

**Susitna-Watana Hydroelectric Project
Fish Passage Feasibility Study
Information Needs
Rev 3: March 26, 2013**

Table 1 – Biological Data Needs

| No. | Item | Data | Comments |
|------------|--|----------------------------|-----------------|
| B1 | Target fish species for upstream and downstream passage. | See attached appendix B1. | |
| B2 | List of other species in the system that may be accessible to any passage facilities. | See attached appendix B2. | |
| B3 | Life stage specific periodicity | See attached appendix B3. | |
| B4 | Migratory characteristics - routes, seasonal timing & duration by species & life stages | See attached appendix B4. | |
| B5 | Estimated numbers & sizes of fish for upstream and downstream migrants | See attached appendix B5. | |
| B6 | Life stage specific parameters – size, migratory behavior, swimming behavior & speed, other physical passage constraints | See attached appendix B6. | |
| B7 | Fish relative abundance upstream and downstream of project including tributaries | See attached appendix B7. | |
| B8 | Locations of spawning and rearing habitats | See attached appendix B8. | |
| B9 | Predators – species, abundance, location | See attached appendix B9. | |
| B10 | Existing ecological conditions – | See attached appendix B10. | |

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|------------|--|--|--|
| | invasive species, light, temperature, flows | | |
| <i>B12</i> | Influence of the reservoir on juvenile and smolt migration timing, and migration routes from tributaries to the reservoir to the intake or capture location. | See Appendix B6. | |
| <i>B13</i> | Influence of post-project reservoir on ice formation on juvenile and smolt migration from tributaries. | To be determined. Is there risk of increased ice conditions that could affect downstream migration and the ability to collect fish out of tributaries. | |
| <i>B14</i> | Influence of the reservoir on fish community and target species including the introduction and proliferation of predators (i.e. Lake Trout) in the modified reservoir environment. | See Appendix B9 | |
| <i>B15</i> | Risk of entrainment of non-target species into the intake or capture device under different passage alternatives | See Appendix B2 | |
| <i>B16</i> | Influence of seasonal and longitudinal changes in turbidity, and thermocline presence and depth on predation and migration routes (depth). | See Appendix B10 | |

Table 2. Physical, Hydrologic and Engineering Information

| No. | Item | Data | Comments |
|-----|---|---|---|
| P1 | Water quality & water temperature under existing conditions, main stem &B tributaries | Presentation on water quality data on 4/9 and 4/10. | |
| P2 | Water quality & water temperature above & below proposed dam | Presentation on water quality data on 4/9 and 4/10. | |
| P3 | Tailwater Rating curves at dam and expected trap location | Included in the P3-P5 PowerPoint presentation. | Forebay rating information is in Item No P5 below |
| P4 | Flow duration by month, through turbines, spillways, other outlets | Included in the P3-P5 PowerPoint presentation. | From operations modeling |
| P5 | Reservoir elevation duration curves by month | Included in the P3-p5 PowerPoint presentation. | From operations modeling |
| P6 | Other project operations data (rule curve, expected operating restrictions) | To be determined | |
| P7 | Ice cover on river and tributaries in project area before project | Presentation on ice conditions data on 4/9 and 4/10. | |
| P8 | Ice cover on reservoir and in river below dam | Presentation on ice conditions data on 4/9 and 4/10. | |
| P9 | Water temperatures during upstream migration period | Presentation on water temperature data on 4/9 and 4/10. | |
| P10 | Water temperatures during downstream migration period | Presentation on water temperature data on 4/9 and 4/10. | |
| P11 | Air temperature information by month (max, min, average) | | |
| P12 | Sediment information (transport rates, sediment gradation, sediment sources & their location) | Gemorphology presentation on 4/9 and 4/10. | |
| P13 | River morphology trends after project operation | Gemorphology presentation on 4/9 and 4/10. | |
| P14 | Topographic mapping of the project site and along river downstream | Attached | Fish passage will be sketched on these sheets |

Table 2. Physical, Hydrologic and Engineering Information

| No. | Item | Data | Comments |
|-----|--|---|--|
| P15 | Current dam layout drawings, plans, elevations, and cross sections (include details of outlet works and spillways) | <p>Drawings provided to Board of Consultants attached. Please note this information may be subject to “Critical Energy Infrastructure” restrictions so care should be taken in divulging details to third parties.</p> <p>Providing pdfs 04-01C002, 04-01C003, 04-03S002, 05-06S001, and dwg files Base dam_site_sm_contours_5ft_z.dwg camp_site_lg2_contours_20ft_z.dwg</p> | Fish passage will be sketched on these sheets. Prefer simplified, scale drawings with a plan, section, and elevation suitable for brainstorm sketching in 11x17 format. Any 3D drawings showing general arrangement would also be helpful. |

Table 2. Physical, Hydrologic and Engineering Information

| No. | Item | Data | Comments |
|-----|--|---|----------|
| P16 | Makeup of project components – turbines (number & type), outlet valves & gates | <p>3 x 200 MW Francis Turbines fed by individual penstocks</p> <p>Intake structure - Multi-level, gated</p> <p>Number of Levels- 6 Number</p> <p>Number of shutters per level 8</p> <p>Dimensions of Shutters 25 ft. H x 22 ft. W</p> <p>Control Gates - 2 Number per intake</p> <p>Dimensions 18.5 ft. H x 8 ft. W</p> <p>Invert Elevation of Intake 1800 ft.</p> <p><u>Also Outlet facilities</u> sized to pass 50 year flood if turbines are operating:</p> <p>Control Structures 6 Number Fixed Cone Valves</p> <p>Diameter 78 inches</p> <p>Water Passage Diameter 20 feet x 2</p> <p>Capacity 24,000 cubic feet per second</p> <p>Intakes for outlet facilities - 2 Number without shutters, but with trash racks and 2 gates</p> | |

Table 2. Physical, Hydrologic and Engineering Information

| No. | Item | Data | Comments |
|-----|--|---|---|
| P17 | Projected operation of project turbines, gates, & valves | <p>Turbines will be operated in accordance with rules to be agreed with environmental stakeholders, but some load following is to be expected.</p> <p>Turbine flow at full pool and 200 MW generation will be 4544 cfs per unit.</p> <p>Turbine flow at minimum pool (1850) and 200 MW generation will be 6917 cfs per unit</p> <p>Shutters at power intake will be moved to accommodate drawoff at chosen depths. Heated ice booms will be activated as appropriate to prevent ice build up on trash racks etc.</p> <p>Outlet facilities will be operated as agreed with environmental stakeholders, but will be capable of passing (in conjunction with poewater flows, floods up to 50 year return period.</p> <p>Spillway will operate at full pool level if flood flows are above 50 year return period.</p> <p>Normal spillway operation will be by incremental gate opening selected by the operator until the water level cannot be maintained at which time the gates will be raised sequentially.</p> | <p>Turbines operate to meet Railbelt loads and minimum flow requirements. Fixed-cone valves operate to control floods up to about the 1 in 50 year event. The gated spillway operates for floods greater than about the 1 in 50 year event. Refinements to this operation are to be determined.</p> |

Table 2. Physical, Hydrologic and Engineering Information

| No. | Item | Data | Comments |
|-----|---|---|----------|
| P18 | Site access or restrictions to access for operation and maintenance. Include entire project area at dam, along reservoir, and into tributaries (i.e., existing or planned access roads) | <p>Access corridors have been established westwards on the north bank of the Susitna, westwards on the south bank of the Susitna (both to the ARRC but without connection to the State highways) and also northwards to the Denali highway. Road width will be 37ft, but bridges will be single lane. The road will be designed for movement of the transformers – approximately 200 tons.</p> <p>There will be site access to the upstream side of the dam, around the dam works, and to the quarry, most of which will be reinstated if appropriate. No roads to the reservoir area or tributaries are currently planned.</p> | |
| P19 | Electrical power availability | Yes | |
| P20 | Amounts and types of debris expected in the reservoir | There may be occasional logs or similar organic debris. Possibly dead fauna occasionally (bears, caribou, moose etc.). During winter there will be ice. | |
| P21 | Amounts and types of debris expected below the dam | None except for dead fauna. | |
| P22 | Location downstream of any barrier and trap & haul locations | None chosen | |
| P23 | Other data which you feel are important to fish passage | | |

