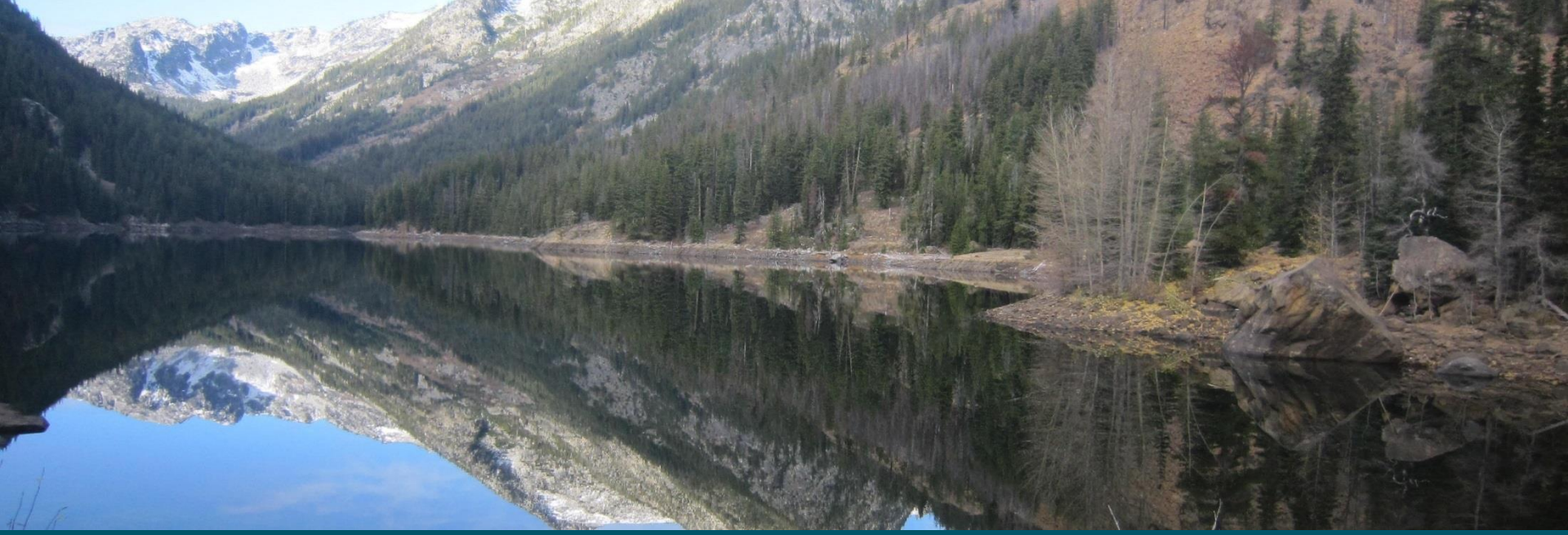
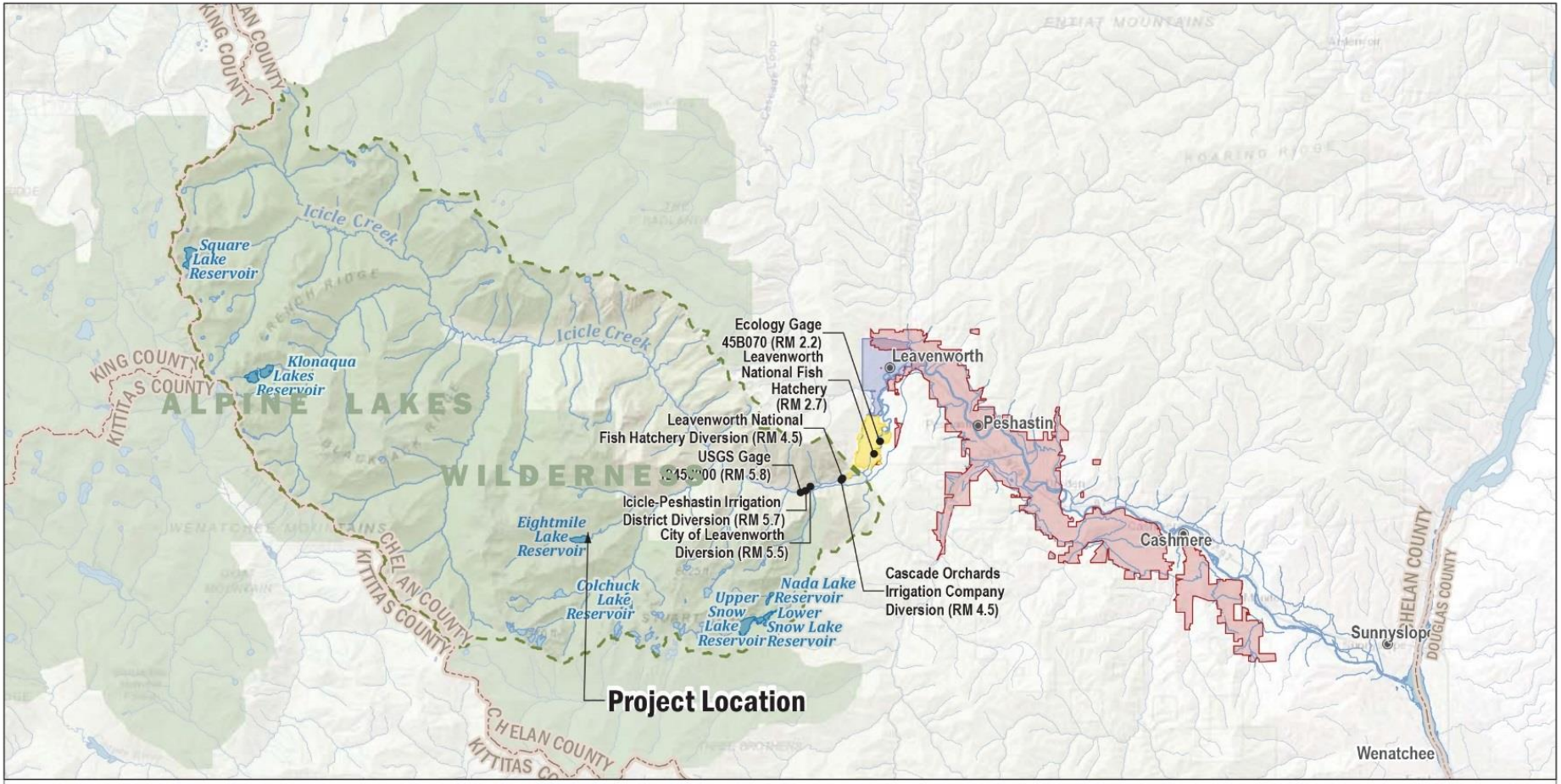


Eightmile Lake Storage Restoration – Feasibility Study

Presented by

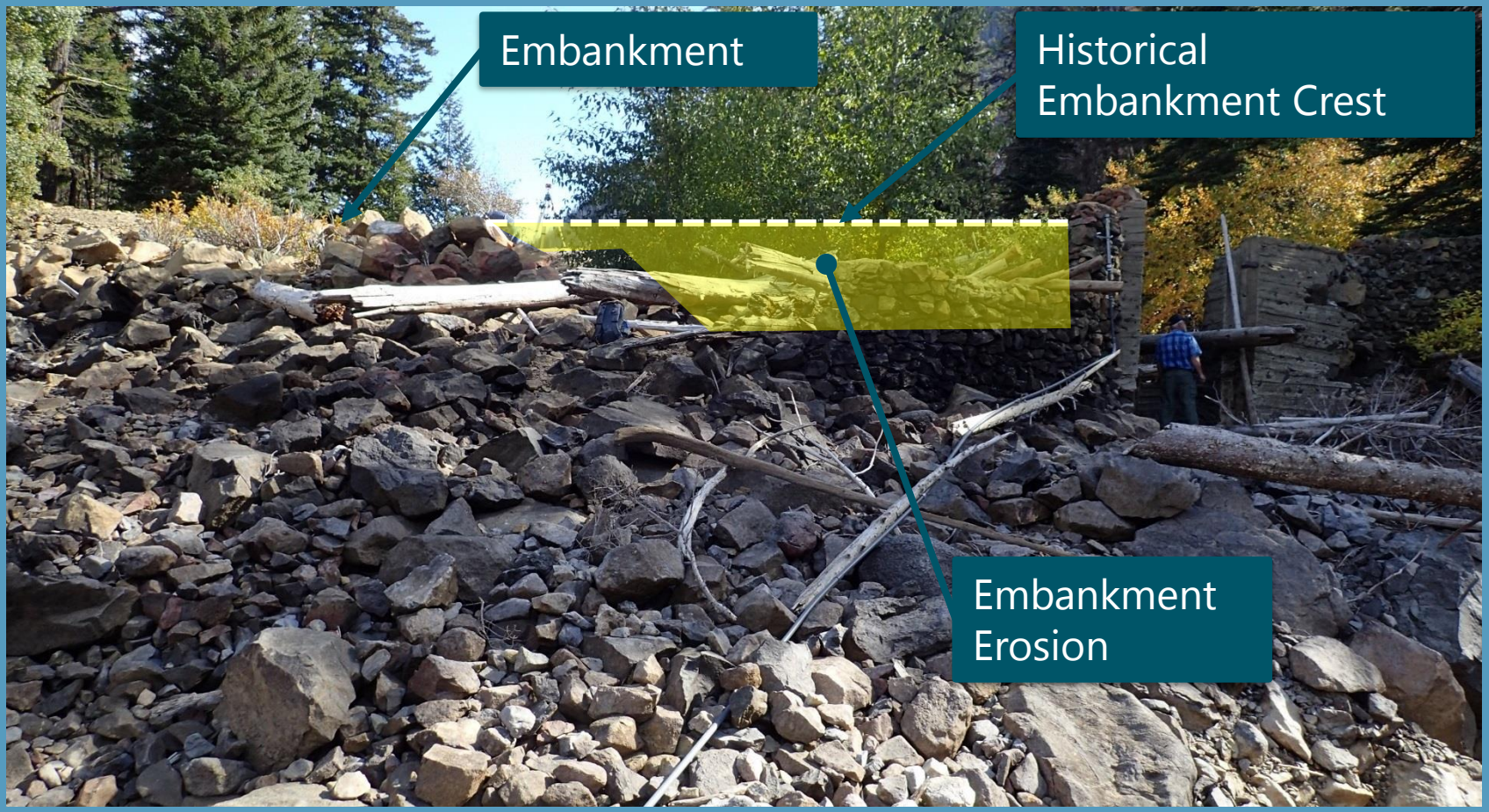
David Rice, P.E. – Anchor QEA, LLC

April 27, 2017


Icicle Creek
Square Lake Reservoir
Klonaqua Lakes Reservoir
ALPINE LAKES WILDERNESS
KING COUNTY
KITTITAS COUNTY
CHELAN COUNTY
Ecology Gage 45B070 (RM 2.2)
Leavenworth National Fish Hatchery (RM 2.7)
Leavenworth National Fish Hatchery Diversion (RM 4.5)
USGS Gage 12457000 (RM 5.8)
Icicle-Peshastin Irrigation District Diversion (RM 5.7)
City of Leavenworth Diversion (RM 5.5)
Cascade Orchards Irrigation Company Diversion (RM 4.5)
Eightmile Lake Reservoir
Colchuck Lake Reservoir
Upper Snow Lake Reservoir
Nada Lake Reservoir
Lower Snow Lake Reservoir
Project Location
Leavenworth
Peshastin
Cashmere
Sunnyslope
Wenatchee
DOUGLAS COUNTY
LEGEND:
Points of Interest
Leavenworth Urban Growth Area
Cascade Orchards Irrigation
IPID Service Area
County
Icicle Creek Watershed
0
5
Miles

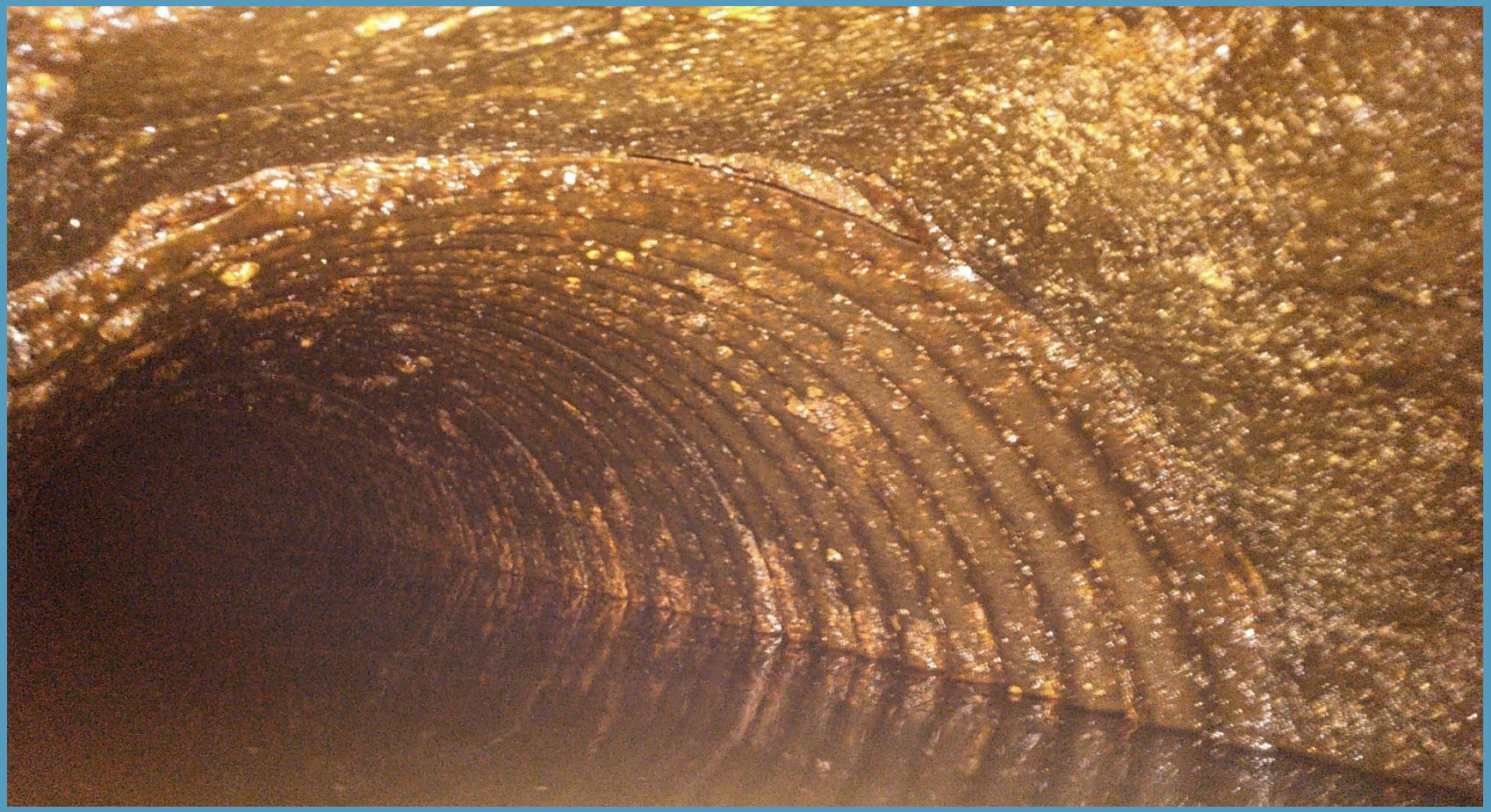
Existing Dam and Spillway

Existing Embankment



Low-Level Outlet Gate

Low-Level Outlet Pipe, Near Pipe Inlet



Low-Level Outlet Pipe, Log-Stave Section

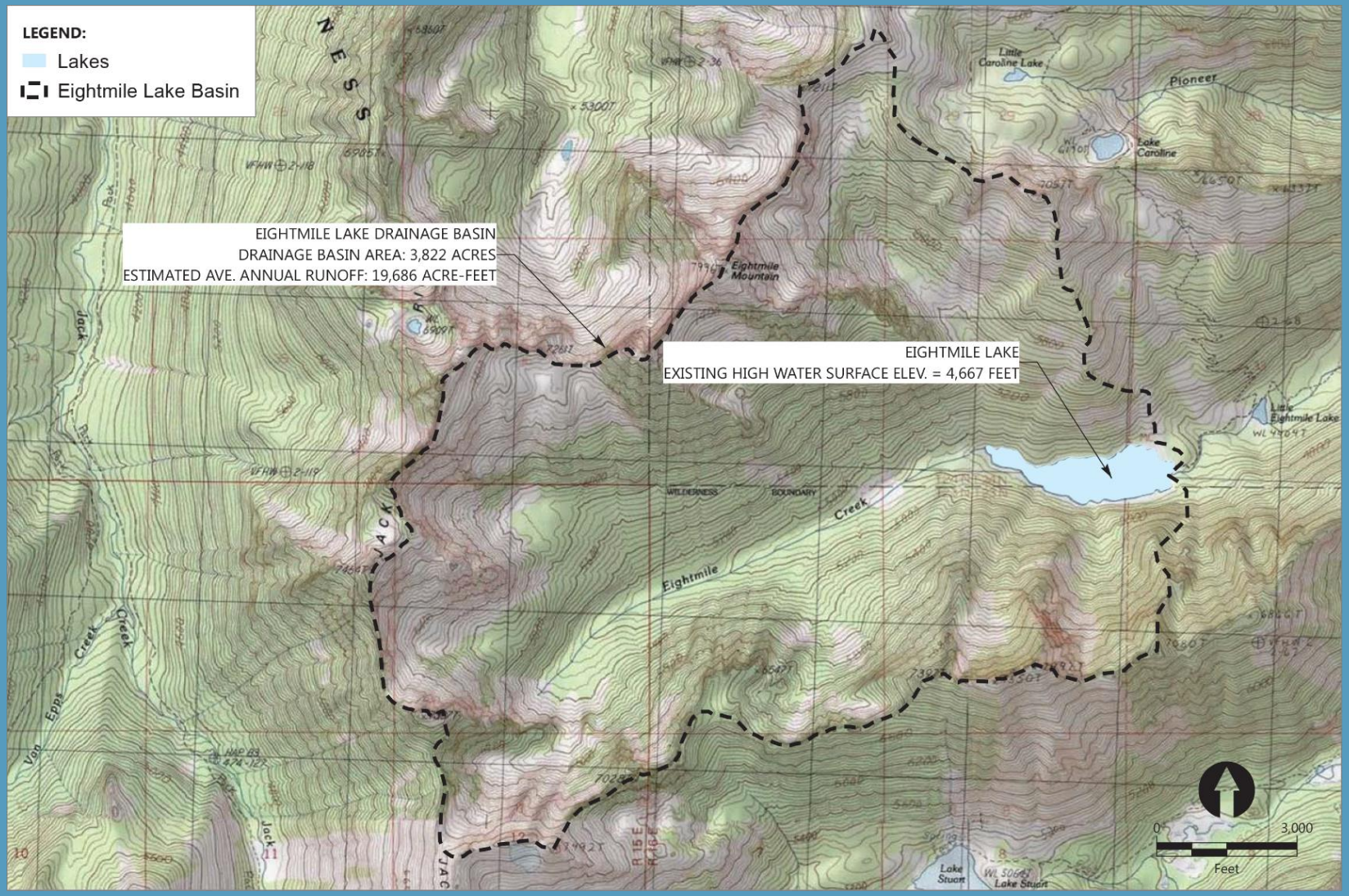
Low-Level Outlet Pipe, Wood Stave Pipe

Low-Level Outlet Pipe, Near Pipe Outlet

Existing Challenges, Deficiencies, Constraints

- Gate Operation
  - Requires come along to open and close gate
  - Rocks/debris make operation challenging
- Dam Condition and Level Control
  - Embankment erosion, reduced water storage
  - <1,400 acre-feet available without pumping/siphoning
- Low-Level Outlet Pipe
  - Multiple materials, some in poor condition
  - Pipe collapse has recently reduced capacity
- Storage releases are critical to IPID late summer water supply, especially during dry years

Eightmile Lake Drainage Basin

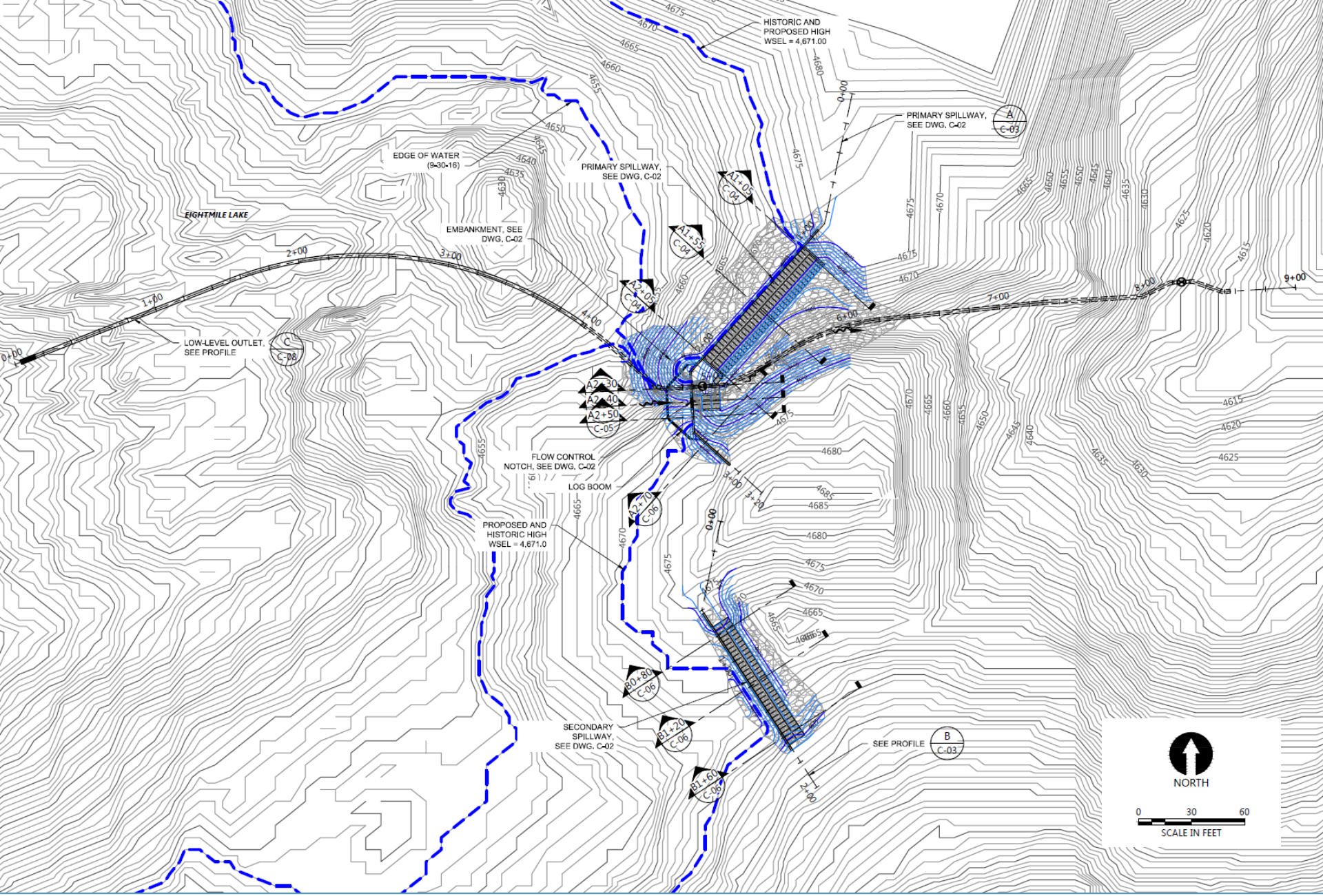


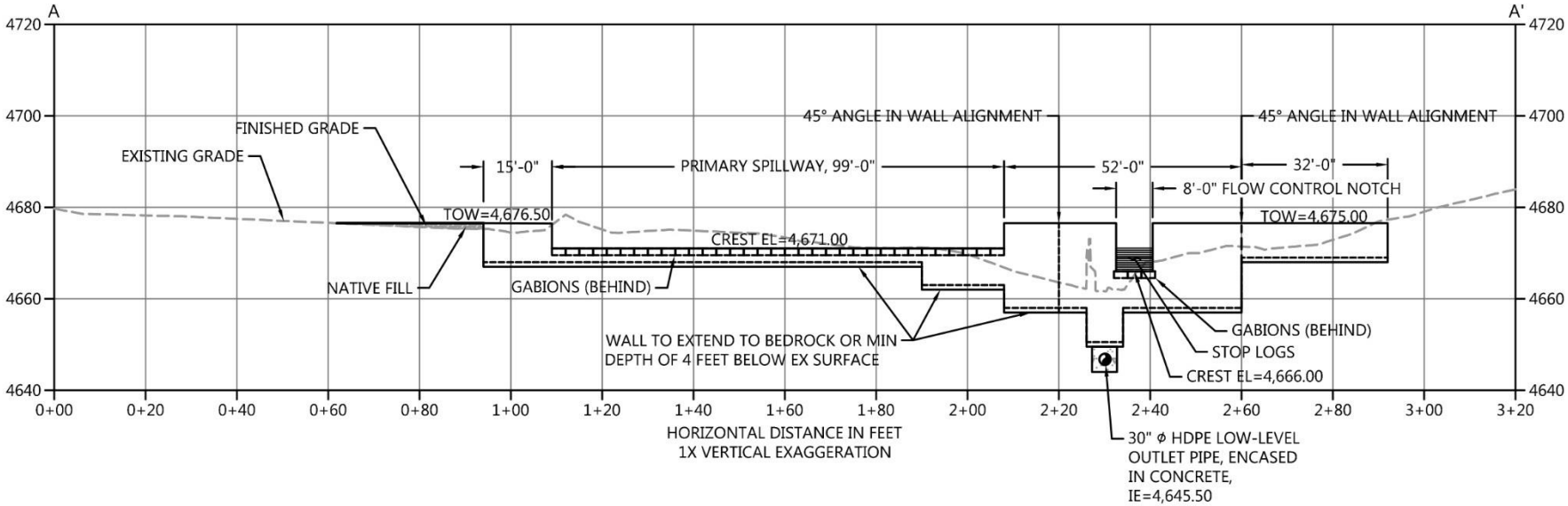
Eightmile Lake Hydrology

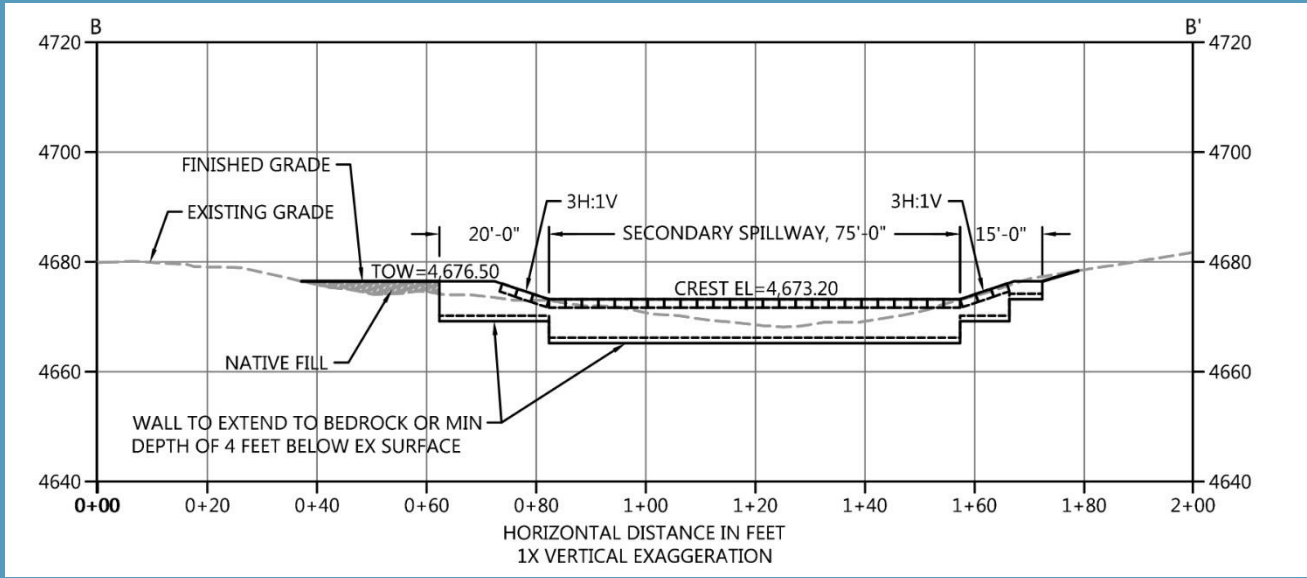
Characteristic	Estimated Value
Drainage Area	3,822 acres
Maximum Annual Watershed Yield	31,001 acre-feet
10% Exceedance Annual Watershed Yield	24,829 acre-feet
Mean Annual Watershed Yield	19,686 acre-feet
50% Exceedance Annual Watershed Yield	19,128 acre-feet
90% Exceedance Annual Watershed Yield	15,152 acre-feet
Minimum Annual Watershed Yield	11,419 acre-feet

Consultation with Ecology Dam Safety Office

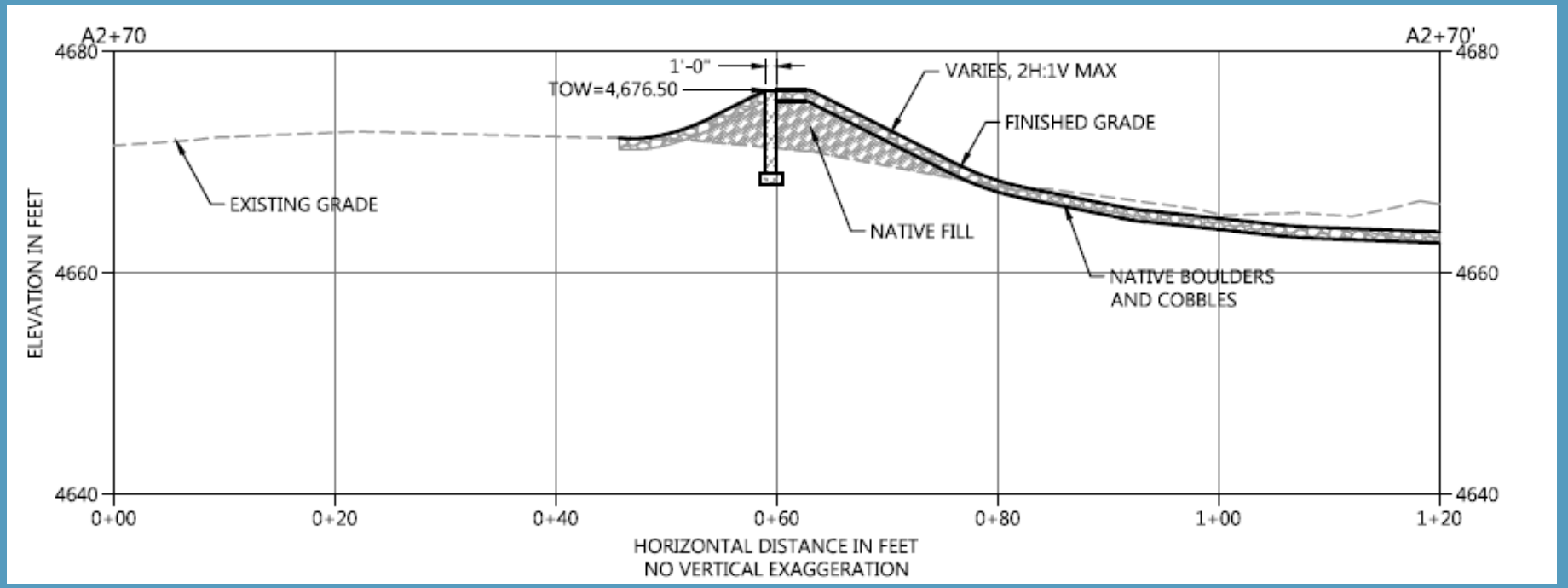
- Reconnaissance Inspection, 1995
- Initiated review of proposed storage restoration project with Dam Safety, phone call, February 2017
  - Replacement of dam and outlet facilities will require detailed review by Dam Safety…engineering reports, drawings, specifications, inspection plan, O&M Plan
- Preliminary hydrology and hydraulic calculations have been completed, per Dam Safety Guidelines
- Feasibility level design based on conservative design assumptions (Step 8 design storm)


HISTORIC AND PROPOSED HIGH WSEL = 4,671.00
PRIMARY SPILLWAY, SEE DWG, C-02
EDGE OF WATER (9-30-16)
EIGHTMILE LAKE
EMBANKMENT, SEE DWG, C-02
LOW-LEVEL OUTLET, SEE PROFILE
FLOW CONTROL NOTCH, SEE DWG, C-02
LOG BOOM
PROPOSED AND HISTORIC HIGH WSEL = 4,671.0
SECONDARY SPILLWAY, SEE DWG, C-02
SEE PROFILE
NORTH
0 30 60
SCALE IN FEET

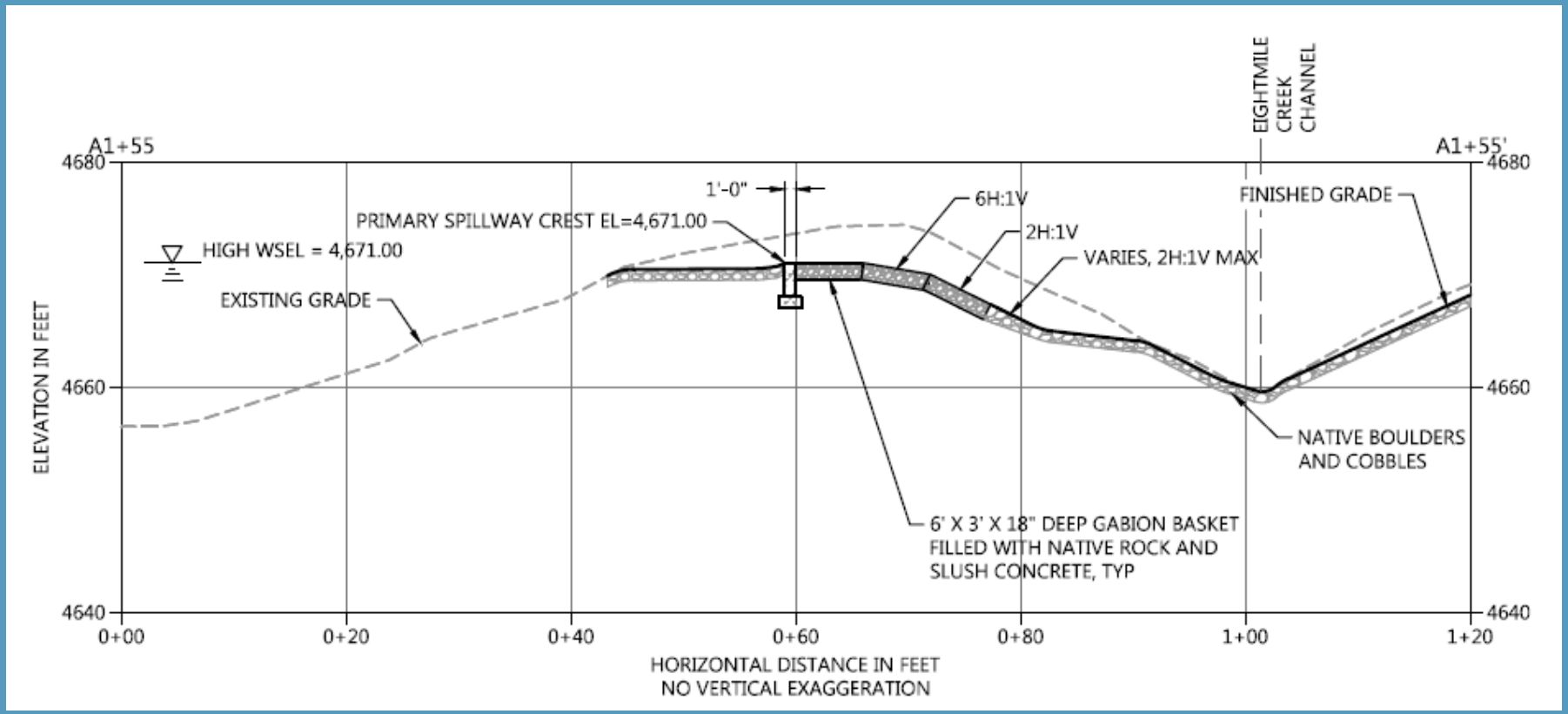

A
A'
4720
4700
4680
4660
4640
FINISHED GRADE
EXISTING GRADE
15'-0"
PRIMARY SPILLWAY, 99'-0"
45° ANGLE IN WALL ALIGNMENT
52'-0"
45° ANGLE IN WALL ALIGNMENT
32'-0"
8'-0" FLOW CONTROL NOTCH
TOW=4,676.50
CREST EL=4,671.00
TOW=4,675.00
NATIVE FILL
GABIONS (BEHIND)
WALL TO EXTEND TO BEDROCK OR MIN
DEPTH OF 4 FEET BELOW EX SURFACE
GABIONS (BEHIND)
STOP LOGS
CREST EL=4,666.00
0+00
0+20
0+40
0+60
0+80
1+00
1+20
1+40
1+60
1+80
2+00
2+20
2+40
2+60
2+80
3+00
3+20
HORIZONTAL DISTANCE IN FEET
1X VERTICAL EXAGGERATION
30" ϕ HDPE LOW-LEVEL
OUTLET PIPE, ENCASED
IN CONCRETE,
IE=4,645.50


B
B'
4720
4700
4680
4660
4640
FINISHED GRADE
EXISTING GRADE
3H:1V
20'-0"
SECONDARY SPILLWAY, 75'-0"
3H:1V
15'-0"
TOW=4,676.50
CREST EL=4,673.20
NATIVE FILL
WALL TO EXTEND TO BEDROCK OR MIN
DEPTH OF 4 FEET BELOW EX SURFACE
0+00
0+20
0+40
0+60
0+80
1+00
1+20
1+40
1+60
1+80
2+00
HORIZONTAL DISTANCE IN FEET
1X VERTICAL EXAGGERATION

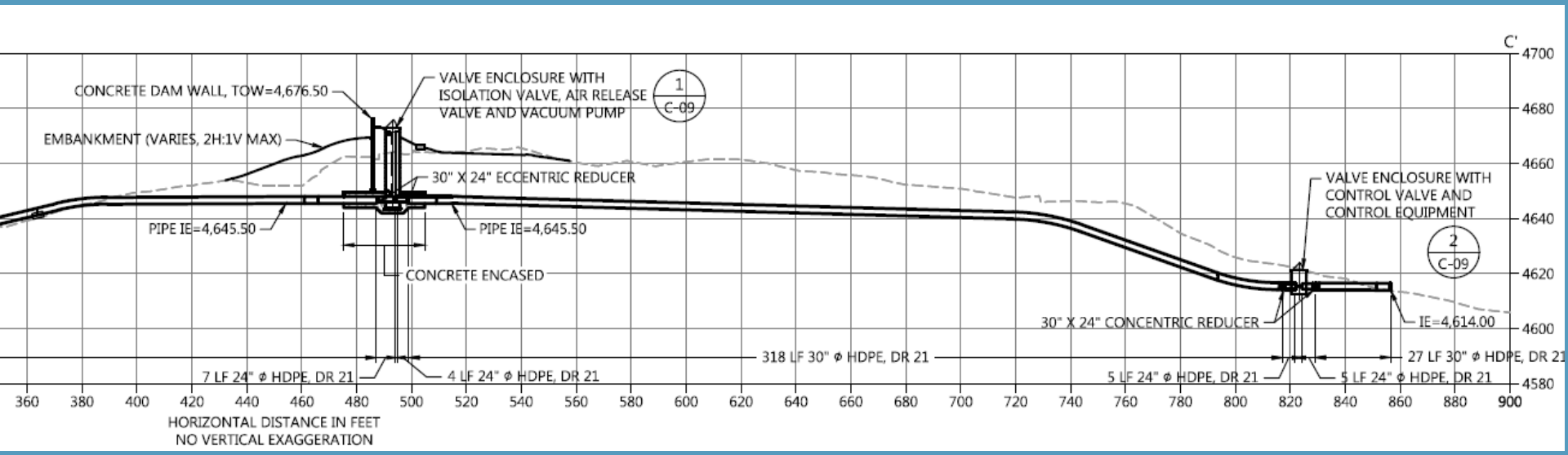
Typical Section – Embankment



Typical Section – Spillway



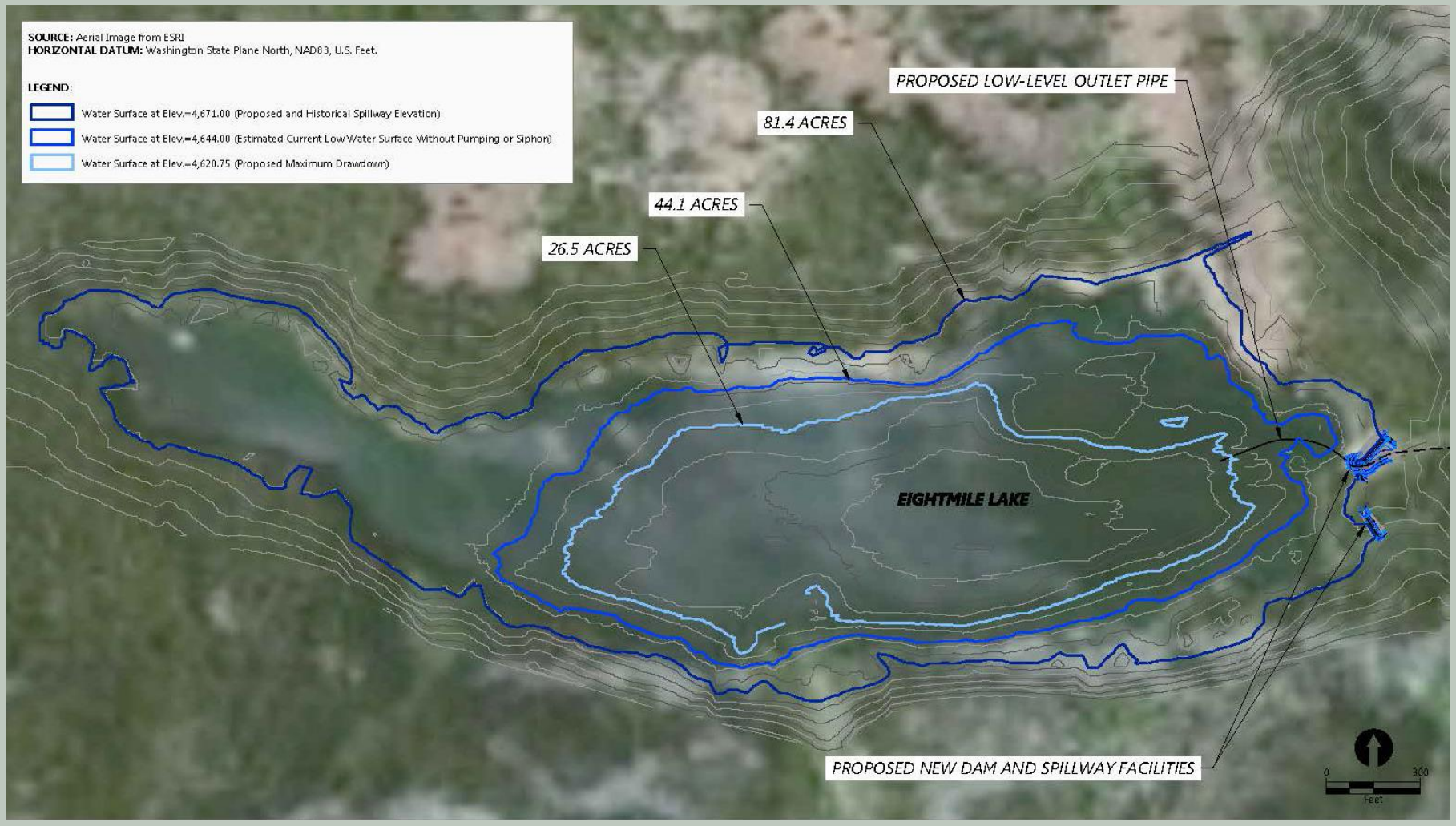
Low-level Outlet



Anticipated Reservoir Operation

Month	Storage Level	Stop Logs	Low-level Outlet Pipe Operation	Isolation Valve Status	Control Valve Status
January	Refill	Removed	Closed/Filling	Open	Closed
February	Refill	Removed	Closed/Filling	Open	Closed
March	Refill/Spill	Removed	Closed/Filling	Open	Closed
April	Refill/Spill	Removed	Closed/Filling	Open	Closed
May	Refill/Spill	Removed	Closed/Filling	Open	Closed
June	Refill	Placed	Closed	Open	Closed
July	Full	Placed	Release Begins	Open	Partially Opened
August	Draw Down	Placed	Gravity Release	Open	Partially Opened
September	Draw Down	Placed	Gravity/Siphon Release	Open	Fully Opened
October	Low	Removed	Closed	Open	Closed
November	Refill	Removed	Closed/Filling	Open	Closed
December	Refill	Removed	Closed/Filling	Open	Closed

Water Surface Area Comparison



Construction Challenges

- Access and mobilization of equipment and materials
  - Via helicopter
  - Overland
  - On-site materials
- Seasonal restrictions
  - Lake level would need to be drawn down
  - Impact to lake and irrigation water supply
- Excavation and earth moving
  - Large rock
  - Deep excavation
- Minimizing disturbance

Ongoing Work

- Refine opinions of cost
- Complete feasibility study report
- Review and refine with input from IPID

Next Steps, Following Feasibility Study

- IPID investigation of temporary pipe repair
- Review feasibility analysis with Dam Safety
- Develop detailed designs
- Develop and implement permitting strategy to secure permits
- Continue consultation with the U.S. Forest Service
- Refine construction approach

Questions/Discussion