Inland Geographic Response Plan (GRP) for Complex, Variable, Limited Access River Settings

AUTHORS

Greg McGowan (Arcadis)

101 Creekside Ridge Court; Suite 200

Roseville, California 95678

Michael Algots (UPRR)

1600 Vernon Street

Roseville, California 95678

Josh Gravenmier (Arcadis)

2999 Oak Road; Suite 300

Walnut Creek, California 94597

ABSTRACT 2017-427

Geographic Response Plans (GRPs) are a key tool in response preparedness, but are limited in inland settings, especially in remote areas. Development of a GRP for 200 miles of the Feather River in California required consideration of highly variable seasonal flow conditions, extremely limited access, and numerous sensitive ecological and cultural resources. This setting required adjustments to the typical prioritization of GRP response strategies based on the sensitivity of potentially exposed resources at risk, and instead increased focus on access and infrastructure locations in relation to natural and man-made collection areas. With a highway on one side of the steep-walled canyon, and a state-designated “high-hazard area” for the railroad line on the other, the GRP also needed to consider a wide variety of potentially released material types and source points. The scoping and GRP development was led by a

steering committee including the Union Pacific Railroad and BNSF Railway, the U.S. EPA (Region 9), CA Department of Fish and Wildlife Office of Oil Spill Prevention and Response (OSPR), ARCADIS, and numerous regional and local organizations as well as response contractors. The resulting GRP is a pragmatic document that provides critical response information to optimize the efficiency and effectiveness of the first 24 – 48 hours of incident response in this challenging environment. This paper discusses the challenges faced and the resultant strategic measures addressing limited access, fast-water booming, resource mapping, and other critical planning parameters to develop a pragmatic and effective GRP.

INTRODUCTION

A Geographic Response Plan (GRP) is a planning document and response tool that is intended to guide local responders in the first 24-48 hours of a major oil spill until additional response assets can be deployed and a Unified Command is established. Typically, GRPs provide more detailed local or regional information for spill response as a subset of an Area Contingency Plan (ACP). ACPs currently provide less detailed coverage for inland areas and the hundreds of thousands of surface waters therein.

With recent increases in the volume of crude oil transported by freight rail across the United States, and an increased focus on the petroleum pipeline network in the U.S., there has been a heightened interest on the need for inland GRPs. This paper addresses key considerations for the preparation of inland GRPs.

Background – Geographic Response Planning

As described by the California Office of Spill Prevention and Response (OSPR), GRPs are site-specific strategies for the initial response to hazardous materials spills, including oil spills,

into surface waters. GRPs are created to provide guidelines for responders in the event of a spill, which significantly reduces the time needed to make informed decisions during the initial response. A GRP provides the responders with essential information about the site; the equipment needed to carry out an effective response; ecological, cultural and economic resources at risk in the area; access details for staging response equipment and activities; notification and contain information; and other information. The goal of a GRP is to ensure that the response to a spill is rapid and effective, and that sensitive resources are protected. This information, together with estimates of response timeframes and anticipated travel rates (fate and transport data) for spilled material, staging locations and pre-identified deployment strategies, provides a basis for first responders to implement an effective and coordinated initial response.

GRPs are typically developed for a specific area (for example a river, a lake, or section of waterway), and include tactical response strategies tailored to a particular shoreline or waterway at risk of injury from an oil spill. GRPs have two main objectives:

- Identify sensitive natural, cultural or significant economic resources at risk of injury from oil spills and oil spill response; and
- Describe and prioritize response strategies in an effort to prevent or reduce injury to these resources at risk from oil spills and from the response actions.

A GRP contains a set of planned response strategies that are designed to give responders important information about specific sites so that potential damage to sensitive resources is minimized in the first 24 – 48 hours following a spill. These can be actions to control, contain, redirect, and collect the spilled material. The strategies are designed to be flexible, letting responders adjust actions to meet the needs of current conditions, such as water levels, flow

rates, or weather; and also on the type of material released (typically assuming a floating oil, but potentially addressing miscible or sinking materials as well).

A GRP is developed with representatives from various levels of government, first responders and oil spill response organizations, subject matter experts, and industry working together to identify risks and sensitive resources, and to prioritize response actions based on the released material, the location and movement of the released material, and the potentially impacted resources at risk. Participants in the development of a GRP identify resource priorities and strategies for specific locations. Many factors are considered in identifying specific locations for protection in the GRP area, such as access, flow conditions and other seasonal changes, shoreline and resource sensitivity to oiling and spill response actions, and equipment availability. Then potential sites are visited in the field to verify assumptions and gather information. Some sites may be added or dropped from the list of strategies as a result of field verification.

Once an area is identified for consideration, planners evaluate site-specific qualities that determine what type of response would be most effective. This can include resource qualities such as habitat types, presence of threatened and endangered species, or presence of a drinking water intake or cultural resources, as well as practical qualities such as accessibility, physical/hydrologic conditions, and responder safety.

In general, other response activities or information included in GRPs are:

- Notifications/Communications
- Incident Command Structure
- Response Tactics/Strategies, Assets and Resources
- Logistics

- Maps

METHODS

In developing a GRP for an inland water system, there are some key considerations:

- Access Restrictions May Drive Decisions More Than Sensitive Receptor Locations
- Understand Complex Hydrology and Water Usage Issues

These elements are discussed in the following sections.

Recognizing Different Challenges in Response Issues

Inland surface waters are extremely variable and consistent. For example, desert washes may experience short duration, high intensity flows during rain events followed by months with no surface water. Conversely, large rivers support perennial flows with periods of extreme volume and velocity during flood events. Lakes, ponds, and wetlands also present dramatically different conditions dictating different spill response and recovery tactics. Containment and recovery tactics need to be sufficiently flexible to allow for low-flow and high-flow conditions, or separate tactics should be identified along with a decision tree to facilitate a rapid understanding by responders as to which tactic applies at the time of a spill. It is also important to note that fast-water booming (>2 knot velocity) is difficult and requires specialized training and equipment that not all first responders and oil spill response organizations typically have received. For example, fast-water booming requires specialized health and safety training as well as personal protective equipment (PPE) that differs from typical hazmat PPE (e.g., helmets instead of hardhats).

In addition to the disparate water features themselves, the associated vegetation types, wildlife species diversity and usage, the cultural resources, and the economic uses may also be significantly more complex in a freshwater system than in a coastal or marine setting. Riparian and wetland vegetation types supported by inland waters commonly are considered sensitive and afforded special regulatory protection, and also commonly harbor a rich diversity of wildlife including amphibians, avian resources, invertebrates, reptiles, and mammals. Due to the unique integration of surface water, hydric soils, and hydrophytic vegetation, these communities commonly support rare and protected botanical and wildlife species as well as special seasonal importance for breeding and rearing of young. Limiting ingress and egress routes to minimize vegetation impacts and soil compaction; consideration of passive or chemical countermeasures suitable for freshwater use; and biological surveys and monitoring to maximize avoidance of sensitive resources while maintaining maximum response effectiveness and operational flexibility, should be considered during GRP development.

Access May Drive Decisions More than Sensitive Receptor Locations

Traditionally, the locations and prioritization of booming and response strategies in a GRP are based on the locations and sensitivity of the identified ecological, economic, and cultural resources at risk. Although those factors are equally important for the development of an inland GRP, there are inland settings where access to the water is extremely limited. Steep walled, deep canyons for example, present settings in which access may only be available in limited areas and via small unmaintained roads. In such cases, the prioritization of the response strategy locations must be based on access, rather than on the locations of sensitive resources.

Understand Complex Hydrology and Water Usage Issues

The flow characteristics of inland waters are significantly less predictable and more diverse than in marine settings. Even in a relatively short section of a river, there may be substantial variation from reach to reach, from season to season, and from year to year. For example, flow may range from 3,000 cubic feet per second (cfs) to 300,000 cfs in the same river depending on current rainfall, snowmelt, and other weather conditions in the watershed. This may substantially complicate response planning in a GRP, and requires that the response strategies be developed to account for a wide array of conditions and to explicitly address response locations or tactics that may not be feasible during certain conditions.

Water usage in inland settings is also highly variable and often unpredictable. Uses including drinking water sources, agricultural water sources, hydroelectric water sources, and recreational activities (e.g., fishing and boating) are important uses of freshwater systems. Many such uses are readily apparent and may pose both opportunities and constraints for response. For example, hydroelectric facilities such as dams, are a sensitive economic resource to be protected, but also offer some capacity to control water flow and water levels in the river/reservoir. Other uses are less apparent; for example, agricultural irrigation intakes may not be mapped and may be difficult to identify. Agricultural pumps may also be on automated timers that will energize without warning and pump spilled material onto food crops and other agricultural areas.

Freshwater systems are also complicated by the myriad tributaries, culverts, inlets/outlets, and other natural and anthropogenic diversions and conveyances that complicate response planning and implementation by creating non-intuitive flow patterns that must be addressed in the GRP.

RESULTS/DISCUSSION

Spill response planning and implementation in inland settings is complex and dynamic. A moderately sized river may carry released oil 25 miles in six hours, resulting in 50 miles of oiled shoreline (both banks). Along that shoreline, there may be hydroelectric diversions, irrigation pumps for food crops, drinking water sources, sacred Native American sites, threatened and endangered species, recreational areas, and many other resources at risk. Access to the water for booming and other spill response activities may be highly constrained and limited to only a small number of suitable response locations without construction of new roads, work pads, and staging areas. Remote locations may have slow response times requiring mobilization of response equipment from distant areas. Such locations may also have little or no cellular or internet service to support communications with outside resources. The oiled shoreline may have a large number of public and private landowners and a very large number of stakeholders and interested parties. To develop an effective GRP in such settings, several fundamental elements must be considered:

- Access is Everything – The ability to protect resources at risk is dependent on the ability to deliver response personnel and assets to the area quickly, efficiently, and safely.
- Drive Every Road – Spend plenty of time in the field seeking access points and mapping resources. Aerial imagery is helpful, but is not a practical substitute for directly exploring the area and every possible access route. Communications with locals will provide extremely valuable information. Kayakers and fisherman have detailed knowledge of the waters and the watershed and can provide a wide array of critical response information.

- Understand Water Management Options – The presence of dams, diversions, culverts, and pumping systems offers both opportunities and constraints for effective spill response.
- Consider Atypical Options – In a steep walled canyon, the road or highway may need to serve as the staging area. Helicopters may be useful to deliver personnel and equipment.
- Establish a Steering Committee for the GRP – It's easier to edit than create; a small focused leadership team can effectively develop a draft GRP. That group can then identify the next level of stakeholders and potential data sources for subsequent development and review of more site-specific information. Ultimately, the input of a large group of stakeholders is valuable, but a phased roll-out of the GRP will compress the development time and the number of comment and review iterations.
- It Must Be Pragmatic – Review every option, tactic, and strategy to ensure that practical common sense applies. Plan for standard response infrastructure rather than customized equipment.
- Stage Equipment in the Region – To maximize effectiveness, response assets need to be deployed within six hours. Ensure that the requisite assets are staged for deployment within that timeframe and that trained personnel are available.
- Exercises and Drills Are Critical – A GRP should be a dynamic document that is regularly tested and updated based on the results of field trials. Run field deployment exercises during different seasonal conditions and in different flow scenarios at different locations in the GRP coverage area. Update the GRP based on the results to continually improve the document.

- Water Safety Training – Water safety is critical to effective spill response on inland waters. The PPE and the safety roles for work in and near water, particularly fast flowing water, are different than other hazmat response settings.

CONCLUSION

Inland GRPs are critically important tools to protect surface water quality and to avoid and minimize impacts to cultural, ecological, and economic resources at risk from spills and spill response actions. GRPs provide more detailed information than can be included in an ACP.

Many of the inland surface waters in the United States pose complex challenges for spill response including:

- Limited Access for Response Personnel and Equipment
- Dynamic Water Levels, Flow Volume, and Water Velocity from Reach to Reach, Season to Season, and Year to Year
- Complex and Diverse Shoreline Types (e.g., sand, cobble, exposed bedrock)
- Complex, Diverse and Sensitive Shoreline Habitats for Botanical and Wildlife Resources
- Extensive Cultural Heritage Including Sacred Native American Sites and Historical Uses
- Extensive Economic Resources Including Hydroelectric Power, Drinking Water Sources, Irrigation Sources, and Recreational Uses

All of these key challenges can be effectively addressed in a GRP, but they require significant field time; extensive engagement with local, state, and federal resource agencies; extensive engagement with people from the area; and coordination with stakeholders (water

users) including industrial, agricultural, and recreational water users; to develop flexible and/or broadly applicable response strategies that account for the complex nature of inland waters.

REFERENCES

California Department of Fish and Wildlife Office of Spill Prevention and Response, 2015. Guidance Document, For Use In The Preparation of Contingency Plans, Geographic Response Planning.

BIBLIOGRAPHY

Energy and Environmental Affairs, State of Massachusetts, 2016. Massachusetts Geographic Response Plan (GRP). http://www.mass.gov/eea/agencies/massdep/cleanup/marine/massachusetts-geographic-response-plan.html (last accessed 12.15.16).

Department of Ecology, State of Washington, 2016. Geographic Response Plans. http://www.ecy.wa.gov/programs/spills/preparedness/GRP/ (last accessed 12.15.16).