integrated offsite

Emergency Preparedness

Planning is the key to emergency preparedness and response! Although modeling disaster scenarios is quite complex, the complexity of modeling cannot stand in the way of compliance with regulatory requirements and public expectations.

With the extreme consequences of liquid leaks or spills, it is imperative that a land-based spill model be realistic. A comprehensive spill model is founded on proven algorithms that account for variations in surface cover, fluid properties, soil absorption, and terrain variations.

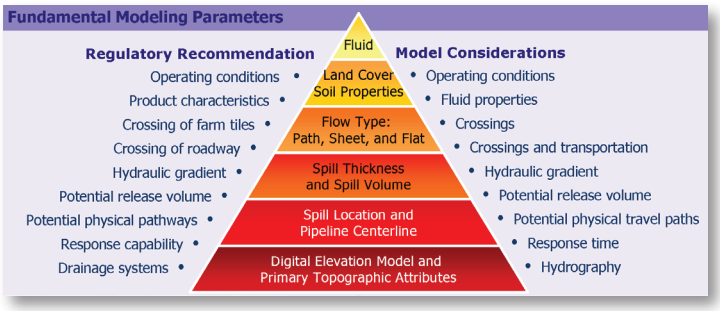
Overland Flow Model

Through review of various regulations and literature, it is possible to determine the fundamental parameters required for modeling overland spills. These factors include terrain/topography, drainage systems (natural or man-made), fluid properties, operating condition, potential release volume, and emergency response time. This listing is certainly not comprehensive and misses a few critical factors such as surface cover, soil properties, and weather conditions. These factors allow for flow resistance, soil absorption, and fluid evaporation to be included in the Overland Flow model.

The methodology developed by Integrated Informatics for this ArcGIS add-in is able to model liquid spills through inclusion of all factors defined by the regulations augmented by the suggested critical factors.

Our approach is based on rigorous methods for establishing realistic resistance to flow over the ground surface. The algorithm used to establish a continuous surface of fluid flow resistance takes into account variation in surface cover, slope (directional), fluid properties, and several other key inputs.

With the Overland Flow resistance established, the next step is to calculate the path or paths a spill would make by passing over a topographic surface and accounting for resistance. These calculations can be constrained by defining upper limits on spill travel time, spill volume, spill area, or maximum travel distance.



Results and Reporting

Integrated Offsite is a specialized application based on geographic information system technology and is able to produce meaningful results readily useable by safety, environmental, planning, and public relations personnel.

Depending on the constraints applied to the model, results may be produced for every stage of Overland Flow determination. This includes potential spill travel paths or specific flow paths for a given scenario. This output also represents spill travel time tightly coupled with the spill area and spill travel distance -- as well as thorough analysis of High Consequence Areas (HCA).

If required, fluid volume retained at any location can be calculated and is yet another output from the spill modeling process. Results are dependent on fluid properties, soil absorption, evaporation, and more!

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Model Flexibility

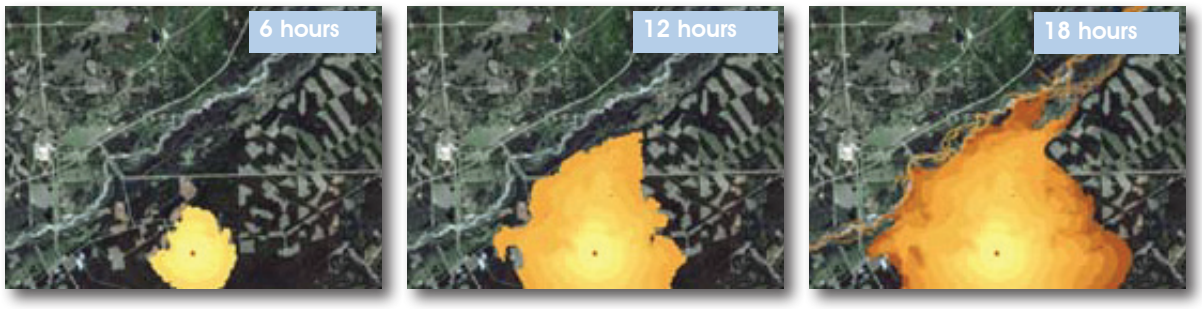
The example shown below is the result of calculating spill travel time from a single source with an unlimited amount of spill product. Snapshots of the spill travel calculated from a single spill location are shown spanning an 18 hour time interval.

This particular example highlights some of the features of the Overland Flow model. For instance, the model has chosen to flow over flat land, seek out valley bottoms, and move around hills — that is, the model knows not to flow uphill!

Another feature of the model is its ability to show the relationship between spill travel time and spill travel distance. Looking at the 6 hour snapshots shows more distance traveled in the third 6 hours (18 hour window) because of the spill interaction with a river.

Additional Applications

The main driver behind this Overland Flow model is to address the needs of the oil and gas industry, meeting their emergency preparedness requirements. However, the value of Integrated Offsite reaches far beyond the Natural Resources sector. Its methodology and results have direct applicability to other industries, such as those involved in emergency response and remediation. The model may be used to help first responders with their planning process for response times, establish effective emergency response control points, and even estimate cleanup and remediation costs.



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