R&D & Innovation: Managing Water Quality in the Elk Valley

Christian Baxter, Director, Environmental Strategy
#1 producer of steelmaking coal in North America

#3 zinc miner in the world

Top 10 copper miner in the Americas

Developing an energy business

About Teck:
100+ years of history as a mining company
10,000+ employees worldwide
12 active operations in Canada, the U.S., Chile and Peru
$12 billion (CDN) in 2017 total revenue

*Not on map, exploration & marketing offices around the world
Teck Coal: Elk Valley Operations

- Prince Rupert
- Ridley Terminal
- Prince George
- Quintette
- Cardinal River
- Elk Valley
- Kamloops
- Edmonton
- Calgary
- Neptune Terminal
- Vancouver
- Westshore Terminal
- Seattle
- Elkford
- Greenhills
- Line Creek
- Sparwood
- Elkview
- Coal Mountain
- Fernie
- British Columbia
- U.S.A.
Teck is a global sustainability leader

Best 50 Corporate Citizens in Canada for 11th straight year

One of top 100 most sustainable companies in Canada & worldwide

Named to the Dow Jones Sustainability Index eight years in a row

Top 50 Socially Responsible Corporations in Canada

2017 Towards Sustainable Mining Awards from MAC for Cardinal River, Greenhills & Trail Operations

2017 Responsible Business Award for Sustainability Report of the Year
BC Government used Section 89 of the *Environmental Management Act* to mandate creation of an Area-Based Management Plan

1. **Targets**: set site specific water quality targets and timelines to achieve them

2. **Water Management**: implement water treatment & mitigation actions to achieve targets

3. **Monitoring**: comprehensive environmental performance monitoring programs

4. **Research & Development**: to improve and develop mitigations

5. **Adaptive Management**: developed with uncertainties; to adapt implementation based on new information & learnings
Elk Valley Water Quality Plan
Decision Factors

Approved in November 2014:

• Targets are based on sound science using the best available information

• Developed with the participation of First Nations, US/Canadian regulators, and an independent scientist (TAC)

• Commitment to adaptively manage actions and environmental targets to ensure environmental objectives are met

• Robust monitoring and continued studies

• Ongoing engagement with key stakeholders
Monitoring

- Regional Aquatic Effects Monitoring Program
- Local Aquatic Effects Monitoring Programs
- Environmental Monitoring Committee
• Monitoring of water quality, sediment quality, biology (productivity, community/health, tissue)

• Lake Koocanusa Research and Monitoring Working Group (+ Se subcommittee)
Data Transparency

Research and Monitoring Reports

Results of ongoing water quality research and monitoring undertaken as part of the Elk Valley Water Quality Plan.

www.teck.com/elkvalley or contact Christian.Baxter@teck.com
Stage 1 and Stage 2
Work prior to and during the development of the Adaptive Management Plan (2013–2016)
West Line Creek
Active Water Treatment Facility

Capacity of ~5,500 m$^3$ of water per day

Selenium reduced
~96%

Nitrate reduced
>99%

Production of reduced selenium species

Advanced Oxidation Process

Late summer 2018 restart
Next plant under construction at Fording River Operations

Additional plants required, influenced by R&D outcomes

Expected spend
- 2018-2022 $850-900M
- 2023+ $65M/year
- $5-6/t operating costs
Research & Development

Passive Treatment
- Permeable Reactive Barriers
- Low flow bioreactors
- Pit lakes used for NO\textsubscript{3} removal
- Different variants of in situ treatment
- Suboxic layers below dump

Source Control
- Covers to prevent water infiltration
- Covers to prevent oxygen ingress
- Suboxic layers
- Snow/water management
- Surface design to focus infiltration
Saturated Rock Fills