Illington Dam
408 Illington Rd, Ossining, NY

POND & DAM DESIGN OUTLINE

- Pond & Dam Geometry
- Cut & Fill Site Plan
- Drainage Area Summary
- Earth Dam Soil Analysis
- Pond Volume Calculations (Spillway Elevation)

Prepared By:

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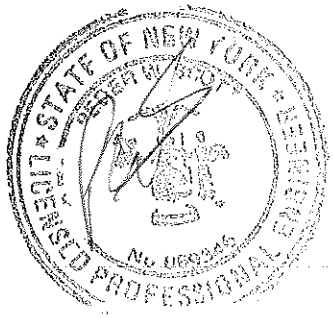
February 20, 2020



Pond & Dam Geometry

Existing Dam – Failed:	Stone & Mortar
Top:	334.0
Bottom:	330.0
Length:	58.0 feet to berm
Spillway:	10.0' wide x 22' long

Proposed Dam	
Top of Earth Berm:	339.0 x 12' wide
Top of Concrete Dam:	339.0 x 5.0' wide at top
Bottom of Dam:	328.0(pending soil borings)
Length:	76.0'
Spillway:	30.0' wide
	Crest: 336.0 to 332.0 x 10' long
	Slope is: parabolic

Pond Size:	246' long x 148.0' wide
Surface Area:	39,700 sf = 0.91 acres
Water surface Elev.:	336.0 ft
Bottom Elev.:	330.0 ft

Pond Size includes plunge pool:	61' x 76' x 5' deep
Rip-rap Weir:	335.0 x 14.0' wide

Soil Excavated:	2,930 cy
Soil Compacted into Earth Berm:	1,443 cy
Net Soil:	1,486 cy (Grid Method)

Note: Pond Crest – toe of dam (336.0-328.0) = 8.0 feet
with 217,000 gal storage: (crest: 336.0 to bottom: 330.0)

NYSDEC Dam Safety Permit is not required.

Pond includes 15' bench at edge (336 o 335)
Slope of Pond Interior: 2/10

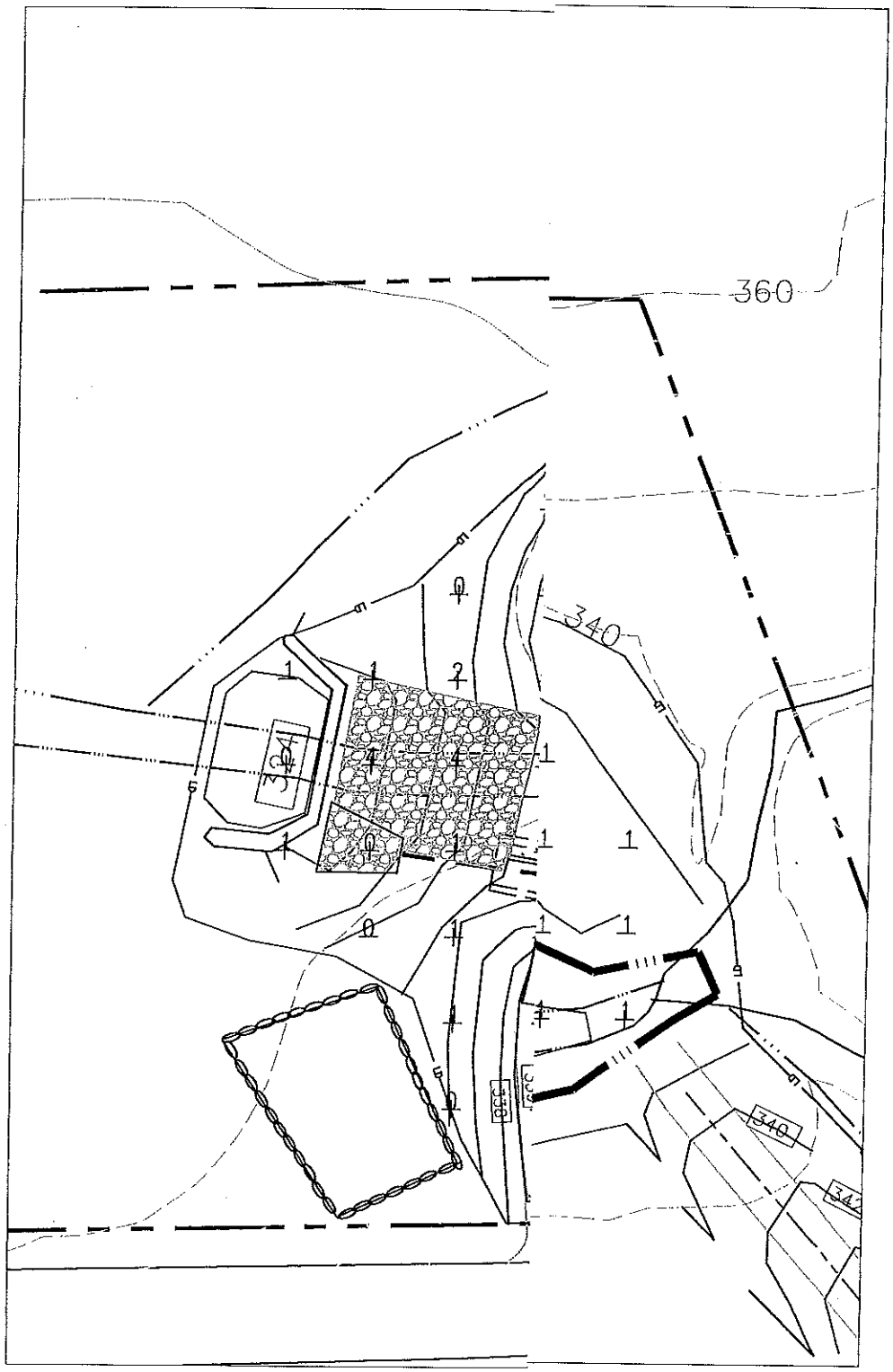
Access to Pond
Existing road defined by topography shall be upgraded to 12' wide with a slope of 10% extending from Illington Rd to elevation of 336.0 ft. proposed water line. Crossing is with temporary pipe or wood structure.

Secondary Access to Dam (for concrete pouring)
Adjacent to stone wall lining cemetery. Propose 12' wide driveway to dam top of 336.0' at slope of 8% for concrete trucks.

Channel Below Dam:
Slope: 13%
Width: 30 feet
Shape: Trapezoidal
Liner: Rip-rap: D50 = 18"; Thickness = 36"

Specific Design Details
Dam stability based upon size of concrete preventing rotation around the heel.
NYSDEC has 4 criteria to be met: Base Flow Loading; 100 year Loading; Winter Base Flow with Ice; and Earthquake Loads each required FS of 2.0. Final design pending.

Drain down pipe required with valve: 36" diameter SCH 80 PVC or Steel pipe bolted to steel knife valve as required by NYSDEC for drain down.



CUT&FILL

GRAPHIC SCALE

40 20 0 40 43

(IN FEET)

1 inch = 40 ft.

Net CY

1486 (C)

Method

Grid

Revisions			Dwg. Title	CUT&FILL PLAN	Dwg. No.	SY1A
No.	Date	Description	Project Title	ILLINGTON DAM	Seal	
			Proj. No.	19-145	Drawn by	PWS
			Date	2-20-20	Scale	AS NOTED

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3871 ROUTE 6
BREWSTER, NY 10509 845-278-2110

Drainage Area Summary

Watershed – Total: 104.88 acres

Pre-Development		
Imp		
Illington Rd:	Length (2,440) x 22 ft =	53,680
Eastern Drive:	598 x 30 ft =	17,940
Taconic:	2,468 x 20 ft =	172,760
Taconic West:	3,172 x 70 ft =	222,040
Commercial Bldg:	16,000 sf + 28,000 Parking =	44,000
House:	2,500 ft footprint (avg.) x 6 =	15,000
Driveway:	(355 + 133 + 187 = 181 + 85 + 1.40) x 14' width = 1,081 x 14 =	15,134
Total Imp.:	12.41 acres	
Brush		
Open Area:	356,000 totals: B Soil = 287,000; C Soil = 68,900	
	B Soils – Shoulder of Roads: 5' each side = 8,678 (10) =	86,780
	Total Brush B = 8.6 acres	
	Total Bruch C = 1.58 acres	
Lawn		
Commercial:	62,000	
Residential:	32,000 / Residence x 6	
Total Lawn =	5.8 acres	
Wetlands – LEB Soil:	0.88 acres	
	Total Wetland = 0.88 acres	
Remainder Forest:	104.88 – 12.41 – 10.2 – 5.8 - .88 =	75.62
% Forest	75.6 / 10,488 =	72%
	(checks with Stream Stat)	
	Total pre-development forest:	75.62 acres
Post-Development:		
New Pond:	39,615 =	0.9 acres
	(replaces wetland)	
	Total Post-Development Forest:	75.62 acres

Earthen Dam Design Synopsis

Soils defined by NRCS Soil Site as defined on plans. Two soils in vicinity of dam:

CSO – Chatfield -Charlton Complex – Hilly, very rocky
- 0 to 2" Very dark grayish brown loam
- 2" to 7" Dark brown loam
- 7" to 24" Brown flaggy silt loam

Bedrock – 24" Fractured Granit Bedrock
- or for Charlton: 24" to 60" Dark grey brown sandy loam
- Permeability moderate to rapid (0.6 to 6.0 in./hr.)

LCB – Leichester Loam
- Capability subclass IIIW
- 0" to 8" Dark grey brown loam
- 8" to 18" Dark brown sandy loam – Mottles
- 18" to 26" Brown sandy loam – Mottles
- 26" to 60" Brown sandy loam – Mottles
- Very deep water table with 1.5' of surface
- Permeability: Moderate to rapid infiltration with 1.5' of surface (0.6 to 6.0 in. /hr.)

No soil borings to date at the site.

Cut Off Trench Requirements

GC Clayey Gravels
SC Clayey Sand & Clay Mixture
CH Inorganic Clays
CL Inorganic Clays

MH Inorganic Silt / Clay
- Mixture Atterberg Limit – Below A – PI < 4
- Not Permitted

ML Inorganic Silt / Clay
- Mixtures – Atterberg Limit
- Not Permitted Below A – Line

Conclusions

No on site material is suitable for core or cut off trench construction. Material must be processed off site.

A liner is required of either Bentonite mixture or 10 mil pondscape barrier.
Note: The core is still required for the dam.

File.... Z:\PROGRAMS\PONDPACK\IILLINGOTN ROAD DAM\DAM DESIGN STARTING AT 335.PPW
Title... MAIN POND

POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
335.00	24728.000	.5677	.0000	.000	~~.000~~
336.00	33441.000	.7677	1.9955	.665	.665
337.00	38393.000	.8814	2.4717	.824	~~1.489~~
338.00	42000.000	.9642	2.7674	.922	2.412
339.00	43000.000	.9871	2.9269	.976	3.387

216,700 GALLONS SPILLWAY ELEV.

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

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID STORMS.RNQ WESTCH-ILLINGTON

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID
90%	1.4000	Synthetic Curve	SCSTYPES	TypeIII 24hr
25NR	6.5000	Synthetic Curve	GAUGED	Synth.Tbl 25
100NR	9.3000	Synthetic Curve	GAUGED	Synth.Tbl 100

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

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

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
*POST	JCT	base	.512		13.1740	1.22		
*POST	JCT	25NR	26.004		13.0430	121.53		
*POST	JCT	100 NR	45.612		13.0340	243.54		
*PRE	JCT	base	.501		12.5550	1.70		
*PRE	JCT	25NR	25.982		13.0170	122.03		
*PRE	JCT	100 NR	45.596		12.9790	244.35		
TOTAL POND	IN POND	base	.531		12.5160	1.97		
TOTAL POND	IN POND	25NR	26.247		12.9820	123.26		
TOTAL POND	IN POND	100 NR	45.939		12.9820	246.38		
TOTAL POND	OUT POND	base	.512		13.1740	1.22	336.06	.833
TOTAL POND	OUT POND	25NR	26.004		13.0430	121.53	337.49	2.296
TOTAL POND	OUT POND	100 NR	45.612		13.0340	243.54	338.38	3.372
WS POST	AREA	base	.531		12.5160	1.97		
WS POST	AREA	25NR	26.248		12.9820	123.26		
WS POST	AREA	100 NR	45.940		12.9820	246.38		
WS PRE	AREA	base	.501		12.5550	1.70		
WS PRE	AREA	25NR	25.982		13.0170	122.03		
WS PRE	AREA	100 NR	45.597		12.9790	244.35		

Pond

Calc volume of forebay storage as sediment basin:

Overall pond watershed 104 acres
The watershed directly to the (2) streams entering the pond total: 18 acres

Use RUSLE Method – Refer to NYSS ESC Manual

$A = Rk\,(LS)\,C$

$R = 150$

Charlton k = .48
Leichester k = .24 (20% area)
Use k = .38 weighted avg.

Percent Slope: 10%
Slope Lengths: 800 ft avg.
See Stream Stat Data

LS = 7.0
C = Forest Use / Established – 75% Cover Weeds
C = .011

$A = Rk\,(LS)\,C$
= 4.3 tons /acre (18 acres) = 79 tons / year

Conversion T = .70 (tons to cy)

A = 79 (.7) = 55 cy /year = 1,493 cf/year

Volume of Stream Plunge Pool
Base 330 @ 276 sf
332 @ 759 sf
334 @ 1,543 sf
335 @ 2,742 sf (top)

Per Pond Pack – Volume = .123 acre – ft
= 5,400 cf

1,493 cf capacity @ elevation: 332.5 (clean out elevation)

Sedimentation Basin Sizing

Refer to manual: New York State Guidelines for Sediment and Erosion Control

The project sedimentation control during construction consists of dividing the lands through implementation of temporary swales and diversion dikes into watershed areas depicted on the Erosion Control Plan. The following is an analysis of the respective watersheds and design of sedimentation basins. The basins have sufficient volume to store sediment load plus runoff from 1.0 inch first flush and to route the 10-year storm through the outlet structure.

Refer to Guidelines for applicable Standards, Section Page 5A.49

Sedimentation Basin Design Form

I) Sedimentation Basin: #1
Location: Southern end of pond
Class of Basin: 2
Watershed #: WS#1 accessway and staging area
Area: .28 acres disturbed
Design Requirements: Refer to Temporary Sediment Design Data Sheet

II) Minimum Storage Volume: 134 cy/acre
Drainage Acreage: .28 acres
Volume Required: 37.5 cf = 1,013 cf Provided: 1,294 cf @ 339.5
Shape: Length/Width: 2/1 : 40' x 20'
Sediment Top: 340.5
Sediment Bottom: 336.0

III) Minimum Surface Area:
A required = 0.01 QP = 117 sf
A required = 0.015 D.A. = 190 sf
Proposed: 800 sf

IV) Hydraulic Design – Using TR55
Water Shed area: As = .28 acres
Class B Soils
Exposed Earth: CN = 86
Tc: Sheet Flow Limit = 50 feet
Concentration Flow: 20 feet
Swale Flow (N/A)
Length: 0
X-Section _____
Slope:
Surface : Gravel/Stone
D_{50} Req'd _____ Fig ( )
N Value _____ Fig ( )
Velocity _____ FPS
Qp 10-year = 0.27 cfs

V) Spillway Design
Vertical Pipe or Outlet Box
Select: vertical pipe – 12" ∅ riser – top @ 339.5 for storage volume

Min. Size = .2 cfs/acre, times drainage acreage = .06 cfs
Emergency Spillway: 1.0' below top elevation @ 339.5
D_{50} Stone 6"
Width: 4 Feet with V_1 side slopes
Flow Capacity 1.0 cfs
Refer to Flow Master program attached

VI) Dewatering Basin
Dewatering required over 10-hour period
$A_0 = \frac{As \times 2h^{.5}}{12256} = .018$ sf Orifice = 2" dia.

VII) Routing Calculations Using TR55 Modeling
1) Basin Design: Routing 10-year storm with outlet riser
2) Model Drain Down Calculation: refer to TR55 calculations – Under 10 hours
3) Emergency Overflow Weir: Routing 100-year Storm
Note: 10-year required per NYSDEC

Routing Synopsis
Computer Model: Basin Top = 340.5
Basin Bottom = 336.0
Assume 50% Fill Sediment (routed from 337.0)

Routing	Routing Elevation	Free Board	Emergency Weir Flow Elevation
1-year	337.98	2.5	N/A
10-year	339.53	1.0	0.0
100-year	339.58	0.92	0.08

Refer to Center Model Synopsis

VII) Anti Seep Collars
Discharge Pipe: 12" ∅
Riser @ 339.5
Pipe Out @ 336.0
Length = 34.0 ft
Y = 3.5 LS = 22.2
Use 2 Collars – 2.75 x 2.75

IX) Pipe Discharge
100-Year Flow Out: .77 cfs
Capacity: 12" ∅ pipe @ 1% x 34' long: 3.2 cfs

Table of Contents

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID STORMS.RNQ WESTCH-ILLINGTON

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID
100NR	9.3000	Synthetic Curve	GAUGED	Synth.Tbl 100
1-YR	2.7944	Synthetic Curve	SCSTYPES	TypeIII 24hr
10-YR	4.9094	Synthetic Curve	SCSTYPES	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)

Storage Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
*DISCHARGE		JCT	100 NR	.168		12.9380	.77		
*DISCHARGE		JCT	1	.038		12.3540	.14		
*DISCHARGE		JCT	10	.082		12.4310	.30		
MOBILIZ AREA		AREA	100 NR	.165		12.9520	.77		
MOBILIZ AREA		AREA	1	.035		12.1010	.46		
MOBILIZ AREA		AREA	10	.079		12.1030	1.01		
SEDIMENT	IN	POND	100 NR	.165		12.9520	.77		
SEDIMENT	IN	POND	1	.035		12.1010	.46		
SEDIMENT	IN	POND	10	.079		12.1030	1.01		
SEDIMENT	OUT	POND	100 NR	.168		12.9380	.77	339.58	.029
SEDIMENT	OUT	POND	1	.038		12.3400	.14	337.98	.010
SEDIMENT	OUT	POND	10	.082		12.4310	.30	339.52	.027

Type.... Design Storms
Name.... WESTCH-ILLINGTON

File.... C:\HAESTAD\PPKW\RAINFALL\STORMS.RNQ
Title... ROUTING OF STORMS THROUGH BASIN
100 YR AND 25 YR

DESIGN STORMS SUMMARY

Design Storm File,ID = STORMS.RNQ WESTCH-ILLINGTON

Storm Tag Name = 100NR
Description: 100 YEAR NRCC-C STORM EVENT

Data Type, File, ID = Synthetic Storm GAUGED.RNF Synth.Tbl 100
Storm Frequency = 100 NR yr
Total Rainfall Depth= 9.3000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= 1.0000 hrs End= 24.0000 hrs

Storm Tag Name = 1-YR
Description: 1 YEAR FIRST FLUSH

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeIII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.7944 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-YR
Description: 10 YEAR

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeIII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 4.9094 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... Z:\PROGRAMS\PONDPACK\IILLINGOTN ROAD DAM\SEDIMENT BASIN.PPW
Title... SEDIMENT WATERSHED

::
TIME OF CONCENTRATION CALCULATOR
::

SEDIMENT WATERSHED

Segment #1: Tc: TR-55 Shallow
Description: EARTH FLOW

Hydraulic Length	20.00 ft
Slope	.080000 ft/ft
Unpaved	
Avg.Velocity	4.56 ft/sec

Segment #1 Time: .0012 hrs

Segment #2: Tc: TR-55 Sheet
Description: SHEET FLOW

Mannings n	.1000
Hydraulic Length	50.00 ft
2yr, 24hr P	3.6000 in
Slope	.100000 ft/ft
Avg.Velocity	.41 ft/sec

Segment #2 Time: .0336 hrs

==========
Total Tc: .0348 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

File.... Z:\PROGRAMS\PONDPACK\IILLINGOTN ROAD DAM\SEDIMENT BASIN.PPW
Title... SEDIMENT WATERSHED

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.... Z:\PROGRAMS\PONDPACK\IILLINGOTN ROAD DAM\SEDIMENT BASIN.PPW
Title... SEDIMENTBASIN

POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
336.00	85.000	.0020	.0000	.000	.000
338.00	371.000	.0085	.0145	.010	.010
340.00	777.000	.0178	.0387	.026	.035

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.... Z:\PROGRAMS\PONDPACK\IILLINGOTN ROAD DAM\SEDIMENT BASIN.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 336.00 ft
Increment = .10 ft
Max. Elev.= 340.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	A	--->	TW	339.500	340.000
Orifice-Circular	B	--->	TW	336.000	340.000
Weir-Rectangular	C	--->	TW	339.500	340.000

TW SETUP, DS Channel

File.... Z:\PROGRAMS\PONDPACK\IILLINGOTN ROAD DAM\SEDIMENT BASIN.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID	= A	
Structure Type	= Stand Pipe	
# of Openings	= 1	
Invert Elev.	= 339.50	ft
Diameter	= 1.0000	ft
Orifice Area	= .7854	sq.ft
Orifice Coeff.	= .600	
Weir Length	= 3.14	ft
Weir Coeff.	= 3.300	
K, Submerged	= .000	
K, Reverse	= 1.000	
Kb,Barrel	= .000000	(per ft of full flow)
Barrel Length	= .00	ft
Mannings n	= .0000	

Structure ID	= B	
Structure Type	= Orifice-Circular	
# of Openings	= 1	
Invert Elev.	= 336.00	ft
Diameter	= .1667	ft
Orifice Coeff.	= .600	

Structure ID	= C	
Structure Type	= Weir-Rectangular	
# of Openings	= 1	
Crest Elev.	= 339.50	ft
Weir Length	= 4.00	ft
Weir Coeff.	= 2.800000	

Weir TW effects (Use adjustment equation)

File.... Z:\PROGRAMS\PONDPACK\IILLINGOTN ROAD DAM\SEDIMENT BASIN.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

Index of Starting Page Numbers for ID Names

sediment emergency weir
Worksheet for Trapezoidal Channel

Project Description	
Project File	untitled.fm2
Worksheet	sediment basin overflow
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.020000	ft/ft
Left Side Slope	1.000000	H : V
Right Side Slope	1.000000	H : V
Bottom Width	4.00	ft
Discharge	1.00	cfs

Results		
Depth	0.16	ft
Flow Area	0.67	ft²
Wetted Perimeter	4.46	ft
Top Width	4.32	ft
Critical Depth	0.12	ft
Critical Slope	0.048808	ft/ft
Velocity	1.49	ft/s
Velocity Head	0.03	ft
Specific Energy	0.20	ft
Froude Number	0.67	
Flow is subcritical.		