

**Resolution Copper Project and Land Exchange
Environmental Impact Statement**

USDA Forest Service
Tonto National Forest
Arizona
March 30, 2017

Process Memorandum to File

Summary of GIS Spring Coverage

This document is deliberative and is prepared by the third-party contractor in compliance with the National Environmental Policy Act and other laws, regulations, and policies to document ongoing process and analysis steps. This document does not take the place of any Line Officer's decision space related to this project.

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Purpose of Process Memorandum

The purpose of this process memorandum is to provide a summary of the geographic information system (GIS) spring coverage that SWCA created for the Resolution Copper Project (Resolution). This coverage may be used for analysis during the Environmental Impact Statement (EIS) process. These springs are recognized as being unconfirmed in the field, with many likely to be ephemeral or seasonal. Such springs are unlikely to be connected with the regional aquifers that would experience drawdown from the mine dewatering, because regional water sources are more stable and less likely to fluctuate seasonally or during drought. The EIS analysis may instead focus solely on perennial springs that likely receive water from regional sources; this has yet to be determined.

Key Process Steps

SWCA collected seeps and springs GIS data from 8 different sources. Features in each GIS coverage were first reviewed and corrected for duplicates before combining into one GIS coverage. Each seep/spring feature was then assigned a unique Resolution name.

The resulting 'Resolution-Springs' coverage contains locations of seeps and springs within 20 miles of Resolution's General Plan of Operation project elements (East Plant Site, West Plant site, Tailings Storage Facility, and MARRCO). The following data sources were used in creating the Resolution-Springs coverage:

1. WestLand Resources, Inc. field crews surveyed springs in the Superior area and portions of Queen Creek, Devils Canyon and Mineral Creek. Surveys conducted 2009-2012, year visited is listed in GIS attribute data.
2. Montgomery and Associates field located springs within the Upper Queen Creek and Devils Canyon as identified in their 2012 report: Hydrologic Monitoring Locations - Upper Queen Creek / Devils Canyon Study Area 2012.
3. Water point features identified as springs or seeps on the Tonto National Forest. The water point layer was created by each individual forest within Southwest Region 3.
4. Geographic Names Information System (GNIS); developed by the U.S. Geological Survey (USGS) as a Federal repository of information regarding geographic feature names published on Federal maps, charts, and other documents.
5. National Hydrography Dataset (NHD), a USGS feature-based database of surface water drainage.
6. Arizona Department of Water Resources (ADWR) Surface Water Rights Filings (SWR) database. Features were used that identified springs or seeps as the water source.
7. Arizona Land Resource Information System (ALRIS) dataset of spring locations across Arizona. Data were created by Arizona State Land Department by extracting information from the USGS Geonames database and the USGS Digital Line Graphs (DLG)s.

8. Personal communication with Tonto Forest staff.

Decision tree for determining duplicates

Individual features within each coverage were first compared to each other to determine if there were internal data overlap. Once those duplicates were resolved, each coverage was systematically compared to all others to identify and remove duplicates. Below are the decision trees used for each scenario.

Within each coverage

ADWR-SWR data: Does more than one feature have the same 'Water Source' name?

- No → keep feature(s)
- Yes → do duplicate features have the same geographic location (within 0.25 miles of each other)?
 - No → keep both features
 - Yes → Is one feature identified as a point-of-diversion?
 - Yes → keep this feature
 - No → View features overlaid onto high resolution aerials for context and final decision

All other data: Does more than one feature have the same name?

- No → keep feature(s)
- Yes → do duplicate features have the same geographic location (within 0.25 miles of each other)?
 - No → keep both features
 - Yes → View features overlaid onto high resolution aerials for context and final decision

Across coverages

Once internal duplicates were removed, then individual features across coverages were compared. A similar decision tree was used for this exercise, but with greater consideration given to a feature's geographic location. For example, when duplicates were discovered in a coverage that had been field located – WestLand Resources data, Montgomery and Associates data, and to some extent the Water Points data from Tonto Forest – the field located feature was retained and duplicates in all other coverages were removed. Similarly, the location of features in the NHD, GNIS, or ARLIS coverages were retained over those in the ADWR coverage because ADWR locations are accurate to only the quarter-quarter section.

Across 2 coverages: Is there more than one feature within 0.25 miles of each other?

- No → keep feature(s)
- Yes → are any of the names nearly similar or the same?

- No → View features overlaid onto high resolution aerials for context (i.e. channel and vegetation patterns) to determine if duplicate or discrete features
 - If duplicate has different names, memorialize that in the 'Notes' field in the attribute table (i.e. "AKA Box Spring").
- Yes→ remove duplicates in coverage(s) with least reliable location

Combining coverages and unique naming

Once duplicates were reconciled, all 8 coverages were combined into one 'Resolution-Springs' coverage. Only select attributes such as the original name, data source, and internal notes were carried forward to the new Resolution-Springs coverage.

A final check for duplicates was conducted on the resulting coverage following the decision tree described above for within a coverage. A unique Resolution name was then assigned to each feature.

Naming convention: Is the feature's name blank or just listed as Unnamed or Spring?

- No → keep feature original name
- Yes→ does the feature have an AKA listed in the notes?
 - Yes → use AKA name
 - No → rename to "Unnamed Spring"
 - Is there a feature(s) with the same name?
 - No → keep feature original name
 - Yes→ add a unique number at the end of the name (e.g. Sycamore Spring-4).