

MEASURING SUCCESS TO ACHIEVE REGULATORY SIGN-OFF

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ABSTRACT

For simple sites such as wellsites, the requirements to achieve regulatory sign-off are clearly defined. For more complex sites such as mines (coal, mineral, aggregate pits, and quarries) the legislative requirements are not as clearly defined. The differences between legislative requirements are often a result of the complexity of the sites, which can be amplified by the sheer size of some locations. Using geographical information systems (GIS) with available spatial datasets (wet area mapping, land capability modeling, vegetation cover type, soil classification, surficial geology, wildfires, flooding, wet areas, wildlife habitat, etc.) allows the opportunity to analyze key site characteristics both pre- and post-disturbance and define realistic end targets for a site. The use of GIS spatial datasets during the planning stage makes it possible to relate the site conditions (progressive and final reclamation) at time of monitoring, back to the desired target for a site or sub-component of a site to determine if a site is on target, and to make interventions (weed control, supplement revegetation, wildlife preclusion, etc.), as necessary. Monitoring results over time contributes to continual improvement and creates a legacy GIS database to be used when planning reclamation programs, creating targets for a site, and applying for final reclamation.

KEY WORDS

Monitoring, reporting, GIS, data, progressive reclamation, reclamation.

INTRODUCTION

The transition of reclaimed lands to the crown is often complicated by legislation, reluctance of regulators to certify portions or entire sites prior to full closure, and hesitancy by mines (coal, mineral, aggregate pits and quarries), since they will lose access to the certified lands. The progression towards regulatory signoff is simple in concept but complex in practice, due to stakeholder requirements, legislation, the long-life typical of mines, and the ability to link pre-disturbance conditions to reclamation objectives and outcomes. Key to measuring success to achieve regulatory signoff is the development of a comprehensive reclamation monitoring program coupled with robust data management and reporting. This paper touches on all these aspects, incorporating learning's from projects and literature.

LEGISLATION

In British Columbia, legislation requires all mining operations to carry out a program of environmental protection and reclamation to ensure that upon termination of mining, land, watercourses, and cultural heritage resources will be returned to a safe and environmentally sound state and to an acceptable end land use (MEM, n.d.a.); or once operations cease, mine site lands are returned to a useful and productive state (MEM, n.d.b.).

In Alberta, legislation under the Environmental Protection and Enhancement Act (EPEA) states that "equivalent land capability" must be met, which means that the ability of the land to support various land

uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical; (GOA, 2013). The Government of Alberta defines reclamation as: "...the stabilization, contouring, maintenance, conditioning, reconstruction, and revegetation of the surface of the land to a state that permanently returns the plant to a land capability equivalent to its predisturbed state" (AESRD, 2012). If the inspector is satisfied that the conservation and reclamation have been completed in accordance with appropriate sections of the act and a reclamation certificate, then the inspector may issue a reclamation certificate to all or only a part of the specified land (GOA, 2014).

OBJECTIVE AND CRITERIA DEVELOPMENT

At the start of the process, identify and engage local stakeholders including communities, First Nations, overlapping industries, and regulators. Review with stakeholders the overall goal of the reclamation program as it relates to approval conditions and current legislation. State the goal concisely and in plain language by reducing the ambiguity and subjective interpretation of the approval conditions and legislation.

Establish the objectives of the reclamation program with the focus to meet the goal of achieving regulatory sign-off (reclamation certificate). The objectives should be clear, consider stakeholder needs, current values, economics, technical capability, and meet company requirements.

Identify criteria (critical measures of success) to measure if a site is on track to meeting the goal and prescribed objectives. Adapt as conditions change and use criteria and protocols that provide flexibility, while still being rigorous enough to be defensible. Establish criteria that are acceptable to stakeholders. Involve all interested parties early in the process and keep all parties (interested or otherwise) informed of the progress towards establishing criteria and protocols. Currently the success of reclamation focuses flora-based criteria of success, leaving fauna relatively, with the assumption that if the desired flora recovers so will the desired fauna. Incorporate key performance indicators (KPI) that will serve to determine success and assist in the development of best management practices.

MONITORING

Define the reasons for monitoring, types of data to collect, methods to collect the data, and how the data will be analyzed and interpreted. Establish the objectives of the monitoring program. Develop protocols to measure the criteria that integrate the objectives of the reclamation program without being exclusive to single aspects or land uses. Assemble a team of technical experts from multiple disciplines and include stakeholders. Determine the level of data quality needed. In the early stages of the program, involve outside agencies (Universities, researchers, government agencies, etc.) to determine opportunities for collaboration. Consider the necessity to monitor both flora and fauna in an integrated manner. Protocols developed to measure predominately flora may require modification or support through research (planned and conducted) to validate the assumption that criteria used to measure flora reflect decolonization of key fauna species.

Establish a reclamation monitoring program with methodologies to conduct and report reclamation monitoring. The reclamation monitoring program should assess vegetation, soils, and wildlife on sites associated with the project. Develop a reclamation monitoring program considerate of the following purposes:

- Assess the state of sites related to the project.
- Qualify and quantify the state of each site related to the project.

- Document the state of each site for inclusion in regulatory, internal, and external reporting.
- Evaluate the appropriateness and effectiveness of the reclamation program and monitoring criteria.
- Frequently and consistently measure against KPIs.
- Identify and propose corrective measures (e.g., for erosion, poor revegetation, subsidence, etc.).
- Report best management practices (e.g., revegetation, erosion control, wildlife reintegration, etc.) observed during the assessments.

Create data collection protocols (written procedures, such as formal standard operating procedures) to be used in sampling, monitoring, and managing the data. Create protocols that are concise and detailed to avoid interpretation by persons collecting and interpreting the data. Data that is accurate and consistent transcends changes in company staff and consultants resulting in data that is useful for the life of the project and applicable at time of application for reclamation certificate or closure.

DATA MANAGEMENT

The monitoring program is basically three steps: sampling, analysis, and interpretation. Sampling is time bound and therefore needs to be accurate and in a format that transcends technology changes (e.g., in a format that is continually supported, such as PDF or hard copy). Incorporate an information management system early (files and electronic). Common challenges include different and sometimes incompatible software between the consultant and company or that existing data is in obsolete format or in the case of spatial data, incorrectly georeferenced. These issues need to be identified and addressed ongoing.

Currently the dominant systems to store, process, and review data include computer aided drafting (CAD), geographical information system (GIS), tabular databases, and word processing related programs (Microsoft suite of programs such as Excel and Word). More progress is being made towards customized systems that integrate GIS and SharePoint systems to capture and manage documentation, including management decisions, and to store and retrieve documentation effectively and efficiently.

Data management systems should allow easy and transparent retrieval of information by or for third parties to review and audit for assurance and accountability (e.g., liability calculation, confirmation of treatments, etc.). Data management systems must incorporate a robust quality management system for both data entry and retrieval that supports the reclamation monitoring program.

Ensure that the data collected during the exploration phase (pre-disturbance) and reclamation is available and acceptable for subsequent environmental modeling and prediction studies, and that the data can be used for the analysis of the success of the reclamation program and stated objectives (Mclemore, Russell & Smith, 1999). Avoid the trap of collecting data simply for the sake of data collection.

Obtain available spatial datasets such as wet area mapping, land capability modeling, vegetation cover type, soil classification, surficial geology, wildfires, flooding, wet areas, wildlife habitat, etc. to analyze key site characteristics both pre- and post-disturbance. Use GIS to analyze data collected as part of the reclamation monitoring program to determine if a site or is on target to meet stated objectives and to make management interventions such as weed control, supplemental revegetation, etc.

REPORTING

Report the results of monitoring to show that the reclamation monitoring program is meeting objectives. Start reporting early by involving local stakeholders to determine the frequency, type, and style of reporting so that reporting is easily understood and transparent. Regulatory requirements for reporting may be already defined within existing legislation. Transparent and timely reporting will build trust with

stakeholders, investors, and other companies within the industry. Incorporate existing systems (i.e., Google Earth) with existing spatial data to allow easy access by stakeholders.

SUMMARY

Accurate data (pre- and post-disturbance) that is managed to transcend technology/software changes, and which is suitable for use in data management and GIS systems of the time, will allow mine operators to monitor, analyze, improve, and report on reclamation programs and prove success and obtain regulatory sign-off.

CLOSING

This paper is prepared as a part of the presentation with the same name to be given at the annual British Columbia Technical and Research Committee on Reclamation to be held in Prince George, September 22-25, 2014.

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