



### 1.0 INTRODUCTION

Murphy Oil Company Ltd. (Murphy) constructed a sweet natural gas pipeline measuring approximately 28.67 km in length, from a-21-B, 93-P-9 to Brainard Meter Station within the NE ¼ of Sec 7, TP 74, Rg 12, W6M (the Project), between February and November 2008. The Project crosses the BC-Alberta border between Tomslake, British Columbia and Hythe, Alberta (Survey Plans are provided in Appendix A, Figure 1 Sheets 1-9 are provided in Appendix B). As part of Murphy's application to the National Energy Board (NEB), an Environmental and Socio-Economic Assessment (ESA) and an Environmental Protection Plan (EPP) were submitted (TERA Environmental Consultants [TERA] 2007a, 2007b, 2007c) as per the requirements of the Filing Manual (NEB 2004) under Section 58 of the *National Energy Board Act*.

As stated within Section 9.1 of the ESA, a Post Construction Monitoring Program (PCMP) was to be developed and implemented after both the first and second complete growing seasons following construction to assess and report the effectiveness of environmental impact mitigation and reclamation measures. In 2009, soil, vegetation and watercourse assessments were completed along the pipeline right of way (ROW) as part of the first year PCMP (TERA Environmental Consultants 2007d). The results of the 2009 assessment, along with landowner input and any other applied remedial measures, were documented within the first year PCMP report completed by Golder Associates Ltd. (Golder) in November 2009 (Golder 2009). Similarly, in 2010, soil, vegetation and watercourse assessments were completed by Golder as part of the second year PCMP. The results of the 2010 assessment, along with landowner input and any other remedial measure taken, were documented within the second year PCMP report completed by Golder in December 2010 (Golder 2010).

Murphy retained Golder to conduct a third year PCMP assessment in 2011 to identify outstanding issues and provide recommendations for further mitigation. This report documents the findings of the third year PCMP assessment and provides recommendations for further mitigation to address outstanding issues.

### 2.0 SCOPE OF WORK AND METHODOLOGY

The third year PCMP assessment was completed to follow-up on the effectiveness of mitigation and reclamation parameters on disturbed soils, vegetation and watercourses identified during the second year PCMP assessment. The third year PCMP assessment was completed based on the requirements outlined within the EPP and included the following:

- A visual assessment of the soil within areas previously identified to have admixing, compaction, stoniness, contour issues, and erosion potential as documented in the second year PCMP report.
- A visual assessment of the vegetation within areas that previously exhibited vegetation issues related to percent coverage, overall health, and presence of nuisance or noxious weed species as documented in the second year PCMP report.
- A visual assessment of the effectiveness of erosion control structures (ECS) implemented at watercourses crossed by the right of way (ROW) and an assessment of any residual impacts on watercourses identified within the second year PCMP report.
- Telephone consultation with landowners of properties crossed by the ROW to record their comments regarding the results of reclamation activities since the second year PCMP assessment.



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Ben Rauscher and Laura Stewart, both environmental scientists with Golder, conducted the third year PCMP assessment between October 25 and 28, 2011.

The third year PCMP assessment was primarily a visual inspection. Areas on the ROW with poor vegetation growth were inspected using a hand auger to assess compaction and admixing.

### 3.0 PROJECT DESCRIPTION

The Project is located between Tomslake, British Columbia and Hythe, Alberta. It traverses agricultural and forested land in both provinces and parallels two existing pipeline ROW along approximately 70% of its length. The Project ROW crosses approximately 450 m of the One Island Grazing Reserve and approximately 5 km of the Agricultural Land Reserve (ALR) in British Columbia. In Alberta, the ROW traverses approximately 5.5 km of Crown land, with the remainder situated on privately owned land.

The ROW crosses two watercourses and six non-classified drainages within British Columbia and two watercourses and nine non-classified drainages within Alberta. The four watercourses traversed by the ROW include an unnamed tributary to Tupper Creek, Tupper Creek, an unnamed tributary to Albright Creek and an unnamed tributary to Keeping Lake.

### 4.0 ASSESSMENT RESULTS

#### 4.1 Soil Assessment

The third year post-construction soil conditions along the ROW and within the Timber Decking Site(s) TDS were visually assessed based on the PCMP requirements outlined within the EPP. Areas with poor vegetative regrowth were hand augured to assess compaction and admixing potential. The assessed third year post-construction soil conditions are described in this section. Outstanding soil issues, potential adverse effects, and proposed mitigation are described by site in Table 1 as well as a proposed mitigation schedule that accounts for seasonal considerations related to soil work within forested and cultivated lands. Representative photographs are included in Appendix C.

**Table 1: Soil Characteristics of Outstanding Issues Identified During Third Year PCMP (2011)**

Location	Soil Issue	Potential Adverse Effect	Proposed Mitigation	Proposed Schedule
Chainage 1+250 to 1+450	Visible roach atop pipeline trench with subsidence present on either side.  Tension cracks.  Poorly constructed water bars.	Risk of erosion and restrictions to vegetation growth.	Re-crown pipeline by redistributing the roach across the ROW to address contour issues.  Extend water bars across ROW width and beyond to carry water off the ROW.	Winter 2012 with follow-up monitoring in the Summer/Fall of 2012.
Chainage 1+300	Subsidence and intersecting water bar leading to scouring directly above pipeline trench.	Continued erosion leading to pipeline exposure.	Repair water bar, ensure adequate topsoil, and seed with appropriate seed mixture.	Winter 2012 with follow-up monitoring in the Summer/Fall of 2011.



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Location	Soil Issue	Potential Adverse Effect	Proposed Mitigation	Proposed Schedule
Chainage 2+800	Sloughing/sliding on the north slope above the tributary to Tupper Creek.	Continued erosion and sloughing.  Sedimentation of the tributary to Tupper Creek.	Have area assessed by a qualified geotechnical engineer.	Winter/Spring 2012 with follow-up monitoring in the Summer/Fall of 2012.
Chainage 2+900 to 3+000	Poorly constructed water bars.  Unmaintained erosion control structures (straw wattles, silt fences).	Continued erosion, and sedimentation of the tributary to Tupper Creek.	Install temporary ECS until such time that permanent measures can be completed.  Extend water bars across ROW width and beyond to ensure water is carried off ROW.  Repair silt fencing immediately adjacent to the tributary, reseed and restrict access until vegetation re-establishes.  Remove straw wattles.	Winter 2012.  Spring/Summer 2012 with follow-up monitoring in the Summer/Fall 2012.
Chainage 4+800 to 4+900	Unmaintained erosion control structures (straw wattles).	N/A	Remove straw wattles	Spring/Summer 2012 with follow-up monitoring in the Summer/Fall 2012.
Chainage 5+975 to 6+450	Up to 10% stones (boulder, cobble, and gravel) identified within the ROW.	Decreased soil fertility.	Collect and dispose of stones within the ROW.	Spring/Summer of 2012.
Chainage 7+250 to 7+450	Poorly constructed water bars.	Continued erosion.	Install temporary ECS until such time that permanent measures can be completed.  Extend water bars across ROW width and beyond to ensure water is carried off ROW.	Winter 2012.  Spring/Summer 2012 with follow-up monitoring in the Summer/Fall of 2012.