Utilizing GIS to Effectively Manage Pipeline Regulatory Requirements

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Points of Discussion

- Common hurdles of regulatory requirements
- Advantages of Utilizing GIS to manage pipeline integrity and emergency response
- Case Studies Examples

Regulatory Requirements

Regulatory Requirements

- The office of Pipeline Safety ensures safety in the design, construction, operation, maintenance, and *spill response planning* of America's 2.6 million miles of natural gas and hazardous liquid transportation pipelines.
- The Environmental Protection Agency (EPA) has primary responsibility for enforcing many of the *environmental* statutes and regulations of the United States.

Regulatory Requirements

- In recent years, provisions have been added for new leak detection methods.
- The standards have also been amended to include processes for managing safety, such as the use of integrity management programs.
- Regulators ensure companies are complying with requirements through measures such as inspections, audits, and investigations.

Regulatory Hurdles

Pipeline companies are responsible for:

- Following strict rules detailing how pipelines are built, operated, and even retired
- Due diligence for pipeline integrity management
- Timely reporting

Regulatory Hurdles

Consequences for not complying with regulatory requirements:

- Drop in pipeline pressure rates, reducing capacity
- Monetary fines
- Pipeline shut down order

Common hurdles associated with pipeline regulations:

- Takes a significant amount of time to manually gather info
- Resources required to analyze and report findings

Advantages of GIS and Case Studies

Advantages of GIS for…

Administration of Integrity Management Programs

- Preparing the integrity dig program
- Knowing the exact location of the anomaly
- Determining land ownership details
  - *Who owns the land where the dig is required?*
- Reduce environmental impacts to the land
- Overlay previous integrity data to understand the progression of anomaly

Case Study Example: Integrity Management Program

Utilize ArcGIS to create a dig program

- Provide a list of all landowners that need to be contacted
- Provide the coordinates of the dig site within <1 meter of the anomaly
- Analyze the rate of progression of anomalies on the pipeline over multiple ILI runs

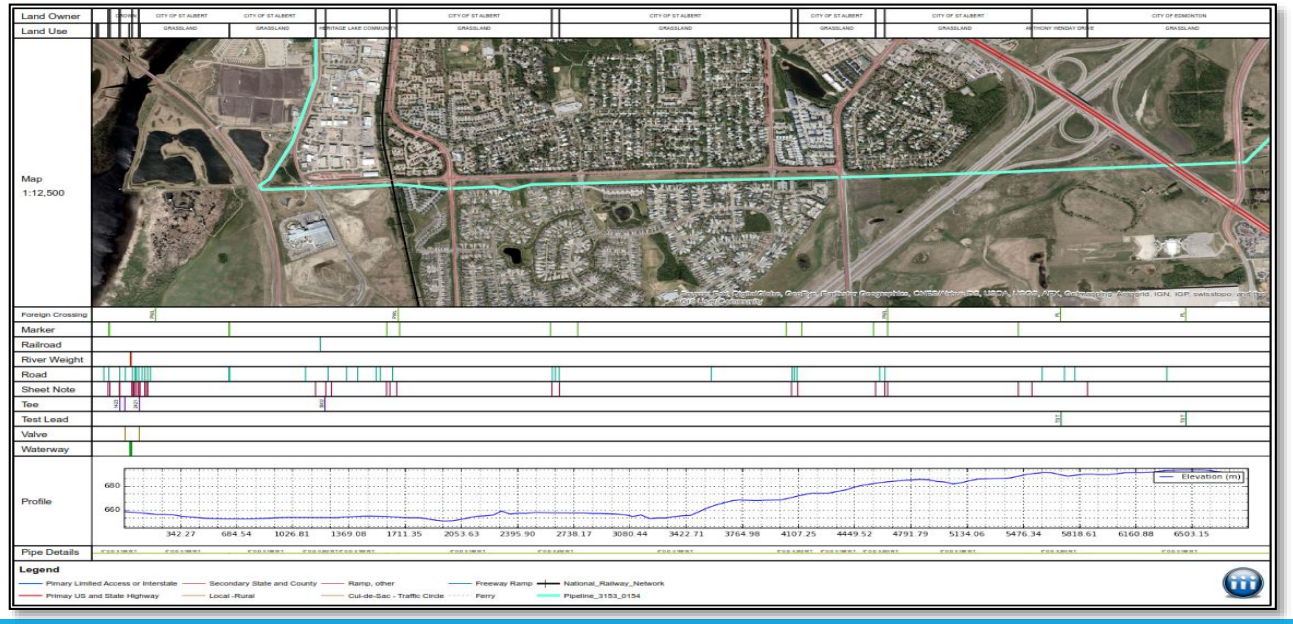
Benefits

- Reduced costs
- Lower lease access payments, dig costs reduced, reduced dig crew costs
- Less environmental impact to land

Case Study Example: Integrity Management Program

Utilize ArcGIS to create an alignment sheet

- Show landowner details in and around the area of the proposed dig site
- Easily see the pipeline attribute data in the proposed dig site
- Better understand the elevation and ground cover of the area



Advantages of GIS for:

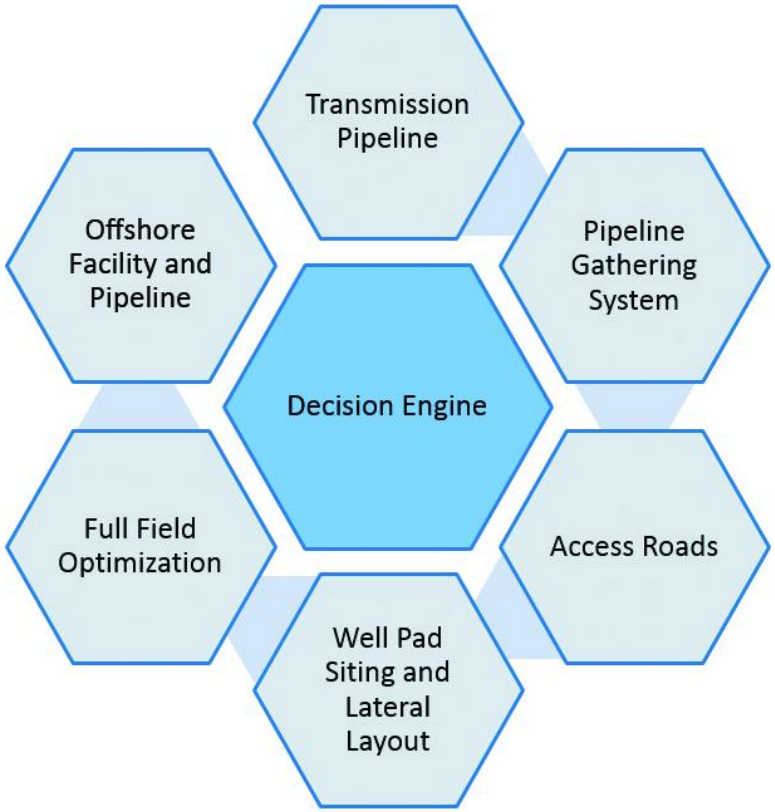
Field Development Planning

- Where are the environmentally sensitive areas?
- Is there existing infrastructure?
- What preventative measures can be taken to reduce environmental impact?
- Utilizing GIS for field development planning will give you results within days or hours after implementation!
- Variability on project and scenario definitions
- Data management, analysis tools, reporting and visualization tools necessary for managing repeatable settings and outputs

Case Study Example: Field Development Planning

Design your Workflow

- Field Development planning needs to be designed around a core suite of capabilities
- Configurable based on modeling requirements
- Flexibility for specific settings
- Ability to be embedded in your proprietary processes or products



Case Study Example:
Field Development Planning

Producing your results…

- Optimal locations of assets and facilities
- Locations may be sited based on standard optimization or temporal analysis
- Placement based on a backcast or forecast approach
- Planning process provides results that maximize the power produced while reducing environmental and visual impact, construction costs, and time

Case Study Example: Field Development Planning

Placement of assets may vary based on the approach…

FORECAST

- Generally based on close range outlooks on production to plan pipeline network
- Pipeline network designed and installed for first few wells
- More wells planned, more pipelines designed and installed
- Pipeline network utilizes the existing network where possible for tie-ins
- New wells sites are daisy-chained to existing sites and pipelines
- Each year's plan is optimized but not the overall pipeline network

BACKCAST

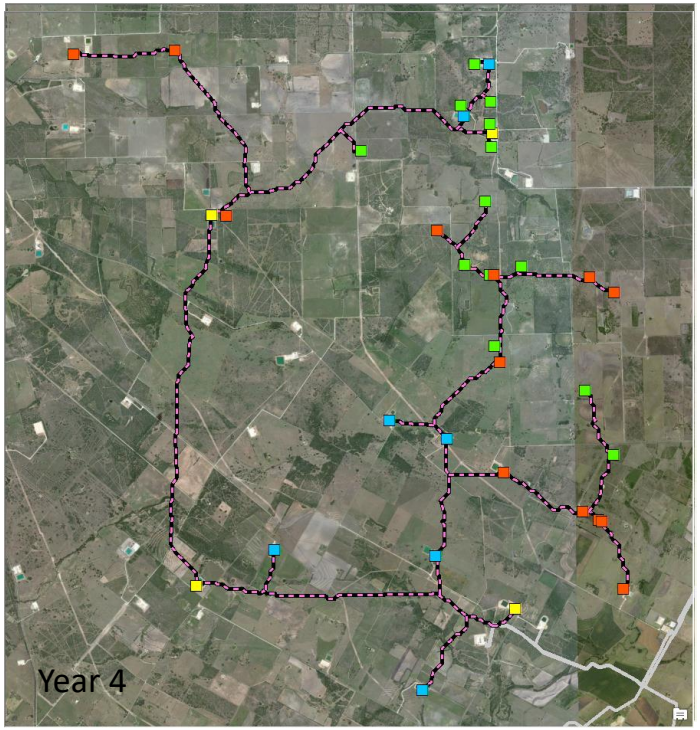
- Future desired state is envisioned and steps to attain defined from future to present
- Entirety of the pipeline network is planned based on a future state
- It is understood that a plan may need to change – this is a good use of contingency
- Prize is large for companies that can plan and execute

Case Study Example:
Field Development Planning

FORECAST

This example takes the following into account…

- Planned Well Pads Per Year
- Sited Pipelines Per Year

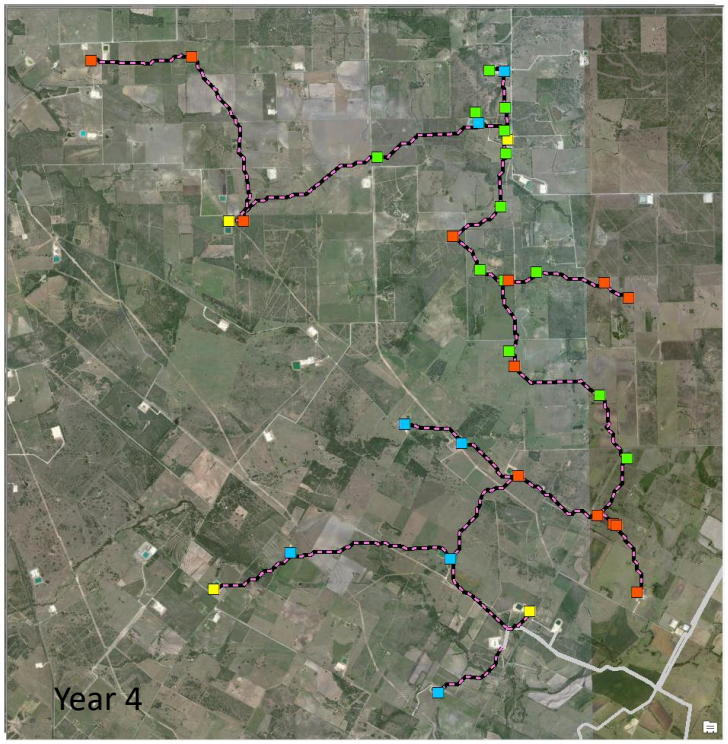


Case Study Example:
Field Development Planning

BACKCAST

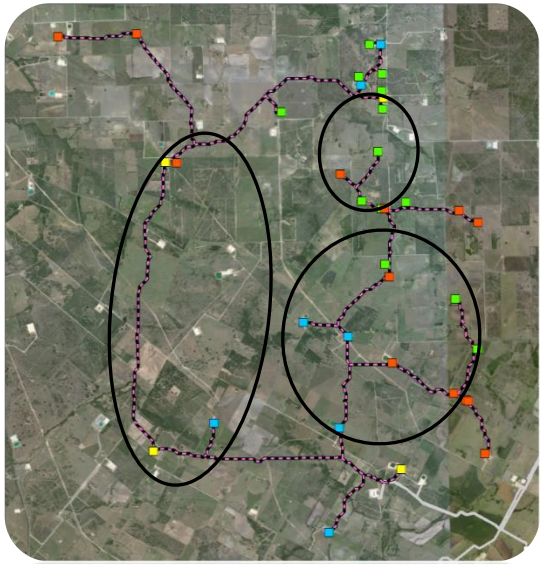
This example takes the following into account…

- Well Pads planned by Year 4 as well as the associated pipeline gathering system
- Plan the network with the overall network in mind



Case Study Example:
Field Development Planning

FORECAST



BACKCAST

Case Study Example: Field Development Planning

Comparison for Field Expansion

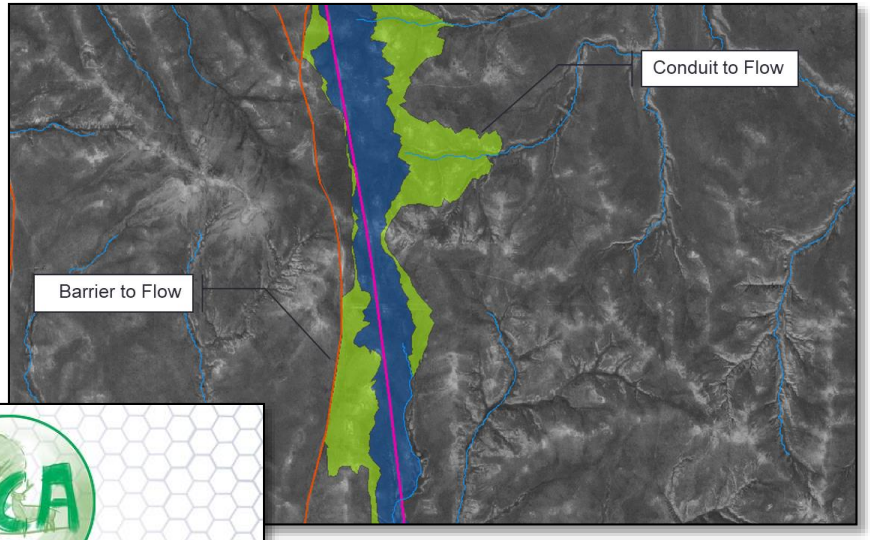
Year	Forecast (mi)	Backcast (mi)	Actual (mi)
1	11.6	14.6	13.9
2	4.8	3.4	3.2
3	10.0	5.5	8.0
4	2.3	0.5	4.8
Total	**28.7**	**24.0**	**29.9**

Approach	Difference to Actual (mi)	Percentage	Savings ($)*
Forecast	1.2	4%	$1.1MM
Backcast	5.9	20%	$5.3MM

Advantages of GIS for:

Fate and Transport Modeling

- What is the worst case scenario if a release were to happen?
- What are the High Consequence Area (HCA) impacts?
- What preventative measures can be taken to reduce impact?



Case Study Example: Fate and Transport Modeling

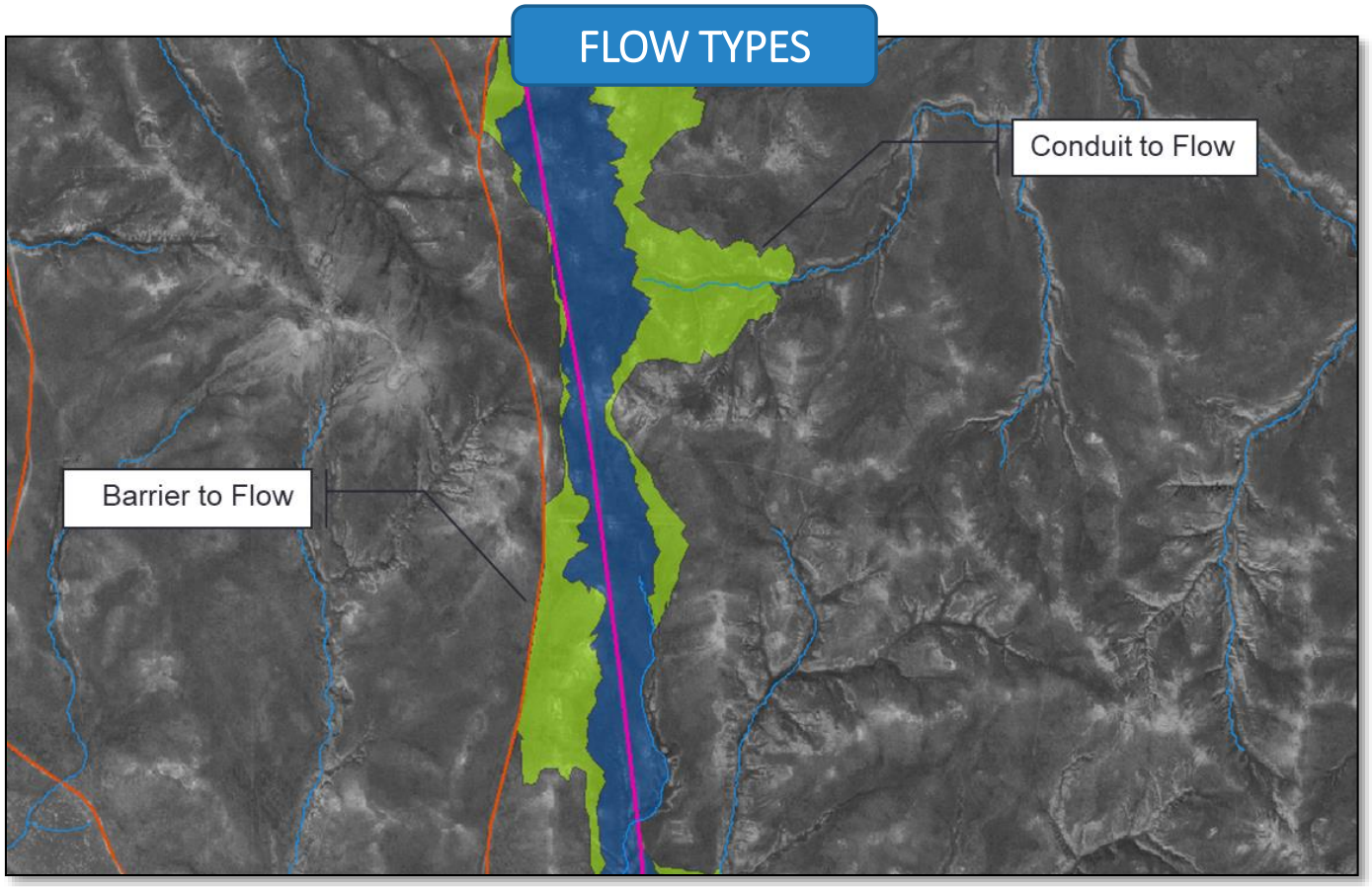
What is Overland Flow?

- Prediction of the movement, extent, and time taken for an uncontrolled release (from a pipeline) to travel over the ground surface, seep into the soil matrix, and reach conduits for transport.

Overland Flow Models can be used in support of:

- High Consequence Area (HCA) Analysis
- Emergency Response Planning (Control Points)
- Valve Placement/Configuration
- Pipeline Risk Assessment
- Public Awareness and Consultation

Case Study Example:
Fate and Transport Modeling



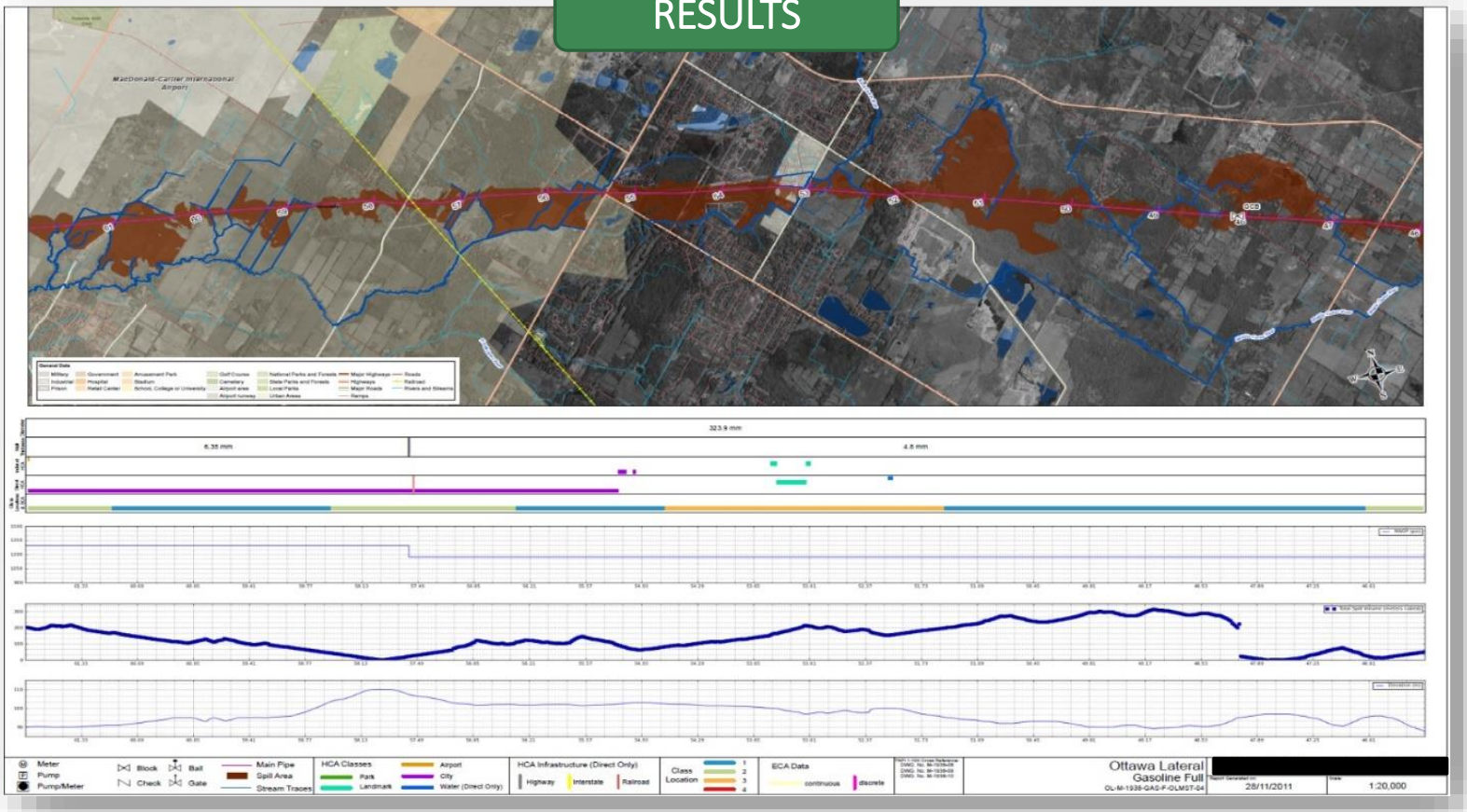
Case Study Example: Fate and Transport Modeling

Fundamental parameters required for modeling overland spills include:

- Terrain/Topography
- Drainage Systems (natural and/or man-made)
- Fluid Properties
- Operating Condition
- Potential Release Volume
- Emergency Response Time

Case Study Example:
Fate and Transport Modeling

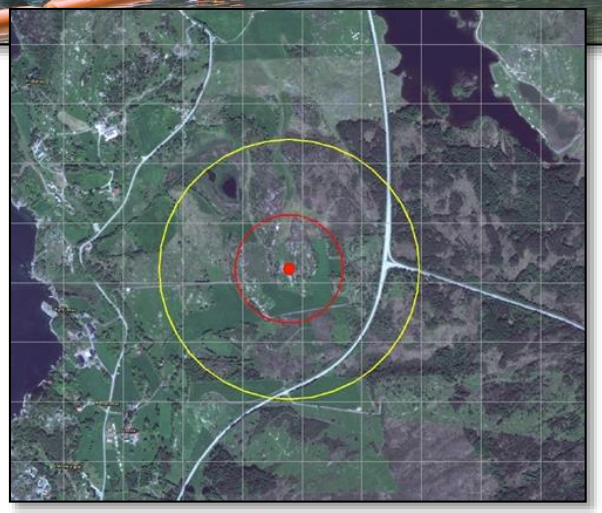
RESULTS



Advantages of GIS for:

Emergency Preparedness and Response

- What is around the area of the emergency?
- Evacuation requirements
- Is there a community shared services group that can be mobilized?
- Where are the safety zones?
- What did the area look like prior to the incident?



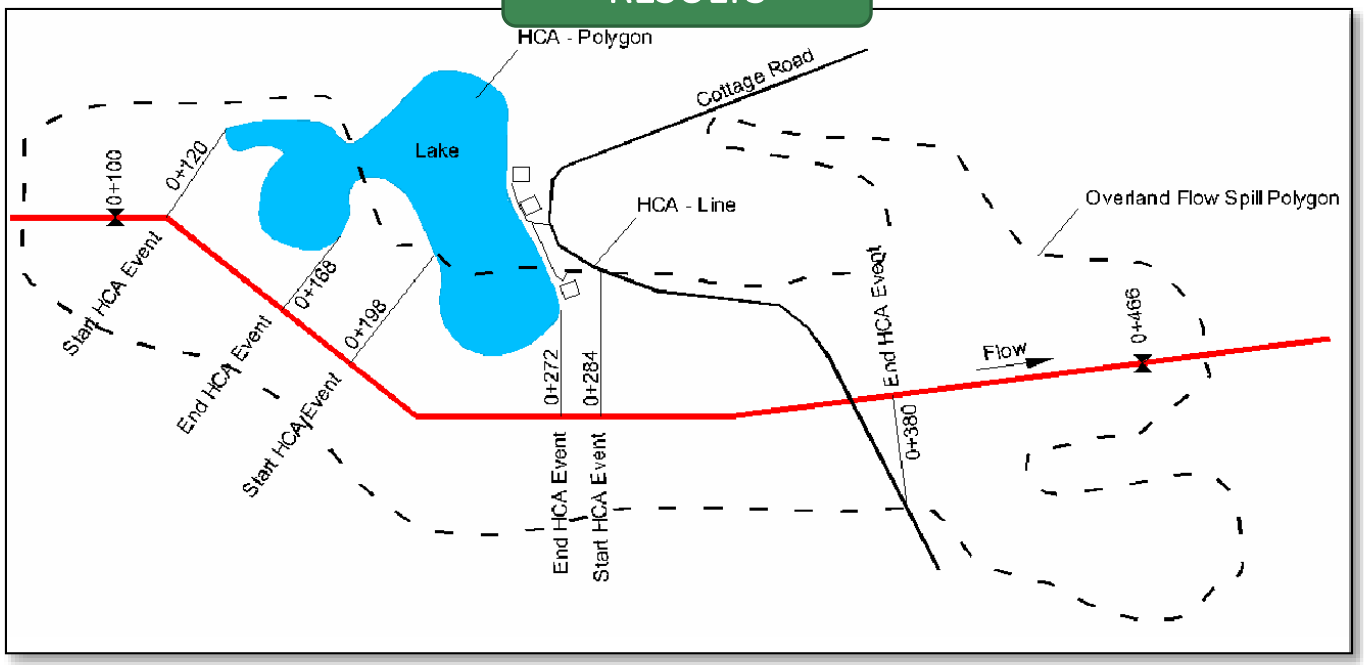
Case Study Example: Emergency Preparedness and Response

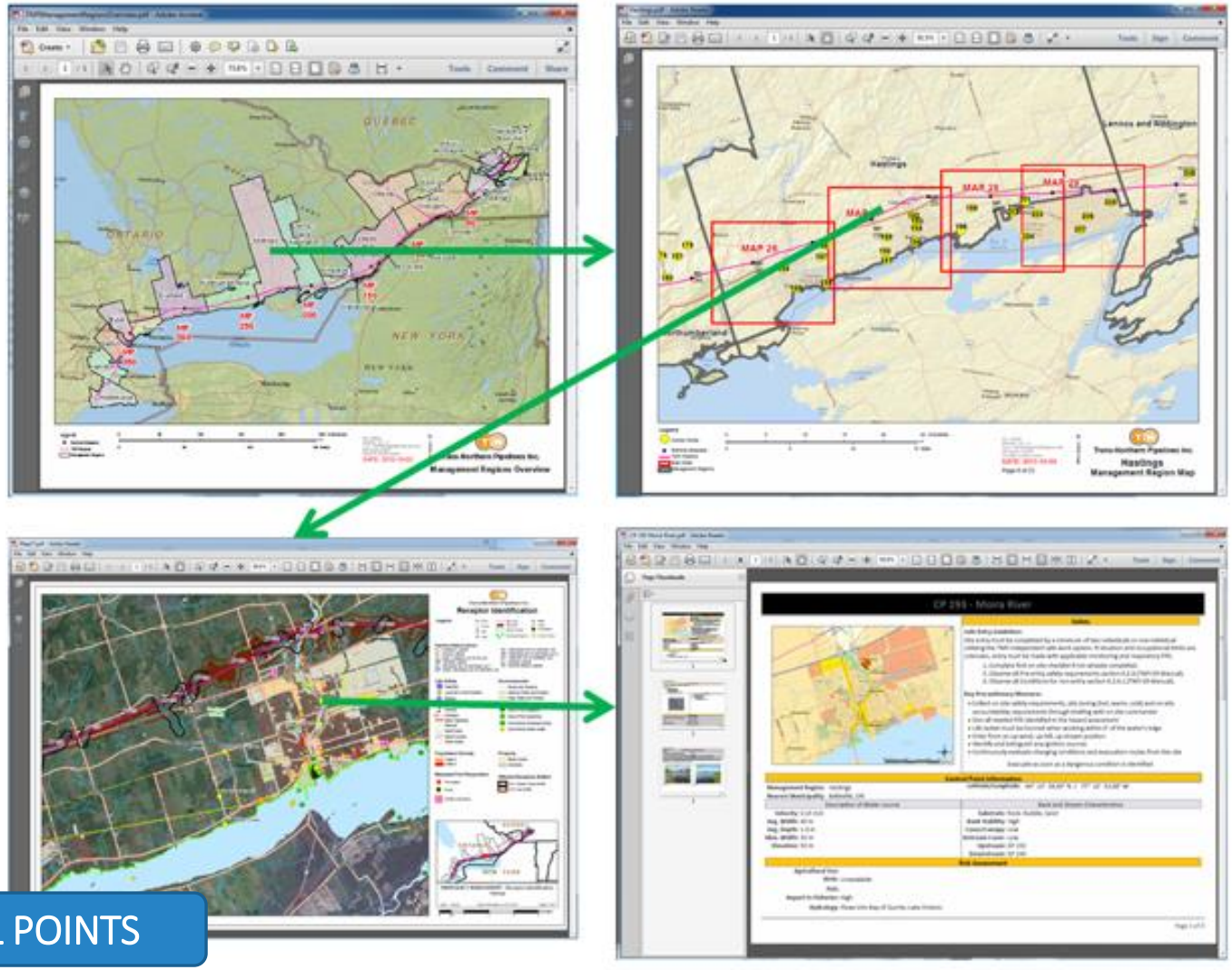
What is your approach to addressing these scenarios?

- High Consequence Area (HCA) determination supports the assessment and reporting of both directly and indirectly affected HCAs within simple or complex analysis areas.
- Define an analysis area by utilizing a selected offset distances field or a complicated pre-defined polygonal geometry.

Case Study Example: Emergency Preparedness and Response

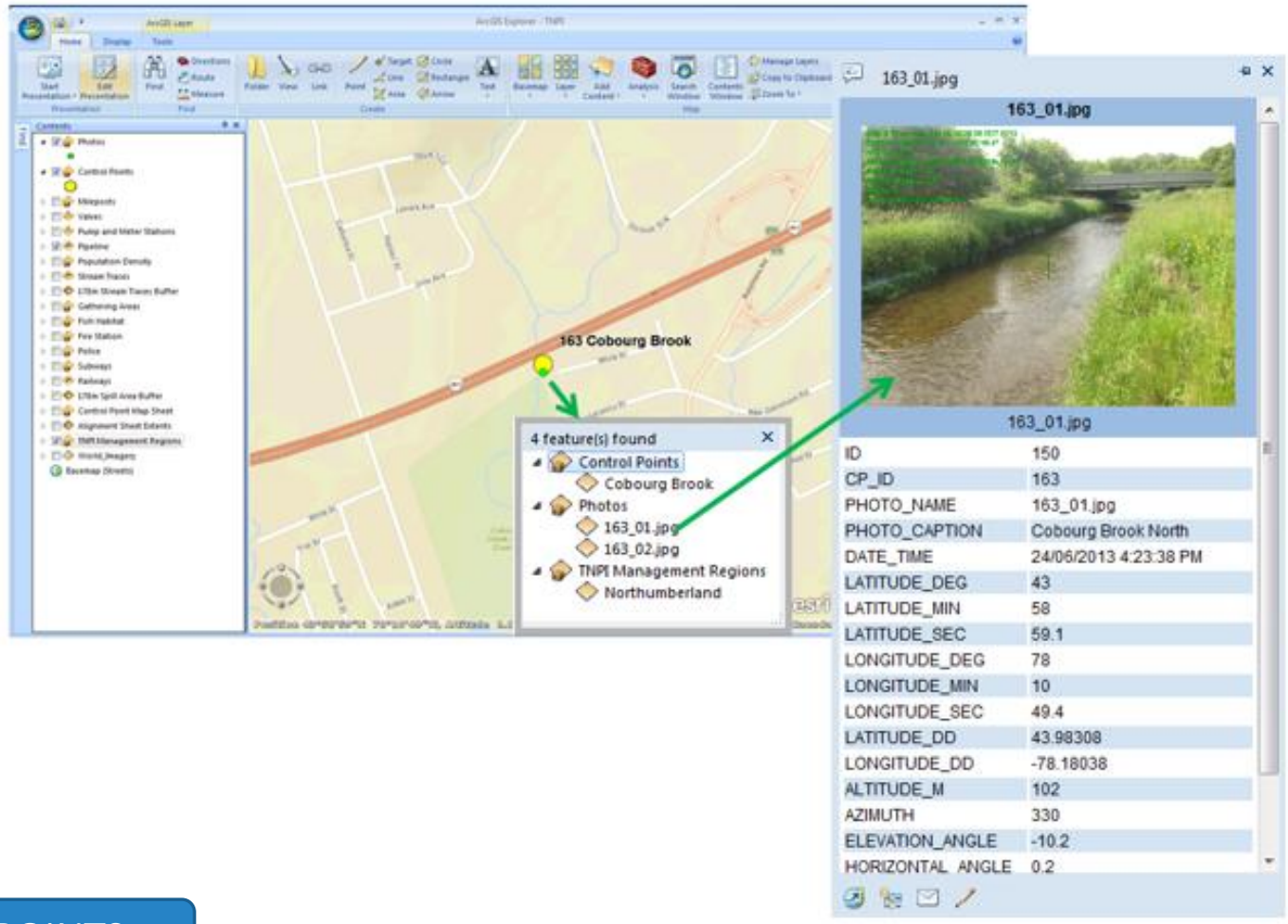
RESULTS





CONTROL POINTS

Case Study Example: Emergency Preparedness and Response



CONTROL POINTS

Case Study Example: Emergency Preparedness and Response

Questions?

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