

ACWI/SSWD: Spill Response Use Case Work Group Teleconference Notes

10/24/2014

- ICWater was a model developed with funding from FEMA and EPA and USFS. Now maintained through DOD. Uses NHD+ version and links into USGS real-time stream gages so that travel times and dispersion calculations represent actual conditions.
- Riverspill is the hydrologic modeling tool.
- ArcGIS Desktop application. Point-and-click interface to pinpoint spill origin; tools to represent the type of material spilled; tracing spill progress.
- Used for the West Virginia chemical spill
- On-the-landscape measurements help with ground-truthing predictions.
- Should add Cameo to this use case because emergency responders already use it.

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CAMEO is a system of software applications used to plan for and respond to chemical emergencies. Developed by EPA and the National Oceanic and Atmospheric Administration to assist front-line chemical emergency planners and responders, CAMEO can access, store, and evaluate information critical for developing emergency plans.

Users:

- Firefighters
- State Emergency Response Commissions (SERCs) and Tribal Emergency Response Commissions (TERCs)
- Local Emergency Planning Committees (LEPCs)
- Industry
- Schools
- Environmental Organizations
- Police Departments

Components:

- **CAMEOfm - Database and Information Management Tool**
CAMEOfm is a database application that includes eight modules (such as Facilities and Contacts) to assist with data management requirements under the Emergency Planning and Community Right-to-Know Act (EPCRA). Each year, facilities covered by EPCRA must submit an emergency and hazardous chemical inventory form to their LEPC, SERC, and local fire department. Most facilities submit a Tier II form, which contains basic facility identification information, employee contact information, and information such as storage amounts, storage conditions, and locations for chemicals stored or used at the facility. You can use CAMEOfm to store this information, by entering it manually or by importing a Tier2 Submit file (if the facilities and/or planners in your state use that program). CAMEOfm can also be used to navigate between ALOHA, MARPLOT, and the downloadable version of CAMEO Chemicals.
- **CAMEO Chemicals - Chemical Response Datasheets and Reactivity Prediction Tool**
CAMEO Chemicals has an extensive chemical database with critical response information for thousands of chemicals. There are two primary types of datasheets in the database: chemical datasheets and UN/NA datasheets. Chemical datasheets provide physical properties, health hazards, information about air and water hazards, and recommendations for firefighting, first aid, and spill response. UN/NA datasheets provide response information from the Emergency Response Guidebook and shipping information from the Hazardous Materials Table (49 CFR 172.101). In addition to the

information on the datasheets, you can also add chemicals to the MyChemicals collection to see what hazards might occur if the chemicals in the collection were mixed together. CAMEO Chemicals is available [online](#), as a [mobile website](#), and as a [downloadable version](#).

- **MARPLOT - Mapping Applications for Response, Planning, and Local Operational Tasks**

MARPLOT is the mapping application. It allows users to "see" their data (e.g., roads, facilities, schools, response assets), display this information on computer maps, and print the information on area maps. The areas contaminated by potential or actual chemical release scenarios also can be overlaid on the maps to determine potential impacts. The maps are created from the U.S. Bureau of Census TIGER/Line files and can be manipulated quickly to show possible hazard areas.

- **ALOHA - Areal Locations of Hazardous Atmospheres**

ALOHA is an atmospheric dispersion model used for evaluating releases of hazardous chemical vapors. ALOHA allows the user to estimate the downwind dispersion of a chemical cloud based on the toxicological/physical characteristics of the released chemical, atmospheric conditions, and specific circumstances of the release. ALOHA can estimate threat zones associated with several types of hazardous chemical releases, including toxic gas clouds, fires, and explosions. Threat zones can be plotted on maps with MARPLOT to display the location of other facilities storing hazardous materials and vulnerable locations, such as hospitals and schools. Specific information about these locations can be extracted from CAMEO information modules to help make decisions about the degree of hazard posed.

ICWater: Incident Command Tool for Drinking Water Protection provides real-time assessments of the travel and dispersion of contaminants in streams and rivers. It is structured around the RiverSpill model which has been enhanced to make use of the 1:100 000-scale National Hydrography Dataset Plus (NHDPlus).

Users:

- Water Utilities
- River Basin Commissions
- DOD and Federal, State and Local civil government (environmental and emergency response agencies)

Components:

- **River network**

ICWater uses the NHDPlus river network for downstream and upstream tracing. According to the EPA (2005), the NHDPlusV1 is an integrated suite of application-ready geospatial data sets that incorporate many of the best features of the NHD, NED and WBD. OCONUS version – uses river networks created from terrain (flows/velocities from rainfall, PET – geospatial stream flow model)

- **Flow and Velocity**

ICWater uses a relationship between river velocity and river flow (Leopold & Maddock 1953) to determine the real-time velocity from the measured (gauged) real-time flow. Real-time gauges are used to update the average reach flow to the current conditions. Gauges are selected based on their proximity to the contaminant release location. The calculations use the ratio of real-time velocity to long-term average velocity for extrapolation to river reaches not represented by the real-time gauge network. Conditions are based on the flow data from the USGS Current Water Data for the Nation (USGS 2013a).

- **Contaminant database**

A contaminant database is also included which identifies biological, chemical and radiological contaminants and their toxicities, decay rates, properties.

- **Source Term**

Point discharge (instantaneous and continuous release); non-point source (runoff from atmospheric deposition of contaminant) – user supplied deposition pattern or output from a model – coupled with rainfall data (uses elevation, land use and soil types to calculate rainfall-runoff relationships and overland flow)

- **Asset Database**

Drinking Water Intakes, Municipal and Industrial Dischargers, Gages, Dams, Schools, Hospitals, HAZMAT Sites (TRI, Risk Management Plan, RCRA, Superfund), Bridges, Rails, Roads, Pipelines, Fire, Police, Landfills, Mines, Political Boundaries

- **Output**

Downstream Tracing, Upstream Tracing, Breakthrough Curve

- **Recent Applications**

West Virginia chemical spill, Fukushima Nuclear Power Plant Incident

StreamStats (contributed by Kernell Ries)

Several USGS Water Science Centers have been talking with potential cooperators recently about adding time-of-travel functionality to StreamStats. As of now, none of the proposals that they have generated have been funded, but it is likely that at least one and maybe more of them will be funded this year. Any work that the USGS does on these studies should take into account whatever needs are identified by the spill response use case workgroup. The proposed studies would base the velocity computations on new equations that are in the final stages of development by Greg Schwarz, a statistician in the USGS NAWQA program. The equations will replace Harvey Jobson's 1996 equations. They will be developed from a dataset of time-of-travel (TOT) studies that is about 3 times the size of what Harvey used. Also, it has been proposed to assemble all of the TOT studies into a database, so that StreamStats users could see on the map where the studies have been conducted and retrieve information from the studies. Where studies have been done, then the velocity estimates used for spill response would be adjusted to reflect the data from the studies. How this would be done has yet to be determined.

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1/23/2015

Preliminary list of spill response organizations – primarily focused on riverine and estuarine domains:

Upper Mississippi River Basin Commission

<http://www.umrba.org/>

Interstate Commission on the Potomac River Basin

<http://www.potomacriver.org/pollution/spills-notification>

<http://www.potomacriver.org/fs/spillfs.pdf>

Duke Energy – Dan River Response

<http://www.duke-energy.com/dan-river/>

Susquehanna River Basin Commission

http://www.srbcb.net/programs/docs/EWSGeneral01_09.pdf

Delaware River Basin Commission

<http://www.state.nj.us/drbc/about/public/publications/>

Great Lakes Commission

<http://glc.org/files/main/resolutions/FINAL-20120911-Emergency.pdf>

Ohio River Valley Water Sanitation Commission

<http://www.orsanco.org/emergency-response-program>

Links to two papers

Water Contamination Modeling—A Review of the State of the Science

http://www.scirp.org/journal/PaperInformation.aspx?PaperID=27683#.VMJZ2_63rWE

Modeling the Fate and Transport of a Chemical Spill in the Elk River, West Virginia

<http://ascelibrary.org/doi/abs/10.1061/%28ASCE%29EE.1943-7870.0000930>

EPA study

Comparison of ICWater's main features and the application/functional differences with the ORSANCO's RSMS (Riverine Spill Modeling System) model - potential upgrades to RSMS can perhaps compliment ICWater or be incorporated into ICWater

Chemical spill tool kit (similar to end goal of the OWDI use-case) has been identified in the IWRSS stakeholder meetings held in the Ohio Basin - Integrated Water Resources Science and Services Ohio River Basin Stakeholder Report June 25 and 26, 2014

- Upper Basin (Cincinnati) - Project #2: (Water Quality) Develop a decision support system initially focused on spill response.

- Having access to high-quality water-velocity data for tributaries would improve spill responses. This could be accomplished with new gages
- More information is needed to implement management changes in reservoir storage, releases, and dam operations to mitigate spills. Should more water be stored to lower flows during a spill? Or should higher flows be used to dilute the spill?
- Decision 1: Are policies for preparation and emergency response to upstream spills/accidental releases adequate? Gaps:
- Better knowledge of downstream travel time, contaminant concentrations, and resulting impacts (i.e., human and aquatic community health effects, treatability, etc.) of upstream spills.
- Spatial information on potential sources of spills (e.g., high risk land uses, transportation crossings, key outfall/discharge locations).
- Better understanding of downstream vulnerability (e.g. at drinking water intakes, sensitive habitats).
- Pilot Project: Develop a decision support system initially focused on spill response

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2/27/2015

- Overview of WV chemical spill response and modeling - paper in Journal of Environmental Engineering
<http://ascelibrary.org/doi/abs/10.1061/%28ASCE%29EE.1943-7870.0000930>
- StreamStats briefing
- USGS meeting and discussion on time of travel work and dye studies
- Background on EPA Drinking Water Mapping Application for Protecting Source Waters
- [Gulf of Mexico Restoration Initiative](#) annual conference took place recently, including numerous presentations and side meetings: marsh erosion, impacts on marsh species, data management, and historical data sets. GRIIC (data store)
<https://data.gulfresearchinitiative.org/>
- Environmental Disasters Data Management (EDDM) Working Group
<http://crrc.unh.edu/workshops/EDDM> has lots of good information and presentations on typical types of environmental data collected during environmental disasters and the data management systems and data collection protocols used.

Are there other data sets the group can think of, that should be included in this use case?

- NHDPlus
- Real time stream gage data
- forecast data from River Forecast Centers
- list of diversion points (drinking water, agricultural, industrial) below the spill -- note that some data sets, such as locations of drinking water intakes, are sensitive information and are not publically sharable
- locations of highway bridge crossings, rail lines, and pipelines can help determine sites of potential future spills
- discharge points, e.g. facilities registry system (FRS-EPA db)
- residence times for reservoirs, estimates by Rich Moore, USGS SPARROW team, sometime this year(?)