



Memorandum

TO: Doug Roderick, PE, Interim Engineering Manager

FROM: Tonia M. Tabucchi Herrera, PE, Senior Engineer
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DATE: March 26, 2021

SUBJECT: **Hemphill Diversion Structure Project (FATR #7032) – Cost Estimates for Alternatives Under Review in DEIR**

ENGINEERING

BACKGROUND:

The Hemphill Diversion Structure Project (Project) Draft Environmental Impact Report (EIR) will be released for public comment and review on April 1, 2021. The Draft EIR identified seven (7) project objectives:

- 1) Provide passage for anadromous fish at Hemphill Diversion Structure through elimination or modification of the existing structure.
- 2) Provide for a project that limits operational and maintenance activities within Auburn Ravine.
- 3) Maintain NID's water rights (pre and post-1914) within Auburn Ravine.
- 4) Continue to provide raw water deliveries via the Hemphill Canal.
- 5) Minimize or eliminate fish passage into Hemphill Canal.
- 6) Provide for a project that reduces the risk of further upstream erosion.
- 7) Provide a project that is economically feasible to implement, operate, and maintain.

The goal of this memo is to provide cost estimates to assist in evaluating the Project as it relates to the above objective 7.

Staff, through consultation with experts in their field and past project practices and experiences, have developed cost estimates for the three (3) alternatives under review in the Draft EIR:

Alternative 1 - Riverbank Infiltration Gallery

Alternative 2 - Fish Passage

Alternative 3 - Pipeline

DESCRIPTION OF ALTERNATIVES:

Each alternative includes the removal of the diversion structure (dam). Due to the likely permitted work window (June through October), the Contractor would install a cofferdam and temporary bypass to allow water past the construction site into the ravine and to maintain service to the Hemphill Canal.

Alternative 1 - Riverbank Infiltration Gallery Alternative, would include the work noted above and the construction of an infiltration gallery within the south bank of the Auburn Ravine, downstream of the existing diversion structure.

The infiltration gallery would consist of the necessary piping, imported engineered compacted fill, rip-rap, a wet well system with two-20 cubic-feet per second pumps, and a backflush system.

Canal modification would occur at the discharge point of the pumps into the canal and upstream to the existing canal head intake structure. From the new discharge into the canal and upstream of the existing intake, the canal would be filled in with suitable material. A concrete discharge box, or armoring of the canal, would be required at the new point of entry into the canal.

Electrical would be brought to the site from Virginiatown Road. The electrical extension would be above ground.

Site stabilization, restoration, and north bank stabilization are included in the cost.

Alternative 2 - Fish Passage Alternative, would include the work noted above for the diversion removal and the construction of a nature-like fish passage within Auburn Ravine at the location of the existing diversion structure.

The nature-like fish passage would be a roughened rock ramp resembling a riffle within the stream channel with the upstream crest elevation being lower than the existing concrete dam crest.

A fish screen would be installed at the head of the Hemphill Canal. Additional canal modifications would include piping and/or lining and regrading a portion of the canal from the intake to the first service box. This work would include the replacement of existing culverts and modification/replacement of the existing gaging station.

Electrical would be brought to the site from Virginiatown Road to provide fish screen cleaning. The electrical extension would be above ground.

Alternative 3 - Pipeline Alternative, would include the work noted above for the diversion removal and the construction of a pipeline from the Auburn Ravine 1 Canal within the Placer Yard.

The approximately 4.5-mile, 24-inch diameter pipeline would be installed predominately in paved roadways from the Placer Yard facility extending along Fruitvale Road, Fowler Road, and Virginiatown Road. A portion of the pipeline would be installed cross-country. In order to reach the Hemphill Canal, the pipeline section crossing Auburn Ravine would be an aerial crossing.

Canal modification would occur at the new discharge point into the canal and upstream to the existing canal intake structure. From the new discharge point into the canal and upstream to the existing intake the canal would be filled in with suitable material. A concrete discharge box or armoring of the canal would be required at the new point of entry.

ENERGY COST ESTIMATE:

Alternative 1 cost estimates were calculated utilizing the proposed pump sizes, estimated amperage, and PG&E rates at other District facilities. The pumps are assumed to run for 24 hours, 182 irrigation service days, and 8 service days (if permitted to do so). The estimated energy cost for the pumps is approximately \$40,000 per irrigation season. The cost estimate is subject to PG&E rates and actual pump design.

Alternative 2, automatic fish screening, will have energy costs associated with the automatic fish screening cleaning. During design, alternatives to electrical power will be considered and could include solar and self-propelled cleaning.

Alternative 3 would not require any energy to operate, relying on gravity feed.

COSTS TO BE DETERMINED:

Additional access costs:

A temporary construction and access easement to the south side of the ravine will be needed for construction of all alternatives. An existing private dirt road through an on-going developing parcel starts at HWY193 and terminates near the ravine. Alternatives 1 and 2 will require a permanent easement for access from the south side of the canal. Currently, the District has access via the berm on the south. However, there will be times that equipment necessary for on-going maintenance will require more efficient access.

Operation and Maintenance Costs:

The estimated costs provided are for the construction of the project only and do not include costs for Operation and Maintenance of the facility. If needed, this can be further explored to quantify for each alternative.

Qualitatively, Alternative 1 will have the highest operation and maintenance costs, while Alternative 3 is the lowest. Alternative 1 would most likely require periodic inspection and backflushing to ensure efficiency, and that the required delivery amounts are met for water sales. Alternative 2 may require adjustment of the nature-like rock placement after large storm events, or removal of any material caught that would affect migration. The screen system on the canal intake will require periodic inspection. The automatic cleaning should allow for any heavy cleaning such as sediment removal before or after irrigation season. Alternative 3, aerial crossing, would require periodic maintenance during the life of the facility, including painting and periodic operation of any isolation valves.

COST ESTIMATE ASSUMPTIONS:

Contingency was added to the cost estimate due to the conceptual level of the design. From conceptual design progressing to final, contingency would be eliminated. The percentage of the contingency is in-line with industry standards.

Estimating the cost for engineering (design), construction management, and administration is calculated as a percentage of the estimated construction cost. The industry standard is about 20% of construction cost. This assumes that a third party does the design, construction management, and administration. Most often, the District Staff provides construction management, inspection, and administration, so that percentage may be able to be lowered. Additionally, depending on the project selected, design also may be completed by District Staff, resulting in a further lower percentage.

The cost estimate for environmental protection and mitigation was included to account for the cost associated with implementing mitigation, which can include, but is not limited to, District hired consultants for pre-construction surveys, training, and monitoring, exclusion fencing, and additional permit requirements. This number will be refined with the final design and permitting.

Revegetation could be imposed by environmental mitigation, permitting, and the Storm Water Pollution Prevention Plan, in addition to those costs noted above. This cost assumes revegetation of areas disturbed as a result of construction outside of permanent access points to District facilities. This cost would be further refined based on the areas of disturbance and the type of revegetation required – hydroseeding versus plugs, for example.

Construction of Alternative 3 is assumed to be constructed by a Contractor. The cost of construction would be less if District crews construct the pipeline.

COST ESTIMATE SUMMARY:

Below are the costs per alternative. Costs include estimates for design, any additional studies, permitting, environmental mitigation, and construction. For a detailed breakdown, see the attached spreadsheet.

Alternative 1 Infiltration Gallery: \$11,840,800

Alternative 2 Fish Passage: \$4,343,300

Alternative 3 Pipeline: \$14,415,200

Attachment: (1)

- Hemphill Conceptual Cost Estimates for Alternatives

HEMPHILL CONCEPTUAL COST ESTIMATES FOR ALTERNATIVES

March 2021

Alternative 1 - Infiltration Gallery

Item No.	Description	Estimated Quantity	Unit	Unit Price	Line Item Cost
1	Mobilization / Demobilization (10%)	1	LS	--	\$608,800
2	Infiltration Gallery ^a	1	LS	\$4,965,000	\$4,965,000
3	Electrical ^a	1	LS	\$200,000	\$200,000
4	Dam demolition ^a	1	LS	\$190,000	\$190,000
5	Reconfigure Stream Bed ^a	1	LS	\$475,000	\$475,000
6	Upstream Erosion Control	1	LS	\$100,000	\$100,000
7	Permit Fees	1	LS	\$75,000	\$75,000
8	Studies and Consultant Reports	1	LS	\$83,000	\$83,000
Bid Items Subtotal:					\$6,696,800
25% Contingency					\$1,674,000
~3% Bond Allowance:					\$201,000
8% Revegetation					\$536,000
Direct Cost Subtotal:					\$9,107,800
20% Engineering, construction management and administration:					\$1,822,000
~10% Environmental protection and mitigation:					\$911,000
Indirect Cost Subtotal:					\$2,733,000
Total Cost:					\$11,840,800

Alternative 2 - Rock Ramp^b

Item No.	Description	Estimated Quantity	Unit	Unit Price	Line Item Cost ^d
1	Mobilization / Demobilization (10%)	1	LS	--	\$223,300
2	Storm Water Pollution Prevention Plan	1	LS	\$40,000	\$40,000
3	Temporary bypass of water	1	LS	\$79,000	\$79,000
4	Clearing / Grubbing and Debris Removal	0.5	AC	\$16,000	\$8,000
5	Sheeting, shoring, and bracing	1	LS	\$37,000	\$37,000
6	Dam demolition	1	LS	\$190,000	\$190,000
7	Engineered streambed material	2,000	CY	\$88	\$177,000
8	Boulder Weirs and Boulder Clusters	3,879	TON	\$72	\$278,000
9	Reprofile Irrigation Canal	1	LS	\$600,000	\$600,000
10	Grade/reprofile upstream of dam	800	CY	\$82	\$66,000
11	Fish Screen	1	LS	\$400,000	\$400,000
12	Permit Fees	1	LF	\$75,000	\$75,000
13	Studies and Consultant Reports	1	LS	\$83,000	\$83,000
14	Electrical ^e	1	LS	\$200,000	\$200,000
Bid Items Subtotal:					\$2,456,300
25% Contingency					\$614,000
~3% Bond Allowance:					\$74,000
8% Revegetation					\$197,000
Direct Cost Subtotal:					\$3,341,300
20% Engineering, construction management and administration:					\$668,000
~10% Environmental protection and mitigation:					\$334,000
Indirect Cost Subtotal:					\$1,002,000
Total Cost:					\$4,343,300

Alternative 3 - Pipeline

Item No.	Description	Estimated Quantity	Unit	Unit Price	Line Item Cost
1	Mobilization / Demobilization (10%)	1	LS	--	\$741,200
2	Storm Water Pollution Prevention Plan	1	LS	\$50,000	\$50,000
3	Purchase and Installation of 24" pipe ^c	23,140	FT	\$288	\$6,664,000
4	Overhead Aerial Crossing	1	LS	\$250,000	\$250,000
5	Permit Fees	1	LS	\$75,000	\$75,000
6	Studies and Consultant Reports	1	LS	\$83,000	\$83,000
7	Dam Demolition	1	LS	\$190,000	\$190,000
8	Upstream Erosion Control	1	LS	\$100,000	\$100,000
Bid Items Subtotal:					\$8,153,200
25% Contingency					\$2,038,000
~3% Bond Allowance:					\$245,000
8% Revegetation					\$652,000
Direct Cost Subtotal:					\$11,088,200
20% Engineering, construction management and administration:					\$2,218,000
~10% Environmental protection and mitigation:					\$1,109,000
Indirect Cost Subtotal:					\$3,327,000
Total Cost:					\$14,415,200

Notes: ^a Costs referenced from Westcon Construction ROM estimate 3/11/2021

^b Rock Ramp costs provided by Northwest Hydraulic Consultants, February 2021. NID revised the Dam demo cost from median estimate of 650 CY at \$200/CY total \$130,000 to the amount quoted by Westcon Construction for "apples to apples" comparison as that portion of the job is required for all alternatives.

^c Piping costs assume \$12 per diameter inch of pipe

^d Costs are rounded to the nearest thousand

^e Cost for electrical for fish screen added