Freeport-McMoRan Sensor Data and GIS Approach for Visualization
July 23, 2015
Sensor Data

- Sensor Data plays an important role in exposing the problems in the mine cycle
- Sensors help determine severity of issue and thus prioritize the need for attention
- Data for various sensors are available for example:
  - Tire Pressure, Suspension Cylinder, Fuel Level, Flow Meters, Payload Status, Weather Stations, Ground Speed, Engine Load, Avg. Flow etc.

This presentation covers how Freeport-McMoRan is using GIS to visualize the suspension sensor data and then making the application available to site users for daily implementation and follow up.
Project Goals

- **Objective:** Use of Sensor and GPS data to measure road quality and identify adverse conditions for roads.

- **Approach:**
  - Conduct onsite field observations to locate bad road conditions and observe truck behavior at those locations.
  - Analyze sensor data to identify key indicators of road condition using:
    - Suspension cylinder pressure
    - GPS
  - Visualize findings using geospatial technologies.
We used field observations to identify bad points in the road

**Process**

- Traveled to mines to take field observations
- Observed trucks hitting rough sections of road and logged data (see example)
- Used Garmin GPS to pinpoint location of observed road conditions

Example:

- **Big Hole**
  - Lat: 32.7933
  - Long: -108.0835
  - Time: 12:54
  - Truck: 713
Road Quality – Sensor Observations

Trucks and Sensors → Feed → GPS and Sensor Data

Analyze Road Conditions
GIS Methodology and Automation

Haul Truck Suspension Analytics

- Python Script
  - ODBC Connection
  - Hive Table
    - Data/Records
      - Exists
        - Yes
        - No
          - Web Application (Data as per previous last update)
  - File Geodatabase
  - SDE
    - Updates Daily Table
    - Appends History Table (Time Series)
  - Web Application
- Haul truck routes with Road Observations Heat Map™

**Key**
- Field Observation
- ‘Good’ Strut Pressure
- ‘Bad’ Strut Pressure
Road Quality Deployment Across Portfolio
Road Quality Summary

- Objective
  - Used sensor and GPS data to measure road quality and identify adverse road conditions

- Operationalize
  - Using ArcGIS platform, create road quality heat-map
  - Create daily refresh of report

- Opportunities
  - Engage site operations to integrate into processes
  - Capture opportunity – differences in speed between when segment is ‘good’ vs ‘bad’
  - Build geospatial visualization that prioritizes bad segments based on impact-to-efficiency
  - Create road health scorecard
Road Quality & GIS Wrap Up

- Thank You
- Questions and comments most welcome...