

City of San Diego Analyzes Ocean Data with Dynamic GIS Tools

Leveraging Web 2.0 Technology

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What we will cover today

- Who we are
- What we do
- **BioMap** Overview
 - Purpose
 - Architecture
 - User Interface
 - Tools
 - **Data Inspectors**
 - CTD
 - Bacteriology
 - Benthic communities
- Summary & Future Directions...



All in 30 minutes...

The City of San Diego Wastewater System and Facilities



- Wastewater collection
 - 1.3 million people
- Advanced primary treatment and disposal for 15 municipalities
 - 2.2 million people
- Treatment Plants = 4
- Volume of wastewater treated
 - 62,000,000,000 gallons / year

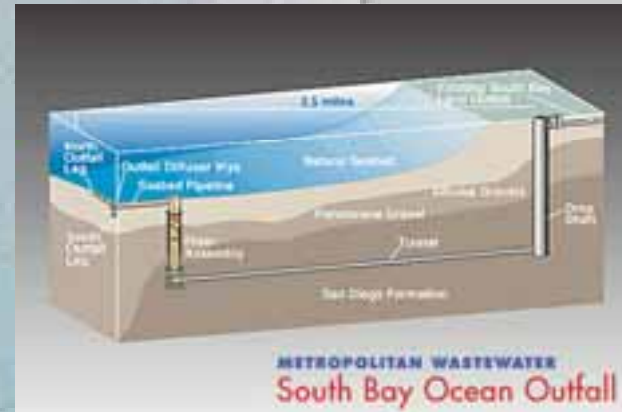
City of San Diego Public Utilities Department Environmental Monitoring & Technical Services Division (EMTS)



Point Loma WTP

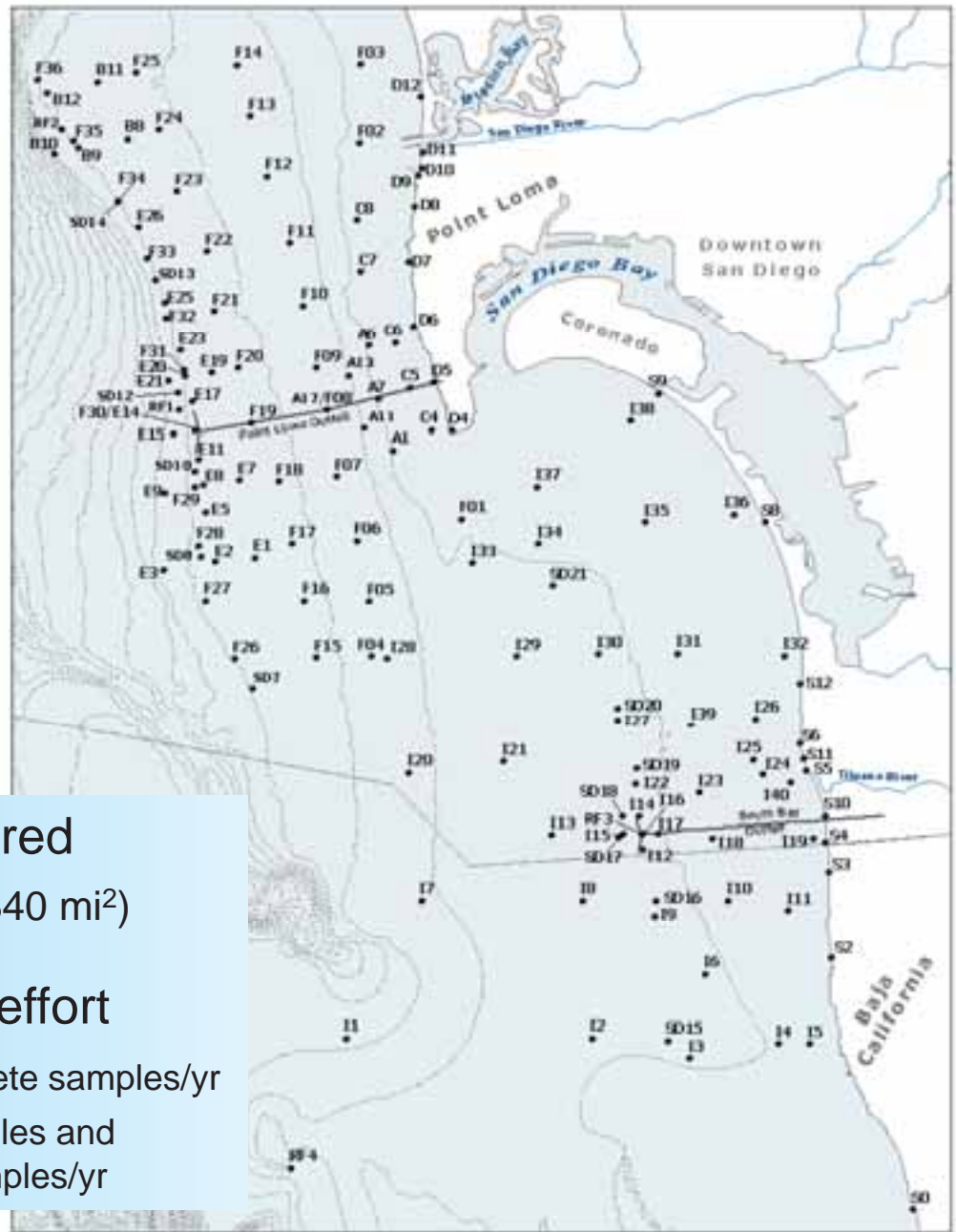
Point Loma (PL) Ocean Outfall

- Since 1963
- extended in 2003
- now ~7.2 km long (4.5 mi)
- discharges ~175 MGD
- @ depth of 100m (320 ft)



South Bay (SB) Ocean Outfall

- Since 1999
- ~5.6 km long (3.5 mi)
- discharges ~20 MGD
- @ depth of 27m (90 ft)



Total area covered
~880 km² (~340 mi²)

Total sampling effort
7,838 – total discrete samples/yr
26,178 – total samples and subsamples/yr

Ocean Monitoring Program Research Data



NPDES Permit Reqs

- Bacteriology / Beach Closures
- Water quality (CTD)
- Sediment contaminants
- Benthic communities
- Fish size & abundance
- Bioaccumulation
- Toxicology
- Moored Observation System (2006)
- Remote Sensing (2002)

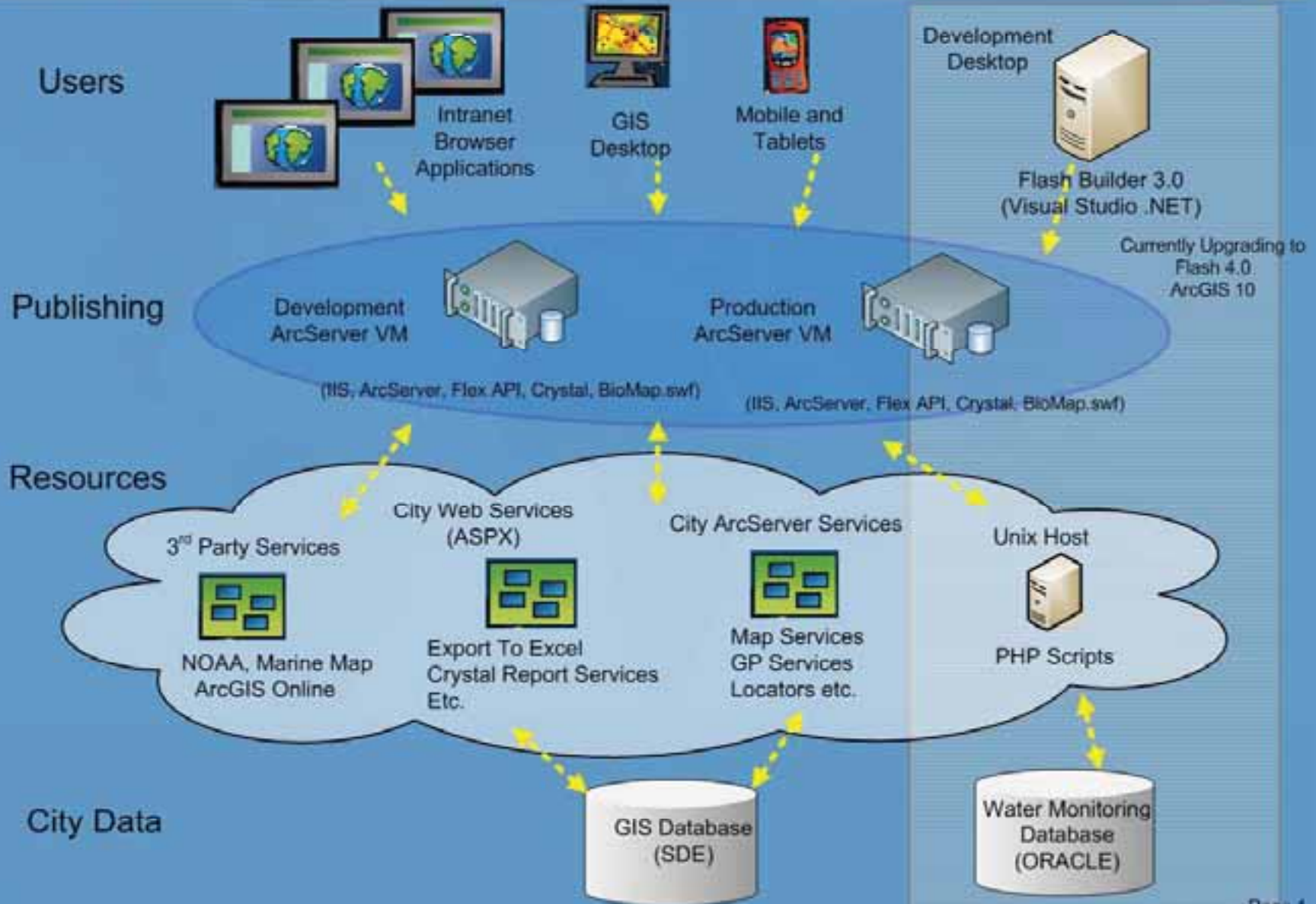
BioMap

- All staff can dynamically analyze data
 - Instant feedback loop
- Huge dataset with many parameters and conditions
- Results for on-the-fly queries
- Trends, History and Outliers

Exploration

- Rapid data overlay
- Flexible Queries
- Direct Link to Oracle database
- Printing, Exporting to Excel, and Reporting
- Spatial Distribution Statistics

BioMap Infrastructure



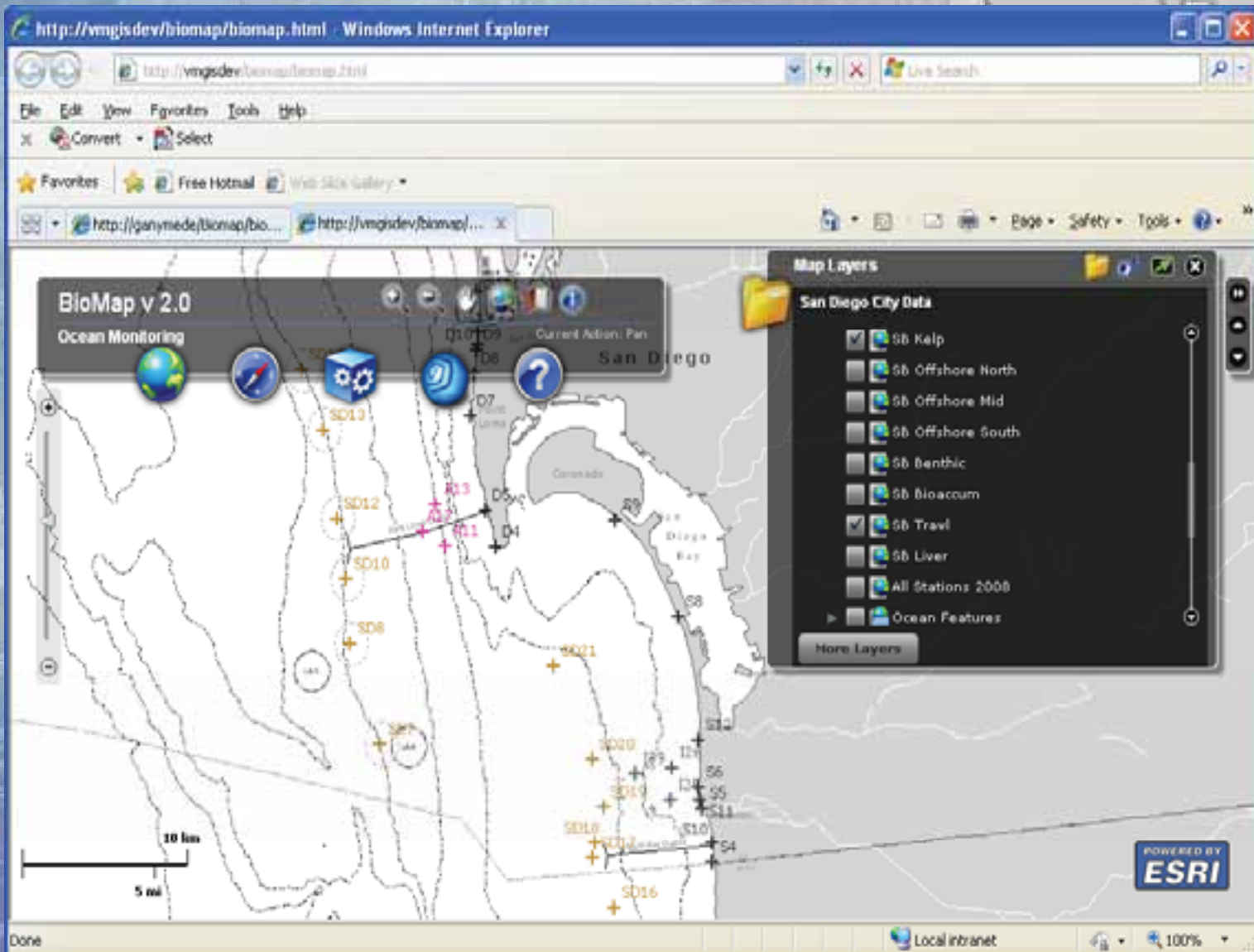
Standard GIS Tools

The screenshot shows the BioMap v 2.0 web application running in a Windows Internet Explorer browser. The browser's address bar displays the URL `http://emgsdev/biomap/biomap.html`. The application interface includes a top navigation bar with icons for home, search, and help. Below this is a main map area showing a satellite-style map of a coastal region. A data popup is visible over the map, displaying the text: "Area: 131.47 sq km" and "Perimeter: 88.66 km". To the left of the map is a vertical toolbar with icons for "Map Layers", "Overview Map", "Print Standard Map", and "Print Screen Map". To the right of the map is a "Tools" panel with icons for "Identify", "Select Stations", "Station Distance", "Draw and Measure", and "Directions". A "Draw and Measure" dialog box is open over the map, showing various drawing tools like a point, line, polygon, and rectangle, along with a text input field and a "Draw" button.

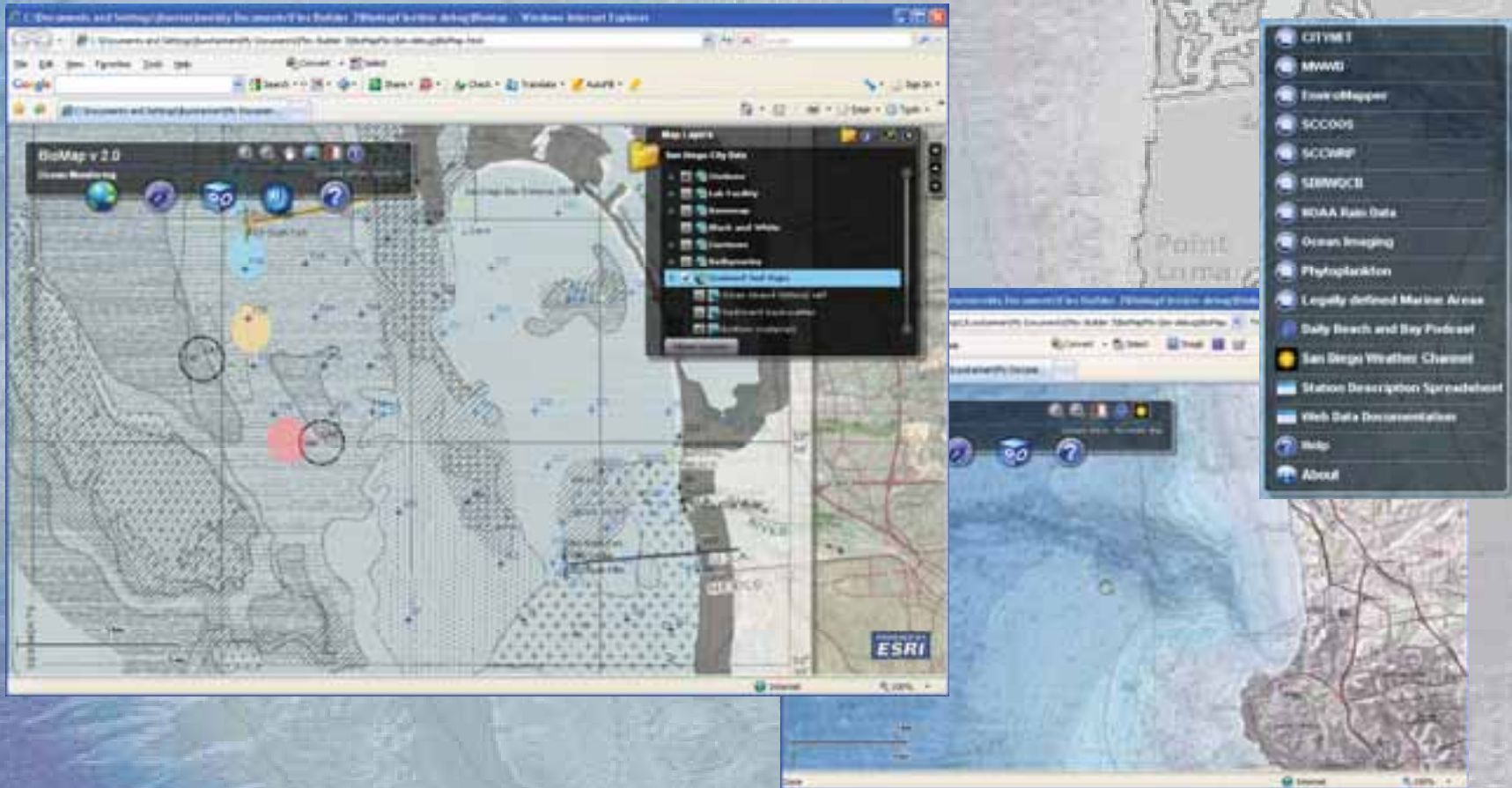
The "Station Distance" dialog box is shown, featuring a "Pair of Stations" section. It contains two dropdown menus: "From Station" set to "P10 Center" and "To Station" set to "C3". There are checkboxes for "To Point" next to each dropdown. A "Calculate" button is positioned below the dropdowns. The dialog also displays two output fields: "Distance in Meters" with the value "1.462" and "Distance in Kilometers" with the value "0.909". A "Reset" button is located at the bottom right of the dialog.

The "v 2.0" navigation menu is displayed, showing a list of interactive options. The menu items are: "Zoom In", "Zoom Out", "Pan", "Full Extent", "Bookmarks", "Find: By Address", "Find: By Lat Long", "Find: By Map", "Find: By Query", and "Find: By List". Each item is accompanied by a small icon representing its function. The menu is styled with a blue background and white text.

Cached templates

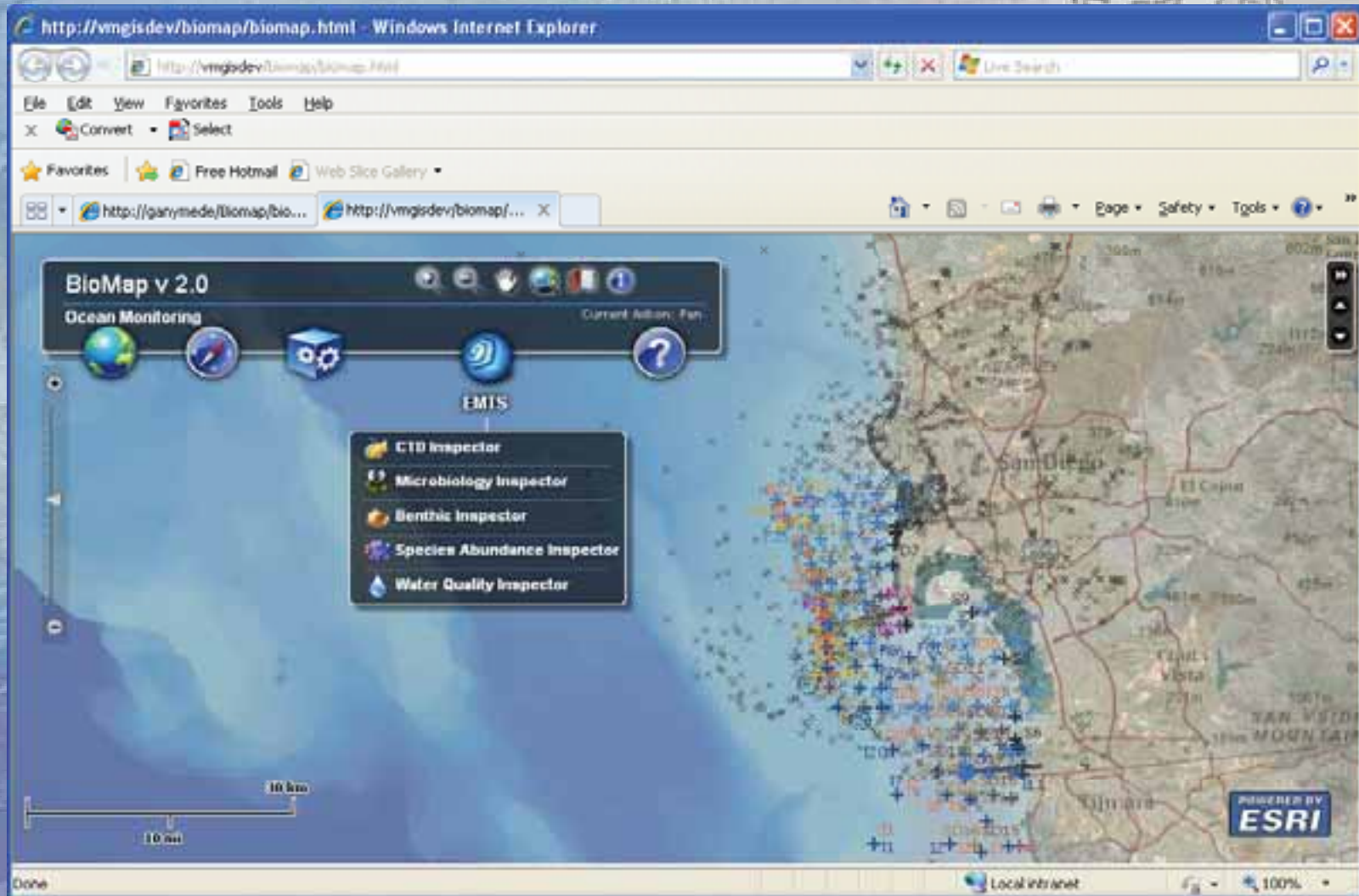


Mash-Up of Local and National, Current and Historical Map Data

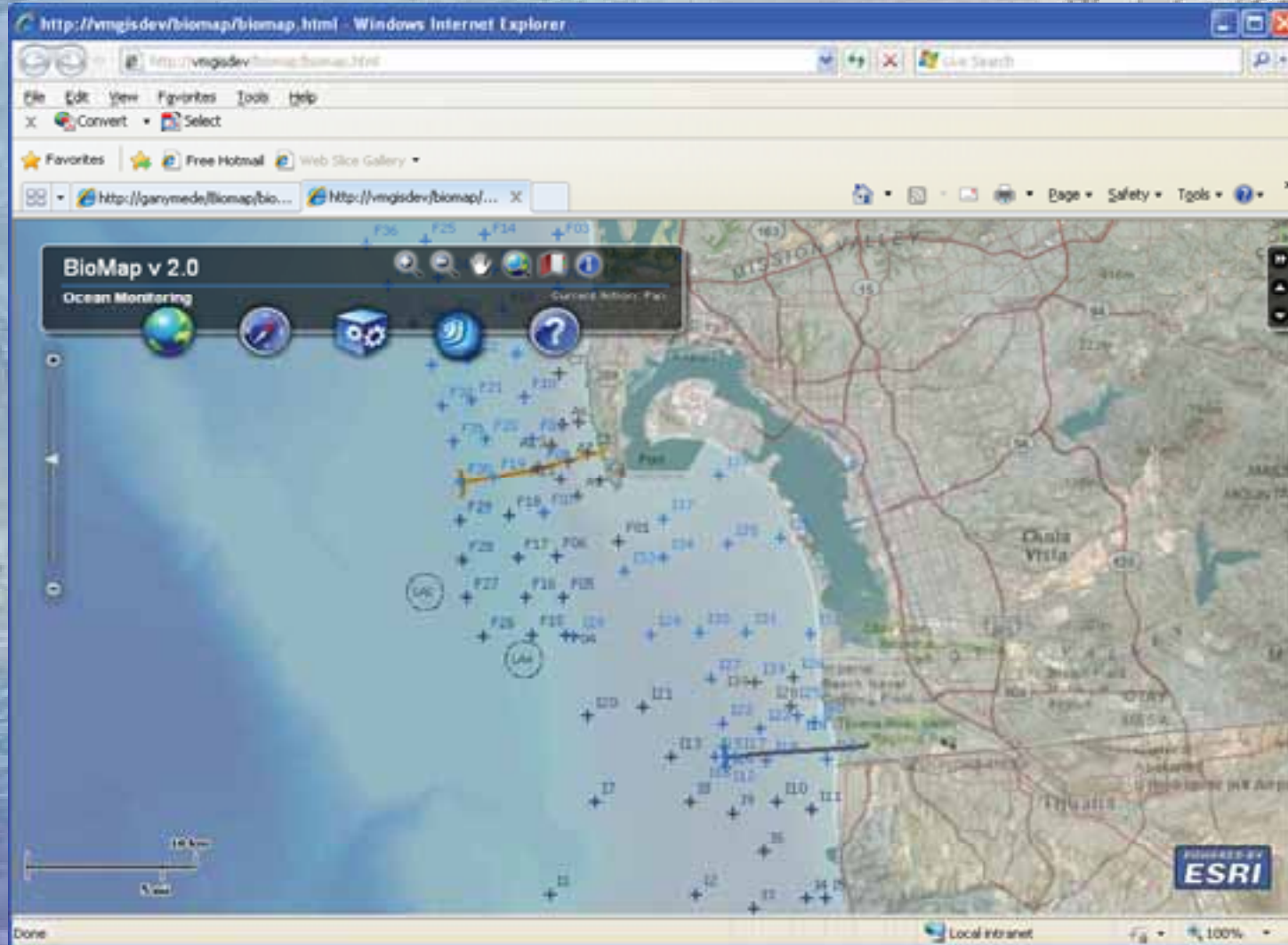


La Jolla Canyon bathymetry with hillshade and USGS Topo from ArcGIS online:

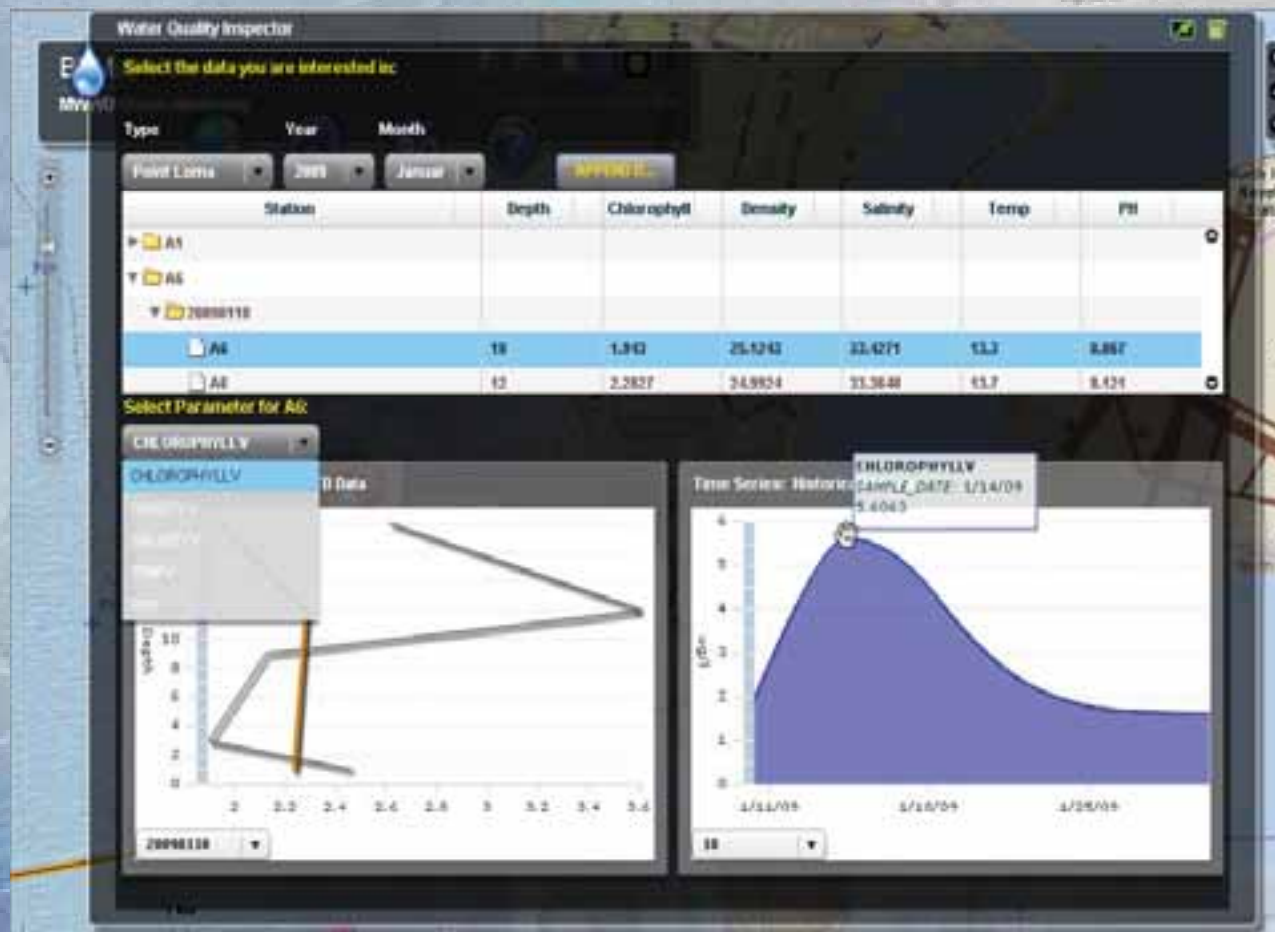
Not-so-standard GIS tools: the Marine Data Inspectors



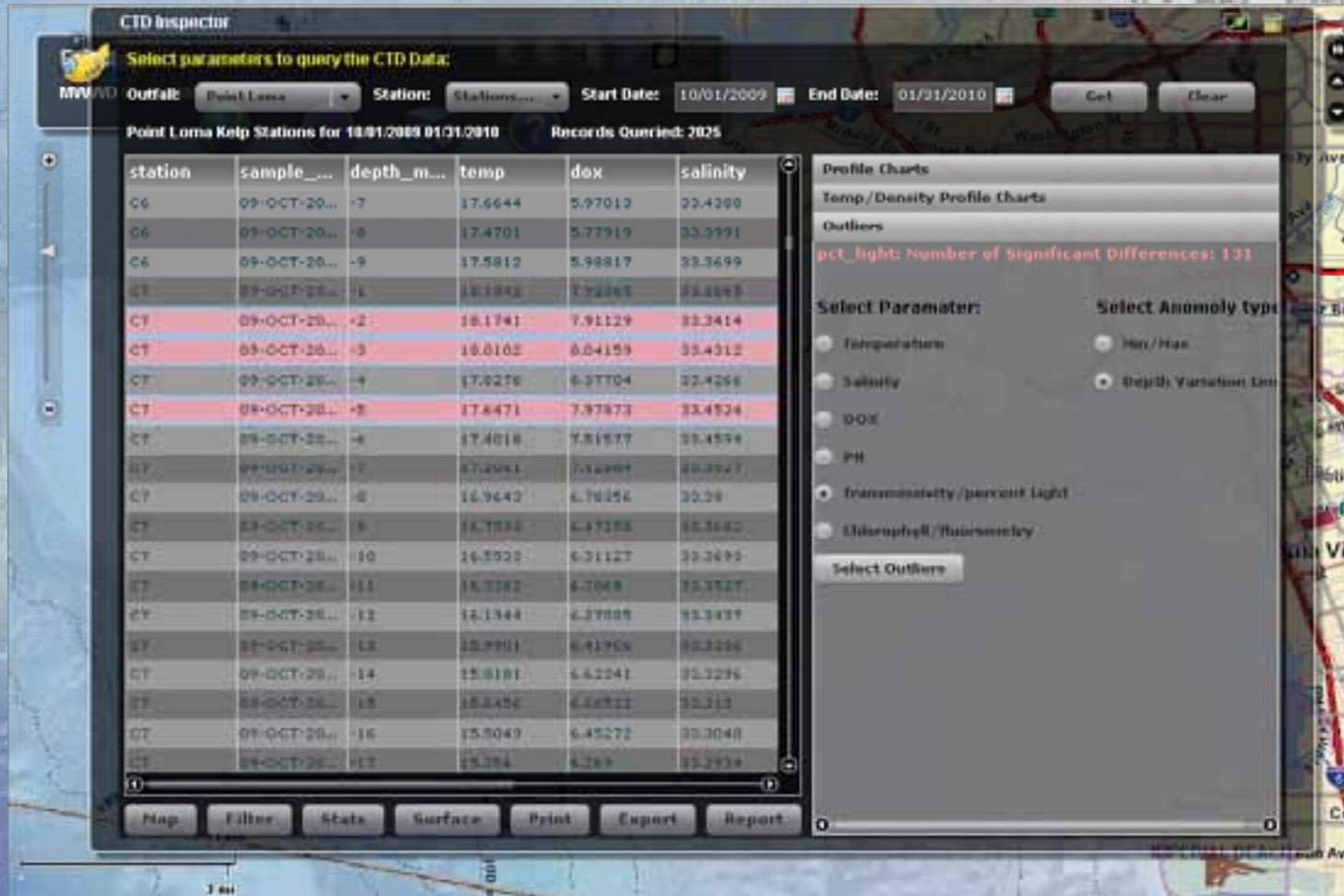
CTD Inspector for Water Quality Data



Investigate Water Column Profiles and Historical Variances

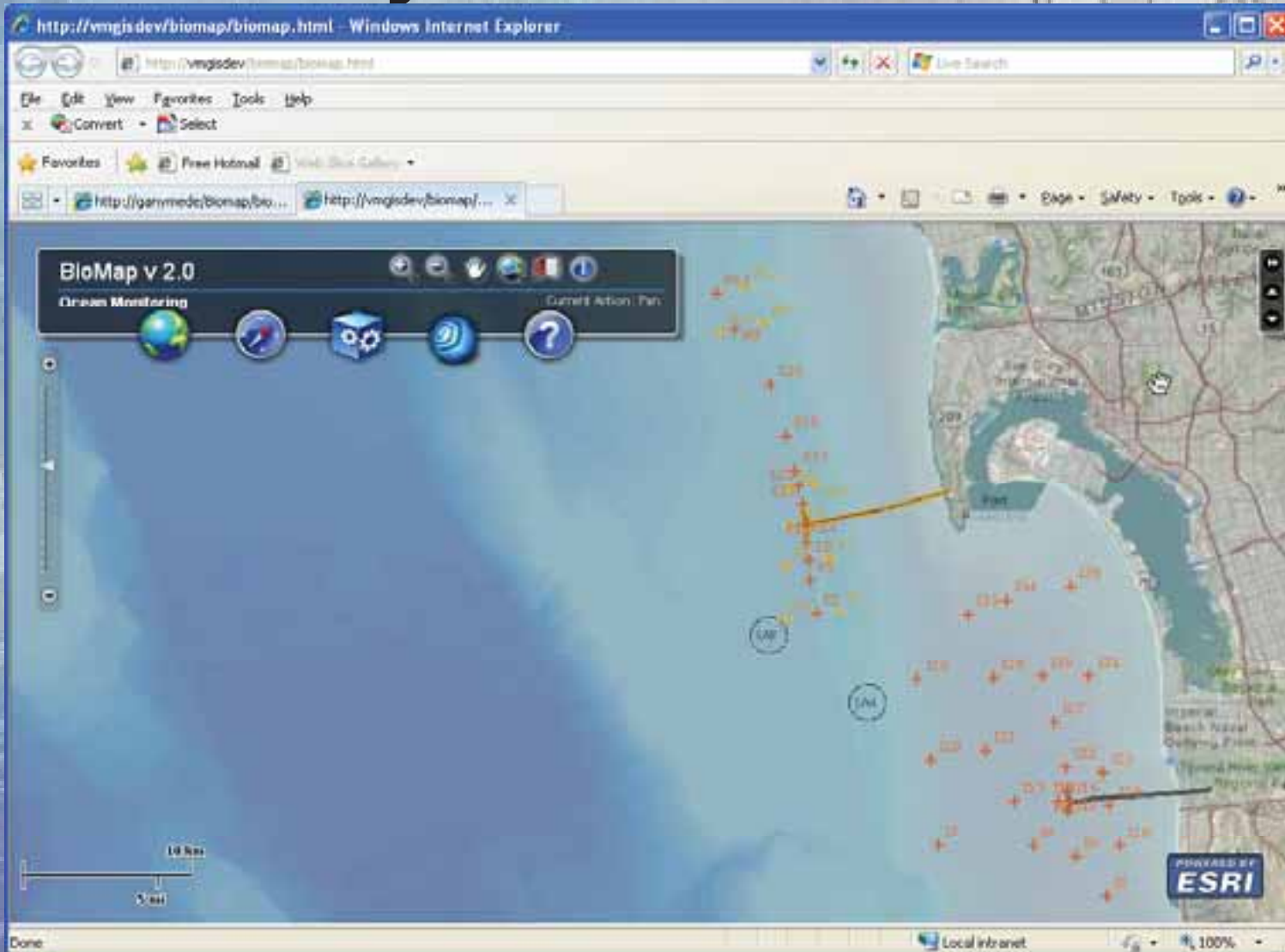


Review Trends and Find Data Anomalies in CTD Data

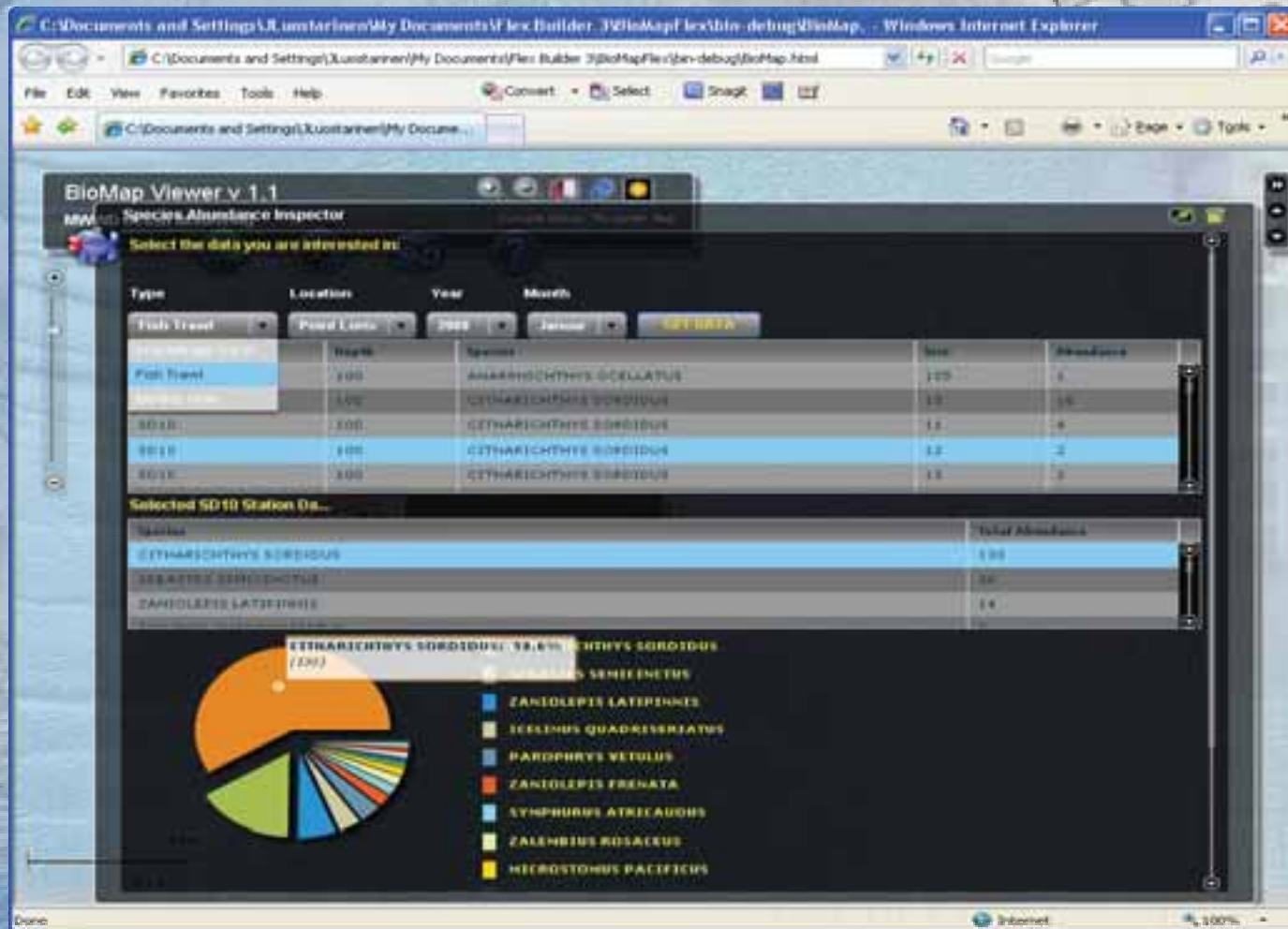


Data anomalies highlighted in pink in data grid and on Map

Benthic Inspector for Macrofauna Community Data



Species Abundance and Diversity



Pie chart of invertebrate species collected at a particular station on a given sample date

TJ Spill- Jan 2011



KPBS
Listen + Schedules + Programs + Docs + Give +
News Arts & Culture Family Living Events
Border Environment Politics Editors Roundtable These Days
Economy Health Public Safety Emission Special Reports
Education Military Science San Diego Week On Ramp

Tijuana Sewage Spill Leaves Lesson For Both Sides Of The Border

BY RUXANDRA GUEB
January 20, 2011

VIDEO

00:00 / 00:00

Play Download



Photo by Ruxandra Gueb

Above: A sign warning people not to swim in Imperial Beach was put up earlier this week, after reports that 2.1 million-gallons of sewage had spilled just south of the border, in Playas de Tijuana.

SAN DIEGO -- Ben McCue stood feet away from the beach on the United States side, facing a sign that reads "Keep Out, Sewage Contaminated Water." He said Imperial Beach is used to warning signs due to pollution, but the Playas de Tijuana incident -- a massive amount of sewage flowing from a broken pipe -- was more problematic.

"The real issue in the public notification," said McCue, conservation director for local nonprofit, WILDCOAST. "(We are concerned by) the fact that there were reports from residents that the spill in Tijuana was going on since December 23rd and three weeks passed without the authorities really doing anything. It really took media reports to get them to go into action."

Sewage spills aren't new along San Diego and Tijuana's shared coast. Typically, people on both sides of the border keep an eye on this and inform each other so that measures can be taken to fix broken pipes. But this time, there was a breakdown in communication.

BioMap Demo (.wmv)

Flexible User Interface:

- Build SQL Query without SQL
 - (1 year CTD data = 40k rows → 9 sec – no indexing)
- Multiple Levels of Filtering
 - Select by Project, List, Map
 - Grid allows dynamic sorting, filtering and manual selection
- User-controlled thematic mapping
 - Change Symbol Colors, Size
 - Change Class Ranges and Outlier limits

- [2011-02-07 12.33 5Min.wmv](#)

Tips and Thoughts for Developers

- Allowed User Investigation by using static SQL on the back end, change parameters from client. Put Code in the most efficient place (DB, mid-tier, client)
- Map is Data Driven
 - only settings for graphics are adjustable
- Use what is already available in your existing environment (even if it isn't the programmers first choice)
- The question on What Technology?
 - Balance of standards, what is in the existing resources, and staff familiarity. Then just go for it!

Future Directions...



- Tools for increasingly synoptic views by juxtaposing data layers, graphs, timelines, and spatial statistics
 - Investigate the benefits of NetCDF format
- Systematic use of spatial statistics
- Real-time integration of automated data sources
- Spatially-linked video and animations
 - Tool to help compile screen-capture animations
- Plume tracking with 3D ocean circulation models



City of San Diego Analyzes Trends in Ocean with Dynamic GIS Tools

View This Presentation at:
www.quarticsolutions.com

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