DELAWARE VALLEY EARLY WARNING SYSTEM

LTRANS Application for Spill Trajectory Forecasting

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DELAWARE VALLEY EARLY WARNING SYSTEM

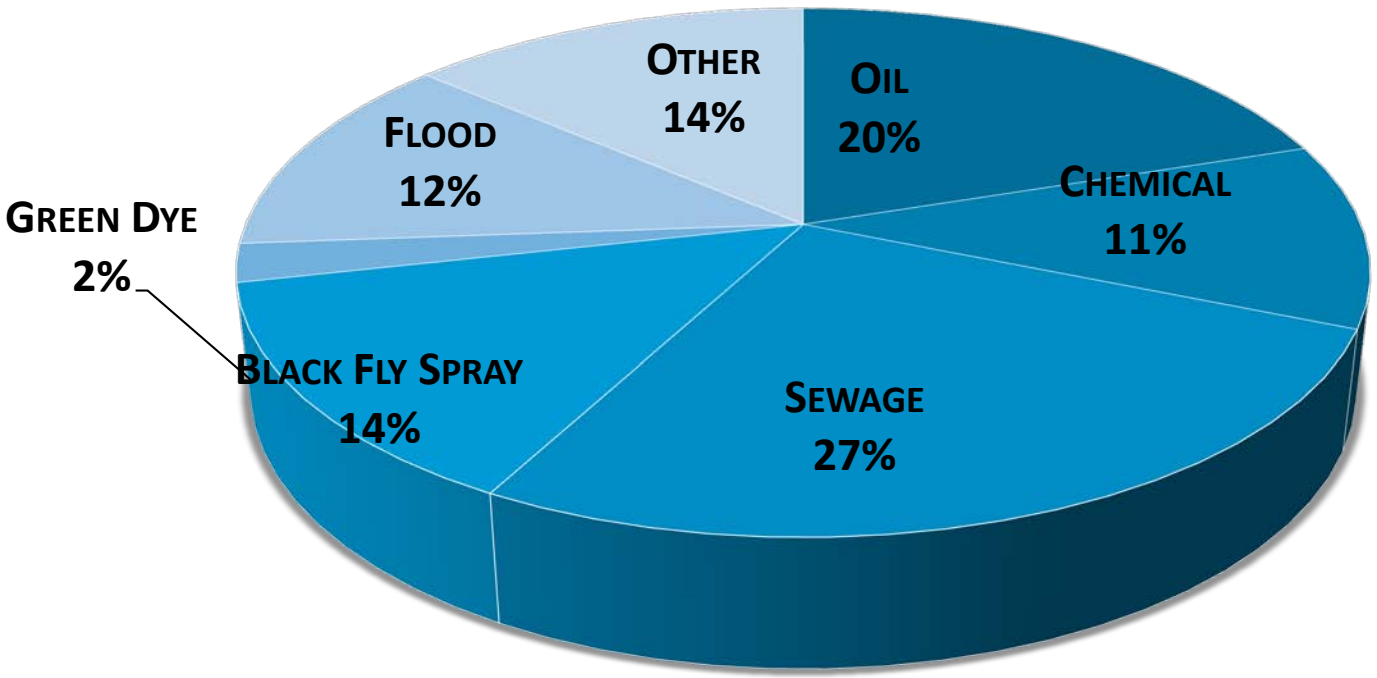
Overview

115 intakes in coverage area

EWS Water Quality Event History

256 Events Reported

JANUARY 2005 – JANUARY 2014



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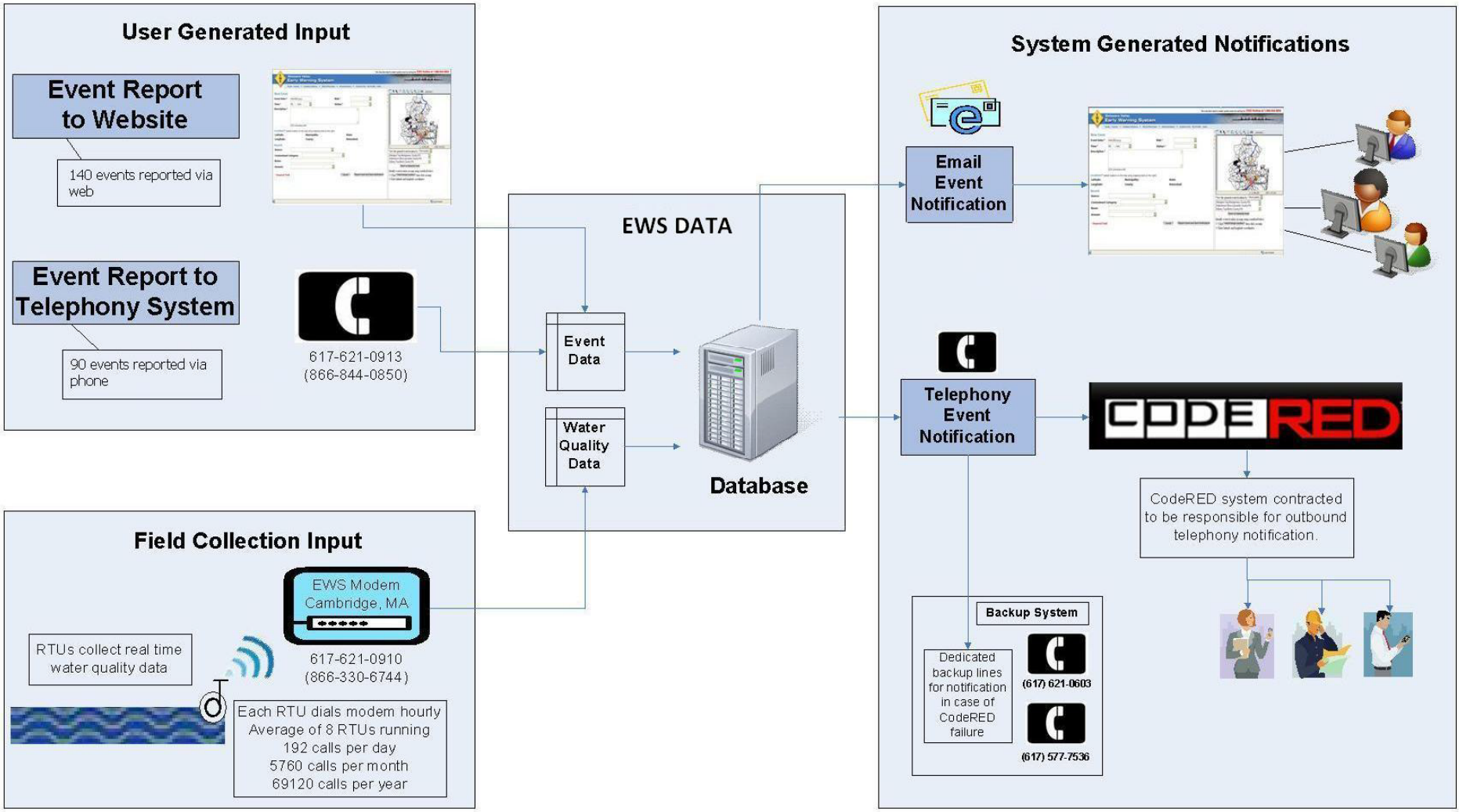
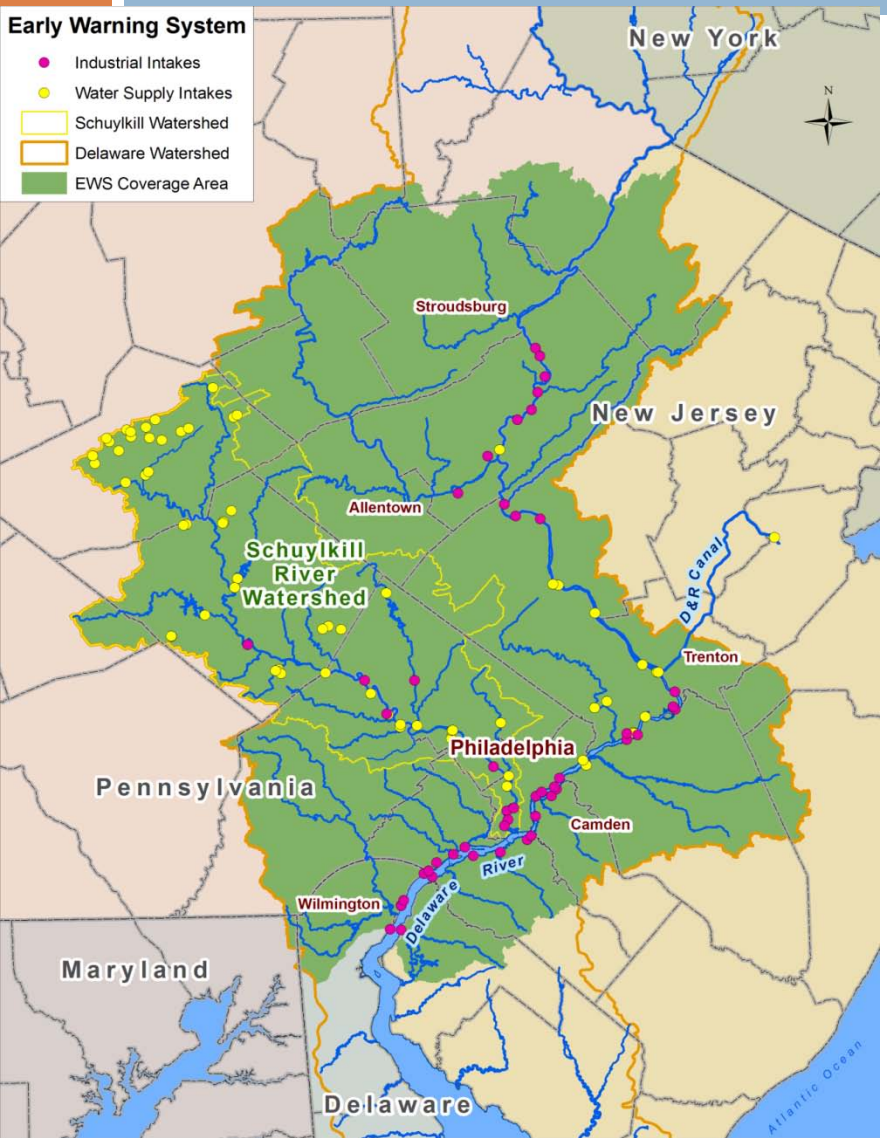
Major System Communications Elements



Spill Routing



- Tributary to Delaware River and Delaware River Upstream of Trenton: Routing model (USGS stream gages)
- Delaware River Downstream of Trenton: Tidal Transport Model
  - DBOFS currents
  - LTRANS particle trajectories

TIDAL MODEL STRUCTURE

Delaware Bay Operational Forecast System

LTRANS

EWS Tidal Model Features

- Automated
- On demand
- Preprocessing ahead of time
- Graphic output
  - Results communicated for non-engineer/non-scientist use
- Updates automatically

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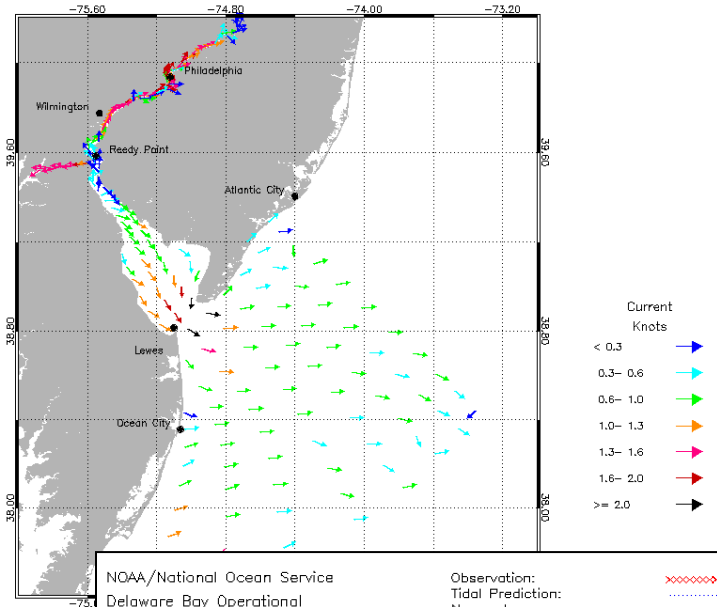
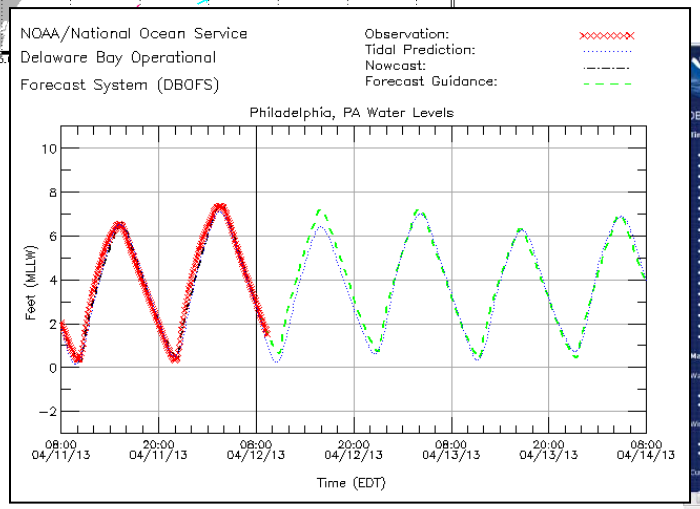
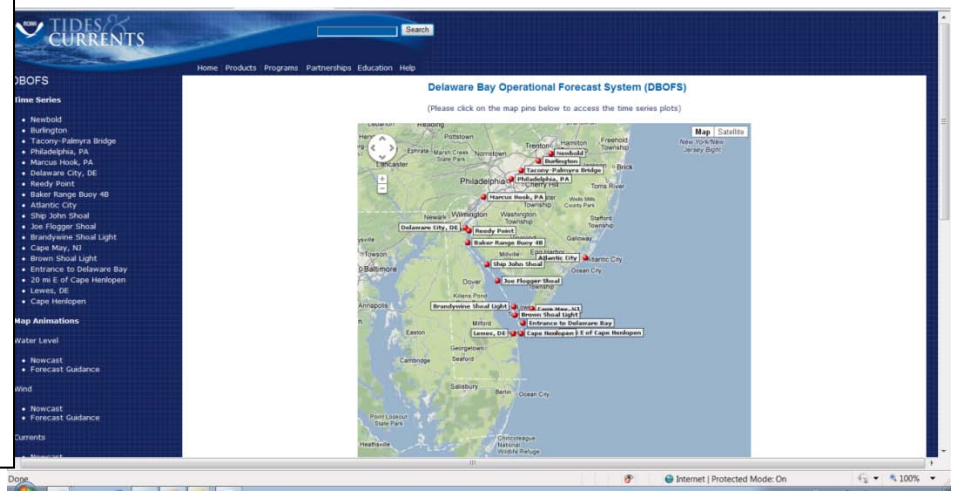
DBOFS







- 3D ROMS model
- 48-hour forecasts, updated every 6 hrs
- Model forecasts on OPeNDAP Server
- Includes Delaware River to Trenton (not tributaries)

Why Use LTRANS?

- Lagrangian Model
  - Computational efficiency
- Meets compatibility needs with ROMS
- Particles can be treated as neutrally buoyant
  - Unknown contaminant

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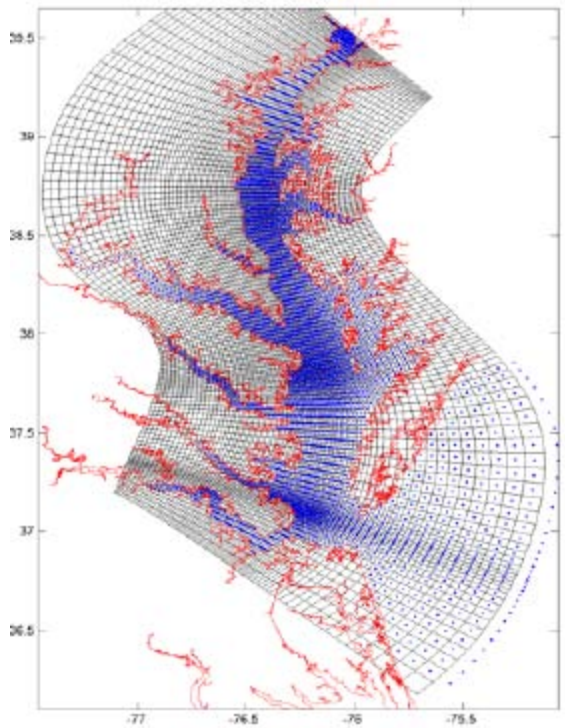
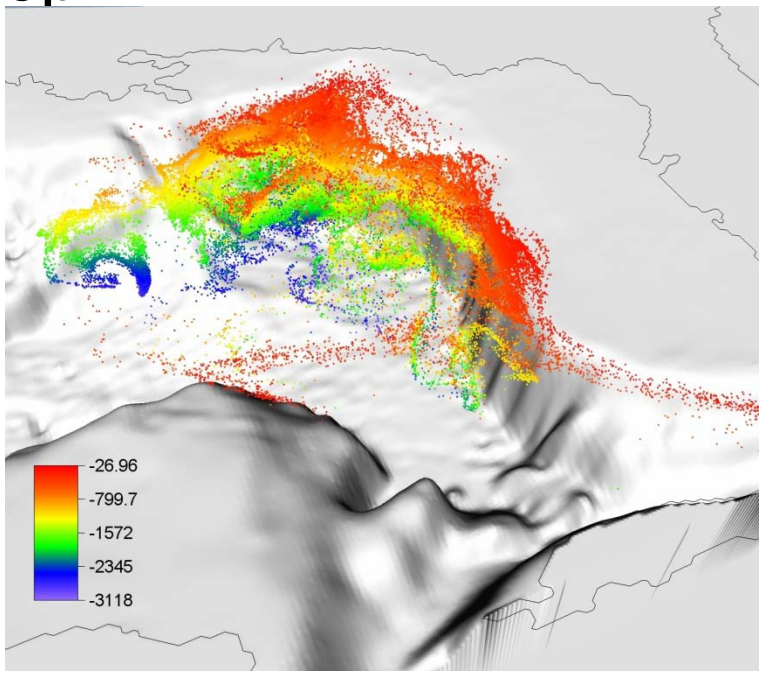
Other LTRANS Applications

- Oyster Larvae in Chesapeake Bay



http://northweb.hpl.umces.edu/publications/Reports/Northetal_DNR_final_report_31July06.pdf

- Deep Water Horizon Oil Spill



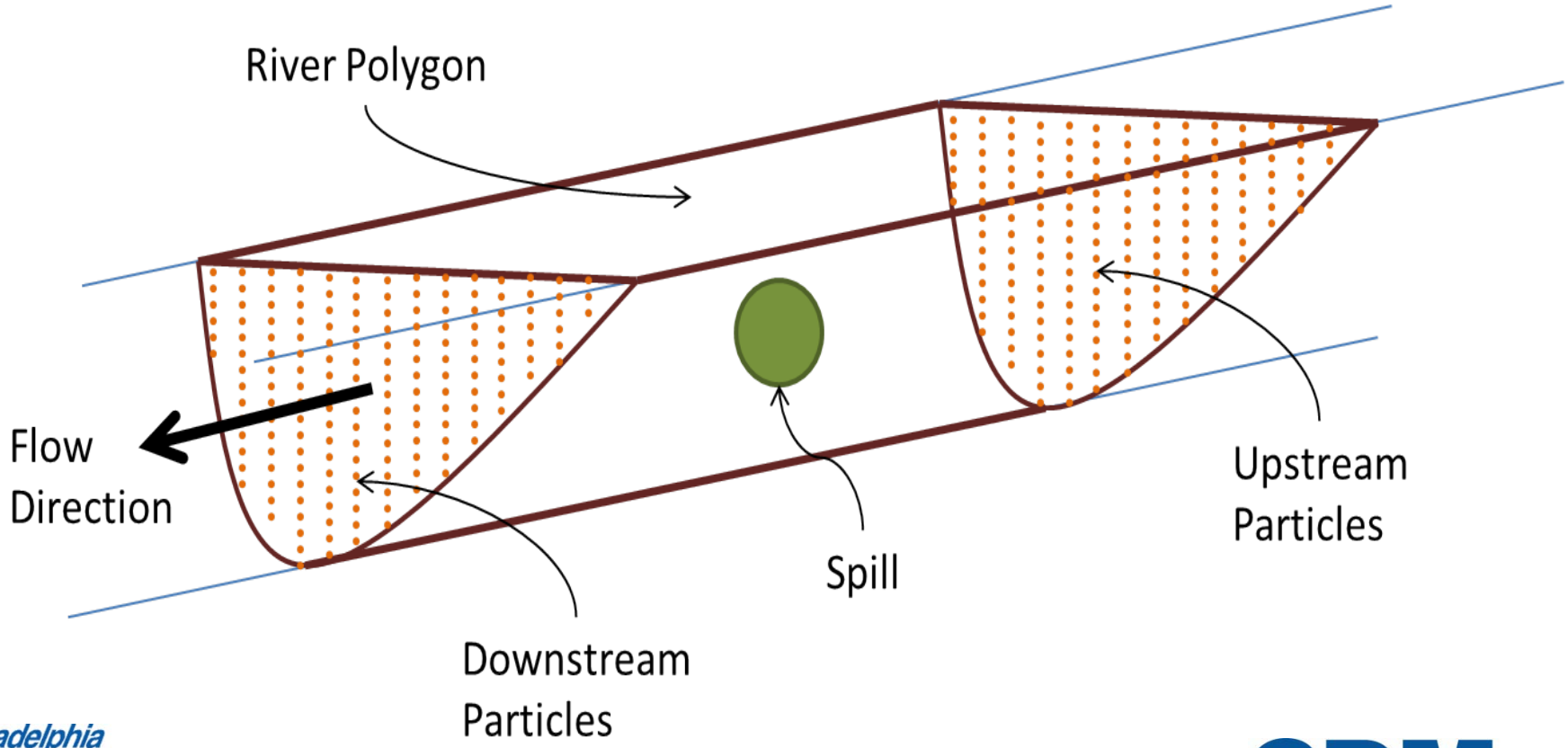
http://www.agu.org/meetings/fm10/fm10-sessions/fm10_OS42A.html

North, E. W., E. E. Adams, S. Schlag, C. R. Sherwood, R. He, S. Socolofsky. 2011. Simulating oil droplet dispersal from the Deepwater Horizon spill with a Lagrangian approach. AGU Book Series: Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record Breaking Enterprise.

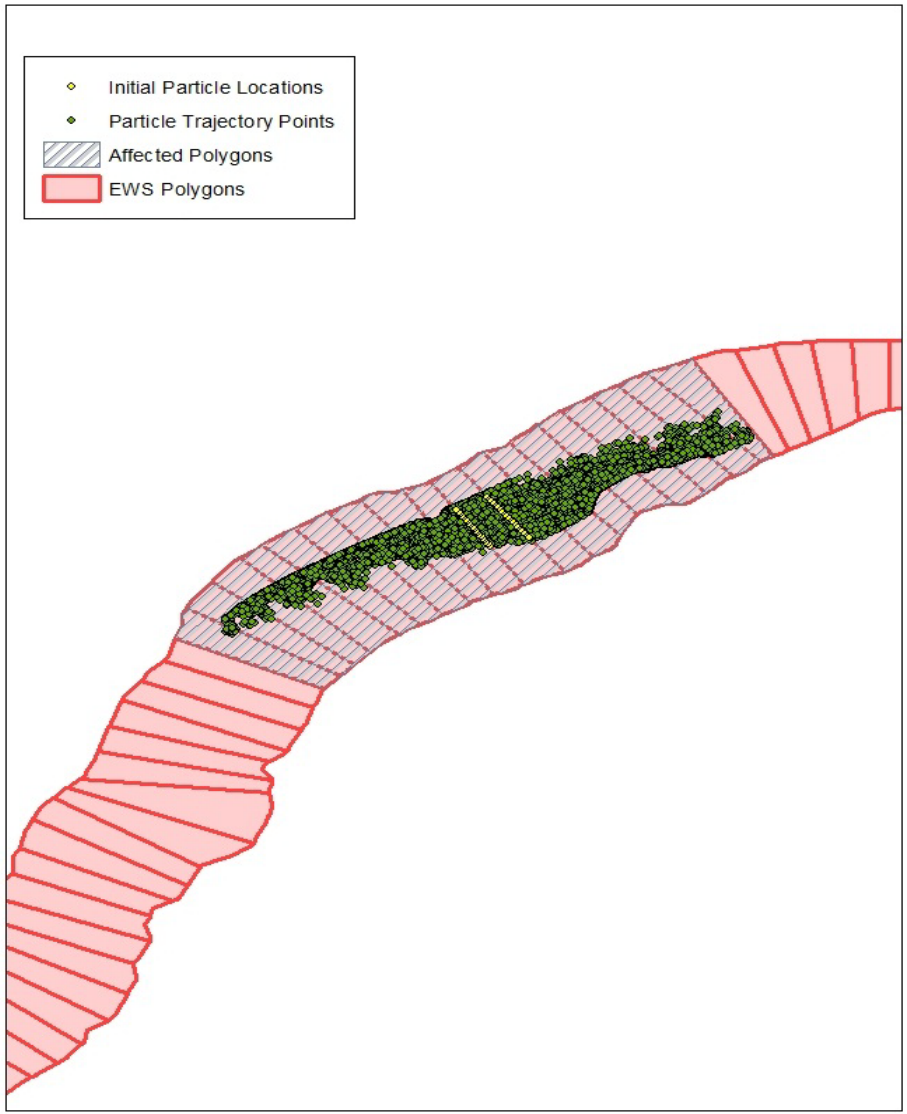
Polygon Approach

- 184 Polygons
- Impacts:
  - Initial particle locations
  - Results reporting to EWS users

LTRANS Spill representation



Model Results and Map Representation



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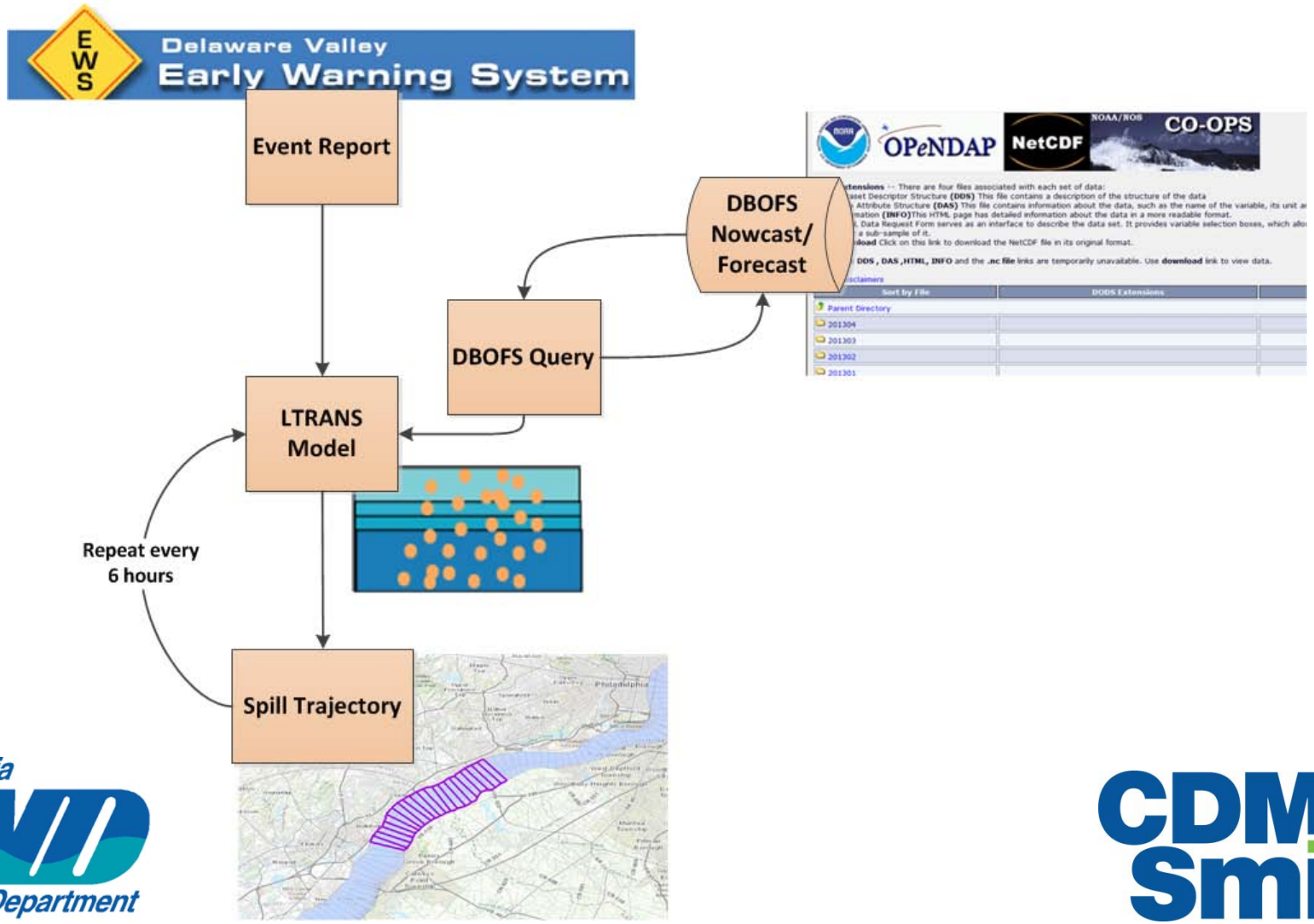
Tidal Model Workflow



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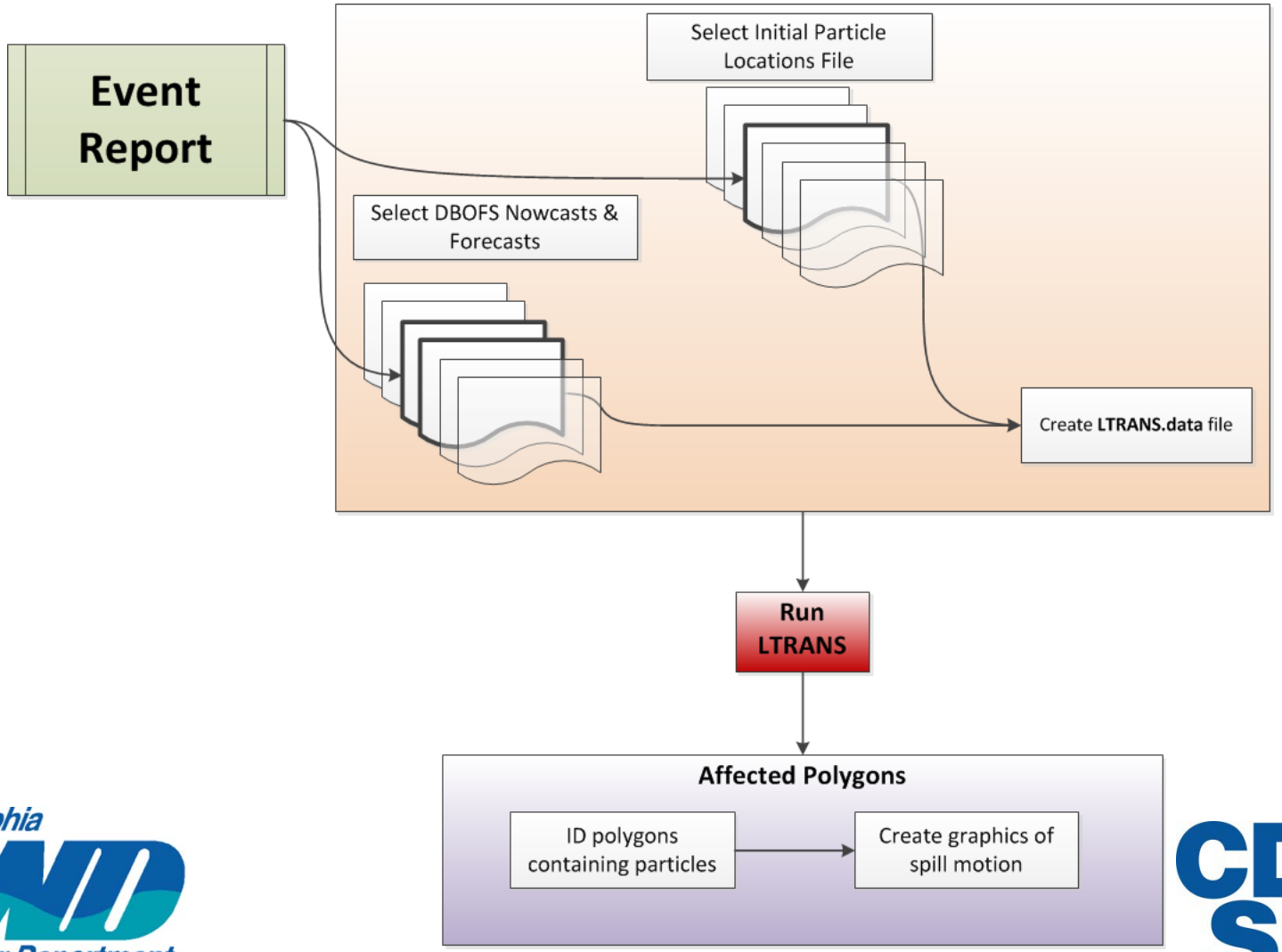
Automated Model Configuration



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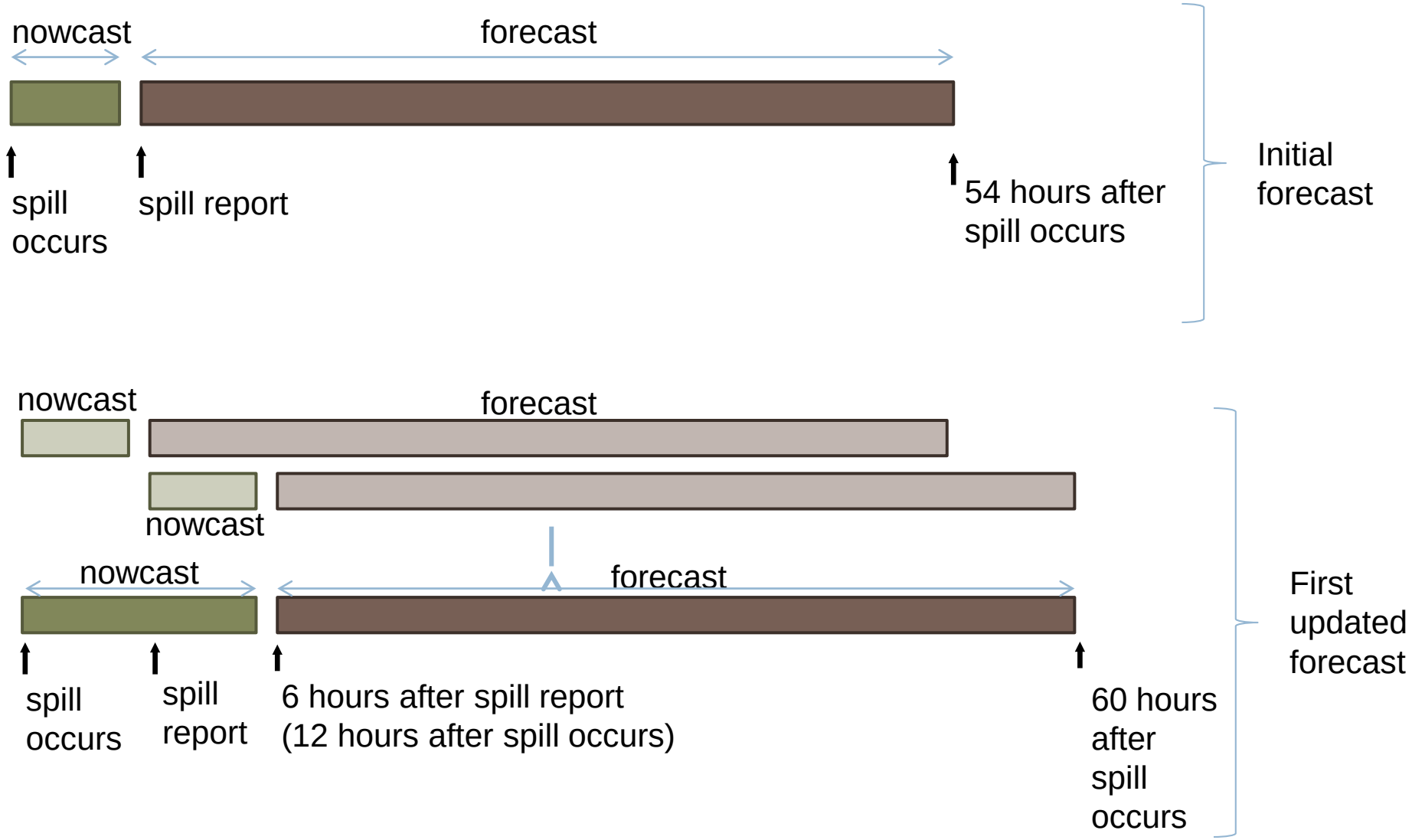
Particle Track Updating



Sources of Uncertainty

- Spill Parameters
  - Location
  - Time
  - Contaminant (characteristics)
  - Quantity
- Upstream boundary conditions
- DBOFS resolution
- LTRANS Settings

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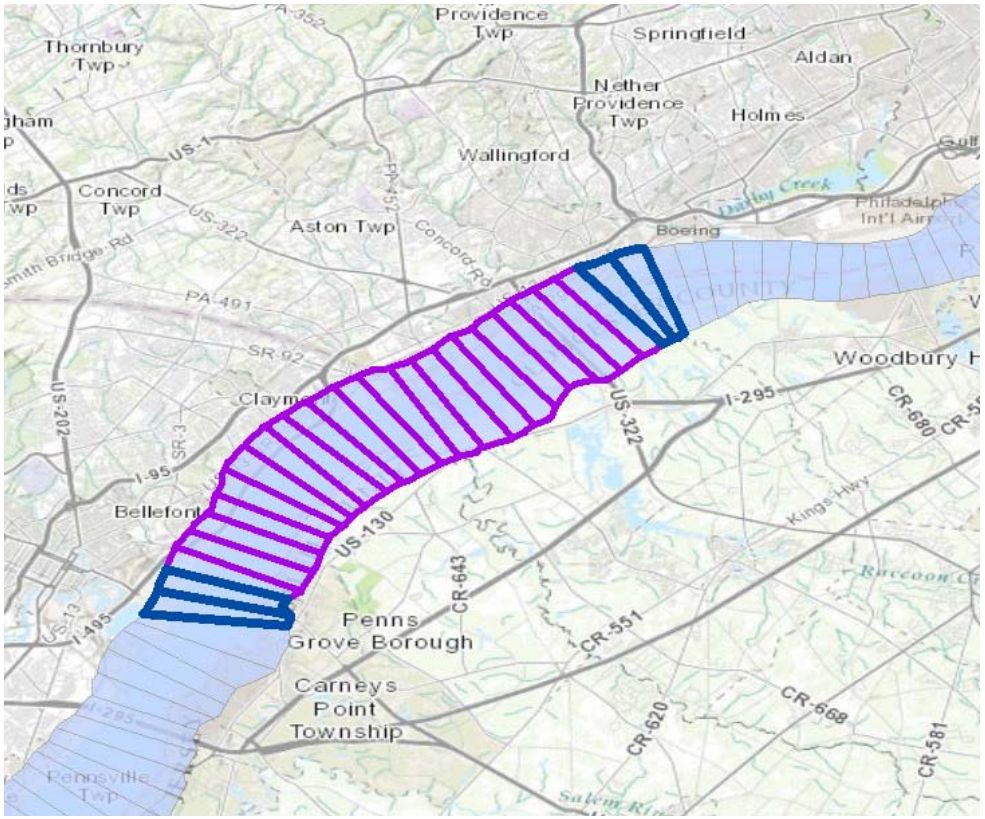
Background variability: create 2 “buffer” polygons up and down stream at all times



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Next Steps

- Diffusivity – test vertically variable diffusivity
- Evaluate number of particles
- Validation
  - Eulerian-Lagrangian Model comparison
  - Dye study

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