC   0.189   0.194   0.199   0.205   0.210   0.216   0.222   0.228   0.235   0.242
            25           PC   0.250   0.258   0.266   0.276   0.287   0.298   0.312   0.328   0.363   0.416
            26           PC   0.500   0.584   0.638   0.673   0.689   0.702   0.714   0.725   0.734   0.743
            27           PC   0.751   0.758   0.766   0.772   0.779   0.785   0.790   0.796   0.801   0.806
            28           PC   0.811   0.816   0.821   0.825   0.829   0.834   0.838   0.842   0.845   0.849
            29           PC   0.853   0.857   0.860   0.864   0.867   0.870   0.874   0.877   0.880   0.883
            30           PC   0.886   0.889   0.892   0.895   0.898   0.900   0.903   0.906   0.908   0.910
            31           PC   0.911   0.913   0.915   0.917   0.919   0.920   0.922   0.924   0.925   0.927
            32           PC   0.929   0.930   0.932   0.933   0.935   0.936   0.938   0.939   0.941   0.942
            33           PC   0.944   0.945   0.946   0.948   0.949   0.951   0.952   0.953   0.955   0.956
            34           PC   0.957   0.958   0.960   0.961   0.962   0.963   0.965   0.966   0.967   0.968
            35           PC   0.969   0.971   0.972   0.973   0.974   0.975   0.976   0.977   0.978   0.979
            36           PC   0.981   0.982   0.983   0.984   0.985   0.986   0.987   0.988   0.989   0.990
            37           PC   0.991   0.992   0.993   0.994   0.995   0.996   0.997   0.998   0.999   1.000
            38           BA  .00920
            39           LS           70.13
            40           UD     .22

            41           KK  EXWS2A
            42           KO                                    21
            43           KM  FLOWS FROM EXISTING WATERSHED 2A
            44           BA  .02038
            45           LS           70.58
            46           UD     .37
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1                                          HEC-1 INPUT                                          PAGE  2

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            47          KK  EXWS2B
            48          KO                                      21
            49          KM  FLOWS FROM EXISTING OFFSITE WATERSHED 2B
            50          BA  .02026
            51          LS           80.21
            52          UD     .36

            53          KK   EXDP2
            54          KO                                      21
            55          KM  SUM FLOWS FROM EXISTING WATERSHED 2A AND 2B
            56          HC       2

            57          KK   EXDP3
            58          KO                                      21
            59          KM  FLOWS FROM EXISTING WATERSHED 3
            60          BA  .02077
            61          LS           65.25
            62          UD     .22

            63          KK  EXWS4A
            64          KO                                      21
            65          KM  FLOWS FROM EXISTING WATERSHED 4A
            66          BA  .00259
            67          LS              55
            68          UD     .16

            69          KK  EXWS4B
            70          KO                                      21
            71          KM  FLOWS FROM EXISTING OFFSITE WATERSHED 4B
            72          BA  .00053
            73          LS           79.20
            74          UD     .23

            75          KK   EXDP4
            76          KO                                      21
            77          KM  SUM FLOWS FROM EXISTING WATERSHED 4A AND 4B
            78          HC       2

            79          KK   EXWS5
            80          KO                                      21
            81          KM  FLOWS FROM EXISTING OFFSITE WATERSHED 5
            82          BA  .01398
            83          LS           70.96
            84          UD     .15

            85          KK  EXTOTL
            86          KO                                      21
            87          KM  EXISTING TOTAL SUM OF HYDROGRAPHS TO AVOID ERROR
            88          HC       5
            89          KM   * * *   PROPOSED CONDITIONS   * * *
1                                          HEC-1 INPUT                                          PAGE  3

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            90          KK   PRDP1
            91          KO                                      21
            92          KM  FLOWS FROM PROPOSED WATERSHED 1
            93          BA  .00301
            94          LS           72.17
            95          UD     .25

            96          KK  PRWS2D
            97          KO                                      21
            98          KM  FLOWS FROM PROPOSED WATERSHED 2D
            99          BA  .00192
           100          LS           88.27
           101          UD     .31

           102          KK  PRWS2H
           103          KO                                      21
           104          KM  FLOWS FROM PROPOSED WATERSHED 2H
           105          BA  .00040
           106          LS              74
           107          UD     .01

           108          KK   SUM2A
           109          KO                                      21
           110          KM  SUM AREAS PRWS2D AND PRWS2H
           111          HC       2

           112          KK   PONDA
           113          KO                                      21
           114          KM  FLOWS ROUTED THROUGH EXTENDED DETENTION BASIN A
           115          RS       1    ELEV     552
           116          SA   .1316   .1780   .2297
           117          SE     552     554     556
           118          SL   553.5   .0872     .61      .5
           119          SS  554.75       4   3.367     1.5

           120          KK  PRWS2C
           121          KO                                      21
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 122          KM  FLOWS FROM PROPOSED WATERSHED 2C
 123          BA  .00629
 124          LS          71.13
 125          UD     .33

 126          KK  PRWS2E                                                          E
 127          KO                                  21
 128          KM  FLOWS FROM PROPOSED WATERSHED 2E
 129          BA  .02740
 130          LS          70.65
 131          UD     .45
1                                    HEC-1 INPUT                                 PAGE  4

     LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 132          KK  PRWS2F                                                          E
 133          KO                                  21
 134          KM  FLOWS FROM PROPOSED WATERSHED 2E
 135          BA  .01222
 136          LS          74.56
 137          UD     .36

 138          KK   SUM2C
 139          KO                                  21
 140          KM  SUM AREAS BYPASSING PONDS-FILTER-DRYWELL
 141          HC       4

 142          KK  PRWS2J                                                          E
 143          KO                                  21
 144          KM  FLOWS FROM PROPOSED WATERSHED 2J
 145          BA   .0003
 146          LS            98
 147          UD      .2

 148          KK   DIV2J
 149          KO                                  21
 150          KM  DIVERT FIRST FLUSH TO FILTER
 151          DT    BP2J     .02
 152          DI     100
 153          DQ     100

 154          KK  PRWS2K                                                          E
 155          KO                                  21
 156          KM  FLOWS FROM PROPOSED WATERSHED 2K
 157          BA   .0002
 158          LS            98
 159          UD      .2

 160          KK   DIV2K
 161          KO                                  21
 162          KM  DIVERT FIRST FLUSH TO DRY WELL
 163          DT    BP2K     .01
 164          DI     100
 165          DQ     100

 166          KK  PRWS2L                                                          E
 167          KO                                  21
 168          KM  FLOWS FROM PROPOSED WATERSHED 2L
 169          BA  .00024
 170          LS            98
 171          UD      .2

 172          KK   DIV2L
 173          KO                                  21
 174          KM  DIVERT FIRST FLUSH TO DRY WELL
 175          DT    BP2L     .02
 176          DI     100
 177          DQ     100
1                                    HEC-1 INPUT                                 PAGE  5

     LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 178          KK   PRDP2
 179          KO                                  21
 180          KM  SUM AREAS AND PONDS
 181          HC       4

 182          KK  PRWS3A
 183          KO                                  21
 184          KM  FLOWS FROM PROPOSED WATERSHED 3A
 185          BA  .01554
 186          LS          73.23
 187          UD     .24

 188          KK  PRWS3D
 189          KO                                  21
 190          KM  FLOWS FROM PROPOSED WATERSHED 3D
 191          BA  .00348
 192          LS          80.70
 193          UD     .16

 194          KK   SUM3A
 195          KO                                  21
 196          KM  SUM AREAS PRWS3A AND PRWS3D
 197          HC       2
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 198          KK   PONDD
 199          KO                                      21
 200          KM  FLOWS ROUTED THROUGH EXTENDED DETENTION BASIN D
 201          RS       1    ELEV     564
 202          SA   .2089   .2923   .3805   .4795
 203          SE     564     566     568     570
 204          SL  565.25  .00545     .61      .5
 205          SS   567.5       4   3.367     1.5

 206          KK  PRWS3B
 207          KO                                      21
 208          KM  ADDITIONAL AREA FROM POND-E
 209          BA  .00039
 210          LS              74
 211          UD     .01

 212          KK   SUM3B
 213          KO                                      21
 214          KM  SUM AREAS PRWS3B AND PONDD
 215          HC       2

 216          KK   PONDE
 217          KO                                      21
 218          KM  FLOWS ROUTED THROUGH EXTENDED DETENTION BASIN D
 219          RS       1    ELEV     560
 220          SA   .2089   .2923   .3805   .4795
 221          SE     560     562     564     566
 222          SL  561.25  .00545     .61      .5
 223          SS  564.75       4   3.367     1.5
1                                        HEC-1 INPUT                                                    PAGE  6

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 224          KK  PRWS3C
 225          KO                                      21
 226          KM  FLOWS FROM PROPOSED WATERSHED 3C
 227          BA  .00946
 228          LS           71.43
 229          UD     .14

 230          KK   PRDP3
 231          KO                                      21
 232          KM  SUM AREAS AND PONDS
 233          HC       2

 234          KK   PRDP4
 235          KO                                      21
 236          KM  FLOWS FROM PROPOSED WATERSHED 4A
 237          BA  .00021
 238          LS              55
 239          UD      .1

 240          KK  PRWS5A
 241          KO                                      21
 242          KM  FLOWS FROM PROPOSED WATERSHED 2A
 243          BA  .00617
 244          LS           77.29
 245          UD      .2

 246          KK   PONDC
 247          KO                                      21
 248          KM  FLOWS ROUTED THROUGH EXTENDED DETENTION BASIN C
 249          RS       1    ELEV     540
 250          SA  .03145     .06    .094   .1329
 251          SE     540     542     544     546
 252          SL   541.5    .785     .61      .5
 253          SS  544.75       4   3.367     1.5

 254          KK  PRWS2G
 255          KO                                      21
 256          KM  FLOWS FROM PROPOSED WATERSHED 2G
 257          BA  0.0010
 258          LS            83.8
 259          UD     .13

 260          KK   PRDP5
 261          KO                                      21
 262          KM  SUM 2 AREAS-AND POND- FOR DRAIN POINT 5
 263          HC       2

 264          KK  PRTOTL
 265          KO                                      21
 266          KM  SUM 5 MAIN DRAIN POINTS
 267          HC       5
 268          ZZ
```

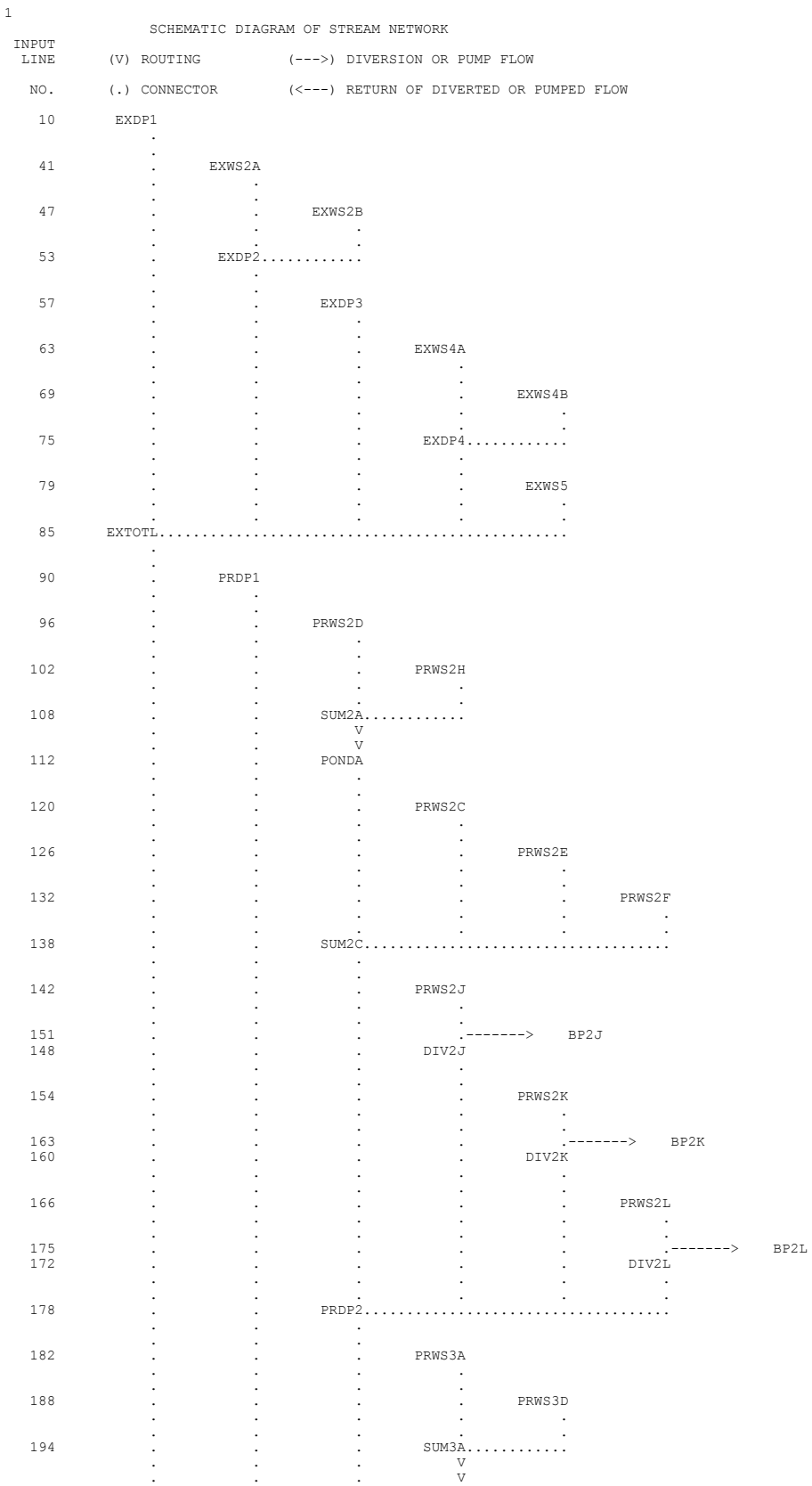
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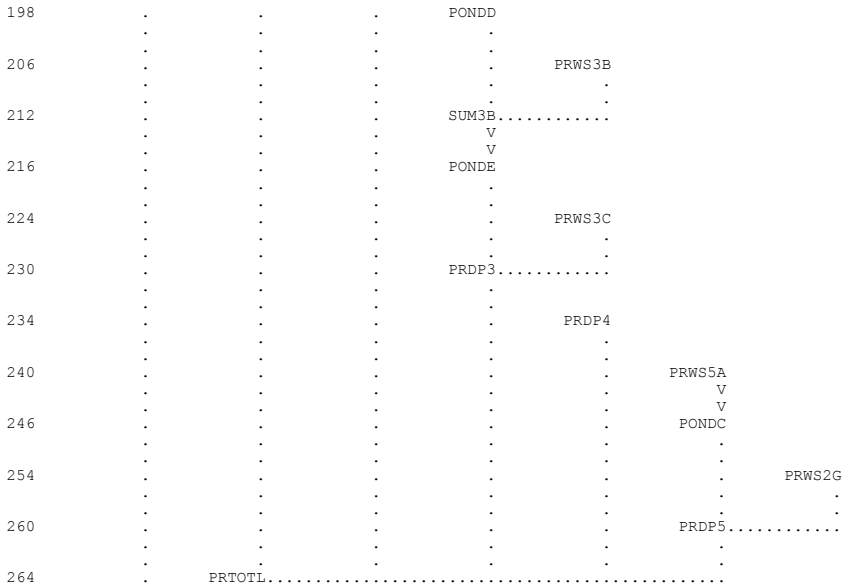
SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT LINE NO.
(V) ROUTING
(.) CONNECTOR
(---->) DIVERSION OR PUMP FLOW
(<---) RETURN OF DIVERTED OR PUMPED FLOW
10 EXDP1
41 EXWS2A
47 EXWS2B
53 EXDP2
57 EXDP3
63 EXWS4A
69 EXWS4B
75 EXDP4
79 EXWS5
85 EXTOTL
90 PRDP1
96 PRWS2D
102 PRWS2H
108 SUM2A
112 PONDA
120 PRWS2C
126 PRWS2E
132 PRWS2F
138 SUM2C
142 PRWS2J
151 BP2J
148 DIV2J
154 PRWS2K
163 BP2K
160 DIV2K
166 PRWS2L
175 BP2L
172 DIV2L
178 PRDP2
182 PRWS3A
188 PRWS3D
194 SUM3A


198
PONDD
206
PRWS3B
212
SUM3B
216
PONDE
224
PRWS3C
230
PRDP3
234
PRDP4
240
PRWS5A
246
PONDC
254
PRWS2G
260
PRDP5
264
PRTOTL

```
 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *          VERSION 4.1                 *                    *          609 SECOND STREET           *
 *  RGMHEC2000              HEC-1.COM   *                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   11JUN07  TIME  12:04:03  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************
```

```
                        R.G. MASTROMONACO, P.E. - SANTUCCI YORKTOWN FARMS
                      TOWN OF YORKTOWN
                        USE SCS TYPE 3 DISTRIBUTION FOR SELECTED STORM RAINFALLS
                        FILENAME:YORKTOWN FARMS D&H 28 LOT 9-28-05.DAT, DATE:9/28/05
                        USE SCS LAG

   6 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN           6  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      9    0  ENDING DATE
                     NDTIME        0754  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .10 HOURS
                       TOTAL TIME BASE  199.90 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                     .37       .47       .60       .67       .80       .93      1.00


               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                   FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS
```

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .37	RATIO 2 .47	RATIO 3 .60	RATIO 4 .67	RATIO 5 .80	RATIO 6 .93	RATIO 7 1.00
HYDROGRAPH AT											
+	EXDP1	.01	1	FLOW	2.	4.	7.	9.	13.	16.	18.
				TIME	12.30	12.30	12.30	12.30	12.30	12.30	12.30
HYDROGRAPH AT											
+	EXWS2A	.02	1	FLOW	4.	8.	13.	16.	23.	30.	33.
				TIME	12.50	12.50	12.50	12.40	12.40	12.40	12.40
HYDROGRAPH AT											
+	EXWS2B	.02	1	FLOW	9.	13.	20.	24.	31.	38.	42.
				TIME	12.40	12.40	12.40	12.40	12.40	12.40	12.40
2 COMBINED AT											
+	EXDP2	.04	1	FLOW	13.	21.	33.	40.	54.	68.	75.
				TIME	12.50	12.40	12.40	12.40	12.40	12.40	12.40
HYDROGRAPH AT											
+	EXDP3	.02	1	FLOW	3.	7.	13.	16.	24.	31.	36.
				TIME	12.40	12.30	12.30	12.30	12.30	12.30	12.30
HYDROGRAPH AT											
+	EXWS4A	.00	1	FLOW	0.	0.	1.	1.	2.	3.	3.
				TIME	12.50	12.40	12.30	12.30	12.30	12.20	12.20
HYDROGRAPH AT											
+	EXWS4B	.00	1	FLOW	0.	0.	1.	1.	1.	1.	1.
				TIME	12.30	12.30	12.30	12.30	12.30	12.30	12.30
2 COMBINED AT											
+	EXDP4	.00	1	FLOW	0.	1.	1.	2.	3.	4.	4.
				TIME	12.30	12.30	12.30	12.30	12.30	12.30	12.20

```
 HYDROGRAPH AT
```

+	EXWS5	.01	1	FLOW	4.	8.	13.	16.	22.	28.	31.
				TIME	12.30	12.20	12.20	12.20	12.20	12.20	12.20
5 COMBINED AT											
+	EXTOTL	.09	1	FLOW	22.	38.	64.	78.	108.	139.	155.
				TIME	12.40	12.40	12.30	12.30	12.30	12.30	12.30
HYDROGRAPH AT											
+	PRDP1	.00	1	FLOW	1.	1.	3.	3.	4.	5.	6.
				TIME	12.40	12.30	12.30	12.30	12.30	12.30	12.30
HYDROGRAPH AT											
+	PRWS2D	.00	1	FLOW	1.	2.	3.	3.	4.	4.	5.
				TIME	12.40	12.40	12.40	12.40	12.40	12.40	12.30
HYDROGRAPH AT											
+	PRWS2H	.00	1	FLOW	0.	0.	1.	1.	1.	1.	1.
				TIME	12.10	12.10	12.10	12.10	12.10	12.10	12.10
2 COMBINED AT											
+	SUM2A	.00	1	FLOW	1.	2.	3.	3.	4.	5.	5.
				TIME	12.30	12.30	12.30	12.30	12.30	12.30	12.30
ROUTED TO											
+	PONDA	.00	1	FLOW	0.	0.	0.	0.	0.	0.	1.
				TIME	.00	20.20	15.20	14.90	14.50	14.40	13.70
			** PEAK STAGES IN FEET **								
			1	STAGE	553.26	553.56	553.74	553.90	554.28	554.68	554.82
				TIME	25.40	20.30	15.60	15.00	14.60	14.50	13.70
HYDROGRAPH AT											
+	PRWS2C	.01	1	FLOW	1.	3.	5.	6.	8.	10.	11.
				TIME	12.40	12.40	12.40	12.40	12.40	12.40	12.40
HYDROGRAPH AT											
+	PRWS2E	.03	1	FLOW	5.	9.	16.	20.	28.	36.	41.
				TIME	12.60	12.60	12.50	12.50	12.50	12.50	12.50
HYDROGRAPH AT											
+	PRWS2F	.01	1	FLOW	4.	6.	10.	12.	16.	20.	22.
				TIME	12.50	12.40	12.40	12.40	12.40	12.40	12.40
4 COMBINED AT											
+	SUM2C	.05	1	FLOW	10.	18.	30.	37.	51.	65.	73.
				TIME	12.50	12.50	12.50	12.50	12.50	12.50	12.50
HYDROGRAPH AT											
+	PRWS2J	.00	1	FLOW	0.	0.	1.	1.	1.	1.	1.
				TIME	12.20	12.20	12.20	12.20	12.20	12.20	12.20
DIVERSION TO											
+	BP2J	.00	1	FLOW	0.	0.	0.	0.	0.	0.	0.
				TIME	12.20	12.10	11.80	11.60	11.10	10.60	10.30
HYDROGRAPH AT											
+	DIV2J	.00	1	FLOW	0.	0.	1.	1.	1.	1.	1.
				TIME	12.40	12.20	12.20	12.20	12.20	12.20	12.20
HYDROGRAPH AT											
+	PRWS2K	.00	1	FLOW	0.	0.	0.	0.	1.	1.	1.
				TIME	12.20	12.20	12.20	12.20	12.20	12.20	12.20
DIVERSION TO											
+	BP2K	.00	1	FLOW	0.	0.	0.	0.	0.	0.	0.
				TIME	12.00	11.90	11.20	10.90	10.20	9.60	9.10
HYDROGRAPH AT											
+	DIV2K	.00	1	FLOW	0.	0.	0.	0.	1.	1.	1.
				TIME	12.20	12.20	12.20	12.20	12.20	12.20	12.20
HYDROGRAPH AT											
+	PRWS2L	.00	1	FLOW	0.	0.	0.	1.	1.	1.	1.
				TIME	12.20	12.20	12.20	12.20	12.20	12.20	12.20
DIVERSION TO											
+	BP2L	.00	1	FLOW	0.	0.	0.	0.	0.	0.	0.
				TIME	12.20	12.20	12.00	11.90	11.70	11.20	11.00
HYDROGRAPH AT											
+	DIV2L	.00	1	FLOW	0.	0.	0.	1.	1.	1.	1.
				TIME	12.60	12.40	12.20	12.20	12.20	12.20	12.20
4 COMBINED AT											
+	PRDP2	.05	1	FLOW	11.	18.	31.	38.	52.	67.	74.
				TIME	12.50	12.50	12.50	12.50	12.50	12.50	12.50
HYDROGRAPH AT											
+	PRWS3A	.02	1	FLOW	5.	8.	14.	17.	23.	29.	32.
				TIME	12.30	12.30	12.30	12.30	12.30	12.30	12.30
HYDROGRAPH AT											
+	PRWS3D	.00	1	FLOW	2.	3.	5.	5.	7.	9.	10.
				TIME	12.20	12.20	12.20	12.20	12.20	12.20	12.20
2 COMBINED AT											
+	SUM3A	.02	1	FLOW	7.	11.	18.	22.	29.	37.	41.
				TIME	12.30	12.30	12.30	12.30	12.30	12.30	12.30

```
 ROUTED TO
+                  PONDD       .02     1   FLOW          0.       1.       3.       6.      14.      23.      28.
                                           TIME        24.00    17.00    13.40    12.90    12.60    12.50    12.50

                                   ** PEAK STAGES IN FEET **
                                   1   STAGE      566.94   567.62   567.86   568.06   568.52   568.92   569.12
                                           TIME        24.40    17.10    13.40    12.90    12.60    12.50    12.50

 HYDROGRAPH AT
+                  PRWS3B      .00     1   FLOW          0.       0.       0.       1.       1.       1.       1.
                                           TIME        12.10    12.10    12.10    12.10    12.10    12.10    12.10

  2 COMBINED AT
+                   SUM3B      .02     1   FLOW          0.       1.       3.       6.      14.      23.      28.
                                           TIME        12.10    17.10    13.40    12.90    12.60    12.50    12.50

 ROUTED TO
+                   PONDE      .02     1   FLOW          0.       0.       0.       0.       2.       4.       7.
                                           TIME       192.50   191.60    26.20    23.60    16.70    14.20    13.60

                                   ** PEAK STAGES IN FEET **
                                   1   STAGE      561.51   562.01   563.71   564.74   565.01   565.22   565.37
                                           TIME       199.90   199.80    27.10    26.90    16.70    14.20    13.60

 HYDROGRAPH AT
+                  PRWS3C      .01     1   FLOW          3.       5.       9.      11.      15.      20.      22.
                                           TIME        12.20    12.20    12.20    12.20    12.20    12.20    12.20

  2 COMBINED AT
+                   PRDP3      .03     1   FLOW          3.       5.       9.      11.      15.      20.      22.
                                           TIME        12.20    12.20    12.20    12.20    12.20    12.20    12.20

 HYDROGRAPH AT
+                   PRDP4      .00     1   FLOW          0.       0.       0.       0.       0.       0.       0.
                                           TIME        12.30    12.30    12.20    12.20    12.20    12.20    12.20

 HYDROGRAPH AT
+                  PRWS5A      .01     1   FLOW          3.       4.       7.       8.      11.      13.      15.
                                           TIME        12.30    12.30    12.30    12.30    12.30    12.20    12.20

 ROUTED TO
+                   PONDC      .01     1   FLOW          2.       3.       5.       5.       6.       8.      10.
                                           TIME        12.50    12.50    12.50    12.50    12.50    12.50    12.50

                                   ** PEAK STAGES IN FEET **
                                   1   STAGE      541.87   542.25   543.00   543.38   544.15   544.87   545.07
                                           TIME        12.50    12.50    12.50    12.50    12.50    12.50    12.50

 HYDROGRAPH AT
+                  PRWS2G      .00     1   FLOW          1.       1.       2.       2.       2.       3.       3.
                                           TIME        12.20    12.20    12.20    12.20    12.20    12.20    12.20

  2 COMBINED AT
+                   PRDP5      .01     1   FLOW          2.       4.       6.       6.       8.       9.      11.
                                           TIME        12.50    12.40    12.30    12.30    12.30    12.50    12.50

  5 COMBINED AT
+                  PRTOTL      .09     1   FLOW         15.      27.      45.      54.      73.      93.     104.
                                           TIME        12.40    12.40    12.40    12.40    12.40    12.40    12.40


 *** NORMAL END OF HEC-1 ***
```

APPENDIX C
INSPECTION FORM
Maintenance Inspection Checklist

Appendix G: Maintenance Inspection Checklists

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 insider 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		

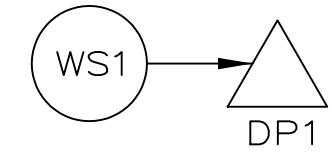
Maintenance Item	Satisfactory/ Unsatisfactory	Comments
2. Complaints from residents		
3.Aesthetics a. Grass growing required		
b. Graffiti removal needed		
c. Other (specify)		
4. Conditions of maintenance access routes.		
5. Signs of hydrocarbon build-up		
6. Any public hazards (specify)		
8. Wetland 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)		

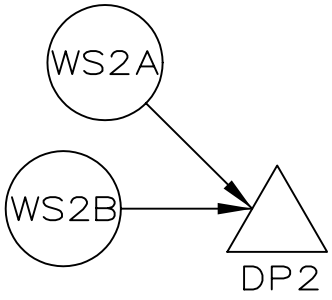
Comments:

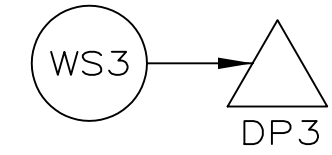
APPENDIX D
(MAPS & PLANS)

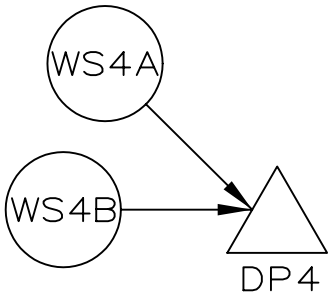
Existing Watershed Schematic
Proposed Watershed Schematic
Proposed HEC-1 Watershed Schematic
Existing Watershed Map
Proposed Watershed Map

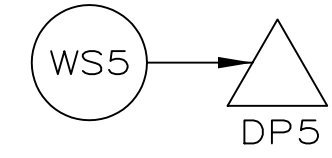
PRE CONSTRUCTION
DRAINAGE SCHEMATIC



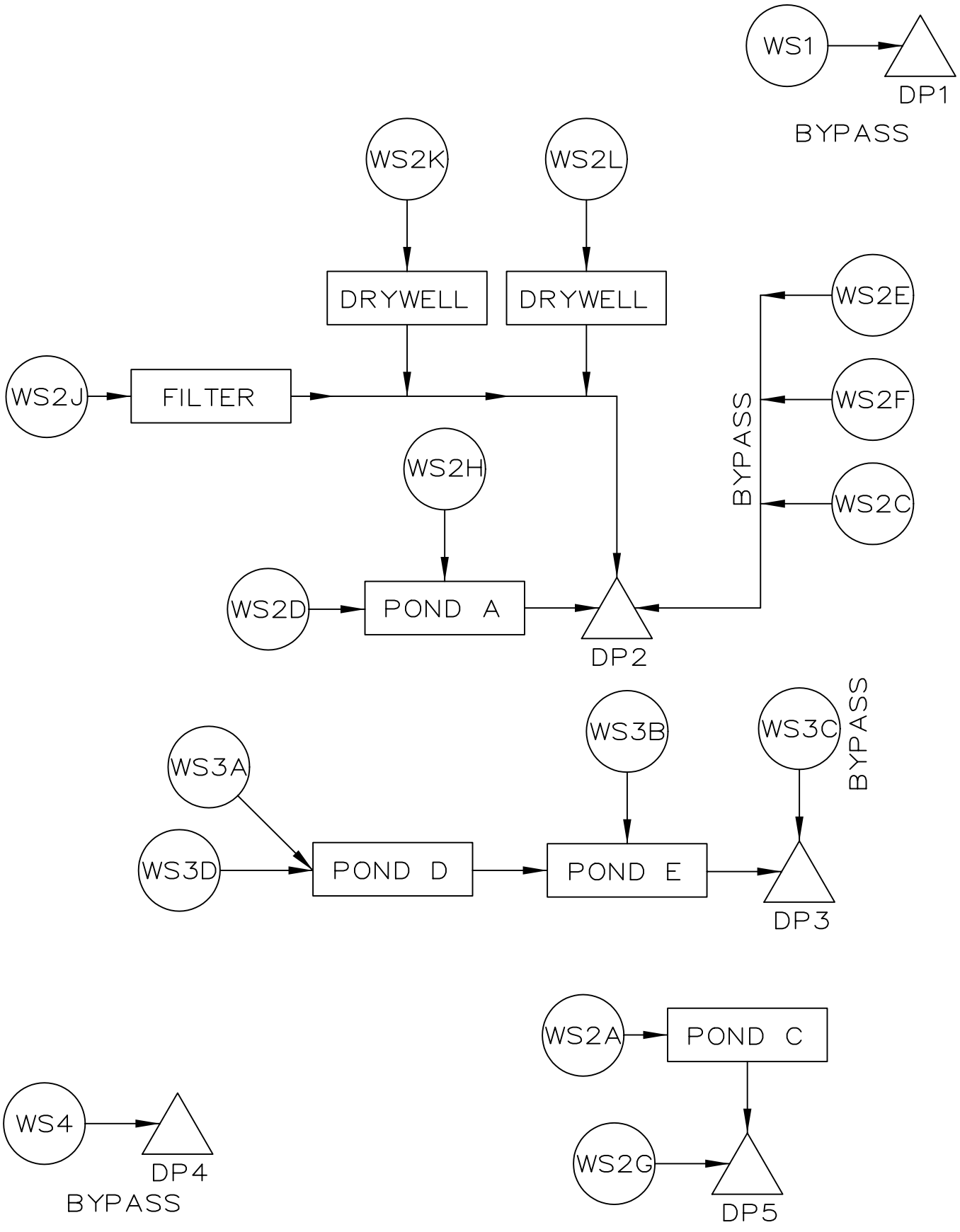




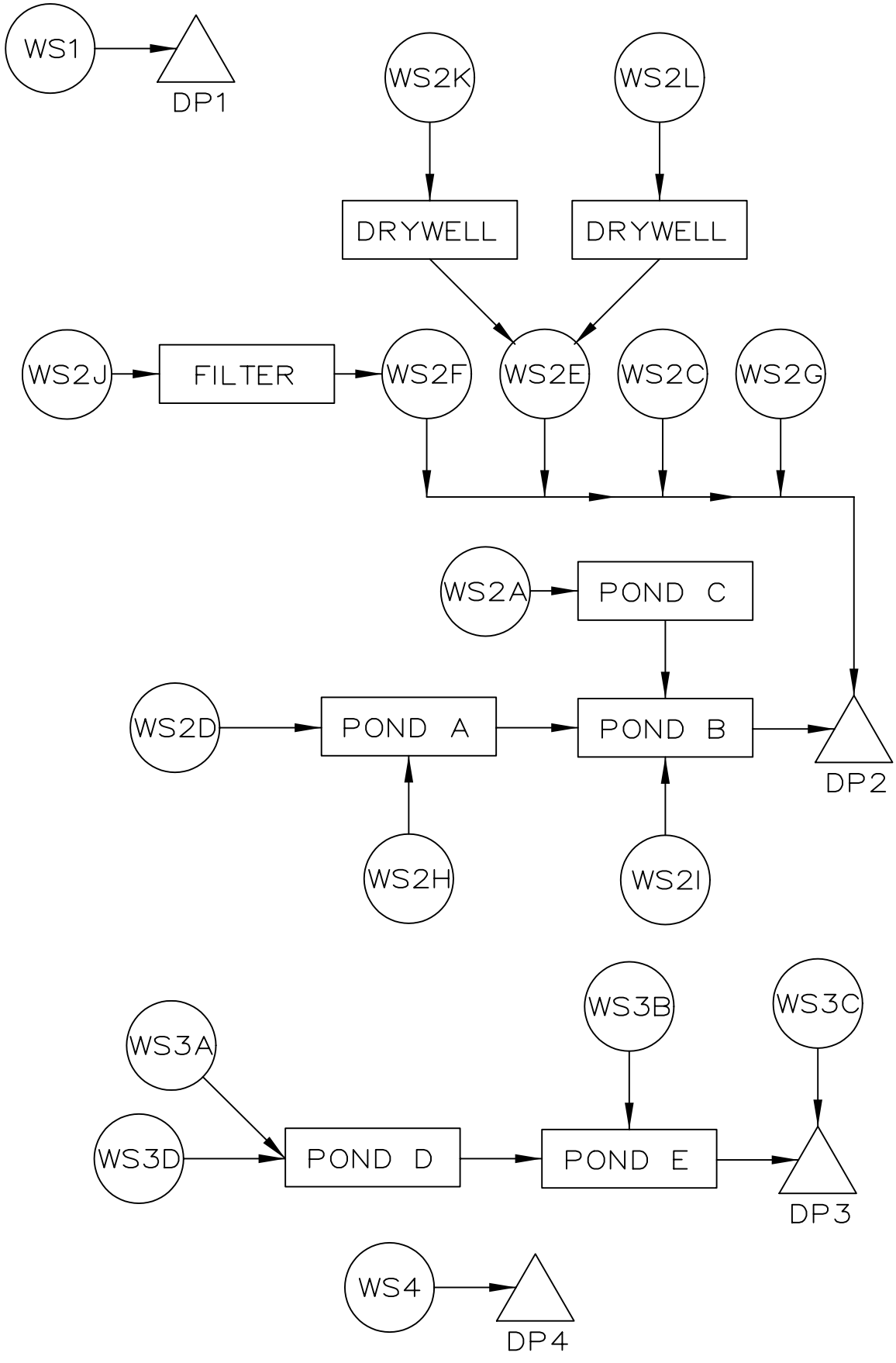




NYSDEC POST CONSTRUCTION DRAINAGE SCHEMATIC



HEC-1
POST CONSTRUCTION
DRAINAGE SCHEMATIC



DP1
DP2
DP3
DP4
DP5
WS 1
256453 S.F.
5.887 ACRES
WS 2A
561189 S.F.
12.88 ACRES
WS 2B
565020 S.F.
12.971 ACRES
WS 3
579042 S.F.
13.293 ACRES
WS 4A
72485 S.F.
1.664 ACRES
WS 4B
14971 S.F.
0.343 ACRES
TOWN OF SOMERS
TOWN OF YORKTOWN
APPROXIMATE LOCATION OF DEC WETLAND BUFFER
APPROXIMATE LOCATION OF DEC WETLAND BUFFER
POND
WETLANDS FLAGGED BY TMA
100 FT. WETLAND BUFFER
MAIN STREET
ROUTE 6
GAY RIDGE ROAD
RIDGE COURT
COURT
STONEWALL COURT
BALDWIN PLACE
WESTCHESTER CO.
OSCEOLA

LOCATION MAP
N.T.S.

0 80 160
SCALE IN FEET

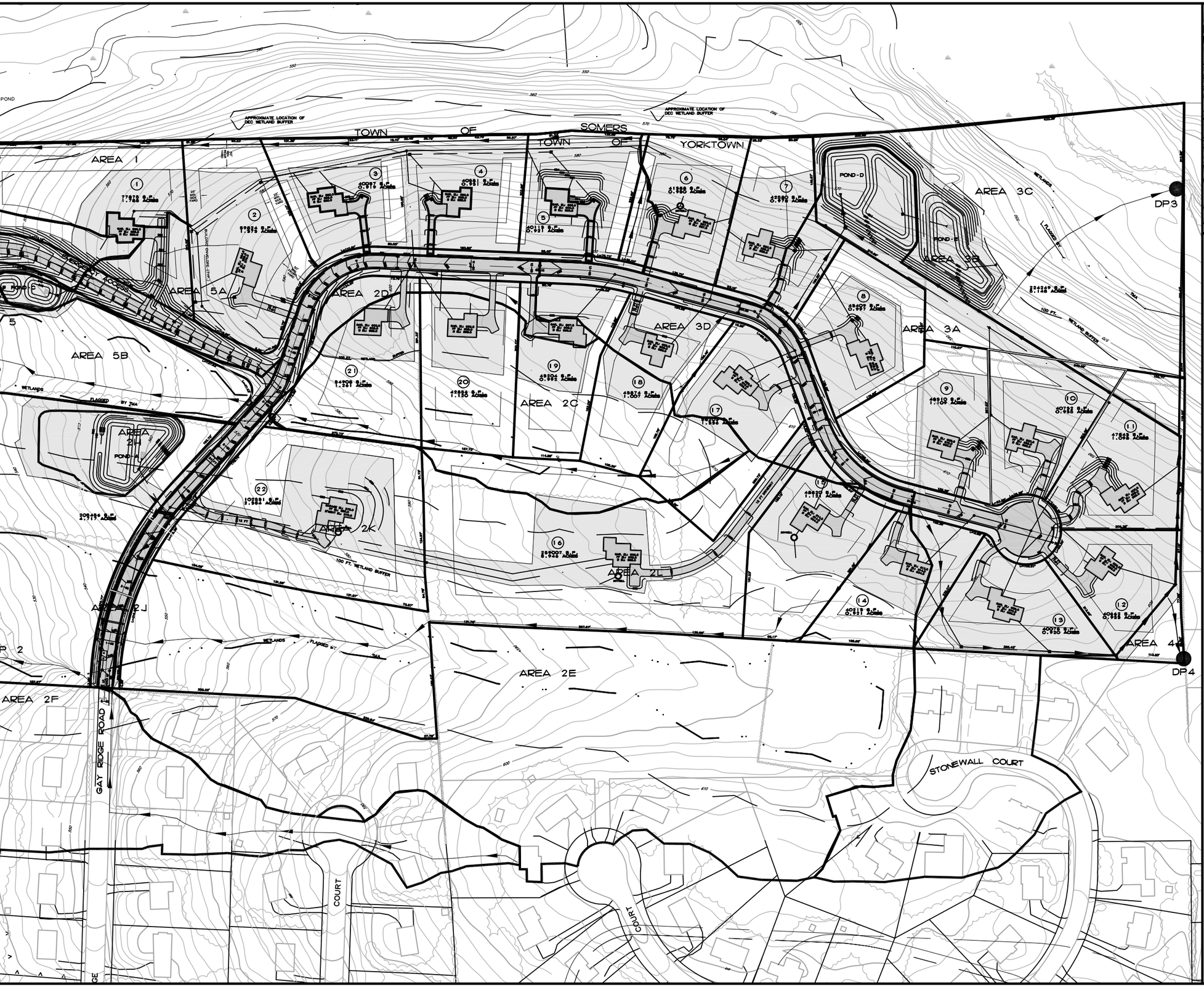
LEGEND

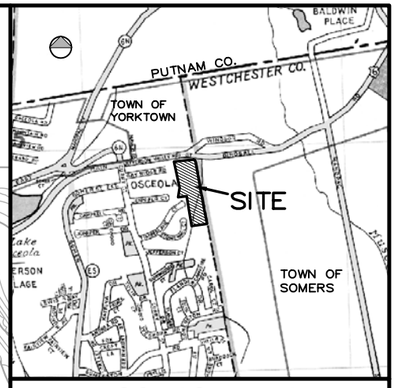
EXISTING	PROPOSED	
		CATCH BASIN
		DRAIN MANHOLE
		SAN. SEWER MANHOLE
		HYDRANT
		DRAIN INLET
		WATER VALVE
		HEADWALL
		DRY WELL
		STREET LIGHT
		MONUMENT
		WELL
		S.D.A.
294	294	CONTOUR LINE
		WETLANDS FLAGGED BY TIM MILLER ASSOCIATES (2003–2004)

RALPH G. MASTROMONACO, P.E., P.C.
Consulting Engineers
13 Dove Court, Croton-on-Hudson, New York 10520
(914) 271-4762 (914) 271-2820 Fax

EXISTING WATERSHED

PREPARED FOR
YORKTOWN FARMS
TOWN OF YORKTOWN
WESTCHESTER CO., N.Y.
MAY 2, 2007





LOCATION MAP
SCALE: 1" = 2000'

0 80 160

SCALE IN FEET

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PROPOSED WATERSHED MAP

PREPARED FOR

YORKTOWN FARMS
TOWN OF YORKTOWN
WESTCHESTER CO., N.Y.
JUNE 6, 2007

SHEET 1 OF 1 SHEETS