MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

Rely on us.

TO: Commissioners Brown, Carlson, Barofsky, McRae and Schlossberg

FROM: Lisa Krentz, Electric Generation Manager; Mark Zinniker, Generation Engineering Supervisor; and Jeremy Somogye, Generation Engineering Planner IV

DATE: June 16, 2022

SUBJECT: Goal #3(a) Leaburg Canal TBL & Strategic Assessment Update

OBJECTIVE: Discussion / Direction

Issue

This memo provides an update on our progress toward achieving the 2022 EWEB organizational goal #3a to *work in collaboration with the Board and the McKenzie Valley Community to set the direction of the **Leaburg Hydro Electric Project** toward either a power producing asset or a storm water conveyance asset.* This memo provides updates to the Triple Bottom Line analysis of EWEB's long-term options, as well as our near-term risk mitigation efforts.

Background

The Leaburg Canal has been operating as a stormwater conveyance facility since October 2018, when observations of internal erosion of the canal embankments prompted EWEB to dewater the canal and cease power generation until the dam safety issue could be resolved. Following subsequent findings that some canal embankments may also present earthquake safety risks, EWEB initiated a comprehensive risk assessment of the entire canal to better understand the level of investment that would be required to ensure long term safe and reliable operation. This assessment indicated that the necessary level of investment would be considerable and the Net Present Value (NPV) for the Leaburg Project would be substantially negative with less than 20 years remaining on the FERC operating license. Based on this understanding, pursuing a rapid return-to-service (RTS) was not considered appropriate in the short term. Instead, the Board directed staff to pursue near-term risk reduction measures for safe stormwater conveyance while, in parallel, performing a Triple Bottom Line (TBL - social, environmental, and economic) analysis of long-term options. The fundamental long-term options are to pursue a return-to-service/relicensing of the Project or move toward permanent decommissioning of the Project.

EWEB staff continue to advance the development of near-term risk reduction measures, which are needed to ensure safe operation until a long-term plan is implemented. We are working with the consultant team that performed the risk assessment, led by Cornforth Consultants. The consultant team is currently preparing the Drilling Program Plan (DPP), which is on target for completion in Q3 of 2022. Subsurface exploration and drilling for near-term risk reduction planning is expected to commence by early 2023.

In order to provide the Board with information to make an informed selection on the most appropriate long-term path forward by the fourth quarter of 2022, EWEB staff retained a consulting team (led by GEI

Consultants) to assist in developing detailed analyses of the social, environmental, and financial impacts of various scenarios. Progress on this effort is detailed in this memo.

Eleven alternatives were initially identified and ultimately narrowed to four options that will be fully evaluated using the TBL and key decision parameters. The four alternatives that have been selected for detailed TBL analysis and will be presented to the Board during subsequent progress updates are:

- **Alternative 1 – Decommission:** Return site to pre-project conditions
- **Alternative 2 – Return to Service:** Full facility restoration of existing power generation configuration
- **Alternative 3 – Return to Service:** New hydro powerhouse at Luffman Spillway and conversion to stormwater conveyance downstream of the proposed powerhouse
- **Alternative 4 – Decommission:** Combination of storm water conveyance (SWC) and return to pre-project conditions

Please see Appendix A for a more detailed description of the above alternatives, as well as the alternatives that were not selected for further evaluation.

Financial Update

The consultant team and EWEB staff have developed initial cost estimates for upfront investment needed for the four long term alternatives, which will be used as inputs into the TBL. Costs for near term risk reduction measures, estimated at $20M, are separate and apply to all scenarios. Additional financial considerations, such as ongoing O&M and replacement power costs, are not yet included. More information on those parameters is provided later in this memo.

All four alternatives are currently in the feasibility assessment and study phase, creating significant cost uncertainty such that estimates will be in an expected range of -30% to +50% from baseline, in accordance with the American Association of Cost Engineering (AACE) Class 4 guidelines detailed in Table 1.

	Primary Characteristic	Secondary Characteristic		
Estimate Class	**Maturity Level of Project Definition Deliverables Expressed as % of complete definition**	**End Usage Typical Purpose of Estimate**	**Methodology Typical Estimating Method**	**Expected Accuracy Range Typical Variation in Low and High Ranges[1]**
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Table 1: American Association of Cost Engineering Estimate Classes

Baseline cost estimates, including low and high ranges, for the four alternatives are shown in Table 2. Estimates include, but are not limited to, the following categories, all of which fall into AACE Class 4:

- Subsurface Exploration & Feasibility Studies

- Legal and Administration
- Property and Water Right Acquisitions
- Permitting and Relicensing
- Design and Construction Planning
- Construction
- Post-Construction Oversite and Studies

Table 2: Baseline Cost Estimates and Expected Range			
Alternative	**Baseline**	**-30%**	**+50%**
1. Return to Pre-construction Conditions	$252,470,000	$176,729,000	$378,705,000
2. Full Facility Renewal	$257,860,000	$180,502,000	$386,790,000
3. New Powerhouse near Luffman Spillway; Canal Downstream Converted to Stormwater Conveyance	$179,100,000	$125,370,000	$268,650,000
4. Canal Converted to Stormwater Conveyance; Dam and Powerhouse removed	$184,600,000	$129,220,000	$276,900,000

Capital Spending Timeline

The construction duration and schedule of capital spending may be different for the Return to Service (RTS) vs. Decommissioning scenarios. If a RTS alternative is chosen, an accelerated schedule can be pursued to benefit from generation revenue as soon as possible. The most aggressive schedule for a RTS alternative assumes an approximate 8-year planning, design, and construction schedule, resulting in relatively intense annual spending. In contrast, the schedule for either decommissioning scenario would likely extend through the current license period that ends in 2040. Spending for decommissioning work is likely to result in a slower and more extended average annual spending rate.

Estimates for the pace of spending for RTS, assuming an accelerated schedule, and decommissioning are shown below as a percent of total cost over time:

Table 3: Percent of Total Cost Over Time for RTS and Decommissioning															
Return to Service Alternatives Percent of Capital Spending from 2023 to 2033															
‘23	**‘24**	**‘25**	**‘26**	**‘27**	**‘28**	**‘29**	**‘30**	**‘31**	**‘32**	**‘33**					
3%	5%	11%	15%	19%	18%	15%	7%	4%	2%	1%					
Decommissioning Alternatives Percent of Capital Spending from 2023 to 2040															
‘23	**‘24**	**‘25**	**‘26**	**‘27**	**‘28**	**‘29**	**‘30**	**‘31**	**‘32**	**’33**	**‘34**	**’35-‘36**	**‘37-‘38**	**‘39**	**‘40**
2%	3%	3%	3%	4%	4%	4%	4%	7%	8%	13%	15%	16%	12%	4%	2%

Net Present Value

For each of the four selected alternatives, the EWEB financial team is preparing the Net Present Value (NPV) for inclusion in the TBL.

Primary NPV analysis inputs:

Table 4: Net Present Value Inputs				
Input to NPV ($ million)	**Alternative 1 – Decommission to Pre-Project**	**Alternative 2 – RTS to Existing Power Plant**	**Alternative 3 – RTS to New Power Plant**	**Alternative 4 – Decommission to SWC**
Initial Capital Cost[1]	$252,470,000	$257,860,000	$179,100,000	$184,600,000
Ongoing Capital Cost:[2]				
Normal Year (Annually)	$125,000	$282,000	$230,000	$215,000
Major Improvements (5-yr)	$400,000	$1,475,000	$1,100,000	$923,000
Annual O&M Cost[3]	$400,000	$765,000	$700,000	$646,000
Annual Generation[4]	0 MWh	95,800 MWh	37,400 MWh	0 MWh
Average Annual Power Prices:[5]				
Projected	$0	$53.00	$53.00	$0
High	$0	$94.00	$94.00	$0
Low	$0	$18.00	$18.00	$0
Expected REC Value[6,7]	$0	$5.00	$2.00	$0
Expected Carbon Value[6,7]	$0	$6.00	$2.00	$0
Expected Capacity Value[6,8]	$0	$9.00	$4.00	$0

[1] Estimated baseline costs for each alternative.

[2] Estimated costs for equipment replacement and renewal, as necessary to maintain reliability.

[3] Annual labor, material, and support service costs.

[4] Estimated hydroelectric power production value based on historical patterns for Leaburg Project. Rounded to nearest hundred.

[5] Forecasted market pricing, in Dollars per MWh, based on Integrated Resource Plan (IRP) projections, from November 2029 through December 2076. Rounded to nearest dollar.

[6] Estimated values based on IRP projections. Rounded to nearest dollar.

[7] Expected Renewable Energy Credit (REC) and Carbon Values in Dollars Per MWH. Based on IRP projections.

[8] Expected Capacity Value in Dollars per KW. Based on IRP projections.

Additional underlying NPV assumptions for all alternatives:

Table 5: NPV Assumptions for all Alternatives	
Escalation Rates:	
O&M Labor	3.0%
Non-labor Escalation	2.5%
Capital Labor/Non-labor Escalation	3.0%
Capacity Value Escalation (nominal output)	2.1%
Discount Rates:	
Nominal Dollars	6.3%
Uninflated Dollars	4.2%
Historical Inflation Rate[1]	2.1%

[1] Based on historical inflation – Bureau of Labor Statistics headline inflation rate (average 2018-2021)

The REC and carbon values are analyzed using theoretical (shadow) carbon prices to include the low, medium, and high REC prices multiplied by the baseline Leaburg generation output. This assumes a return to service date in late 2029 and generation that extends through 2075. The NPV analysis also considers the potential impact of a change in flow regime at Cougar Reservoir that could reduce generation output of either RTS alternative compared to historic conditions. It is our intent to perform sensitivity analysis on the key financial parameters to determine which parameters most affect the NPV results. Because the NPV values are still being developed, they are not presented herein. Preliminary NPV values may be discussed at the upcoming work session if available.

TBL Methodology

The consultant team is working closely with EWEB subject matter experts (SME's) to gather specific information for the TBL analysis. EWEB SME's include staff from Generation Engineering & Operations, Communications, Environmental, Property, Finance, and Power Planning.

The project team has identified the overarching TBL attributes for further evaluation, as summarized in Table 6. The list will be updated as new information becomes available. Note these primary attributes include additional specific sub-categories not shown below.

Table 6: Triple Bottom Inputs

Social	Environmental	Economic
• Public Safety • Local Economics (ex. property values, local jobs, local business resiliency) • Financial Impacts (ex. Property acquisition, change in property tax revenues) • Water Rights and Water Supply • Environmental Justice • Recreation • Visual/Aesthetics • Historic Preservation • Firefighting Resources • Local Transportation Network • Tribal Resources • Insects and Pests	• Climate Impacts • Water Quality • Aquatic Resources • Air Quality • Terrestrial Resources	• Rate Impacts • Capital Cost • O&M Cost • Net Present Value • Hydropower Value • Resiliency • Other Costs (ex. ongoing FERC licensing costs, ongoing liability) • Other Economic Issues (Ex. Power contract compliance, EWEB bond capacity, other project impacts, financial resiliency)

Each of the three main elements of the TBL (social, environmental, economic) will be evaluated based on the impacts of the alternatives. Weighing the tradeoffs between impacts is not straightforward and should reflect our customer's values and priorities. As a publicly owned utility that is funded through rates paid by our customer owners, economic considerations have a direct social impact. Given the substantial community wide implications associated with this decision, our intent is to perform sensitivity analysis to determine if adjustments in category impacts results in a different outcome. Additionally, to aid in decision making, the Board will be provided a tool to easily modify the impacts for each component to personally evaluate sensitivity. For example, if the Board determines that community wide impact considerations (ex. rate impact for EWEB's entire customer base) are more substantial than sub-community considerations, they will be able to evaluate those elements accordingly and view results.

Public Outreach Update

The EWEB Communications team and project staff continue to inform the public about the status of the Leaburg Canal evaluation and are following the Communication and Stakeholder Engagement Strategy that was submitted to the Board in December 2021 (https://www.eweb.org/documents/board-meetings/2021/12-07-21/corr-leaburg-canal-communication-and-stakeholder-engagement-strategy.pdf).

The project team receives periodic feedback from upriver community members via emails and calls, and a survey to gather feedback on potential impacts that was distributed to upriver community members in early June. Additionally, we have scheduled two upriver outreach events per month throughout the summer to engage community members and gather feedback for inputs into the TBL. Hatchery stakeholders, including the U.S. Army Corps of Engineers, NOAA Fisheries and Oregon Department of Fish & Wildlife, were provided an update on June 2nd.

Upcoming Project Milestones

- Board Meeting - August 2, 2022: Refined Cost Information and TBL Update.
- Board Meeting - October 4, 2022: Summary of draft report.
- Board Meeting - December 6, 2022 (tentative as required): Final report and recommendation.
- Special Meeting/Work Session December 20, 2022 – Expected Board action.

Requested Board Action

No Board action is requested at this time. We request feedback on approach and suggestions for ongoing work.

Please contact Lisa Krentz, Mark Zinniker, or Jeremy Somogye with questions.

Appendix A
Alternative Scenario Descriptions

Description of Alternatives Selected for Further Consideration

The primary considerations that were used to select the alternatives for further evaluation are as follows:

- Upfront capital investment.
- Operational & maintenance (O&M) costs.
- Potential power generation revenues vs. investment and O&M costs.
- Likelihood of economic and regulatory feasibility.
- Flexibility to incorporate near-term canal modifications into long-term solution(s) with minimal re-work.
- Retention of hydroelectric generation water rights and the FERC operating license.
- Bookended alternatives that will help define the maximum base-line scenarios from cost, regulatory compliance, and complexity perspectives.

Alternative 1 - Decommission by returning the site to pre-construction conditions (Bookend Scenario): This alternative was selected for further evaluation and consists of returning the site to "pre-construction conditions" to the extent necessary to meet FERC decommissioning and all other regulatory requirements. The Project features, including the dam, canal, and power generating facilities would be entirely removed, and the pre-construction drainage patterns intercepted by the canal would be re-established. The consultant team estimates that there are 8 to 11 drainage pathways that would be routed directly to the river, many of which would require crossing Highway 126. A new access bridge would be required to be constructed in place of Leaburg Dam to provide access to the south side of the river.

Alternative 2 - Full facility restoration of existing power generation configuration (Bookend Scenario): This alternative was selected for further evaluation and consists of a "full facility renewal" to the extent necessary to meet FERC and all other regulatory requirements. The Project features, including the dam, canal intake, canal, and power generating facilities would be rehabilitated and remediated to meet required specifications. The rehabilitated canal embankment would include lining alternatives to reduce seepage and improve slope stability where necessary. Certain reaches, such as the Ames and Cogswell reaches, would be entirely removed and reconstructed to mitigate the identified seismic liquefaction and internal erosion issues. The canal would continue to function as a full-length power canal and the existing intake at the upstream end of the canal would be rehabilitated and maintained.

Alternative 3 - New powerhouse near the Luffman Spillway and conversion to stormwater conveyance downstream of the proposed powerhouse: This alterative was selected for further evaluation and consists of a new powerhouse constructed near the Luffman Spillway (1.25 miles downstream from Leaburg Dam), with rehabilitation of the upstream length of the canal to the new powerhouse. The canal downstream of the new Luffman Spillway powerhouse location would be

remediated to allow for stormwater conveyance. Due to identified seismic stability and seepage issues, certain reaches like the Cogswell and Ames reaches would be modified to provide adequate stability for stormwater conveyance. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained.

Alternative 4 - Decommissioning with a combination of stormwater conveyance and return to pre-construction conditions: This alternative includes construction of a new spillway at Johnson Creek and modifications to the Luffman spillway. The canal downstream of Luffman spillway would be modified to allow for tributary isolation and stormwater conveyance. Due to identified seismic stability and seepage issues, the Cogswell and Ames reaches would be modified to provide adequate stability in those reaches for stormwater conveyance. Leaburg Dam would be removed, and the McKenzie River would be restored to a "pre-construction" configuration. A new access bridge would replace Leaburg Dam to provide access to the south side of the river. This alternative is a flexible option that converts short-term risk reduction measures that are under consideration into a long-term solution.

Description of Alternatives Not Selected for Further Consideration

In addition to the primary considerations identified above for the selected alternatives, the following issues were also considered when determining which alternatives will not be further evaluated:

- The certainty that doing nothing would be unacceptable to EWEB, the public, and all regulatory stakeholders.
- The presence of significant slope instability and potential land-slide risk near the prospective powerhouse location at Hansen Creek which would require extensive mitigation.
- The limited power production revenues vs. overall investment and O&M cost for the close-coupled power generation alternatives.
- The high uncertainty of accomplishing intergovernmental partnerships for funding, obtaining the necessary non-hydroelectric water rights, and successfully completing a jurisdictional transfer of the canal to another entity for use as an environmental amenity.
- The high likelihood that long term use of portions of the canal system for stormwater conveyance will be regulatorily acceptable/preferred over returning the Project to pre-construction conditions.

Do Nothing: Taking no action and leaving the project facilities in their current condition was not selected as an alternative for further evaluation because risk assessment results indicate a safety hazard exists that must be remedied. The no action alternative does not meet the requirements of EWEB organizational goal #3 to *work in collaboration with the Board and the McKenzie Valley Community to set the direction of the **Leaburg Hydro Electric Project** toward either a safe and reliable power producing asset or a safe and reliable stormwater conveyance asset.*

New powerhouse at Luffman Spillway and canal returned to pre-construction conditions downstream of the proposed powerhouse: This alternative consists of a new powerhouse constructed at Luffman Spillway (Sta. 66+00), with rehabilitation of the upstream length of the canal to the new powerhouse and full decommissioning of the canal length downstream of the new powerhouse. The portion of canal extending downstream of the newly constructed powerhouse would be entirely decommissioned, i.e. cut and filled to match the grade adjacent to the canal, to the extent possible, prior to construction, and the pre-construction drainage patterns intercepted by the canal would be re-established. There are 6 to 9 drainage pathways that would be routed directly to the river, many of which would require crossing Highway 126. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the high likelihood that long term use of portions of the canal system for stormwater conveyance will be regulatorily acceptable/preferred over returning the Project to pre-construction conditions.

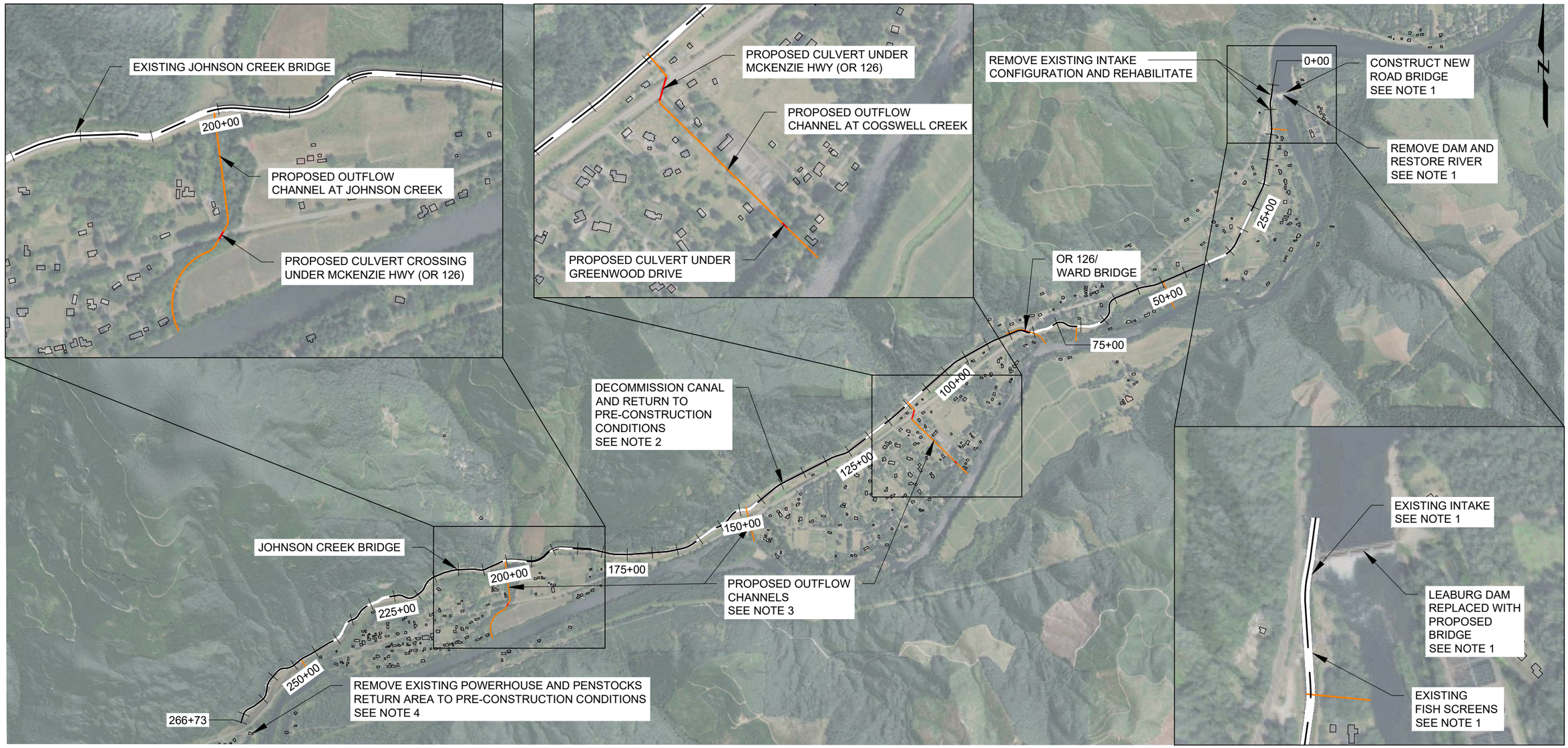
New powerhouse at Hansen Creek and stormwater conveyance downstream of the proposed powerhouse: This alternative consists of a new powerhouse constructed at Hansen Creek (Sta 151+60), with rehabilitation of the upstream length of the canal to the new powerhouse. The canal downstream of the new powerhouse will remain in service to allow for stormwater conveyance. The rehabilitated canal embankment upstream of the new powerhouse at Sta 151+60 would include lining alternatives to reduce seepage and improve slope stability. The portion of canal extending downstream of the newly constructed powerhouse would be maintained to be used for stormwater conveyance. Due to identified seismic stability and seepage issues, the Cogswell and Ames reaches would be modified to provide adequate stability in those reaches for stormwater conveyance. The Cogswell Reach would be reconstructed and lined upstream of the new powerhouse. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the presence of significant slope instability and potential land-slide risk near the prospective powerhouse location at Hansen Creek which would require extensive mitigation.

New powerhouse at Hansen Creek and canal returned to pre-construction conditions downstream of the proposed powerhouse: This alternative consists of a new powerhouse constructed at Hansen Creek (Sta 151+60), with rehabilitation of the upstream length of the canal to the new powerhouse. The portion of canal extending downstream of the newly constructed powerhouse would be entirely decommissioned, i.e. cut and filled to match the grade adjacent to the canal, to the extent possible, and the pre-construction drainage patterns intercepted by the canal would be re-established. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the presence of significant slope instability and potential land-slide risk near the prospective powerhouse location at Hansen Creek, which would require extensive mitigation, as well as the likelihood that long term use of portions of the canal system for stormwater conveyance will be regulatorily acceptable/preferred over returning the Project to pre-construction conditions.

Close-coupled powerhouse at Leaburg Dam with stormwater conveyance downstream of the proposed powerhouse: This alternative consists of a new close-coupled powerhouse constructed at Leaburg Dam, with rehabilitation of the immediate upstream length of the canal to the new powerhouse. The remaining portion of the canal downstream of the new powerhouse will be modified to allow for stormwater conveyance. Due to identified seismic stability and seepage issues, the Cogswell and Ames reaches would be modified to provide adequate stability in those reaches for stormwater conveyance. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the limited power production revenues vs. overall investment and O&M cost for the close-coupled power generation alternatives.

Close-coupled powerhouse at Leaburg Dam with canal returned to pre-construction conditions downstream of proposed powerhouse: This alternative consists of a new close-coupled powerhouse constructed at Leaburg Dam and decommissioning of the canal length downstream of the new powerhouse. The portion of canal extending downstream of the newly constructed close-coupled powerhouse would be entirely decommissioned, i.e. cut and filled to match the grade adjacent to the canal, to the extent possible, prior to construction. A drainage plan would be developed for this alternative to allow for previous runoff into Leaburg Canal to return to the McKenzie River. There are 8 to 11 drainage pathways that would be routed directly to the river for this alternative, many of which would require crossing Highway 126. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the limited power production revenues vs. overall investment and O&M cost for the close-coupled power generation alternatives.

Canal converted into an environmental amenity: This alternative consists of the canal being converted into an environmental amenity through removing the existing powerhouse and penstocks and rehabilitating portions of embankment along the length of the canal. The existing powerhouse and penstocks located at the end of Leaburg Canal would be removed or decommissioned. The remaining existing canal would be maintained to continue to route runoff and convey a limited amount of flow from the McKenzie River (less than 100 cfs compared to up to 2,500 cfs for power generation). Due to identified seismic stability and seepage issues, certain reaches such as the Cogswell and Ames reaches would be removed and reconstructed to provide adequate stability. No lining alternatives would be constructed within the canal. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be modified for the proposed use as a low flow diversion. This alternative would allow for continued water conveyance to the McKenzie fish hatchery and irrigators as well as other environmental uses of the canal, such as serving as a fish rearing habitat and possibly spawning habitat. This alternative would require a highly unlikely permanent transfer of the canal to a partnering State or Federal agency for ongoing operation and maintenance. This alternative was not selected due to the high uncertainty of accomplishing intergovernmental partnerships for funding, obtaining the necessary non-hydroelectric water rights, and successfully completing a jurisdictional transfer of the canal to another entity for use as an environmental amenity.



NOTES:

DECOMMISSION THE PROJECT THROUGH EARTHWORK, PERFORMING CUT AND FILL OF THE CANAL TO RETURN THE SITE TO PRE-PROJECT CONDITIONS. MODIFICATIONS REQUIRED FOR THIS ALTERNATIVE INCLUDE:

1. REMOVE EXISTING LEABURG DAM AND ASSOCIATED INFRASTRUCTURE. CONSTRUCT NEW BRIDGE IN SAME LOCATION.
2. RE-GRADE THE ENTIRE LENGTH OF THE CANAL THROUGH EXCAVATION OF THE EMBANKMENT AND FILLING OF THE CANAL. MATCH PRE-PROJECT CONDITIONS OF THE SURROUNDING AREA. REFERENCE DETAIL G-1 ON FIGURE 5.
3. CONSTRUCT PROPOSED OUTFLOW CHANNELS AT SPECIFIED LOCATIONS TO RETURN TRIBUTARY FLOW FROM ADJACENT WATERSHEDS TO THE MCKENZIE RIVER.
4. REMOVE THE EXISTING POWERHOUSE AND PENSTOCKS.

SOURCE:

1. ORTHOIMAGERY AND LIDAR BASEMAP DATA PROVIDED BY EWEB.

LEGEND:

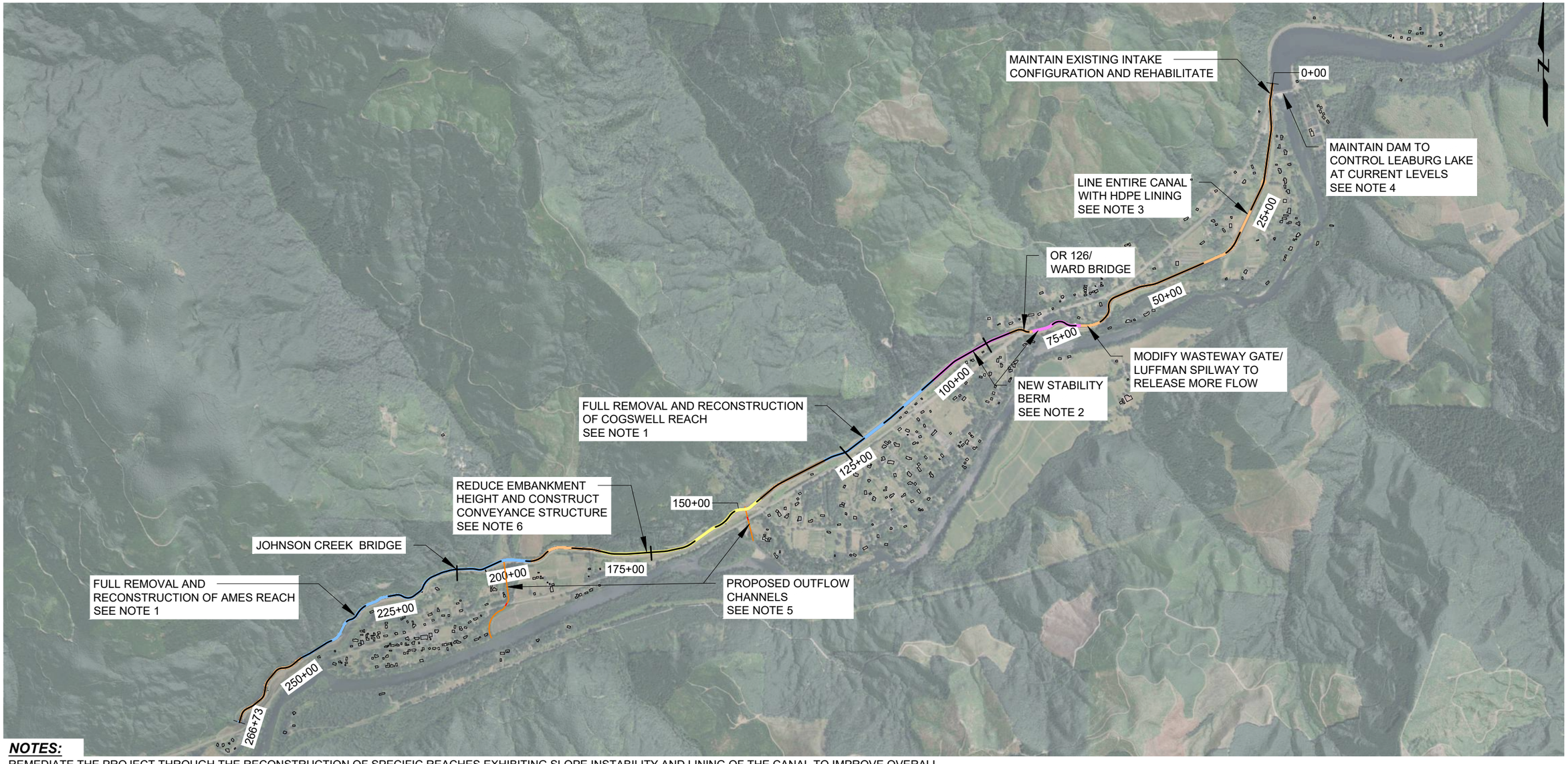
FULL CANAL REMOVAL - CUT AND FILL TO MATCH SLOPE OF VALLEY (PRE-PROJECT CONDITIONS)

0 2000 4000

SCALE: 1" = 2000'

Not Issued for Construction

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	ALTERNATIVE 1 RETURN SITE TO PRECONSTRUCTION
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 1



NOTES:

REMEDIATE THE PROJECT THROUGH THE RECONSTRUCTION OF SPECIFIC REACHES EXHIBITING SLOPE INSTABILITY AND LINING OF THE CANAL TO IMPROVE OVERALL SEEPAGE CONCERNS. MODIFICATIONS FOR THIS ALTERNATIVE INCLUDE:

1. FULLY REMOVE AND RECONSTRUCT THE CANAL FOR THE AMES AND COGSWELL REACHES TO ADDRESS INTERNAL EROSION AND SLOPE STABILITY ISSUES. DENOTED BY THE BLUE PORTIONS OF THE CANAL.
2. CONSTRUCT A STABILITY BERM TO ADDRESS STABILITY CONCERNS ALONG PORTIONS OF THE EMBANKMENT THAT WILL NOT BE RECONSTRUCTED
3. LINE THE ENTIRE LENGTH OF THE CANAL WITH HIGH DENSITY POLYETHYLENE (HDPE) LINER COVERED WITH SHOTCRETE. REFERENCE DETAIL G-2 ON FIGURE 5 AND FIGURE 7. SECTION WITH NEW CONCRETE CONVEYANCE WILL NOT BE LINED WITH HDPE AND SHOTCRETE, SEE NOTE 6.
4. MAINTAIN EXISTING LEABURG DAM, CANAL INTAKE CONFIGURATION, AND EXISTING POWERHOUSE IN ORDER TO CONTINUE OPERATING THE MCKENZIE RIVER AT CURRENT LEVELS.
5. CONSTRUCT PROPOSED OUTFLOW CHANNELS AT SPECIFIED LOCATIONS TO RETURN FLOW TO THE MCKENZIE RIVER.
6. REDUCE EMBANKMENT HEIGHT AND CONSTRUCT CONCRETE CONVEYANCE STRUCTURE WITH SAME INVERT AS EXISTING CANAL. SEE DETAIL G-7 ON FIGURE 6

SOURCE:

1. ORTHOIMAGERY AND LIDAR BASEMAP DATA PROVIDED BY EWEB.

LEGEND:

- INSTALL HDPE LINING
- FULL REMOVAL AND RECONSTRUCTION WITH SHALLOWER EMBANKMENT SLOPE AND HDPE LINING
- REDUCE EMBANKMENT HEIGHT AND CONSTRUCT CONCRETE CONVEYANCE STRUCTURE
- CONSTRUCT STABILITY BERM AND INSTALL HDPE LINING

Not Issued for Construction

0 2000 4000

SCALE: 1" = 2000'

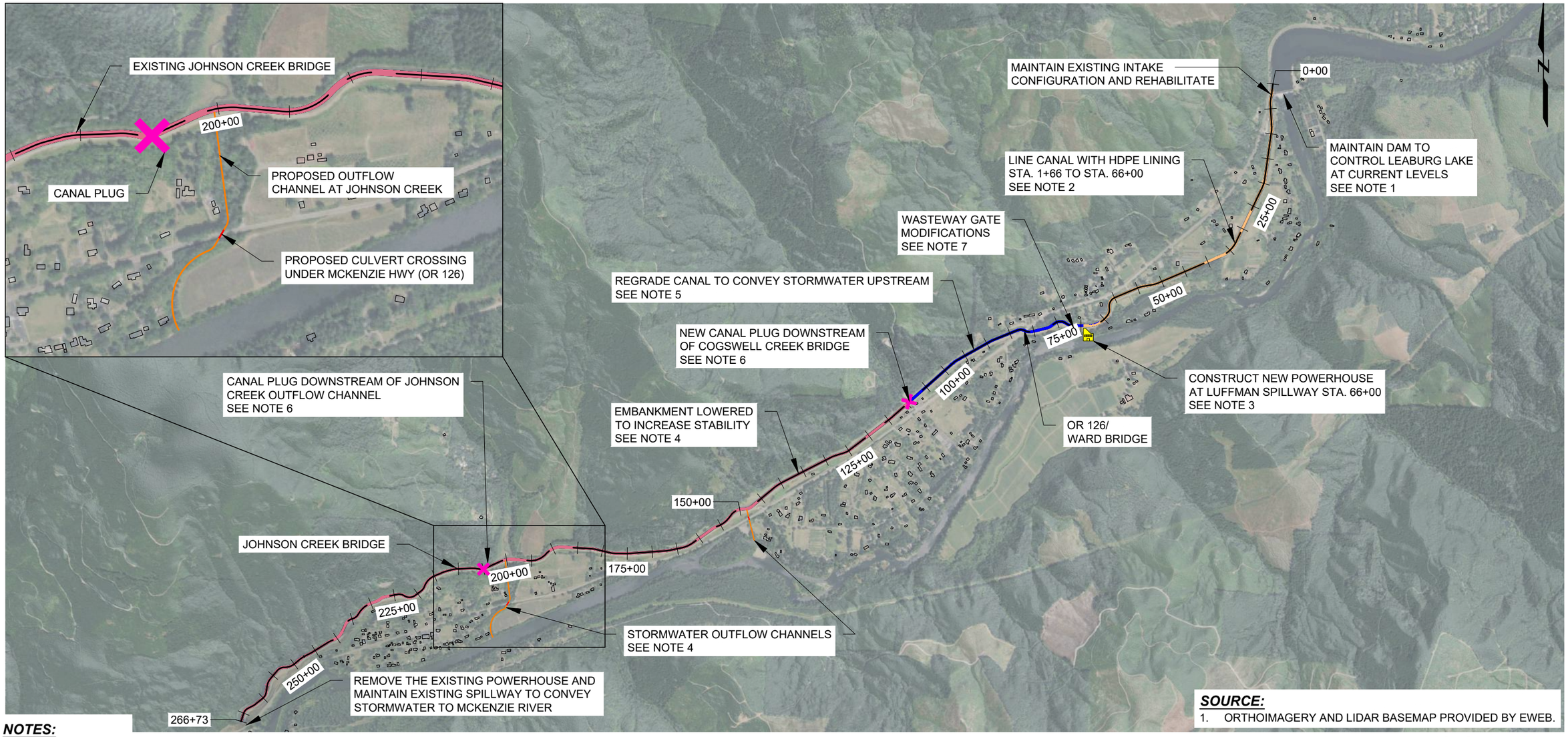
Strategic Evaluation of
Leaburg-Walterville Hydroelectric Project
Leaburg, OR

Eugene Water & Electric Board
Eugene, OR

GEI Consultants

ALTERNATIVE 2
FULL FACILITY RENEWAL

Project 2104273 | June 2022 | Fig. 2



SOURCE:

1. ORTHOIMAGERY AND LIDAR BASEMAP PROVIDED BY EWEB.

NOTES:

RETURN THE PROJECT TO SERVICE WITH A NEW POWERHOUSE AT LUFFMAN SPILLWAY. MAINTAIN THE DOWNSTREAM CANAL FOR STORMWATER CONVEYANCE, AND REMEDIATE THE EXISTING CANAL EXHIBITING SLOPE INSTABILITY BY LOWERING THE EMBANKMENT. MODIFICATIONS REQUIRED FOR THIS ALTERNATIVE INCLUDE:

1. MAINTAIN EXISTING LEABURG DAM AND CANAL INTAKE CONFIGURATION.
2. LINE THE EFFECTIVE LENGTH OF THE CANAL UP TO THE PROPOSED LUFFMAN SPILLWAY POWERHOUSE WITH HIGH DENSITY POLYETHYLENE (HDPE) LINER COVERED WITH SHOTCRETE. REFERENCE DETAIL G-2 ON FIGURE 5 AND FIGURE 7.
3. CONSTRUCT A NEW POWERHOUSE AT LUFFMAN SPILLWAY. REFERENCE DETAIL G-4 ON FIGURE 5..
4. REDUCE THE EMBANKMENT HEIGHT AND MAINTAIN THE PORTION OF THE CANAL DOWNSTREAM OF THE PROPOSED POWERHOUSE FOR STORMWATER CONVEYANCE FOR FLOWS UP TO THE 10,000 YEAR FLOOD (DETAIL G-6 ON FIGURE 6) AND CONSTRUCT STORMWATER OUTFLOWS AT JOHNSON CREEK AND HANSEN CREEK .
5. REGRADE COGSWEL REACH UPSTREAM OF COGSWELL CREEK TO DISCHARGE AT THE WASTEWAY GATE.
6. CONSTRUCT A CANAL PLUG AT JOHNSON CREEK AND COGSWELL CREEK TO SEGREGATE STORMWATER CONVEYANCE FLOW WITHIN THE CANAL.
7. IMPLEMENT MODIFICATIONS TO THE WASTEWAY GATE AND LUFFMAN SPILLWAY IN ORDER TO RELEASE STORM FLOWS FROM COGSWELL CREEK.

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0 2000 4000

SCALE: 1" = 2000'

LEGEND:

- INSTALL HDPE LINING
- EMBANKMENT LOWERED AND CANAL UTILIZED AS STORMWATER CONVEYANCE. PROPOSED EMBANKMENT HEIGHT SUFFICIENT TO CONVEY 10,000 YEAR FLOOD WITH 2' OF FREEBOARD
- CANAL GRADING TO DIVERT RUNOFF UPSTREAM TOWARDS NEW POWERHOUSE

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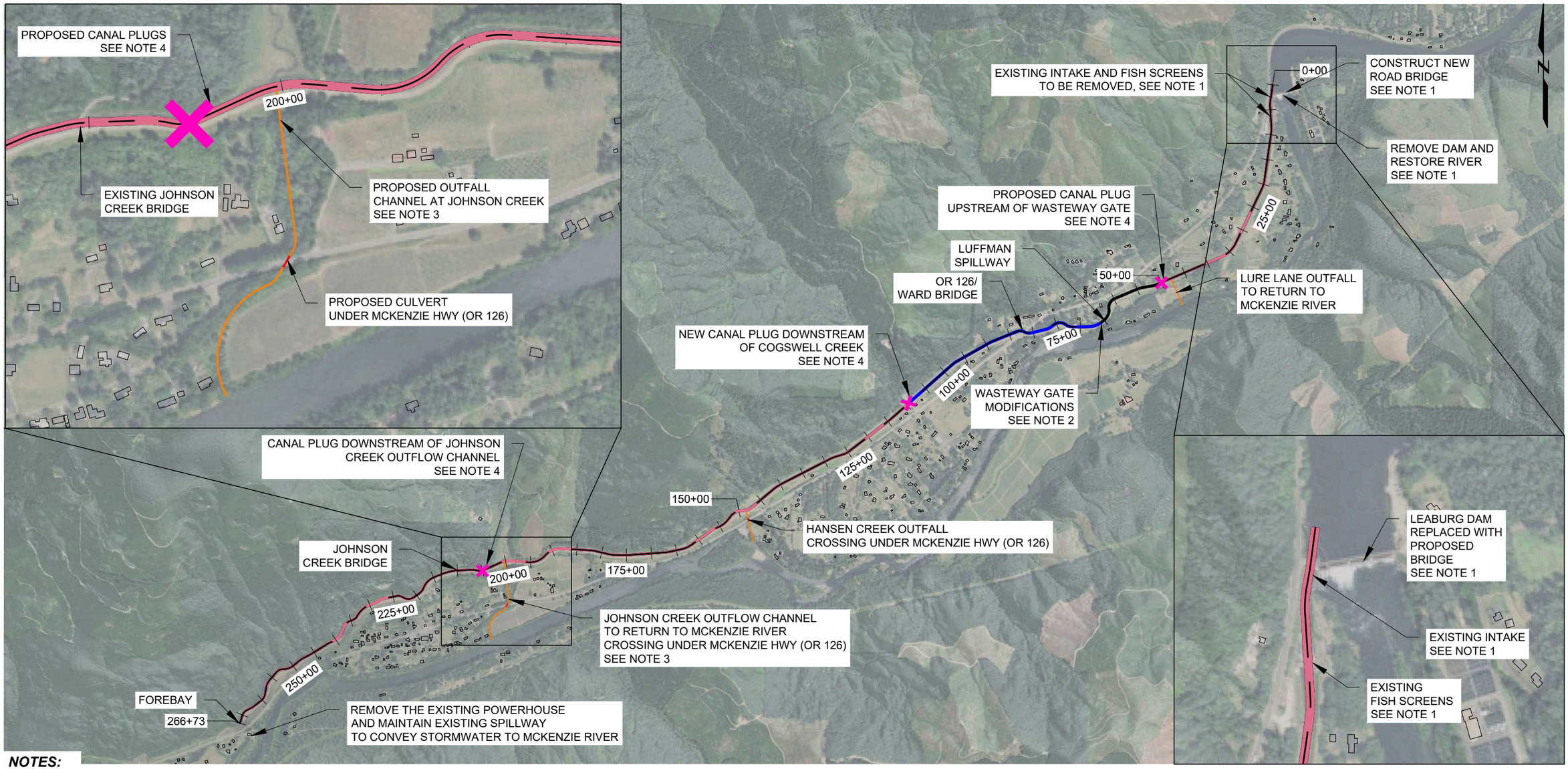
Eugene, OR

GEI Consultants

ALTERNATIVE 3
LUFFMAN SPILLWAY POWER-HOUSE & DOWNSTREAM RECONSTRUCTION

Project 2104273 | June 2022 | Fig. 3



NOTES:

DECOMMISSION THE PROJECT THROUGH A COMBINATION OF CHANGES, INCLUDING LOWERED EMBANKMENT, PROPOSED STORMWATER CONVEYANCE, AND RETURNING THE SITE TO PRE-PROJECT CONDITIONS. MODIFICATIONS REQUIRED FOR THIS ALTERNATIVE INCLUDE:

1. REMOVE EXISTING LEABURG DAM AND ASSOCIATED INFRASTRUCTURE,AND BUILD A NEW BRIDGE IN PLACE OF THE EXISTING DAM.
2. IMPLEMENT MODIFICATIONS TO THE WASTEWAY GATE AND LUFFMAN SPILLWAY IN ORDER TO RELEASE STORM FLOWS FROM COGSWELL CREEK.
3. REDUCE THE EMBANKMENT HEIGHT AND MAINTAIN THE CANAL FOR STORMWATER CONVEYANCE FOR FLOWS UP TO THE 10,000 YEAR FLOOD (DETAIL G-6 ON FIGURE 6) AND CONSTRUCT STORMWATER OUTFLOWS AND JOHNSON CREEK AND HANSEN CREEK.
4. CONSTRUCT A CANAL PLUG AT JOHNSON CREEK, COGSWELL CREEKK, AND WASTEWAY GATE TO SEGREGATE STORMWATER CONVEYANCE FLOW WITHIN THE CANAL.

SOURCE:

1. ORTHOIMAGERY AND LIDAR BASEMAP DATA PROVIDED BY EWEB.

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LEGEND:

0 2000 4000

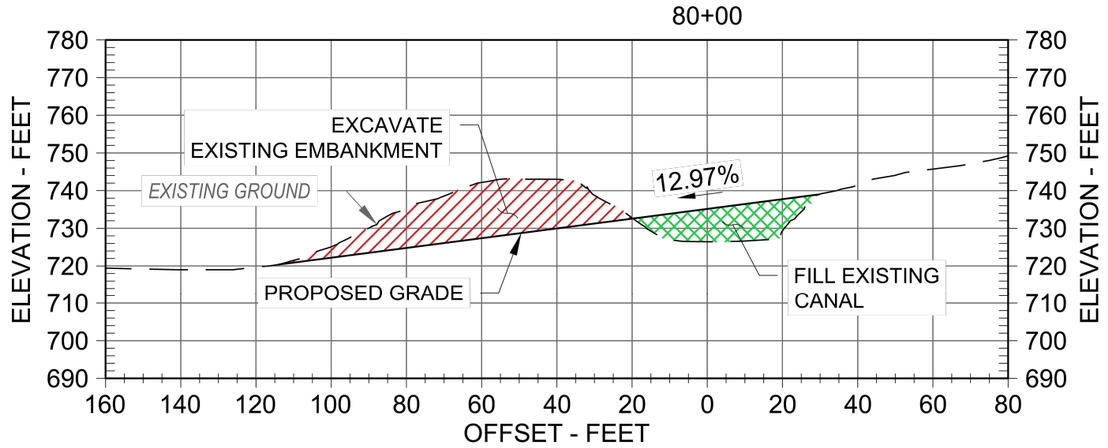
SCALE: 1" = 2000'

CANAL GRADING TO DIVERT RUNOFF UPSTREAM TOWARDS MODIFIED WASTEWAY GATE

EMBANKMENT LOWERED AND CANAL TO BE UTILIZED AS STORMWATER CONVEYANCE. PROPOSED EMBANKMENT HEIGHT SUFFICIENT TO CONVEY 10,000 YEAR FLOWS WITH 2' OF FREEBOARD

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	ALTERNATIVE 4 NEW SPILLWAY AT JOHNSON CREEK AND WASTEWAY GATE MODIFICATIONS
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 4

EXAMPLE EXCAVATION/FILL SECTION



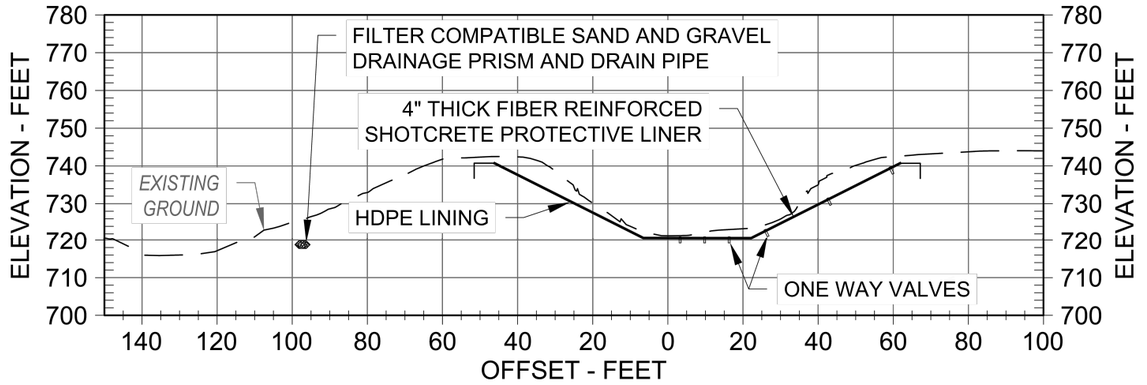
G 1 TYPICAL SECTION

STA. 80+00 - DECOMMISSION CANAL

0 40 80

SCALE, FEET

EXAMPLE HDPE LINING SECTION



G 2 TYPICAL SECTION

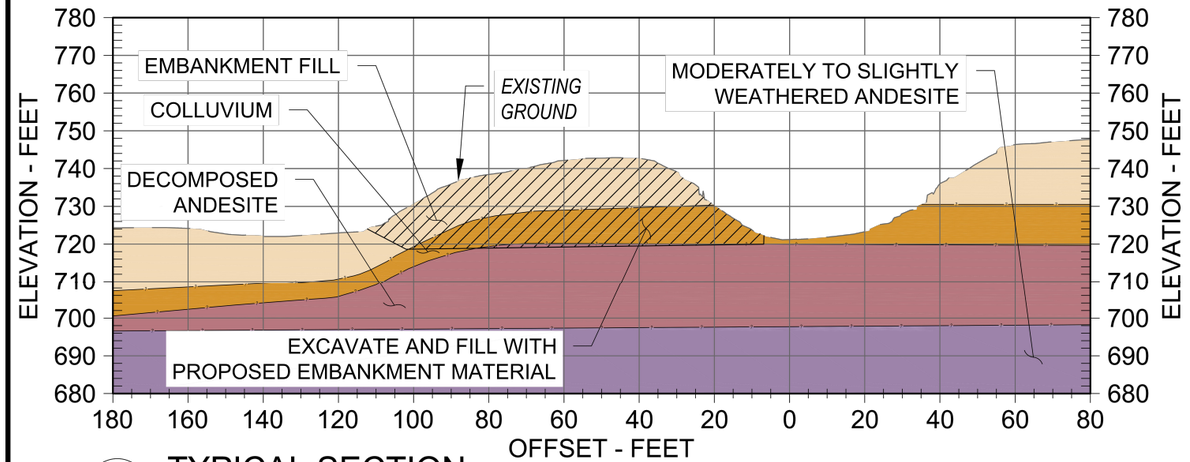
STA. 121+50 - HDPE & SHOTCRETE LINING

SEE FIGURE 7 FOR ADDITIONAL DETAILS

0 40 80

SCALE, FEET

EXAMPLE EMBANKMENT RECONSTRUCTION SECTION

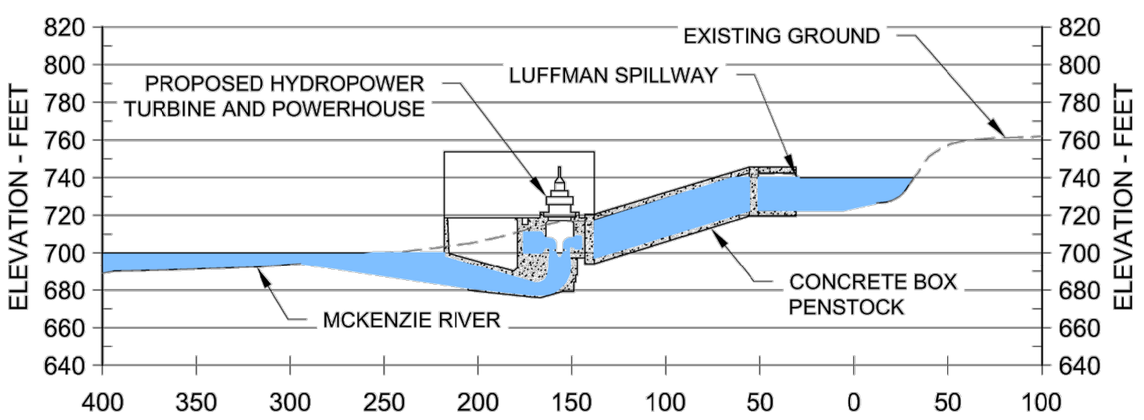


G 3 TYPICAL SECTION

0 40 80

SCALE, FEET

NEW LUFFMAN POWERHOUSE



G 4 LUFFMAN SPILLWAY

SCALE: 1:1 V:H

1. ALL SECTIONS ORIENTED LOOKING DOWNSTREAM
2. GEOLOGIC DATA SHOWN IS EXTRACTED AND MODIFIED FROM "AMES STABILITY EVALUATION REPORT" AND "COGSWELL CREEK SEEPAGE AND STABILITY EVALUATION REPORT" (CORNFORTH CONSULTANTS, 2020). GEOLOGIC UNIT EXTENTS ARE APPROXIMATE AND WILL VARY ALONG THE ALIGNMENT.

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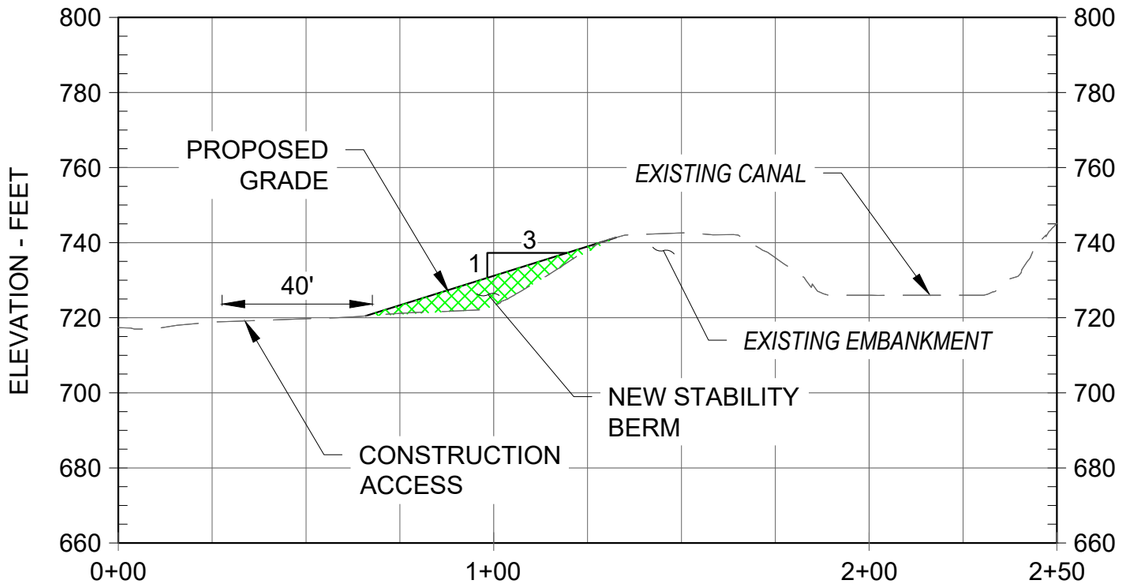
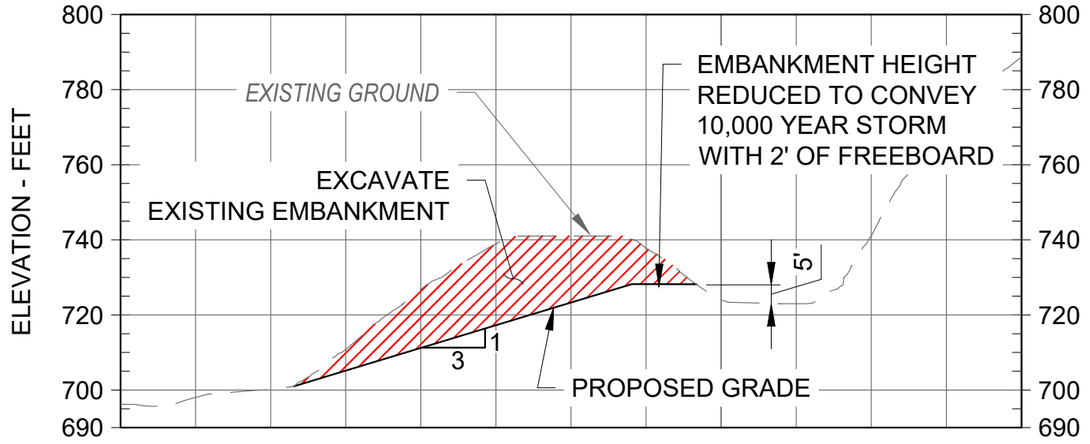
Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	PREFERRED ALTERNATIVE TYPICAL SECTIONS 1
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 5



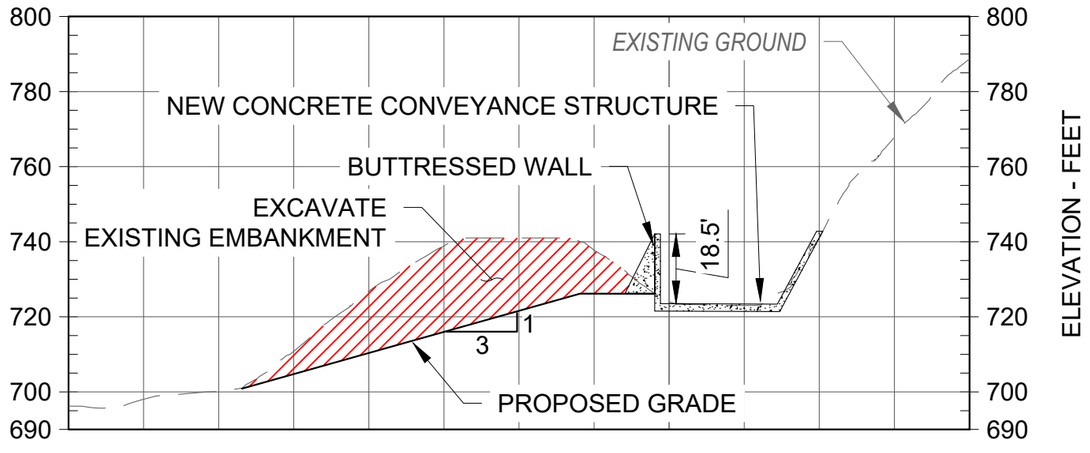
G 5 TYPICAL STABILITY BERM SECTION

STA. 90+00



G 6 TYPICAL STORM WATER DIVERSION SECTION

STA. 155+00



G 7 LOWERED EMBANKMENT WITH CONVEYANCE STRUCTURE

STA. 155+00

0 40 80

SCALE, FEET

NOTE:

1. ALL SECTIONS ORIENTED LOOKING DOWNSTREAM

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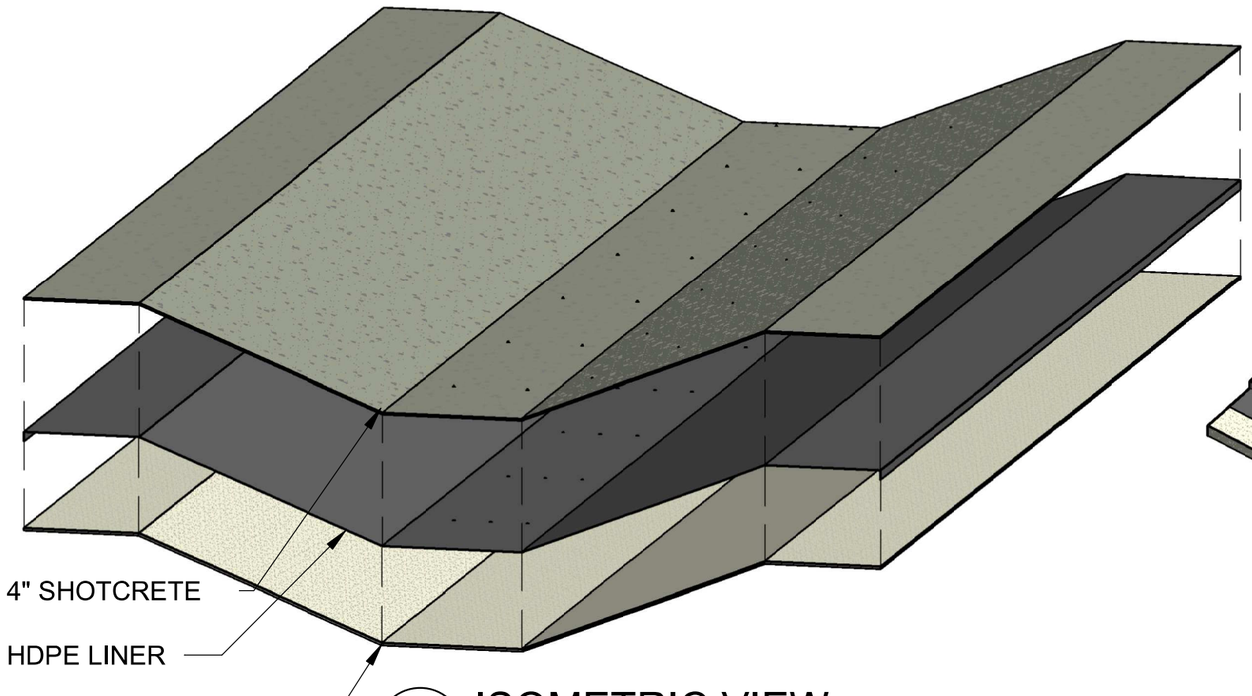
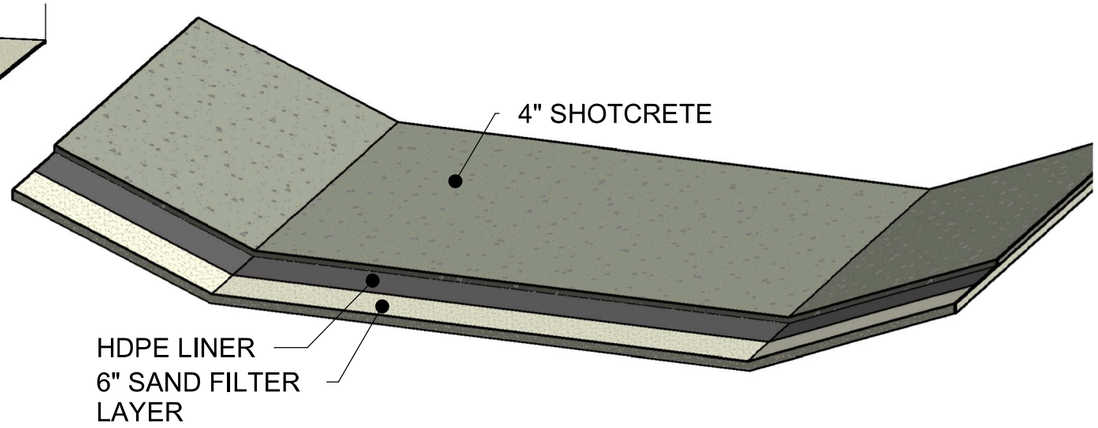
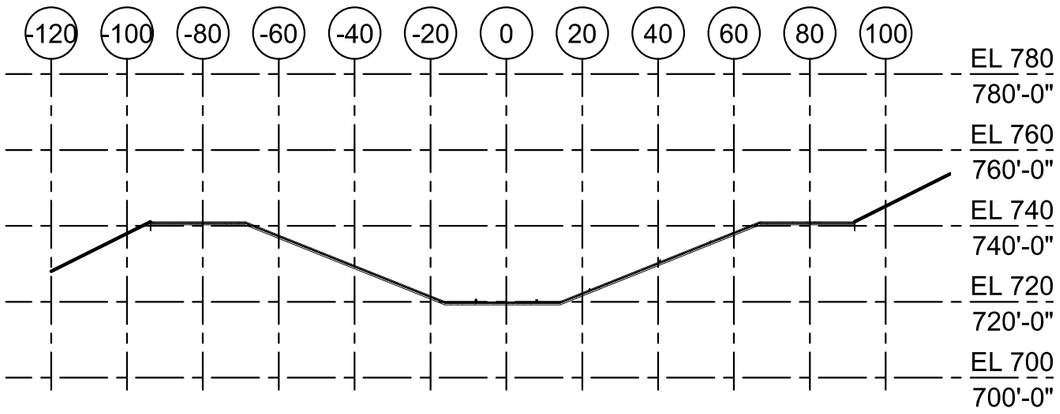
Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	PREFERRED ALTERNATIVES TYPICAL SECTIONS 2
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 6



1 ISOMETRIC VIEW

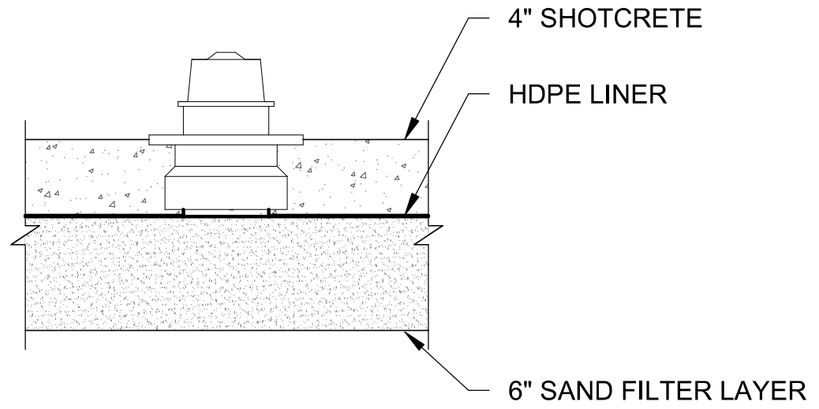


2 ISOMETRIC VIEW



SECTION

SCALE: 1" = 40'-0"



3 DRAIN SECTION

SCALE: 1 1/2" = 1'-0"

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	SHOTCRETE AND HDPE LINING DETAIL
Eugene Water & Electric Board	PROJECT 2104273	June 2022 Fig. 7