

TOWN OF IPSWICH

UTILITIES DEPARTMENT



272 HIGH STREET • IPSWICH, MA 01938 • (978) 356-6635 • FAX: (978) 356-6634

To: Town of Ipswich Select Board/Water Commissioners

From: Vicki Halmen, Water Director

Subject: Dow Brook Dam

Date: April 27, 2018

Seepage on Dow Brook Dam was detected by Water Department staff on the downstream slope of the dam in early April. Our dam engineers, Haley & Aldrich (H&A), were notified and conducted a site visit on April 10th (April 12th summary letter attached). The Board was made aware of a change in condition of the Dow Brook Dam on April 11, 2018.

As requested by H&A, the water level in the Dow Brook Reservoir was lowered to the spillway invert level, about 2-feet lower than the level on April 10th. This was accomplished by cutting and removing sections of the wooden flashboards within the dam spillway. The water level and seepage area are monitored daily by staff. With the level now lowered, the seepage is still present but no longer actively flowing. H&A returned for a follow-up site visit on April 25th with a representative from the Massachusetts Office of Dam Safety. The current status of the dam is stable, but unsafe. The water level must remain at or below its currently position to prevent further damage to the dam. The Office of Dam Safety will be issuing the Town an order to repair the dam (April 26th H&A letter to Office of Dam Safety attached).

H&A's recommended repair entails driving sheeting through the dam to prevent the seepage and maintain the structural integrity of the dam. The cost for this is estimated at approximately \$500,000. Due to the concerns over the limitations to the water supply and the unsafe condition of the dam, I recommend proceeding immediately with corrective actions.

We have taken initial steps toward the repair, including:

- retaining a wetlands scientist
- retaining a land surveyor
- requesting a small project permit with the Conservation Commission for borings along the dam
- Authorizing H&A to complete a boring plan

This project was not planned or budgeted. We are analyzing our current FY18 budgets and expect to identify funds to complete the engineering for the repair before the end of the fiscal year. However, construction and engineering oversight is not funded. It is recommended to modify the 2018 ATM Article 11 language to allow the funds to be used for this project. I have been working closely with the Town Manager and Finance Director to explore this option.

As a precaution, we have closed Dow Brook Dam to recreational activities until further notice. Barricades have been placed at either end of the dam to prohibit public access. Signs are currently being made to alert visitors to keep off the dam. Warnings have been posted on the Town website and on the Utilities Department social media pages.

Our Dow Brook Reservoir storage is now 20% below maximum capacity. This is a serious situation that could impact our ability to supply water to the community through the summer months. MassDEP has been notified and will be kept informed of any changes in conditions. AECOM, the Town's consultant working on a water supply and demand study and the potential new well development on the Lynch site, has also been notified of the situation, as it relates to their project scope.

Despite the lower water level, water is overflowing the dam spillway and the reservoir continues to receive recharge. Therefore, annual hydrant flushing will proceed as planned beginning at midnight on April 30th as long as there is reservoir recharge. We will monitor conditions closely and stop flushing activities immediately if necessary. If conditions change, we are prepared to issue mandatory water restrictions or a full water ban to ensure a continuous supply of water to maintain the public health, safety and welfare of the citizens of Ipswich.



HALEY & ALDRICH, INC.
465 Medford St.
Suite 2200
Boston, MA 02129
617.886.7400

12 April 2018
File No. 34473-006

Ipswich Water Department
Town of Ipswich
PO Box 151
Ipswich, Massachusetts 01938

Attention: Vicki Halmen, Water Director

Subject: Site Visit and Dam Condition
Dow Brook Reservoir Dam
Ipswich, Massachusetts

Ladies and Gentlemen:

This letter is written concerning the current condition of Dow Brook Reservoir Dam in Ipswich, Massachusetts. Denis Bell of Haley & Aldrich visited the dam site on 10 April 2018 and discussed the observations and recommendations below with the Ipswich Water Director, Vicki Halmen during the visit.

Dow Brook Reservoir Dam Condition

We understand site personnel noticed seepage on the downstream slope/toe of the dam on 4 April 2018. Denis Bell visited on 10 April 2018 and observed the seepage. During the site visit the water level within Dow Brook Reservoir was recorded at El. 33.3, about 4.2 ft below the concrete curb on the bridge, and 2.8 ft above the spillway slab invert. A site plan dated 17 April 1981 includes the top of concrete curb on the bridge at El. 37.5.

- Top of Concrete Curb on Bridge El. 37.5
- Top of Dam El. 35
- Water Level El. 33.3
- Top of Flashboards El. 33.3
- Top of Granite Corewall El. 32
- Spillway Slab Invert El. 30.5
- Top of Seep El. 28+/-
- Bottom of Seep El. 22 +/-

The observed seep measured about 11 ft on the downstream slope, perpendicular to the dam axis, and 8 ft wide, along the dam axis. The seep was actively producing water during the site visit; however, the water was visually clear and causing minor damage to the grass vegetation on the slope. Two additional

seeps were observed 8 to 12 ft north of the main seep on the downstream slope. The additional seeps were 3 to 4 ft in diameter and at about El. 26. The seeps were located about 73 to 90 ft north of the bridge.

In addition to the seeps on the main dam, seepage was also observed at the left abutment contact. Seepage at this location has been observed since the 1980s and records indicate the seep was historically estimated at 5 gallons per minute, the seep was clear and damage was not reported.

Seepage at the left abutment during this site visit was different, and larger, than the seepage reported since the 1980s. Seepage observed on 10 April 2018 occurred over a 30 ft long area and visually estimated at 30 to 40 gallons per minute. Minor erosion was observed at the left abutment, including gullies, less than 2 in. in depth.

Conclusions

The observed seeps are likely caused by high water levels in the reservoir. The water is 1.3 ft above the top of the corewall. This condition is causing water to flow over the corewall and 'daylight' on the downstream slope, causing seeps. The seeps will get worse with time and compromise the dam if the water level is not lowered.

The dam has been in service since the 1890s and relatively few problems have been reported. In 1981, a bentonite slurry cutoff wall was added along the left side and left abutment due to seepage at that location. Since that time, the dam has reportedly performed well.

Recommendations

The seeps at Dow Brook Dam are concerning and action should be taken to prevent further damage to the dam. In addition, the seeps should be monitored daily.

We recommend the water level be lowered within the next day. To start, lower the water 1 ft, to El. 32.3 (1.8 ft above the spillway slab invert) and the monitor the seeps. If the seeps continue, the water level should be lowered to a level where the seeps stop.

Town of Ipswich
12 April 2018
Page 3

Closure

Please contact the undersigned at 617-886-7343 if you wish to discuss the above information or have additional questions.

Sincerely yours,
HALEY & ALDRICH, INC.

A handwritten signature in black ink that reads "Denis J. Bell". The signature is written in a cursive, slightly slanted style.

Denis J. Bell, P.E.
Senior Engineer

Attachments:

Figure
Photos

G:\34473\006-DowBrook-2018\2018-0412-HAI-DowBrookDam-Condition-F.docx



Photo 1
Spillway with Water at El. 33.3



Photo 2
Area of Seeps on Downstream Slope



Photo 3
Area of Seep, 73 ft from Bridge



Photo 4
Water Level at El. 33.3 at the Gatehouse



Photo 5
Seep at Dam



Photo 6
Seep at Dam, about 11 ft by 8 ft



Photo 7
Seep at Dam



Photo 8
Flashboards at El. 33.3



Photo 9
Right Downstream Slope



Photo 10
Seeps at Downstream Toe of Left Abutment



HALEY & ALDRICH, INC.
465 Medford St.
Suite 2200
Boston, MA 02129
617.886.7400

26 April 2018
File No. 131007-002

Massachusetts Department of Conservation and Recreation
Office of Dam Safety
251 Causeway Street, Suite 800
Boston, MA 02114-2104

Attention: William Salomaa, Director

Subject: Site Visit and Dam Condition
Dow Brook Reservoir Dam
Ipswich, Massachusetts

Ladies and Gentlemen:

This letter is written concerning the current condition of Dow Brook Reservoir Dam in Ipswich, Massachusetts. Denis Bell of Haley & Aldrich visited the dam site on 10 April 2018 and 25 April 2018. We discussed the observations and recommendations below with the Ipswich Water Director, Vicki Halmen and Superintendent Joseph Ciccotelli during the visit.

Dow Brook Reservoir Dam Condition

Site personnel noticed seepage on the downstream slope/toe of the dam on 4 April 2018. Denis Bell visited on 10 April 2018 and observed the seepage. During the site visit the water level within Dow Brook Reservoir was recorded at El. 33.3.

The observed seep on 10 April 2018 measured about 11 ft on the downstream slope, perpendicular to the dam axis, and 8 ft wide, along the dam axis. The seep was actively producing water during the site visit; however, the water was visually clear and causing minor damage to the grass vegetation on the slope.

In addition to the seeps on the main dam, seepage was also observed at the left abutment contact. Seepage at this location has been observed since the 1980s and records indicate the seep was historically estimated at 5 gallons per minute, the seep was clear and damage was not reported.

Seepage at the left abutment on 10 April 2018 was different, and larger, than the seepage reported since the 1980s. Seepage observed on 10 April 2018 occurred over a 30 ft long area and visually estimated at 30 to 40 gallons per minute. Minor erosion was observed at the left abutment, including gullies, less than 2 in. in depth.

On 25 April 2018, Mr. Bell completed an additional site visit and contacted Massachusetts Office of Dam Safety and informed them of the conditions. On 25 April 2018, the water level was at spillway invert level, about 2 ft lower than on 10 April 2018. The seepage areas were saturated and thinly vegetated. The seeps were not actively flowing on 25 April 2018.

Recommendations

The seeps at Dow Brook Dam are concerning and action should be taken to prevent further damage to the dam. In addition, the seeps should be monitored daily.

We recommend the water level be maintained at, or below, spillway invert elevation until repairs can be made to bring the dam into compliance with Massachusetts Dam Safety Regulations.

Closure

Please contact the undersigned at 617-886-7343 if you wish to discuss the above information or have additional questions.

Sincerely yours,
HALEY & ALDRICH, INC.



Denis J. Bell, P.E.
Senior Engineer



Attachments:

Dam Follow Up Inspection Form

C: Town of Ipswich; Vicki Halmen

**Commonwealth of Massachusetts
Department of Conservation and Recreation
Office of Dam Safety Poor and Unsafe Condition Dam Follow-up Inspection Form**

(Complete this inspection form and provide a cover letter on consulting firm letterhead that briefly summarizes the current follow-up inspection and findings. The cover letter shall be signed and stamped by the Registered Professional Engineer in charge of the inspection)

Dam Name: Dow Brook Reservoir Dam
Dam Owner: Town of Ipswich
Nat. ID Number: MA00165
Hazard Potential: Significant
Location of Dam (town): Ipswich, Massachusetts
Coordinate location (lat,long): 42°41.9' N, 70°52.3' W
Date of Inspection: 25 April 2018
Weather: Light Rain, 50s

Consultant Inspector(s): Haley & Aldrich, Inc.; Denis J. Bell, P.E.

Others in Attendance at Field Inspection:

Attachments: Figure 1 Project Locus
Figure 2 Site Plan
Appendix A Photos

I. Previous Inspection date/Overall Condition:

- Date of most recent formal Phase I Inspection Report:
29 August 2017
- Overall condition reported in most recent Phase I Inspection Report:
Satisfactory

II. Previous Inspection Deficiencies:

- List identified deficiencies in the most recent Phase I Inspection Report:
 1. The trees and vegetation on the left upstream abutment contact with the dam should be removed and health grass cover established and maintained.
 2. Minor cracking and rusting was observed at the spillway and should be patched.
 3. The seepage breakout at the left toe of the dam should be monitored and riprap should be installed to prevent the seep from eroding the toe.

III. Overall Condition of Dam at the Time of the Current Follow-up Inspection:

- a. **State the current condition:** UnSafe
b. **Have conditions changed since the previous inspection?** Yes

IV. Comparison of Current Conditions to Condition Listed in Previous Phase I Inspection Report:

- a. **Have any of the deficiencies listed in the previous Phase I Inspection Report worsened?**

Yes

- b. **If yes, list the changes.**

The seep at the left abutment has increased to over a 30 to 40 ft length of the dam.

- c. **Are there any additional deficiencies that have been identified in the current inspection?**

Yes

- d. **If yes, list the deficiencies and describe.**

Seeps have developed on the downstream toe of the dam at the right side. The observed seep measured about 11 ft on the downstream slope, perpendicular to the dam axis, and 8 ft wide, along the dam axis. The seep was actively producing water on the site visit on 10 April 2018; however, the water was visually clear and causing minor damage to the grass vegetation on the slope. Two additional seeps were observed 8 to 12 ft north of the main seep on the downstream slope. The additional seeps were 3 to 4 ft in diameter and at about El. 26. The seeps were located about 73 to 90 ft north of the bridge.

On 25 April 2018, with the reservoir water level about 3 ft lower than 10 April 2018, the seep area of concern was wet and saturated with standing puddles, however, water was not observed to be actively flowing.

V. Dam Safety Orders:

- **List dam safety orders that have been issued to the dam owner pertaining to this dam.**

None.

VI. Maintenance:

1. Indicate if there exists an operation and maintenance plan for the dam.
Yes, the dam is operated as the water supply for Ipswich and is operated daily.
2. Indicate if it appears the dam is being maintained.
Yes, the dam is staffed and maintained.

VII. Recommendations:

1. The reservoir level should be maintained at the Spillway Invert Elevation, or lower, until repairs are completed to bring the dam into compliance with Massachusetts Dam Safety Regulations.
2. The condition of the dam should be monitored daily for signs of additional seepage and deterioration.
3. The dam should be repaired to prevent seepage and bring the dam into compliance with dam safety regulations.

VIII. Other Comments or Observations:

IX. Updated Site Sketch with Photo Locations:

See Attached

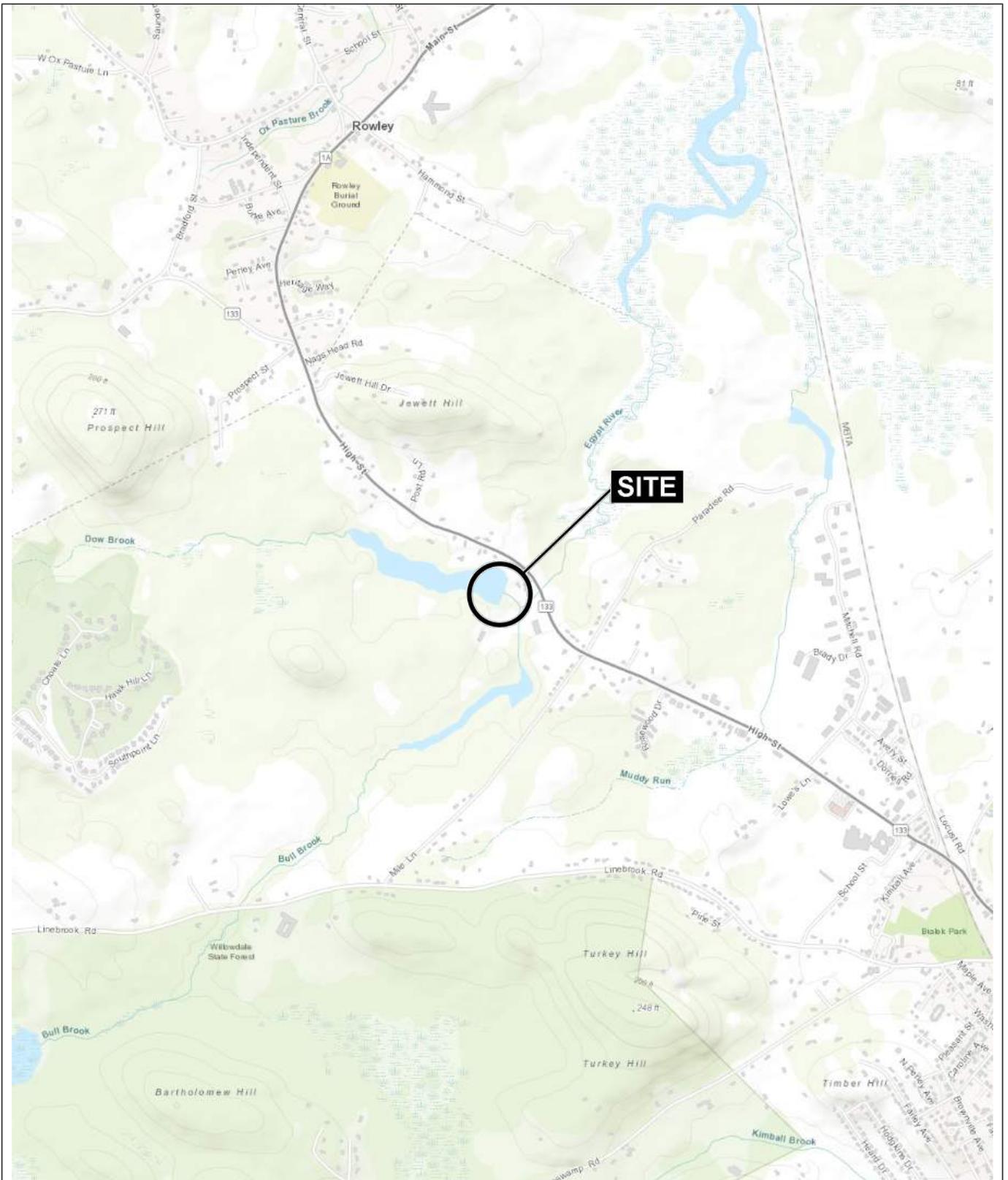
X. Updated Photos:

See Attached

XI. Copy of Locus Map from Phase I Report:

See Attached

XII. Other applicable attachment:



MAP SOURCE: ESRI

SITE COORDINATES: 42°41'54"N, 70°52'15"W

**HALEY
ALDRICH**

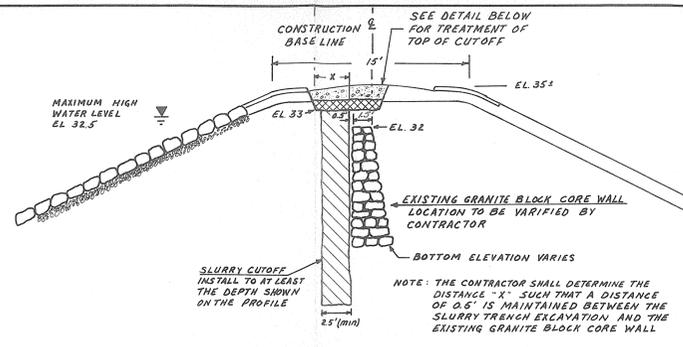
DOW BROOK RESERVOIR DAM
MA 00165
IPSWICH, MASSACHUSETTS



PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
AUGUST 2017

FIGURE 1



25 APRIL 2018
SEEP AREA WAS SATURATED,
NOT FLOWING

SEEPS CONTINUED
ON 24 APRIL 2018

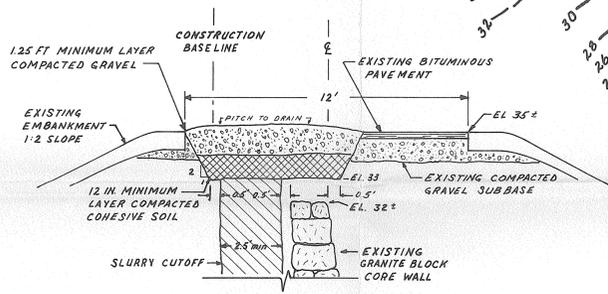
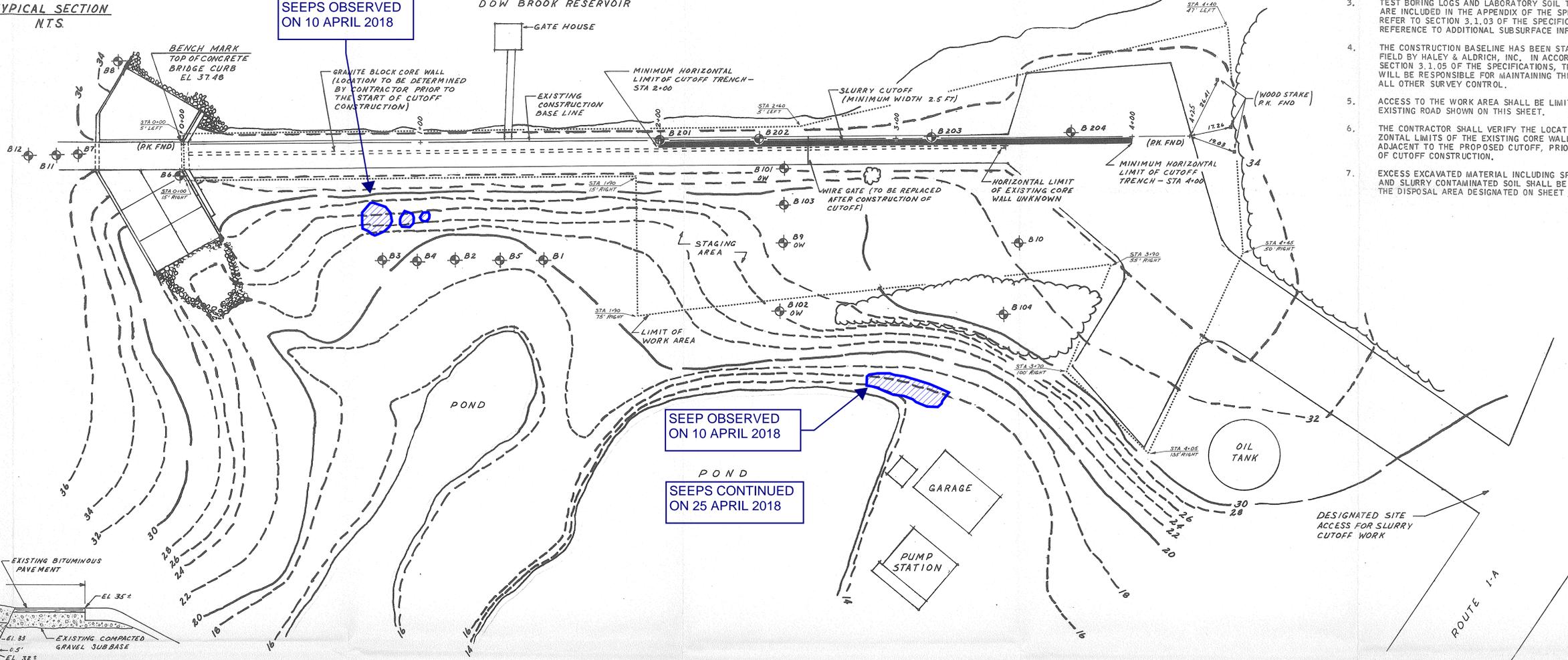
SEEPS OBSERVED
ON 10 APRIL 2018

SEEP OBSERVED
ON 10 APRIL 2018

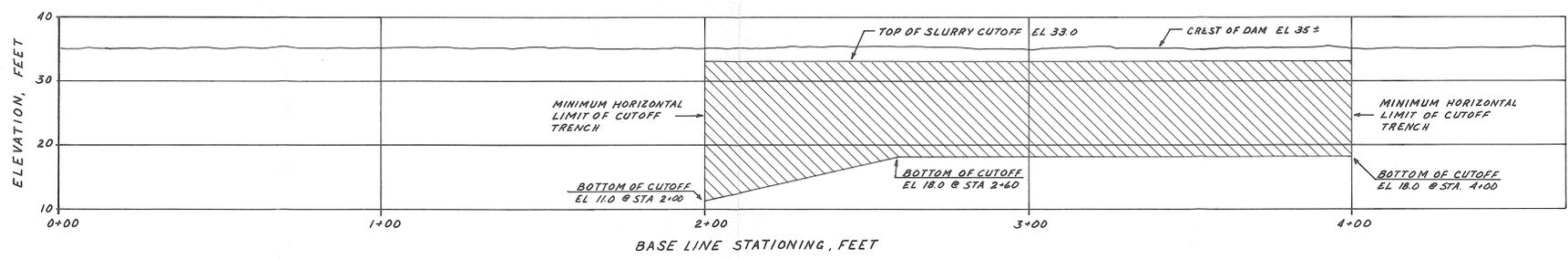
SEEPS CONTINUED
ON 25 APRIL 2018

- LEGEND:**
- 22 --- EXISTING GROUND CONTOURS
 - 30 --- TREE LINE
 - ⊕ 65 LOCATION AND IDENTIFICATION NUMBER OF TEST BORING
 - OW INDICATES OBSERVATION WELL INSTALLED IN COMPLETED BOREHOLE

- NOTES:**
1. SITE PLAN TAKEN FROM TOPOGRAPHIC PLAN PREPARED BY C. R. STONE, DATED 22 APRIL 1969.
 2. ELEVATIONS SHOWN ON THE DRAWING ARE BELIEVED TO BE REFERENCED TO U.S. COAST & GEODETIC SURVEY MEAN SEA LEVEL DATUM (1929).
 3. TEST BORING LOGS AND LABORATORY SOIL TEST RESULTS ARE INCLUDED IN THE APPENDIX OF THE SPECIFICATIONS. REFER TO SECTION 3.1.03 OF THE SPECIFICATIONS FOR REFERENCE TO ADDITIONAL SUBSURFACE INFORMATION.
 4. THE CONSTRUCTION BASELINE HAS BEEN STAKED OUT IN THE FIELD BY HALEY & ALDRICH, INC. IN ACCORDANCE WITH SECTION 3.1.05 OF THE SPECIFICATIONS, THE CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING THE BASELINE AND ALL OTHER SURVEY CONTROL.
 5. ACCESS TO THE WORK AREA SHALL BE LIMITED TO THE EXISTING ROAD SHOWN ON THIS SHEET.
 6. THE CONTRACTOR SHALL VERIFY THE LOCATION AND HORIZONTAL LIMITS OF THE EXISTING CORE WALL, WHERE IT IS ADJACENT TO THE PROPOSED CUTOFF, PRIOR TO THE START OF CUTOFF CONSTRUCTION.
 7. EXCESS EXCAVATED MATERIAL INCLUDING SPENT SLURRY AND SLURRY CONTAMINATED SOIL SHALL BE HAULED TO THE DISPOSAL AREA DESIGNATED ON SHEET 2.



NOTE: AFTER CONSTRUCTION OF THE SLURRY CUTOFF IS COMPLETE THE EXISTING EMBANKMENT SHALL BE RESTORED TO ITS ORIGINAL CONDITION.



DOW BROOK RESERVOIR DAM
IPSWICH, MASSACHUSETTS
NID MA00165

| Date | Description of Revision | By | Chk. | App. |
|------|-------------------------|----|------|------|
| | | | | |
| | | | | |

SKETCH OF SEEP AREAS

SCALE: AS SHOWN
APRIL 2018



Photo 1
Spillway with Water at El. 33.3
4/10/2018



Photo 2
Area of Seeps on Downstream Slope
4/10/2018



Photo 3
Area of Seep, 73 ft from Bridge
4/10/2018



Photo 4
Water Level at El. 33.3 at the Gatehouse
4/10/2018



Photo 5
Seep at Dam
4/10/2018



Photo 6
Seep at Dam, about 11 ft by 8 ft
4/10/2018



Photo 7
Seep at Dam
4/10/2018



Photo 8
Flashboards at El. 33.3
4/10/2018



Photo 9
Right Downstream Slope
4/10/2018



Photo 10
Seeps at Downstream Toe of Left Abutment
4/10/2018



Photo 1
Spillway with Water at El. 31.3
4/25/2018



Photo 2
Area of Seeps on Downstream Slope
4/25/2018



Photo 3
Area of Seep, 73 ft from Bridge
4/25/2018



Photo 4
Seep
4/25/2018



Photo 5
Seep at Dam
4/25/2018



Photo 6
Seep at Dam, about 11 ft by 8 ft
4/25/2018



Photo 7
Seep at Dam
4/25/2018



Photo 8
Flashboards Removed, Spillway Invert about El. 31.3
4/25/2018



Photo 9
Downstream Slope
4/25/2018



Photo 10
Seeps at Downstream Toe of Left Abutment
4/25/2018