6.0 KNOWLEDGE GAPS AND RECOMMENDATIONS

This section summarizes the knowledge gaps identified through the literature review and outreach program that will need to be addressed before a final decision is made on alternative management and reclamation approaches for mineral soil pads in peatlands.

6.1 RATIONALE AND PROCESS FOR APPLYING A VARIANCE TO CRITERIA

The following knowledge gaps were identified regarding considerations for leaving reclamation deficiencies in place on upland sites and applying for a variance to criteria. Information on these subjects is required to inform a complete net environmental cost/benefit analysis for leaving deficiencies in place.

- Acceptable dimensions for landscape deficiencies (cut and fills, subsidence) to account specifically for operability constraints of forest harvest equipment
- Risk matrix for assessing fire hazard of woody debris piles left in place on wellsites
- Success rate of wellsites with no topsoil that achieve and maintain equivalent land capability in the long term and the factors that contribute to success or failure; analysis of whether there are differences in recovery on a wellsite with no topsoil vs. a pad left in place with no topsoil
- Empirical evidence showing noxious weed persistence after canopy closure (Small et al., 2018)
- Short- and long-term impacts of noxious weeds and undesirable species on forest species and community development as a whole, and quantification of the length of the resultant successional delay, if it occurs (Small et al., 2018)
- Short- and long-term impacts of herbicide application to control noxious weeds and undesirable species on forest plant community development, particularly as it relates to herbicide overspray (Small et al., 2018)
- Long term impacts of soil stockpiling on soil organic matter and nutrients, especially after stockpiled material is re-spread
- Empirical evidence of delayed ecosystem recovery after soils are re-stripped and re-placed a second time on a wellsite during reclamation to correct deficiencies and measurement of the length of the delay
- Cumulative impacts of leaving multiple deficiencies in place, and the threshold at which cumulative impacts degrade overall ecological function

- Magnitude of carbon emissions released during traditional reclamation to correct deficiencies (including site access) and whether these emissions are substantial enough to warrant their inclusion in the determination of the environmental net benefit associated with traditional vs. modified reclamation

6.2 RATIONALE AND PROCESS FOR LEAVING A MINERAL SOIL PAD IN PLACE

The following knowledge gaps were identified regarding considerations for leaving pads in place in peatlands and applying for a change in land use. Information on these subjects is required to inform a complete net environmental cost/benefit analysis for leaving pads in place in peatlands.

- Extent and severity of impacts related to well pads left in place in peatlands compared to impacts related to roads left in place in peatlands
- More thorough understanding of the relationship between peatland type (bog vs. fen), feature type (pad vs. road) and direction of water flow relative to the feature on the occurrence of impacts to hydrology
- Impacts of pads and roads left in place on groundwater
- Impacts of pads and roads left in place on wildlife habitat, wildlife movement and use of the landscape
- Cumulative impacts of multiple pads and roads on local and regional peatland hydrology, chemistry, vegetation and greenhouse gas fluxes and the threshold at which cumulative impacts degrade overall ecological function of the region
- Methods that can be used for measuring the occurrence and extent of current pad impacts to hydrology, as well as the potential for future impacts
- Success rate of pads left in place with no topsoil that achieve and maintain upland ecosystem function and equivalent land capability in the long term.,. Specific knowledge gaps related to upland ecosystem function on pads left in place include:
    - Relative importance of factors that influence successful reforestation of pads (e.g., soil quality, topsoil depth, compaction, dispersal vectors, historical revegetation efforts, time, surrounding peatland type, water quality and levels, etc.)
    - Potential for water table to rise into the root zone over time
    - Resiliency of upland ecosystems developed on pads left in place

- Success rate of pad removal in achieving peatland ecosystem function and equivalent land capability and the factors and reclamation practices that contribute to success or failure. Specific knowledge gaps related to pad removal include:
    - Extent of peat compression under the pad, and how this is impacted by the thickness and overall weight of the pad
    - Extent of peat rebound after the pad is removed and how this is impacted by the duration of the pad being in place and thickness of the pad
    - Potential for and risk of minimal peat rebound and the creation of an open water body with cattails instead of a site on a trajectory to a functional peatland
    - Impacts to underlying peat chemistry resulting from the pad material, and how those changes may impact a developing plant community after removal of the pad
- Magnitude of carbon emissions released during pad removal (including site access) and whether these emissions are substantial enough to warrant their inclusion in the determination of the environmental net benefit associated with pad removal vs. leaving the pad in place

6.3 RECOMMENDATIONS

Recommendations

- Clarification from government for the required approvals for requests for variance to criteria on upland sites. Currently there is confusion as to whether AEP (as the landowner) is involved in the decision.
- Guidance document on how to best prepare variances on upland sites. The guidance document would help government and industry standardize methods to apply common variances to help streamline the certification process. Additionally , the guidance document would provide a library of resources and references to be used for common variances used for non routine applications. The document would outline how to prepare good quality justifications which would help provide more consistency further streamlining the process.
- Collect data remotely and in the field via case studies or a more rigours experimental design to provide empirical evidence pads can be left in place to create functioning forests. Information collected would be used to determine factors that are needed to create successful forests on padded sites., this science based information would be used to help support reclamation certificate applications for sites that will have pads left in place. Additionally, the data collected

will provide industry better decision or risk-based tools to help prioritize and determine what sites require pad removal and what sites can be left in place. Data also would be used to help determine what factors (e.g., peatland type, pad type, hydrology, etc.) lead to impacts from pads.

- Develop decision support tool/policy framework recommendations for leaving pads in place on peatlands

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