# Summary of informal written comments on draft study reports for the Grant Lake Project (No. 13212) and Kenai Hydro, LLC (KHL) responses.

| Comment Number | Date | Affiliation | Comment | Kenai Hydro, LLC (KHL) Response |
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| **Aquatic Habitat Mapping and Instream Flow Report** | | | | |
| 1 | 4/30/2014 | ADF&G | **1.1 Proposed Project Description**<br>Comments to the proposed project description are given in ADF&G's comments on the Water Quality and Hydrology study report and are not repeated here. | Comment noted. A formal, consistent and collaboratively refined project description will be incorporated into the Draft License Application (DLA) for stakeholder review and comment. |
| 2 | 4/30/2014 | ADF&G | **1.2 Existing Information**<br><br>***Page 5:***<br>*"Collaboratively, the TWG and KHL decided to select an Instream Flow Study methodology based on the knowledge obtained from the summer 2009 aquatic resources and hydrology studies (HDR 2009a). Data and analyses from these studies were shared with the TWG in July and September. Based on the knowledge gained of Grant Creek's fish and hydrologic resources, KHL presented a proposed instream flow approach to the TWG on September 23 (HDR 2009a). Physical stream data required for instream flow modeling, per the proposed approach, were collected at 18 transects during low- and mid-flow conditions in 2010. Where applicable, these data were used in the 2013 Instream Flow Study."*<br><br>**Comment:**<br>It is not clear from the report how data from these previous efforts were used in the 2013 Instream flow study. For example, the previous contractor (HDR) collected substantial habitat suitability information for spawning salmon and it does not appear that these data were used. | KHL field checked all the instream flow data that were collected during the 2009 study, including benchmarks, headpins, bed elevations, water surface elevations, calibration measurements, and substrate and cover coding. Where data were still good and not substantially changed, KHL used it. However, in many instances, there were significant changes to that data. Where there were significant changes in bed profiles (including the thalweg, or where the creek had altered the bed, as was the case in the Reach 3 side channel) or where the hydraulic control had shifted, invalidating the prior stage/discharge relationship, KHL collected new data. The prior 2009 data allowed KHL additional flexibility in modeling where the data were still valid.<br><br>KHL is unaware of any habitat suitability information collected in 2009. |
| 3 | 4/30/2014 | ADF&G | **2.3 Specific Goals of the Instream Flow Study**<br><br>***Page 6:***<br>*"Assist impact analysis by modeling changes in key types of fish habitat relative to potential changes in stream flow."*<br><br>**Comment:**<br>The overarching goal of the ISF study, as stated in the 2014 report, was to "assist impact analysis by modeling changes in key types of fish habitat relative to potential | Per the comment, KHL has formed an "Instream Flow Sub-committee" to address the additional analytical needs of stakeholders related to instream flow and fisheries impacts issues. This group is currently meeting on a bi-weekly basis and two ADF&G representatives are active participants in these meetings. It is KHL's intent to utilize this collaborative group as the mechanism for addressing additional analytical needs that will ultimately result |

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| | | | changes in stream flow." This goal was not fully met because the applicant did not perform the analyses outlined in their 2012 Aquatic Resources Study Plan[1]. Specifically, they were to "identify important factors that influence fish use of key habitats for input to the instream flow analysis", assess "changes in the availability of microhabitat (depth, velocity, substrate, and cover) across a transect or at specific cells or groups of cells along the transect as a function of discharge", and assess changes in "lateral connectivity of main channel flow with side-channel, off-channel, or undercut bank habitats as a function of flow." Of these major objectives only the second, changes in depth and velocity as a function of discharge, was fully pursued. Based on recent presentations and ongoing discussions, the applicant may have collected data that would allow the other objectives to be addressed, and we encourage and are pursuing further exploration of this with them. | in further refinement of instream, aquatic impacts as a result of project operations in the DLA.<br><br>Future meetings of the Instream Flow Sub-committee will focus on specific needs at individual transects. Once the Work Group has identified the specific work products that would be helpful for analysis, KHL will produce these. |
| 4 | 4/30/2014 | ADF&G | **4.1 Grant Creek Aquatic Habitat Mapping**<br>***Page 11:***<br>*"The team identified key fish habitats in Grant Creek, based on observed fish use. This was accomplished by analyzing the microhabitat fish use data collected in support of the habitat mapping study, data collected in support of the Instream Flow Study, and data collected in 2009 during the reconnaissance study (HDR 2009a)."*<br><br>**Comment:**<br>An overarching objective of the applicant's 2012 habitat mapping study plan[2] was to "identify important factors that influence fish use of key habitats for input to the instream flow analysis." This study plan also included the objective of characterizing the distribution of important habitat features, in both occupied and unoccupied habitats, as would be necessary to identify what factors influence fish use of habitat. This study didn't address this objective because such an assessment was not made. Habitat criteria were collected independently of habitat maps and without regard to a systematic protocol for recognizing and delineating habitat features. These data may exist, but they were not reported in the ISF study report. The macro and mesohabitat delineations are depicted on figures, but no descriptions are given. It is therefore unclear what habitat framework was used, and ultimately, what habitat features control the distributions of fish. A clear habitat delineation framework is needed to support fish surveys, analyses of habitat use, and the ISF study. All this information cannot entirely come from the figures, as the ISF study report currently stands.<br>The lateral distributions of fish were not considered beyond side channels and channel-margin habitats were not included into the ISF study. Given the fact that spawning and rearing both tended to occur along the margins of all channel types, | Comment noted. Per Mr. Miller's note and based on the bi-weekly Instream Flow Sub-committee meetings, additional imagery has been developed that will alleviate a majority of the concern associated with this comment. KHL will integrate both this additional graphics as well as some additional text that further defines the macro and meso habitat delineations into the final report. As a note, this text and the additional graphics will also be incorporated into the DLA which ADF&G will have the opportunity to formally review and comment on. |

[1] Kenai Hydro, LLC. 2012. Aquatic Resources Final Study Plan, November 2012
[2] Kenai Hydro, LLC. 2012. Aquatic Resources Final Study Plan, November 2012

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| | | | this oversight is a major shortcoming of the study. It ultimately undermines the applicant's objective to identify habitat features controlling habitat selection and ultimately, the value of the site specific habitat suitability criteria (HSC). For the most part, spawning did not occur in riffles, or pools within the central portions of the main channel. Spawning was preferential to channel-margin habitats, as stated in the Fisheries study report. Only in the legends of the habitat maps is it apparent that some channel-margin habitats were considered, but no definitions are given in terms of a repeatable habitat delineation framework. In order to evaluate what habitat features are important to fish, we need to measure them in sufficiently detail and in a repeatable way.<br>Monte Miller Note: Distribution of spawning fish by species was presented after draft reports were made available. Inclusion of the figures and associated supporting text in the final reports would clarify issues here. It is apparent that in Grant Creek the limiting factor for spawning (all species) is suitable spawning habitat. Because the stream is generally bedrock controlled, identified spawning occurred in niche habitat, behind boulders or where small pockets of suitable substrate has accumulated. There are not widespread spawning gravels available, therefore channel margin habitats with slower velocities and some gravel deposition are selected by spawners. | |
| 5 | 4/30/2014 | ADF&G | **4.2 Grant Creek Instream Flow Study**<br>**General comment:**<br>The need was to specifically link spatially explicit depths and velocities of known spawning habitat with flow. Given the turbulence of Grant Creek and the lack of coherence between spawning and channel hydraulics, the interagency technical working group was skeptical about the use of a 1-D hydraulic model (PHABSIM) to accurately simulate velocities on Grant Creek. The focus was then shifted to the use of interactive wetted perimeter modeling of depth and lateral connectivity. And the intention was to use this tool to model spatially explicit depths within specific portions of the wetted perimeter used for spawning. This analytical tool was further supported by the apparent lack of regard for site-specific hydraulics by salmon, an observation that has now been confirmed by the applicant.<br>Monte Miller Note: Identification of use of niche habitat places this stream in a potential category of not following accepted normal and expected spawning conditions. Site specific hydraulics may not be as much of a factor as one would expect on other streams. | In its analysis, KHL stated that spawning salmonids didn't show the classic use of certain depths and velocities, as may be observed in streams with a different morphology, but rather were focused more on the available suitable substrate.<br><br>One of the work products that KHL will produce, after consulting with the Instream Flow Sub-committee, will be a series of charts and tables that show locations of spawning substrates as positioned along the measured transects. These work products will allow the Instream Flow Sub-committee to examine location of spawning substrates in relation to position along the stream within the wetted perimeter, as well as its lateral connectivity. |
| 6 | 4/30/2014 | ADF&G | **4.2 Grant Creek Instream Flow Study**<br>**General comment:**<br>In the applicant's 2012 Aquatic Resources Study Plan[3], the use of an interactive wetted perimeter model was outlined to be the course of study, along with | Please see response to Comment 5. |

[3] Kenai Hydro, LLC. 2012. Aquatic Resources Final Study Plan, November 2012

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| | | | PHABSIM. Based on the applicants 2014 ISF report, only a PHABSIM analytical framework was utilized to assess flow habitat relationships. An Oregon Method was used to assess connectivity in Reach 5, but the use of an interactive wetted perimeter model to simulate depths and lateral connectivity was not included. Interactive water surface elevation graphics are reported in Appendix 4 of the 2014 ISF report, but this falls well short of what was originally requested and planned.<br>Monte Miller Note: If the study plan was deviated from due to a new understanding of the stream and resource use of features, a discussion of how and why the study was adapted should be included. | |
| 7 | 4/30/2014 | ADF&G | **4.2 Grant Creek Instream Flow Study**<br>***Page 29:***<br>*"A number of different graphs can be provided and may include the "wetted perimeter versus flow" relationship, a static cross section of the channel showing substrate distribution and water surface at any flow, and/or a dynamic Excel graphic. A static example of the dynamic graphic is shown below in Figure 3. Changing the value in the "Discharge Window" will adjust the water level up or down corresponding to the stage/discharge formula imbedded in the worksheet. Wetted perimeter and average depth values in the lower right also change with the assigned discharge. Values such as percent of change in wetted perimeter can be easily added to the graphic. This type of dynamic graphic can be provided for any transect, as appropriate."*<br><br>**Comment:**<br>It would be helpful if the applicant could provide graphics, as described in this excerpt, displaying substrate suitability, spawning locations, and interactive wetted perimeter and depth so that lateral connectivity relationships for important channel margin spawning habitats can be assessed.<br>Miller Note: The additional information on spawning locations of species and discussion of use should be included (previously stated). | Comment noted. KHL has created an extensive GIS data base that encompasses all resource areas and provides ample opportunity to create graphics of this nature. Based upon collaborative discussions with the Instream Flow Sub-committee, if additional graphics needs exist for documentation/analytical purposes they will be incorporated into the DLA for stakeholder review. |
| 8 | 4/30/2014 | ADF&G | **4.2.2 Habitat Availability and Transect Selection**<br>**General comment:**<br>Transects were placed at known spawning locations because there was high fidelity to spawning sites and the distribution of spawning was not coherent with the distribution of traditional habitat features. Even so, it would still be helpful if the locations of these transects were described, in terms of the applicant's habitat delineation framework, so we know which habitats are represented. Table 4.2-1 reports the transects and the represented mesohabitats, but these habitats are not summarized in the same terms as they were assessed in the 2013 studies. In other words, the habitat delineation framework is not the same. In addition, the position of spawning, along the transect, is not summarized. Since this was the basis for the selection of the transects, this information should be included. | Comment noted. Per Mr. Miller's note and based on the bi-weekly Instream Flow Sub-committee meetings, additional graphics has been and will continue to be developed (per discussions) that will alleviate a majority of the concern associated with this comment. KHL will integrate both this additional graphics as well as some additional text that further defines the macro and meso habitat delineations into the DLA which ADF&G will have the opportunity to formally review and comment on. |

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| | | | Monte Miller Note: This information has been provided after the draft study reports were made available. Figures and discussions should be included in the reports. Transects have been identified in a figure and it is probably safe to say that while transects were first established to be associated with spawning activity, the number of transects on this relatively short stream, are sufficient to provide comprehensive inclusion of habitats. | |
| 9 | 4/30/2014 | ADF&G | **4.2.3 Habitat Utilization / Habitat Suitability Criteria**<br>***Page 14:***<br>*"The purpose of the habitat utilization component of the Instream Flow Study was to determine which meso- and microhabitat factors the fish in Grant Creek occupied to assess the impacts, if any, the Project would have on instream habitat. To maximize the knowledge of habitat selection factors for fish in Grant Creek, observations were made at the locations of the transects and fish habitat sites, as described in the previous section.*<br>*Fish spawning and rearing microhabitat values were recorded at programmatically-selected sites in Reaches 1 through 4. Measured microhabitat use parameters varied by habitat units. During the Instream Flow TWG meeting on September 23, 2009, Table 4.2-2 was developed with input from TWG members.*<br>*In 2013, measurements of 99 spawning pairs of sockeye were taken at flows ranging from 338 cfs – 469 cfs in the mainstem and 28 cfs – 74 cfs in the side channels. Measurements of 47 coho spawning pairs were taken at flows ranging from 169 cfs – 285 cfs; however, all but 4 of the observed coho spawning occurred at flows ranging from 169 cfs – 179 cfs. For this reason, McMillen extended the probability of use curves to reflect the upper end of optimum utilization (i.e., value of 1.0) in the Cooper Creek curves. Only three Chinook Salmon pairs were observed spawning; these were discarded and literature-based curves were used."*<br><br>**Comment:**<br>Habitat suitability criteria (HSC) for spawning sockeye salmon were collected at flows ranging from 338 – 469 cfs, in the main channel. In order to evaluate the representativeness of these HSC, we need to know when and where they were collected, in reference to a specific habitat delineation framework or set of repeatable habitat features. We need to know the longitudinal position (what transect and what stream reach), and the proximity to the stream bank (lateral position). These details are not given in the 2014 ISF Report. We also need to know whether each observation represent a redd or a cluster of redds, and how many measurements were taken in each definable cluster of redds.<br>It would also be helpful if HSC were presented in reference to a habitat delineation | KHL collected site-specific data for each redd that was observed. These data included depth, velocity, and substrate. Using techniques described in WDFW/WDOE (2013)[4], KHL measured where fish were present; this was the habitat utilization portion of the study. In addition, KHL also measured habitat availability, which sampled upstream, downstream and in the vicinity of the measured redds. When fish were observed in the area of the transects, KHL used those transects to identify availability at the given flow; this provided extensive and calibrated information surrounding those redds. Where there were no transects in the immediate vicinity of redds, KHL collected availability data on temporary transects above, across, and below the measured redds. Locations of redds, in relation to transects or known features, was noted. Dates and flows were also recorded at the time of measurements. |

[4] WDFW (Washington Department of Fish and Wildlife) and WDOE (Washington Department of Ecology). 2013. Instream flow study guidelines: technical and habitat suitability issues including fish preference curves. Updated April 1, 2013.

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| | | | framework. This omission will help us identify what habitat features are important to consider when conditioning HSC. HSC are only relevant when they are considered within those features that actually control habitat selection, and this analysis was not performed, though it was planned in the 2012 Study Plan. We look forward to continued discussions with the applicant's contractors to utilize what existing data can be used to identify the context and representativeness of the site-specific HSC for this project.<br>Monte Miller Note: The selection of niche habitat for spawning may cause difficulties in use of a habitat delineation framework. The study appears to have moved past the study plan and discussion of change in plan should be discussed. | |
| 10 | 4/30/2014 | ADF&G | **4.2.3 Habitat Utilization / Habitat Suitability Criteria**<br>***Page 14:***<br>*"In 2013, measurements of 99 spawning pairs of sockeye were taken at flows ranging from 338 cfs – 469 cfs in the mainstem and 28 cfs – 74 cfs in the side channels. Measurements of 47 coho spawning pairs were taken at flows ranging from 169 cfs – 285 cfs; however, all but 4 of the observed coho spawning occurred at flows ranging from 169 cfs – 179 cfs. For this reason, McMillen extended the probability of use curves to reflect the upper end of optimum utilization (i.e., value of 1.0) in the Cooper Creek curves. Only three Chinook Salmon pairs were observed spawning; these were discarded and literature-based curves were used. Information relating to site-specific HSC was developed from these data and used in combination with HSC curves available in the existing literature and professional judgment to determine final HSC curves to be used in modeling."*<br><br>**Comment:**<br>HSC data collected by the applicant's previous contractor do not appear to have been considered in the 2013 efforts. These data may eliminate the need to utilize literature-based curves developed on lower-gradient alluvial streams that may or may not be transferrable to this stream.<br>Monte Miller Note: If information was collected over redds, to include velocity and depth, then a comparison can be completed. Again, caution should be exercised since the spawning choices in this system may be first limited to niche habitat containing suitable gravels, with depth and velocity factors at those sites being secondary. Success of spawning may be affected by all factors at a redd site. Use of literature generated HSC's may be limited because fish in this system may be forced to utilize more extreme conditions, resulting in a wider set of curves for this specific system. | Comment noted. It is anticipated that KHL's ongoing discussions with the Instream Flow Sub-committee will continue to define the parameters with which the habitat suitability analysis is conducted. These additional analyses and associated results will all be documented in the DLA and provided to the stakeholders for review.<br><br>Please also see response to Comment 2. If HSC data were collected in 2009, KHL is unaware of these data, nor do they have records or copies of them. |
| 11 | 4/30/2014 | ADF&G | **4.2.7.1 Hydraulic Modeling**<br>**General comment:**<br><u>*Bracketing the instream flow question:*</u><br>It is assumed that the technical working group is most interested in the importance of | Comment noted and KHL agrees with this assessment. |

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| | | | low – medium flows to support salmonid habitat in this system. Grant Creek is also bedrock controlled and resistant to channel change, which minimizes the issue of channel maintenance. This exclusion of channel maintenance flows allows the instream flow question to be bracketed within a range of flows that are most important to seasonal uses of habitat by salmonids. This is important because it narrows the focus of hydraulic modeling and model performance to a specific range of flows. | |
| 12 | 4/30/2014 | ADF&G | **4.2.7.1 Hydraulic Modeling**<br>**General comment:**<br>_Hydraulic modeling challenges:_<br>It can be a challenge to get PHABSIM hydraulic models to calibrate well in turbulent streams. In order to evaluate the performance of the hydraulic models applied on Grant Creek, a comparison of measured and modeled flows and velocities could be made. In the ISF report, however, only measurements for the single velocity calibration flow are provided. It would be helpful if velocities could be provided for flows within each flow range of interest.<br>Good hydraulic model performance requires accurate simulations, of which velocity is the most problematic. To simulate velocities in the interested discharge range, two velocity calibration sets are usually the minimum recommendation, especially within irregular channel morphology (see Waddle 2001[5]). Grant Creek is certainly irregular in its morphology, so evaluation of the velocity simulations is important.<br>According to Waddle (2012; **emphasis is added**).<br>"In those instances in which a single velocity set has been used in the simulations, it is a **matter of professional judgment as to the quality of the simulations**, assuming that any erroneous velocity errors have been accounted for. However, if during a review of the channel characteristics for the cross sections it is determined that gross changes in channel geometry occur at some "threshold" water surface elevation (i.e., discharge), then the velocity simulations should be carefully examined to determine if the distribution across the change in channel geometry makes rational sense. This situation often arises where only a single velocity set was collected at a low flow or alternatively at only the high flow and a large "floodplain" type geometry exists. **It is unlikely (but not impossible) that a standard application of the single calibration velocity set will reflect the velocity magnitudes and distributions across such a radical change in channel geometry.** Modification of the velocity simulations using professional judgment is the only real option if the collection of an additional velocity calibration set(s) cannot be accomplished under the constraints of the project. | _Simulated velocities over a range of flows:_<br>Calibration details that show velocity distributions across the range of modeled flows for each transect are provided in Appendix 3. For example, Table A.3-16 shows simulated and measured velocities at the calibration flow (182 cfs) as well as simulations ranging from 10 cfs – 700 cfs for the "1 flow" model. Table A.3-17 shows the measured and a series of simulated flows, ranging from 182 cfs – 1,000 cfs for both the "1 flow" model, as well as the depth calibration model. These simulations of velocities allow professional judgment as to whether or not these velocities appear reasonable.<br><br>One velocity models are commonly used for instream studies. KHL contractors have previously conduced 1-flow models in Washington, California, and North Carolina.<br><br>One-flow models typically model better in a downward direction; for that reason, often both one velocity models and depth calibration models are used to model in an upward direction (T.A. Payne, pers. communication w/John Blum, McMillen LLC)[6]. |

[5] Citation: Waddle, T.J., ed., 2012, PHABSIM for Windows: User's Manual and Exercises: Fort Collins, CO, U.S. Geological Survey, 288 p.
[6] John Blum (McMillen LLC) personal communication with Thomas Payne Normandeau Associates, Inc. (date unspecified).

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| | | | **In those instances where multiple velocity sets have been collected, the user can easily check the validity of the velocity simulations by comparing the predicted velocities to one or more of the other calibration velocity sets. In the event that the predicted versus observed velocity profiles are not within an acceptable range, then one or more of the other calibration velocity sets should be used for the appropriate range of discharge.** Channel geometry changes in this situation can often provide guidance to the analyst for the water surface elevation and hence discharge ranges, that a particular velocity calibration set might be most appropriate. Again, any VAF functional relationship which deviates from the "expected" relationship should have a physical justification based on site-specific characteristics."<br>On Grant Creek, the applicant has used a single velocity calibration set and a method using depth calibration. The depth calibration method uses Manning's equation to solve for the velocities at a uniform roughness coefficient (n-value), but this method is usually only intended for prototype channels not found in nature, where roughness is uniform and known. The channel of Grant Creek is plagued with irregularities in roughness and USGS does not recommend the use of this method, except in extreme cases where field conditions or equipment failures prevented the collection of velocity profiles.<br>The use of a single velocity calibration set is also not recommended for irregular channels with high roughness. It is recommended that at least two velocity calibration sets are collected to represent the range in flow that is most important to fish habitat. The applicant's collection of a single velocity calibration set is somewhat problematic, in that model performance was not the best at flows that were immediately higher or lower than the flow at which the velocity calibration set was collected (180-200 cfs). This can be seen from the velocity adjustment factors (VAFs) provided in the ISF study report (see Appendix 3).<br>The applicant's VAFs reveal a rather high degree of variation in the difference between measured and modeled flows and, by default, velocities. Over the range of simulated flows, this difference is far greater than 20%, with the highest differences in the low discharge range (< 50 cfs). As an example, in reach 1, modeled flows are universally higher (3-4 times higher) in this range of flows. This makes it questionable whether the simulated velocities are realistic in this flow range. In order to evaluate this, we'd need to compare simulated velocities with measured velocities, if they were obtainable and are available. | As stated in the draft report, the restriction to variance in VAFs of 20% +/- is applicable for three flow regression models only. The range of tolerances is much greater for 1-velocity set models. The VAFs shown in Appendix 3 are within tolerances for a 1-flow model. |
| 13 | 4/30/2014 | ADF&G | **4.2.7.3 Hydraulic Model Calibration**<br>***Page 19:***<br>*"Velocity Adjustment Factors (VAFs) are generally a measure of how well a model simulates the actual velocities. In a one velocity set model, however, the VAFs are actually adjustment factors of discharge, not velocities, and a wider range of values is acceptable."* | Comment noted. As previously mentioned, collaboration and ongoing data analysis is being conducted via the discussions with the Instream Flow Sub-committee. VAF's will continue to be a topic and the analysis will be tailored toward an acceptable range. |

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| | | | **Comment:**<br>As stated previously, the VAFs, by default, represent the velocities of the stream, even if they are a ratio of computed and measured discharge. And if a wider range of values is acceptable, then we recommend discussions on what that acceptable range is. We are seeing rather extreme VAFs which indicate that the difference between measured and modeled flows is quite high, in some situations. | Please also see response to Comment 12. |
| 14 | 4/30/2014 | ADF&G | **4.2.7.4 Transect Weighting**<br>**General comment:**<br>Based on ongoing conversations with the applicant's contractors, we understand that the transect weighting process will be based on continued discussions, with regard to the seasonal distributions of fish. | Comment noted. |
| 15 | 4/30/2014 | ADF&G | **4.2.8 Measured Flows for Grant Creek**<br>**General comment:**<br>In this section, the range of flows used for depth calibration is given. It would be helpful if velocities collected within this range of flows could be used to assess hydraulic model performance above and below the single velocity calibration set. | Calibration details that show velocity distributions at a range of flows for each transect are provided in Appendix 3. For example, Table A.3-16 shows simulated and measured velocities at the calibration flow (182 cfs) as well as simulations ranging from 10 cfs – 700 cfs for the "1 flow" model. Table A.3-17 shows the measured and a series of simulated flows, ranging from 182 cfs – 1,000 cfs for both the "1 flow" model, as well as the depth calibration model. |
| 16 | 4/30/2014 | ADF&G | **5.1 Grant Creek Aquatic Habitat Mapping**<br>*"Table 5.1-1 summarizes mesohabitats found in Grant Creek. Riffle habitats were predominant, accounting for 50 percent of all habitats. This was consistent throughout all reaches, with the exception of the secondary channel in Reach 3. Riffle habitats were followed by pools (19.3 percent) and cascades (15.3 percent); all of the cascades were found in the canyon (Reach 5).*<br>*Table 5.1-2 shows habitat types (stream margin, overhead vegetation, undercut banks, and LWD) found in Grant Creek. LWD was sparse in the mainstem of Grant Creek. High flows in Grant Creek move LWD downstream and eventually into the Trail Lakes. In the side channels and distributaries, where flows and velocities are much less than the main channel, LWD is relatively abundant."*<br><br>**Comment:**<br>It would be helpful if this information was provided for the transects and the site-specific HSC. This information is needed to focus and condition the analysis of microhabitat data. | Additional work products for the Instream Flow Sub-committee have included transects in relation to habitat features. Please also see response to Comment 9. |
| 17 | 4/30/2014 | ADF&G | **6.2.1 Grant Creek Habitat**<br>**Page 81:**<br>*"Preliminary results from the Instream Flow Study indicate that spawning is limited in Grant Creek due to lack of suitable spawning substrate; the substrate that is* | Comment noted. Please also see response to Comment 5. |

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| | | | *present is recruited from Reaches 5 and 6 (Canyon). Substrates did not tend to be rounded, as observed in most high quality salmonid streams. The sediment from the canyon consists mostly of slate and greywacke (i.e., sandstone). When slate fractures, it tends to be platy (i.e., broad and flat), while greywacke fractures tend to be angular in nature (KHL 2014b).*<br>*Spawning appears to be opportunistic and activity more directed by the presence of spawning sediment rather than by water depths and velocities. For example, KHL observed sockeye salmon spawning in 1 foot of depth and 1 foot per second velocities, while spawning activity was also observed about 30 feet away in the middle of the channel where depths of 3 to 4 feet and velocities up to 6 feet per second were noted."*<br><br>**Comment:**<br>These observations mirror all those made since the origin of this project, and over four spawning cycles. They also encourage the use of interactive modeling of depth and lateral connectivity to model spatially explicit depths within specific portions of the wetted perimeter used for spawning. | |
| 18 | 4/30/2014 | ADF&G | **7.0 Variances from FERC-approved study plan and proposed modifications**<br>Monte Miller Note: There are several comments by Jason Mouw which indicate that either parts/tasks of study plans were either not completed or were modified. Please make sure that all changes from the proposed study plans are documented and discussed to provide justification. | KHL will utilize ADF&G's comments and review the study plan to fully document any variances that occurred. Please also see responses to Comments 5 and 9. |
| **Fisheries Assessment Report** | | | | |
| 19 | 4/30/2014 | ADF&G | **1.1 Proposed Project Description**<br>Comments to the proposed project description are given in ADF&G's comments on the Water Quality and Hydrology study report and are not repeated here. | Comment noted. A formal, consistent and collaboratively refined project description will be incorporated into the DLA for stakeholder review and comment. |
| 20 | 4/30/2014 | ADF&G | **1.3.1.1 Grant Creek Fish Resources**<br>**Page 6:**<br>*"Upper Grant Creek is impassable to salmon 0.5 mile (Ebasco 1984) to 1 mile (Johnson and Klein 2009) upstream of the mouth; fish habitat is most likely concentrated within the lower portion of stream."*<br><br>**Comment:**<br>It is a bit inaccurate to state that Grant Creek is impassible to salmon ½ to 1 mile upstream of the mouth. The applicant's recent studies reveal that salmon passage | Comment noted. The citation was simply intended to provide additional background on historical studies that had been completed in Grant Creek. The results in this report clearly state that passage is available to the barrier falls at the top of Reach 5 (approximately RM 1.0). This clarity will be restated in the DLA as well.<br><br>The statement was intended to summarize previous |

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| | | | extends into the canyon (reach 5), which is beyond 1 mile upstream. | research, and while the summary was correct, the conclusion of Ebasco (1984)[7] was inaccurate. The language has been revised to state that Grant Creek is impassable at the base of the falls, which is at the top of Reach 5 and one mile upstream of the confluence. |
| 21 | 4/30/2014 | ADF&G | **1.3.3 Need for Additional Information**<br>***Page 11:***<br>*"The field studies conducted in 2013 were intended to provide information on the following general topics. Specific objectives for study components will be described below for each component.*<br>• *Juvenile fish use of winter habitats.*<br>• *Better definition of fish use of micro-habitats and overall species composition and relative abundances in Reaches 1 through 4.*<br>• *Extent of rainbow trout spawning in Grant Creek.*<br>• *Use of Reach 5 by juvenile and adult fish, with additional emphasis on spawning Chinook salmon use of Reach 5.*<br>• *Delineation of aquatic habitats available in Grant Creek; identify key habitats for fish and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.*<br>• *Estimation of salmon spawning escapement in Grant Creek.*<br>• *Examination of how important individual habitat units may be affected by changes in flow due to the operation of the proposed Project using instream flow assessment methods.*<br>• *Fish resources and habitat use of the Trail Lake Narrows at the proposed bridge site."*<br>•<br>**Comment:**<br>Aquatic habitats were delineated, but not in a way that captured the most commonly utilized habitats, channel margins or shallow shoreline areas. This could be reconciled if the lateral position, or distance from the channel margin, was recorded when habitat suitability criteria (HSC) were collected, but this is not apparent from either the IFIM report or the Fisheries report. If channel margin habitat units weren't delineated, or the lateral positions of HSC were not collected, flow-habitat relationships cannot be developed for these most heavily utilized habitat features. They can't be distinguished by microhabitat factors (HSC) alone. In other words, HSC don't discriminate or differ between those portions of the wetted perimeter that | Comment noted and per response to Comment #10 above, it is anticipated that KHL's ongoing discussions with the Instream Flow Sub-committee will continue to define the parameters with which the habitat suitability analysis is conducted. These additional analyses and associated results will all be documented in the DLA and provided to the stakeholders for review. |

[7] Ebasco (Ebasco Services, Inc.). 1984. Grant Lake Hydroelectric Project Detailed Feasibility Analysis. Volume 2. Environmental Report. Rep. from Ebasco Services Incorporated, Bellevue, Washington.

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| | | | are utilized for spawning, year after year, and those that weren't.<br>The microhabitat of utilized habitats was surveyed, but unoccupied habitat units weren't. As such, it may be difficult to identify key habitats, factors influencing their use, and estimate flow-habitat relationships. In the ISF report (on the bottom of page 81) the observation that stream depth and velocity were not influential to spawning habitat selection was made. This could be examined quantitatively if both occupied and unoccupied habitats were surveyed, and it may be possible to conduct such an analysis with the transect data, if HSC were collected along them in a spatially explicit manner. But the fact that site-specific depths and velocities didn't seem to matter, highlights the importance of a habitat delineation framework that sets apart channel margin habitat, so that instream flow relationships can be developed for them. | |
| 22 | 4/30/2014 | ADF&G | **2.1.2 Distribution of Spawning Salmon in Grant Creek**<br>***Page 12:***<br>*"Identify critical spawning habitats as required for general assessment of Project impacts."*<br><br>**Comment:**<br>This objective wasn't clearly addressed in the Fisheries report. It would be helpful to identify the longitudinal and lateral positions that were most important to spawning. This might best be accomplished by identifying which instream flow transects represented the highest use and have the necessary habitat information summarized for these transects.<br>Monte Miller Note: The figures and discussions provided following release of the draft report should be incorporated in the report. | Comment noted. Per ongoing discussion and collaboration with the Instream Flow Sub-committee, "important" spawning areas have been further delineated via GIS mapping exercises. Those maps have been made available to the group and will be incorporated into the DLA and utilized in upcoming discussions with stakeholders. |
| 23 | 4/30/2014 | ADF&G | **4.1.3 Distribution of Spawning Salmon in Grant Creek**<br>***Page 33:***<br>*"The distribution of spawning salmon in Grant Creek was documented during spawning (redd) surveys and radio telemetry surveys. During redd surveys, the location and number of redds were recorded on maps of Grant Creek. For radio telemetry surveys, the location of tagged fish were also noted on maps of Grant Creek. The combination of both survey techniques is useful in defining spawning habitat especially when turbidity precludes observations of spawning in deeper water. The primary goal of these surveys was to identify sensitive spawning habitats in Grant Creek."*<br><br>**Comment:**<br>During redd surveys, the location and number of redds was recorded on maps. As stated in the report, the primary goal of these surveys was to identify sensitive spawning habitats in Grant Creek. Unfortunately, very little information on spawning habitat is given. The locations are depicted on maps, but it is difficult to | Comment noted. Need for additional documentation related to habitat delineation will be assessed with the Instream Flow Sub-committee and detailed in the DLA. |

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| | | | obtain much detail from these depictions.<br>Monte Miller Note: See previous comments on inclusion in the report of additional figures and discussions.<br>In order to assess the sensitivity of these habitats to operation of the proposed project, detailed information about spawning habitat is needed. This information includes the dates of spawning, lateral position (proximity to the shoreline), and mesohabitat type. The maps, presented in the report, overlay spawning locations upon mesohabitats but the mesohabitats aren't defined. In many cases, the spawning symbols occlude the habitat layer and the lateral position of the redd.<br>There is also a bit of confusion on the definitions of habitat categories used to structure habitat and fish distribution surveys. Table 5.1-15 summarizes fish use of macro habitat types (backwaters, mainstem, and side channels) and Table 5.1-16 summarizes fish use by selected mesohabitats, but this overall delineation does not include the lateral habitat types that were most important to some species, like sockeye. In the text, these habitats were referred to as "stream margins" (e.g. bottom of page 75), but these lateral habitat features were not delineated from habitats about the thalweg. They also weren't integrated with the collection microhabitat features that should be conditioned by association with utilized hydraulic features, if they are to be effective at describing habitat use. | |
| 24 | 4/30/2014 | ADF&G | **4.2.1 Adult Rainbow Trout Abundance, Distribution, and Spawning in Grant Creek**<br>***Page 34:***<br>*"Radio-tagged trout were tracked twice per week for the duration of the study period, and their location at the time of detection was determined using triangulation techniques. Those positions were recorded on maps of the study area."*<br><br>**Comment:**<br>As with all species and life stages, this section needs to be more explicit, in terms of habitat features. The habitat delineation used for rainbow trout is also different than it was for salmon. The macro habitat types were excluded and, based on Table 5.2-7, the mesohabitat delineation was different. | The habitat delineation used for rainbow trout was the same as that used for anadromous salmonids. Table 5.2-7 did not include some macro-habitats because no detections of tagged fish occurred at those locations. However, for consistency those habitat types have been added to Table 5.2-7. |
| 25 | 4/30/2014 | ADF&G | **4.2.3 Resident and Rearing Fish Use of Open Water Habitats in Lower Grant Creek**<br>***Page 6:***<br>*"Habitat for juvenile fish exists mainly in stream margins, eddies, deep pools, and side channels offering reduced velocities (Ebasco 1984)."*<br><br>**Comment:**<br>Though all species and life stages utilized stream margins, eddies, and off channels, there weren't habitat categories encompassing any of these hydraulic features. | Grant Creek has an extremely variable and flashy natural flow regime that fluctuates significantly both seasonally and from year to year. As such, spawning in the creek is primarily done in an opportunistic fashion laterally across the stream. While some focus by fish was placed on certain marginal areas, depending on the year and/or seasonal flow, these same areas may be dewatered during key spawning times. KHL believes that the project can provide a more stable flow regime |

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| | | | Habitat features were depicted on the figure 3.1-1 (map), but no descriptions for these features was given in the text, and there is no apparent overlap with any of the omitted habitat features.<br>Habitat features are used to structure surveys of habitat, fish distribution and habitat use, and assessment of flow-habitat relationships. We are limited in our ability to assess the sensitivity of utilized habitats to proposed project operations unless we can be explicit about some aspect of habitat with a definable relationship to flow. The omission of important habitat features from this study may ultimately prevent effective quantification of flow-habitat relationships used to assess the environmental impact of proposed operations. | during these peak times and potentially sustain more habitat (marginal and otherwise) than is currently perpetuated annually. Ongoing collaboration related to the specifics of the proposed operational scenario will continue with the Instream Flow Sub-committee and broader stakeholder work groups during the July 2014 workshop and all details and associated agreements will be documented for review in the DLA. |
| 26 | 4/30/2014 | ADF&G | **5.1.3 Distribution of Spawning Salmon in Grant Creek**<br>**General comment**:<br>The figures depicting the distributions of spawning salmon (5.1-6-5.1-12) are really sharp and very helpful, and the distributions are also summarized, by macro and mesohabitats, in tables 5.1-15 and 5.1-16. These two data sources specifically illustrate the inadequacy of the applicant's habitat delineation framework.<br>In the figures (5.1-6-5.1-12), the majority of the spawning locations are clearly along the channel margin, or in lateral habitat features, such as backwaters and side channels. This is especially true for sockeye salmon. Yet in the tables, there is no habitat category for channel margins. | Comment noted. Need for additional documentation related to habitat delineation will be assessed with the Instream Flow Sub-committee and detailed in the DLA. |
| 27 | 4/30/2014 | ADF&G | **5.1.3.3 Spawning Habitat**<br>***Page 75:***<br>*'In mainstem areas, spawning usually occurred along the stream margins or in areas protected from the main current. Chinook were the exception, building redds mid-channel within the stronger current. In side channels, salmon spawned throughout the width of the channel and in backwater areas, salmon usually selected locations close to the mainstem where suitable stream velocity and substrate were present. The majority of redds in Grant Creek were located in riffle (71 percent) and pool (19 percent) habitat (Table 5.1-16). In Reach 1, spawning for pink, sockeye and coho salmon most often occurred in riffle and pool habitat along the stream margins in the mainstem areas away from the thalweg and the highest stream velocities. Chinook spawned only in riffle habitat most often mid-channel where higher velocity and larger spawning substrates occurred. In Reach 2, most spawning occurred in mainstem riffle habitat along the stream margins for sockeye and coho salmon. Irregularities along the stream margin (large woody debris [LWD], bedrock, boulders) of riffle habitat created areas of lower velocity and suitable spawning substrate. Sockeye and coho also spawned in the stream margins of some pool habitat (lateral scour pool) of Reach 2."*<br><br>**Comment:**<br>Clearly most of the spawning occurred in channel margin areas, *adjacent to* riffles. | Comment noted. Need for additional documentation related to habitat delineation will be assessed with the Instream Flow Sub-committee and detailed in the DLA. |

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| | | | It could be argued that this categorical selection is driven by the availability of suitable substrate, but this analysis was not performed, because the applicant's objective of comparing used and avoided habitat was not conducted. Even if the use of channel margins was conditioned by substrate, the use of hydraulics to model flow-habitat relationships is questioned, given the general observation that indicated the incoherence of spawning with depth and velocity. | |
| 28 | 4/30/2014 | ADF&G | **5.2.3 Resident and Rearing Fish Use of Open Water Habitats in Lower Grant Creek**<br>***Page 95:***<br>*"The detections of fish in Reach 1 and 2 occurred throughout the period radio-tagged rainbow trout were detected within Grant Creek (May 25 through October 17), whereas detections in Reach 3 occurred primarily shortly after tagging (June 20 through August 15); and the single detection in Reach 4 occurred on June 28. As discussed in Section 5.2.2.1, no rainbow trout redds were observed in Grant Creek in 2013. However, due to the poor water clarity and high flows, that was not unexpected. Detections primarily in Reach 3 shortly after tagging, coupled with suitable pockets of gravel at the locations of detection suggest that the majority of rainbow trout spawning likely occurred in Reach 3; including both the mainstem of Grant Creek and the secondary channel. The location of detections in Reach 3 for rainbow trout correspond with the location of observed redds for both sockeye and coho. And while spawning substrates for the three species varies to some degree, the observations for Chinook, sockeye, and coho indicate that due to the limited amount of spawning gravel in Grant Creek, the fish will spawn in what visually appears to be marginal spawning habitat."*<br><br>**Comment:**<br>These detections may or may not represent spawning habitats, and most likely represent rearing and feeding habitats, especially during the periods when adult salmon are present. Good spawning gravel and shoreline areas are also expected to be good locations for feeding on both terrestrial and aquatic food sources. As with salmon spawning, these shoreline areas need to be delineated from thalweg positions, so that flow-habitat relationships can be independently developed within them. | As stated within the report, while KHL believes that many of the rainbow trout that were tagged were likely non-spawners due to the timing of the weir installation, their collection and tagging, KHL also knows that some tagged trout were sexually mature. As also stated, detections in Reach 3 occurred primarily during the period of June 20 through August 15, whereas spawning by anadromous species at those locations didn't begin until August 25 to any degree. While rainbow may well have been in Reach 3 feeding on terrestrial and aquatic organisms, it is interesting that they migrated downstream into Reach 1 before their main food source (salmon eggs) were available. While conjecture, this indicates that it is very likely that some of those fish were in Reach 3 to spawn given that the substrate most conducive to rainbow spawning was within that reach. While we believe the statements in the report to be accurate and justified given timing and conditions, we have provided a caveat that rainbow presence within Reach 3 at the specified time may have been due to feeding behavior. |
| **Water Quality and Hydrology Report** | | | | |
| 29 | 4/30/2014 | ADF&G | **1.0 INTRODUCTION**<br>**General comment:**<br>One objective of this study was to estimate how lake level fluctuations and operation of the intake structure and diversion tunnel would affect hydrology and water quality below the tailrace. At this point, however, uncertainties associated with the design and operation of the project prevented such an assessment. The potential design concepts are as follows:<br>Monte Miller Note: The final designs and project operation scenarios will be made | Comment noted. Per the collaborative discussion during the March 2014 study report work group meetings (and after), the next set of meetings in July 2014 will more specifically outline project infrastructure, operations and the integration of those aspects with current natural resource conditions, potential impacts (positive and negative) and any potential protection, mitigation and |

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| | | | available in the next few months. Until then, all evaluation is speculative in nature and subject to revision, as necessary. | enhancement (PM&E) measures that may be considered. Once this discussion and any associated agreements have been made all documentation and associated project information will be described in the DLA and formally provided to the stakeholders for review. |
| 30 | 4/30/2014 | ADF&G | ***Page 2:***<br>*"Two concepts are currently being evaluated for water control at the outlet of Grant Lake. The first option would consist of a natural lake outlet that would provide control of flows out of Grant Lake. A new low level outlet would be constructed on the south side of the natural outlet to release any required environmental flows when the lake is drawdown below the natural outlet level.*<br>*In the second option, a concrete gravity diversion structure would be constructed near the outlet of Grant Lake. The gravity diversion structure would raise the pool level by a maximum height of approximately 2 feet (from 703 to 705 feet NAVD 88), and the structure would have an overall width of approximately 120 feet. The center 60 feet of the structure would have an uncontrolled spillway section with a crest elevation at approximately 705 feet NAVD 88. Similar to the first option, a low level outlet would be constructed on the south side of the natural outlet to release any required environmental flows when the lake is drawn down below the natural outlet level."*<br><br>**Comment:**<br>Until the hydraulic control of the outlet is designed and reservoir-level operations are finalized, it will be difficult to address potential environmental impacts along the shoreline of Grant Lake. Likewise, the operation of the diversion structure and tunnel, and the location of the tailrace are also needed to assess hydrology and water quality in the bypass reach and below the tailrace. | Comment noted. Per the collaborative discussion during the March 2014 study report work group meetings (and after), the next set of meetings in July 2014 will more specifically outline project infrastructure, operations and the integration of those aspects with current natural resource conditions, potential impacts (positive and negative) and any potential PM&E measures that may be considered. Once this discussion and any associated agreements have been made all documentation and associated project information will be described in the DLA and formally provided to the stakeholders for review. |
| 31 | 4/30/2014 | ADF&G | **2.0 STUDY OBJECTIVES**<br>**General comment:**<br>This study addressed baseline hydrology and water quality, but the objectives could not be addressed because the operations of the project remain to be finalized. | Comment noted. Per the collaborative discussion during the March 2014 study report work group meetings (and after), the next set of meetings in July 2014 will more specifically outline project infrastructure, operations and the integration of those aspects with current natural resource conditions, potential impacts (positive and negative) and any potential PM&E measures that may be considered. Once this discussion and any associated agreements have been made all documentation and associated project information will be described in the DLA and formally provided to the stakeholders for review. |

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| 32 | 4/30/2014 | ADF&G | **4.1 Water Quality and Temperature**<br>***Page 23:***<br>*"Six sites were monitored in 2013 on Grant Creek. They included four previously established sites (GC100, GC200. GC250, GC300), two new upstream sites (GC500 and GC600) in the canyon reach and two off channel sites (ISF 230 and ISF 300) selected based on observed fish utilization."*<br><br>**Comment:**<br>Typically, alluvial streams exhibit high spatial variability in water quality, especially intragravel conditions. Normally, a data collection network needs to be diversified to account for this variability, by placing intragravel temperature loggers that account for geomorphic variability. In this situation, the geomorphic variability of Grant Creek is relatively low and bedrock controlled. As such, spatial variability in water quality is expected to be low. The study reach is also quite short.<br>The water quality data collection network on Grant Creek consisted of 3 sensor locations, one just above the confluence with Trail Lake (GC 100), one at the historic USGS gage location (GC 200), and another at the head of reach 3 (GC 300). This network seems a bit sparse, but the placement of sensors does seem to account for the distribution of spawning. GC 100 corresponds with the most important spawning location, in reach1, and GC 300 is just upstream of the most important spawning locations, in the vicinity of the island complex. GC 200 is a good central location between these two sites and is positioned at the confluence of the side channels from reach 3.<br>There were two off-channel temperature stations, GC 250 and GC 200. These locations demonstrated significant seasonal differences in temperature, which leads to the question of intragravel water quality at the most important spawning locations. These are the temperatures most relevant to spawning site selection and egg incubation. It would also have been helpful to assess these intragravel water temperatures because off-channel variability suggests the influence of groundwater.<br>Monte Miller Note: The nature of this stream is one of bedrock control. As such, gravel deposits are limited in depth and location. With that in mind, intragravel temperatures would not seem to be likely to differ from water temperatures. | Comment noted. Per the collaborative discussions during the March 2014 study report work group meetings (and after), KHL communicated that thermologgers were strategically placed in a series of redds in Grant Creek to assess intragravel temperatures. That data will be preliminarily discussed with stakeholders at the July 2014 meeting and further documented in the DLA. That said, the preliminary data suggests that Mr. Millers assessment in the comment in correct and that very little variability in temperature exists between ambient stream temperatures and those measured in the redds. |
| 33 | 4/30/2014 | ADF&G | ***Page 24:***<br>*"Winter temperature data was collected at one site (GC200)."*<br><br>**Comment:**<br>It would also have been helpful to have collected Grant Creek temperature data year around. It's unclear why the temperature loggers were retrieved from the stream prior to winter. Temperature data are important to our evaluation of impacts to salmon egg incubation and our assessment of the environmental impact of project operations.<br>Monte Miller Note: Year long temperature data is useful in determining the timing of | All temperature loggers were left in Grant Lake and Grant Creek to continue collecting data through the winter of 2013-14. Preliminary results from these data will be presented at the July meetings and summarized in the DLA. In addition, a relict temperature logger from site GC 250 was recovered during 2013 field efforts. This recovered logger was deployed in October of 2009 and provides daily mean temperature data for 2 winter seasons before reaching memory capacity on February 6, 2011 |

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| | | | emergence of salmonid alevin from the gravels. Year round temperature date should be presented. It was stated that data loggers were recovered in the lake and successfully downloaded. During a recent meeting, I believe that it was also stated that a data logger was recovered from a pool in reach 3-4 when water levels were low. Was this correct and was that data logger downloadable? | (Refer to Appendix 1c; Tables A.1c3-A.1c5) . |
| 34 | 4/30/2014 | ADF&G | **5.1 Water Quality and Temperature**<br>***Page 15 (Trail Lake Narrows):***<br>*"Three sampling events were conducted at this site (June, August, and September 2013)."*<br><br>***Page 16:***<br>*"There were three sampling sites on Grant Creek, all located below the canyon reach. Each site was sampled once in August 2013."*<br><br>**Comment:**<br>Water quality was sampled 3 times (in June, August, and September) in Trail Lake Narrows, but it was only sampled once on Grant Creek (in August). It would have been helpful to have reversed the level of effort and it would have been helpful to include a sample at base flow, in April. A base flow measurement is most relevant to incubation, the least influenced by snow and glacier melt, and the most influenced by regional groundwater.<br>Monte Miller Comment: This sampling may provide information on water quality in the Trail Lake Narrows, but without sampling at the same time in both Grant Creek and either Trail Lake or the narrows above the influence of Grant Creek, is impossible to identify specific sources causing any issues with water quality. | Since water quality data were not available for Trail Lakes Narrows, 3 sampling events were agreed to in an effort to establish baseline conditions. The August 2013 sampling in Grant Creek was design to dovetail with results from earlier study efforts in 2009 and 2010. Since most water quality analytes are in low concentrations or below detection limits, the August sampling was designed to assess temporal trends from previous samplings of Grant Lake and Grant Creek dating back to the 1980's.<br><br>Base flows in Grant Creek are driven by spill over the outlet of Grant Lake. As shown in the accretion study, all of this water is conveyed downstream with little to no accretion. Therefore, groundwater influences are minimal, even during baseflow conditions. In fact, a March 2014 field visit to service temperature loggers showed that the 2 off-channel rearing locations were frozen solid. |
| **Terrestrial Resources Report** | | | | |
| 35 | 3/27/14 | USACE | In addition to wetlands, waters of the U.S. (WOUS) generally also include any streams that exhibit an ordinary high water mark, and open waters that exhibit an ordinary high water mark. I'll need a description of all the non-wetland waters in the wetland study area, these include Grant Creek, Grant Lake, the tributary streams of Grant Creek and Grant Lake, and the Trail Lakes narrows. The description should include information on flow regime, the indicators of the presence of an ordinary high water mark, and general channel dimensions. For further guidance on what information to provide, please see Special Public Notice 2010-45 (located here: http://www.poa.usace.army.mil/Portals/34/docs/regulatory/specialpns/SPN-201045.pdf). | For Grant Creek, Grant Lake, the tributary streams of Grant Creek and Grant Lake, and the Trail Lakes Narrows, KHL will add the following information to a table in the Wetlands and Waters section of the Terrestrial Report: flow regime (using National Wetlands Inventory [NWI] water regime modifier), the indicators of the presence of an ordinary high water mark, and general channel dimensions. |
| 36 | 3/27/14 | USACE | In addition to a functional assessment of the wetland areas, we also need information on the functions provided by Grant Creek, Grant Lake, the tributary streams of Grant Creek and Grant Lake, and in the Trail Lakes narrows. | For Grant Creek, Grant Lake, the tributary streams of Grant Creek and Grant Lake, and the Trail Lakes Narrows, KHL will add functional assessment information to the Wetlands and Waters section of the Terrestrial Report. |

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| 37 | 3/27/14 | USACE | The USACE is responsible for determining which waters are subject to our jurisdiction (i.e. are WOUS). We can proceed through permitting with a Preliminary Jurisdictional Determination (PJD) wherein all wetlands that exhibit the three criteria are assumed to be jurisdictional and all non-wetland waters that exhibit an ordinary high water mark are assumed to be jurisdictional. The applicant would then be responsible for avoiding, minimizing, and then providing compensatory mitigation, as appropriate, for all the waters in the project area.<br><br>Alternatively, we can make an Approved Jurisdictional Determination (JD), wherein we specifically identify all waters that are jurisdictional and all waters that are not jurisdictional. If there are waters which the applicant believes are not jurisdictional because they do not have a surface or shallow sub-surface connection to downstream waters (i.e. are isolated), and the applicant would like an Approved JD, please provide maps, including but not limited to any available topographic, aerial or LiDAR, ground level photography, and any other information that you have to demonstrate that there is no surface or shallow subsurface connection to Grant Creek or Grant Lake. While an approved JD may remove some waters from our permit evaluation, the process of making a determination that a wetland is isolated does require coordination up to our Headquarters level and with USEPA, and requires more time than a PJD. The applicant can request an Approved JD at any time, even if a PJD is issued. | KHL appreciates the information on our options and we anticipate continued collaboration with the U.S. Army Corps of Engineers (USACE) related to these options and our application process over the course of the next few months leading up to the DLA distribution. |
| 38 | 3/27/14 | USACE | In reference to the two slides in the wetlands presentation titled "Wetlands: Potential Qualitative Construction Impacts (Short-Term)" and "Wetlands: Potential Qualitative Operational Impacts (Long-Term)": We define a loss of WOUS as Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. *Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody.* The loss of stream bed includes the linear feet of stream bed that is filled or excavated. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States.<br><br>*If the following activities occur inside the boundary of a jurisdictional wetland or below the ordinary high water mark of a stream or lake, we would likely consider them to be a loss of waters: any permanent discharge of rock, soil, concrete, or other material, as well as any mechanical land clearing, grading, inundation or dewatering, excavation, bank stabilization, culvert installation, and/or stream channelization*. There are some impacts listed as indirect on the slides that we would consider to be direct impacts, such as dewatering portions of Grant Creek, and inundation of wetlands/streams by raised Grant Lake levels. | KHL will edit the "Potential Wetland and Waters Impacts" table, and any associated text to reflect the definitions of permanent direct adverse impacts described in this comment. |

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| 39 | 3/27/14 | USACE | Is any backwater effect expected in wetlands and streams along the lake, and which would be located upstream/upslope of those waters that would be directly impacted by flooding? We would consider the resulting backwater to be an indirect impact. | Per our collaborative discussions during our March meetings, KHL indicated that Grant Lake fluctuation with the project in place would deviate minimally (if at all) from natural conditions. As such, no backwatering effect is expected. Our next set of meetings in July will more specifically outline project infrastructure, operations and the integration of those aspects with current natural resource conditions, potential impacts (positive and negative) and any potential PM&E measures that may be considered. Once this discussion and any associated agreements have been made all documentation and associated project information will be described in the DLA and formally provided to the stakeholders for review. |
| 40 | 3/27/14 | USACE | As the access road or the Iditarod Trail are re-routed, as always, take every opportunity to avoid waters crossings or minimize waters crossings.<br>Try to maintain as natural operation of wetlands in detention pond as possible. | Comment noted. KHL will remain committed to minimizing impacts to all natural resources within the project area. |
| 41 | 3/27/14 | USACE | When an application is submitted to us, please fill out the attached spreadsheets with the requested information. This will allow us to more efficiently evaluate the application. | Comment noted. KHL appreciates you providing the spreadsheets. |
| 42 | 4/30/2014 | ADF&G | **General comments:**<br>Environmental impacts to shoreline fishery and wildlife resources primarily depend on lake-level regulation. The morphology and function of the lake shore, where it is not bedrock controlled, is maintained by a fluctuating lake level that seasonally spreads out wave energy. The vegetation of the lake's shoreline has similarly adapted to the seasonal pattern of lake-level variability. In areas of the shoreline where wave energy is low and depth is shallow, aquatic and wetland plant species develop. In areas where the wave energy is high, species with a high tolerance of disturbance, such as willow and alder, establish and are maintained. Tributaries further diversify the shoreline by providing alluvium and plant propagules that develop and maintain alluvial fans. The materials transported by these streams and the wave action of the lake's shoreline interact to provide unique forested and shoreline wetlands.<br>Alteration of the lake level and lake-level variability can lead to significant changes to the morphology and habitat functions of the lake shore. Elevation of the lake's stage leads to inundation of riparian vegetation. Unnatural draw down of the lake level leads to lake-shore incision and incision of tributary channels. Unnatural fluctuation of the lake shore (in terms of fluctuation frequency, duration, and timing) can disrupt the natural equilibrium between the lake's hydrology and the ecology of plant and animal species. | Comment noted. Per the collaborative discussions during the March 2014 study report work group meetings, KHL indicated that Grant Lake fluctuation with the project in place would deviate minimally from natural conditions. This combined with the fact that a significant amount of the Grant Lake shoreline consists of steep, bedrock slopes lead KHL to determine that any impacts to the natural resource specifics discussed in your comment would be minor. The next set of meetings in July 2014 will more specifically outline project infrastructure, operations and the integration of those aspects with current natural resource conditions, potential impacts (positive and negative) and any potential PM&E measures that may be considered. Once this discussion and any associated agreements have been made all documentation and associated project information will be described in the DLA and formally provided to the stakeholders for review. |

| Comment Number | Date | Affiliation | Comment | Kenai Hydro, LLC (KHL) Response |
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| | | | Riparian plants that are important to moose and bear for food, have reproductive cycles that are timed with the natural pattern of fluctuation of the lake level. The ecology of furbearers and waterbirds are equally adapted to the lakes natural flow variability.<br>At this point, the applicant has yet to finalize a lake-level design concept and a diversionary operations model. These details are necessary to predict the environmental impacts of this project to shoreline resources. Both the level of the lake and the regulation of lake-level variability are important. Operation within the natural range of variability in lake level will lead to relatively minor changes to shoreline resources, provided the lake level is regulated to follow the natural hydrography of Grant Lake. Removal of this variability can lead to erosion of the shoreline and can disconnect the lake from the resources it has developed along the shoreline. | |