Unlocking the Value of Down-hole Geophysical Data

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Location: Almaty 19th November 2015

- Major money decisions are based on the models we generate
- The accuracy and reliability of our models are only as good as the accuracy, reliability and quality of our input data
- Down-hole geophysical data can improve the quality of our input data producing high confidence models and decreasing decision making risk

Where Down-hole geophysics can help decrease risk and save money:

- Data validation and QAQC
- Geological interpretation
- Grade proxies for Coal, Uranium, Phosphate
- Hydrogeology modelling

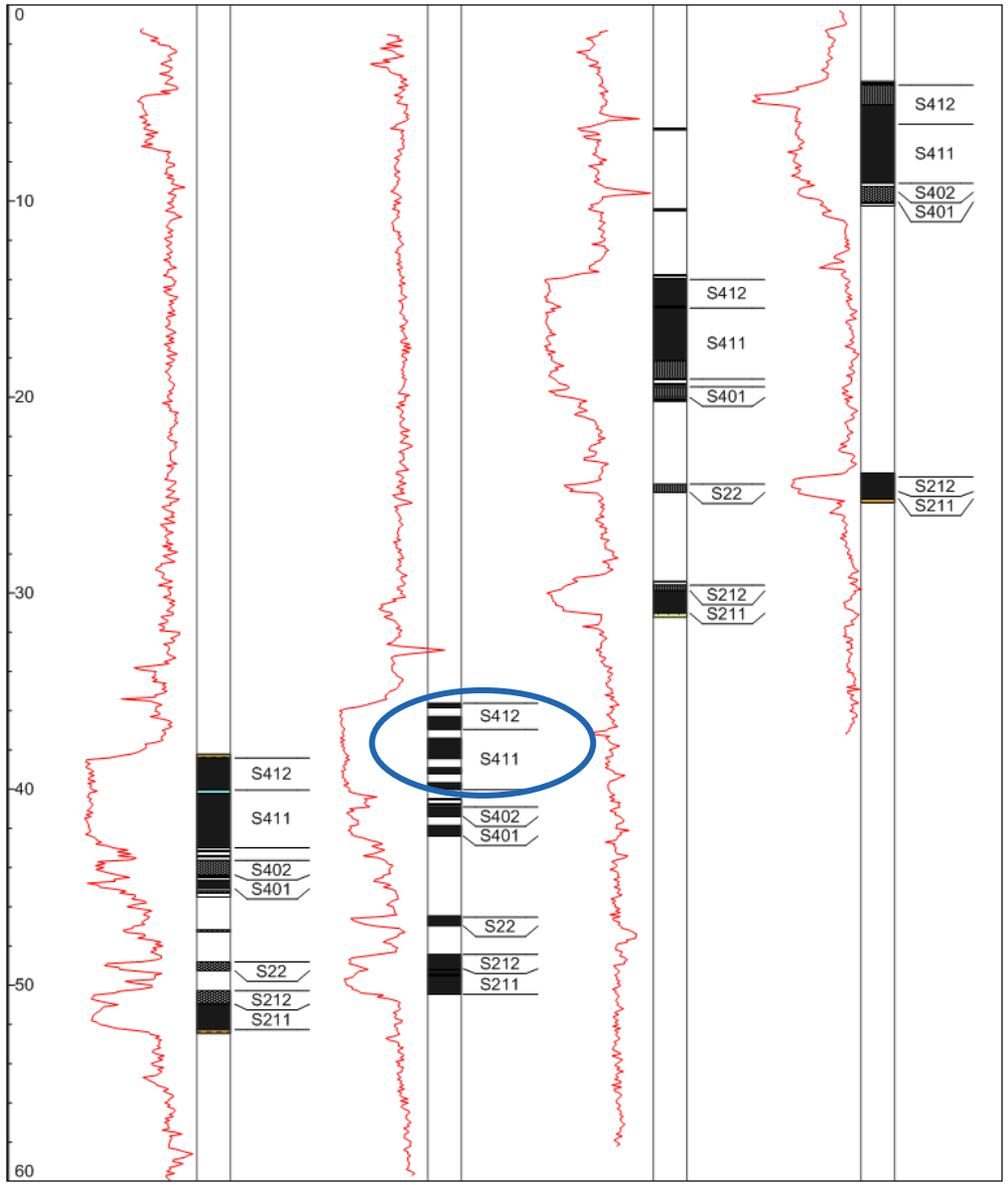
BAD DATA COSTS MONEY

Data Validation - Quality Assurance and Quality Control

- Assessing core recovery and assigning core loss
- Depth validation for lithology and assay samples
- Density measurements – continuous through the entire hole
- Validating sampling and analysis procedures

- **Objective check on the drilling contractor helping to implement clauses such as minimum recovery through mineralisation**
- **Allows assessment of the representativity of the underlying samples**
- **Improves the quality and accuracy of the data**

Geological Interpretation and Correlation – Coal Example (Density)



- Comparison of core logging and density log on section
- Does not require cored holes
- Characterisation of lithological relationships
- Validation of lithological logging (blue circle)
- **More reliable and accurate models**
- **Better informed decisions such as mine planning**

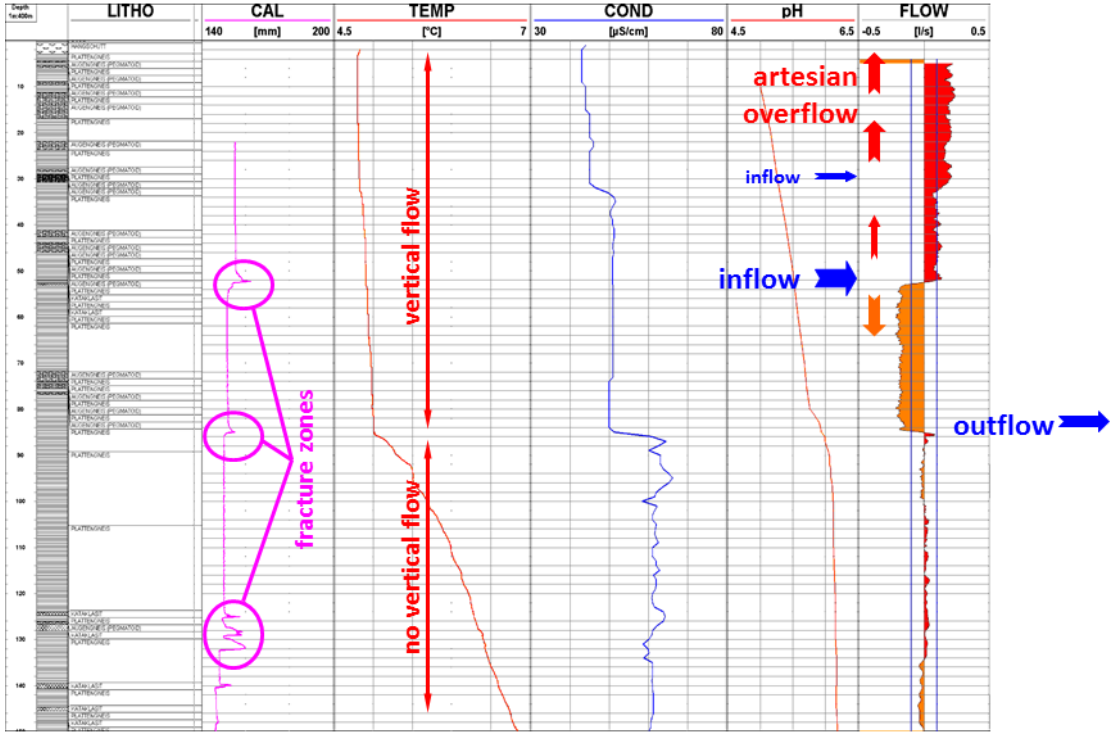
Grade Proxies and minimising sampling

- **Coal**
  - Density and gamma show changes in coal quality.

- **Uranium**
  - Equilibrium deposits can use Spectral Gamma to inform grade and guide sampling
  - Disequilibrium deposits – largely this type in Kazakhstan can use Prompt Fisson Neutron (PFN) tools to directly assay ^{235}U giving continuous grade down hole
  - Does not require core – but mostly used in conjunction with assay methods
- **Phosphate/Potash**
  - Natural gamma informs the limits of the mineralisation where there are no visual controls
  - Cost effective information for grade control and mine planning

- **Highlights grade risk**
- **Saves money on sampling**
- **Further information to support grade control strategies and decision making**

- **Caliper** – borehole diameter
- **Neutron** - porosity
- **Temperature** Profiles - flow
- **Conductivity /Resistivity**
- **Flowmeter** – rates of movement



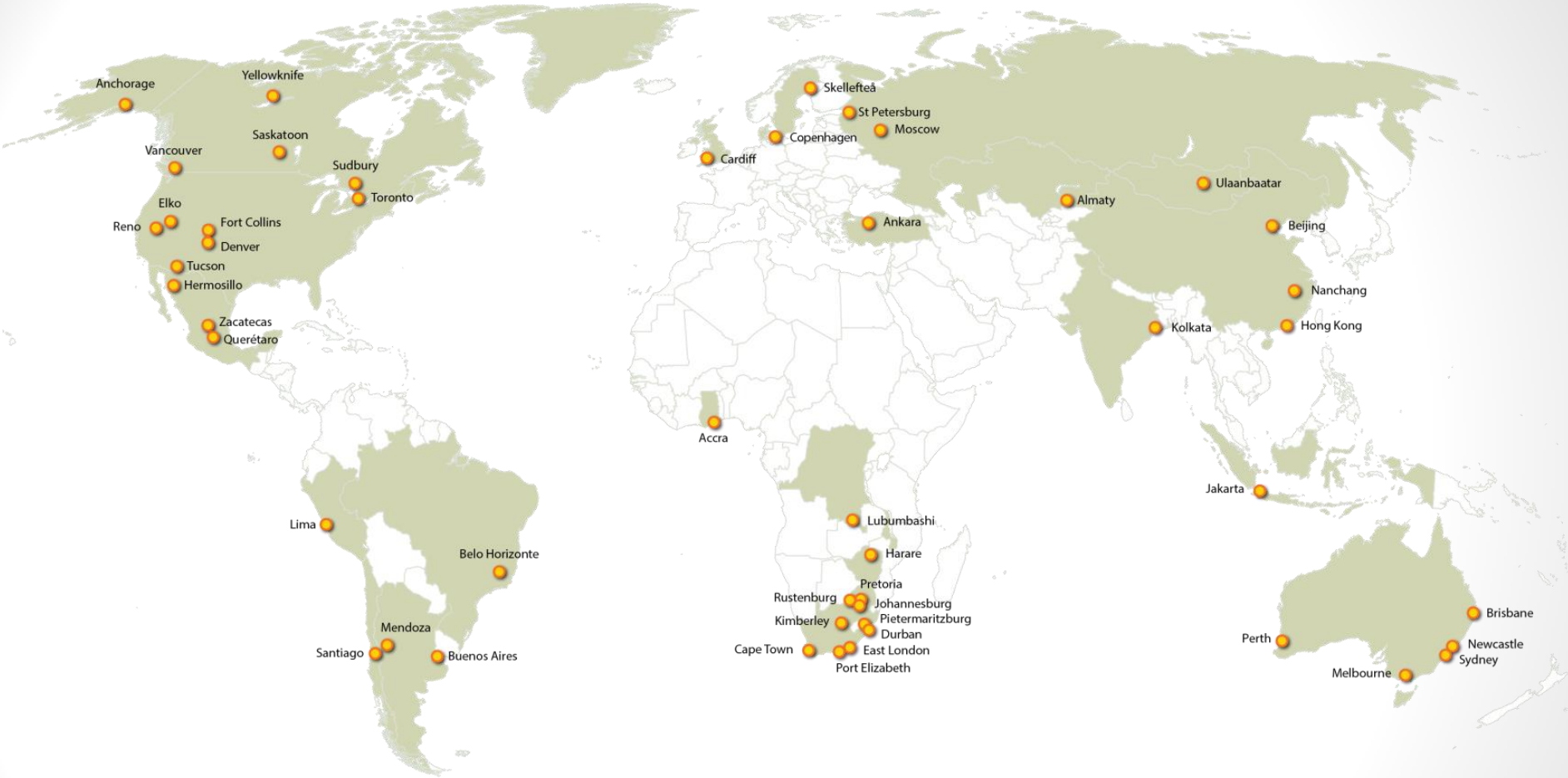
- **Informs other borehole tests such as packer and pump tests**
- **More detailed and accurate hydrogeological models on which to simulate mine water management solutions and geotechnical parameters (slope angles)**
- **Decreased risk in mine and surface water management solutions**

Conclusions

- **Prevents density biases of unconsolidated material and the impact of over-reporting tonnages in Resources and Reserves**
- **Depth corrections and core loss assigning ensures the geological model is accurate, and gives objective check on the drilling contractor**
- **More accurate geological interpretations and models are generated which can be used to inform resource estimation, grade control and mine planning**
- **Grade proxies can be used to support modelled cut-offs and Resources where there are only RC holes, saving money on drilling and providing reliable information**
- **Minimises sampling within the drillholes saving money on sampling costs and optimising the sampling strategy**
- **More detailed and reliable hydrogeological models can be generated which allows for the most cost effective solutions to surface and ground water management to be implemented**

Very simple procedure to create a grid and convert a wireframe surface into a grid

SRK Office Locations



>1,500 Professionals, 50 offices, 22 countries, 6 continents