

EXHIBIT E – ENVIRONMENTAL REPORT

SUBPART E.10 ALTERNATIVE ANALYSIS

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E.10.1 ALTERNATIVE SITES CONSIDERED

As described in Exhibit B.1, the following alternative sites were considered in developing the proposed configuration of the project:

- Restoration of the existing project facilities on the west bank of the river.
- Development of power facilities on the east bank of the river with the following two options.
 - Power facilities located upstream of Similkameen Falls with a tailrace channel below the fall (proposed Project).
 - Power facilities located downstream of Similkameen Falls

Exhibit B.1 presents an analysis of powerhouse location options. Environmental considerations in the selection of the proposed Project Site included effects to water quality, fisheries, and cultural resources, recreation, and visual resources.

Restoration of the existing Project on the west bank was rejected as described in Exhibit B.1. The following discussion compares the effects of the proposed project with the effects of the downstream alternative.

WATER QUALITY

It appears that the hydraulic control for the pool area below the falls is near the existing (old) powerhouse. For this reason, if the tailrace location and orientation do not allow flow and circulation to the upstream portion of the tailrace pool, the pool area below the falls could become stagnant at times when most of the river flow is diverted for power generation. This could degrade water quality, particularly during summer when temperature may increase and DO may decrease. This could affect fish using the area, and will affect the 401 water quality certification. These effects would be greater with the downstream powerhouse location.

The upstream powerhouse design proposes tailrace outfall options that appear to reduce potential conflicts in compliance with water quality standards. It is expected that water from the tailrace discharge would circulate in an eddy up to the base of the falls. This is because water will discharge to a deep pool that extends from the base of the falls downstream past the discharge point. Under this design, water quality at the base

of the falls should not be appreciably different from water quality just downstream from either tailrace location.

FISHERIES

The location of the proposed powerhouse should have no effect on fisheries. The location and orientation of the tailrace will have a substantial influence on the potential for the Project to impact fisheries resource. The selected location and tailrace design should minimize these effects (see Exhibits A and B). The proposed design (Kaplan turbines) is such that fish are unable to access the turbine, regardless of the choice of powerhouse location. The exception to this would be large steelhead or other large fish that might be able to enter the draft tubes during low flow periods. The tailrace design includes conical net barriers at the downstream end which would exclude any larger fish from entering the tubes. The nets are described in Exhibit B and Exhibit E.3.2.

Steelhead and Chinook salmon are known to spawn and rear in the Similkameen River below the Project, however redd densities immediately downstream of the Project are low and most spawning occurs in the lower reaches in the system. Sockeye are observed throughout the lower Similkameen River prior to spawning further upstream in the Okanogan River. The reach below the tailrace provides little spawning habitat for anadromous salmonids, but it does provide staging areas (cooler water refugia) that are important to the reproductive success of these species. The areas below the dam provide deep, low-velocity pools that have lower stream temperatures as compared to much of the remainder of the Okanogan basin. Salmonids, therefore, use these thermal refugia during the late summer and fall periods when temperatures are high elsewhere in the upper Okanogan system. They stay until thermal barriers are reduced, allowing the fish to access spawning sites.

Given the use of the area for staging and thermal refugia, the greatest potential effect on fish related to the location and orientation of the tailrace is the potential to affect water quality (and therefore the condition of the fish using the immediate area of the tailrace). The downstream powerhouse location has the greater potential to affect fish, as it provides less design flexibility to direct flow into the uppermost section of the tailrace pool. Therefore, water exchange/mixing may be minimal in the pool at the base of the falls if the downstream site is selected. If water in the upper portion of the pool is physically isolated, increased temperature and decreased DO may create habitat conditions that are less suitable for salmonids.

CULTURAL RESOURCES

Six cultural resources have been identified on the east bank of the Similkameen River in the vicinity of the proposed powerhouse location which include: the existing Enloe Dam (45OK368), the historic road (HR-2) to the operator's house, the pump house (HR-3), the Oroville-Tonasket Irrigation District Canal (HR-4), the original powerhouse foundation (45OK1239), and prehistoric/historic archaeological site (45OK367). Of these

six resources, only the existing Enloe Dam (45OK368) has been determined eligible for the NRHP (to be confirmed by SHPO). The other resources were determined not eligible for the NRHP, and thus will not be evaluated for Project impacts. At the request of the CRWG additional testing was conducted to confirm the NRHP eligibility of site 45OK367. The additional testing confirmed that the site was not eligible.

The powerhouse location decision should not affect the dam. Avoiding these additional resources would reduce the mitigation requirements.

RECREATIONAL RESOURCES

The upstream powerhouse location would have little effect on existing recreational uses which rely on the old access road (the exception would be that a local outfitter presently lowers his rafts down the steep rock face near the proposed powerhouse location). A park-like setting is available on the peninsula immediately above the current parking lot, and would be relocated landward of the peninsula, near the new parking area. Vehicles used for camping, loading and unloading boats, etc. would have to park in the new parking area.

The downstream location could create problems with security as access would be through and around the project, which could potentially limit access to areas below the dam. It might have been possible to avoid conflicts by routing access upslope to the east of the facilities, but this would have required construction of additional access facilities, including a stairway down a relatively steep slope. If access had been denied, recreational access to the river could have been provided at alternative locations, but that would have eliminated existing informal recreation which has developed at the site.

AESTHETIC RESOURCES

From a visual resources perspective, the existing environment already incorporates both man-made and natural elements, and thus is not a pristine, natural area. The restoration of the existing project facilities on the west bank of the river, therefore, would have minimal visual impacts due to the current existence of hydroelectric facilities, namely the existing powerhouse, penstock, and dam.

For the alternatives on the east bank of the river, GIS models and photographic simulations prepared for four KOPs selected for impact analysis in the *Draft Visual Resource Technical Report* (Appendix E.8.1), reveal that views of any east bank powerhouse would be very limited, whether it was located at the upstream or downstream site.

Viewpoints looking from the west to east side of the river are not open to public access; analysis is thus limited to views from the east looking up-river and down. Four viewsheds available to recreational users were analyzed. From two of them (Loomis-Oroville Road [KOP#1] and the Overlook [KOP#2]), both of the powerhouse location

alternates are mostly hidden from view due to the topography of the canyon. The approach channel and intake canal would be barely observable.

At the third location (Recreators' views from the rocks below Enloe Dam on the Similkameen River [KOP #3]), the views of either powerhouse location would seem to be slightly more extensive with the top portion of the facility being visible from this location. For both of the east bank alternatives, the powerhouse, penstock, and surge tanks on the west bank would be removed. Although the ruinous condition of these features are appealing to many people, their removal would also increase the visibility of native rocky canyon walls and vegetation and thus, partially restore the natural visual environment.

At KOP #4, looking west along the crest of the Enloe Dam, observers would see the new approach channel and intake canal and potentially observe a slight rise in water levels due to the introduction of the crest gates, but this site would not be open to the public and these modifications are minimal.

E.10.2 ALTERNATIVE FACILITY DESIGNS, PROCESSES, AND OPERATIONS CONSIDERED

The principal facility design alternative considered was the use of crest gates. Figure E.10-1 shows the areas that would remain inundated for longer seasons with five-foot crest gates in place. The environmental effects of installing crest gates primarily relate to the increase in pool level. Environmental considerations in the selection of crest gates included effects on water level and streamflow, fisheries, wildlife, riparian and wetland habitat, cultural resources, and recreation.

[Figure E.10-1]

STREAMFLOW DOWNSTREAM OF ENLOE DAM

The installation of crest gates will not affect the proposal to operate the project in a run-of-river mode. Therefore, the flow regime downstream of the project would be similar to natural inflow to Enloe Reservoir.

A potential project operation issue may be raised by short term downstream flow fluctuations during an unscheduled outage of the powerplant due to mechanical or electrical failure or a power transmission system outage. With crest gates, this problem can be addressed by operating the gates so that they spill and therefore maintain downstream flow. Without crest gates an additional bypass gate or valve may be required to maintain flow until either the powerhouse returns to service or there is sufficient overflow over the spillway to maintain downstream flow. This bypass would be an additional cost to the project and therefore the capability of the crest gates to maintain downstream flow in the event of an outage is an additional benefit of this option.

WATER LEVEL IN ENLOE RESERVOIR

The existing water level on Enloe Reservoir is influenced by the flow in the river and the elevation of the existing spillway at Enloe Dam. Since the reservoir is shallow, a backwater curve extends back from the water surface at the spillway to the head of the reservoir where the gradient of the water surface becomes that of the Similkameen River. If power generation were restored without crest gates then the water level on the reservoir would need to be lowered below the crest of the existing spillway to minimize spill over the dam and allow diversion of water through the intake, powerhouse and back to the river.

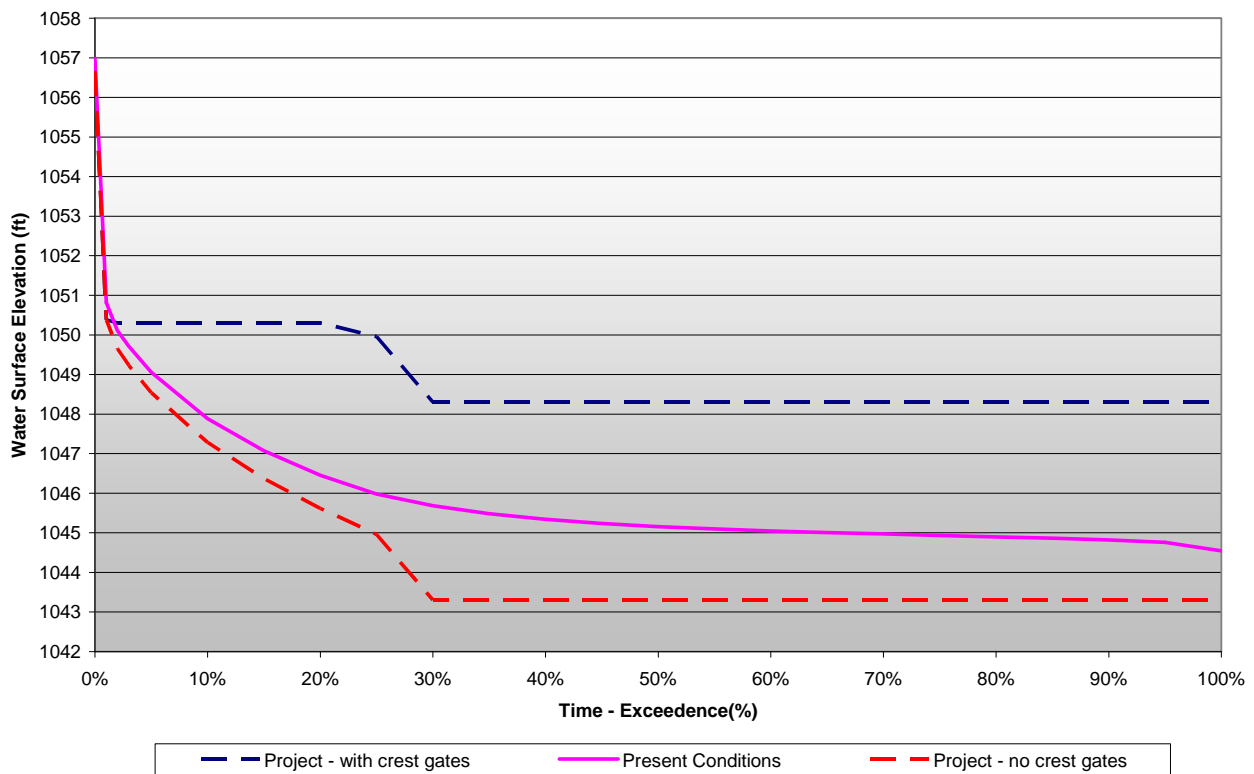
At times when the river flow exceeds the hydraulic capacity of the powerhouse (about 30 percent of the time) streamflow will flow both through the powerhouse and over the spillway. Crest gates will increase the water level of the reservoir, as shown on Figure E.10-2. The figure shows the time distribution of water surface elevation in the form of exceedance curves. These curves show that with the project the reservoir elevations would be stable 70 percent of the time and rise the remaining 30 percent of the time during the spring freshet period. During the 70 percent of time when reservoir elevation remains stable, the rise increase in water elevation normally would be held at approximately four feet. This would probably not substantially increase the width of the reservoir, given the steep sides of the valley along the existing reservoir.

With an increase in elevation, the reservoir would probably extend about 0.4 miles beyond Shanker's Bend. The inundation of the area around Shanker's Bend would convert 0.4 miles of lotic (flowing water) environment into a lentic (slow or pooled water) environment. The increased amount of lentic habitat could have a beneficial effect on lake-oriented and warmwater fish species. The decreased amount of lotic habitat would have a detrimental effect on those species requiring a stream-type environment during

part of their life history. For the most part this would be amphibians, macroinvertebrates, and small riffle dwelling fish like sculpins. Many of the species found in the reservoir provide potential sport fisheries opportunities (e.g., perch and bass) but many are introduced species. The native species found in the area (prior to the dam) use lotic habitats. Mountain whitefish could be affected if they spawn in the riffles presently found in the Shanker’s Bend area.

The curves also show the relationship of the two operating options to present conditions, and indicate that extreme elevations during large floods (shown at the left side of the graph) would not be significantly affected. In terms of maintaining stable water levels for riparian habitat, the crest gates offer less annual fluctuation in water levels than the present condition and restoring power generation without restoring the flashboards.

**Figure E.10-2
Projected Effect of Crest Gates on Upstream Water Levels at Enloe Dam**



WATER QUALITY AND FISHERIES

Maximum daily temperatures have been shown to be reduced as the Similkameen River flows through Enloe Reservoir in late summer. This cooling occurs as inflowing warm river water mixes with cooler water that is still moving through the reservoir from the previous night. Therefore, the deeper and slower moving water associated with a larger reservoir is not a concern for raising high daily water temperatures in the river.

FISHERIES

Five-foot high crest gates would have no significant effect on flows downstream of the project once the gates are elevated. The only fluctuation in flows would occur at the time the reservoir is initially filled (with the crest gates in place), and this would take place during relatively high flow conditions (late-spring or early summer, as the hydrograph is declining). Maintenance of the gates would not require filling of the reservoir behind the gates during any other time. An operation plan to raise the crest gates would need to be implemented to manage changes in discharge from the Project to protect fish spawning downstream of the dam. The operations plan would assure that water levels would be maintained to protect important downstream spawning and rearing areas for target fish species (e.g., salmonids). Criteria for raising and lowering the gates would include water levels for spawning as well as flood criteria.

Under an operations plan for raising the crest gates as flows drop, flow changes would not be detectible. The facility would maintain a run-of-the-river operation when the gates are raised or lowered, there would be no significant changes in flow and no corresponding effects on fish or fish habitat downstream of the project.

During an unscheduled outage of the powerplant, flow fluctuations downstream may occur. Compensatory downstream flows could be provided to minimize effects on fish habitat.

RIPARIAN & WETLANDS

Exhibit E.3.3 presents the acreage that is currently seasonally inundated, but would be permanently inundated by the Project with crest gates. About 12.2 acres would be affected. Up to 5.1 acres of herbaceous wetland or riparian vegetation could be inundated; some of these wetlands may qualify as jurisdictional and Other Waters of the United States. The new permanent inundation zone would include a seasonal pond located in a depression on the east side of the reservoir, between the dam and Shanker's Bend and herbaceous wetland and riparian habitat associated with that pond.

CULTURAL RESOURCES

There are historic and archaeological resources located near the existing waterline above the dam, which are not being recommended as eligible for the NRHP. The only NRHP-eligible resource that could potentially be affected by a 5 feet increase in pool elevation is 45OK532 (a pre-historic site).

RECREATIONAL RESOURCES

Limited recreational use is made of the immediate shoreline of the reservoir, other than at the dam itself and at the upper end at Shanker's Bend. Potential impacts to recreation would be primarily result from permanent inundation of informal recreation sites that are currently seasonally inundated.

The District proposes to re-locate a segment of the upstream access road, which is currently seasonally inundated. If the District's proposal is accepted, this portion of road would be restored to natural conditions but would be inundated for longer periods. The road would not be gated but would not be plowed in winter unless District personnel needed to use it. Snow is expected to close the road in winter. Alternative Electric Energy Sources Considered

Exhibit D, Section D.6 discusses alternative electrical energy sources considered. Although the District has not developed a specific electric energy alternative that would be pursued if the Project were not licensed, The District could increase market purchases from the Bonneville Power Administration (BPA). However, new load growth would need to be met by non-BPA power purchases or by "Tier 2" purchases (new, more expensive power resources) to be developed by BPA.

The District is developing an Integrated Resources Plan (IRP). The IRP includes market purchases, small biomass, wind, hydroelectric, conservation to meet projected District load growth. If a new large capital project were considered to replace market purchases, natural gas or coal-fired generation would be the most likely preferred sources.

Implementation of emissions-free hydroelectric generation would provide significant air quality benefits as compared to coal or natural gas generation. Project-equivalent emissions are calculated below for two hypothetical scenarios: 1) gas-fired combined cycle generation, and 2) coal-fired steam generation. Emissions are calculated on a maximum pounds per hour (lbs/hr) and an average tons per year (tons/yr) basis, using an hourly output of 9.0 MW (gross) and annual output of 47.3 GWh. Table E.10-1 characterizes theoretical increases in emissions for replacing 9.0 MW hydroelectric capacity at a 59 percent annual capacity factor.

GAS-FIRED COMBINED CYCLE EQUIVALENT EMISSIONS

Combined cycle generation (i.e., gas turbine, heat recovery steam generator, and steam turbine) was analyzed with current Best Available Control Technology (BACT) emission controls for nitrogen oxides (NOX), carbon monoxide (CO), reactive organic compounds (ROC), 10-micron particulate matter (PM10), and sulfur oxides (SOX). Byproduct ammonia (NH3) slip from Selective Catalytic Reduction (SCR) NOX control technology is also calculated. Carbon dioxide (CO2) emissions are based on the stoichiometric gas emission factor of 115 lb/mmBTU.

Gas-fired combined cycle emission factors in units of lb/mmBTU for NO_x, CO, ROC, and NH₃ are derived from permit conditions for a recently constructed new 250 MW (nominal) combined-cycle gas turbine generating unit. Emissions factors for PM₁₀ and SO_x are taken from USEPA AP-42, Section 3.1, Stationary Gas Turbines, April 2000. Emission factors were converted from units of lb/mmBTU to units of lb/MW-hr, using an average heat rate of 7.110 mmBTU/MW-hr (equivalent to 48 percent average thermal efficiency). Equivalent hourly and annual emissions are shown in Table E.10-1.

Table E.10-1. Equivalent Gas-Fired Combined Cycle Emissions

Equivalent Project Combined Cycle Generation	Hourly	NO _x lbs/hr	CO lbs/hr	ROC lbs/hr	PM ₁₀ lbs/hr	SO _x lbs/hr	NH ₃ lbs/hr	CO ₂ lbs/hr
Capacity Factor 100%	9.0 MW	0.47	0.29	0.16	0.42	0.04	0.44	7,359
Capacity Factor 59%	46,500 MW	1.22	0.74	0.42	1.09	0.10	1.13	19,011

COAL-FIRED EQUIVALENT EMISSIONS

Coal-fired generation (i.e., steam boiler and steam turbine) typically operates with particulate matter (PM₁₀) controls (electrostatic precipitators or baghouses). Emissions of NO_x, CO, ROC, and SO_x are assumed to be uncontrolled, and were characterized based on a currently operating large central station coal plant (Mohave Generating Station). Actual 2005 emissions at Mohave were used to compute NO_x, SO_x, and CO₂ emission factors. CO, ROC, and PM₁₀ emission factors for coal are based on data contained in AP-40, the Air Pollution Engineering Manual. Emission factors were converted from units of lb/mmBTU to units of lb/MW-hr, using the Mohave design heat rate of 10.682 mmBTU/MW-hr (equivalent to 31.95 percent average thermal efficiency). Equivalent hourly and annual emissions are shown in Table E.10-2.

Table E.10-2. Equivalent Coal-Fired Emissions

Equivalent Project Coal Fired Generation	Hourly	NO _x lbs/hr	CO lbs/hr	ROC lbs/hr	PM ₁₀ lbs/hr	SO _x lbs/hr	CO ₂ lbs/hr
Capacity Factor 100%	9.0 MW	38.07	2.60	0.30	5.38	76.14	19,708
Capacity Factor 59%	46,500 MWh	98.35	6.71	0.77	13.91	196.70	50,913

E.10.3 CONSEQUENCES OF LICENSE DENIAL

WATER USE AND QUALITY

Without the Project, conditions would generally remain the same for water quality constituents in the lower Similkameen River. Except in the bypass reach, differences in summer water temperatures are not expected with or without the Project. Not constructing the Project would leave more water flowing between the dam and falls; thus, the bypass reach may be less subject to heating in the summer months without the Project. However, because the bypass reach provides little or no fish habitat, reducing the occurrence of high temperature and low dissolved oxygen conditions by maintaining the full river flows through this approximately 100-yard reach provides minimal benefits to aquatic life. More importantly, diverting up to 1,600 cfs around the dam and falls could provide considerable reduction in the high total dissolved gas (TDG) conditions that would continue without the Project. The most important water quality consequence of not implementing the Project would be that the occurrence and magnitude of high TDG conditions would not be reduced because the full river flows would continue to pass over the dam and falls.

FISH

If the license were denied, there would not be any prevention, mitigation, or enhancements measures initiated to enhance the fisheries resource. Since the dam exists, some of the effects to fisheries that exist today would continue with no mitigation provided to offset current effects. For example, TDG is known to be above protective standards for fish as the facility exists. By diverting water through the hydroelectric plant, it is expected to reduce spill over the dam and therefore reduce the potential for TDG exceedance during certain flow scenarios. If the license is denied, some impacts to fisheries resources would not occur. With the Project, there could be some loss of small resident fish (about 5% mortality) through entrapment or entrainment related to the intake structure. Changes in water elevation due to the operation of the crest gates would not occur, which would have increased slow moving water habitat and decreased riverine-type habitat. In general, there would likely be a benefit to fisheries downstream of the dam (especially salmon fisheries below the project) if the Project were built and TDS levels reduced.

BOTANY

If the license were denied, certain impacts to botanical resources would not occur, including 1) loss of a small amount of riparian vegetation for the construction of the intake structure, 2) limited impacts to upland vegetation from construction of the powerplant and a new access road, and 3) vegetation type changes from changes in the water elevation due to the operation of the crest gates. Because no mitigation actions would be implemented, impacts to riparian vegetation from use of the existing access road, grazing, and public use would continue. Continued accumulation of sediment in the reservoir reach could result in changes in shoreline vegetation. Because

these changes would depend on the distribution of the accumulated sediment, it is not possible to predict whether there would be an increase in riparian and wetland vegetation, a decrease, or only a shift in the vegetation types present at various locations along the reservoir reach of the Similkameen River.

WILDLIFE

The consequences of license denial on the wildlife resources would be relatively minor. Indirect effects could result from continuing deterioration of riparian habitat bordering the dirt road paralleling the east side of the reservoir. Use of off road vehicles could affect riparian and wetland habitat bordering the road. Although a relatively small proportion of the total riparian habitat would be affected by the continuation of this activity, riparian habitat is the highest value habitat and supports the highest species diversity of wildlife in Project Area. In summary, effects would be limited to a small number of animals and small proportion of the available habitat in the Project Area.

CULTURAL RESOURCES

This section describes effects to the historical and archaeological resources in the Project Area as a consequence of license denial. Additional information about Traditional Cultural Properties within the APE is included in the TCP report, which is Appendix A to the Cultural Resources Section 106 Technical Report.

HISTORICAL RESOURCES

Two historical resources within the Project APE are currently listed on the NRHP. The 1920 Enloe Dam and Powerhouse (45OK368) were listed in the NRHP in 1978. A third resource, the abandoned Great Northern Railway, located along the western edge of the Similkameen River, embodies integrity of location, setting, and feeling and is eligible for the National Register.

If the license application were denied, there would be no significant impact to the Great Northern Railroad Grade (HR-1). However, the NRHP-listed Enloe Dam and Enloe Powerplant and Penstock would not be maintained and would deteriorate further. The existing facilities would likely continue to deteriorate if the license were denied. The overall deteriorated state of the powerhouse is defined by its missing roof, damaged structural walls and missing or broken windows. Even without the bridge that once crossed over the river making access to the powerhouse easier, vandalism has continued to occur.

ARCHAEOLOGICAL RESOURCES

Six cultural resources have been identified on the east bank of the Similkameen River in the vicinity of the proposed powerhouse locations which include the existing Enloe Dam (45OK368), the historic road (HR-2) to the operator's house, the pump house (HR-3), the Orville-Tonasket Irrigation District Canal (HR-4), the original powerhouse foundation (45OK1239), and prehistoric/historic archaeological site (45OK367). Of these six

resources, only the existing Enloe Dam (45OK368) has been determined eligible for the NRHP. The other resources were determined not eligible for the NRHP, and thus will not be evaluated for project impacts.

The location of the powerhouse would not change effects to cultural resources

SOCIO-ECONOMIC IMPACTS

Without the Project, the socioeconomic benefits of its construction documented in Exhibit E.5 would not occur. These include the loss of temporary construction employment opportunities and the associated community business revenues from local spending of payroll, for both relocated personnel and locally hired employees. Therefore, taxable revenues would also be lower than under the “with Project” alternative. There is also the potential for changes in electricity rates, due to continued reliance on other sources of electricity. The cost of energy to the District’s ratepayers would likely increase.

GEOLOGICAL AND SOIL RESOURCES

With the exception of the area immediately upstream and downstream of Enloe Dam, implementation of the proposed project would have minimal impacts to soils and geological resources, and the consequences of license denial would likewise be minimal. In either case, slope stability and soil conditions around the impoundment will not be affected. The river will continue to transport bed-load and fine sediments through the Project Area with or without construction of the hydroelectric generation facilities.

Without the Project, however, there would be no disturbance of soils or excavation of bedrock on the east bank of the river around the existing dam. The existing sediment bar on the left side of the forebay would remain undisturbed, and sediment would continue to accumulate there.

RECREATIONAL RESOURCES

Recreational use of the area is informal and is not dependent on measures or facilities provided by the District, with the exception of the warning signs and safety barriers near the dam. Informal recreation would continue along the east bank, including public access to the river, informal camping, sightseeing, fishing, boating, recreational gold mining, and hunting.

The District will continue to maintain warning signs and safety barriers whether or not its License Application is approved. There could be some increase in risk to recreational users if the original project features deteriorate over time.

It is not anticipated that denial of a license would affect the planned non-motorized public access trail that Okanogan County plans to construct west of the Similkameen River. Development of that trail may result in increased visitor use of the dam site

because Enloe Dam and the appurtenant facilities will be visible from the trail and more people are likely to become aware of them. Impacts of increased use would be addressed through adaptive management if the Project were licensed; denial of a license may result in un-managed impacts such as erosion, soil compaction, and littering.

AESTHETIC RESOURCES

No perceptible changes to naturally-occurring visual resources would be apparent, while man-made visual resources, such as the existing powerhouse, surge tanks, and penstock would continue to gradually degrade.

LAND USE

If the District were denied a license for the Enloe Hydroelectric Project, there would be few consequences related to land use. Visitors are expected to be allowed to continue to use the existing County access roads to reach the dam site. Access to the dam site would not be improved, and the south access road would continue to deteriorate.

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