



REMTECH 2011

Medicine Hat Phosphogypsum Stack Capping Project

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Medicine Hat Phosphogypsum Stack Capping Project Method to Manage Tailing Deposits



Aerial overview of the Medicine Hat PG Stack Capping project over its development

Introduction

- **Medicine Hat Fertilizer Production Facility**
- **Mid 1950s – Production Starts**
 - Phosphoric Acid
 - Phosphogypsum (PG) is by-product
 - PG is pumped to stack area as slurry
- **Early 1980s – Production Ceased**
 - Stack area was approximately 250 hectares
 - Depth ranged from two metres to six metres below the surface of the stack
 - Capping was determined to be the optimal method to manage the PG stack long-term



The project sought to advance the knowledge of the properties of PG and to develop grading and materials handling procedures for the PG

Project Site



Aerial overview of the Medicine Hat PG Stack (grey) part way through the capping project

Objectives

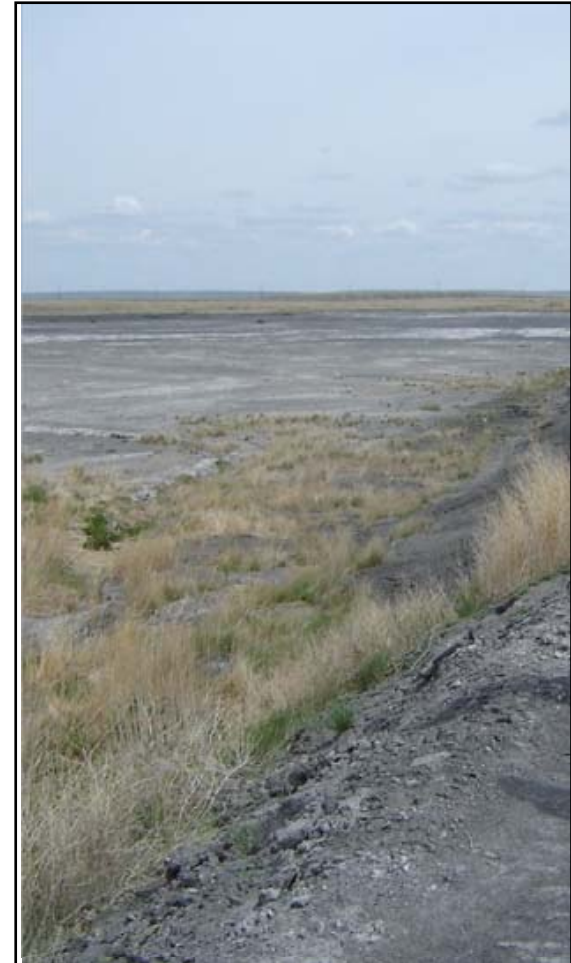
- **Be protective of human and ecological health**
 - Groundwater
 - Air emissions
 - Wildlife use
 - Runoff management
- **Provide a productive end land use**
- **Meet regulatory requirements**
- **Facilitate long-term management**



The concerns associated with water infiltration were considered because of the potential for various components of PG to enter the groundwater system

Engineering Scope

- Provide engineering services for conceptual design
- Document the behavior of PG during construction activities
- Conduct capping trials
- Provide input to a Risk Management Plan (RMP) and design basis Memorandum (DBM)
- Perform detail engineering, construction specifications, tender documents, tendering services, services during construction, and a construction QA/QC report



Innovations

Examining the feasibility of large-scale capping:

- Determine the effectiveness of utilizing scrapers to excavate, haul, and unload clay barrier layer materials
- Determine the necessary cover thickness to allow for the movement of heavy equipment
- Evaluate the ability to compact clay over a PG base utilizing conventional compaction methods
- The properties and handling of PG
 - Determine the optimal method to move PG
 - Note how PG reacts to disturbance, including wind and equipment
 - Determine whether the 300mm thick clay barrier layer was sufficient
- The preparation of the stack for capping
 - Determine the PG preparation required in order to install a soil cover layer
 - Determine the effort required to compact the PG
 - Determine the stability of the stack and any variation in different areas



Complexity

- Technical Challenges
- Physical and chemical properties
- Meet required hydraulic conductivity values
- Meet required compaction
- Stack Challenges
- Size of the area being capped
- Settlement of PG causing varying consolidation
- Solution: Wetting and rolling the PG base
- Preparation of Base
- PG wetted and packed
- Wetted immediately before and after packing
- This ensured a hydrated crust was established



Stantec had to understand and minimize the potential for inadvertent mixing of PG into the compacted clay base from contaminated construction equipment during packing, while maintaining a moisture barrier to prevent dusting

Complexity Continued

Strategy

- Utilizing past data to enhance the following year's success
- Design amendments
- Using past assumptions to make decisions
- Construction Quality Assurance/Quality Control
 - Construction completed mid-October each year (2005, 2006, 2007, 2008)
 - Topographic survey data collected throughout to confirm required thickness was achieved
- Vegetation
 - Soil cover layer for vegetation prepared
 - Paratilling soil cover layer at 400 mm (rooting depth)

Construction

Construction Activities:

- Padding out on soil
- Utilizing tracked dozers
- Best practice methods were developed
- Utilization of a water truck to minimize dusting
- Established application methods, rates, and total volumes to minimize dusting issues to ensure a hydrated crust
- Development of specific procedures
- Project completed in four stages



Meeting and Exceeding Needs

- Maintained the project schedule
- Met milestones established in each year (2005-2008)
- Zero safety and environmental incidents
- Utilized knowledge gained through successful completion
- Transferring knowledge to other similar projects
- The completion of the Medicine Hat Stack Capping Project is part of a long-term relationship between Stantec and Viterro



Project Benefits

- Formerly uncapped 250 hectares now capped and revegetated
- Protective of human and ecological health
- Provide a productive end land use
- Meets regulatory requirements
- Facilitates long-term management





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Questions?

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