

# Metakaolin

An environmentally friendly,  
high performance, naturally occurring  
supplementary cementitious material





## Whitemud Resources Inc.

Mineral leases  
>150,000,000 tonnes

Proven reserves  
>50,000,000 tonnes

175,000 tonnes year  
Metakaolin processing  
facility





# Whitemud Resources Inc.

Proprietary bulk rail and truck loading facilities

Located southwest of Regina, Saskatchewan

# Metakaolin (MK) is a Supplementary Cementitious Material (SCM)

MK is processed from naturally occurring kaolin clay and meets CSA A-3000-08 and ASTM C618 standards

Improves the quality, strength, resistance to chemical attack, durability and environmental footprint of concrete

Cost effective when used alone in a mix or with Fly Ash, Slag or Silica Fume

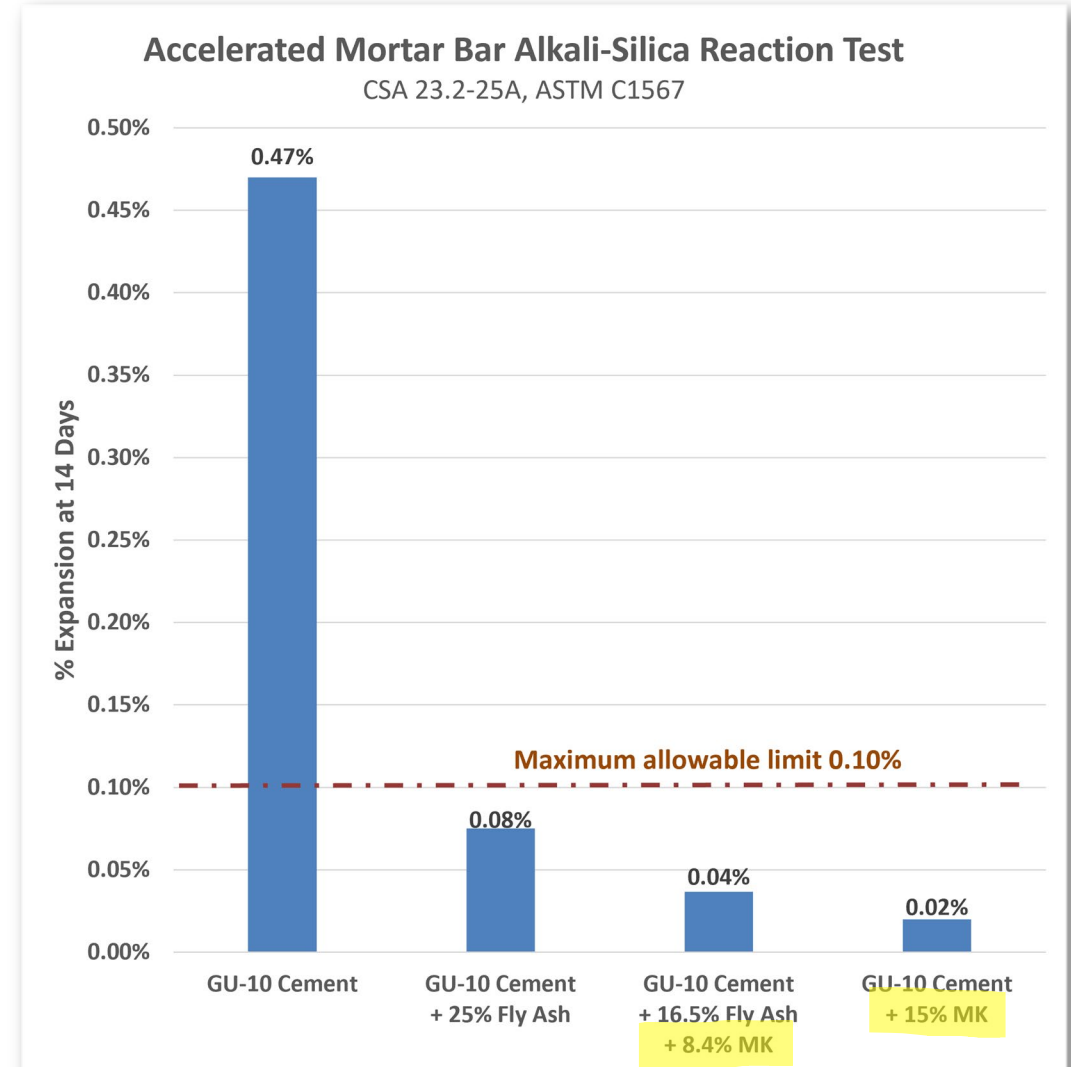


# MK Improves Durability

Counteracts aggressive causes of concrete degradation

Concrete made with MK meets stringent requirements for:

- Chlorides (including C-XL, C-1)
- Sulfates (S-1 and S-2)
- Alkali-Silica Reaction mitigation (CSA 23.2 28A and ASTM C-1293)

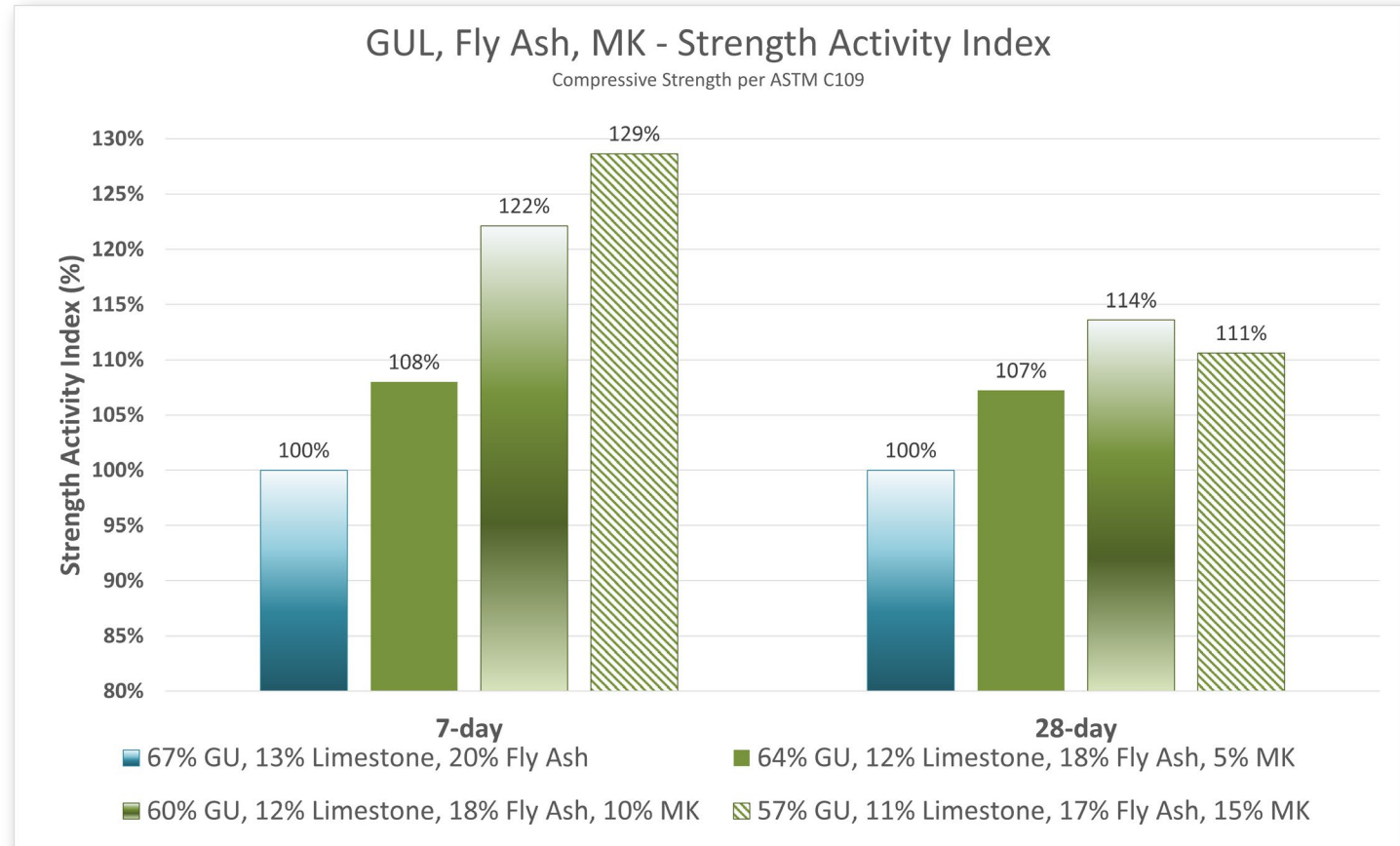


Source: Whitemud internal testing

# MK Enhances Strength

Increases 7-day, 28-day and long-term strength

Improves performance of conventional and eco-friendly concrete mixes when used alone or in conjunction with other SCMs

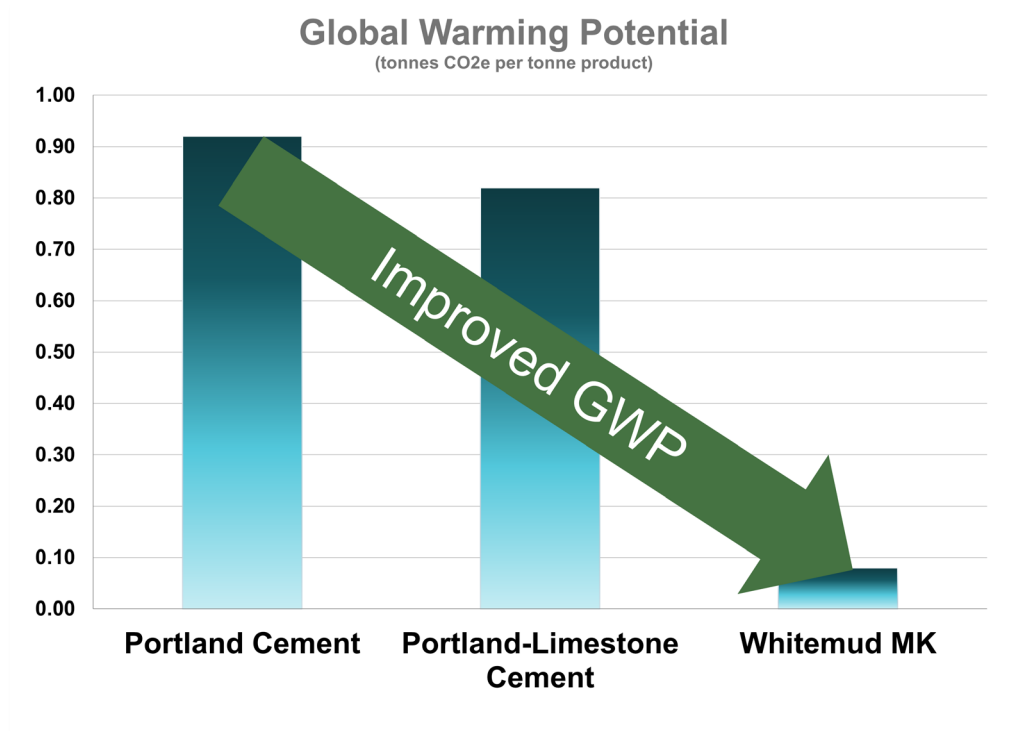


Source: Whitemud internal testing

# MK Reduces Cement's Environmental Footprint

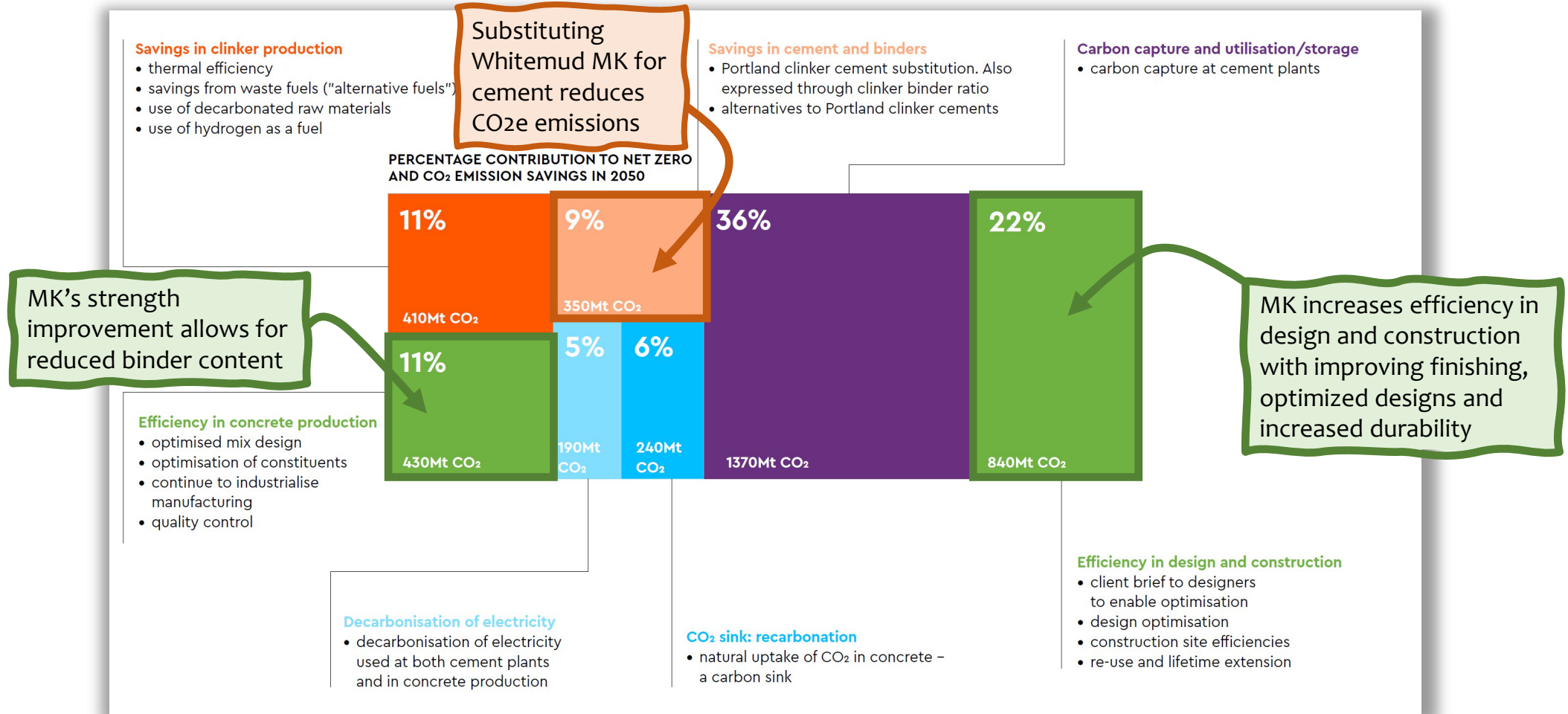
Adding MK improves the environmental footprint of both Portland and Portland-limestone based concretes

- Manufactured with renewable fuels and electricity, Whitemud MK reduces Global Warming Potential (GWP) by nearly 90% when compared to Portland or Portland-limestone cement
- MK reduces the heat island effect when used in pavements and roofing systems
- MK increases durability and reduces overall life cycle costs





# MK Contributes to a Net Zero Future



Source: Concrete Future – The GCCA 2050 Cement and Concrete Industry Roadmap for Net Zero Concrete



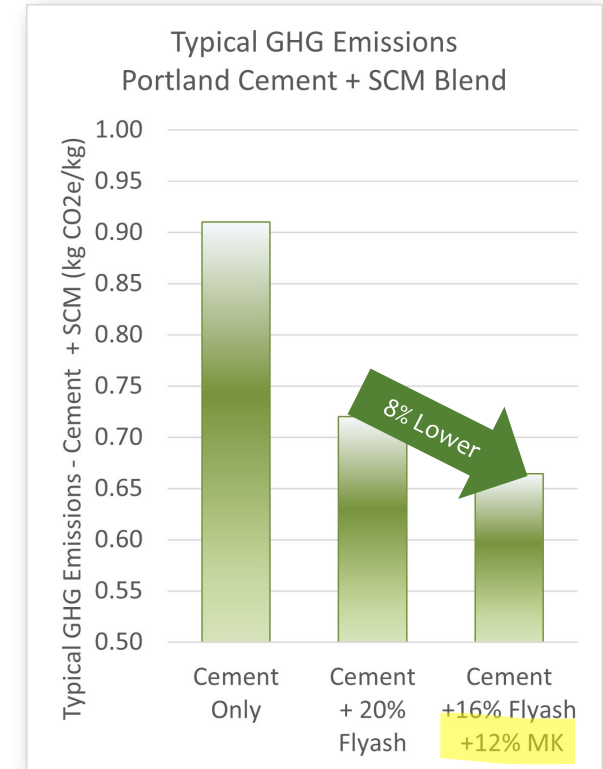
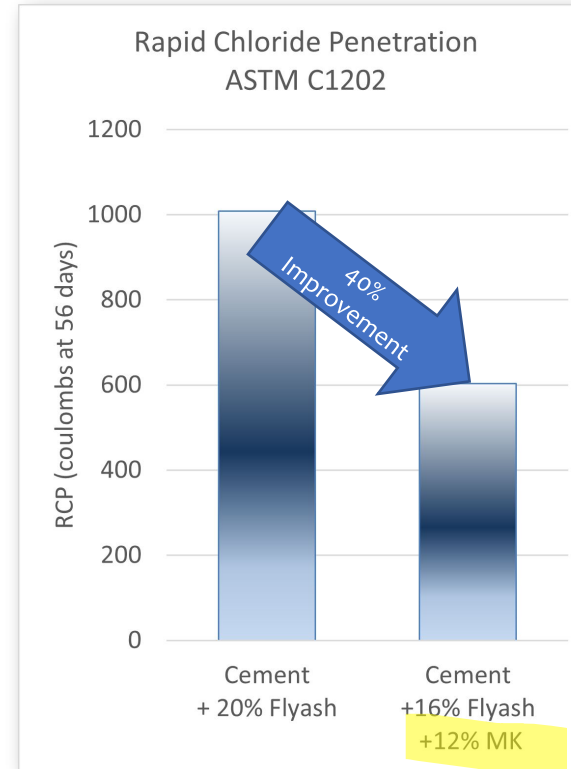
# MK Improves Fly Ash Mixes

MK is an ideal enhancement for a wide variety of concrete mix designs

MK further improves on fly ash's GHG reduction potential

MK helps build strength quicker and improves setting times of fly ash mixes

MK greatly increases chloride resistance of fly ash mixes



Source: EBA Engineering & Whitemud internal testing

# Comparing MK to Other SCMs

**Fly Ash:** Sources of quality fly ash are being rapidly reduced and curtailed as coal fired power plants are phased out

**Slag:** North America relies on imports from international suppliers which can be interrupted

**Silica Fume:** Very expensive and North American supplies are limited

Attribute	Metakaolin	Fly Ash	Slag	Silica Fume
Early Strength	Excellent	Poor	Poor	Excellent
Long Term Strength	Excellent	Good	Good	Excellent
Permeability	Excellent	Good	Good	Excellent
Chlorides	Excellent	Good	Good	Excellent
Alkali Silica Reaction	Excellent	Excellent	Excellent	Good
Sulfates	Good	Excellent	Excellent	Good
Cost	Medium	Low	Low	Very High
Availability	Readily	Dwindling	Import Reliant	Limited

Source: Van Dam, T, "Supplementary Cementitious Materials and Blended Cements to Improve Sustainability of Concrete Pavements", National Concrete Paving Technical Center, 2013

# Whitemud Metakaolin

## The Best Choice SCM

An eco-friendly Made-in-Canada solution to improve the carbon footprint and durability of Portland and Portland-limestone based concretes

- Deters Chlorides, Sulphates and Alkali-Silica Reactions
- MK's small particle size and high reactivity with calcium hydroxide reduces porosity, cracks and voids in concrete
- Improves mix performance and concrete strength when used alone with cement or in combination with other SCMs
- Cuts greenhouse gases by more than 90% vs the cement it replaces in a mix

Produced in Western Canada and available for distribution by road and rail

2022-01-21





# Whitemud Metakaolin - Project Highlights



**The Bow Calgary**  
Improved pumpability,  
shrinkage resistance and  
strength properties allowed  
for significant project  
efficiency gains



**U of C - Taylor Family  
Digital Library**  
Greener building with  
improved consistency,  
placement and colour



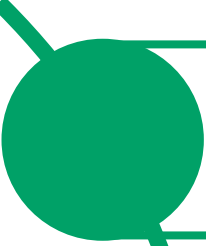
**U of C EEEL Building**  
Using MK in construction  
embodies everything the  
Energy Environment  
Experiential Learning  
building represents




**HWY 39 Bridge  
Overpass**  
Meeting SK Highways  
specifications




# Whitemud Metakaolin - Customer Testimonials




“We have been using Whitemud’s Metakaolin for seven years as a standard mix component in our ready-mix concrete. (Preventing) ASR pop-outs was one of the primary reasons why we made the decision to batch all of our concrete with Whitemud’s Metakaolin. Since we started using MK, have had zero reported instances of ASR pop-outs on our slab mixes. We have also come to appreciate the other positive attributes of MK including reduced shrinkage, improved workability and creaminess, and increased durability through a reduction in permeability. When crews first work with our MK mix, we frequently hear, “WOW! These guys really know how to make concrete!” MK in the mix produces a smoother product that rakes, floats and power trowels beautifully.” – Duracon Concrete Corp Owner



“I liked the Metakaolin concrete as soon as it came out of the truck. We were able to get our stripping strengths in 3 days, without accelerators. We can compress our construction schedule. Having Whitemud’s Metakaolin in the mix provides LEED points without adding work and time.” – EllisDon Senior Superintendent



“Using new products can sometimes be problematic however we had no issues integrating Whitemud’s Metakaolin into the project. The finishers found the mix to be really creamy and placing was no different to our normal mix. Coloration was more consistent on the form site of the slab. We would have no hesitation using this product on our next job.” – CANA Senior Project Manager



“The main challenges on the Bow Tower job were shrinkage and pump ability. The flow ability through the congested rebar required reducing the maximum aggregate size which increased the potential for shrinkage. Metakaolin in the mix has assisted in alleviating these issues. Our concrete mix design was able to satisfy the requirements for shrinkage and cracking. The pumping characteristics have met all requirements at the lower levels of the 58-floor structure. Metakaolin in our present mix designs has proven beneficial for LEED projects, early strengths, and stripping times.” – Inland Concrete QA/QC Lead

# Whitemud Resources Inc.

A proven resource with mineral leases supporting more than 200 years of production

North American production reduces the risk of SCM supply interruptions or possible foreign export restrictions

MK - a high performance SCM with a proven path to lower greenhouse gas emissions





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