



**Tighe&Bond**

Lower Mill Pond Dam (MA01076)  
Brewster, MA

## **Chapter 253 Permit Application**

Prepared For:

**Town of Brewster, Massachusetts**

April 2012

11-05222-03  
April 13, 2011



Mr. Mark Geib  
Department of Conservation and Recreation  
Office of Dam Safety, Permits  
251 Causeway Street, Suite 600  
Boston, MA 012114

Re: **Chapter 253 Permit Application  
Lower Mill Pond Dam (MA01076)  
Brewster, Massachusetts**

Dear Mr. Geib:

On behalf of the dam owner, the Town of Brewster, we are submitting an application for a Chapter 253 Dam Safety Permit for the construction of improvements to Lower Mill Pond Dam on Stony Brook Road in Brewster, Massachusetts.

Lower Mill Pond Dam is classified as an Intermediate sized, Low Hazard Potential (Class III) dam, in accordance with Massachusetts Department of Conservation and Recreation (MADCR) classification procedures per the Massachusetts Dam Safety regulations (302 CMR 10.00). Class III dams are dams that may cause minimal property damage and loss of life is not expected in the event of failure. A 2010 Phase 1 inspection and subsequent site visits conducted by Tighe & Bond have provided information that would assist the dam owner with prioritizing dam repair to improve the condition and performance of the dam.

On the basis of visual inspections, the dam is currently considered in Poor condition. This application is to request the replacement of the upstream stone masonry wall and primary spillway with concrete structures, to raise the spillway training walls, and to install a new low level outlet gate. Woody vegetation will be cleared around the embankments, and overtopping protection in the form of geocell panels will be installed on the embankment. During the spillway design flood, which corresponds to a 50-year storm, our hydrology and hydraulic analysis indicates the current spillway geometry does pass this size storm without overtopping the embankment; however, there is minimal freeboard. Therefore, the overtopping protection is simply to protect the embankments due to wave action.

Should you have any questions or require any additional information, please call me at (508) 471-9645.

Very truly yours,

**TIGHE & BOND, INC.**

A handwritten signature in black ink that reads 'Christopher D. Haker'.

Christopher D. Haker, P.E.  
Senior Engineer

Enclosures

Copy: Chris Miller, Brewster Natural Resources Department

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**JURISDICTIONAL DETERMINATION  
CHAPTER 253 PERMIT APPLICATION**

**Dam**

**Name:** Lower Mill Pond Dam (aka Stoney Brook Dam) – MA01076 **Date:** April 2012

**Dam**

**Location (City or Town):** Brewster

**Owner(s) Name:** Town of Brewster

Any person(s), who proposes to construct, repair, materially alter, breach or remove a dam, pursuant to M.G.L. Chapter 253, as amended by Chapter 330 of the Acts of 2002, must file with the Commissioner a permit application to determine whether or not a Chapter 253 Dam Safety Permit is required. Routine maintenance related work does not require a Chapter 253 Dam Safety Permit, however the owner(s) must file for a determination. No work is to commence before a determination is made by the Commissioner **(PART A)**.

If the Commissioner determines that the proposed work falls within the jurisdiction of M.G.L. Chapter 253 the Owner(s) must apply for a permit **(PART B)**.

The application and notices shall be sent by certified mail to DCR, Office of Dam Safety, Permits. All permit applications must comply with design and construction criteria as specified in 302 CMR 10.00: Dam Safety Rules and Regulations effective November 4, 2005.

Certain dams and reservoirs as defined in 302 CMR 10.00 are excluded from filing. Also, the approval of the Commissioner shall not apply to small dams or embankments constructed for irrigation, detention, storage tanks, or other purposes that impounds less than 15 acre-feet, regardless of height and is not in excess of 6 feet in height, regardless of storage capacity provide that any discharge(s) shall not materially affect property.

Any action taken by the Commissioner in regard to this application does not release the owner(s) from the requirements of any other law or regulatory authority.

COMMONWEALTH OF MASSACHUSETTS · EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

Department of Conservation and Recreation  
Office of Dam Safety  
John Augustus Hall  
180 Beaman Street  
West Boylston, MA 01583  
508-792-7716 508-792-7718 FAX  
www.mass.gov/dcr



Deval L. Patrick  
Governor

Timothy P. Murray  
Lt. Governor

Ian A. Bowles, Secretary  
Executive Office of Environmental Affairs

Richard K. Sullivan, Jr., Commissioner  
Department of Conservation & Recreation

**(PART A)**

**Notice of Jurisdictional Determination**

PER 302 CMR 10.00

(CHECK THE APPROPRIATE COLUMN)

1. Is there any risk to life and/or property resulting from flooding and/or a dam failure?  
Yes( ) No(**X**)
  
2. Is the structure classified as a roll/river dam?  
Yes( ) No(**X**)
  
3. Does the maximum impoundment exceed 15 acre-feet (1 surface acre x 1 foot deep)?  
Yes(**X**) No( )
  
4. Does the height of the dam exceed 6 feet above the natural bed of the stream at any point?  
Yes(**X**) No( )

If a question is answered **Yes**, then the Commissioner has the authority to determine the need for a permit. If the answer to any question is unknown, the applicant needs to request a determination, **(PART A)**. If all questions are answered **No** a written determination may still be requested from the Commissioner **(PART A)**.

**Any request for jurisdictional determination relative to work to be performed on, or affecting a dam, must contain the following basic information:**

The present dam owner(s) name, address and telephone number based on Registry of Deeds records (Book and Page Numbers) and also Town/City records (Assessor maps and tax records).

**Town of Brewster, Board of Selectmen  
2198 Main Street  
Brewster, MA 02631  
508-896-3701**

A topographic or town map clearly indicating the dam location, impoundment, dam name and local access. **Refer to Figure 1 provided in Appendix A.**

A plan view of the dam showing pertinent details: i.e. elevations, length, width, spillway, controls, buildings etc. Also the maximum cross section through the dam as measured from the lowest point. **Refer to Proposed Construction Drawings provided in Appendix E.**

Elevation(s) and surface area (acres) of the pond. Normal (spillway) and maximum (crest) volumes of water impounded (acre-feet) by the dam (measured or estimated).

	Elevation (feet)	Surface Area (acres)	Storage Volume (acre-feet)
<b>Normal Pool</b>	<b>26.0</b>	<b>51</b>	<b>250</b>
<b>Maximum Pool</b>	<b>27.5</b>	<b>440<sup>1</sup></b>	<b>690<sup>1</sup></b>

<sup>1</sup> Note that the Maximum Pool surface area and storage volume account for storage in Upper Mill Pond and Walkers Pond.

A brief statement regarding possible damage and risk to life based on flood discharges and/or a dam breach.

**There are no residential structures downstream of Lower Mill Pond Dam which would likely be affected if the dam failed. In the event of a dam failure, water would flow downstream approximately a half mile to a culvert below Main Street and then another half mile to Cape Code Bay. Failure of the dam at maximum pool may cause minimal property damage and loss of life is not expected. As a result, the dam is classified as Low hazard.**

Full nature of work to be performed and signature of owner(s) and/or applicant(s) submitting this request.

**A summary of the proposed work is as follows:**

- **Site clearing and removal of stumps and associated root balls.**
- **Install temporary cofferdams upstream and downstream of the existing stone masonry wall. Remove existing wall, sluice gate, and spillway, and selectively demolish stone masonry spillway training walls immediately downstream of the spillway. Construct new concrete upstream wall with stone facing/cap and concrete spillway, and install new metal sluice gate. Raise the stone masonry training walls downstream of the spillway to better contain peak spillway discharge flows.**
- **Perform minor regrading to improve embankment runoff and maintenance.**
- **Installation of overtopping protection consisting of geocell panels infilled with loam and seed.**

Photos of dam showing structures; i.e. gates, outlets, spillways. Also, any past history of repairs, flooding events, owners, etc.

**Refer to photographs provided in Appendix B.**

(PART A cont.)

**Regular Maintenance**

**Further, any request to the Commissioner for a jurisdictional determination relative to maintenance work on a dam must complete the following section:**

If considered regular maintenance or permitted water adjustments for pond maintenance, flood operation and/or other dam/pond activity.

**Check Here** N/A

Typical maintenance activities include, but are not limited to the following items.

- |   |             |
|---|-------------|
| 1. Normal water level pond drawdown?                  | Yes( )No( ) |
| 2. Minor Earthwork/masonry maintenance and repair?    | Yes( )No( ) |
| 3. Riprap maintenance and repair?                     | Yes( )No( ) |
| 4. Vegetation and tree maintenance (less 6”Diameter)? | Yes( )No( ) |
| 5. Rodent damage control?                             | Yes( )No( ) |
| 6. Traffic damage controls and erosion?               | Yes( )No( ) |
| 7. Mechanical maintenance to outlets?                 | Yes( )No( ) |
| 8. Electrical maintenance?                            | Yes( )No( ) |
| 9. Cleaning?  | Yes( )No( ) |
| 10. Concrete maintenance?                             | Yes( )No( ) |
| 11. Metal component maintenance?                      | Yes( )No( ) |
| 12. Other as specified:                               | Yes( )No( ) |

Please describe the **nature of proposed regular maintenance** checked above by item number. Use additional paper if necessary.

**STOP HERE if requesting a project determination, If applying for a Permit proceed to PART B.**

**(PART B)**

**Application for Dam Safety Permit**

General Information:

1. Dam location (City/Town) attach locus map and local access to the dam.
2. Dam Name(s): **Lower Mill Pond Dam (aka – Stoney Brook Dam)**
3. Impoundment Name(s): **Lower Mill Pond**
4. Assessor’s Information (city or town tax assessors office):  
Map Number: **35 (new maps), 36 (old maps)**  
Section Number: **N/A**  
Lot(s) Number: **47 (new maps), 21 (old maps)**  
Record Owner(s) and Address: **Brewster Town Of, Stony Brook Grist Mill, 2198 Main Street, Brewster, MA 02631**
5. Registry Location: **Barnstable**  
Book and Page: **565/129**  
Present and/or Prospective owner(s):  
Name: **Town of Brewster, Board of Selectmen**  
Address: **2198 Main Street, Brewster, MA 02631**  
Telephone: \_\_\_\_\_
6. Present or prospective abutter(s), for DCR funded or granted projects:  
Name: **Please refer to Appendix C for a Certified List of Abutters.**  
Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_
7. Name of US Geological Survey map quadrangle: **Harwich & Dennis**
8. Name of reservoir or waterway: **Lower Mill Pond; Stony Brook**
9. Is there specific legislative authority to construct the dam?      **N/A**    Yes( )No( )  
If yes, identify: \_\_\_\_\_
10. Purpose of the dam structure? **The dam was originally constructed to power the downstream historic grist mill, which is now a museum. The impoundment is also currently used for recreation and acts as spawning and nursery habitat for river herring.**

11. Nature of work to be performed: New dam Yes( )No(**X**), Alteration or major repair of existing dam Yes (**X**)No( ), Other repair or pond work effecting dam Yes( )No(**X**).

12. Is a MEPA Certification required to perform the proposed work? Yes( )No(**X**)

(PART B cont.)

**HAZARD POTENTIAL EVALUATION**

(Based on downstream field investigation)

1. The number of people that could be effected by failure or overtopping of the dam structure, and to what degree they could be effected:

**A breach failure of Lower Mill Pond Dam is not expected to cause loss of life as there are no residential structures downstream of the dam.**

2. The estimated number of properties (homes, building, etc.) that could be effected by failure or overtopping of the dam structure, and to what degree they could be effected:

**A breach failure of Lower Mill Pond Dam may cause minimal flooding to the grist mill immediately downstream, but is not expected to impact any residential or commercial properties.**

3. The estimated roads or other structures that could be effected by failure or overtopping of the dam structure, and to what degree they could be effected:

**Failure of the dam at maximum pool may impact Stony Brook Road, which is a side street. However, the approximately 4 foot wide by 3.5 foot tall culvert below the road has a greater capacity than the spillway. The flood wave resulting from a dam failure would likely have minimal impact on the roadway.**



(PART B cont.)

**HYDROLOGIC, HYDRAULIC AND STRUCTURAL CONSIDERATIONS**

Hydrologic, hydraulic and structural design procedures should be used, as established by one of the following: The U.S Army Corps of Engineers, the U.S. Bureau of Reclamation, the U.S. Soil Conservation Service and other procedures universally accepted as sound engineering practice.

1. Contributory drainage area (sq. mi.): 4.7  
(Attach topographic map with outline of drainage area) **Please refer to Figure 2 provided in Appendix D.**
2. Design storm duration: **Based on Lower Mill Pond Dam's Intermediate size and Low hazard classification, the design storm is the 50-year, 24-hour storm event based on 302 CMR 10.00.**  
Rainfall Intensity (inches/hour) 6.92 inches / 24-hours
3. Runoff (%) 26% Inches: 1.82 (average)
4. Peak Outflow (cfs): 39 cfs
5. Previous know flood of record (month/year): Dam reportedly overtopped in 1955
6. Design maximum flood level elevation: 27.3 feet
7. Addition information: **Please refer to the Hydrologic/Hydraulic Analysis Output included in Appendix D. The spillway has the capacity to pass the SDF of the 50-year storm event with approximately 0.2 feet of freeboard. It was determined that widening the spillway in order to pass the SDF with at least one foot of freeboard would be impractical and cost prohibitive as the entire dam would become a spillway. Geocells are proposed to provide overtopping protection of the embankment in lieu of freeboard. Flow through the sluice gate was not consider during the SDF to be conservative.**

**DESIGN CRITERIA**

1. Datum used: MSL of 1929 \_\_\_\_\_ NAVD 88 X Assumed \_\_\_\_\_ Other \_\_\_\_\_
2. Type of structure (earth, concrete, etc.): **Earthen embankment with upstream and downstream stone masonry walls.**
3. Maximum structural height of the dam (feet): 6.5
4. Crest length (ft): 100 Crest width (ft): **Varies (approx. 20 feet)**
5. Top elevation of dam: **27.50 feet (top of upstream wall)**

6. Present river or channel elevation at dam (ft): **Channel bottom approx. 21.0 feet at toe of downstream wall**
7. Normal pool elevation (ft): **26.09**
8. Normal pool surface area (acre): **51**
9. Normal impoundment (acre-ft): **250**
10. Maximum pool elevation (ft): **27.5**
11. Maximum pool surface area (acre): **440**
12. Maximum impoundment (acre-ft): **690**
13. Freeboard, as measured from the maximum design pool elevation to the crest of dam (ft): **0.2**
14. Nature of slope protection: **Embankment to be covered with embedded geocell infilled with loam and re-vegetated.**
15. Primary Spillway information:  
 Spillway type: **Uncontrolled broad-crested concrete weir with rectangular notch for fish passage.**  
 Top elevation: **26.09 feet**  
 Dimensions (ft): **5 feet long with 1.5 foot long notch in center**  
 Capacity (cfs): **46**  
 Percentage of design flood: **118%**
16. Emergency Spillway information:  
 Spillway type: **N/A**  
 Top elevation: \_\_\_\_\_  
 Dimensions (ft): \_\_\_\_\_  
 Capacity (cfs): \_\_\_\_\_  
 Percentage of design flood: \_\_\_\_\_
17. Low Level Outlet (s):  
 Type(s): **Metal slide gate with crank operator**  
 Invert elevation(s): **21.5 feet**  
 Dimension(s) (ft): **24" x 60" gate with 36" travel**  
 Capacity (cfs): **50 cfs @ top of dam**

Percentage of design flood: 106%

**SUBSURFACE INVESTIGATION**

Boring logs, analysis and recommendations to accompany this application.

**Soil borings and seepage and stability analyses were not performed for this project as the deficiencies at the dam are localized and easily identifiable. No seepage through the embankment has been observed, and leakage through the upstream stone masonry wall will be addressed by construction of a new cast-in-place concrete wall. There are no apparent signs of slope instability, and the downstream embankment slopes are approximately 15H:1V. Access for a drill rig to perform soil borings is difficult if not impossible without construction of a new access road. While such a road will be necessary for the repair work, the cost to construct the new access road for drill rig access is excessive considering the value the information provides.**

**CONSTRUCTION DRAWINGS**

Names and addresses of abutters to the proposed project must be clearly indicated on the construction drawings.

**Please refer to Appendix E.**

**(PART B cont.)**

**SIGNATURE SECTION**

**Applicant(s)**

Name(s) Town of Brewster Natural Resources Department

Street: 2198 Main Street

City/Town: Brewster State: MA Zip: 02631

Telephone: 508-896-4546 Fax: 508-896-8089 Email Address: cmiller@town.brewster.ma.us

Signature and Title \_\_\_\_\_ Date: \_\_\_\_\_

**Chris Miller, Director, Natural Resources Department**

**Licensed professional civil engineer registered in Massachusetts.**

Name: Christopher D. Haker, P.E.

Company: Tighe & Bond, Inc.

Street: 446 Main Street

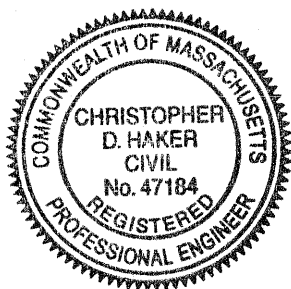
City/Town: Worcester State: MA Zip: 01608

Telephone: 508-471-9645 Fax: 508-795-1087 Email Address: CDHaker@tighebond.com

Signature:  Date: 4/12/2012

**Christopher D. Haker, P.E., Senior Engineer**

Stamp and License Number:



**Chapter 253 Application Fee and Permit Fees:**

- (a) The fee to apply for a Chapter 253 Dam Safety Permit to construct, materially alter, perform major repairs, breach or remove a dam is \$50.00
- (b) The fee for review and issuance of a Chapter 253 Dam Safety Permit is based on the size and cost of the proposed project (construction and engineering) as follows:
  - 1. For a dam construction project costing up to \$100,000.00 the fee will be \$250.00
  - 2. For a dam construction project costing from \$100,000.00 to \$500,000.00 the fee will be \$500.00
  - 3. For a dam construction project costing between \$500,000.00 and \$1,000,000.00 the fee will be \$750.00
  - 4. For any dam project over \$1,000,000.00, the fee will be \$1,000.00

**The cost of the proposed project:**

- (a) The cost of engineering: \$ 70,800
- (b) The cost of construction: \$ 290,000

The total cost: \$ 360,800

Please enclosed check or money order payable to: The Commonwealth of Massachusetts, Office of Dam Safety – Permits Section    **N/A - Exempt**

**Exclusions: The Commonwealth, its agencies, authorities and political sub-divisions, including municipalities, are exempt from the payment of fees.**

**Minimum Submission Requirements:**

With this application submit one set of bounded (utilizing plastic comb bindings) final design report with 11”x 17” design drawings. An electronic copy of the design report and drawings in PDF (compatible with Adobe Reader Version 6.0 or later) format presented on compact disc (CD-R media, closed for future recording). CD’s shall be protected by jewel case and contain a label indicating the dam project name, NID ID #, the Town in which the dam is located, and the date of the design report.

**All required submittals shall be sent by certified mail to:**

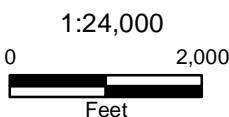
Department of Conservation and Recreation  
Office of Dam Safety, Permits  
John Augustus Hall  
180 Beaman Street  
West Boylston, MA01583

Approval or denial of a permit will be issued within 60 days from the time the final design report and permit application is received.

APPENDIX A  
**USGS Site Locus**



Dam Location  
Latitude: 41.74431506  
Longitude: -70.11248397



### FIGURE 1 SITE LOCUS MAP

Lower Mill Pond Dam  
Rehabilitation Project  
Brewster, Massachusetts

**Tighe & Bond**

December 2011

Based on USGS Topographic Map for  
Harwich, MA Quadrangle.  
Revised 1974. 10-Foot Contour Interval.



APPENDIX B  
**Photographs**





Photo No. 1 – Upstream stone masonry wall with spillway in foreground, viewed from right abutment



Photo No. 2 – Concrete spillway weir with rectangular orifice for fish passage



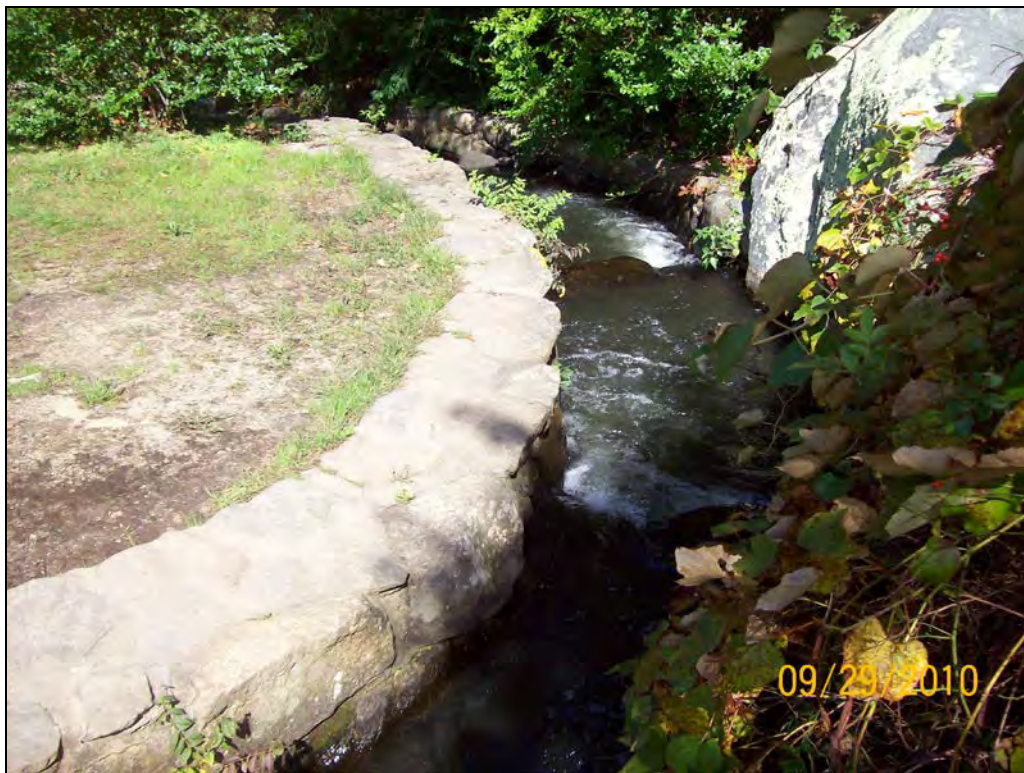


Photo No. 3 – Spillway discharge channel with stone masonry walls



Photo No. 4 – Embankment crest viewed from spillway





Photo No. 5 – Low level outlet slide gate



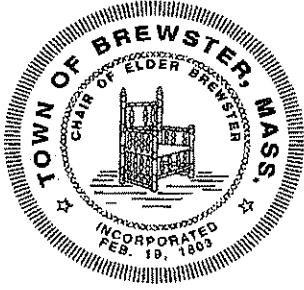
Photo No. 6 – Left abutment area with leakage visible on right





Photo No. 7 – Downstream side of embankment and transition to natural ground

APPENDIX C  
**Certified List of Abutters**



# Town of Brewster

2198 MAIN STREET  
BREWSTER, MASSACHUSETTS 02631-1898

(508) 896-3701  
FAX (508) 896-8089

OFFICE OF:  
BOARD OF ASSESSORS

December 5, 2011

To Whom It My Concern:

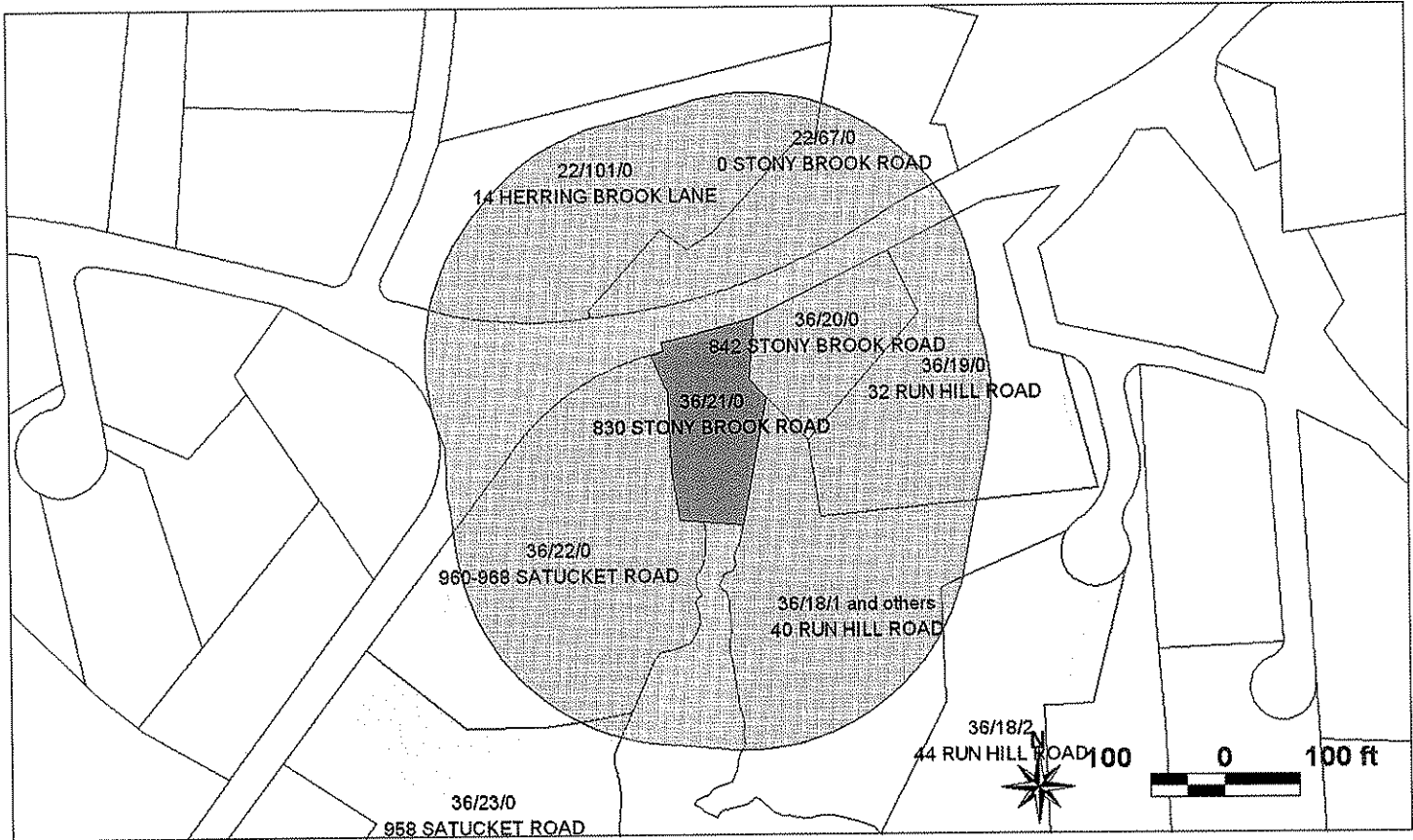
This certifies that the attached list sets forth the names and addresses of the abutters to, the abutters to abutters within 300 feet of, and the properties directly across the street from, **830 Stony Brook Road, Map 36, Parcels 21**, as shown on the records of the Brewster Assessing Department.

Respectfully Submitted,

David H. Tately, MAA  
Deputy Assessor

TOWN OF BREWSTER, MA  
 BOARD OF ASSESSORS  
 2198 Main Street Brewster, MA 02631

Abutters List Within 300 feet of Parcel 36/21/0



Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
2580	22-67-0-E (0350015000)	BREWSTER TOWN OF HERRING RUN	0 STONY BROOK ROAD	2198 MAIN STREET	BREWSTER	MA	02631
2624	22-101-0-R (0350014000)	SUMNER CHARLES L & JOHANSEN CYNTHIA G	14 HERRING BROOK LANE	14 HERRING BROOK LANE	BREWSTER	MA	02631
5994	36-18-1-R (0350043000)	TRICKEY CAROLINE & WALKER SARAH ADELAIDE	40 RUN HILL ROAD	136 BRADY AVENUE	SALEM	NH	03079
14601	36-18-101-E ( )	BREWSTER CONSERVATION TRUST	0 STONY BROOK ROAD REAR	PO BOX 268	BREWSTER	MA	02631
5995	36-18-2-R (0350042000)	TARANTO RICHARD G & PLAUT VICKI L	44 RUN HILL ROAD	7507 GLENBROOK ROAD	BETHESDA	MD	20814
5997	36-19-0-R (0350044000)	ERICKSON STEPHANIE L	32 RUN HILL ROAD	32 RUN HILL ROAD	BREWSTER	MA	02631
5998	36-20-0-R (0350046000)	MORONEY THOMAS F JR	842 STONY BROOK ROAD	842 STONY BROOK ROAD	BREWSTER	MA	02631
5999	36-21-0-E (0350047000)	BREWSTER TOWN OF STONY BROOK GRIST MILL	830 STONY BROOK ROAD	2198 MAIN STREET	BREWSTER	MA	02631
6000	36-22-0-R (0350048000)	THORNE JOHN & SARA M	960-968 SATUCKET ROAD	1920 PLYMOUTH STREET NW	WASHINGTON	DC	20012
6001	36-23-0-R (0350049000)	COUZENS JAMES S TRUSTEE COUZENS NOMINEE TRUST	958 SATUCKET ROAD	958 SATUCKET ROAD	BREWSTER	MA	02631

22-67-0-E

BREWSTER TOWN OF  
HERRING RUN  
2198 MAIN STREET  
BREWSTER, MA 02631

22-101-0-R

SUMNER CHARLES L &  
JOHANSEN CYNTHIA G  
14 HERRING BROOK LANE  
BREWSTER, MA 02631

36-18-1-R

TRICKEY CAROLINE &  
WALKER SARAH ADELAIDE  
136 BRADY AVENUE  
SALEM, NH 03079

36-18-101-E

BREWSTER CONSERVATION TRUST  
PO BOX 268  
BREWSTER, MA 02631

36-18-2-R

TARANTO RICHARD G &  
PLAUT VICKI L  
7507 GLENBROOK ROAD  
BETHESDA, MD 20814

36-19-0-R

ERICKSON STEPHANIE L  
32 RUN HILL ROAD  
BREWSTER, MA 02631

36-20-0-R

MORONEY THOMAS F JR  
842 STONY BROOK ROAD  
BREWSTER, MA 02631

36-21-0-E

BREWSTER TOWN OF  
STONY BROOK GRIST MILL  
2198 MAIN STREET  
BREWSTER, MA 02631

36-22-0-R

THORNE JOHN & SARA M  
1920 PLYMOUTH STREET NW  
WASHINGTON, DC 20012

36-23-0-R

COUZENS JAMES S TRUSTEE  
COUZENS NOMINEE TRUST  
958 SATUCKET ROAD  
BREWSTER, MA 02631

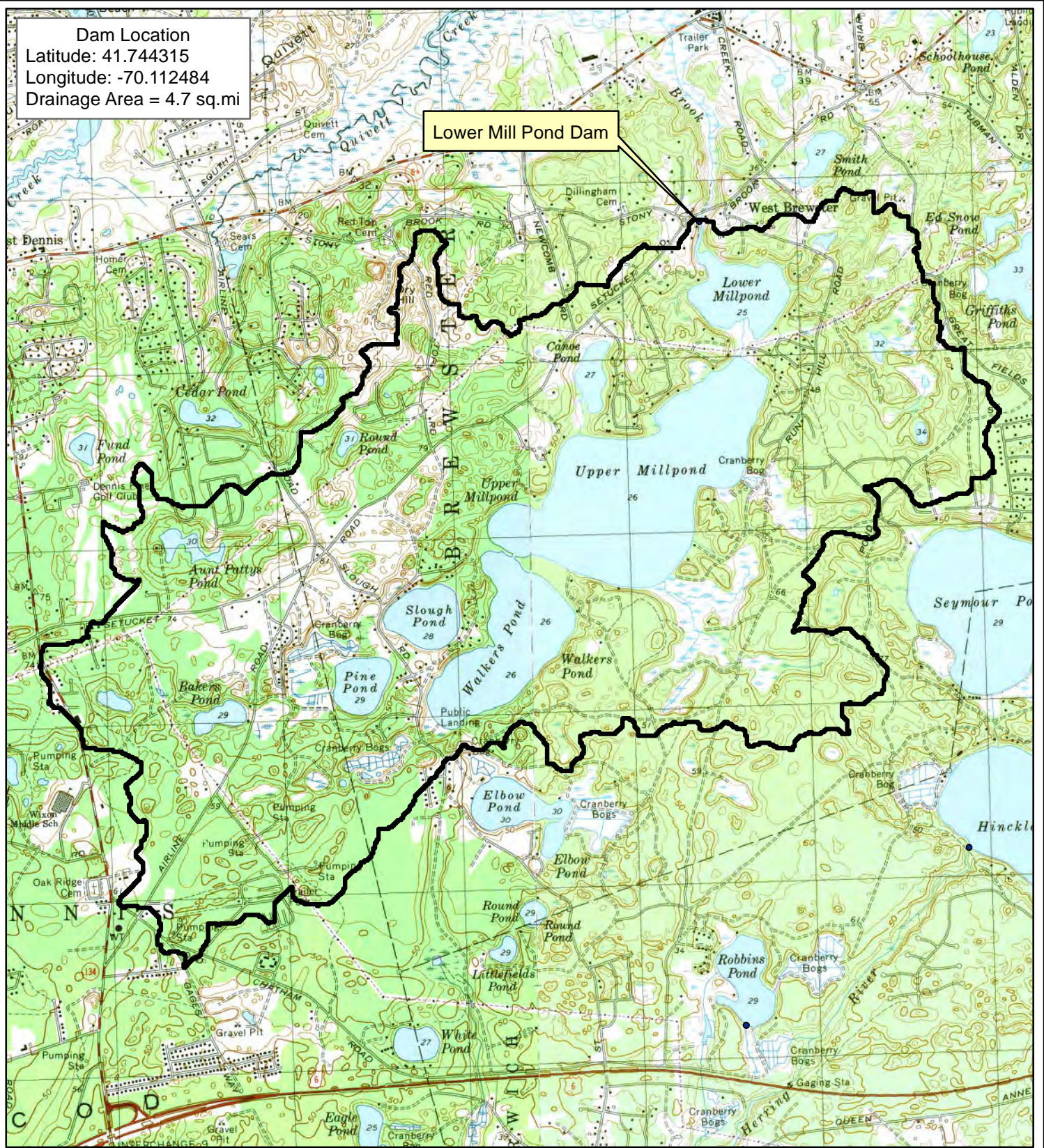



APPENDIX D  
**Hydrologic/Hydraulic Analysis**

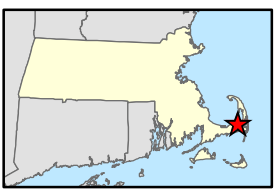
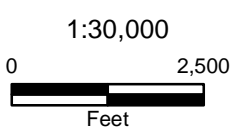


Dam Location  
 Latitude: 41.744315  
 Longitude: -70.112484  
 Drainage Area = 4.7 sq.mi

Lower Mill Pond Dam



 Watershed Delineation



**FIGURE 2**  
**MAP OF DRAINAGE AREA**

Lower Mill Pond Dam  
 Brewster, Massachusetts  
 MA01076

**Tighe & Bond**  
 November 2011

Based on USGS Topographic Map for Harwich & Dennis, MA Quadrangle. Revised 1974



# 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	Massachusetts
Location	near 830 Stony Brook Rd, Brewster, MA 02631, USA
Longitude	70.112 degrees West
Latitude	41.744 degrees North
Elevation	20 feet
Date/Time	Mon, 5 Dec 2011 13:21:07 -0500

### Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.45	0.55	0.73	0.91	1.14	1yr	0.78	1.14	1.33	1.68	2.14	2.73	3.13	1yr	2.42	3.01	3.45	4.07	4.68	1yr
2yr	0.36	0.56	0.70	0.92	1.16	1.45	2yr	1.00	1.38	1.68	2.09	2.61	3.25	3.65	2yr	2.88	3.51	3.97	4.72	5.30	2yr
5yr	0.44	0.69	0.86	1.15	1.47	1.86	5yr	1.27	1.77	2.15	2.67	3.28	4.02	4.52	5yr	3.56	4.34	4.90	5.72	6.42	5yr
10yr	0.51	0.80	1.01	1.37	1.78	2.25	10yr	1.53	2.14	2.60	3.21	3.91	4.74	5.32	10yr	4.19	5.11	5.76	6.61	7.42	10yr
25yr	0.61	0.97	1.23	1.70	2.26	2.89	25yr	1.95	2.75	3.34	4.09	4.93	5.87	6.60	25yr	5.20	6.34	7.12	8.00	8.99	25yr
50yr	0.70	1.13	1.45	2.03	2.73	3.49	50yr	2.35	3.33	4.03	4.91	5.87	6.92	7.77	50yr	6.12	7.47	8.37	9.26	10.40	50yr
100yr	0.81	1.32	1.70	2.41	3.28	4.21	100yr	2.83	4.02	4.85	5.88	6.98	8.15	9.16	100yr	7.21	8.81	9.84	10.74	12.04	100yr
200yr	0.95	1.54	2.00	2.86	3.95	5.08	200yr	3.41	4.87	5.85	7.05	8.30	9.61	10.82	200yr	8.50	10.40	11.57	12.46	13.95	200yr
500yr	1.16	1.90	2.48	3.60	5.05	6.51	500yr	4.36	6.27	7.48	8.96	10.44	11.95	13.48	500yr	10.57	12.96	14.35	15.19	16.95	500yr

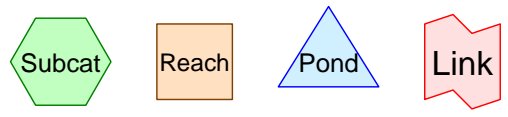
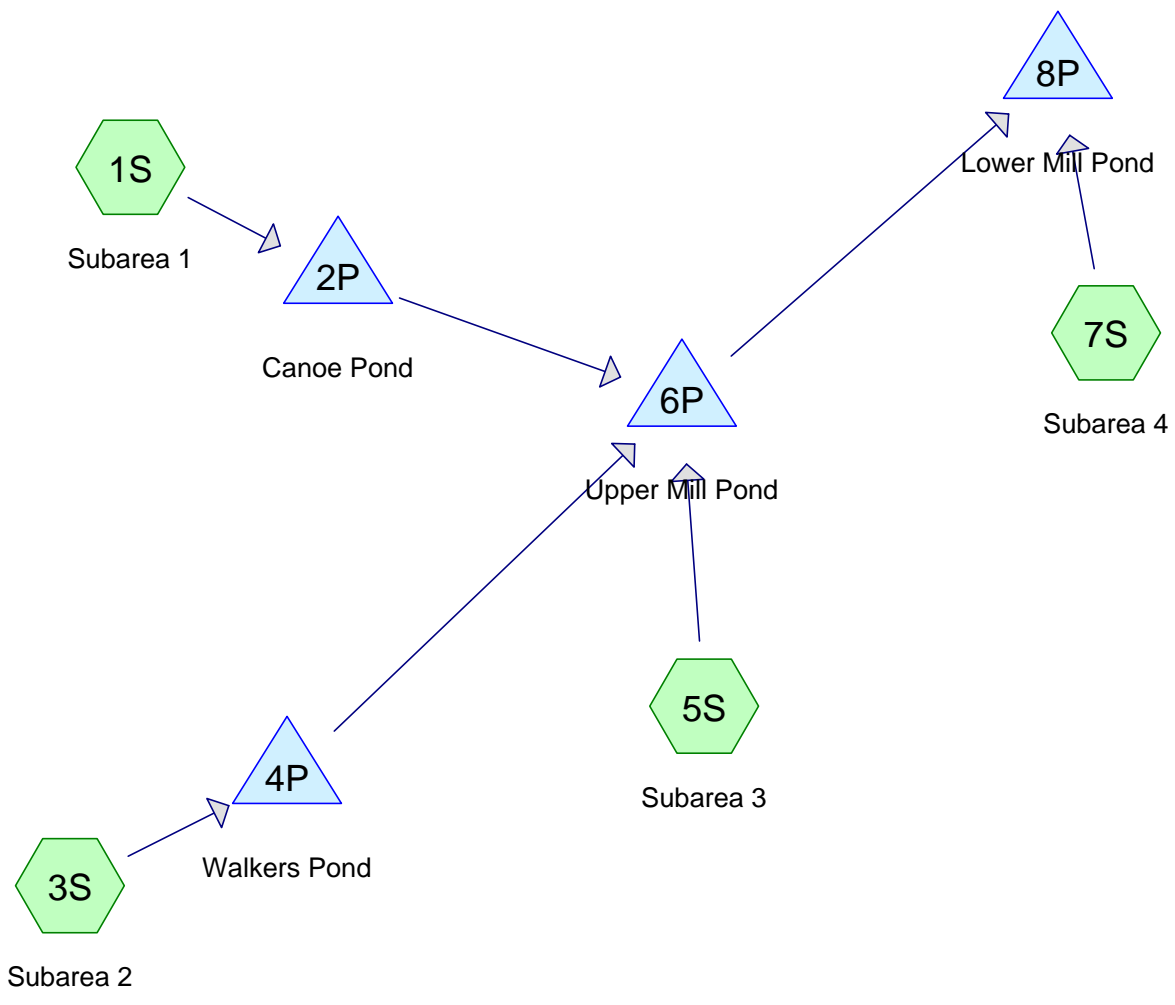
### Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.38	0.47	0.63	0.78	0.92	1yr	0.67	0.90	1.10	1.60	1.99	2.34	2.60	1yr	2.07	2.50	3.18	3.56	4.31	1yr
2yr	0.35	0.54	0.66	0.90	1.11	1.36	2yr	0.96	1.33	1.56	2.10	2.64	3.17	3.56	2yr	2.81	3.42	3.85	4.64	5.19	2yr
5yr	0.41	0.63	0.78	1.07	1.36	1.66	5yr	1.17	1.62	1.95	2.55	3.11	3.77	4.26	5yr	3.34	4.10	4.62	5.44	6.10	5yr
10yr	0.46	0.70	0.87	1.21	1.57	1.93	10yr	1.35	1.88	2.25	2.87	3.50	4.28	4.81	10yr	3.79	4.63	5.16	6.08	6.84	10yr
25yr	0.53	0.81	1.01	1.44	1.89	2.34	25yr	1.63	2.29	2.62	3.32	4.11	5.09	5.72	25yr	4.51	5.50	6.10	6.91	7.96	25yr
50yr	0.59	0.91	1.13	1.62	2.18	2.72	50yr	1.88	2.66	2.94	3.67	4.65	5.81	6.54	50yr	5.15	6.29	6.93	7.65	8.93	50yr
100yr	0.67	1.02	1.28	1.85	2.53	3.15	100yr	2.18	3.08	3.31	4.07	5.28	6.67	7.49	100yr	5.90	7.20	7.88	8.44	10.01	100yr
200yr	0.76	1.14	1.45	2.09	2.92	3.69	200yr	2.52	3.61	3.74	4.45	5.99	7.64	8.60	200yr	6.76	8.27	8.99	9.32	11.26	200yr
500yr	0.89	1.33	1.71	2.48	3.53	4.57	500yr	3.05	4.47	4.39	5.03	7.10	9.18	10.41	500yr	8.12	10.01	10.77	10.64	13.19	500yr

### Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.34	0.52	0.64	0.86	1.05	1.30	1yr	0.91	1.27	1.54	2.07	2.57	3.02	3.37	1yr	2.67	3.24	3.72	4.36	4.98	1yr
2yr	0.39	0.60	0.73	0.99	1.22	1.49	2yr	1.06	1.46	1.70	2.35	2.84	3.36	3.80	2yr	2.98	3.66	4.15	4.88	5.53	2yr
5yr	0.49	0.75	0.93	1.28	1.62	1.96	5yr	1.40	1.92	2.28	2.96	3.67	4.30	4.77	5yr	3.80	4.59	5.17	5.97	6.72	5yr
10yr	0.59	0.91	1.13	1.58	2.04	2.44	10yr	1.76	2.38	2.81	3.56	4.45	5.18	5.79	10yr	4.58	5.57	6.29	7.03	7.90	10yr
25yr	0.78	1.18	1.47	2.10	2.76	3.26	25yr	2.38	3.18	3.89	4.69	5.74	6.64	7.41	25yr	5.88	7.12	8.03	9.08	9.80	25yr
50yr	0.95	1.44	1.79	2.58	3.47	4.05	50yr	3.00	3.96	4.90	5.76	6.97	8.00	8.90	50yr	7.08	8.56	9.67	10.84	11.54	50yr
100yr	1.16	1.76	2.20	3.18	4.36	5.04	100yr	3.77	4.93	6.17	7.07	8.45	9.64	10.71	100yr	8.53	10.30	11.61	12.96	13.58	100yr
200yr	1.43	2.15	2.72	3.94	5.50	6.27	200yr	4.75	6.13	7.77	8.72	10.24	11.62	12.86	200yr	10.28	12.37	13.96	15.56	15.99	200yr
500yr	1.88	2.80	3.61	5.24	7.45	8.33	500yr	6.43	8.14	10.57	11.52	13.21	14.86	16.40	500yr	13.15	15.77	17.79	19.83	19.83	500yr





**Drainage Diagram for Lower Mill Pond Dam\_FINAL\_notch**  
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## Lower Mill Pond Dam\_FINAL\_notch

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### Area Listing (all nodes)

<u>Area (acres)</u>	<u>CN</u>	<u>Description (subcats)</u>
926.025	30	Woods, Good, HSG A (3S,5S,7S)
663.775	36	Woods, Fair, HSG A (1S,3S,5S,7S)
201.400	39	>75% Grass cover, Good, HSG A (3S,5S,7S)
9.300	49	50-75% Grass cover, Fair, HSG A (1S)
229.600	54	1/2 acre lots, 25% imp, HSG A (1S,5S,7S)
2.100	55	Woods, Good, HSG B (3S)
248.400	61	1/4 acre lots, 38% imp, HSG A (3S)
4.140	74	>75% Grass cover, Good, HSG C (7S)
125.800	77	Woods, Good, HSG D (5S,7S)
27.205	79	Woods, Fair, HSG D (1S,3S)
19.390	80	>75% Grass cover, Good, HSG D (3S)
19.390	84	50-75% Grass cover, Fair, HSG D (3S)
3.115	85	1/2 acre lots, 25% imp, HSG D (3S)
2.760	98	Paved parking & roofs (7S)
49.000	98	Paved roads w/curbs & sewers (1S,3S,5S,7S)
497.200	99	Water (1S,3S,5S,7S)
<hr/>		
3,028.600		

**Lower Mill Pond Dam\_FINAL\_notch**

Type III 24-hr 50 year Rainfall=6.92"

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Time span=6.00-60.00 hrs, dt=0.05 hrs, 1081 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Subarea 1**

Runoff Area=119.100 ac Runoff Depth=1.62"

Flow Length=3,247' Slope=0.0218 '/' Tc=123.1 min CN=50 Runoff=47.34 cfs 16.102 af

**Subcatchment 3S: Subarea 2**

Runoff Area=1,309.400 ac Runoff Depth>1.71"

Flow Length=14,309' Slope=0.0042 '/' Tc=895.5 min CN=51 Runoff=143.63 cfs 186.358 af

**Subcatchment 5S: Subarea 3**

Runoff Area=1,117.700 ac Runoff Depth=2.17"

Flow Length=11,933' Slope=0.0067 '/' Tc=540.4 min CN=56 Runoff=226.42 cfs 201.771 af

**Subcatchment 7S: Subarea 4**

Runoff Area=482.400 ac Runoff Depth=1.36"

Flow Length=8,817' Slope=0.0074 '/' Tc=507.3 min CN=47 Runoff=60.71 cfs 54.871 af

**Pond 2P: Canoe Pond**

Inflow=47.34 cfs 16.102 af

Primary=47.34 cfs 16.102 af

**Pond 4P: Walkers Pond**

Inflow=143.63 cfs 186.358 af

Primary=143.63 cfs 186.358 af

**Pond 6P: Upper Mill Pond**

Inflow=326.87 cfs 404.231 af

Primary=326.87 cfs 404.231 af

**Pond 8P: Lower Mill Pond**

Peak Elev=27.32' Storage=386.641 af Inflow=384.52 cfs 459.102 af

Outflow=39.52 cfs 119.802 af

**Total Runoff Area = 3,028.600 ac Runoff Volume = 459.102 af Average Runoff Depth = 1.82"**

**76.84% Pervious Area = 2,327.069 ac 23.16% Impervious Area = 701.531 ac**

**Lower Mill Pond Dam\_FINAL\_notch**

Type III 24-hr 50 year Rainfall=6.92"

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**Subcatchment 1S: Subarea 1**

Runoff = 47.34 cfs @ 13.83 hrs, Volume= 16.102 af, Depth= 1.62"

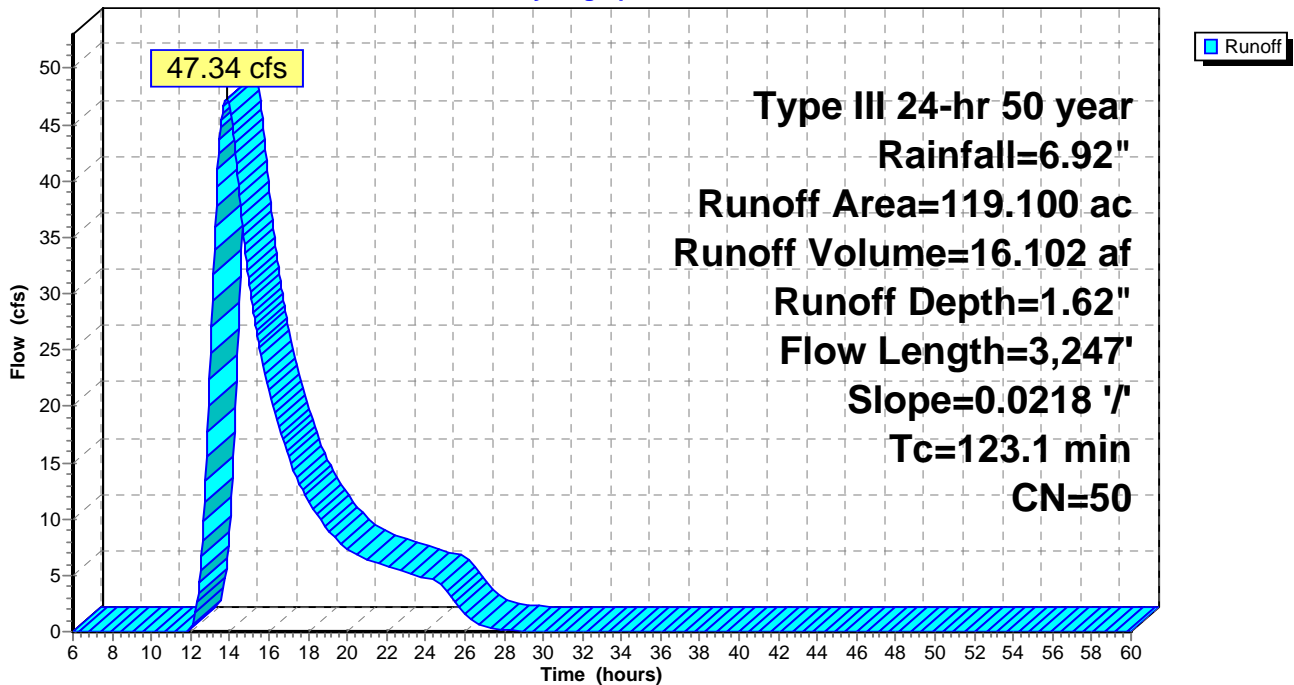
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50 year Rainfall=6.92"

Area (ac)	CN	Description
13.000	99	Water
3.000	79	Woods, Fair, HSG D
68.900	36	Woods, Fair, HSG A
21.300	54	1/2 acre lots, 25% imp, HSG A
9.300	49	50-75% Grass cover, Fair, HSG A
3.600	98	Paved roads w/curbs & sewers
119.100	50	Weighted Average
97.175		Pervious Area
21.925		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
123.1	3,247	0.0218	0.44		Lag/CN Method,

**Subcatchment 1S: Subarea 1**

Hydrograph



**Lower Mill Pond Dam\_FINAL\_notch**

Type III 24-hr 50 year Rainfall=6.92"

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**Subcatchment 3S: Subarea 2**

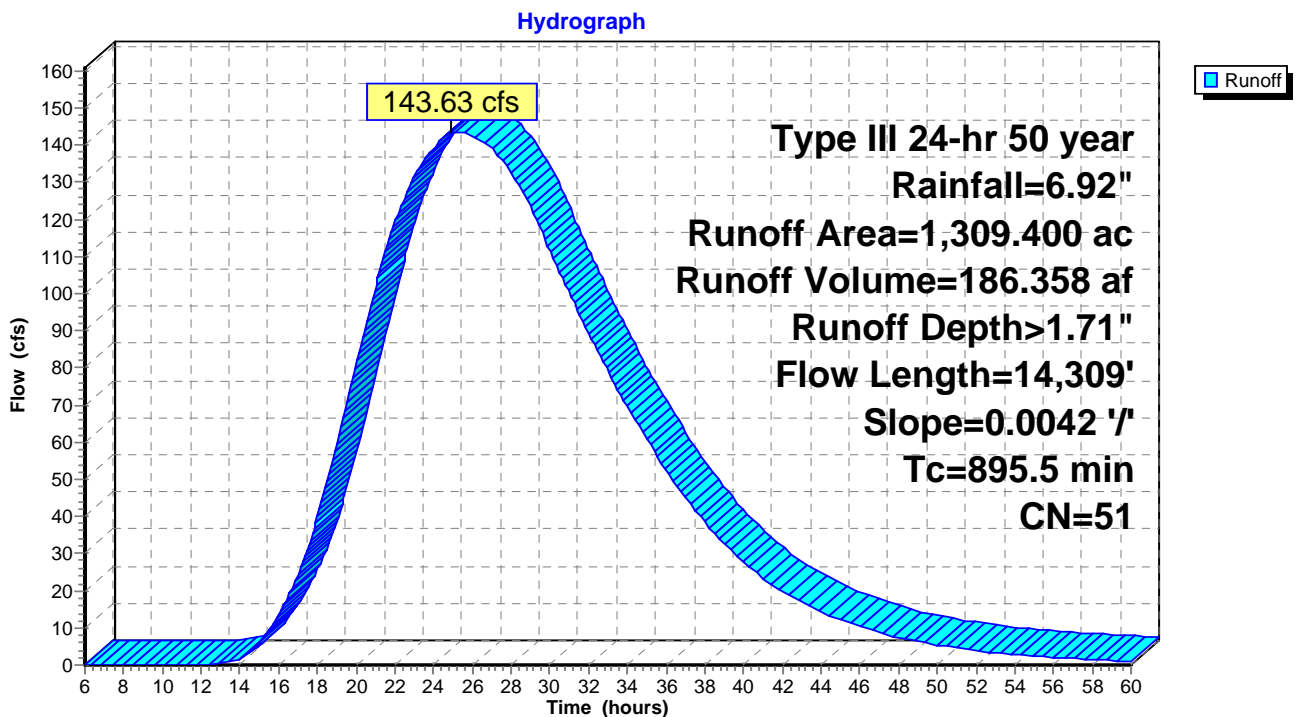
Runoff = 143.63 cfs @ 24.91 hrs, Volume= 186.358 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50 year Rainfall=6.92"

Area (ac)	CN	Description
173.000	99	Water
24.205	79	Woods, Fair, HSG D
3.115	85	1/2 acre lots, 25% imp, HSG D
19.390	84	50-75% Grass cover, Fair, HSG D
496.725	30	Woods, Good, HSG A
248.400	61	1/4 acre lots, 38% imp, HSG A
132.700	39	>75% Grass cover, Good, HSG A
24.800	98	Paved roads w/curbs & sewers
2.100	55	Woods, Good, HSG B
19.390	80	>75% Grass cover, Good, HSG D
165.575	36	Woods, Fair, HSG A
1,309.400	51	Weighted Average
1,016.429		Pervious Area
292.971		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
895.5	14,309	0.0042	0.27		Lag/CN Method,

**Subcatchment 3S: Subarea 2**





**Lower Mill Pond Dam\_FINAL\_notch**

Type III 24-hr 50 year Rainfall=6.92"

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**Subcatchment 5S: Subarea 3**

Runoff = 226.42 cfs @ 19.83 hrs, Volume= 201.771 af, Depth= 2.17"

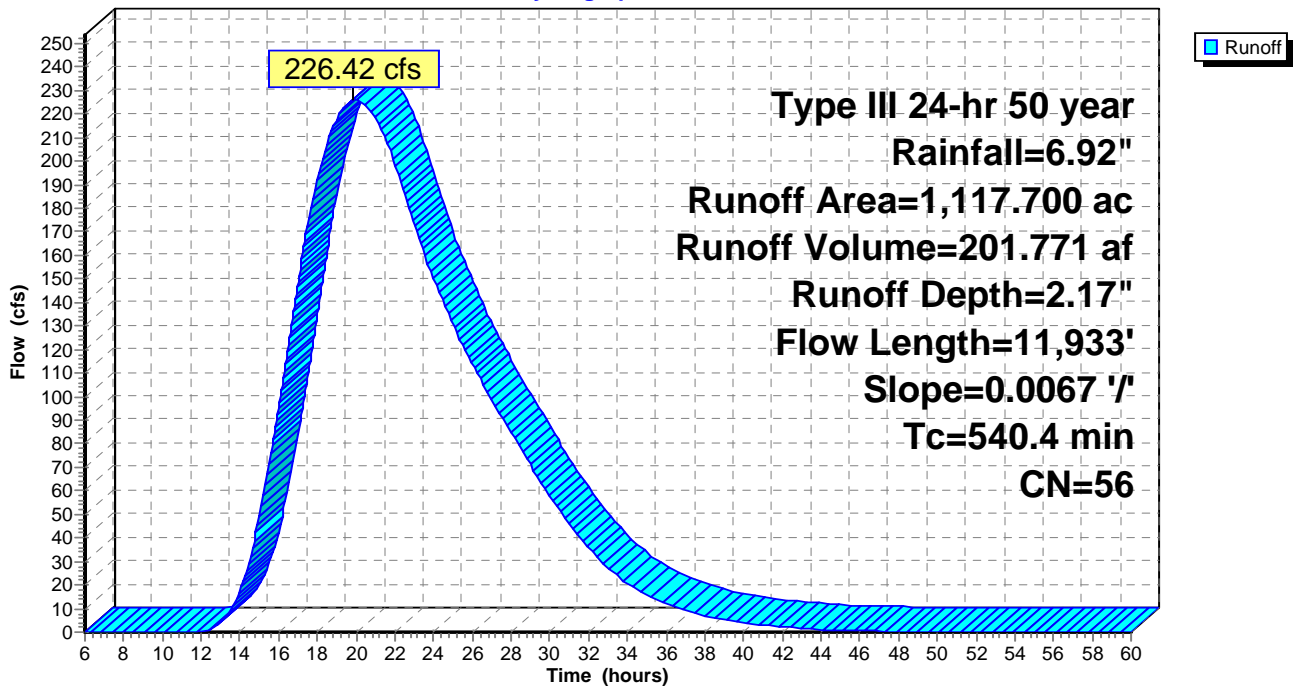
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50 year Rainfall=6.92"

Area (ac)	CN	Description
255.400	99	Water
98.700	77	Woods, Good, HSG D
271.750	30	Woods, Good, HSG A
161.000	54	1/2 acre lots, 25% imp, HSG A
45.100	39	>75% Grass cover, Good, HSG A
14.000	98	Paved roads w/curbs & sewers
271.750	36	Woods, Fair, HSG A
1,117.700	56	Weighted Average
808.050		Pervious Area
309.650		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
540.4	11,933	0.0067	0.37		Lag/CN Method,

**Subcatchment 5S: Subarea 3**

Hydrograph



**Lower Mill Pond Dam\_FINAL\_notch**

Type III 24-hr 50 year Rainfall=6.92"

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**Subcatchment 7S: Subarea 4**

Runoff = 60.71 cfs @ 19.74 hrs, Volume= 54.871 af, Depth= 1.36"

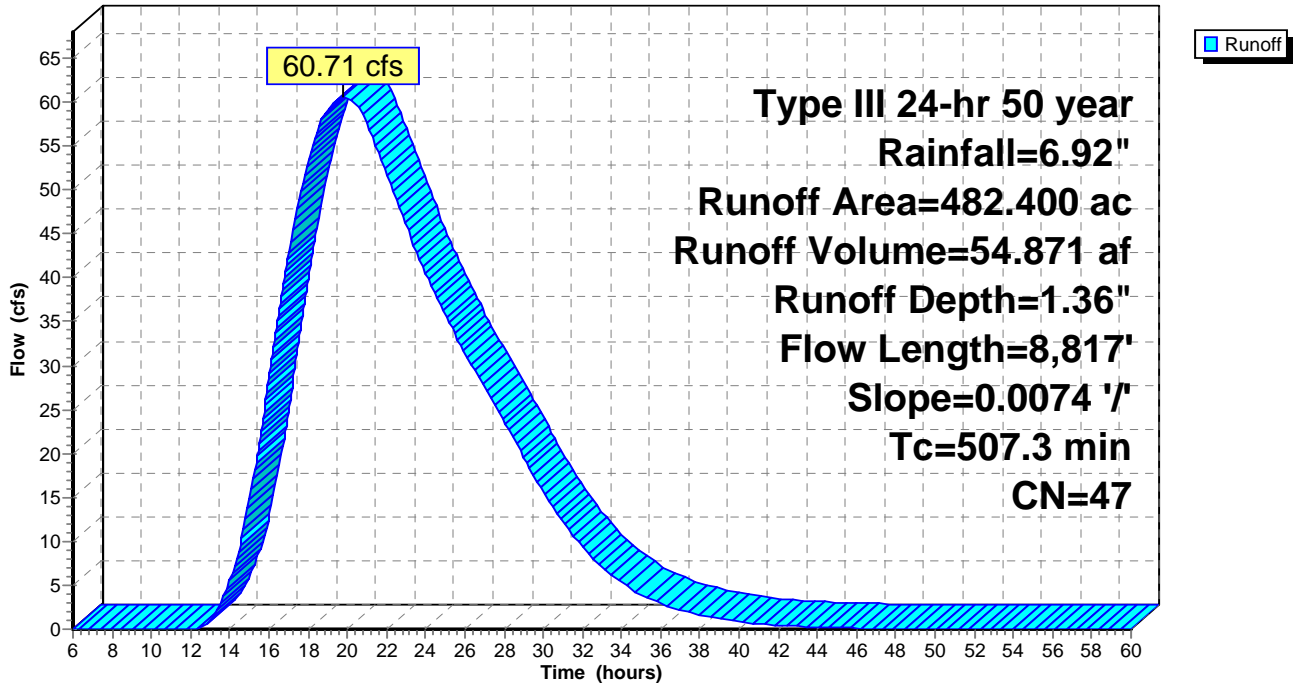
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50 year Rainfall=6.92"

Area (ac)	CN	Description
55.800	99	Water
27.100	77	Woods, Good, HSG D
157.550	30	Woods, Good, HSG A
47.300	54	1/2 acre lots, 25% imp, HSG A
23.600	39	>75% Grass cover, Good, HSG A
6.600	98	Paved roads w/curbs & sewers
2.760	98	Paved parking & roofs
4.140	74	>75% Grass cover, Good, HSG C
157.550	36	Woods, Fair, HSG A
482.400	47	Weighted Average
405.415		Pervious Area
76.985		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
507.3	8,817	0.0074	0.29		Lag/CN Method,

**Subcatchment 7S: Subarea 4**

Hydrograph



Pond 2P: Canoe Pond

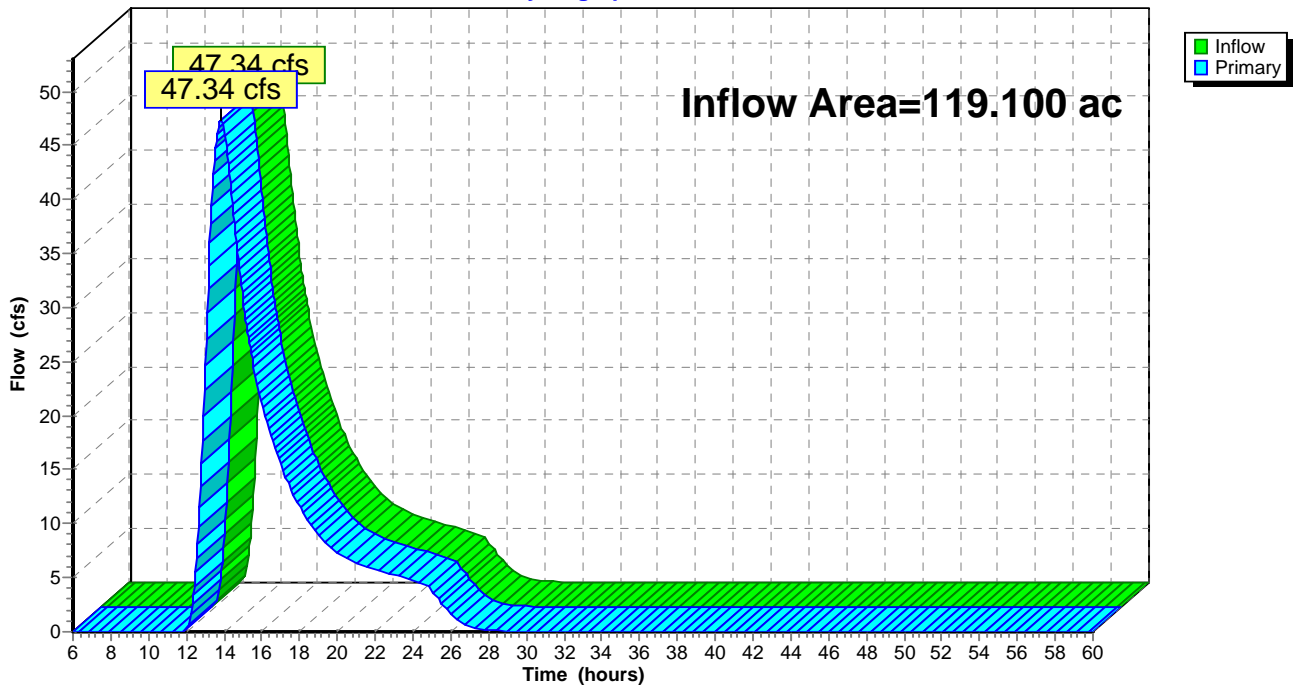
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 119.100 ac, Inflow Depth = 1.62" for 50 year event  
Inflow = 47.34 cfs @ 13.83 hrs, Volume= 16.102 af  
Primary = 47.34 cfs @ 13.83 hrs, Volume= 16.102 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs

Pond 2P: Canoe Pond

Hydrograph



Pond 4P: Walkers Pond

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,309.400 ac, Inflow Depth > 1.71" for 50 year event

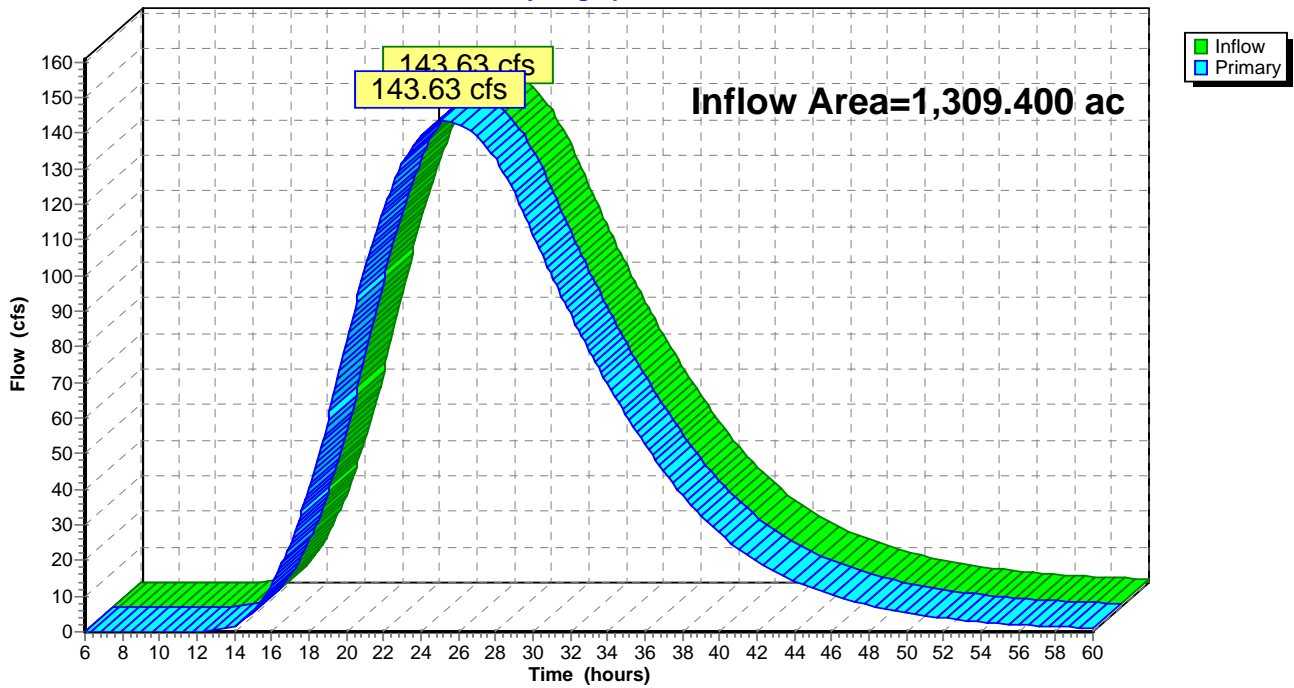
Inflow = 143.63 cfs @ 24.91 hrs, Volume= 186.358 af

Primary = 143.63 cfs @ 24.91 hrs, Volume= 186.358 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs

Pond 4P: Walkers Pond

Hydrograph



### Pond 6P: Upper Mill Pond

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,546.200 ac, Inflow Depth > 1.91" for 50 year event

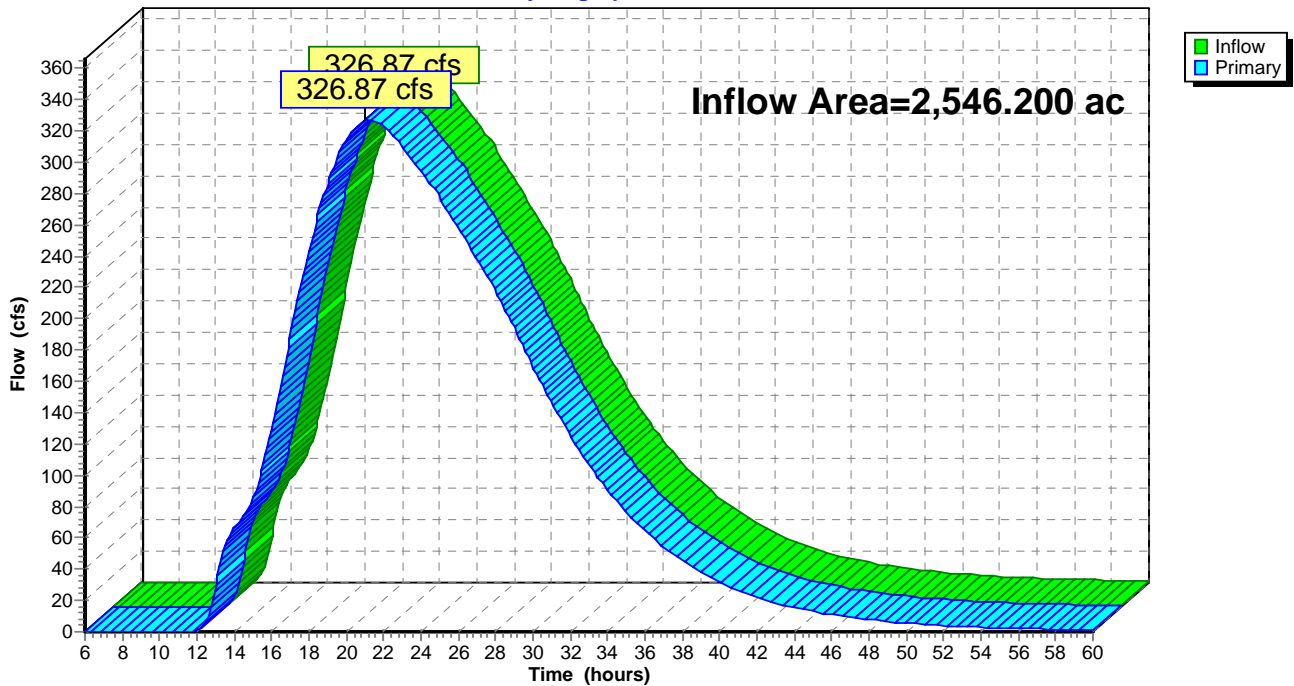
Inflow = 326.87 cfs @ 21.05 hrs, Volume= 404.231 af

Primary = 326.87 cfs @ 21.05 hrs, Volume= 404.231 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs

### Pond 6P: Upper Mill Pond

Hydrograph



**Lower Mill Pond Dam\_FINAL\_notch**

Type III 24-hr 50 year Rainfall=6.92"

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**Pond 8P: Lower Mill Pond**

Inflow Area = 3,028.600 ac, Inflow Depth > 1.82" for 50 year event  
 Inflow = 384.52 cfs @ 20.98 hrs, Volume= 459.102 af  
 Outflow = 39.52 cfs @ 38.98 hrs, Volume= 119.802 af, Atten= 90%, Lag= 1,079.6 min  
 Primary = 39.52 cfs @ 38.98 hrs, Volume= 119.802 af

Routing by Stor-Ind method, Time Span= 6.00-60.00 hrs, dt= 0.05 hrs  
 Peak Elev= 27.32' @ 38.98 hrs Surf.Area= 0.000 ac Storage= 386.641 af

Plug-Flow detention time= 1,352.8 min calculated for 119.802 af (26% of inflow)  
 Center-of-Mass det. time= 921.0 min ( 2,410.5 - 1,489.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	660.000 af	<b>Custom Stage Data</b> Listed below

Elevation (feet)	Cum.Store (acre-feet)
26.00	0.000
27.50	440.000
29.00	660.000

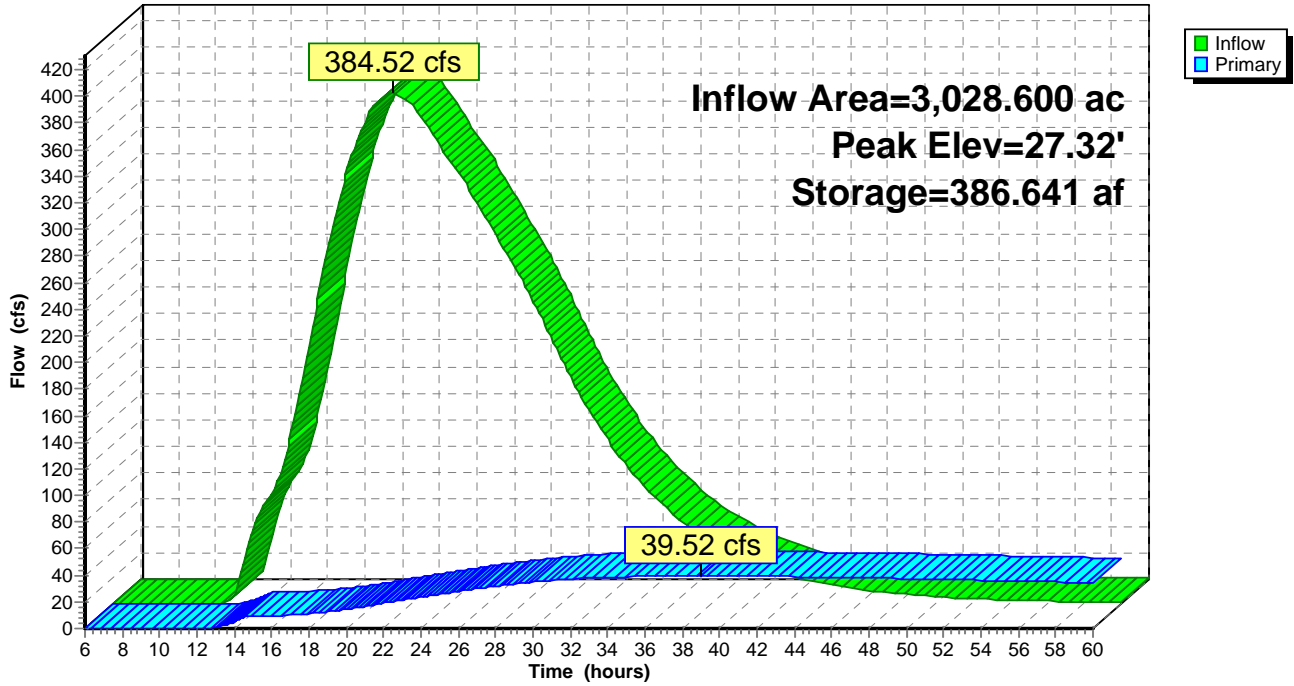
Device	Routing	Invert	Outlet Devices
#1	Primary	24.54'	<b>Custom Weir/Orifice, C= 2.70</b> Head (feet) 0.00 1.55 1.55 2.96 2.96 4.50 Width (feet) 1.50 1.50 5.00 5.00 100.00 100.00

**Primary OutFlow** Max=39.52 cfs @ 38.98 hrs HW=27.32' (Free Discharge)

↑1=Custom Weir/Orifice (Weir Controls 39.52 cfs @ 4.67 fps)

Pond 8P: Lower Mill Pond

Hydrograph



APPENDIX E  
**Design Drawings**



# LOWER MILL POND DAM REHABILITATION BREWSTER, MASSACHUSETTS

MARCH 2012

TOWN OF BREWSTER

CHRIS MILLER - DIRECTOR,  
NATURAL RESOURCES DEPARTMENT

NATIONAL OCEANIC AND  
ATMOSPHERIC ADMINISTRATION

ASSOCIATION TO  
PRESERVE CAPE COD

**Tighe&Bond**  
Consulting Engineers

SHEET NO.	TITLE
1	COVER SHEET
2	GENERAL NOTES AND LEGEND
3	EXISTING CONDITIONS AND SITE PREPARATION PLAN
4	PROPOSED CONDITIONS PLAN
5	PROPOSED CONDITIONS AND PART PLAN
6	SECTIONS
7	DETAILS
8	DETAILS
9	STRUCTURAL NOTES AND DETAILS



LOCUS PLAN  
SCALE: 1"=2000'

**DRAFT SET  
NOT FOR CONSTRUCTION**

**COMPLETE SET 9 SHEETS**



## EROSION AND SEDIMENTATION CONTROL NOTES:

- E1. TEMPORARY SEDIMENT AND EROSION CONTROL BY THE CONTRACTOR SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS LISTED BELOW.
- E2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES NECESSARY TO EXECUTE AND COMPLETE THE WORK OF THE CONTRACT, IN COMPLIANCE WITH THE TERMS AND CONDITIONS CONTAINED IN THE CONTRACT AND PROJECT PERMITS. CONTROLS SHOWN ON THE CONTRACT DRAWINGS AND MENTIONED IN THE TECHNICAL SPECIFICATIONS SHALL BE CONSIDERED MINIMUM REQUIREMENTS. THE CONTRACTOR SHALL EMPLOY WHATEVER SUPPLEMENTARY MEASURES NECESSARY TO PROTECT WETLANDS, WATERS, AND ADJACENT AREAS FROM DISTURBANCE OR DISCHARGE OF SEDIMENTS.
- E3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SEDIMENT AND EROSION CONTROLS TO MEET THE CONDITIONS OF ALL APPLICABLE PERMITS AND REGULATIONS. SUCH CONTROLS SHALL BE INSTALLED WHEREVER THE POTENTIAL EXISTS FOR THE DISTURBANCE OF LAND OR THE TRANSPORT OF SEDIMENT.
- E4. EROSION AND SEDIMENTATION CONTROLS SHALL CONSIST OF MULCH LOGS OR EQUIVALENT PER DETAIL PROVIDED ON SHEET 7.
- E5. MULCH LOGS SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF CLEARING AND GRUBBING ACTIVITIES. LOCATION OF MULCH LOGS TO BE ADJUSTED UPON COMPLETION OF CLEARING AND GRUBBING BUT PRIOR TO COMMENCEMENT OF GRADING ACTIVITIES.
- E6. ALL EROSION AND SEDIMENTATION CONTROLS SHALL BE MAINTAINED IN GOOD CONDITION AND PROPER WORKING ORDER. NECESSARY REPAIRS SHALL BE MADE IMMEDIATELY.
- E7. ALL EROSION AND SEDIMENTATION CONTROLS SHALL BE PROPERLY DISPOSED OFF-SITE UPON COMPLETION OF WORK, SITE STABILIZATION AND/OR UPON AUTHORIZATION FROM THE OWNER.
- E8. COFFERDAMS WILL BE INSTALLED IN PHASES AS INDICATED ON SHEET 4 TO PERFORM REMOVAL OF THE EXISTING STONE MASONRY WALL, AND CONSTRUCTION OF THE NEW WALL AND THE LOWER LEVEL OUTLET GATE. FLOW THROUGH EITHER THE SPILLWAY OR LOW LEVEL OUTLET GATE MUST BE MAINTAINED AT ALL TIMES IN ACCORDANCE WITH DATES DEFINED IN THE SPECIFICATIONS AND FOR PERMIT CONDITIONS.

## BEST MANAGEMENT PRACTICES

### INSPECTION AND MAINTENANCE

- SEDIMENT AND EROSION CONTROLS AND BMPS SHALL BE INSTALLED PRIOR TO COMMENCING CONSTRUCTION AT THE SITE. NO WORK WHICH SHALL DISTURB THE SITE OR CREATE THE POTENTIAL FOR SEDIMENT RELEASE SHALL COMMENCE UNTIL THE SEDIMENT AND EROSION CONTROLS HAVE BEEN INSPECTED AND APPROVED BY THE OWNER, ENGINEER, AND REGULATORY AGENCIES. ALL CONTROLS AND BMPS SHALL BE SUBJECT TO INSPECTION BY THE OWNER, HIS REPRESENTATIVE, AND REGULATORY AGENCIES AT ANYTIME THEREAFTER.
- PERIODIC INSPECTION, MAINTENANCE, AND CLEANING OF TEMPORARY EROSION OF SEDIMENT CONTROL MEASURES AND BEST MANAGEMENT PRACTICES (BMPS) SHALL BE REQUIRED. ALL CONTROLS AND BMPS SHALL BE INSPECTED EVERY 7 DAYS AND WITHIN 24 HOURS OF RAINFALL EVENTS OF 0.5 INCHES OR GREATER. ROUTINE INSPECTION AND MAINTENANCE WILL REDUCE THE CHANCE OF POLLUTING STORMWATER BY FINDING AND CORRECTING PROBLEMS BEFORE THE NEXT RAIN EVENT. THE FOCUS OF THE INSPECTION WILL BE TO DETERMINE:
  - 1) WHETHER OR NOT THE MEASURE WAS INSTALLED / PERFORMED CORRECTLY;
  - 2) WHETHER OR NOT THERE HAS BEEN ANY DAMAGE TO THE MEASURE SINCE IT WAS INSTALLED OR PERFORMED; AND
  - 3) WHAT SHOULD BE DONE TO CORRECT ANY PROBLEMS WITH THE MEASURE. EACH MEASURE IS TO BE OBSERVED TO DETERMINE IF IT IS STILL EFFECTIVE. IN SOME CASES, SPECIFIC MEASUREMENTS MAY BE TAKEN TO DETERMINE IF MAINTENANCE OF THE MEASURES IS REQUIRED.

### SITE MANAGER

- PRIOR TO CONSTRUCTION, A SITE MANAGER WILL BE DESIGNATED BY THE CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION, MONITORING, INSPECTION, AND CORRECTION OF EROSION AND SEDIMENT CONTROL MEASURES.

### CONSTRUCTION SITE ENTRANCE

- TO REDUCE THE TRACKING OF SEDIMENT FROM THE CONSTRUCTION SITE ONTO OTHER AREAS OF THE PROPERTY AND/OR PUBLIC ROADS, AS WELL AS THE PRODUCTION OF AIRBORNE DUST, A STABILIZED CONSTRUCTION ENTRANCE IS TO BE ESTABLISHED AND AT ANY ADDITIONAL AUTHORIZED PERMANENT CONSTRUCTION STAGING AREA. THE ENTRANCE IS TO CONSIST OF A 6-INCH THICK PAD OF CRUSHED STONE UNDERLAIN WITH FILTER FABRIC OR A BITUMINOUS CONCRETE APRON.

### SITE CLEARING

- DURING SITE CLEARING, EXISTING VEGETATION WITHIN THE OVERALL LIMITS OF CLEARING AND GRUBBING SHALL BE CLEARED AND REMOVED, EXCEPT AS OTHERWISE DIRECTED. THIS INCLUDES ALL VEGETATION ON THE DAM EMBANKMENT AND WITHIN 10 FEET OF THE DAM EMBANKMENT. PRIOR TO ANY SITE CLEARING ACTIVITIES, SEDIMENT CONTROL BARRIERS OR SAFETY FENCING, SHALL BE PLACED ALONG THE OUTER LIMIT OF DISTURBANCE. CLEARING IS TO BE LIMITED TO THOSE AREAS OF PROPOSED WORK. DISTURBED AREAS ARE TO BE KEPT TO A MINIMUM. NO TREE WITH A BREAST HEIGHT DIAMETER OF GREATER THAN 6 INCHES SHALL BE CLEARED FROM AREAS OUTSIDE THE LIMITS OF CLEARING AND GRUBBING WITHOUT PRIOR APPROVAL FROM THE OWNER.

### SILT FENCE BARRIERS

- MULCH LOGS ARE TO BE PLACED TO TRAP SEDIMENT TRANSPORTED BY RUNOFF BEFORE IT REACHES THE DRAINAGE FEATURES, WATERBODIES, OR WETLANDS, IN ADDITION TO AREAS WHERE HIGH RUNOFF VELOCITIES OR HIGH SEDIMENT LOADS ARE EXPECTED. THE MULCH LOGS ARE TO BE REPLACED AS DETERMINED BY PERIODIC FIELD INSPECTIONS.

### DUST CONTROL

- STANDARD DUST CONTROL MEASURES, INCLUDING SPRAYING AND MISTING SHALL BE USED AS NECESSARY. CALCIUM CHLORIDE SHALL NOT BE ALLOWED ON THIS PROJECT.

### STAGING AREAS

- THE CONTRACTOR SHALL COORDINATE LAYDOWN STAGING AREAS IN WHICH TO STORE EQUIPMENT AND MATERIALS WITH THE OWNER.
- STAGING AREAS SHALL BE SURROUNDED WITH MULCH LOG EROSION BARRIERS ON THE DOWN HILL SIDE.
- DURING AND AFTER CONSTRUCTION, ALL PAVED ROAD AND DRIVEWAY SURFACES ARE TO BE SCRAPED AND BROOMED FREE OF EXCAVATED MATERIALS ON A DAILY BASIS, UNLESS APPROVED BY THE OWNER.

### STOCKPILED MATERIALS

- STOCKPILES OF SOIL CREATED DURING CONSTRUCTION ACTIVITIES ARE TO BE SURROUNDED WITH EROSION CONTROLS WHERE POSSIBLE. OTHER ALTERNATIVES UTILIZED MAY INCLUDE GRAVEL FILTER BERMS OR SIMILAR MEASURES LAID AROUND THE PERIMETER OF THE STOCKPILE. STOCKPILES OF ERODIBLE MATERIAL SHALL BE COVERED PRIOR TO INCLEMENT WEATHER WITH A MINIMUM OF 20 MIL POLYETHYLENE SHEETING.

### EQUIPMENT FUELING

- EQUIPMENT FUELING AND OTHER ACTIVITIES INVOLVING PETROLEUM, OIL, OR OTHER POTENTIALLY HAZARDOUS SUBSTANCES ARE TO BE PERFORMED AT PRE-APPROVED, DESIGNATED AREAS WITH APPROPRIATE SPILL PREVENTION AND CONTROL MEASURES. PORTABLE SECONDARY CONTAINMENT IS TO BE USED, AND SORBENT MATERIALS ARE TO BE PLACED AROUND THE PERIMETER OF THE FUELING AREA. FUELING WITHIN THE STATUTORY BUFFER ZONE (100 FEET FROM WETLANDS OR BANK) SHALL NOT BE ALLOWED.

### CONSTRUCTION DEWATERING

- CONSTRUCTION DEWATERING SHALL BE REQUIRED DURING PORTIONS OF CONSTRUCTION WHICH REQUIRE EXCAVATION OR OTHER ACTIVITIES WHERE GROUNDWATER MAY INTERFERE WITH THE WORK. CONSTRUCTION DEWATERING DISCHARGE TO A SURFACE WATER BODY SHALL BE PRE-TREATED FOR SEDIMENT REMOVAL BY PASSING THROUGH AN APPROPRIATELY SIZED FILTER BAGS OR FRACTIONATION / SEDIMENTATION TANK PRIOR TO DISCHARGE, AS NECESSARY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DEWATERING TECHNIQUES AND MAINTAINING DEWATERING PROCEDURES THROUGHOUT THE DURATION OF THE PROJECT.

### OUTLET PROTECTION

- APPROPRIATE OUTLET PROTECTION, CONSISTING OF STONE CHANNEL LINING, A LEVEL SPREADER, OR OTHER SUCH MEASURE SHALL BE PROVIDED AT THE OUTLET OF ANY DEWATERING CONDUIT OR STORMWATER CULVERT OR CHANNEL OUTFALL TO REDUCE VELOCITIES AND ENHANCE SEDIMENTATION PRIOR TO DISCHARGE.

### LIMITS OF WORK

- THE CONTRACTOR SHALL LINE THE UPGRADIENT BOUNDARY OF WORK AREAS WITH ORANGE SAFETY FENCING PLACED AT THE LIMITS OF WORK BEFORE THE START OF SITE CLEARING ACTIVITIES.

### TEMPORARY STABILIZATION

- WHEN NECESSARY, TEMPORARY SLOPE PROTECTION SHALL BE PROVIDED BY INSTALLING SEDIMENT TRAP BARRIERS AT THE TOE OF FILLS OR CUT SLOPES. IF ADDITIONAL STABILIZATION IS NEEDED, THEN THE CONTRACTOR SHALL INSTALL MULCH LOGS, MATTING, SUCH AS STRAW, JUTE, WOOD FIBER, OR BIO OR PHOTO-DEGRADABLE MESH.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN TWO WEEKS, THE AREAS SHALL BE MULCHED WITH STRAW AT A RATE OF 100 LBS. PER 1,000 S.F. TO HELP CONTROL EROSION. TWO INCHES OF WOOD CHIP MULCH MAY ALSO BE USED AS TEMPORARY COVER.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN ONE MONTH, THE AREAS SHALL BE TOPSOILED AND SEEDED AS PER THE SPECIFICATIONS AND AT NO ADDITIONAL COST TO THE OWNER.
- LEAVE THE SURFACE OF ALL EXCAVATIONS AND FILLS IN A FIRM AND STABLE CONDITION AT THE END OF EACH DAY. ROLL OR OTHERWISE TREAT THE SURFACE AS NEEDED.

### SITE RESTORATION

- STABILIZATION OF DISTURBED AREAS OR NEW SOIL FILLS SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY AND PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, USING HYDRO-SEEDING, BROADCASTING, OR OTHER APPROVED TECHNIQUES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF PREVIOUSLY VEGETATED UPLAND AREAS DISTURBED BY CONSTRUCTION ACTIVITIES. RESTORATION OF UPLAND AREAS SHALL CONSIST OF REPLACEMENT OF TOPSOIL OR PLACEMENT OF IMPORTED LOAM AS NEEDED SUCH THAT A MINIMUM OF 6 INCHES OF SUITABLE MATERIAL IS PRESENT AND APPROPRIATELY, LIMED, FERTILIZED, GRADED, AND SCARIFIED.

WHERE NOT OTHERWISE SPECIFIED, DISTURBED UPLAND AREAS BEYOND THE 100' WETLAND BUFFER ZONE SHALL THEN BE SEEDED WITH AN APPROVED SEED MIX AT A RATE OF 2 POUNDS OF LIVE SEED PER 1,000 S.F. SEEDING RATE SHALL BE DOUBLED FOR DORMANT SEEDING. SEED MIX FOR AREAS BEYOND THE 100' WETLAND BUFFER ZONE SHALL BE AS FOLLOWS OR AS APPROVED BY THE ENGINEER:

COMMON NAME	BOTANICAL NAME	PERCENT COVER
CREeping RED FESCUE	Festuca rubra	50%
FAWN TALL FESCUE	Festuca arundinacea	30%
GULF ANNUAL RYEGRASS	Lolium multiflorum	10%
RED TOP BENTGRASS	Agrostis gigantea	5%
LADINO WHITE CLOVER	Trifolium repens	5%

WHERE NOT OTHERWISE SPECIFIED, DISTURBED UPLAND AREAS WITHIN THE 100' WETLAND BUFFER ZONE SHALL THEN BE SEEDED WITH AN APPROVED SEED MIX AT A RATE OF 1 POUND OF LIVE SEED PER 1,000 S.F. SEEDING RATE SHALL BE DOUBLED FOR DORMANT SEEDING. SEED MIX FOR AREAS WITHIN THE 100' WETLAND BUFFER ZONE SHALL BE AS FOLLOWS OR AS APPROVED BY THE ENGINEER:

### THE NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DETENTION BASINS AND MOIST SITES:

COMMON NAME	BOTANICAL NAME
SWITCHGRASS	Panicum virgatum
VIRGINIA WILD RYE	Elymus virginicus
CREeping RED FESCUE	Festuca rubra
FOX SEDGE	Carex vulpinoidea
CREeping BENTGRASS	Agrostis alatonifera
SOFT RUSH	Juncus effusus
NEW ENGLAND ASTER	Aster novae-angliae
GRASS-LEAVED GOLDENROD	Euthamia graminifolia
NODDING BUR MARIGOLD	Bidens cernua
GREEN BULRUSH	Scirpus atrovirens
JOE-PYE WEED	Eupatorium maculatum
BONESET	Eupatorium perfoliatum
BLUE VERVAIN	Verbena hastata

- RESTORED AREAS SHALL BE ROLLED AND THEN APPROPRIATELY MULCHED WITH HAY, STRAW, WOOD CHIPS OR OTHER APPROVED WEED-FREE MATERIAL. BIO OR PHOTO-DEGRADABLE EROSION CONTROL FABRIC IS ALSO ACCEPTABLE FOR POST-RESTORATION STABILIZATION. ON FLAT SURFACES AND ON SLOPES OF 3:1 OR FLATTER, MULCH OR EROSION CONTROL MATTING SHALL TO BE USED AFTER PERMANENT SEEDING TO PROTECT SOIL FROM THE IMPACT OF FALLING RAIN AND TO INCREASE THE CAPACITY OF THE SOIL TO ABSORB WATER. FOR STEEPER SLOPES, EROSION CONTROL MATTING SHALL BE USED.
- FINAL STABILIZATION SHALL BE CONSIDERED COMPLETE WHEN ALL SOIL-DISTURBING ACTIVITIES HAVE BEEN COMPLETED AND A UNIFORM, PERENNIAL VEGETATIVE COVER WITH A DENSITY OF EIGHTY PERCENT HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES (SUCH AS THE USE OF MULCHES OR EROSION CONTROL MATTING) HAVE BEEN EMPLOYED ON ALL UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL VEGETATED SURFACES, INCLUDING WATERING, FERTILIZING, AND RE-SEEDING UNTIL ESTABLISHMENT CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.

## LEGEND

	CULVERT
	DECIDUOUS TREE
	CONIFER TREE
	SHRUB
	EDGE OF WATER
	TREELINE
	GUARDRAIL
	DRAIN LINE
	EXISTING INTERMEDIATE CONTOURS
	EXISTING INDEX CONTOURS
	PROPOSED CONTOURS (1' INTERVAL)
	50-FOOT WETLAND BUFFER ZONE
	100-FOOT WETLAND BUFFER ZONE
	200-FOOT RIVERFRONT BOUNDARY
	EDGE OF PAVEMENT
	PROPOSED SEDIMENTATION AND EROSION CONTROL DELINEATION
	PROPOSED LIMITS OF CLEARING
	APPROXIMATE LIMITS OF WORK
	EXISTING STONE WALL
	APPROXIMATE LIMIT OF LAYDOWN AND STOCKPILE AREA
	PROPOSED GEOCELL
	STABILIZED CONSTRUCTION ENTRANCE/EXIT
	WETLAND BOUNDARY FLAG
	LIMIT OF INLAND BANK

**DRAFT SET  
NOT FOR  
CONSTRUCTION**

**Town of  
Brewster**

**Lower Mill  
Pond Dam  
Rehabilitation**

Brewster, Massachusetts

### VERIFY SCALE

BAR IS 1 INCH ON ORIGINAL DRAWING  
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Mark	Date	Description

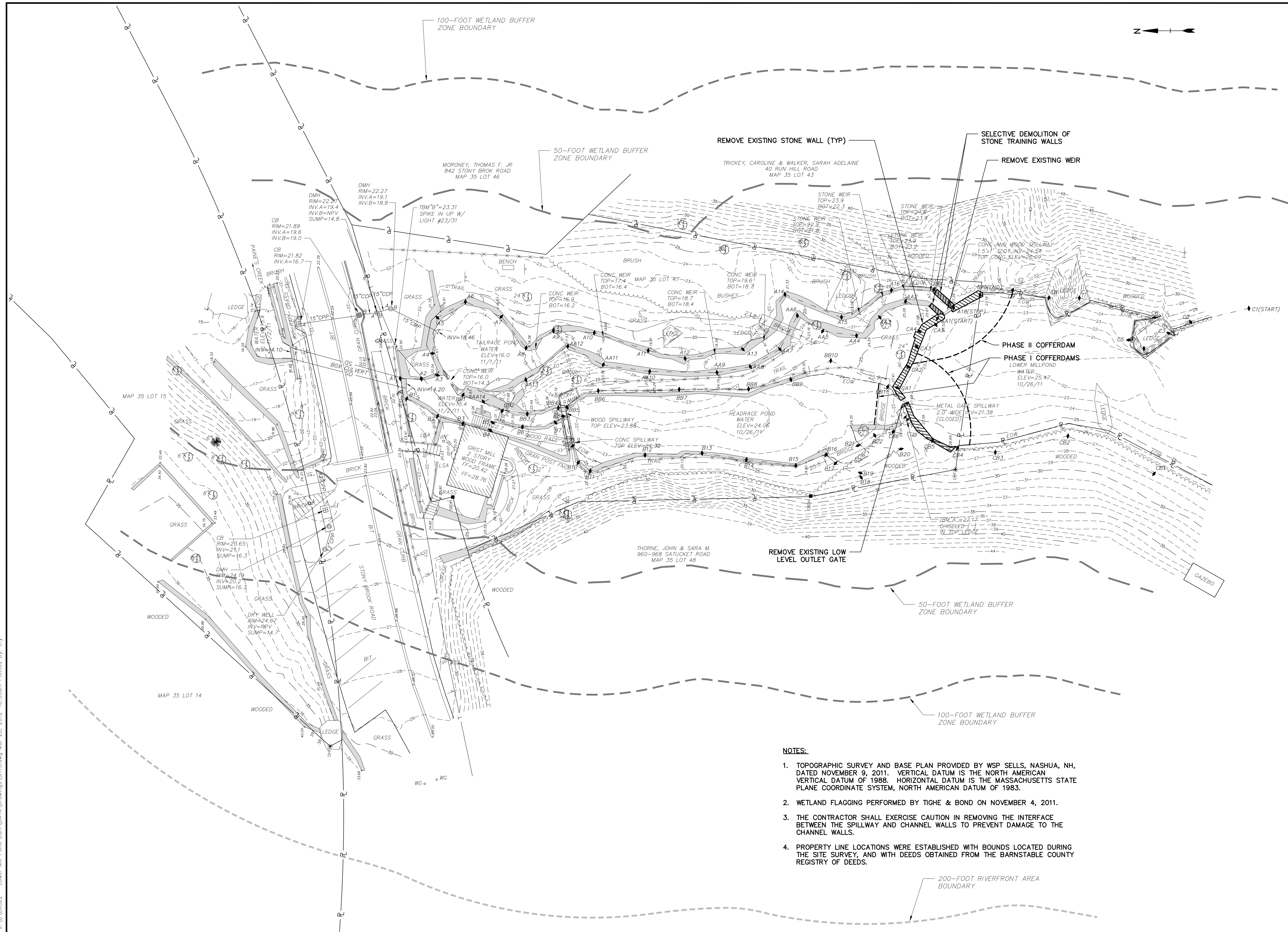
PROJECT NO: B0522  
FILE: Sh12  
DRAWN BY: CFY  
CHECKED: ZDB  
APPROVED BY: DAM, CDH

GENERAL NOTES AND LEGEND

SCALE: NO SCALE

SHEET 2 OF 9





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 CONSTRUCTION**

**Town of  
 Brewster**  
  
**Lower Mill  
 Pond Dam  
 Rehabilitation**  
  
 Brewster, Massachusetts

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- NOTES:**
1. TOPOGRAPHIC SURVEY AND BASE PLAN PROVIDED BY WSP SELLS, NASHUA, NH, DATED NOVEMBER 9, 2011. VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988. HORIZONTAL DATUM IS THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983.
  2. WETLAND FLAGGING PERFORMED BY TIGHE & BOND ON NOVEMBER 4, 2011.
  3. THE CONTRACTOR SHALL EXERCISE CAUTION IN REMOVING THE INTERFACE BETWEEN THE SPILLWAY AND CHANNEL WALLS TO PREVENT DAMAGE TO THE CHANNEL WALLS.
  4. PROPERTY LINE LOCATIONS WERE ESTABLISHED WITH BOUNDS LOCATED DURING THE SITE SURVEY, AND WITH DEEDS OBTAINED FROM THE BARNSTABLE COUNTY REGISTRY OF DEEDS.

Mark	Date	Description

PROJECT NO:	B0522
FILE:	SHT3
DRAWN BY:	CFY
CHECKED:	ZDB
APPROVED BY:	DAM CDH

EXISTING CONDITIONS AND  
 SITE PREPARATION PLAN

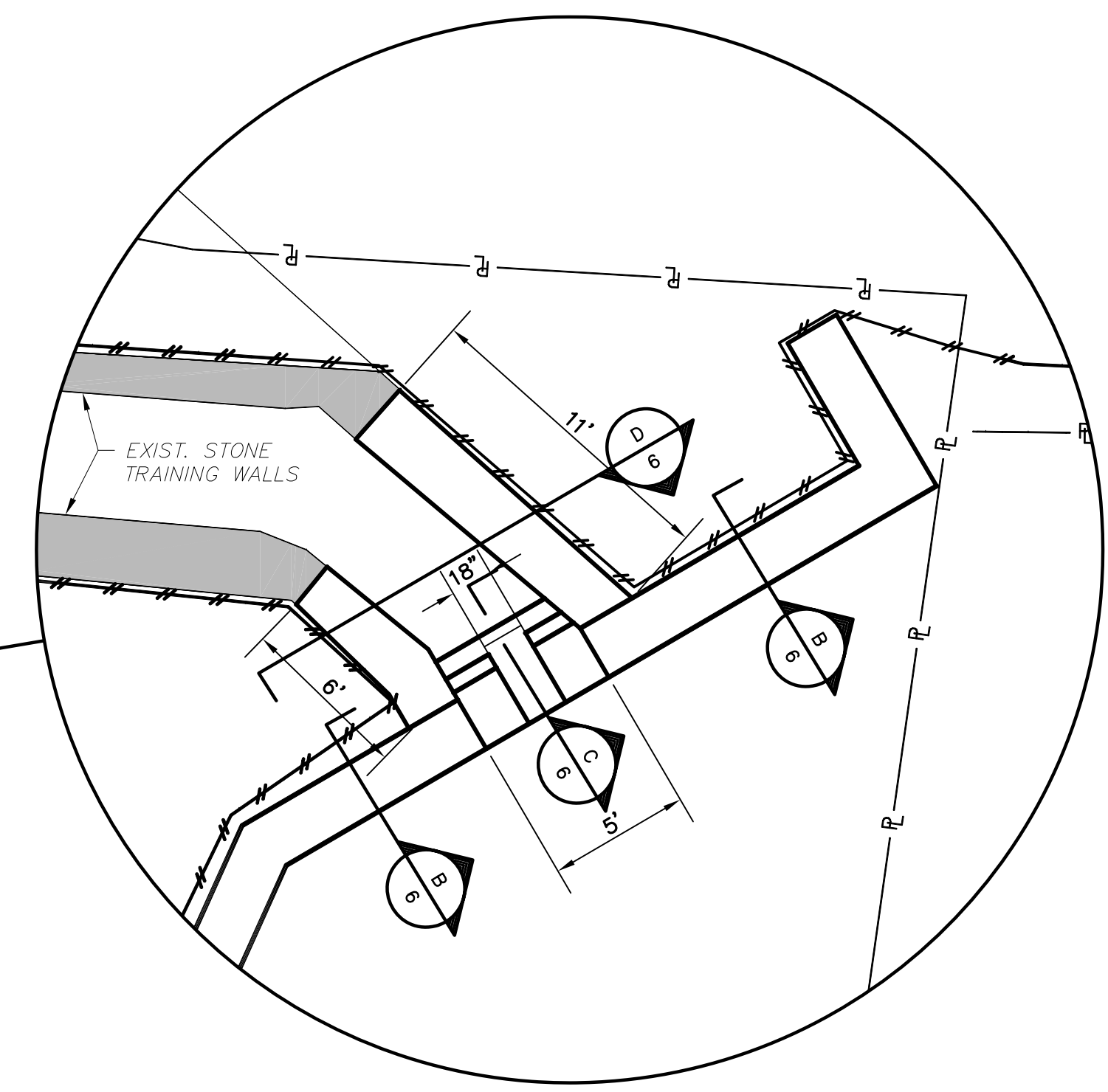
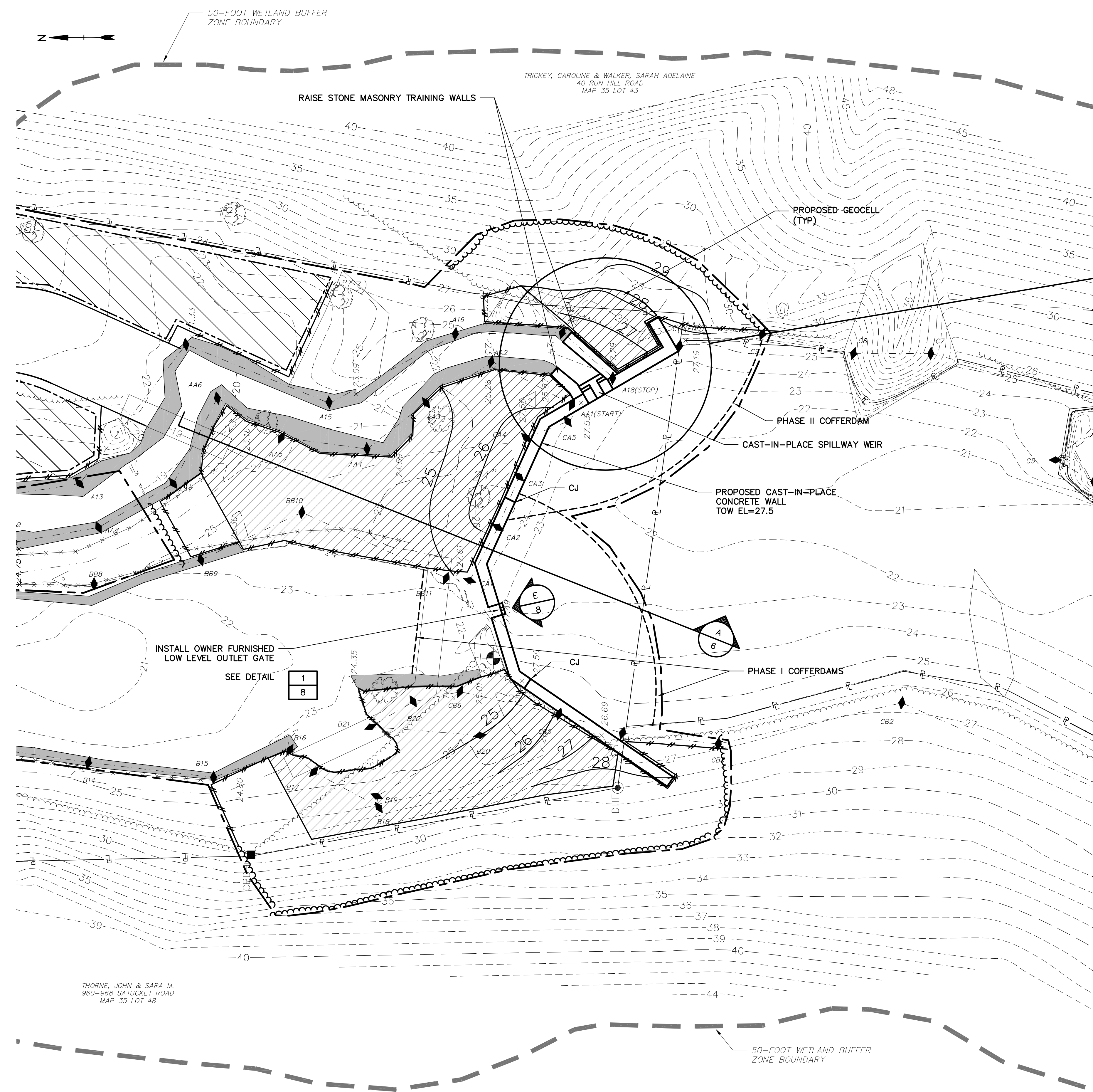
SCALE: 1"=20'  
 SHEET 3 OF 9

J:\XB\B0522 - Lower Mill Pond Dam\DATA\Drawings\SHT3.dwg Mar 26, 2012 10:59am Plotted By: cfy









ENLARGED DETAIL OF SPILLWAY  
 1"=5'

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 Brewster**  
  
 Lower Mill  
 Pond Dam  
 Rehabilitation  
  
 Brewster, Massachusetts

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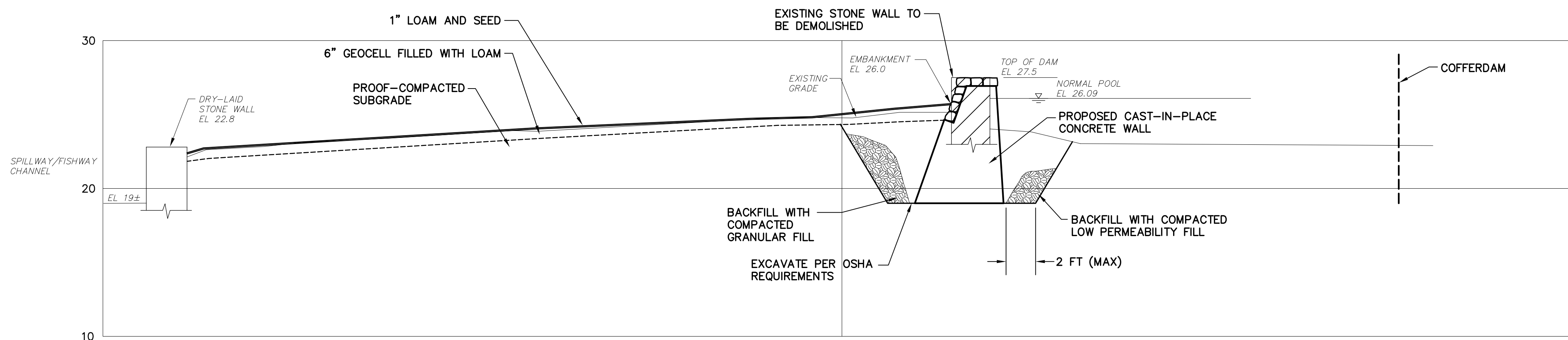
Mark	Date	Description

PROJECT NO: B0522  
 FILE: SHT5  
 DRAWN BY: CFY  
 CHECKED: ZDB  
 APPROVED BY: DAM CDH

PROPOSED CONDITIONS  
 PART PLAN  
 SCALE: 1"=10'

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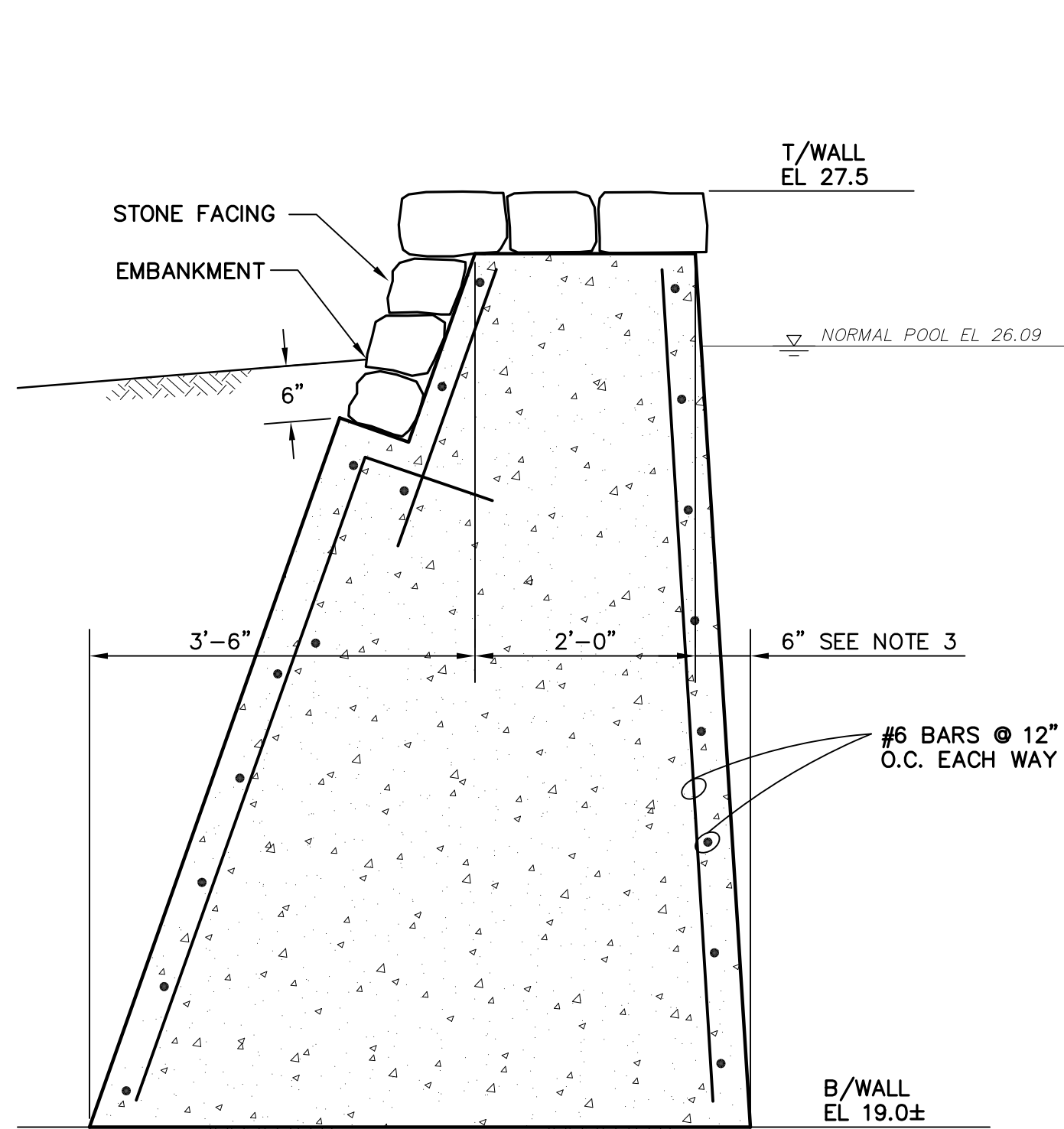




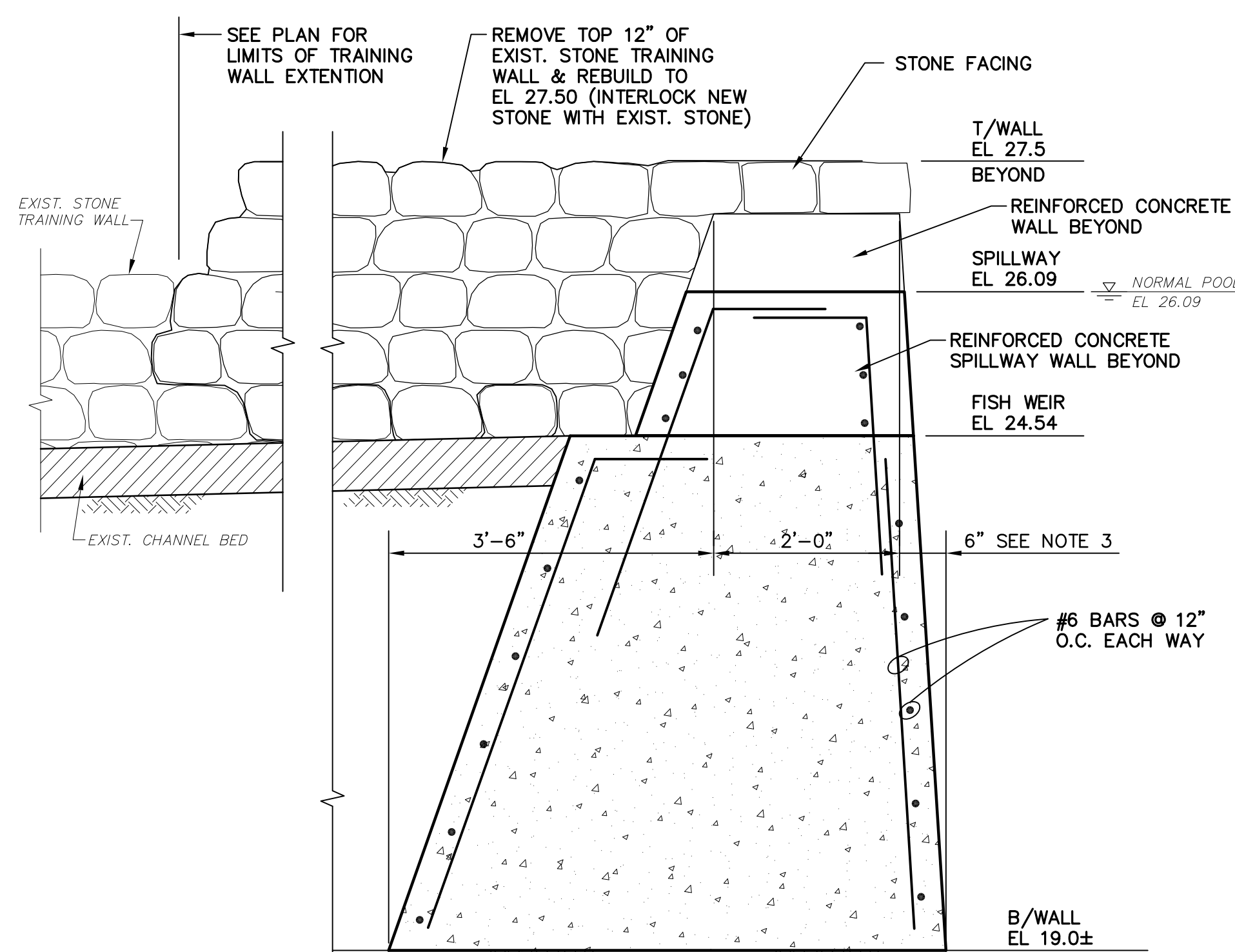
SECTION A-A  
1"=5'

**NOTES:**

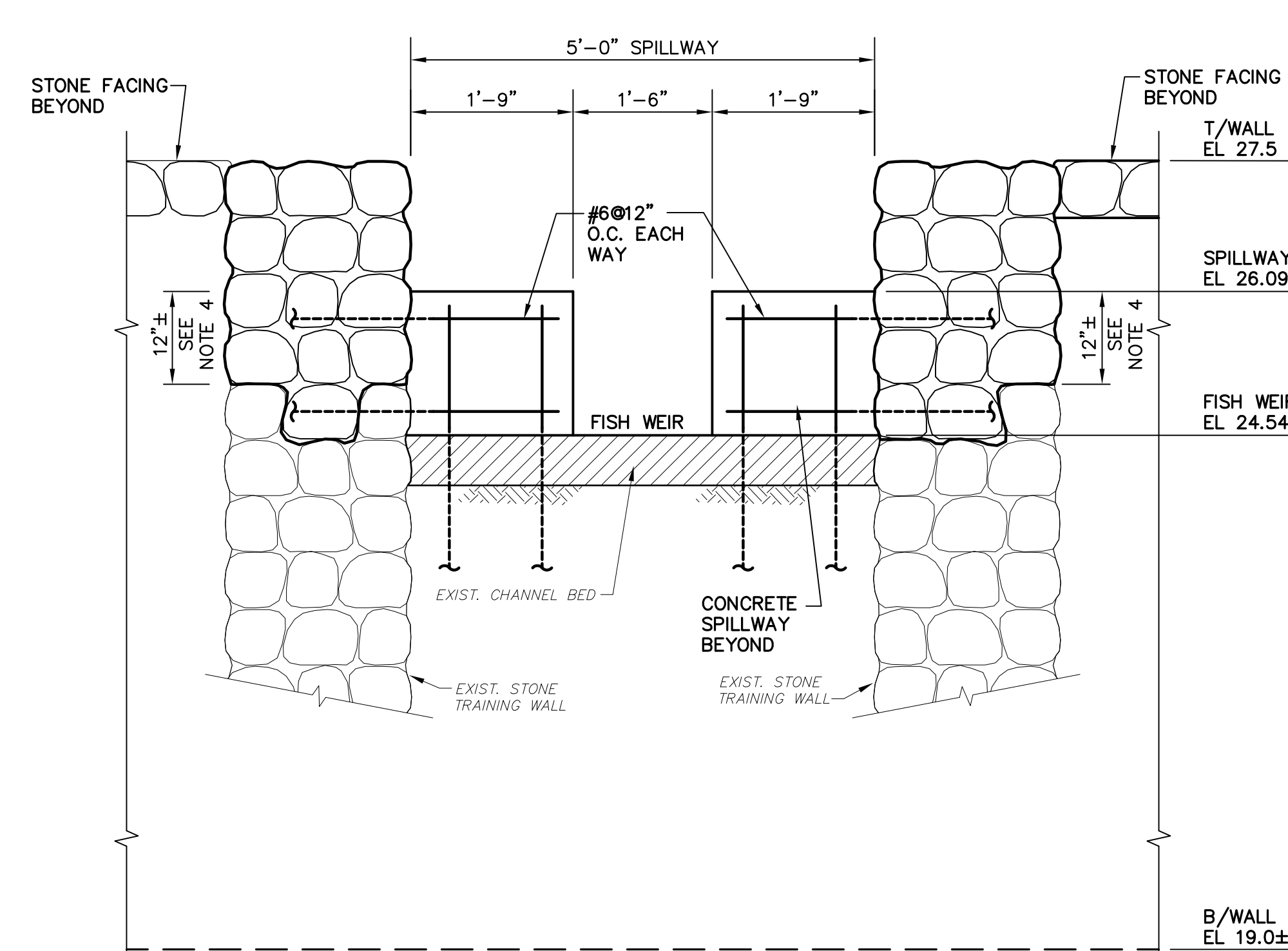
1. ALL EXCAVATIONS AND VOIDS ON THE UPSTREAM SIDE AND WITHIN 10 FEET OF THE UPSTREAM CORNER AT EACH END OF THE WALL SHALL BE BACKFILLED WITH COMPACTED LOW PERMEABILITY FILL, OTHERWISE, BACKFILL SHALL CONSIST OF GRANULAR FILL.
2. THE CONTRACTOR SHALL EXCAVATE A TEST PIT PRIOR TO THE START OF WALL DEMOLITION TO VERIFY THAT THE BASE OF THE EXISTING WALL IS AT OR ABOVE EL 19.0 FEET.
3. UPSTREAM FACE OF DAM SHALL BE VERTICAL AT LOW LEVEL OUTLET GATE.
4. REMOVE TOP 12" OF EXIST. STONE TRAINING WALL & REBUILD TO EL 27.50 (INTERLOCK NEW STONE WITH EXIST. STONE)



SECTION B-B  
3/4"=1'-0"



SECTION C-C  
3/4"=1'-0"



SECTION D-D  
3/4"=1'-0"

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Pond Dam  
Rehabilitation**

Brewster, Massachusetts

**VERIFY SCALE**

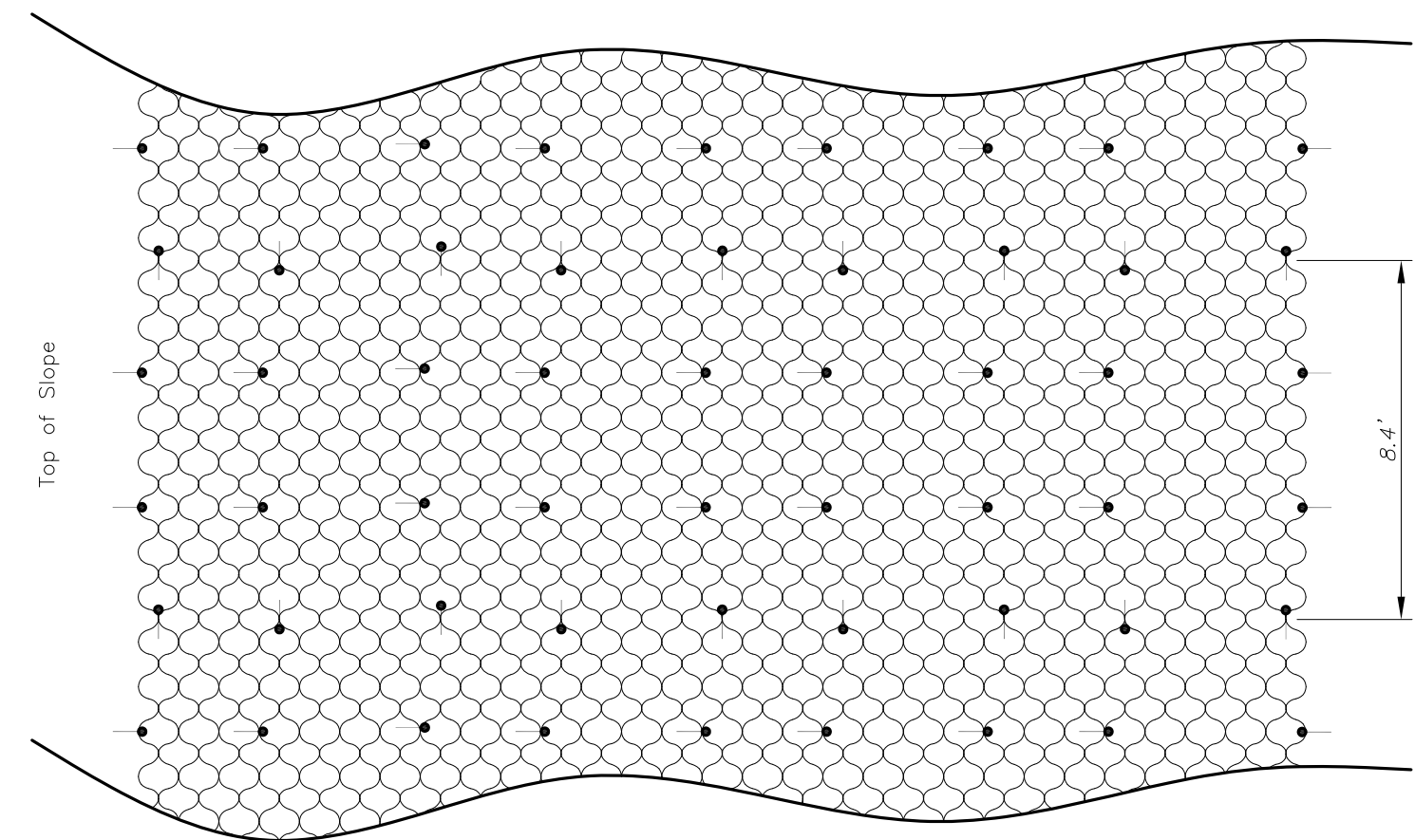
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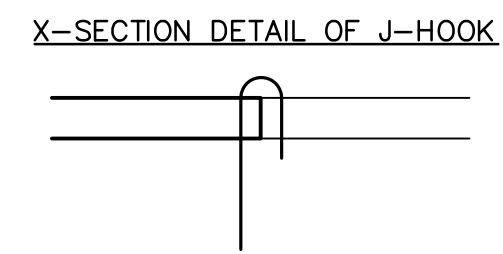
SECTIONS

SCALE: AS SHOWN

SHEET 6 OF 9

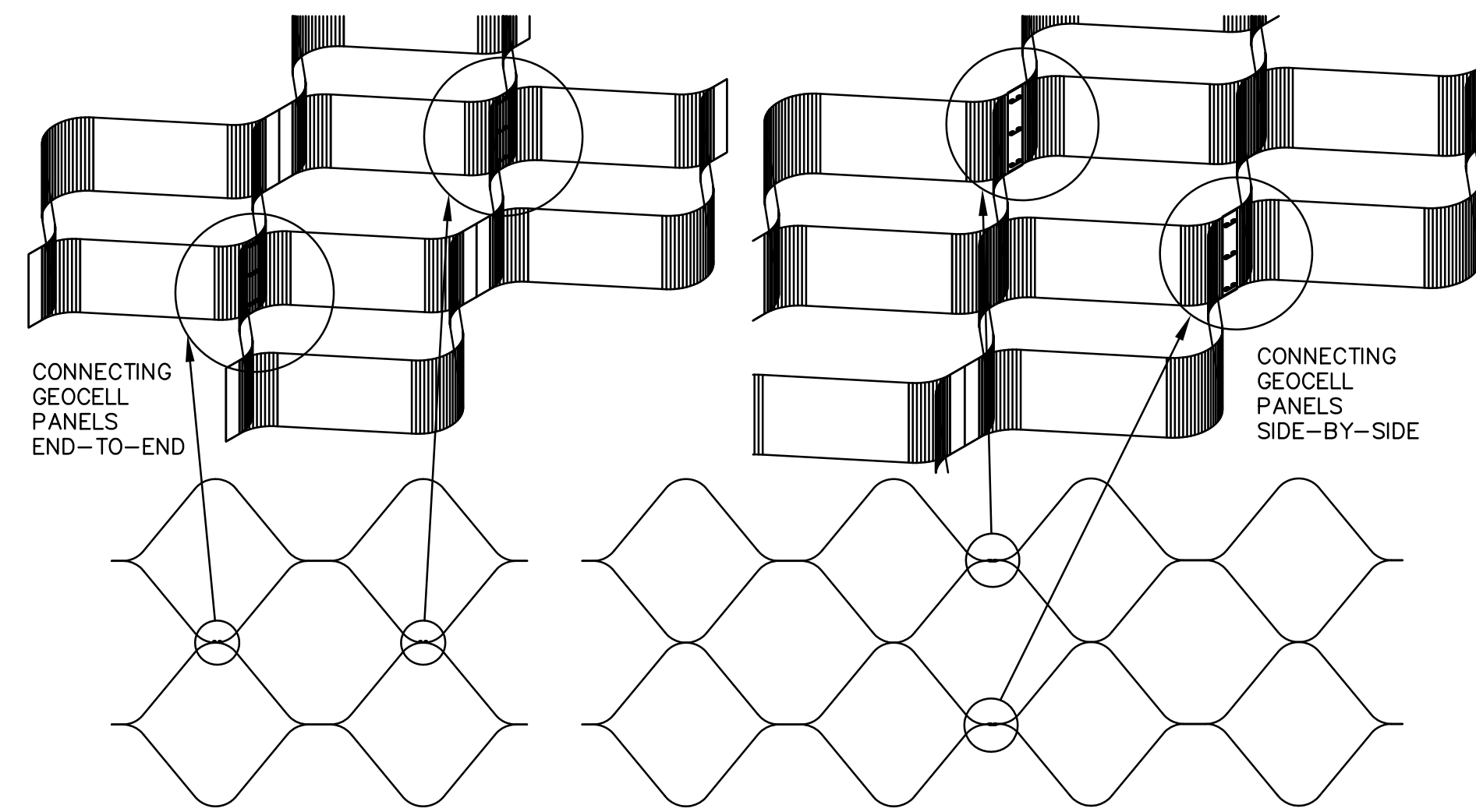


LEGENDS:  
• "J" HOOKS OR STAKES

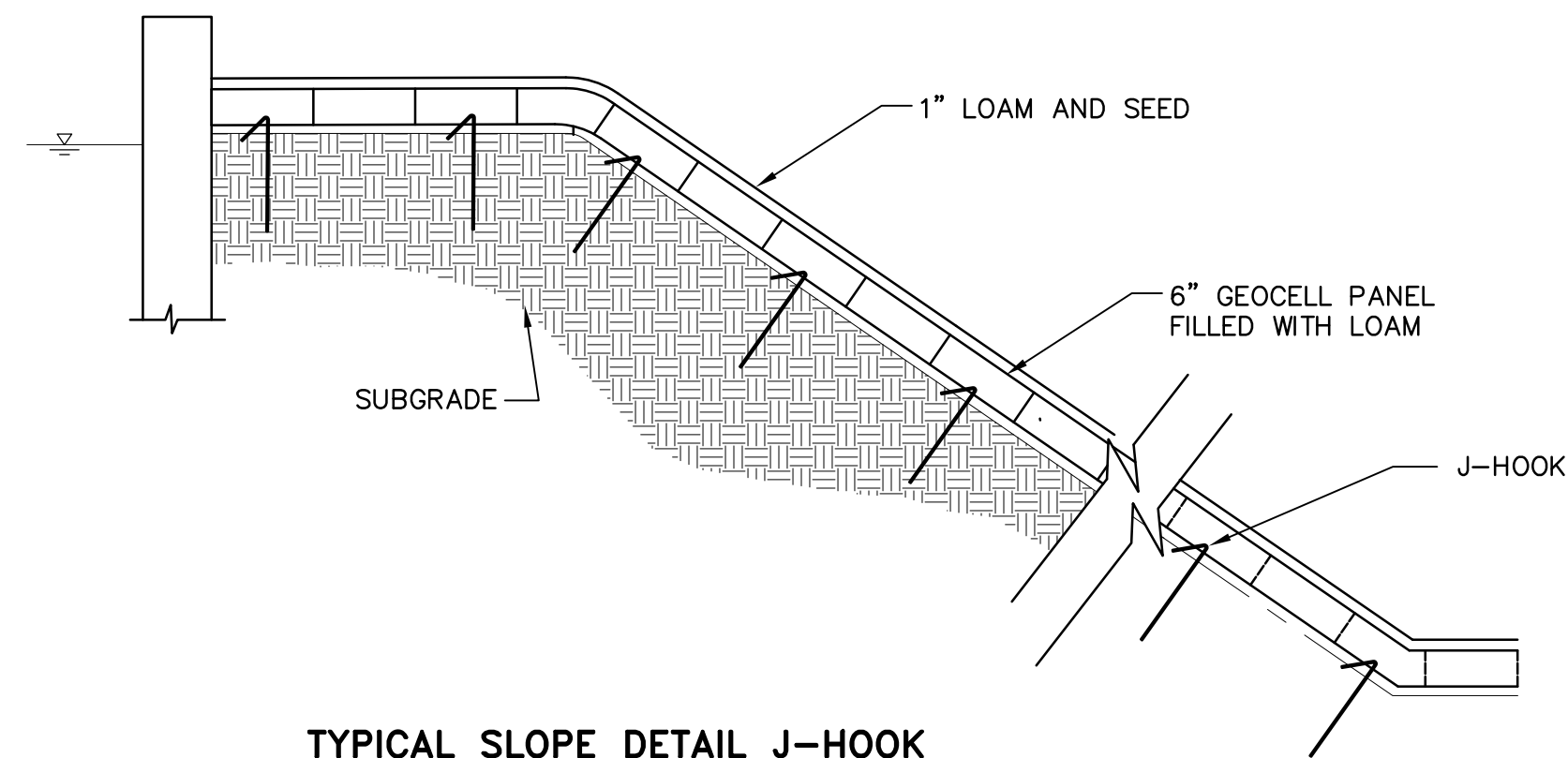


NOTES:  
1. TYPICAL STAKING PATTERN  
2. J-HOOKS ALONG EDGE OF PANEL ALSO SERVICE ADJACENT PANEL

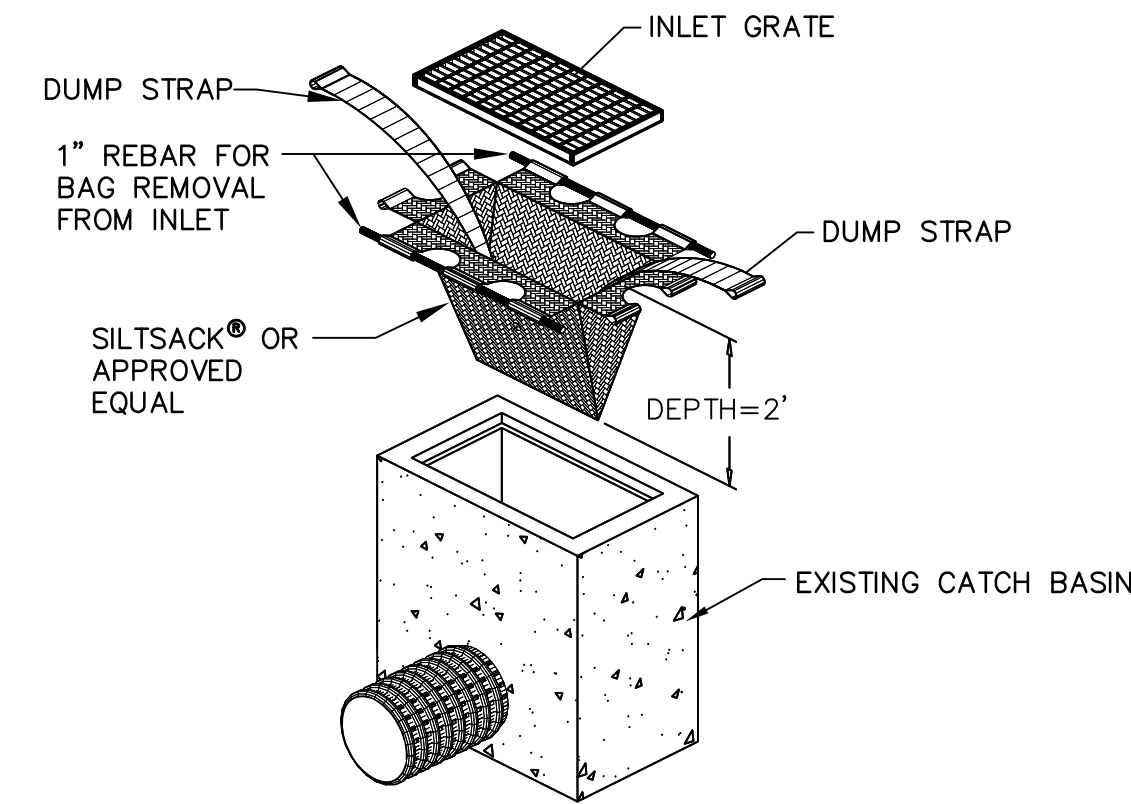
**GEOCELL STAKE PATTERN**  
NO SCALE



**TYPICAL GEOCELL PANEL STAPLING DETAILS**  
NO SCALE

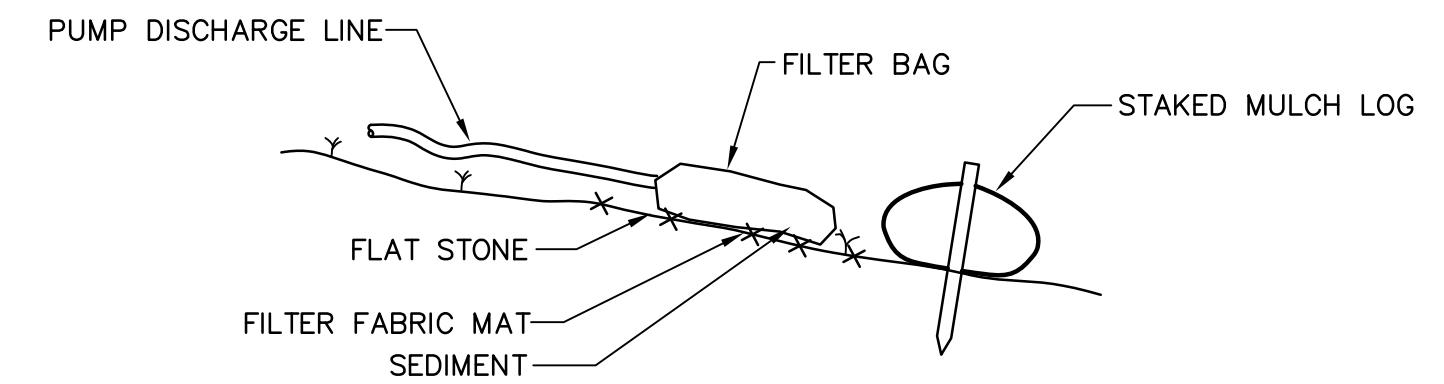
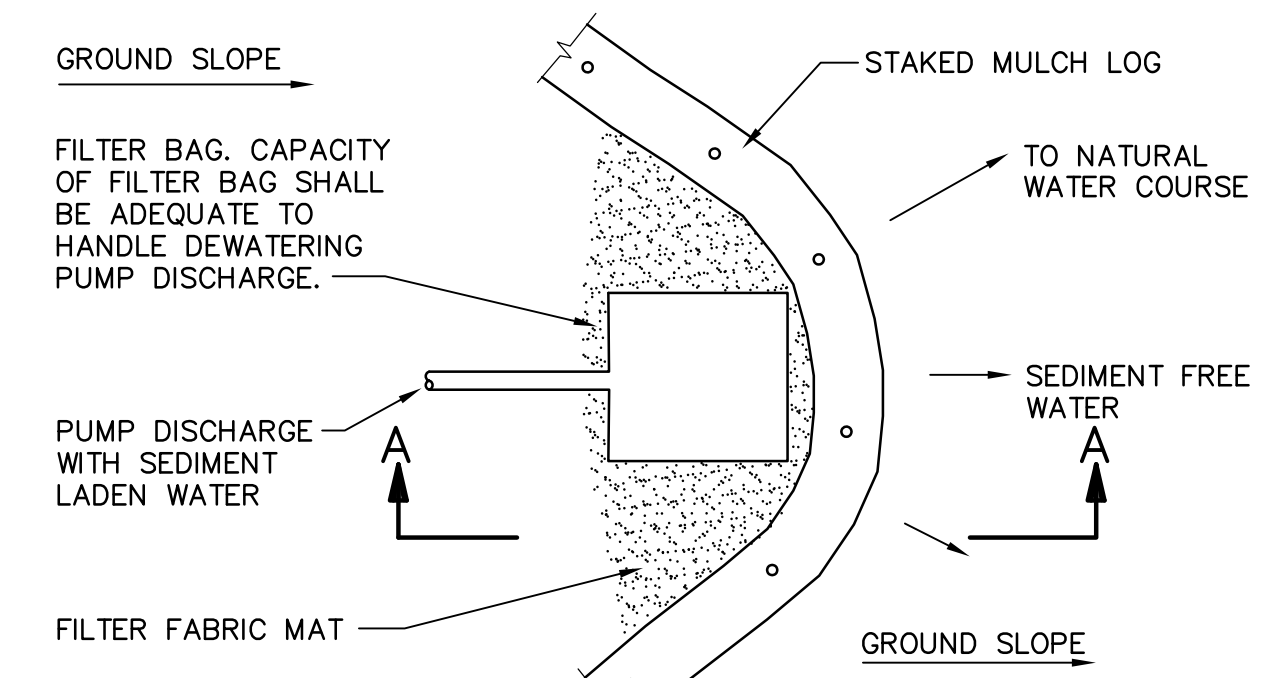


**TYPICAL SLOPE DETAIL J-HOOK**  
NO SCALE

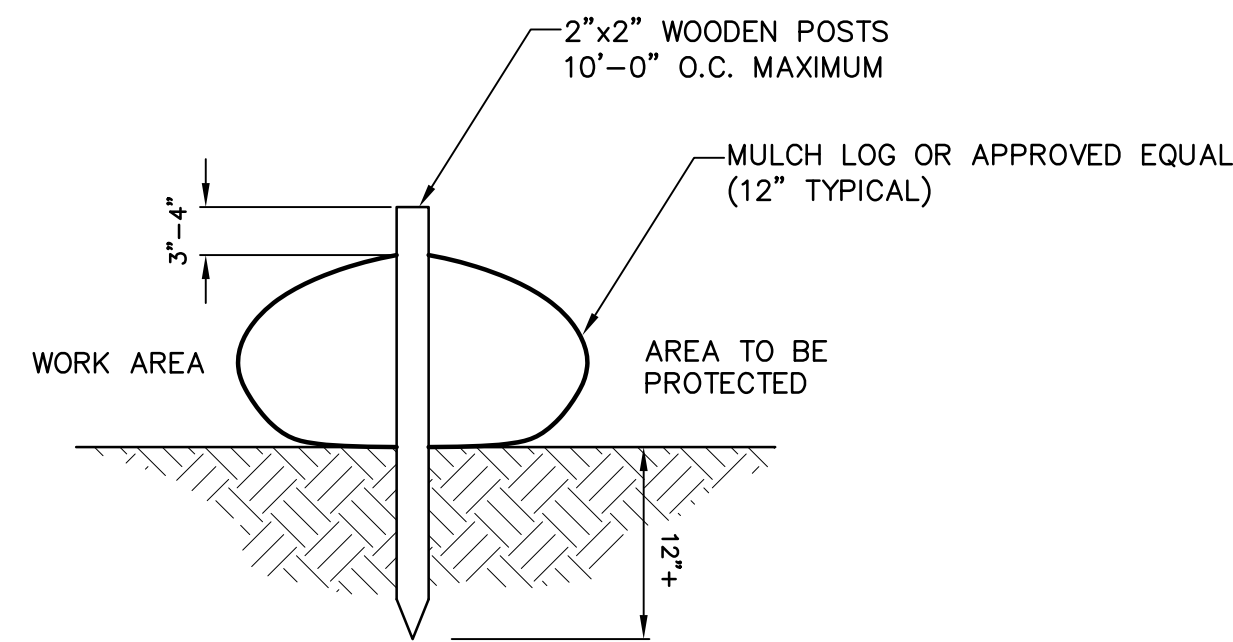


NOTES:  
1. SILTSACKS FOR TRENCH GRATE WILL MATCH OPENING LENGTH AS REQUIRED.  
2. SILTSACKS SHALL BE CLEANED OUT AND MAINTAINED IN GOOD WORKING ORDER PER MFR RECOMMENDATIONS.

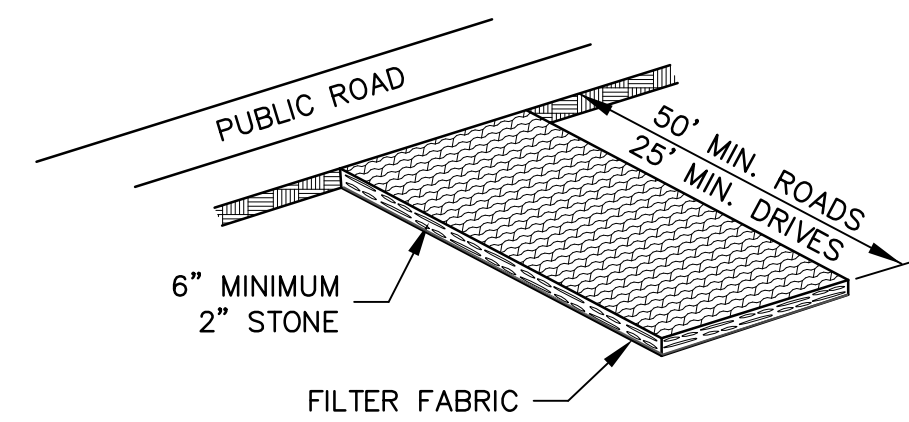
**TYPICAL CATCH BASIN PROTECTION DETAIL**  
NO SCALE



**SECTION A-A**  
**SEDIMENT TRAP**  
NO SCALE



**MULCH LOG DETAIL**  
NO SCALE



**CONSTRUCTION ENTRY**  
NO SCALE

**DRAFT SET  
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CONSTRUCTION**

**Town of  
Brewster**

**Lower Mill  
Pond Dam  
Rehabilitation**

Brewster, Massachusetts

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PROJECT NO: B0522

FILE: DETAILS

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CHECKED: ZDB

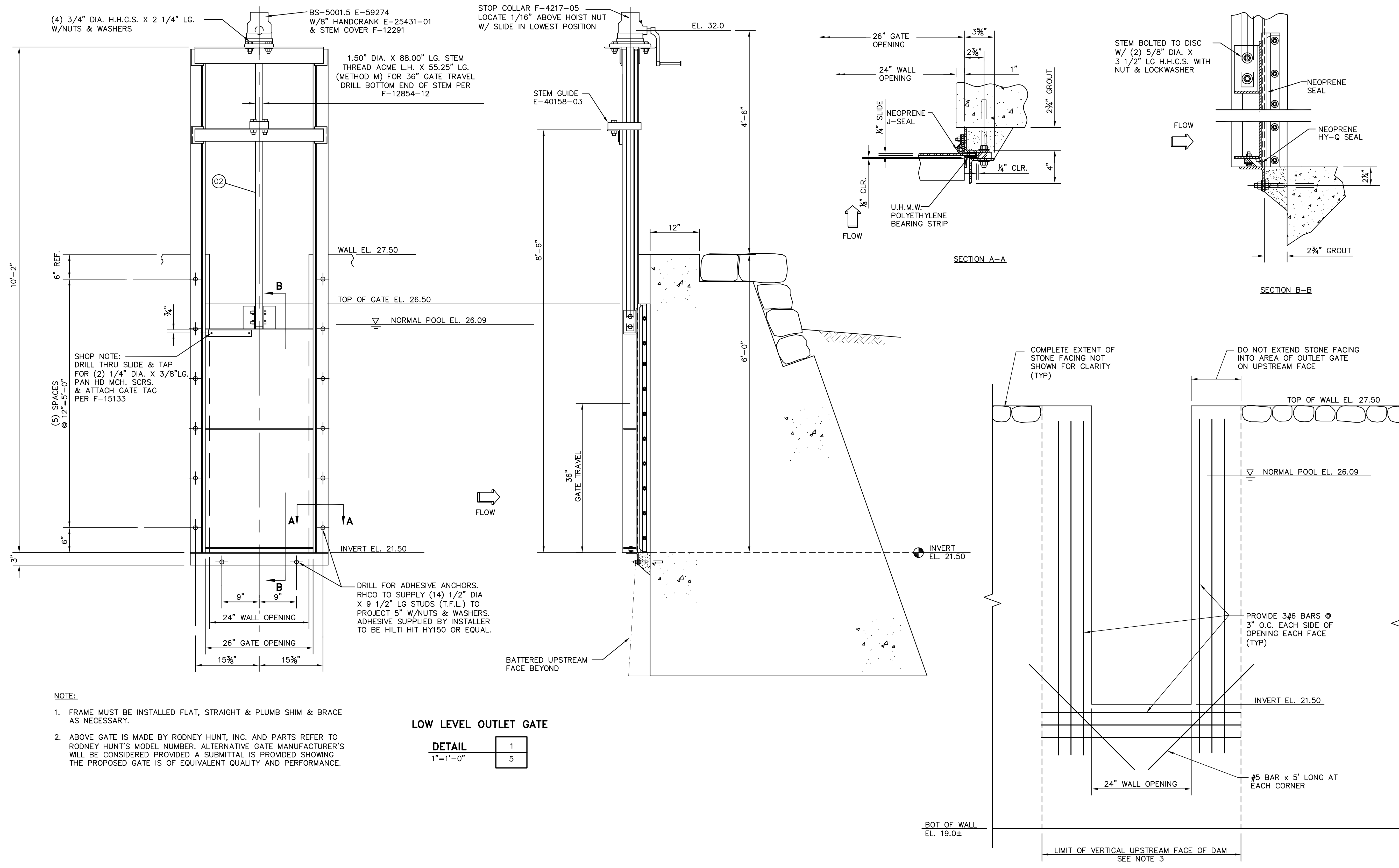
APPROVED BY: DAM, CDH

DETAILS

SCALE: AS SHOWN

SHEET 7 OF 9





- NOTE:**
1. FRAME MUST BE INSTALLED FLAT, STRAIGHT & PLUMB SHIM & BRACE AS NECESSARY.
  2. ABOVE GATE IS MADE BY RODNEY HUNT, INC. AND PARTS REFER TO RODNEY HUNT'S MODEL NUMBER. ALTERNATIVE GATE MANUFACTURER'S WILL BE CONSIDERED PROVIDED A SUBMITTAL IS PROVIDED SHOWING THE PROPOSED GATE IS OF EQUIVALENT QUALITY AND PERFORMANCE.

**LOW LEVEL OUTLET GATE**

<b>DETAIL</b>	<b>1</b>
1"=1'-0"	<b>5</b>

**REINFORCING FOR LOW LEVEL OUTLET GATE**

- NOTES:**
1. UPSTREAM FACE OF DAM SHALL BE VERTICAL AT LOW LEVEL OUTLET GATE.
  2. LOW LEVEL OUTLET GATE NOT SHOWN FOR CLARITY.
  3. COORDINATE REQUIREMENTS WITH OUTLET GATE MANUFACTURER.

**ELEVATION** E  
 1"=1'-0" 5

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 NOT FOR  
 CONSTRUCTION**

**Town of  
 Brewster**  
  
**Lower Mill  
 Pond Dam  
 Rehabilitation**  
  
 Brewster, Massachusetts

**VERIFY SCALE**

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Mark	Date	Description

PROJECT NO: B0522  
 FILE: DETAILS  
 DRAWN BY: CFY  
 CHECKED: ZDB, CSF  
 APPROVED BY: DAM, CDH

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**GENERAL**

- G1 Structural work shall conform to Massachusetts State Building Code, latest edition, including most recent addenda, and Contract Documents. In case of conflict, most stringent requirement shall govern.
- G2 Contractor shall verify and coordinate dimensions related to this project.
- G3 Contractor shall examine drawings for all trades for the verification of location and dimensions of all chases, inserts, openings, sleeves and other project requirements not shown on the structural drawings.
- G4 Provide caulking at all control joints. Provide compressible filler and sealant at all expansion and isolation joints.
- G5 Provide premolded joint filler where slabs on grade abut walls and columns.

**CONCRETE**

- C1 Concrete work shall conform to the latest editions of the building code requirements for reinforced concrete (ACI 318), and specifications for structural concrete for building (ACI 301).
- C2 Concrete shall be controlled concrete, proportioned, mixed and placed under the supervision of an approved concrete testing agency or the Engineer.
- C3 Concrete shall be normal weight concrete and shall have a compressive strength as specified at 28 days, unless otherwise noted and shall be air entrained (see specs)
- C4 The use of construction joints where shown on the drawings is mandatory. Omissions, additions or changes shall not be made except with the submission of a written request together with drawings of the proposed joint locations for approval of the structural engineer.
- C5 Where construction joints are not shown, drawings showing location of construction joints and concrete placing sequence shall be submitted to the Engineer for approval prior to preparation of the reinforcement shop drawings.
- C6 Concrete slabs shall be cast so that the slab thickness is at no point less than that indicated on the drawings.
- C7 Concrete shall be cast alternately or in a checkerboard fashion so that adjacent sections are placed no sooner than three days apart.
- C8 Concrete shall be placed without horizontal construction joints except where shown or noted.
- C9 Exposed edges of concrete elements shall have chamfered corners.
  
- F1 No concrete shall be placed in water or on frozen ground.
- F2 Bottom of foundation elevations given on plans are to be considered minimum depths. Contractor shall have further excavation as required to reach good bearing.
- F3 All excavations for footings shall be finished by hand for the last 6".
- F4 All finished excavations shall be inspected by the Engineer before any concrete is placed.
- F5 All backfill under or adjacent to any portion of the structures shall be compacted in 6" lifts. See Specifications.
- F6 Remove unsuitable fill and/or improve the subgrade per specification requirements. Backfill with compacted structural (granular) fill up to the underside of the building slabs. See Specifications.

**BUILDING OF STONE WALLS:**

- S1 This work shall consist of the removal and rebuilding of present stone masonry walls and installing stone facing on reinforced concrete structure in close conformity with the lines and grades shown on the drawings.
- S2 The stone shall consist of those in the present walls on site and such new stones as may be required to rebuild the existing walls and construct new walls as shown on the drawings.
- S3 Stones for field stone masonry shall consist of sound durable blasted or field stone free from seams, cracks and other structural defects and of an approved and satisfactory quality and shape.
- S4 The stone shall have straight edges without re-entrant angles. The faces shall be flat but not necessarily rectangular in shape.
- S5 Individual stone shall have, when set in the wall, no face dimension less than 8". Stretchers shall have a depth in the wall at least 1-1/2 times the rise, and a length on the face at least twice the rise. Headers shall have a length on the face at least equal to the rise. Headers shall hold in the heart of the wall the same size as shown on the face and shall extend at least 12" more than the stretchers into the backing.
- S6 The height and width of the new and rebuilt stone walls shall match the width of the existing stone walls where applicable and shall match that shown on the drawings for new walls.
- S7 Stones in the existing walls shall be removed and set aside.
- S8 The stone facing shall be installed to a minimum depth of 6" below grade.
- S9 The masonry shall be laid in beds of mortar as described below and the face pattern shall be of uniform appearance throughout.
- S10 The stones shall be laid on horizontal beds parallel to the natural bed of the stone. Vertical joints shall be broken by at least 6".
- S11 The wall shall be compactly laid having all interior joints completely filled with suitable stones or spalls.

**REINFORCEMENT**

- R1 Detailing, fabrication, and erection of reinforcement, unless otherwise noted, shall conform to ACI "Building Code Requirements for Reinforced Concrete (ACI 318)" and ACI "Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315)", latest edition.
- R2 Steel reinforcement unless otherwise shown shall conform to ASTM A615 Grade 60 minimum (yield strength - 60,000 psi).
- R3 Welded wire fabric reinforcement shall conform to: ASTM A185.
- R4 Provide and schedule on shop drawings, all necessary accessories to hold reinforcement securely in position: minimum requirements shall be: high chairs, 4'-0" on center, #5 support bar for high chairs, slab bolsters, 3'-6" on center, all wire chairs and bolsters to be plastic tipped.
- R5 The concrete protective covering for cast-in-place concrete reinforcement shall be 3 inches, unless otherwise shown.
- R6 Where continuous bars are called for they shall be run continuously around corners and lapped at necessary splices or hooked at discontinuous ends.
- R7 Where reinforcement is not shown on drawings, provide reinforcement in accordance with applicable typical details or similar to that shown for most nearly similar situations, as determined by the Engineer. In no case shall reinforcement be less than minimum reinforcement permitted by the applicable codes.
- R8 Where reinforcement is called for in section, reinforcement is considered typical wherever the section applies.
- R9 Reinforcement shall be continuous through all construction joints unless otherwise indicated on the drawings.
- R10 Welded wire fabric shall lap 12" or two spaces, whichever is larger, and shall be wired together.
- R11 Reinforcement coupler splices shall be mechanical devices capable of transmitting the ultimate tensile and compressive strength of the bar.
- R12 Installation of reinforcement shall be completed at least 24 hours prior to scheduled concrete placement. Notify Engineer of completion at least 24 hours prior to scheduled completion of placement or reinforcement.
- R13 Reinforcement shall be set before placing concrete. Setting any reinforcement into wet concrete is prohibited.

**DEMOLITION**

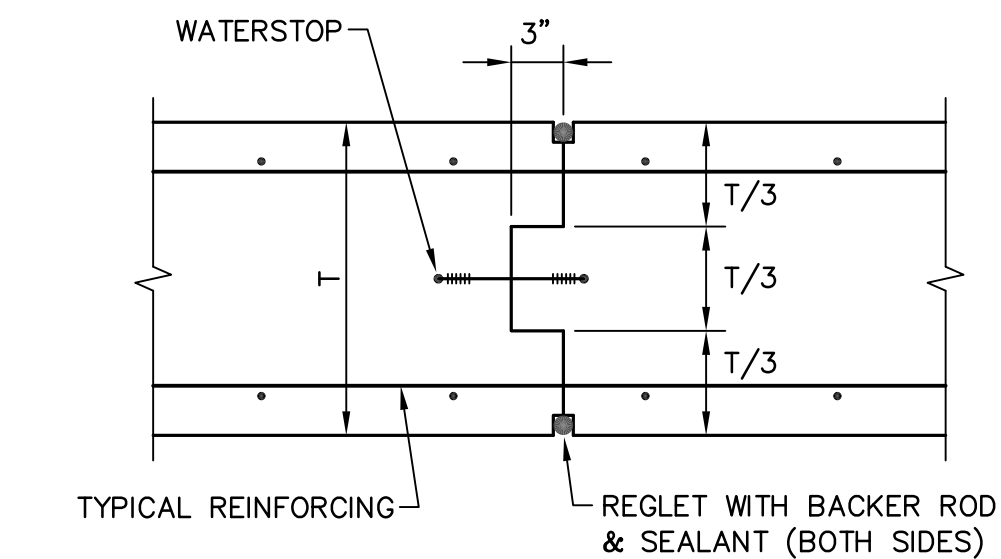
- D1 Drawings were developed from original the site survey and site observations. All features shown are approximate. Contractor is responsible for verifying all existing conditions.
- D2 Unless noted, all structures and their contents, fences, walks, concrete, asphalt, and miscellaneous debris within the specified area shall be demolished and disposed of or recycled unless otherwise noted.
- D3 Contractor shall install a six foot tall temporary fence around demolition area during demolition.
- D4 Contractor shall be responsible for coordinating with the dpw to obtain any necessary permits/police details. Contractor shall bear costs associated with any necessary permits/police details.
- D5 Remove all foundation components (i.e. walls, slabs, footings, etc.) in their entirety, within limits shown on drawings.

- S12 Mortar and grout materials
  - a. Portland cement: ASTM C150, type I, except type III may be used for cold weather construction.
  - b. Mortar aggregate: ASTM C144, standard masonry type.
  - c. Hydrated lime: ASTM C207, type s.
  - d. Grout aggregate: ASTM C404, fine and coarse.
  - e. Water: clean and potable.
  - f. Water repellent: granular or liquid type. water repellent admixture shall be hydrocide powder manufactured by sonneborn, omicron by master builders co., integral waterpeller by euclid chemical, or approved equal.
  - g. Admixtures: the use of admixtures, other than water repellent admixtures, is prohibited unless specifically submitted and approved by the engineer.
- S13 Mortar mixes
  - a. Mortar for all masonry: ASTM C270, type s using proportion specification.
  - b. All mortar shall contain water repellent.
- S14 Mortar mixing:
  - a. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
  - b. Achieve uniformly damp sand immediately before mixing process.
  - c. Add mortar color and admixtures to achieve uniformity of mix and coloration.
  - d. Re-temper only within two hours of mixing.
- S15 Mortar coloring:
  - a. Pigments for coloring mortar shall be chemically pure, inorganic oxides in compounds suitably prepared for use in masonry mortar.
  - b. Provide mortar color selected by owner. Color shall be selected from full range of colors available.

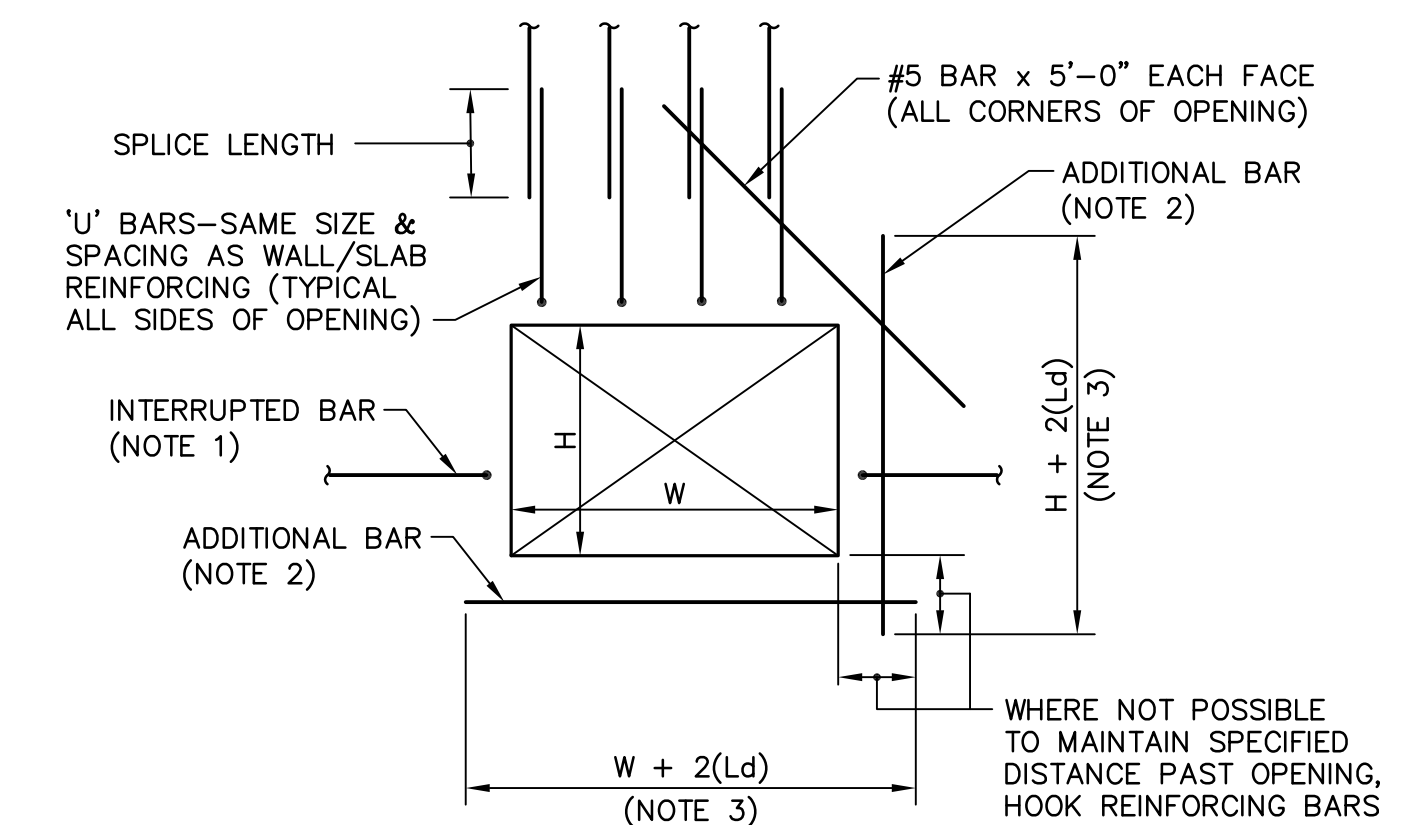
REBAR SPLICE LENGTH SCHEDULE				
BAR SIZE DESIGNATION		DEVELOPMENT LENGTH (INCHES)	SPLICE LENGTH (INCHES)	
ENGLISH	METRIC	Ld	CLASS B	CLASS B TOP BARS
#3	#10	15	19	25
#4	#13	19	25	33
#5	#16	24	31	40
#6	#19	29	37	48
#7	#22	42	54	70
#8	#25	48	62	81
#9	#29	54	70	91
#10	#32	61	79	103

**NOTES:**

1. IF CLEAR SPACING BETWEEN THE REBARS IS LESS THAN THREE BAR DIAMETERS, OR IF COVER IS LESS THAN TWO BAR DIAMETERS, INCREASE THE SPLICE LENGTH BY AN ADDITIONAL 50%.
2. IF EPOXY COATED REBAR IS USED, INCREASE THE SPLICE LENGTH BY AN ADDITIONAL 50%.
3. IF LIGHTWEIGHT CONCRETE IS USED, INCREASE THE SPLICE LENGTH BY AN ADDITIONAL 30%.
4. THE MINIMUM REBAR SPLICE LENGTH SCHEDULE IS BASED ON F'c= 4,000 PSI AND Fy= 60,000 PSI. ADJUST FOR OTHER STRENGTHS USING ACI-318.
5. FOR HORIZONTAL REINFORCEMENT SO PLACED THAT MORE THAN 12 INCHES OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW, INCREASE THE DEVELOPMENT LENGTH BY AN ADDITIONAL 30%.
6. WHEN BARS OF DIFFERENT SIZE ARE LAP SPLICED, THE SPLICE LENGTH SHALL BE THE LARGER OF EITHER THE DEVELOPMENT LENGTH OF THE LARGER BAR OR THE SPLICE LENGTH OF THE SMALLER BAR.



**WALL CONSTRUCTION JOINT**  
NO SCALE



**NOTES:**

1. FOR SLAB OR WALL APPLICATION WITH A CONCRETE THICKNESS LESS THAN 12 INCHES, 180° OR 90°, HOOK BARS MAY BE USED IN LIEU OF 'U' BARS.
2. PROVIDE ADDITIONAL BARS USING NOT LESS THAN ONE HALF OF INTERRUPTED BARS AT EACH SIDE OF OPENING AT 3" ON CENTER.
3. FOR TOP BARS IN SLAB, INCREASE DEVELOPMENT LENGTH BY 30%.

**TYPICAL REINFORCING AT OPENINGS IN CONCRETE WALLS AND SLABS**  
NO SCALE

**DRAFT SET  
NOT FOR  
CONSTRUCTION**

**Town of  
Brewster**

**Lower Mill  
Pond Dam  
Rehabilitation**

**Brewster, Massachusetts**

**VERIFY SCALE**

BAR IS 1 INCH ON ORIGINAL DRAWING  
0 1 INCH  
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

Mark	Date	Description

PROJECT NO: B0522

FILE: SHT9

DRAWN BY: CFY

CHECKED: CSF

APPROVED BY: DAM, CSF

STRUCTURAL NOTES AND DETAILS

SCALE: NO SCALE

**SHEET 9 OF 9**