HOMESTAKE MINING COMPANY SITE

Site Background Standards Discussion

Santa Fe, NM

May 5, 2015

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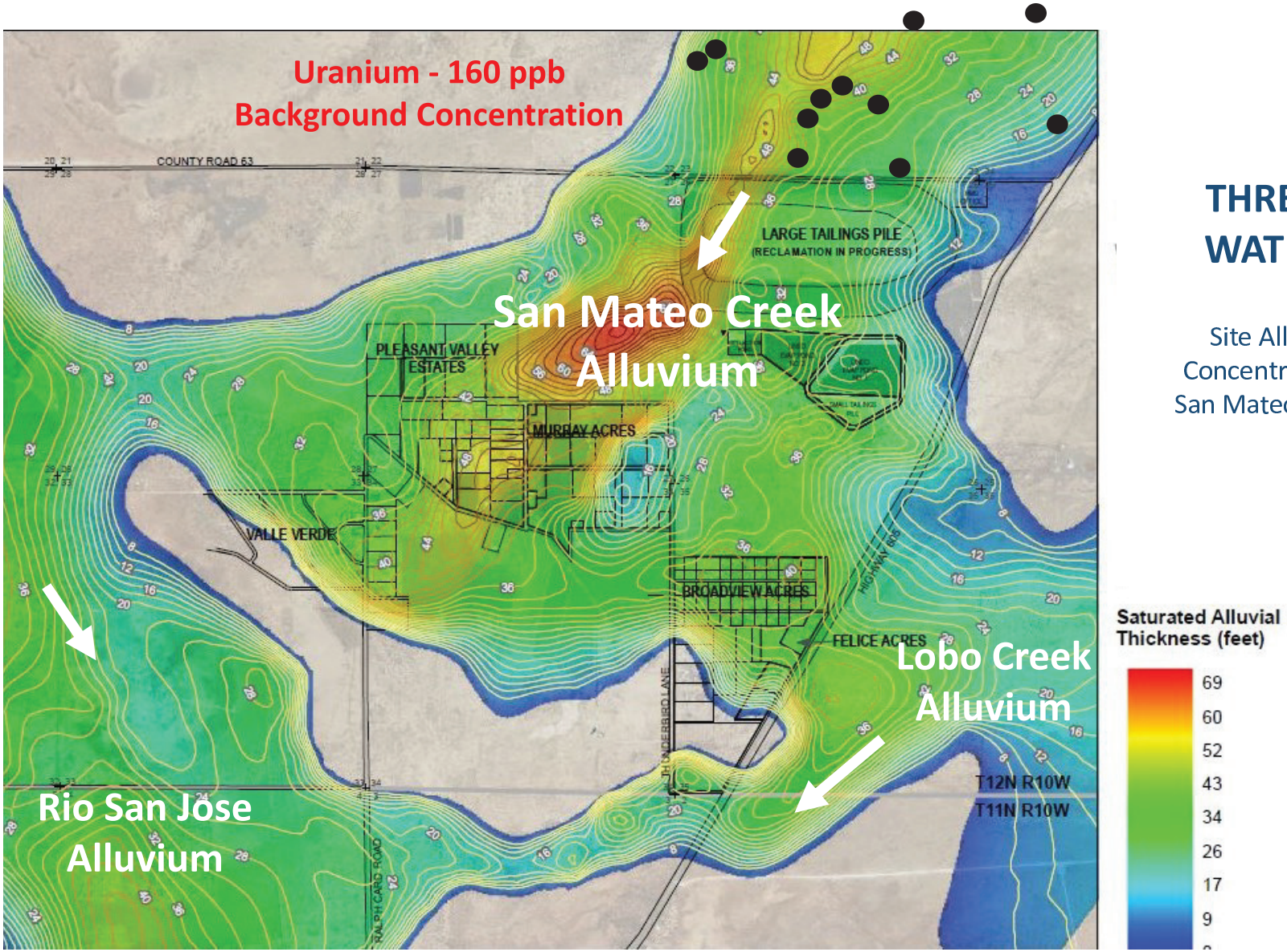
U.S. EPA Region 6

9787560

ALLUVIAL AQUIFER

BACKGROUND WATER QUALITY ASSESSMENT



THREE ALLUVIAL WATER SYSTEMS

Site Alluvium Background Concentrations Based Only on San Mateo Creek Alluvial Water Quality

● Homestake Background Well

Water

Dry

42’ Saturation Thickness (feet)

10 Bore Hole No.

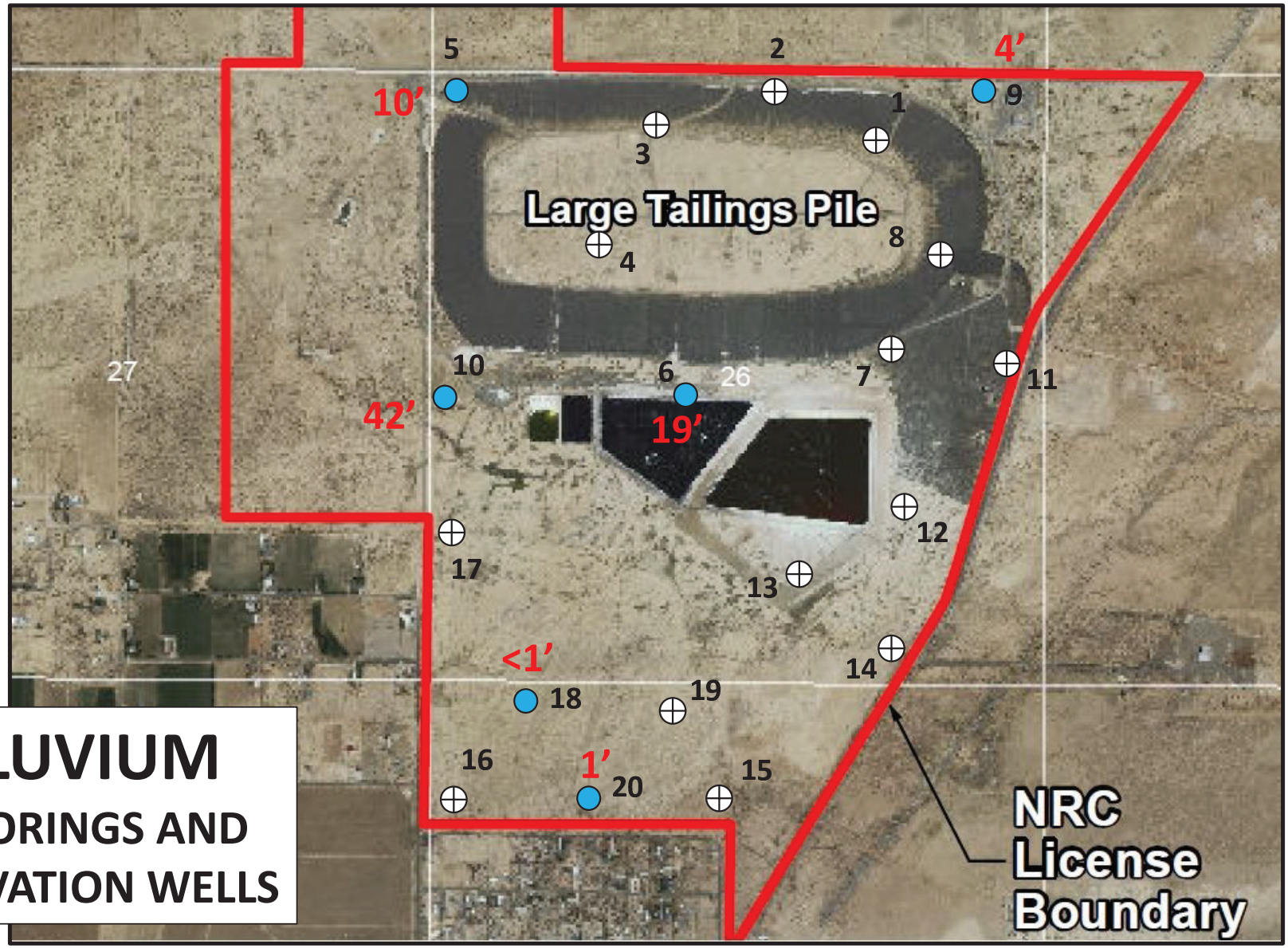


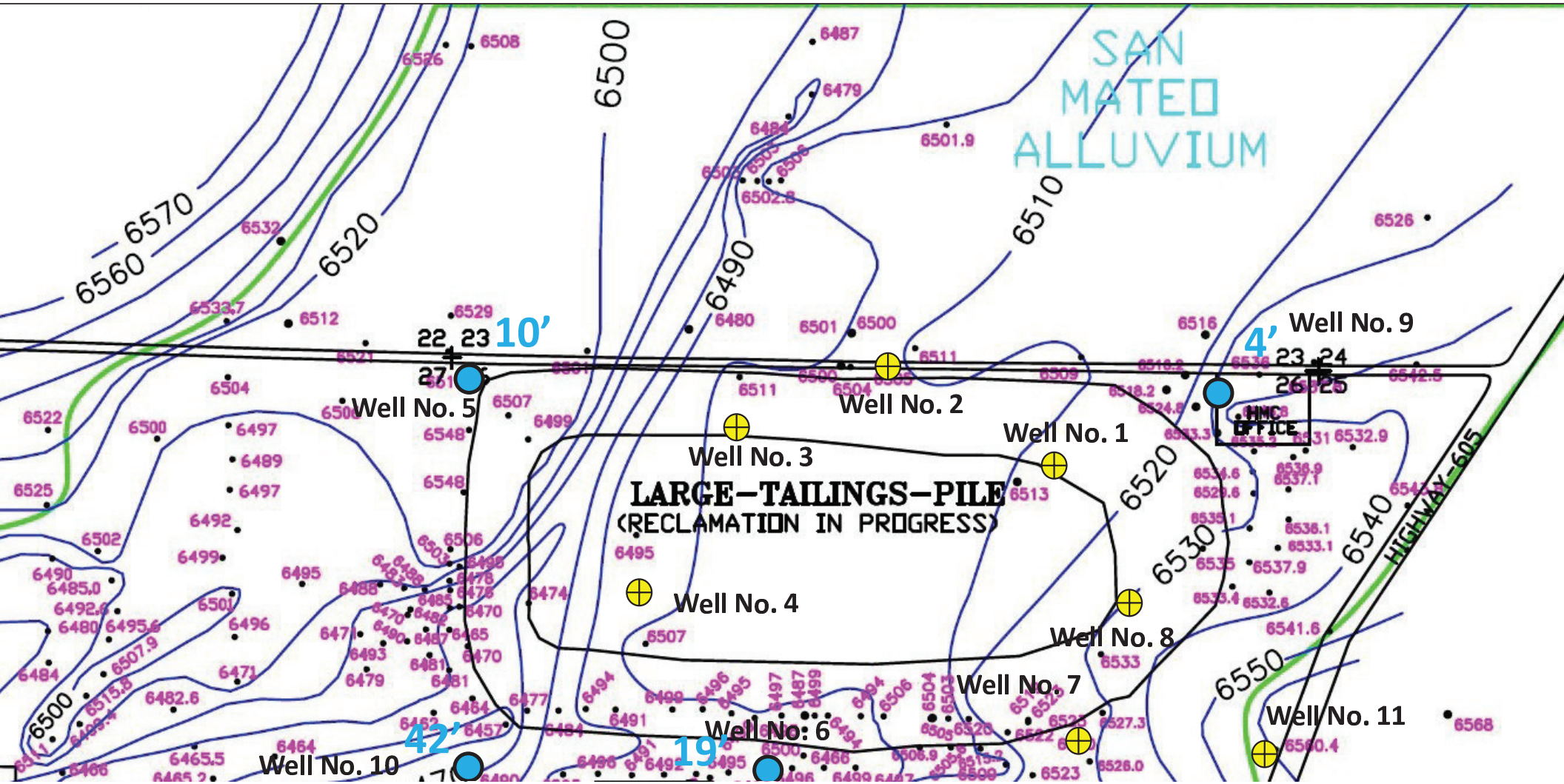
Figure Modified from Homestake CAP

ALLUVIUM

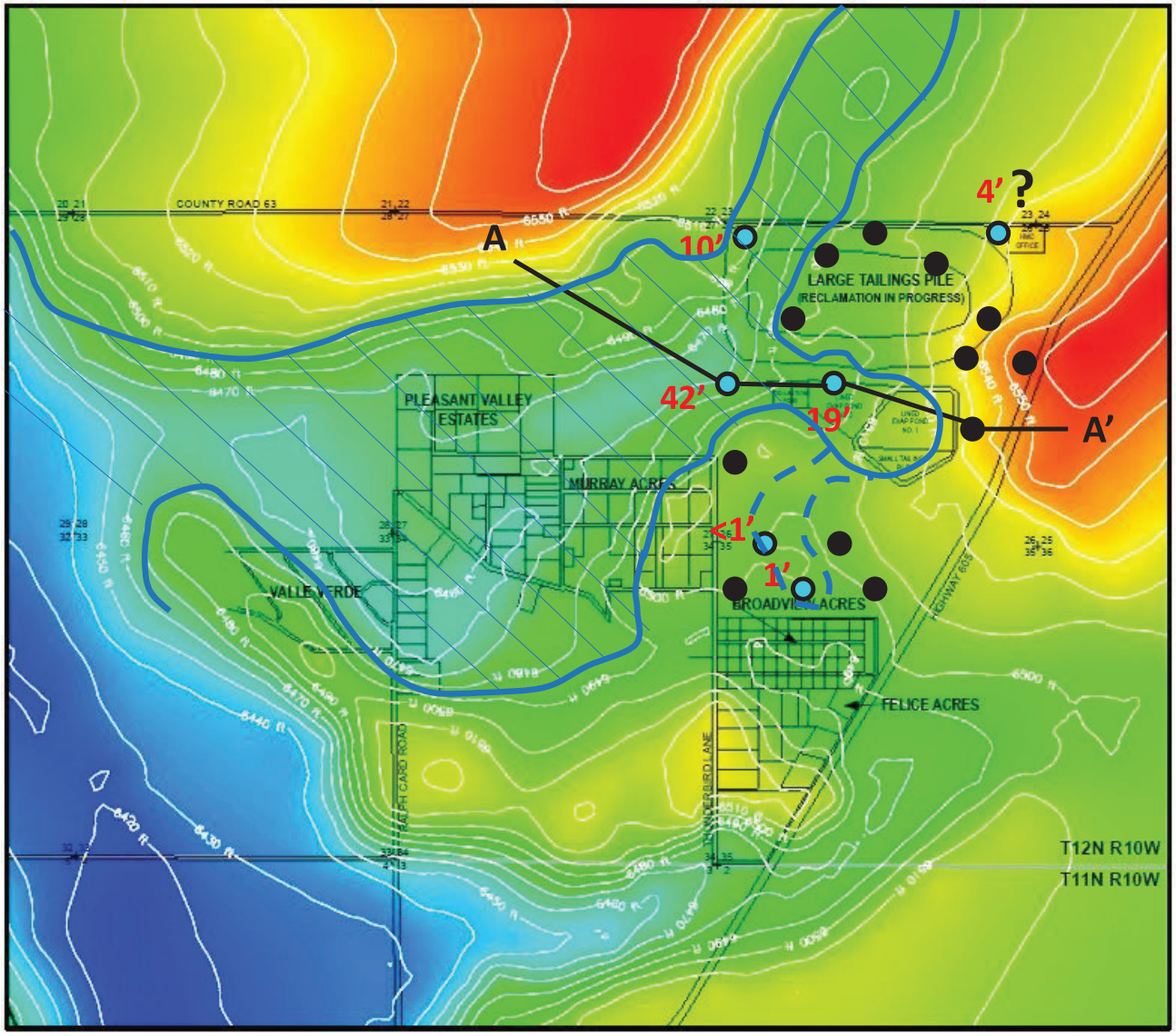
1960 BORINGS AND OBSERVATION WELLS

BASE OF ALLUVIUM STRUCTURE CONTOUR MAP

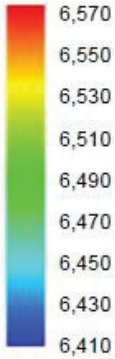
Modified from Homestake Annual Report - 2013



SATURATED ALLUVIUM 1960

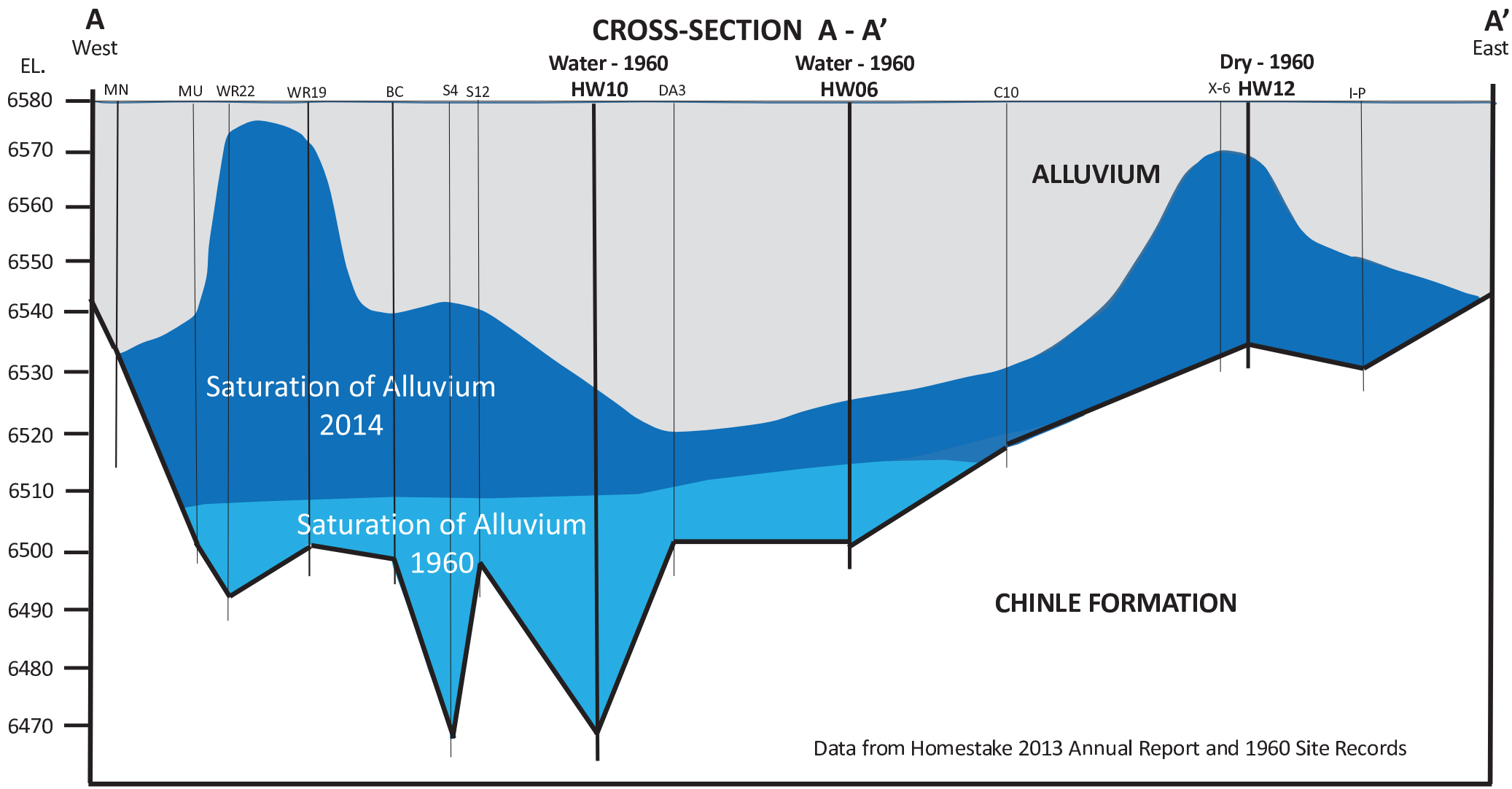


- Water in Borehole
- Dry Borehole



BASE OF ALLUVIUM ELEVATION (FT-AMSL)

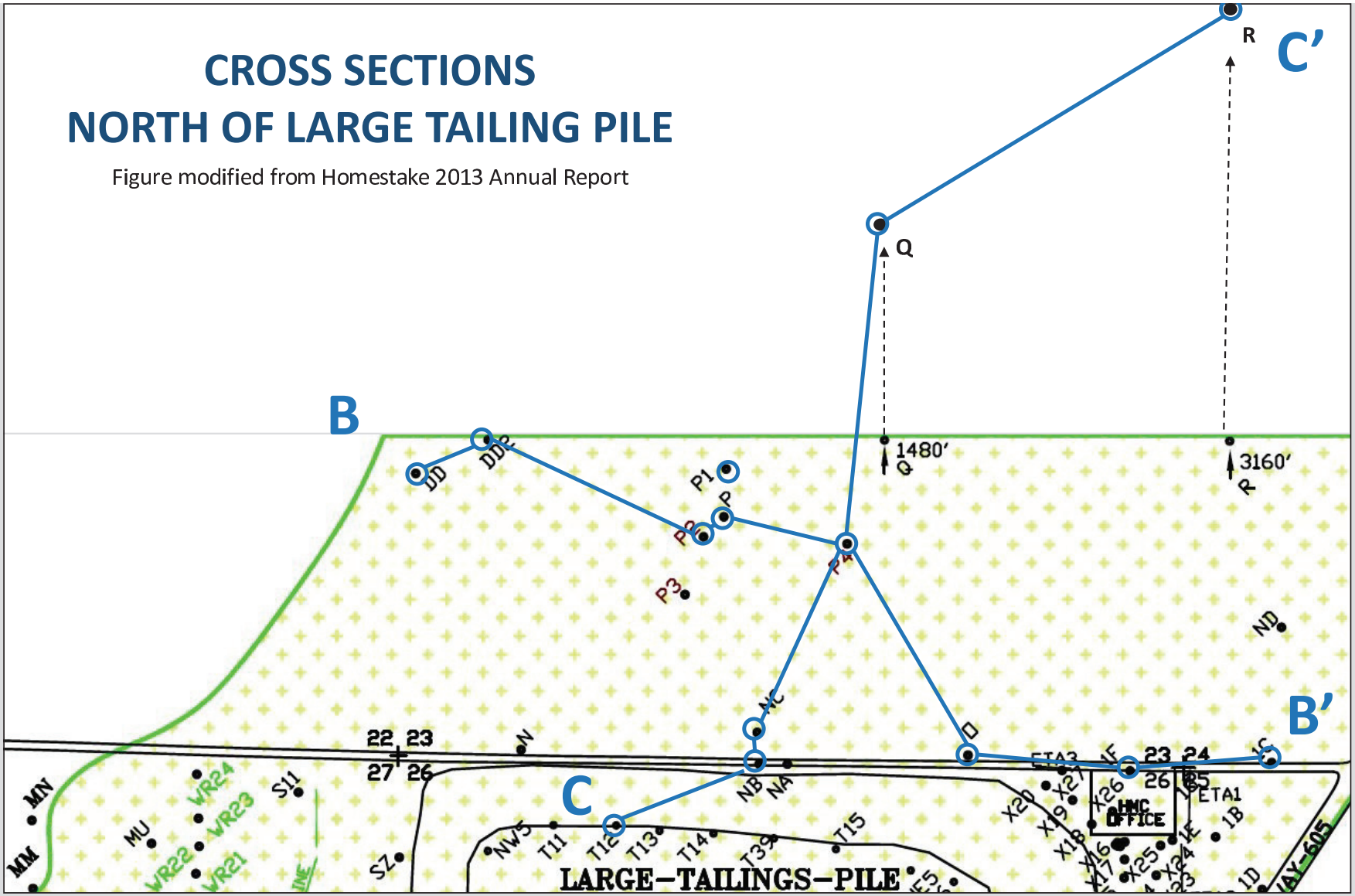
Modified From Homestake CAP

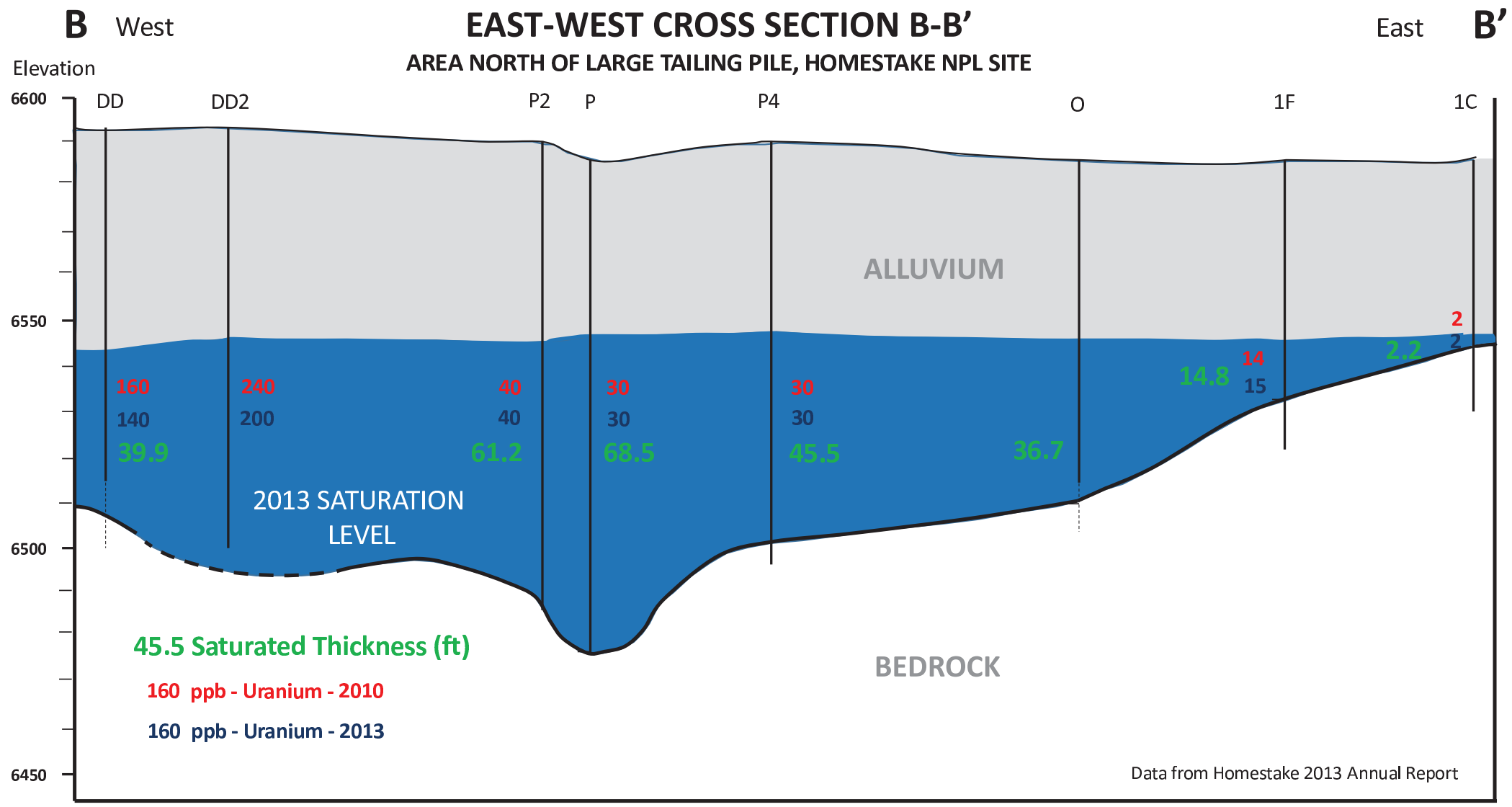


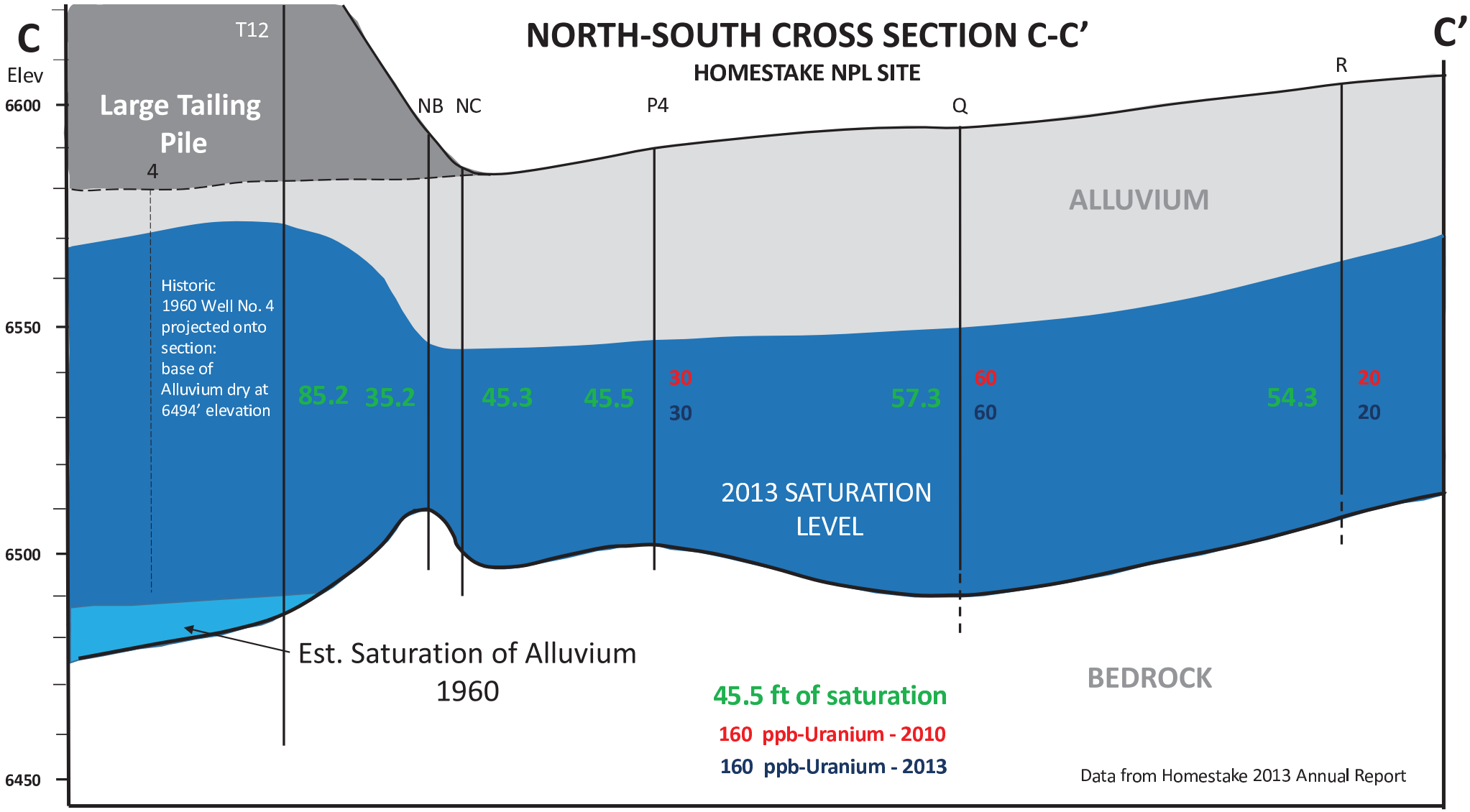
HOMESTAKE MINING COMPANY NPL SITE

CROSS SECTIONS
NORTH OF LARGE TAILING PILE

Figure modified from Homestake 2013 Annual Report

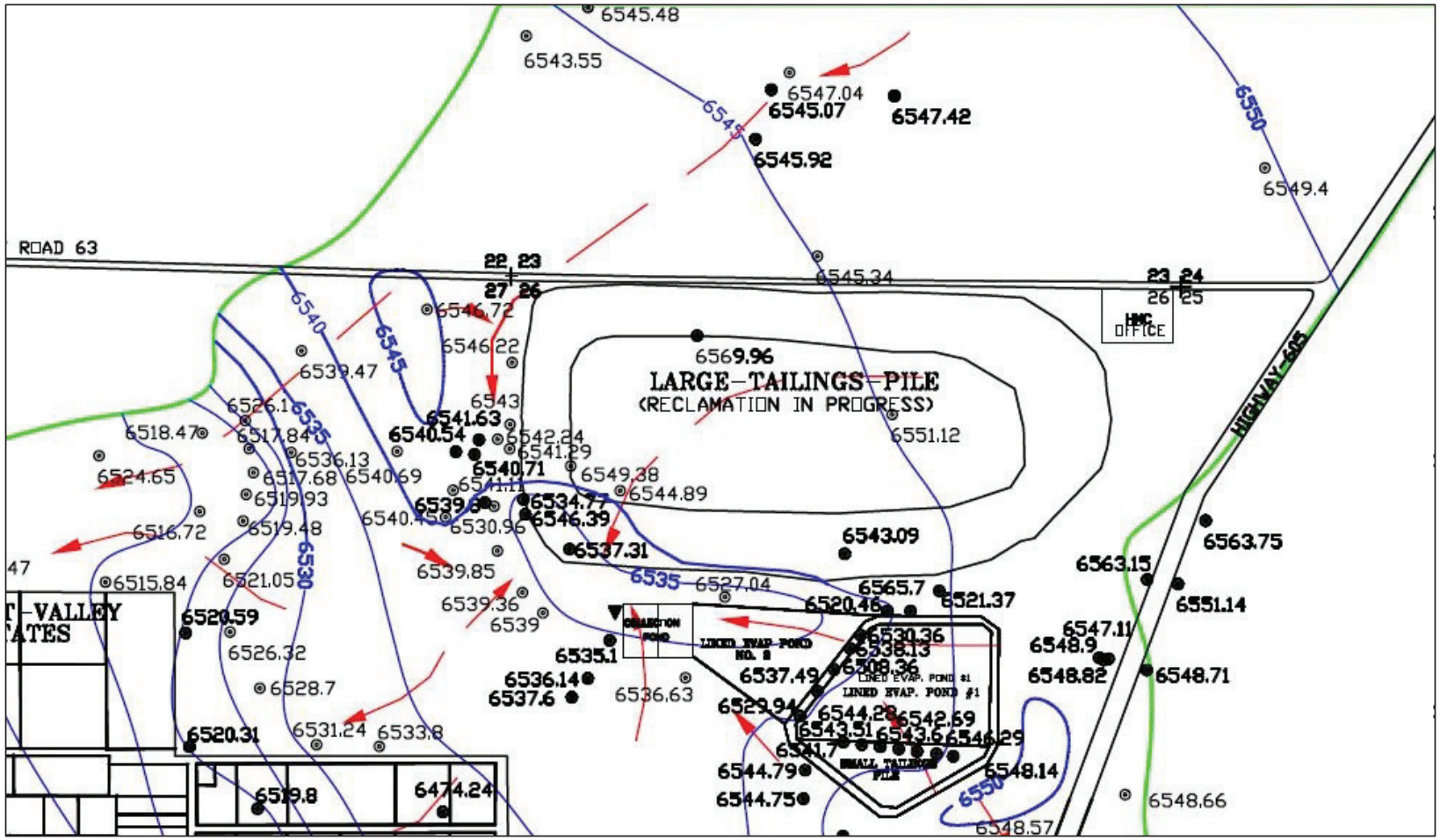



B
West
EAST-WEST CROSS SECTION B-B'
AREA NORTH OF LARGE TAILING PILE, HOMESTAKE NPL SITE
East
B'
Elevation
6600
6550
6500
6450
DD
DD2
P2
P
P4
O
1F
1C
ALLUVIUM
160
140
39.9
240
200
40
40
61.2
30
30
68.5
30
30
45.5
36.7
14.8
14
15
2.2
2
2
2013 SATURATION LEVEL
BEDROCK
45.5 Saturated Thickness (ft)
160 ppb - Uranium - 2010
160 ppb - Uranium - 2013
Data from Homestake 2013 Annual Report


NORTH-SOUTH CROSS SECTION C-C'
HOMESTAKE NPL SITE
C
C'
Elev
6600
6550
6500
6450
T12
Large Tailing Pile
4
NB
NC
P4
Q
R
ALLUVIUM
Historic 1960 Well No. 4 projected onto section: base of Alluvium dry at 6494' elevation
85.2
35.2
45.3
45.5
30
30
57.3
60
60
54.3
20
20
2013 SATURATION LEVEL
Est. Saturation of Alluvium 1960
BEDROCK
45.5 ft of saturation
160 ppb-Uranium - 2010
160 ppb-Uranium - 2013
Data from Homestake 2013 Annual Report

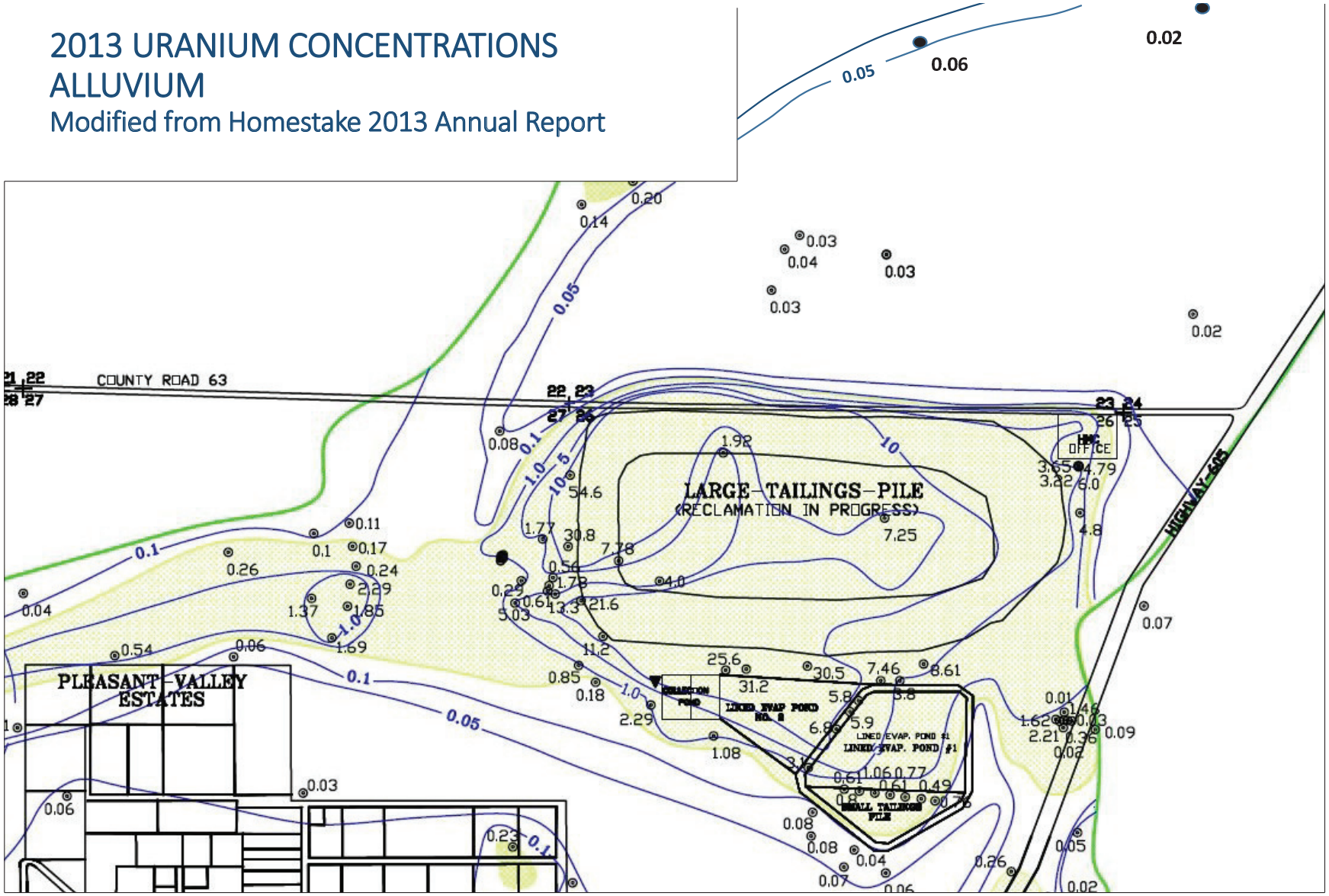
ALLUVIUM POTENTIOMETRIC SURFACE MAP

Homestake 2013 Annual Report



2013 URANIUM CONCENTRATIONS ALLUVIUM

Modified from Homestake 2013 Annual Report



Uranium Concentrations Near Upgradient Background Wells

Homestake 2013
Annual Report

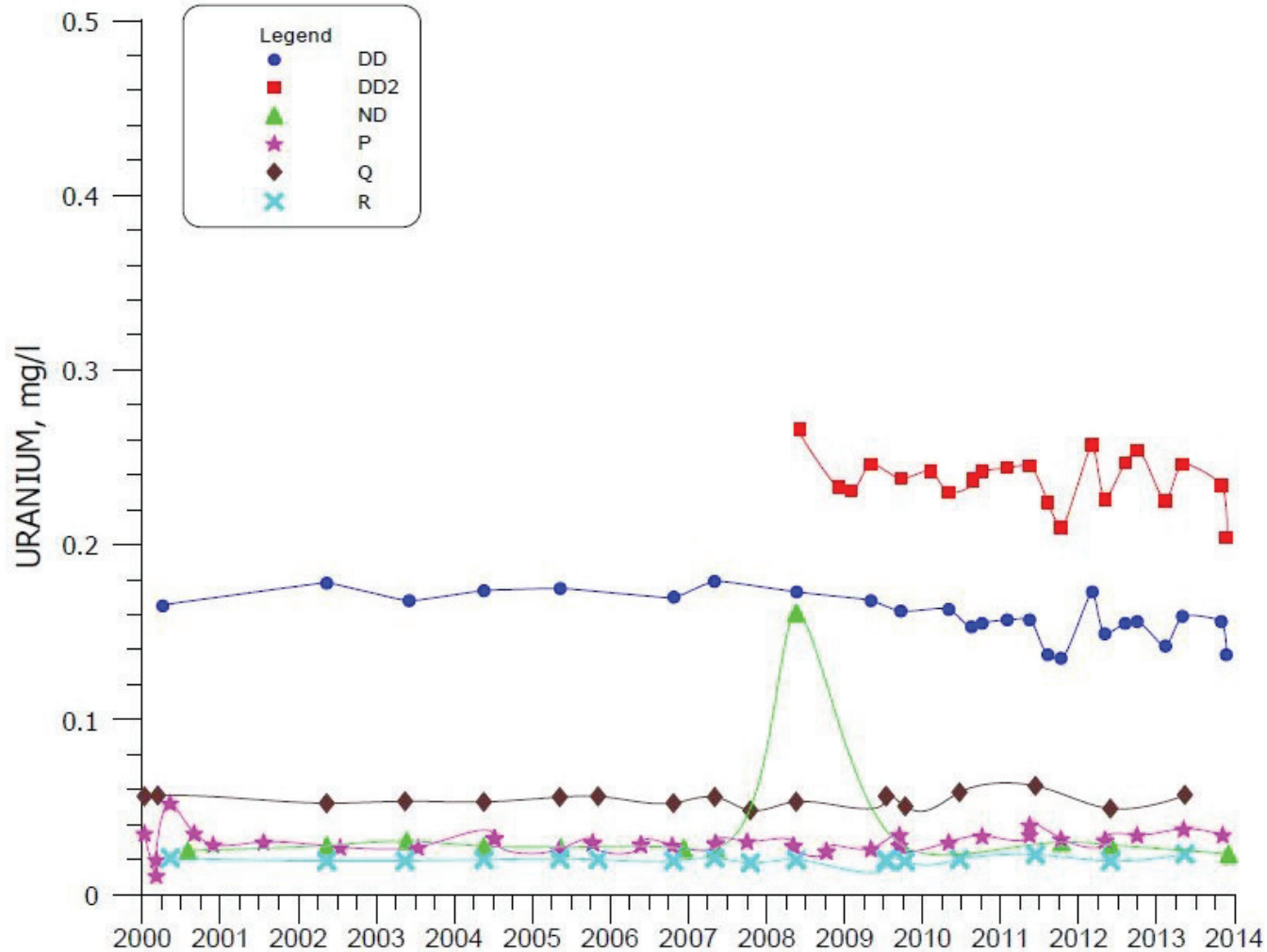
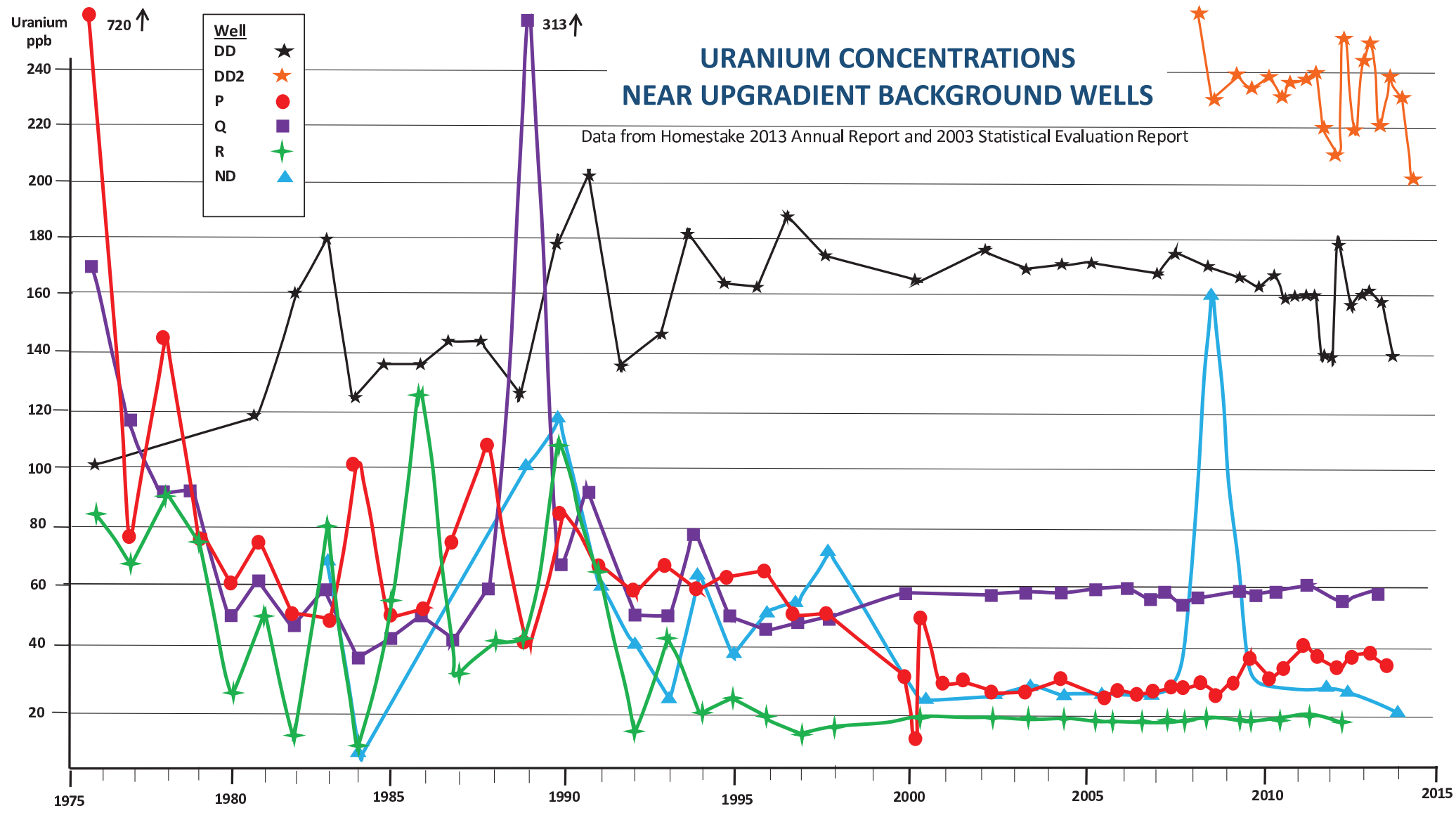


FIGURE 4.3-54. URANIUM CONCENTRATIONS FOR WELLS DD, DD2, ND, P, Q AND R.


URANIUM CONCENTRATIONS
NEAR UPGRADIENT BACKGROUND WELLS
Data from Homestake 2013 Annual Report and 2003 Statistical Evaluation Report
Uranium ppb
720
313
Well
DD
DD2
P
Q
R
ND
240
220
200
180
160
140
120
100
80
60
40
20
1975
1980
1985
1990
1995
2000
2005
2010
2015

Water Level Elevation Near Upgradient Wells

Homestake 2013
Annual Report

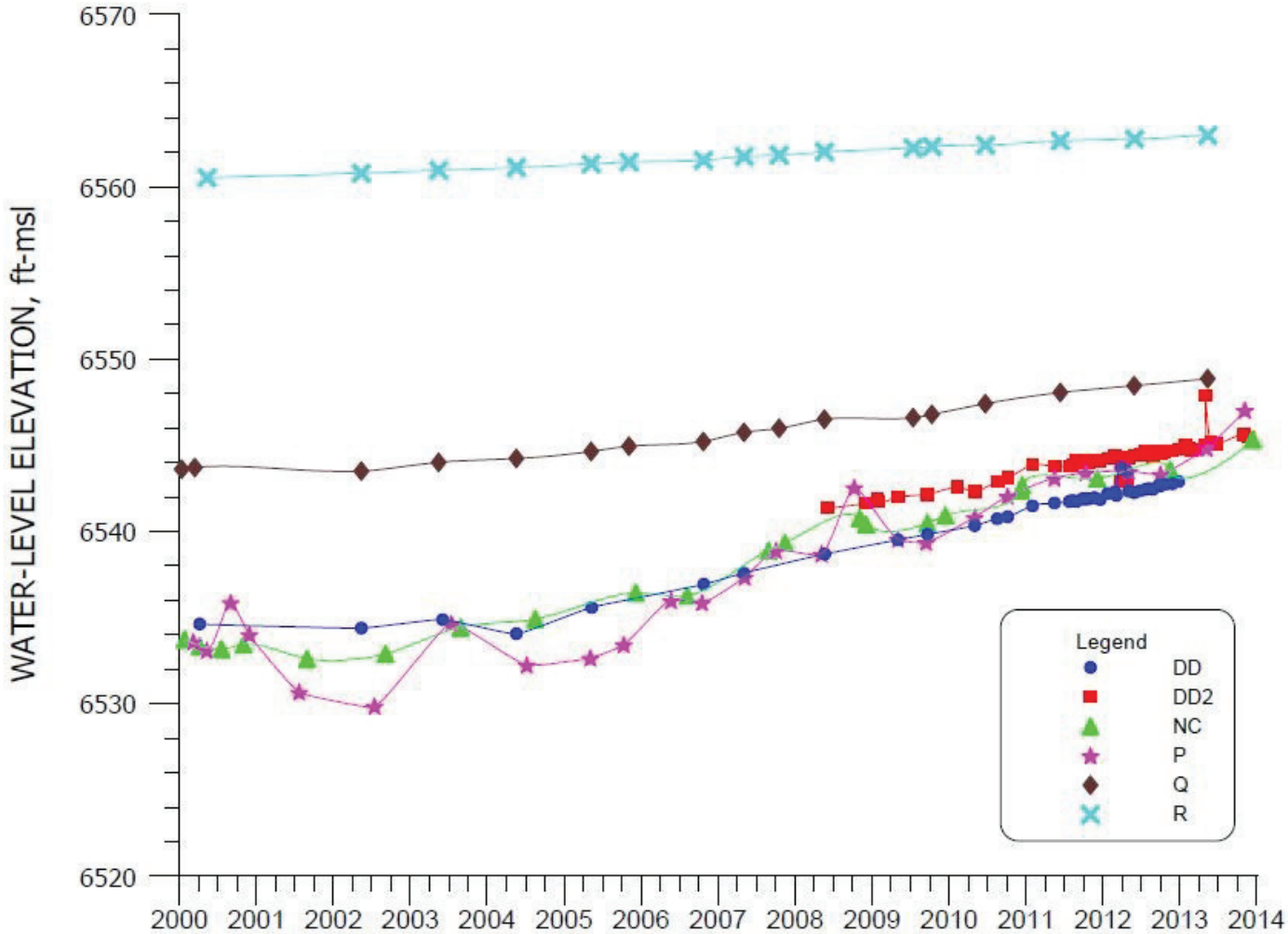


FIGURE 4.2-3. WATER-LEVEL ELEVATION FOR WELLS DD, DD2, NC, P, Q, AND R.

Water Level Elevation Near Upgradient Wells

Homestake 2000
Annual Report

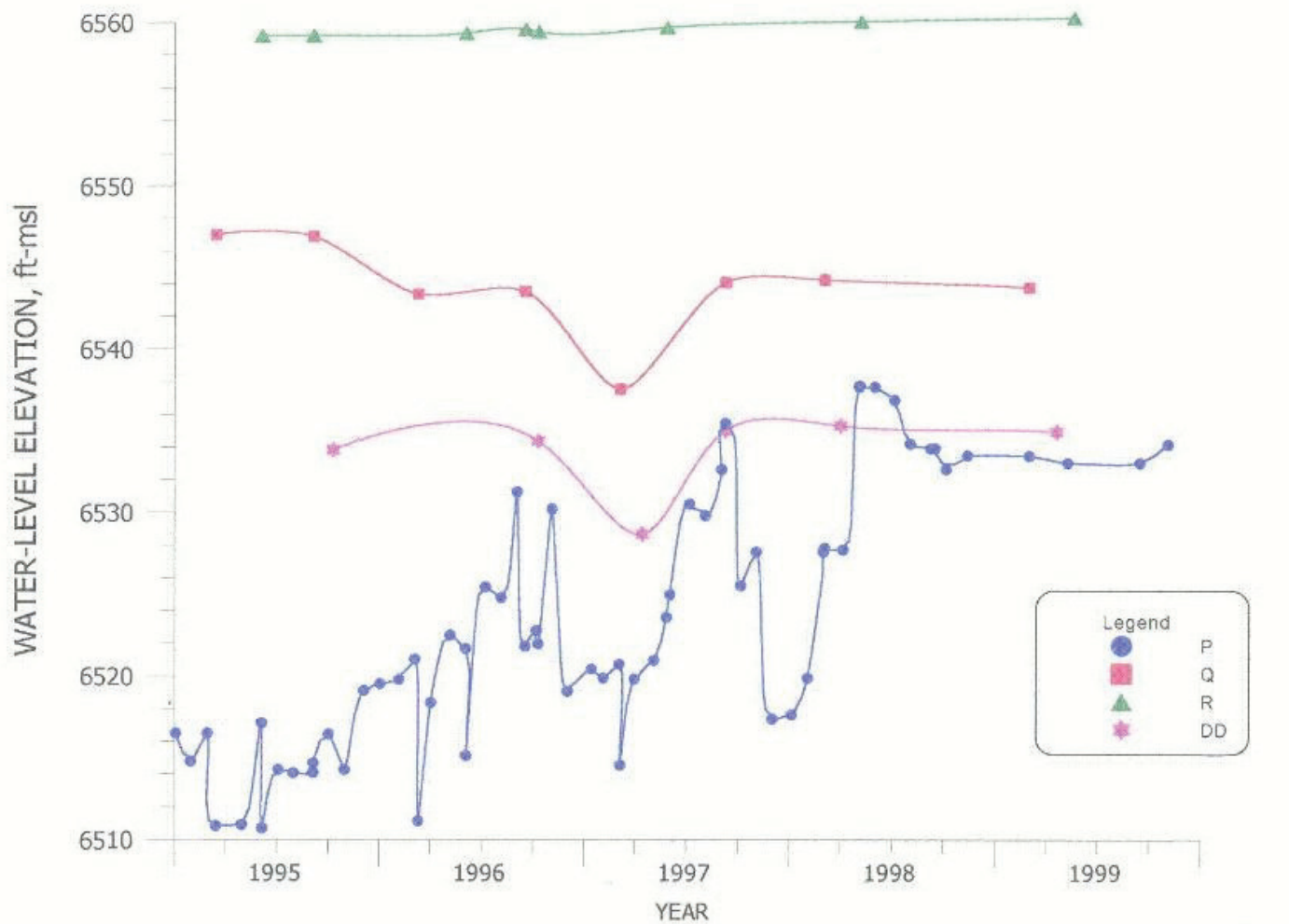
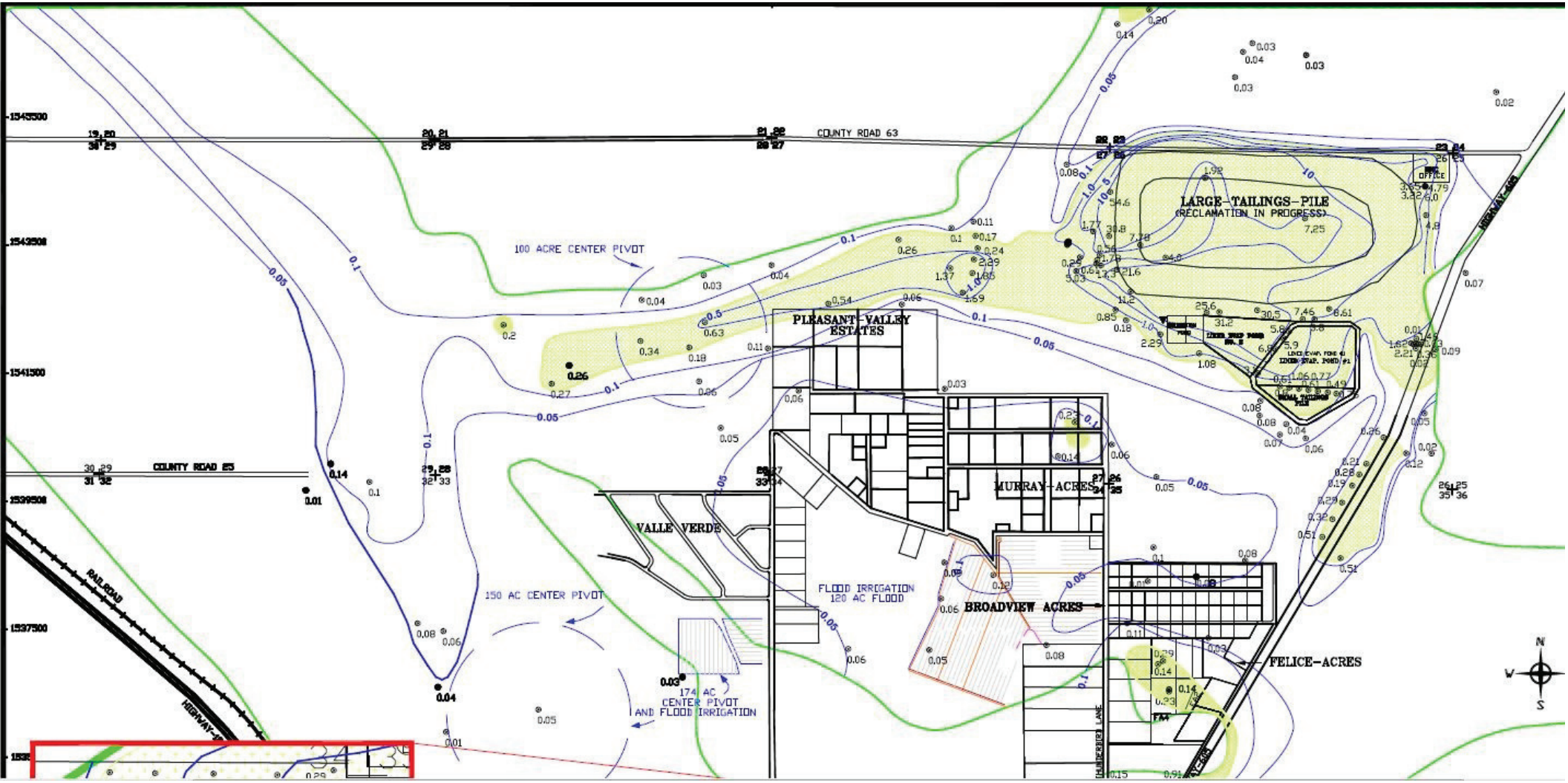


FIGURE 4.2-3. WATER-LEVEL ELEVATION FOR WELLS P, Q, R AND DD. C12

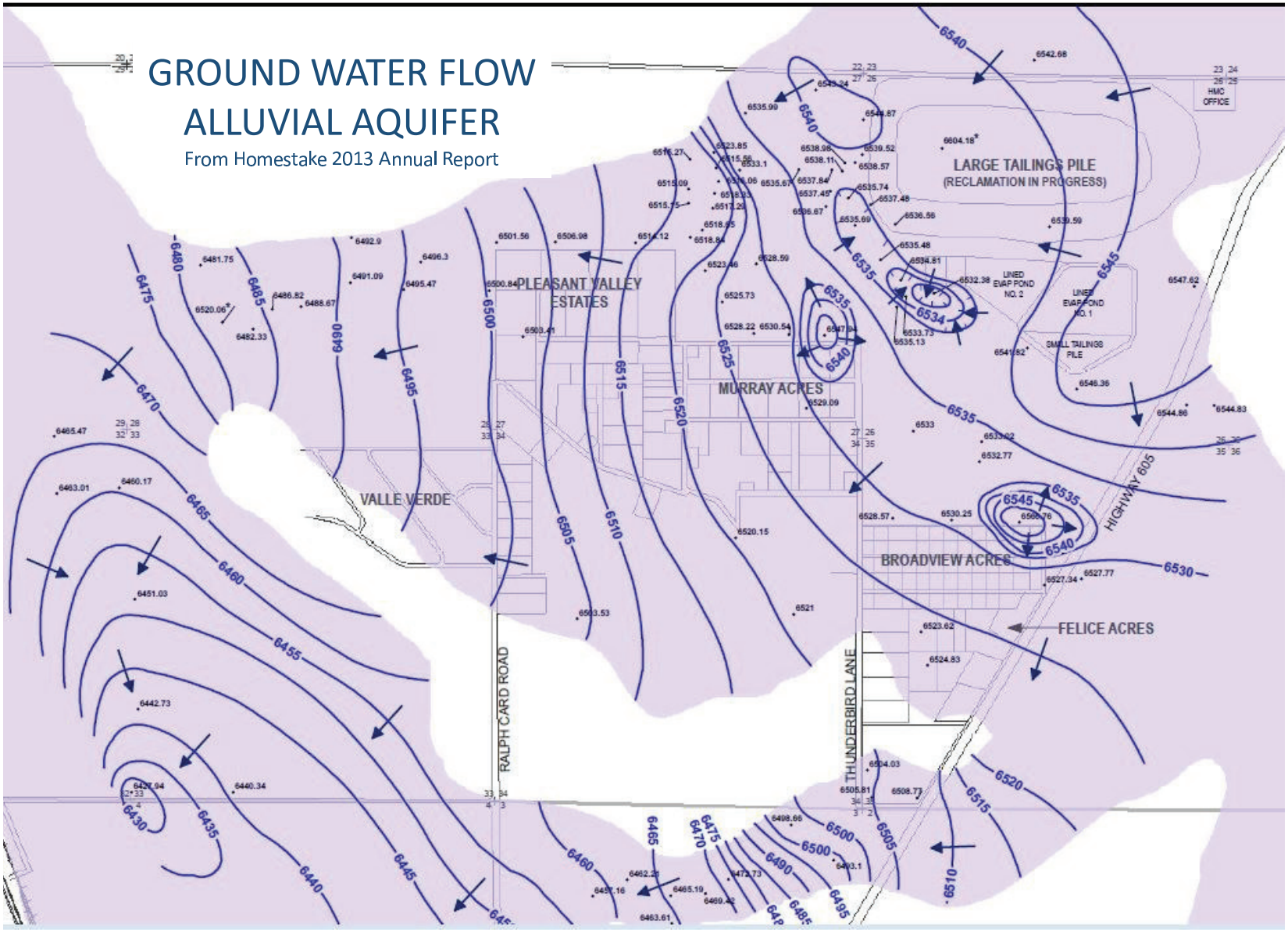
URANIUM CONCENTRATIONS – ALLUVIAL AQUIFER

Homestake 2013 Annual Report



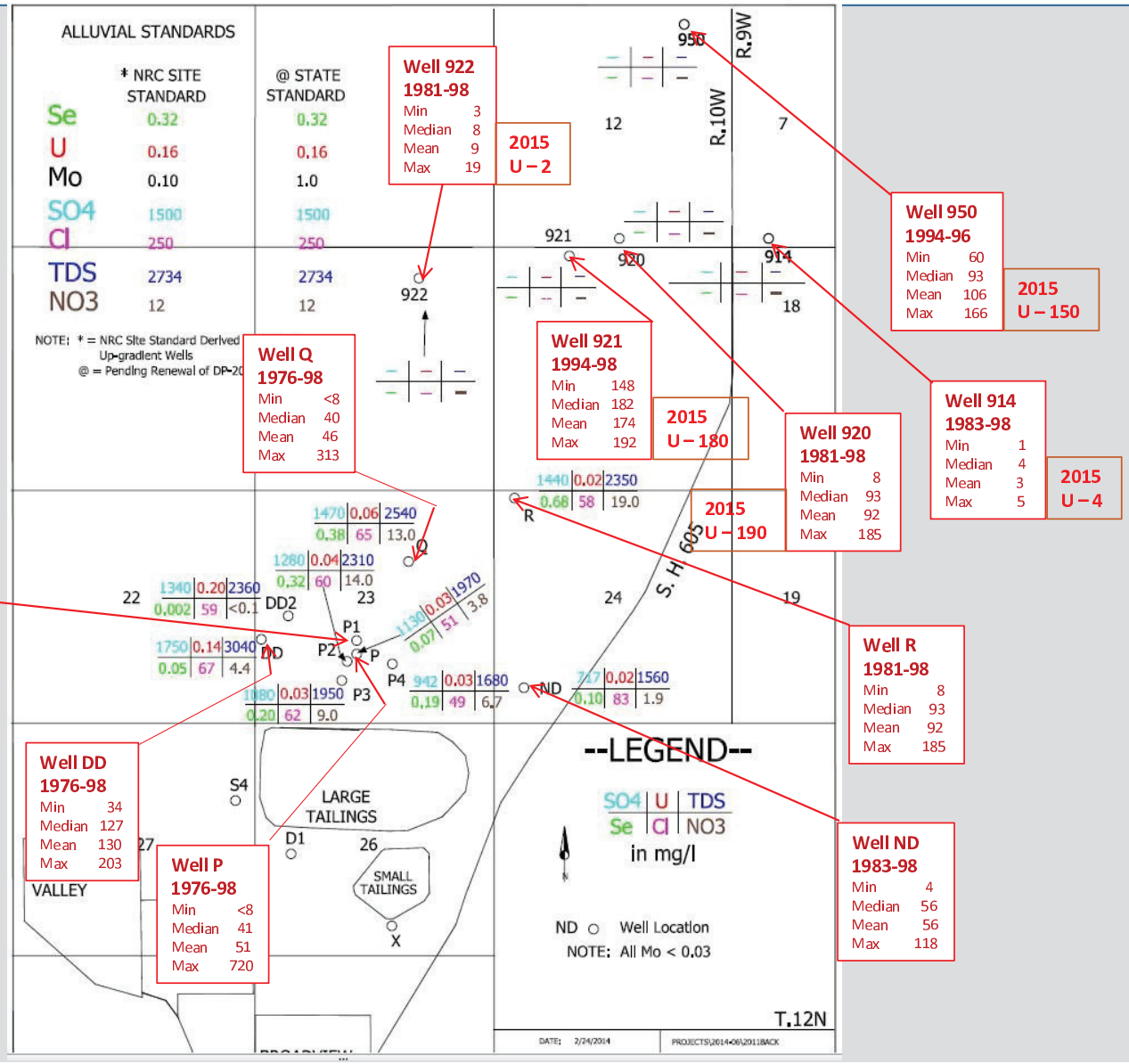
GROUND WATER FLOW
ALLUVIAL AQUIFER

From Homestake 2013 Annual Report

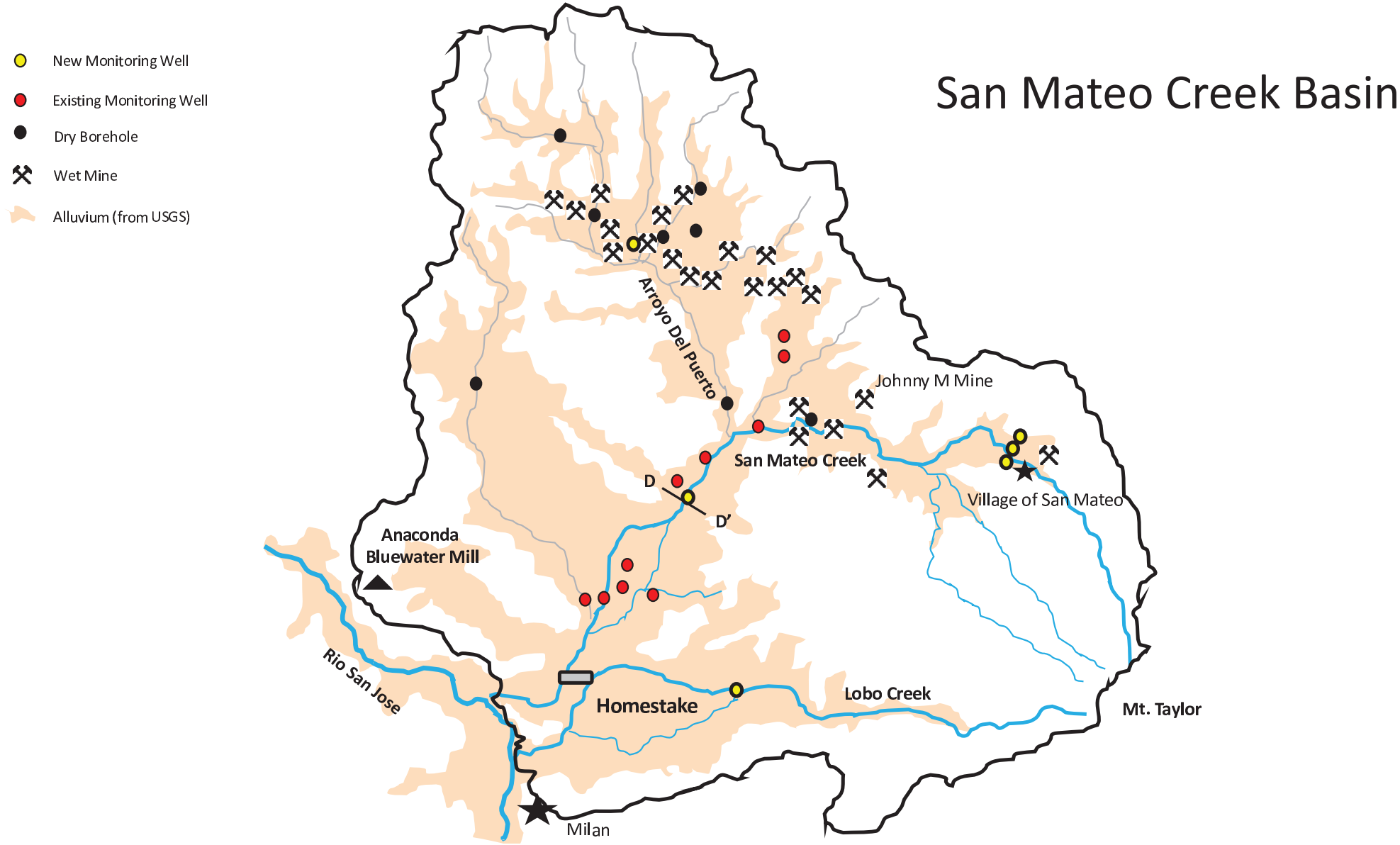


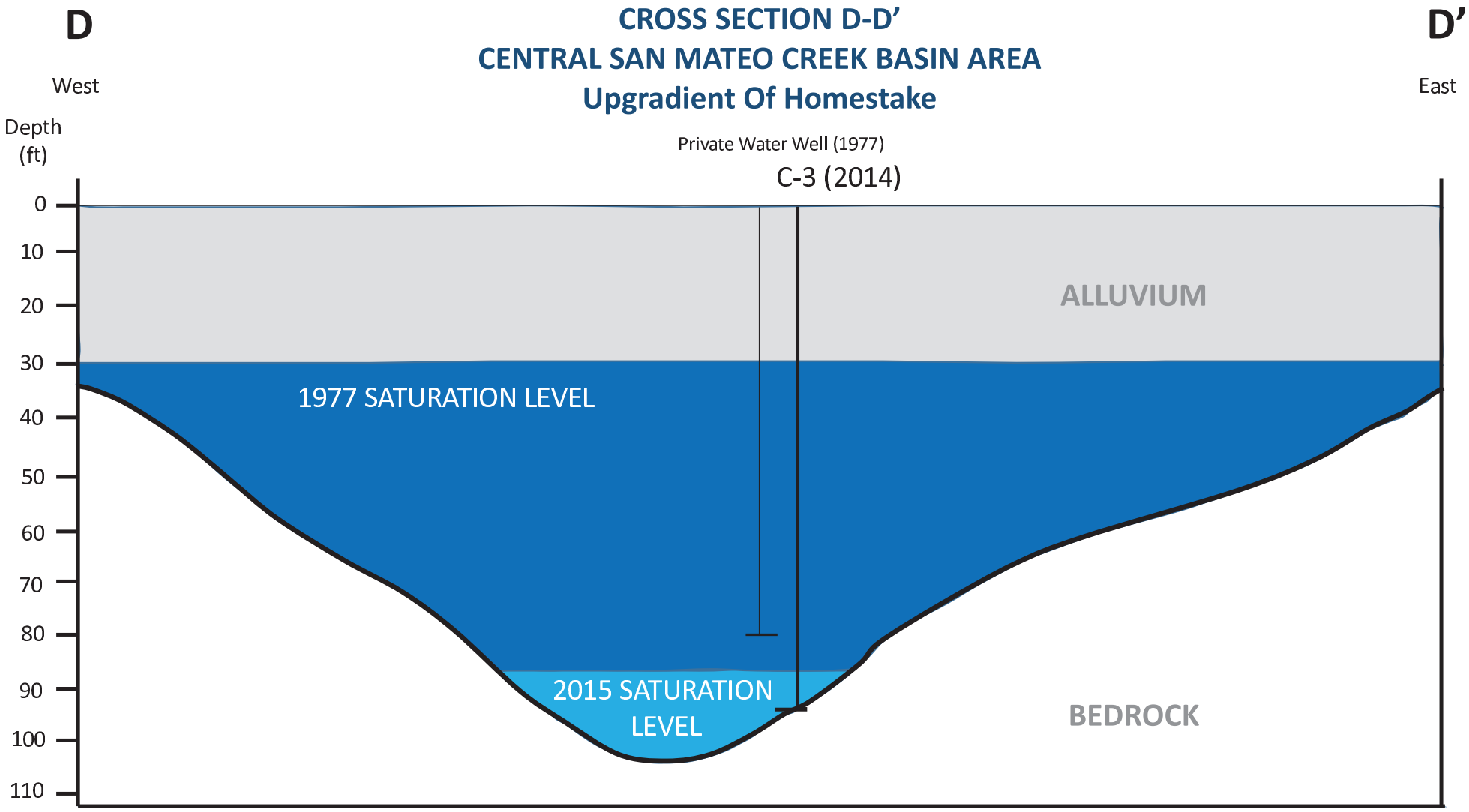
NEAR UPGRADIENT AND FAR UPGRADIENT BACKGROUND WELL CHEMISTRY DATA

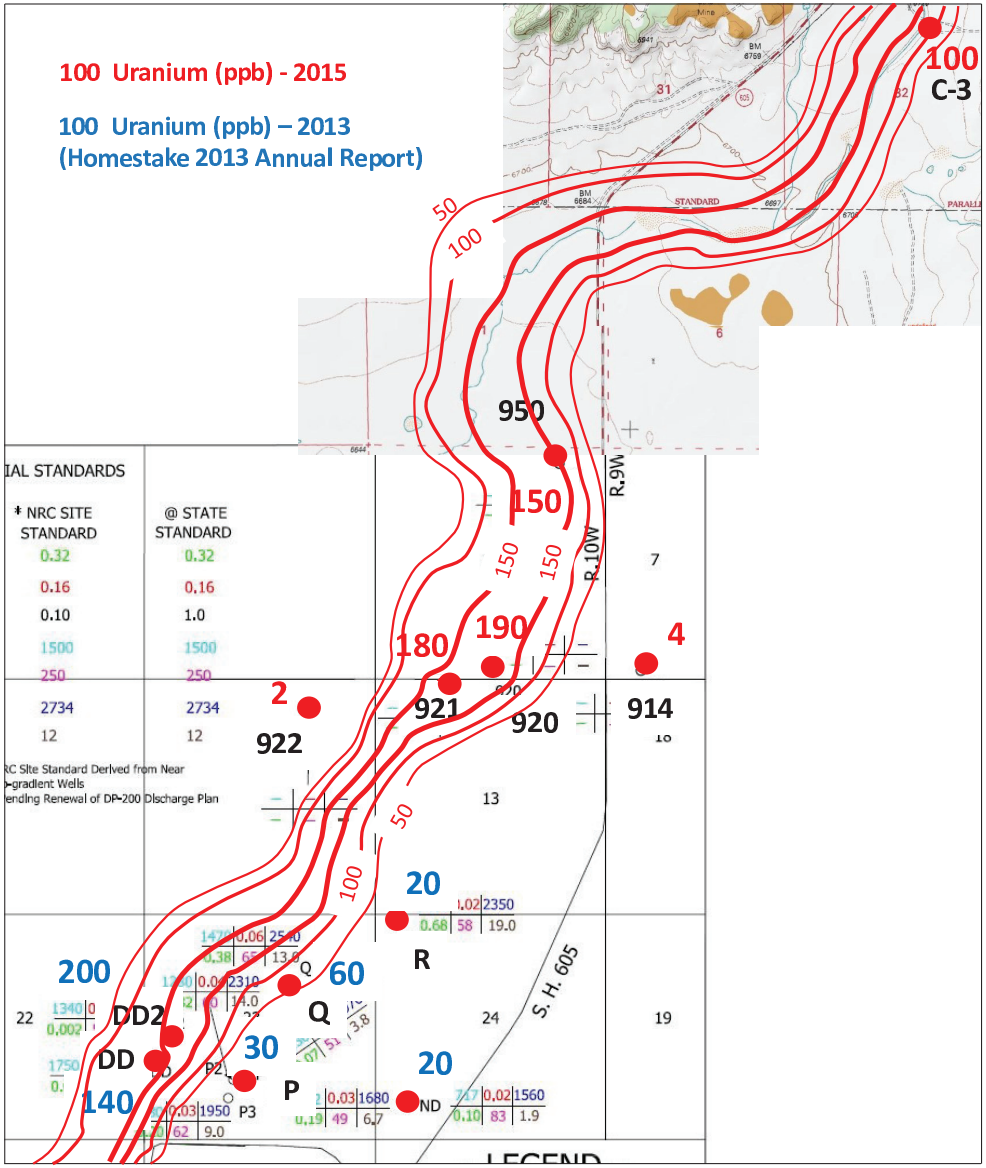
Uranium Concentrations Depicted in Inserts



From Homestake 2013 Annual Report
And 2003 Statistical Evaluation Report


San Mateo Creek Basin
New Monitoring Well
Existing Monitoring Well
Dry Borehole
Wet Mine
Alluvium (from USGS)
Arroyo Del Puerto
Johnny M Mine
San Mateo Creek
D
D'
Village of San Mateo
Anaconda
Bluewater Mill
Rio San Jose
Homestake
Lobo Creek
Mt. Taylor
Milan

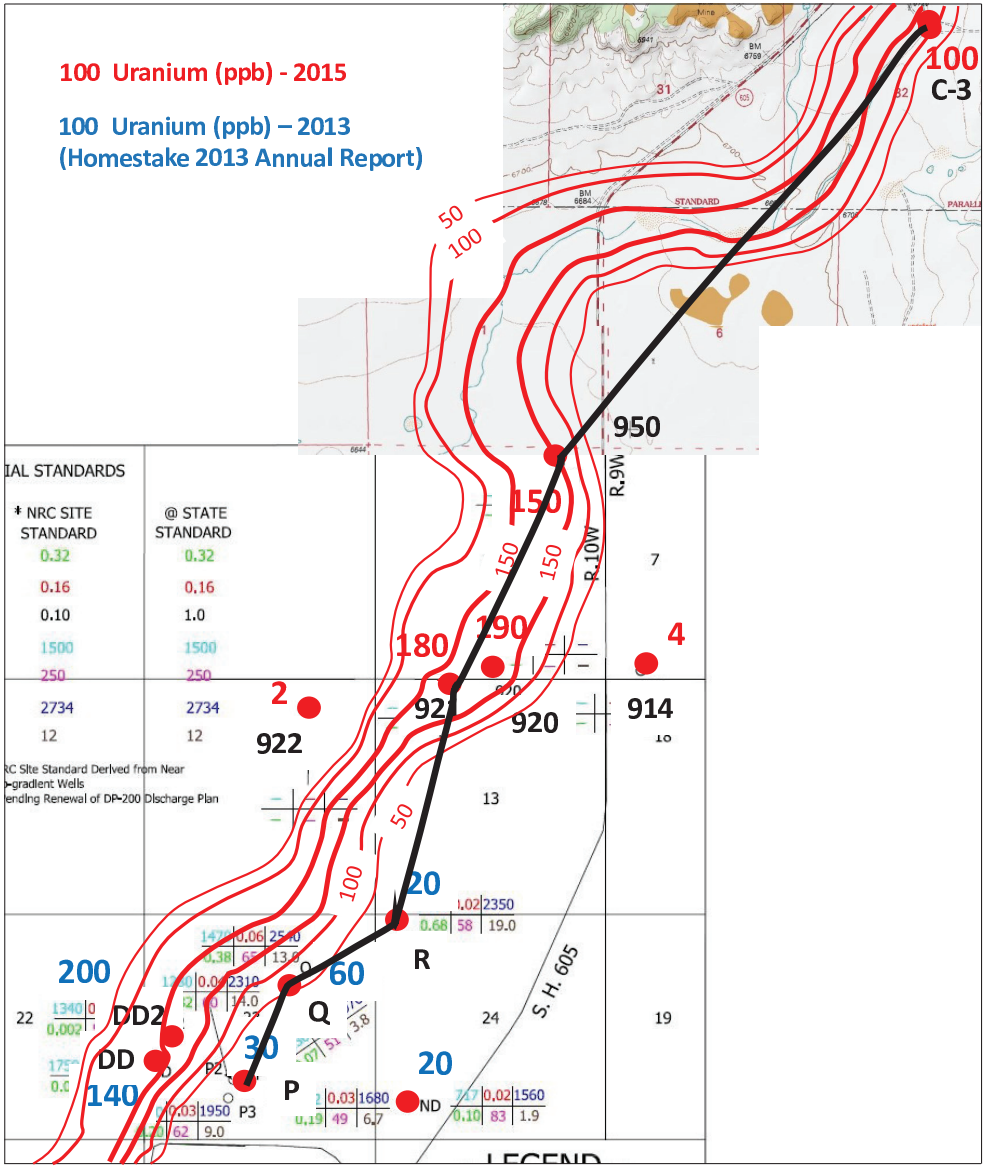

D
D'
CROSS SECTION D-D'
CENTRAL SAN MATEO CREEK BASIN AREA
Upgradient Of Homestake
West
East
Depth (ft)
Private Water Well (1977)
C-3 (2014)
0
10
20
30
40
50
60
70
80
90
100
110
ALLUVIUM
1977 SATURATION LEVEL
2015 SATURATION LEVEL
BEDROCK



URANIUM CONCENTRATION CONTOUR MAP

ALLUVIAL AQUIFER NORTH OF HOMESTAKE

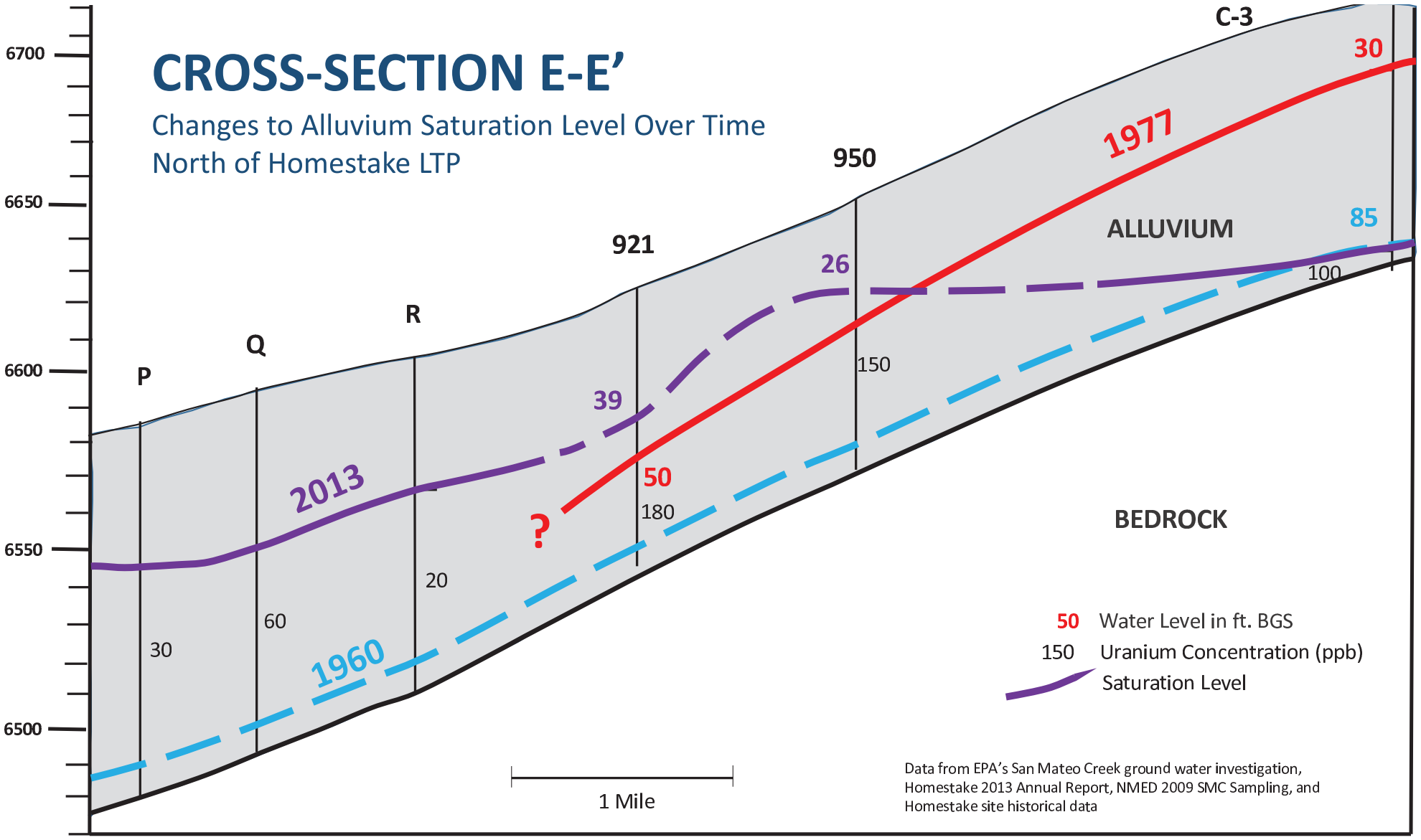
Base map from Homestake 2013 Annual Report
Data from EPA's San Mateo Creek ground water investigation, Homestake 2013 Annual Report



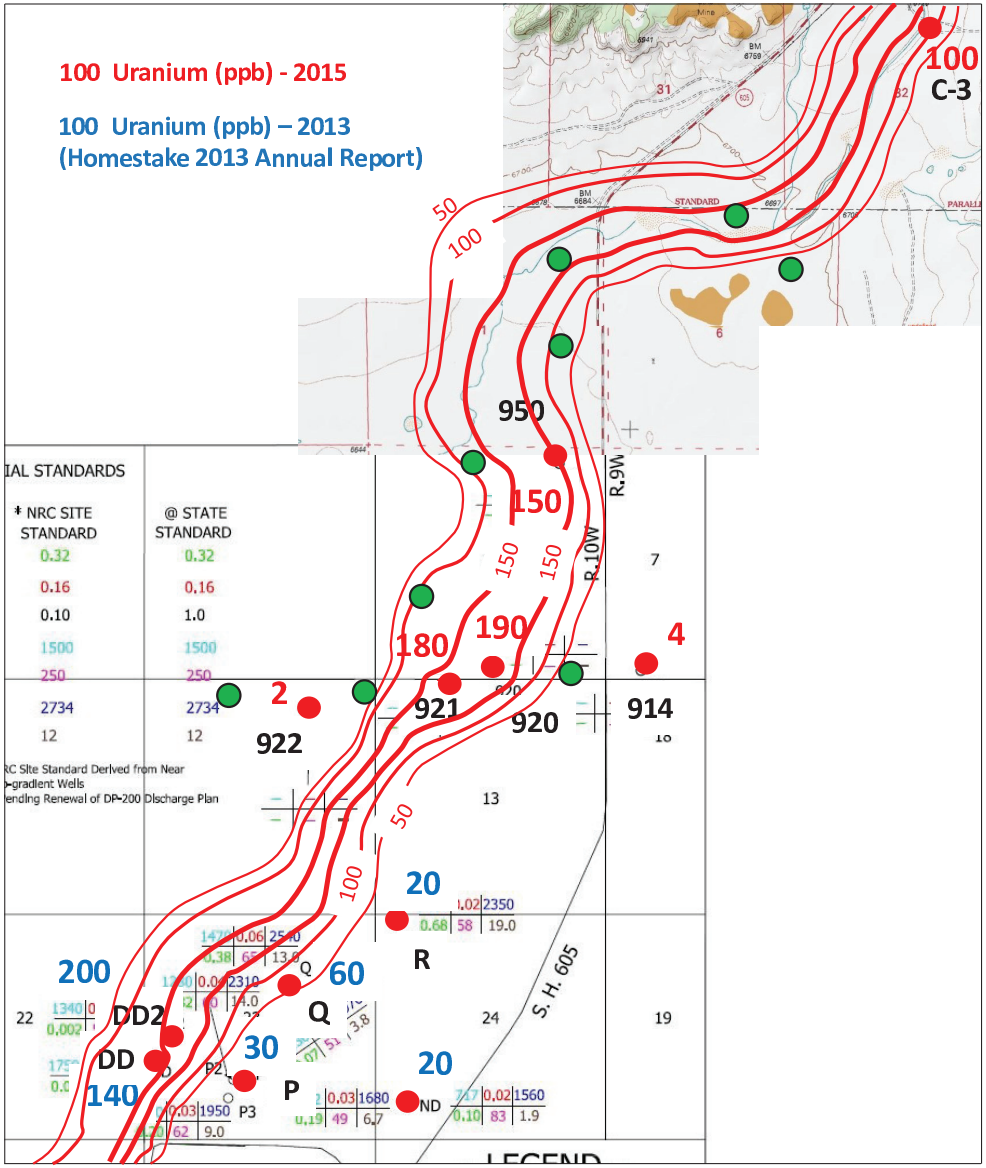
CROSS-SECTION E-E' TRANSECT

ALLUVIAL AQUIFER NORTH OF HOMESTAKE

Base map from Homestake 2013 Annual Report
Data from EPA's San Mateo Creek ground water investigation, Homestake 2013 Annual Report



CROSS-SECTION E-E'
Changes to Alluvium Saturation Level Over Time
North of Homestake LTP
6700
6650
6600
6550
6500
P
Q
R
921
950
C-3
30
60
20
180
150
100
30
85
26
39
50
?
1977
2013
1960
ALLUVIUM
BEDROCK
50 Water Level in ft. BGS
150 Uranium Concentration (ppb)
Saturation Level
1 Mile
Data from EPA's San Mateo Creek ground water investigation, Homestake 2013 Annual Report, NMED 2009 SMC Sampling, and Homestake site historical data



PLANNED EPA ALLUVIAL MONITORING WELLS NORTH OF HOMESTAKE 2015

San Mateo Creek Basin Ground Water Investigation

● Planned Alluvial Monitoring Well

Base map from Homestake 2013 Annual Report
Data from EPA's San Mateo Creek ground water investigation, Homestake 2013 Annual Report

CHINLE AQUIFERS

BACKGROUND WATER QUALITY ASSESSMENT

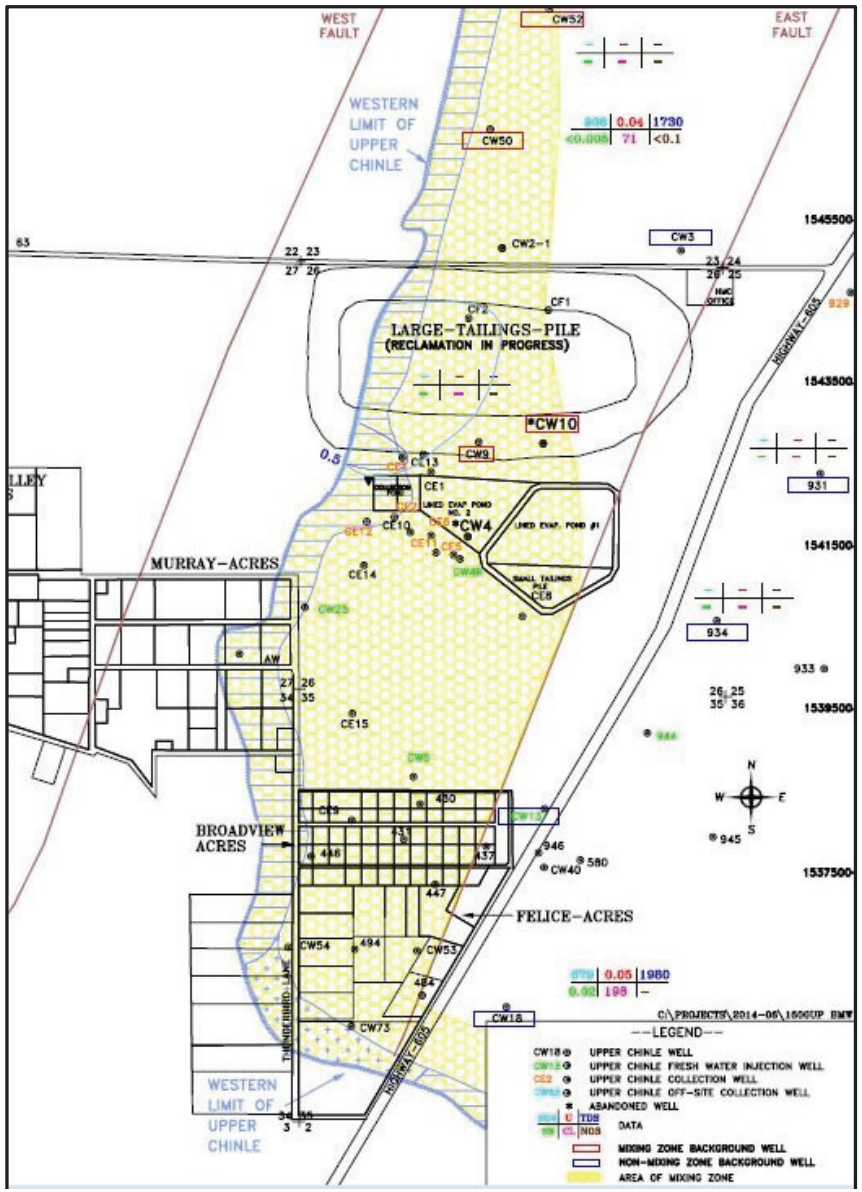
UPPER CHINLE

Mixing Zone wells

- CW-50 and CW-52 are in good locations
- CW-9 and CW-10 not in best locations but water appears to be of better quality

Non-Mixing Zone Wells

- 931 and 934 are in good locations
- Why are Uranium levels in CW-3, CW-13 and CW-18 are so high?



Data Availability

- CW-50 and CW-52 – 2003 to Present
- CW-9 – 1987 to 2000
- CW-10 – 1987 to 1994
- 931 – 1982 to 2000
- 934 – 1982 to 2003
- CW3 – 1984 to 2001*
- CW13 and CW18 – 1994 and 1995, respectively, to 2003

* Well CW3 samples collected after 2001 were not used. The constituent concentrations are elevated due to continuous pumping at that well

Map from Homestake 2013 Annual Report

UPPER CHINLE BACKGROUND WELL DATA

	Well	Uranium (ppb)	Selenium (ppb)	Molybdenum (ppb)	Sulfate (ppm)	TDS (ppm)
Cleanup Standards (MZ)		180	140	100	1750	3140
Mixing Zone	CW-50*	41-42	<5-7	<30		
	CW-52*	9-41	17-28	<30		
	CW-9	<8.5-55	<10-25	<30-110		
	CW-10	12-50	<1-7	<10-20		
Cleanup Standards (NMZ)		90	60	100	914	2010
Non-Mixing Zone	CW-3	02-76	05-68	10-50	566-1,050	920-2,130
	CW-13	45-96	36-244	<30		
	CW-18	16-148	<10-129	<30-50		
	931	04-50 (144?)	05-30	10-110 (420)	608-779	1,290-2,160
	934	08-93 (361)	05-63	10-230	620-821	1,549-1,930

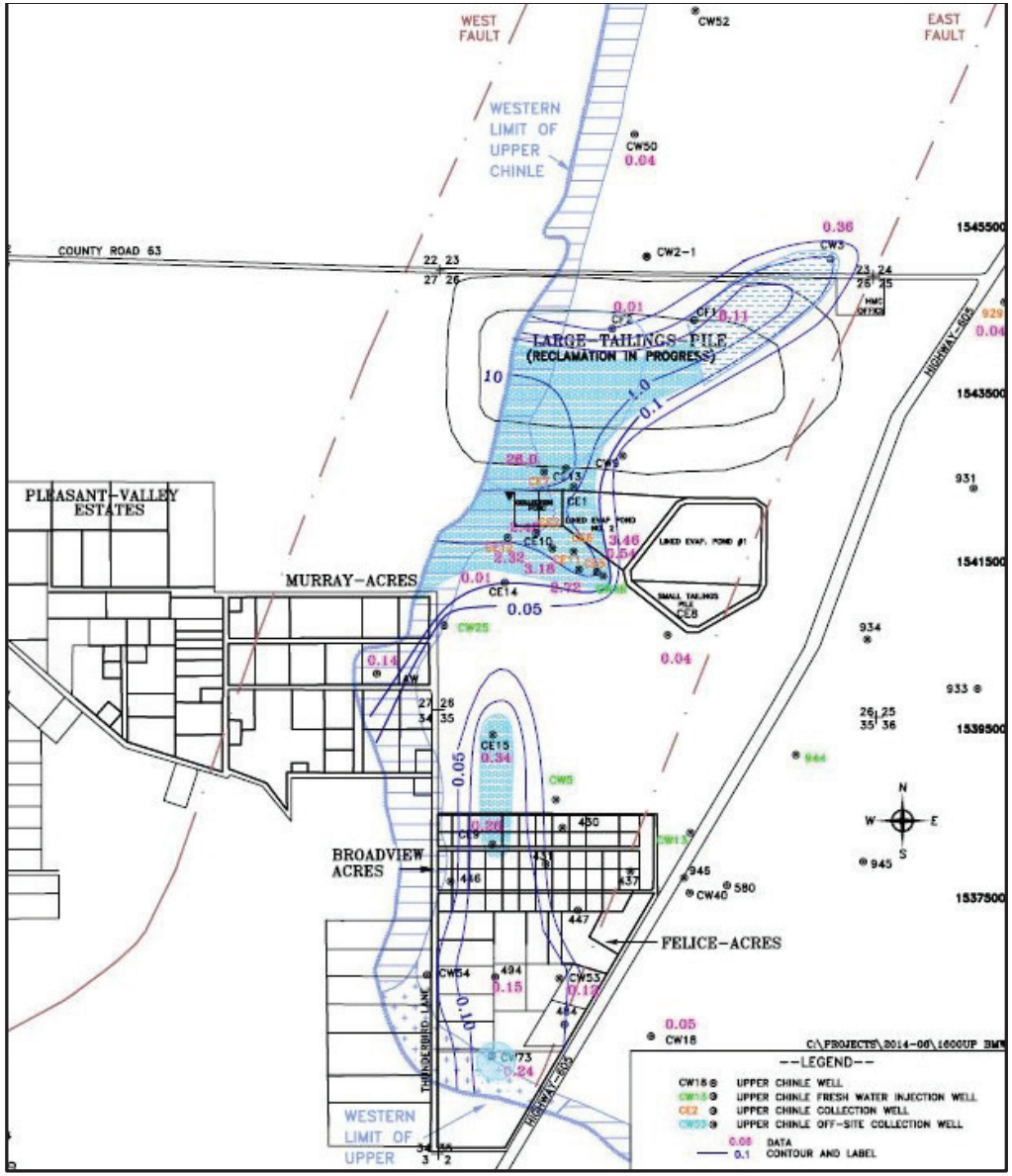
*Only two sampling events data available

Data from Homestake 2003 Statistical Evaluation Report

URANIUM ISOCONCENTRATION CONTOUR MAP

Upper Chinle

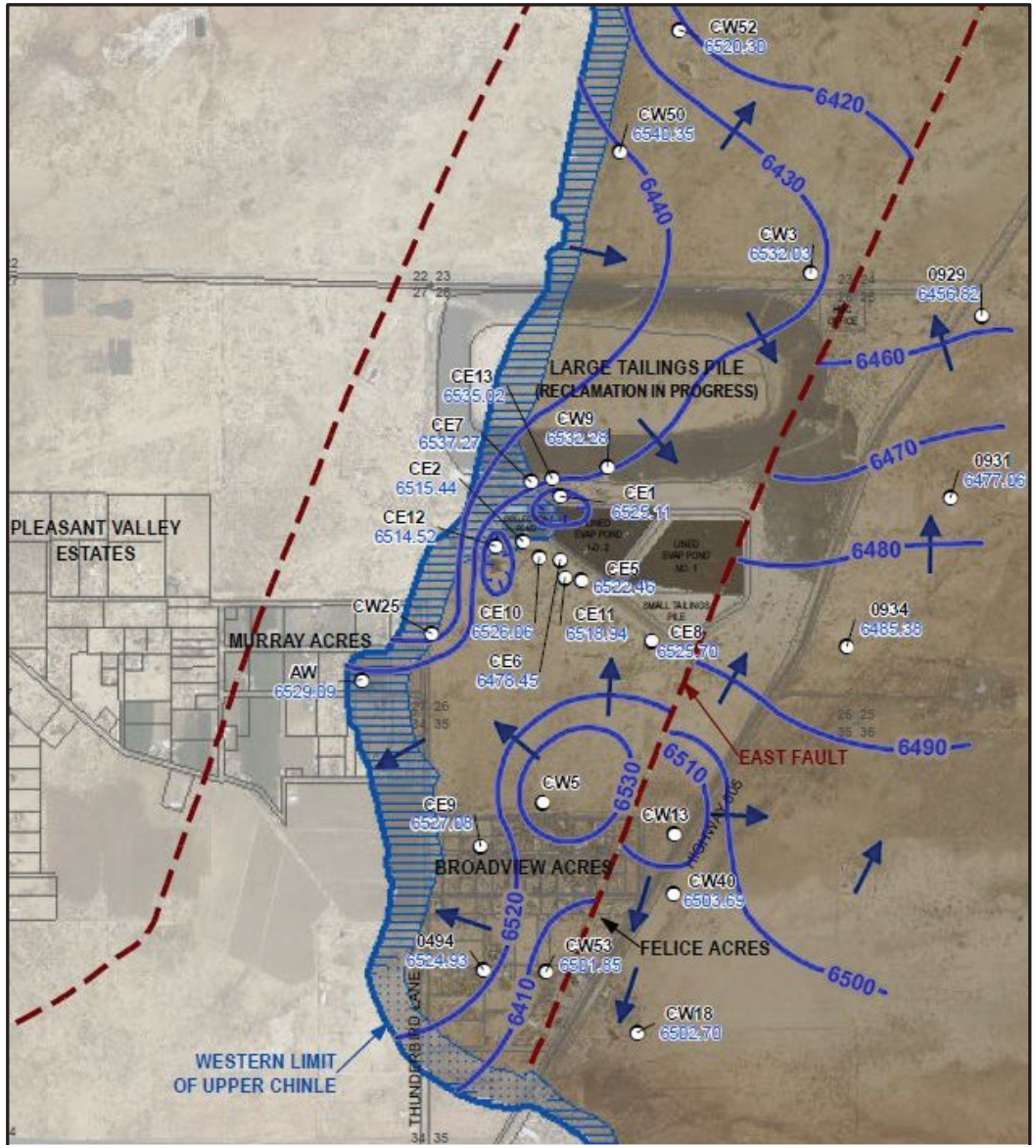
Homestake 2013 Annual Report



GROUND WATER FLOW DIRECTION

Upper Chinle

Homestake CAP



MIDDLE CHINLE

Mixing Zone Wells

- CW-15, CW-17, CW-24, CW-35, WR25 - Reasonable

Non- Mixing Zone Wells

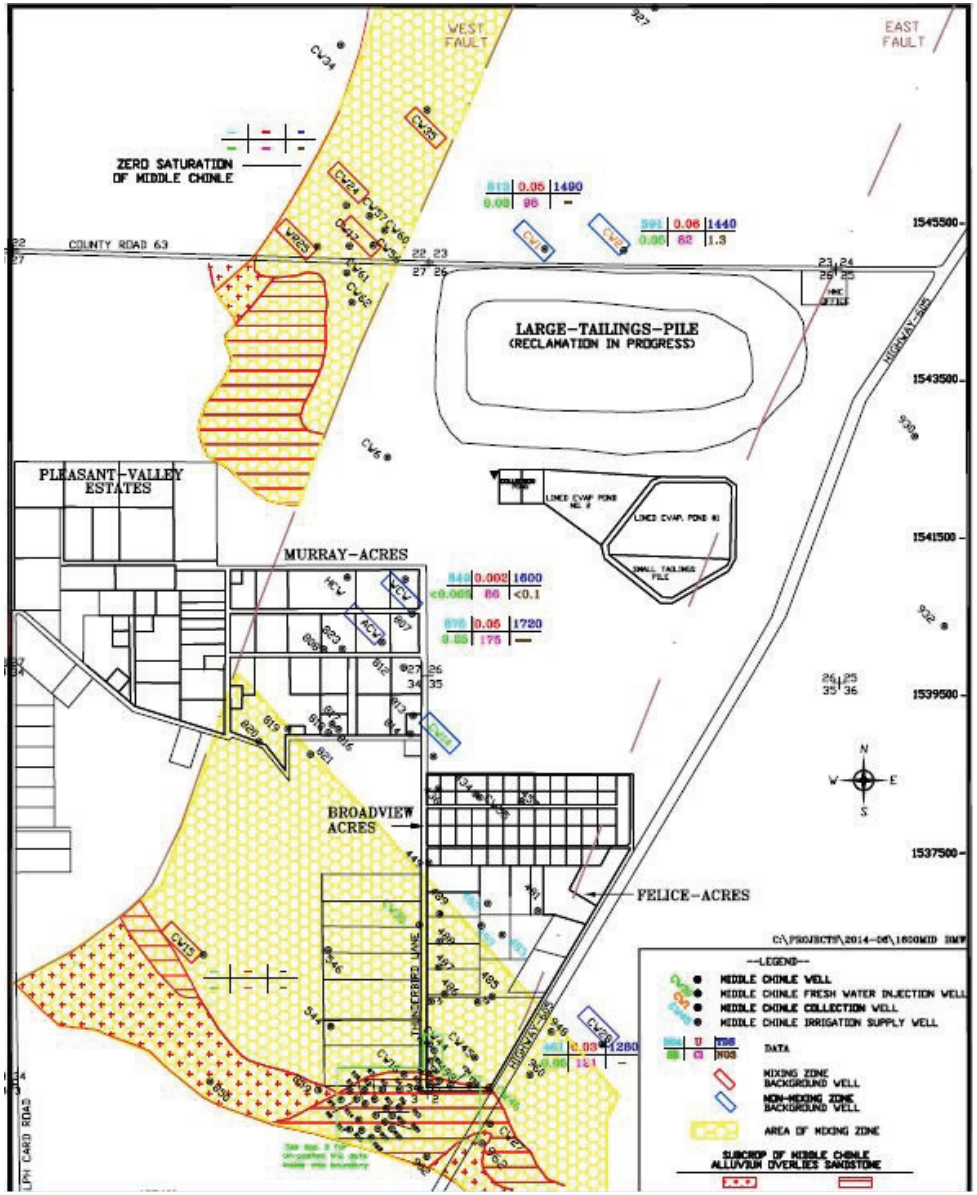
- CW1, CW2 CW-28, ACW, WCW - Reasonable
- CW-14 appears impacted by Se

- Why not use 930 or 932 for background?

Data Availability

- CW-1 and CW-2 – 1982-2003
- CW-14- 3 samples from 1995
- CW-28 – 1995-2003
- WCW- 1980-2000

Why is chemistry in Mixing Zone west of west fault used for background in east of west fault



Map from Homestake 2013 Annual Report

MIDDLE CHINLE BACKGROUND WELL DATA

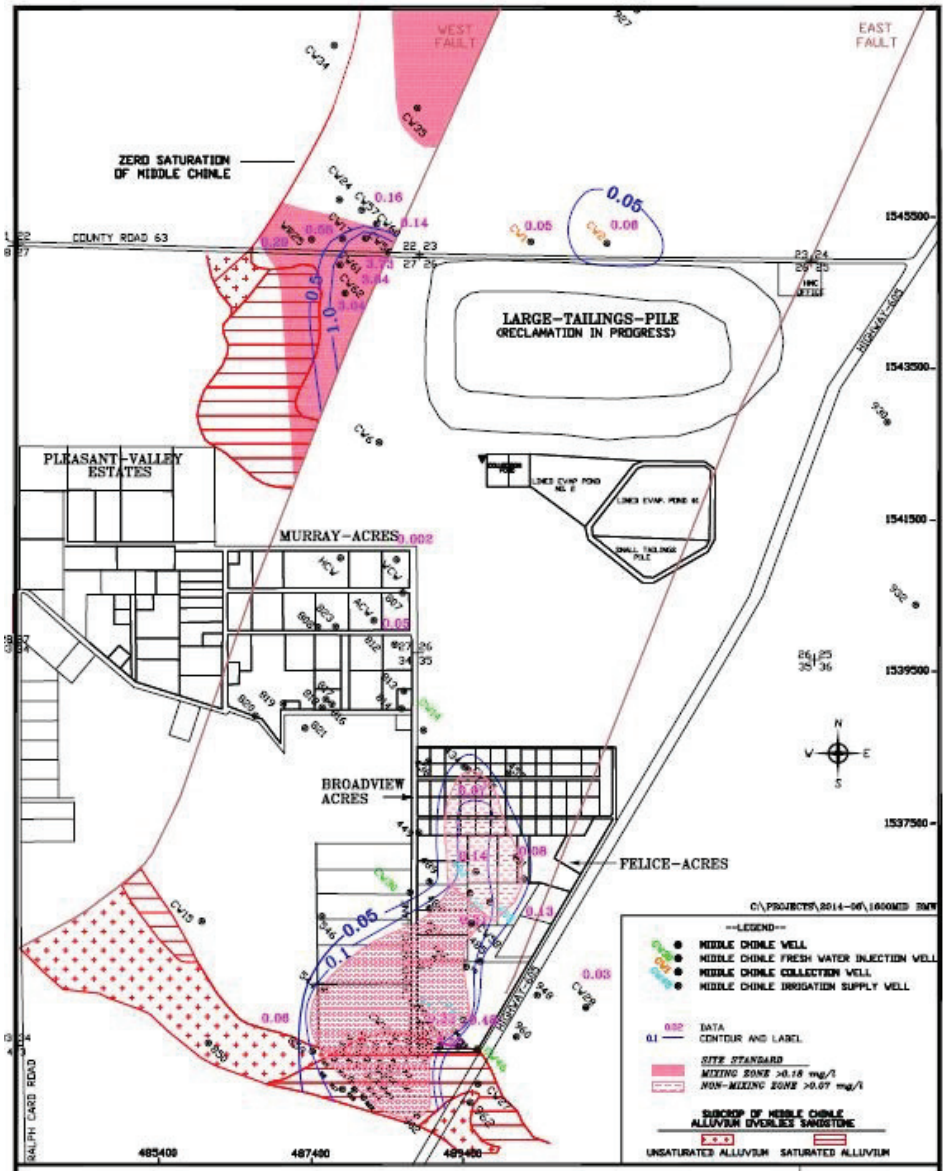
Data from Homestake 2013 Statistical Evaluation Report

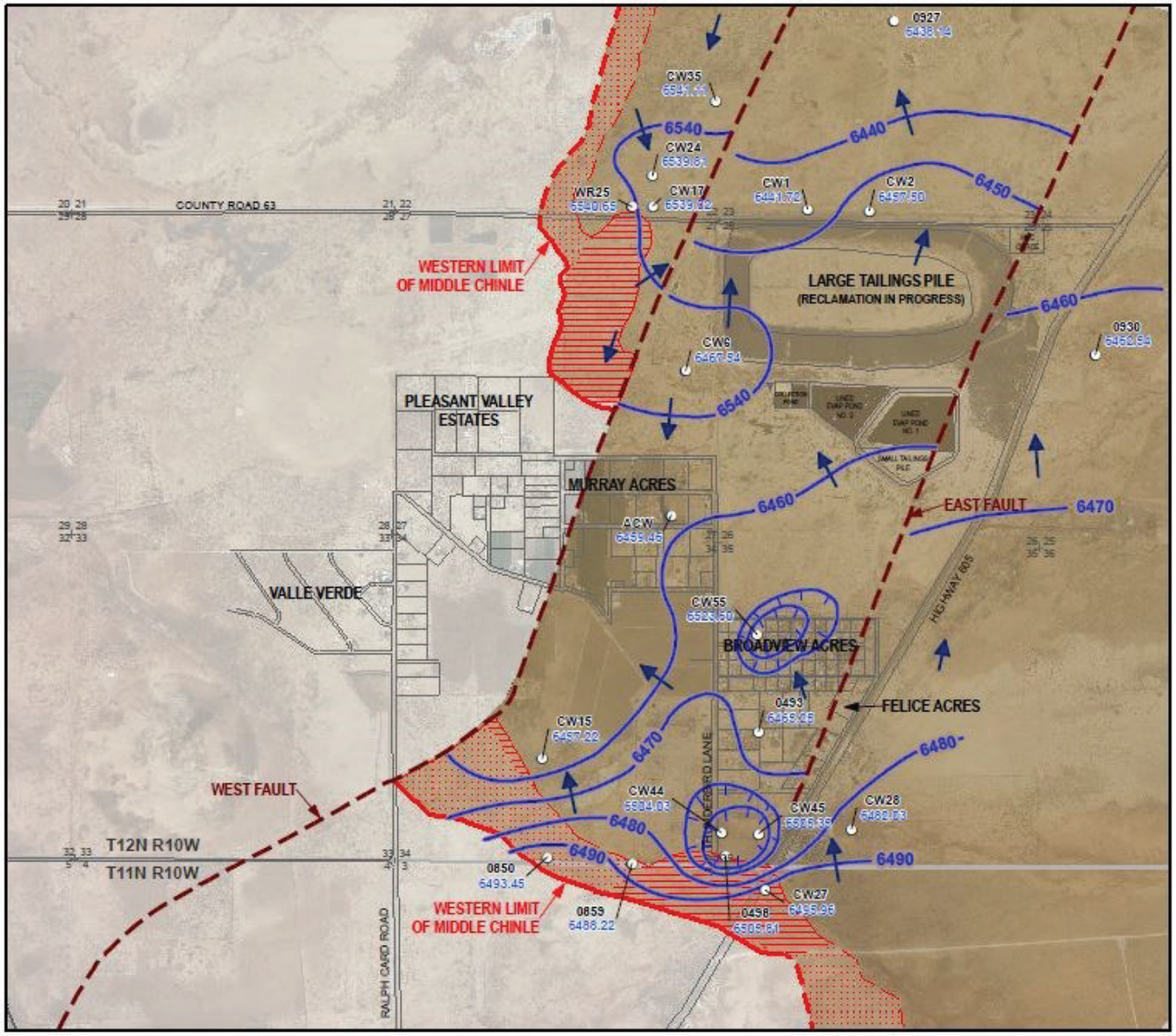
	Well	Uranium	Selenium	Molybdenum	Sulfate	TDS	
Cleanup Standards (MZ)		180	140	100	1750	3140	
Mixing Zone	CW-15	15-50	11-42	<30		1446-1710	C/E Block
	CW-17	69-175	69-116	<30-70		1620-3250	Western Block
	CW-24	101-154	34-79	<30-40		3020-3160	
	CW-35	141-231	12-520	<30		1830-2370	
	WR-25						
Cleanup Standards (NMZ)		70	70	100	857	1560	
Non-Mixing Zone	CW-1	<8.5-62	11-90	<30-40		2020-2514	Central and Eastern Block
	CW-2	<8.5-69	<10-30	<10-50		860-2280	
	CW-28	11-61	16-83	<30-30		944-1410	
	ACW	<8.5-25	<10-10	<10-30		1172-1470	
	WCW	<8.5-33	<10-20	<10-30		1170-1980	
	CW-14	10-19	83-222	<30		1306-1486	

URANIUM CONCENTRATION MAP

Middle Chinle

Homestake 2013 Annual Report





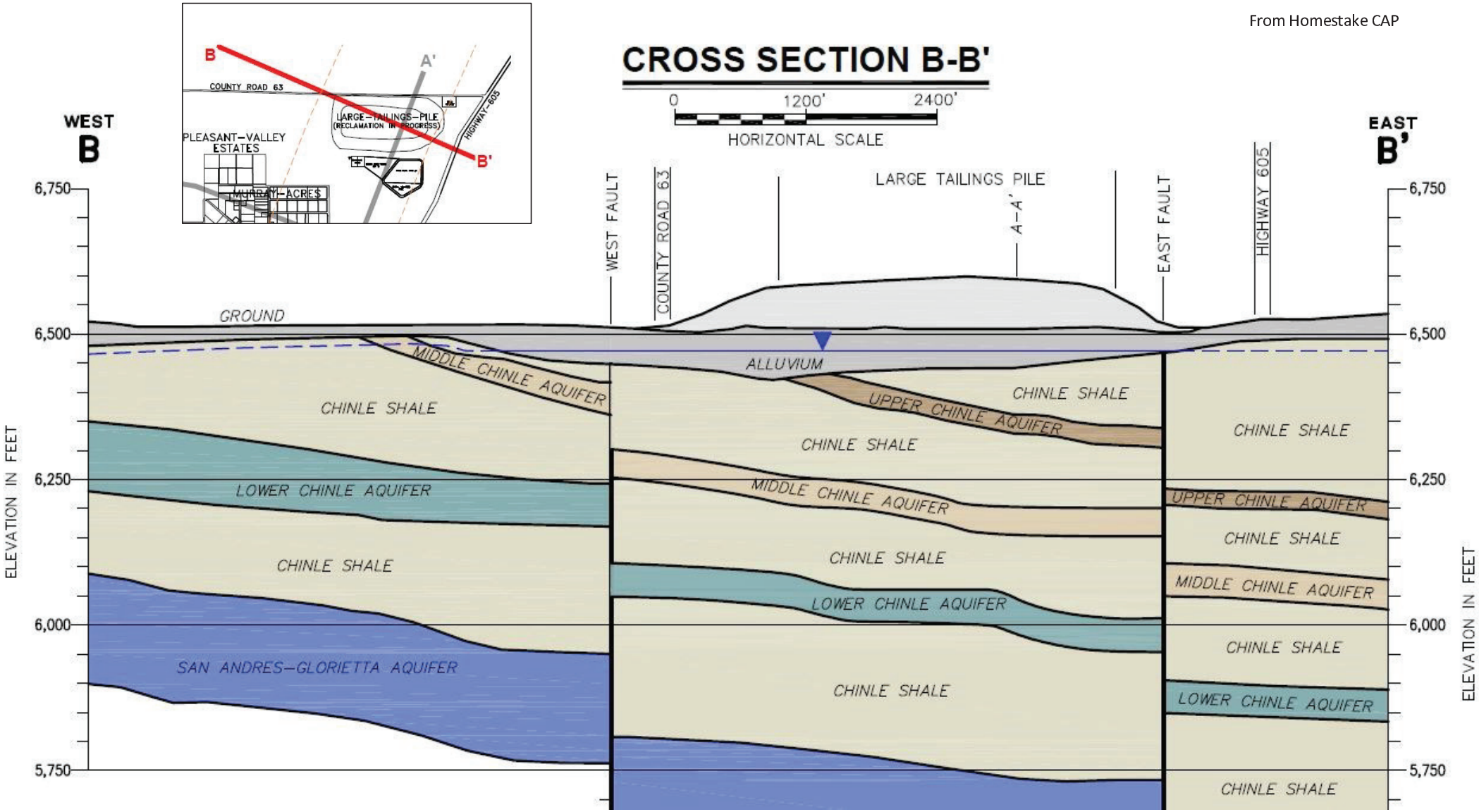
GROUND WATER FLOW MAP

Middle Chinle

Homestake CAP

Aquifer In West Fault Block Separated From Central And East Block

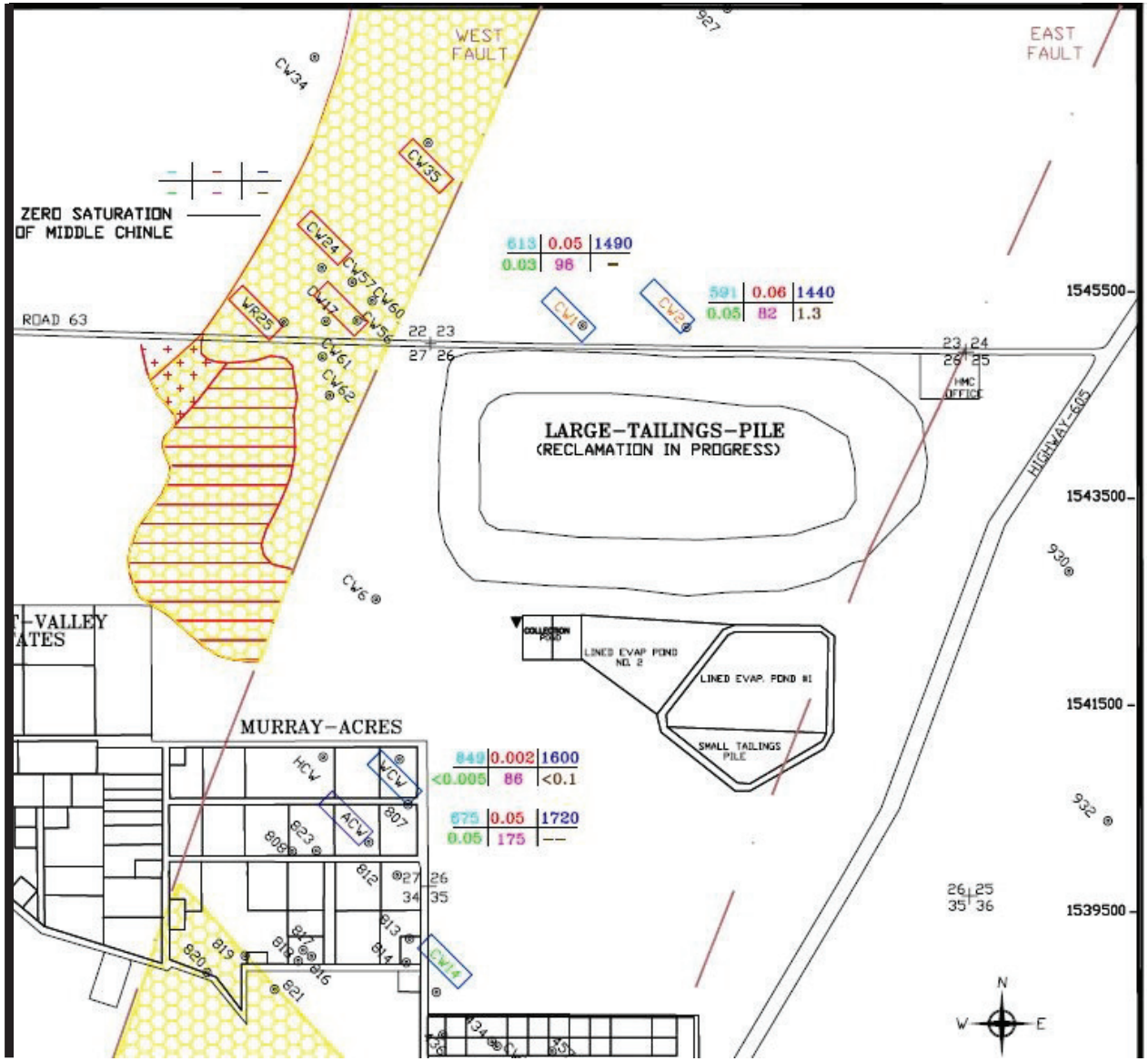
From Homestake CAP



MIDDLE CHINLE

Other Issues for Mixing Zone

- No Non-Mixing Zone water quality west of West Fault?
- Downgradient Extent of Mixing Zone west of West Fault not delineated?



Map from Homestake 2013 Annual Report

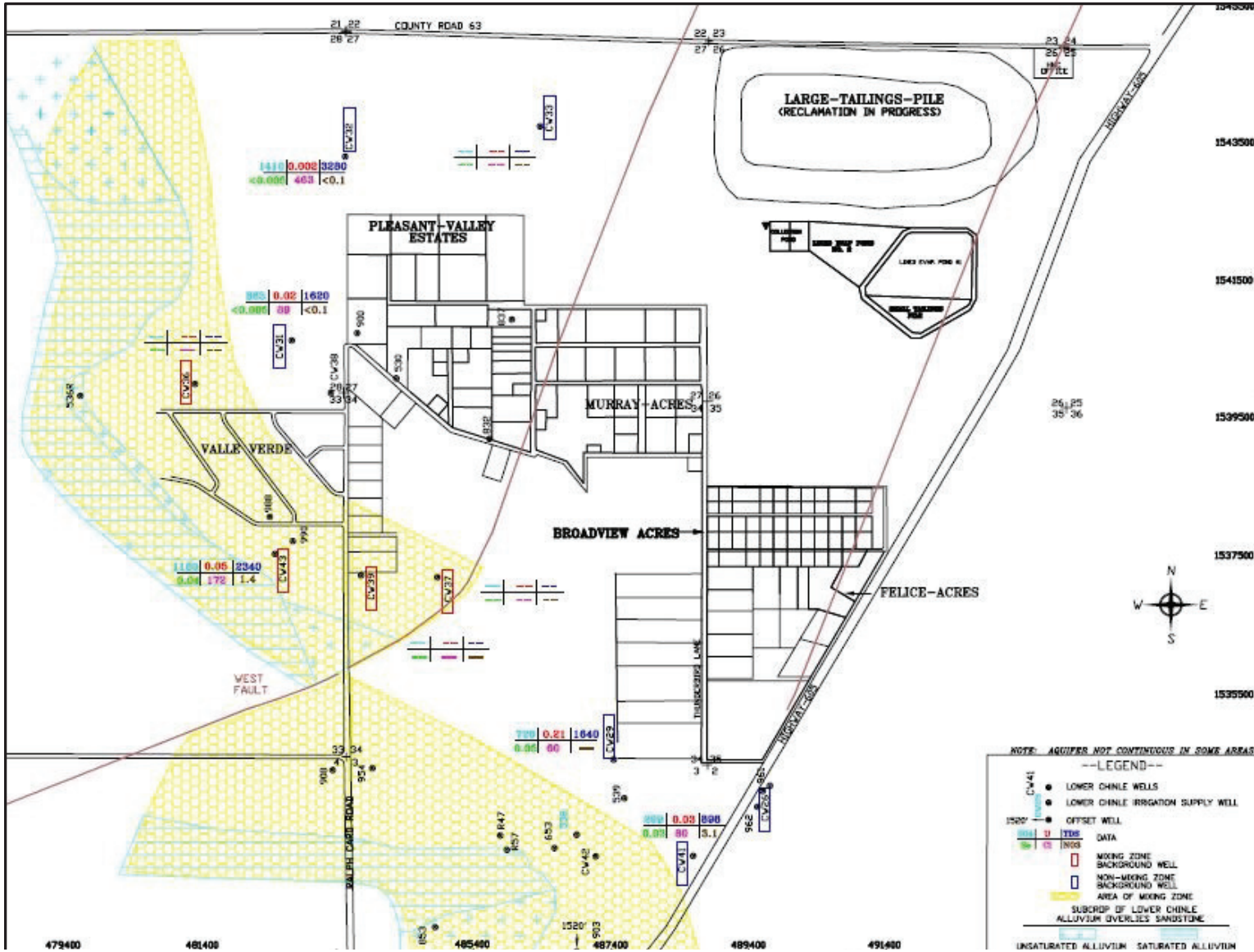
LOWER CHINLE

Mixing Zone Wells
- CW-26, CW-29, CW-31, CW-32, CW-33, CW-41
- Background levels seem high

Non-Mixing Zone Wells
- Selenium in C/E Blocks seems high for Non-Mixing Zone

- Water quality is better in private wells than in background monitor wells

Data Availability
- All Wells – 1995-2002 except CW-41
- CW-41-1996-1998



Map from Homestake 2013 Annual Report

LOWER CHINLE BACKGROUND WELL DATA

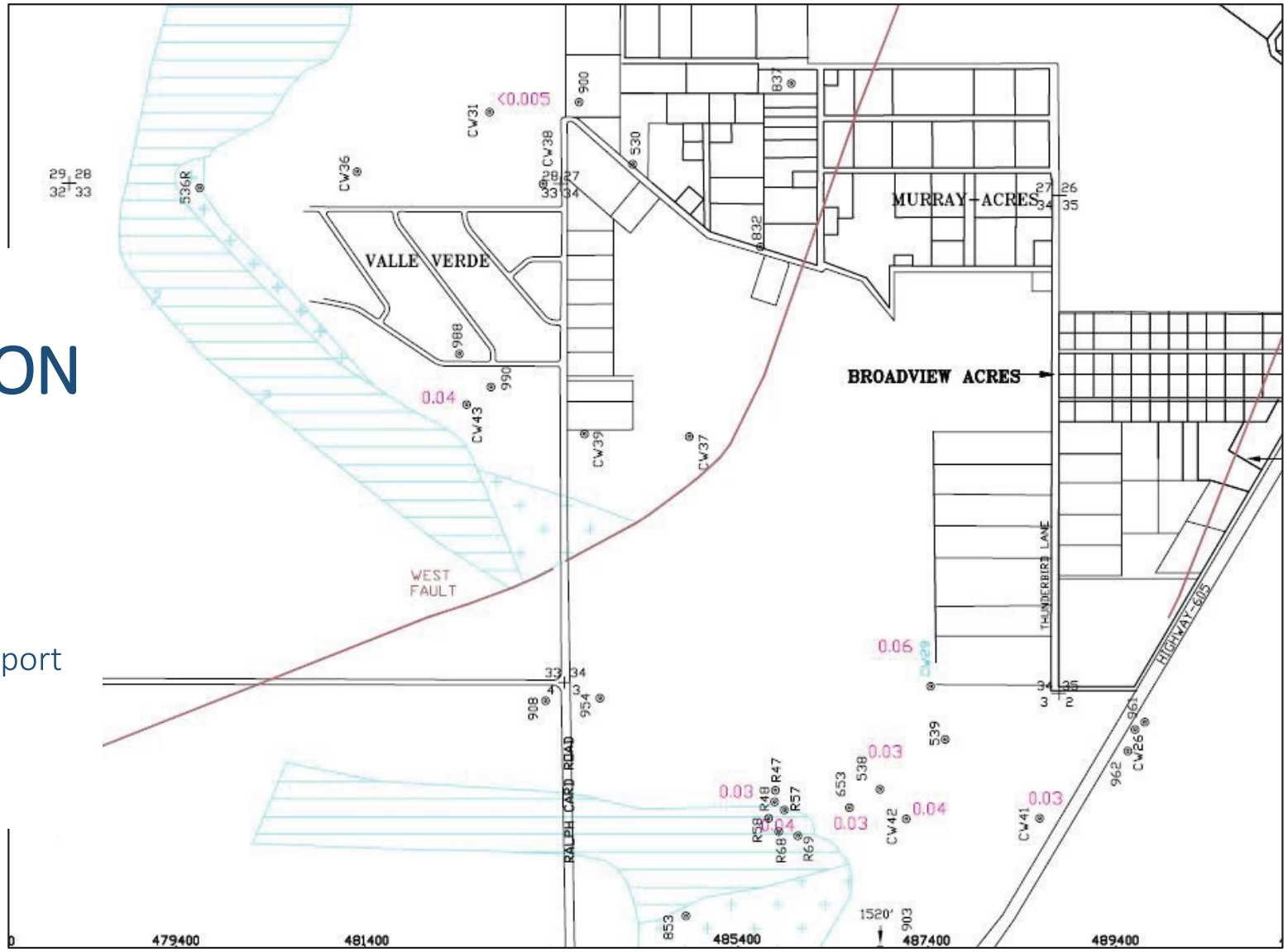
	Well	Uranium	Selenium	Molybdenum	Sulfate	TDS
Cleanup Standards (MZ)		180	140	100	1750	3140
Mixing Zone	CW-36	2-13	<5-35	<30		
	CW-37	24-32	75-96	<30		
	CW-39	17-45	31-85	<30		
	CW-43	21-33	9-25	<30		
Cleanup Standards (NMZ)		30	320	100	2000	4140
Non-Mixing Zone	CW-26	16-24	192-364	<30-120		
	CW-29	9-53	<14-155	<30		
	CW-31	6-16	<5	<30		
	CW-32	6-10	<10-2570	<30		
	CW-33	<10-26	<10-14	<30		
	CW-41	13-48	8-24	<30		

Data from Homestake 2003 Statistical Evaluation Report

SELENIUM CONCENTRATION MAP

Lower Chinle

Homestake 2013 Annual Report



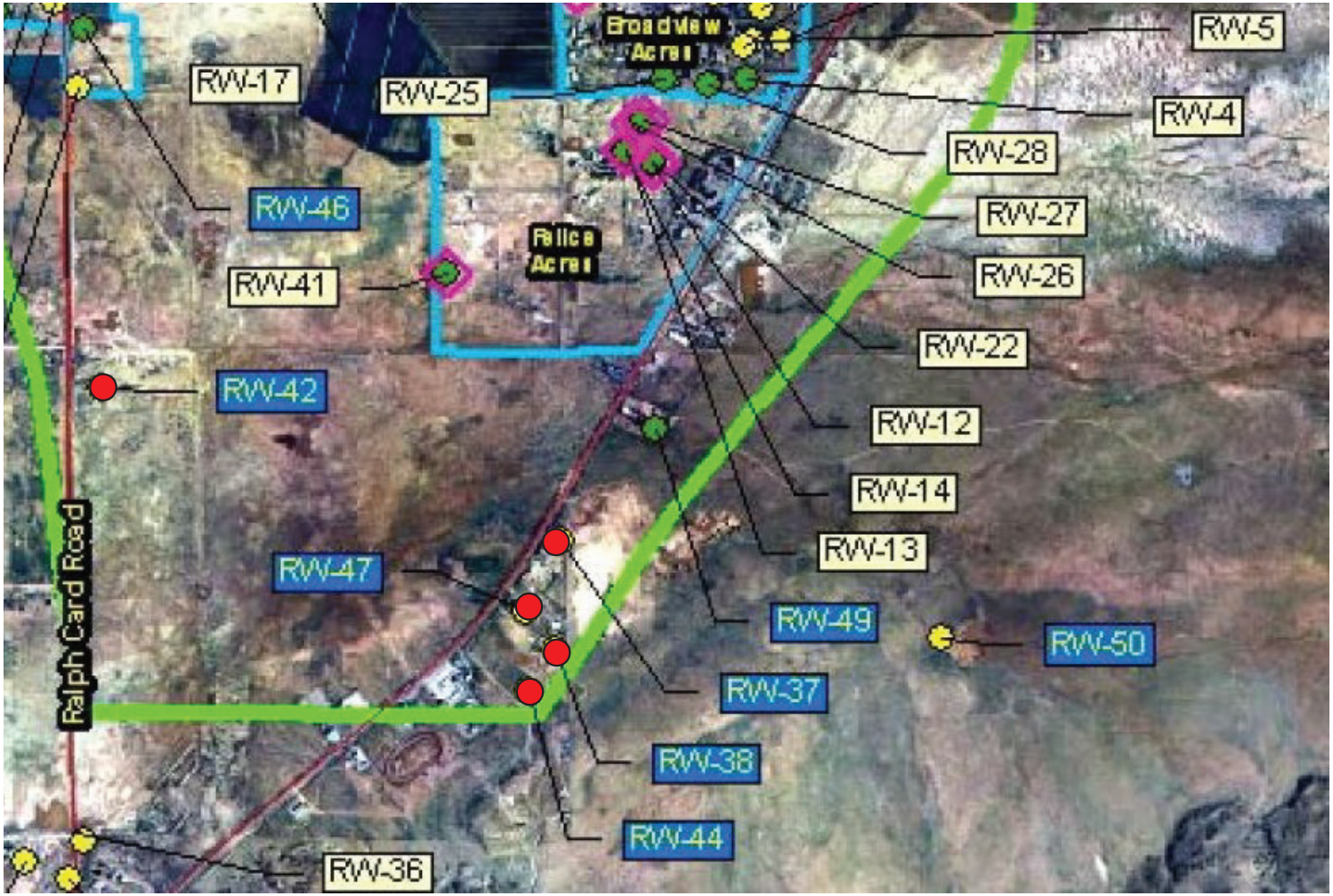
LOWER CHINLE - PRIVATE WELL DATA

(select wells southeast of Felice Acres)

Well	Uranium (ppb)	Selenium (ppb)	TDS (ppm)
RW-37 (963)	15	12	700
RW-38 (572)	11	8	598
RW-42 (954)	6	2	934
RW-44 (574)	17	9	606
RW-47 (964)	16	11	658

Data from NMED Summary Report on 2005-2007 Residential Sampling

PRIVATE WELL LOCATIONS

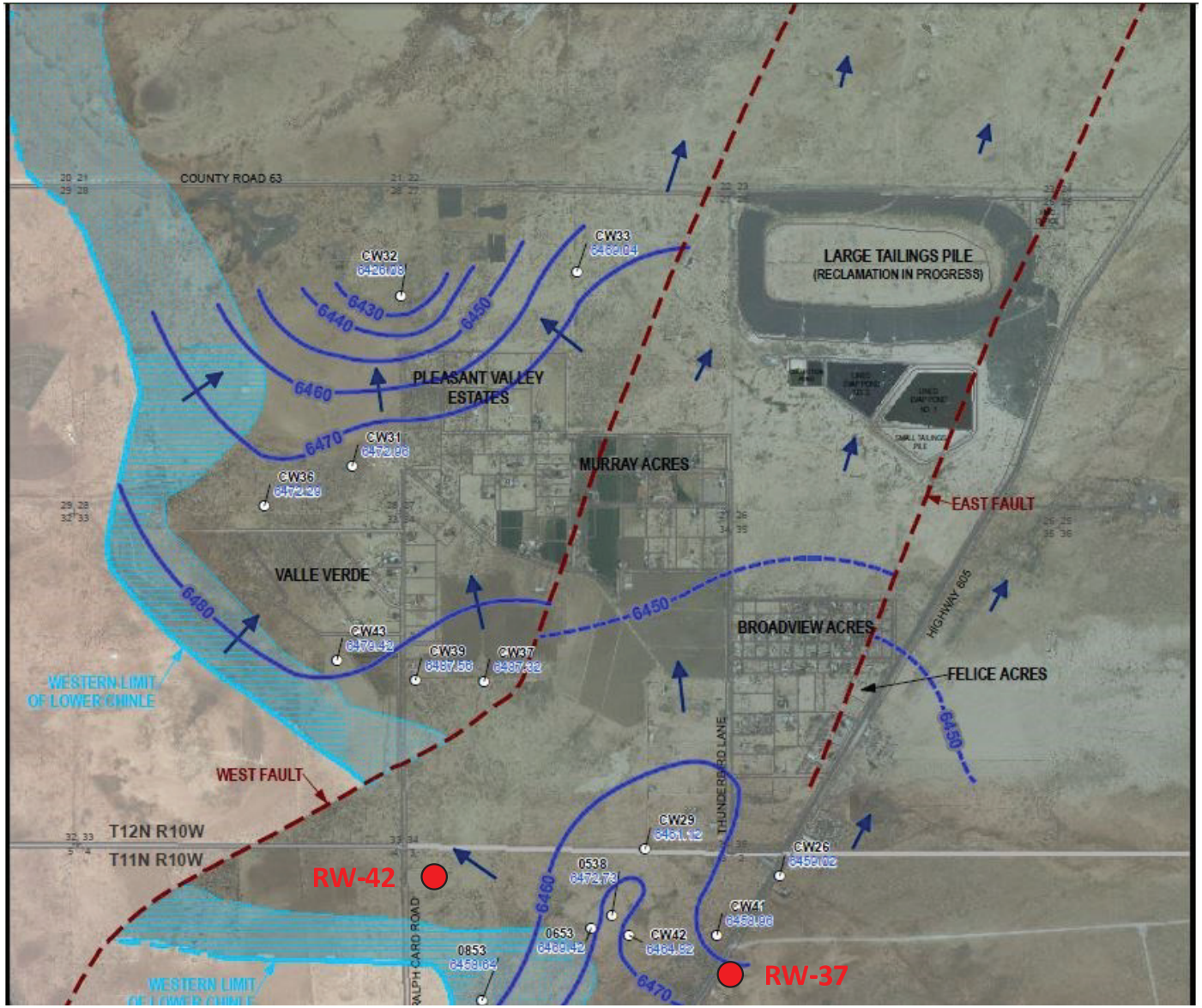


Map from NMED Summary Report on 2005-2007 Residential Sampling

GROUND WATER FLOW MAP

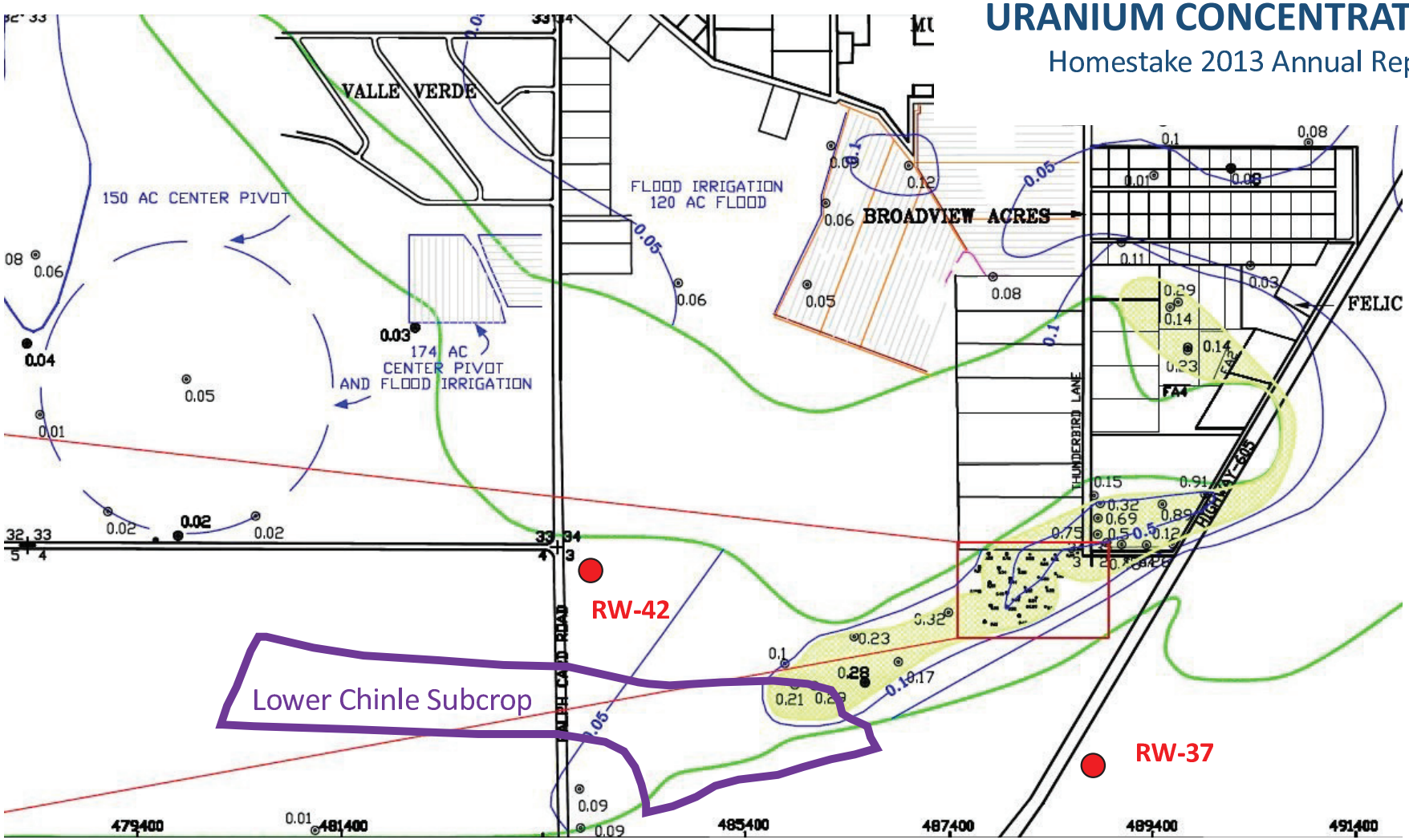
Lower Chinle

Homestake CAP



URANIUM CONCENTRATION MAP

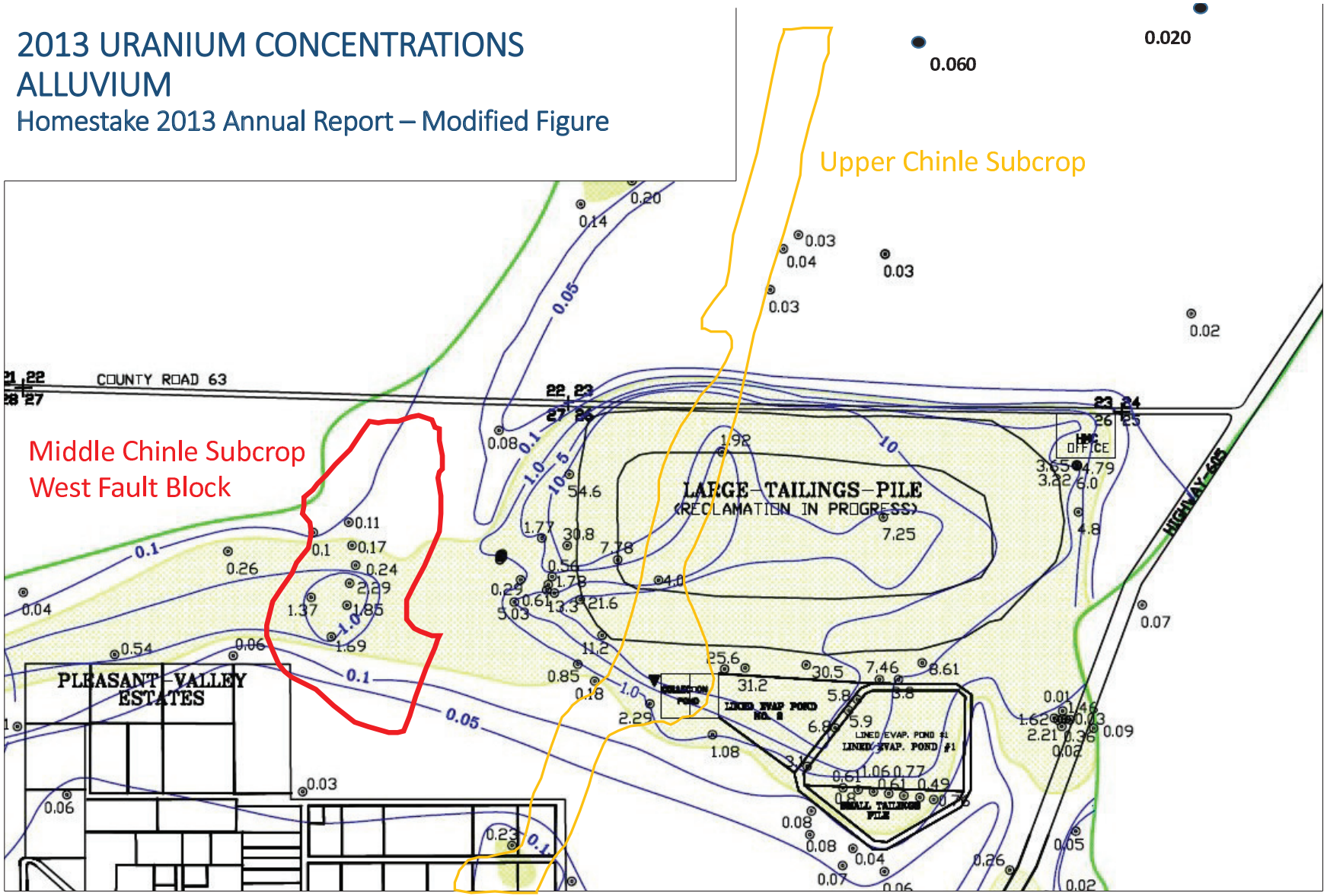
Homestake 2013 Annual Report



EXTRA SLIDES

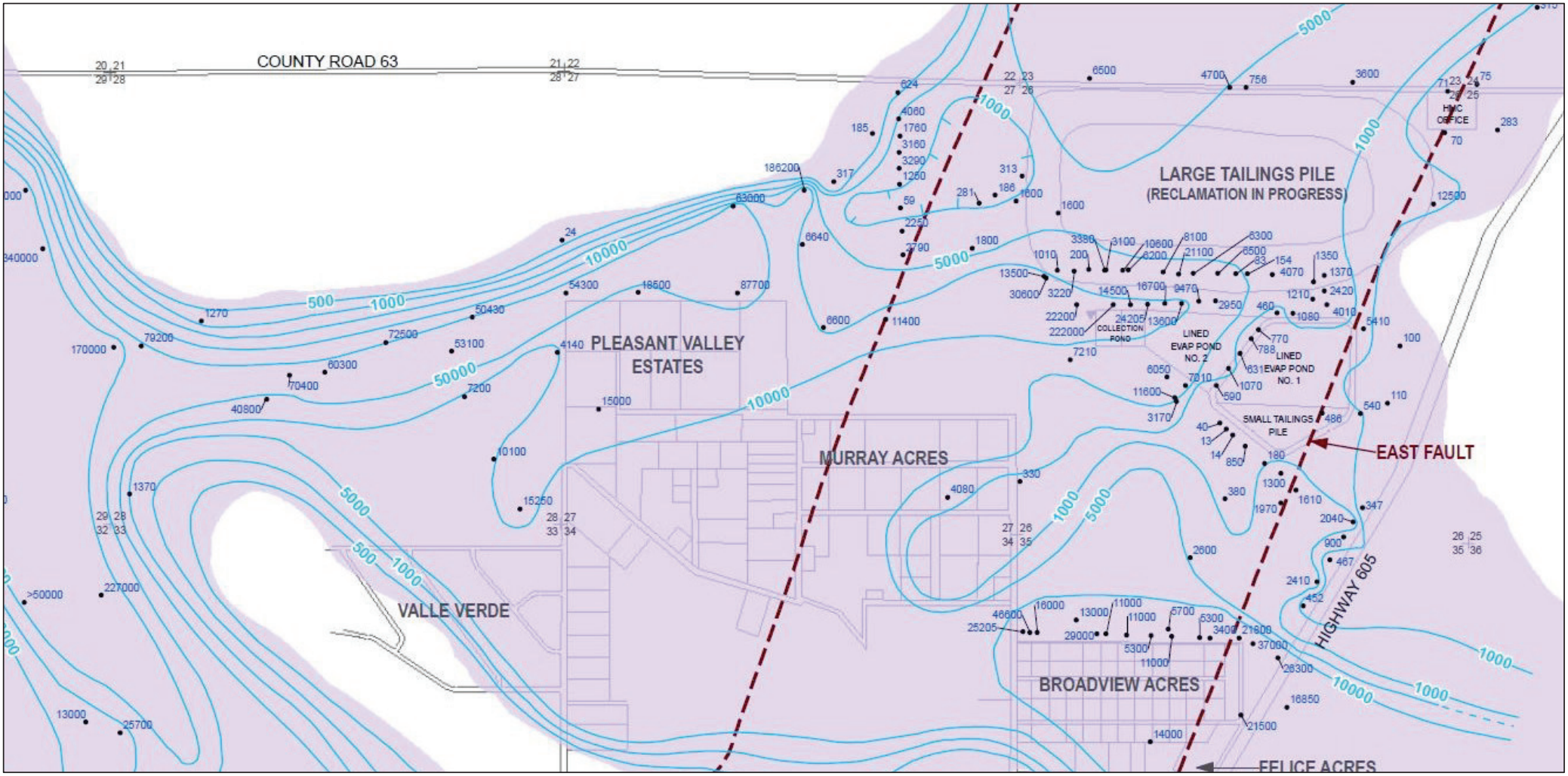
2013 URANIUM CONCENTRATIONS ALLUVIUM

Homestake 2013 Annual Report – Modified Figure



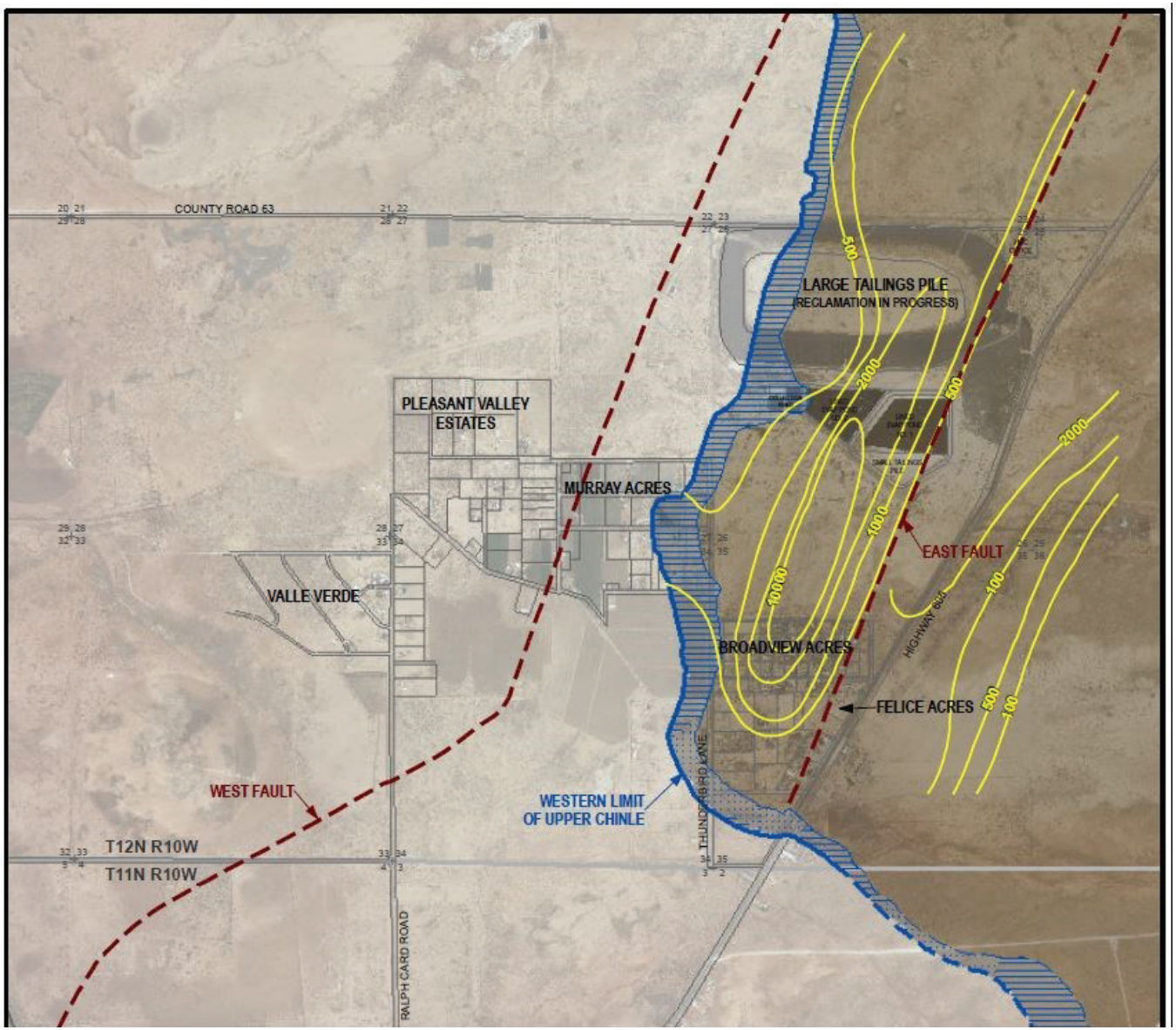
TRANSMISSIVITY – ALLUVIAL AQUIFER

Homestake CAP



TRANSMISSIVITY
Upper Chinle

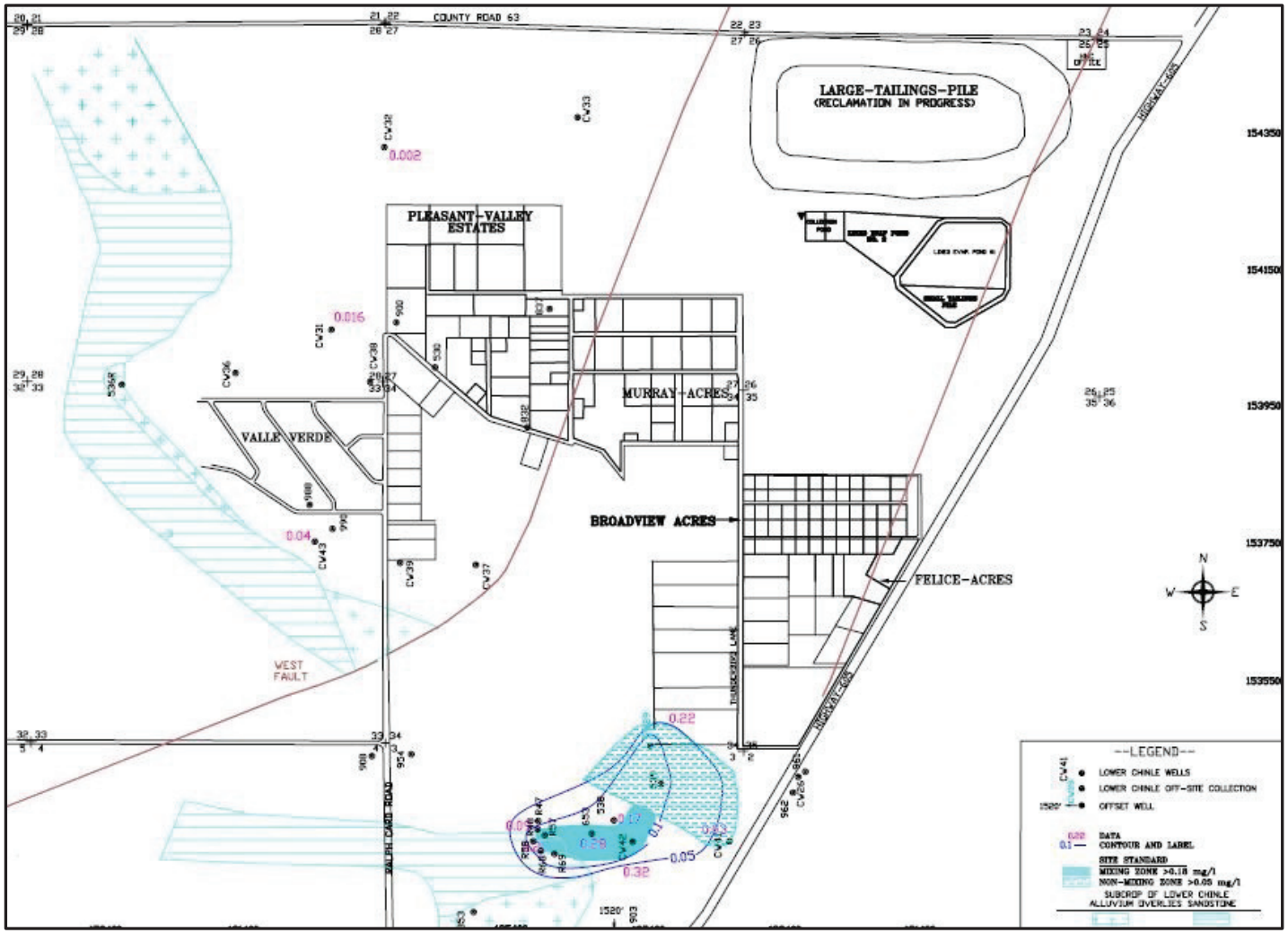
Homestake CAP



URANIUM CONCENTRATION MAP

Lower Chinle

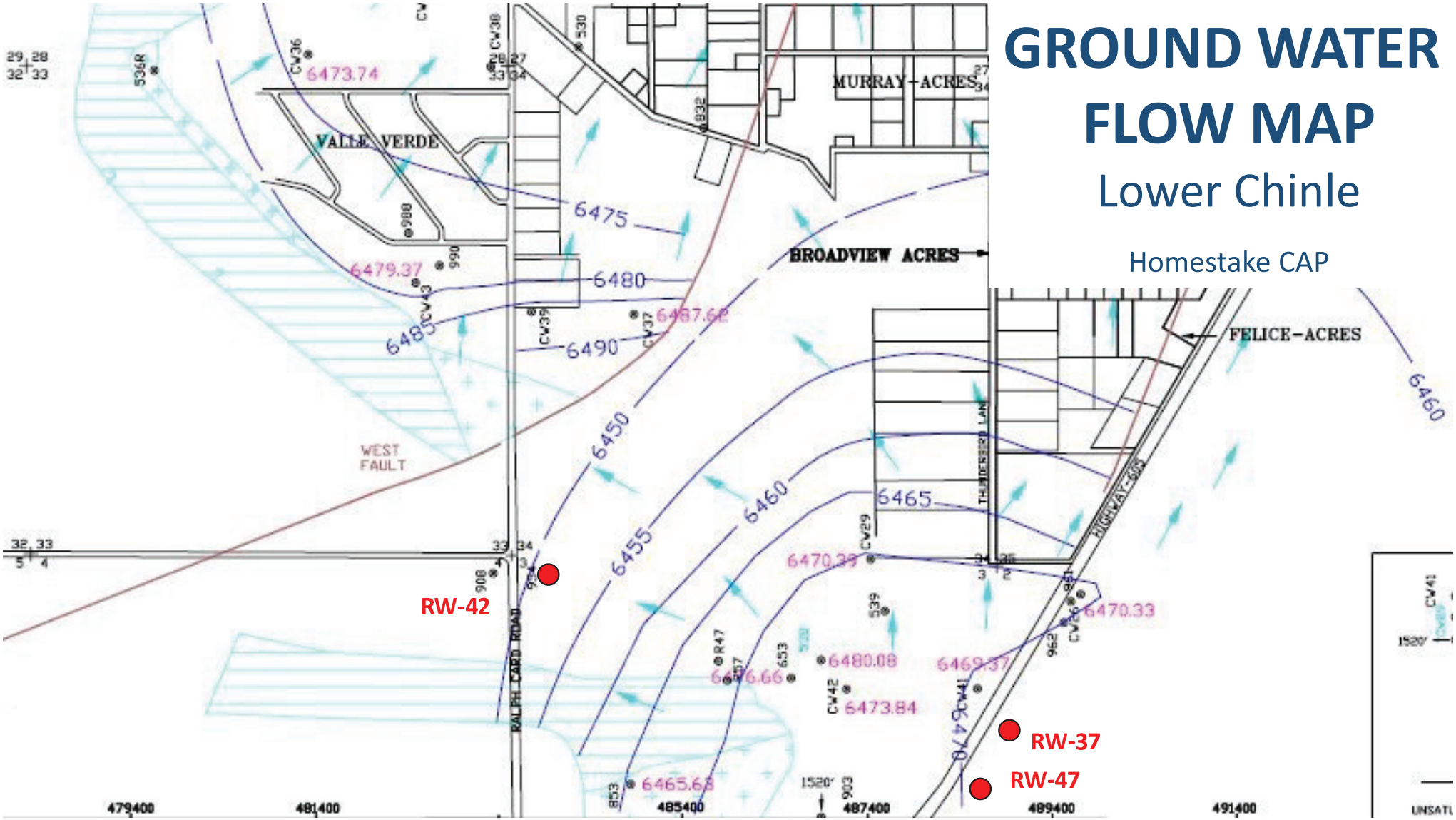
Homestake 2013 Annual Report



GROUND WATER FLOW MAP

Lower Chinle

Homestake CAP

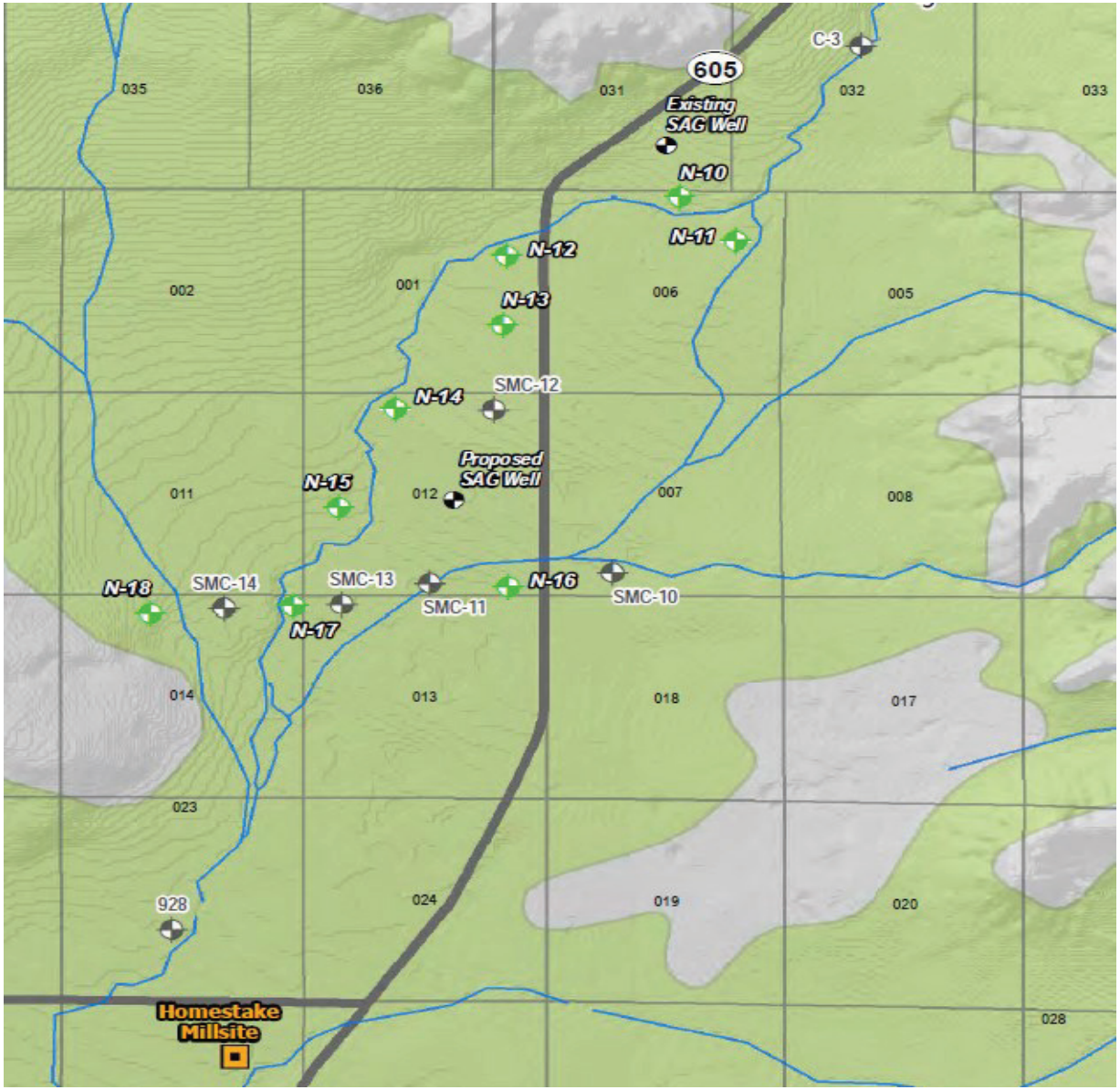


MOLYCORP QUESTA MINE
2010 EPA RECORD OF DECISION

Final cleanup levels for human health COCs in Mine Site Area ground water are depicted on Table 12-12. The cleanup levels include federal and New Mexico drinking water standards (MCLs), New Mexico water quality standards, EPA health-based criteria, and background levels. Background levels were estimated as part of the USGS Baseline

[84] In the area of Spring 13, if the contamination in alluvial ground water is not mining related, but rather from natural sources, ground water cleanup levels will not be attained.

Investigation for colluvial and bedrock ground water (*i.e.,* pre-mining baseline water quality) and as part of the RI for the alluvial aquifer. These background levels are cleanup levels for some COCs. For the alluvial aquifer, the background levels are the cleanup levels only for the northern portion of the aquifer along the mine site. The cleanup levels for the middle and southern portion of the alluvial aquifer are the federal and New Mexico standards and EPA health-based criteria. EPA policy is generally to clean up to background levels, if such levels exceed standards or health-based criteria.[72] Under New Mexico Water Quality Act regulations, the numeric standard for a specific constituent does not have to be achieved if that constituent is present in natural background concentrations above the numeric standard [§ 20.6.2.4101B NMAC]. Depending on the background levels estimated by the USGS for individual drainages at the mine site, colluvial and bedrock ground water remediated to background levels in certain drainages may be unsuitable for drinking water as highly mineralized rock and natural scar formation has resulted in some background concentrations exceeding standards or health-based criteria.


605
C-3
Existing SAG Well
N-10
N-11
N-12
N-13
N-14
SMC-12
Proposed SAG Well
N-15
N-16
SMC-10
SMC-11
SMC-13
SMC-14
N-17
N-18
928
Homestake Millsite
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