BROCKWAY
ENGINEERING
P.L.L.C.

Hydraulics
Hydrology
Water Resources

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TWIN FALLS,
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RECEIVED
FEB 18 2004
Department of Water Resources

April 2, 2003

Howard Morris
Hoagland Ditch Company
1101 East 2900 South
Hagerman, ID 83332

Re: Hoagland Tunnel Weir Design Report

Dear Howard:

Enclosed are drawings for the proposed broad crested weir to measure your irrigation diversion from the Hoagland Tunnel. The weir design was based on the required operating parameters as well as the survey information collected during our site visit.

For this project, we have designed a broad crested weir. The concrete wall and weir structure will attach to the existing rectangular channel as shown on the two drawings included with this letter report. You will need to saw cut the existing structure and anchor the new structure to the existing channel with embedded epoxy grouted rebar anchors.

The proposed structure contains a 3' wide broad crested weir and a 3' wide overflow channel to the fish rearing facility. The structure is to be constructed of cast in place concrete reinforced with #4 rebar as shown on the plans. All areas below concrete structures should be dewatered, compacted, and placed on 8" of compacted granular select fill. I would recommend a good clean ¾" minus base material for use under all concrete structures. It is our understanding that the water exiting the tunnel will be diverted above and away from the construction activities leaving a dry are to complete the concrete work. Please review the drawings and contact me if you have any questions concerning the structure or placement of the structure.

The measurement device is a broad crested weir which is a good measuring devise when a small amount of head (elevation difference) is available. Based on our survey and your desire to not back up the water into the tunnel opening, we have very little elevation to work with in placing the weir. As such, it is very important that the weir be installed in the correct location and even more important that it is installed at the correct elevation. If the weir is installed too low, the water level in the Hoagland Ditch will submerge the weir and not allow accurate flow measurements. If the weir is set too high, the weir will back up water into the tunnel potentially decreasing the total flow from the tunnel. We would strongly advise allowing us to confirm the elevation of the structure and weir prior to pouring concrete to make sure the structure is placed a the correct elevation.

The top of the broad crested weir should be smooth and perfectly flat in all directions. Please make sure the contractor you use is aware of this requirement. The gauge for measuring the head on the weir should be mounted using the survey equipment or a reliable 6' level. The bottom of the gauge (0.00 ft) should be set at the top of the weir so the gauge will read the water elevation over the weir. We can assist with placement of the staff gauge if necessary.

As discussed, we have incorporated 2" c-channel embeds into the structure in two main locations. The first location is in the waste opening area where you will utilize stop-logs to regulate the level of the pond. Regulating the level of the pond will determine the amount of water flowing over the weir and into the Hoagland Ditch. The other set of embeds are located on the weir structure upstream of the staff gauge location. These are to be used to stop the flow of water into the Hoagland Ditch during non-irrigation periods. During periods of flow measurement into the ditch, all boards should be removed at all times. If boards are left in, they will likely affect the weir performance and flow measurements.

Please note that we have incorporated a pond liner material into the system to prevent undermining on the upstream face and erosion on the waste outfall channel. This liner should be attached to the concrete face with a steel backer bar and Hilti type anchors. The liner should be buried and covered with native material and rip-rap stone.

Included with this design submittal is the rating table for this weir and a diagram which shows the proper way to read a Stevens Staff Gauge. The measurement error of this weir at 7.0 cfs is less than 4% which is very good for an open channel measurement device.

Please review the enclosed engineering drawings and rating table. If you have any questions or comments concerning this design, please don't hesitate to contact me. We would appreciate the opportunity to provide some construction support to verify the structure dimensions and elevations. Please let us know if you would like assistance during the construction phase of the project. Thank you and have a great day.

Sincerely,

Jeffrey S. Rau, P.E.

PROFESSIONAL ENGINEER REGISTERED 8015 4/2/03 STATE OF IDAHO JEFFREY S. RAU

Attachment: Hoagland Tunnel Weir Drawing Package (3 Sets)
Rating Table – Hoagland Tunnel Weir
Stevens Gauge Diagram

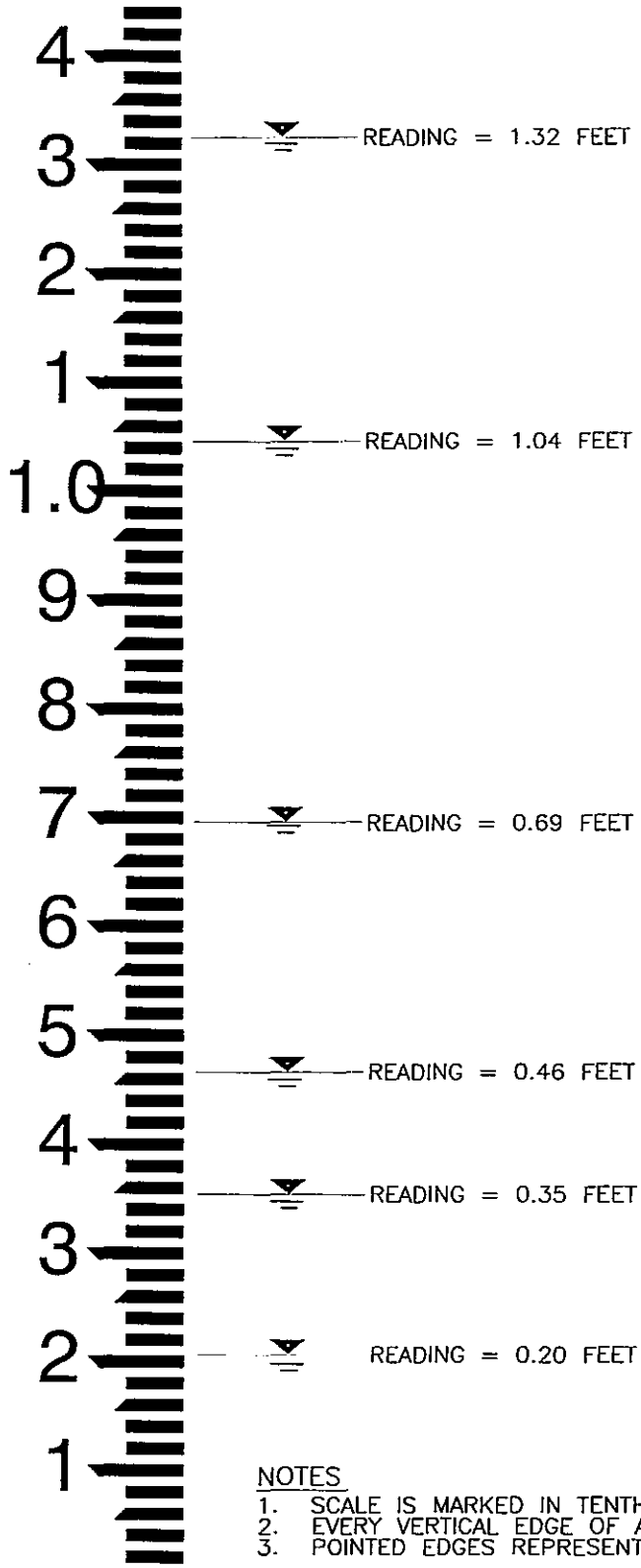
## Ditchriders Table - Hoagland Tunnel 3' Wide Broad Crested Weir

Flowrates shown in cubic feet per second (cfs)

| Head (ft) | 0 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.1 | n/a | n/a | n/a | n/a | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 |
| 0.2 | 0.8 | 0.9 | 0.9 | 1.0 | 1.1 | 1.1 | 1.2 | 1.3 | 1.4 | 1.4 |
| 0.3 | 1.5 | 1.6 | 1.7 | 1.8 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 |
| 0.4 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 | 2.8 | 2.9 | 3.0 | 3.2 | 3.3 |
| 0.5 | 3.4 | 3.5 | 3.6 | 3.7 | 3.8 | 3.9 | 4.0 | 4.1 | 4.2 | 4.4 |
| 0.6 | 4.5 | 4.6 | 4.7 | 4.8 | 5.0 | 5.1 | 5.2 | 5.3 | 5.4 | 5.6 |
| 0.7 | 5.7 | 5.8 | 6.0 | 6.1 | 6.2 | 6.4 | 6.5 | 6.6 | 6.8 | 6.9 |
| 0.8 | 7.0 | 7.2 | 7.3 | 7.5 | 7.6 | 7.8 | 7.9 | 8.1 | 8.2 | 8.4 |
| 0.9 | 8.5 | 8.7 | 8.8 | 9.0 | 9.1 | 9.3 | 9.4 | n/a | n/a | n/a |
| 1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

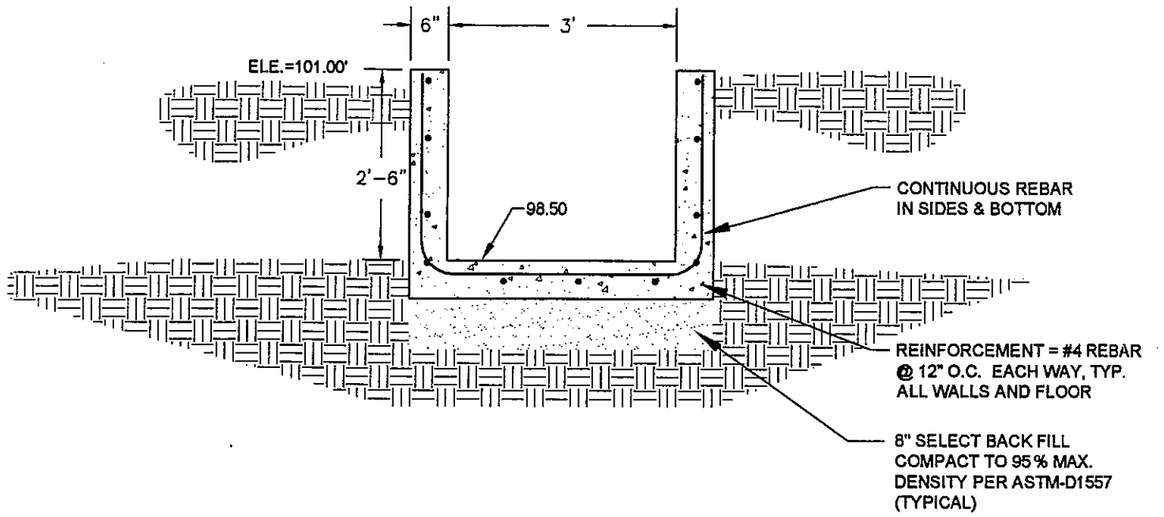
Note: Head distance is measured elevation of the water surface from the top of the broad crested weir sill. Measurement to be taken at 3' back from the start of the weir ramp on staff gauge mounted to concrete channel.
n/a = areas outside the measurable range for this weir

Prepared by: Brockway Engineering, PLLC
2016 North Washington Street, Suite 4
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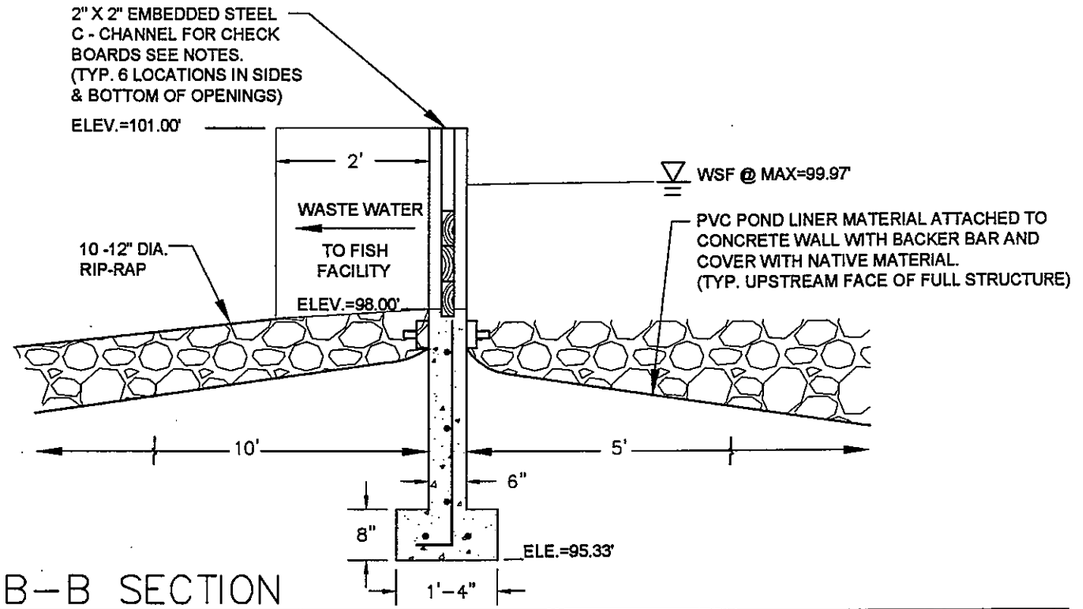

NOTES
1. SCALE IS MARKED IN TENTHS AND HUNDREDS OF FEET.
2. EVERY VERTICAL EDGE OF A BLACK MARK IS 0.01 FEET.
3. POINTED EDGES REPRESENT 0.10 AND 0.05 FEET INCREMENTS.

| | | | | |
|---|---|---|---|---|
| BROCKWAY ENGINEERING P.L.L.C. | Hydraulics ◆ Hydrology ◆ Water Resources | TYPE "C" STAFF GAUGE DIAGRAM | SHEET 1 OF 1 | DRAWN JSR |
| | | BROCKWAY ENGINEERING | DATE 8/17/98 | REVISIONS |
| | | | SCALE NONE | |



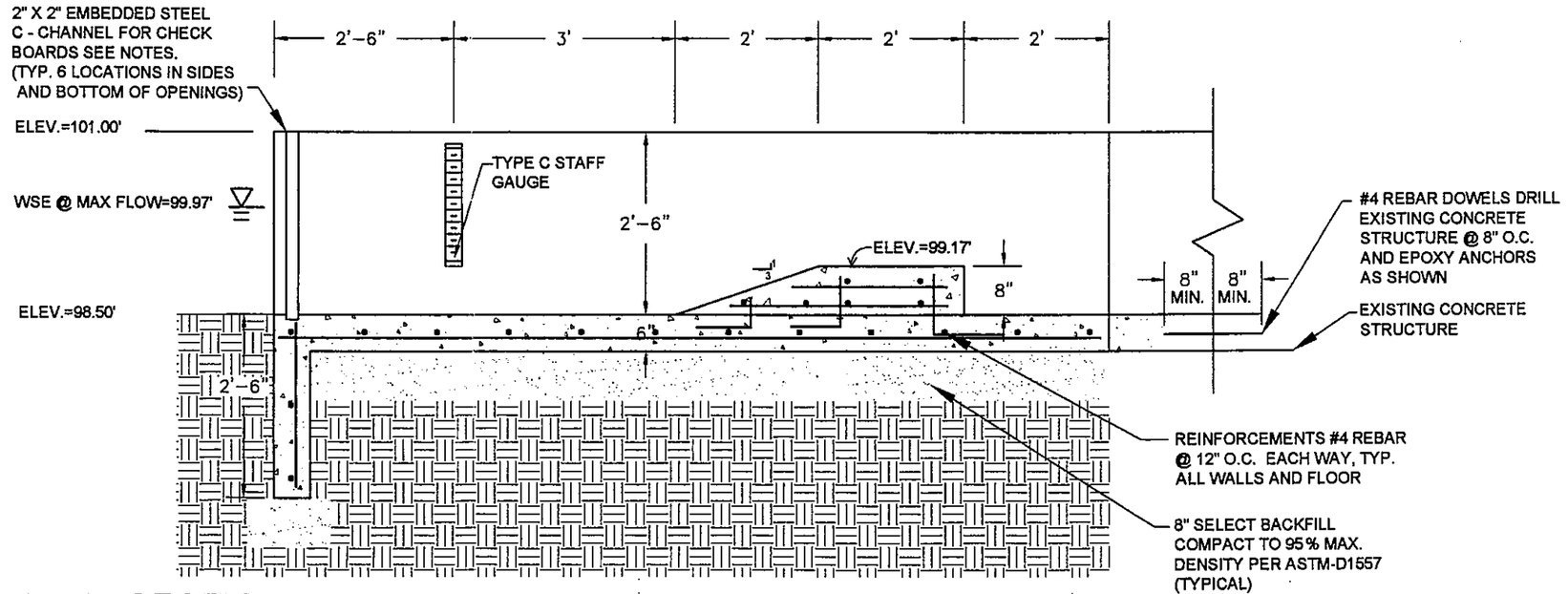

## C–C SECTION

SCALE 1"–2' (11 x 17 DRAWING)




## B–B SECTION

SCALE 1"–2' (11 x 17 DRAWING)




## A–A SECTION

SCALE 1"–2' (11 x 17 DRAWING)

PROFESSIONAL ENGINEER
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9013
4/2/03
STATE OF IDAHO
JEFFREY S. RAU

1. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3,500 PSI.
2. REBAR SHALL BE GRADE 60 STEEL.
3. ALL CHECK-BOARDS SHALL BE REMOVED FROM THE WEIR PORTION OF THE STRUCTURE FOR ACCURATE MEASUREMENT.
4. WEIR SILL SHALL BE PERFLECTLY FLAT AND LEVEL. MAXIMUM ALLOWABLE ELEVATION DIFFERENCE ACROSS SILL SHALL BE 1/16".

THIS DRAWING HAS BEEN PREPARED BY BROCKWAY ENGINEERING, PLLC FOR A SPECIFIC PROJECT TAKING INTO ACCOUNT THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH BROCKWAY ENGINEERING & THE CLIENT IS GRANTED.

| REV | DESCRIPTION | DATE | APPD. | REFERENCE DRAWINGS |
|---|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | 4/2/03 | DSR | 1 WEIR |

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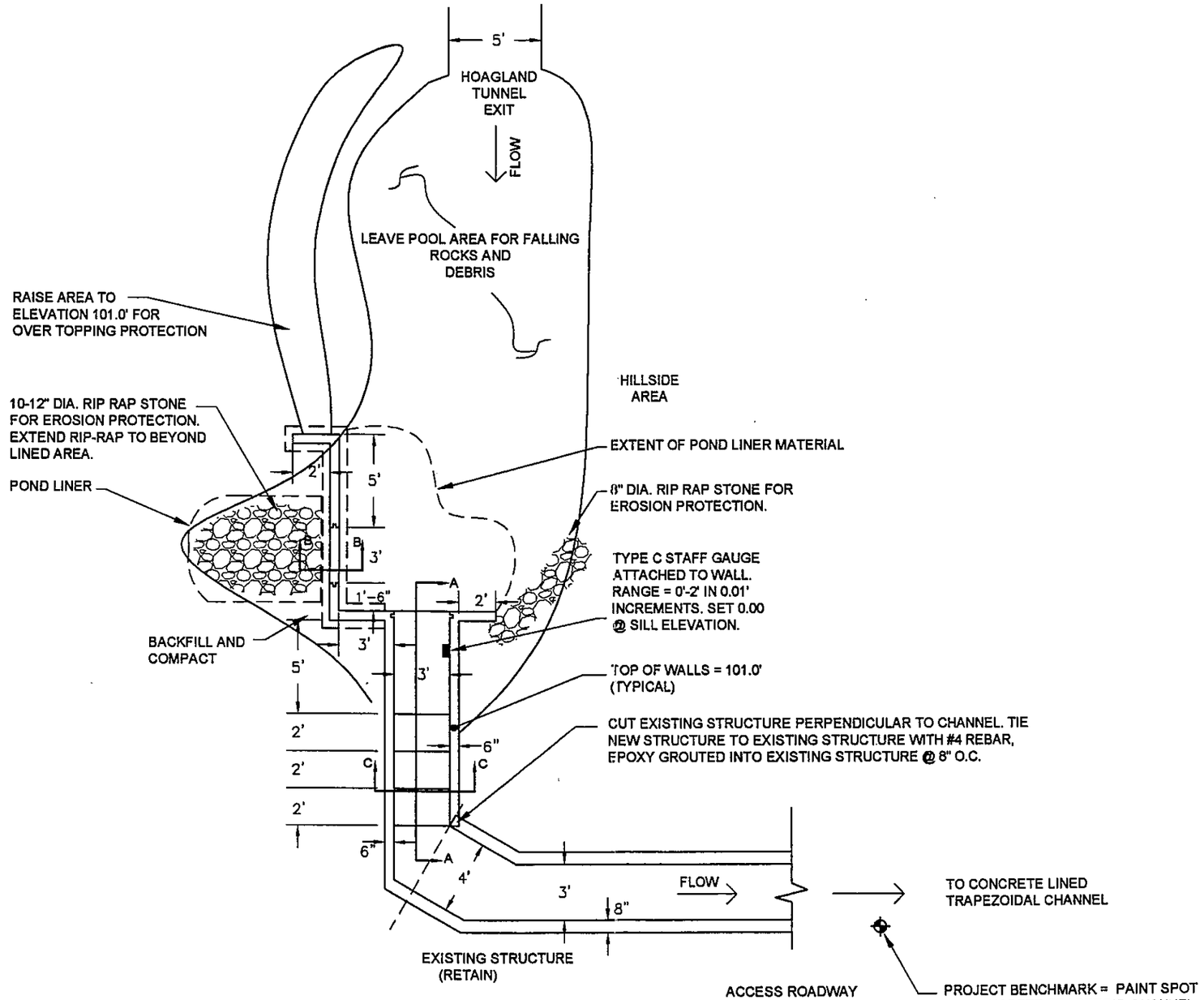
HOAGLAND DITCH COMPANY

WEIR SECTIONS

PROJECT # 624–01–2003

DWG # 2

REV 0




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STATE OF IDAHO
JEFFREY S. RAU

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| REV | DESCRIPTION | DATE | APPD. | REFERENCE DRAWINGS |
|---|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | 4/2/03 | JSR | 2 SECTIONS |

SCALE 1:80
(11 X 17 DRAWING)

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HOAGLAND DITCH COMPANY

BROAD CRESTED WEIR PLAN

PROJECT # 624-01-2003

DWG # 1

REV 0