

Executive Summary

The following executive summary of the IEP's findings is intended to provide as concise conclusions as possible against the assigned terms of reference as well as limitations of the study. Each of these findings is further elaborated in the remainder of this report.

Terms of reference are stated below sequentially, followed by respective findings. The IEP welcomes clarification and discussion of its work.

Findings

A) Regarding construction and design of the Undai River main stem diversion, in particular:

- *Whether the diversion of the Undai River main stem is designed and has been constructed to function as needed to return the quality and quantity of water to the herders that the Undai previously provided;*
- *The direct, indirect and cumulative impacts on herders' pasture, access to water and water quality resulting from the diversion of the Undai River main stem; and*
- *Any feasible alternatives or modifications to the diversion of the Undai River main stem or associated monitoring and/or mitigation plans that would avoid or reduce impacts on the herders' pasture, access to water and water quality.*

Groundwater drawdown has occurred through water extraction for mine construction, dewatering and open pit development. Since connectivity was found to exist to the alluvium of the Undai River, the drawdown of groundwater around the cone of depression of the open pit has resulted in the loss of water in the alluvium of the Undai River and Bor Ovoo spring over a 1-2 km reach of the Undai River (Smith, 2013; pages 10, 39)¹.

Water abstraction due to coal road and railroad construction, along with poor drainage design, has had an impact on the flood flows and recharge of the Undai River aquifer. Although these impacts are not directly related to the OT Project or to the Undai River Diversion, they are treated in the Phase 1 IEP Report as part of the analysis of cumulative impacts to herder water sources and pasture fragmentation.

The most obvious direct effect of the Undai River diversion on herders' access to water is the loss of access to surface water of the Undai River along the diverted section of the Undai River bed during periodic flood flows. Since there is no significant alluvial aquifer in the area of the new diversion channel -- and part of the alluvial aquifer of the original channel is affected by the cone of depression -- another effect is a loss of groundwater recharge of the Undai River alluvial aquifer during periodic flood flows.

The type of modeling (rainfall/runoff) used for the design of the dam and diversion channel introduces a high degree of uncertainty to the actual flood flow prediction and additional data is needed to accurately measure and model surface flows in the Undai River (Smith, 2013).

B) Regarding planned relocation of the Bor Ovoo spring, in particular:

¹ Smith, G. 2013: Oyu Tolgai, Hydrological Conditions near the Mine Site, Report by Aquaterra for OT LLC

- *The appropriateness of the proposed design for the relocation of the Bor Ovoo spring and any alternatives or modifications that would better replicate the ecological, cultural and social functions of the original spring*
- *The direct, indirect and cumulative impacts on herders' pasture, access to water and water quality resulting from the relocation of the Bor Ovoo spring.*

The direct effect of the relocation of the Bor Ovoo spring on the herders' access to water and water quality is the complete loss of the spring. The temporary replacement water source at the Southern fence line of the MLA delivers water, however it does not replicate the functions for livestock herding neither the ecological functions of wildlife habitat of Bor Ovoo spring. **The loss of the original Bor Ovoo spring has caused longer distances for herders to access water at the current water outlet of the diversion pipe;** with the establishment of the latest fence line along the MLA border, this has become even more pronounced. Likewise, the lack of recent flood flows and resultant lack of re-charge of herders' wells affects herders along the Undai River. Herders' observations on the decline in recent years of recharge rates of herders' wells and of open water (zadgai) along the Undai River are detailed in this report. In October 2014, an IEP field visit found that the only open water in the Undai River was at "Khuurt" zadgai, where a small amount of water was present.

The loss of access to summer pasture and loss of water sources due to watershed wide impacts by the OT mine and infrastructure development (including coal road) has resulted in far reaching and irreversible disturbance to traditional nomadic livestock husbandry in Khanbogd Soum, especially in Javkhalant Bag effecting the whole herding community. The search for water and pasture and inability to let winter pastures rest, is degrading remaining pastures; with the effects of fragmentation, mechanical disturbance, dust and litter along infrastructure corridors, the cumulative impacts are severe and will continue to increase as mine development proceeds.

Water quality monitoring results show good alluvial groundwater quality above and below the diversion and no evidence of contamination by contribution from contact with mineralized bedrock (Monthly Monitoring Report #34, December, 2014). Although the water quality monitoring shows the quality of the water coming from the pipe is good, **the water quality deteriorates below the pipe (increased pH, TDS, EC, sulfate, chloride) most likely due to animal use/concentration of animal waste.**

Losses of pasture productivity as a result of resettlement of households from the MLA were found to be significant for affected households as pressure on pastures increased (CPR 2012 b)² and this trend is further exacerbated through stress on water resources.

It is not possible to distinguish the direct effects of the diversion on pasture with the current baseline information from effects through other project activities. Changes in forage plant species composition along the Undai River indicate dryness and pasture degradation. Meteorological records of the last decade document a slight increase in annual precipitation and included several years of exceptionally high annual rainfall. Vegetation responses in Gobi rangelands to climate are complex; it is not conclusive to link a deteriorating trend in vegetation in the project-impacted areas to climate change primarily.

² Center for Policy Research, 2012 b: Assessment of Changes Occurred to Sufficiency and Quality of Pasturelands of Khanbogd Soum's Herders' Households Involved in the Settlement Program and Suggestions