Los Alamos
NATIONAL LABORATORY
EST. 1943

Chromium Groundwater Remediation Campaign

Presentation to the Citizens' Advisory Board

March 26, 2014

LAUR 14-21884

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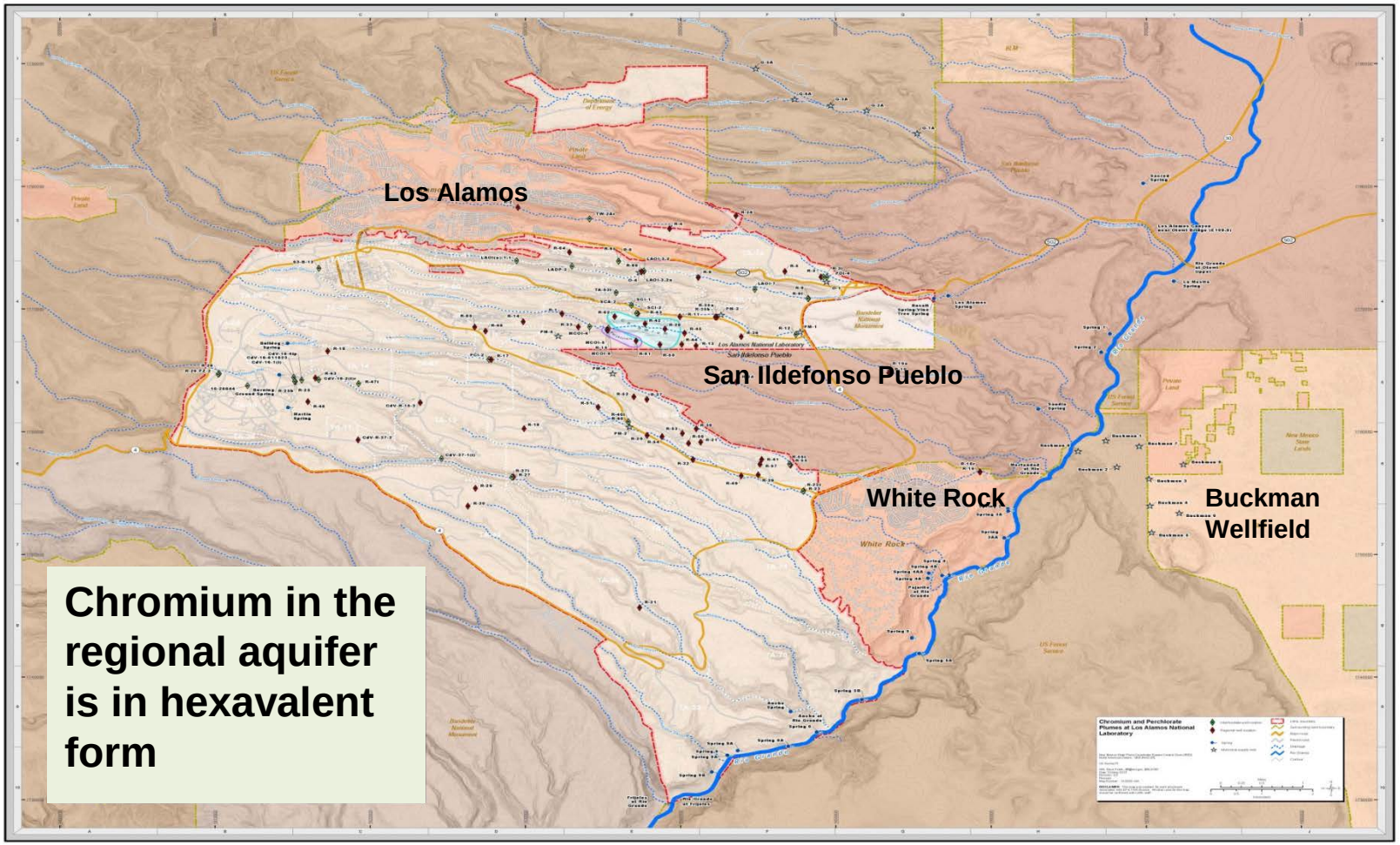
Presentation Overview

- What is the chromium groundwater remediation campaign?
- Background
- Nature and extent
- 2013 activities and results
- Path forward

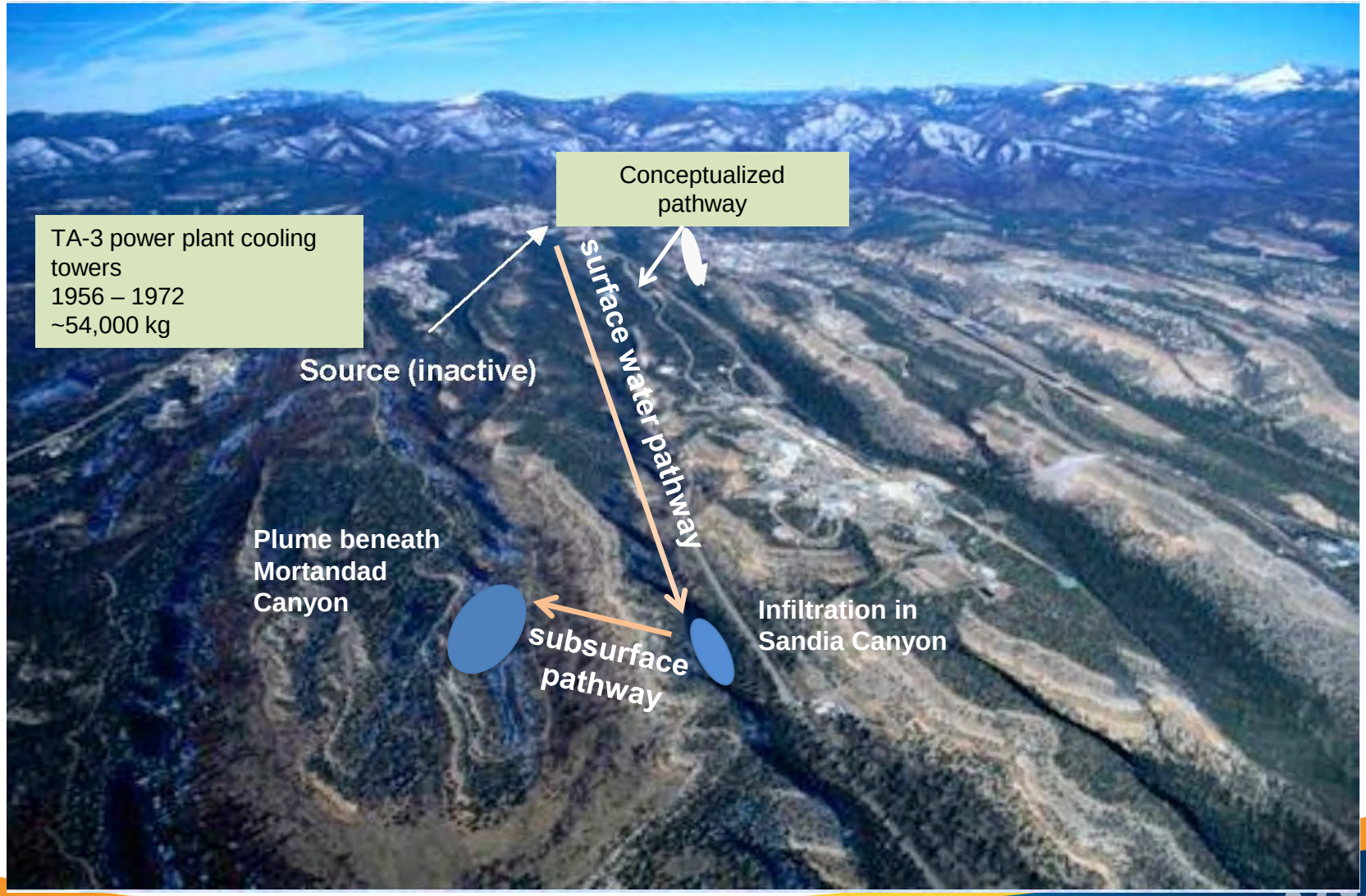
Chromium Groundwater Remediation Campaign

- Accelerated project to address chromium contamination in groundwater
  - √ Bias towards action
  - √ Goal-oriented
  - √ Establishes key schedule milestones for remediation goals
  - √ Active engagement with regulators and stakeholders

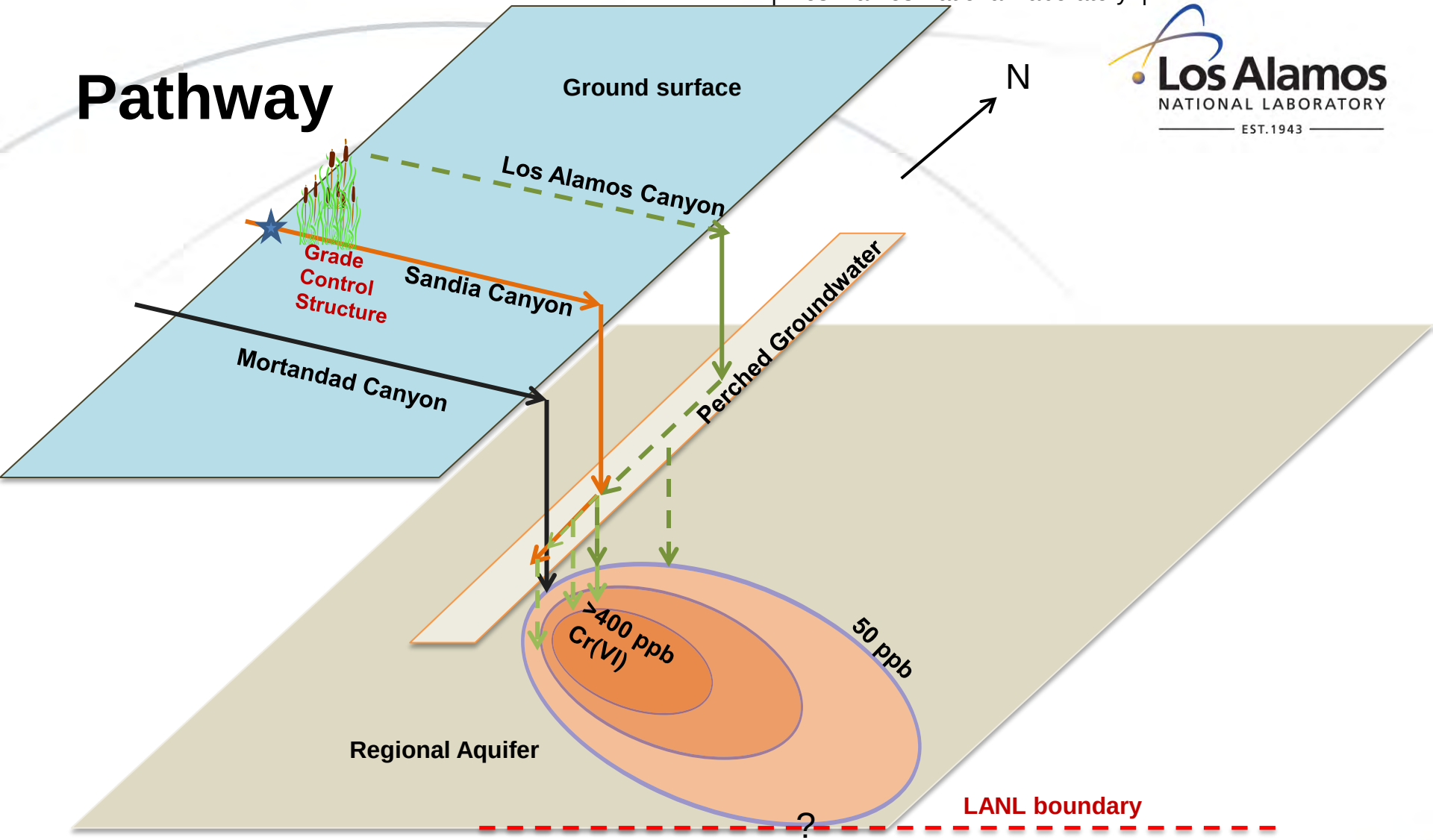
Chromium Plume



Chromium Fate and Transport



Pathway


Ground surface
N
Los Alamos Canyon
Grade Control Structure
Sandia Canyon
Mortandad Canyon
Perched Groundwater
>400 ppb Cr(VI)
50 ppb
Regional Aquifer
?
LANL boundary

Sandia Canyon Wetland

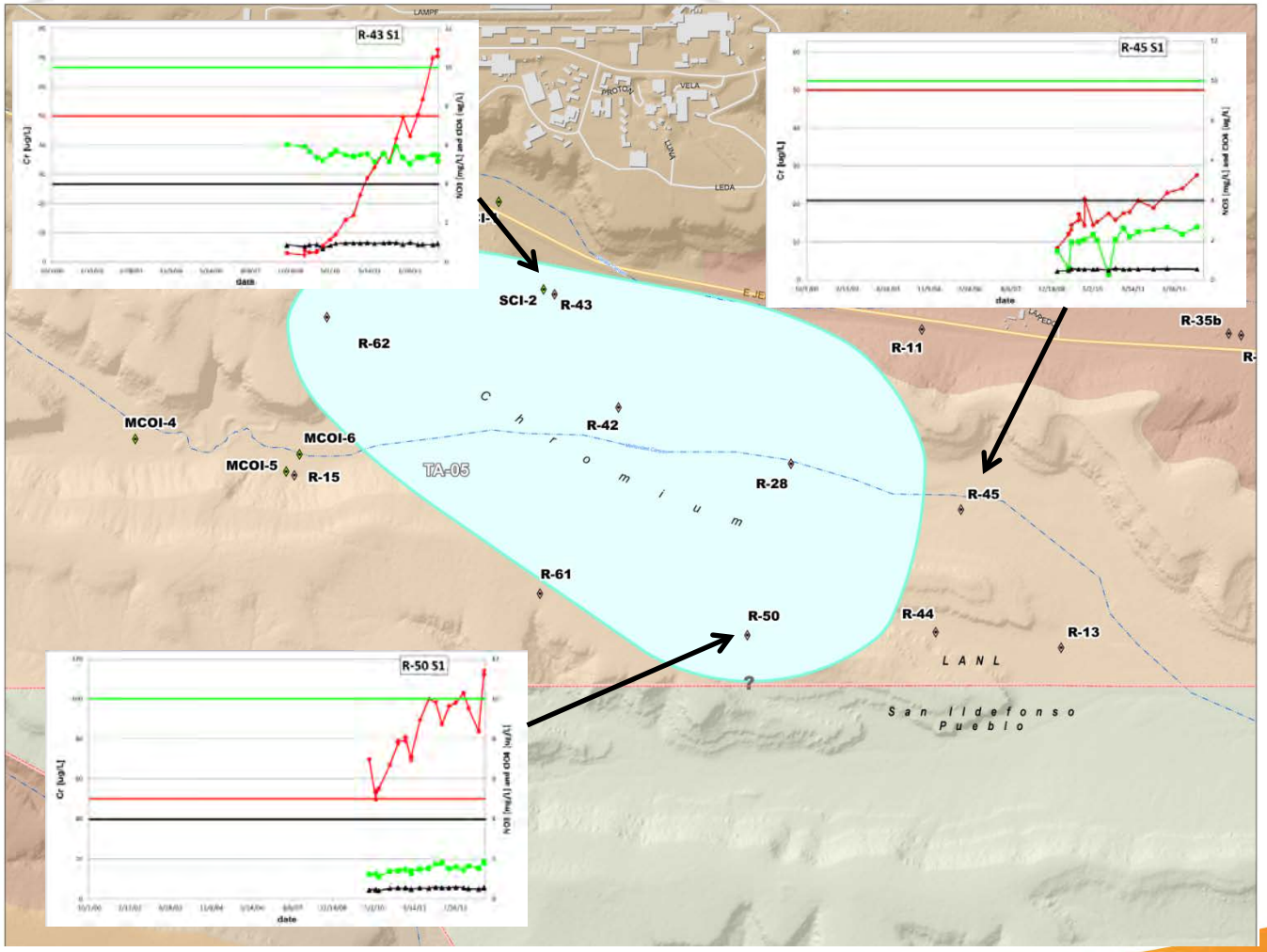
Sandia Wetland Grade Control Structure

Buried sheet piling controls stream gradient
Prevents erosion

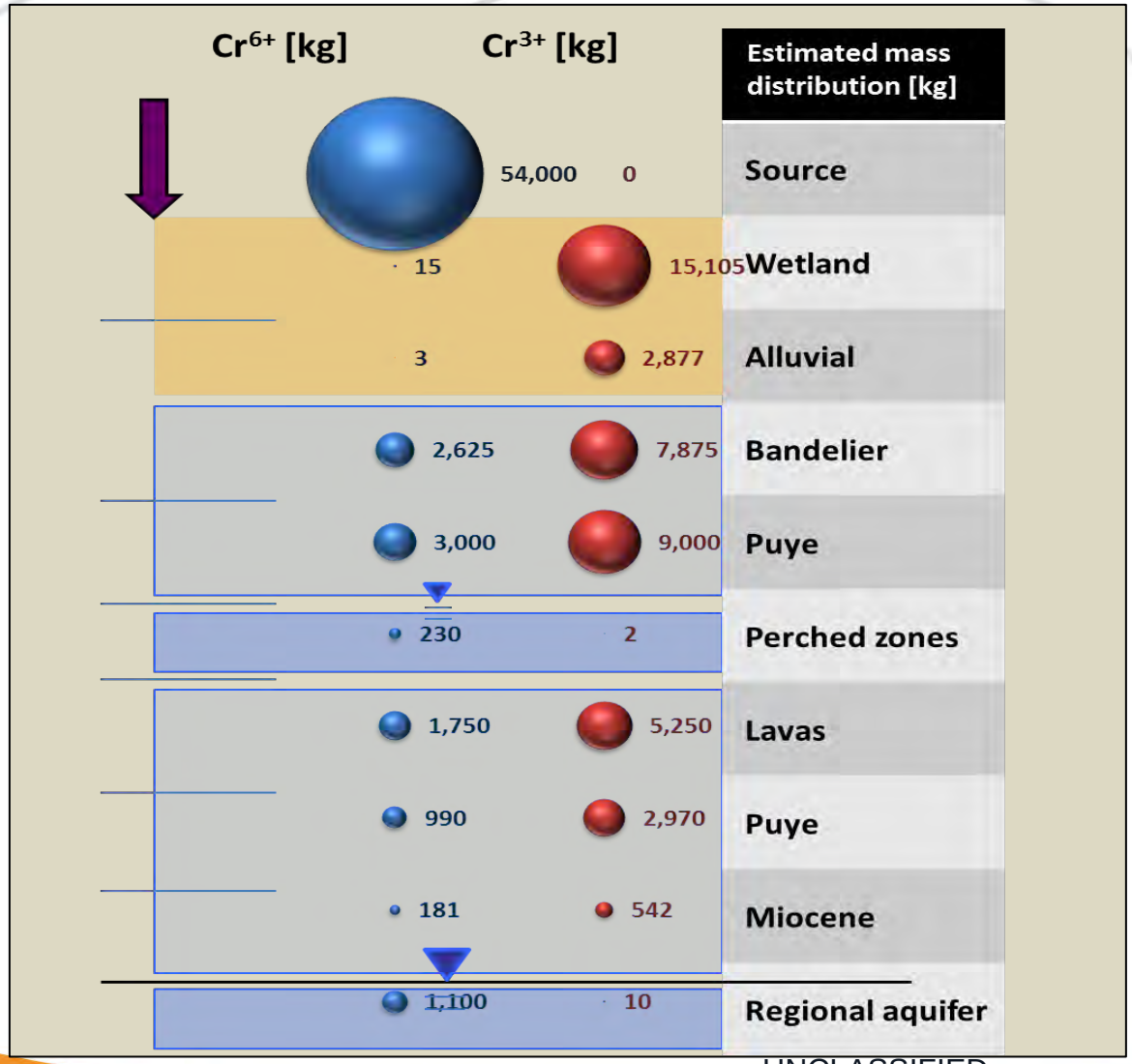
Engineered “drop” from wetland surface to channel

Nature and Extent in Regional Aquifer

Monitoring data from several wells along plume periphery show increasing trends in Cr



Distribution of Cr6+ and Cr3+



- Natural processes have converted much Cr6+ to stable, non-toxic Cr3+
- Important to understand distribution and form of Cr mass to guide remedial actions

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2013 Field Activities

Objectives:

1) Collect hydrologic data to support optimization of mass removal in centroid

2) Evaluate the potential for mass removal from the perched-intermediate zone

Aquifer tests at existing monitoring wells

- R-42
- R-28
- SCI-2

- Capture zone analysis in centroid (high mass area)

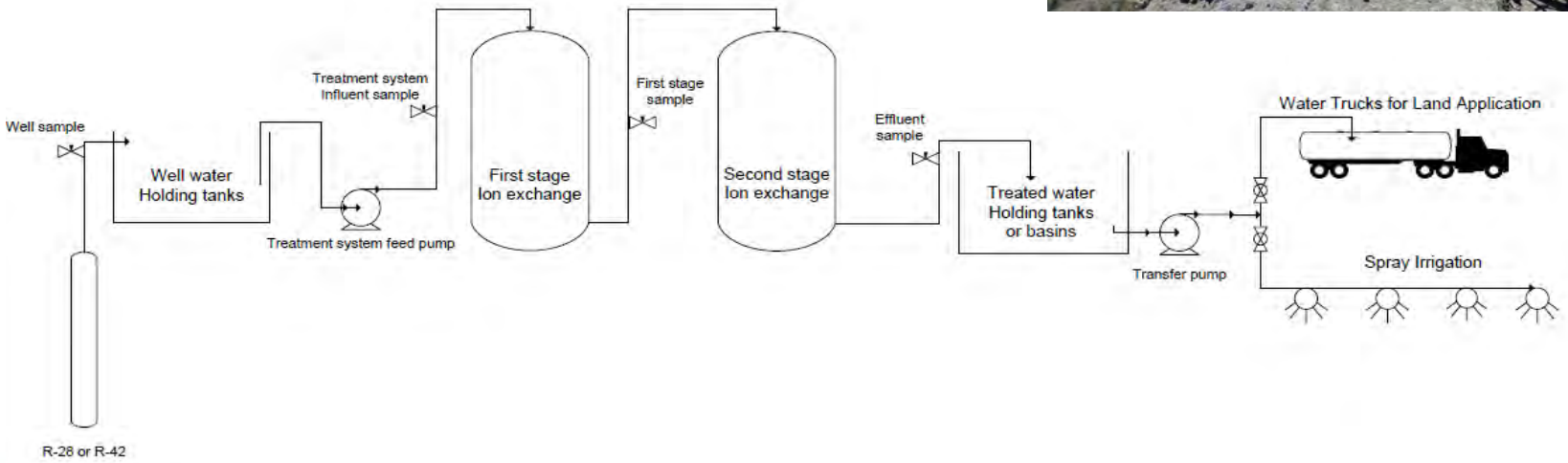
- Characterize behavior of contaminant concentrations during pumping

- Source removal

Treatment of Pumped Water

- Evaluate efficiency of treatment system
- Required to meet land-application criteria

LANL Groundwater Chromium Treatment System



Well Housing

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Ion Exchange Vessels

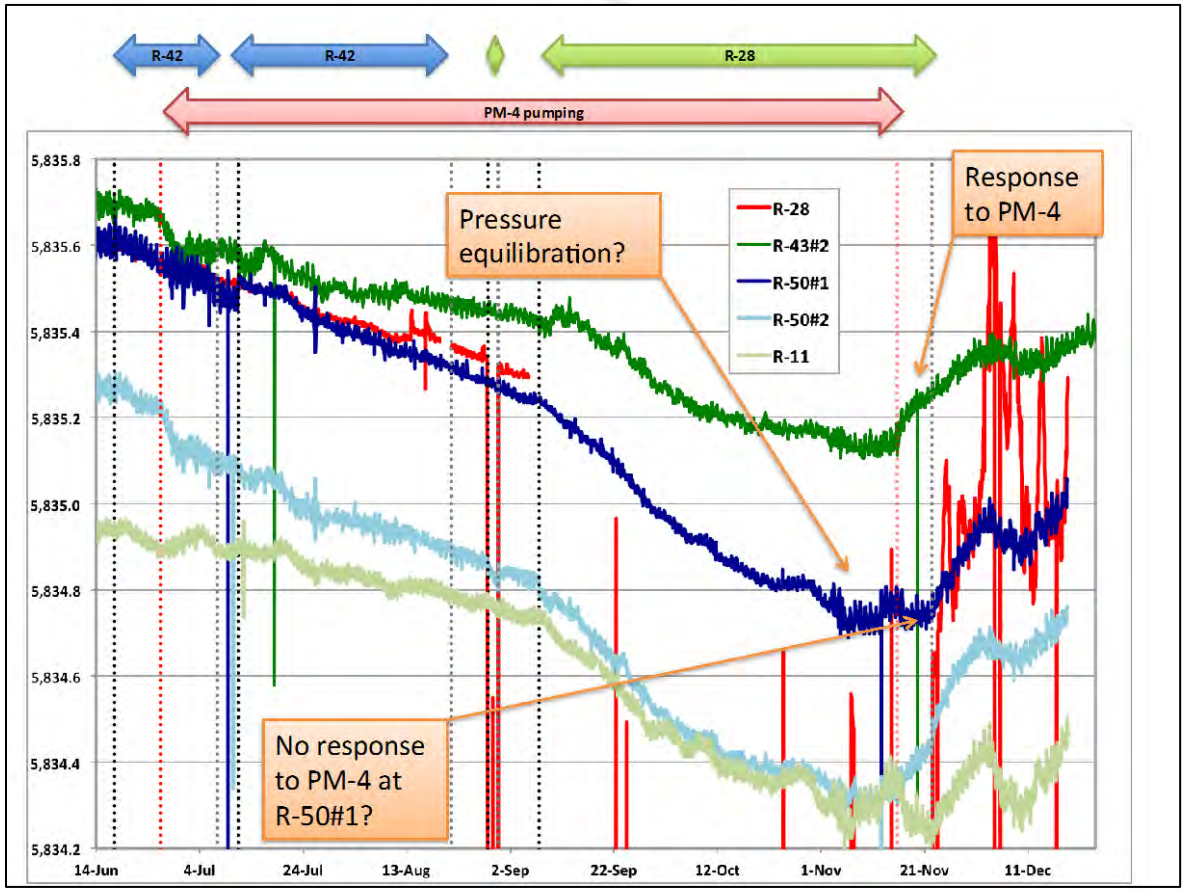
Holding Tanks

Sampling

What we learned in 2013

Pressure responses

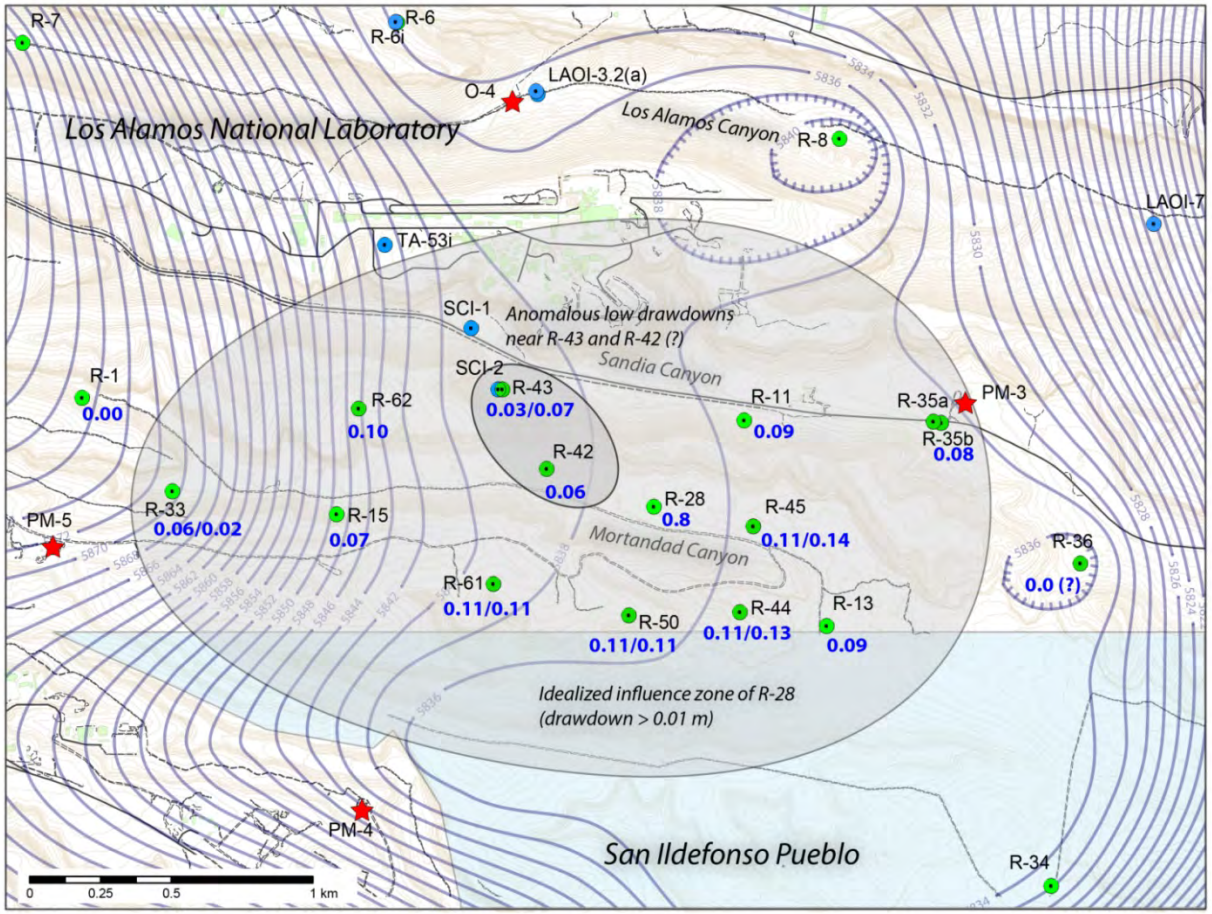
- Most wells responded to the extended aquifer pumping at R-28 and R-42
- Pumping at R-42 produced pressure responses only at 1 nearby well
- Pumping at R-28 produced pressure responses a most wells within the plume



What we learned in 2013

Hydrologic zone of influence

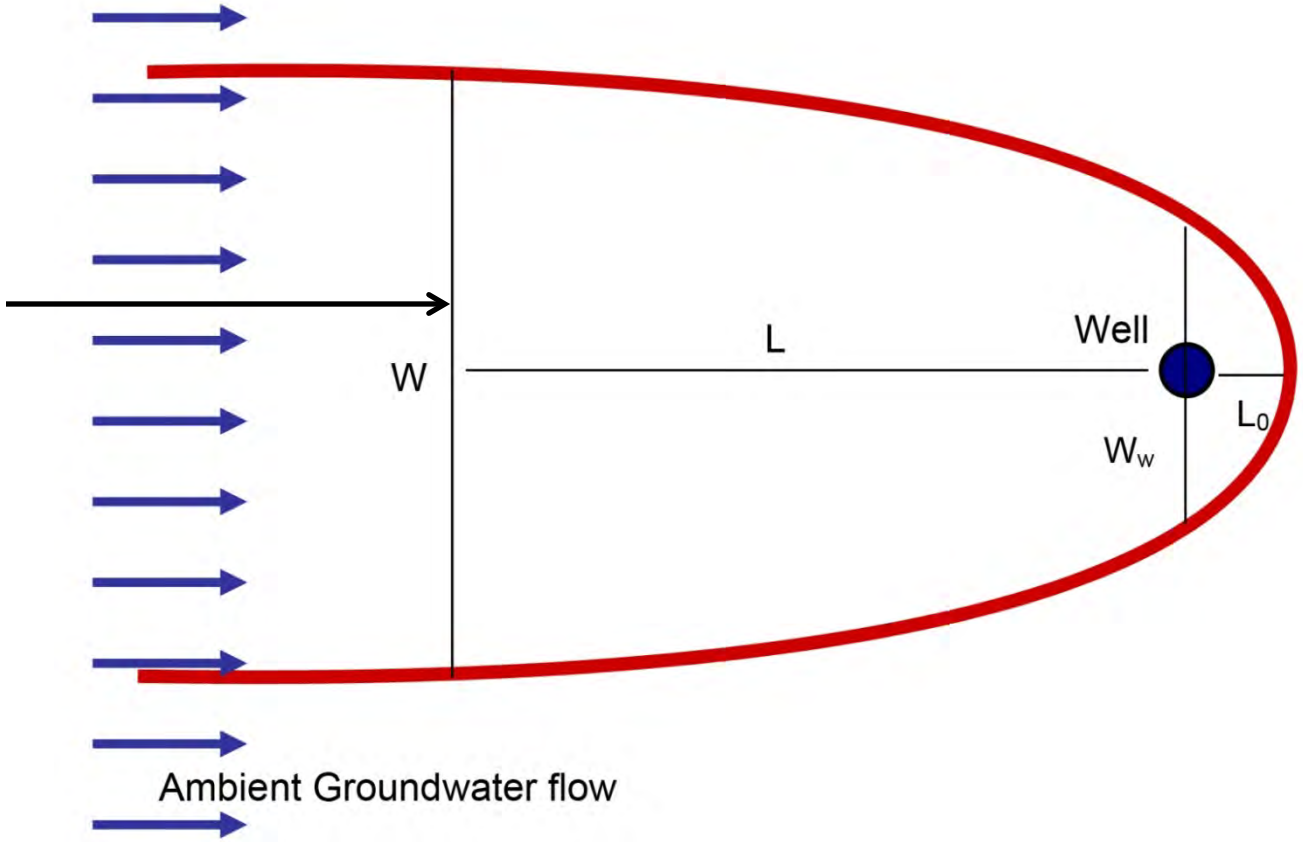
- R-28 produces a much larger zone of influence to pumping than R-42
- Consistent with aquifer properties at each well



What we learned in 2013

Conceptualized capture zone

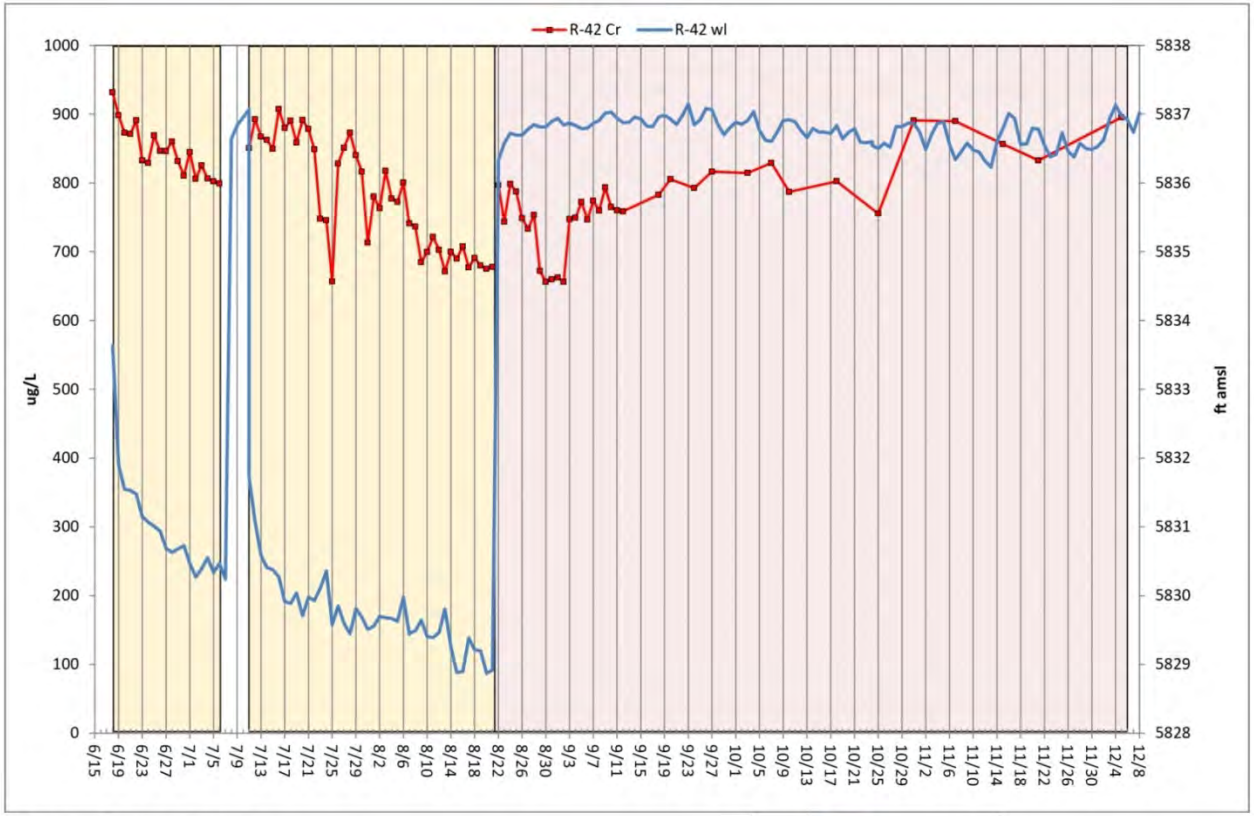
Maybe be up to ~400 m with sustained pumping near R-28



What we learned in 2013

Cr trends during pumping at R-42

- Concentrations declined by ~27% over about 1 month
- Rebound over about 2 months



Chronology of pumping and rebound				
Well	Pumping	Pump failure	Rebound	Average Discharge Rate
R-42	6/18 - 7/6/13; 7/12 - 8/21/13	7/7 - 7/11/13	8/22 - 12/5/13	7 gpm*

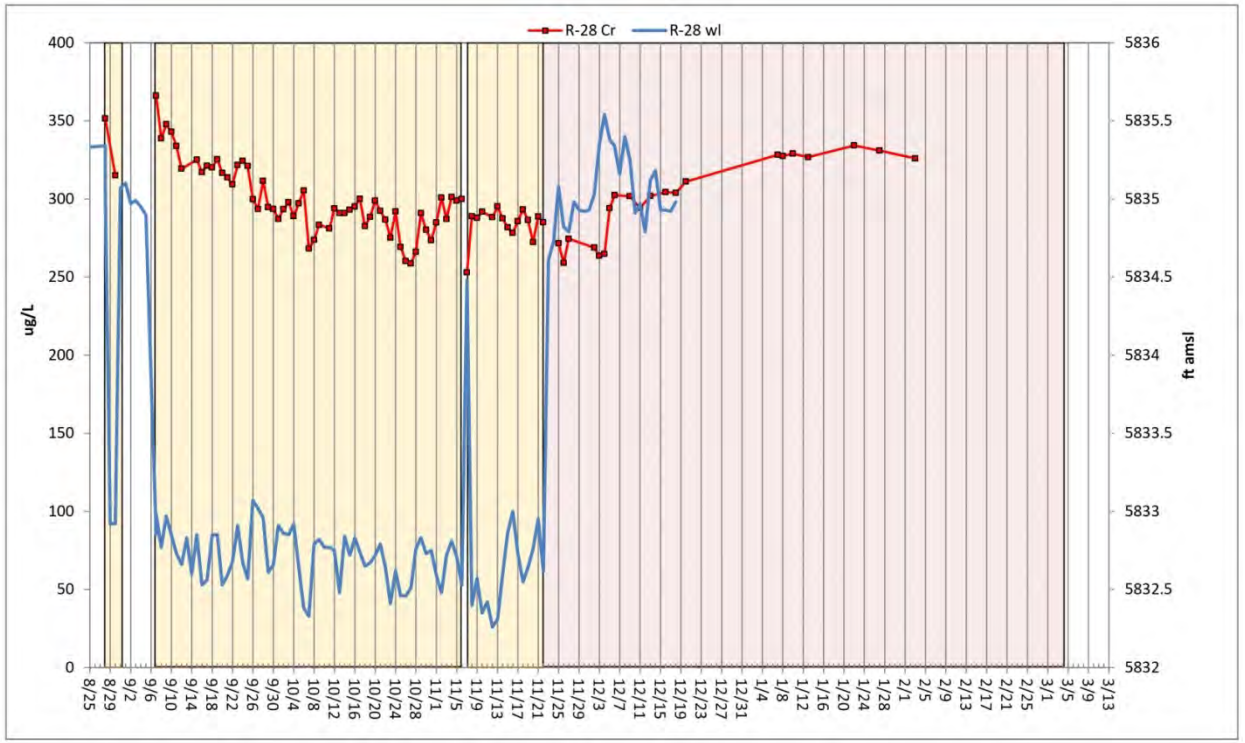
*gpm = gallons per minute

R-42 time series plot for chromium and water level during pumping and rebound sampling.

What we learned in 2013

Cr trends during pumping at R-28

- Concentrations declined by ~20% over about 1.5 month
- Rebound over about 2 months



Chronology of pumping and rebound

Well	Pumping	Pump failure	Rebound	Average Discharge Rate
R-28	• 8/28 - 8/30/13 (pump set in shroud in sump below screen) • 9/7-11/6 (pump removed from shroud and reset above screen) • 11/7-11/22/13	• 8/30 - 9/7/13 • 11/6 (1730 hrs) - 11/7/13 (0700 hrs) generator tripped	11/22/13 - 3/4/14	28.9 gpm*

*gpm = gallons per minute

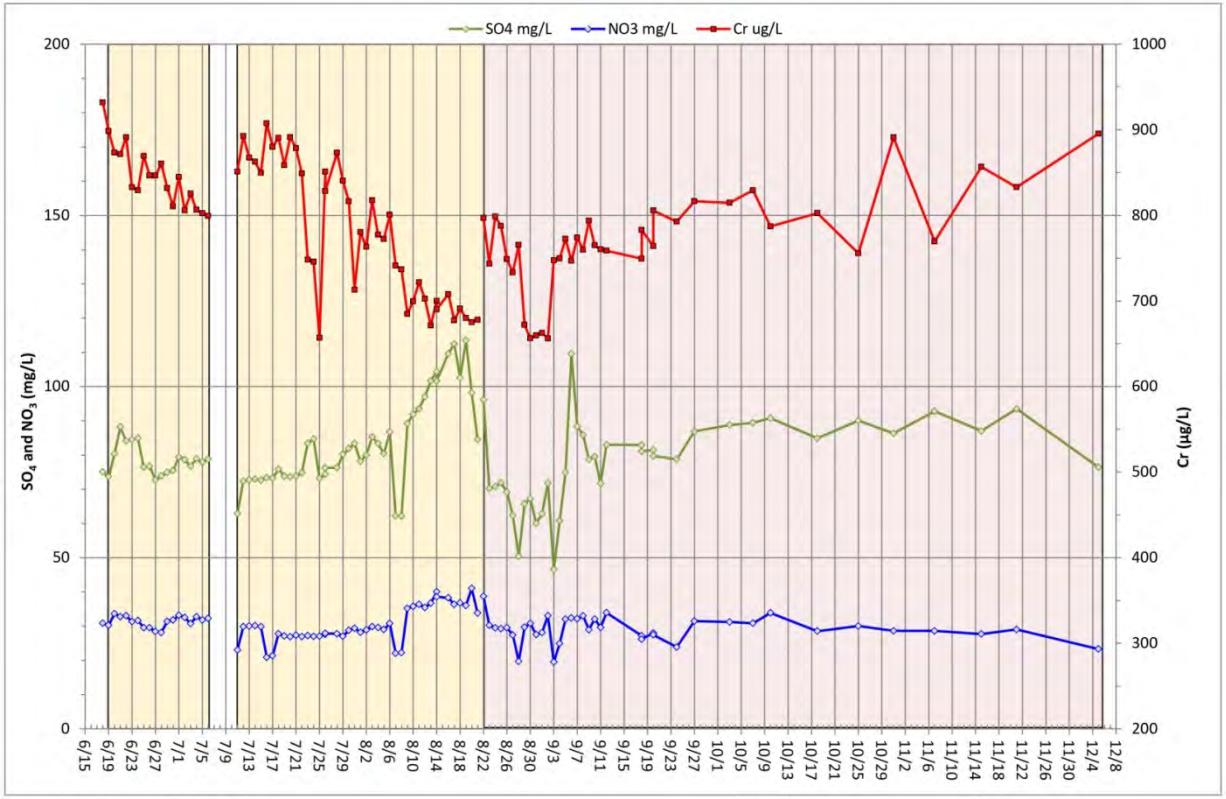
pumping
rebound

R-28 time series plot for chromium and water level during pumping and rebound sampling.

What we learned in 2013

Trends of other constituents

- Other collocated constituents remained relatively stable, but
- may also show opposite trend to Cr at times



Chronology of pumping and rebound

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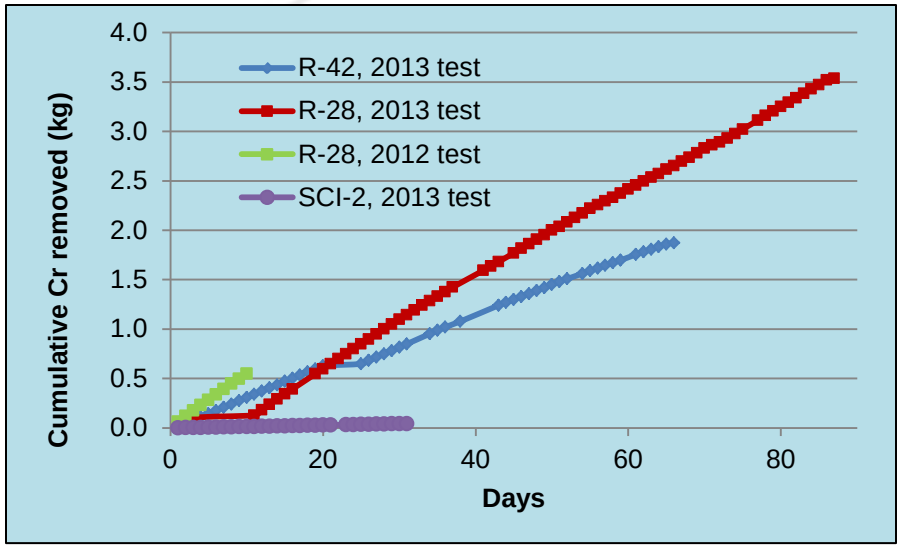
*gpm = gallons per minute

pumping
rebound

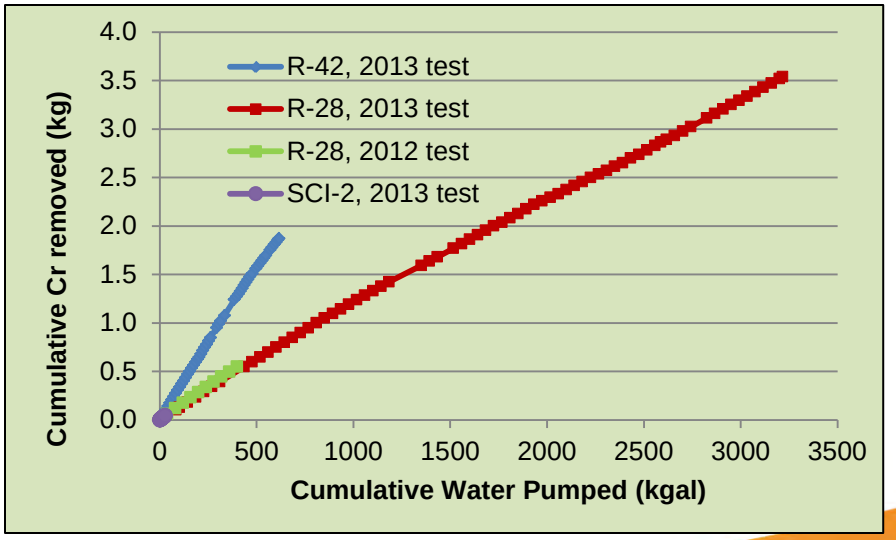
R-42 time series plots for chromium, sulfate, and nitrate during pumping and rebound sampling.

What we learned in 2013

Chromium mass removal

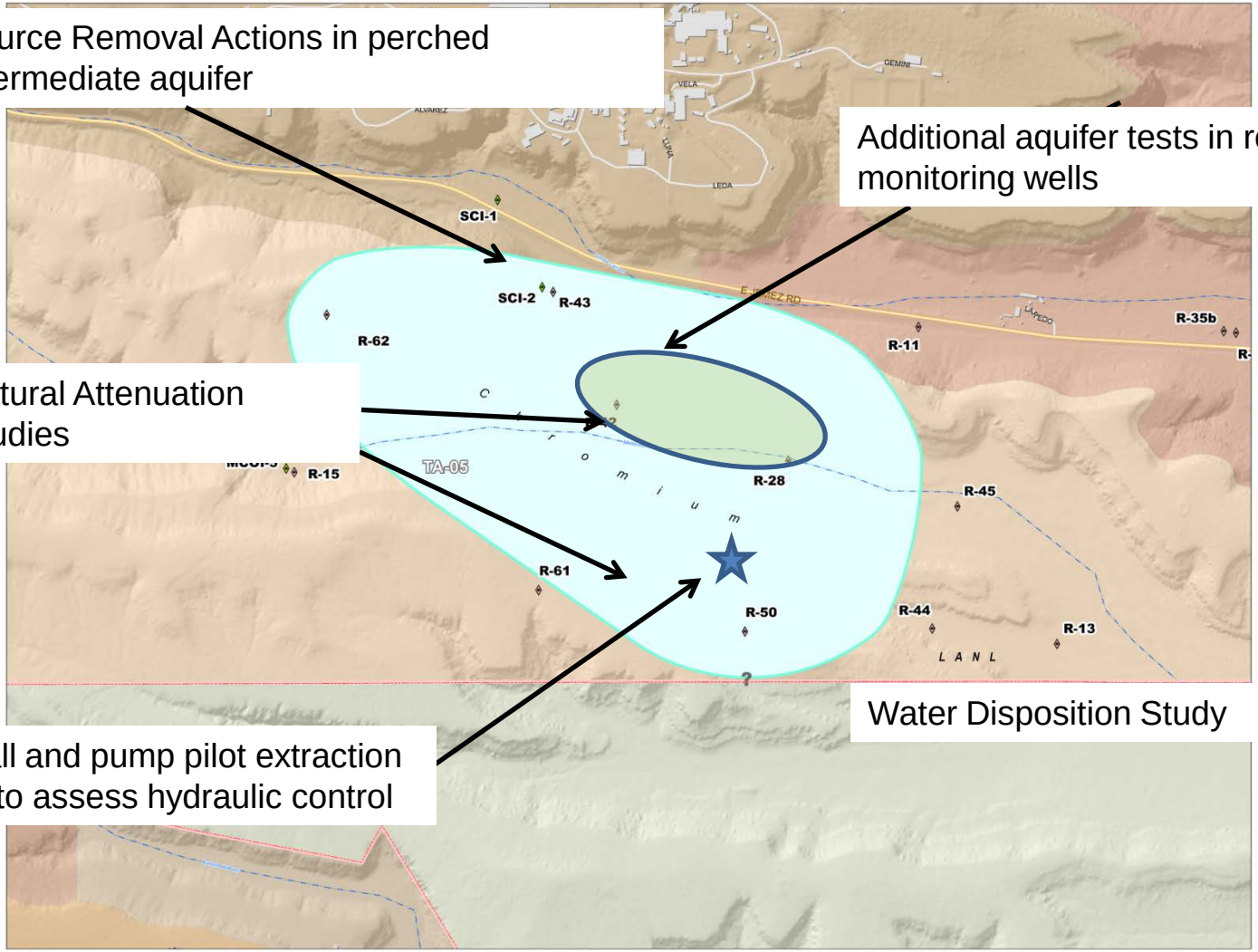


Higher Cr <u>mass removal rates</u> at R-28
- Lower concentrations (~300 ppb)
- 4x higher pumping rate of R-42 (29 gpm)



Higher Cr <u>mass removal efficiency</u> at R-42)
- Higher concentrations (~800 ppb)
- ¼ the pumping rate of R-28 (~7 gpm)

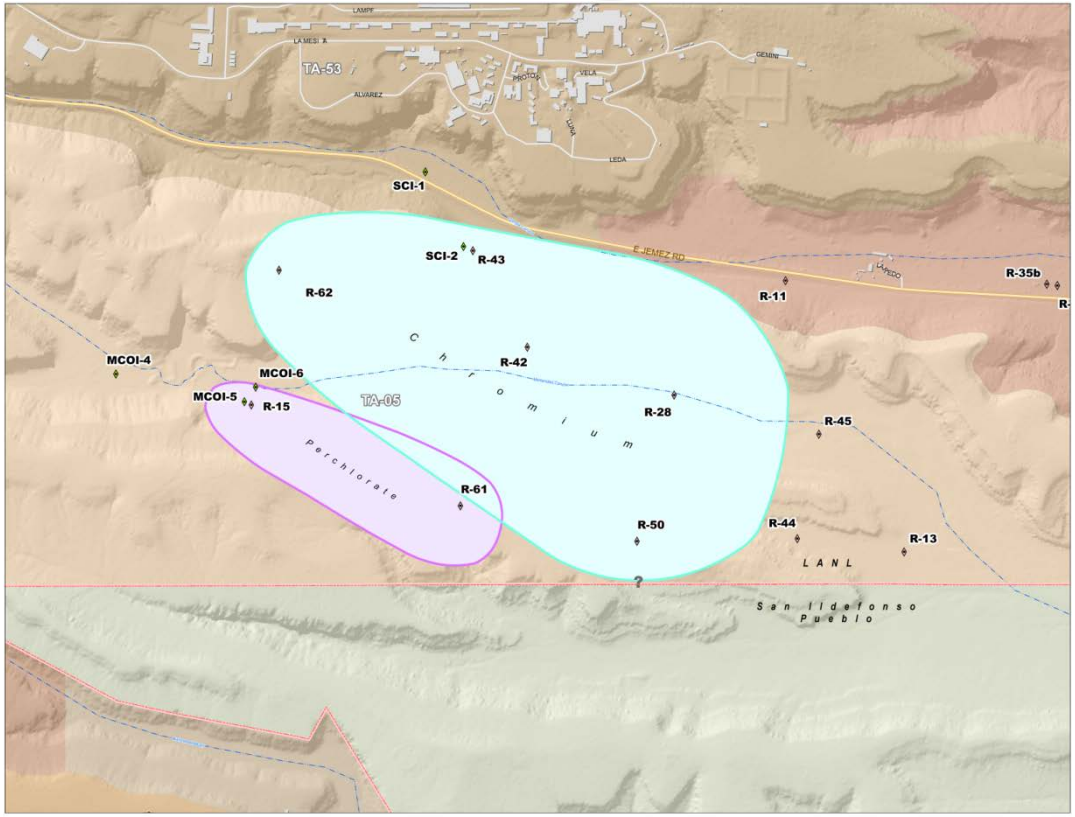
What we are doing in FY14



Perchlorate

Mortandad Canyon Source

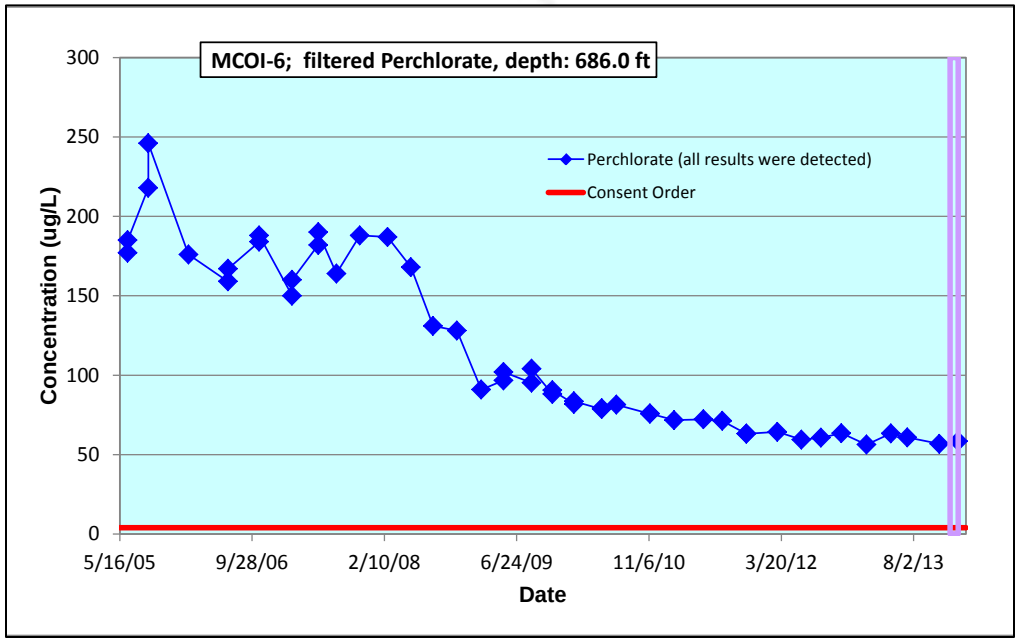
- Associated with legacy plutonium processing
- Released in treatment plant effluent
- Wastewater treatment improved in 2000 to 4ppb for perchlorate



Perchlorate

Source Control

- Concentrations along pathway significantly decreasing
- Improved treatment beginning in 2000
- Reduced (near zero) liquid effluent since mid 2011
- Both?
- Lessons for Cr?



Questions?