Region 10
Sharing Analytical Data

Office of Water - Water Quality Exchange (WQX Schemas)

WQX/STORET Outbound Web Service (Schemas)

Region 10 Contacts

Coeur d'Alene Superfund Site Manager: Anne Dailey

GIS/Data Analysis: Sue McCarthy, Matt Gubitosa

Regional QA Manager: Ginna Grepo-Grove

Dailey.anne@epa.gov, Gubitosa.matt@epa.gov, Mccarthy.sue@epa.gov, Grepo-grove.gina@epa.gov

Topics

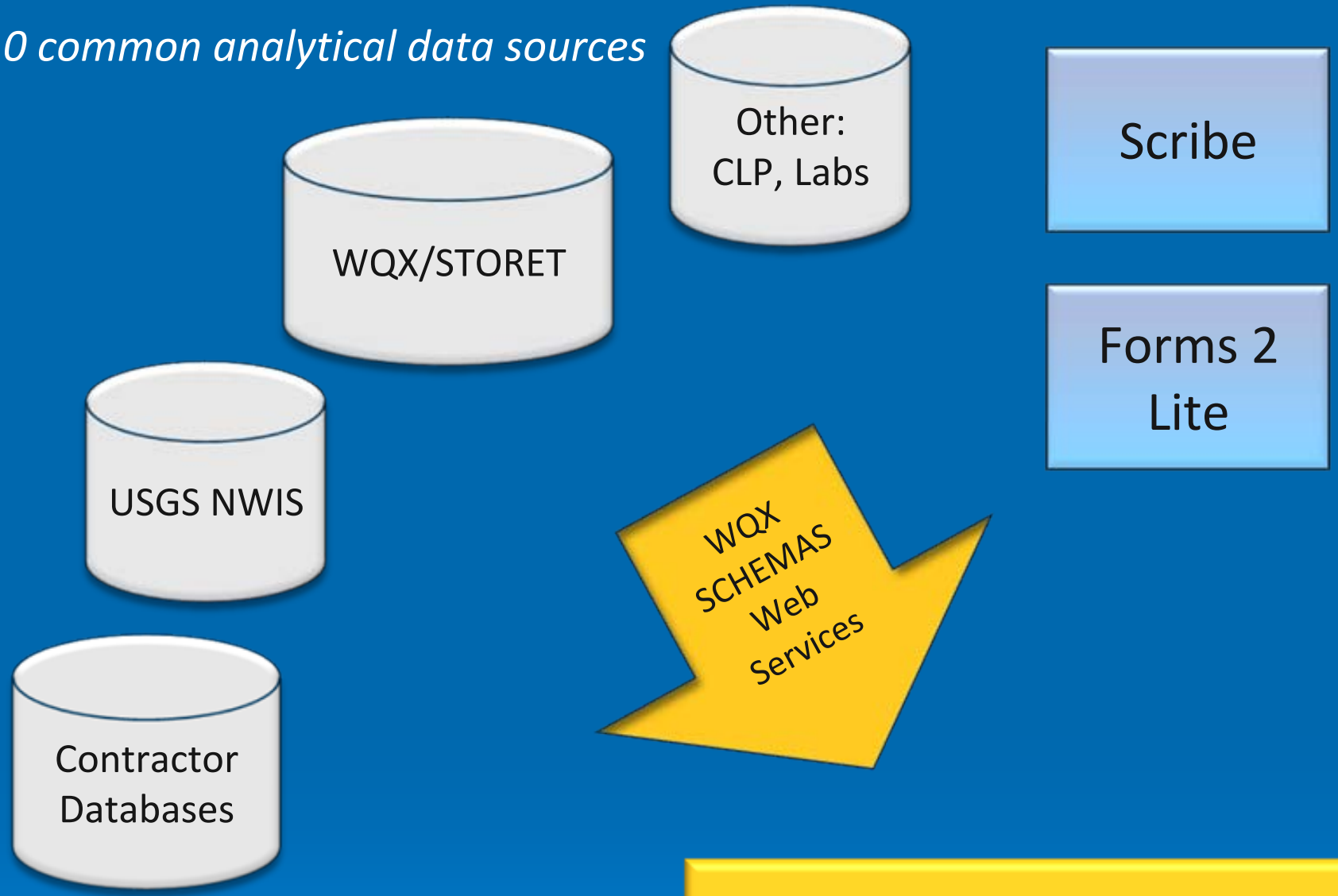
- Region 10 - data management
- Analytical data - what do analysts need
- Hidden Gem for Superfund Data:
  - WQX Schema - possible solution for data sharing
  - WQX / STORET System - R10 uses
- Examples - potential of WQX
  - WQX/STORET System as a data repository
    - Superfund and Scribe data
  - WQX outbound XML web services / schema
    - Means for sharing data between systems

- Region 10 Data Management
  - Resources are limited compared to other EPA regions: no EQUIS, no Response Manager….
  - Tend to leverage HQ expertise and products
- Region 10 - Data Sharing is Essential
  - Large Superfund Sites - CDA Basin
  - Regional Initiatives - Puget Sound Partnership
  - Emergency Response
  - Daily Work – regularly incorporate analytical data into tools (GIS, spreadsheets…). This analytical data can originate from external systems

Analytical Data for Decision Making

- What basic information is necessary?
  - Project Information
  - Sample Locations
  - Sample Results - analytes, media ….
  - QA, QAPP information
- What would be nice – easy means of exchanging data between different data originators:
  - Data Schema (format) that is simple, versatile
  - Schema/tools that are adaptable to different data sources

R10 common analytical data sources



If we can map data to a simple common schema - data from different sources can be combined for analysis

Analytical Tools

Web Mapping Services
Mapping Applications
Spreadsheets , Models...

What is WQX?

- A framework that facilitates the storage and retrieval of environmental monitoring data
- WQX uses standard data sharing templates (schemas) that specify data elements and data structure (XML)
- The WQX schema is an implementation of the ESAR (Environmental Sampling, Analysis and Results) data standard – Nationally Accepted Standard
- WQX based on the Environmental Data Standards Council (EDSC) Standards, EPA Standards - Uses EPA's Substance Registry System (SRS), IT IS
- More Info - http://www.epa.gov/storet/wqx.html
  - Kristen Gunthardt
  - Kevin Christian
  - Dwane Young

WQX Schema

- Primary components: Organization, Project, Monitoring Location, Monitoring Activity - Samples, and Results
- Data elements currently accommodate physical, chemical, fish tissue, biological, habitat monitoring data
  - *Superfund: field and analytical results, methods, media/matrices – water, soil, sediment, tissue, …. QA information (up to a SEDD 2a), References to QAPPs ….*

WQX History

- February 2007 – WQX version 1.0
  - Physical, chemical, fish tissue schemas
- May 2008 Version 2.0
  - Biological, Habitat released
- EPA's WQX/STORET System: 2 Methods are now supported for submitting data – using the Inbound Schemas
  - Node on the NEIEN – states or large organizations with IT staffs
    - PNW Node, State nodes - exchange XML
  - WQX Web – smaller organizations without IT staff
    - A flat file (excel or access) is imported into WQX Web where it is converted and corrected to make it compatible with WQX
    - Data is submitted through CDX into WQX database/STORET Warehouse (Region10 – CDA)
- WQX Outbound Schemas/web services for retrieving data ~ 2008-2009
- USGS Web Services - implementation of WQX outbound schema for analytical data from NWIS - 2009

R10 Superfund and WQX – Why Now?

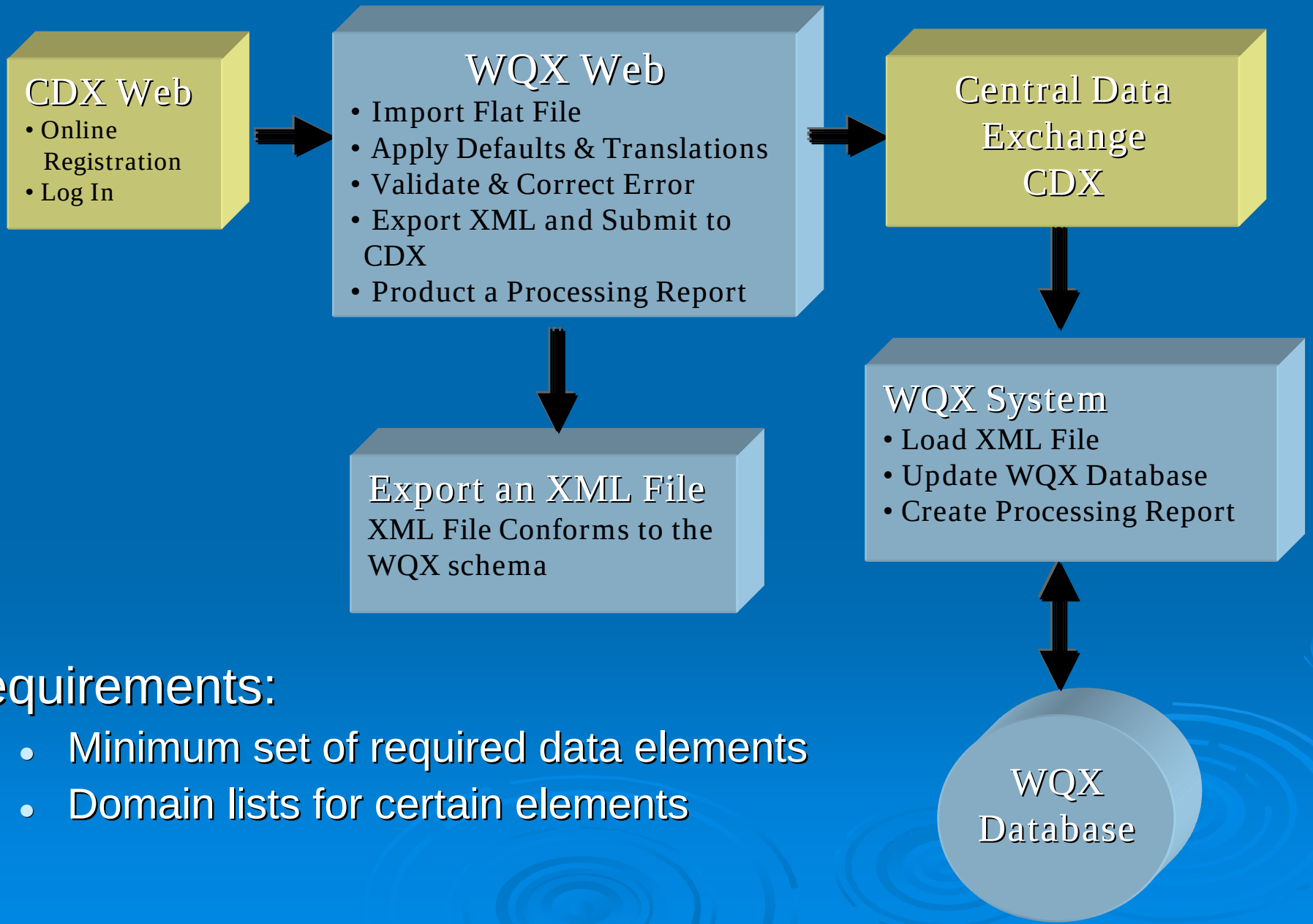
- Efficient – WQX is a headquarters system developed by OW
  - Technically state of the art - well designed, standardized, non-proprietary
  - Data repository - it can house historical and current site data
  - Leverage CLP - house a subset of CLP data in WQX and use it for data analysis.

- Data is Accessible
  - Site Stakeholders can have access to the data
  - Facilitates Secondary Use of Superfund Data – Puget Sound Partnership
  - Mega Sites – multiple: site managers; operable units; agencies; contractors
  - Data download is available via the web – WQX/STORET outbound web services

- Data Analysis - Utilize WQX/STORET Outbound Web Services
  - Retrieve data for mapping, data analysis, and reporting in a simple schema
  - Access and use other data both in and outside of WQX using simple schema
    - Data submitted to WQX by Tribes, States, other EPA offices, other agencies
    - USGS NWIS web services – WQX schema
    - By Mapping to a common schema - data from disparate sources can be combined for analysis

Examples Uses of WQX/STORET Inbound Web Services and WQX Web

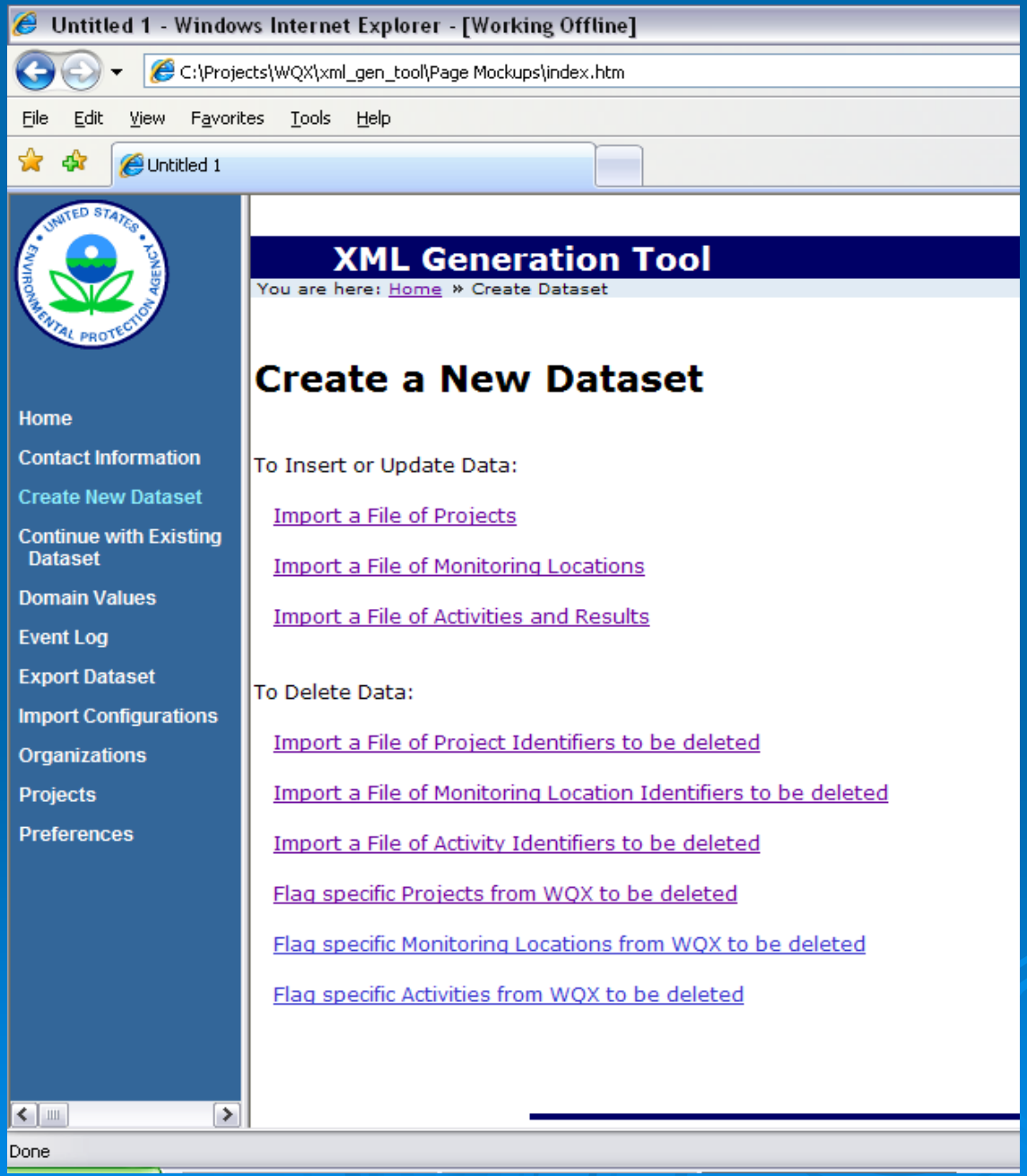
R10 WQX Data Flow WQX Web



Requirements:

- Minimum set of required data elements
- Domain lists for certain elements

WQX Web


Untitled 1 - Windows Internet Explorer - [Working Offline]
C:\Projects\WQX\xml_gen_tool\Page Mockups\index.htm
File Edit View Favorites Tools Help
Untitled 1
Home
Contact Information
Create New Dataset
Continue with Existing Dataset
Domain Values
Event Log
Export Dataset
Import Configurations
Organizations
Projects
Preferences
XML Generation Tool
You are here: Home » Create Dataset
Create a New Dataset
To Insert or Update Data:
Import a File of Projects
Import a File of Monitoring Locations
Import a File of Activities and Results
To Delete Data:
Import a File of Project Identifiers to be deleted
Import a File of Monitoring Location Identifiers to be deleted
Import a File of Activity Identifiers to be deleted
Flag specific Projects from WQX to be deleted
Flag specific Monitoring Locations from WQX to be deleted
Flag specific Activities from WQX to be deleted
Done

Lab Results

- Superset/CLP
- SEDD
- Forms 2 Lite

→ **WQX Web Data Submission Tool**

Provide:

- Organization - F2L
- Project - F2L
- Monitoring Location - F2L
- Results (example below)

Microsoft Excel - R10 Lab Data.xls

S1 | Sample Matrix

	A	B	C	D	E	N	O	P	Q	R	T	U	W
1	Project ID	Station ID	Cooperating Or	Sample ID	Activity Type	Characteristic Name	Result Value	Unit of Measure	ResultMeasureQual	Sample Mediur	Sample Date	Sample Time	Result S
2	TEC-701Z	B6-01	CH2M	06414000	Sample	SIEVE #60 (0.250MM)	2.5	%		Soil	10/9/2006		F
3	TEC-701Z	B6-01	CH2M	06414000	Sample	SIEVE #230 (0.063MM)	0.6	%		Soil	10/9/2006		F
4	TEC-701Z	B6-01	CH2M	06414000A	Sample	MERCURY	*Not Detected	mg/kg	U	Soil	10/9/2006		F
5	TEC-701Z	B6-01	CH2M	06414000A	Sample	LEAD	113	mg/kg		Soil	10/9/2006		F
6	TEC-701Z	B6-01	CH2M	06414000A	Sample	SILVER	3	mg/kg		Soil	10/9/2006		F
7	TEC-701Z	B6-01	CH2M	06414000A	Sample	ARSENIC	14	mg/kg		Soil	10/9/2006		F
8	TEC-701Z	B6-01	CH2M	06414000A	Sample	CADMIUM	0.87	mg/kg		Soil	10/9/2006		F
9	TEC-701Z	B6-01	CH2M	06414000A	Sample	COPPER	68.3	mg/kg		Soil	10/9/2006		F
10	TEC-701Z	B6-01	CH2M	06414000A	Sample	ZINC	298	mg/kg		Soil	10/9/2006		F
11	TEC-701Z	B6-01	CH2M	06414000B	Sample	MERCURY	0.144	mg/kg		Soil	10/9/2006		F
12	TEC-701Z	B6-01	CH2M	06414000B	Sample	LEAD	281	mg/kg		Soil	10/9/2006		F
13	TEC-701Z	B6-01	CH2M	06414000B	Sample	SILVER	1.8	mg/kg		Soil	10/9/2006		F
14	TEC-701Z	B6-01	CH2M	06414000B	Sample	ARSENIC	22	mg/kg		Soil	10/9/2006		F
15	TEC-701Z	B6-01	CH2M	06414000B	Sample	CADMIUM	2.6	mg/kg		Soil	10/9/2006		F
16	TEC-701Z	B6-01	CH2M	06414000B	Sample	COPPER	219	mg/kg		Soil	10/9/2006		F
17	TEC-701Z	B6-01	CH2M	06414000B	Sample	ZINC	649	mg/kg		Soil	10/9/2006		F
18	TEC-701Z	B6-02	CH2M	06414001	Sample	SIEVE #60 (0.250MM)	4.8	%		Soil	10/9/2006		F
19	TEC-701Z	B6-02	CH2M	06414001	Sample	SIEVE #230 (0.063MM)	0.6	%		Soil	10/9/2006		F
20	TEC-701Z	B6-02	CH2M	06414001A	Sample	MERCURY	5.79	mg/kg		Soil	10/9/2006		F
21	TEC-701Z	B6-02	CH2M	06414001A	Sample	LEAD	11000	mg/kg		Soil	10/9/2006		F
22	TEC-701Z	B6-02	CH2M	06414001A	Sample	SILVER	27	mg/kg		Soil	10/9/2006		F
23	TEC-701Z	B6-02	CH2M	06414001A	Sample	ARSENIC	54.3	mg/kg		Soil	10/9/2006		F
24	TEC-701Z	B6-02	CH2M	06414001A	Sample	CADMIUM	35.3	mg/kg		Soil	10/9/2006		F
25	TEC-701Z	B6-02	CH2M	06414001A	Sample	COPPER	230	mg/kg		Soil	10/9/2006		F
26	TEC-701Z	B6-02	CH2M	06414001A	Sample	ZINC	5990	mg/kg		Soil	10/9/2006		F
27	TEC-701Z	B6-02	CH2M	06414001B	Sample	MERCURY	15.3	mg/kg		Soil	10/9/2006		F
28	TEC-701Z	B6-02	CH2M	06414001B	Sample	LEAD	18700	mg/kg		Soil	10/9/2006		F
29	TEC-701Z	B6-02	CH2M	06414001B	Sample	SILVER	47.6	mg/kg		Soil	10/9/2006		F
30	TEC-701Z	B6-02	CH2M	06414001B	Sample	ARSENIC	123	mg/kg		Soil	10/9/2006		F

sto_final_z | particle size imported | sed2006analytic imported | sed2006analyticgeneric par size

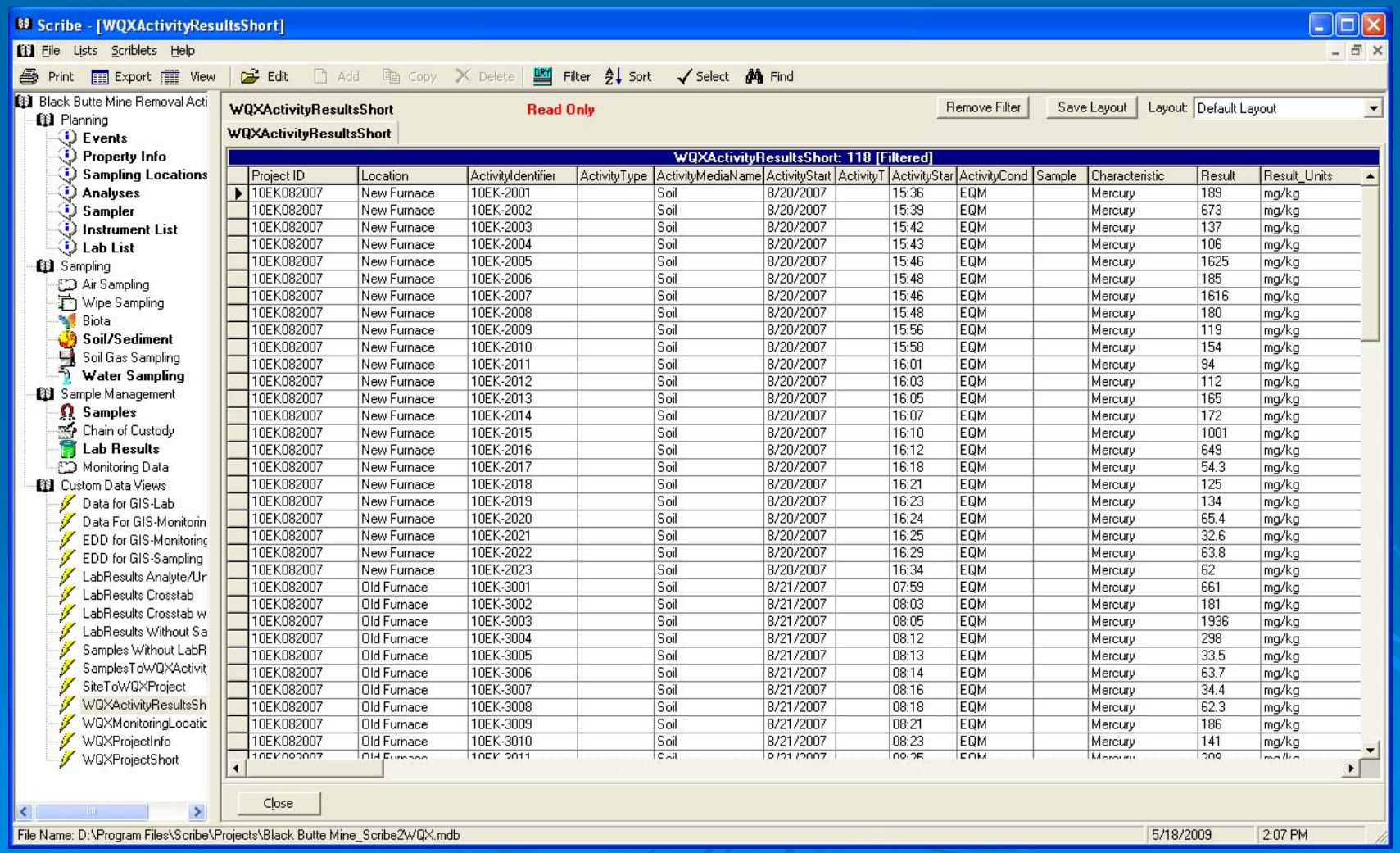
Ready

R10 Scribe to WQX Pilot (ERU)

ERU Scribe

- Custom Data Views : WQXViews
- Lab Results
- Custom Lists - WQX Domain Values

→ WQX Web Data Submission Tool



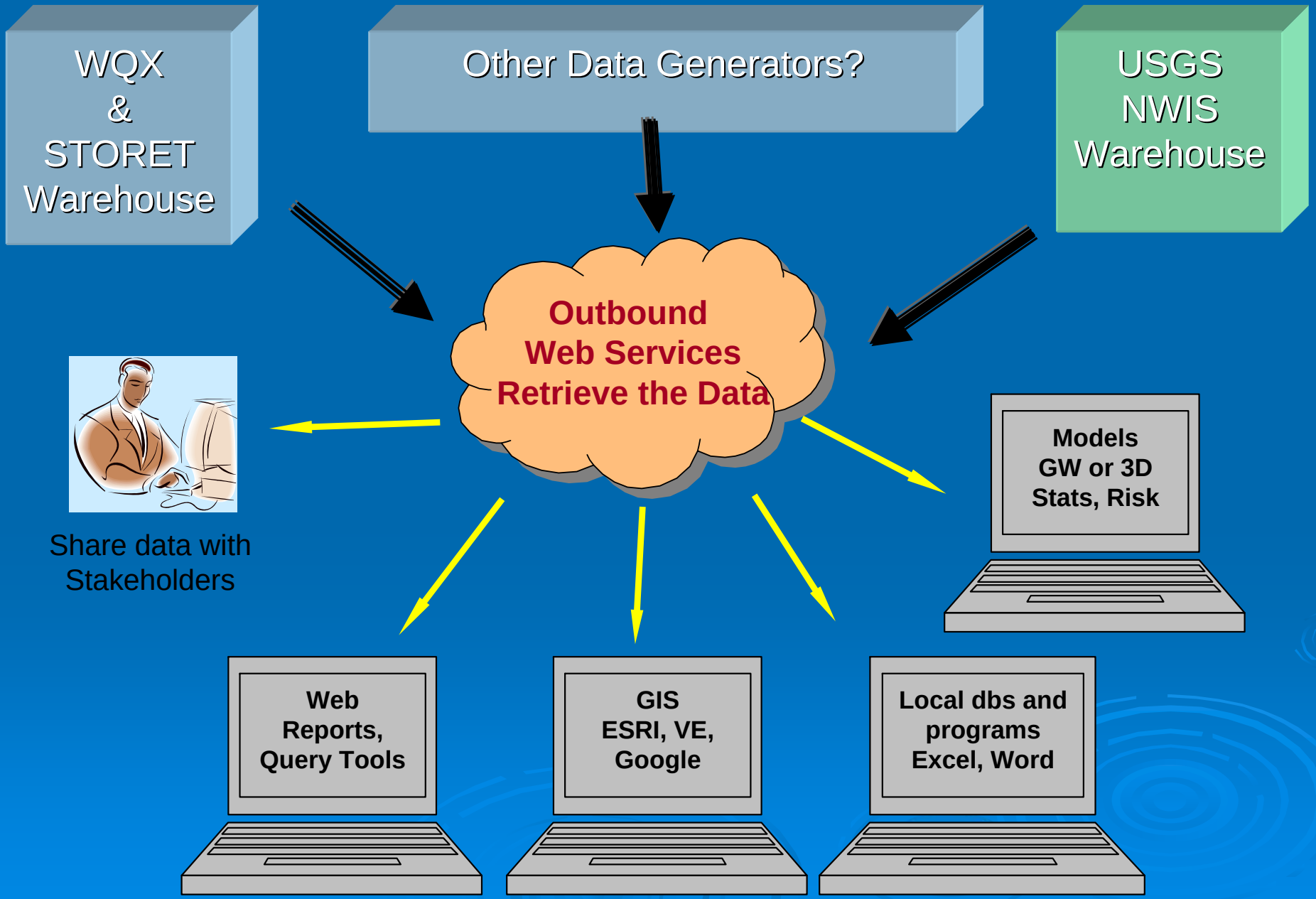
WQX/STORET Outbound Web Services

WQX/STORET Outbound Web Services

http://www.epa.gov/storet/web_services.html

- Four Core Services based upon schemas:
  - **Stations service** – provides specific station information
  - **Results service** – provides results data
  - **Watershed/Station Catalog service** – provides summary information
  - **Project Catalog service** – provides summary information by projects based on an input of min/max latitude/longitude
- USGS NWIS database is implementing similar stations and results services based upon the WQX Outbound Schemas

WQX/STORET Outbound Web Services



Mapping WQX/STORET Stations

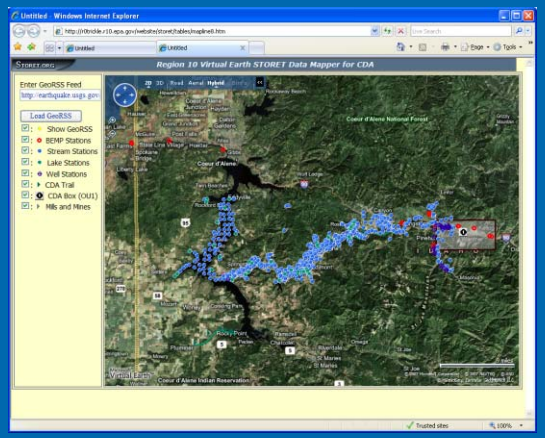
Call: Get Stations For Map Supply Lat - Long

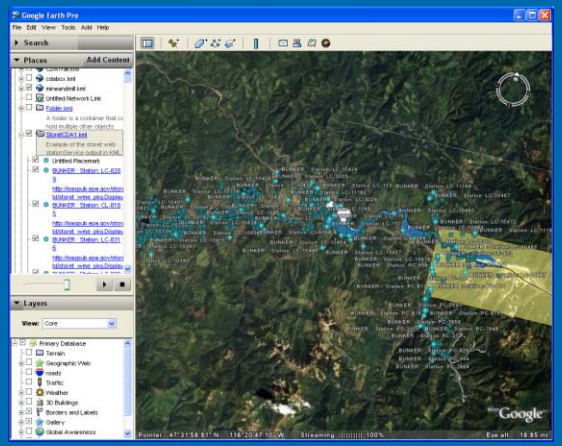
Process: Converts data to different mapping formats

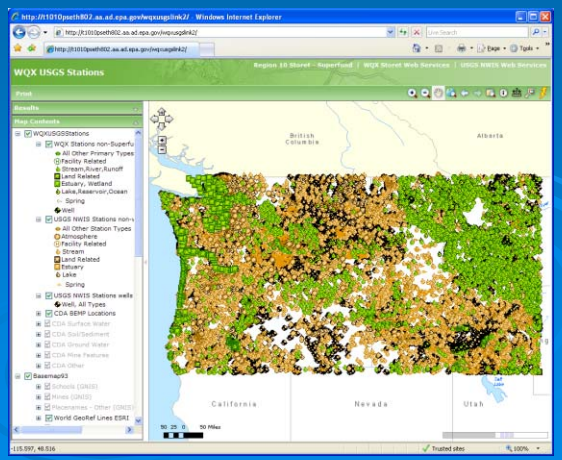
Virtual Earth

Google Earth

ESRI Products

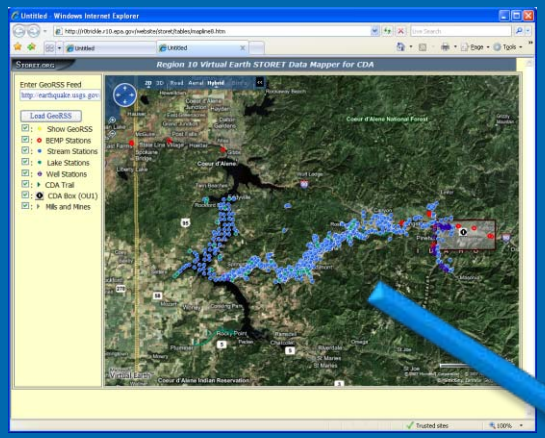


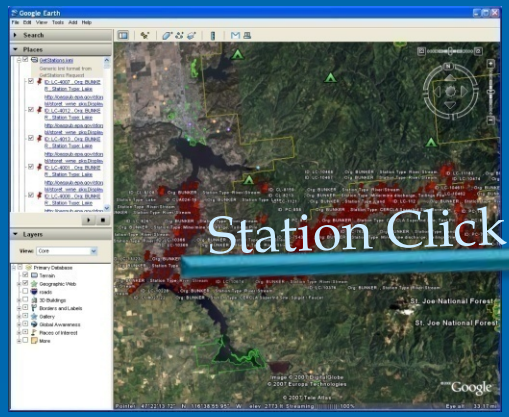


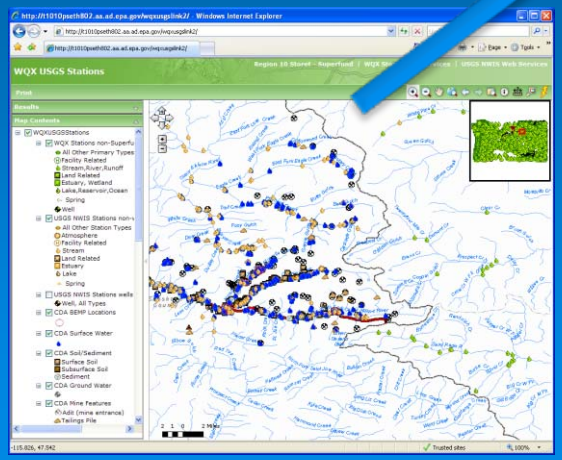


- Example of a scheduled, automated process that runs against the outbound web services and populates a GIS database

Web Service: Get Results (Using Mouse Click)







Call:
Get Results
Web Service

Untitled - Windows Internet Explorer

http://r0trickle.r10.epa.gov/website/storet/tables/resultStation.htm

Live Search

Untitled

Page Tools

STORET.ORG

Region 10: Storet StationResults Web Service Query

Organization: Bunker Hill Mining and Metallurgical Complex

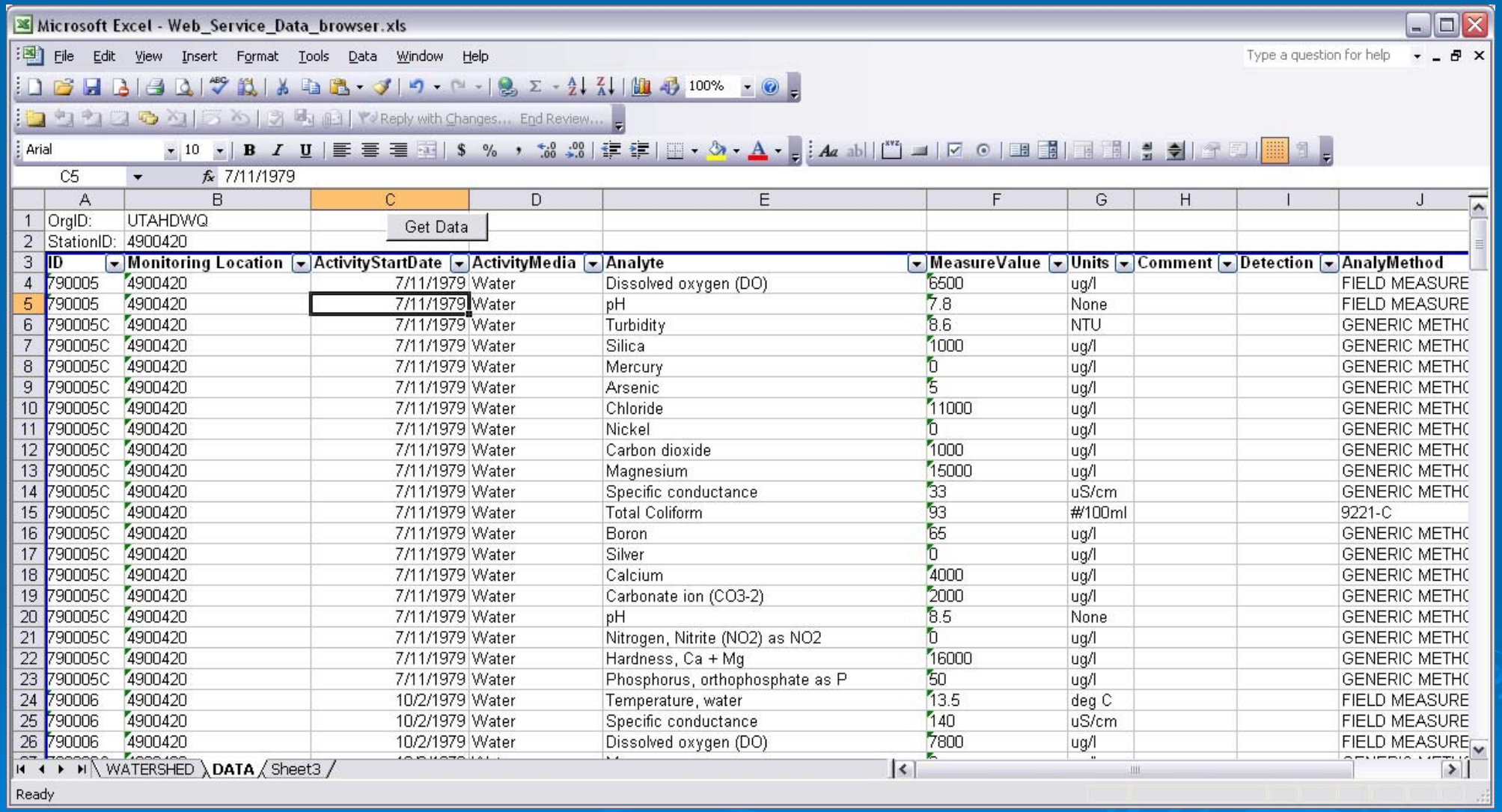
Org ID	Station ID	Activity Identifier	Activity Type	Activity Matrix	Activity Start Date
BUNKER	LC-8261	188003	Sample	Water	1997-07-23

CharacteristicName	Result Measure	Measure Unit	CommentText	SampleFraction	Result Type	DetectionCondition
Barium			U/None/U	Total	Actual	*Non-detect
Cadmium	4	ug/l	None/None/A	Total	Actual	
Chromium			U/None/U	Total	Actual	*Non-detect
Copper			U/None/U	Total	Actual	*Non-detect
Zinc			U/None/U	Total	Actual	*Non-detect
Aluminum			U/None/U	Dissolved	Actual	*Non-detect
Iron			U/None/U	Dissolved	Actual	*Non-detect
Manganese			U/None/U	Dissolved	Actual	*Non-detect
Nickel	12	ug/l	None/None/A	Dissolved	Actual	
Barium	4.8	ug/l	None/None/A	Dissolved	Actual	
Cadmium	2.9	ug/l	None/None/A	Dissolved	Actual	
Chromium			U/None/U	Dissolved	Actual	*Non-detect
Copper	14	ug/l	None/None/A	Dissolved	Actual	
Zinc			U/None/U	Dissolved	Actual	*Non-detect
Mercury			U/None/U	Total	Actual	*Non-detect
Iron			U/None/U	Total	Actual	*Non-detect
Lead			U/None/U	Total	Actual	*Non-detect
Manganese			U/None/U	Total	Actual	*Non-detect
Nickel			U/None/U	Total	Actual	*Non-detect
Arsenic			U/None/U	Total	Actual	*Non-detect

Done Trusted sites 100%

- Example of an interactive real-time request to the outbound web service

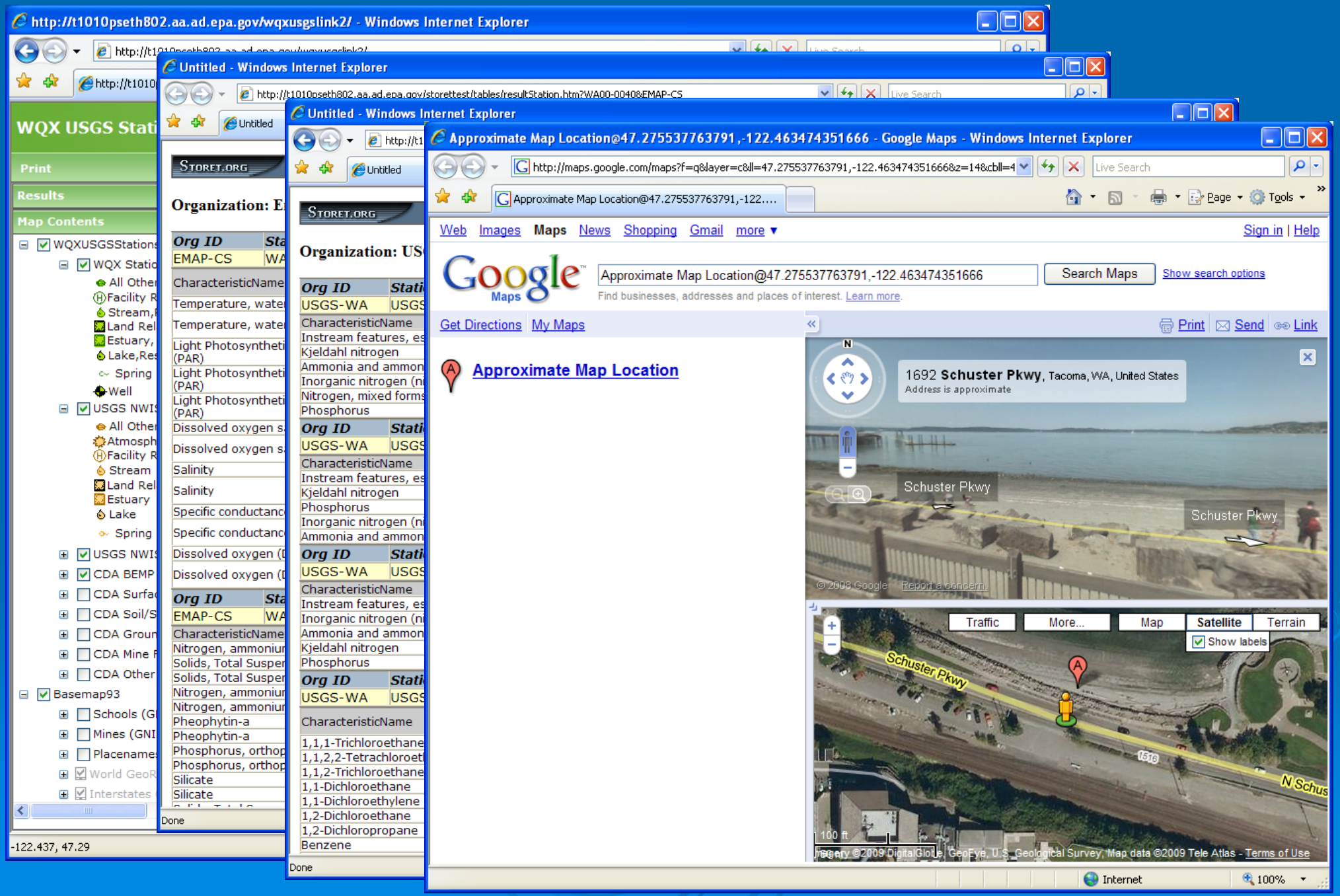
Get Station, Get Result, Get Organizations From Excel



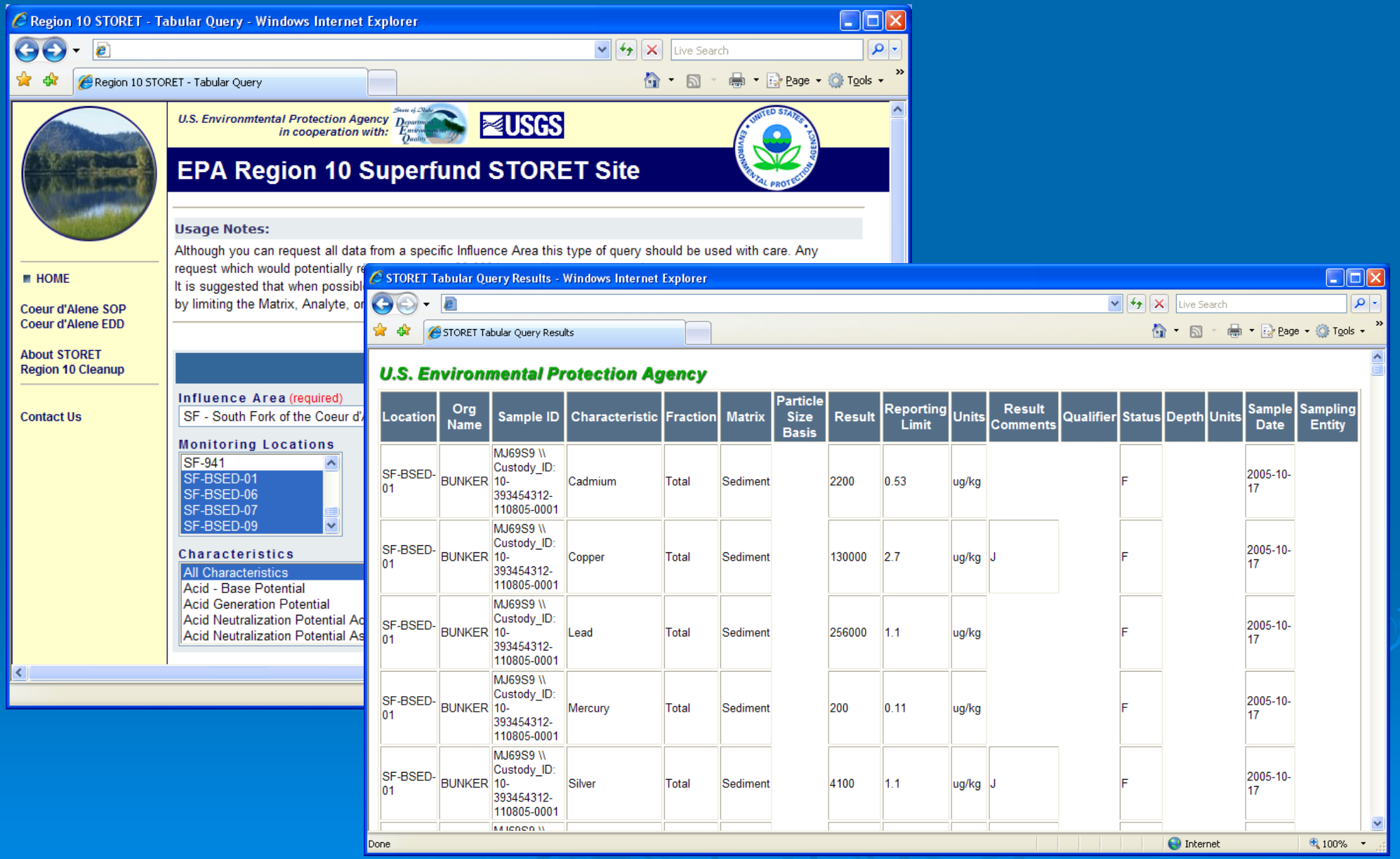
ID	Monitoring Location	ActivityStartDate	ActivityMedia	Analyte	MeasureValue	Units	Comment	Detection	AnalyMethod
790005	4900420	7/11/1979	Water	Dissolved oxygen (DO)	6500	ug/l			FIELD MEASURE
790005	4900420	7/11/1979	Water	pH	7.8	None			FIELD MEASURE
790005C	4900420	7/11/1979	Water	Turbidity	8.6	NTU			GENERIC METHO
790005C	4900420	7/11/1979	Water	Silica	1000	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Mercury	0	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Arsenic	5	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Chloride	11000	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Nickel	0	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Carbon dioxide	1000	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Magnesium	15000	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Specific conductance	33	uS/cm			GENERIC METHO
790005C	4900420	7/11/1979	Water	Total Coliform	93	#/100ml			9221-C
790005C	4900420	7/11/1979	Water	Boron	65	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Silver	0	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Calcium	4000	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Carbonate ion (CO3-2)	2000	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	pH	8.5	None			GENERIC METHO
790005C	4900420	7/11/1979	Water	Nitrogen, Nitrite (NO2) as NO2	0	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Hardness, Ca + Mg	16000	ug/l			GENERIC METHO
790005C	4900420	7/11/1979	Water	Phosphorus, orthophosphate as P	50	ug/l			GENERIC METHO
790006	4900420	10/2/1979	Water	Temperature, water	13.5	deg C			FIELD MEASURE
790006	4900420	10/2/1979	Water	Specific conductance	140	uS/cm			FIELD MEASURE
790006	4900420	10/2/1979	Water	Dissolved oxygen (DO)	7800	ug/l			FIELD MEASURE

Example of an interactive real-time request to the outbound web services from Excel

Region 10 Beta Mapping Application
Calls WQX, USGS Web Services, Google Street View



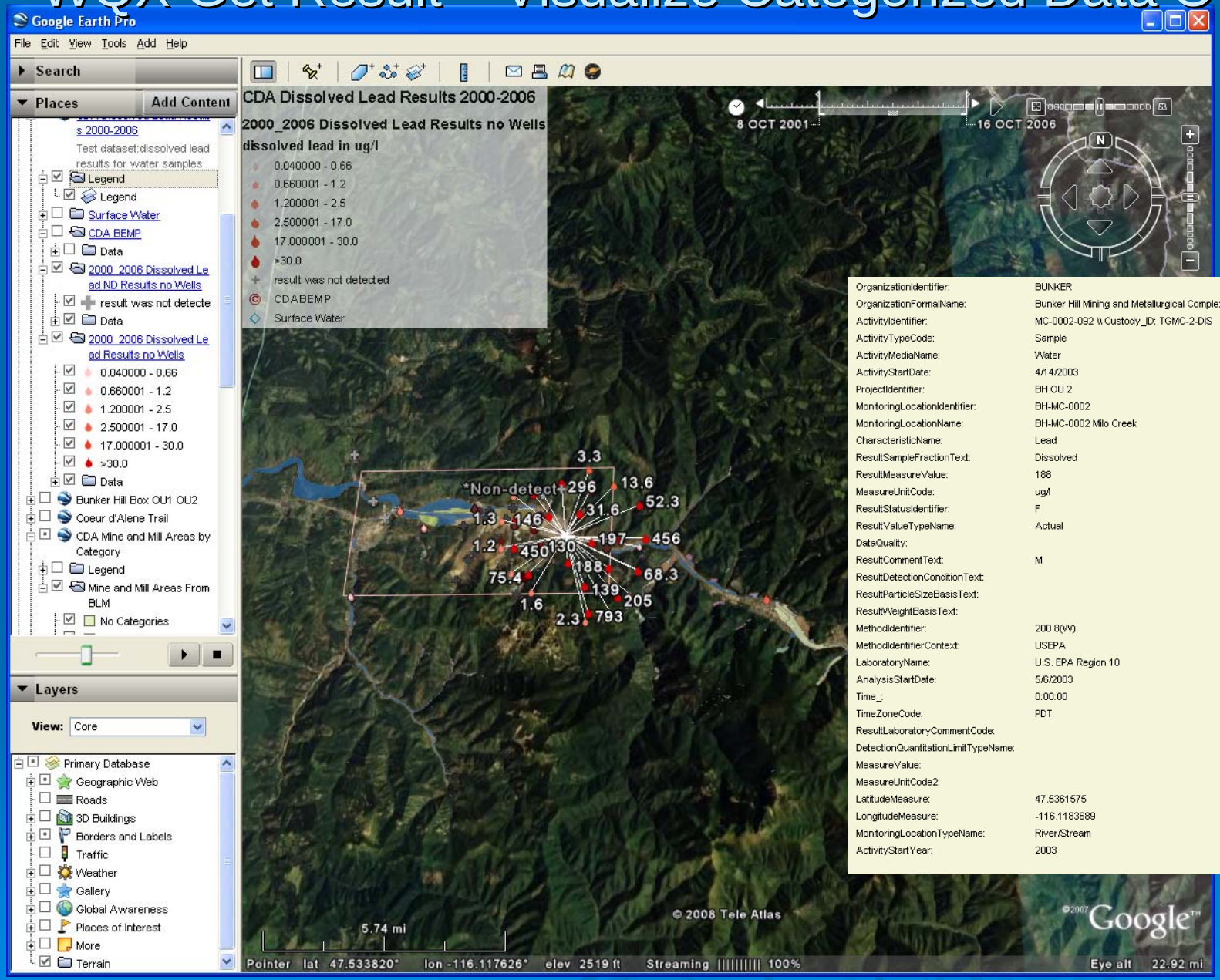
Beta Tabular Query Tool using the Get Results Web Service



Location	Org Name	Sample ID	Characteristic	Fraction	Matrix	Particle Size Basis	Result	Reporting Limit	Units	Result Comments	Qualifier	Status	Depth	Units	Sample Date	Sampling Entity
SF-BSED-01	BUNKER	MJ69S9 \\ Custody_ID: 10-393454312-110805-0001	Cadmium	Total	Sediment		2200	0.53	ug/kg			F			2005-10-17	
SF-BSED-01	BUNKER	MJ69S9 \\ Custody_ID: 10-393454312-110805-0001	Copper	Total	Sediment		130000	2.7	ug/kg	J		F			2005-10-17	
SF-BSED-01	BUNKER	MJ69S9 \\ Custody_ID: 10-393454312-110805-0001	Lead	Total	Sediment		256000	1.1	ug/kg			F			2005-10-17	
SF-BSED-01	BUNKER	MJ69S9 \\ Custody_ID: 10-393454312-110805-0001	Mercury	Total	Sediment		200	0.11	ug/kg			F			2005-10-17	
SF-BSED-01	BUNKER	MJ69S9 \\ Custody_ID: 10-393454312-110805-0001	Silver	Total	Sediment		4100	1.1	ug/kg	J		F			2005-10-17	

Google Earth Screen Captures

WQX Get Result – Visualize Categorized Data Over Time



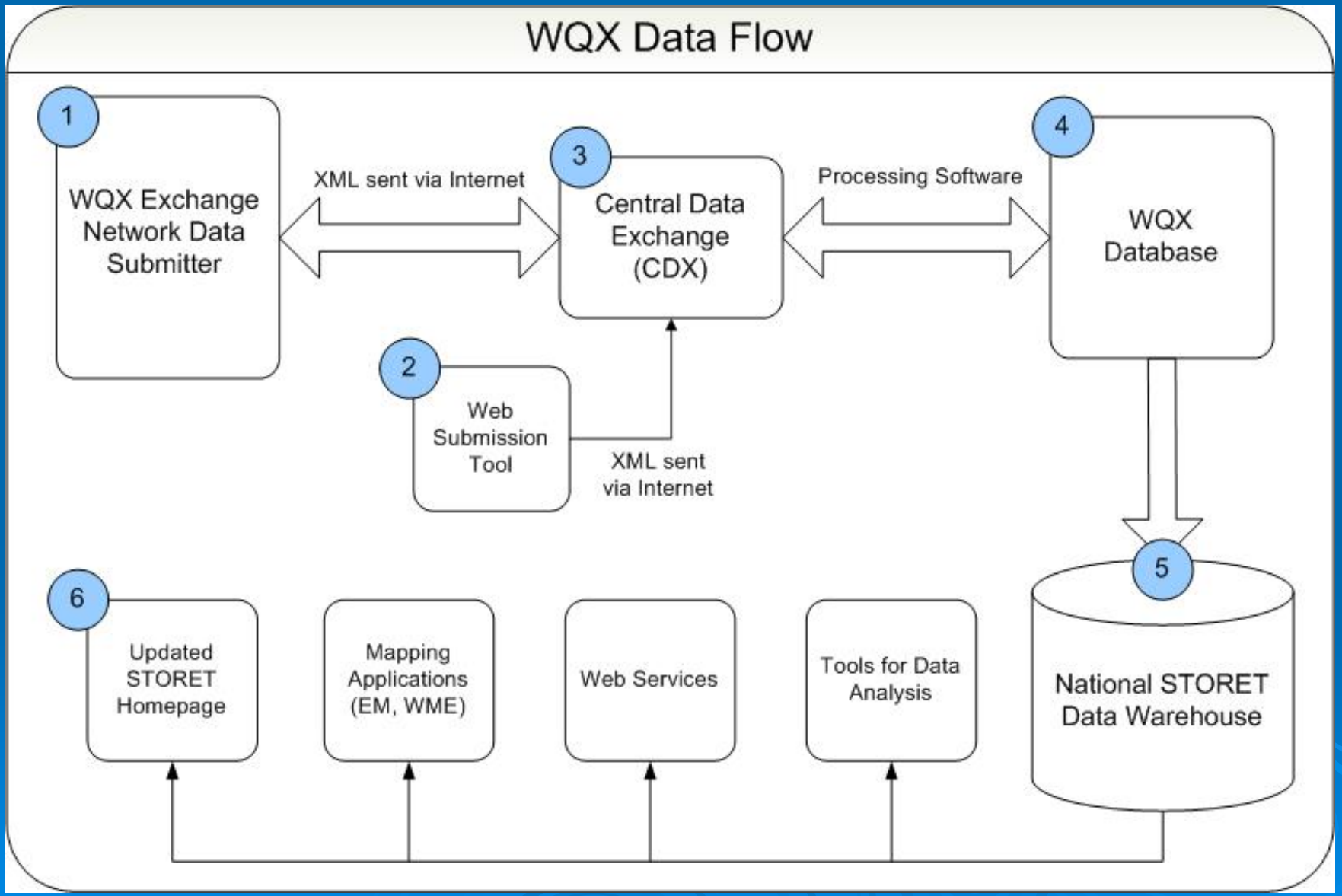
Advanced analytical use of outbound web services

Summary - Looking Forward

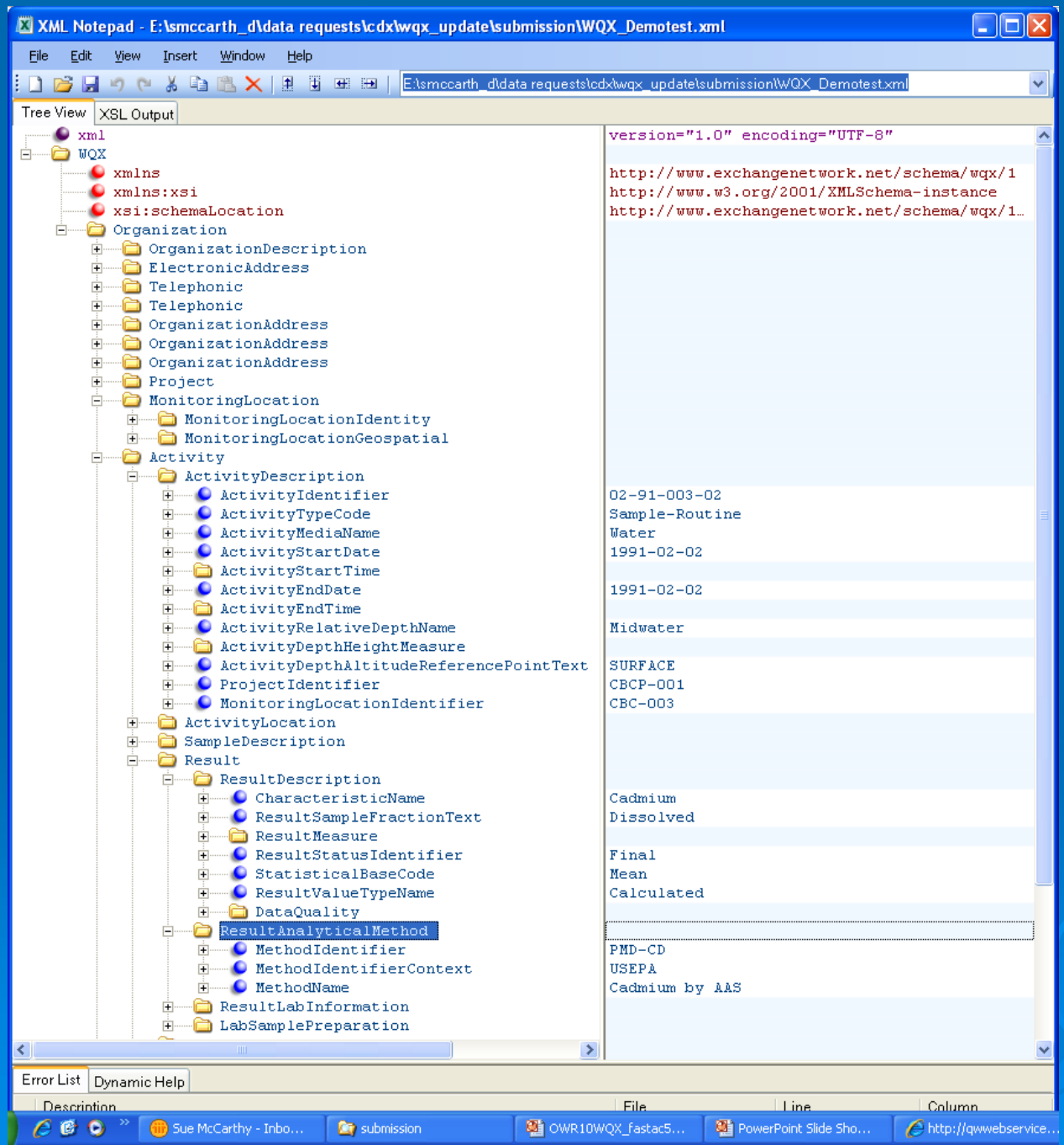
- Urge OSWER and other data providers to investigate the WQX schema and database
  - Emergency Response Data
    - Investigate Scribe - WQX Schema crosswalk
    - WQX version of Scribe with custom lists and views
  - Superfund Data
    - Investigate SEDD /WQX Schema similarities
    - Pilot flow of data from SMO/CLP to WQX
    - WQX version of Forms 2 Lite
- Leverage the expertise of the Office of Water (Kristen Gunthardt, Kevin Christian)

Gunthardt.kristen@epa.gov, Christian.kevin@epa.gov

Extra Informational Slides Follow


WQX Data Flow
1
WQX Exchange Network Data Submitter
XML sent via Internet
3
Central Data Exchange (CDX)
Processing Software
4
WQX Database
2
Web Submission Tool
XML sent via Internet
5
National STORET Data Warehouse
6
Updated STORET Homepage
Mapping Applications (EM, WME)
Web Services
Tools for Data Analysis

Example WQX XML Submittal



Example of data returned from the outbound web services XML (USGS)