Removing the Wellsite Footprint II: Revegetation Strategies and Ecohydrologic Considerations for Well Pad and Road Reclamation in Fen Peatland
(Best Practice Recommendations)

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For:
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Alberta-Pacific Forest Industries Inc.
Canadian Natural Resources Limited
Cenovus Energy
ConocoPhillips Canada
Devon Canada Corporation
Husky Energy
Imperial Oil Resources
Japan Canada Oil Sands Limited
MEG Energy Corp.
Nexen CNOOC Ltd.
Statoil Canada
Suncor Energy

With the Additional Financial Contributions of:
Alberta Upstream Petroleum Research Fund
Distributed on behalf of Canadian Association of Petroleum Producers and Explorers and Producers Association of Canada by Petroleum Technology Alliance Canada.

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**Best Practices Recommendations:**

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**Future Construction**

The effects of roads and pads upon adjacent peatlands will vary with the methods by which they are constructed as well as the peatland type, peat depth, peat physical properties, and the underlying mineral soil underneath. How easily roads and pads can be reclaimed also depend on these things. Therefore, how and where pads and roads are to be built should be carefully planned to minimize their effects on peatlands and minimize the cost and difficulty of reclamation when their useful life is over. Some features within peatlands can be reclaimed fairly easily because of how and where they were constructed. Studying these examples, as well as investigating construction methods used elsewhere or developing new ones, will help to reduce both the footprint and overall costs associated with construction in peatlands.

**Reclamation Planning**

Similarly, a good plan is required prior to reclaiming an existing road or pad because reclamation success and the methods you have available to you will also depend on how and where a road or pad was built. Think carefully about what are reasonable expectations for the outcome of the reclamation project. Think about what alternatives you might have for the final reclamation product, the types of equipment and methods you have available given the conditions you need to deal with, and the costs/benefits of a range of possible reclamation choices. Furthermore, look at the broader landscape and consider how the reclaimed road or feature can be blended into it, rather than fixating on removing of every bit of the feature from the environment. For example, it may be less important to entirely remove a road or pad from a landscape in which a mix of upland and lowland features naturally occurs in the surrounding area. In cases, if it is difficult to remove fill material completely, it might be acceptable to keep some part of the road or pad as an upland feature that can blend with the surrounding landscape. Even a road or pad within a large continuous peatland could possibly be reclaimed as an upland feature blended into the landscape if doing so does not disrupt water flow, if it mimics similar examples in nature, and removal of the fill material would cause more harm than leaving
it in place.

**Fill Removal**

While considering the overall landscape and how some remnants of a road or pad might fit into it is important, it should always be the goal of the reclamation plan to remove as much introduced fill as is practically possible to reduce potential influence on water flow and groundwater chemistry, as well as to minimize the area remaining to be blended with the surrounding landscape. The less of a road or pad that remains, the less effort will be required to establish suitable vegetation upon it. Fill removal should not be too difficult when the fill is not too deep (e.g. ~1.5 m) and there is a liner between the clay and peat. In such cases, removing all of the fill is preferred because the liner beneath a shallow layer of fill may cause problems for revegetation. On the other hand, if the clay is placed over corduroy with no liner, remove as much as possible and churn the remaining fill under the peat with the excavator, bringing as much peat to the surface as possible.

**Make Sure There is Organic Soil on Top**

Organic soil is preferred to mineral soil for growing peat-forming vegetation. Therefore removal of fill completely and establishing vegetation on the underlying peat is again the preferred option if possible. If some fill has to be left in place, bringing in organic soil, such as stockpiled peat, is desirable. A minimum depth of 20 cm may be sufficient, but 30 – 50 cm would likely be adequate.

**Surface Roughness**

There are three situations in which to apply surface roughness. The first is in the removal of relatively shallow fill over peat without a textile liner between the fill and underlying peat. In this case, the surface is roughened in the process of churning the last remaining bit of fill material under the peat and bring peat up to the surface. A rough surface is produced in doing so and should be left rough. The second case is excavating deep fill to within the water table, but leaving the remaining fill in place. This case is equally applicable to roads and pads. Create roughness (hummocks and hollows that differ in elevation to about 1 m) by digging a bucket full of soil with the excavator and dumping it back in place, similar to digging up a garden space with a spade. The purpose of roughening is to provide deeper pathways of water flow, while retaining varying the surface heights to provide many different places for plants to grow even if the water table fluctuates. Roughening deep fill left after excavation can be used in combination with a cap of stockpiled peat to provide the greatest variety of potential environments for
vegetation establishment. The final case is “fluffing” of peat that was compacted by overlying fill once the fill has been removed. The compacted peat should be lifted with the excavator in a manner similar to the churning or spading described for the other two cases, however it need not be as aggressive. Height differences along the surface of about 50 cm should be sufficient. If the newly exposed peat surface is fairly even with the surrounding peat, fluffing or roughening may not be necessary.

**Maintain or Establish Water Flow Across Roads**

Making sure there is flow of water across roads in peatlands is a priority. This can be achieved in a number of ways, and several should probably be used in combination. Removing the road entirely is the best option, but is not always possible. Lowering the surface deeper into the water table is another option, which probably will produce acceptable results when the excavation is partially refilled with organic soil. Creating a rough surface on the excavation may allow less fill to be removed while still retaining satisfactory flow across the road. Regardless of how deep the road surface is lowered to, it will likely still dam water flow to some degree. It might therefore be necessary to cut deeper channels at intervals along the road, install more or larger culverts, or completely remove short sections of road to enhance water flow. If the road surface is not roughened, crown the lowered road surface to prevent ponding to prevent producing a perched water table.

**Revegetation**

Developing peat-forming moss over organic soil is the quickest route to restoration of disturbed peatland. The manual produced by Quinty and Rochefort (2003) can be applied to reclamation of roads and pads. Introduction of a sufficiently deep organic soil will be needed to put on top of fill left in place. If all the fill has been removed, the method can be applied directly to the underlying peat. Be careful to take material from only the top 10 cm of the donor peat location. The material needs to be macerated, either with something like a rotary tiller when collecting it, or with something like a manure spreader when applying it. Maceration is important because it increases the number of potential pieces of moss that will grow into new plants and increases the area to which the material can be applied. The material is applied thinly so that you have a ratio of receiving area to donor area of 10:1. Cover the transferred moss with an adequate depth of straw or other suitable mulch to prevent it from drying out. Follow the instructions in the Quinty and Rochefort (2003) manual.
Sedges and related species should be planted to because they are adaptable and tolerant of varying moisture conditions, except for very locations. These plants also protect the transferred mosses from drying out and promote natural moss establishment. Sedges and related species can be grown in a greenhouse and planted as seedlings or transplanted from the adjacent area. Plant at a density of about 4 – 6 plants per square meter.

Woody species are also good choices for planting as they often form a component of early peatland development as well as in mature peatlands. Willow cuttings will likely perform well. Black spruce and Labrador tea seedlings grown in a greenhouse may also do well, while transplanting may have less success. Other woody species such as larch and bog birch should also be attempted, again with greenhouse stock probably producing best results.