RFI 011a
Pebble Project EIS

Request for Information

Title/Subject:	**Follow up on HDD Operations**
Requestor:	**AECOM**
Date Transmitted:	**7/16/2019**
Recipient:	**Pebble Limited Partnership (PLP)**
Response Requested by:	**7/26/2019**
Rationale:	Additional information on Horizontal Directional Drilling (HDD) operations in Cook Inlet and Iliamna Lake is needed to help inform the impact analysis for the Preliminary Final EIS. Based on a comment received from the Alaska Department of Fish and Game (ADF&G) on the Draft EIS, it is unclear how total containment and proper disposal can take place for HDD operations where one end begins aboveground and the other end comes out underwater.
Describe the Information Requested and Level of Detail:	For HDD operations into Cook Inlet and Iliamna Lake, where one end begins above ground and the other end comes out underwater, please describe what drilling methods and fluids would be used for controlling pressure near the open water ends and how the fluid would be contained. If all fluid cannot be contained, please provide the constituent elements of the fluid and anticipated volume of discharge in all aquatic resources.

Recipient Response Form

Date Received from USACE:	Click here to enter text.
Response from Recipient (Describe Information Requested to the Level of Detail Requested; Provide Attachments as Needed):	The trenchless crossing for the proposed project can be performed by HDD or Direct Pipe (a micro tunneling technique). The crossing design and execution methodology will be finalized during detailed design and State permitting. Several parameters will be used in the design of the crossing to limit the fluid loss and minimize environmental concerns. Among these are the geometry of the crossing (profile), the methodology which may be used to drill and capture fluid and the fluid composition which will be as environmentally friendly as possible. **Design and Methodology** During standard HDD operations, drilling fluid is injected into the HDD bore under pressure. This is required to force soil and rock cuttings from the drill bit to the surface where they can be separated from the drill fluid. It is possible for drill fluid to travel short distances out from the HDD bore due to this pressure. To minimize the risk of premature drill fluid leakage, the HDD will be designed and drilled considering appropriate drill fluid pressures for the subsurface soil and groundwater conditions. Drilling fluid returns and annular pressures are closely monitored during HDD operations to check that excessive drill fluid loss is not occurring. The drilling specifications and drill fluid plan developed during detailed engineering will provide specifications to avoid the potential for excess drilling fluid to escape into the overlying waters of Cook Inlet. If drill fluid leakage is observed during operations, typically, drilling operations are discontinued until the issue can be resolved per pre-developed and pre-approved procedures. Mitigation procedures may include lowering drill fluid pressure, adjusting mud viscosity, and adding lost circulation material – for example shell husks – to the drilling fluid to reduce fluid loss and minimize borehole formation erosion at the loss point. Additionally, the drill profile should be designed to maximize the volume of material that can be maintained within the borehole such that the fluid does not escape. In this case a sort of P-trap is formed to maintain as much fluid as possible below the

	crossing exit to the waterbody. The pipeline crossing will require an exit pit and a pipeline trench to extend the pipeline into the water body. Where possible, the exit pit and trench will be pre-excavated prior to completing the soil boring. The exit pit and pipeline trench will be dug below natural seabed which will inherently capture any drilling fluid that is released from the boring. The typical drilling fluids used for trenchless crossing construction are environmentally friendly in that they are primarily a composition of fresh water and bentonite (clay). This fluid is inherently heavier than water (specific gravity in the order of 1.3) and therefore should stay within the confinement of the exit pit. The exit pit will be required to be designed to allow for containment of the expected volume of fluid that may be released, i.e. the volume of fluid that is only above the exit point elevation. The pipeline trench will allow for additional spare volume if the drill fluid were to escape beyond the exit pit. The exit pit would also be oversized to allow a containment cap of native material to be placed over the captured drilling fluid. This methodology will then provide long term containment of the deposited fluid. Alternatively, a dredge vessel may be utilized to pump the drilling fluid from the containment pit, therefore reclaiming as much fluid as possible. In some cases, the drilling methodology may be designed to limit the drill fluid release by returning drill cuttings directly to the surface in a process known as forward reaming. When utilizing this process, the entire HDD crossing, except for the last remaining exit footage (~300ft) is drilled from the onshore entry and all the circulated cuttings and fluids are returned to the shore side entry point for processing and disposal leaving clean fluid in the bore. If feasible for the crossing, the last remaining footage of the drill is completed utilizing a drill, from the shore side, that is equivalent to the full diameter of the bore. This methodology ensures that the bore is maintained open with the drill string and displaced fluids are returned to the surface apart from the minimal fluids pushed directly in front of drill. Any fluid that escapes during the final opening process should be contained in the exit pit. If the forward reaming method from shore is found not to be feasible, an HDD may be performed with offshore support. In this instance, a steel casing marine riser may be installed at the marine exit pit location. In this case, a suitable vessel such as a jack up barge will be utilized to provide a casing/riser on the seaside of the HDD and to perform HDD operations from the marine side. With this option HDD operations from both onshore and offshore may be possible. The offshore support will enable the establishment of a closed circulation system and allow for cuttings/mud to be recovered to the offshore vessel through the casing (riser). The drill returns can then be processed and recycled. After processing, these returns can be stored in tanks onboard the vessel or transported to shore for disposal. Where permitted, treated water based fluids may be discharged offshore following BOEM and EPA guidelines. This option will be dependent upon the results of detailed HDD engineering assessments, design, and installation plan. Alternatively, if the HDD process is determined not to be feasible an alternative crossing method know as Direct Pipe® may be utilized. This process allows all the drilling to be performed mechanically with the drilling fluids and cuttings processed through the drilling unit known as a micro Tunnel Boring Machine (MTBM). The MTBM design utilizes drilling fluid and mechanical cutters to complete the drilling process and ingest the fluid and cuttings into the machine and then pumps them to the entry site location for processing. The direct pipe process requires the pipeline or a casing to be installed directly behind the MTBM, providing the advantage of limiting the volumes of fluid that are present in the borehole at all times. The annular cavity of the borehole is lubricated with a low pressure drilling slurry (bentonite) that prevents the potential for frac out and other fluid losses. Further, where possible the use of drilling fluids may be stopped prior to completion of the borehole and exit into the sea, this eliminating the potential for drilling fluid losses at the exit point. As a result, the potential volume of fluid loss is minimized only to the

	annular space surrounding the pipe-string to the borehole. **Drilling Fluid** Drilling fluid is typically composed of only water and bentonite. Any other additives that might be required would be selected and used in compliance with the Alaska Department of Environmental Conservation General Permit AKG320000 – Statewide Oil and Gas Pipelines. **Volumetric Estimates** As the HDD execution methodology has not been selected, no exact volumetric calculation for cuttings or potential drilling fluid losses is available at this time. As a point of reference, a 2000' foot long 18" diameter HDD hole would produce approximately 130 cubic yards of cuttings, while a 300' long section of the hole would produce approximately 20 yards of cutting. An assessment of the potential for turbidity and the possible amount of turbidity will be done at later stages in the project and a mitigation plan will be developed to address and minimize any turbidity impacts to Cook Inlet waters in the event of a release.
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AECOM Intake Form

Date Response was Received:	**7/26/19**
Received by:	**AECOM**
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