APPENDIX 11
MEADOW CREEK WEST PIPELINE CORRIDOR STUDY
Sign-off Sheet

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1.0 INTRODUCTION

1.1 EXECUTIVE SUMMARY

Suncor Energy Inc. (Suncor) is preparing an Environmental Impact Assessment report to the Alberta Energy Regulator (AER) for the Meadow Creek West (MCW) Project. With Suncor’s Meadow Creek East (MCE) Project in the vicinity, Suncor would like to include a plausible utility corridor route between the two central processing facilities (CPF). The Meadow Creek West Pipeline Corridor is to include dilbit, diluent, source water and disposal water pipelines. This report provides that corridor route and two others which were investigated.

1.2 PURPOSE

The purpose of this document is to recommend a preliminary route between MCE to MCW for the buried utility pipeline corridor shown in Figure 1.3.1. It considers optimal route length, general constructability, accessibility to the right-of-way (ROW), environmental considerations, geohazards, adjacent available workspace, utilization of Suncor’s planned pipeline corridors and proximity to foreign pipelines. This document will evaluate each option and identify major crossings, with a high level recommended crossing methodology for each type of crossing.

All information in this report is based on LiDAR, an Environmental Impact Assessment (EIA) completed by CRE-Stantec Ltd., and publicly available data. The planned pipeline corridors and wellpad dispositions were provided by Suncor. The pipeline corridor will consist of NPS 12 Diluted Bitumen (dilbit), NPS 8 Diluent, NPS 6 Source Water, and NPS 4 Disposal Water pipelines. The location of Meadow Creek East Project is SE ¼ Section of 35 and Meadow Creek West Project is NW ¼ Section of 13-85-11 W4M.

As the project and design progress, the routing will be refined and re-evaluated as additional data is collected.

1.3 PROJECT SCOPE & BATTERY LIMITS

Stantec Consulting Ltd. (Stantec) has provided a Desktop Study (the Study) to validate three (3) potential corridor route options from MCE to MCW utilizing contours, aerial mapping, and LiDAR. The Meadow Creek West Pipeline Corridor Study (the Study) will review the technical, constructability, and environmental aspects for the pipeline routes considered.

This Study illustrates the underground (U/G) pipelines portion of the project as illustrated in Figure 1.3.1 below for discussion purposes only.
Figure 1.3.1 – Simplified Interactive Diagram

2.0 PIPELINE SIZING

Pipeline sizing and material were provided by Suncor and are summarized in the Table below.

<table>
<thead>
<tr>
<th>Utility Pipelines</th>
<th>Pipe Size (NPS)</th>
<th>Pipe Material</th>
<th>Route 1 - Distance from MCE to MCW (km)</th>
<th>Route 2 - Distance from MCE to MCW (km)</th>
<th>Route 3 - Distance from MCE to MCW (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diluted Bitumen</td>
<td>12</td>
<td>ERW c/w ext. coating</td>
<td>21</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Diluent</td>
<td>8</td>
<td>ERW c/w ext. coating</td>
<td>21</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Source Water</td>
<td>6</td>
<td>ERW c/w ext. coating and HDPE Liner</td>
<td>21</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Disposal Water</td>
<td>4</td>
<td>ERW c/w ext. coating and HDPE Liner</td>
<td>21</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Tie-ins for all pipelines were assumed at the same location.*
3.0 PIPELINE DESIGN CONSTRAINTS, EXCLUSIONS, ASSUMPTIONS, AND ROUTE DETERMINATION

The Meadow Creek dilbit, diluent, source and disposal water pipelines will be installed below grade to transport product to and from the MCE to MCW CPFs and surrounding infrastructure. The distance and number of crossings will differ between the three (3) proposed routes.

The primary constraints, exclusions, and assumptions for the route selection are:

- Length of route as short as practical to minimize cost
- The tie-ins for the source and disposal water pipeline are at each CPF (locations to vary over time)
- The tie-ins for dilbit and diluent pipeline are at each CPF tank facility area
- Follow linear disturbances where possible, such as existing ROWs, LOCs, and powerline easements
- Watercourse crossings – Hangingstone River and unnamed creeks and streams
- Major Road / Highway crossings - Highway 63
- Power line crossing on the east side of Highway 63
- Crossing large / steep river valley – Sundog Valley
- Access to the ROW
- Avoid side hills for better constructability
- AER watercourse setback requirements stipulated in the Enhanced Approval Process Integrated Standards and Guidelines
- Geohazards visible on available aerial photography (note geotechnical investigation was completed to a 2 meter depth)
- No cost estimation at this stage, routes are generally selected based on length. Cost estimates to be completed during future phases of the project to help determine the optimal route.
- Muskeg is present throughout the ROW; therefore minimum cover shall be 1.5 meters as per Suncor Corporate Technical Standard 0222 Rev. 2 – See Section 5.4.4.9
- The frost line of 1.5 meters will be used for the ROW cross section and spacing purposes
- A minimum distance of 600 mm will be maintained between pipelines until further stress analysis on thermal movements is evaluated
- Construction to commence during the winter months and completed in one construction season due to wet ground conditions
- HDPE liner pulls will be in 600 m sections. Approx. 40 pull sections along corridor length.
- No issues with land acquisitions or permitting
- Crossing methodology based on desktop information; further review of geotechnical, environmental, and hydrology would be required in detailed engineering phase
Limited by the above constraints, the route was selected based on existing ROWs where possible in order to minimize the construction footprint, while deviating from existing ROWs to avoid congested areas.

### 4.0 PRELIMINARY PIPELINE ROUTE OPTIONS

The table below outlines information regarding each of the proposed routes as it relates to corridor length, number of crossings, and recommended crossing method.

<table>
<thead>
<tr>
<th>ROUTE OPTION</th>
<th>APPROX. LENGTH OF CORRIDOR (km)</th>
<th>CROSSINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minor / Dirt Roads</td>
<td>Major Roads / Highways</td>
</tr>
<tr>
<td>1</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>24</td>
<td>2</td>
</tr>
</tbody>
</table>

*Further environmental and geotechnical assessment will be required to determine feasible crossing methodology for Sundog Valley.

#### 4.1 GENERAL TERRAIN

From a desktop review of the terrain between the MCW and MCE CPFs, there are a number of environmental and constructability concerns that are present, which have helped influence the selection of the three (3) proposed routes required for this Study.

1) Slope stability concerns (i.e., steepness and unstable) with Stoney Mountain Hill near MCE through Sundog Valley.

2) Significant profile drop – MCE Elevation = 740 m; MCW Elevation 570 m.
   a. Refer to Attachment 1 for Overview Map of Route Profiles.

3) Muskeg depths – limited due to geotechnical information only completed to a 2 m depth.
The intent will be to avoid Sundog Valley and as many watercourse crossings for constructability and environmental reasons.

4.2 ROUTE 1 DESCRIPTION

Route 1 is the shortest route (approximately 22 km) from MCE to MCW, thus minimizing costs and overall footprint. In addition it uses existing right of ways (pads and pipelines) as much as possible. However, since it crosses Sundog Valley, it presents a major constructability risk and could potentially result in an increase total installed cost (TIC), as there are unstable slopes and access concerns present. This route has the highest number of crossings with a total of eighteen (18). This includes crossing two (2) pipeline corridors, the Hangingstone River and Highway 63, which are unavoidable from MCE to MCW for all three proposed routes. From an environmental stand point, the route includes eleven (11) watercourse crossings that cannot be avoided and crossing of the Sundog Valley proving it to be the least ideal.

4.3 ROUTE 2 DESCRIPTION

Route 2 is approximately 24 km in length and exits the MCE CPF with the intention of avoiding Suncor’s planned pipeline corridor and wellpad dispositions, which provides an advantage during design and construction stages in regards to pile spacing. However, by not paralleling adjacent corridors, additional Temporary Workspace (TWS) may be required with this option. The route has a total of fourteen (14) crossings and avoids the Sundog Valley. From an environmental standpoint, there are a total of seven (7) watercourse crossings and steep terrain is reduced.

4.4 ROUTE 3 DESCRIPTION

Route 3 is approximately 24 km in length and exits MCE CPF following Suncor’s planned pipeline corridor while avoiding wellpad dispositions and connecting with Route 2 before the Hangingstone River crossing. Following the planned corridor allows reduces TWS thereby reducing the overall clearing needed for construction. This route has the lowest number of crossings with a total of thirteen (13) and avoids the Sundog Valley. Similar to Routes 1 and 2, this route also includes crossing two (2) pipeline corridors, the Hangingstone River and Highway 63, which are unavoidable. From an environmental standpoint, there are a total of seven (7) watercourse crossings, steep terrain is reduced, which is comparable to Route 2. However, Route 3 parallels planned infrastructure at MCE further reduces TWS requirements.

4.5 RECOMMENDATION

Based on the routes listed above, Stantec recommends Route 3 as the most feasible options from an environmental, constructability and economic stand point. Even though it involves a similar number of major crossings, such as the pipeline corridors, Hangingstone River and Highway 63, it more importantly avoids crossing the Sundog Valley, which poses a major constructability and environmental concern due to steepness and slope stability. Both Route 2 and Route 3 follow a separate ROW for the first 9 km when exiting MCE, with the last 15 km following the identical corridor until the tie-in at MCW. However, since Route 3 follows a planned pipeline corridor at MCE (see Attachment 1), it reduces the need for additional...
TWS clearing, thus reducing the overall environmental effect. Consideration of the design constraints, exclusions, and assumptions outlined above to propose a preliminary route on Suncor’s behalf, a further detailed evaluation would be required to ensure the most cost-effective option is selected between Route 2 and 3 in terms of environmental, constructability and economy constraints.

5.0 CONSTRUCTION METHOD OPTIONS

A typical ROW Cross Section has been included for information. Refer to Attachment 2.

6.0 TEMPORARY WORKSPACE

Typical temporary workspace (TWS) requirements have been identified on the ROW Cross Section included; refer to Attachment 2. The additional workspace is needed to accommodate the placement of additional excavated spoil material common at crossings. TWS also serves as a location adjacent to the ROW where sections of pipe can be assembled and stored until that section of pipeline is scheduled for installation.

TWS will be required for the installation of HDPE liners for the source and disposal water pipelines. These pull locations require extra width excavation as the flanged connections have to be offset to accommodate the liner installation into the carbon steel pipeline. These excavations or bell holes may remain open for extended periods of time and consequently require extra width to allow equipment access to the trench from both sides. The placement of these TWS requirements would be selected based on a 600 meter length maximum flange spacing rule of thumb. Bends have an effect on the maximum pull length and have been taken into account when selecting these TWSs.

7.0 ROW ACCESS ROADS

Access to the start of the pipeline ROW will be attainable from both the MCE and MCW CPFs. Highway 63 roadway will be used as the main route to accommodate access to the ROW during construction. Construction access along the entire ROW will be available; however intermittent access roads or shoo-fly roads would be beneficial to allow quick and easy access to different areas of the ROW during construction for trucks (4x4) or ATV use.

Confirmation of winter access roads will require additional investigating to select potential additional access to the pipeline ROW to eliminate traffic congestion along the ROW.

A preliminary route map has been prepared, refer to Attachment 1. The winter access roads will have to be frost packed to make them passable to vehicle traffic.

Road use agreements will be required prior to construction and early selection of these roads will facilitate the acquisition of the agreements. In order to select the appropriate routes, an extended review of the area will be required.
8.0 ATTACHMENTS

1) Meadow Creek West Pipeline Corridor Study: Overview Map of 3 Proposed Routes

2) Cross Section – 34m ROW (2 separate common trenches)
Route Option 1 - 22 km
Route Option 2 - 24 km
Route Option 3 - 24 km

MCW Dilbit/Diluent Tie-in
MCE Dilbit/Diluent Tie-in
MCW Water/Waste water lines From MCE
MCE Water/Waste water lines From MCW

Route Options
Overview Map

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.
Sources: IHS, Suncor Energy

Route Options
Overview Map
Notes:
1) Depth of Source and Disposal Water Pipelines to range from 1.5m to 2.1m. To be confirmed once Geotechnical Investigation Report is completed. Overall footprint dependent on depth.
2) ROW X-Section is Not To Scale (NTS).