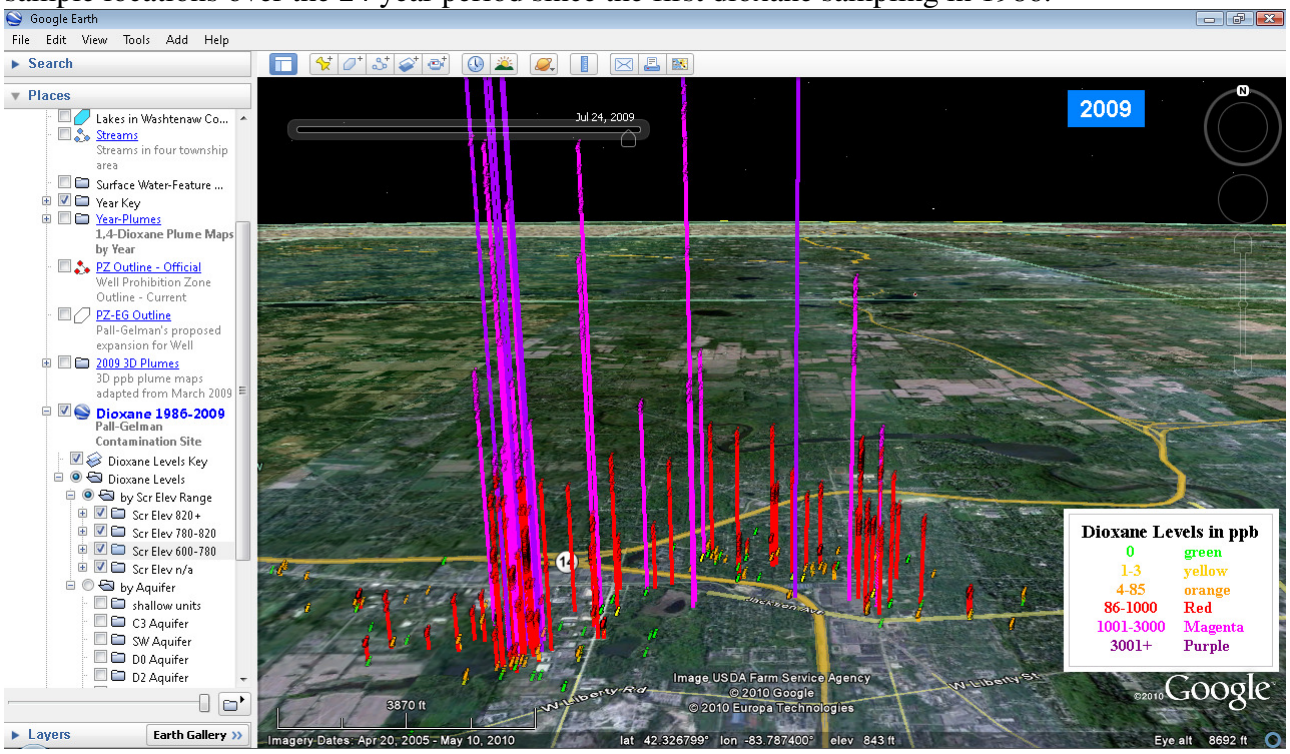
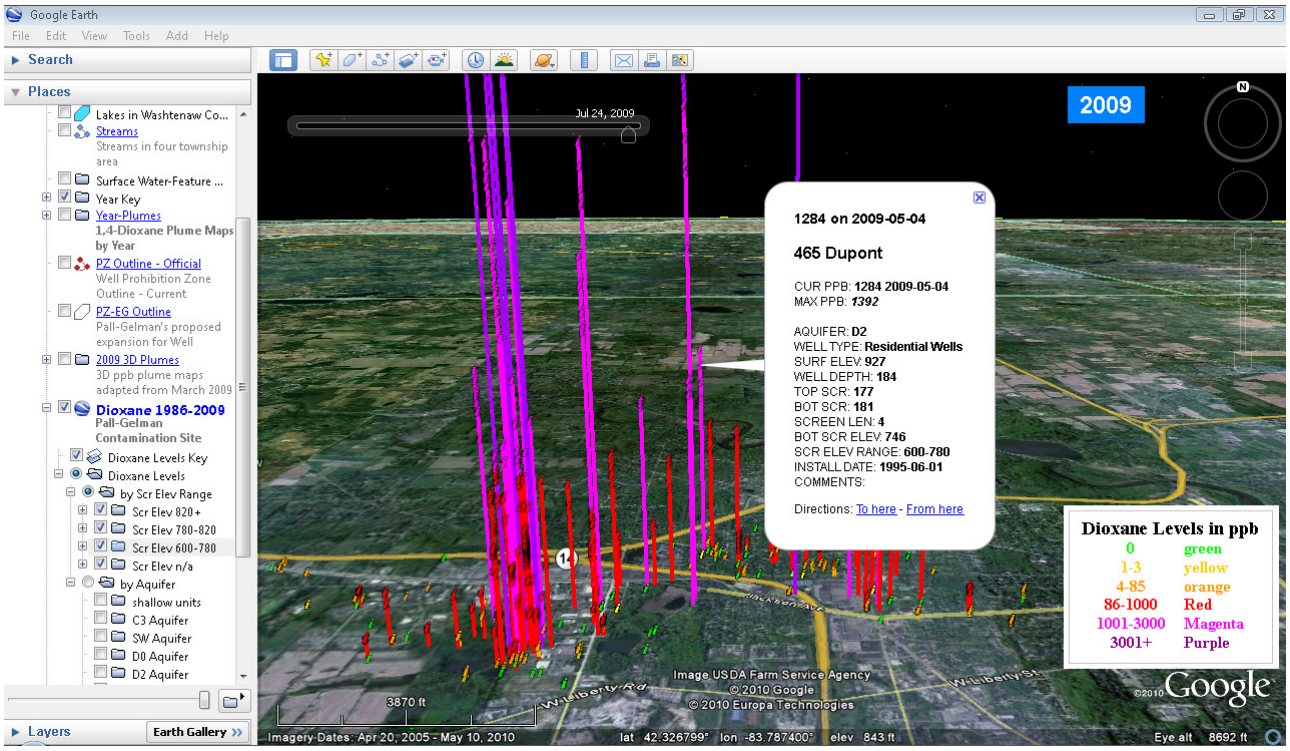
Google Earth: A Platform for Open Data

by Roger Rayle, CSF Associate

Google Earth allows one to mashup information from different sources. For example, I have loaded over 14,000 1,4-dioxane readings from the Pall/Gelman Contamination Site from about 400 sample locations over the 24 year period since the first dioxane sampling in 1986.

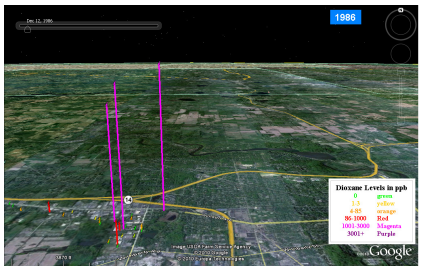


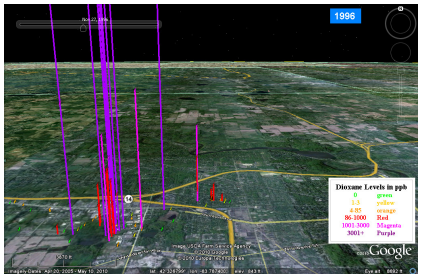
Each dioxane reading is shown as a placemark located at its sampled location and elevated above ground level 1 meter for each part per billion (ppb) of dioxane.
A bar extends from the elevated placemark to the ground forming an in-place bar graph of the dioxane readings. The bar is color-coded by ppb range to let the viewer know which are the higher bars even when the field of view cuts off the top of the bars.

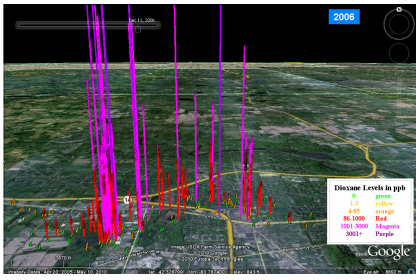


Clicking the "i = information" icon on a bar brings up a pop-up balloon with details about that one data point... Location, Date, ppb, Well depth, Screened Elevation, etc.

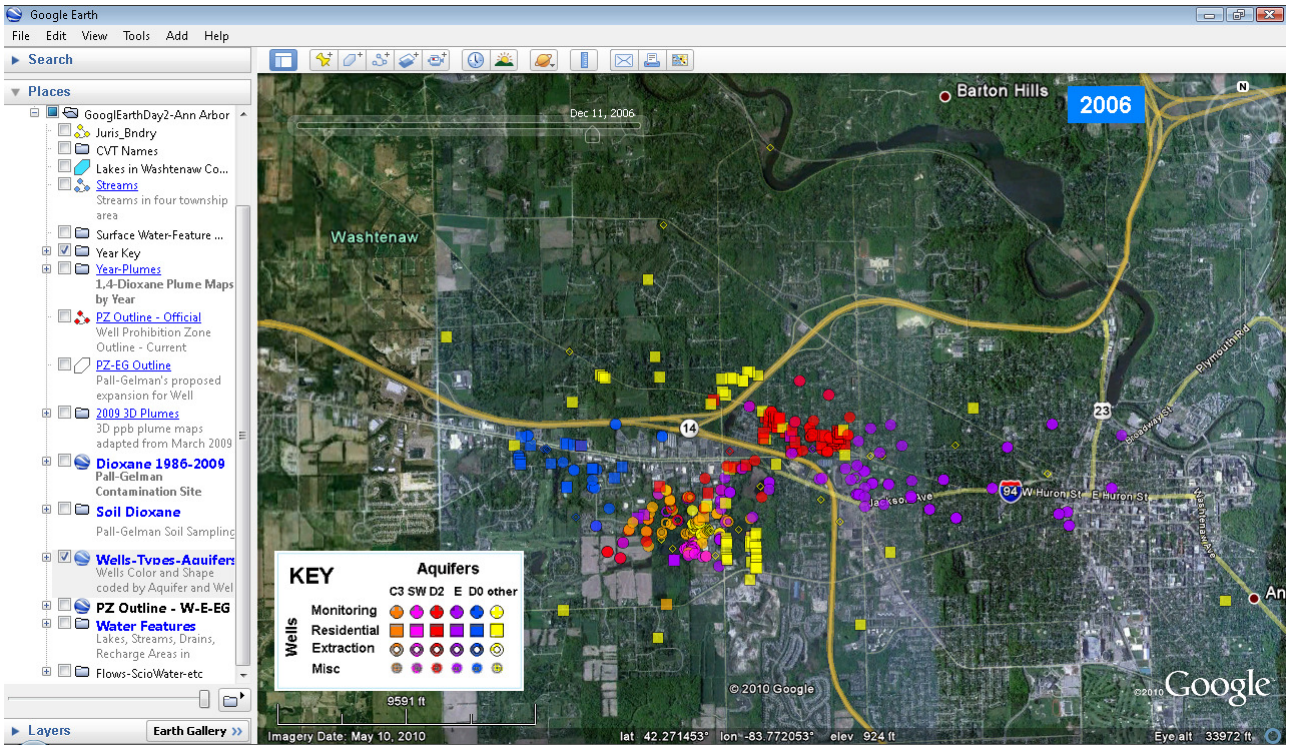
Each data point is time coded to appear at the proper time as the timeline at the top of Google earth is "played". A data point is coded to stay in view for up to a year unless another reading at that location supersedes it. The result is a 4-D bar graph showing the magnitude of where each dioxane reading occurred over time.



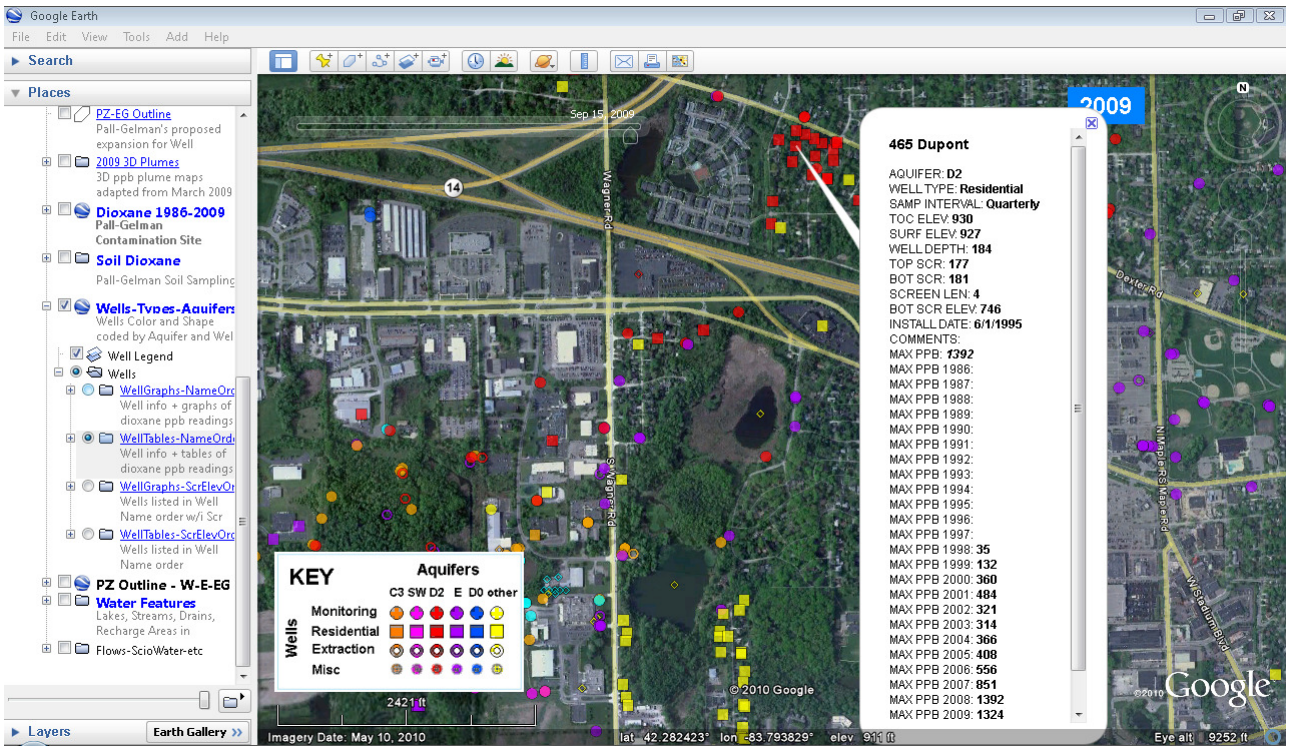


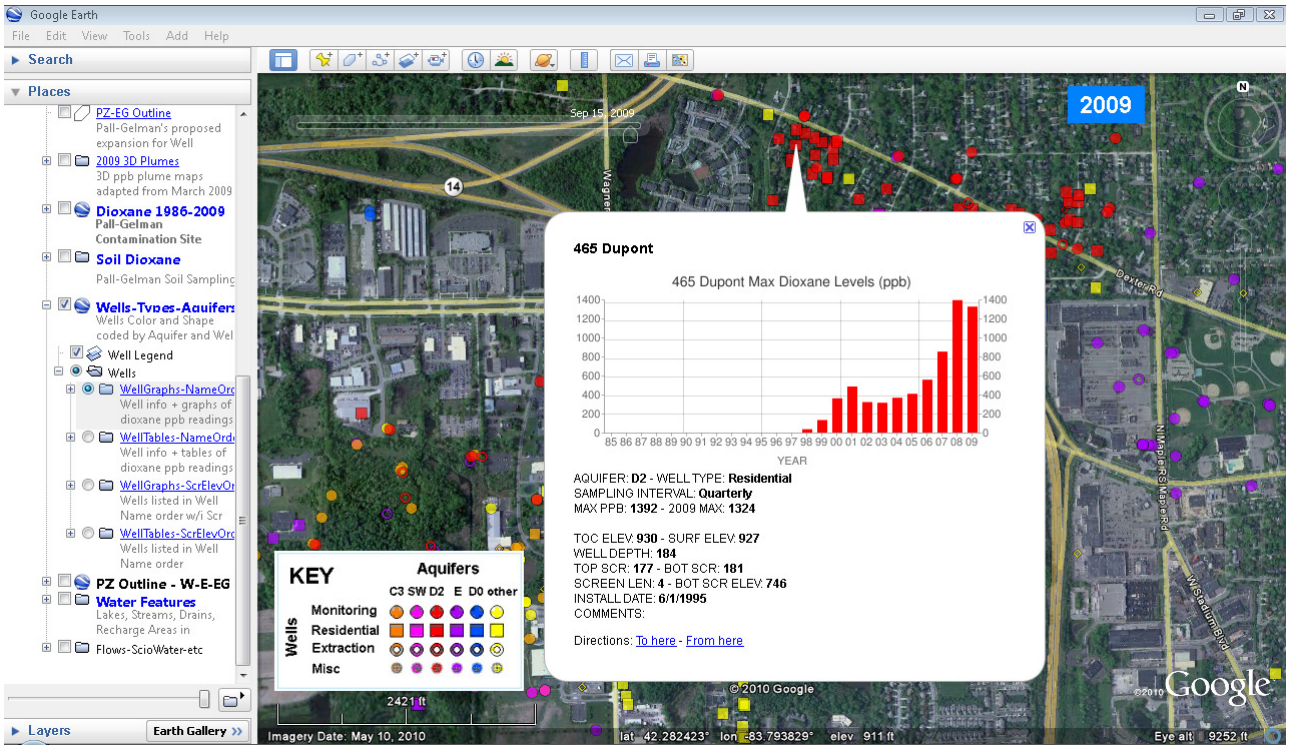


Another layer shows where all of the sampled locations (mostly wells) are, with each well/location icon color-coded by aquifer, and shape-coded by well type.



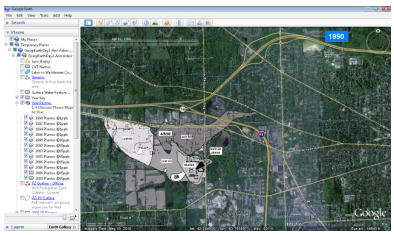
Clicking on an icon brings up a pop-up balloon with details about that sample location/well, e.g. Well Name, Ground Elevation, Screened Elevation, Date Installed, Maximum PPB, Maximum ppb per year, etc.

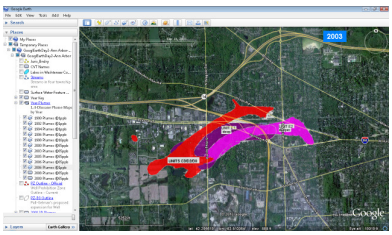


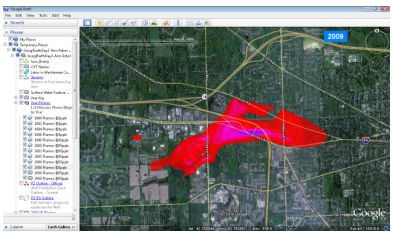


One version of this "Well" layer shows the maximum ppb readings per year in the balloon as a table... another versions shows them in a bar chart. (The bar chart version uses Google Charts API, thus requiring an internet connection to generate the chart in real time.)

Two-dimensional map images can also be overlaid as layers onto the surface of Google Earth. For the Pall/Gelman site, I have overlaid available yearly plume maps generated by the polluter, the

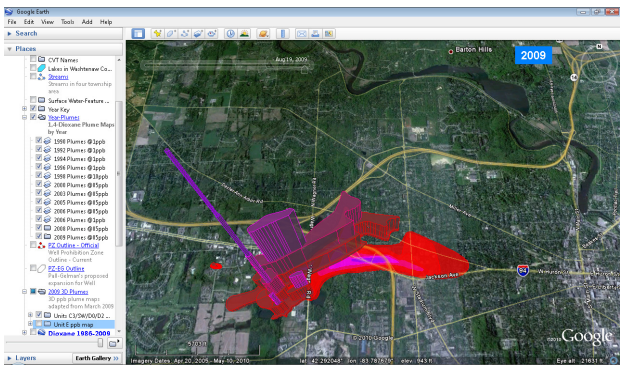


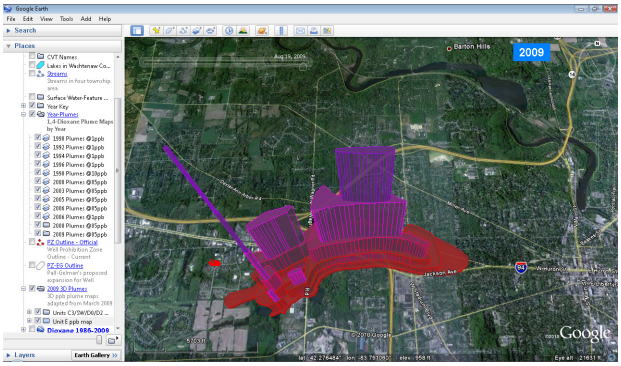




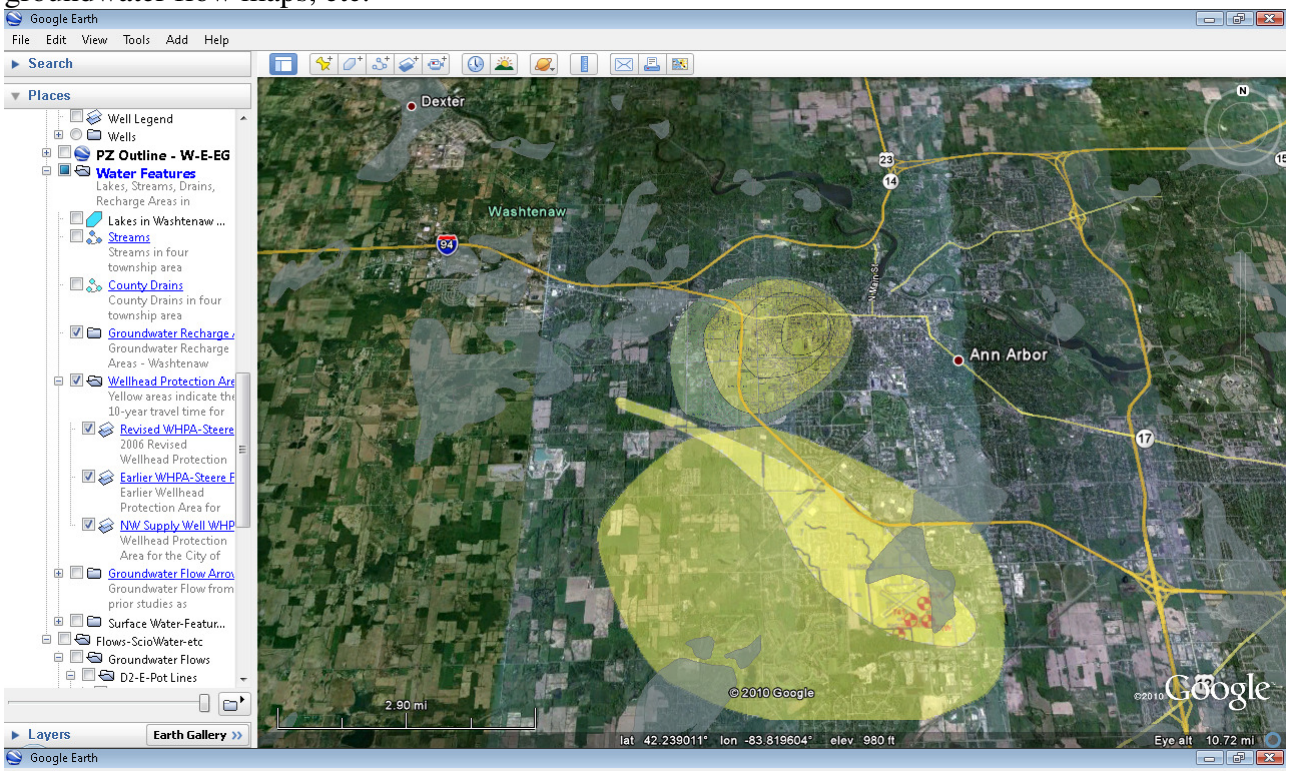
State, and the County to show dioxane plume changes over time..

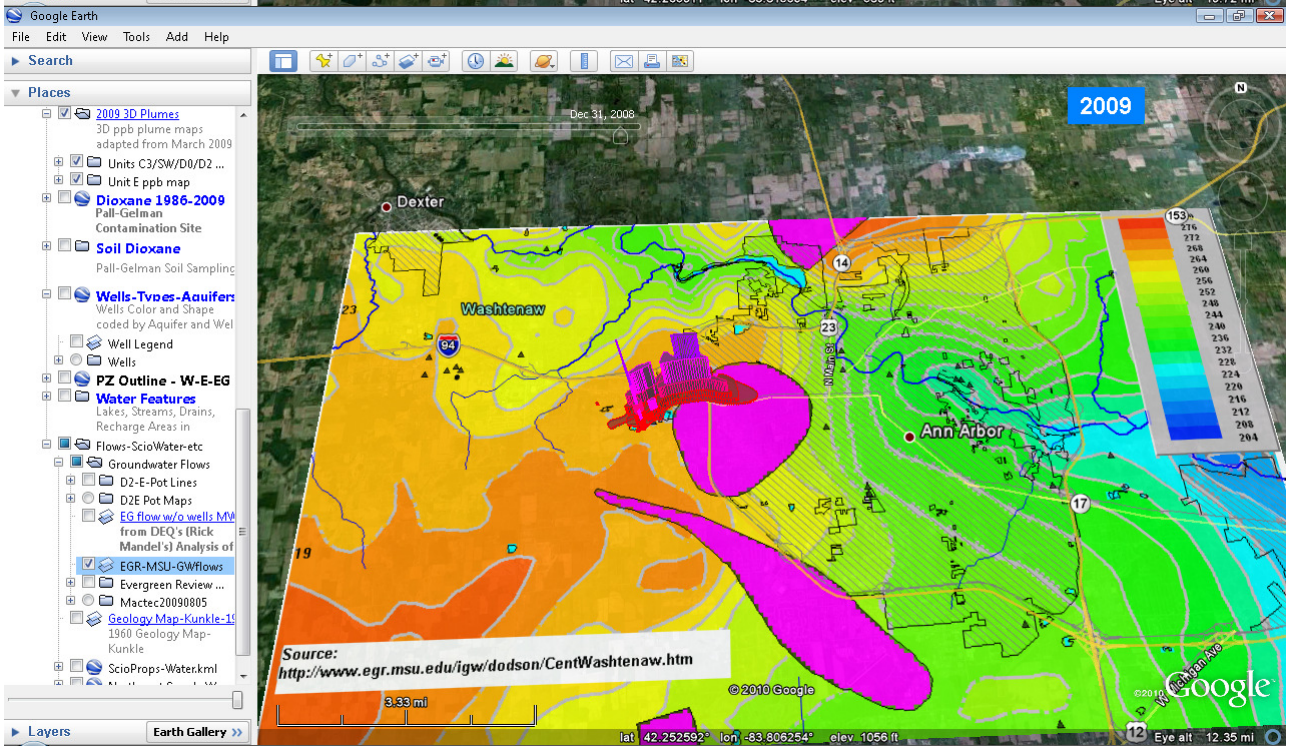
By extruding ppb iso-contour lines up to their appropriate levels, a 2D map becomes a 3D map, conveying more information on how much dioxane is in each aquifer set.

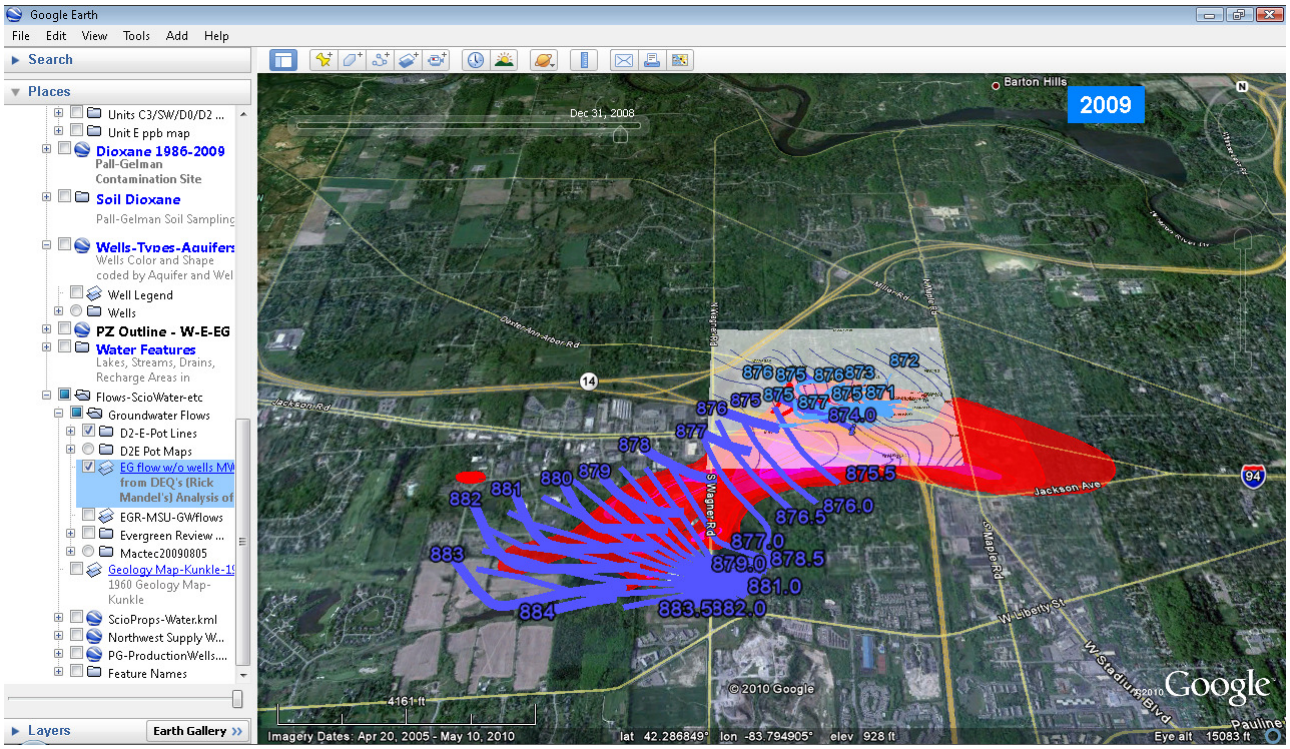




In addition, I have added layers for map images of wellhead protection areas for municipal well sources, images of groundwater recharge areas, images from geology maps, images from groundwater flow maps, etc.

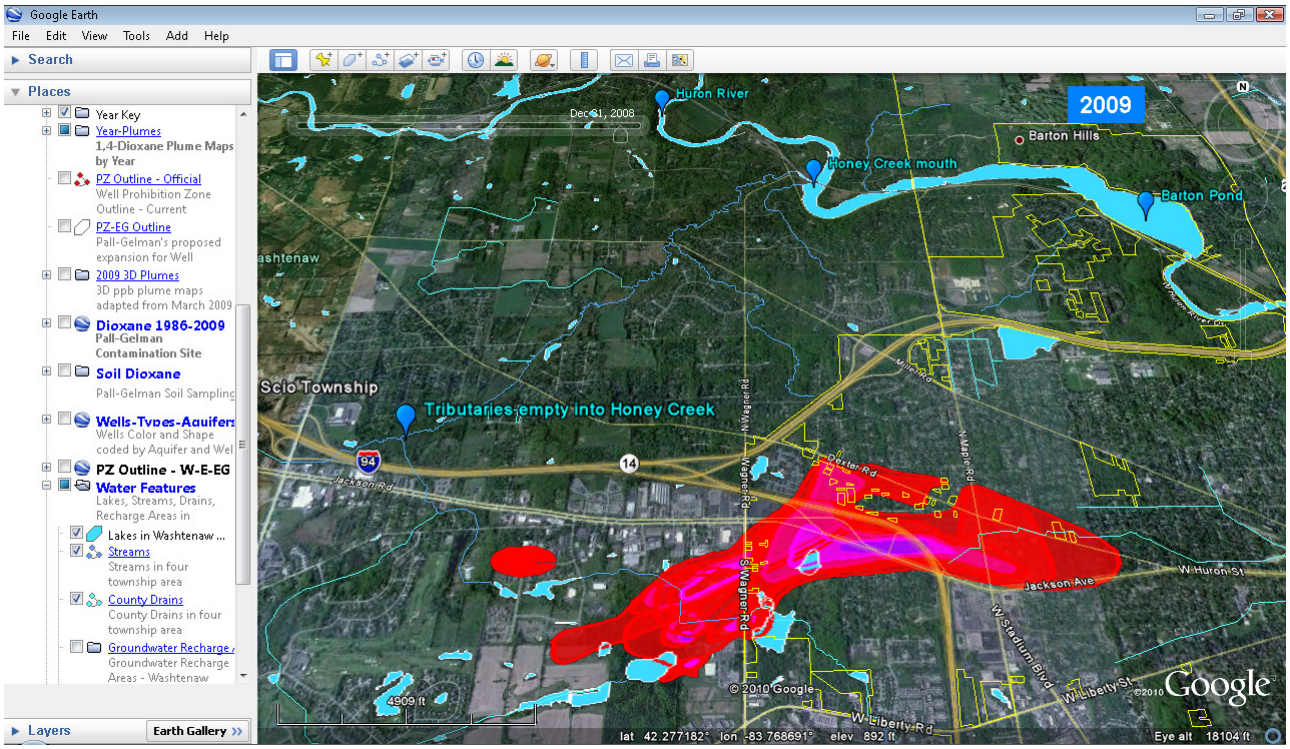




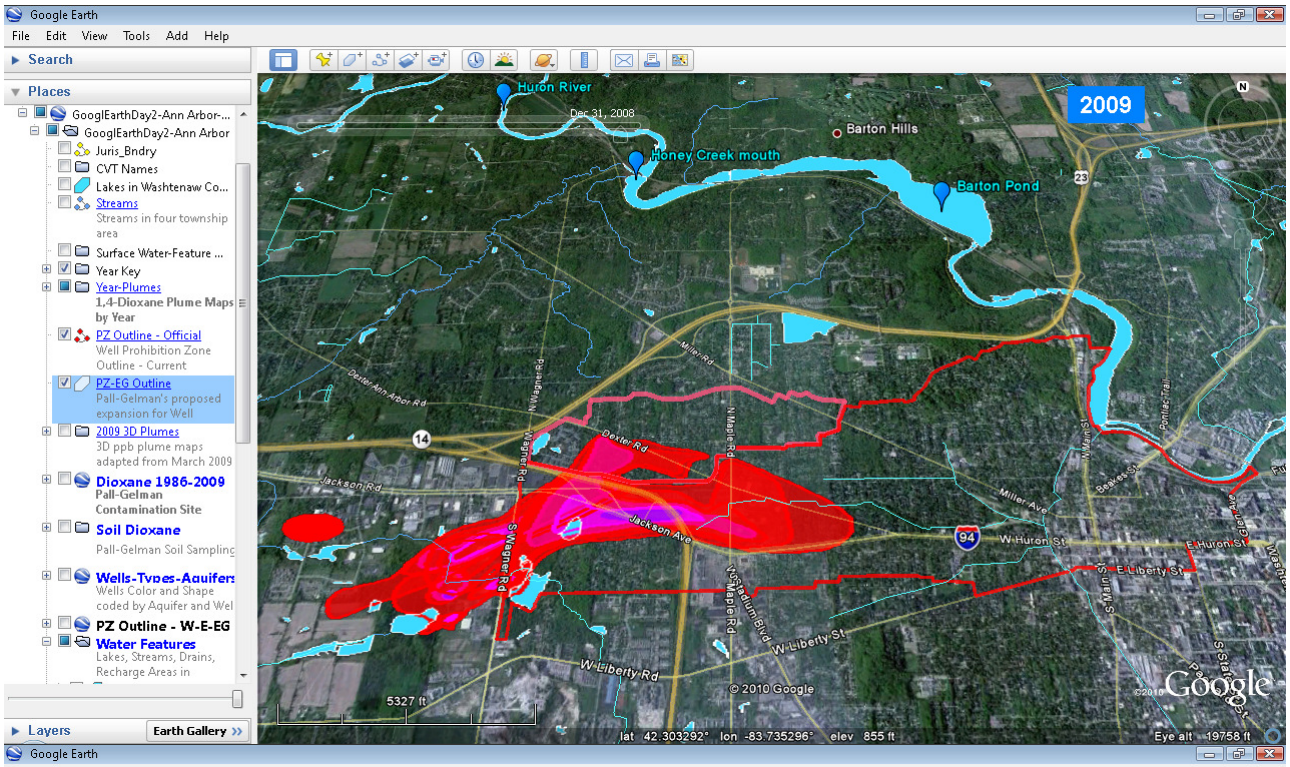


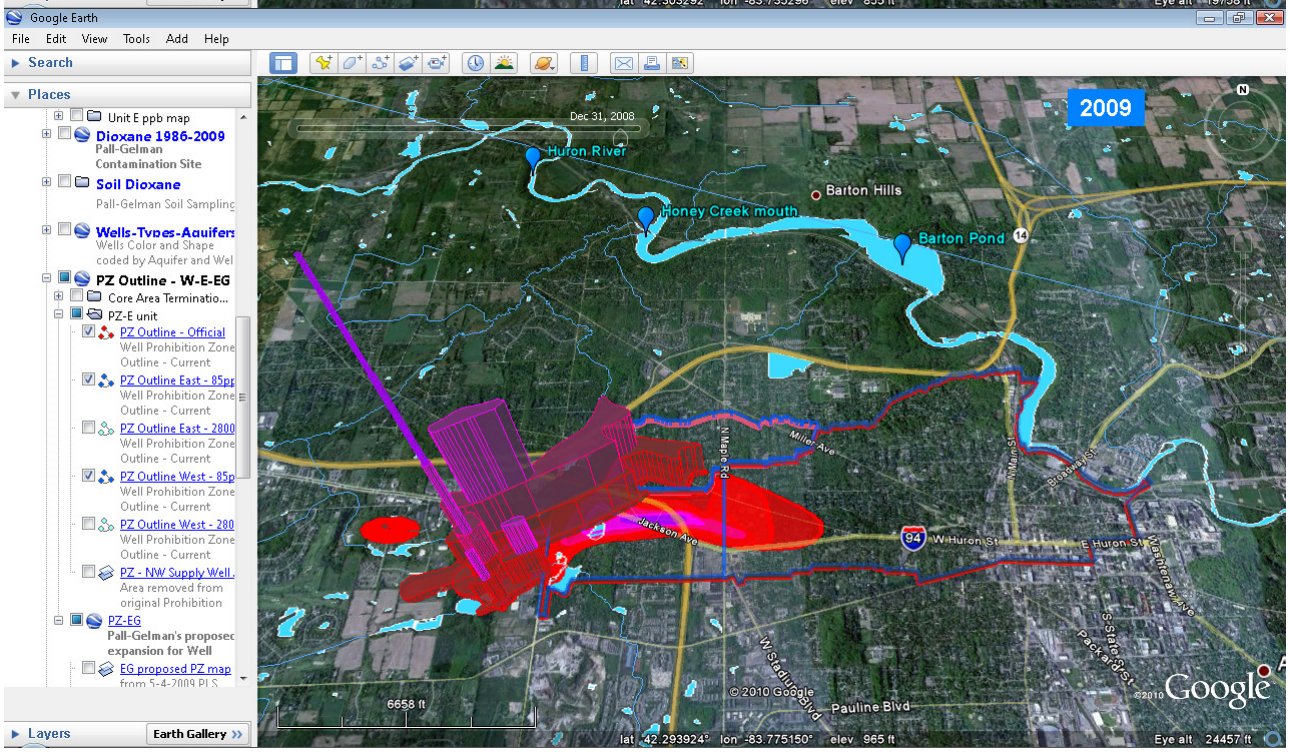
Most of these map images came from PDFs or scans of paper copies which had to be scaled and oriented properly onto Google Earth. Ideally, in the near future, such maps could come in electronically as KML files, pre-geocoded to open up as Google earth layers.

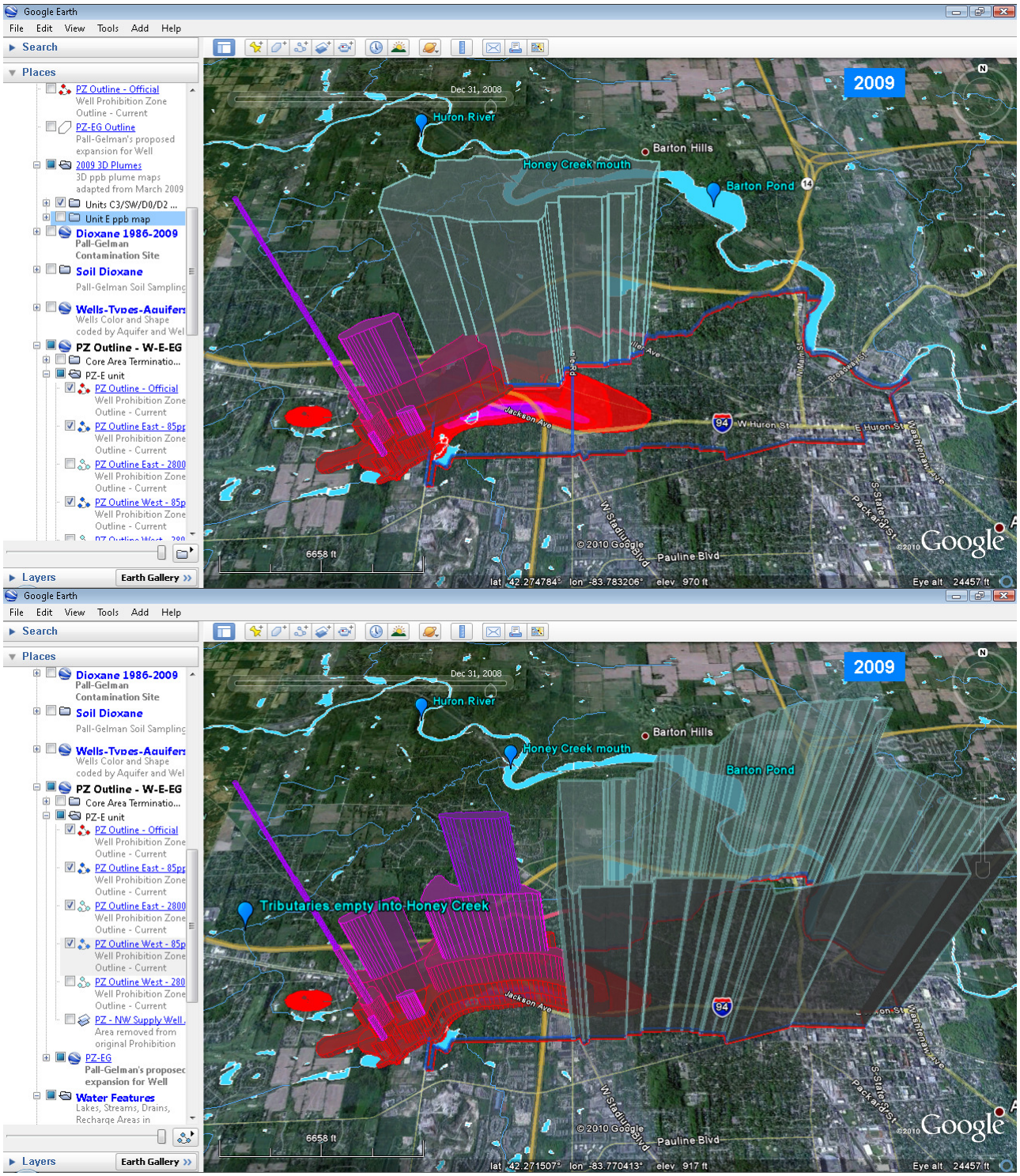
Some other local geographic feature layers have recently been available as KMLs from local government datasets, e.g. Water Bodies, Streams, County Drains, Municipal Boundaries, and of course, the Well Prohibition Zone (PZ) for the Pall/Gelman site.



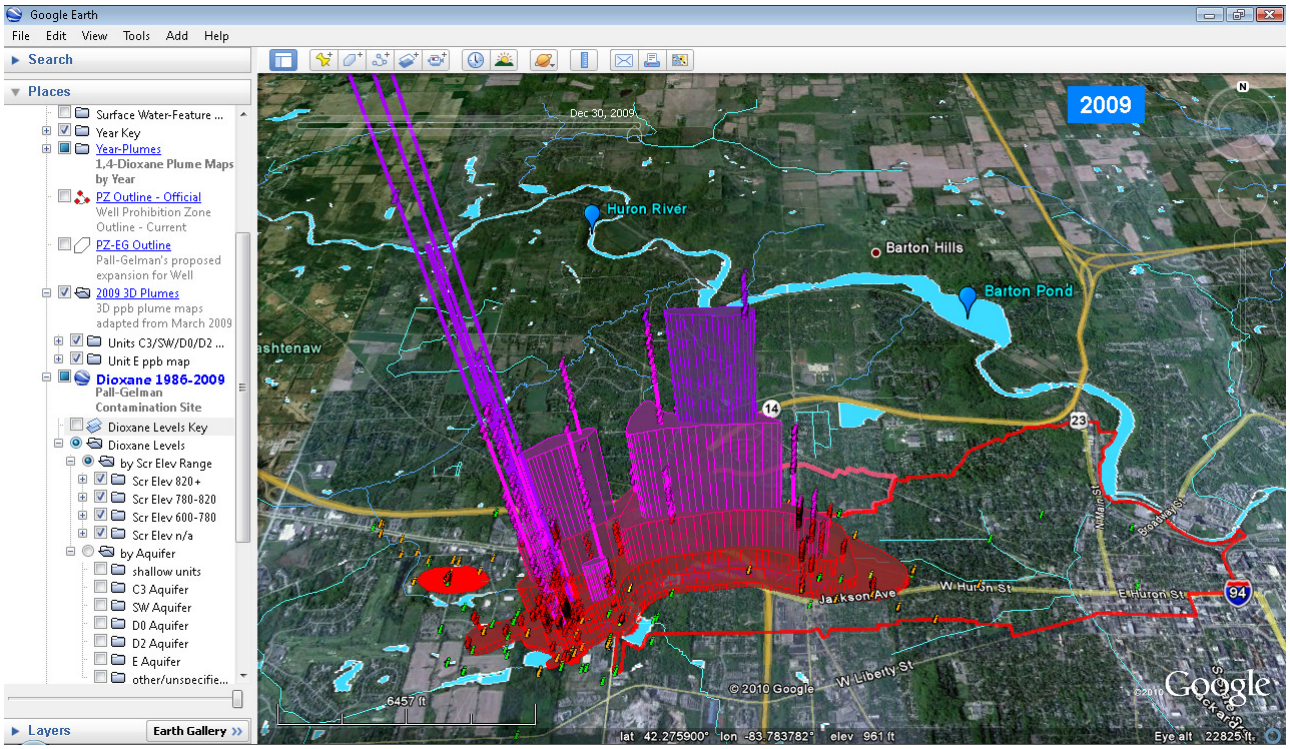
I have augmented the PZ layer to depict the various levels of cleanup required in and around the site by extruding the PZ boundary up to 3, 85, and 2800 meters (scale: 1 meter = 1 ppb) to show "boxes" laterally and "vertically" within which the dioxane is supposed to be contained.


Google Earth
File Edit View Tools Add Help
Search
Places
Layers
Earth Gallery
Huron River
Dec 31, 2008
Honey Creek mouth
Barton Hills
Barton Pond
2009
Dexter-Ann Arbor Rd
Dexter Rd
Jackson Rd
Jackson Ave
Miller Rd
Miller Ave
W Huron St
E Huron St
W Liberty Rd
W Liberty St
E Liberty St
Pauline Blvd
N Maple Rd
N Wagner Rd
S Wagner Rd
N Main St
S State St
Beakes St
Broadway St
Pontiac Trail
Warrenaw Ave
5327 ft
© 2010 Google
lat 42.303292° lon -83.735296° elev 855 ft
Eye alt 19758 ft

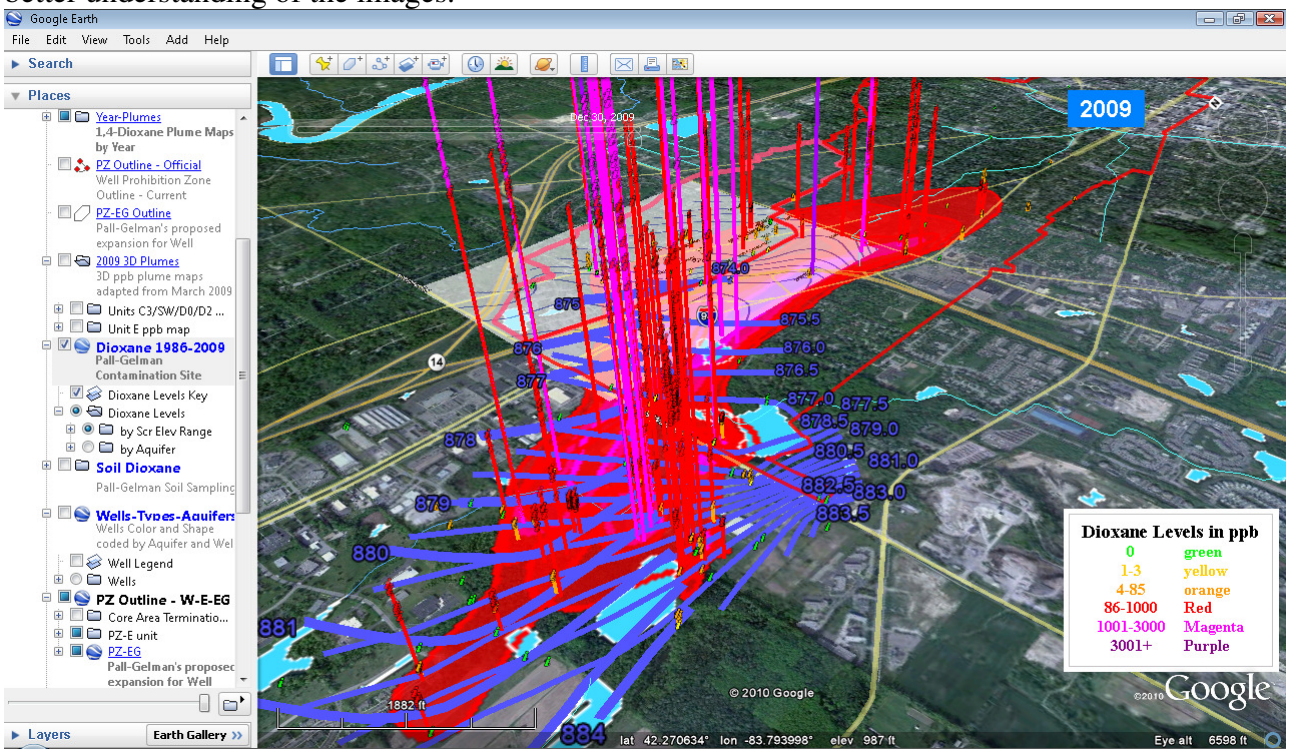

Google Earth
File Edit View Tools Add Help
Search
Places
Layers
Earth Gallery
Dec 31, 2008
Huron River
Honey Creek mouth
Barton Hills
Barton Pond
2009
Jackson Ave
Miller Ave
W Huron St
E Huron St
W Stadium Blvd
Pauline Blvd
N Maple Rd
N Main St
S State St
Broadway St
Warrenaw Ave
6658 ft
© 2010 Google
lat 42.293924° lon -83.775150° elev 965 ft
Eye alt 24457 ft



By mashing up all these various layers together, Google Earth provides an effective platform for decision making for complex situations.

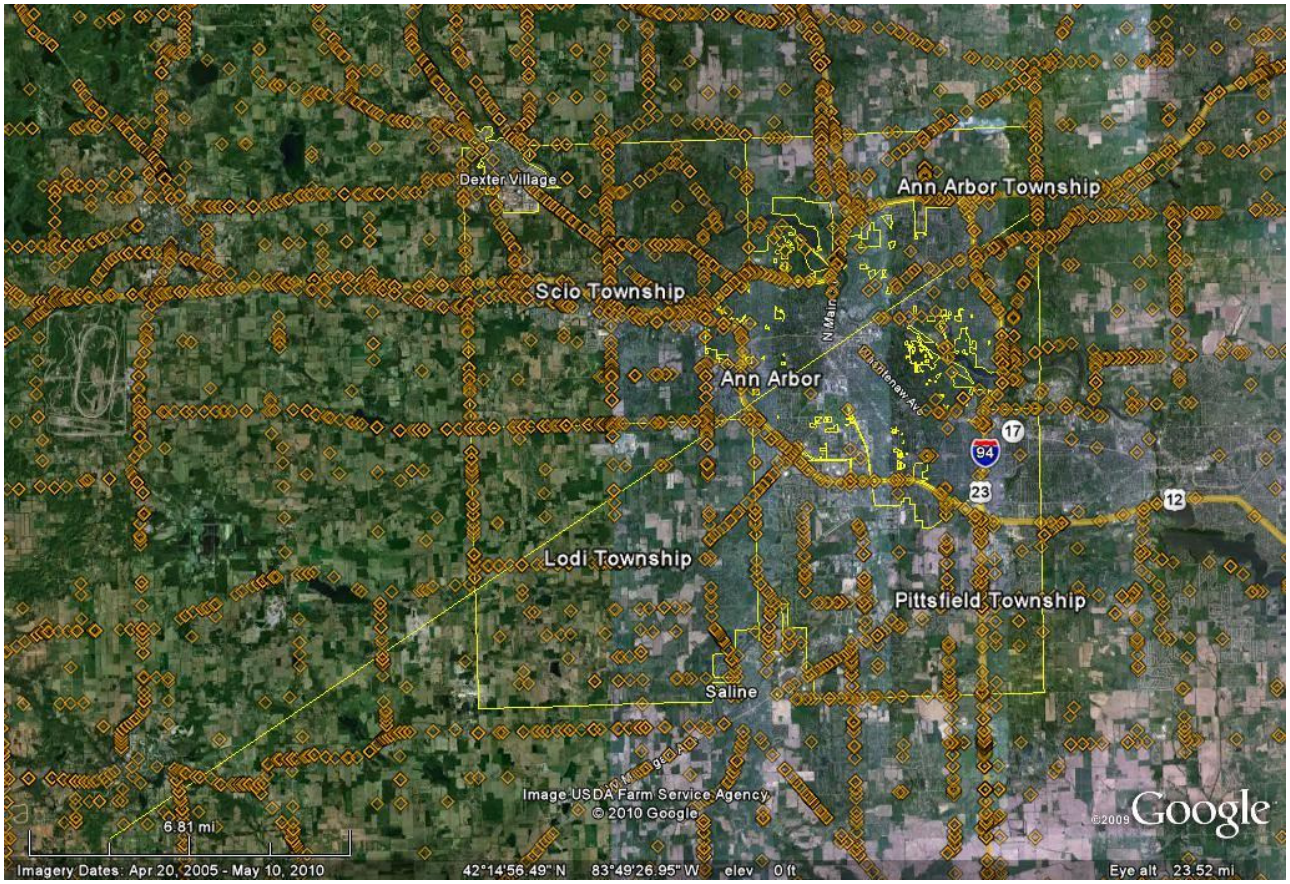


Furthermore, Google earth allows one to view chosen layers from any direction, range, and tilt for better understanding of the images.

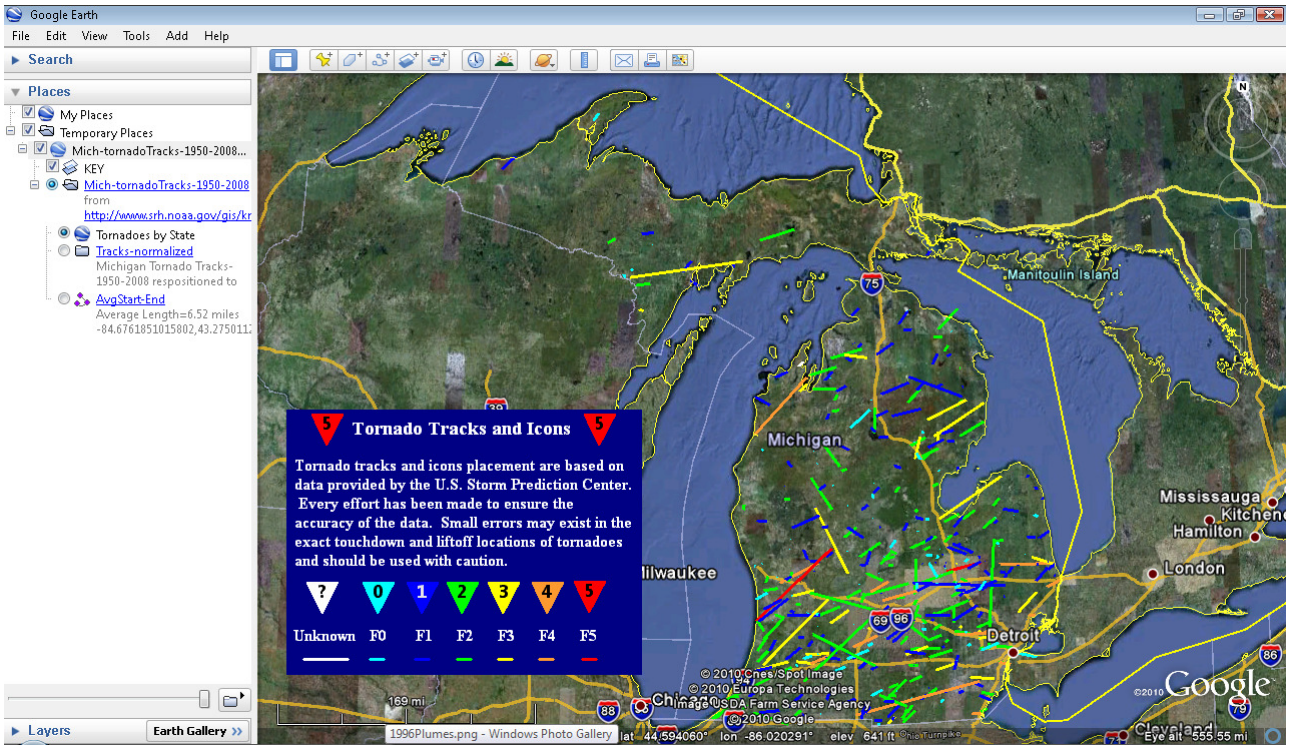


Google Earth is useful for depicting reality for more ordinary issues. Within recent months, I have mashed up publicly available datasets to address some current local issues:

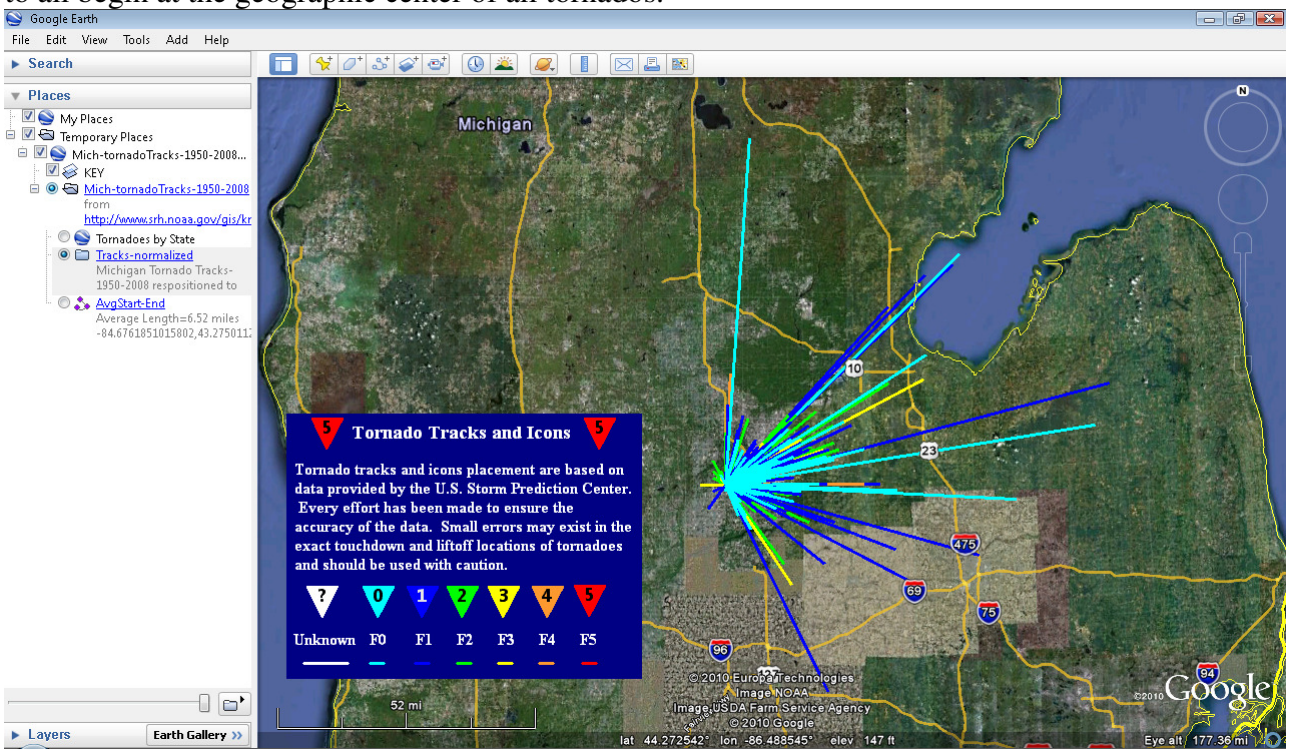
Car/deer incidents 2004-2008



Tornados in Michigan 1950-2008



To test the theory that most tornados come from the southwest direction, I shifted the tornado paths to all begin at the geographic center of all tornadoes.



This adjusted layer shows that only a small number of Michigan tornados end up west from where started and most do go northeasterly. However, some of the longer tornados went in unusual directions, e.g. straight north or south-southeast.

Some huge advantages of using Google Earth are that it is free, easy to use, widely available, already pre-loaded with periodically updated base layers, and easy to add one's own data layers, and easy to share the resulting mashups through various means.

In conclusion, Google Earth is an effective platform for depicting simple to complex datasets that have geographical elements. Even with the free version of Google Earth, one can make useful mashups of one's own data to create effective presentations and decision support tools, but the mashups are enhanced with the incorporation of relevant, publicly available, geo-coded datasets.

As more and more geo-coded datasets become available from forward thinking private and public sources, finding and incorporating these data as layers in one's Google Earth mashups will continue to be much easier. Relationships between various information layers will be more evident and the reality of situations covered will be easier to grasp.

Two major ongoing challenges often remain:

1. Getting appropriate public datasets geo-coded and shared in an "open" standard format like KML
2. Getting traditionally oriented decision makers comfortable using "open" data aggregating tools like Google Earth.