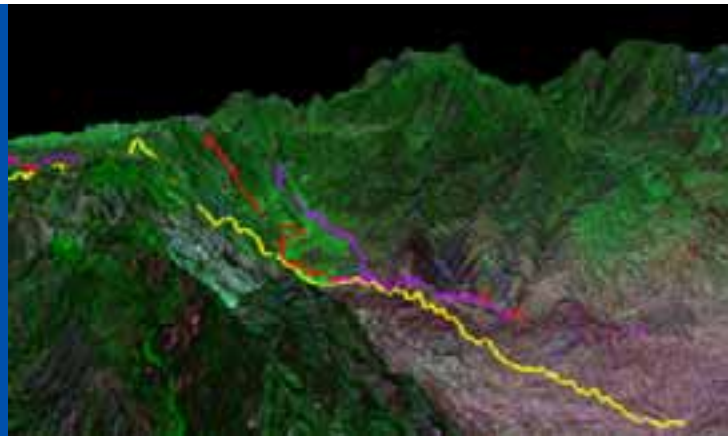
Geographical Information Systems Pipeline Route Optimization (GISPRO)

A qualitative approach to pipeline scoping



Geoff Price

Chevron Pipe Line Company
Houston, TX

July 14, 2010

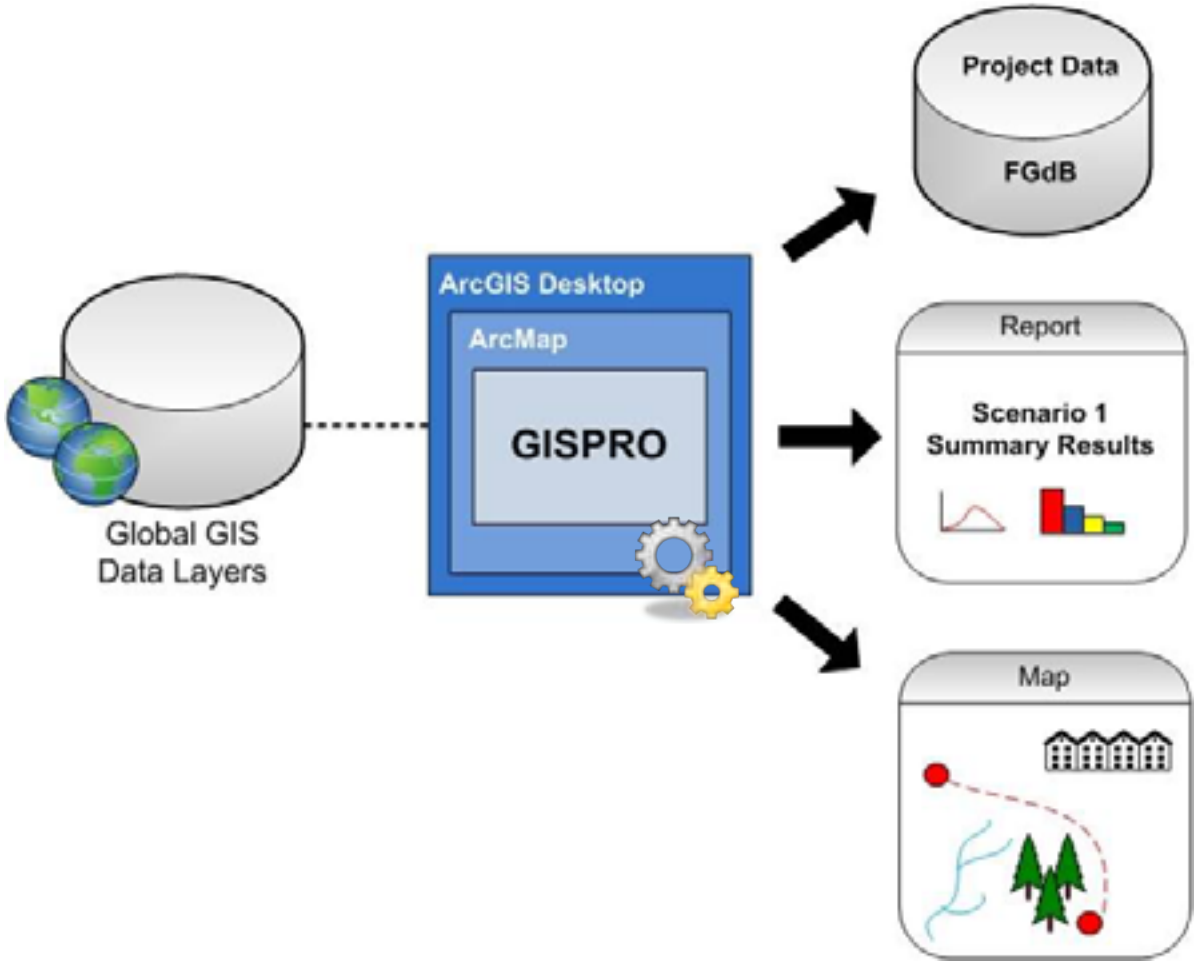
Overview

- What is GISPRO?
- Business Case Overview
- Raster Basics
- Pipeline Routing Business Rules
- Least-Cost Path
- Analyzing Results
- Case Study
- Q&A

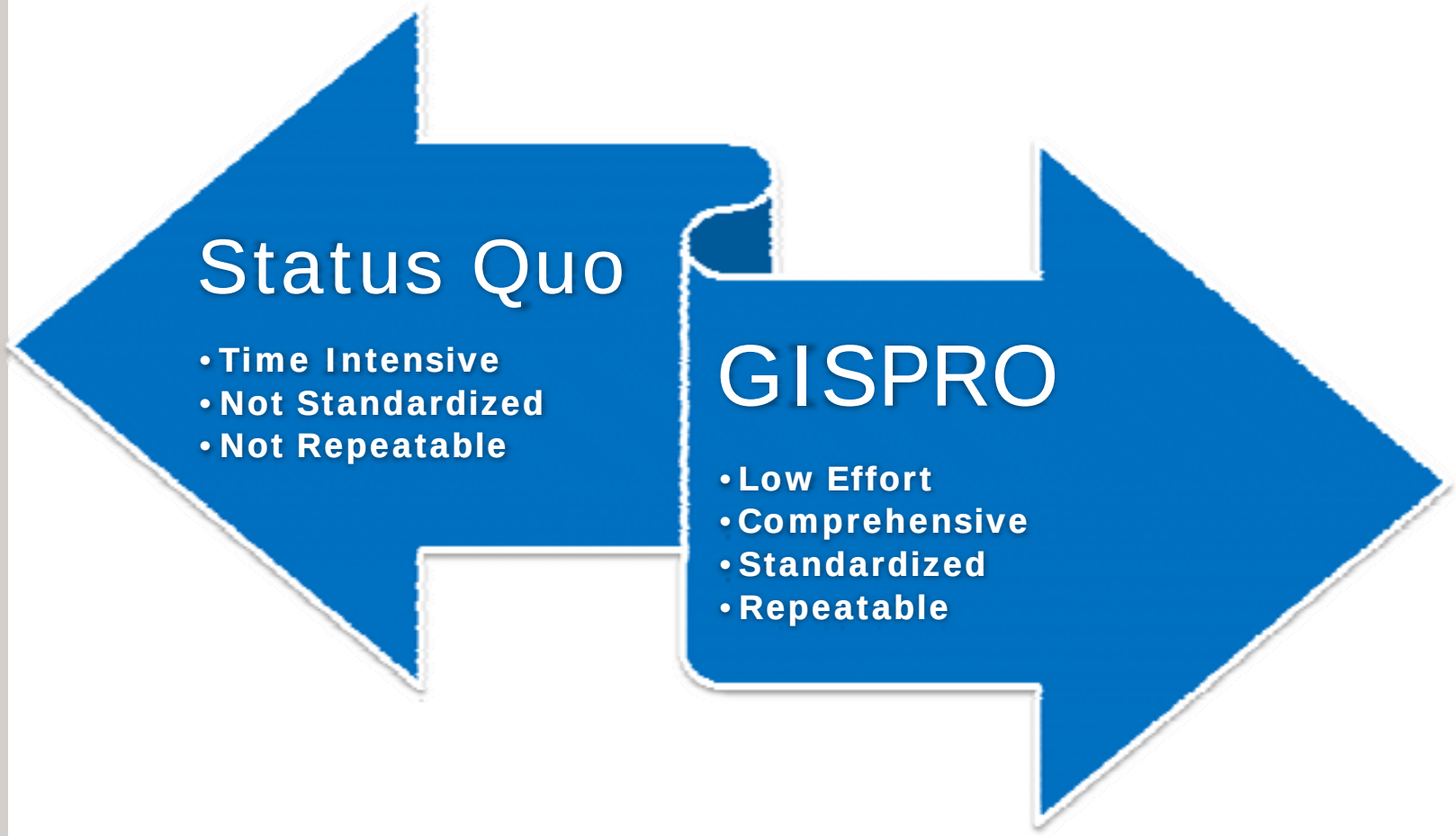
GISRPO…

*… is a qualitative tool that enables **early phase** cost estimates for pipeline opportunities up to **6x faster** than traditional methods and **identifies optimal routing**.*

GISPRO Architecture

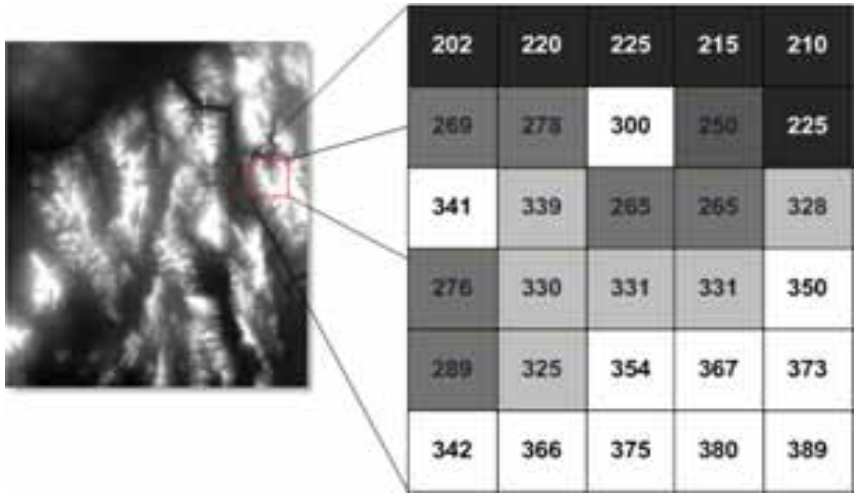


Business Case



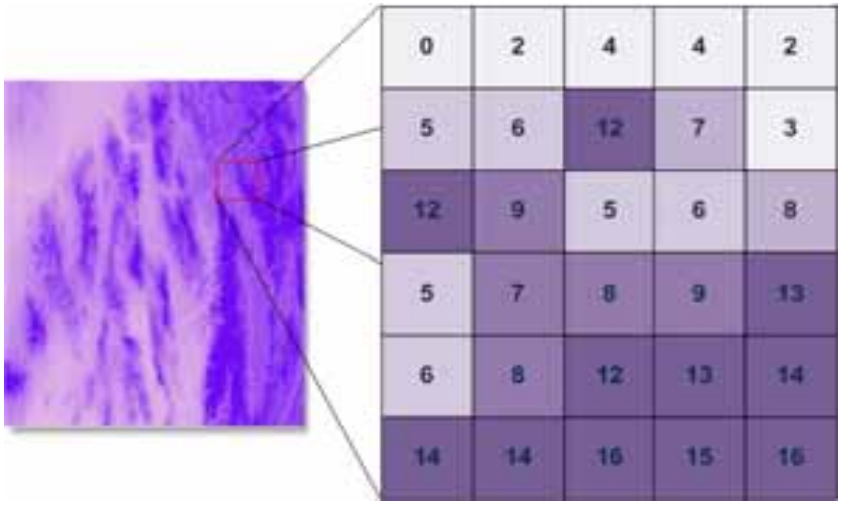
Raster Basics

Digital Elevation Model (DEM)



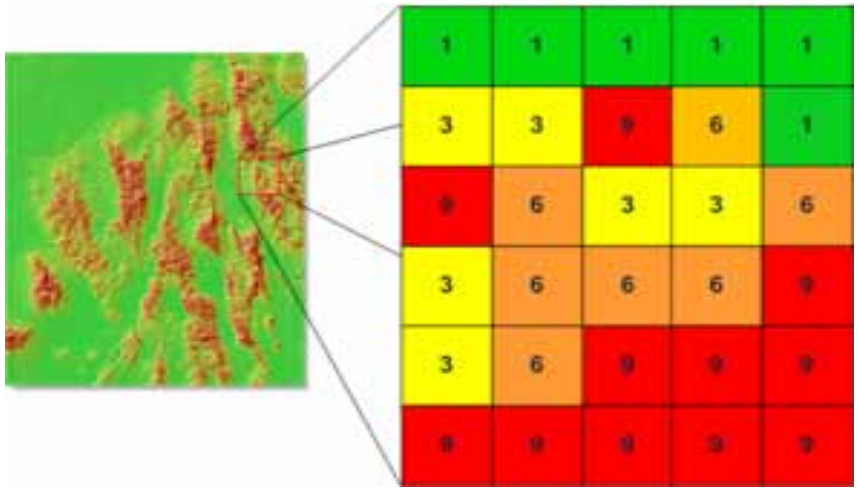
Raster Basics

Derived Surface
(% Slope)



Raster Basics

Reclassify
"Discrete Cost Surface"



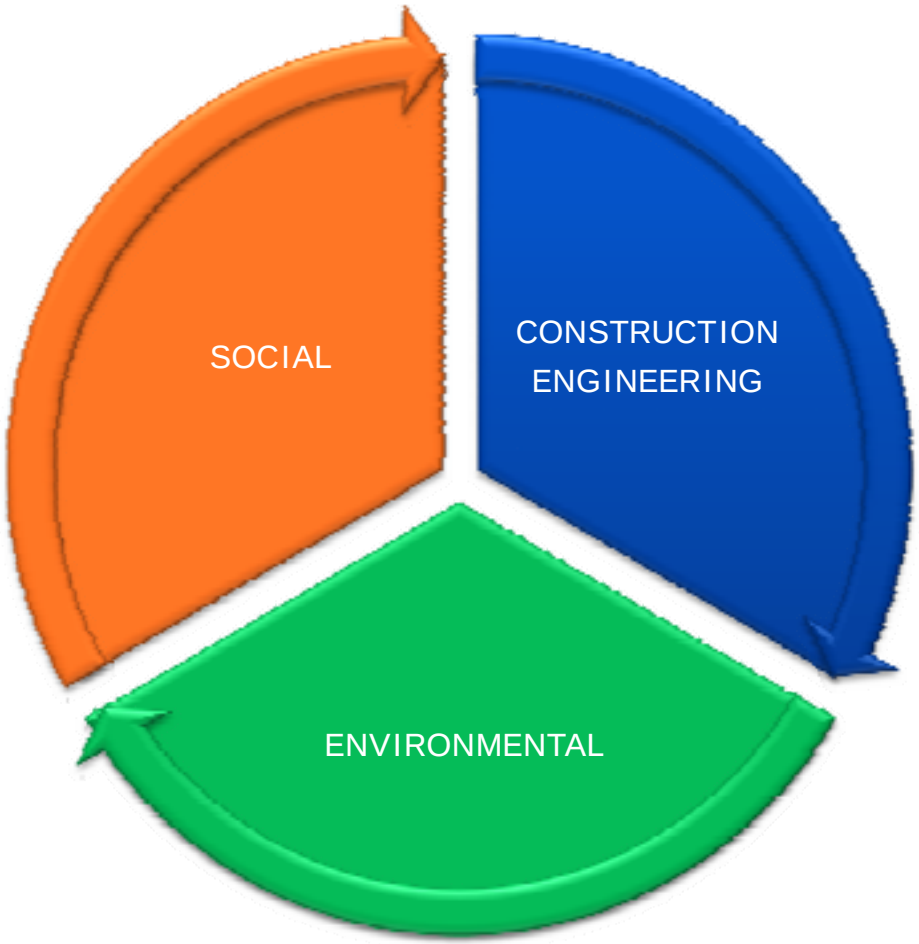
"Good"

1

9

"Bad"

Establishing Business Rules



Establishing Business Rules

Avoid Steep Slopes

How steep is "steep"?

Minimize Crossings

Crossing Distance?

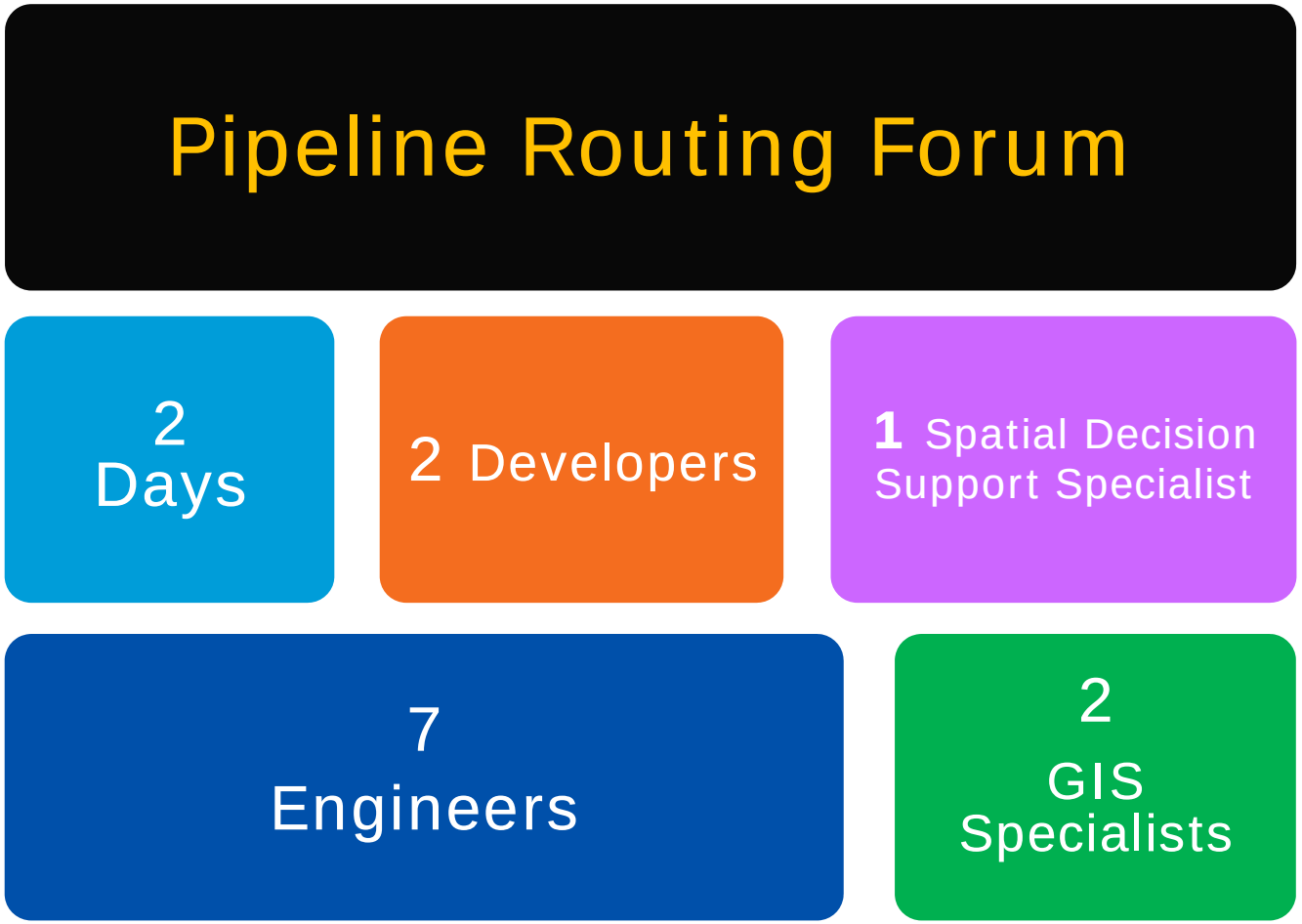
Avoid Sensitive Areas

Avoid or Minimize?

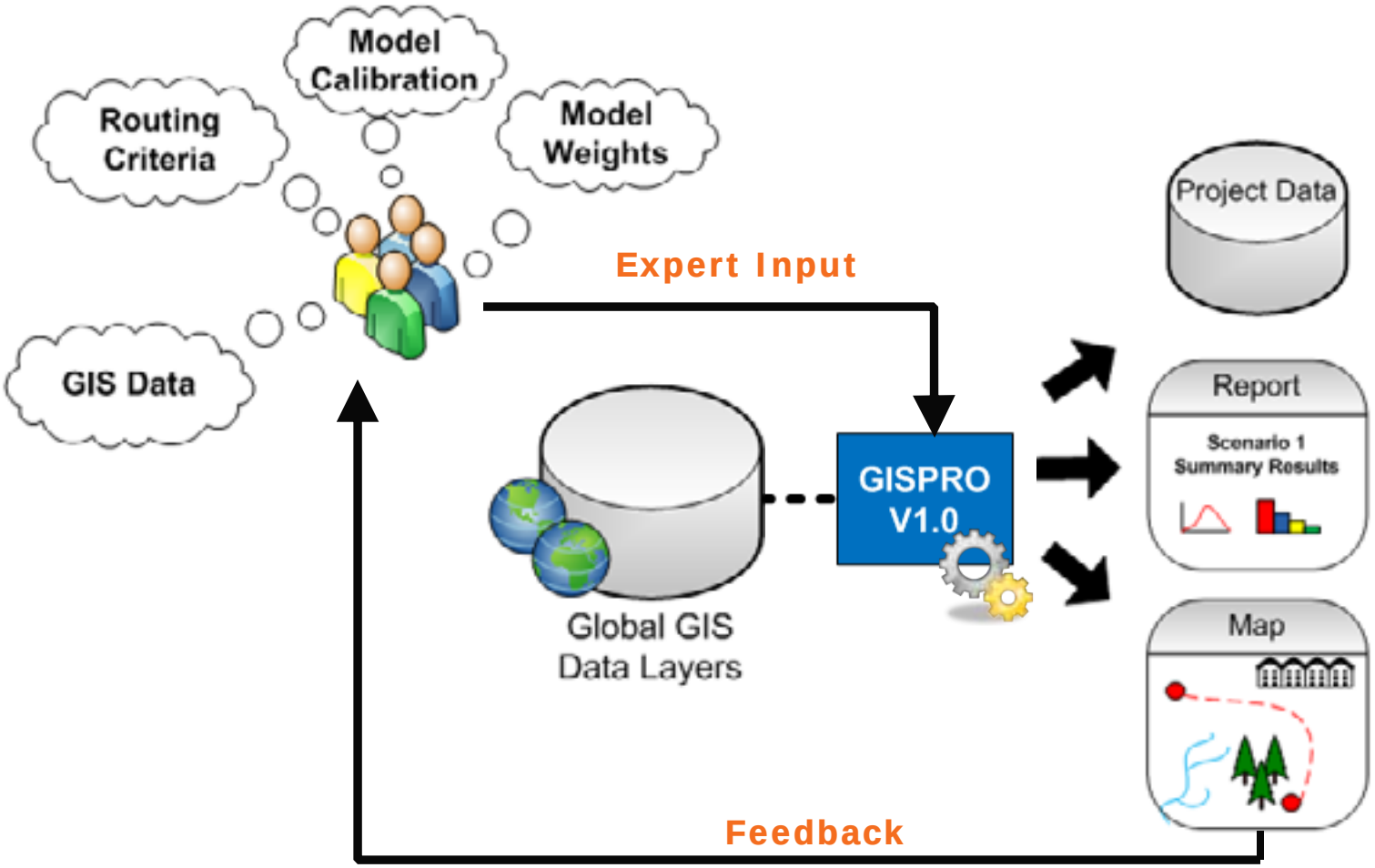
Maximize Existing Infrastructure

What Type?

Establishing Business Rules



GISPRO Architecture (revised)

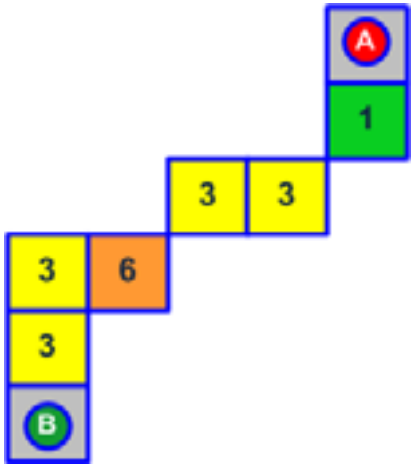


Least-Cost Path

Discrete Cost Surface

% Slope

Least-Cost Path



"Scenario 1"

Least-Cost Path

Discrete Cost Surface 1

% Slope

+

Discrete Cost Surface 2

Earthquake Zone

=

Total Accumulative Cost

Least-Cost Path

Total Accumulative Cost

2	2	2	2	A
4	12	10	15	10
10	15	12	12	15
4	15	15	15	10
4	15	18	10	10
B	10	18	10	10

Least-Cost Path

“Scenario 2”

Least-Cost Path

% Slope

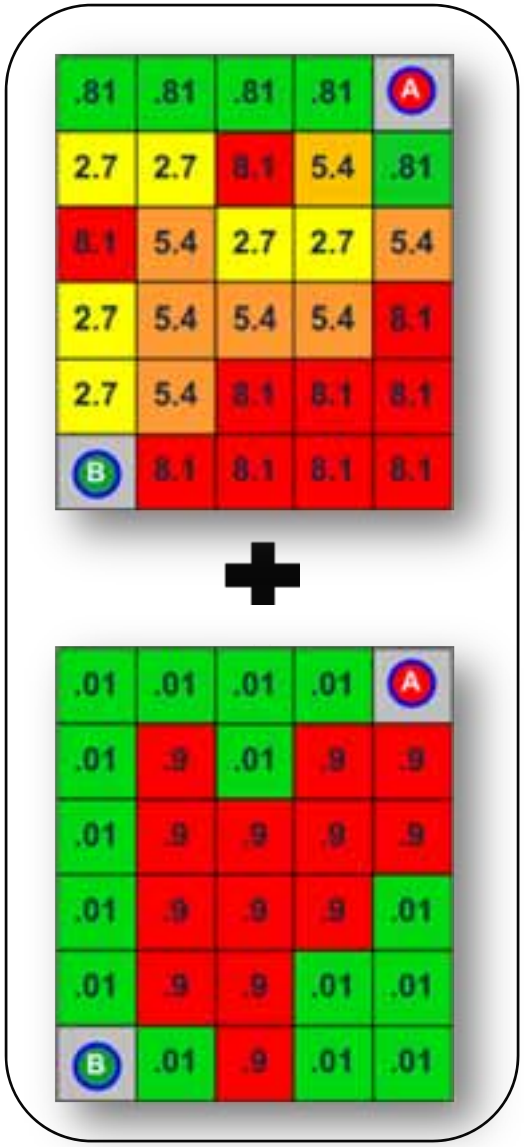
× .90 =

Earthquake Zone

× .10 =

Weights of Influence

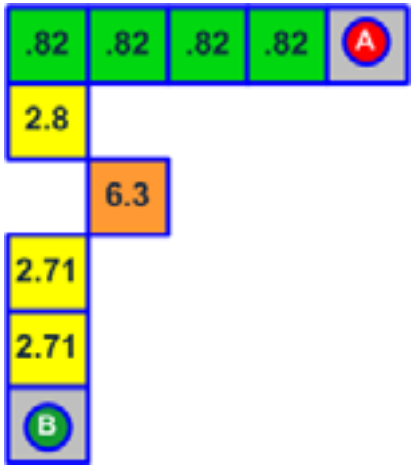
Weighted Cost Surface



Least-Cost Path

Total Accumulative Cost Surface

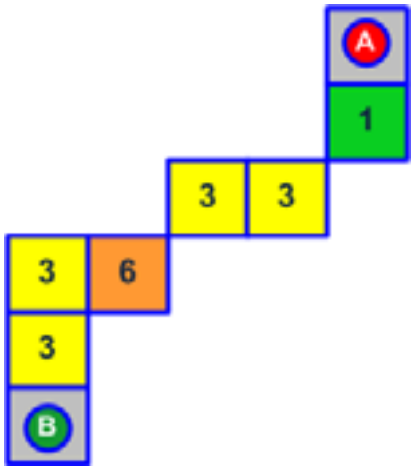
Least-Cost Path



"Scenario 3"

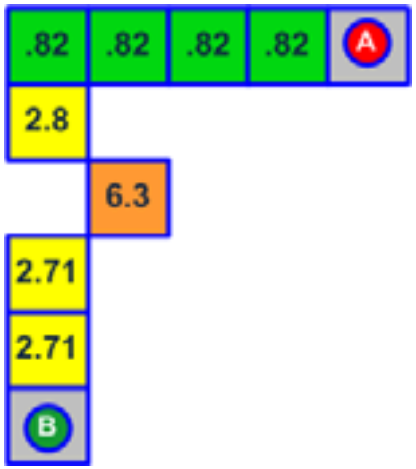
Least-Cost Path

Scenario 1



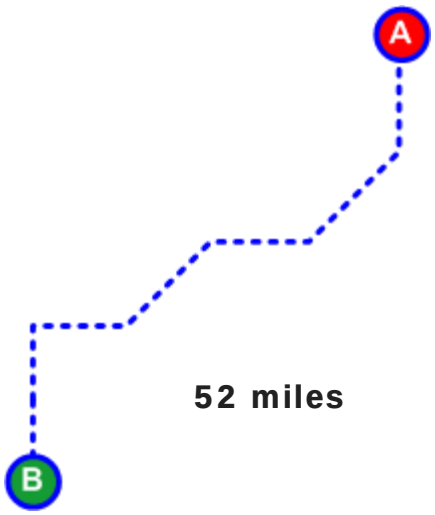
Scenario 2

Scenario 3



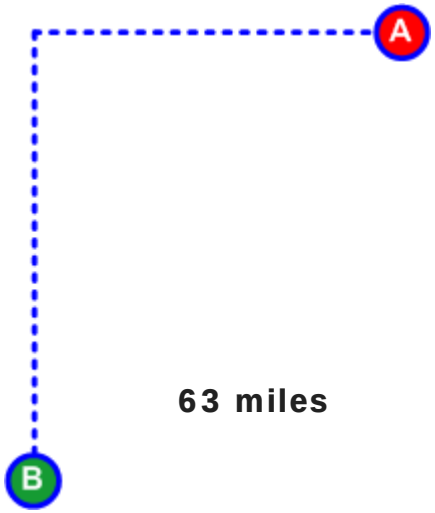
Analyzing Results

Scenario 1



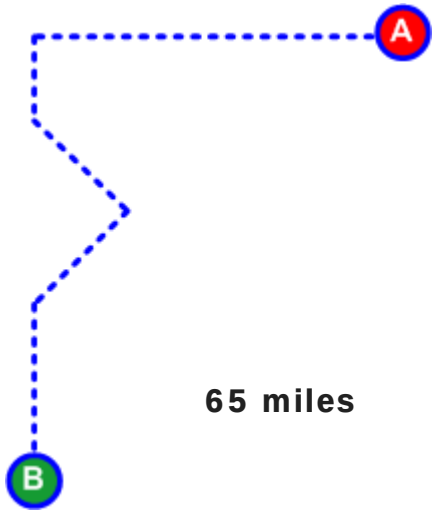
52 miles

Scenario 2



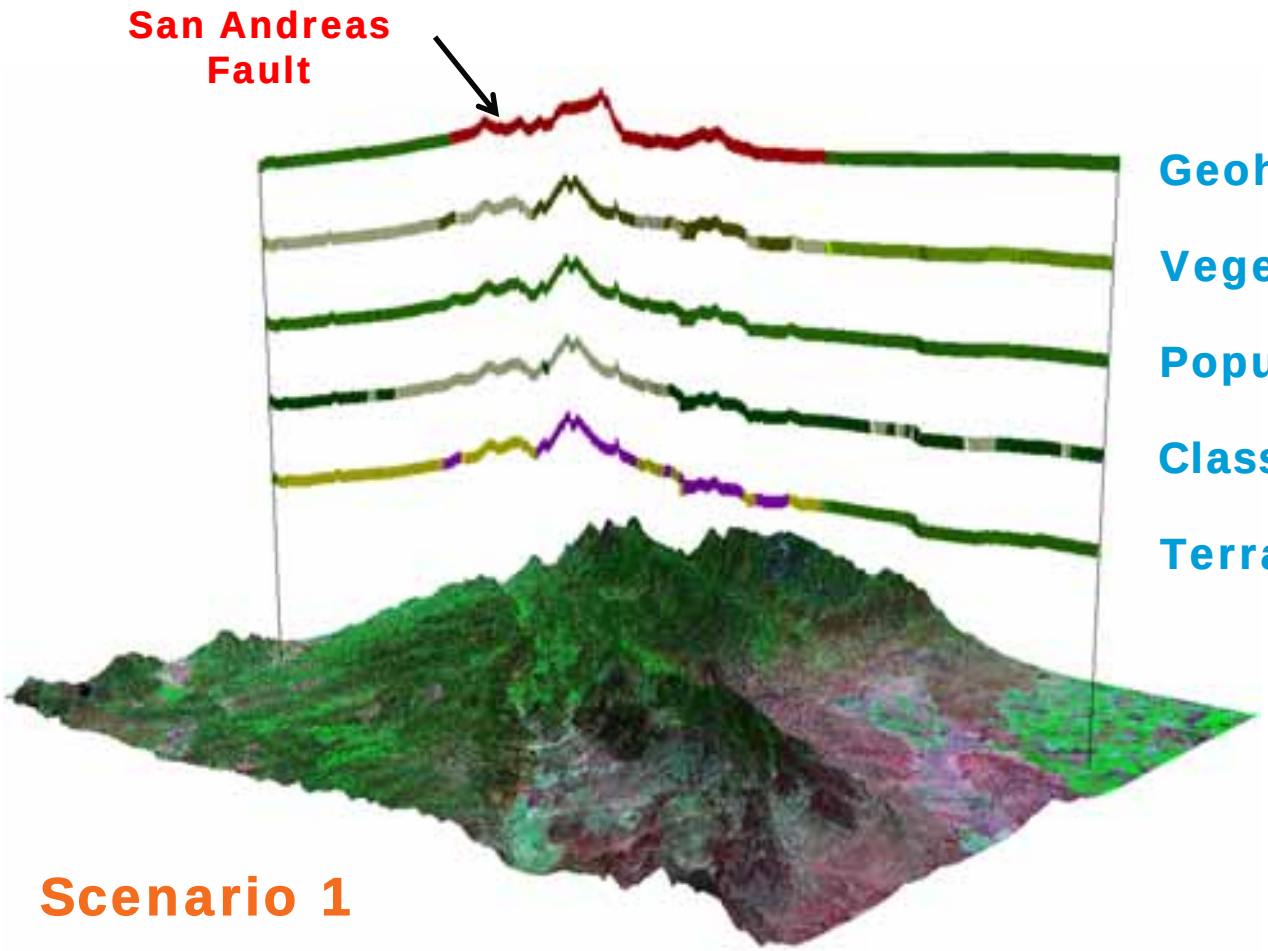
63 miles

Scenario 3



65 miles

Analyzing Results



Geohazards

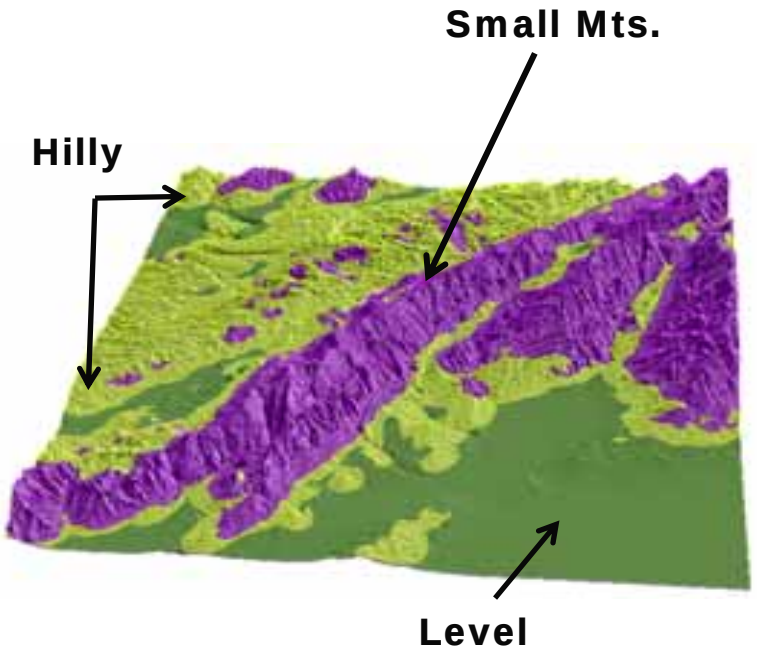
Vegetation Density

Population Density

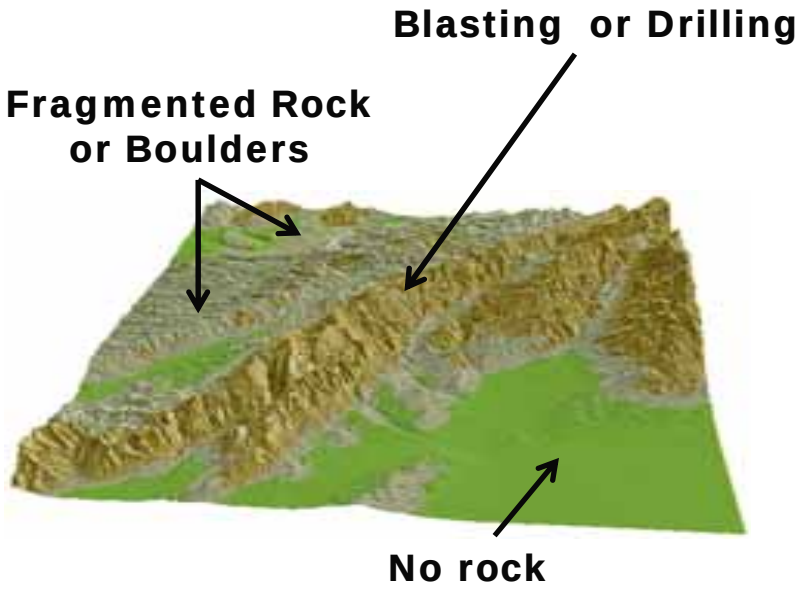
Class Location

Terrain Conditions

Analyzing Results



Productivity



Constructability

A Case Study – Idaho Reroute

The Business Rules

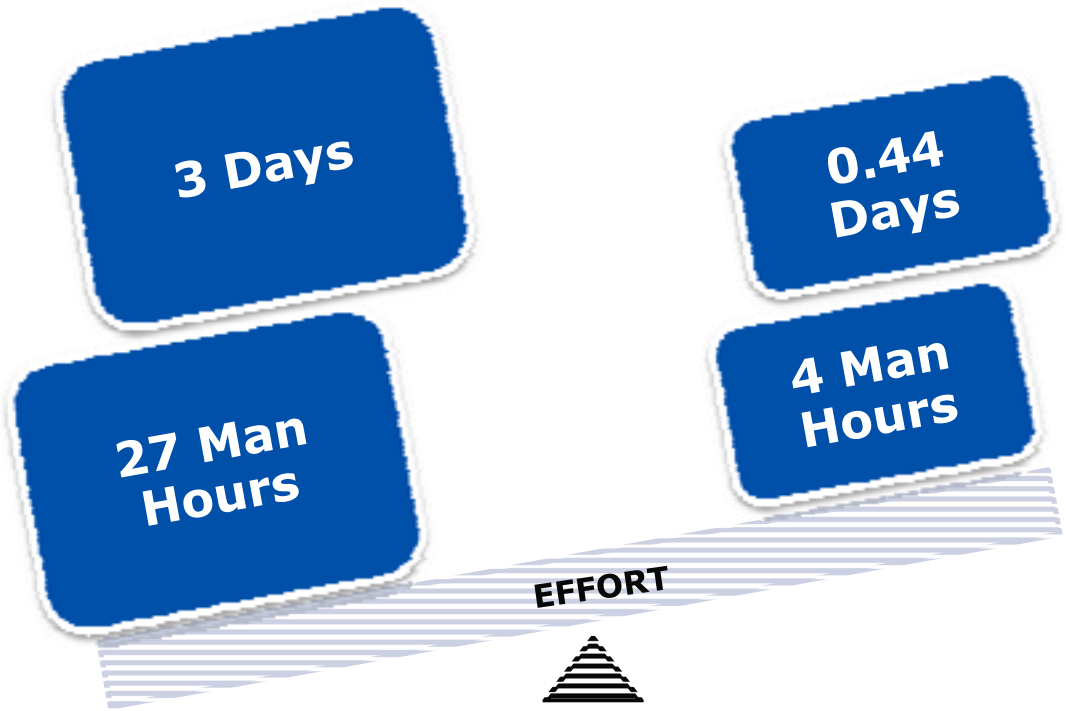
- Avoid
  - Tribal lands
  - National Forests
  - National grass lands
- Minimize
  - River Crossings
  - Road Crossings
  - Urban Areas

A Case Study – Pocatello Reroute

Manual Method

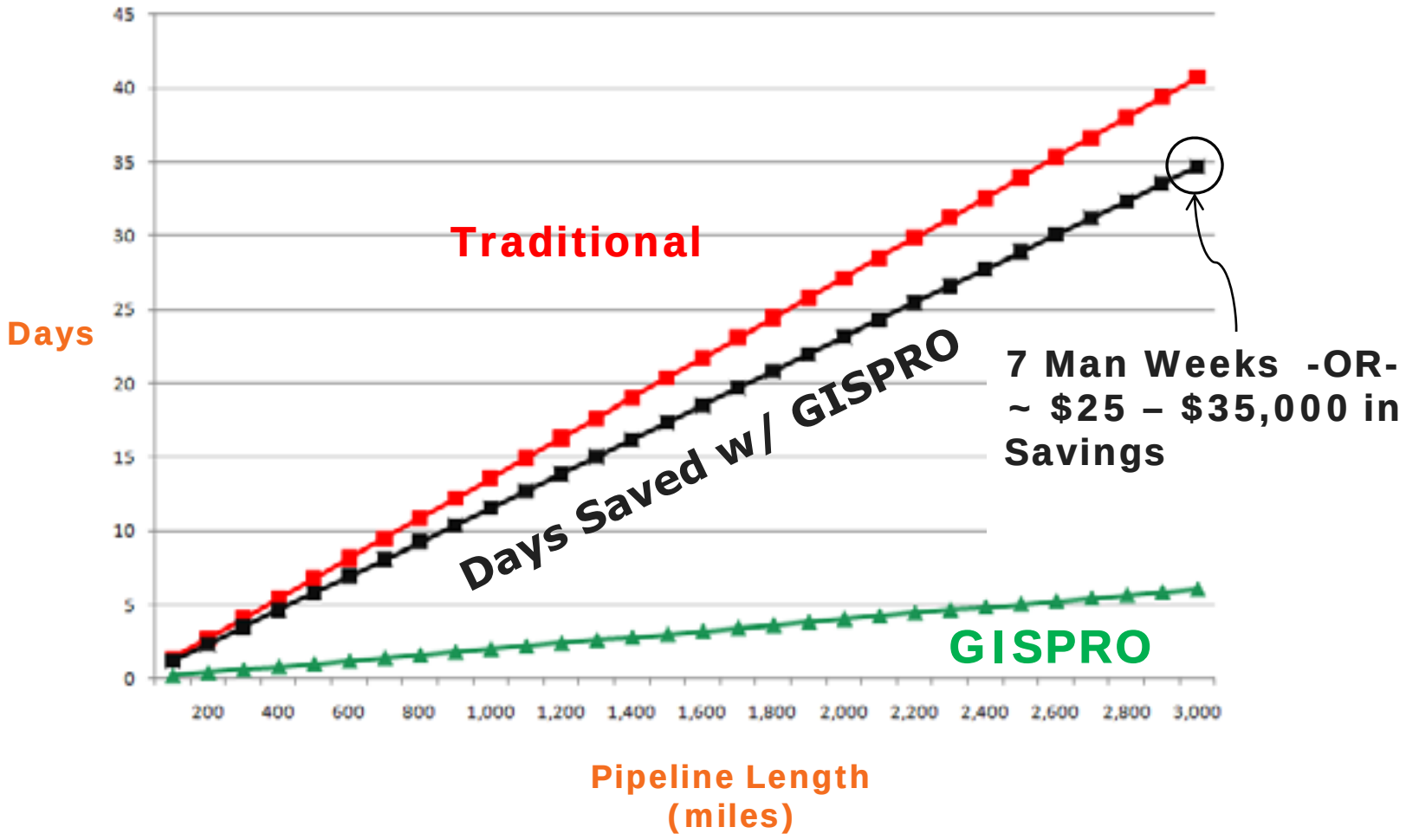
GISPRO

6.75x Faster



2.5 Days Saved

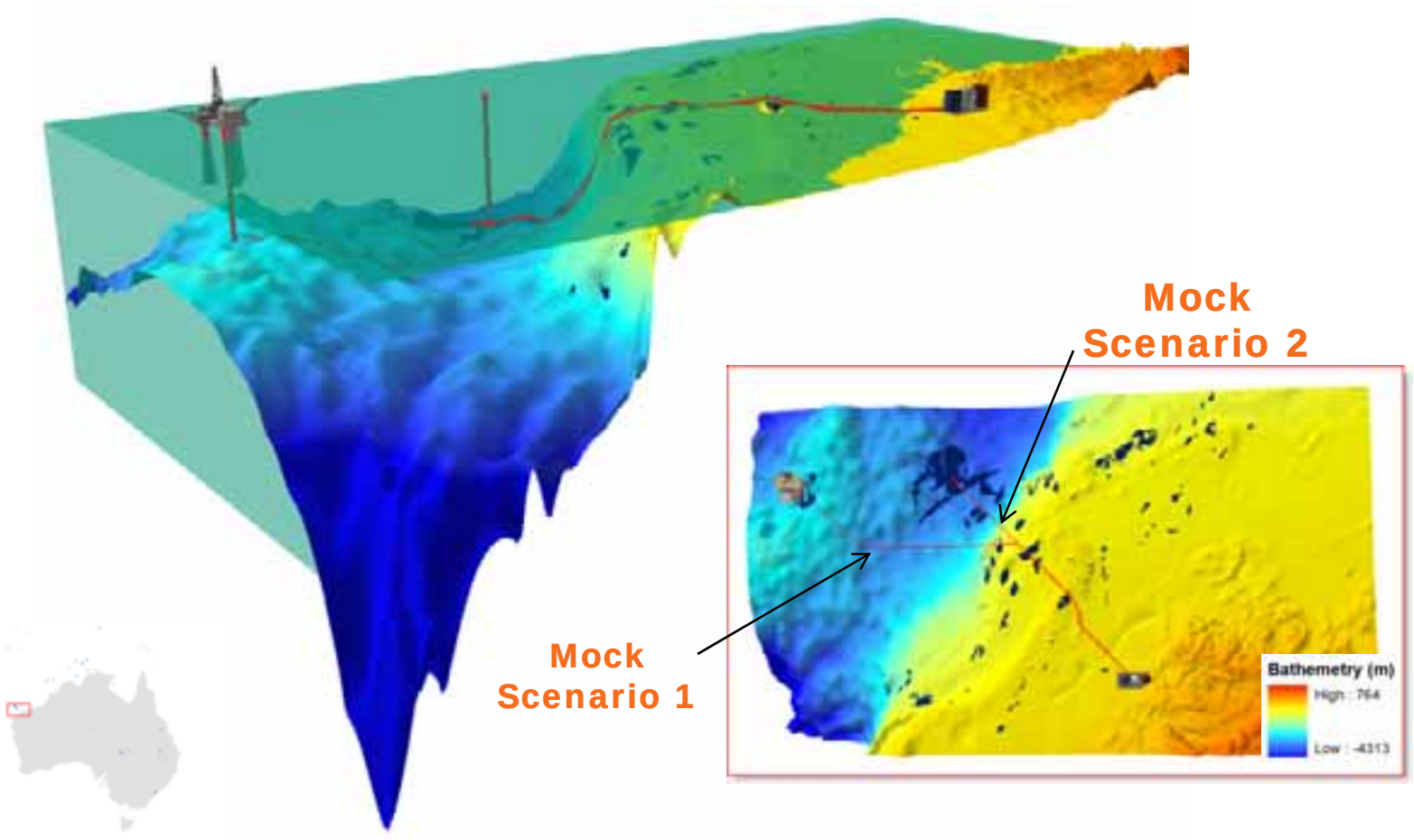
Potential Savings



Future Enhancements

- ArcGIS Server Integration
- Process Integration
- Cost Model Integration
- Offshore Model

Offshore Analysis



Questions?