CLARK, LINCOLN, AND WHITE PINE COUNTIES GROUNDWATER DEVELOPMENT PROJECT EIS

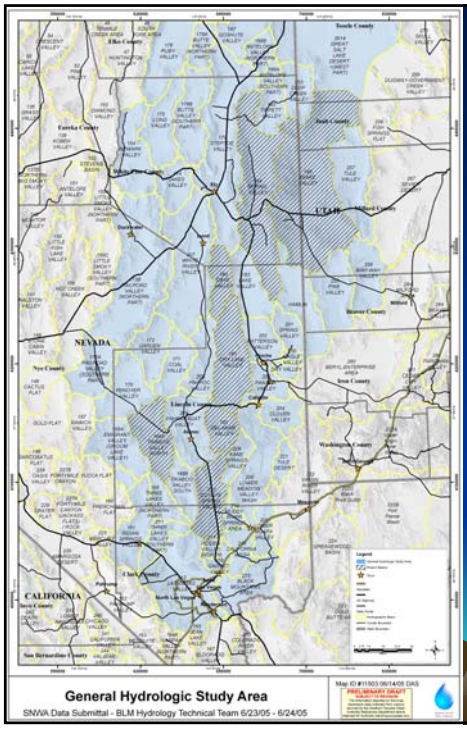
WATER RESOURCES TECHNICAL REVIEW
MEETING 1 – BASELINE DATA
June 23-24, 2005

HYDROCHEMISTRY AND GEOCHEMISTRY

Stephen Y. Acheampong, PhD
Southern Nevada Water Authority

Overview

- Objective
- Types of data compiled
- Sources of Data
- Data sites
- Data considerations
- Possible use of data
- Location of information



General Hydrologic Study Area

- Project basins are hatched

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Objective

- Compile a comprehensive database of groundwater (springs and wells) chemistry and environmental isotope data

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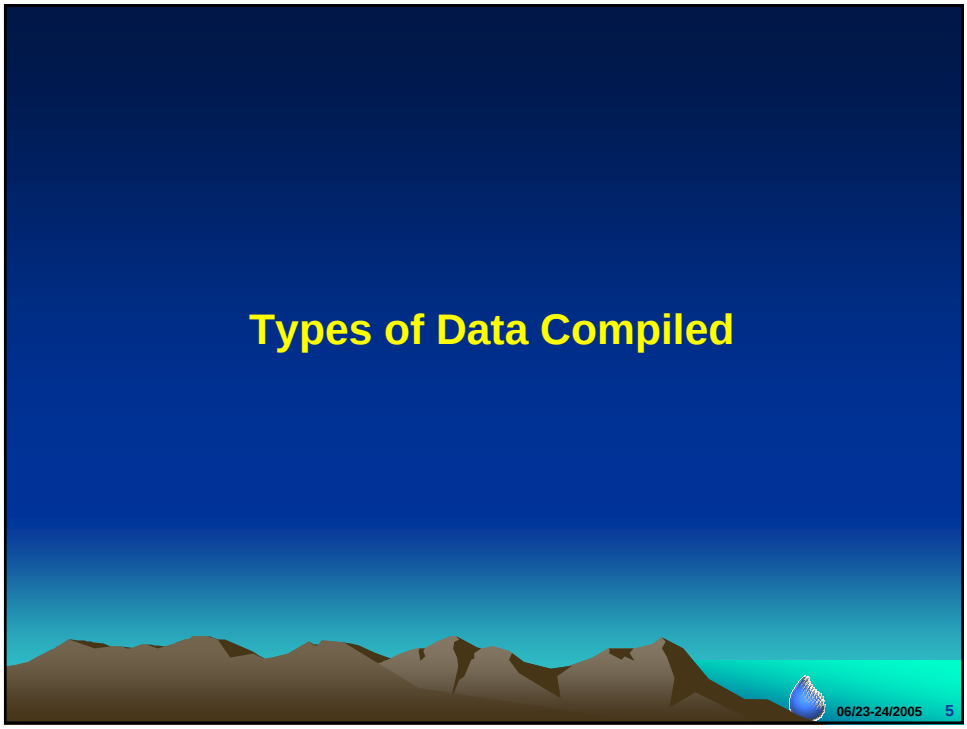
Types of Data Compiled
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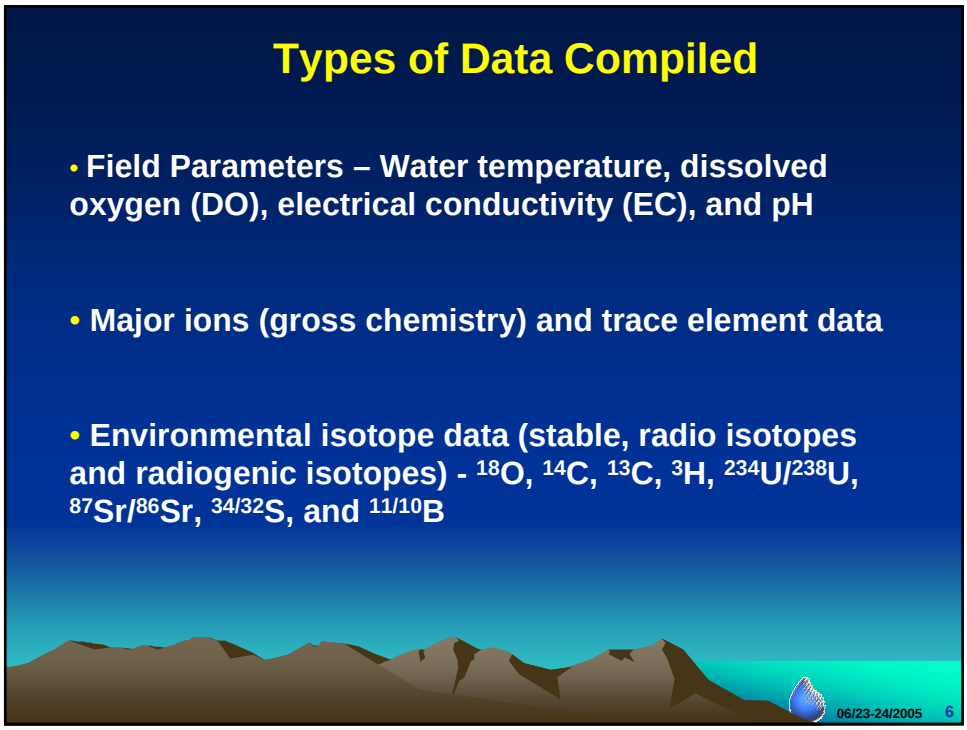
Types of Data Compiled
• Field Parameters – Water temperature, dissolved oxygen (DO), electrical conductivity (EC), and pH
• Major ions (gross chemistry) and trace element data
• Environmental isotope data (stable, radio isotopes and radiogenic isotopes) - ^{18}O, ^{14}C, ^{13}C, ^{3}H, $^{234}U/^{238}U$, $^{87}Sr/^{86}Sr$, $^{34/32}S$, and $^{11/10}B$
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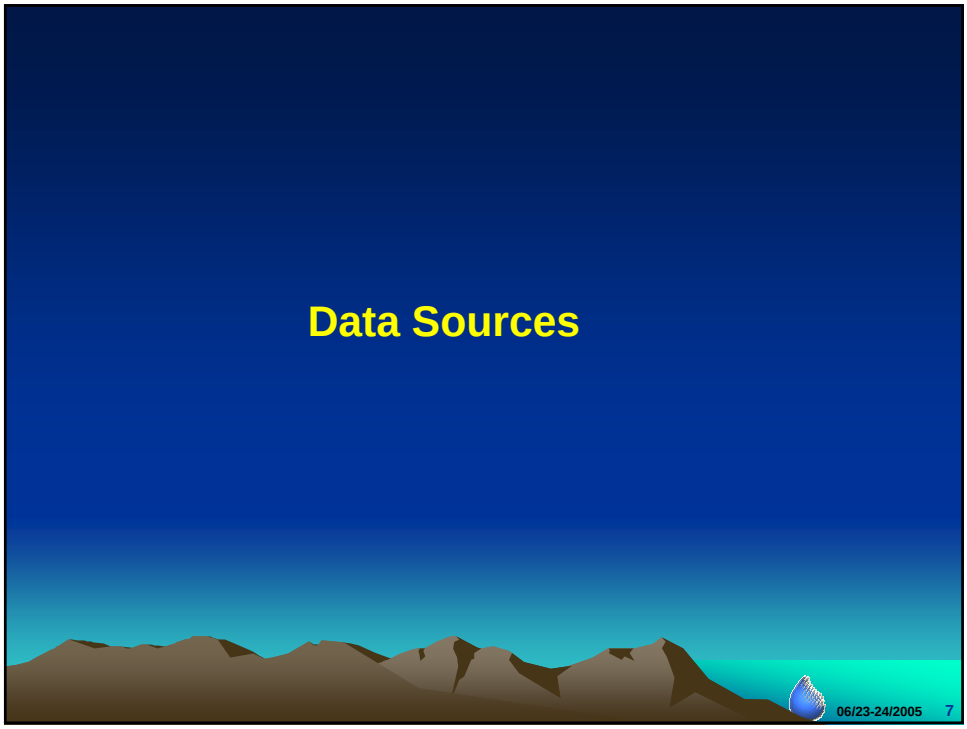

Data Sources

- Southern Nevada Water Authority (SNWA)
- Desert Research Institute
- U.S. Geological Survey Regional Aquifer Analysis (USGS RASA) Professional Papers
- U.S. National Water Quality Assessment (NAQWA) Program

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Data Sources (cont'd)

- USGS National Water Information System (NWIS) at http://waterdata.usgs.gov/nwis
- Ertec and Fugro Consulting Reports on MX Siting Investigation Project
- Geothermal Laboratory at the Southern Methodist University (David Blackwell; at their website www.smu.edu/geothermal

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Data Sources (cont'd)

- Nevada Bureau of Mines and Geology http://www.nbmg.unr.edu/geothermal/geochemdata/readme-geochem.htm
- State of Nevada Public Water System (PWS)
- State of Nevada Water Resources Bulletins
- Miscellaneous drilling and consulting reports

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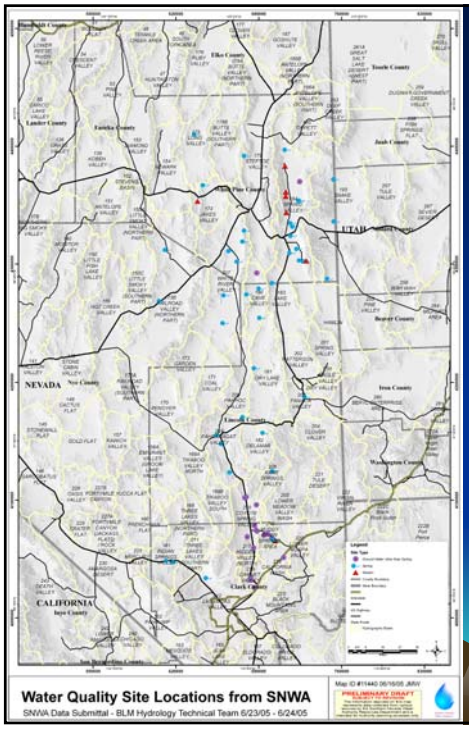
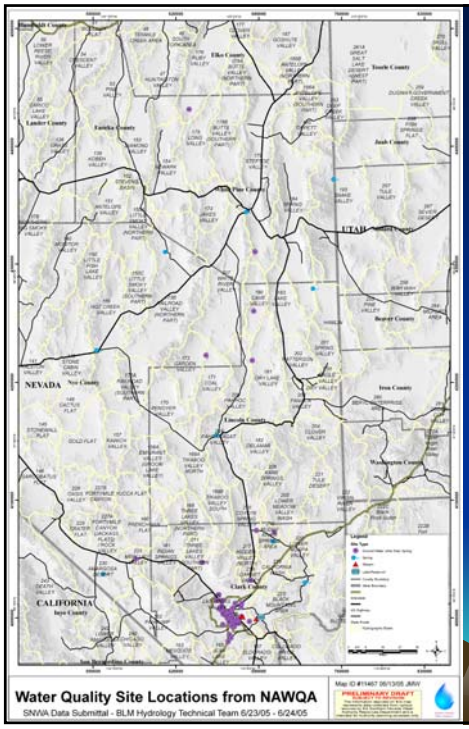
Data Sites



SNWA Data Sites

- Springs and wells sampled by SNWA – a total of 81 sites
- Includes data from reports by consulting firms for individuals and organizations in the study area (e.g. Beverly Jacob's well in Dry Lake Valley)

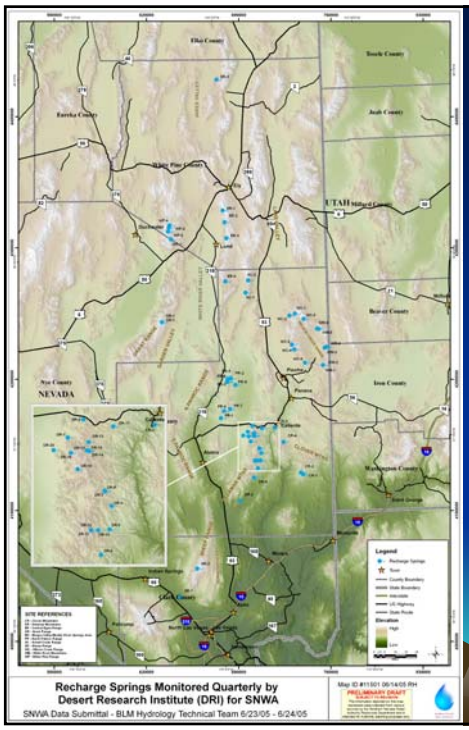
Map ID# 11440



USGS NAWQA Sites

- Consists of springs and wells
- A total of 61 sites – downloaded in the summer of 2004 and updated on May 25, 2005

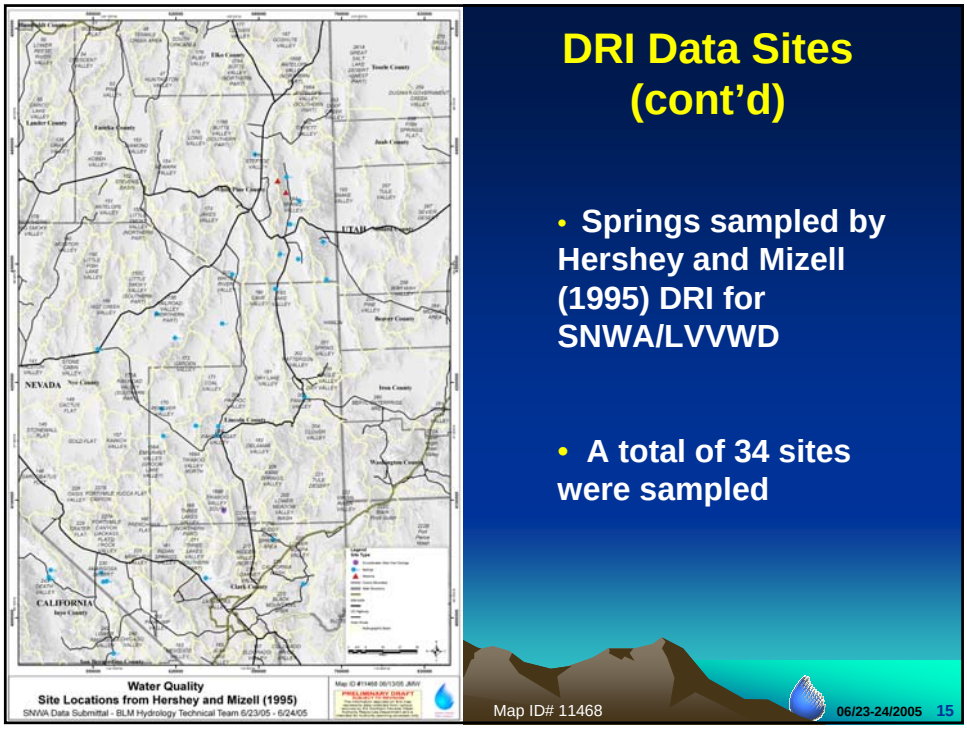
Map ID# 11467



DRI Sites

- Springs in recharge areas monitored quarterly by DRI for SNWA
- Mostly mountain-front springs (but includes some regional springs)
- A total of 61 springs are monitored

Map ID# 11501


Water Quality
Site Locations from Hershey and Mizell (1995)
SNWA Data Submittal - BLM Hydrology Technical Team 6/23/05 - 6/24/05
DRI Data Sites (cont'd)
• Springs sampled by Hershey and Mizell (1995) DRI for SNWA/LVVWD
• A total of 34 sites were sampled
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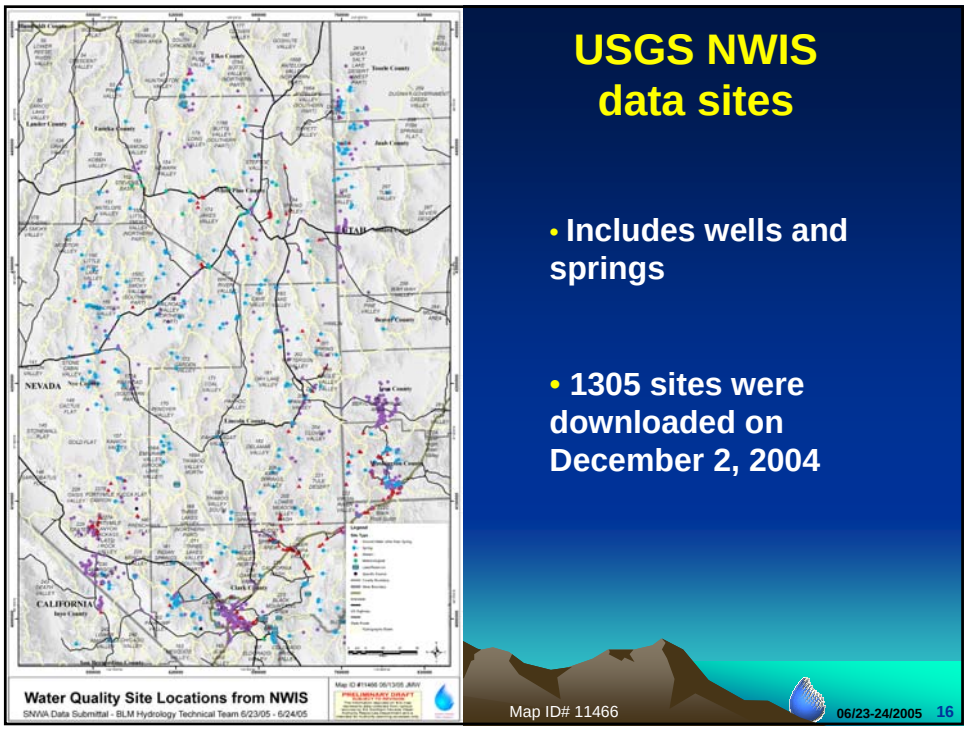
Water Quality Site Locations from NWIS
SNWA Data Submittal - BLM Hydrology Technical Team 6/23/05 - 6/24/05
USGS NWIS data sites
• Includes wells and springs
• 1305 sites were downloaded on December 2, 2004
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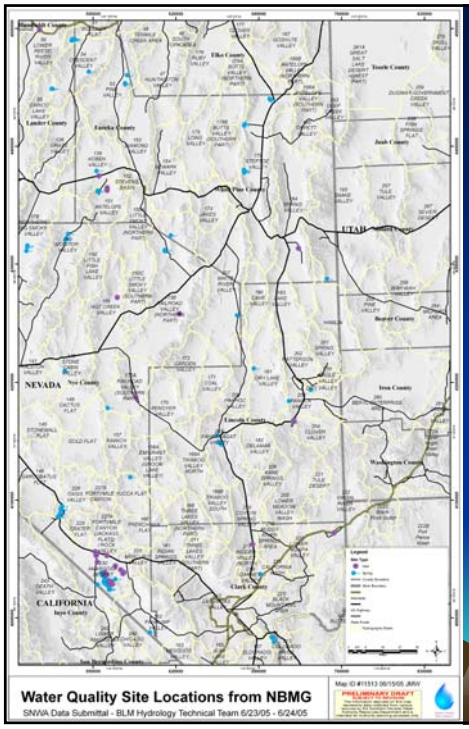


NBMG data sites

- Mainly geothermal wells and springs
- A total of 114 sites downloaded on October 11, 2004
- Website created in 2002 and updated periodically

Map ID# 11513

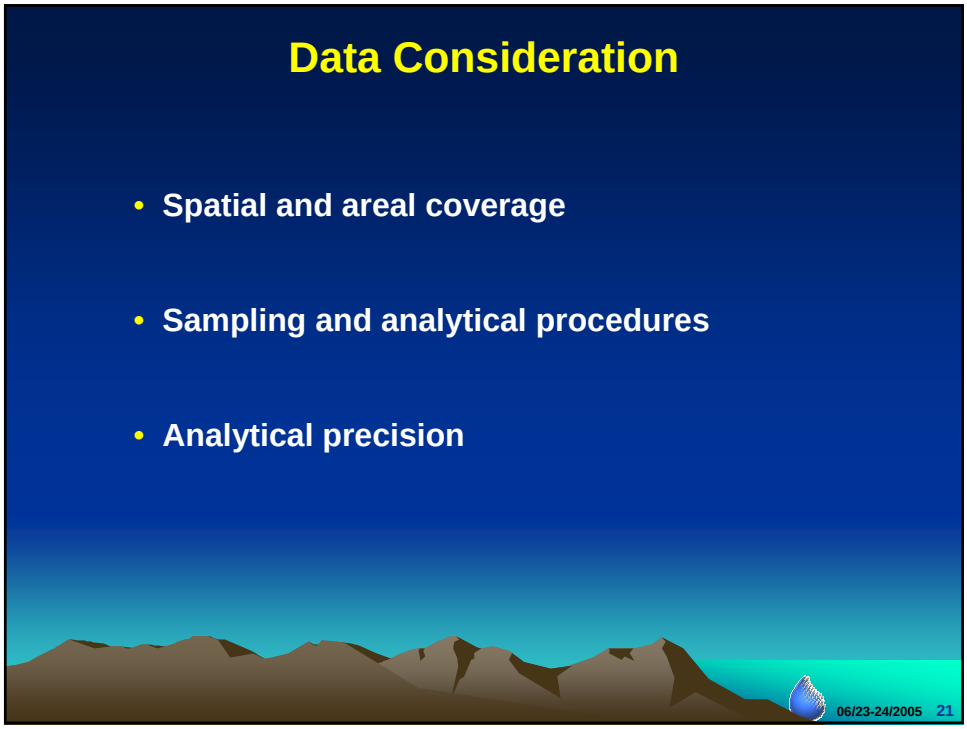
Periods of data collection

Periods of data collection

- SNWA – 1991 through 2004
- USGS – RASA Professional Papers, NAWQA - 1980s to 2004
  - includes data from the MX Siting Program and the Fugro Reports of the 1980s
- DRI – 1991 through 2004

Periods of data collection

- NBMG – 1904 through 2003
- State of Nevada PWS:
  - Lincoln County: November 28, 1989 – November 18, 2003
  - White Pine County: September 17, 1986 – December 5, 2003


Data Consideration
• Spatial and areal coverage
• Sampling and analytical procedures
• Analytical precision
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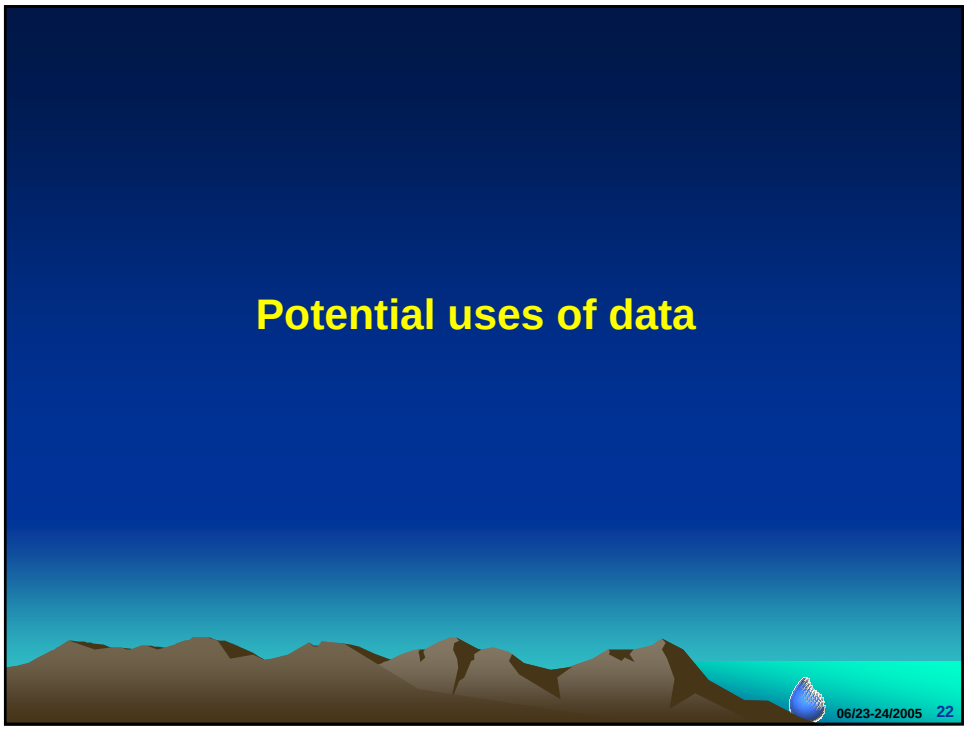
Potential uses of data
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Potential Use of Data

- Gross chemistry (major ions), trace elements, and field chemistry data will be used to determine baseline quality of groundwater in the area
- Major ions data – used to determine chemical water types and processes controlling groundwater chemistry
- Gross chemistry and temperature data - used to estimate depths of groundwater circulation

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Potential use of data

- Isotopes provide insight into the age, origin, and pathways of water movement
- Deuterium and oxygen-18 – used to determine recharge sources and pathways of groundwater
  - They (D and ^{18}O) are part of the water molecule and are ideal tracers for determining the sources and mixing relations of different waters
- Deuterium and chloride – used to estimate evaporation

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Potential Use of Data

- Carbon-14 and tritium – used to estimate the age and travel times of groundwater
- Uranium, strontium, and boron isotopes – used to determine the sources and mixing of groundwater
  - they (U, Sr, and B) undergo geochemical reactions that must be accounted for
- Sulfur isotopes – used to trace the source of sulfur

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Example of a Potential use of data

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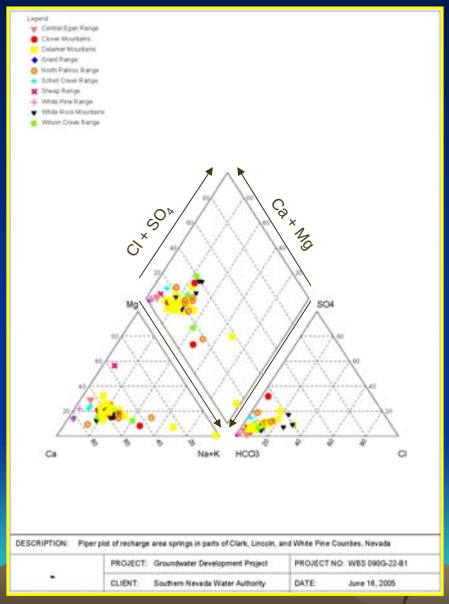
Chemical Water Types



- Piper diagram of springs in recharge area collected by DRI
- The water is mainly Ca-HCO_3 and Ca-Mg-HCO_3 water due to the rock types in the recharge area

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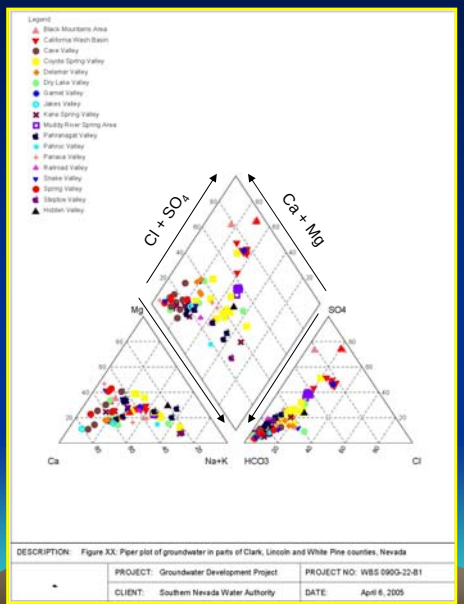
Chemical Water Types



- Groundwater in the northern part of Eakin's White River Flow System (WRFS) is mainly Ca-HCO_3/Ca-Mg-HCO_3 water
- Na increases in groundwater in the southern part - Ca-Na-Mg-HCO_3/Na-Ca-Mg-HCO3-SO4 water
- Due to water/rock reactions involving different types of rocks

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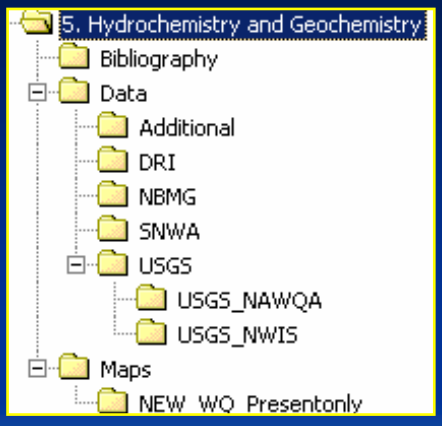
Summary

- Geochemical data collected as part of this project and the historical data compiled will be used with other hydrologic and geologic data to evaluate the water resources in the area

Location of information



- Information provided and all related geochemistry materials are located in the directories shown on the left

Thank You
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