

# BOARDWALK



## PIPELINE PARTNERS

# Pipeline Risk Analysis

PHMSA Pipeline Risk Modeling Methodologies

Public Workshop

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# BOARDWALK PIPELINE PARTNERS, LP

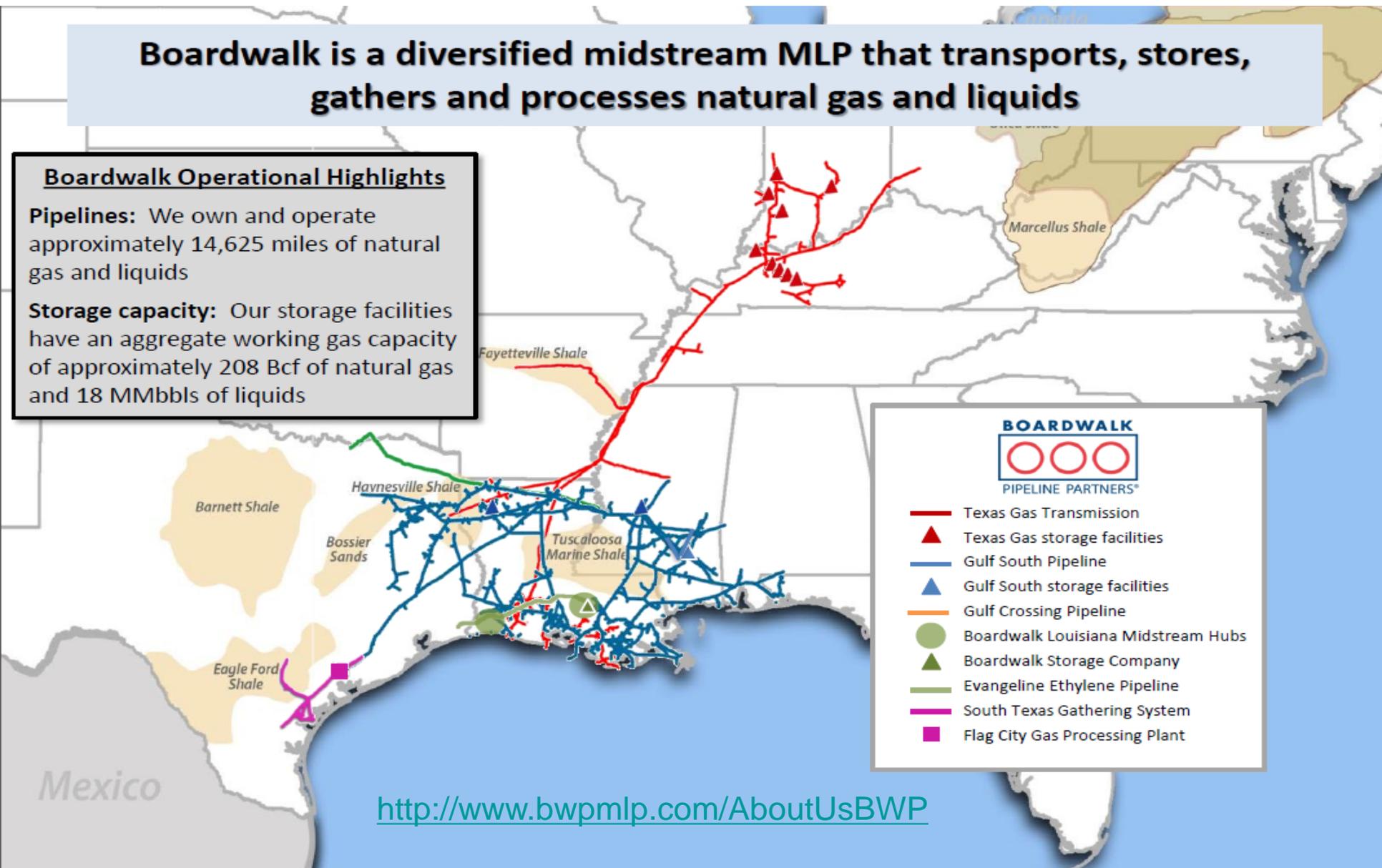


**Boardwalk is a diversified midstream MLP that transports, stores, gathers and processes natural gas and liquids**

## Boardwalk Operational Highlights

**Pipelines:** We own and operate approximately 14,625 miles of natural gas and liquids

**Storage capacity:** Our storage facilities have an aggregate working gas capacity of approximately 208 Bcf of natural gas and 18 MMbbls of liquids



- Texas Gas Transmission
- ▲ Texas Gas storage facilities
- Gulf South Pipeline
- ▲ Gulf South storage facilities
- Gulf Crossing Pipeline
- Boardwalk Louisiana Midstream Hubs
- ▲ Boardwalk Storage Company
- Evangeline Ethylene Pipeline
- South Texas Gathering System
- Flag City Gas Processing Plant

<http://www.bwplp.com/AboutUsBWP>

# Goals for Risk Management

## Broad deployment *anytime, anywhere, real time*

- Access to maps, data, and risk tools

## Functional *see it, own it, solve it, do it*

- Engage operations management and field employees
- Improve data collection and management

## Common understanding of risk *simplified to core elements*

- Data, integration, and threat identification and interaction

## Leverage Technology *real world application*

- Commercially available
- Adapt work processes



# Risk Management Tools

## GIS database

- ESRI Spatial data model common to all Boardwalk companies.

## ESRI GIS software applications for all geospatial activities

- HCA, Class, MAOP, and Risk Evaluations
- Alignment of pipeline attributes such ILI anomalies and CIS evaluations

## Cloud infrastructure for entire system

- Amazon and Google Cloud environments

## Damage Prevention

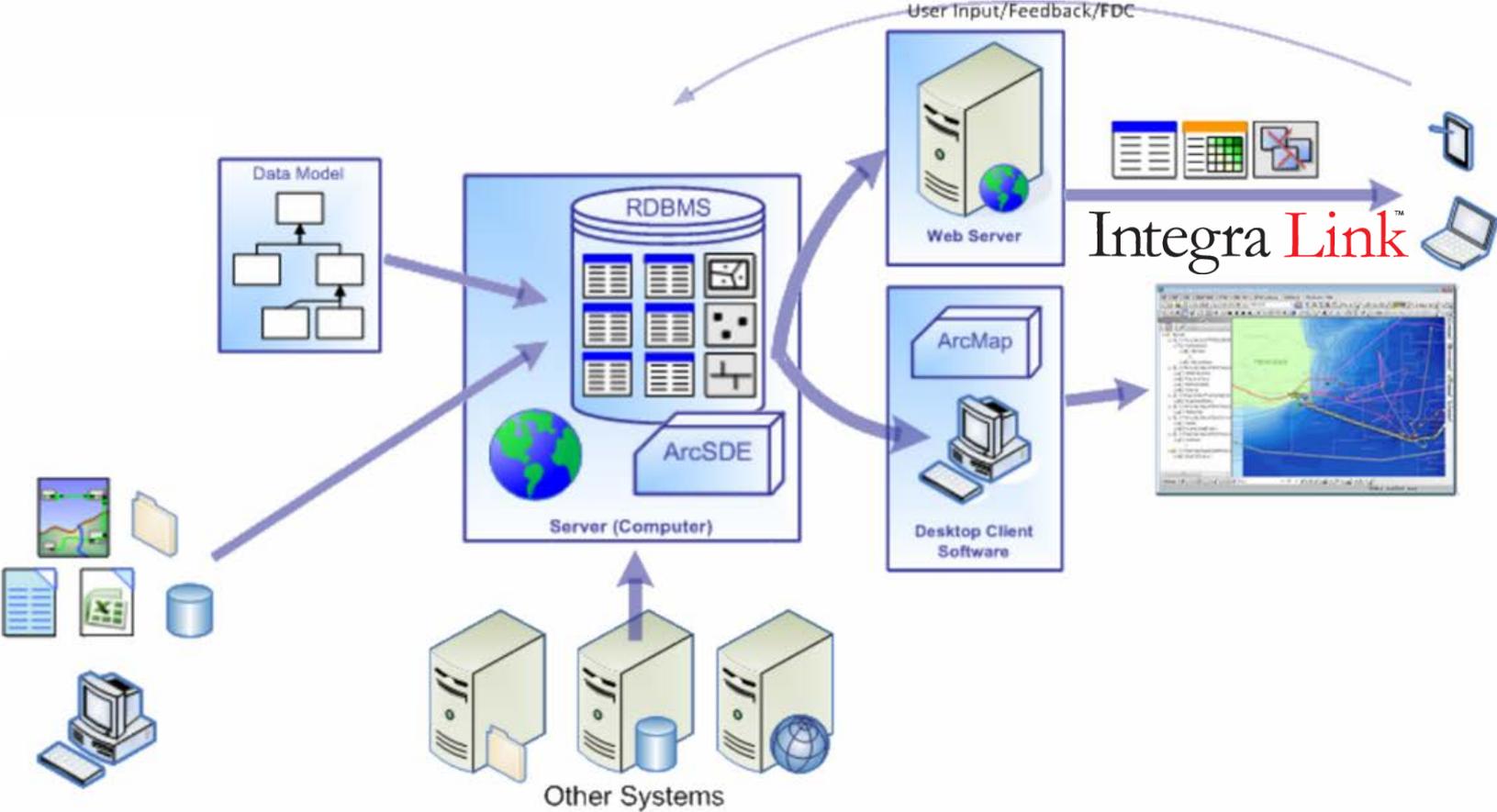
- Irthnet software and one call records

## Risk Model

- Based on Drivers, Resistors, Indicators, Preventers (**DRIP Model**)



# Architecture & Integration

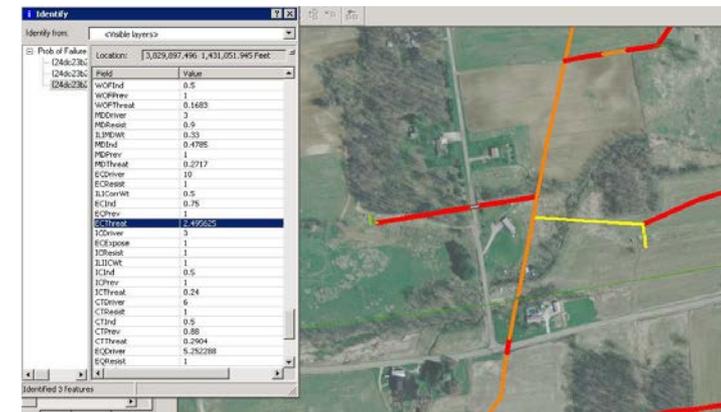
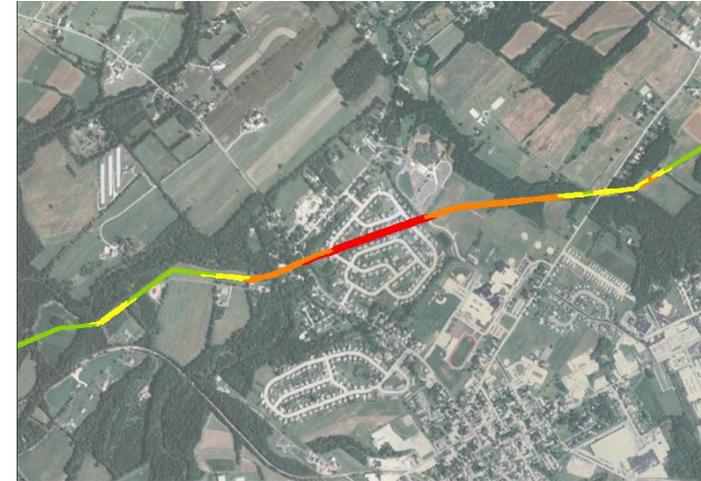


# Risk Management Tools

## GIS Risk Graphic Display

- GIS tools for data integration and spatial analysis
- Operates directly on the database and results stored in GIS
- Open solution allows access to other data sources:
  - Other company data sources – Maximo
  - Commercial data (RexTag, ESRI)
  - Public domain data sources (FEMA flood, National Highway Performance Monitoring System)

*“Open Environment and single data source”*



# Risk Management Tools

Relative risk is often used when the study involves comparing the likelihood, or chance of an event occurring between two (2) groups.

***Relative Risk is considered a descriptive statistic, not an inferential statistic; as it does not determine statistical significance.*** Relative

Risk utilizes the probability of an event occurring in one group compared to the probability of an event occurring in the other group.



# Risk Management DRIP Model

- **Drivers** – data that provide direct causal information on specific failure or consequence components.
- **Resistors** – data that indicate a potential resistance to a failure or consequence component.
- **Indicators** – data that provide an indication a particular failure or consequence component may or may not exist.
- **Preventers** – data that indicate actions taken to prevent the occurrence of a failure or consequence component.



# Risk Management DRIP Model

## Drivers and Indicator

- Data items are scored based on existence, type, or magnitude of the indication
- Data items are summed; higher scores increase threat/risk, lower scores decrease threat/risk
- **Driver example** – *Pipe Age*
- **Indicator example** – *Leak History*

## Resistors and Preventers

- Data items are scored based on existence, type, or magnitude of the indication
- Data items are multiplied to provide values for each failure/consequence component and act to reduce threat/risk
- **Resistor example** – *Pipe Coating Type*
- **Preventer example** – *Hydrotest*



# DRIP ALGORITHM

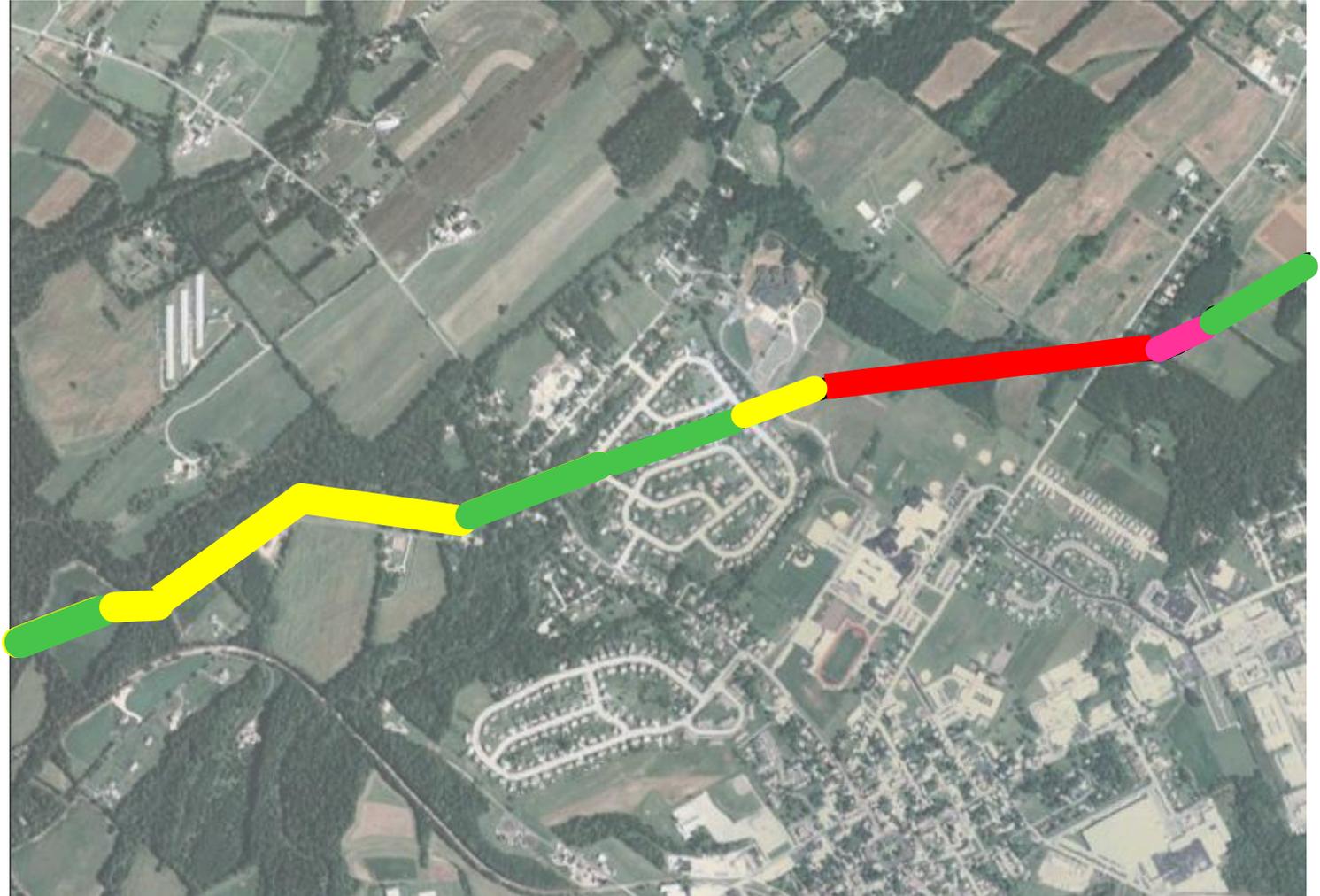
## External Corrosion

**D**rivers  
Pipe Age

**R**esistors  
Coating Type

**I**ndicators  
Leak History

**P**reventers  
HydroTest  
Year &  
Pressure



# Risk Management DRIP Model

- Interacting threats evaluated directly in the risk calculation process
- Analysis completed within the DRIP Model for threat interactions
  - External corrosion associated with LF-ERW welded pipe
  - External corrosion accelerated by 3<sup>rd</sup> party damage
  - Construction defects accelerated by Weather Related or Outside Force
- Risk score for a pipe section is adjusted, flagged for evaluation and potential change
  - Vintage pipe with acetylene welds – higher risk score vs new pipe
  - Area susceptible to weather related or outside forces – higher risk score

# Risk Management Analysis

Drilldown: Company->HCA->Segment

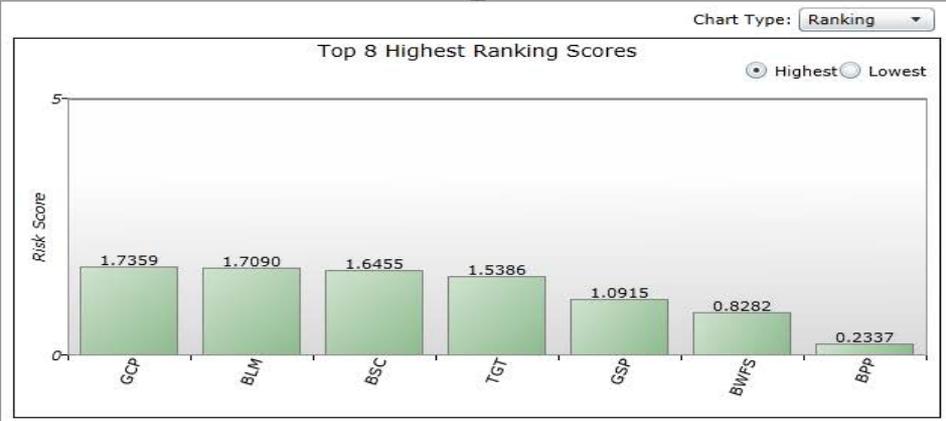
Company

Filter

Filter

Company	Avg Risk Score	High Risk Score	Low Risk Score	Avg Conseq of Failure
GCP	1.7359	3.3573	0.0529	
BLM	1.7090	3.4204	0.0634	
BSC	1.6455	3.0026	0.3427	
TGT	1.5386	3.0776	0.0322	
GSP	1.0915	2.4490	0.0319	
BWFS	0.8282	2.3496	0.0323	
BPP	0.2337	1.7830	0.0706	

Page 1 of 1 Total Records: 7



# Risk Management Analysis

Comparison of the effective impact for various risk mitigation scenarios and costs

Mitigation Manager - Windows Internet Explorer

http://mitigationmanager-qa/Mitig

Scenarios Available:

- 1 INCREASE DOC
- 1 INCREASED LINE MARKERS
- 1 INCREASED PATROLLING
- 1 INSTALL REMOTE CONTROL
- 1 PIPE REPLACEMENT
- 1 PIPELINE IDLING
- 1 PRESSURE TEST
- 1 REMOVE CASING
- 1 SLEEVE INSTALL

Scenarios Selected:

- 1 RECOAT

Scenario Detail/Override:

Selected Scenario: 1 RECOAT  
 Description: WILLBROS  
 Threat(s) Impacted:  
 Setup Cost: 10000 (Default Setup Cost: 1)  
 Unit Cost: 200000 (Default Unit Cost: 5280)  
 Unit Type: Mile

Variable | New Value

CoatingType | FBE

ECCOUNT | 0

Buttons:  Combine multiple scenarios, Calculate What If, Save Report, Submit Report, Export

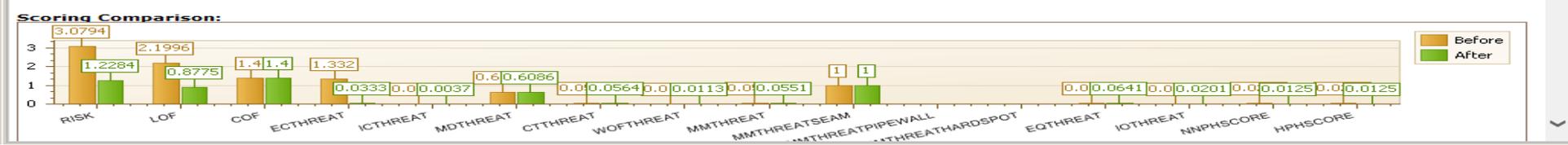
Report Name: Report Status: Unsubmitted Date last saved: 8/13/2015 12:20:29 PM

**Project Scoring Results:**

	Before	After	Change
Risk	3.0794	1.2284	↓ 60.1%
Consequence	1.4000	1.4000	-
Likelihood	2.1996	0.8775	↓ 60.0%
EThreat	1.3320	0.0333	↓ 97.5%
ICThreat	0.0037	0.0037	-
MDThreat	0.6086	0.6086	-
CTThreat	0.0564	0.0564	-
WOThreat	0.0113	0.0113	-
MMThreat	0.0551	0.0551	-
MMThreatSeam	1.0000	1.0000	-
MMThreatPipeWall	0.0000	0.0000	-
MMThreatHardSpot	0.0000	0.0000	-
EQThreat	0.0641	0.0641	-
IOThreat	0.0201	0.0201	-
NNPHScore	0.0242	0.0125	↓ 48.3%
HPHScore	0.0242	0.0125	↓ 48.3%

**Project Benefit Calculations:**

Risk Reduction Metric (RRM): 1.2184  
 Description:  $RRM = (1 / ((Cost / Miles) / (-Risk Change))) * 1000000$   
 Miles: 0.00758  
 Cost: \$ 11516



# DRIP Model





# QUESTIONS?