Developing Pipeline Reclamation Standards in Alberta (Canada) *

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1. ABSTRACT

Development of Alberta's oil and gas industry has led to a proliferation of pipelines in the province. All Alberta pipelines require a reclamation certificate before the proponent is released of reclamation liabilities. This has led to much discussion of how to assess oil and gas wellsites and pipeline reclamation success since the early 1980s. The requirement for reclamation certification is that land have equivalent capability to that which existed prior to the disturbance. The approach that has been used for wellsite reclamation success evaluation is a parameter by parameter comparison and pass/fail system. In this case each parameter must pass or the site fails. NOVA Gas Transmission Ltd. undertook, in late 1996, to put together a group of government regulatory and non-regulatory personnel, industry and third party individuals to develop a more integrated capability based evaluation system. Various approaches were field tested in 1997 and 1998. This paper reports on the process used, the field results and current status of the project.

2. INTRODUCTION

Most people are not aware of the presence of pipelines because they are generally buried and are rarely seen as the soil over them continues to support pre-disturbance activities such as agriculture, forestry, urban and rural communities, and wildlife habitat. As a result it may be a surprise that Mutrie and Gilmore (1995) estimated that Alberta has over 2,000,000 km of pipelines in the ground.

Concern about the environmental impacts from construction of pipelines has brought legislation governing their construction, operation and decommissioning. Within Alberta there was no legislated requirement for the reclamation of disturbed lands prior to 1963 when the Surface Reclamation Act was proclaimed (Brocke 1988). Ten years later, in 1973, the Land Surface Conservation and Reclamation Act was proclaimed. This new Act required that environmental protection and reclamation be part of the development planning (Landsburg and Fedkenheuer 1990). A review and approval system that included Environmental Impact Assessments and Development and Reclamation Approvals was subsequently implemented. Regulatory changes were made in 1983 and

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again in 1993 with the passage of the Alberta "Environmental Protection and Enhancement Act" (Alberta Environmental Protection 1994).

The 1993 legislation brought the requirement to return land disturbed by pipeline construction to an equivalent land capability at the time of abandonment. Equivalent land capability is currently defined as, "The ability of the land to support various land uses after reclamation is similar to the ability that existed prior to any activity being conducted on the land, but that the individual land uses will not necessarily be identical" (Powter 1998).

The requirement to have equivalent land capability at the time of application for a reclamation certificate brought the need to be able to measure equivalent land capability. Some documentation is required to enable the regulator to acknowledge that the area is suitably reclaimed and to release the

proponent from further reclamation liability, as well as to assure the public that a suitable reclamation job has been done. This documentation has been difficult to obtain agreement on and it has been the subject of much discussion since the mid-1980s. The definition of reclamation success and how to measure it was the topic of a workshop in 1992 (Mahnic and Toogood 1992). Following the workshop, focus shifted to oil and gas wellsite reclamation criteria development for several years where a parameter based checklist was developed and used. For these areas, specific individual parameters are compared on and off the wellsite and each must pass or the site fails.

There has been a desire by some to utilize this system for pipelines as well. Others have suggested using a capability rating system such as has been used in agriculture for many years. It is recognized that some modifications may be required to either system if they are to be applied to pipelines. These two approaches reached a stalemate in 1996. At that point NOVA Gas Transmission offered to take the lead in working to develop a land capability rating system to demonstrate what it might contain and how it might work better for pipeline reclamation assessment. This paper addresses the approach used and the results of the approach.

3. PROCESS

In 1995, as interest in reclamation standards for pipelines again began to increase, several joint government-industry working groups were established. In mid-1996, a version of the wellsite reclamation criteria was modified and tabled for consideration as pipeline reclamation criteria. As discussed earlier, the wellsite criteria are basically a parameter-by-parameter pass or fail system.

To deal with the issue of developing a capability-based assessment of pipeline reclamation, a varied group of people were required around the table. A group of people consisting of representatives from government regulatory bodies, industry and also some independent experts, was invited to participate. The group was formally named the NGTL (NOVA Gas Transmission Ltd.) External Soils Advisory Board and consisted initially of: Adolf Bruneski, Land and Forest Service, Alberta Environment; Jim Burke, NOVA Gas Transmission Ltd. (now J. D. Burke and Associates Ltd.); Dr. Al Fedkenheuer, NOVA Gas Transmission Ltd. (Chairperson); Heather Gerling, Public Lands Division, Alberta Agriculture, Food & Rural Development; Tom Goddard, Conservation and Development Branch, Alberta Agriculture, Food & Rural Development; Vasile Klaassen, PanCanadian Petroleum Limited; Len Knapik, Pedocan Land Evaluation Ltd.; Leonard Leskiw, Can-Ag Enterprises Ltd.; Dr. Anne Naeth, University of Alberta; Dr. Wayne Pettapiece, formerly with the Research Branch, Agriculture and Agri-Food Canada (now Pettapiece Pedology); Chris Powter, Environmental Sciences Division, Alberta Environment; and Rob Staniland, Talisman Energy Inc. Dr. Naeth and Len Knapik withdrew from the committee due to time availability constraints.

A key component of this board is members that are not directly involved in oil and gas from an industry or government regulatory perspective, e.g. T. Goddard and W. Pettapiece. They have brought both a practical and scientific perspective to the Board, as well as considerable experience.

The Board's primary short-term objective was to develop a pipeline reclamation evaluation tool. There was much discussion as to when this tool would be applied, either at post-construction or upon abandonment of the pipeline or at both times. It was agreed that the Board would focus on abandonment criteria which would be applied at the end of the life of a pipeline. In this way, the operator would know, in the planning stages of construction, what would be measured at the end. This would encourage good planning of soils handling and other environmental issues during construction in order to minimize the cost over the life of the pipeline.

Important components of the reclamation evaluation tool as identified by the Board were:

- scientific validity,
- identification of important environmental parameters,
- clear description of how to measure those environmental parameters.
- relatively easy usage,
- cost-effectiveness, and
- provision of reproducible results,

It was also a desire that time not be spent initially building new systems but to evaluate systems and processes already available. In the end, it was decided that a visual assessment as well as several others, one with a more detailed level than the visual, but

not requiring laboratory analyses, and another requiring laboratory analyses needed to be developed. As well, the Land Suitability Rating System (Agronomic Interpretations Working Group 1995) and a version of the wellsite reclamation criteria system (Wellsite Criteria Working Group 1995) were tested. Along with these systems, a landowner reclamation evaluation form was also developed.

Following agreement on the systems to use, the Board retained three senior consultants to take the systems to the field and evaluate their field performance. This was done in October and November, 1997. The consultants were sent to three central areas of the province and asked to employ the systems on five pipeline segments, chosen by representatives of the Board, in each area. The consultants were not to be on the same site at the same time, nor were they to discuss their findings with each other until after their reports had been submitted to the Board. One day was spent in the field by the Board and each consultant was visited at a different pipeline location. Subsequent to the receipt of the reports, three members of the Board undertook to summarize the consultant reports into one summary report.

The Board took the results of the 1997 field evaluation and the consultant recommendations and revised the evaluation tool into a three-step process for a re-test in the field season of 1998. One step was a landowner reclamation evaluation form that reflects the parameters being assessed by consultants. The other two steps were done by consultants. During Phase 1, three parameters under landscape (drainage, coarse fragments and microtopography), vegetation (cover, composition and vigor) and soil (color, texture and surface structure) must be met in order for the site to pass. If the area fails the Phase 1 portion, assessment must continue under a Phase 2 evaluation consisting of a more detailed soils assessment only.

The 1998 field study covered a range of ecological conditions in Alberta. This included approximately five pipeline sites in the dry Prairies (Brooks), salt-affected and clayey soils in the Parkland region (Vegreville and Grande Prairie), the southern Boreal (Lac La Biche), and the foothills Montane (Pincher Creek). All areas included both cultivation and grazing land uses.

The larger percentage of the direct funding of the consultants and other activities has come from
NGTL, with significant funding also coming from the Canadian Association of Petroleum Producers and more recently, Alberta Environment.

4. RESULTS

Accomplishments of the Board to date consist of: development of Board objectives, an evaluation tool framework, tool parameters, an evaluation process, completion of a field evaluation study in 1997 and 1998 (using three external consultants in each year), comparison of seven systems initially in 1997, comparison of selected modified systems

in 1998, development of a separate summary report of the 1997 and 1998 field studies, and completion of landowner reclamation evaluation forms.

Results from the 1997 field study were:

- Agreement on pass/fail results among the three consultants who visited the same sites was less than 45 percent in all of the reclamation evaluation systems tested in 1997, except for the Visual system where there was about 90 percent agreement,
- Across the 18 quarter sections in the study, the average topsoil depth was 16 cm (+/- 8 cm) both on and off the pipeline right-of-way. Topsoil depth recordings by the consultants reflected this natural variability as one consultant reported finding 10 to 26 cm of topsoil, another reported finding 10 to 19 cm and the third consultant reported 12 to 26 cm. These readings were all for the same 65 ha and were done by well-qualified soils professionals. Again, this was the natural variability in an agricultural field,
- Topsoil thickness alone is a poor indicator of reclamation success as systems that relied heavily on topsoil depth as a measure of reclamation success had failure rates of greater than 40 percent based on topsoil depth by itself,
- Removing the topsoil depth parameter resulted in failure rates of about 15 percent,
- The visual parameters caught about 73 percent out of 183 right-of-way transect failures. This means many of the failures were apparent to the evaluator before subsurface parameters were evaluated.

In the 1998 field study, line segments were evaluated in 32 quarter sections (160 acres: 65 ha) by each of three consultant companies in August and September by applying both Phase 1 and Phase 2 to all areas. Results of the study were:

- On 44% of the line segments all three consultants agreed whether the area passed or failed the Phase 1. Of the remaining areas, in 34% of the cases two of three consultants passed them and in the remaining 22%, two of three consultants failed them,
- In 66% of the Phase 2 assessments all three consultants agreed (all were passes), of the remaining line segments 28% were rated as passes by two of three consultants and 6% were rated as fails,
- There were no cases where an area passing Phase 1 was failed under the Phase 2 assessment. This implies this part of the system works as designed,
- Several weaknesses were identified including how to handle cases where the disturbed area was better than the control areas, flexibility in dealing with non-standard, and exceptional, circumstances and more clarity in the vegetation assessment.

In the part of this process where landowner input was sought, the following results were obtained:

- In the 1998 study, 94% of the 31 landowners contacted responded, with some encouragement, by filling out the forms evaluating reclamation success as they saw it for the study pipelines on their land,
- 72% of the line segments were rated as passes by the landowners,
- The landowner evaluation and the Phase 1 rating by all three consultants agreed on 72% of the line segments (15 "pass" and 6 "fail" ratings, respectively),
- On three line segments (10%) the landowners rated the area as "pass" and the Phase 1 ratings by all these consultants was a "fail".

5.0 CONCLUSIONS

The NGTL External Advisory Board has concluded that:

- The general concept of a land capability based, relatively rapid Phase 1 "screening" assessment and an "as required" more detailed Phase 2 soil evaluation is workable and appears to address the proper concerns and issues,
- The weaknesses identified thus far in the process are manageable and are currently undergoing revision,
- Landowners are willing to participate, there is generally good agreement between the landowner and consultant ratings, and the landowner evaluation form can be a useful first evaluation of pipeline reclamation, and
- Some form of orientation (training) sessions will likely increase the level of agreement among the consultant ratings.

The Board is continuing to pursue this approach and will likely recommend it be used on a trial basis for a year. If this approach is implemented, it will be important to review and revise the process, if necessary, based on its use and input by a wide variety of users, including members of the public.

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