The Los Alamos National Laboratory WATER campaigns

Chromium Groundwater Cleanup in Mortandad Canyon

for the

Northern New Mexico Citizens' Advisory Board

Los Alamos National Laboratory

September 24, 2014

LA-UR-14-27280

Operated by Los Alamos Security, LLC for the U.S. Department of Energy's NNSA

Los Alamos NATIONAL LABORATORY EST.1943

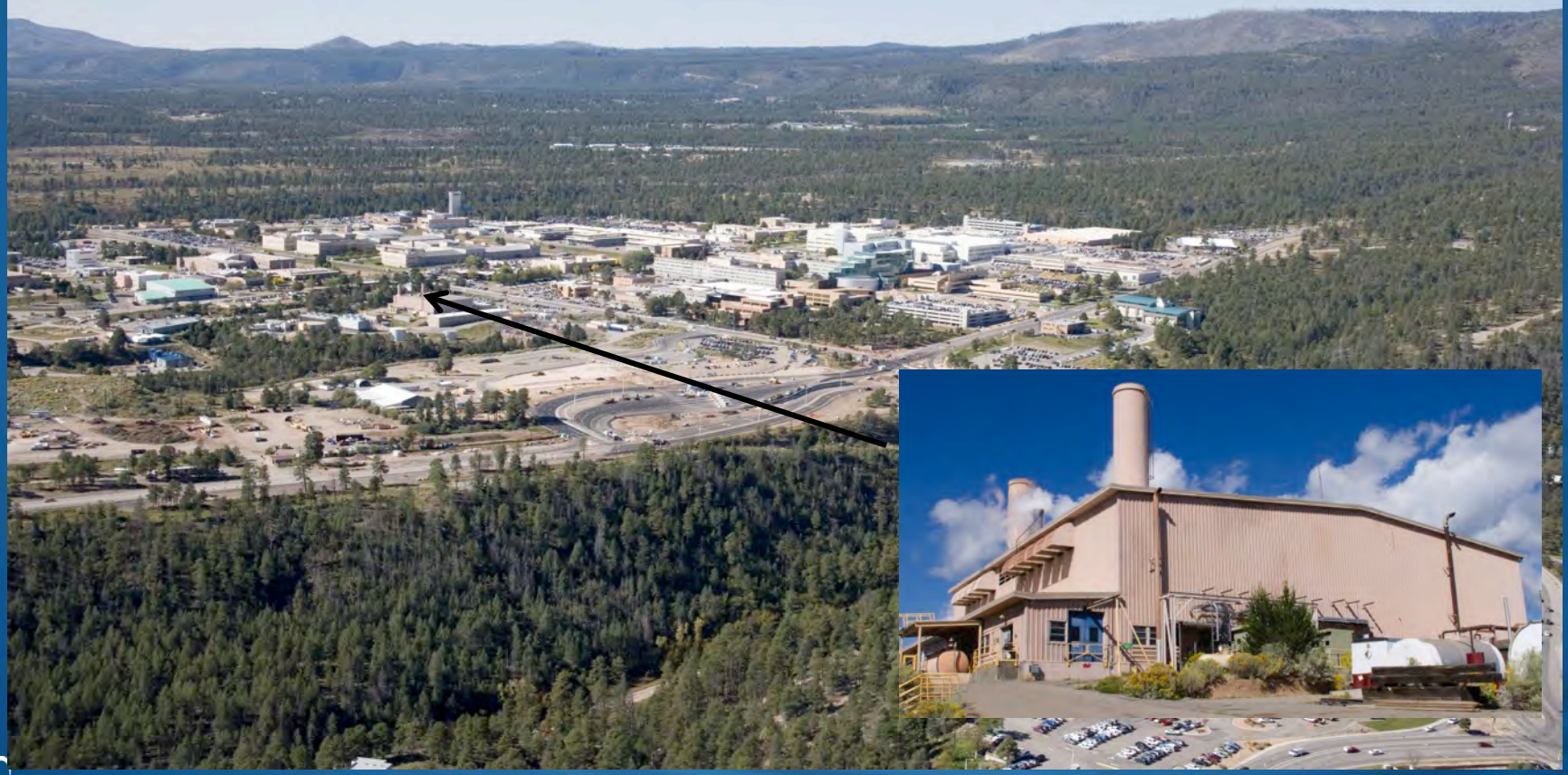
NNSA National Nuclear Security Administration

Presentation Overview

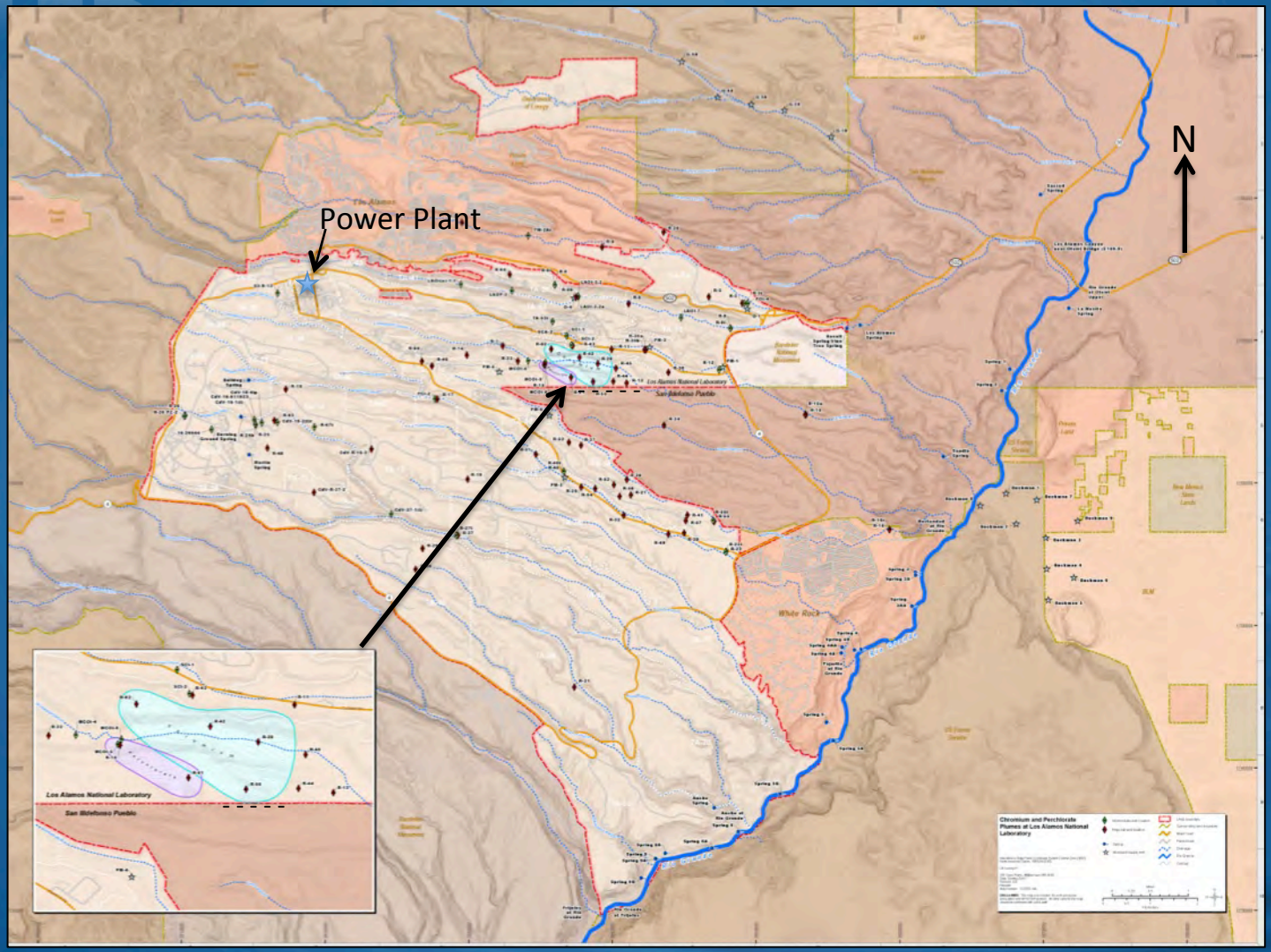
- History, location and background - refresher
- Nature and extent of Cr plume
- Overall remediation strategy
- Current activities

History

- Chromium came from cooling towers at a Laboratory power plant
- Up to 160,000 pounds released from 1956-72 in hexavalent, [Cr(VI)] form
- Commonly used in industry at that time as a corrosion inhibitor



Plume Location

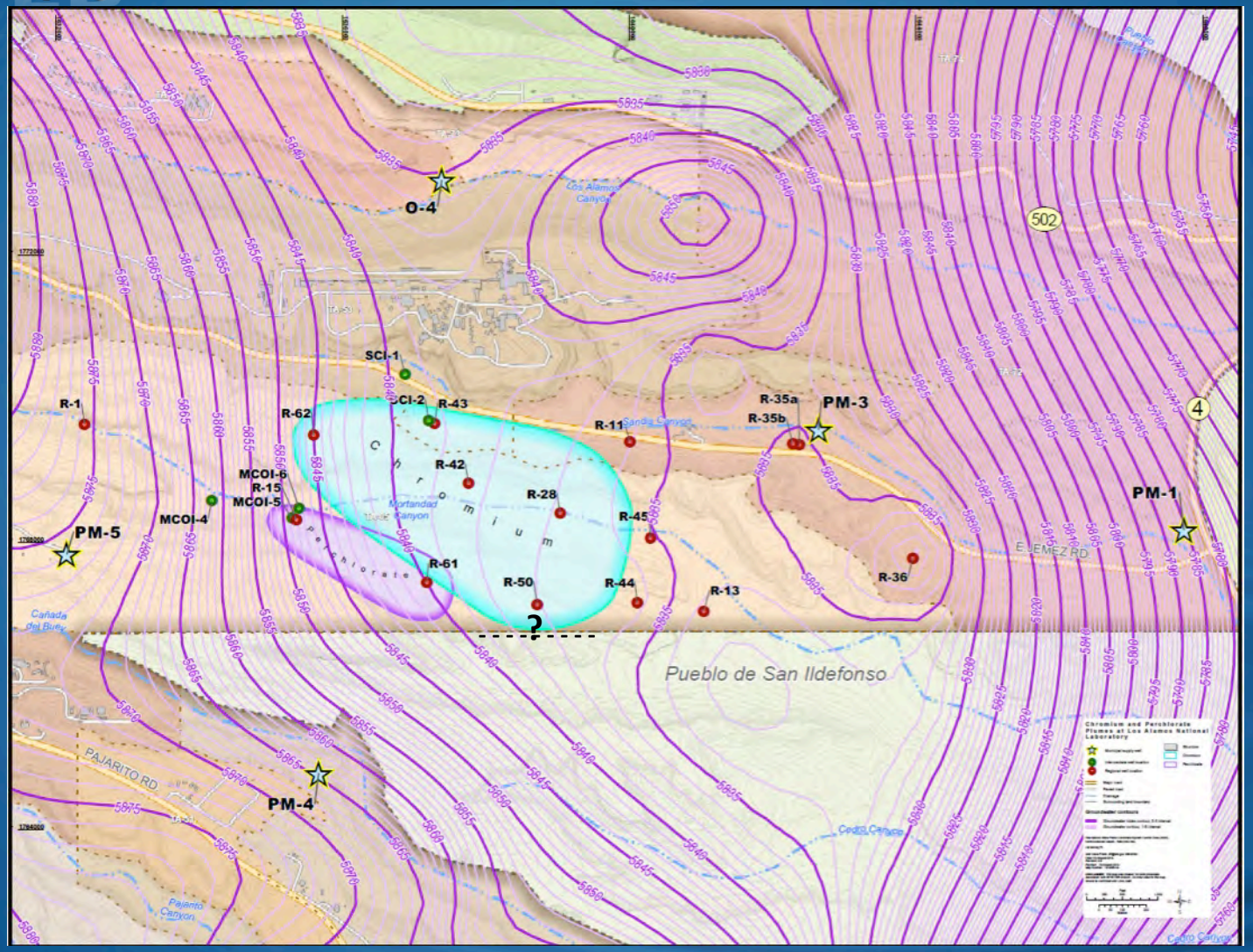


Background: Plume Details

- Chromium plume is in regional aquifer beneath Mortandad Canyon
  - Hexavalent (CrVI) form in groundwater
  - 900–1,000 feet below canyon bottom
  - Size is approximately 1 mile x 1/2 mile x <100 feet thick
  - Plume edge is approximately ½ mile from the closest drinking water well
- Chromium also present in wetland soils and beneath canyon floor in rock layers (vadose zone) between surface and regional aquifer
  - Mostly stable non-toxic trivalent (CrIII) form
  - Some residual CrVI in vadose zone – potential long-term source to groundwater

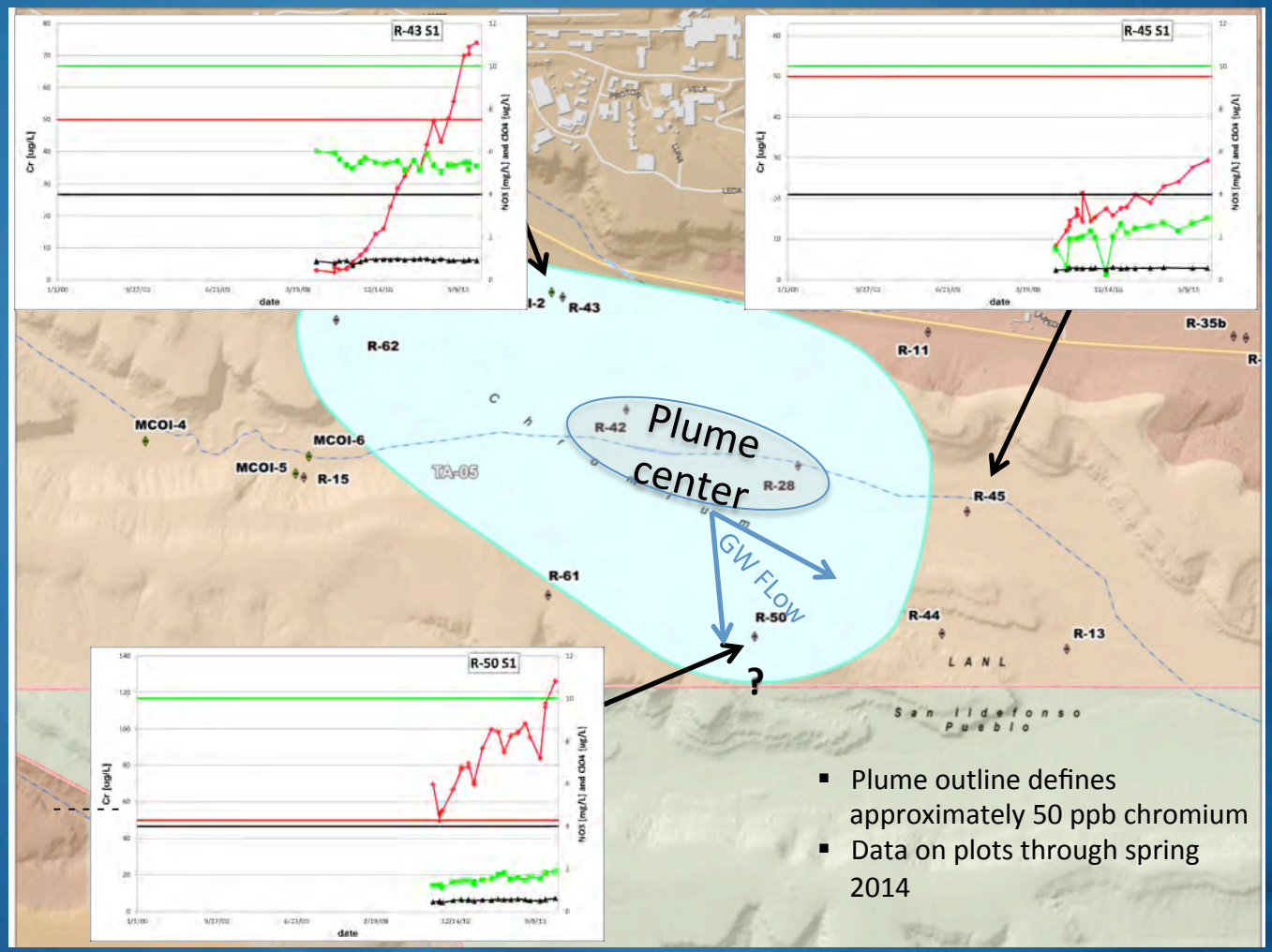
The Laboratory samples water as part of its monitoring program.

Plume Setting



Attributes of the Plume

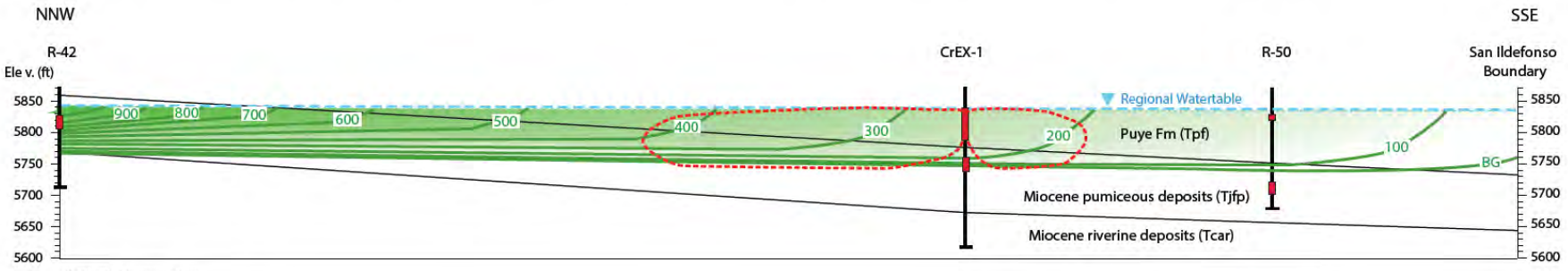
Monitoring data from several wells at the plume periphery show increasing trends in Cr



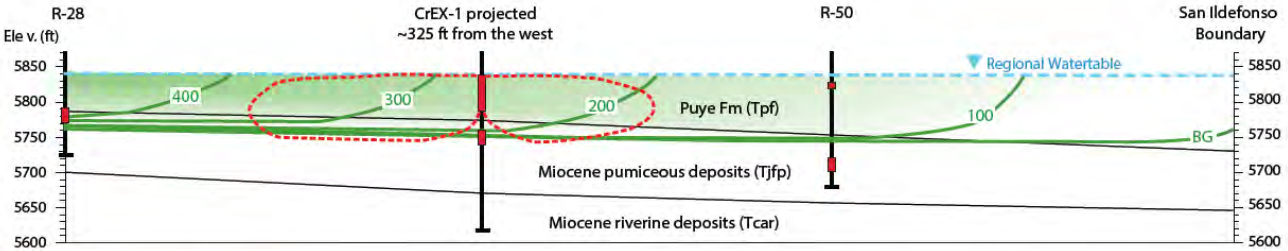
- Plume outline defines approximately 50 ppb chromium
- Data on plots through spring 2014

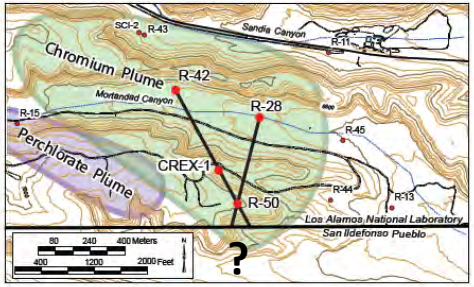
Plume Cross Section

Geologic Cross Sections Through the Chromium Contaminant Plume Showing Contours of Chromium Concentration in the Upper Part of the Regional Aquifer

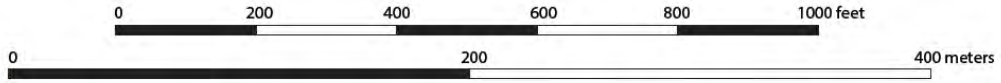


No Vertical Exaggeration
Red boxes are well screens





Map showing locations of cross sections

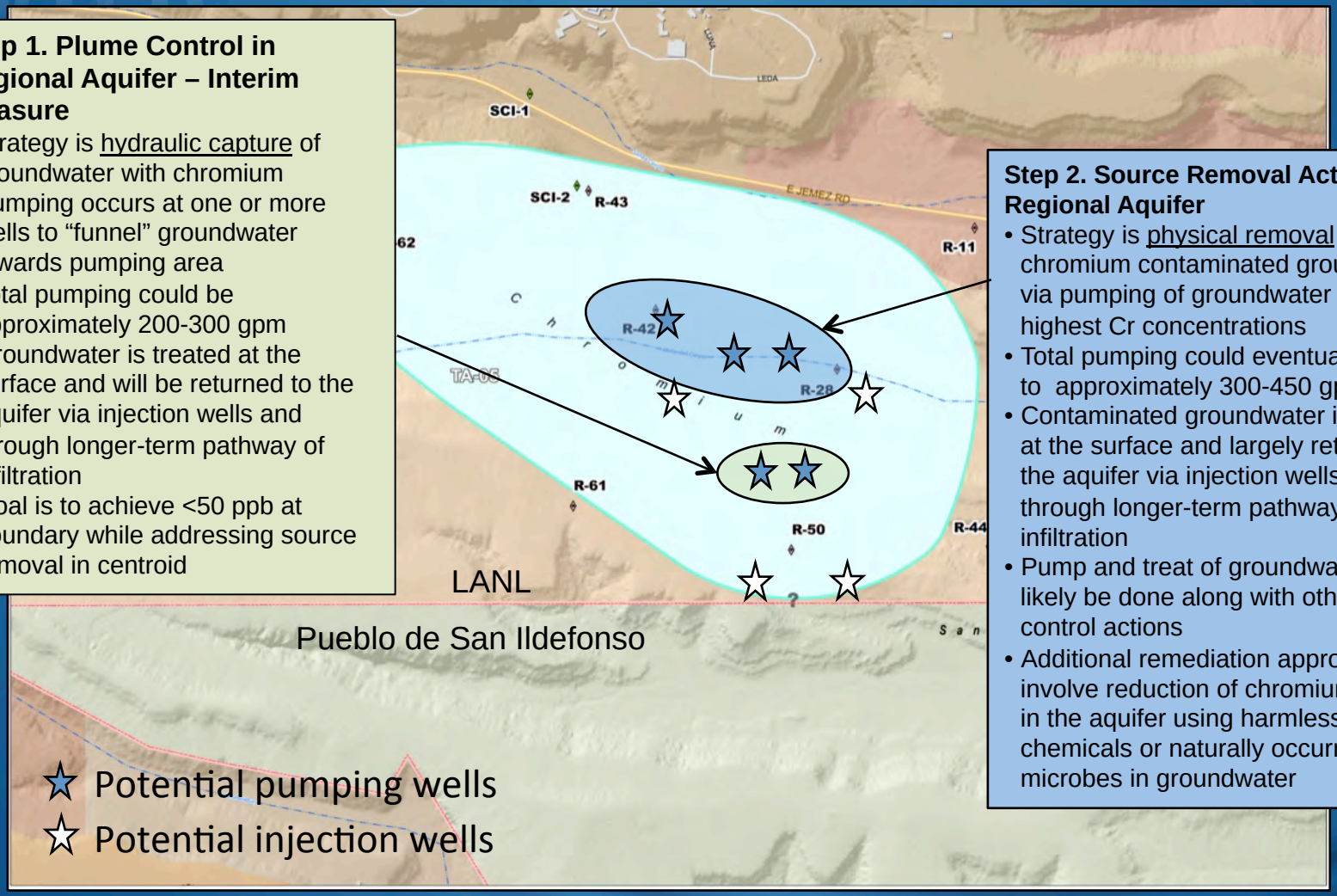


Green numbers indicate chromium concentrations in µg/L for contours; BG indicates background Concentrations. Dashed red line shows schematic zone of water extraction from the upper well screen during pumping of well CrEX.

Remediation Strategy

Step 1. Plume Control in Regional Aquifer – Interim Measure

- Strategy is hydraulic capture of groundwater with chromium
- Pumping occurs at one or more wells to "funnel" groundwater towards pumping area
- Total pumping could be approximately 200-300 gpm
- Groundwater is treated at the surface and will be returned to the aquifer via injection wells and through longer-term pathway of infiltration
- Goal is to achieve <50 ppb at boundary while addressing source removal in centroid



Step 2. Source Removal Actions in Regional Aquifer

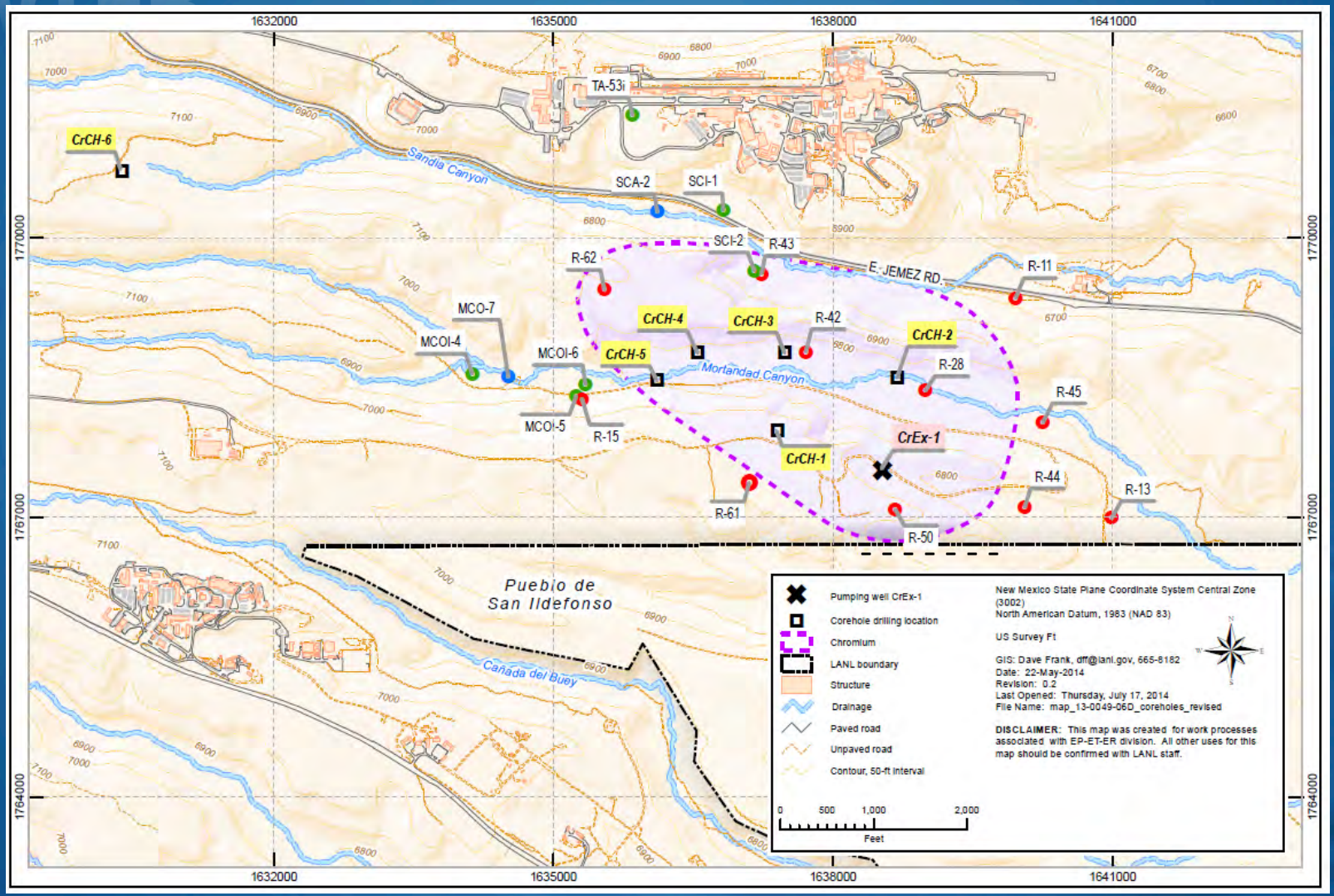
- Strategy is physical removal of chromium contaminated groundwater via pumping of groundwater with highest Cr concentrations
- Total pumping could eventually be up to approximately 300-450 gpm
- Contaminated groundwater is treated at the surface and largely returned to the aquifer via injection wells, and through longer-term pathway of infiltration
- Pump and treat of groundwater will likely be done along with other source-control actions
- Additional remediation approaches involve reduction of chromium in place in the aquifer using harmless chemicals or naturally occurring microbes in groundwater

Work Objectives for 2014-2015

- Install extraction wells
  - ✓ Recently completed installation of a pilot test extraction well to evaluate the capture zone associated with high-volume pumping
- Drill 6 coreholes and complete each as piezometers for remediation studies
  - Profile of chromium in vadose zone and groundwater
  - Studies on core materials for MNA and insitu biological treatment for chromium
  - Cross-hole testing
  - Water-quality and water-level monitoring
  - Other geochemical studies
- Install one or more injection wells for treated water
- Install treated water effluent pipeline
- Pump at extraction well(s) and inject treated water to obtain/maintain hydraulic control of the plume
- Install an additional monitoring well on San I pueblo property coordinated with NMED and San Ildefonso
- Use advanced modeling (ASCEM) to understand plume dynamics and response to remediation

Drilling to install the CrEX-1 extraction well began on July 4.

Remediation Technologies - Coreholes



Key Interfaces

- NMED, OSE, NEPA, and other
- San Ildefonso
  - ✓ Expedited actions due to increasing Cr concentrations near boundary
  - ✓ Installation of monitoring well on San I land
  - ✓ Engage on remediation strategies to expedite solutions
- Los Alamos County:
  - ✓ Ensure that pumping and other remediation strategies do not interfere with water supply pumping
  - ✓ Continue to monitor at sentinel wells and within water supply wells
  - ✓ Engage with the county if it appears that water supply pumping is adversely affecting plume behavior
- CAB and other Stakeholders
  - ✓ Transparent communications of plans and progress

Groundwater pumping wells physically remove the plume.

Constructing the pad for the CrEx-1 extraction well

Basins for storing treated groundwater.

Drilling on the CrEX-1 extraction well began on July 4, 2014 and completed in early September.

The treatment site in Mortandad Canyon.

Portable storage containers are used at the site to hold water.

Questions?