

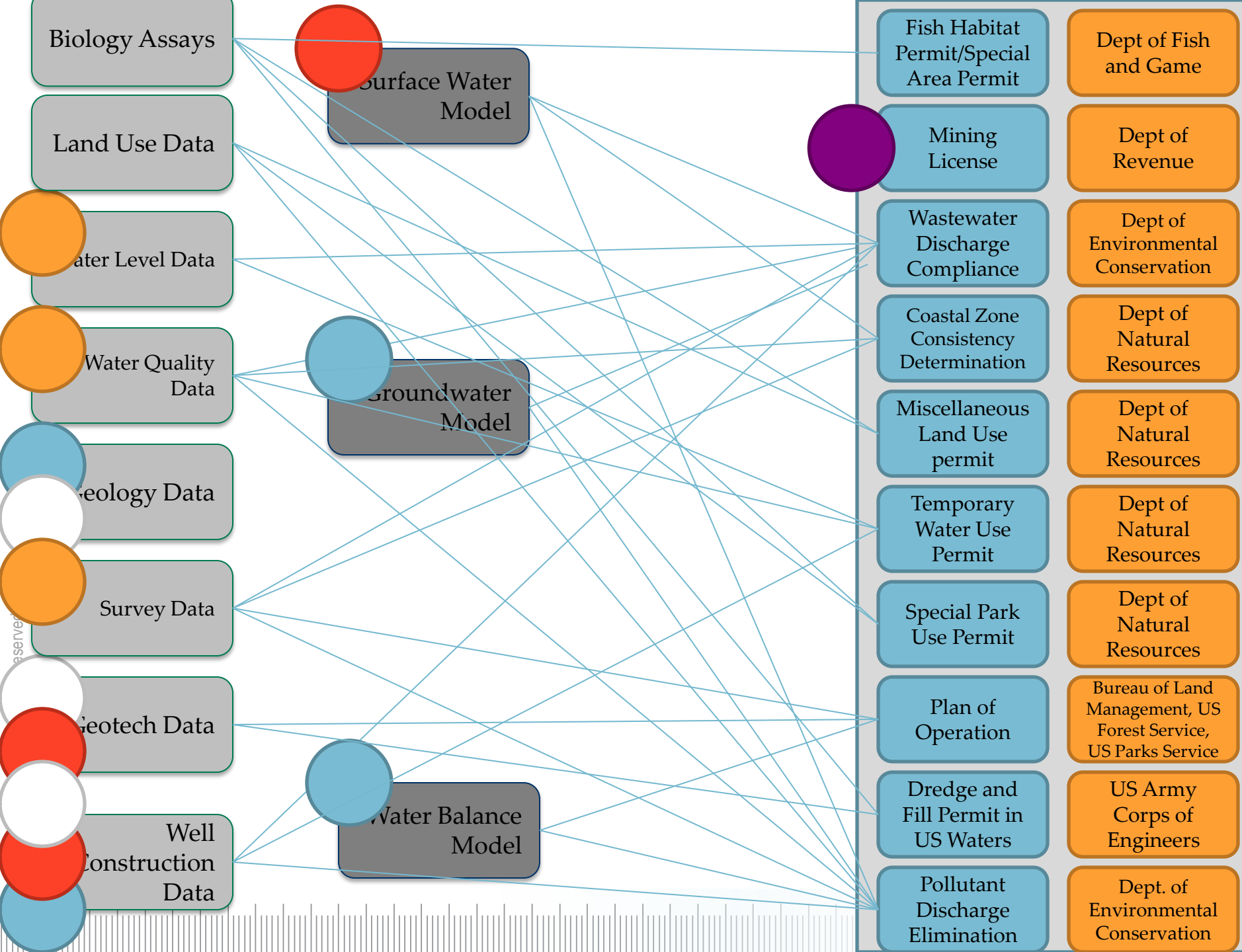
Water Analytics ~~Data Management~~

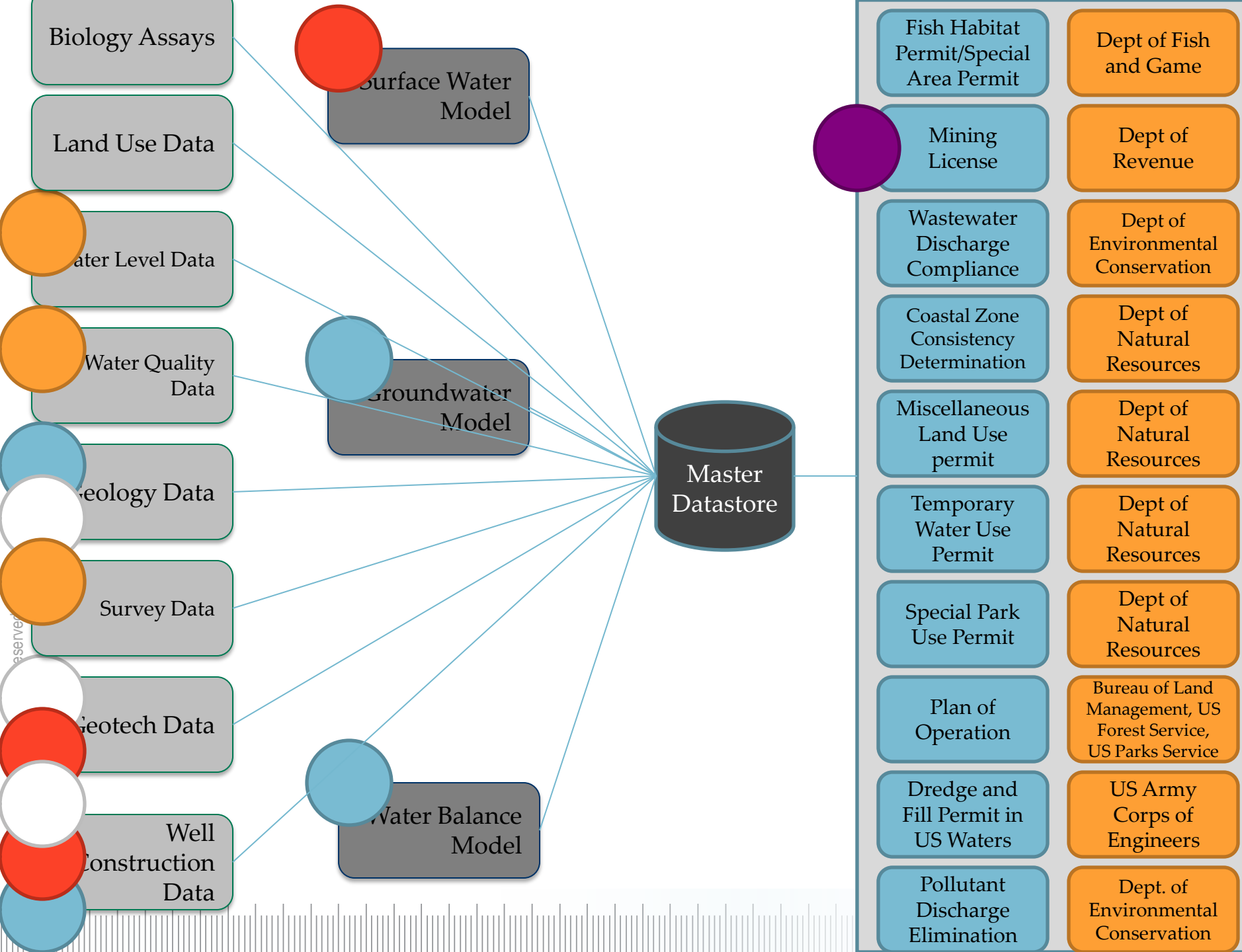
For Effective Decision Making

Environmental Concerns are a BIG Annual Expense

Company	Environmental Cost (Millions)	Earnings (Millions)	% Earnings toward Environmental Spend	Year
ExxonMobil	\$3,200	\$41,060	8%	2011
BP	\$8,435	\$39,817	21%	2011
Suncor	\$205	\$4,304	5%	2011
Shell	\$597	\$20,500	3%	2010
Chevron	\$2,900	\$19,000	15%	2010
ConocoPhillips	\$130	\$12,436	1%	2011

PERMITTING APPLICATION DATA TANGLES





Key Benefits and Uses

Permitting Phase:

- All entities work with shared data store and use most recent copies of data sets, resulting in less rework and efficiency gains
- Clearer data tracking results in increased data confidence and more accurate permit submissions
- Permit preparation processes are more transparent as progress towards such submissions is visible and traceable

Potential for earlier mine permit application submission and approvals

**HOW MUCH WATER IS
AVAILABLE?
WHERE DOES IT GO?
WHAT IS THE QUALITY?**

HydroManager

Welcome, SIS_ADMIN | Wednesday, February 10, 2010

[Personalization](#) | [Logout](#) | [About](#)

Regions Statistics

Water Supply

Data Browser

Dams

Map

Wellfields

Documents Search

More▼

**Madinah****Population:** 1,886,708 **Supplied water:** 367,260 m3/day**%Population:** 7% **% daily supplied water:** 6%**Area:** 151,990 Km2 **Average litter/capita:** 194 l/day**Average treated wastewater:** 112,809 m3/day**Supplied/Treated:** 31%**Global Statistics**

Statistics

Coverage

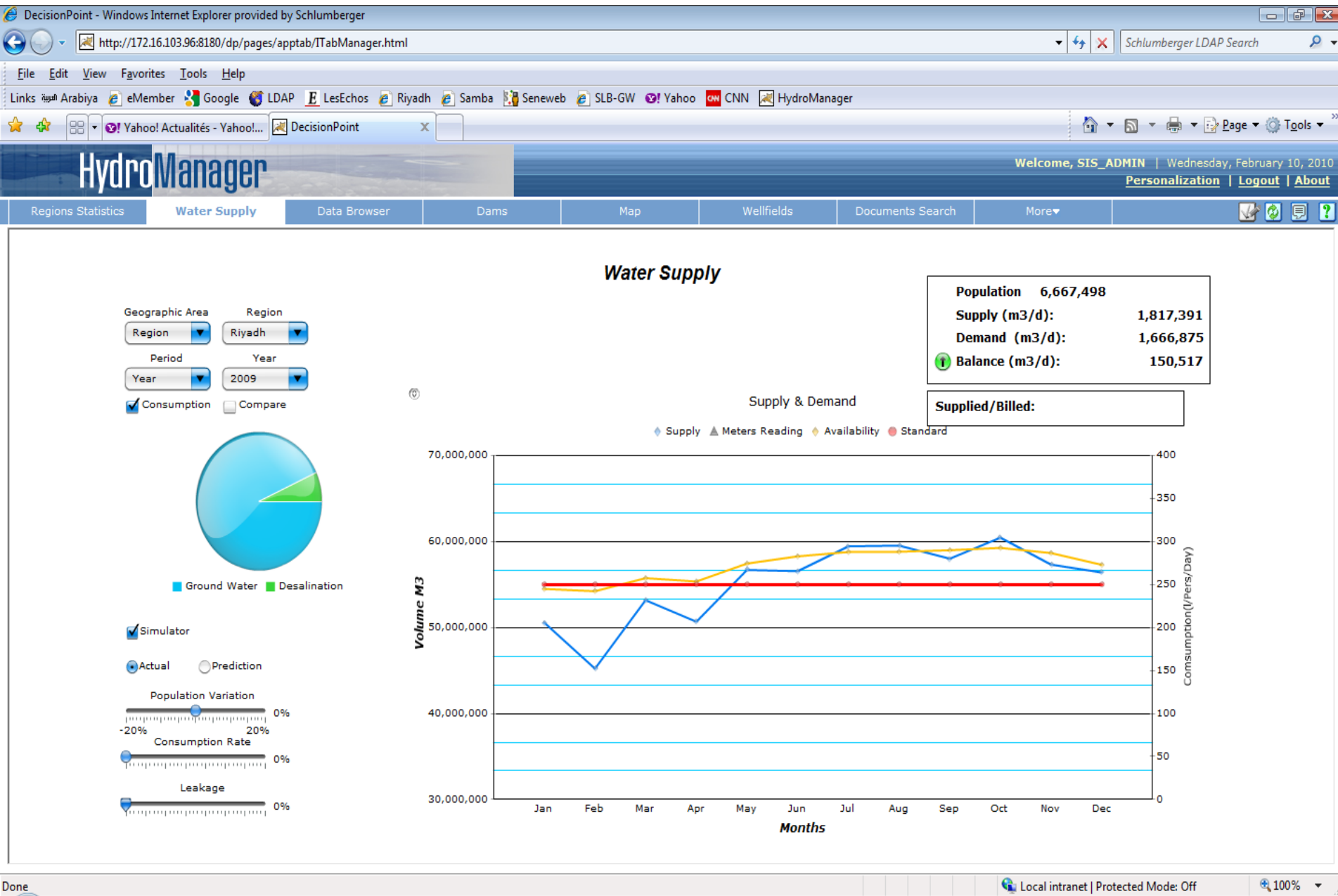
Charts

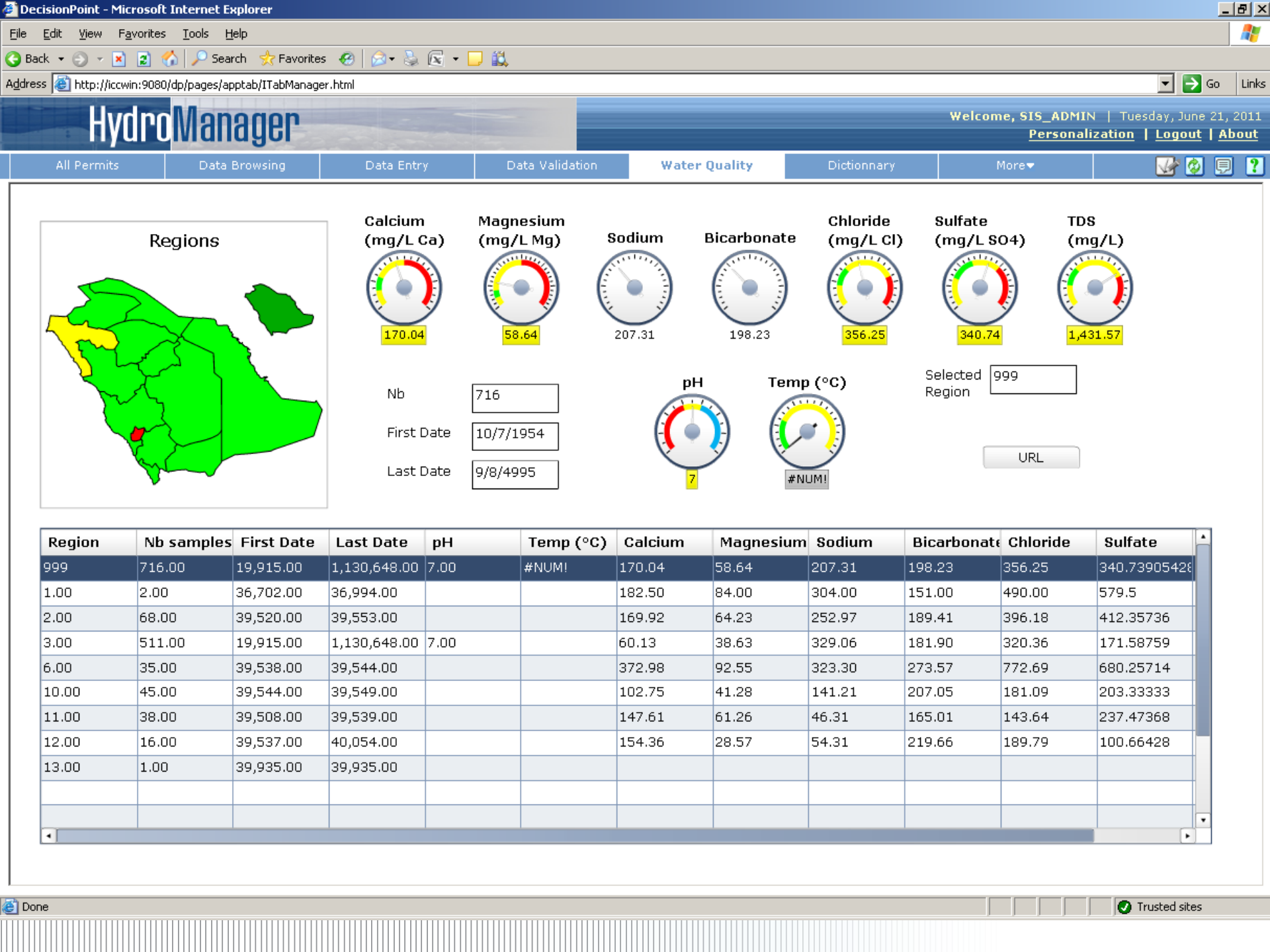
Tables

Water Wells 537**Dams:** 16**Weather Stations:** 67**Treatment Plants:** 28**Wastewater treatment Plants:** 7**Water Reservoirs:** 92

Decision Support

water.slb.com | swstechnology.com





Key Benefits and Uses

Better and Complete Data Sets:

- All data for new wells must be submitted online; drillers are only paid when data are validated and approved

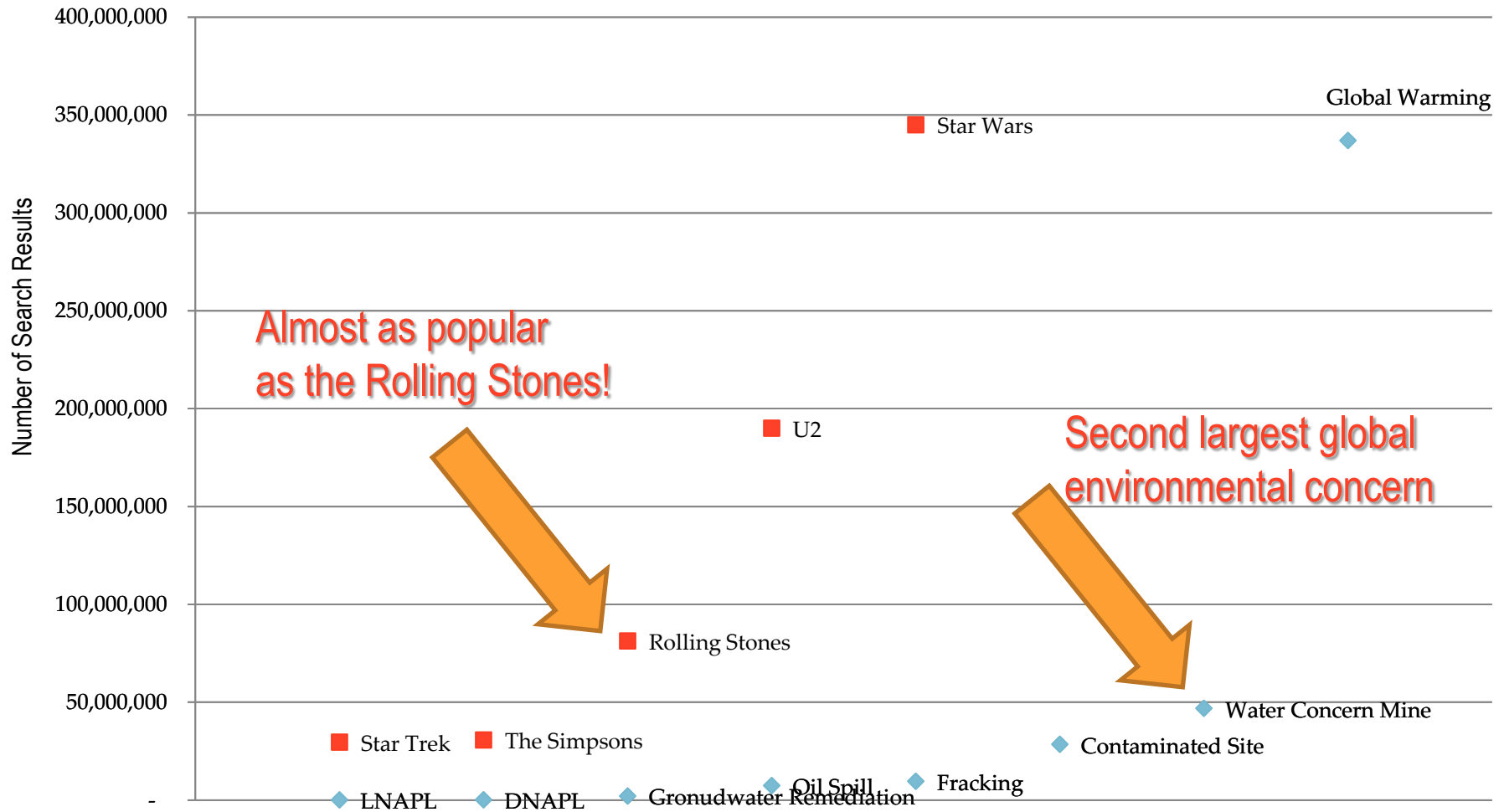
Automated daily reports:

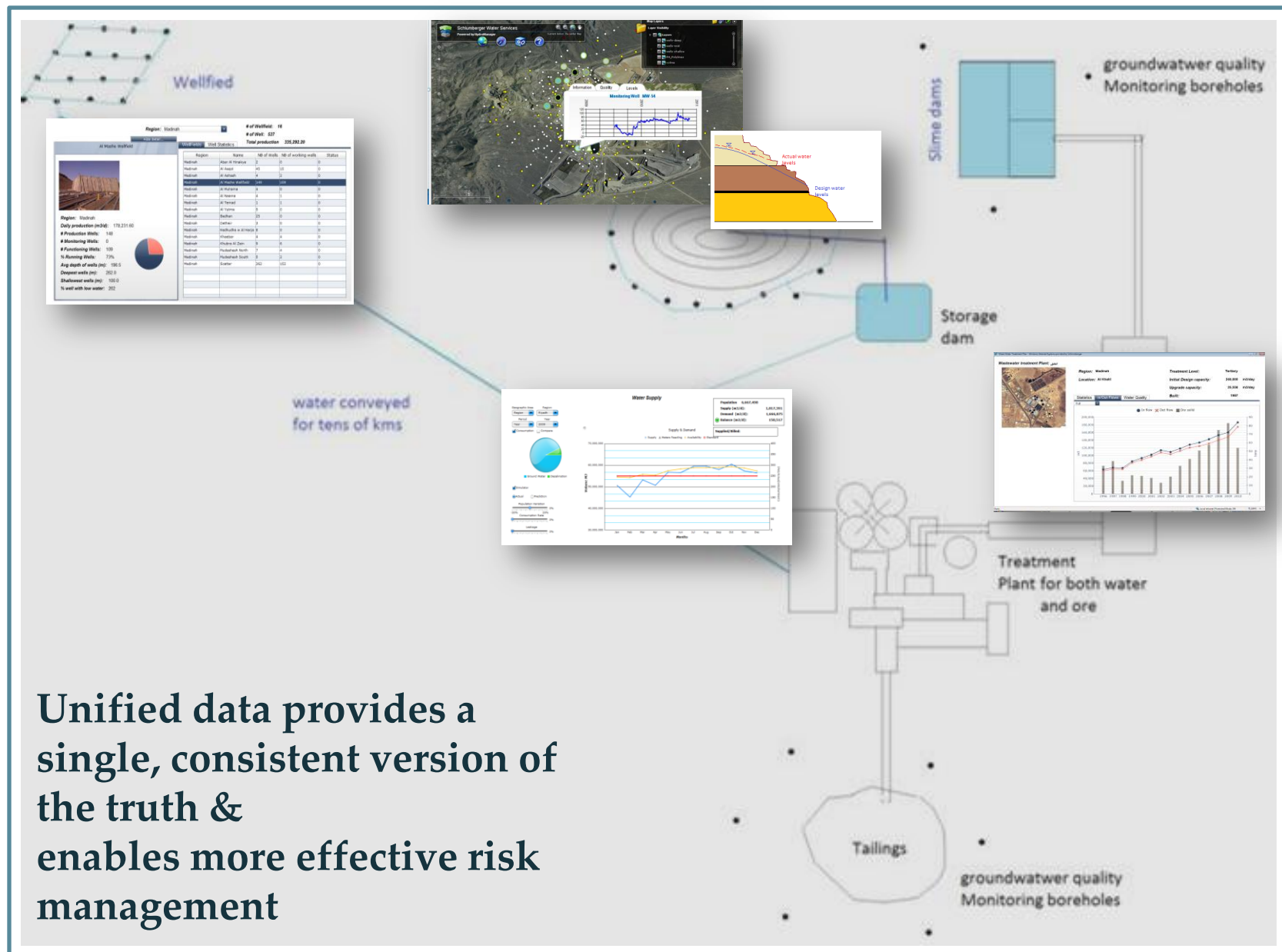
- For all key water metrics enable staff to spend their time focusing on addressing problems, and not formatting data sets

Supply and demand projections:


- Forecasts identify approaching concerns and their causes earlier

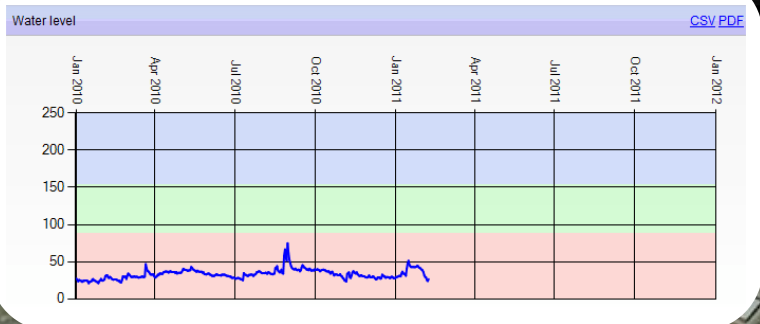
Google Doesn't Lie





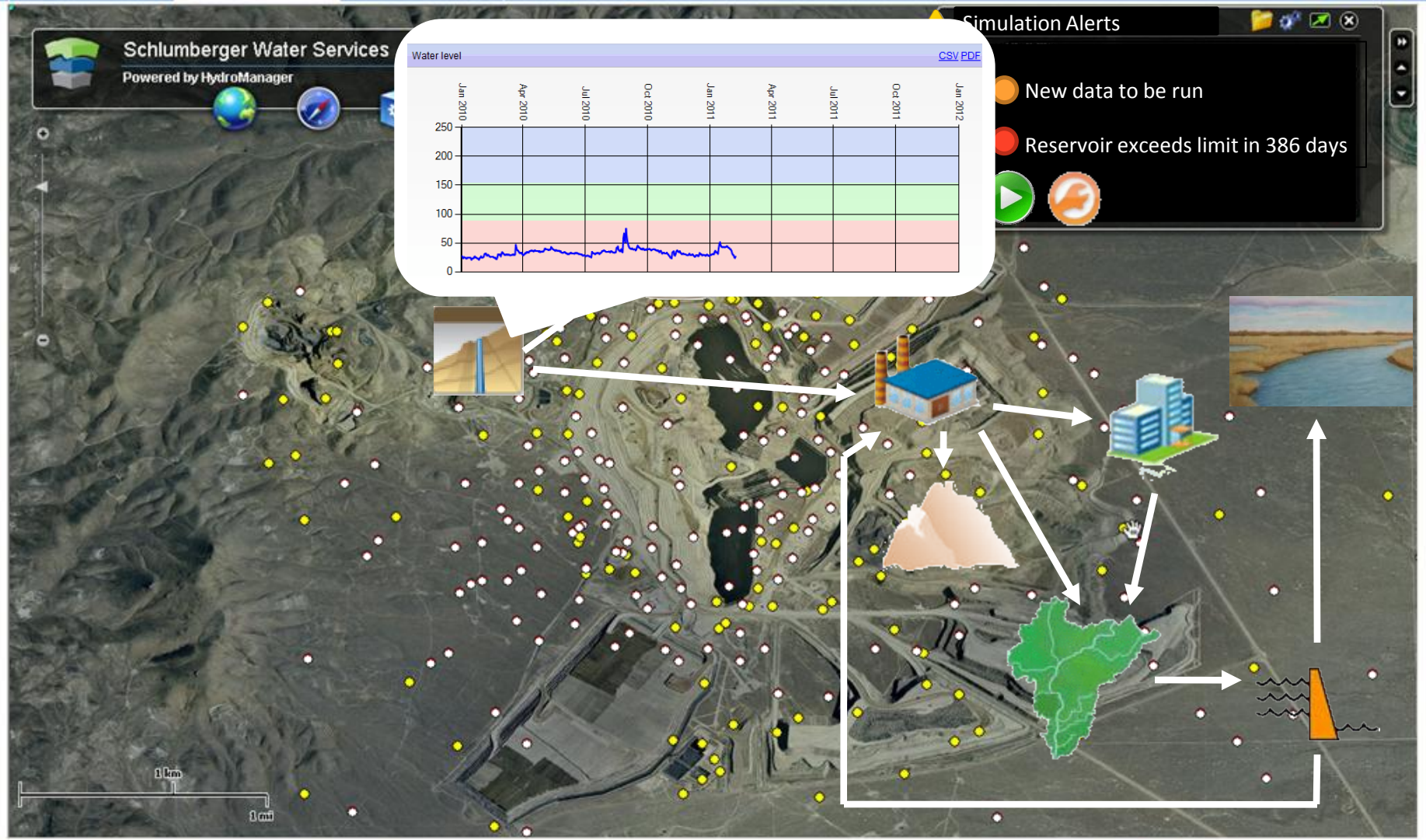
Unified data provides a single, consistent version of the truth & enables more effective risk management

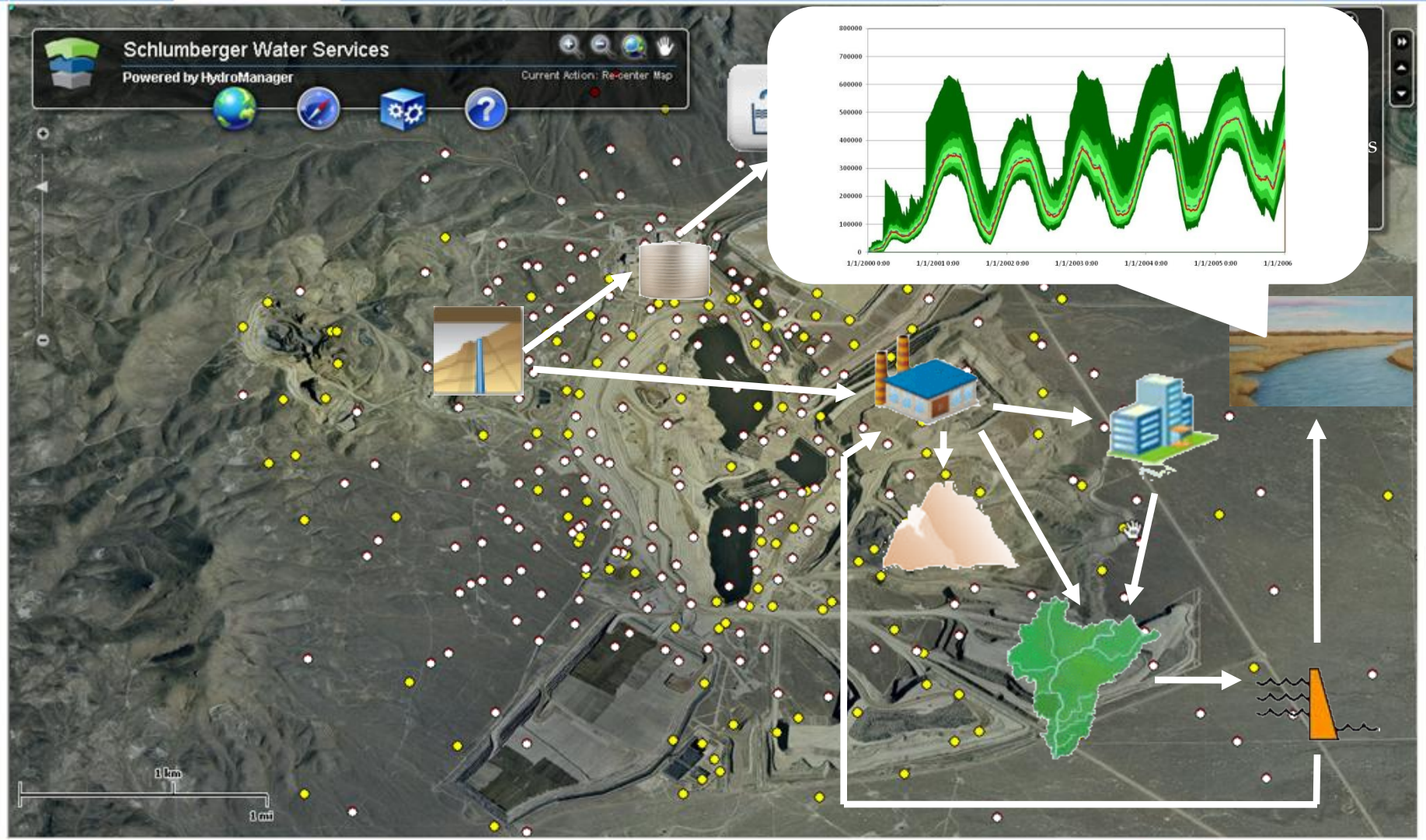
 **Schlumberger Water Services**
Powered by HydroManager

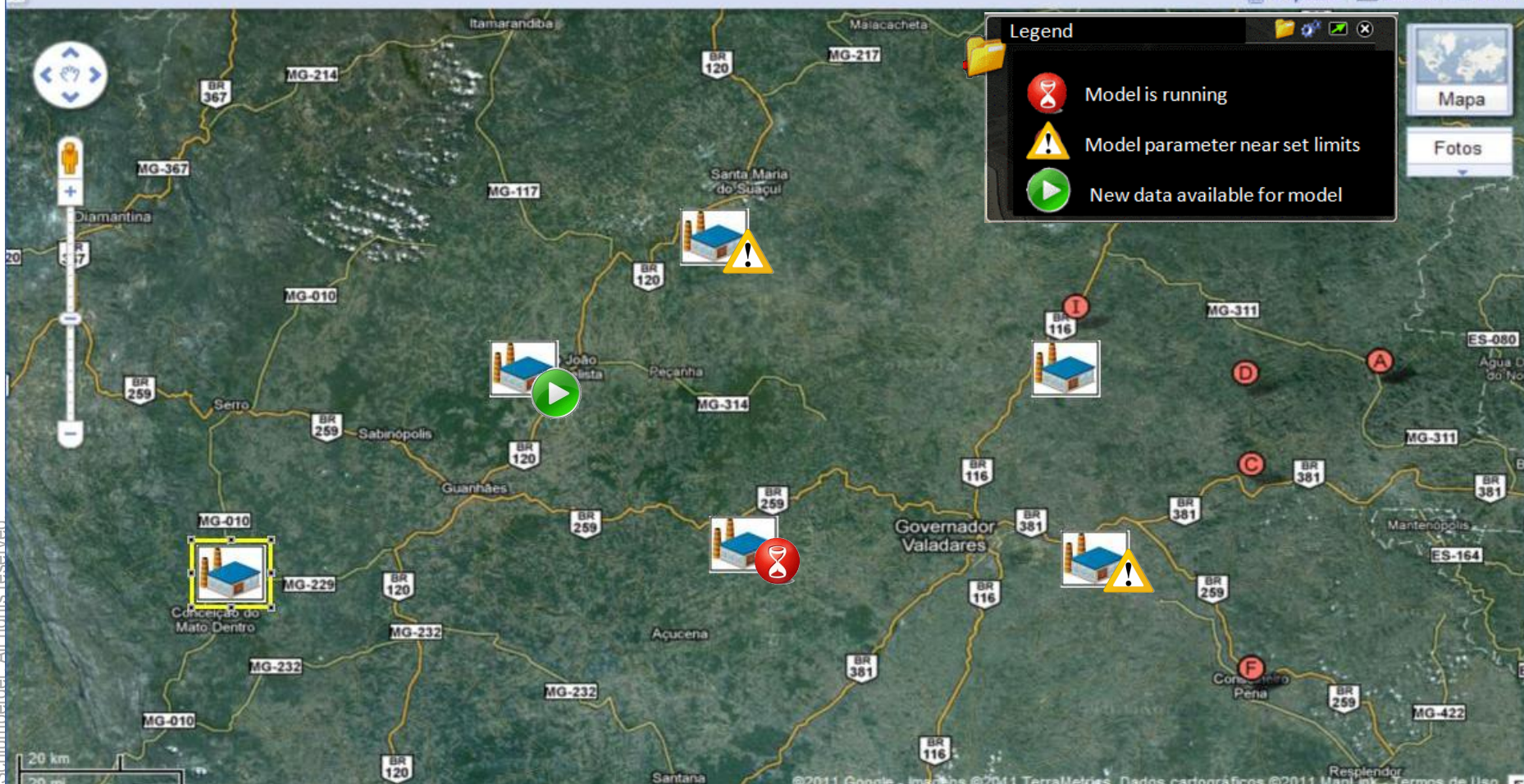


Simulation Alerts

- New data to be run
- Reservoir exceeds limit in 386 days







Key Benefits and Uses

Digital, online system for evaluating water balance scenarios to guide mine planning efforts:

- No software installation = easy access for all
- Smaller learning curve – no complex training necessary for majority of users,
- Standardized, transparent approach to water balance calculations for all mines in NAM and LAM

Evaluation against regulatory permits and notification of concerns:

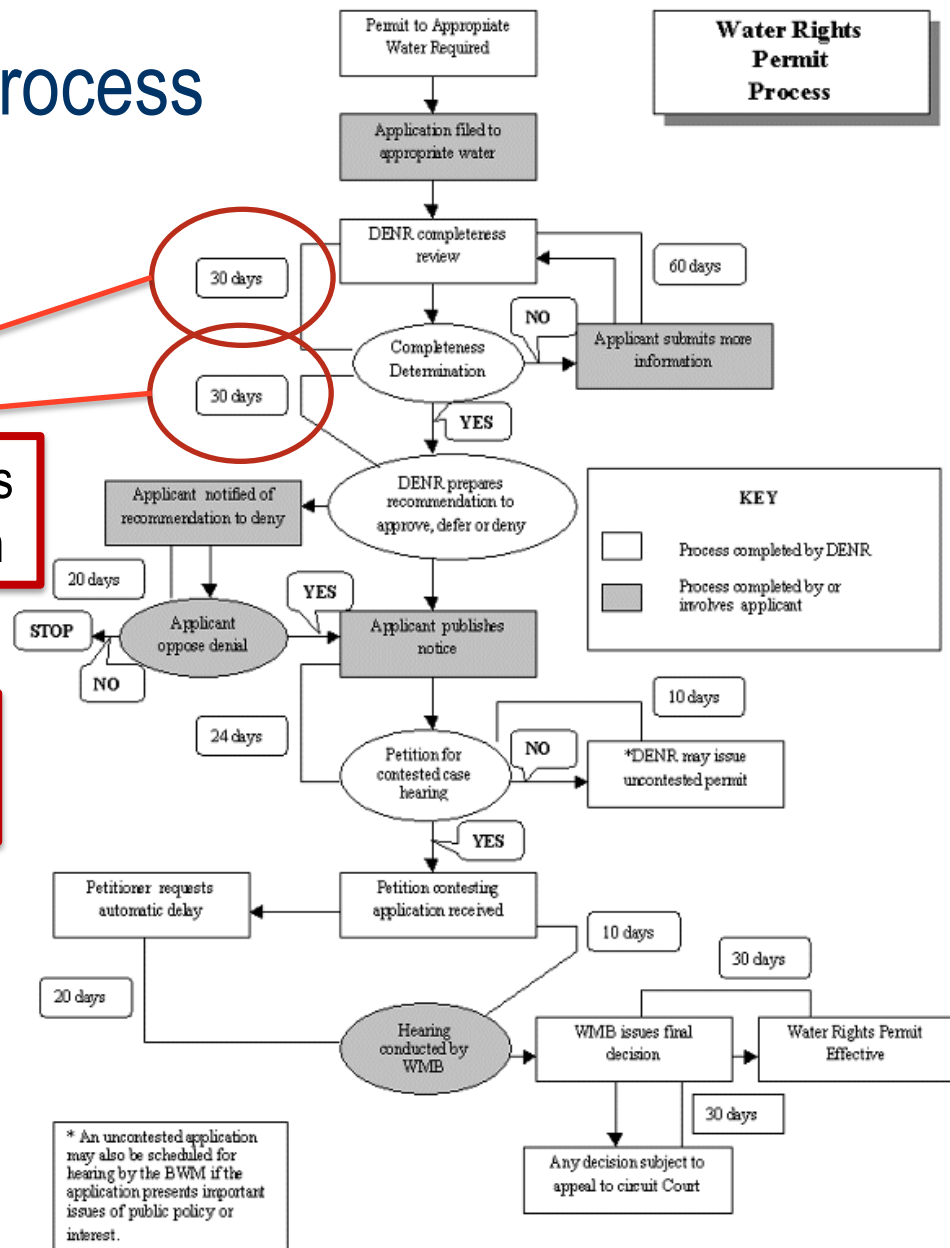
- Up-to-date evaluation of current permits in relation to nearby active permits becomes possible
- Regulatory guidelines are upheld with early detection of potential concerns

LENGTHY WELL PERMITTING PROCESS

“Typical” Permitting Process

30 days to determine completeness
PLUS 30 days for recommendation

Minimum ~70 days for issuance
As much as 100 days if contested



DecisionPoint - Windows Internet Explorer provided by Schlumberger

File Edit View Favorites Tools Help

http://192.168.100.21:8080/dp/pages/apptab/ITabManager.html

DecisionPoint

Welcome, SIS_ADMIN | Thursday, May 13, 2010
Personalization | Logout | About

Administration ArcGIS Server Maps ArcIMS Maps Data Search Organizer Excel Loader HGA Viewer More

Tree: DSS

- Well Permitting DSS
 - DSS
 - Settings
 - Agriculture
 - Domestic**
 - Industrial
 - Un Processed Applications
 - Processed Applications

Please enter required Parameter settings for Domestic Applications:

Parameter	Threshold 1	Threshold 2	Use?
Discharge (m ³ /hr)	20.0	0.0	<input checked="" type="checkbox"/>
Drop in WL (m)	2.0	3.0	<input checked="" type="checkbox"/>
Salinity (mg/L)	1000.0	0.0	<input checked="" type="checkbox"/>
Saturated Thickness (m)	150.0	100.0	<input checked="" type="checkbox"/>
Transmissivity (m ² /d)	10.0	0.0	<input type="checkbox"/>

Threshold Order █ █ █

Well Interference Settings:

Maximum # of Wells within Circular Radius meters ☒

Distance to Closest Well meters ☒

Wells Density (per Hectare) ☒

Save Settings

Done

Internet 100%

Decision Support System - Windows Internet Explorer provided by Schlumberger

File Edit View Favorites Tools Help

Data View

Data View of EAD ▶ HGADssResults_1.0

Page 1 of 1 Table Size 100

Name	X	Y	Usage	DssResult	Salinity	ChangeInWL	SaturatedThickness	Transmissivity
ADD0800422	323,174	2,668,168	Industrial Red	G - 7832.233	G - -0.0167	G - 163.57	Not Used	
ADD0800425	326,330	2,668,446			13747.78 G - -0.0226	G - 259.873	Not Used	
ADD0800443	328,281	2,668,493			13747.78 G - -0.0226	G - 259.873	Not Used	
ADD0800434	327,016	2,668,500			13747.78 G - -0.0226	G - 259.873	Not Used	

Total Records: 4 Entity: HG

cord Selected.

- Set as Approved
- Set as Rejected
- Set as Undecided
- Context Viewer

Map Satellite Hybrid Terrain

☒ Show labels

2000 ft

Map data ©2010 LeadDog Consulting, Europa Technologies - Terms of Use

Key Benefits and Uses

Digital, online system for well permitting application and approvals means:

- Easier permit searching,
- Faster process (no need for manual data entry step)
- Up-to-date evaluation of current permits in relation to nearby active permits becomes possible

Evaluation of permits against consistent set of standards means:

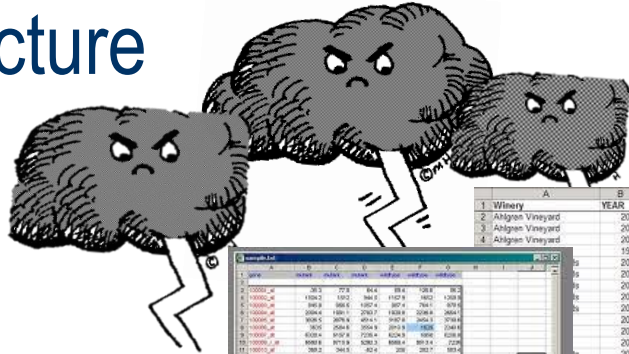
- Regulatory guidelines are upheld

Automation of assessment criteria means:

- Faster turn-around time for applicants
- Agency employees can spend more time on questionable or problematic permits, and not on the more “routine” submissions

**LARGE DATA INVESTMENT,
NO RESULTS...**

Previous Data Flow Structure



Winery	YEAR	Description	1.5L	Type
2002 Pinot Noir Ventana				
2002 Cabernet Franc				
2004 Pinot Santa Cruz				
1997 Cabernet Sauvignon Reserve				
2003 Chardonnay Trout Gulch				
2005 Syrah Santa Cruz				
2005 Chardonnay				
2004 Zinfandel				
2004 Pinot Noir				
2002 Emory Estate				
2004 Syrah				
2002 Merlot				
2004 Cabernet				
2003 Syrah				
2000 Cabernet				
2004 Zinfandel				
2004 Syrah				
2004 Chardonnay				
2006 Pinot Noir				
2001 Zinfandel				



Real-Time Data Collection



Security



Local/Wide Area Network



Laboratories, Consultants, Drillers Client Staff

Monitoring

WQ

Tanks

Discharge

Wells

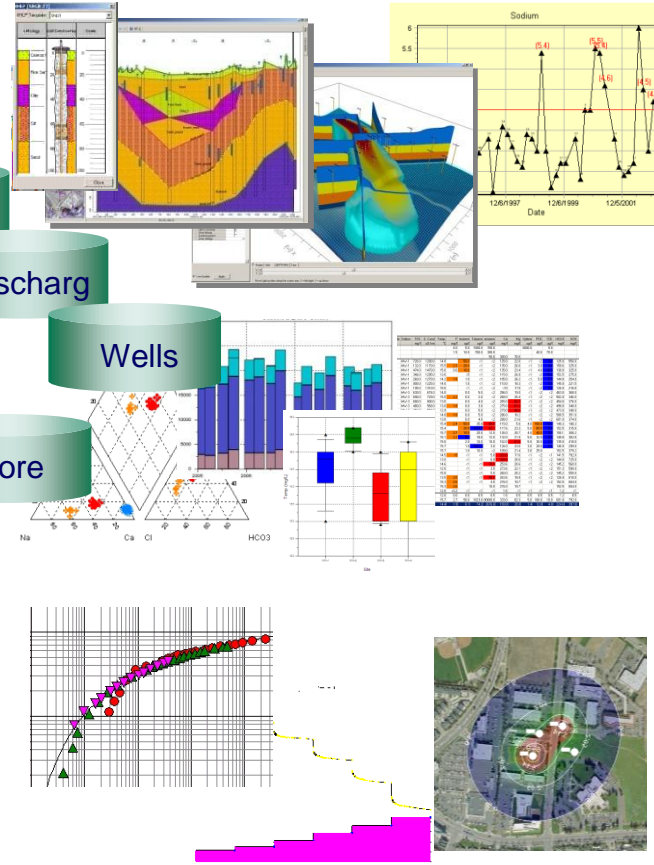
Surface

Core

Pump

Images

Others



Borehole logs are accessible through HM on demand

ArcGIS Map HGA Viewer Well Monitor Water Level

Tree: ADWRDMS

- WS_2.0_SQL_WaterWells
 - Diver
 - demo
 - Projects
 - Demonstration
 - Station_Groups
 - SQL_Groups
 - Abandoned_Wells
 - Chemistry_Wells
 - Constructed_Wells
 - Geophysics_Wells
 - Lithology
 - Pumping
 - Shallow_L
 - Water_Lev
 - Generic
 - Station Data
 - Data By Category
 - Queries
 - CrossSections
 - A-A'
 - B-B'
 - C-C'
 - D-D'
 - E-E'
 - AA

Data View

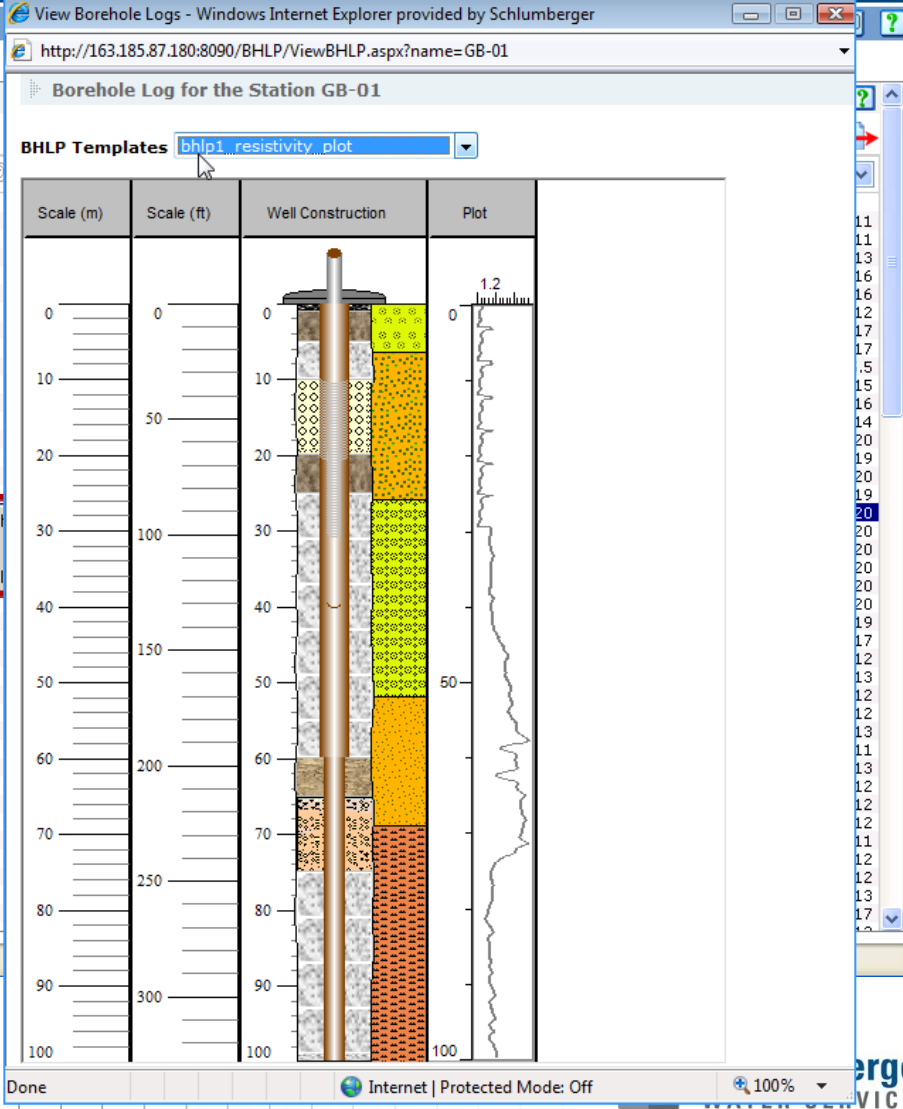
Data View of demo

Page 1 of 6 Table Size 100

StationID	
1 MW-1	
2 MW-2	
3 MW-3	
4 MW-4	
5 MW-5	
6 MW-6	
7 MW-7	
8 MW-8	
9 MW-9	
10 MW-10	
11 MW-11	
12 MW-12	
13 MW-13	
14 MW-14	
15 MW-15	
16 MW-16	
22 MW-22	
23 MW-23	
24 MW-24	
25 MW-25	
26 MW-26	
27 MW-27	
28 MW-28	
29 MW-29	
30 MW-30	
31 MW-31	
32 MW-32	
33 MW-33	
34 MW-34	
35 MW-35	
36 MW-36	
37 MW-37	
38 MW-38	
39 MW-39	
40 MW-40	

Done

Right-click to view borehole logs for selected wells



Key Benefits and Uses

Align Seven Prime Contractors:

- Technical teams were very siloed and all delivered data in different formats; informed decisions were slow to arrive at, and not always based on consistent information

Enable Consistent Access to Existing High Quality Data Store:

- Previously, invested heavily in master data store, but data was slow to come out of it. As a result, project managers were not using this data set for their projects
- Now, everyone has access to the master data store to build from for their project work

"This software will change the way we do business here, and may help to shorten the time for site closure"

Integrate our Environmental Tools with Existing GIS Infrastructure:

- Integrated borehole log online viewer with their existing ArcGIS Server instance
- Now all ArcGIS Server Map users can see contextual borehole logs built on-the-fly

BIG PICTURE CONSIDERATIONS

Exploration

Development

Production

Natural Water Sourcing
Intrinsic Susceptibility
Risk Assessments

Near Surface Data?

Geology and
Geophysics
Data Collection
Volume Estimates

Opportunity?

Impact Assessments
Baseline Data
Source/disposal option
investigation

Monitoring Wells?
Source/Disposal Wells?

Infrastructure
Well Planning
Well Construction

Opportunity?

Compliance Events
Source/Disposal
Events
Mitigation

Source/Disposal Vol.?

Production Events
Production Volumes
Enhancements
(Fracking, EOR, SAGD)

Opportunity?

Oil and Gas

Environmental

Thank you

Jennifer Hurley

jhurley@slb.com

www.swstechnology.com



Schlumberger
WATER SERVICES