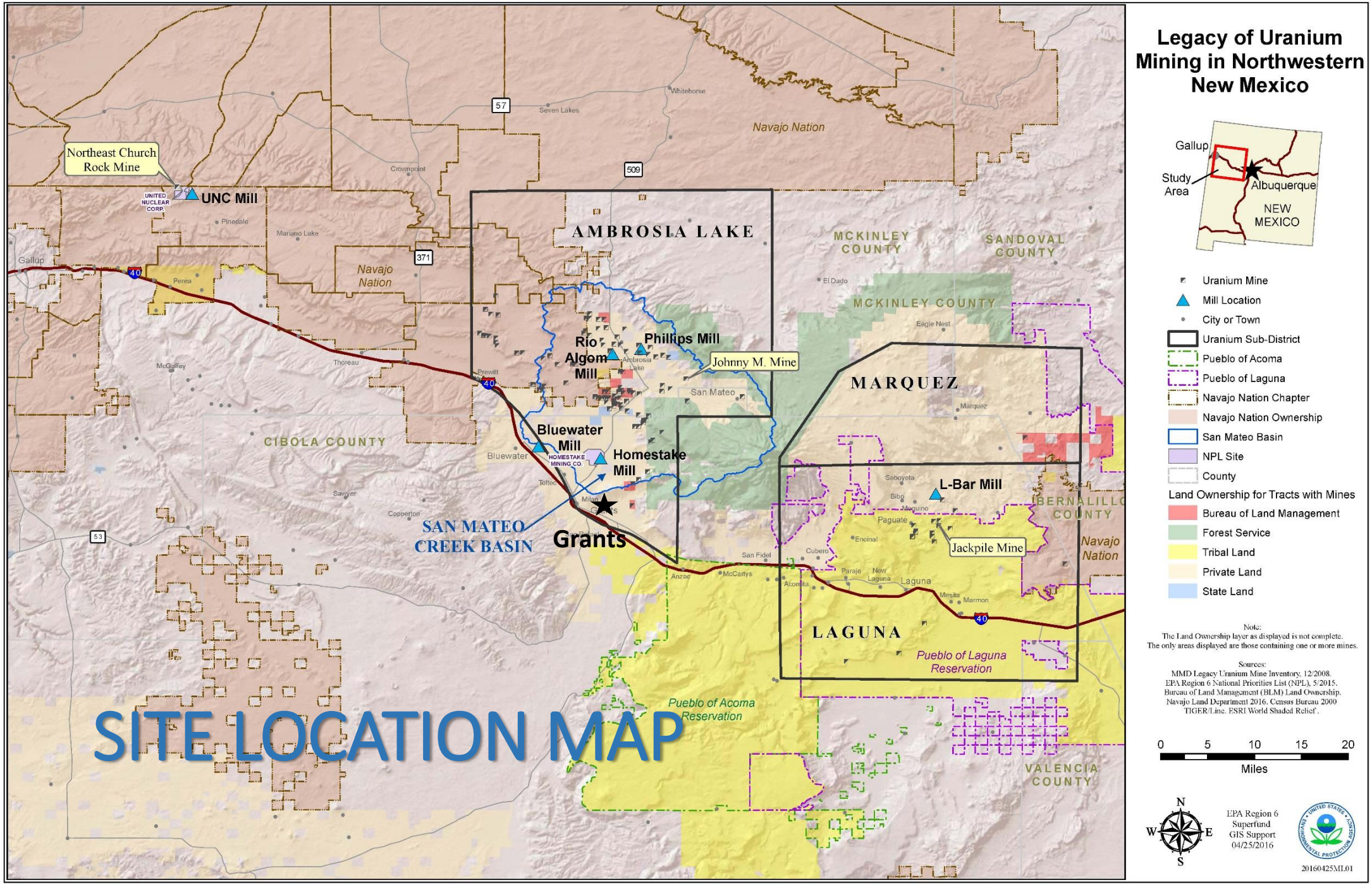
EPA GROUND WATER INVESTIGATION

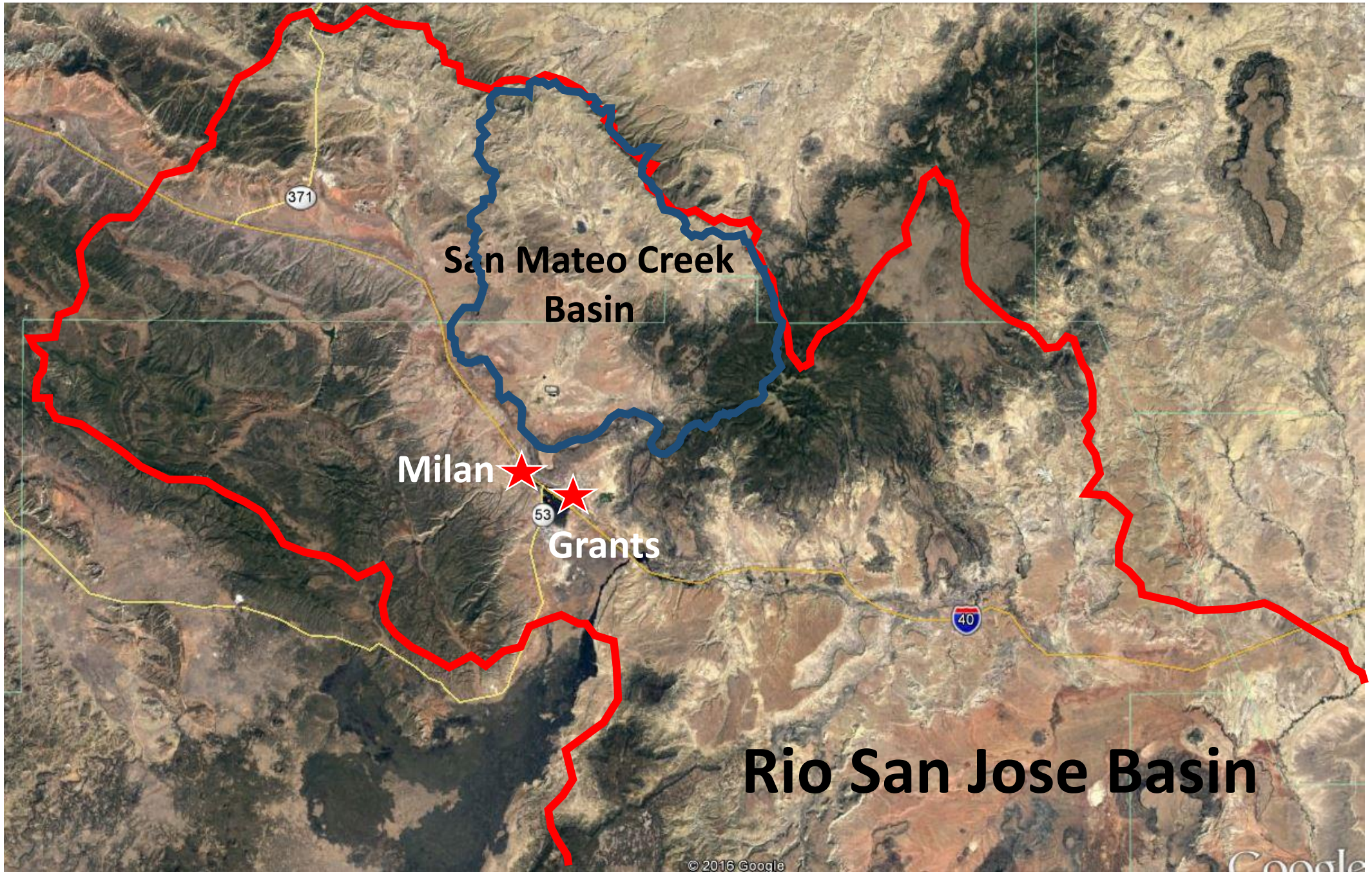
San Mateo Creek Basin Uranium Legacy Site

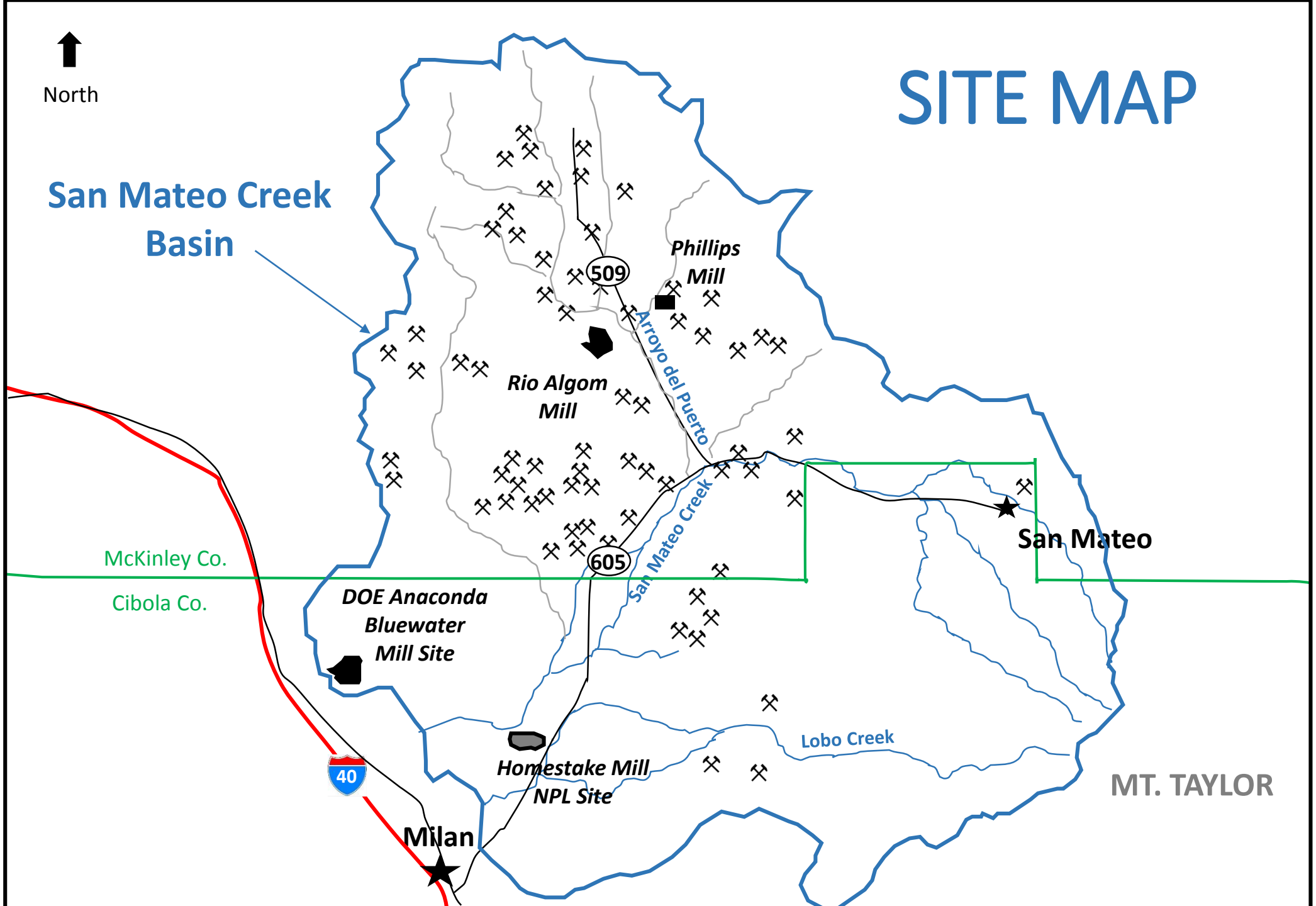
November 16, 2016

Presentation to BVDA/MASE

9881387


Legacy of Uranium Mining in Northwestern New Mexico
Gallup
Study Area
Albuquerque
NEW MEXICO
Uranium Mine
Mill Location
City or Town
Uranium Sub-District
Pueblo of Acoma
Pueblo of Laguna
Navajo Nation Chapter
Navajo Nation Ownership
San Mateo Basin
NPL Site
County
Land Ownership for Tracts with Mines
Bureau of Land Management
Forest Service
Tribal Land
Private Land
State Land
Note:
The Land Ownership layer as displayed is not complete.
The only areas displayed are those containing one or more mines.
Sources:
MMD Legacy Uranium Mine Inventory. 12/2008.
EPA Region 6 National Priorities List (NPL), 5/2015.
Bureau of Land Management (BLM) Land Ownership.
Navajo Land Department 2016. Census Bureau 2000
TIGER/Line. ESRI World Shaded Relief.
0 5 10 15 20
Miles
N
W
E
S
EPA Region 6
Superfund
GIS Support
04/25/2016
20160425ML01
Northeast Church Rock Mine
UNITED NUCLEAR CORP.
UNC Mill
AMBROSIA LAKE
MCKINLEY COUNTY
SANDOVAL COUNTY
Navajo Nation
Rio Algom Mill
Phillips Mill
Johnny M. Mine
MARQUEZ
Bluewater Mill
HOMESTAKE MINING CO.
Homestake Mill
CIBOLA COUNTY
SAN MATEO CREEK BASIN
Grants
L-Bar Mill
Jackpile Mine
BERNALILLO COUNTY
LAGUNA
Pueblo of Laguna Reservation
Pueblo of Acoma Reservation
VALENCIA COUNTY
SITE LOCATION MAP


San Mateo Creek
Basin
Milan
Grants
371
53
40
Rio San Jose Basin
© 2016 Google

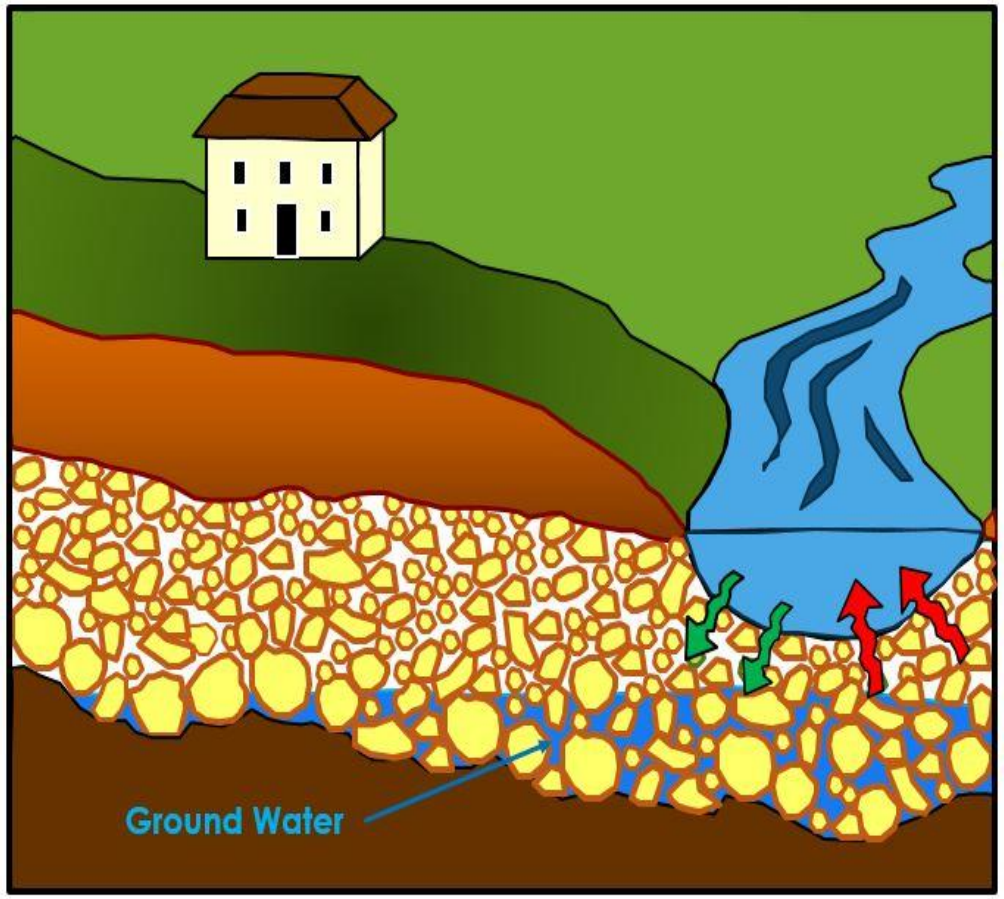

SITE MAP
North
San Mateo Creek Basin
Phillips Mill
509
Arroyo del Puerto
Rio Algom Mill
San Mateo Creek
605
San Mateo
McKinley Co.
Cibola Co.
DOE Anaconda Bluewater Mill Site
Lobo Creek
Homestake Mill NPL Site
40
Milan
MT. TAYLOR

PROJECT OBJECTIVE

Characterize ground water quality and impact by legacy uranium mining and milling activities

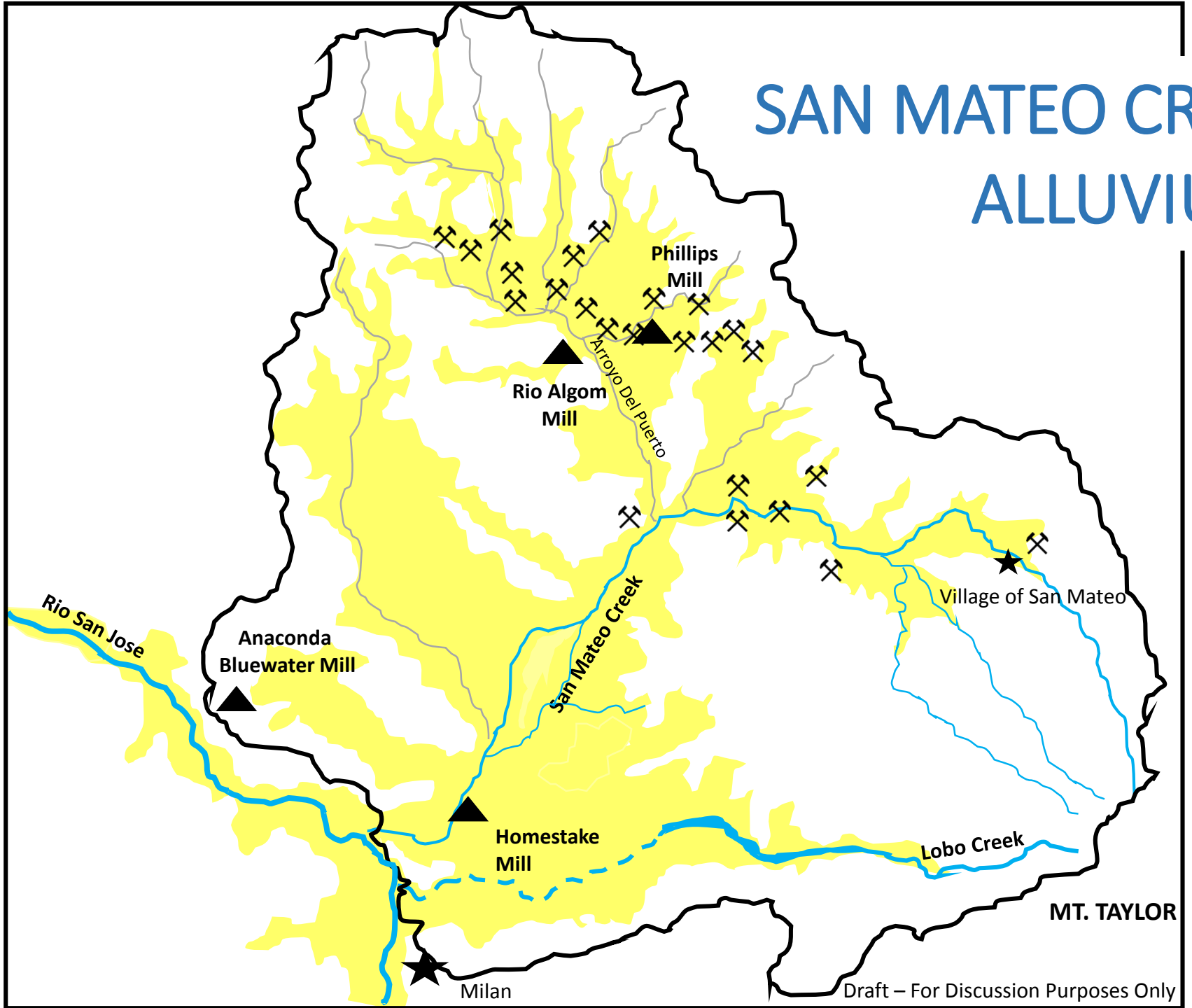
WHERE IS THE GROUND WATER?

- Alluvial Ground Water
  - Shallow ground water
  - At depths reaching about **120 feet** below ground surface
  - In sediments at base of drainage channels (arroyos, creeks)
- Bedrock Ground Water
  - Deeper ground water
  - Hundreds of feet below ground surface
  - In rock formations



Modified from City of Las Cruces Poster Display

SAN MATEO CREEK BASIN ALLUVIUM



Alluvium

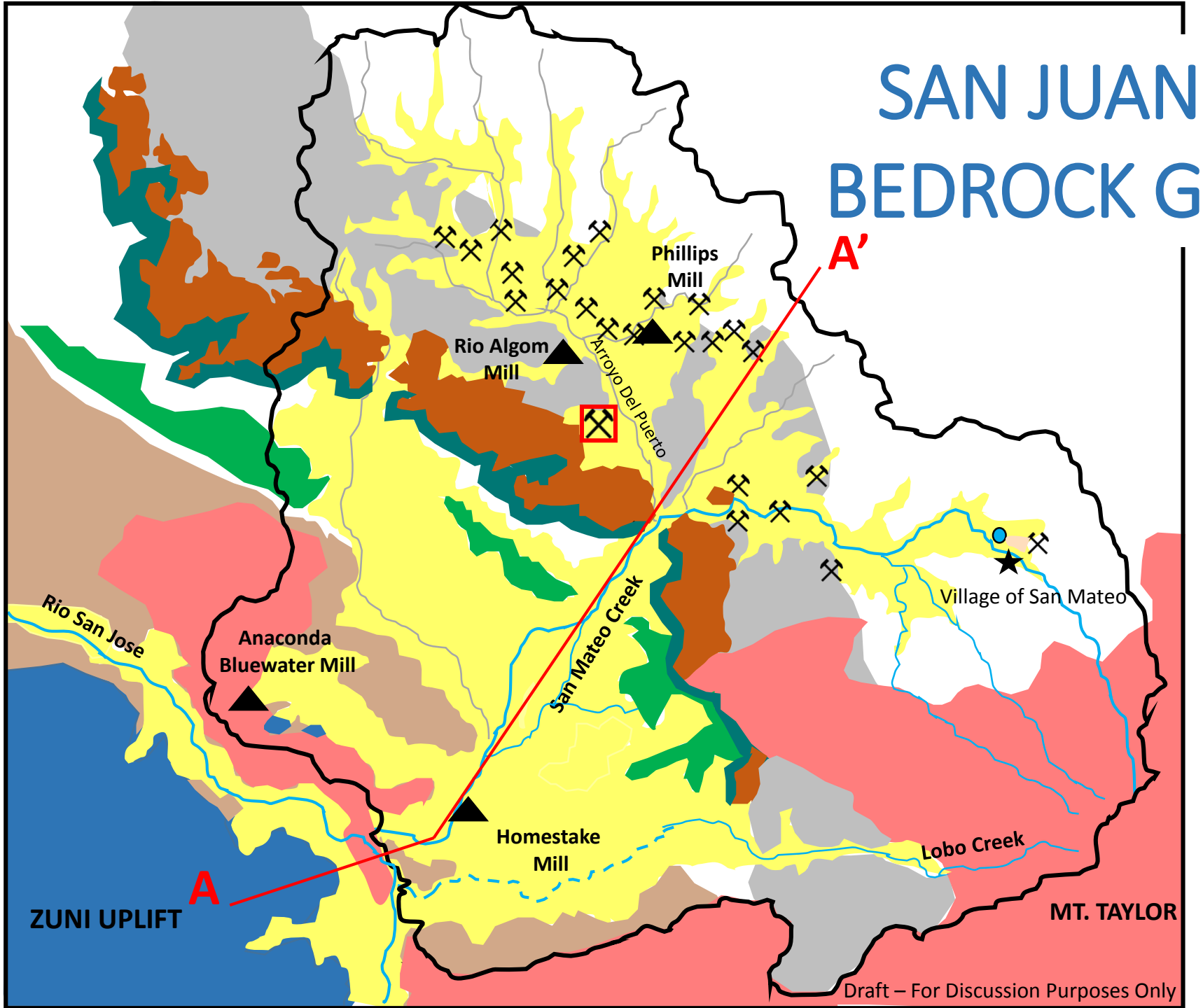
Wet Mine

ALLUVIUM:

Sediments Deposited in Basin from Erosional Processes;

Comprised of Sand, Silt, Clay and Gravel

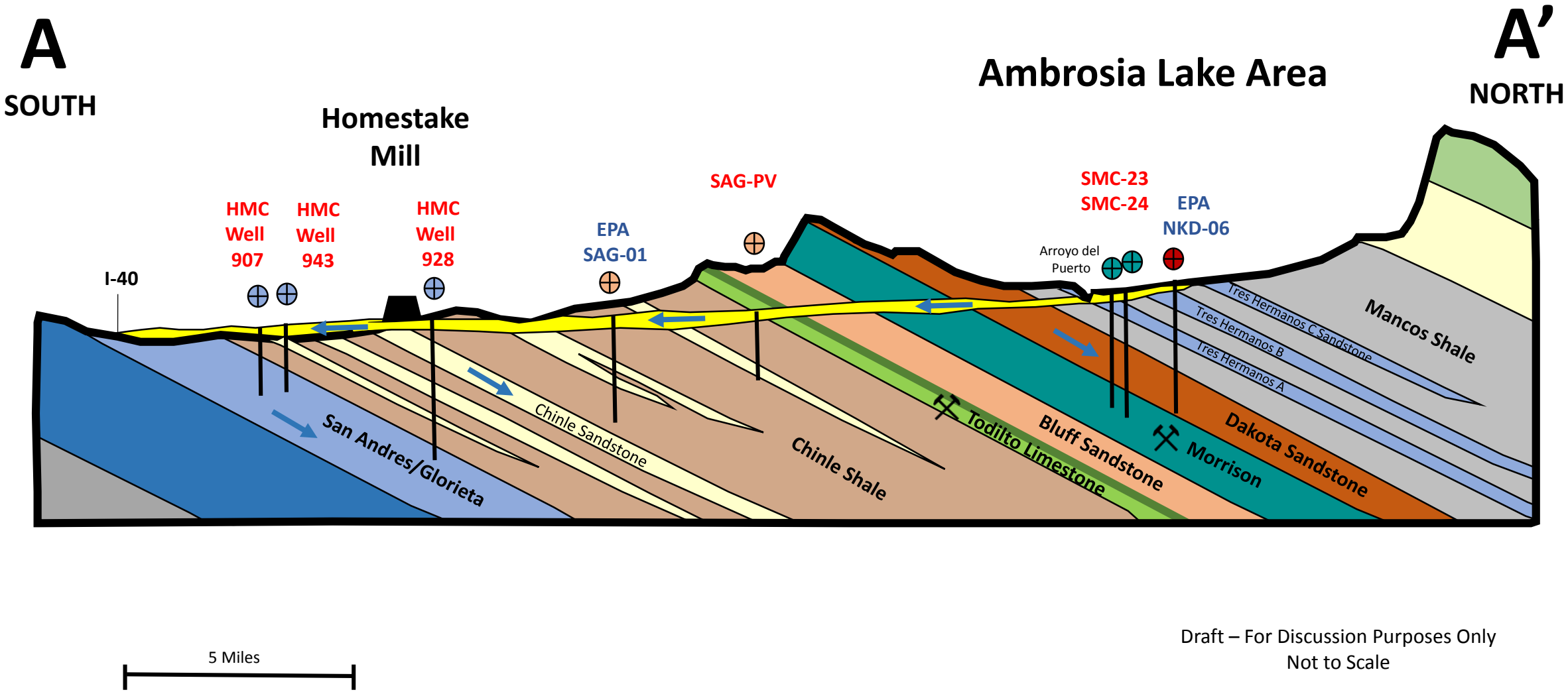
SAN JUAN BASIN BEDROCK GEOLOGY



- Alluvium
- Mancos Shale
- Dakota Sandstone
- Morrison Fm
- Todilto Limestone
- Chinle Shale and Sandstone
- San Andres/Glorietta Limestone
- Volcanic
- Former Uranium Mill
- Wet Mine
- Spencer Mine

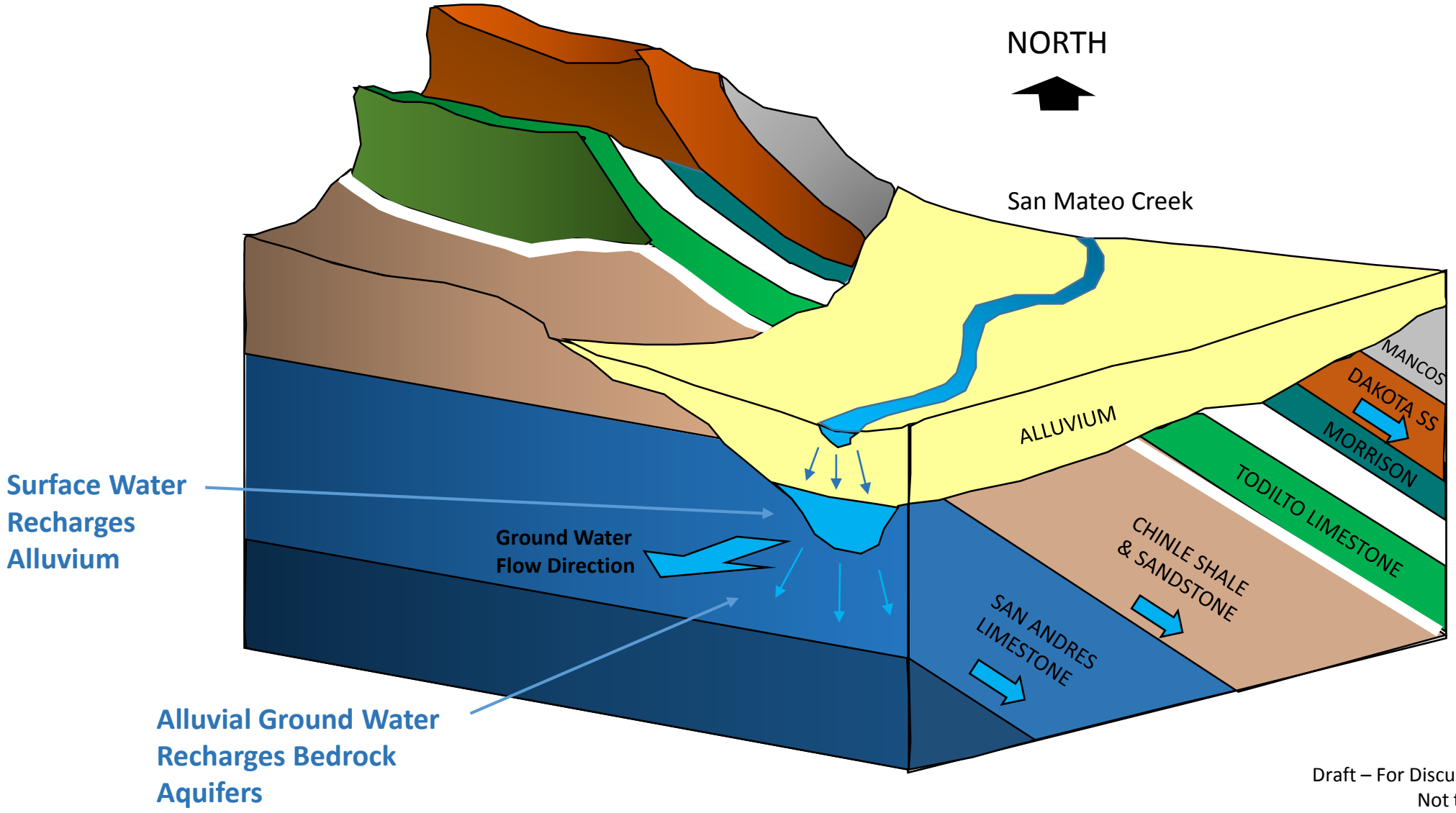
CONCEPTUAL SITE GROUND WATER MODEL

Generalized Cross Section Through San Mateo Creek Basin



Draft – For Discussion Purposes Only
Not to Scale

CONCEPTUAL SITE GROUND WATER MODEL



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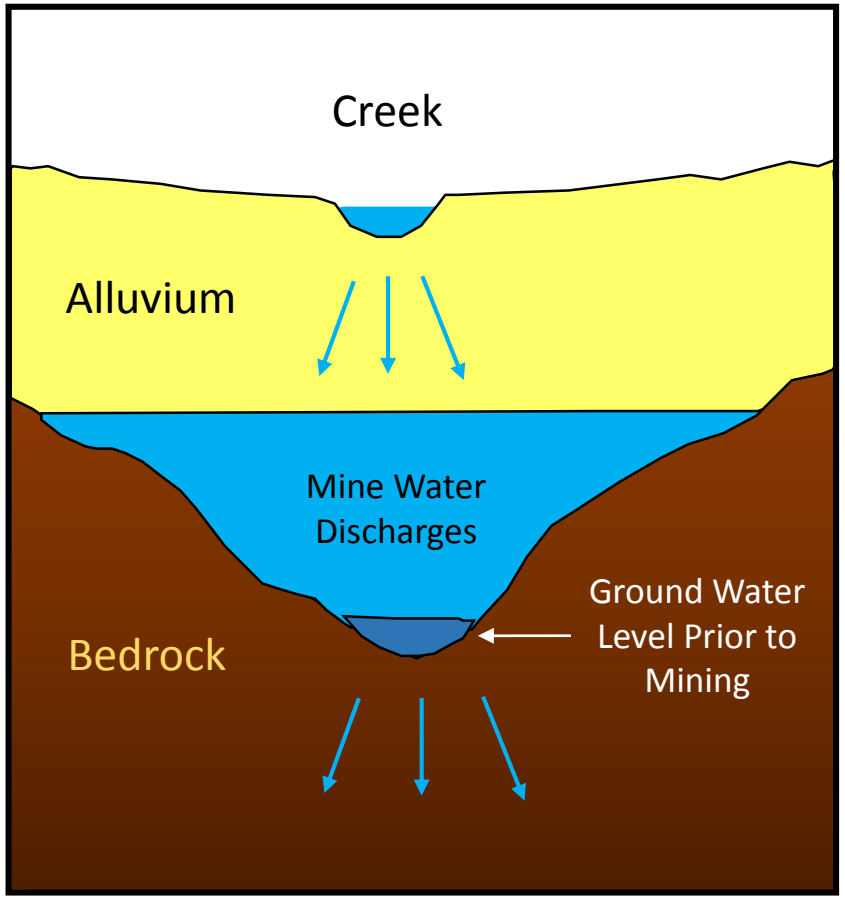
Not to Scale

HOW DID MINING OPERATIONS AFFECT GROUND WATER?

- ***Discharged billions of gallons*** of mine water to creeks and arroyos
- ***Water infiltrated*** into ground
- ***Increased amount of ground water*** in alluvial sediments and bedrock
- ***Changed quality*** of ground water



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MINE WATER DISCHARGE

Artificially Created Flows in Creeks and Arroyos

Wet Mine

Draft – For Discussion Purposes Only

MULTI-PHASED INVESTIGATION

Phase 1

Shallow Alluvial Aquifer
2012 – 2016
(Completed)

Phase 2

Bedrock & Alluvial Aquifers
2015 – 2017

Phase 3

Develop Conceptual Site Ground Water Model
2017 - 2018

Wet Alluvial Sediments

Bedrock Sandstone

Drill Bit and Piping

PHASE 1 ACTIVITIES COMPLETED

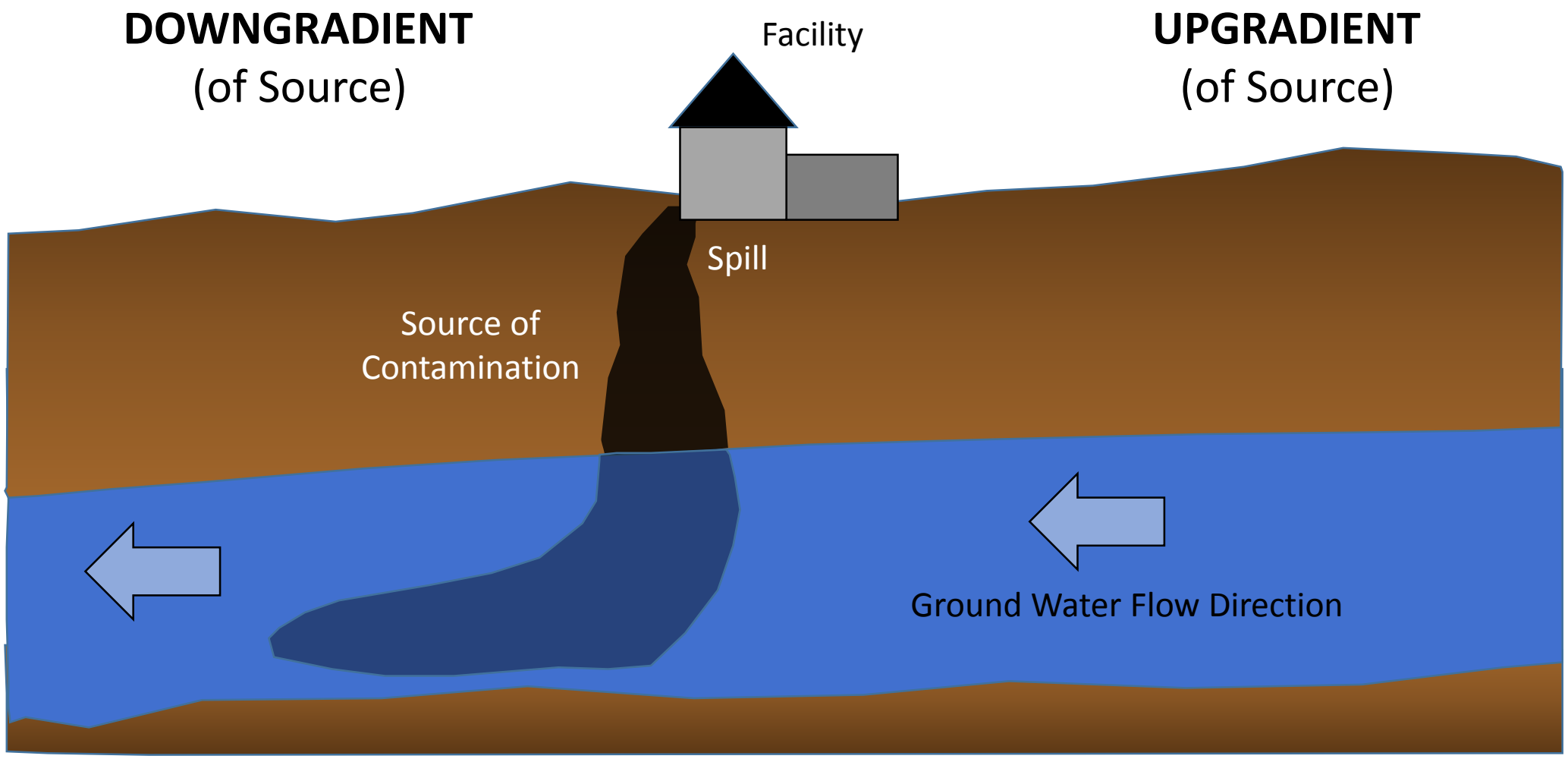
- 30 Boreholes Drilled
  - 6 monitoring wells installed where water encountered
  - 24 boreholes dry
- 15 Existing Wells Sampled
  - 10 private wells
  - 5 industry monitoring wells
  - Includes both alluvial and bedrock wells

Core Sample

PHASE 1 RESULTS SUMMARY

- Attempt to Characterize Alluvial Water Quality had **Mixed Results**
  - Lack of Natural Saturation in Many Areas Investigated
- Alluvial **Water Quality Varies** Across Basin
  - Good quality upgradient of mines and mills
  - Poor quality downgradient of mines and mills
- Mine Discharge Water **Increased Saturation** in Alluvium
- Mine Discharge Water **Draining Out** of Alluvium Today

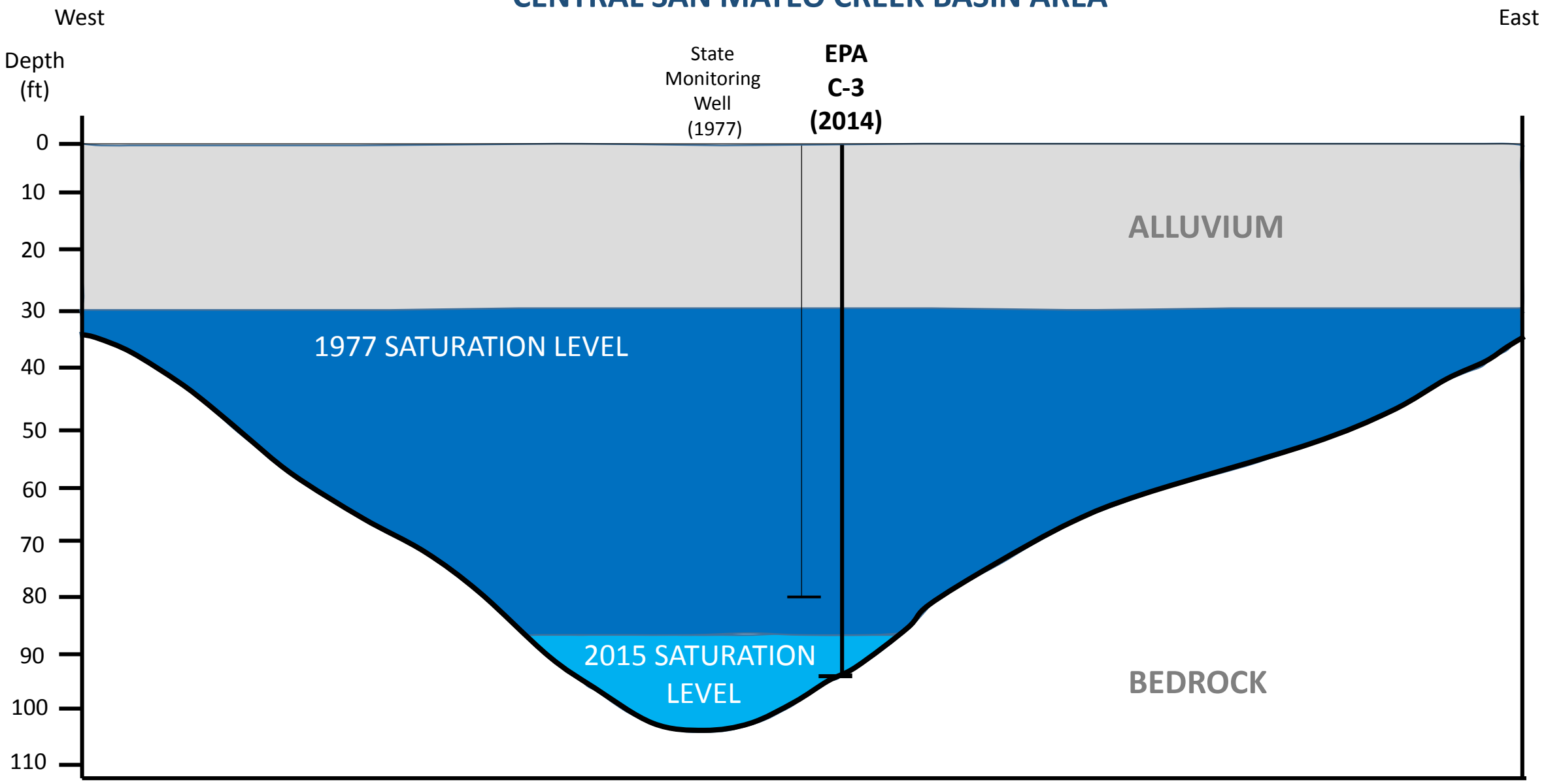
UPGRADIENT VS DOWNGRADIENT



Illustration

CROSS SECTION A-A'

CENTRAL SAN MATEO CREEK BASIN AREA



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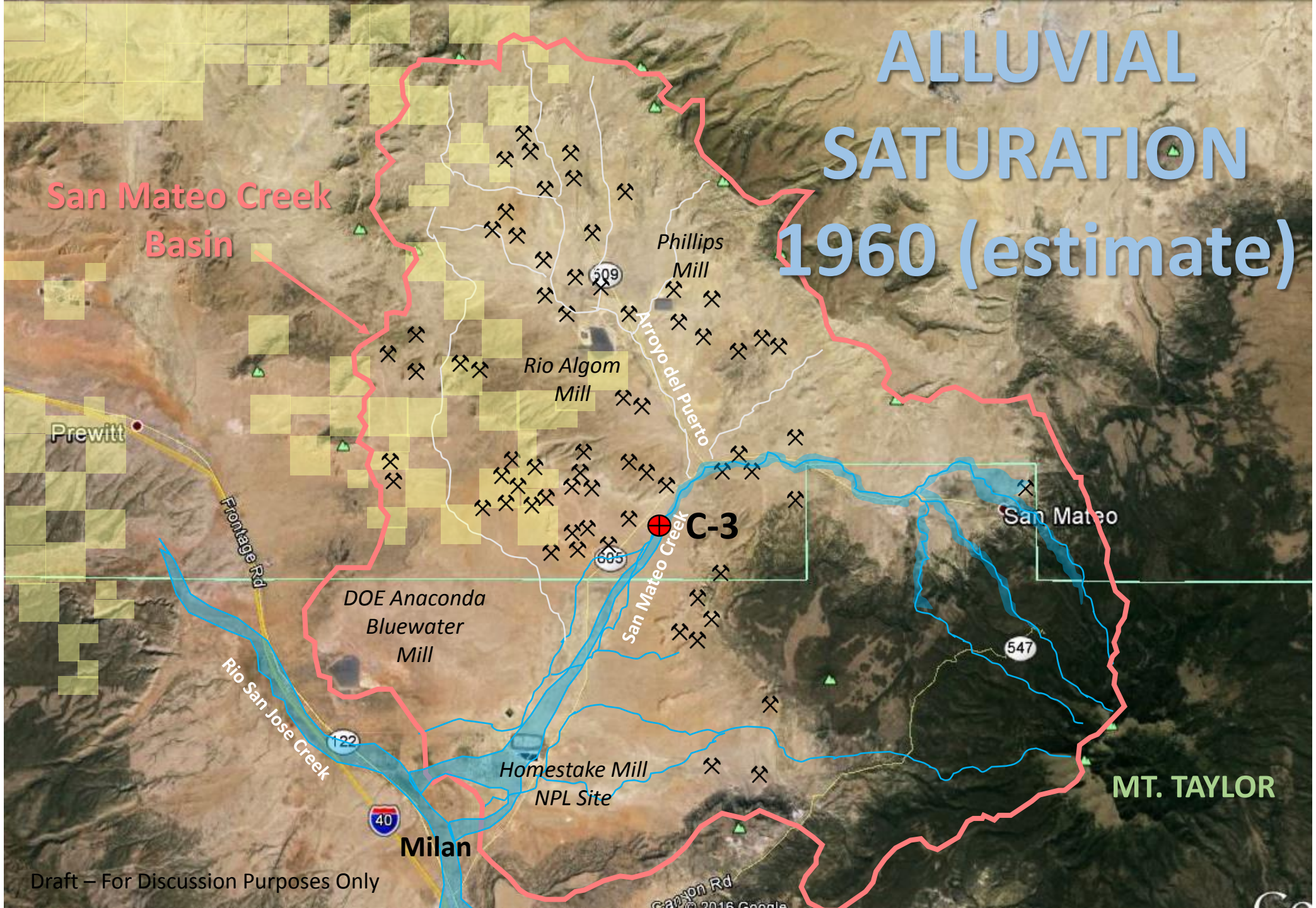
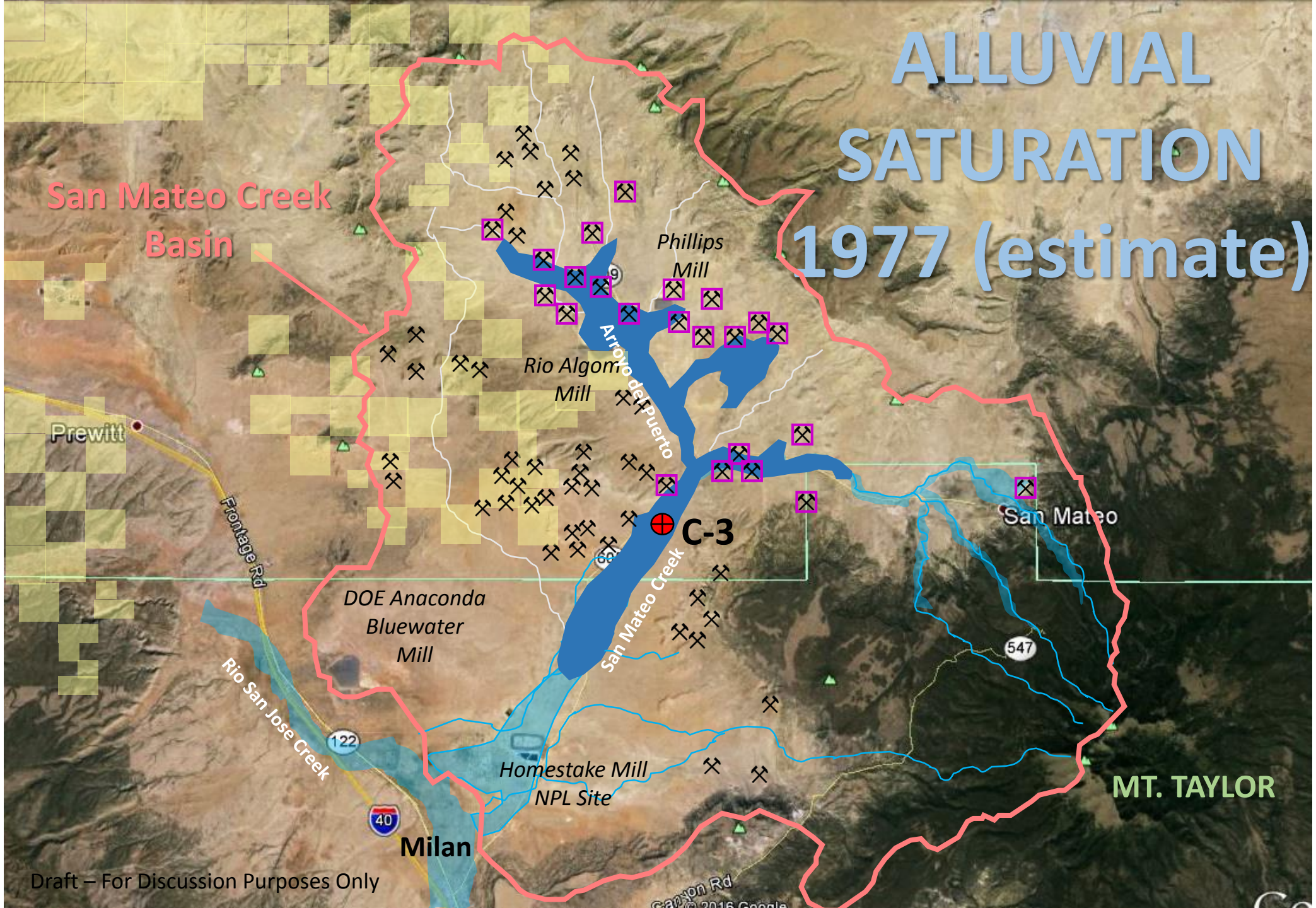
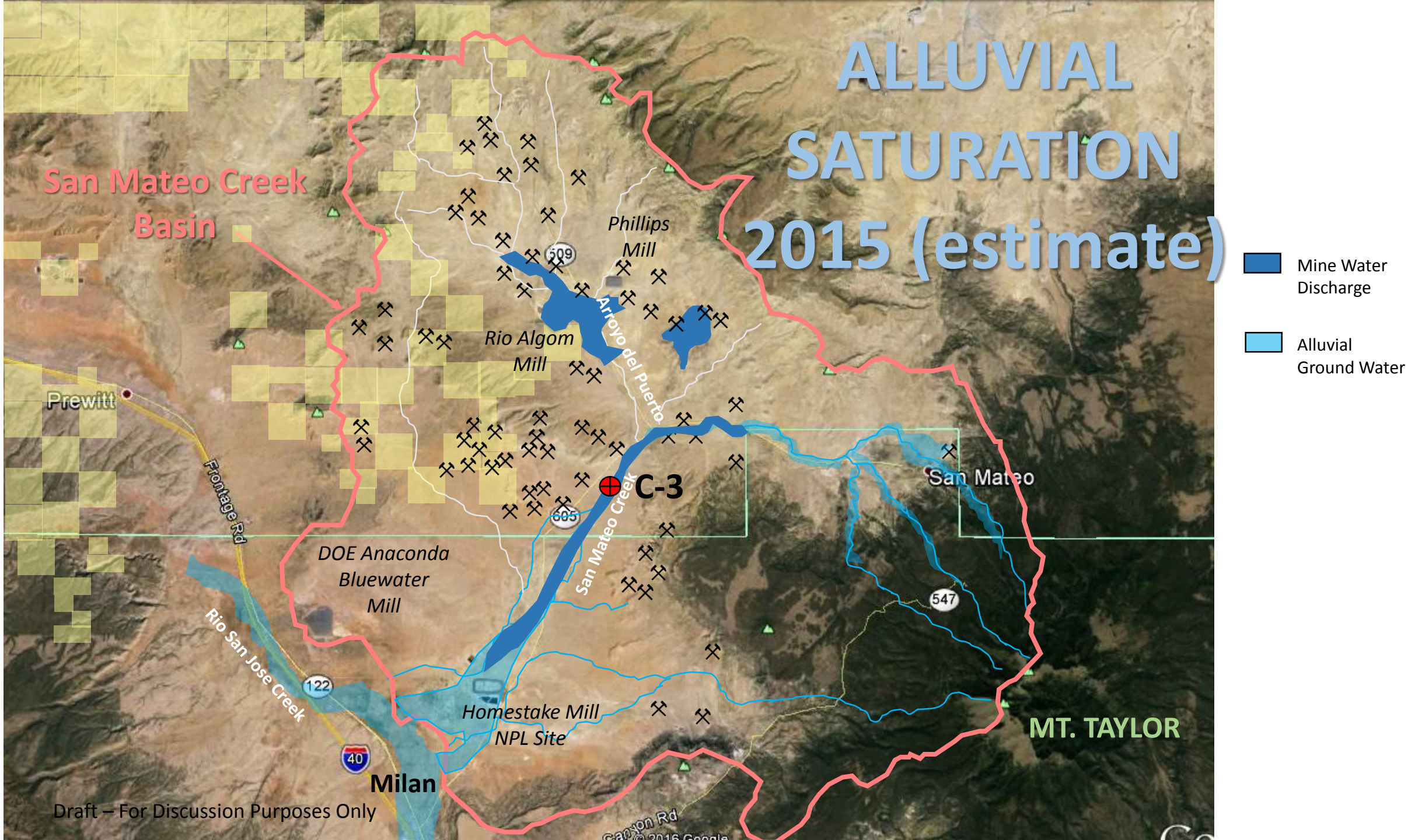

ALLUVIAL SATURATION 1960 (estimate)
San Mateo Creek Basin
Phillips Mill
Rio Algom Mill
Arroyo del Puerto
Prewitt
Frontage Rd
C-3
San Mateo Creek
San Mateo
DOE Anaconda Bluewater Mill
Rio San Jose Creek
Homestake Mill NPL Site
MT. TAYLOR
Milan
Draft – For Discussion Purposes Only
Alluvial Ground Water



Draft – For Discussion Purposes Only



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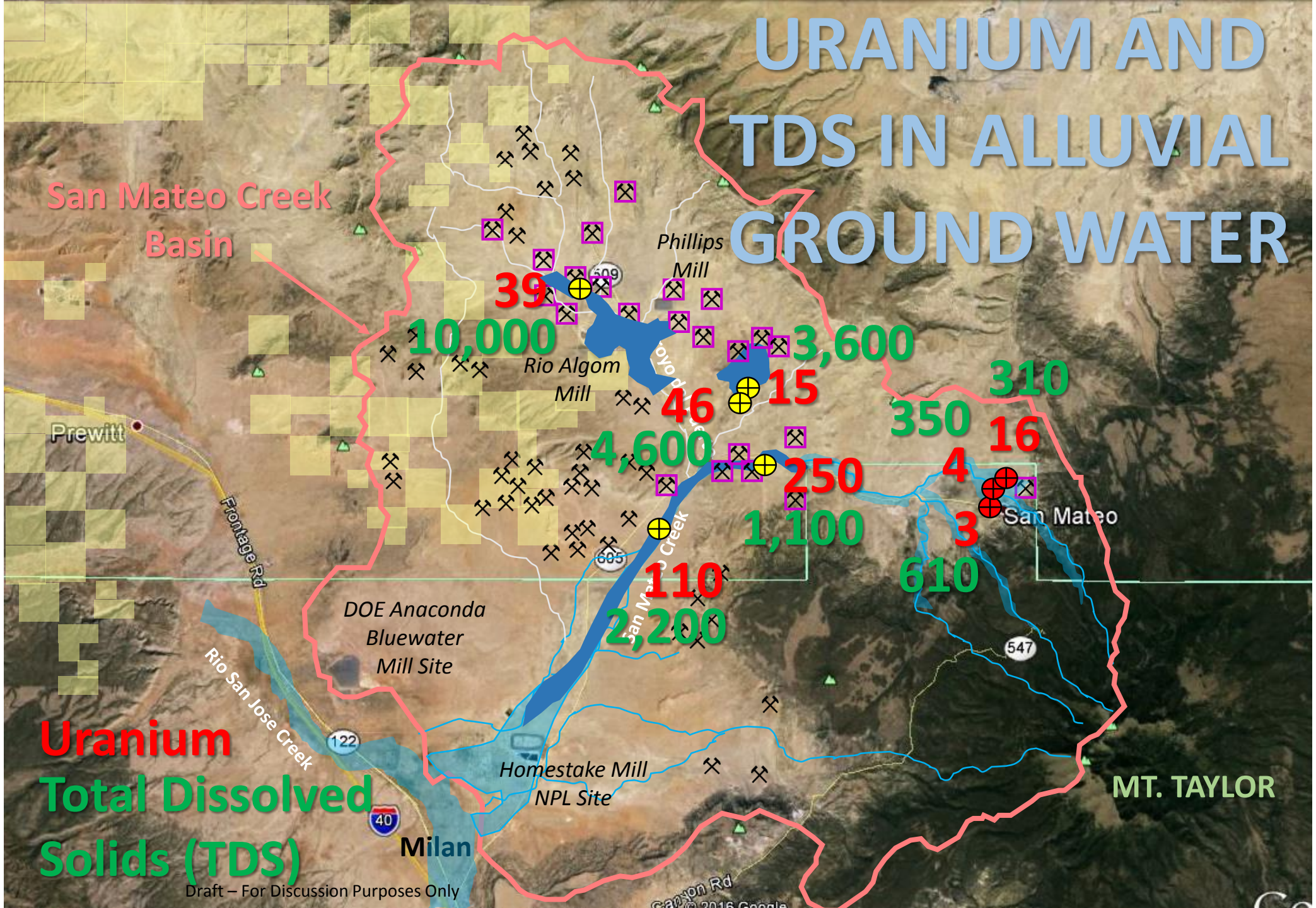
URANIUM AND TDS IN ALLUVIAL GROUND WATER



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EPA Background Well

Well Downgradient to Legacy Mines

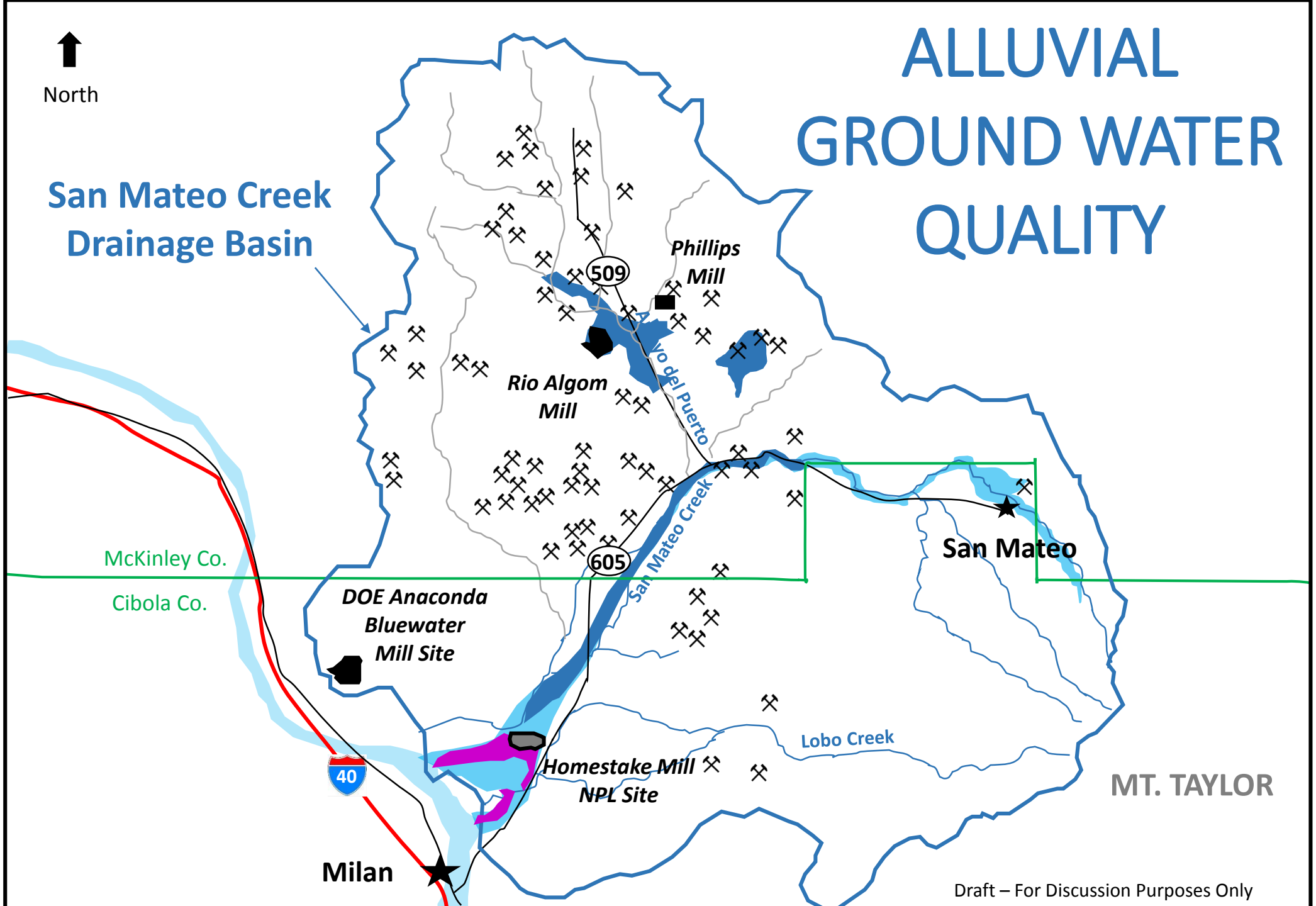
16 Uranium (ppb)

610 Total Dissolved Solids (ppm)

Alluvial Water

Mine Water Discharge

Wet Mine


ALLUVIAL GROUND WATER QUALITY
North
San Mateo Creek Drainage Basin
Phillips Mill
509
Rio Algom Mill
Arroyo del Puerto
San Mateo Creek
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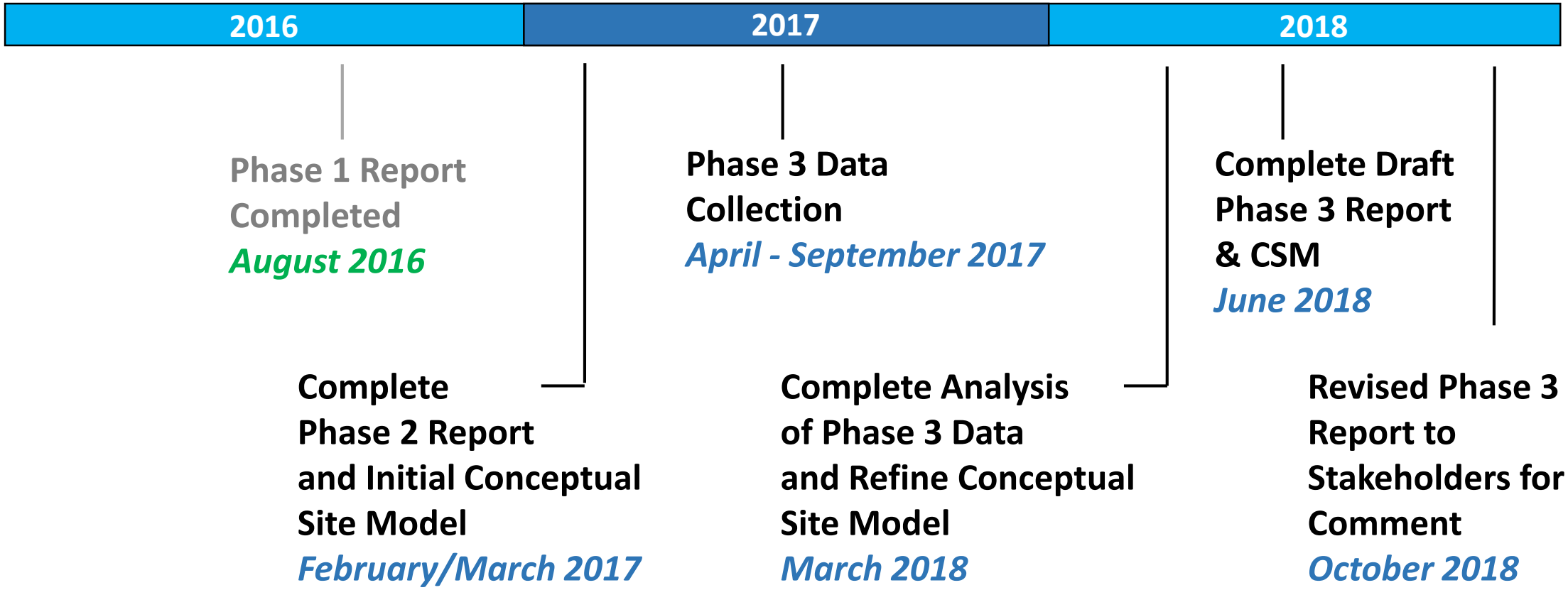
San Mateo
McKinley Co.
Cibola Co.
DOE Anaconda Bluewater Mill Site
Lobo Creek
Homestake Mill NPL Site
40
Milan
MT. TAYLOR
Alluvial Ground Water
Poor Alluvial Water Quality (Exceeds Standards)
Poor Alluvial Water Quality Contaminated by Homestake NPL site (Exceeds Standards)
Draft – For Discussion Purposes Only

PLANNED ACTIVITIES FOR GROUND WATER INVESTIGATION