Key Trends in Reclamation Planning

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Outline

• Primer

• Context

• Pre-operational/pre-construction planning

• During site operation

• Post-reclamation

• Legacy Sites
WHO MADE THIS BIG MESS??
Paradigm Shift?

• Currently transitioning?

  • from former paradigm of making and cleaning up messes to coordinating, integrating, and minimizing messes

• Industrial footprint is growing in Alberta and will continue to do so for some time. Means many, many small messes and some very big messes

• Messes are becoming less isolated; where one ends and the next begins is becoming less clear because the landscape is integrated, therefore the messes become integrated - i.e. **Cumulative Effects**
Nothing Offensive Meant by “Messes”

• Just trying to describe in simple terms what happens on an industrial landscape - we have historically been resource focused...

• Alberta’s landscape is getting busier

New Paradigm

• The cumulative nature of messes demands that more planning and better strategizing are required in deciding where and how messes are made and how and when they’ll be cleaned up.

• Ultimately, goal is to prevent messes in the first place (not resource extraction, just the messes), make them smaller and less intense, and make the evidence of them go away quicker.

• Will require greater integration within and among companies with respect to landscape decision making.
  - i.e. departments will need to collaborate more regarding where things go, how they are built, and planning for effective clean up.

• Applies to exploration, drilling, construction, reclamation.

• May require greater collaboration with regulators also.
Considering Cumulative Effects

There is increasing emphasis being placed on consideration of the effects of all projects and activities in an area (cumulative effects). The ability of natural landscapes to support oil and gas activities on a sustainable basis hinges on the timing and intensity of development. Best management practices and innovative procedures can go a long way toward managing impacts. On some sites, however, the level and duration of activities may be such that phasing and careful timing of field operations may be necessary. This can avoid fragmentation and cumulative impacts that may have more permanent effects on the health of the prairie landscape.

"Existing activities should be examined and at a minimum, new projects integrated with them to reduce the overall level of disturbance."

Manyberries Region, Alberta – An example of energy sector development; squares are wellsites, lines are pipelines and access roads
Paradigm Shift in Progress

• Wetland Gap Analysis (2010):
  • Landscape assessment and planning/cumulative effects assessment and management

• AENV (~2012): Project-Level Conservation, Reclamation, and Closure Plan shall include:
  • integration of landforms, topography, vegetation, waterbodies, and watercourses with adjacent undisturbed areas and adjacent reclamation areas
Context
Reclamation Planning Boils Down to Context

• What is the relationship between the site in question and the local landscape?

• What is the relationship between the local landscape (and all other disturbances it contains) to the broader or regional landscape with all of it’s disturbances?

• Refers to the ecological and functional context of the area to be reclaimed in relation to the surrounding landscape. (e.g. borrow pits or pads left in place)
• More than just restoring soil productivity and revegetating (i.e. “cleaning up messes”)
  • accounting for interactions with surroundings
  • assessing and managing cumulative effects.

• Scale dependent, but applies to both site-specific (e.g. wellsite) and project-level (e.g. oil sands upgrader) scales.
  • What you consider may be different for each scale, but taking context into account applies to all scales.
  • Scales will be interrelated and decisions made at each scale will affect outcomes at other scales
Pre-Operational Planning
Pre-Operational Planning: Integrating Context Prior to Disturbance

• Best able to address footprint and cumulative effects at this time

• Can strategically choose site location

• Can evaluate site constraints and choose appropriate technologies to address them and minimize footprint

• Can collect site information to guide construction and reclamation prescriptions

• Can plan integration with landscape and other disturbances/reclamation

• Can plan for contextually sound contingencies should there be reclamation failures
Pre-Construction/Pre-Operational Planning

• Key decisions include:

  • Where to locate sites strategically so that footprint impacts will be minimized within the geologic and technical constraints driving site location
    
    • e.g. existing openings or previously disturbed areas, level areas, mineral soil for longer term infrastructure

  • What tools/technology to select that will enable footprint minimization (reduce size, intensity, duration)

  • What local and regional information to collect that may influence construction practices (e.g. soil stripping), reclamation prescriptions (need for planting, species selection), or other management decisions
Examples: Site Location
Examples: Tools/Technology

• Slant or directional drilling rigs improve flexibility in selecting top-hole locations and help reduce footprint by enabling drilling of multiple wells from a single location.

• Self-levelling rigs help to reduce soil disturbance because less levelling of the site is required.

• Snow-making also reduces soil disturbance by providing alternate material to level sites rather than stripping soil.
Slant and or Directional Drilling Aids in Site Selection and Footprint Minimization
Snow Making or Self-Levelling Rigs Can Reduce Need for Soil Disturbance

- Snow-makers can make 100 m$^3$/hr
- Can make snow at temperatures as high as -1°C

Photos courtesy of Carter Industries (www.carterindustries.ca)
Examples: Site Information

• identification and depth of soil horizons
• depth to major root zone
• root zone thickness
• depth to mottles or gley
• texture of soil horizons
• slope steepness and direction
• complexity of slopes
• surface drainage mapping or hydrologic information
• canopy composition
• dominant shrub and herbaceous plants
• potential problem or invasive species (e.g. *Calamagrostis canadensis*)
Responses to Soil Texture: Trees

WellSiteVegMVSHNAwDensity1859Gph

WellSiteVegMVSHNPbDensityMod1841Gph

WellSiteVegMVSHNBwDensity1292Gph
Responses to Soil Texture: *Calamagrostis canadensis*
Pre-Ops Summary

• Reduce reclamation needs up front by minimizing footprint via strategic planning

• Select sites that maximize opportunity for disturbance reduction

• Select tools to help you achieve disturbance reduction

• Collect and use resource information to aid in construction and reclamation prescription decisions

• Plan for contingencies
Activities During Site Operation
During Site Operation: Interim Reclamation

• What is it?

• Reclaiming as much of the disturbed site as possible even while the site is still operational

• Replace soil and revegetate all areas of a disturbance that will not be regularly redisturbed (e.g. leave a teardrop at a well for operating, but reclaim the rest).

• As opposed to keeping the bulk of the footprint in a non-vegetated condition and soil stockpiled over the entire operational life of the site.
Objections to Interim Reclamation?

• Objections usually based on the possibility that the reclaimed area might be redisturbed during well servicing or other activity...

  • Well, so what??

• Benefits to soil and it’s end use capability out-weigh the inconvenience or possible risks of redisturbance

• Delaying reclamation contributes to sterility and makes final reclamation more difficult
Why Interim Reclamation?

• We like to think of soil as “cryonically” preserved when it is stockpiled, ready to be reanimated when we put it back after reclamation...

Photo courtesy: freedigitalphotos.net
Why Interim Reclamations?

- But realistically, stockpiling soil is more like mummification than cryonics...
Why Interim Reclamation?

• Re-animation, as from cryonics, is beyond reasonable expectation for stockpiled soil.

• At best, stockpiled soil is kept slightly alive... or mostly dead

• Interim reclamation is like putting the soil on life support.
Interim Reclamation = Life Support

• Stockpiling only keeps a small proportion of the stockpile alive because the bulk of the soil is buried, restricting oxygenation, nutrient cycling, seed and propagule viability, structural integrity (tilth)

• Putting the topsoil back to use as soon as possible via interim reclamation maintains propagule viability, keeps soil aerated, supports soil microorganisms, re-establishes nutrient cycling, contributes to the seed bank

• Because the soil is mostly alive rather than slightly alive, it can sustain injury by occasional redisturbance without suffering severe harm

• At final reclamation, the capability of the soil has been maintained to a large extent over the life of the site and does not have to be re-established. Recovery after final reclamation should therefore be more successful
Post Operations
Contingency

• Any plan has a degree of uncertainty

  • What will actually grow? How long will it take? When will we know whether we are successful or not?

• May be an iterative process (trial and error), but pre-ops planning should identify uncertainties and potential risks, thereby preparing for actions in post-op stage

• In some cases of failure, options may be obvious, in others it might be “wait and see”
You Never Know What You’re Gonna Get...
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Legacy Sites
A Note on Legacy Sites... Its Not Too Late!

• Contextual approach can and should be applied to legacy sites

• Can’t do anything about construction or siting location, but...

• Can still examine fit and function with surrounding landscape,

• Can integrate with surrounding reclamation needs,

• Can integrate into broader landscape context,

• Can gather site and adjacent information for prescriptive purposes
Thank you!