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Tonto National Forest
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Process Memorandum to File

Post-DEIS Review of Updated Hydrological Data (2016–2019)

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Purpose of Process Memorandum

The purpose of this process memorandum is to summarize the additional data received after the publication of the *Draft Environmental Impact Statement: Resolution Copper Project and Land Exchange* ("the DEIS"). This memorandum will be based on the hydrological and hydrochemical data contained in the process memorandum titled *Summary of Hydrologic, Hydrochemical, and Geochemical Data Received to Date* and associated addendums.

The additional baseline hydrology and hydrochemical data received from Resolution Copper Mining, LLC (Resolution Copper) were grouped into four categories:

1. March 26, 2020 Submittal
    a. **Hydrochemistry.** Hydrochemistry data for groundwater (wells and piezometers), springs, and surface water for established monitoring stations were provided in formatted PDF tables and as attachments in Excel spreadsheets. Water quality results from well development were not included as they may not be representative of the aquifer groundwater quality.
    b. **Groundwater levels.** Water-level measurements recorded in wells and piezometers were provided in PDF plots and attached Excel spreadsheets.
    c. **Surface water flows**. Flow data from sondes and stream gages, including those operated by the United States Geological Survey (USGS), were provided in PDF plots and as attached Excel spreadsheets.
    d. **Surface water occurrence surveys** were provided in PDF plots and as attached Excel spreadsheets.

Based on the categories of updated data received, this process memorandum provides an update to the following:

- Groundwater Levels
- Groundwater Hydrochemistry
- Surface Flows
- Surface Hydrochemistry
- Surface Water Occurrence Surveys

No additional geochemical data were provided; therefore, no additional analysis of geochemical data is included in this process memorandum.

Note that the overall purpose of this memo is primarily to determine if the data sets relied upon for the August 2019 DEIS analysis have substantially changed or expanded, in order to ensure that the Final Environmental Impact Statement (FEIS) is updated appropriately.

Groundwater Levels

Updated Baseline Data

The DEIS analyzed groundwater levels using groundwater wells/piezometers and associated water level readings that were provided in the *Hydrograph Set For Current Hydrogeologic Monitoring Network* report, which included groundwater well water level data up to the first quarter of 2016 (1Q16).

Resolution Copper has continued measuring groundwater levels. In order to assess whether the extended monitoring period for groundwater levels has significantly changed conditions as disclosed in the DEIS, the groundwater well water level data were compared between 1Q16 and the most recent water level data reading (2019) to determine if there was a difference between these two readings. This comparison is provided in Table 1.

Table 1. Groundwater Well Water Level Comparison

Well	Aquifer		Water Level (feet amsl) at 1Q16	Water Level Read Date at 1Q16 (mm/dd/yyyy)	Current Water Level (feet amsl)	Water Level Read Date Current (mm/dd/yyyy)	Difference between 1Q16 and Current (feet)
JI Ranch Corral	Shallow alluvial/ perched	Transducer	4,424	03/01/2016	4,428	09/25/2019	4
		Manual	4,424	03/18/2016	4,428	09/25/2019	4
JI Ranch Middle	Shallow alluvial/ perched	Transducer	4,426	03/01/2016	4,425	09/25/2019	−1
		Manual	4,425	03/18/2016	4,425	09/25/2019	0
Hackberry Windmill	Shallow alluvial/ perched	Transducer	3,896	03/01/2016	3,888	09/26/2019	−8
		Manual	3,895	03/16/2016	3,888	09/26/2019	−7
HRES-01	Apache Leap Tuff	Sounder	3,067	09/03/2008	-	-	-
		Transducer	3,038	02/26/2008	-	-	-
HRES-02	Apache Leap Tuff	Transducer	3,688	03/01/2016	3,685	09/26/2019	−3
		Manual	3,688	02/22/2016	3,684	09/26/2019	−4
HRES-03d	Apache Leap Tuff	Transducer	3,789	2016	-	-	-
HRES-04	Apache Leap Tuff	Transducer	3,677	03/01/2016	3,671	10/31/2018	−6
		Manual	3,674	05/18/2015	3,673	10/31/2018	−1
HRES-05	Apache Leap Tuff	Transducer	3,672	03/01/2016	3,671	09/26/2019	−1
		Manual	3,672	02/22/2016	3,670	09/26/2019	−2
HRES-06	Apache Leap Tuff	Transducer	4,042	03/01/2016	4,041	07/03/2019	−1
		Manual	4,042	04/13/2016	4,041	07/03/2019	−1

Well	Aquifer		Water Level (feet amsl) at 1Q16	Water Level Read Date at 1Q16 (mm/dd/yyyy)	Current Water Level (feet amsl)	Water Level Read Date Current (mm/dd/yyyy)	Difference between 1Q16 and Current (feet)
HRES-07	Apache Leap Tuff	Freestanding	3,633	09/08/2015	-	-	-
		Freestanding-S	3,635	09/30/2009	-	-	-
		Freestanding-D	3,635	09/30/2009	-	-	-
		Manual	3,633	02/22/2016	3,633	04/08/2019	0
HRES-08	Apache Leap Tuff	Freestanding	3,858	03/01/2016	3,858	09/26/2019	0
		Freestanding-S	3,860	05/24/2011	-	-	-
		Freestanding-D	3,822	05/24/2011	-	-	-
		Manual	3,857	02/22/2016	3,857	09/26/2019	0
HRES-09	Apache Leap Tuff	Freestanding	3,672	03/01/2016	3,670	04/15/2019	−2
		Manual	3,672	05/31/2016	3,670	09/26/2019	−2
HRES-10	Apache Leap Tuff	Transducer	2,895	03/01/2016	2,886	08/27/2019	−9
		Manual	2,888	03/23/2016	2,886	08/27/2019	−2
HRES-11	Apache Leap Tuff	Transducer	2,826	03/01/2016	2,825	08/01/2018	−1
		Manual	2,825	10/20/2015	2,825	08/01/2018	0
HRES-12	Apache Leap Tuff	Transducer	4,094	03/01/2016	4,098	10/17/2019	4
		Manual	4,095	03/30/2016	4,098	10/17/2019	3
HRES-13	Apache Leap Tuff	Transducer	3,725	03/01/2016	3,724	11/15/2019	−1
		Manual	3,724	02/22/2016	3,724	11/15/2019	0
HRES-14	Apache Leap Tuff	Transducer	3,680	03/01/2016	3,680	10/14/2019	0
		Manual	3,681	03/30/2016	3,680	10/14/2019	−1
HRES-15	Apache Leap Tuff	Transducer	3,669	03/01/2016	3,667	04/16/2019	−2
		Manual	3,669	03/30/2016	3,667	04/16/2019	−2
HRES-17	Apache Leap Tuff	Transducer	3,649	03/01/2016	3,647	10/14/2019	−2
		Manual	3,648	03/30/2016	3,647	10/14/2019	−1
A-06	Apache Leap Tuff	Transducer	3,644	03/01/2016	3,643	10/14/2019	−1
		Manual	3,644	03/30/2016	3,643	10/14/2019	−1
MJ-11	Apache Leap Tuff	Transducer	3,615	03/01/2016	3,615	12/29/2019	0
		Manual	3,616	03/30/2016	3,616	06/25/2019	0
DHRES-01	Deep	Freestanding	−46	03/01/2016	−292	12/27/2019	−246
		Transducer-66 m	1,397	03/01/2016	1,407	12/27/2019	−10
		Transducer-374 m	3,223	03/01/2016	2,903	12/27/2019	−320
		Transducer-683 m	3,629	03/01/2016	3,621	12/27/2019	−8

Well	Aquifer		Water Level (feet amsl) at 1Q16	Water Level Read Date at 1Q16 (mm/dd/yyyy)	Current Water Level (feet amsl)	Water Level Read Date Current (mm/dd/yyyy)	Difference between 1Q16 and Current (feet)
		Transducer-772 m	3,644	03/01/2016	3,639	12/27/2019	−5
		Transducer-973 m	3,667	03/01/2016	3,662	12/27/2019	−5
DHRES-02	Deep	Freestanding	−372	03/01/2016	−581	12/27/2019	−209
		Transducer-319 m	3,328	03/01/2016	2,978	12/27/2019	−350
		Transducer-458 m	3,633	03/01/2016	3,605	12/27/2019	−28
		Transducer-608 m	3,677	03/01/2016	3,604	12/27/2019	−73
		Transducer-666 m	3,587	03/01/2016	3,441	12/27/2019	−146
		Transducer-915 m	3,676	03/01/2016	3,663	12/27/2019	−13
DHRES-06	Deep	Freestanding	3,241	03/01/2016	3,237	04/08/2019	−4
		Piezometer-928 m	3,701	03/01/2016	3,691	10/26/2019	−10
		Piezometer-994 m	3,824	03/01/2016	3,823	10/28/2019	−1
		Piezometer-1,022 m	3,813	03/01/2016	3,813	10/28/2019	0
		Piezometer-1,152 m	3,853	03/01/2016	3,853	10/28/2019	0
		Manual	3,241	02/22/2016	3,237	04/08/2019	−4
DHRES-09	Deep	Transducer	2,944	03/01/2016	2,938	12/28/2019	−6
		Manual	176	07/22/2016	176	10/03/2016	0
DRHRES-11	Deep	Freestanding	2,928	03/01/2016	2,775	10/17/2019	−153
		Piezometer-214 m	7,654	02/28/2016	3,625	10/17/2019	−3,971
		Piezometer-320 m	3,714	03/01/2016	3,683	10/17/2019	−31
		Piezometer-457 m	3,767	03/01/2016	3,748	10/17/2019	−19
		Piezometer-565 m	3,843	03/01/2016	3,835	10/17/2019	2
		Piezometer-705 m	4,016	09/30/2014	4,000	10/17/2019	−16

Well	Aquifer		Water Level (feet amsl) at 1Q16	Water Level Read Date at 1Q16 (mm/dd/yyyy)	Current Water Level (feet amsl)	Water Level Read Date Current (mm/dd/yyyy)	Difference between 1Q16 and Current (feet)
		Piezometer-967 m	4,019	03/01/2016	4,019	10/17/2019	0
		Manual	2,917	03/30/2016	2,921	01/13/2017	4
DHRES-13	Deep	Freestanding	2,705	03/01/2016	2,670	12/27/2019	−35
		Piezometer-649 m	2,824	03/01/2016	2,803	12/27/2019	−21
		Piezometer-730 m	2,844	03/01/2016	2,820	12/27/2019	−24
		Piezometer-788 m	2,846	03/01/2016	2,823	12/27/2019	−23
		Piezometer-846 m	2,927	03/01/2016	2,913	12/27/2019	−14
		Manual	2,705	04/05/2016	2,687	02/08/2018	−18
DHRES-15	Deep	Freestanding	3,238	03/01/2016	3,236	01/30/2020	−2
		Piezometer-355 m	3,233	03/01/2016	3,118	12/27/2019	−105
		Piezometer-398 m	3,345	03/01/2016	3,225	12/27/2019	−120
		Piezometer-710 m	3,543	03/01/2016	3,548	12/27/2019	5
		Manual	3,238	04/06/2016	-	-	-
DHRES-03	Other	Piezometer-102 m	2,495	03/01/2016	2,489	12/25/2019	-6
		Piezometer-539 m	2,573	03/01/2016	2,571	12/25/2019	−2
		Piezometer-729 m	2,658	03/01/2016	2,644	12/27/2019	−14
		Piezometer-782 m	2,724	03/01/2016	2,727	12/27/2019	3
DHRES-04	Other	Freestanding	2,601	03/01/2016	2,616	12/28/2019	15
		Manual	2,603	07/22/2016	2,612	02/12/2019	9
DHRES-05B	Other	Freestanding	2,578	03/01/2016	2,557	12/27/2019	−21
		Manual	2,574	10/03/2016	-	-	-
DHRES-07	Other	Freestanding	2,909	03/01/2016	2,912	12/27/2019	3
		Piezometer-95 m	3,015	03/01/2016	2,995	12/28/2019	−20
		Piezometer-108 m	2,892	03/01/2016	2,879	12/28/2019	−13

Well	Aquifer		Water Level (feet amsl) at 1Q16	Water Level Read Date at 1Q16 (mm/dd/yyyy)	Current Water Level (feet amsl)	Water Level Read Date Current (mm/dd/yyyy)	Difference between 1Q16 and Current (feet)
		Piezometer-169 m	3,015	03/01/2016	2,983	12/21/2019	−32
		Piezometer-374 m	3,387	03/01/2016	3,365	12/27/2019	−22
		Piezometer-800 m	3,679	03/01/2016	3,682	12/26/2019	3
		Piezometer-920 m	3,650	03/01/2016	3,644	12/24/2019	−6
		Manual	2,921	06/01/2016	-	-	0
DHRES-08	Other	Piezometer-196 m	2,030	03/01/2016	1,858	12/09/2019	−172
		Piezometer-231 m	286	03/01/2016	92	12/26/2019	−194
		Piezometer-406 m	2,040	03/01/2016	1,846	12/26/2019	−194
		Piezometer-512 m	2,880	03/01/2016	2,757	12/26/2019	−123
		Piezometer-580 m	12,208	03/01/2016	12,215	10/31/2016	7
		Piezometer-657 m	−1.12E+17	03/01/2016	−1.12E+17	10/31/2016	0
		Piezometer-792 m	3,555	03/01/2016	3,605	12/26/2019	50
		Piezometer-980 m	3,651	03/01/2016	3,643	12/26/2019	−8
DHRES-14	Other	Freestanding	3,484	03/01/2016	3,484	01/11/2017	0
		Piezometer-822 m	3,622	03/01/2016	3,627	12/27/2019	5
		Piezometer-888 m	3,612	03/01/2016	3,603	12/27/2019	−9
		Piezometer-1,071 m	3,641	03/01/2016	3,636	12/27/2019	−5
		Piezometer-1,214 m	3,979	03/01/2016	3,974	12/27/2019	−5
		Manual	3,487	09/11/2015	3,487	04/17/2019	0
DHRES-16	Other	Piezometer- -387 m	2,267	03/01/2016	2,186	12/27/2019	−81
		Piezometer- -157 m	2,516	03/01/2016	2,501	12/27/2019	−15

Well	Aquifer		Water Level (feet amsl) at 1Q16	Water Level Read Date at 1Q16 (mm/dd/yyyy)	Current Water Level (feet amsl)	Water Level Read Date Current (mm/dd/yyyy)	Difference between 1Q16 and Current (feet)
		Piezometer-287 m	2,605	03/01/2016	2,583	12/27/2019	−22
		Piezometer-535 m	2,620	03/01/2016	2,611	12/27/2019	−9
		Piezometer-577 m	2,618	03/01/2016	2,616	12/27/2019	−2
		Piezometer-743 m	2,598	03/01/2016	2,598	12/27/2019	0
HRES-03	Other	Transducer-D	3,789	03/01/2016	3,788	10/07/2019	−1
		Manual-D	3,789	04/06/2016	3,788	10/07/2019	−1
		Transducer-S	3,782	04/06/2016	3,780	10/07/2019	−2
		Manual-S	3,782	04/06/2016	3,779	10/07/2019	−3
HRES-16	Other	Transducer	3,617	03/01/2016	3,617	04/16/2019	0
		Manual	3,617	03/30/2016	3,616	10/14/2019	−1
HRES-18	Other	Freestanding	3,395	03/01/2016	3,392	10/14/2019	−3
		Manual	3,394	03/30/2016	3,634	10/14/2019	300
HRES-19	Other	Freestanding	3,634	01/25/2013	-	-	-
		Manual	3,633	02/22/2016	3,634	10/14/2019	1
HRES-20	Other	Transducer	3,669	03/01/2016	3,669	10/14/2019	0
		Manual	3,669	03/30/2016	3,669	10/14/2019	0
HRES-21	Other	Transducer	3,673	03/28/2016	3,672	10/07/2019	−1
		Manual	3,673	03/28/2016	3,672	10/07/2019	−1

Note: "-" signifies no additional data were provided beyond 1Q16.

Ramifications for Updated Groundwater Level Analysis

Of the wells that are representative of groundwater levels in the shallow alluvial/perched aquifer, one well increased between 2016 and 2019 by 4 feet. The remaining two wells either remained unchanged or decreased between 2016 and 2019 from 1 to 8 feet.

Of the wells that are representative of groundwater levels in the Apache Leap Tuff, only one well increased between 2016 and 2019, from 3 to 4 feet. The remaining 18 wells all either remained unchanged, had no new readings, or decreased between 2016 and 2019 from 1 to 9 feet.

Of the wells that are representative of groundwater levels in the deep aquifer, all wells remain unchanged, had minimal increases (from 4 to 5 feet), or decreased between 2016 and 2019, from 1 to 3,971 feet.

Overall, only the deep groundwater system has substantially changed. As anticipated, there is continued drawdown in the deep groundwater system due to the ongoing dewatering, but no substantial impact on water levels in the Apache Leap Tuff or shallow groundwater system.

Specific changes in the FEIS include:

- Update the values for DHRES wells shown in Table 3.7.1-1

Groundwater Hydrochemistry

Updated Baseline Data

The DEIS analyzed groundwater hydrochemistry impacts using select wells that represent either the shallow, Apache Leap Tuff, or deep aquifers. The details of this process are included in the *Summary and Analysis of Groundwater-Dependent Ecosystems* Process Memorandum. The baseline data at these wells included collecting samples at each well for certain constituent categories. The details of these constituent categories are included in the *Addendum #1 to October 18, 2016 Process Memo "Summary of Hydrologic, Hydrochemical, and Geochemical Data Received to Date"* Process Memorandum.

The groundwater hydrochemistry data were compared between the previously analyzed hydrochemistry data and the updated hydrochemistry data to determine if additional samples were collected that were not previously analyzed in the DEIS as shown in Table 2. If additional sample collections were taken, the associated constituents that were analyzed are also included.

Table 2. Groundwater Hydrochemistry Comparison

Well*	Aquifer Designation by Resolution Copper*	Dates Analyzed in DEIS (mm/dd/yyyy)	New Dates Analyzed (mm/dd/yyyy)	Constituents Analyzed†
JI Ranch Corral	Shallow alluvial/perched	06/21/2007–05/23/2012	-	-
JI Ranch Middle	Shallow alluvial/perched	05/30/2008–11/06/2015	03/18/2016–09/22/2016	General Chemistry, Metals
Hackberry Windmill	Shallow alluvial/perched	06/07/1986–11/05/2015	-	-
HRES-01	Apache Leap Tuff	03/18/2004	-	-
HRES-02	Apache Leap Tuff	04/06/2004–05/17/2012	-	-
HRES-03d	Apache Leap Tuff	04/16/2004	-	-
HRES-04	Apache Leap Tuff	04/15/2004–06/01/2009	-	-
HRES-05	Apache Leap Tuff	04/02/2004–05/10/2012	-	-

Well*	Aquifer Designation by Resolution Copper*	Dates Analyzed in DEIS (mm/dd/yyyy)	New Dates Analyzed (mm/dd/yyyy)	Constituents Analyzed†
HRES-06	Apache Leap Tuff	06/12/2007–05/18/2012	-	-
HRES-07	Apache Leap Tuff	02/26/2008–05/10/2012	-	-
HRES-08	Apache Leap Tuff	07/21/2011–05/10/2012	-	-
HRES-09	Apache Leap Tuff	12/29/2010–07/29/2014	-	-
HRES-10	Apache Leap Tuff	09/24/2010–11/20/2015	03/23/2016	General Chemistry, Metals, Isotopes, Radionuclides
HRES-11	Apache Leap Tuff	05/01/2012–11/14/2012	-	-
HRES-12	Apache Leap Tuff	05/15/2012–11/7/2012	-	-
HRES-13	Apache Leap Tuff	06/03/2011–11/8/2012	-	-
HRES-14	Apache Leap Tuff	07/15/2011–11/09/2012	-	-
HRES-15	Apache Leap Tuff	04/30/2012–08/09/2012	-	-
HRES-17	Apache Leap Tuff	05/16/2012–11/09/2012	-	-
A-06	Apache Leap Tuff	09/24/2007–05/14/2012	-	-
CT	Apache Leap Tuff	04/20/2010–12/17/2015	03/23/2016	General Chemistry, Metals, Isotopes, Radionuclides
MJ-11	Apache Leap Tuff	09/29/2007–05/16/2012	-	-
DHRES-01	Deep	11/28/2008	-	-
DHRES-02	Deep	07/20/2011–10/27/2011	-	-
DHRES-06	Deep	01/09/2011	-	-
DHRES-09	Deep	09/02/2011–8/20/2012	10/04/2016	General Chemistry, Metals, Isotopes, Radionuclides
DHRES-11	Deep	06/29/2011–08/15/2012	-	-

Well*	Aquifer Designation by Resolution Copper*	Dates Analyzed in DEIS (mm/dd/yyyy)	New Dates Analyzed (mm/dd/yyyy)	Constituents Analyzed†
DHRES-13	Deep	06/28/2011–08/22/2012	-	-
DHRES-15	Deep	07/16/2014–01/29/2015	-	-

* Details of well selection and aquifer designation are provided in the *Summary and Analysis of Groundwater-Dependent Ecosystems* Process Memorandum.

† The constituent categories are defined in the *Addendum #1 to October 18, 2016 Process Memo "Summary of Hydrologic, Hydrochemical, and Geochemical Data Received to Date".*

Note: "-" signifies that no new data were provided beyond what was already analyzed in the DEIS.

As shown above in Table 2, there are four well locations that have updated hydrochemistry data that were not previously analyzed in the DEIS. The General Chemistry (Table 3), Metals (Table 4), and Diagnostic (Table 5) constituents were reviewed and compared to the previously analyzed hydrochemistry data, which is consistent with the *Summary and Analysis of Groundwater-Dependent Ecosystems* Process Memorandum process.

Table 3. General Chemistry Comparisons

Well	Na, DEIS Analysis (mg/l)	Na, New Sample (mg/l)	Na, % difference	K, DEIS Analysis (mg/l)	K, New Sample (mg/l)	K, % difference	Mg, DEIS Analysis	Mg, New Sample (mg/l)	Mg, % difference	Ca, DEIS Analysis	Ca, New Sample (mg/l)	Ca, % difference	SO_4, DEIS Analysis	SO_4, New Sample (mg/l)	SO_4, % difference	Cl, DEIS Analysis	Cl, New Sample (mg/l)	Cl, % difference	HCO_3, DEIS Analysis	HCO_3, New Sample (mg/l)	HCO_3, % difference	CO_3, DEIS Analysis	CO_3, New Sample (mg/l)	CO_3, % difference
JI Ranch Middle	15.6–25	15.1–19.4	0	0.76–2	0.09–0.6	0	5.2–7.8	5.1–7.5	0	22.1–34	21.4–31.8	0	32.7–170	40–53.4	0	12.9–35	19.5–28	0	57–84	52.7–67.8	0	0	Not Detected	0
HRES-10	26–42	21.1	0	1.9–2.1	1.43	0	10–19	7.8	0	4–88	36.9	0	94–160	83.4	0	9.6–19	10.2	0	159–232	127	0	0	Not Detected	0
CT	43–57.5	59.4	3.3	1.0–2	0.9	0	22–28.5	28.4	0	67–89.6	91.1	1.7	120–163	141	0	18–24.7	17.8	0	256–365	409	12.1	0	Not Detected	0
DHRES-09	32–33	33.4	1.2	3.8	3.8	0	42–43	43.5	1.2	110	117	6.4	240–260	241	0	25–26	24.6	0	329	340	3.3	0	Not Detected	0

Note: New sample values that are lower than the DEIS analyzed values would not meaningfully contribute to warrant an updated groundwater hydrochemistry analysis, therefore, the percent difference is effectively zero.

Table 4. Metal Comparisons

Well	As, DEIS Analysis (mg/l)	As, New Sample (mg/l)	As, % difference	Ba, DEIS Analysis (mg/l)	Ba, New Sample (mg/l)	Ba, % difference	Cd, DEIS Analysis (mg/l)	Cd, New Sample (mg/l)	Cd, % difference	Cr, DEIS Analysis (mg/l)	Cr, New Sample (mg/l)	Cr, % difference	Pb, DEIS Analysis (mg/l)	Pb, New Sample (mg/l)	Pb, % difference	Hg, DEIS Analysis (mg/l)	Hg, New Sample (mg/l)	Hg, % difference	Se, DEIS Analysis (mg/l)	Se, New Sample (mg/l)	Se, % difference	Cu, DEIS Analysis (mg/l)	Cu, New Sample (mg/l)	Cu, % difference	Ag, DEIS Analysis (mg/l)	Ag, New Sample (mg/l)	Ag, % difference
JI Ranch Middle	0.001–0.002	<0.00023–0.0017	0	0.090–0.091	0.081–0.16	75.8	0.00009–0.001	<0.000072–0.00009	0	0.0005–0.001	<0.0004–<0.0015	50	0.001–0.0066	<0.000031–0.0044	0	0.00004–0.0002	<0.000053	0	0.0006–0.002	<0.0006–0.0014	0	0.0018–0.0022	0.0025–0.0074	236.4	0.00003–0.001	<0.000021–0.000048	0
HRES-10	0.00027–0.0012	0.00071–0.00074	0	0.026–0.042	0.019	0	0.000072–0.001	<0.000072	0	0.0006–0.001	<0.0004 –<0.0008	0	0.00008–0.0037	0.00010–0.00024	0	0.00004–0.0002	<0.000053 –0.00006	0	0.0006–0.002	<0.0006	0	0.0012–0.003	0.0025–0.0032	6.7	0.000021–0.001	<0.000021	0
CT	0.00027–0.001	0.00057 –0.0018	80	0.023–0.027	0.023–0.026	0	0.00036–0.001	0.00008 –0.00017	0	0.0007–0.001	<0.0008 –0.0008	0	0.001–0.0064	0.00028–0.0076	18.8	0.00004–0.0002	<0.000053–0.00013	0	0.0007–0.002	0.0011–0.0014	0	0.036–0.059	0.0061–0.025	0	0.000022–0.001	<0.000021–0.000069	0
DHRES-09	0.001	<0.00023	0	0.041–0.045	0.044–0.046	2.2	0.001	<0.000021	0	0.001	<0.0008–<0.0015	50	0.001–0.0016	<0.000075	0	0.0002	<0.000053	0	0.0023–0.0028	0.0017–0.0020	0	0.001	<0.0013–<0.0026	0	0.001	<0.000025	0

Note: New sample values that are lower than the DEIS analyzed values would not meaningfully contribute to warrant an updated groundwater hydrochemistry analysis, therefore, the percent difference is effectively zero.

Table 5. Diagnostic Comparisons

Well	Carbon-14, DEIS Analysis (pmC)	Carbon-14, New Sample (pmC)	Carbon-14, % difference	Tritium, DEIS Analysis	Tritium, New Sample (TU)	Tritium, % difference
JI Ranch Middle	94.8–105.6	-	0	2.5–4.2	-	0
HRES-10	103.4–104.8	104.8	0	2.2–3.4	3.4	0
CT	101.4–106.3	103.6	0	1.8–2.8	2.9	3.6
DHRES-09	81.7–82.4	84.7	2.8	1.5	1.1	0

Note: New sample values that are lower than the DEIS analyzed values would not meaningfully contribute to warrant an updated groundwater hydrochemistry analysis, therefore, the percent difference is effectively zero.

"-" signifies that no new data were provided.

Ramifications for Updated Groundwater Hydrochemistry Analysis

Three new samples were obtained from JI Ranch Middle that post-date the data used in the DEIS. A single sample was obtained from HRES-10, CT Well, and DHRES-09 that post-dates the data used in the DEIS. Based on the 19 new sample constituents provided for each well (see Tables 3–5):

JI Ranch Middle: 16 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The metals barium, chromium, and copper all showed increases in concentration in the post-DEIS samples.

HRES-10: 18 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The metal copper showed an increase in concentration in the single post-DEIS sample collected.

CT: 13 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The values of sodium, calcium, and tritium all showed a slight increase in concentrations in the single post-DEIS sample collected, and the concentrations of bicarbonate, arsenic, and lead all showed slightly greater increases in the single post-DEIS sample collected.

DHRES-09: 11 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The values of sodium, magnesium, bicarbonate, barium, carbon-14, and tritium all showed a slight increase in concentration in the single post-DEIS sample collected, while the values of calcium and chromium showed moderate increases in the single post-DEIS sample collected.

Specific changes considered in the FEIS include:

- The analysis of groundwater-dependent ecosystems (GDE) water sources is based on the full record of water quality for each GDE compared to the full record of water quality for

each of three groundwater systems (shallow, Apache Leap Tuff, deep). The conclusions of water sources for each GDE are based on a preponderance of evidence from multiple sources, including hydrochemistry, isotopes, and physical hydrology.

No specific lines of evidence used in the analysis of GDE water sources are substantially affected by the post-DEIS samples; nor are the conclusions regarding GDE water sources affected by the post-DEIS samples:

- Metals constituents were not used to assess GDE water sources and are not applicable.
- "Diagnostic" constituents used in the GDE assessment include carbon-14, tritium, and the Piper diagrams (which utilize concentrations of calcium, sodium, potassium, magnesium, bicarbonate, sulfate, and chloride). One Apache Leap Tuff well (CT) and one deep groundwater system (DHRES-09) have additional carbon-14 and tritium samples with higher concentrations, but these concentrations are less than 5 percent different in concentration than those used for the DEIS analysis and would not change the results. These same two wells have slightly higher concentrations for constituents used for Piper diagrams, but mostly less than 5 percent (the highest was a 12 percent increase in bicarbonate). Further screening indicates these would shifted the overall makeup of the Piper diagram in a negligible way.
- No changes in concentration in "weight of evidence" constituents used to assess GDE water sources were identified.

- Update the time frames shown in Table 3.7.2-3.
- Update Table N-1 in Appendix N to reflect slight changes in number of samples, minimum, minimum, mean, and median values.
- Update Table 3.7.2-8

Surface Flows

Updated Baseline Data

The DEIS analyzed the natural stream and spring flow of Devil's Canyon using baseflow monitoring locations and manual flow measurements. The details of this analysis and process are included in the *Review of Hydrologic Trends in Devil's Canyon and on Oak Flat* Technical Memorandum.

The surface water flow data of Devil's Canyon were compared between the previously analyzed data and the updated data (Table 6).

Table 6. Devil's Canyon Surface Water Flow Comparison

Location	Survey Dates Analyzed in DEIS (mm/dd/yyyy)	Flow (gpm) Analyzed in the DEIS	New Survey Dates (yyyy)	New Baseflow (cfs)
DC-8.2W	05/20/2003	11	N/A	N/A
	08/21/2003	11		
	11/12/2003	8		
	02/17/2004	11		
	05/21/2004	12		
	08/16/2004	9		
	11/16/2004	2		
	02/25/2005	3		
	05/11/2005	10		
	08/16/2005	1		
	11/05/2008	1		
	05/19/2009	10		
	11/10/2010	0		
	05/03/2012	5		
	02/27/2014	2		
	05/29/2014	2		
	09/03/2014	5		
	11/21/2014	5		
	10/14/2015	15		
	09/23/2016	5		
DC-6.6W	05/29/2003	0	N/A	N/A
	09/03/2003	0		
	11/04/2003	1		
	02/18/2004	1		
	05/04/2004	0		
	08/19/2004	0		
	11/12/2004	1		
	02/16/2005	32		
	05/17/2005	0		
	09/07/2005	0		
	05/04/2012	2		
	02/27/2014	1		

Location	Survey Dates Analyzed in DEIS (mm/dd/yyyy)	Flow (gpm) Analyzed in the DEIS	New Survey Dates (yyyy)	New Baseflow (cfs)
	09/25/2014	0.1		
	11/07/2014	1		
	02/17/2016	0		
DC-6.1E	05/20/2004	2	N/A	N/A
	08/23/2004	1		
	11/18/2004	2		
	02/28/2005	0		
	05/24/2005	0		
	08/23/2005	0		
	08/07/2008	1		
	11/06/2008	0		
	05/20/2009	3		
	03/19/2010	1		
	10/19/2010	5		
	11/10/2010	80		
	08/15/2012	0		
	12/16/2015	1.5		
	07/19/2016	6		
DC-4.1E	02/10/2014	1.5		
	05/20/2014	1.5	N/A	N/A
	08/28/2014	3		
	11/25/2014	1		
	12/16/2015	2		
	05/24/2016	0.3		
	12/15/2016	0.8		
	03/31/2017	0.1		

Ramifications for Updated Surface Flow Analysis

Since no new surface water flow data of Devil's Canyon were provided (see Table 6), no new analysis can be done. The analysis provided in the *Review of Hydrologic Trends in Devil's Canyon and on Oak Flat* Technical Memorandum remains current.

Surface Hydrochemistry

The surface water hydrochemistry data were compared between the previously analyzed hydrochemistry data and the updated hydrochemistry data to determine if additional samples were collected that were not previously analyzed in the DEIS as shown in Table 7. If additional sample collections were taken, the associated constituents that were analyzed are also included.

Updated Baseline Data

Table 7. Surface Water Hydrochemistry Comparison

Surface Water Sampling Location	Dates Analyzed in DEIS (mm/dd/yyyy)	New Dates Analyzed (mm/dd/yyyy)	Constituents Analyzed
DC 10.9C	08/27/2003–10/23/2015	02/16/2016–09/02/2016	General Chemistry, Metals, Field Parameters
DC 13.5C	08/27/2003–04/27/2012	02/15/2016–08/31/2016	General Chemistry, Metals, Field Parameters
DC 14.7C	03/05/2004–03/03/2014	01/21/2016	General Chemistry, Metals, Field Parameters
DC 15.2C	02/15/2005–08/10/2005	01/21/2016	General Chemistry, Metals, Field Parameters
DC 15.5C	08/05/2008–08/13/2012	01/21/2016	General Chemistry, Metals, Field Parameters
DC 4.1E	05/21/2003–12/16/2015	05/24/2016–03/31/2017	General Chemistry, Metals, Field Parameters
DC 5.5C	11/10/2003–12/16/2015	03/22/2016–07/19/2016	General Chemistry, Metals, Field Parameters
DC 6.1E	06/05/2003–12/16/2015	03/22/2016–07/19/2016	General Chemistry, Metals, Field Parameters
DC 6.14C	08/20/2008–11/23/2015	02/17/2016–06/14/2016	General Chemistry, Metals, Field Parameters
DC 6.6W	05/29/2003–11/23/2015	02/17/2016–08/23/2016	General Chemistry, Metals, Field Parameters
DC 7.1C	05/29/2003–11/23/2015	02/17/2016–08/26/2016	General Chemistry, Metals, Field Parameters
DC 8.1C	08/06/2008–10/14/2015	02/19/2016–09/23/2016	General Chemistry, Metals, Field Parameters
DC 8.2W	05/20/2003–10/14/2015	02/19/2016–09/23/2016	General Chemistry, Metals, Field Parameters
DC 8.8C	05/20/2003–10/14/2015	02/19/2016–09/23/2016	General Chemistry, Metals, Field Parameters

Surface Water Sampling Location	Dates Analyzed in DEIS (mm/dd/yyyy)	New Dates Analyzed (mm/dd/yyyy)	Constituents Analyzed
Whitlow Dam Outlet	03/04/2015–10/20/2015	09/05/2017–10/10/2019	Field Parameters, General Chemistry, Isotopes, Radionuclides, Metals

As shown above (see Table 7), all select sampling locations have updated hydrochemistry data that were not previously analyzed in the DEIS. The General Chemistry (Table 8) and Metals (Table 9) constituents were reviewed and compared to the previously analyzed surface water hydrochemistry data, which can be found in Appendix N of the DEIS.

Ramifications for Updated Surface Hydrochemistry Analysis

Based on the 17 new sample constituents provided for each well (see Tables 8 and 9):

DC 10.9C: 16 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Bicarbonate showed an increase.

DC 13.5C: 14 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentrations of Sodium, Potassium, and Barium all showed an increase.

DC 14.7C: 16 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Barium showed an increase.

DC 15.2C: 17 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples.

DC 15.5C: 17 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples.

DC 4.1E: 16 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Calcium showed a slight increase and the concentration of Barium showed a moderate increase.

DC 5.5C: 17 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples.

DC 6.1E: 17 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples.

DC 6.14C: 11 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentrations of Sodium and Calcium showed a slight increase, and the concentrations of Magnesium, Potassium, Bicarbonate all showed a moderate increase. The concentration of Chromium showed a significant increase.

DC 6.6W: 16 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Copper showed a significant increase in one sample.

DC 7.1 C: 13 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Magnesium showed an increase and the concentrations of Sodium, Chloride, and Barium all showed an increase.

DC 8.1 C: 15 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentrations of Sulfate and Silver both showed a slight increase.

DC 8.2 W: 15 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Barium showed a slight increase and the concentration of Chromium showed a moderate increase.

DC 8.8 C: 16 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Barium showed an increase.

Whitlow Dam Outlet: 4 constituents showed no difference between the concentrations analyzed in the DEIS and the new samples. The concentration of Silver showed a slight increase, the concentration of Sulfate showed an increase, and the values of Potassium, Magnesium, Calcium, Chloride, Bicarbonate, Arsenic, Barium, Cadmium, Lead, Selenium, and Copper all showed increases.

The primary water quality impact analyzed in the DEIS is the seepage from the tailings storage facility, with a focus on total dissolved solids, sulfate, selenium, cadmium, antimony, and copper. While some baseline surface water concentrations for Devil's Canyon have changed, these waters receive no input from potential tailings seepage and overall have no bearing on the water quality analysis in the DEIS. The summaries shown in Appendix N of the DEIS remain valid, and no conclusions of the analysis the DEIS are changed by the post-DEIS surface water quality data from Devil's Canyon.

Whitlow Ranch Dam, however, represents the nearest perennial water potentially impacted by seepage from the tailings storage facilities at Alternatives 2, 3, and 4. The water quality modeling in the DEIS used a data set of 15 samples collected between March 2015 and December 2017. This data set has now been extended with six additional samples collected between September 2018 and December 2019. This extended data set has resulted in a change in baseline water quality with respect to the key constituents used for the DEIS (sulfate, cadmium, selenium, and copper).

A key tenet of the DEIS analysis is that of being conservative in approach; with respect to water quality analyses, this means to perform the analysis so as to overestimate water quality concentrations caused by the mine, not underestimate them. In this case, with the exception of cadmium, the extended data result in lower baseline water quality for the key constituents

disclosed in the DEIS (see Table 10). Because seepage concentrations are added to the baseline water quality concentrations during the water quality modeling, this would result in the overall modeled impacts being less, not greater. The existing DEIS water quality, using the baseline through December 2017, is a conservative estimate that would slightly overestimate water quality impacts from seepage.

Cadmium theoretically shows an increase in median concentration of 26 percent, from 0.00005 mg/L to 0.000063 mg/L. However, the new samples are actually all below the laboratory detection limit. For the median calculations, non-detect values are calculated using the detection limit. Fundamentally, the values of cadmium were previously non-detections, and they still are non-detections, even though the median has changed. Regardless, the modeled water quality impacts from cadmium are 25 times below the most stringent surface water standard, and these slight changes in baseline water quality would not change any conclusions in the FEIS.

Overall, the water quality used in the DEIS remains an appropriate technique and the extended data set at Whitlow Ranch Dam would not change the DEIS conclusions. No changes are being made in the analysis contained in the FEIS.

Table 8. General Chemistry Comparisons

Well	Na, DEIS Analysis (mg/l)	Na, New Sample (mg/l)	Na, % difference	K, DEIS Analysis (mg/l)	K, New Sample (mg/l)	K, % difference	Mg, DEIS Analysis	Mg, New Sample (mg/l)	Mg, % difference	Ca, DEIS Analysis	Ca, New Sample (mg/l)	Ca, % difference	SO_4, DEIS Analysis	SO_4, New Sample (mg/l)	SO_4, % difference	Cl, DEIS Analysis	Cl, New Sample (mg/l)	Cl, % difference	HCO_3, DEIS Analysis	HCO_3, New Sample (mg/l)	HCO_3, % difference	CO_3, DEIS Analysis	CO_3, New Sample (mg/l)	CO_3, % difference
DC 10.9C	4–9.9	5.6–9.1	0	1.5–2.8	1.5–2.4	0	1.5–4.6	1.7–3.5	0	5.5–17.6	6.2–12.4	0	2.5–52.6	0.22–16	0	2.9–16.7	7.2–13.8	0	10.6–50.1	8.9–61.9	23.6	0	0	0
DC 13.5C	4.1–8.3	5.9–11.3	36.1	1.4–2.7	1.4–3.1	14.8	1.4–5.8	1.4–4.5	0	4.9–22.3	6.4–16.3	0	0.7–27.4	0.6–15.5	0	3.2–27.3	8.3–26	0	9–77.2	9–65.8	0	0	0	0
DC 14.7C	3.2–6	5.4	0	1.6–2.4	1.5	0	1.6–2	1.8	0	5.5–6.6	5.9	0	7.8–16.4	6.3	0	1.9–6.8	6.1	0	7.1–15.1	6.3	0	0	0	0
DC 15.2C	4.2–10.9	5	0	1.9–4.1	1.3	0	1.5–5.7	1.5	0	5.9–21.3	5.1	0	11–58	5.6	0	3.5–20.2	5.6	0	11.5–27.8	5.6	0	0	0	0
DC 15.5C	3.2–13.2	4	0	1.1–8.8	1.2	0	1–6.3	1.2	0	3.1–20.3	3.7	0	0.3–14.3	10.4	0	2.6–19	2.9	0	5–99.4	3.9	0	0	0	0
DC 4.1E	21.5–23	20.9	0	1–1.1	1.1	0	4.3–4.7	4.6	0	27.1–28.4	31.4	3.5	3–3.6	3	0	4.4–4.6	4.4	0	151–163	159	0	0	0	0
DC 5.5C	5.7–32.2	14.1	0	1.4–3.7	1.7	0	1.8–11.4	4.5	0	7.8–55.9	22.5	0	10.9–41.6	11.6	0	3.4–11.4	7.8	0	22.1–275	110.3	0	0	0	0
DC 6.1E	19.5–24.2	22.2–22.3	0	1–2.4	1.2	0	4.6–6.8	5–5.2	0	16.1–45.1	33.5–35.2	0	0.6–30.2	8.1–14.1	0	4.8–12.8	5–5.9	0	98.6–187	181	0	0–8.9	0	0
DC 6.14C	4.6–22.3	10–22.7	1.8	1.7–2.7	1.3–3.2	18.5	1.3–8.4	2.7–9	7.1	5.1–36.8	12.8–38.2	3.8	0.4–15.1	5.2–14.4	0	3.0–12.4	7–11.6	0	11.8–171	49–203	18.7	0–5	0	0
DC 6.6W	6.8–33.4	22.6–24.8	0	1.2–7.6	2.9–6.3	0	2.4–21.1	8.5–15	0	9.0–92.1	36–55.4	0	1.3–19.2	3.4–5.9	0	3.3–10.2	7.2–7.5	0	28.5–234	137–162	0	0	0	0
DC 7.1C	4.7–29.6	9.9–36.5	23.3	1.1–3.1	1.3–3	0	1.6–8.8	2.6–9.5	8.0	6.7–41.4	12.1–31.1	0	0.9–71.1	1.8–25.3	0	3.0–11.1	7–18.8	69.4	15.5–200	46.4–171	0	0	1.1	-
DC 8.1C	5.3–28.1	10.7–24.8	0	1.2–1.6	1–1.3	0	1.6–6.5	2.8–6.1	0	6.3–32.9	12.7–32.6	0	2.4–13.5	3.8–13.7	1.5	4.5–8.9	5.5–6.9	0	17.6–199	55–183	0	0	0	0
DC 8.2W	19.4–24	22–22.5	0	0.9–1.1	0.9–1.1	0	5.1–6.1	5.1–5.6	0	24.8–30.6	28.5–30.6	0	3.5–5.6	4.1–4.4	0	4.7–6.4	5–5.3	0	159–178	165–171	0	0	0	0
DC 8.8C	4.5–30.9	8.2–29.9	0	1–2.2	0.9–1.4	0	1.5–6.3	2.2–5.9	0	9.8–34.3	9.2–31.7	0	4.7–18.2	4.5–14.8	0	2.8–8.4	6.3–7.6	0	13.1–199	29.9–200	0.5	0	0	0

Well	Na, DEIS Analysis (mg/l)	Na, New Sample (mg/l)	Na, % difference	K, DEIS Analysis (mg/l)	K, New Sample (mg/l)	K, % difference	Mg, DEIS Analysis	Mg, New Sample (mg/l)	Mg, % difference	Ca, DEIS Analysis	Ca, New Sample (mg/l)	Ca, % difference	SO_4, DEIS Analysis	SO_4, New Sample (mg/l)	SO_4, % difference	Cl, DEIS Analysis	Cl, New Sample (mg/l)	Cl, % difference	HCO_3, DEIS Analysis	HCO_3, New Sample (mg/l)	HCO_3, % difference	CO_3, DEIS Analysis	CO_3, New Sample (mg/l)	CO_3, % difference
Whitlow Dam Outlet	41–46.3	32–42.9	0	3–4.2	2.3–7.7	83.3	25.5–27	17–39.6	46.7	104–116	73.7–146	25.9	136–150	93.3–160	6.7	27.4–28.8	16.8–33.7	17.0	328–350	278–416	18.9	0–3.2	0	0

Note: New sample values that are lower than the DEIS analyzed values would not meaningfully contribute to warrant an updated groundwater hydrochemistry analysis, therefore, the percent difference is effectively zero.

Table 9. Metal Comparisons

Well	As, DEIS Analysis (mg/l)	As, New Sample (mg/l)	As, % difference	Ba, DEIS Analysis (mg/l)	Ba, New Sample (mg/l)	Ba, % difference	Cd, DEIS Analysis (mg/l)	Cd, New Sample (mg/l)	Cd, % difference	Cr, DEIS Analysis (mg/l)	Cr, New Sample (mg/l)	Cr, % difference	Pb, DEIS Analysis (mg/l)	Pb, New Sample (mg/l)	Pb, % difference	Hg, DEIS Analysis (mg/l)	Hg, New Sample (mg/l)	Hg, % difference	Se, DEIS Analysis (mg/l)	Se, New Sample (mg/l)	Se, % difference	Cu, DEIS Analysis (mg/l)	Cu, New Sample (mg/l)	Cu, % difference	Ag, DEIS Analysis (mg/l)	Ag, New Sample (mg/l)	Ag, % difference
DC 10.9C	0.001–0.014	0.00090–0.0079	0	0.022	0.0097–0.021	0	0.000072–0.001	0.000021–0.000072	0	0.00043–0.006	0.0004–<0.0015	0	0.000031–0.005	<0.000075–0.00024	0	0.00004–0.0002	<0.000053–<0.000055	0	0.0006–0.003	<0.00006–0.0003	0	0.0012–0.017	<0.0013–0.0091	0	0.000021–0.00031	<0.000021–0.000096	0
DC 13.5C	0.00083–0.025	0.0016–0.0085	0	0.015	0.0085–0.026	73.3	0.0001–0.002	<0.000021–<0.000072	0	0.0003–0.006	<0.0004–0.0018	0	0.001–0.005	<0.000075–0.0011	0	0.0002	<0.000053–<0.000055	0	0.00021–0.003	<0.0002–<0.0006	0	0.007–0.03	<0.0026–0.0079	0	0.0001–0.005	<0.000021–0.000037	0
DC 14.7C	0.005–0.025	0.0014–0.0019	0	0.016	0.0078–0.019	18.8	0.0001–0.002	<0.000072	0	0.0005–0.006	0.0008	0	0.0005–0.003	0.00018–0.0013	0	0.00003–0.0002	<0.000055	0	0.0003–0.003	0.0006	0	0.01–0.029	0.0085–0.0209	0	0.0001–0.005	<0.000021	0
DC 15.2C	0.003–0.025	0.0016–0.0018	0	-	0.0065–0.0082	-	0.0002–0.002	<0.000072	0	0.006	<0.0008–0.0006	0	0.003	0.00015–0.00021	0	0.0002	<0.000055	0	0.003	<0.0006–0.0006	0	0.01–0.017	0.0068–0.0082	0	0.0001	<0.000021	0
DC 15.5C	0.025–0.038	0.0015–0.0020	0	0.005–0.036	0.0039–0.0053	0	0.0002–0.002	<0.000072	0	0.006	<0.0008–0.0005	0	0.003	0.00017–0.00023	0	0.0002	<0.000055	0	0.0003–0.003	<0.0006–0.0006	0	0.01	0.0074–0.0083	0	0.005	<0.000021	0
DC 4.1E	0.0017–0.003	0.0020–0.0023	0	0.012–0.014	0.013–0.015	7.1	0.000072–0.00025	<0.000021	0	0.0004–0.006	<0.0015–0.0012	0	0.000031–0.005	<0.000075–0.0001	0	0.00003–0.0002	<0.000053	0	0.0005–0.003	0.0002–0.0003	0	0.0012–0.003	<0.0013–<0.0026	0	0.000021–0.005	<0.000025	0
DC 5.5C	0.0034–0.025	0.00026–0.0028	0	0.02–0.05	0.017–0.019	0	0.000072–0.002	<0.000072	0	0.0003–0.006	<0.0004–<0.0008	0	0.000031–0.005	<0.000031–0.00007	0	0.00004–0.0003	<0.000053	0	0.0003–0.003	<0.0006	0	0.003–0.01	<0.0023–0.0028	0	0.000021–0.005	0.000023–<0.000021	0
DC 6.1E	0.0015–0.025	0.002	0	0.017–0.019	0.018–0.019	0	0.000072–0.002	<0.000021–<0.00072	0	0.0005–0.006	0.0004–<0.0015	0	0.000031–0.003	<0.000031–<0.000075	0	0.00004–0.0002	<0.000053–0.000063	0	0.0003–0.003	<0.0006–0.0003	0	0.0012–0.01	<0.0012–<0.0026	0	0.000021–0.005	<0.000021–<0.000025	0
DC 6.14C	0.003–0.025	0.0023–0.0048	0	0.0076–0.041	0.013–0.038	0	0.000072–0.002	<0.000021–<0.000072	0	0.0005–0.006	<0.0004–<0.0015	150	0.000031–0.003	0.00008–0.00012	0	0.00004–0.0002	<0.000053–<0.000055	0	0.0002–0.003	<0.0002–<0.0006	0	0.0012–0.01	<0.0013–0.0049	0	0.000021–0.005	<0.000021–0.00003	0
DC 6.6W	0.003–0.023	0.002–0.013	0	0.48	0.015–0.39	0	0.0001–0.0014	<0.000021–0.00043	0	0.0003–0.023	<0.0008–0.013	0	0.001–0.05	<0.000031–0.027	0	0.0001–0.0002	<0.000053–0.0001	0	0.0008–0.02	<0.0002–0.0018	0	0.0021–0.018	<0.0023–0.099	450	0.0001–0.00042	<0.000021–0.00015	0
DC 7.1C	0.0036–0.025	0.0027–0.01	0	0.023–0.025	0.014–0.031	24	0.000072–0.002	<0.000021–<0.000072	0	0.0003–0.006	<0.0004–<0.0015	0	0.00004–0.005	<0.000075–0.0016	0	0.00004–0.0002	<0.000053–<0.000055	0	0.0006–0.006	<0.0002–0.0006	0	0.001–0.01	<0.0013–0.0052	0	0.000021–0.005	<0.000021–<0.000025	0
DC 8.1C	0.0022–0.025	0.0018–0.0028	1.2	0.018–0.028	0.014–0.025	0	0.000072–0.002	<0.000021–<0.000072	0	0.0005–0.006	<0.0004–<0.0015	0	0.000031–0.003	<0.000075–0.00013	0	0.00004–0.0002	<0.000053–<0.000055	0	0.0003–0.003	0.0002–0.0009	0	0.0012–0.01	<0.0013–0.0052	0	0.000021–0.005	<0.000021–<0.000025	0
DC 8.2W	0.002–0.025	0.0021–0.0029	0	0.018–0.019	0.018–0.020	5.3	0.000072–0.002	<0.000021–<0.000072	0	0.00049–0.0011	<0.0008–<0.0015	36.4	0.00011–0.005	<0.000031–<0.000075	0	0.00004–0.0002	<0.000053–<0.000055	0	0.0003–0.003	0.0002–0.0009	0	0.0012–0.01	<0.0012–<0.0026	0	0.000021–0.005	<0.000021–<0.000025	0
DC 8.8C	0.0013–0.005	0.0019–0.0055	0	0.023	0.012–0.028	21.7	0.000072–0.0002	<0.000021–<0.000072	0	0.0003–0.006	<0.0004–<0.0015	0	0.000031–0.005	<0.000075–0.00018	0	0.00004–0.0002	<0.000053–<0.000055	0	0.0006–0.006	<0.0002–<0.0006	0	0.0012–0.01	<0.0013–0.0067	0	0.000021–0.0001	<0.000021–0.000025	0

Well	As, DEIS Analysis (mg/l)	As, New Sample (mg/l)	As, % difference	Ba, DEIS Analysis (mg/l)	Ba, New Sample (mg/l)	Ba, % difference	Cd, DEIS Analysis (mg/l)	Cd, New Sample (mg/l)	Cd, % difference	Cr, DEIS Analysis (mg/l)	Cr, New Sample (mg/l)	Cr, % difference	Pb, DEIS Analysis (mg/l)	Pb, New Sample (mg/l)	Pb, % difference	Hg, DEIS Analysis (mg/l)	Hg, New Sample (mg/l)	Hg, % difference	Se, DEIS Analysis (mg/l)	Se, New Sample (mg/l)	Se, % difference	Cu, DEIS Analysis (mg/l)	Cu, New Sample (mg/l)	Cu, % difference	Ag, DEIS Analysis (mg/l)	Ag, New Sample (mg/l)	Ag, % difference
Whitlow Dam Outlet	0.0011–0.0026	0.0015–0.021	708	0.037–0.053	0.022–0.19	258	0.000072–0.00025	<0.000063–0.00065	160	0.0005–0.0024	<0.0010–0.014	0	0.00063–0.0035	<0.00014–0.038	986	0.00004–0.00006	0.00000394–0.0000265	0	0.0006–0.00071	0.0003–0.0011	54.9	0.0033–0.0096	0.00073–0.196	1,941.7	0.000021–0.0005	<0.000036–0.000523	4.6

Note: New sample values that are lower than the DEIS analyzed values would not meaningfully contribute to warrant an updated groundwater hydrochemistry analysis, therefore, the percent difference is effectively zero.

Table 10. General Chemistry Comparisons

	Cr	Co	Cu	F	Fe	Pb	Mg	Mn	Mo	Ni
	DIS	DIS	DIS	TOT	DIS	DIS	DIS	DIS	DIS	DIS
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Median concentration used in DEIS water quality modeling, based on March 2015–December 2017 data set (mg/L)	0.0015	0.0013	0.0023	0.407	0.048	0.000075	22.4	0.15	0.003	0.0027
Median concentration based on March 2015–December 2019 extended data set (mg/L)	0.0019	0.0013	0.002	0.377	0.056	0.00011	22.4	0.15	0.003	0.0027
Difference (%)	27%	0%	−13%	−7%	17%	47%	0%	0%	0%	0%

	NO3-N	K	Se	Si	Ag	Na	SO4	Tl	Zn	TDS
	TOT	DIS	TOT	DIS	DIS	DIS	TOT	DIS	DIS	DIS
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Median concentration used in DEIS water quality modeling, based on March 2015–December 2017 data set (mg/L)	1.9	2.95	0.0007	37.4	0.000036	35.7	136	0.00003	0.003	546
Median concentration based on March 2015–December 2019 extended data set (mg/L)	1.47	2.97	0.0007	37.4	0.000036	35.7	133	0.00003	0.0039	531
Difference (%)	−23%	1%	0%	0%	0%	0%	−2%	0%	30%	−3%

Note: A negative difference indicates that the updated data set shows better baseline water quality (lower concentrations) than what was used in the DEIS water quality modeling, and therefore the DEIS water quality modeling overestimates water quality impacts from tailings seepage.

Surface Water Occurrence Surveys

Updated Baseline Data

The DEIS analyzed the presence and extent of surface water occurrence as outlined in the *Surface Water Baseline Addendum: Upper Queen Creek, Devils Canyon, and Mineral Creek Watersheds* Report, which included surveying surface water reaches over multiple years.

The surface water occurrence data were compared between the previously analyzed data and the updated data to determine if additional surveys were conducted that were not previously analyzed in the DEIS, as shown in Table 11.

Table 11. Surface Water Occurrence Comparison

Reach ID	Survey Dates Analyzed in DEIS (yyyy)	New Survey Dates (yyyy)
Queen Creek	2002–2015	2017- 2019
Devil's Canyon	2002–2014	2019
Iron Canyon	2008–2014	-
Rancho Rio	2003–2014	-
Hackberry Canyon	2002–2014	-
Mineral Creek	2008–2014	2019
Lyons Fork	2008–2014	-
Arnett Creek	-	2019
Telegraph Canyon	-	2019

"-" signifies that no new data were provided beyond what was already analyzed in the DEIS.

Ramifications for Updated Surface Water Occurrence Analysis

The DEIS statistically reviewed the hydrologic trends for Devil's Canyon as outlined in the *Review of Hydrologic Trends in Devil's Canyon and on Oak Flat* Technical Memorandum. This memo concluded that the previous data for Devil's Canyon showed there is no objective indication that surface water features have been impacted by ongoing dewatering pumping conducted by Resolution Copper. For Devil's Canyon, this memo made this conclusion using the Mann-Kendall statistical test. The new saturated length is provided by quarter and in total for Devil's Canyon (Table 12).

Table 12. Saturated Length Comparison for Devil's Canyon

Category	Previous Saturated Lengths (miles)	New Saturated Length (miles)
First Quarter Only	5.63–9.81	-
Second Quarter Only	1.69–3.99	-
Third Quarter Only	1.95–7.33	-
Fourth Quarter Only	2.35–6.03	3.7
All Quarters	1.69–9.81	3.7

"-" signifies that no new data were provided beyond what was already analyzed in the DEIS.

The new saturated length (see Table 12) has been previously analyzed within the DEIS analyzed saturated lengths. Therefore, no additional analysis is needed.