Ministry of Land, Water and Resource Stewardship Victoria, B.C.

MEMORANDUM

File: 44150-01 - FRX

July 22nd, 2022

To: Todd Goodsell, Project Assessment Director, Environmental Assessment Office

From: Emily Cameron, R.P. Bio, Vegetation Ecologist, Ministry of Land, Water and Resource Stewardship. Technical advisor for high elevation grasslands.

Re: FRX Readiness Decision – Concerns related to historic loss and present condition of high elevation grasslands in the Elk Valley

During review of the Fording River Extension Project – Detailed Project Description, comments were provided by FLNRORD so that concerns and potential risks associated with FRX to high elevation grasslands in the Elk Valley may be considered by the EAO. Ongoing work has been undertaken by FLNRORD and MOE to determine both the distribution and drivers of condition for these red and blue-listed high elevation grasslands.

My opinion as an R. P. Biologist is that existing current cumulative effects associated with coal mining and coal mining exploration on high elevation grasslands in the Elk Valley are significant. FRX will have additional significant negative impacts on remaining high elevation grasslands in the Elk Valley, and impacts associated with direct loss of high elevation grasslands will not be mitigatable. This opinion is informed and supported by the following data that should be considered by the EAO prior to the readiness decision, during the application review and the effects assessment:

1) Restricted distribution of high elevation grasslands in British Columbia: There are 5 high elevation grassland (HEG) types in the Elk Valley that are red- or blue-listed within British Columbia due to their rarity and high threats from permanent conversion to coal mines and mine infrastructure (B.C. CDC 2021). The rough fescue type (Gg16, red-listed in 2021, 1280 ha in 2021) and the Idaho fescue type (Gg14, red-listed in 2021, 420 ha in 2021) are restricted to the Kootenays and cover less than 0.01% of British Columbia's land base and 0.5% of the Elk Valley CEMF area. They are not known to occur elsewhere in British Columbia (B.C. CDC 2021). Almost all significantly sized occurrences of the rough fescue type (Gg16) occur within the east side of the Elk Valley (B.C. CDC iMap 2022).

2) Historic losses associated with coal mining and coal mining exploration: Since 1950, approximately 32% of Gg16 area has been permanently lost to mining developments at Fording River, Line Creek, Elkview, and Greenhills coal mines (Figure 1, B.C. CDC

iMap 2022) and 15% of Gg14 area has been permanently lost to the same projects (Figure 2, B.C. CDC iMap 2022). These losses do not include mining exploration roads (Figure 3), which are additional permanent losses of Gg14 and Gg16, which account for an additional approximate 2% loss of Gg16 and 14 (B.C. CDC 2021).

3) Risk of permanent high elevation grassland loss associated with FRX: If extirpated Gg16 area is excluded from area calculations, 18% of remaining Gg16 is located on FRX. Proceeding with FRX is forecasted to result in permanent loss of 44% of the total Gg16 from the 1950's baseline. This total loss does not include mining exploration roads, or any other permitted or planned mining projects in the Elk Valley, so permanent losses will be higher (Figure 1, B.C. CDC iMap 2022). Five percent of the total remaining Gg14 area is within the proposed FRX, representing a forecasted permanent loss of 20% from 1950's baselines. This total loss does not include mining exploration roads, or any other permitted or planned mining projects in the Elk Valley, and so permanent losses will be higher (Figure 2, B.C. CDC iMap 2022).

4) Drivers of remaining grassland condition: Area-based calculations for high elevation grasslands do not consider measures of condition (Figure 3), and changes to high elevation grassland condition is not identified in the Detailed Project Description. Presently, 7% of extant Gg16 grasslands are in a non-functional condition (Turnbull) and 12% of remaining Gg16 grasslands are at risk of becoming non-functional (Burnt Ridge Extension, Lower Todhunter, Greenhills) (Cameron et al. in Prep). Grasslands on Castle Mountain are in good to excellent condition, and Castle represents 22% of remaining grasslands in good, excellent, or unknown condition (Cameron et al. in Prep). Grasslands at lower elevations on Ewin Ridge (including North Central) may not be in good-excellent condition and have been observed to occur in seral configurations, and high elevation grasslands on the west side of the Elk Valley are small (B.C. CDC iMap 2022) and likely to be heavily grazed. Declines in condition may be associated with overgrazing by ungulates as they become concentrated on extant grassland area (Poole et al. 2018, Cameron et al. in Prep).

5) No evidence of high elevation grassland recovery after reclamation: Evidence shows that generalized approaches to mining exploration road reclamation in Gg16 result in significantly different ecosystems that do not resemble undisturbed Gg16, irrespective of time since disturbance and are likely related to alteration in site and soil conditions (Cameron et al., In Prep.). Road recovery areas were consistently different from undisturbed adjacent grasslands at sites located at Turnbull Mountain, Ewin Ridge, Todhunter, Castle Mountain, Horseshoe and Burnt Ridge Extension, so reclaimed mining area does not contribute to high elevation grassland area (Cameron et al. in Prep).

6) Additional impacts not addressed in the Detailed Project Description: Alterations of climate and wind patterns associated with mountain removal were not identified in the Detailed Project Description and are likely to have impacts on condition of adjacent grasslands. Impacts of overgrazing, particularly on Turnbull Mountain, are likely compounded by alterations in wind patterns as mountain removal proceeds. The soils at these sites are aeolian in origin (MacKillop et al. 2018) and are easily transported by winds when the ground surface is not protected by vegetation. Snow, a source of

moisture in moisture-limited environments, is likely also removed from this site due to wind and coal dust – albedo effects (Figure 5). At Turnbull, the surface of the ground eroded by 10-12 cm relative to ground surface height in 10-year exclosure cages, indicating significant loss of soils over the course of 10 years and is likely a consequence of removing Eagle Mountain, subsequent wind pattern alterations, and overgrazing. More research on impacts of mountain removal to localized weather patterns is required to understand impacts of mountain removal coal mining on the broader landscape. Existing and future impacts of mountain removal on adjacent high elevation grasslands needs to be considered during the effects assessment phase.

Research is presently being undertaken to quantify and qualify drivers of grassland change, and to develop a seral grassland classification to better understand patterns of grassland condition across the Elk Valley. Research on road reclamation, impacts of ungulate grazing, and patterns of temporal grassland change are scheduled to be submitted for peer review near the end of March 2023. Pending funding availability, research on alterations to localized wind patterns may take place during 2022-2023. Data and learnings from this work will be publicly available as analyses progress.

Please consider the permanent loss of native high elevation grassland area associated with coal mining and coal mining exploration and subsequent changes to condition of remaining high elevation grasslands when assessing expected impacts associated with FRX and other coal mining projects in the Elk Valley.

Emily Cameron
MSc, R.P. Bio

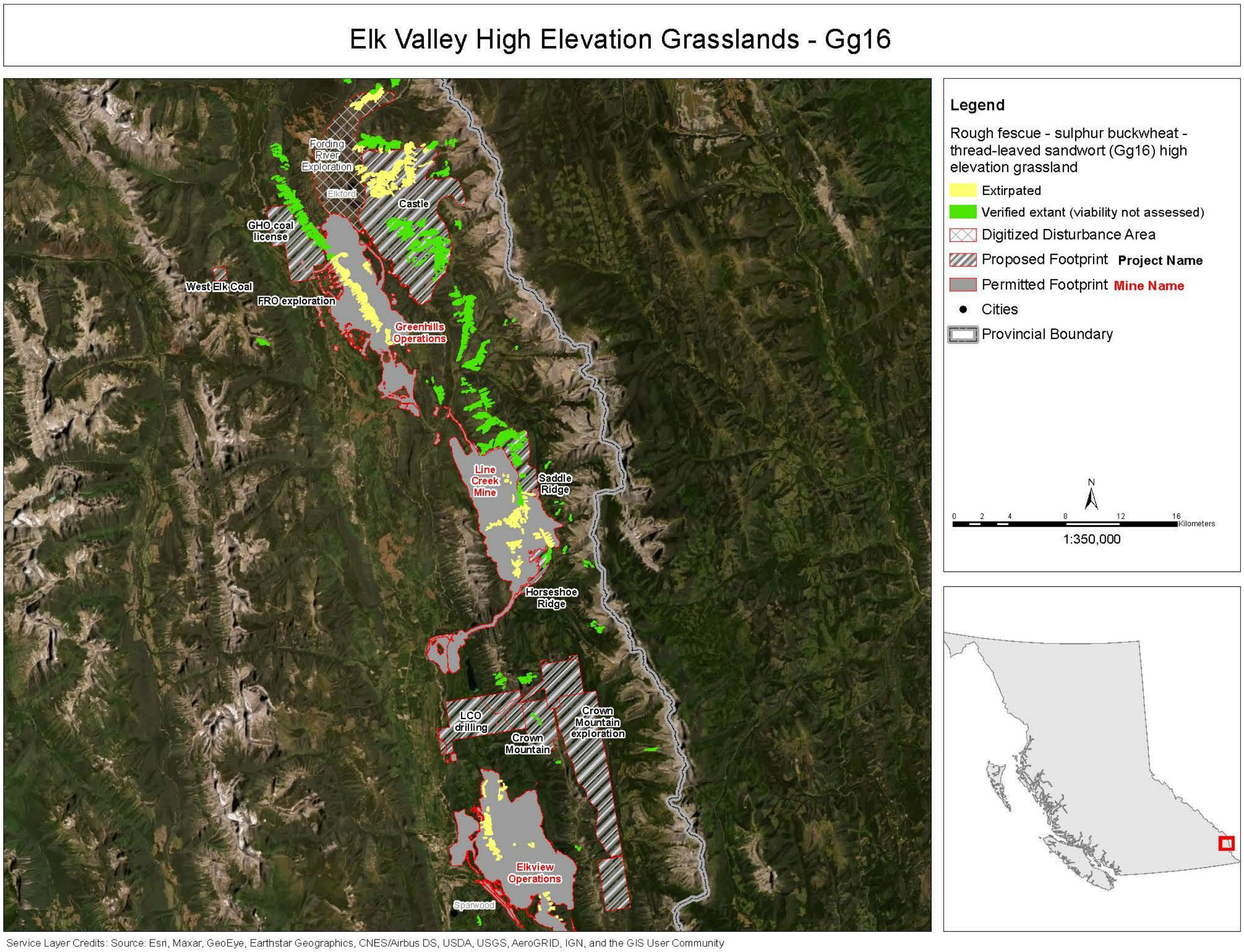

Figure 1: Gg16 Rough fescue type high elevation grassland in the Elk Valley. Gg16 is largely confined to the east side of the Elk Valley.

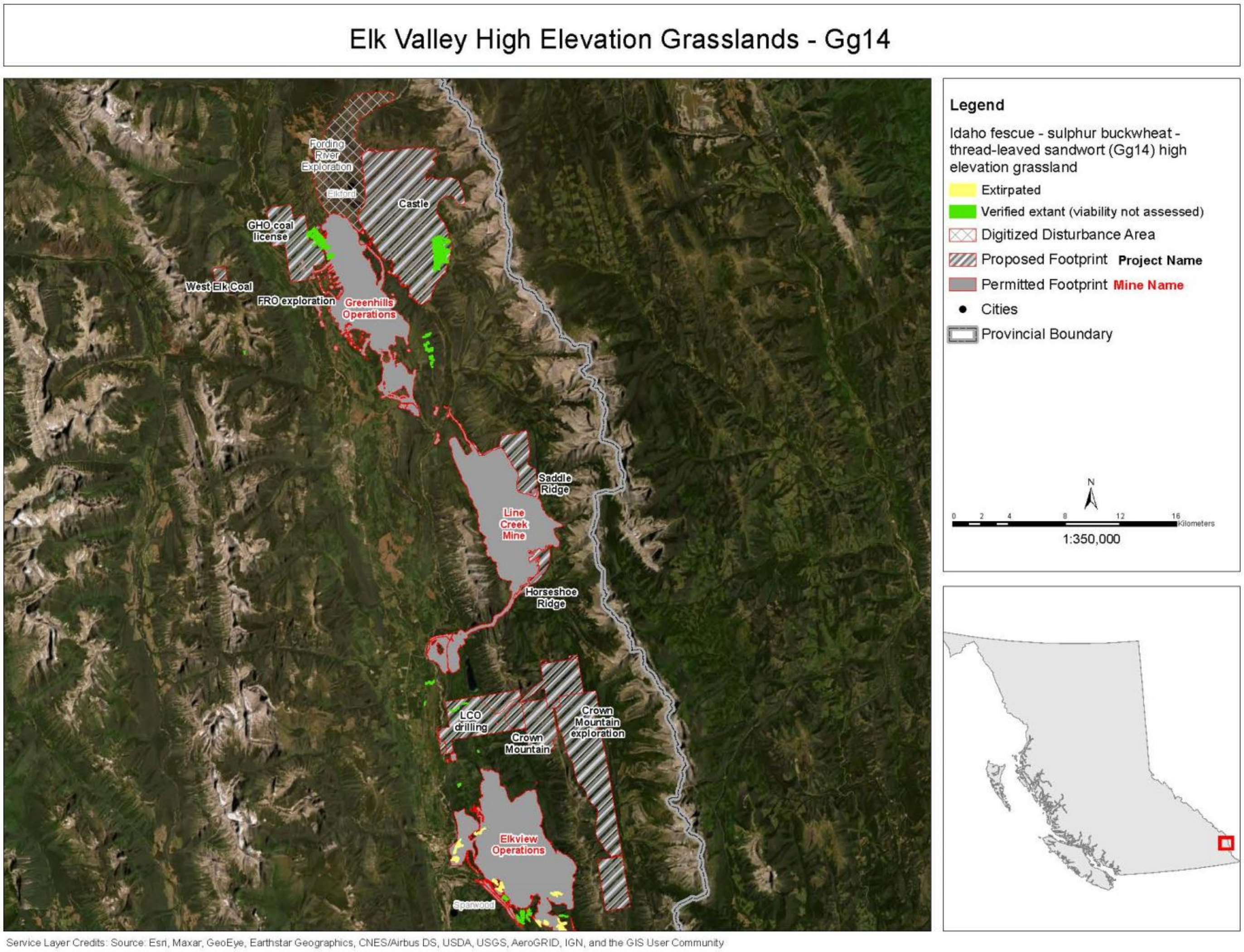

Figure 2: Gg14 in the Elk Valley. Note additional occurrences outside the extent of this map into the Flathead Valley

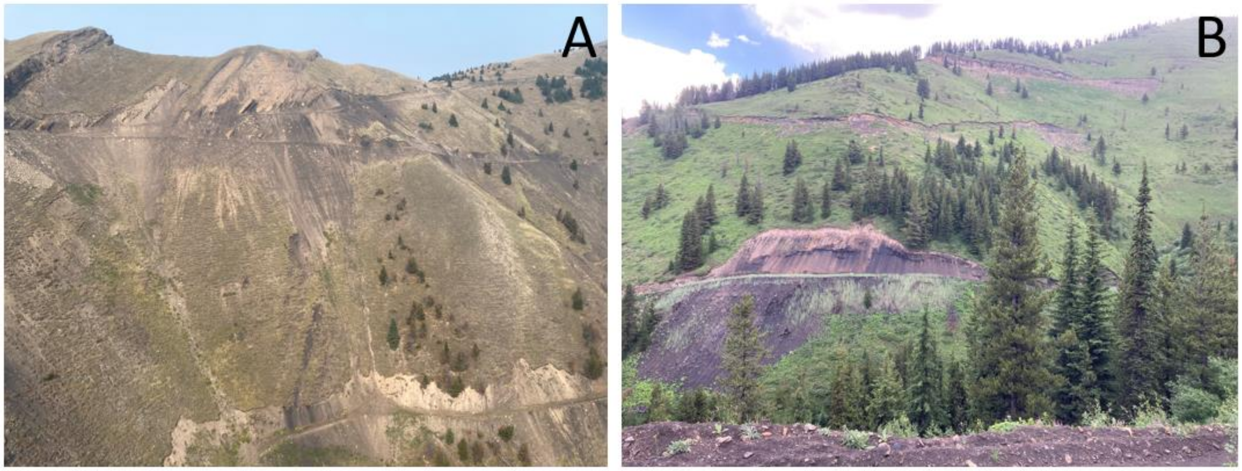

Figure 3: Mining exploration roads at A) Turnbull Mountain and B) Castle Mountain. Note spillage downslope from the road, presence of invasive plant species (Canada thistle in A as darker green patches), and agronomic seed mixes with different species mixes than native grasslands in B. To date, HEG research project data indicates that road reclamation does not result in vegetation communities similar to undisturbed grassland and so these area losses are permanent.

Figure 4: A) Gg16 in excellent condition with high cover of rough fescue; B) Gg16 at risk of becoming non-functional. Note marginal presence of bunchgrasses C) Gg16 as a non-functional grassland. Note high cover of rough fescue inside the 10-year exclosure cage, the prevalence of weeds, exposed mineral soil, and Poa spp. and a lack of bunchgrasses outside of the exclosure cage.

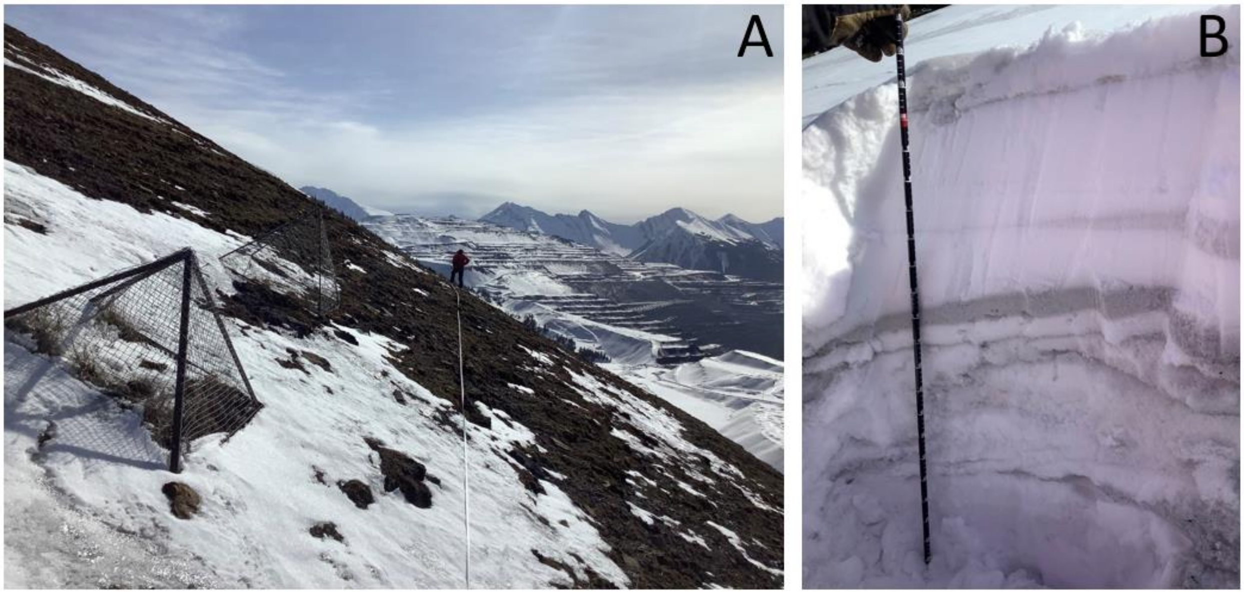

Figure 5: A) Gg16 at Turnbull Mountain is frequently snow-free in the winter, likely related to altered wind patterns and albedo effects. B) Snow stripped from Turnbull (A) is deposited in the lee of Turnbull's crest. Snow depths here are just over 2 m. Snow layers are darkened by coal dust. Altered snow distribution patterns and albedo impacts may be unexpected consequences of mountain removal and may exacerbate impacts from overgrazing.

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