



Natural reclamation and erosion control installation

Project Details

COMPANY

Shell Canada Limited

COUNTRY

Canada

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Natural Reclamation and Erosion Control for Onshore Pipelines

CONTEXT

In Western Canada, industry is required to reclaim right-of-ways following pipeline construction and placement. As more deposits of oil and gas are explored and extracted, the cumulative footprint of these disturbances grows, and so does the need to reclaim well pads and pipeline right-of-ways. There are knowledge gaps in understanding optimal reclamation and revegetation strategies along gas pipelines in forested areas specific to the Peace region of northeastern British Columbia. The objective of this project was to identify factors that affect plant growth and survival and to help bridge that knowledge gap.

Shell Canada Limited (Shell) projects often involve the construction of pipeline corridors in ecologically diverse areas on previously undeveloped lands known as *greenfields*. The construction activities not only cover the civil works to lay the pipeline and build the pump/compressor stations, but also the reclamation work to return disturbed land to an equivalent land capability with minimal impact on the environment.

The research project was conducted by a graduate student at the University of Northern British Columbia (UNBC) at a Shell site in northeastern British Columbia, Canada, which contains several reclamation plots in the Deep Basin Ojay Project site.

Pipeline projects involve many stakeholders with specific interests and concerns. In this region pipeline right of ways often traverses lands with rights of use belonging to multiple indigenous communities concerned with the fragmentation of the land and its impacts on the local ecosystem. Therefore, all solutions are strictly reviewed with these local concerns in mind. Key stakeholders for this project included the British Columbia government (Oil and Gas Commission), First Nation communities, and ReClaimit Ltd – the execution contractor.

OBJECTIVE & PROJECT DESCRIPTION

The aim of the project is to return disturbed land to an equivalent land capability with minimal environmental impact. The Ojay pipeline has eight reclamation research sites each approximately 20 meters wide by 100 meters long. Shell has tested various *soil bioengineering* (the use of living plant materials to create structures that perform some soil-related engineering functions) approaches at these sites.

THE BUSINESS CASE

As described, pipeline construction activities include a reclamation phase that returns disturbed land to an equivalent land capability with minimal environmental impact. This entails natural reclamation of

disturbed land. In a typical pipeline reclamation project, the forest will naturally encroach back on the deforested/disturbed area. It takes a significant amount of time (decades) for second generation forest to grow back. The goal of this project was to evaluate ways to improve and speed the reclamation of land previously disturbed by construction activities and forest clearance, by creating secondary forest growth through comparison of different types of vegetation and seeds to speed up the reclamation process.

Natural infrastructure solutions offer a lower operating and maintenance cost over gray infrastructure alternatives and are known to be superior overtime compared to the more traditional stabilization methods. In addition, they have a lower overall environmental impact, helping to meet the requirements for reclamation.

These modular solutions are designed to be sensitive to the local environment (e.g., allow access to local wildlife). In addition, timelines for implementation generally fit very well with the overall project timeline as pipeline construction and tree planting share a common seasonal criteria and the activities can therefore be executed within the same timeframe, saving costs on implementation.

DECISION MAKING PROCESS

UNBC proposed this research project to Shell under an existing partnership, funded by income generated from ground birch. It was approved on an asset-level, and completed by UNBC.

UNBC and Shell worked with the First Nations communities in a series of workshops to evaluate the effects of reclamation projects on these communities. Workshops included a project review and transfer of traditional knowledge from the First Nations participants to be included in the project design. Results were later shared with the First Nations communities.

DETAILED PROJECT DESCRIPTION

Bioengineered solutions can be applied to a wide variety of sites disturbed by construction activities. These solutions use natural components of pioneering plant communities and thus align well with ecological restoration strategies.

It is preferred to use local plant species to construct soil bioengineering solutions for naturally disturbed sites. Some recent innovations in reclamation approaches include the use of willow trees and other tree, shrub, and plant species to control soil erosion and establish a renaturalization pathway.

In the past 15 years, Shell has proven successful in willow staking through several upstream projects. Poplars and willows are highly valued for erosion control and efficient control of groundwater due to their rapid growth, high rooting capacity, extensive root systems, and high water use.

These natural infrastructure solutions are multi-functional. They reduce loss and fragmentation of wildlife habitat, reduce soil compaction, and improve land capability and productivity in agricultural, prairie, and forested areas. They also reduce anthropogenic disturbances to local ecosystems.

As described previously, this project is comprised of eight reclamation research sites, each approximately 20 meters wide by 100 meters long. Shell tested various soil bioengineering approaches at these eight sites including: various combinations of native seeds and soil types at a range of site conditions (e.g. slope, sunlight).

The study was comprised of eight field blocks along the Ojay pipeline—four per bioclimatic zone were placed on different slope positions: south facing, crest position, north facing, and the fourth in a wetland. A suite of species were planted, two in every block for comparison. One block acted as a control site and was not planted.

The success of each block was evaluated during the field sampling phase from Spring 2012 and late Summer 2013. Soil factors included moisture content, soil pH, bulk density, cation exchange capacity, particle size analysis, total C, and major nutrient contents including total N, S, K and available P. Plant measurements

included height and stem diameter, and height- to diameter ratio accumulation of lodgepole pine seedlings, height and cover area of shrubby cinquefoil, and inventory of planted species and natural regeneration.

The project is fully implemented, and has been operational for 3 years. Optimization studies are ongoing.

The project costs approximately C\$80000, and was financed by Shell Canada Limited.

LESSONS LEARNED

Key lessons learned on this project include:

- This natural infrastructure solution must be engineered to meet site specific conditions (e.g., soil type, moisture level, light).
- Different skills are required for the design phase and implementation phase.
- Long winters and short summers can create time constraints.
- Plant species establishment and survival rates must be considered to ensure long term success.
- Local environmental agencies were focused on achieving sustainable outcomes, and were, therefore, more sympathetic to soft engineering solutions.
- Installation of this natural infrastructure solution is easily taught, allowing for training of the local community.

FUTURE IMPLEMENTATION AND NEXT STEPS

Shell continues to investigate different reclamation methods, using direct seeding, nursery stock grown from native seed and possibly peat pucks (seed with nutrients), to better understand the feasibility of the technology as well as the costs and time involved in growing such solutions.

REFERENCES

- Dow, Swiss Reinsurance Company, Shell Global, Unilever, and The Nature Conservancy. 2013. "Green Infrastructure Case Studies." Available at: <http://www.nature.org/about-us/working-with-companies/case-studies-for-green-infrastructure.pdf>. June.

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