



Smart. Responsive. Efficient.



Planning for Reclamation During Remediation

October 11, 2017

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RemTech Symposium 2017



Presentation Overview

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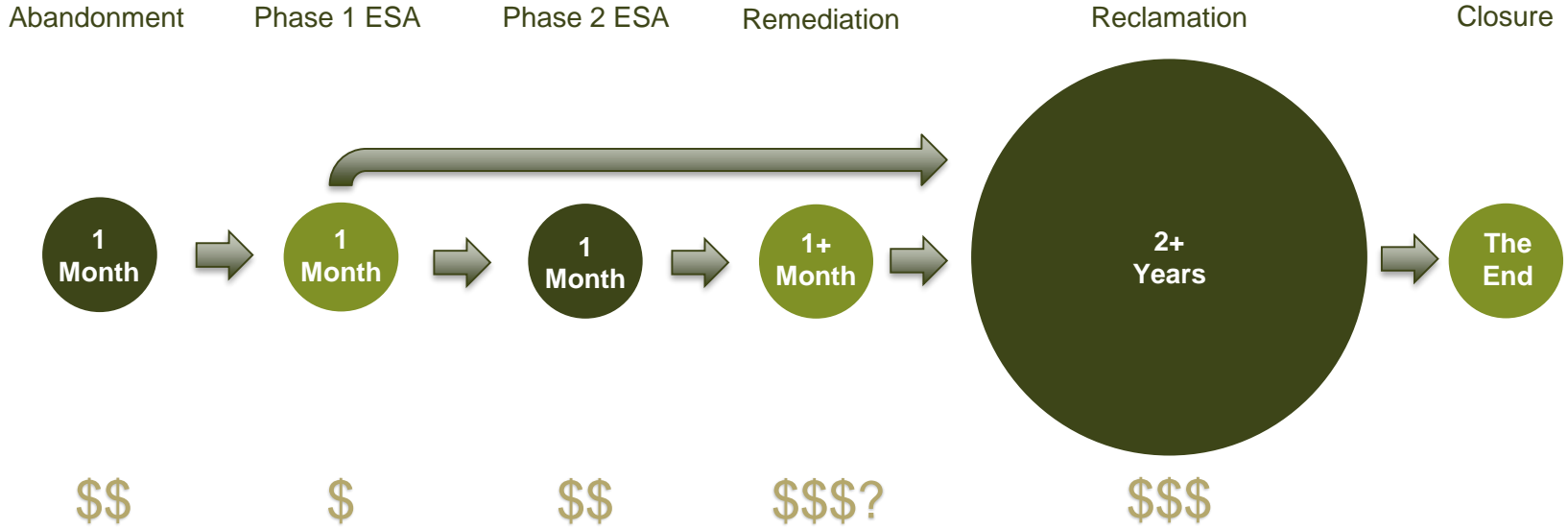
Introduction

*Alberta's enormous well abandonment problem can be solved with creativity and courageous thinking.
Here's a start.*

- Terry Etam, Boe Report, 2016



Challenge: Getting to Site Closure





Solution: Multi-disciplinary Team



Management

- Communications
- Timelines
- Budgets
- Cross-training



Assessment

- Phase 1 ESA
- Phase 2 ESA
- Hydrology / hydrogeology
- Liability assessment



Remediation

- Earthworks
- Treatments & amendments
- In-situ & ex-situ systems
- Documentation & reporting




Reclamation

- Communications
- Earthworks
- Surface preparation
- Revegetation
- Monitoring & maintenance
- Assessment & application



Goal: Timely Closure





Vegetation Management

Vegetation Management

Common challenges:

- Weeds introduced through soil and materials
- Weeds spread because of disturbed ground
- No planning for weed control

The multi-disciplinary team approach:

- Begin weed control at the assessment phase
 - Routine monitoring
 - Seed soil stockpiles
-



Vegetation Mangement: Soil Piles



Soil stockpile in desperate need of weed control.



Soil stockpile with grass cover and no weeds.

Vegetation Management: Foxtail Barley



Remediated area immediately after completion.



Same location next year.

Vegetation Management: Cost Implications

Grass example:

Item	Details	Cost	Time
Weed control	Herbicide x 2 Tractor Consultant	\$5,000 - \$10,000	1 – 2 years
Reseeding	Herbicide x 1 Tractor Consultant	\$3,500	1 year
Total		\$8,500 - \$13,500	2 – 3 years





Soil Conservation

Soil Conservation

Common challenges:

- Topsoil loss from poor stripping
 - Admixing from rutting
 - Moving poorly placed piles
-

The multi-disciplinary team approach:

- Use appropriate equipment *and operator* to strip soil
 - Strip a large work area, or the whole site
 - Prevent driving and placing common soil on topsoil
-



Soil Conservation: Soil Stockpiles



Small, scattered piles complicate getting an even spread, often need moving, and usually vary in quality.



Single windrows, stripped to edge of a large work area, accommodate recontouring uniform replacement.

Soil Conservation: Admixing



Remember to consider access routes to fill sources, not just the worksite itself.



Stripping the entire site ensures that topsoil will be conserved, and is often necessary anyway for full reclamation.

Soil Conservation: Cost Implications

Topsoil Import Example:

Item	Details	Cost	Time
Topsoil (\$5 / yard)	500 m ³	\$3,250	Not applicable
Consultant & laboratory	Sourcing Testing Supervision	\$3,000	
Trucking (\$100 / hr)	40 loads	\$5,000	
Total		\$11,250	





General Topics

General Topics

Common challenges:

- Poor housekeeping
 - Missed opportunities to look for buried soil
 - Poor communication with stakeholders
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The multi-disciplinary team approach:

- Conduct routine monitoring and maintenance
 - Collect reclamation data at Phase 2 and Remediation
 - Communicate regularly *and effectively*
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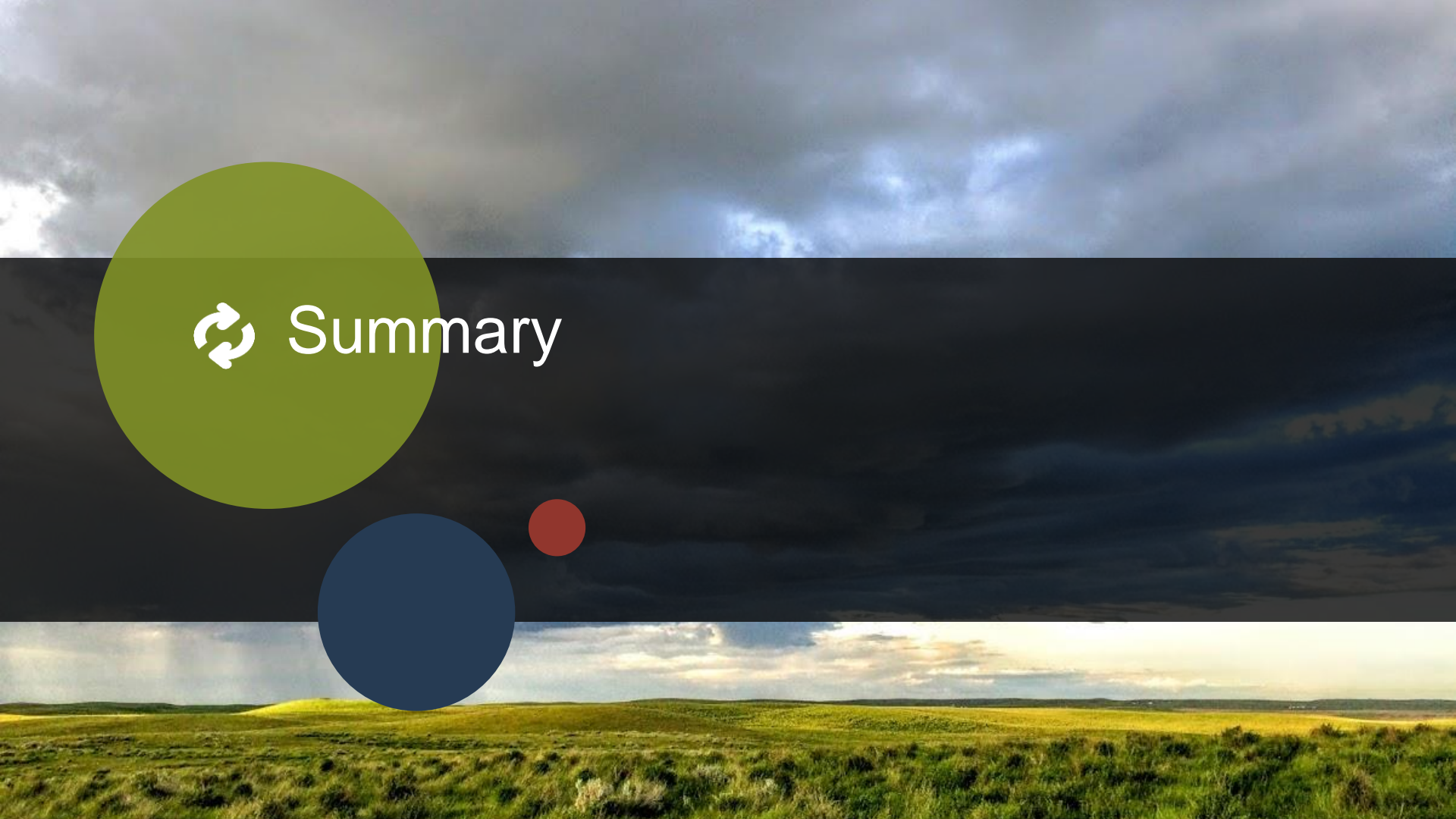
Cost Savings

Consider what the reclaimed landscape will be while planning remediation:

- Recontouring may present opportunities to use subsoil guidelines
- The landscape can influence how to backfill an excavation



Summary





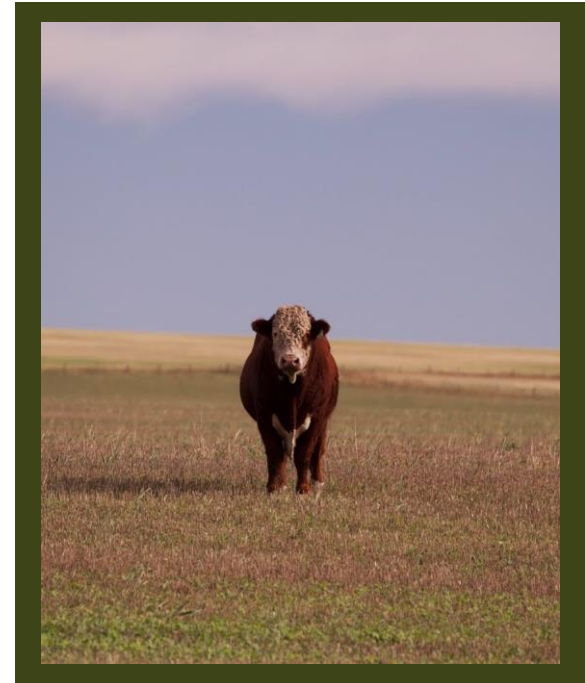
What Could Go Wrong?

Common occurrences:

- Added time
 - Added cost
 - ***Antagonistic stakeholder***
-

The multi-disciplinary team approach:

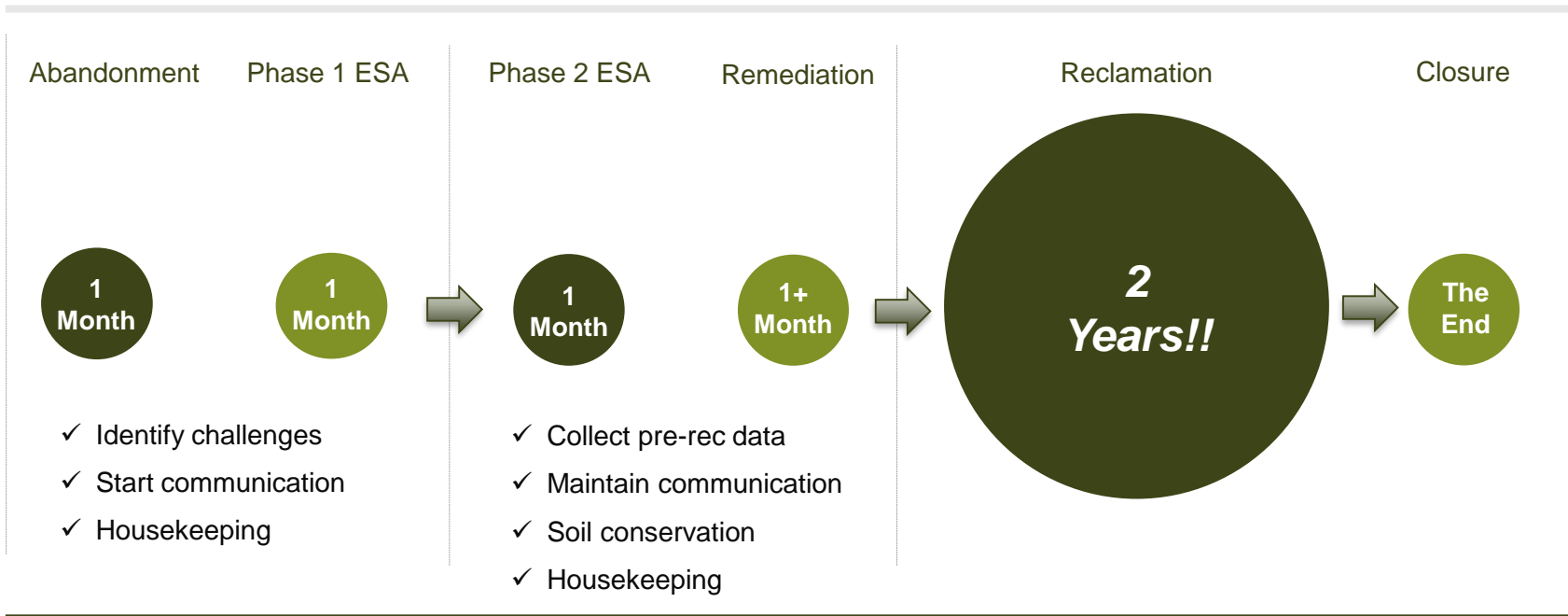
- End-in-mind planning
 - Cross-training
 - Communication
-





Summary:

Planning for Reclamation at *All* Phases





Questions?

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Thank-you

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