Application for Authorization to Construct or Alter a Dam
10 V.S.A. Chapter 43
Vermont Department Of Environmental Conservation
Facilities Engineering Division

Name of Project:

Curtis Pond Dam Rehabilitation

Calais, VT

DuBois & King Project No. 921439

Owner/Applicant:

Town of Calais

3120 Pekin Brook Road

East Calais, VT 05650

Prepared by Authorized Agent:

28 North Main Street
Randolph, VT 05060
Phone: (802) 728-3376
Fax: (802) 728-4930

Dated: May 2013

Application No.	
Dam	Curtis Pond Dam
Town	Calais

STATE OF VERMONT

DEPARTMENT OF ENVIRONMENTAL CONSERVATON

APPLICATION FOR AUTHORIZATION TO CONSTRUCT OR ALTER A DAM

10 V.S.A. Chapter 43

1. Applicant Name: **Town of Calais** Telephone: **802-456-8720**
   Address **3120 Pekin Brook Rd East Calais, VT 05650**
2. Legal Entity Form **Municipality** Date Formed
   Place Formed Date Reg. In VT
3. Contact Name: **Shawn Patenaude (DuBois & King)** Title: **Sr. Dam Engineer**
   Address: **28 North Main Street** Telephone: **802-728-3376**
   Randolph, VT 05060
4. Land Ownership And Flowage Rights: Complete Schedule A

5. PROJECT DESCRIPTION

   a. ☒ Reconstruction/Alteration/Modification
   ☐ New Construction
   ☐ Removal/Breaching

   b. Name of Dam **Curtis Pond Dam**

   c. Town **Calais**

   d. Watercourse **Curtis Pond**

   e. Drainage Area **917** A

   f. Type of Dam **dry laid masonry wall**

			Existing		Proposed	
g.	Surface Area	@ NWL	**72**	A	**72**	A
		@Top of Dam (El. **1002.5**')	**75**	A	**75**	A
h.	Storage	@ NWL	**724**	AF	**724**	AF
		@Top of Dam (El. **1002.5'**)	**1000**	AF	**1000**	AF
i.	Height (maximum)		**12**	FT	**12**	FT

j. Will the existing normal water level be raised? ☐ Lowered? ☐ How much? **NO**

k. General description and purpose of project. **The purpose of this project is to rehabilitate the existing Curtis Pond Dam. The most recent inspection in May 2012 indicated that the overall condition of the dam was poor. The recommended course of action was to replace or repair the dam ASAP.**

l. Method of operation: **During construction, the level of the pond shall be maintained at a level low enough to accommodate construction.**

6. ENGINEER

a. Design:

Name: **Shawn Patenaude, DuBois & King** VT PE License No. **8642**

Address: **28 N. Main Street, Randolph, VT 05060**

Telephone: **802-728-3376**

b. Construction Supervision:

Name: **Shawn Patenaude** VT PE License No. **8642**

Address: **28 N. Main Street, Randolph, VT 05060**

Telephone: **802-728-3376**

7. ESTIMATED CONSTRUCTION COST: **$314,000.00**

8. ESTIMATED START DATE: **June 1, 2013** COMPLETION DATE: **Aug 31, 2013**

9. FINANCIAL INFORMATION: Complete Schedule B

10. RIGHT OF ENTRY: Complete Schedule C

11. PUBLIC GOOD: Complete Schedule D

12. DOCUMENTS AND SCHEDULED ATTACHED

☒ Location Map ☒ Soils Information

☒ Schedules A, B, C, and D ☒ Hydrologic and Hydraulic Analysis

☒ Plans and Specifications ☐ Breach Analysis

☒ Other: _____

13. APPLICATION FEE ENCLOSED: **$N/A**
14. CERTIFICATION: I certify that the information in this application and the attached schedules is true and accurate to the best of my (our) knowledge.

Signature of Applicant: _____ Date: _____

_____

Typed Name(s) and Title(s)

ATTACHMENTS

FIGURES

Figure 1: (USGS) Location Map

SCHEDULES

Schedule A: **Land Ownership and Flowage Rights**
Schedule B: **Financial Information**
Schedule C: **Right of Entry**
Schedule D: **Public Good**

ENGINEERING COMPUTATION & ANALYSIS

- **Hydrologic and Hydraulic Analysis**
- **Structural Design**

OPERATIONS & MAINTENANCE

- **First Filling (Refilling) Procedures**
- **Operations & Maintenance Manual**

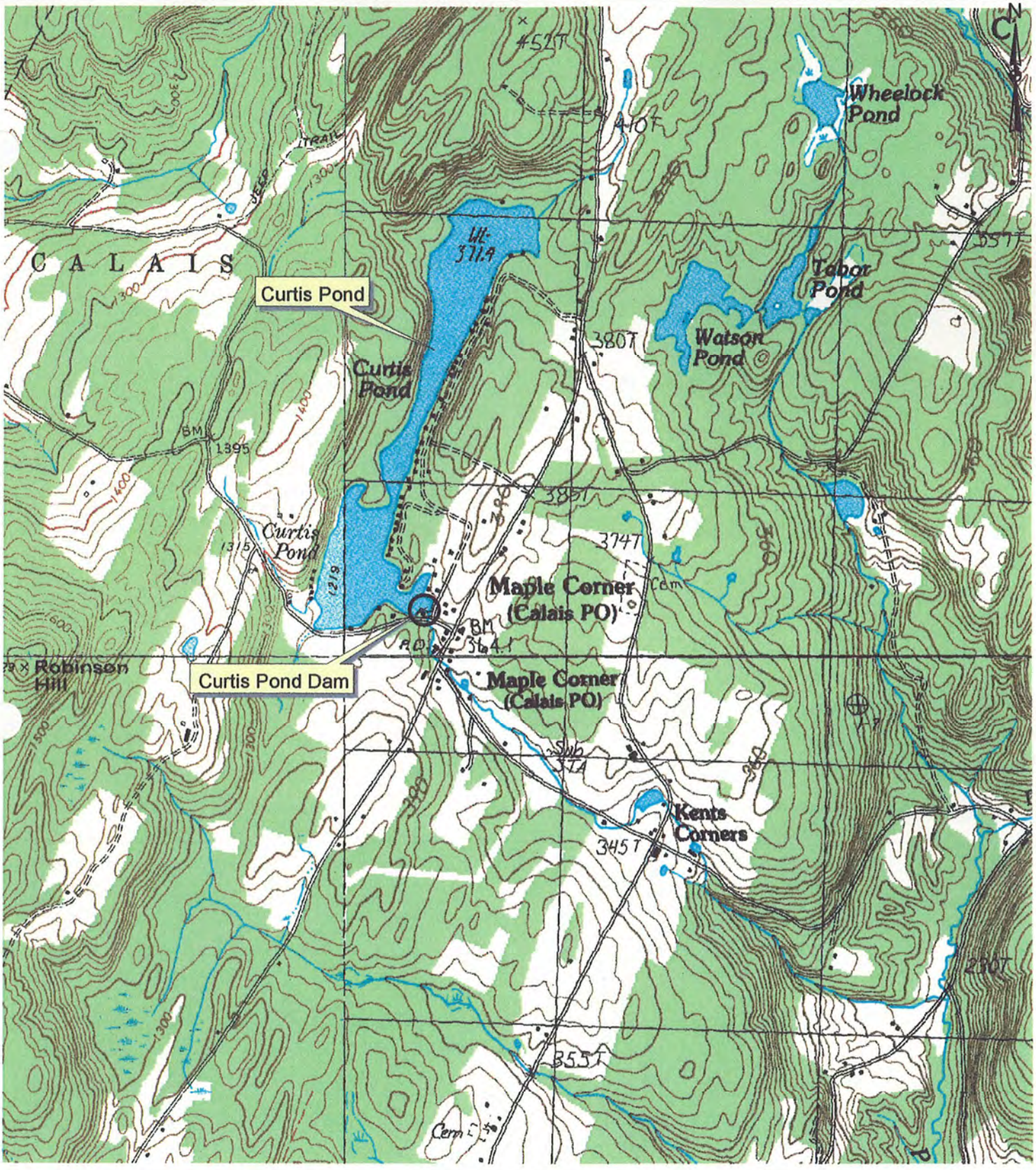
TECHNICAL SPECIFICATIONS

ENGINEERING DRAWINGS

Sheet 1 of 9: **Title Sheet**
Sheet 2 of 9: **General Notes**
Sheet 3 of 9: **Existing Conditions and Baseline Layout Plan**
Sheet 4 of 9: **New Conditions Site Plan**
Sheet 5 of 9: **Baseline Profile**
Sheet 6 of 9: **New Concrete Cutoff Wall Typical Sections**
Sheet 7 of 9: **Concrete Details**
Sheet 8 of 9: **Outlet Channel Plan and Details**
Sheet 9 of 9: **Control of Water / Erosion Control Details**

FIGURES

Figure 1: (USGS) Location Map



DuBois & King inc.

engineering
planning
management
development

CURTIS POND DAM
CALAIS, VERMONT

SITE LOCATION MAP

DRAWN BY: JDA	DATE: 10/08/03
CHECKED BY:	PROJ. NO. 618450L
PROJ. ENG.	DRAW. NO.

0 500 Feet

SCHEDULES

Schedule A: **Land Ownership and Flowage Rights**
Schedule B: **Financial Information**
Schedule C: **Right of Entry**
Schedule D: **Public Good**

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Schedule A
Land Ownership and Flowage Rights

1. Name of Applicant **Town of Calais**
2. Do you own in fee all of the land upon which the dam and its appurtenances are or will be located? ☐ Yes ☒ No
   If answer is "No":
   a. Who owns the land?

      Name

      Address
   b. What legal interest, if any, do you have in the land?

   c. Have you been given permission by the landowner(s) to construct or alter the dam? ☐ Yes ☐ No
      If answer is "Yes", attach copies of easements, agreements, or other documents conveying this permission, **and** an agreement with the landowner(s) stating who will be responsible for the operation, maintenance and safety of the dam.
3. For a **new** dam. Do you own in fee all the lands subject to flowage by the proposed dam with water level:
   a. at NWL? ☐ Yes ☐ No
   b. at Top of Dam? ☐ Yes ☐ No
      If "No", provide the names and addresses **and** copies of flowage easements or letters of permission from the affected landowners.
4. For an **existing** dam. Do you own in fee all the lands subject to flowage by the existing dam with water level:
   a. at NWL? ☐ Yes ☐ No
   b. at Top of Dam? ☐ Yes ☐ No
   c. If the answer to either part of 4 (b) is "Yes", Do you own in fee all **additional** acreage that will be subject to flowage? ☐ Yes ☐ No
      If "No", provide names and addresses of affected landowners, **and** provide copies of flowage easements or letters of permission from the affected landowners.

5. Are there any other persons who have flowage, mill, power, or other rights at this site? ☐ Yes ☒ No
   If "Yes" provide names and addresses and the type of rights for any such persons.

Notes:

1. If the answer to any part of Questions 2 (c), 3(a) and (b), and 4 (c) is "No," the necessary permissions easements and/or flowage rights will have to be obtained from the affected landowners before this application can be processed.

2. NWL= Normal Water Level.

3. Top of dam = Water level at the top of the non-overflow part of the structure, i.e., at top of freeboard.

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Schedule B
Financial Information

1. Name of Applicant: **Town of Calais**
2. Excluding the cost of the land, what is the total cost of the project? **$314,000**
3. How will this project be funded, what financing has been obtained, and what additional financing will be necessary?
   Paid through capital funds of Town of Calais

4. How will operation and maintenance of the completed project be funded?
   Paid through capital funds of Town of Calais

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Schedule C
Right of Entry

Permission is hereby given to employees of the Agency of Natural Resources to enter upon the lands owned or leased by the applicant for the purpose of investigating the project applied for under provisions of 10 V.S.A. §§1084, 1087 and 8005 for processing this application, and for inspections prior to, during and upon completion of any construction that may be authorized by 10 V.S.A. §1086 (b).

Signature of Applicant: _____ Date: _____

Town of Calais
Typed Name(s) and Title(s)

Application No.	
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Schedule D
Public Good

1. Name of Applicant: **Town of Calais**
2. Address and answer, to the extent possible, the following questions as it relates to each of the 13 factors in 10 V.S.A. §1086(a). Complete responses on form below or use separate sheets and attach to this form. What effect will the proposed project have on:
   - (1) the quantity, kind and extent of cultivated agricultural land that may be rendered unfit for use by the project, including both the immediate and long range agricultural land use impacts;
   - (2) scenic and recreational values;
   - (3) fish and wildlife;
   - (4) forests and forest programs;
   - (5) the need for a minimum water discharge flow rate schedule to protect the natural rate of flow and the water quality of the affected waters;
   - (6) the existing uses of the waters by the public for boating, fishing, swimming, and other recreational uses;
   - (7) the creation of any hazard to navigation, fishing, swimming or other public uses;
   - (8) the need for cutting clean and removal of all timber or tree growth from all or part of the flowage area;
   - (9) the creation of any public benefits;
   - (10) the classification, if any, of the affected waters under chapter 47 of this title;
   - (11) any applicable state, regional or municipal plans;
   - (12) municipal grand lists and revenues;
   - (13) public safety; and
   - (14) in the case of proposed removal of a dam that formerly related to or was incident to the generation of electric energy, but which was not subject to a memorandum of understanding dated prior to January 1, 2006 relating to its removal, the potential for and value of future power production.

This information is needed before the department can act on the application and will be considered in the department's determination of public good under 10 V.S.A. § 1086(a) where these 14 factors, among other things, must be considered.

Schedule D Cont.

Responses:	
(1)	**There is no active farming adjacent to the project work area. No cultivated agricultural lands are expected to be rendered unfit for use, including both the immediate and long range agricultural land use impacts. There will be no change in water level and no new lands being flowed.**
(2)	**The project may include cutting a minimal number of trees and shrubs in the immediate vicinity of the dam embankment, but not enough to create alterations of the scenic nature in the project area. A new concrete cut-off wall will be visible, however the general scenic corridor as viewed from the project area or from other vantage points will not be significantly impacted. No adverse impacts to existing scenic values will occur. Current recreational values of Curtis Pond will not be affected.**
(3)	**The pond water level will not change, nor will the operation of the dam. No impacts to fish or wildlife will occur as a result of this project.**
(4)	**A minimal number of trees and shrubs located directly around the dam embankment may be removed per dam safety requirements. The project does not include the mass cutting of forests or other construction activities within a forest. Therfore, the project will not have any impact on the forests or forest programs.**
(5)	**Rehabilitation of the dam will not change the the flow that occurs with the existing dam.**
(6)	**Rehabilitation of this dam will not affect the public use of Curtis Pond for boating, fishing, swimming, or other recreational uses.**
(7)	**The planned rehabilitation calls for a replacement of the current spillway with a similar configuration. In addition, the new low level outlet will be slip-lined into the existing low level conduit. A new sluice gate will be affixed to the new cut-off wall. A new trash rack will be provided for the principal spillway and low level outlet. None of these proposed rehabilitation measures will result in the creation of a hazard to navigation, fishing and swimming.**
(8)	**The project includes cutting a minimal number of trees located on the dam embakment.**
(9)	**This rehabilitation project enhances public safety by reducing potential damages to downstream properties as a result of possible future failure of the existing dam during the SDF.**
(10)	**The waters of Curtis Pond discharge to a tributary of Pekin Brook.**
(11)	**The project will have no known effect on any state, regional or municipal plans.**
(12)	**The project is not expected to have any adverse effect on the municipal grand list and revenues.**
(13)	**The plans and specifications for the project described herein are adequate to provide for the public safety. The completion of the project will help ensure greater safety in a major storm event as a result of improvements to the dam.**

(14)	**The Curtis Pond Dam has never been related to or was incident to the generation of electric energy. There is no potential for and value of future power production.**

ENGINEERING COMPUTATION & ANALYSIS

- **Hydrologic and Hydraulic Analysis**
- **Structural Design**

Hydrologic and Hydraulic Analysis

Table 1
Existing Conditions
Flood Routing Results Summary

Flood Frequency	Total Inflow Peak Discharge (cfs)	Routed Outflow Peak Discharge (cfs)	Maximum Lake Level (assumed datum)	Available Freeboard (ft)
2-Year	239	8	1001.7	0.8
10-year	520	20	1002.2	0.3
25-year	764	44	1002.6	-0.1
50-Year	951	86	1002.8	-0.3
100-year	1,222	161	1003.1	-0.6
500-year	1,521	271	1003.3	-0.8
¼-PMP	1,561	330	1003.5	-1.0
½- PMP	3,959	1,804	1005.3	-2.8
¾ - PMP	6,508	4,168	1006.8	-4.3
1-PMP	8,802	6,063	1007.6	-5.1

Notes: Freeboard is measured from the top of the dam to the maximum lake level
Initial Water Level: El. 1001.0 (lake level at beginning of flood)
Top of Dam: El. 1002.5 (Average)

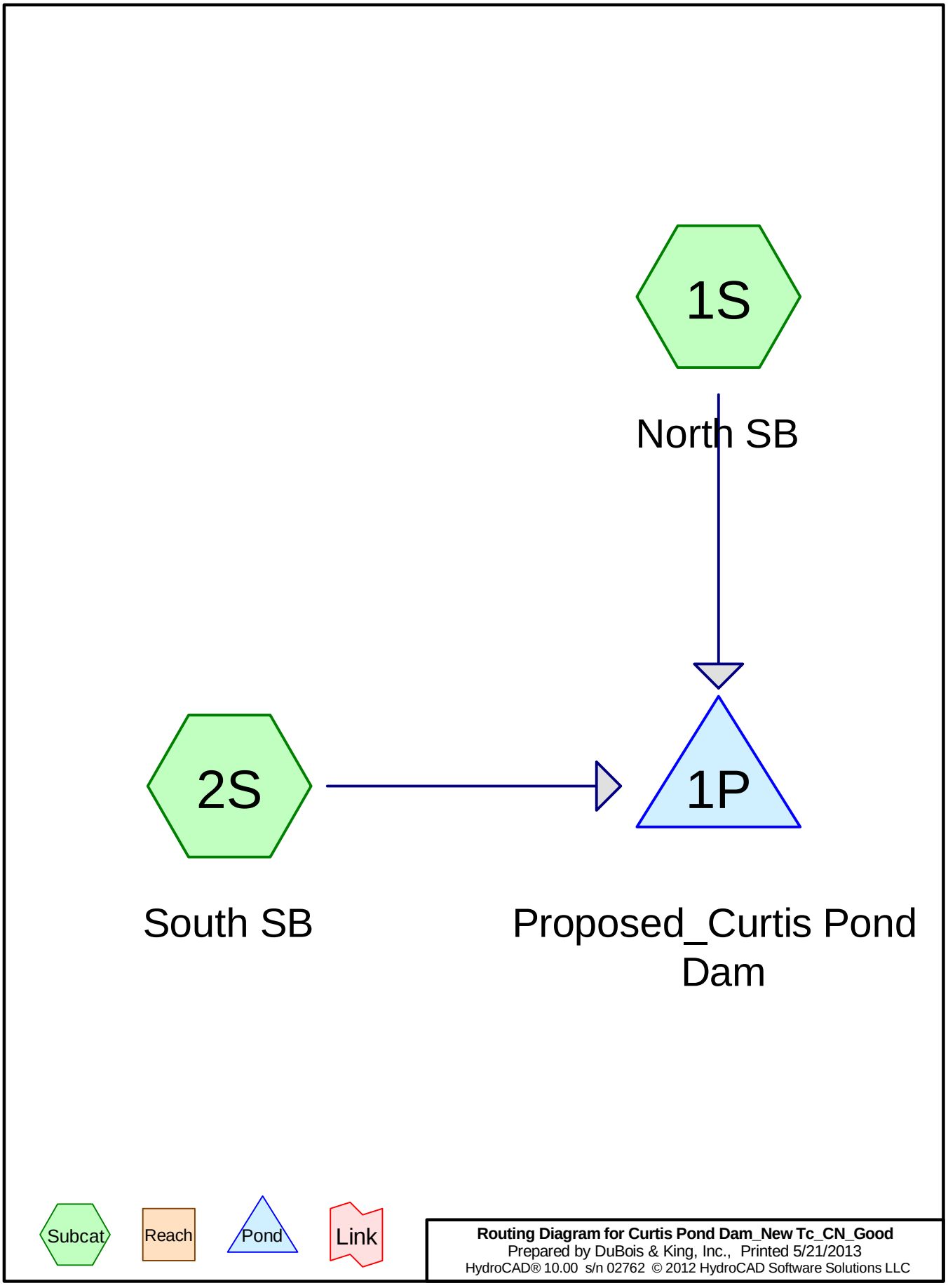
Table 1
Proposed Conditions
Flood Routing Results Summary

Flood Frequency	Total Inflow Peak Discharge (cfs)	Routed Outflow Peak Discharge (cfs)	Maximum Lake Level (assumed datum)	Available Freeboard (ft)
2-Year	137	8	1001.4	1.1
10-year	338	20	1001.8	0.7
25-year	513	33	1002.2	0.3
50-Year	684	47	1002.5	0.0
100-year	892	96	1002.7	-0.2
500-year	1564	349	1003.4	-0.9
¼-PMP	1484	327	1003.4	-0.9
½- PMP	3860	1678	1005.3	-2.8
¾ - PMP				
1-PMP				

Notes: Freeboard is measured from the top of the dam to the maximum lake level
Initial Water Level: El. 1001.0 (lake level at beginning of flood)
Top of Dam: El. 1002.5 (Average)
Proposed Spillway Crest width = 10 feet

Hydrology

1. New Tc
2. CN = Good not Fair
3. Incorporated the Pond surface area into SB1 and SB2. Soils that were not ranked were set equal to CN = 98, as in the original model



Routing Diagram for Curtis Pond Dam_New Tc_CN_Good
Prepared by DuBois & King, Inc., Printed 5/21/2013

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
65.905	98	Water Surface, HSG D (1S, 2S)
14.302	98	Water Surface, HSG D_Unrated (1S, 2S)
43.792	30	Woods, Good, HSG A (1S, 2S)
126.641	55	Woods, Good, HSG B (1S, 2S)
65.189	70	Woods, Good, HSG C (1S, 2S)
567.794	77	Woods, Good, HSG D (1S, 2S)
883.623	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
43.792	HSG A	1S, 2S
126.641	HSG B	1S, 2S
65.189	HSG C	1S, 2S
648.001	HSG D	1S, 2S
0.000	Other	
883.623		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	80.207	0.000	80.207	Water Surface	1S, 2S
43.792	126.641	65.189	567.794	0.000	803.416	Woods, Good	1S, 2S
43.792	**126.641**	**65.189**	**648.001**	**0.000**	**883.623**	**TOTAL AREA**	

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: North SB Runoff Area=550.337 ac 8.75% Impervious Runoff Depth=4.15"
Flow Length=10,419' Tc=85.8 min CN=75 Runoff=990.39 cfs 190.299 af

Subcatchment 2S: South SB Runoff Area=333.286 ac 9.62% Impervious Runoff Depth=3.62"
Flow Length=6,247' Tc=92.0 min CN=70 Runoff=495.68 cfs 100.497 af

Pond 1P: Proposed_Curtis Pond Peak Elev=1,003.35' Storage=1,096.039 af Inflow=1,484.01 cfs 290.795 af
Primary=94.66 cfs 117.739 af Secondary=232.35 cfs 102.686 af Outflow=327.01 cfs 220.425 af

Total Runoff Area = 883.623 ac Runoff Volume = 290.795 af Average Runoff Depth = 3.95"
90.92% Pervious = 803.416 ac 9.08% Impervious = 80.207 ac

Summary for Subcatchment 1S: North SB

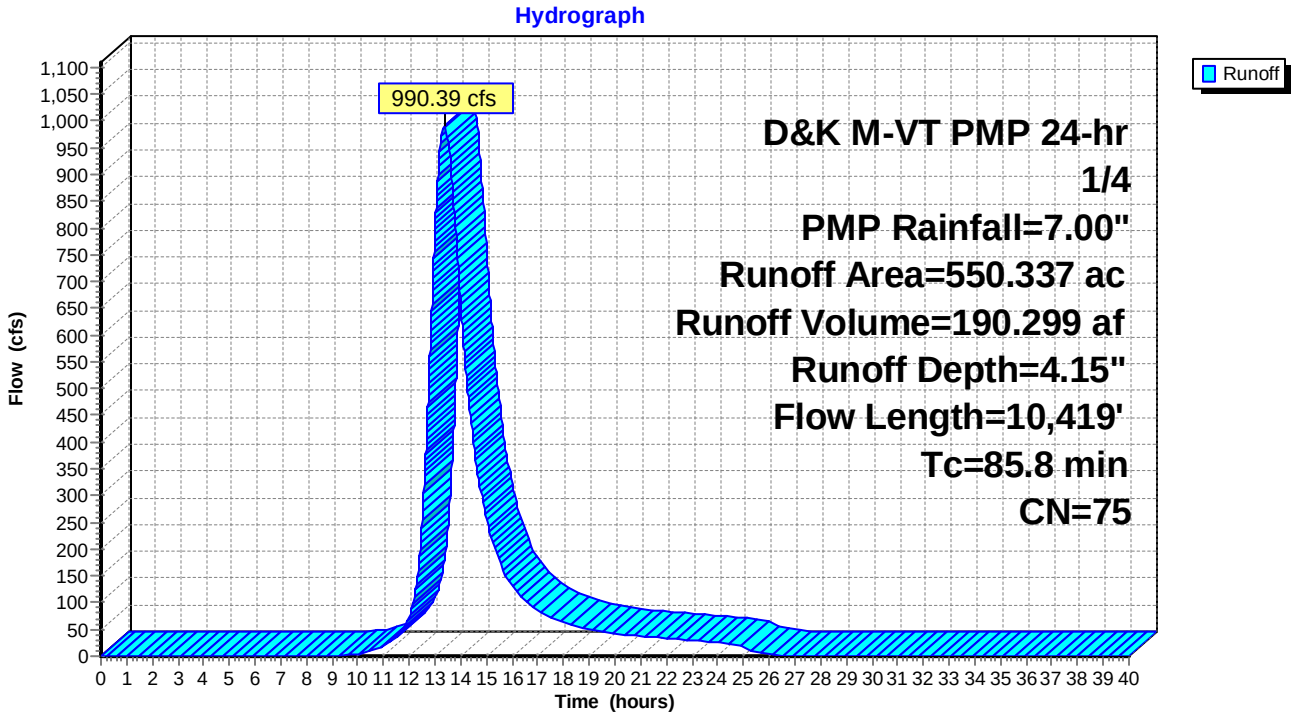
Runoff = 990.39 cfs @ 13.35 hrs, Volume= 190.299 af, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
D&K M-VT PMP 24-hr 1/4 PMP Rainfall=7.00"

	Area (ac)	CN	Description
	15.447	30	Woods, Good, HSG A
	53.503	55	Woods, Good, HSG B
	40.172	70	Woods, Good, HSG C
	393.072	77	Woods, Good, HSG D
*	8.600	98	Water Surface, HSG D_Unrated
	39.543	98	Water Surface, HSG D
	550.337	75	Weighted Average
	502.194		91.25% Pervious Area
	48.143		8.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	100	0.0572	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
39.1	1,003	0.0292	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
13.0	4,066	0.0480	5.20	31.19	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
4.9	5,250		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
85.8	10,419	Total			

Subcatchment 1S: North SB



Summary for Subcatchment 2S: South SB

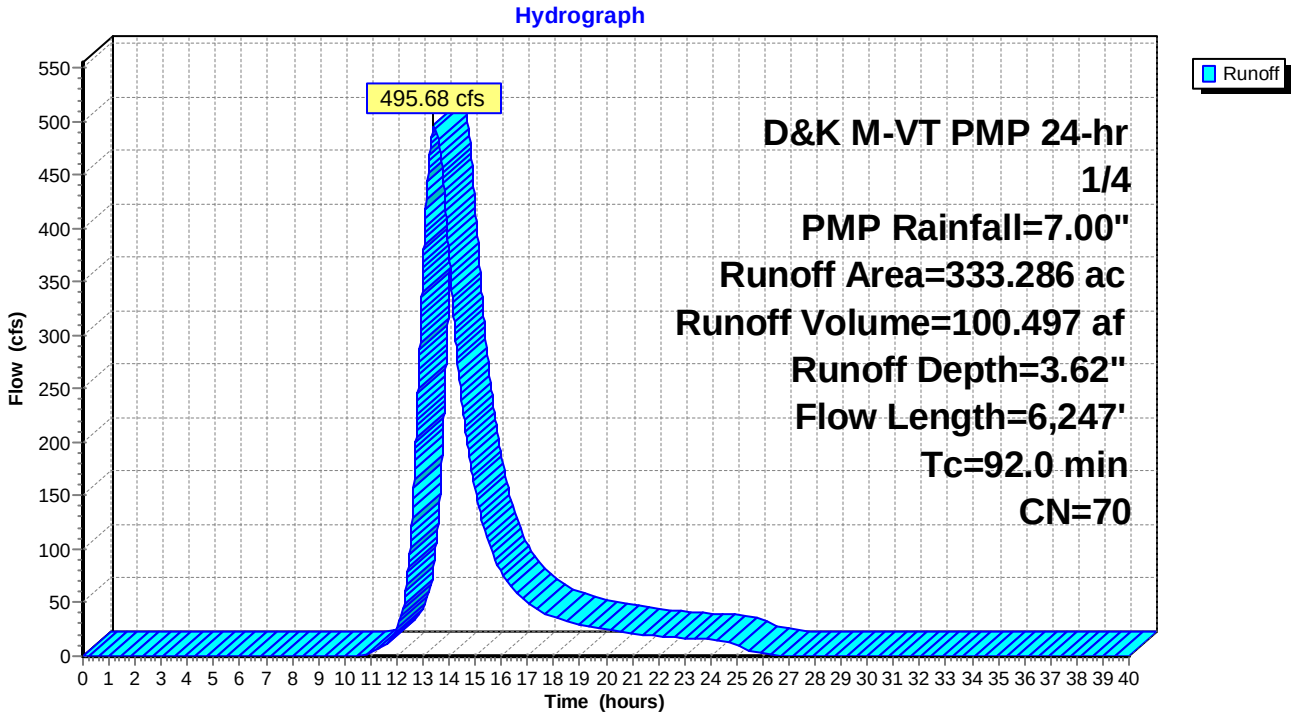
Runoff = 495.68 cfs @ 13.40 hrs, Volume= 100.497 af, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
D&K M-VT PMP 24-hr 1/4 PMP Rainfall=7.00"

	Area (ac)	CN	Description
	28.345	30	Woods, Good, HSG A
	73.138	55	Woods, Good, HSG B
	25.017	70	Woods, Good, HSG C
	174.722	77	Woods, Good, HSG D
*	5.702	98	Water Surface, HSG D_Unrated
	26.362	98	Water Surface, HSG D
	333.286	70	Weighted Average
	301.222		90.38% Pervious Area
	32.064		9.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	100	0.0187	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
34.7	1,109	0.0454	0.53		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.9	3,538	0.0522	5.42	32.52	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
1.4	1,500		17.94		**Lake or Reservoir, Pond** Mean Depth= 10.00'
92.0	6,247	Total			

Subcatchment 2S: South SB



Summary for Pond 1P: Proposed_Curtis Pond Dam

[58] Hint: Peaked 0.85' above defined flood level

Inflow Area = 883.623 ac, 9.08% Impervious, Inflow Depth = 3.95" for 1/4 PMP event
Inflow = 1,484.01 cfs @ 13.39 hrs, Volume= 290.795 af
Outflow = 327.01 cfs @ 15.30 hrs, Volume= 220.425 af, Atten= 78%, Lag= 114.1 min
Primary = 94.66 cfs @ 15.30 hrs, Volume= 117.739 af
Secondary = 232.35 cfs @ 15.30 hrs, Volume= 102.686 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Starting Elev= 1,001.00' Surf.Area= 70.310 ac Storage= 915.367 af
Peak Elev= 1,003.35' @ 15.30 hrs Surf.Area= 95.766 ac Storage= 1,096.039 af (180.671 af above start)
Flood Elev= 1,002.50' Surf.Area= 74.400 ac Storage= 1,023.900 af (108.533 af above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 363.8 min (1,257.0 - 893.1)

Volume	Invert	Avail.Storage	Storage Description
#1	970.50'	3,901.900 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

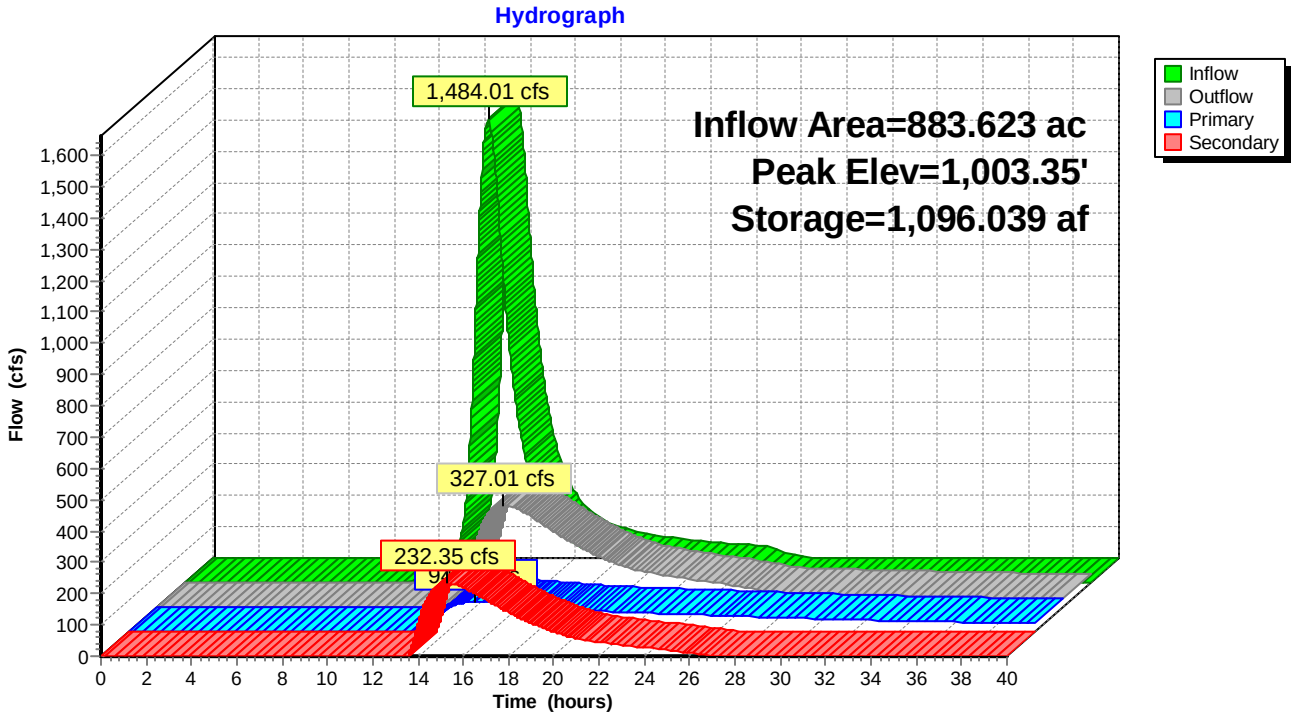
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
970.50	0.180	0.000	0.000
976.50	3.510	11.070	11.070
1,002.50	74.400	1,012.830	1,023.900
1,003.50	99.600	87.000	1,110.900
1,023.50	179.500	2,791.000	3,901.900

Device	Routing	Invert	Outlet Devices
#1	Primary	1,001.00'	**10.0' long x 21.5' breadth BCRectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 5.00
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 2.63
#2	Secondary	1,002.50'	**Asymmetrical Weir_LOB, C= 2.63**
			Offset (feet) 11.00 25.00 89.50 89.60
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00
#3	Secondary	1,002.50'	**Asymmetrical Weir_ROB, C= 2.63**
			Offset (feet) 99.50 99.51 145.00 159.00
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00

Primary OutFlow Max=94.62 cfs @ 15.30 hrs HW=1,003.35' (Free Discharge)
└**1=BCRectangular Weir** (Weir Controls 94.62 cfs @ 4.03 fps)

Secondary OutFlow Max=231.43 cfs @ 15.30 hrs HW=1,003.35' (Free Discharge)
└**2=Asymmetrical Weir_LOB** (Weir Controls 135.24 cfs @ 2.35 fps)
└**3=Asymmetrical Weir_ROB** (Weir Controls 96.19 cfs @ 2.32 fps)

Pond 1P: Proposed_Curtis Pond Dam



Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: North SB Runoff Area=550.337 ac 8.75% Impervious Runoff Depth=2.14"
Flow Length=10,419' Tc=85.8 min CN=75 Runoff=470.99 cfs 98.004 af

Subcatchment 2S: South SB Runoff Area=333.286 ac 9.62% Impervious Runoff Depth=1.75"
Flow Length=6,247' Tc=92.0 min CN=70 Runoff=214.17 cfs 48.661 af

Pond 1P: Proposed_Curtis Pond Dam Peak Elev=1,002.47' Storage=1,021.527 af Inflow=683.65 cfs 146.665 af
Primary=46.93 cfs 82.754 af Secondary=0.00 cfs 0.000 af Outflow=46.93 cfs 82.754 af

Total Runoff Area = 883.623 ac Runoff Volume = 146.665 af Average Runoff Depth = 1.99"
90.92% Pervious = 803.416 ac 9.08% Impervious = 80.207 ac

Summary for Subcatchment 1S: North SB

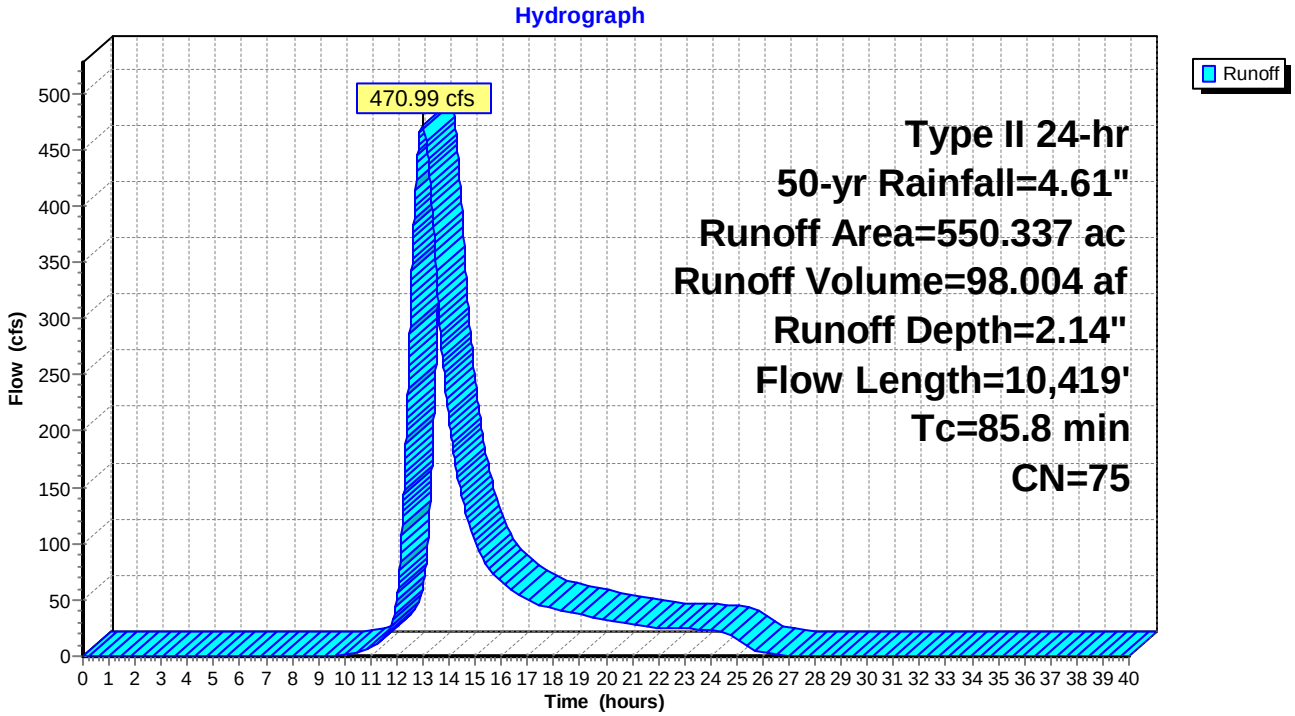
Runoff = 470.99 cfs @ 12.97 hrs, Volume= 98.004 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.61"

	Area (ac)	CN	Description
	15.447	30	Woods, Good, HSG A
	53.503	55	Woods, Good, HSG B
	40.172	70	Woods, Good, HSG C
	393.072	77	Woods, Good, HSG D
*	8.600	98	Water Surface, HSG D_Unrated
	39.543	98	Water Surface, HSG D
	550.337	75	Weighted Average
	502.194		91.25% Pervious Area
	48.143		8.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	100	0.0572	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
39.1	1,003	0.0292	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
13.0	4,066	0.0480	5.20	31.19	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
4.9	5,250		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
85.8	10,419	Total			

Subcatchment 1S: North SB



Summary for Subcatchment 2S: South SB

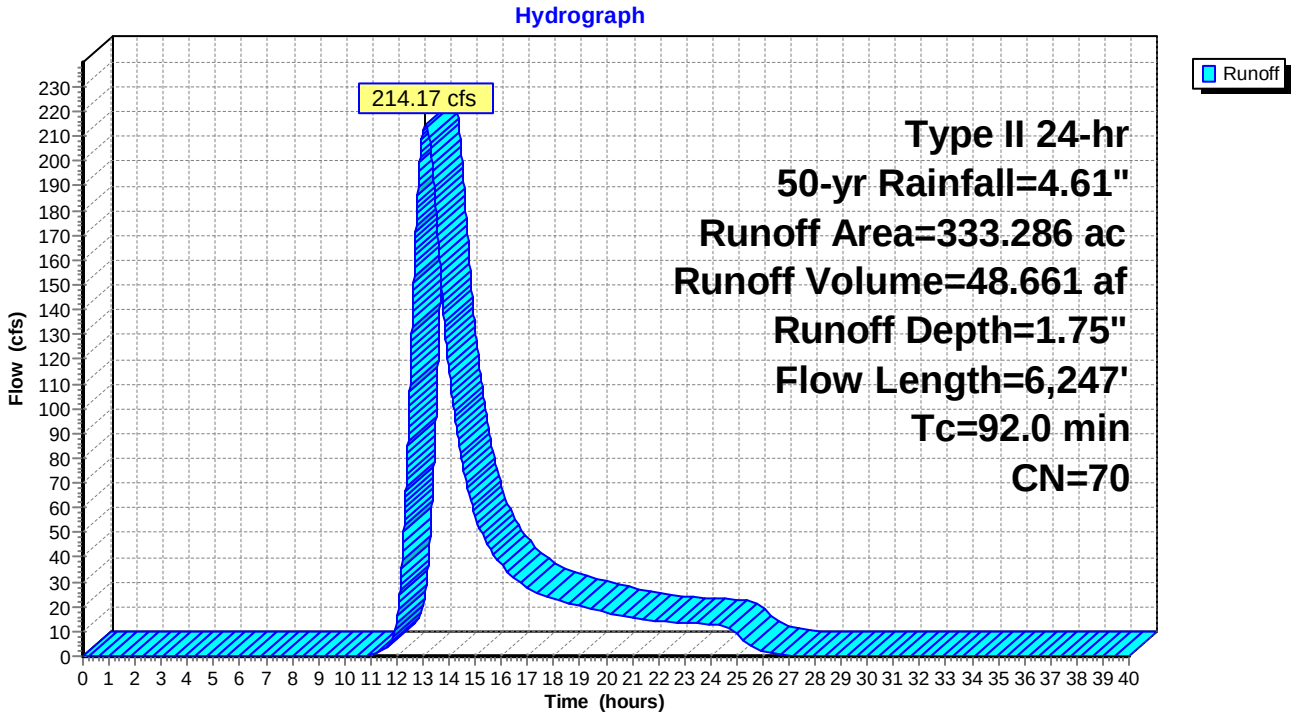
Runoff = 214.17 cfs @ 13.09 hrs, Volume= 48.661 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.61"

	Area (ac)	CN	Description
	28.345	30	Woods, Good, HSG A
	73.138	55	Woods, Good, HSG B
	25.017	70	Woods, Good, HSG C
	174.722	77	Woods, Good, HSG D
*	5.702	98	Water Surface, HSG D_Unrated
	26.362	98	Water Surface, HSG D
	333.286	70	Weighted Average
	301.222		90.38% Pervious Area
	32.064		9.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	100	0.0187	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
34.7	1,109	0.0454	0.53		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.9	3,538	0.0522	5.42	32.52	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
1.4	1,500		17.94		**Lake or Reservoir, Pond** Mean Depth= 10.00'
92.0	6,247	Total			

Subcatchment 2S: South SB



Summary for Pond 1P: Proposed_Curtis Pond Dam

Inflow Area = 883.623 ac, 9.08% Impervious, Inflow Depth = 1.99" for 50-yr event
Inflow = 683.65 cfs @ 13.06 hrs, Volume= 146.665 af
Outflow = 46.93 cfs @ 20.40 hrs, Volume= 82.754 af, Atten= 93%, Lag= 441.0 min
Primary = 46.93 cfs @ 20.40 hrs, Volume= 82.754 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Starting Elev= 1,001.00' Surf.Area= 70.310 ac Storage= 915.367 af
Peak Elev= 1,002.47' @ 20.40 hrs Surf.Area= 74.313 ac Storage= 1,021.527 af (106.159 af above start)
Flood Elev= 1,002.50' Surf.Area= 74.400 ac Storage= 1,023.900 af (108.533 af above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 608.5 min (1,524.5 - 916.0)

Volume	Invert	Avail.Storage	Storage Description
#1	970.50'	3,901.900 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

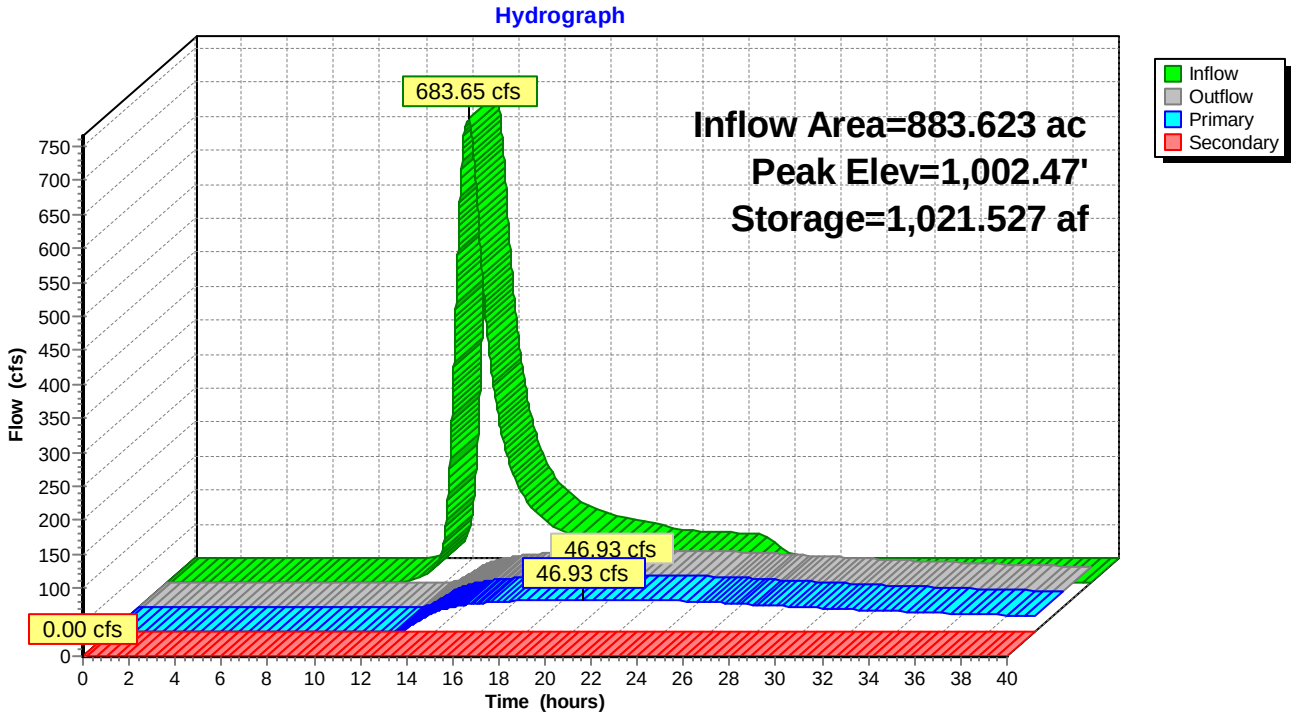
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
970.50	0.180	0.000	0.000
976.50	3.510	11.070	11.070
1,002.50	74.400	1,012.830	1,023.900
1,003.50	99.600	87.000	1,110.900
1,023.50	179.500	2,791.000	3,901.900

Device	Routing	Invert	Outlet Devices
#1	Primary	1,001.00'	**10.0' long x 21.5' breadth BCRectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 5.00
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 2.63
#2	Secondary	1,002.50'	**Asymmetrical Weir_LOB, C= 2.63**
			Offset (feet) 11.00 25.00 89.50 89.60
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00
#3	Secondary	1,002.50'	**Asymmetrical Weir_ROB, C= 2.63**
			Offset (feet) 99.50 99.51 145.00 159.00
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00

Primary OutFlow Max=46.90 cfs @ 20.40 hrs HW=1,002.47' (Free Discharge)
└**1=BCRectangular Weir** (Weir Controls 46.90 cfs @ 3.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,001.00' (Free Discharge)
├**2=Asymmetrical Weir_LOB** (Controls 0.00 cfs)
└**3=Asymmetrical Weir_ROB** (Controls 0.00 cfs)

Pond 1P: Proposed_Curtis Pond Dam



Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: North SB Runoff Area=550.337 ac 8.75% Impervious Runoff Depth=2.73"
Flow Length=10,419' Tc=85.8 min CN=75 Runoff=608.14 cfs 125.098 af

Subcatchment 2S: South SB Runoff Area=333.286 ac 9.62% Impervious Runoff Depth=2.29"
Flow Length=6,247' Tc=92.0 min CN=70 Runoff=286.33 cfs 63.653 af

Pond 1P: Proposed_Curtis Pond Dam Peak Elev=1,002.72' Storage=1,040.862 af Inflow=891.72 cfs 188.750 af
Primary=59.53 cfs 98.467 af Secondary=36.88 cfs 21.996 af Outflow=96.41 cfs 120.463 af

Total Runoff Area = 883.623 ac Runoff Volume = 188.750 af Average Runoff Depth = 2.56"
90.92% Pervious = 803.416 ac 9.08% Impervious = 80.207 ac

Summary for Subcatchment 1S: North SB

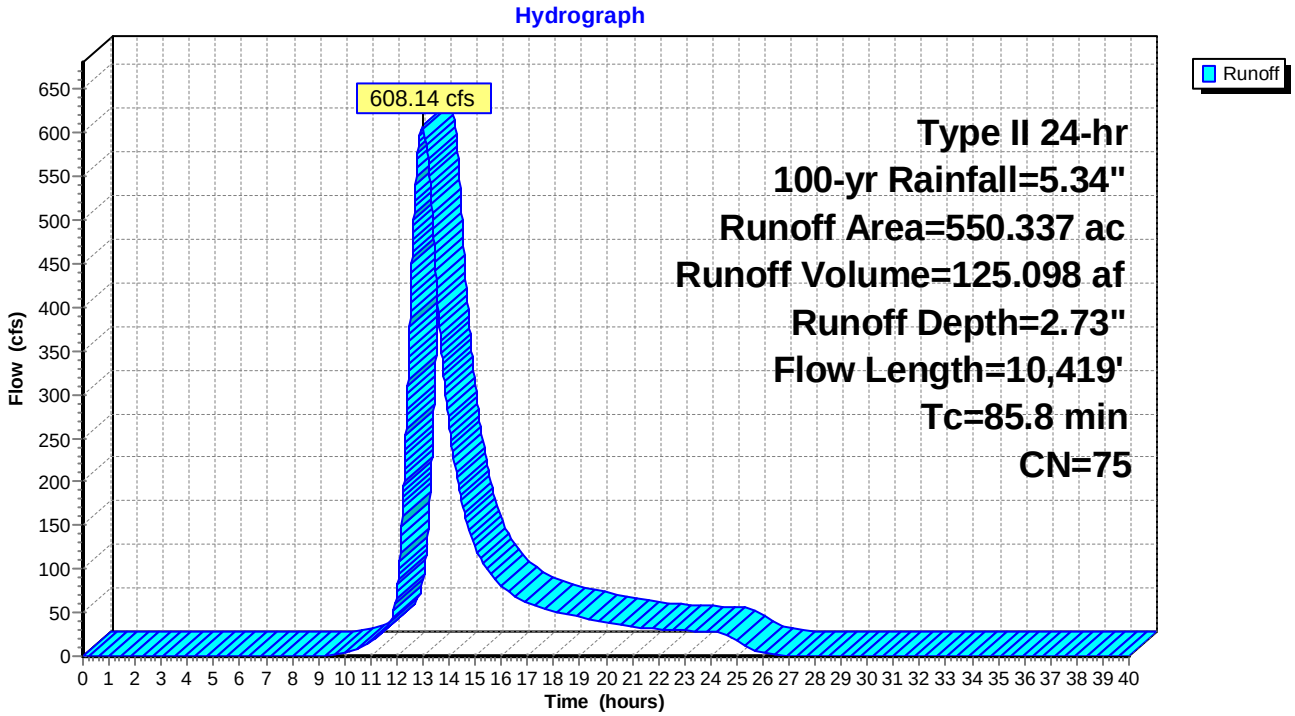
Runoff = 608.14 cfs @ 12.97 hrs, Volume= 125.098 af, Depth= 2.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.34"

	Area (ac)	CN	Description
	15.447	30	Woods, Good, HSG A
	53.503	55	Woods, Good, HSG B
	40.172	70	Woods, Good, HSG C
	393.072	77	Woods, Good, HSG D
*	8.600	98	Water Surface, HSG D_Unrated
	39.543	98	Water Surface, HSG D
	550.337	75	Weighted Average
	502.194		91.25% Pervious Area
	48.143		8.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	100	0.0572	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
39.1	1,003	0.0292	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
13.0	4,066	0.0480	5.20	31.19	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
4.9	5,250		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
85.8	10,419	Total			

Subcatchment 1S: North SB



Summary for Subcatchment 2S: South SB

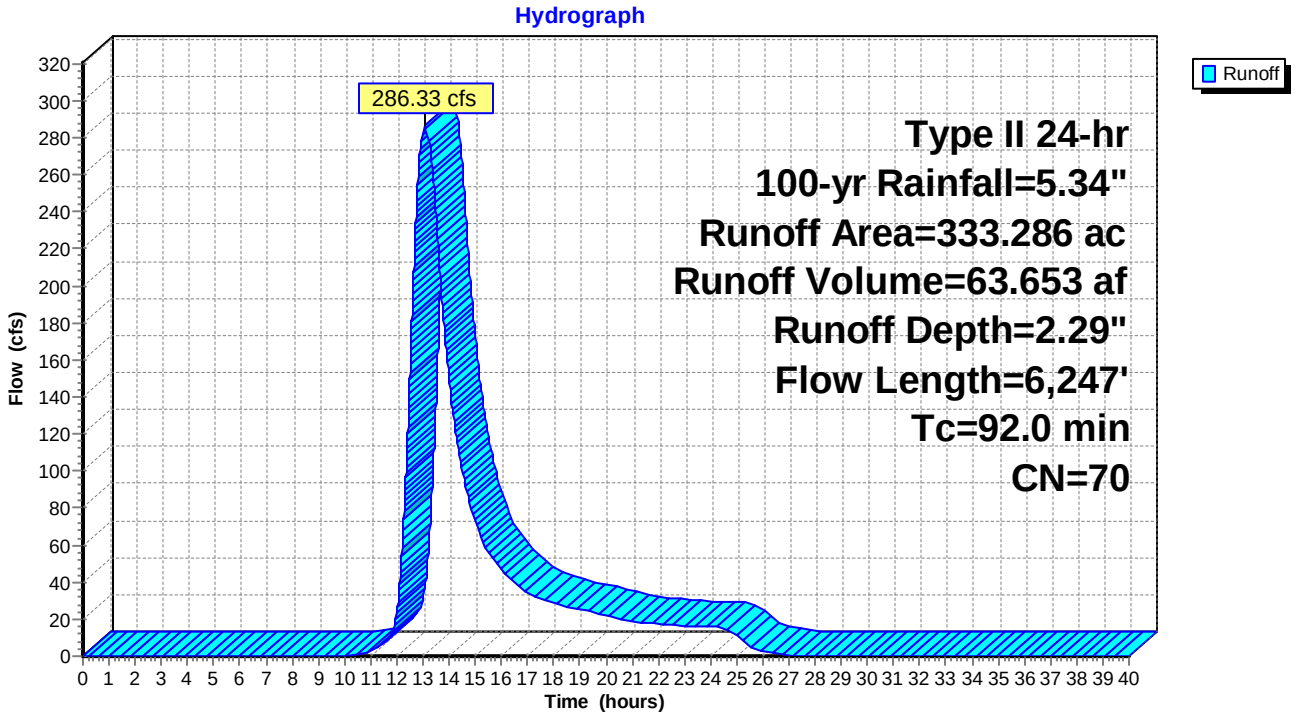
Runoff = 286.33 cfs @ 13.08 hrs, Volume= 63.653 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.34"

	Area (ac)	CN	Description
	28.345	30	Woods, Good, HSG A
	73.138	55	Woods, Good, HSG B
	25.017	70	Woods, Good, HSG C
	174.722	77	Woods, Good, HSG D
*	5.702	98	Water Surface, HSG D_Unrated
	26.362	98	Water Surface, HSG D
	333.286	70	Weighted Average
	301.222		90.38% Pervious Area
	32.064		9.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	100	0.0187	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
34.7	1,109	0.0454	0.53		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.9	3,538	0.0522	5.42	32.52	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
1.4	1,500		17.94		**Lake or Reservoir, Pond** Mean Depth= 10.00'
92.0	6,247	Total			

Subcatchment 2S: South SB



Summary for Pond 1P: Proposed_Curtis Pond Dam

[58] Hint: Peaked 0.22' above defined flood level

Inflow Area = 883.623 ac, 9.08% Impervious, Inflow Depth = 2.56" for 100-yr event
Inflow = 891.72 cfs @ 12.99 hrs, Volume= 188.750 af
Outflow = 96.41 cfs @ 16.94 hrs, Volume= 120.463 af, Atten= 89%, Lag= 237.0 min
Primary = 59.53 cfs @ 16.94 hrs, Volume= 98.467 af
Secondary = 36.88 cfs @ 16.94 hrs, Volume= 21.996 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Starting Elev= 1,001.00' Surf.Area= 70.310 ac Storage= 915.367 af
Peak Elev= 1,002.72' @ 16.94 hrs Surf.Area= 79.939 ac Storage= 1,040.862 af (125.494 af above start)
Flood Elev= 1,002.50' Surf.Area= 74.400 ac Storage= 1,023.900 af (108.533 af above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 517.6 min (1,426.4 - 908.8)

Volume	Invert	Avail.Storage	Storage Description
#1	970.50'	3,901.900 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

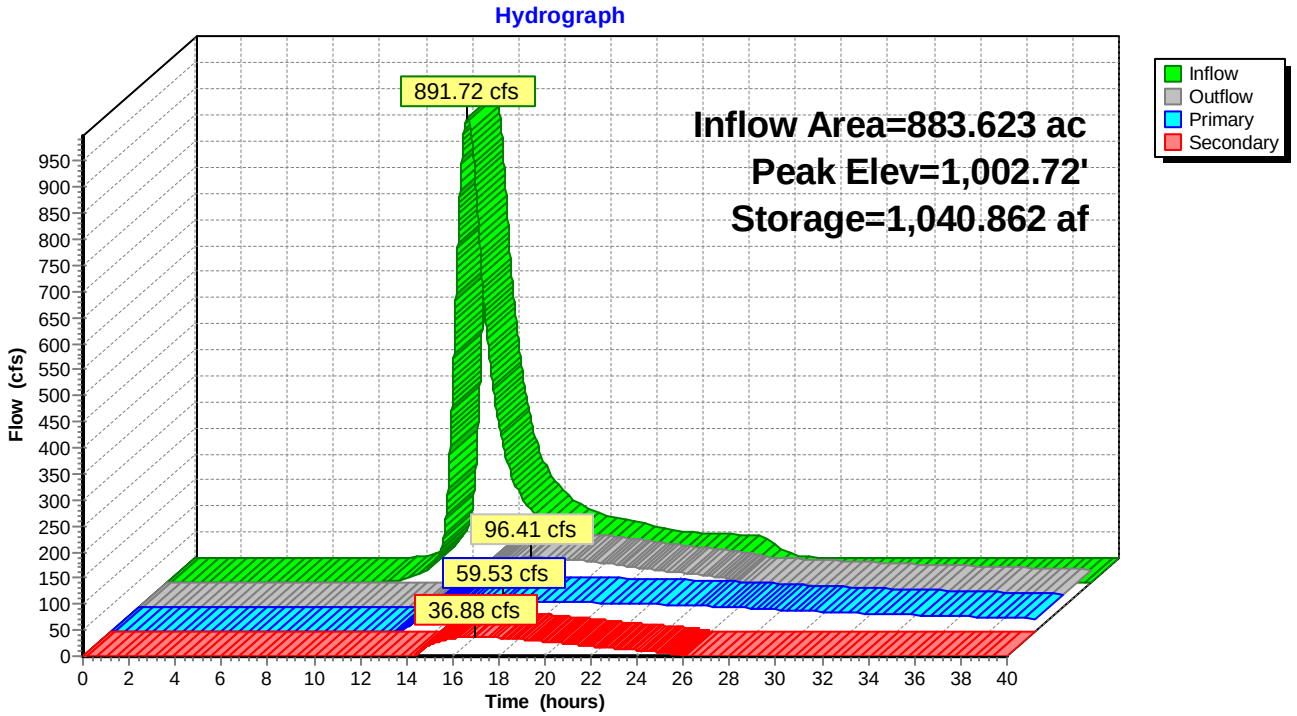
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
970.50	0.180	0.000	0.000
976.50	3.510	11.070	11.070
1,002.50	74.400	1,012.830	1,023.900
1,003.50	99.600	87.000	1,110.900
1,023.50	179.500	2,791.000	3,901.900

Device	Routing	Invert	Outlet Devices
#1	Primary	1,001.00'	**10.0' long x 21.5' breadth BCRectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 5.00
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 2.63
#2	Secondary	1,002.50'	**Asymmetrical Weir_LOB, C= 2.63**
			Offset (feet) 11.00 25.00 89.50 89.60
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00
#3	Secondary	1,002.50'	**Asymmetrical Weir_ROB, C= 2.63**
			Offset (feet) 99.50 99.51 145.00 159.00
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00

Primary OutFlow Max=59.32 cfs @ 16.94 hrs HW=1,002.72' (Free Discharge)
└**1=BCRectangular Weir** (Weir Controls 59.32 cfs @ 3.45 fps)

Secondary OutFlow Max=30.00 cfs @ 16.94 hrs HW=1,002.72' (Free Discharge)
├**2=Asymmetrical Weir_LOB** (Weir Controls 17.58 cfs @ 1.22 fps)
└**3=Asymmetrical Weir_ROB** (Weir Controls 12.42 cfs @ 1.22 fps)

Pond 1P: Proposed_Curtis Pond Dam



Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: North SB Runoff Area=550.337 ac 8.75% Impervious Runoff Depth=4.63"
Flow Length=10,419' Tc=85.8 min CN=75 Runoff=1,043.86 cfs 212.275 af

Subcatchment 2S: South SB Runoff Area=333.286 ac 9.62% Impervious Runoff Depth=4.07"
Flow Length=6,247' Tc=92.0 min CN=70 Runoff=522.35 cfs 113.086 af

Pond 1P: Proposed_Curtis Pond Peak Elev=1,003.39' Storage=1,100.480 af Inflow=1,563.94 cfs 325.361 af
Primary=97.44 cfs 126.584 af Secondary=251.35 cfs 125.950 af Outflow=348.79 cfs 252.533 af

Total Runoff Area = 883.623 ac Runoff Volume = 325.361 af Average Runoff Depth = 4.42"
90.92% Pervious = 803.416 ac 9.08% Impervious = 80.207 ac

Summary for Subcatchment 1S: North SB

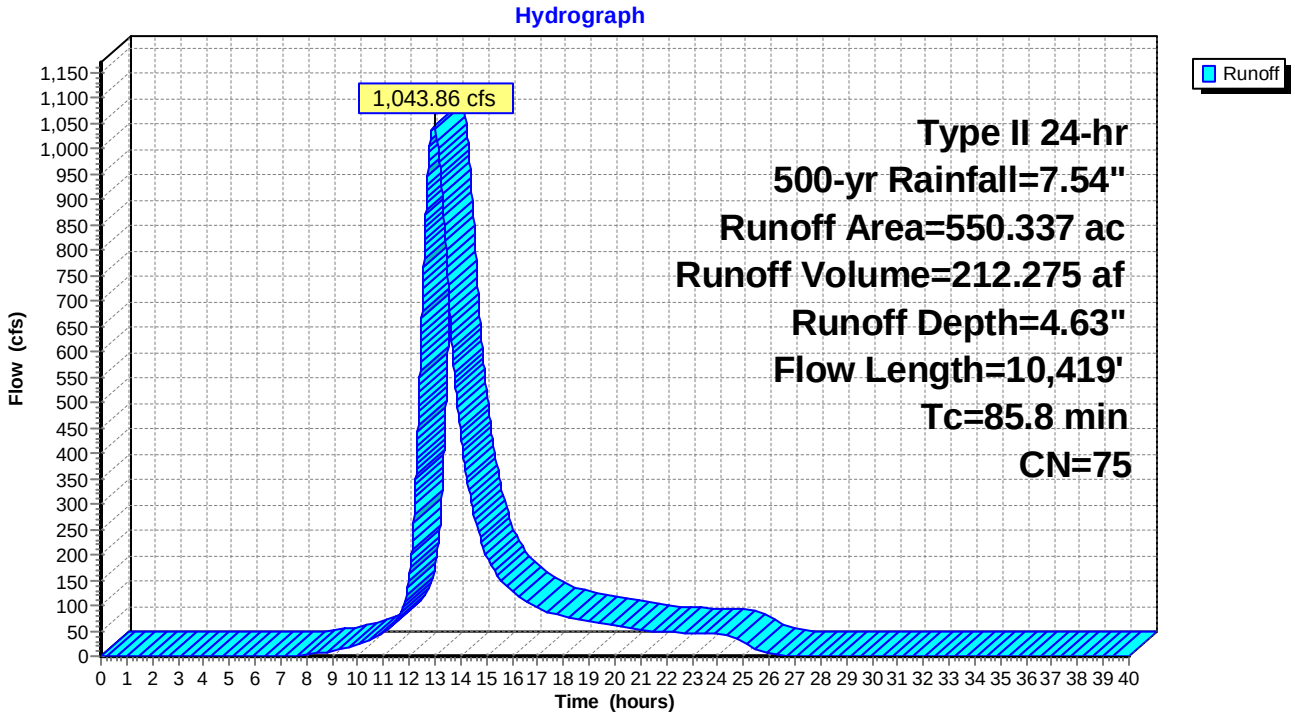
Runoff = 1,043.86 cfs @ 12.96 hrs, Volume= 212.275 af, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr 500-yr Rainfall=7.54"

	Area (ac)	CN	Description
	15.447	30	Woods, Good, HSG A
	53.503	55	Woods, Good, HSG B
	40.172	70	Woods, Good, HSG C
	393.072	77	Woods, Good, HSG D
*	8.600	98	Water Surface, HSG D_Unrated
	39.543	98	Water Surface, HSG D
	550.337	75	Weighted Average
	502.194		91.25% Pervious Area
	48.143		8.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	100	0.0572	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
39.1	1,003	0.0292	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
13.0	4,066	0.0480	5.20	31.19	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
4.9	5,250		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
85.8	10,419	Total			

Subcatchment 1S: North SB



Summary for Subcatchment 2S: South SB

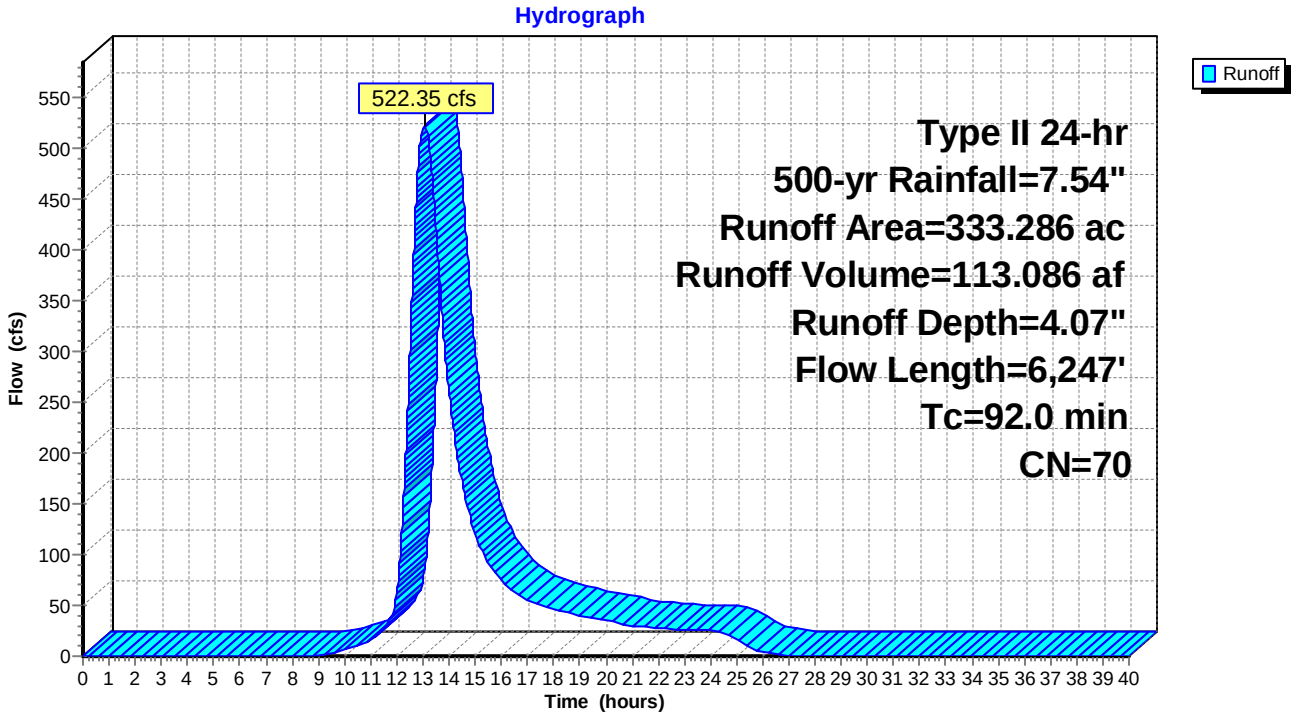
Runoff = 522.35 cfs @ 13.08 hrs, Volume= 113.086 af, Depth= 4.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr 500-yr Rainfall=7.54"

	Area (ac)	CN	Description
	28.345	30	Woods, Good, HSG A
	73.138	55	Woods, Good, HSG B
	25.017	70	Woods, Good, HSG C
	174.722	77	Woods, Good, HSG D
*	5.702	98	Water Surface, HSG D_Unrated
	26.362	98	Water Surface, HSG D
	333.286	70	Weighted Average
	301.222		90.38% Pervious Area
	32.064		9.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	100	0.0187	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
34.7	1,109	0.0454	0.53		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.9	3,538	0.0522	5.42	32.52	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
1.4	1,500		17.94		**Lake or Reservoir, Pond** Mean Depth= 10.00'
92.0	6,247	Total			

Subcatchment 2S: South SB



Summary for Pond 1P: Proposed_Curtis Pond Dam

[58] Hint: Peaked 0.89' above defined flood level

Inflow Area = 883.623 ac, 9.08% Impervious, Inflow Depth = 4.42" for 500-yr event
Inflow = 1,563.94 cfs @ 12.98 hrs, Volume= 325.361 af
Outflow = 348.79 cfs @ 14.86 hrs, Volume= 252.533 af, Atten= 78%, Lag= 113.0 min
Primary = 97.44 cfs @ 14.86 hrs, Volume= 126.584 af
Secondary = 251.35 cfs @ 14.86 hrs, Volume= 125.950 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Starting Elev= 1,001.00' Surf.Area= 70.310 ac Storage= 915.367 af
Peak Elev= 1,003.39' @ 14.86 hrs Surf.Area= 96.928 ac Storage= 1,100.480 af (185.112 af above start)
Flood Elev= 1,002.50' Surf.Area= 74.400 ac Storage= 1,023.900 af (108.533 af above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 348.5 min (1,241.8 - 893.4)

Volume	Invert	Avail.Storage	Storage Description
#1	970.50'	3,901.900 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

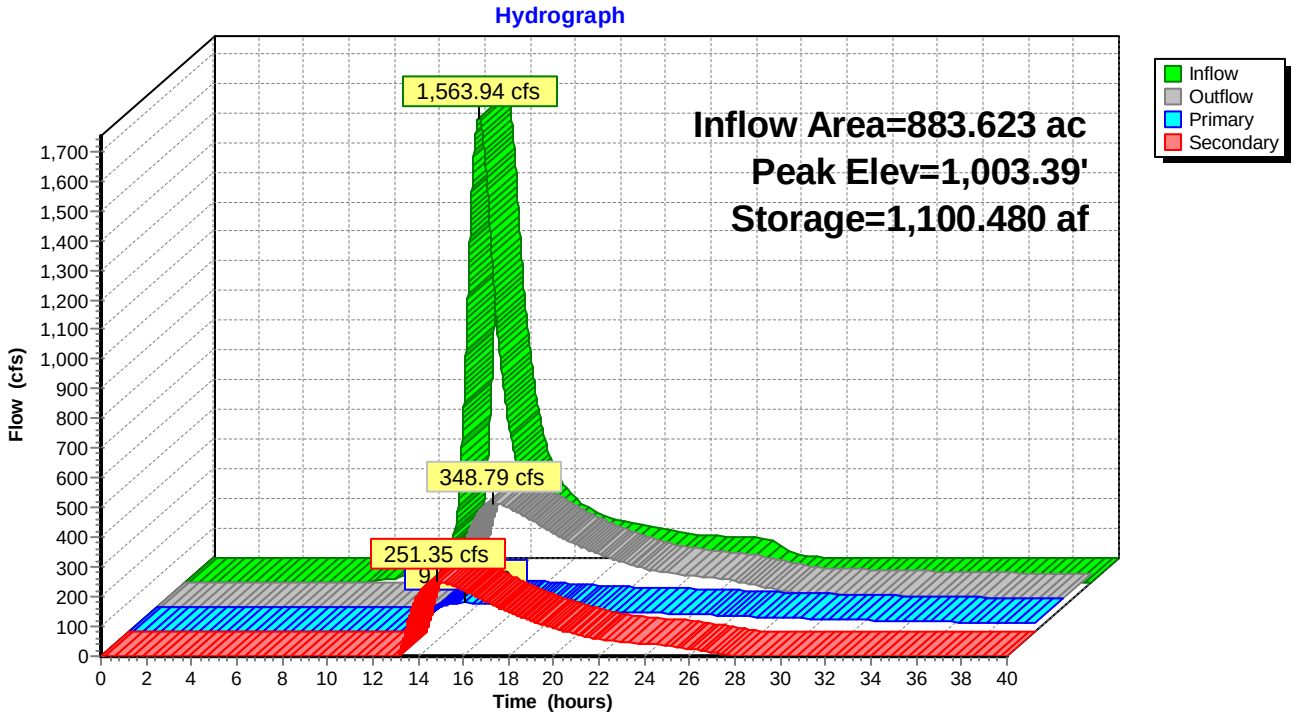
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
970.50	0.180	0.000	0.000
976.50	3.510	11.070	11.070
1,002.50	74.400	1,012.830	1,023.900
1,003.50	99.600	87.000	1,110.900
1,023.50	179.500	2,791.000	3,901.900

Device	Routing	Invert	Outlet Devices
#1	Primary	1,001.00'	**10.0' long x 21.5' breadth BCRectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 5.00
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 2.63
#2	Secondary	1,002.50'	**Asymmetrical Weir_LOB, C= 2.63**
			Offset (feet) 11.00 25.00 89.50 89.60
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00
#3	Secondary	1,002.50'	**Asymmetrical Weir_ROB, C= 2.63**
			Offset (feet) 99.50 99.51 145.00 159.00
			Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00

Primary OutFlow Max=97.42 cfs @ 14.86 hrs HW=1,003.39' (Free Discharge)
└**1=BCRectangular Weir** (Weir Controls 97.42 cfs @ 4.07 fps)

Secondary OutFlow Max=250.88 cfs @ 14.86 hrs HW=1,003.39' (Free Discharge)
├**2=Asymmetrical Weir_LOB** (Weir Controls 146.58 cfs @ 2.41 fps)
└**3=Asymmetrical Weir_ROB** (Weir Controls 104.30 cfs @ 2.38 fps)

Pond 1P: Proposed_Curtis Pond Dam



Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: North SB Runoff Area=550.337 ac 8.75% Impervious Runoff Depth=24.36"
Flow Length=10,419' Tc=85.8 min CN=75 Runoff=5,550.41 cfs 1,117.290 af

Subcatchment 2S: South SB Runoff Area=333.286 ac 9.62% Impervious Runoff Depth=23.44"
Flow Length=6,247' Tc=92.0 min CN=70 Runoff=3,140.96 cfs 651.062 af

Pond 1P: Proposed_Curtis Pond Peak Elev=1,008.72' Storage=1,685.023 af Inflow=8,658.56 cfs 1,768.352 af
Primary=564.03 cfs 308.368 af Secondary=3,568.81 cfs 1,379.363 af Outflow=4,132.84 cfs 1,687.731 af

Total Runoff Area = 883.623 ac Runoff Volume = 1,768.352 af Average Runoff Depth = 24.02"
90.92% Pervious = 803.416 ac 9.08% Impervious = 80.207 ac

Summary for Subcatchment 1S: North SB

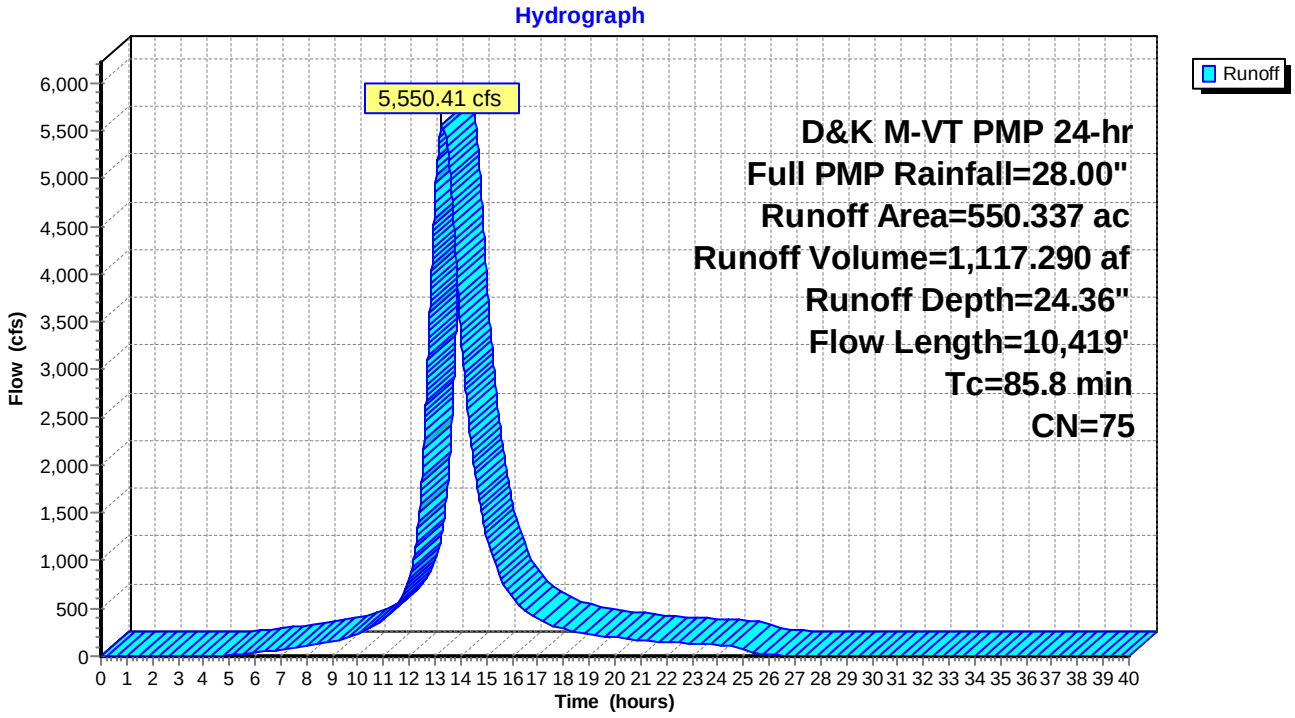
Runoff = 5,550.41 cfs @ 13.26 hrs, Volume= 1,117.290 af, Depth=24.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
D&K M-VT PMP 24-hr Full PMP Rainfall=28.00"

	Area (ac)	CN	Description
	15.447	30	Woods, Good, HSG A
	53.503	55	Woods, Good, HSG B
	40.172	70	Woods, Good, HSG C
	393.072	77	Woods, Good, HSG D
*	8.600	98	Water Surface, HSG D_Unrated
	39.543	98	Water Surface, HSG D
	550.337	75	Weighted Average
	502.194		91.25% Pervious Area
	48.143		8.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.8	100	0.0572	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
39.1	1,003	0.0292	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
13.0	4,066	0.0480	5.20	31.19	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
4.9	5,250		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
85.8	10,419	Total			

Subcatchment 1S: North SB



Summary for Subcatchment 2S: South SB

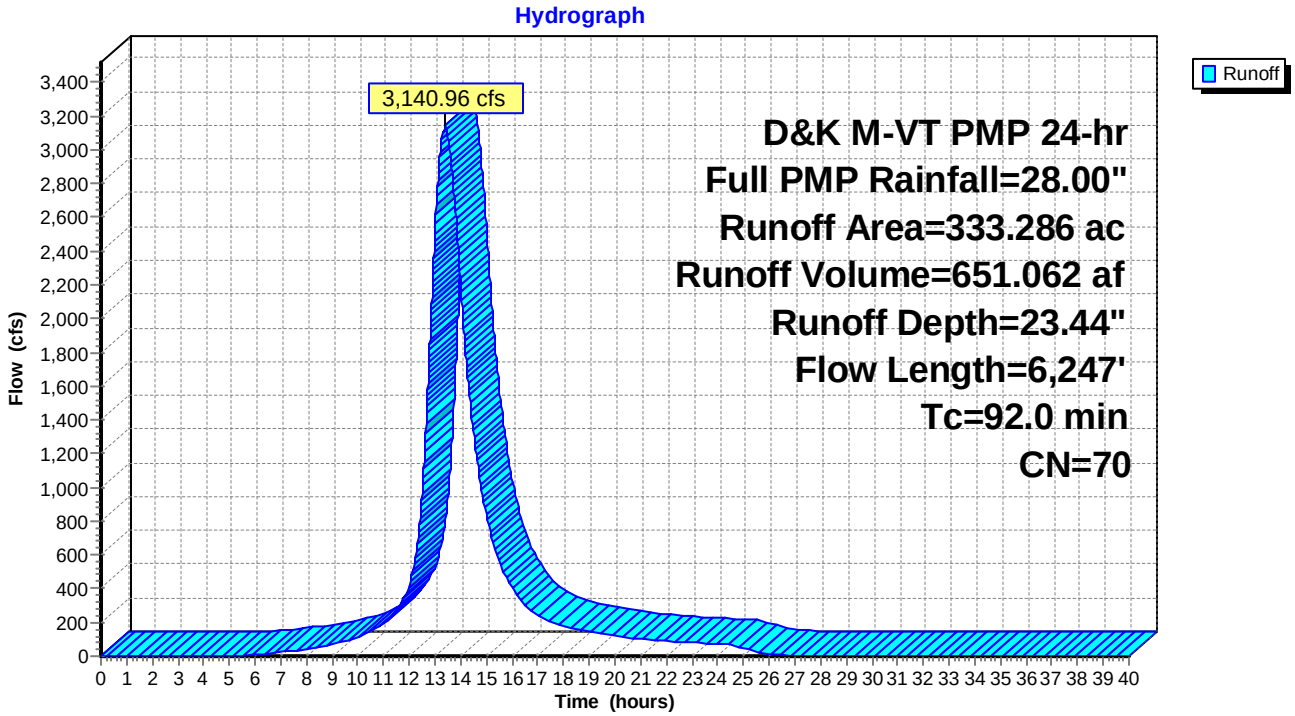
Runoff = 3,140.96 cfs @ 13.39 hrs, Volume= 651.062 af, Depth=23.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
D&K M-VT PMP 24-hr Full PMP Rainfall=28.00"

	Area (ac)	CN	Description
	28.345	30	Woods, Good, HSG A
	73.138	55	Woods, Good, HSG B
	25.017	70	Woods, Good, HSG C
	174.722	77	Woods, Good, HSG D
*	5.702	98	Water Surface, HSG D_Unrated
	26.362	98	Water Surface, HSG D
	333.286	70	Weighted Average
	301.222		90.38% Pervious Area
	32.064		9.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	100	0.0187	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.33"
34.7	1,109	0.0454	0.53		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.9	3,538	0.0522	5.42	32.52	**Channel Flow,** Area= 6.0 sf Perim= 6.4' r= 0.94' n= 0.060
1.4	1,500		17.94		**Lake or Reservoir, Pond** Mean Depth= 10.00'
92.0	6,247	Total			

Subcatchment 2S: South SB



Summary for Pond 1P: Proposed_Curtis Pond Dam

[95] Warning: Outlet Device #2 rise exceeded
[95] Warning: Outlet Device #3 rise exceeded
[58] Hint: Peaked 6.22' above defined flood level

Inflow Area = 883.623 ac, 9.08% Impervious, Inflow Depth = 24.02" for Full PMP event
Inflow = 8,658.56 cfs @ 13.35 hrs, Volume= 1,768.352 af
Outflow = 4,132.84 cfs @ 14.29 hrs, Volume= 1,687.731 af, Atten= 52%, Lag= 56.5 min
Primary = 564.03 cfs @ 14.29 hrs, Volume= 308.368 af
Secondary = 3,568.81 cfs @ 14.29 hrs, Volume= 1,379.363 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Starting Elev= 1,001.00' Surf.Area= 70.310 ac Storage= 915.367 af
Peak Elev= 1,008.72' @ 14.29 hrs Surf.Area= 120.447 ac Storage= 1,685.023 af (769.655 af above start)
Flood Elev= 1,002.50' Surf.Area= 74.400 ac Storage= 1,023.900 af (108.533 af above start)

Plug-Flow detention time= 449.1 min calculated for 772.364 af (44% of inflow)
Center-of-Mass det. time= 156.8 min (1,011.6 - 854.9)

Volume	Invert	Avail.Storage	Storage Description
#1	970.50'	3,901.900 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

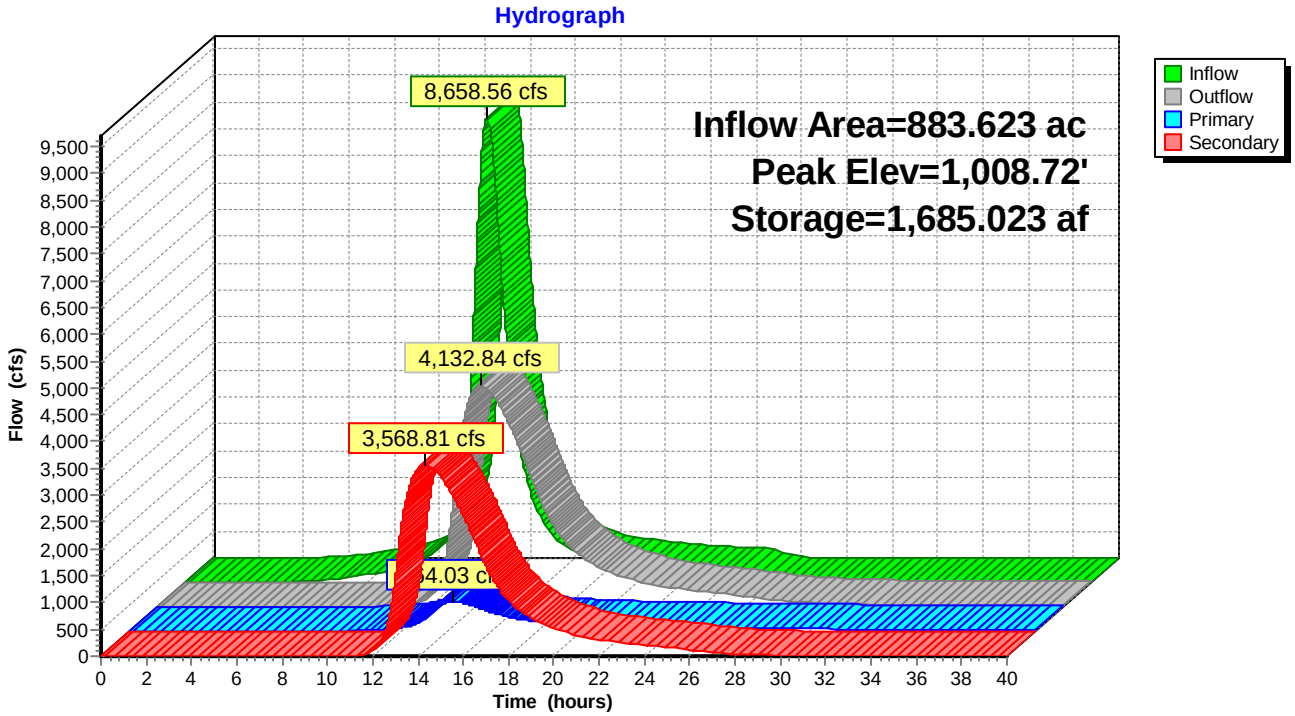
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
970.50	0.180	0.000	0.000
976.50	3.510	11.070	11.070
1,002.50	74.400	1,012.830	1,023.900
1,003.50	99.600	87.000	1,110.900
1,023.50	179.500	2,791.000	3,901.900

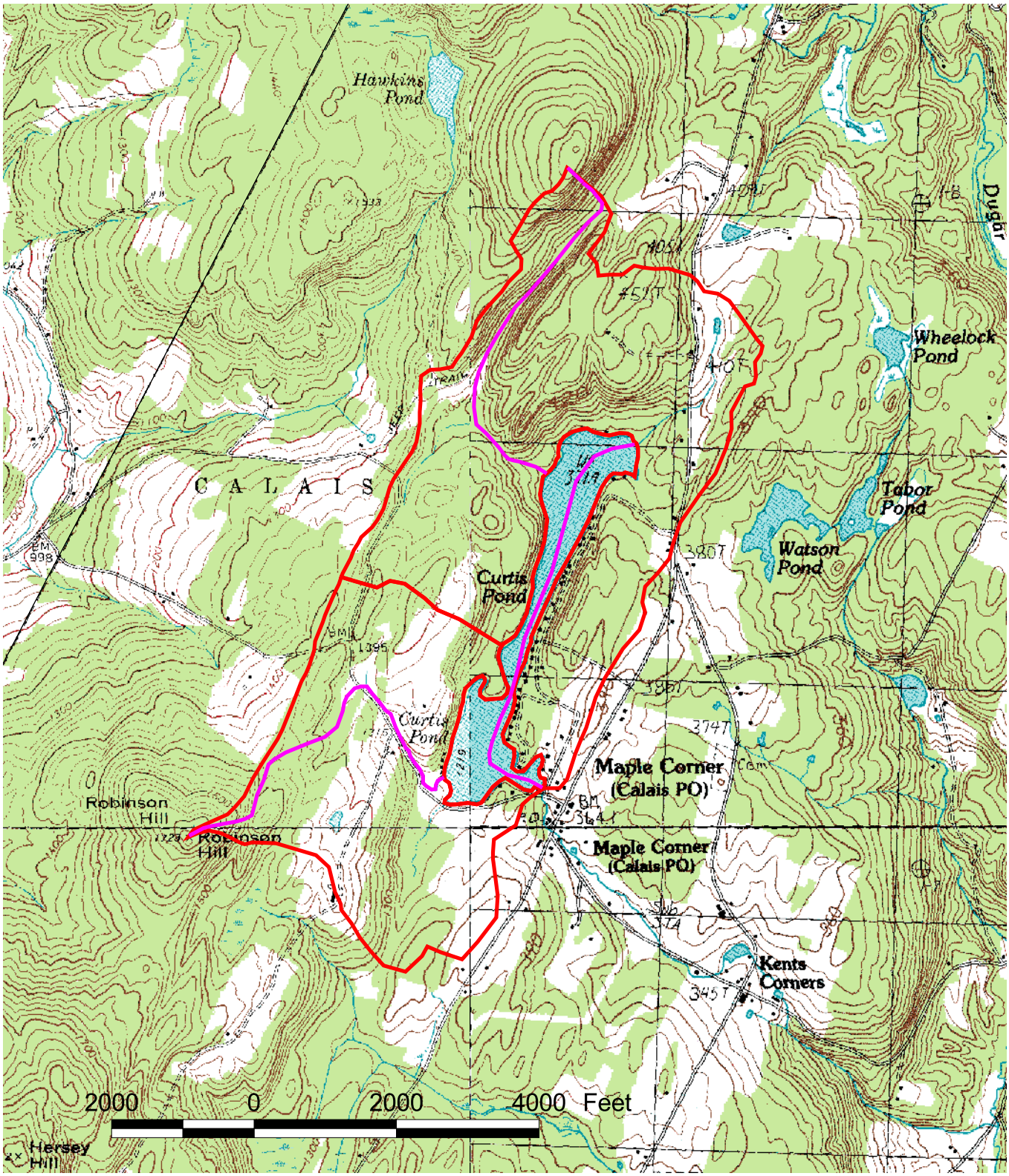
Device	Routing	Invert	Outlet Devices
#1	Primary	1,001.00'	**10.0' long x 21.5' breadth BCRectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 5.00 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 2.63
#2	Secondary	1,002.50'	**Asymmetrical Weir_LOB, C= 2.63** Offset (feet) 11.00 25.00 89.50 89.60 Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00
#3	Secondary	1,002.50'	**Asymmetrical Weir_ROB, C= 2.63** Offset (feet) 99.50 99.51 145.00 159.00 Elev. (feet) 1,006.00 1,002.50 1,002.50 1,006.00

Primary OutFlow Max=563.93 cfs @ 14.29 hrs HW=1,008.72' (Free Discharge)
└**1=BCRectangular Weir** (Weir Controls 563.93 cfs @ 7.31 fps)

Secondary OutFlow Max=3,569.47 cfs @ 14.29 hrs HW=1,008.72' (Free Discharge)
├**2=Asymmetrical Weir_LOB** (Weir Controls 2,060.93 cfs @ 7.49 fps)
└**3=Asymmetrical Weir_ROB** (Weir Controls 1,508.54 cfs @ 7.24 fps)

Pond 1P: Proposed_Curtis Pond Dam





DuBois & King inc.

engineering planning management development

DRAWN BY: JDT	DATE: 02/09/01
CHECKED BY:	PROJ. NO.
PROJ. ENG.	DRAW. NO.

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Vermont
Location	near 583 Camp Road, Calais, VT 05648, USA
Longitude	72.498 degrees West
Latitude	44.385 degrees North
Elevation	1,302 feet
Date/Time	Tue, 19 Mar 2013 10:10:29 -0400

Curtis Pond Dam
Calais, VT

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.41	0.51	0.66	0.83	1.02	**1yr**	0.72	0.94	1.16	1.40	1.67	1.99	2.28	**1yr**	1.76	2.19	2.59	3.16	3.68	**1yr**
2yr	0.30	0.46	0.57	0.75	0.94	1.17	**2yr**	0.81	1.07	1.33	1.62	1.95	2.33	2.66	**2yr**	2.07	2.55	3.00	3.65	4.23	**2yr**
5yr	0.35	0.54	0.68	0.91	1.16	1.45	**5yr**	1.00	1.31	1.65	2.00	2.39	2.83	3.22	**5yr**	2.51	3.09	3.60	4.36	5.00	**5yr**
10yr	0.39	0.61	0.77	1.05	1.37	1.72	**10yr**	1.18	1.54	1.96	2.36	2.80	3.28	3.72	**10yr**	2.90	3.58	4.13	4.99	5.68	**10yr**
25yr	0.45	0.72	0.92	1.27	1.69	2.13	**25yr**	1.46	1.90	2.44	2.92	3.44	3.98	4.51	**25yr**	3.52	4.34	4.95	5.97	6.74	**25yr**
50yr	0.51	0.83	1.06	1.48	1.99	2.52	**50yr**	1.72	2.22	2.88	3.44	4.02	4.61	5.22	**50yr**	4.08	5.02	5.69	6.84	7.66	**50yr**
100yr	0.59	0.95	1.22	1.73	2.35	2.98	**100yr**	2.03	2.61	3.40	4.04	4.69	5.34	6.06	**100yr**	4.73	5.82	6.53	7.84	8.72	**100yr**
200yr	0.66	1.08	1.40	2.01	2.78	3.53	**200yr**	2.40	3.07	4.03	4.76	5.48	6.19	7.02	**200yr**	5.48	6.75	7.51	9.00	9.92	**200yr**
500yr	0.80	1.31	1.70	2.47	3.46	4.41	**500yr**	2.99	3.80	5.02	5.90	6.74	7.54	8.55	**500yr**	6.67	8.22	9.03	10.79	11.78	**500yr**

Lower Confidence Limits

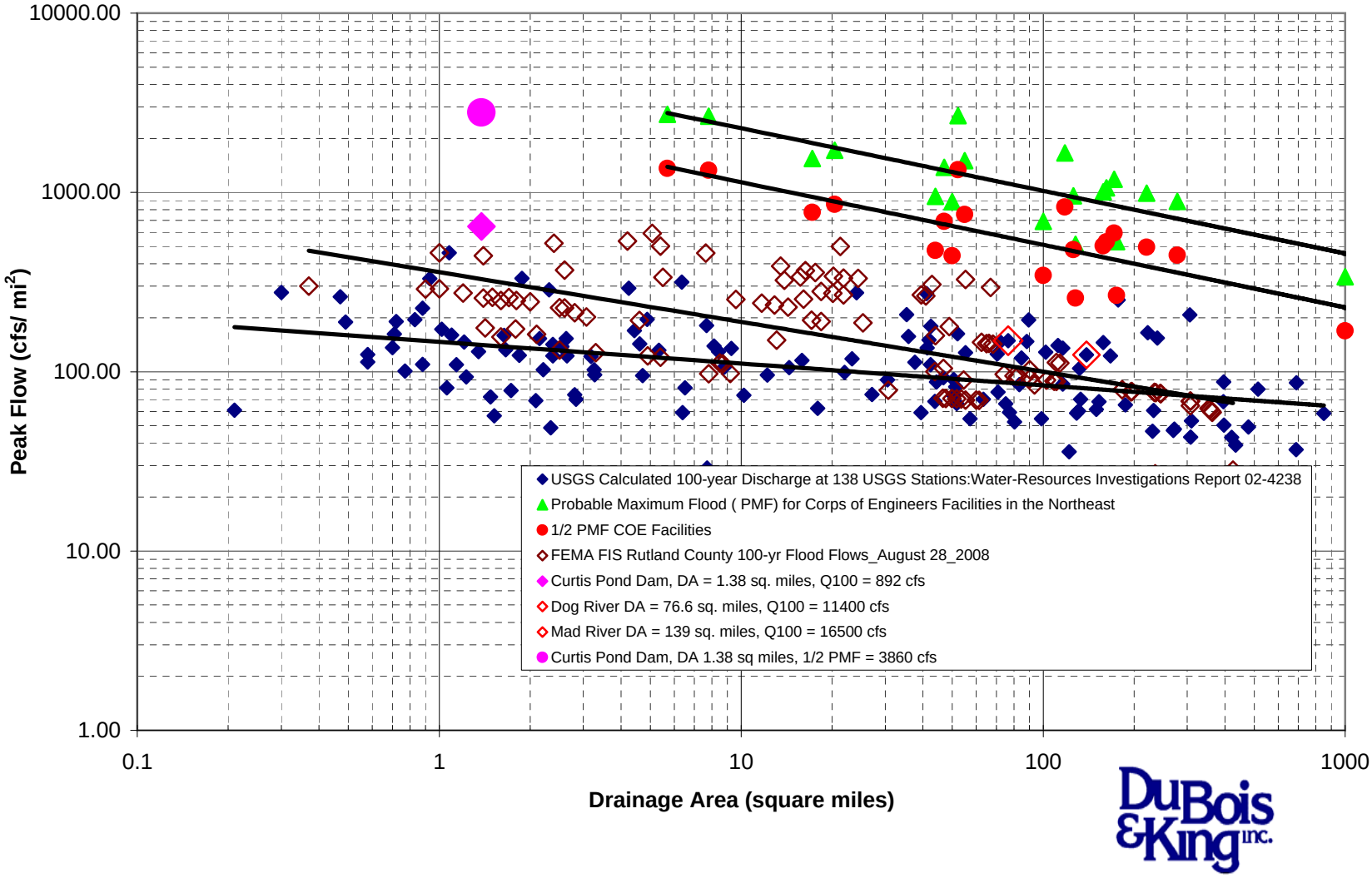
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.22	0.33	0.41	0.55	0.67	0.78	**1yr**	0.58	0.76	0.91	1.13	1.48	1.66	1.95	**1yr**	1.47	1.88	2.27	2.85	3.26	**1yr**
2yr	0.29	0.45	0.55	0.75	0.93	1.06	**2yr**	0.80	1.04	1.20	1.51	1.86	2.26	2.56	**2yr**	2.00	2.47	2.91	3.51	4.10	**2yr**
5yr	0.33	0.51	0.63	0.86	1.10	1.26	**5yr**	0.95	1.23	1.42	1.76	2.17	2.59	2.97	**5yr**	2.29	2.86	3.33	4.04	4.61	**5yr**
10yr	0.34	0.52	0.64	0.90	1.16	1.44	**10yr**	1.00	1.40	1.60	1.96	2.42	2.85	3.30	**10yr**	2.52	3.18	3.68	4.41	5.01	**10yr**
25yr	0.38	0.57	0.72	1.02	1.35	1.70	**25yr**	1.16	1.66	1.88	2.27	2.78	3.24	3.80	**25yr**	2.87	3.66	4.20	4.91	5.61	**25yr**
50yr	0.41	0.62	0.78	1.12	1.50	1.94	**50yr**	1.30	1.89	2.12	2.51	3.09	3.54	4.24	**50yr**	3.13	4.08	4.65	5.34	6.09	**50yr**
100yr	0.45	0.67	0.84	1.22	1.67	2.22	**100yr**	1.44	2.17	2.40	2.77	3.41	3.83	4.68	**100yr**	3.39	4.50	5.15	5.78	6.59	**100yr**
200yr	0.48	0.72	0.91	1.32	1.85	2.54	**200yr**	1.59	2.48	2.72	3.05	3.77	4.15	5.25	**200yr**	3.68	5.05	5.72	6.25	7.12	**200yr**
500yr	0.54	0.80	1.03	1.49	2.12	3.07	**500yr**	1.83	3.00	3.21	3.44	4.29	4.69	6.14	**500yr**	4.15	5.90	6.61	6.99	7.93	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.44	0.54	0.73	0.89	1.04	**1yr**	0.77	1.02	1.19	1.48	1.79	2.13	2.54	**1yr**	1.89	2.44	2.88	3.61	3.97	**1yr**
2yr	0.31	0.48	0.60	0.81	1.00	1.13	**2yr**	0.86	1.10	1.26	1.61	2.00	2.47	2.78	**2yr**	2.19	2.67	3.13	3.86	4.43	**2yr**
5yr	0.37	0.56	0.70	0.96	1.22	1.44	**5yr**	1.05	1.40	1.63	2.05	2.51	3.08	3.50	**5yr**	2.73	3.36	3.89	4.72	5.41	**5yr**
10yr	0.44	0.68	0.84	1.18	1.52	1.73	**10yr**	1.31	1.69	1.96	2.49	3.02	3.66	4.17	**10yr**	3.24	4.01	4.58	5.59	6.32	**10yr**
25yr	0.56	0.85	1.06	1.51	1.98	2.21	**25yr**	1.71	2.16	2.54	3.21	3.89	4.64	5.29	**25yr**	4.10	5.09	5.67	6.99	7.79	**25yr**
50yr	0.67	1.02	1.27	1.82	2.45	2.67	**50yr**	2.11	2.61	3.08	3.94	4.71	5.55	6.31	**50yr**	4.91	6.07	6.68	8.32	9.15	**50yr**
100yr	0.80	1.21	1.52	2.20	3.01	3.22	**100yr**	2.60	3.15	3.75	4.80	5.71	6.66	7.76	**100yr**	5.89	7.47	7.86	9.90	10.75	**100yr**
200yr	0.97	1.46	1.85	2.67	3.73	3.88	**200yr**	3.22	3.80	4.56	5.88	6.93	7.97	9.29	**200yr**	7.05	8.93	9.26	11.77	12.65	**200yr**
500yr	1.25	1.86	2.39	3.47	4.94	4.97	**500yr**	4.26	4.86	5.92	7.76	8.96	10.11	11.77	**500yr**	8.95	11.32	11.48	14.83	15.67	**500yr**

Powered by ACIS Northeast Regional Climate Center

Regional Analysis
100-year Computed Peak Flows in the Northeast
Vermont-Western New Hampshire-Northwestern Mass.- Eastern New York



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Structural Design

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☐ Williston, VT 05495 (802) 878-7661
☐ Bedford, NH 03110 (603) 637-1043
Engineering*Planning
Development*Management

JOB 921939 ~ Curtis Pond Dam
SHEET NO. 1 OF 16
CALCULATED BY SRP DATE 3/11/13
CHECKED BY _____ DATE _____
SCALE _____

Structural Analysis

Load Case I ~ Normal Conditions
- WSEL = 1001.0

Load Case II ~ SDF (Design Storm)
- WSEL = 1003.5 (1ft of overtopping)
- No tailwater
- No passive resistance due to existing soil, i.e. "washed out"

Load Case IIA ~ Normal Conditions plus Ice
- Since the overflow spillway is at the center of the new cutoff wall ice is assumed to not be an effect. Therefore this load case is not relevant.

Load Case III ~ Normal plus Earthquake
- Not considered

Load Case IV* ~ Post Construction Loading
*Not an official FERC load case
- Full soil load on the D/S face of the cutoff wall with no hydrostatic load on u/s face

* By inspection the design will be based on Load Case II and Load Case IV. Load Case II will control, load case IV is used to confirm post construction and drawdown conditions.

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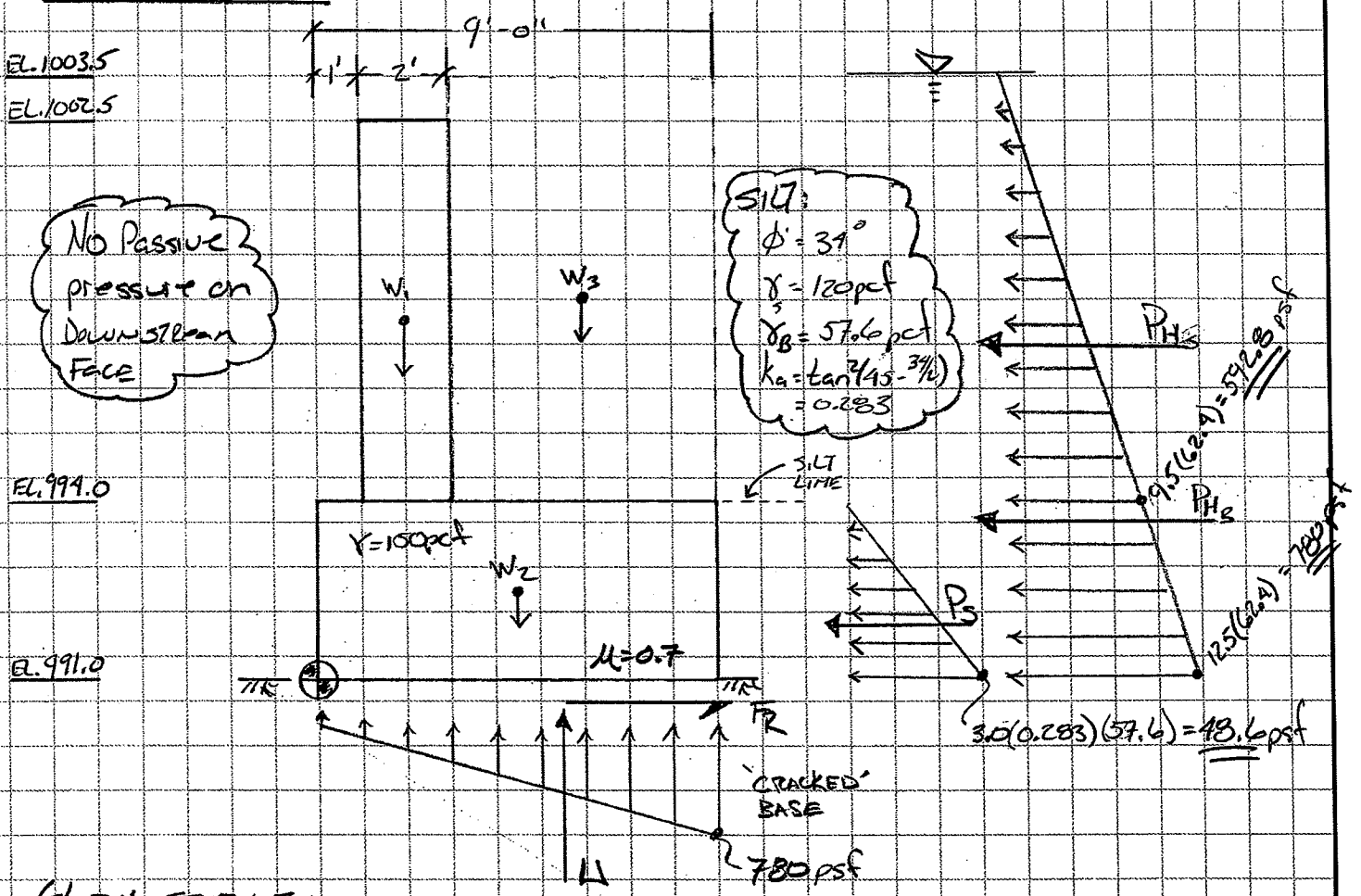
JOB 921439 ~ Curtis Pond Dam
SHEET NO. 7 OF 16
CALCULATED BY SRP DATE 3/11/13
CHECKED BY _____ DATE _____
SCALE 1/4" = 1'-0"

Loading Diagram ~ Load Case II (½ PMF Water Level)



Global Stability

Source	Force	Moment Arm	Moment	
P_{HS} (Hydrostatic)	2816	2.83	7,969	
P_{HB} (Hydrostatic Base)	1875	4.17	20,329	
P_S (Soil)	73	1.0	73	Disturbing Moments = 41,462 lb-ft
U	3510	6.0	21,060	
W_1 (Stem)	2550	2.0	5100	
W_2 (Ftg)	4050	4.5	18,225	Resisting Moments = 44,667 lb-ft
W_3 (Wt of H_2O)	3557	6.0	21,342	
F_R (Friction)	7110	—		

10,157

* F.S. Sliding: $\frac{7110 - 3510}{1875 + 73} = 0.73 \times N.G.$ [Discount U + W3: $\frac{4620}{1875+73} = 0.94$]

Use Dowels

See sheet ___ of ___ for Dowel Design

F.S. Overturning: $\frac{44,667}{41,462} = 1.08$ [Discount U + W3: $\frac{23,325}{20462} = 1.14$]

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JOB 921439 2 Curtis Pond Dam
SHEET NO. 3 OF 16
CALCULATED BY SRP DATE 3/11/13
CHECKED BY DATE
SCALE

STRENGTH DESIGN – LOAD CASE II (ACI 350)

STEM DESIGN

$M = 20{,}329 \text{ ft-lb} + 73 \text{ ft-lb} = 20{,}402 \text{ ft-lb}$

per ACI 350 9.2.5 → 1.6 H "Soil + Water" Load Factor

per ACI 350 9.2.6 $S_d = \frac{\phi f_y}{\gamma f_s} \geq 1.0$; $\frac{0.9(60000)}{1.6(20{,}000)} = 1.6875$

$S_d M_u = 1.6(1.6875)(20.4 \text{ k-ft}) = 55.1 \text{ k-ft}$

$V = 4875 \text{ lb} + 73 \text{ lb} = 4{,}948 \text{ lb} \sim 4.9 \text{ K}$

$V_u = 1.6(4.9 \text{ k}) = 7.8 \text{ K}$

Use #6 reinforcing bar $A_{bar} = 0.44 \text{ in}^2$, $d_{bar} = 0.75 \text{ in}$

$d = 24'' - 2'' \text{ cr} - 0.75/2 = 21.625 \text{ in}$

$A_{s\,req'd} = \frac{55.1 \text{ k-ft}}{(3.76)(21.625'')} = 0.677 \text{ in}^2$

Try #6 @ 9" O.C. → $A_{s\,prov} = 0.44 \text{ in}^2 (12''/9'') = 0.59 \text{ in}^2$ X

Try #6 @ 6" O.C. → $A_{s\,prov} = 0.44 \text{ in}^2 (12/6) = 0.88 \text{ in}^2$

$T = A_s f_y = 0.88 \text{ in}^2 (60 \text{ ksi}) = 52.8^{K}$ $\quad T = Ca$

$C = 0.85 f'_c b a = 0.85(4 \text{ ksi})(12'')a = 40.8^{K} a$

$a = 1.29$

$\phi M_n \Rightarrow \phi A_s f_y \left(d - \frac{a}{2}\right)\left(\frac{1 \text{ ft}}{12''}\right) = 0.9(52.8)\left(21.625 - \frac{1.29}{2}\right)\left(\frac{1}{12}\right)$

$= 83.1 \text{ k-ft} \geq S_d M_u$ ✓ OK

$A_{s\,min} = \frac{4}{3}\frac{M_u}{(3.76)d} = \frac{4}{3}\frac{1.6(20.4)}{(3.76)(21.625)} = 0.535 \text{ in}^2 \leq A_{s\,prov}$ ✓

ACI 350 10.5.3 →

$\phi V_c = \phi 2\sqrt{f'_c}\, b_w d = 0.75(2)\sqrt{4000}(12)(21.625)\left(\frac{1}{1000}\right)$

$= 29.6^{K} \geq V_u$ ✓ OK

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JOB 921439 ~ Curtis Pond Dam
SHEET NO. 4 OF 16
CALCULATED BY SRP DATE 3/11/13
CHECKED BY _____ DATE _____
SCALE _____

CHECK MIN. WALL REINFORCING ~ ACI 350 14.3.2 & 14.3.3 & 7.12.2.1 (Grade 60)

(VERT) $A_{s,min} = 0.003(12")(24") = 0.864\ in^2 \leq A_{s\,prov.} = 0.88\ in^2$

(HOR) $A_{s\,min} = 0.003(12")(24") = 0.864\ in^2$

↳ DISTRIBUTED @ F.F.

$\frac{1}{2}(0.864\ in^2) = 0.432\ in^2$

~USE REINFORCING~

#6 @ 6" O.C. V. W/S FACE

#6 @ 12" O.C. H. F.F.

DEVELOPMENT LENGTH

$$l_d = \left(\frac{f_y \alpha \beta \gamma}{25\sqrt{f'_c}}\right) d_b \;;\quad f_y = 60\ ksi \quad f'_c = 4\ ksi$$

$\alpha = 1.3$ $\#6\ d_b = 0.75\ in$

$\beta = 1.0$

$\gamma = 0.8$

$$= \frac{(60000)(1.3)(1.0)(0.8)}{25\sqrt{4000}}(0.75) = 39.5\ in \Rightarrow USE\ \boxed{40\ in}$$

DOWEL DESIGN

$$A_{vf} = \frac{V_u}{\phi f_y \mu} \Rightarrow \frac{7.8^k}{0.75(60ksi)(0.7)} = 0.248\ in^2$$

USE #9 @ 18" O.C. $A_{bar} = 1.00\ in^2$, $d_{bar} = 1.128\ in$

$A_{s\,prov.} = 0.67\ in^2$

$$F.S._{sliding} = \frac{(7110 - 3510) + T_{Dowel}}{4875 + 73} \geq 1.5 \Rightarrow T_{Dowel} = 3822\ lb$$

$$A_{s\,req'd} = \frac{1.6875(1.6)(3.8^k)}{0.9(60\ ksi)} \Rightarrow 0.19\ in^2 \leq 0.67\ in^2\ \checkmark\ OK$$

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SHEET NO. 5 OF 16
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SCALE ______

dowel design (cont'd)

$$l_d = \frac{A_{s\,reqd}}{A_{s\,prov}} \left(\frac{f_y \alpha \beta \lambda}{20\sqrt{f'_c}} \right) d_b \Rightarrow \frac{0.248}{0.67} \left(\frac{60000(1.3)(1.0)(0.8)}{20\sqrt{4000}} \right)(1.128)$$

$= 20.6$ IN $\Rightarrow$ USE 24 IN

EXTEND INTO FTG w/ NO Hook since MAX WALL Section has a 36" footing.

from PTI ~ Bond length => EMBEDMENT

$$L_b = \frac{P}{\pi d \tau_w} \quad ; \quad P = S_d V_u \quad \pi = 3.14 \quad d = 1.128 \text{ IN}$$

* $\tau_w = 200$ psi
* RQD + BEDROCK Analysis is not available. Assume a "HARD SHALE". Also, dowels will be placed after dental concrete so some bond will be in concrete.

$$= \frac{1.6875(7.8)(1000)}{(3.14)(1.128 \text{ IN})(200 \text{ psi})} = 18.6 \text{ IN}$$

USE 24 IN embedment into BEDROCK / Dental Concrete

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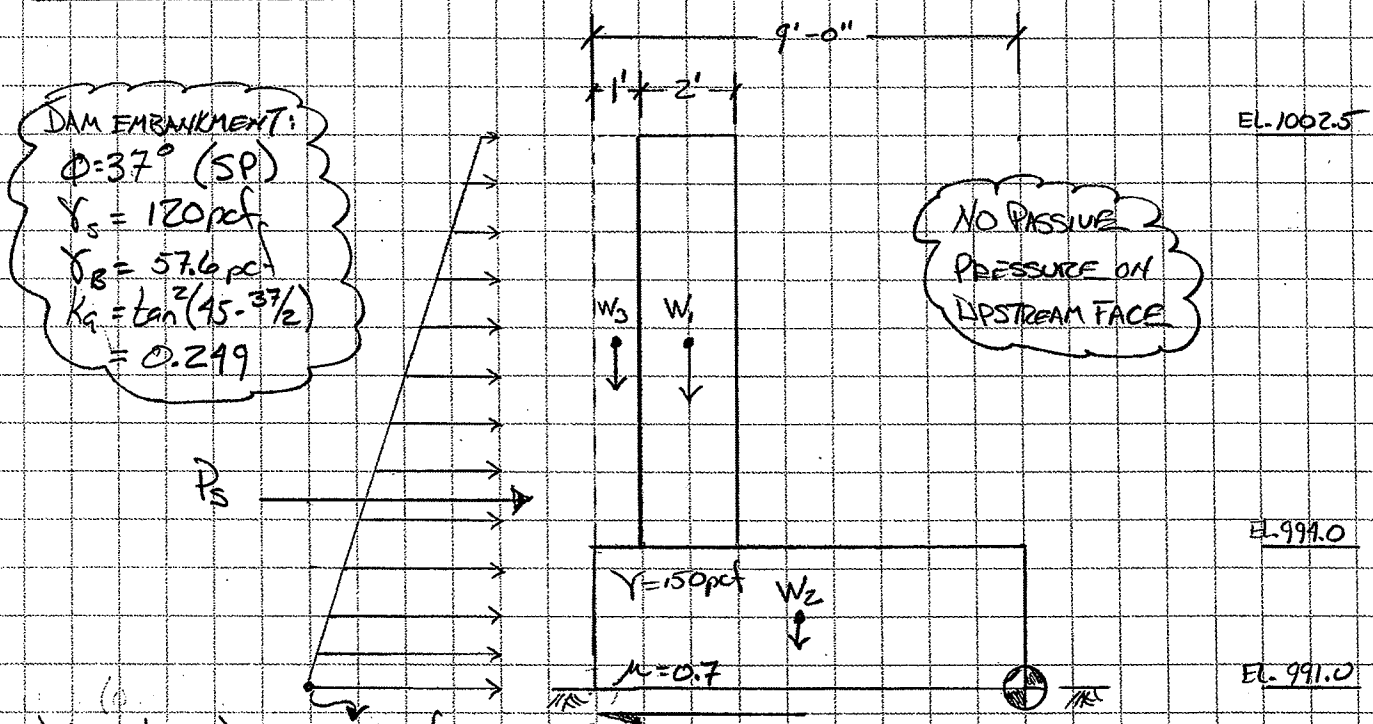
SCALE 1/4" = 1'-0"

LOADING DIAGRAM – LOAD CASE IV (Post-Construction)



(11.5)(0.249)(120) = 343.6 pcf

FR = 0.7 (2550 + 4050 + 1020) = 5334 lb

GLOBAL STABILITY

Source	Force	Moment Arm	Moment	
PS (Soil)	1975.7	3.83	7,574	← Disturbing Moment
W1 (Stem)	2550	7.0	17,850	Resisting Moments
W2 (Ftg)	4050	4.5	18,225	= 44,745 lb-ft
W3 (Soil)	1020	8.5	8,670	
FR (Fricl.)	5334	–	–	

F.S. sliding: $\frac{5334}{1976} = 2.7$ ✓ OK ≥ 1.5

F.S. OT: $\frac{44,745}{7574} = 5.9$ ✓ OK ≥ 1.5

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SHEET NO. 7 OF 16
CALCULATED BY SRP DATE 3/11/13
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STRENGTH DESIGN ~ LOAD CASE IV (ACI 350)

$M = 7,574$ lb-ft $\rightarrow$ 7.6 K-ft
$M_U = 1.6(7.6) = 12.2$ K-ft
$S_d M_U = 1.6875(12.2\text{ K-ft}) = \underline{20.5\text{ K-ft}}$

$V = 1976$ lb $\rightarrow$ 2.0 K-ft
$V_U = 1.6(20) = \underline{3.2\text{ K-ft}}$

USE #6 reinforcing bar $A_{bar} = 0.44\text{ in}^2$, $d_{bar} = 0.75$ in
$d = 24" - 2"\text{ cl} - 0.75/2 = 21.625$ in

$$A_{s\,req'd} = \frac{20.5\text{ K-ft}}{(3.76)(21.625\text{ in})} = \underline{0.25\text{ in}^2}$$

USE #6 @ 12" O.C. $\underline{A_{s\,prov.} = 0.44\text{ in}^2}$ ✓ OK

$T = A_s f_y = 0.44\text{ in}^2(60\text{ ksi}) = 26.4$ K
$C = 0.85 f'_c b a = 0.85(4000)(12)(a)/1000 = 40.8^{K}a$
$a = 0.65$

$\phi M_n = \phi A_s f_y (d - a/2)(1/12) \Rightarrow 0.9(26.4)(21.625 - \frac{0.65}{2})(1/12) = 42.2$ K-ft

$42.2 \geq 20.5$ ✓ OK

$A_{s\,min} = \frac{4}{3}\left(\frac{M_U}{3.76}\right)d \Rightarrow \frac{4}{3}\frac{12.2^{K}}{(3.76)(21.625)} = 0.20\text{ in}^2 \leq A_{s\,prov.}$ ✓ OK

$\phi V_c = \phi 2\sqrt{f'_c}\, b_w d = 0.75(2)\sqrt{4000}(12)/1000(21.625)$
$= 24.6^{K} \geq 3.2^{K}$ ✓ OK

$A_{s\,min} = 0.864\text{ in}^2 \leq 0.88\text{ in}^2 + 0.44\text{ in}^2 = 1.32\text{ in}^2$
ACI 350 14.3.2
(0.88 in²: U/S FACE; 0.44 in²: D/S FACE) ✓ OK

USE #6 @ 12" O.C. U. P/S FACE

DuBois & King, Inc
Dam Engineering
PO Box 339
Randolph, VT

Title : Load Case 2
Job # : 921439 Dsgnr: SRPaten: Date: MAR 13,2013
Description....
SDF loading with total failure of downstream dam.

This Wall in File: I:\921439 Curtis Pond Dam\Structural\curt

Cantilevered Retaining Wall Design

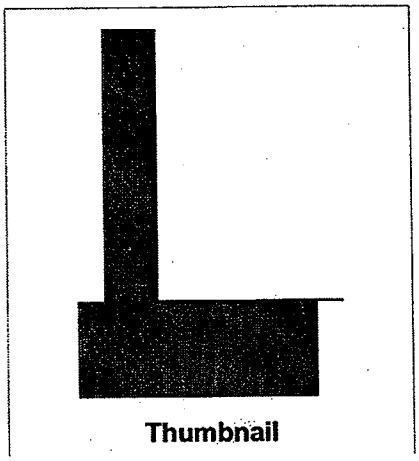
Code: IBC 2009

Criteria

Retained Height	=	0.00 ft
Wall height above soil	=	8.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	0.00 in
Water height over heel	=	9.5 ft

Soil Data

Allow Soil Bearing	=	12,000.0 psf
Coulomb Soil Pressure calculation		
Soil Friction Angle	=	34.0 deg
Active Pressure:Ka*Gamma	=	27.0 psf/ft
Passive Pressure:Kp*Gar	=	389.1 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.52 OK
Sliding	=	1.00 Ratio < 1.5!
Total Bearing Load	=	6,600 lbs
...resultant ecc.	=	39.47 in
Soil Pressure @ Toe	=	3,633 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	12,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	5,086 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	0.0 psi OK
Footing Shear @ Heel	=	8.8 psi OK
Allowable	=	94.9 psi

Sliding Calcs (Vertical Component Used)

Lateral Sliding Force	=	3,679.5 lbs
less 60 % Passive Force	= -	1,050.5 lbs
less 100% Friction Force	= -	2,640.0 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	1,828.7 lbs NG

Load Factors

Building Code	IBC 2009
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	24.00
Rebar Size	=	# 6
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

USE DOWELS TO RESIST SLIDING

Design Data

fb/FB + fa/Fa	=	0.255
Total Force @ Section	lbs =	3,400.4
Moment....Actual	ft-# =	10,768.1
Moment.....Allowable	=	42,175.0
Shear.....Actual	psi =	13.1
Shear.....Allowable	psi =	94.9
Wall Weight	=	300.0
Rebar Depth 'd'	in =	21.63
LAP SPLICE IF ABOVE	in =	37.00
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.00

Lap splice above base reduced by stress ratio
Hook embedment reduced by stress ratio

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	4,000.0
Fy	psi =	60,000.0

DuBois & King, Inc
Dam Engineering
PO Box 339
Randolph, VT

Title : Load Case 2
Job # : 921439 Dsgnr: SRPaten Date: MAR 13,2013
Description....
SDF loading with total failure of downstream dam.

This Wall in File: I:\921439 Curtis Pond Dam\Structural\curt

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

Toe Width	=	1.00 ft
Heel Width	=	8.00
Total Footing Width	=	9.00
Footing Thickness	=	36.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 4,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.50 @ Btm.= 2.50 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	5,086	0 psf
Mu' : Upward	=	2,310	59 ft-#
Mu' : Downward	=	315	11,340 ft-#
Mu: Design	=	1,995	11,281 ft-#
Actual 1-Way Shear	=	0.00	8.84 psi
Allow 1-Way Shear	=	94.87	94.87 psi

Toe Reinforcing = # 6 @ 18.00 in
Heel Reinforcing = # 6 @ 12.00 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings
Toe: Not req'd, Mu < S * Fr
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#			.....RESISTING..... Force lbs	Distance ft	Moment ft-#
*Heel Active Pressure	=	3,800.9	4.07	15,452.6	Soil Over Heel	=	0.0	6.00	0.0
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Toe Active Pressure	=	-121.4	1.00	-121.4	Surcharge Over Heel	=			
Surcharge Over Toe	=				Adjacent Footing Load	=			
Adjacent Footing Load	=				Axial Dead Load on Stem	=			
Added Lateral Load	=				* Axial Live Load on Stem	=			
Load @ Stem Above Soil	=				Soil Over Toe	=			
					Surcharge Over Toe	=			
					Stem Weight(s)	=	2,550.0	2.00	5,100.0
					Earth @ Stem Transitions	=			
Total	=	3,679.5	O.T.M. =	15,331.2	Footing Weight	=	4,050.0	4.50	18,225.0
					Key Weight	=			
					Vert. Component	=			
					Total =		6,600.0 lbs	R.M.=	23,325.0

Resisting/Overturning Ratio = 1.52
Vertical Loads used for Soil Pressure = 6,600.0 lbs

*Includes water table effect

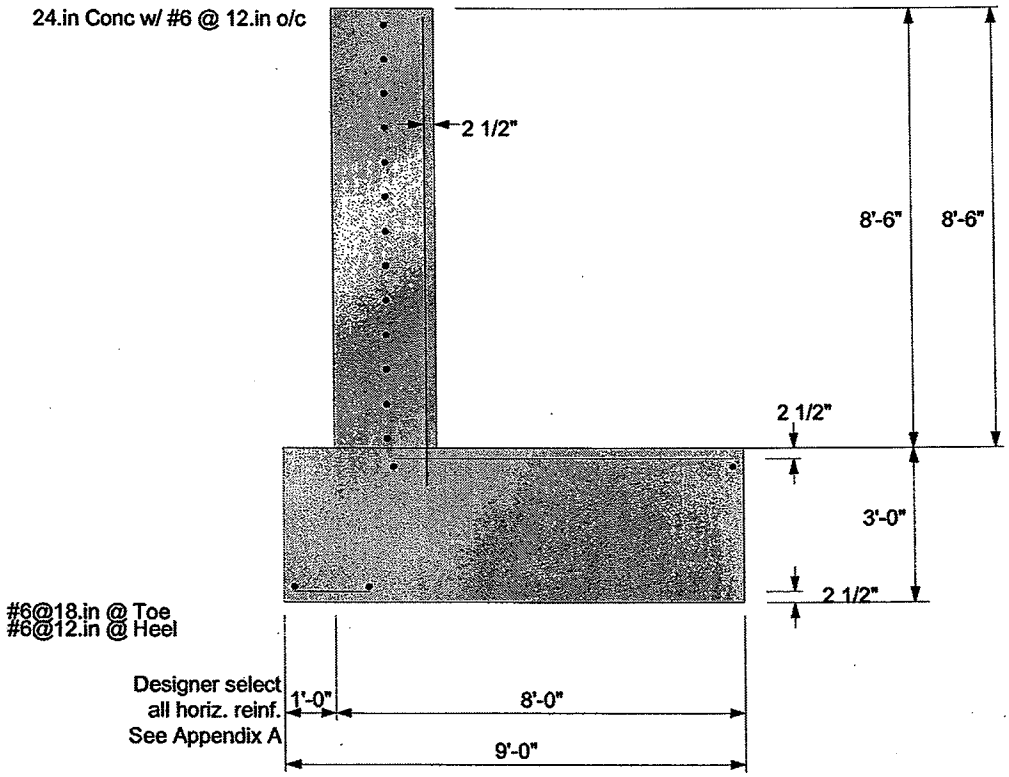
* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

DESIGNER NOTES:

10/16

1003.5

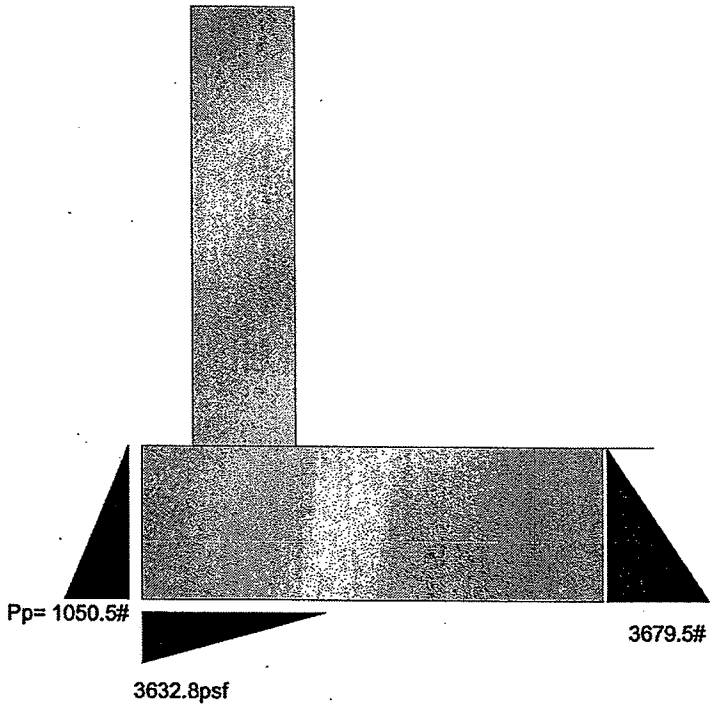
1002.5



994.0

991.0

11/16



Cantilevered Retaining Wall Design

Code: IBC 2009

CalcTrac is a condensed trace of calculation procedures
for the designer's review. To verify a questioned
result we recomend an independent calculation.

Beginning of Trace 3/22/2013 16:02:35 RP9.27

Retained Height = 0.0000 ft
Noted that Coulomb Method being used
Actual Heel Width (past back of stem) = 6.0000 ft
Soil Height for Stability (wall+footing+bslope) = 3.0000 ft

Calculating Overturning Values

Active Pressure (water table condition included) = 3,800.88, Moment = 15,452.61 ft-#
Force of water over heel = 3,800.88 - 121.390 = 3,679.49
Arm = 4.0655 ft, Moment = 15,452.61 ft-#
Active Pressure @ Toe: [(0.0000 + 36.0000)/12]^2 * 26.9756 / 2.0= -121.390 lbs
Arm = (0.0000 + 36.0000) / 3 /12 = 1.0000 ft, Moment = -121.390 ft-#
Toe Active Pressure Used To Resist Sliding, so ADD Soil over toe = -121.390 lbs to Total Overturning Loads

Calculating Resisting Moments

Soil Wt Over Heel = 6.0000 * 0.0000 * 110.000 = 0.0001 lbs
Arm = 9.0000 - 6.0000 / 2.0 = 6.0000 ft, Moment = 0.0001 * 6.0000 = 0.0004 ft-#
Top Stem Weight = 2,550.00 lbs, Arm = (1.0000 + 2.0000 / 2.0) = 2.0000 ft
Stem Avg. Arm = 24.0000 ft, Total Moment = 61,200.00 ft-#
Avg. Arm = 0.0000 ft, Moment = 0.0000 ft-#
Footing Weight = 9.0000 * 36.0000 * 150.000 = 4,050.00 lbs, Arm = 9.0000 / 2.0 = 4.5000 ft, Moment = 18,225.00 ft-#
Key Weight = 0.0000 * 0.0000 * 150.000 = 4,050.00 lbs, Arm = 0.0000 + 0.0000 / 2.0 = 0.0000 ft, Moment = 0.0000 ft-#
Total Resis. Wt = 6,600.00 lbs, Moment = 23,325.00 ft-#

Calculated Stem Forces for Preliminary Checks

Cantilevered Stem Calculations

Top Stem Section: Shear = 3,400.44 lbs, Moment = 10,768.06 ft-#
Calcualting Actual Shear Stress
Concrete Unit Shear Stress = 3,400.44 / 21.6250 / 12.0 = 13.1038 psi
Determine Allowable Moments
Top Concrete Stem Capacity = 506,099.88 in-#
Top Concrete Stem Shear Capacity = 0.75 * 2.0 * sqrt(4,000.00) = 94.8683 psi

Calculating Soil Pressure

Toe Bar Depth = 36.0000 - 2.5000 - 0.5 = 33.0000 in, Heel Bar Depth = 36.0000 - 2.5000 - 0.5 = 33.0000 in
Service Load Soil Pressures.....
P = 6,600.00 lbs, Ecc = -39.4658 in, Toe Pressure = 3,632.82 psf, Heel Pressure = 0.0000 psf

Calculating Factored Load Shear in Footing:

P = 9,240.00 lbs, Ecc = -39.4658 in, Toe Pressure = 5,085.95 psf, Heel Pressure = 0.0000 psf
Shear @ Toe = (0.0000 - 1.4000 * (36.0000 * 1.0417 + 0.0000 * 0.7639 + 0.0000) * 0.0000) / (12.0 * 33.0000) = 0.0000 psi
Shear @ Heel = (0.0000 - 3,780.00 - 0.0000 - 0.0000 - 0.0000) / (12.0 * 33.0000) = 8.8361 psi
Shear Distances from Edge; Toe = 12.0000 in, Heel = 72.0000 in
Toe Upward Moment = 2,309.69 ft-#
Toe Downward Moment = 1.4000 * (36.0000 * 1.0417 + 0.0000 * 0.7639 + 0.0000) * 12.0000^2 / 2.0 / 12.0 = 315.000 ft-#
Toe Design Moment = 2,309.69 - 315.000 = 1,994.69 ft-#
Design Toe Moment <= 5.5 * d^2 * SQRT(f'c) --->> No Reinforcing Used
Heel Upward Moment = 59.3211 ft-#
Heel Downward Moment = 1.4000 * (36.0000 * 1.0417 + 0.0000 * 0.7639 + 0.0000 + 0.0000) * 72.0000^2 / 2.0 / 12.0 = 11,340.00 f
Add moment due to vertical soil component = 1.6000 * 0.0000 * 72.0000 = 0.0000 ft-#
Heel Design Moment = -11,280.68 ft-#
Design Heel Moment <= 6.5 * d^2 * SQRT(f'c) --->> No Reinforcing Used
Soil Height for Passive Pressure = 0.0000 + 36.0000 + 0.0000 = 36.0000 in
Sliding Resistance due to Friction = 6,600.00 * 0.4000 = 2,640.00 lbs
Friction Resistance adjusted for Specified '%' = 1.0000 * 2,640.00 = 2,640.00 lbs
Sliding Passive Pressure = (36.0000 - 0.0000) * 2.7020 * (36.0000 - 0.0000)/2.0)
+ (0.0000 * 2.7020 * (36.0000 - 0.0000)) = 1,750.88 lbs
Passive Resistance adjusted for Specified '%' = 0.6000 * 2,640.00 = 630.317 lbs
Sliding Factor of Safety = (1,050.53 + 2,640.00) / 3,679.49 = 1.0030 lbs

Calculating Footing Rebar Requirements

Rho:Balanced = 0.8500 * 4,000.00 / 60,000.00 * 0.8500 * (87000.0 / (87000.0 + 60,000.00)) = 0.0285

Calculated Stem Forces for Final Checks

Cantilevered Stem Calculations

62 Top Stem Section: Shear = 3,400.44 lbs, Moment = 10,768.06 ft-#
63 Calcualting Actual Shear Stress
64 Concrete Unit Shear Stress = 3,400.44 / 21.6250 / 12.0 = 13.1038 psi
65 Determine Allowable Moments
66 Top Concrete Stem Capacity = 506,099.88 in-#
67 Top Concrete Stem Shear Capacity = 0.75 * 2.0 * sqrt(4,000.00) = 94.8683 psi

TABLE C-1

Friction Coefficient for Concrete Cast on Soil
(reference 4)

Interface Materials	Friction Coefficient, f
Mass concrete on the following foundation materials:	
Clean sound rock	0.70
Clean gravel, gravel–sand mixtures, coarse sand	0.55 to 0.60
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	0.45 to 0.55
Clean fine sand, silty or clayey fine to medium sand	0.35 to 0.45
Fine sandy silt, nonplastic silt	0.30 to 0.35
Very stiff and hard residual or preconsolidated clay	0.40 to 0.50
Medium stiff and stiff clay and silty clay	0.30 to 0.35

C-4.2. The size of thrust block for downward directed thrust is calculated by;

$$A_{TB} \geq F_S T_Y / q_S$$

where;

A_{TB} = bottom area of thrust block,
T_y = vertical component of thrust force,
q_S = allowable bearing capacity of soil, and
F_S = Factor of Safety.

C-4.3. There is also a horizontal component of thrust (T_x) in vertical bends. The sizing of thrust block for the horizontal component is calculated by the same formula used for horizontal bends, except the term T is replaced by $T_x = 2PA \sin 0/2 \cos 0$.

C-4.4. These are shown in Figures C-4, C-5, C-6 and C-7.

C–5. Restrained Joints. There are several approaches to this. They all calculate the length of pipe to be restrained on both sides of the joint. The length to be restrained may be determined by;

$$L \geq F_S(PA \tan 2/2)/(F_f + 0.5\ R\ (_S\ Z\ K_p\ D_o)$$

where;

TABLE 1
Typical Properties of Compacted Soils

Group Symbol	Soil Type	Range of Maximum Dry Unit Weight, pcf	Range of Optimum Moisture, Percent	Typical Value of Compression		Typical Strength Characteristics				Typical Coefficient of Permeability ft./min.	Range of CBR Values	Range of Subgrade Modulus k lbs/cu in.
				At 1.4 tsf (20 psi)	At 3.6 tsf (50 psi)	Cohesion (as compacted) psf	Cohesion (saturated) psf	ϕ (Effective Stress Envelope Degrees)	Tan ϕ			
				Percent of Original Height								
GW	Well graded clean gravels, gravel-sand mixtures.	125 - 135	11 - 8	0.3	0.6	0	0	>38	>0.79	5×10^{-2}	40 - 80	300 - 500
GP	Poorly graded clean gravels, gravel-sand mix	115 - 125	14 - 11	0.4	0.9	0	0	>37	>0.74	10^{-1}	30 - 60	250 - 400
GM	Silty gravels, poorly graded gravel-sand-silt.	120 - 135	12 - 8	0.5	1.1	.....	.....	>34	>0.67	$>10^{-4}$	20 - 60	100 - 400
GC	Clayey gravels, poorly graded gravel-sand-clay.	115 - 130	14 - 9	0.7	1.6	.....	.....	>31	>0.60	$>10^{-7}$	20 - 40	100 - 300
SW	Well graded clean sands, gravelly sands.	110 - 130	16 - 9	0.6	1.2	0	0	38	0.39	$>10^{-3}$	20 - 40	200 - 300
SP	Poorly graded clean sands, sand-gravel mix.	100 - 120	21 - 12	0.8	1.4	0	0	37	0.74	$>10^{-3}$	10 - 40	200 - 300
SM	Silty sands, poorly graded sand-silt mix.	110 - 125	16 - 11	0.8	1.6	1050	420	34	0.67	$5 \times >10^{-5}$	10 - 40	100 - 300
SM-SC	Sand-silt clay mix with slightly plastic fines.	110 - 130	15 - 11	0.8	1.4	1050	300	33	0.66	$2 \times >10^{-6}$	5 - 30	100 - 300
SC	Clayey sands, poorly graded sand-clay-mix.	105 - 125	19 - 11	1.1	2.2	1550	230	31	0.60	$5 \times >10^{-7}$	5 - 20	100 - 300
ML	Inorganic silts and clayey silts.	95 - 120	24 - 12	0.9	1.7	1400	190	32	0.62	$>10^{-5}$	15 or less	100 - 200
ML-CL	Mixture of inorganic silt and clay.	100 - 120	22 - 12	1.0	2.2	1350	460	32	0.62	$5 \times >10^{-7}$	.....	
CL	Inorganic clays of low to medium plasticity.	95 - 120	24 - 12	1.3	2.5	1800	270	28	0.54	$>10^{-7}$	15 or less	50 - 200
OL	Organic silts and silt-clays, low plasticity.	80 - 100	33 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	50 - 100
MH	Inorganic clayey silts, elastic silts.	70 - 95	40 - 24	2.0	3.8	1500	420	25	0.47	$5 \times >10^{-7}$	10 or less	50 - 100
CH	Inorganic clays of high plasticity	75 - 105	36 - 19	2.6	3.9	2150	230	19	0.35	$>10^{-7}$	15 or less	50 - 150
OH	Organic clays and silty clays	65 - 100	45 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	25 - 100

Notes:

16/16

Table 6.1 Typical Average Ultimate Bond Stresses-Rock/Grout

ROCK	AVERAGE ULTIMATE BOND STRESS-ROCK/GROUT	
	MPa	*PSI*
Granite & Basalt	1.7 - 3.1	250 - 450
Dolomite Limestone	1.4 - 2.1	200 - 300
Soft Limestone	1.0 - 1.4	150 - 200
Slates & Hard Shales	0.8 - 1.4	120 - 200
Soft Shales	0.2 - 0.8	30 - 120
Sandstones	0.8 - 1.7	120 - 250
Weathered Sandstones	0.7 - 0.8	100 - 120
Chalk	0.2 - 1.1	30 - 155
Weathered Marl	0.15 - 0.25	25 - 35
Concrete	1.4 - 2.8	200 - 400

USE AS BOND STRESS FOR ROCK & CONCRETE

8. Grouting methods and pressures, and mix designs
9. The bond length

The typical values shown in Table 6.1 are not intended for use in final design. Working bond stresses shall be established on a project-by-project basis after review of all available geologic data, rock cores and previous experience in similar conditions.

Each rock anchor shall be tested in order to verify the load carrying capacity of the anchor and to preload the tendon (see Section 8).

6.7.2 Soil Anchors

6.7.2.1 General Considerations

Existing theoretical and empirical methods for predicting anchor capacity should only be used for preliminary design estimate purposes. The anchor performance shall be verified by field-testing.

Actual bond length dimensions for specific design

The ultimate bond stress between the rock and the anchor grout can be approximated by using a value of 10% of the unconfined compressive strength of the rock, up to a maximum value of 4.2 MPa (600 psi).

C6.7.2 Soil Anchors

C6.7.2.1 General Considerations

Normally, the bond length for soil anchors is in the range of 6-12 m (20-40 ft). Bond lengths greater than 15 m (50 ft) in soil are not efficient, unless special provisions are taken to transfer load throughout the bond zone.

GREEN MOUNTAIN BORING

PO Box 218
East Barre, VT 05649

To: Dubois & King
ATTN: Jeff Tucker
Route 66 Professional Center
Randolph, Vermont 05060

Date	10/21/03
Job Name/Site	Curtis Pond Dam/Calais, Vermont
Job Number	03064
Crew	Michael McGinley/Tyler Sabin
Inspector	

HOLE #	OFFSET	STATIC LEVEL	SOILS	AUGER REFUSAL	DEPTH
P-1	-	1.5'	Tripod probe until refusal	4.5'	4.5'
P-2	-	3'	Rebar until refusal	5'	5'
P-3	-	1.5'	Rebar until refusal	4'9"	4'9"

TOTAL FOOTAGE: 14'3"

AUGERS USED: Solid

GREEN MOUNTAIN BORING

PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME: LOCATION: GMB JOB #:	Curtis Pond Dam Calais, Vermont 03064	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	1 10/20/03 B-1

Ground Water Observations None at 0 hours	Augers-Size I.D. 3.25" Split Spoon 1 3/8" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: Date Started: 10/20/03 Date Completed: 10/20/03 Boring Foreman: Michael McGinley Inspector: Jeff Tucker Soils Engineer:

LOCATION OF BORING:

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Inches	Sample Rec. Inches
0-2	Dry	4/3/6/2	Damp		Sand, small stones and fractured rock	1	24	8
2-4	Dry	2/15/40/100 for 4"	Wet/Dry	2.5'	Sand, into weathered rock, into ledge	2	24	24
					Split spoon refusal at 3'10"			

Ground Surface to: 2' Used 3.25" augers, then split spoon to refusal at 3'10"

SUMMARY B-1

Earth Boring	3'10"
Rock Coring	
Samples	2

GREEN MOUNTAIN BORING
PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME: LOCATION: GMB JOB #:	Curtis Pond Dam Calais, Vermont 03064	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	2 10/20/03 B-2

Ground Water Observations None at 0 hours	Augers-Size I.D. 3.25" Tripod Split Spoon 1 3/8" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: Date Started: 10/20/03 Date Completed: 10/20/03 Boring Foreman: Michael McGinley Inspector: Jeff Tucker Soils Engineer:

LOCATION OF BORING: As marked

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Pen. Inches	Rec. Inches
0-2	Dry	2/1/1/2	Dry		Sand and small stones	1	24	4
2-4	Dry	11/8/5/3	Dry		Weathered rock with a trace of sand	2	24	16
4-6	Dry	4/8/4/3	Dry		Rock fragments with a trace of sand	3	24	12
6-8	Dry	4/6/8/7	Wet		Weathered rock, trace of sand	4	24	8
8-10	Dry	9/9/6/15	Wet		Weathered rock, trace of sand	5	24	16
10-12	Dry	9/50/15/12	Wet		Rock fragments, trace of sand	6	24	12
14	Dry	13/11/15/100 for 2"	Wet		Till and rock fragments	7	24	24
					Split spoon refusal at 13'8"			

Ground Surface to: 12' Used 3.25" augers, then split spoon to refusal at 13'8"

SUMMARY B-2

Earth Boring	13'8"
Rock Coring	
Samples	7

GREEN MOUNTAIN BORING

PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME:	Curtis Pond Dam	SHEET:	3
				DATE:	10/20/03
		LOCATION:	Calais, Vermont	HOLE #:	B-3
				LINE & STA.	
		GMB JOB #:	03064	OFFSET:	

Ground Water Observations	Augers-Size I.D.	3.25" Tripod	Surface Elevation:	
	Split Spoon	1 3/8"	Date Started:	10/20/03
	Hammer Wt.	140#	Date Completed:	10/20/03
None at 0 hours	Hammer Fall	30"	Boring Foreman:	Michael McGinley
			Inspector:	Jeff Tucker
			Soils Engineer:	

LOCATION OF BORING: As marked

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample		
						No.	Pen. Inches	Rec. Inches
0-2	Dry	2/3/1/1	Dry		Sand and small stones with rock fragments	1	24	10
2-4	Dry	1/1/10/8	Wet		Sand and small stones with rock fragments	2	24	6
4-6	Dry	4/5/7/3	Wet		Sand and small stones with rock fragments	3	24	6
6-8	Dry	2/2/8/12	Wet		Organics (wood), sand, trace of silt, small stones	4	24	10
8-10	Dry	25/35/100 for 3"	Wet		Rock fragments	5	24	12
					Split spoon refusal at 9'3"			

Ground Surface to: 8' Used 3.25" augers, then split spoon to refusal at 9'3"

SUMMARY B-3

Earth Boring	9'3"
Rock Coring	
Samples	5

GREEN MOUNTAIN BORING

PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME:	Curtis Pond Dam	SHEET:	4
				DATE:	10/20/03
		LOCATION:	Calais, Vermont	HOLE #:	B-4
				LINE & STA.	
		GMB JOB #:	03064	OFFSET:	

Ground Water Observations	Augers-Size I.D.	3.25" Tripod	Surface Elevation:	
	Split Spoon	1 3/8"	Date Started:	10/20/03
None at 0 hours	Hammer Wt.	140#	Date Completed:	10/20/03
	Hammer Fall	30"	Boring Foreman:	Michael McGinley
			Inspector:	Jeff Tucker
			Soils Engineer:	

LOCATION OF BORING: As marked

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample		
						No.	Pen. Inches	Rec. Inches
0-2	Dry	1/1/1/2	Damp		Sand, small stones, trace of organics	1	24	3
2-4	Dry	2/2/8/8	Wet		Sand, small stones, trace of silt, rock fragments	2	24	6
4-6	Dry	6/9/9/12	Wet		Sand, small stones, rock fragments, trace of silt	3	24	8
6-8	Dry	1/4/35/100 for 5"	Wet		Sand, small stones, till like material, rock fragments	4	24	16
					Split spoon refusal at 7'11"			

Ground Surface to: 6' Used 3.25" augers, then split spoon to refusal at 7'11"

SUMMARY B-4

Earth Boring	7'11"
Rock Coring	
Samples	4

OPERATIONS & MAINTENANCE

CURTIS POND DAM
STATE ID # 40.09
NAT ID # VT00063

REFILLING PROCEDURES

1. Upon review and acceptance of this plan by the Vermont Dam Safety Section, The Town of Calais (Owner) will be provided with written authorization to refill the dam up to the designed surface elevation of 1001.0 feet. The Owner shall be responsible for the refilling of the pond and shall provide personnel to monitor the refilling on a daily basis.
2. Refilling of the pond is accomplished by interrupting the outflow of water flowing through the low-level drainpipe by closing the gate valve. Once the valve is set in its initial position to achieve minimum flows, the water level in the impoundment will begin to rise. As the water level rises the outflows will begin to increase requiring the valve to be repositioned to capture more water while still meeting the minimum flow and water level requirements further discussed below.
3. Minimum stream flows must be maintained while refilling the dam. The gate must never be in the fully closed position during this period. Minimum stream flows (Conservation Flows) shall be no less than 310 GPM between June 1 and September 30, 620 GPM between October 1 and March 31, and 2,478 GPM between April 1 and May 31. Discharge volume shall be calculated by measuring the depth of water flowing into the roadway culvert downstream of the dam under Worchester Road, and then applying that measurement to a rating table provided by the Engineer. The rating table is used to convert inches of water flowing out of the pipe into gallons per minute (GPM). Daily discharge from the pond shall be monitored and recorded at the same time each day.
4. Refilling of the pond shall not exceed 1 foot per 24-hour period. In the event of a storm, extra precautions such as additional monitoring of the dam and watching the weather forecast will need to be made to guard against refilling the dam too rapidly. It is critical that judgment be exercised during a storm event. If it appears there is potential for the water level to rise too quickly, then the valve must be adjusted to counter against it. The owner shall maintain a daily log of pond elevations and estimated outflows discussed in part 3 of this procedure, and shall provide the Vermont Dam Safety Section with a copy of the log within 14 days after refilling the dam. Levels of the pond shall be measured from the spillway crest elevation of 1001.0.
5. In the event that minimum flows cannot be maintained due to dry conditions, the Owner will be permitted to use 10% of any instantaneous flows (i.e. rainstorm runoff) for refilling.
6. The Owner shall carefully monitor all components of the dam during refilling for signs of leakage or distress and report any findings to the Engineer immediately and record in your daily log.
7. Once the dam level has reached El. 1001.0 and the base flow is being passed over the spillway, the valve may be closed and the refilling procedure has finished.

CURTIS POND DAM
STATE ID # 40.09
NAT ID # VT00063

OPERATIONS& MAINTENANCE MANUAL

I. INTRODUCTION / BACKGROUND

The following is an Operations and Maintenance (O&M) Manual for the Curtis Pond Dam, located in Calais, Vermont. The purpose of this O&M is to provide instruction for the owner's use, for the general operation and maintenance of the dam.

The Curtis Pond Dam impounds a 72-acre pond, which is located on the Pekin Brook in Peru, Vermont. The dam was originally constructed in c.1900 to increase the water level and combine two separate ponds. The dam has never experienced a major reconstruction.

The purpose of this project is to construct a freestanding concrete cutoff wall upstream of the dam and replace the deteriorated principal spillway, line the outlet barrel, and install a new low level outlet control valve.

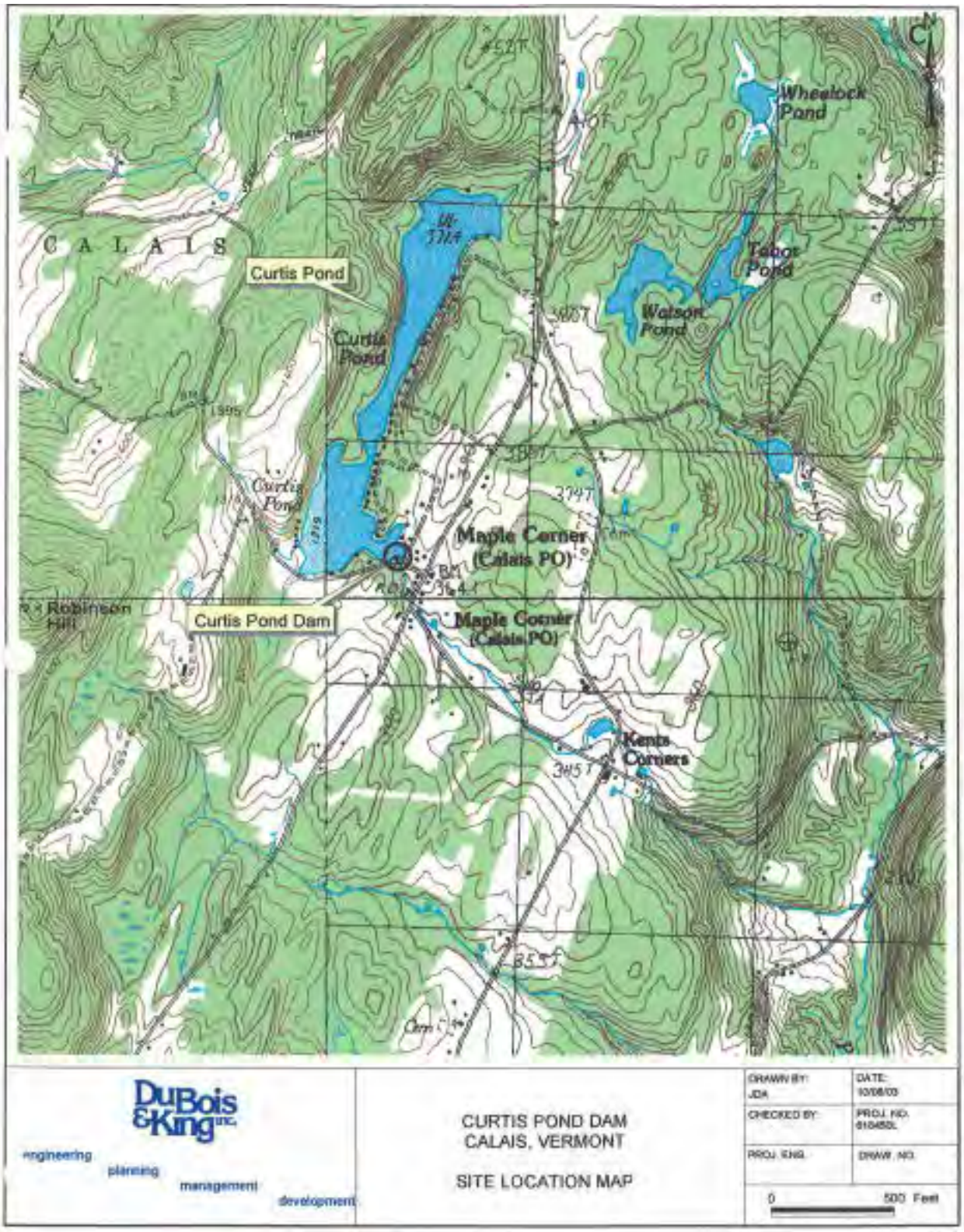

CALAIS
Curtis Pond
Curtis Pond
Curtis Pond
Curtis Pond Dam
Robinson Hill
Maple Corner (Calais PO)
Maple Corner (Calais PO)
Kents Corners
Wheelock Pond
Watson Pond
Tabor Pond
DuBois & King inc.
engineering
planning
management
development
CURTIS POND DAM
CALAIS, VERMONT
SITE LOCATION MAP
DRAWN BY: JDA
DATE: 10/08/03
CHECKED BY:
PROJ. NO. 610455L
PROJ. ENG.
DRWG. NO.
0
500 Feet

Table 1
Dam Description

State Identification Number:	Department of Environmental Conservation No.40.09 National Dam Inventory No. VT00063	
Hazard Classification:	Significant Hazard, Class II	
Coordinate Location	44.3765 N Latitude, 72.4958 W Longitude	
Drainage Area:	Size**:** 917 acres (1.38 square miles) Type: Forested Woodland with Moderate Sloping Terrain.	
Elevations (feet local):	Top of dam (Earth Embankment) Emergency Spillway Crest Primary Spillway Crest Low-Level Outlet Invert (Valve Invert)	1002.5 N/A 1001.0 995.0
Lake Surface Area (acres):	Top of Dam Spillway Crest	75 acres 72 acres
Lake Storage (acre-feet):	Top of Dam	1,000 ac-ft
Dam:	Type: Overall Length: Height: Top Width: Side Slopes:	Stone/Earth Fill w/ Concrete Cutoff Wall 120 feet 11 feet Maximum Section 20-feet upstream face to downstream face Vertical Upstream/Downstream
Spillways:	Principal Spillway: Emergency Spillway:	10 foot Concrete Channel N/A (designed stable during overtopping)
Low-Level Pond Drain	16 inch diameter SDR 17 HDPE pipe with 16 inch gate valve upstream of the concrete cutoff wall.	

II. ASSIGNMENT OF RESPONSIBILITY

As required under Order Approving Application to Reconstruct a Dam (Order), 10 V.S.A. Chapter 43, Application No. 2011-1, Town of Calais, VT, as Owners, shall be responsible for the operation, maintenance and monitoring of the dam in accordance with the Order.

As Owner, Town of Calais, VT is responsible for all aspects of dam safety procedures. The Owner should assign a dam monitor with specific responsibilities for ensuring that inspections, maintenance, mowing, and general appearance as outlined in the following sections and the appended inspection and maintenance log are conducted and recorded.

The Dam Monitor should coordinate with the Vermont Dam Safety Office and become familiar with the dam and trained in its operation and maintenance. The Dam Monitor name, address, telephone number and other applicable contact information should be kept on file at Town of Calais, VT and at the Vermont Dam Safety Office.

III. OPERATING PROCEDURES

1. Principal Spillway

There are no specific operations for the principal spillway. There is no required operation of the spillway other than keeping it free of debris, which is discussed under Section IV- Maintenance.

The pond level is expected to increase during periods of excess runoff (storms). Table 2 - Hydraulic Routing Summary presented on the next page indicates projected lake levels during selected theoretical storm events. There is no required operation or action for the dam operator during a storm event or any required adjustments to the spillway.

Prior to a predicted extreme event and following all significant events, the dam monitor should inspect the dam to identify any potential damage to the structure.

The pond level is expected to drop slightly below the spillway crest elevation during droughts, due to evaporation from the surface area. There is no required operation or action for the dam operator to take in the event of a drought.

2. Emergency Spillway

There is no emergency spillway for this dam. The rehabilitation design takes into account limited hydraulic capacity during significant flood events. The dam is designed to be stable when overtopped.

Table 2
Hydraulic Routing Summary

Flood Frequency	Peak Inflow (cfs)	Peak Outflow* (cfs)	Maximum Pond Water Level (Local datum)	Available Freeboard (Feet)**
50-Year	**684**	**47**	**1002.5**	**0.0**
100-Year	**892**	**96**	**1002.7**	**-0.2**
500-Year	**1564**	**349**	**1003.4**	**-0.9**
¼ PMF	**1484**	**1678**	**1005.3**	**-2.8**

1. **Values rounded to nearest significant digit.**
2. **Normal Pool Elevation = 1001.0**
3. ***Discharge computed by HydroCAD with non-failure of Curtis Pond Dam assumed. Top of Dam = El. 1002.5**
4. **Negative values indicate overtopping**

3. Low-Level Outlet Pipe

The low-level outlet pipe extends from the cutoff wall into the pond. The outlet pipe is a 16" SDR 17 HDPE Pipe. The control valve is a 16 inch ductile iron gate valve mounted to the upstream side of the cutoff wall. The valve operator is located in a valve box that extends above the spillway crest. A debris screen is located at the inlet of the pipe.

Operation of the gate valve is discussed under section IV: Maintenance.

4. Draining of Pond

The Owner shall notify the Vermont Dam Safety Section prior to initiating dewatering activities.

The pond may be lowered by opening the low level gate valve. Please note drawdown and refill shall not progress faster than one foot of rise or fall per any 24 hour period.

Refilling shall follow the Refilling Procedures.

5. Inspection of the Dam

The Curtis Pond Dam is subject to periodic inspections by the Vermont Dam Safety Section.

The dam monitor should inspect the dam every year and document any changes to the condition of the dam. The best time of the year to make these observations is during the months of April and May. Observation during this time period makes identification of problem areas such as seepage and sinkholes more readily identified due to vegetation lying flat in its dormant state.

Observations and measurements made during the inspections shall consist of the following:

- ✓ Recording of the pond level.
- ✓ Inspection of the principal spillway.
- ✓ Exercising of the gate valve.
- ✓ Inspection of the low-level drainpipe, visible portions, looking from the downstream end.
- ✓ Observation of the general conditions of the shoreline and embankment.
- ✓ Photographs shall be taken in the same location during each inspection.
- ✓ Photographs taken shall be compared to photos taken during the previous inspection to identify possible changes in the condition of the dam.

The spillway shall remain unobstructed and allowed to freely discharge. All accumulated debris shall be cleared from the spillway on a regular basis, and before and after all significant flood events. The outlet channel shall also be kept clear of woody debris and other obstructions between the stilling basin and the Worchester Road culvert.

The general condition of the dam shall be inspected for signs of deterioration including displaced stone on the downstream face, animal burrows and sink holes on the crest and defect in the concrete cutoff wall. The inspection shall include canvassing the entire dam looking for changes of conditions. Observation including any changes should be recorded in the maintenance log.

IV. MAINTENANCE

Routine maintenance is necessary to maximize the ability of the dam to safely pass runoff during flood events. The primary maintenance item is to keep the spillway cleared of woody debris, brush and other debris that may impede flows. Specifically, the following maintenance measures should be performed.

SAFETY FIRST: ONLY EXPERIENCED PERSONNEL SHOULD WORK AROUND THE SPILLWAY AND WATER AREAS.

1. Remove any floating or grounded debris (tree limbs, etc.) upstream of the spillway. This should be done within reasonable safety guidelines. The guidelines could include, but are not limited to:

    - Training on an inspection team.
    - Two person inspection team.
    - Hardhats, floatation, and other safety equipment.

2. Monitor and report any seepage evident in the areas emanating from, adjacent to, or downstream from the spillway. If previously unobserved seepage becomes evident, notify the Vermont Dam Safety at (802) 490-6229 no later than 24 hours after the observation.

3. Preventative maintenance shall include the exercising of the 16-inch gate valve biannually, to ensure proper operation. Basic operation requires a "valve wrench", provided by the contractor during construction, being used to open and close the valve. Only trained personnel shall operate the gate valve. The gate valve shall be opened in increasing amounts at first. The gate valve shall be opened no more than a few turns, and then closed. The gate valve then should be opened and closed in increasing amounts until it is fully opened. The valve can then be fully closed.

4. Mowing of the embankment crest and areas immediately downstream of the stone face is essential to maintain a visual assessment of the dam operation. Mowing prevents woody vegetation, such as bushes and roots from propagating. A general mowing of the grassed surfaces should be completed a minimum of twice per year, once in mid summer and once in later fall.

5. It is important that trees are not allowed to take hold on the dam and should be removed as soon as reasonably possible. Tree roots have an adverse effect on earthen embankments. If trees are allowed to mature the root systems can create voids in the embankment and thus compromising the integrity of the dam.

An inspection and maintenance log should be maintained to document the performance of the

dam. The purpose of the inspection log is to provide a basis for tracking changes to the condition and function of the dam. Inspections provide a history on which to determine the need and timing of maintenance or repair. They also help determine the effectiveness of the routine maintenance. All pertinent information observed during the routine maintenance and the annual inspections shall be recorded in chronological order and filed with the Owner.

Contact Information

State of Vermont
Agency of Natural Resources
Department of Environmental Conservation
FACILITIES ENGINEERING DIVISION
National Life Building MAIN 1
1 National Life Drive
Montpelier, VT 05620-3510

Fax: 802-828-1552

Dam Safety Engineer:
Stephen P. Bushman, P.E.
steve.bushman@state.vt.us
Cell: 802-490-6229

TECHNICAL SPECIFICATIONS

.

TOWN OF CALAIS, VT

CURTIS POND DAM REHABILITATION

CONTRACT DOCUMENTS
TECHNICAL SPECIFICATIONS

MAY 22, 2013

NOT FOR CONSTRUCTION

DuBois & King inc.

ENGINEERING • PLANNING • DEVELOPMENT • MANAGEMENT

TABLE OF CONTENTS

TOWN OF CALAIS, VT

CURTIS POND DAM
REHABILITATION
921439

EJCDC Contract Documents not included in this submission

SPECIFICATIONS

Division 1 - General Requirements

Division 2 - Site Work

Division 3 - Concrete

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work to be performed under this Contract is shown on the Drawings and defined in the Specifications. This Section covers certain specific information to further clarify the intent and requirements of the Contract.

B. The DESCRIPTION paragraph in each section is a statement or short word summary of the content of the section. This paragraph is not intended to "scope" the section or to imply a trade responsibility. It is merely a brief description of the significant items described in the section and is used to simplify the finding of specific information.

C. The "related work" paragraphs are also not meant to be all inclusive. Again, they serve the function of assisting the reader in locating specific information.

1.02 DEFINITIONS

Electric Utility Co	Green Mountain Power	888-835-4672
	Washington Electric Co-Op	800-932-5245
Telephone Company	Fairpoint	866-984-2001
	“Dig Safe”	888-344-7233
State Highway Department	VTrans District #6	802-828-2691

1.03 SYSTEM DESCRIPTION

A. Work includes removal and replacement of the existing concrete spillway outlet and channel, construction of a low concrete retaining wall and footing, placement of riprap and excavation and placement of earthen embankment material. Access to the work site will require upgrades to the roadway including stabilizing gravel and stone.

B. The work also involves miscellaneous improvements to the water system piping on the dam including extending ductile iron piping, installing new manhole covers and structures, and cutting and capping abandoned water lines.

END OF SECTION

SECTION 01018 - ITEMS PROVIDED BY OWNER

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section defines items provided by Owner and Contractor's limitations in their use.

1.02 LANDS AND EASEMENTS

A. Owner has acquired, or will furnish, the lands and permanent and temporary easements as delineated on the Drawings on file in the Owner's office. Such acquisitions will be paid for by Owner.

B. Prior to the start of Work, Contractor's qualified surveyor shall locate the limiting boundaries of the temporary and permanent easements and of the lands owned by Owner. No construction activity, access, storage, or other use shall take place beyond these limiting boundaries.

C. The permanent easements have been provided for the installation of the Work. The temporary easements are provided for the convenience of Contractor for purposes of access, storage and to provide space for the proper installation of the Work. The installation of permanent Work within a temporary easement is not permitted.

1.03 LAND AND EASEMENT ACQUISITIONS BY CONTRACTOR

A. Should Contractor require additional lands for access, storage, maneuvering, temporary construction facilities or for any other temporary purpose, he shall purchase the land, secure a temporary easement or, as a minimum, secure written authorization of the owner(s) of the land(s) and file a copy of same with Engineer prior to using such land.

B. Should a permanent installation be made by Contractor which is not within Owner's land or within a permanent easement, as required, Contractor shall immediately notify Engineer and advise him of Contractor's proposed corrective action to be taken. If Contractor requests approval to maintain the Work where installed, and Engineer determines that such location is acceptable

for the proper performance and functioning of the Project as a whole, Contractor with Owner’s permission shall purchase the additional land in the name of Owner or acquire a permanent easement for Owner. All such deeds and easement papers must receive Owner's approval prior to execution. If such lands or easements cannot be secured by Contractor, the Work shall be removed and relocated to the location shown on the Drawings.

C. Contractor shall bear all costs associated with this Paragraph 1.03, including those sustained by Owner for legal fees, additional engineering services and other related expenses.

1.04 SUBSURFACE EXPLORATIONS

A. Owner has had borings and or hand probes made at various times and locations at the site. For the convenience of bidders, logs of such subsurface data are appended to the Specifications Section 2010. The approximate locations of the borings are shown on the Drawings.

B. The logs represent the findings at the time the explorations were made and this data is offered in good faith solely for the purpose of placing Contractor in receipt of all information available, and in no event is to be considered a part of the Contract Documents. Contractor must interpret such data according to his own judgment. Contractor further acknowledges that he assumes all risk contingent upon the nature of the subsurface conditions to be actually encountered by him in performing the Work covered by the Contract, even though such actual conditions may result in Contractor performing more, or less work than he originally anticipated.

C. Contractor may make his own borings, hand probes, explorations and observations to determine soil, water and other subsurface conditions. Contractor shall plan the Work based upon his own findings.

D. If actual subsurface or latent conditions materially differ from the data referred to in Par. 1.04.A, immediately notify Engineer.

END OF SECTION

SECTION 01052 - SURVEYS AND LAYOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work covered by this Section includes the surveying, staking and laying out of the Work.

1.02 QUALITY ASSURANCE

A. All survey work for laying out the Work, for measuring pay items, and for preparing Record Drawings shall be done by a qualified Surveyor, as Chief of Party, and qualified assistants experienced in this type of work.

B. Contractor is responsible for the accuracy of his own work and shall maintain all reference points, stakes, etc., throughout the life of the Contract.

1.03 SUBMISSIONS

A. See Section 01300.

B. Copies of computations and reference points specified in Paragraph 3.04, submitted daily.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide all instruments, rods, measures, stakes, ribbons, nails and all other materials and equipment to perform the work of this Section.

PART 3 - EXECUTION

3.01 INSPECTIONS

A. Carefully examine the Drawings and immediately report to Engineer any error, apparent discrepancy in the data shown or omissions of data required for accurately accomplishing the Work.

3.02 LAYOUTS

A. Establish any additional base lines which may be required to locate the Work and provide suitable, adequate and sufficient number of bench marks, slope stakes, batter boards, and other required control and reference points.

B. Perform all required surveys and accurately lay out the Work.

3.03 MEASUREMENTS

A. Make all measurements for payment purposes as set forth under Section 01150.

3.04 FIELD NOTES AND COMPUTATIONS

A. Make all computations necessary to establish the exact position of the Work. Maintain field notes of all ties, baselines, reference points, bench marks and other control points. Also maintain field notes of all data required to be shown on the record drawings.

3.05 TIES

A. Property Monuments - Prior to any work in the vicinity of an existing property monument or marker, accurately provide at least four ties to physical objects which will not be damaged, destroyed or disturbed in the course of the Work.

B. New Underground and Underwater Work - On all new Work which will be buried or submerged in water and will not be visible at the completion of the Work, such as ends of house connections, stub-outs, dead ended pipes, outfall pipes, and like objects, provide elevations and three ties to physical objects to facilitate the locating of such items at a later date.

3.06 REPLACEMENTS

A. All existing and new reference points, ties, bench marks, property markers and other control points damaged, destroyed or disturbed during construction shall be reestablished and replaced.

END OF SECTION

SECTION 01150 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section covers the requirements for measurements and records for payment purposes, and describes the items under which payments will be made for all work performed under this Contract.

B. Items not specified to be measured or paid for shall be included in an appropriate unit price item or in a Lump-Sum item.

1.02 MEASUREMENT REQUIREMENTS

A. Where payments will be made removing rock and existing materials, notify Engineer so that he may inspect the materials to be removed, so that he may witness the measuring, and so that he may approve the record of measurements. All materials removed without conforming to the above procedures, and which Engineer cannot verify or substantiate, will not be paid for.

B. Maintain complete, neat, clean, and legible field notes for all measured items. Notes shall contain spaces for Contractor's and Engineer's signatures plus additional space for comments. An original and a copy shall be made for all notes and one copy shall be turned over to Engineer daily. The Engineer's signature shall not be construed as an acceptance of the Work, or the measurements made, but shall mean that he was present when the measurements were made.

1.03 SUBMITTALS

A. See Section 01300.

B. Field notes of all measurements for payment purposes delivered to Engineer daily.

C. Copies of all invoices required for payments out of cash allowance(s).

D. Monthly Applications for Payment, on the forms included in the Supplementary Conditions.

1.04 SCHEDULING

A. Notify Engineer, as far in advance as possible, of the making of measurements so that the Engineer may observe existing conditions, work being performed, and measurements being made.

B. Allow for and afford Engineer ample time, space and equipment to observe measurements and to verify measurements and elevations.

PART 2 - PRODUCTS

2.01 GENERAL

Provide all labor, materials, facilities, levels, measuring devices and all other equipment and items necessary to properly and accurately perform all measurements for payment purposes.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS & STIPULATIONS

A. Perform all measuring required under this Section.

B. No separate payments will be made for work under this Contract except for the pay items stipulated in this PART 3. All costs in connection with the Work shall be included in one or more of the pay items as appropriate.

C. Each pay item shall be full compensation for all costs in connection with the item including but not limited to:

1. The furnishing of all materials, labor, equipment, tools, and all incidentals.

2. The installation of all materials, equipment, facilities, accessories and appurtenant items.

3. The proper share of overhead and profit.

4. Any excavation, trenching, backfilling, dewatering, shoring or testing required.

5. The restoration of unpaved surfaces.

6. Any temporary facilities or controls required including flaggers and/or uninformed traffic officers.

7. All erosion and dust control measures.

8. All related and incidental work and items necessary or required to complete the Work and to provide completely connected, operational and approved systems capable of performing as required.

9. Clearing and grubbing.

10. Record and maintain record drawings throughout the project construction period.

D. Each pay item which specifically involves excavation shall be considered to include full compensation for:

1. Excavation in earth.

2. Disposal of any surplus.

3. Handling of water as specified.

4. Installation and removal of sheeting and bracing.

E. If solid rock excavation is required, additional compensation will be paid under the item "Rock Excavation and Disposal," with the exception of items which specifically include payment for rock excavation.

3.02 MEASUREMENT & PAYMENT ITEMS

The names of the following items are abbreviated forms of the Bid Items as contained on the Price Schedule in the Bid Form. The names, as shown below or on the Bid Form, shall not be construed to represent a complete description of all of the Work included under such items and are provided only as a means of identification and ease of conversation.

Item No.

1. MOBILIZATION:

Lump sum, no measurement required.

Payment shall be lump sum for work items necessary for the movement of personnel, equipment and materials to the project site, establishment of all field office's and related facilities necessary to perform the work on the project and for all other costs and operations which must be performed prior to the beginning of the work. In addition, this pay item will include all costs associated with movement of personnel, equipment and materials from the project site by final acceptance of the project and all clean up work as required herein.

The first fifty percent (50%) of the lump sum shall be paid once all personnel, equipment and materials necessary to initiate excavation and foundation preparation is on site. The next forty percent 40% shall be paid following completion of twenty percent (20%) of the contract, excluding Mobilization. The final ten percent (10%) shall be paid at Substantial Completion, once a majority of Demobilization has occurred.

Item No.

2. SURVEY LAYOUT

Lump sum, no measurement required.

Payment shall be lump sum complete, including staking and layout of the dam baseline and channel line.

Item No.

3. CONTROL OF WATER

Lump sum, no measurement required.

Payment shall be lump sum complete, including installation and subsequent removal of the temporary coffer dam, placement, handling and maintenance of pumps and any other miscellaneous work necessary to keep the work area dry and base flow discharging from the pond into the downstream channel.

The first 60 percent (60%) of the lump sum shall be paid once the temporary coffer dam and appurtenances are in place and properly functioning. The remaining forty percent (40%) shall be paid by equal installments throughout the remaining contract period, with one hundred percent (100%) being paid upon the initial refilling of the pond.

Item No.

4. CLEARING AND GRUBBING

Lump sum, no measurement required.

Payment shall be lump sum for the removal and off-site disposal of vegetation, cutting of trees, removal of roots, stumps, rocks, muck, and other objectionable materials deleterious to the work as shown on the plans and/or as directed by the Engineer.

Item No.

5. TEMPORARY EROSION AND SEDIMENT CONTROL

Lump sum, no measurement required.

The first 60 percent (60%) of the lump sum shall be paid once the temporary erosion control measures are in place and properly functioning. The remaining forty percent (40%) shall be paid by equal installments throughout the remaining contract period, with one hundred percent (100%) being paid by Final Completion.

Payment shall be lump sum for the complete installation and removal of the various types of erosion control measures shown on the Drawings and specified on the plans. Payment shall include costs for constructing barriers, silt fences, stone check dams, project demarcation fences, and all other necessary items to complete the work as shown on the plans.

Item No.

6. SEEDING

Measure the actual area on which seed has been placed in accordance with the plans and/or per the Engineer's direction.

Payment shall be per pound applied.

Item No.

7. FERTILIZER

Measure the actual area on which fertilizer has been placed in accordance with the plans and/or per the Engineer's direction.

Payment shall be per pound applied.

Item No.

8. MULCH

Measure the actual area on which mulch has been placed in accordance with the plans and/or per the Engineer's direction.

Payment shall be per ton applied.

Item No.

9. GENERAL EXCAVATION

Compute cubic yardage of excavated material from the earth embankment measured in place and as determined by the cross-sections shown on the Drawings.

Payment shall be per cubic yard of general material excavated and disposed.

Item No.

10. LOAM/TOPSOIL

Measure the actual placed cubic yard volume of loam/topsoil placed as indicated on the Drawings and directed by the engineer.

Payment shall be for each cubic yard of in-place loam/topsoil.

Item No.

11. EARTHEN EMBANKMENT MATERIAL

Embankment Material necessary to (re)construct the earth dam as shown on the Drawings shall meet the specifications and be trucked in from an approved off-site source.

Compute cubic yardage of placed Embankment Material measured in-place from cross-sections made by the Contractor and the Engineer. Embankment Material shall be used in all areas shown on the Drawings.

Payment shall be per cubic yard of embankment material placed, compacted, and tested. Excavation and disposal of existing material required for the placement of Embankment Material shall be paid for subsidiary to COMMON EXCAVATION.

Item No.

12. BANK-RUN GRAVEL

Bank-Run Gravel necessary for common fill in areas not designated “EMBANKMENT MATERIAL” as shown on the Drawings shall meet the specifications and be trucked in from an approved off-site source.

Compute cubic yardage of placed Bank-Run Gravel measured in-place from cross-sections made by the Contractor and the Engineer. Bank-Run Gravel shall be used in only the areas shown on the Drawings.

Payment shall be per cubic yard of Bank-Run Gravel placed, compacted, and tested. Excavation and disposal of existing material required for the placement of BANK-RUN GRAVEL shall be paid for subsidiary to COMMON EXCAVATION.

Item No.

13. STONE FILL BLEND, TYPE I/II

Measure the actual placed cubic yard volume of stone fill blend placed as indicated on the Drawings and directed by the Engineer.

Payment shall be for each cubic yard of in-place stone fill.

Item No.

14. REINFORCED CONCRETE (INCL. SPILLWAY TRAINING WALLS, SPILLWAY SLABS, CUTOFF WALL, STRUCTURAL FOOTING)

Measure the volume of Class A (4000 psi) Concrete, based on payment limits shown on the Drawings or as specified.

Payment shall be per cubic yard, placed as specified for Class A cast-in-place concrete. The unit price shall include the cost for formwork, water stops, reinforcing, dowel anchors, and proper preparation of all surfaces on which concrete will be placed including cleaning of bedrock foundation.

Item No.

15. UN-REINFORCED CONCRETE (INCL. CONCRETE LEVELING PAD, DENTAL CONCRETE, 'MUD MATTING')

Measure the volume of Class C (3000 psi) Concrete, based on payment limits shown on the Drawings or as necessary.

Payment shall be per cubic yard, placed as specified for all Class C cast-in-place concrete. The unit price shall include the cost for formwork, and proper preparation of all surfaces on which concrete will be placed, including cleaning of bedrock foundation.

Item No.

16. LOW LEVEL OUTLET ASSEMBLY

Lump sum, no measurement required.

Payment shall be for all work necessary to construct the LOW LEVEL OUTLET ASSEMBLY as shown on the Drawings and in the specifications, including pipe, slip-line pipe grouting, wall sleeve, valve and operator, valve box, trash rack, and other miscellaneous materials and fabrications.

END OF SECTION

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section generally describes the types of submittals required during construction, procedures for making submittals, the preparation of submittals and the times submittals are required.

B. Additional submissions are required by the Instructions to Bidders and the General Conditions. Such submittals generally include such things as Bids and Bidding Documents, insurance policies, certifications of bond and insurance coverage, Applications for Payment, requests for Change Orders, guarantees, permits, certifications and documents required by Federal, State and Local authorities, submissions required by utility companies and other persons, firms or organizations and other such submittals.

C. The requirements of this Section are general in nature and basically apply to all Sections of the Specifications. Additional submissions and more specific requirements on submissions are contained in the various Specification Sections. In each individual Section, no attempt was made to cover or repeat the submissions contained in this Section and, therefore, the total of all submissions required are the combination of those described in this Section plus those specified in the various other Sections.

1.02 IDENTIFICATION OF SUBMITTALS

A. Completely identify each submittal and resubmittal by showing at least the following information (attached form may be used):

1. Name of Project.

2. Name, address and telephone number of Contractor and Contractor's stamp of approval, indicating that the submission has been thoroughly checked by Contractor for conformance and fit.

3. Name, address and telephone number of individual, firm or organization who will be doing the fabri-

cation, supplying or manufacturing of equipment and materials and the name of the individual who may be contacted for further information.

4. Drawing number and Specification Section number to which submittal applies.

5. The location, service, equipment designation and other information to specifically indicate the item for which acceptance is requested.

6. Whether it is an original submittal (first submission) or a resubmittal (second, third, etc., submission).

Submissions not containing the above will be returned to Contractor, un-reviewed by Engineer.

1.03 COORDINATION OF SUBMITTALS

A. Prior to submitting to Engineer, fully coordinate all interrelated work. As a minimum, do the following:

1. Determine and verify all field dimensions and conditions, materials, catalog numbers and similar data.

2. Coordinate with all trades, subcontractors, other contractors, public agencies, and utility companies and secure all necessary approvals, in writing.

3. Clearly indicate any deviations from the Contract Documents.

B. Make submittals in groups containing all associated items which in some way depend upon each other. This also applies to color charts, as one color may not be able to be selected without the selection of other colors so as to form a color coordinated group. Engineer may elect not to review partial, incomplete submissions, whereupon he will return the incomplete submission to the Contractor for a resubmission of a complete submittal.

1.04 TIMING OF SUBMITTALS

A. Except where otherwise specifically noted, allow 15 days, after receipt by Engineer, for Engineer to review and process submittals. Make submittals far enough in

advance of scheduled dates of installation to provide time for reviews, for securing necessary acceptance, for possible revisions and resubmittals, and for placing orders and securing delivery.

B. Submissions may be returned un-reviewed, rejected for several reasons, accepted conditioned upon submission of related items or for other reasons set forth in the Contract Documents.

C. Make submissions well in advance as the returning or rejecting of submissions or other similar circumstances are possible and are deemed "avoidable delays" as defined in the General Conditions. Costs for these delays or those attributed to Contractor's tardiness in making submittals shall be borne by the Contractor.

1.05 DESTINATION OF SUBMITTALS

A. Unless otherwise specified, copies of every submission shall be sent to Engineer's home office as follows:

DuBois & King, Inc.
28 North Main Street
P.O. Box 339
Randolph, Vermont 05060-0339

ATTN: Construction Manager

Facsimile transmissions will not be accepted.

1.06 CLARITY OF SUBMITTALS

A. All printed materials shall be neat, clean, clear and legible, and of such quality that they can be easily reproduced by normal photocopying or blueprinting machines. Copies not conforming to this paragraph may be returned to Contractor, un-reviewed.

1.07 CONTRACTOR'S APPROVAL STAMP

A. The stamp shall have the following wording: "I hereby certify that I have carefully examined the enclosed submittal(s) and have determined and verified all field measurements, construction criteria, materials, catalog numbers and similar data, coordinated the submittal(s) with other submissions and the work of other trades and contractors, and that to the best of my knowledge and belief, the enclosed submittal(s) is/are in full

compliance with the Contract requirements, except as follows (enter NONE if there are no exceptions):"

B. Each copy of every submittal shall be stamped with the Contractor's approved stamp.

1.08 ENGINEER'S REVIEW

A. Engineer will review and comment on each submission conforming to the requirements of this Section. Engineer's review will be only for conformance with the design concept of the Project and will be confined to general arrangement and compliance with the Contract Documents only, and will not be for the purpose of checking dimensions, weights, clearances, fitting, tolerances, interferences, or coordination of trades or contractors. The acceptance of a separate item does not represent acceptance of an assembly in which the item functions. Engineer's review and comments will in no way relieve Contractor of any of his responsibilities under the Contract.

B. Submittals will be marked as follows:

1. Accepted - Submittal appears to conform to Contract Documents and Contractor may proceed with ordering and installation.

2. Accepted As Corrected - Same as "Accepted," except it is accepted on the basis that the modifications or notes added to the submittal by Engineer will be complied with by Contractor.

3. Rejected, Revise and Resubmit - Submission is not acceptable and shall be revised and resubmitted by Contractor.

4. Rejected-Unacceptable - Submission is unacceptable as it does not appear to conform to the Contract Documents. A completely new submission of other equipment or different materials is required.

C. No payment will be made on any item for which a submission is required if such submission:

1. has not been made,

2. has been made but was not stamped "Accepted" by Engineer,

3. has been made and stamped "Accepted As Corrected," but Contractor has not complied with Engineer's notes marked on the submittal,

4. has been made and stamped "Accepted," but item provided does not conform to the shop drawing nor to the Contract Documents.

1.09 RESUBMISSIONS

A. Prepare new and additional submissions, make required corrections, and resubmit corrected copies until accepted. On or with resubmittals, clearly describe revisions and changes made, other than the corrections requested by Engineer, which did not appear on the previous submissions.

1.10 CONTRACTOR'S RESPONSIBILITIES

A. Engineer's acceptance of submittals shall not relieve Contractor of responsibility for any deviation from the requirements of the Contract Documents unless Contractor has informed Engineer, in writing, of such deviation at the time of submission and Engineer has given written acceptance to the specific deviation, nor shall Engineer's acceptance relieve Contractor from responsibility for errors or omissions in the submittals.

B. No portion of the Work requiring a submission shall be commenced until the submission has been accepted by Engineer.

PART 2 - SUBMITTALS

2.01 SCHEDULE OF VALUES

A. Within fifteen (15) days after the signing of the Agreement, submit to Engineer two (2) copies of a schedule of values of the various portions of the Work, including quantities aggregating the total Contract Price, and supported by such data to substantiate its correctness as Engineer may require. Each item in the schedule of values shall include its proper share of overhead and profit. This schedule, when accepted by Engineer, shall only be used as a basis for Contractor's Periodic Estimate. No payments will be

made to Contractor until such Schedule has been submitted and accepted by Engineer.

B. Within fifteen (15) days after the signing of the Agreement, submit to Engineer 2 copies of a Cashflow Schedule including estimated monthly payment schedule for the Project in accordance with the General Conditions, Article 3.3.

C. On "unit price" items, the schedule of values shall contain unit prices for various stages of work, such as restoration of surfaces broken down into paved, unpaved and other types of areas to be restored.

D. On "per each" or "lump sum" items, break prices down sufficiently to provide a convenient and realistic means for determining the amount of work done during various stages of progress.

E. Where prices are not broken down sufficiently to accurately determine the value of Work completed, Engineer will estimate the value of the Work completed and will deduct some amount so as to arrive at a conservative value which will allow Owner to easily complete the Work with the unpaid balance. When the required detail in the Schedule of Values is not provided by Contractor, Contractor agrees to accept Engineer's determinations.

2.02 CERTIFICATIONS

A. Submit in triplicate certifications of compliance whenever required by the Specifications or Engineer. Certifications shall be complete and exact, they shall be properly authenticated by the written signature, in ink, of an owner, officer or duly authorized representative of the person, firm or organization issuing such certification, and they shall guarantee that the materials or equipment are in complete conformance with the requirements of these Specifications. Submit the "Certificate of Compliance" attached hereto, or a reasonable facsimile.

2.03 CONSTRUCTION SCHEDULE

A. Within fifteen (15) days after the signing of the Agreement, submit for Engineer's and Owner's information, a construction schedule showing, in detail, the proposed sequence of the Work and the estimated date of starting and completing each stage of

the Work in order to complete the Project within the Contract Time. Prepare the schedule in a manner so that the actual progress of the Work can be recorded and compared with the expected progress. Coordinate the construction schedule with the proposed schedules of other contractors, if any, engaged in work at, or adjacent to, the Project site.

B. Coordinate the Work and make every effort to maintain the construction schedule. In the event actual progress begins to lag the schedule, promptly employ additional means or methods of construction to make up the lost time.

C. Notify Engineer in writing (1) 72 hours before commencing any work at the site, (2) 4 weeks before resuming work after a winter shutdown, and (3) at least 48 hours before resuming work in the case of a temporary suspension of work.

D. Prepare and submit, with the Construction Schedule, a separate schedule listing dates for submission of major shop drawings, submittals, and material samples.

2.04 SHOP DRAWINGS

A. Submit shop drawings for all fabricated work, for all manufactured items and for all other items specifically required by the Specifications.

B. Unless otherwise specified, submit six copies of each drawing, catalog cut, procedure, or other material. If a resubmission is not required, Engineer will retain four copies and return the remaining copies to Contractor to be distributed.

C. Subcontractors must submit shop drawings directly to Contractor for checking. Thoroughly check subcontractors' shop drawings for measurements, sizes of members, details, materials, and conformance with the Contract Documents. Return submittals that are found to be inaccurate or in error. Do not submit to Engineer until corrections have been made.

D. Clearly show the relation of the various parts, and, where the Work depends upon field measurements, make measurements and include them on the shop drawings before submitting to Engineer.

E. Reference all submissions to clearly indicate the Specification Section, location, service and function of each particular item. Submissions for a single item, or group of related items, shall be complete. When submitting manufacturers' catalogs, pamphlets or other data sheets, in lieu of prepared shop drawings, specifically identify in ink the items for which acceptance is being sought.

F. If the shop drawings contain any departures from the Contract requirements, specifically describe them in Contractor's letter of transmittal. Where such departures require revisions to layouts or structural changes to the Work as shown, Contractor shall, at his own expense, prepare and submit revised layout and structural drawings. Make drawings the same size as the Contract Drawings.

2.05 SAMPLES

A. Where required, submit sample or test specimens of materials to be used or offered for use. Samples shall be representative, in all respects, of the material offered or intended, shall be supplied in such quantities and sizes as may be required for proper examination and tests, and shall be delivered to Engineer, prepaid, along with identification as to their sources and types or grades. Submit samples well in advance of anticipated use to permit the making of tests or examinations.

B. Samples will be checked with reasonable promptness only for conformance with the design and for compliance with the information given in the Contract Documents.

C. The Work shall be in accordance with the accepted sample. The use of materials or equipment for which samples are required to be submitted for acceptance is not permitted until such acceptance has been given by Engineer.

2.06 SPARE PARTS

A. For each item, provide a list of parts and supplies that are normally furnished at no extra cost or are specified to be furnished under this Contract, and a separate list of additional items which manufacturer recommends having "on hand" in order to insure efficient and proper operation for the first year of service.

2.07 COLORS - PATTERNS

A. Unless the precise color and pattern are specified, whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts for Engineer's and Owner's review and selection.

B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited for the installation, completely describe the relative costs and capabilities of each.

2.08 MANUFACTURER'S SERVICE STATIONS

A. The product of a manufacturer who does not maintain an adequate service station and a sufficient stock of spare parts in a reasonable vicinity of the Project, is subject to rejection by Engineer solely on that basis. With each submission, submit information on manufacturer's facilities and give complete details of their service policies and capabilities, and a general idea of the stock of spare parts available.

2.09 TEST RESULTS AND INSTALLATION

A. Whenever tests are required on materials and equipment, such tests shall be performed and two (2) copies of the test results submitted to Engineer. Do not deliver to the Project or incorporate into the Work any materials or equipment for which Engineer has not issued a written acceptance of the required tests and test results.

END OF SECTION

SECTION 01410 - TESTING AND LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section covers the requirements for utilizing the services of an approved independent testing laboratory to perform tests and inspections to determine compliance with these Specifications.

B. Sampling and testing methods and procedures can also be found in the following Sections:

Soil Compaction	02250
Earth Dam	02260
Cast-in-Place Concrete	03300

1.02 QUALITY ASSURANCE

A. In order to establish compliance with the Contract Documents, materials shall be thoroughly and completely tested, examined and evaluated before they are incorporated into the Work. During and after installations, additional tests, examinations, and evaluations shall be made to determine continued compliance throughout the course of the Work.

B. Testing laboratory shall be a reputable, experienced firm which is capable of performing all of the required testing and a firm which is regularly engaged as a testing laboratory. Contractor shall be responsible for retaining the testing laboratory and paying all cost of testing.

C. Perform all sampling and testing in strict accordance with specified procedures and use the materials, instruments, apparatus, and equipment required by the codes, regulations and standards. Where specific testing requirements or procedures are not described, perform the testing in accordance with all pertinent codes and regulations and with recognized standards for testing.

D. In the event that samples and test specimens are not properly taken, handled, stored or delivered, or if other requirements of this Section are not complied with, Engineer reserves the right to delegate any or

all of this work to others, or to take whatever action he deems necessary to ensure that sampling and testing are properly accomplished, for which all costs shall be borne by Contractor.

E. Engineer further reserves the right to disallow the use of a specific testing laboratory, even after prior acceptance if the laboratory fails to meet or comply with the requirements of this Section. If this should occur, immediately dispose of the testing laboratory's services and retain the services of a different laboratory acceptable to Engineer.

1.03 SUBMITTALS

A. See Section 01300.

B. Within five (5) days after Notice to Proceed, submit brochures or other documentation from a qualified laboratory, clearly indicating experience, location, qualifications of staff, available equipment and facilities, standard fees, other pertinent information, and descriptions of any limitations or restrictions. Based upon this material, Engineer will authorize or reject the use of the proposed testing laboratory. In the case of rejection, Contractor shall submit brochures or other documentation of a second firm for review.

C. Certified copies of each test result. Mail copies directly from the laboratory to Engineer, at both his field office and his home office. Contractor shall make arrangements with the laboratory to secure his own copies.

1.04 DELIVERY, STORAGE AND HANDLING

A. Extreme care shall be exercised in the taking, storage, handling and delivery of samples and test specimens to avoid breakage, damage and disturbance.

B. Provide all required storage facilities.

C. Carefully deliver all samples and test specimens to the laboratory.

1.05 SCHEDULING

A. Except where otherwise specified, Engineer will determine the number of samples to be taken, the date and time samples will be taken and tests made, the number

and type of tests to be performed, who will collect the samples, how they will be handled and stored, and when laboratory personnel are required on site.

B. Engineer will notify Contractor of his decision to take samples and/or have tests made and provide him with the pertinent information. Contractor is responsible for notifying the testing laboratory and for having the testing performed, on schedule.

C. In addition to the above, Contractor shall make his own arrangements for the sampling and testing of materials he proposes to incorporate into the Work.

D. Notify Engineer at least 24 hours in advance of the times at which scheduled samples or tests will be conducted.

E. If samples and/or tests cannot be taken or performed when required, delay the Work until such time that they can be accomplished. Where possible, any work which has been installed but has not been sampled or tested as required, shall be tested by other means. Upon Engineer's request, uncover any work which has been buried or covered and perform special tests designated by Engineer. If the work cannot be tested by other means, Engineer may declare the work unacceptable. All costs associated with noncompliance and for special testing shall be borne by the Contractor.

F. Should the testing laboratory be scheduled to take or collect samples or to perform tests, and finds that it is unable to do so as result of delays in construction, inclement weather, or any other reason, reschedule the tasks for a date acceptable to Engineer.

G. Plan all work and operations to allow for the taking and collection of samples and allow adequate time for the performance of tests. Delay the progress of questionable work until the receipt of the certified test reports.

PART 2 - PRODUCTS

2.01 TESTING LABORATORY

The testing laboratory shall meet the following criteria:

A. Be capable of performing all of the required tests.

B. Be regularly engaged in performing the types of services required.

C. Have adequate facilities, materials, equipment and personnel to perform the services.

D. Have an adequately trained, experienced and qualified staff.

E. Have at least one registered professional engineer who shall be capable of performing field tests, supervising laboratory testing, and who can interpret test results. The professional engineer shall be thoroughly knowledgeable in materials, soils, bituminous paving and concrete.

F. Must be able to be on the Project site within 4 hours after being notified to come.

2.02 TEST REPORTS

A. Each report shall be in writing and shall include the testing method used, the test results, the specified results, the exact location of where the test specimens were taken, the date taken, Project identification, Contractor's name, and other pertinent information required for a complete and meaningful test report.

B. Each report shall be signed and certified by a responsible officer of the testing agency.

C. Mail reports directly to Engineer within 24 hours after the sample is taken, except in those instances where tests cannot be immediately performed because of required curing or incubation periods, or lengthy testing procedures.

D. The laboratory shall verbally communicate test results to Engineer, when he requests same. This does not eliminate nor replace the requirements for a written report.

PART 3 - EXECUTION

3.01 COOPERATION WITH TESTING LABORATORY

A. Allow representatives of the testing laboratory access to the Work at all times.

B. Provide all equipment, labor, materials and facilities required by the laboratory to properly perform its functions.

C. Cooperate with and assist laboratory personnel during the performance of their work.

3.02 TEST SPECIMENS AND SAMPLES

A. Test specimens and samples shall be taken by the person(s) designated in other Sections, or as directed by Engineer. Do field sampling and testing in the presence of Engineer.

B. Provide all materials, equipment, facilities and labor for securing samples and test specimens and for performing all field testing.

END OF SECTION

SECTION 01575 - TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

A. Section 02483 - Topsoil and Seeding: Permanent turf for erosion control.

1.03 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.

B. The Contractor shall comply with the requirements of State of Vermont "Handbook Soil Erosion and Sediment Control on Construction Sites".

C. Best Management Practices Standard: Federal Highway Administration Best Management Practices for Erosion and Sediment Control.

D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

1. Owner will obtain permits and pay for securities required by authority having jurisdiction.
2. Obtain and pay for permits and provide security required by authority having jurisdiction.
3. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.

F. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

G. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 5 years.

I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary

preventive measures, pump dry and remove deposited sediment after each storm.

K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Erosion and Sedimentation Control Plan:

1. Include:

a. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
b. Schedule of temporary preventive measures, in relation to ground disturbing activities.

2. Obtain the approval of the Plan by authorities having jurisdiction.
3. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:

1. Straw or hay.
2. Erosion control matting or netting.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.

D. Silt Fence Posts: One of the following, minimum 5 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Hardwood, 2 by 2 inches in cross-section.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:
   a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
   b. Along the toe of cut slopes and fill slopes.
2. Space sediment barriers with the following maximum slope length upslope from barrier:
   a. Slope of Less Than 2 Percent: 100 feet.
   b. Slope Between 2 and 5 Percent: 75 feet.
   c. Slope Between 5 and 10 Percent: 50 feet.
   d. Slope Between 10 and 20 Percent: 25 feet.
   e. Slope Over 20 Percent: 15 feet.

C. Soil Stockpiles: Protect using one of the following measures:

1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

D. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

E. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers

with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.

5. Install with top of fabric at nominal height and embedment as specified.
6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
8. Fasten fabric to wood posts using one of the following:
   a. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
   b. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.

B. Mulching Over Large Areas:

1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
2. Erosion Control Matting: Comply with manufacturer's instructions.

C. Mulching Over Small and Medium Areas:

1. Dry Straw and Hay: Apply 4 to 6 inches depth.

D. Temporary Seeding:

1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.

5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:

1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Clean out temporary sediment control structures weekly and relocate soil on site.

E. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section covers general requirements for products and the criteria which must be met by Contractor when he desires to utilize substitute products. In order to determine the total requirements of each Specifications Section, this Section shall be used in conjunction with all other Sections and the requirements contained herein shall be in addition to the requirements set forth in all other Sections.

1.02 QUALITY ASSURANCE

A. In addition to Contractor's warranties and guarantees on materials and equipment required under the General Conditions, Contractor is solely responsible to see that all materials, equipment, products and the finished Work complies accurately and completely with the Contract Documents. Contractor should test and inspect all materials and items of Work prior to ordering and installation, to satisfy himself that all Contract requirements are being met.

B. The Engineer may check all or any portion of the Work and Contractor shall afford all necessary assistance to Engineer in carrying out such checks. Such checking by Engineer shall not relieve Contractor of any responsibilities for the accuracy or completeness of the Work.

C. If witnessed shop tests or inspections are required at the point of manufacture, Contractor shall keep Engineer advised as to the progress of the Work so that he may arrange for inspection at the proper time and place.

D. Should any dispute arise as to the quality or fitness of workmanship, equipment, materials or articles, the decision shall rest with Engineer, and shall be based upon the requirements of this Contract.

E. At the request of Engineer, Contractor shall promptly provide the services of a competent representative of the manufacturer at the Project site, fully equipped and prepared to answer questions, perform tests, make

adjustments and to prove compliance with the Specifications.

1.03 SUBMITTALS

A. Within 30 days after formal execution of the Contract, submit in accordance with Paragraph 2.01.F, a complete products list and formal request for substitution of products and methods of construction.

B. Promptly submit guarantees set forth in Paragraph 1.05 and other materials required in Section 01300 and all other Sections.

1.04 DELIVERY, STORAGE AND HANDLING

A. The general transportation, storage and handling of materials and equipment shall conform to the recommendations of the manufacturer furnishing the item and the requirements of the Specifications. All of the items of Work shall be carefully handled and protected to avoid damage or disfiguration. Deliver materials and equipment in manufacturers' crates and containers.

B. Store equipment and materials at the Project site in conformity to applicable statutes, ordinances, regulations and rulings of proper public authority. Do not unnecessarily store materials or equipment on the Project site and take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.

C. Materials stored upon streets or roads shall be placed so as to cause minimum obstruction to traffic and to the public. Do not place materials within ten feet of fire hydrants. Keep gutters, swales and drainage inlets unobstructed at all times. Do not store materials nor encroach upon private property without the written consent of the owners of such private property.

D. Store materials so as to ensure the preservation of their quality and fitness and store in a manner which will allow prompt and proper inspection.

E. Do not permit materials not complying with the requirements of the Contract to be brought onto or to be stored at the Project site. Immediately remove from the Project site all non-complying materials and equipment and replace them with items which are in full compliance.

F. Delivery of all materials to the site or removal of spoil, garbage, debris and other materials from the site shall be done in a manner which will not cause any nuisance or allow spillage of materials from the transporting vehicles.

1.05 GUARANTEES

A. Whenever a manufacturer, supplier or other person, or firm furnishes, offers to furnish or normally furnishes a guarantee, whether required by the Specifications or not and no matter how long the guarantee period is, Contractor shall accept or secure all such guarantees and furnish same to Engineer. Contractor shall also fill out and send to manufacturers all warranty and guarantee documents required by them in order to effect such warranties and guarantees, with a copy to Owner.

1.06 CONTRACTOR'S OPTIONS

A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.

B. For products specified by naming several products or manufacturers, select any product and manufacturer named.

C. For products specified by manufacturer and model or catalog number, but indicating the option by naming equivalent manufacturer or stating "or equal" after the specified product, Contractor must submit for substitution for any product not specifically named.

D. Products specified by naming only one product and manufacturer, there is no option, and no substitution will be allowed.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials, equipment and accessories shall be new and unused and shall be essentially the standard product of a manufacturer of established good reputation and regularly engaged in the production and fabrication

of such material or equipment. All equipment shall be current modifications which have been in successful regular operation under comparable conditions for a period of at least five years. This time requirement does not apply to minor details nor to thoroughly demonstrated improvements in design or in material or construction. Further, equipment not meeting the time requirement may be considered when the manufacturer is willing to provide a Performance Bond for the duration of the time period which will guarantee replacement of the equipment installed at no cost to the Owner in the event of failure. The Engineer shall be the final judge of the terms and conditions of the Performance Bond.

B. Owner reserves the right to reject any material or equipment manufacturer who, although he appears to be qualified and meets the technical requirements, does not provide satisfactory evidence indicating adequate and prompt post-installation repair and maintenance service, as required to suit the operational requirements of Owner.

C. Whenever it is required that Contractor shall furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable on the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required. Perform Work in full conformity and harmony with the intent to secure the best standard of construction and equipment of the Work as a whole or in part.

D. Items of any one type of material or equipment shall be the product of a single manufacturer. For ease of Owner in maintaining and obtaining service for equipment and for obtaining spare parts from as few places as possible, to the maximum extent possible, use equipment of a single manufacturer. The Engineer reserves the right to reject any equipment from various manufacturers if suitable equipment can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.

E. It is mandatory that all electrical, mechanical and other equipment requiring spare parts and servicing shall be supplied only by manufacturers who maintain

adequate service stations and sufficiently stock spare parts in a reasonable vicinity of the Project. The Engineer reserves the right to reject all manufacturers not meeting the requirements of this paragraph.

F. Prepare a complete products list of all products proposed for installation. Tabulate list by each specification section and include name and address of manufacturer/supplier, trade name, and model or catalog designation.

2.02 NAMEPLATES

A. Each unit of equipment shall have the manufacturer's name or trademark on a corrosion-resistant nameplate securely affixed in a conspicuous place. The manufacturer's name or trademark may be cast integrally with stamp, or otherwise permanently marked upon the item of equipment. Such other information as the manufacturer may consider necessary for complete identification shall be shown on the nameplate.

2.03 FABRICATIONS

A. Insofar as possible, shop prefabricate all items complete and ready for installation. Accurately fabricate all items to the details shown on the Drawings and on the accepted shop drawings.

2.04 SPARE PARTS

A. For each item, provide a list of parts and supplies that are normally furnished at no extra cost or are specified to be furnished under this Contract, and a separate list of additional items which manufacturer recommends having "on hand" in order to insure efficient and proper operation for the first year of service.

2.05 SUBSTITUTIONS

A. Names - The Drawings and Specifications list acceptable manufacturers, commercial names, trademarks, brands and other product, material and equipment designations. Certain items of equipment or products specified herein and the related portions of work indicated on the Drawings have been selected, established, and/or designed to perform specific functions and are deemed suitable for the service intended. These items include details relating to the materials, structural, mechani-

cal and electrical characteristics, and the relationship of the equipment to the overall Project. The specific design features and construction characteristics of the equipment incorporated in the Contract Drawings were selected to enhance compatibility of related facilities.

B. Submissions - Should the Contractor desire to supply equipment other than that specifically incorporated in the design and/or the Contract Drawings, he must:

1. Defend the desired substitution by providing the Engineer with such information as he may request to determine the equality of the equipment proposed.

2. Reimburse the Owner for all engineering costs necessary in excess of the initial review of the submittal and determination that the substitution of equipment clause applies. Such costs may relate to field trips, testing of materials, use of laboratory facilities, test result analysis, and revisions to the Contract Drawings, as necessary to incorporate equipment if accepted for substitution.

3. Pay all increases in construction or related cost necessitated by the substitution.

4. If requested, provide a performance bond from the manufacturer in the amount of the value of the installed equipment for a period of up to five years. Such protection shall be in addition to other provisions and shall assure replacement of any equipment defective in workmanship, materials, or performance, at no cost to the Owner. Terms and conditions of such a bond shall be as determined by the Owner.

C. Use of Substitutes - A Contractor wishing to proceed under this provision for Substitution of Equipment, must adhere to the procedure which follows:

1. The Contractor shall submit a written request for Substitution of Equipment, shall fully identify the Substitution desired, and specifically acknowledge acceptance of the responsibilities noted above in Paragraph 2.05, B. Submissions, 1 through 4.

2. The Contractor shall submit the following items to the Engineer at the time he presents the request for Substitution of Equipment.

   a. Sufficient design information to fully describe the proposed equipment, including literature, photographs, typical drawings, etc., as required.

   b. Specific performance data, such as characteristic curves or charts, specifications, and descriptions which relate to design criteria normally applicable to the particular type of equipment. As a minimum, values shall include reference to the stated design conditions, efficiencies, brake horsepower, and installed horsepower.

   c. Specific information pertaining to the mechanical design of the equipment. The data shall include, but not necessarily be limited to the following, as applicable: motors, gear units, service factors, lubrication system(s), design information (torque, bending moment, and weight), equipment support design, variable speed drives, bearings, ventilation requirements, and connected pipe sizes.

   d. A list of current installations fully operating in comparable climatic conditions, including location, size and type of installation and treatment process, actual operating data including input and output parameters and overall performance, Owner's name, and the name, address, and telephone number of an Owner's representative who is fully familiar with the installation. The facilities shall have a minimum of five years operating experience. The Owner may accept a performance bond as specified in paragraph 2.05 B.4 of this section in lieu of the five year operating experience.

   e. A brief description of operation procedures and maintenance requirements.

   f. Estimated operating costs, power requirements, motor sizes for proposed installation.

g. A statement listing the advantages and savings or additional cost involved to the Owner.

h. Any amplification or clarification of other information as may be required by the Engineer.

D. Determination of Equals - If the Engineer determines the Contractor's initial request for substitution of equipment is incomplete or that additional information is required to judge the equality of the proposed substitution, the Contractor shall submit such information upon request by the Engineer. If the Contractor fails to supply such information within a reasonable time period as specified by the Engineer in his written request, the Engineer may determine that the Contractor's request for substitution of equipment is incomplete and not acceptable, in which case the equipment as specified in the Contract Drawings shall be provided in order to avoid undue delay in timely completion of the Project.

PART 3 - EXECUTION

3.01 INSPECTIONS - PREPARATIONS

A. Prior to work under any Section, carefully inspect the Work of all other trades and verify that all such Work is in conformance with the Contract Documents and is complete to the point where the Work under that Section may properly commence. Extreme care shall be exercised so as to avoid the need to remove and replace Work and to avoid unnecessary cutting and patching.

B. Inspect all surfaces to be sure that they have been properly prepared before applying new Work to such surfaces.

C. Make all required measurements in the field to ensure proper and adequate fit of all items.

D. Verify that all Work can be installed in strict accordance with the Drawings and the accepted shop drawings. Immediately report discrepancies to Engineer.

E. Do not proceed with the Work under any Section until conditions are proper.

3.02 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.

B. All Work shall be done in a workmanlike manner and set to proper lines and grades.

C. Where performance criteria are specified, do all Work necessary to attain the required end results.

3.03 FIELD QUALITY CONTROL

A. Neither observations by Engineer nor inspections, tests or approvals by other persons shall relieve Contractor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.

B. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested or approved by some public body, Contractor shall assume full responsibility therefor, pay all costs in connection therewith and furnish Engineer the required certificates of inspection, testing or approval.

C. The Owner reserves the right to independently perform laboratory tests at the Owner's costs on random samples of material or performance tests on equipment delivered to the site. These tests, if made, will be conducted in accordance with the appropriate referenced standards or Specification requirements. The entire shipment represented by a given sample, samples or piece of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements. All rejected materials or equipment shall be removed from the site, whether stored or installed in the Work, and the required replacements shall be made, all at no additional cost to Owner.

3.04 ADJUST AND CLEAN

A. Upon the completion of installations, and as a condition of its acceptance, visually inspect all Work, adjust all components for proper alignment and use and touch-up all abrasions and scratches to make them completely invisible.

B. Keep the site in a neat, safe and orderly condition at all times and free from accumulations of debris, excess materials, garbage, unsightly materials, spoil materials and materials of like character.

C. Thoroughly examine all materials and equipment with protective or decorative finishes for defects and damage prior to being covered. In the case of buried items of Work, restore protective surface covers so as to conform to the Contract requirements prior to being backfilled, buried or embedded, as the case may be. In the case of exposed items of Work, for which a decorative finish is required, all scratches, discolorations, unmatched colors, disfigurations, and damages shall be repaired and touched-up so as to provide a neat, clean finish, uniform in color.

3.05 UNCOVERING WORK

A. Unless otherwise specified or directed by Engineer, no Work shall be covered until it has been inspected, tested, and authorized to be covered by Engineer. If any Work is covered without the consent of Engineer, it must, if requested by Engineer, be uncovered for his observation and replaced at Contractor's expense.

3.06 PROTECTION

A. During the progress of the Work, and up to the date of Substantial Completion, Contractor shall be solely responsible for the care and protection of all Work and materials covered by this Contract. All Work and materials shall be protected against damage or loss from any cause whatsoever and Contractor shall rebuild, replace, restore and make good all injuries, losses, damages, re-erection and repairs occasioned or rendered necessary, to all or any portions of the Work, and at Contractor's expense.

B. Neither Owner nor any of its officers, employees or agents assumes any responsibility for collecting indem-

nity from any persons causing damage to the Work of Contractor.

3.07 DEFECTIVE WORK

A. The repair, removal, replacement and correction of defective Work is a part of this Contract and shall be promptly done in accordance with the requirements set forth in the General Conditions. All costs in connection with the correction of defective Work shall be borne by Contractor.

END OF SECTION

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section provides instructions to the Contractor, the Engineer, and the Owner in scheduling the sequence of events and requirements leading to final acceptance of the Project, occupancy by the Owner and the responsibilities of the respective parties.

B. Related work specified elsewhere includes:

Submittals	01300
Cleaning	01710
Project Record Documents	01720
Operations & Maintenance Data, Materials & Spare Parts	01730

1.02 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

A. The construction of the Project or a specified part thereof is sufficiently completed in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended.

B. The Contractor shall:

1. Submit all appropriate plumbing, electrical, building, health, and environmental certificates of compliance required by the Contractor to obtain in the performance of his work.

2. Submit all required test results and written certification that equipment and systems have been tested in presence of Owner's representative and are fully operational.

3. Submit required Operation and Maintenance Manuals, data, materials, and spare parts per requirements of Section 01730.

4. Provide operator training to the Owner.

5. Submit Project Record Drawings per requirements of Section 01720.

6. Meet other requirements of this Section and by government agencies stated elsewhere within these Contract Documents.

1.03 SUBSTANTIAL COMPLETION

A. The Contractor is advised that Substantial Completion must be attained at a reasonable time prior to the Contract Completion Date and attaining Final Completion. Generally, this shall be at least 30 to 60 days prior to the Contract Completion Date to allow for the Contractor to complete all punch list and outstanding work items prior to arranging for a final completion inspection by the Engineer, Owner, and/or government agencies as appropriate.

B. The Contractor shall:

1. Submit written certification to the Engineer, that the Project or designated portion of the Project is substantially complete.

2. Submit a written request for a Substantial Completion inspection by the Engineer.

C. The Engineer will make an inspection within ten days after receipt of certification, together with Owner's Representative.

D. Should the Engineer and Owner consider that Work is substantially complete, the Engineer will prepare and issue a Certificate of Substantial Completion, containing:

1. Effective date of Substantial Completion.

2. Engineer's punch list of items to be completed or corrected.

3. The time within which Contractor shall complete or correct work of listed items.

4. Time and date Owner will assume possession of Work or designated portion thereof.

5. Responsibilities of Owner and Contractor for:

a. Insurance
b. Utilities

c. Operation of mechanical, electrical and other systems
d. Maintenance and cleaning
e. Security
f. Warranties (list exceptions if any)

6. Signatures of:

a. Engineer
b. Contractor
c. Owner

E. Should the Engineer disagree with the Contractor's Certification that Work is substantially complete:

1. The Engineer will postpone inspection and will promptly notify the Contractor in writing, stating the reasons.

2. The Contractor shall complete the Work, and send second written notice to the Engineer, certifying that the Project, or designation portion of the Project, is substantially complete and request re-inspection.

3. The Engineer will then schedule an inspection of the Work as above.

F. For Owner occupancy of Project or Designated Portion of Project, the Contractor shall:

1. Perform final cleaning in accordance with Section 01710.

2. Furnish and fill all vessels that are required to be filled with the appropriate materials. The materials and method of filling shall be as recommended by the manufacturer and as accepted by the Engineer. These vessels include, but are not limited to the following:

a. Storage Tanks (chemicals, petroleum products, etc.)
b. Process Tanks
c. Fuel Tanks
d. Reservoirs
e. Lagoons
f. Barrels
g. Gas Cylinders

G. The Owner will occupy the Project under provisions stated in the Certificate of Substantial Completion.

1.04 FINAL INSPECTION

A. The Contractor is reminded that the status of Final Completion must be achieved on or before the Contract Completion Date to fully meet the conditions of this Contract.

B. The Contractor shall submit written certification that:

1. Work has been completed in accordance with Contract Documents.

2. Project is completed, and ready for final inspection.

C. If the Engineer concurs with the Contractor's Certification, the Engineer will schedule a final inspection by a representative of the Engineer, Owner, and appropriate State and Federal Agencies to occur within ten working days after receipt of the certification.

D. Should the Engineer disagree with the Contractor's certification that work is finally complete:

1. The Engineer will postpone inspection and will notify the Contractor in writing, stating the reasons.

2. The Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that the Work is complete.

3. The Engineer will then schedule an inspection of the Work as above.

E. Should the Engineer consider that work is finally complete in accordance with requirements of the Contract Documents, he will request the Contractor to deliver the appropriate Project Closeout submittals and will prepare the Final Completion Certificate for execution by Contractor and Owner.

1.05 REINSPECTION COSTS

A. Should the Engineer be required to perform second inspections because of failure of Work to comply with

original certifications of the Contractor, the Owner will compensate the Engineer for additional services, and deduct amount paid from final payment to the Contractor.

1.06 CLOSEOUT SUBMITTALS

A. Guarantees and Bonds

B. Evidence of Payments and Release of Liens

1. The Contractor shall submit:

a. Contractor's Affidavit of Payment of Debts and Claims.
b. Contractor's Affidavit indemnifying the Owner or Owner's agents harmless from all claims as stated in the General Conditions.

C. Final Periodic Estimate:

1. The Contractor shall submit final periodic estimate in accordance with requirements of General and Supplementary Conditions.

D. Meet other requirements of this section and by government agencies stated elsewhere within these Contract Documents.

1.07 FINAL CERTIFICATE OF PAYMENT

A. The Engineer will issue final certificate in accordance with provisions of General Conditions.

1.08 POST-CONSTRUCTION INSPECTION

A. Prior to expiration of one year from Date of Substantial Completion, the Engineer will make visual inspection of Project in company with Owner and Contractor to determine whether correction of Work is required, in accordance with provisions of the General Conditions.

B. For Guarantees beyond one year, the Engineer will make inspections at request of the Owner after notification to the Contractor.

C. The Engineer will promptly notify the Contractor, in writing, of any observed deficiencies which shall be promptly corrected by the Contractor at his expense.

END OF SECTION

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Maintaining premises and public properties.

2. Final clean up.

B. Related requirements specified elsewhere:

Project Closeout	01700

1.02 QUALITY ASSURANCE

A. Maintain the Work site in a clean condition at all times.

B. Upon written notice from the Engineer to perform cleaning as specified herein, the Contractor shall have twenty-four hours to comply. If Contractor fails to comply, then Owner may perform whatever work is necessary by whatever means he may deem expedient, and all expenses incurred by Owner will be charged to and paid for by the Contractor.

1.03 SAFETY REQUIREMENTS

A. Maintain project in accordance with U.S. Department of Labor, Safety and Health Regulations, CFR 20 Part 1926 and all subsequent amendments.

B. Store volatile wastes in covered metal containers.

C. Prevent accumulations of wastes which create hazardous conditions.

D. Provide adequate ventilation during use of volatile or noxious substances.

E. Conduct cleaning and disposal operations to comply with local and state ordinances and anti-pollution laws and as approved by the Engineer.

1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

2. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

C. Clean site and public properties, and dispose of waste materials, debris and rubbish daily.

D. Dispose of waste materials, debris and rubbish in an acceptable manner.

E. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.02 FINAL CLEANING

A. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

B. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior and exterior finished surfaces.

C. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

D. Broom clean surfaces; rake clean other surfaces of grounds.

E. Remove snow and ice from building access.

F. Tear down, remove and dispose of all temporary buildings and structures as approved by the Engineer.

G. Upon removal of temporary toilet facility, remove, disinfect, and cover all organic matter as approved by the Engineer.

H. Remove all tools, equipment, machinery and surplus materials from the project.

I. Restore to a condition equal to the original condition, all portions of the site not designated for alteration and all public and private property that was damaged.

J. Maintain cleaning until project or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the requirements for record documents.

B. Related work specified elsewhere includes:

Surveys and Layout	01052
Measurement and Payment	01150
Submittals	01300
Project Closeout	01700

1.02 SUBMITTALS

A. As soon as possible after the installation of the Work, submit record drawings, specifications, addenda, and Shop Drawings, plus all approved field sketches and diagrams, to Engineer for his review and use in establishing a basis for final payment.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

Hand Drawn Redline Drawings or AutoCad files showing the As-Built conditions.

PART 3 - EXECUTION

3.01 RECORD DOCUMENTS

A. Maintain at the site, one record set of all Drawings, Specifications, Addenda, Change Orders, accepted shop drawings and accepted submittals, Field Test Records and Manufacturer's Certificate of Compliance and Test Data. Make these materials available for inspection by Engineer, Owner, regulatory agencies and other interested persons, upon request, and maintain in good, clean, current condition.

B. Keep record documents current.

C. Do not permanently conceal any work until required information has been recorded.

3.02 RECORD DRAWINGS

A. The general intent of the record drawings is to record all of the Work, pay items, and all existing obstructions, features and materials encountered in the Work so as to produce a set of drawings accurately depicting the Work as-built and existing conditions. On the record drawings, mark in red the following minimum required items at the time they occur:

1. All approved field changes and conditions.

2. The Work, AS-BUILT.

3. All utility lines and structures encountered in the Work, including size, material and elevation.

4. Streams, ditches and other watercourses.

5. Other pipes and structures encountered below ground.

6. Limits, depths, cross sections and extent of rock, unstable material and other materials encountered and for which a payment for removal will be made. Include volume removed.

7. Locations of buried pipe adapters, specialties and appurtenances.

8. Locations, ties, and elevations of ends of sewer house connections and water services installed.

9. Depths of various elements of new structure foundations in relation to first floor or top levels.

10. Changes made to interior piping systems including all pipe sizes, fittings, valving and appurtenances.

B. Locations and elevations of the Work and limits and quantities of pay items shall be accurate. Use stationing shown on the Drawings where possible but provide three ties to all underground or underwater Work which will not be visible after completion of the Work,

such as ends of house connections, ends of water services, stubouts, dead-ended lines, outfall pipes, buried pipes, utilities, and similar items.

C. All existing obstructions, elevations and locations shall be reasonably accurate and direction of pipelines shall be shown approximate. Use stationing shown on Drawings.

3.03 SPECIFICATIONS AND ADDENDA

A. Legibly mark up each Section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually installed.

2. Changes made by Change Order or Field Order.

3. Other matters not originally specified.

3.04 SHOP DRAWINGS

A. Maintain as record documents those Drawings so directed by the Engineer.

B. Legibly annotate drawings to record changes made after review.

END OF SECTION

SECTION 01730 - OPERATIONS AND MAINTENANCE DATA, MATERIALS AND SPARE PARTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section covers the requirements for operation and maintenance manuals, maintenance materials, spare parts, and special tools.

B. Related work specified elsewhere includes:

Submittals	01300
Material and Equipment	01600
Project Closeout	01700

1.02 OPERATION AND MAINTENANCE MANUALS

A. Submit six (6) complete operation and maintenance manuals for valves, hydrants, pumps, motors, all power or electrically driven equipment, other items requiring routine operation and maintenance, and as required by the Specifications.

B. Neatly bind manuals in durable covers, and clearly index or provide thumb tabs for each item or product.

C. Manual shall include as a minimum the following:

1. Manufacturer's and service representative's name, address and telephone number.

2. Installation instructions.

3. Startup and operation instructions.

4. Inspection, maintenance, and adjustment instructions.

5. Lubrication schedules and instructions.

6. Parts lists and data sheets.

7. Troubleshooting guides for electrical and mechanical equipment.

D. Manuals shall also contain the following, if applicable:

1. Schematic diagrams of control systems.

2. Circuit directions for each electrical and communications panel board.

E. Manuals shall clearly indicate which equipment models have been supplied including accessories, etc.

F. Catalog cut sheets are not acceptable unless completely explanatory in sequencing of:

1. Startup
2. Checking
3. Shutdown
4. Identification of specific equipment models, accessories, etc.
5. Other instructional data.

G. Submit manuals upon final acceptance of Shop Drawings and Project Data.

H. Manuals are considered an integral part of some equipment, therefore, no progress payments beyond 50% of the related equipment will be made until manuals for this equipment have been accepted by the Engineer.

1.03 SPARE PARTS AND MATERIALS

A. Provide spare parts and materials that are normally furnished at no extra cost and that are specified to be furnished by the Specifications.

B. Deliver, handle, and protect parts and materials as specified in Section 01600.

C. Distribute and store in locations as directed by the Engineer.

1.04 SPECIAL TOOLS

A. Furnish one set of special tools or devices for each type of equipment which is necessary for its proper operation and maintenance.

B. Tools shall be high grade, smooth, forged, alloy, tool steel.

C. Grease guns shall be lever type.

D. Furnish steel wall cases, as approved by the Engineer, in sufficient quantity to contain all special tools. Locate and erect as directed by the Engineer.

1.05 LUBRICANTS

A. Furnish one year supply of lubricants necessary for proper lubrication of all equipment.

B. Lubricants shall be as recommended by Manufacturers.

C. Furnish in approved containers.

D. Store as directed by the Engineer.

1.06 FACILITIES STARTUP

A. Furnish all liquids and materials required to operate and maintain the facilities for the initial startup period.

B. Quantity of liquids and materials shall be as:

1. Recommended by the Manufacturer's Service Representative.

2. Directed by the Engineer.

3. Required by the sections of the Specifications.

C. Fill all units with appropriate liquids or materials as accepted or directed by the Engineer.

D. Pay all costs associated with facilities startup and testing.

END OF SECTION

SECTION 02010 - SUBSURFACE CONDITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General - This section defines items related to subsurface conditions provided by Owner and Contractor's limitations in their use.

1.02 SUBSURFACE EXPLORATIONS

A. Owner has had soil test borings conducted at various locations at the site. For the convenience of bidders, logs of such subsurface data are appended to this section. The approximate location of the test pits are shown on the Drawings.

B. The logs represent the findings at the time the exploration were made and this data is offered in good faith solely for the purpose of placing Contractor in receipt of all information available, and in no event is to be considered a part of the Contract Documents or a warrant of subsurface conditions.

1.03 ADDITIONAL INFORMATION

A. The Contractor should visit the site and acquaint himself with all existing conditions. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions but such subsurface investigations shall be performed only under the schedules and arrangements approved in advance by the Owner. As approved by the Engineer and Owner, Contractor shall plan the Work based upon his own findings.

B. The Owner, Engineer or an authorized representative will observe performance of work in connection with excavating, filling, and grading. Readjust all work performed to the existing conditions.

C. If actual subsurface or latent conditions materially differ from the data referred to in Paragraph 1.2B, immediately notify Engineer.

D. Contractor shall bear all costs associated with this Paragraph 1.3, including those sustained by Owner and other related expenses.

END OF SECTION

GREEN MOUNTAIN BORING

PO Box 218
East Barre, VT 05649

To: Dubois & King
ATTN: Jeff Tucker
Route 66 Professional Center
Randolph, Vermont 05060

Date	10/21/03
Job Name/Site	Curtis Pond Dam/Calais, Vermont
Job Number	03064
Crew	Michael McGinley/Tyler Sabin
Inspector	

HOLE #	OFFSET	STATIC LEVEL	SOILS	AUGER REFUSAL	DEPTH
P-1	-	1.5'	Tripod probe until refusal	4.5'	4.5'
P-2	-	3'	Rebar until refusal	5'	5'
P-3	-	1.5'	Rebar until refusal	4'9"	4'9"

TOTAL FOOTAGE: 14'3"

AUGERS USED: Solid

GREEN MOUNTAIN BORING

PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME: LOCATION: GMB JOB #:	Curtis Pond Dam Calais, Vermont 03064	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	1 10/20/03 B-1

Ground Water Observations None at 0 hours	Augers-Size I.D. 3.25" Split Spoon 1 3/8" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: Date Started: 10/20/03 Date Completed: 10/20/03 Boring Foreman: Michael McGinley Inspector: Jeff Tucker Soils Engineer:

LOCATION OF BORING:

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Inches	Sample Rec. Inches
0-2	Dry	4/3/6/2	Damp		Sand, small stones and fractured rock	1	24	8
2-4	Dry	2/15/40/100 for 4"	Wet/Dry	2.5'	Sand, into weathered rock, into ledge	2	24	24
					Split spoon refusal at 3'10"			

Ground Surface to: 2' Used 3.25" augers, then split spoon to refusal at 3'10"

SUMMARY B-1

Earth Boring	3'10"
Rock Coring	
Samples	2

GREEN MOUNTAIN BORING

PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME: LOCATION: GMB JOB #:	Curtis Pond Dam Calais, Vermont 03064	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	2 10/20/03 B-2

Ground Water Observations None at 0 hours	Augers-Size I.D. Split Spoon Hammer Wt. Hammer Fall	3.25" Tripod 1 3/8" 140# 30"	Surface Elevation: Date Started: Date Completed: Boring Foreman: Inspector: Soils Engineer:	 10/20/03 10/20/03 Michael McGinley Jeff Tucker

LOCATION OF BORING: As marked

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Inches	Sample Rec. Inches
0-2	Dry	2/1/1/2	Dry		Sand and small stones	1	24	4
2-4	Dry	11/8/5/3	Dry		Weathered rock with a trace of sand	2	24	16
4-6	Dry	4/8/4/3	Dry		Rock fragments with a trace of sand	3	24	12
6-8	Dry	4/6/8/7	Wet		Weathered rock, trace of sand	4	24	8
8-10	Dry	9/9/6/15	Wet		Weathered rock, trace of sand	5	24	16
10-12	Dry	9/50/15/12	Wet		Rock fragments, trace of sand	6	24	12
14	Dry	13/11/15/100 for 2"	Wet		Till and rock fragments	7	24	24
					Split spoon refusal at 13'8"			

Ground Surface to: 12' Used 3.25" augers, then split spoon to refusal at 13'8"

SUMMARY B-2

Earth Boring	13'8"
Rock Coring	
Samples	7

GREEN MOUNTAIN BORING

PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME: LOCATION: GMB JOB #:	Curtis Pond Dam Calais, Vermont 03064	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	3 10/20/03 B-3

Ground Water Observations None at 0 hours	Augers-Size I.D. Split Spoon Hammer Wt. Hammer Fall	3.25" Tripod 1 3/8" 140# 30"	Surface Elevation: Date Started: Date Completed: Boring Foreman: Inspector: Soils Engineer:	 10/20/03 10/20/03 Michael McGinley Jeff Tucker

LOCATION OF BORING: As marked

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Inches	Sample Rec. Inches
0-2	Dry	2/3/1/1	Dry		Sand and small stones with rock fragments	1	24	10
2-4	Dry	1/1/10/8	Wet		Sand and small stones with rock fragments	2	24	6
4-6	Dry	4/5/7/3	Wet		Sand and small stones with rock fragments	3	24	6
6-8	Dry	2/2/8/12	Wet		Organics (wood), sand, trace of silt, small stones	4	24	10
8-10	Dry	25/35/100 for 3"	Wet		Rock fragments	5	24	12
					Split spoon refusal at 9'3"			

Ground Surface to: 8' Used 3.25" augers, then split spoon to refusal at 9'3"

SUMMARY B-3

Earth Boring	9'3"
Rock Coring	
Samples	5

GREEN MOUNTAIN BORING

PO Box 218 ° East Barre, Vermont 05649 ° 802 476-5073

TO:	Dubois & King ATTN: Jeff Tucker Route 66 Professional Center Randolph, Vermont 05060	PROJECT NAME: LOCATION: GMB JOB #:	Curtis Pond Dam Calais, Vermont 03064	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	4 10/20/03 B-4

Ground Water Observations None at 0 hours	Augers-Size I.D. Split Spoon Hammer Wt. Hammer Fall	3.25" Tripod 1 3/8" 140# 30"	Surface Elevation: Date Started: Date Completed: Boring Foreman: Inspector: Soils Engineer:	 10/20/03 10/20/03 Michael McGinley Jeff Tucker

LOCATION OF BORING: As marked

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Inches	Sample Rec. Inches
0-2	Dry	1/1/1/2	Damp		Sand, small stones, trace of organics	1	24	3
2-4	Dry	2/2/8/8	Wet		Sand, small stones, trace of silt, rock fragments	2	24	6
4-6	Dry	6/9/9/12	Wet		Sand, small stones, rock fragments, trace of silt	3	24	8
6-8	Dry	1/4/35/100 for 5"	Wet		Sand, small stones, till like material, rock fragments	4	24	16
					Split spoon refusal at 7'11"			

Ground Surface to: 6' Used 3.25" augers, then split spoon to refusal at 7'11"

SUMMARY B-4

Earth Boring	7'11"
Rock Coring	
Samples	4

SECTION 02100 - CLEARING & GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes clearing and grubbing as required to perform the work.

B. Related work specified elsewhere includes:

Temporary Erosion and Sedimentation Control	01575
Topsoil and Seeding	02483

C. It is the intent of this Section to limit the area of clearing and grubbing to the minimum area possible to allow for the proper installation of the Work and to preserve all plantings, trees, shrubs, grass and natural vegetation to the limits shown on the plans.

1.02 QUALITY ASSURANCE

A. Confine clearing and grubbing operations to within the following limits:

1. All areas where work is required to be done, but, to the minimum extent possible to properly install the work.
2. Within the Grading Limits when shown on the Drawings.
3. Within the easements provided by Owner.
4. Within the property lines of lands owned by Owner.

B. No trees, plants, shrubs, flowers or vegetables shall be removed or trimmed without the prior permission of the Engineer, except where otherwise specified.

C. Provide at least one person who shall be present at all times during clearing and grubbing operations who shall be thoroughly familiar with the following:

1. The types of trees and plantings encountered.
2. The proper procedures and methods for taking-up and preserving trees and plantings.
3. The proper procedures and methods for felling, trimming, pruning and caring for trees and plants and their roots.

Such person(s), firm(s) or subcontractor(s) must be totally familiar with this type of work and shall be responsible for directing all work affecting existing trees, plantings and vegetation.

1.03 SUBMITTALS

A. See Section 01300.

B. Contractor's schedule indicating dates upon which Contractor and Engineer will traverse the site to allow Contractor to indicate the trees and plantings which he has determined to be necessary to remove and to obtain Engineer's approval.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store trees, plants and shrubs in protected areas and give ample water to keep them in a thriving condition for subsequent replanting.

B. Store slate and flagstone sidewalk sections, granite and stone curbs, fences, signs, guiderails and other items at approved locations for subsequent reinstallation.

C. Obstruction of roads, driveways, sidewalks, gutters and drainage ditches, swales and channels with stored materials is not permitted.

1.05 JOB CONDITIONS

A. Burning of materials at the site is not permitted without the proper authorization of the appropriate local and state agencies.

B. Materials not specified to be stored or reused shall be promptly removed and disposed of off-site.

C. The locations of trees, plantings, vegetation, sidewalks, curbs and other living and nonliving items, as shown on the Drawings, have been determined by actual surveys at the time surveys were made. Since that time, additional items may have been built, some items may have been removed, and the condition of things may have changed. Carefully examine the site prior to bidding and become fully acquainted with the existing conditions as the Contract Price includes the cost for removing and replacing all obstacles and

obstructions, as required, whether shown on the Drawings or not.

D. Use all means necessary to protect existing objects designated to remain and, in the event of damage, immediately make all necessary repairs and replacements.

1.06 SCHEDULING

A. Avoid interference with the use of, and passage to and from, adjacent buildings, facilities, driveways, walks, drainage systems and road.

B. Pavements which are required to be removed, including highways, driveways and walks, may be saw cut in advance, but do not remove until the work is ready to be installed.

C. Do not remove highway signs, guiderails and all other control, safety and warning devices until just prior to the installation of the work.

D. Do not remove fences until the property owners affected are notified at least four days in advance of such removal. Unless written permission from a fence owner is received, do not remove a fence more than 48 hours in advance of the installation of the work affecting the fence.

E. It is the intent of this Section that all items affecting traffic, safety, lives and the containment of humans and animals and all items essential to the protection of property or the operation of a business be left in place as long as possible and replaced as soon as possible when such items must be removed.

PART 2 - MATERIALS

2.01 PRUNING PAINT

Asphalt base paint specially formulated for horticultural application to cut or damaged plant tissue.

2.02 EXPLOSIVES

Explosives are not permitted for clearing and grubbing operations.

2.03 OTHER MATERIALS

All other materials not specifically described but required for proper completion of the work of this Section, shall be as selected by Contractor subject to the approval of Engineer.

PART 3 - EXECUTION

3.01 INSPECTIONS

A. Verify that all limiting boundaries such as permanent and temporary easements, property lines, rights-of-way and grading limits have been accurately located and clearly marked.

B. Verify that pipeline routings and other items of work have been accurately located and clearly marked.

3.02 PREPARATION

A. Mark all trees, plantings and other objects which are deemed necessary to be removed, trimmed, cut or taken-up and preserved.

B. Notify and accompany Engineer through the site to inspect the items marked under Paragraph A, above. Describe which are to be trimmed, removed, and replanted and secure Engineer's approval.

3.03 CLEARING AND GRUBBING

A. Clearing consists of cutting and disposing of all trees, down timber, stubs, brush, bushes, snags, rubbish, debris, and other objectionable matter and materials and the removal and storage of fences, signs, walks, guiderails, curbs and other items to be restored.

B. Grubbing consists of the removal and disposal of all stumps, roots, duff, foundations and other objectionable matter and materials.

C. All operations shall be done in a manner so that present growth will blend with the limits of construction and a natural appearance will be attained.

D. Employ whatever measures are necessary to avoid erosion.

3.04 TREES AND PLANTINGS

A. In grassed, planted and open areas, do not remove or trim trees or plantings without the prior permission of Engineer. Take-up and preserve small trees, plantings, flowers and similar vegetation for reuse.

B. In wooded areas, trees may be removed and/or trimmed, as required, for the proper installation of the work. Gross and unnecessary removal of trees is not permitted.

C. If it is impractical to fell trees as a whole, remove them in sections according to standard practices of professional tree removal. Fall trees to the center of the area being cleared to minimize damage to trees that are to be left standing.

D. Immediately after felling a tree, remove branches, cut trunk and limbs and remove all materials from the site.

E. All trees to remain shall not come in contact with any machine or appliance that will in any manner injure, sear or kill them.

F. Property owners shall have the right to cut and remove any wood in advance of the Contractor's operations. All other timber and wood which is removed shall become the property of Contractor.

G. All trees left standing which have been trimmed or become scarred by Contractor's operations shall be promptly repaired by properly cutting, smoothing and painting.

H. Trees to be trimmed shall be evenly cut to achieve neat severance with the least possible damage to the tree.

I. Where roots are cut or damaged, apply wet burlap to prevent drying out.

3.05 PAVEMENTS, WALKS, CURBS & RAILS

A. Remove existing pavements, walks and curbs to the limits shown on the Drawings, or if not shown, to the minimum extent possible.

B. Saw cut asphalt and concrete paved surfaces before removal. Use a saw which will cut a neat, straight joint line.

C. Carefully remove slate and flag stone walks, granite and stone curbs and guiderails to the minimum extent possible. Terminate removals at a joint or guiderail post. Store and protect for reuse.

3.06 WALLS, FENCES AND OTHER OBSTRUCTIONS

A. All walls, fences, signs, sheds and other obstructions encountered shall be carefully taken-up and stored for subsequent replacement.

B. Do not disturb property markers unless absolutely necessary. If it becomes necessary to disturb or remove a property marker, have a qualified surveyor provide four (4) ties to the marker. The qualified surveyor shall replace the marker as soon as possible.

C. Remove and dispose of all other obstructions which will affect the work or which are specifically designated to be removed.

3.07 DISPOSAL

A. Burning at the site is not permitted without the proper authorization of the appropriate local and state agencies.

B. Burial of materials at the site is not permitted.

C. All materials shall be promptly removed and disposed of away from the site.

D. Methods of disposal shall conform to the requirements of all Federal, State and Local Laws and Ordinances.

E. Leave site in a neat and orderly condition.

3.08 PROTECTION

A. Carefully protect and guard all trees, shrubs and vegetation and take every precaution to avoid damage to utilities, buildings and other property.

B. Injured or damaged trees shall be repaired in accordance with TREES AND PLANTINGS.

C. All trees, shrubs or plantings which are taken-up for subsequent reuse, and die, shall be replaced with species in-kind.

3.09 REPLANTING AND RESTORATION OF SURFACES

A. The requirements for replanting and restoration of surfaces are contained in Section 02483.

END OF SECTION

SECTION 02250 - SOIL COMPACTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section covers the requirements for soil compaction.

B. Related work specified elsewhere includes:

Site Work	Division 2

1.02 QUALITY ASSURANCE

A. The taking of samples and the performing of field compaction density tests shall be done by an independent testing laboratory.

B. Provide at least one person who shall be present at all times during the soil compaction operations and who shall be thoroughly familiar with the various types of compaction equipment, proper compacting techniques and methods, and soils behavior, and who shall direct the compaction operations.

1.03 SUBMITTALS

A. See Section 01300.

B. List and description of proposed compaction equipment.

C. Copies of the results of the laboratory sieve analyses and moisture density tests, certified by the Testing Laboratory.

1.04 JOB CONDITIONS

A. Compaction shall not take place in freezing weather or when materials to be compacted are frozen, too wet or moist, or too dry.

B. Schedule the Work to allow ample time for laboratory tests and to permit the collecting of samples and the performing of field density tests during the back-filling and compaction operations.

C. Protect pipes, structures and all other subsurface work from displacement or injury during compaction operations.

PART 2 - PRODUCTS

2.01 COMPACTION

Utilize the proper compaction methods and equipment to suit the soils and conditions encountered.

2.02 LABORATORY TEST REPORTS

A. As a minimum, the laboratory moisture-density testing reports shall contain the following:

1. Laboratory's name.

2. Date, time and specific location from which sample was taken and name of person who collected the sample.

3. Moisture - Density Curve plotted on graph paper to as large a scale as is practical with all points used to derive the curve being clearly visible.

4. Designation of the test method use.

5. The optimum density and moisture content.

6. A description of the sample.

7. The date the test was performed and the person who performed the test.

8. The Project name, identification and Contractor's name.

9. The signature of a responsible officer of the Testing Laboratory certifying to the information contained in the report.

B. As a minimum, the field compaction density testing reports shall contain the following:

1. Laboratory's name.

2. Date, time, depth and specific location at which the test was made and the person's name who performed the test.

3. Designation of the test method used.

4. Designation of the material being tested.

5. Test number.

6. In place dry density and moisture content.

7. Optimum density and moisture content.

8. Percentage of optimum density achieved.

9. The Project name, identification and Contractor's name.

10. The signature of a responsible officer of the Testing Laboratory certifying to the information contained in the report.

2.03 OTHER MATERIALS

All other materials which are required to achieve adequate compaction shall be as selected by Contractor subject to approval of Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that layers of material are no thicker than the maximum thicknesses specified in other Sections.

B. Verify that moisture content is nearly optimum.

C. Do not begin compaction operations until conditions are satisfactory.

3.02 PERFORMANCE

A. Compaction densities shown are percentages of the maximum density obtainable at optimum moisture content as determined by ASTM D1557, (Method C).

B. Moisten or dry each layer of material to achieve optimum moisture content. Unless otherwise specified or directed by Engineer, compact each layer of material to the required densities defined in Section 02260.

3.03 FIELD QUALITY CONTROL

A. Perform a laboratory moisture density test for each type of soil proposed for use or encountered in the Work. Determine optimum moisture content in accordance with ASTM D1557, (Method C).

B. Engineer will designate the time, date and exact location of all field compaction density tests. Field density tests may be ordered by Engineer in accordance with the following average frequencies:

1. Under Structures - One test for every 400 square foot area of each layer of compacted granular fill.

2. Outside of Structures - One test for each foot of backfill at intervals of approximately 50' around the structure.

3. Trenches - One test for each foot of backfill at intervals of approximately 200' along the trench.

4. Embankment - Three tests for each vertical foot of compacted fill.

5. Roads - One test for each layer of compacted fill and base material at intervals of approximately 200' along the roadway.

C. Testing frequency indicated in Paragraph 3.03.B is at the discretion of the Engineer, and may be decreased as the Project progresses.

D. Field density and moisture testing shall conform to the requirements of ASTM D1556 or D2922 and ASTM D3017. Soils shall be described in accordance with ASTM D2488, Visual-Manual Procedure.

3.04 COORDINATION

A. Provide all assistance and cooperation during testing and coordination operations to allow ample time for the required sampling and testing.

B. See Section 01410 for requirements as they apply to making arrangements with the approved testing laboratory.

3.05 ADJUST AND CLEAN

A. Replace or repair any pipe, structure or other Work which has been displaced, damaged, or injured.

B. Compacted soils not meeting compaction densities shall be re-excavated, re-compacted and retested at the contractor's expense until all requirements are met.

END OF SECTION

SECTION 02260 - EARTH DAM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes construction of an earthen dam.

B. Related work specified elsewhere includes:

Temporary Erosion and Sedimentation Control	01575
Clearing & Grubbing	02100
Soil Compaction	02250
Topsoil and Seeding	02483

1.02 QUALITY ASSURANCE

A. All finished grades shall be as shown on the Drawings. Use a qualified surveyor to set all grade stakes and to ensure that the resulting final grades are those which are required.

B. When placing fill or constructing embankments, moisten or dry fill material to the proper moisture content as determined by ASTM D1557, (Method C).

1.03 SUBMITTALS

A. See Section 01300.

B. Certified copies of all results of maximum density tests and field compaction density tests.

C. Gradations of stone, gravel, and other materials proposed for use.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery of borrow materials to the site or removal of spoil from the site shall be done in a manner which will not cause any nuisance or allow spillage of materials from the transporting vehicle.

B. Store topsoil separately from all other excavated materials and preserve for reuse.

C. Materials which are required to be stored shall be stored in an orderly manner and at a sufficient distance away from banks of excavations and trenches to avoid overloading and prevent slides or cave-ins. Do not store materials on, over or adjacent to structures or utilities which may collapse due to the added weight.

D. Promptly remove materials not specified to be stored or reused.

E. Obstruction of roads, driveways, sidewalks or interference with drainage along gutters, ditches or drainage channels with stored material is not permitted. If materials cannot be stored at the site to avoid such obstructions and interferences, they shall be stored away from the site and brought back when and as needed.

1.05 JOB CONDITIONS

A. Keep ground surface well drained, but avoid erosion. Do not place fill in water or over ice or snow.

B. Filling with frozen materials or when materials already in place are frozen, is not permitted.

C. If fill freezes, all materials which frozen shall be removed prior to placing additional fill.

1.06 SCHEDULING AND SEQUENCING

A. Schedule the Work with Engineer and afford him adequate time and space to make all required inspections.

B. Schedule work and coordinate operations with the approved testing laboratory. If the laboratory cannot be available to perform required tests, grading and filling operations may have to be delayed in order to accomplish certain field tests.

PART 2 - PRODUCTS

2.01 EMBANKMENT MATERIAL

A. Material shall be gravelly silty sand, with no organic matter and no stones larger than 6-inches.

B. Embankment material shall be processed and delivered from an approved off-site source. This material may be processed in the borrow area to obtain the desired moisture content of ±2% of the optimum moisture content as determined by ASTM D1557 (Method C).

C. Embankment material shall be widely graded and conform to the following gradation:

Percent passing 6-inch sieve	= 100
Percent passing 1-inch sieve	= 84-100
Percent passing No. 4 sieve	= 67-95
Percent passing No. 40 sieve	= 42-82
Percent passing No. 100 sieve	= 34-68
Percent passing No. 200 sieve	= 28-56

2.04 STONE FILL

A. Material shall be reasonably well graded which will result in a well compacted mass when placed.

B. Material shall be approved hard blasted angular rock, free of rounded or flat stones with the smallest dimension not less than 33% of the largest dimension.

C. Material shall be free of dirt, deleterious material structurally weak pieces and chrysotile (asbestos).

D. Material shall meet the requirements of the following table.

Material Designation	Longest Dimension Varies Between	Least Dimension of In Place D_{50}
Stone Fill, Type I	1 inches - 12 inches	4 inches
Stone Fill, Type II	2 inches - 36 inches	12 inches
Stone Fill, Type III	3 inches - 48 inches	16 inches
Stone Fill, Type IV	3 inches - 60 inches	20 inches
Stone Fill, Blend Type I/II	1 inches - 36 inches	12 inches

2.05 Bank-Run Gravel

A. Material shall be naturally occurring material with no organic matter and no stones larger than 6-inches. Borrow shall be obtained from approved sources, consisting of stone and sand reasonably free from loam,

silt, clay, and organic material and shall meet the requirements of the following table:

B. Material shall be widely graded as follows and shall meet the requirements of the gradation:

Percent passing 6-inch sieve	=	100
Percent passing No. 4 sieve	=	20 - 60
Percent passing No. 200 sieve	=	0 - 15

2.06 Roadway Gravel

A. Material shall consist of clean, hard gravel, crushed gravel, or crushed stone. It shall be obtained from approved sources and reasonably free from loam, silt, clay, and organic material and shall meet the requirements of the following table:

B. Material shall be widely graded as follows and shall meet the requirements of the gradation:

Percent passing 6-inch sieve	=	100
Percent passing No. 4 sieve	=	20 - 60
Percent passing No. 200 sieve	=	0 - 15

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that the clearing and grubbing operations have been completed.

B. Verify that grade stakes have been properly and accurately set.

C. Do not begin operations until conditions are satisfactory.

3.02 DISPOSAL OF MATERIALS

A. Use approved on-site materials to the extent they are available.

B. Remove from the site all unsuitable material. Do not store or stockpile unsuitable material at the Project site and do not incorporate into the Work.

3.03 UNSUITABLE MATERIALS

A. Remove all loose boulders, vegetation, roots, topsoil, peat, and organic silty sand to the top of the glacial till layer within the dam construction limits.

B. Stockpile or dispose of all unsuitable material as directed by the Engineer or Owner.

3.04 FOUNDATION PREPARATION

A. Maintain surface free of ponded water.

B. Backfill and compact with embankment material all excavated pits or depressions according to paragraph 3.05.

C. The excavated surface shall be rolled with at least four coverages of an approved static roller. Alternative rolling equipment may be used upon approval of the Engineer.

D. Scarify the surface with a harrow prior to placing embankment fill.

E. Engineer will inspect foundation surface prior to placement of any embankment material.

3.05 PLACEMENT OF EMBANKMENT MATERIAL

A. Fill material shall meet the requirements of subsection 2.01 and shall be as acceptable to Engineer.

B. Water content shall be carefully controlled and the in place water content shall be within 2% of the optimum moisture content.

C. Place fill in 9-inch thick loose layers.

D. Compact to 95% of the maximum density obtainable at optimum moisture content as defined by ASTM D1557, (Method C), using an approved static roller. Around concrete structures use acceptable mechanical tampers and place material in 4-inch thick loose layers with no stones larger than 2 inches.

E. Keep surface of embankment sloped and graded so that surface water flows off and does not pond during periods of rain. Where ruts or erosion occur, add additional fill and reshape and recompact before placing next lift.

F. Drying and cracking of the surface shall be prevented.

G. Scarify with a harrow before placing next lift.

3.07 PLACEMENT OF STONE FILL

A. Place stone fill in a manner so as to produce a reasonably well graded mass of rock with the minimum practicable percentage of voids. The finished stone surface shall be free from objectionable pockets of smaller stones and clusters of larger stones.

B. Placing stones in layers or dumping by methods likely to cause segregation of the various sizes is not permitted. Obtain the desired distribution of the various sized stones by selective loading, controlled dumping of successive loads or by other approved means.

C. Completely fill voids with fine stone or gravel. Rearrange stones by mechanical equipment or by hand to the extent necessary to obtain a reasonably well graded distribution.

D. The final stone surface shall not exceed 3", plus or minus, from the required grades and elevations. Leave stone fill in a firm stable mass.

3.08 FIELD QUALITY CONTROL

A. Soils testing shall be performed by the approved independent testing laboratory in accordance with Section 02250 - Soil Compaction.

Embankment material will require additional gradation analyses to be performed prior to placement. Sample and perform a gradation analysis of the embankment material for every 200 c.y. placed.

END OF SECTION

SECTION 02315 – EXCAVATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Excavating for the installation of the toe drain filter and low-level outlet pipe.

1.02 RELATED REQUIREMENTS

Earth Dam	02260
Fill and Backfill	02316

PART 2 PRODUCTS - NOT USED

PART 3 – EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

3.02 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Cut utility trenches wide enough to allow inspection of installed utilities.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

END OF SECTION

SECTION 02401 - DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the maintenance of trenches and excavations free of water, snow, ice, and other liquids.

B. Related work specified elsewhere includes:

Division 2 – Site Work

C. Definition: Liquids, as used in this Section, means sewage, water, storm-water, groundwater, or other liquid or fluid material.

1.02 QUALITY ASSURANCE

A. Conduct operations in a manner which will keep the Work free of standing and flowing liquids, snow, and ice, and dispose of these materials in an approved manner so as not to damage or create a nuisance to the Work, the public, surface and ground waters, and adjacent properties.

B. The accumulation of liquids, ice and snow in excavations, trenches, areas to be graded and adjacent areas during construction is not permitted.

C. Unless otherwise noted or approved by Engineer, the placement of Work in a liquid is not permitted.

D. The use of installed pipes, or pipes under construction, to drain excavations, trenches and adjacent areas is prohibited, except in the case of drainage pipes where it is necessary to maintain flow from watercourses.

E. Obtain all discharge and water quality permits from the State of Vermont applicable agencies - Fines resulting from noncompliance with the statutes, regulations and permit conditions set by the State of Vermont will be the sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

Provide all equipment and materials necessary to perform dewatering operations in a safe and satisfactory manner.

PART 3 - EXECUTION

3.01 PERFORMANCE

A. Perform all ditching, diking, pumping, well pointing and bailing, and construct all drains and channels necessary to keep all work areas clear of liquids, ice and snow during the progress of the Work and until the finished work is safe from injury.

B. Do not permit any liquid to rise over any work in place until such work is adequately protected.

C. Locate noise producing dewatering equipment as far from residences, businesses, and the public in general, so as to minimize noise pollution. When required, or directed by Engineer, provide acoustical enclosures or barriers to reduce noise to an acceptable level.

3.02 DISPOSAL

A. Dispose of all liquid, ice and snow in a manner which will not create a hazard to public health, nor cause injury to public or private property, lives, work installed or in progress, or public streets, nor cause any interference in the use of streets and roads by the public, nor cause erosion.

B. Do not permit liquids containing sewage, sludge, gas, oil, sediments and other deleterious, poisonous, toxic or oxygen demanding substances to enter streams, lakes, other surface waters or into the groundwater.

C. Secure written permission from the appropriate agency before utilizing a storm drain for the disposal of liquids. Do not overload sewers. Terminate the use of storm drains during any storm where the combined runoff and dewater will result in flooding.

D. Dispose of all liquids directly into settling ponds when indicated on the drawings or directed by the Engineer.

3.03 PROTECTION

A. Provide adequate protection from the effect of possible uplift due to storm or groundwater where buoyancy might lift installed work or cause joint or structure failure during construction.

B. Protect the interior of installed work from the entering and accumulation of liquids, ice and snow. Immediately remove and dispose any accumulation which may occur.

3.04 ADJUST AND CLEAN

Adjust, repair, replace or clean all work, surfaces and property which may have been damaged as a result of any dewatering operation.

END OF SECTION

SECTION 02483 - TOPSOIL AND SEEDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes providing topsoil, seeding, fertilizing and liming unpaved areas within approved limits as directed by the Engineer or as shown on the Drawings.

B. Related work specified elsewhere includes:

Site Work	Division 2

1.02 QUALITY ASSURANCE

A. Provide at least one person who shall be present at all times during the top-soiling and seeding operations and who shall be thoroughly familiar with the types of materials being installed and the best methods for their installation and who shall direct all work performed under this Section.

B. Establish a good stand of grass of uniform color and density.

C. Sod may be used in lieu of seed, and shall be provided where specified, where shown on the Drawings, in areas where the establishment of grass may be difficult due to steep slopes or drainage flows, and where required to prevent erosion.

D. Protect, maintain and care for all grassed areas.

1.03 SUBMITTALS

A. See Section 01300.

B. Lime label containing manufacturer's name, type of lime, weight and guaranteed analysis.

C. Proposed seed mixtures and manufacturer's recommended rate of application.

D. Seed labels containing vendor's name, seed name, lot number, percentage of germination, percentage of

purity, percentage of weed seed and percentage of inerts.

E. Fertilizer labels containing manufacturer's name, brand name, type, weight and guaranteed analysis.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Seeding and sodding shall be done during the following times, and then only when conditions are satisfactory:

Seeding: When the ground becomes workable in the spring to June 1st, and between August 15th and October 1st.

Sodding: May 1st to October 15th.

1.05 GUARANTEE

A. All work shall be guaranteed for a minimum of one year from the date of first acceptance of the Work or from the date when Engineer determines that Contractor has established a good, vigorous and healthy stand of grass of uniform color and density, whichever date is later.

B. Final acceptance will be given by Owner after established grassed and sodded areas have been in place for one year in a vigorous and healthy condition.

PART 2 - MATERIALS

2.01 TOPSOIL

Approved topsoil, obtained from excavation and grading work or, if insufficient material is available, it shall be imported.

2.02 LIME

A. Calcic or dolomitic ground limestone.

B. Total carbonates - 85% minimum content.

C. Magnesium oxide - 10% minimum content for dolomitic and high magnesium limes.

2.03 FERTILIZER

A. Standard Commercial Grade - dry, free-flowing type suitable for common spreader application - or - finely-ground, water soluble type suitable for power spray application - or - granular or pellet type suitable for application by blower equipment.

B. Minimum content- 10% total nitrogen
- 6% available phosphoric acid
- 10% water-soluble potash

2.04 SEED MIXTURES

A. Grade A quality, fresh and re-cleaned and proven to produce satisfactory growth in the locality of the Project.

B. In existing grass areas, mixtures shall be comparable to existing grasses and, when established, shall match as nearly as practicable the existing undisturbed grass.

C. In new grass areas designated as lawns, mixtures shall be:

% by Wgt. Seed	Species	P.L.S.	Max. Weed
60 - 70	Creeping Red Fescue	90%	0.5%
20 - 30	Kentucky Blue Grass	85%	0.5%
10	Perennial Rye Grass	85%	0.5%

P.L.S. = Purity times germination (U.S.D.A., Bulletin No. 480.)

2.05 SOD

A. Firm, dense, even textured and showing good root development. Grasses shall be of the type required for the intended use, suitable for the climatic conditions at the Project site, and as approved by the Engineer.

B. Sod shall have a compact growth and shall be reasonably free from weeds, plants, large stones and other objectionable or detrimental materials.

C. All sod shall be living, healthy and showing signs of vigorous growth.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that all underground and above ground work has been completed to the point where top-soiling, seeding and/or sodding operations may properly commence without unnecessary disturbances at a later date.

B. Do not commence work under this Section until conditions are satisfactory.

C. Loosen all ground surfaces to a minimum depth of 2 inches to facilitate bonding of the topsoil to the subgrade. Use discs, spike-tooth harrows, or other approved means.

D. Clean surface of subgrade of all stones, sticks and rubbish larger than 2 inches in size and all litter and detrimental materials.

E. After spreading, break up large, stiff clods and hard lumps, and rake off all stones and rocks larger than 1 inch in size, roots, litter, foreign matter, poisonous materials, and other materials which may be detrimental to the Work. Dispose of all such materials off-site.

F. Remove all topsoil spilled on highways, shoulders, sidewalks, driveways and other surfaces for which topsoil is not specified or required.

3.03 LIMING

A. Apply separately at the rate of 50 pounds/1,000 square feet, prior to fertilizing, seeding, and sodding. Lime may be applied dry spreader or as an aqueous solution by spraying.

B. After application, work lime into the top 3 inches of soil and redress surface to a smooth finish.

3.04 FERTILIZING

A. Uniformly spread fertilizer at the rate of 25 pounds/1,000 square feet with a cyclone or broadcasting type spreader.

3.05 SEEDING

A. Sow seed uniformly with a cyclone or broadcasting type spreader at a rate recommended by the seed vendor and as approved by Engineer. The rate shall be based upon "new lawn" requirements and shall not be less than 5 pounds per 1,000 square feet.

B. Sow seed when soils are moderately dry and when wind does not exceed five miles per hour.

3.06 ROLLING

A. Where rolling is required, compact soil lightly with a lawn-roller, immediately after seed is sown.

3.07 MULCHING - GENERAL

A. In grass areas, use mulch, matting, or a blanket to protect the seeded areas. Apply within 24 hours after the seeding operation is completed.

B. In Open and wooded areas, mulching is optional, except where it is required for erosion control.

3.08 MAINTENANCE

A. Properly maintain all turfed areas by watering, cultivation, weeding, mowing, reseeding, filling eroded areas and other repairs and replacements until final acceptance of the Work.

B. Reseed all areas where seed has failed to germinate and where seeded areas have been damaged by erosion, people, vehicular traffic or other causes.

C. After sod has started to grow, resod any areas or portions failing to show life. Resod as often as necessary in order to establish a healthy, growing sod.

END OF SECTION

SECTION 02610 - BURIED PIPE AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes the material and bedding requirements for all pipe and pipe fittings for underground pressure and nonpressure piping.

B. Related work specified elsewhere includes:

General Requirements	Division 1
Site Work	Division 2

C. Abbreviations: (Also, see PIPE SCHEDULE 02610-1)

ABS	-	Acrylonitrile-Butadiene-Styrene
ACCGMP	-	Asph Coated, Corrugated Galv Metal Pipe
ASP	-	Alloy Steel Pipe
CISP	-	Cast Iron Soil Pipe
CMP	-	Corrugated Metal Pipe
CUP	-	Copper Pipe
DIP	-	Ductile Iron Pipe
PE	-	Polyethylene
PVC	-	Polyvinyl Chloride
PCCP	-	Prestressed Concrete Cylinder Pipe
RCP	-	Reinforced Concrete Pipe
VCP	-	Extra Strength Vitrified Clay ipe

1.02 QUALITY ASSURANCE

A. Pipe and pipe fittings shall be produced in a plant of recognized reputation that is regularly engaged in the production of pipe conforming to the specified standards. Pipe and pipe fittings of the same type shall be the product of a single manufacturer.

B. All pipe shall be manufactured in a plant of a member of the following organizations:

Pipe	Organization
CISP	Cast Iron Soil Pipe Institute
DIP	Ductile Iron Pipe Research Association
CMP	National Corrugated Steel Pipe Assoc
PVC & PE Pipe	Plastics Pipe Institute
RCP	American Concrete Pipe Association

VCP National Clay Sewer Pipe Institute

C. Furnish the services of a competent field representative of the manufacturer at the start-up of installation of each type of pipe to instruct Contractor and Engineer in installation and inspection procedures. The representative, Contractor and Engineer shall inspect the first shipment or shipments of pipe and check dimensional tolerances prior to the installation of the first section of each type of pipe. The representative shall make periodic scheduled visits to the Project as the Work progresses and be present during leakage testing, when requested by Engineer.

1.03 SOURCE QUALITY CONTROL

A. General - The manufacturers shall test and furnish three copies of certificates covering all pipe and fittings supplied under this Section. Select test samples from the run of pipe proposed to be furnished to the Project. Unless Engineer elects to witness such testing, the manufacturer shall select the samples for testing. Advise Engineer at least two weeks in advance of the time and location of the testing.

B. Alloy-Steel - Certification outlined under ASTM A53.

C. Acrylonitrile-Butadiene-Styrene - Inspect and test ABS pipe in accordance with:

8" and larger - ASTM D2680
Less than 8" - ASTM D2751

D. Black Steel Pipe - Certification outlined under ASTM A53.

E. Cast Iron Soil Pipe - Inspect and test CISP in accordance with ASTM A74.

F. Copper Pipe - Inspect and test CUP in accordance with ASTM B88.

G. Polyethylene Pipe - Inspect and test PE Pipe in accordance with ASTM D1248.

H. Polyvinyl Chloride Pipe - Test as follows:

Test	In Accordance with
Quick Burst	ASTM D1599
Sustained Pressure	ASTM D1598
Acetone Immersion	ASTM D2152

I. Ductile Iron Pipe - Inspect and test DIP in accordance with AWWA C151.

J. Reinforced Concrete Pipe and Prestressed Concrete Cylinder Pipe - Test RCP and PCCP by plant load bearing tests, material tests, concrete cylinder or core tests and inspect completed product.

K. Vitrified Clay Pipe - Test VCP for crushing strength, absorption and acid resistance in accordance with ASTM C301.

L. Additional Testing - In addition to the test required above, Owner may perform additional testing on pipe delivered to the Project site.

1.04 SUBMITTALS

A. See Section 01300.

B. Brochures containing complete information and instructions pertaining to the storage, handling, installation, and inspection of pipe, fittings and joints furnished.

C. Test certificates for the manufacturers' tests required under Paragraph 1.03.

D. Pipe manufacturers' Certificates of Compliance on pipe, with each lot of pipe supplied. Immediately turn certificates over to Engineer. Materials delivered to the site without accompanying certificates will be subject to rejection.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Each length of pipe delivered to the site shall be clearly marked with the name of the manufacturer, class of pipe and pipe diameter. PVC sewer pipe shall be marked with the legend "Type PSMDR 35 PVC Sewer Pipe." Store in accordance with manufacturer's approved instructions.

B. Carefully handle all pipe and fittings when loading and unloading. Lift pipes and fittings by hoists or lower on skid-ways in a manner to avoid shock. Lower pipe into trench with derricks, rope or other suitable equipment.

C. Do not dump or drop pipe and fittings. Those that are dumped or dropped are subject to rejection by Engineer.

D. Ship and store vitrified clay pipe on unit pallets.

E. Store PVC pipe under canvas or other opaque material which will allow air circulation but will eliminate the direct rays from the sun.

F. Apply one coat of primer and solvent cement to all butt ends of ABS pipe when pipe arrives.

G. Comply with all other recommendations of the manufacturers.

PART 2 - PRODUCTS

2.01 ALLOY STEEL PIPES

A. Pipe - ASTM A53, nickel copper alloy steel, standard weight, galvanized.

B. Fittings - ANSI B16.3, 150 psi, galvanized, malleable iron.

C. Unions - AAR Standard, 300 psi, galvanized, malleable iron with bronze to iron seat.

D. Electrical Insulation - Flange insulation sets with full length sleeves, double washers and asbestos gaskets.

2.02 ACRYLONITRILE-BUTADIENE-STYRENE PIPE

A. Pipe - 8" and larger - ASTM D2680, less than 8" ASTM D2751.

B. Fittings - ASTM D2680, Solid wall ABS.

C. Joints - See PIPE SCHEDULE 02610-1.

1. Solvent Cement.

2. Push-on - "O-ring" gasket - ASTM C443.

D. Pipe Bedding – All bedding within the embankment shall be Earth Embankment Material as specified in Section 02260, and as detailed on the Drawings, except on rock, or where otherwise specified or when directed by Engineer.

2.03 DUCTILE IRON PIPE

A. Pipe - AWWA C151, laying lengths, except for closures and specials, shall be a minimum of 18'.

B. Fittings - AWWA C110, grey cast iron or ductile iron rated at 250 psi, unless otherwise noted.

C. Joints - See PIPE SCHEDULE 02610-1.

1. Mechanical - AWWA C111.

2. Push-on - AWWA C111.

3. Flanged - Specially designed long hub screw flanges, face drilling to ANSI B.16.1, Class 125 template for use with AWWA C110 fittings. Flanges shall be shop assembled. Pipe barrels shall be threaded and flanges power-tightened on. Flange faces and pipe ends shall be refaced after assembly, plain face, smooth finish. All pipe threads shall be covered by the flange. Gaskets shall be factory cut, 1/16" thick, flat ring, cloth inserted rubber conforming to ANSI B16.221, 125 pound cast iron joint. Bolts shall be carbon steel, ASTM A307, Grade A, square head machine bolts with heavy steel hexnut. Bolt size and length shall conform to ANSI B16.1 for 125 pound cast iron joints, plain face, smooth finish.

4. Mechanical, Restrained - AWWA C106, except, provide mechanical joint retainer gland with set screws in lieu of follower gland.

5. Ball and Socket - ANSI A21.10, maximum 15 deflection.

D. Class - See PIPE SCHEDULE 02610-1.

E. Couplings

1. Sleeve type coupling - Cast iron coupling for plain end ductile iron pipe. Style 53 by Dresser Manufacturing.

F. Lining - See PIPE SCHEDULE 02610-1.

1. Bituminous per AWWA C151.

2. Cement Mortar with bituminous seal coat per AWWA C104.

G. Coatings - Bituminous per AWWA C151.

2.04 POLYETHYLENE PIPE (PE)

A. Pipe and Fittings - ASTM D1248.

B. Joints - Thermal butt-fusion in accordance with the pipe manufacturer's recommendations.

2.05 POLYVINYL CHLORIDE PIPE

A. NSF Seal - Pipe shall bear National Sanitation Foundation Seal of approval.

B. Pipe and Fittings - See PIPE SCHEDULE 02610-1.

1. ASTM D2241 and ASTM D1784, Type 1, Grade 1 PVC. Laying lengths, except for closures and specials, shall be a minimum of 20 feet, plus or minus one inch.

2. ASTM D1785, Type 1, Schedule 80 pipe - ASTM D2464 threaded fittings - ASTM D2467 socket type fittings.

3. ASTM F789, Type PS-46, ASTM D3212 elastomeric gaskets. Laying lengths not greater than 12.5 feet, plus or minus one inch.

4. ASTM D3034, Type PSM, ASTM D3212 elastomeric gaskets. Laying lengths not greater than 12.5 feet, plus or minus one inch.

5. AWWA C900, ASTM D3139 elastomeric gaskets. Laying lengths, except for closures and specials, shall be a minimum of 20 feet, plus or minus one inch.

6. AWWA C950, with elastomeric gaskets. Laying lengths, except for closures and specials, shall be a minimum of 20 feet, plus or minus one inch.

C. Joints - See PIPE SCHEDULE 02610-1.

1. Rubber sealing ring allowing expansion and contraction at each joint and supplied by the pipe manufacturer. Bell joint integral with the pipe shall be wall thickened so that standard dimension ratios are maintained or exceeded.

2. Solvent Cement - ASTM D2564.

3. Screwed - ASTM D1785 and D2464.

4. Flanged - Flanges shall be screwed, with smooth or O-ring grooved faces as required to match companion flange, complete with gasket and bolts.

D. Pipe Bedding - Six-inch minimum sand shield all around, as detailed on the Drawings.

2.06 REINFORCED CONCRETE PIPE

A. Circular Pipe and Fittings - ASTM C76, Wall B - elliptical reinforcement is prohibited.

B. Elliptical Pipe and Fittings - ASTM C507.

C. Joints - Circular Pipe.

1. For sanitary sewers, pipes shall have bell and spigot ends with joints formed of steel joint rings sealed with a round rubber "O" ring gasket conforming to AWWA C302. Field performance and acceptance tests shall be as specified in ASTM C425. After joints are made and inspected, fill inside and outside of joint with a fibrated asphalt mastic.

2. For storm drains, pipes shall have bell and spigot or tongue and groove ends with joints sealed with a round rubber "O" ring gasket. Design of joints and physical requirements for rubber gaskets shall conform to ASTM C443, except that the Shore durometer hardness shall be 40-55.

D. Joints - Elliptical Pipe - Completely fill inside and outside of joints with fibrated asphalt mastic.

E. Fibrated Asphalt Mastic - Trowel mastic conforming to Federal Specification SS-C-153, Type 1, as manufactured by Flintkote, Barrett, Koppers, or an approved equal.

F. Minimum Laying Lengths - 6' for 12" and 15" pipe and 8' for 18" and larger pipe. Equivalent diameters apply to elliptical pipe.

G. Class - As shown on the Drawings.

2.07 PRESTRESSED CONCRETE CYLINDER PIPE

A. Pipe and Fittings - In accordance with AWWA Specifications C-301, latest revision; and designed for ASTM C-76 equivalent class.

B. Joints - Bell and Spigot ends. Line Spigot end with concrete on its interior surface. Cover Bell Ring with mortar on its exterior surface. Each pipe shall be constructed with a self-centering expansion joint sealed with a rubber gasket.

2.08 COUPLINGS/FLEXIBLE CONNECTIONS

A. Sleeve Type Coupling - Style 38 by Dresser Manufacturing Division, Dresser Industries, Inc., or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Apply a second coat of primer and solvent cement to all butt ends of ABS pipe prior to installation.

B. Pipe installations are specified in other Division 2 Sections under which the pipes are furnished and installed.

3.02 FIELD QUALITY CONTROL

A. In the presence of Engineer, inspect each length of pipe delivered to the job for flaws, cracks, dimensional tolerances and compliance with the applicable specifications.

B. Provide Engineer with suitable templates, calipers, feeler gauges and other equipment for checking pipes

and fittings. Only pipes and fittings accepted by Engineer, and so marked, shall be installed in the Work.

PIPE SCHEDULE 02610-1

PIPE			MATERIALS			
Use	Size	Strength	Pipe/Joint	Lining	Coating	Fittings/Joint
Water Mains	4"+	Cl. 50	DI/PO	CM	BIT	CI or DI/MJ
		SDR 18	PVC/PO	--	--	CI or DI/MJ
	<4"	SDR 26	PVC/PO	--	--	CI or DI/MJ
Water Services	<2½"	SDR 26	CU/FL	--	--	CB/F1
Sewer Mains	All	ES	VC/PO	--	--	VC/C
		SDR 35	PVC/PO	--	--	PVC/PO
		STD	ABS/PO	--	--	ABS/SOL
		DTL	AC/PO	--	--	AC/PO
		Cl. 50	DI/PO	CM	BIT	CI or DI/MJ
	>15"	(*)	PCCP/BS	--	--	PCCP/BS
Force Mains	3"+	Cl. 50	DI/PO	CM	BIT	CI or DI/MJ
		SDR 18	PVC/PO	--	--	CI or DI/MJ
Force Mains	<3"	SDR 26	PVC/PO	--	--	CI or DI/MJ
Bridge Crossing	All	Cl. 50	DI/MJ	CM	BIT	CI or DI/MR
		3/8"	ST/W	--	BIT	--/W
Crossing Casing	All	3/8"	ST/W	--	BIT	--/W
Culverts	All	16 ga.	CM/CB	Gal/A	Gal/A	CM/CB
	All	(*)	RCP/BS	--	--	--
Drains	All	EH	CIS/C	CT	CT	CIS/C
River Crossings	All	Cl. 55	DI/BAS	CM	BIT	--

Pipe strengths shown are minimum. Stronger pipe may be used. Abbreviations used in this SCHEDULE are defined on the next page.

* Design for maximum trench loading which will be applied after backfill is in place.

PIPING ABBREVIATIONS

Strength		Linings and Coatings	
Cl	Class	A	Asphalt
DTL	Refer to Standard Detail 402-5		
EH	Extra Heavy	BIT	Bituminous
ES	Extra Strength	CM	Cement Mortar w/Bituminous Seal Coat
Sch	Schedule		
Std	Standard	CT	Coat Tar Pitch
SDR	Std Dim Ratio	Gal	Galvanized

Materials		Joint Types	
		BAS	Ball and Socket
AS	Alloy Steel	BS	Bell & Spigot
BS	Black Steel	C	Compression
CB	Cast Bronze	CB	Coupling Band
CIS	Cast Iron Soil	F	Flanged
CM	Corrugated Metal	Fl	Flared
CU	Copper	LO	Lead & Oakum
DI	Ductile Iron	MF	Mastic Filled
MI	Malleable Iron	MJ	Mechanical
PE	Polyethylene	MR	Mechanical, Restrained
PVC	Polyvinyl Chloride	PO	Push-on
RC	Reinforced Concrete	S	Solder
ST	Steel	Sc	Screwed
VC	Vitrified Clay	SCL	Sleeve Coupling
WCU	Wrought Copper	Sol	Solvent Cement
WSS	Welded Seamless Steel	W	Welded
ABS	Acrylonitrile-Butadiene-Styrene		

END OF SECTION

SECTION 02641 - BURIED VALVES AND STOPS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Work covered by this Section includes the furnishings and installation of underground gate and other valves, valve and service boxes, where shown on the Drawings and specified herein.

B. Provide all valves and auxiliary equipment required for complete and proper operation of all systems, whether or not they are specifically described.

C. Definitions: Valve - For purposes of this Section, valve means any valve specified in Part 2.

1.02 RELATED SECTIONS

A. Site Work - Division 2

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

A. Similar types of valves shall each be the product of a single manufacturer and the same models shall be identical, with all parts interchangeable.

B. Acceptable products are specified in Part 2. Equivalent products of other manufacturers will be acceptable.

C. Valves shall be of ample strength to withstand and operate satisfactorily under the specified pressures.

D. Unless otherwise specified, perform shop tests with a hydrostatic water pressure equal to twice the rated pressure. Any valve which leaks or shows sign of defects is not permitted.

1.05 SUBMITTALS

A. See Section 01300.

B. Annotate submissions with the valve designations assigned in this Section and on the Drawings.

C. Catalog cuts, with cut-aways, and technical data.

D. Manufacturer's Certification of Compliance.

E. Manufacturer's installation instructions, including any limitations on installation.

F. Operation, maintenance, and spare parts data.

1.06 DELIVERY, STORAGE, AND HANDLING

A. During delivery, storage and handling, keep valves tightly closed to prevent foreign matter from damaging seat faces.

B. Store valves in dry, enclosed areas, off the ground. If there is a likelihood of freezing, move materials to a warm area, or remove potentially dangerous moisture.

C. Verify compliance with Specifications at time of delivery.

1.07 GUARANTEE

A. For a period of 10 years from date of Substantial Completion, manufacturer shall repair or replace any resilient wedge gate valve which has been found defective in materials of workmanship under normal conditions of use and maintenance. Guarantee need not cover alterations made by Owner, damage from accidents, abuse, and vandalism, nor Acts of God. Manufacturer's liability shall be limited to the initial cost of valves and installation.

PART 2 – PRODUCTS

2.01 VALVES – GENERAL

A. Products - The types, sizes, acceptable manufacturers, and catalog numbers of required valves are specified in this Part. Where valves are required for proper operation or control, or where required by pertinent codes, regulations or ordinances, or where shown on the Drawings, yet not included, they shall be furnished and installed and shall be of the proper type, size, and construction, and of a quality equivalent to that established by the valves which are specified.

B. End Connections - Conform to the following:

1. Flanged Cast Iron - ANSI B16.1
2. Flanged Ductile Iron - ANSI B16.42

C. Pressure Rating - 150 psig (min.), non-shock W.O.G., unless otherwise noted.

2.02 GATE VALVES

A. Construction - Rising stem, ductile iron body, flange mounted gate valves. Valves shall be 150 pound unless the pipe to which the valve is attached has a higher class rating.

B. Operators:

1. Provide 2-inch by 2-inch operating nuts.
2. Unless those presently in service in the Community open clockwise, operating nuts shall be turned counterclockwise to open valves.
3. Provide extension rods to bring the operating nut to within one foot of finish grade.

C. Valve Boxes - Provide each buried valve with a valve box unless otherwise specified or required.

D. Indicators –

1. General - Buried valves with post indicators are specified or shown on the drawings, they shall be post indicator type valves and shall conform to the general requirements as listed above.

E. Packing - Valves shall be capable of being repacked under pressure.

2.03 MISCELLANEOUS FITTINGS

A. All adapters and miscellaneous fittings shall provide an adequate seal at the working pressure of the water main and shall be for commercial use.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify that all valves may be installed at the locations indicated on the Drawings, or where required, and that proper operation of the valves will be possible after installation.

B. In the event of interferences, immediately notify Engineer.

C. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

A. Clean all valves of foreign material, inside and out, with emphasis placed on bearing, machined and sliding surfaces.

B. Operate valves several times over the full range from wide open to completely closed. Make adjustments, as required, to attain smooth, easy and proper operation.

C. Adjust packings where required to insure a tight seal and proper operation. Replace defective packings.

D. Replace defective and poorly operating valves.

3.03 VALVE INSTALLATION

A. General - Install valves where shown on the Drawings, where required, or where directed by Engineer. Install in accordance with manufacturer's recommendations.

B. Underground Installations - Install valves in pipelines with operating nuts pointed vertically upward. Install valve and service boxes plumb and straight, taking extra care in maintaining alignment during backfilling. Install seals in each box joint and cover to exclude surface water and infiltration of dirt, silt, and other debris. Boxes which are out of plumb by more than 1" in 6' in any direction, or are misaligned, or make it difficult or impossible to operate a valve, are not permitted.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01600.

3.05 CLEAN AND ADJUST

A. After systems are pressurized, operate valves several times over the full range from wide open to completely closed. Make adjustments, as required, to attain smooth, easy, and proper operation.

B. Adjust packings where required to stop leakage and to secure proper operation.

C. Replace valves which are defective or do not operate properly, easily, and smoothly.

D. Lubricate valves, operators, and appurtenances which require lubrication.

END OF SECTION

SECTION 03100 - CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the furnishing, installation and removal of concrete forms for all cast-in-place concrete shown on the Drawings.

B. Related work specified elsewhere includes:

Concrete Reinforcement	03200
Cast-in-place Concrete	03300

1.02 QUALITY ASSURANCE

A. Provide at least one person who will be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of material being installed, the referenced standards and the requirements of this Work, and who shall direct all work performed under this Section.

B. Comply with all recommendations of American Concrete Institute publication ACI 347, "Recommended Practice for Concrete Formwork."

C. Design formwork to permit removal without damaging concrete and with sufficient strength and rigidity to sustain the dead weight of liquid concrete, together with other dead loads, live loads and other loads to which it will be subjected, without excessive deflection. Make forms tight enough to prevent leakage.

D. Floor and beam centering shall be crowned not less than ¼" in all directions for every 16' of span.

E. Accurately erect formwork to the lines and dimensions shown on the Drawings and straight, true, plumb and square to within a tolerance of one in 300 horizontally and one in 500 vertically. Finished concrete thickness shall be within ¼" of the required thickness, except where equipment and functional requirements necessitate closer tolerances.

F. Use clean, smooth forms, free from nicks, gouges and other defects which may affect appearance or the structural integrity of the concrete or the formwork.

G. Provide temporary openings at the base of wall forms, and at other points, where necessary to facilitate cleaning and inspection immediately prior to placing concrete.

H. Locate all built-in items and penetrations so as not to impair the strength or stability of any structural member of the formwork.

1.03 SPECIAL REQUIREMENTS FOR WATER PROJECTS

A. In areas which will or may be in contact with drinking water, the use of any material which is or may release any pollutant, contaminant, or toxic material, is not permitted.

1.04 SUBMITTALS

A. See Section 01300.

B. Catalog cuts and technical data on forms, form ties and form releasing agent.

C. When concrete surfaces are required to be painted or coated, a letter from the coating manufacturer attesting that the form releasing agent to be used is compatible with the coating material.

1.05 DELIVERY, STORAGE AND HANDLING

A. Use all means necessary to protect formwork materials before, during and after installation and to protect the installed work and materials of other trades.

1.06 SCHEDULING

A. Coordinate Work to allow complete installation of reinforcing steel, conduits, piping and other items of work.

B. Notify Engineer at least 24 hours prior to the installation of formwork and allow ample time for Engineer to inspect reinforcing steel and all other items of work to be embedded in concrete.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Forms - "Steel-Ply" by Symons Corporation, "Formguard" (Class I High Density Plyform) by Simpson Timber Company or an approved wood or metal equal.

B. Form Ties - Galvanized, "Waterseal Snap-ty" by Richmond Screw Anchor Company, an equivalent manufactured by Burke Concrete Accessories, Inc., or approved equal. After ties have been snapped, the remaining metal shall be no closer than 1½" from the surface. Tie wire is prohibited.

C. Form Releasing Agent - "Magic Kote" by Symons Corporation, "Burke Release" by Burke Concrete Accessories, Inc., or an approved equal. Releasing agents which will stain, or have any deleterious effect on concrete, or adversely affect the subsequent application or adhesion of paints, epoxies or other coatings, are prohibited.

D. Shores and Bracings - Use metal type adjustable shores for supports. Wood shores may be used in minor areas with Engineer's concurrence. Where wood shores are permitted, shores must be full height, without splices or use of Ellis type clamps, with the unbraced length not to exceed 50 times the least dimension of the wood shores. Where height of the shores exceeds ten (10) feet, provide adequate diagonal bracing in both longitudinal and transverse directions. In addition, provide adequate diagonal braces at the ends of the formwork. Extend diagonal bracing from the top to the bottom of the shores. Secure shores at the top and wedge at top or bottom, if required. Where shores rest upon the ground, provide mud sills or other bases for the support of the weight to be carried.

PART 3 - EXECUTION

3.01 PREPARATION

A. Make all necessary field measurements to ensure precise fit of all items.

B. Clean all forms and coat with form releasing agent prior to each use. Form releasing agent shall be applied prior to installation of reinforcing steel.

C. Prior to use in waterworks projects, verify that proposed materials comply with the requirements of Paragraph 1.03.

D. Do not close up formwork until Engineer has inspected the reinforcing steel, conduits, and other work to be embedded in concrete.

3.02 INSTALLATION

A. Construct forms to be sufficiently tight to prevent leakage of mortar and to be able to withstand all loads without deflecting beyond allowable limits.

B. Install forms to the shapes, sizes, lines, and dimensions indicated on the Drawings.

C. Coordinate and perform all forming and do all cutting and repairing of forms required to accept built-in and embedded items.

D. Set all required waterstops, pipe sleeves, frames, angles, grilles, bolts, inserts and other items required to be embedded or anchored in the concrete. Accurately set anchor bolts with a template.

E. Securely shore, brace and tie the forms together so as to maintain position and shape, to prevent displacement, and to ensure safety to personnel, equipment and work completed or in progress.

F. Arrange formwork to minimize joints, utilize minimum 48" wide forms where possible.

G. Form corners of columns, girders, beams, walls projecting beyond masonry, and similar exposed corners with a 1.5" chamfer by inserting triangular chamfer strips within the forms, except where the Drawings specifically require a chamfer of a different size or state that chamfering is to be omitted.

3.03 REMOVAL OF FORMS

A. Remove so as not to spall off or cause injury to concrete. Hammering or prying against concrete is prohibited.

B. Remove metal spreader ties on concrete walls by snapping off inside the wall surface.

C. The following table indicates the minimum length of time before forms may be removed. This table is general in nature and shall not be construed as representing safe waiting periods. Do not remove forms before concrete has attained sufficient strength to support its own weight, together with any construction loads or other loads to which it may be subjected.

MINIMUM FORM REMOVAL TIMES

Avg. Ambient Temperature	Walls	Columns	Beams*	Slabs*
Above 90 F	4 days	4 days	8 days	8 days
40 -90 F	1 day	1 day	4 days	5 days
Below 40 F	Do not remove forms until site-cured test cylinder develops 50% of 28-day strength, and in no case, sooner than time required for 40 -90 F temperature.			

* Note - Do not remove shoring and formwork for beams and slabs until site-cured cylinders have attained a strength of at least 3000 psi.

END OF SECTION

SECTION 03200 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the furnishing and installation of all concrete reinforcement shown on the Drawings.

B. Related work specified elsewhere includes:

Concrete Formwork	03100
Cast-in-Place Concrete	03300

1.02 QUALITY ASSURANCE

A. Provide at least one person who shall be present at all times during the execution of this portion of the Work and who shall be thoroughly familiar with the type of materials being installed, the referenced standards and the requirements of this Work, and who shall direct all work performed under this Section.

B. Comply with all recommendations of American Concrete Institute publication ACI 315 "Manual of Standard Practice For Detailing Reinforced Concrete Structures."

1.03 SUBMITTALS

A. See Section 01300.

B. Name of Manufacturer.

C. Certified Mill Test reports, one for each size of bar per shipment.

D. Manufacturer's Certification that reinforcement meets Specification requirements.

E. Shop Drawings showing dimensions, spacing, bar and mesh schedule, bending details, stirrup and support details, and other pertinent data.

1.04 DELIVERY, STORAGE AND HANDLING

A. Storage facilities shall afford easy access for inspection and identification of materials.

B. Store reinforcement off the ground, under cover, and protected from oil, paint, grease, dirt, and other deleterious materials, and from distortion.

C. In the event of damage, make necessary repairs and replacements.

1.05 SCHEDULING

A. Allow not less than 12 hours for Engineer to complete the inspection of reinforcing.

B. Before placing reinforcement for slabs on grade, all piping, conduit and other work below the slab shall be in place and shall have received and passed all required tests and inspections.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars - ASTM A-615, Grade 60. Stirrups and ties shall be Grade 40.

B. Reinforcing Wire - ASTM A-82.

C. Wire Fabric - ASTM A-185.

D. Supporting Devices - galvanized or non-rusting type. Use plastic tipped accessories in concrete exposed to weather, water or view.

2.02 FABRICATION

A. Accurately fabricate to the details and dimensions shown on the Drawings.

B. Reinforcing bars shall be bent cold and shall not be bent or straightened in a manner which will injure the material's properties.

C. Bend all reinforcement in accordance with ACI 318.

PART 3 - EXECUTION

3.01 INSPECTION/PREPARATION

A. Examine reinforcing to insure compliance with the Specifications.

B. Remove all dirt, oil, grease, paint, loose rust, and other deleterious materials from reinforcing prior to setting. Maintain reinforcing in a good, clean condition.

C. Do not install reinforcing until conditions are satisfactory.

3.02 INSTALLATION

A. Accurately position reinforcement and firmly support and wire together to prevent displacement or distortion.

B. Install wire mesh with joints lapped one full mesh, plus two inches, and support at proper height.

C. Stagger splices in reinforcing bars and conform to minimum lengths for splices in accordance with ACI requirements and as indicated on the Drawings.

D. Place dowels and anchor them into position.

E. Provide proper cover around reinforcement, as indicated on the Drawings, or in conformance with ACI requirements when not shown.

F. Placement of reinforcement after concrete has been placed is prohibited.

G. For columns and piers, dowels shall be held rigidly in place by templates. Install reinforcement with proper ties and laps and provide with footing dowels before columns or piers are placed. Lap splices sufficiently to transfer the full stress by bond. (Minimum 30 bar diameters).

3.03 OBSTRUCTIONS

A. In the event conduits, piping, inserts, sleeves or any other items interfere with the placing of reinforce-

ment, as indicated on the Drawings or as otherwise required, consult Engineer for required changes.

3.04 PROTECTION

A. Protect installed reinforcing from damage and displacement before, during, and after placement of concrete.

3.05 ADJUST AND CLEAN

A. Repair or replace all damaged, distorted or displaced reinforcement.

B. At the time concrete is placed, all reinforcement shall be free from dirt, mud, ice, rust, scale, loose mill scale, oil, paint and all other coatings which may destroy or reduce bond between steel and concrete.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the furnishing and installation of cast-in-place concrete, where specified, and shown on the Drawings.

B. Related work specified elsewhere includes:

Testing Laboratory Services	01410
Concrete Formwork	03100
Concrete Reinforcement	03200

1.02 QUALITY ASSURANCE

A. Provide at least one person who shall be present at all times during the execution of this portion of the Work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all work performed under this Section.

B. For finishing of exposed concrete, use only thoroughly trained and experienced concrete finishers.

C. Comply with all recommendations and requirements of ACI Publication ACI 350, "Building Code Requirements for Reinforced Concrete."

1.03 SOURCE QUALITY CONTROL

A. Procure concrete from a single approved central commercial batching plant conforming to "Concrete Plant Standards" of the Concrete Manufacturer's Association.

B. To further insure uniform consistency, coloring, finish, and quality, all aggregates, cement, water and other ingredients shall each be secured from the same source for the duration of the Project.

C. The concrete batching plant, and the raw material, will be subject to inspections and tests performed by Engineer.

D. Provide proper facilities at the plant for Engineer or the testing laboratory to secure samples, to inspect

ingredients and processes used in batching, and methods of delivering.

1.04 DESIGN MIXES

A. At least 35 days prior to the initial placement of concrete, submit concrete design mixes to Engineer for his acceptance. Except where otherwise specified, the design of mixes shall be in accordance with ACI 211.1.

B. Submit the following with the Design mixes:

1. Mix proportions.

2. Source of cement, type, brand and certified copies of Mill reports, including physical and chemical analyses.

3. Source of Pozzolans, type and results of tests made in accordance with ASTM C-618.

4. Source of fine aggregates and results of tests made in accordance with ASTM C33 and ASTM C40.

5. Sources of coarse aggregates and results of tests made in accordance with ASTM C33.

6. For each mix proposed, make and cure four standard 6" dia. concrete test specimens in the lab in accordance with ASTM C192. Furnish compression test results made in accordance with ASTM C39. Break two cylinders at 7 days and two at 28 days.

7. Copies of 7-and 28-day compression test results from other recent projects for which the specified concrete mix was used.

8. Copies of other test results, required by Engineer, to determine compliance.

C. Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with this Specification.

D. Engineer will accept the use of previously established design mixes if all test results made within the last six months by a recognized testing laboratory, are positive and provide sufficient evidence of full compliance with this Specification. If Engineer determines that insufficient documentation and test results

exist, he may request additional testing or he may request a new design mix with complete testing.

E. If the adopted mix fails to produce concrete meeting the requirements for strength and place-ability, Engineer may order additional cement or adjustments to mix proportions.

1.05 SUBMITTALS

A. Name, address and telephone number of concrete supplier and the batching plant.

B. Concrete design mix, material test reports and other data required under Paragraph "DESIGN MIXES".

C. Methods for conveying and placing concrete.

D. Transit-mix Delivery Slips.

E. Gradations of aggregates.

F. Catalog cuts, technical data and manufacturers' recommendations on quantities and use of admixtures.

G. Copies of water analyses, if required under Paragraph MIXING WATER.

H. For water stops, submit:

1. Samples and catalog cuts.

2. Manufacturer's installation and splicing instructions.

3. Shop drawings showing lengths, locations and proposed splices of water stops.

I. Reports of inspections and tests at the concrete batching plant.

J. Certified records of the weights of all materials batched and furnished for the Work.

K. Catalog cuts, technical data and manufacturer's recommendations on quantities, use and applications of grouts, adhesives, hardeners, and other materials proposed for use.

L. Drawings showing locations of all proposed construction joints.

M. Description of hot and cold weather practices to be employed.

N. All records and laboratory test results required under Paragraph "FIELD QUALITY CONTROL."

1.06 DELIVERY, STORAGE AND HANDLING

A. Afford easy access to storage facilities for inspection and identification of shipments.

B. Store cement off the ground in a dry, weatherproof, adequately ventilated structure with provisions to prevent the absorption of moisture.

C. Store aggregates in a manner to assure good drainage, to preclude the inclusion of foreign matter, and to preserve the gradation. Separate each size group by means of bulkheads between the separate piles.

D. Transport dry concrete batches from the central plant to the site in approved truck mixers. Mixers shall conform to the requirements of the Truck Mixer and Agitating Standards of the Truck Mixer Manufacturer's Bureau, with attached manufacturer's plate stating capacity and drum speeds, and a drum revolution counter.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Only place concrete when environmental conditions are satisfactory. Do not place concrete when conditions may adversely affect the placing, finishing or curing of concrete, or its strength.

B. Do not place concrete when the ambient temperature is below 40 F or when the concrete temperature exceeds 85 F. Under certain circumstances, Engineer may accept the placement of concrete under the above conditions, provided the procedures of ACI 305R and ACI 306R are strictly adhered to.

1.08 SPECIAL REQUIREMENTS FOR WATER PROJECTS

A. In areas which will or may be in contact with drinking water, the use of any material which is or may release

any pollutant, contaminant, or toxic material, is not permitted.

1.09 SCHEDULING

A. Notify Engineer at least 48 hours in advance of intent to place concrete.

PART 2 - PRODUCTS

2.01 CONCRETE

A. Unless otherwise specified, all REINFORCED concrete shall be Class A.

B. Unless otherwise specified, all UN-REINFORCED concrete shall be Class C.

C. Classes of concrete are:

Property	Class A	Class B	Class C
28 Day Compressive Strength (psi)	4,000	3,500	3,000
Max. Water-Cement Ratio (lb./lb.)	0.44	0.49	0.50
Min. Cementitious Materials (lbs./C.Y.)	660	611	564
Entrained Air Content(%)	5-7	4-6	3.5-5.5
Slump (Inches)	2-4	2-4	2-4

2.02 CEMENT

A. Portland Cement - ASTM C150, Type II unless otherwise specified.

B. Use of air-entraining or other types of cements is prohibited without the prior acceptance of Engineer.

C. Use only one brand of cement. Color variations which prejudice the appearance of exposed concrete is deemed unacceptable.

2.03 AGGREGATES

A. Fine Aggregate - ASTM C33.

B. Coarse Aggregate - ASTM C33, 1-1/2" maximum size for structural concrete.

2.04 ADMIXTURES

A. Air Entraining - "Use Darex AEA", by W.R. Grace, "Pozzolith MB-VR" by Master Builders or approved equal and shall conform to the requirements of ASTM 260.

B. Water Reducing Retarder Shall meet the requirements of ASTM C-494. Use “Plastiment" by Sika Chemical Corporation, "Pozzolith 322N" by Master Builders, or approved equal. Quantity of retarder to be added per sack of cement shall be as recommended by the approved manufacturer for general use and as required to suit actual ambient or mix temperatures.

C. Water Reducing - Water reducers shall conform with ASTM C-494. High-Range water reducing admixtures (superplasticizers) shall be used at the contractor’s discretion. Where a superplasticizer is used it shall conform to the requirements for Type F or Type G admixtures. No water may be added after superplasticizer is mixed in, which shall be done on site. Where a mid range water reducer is used, it shall conform to the requirements for Type A, Type D, Type F, or Type G. The type selected shall be determined by the Contractor for his placing conditions and mix design. Contractor shall use only mid range water reducers for trowel-finished flatwork.

D. Pozzolans - Pozzolans and fly ash shall conform to the requirements of ASTM-C618 and AASHTO M 295. The supplier shall provide the Engineer with the test results of the ten consecutive samples preceding the one submitted for approval to demonstrate compliance with the uniformity requirements shown in Table 2 of AASHTO M 295.

The Contractor shall provide suitable means for storing and protecting the pozzolans from contamination with foreign materials. Fly ash containing oil shall be rejected.

The combining of different types of fly ash or the mixing of the same type of fly ash from different sources will not be permitted.

The Contractor shall substitute 20 percent of the required Portland Cement with fly ash. The fly ash shall be substituted at a ratio of 1 kg (1 pound) of fly ash for 1 kg (1 pound) of Portland Cement. Fly ash shall not be substituted for Type IP cement.

When any pozzolan is incorporated into a standard class of concrete, necessary adjustments to the mix design shall be made by the Contractor and approved by the Engineer. Proportioning of the concrete mixtures containing pozzolan shall be by the absolute volumes method in accordance with the requirements for each class as specified in specification Section 03300, paragraph 2.01 B. except that the listed water-cement ratio shall be based on total cementitious material (Portland Cement and fly ash).

The use of pozzolans during cold-weather concreting is discouraged. When pozzolans are used during cold-weather concreting an additional test cylinder shall be cast as a field-cure, and left on site for 7 days. The field-cure shall be broken at 28 days with its results compared to the lab-cures.

2.05 MIXING WATER

A. Water shall be fresh, clean and potable.

B. Should Engineer question the suitability of the water, Contractor shall have it tested in accordance with AASHTO T-26.

2.06 NON-SHRINK GROUT

A. “Sikagrount 212" by Sika Chemical Corp. or approved equal.

B. Use the proper type of grout for the intended service and use for grouting equipment, anchor bolts, dowels, bearing plates and similar applications where the grout is confined and where shrinkage must be eliminated.

2.07 WATERSTOPS

A. Hydrophilic: “Greenstreak Model 594 Swell-Stop", “Volclay, Waterstop RX-101, or approved equal.

B. Split Flange PVC: “Greenstreak Model 724” or approved equal.

C. Single Flange PVC: “Greenstreak Model 703” or approved equal.

D. PVC waterstops shall be welded with special waterstop iron and butt-spliced.

2.08 CURING COMPOUND

A. Wet curing methods are to be used unless directed otherwise by Engineer. When approved, curing compound shall be Type I, meeting the requirements of ASTM 309.

2.09 PREMOLDED ASPHALT EXPANSION JOINTS

A. Joint - Asphalt with vegetable fibers, mineral fillers and two asphalt-saturated felt liners, complying with ASTM D994.

B. Uses - Provide at joints in and between sidewalks, driveways, curbs, castings, hydrants, building walls, steps, and at other locations shown on the Drawings.

C. Dimensions - Unless otherwise shown on the Drawings: Thickness = ½" Depth = Thickness of concrete minus ¼".

2.10 EPOXY ADHESIVE

A. "SIKAFLEX-1a" by Sika Chemical Corp., or approved equal.

B. Follow manufacturer’s instructions pertaining to drill bit size, hole preparation and setting instructions. Consult Engineer for embedment lengths.

C. "SIKADUR HI-MOD" by Sika Chemical Corp., "A-H Poly-epoxy Bonding" by Anti-Hydro Waterproofing Co., or approved equal.

2.11 MIXING CONCRETE

A. Transit-mix concrete in accordance with ASTM C94.

B. Transport dry concrete batches from the batching plant and add mixing water at the Project site.

C. Do not mix or agitate batches of greater volume than maximum capacities on the manufacturer's rating plate.

D. Mix or agitate at drum speeds within rating plate tolerances, not exceeding the following limits:

1. Mixing - 4 RPM to a maximum drum speed which will result in a peripheral velocity of the drum of 225 f.p.m. at its largest diameter.

2. Agitating - 2 RPM to 6 RPM.

E. Continue mixing until a uniform concrete is produced, with a minimum of 100 revolutions to the drum. The use of concrete which cannot be uniformly mixed, by mixing in 15 minutes or less, is prohibited.

F. When Type II cement is used, elapsed time between initial contact of the cement with water and the completed discharge of the batch at the Project site shall not exceed 1½ hours or 300 revolutions of the drum, whichever comes first. Reduce the above limits when conditions result in quick-stiffening of the concrete, or when directed by Engineer.

G. Retempering of concrete is not permitted.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect the formwork and verify that it has been properly set and is ready for the receipt of concrete.

B. Verify that all reinforcing has been properly set and secured and that items to be embedded in, built-in, or pass through concrete are at their proper locations and elevations.

C. Before placing concrete, verify that all piping, conduits and other work to be installed within concrete or below slabs on grade have been installed and have received and passed all required tests and inspections.

3.02 PREPARATION

A. Remove all wood and wood scraps, sawdust, hardened concrete, construction debris, ice, snow, and other foreign materials from and between forms and from other areas in which concrete will be placed.

B. Remove water from forms and excavations and divert flows of water to avoid washing over, under or through freshly deposited concrete.

C. Earth foundations to receive concrete shall be clean, undisturbed surfaces, free from frost, snow, ice, mud, debris and standing or running water.

D. Rock foundations shall be approximately level and sufficiently rough for satisfactory bond with the concrete. Clean out faults and seams and clean rock surfaces of objectionable coatings and materials which may reduce bonding of the concrete to the rock.

E. During cold weather, provide an equivalent of 3½' of earth over and adjacent to all footings to keep soil from freezing beneath footing bottoms.

F. Thoroughly clean all areas to receive concrete to ensure proper placement and bonding of concrete.

G. Thoroughly clean concrete transporting and handling equipment. Prepare runways for wheeled equipment. Wheeled equipment shall not run upon, nor shall runways or supports bear upon, reinforcing steel or fresh concrete.

H. Verify that environmental conditions are and will remain satisfactory throughout the period when concrete will be placed, finished, and cured.

I. Should Engineer approve the placement of concrete during inclement weather, store required protective materials on site, ready for use.

J. Verify all scheduling to ensure that the concrete will be placed continuously, without delay or interruption.

K. Verify that Engineer has completed all tests and inspections and that he poses no objections to the placement of concrete.

3.03 BUILT-IN ITEMS

A. General - Make all necessary provisions for the forming and setting of all items to be built into concrete work. Locate items so that they will not impair the strength or stability of any structural member.

B. Pipe and Conduit in Slabs - In structural slabs less than 4" thick, pipes or conduits having "D" over 1" are prohibited. "D" is the maximum outside diameter or dimension of the pipe or conduit. In structural slabs 4" and thicker, "D" shall not exceed 1-3/8 inches. Where pipe and conduit are permitted in the slab, the center-to-center spacing shall not be closer than 3 "D" and in no case, less than 2 inches clear.

C. Junction Boxes in Slabs - Junction boxes are not permitted in structural slabs less than 4" thick. Junction boxes in slabs 4" and thicker shall not exceed 4½" in width and length, and 2" in depth. When placed flush with the bottom in the middle half of the span of 1-way or 2-way slabs, the boxes shall be separated by at least 6" of concrete. When placed outside the middle half of the span, they shall be separated by at least 2" of concrete.

D. Openings in Slabs - Provide openings and depressions in slabs to the sizes and at the locations shown on the Drawings. Where pipes, conduits, or other work pass through openings, fill annular spaces with a silicone sealant.

3.04 PLACING CONCRETE

A. Weather Conditions - Do not place concrete when weather conditions are not suitable for the proper placing, finishing or curing of the concrete. Unless otherwise accepted by Engineer, place concrete only during dry weather. In the event of sudden rainstorms, cover exposed, freshly placed concrete and protect from damage. When cold or hot weather concreting is accepted by Engineer, comply with Paragraphs COLD WEATHER PLACEMENT and HOT WEATHER PLACEMENT.

B. Consistency and Quality of Concrete - Mix, transport, and place concrete so as to maintain proper consistency, to avoid segregation, and to insure placement in final position before initial set takes place. Retempering of concrete is prohibited. Control the rate of placement so that the concrete remains plastic and flows readily into spaces between the reinforcing bars, and can be worked into corners and around inserts without forming voids.

C. Conveying and Placing Concrete - Convey concrete to the forms as rapidly as practicable, utilizing methods which will not cause segregation or loss of ingredients. Free fall from mixer or truck to conveyance

shall not exceed 3'. When placing concrete in final position, the free fall shall not exceed 5'. Place concrete in approximately 2' horizontal layers and avoid the formation of cold joints and poorly bonded sections between layers. The horizontal distribution of concrete by spading or vibration is prohibited.

D. Vibration - Unless otherwise specified or directed by Engineer, vibrate all reinforced concrete. Use only approved mechanical vibrators operated by experienced operators. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Vibrate concrete sufficiently to produce satisfactory consolidation without causing objectionable segregation. Manually shake reinforcing bars to insure bond with the concrete. It is prohibited to use vibrators to transport concrete in the forms and to insert them into lower layers of concrete that have begun to set.

3.05 COLD WEATHER PLACEMENT

A. Unless authorized in writing by Engineer, do not place concrete when the ambient temperature is below 50 F., nor when concrete is likely to be subjected to freezing temperatures before expiration of the curing period.

B. Where cold weather placement is accepted, comply with the recommended practices of ACI 306. Provide enclosures, insulating materials, supplemental heat, and other materials, as required to protect the concrete from damage by freezing.

C. The placement of frozen concrete, or fresh concrete on or against any surface which is frozen or contains snow or ice, is not permitted.

D. The use of salts or chemicals to melt ice or snow in the forms, on concrete, or on the ground, is prohibited.

3.06 HOT WEATHER PLACEMENT

A. Unless approved in writing by Engineer, do not place concrete when the temperature of the concrete is 90 F or greater.

B. When the temperature of the concrete approaches or exceeds 90 F, comply with the recommended practices of ACI 305.

3.07 CONSTRUCTION JOINTS

A. General - The approximate locations of all construction joints are indicated on the Drawings. Submit shop drawings of actual locations and methods of forming well in advance. Locate joints so as not to impair the strength and appearance of the structure and make provisions for the transferring of shear and other forces through construction joints.

B. Columns, Piers and Walls - Make joints in columns and piers at the underside of the deepest girder or beam framing. Terminate the lifts of individual pours, in walls having door and window openings, at the top or bottom of opening, rather than in between. Terminate other lifts at such levels as are indicated or as required to conform to structural requirements or architectural details, or both.

C. Floor Systems - Thoroughly clean all dowels and other projecting reinforcing of concrete before a floor system is placed. Girders, beams, column capitals, and haunches are considered as part of a slab system and shall be placed monolithically therewith. Do not place floor systems until at least 2 hours after the floor system supports have been placed.

D. Maximum Spacing of Joints - Unless otherwise accepted by Engineer, the distance between construction joints shall not exceed the following:

1. Walls and Grade Beams – Twenty (20) feet in any direction.

2. Foundation Slabs and Slabs on Grade - Forty (40) feet.

3. Structural Slabs - Forty (40) feet.

E. Bulkheads - Should the placing of concrete be interrupted for more than 30 minutes, provide temporary vertical bulkheads at the point of maximum moment or minimum shear. At the end of each day's operation, provide plumb bulkheads for joints, at right angles to the plane of stress, located at points of maximum moment or minimum shear. Provide shear bars and keys in beams and slabs, as shown on the Drawings or directed by Engineer.

F. Foundation Slabs and Slabs on Grade - Reinforcing steel shall be continuous through construction joints and adequately supported above the subgrade at all times.

G. Waterstops - Provide waterstops at construction joints in watertight construction and where indicated on the Drawings. Watertight construction means construction which has at least one of its sides in contact with a liquid. Install waterstops to form a continuous watertight seal in the joint and adequately support and protect them during the course of the Work, to insure proper location and function. Install waterstops in as long lengths as practicable. Where joints are required, join waterstops with chemicals or heat and comply with manufacturer's splicing instructions. Water stops in floor and wall joints shall be bonded to waterstops in wall footings.

3.08 BONDING

A. Construction Joints - Before depositing new concrete against concrete which has set, clean surfaces of the set concrete, remove laitance, foreign matter and loose particles, and thoroughly retighten the forms against the previously placed concrete. At vertical joints, slush the surfaces of the set concrete with a grout coat of neat cement. At horizontal surfaces, place a ½" minimum thick coat of plastic cement-sand grout (1:3 mix). Place new concrete before the grout applications have attained their initial set.

B. Existing Concrete Surfaces - Before depositing new concrete against existing concrete surfaces, thoroughly clean existing surfaces of all foreign matter and loose particles and coat them with an epoxy adhesive in accordance with the accepted manufacturer's instructions.

3.09 CURING CONCRETE

A. General - Cure concrete by any of the following methods or combinations thereof. Modify or augment these methods, or adopt additional protective measures, when required to compensate for changes in humidity, temperature, wind, or other conditions. Minimum curing period shall be 7 days.

B. Water Curing - Water curing during cold weather concreting is not permitted. Water curing is mandatory for all channels, tanks and structures which will

contain a liquid. Continuously keep concrete surfaces wet by covering with water, by continuous fog spraying, or by covering with burlaps, cotton mats, or other approved material thoroughly saturated with water and kept wet by intermittent hosing. Protect water cured concrete against freezing for the full curing period specified.

C. Curing Compounds - The use of curing compounds is not permitted during hot weather concreting, when they are incompatible with subsequent coatings, and on water-works projects when they may release pollutants, contaminants, or toxic materials.

D. Waterproof Paper and Sheeting - Slabs, mats and other horizontal surfaces may be covered with non-staining reinforced Kraft paper, polyethylene sheeting not less than 0.004 inch thick, or Kraft paper coated with not less than 0.002 inch thick polyethylene sheeting. Completely cover surfaces, with edges and ends lapped at least 4 inches and sealed with a mastic or pressure-sensitive tape. Secure sheeting to avoid displacement. Immediately repair tears or holes appearing during the curing period.

3.10 PATCHING CONCRETE

A. General - As soon as forms are removed, patch and repair tie holes and other surface defects.

B. Epoxy Coated Surfaces - Patching of surfaces to receive epoxy coatings is specified in Paragraph "FINISHING CONCRETE (OTHER THAN FLOORS)."

C. Preparation - Do not do any patching until all honeycomb and laitance have been cut out to solid concrete. If chipping is necessary, chip areas to be patched to a depth of at least 1", with edges regular and perpendicular to the surface, or slightly undercut. Thoroughly wet the prepared areas, including the area 6" all around each prepared area, just before applying the patching mortar.

D. Mortar - Mortar for patching shall be of the same materials and proportions used for the concrete, except that the coarse aggregate shall be omitted and a sufficient amount of white cement shall be substituted for the grey cement in order to produce a patch whose color matches the color of the surrounding surfaces. Mortar shall not be thicker than 1 part cement to 3 parts

sand. Keep mixing water to a minimum. Retemper mortar, without addition of water, by occasional mixing to prevent setting. Using mortar which has begun to set or is more than 1 hour old is not permitted.

E. Application of Mortar - Thoroughly compact mortar into place and screed to leave the patch slightly higher than the adjacent surface. Leave undisturbed for one or two hours to permit initial shrinkage before being finally finished to match adjoining work. Patches exceeding 1" in depth shall be filled to within 1" of the surface and, after sufficient time has elapsed for shrinkage, final patching shall proceed. Keep all patches wet for at least 5 days.

F. Tie Holes - Except where surfaces will be epoxy coated, solidly fill all holes left by bolts or ties with mortar. Holes passing entirely through the wall shall be filled from the inside face with a device that will force mortar through to the outside face, using a stop held at the outside face to insure complete filling. Holes not passing entirely through walls shall be packed full. Strike off excess mortar flush with a cloth.

3.11 FINISHING CONCRETE (OTHER THAN FLOORS)

A. Rough Finish - Concrete surfaces below grade and other surfaces not exposed to view after construction, shall have fins and rough edges removed and all voids patched in accordance with paragraph PATCHING CONCRETE. All channels and other devices used to convey liquid or solid materials shall be provided with a smooth finish, whether or not it may be in normal view.

B. Smooth Finish - Provide a smooth finish on all exterior and interior surfaces exposed to view after construction and on surfaces of channels which will convey a liquid or solid material. As soon as forms are removed, grind all fins and rough edges smooth with adjacent surfaces and patch all voids and tie holes in accordance with paragraph PATCHING CONCRETE. Thoroughly wet and brush on a cement grout composed of 1 part cement to 2 parts fine aggregate, mixed with water to the consistency of heavy cream. Cement shall be light colored to produce a finish matching the color of the concrete. Thoroughly rub grout over the entire area with clean burlap or a sponge rubber float to fill pits and voids completely. While the grout is still plastic, rub the surfaces with a dry mix of the grout

until no materials remain on the surface, except within pits and voids. The grouting operation for an area shall be completed the day it is started.

C. Surfaces to Receive Epoxy Coatings - Remove oil and grease, and any curing compounds and other materials which are incompatible with or may adversely affect the bonding of the epoxy coatings. Prepare the concrete surfaces as specified for smooth finish. Refer to the applicable painting Specification Section for additional surface preparation requirements.

3.12 ANTI-SCALING/ANTI-SPALLING COMPOUND TREATMENT

A. All exposed exterior concrete surfaces, except those specified to receive coatings or toppings, shall be given two applications of anti-spalling/anti-scaling protective coating before the air temperature drops to 32 F.

B. Prior to application, the surfaces shall have cured for at least 28 days, have been cleaned of all dirt, debris, oil, grease, and other foreign substances which may inhibit penetration, and shall be dry. Ambient temperature of the concrete shall be at least 40ÇF and rising at the time of application. When possible, the temperature should be above 60 F during application.

C. Apply with spray equipment at the rate of 400 sq. ft. per gallon for the first coat and 600 sq. ft. per gallon for the second coat. Apply second coating as soon as the first coating has dried to touch.

3.13 GROUTING

A. Dowel Grouting - Mix, place, compact and cure non-shrink grout in accordance with accepted manufacturer's instructions.

B. Base and Bearing Plate Grouting - Mix, place, compact and cure non-shrink grout in accordance with accepted manufacturer's instructions.

C. Machinery and Equipment Base Grouting - Add coarse aggregate having a maximum size of ¼" to non-shrink grout. Formulate and install in accordance with accepted manufacturer's instructions.

3.14 FIELD QUALITY CONTROL

A. General - All concrete will be sampled, tested and evaluated in accordance with the following paragraphs.

B. Contractor - Contractor shall be responsible for securing the following:

1. Sampling Fresh Concrete - Take all samples in accordance with ASTM C172, except that samples of fresh concrete shall be taken from the middle third of each batch.

2. Temperature/Weather - During the placement of all concrete, the Contractor shall maintain a record of the date, time, outside air temperature, temperature of concrete as delivered and after placement, and weather (calm, windy, clear, cloudy, etc.). During cold weather placement, also record temperatures (for 3 days at 8 hour intervals) at several points within enclosures and on concrete surface, corners, and edges in sufficient number to show highest and lowest concrete temperatures. During hot weather placement, also record the relative humidity. Correlate the data with the progress of work so that conditions surrounding the construction of any part of the structure can be ascertained. Provide all thermometers and equipment and make them available to Engineer whenever he elects to make additional measurements.

3. Slump Test - Test each batch of concrete in accordance with ASTM C143 and when additional water is added and when directed by Engineer. Concrete slumps shall not exceed 5". Provide cones and equipment and maintain them at the site whenever concrete is placed.

4. Entrained Air Content - Test each batch of concrete in accordance with ASTM C231. Maintain entrained air content to within the limits specified in Par. 2.01. Provide the proper equipment and materials and perform tests at the site.

5. Compressive Strength - Make and cure one set of four 6"x12" cylinders in accordance with ASTM C31 for each 50 cubic yards of concrete placed with at least one set made for each day's placement of concrete. For each set of four test cylinders,

test one cylinder at 7 days, two at 28 days and, if any of the 28-day cylinders are unsatisfactory, the remaining cylinder shall be tested at 42 days. Testing of cylinders shall be in accordance with ASTM C39. Test reports shall contain sketches indicating the type of break, notations on whether the break was around or through coarse aggregate and descriptions of anything unusual, such as "severe poppings" during the break. Provide all cylinder molds and an approved storage box for the protection of cylinders. During cold weather, heat the storage box to the same temperature as the placed concrete. Provide all materials and labor for forming, curing, storing and transporting test cylinders to the approved testing laboratory.

6. Density - Each time a set of test cylinders is made, determine the density of the concrete in accordance with ASTM C138.

7. Concrete Coring and Testing - If test cylinders are lost or destroyed, or if test cylinder test results yield low compressive strengths, or for any other reason Engineer questions the adequacy of placed concrete, the concrete shall be cored and tested in accordance with ASTM C42.

8. Sampling and Testing - It is mandatory that the approved testing laboratory perform the compressive strength tests, determine the concrete density, and perform concrete corings. Contractor may perform the slump tests, entrained air tests, and make, cure and transport concrete test cylinders, provided that they are done properly with the proper equipment. If, in Engineer's opinion, Contractor is not performing such sampling or testing properly, or he is not utilizing the proper equipment or procedures, then the approved testing laboratory shall perform all testing and sampling.

C. Evaluation and Acceptance of Concrete Work - As a minimum, the requirements of ACI 301 shall be met before the work can be considered satisfactory. In the event that the concrete does not meet the requirements of these specifications, the Contractor shall bear all costs associated with retesting as required by the Engineer.

3.15 PROTECTION

A. Protect concrete from damage due to sun, rain, flowing water, frost, weather and mechanical injury.

B. Maintain concrete temperature at a minimum of 50 F for not less than 3 days and do not expose concrete to a temperature below 40 F within 7 days after placement.

C. Do not subject concrete walls to lateral pressures until the supporting members are placed. Contractor is responsible for damage to, or misalignment of, walls resulting from earth backfilling, trapped water or other causes.

D. Keep heavy loads away from any wall until the concrete attains its design strength. Place stake banners to prevent encroachment.

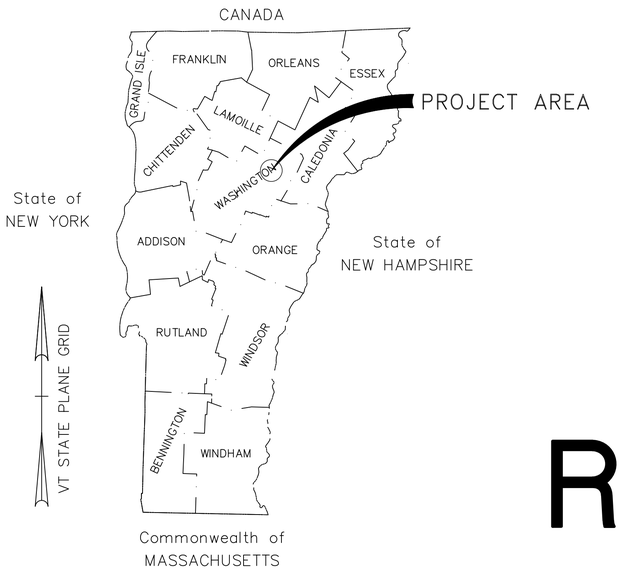
3.16 CORRECTING SURFACE DEFECTS

A. On all exposed concrete walls, the intent of the Specifications is to provide walls which are finished smooth, aesthetically pleasing, uniform in color and appearance and free from depressions, sags, holes, trowel marks, bumps, projections and other surface imperfections. Should Engineer determine that this intent has not been met, Contractor shall perform all repairs, replacements and corrective work which may be required to attain a finish acceptable to Engineer, including grinding or painting, if necessary.

B. If correction of surface defects is required, submit to Engineer the measures and methods proposed.

END OF SECTION

ENGINEERING DRAWINGS

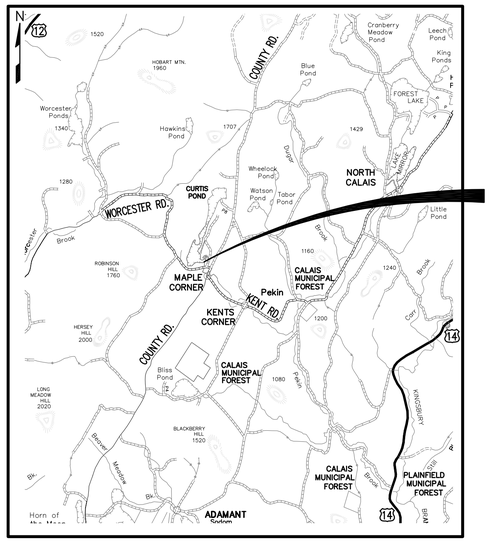


LOCATION MAP
NOT TO SCALE

TOWN OF CALAIS
EAST CALAIS, VERMONT

CURTIS POND DAM REHABILITATION PROJECT

FINAL DESIGN
MAY 22, 2013



PROJECT AREA

LOCATION PLAN
SCALE: 1"=1 MILE±

DuBois & King inc.

engineering
planning
management
development

LIST OF DRAWINGS

TITLE	SHEET NO.
TITLE SHEET	–
GENERAL NOTES	C1
EXISTING CONDITIONS AND BASELINE LAYOUT	C2
NEW CONDITIONS SITE PLAN	C3
BASELINE PROFILE	C4
NEW CONCRETE CUTOFF WALL TYPICAL SECTION	C5
CONCRETE DETAILS	C6
OUTLET CHANNEL PLAN AND DETAILS	C7
CONTROL OF WATER PLAN/EROSION CONTROL DETAILS	C8

FINAL DESIGN
NOT FOR CONSTRUCTION

I:\921439 Curtis Pond Dam\dwg\921439-TTL001.DWG May 22, 2013 - 11:46am

GENERAL PROJECT NOTES:

1. THE PURPOSE OF THIS PROJECT IS TO REHABILITATE COMPONENTS OF THE CURTIS POND DAM AND INSTALL A NEW CONCRETE CUTOFF WALL ALONG THE UPSTREAM FACE OF THE DAM.
2. THE PROJECT OWNER IS THE TOWN OF CALAIS, VERMONT. AN OWNER'S REPRESENTATIVE WILL BE APPOINTED PRIOR TO CONSTRUCTION TO REPRESENT THE OWNER DURING THE PROJECT.
3. TOPOGRAPHY SHOWN ON THE PLANS IS BASED ON FIELD SURVEY COMPLETED BY THE VERMONT DEPT. OF ENVIRONMENTAL CONSERVATION, FACILITIES ENGINEERING DIVISION IN MAY 2003.
4. WRITTEN DIMENSIONS HAVE PRECEDENCE OVER SCALED DIMENSIONS. IN CASE OF CONFLICT BETWEEN THIS PLAN SET AND ANY OTHER DRAWING AND/OR SPECIFICATION, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY FOR CLARIFICATION.
5. THE CONTRACTOR SHALL BE FAMILIAR WITH THE EXISTING CONDITIONS OF THE SITE AND SURROUNDINGS PRIOR TO BIDDING ON OR PERFORMING THE WORK.
6. THE CONTRACTOR SHALL BID AND PERFORM THE WORK FROM A COMPLETE SET OF PLANS AND SPECIFICATION, AND SHALL NOTIFY THE OWNER'S REPRESENTATIVE OF ANY CONFLICTS WITHIN THE CONSTRUCTION DOCUMENTS.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND FOR CONDITIONS AT THE SITE. THESE PLANS, PREPARED BY DUBOIS & KING DO NOT EXTEND TO OR INCLUDE SYSTEMS PERTAINING TO THE SAFETY OF THE CONSTRUCTION CONTRACTOR OR THEIR EMPLOYEES, AGENTS OR REPRESENTATIVES IN THE PERFORMANCE OF THE WORK. THE SEAL OF THE SURVEYOR OR ENGINEER HERE ON DOES NOT EXTEND TO ANY SUCH SAFETY SYSTEMS THAT MAY NOW OR HEREAFTER BE INCORPORATED INTO THESE PLANS. THE CONSTRUCTION CONTRACTOR SHALL PREPARE OR OBTAIN THE APPROPRIATE SAFETY SYSTEMS, WHICH MAY BE REQUIRED BY THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND/OR LOCAL REGULATIONS.
8. THE CONTRACTOR SHALL BID AND PERFORM THE WORK IN ACCORDANCE WITH ALL LOCAL, STATE, AND NATIONAL CODES, SPECIFICATIONS, REGULATIONS, STANDARDS, AND DETAILS.
9. SUBMIT SHOP DRAWINGS AND PRODUCT LITERATURE (MANUFACTURER'S LITERATURE, CUT SHEETS, APPLICATION PROCEDURES, ETC.) FOR ALL PRODUCTS FOR USE IN THE PROJECT, FOR APPROVAL BY THE ENGINEER.
10. A SET OF CONSTRUCTION PLANS AND TECHNICAL SPECIFICATIONS SHALL BE ON SITE AND IN GOOD CONDITION AT ALL TIMES DURING CONSTRUCTION ACTIVITIES.
11. NO DEVIATION OR DEPARTURE FROM THE DESIGN INTENT PRESENTED IN THE CONTRACT DOCUMENTS (PLANS AND SPECIFICATIONS) WILL BE ALLOWED UNLESS AUTHORIZED BY DUBOIS & KING, INC. (D&K) AND APPROVED BY THE VTDEC DAM SAFETY SECTION. D&K CONTACT PERSON FOR NOTIFICATION IS SHAWN R. PATENAUDE, P.E. 888-718-3376.

CONSTRUCTION NOTES

1. LOCATE STAGING AREAS AWAY FROM SENSITIVE AREAS INCLUDING WETLANDS AND STREAM BUFFERS.
2. CONTRACTOR SHALL LAY OUT THE CONSTRUCTION BASELINES AND STAKE OUT LIMITS OF PROPOSED WORK PRIOR TO CONSTRUCTION.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY SHORING, WATER DIVERSION, AND DEWATERING REQUIREMENTS NEEDED FOR THE PROJECT.
4. ALL WORK SHALL TAKE PLACE IN THE DRY. THE CONTRACTOR SHALL DEWATER ALL WORK AREAS PRIOR TO DISTURBANCE. WATER REMOVED FROM WORK AREAS SHALL BE DISCHARGED TO A FILTER BAG LOCATED GREATER THAN 100 FEET FROM ANY FLOWING NON-TURBID WATER.
5. SHOULD A FILTER BAG BE USED TO CONTROL SEDIMENT, A REPLACEMENT FILTER BAG SHALL BE ONSITE AT ALL TIMES. THE FILTER BAGS SHALL BE REMOVED FROM THE SITE ONCE USED.
6. ANY EXCESS MATERIAL SHALL BE DISPOSED OF OFFSITE AT NO ADDITIONAL COST UNLESS OTHERWISE APPROVED IN ADVANCE BY THE VT DEC.

MEETINGS, SUBMITTALS, AND REQUIRED INSPECTIONS

1. THE CONTRACTOR SHALL PARTICIPATE IN AN ON-SITE PRE-CONSTRUCTION CONFERENCE.
2. THE CONTRACTOR SHALL SUBMIT A CONTROL OF WATER PLAN TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. AT A MINIMUM THE CONTRACTOR'S CONTROL OF WATER PLAN SHALL CONFORM TO SPECIFICATION SECTION 2401-DEWATERING AND FOLLOW THE GUIDANCE IN THE CONTROL OF WATER NOTES ON THIS SHEET.
3. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER MATERIAL SLIPS FOR ALL MATERIALS AND ITEMS USED ON THE PROJECT PER THE SPECIFICATIONS SECTION 1300-SUBMITTALS.
4. THE CONTRACTOR SHALL PROVIDE THE ENGINEER 48-HOUR PRIOR NOTICE, FOR ANY PLACEMENT OF CONCRETE AND EMBANKMENT FILL.
5. THE ENGINEER WILL BE REQUIRED TO OBSERVE AND APPROVE CRITICAL ASPECTS OF THE CONSTRUCTION PRIOR TO EXECUTION. THESE CRITICAL ITEMS WILL BE DISCUSSED AT THE PRE-CONSTRUCTION CONFERENCE. FAILURE OF THE CONTRACTOR TO PROVIDE THE ENGINEER WITH A MINIMUM OF 48-HOUR NOTICE MAY RESULT IN DELAYS OF THE PROJECT.

PERMITS

1. THE FOLLOWING PERMITS ARE BEING SECURED FOR THIS PROJECT:
   PERMIT TO CONSTRUCT OR ALTER A DAM - VTDEC.
2. THE CONTRACTOR IS RESPONSIBLE FOR BEING FAMILIAR WITH THE REQUIREMENTS OF THE PERMITS PRIOR TO BIDDING, AND FOR COMPLYING WITH THEM DURING CONSTRUCTION.
3. A COPY OF THE PERMITS SHALL BE ONSITE DURING ALL CONSTRUCTION ACTIVITIES.

UTILITIES

1. THE LOCATION OF UTILITIES SHOWN ON THESE PLANS, IF ANY, IS APPROXIMATE, AND DUBOIS & KING MAKES NO CLAIM TO ITS ACCURACY OR COMPLETENESS.
2. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND DETERMINING THE LOCATION, SIZE, AND ELEVATION OF ALL UTILITIES PRIOR TO THE START OF CONSTRUCTION.
3. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND DETERMINING ALL UTILITIES (ABOVE AND BELOW GROUND) WITHIN THE PROJECT LIMITS, AND TO TAKE THE NECESSARY PRECAUTIONS TO PROTECT UTILITIES DURING CONSTRUCTION. CONTACT DIG-SAFE AT 1-800-DIG-SAFE (WWW.DIGSAFE.COM).
4. THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES FOUND INTERFERING WITH THE PROPOSED CONSTRUCTION, AND APPROPRIATE REMEDIAL ACTION BE SHALL BE DETERMINED AND AGREED UPON BEFORE PROCEEDING WITH THE WORK.

RESTORATION OF SURFACES

1. THE CONTRACTOR MUST APPLY A COURSE OF CRUSHED GRAVEL TO THE CONSTRUCTION ACCESS DRIVES AND STAGING AREAS AS DIRECTED BY THE ENGINEER TO PREVENT RUTTING, EROSION, AND TRACKING OF MATERIAL OFFSITE. AT THE COMPLETION OF WORK, THE CONTRACTOR MUST REMOVE THE GRAVEL AND RE-GRADE, SEED, AND MULCH THE DISTURBED AREA.
2. AT THE COMPLETION OF WORK, THE CONTRACTOR MUST RESTORE ACCESS ROADS AND STAGING AREAS TO PRE-CONSTRUCTION CONDITION. RESTORATION MAY INCLUDE PLACEMENT OF GRAVEL ON EXISTING DRIVES AND / OR APPLICATION OF TOPSOIL, GRASS SEED, FERTILIZER, AND MULCH TO AFFECTED GRASSED AREAS.

PROPOSED CONSTRUCTION SEQUENCE

1. PREPARE STAGING AREA AND STABILIZE ACCESS DAM SITE.
2. INSTALL SILT FENCE AND EROSION CONTROL MEASURES AT DAM SITE.
3. ESTABLISH CONTROL OF WATER MEASURES AND BEGIN LOWERING WATER LEVEL IN CURTIS POND DAM. DRAWDOWN SHALL NOT PROGRESS FASTER THAN 6 INCHES PER ANY 24 HOUR PERIOD.
4. CLEAR TREES AND SHRUBS FROM THE DAM EMBANKMENT AND WITHIN THE IDENTIFIED WORK AREA.
5. CONSTRUCT THE DESIGN ON THESE PLANS.
6. PLACE TOP SOIL, SEED AND MULCH. SEE SPECIFICATIONS SECTION 02483.
7. CONDUCT FINAL INSPECTION WITH VT DEC AND ENGINEER.
8. INITIATE REFILLING OF THE WORK AREA. WHEN THE WORK AREA IS FILLED, REMOVE THE TEMPORARY COFFERDAM.
9. BEGIN RESTORING CURTIS POND TO THE DESIGN WATER LEVEL BY PARTIALLY CLOSING THE LOW LEVEL VALVE.

MATERIAL NOTES

1. THE CONTRACTOR SHALL HAVE A SET OF THE TECHNICAL SPECIFICATION ON SITE DURING ALL CONSTRUCTION ACTIVITIES.
2. ALL MATERIALS USED ON THIS PROJECT SHALL CONFORM TO THE SPECIFICATIONS. FOR ANY DISCREPANCY BETWEEN THE PLANS AND MATERIAL SPECIFICATIONS, THE TECHNICAL SPECIFICATIONS SHALL TAKE PRECEDENCE OVER NOTES CONTAINED ON THESE PLANS.
3. ALL EARTHEN MATERIAL USED ON SITE SHALL BE PLACE AND COMPACTED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. NEW EARTHEN MATERIAL SHALL BE CONSISTENT WITH ON-SITE MATERIAL. THE CONTRACTOR SHALL RECEIVE PRIOR APPROVAL FROM THE ENGINEER BEFORE IMPORTING NEW EARTHEN MATERIAL TO THE SITE.

CONCRETE NOTES

1. NO BACKFILL SHALL BE PLACED AGAINST ANY NEWLY PLACED CONCRETE UNTIL THE ENGINEER HAS APPROVED THE WORK AND SHALL NOT OCCUR PRIOR TO SEVEN (7) DAYS AFTER BEING POURED OR ACHIEVES 85% OF THE SPECIFIED COMPRESSIVE STRENGTH HAS BEEN REACHED.
2. THE CONTRACTOR, AT THE EXPENSE OF THE CONTRACTOR, SHALL REPAIR ANY DAMAGE TO NEWLY PLACED CONCRETE.
3. WHERE THE CONCRETE IS TO BE PLACED BY PUMPING, THE CONTRACTOR SHALL NOTIFY THE ENGINEER A MINIMUM OF ONE WEEK PRIOR TO PLACEMENT FOR REVIEW OF PROCEDURES TO BE USED. THE CONTRACTOR SHALL OBTAIN AND REVIEW ACI 304 - PLACING CONCRETE BY PUMPING METHODS. PROVISION FOR BACK-UP PUMPING EQUIPMENT SHALL BE MADE BY THE CONTRACTOR.
4. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1-1/2 INCH BY 1-1/2 INCH, UNLESS OTHERWISE NOTED.
5. JOINTS AND SCORE MARKS IN CONCRETE SHALL BE CONSTRUCTED AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
6. THE CONTRACTOR SHALL NOTIFY THE ENGINEER A MINIMUM OF 24 HOURS IN ADVANCE OF ALL CONCRETE OPERATIONS.
7. FOOTINGS SHALL BE PLACED ON CLEAN, SOUND BEDROCK. THE CONTRACTOR SHALL REMOVE ALL DELETERIOUS MATERIAL, DUST AND PARTICLES FROM THE BEDROCK SURFACE PRIOR TO CASTING CONCRETE.
8. IF THE EXISTING TOP OF BEDROCK IS LOCATED ABOVE THE BOTTOM OF FOOTING TWO (2) FEET OR LESS, THE BEDROCK MAY BE EXCAVATED DOWN TO THE INDICATED BOTTOM OF FOOTING OR THE BOTTOM OF FOOTING ELEVATION MAY BE ADJUSTED AS DIRECTED BY THE ENGINEER. ALL OVER BREAKAGE BELOW THE BOTTOM OF FOOTING SHALL BE REPLACED WITH CONCRETE, CLASS C.
9. IF THE EXISTING TOP OF BEDROCK IS ABOVE THE BOTTOM OF FOOTING BY MORE THAN TWO (2) FEET, THE FOOTING ELEVATION MAY BE RAISED ACCORDINGLY. BEFORE ANY ADJUSTMENT IS MADE IN THE FOOTING ELEVATION, THE ENGINEER SHALL BE NOTIFIED FOR APPROVAL OF THE ADJUSTMENT.
10. IF THE TOP OF EXISTING BEDROCK IS TWO (2) FEET OR LESS BELOW THE BOTTOM OF FOOTING ELEVATION, THE FOOTING SHALL BE PLACED TO THE TOP OF COMPETENT BEDROCK AS SHOWN USING CONCRETE, CLASS C.
11. IF THE TOP OF EXISTING BEDROCK IS GREATER THAN TWO (2) FEET BELOW THE BOTTOM OF THE FOOTING, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND PREPARE AND SUBMIT A PROFILE OF THE BEDROCK SURFACE IN THE VICINITY OF THE FOOTING. THE CONTRACTOR SHALL NOT PERFORM ANY FURTHER WORK ON THE SUBSTRUCTURE UNTIL NOTIFIED IN WRITING BY THE ENGINEER.
12. ALL CONCRETE WORK SHALL COMPLY WITH THE LATEST ACI SPECIFICATIONS (ACI-350).
13. ALL CAST-IN-PLACE CONCRETE, INCLUDING THE CUT-OFF WALL, SPILLWAY TRAINING WALLS, AND SPILLWAY SLAB SHALL BE CLASS A (4,000 PSI) CAST-IN-PLACE CONCRETE. SEE SPECIFICATIONS SECTION 03300.
14. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60.
15. CONTRACTOR SHALL SUBMIT REINFORCING SHOP DRAWINGS FOR REVIEW BY THE ENGINEER.
16. HOT WEATHER CONCRETE PLACEMENT SHALL BE IN ACCORDANCE WITH ACI 305R.
17. COLD WEATHER CONCRETE PLACEMENT SHALL BE IN ACCORDANCE WITH ACI 306R.
18. PVC WATER STOPS SHALL BE GREENSTREAK, DUMBBELL TYPE, STYLE NO. 705, 724, OR APPROVED EQUAL.
19. HYDROPHILIC WATER STOPS SHALL BE VOLCLAY, WATERSTOP-RX, TYPE RX-101, GREENSTREAK NO. 594 SWELL STOP, OR APPROVED EQUAL.
20. PROVIDE CONSTRUCTION JOINTS AT ALL LOCATIONS OF DISCONTINUOUS CONCRETE PLACEMENT.

EROSION CONTROL NOTES

1. TEMPORARY EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) MEASURES ARE REQUIRED THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD.
2. ALL EPSC ACTIVITIES SHALL CONFORM TO THE VT DEC LOW RISK SITE HANDBOOK FOR EROSION PREVENTION AND SEDIMENT CONTROL, 2006.
3. ALL EARTHWORK AND GRADING PERFORMED BETWEEN OCTOBER 15 AND APRIL 15 SHALL CONFORM TO APPROVED WINTER CONSTRUCTION PRACTICES, AS PRESENTED IN THE VT DEC LOW RISK SITE HANDBOOK FOR EROSION PREVENTION AND SEDIMENT CONTROL.
4. THE CONTRACTOR SHALL BE AWARE OF ALL DISCHARGE INTO THE OUTLET CHANNEL. SHOULD THERE BE VISUALLY DISCOLORED DISCHARGE ENTERING THE OUTLET CHANNEL THE CONTRACTOR SHALL DETERMINE THE SOURCE OF THE DISCOLORED DISCHARGE. IF THE CAUSE OF THE DISCOLORED DISCHARGE IS FROM CONSTRUCTION ACTIVITIES ALL OPERATIONS MUST CEASE UNTIL THE DISCHARGE IS NO LONGER DISCOLORED. ALTERNATIVE MEANS OF CONSTRUCTION SHALL BE ADMINISTERED AS TO AVOID ADDITIONAL RELEASE OF DISCOLORED DISCHARGE INTO THE OUTLET CHANNEL.
5. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL INSTALL SILT FENCING AND EROSION CONTROL DEVICES AS SHOWN ON THESE PLANS. EROSION CONTROLS SHALL BE LOGICALLY PHASED WITH CONSTRUCTION ACTIVITIES AND AS DIRECTED BY THE ENGINEER OR OWNERS REPRESENTATIVE.
6. THE EROSION CONTROLS SHALL BE INSPECTED DAILY PRIOR TO INITIATION OF THE DAY'S ACTIVITIES. MAINTENANCE SHALL TAKE PLACE AT THAT TIME.
7. THE CONTRACTOR SHALL TOPSOIL, SEED AND MULCH THE DISTURBED AREAS WITHIN 7 DAYS OF INITIAL DISTURBANCE. AFTER THIS TIME, ANY DISTURBANCE IN THE AREA MUST BE STABILIZED AT THE END OF EACH WORKDAY. ALL AREAS OF DISTURBANCE MUST HAVE PERMANENT STABILIZATION WITHIN 48 HOURS OF REACHING FINAL GRADE. THE FOLLOWING EXCEPTIONS MAY APPLY:
   A) STABILIZATION IS NOT REQUIRED IF THE EARTHWORK IS TO CONTINUE IN THE AREA WITHIN THE NEXT 24 HOURS AND THERE IS NO PRECIPITATION FORECAST FOR THAT SAME PERIOD OF TIME.
   B) STABILIZATION IS NOT REQUIRED IF THE EARTHWORK IS OCCURRING WITHIN A SELF-CONTAINED EXCAVATION, WITH A DEPTH OF 2 FEET OR GREATER AND NO OUTLET.
8. ALL SLOPES AND DISTURBED AREAS SHALL BE GRADED SMOOTH AND FREE OF POCKETS WITH SUFFICIENT SLOPE TO ENSURE DRAINAGE.
9. ALL SLOPES GREATER THAN 1V:2H SHALL BE TREATED WITH BIODEGRADABLE EROSION CONTROL BLANKET, TYPE S150BN AS MANUFACTURED BY NORTH AMERICAN GREEN OR APPROVED EQUAL. THE BLANKET SHALL BE STAPLED WITH BIODEGRADABLE STAPLES, OVERLAPPED, AND SHINGLED CORRECTLY RELATIVE TO WATER FLOW, AND INSTALLED IN GENERAL ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND SPECIFICATIONS.
10. PERMANENT STABILIZATION SHALL BE CONDUCTED ACCORDING TO THE TECHNICAL SPECIFICATIONS SECTION 02483.
11. REMOVAL OF EPSC MEASURES SHALL ONLY BE DONE FOLLOWING THE APPROVAL OF THE ENGINEER ALL DISTURBANCES CAUSED BY THE REMOVAL SHALL BE REPAIRED IMMEDIATELY.

CONTROL OF WATER NOTES

GENERAL REQUIREMENTS

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTROL OF WATER THROUGHOUT THE DURATION OF THE PROJECT. ANY CHANGES TO THE CONTROL OF WATER PROCEDURE AS OUTLINED HEREIN WILL BE SUBJECT TO APPROVAL OF THE ENGINEER AND THE VERMONT AGENCY OF NATURAL RESOURCES (VANR). OBTAINING THE APPROVAL FOR ANY CHANGES TO THE PROCEDURES FROM VANR SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
2. THE NORMAL WATER SURFACE ELEVATION IS 1001.0 FEET, AS CONTROLLED BY THE CREST OF THE SPILLWAY SLAB. THE POND MAY BE PARTIALLY LOWERED THROUGHOUT THE CONSTRUCTION PERIOD.
3. AN UPSTREAM TEMPORARY COFFERDAM AND OUTLET CONTROL SYSTEM WILL BE REQUIRED TO CONTROL THE WATER IN THE POND AT A LOWERED ELEVATION WITHOUT FULLY DEWATERING CURTIS POND WHILE MAINTAINING A DRY CONDITION IN THE WORK AREA. THE UPSTREAM TEMPORARY COFFERDAM WILL BE A CONCRETE BLOCK OR INFLATABLE COFFERDAM SYSTEM, OR APPROVED EQUAL. SEE SHEET C8 FOR A SCHEMATIC OF A PROPOSED COFFERDAM LOCATION.
4. A DOWNSTREAM STONE OR SANDBAG COFFERDAM WITH A WATER DIVERSION STRUCTURE, BY-PASS PUMPING OR SIMILAR METHOD WILL PROVIDE ADEQUATE PROTECTION AGAINST TURBID WATER DISCHARGE FROM THE WORK AREA INTO THE DOWNSTREAM RECEIVING CHANNEL. SUMP PUMPING WILL BE REQUIRED TO ADEQUATELY CONTROL THE GROUNDWATER WITHIN ANY AND ALL EXCAVATIONS TO ONE (1) FOOT BELOW BOTTOM OF PROPOSED FOUNDATIONS.
5. THE CONTRACTOR SHALL NOT REGULATE DOWNSTREAM FLOWS NOR ALTER THE NATURAL FLOW REGIME EXCEPT WHEN NECESSARY FOR MAINTENANCE, INSPECTION, CONSTRUCTION, OR PROJECT SAFETY. DURING PERIODS WHEN DOWNSTREAM FLOW REGULATION IS NECESSARY, INCLUDING THE REFILLING OF THE POND, MINIMUM DOWNSTREAM CONSERVATION FLOWS, AS NOTED IN THE FOLLOWING TABLE, SHALL BE RELEASED UNLESS INFLOW IS LESS THAN THE SEASONAL CONSERVATION FLOW.

ANNUAL PERIOD	MINIMUM DISCHARGE, CFS	MINIMUM DISCHARGE, GPM
JUNE 1 TO SEPTEMBER 30	0.69	310
OCTOBER 1 TO MARCH 31	1.38	620
APRIL 1 TO MAY 31	5.52	2,478

NOTE: FLOWS NOTED CORRESPOND TO A 1.38 SQUARE MILE (883 ACRES) DRAINAGE AREA.

6. WHEN INFLOW INTO THE POND IS LESS THAN THE SEASONAL CONSERVATION FLOW, UP TO 10 PERCENT OF THE INSTANTANEOUS INFLOW MAY BE USED TO REFILL THE POND WHILE DISCHARGING THE REMAINDER DOWNSTREAM. UNDER NO CIRCUMSTANCES SHALL DOWNSTREAM FLOWS BE INTERRUPTED.
7. DOWNSTREAM FLOWS SHALL BE MAINTAINED AT ALL TIMES. DURING THE INSTALLATION OF THE COFFERDAMS, BYPASS FLOWS SHALL BE ACHIEVED WITH THE USE OF PUMPS. UPON INSTALLATION OF THE COFFERDAMS AND DEWATERING OF THE WORK AREA, MINIMUM STREAM FLOWS WILL BE MAINTAINED. PUMPS CAPABLE OF MEETING MINIMUM STREAM FLOWS SHALL BE ON SITE AT ALL TIMES DURING CONSTRUCTION TO BE USED IN CASE OF EMERGENCY. DURING PERIODS WHEN THE CONTRACTOR IS USING PUMPS TO MAINTAIN MINIMUM FLOWS, BACKUP SYSTEMS SHALL BE ONSITE IN CASE OF FAILURE OF ANY ONE PUMP.

INSTALLATION OF CONTROL OF WATER MEASURES

8. UPON AUTHORIZATION TO PROCEED WITH THE PROJECT, THE CONTRACTOR SHALL INSTALL THE BY-PASS PUMPS TO MAINTAIN MINIMUM FLOWS WHILE THE COFFERDAMS ARE BEING INSTALLED. THE PUMP AND OUTLET SHALL BE INSTALLED IN LOCATIONS THAT WILL NOT REQUIRE BEING MOVED DURING ITS USE. THIS PUMPING EQUIPMENT SHALL REMAIN IN PLACE THROUGHOUT THE CONSTRUCTION ACTIVITY, BEING AVAILABLE FOR USE ON SHORT NOTICE IN THE EVENT OF A SIGNIFICANT STORM OR UNEXPECTED EVENT.
9. BOTH OF THE TEMPORARY COFFERDAMS SHALL BE INSTALLED IN THE WET UPON COMPLETION OF THE PUMP INSTALLATION AND THE DOWNSTREAM FLOWS ARE ESTABLISHED.
10. ONCE THE INSTALLATION OF THE COFFERDAMS AND BY-PASS PIPE IS COMPLETE, THE CONTRACTOR SHALL BEGIN TO DEWATER THE ISOLATED WORK AREA. THE CONTRACTOR SHALL USE PUMPING TO DEWATER THE WORK AREA. THE DEWATERING PUMPS SHALL DISCHARGE TO AN APPROVED UPLAND AREA; HOWEVER ANY CLEAR WATER CAN BE CAREFULLY PUMPED OR SIPHONED DOWNSTREAM. ANY DIRECT DISCHARGE TO THE STREAM SHALL BE SUBJECT TO CONTINUOUS OBSERVATION TO MAKE SURE THAT IT REMAINS CLEAR. THE EQUIPMENT USED TO ACHIEVE THIS DEWATERING SHALL BE SEPARATE FROM THE EQUIPMENT USED TO MAINTAIN MINIMUM STREAM FLOWS.
11. UPON INSTALLATION OF THE CONTROL OF WATER MEASURES AND DEWATERING OF THE WORK AREA, THE CONTRACTOR SHALL REQUEST APPROVAL FROM THE ENGINEER AND VANR TO INITIATE CONSTRUCTION ACTIVITIES.

CONTROL OF WATER DURING CONSTRUCTION

12. DURING CONSTRUCTION, THE WORK AREA SHALL REMAIN DEWATERED BY MEANS OF PUMPING. THE DISCHARGE SHALL BE PUMPED DIRECTED TO AN APPROVED UPLAND AREA. THE CONTRACTOR IS ENCOURAGED TO PUMP DIRECTLY INTO FILTER BAGS TO FURTHER PREVENT TURBID WATER FROM REACHING THE DOWNSTREAM CHANNEL.
13. THE CONTRACTOR SHALL INSPECT THE COFFERDAMS AND BY-PASS EACH MORNING. MAINTENANCE SHALL TAKE PLACE PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES SCHEDULED FOR THAT DAY.

REFILLING REQUIREMENTS

14. UPON COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL RECEIVE WRITTEN AUTHORIZATION TO REFILL THE WORK AREA, ALLOWING THE WATER TO REACH THE INVERT OF THE NEW OUTLET GATE VALVE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REFILLING OF THE WORK AREA AND SHALL PROVIDE PERSONNEL TO MONITOR THE OPERATION AS NEEDED ON A DAILY BASIS. THE CONTRACTOR SHALL CAREFULLY MONITOR ALL COMPONENTS OF THE DAM FOR SIGNS OF LEAKAGE OR DISTRESS AND REPORT ANY FINDINGS TO THE ENGINEER.
15. THE REFILLING OF THE POND TO ITS FULL LEVEL SHALL BE ACHIEVED BY CLOSING THE GATE VALVE INCREMENTALLY. AT A MINIMUM, DOWNSTREAM CONSERVATION FLOWS SHALL BE MAINTAINED, PURSUANT TO ITEM #6 ABOVE.
16. WHEN REFILLING, THE POND SHALL BE CAREFULLY MONITORED AND OUTFLOW ADJUSTMENTS MADE, TAKING SPECIAL CARE TO NOT FURTHER DRAWDOWN THE GREATER POND BY RELEASING FLOW AT A RATE GREATER THAN THE RATE OF FLOW INTO THE POND.
17. ONCE THE WATER SURFACE REACHES THE PRINCIPAL CREST THE VALVE CAN BE FULLY CLOSED AND REFILLING SHALL BE CONSIDERED COMPLETE.

ONGOING MAINTENANCE AND OPERATIONS

18. THESE PROCEDURES SHALL BE UTILIZED DURING ALL FUTURE OPERATIONS AND MAINTENANCE ACTIVITIES REQUIRING THE DRAWDOWN AND REFILLING OF THE POND, CONDUCTED BY THE OWNER.
19. DURING PERIODS WHEN THE CONTRACTOR AND/OR OWNER IS USING PUMPS TO MAINTAIN MINIMUM FLOWS, BACKUP SYSTEMS SHALL BE ONSITE IN CASE OF FAILURE OF ANY ONE PUMP.

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S. BURLINGTON, VT
SPRINGFIELD, VT
BEDFORD, NH

PROFESSIONAL SEAL

NOT FOR CONSTRUCTION FINAL PLANS

NO.	DATE	DESCRIPTION	BY	CK'D

TOWN OF CALAIS
3120 PEKIN
BROOK ROAD
EAST CALAIS,
VERMONT, 05650

JOHN BRABANT
VICE CHAIR
SELECTBOARD

CURTIS POND DAM REHABILITATION PROJECT

SHEET TITLE

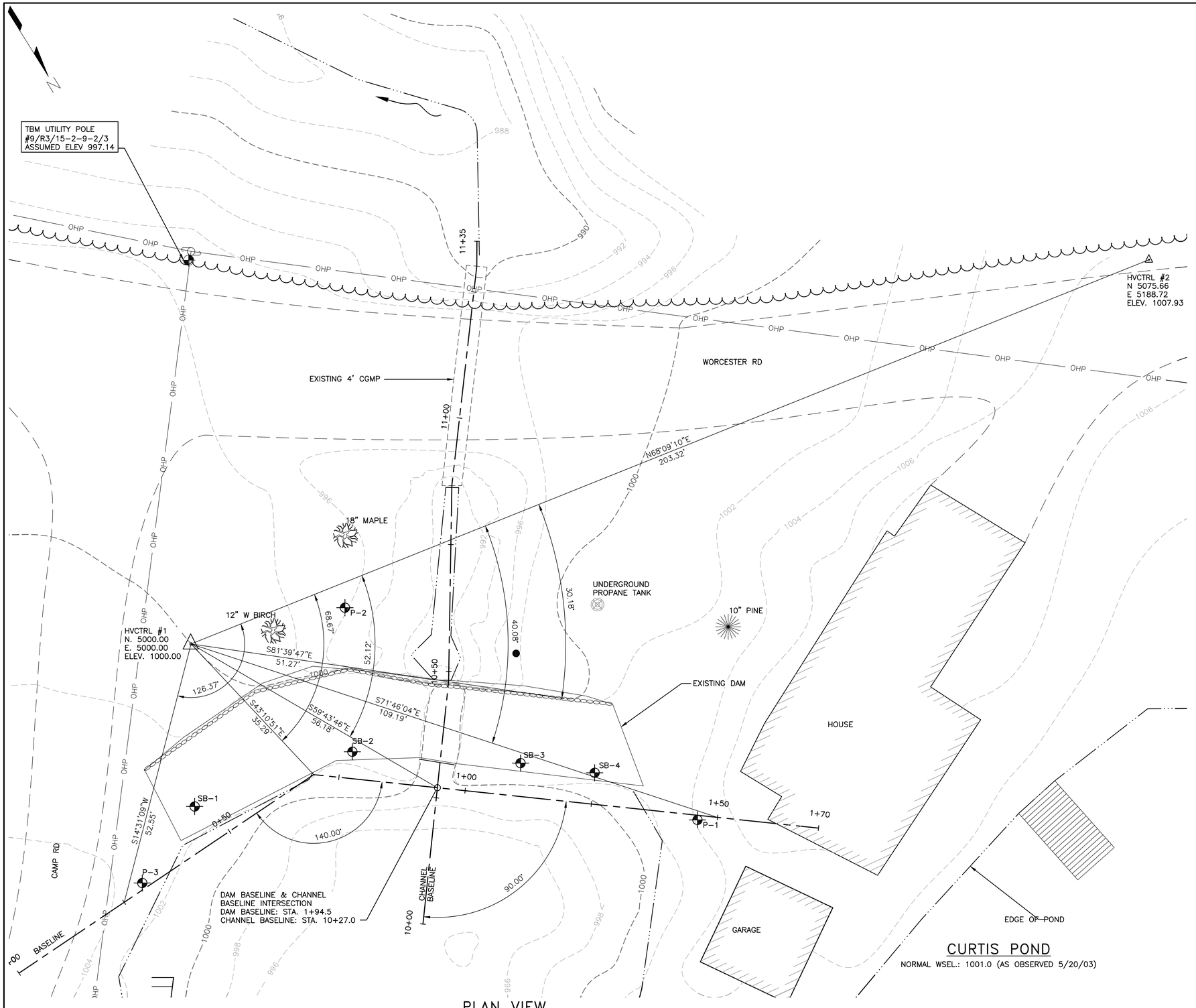
GENERAL NOTES

DRAWN BY	DATE
ZDC/EBS	MAY 2013
CHECKED BY	D&K PROJECT # 921439
PROJ. ENG. SRP	D&K ARCHIVE #

SHEET NUMBER

C1

SHEET 2 OF 9



CURTIS POND

NORMAL WSEL.: 1001.0 (AS OBSERVED 5/20/03)

PLAN VIEW

20 0 20 40 80

SCALE: 1" = 20'

DATUM
HORIZONTAL LOCAL
VERTICAL LOCAL

LEGEND

EXISTING

- 1002 — CONTOUR – 2 FT INTERVAL
- 1000 — CONTOUR – 10 FT INTERVAL
- WATER LEVEL (O.H.W. or O.L.W.)
- BEDROCK OUTCROP
- STA1 — SURVEY STATION
- BURIED PROPANE TANK
- LIGHT POLE
- TREE LINE
- 10" PINE — TREE (CONIFER)
- 18" MAPLE — TREE (DECIDUOUS)
- DOCK
- SB-4 — BORING
- P-1 — AUGER PROBE
- DRY HYDRANT
- OHP — OVERHEAD POWER LINE
- UTILITY POLE
- STONE WALL

NOTE:

1. TOPOGRAPHIC SURVEY WAS PERFORMED BY THE VT. DEPARTMENT OF ENVIRONMENTAL CONSERVATION, FACILITIES ENGINEERING DIVISION IN MAY, 2003 AND PROVIDED TO DUBOIS AND KING FOR USE WITH THIS PROJECT.
2. LOCAL HORIZONTAL AND VERTICAL DATUM SPECIFIC TO PROJECT SITE.

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CURTIS POND DAM REHABILITATION PROJECT

SHEET TITLE

EXISTING CONDITIONS AND BASELINE LAYOUT

DRAWN BY	DATE
ZDC/EBS	MAY 2013
CHECKED BY	D&K PROJECT #
	921439
PROJ. ENG.	D&K ARCHIVE #
SRP	

SHEET NUMBER

C2

SHEET 3 OF 9

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TBM UTILITY POLE
#9/R3/15-2-9-2/3
ASSUMED ELEV 997.14

N

WORCESTER RD

CAMP RD

TYPE I/TYPE II BLEND STONE FILL CHANNEL PROTECTION

STILLING BASIN, SEE SHEET C7 FOR DETAILS

ALL DISTURBED AREAS OUTSIDE OF STONEFILL, WITH SLOPE GREATER THAN 3H:1V, TO BE COVERED WITH TYPE II EROSION CONTROL BLANKET

EXISTING LIGHT POLE TO BE REMOVED AND REPLACED (PROPERTY OWNER TO BE NOTIFIED PRIOR TO REMOVAL)

EXISTING UNDERGROUND PROPANE TANK TO REMAIN UNDISTURBED

NEW CONCRETE SPILLWAY TRAINING WALLS

CONTRACTOR TO TAKE CARE NOT TO DISTURB DOWNSTREAM STONE FACE (TYP.)

APPROXIMATE LIMITS OF EXCAVATION

DOWNSTREAM FACE OF EXISTING DAM

NEW 10 ft OVERFLOW SPILLWAY

EXISTING HOUSE

EXISTING GARAGE

NEW LOW LEVEL PIPE, GATE VALVE WITH VALVE BOX

NEW CONCRETE CUTOFF WALL, SEE SHEET C8 FOR DETAILS

BEDROCK OUTCROP

EXISTING DOCK

TEMPORARY COFFER DAM

18" MAPLE

12" W BIRCH

10" PINE

SB-1 SB-2 SB-3 SB-4

P-1 P-2 P-3

A C6 B C6

0+00 BASELINE 0+50 1+00 1+50 1+70

2H:1V

OHP PDF

LEGEND

EXISTING

- 1002 — CONTOUR – 2 FT INTERVAL
- 1000 — CONTOUR – 10 FT INTERVAL
- WATER LEVEL (O.H.W. or O.L.W.)
- BEDROCK OUTCROP
- STA1 — SURVEY STATION
- BURIED PROPANE TANK
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- DOCK
- SB-4 — BORING
- P-1 — AUGER PROBE
- DRY HYDRANT
- OHP — OVERHEAD POWER LINE
- UTILITY POLE
- STONE WALL
- PDF — PROJECT DELINEATION FENCE
- APPROXIMATE LIMITS OF EXCAVATION

NOTE:

1. TOPOGRAPHIC SURVEY WAS PERFORMED BY THE VT. DEPARTMENT OF ENVIRONMENTAL CONSERVATION, FACILITIES ENGINEERING DIVISION IN MAY, 2003 AND PROVIDED TO DUBOIS AND KING FOR USE WITH THIS PROJECT.

PLAN VIEW

10 0 10 20 40

SCALE: 1" = 10'

DATUM
HORIZONTAL LOCAL
VERTICAL LOCAL

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JOHN BRABANT
VICE CHAIR
SELECTBOARD

CURTIS POND DAM REHABILITATION PROJECT

SHEET TITLE

NEW CONDITIONS SITE PLAN

DRAWN BY	DATE
ZDC/EBS	MAY 2013
CHECKED BY	D&K PROJECT # 921439
PROJ. ENG. SRP	D&K ARCHIVE #

SHEET NUMBER

C3

SHEET 4 OF 9

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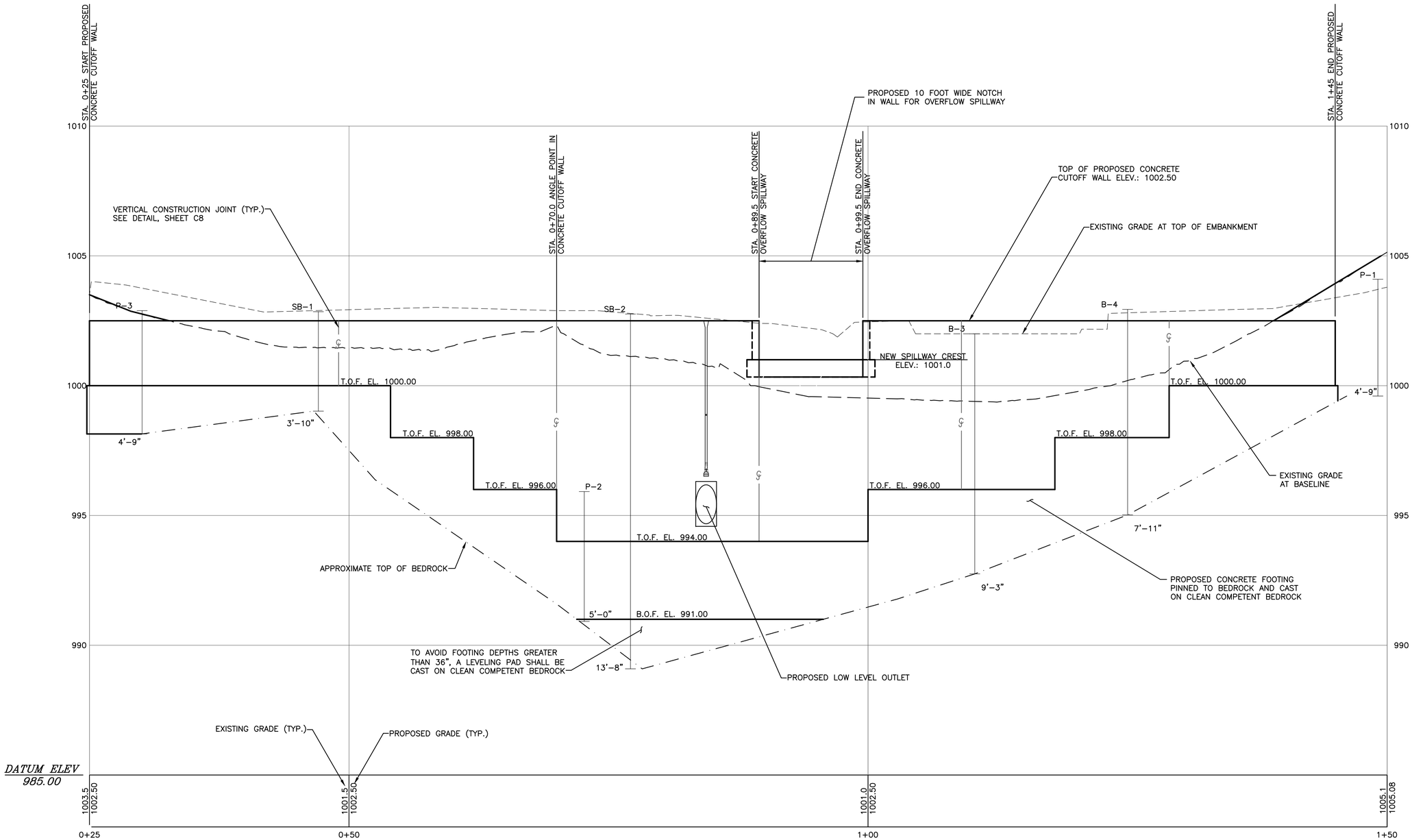

BASELINE PROFILE

NOTES:

1. BEDROCK FOUNDATION SHALL BE CLEANED AND INSPECTED BY ENGINEER PRIOR TO PLACEMENT OF NEW CONCRETE FOOTING.
2. LOCATION OF BEDROCK SHOWN ON THESE PLANS ARE BASED ON SOIL BORINGS AND ARE TO BE CONSIDERED APPROXIMATE.

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BASELINE PROFILE

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SRP	

SHEET NUMBER

C4

SHEET 5 OF 9

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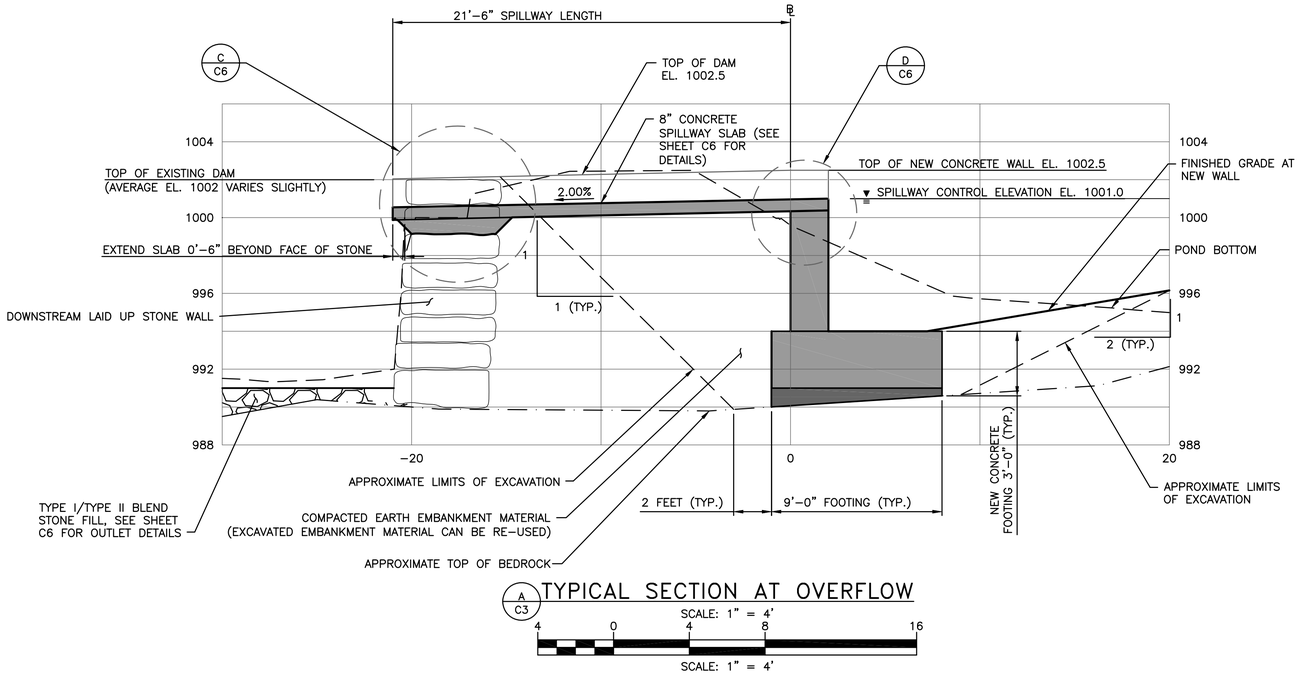
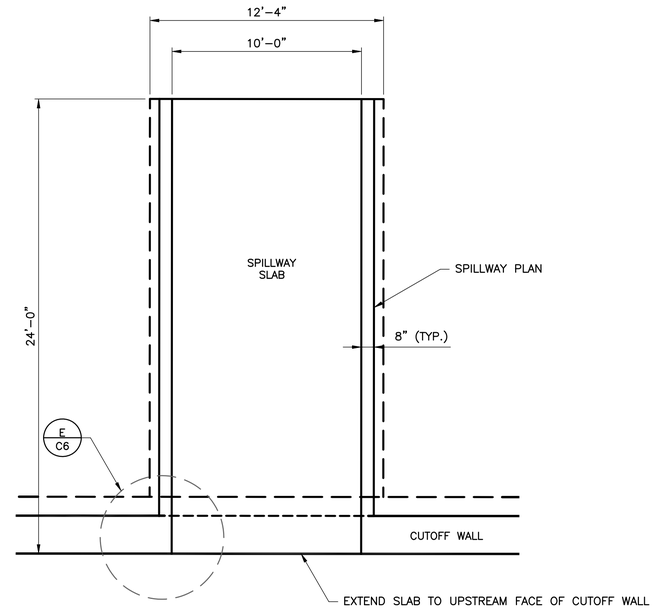


A C3 TYPICAL SECTION AT OVERFLOW

SCALE: 1" = 4'

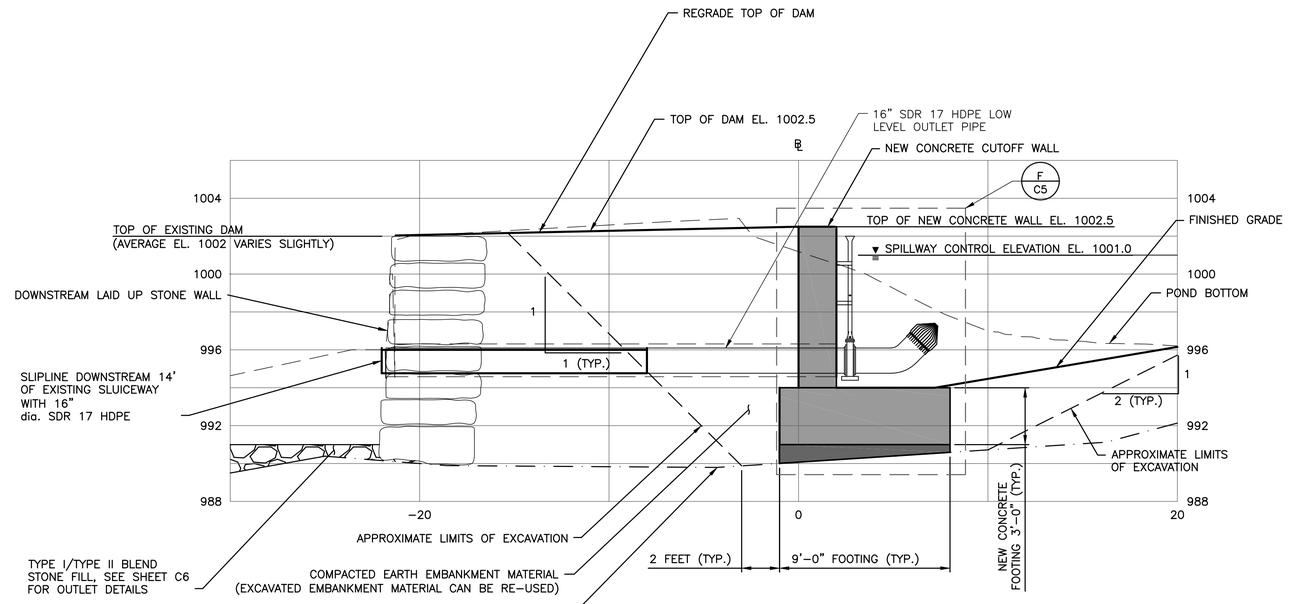
4 0 4 8 16

SCALE: 1" = 4'



SPILLWAY PLAN

SCALE: 1/4" = 1'

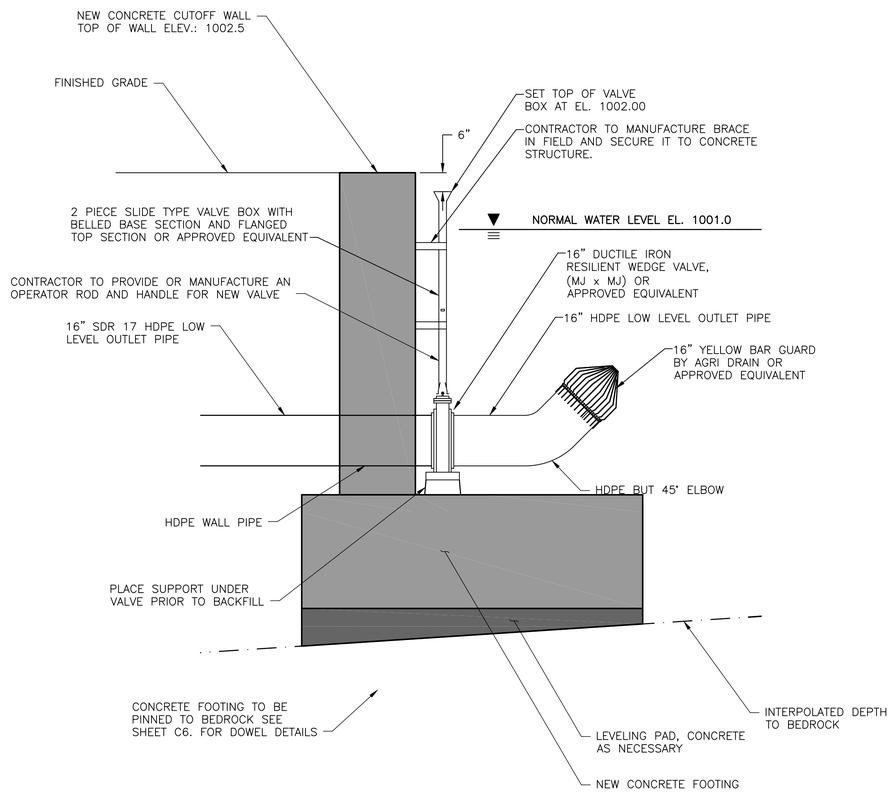


B C3 TYPICAL SECTION LOW LEVEL OUTLET

SCALE: 1" = 4'

4 0 4 8 16

SCALE: 1" = 4'



F C5 LOW LEVEL OUTLET DETAIL

SCALE: 1/2" = 1'

DATUM
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EAST CALAIS, VERMONT, 05650

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VICE CHAIR
SELECTBOARD

CURTIS POND DAM REHABILITATION PROJECT

SHEET TITLE

NEW CONCRETE CUTOFF WALL TYPICAL SECTION

DRAWN BY	DATE
ZDC/EBS	MAY 2013
CHECKED BY	D&K PROJECT #
	921439
PROJ. ENG.	D&K ARCHIVE #
SRP	

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C5

SHEET 6 OF 9

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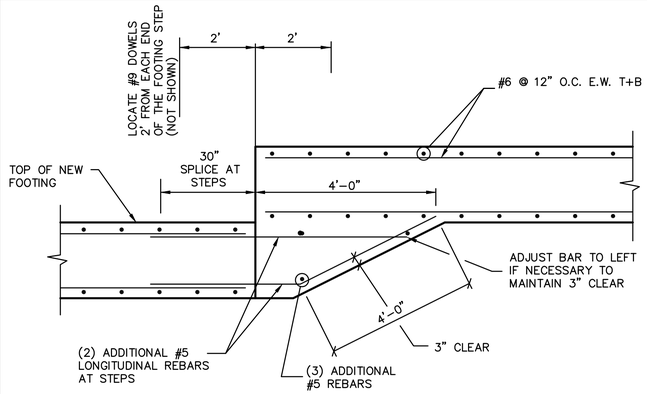
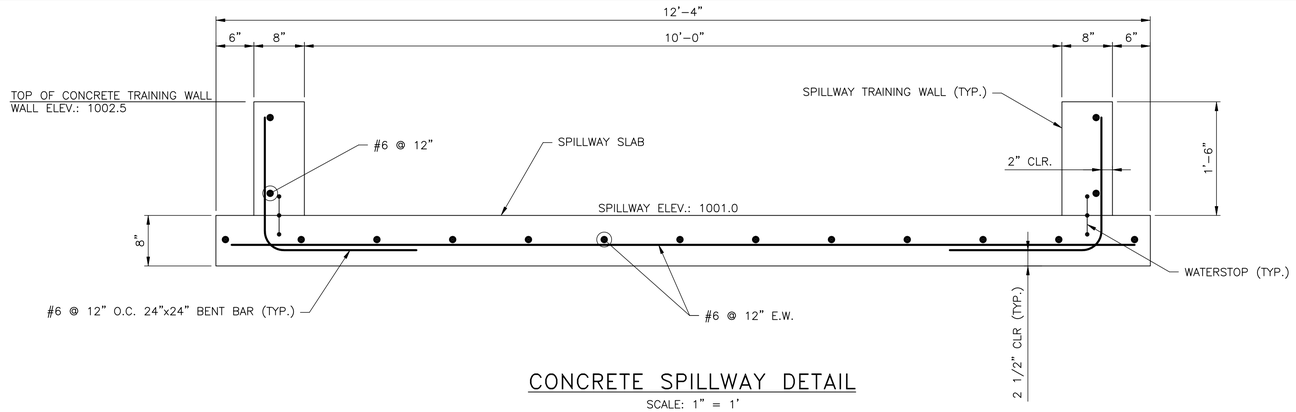


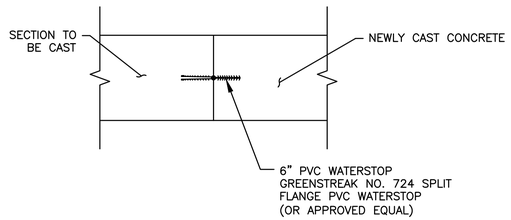
STEP REINFORCING

SCALE: 1/2" = 1'



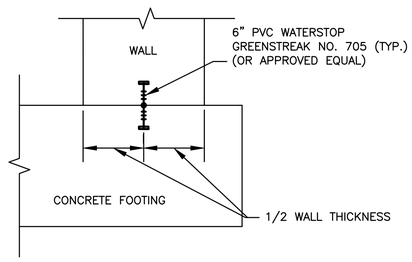
CONCRETE SPILLWAY DETAIL

SCALE: 1" = 1'



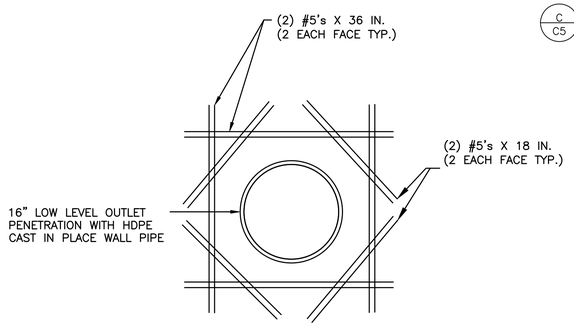
VERTICAL CONSTRUCTION JOINT DETAIL

NOT TO SCALE



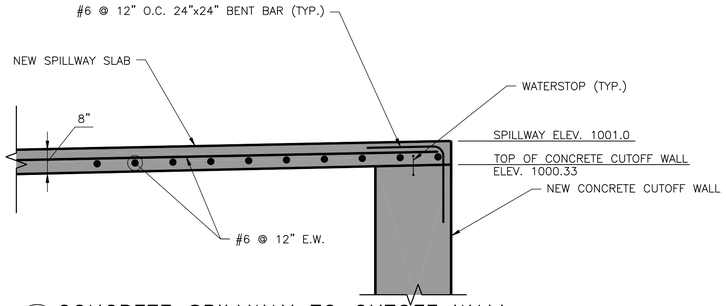
HORIZONTAL CONSTRUCTION JOINT DETAIL

NOT TO SCALE



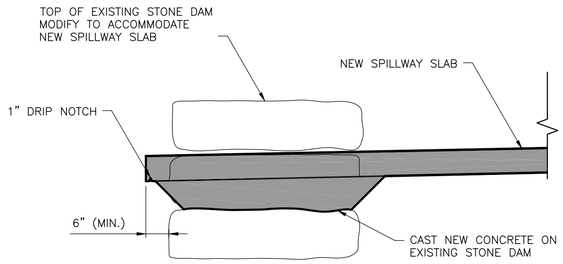
ADDITIONAL REINFORCING AT WALL PENETRATION

NOT TO SCALE



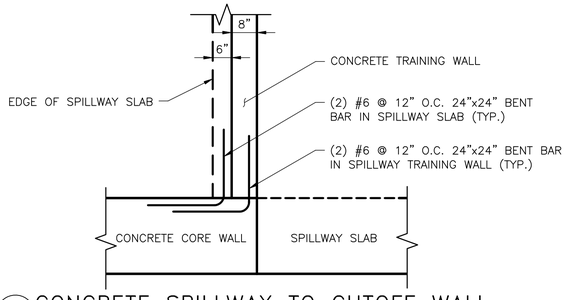
D C5 CONCRETE SPILLWAY TO CUTOFF WALL CONNECTION DETAIL SECTION

SCALE: 1/2" = 1'



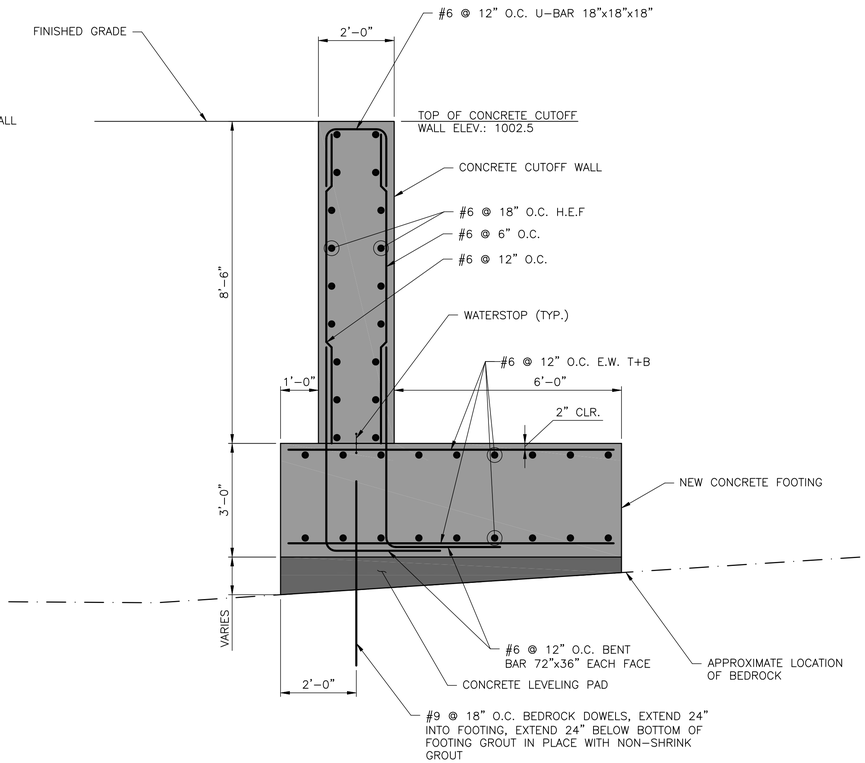
C C5 CONCRETE SPILLWAY DOWNSTREAM END DETAIL

SCALE: 1/2" = 1'



E C5 CONCRETE SPILLWAY TO CUTOFF WALL CONNECTION DETAIL PLAN

SCALE: 1/2" = 1'



CONCRETE CUTOFF WALL DETAIL

SCALE: 1/2" = 1'

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VICE CHAIR
SELECTBOARD

CURTIS POND DAM REHABILITATION PROJECT

SHEET TITLE

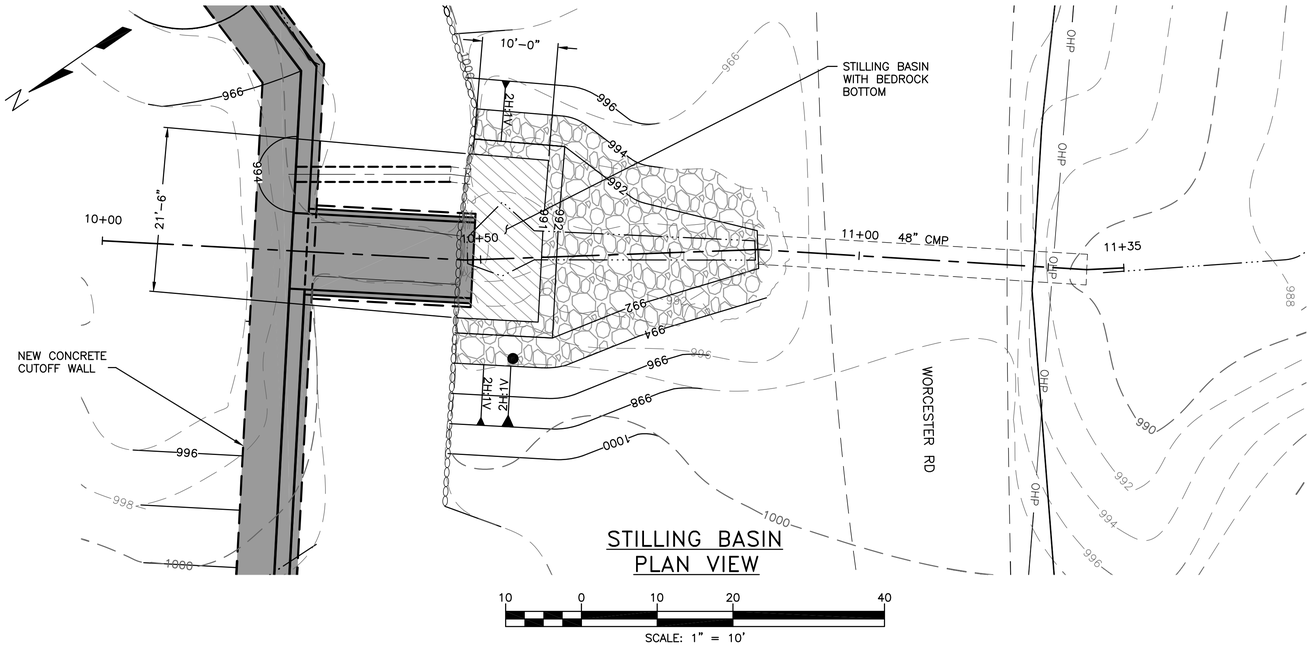
CONCRETE DETAILS

DRAWN BY	DATE
ZDC/EBS	MAY 2013
CHECKED BY	D&K PROJECT #
	921439
PROJ. ENG.	D&K ARCHIVE #
SRP	

SHEET NUMBER

C6

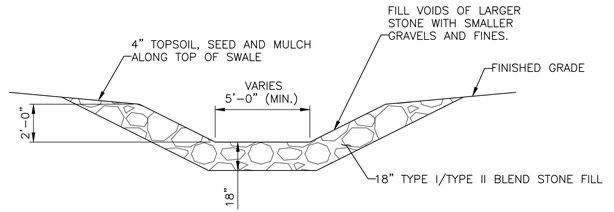
SHEET 7 OF 9



STILLING BASIN PLAN VIEW

10 0 10 20 40

SCALE: 1" = 10'



NOTES:

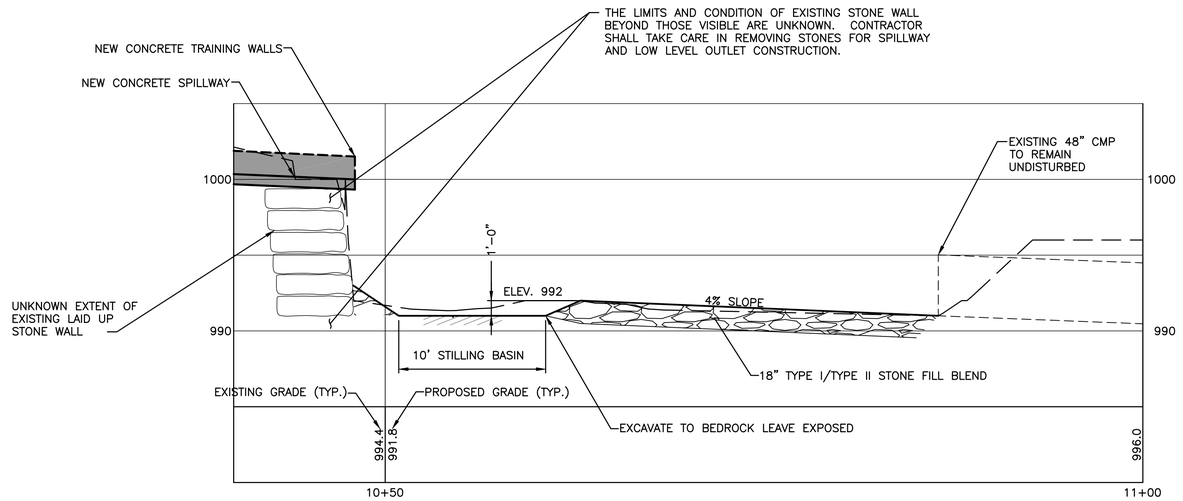
1. RIPRAP TO BE TYPE I/TYPE II STONE FILL.
2. CONTRACTOR SHALL CHOKE ALL VOIDS IN SURFACE OF RIPRAP TO PROMOTE FLOW OF WATER ON TOP OF RATHER THAN THROUGH THE STONE.

STONE LINED SWALE DETAIL

NOT TO SCALE

NOTE:

1. CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STONEWALLS NOT TO BE REMOVED THROUGHOUT THE CONSTRUCTION OF THE REHABILITATION.
2. THE PORTIONS OF THE STONEWALLS TO BE REMOVED SHALL BE DONE IN A MANNER THAT DOES NOT COMPROMISE OR DESTABILIZE THE PORTIONS OF THE WALL THAT ARE TO REMAIN. TO DO SO FALSEWORK MAY BE REQUIRED TO PREVENT THE DESTABILIZATION OF THE STONEWALLS.
3. THE CONTRACTOR AND THE ENGINEER SHALL DISCUSS THE CONSTRUCTION OF THE WORK AND THE INSTABILITY OF EXISTING STONEWALLS. THE CONTRACTOR SHALL PROVIDE SPECIFIC MEANS AND METHODS TO THE ENGINEER THAT WILL RESULT IN MAINTAINING THE STABILITY OF THE WALLS DURING THE CONSTRUCTION OF THE REHABILITATION.
4. ANY DAMAGE TO THE STONEWALLS AS A RESULT OF THIS CONSTRUCTION SHALL BE REPAIRED BY THE CONTRACTOR. THE DAMAGED PORTIONS SHALL BE RETURNED TO A LIKE CONDITION AS PRIOR TO THE DAMAGE TO THE SATISFACTION OF THE ENGINEER.
5. IF BEDROCK IS FOUND TO BE DEEPER IN STILLING BASIN AREA THAN SHOWN ON CHANNEL BASELINE PROFILE, 18" OF TYPE I/TYPEII STONE FILL SHALL BE USED.



STILLING BASIN PROFILE VIEW

5 0 5 10 20

SCALE: 1" = 5'

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VICE CHAIR
SELECTBOARD

CURTIS POND DAM REHABILITATION PROJECT

SHEET TITLE

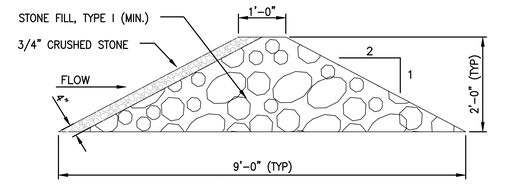
OUTLET CHANNEL PLAN AND DETAILS

DRAWN BY	DATE
ZDC/EBS	MAY 2013
CHECKED BY	D&K PROJECT #
	921439
PROJ. ENG.	D&K ARCHIVE #
SRP	

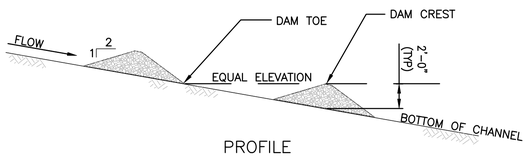
SHEET NUMBER

C7

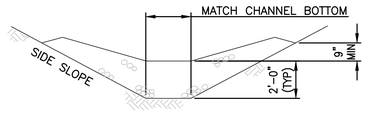
SHEET 8 OF 9



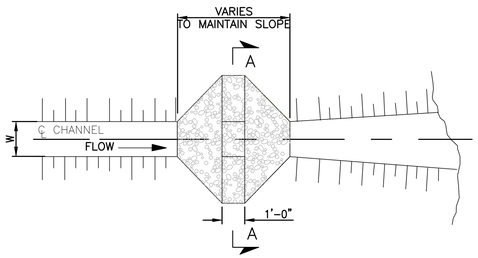
CROSS SECTION



PROFILE



SECTION A–A



PLAN

CHECK DAM – TEMPORARY (STONE)

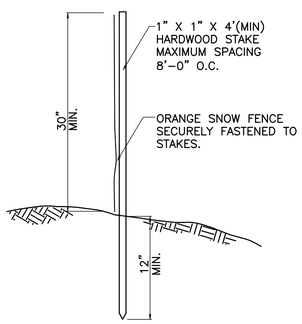
STONE COFFER/CHECK DAM ITEM SUFFIXES	
SUFFIX (XX)	DITCH BOTTOM WIDTH
01	0.0 TO 3.3vft
02	>v3.3 TO 6.6vft
03	>v6.6 TO 9.9vft
04	>v9.9vft

STONE COFFER/CHECK DAM PLACEMENT INTERVAL	
DITCH SLOPE	PLACEMENT INTERVAL **
1 %	200 ft
2 %	100 ft
3 %	65 ft
4 %	50 ft
5 %	40 ft
6 %	35 ft
8 %	25 ft
10 %	20 ft

** BASED ON 2 ft TYPICAL HEIGHT

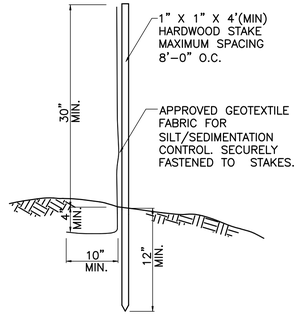
CHECK DAM VOLUMES	
SIDE SLOPE	VOLUME (z)
1:2	0.8 z u
1:3	1.2 z u
1:4	1.6 z u
1:6	2.4 z u

** BASED ON V SHAPED DITCH SECTION. FOR TRAPEZOIDAL DITCH, ADD 3 z/ft OF DITCH WIDTH



PROJECT DEMARCATION FENCE

NOT TO SCALE



SILT FENCE

NOT TO SCALE

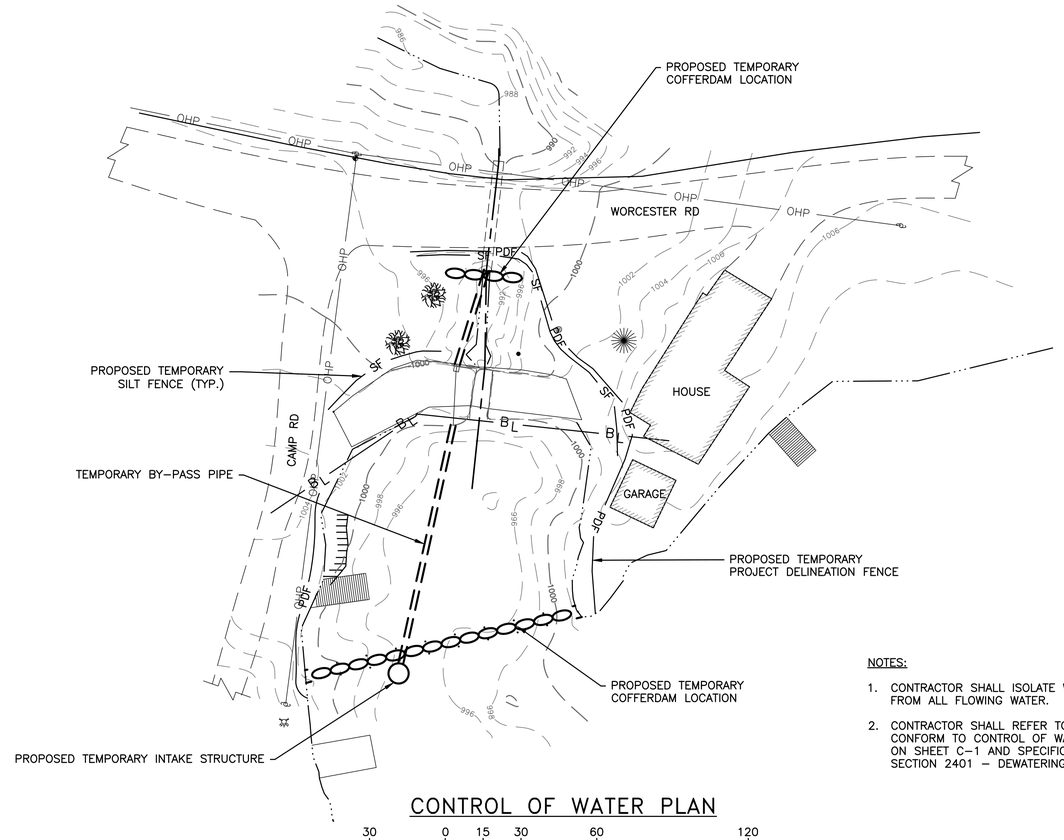
DATUM
HORIZONTAL LOCAL
VERTICAL LOCAL

COFFER/CHECK DAM NOTES:

1. THE PRIMARY PURPOSE OF A CHECK DAM IS TO REDUCE EROSION IN A CHANNEL BY REDUCING FLOW VELOCITY IN THE CHANNEL.
2. CHECK DAMS WILL CAPTURE SEDIMENT THAT FALLS OUT OF SUSPENSION BEHIND THE CHECK DAM DUE TO DECREASED VELOCITY.
3. CHECK DAMS ARE NOT INTENDED TO, AND WILL NOT FILTER SEDIMENT FROM TURBID WATER.
4. SLOPES EXCEEDING 10% SHALL INCLUDE A CHANNEL PROTECTIVE LINING.
5. DETAILS SHOWN SHALL BE USED FOR TEMPORARY INSTALLATION ONLY.
6. MAXIMUM DRAINAGE AREA TRIBUTARY TO STONE CHECK DAM SHALL BE 2.0 ac.
7. MEASURES SHALL BE INSPECTED EVERY SEVEN (7) CALENDAR DAYS, AFTER EACH RAINFALL OF 1/2" OR MORE WITHIN A 12 HOUR PERIOD, OR DAILY DURING PROLONGED RAINFALL. MEASURES SHALL BE CLEANED AND REPAIRED AS REQUIRED.
8. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATION REACHES ONE–HALF OF THE MEASURE HEIGHT. SEDIMENT SHALL BE DISPOSED OF AS UNSUITABLE MATERIAL.
9. COURSE AGGREGATE FACING MATERIAL FOR THE STONE CHECK DAM SHALL MEET THE GRADATION REQUIREMENTS OF SIZE DESIGNATION 3/4" CRUSHED STONE. STONE FILLING CORE MATERIAL FOR THE STONE CHECK DAM SHALL MEET THE GRADATION REQUIREMENTS OF VTRANS STONE FILL, TYPE I. SEE SPECIFICATIONS SECTION 2260–EARTH DAM FOR MATERIAL GRADATIONS.

EROSION CONTROL NOTES

1. TEMPORARY EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) MEASURES ARE REQUIRED THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD.
2. ALL EPSC ACTIVITIES SHALL CONFORM TO THE VT DEC LOW RISK SITE HANDBOOK FOR EROSION PREVENTION AND SEDIMENT CONTROL, 2006.
3. ALL EARTHWORK AND GRADING PERFORMED BETWEEN OCTOBER 15 AND APRIL 15 SHALL CONFORM TO APPROVED WINTER CONSTRUCTION PRACTICES, AS PRESENTED IN THE VT DEC LOW RISK SITE HANDBOOK FOR EROSION PREVENTION AND SEDIMENT CONTROL 2006.
4. THE CONTRACTOR SHALL BE AWARE OF ALL DISCHARGE INTO THE OUTLET CHANNEL. SHOULD THERE BE VISUALLY DISCOLORED DISCHARGE ENTERING THE OUTLET CHANNEL THE CONTRACTOR SHALL DETERMINE THE SOURCE. IF THE CAUSE IS FROM CONSTRUCTION ACTIVITIES ALL OPERATIONS MUST CEASE UNTIL THE DISCHARGE IS NO LONGER DISCOLORED. ALTERNATIVE MEANS OF CONSTRUCTION SHALL BE ADMINISTERED AS TO AVOID ADDITIONAL RELEASE OF DISCOLORED DISCHARGE INTO THE OUTLET CHANNEL.
5. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL INSTALL SILT FENCING AND EROSION CONTROL DEVICES AS SHOWN ON THESE PLANS. EROSION CONTROLS SHALL BE LOGICALLY PHASED WITH CONSTRUCTION ACTIVITIES AND AS DIRECTED BY THE ENGINEER OR OWNERS REPRESENTATIVE.
6. WATER REMOVED FROM WORK AREAS SHALL BE DISCHARGED TO A FILTER BAG LOCATED GREATER THAN 100 FEET FROM ANY FLOWING NON–TURBID WATER.
7. SHOULD A FILTER BAG BE USED TO CONTROL SEDIMENT, A REPLACEMENT FILTER BAG SHALL BE ON SITE AT ALL TIMES. THE FILTER BAGS SHALL BE REMOVED FROM THE SITE ONCE USED.
8. THE EROSION CONTROLS SHALL BE INSPECTED DAILY PRIOR TO INITIATION OF THE DAY'S ACTIVITIES. MAINTENANCE SHALL TAKE PLACE AT THAT TIME.
9. THE CONTRACTOR SHALL TOPSOIL, SEED AND MULCH THE DISTURBED AREAS WITHIN 7 DAYS OF INITIAL DISTURBANCE. AFTER THIS TIME, ANY DISTURBANCE IN THE AREA MUST BE STABILIZED AT THE END OF EACH WORKDAY. ALL AREAS OF DISTURBANCE MUST HAVE PERMANENT STABILIZATION WITHIN 48 HOURS OF REACHING FINAL GRADE. THE FOLLOWING EXCEPTIONS MAY APPLY:
   A) STABILIZATION IS NOT REQUIRED IF THE EARTHWORK IS TO CONTINUE IN THE AREA WITHIN THE NEXT 24 HOURS AND THERE IS NO PRECIPITATION FORECAST FOR THAT SAME PERIOD OF TIME.
   B) STABILIZATION IS NOT REQUIRED IF THE EARTHWORK IS OCCURRING WITHIN A SELF–CONTAINED EXCAVATION, WITH A DEPTH OF 2 FEET OR GREATER AND NO OUTLET.
10. ALL SLOPES AND DISTURBED AREAS SHALL BE GRADED SMOOTH AND FREE OF POCKETS WITH SUFFICIENT SLOPE TO ENSURE DRAINAGE.
11. ALL SLOPES GREATER THAN 1V:2H SHALL BE TREATED WITH BIODEGRADABLE EROSION CONTROL BLANKET, TYPE S150BN AS MANUFACTURED BY NORTH AMERICAN GREEN OR APPROVED EQUAL. THE BLANKET SHALL BE STAPLED WITH BIODEGRADABLE STAPLES, OVERLAPPED, AND SHINGLED CORRECTLY RELATIVE TO WATER FLOW, AND INSTALLED IN GENERAL ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND SPECIFICATIONS. ALL EROSION CONTROL PRODUCTS SHALL CONFORM TO SPECIFICATIONS SECTION 01575.
12. PERMANENT STABILIZATION SHALL BE CONDUCTED ACCORDING TO THE TECHNICAL SPECIFICATIONS SECTION 02483.
13. REMOVAL OF EPSC MEASURES SHALL ONLY BE DONE FOLLOWING THE APPROVAL OF THE ENGINEER. ALL DISTURBANCES CAUSED BY THE REMOVAL SHALL BE REPAIRED IMMEDIATELY.



NOTES:

1. CONTRACTOR SHALL ISOLATE WORK AREA FROM ALL FLOWING WATER.
2. CONTRACTOR SHALL REFER TO AND CONFORM TO CONTROL OF WATER NOTES ON SHEET C–1 AND SPECIFICATIONS SECTION 2401 – DEWATERING

CONTROL OF WATER PLAN

30 0 15 30 60 120

SCALE IN FEET

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JOHN BRABANT
VICE CHAIR
SELECTBOARD

CURTIS POND DAM REHABILITATION PROJECT

SHEET TITLE

CONTROL OF WATER PLAN/EROSION CONTROL DETAILS

DRAWN BY	DATE
ZDC/EBS	MAY 2013
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PROJ. ENG. SRP	D&K ARCHIVE #

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