Area Specific Emergency Response Plans for Linear Energy Transportation Infrastructure

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Large amounts of oil/gas and other substances are transported by pipeline or rail each year. An important challenge for operators of these extensive infrastructures is to develop detailed emergency response plans that meet expectations from regulators and local communities. Emergency response planning for pipelines or railroads that are thousands of kilometres in length and cross multiple waterways and types of sensitive habitats may be a daunting task. Additionally, these linear energy-transportation infrastructures are often in remote areas with difficult or limited access for responders and equipment.

Our experience has been gained from recent projects where we developed Geographical Response Plans (GRPs) and Tactical Response Plans (TRPs) for more than 15,000 km of rail and 5,000 km of pipelines throughout Canada and the USA, and past spills from pipelines and train derailments. This paper highlights the main challenges we encountered and shares tips to successfully undertake emergency response planning for complex and geographically extensive projects.

Challenge 1: Where to start during the project planning phase

Linear energy-transportation infrastructure is often thousands of kilometres in length and crosses multiple waterways and sensitive habitats. It can go through remote areas, with very little accessibility, and very populated areas. The variety of sites and potential sensitivities can be overwhelming. The planning process may only begin by knowing the environment around the linear infrastructure. Here are some of the key elements learned over time:

- Information about waterways is crucial as they are often more sensitive environments and can transport contamination over significant distances. Initial data collection, mainly identification of waterways (either crossing or parallel to the infrastructure), must be completed using satellite imagery from multiple sources (ESRI Basemaps, Google Earth) and up-to-date hydrological data showing flow direction. In past projects, we identified all waterways wider than 5 m as they represented potential vectors for contamination.
- As the linear infrastructure may be substantial in length, segmentation according to watersheds is helpful.
- Once we identified relevant waterways, we estimated a downstream distance to survey according to flow analysis and product characteristics. A good rule of thumb is 15 km downstream for small and secondary streams and 30 km downstream for main rivers.
- Use of a data collector application (Coral App, www.chaac.tech) and the best freely available satellite imagery to conduct the pre-identification of tactical plan locations followed by field validation allows for efficiency throughout the project.
- Work with local responders to identify available information (local knowledge) and what they need to respond to an incident. Content of GRPs and TRPs must be kept to a minimum and easy to understand.

Challenge 2: Keeping emergency response plans real and easily useable

Emergency response plans are vital for ensuring the linear infrastructure is safe for the public and the environment. Finding key locations where an incident may impact life, critical habitat, or waterways is essential. Gathering only the necessary information will help develop cost-effective and practical TRPs.

- Provide only highly operational information for the response plans. Other relevant information may be kept in a GIS database to provide a more extensive overview of the environment if ever needed.
- Conduct field surveys to keep your plans realistic. Target key locations if your budget/time is limited.
    - Aerial surveys are used when the linear infrastructure is extensive, and most of it is in remote locations where driving is impossible. As it is expensive, survey planning must be carried out carefully. These surveys may be done either by UAV or helicopter.
    - Ground surveys are beneficial for areas accessible by roads. It is less costly and provides more detailed information on the TRP location.
- The data collection and management process is a huge element of success. Data quality will ensure that response plans reflect reality, which will greatly help if an emergency occurs.

Challenge 3: Integrating lessons from past incidents

Integrating lessons learned from past incidents is essential for developing high-quality response plans. These are some or our important learnings from past spills:

- Access – Access – Access is the key element. A good access description is fundamental, especially in remote areas. Air operation zones, boat ramps or roads must be described in detail. This information will support an effective mobilization and limit potential impacts, particularly for spills in rivers.
- Take fluctuating water levels into consideration. Changing water levels may directly impact access or require modifications to your response tactic.
- Consideration of seasonal factors is essential. Winter conditions or the rainy season will affect your initial response tactic. Make sure to add comments for winter considerations or heavy rain events to make your plan as robust as possible.