AGRIUM KAPUSKASING PHOSPHATE OPERATIONS LAND RECLAMATION

Description of Work: Scarification and direct broadcast seeding of mine waste materials (rock, clay and till) with erosion control seed mix and native seed mixes. Rock pile, clay pile, plant site and pit shorelines were directly revegetated without adding soil cover over waste mine materials greatly reducing the cost of reclamation. Initial 2014 work was fully warrantied at the owner's request with a supporting 5 year performance guarantee bond. Bond was dissolved in 2019 without any claims due to vegetation still performing very well. As multiple years worth of thick nitrogen fixing vegetation is composting, a layer of organics soil is now starting to build up all over the mine site.

Statistics:

- Installation of 12 test plots (2013) to demonstrate direct seeding success on steep slopes.
- Total seeding area of 389 Hectares (3,890,000 square meters) from 2014 to 2018.
- 70% cover achieved within the first growing season.
- Full cover achieved following the second growing season.
- No temporary erosion control measures were required to stabilise slopes.
- No soil cover or organic amendments required.
- Installation of 15 Ha of erosion control blanket in vegetated channels.
- Installation of 30 test plots on tailings materials.

Challenges Overcome by Erocon:

- Complied with strict client EH&S policies and procedures including ISNetworld certification.
- Integrated seeding schedule with earthworks construction schedule to control erosion.
- Coped with heavy rains, steep slopes, soft terrain and coarse material.
- Unit rate billing applied with no request for extras.

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Waste rock clay and till following rough grading by earthworks contractor.

Typical conditions prior to seeding. Soils include a range of waste rock, clay and till but contain no organic content. The soils are generally non acidic and were directly revegetated.

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Seeding equipment primarily consisted of three John Deere 450 dozers equipped with 3 point hitches, chain harrows, Lely broadcast seeders and GPS units.

Installation of Erosion control blanket within vegetated channels. Blanket was fully keyed in at edges and placed in intimate contact with the soil.

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Early growth of rocky area. Scarified with JD450 LGP and chain harrows.

Erosion control blanket in channel. Note rocks pushed into channel to permit seeding of slopes.

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Fine graded and scarified area prior to seeding. Note erosion control blanket in channel. Seeding was scheduled in channels before the installation of the blanket. Seeding on slopes was scheduled after the installation of Rip Rap by the earthworks contractor.

Early growth on slopes and within channels. Note wet conditions.

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Same area as in previous picture at the end of the first growing season.

General overview of Rock Pile section after first growing season. Note clusters of oversize rocks. Smaller rocks are now hidden by vegetation.

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In distance is a general overview of Rock Pile section after 3 growing seasons. In foreground is the Clay pile after 2 growing seasons.

Use of Low ground pressure unit for swampy terrain sections.

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Loading of seed batch in hopper.

Loading of Stringy native seed mix which required the addition of sand and the use of auger spreader to be spread efficiently.

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Seeding of future shorelines in flooded open pits on 3:1 slopes. As opposed to waste pile seeding the design did include a light amendment of topsoil.

Overview of freshly seeded pit shoreline section.

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Pit shorelines after two growing seasons.

Re fertilizing tailings test plots as per client test protocols.

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