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	New risks identified since July 29, 2019	New risks identified or changed probabilities/impacts since February 25, 2020
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Klamath River Renewal Project - Risk Management Plan

Attachment A Risk Register (KRRC-Owned Risks)

										New risks identified since July 29, 2019		
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Risk ID	Risk Category	Risk Description	Root Cause(s)	Phase When Actualized	Probability (P)	Impact (I)	Risk Weight (P x I)	Overall Rating	KRRC Management Strategy	Risk Management Measure	Risk Owner	Risk Status
Post-GMP												
13	Post-GMP	Increased development Increased development within the floodplain beyond mitigations already included requires additional flood mitigation beyond what is planned.	City/county allows construction permits to be issued to developers	Post-GMP	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Accept	Coordination with appropriate agencies; Consider an early CLOMR application to Counties.	Owner	Open
100	Post-GMP	Irongate Flow Continuation FERC Req: The additional redundancy for a 3rd IFR release facility is still required. Currently not being designed by KP/Kiewit. Risk of being required in the future.	Flow continuation requirement results in constraint on design that increases cost or lengthens schedule	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Manage	Pursue clarity on this requirement ASAP through discussions with PacifiCorp and FERC.	Owner	Open
Field Conditions												
19	Field Conditions	Field Conditions General changed field condition (geotechnical, existing utilities, hazardous materials, and biological resources) leads to redesign, project delays and/or cost overruns.	Field condition differs from documented findings	Construction	5 Very Likely (60-100%)	1 Very Low	5	Med	Manage	Comprehensive field investigation and documentation.	Owner / LTC Owner: To the extent that items are not included in Existing Conditions Report (ECR); PDB: To the extent that they did not properly assess conditions. LTC: To the extent that they did not properly assess conditions; LTC also takes liability for changing circumstances after dam removal leading to greater than anticipated work/changed permit conditions.	Open
41	Field Conditions	Non-burial Related Cultural Resource Discoveries Unanticipated non-burial related cultural resources (foundations, barns, etc.) discovered during reservoir drawdown or construction (beyond current allowance). Costs exceed allowances	Non-burial cultural resource not disclosed or already known about	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Transfer	Identification of existing cultural resources to the extent feasible; Ongoing coordination with Native American groups and local historical societies; Development of treatment measures that would implemented following drawdown or during construction.	Owner / LTC Owner: Responsible for monitoring, delay, or transportation costs related to unknown site conditions; PDB: Responsible for not disrupting known site condition. LTC: In respect of unknown site conditions that are discovered, subject to regulatory and permit language being finalized, LTC will be responsible for modifying design without compensation. Responsible for not disrupting known site conditions.	Open
43	Field Conditions	Burial Related Cultural Resource Discoveries Unanticipated burial related conditions may exist. Including sites, human remains, or funerary items discovered within reservoir areas during reservoir drawdown - requiring cessation of construction activities for a long duration. Discovery impacts ability to perform construction - primarily Yreka waterline, Fall Cr Hatchery, Iron Gate Hatchery, and bridges.	Burial site not disclosed or already known about	Construction	4 Likely (40-59%)	3 Moderate	12	Med	Transfer	Identification of existing cultural resources to the extent feasible; Ongoing coordination with Native American groups and local historical societies; Development of an Inadvertent Discovery Plan, Monitoring Plan, and NAGPRA Plan of Action, and rapid response plan to address the possibility of burial sites becoming exposed during drawdown.	Owner / LTC Owner: Responsible for monitoring, delay, or transportation costs related to unknown site conditions; PDB: Responsible for not disrupting known site conditions. LTC: In respect of unknown site conditions that are discovered, subject to regulatory and permit language being finalized, LTC will be responsible for modifying design without compensation. Responsible for not disrupting known site conditions.	Open
16b	Field Conditions	Cultural Resource Damage Damage to UNKNOWN sites. Would trigger an un-controlled circumstance. Delay to construction.		Construction	5 Very Likely (60-100%)	2 Low	10	Med	Manage		Owner	Open
Construction												
33	Construction	Cofferdam Failure Failure of temporary cofferdams result in demolition delays.	Unconservative design of cofferdams; unanticipated foundation conditions	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Transfer	Comprehensive field investigation, review of original construction, and design review.	Owner / PDB Owner: Responsible for unknown site conditions. PDB: Has design liability for known site conditions.	Open
35	Construction	Hazardous Material - Unforeseen Condition Discovery or release of unknown hazardous material (other than from construction activities) to river during construction (unforeseen condition) may lead to cost impacts.	Project results in unanticipated release of hazardous material into river	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Transfer	Completion of the Phase 1 hazardous material assessments and follow-up evaluations, appropriate health and safety qualifications, experience and other requirements during the procurement process, implementation of BMPs to avoid or contain the release of hazardous material, as well as active overview and enforcement of the Contractor's Hazardous Material Management Plan.	Owner	Open
51	Construction	Diversion Blockage Rapid-drawdown causes slope instability leading to rock slope failure, blocking the diversion intake. This failure will lead to schedule delays and significant cost impacts.	Design analyses unable to cover all geologic conditions and slope geometries; insufficient data	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Share	Comprehensive field investigation and design review; Develop slope monitoring plan for implementation during drawdown; Stockpile riprap for repairs of slope if local failures occur.	Owner / PDB Owner: Responsible for unknown site conditions. PDB: Has design liability for known site conditions.	Open

Attachment A Risk Register (KRRC-Owned Risks)

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192	Construction	Dredging upstream results in unforeseen conditions that increase cost and delay schedule.	If exploratory dredging is completed upstream of Copco No. 1 and significant debris is identified, it may result in increased costs to remove prior to drawdown	Construction	3 Less Likely (20-39%)	4 High	12	Med	Manage	PDB to attempt to complete 2020 dredging.	Owner	Open
85	Construction	JC Boyle Power Canal Scaling: Power Canal Concrete Removal (Full), requires extensive scaling, slope stabilization, worker safety mitigation.	Unanticipated safety related slope scaling/stabilization is necessary to maintain worker safety	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Manage	Kiewit to compare cost of alternatives (Partial versus Full Removal). KRRC decision.	Owner	Open
86	Construction	JC Boyle Scour Hole: Scour Hole filling from the top as proposed by Kiewit is not accepted, will require more extensive laying back of the slopes to facilitate safe access from the bottom, as proposed in the Definite Plan.	BLM does not agree to current design approach to filling the scour hole.	Construction	3 Less Likely (20-39%)	2 Low	6	Med	Manage	KP to prepare 60% Design to allow permitting and approvals to proceed. KRRC BLM lead to coordinate with BLM on acceptance of proposed approach.	Owner	Open
184	Construction	PacificCorp Early Exit: PacificCorp walks away from site early, cannot manage water thru powerhouses during pre-drawdown year, dams just spilling and unable to appropriately control during dam modification work.	PacificCorp negotiates an early exist from the site, thereby requiring KRRC to operate facilities during drawdown	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Manage	Update O&M agreement with needed new items.	Owner	Open
202	Construction	Builders Risk Deductibles	Kiewit excluded a certain number of builders risk incidents. IF these are required, costs may increase	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Manage	Kiewit excluded a certain number of builders risk incidents. Would be \$100k per incident. Assuming overall risk is 2-3 instances.	Owner	Open
180	Construction	Process Water Treatment: Water treatment needed for process water.	If regulatory process results in a requirement to treat process and dewatering water, it could increase cost	Construction	3 Less Likely (20-39%)	2 Low	6	Med	Manage	Proative discussion/negotiation with applicable regulatory agencies.	Owner	Open
196	Construction	Unanticipated Debris Loads: More garbage than expected after drawdown.	Significant amount of unanticipated trash and debris remains post-drawdown and requires removal	Construction	4 Likely (40-59%)	1 Very Low	4	Med	Manage	Consider allowance for debris removal.	Owner	Open
210	Construction	Jenny Creek Stability Analysis: not accepted by Siskiyou County.	Siskiyou Co. reviewers do not agree with assessment, requiring additional work and cost	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Manage	KP developed report provides options of creek stabilization based on differing flow analysis. Original Jenny Creek Bridge design based off old hydraulic data, risk of requiring new stabilization with updated analysis.	Owner	Open
Reservoir Drawdown												
46	Drawdown	Unanticipated Erosion Reservoir drawdown and subsequent operations results in a greater than anticipated level of erosion at bridges or along channel creating passage barrier. This is likely to lead to additional cost.	Local hydrodynamics result in greater than modeled erosion or scour	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Manage	Comprehensive design review; Design additional scour protection for bridges if determined to be needed; Develop monitoring and mitigation plan for during and post reservoir drawdown.	Owner / PDB Owner: Responsible for unknown site conditions. PDB: Has design liability for known site conditions.	Open
47	Drawdown	Unanticipated Effects on Diversion Intakes Reservoir dewatering and subsequent operations have greater than anticipated effects on diversion intakes for irrigation/livestock. This may lead to additional cost.	Greater than predicted suspended sediment and bedload movement	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Share	Comprehensive field investigation and design review; Develop plan for monitoring/mitigating intakes during reservoir drawdown.	Owner / PDB Owner: Responsible for unknown site conditions. PDB: Has design liability for complying with plans and approach.	Open

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48	Drawdown	Unanticipated Effects on Groundwater Wells Reservoir dewatering and subsequent operation has greater than anticipated effects on groundwater wells. This may lead to additional cost.	Difficult to investigate and analyze groundwater relationships	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Accept	Comprehensive field investigation and design review; Implement Groundwater Well Management Plan for evaluating changes in groundwater post-reservoir drawdown and proactively mitigate impacted wells.	Owner (LIMF) / PDB Owner: While owner has certain responsibilities, this is handled separately in the funding set aside for the LIMF and does not add to post-GMP contingency. PDB: Has design liability for complying with plans and approach.	Open
49	Drawdown	Unanticipated Effects on Channel Flooding Reservoir dewatering and subsequent operations have greater than anticipated effect on downstream channel aggradation/flooding. This may lead to additional cost.	Evacuated coarse sediment is greater than anticipated leading to increased channel aggradation and associated flooding	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Accept	Rigorous assessment on transport and flooding during detailed design; Monitoring post-drawdown; Raise awareness that active channel management program needed; Implement measures to manage channel aggradation and flood risk.	Owner (LIMF) / PDB Owner: While owner has certain responsibilities, this is handled separately in the funding set aside for the LIMF and does not add to post-GMP contingency. PDB: Has design liability for complying with plans and approach.	Open
50	Drawdown	Downstream Public Safety Public safety risk in downstream channel during the reservoir drawdown.	Outreach and public safety measures insufficient to keep out public creating potential risk to public safety during drawdown (increased flows)	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Share	Comprehensive education and outreach plan; Detailed review and QA of safety program; Development of a Reservoir Dewatering Awareness Plan that will include procedures for notifying public of the schedule and anticipated flows for reservoir drawdown.	Owner / PDB Owner: To the extent this risk is unavoidable. PDB: To the extent that safety issues are due to contractor fault.	Open
Contractor Performance												
84	Contractor Performance	Labor Strike Construction shutdown due to labor strike may impact schedule and cost	Labor conditions results in a strike by construction workers	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Share	Include Contract requirements for living conditions in camps and worker safety.	Owner / PDB Owner: Responsible for a national strike. PDB: Responsible for this risk which is due to labor conditions.	Open
Dams, Powerhouses, Reservoirs												
32	Dams	Slope Failure Copco lake reservoir rim or local slope failure along access roads may lead to additional cost and schedule delay.	Slope instability, inadequate access road condition assessment prior to construction. Design analyses unable to be made for all geologic conditions and slope geometries; insufficient data	Construction	2 Unlikely (10-19%)	4 High	8	Med	Share	Comprehensive field investigation and design review; Develop plan to address slope failures along Copco Road if they were to occur during reservoir drawdown.	Owner (LIMF) / PDB Owner: While Owner has certain responsibilities, this is handled separately in the funding set aside for the LIMF and does not add to post-GMP contingency. PDB: Has design liability for complying with plans and approach.	Open
55	Dams	Diversion Tunnel Intake Blocked Copco No. 1 and/or Iron Gate Dam diversion tunnel intake blocked by debris during drawdown reducing flow capacity. This may lead to schedule delays and increased costs.	Debris within reservoir blocks intake	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Share	Maximizing the size of the intakes to match the size of the gates; Design debris grating for intake with ability to clear debris from grating.	Owner / PDB Owner: To the extent this risk is unforeseen. PDB: Aware that there will be some debris and contractor responsible for designing appropriate solution.	Open
65	Dams	Dam Failure Iron Gate Dam or J.C. Boyle Dam overtopped during excavation by storm water flows in excess of 100-year event resulting in dam failure. This would lead to additional cost.	Climate change; increased variability in precipitation patterns	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Accept	Require that the dam height during excavation not be less than needed to safely pass a 100-year event through the diversion tunnel; Completion of the FERC Potential Failure Modes Analysis process; Implement EAP, if necessary; Close coordination with the FERC regional office and state dam safety authorities.	Owner Owner: Within the contract, the owner has responsibility if IFC docs are not ready in time for Kiewit to begin construction; however, the risk would be passed on to CDFW/PacifiCorp who are ultimately responsible for design and funding related to the hatchery. PDB: Responsible to the extent that they have the agreed upon time to do the work and do not meet their schedule.	Open
66	Dams	Hatchery Delay Iron Gate and/or Fall Creek Hatchery is not brought online in time to begin drawdown. This may lead to schedule delay.	PacifiCorp does not move forward with planning, designing, costing, and seeking approval for hatchery designs. Inadequate planning, equipment, staff, technical issues, or unfavorable weather	Construction	3 Less Likely (20-39%)	3 Moderate	9	Med	Manage	Rigorous design of replacement supply; Pilot treatment technology; Proactive QA/QC during construction.	Owner / PDB Owner: Within the contract, the owner has responsibility if IFC docs are not ready in time for Kiewit to begin construction; however, the risk would be passed on to CDFW/PacifiCorp who are ultimately responsible for design and funding related to the hatchery. PDB: Responsible to the extent that they have the agreed upon time to do the work and do not meet their schedule.	Open
Yreka Water Supply Pipeline												
74	Yreka	Design Changes by City of Yreka Design review by City of Yreka may result in changes to design. Coordination or other design delays related to City of Yreka water system design.	Lack of coordination or agreement on design process or details	Post-GMP	3 Less Likely (20-39%)	1 Very Low	3	Low	Manage	Proactive coordination with City engineers on process and design requirements; Strict adherence to schedule milestones and KRRC QA process; Keep Designer under KRRC/AECOM control so payments can be withheld due to schedule delays.	Owner Owner: Within the contract, the owner has responsibility if IFC docs are not ready in time for Kiewit to begin construction; however, the risk would be passed on to CDFW/PacifiCorp who are ultimately responsible for design and funding related to the hatchery. PDB: Responsible to the extent that they have the agreed upon time to do the work and do not meet their schedule.	Open

Attachment A Risk Register (KRRC-Owned Risks)

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100	Yreka	Yreka Water Supply Construction Delays Yreka Water System Pipeline Crossing is not constructed in time for dam removal start. If this happens it pushes the dam removal to next calendar year. Differing Site Condition claim during Yreka Water Supply Pipeline Crossing Construction. On-site investigation shows much more complex.	Unforeseen seasonal flow condition in-river, and other unforeseen adverse conditions (e.g., geology) impacting construction schedule.	Construction	3 Less Likely (20-39%)	2 Low	6	Med	Manage	Consider obtaining permits early; consider approved in-river work window for fish protection and other potential risks to construction schedule in planning for contingencies - in order to complete construction in-time for the dam removal start.	Owner / PDB Owner: To the extent IFC docs and permits aren't obtained in time for PDB to begin work. PDB: To the extent that they begin work on schedule but don't complete it on time.	Open
External Events												
9	External Events	Uncontrolled Circumstances Uncontrollable circumstances (e.g. force majeure, war, terrorism)	Uncontrolled circumstances	Construction	1 Very Unlikely (1-9%)	3 Moderate	3	Low	Accept	Prepare Emergency Response Plan (PERP) and require Contractor to prepare their own PERP.	Owner / LTC Owner: To the extent this risk is unforeseen (as defined in the Project Company agreement). LTC: Within the RES agreement, uncontrollable circumstances are extremely limited such that the LTC has to cover the majority of them.	Open
20	External Events	Extreme or Wet Weather Hotter- or colder-than-expected weather causes work stoppage and schedule delays. Wetter-than-expected weather or flows higher than expected during instream construction window increases costs and causes delays.	Climate change; Hydrology	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Accept	Weather analysis during construction planning needs to foresee heat/cold delays; consider including greater than average number of excessive heat/cold days; for hot weather, consider ways to increase night work without affecting noise levels. Rigorous flow analyses during planning/design; Consider defining anticipated rain days in contract as a number greater than average; Define flow return period; Contract requirement for contractor plan for wetter-than-expected weather.	Owner / LTC Owner: To the extent this risk is unforeseen (as defined in the Project Company agreement). LTC: Within the RES agreement, LTC would be responsible for this risk.	Open
22	External Events	On-site Fire Fire in watershed causes on-site fire damage	Lightning; Accidental; Arson	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Share	Fire Management Plan has been developed and Contractor will be required to prepare their own Fire Management Plan.	Owner / PDB / LTC Owner: Responsible for force majeure. PDB: For fire resulting from fault. LTC: Responsible for any item resulting from LTC fault; LTC does not have relief for this type of force majeure event once their work begins.	Open
24	External Events	Earthquake - During Construction Earthquake damages temporary construction leading to additional cost and schedule delays.	Earthquake occurs near project	Construction	1 Very Unlikely (1-9%)	2 Low	2	Low	Accept	Consider specifying a contract defined design earthquake for temporary construction.	Owner / PDB / LTC Owner: Responsible for force majeure. PDB: Builder's Risk may apply in some instances (depending on exclusions ultimately negotiated). LTC: Does not have relief for this type of force majeure once the work begins.	Open
79	External Events	Domestic Terrorism Domestic terrorism or actions to disrupt or stop project during construction may lead to schedule delays.	Extreme opposition to project	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Accept	Develop site security plan that includes project response to different scenarios for disruption of project by domestic terrorists.	Owner	Open
114	External Events	Confiscation by Governmental Body Government confiscates resources or stops work.	External events (disaster, etc.)	Construction	1 Very Unlikely (1-9%)	2 Low	2	Low	Accept	N/A	Owner	Open
115	External Events	Circumstances Affecting Suppliers External events (disaster, etc.) affect the ability of PDB to acquire supplies and materials.	External events (disaster, etc.)	Construction	1 Very Unlikely (1-9%)	2 Low	2	Low	Accept	Early coordination with suppliers to avoid supply limitations.	Owner	Open
72	External Events	PacifiCorp - Access challenges/ Coordination of Work Delays	PacifiCorp access constraints result in schedule delays	Post-GMP	3 Less Likely (20-39%)	2 Low \$1.5M	6	Med	Manage	Develop plan during prelim services for needed PacifiCorp involvement during construction. Address in a revised O&M agreement.	Owner	Open

Attachment A Risk Register (KRRC-Owned Risks)

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Risk ID	Risk Category	Risk Description	Root Cause(s)	Phase When Actualized	Probability (P)	Impact (I)	Risk Weight (P x I)	Overall Rating	KRRC Management Strategy	Risk Management Measure	Risk Owner	Risk Status
Other												
211	Contract Issues	Contract Disputes - Contract disputes between contractors increase as a result of splitting Kiewit/RES contracts.	Disagreement over who is responsible for work or issues pertaining to work	Post-GMP	2 Unlikely (10-19%)	2 Low	4	Low	Manage	Work closely on related work protocol, ongoing partnership meetings and conversations to determine where there may be overlap.	Owner	Open
212	Insurance	Pollution Events - Construction resulting in pollution / environmental issues cause KRRC to pay for deductibles on pollution policies.	Pollution event requires triggers insurance	Post-GMP	4 Likely (40-59%)	1 Very Low	4	Med	Accept	Carefully implement BMPs and review all documentation and develop plans to mitigate exposure to this risk.	Owner	Open
213	Field Conditions	Reliance Documents - Reliance documents may be inaccurate , leading to errors in design.	Once on site, PDB discovers reliance documents were inaccurate	Post-GMP	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Manage	Limit number of reliance documents since not finalized until project implementation date.	Owner	Open
214	Insurance	Cost of Premiums - Estimated costs of premiums for insurance are too low given that estimates are determined over a year in advance.	Estimat for premiums is too low since estimate was made over a year in advance of securing insurance	Post-GMP	4 Likely (40-59%)	2 Low	8	Med	Accept	Seek pricing updates regularly; regularly review insurance approach in light of changing insurance industry.	Owner	Open
215	Contract Issues	Contract QA/QC Issues - Given the complexity of the contract, the contract ends up being difficult to interpret or operationalize.	Once project implemntation begins, it is determined that there are either errors in the contract that need to be renegotiated or terms that are vague and difficult to operationalize.	Post-GMP	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Manage	Work closely with the project team, peer review of contracts, clarity on related work protocol, etc.	Owner	Open

Attachment A Risk Register (PDB-Owned Risks)

New risks identified since July 29, 2019

Risk ID	Risk Category	Risk Description	Root Cause(s)	Phase When Actualized	Probability (P)	Impact (I)	Risk Weight (P x I)	Overall Rating	Risk Management Measure	Risk Owner	Risk Status
Environmental & Permitting											
112	Environmental & Permitting	Permit Reopener Changes during construction that require an amendment to a permit.	Unforeseen or changed site condition requires altering planned construction and project impacts which require a change to a permit. Design change by PDB to save costs or time.	Construction	2 Unlikely (10-19%)	3 Moderate	6	Med	Flexible project descriptions that allow for design options; Comprehensive field investigation and documentation.	PDB / LTC	Open
27	Environmental & Permitting	Construction Permits PDB may be unable to obtain construction permits (e.g. County encroachment permits) in time for construction. This may lead to schedule delays.	Poor planning, insufficient communication, difficulty negotiating requirements	Post-GMP	3 Less Likely (20-39%)	2 Low	6	Med	Owner coordination with Contractor for proactive communication with Counties; Contingency planning for delayed start during first year of construction.	PDB	Open
42	Environmental & Permitting	Cultural Resource Damage Known cultural resource may be damaged during construction. This may lead to a cost impact.	Mitigation measures fail to protect resource	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Identification of existing cultural resources to the extent feasible; Ongoing coordination with tribes and local historical societies to assess potential damage and identify measures.	PDB / LTC	Open
68	Environmental & Permitting	Downstream Biological Resource Damage Greater than anticipated effect on downstream biological resources may lead to additional costs.	Effect of suspended sediment causes greater than anticipated impact to given species	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Develop appropriate aquatic resource measures through coordination with the regulatory agencies; Implement risk management measures to address effect on downstream resources.	PDB / LTC	Open
71	Environmental & Permitting	Bat Loss Bat roosts do not meet success criteria requiring additional mitigation, which may lead to additional cost in fines.	Predictive model of bat roost effectiveness is incorrect	Post-Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Agency input into performance requirements in DB contract and design; Proactive QA/QC during construction. Cost estimates should assume prudent amount of replanting or other habitat maintenance.	PDB / LTC	Open
72	Environmental & Permitting	Habitat Restoration Unanticipated maintenance or repair required during regulatory monitoring and reporting period (e.g. plant establishment, tributary passage blockage, etc.). Habitat restoration may lead to additional cost.	Constructed project component does not meet agency expectations	Post-Construction	2 Unlikely (10-19%)	2 Low	4	Low	Agency input into performance requirements in DB contract and design; Proactive QA/QC during construction. Cost estimates should assume prudent amount of replanting or other habitat maintenance.	PDB / LTC	Open
86	Environmental & Permitting	Restoration Materials Unavailable Local restoration materials (seed, plants) may not be available. This may lead to schedule delays and increased costs.	Insufficient quantities available for collection or insufficient quantities produced by propagation	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Early collection of seed and nursery propagation of plants for restoration prior to award of DB contract.	PDB / LTC	Open
96	Environmental & Permitting	Proliferation of Weeds Weeds outcompete native plants and site restoration goals are not met. This may lead to a cost impact for the project. More monitoring at the end of tail end.	Proliferation of weeds	Post-Construction	2 Unlikely (10-19%)	2 Low	4	Low	Contract warranty period; Post-construction maintenance requirements in contract.	PDB / LTC	Open
Post-GMP											
25	Post-GMP	Contractor Rework Design errors or omissions lead to Project delays or cost overruns	Designer error	Construction	3 Less Likely (20-39%)	2 Low	6	Med	Comprehensive design review; proactive QA/QC.	PDB	Open

Attachment A Risk Register (PDB-Owned Risks)

New risks identified since July 29, 2019

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Field Conditions											
36	Field Conditions	Sediment Access Reservoir sediment may be more difficult to access than anticipated, causing construction delays (restoration)	Lack of material properties understanding	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Comprehensive investigation and testing during planning and detailed design phase (with PDB).	PDB / LTC	Open
Construction											
82	Construction	Hazardous Material - Construction Activities Discovery or release of hydraulic oil or other hazardous material from construction equipment or remediations may be released into the river during construction. This may lead to additional costs.	Contractor mechanical equipment failure results in unanticipated release of hazardous material into river	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Contractor required to develop a Spill Prevention, Control, Countermeasure (SPCC) Plan and active overview and enforcement of the SPCC Plan.	PDB	Open
70	Construction	Circumstances Affecting Suppliers External events (disaster, etc.) affect the ability of PDB to acquire supplies and materials	Economic supply/demand or regional availability	Construction	1 Very Unlikely (1-9%)	3 Moderate	3	Low	Lock in pricing early, secure bonds to backup contracts	PDB	Open
74	Construction	Unable to fully seal temporary cofferdams/divert water	Unknown condition of existing cofferdams, how much repair needed unknown.	Construction	3 Less Likely (20-39%)	2 Low	6	Med	More pumping needed, add 2x the pumping required	PDB	Open
78	Construction	Damage to downstream access road at Copco 1 (put in place year prior) during drawdown	Drawdown flows coming out of adit(s) damage work pad at base of Copco 1, requiring rebuilding.	Construction	5 Very Likely (60-100%)	1 Very Low	5	Med	If required to rebuild post drawdown. Spillway flow	PDB	Open
90	Construction	Copco 1 - Kiewit Concept of drilling two new tunnels (with an upstream steel cofferdam/gate) proves to impact the dam stability and safety resulting in it being not technically feasible.	Agency disagreement with approach	Construction	2 Unlikely (10-19%)	3 Moderate	6	Med	KP to assess dam safety, and design new tunnel outlet facilities to mitigate risks.	PDB	Open
91	Construction	Copco 1 - New diversion tunnel outlet scour	high flows coming from adit cause damage to river channel	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	KP to design outlet, energy dissipation structure and/or plunge pool to mitigate risks of excessive scour during drawdown.	PDB	Open
100	Construction	Drawdown Rates different than anticipated, cause rim stability or other issues requiring correction/mitigation	Unknown conditions under reservoir water level prove to be greater risk of instability.	Construction	1 Very Unlikely (1-9%)	2 Low	2	Low	Control of drawdown rate defined by capacity of drawdown tunnels. (5-10yr) flow event; Contractor defines rate.	PDB	Open
178	Construction	Labor Shortage - challenging to draw craft to the area	Economic supply/demand and strong construction market driving demand for craft elsewhere.	Construction	4 Likely (40-59%)	2 Low	8	Med		PDB	Open
179	Construction	Fuel Escalation in excess of estimate	Commodity price fluctuation	Construction	4 Likely (40-59%)	2 Low	8	Med	Fuel Escalation in excess of estimate (>\$4/GAL AVG)	PDB	Open
182	Construction	Subcontractor(s) fail to complete scope / insolvency / buyout to higher subcontractor to complete scope	Subcontractors take on contracts that stretch to achieve for their capabilities. They underestimate cost or some external factor causes their business failure.	Construction	4 Likely (40-59%)	4 High	16	High	Subcontractor performance failure. Assuming Kiewit subcontracts 60% of \$250M contract. Delay impacts.	PDB	Open
187	Construction	Additional Roadway maintenance required	Copco road unable to handle heavy loads to any extent, causes more damage than anticipated	Construction	3 Less Likely (20-39%)	2 Low	6	Med	MOU with Siskiyou County in estimate, but more damage results are additional.	PDB	Open
196	Construction	Vandalism/ Theft	Site not secure from all sites, large and open. Positioned guards to not mitigate issue	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Hire Security in sufficient quantities and lock up tools/equipment.	PDB	Open

Attachment A Risk Register (PDB-Owned Risks)

New risks identified since July 29, 2019

Risk ID	Risk Category	Risk Description	Root Cause(s)	Phase When Actualized	Probability (P)	Impact (I)	Risk Weight (P x I)	Overall Rating	Risk Management Measure	Risk Owner	Risk Status
189	Construction	Headcutting at Jenny, Camp, Scotch. River cuts back more than anticipated/undermines structures	Heavy flow year before all stabilization has taken root	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Design to reasonable flow conditions. Monitor after installation.	PDB	Open
190	Construction	Professional Liability policy included in 60% estimate is \$2.2M. This is just an indicative market price, but policy won't be purchased until 2021. Risk of escalation	Surging insurance industry in northern California.	Construction	4 Likely (40-59%)	1 Very Low	4	Med	Lock in pricing as early as possible.	PDB	Open
193	Construction	Production rate risk, unable to achieve productions as outlined in cost estimate.	Site conditions or operations prove more difficult than anticipated	Construction	2 Unlikely (10-19%)	3 Moderate	6	Med	Base estimate of comparable project experience.	PDB	Open
194	Construction	Unable to take geotech borings for scotch/camp foundations. May need to re-design/increase cost of foundations for crossings.	Unable to access site due to PacificCorp access restrictions/red tape	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Design reasonable foundations until conditions are known.	PDB	Open
195	Construction	QSD/QSP California process for erosion control yields much greater scope than currently designed.	BMP controls required prove in excess of current plan	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Have QSD/QSP professional analyze erosion control plans during the design phase.	PDB	Open
197	Construction	Liquidated Damages (Daily LD's)	Contractor late	Construction	4 Likely (40-59%)	1 Very Low	4	Med	Manage schedule and critical path	PDB	Open
198	Construction	Liquidated Damages (Lump Sum) exceedance of longest date	Contractor late	Construction	3 Less Likely (20-39%)	3 Moderate	9	Med	Manage schedule and critical path	PDB	Open
203	Construction	Potential that subcontractor escalation assumption not sufficient to cover actual escalation experienced at time of construction.	Current construction market very strong. Many places for subs to work and they are commanding higher prices.	Construction	4 Likely (40-59%)	2 Low	8	Med	Forecast and estimate escalation	PDB	Open
205	Construction	Airboats can not keep up with the rate of draw down to evacuate sediment.		Construction	3 Less Likely (20-39%)	3 Moderate	9	Med	Sediment will then have to be removed with conventional earthmoving equipment	PDB	Open
206	Construction	Availability of qualified labor from unions could reduce production		Construction	5 Very Likely (60-100%)	4 High	20	High	Ability to dictate quality and production rates	PDB	Open
Reservoir Drawdown											
34	Drawdown	Dam Failure Dam or similar structure fails during drawdown, leading to additional costs.	Failure mode not investigated or analyzed properly	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Rigorous detailed design analysis surrounding dam safety during drawdown; Completion of the FERC Potential Failure Modes Analysis process; Close coordination with the FERC regional office and state dam safety authorities; Implement FERC Emergency Action Plan, as appropriate.	PDB	Open
89	Drawdown	Ice Impediment Reservoir ice impedes sediment flushing during reservoir drawdown leading to cost increases.	Ice on one or more reservoirs during drawdown might impede sediment erosion	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Incorporate management measures into design where possible.	PDB	Open
55	Drawdown	Diversion Tunnel Intake Blocked Copco No. 1 and/or Iron Gate Dam diversion tunnel intake blocked by debris during drawdown reducing flow capacity. This may lead to schedule delays and increased costs.	Debris plugs tunnel.	Construction	3 Less Likely (20-39%)	2 Low	6	Med	Develop plan for pre-dredging area in 2020.	PDB	Open
Contractor Performance											
26	Contractor Performance	Construction Errors Construction errors (quality control) may lead to additional costs.	EOR fails to properly inspect or direct work in the field; QC failures	Construction	4 Likely (40-59%)	1 Very Low	4	Med	Clear contract requirements; Owner review and enforcement of Contractor QA/QC Plan and rigorous Owner audit and spot testing to confirm results.	PDB	Open
195	Contractor Performance	Production Inefficiencies	Site constraints or climate hinder operations more than anticipated	Construction	2 Unlikely (10-19%)	3 Moderate	6	Med	Plan operations around seasonal weather patterns and flow period.	PDB	Open

Attachment A Risk Register (PDB-Owned Risks)

New risks identified since July 29, 2019

Risk ID	Risk Category	Risk Description	Root Cause(s)	Phase When Actualized	Probability (P)	Impact (I)	Risk Weight (P x I)	Overall Rating	Risk Management Measure	Risk Owner	Risk Status
Dams, Powerhouses, Reservoirs											
52	Dams	Large Gate Procurement Copco No. 1 and/or Iron Gate Dam large gate procurements delay gate installation resulting in delay of reservoir drawdown	Manufacturer requires additional information; (note: E&O covered elsewhere)	Post-GMP	4 Likely (40-59%)	2 Low	8	Med	Early detailed design; Early involvement of the Contractor to initiate gate procurement activities including input from the gate fabricator; Contractual milestones with liquidated damages; Early Contractor input including planning underwater work to modify/demo the existing Iron Gate Dam gate structure.	PDB	Open
53	Dams	Tunnel Modifications Copco No. 1 and Iron Gate Dam tunnel modifications are more difficult to construct causing schedule and cost overruns	Changed site condition or design omission	Construction	3 Less Likely (20-39%)	3 Moderate	9	Med	Comprehensive field investigation and design review; Early Contractor input as well as transparent Contractor progress cost estimates based on proven means and methods.	PDB	Open
54	Dams	Dam Diversion Malfunction Copco No. 1 or Iron Gate Dam diversion gate malfunctions during drawdown resulting in delay of reservoir drawdown	Faulty equipment or equipment failure (note E&O covered elsewhere)	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Proactive QA/QC during design; Include backup systems for operating the gates in the design and construction including special inspections and testing of the gates prior to drawdown.	PDB	Open
External Events											
31	External Events	Onsite Public Safety Public safety at construction site. Injuries or damage may lead to additional cost and schedule delays.	Public safety measures insufficient to keep out public	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Development of appropriate health and safety qualifications, experience and other requirements during the procurement process, as well as active overview and enforcement of the Contractor's health and safety and site security plans. No public access to work areas.	PDB	Open
104	External Events	Wildfire Wildfire ignited by construction activities spreads and affects other properties.	Hot work, or other activities during the dry months generate sparks or heat that ignite dry grass and brush around the project that then spreads to neighboring populated areas.	Construction	1 Very Unlikely (1-9%)	5 Very High	5	High	Fire Management Plan has been developed and Contractor will be required to prepare their own Fire Management Plan.	PDB	Open

Attachment A Risk Register (LTC-Owned Risks)

New risks identified since July 29, 2019

Risk ID	Risk Category	Risk Description	Root Cause(s)	Phase When Actualized	Probability (P)	Impact (I)	Risk Weight (P x I)	Overall Rating	Risk Management Measure	Risk Owner	Risk Status
Environmental & Permitting											
12c	Environmental & Permitting	Permit Reopener Changes during construction that require an amendment to a restoration permit.	Changes during construction that require an amendment to a restoration permit.	Post-Construction	1 Very Unlikely (1-9%)	2 Low	2	Low	Maintain positive relationships with regulators and have contingency plan in place for permit amendments.	LTC	Open
37	Environmental & Permitting	Special-Status Species Presence Special-status species (incl. bald and golden eagles) presence delays construction	Unanticipated species found onsite cause stop work	Construction	4 Likely (40-59%)	2 Low	8	Med	Additional surveys to identify nest locations in the years leading up to construction; Implementation of the avoidance and minimization measures identified in the Definite Plan; Effective transfer of risk through Contract terms to Design-Builder. Pre-construction surveys; Design planning; Require work areas to be cleared prior to nesting season; Proactive surveys for nesting activity during nesting season; Proactive nesting mitigation measures during nesting season. Draft permits so that stop work is not a remedy, absent negligence by restoration company.	LTC	Open
40	Environmental & Permitting	Permit Requirements Not Satisfied Mitigation measures or permit requirements may not be satisfied. This may lead to delays and additional costs.	Responsible party (PDB or LTC) does not meet expectations of permitting agencies in meeting permit requirements	Post-Construction	4 Likely (40-59%)	1 Very Low	4	Med	Coordination between Designer, Contractor, and permitting agencies; Satisfy permit requirements.	LTC	Open
70	Environmental & Permitting	Protected Species Loss Coho or Bald and Golden Eagle net loss within 5 years of construction completion may lead to additional cost in fines.	Mitigation and rehabilitation measures provide insufficient protection	Post-Construction	2 Unlikely (10-19%)	2 Low	4	Low	Proactively monitor species before and during construction; Implement additional risk management measures.	LTC	Open
190	Environmental & Permitting	Non-CEQA Related Mitigation	Unanticipated mitigation requirements included in final permits that increase cost	Post-Construction	2 Unlikely (10-19%)	2 Low	4	Low	Maintain close coordination with regulatory agencies.	LTC	Open
Construction											
91	Construction	Fish Barriers Unknown fish passage barriers are found during drawdown. Their discovery will lead to additional cost.	Unknown pre-existing barriers exposed during drawdown	Construction	3 Less Likely (20-39%)	1 Very Low	3	Low	Review of historic documents for evidence of barriers; Require Contractor to develop contingency plan to evaluate for barriers following reservoir drawdown and actions to remove barriers during dam removal.	LTC	Open
92	Construction	Insufficient Dam Foundation Removal Copco 1 - Removal of concrete foundations of the dam do not go deep enough to ensure long-term fish passage.	Fish passage barrier develops at Copco No.1 former dam location	Post-Construction	1 Very Unlikely (1-9%)	3 Moderate	3	Low	COVERED BY LTC - dependent on timing Assess removal designs and fish passage designs to ensure long term fish passage, including assessment of river bed erosion downstream and impact on the river grades and future river bed levels.	LTC	Open
95	Construction	Insufficient Dam Foundation Removal Copco 2 - Removal of concrete foundations of the dam do not go deep enough to ensure long-term fish passage.	Fish passage barrier develops at Copco No. 2 former dam location	Post-Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	COVERED BY LTC - dependent on timing Assess removal designs and fish passage designs to ensure long term fish passage, including assessment of river bed erosion downstream and impact on the river grades and future river bed levels.	LTC	Open
207	Construction	Landslide during drawdown	Landslide occurs creating issue with passage	Construction	2 Unlikely (10-19%)	1 Very Low	2	Low	Develop contingency plan.	LTC	Open

Attachment A Risk Register (LTC-Owned Risks)

New risks identified since July 29, 2019

Risk ID	Risk Category	Risk Description	Root Cause(s)	Phase When Actualized	Probability (P)	Impact (I)	Risk Weight (P x I)	Overall Rating	Risk Management Measure	Risk Owner	Risk Status
208	Construction	Any Stop work due to species	Species presence results in a stop work, thereby increasing cost and delaying schedule	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Draft permits so that stop work is not a remedy, absent negligence by restoration company.	LTC	Open
209	Construction	Change in labor agreement rates for restoration	-	Construction	2 Unlikely (10-19%)	2 Low	4	Low	Develop contingency plan.	LTC	Open
Reservoir Drawdown											
45	Drawdown	Regulatory Shutdown - Water Quality Reservoir drawdown impacts water quality more severely than anticipated causing project regulatory shutdown, delaying the project.	Permit conditions and/or inadequate modeling of water quality; duration of drawdown extends past March due to extreme weather	Construction	1 Very Unlikely (1-9%)	1 Very Low	1	Low	Perform comprehensive water quality studies prior to construction; Implement risk management measures needed to comply with water quality requirements.	LTC	Open
External Events											
73	External Events	Earthquake - Post Construction Large seismic event up to design Maximum Credible Earthquake (MCE) occurs after project completion that results in blockage of Klamath River, leading to additional costs.	Large seismic event causes catastrophic landslide or slope failure	Post-Construction	2 Unlikely (10-19%)	3 Moderate	6	Med	Develop clear design requirements for PDB contract; Work with dam safety authorities to set reasonable design criteria and associated durations.	LTC	Open