ADAPTIVE WATER MANAGEMENT AND CLIMATE CHANGE RESILIENCY THROUGH PROBABILISTIC SIMULATION

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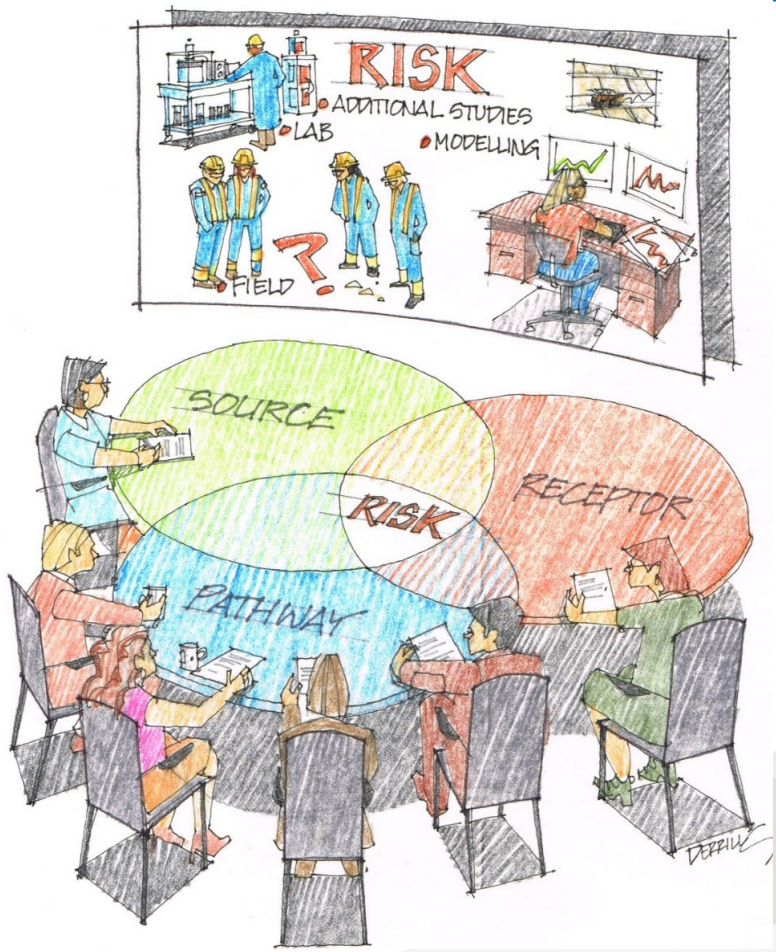
Value for Water Management

- More than ever responsible water use in mining is an expectation for mine operators
- No longer a **Closure Problem**
  - Early planning allows taking advantage of site configurations and landform designs at start up
- Robust site-wide water balance
  - Sensitivity analysis of possible upset conditions – extreme climate events
  - Easily be adapted

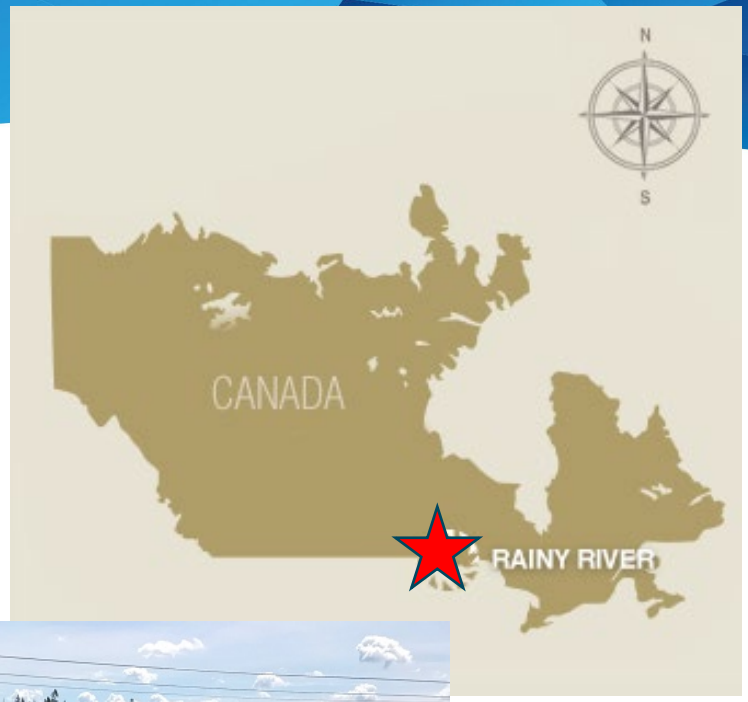


Objective: To develop a tool for site to identify key driving factors of the water balance

- *Reduce the risk of costly last-minute adaptations, or long-term liabilities associated with capture and treatment of water.*

Rainy River Site Overview

- NewGold Rainy River Mine
  - Fort Francis, Ontario
  - Commercial Production Nov 2017
  - 2020 production 228,919 ounces of gold and 361,862 ounces of silver
  - Average precip 695 mm; 540 mm as rainfall
  - Average daily Temp 18 degrees C; freezing from Nov to March



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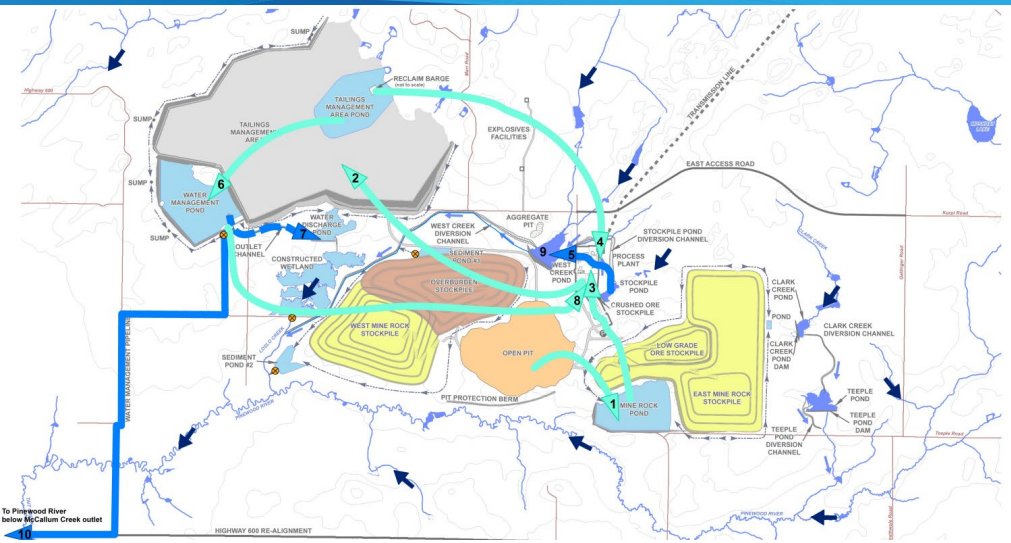
Water Balance and Water Quality Model



NewGold, OMS, August 2017

- WB / WQ Model capable of informing on site water management decisions
  - Consideration of long-term site water management into closure
  - Include extreme climate events
  - **Deterministic** and **Probabilistic**

- Functional Water Balance Model developed
- Informs treatment design criteria
- Fully handed over to New Gold Personnel

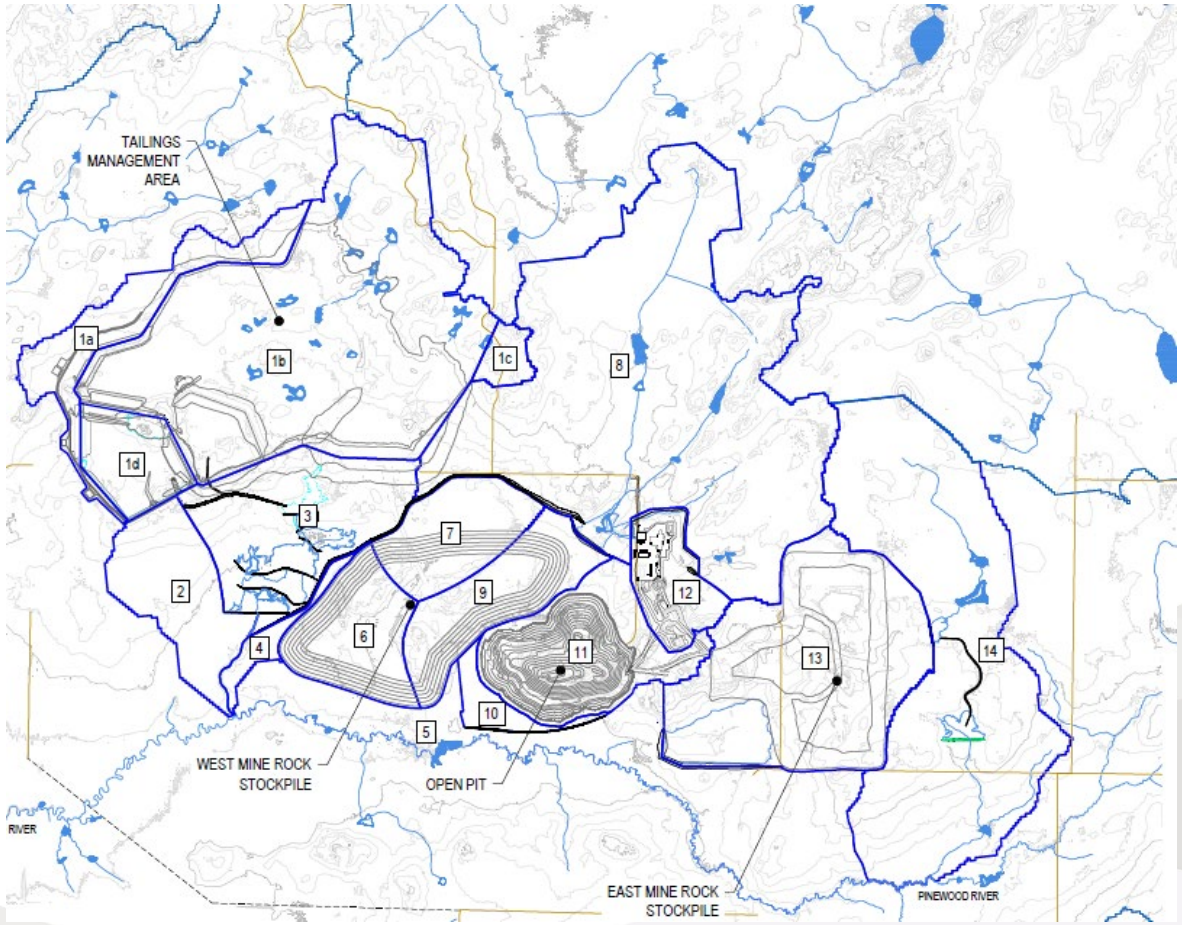
Water Management through Life of Mine

- GoldSim Dynamic Monte Carlo Simulation Software (GoldSim, 2014)
- Key activity for success was creating accurate timeline of changing management scenarios as mine advanced into operations, closure and post-closure

Water Management through Life of Mine

Current Condition (March 2018 to June 2019)

- Transition construction to operations
  - Verification and Operational Decision Making
- Update of Current and Proposed Facilities and Configurations
- Climate conditions
- Contributing watershed areas
- Water use and discharge requirements
  - Timelines, volumes, restrictions



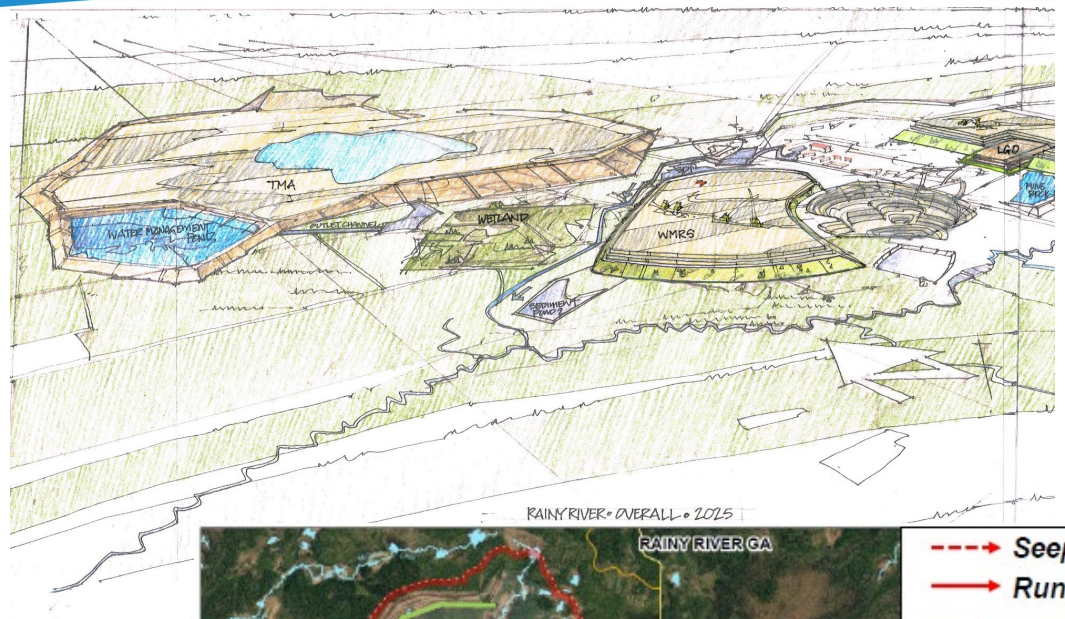
Water Management through Life of Mine

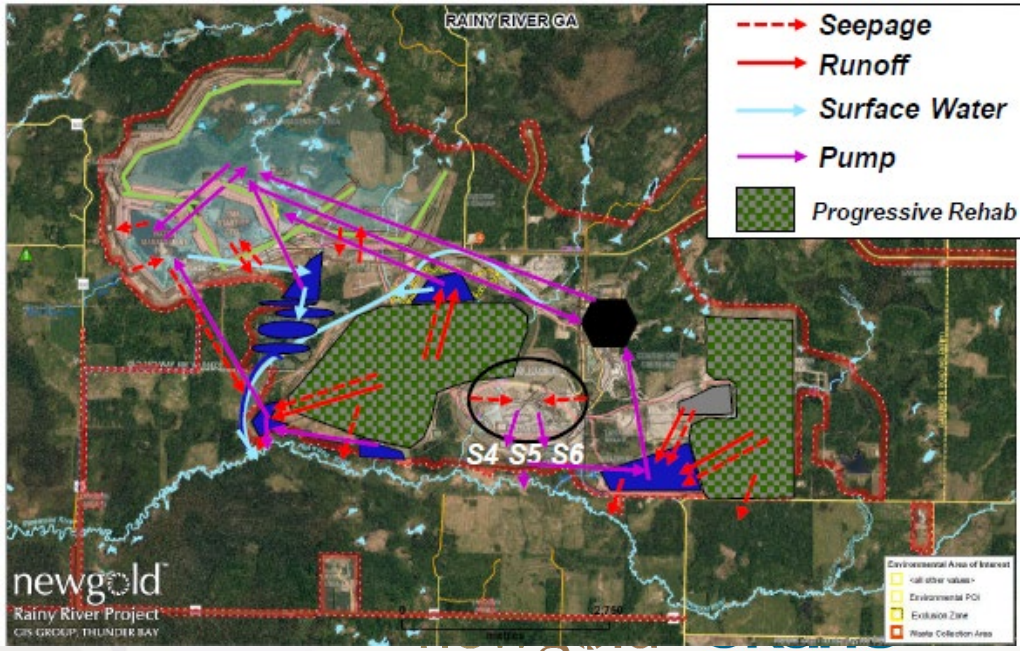
Early Operations (2019 to 2026)

- Production mining underground and Open Pit
- Ore processing, increased tailings and stockpile volumes
- Start of progressive reclamation activities – constructed wetland
- Water use limited to pit dewatering
- Water discharge from limited facilities

Late Operations (2026 to 2032)

- Cessation of underground and mill fed from onsite stockpiles
- Stockpiles and TMA reach full extent
- Water use and discharge remains consistent





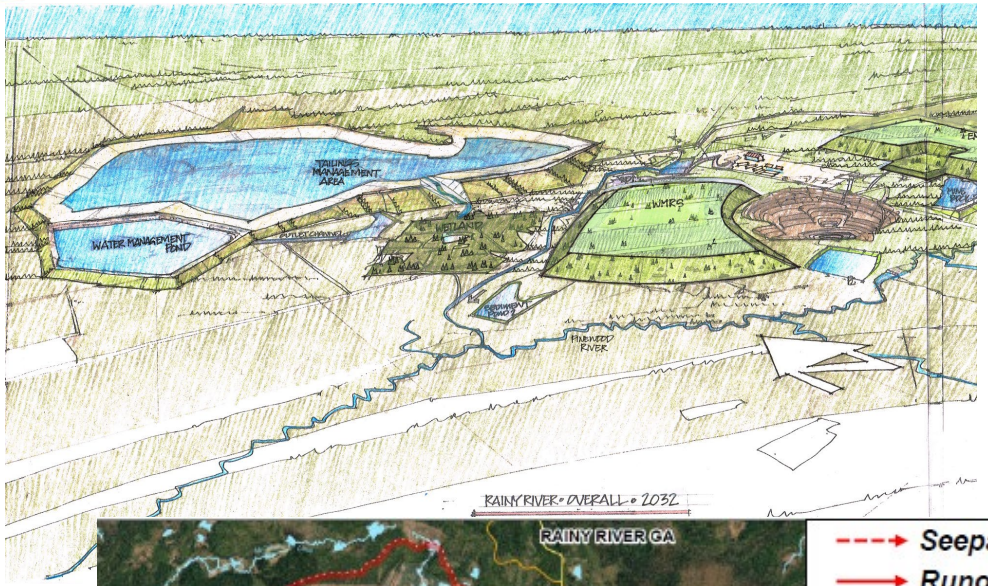
Water Balance Implications for Water Management

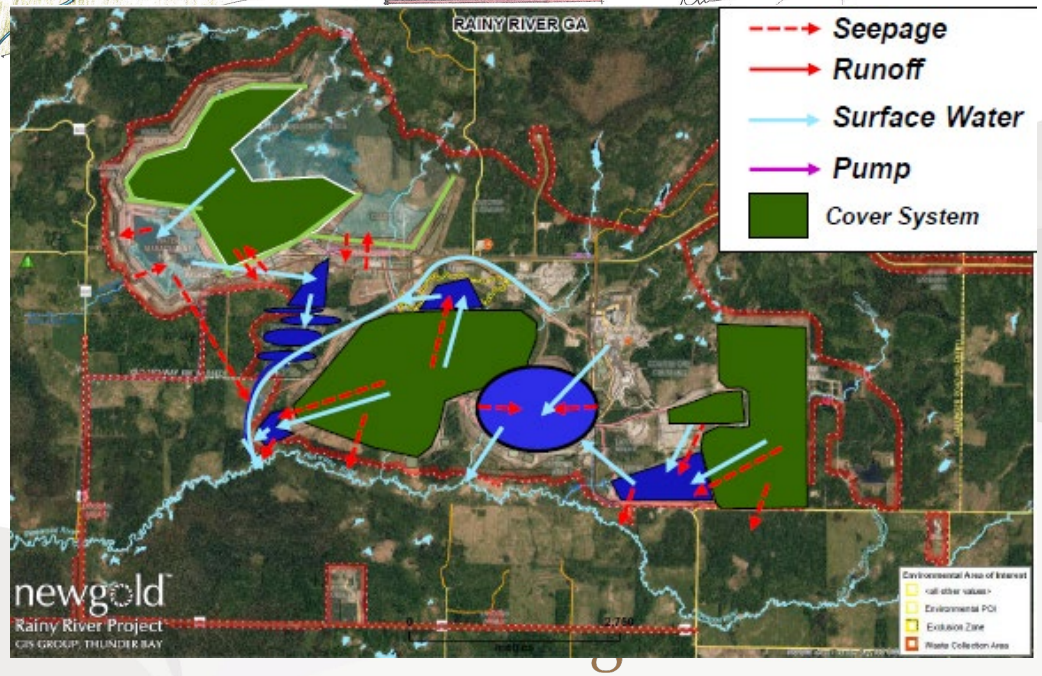
Closure(2032 to Pit Flooding)

- Operations cease
- Processing completed
- Closure activities commence
- Still water management occurring
- No water taking requirements

Post-Closure (> pit lake development)

- All reclamation activities completed
- Water management through gravity drains and management for quality

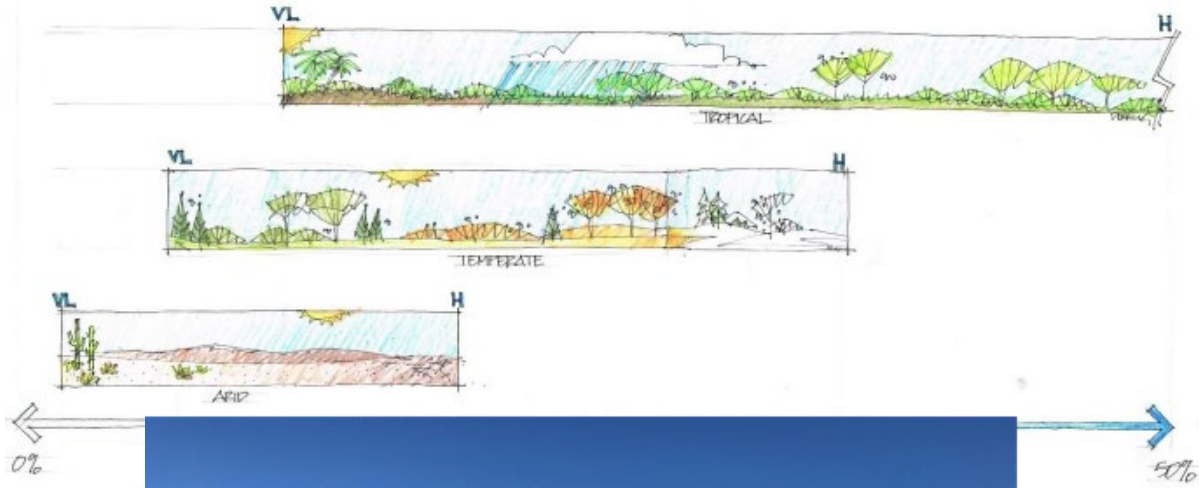


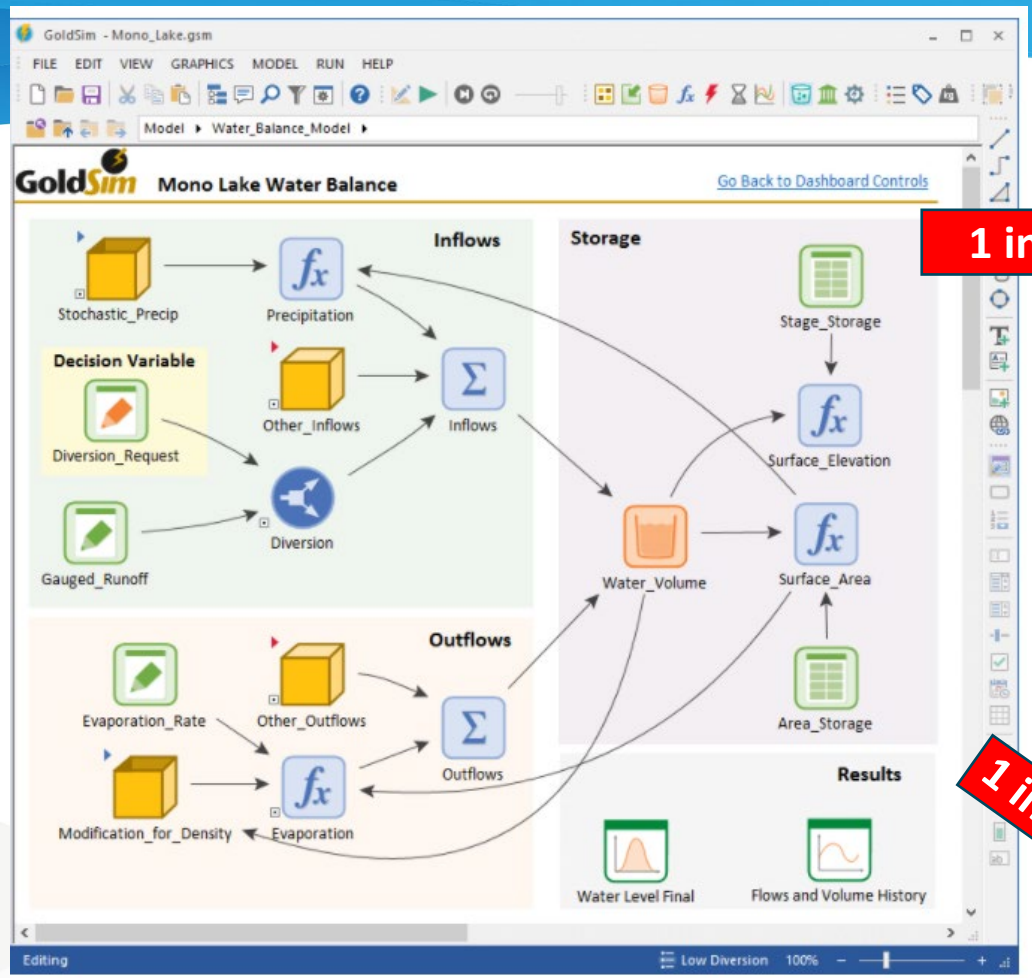


Hydrological Event Development

Detailed Review:

- Impacts of extreme events and back to back extreme events (Wet and Dry conditions)
- Available site climate data used to develop Site Synthetic 100-year climate record
  - 1/20 dry year
  - 1/20 wet year
  - 1/100 wet year; and
  - 7 day, 10 year low flow event





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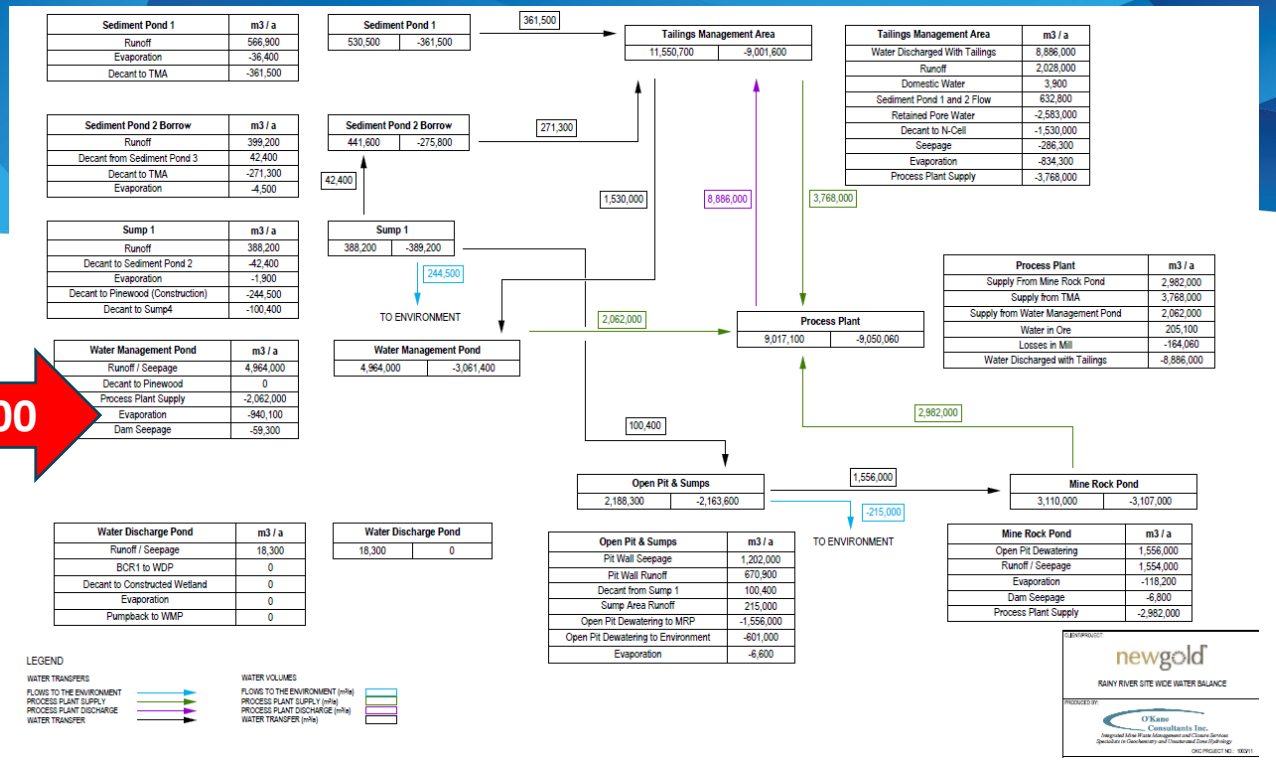

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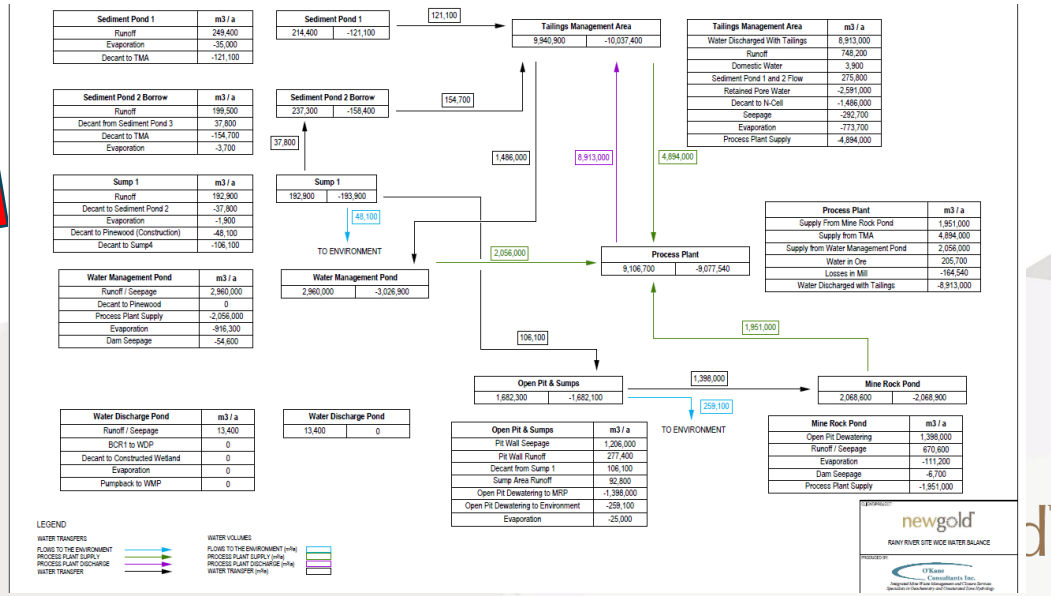

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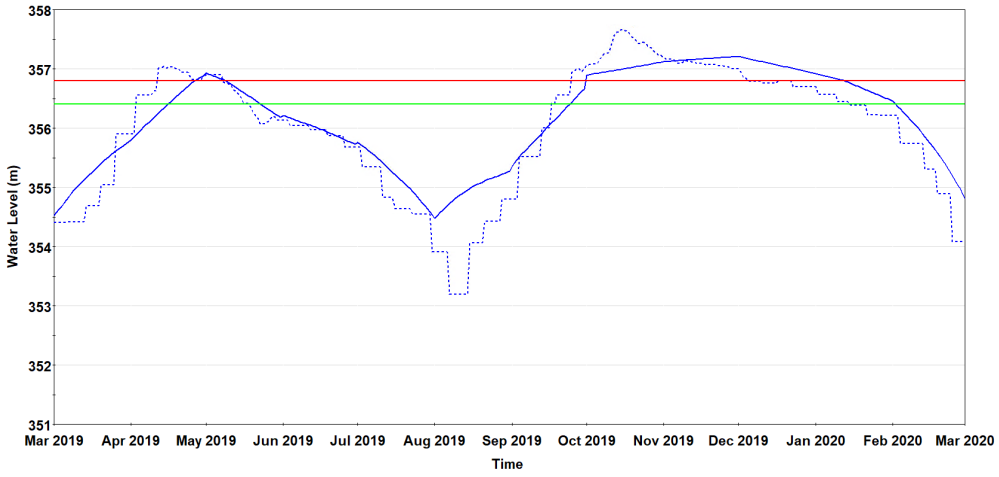
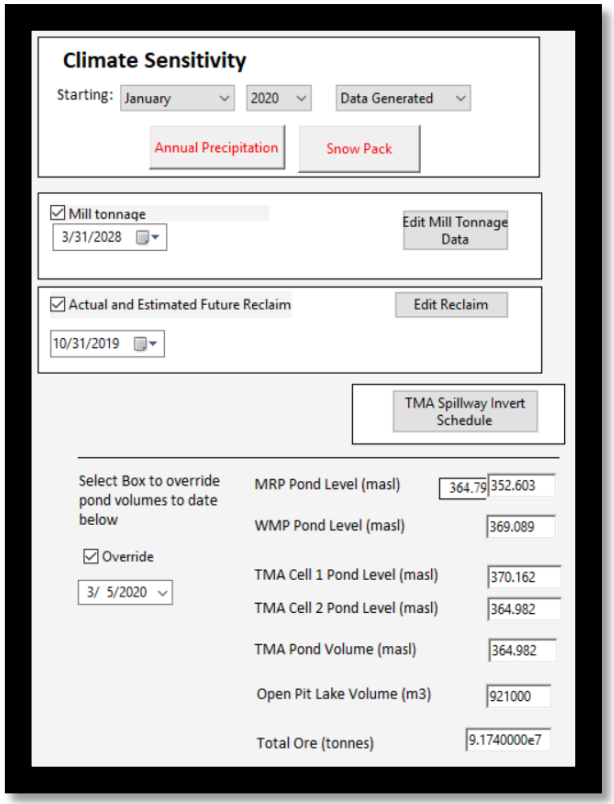
Continuous Calibration and Upkeep

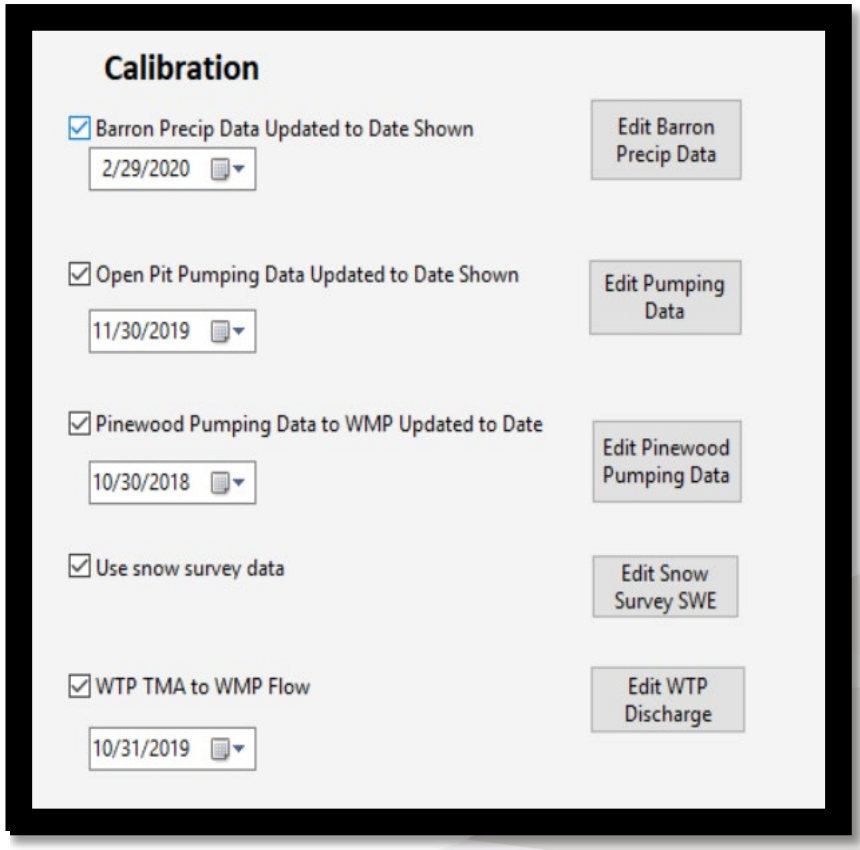
- Continuous Data Collection and Calibration:
  - Climate data
  - Production rates
  - Dewatering and water taking rates
  - Bathymetry surveys completed and updated
  - Review of watersheds and diversion
  - ‘Rules’ for water management structures

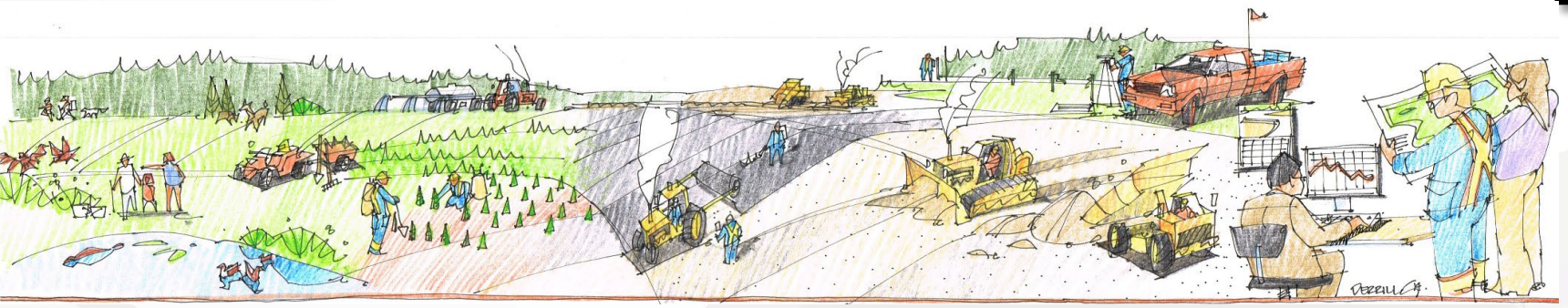


Site Operations Water Management Tool

- Training and Hand-off of Water Balance to New Gold Management and Site Environment Staff
- Creation of Dashboard for Managers and Environment
  - Environment model updates and validation
  - Allow for scenario analysis by Management







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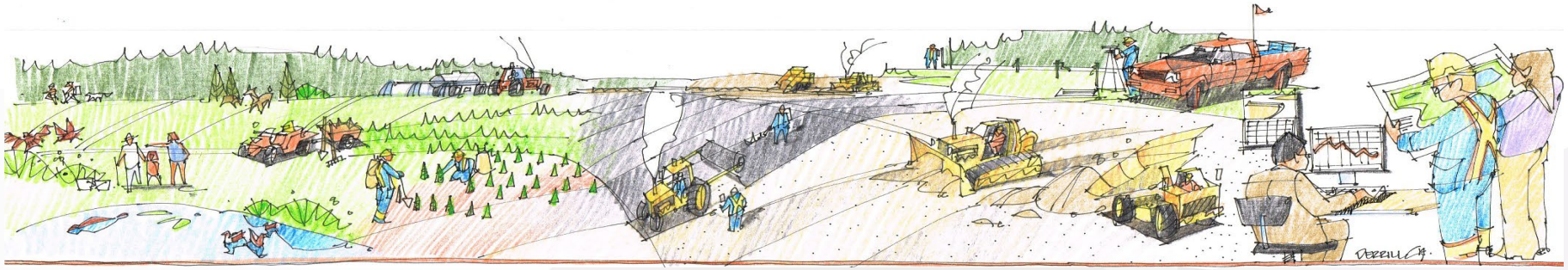
Site Operations Water Management Tool

- Site ran, robust model, using calibrated inputs, allows for evaluation of current and future performance with higher confidence, which reduces **probability** of failure, reducing water management related ***risks*** and ***costs*** by adaption and optimization of site water management.
  - Predictions – Most Probable
  - Predictions – Deterministic



Thank You!

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25 Years Advancing Mine Closure Solutions

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