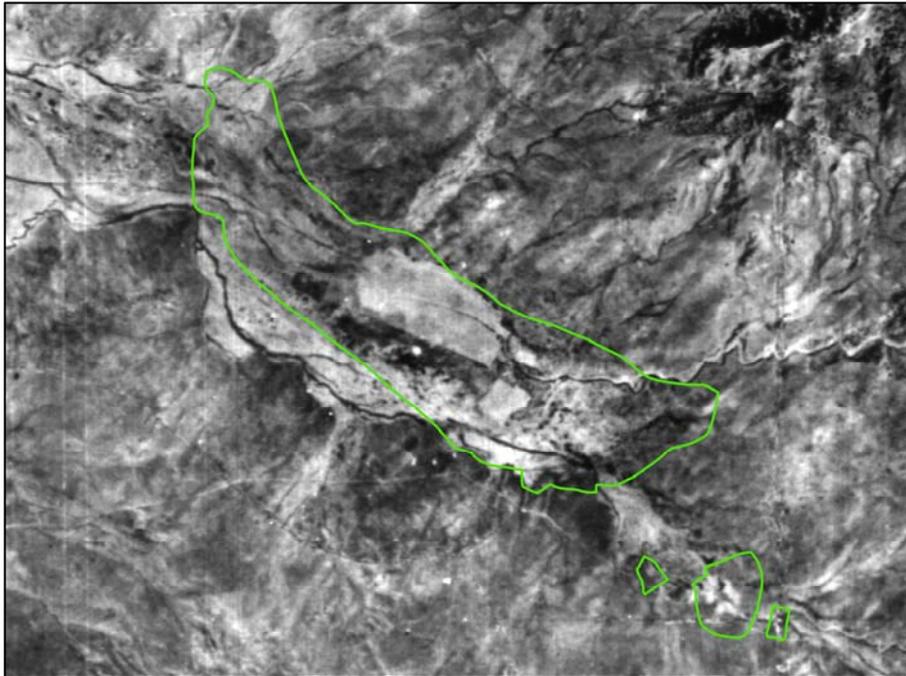


APPENDIX G-1

STATE OF ARIZONA
DEPARTMENT OF WATER RESOURCES



**Verification of Claimed Agricultural Lands
on the Hopi Indian Reservation**



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Statewide Planning**

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Text

1.0 INTRODUCTION

1.1 BACKGROUND

As part of the Little Colorado River (LCR) General Stream Adjudication, the Superior Court of Arizona has directed the Arizona Department of Water Resources (ADWR) to prepare a Hydrographic Survey Report (HSR) for the Hopi Indian Reservation (Ballinger, 2002). **Figure 1** shows the location of the Reservation. The Hopi have a long history of farming in the region, and their water right claims in the adjudication reflect this history.

The Hopi and the United States both claim that a total of 38,556 acres of Reservation land have been used for crop production, of which 1,042 acres are claimed as “precipitation farmed” (Hopi, 2004 and United States, 2004). They are claiming a maximum of approximately 49,200 acre-feet per year (AFA) of surface water diversions and spring discharge to irrigate 37,514 acres of cropped land. However, far less acreage has apparently been cropped by the Hopi in any given year. Historic records suggest that, since the 1870’s, a range of between 3,500 to 6,500 acres has typically been cropped annually on the Reservation (Anderson, 2008). ADWR (2008a) estimated that between 5,570 and 6,506 acres were cropped by the Hopi in 2005.

1.2 PURPOSE AND SCOPE

The Hopi agricultural claims represent a composite of all lands that they determined, through analysis of aerial photographs, had at one time been farmed on the Reservation. Between 1989 and 1994, a consultant and two subcontractors for the Tribe conducted a survey of previously cropped lands on Reservation. They reviewed aerial photographs spanning seven decades, from the mid-1930s through the early 1990s, by stereoscopic means. Using Mylar overlays, lands that they considered to have had evidence of cropping were outlined, color coded by year, and later transferred to a set of USGS topographic quadrangle maps (quads). Quality control and edge matching efforts were completed between 1991 and 1994. Agricultural lands identified on the quads were eventually digitized into Geographic Information System (GIS) polygons and hard copy maps provided to ADWR with their adjudication claims. **Appendix A** presents a summary by the Hopi consultants that describe their methodology.

ADWR has attempted to verify that the claimed Hopi agricultural lands were previously cropped by analyzing digital copies of the same photographs that were used by the Hopi consultants. This report provides the results from ADWR's analysis.

2.0 DATA SOURCES

2.1 CLAIMED AGRICULTURAL FIELDS

On behalf of the United States, Natural Resource Consulting Engineers (NRCE) sent ADWR a digital version of the claimed Hopi agricultural lands as a GIS shapefile. The original file sent contained 8,121 polygons (individual field boundaries) that represented a composite of all agricultural lands identified on the Reservation, with individual fields ranging in size from less than 0.0001 acres to over 2,400 acres. Subsequent review by ADWR suggested that some of the very small claimed fields were residual errors from digitizing (**Figure 2**). Included with each claimed field was information on irrigation type (perennial, spring, seasonal, range pasture, native and precipitation farming) and surface water drainage (Dinnebito, Jadito or Jedito, Moenkopi, Oraibi and Polacca).

Many of the claimed fields bordered one another. To reduce the number of fields for ADWR to verify while maintaining the same agricultural ‘footprint’, ADWR GIS staff employed the ArcGIS Dissolve tool (ESRI, 2008) to join or ‘dissolve’ contiguous fields. This reduced the number of individual claimed fields to verify from 8,121 to 2,214. Note that approximately 6.5 acres of the footprint were eliminated during the dissolve process, mostly because of slight overlaps between individual polygons in the original dataset.

Figure 3 provides an example of a cluster of 32 fields in the original claim. After ADWR joined fields that shared borders, the cluster was reduced to one, 120.5-acre parcel.

2.2 AERIAL PHOTOGRAPHS

ADWR used the same or similar aerial photographs for verification of the claimed agricultural lands as the Hopi contractors. This included photographs from the 1930s, 1950s, 1970s, 1980s, 1990s and 2005. With the exception of the most recent photographs from the 1990s and 2005, which had already been spatially referenced, ADWR had to georeference the scanned copies of each photograph before comparing them to the claimed fields. To georeference, ADWR adjusted the scale and rotation of the aerial photographs to match similar geographic features found in the 2005 photography. A brief description of the photographs that ADWR reviewed follows.

2.2.1 1930s Fairchild

ADWR received 1930s aerial photographs from the Arizona State University (ASU) Map Collection. The black and white photography came from the Navajo and Little Colorado projections of the Fairchild Surveys which were flown between 1934 through 1937. The original scale of the photographs was 1:30,000, with each covering approximately 15 minutes of latitude and 15 minutes of longitude, or about 240 square miles. ADWR found during its review that the latitude and longitude markings on some of these photographs were in error. **Figure 4** provides an index and an example of the 1930s photography.

2.2.2 1950s Army Map Service

The Bureau of Indian Affairs (BIA) provided ADWR with a scanned copy of a set of aerial photographs from the Army Map Service Collection that was flown between February 1954 and October 1955. As specified on the prints, the photographs were taken as part of USGS Projects VV-HU and VV-OA. Their original scale is believed to be between 1:30,000 and 1:37,400, with each photograph covering approximately 55 square miles. **Figure 5** provides a flight line index and an example of the 1950s photography.

2.2.3 1970s USGS

ADWR already had a copy of several aerial photographs flown by the USGS in the 1970s. Some individual photographs of the Reservation not in ADWR's collection were obtained from the ASU Map Collection. This set of black and white photographs was originally scaled at 1:24,000, with each photograph covering one 7.5-minute quad or approximately 60 square miles. **Figure 6** provides an index and an example of the 1970s photography.

2.2.4 1974 BIA

The BIA also provided ADWR with a scanned copy of a set of aerial photographs flown in 1974. Each of the 445 low-elevation aerial photographs covers approximately 7 square miles. The photography is black and white and there is significant overlap between neighboring images because the originals were taken as stereopairs. This high-quality photography only covers the District 6 portion of the Reservation. **Figure 7** provides an index and an example of the 1974 photography.

2.2.5 1980s NHAP

ADWR also obtained a scanned copy of 1980s aerial photography from the BIA. This imagery originated from the USGS National High Altitude Photography (NHAP) program. NHAP photography was taken at an altitude of 40,000 feet and processed over USGS 7.5-minute quads. Black and white photography obtained under the NHAP program was originally scaled at 1:80,000 (USGS, 2006a). Approximately 70 images along Flight Lines 81, 83 and 93 were provided. ADWR created mosaics of these images to simplify their analysis. Between four and eight individual images comprised each mosaic and each mosaic covered between 180 to 360 square miles. ADWR did not receive any 1980s photography from the BIA for the Moenkopi portion of the Reservation. **Figure 8** provides an index and an example of the 1980s photography.

2.2.6 1990s USGS NAPP

To review the claimed agricultural lands during the 1990s, ADWR used a set of black and white photography that the USGS had flown as part of its National Aerial Photography Program (NAPP). This imagery was taken at an altitude of 20,000 feet with the original prints centered on quarter sections of the 7.5-minute USGS quads (USGS, 2006b). In the vicinity of the Reservation, each original print covers approximately 15 square miles. ADWR used a mosaic of the dataset that had been compressed into an Enhanced Compressed Wavelet (ECW) format for each half degree or 30 minute section. The ECWs were compressed in 2002 by the Arizona State Land Department with some loss in resolution from the originals. ADWR was unable to obtain the original, uncompressed images. **Figure 9** provides an index and an example of the 1990s photography.

2.2.7 2005 US Census Imagery

ADWR also reviewed the claimed agricultural lands using aerial photography flown between June and October 2005 for the U.S. Census (SCO, 2005). ADWR obtained the imagery as county mosaics that had been compressed into a multi-resolution, seamless image database (MrSID) format. The one-meter pixel resolution, color imagery covered the entire Reservation and was collected at a scale of 1:40,000 (flown approximately 20,000 feet above ground). **Figure 10** provides an index and an example of the 2005 photography.

3.0 ADWR METHODOLOGY

3.1 FIELDS SELECTED FOR VERIFICATION

After joining contiguous claimed fields, ADWR staff randomly reviewed about 25% of the resulting fields that covered between 0 and 10 acres, about 50% of the fields that covered between 10 and 100 acres, and 100% of the fields that covered more than 100 acres. **Table 1** summarizes the number of fields that ADWR selected for verification. Overall, 34% of the 2,214 joined fields were reviewed, representing 76% of the total claimed acreage.

3.2 GEODATABASE DESIGN

Data associated with the 2,214 joined fields that comprise the Hopi agricultural claim were stored in a Microsoft Access file and queried using a personal geodatabase designed in ESRI's ArcCatalog 9.2. Locational data were referenced to the North American Datum of 1983 (NAD83), and projected as High Accuracy Reference Network (HARN) Universal Transverse Mercator (UTM) coordinates. Whether a field was selected for verification by ADWR, evidence of agriculture based on ADWR's review of the aerial photography, and various other information were also stored in the geodatabase.

Table 2 lists the specific data (attributes) stored in the geodatabase for each field and **Table 3** lists the levels of evidence that ADWR found of agriculture. The latter is discussed further in **Section 3.4**.

3.3 PREPARATION OF AERIAL PHOTOGRAPHS

Most of the aerial photography available to ADWR for field verification effort was scanned, digital versions of hard-copy prints that had been stored as Tagged Image File Format (TIFF) images. The photography often lacked a spatial reference and had to be georeferenced and indexed by ADWR before it could be reviewed.

3.3.1 Georeferencing

The following steps were taken by ADWR GIS staff to spatially reference the aerial photographs:

1. The images were added to a project file containing locational information including boundaries of the Reservation and USGS quads, latitude and longitude lines, and the 2005 imagery;
2. Using the ArcGIS Georeferencing Toolbar, the images were rotated so that north was up;
3. Several control points were added that provided map coordinates for known positions on each image. Known positions could include a distinct geologic feature, a road intersection or even a unique tree. By adding control points, the scale of the images was automatically adjusted and the images were rotated to a more accurate position;
4. Georeferencing data were saved when the analyst was satisfied with the final alignment or 'registration' of the images; and
5. The registered images were transferred to a new file for later analysis.

3.3.2 Indexing

ADWR created indices for most of the aerial photographs that it reviewed. Indices for the 1930s Fairchild and 1970s USGS photographs were based on USGS quad boundaries, with each 1970s photograph corresponding to a 1:24,000 quad and each 1930s photograph corresponding to four 1:24,000 quads. An index for the 1950s photographs was developed based on the associated flight lines and an index for 1980s photography consisted of 13 'tiles' with each tile representing a mosaic of several individual photographs.

3.4 ANALYSIS OF AERIAL PHOTOGRAPHY

After the geodatabase was designed and the aerial photography georeferenced and indexed, ADWR began to review the claimed fields that it had selected for verification. The following levels of evidence were used by ADWR to record whether it had verified agricultural activity:

- If there was photographic evidence of agriculture across an entire field in a given year, ADWR’s observation was recorded in the database and coded for that year as “Yes”;
- If only part of a selected field showed evidence of agriculture, ADWR’s observation was recorded for that year as “Partial”;
- If, due to poor image quality, it was difficult to determine if agriculture had actually occurred in an area, ADWR’s observation for that year was recorded as a “Questionable”;
- If there was no evidence of agricultural activity on any part of the field in a given year, ADWR’s observation was recorded as “No”;
- If there was already evidence of agriculture in another year, the analyst did not review the photography for additional years and recorded ADWR’s observation as “Not Reviewed”;
- and
- In some areas of the Reservation, aerial photography was unavailable for a given year, in which case ADWR’s observation was recorded as “No Coverage”.

These levels of evidence are further summarized in **Table 3**.

Because the claimed Hopi agricultural lands represent a composite of any farming activity occurring on the Reservation from the 1930s onward, ADWR only attempted to verify that a given field had been cropped at least once during this period. Once convincing evidence was found, ADWR’s review of other photography could stop. Alternatively, if no evidence was found in a given year, other available photography was analyzed by ADWR and all of the evidence combined. A ‘composite’ determination was then entered into the geodatabase

Figure 11 shows the methodology flowchart used to determine whether a claimed Hopi field had been verified by ADWR. Note that ADWR did not attempt to verify the type of irrigation that had been claimed for each field, only whether there was photographic evidence that the claimed agricultural lands had been previously cropped.

4.0 RESULTS

Table 4 summarizes ADWR's verification results. ADWR reviewed 29,399 acres or 76% of the total claimed agricultural acreage on the Reservation. Of the acreage that ADWR reviewed:

- About 11% was found to have complete evidence of agricultural activity;
- About 55% was found to have partial evidence of agricultural activity in one or more years; and
- About 34% was found to have either questionable or no evidence of agricultural activity in the available photography.

In **Table 5**, ADWR estimates the evidence of agriculture for the entire claim based on extrapolating the results from the claimed fields that ADWR did attempt to verify. The total claimed acreage (38,565) was multiplied by the percentage of fields that ADWR determined had complete, partial, questionable or no evidence of agriculture. Based on this extrapolation, ADWR estimates that *there is convincing or partial evidence of farming on 25,261 acres of the Reservation that were claimed as agricultural lands and questionable or no evidence of farming on the other 13,304 acres that were claimed for this purpose.* Note that it is possible that portions of the estimated 5,760 'questionable' acres have been used for agriculture, but the photographic evidence was inconclusive.

Appendix B presents a series of USGS quads that show the location of claimed agricultural lands by irrigation type and the results of ADWR's analysis. Also shown on the quads are drainages with runoff areas of 0.01, 0.1, and 1.0 square kilometers. ADWR (2008b) used digital elevation model (DEM) data and geospatial modeling to derive these drainages. The modeled drainages suggest that all or portions of most claimed fields may obtain water from surface runoff. An index map is included in the appendix that shows the location of the 54 quads where Hopi agriculture is claimed.

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Tables

TABLE 1. FIELDS SELECTED BY ADWR FOR VERIFICATION

Acreage Range	Field Selection	Field Count¹	Total Acreage²	Percentage of Fields Reviewed Within Acreage Range	Percentage of Total Fields Reviewed	Percentage of Total Acreage Reviewed
0 to 10 acres	Not Reviewed	1,242	3,818	26.51%	20.23%	3.51%
	Reviewed	448	1,354			
	<i>Subtotal</i>	<i>1,690</i>	<i>5,172</i>			
10 to 100 acres	Not Reviewed	216	5,348	53.15%	11.07%	18.27%
	Reviewed	245	7,046			
	<i>Subtotal</i>	<i>461</i>	<i>12,393</i>			
>100 acres	Not Reviewed	0	0	100.00%	2.85%	54.45%
	Reviewed	63	21,000			
	<i>Subtotal</i>	<i>63</i>	<i>21,000</i>			
All Acreage Ranges	Total	2,214	38,565	---	34.15%	76.23%

Notes:

¹ A total of 8,210 individual fields were claimed. ADWR reduced this number to 2,214 by joining fields that bordered each other.

² The total acreage of agricultural lands listed in the claims (38,556) was slightly lower than that shown on maps provided to ADWR by the claimants (38,565).

TABLE 2. ATTRIBUTES OF AGRICULTURAL FIELDS STORED IN GEODATABASE

NAME	DESCRIPTION	TYPE	DOMAIN
OBJECTID	Auto Number assigned by ArcGIS	Integer	
SHAPE	Automatically generated geometric calculation	Object Linking & Embedding (OLE)	
Ag_1930s	Evidence of agriculture by given year(s) of aerial photography	Text	Y = Yes P = Partial Q = Questionable N = No NS= Not Selected For Review NC=No Coverage NR=Not reviewed due to evidence found in alternate year(s) R=More Review Needed
Ag_1954			
Ag_1970s			
Ag_1974			
Ag_1980s			
Ag_1990s			
Ag_2005			
Complete	Record of whether the review of a field had been completed	Text	Y = Yes N = No
Comp_Evidence	Combined or 'composite' evidence	Text	Y = Yes P = Partial Q = Questionable N = No NS= Not Selected For Review
Remarks_1930s	Remarks on evidence	Text	
Remarks_1954			
Remarks_1970s			
Remarks_1974			
Remarks_1980s			
Remarks_1990s			
Remarks_2005			
Pre_Select	Was field selected for verification	Text	Y = Yes N = No
Reviewer1	ADWR staff that conducted the primary verification	Text	WRWDM=Bill Musielak WRCLB = Carol Birks
Reviewer2	ADWR staff that conducted the secondary verification	Text	
SHAPE_Length	Automatically generated geometric calculation	Number	
SHAPE_Area	Automatically generated geometric calculation	Number	
Acres	Acreeage of field	Number	
Acreeage_Range	Acreeage range of field	Text	Either 0-10, 10-100 or 100+

TABLE 3. LEVELS OF EVIDENCE USED BY ADWR TO SPECIFY WHETHER FIELD WAS PREVIOUSLY CROPPED

DATABASE CODE	LEVEL OF EVIDENCE	EXPLANATION
Y	Yes (Complete)	Convincing evidence of agriculture within the entire claimed area
P	Partial	Convincing evidence of agriculture within part of claimed area
Q	Questionable	Inconclusive evidence of agriculture within claimed area
N	No	No convincing evidence of agriculture within claimed area
NS	Not Selected	Field not selected for verification
NC	No Coverage	Aerial photography not available in given year for claimed area
NR	Not Reviewed	Not reviewed since convincing evidence found in other year(s)

TABLE 4. ADWR VERIFICATION RESULTS

EVIDENCE OF AGRICULTURE?	NUMBER OF JOINED FIELDS	CLAIMED ACREAGE	PERCENTAGE OF ACREAGE REVIEWED	PERCENTAGE OF TOTAL ACREAGE CLAIMED
Complete	147	3,192	10.86%	8.28%
Partial	222	16,065	54.64%	41.66%
Questionable	204	4,391	14.94%	11.39%
No	183	5,751	19.56%	14.91%
Total Reviewed	756	29,399	100.00%	76.23%
Not Selected For Review	1,458	9,166	---	23.77%
Total Claim	2,214	38,565	---	100.00%

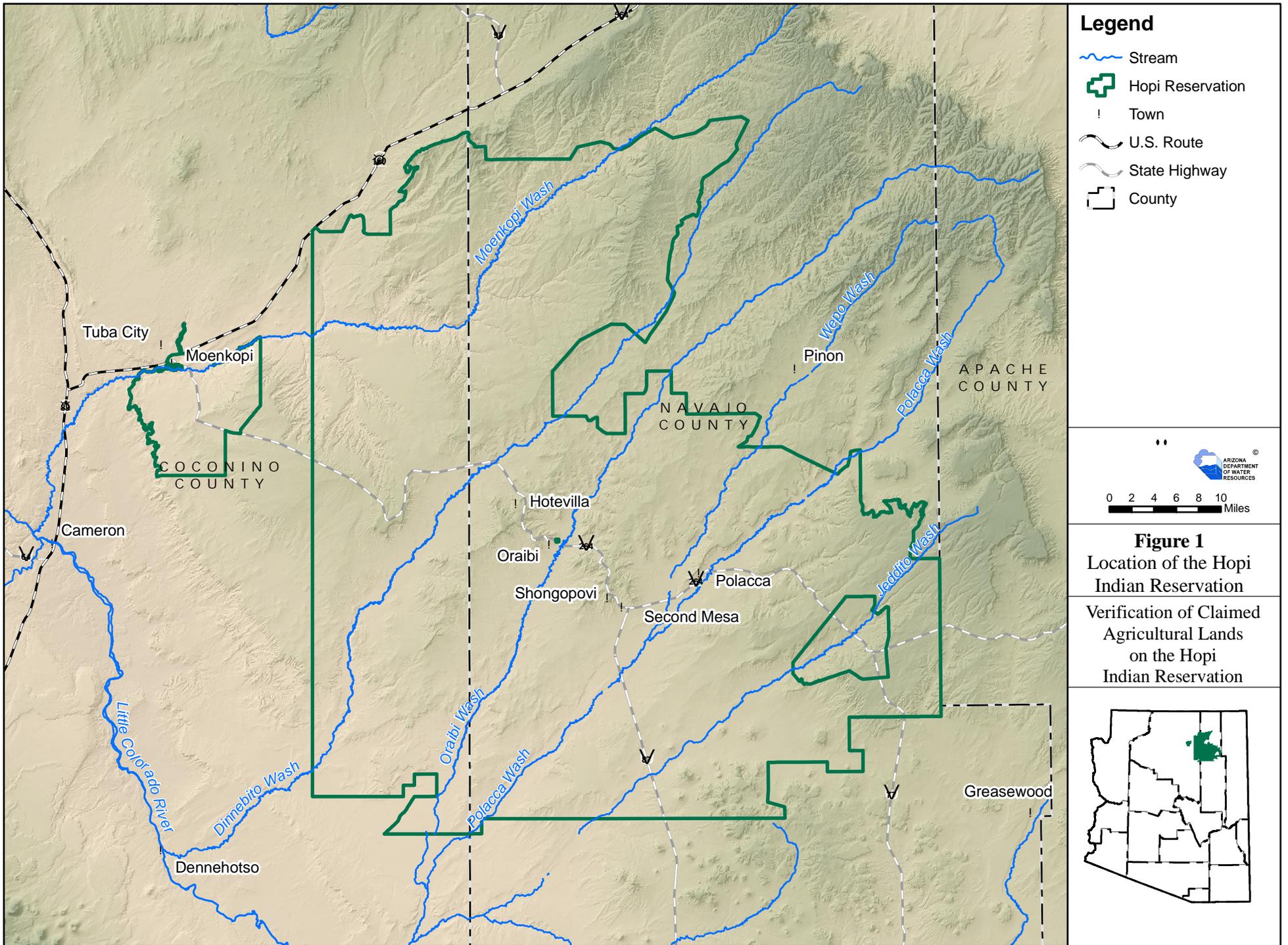
TABLE 5. ADWR ESTIMATE OF PREVIOUSLY CROPPED ACREAGE¹

EVIDENCE OF AGRICULTURE?	PERCENTAGE OF ACREAGE	ESTIMATED ACREAGE
Complete	10.86%	4,187
Partial	54.64%	21,074
Questionable	14.94%	5,760
No	19.56%	7,544
<i>Total Claim</i>	<i>100.00%</i>	<i>38,565</i>

Note:

¹ Based on extrapolating ADWR's verification results from **Table 4** to the fields that it did not select for review. In other words, the total claimed acreage (38,565) was multiplied by the percentage of fields that ADWR determined had complete, partial, questionable or no evidence of agriculture.

Figures



Legend

-  Stream
-  Hopi Reservation
-  Town
-  U.S. Route
-  State Highway
-  County

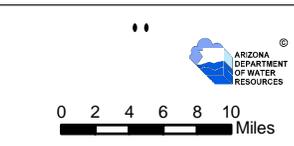
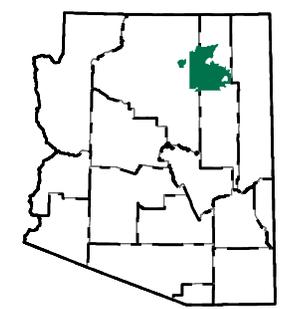
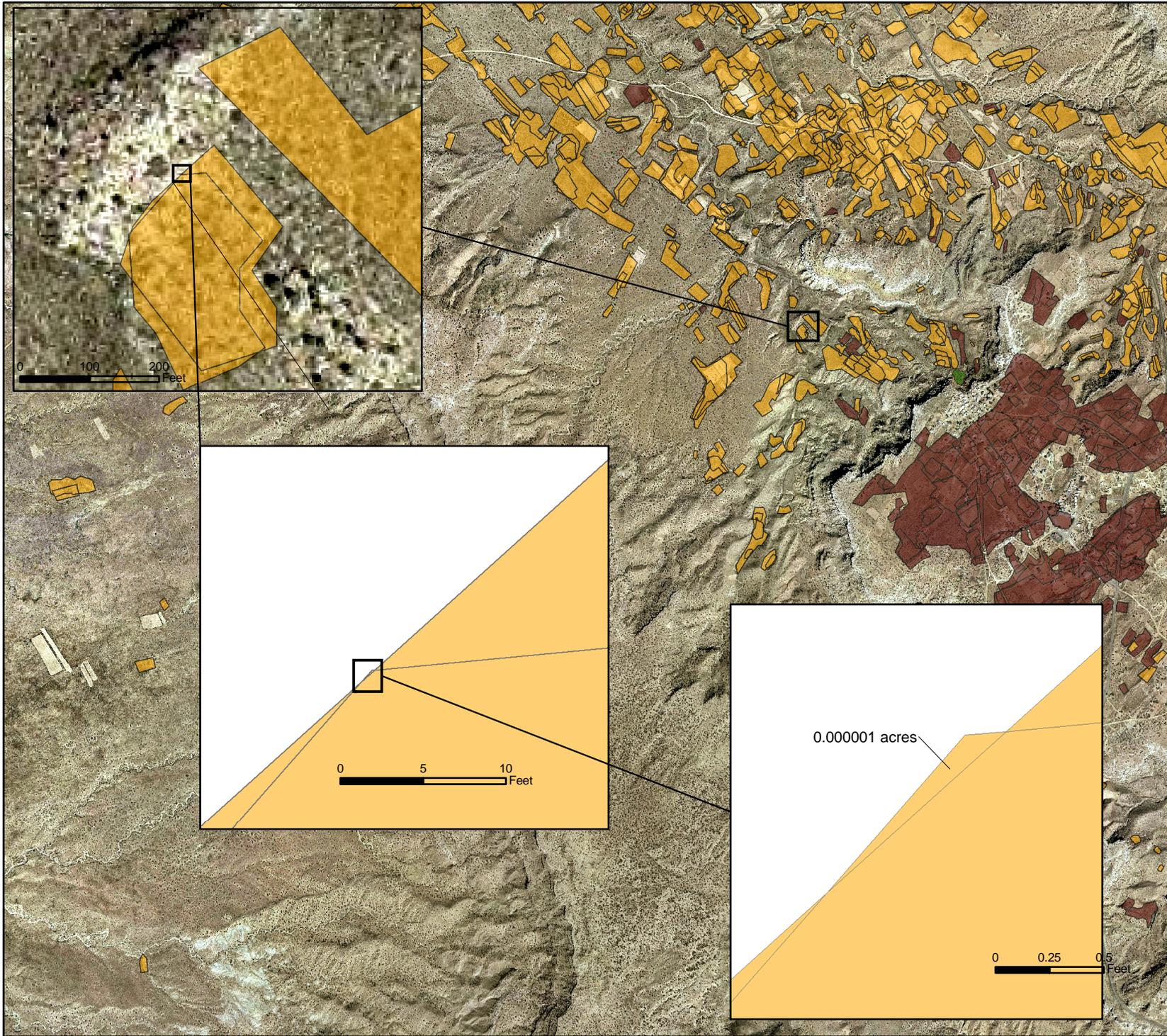


Figure 1
 Location of the Hopi Indian Reservation
 Verification of Claimed Agricultural Lands on the Hopi Indian Reservation





- Legend**
- Claimed Irrigation Type**
- Spring
 - Native
 - Precipitation Farming
 - Hopi Reservation

Basemap: 2005 Census Imagery

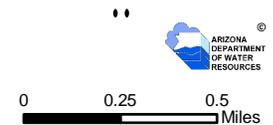
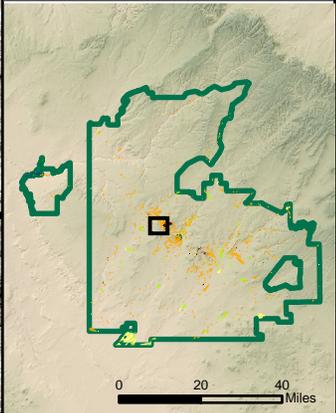
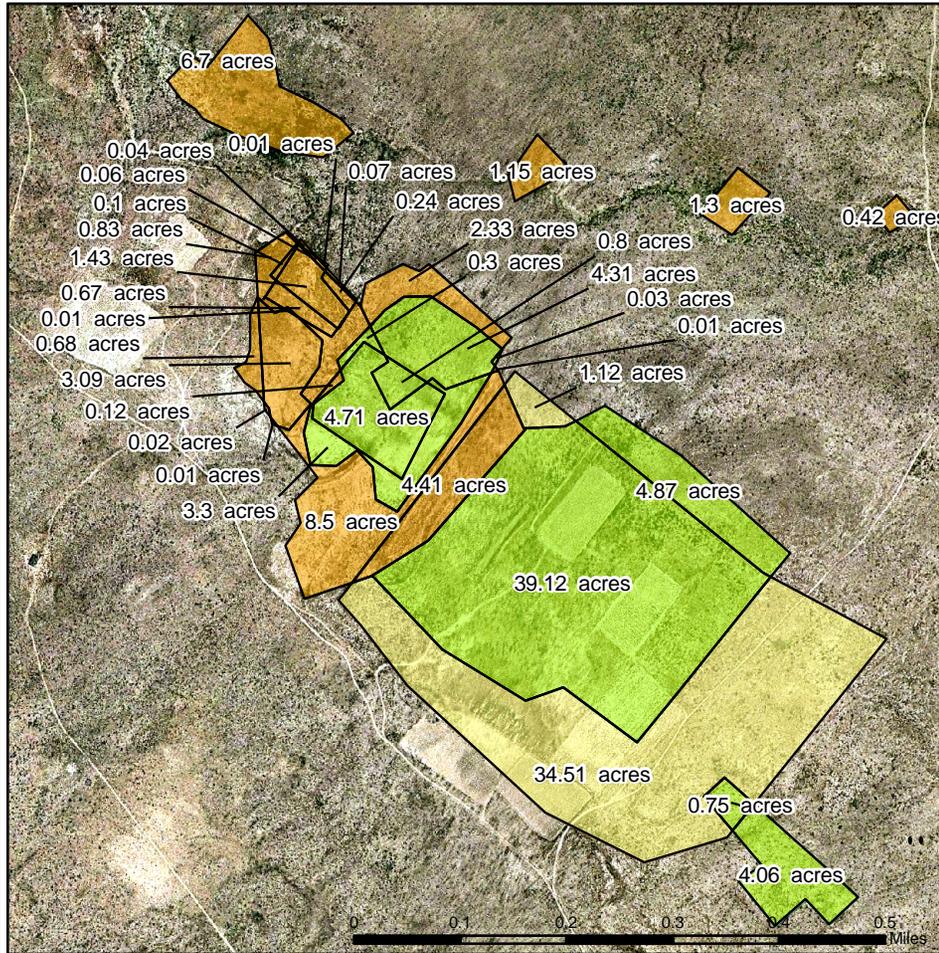


Figure 2
 Example of Very Small Fields in Original Claim

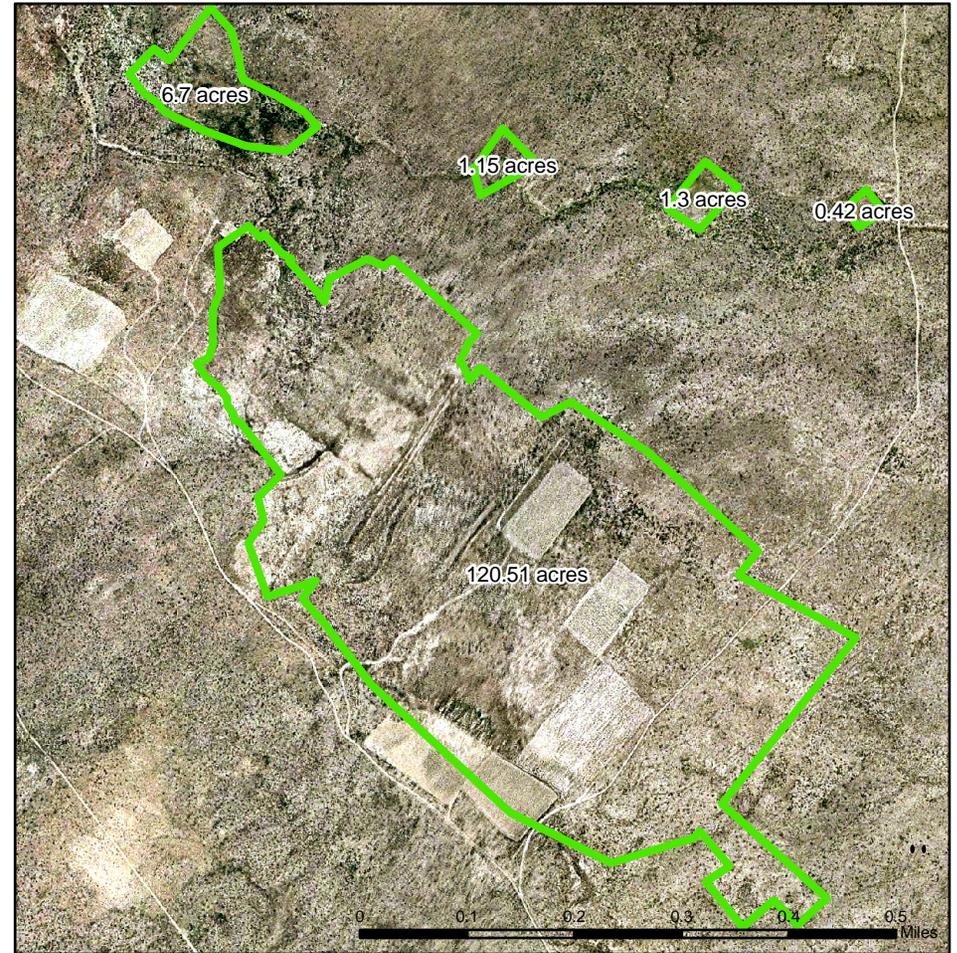
Verification of Claimed Agricultural Lands on the Hopi Indian Reservation



Original, Individually Claimed Fields



Joined Fields Analyzed by ADWR



Claimed Irrigation Type

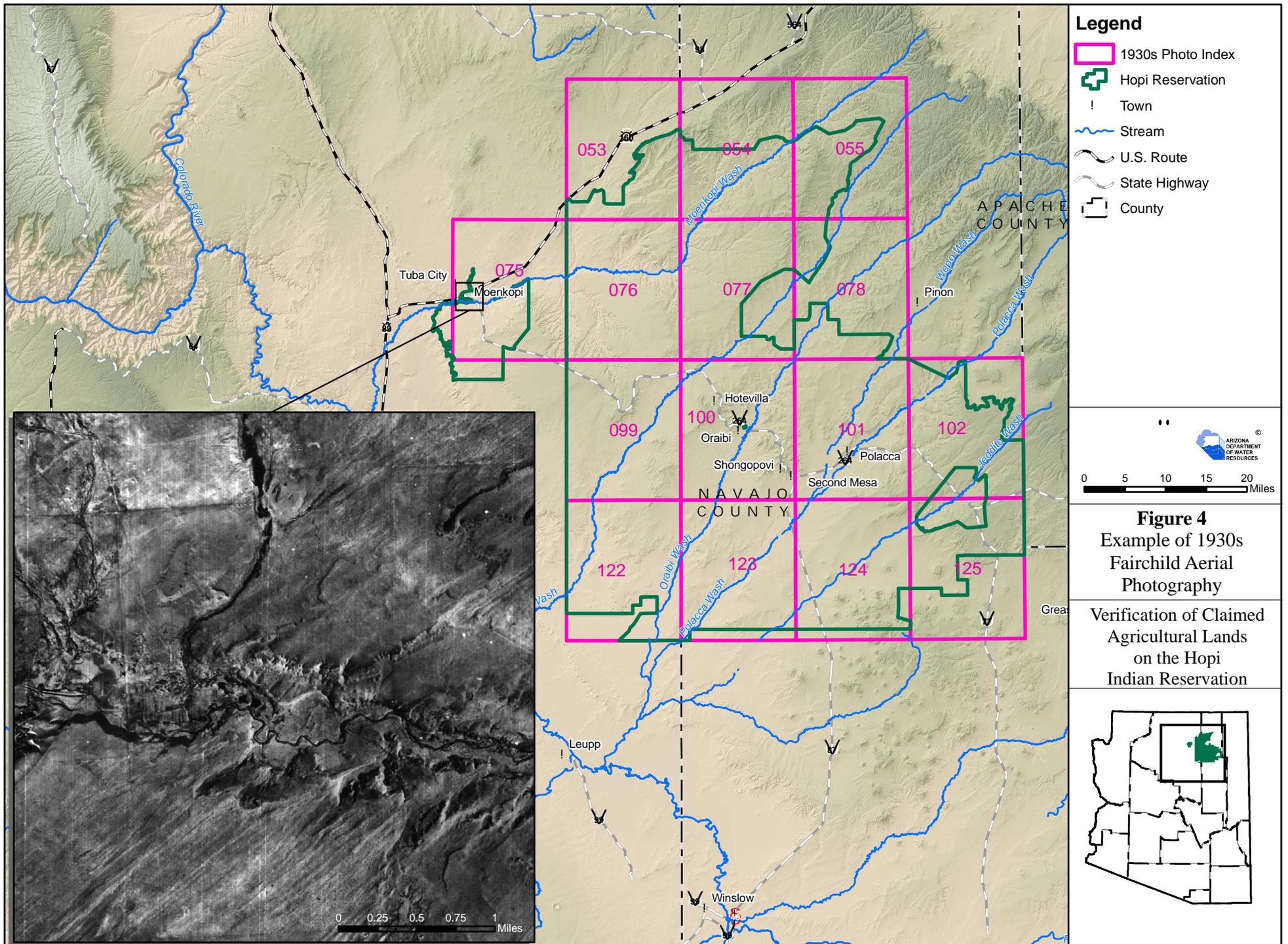
- Seasonal
- Range Pasture
- Native
- Final Outline of Joined Fields

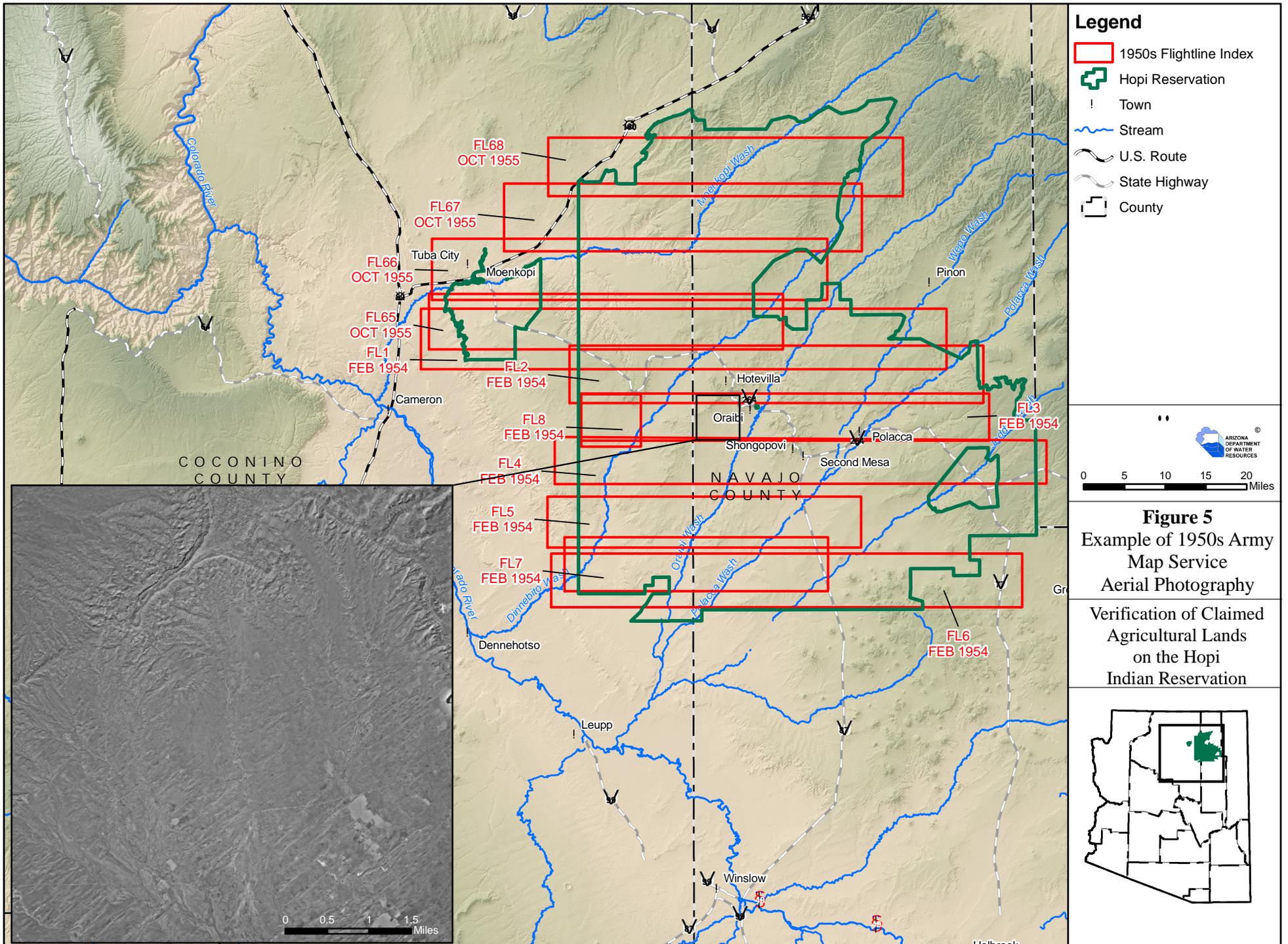
Figure 3
Example of Claimed Fields
Joined by ADWR before
Analysis

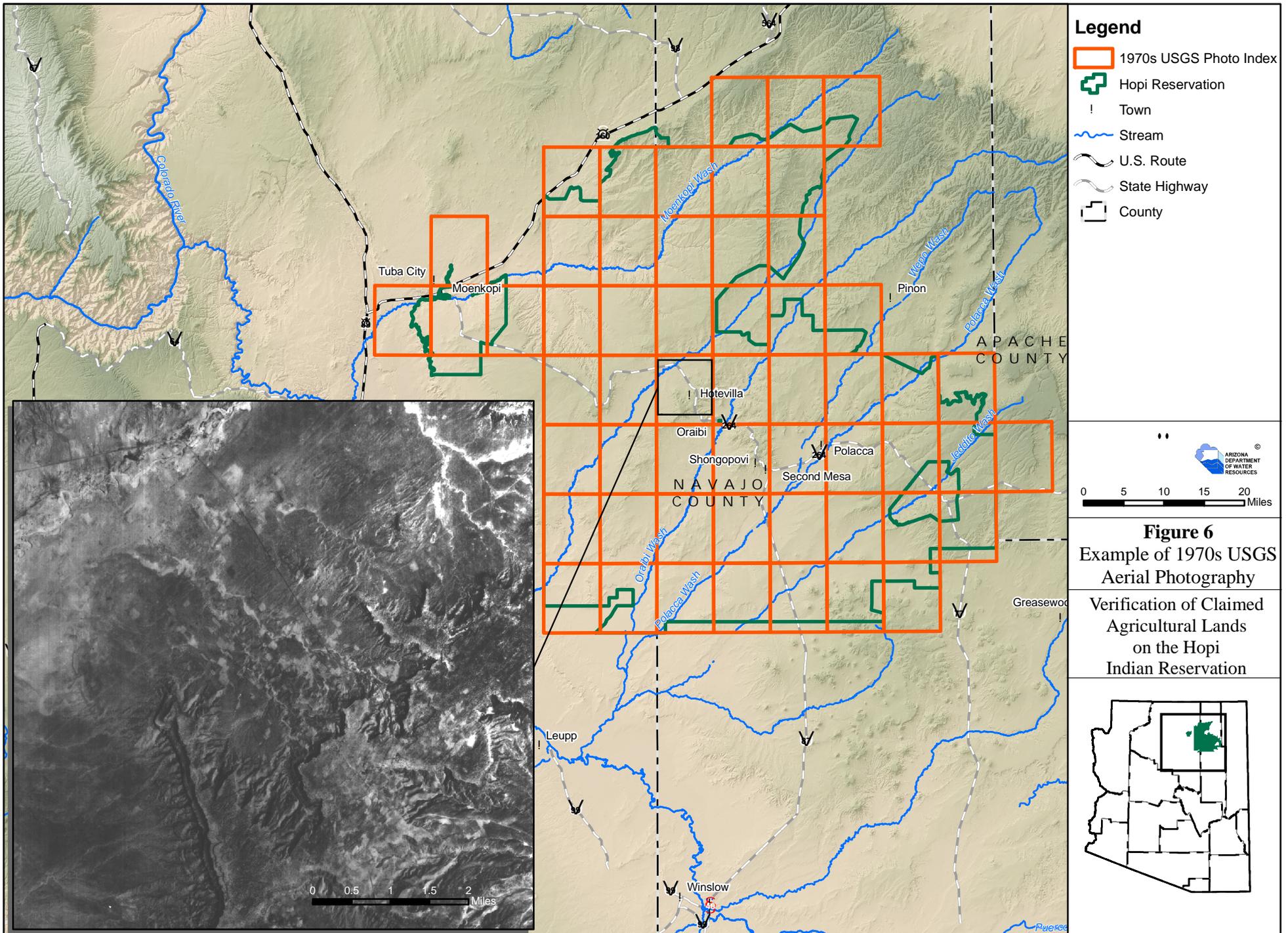
Verification of Claimed
Agricultural Lands
on the Hopi
Indian Reservation

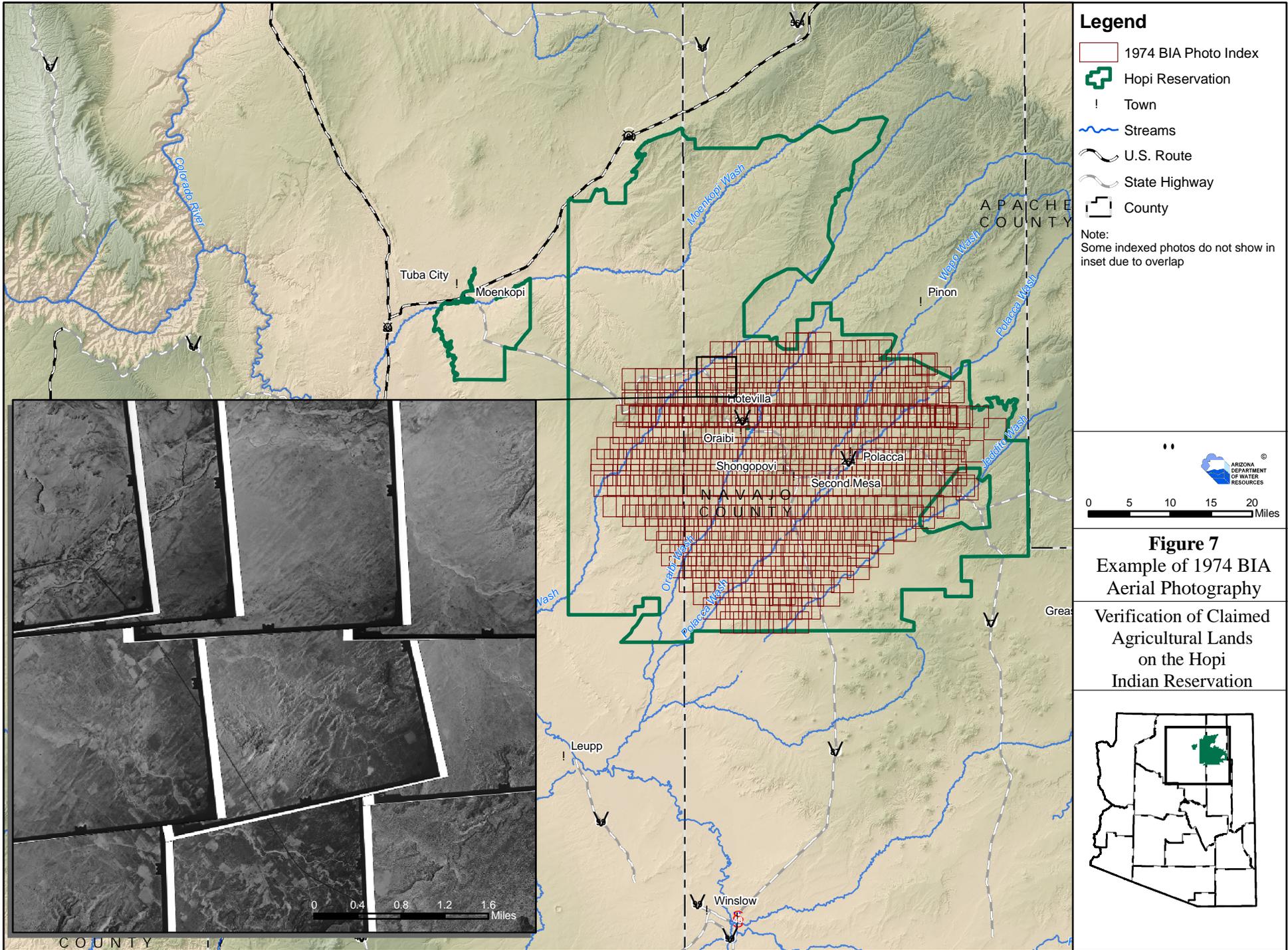


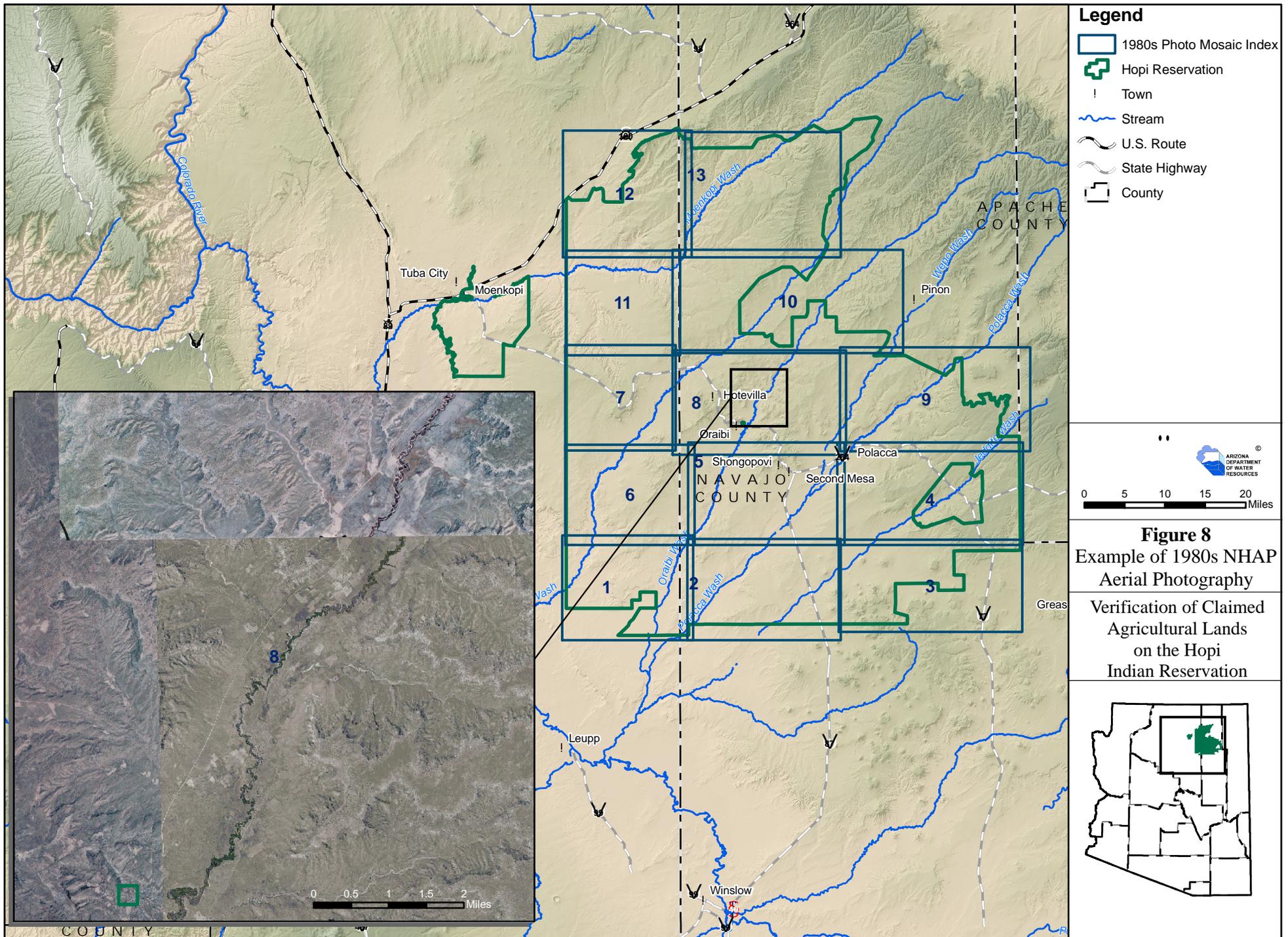
Basemap: 2005 Census Imagery

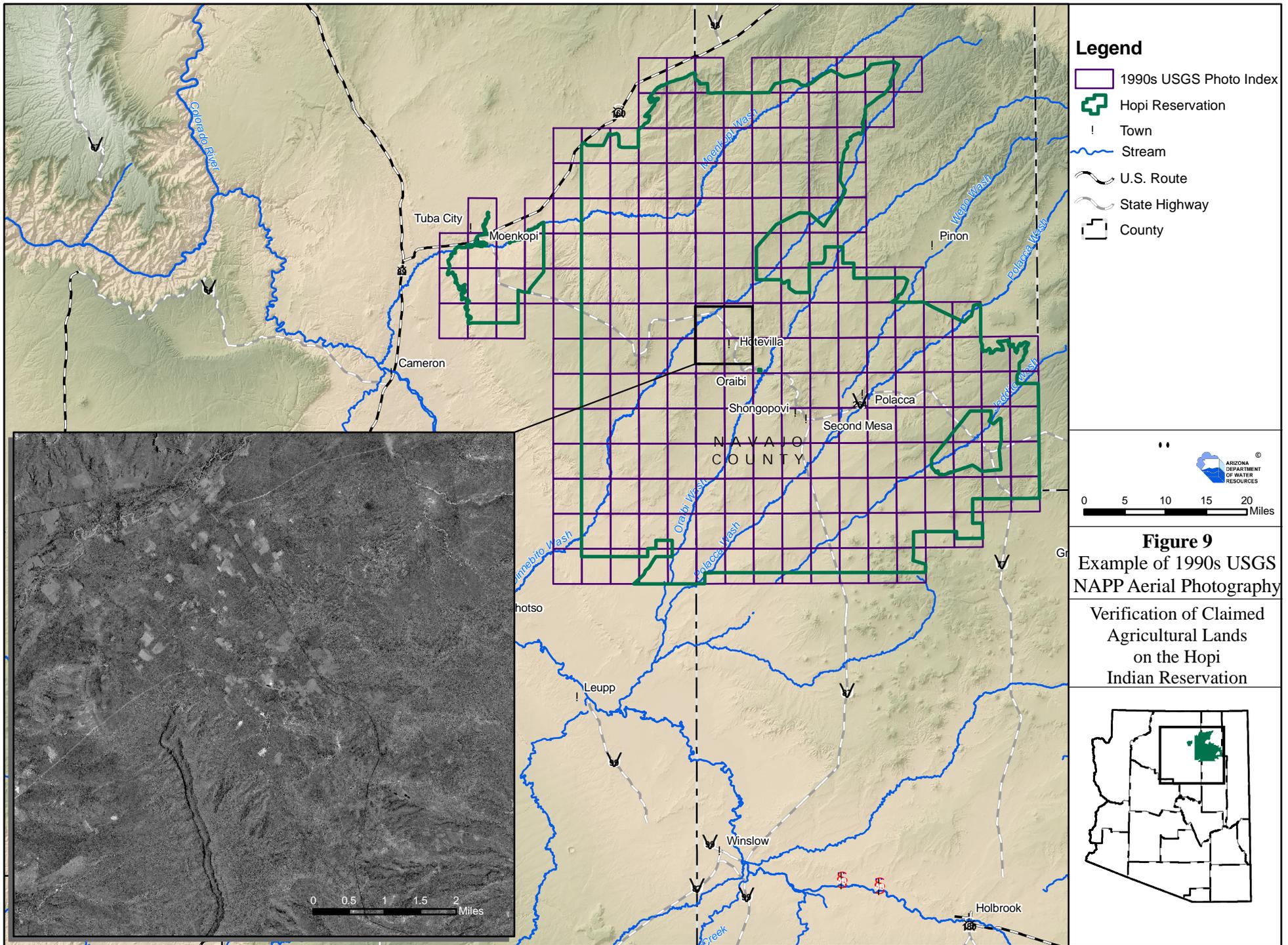


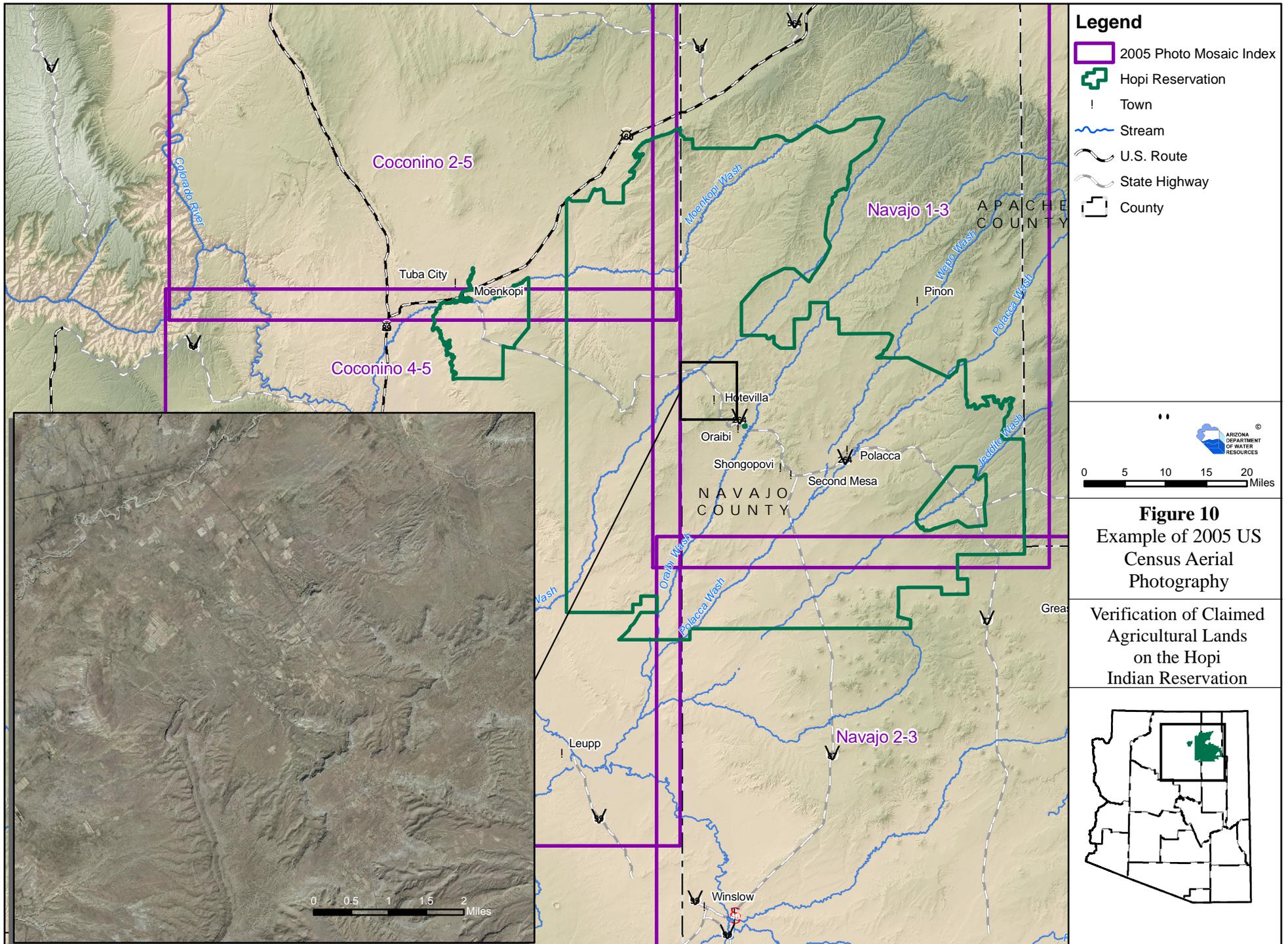












Legend

-  2005 Photo Mosaic Index
-  Hopi Reservation
-  Town
-  Stream
-  U.S. Route
-  State Highway
-  County

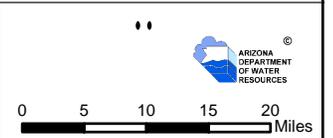
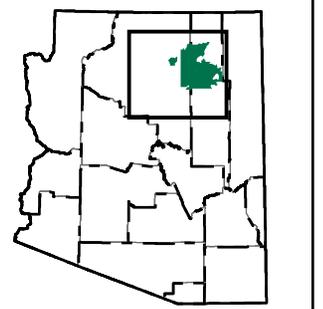


Figure 10
Example of 2005 US
Census Aerial
Photography

Verification of Claimed
Agricultural Lands
on the Hopi
Indian Reservation



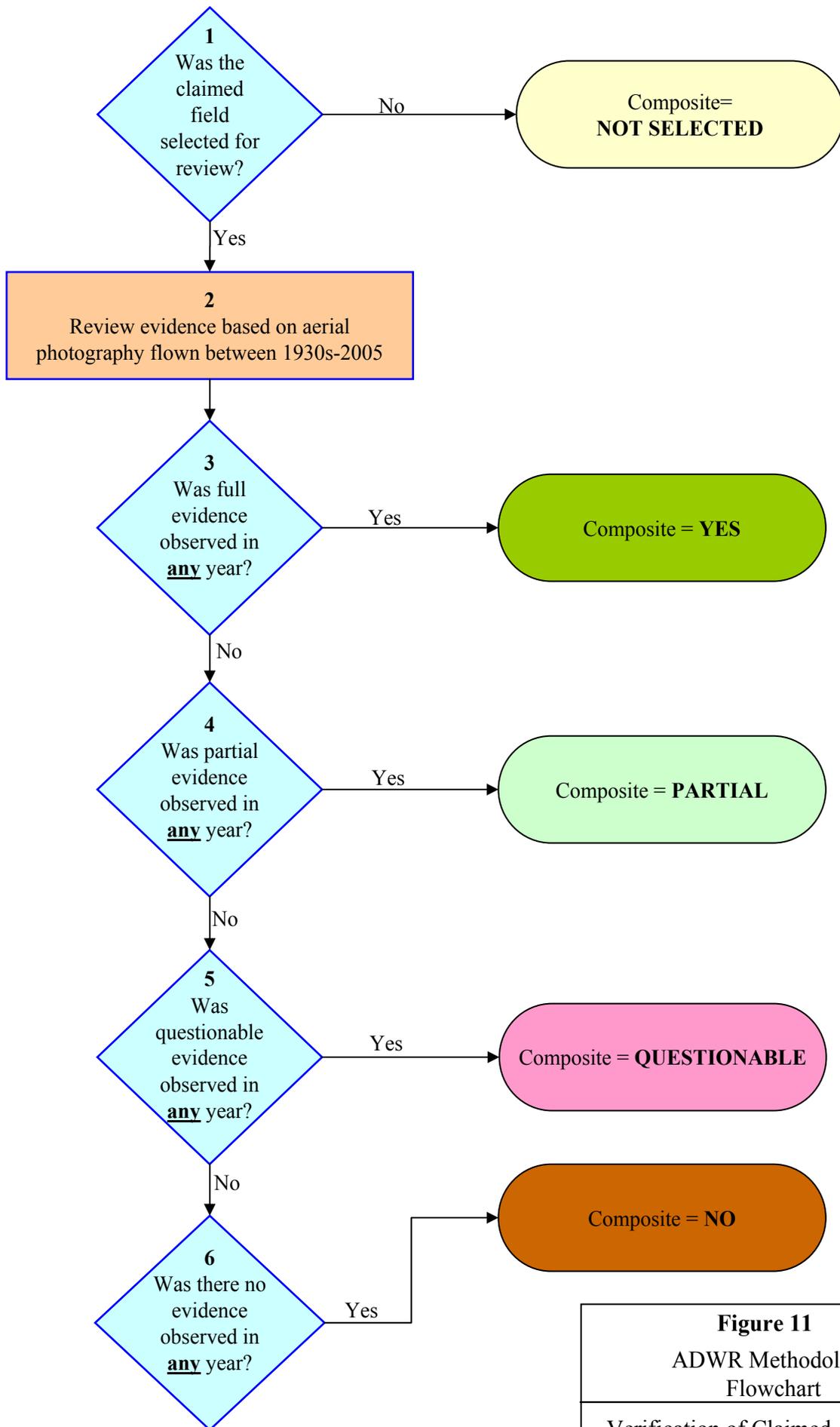


Figure 11
ADWR Methodology
Flowchart
Verification of Claimed Agricultural
Lands on the Hopi Indian Reservation

Appendix A

INVENTORY
Little Colorado River
(Lands with a History of Irrigation)
Edward L. "Gonzo" Gonzales and Assoc.

Survey History

My involvement in the Little Colorado River Basin inventory began on December 4 and 5, 1989 during a work session with the Arizona Department of water resources.

At this meeting an agreement was reached that the U.S.G.S. 7.5 Topographic quad maps would be the base for our water resource inventory.

The survey area consists of 231 quad maps covering over eight million acres. (Exhibit 1 and 2)

The first task was to acquire copies of the above mentioned maps, and various years of aerial photography. A 1980 series of aerial photography was selected as the base for the survey. The earliest aerial photography for the area is from 1934-1936. There are other subsequent years of photography that supplemented the inventory (Exhibit 3)

A standard system was adopted by the B.I.A. staff, and the contractors for the classification of land. (Exhibit 4) This method of classification is intended to provide meaningful separation among a great variety of parcels of land with a history of irrigation as possible.

Exhibit 4 will reflect a great variety of types of farming, and irrigation. Beside the lands with a history of irrigation, other water uses needed to be inventoried. This included springs, seeps, wells for domestic, stock and other commercial, and industrial uses. Stock ponds gathering rain, and snow run off are also a part of this inventory.

The Navajo, and Hopi tribes elected to do their own survey of these resources, with oversight by the Albuquerque B.I.A. office.

As lead contractor working with the B.I.A. staff, and other consultants, work commenced in early 1990 on the project.

I reviewed all the aerial photography by stereoscopic means. This was done with a Skkisha TRA2 tracking stereoscope. Two other subcontractors were employed to stereo review the aerial photography, so as to have two independent classifications of lands with a history of irrigation.

These firms, Soils and Water West, headed by Cliff Landers, and Ebert and Associates, headed by Jim Ebert are both from Albuquerque and have many years of experience in aerial photo interpretation.

The aerial photos from various years were exchanged on a regular basis to expedite the project.

The stereo photo interpretations of lands with a history of irrigation were outlined on clear mylar overlays covering the aerial photos. This data was then transferred to the 1980 base photography with different colors representing various years of photography. A concise comparison of both stereoscopic reviews was made, and adjusted where necessary. The compilation of the data plots were transferred to a set of reduced U.S.G.S. topographic quads that had been scale matched to the 1980 photographic base.

The project was divided with Soil & Water West doing the western half, and Ebert and Associates the eastern half by stereoscopic photo review.

Thousands of aerial photos were reviewed as part of the project. My firm, Edward L. Gonzales and Assoc. was the lead contractor to develop the final map product from the data gathered in the study.

During the course of photographic review, questioned areas were personally inspected in the field in great detail as the on going part of the inventory, in conjunction with the B.I.A. staff and other project contractors.

The flight lines were given a number for each 7.5 minutes of longitude starting with the most westerly line being line 1. The system closed with flight line 24 at the Arizona-New Mexico border. Exhibit 2.

Base draft U.S.G.S. topographic maps were complete with various years of data. They were then delivered to Ebert and Associates of Albuquerque where they were digitized.

Joint work sessions were held between contractors for purpose of quality control, and map edge matching. The majority of this work was completed during the 1991, 1994 period. The original aerial photos, and maps used on this project are all archived at the Albuquerque office of the B.I.A. Rights Protection Division.

The digitized data base contains photointerpretive mapping and compilation efforts undertaken by Soils & Water West, Ebert and Associates, and Edward L. Gonzales & Assoc., B.I.A. staff members John Cawley, and Chris Banet were very instrumental in guiding the massive compilation project to its present state.

All of the data has been digitized by Ebert and Associates. The final use of this information now awaits guidance from legal council involved with this suit.

Xerox copies of sample printouts at various scales are part of this report as exhibits 8, 9, and 10.

Now with the closing of this report, all back-up data will be returned to the Bureau of Indian Affairs Office in Albuquerque for storage.

I will be available for any discussion on this project as the need arises.

Respectfully submitted,
January 1997

A handwritten signature in cursive script, appearing to read "Edward L. Gonzales".

Edward L. Gonzales and Assoc.

CLASSIFICATION OF FARMED LANDS BY PHOTO INTERPRETATION
on Indian Lands
in the Little Colorado River Watershed

The US photo interpretation team has devised a system for classification of farmed lands identified on photography. The system is intended primarily to separate the farmed lands into types of farming for which there will be a significantly different water claim. The system will identify the primary source (surface, ground or precipitation) of water used for a particular parcel of farmed land. Additionally, it will identify the year of photography on which a parcel has been identified, and the degree of confidence which the interpreter has in an identification. This method of classification is intended to provide a meaningful separation amongst a great variety of parcels of farmed lands, while remaining as simple as possible.

The system uses a tripartite symbol. The first part of the symbol is a number which incorporates the type of farming and the source of farm water. The second part is a letter relating to the degree of the interpreter's confidence. The third part is a number which identifies the year of photography which the parcel has been identified on.

+ First part of the symbol (farming type) definitions:

1. Perennial irrigation: perennial surface water is available to the parcel, conveyed by permanent structures.
2. Seasonal irrigation: seasonal surface water available to parcel and used on planted fields; water is conveyed by structures, ranging from spreader dike to diversion with ditches (these can be temporary structures).
3. Range pasture irrigation: seasonal surface water available to parcel and used to improve range for pasture; water is conveyed by structures, ranging from spreader dike to diversion with ditches (these can be temporary structures).
4. Native irrigation: seasonal surface water available to parcel and water control structures are at a minimum. Water arrives at the structure by strategic placement of the parcel rather than by conveyance of the water.
5. Well irrigation: perennial ground water available to the parcel, distributed from a well.
6. Spring irrigation: perennial ground water available to parcel, distributed from a spring.
7. Seepage irrigation: perennial ground water available to parcel, distributed from a seep.
8. Precipitation farming of orchards: the main source of water to the parcel is precipitation which is used for the growing of tree crops.
9. Precipitation farming orchards: the main source of water to the parcel is precipitation which is used for crops other than trees.
10. Behind the dike irrigation range pasture irrigation: seasonal surface water available to parcel, retained at the site of the parcel by a dike, berm, dam, or similar structure.

Types 1 - 4 and 10 are surface water types; 5 - 7 are ground water types; 8 and 9 are precipitation water types.

+ Second part of symbol (confidence level) definitions:

H - an aitch indicates that the interpreter has a high degree of confidence that the parcel has been farmed and conforms to one of the types defined above.

M - an em indicates that the interpreter has a medium degree of confidence in the parcel identification.

L - an el indicates that the interpreter has a low degree of confidence in the parcel identification.

The degree of confidence will in part determine the need for ground verification of parcels.

+ Third part of symbol (year of photography):

This indicates the year of photography on which a parcel was identified.

↓ Examples of identifying symbols: 4H81, 3M81, 2M34, 6H52, 9H81, 4L81, 1H34

D R A F T

**Aerial photography used to identify farmed lands
within the Indian lands of the
Little Colorado River watershed.**

- 1935 - Black and white photography of Fairchild surveys from the Navajo and Little Colorado projects. Various parts of the projects were flown in 1934, 1935, 1936, and 1937. Contact prints used at scale of 1:30,000. Interpretation of entire project area was made from these.
- 1952 - Black and white photography, USGS project GS-WH. Contact prints used at scale of 1:20,000. Interpretation of eastern side of project area (Greasewood to Red Lake) was made from these.
- 1953 - Black and white photography, USGS project GS-VAX. Contact prints used at scale of 1:37,400. Interpretation of the area along the Little Colorado river itself was made from these.
- 1954 - Black and white photography, 1954 of the Army map service. Two time enlargements used at scale of 1:30,000. Interpretation of the Tolani lakes area, Moenkopi/Tuba City area and Hopi district 6 was made from these.
- 1954 - Black and white photography, USGS project GS-VCF. Contact prints were used at scale of 1:37,400. Interpretation of the area near the confluence of the Little Colorado and Big Colorado was made from these.
- 1967 - Black and white photography, USGS project GS-SWBT. Contact prints used at scale of 1:12,000. Interpretation of the area along the Little Colorado river itself near Winslow was made from these.
- 1980 - Color infrared photography of National High Altitude Photography (NHAP) program. Two time enlargements were used at scale of 1:30,000. Interpretation of entire project area was made from these. Some of these were flown during 1981, 1983, 1984 and 1986.
- 1988 - Black and white photography of BIA Leupp project, north portion. Contact prints were used at scale of 1:24,000. Interpretation of Tolani Lakes area was made from these.
- 1990 - Black and white photography of BIA Leupp project, south portion. Contact prints were used at scale of 1:24,000. Interpretation of Leupp area was made from these.
- 1992 - Black and white photography of National Aerial Photography Program (NAPP). Contact prints were used at scale of 1:40,000. Interpretation of Navajo new lands near Sanders was made from these. Some of these were flown in 1990.

Unioned Acreages by Watershed and Field Type

Watershed	Field Type			Total
		Direct	Not Direct	
Black Creek	1		2022.68	2022.68
	2		1494.00	1494.00
	3		1969.06	1969.06
	4		3850.66	3850.66
	5		7.73	7.73
	6		464.48	464.48
	7		223.36	223.36
	8		0.00	0.00
	9		40.76	40.76
	10		91.45	91.45
Total		0.00	10164.17	10164.17
Canyon Diablo	1		25.50	25.50
	2		0.00	0.00
	3		297.50	297.50
	4		0.00	0.00
	5		0.00	0.00
	6		0.00	0.00
	7		0.00	0.00
	8		0.00	0.00
	9		0.00	0.00
	10		11.92	11.92
Total		0.00	334.92	334.92
Dinnebito	1		161.25	161.25
	2		3125.10	3125.10
	3		2847.68	2847.68
	4		6417.65	6417.65
	5		0.00	0.00
	6		2.62	2.62
	7		0.00	0.00
	8		31.20	31.20
	9		928.90	928.90
	10		529.71	529.71
Total		0.00	14044.11	14044.11
Jadito Wash	1		0.00	0.00
	2		1624.02	1624.02
	3		2384.03	2384.03
	4		4927.13	4927.13
	5		0.00	0.00
	6		0.00	0.00
	7		0.00	0.00
	8		0.00	0.00
	9		53.29	53.29
	10		750.26	750.26
Total		0.00	9738.73	9738.73

Unioned Acreages by Watershed and Field Type

Watershed	Field Type			Total
		Direct	Not Direct	
Minor Tributaries	1	2221.67	252.68	2474.35
	2	2540.66	623.11	3163.77
	3	6075.03	3451.23	9526.26
	4		849.54	849.54
	5		295.51	295.51
	6		67.97	67.97
	7		0.00	0.00
	8		0.00	0.00
	9		7.20	7.20
	10		771.42	771.42
Total		10837.36	6318.66	17156.02
Moenkopi Wash	1		2099.63	
	2		854.20	
	3		2808.87	
	4		5403.57	
	5		6.51	
	6		116.40	
	7		0.00	
	8		23.67	
	9		25.13	
	10		922.60	
Total		0.00	12260.60	12260.60
Oraibi Wash	1		349.84	349.84
	2	221.89	2973.73	3195.61
	3	127.05	17875.85	18002.89
	4		8053.41	8053.41
	5		0.00	0.00
	6		0.00	0.00
	7		0.00	0.00
	8		122.59	122.59
	9		729.32	729.32
	10		565.26	565.26
Total		348.93	30670.00	31018.93
Polacca Wash	1		350.16	
	2		2626.95	
	3		7816.75	
	4		13128.92	
	5		0.00	
	6		22.41	
	7		0.00	
	8		52.44	
	9		1096.26	
	10		651.07	
Total		0.00	25744.96	25744.96

Unioned Acreages by Watershed and Field Type

Watershed	Field Type			Total
		Direct	Not Direct	
Pueblo Colorado Wash	1		2765.72	
	2		2285.24	
	3		5662.39	
	4		6546.89	
	5		0.00	
	6		0.00	
	7		14.85	
	8		0.00	
	9		24.55	
	10		550.25	
Total		0.00	17849.88	17849.88
Rio Puerco	1		90.70	
	2		42.91	
	3		265.70	
	4		1670.93	
	5		0.98	
	6		0.00	
	7		0.00	
	8		0.00	
	9		22.09	
	10		181.57	
Total		0.00	2274.88	2274.88
Wide Ruins Wash	1		183.72	
	2		1412.55	
	3		1090.01	
	4		1614.20	
	5		5.88	
	6		0.00	
	7		34.75	
	8		0.00	
	9		63.13	
	10		80.96	
Total		0.00	4485.22	4485.22
Zuni River	1			
	2			
	3			
	4		208.86	
	5			
	6			
	7			
	8			
	9			
	10		244.50	
Total		0.00	453.37	453.37
Grand Totals		11,186.29	134,339.48	145,525.77

Little Colorado – Irrigation on Indian Lands meeting on November 16

Agenda

1. Intro
2. Task = describe all irrigation, 1900 to 1990
3. Method (to be exemplified with Cornfields and Mt. Beautiful Quads)
 - a. Document search
 - b. Definition of irrigated classes
 - c. Photo interpretation with transparent overlays, identifying irrigation classes
 1. 1930s
 2. 1950s
 3. 1980s
 4. 1990s
 - d. Coalescence of overlays
 - e. Transfer of overlays to manuscript
 - f. Digitization
 - g. Unionizing
4. End product = unionized fields plus ownership and watershed

Watershed Acreages by Field Type, Reservation & Direct/Not Direct Little Colorado Irrigation for the 1980's
 LCR Tribes 26 May 1995

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Black Creek	1	0	1810.18	0	0	0	0	0	0	1810.18
	2	0	1073.83	0	0	0	0	0	0	1073.83
	3	0	1506.14	0	0	0	0	0	0	1506.14
	4	0	2756.38	0	0	0	0	0	0	2756.38
	5	0	7.9	0	0	0	0	0	0	7.9
	6	0	430.42	0	0	0	0	0	0	430.42
	7	0	223.67	0	0	0	0	0	0	223.67
	8	0	0	0	0	0	0	0	0	0
	9	0	29.8	0	0	0	0	0	0	29.8
	10	0	101.47	0	0	0	0	0	0	101.47
	Total	0	7939.79	0	0	0	0	0	0	7939.79
Canyon Diablo	1	0	25.75	0	0	0	0	0	0	25.75
	2	0	0	0	0	0	0	0	0	0
	3	0	136.11	0	0	0	0	0	0	136.11
	4	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0
	10	0	3.01	0	0	0	0	0	0	3.01
	Total	0	164.87	0	0	0	0	0	0	164.87
Dinnebito Wash	1	0	0	0	0	0	161.51	0	0	161.51
	2	0	354.11	0	0	0	671.26	0	0	1025.37
	3	0	865.1	0	0	0	1598.74	0	0	2463.84
	4	0	1899.96	0	0	0	2661.82	0	0	4561.78
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	2.77	0	0	2.77
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	49.1	0	0	49.1
	9	0	34.87	0	0	0	956.53	0	0	991.4
	10	0	100.72	0	0	0	428.96	0	0	529.68
	Total	0	3254.76	0	0	0	6530.69	0	0	9785.45

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Jadito Wash	1	0	0	0	0	0	0	0	0	0
	2	0	66.1	0	11.76	0	904.25	0	0	982.11
	3	0	1323.99	0	0	0	961.1	0	0	2285.09
	4	0	2264.04	0	126.21	0	985.9	0	0	3376.15
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	23.04	0	21.24	0	0.71	0	0	44.99
	10	0	477.5	0	0	0	277.71	0	0	755.21
	Total	0	4154.67	0	159.21	0	3129.67	0	0	7443.55
Minor Tributaries	1	1746.66	0	0	0	0	0	0	0	1746.66
	2	1786.13	174.54	0	0	0	0	0	0	1960.67
	3	2266.58	1286.02	0	0	0	0	0	0	3552.6
	4	1.45	664.8	0	0	0	11.83	0	0	678.08
	5	0	69.34	0	0	0	0	0	0	69.34
	6	0	2.32	0	0	0	0	0	0	2.32
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	7.46	0	0	0	0	0	0	7.46
	10	0	723.41	0	0	0	2	0	0	725.41
	Total	5800.82	2927.89	0	0	0	13.83	0	0	8742.54
Moenkopi Wash	1	0	1682.73	0	0	0	0	0	242.17	1924.9
	2	0	518.38	0	0	0	271.12	0	0	789.5
	3	0	1843.84	0	0	0	817.59	0	0	2661.43
	4	0	2408.89	0	0	0	845.02	0	0	3253.91
	5	0	6.9	0	0	0	0	0	0	6.9
	6	0	77.93	0	0	0	0	0	0	77.93
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	13.65	0	0	13.65
	9	0	25.83	0	0	0	1.05	0	0	26.88
	10	0	773.57	0	0	0	171.19	0	0	944.76
	Total	0	7338.07	0	0	0	2119.62	0	242.17	9699.86

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Orabi Wash	1	0	0	0	0	0	336.11	0	0	336.11
	2	222.59	250.29	0	0	0	585.05	0	0	1057.93
	3	92.87	12801.06	0	0	0	4857.65	0	0	17751.58
	4	0	1341.12	0	0	0	3961.26	0	0	5302.38
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	11.66	0	0	11.66
	9	0	3.85	0	0	0	367.65	0	0	371.5
	10	0	115.56	0	0	0	516.05	0	0	631.61
	Total	315.46	14511.88	0	0	0	10635.43	0	0	25462.77
Polacca Wash	1	0	0	0	0	0	350.61	0	0	350.61
	2	0	617.27	0	0	0	696.39	0	0	1313.66
	3	0	4168.07	0	0	0	3366.26	0	0	7534.33
	4	0	2386.64	0	0	0	4934.38	0	0	7321.02
	5	0	0	0	0	0	0	0	0	0
	6	0	2.56	0	0	0	16.88	0	0	19.44
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	27.27	0	0	27.27
	9	0	16.78	0	0	0	548.16	0	0	564.94
	10	0	546.56	0	0	0	303.99	0	0	850.55
	Total	0	7737.88	0	0	0	10243.94	0	0	17981.82
Pueblo Colorado Wash	1	0	2134.37	0	0	0	0	0	0	2134.37
	2	0	1228.49	0	0	0	0	0	0	1228.49
	3	0	3114.63	0	0	0	0	0	0	3114.63
	4	0	3764.93	0	0	0	0	0	0	3764.93
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	17.22	0	0	0	0	0	0	17.22
	8	0	0	0	0	0	0	0	0	0
	9	0	26.7	0	0	0	0	0	0	26.7
	10	0	581.87	0	0	0	0	0	0	581.87
	Total	0	10868.21	0	0	0	0	0	0	10868.21

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Rio Puerco	1	0	69.95	0	0	0	0	0	0	69.95
	2	0	41.89	0	0	0	0	0	0	41.89
	3	0	236.75	0	0	0	0	0	0	236.75
	4	0	757.6	0	0	0	0	0	0	757.6
	5	0	1.1	0	0	0	0	0	0	1.1
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	19.43	0	0	0	0	0	0	19.43
	10	0	171.98	0	0	0	0	0	0	171.98
	Total	0	1298.7	0	0	0	0	0	0	1298.7
Wide Ruins Wash	1	0	184.12	0	0	0	0	0	0	184.12
	2	0	1262.22	0	0	0	0	0	0	1262.22
	3	0	739.06	0	0	0	0	0	0	739.06
	4	0	931.22	0	0	0	0	0	0	931.22
	5	0	6.14	0	0	0	0	0	0	6.14
	6	0	0	0	0	0	0	0	0	0
	7	0	35.44	0	0	0	0	0	0	35.44
	8	0	0	0	0	0	0	0	0	0
	9	0	61.48	0	0	0	0	0	0	61.48
	10	0	117.97	0	0	0	0	0	0	117.97
	Total	0	3337.65	0	0	0	0	0	0	3337.65
Zuni River	1	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0
	4	0	146.36	0	0	0	0	0	0	146.36
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0
	10	0	184.43	0	0	0	0	0	0	184.43
	Total	0	330.79	0	0	0	0	0	0	330.79
GRAND TOTALS		6116.28	63865.16	0	159.21	0	32673.18	0	242.17	103056

Watersheds by Field Type, Reservation and Direct/Not Direct Little Colorado Irrigation
18 May 1995

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Black Creek	1	0	2026.98	0	0	0	0	0	0	2026.98
	2	0	1492.73	0	0	0	0	0	0	1492.73
	3	0	1981.51	0	0	0	0	0	0	1981.51
	4	0	3897.25	0	0	0	0	0	0	3897.25
	5	0	7.9	0	0	0	0	0	0	7.9
	6	0	466.45	0	0	0	0	0	0	466.45
	7	0	224.94	0	0	0	0	0	0	224.94
	8	0	0	0	0	0	0	0	0	0
	9	0	41.82	0	0	0	0	0	0	41.82
	10	0	97.95	0	0	0	0	0	0	97.95
	Total	0	10237.53	0	0	0	0	0	0	10237.53
Canyon Diablo	1	0	25.75	0	0	0	0	0	0	25.75
	2	0	0	0	0	0	0	0	0	0
	3	0	297.82	0	0	0	0	0	0	297.82
	4	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0
	10	0	11.98	0	0	0	0	0	0	11.98
	Total	0	335.55	0	0	0	0	0	0	335.55
Dinnebito Wash	1	0	0	0	0	0	161.51	0	0	161.51
	2	0	954.21	0	0	0	2177.27	0	0	3131.48
	3	0	923.55	0	0	0	1918.52	0	0	2842.07
	4	0	1997.94	0	0	0	4463.59	0	0	6461.53
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	2.77	0	0	2.77
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	34.92	0	0	34.92
	9	0	28.02	0	0	0	918.27	0	0	946.29
	10	0	100.72	0	0	0	437.92	0	0	538.64
	Total	0	4004.44	0	0	10114.77	0	0	0	14119.21

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Jadito Wash	1	0	0	0	0	0	0	0	0	0
	2	0	104.95	0	42.86	0	1480.21	0	0	1628.02
	3	0	1327.53	0	0	0	1064.26	0	0	2391.79
	4	0	2891.65	0	284	0	1800.83	0	0	4976.48
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	25.15	0	21.24	0	9.59	0	0	55.98
	10	0	486.58	0	0	0	277.27	0	0	763.85
	Total	0	4835.86	0	348.1	0	4632.16	0	0	9816.12
Minor Tributaries	1	2314.73	0	0	0	0	0	0	0	2314.73
	2	2334.92	298.26	0	0	0	0	0	0	2633.18
	3	3096.77	2652.72	0	0	0	0	0	0	5749.49
	4	0	931.17	0	0	0	119.73	0	0	1050.9
	5	0	69.34	0	0	0	0	0	0	69.34
	6	0	2.32	0	0	0	0	0	0	2.32
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	7.46	0	0	0	0	0	0	7.46
	10	0	795.3	0	0	0	3.13	0	0	798.43
	Total	7746.42	4756.57	0	0	0	122.86	0	0	12625.85
Moenkopi Wash	1	0	1865.78	0	0	0	0	0	243.42	2109.2
	2	0	584.02	0	0	0	271.12	0	0	855.14
	3	0	2001.8	0	0	0	830.13	0	0	2831.93
	4	0	3727.07	0	0	0	1770.59	0	0	5497.66
	5	0	6.9	0	0	0	0	0	0	6.9
	6	0	122.65	0	0	0	0	0	0	122.65
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	24.03	0	0	24.03
	9	0	25.83	0	0	0	1.05	0	0	26.88
	10	0	778.97	0	0	0	167.27	0	0	946.24
	Total	0	9113.02	0	0	0	3064.19	0	243.42	12420.63

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Oraibi Wash	1	2.25	0	0	0	0	350.33	0	0	352.58
	2	220.51	2056.42	0	0	0	1129.07	0	0	3406
	3	127.87	13638.11	0	0	0	4759.1	0	0	18525.08
	4	0	2072.49	0	0	0	6056.05	0	0	8128.54
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	129.08	0	0	129.08
	9	0	8.29	0	0	0	734.29	0	0	742.58
	10	0	79.83	0	0	0	496.22	0	0	576.05
Total		350.63	17855.14	0	0	13654.14	0	0	0	31859.91
Polacca Wash	1	0	0	0	0	0	350.62	0	0	350.62
	2	0	784.42	0	0	0	1846.93	0	0	2631.35
	3	0	4719.07	0	0	0	3125.64	0	0	7844.71
	4	0	4812.2	0	0	0	8433.7	0	0	13245.9
	5	0	0	0	0	0	0	0	0	0
	6	0	2.56	0	0	0	20.18	0	0	22.74
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	56.58	0	0	56.58
	9	0	16.78	0	0	0	1104.46	0	0	1121.24
	10	0	412.43	0	0	0	255.59	0	0	668.02
Total		0	10747.46	0	0	15193.7	0	0	0	25941.16
Pueblo Colorado Wash	1	0	2770.89	0	0	0	0	0	0	2770.89
	2	0	2294.3	0	0	0	0	0	0	2294.3
	3	0	5680.75	0	0	0	0	0	0	5680.75
	4	0	6629.73	0	0	0	0	0	0	6629.73
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	15.64	0	0	0	0	0	0	15.64
	8	0	0	0	0	0	0	0	0	0
	9	0	26.7	0	0	0	0	0	0	26.7
	10	0	566.46	0	0	0	0	0	0	566.46
Total		0	17984.47	0	0	0	0	0	0	17984.47

Watershed Name	Field Type	Navajo		Jadito Island		Hopi		Moenkopi Island		TOTAL
		Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	Direct	Not Direct	
Rio Puerco	1	0	91.93	0	0	0	0	0	0	91.93
	2	0	43.22	0	0	0	0	0	0	43.22
	3	0	267.46	0	0	0	0	0	0	267.46
	4	0	1699.4	0	0	0	0	0	0	1699.4
	5	0	1.1	0	0	0	0	0	0	1.1
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	22.88	0	0	0	0	0	0	22.88
	10	0	189.64	0	0	0	0	0	0	189.64
Total		0	2315.63	0	0	0	0	0	0	2315.63
Wide Ruins Wash	1	0	184.11	0	0	0	0	0	0	184.11
	2	0	1413.28	0	0	0	0	0	0	1413.28
	3	0	1092.54	0	0	0	0	0	0	1092.54
	4	0	1642.78	0	0	0	0	0	0	1642.78
	5	0	6.25	0	0	0	0	0	0	6.25
	6	0	0	0	0	0	0	0	0	0
	7	0	35.44	0	0	0	0	0	0	35.44
	8	0	0	0	0	0	0	0	0	0
	9	0	64.04	0	0	0	0	0	0	64.04
	10	0	83.54	0	0	0	0	0	0	83.54
Total		0	4521.98	0	0	0	0	0	0	4521.98
Zuni River	1	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0
	4	0	212.87	0	0	0	0	0	0	212.87
	5	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0
	10	0	248.56	0	0	0	0	0	0	248.56
Total		0	461.43	0	0	0	0	0	0	461.43

GRAND TOTALS 8097.05 87169.08 0 348.1 0 46781.82 0 243.42 142639.47

		Hopi	Navajo	Zuni	Total
Black Creek	1	0.00	1,627.91	0.00	1,627.91
	2	0.00	1,490.54	0.00	1,490.54
	3	0.00	1,812.47	0.00	1,812.47
	4	0.00	3,660.22	0.00	3,660.22
	5	0.00	7.89	0.00	7.89
	6	0.00	304.69	0.00	304.69
	7	0.00	185.37	0.00	185.37
	9	0.00	41.76	0.00	41.76
	10	0.00	96.63	0.00	96.63
	Total	0.00	9,227.48	0.00	9,227.48
Canyon Diablo	1	0.00	25.73	0.00	25.73
	3	0.00	297.58	0.00	297.58
	10	0.00	11.97	0.00	11.97
	Total	0.00	335.28	0.00	335.28
Dinnebito Wash	1	161.37	0.00	0.00	161.37
	2	2,162.25	966.67	0.00	3,128.91
	3	1,917.67	1,246.09	0.00	3,163.76
	4	4,516.27	1,988.19	0.00	6,504.46
	6	2.77	0.00	0.00	2.77
	9	917.55	27.99	0.00	945.54
	10	437.59	100.64	0.00	538.23
	Total	10,115.45	4,329.59	0.00	14,445.04
Jadito Wash	2	1,478.71	135.86	0.00	1,614.57
	3	1,062.04	1,327.36	0.00	2,389.40
	4	1,799.20	3,097.10	0.00	4,896.30
	9	9.59	37.56	0.00	47.15
	10	276.94	466.85	0.00	743.78
	Total	4,626.47	5,064.74	0.00	9,691.21
Little Colorado	1	0.00	2,170.75	0.00	2,170.75
	2	0.00	2,486.20	79.41	2,565.60
	3	0.00	3,150.63	1,940.80	5,091.43
	5	0.00	0.00	0.23	0.23

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		Hopi	Navajo	Zuni	Total
Little Colorado	6	0.00	0.00	46.25	46.25
	Total	0.00	7,807.57	2,066.69	9,874.26
Minor Tributaries	1	0.00	0.00	237.73	237.73
	2	0.00	183.41	19.16	202.57
	3	0.00	2,664.03	0.00	2,664.03
	4	118.61	694.63	0.00	813.24
	5	0.00	69.29	87.31	156.61
	6	0.00	2.32	0.00	2.32
	9	0.00	7.46	0.00	7.46
	10	3.13	745.32	0.00	748.45
	Total	121.74	4,366.47	344.21	4,832.41
Moenkopi Wash	1	257.61	1,468.09	0.00	1,725.69
	2	270.92	583.59	0.00	854.51
	3	806.47	2,023.18	0.00	2,829.66
	4	2,315.31	3,191.27	0.00	5,506.58
	5	0.00	6.91	0.00	6.91
	6	29.97	92.58	0.00	122.55
	9	1.05	25.81	0.00	26.85
	10	167.13	778.38	0.00	945.51
	Total	3,848.44	8,169.80	0.00	12,018.24
Oraibi Wash	1	349.99	0.00	0.00	349.99
	2	1,130.94	1,894.91	0.00	3,025.85
	3	4,637.31	12,465.27	0.00	17,102.57
	4	6,226.16	2,048.29	0.00	8,274.46
	8	5.49	0.00	0.00	5.49
	9	733.10	8.28	0.00	741.39
	10	505.50	70.01	0.00	575.51
	Total	13,588.49	16,486.76	0.00	30,075.26
Oraibi/Minor Tributaries	2	0.00	40.51	0.00	40.51
	3	0.00	249.31	0.00	249.31
	Total	0.00	289.82	0.00	289.82
Oraibi/Polacc	2	0.00	169.03	0.00	169.03

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		Hopi	Navajo	Zuni	Total
Oraibi/Polacca	3	0.00	1,380.13	0.00	1,380.13
	Total	0.00	1,549.16	0.00	1,549.16
Polacca Wash	1	350.29	0.00	0.00	350.29
	2	1,842.07	734.03	0.00	2,576.10
	3	3,139.60	4,217.10	0.00	7,356.70
	4	8,450.64	4,822.32	0.00	13,272.96
	6	20.16	2.55	0.00	22.71
	8	12.72	0.00	0.00	12.72
	9	1,103.44	16.75	0.00	1,120.19
	10	255.34	412.02	0.00	667.36
	Total	15,174.26	10,204.77	0.00	25,379.03
Pueblo Colorado Wash	1	0.00	2,594.75	0.00	2,594.75
	2	0.00	2,279.54	0.00	2,279.54
	3	0.00	5,556.42	0.00	5,556.42
	4	0.00	6,252.80	0.00	6,252.80
	7	0.00	15.62	0.00	15.62
	9	0.00	25.99	0.00	25.99
	10	0.00	526.95	0.00	526.95
	Total	0.00	17,252.07	0.00	17,252.07
Rio Puerco	2	0.00	43.17	0.00	43.17
	3	0.00	258.26	0.00	258.26
	4	0.00	1,365.39	0.00	1,365.39
	5	0.00	1.10	0.00	1.10
	9	0.00	22.86	0.00	22.86
	10	0.00	187.41	0.00	187.41
	Total	0.00	1,878.18	0.00	1,878.18
Wide Ruins Wash	1	0.00	183.86	0.00	183.86
	2	0.00	1,358.28	0.00	1,358.28
	3	0.00	1,066.58	0.00	1,066.58
	4	0.00	1,606.72	0.00	1,606.72
	5	0.00	6.23	0.00	6.23
	7	0.00	35.39	0.00	35.39

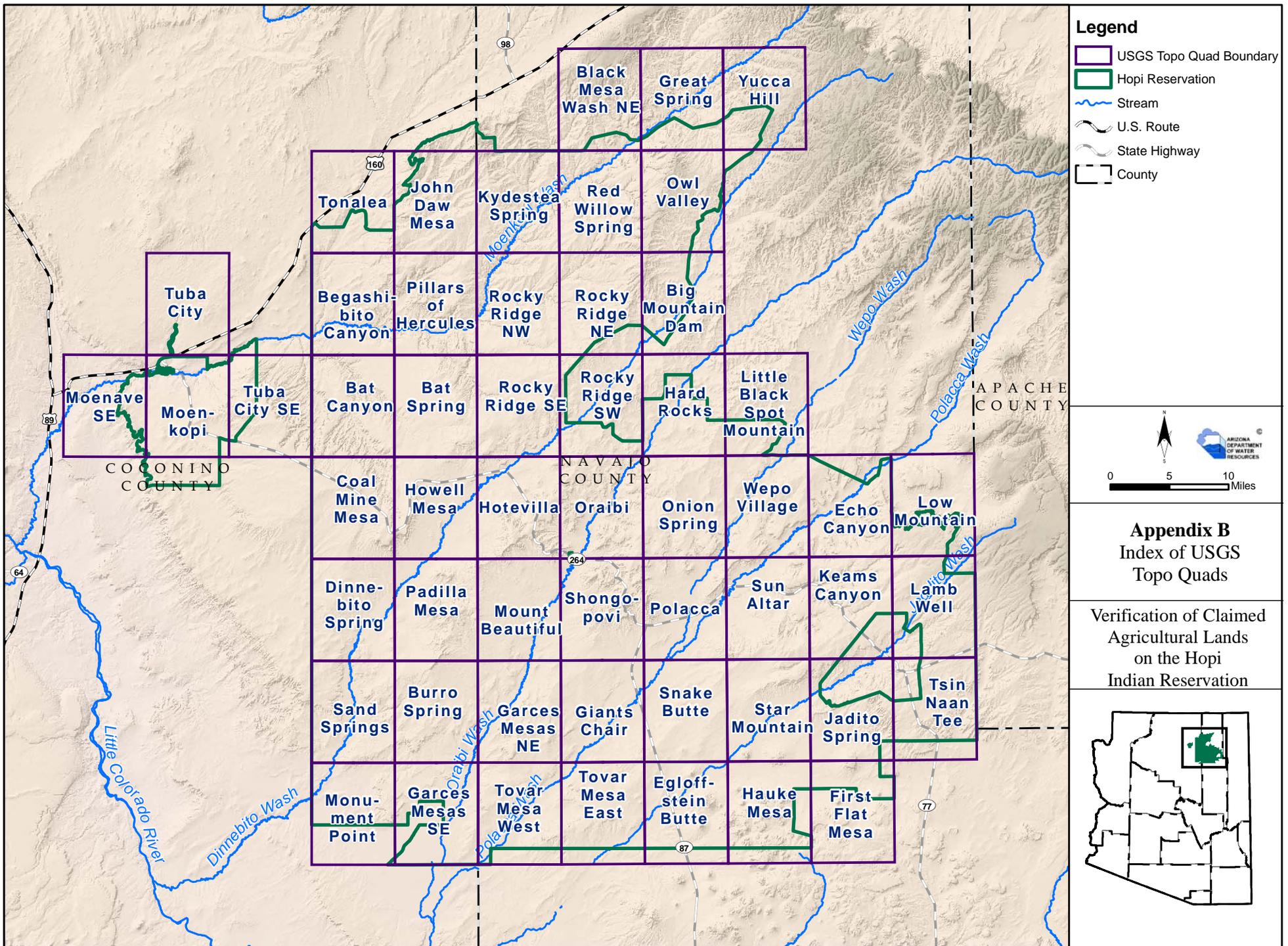
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		Hopi	Navajo	Zuni	Total
Wide Ruins Wash	9	0.00	63.94	0.00	63.94
	10	0.00	83.44	0.00	83.44
	Total	0.00	4,404.44	0.00	4,404.44
Zuni River	4	0.00	212.56	0.00	212.56
	10	0.00	248.18	0.00	248.18
	Total	0.00	460.75	0.00	460.75
Total		47,474.87	91,826.86	2,410.89	141,712.62

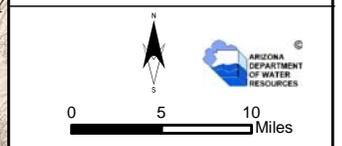
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Appendix B

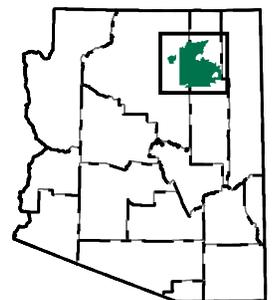


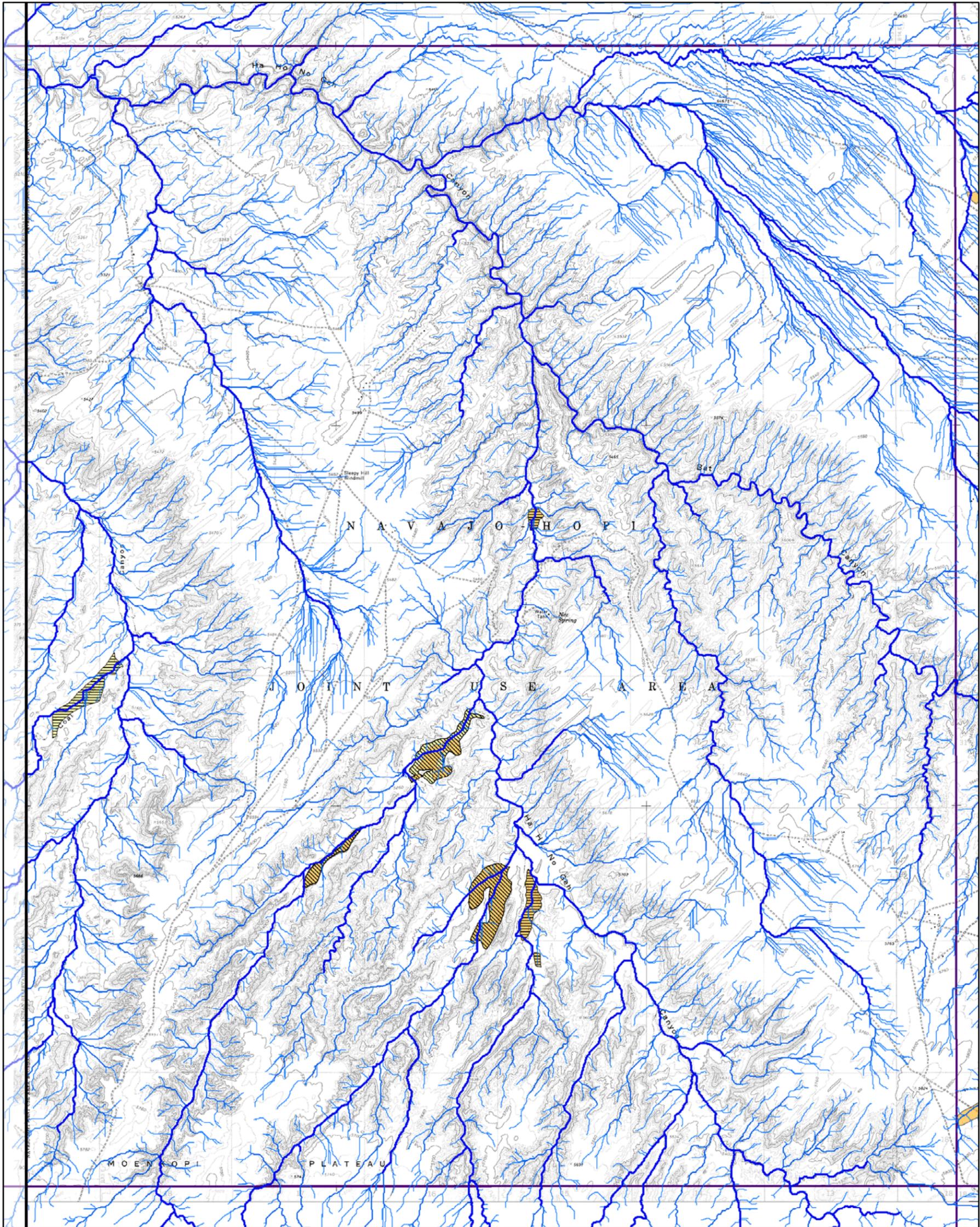
- Legend**
- USGS Topo Quad Boundary
 - Hopi Reservation
 - Stream
 - U.S. Route
 - State Highway
 - County



Appendix B
Index of USGS
Topo Quads

Verification of Claimed
Agricultural Lands
on the Hopi
Indian Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Bat Canyon Quad)

Legend

Claimed Irrigation Type

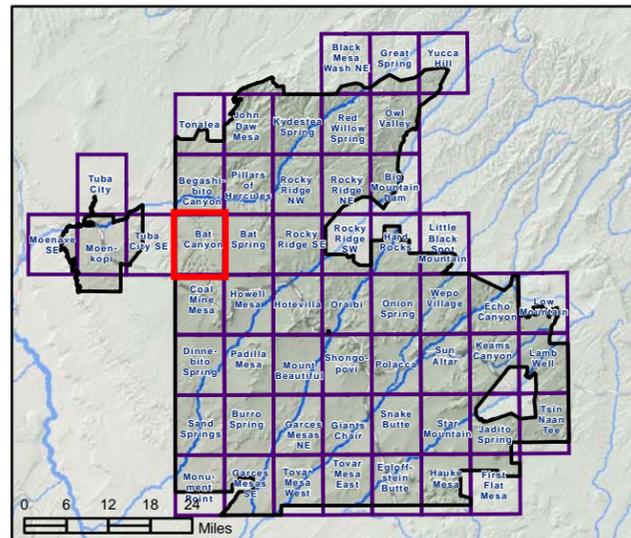
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

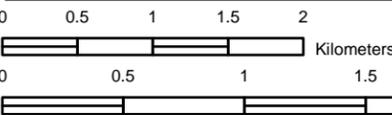
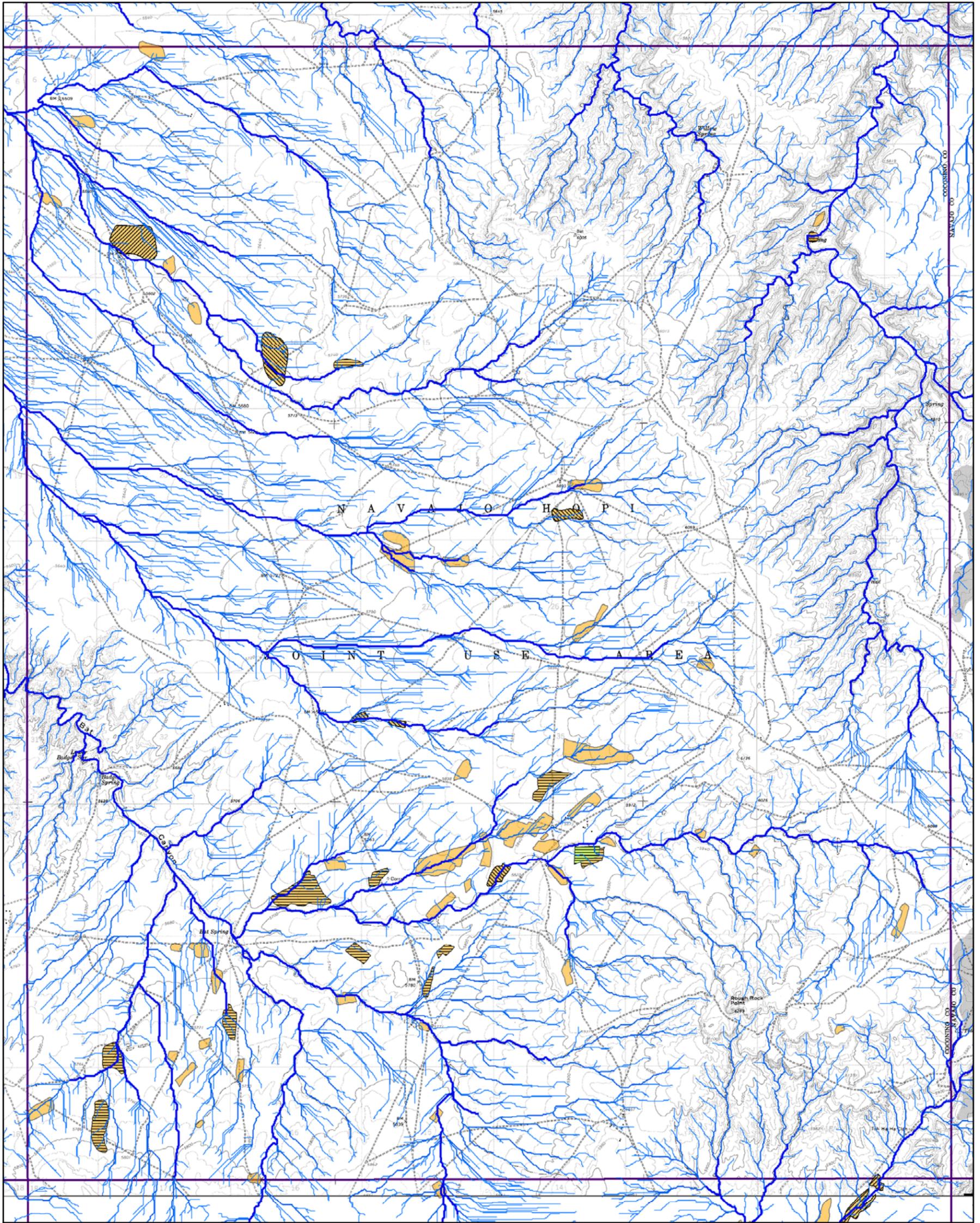
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Bat Spring Quad)

Legend

Claimed Irrigation Type

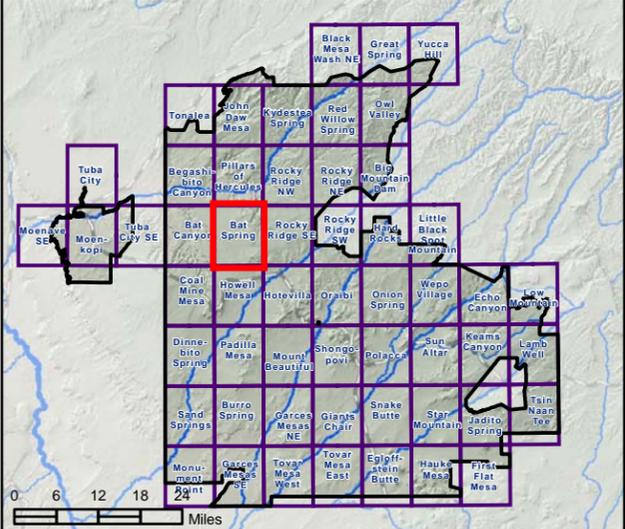
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

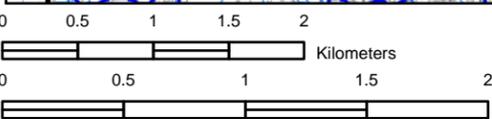
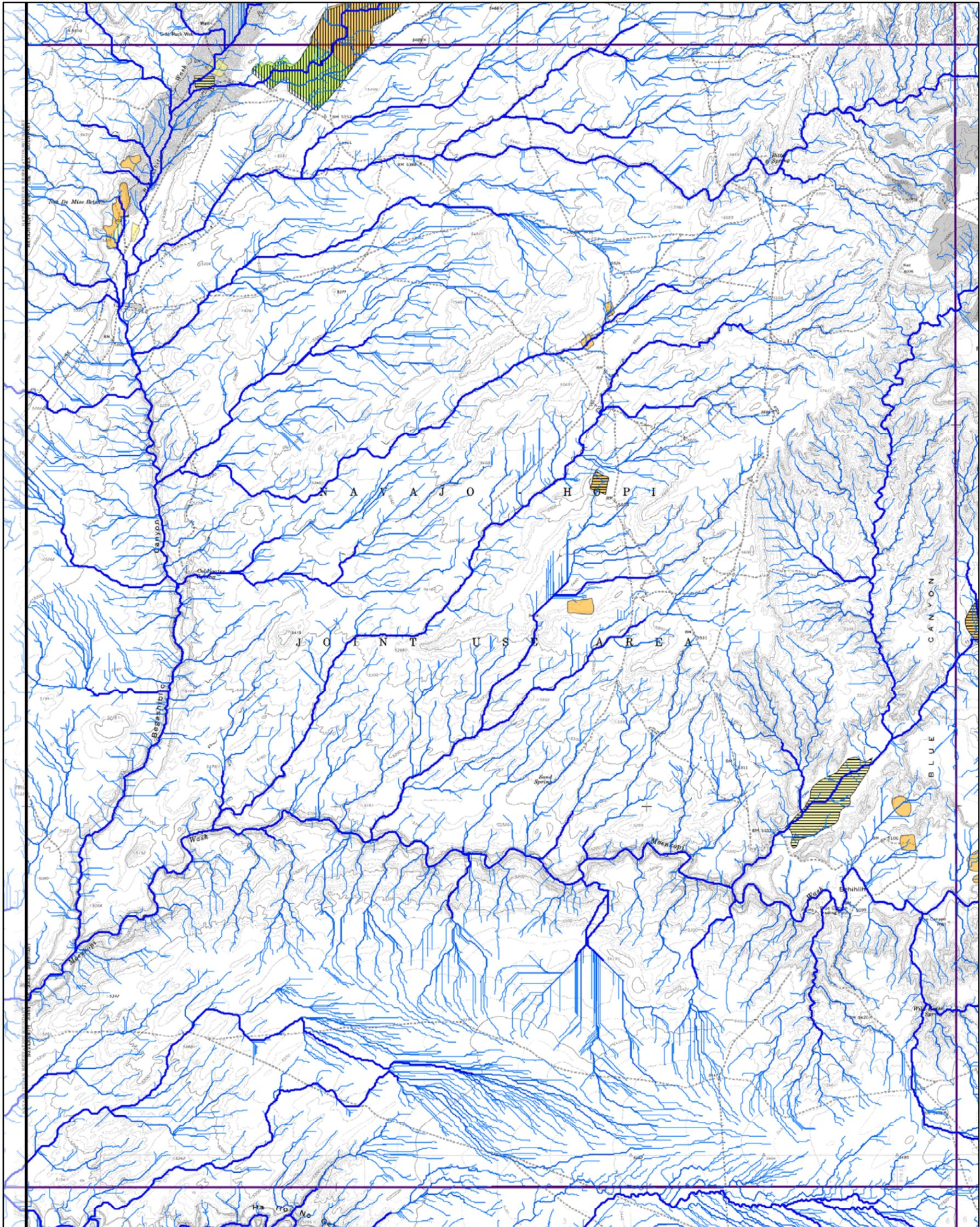
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Begashibito Canyon Quad)

Legend

Claimed Irrigation Type

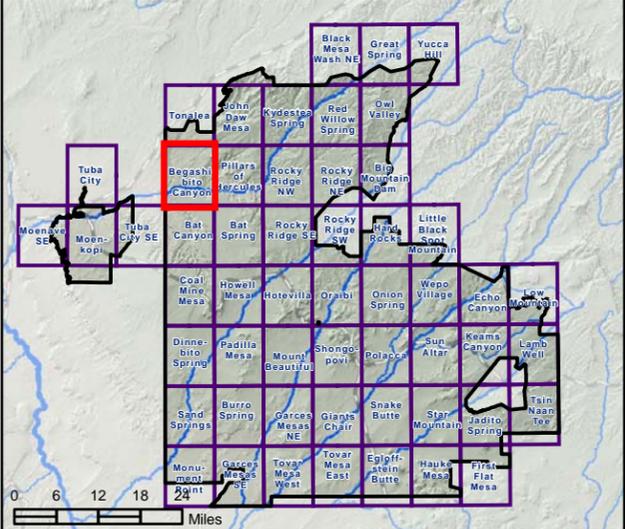
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

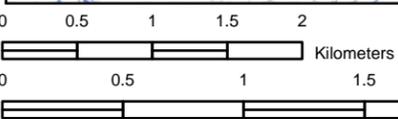
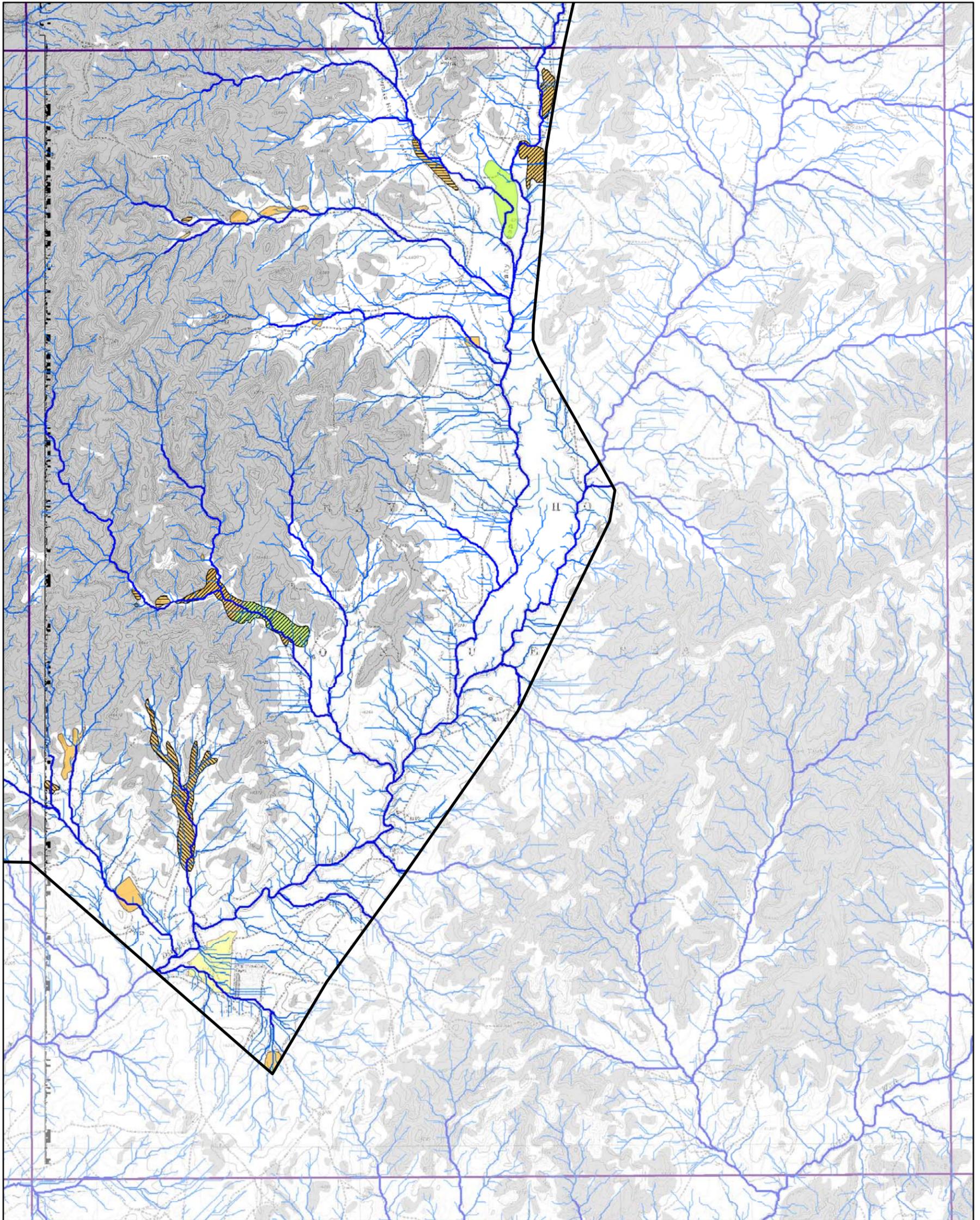
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Big Mountain Dam Quad)

Legend

Claimed Irrigation Type

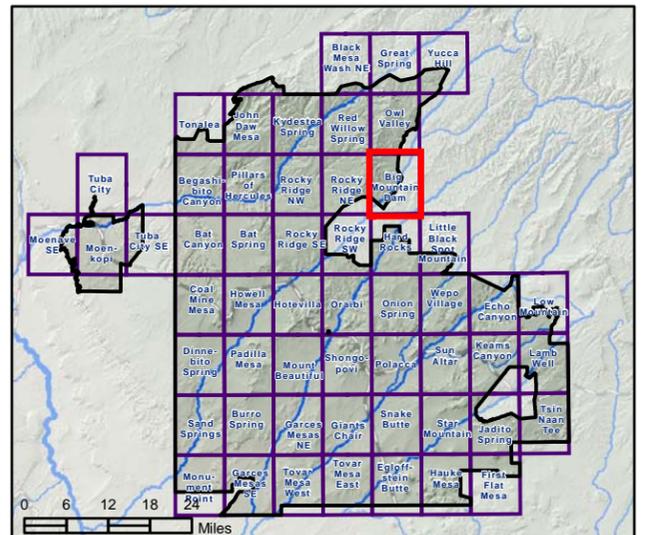
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

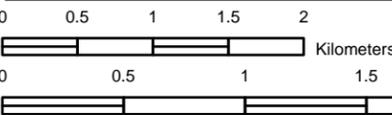
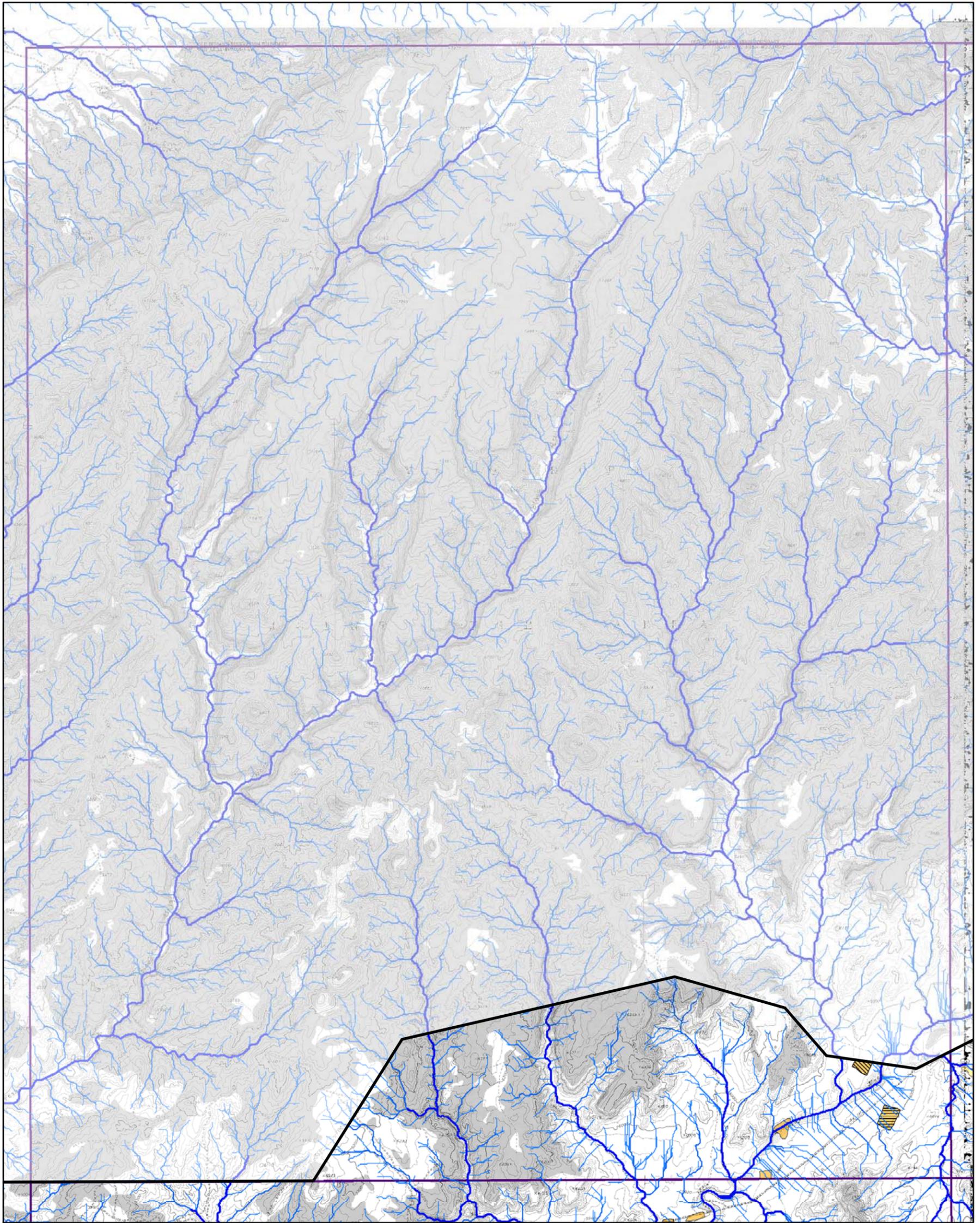
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Black Mesa Wash NE Quad)

Legend

Claimed Irrigation Type

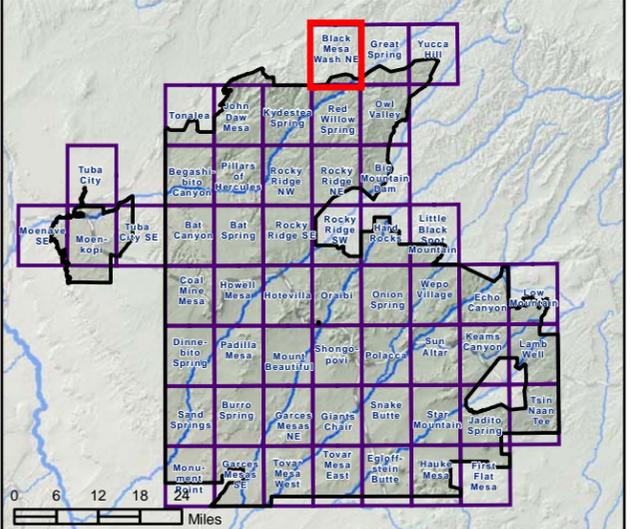
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

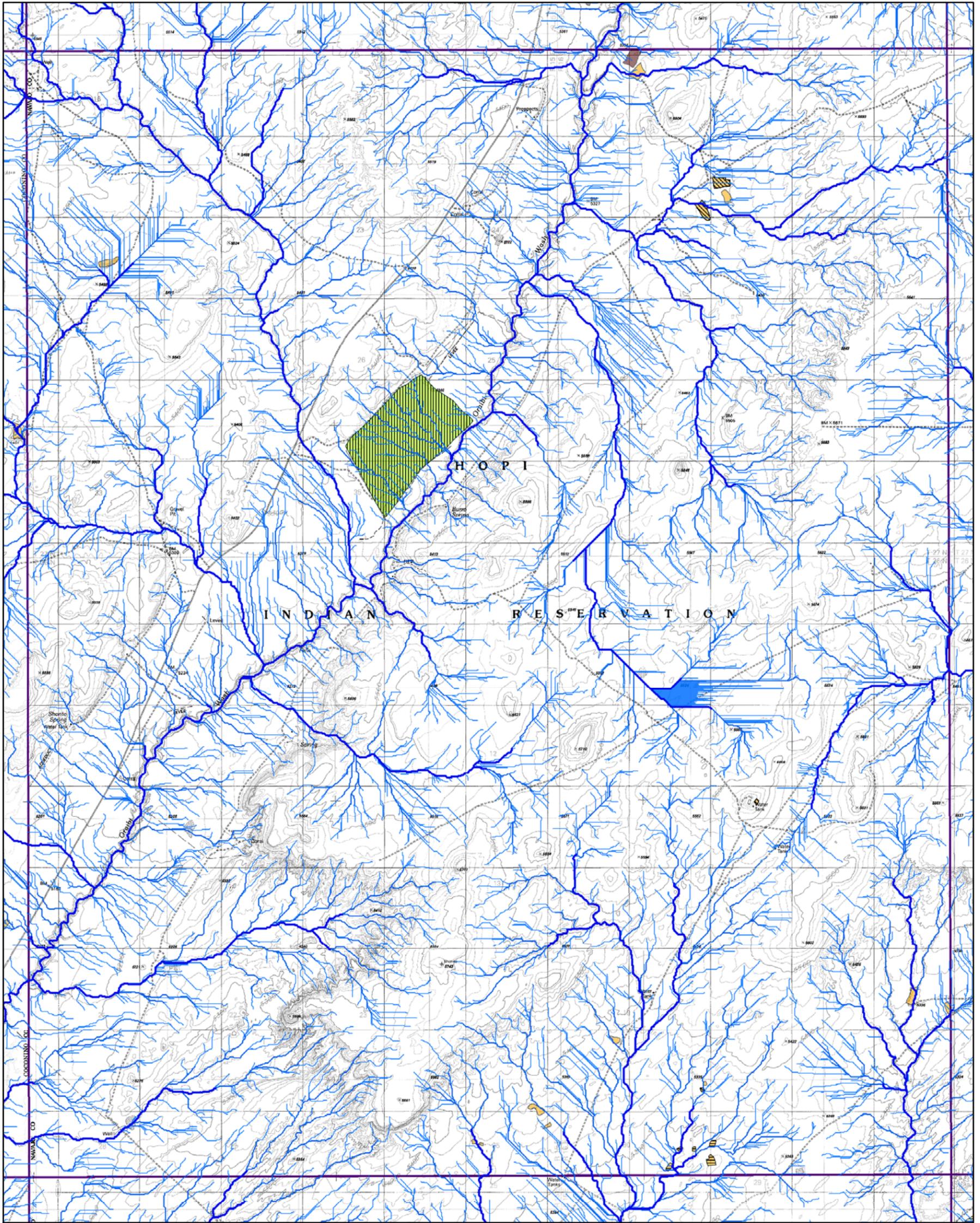
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Burro Spring Quad)

Legend

Claimed Irrigation Type

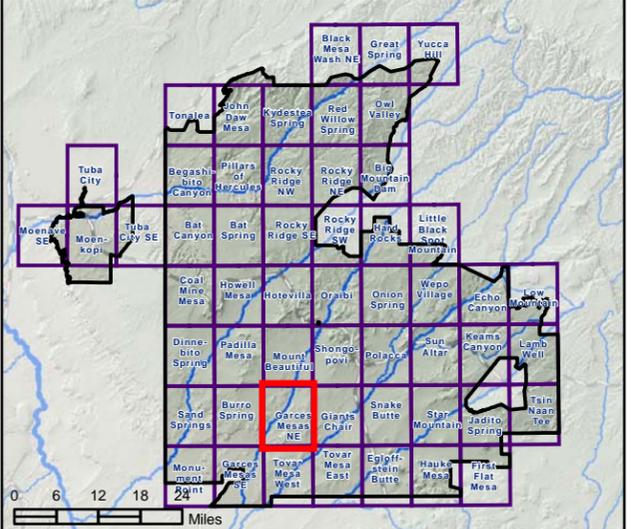
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

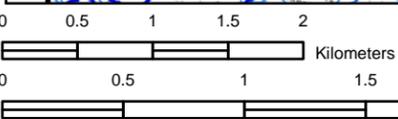
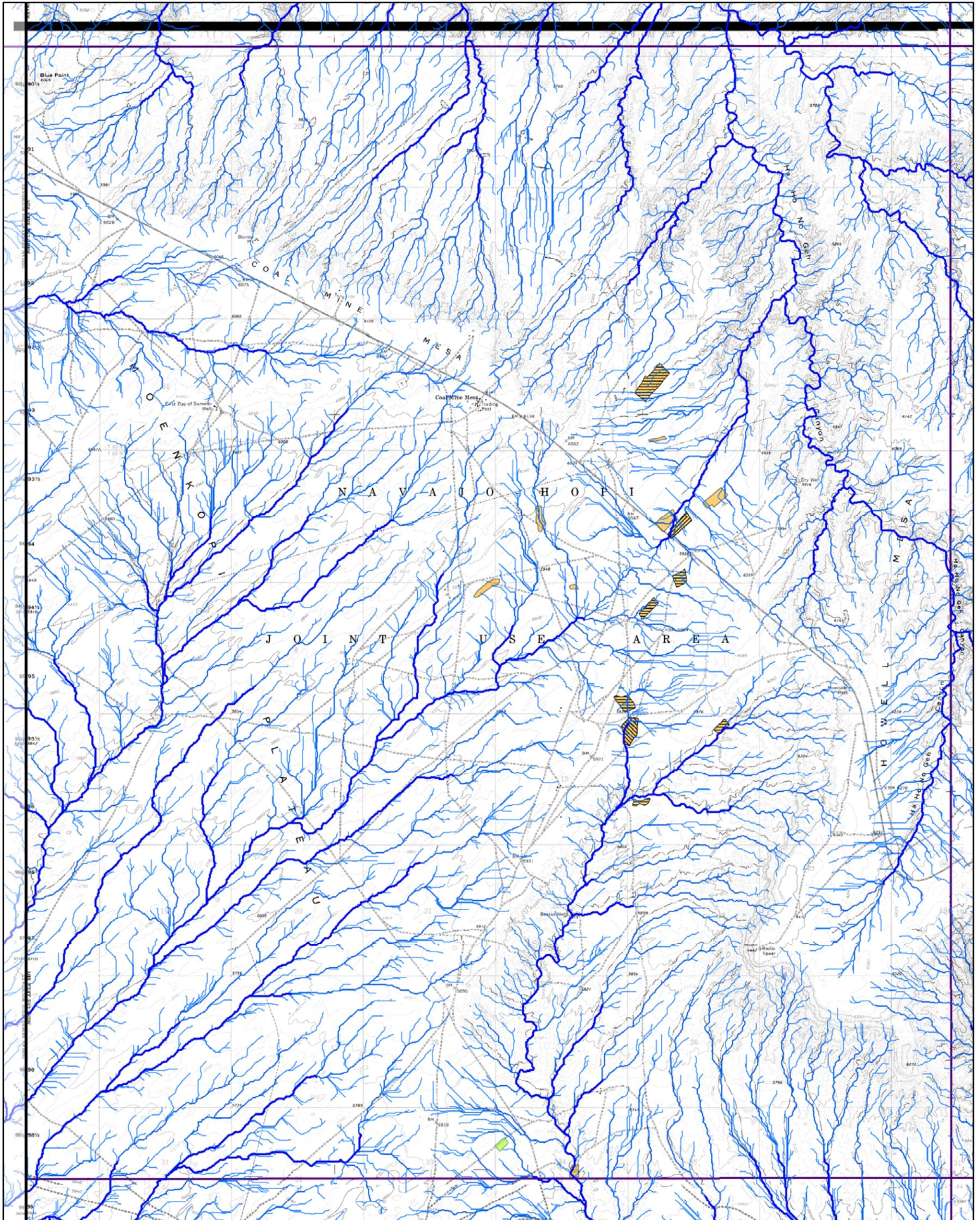
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Coal Mine Mesa Quad)

Legend

Claimed Irrigation Type

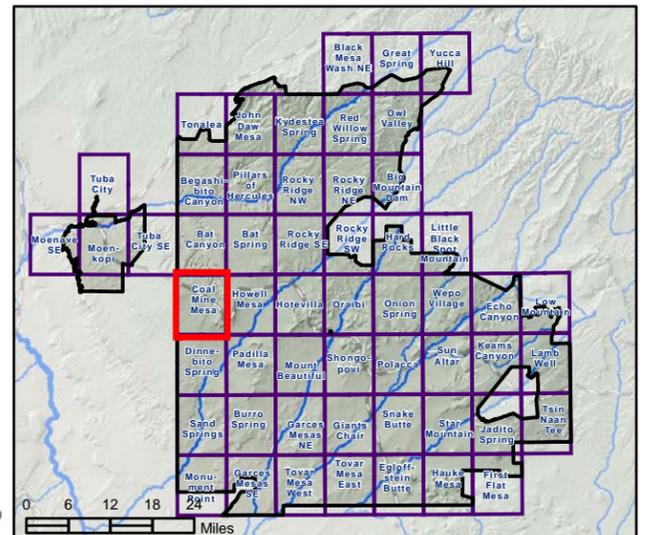
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

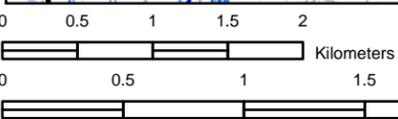
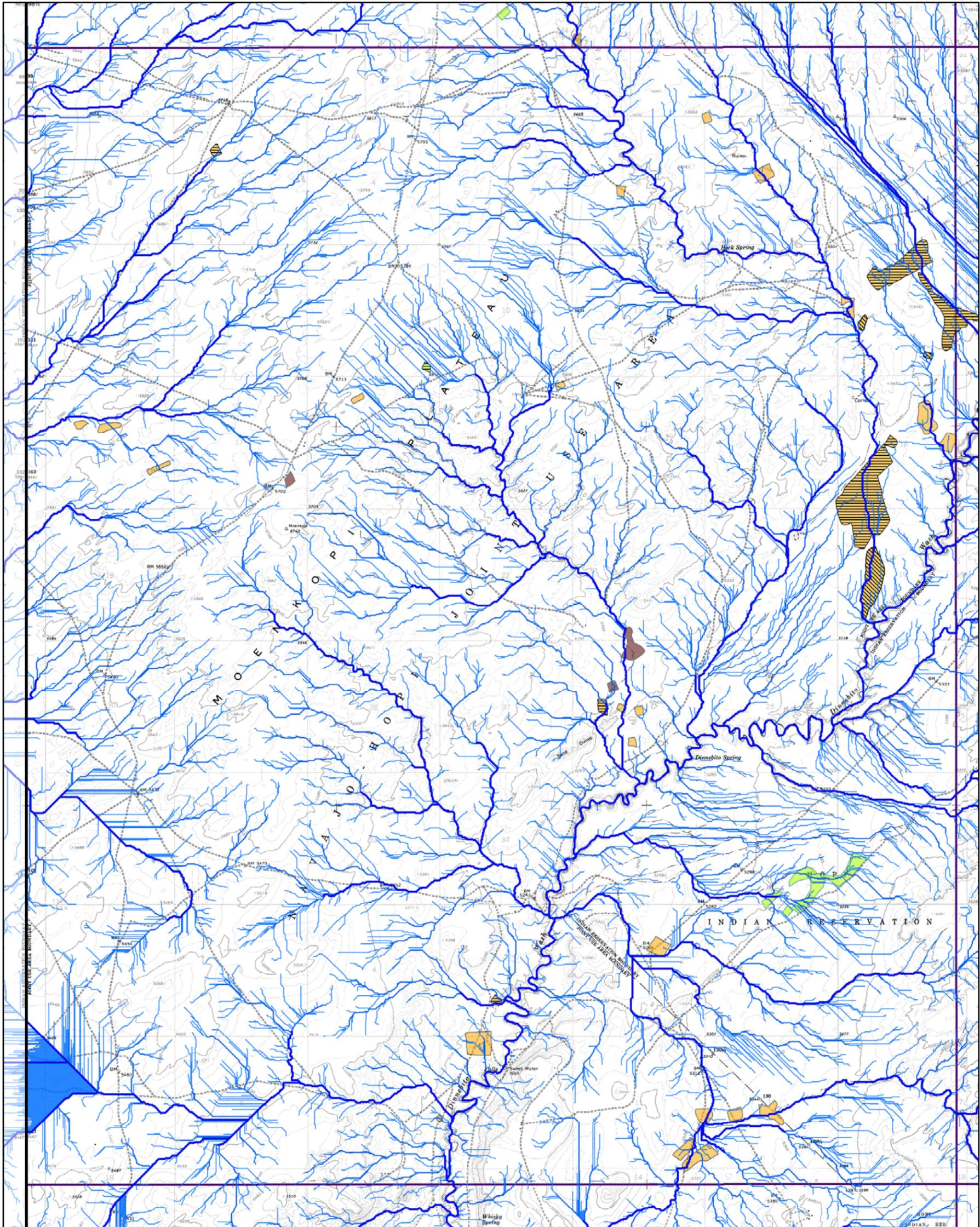
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Dinnebito Spring Quad)

Legend

Claimed Irrigation Type

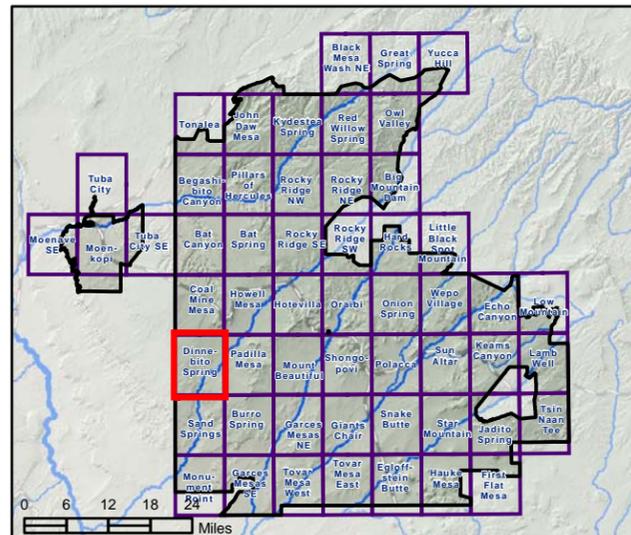
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

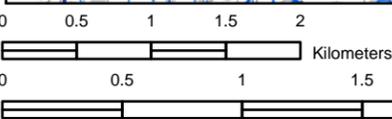
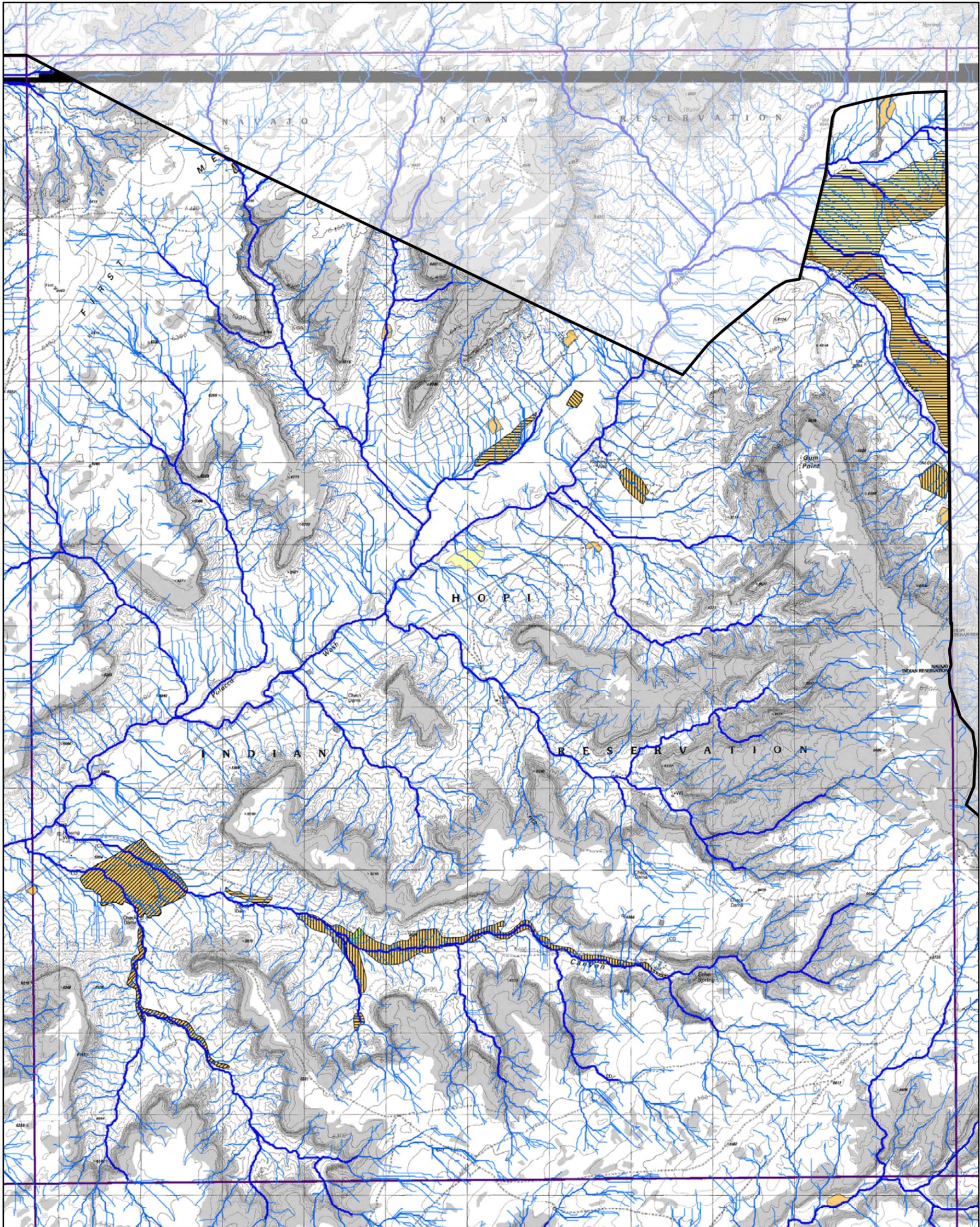
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Echo Canyon Quad)

Legend

Claimed Irrigation Type

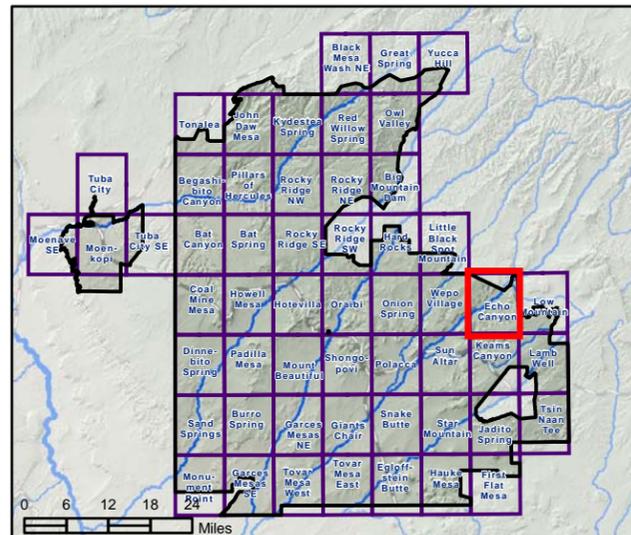
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

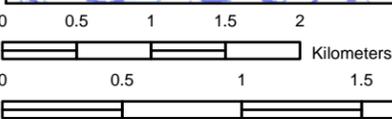
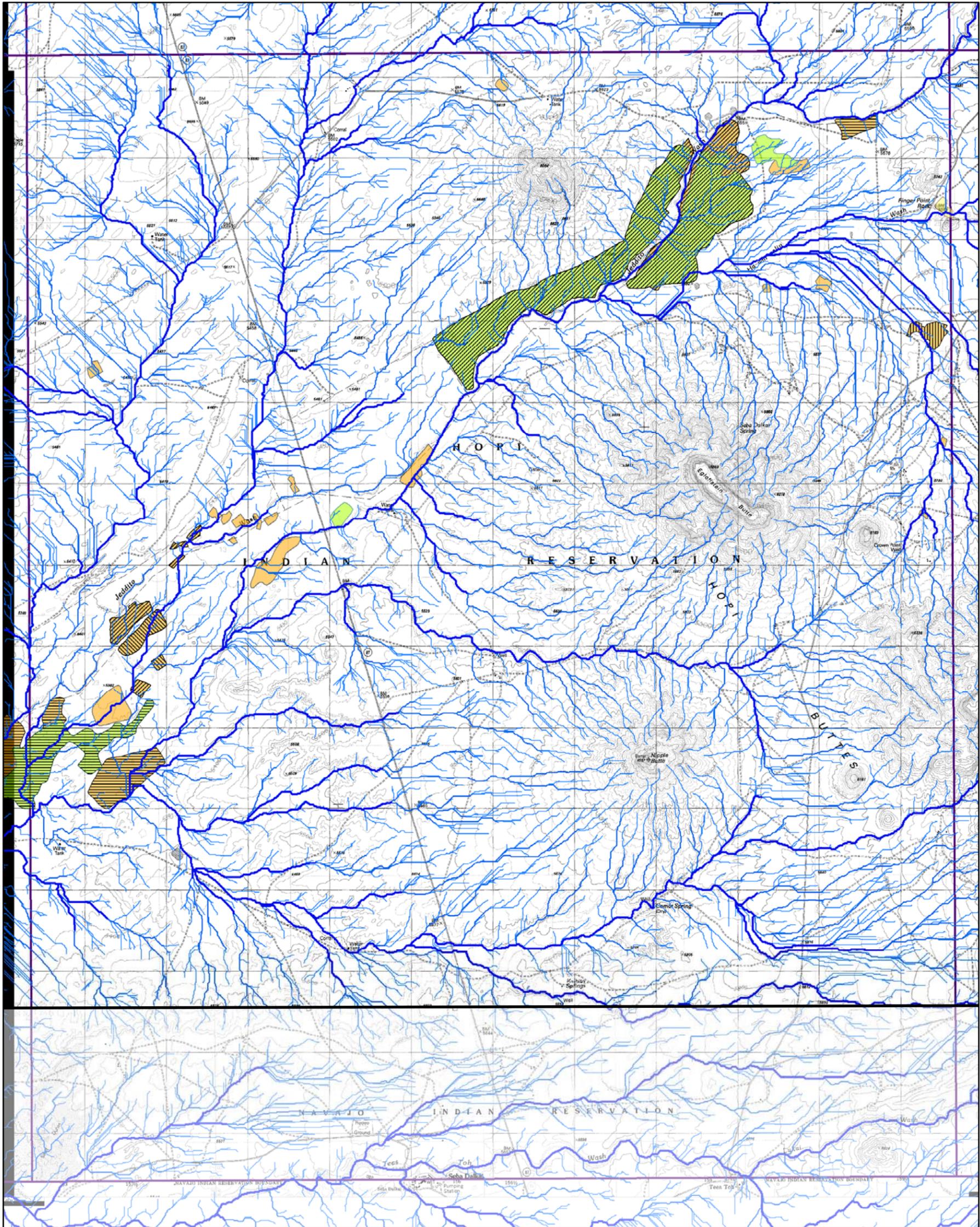
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Egloffstein Butte Quad)

Legend

Claimed Irrigation Type

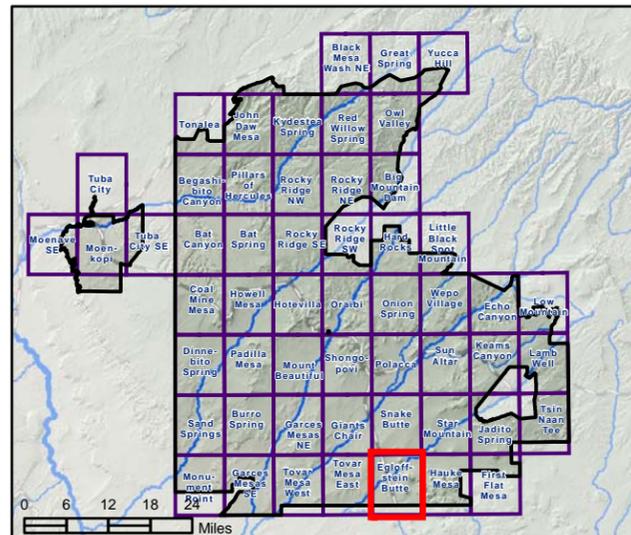
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

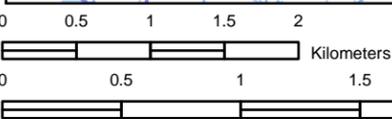
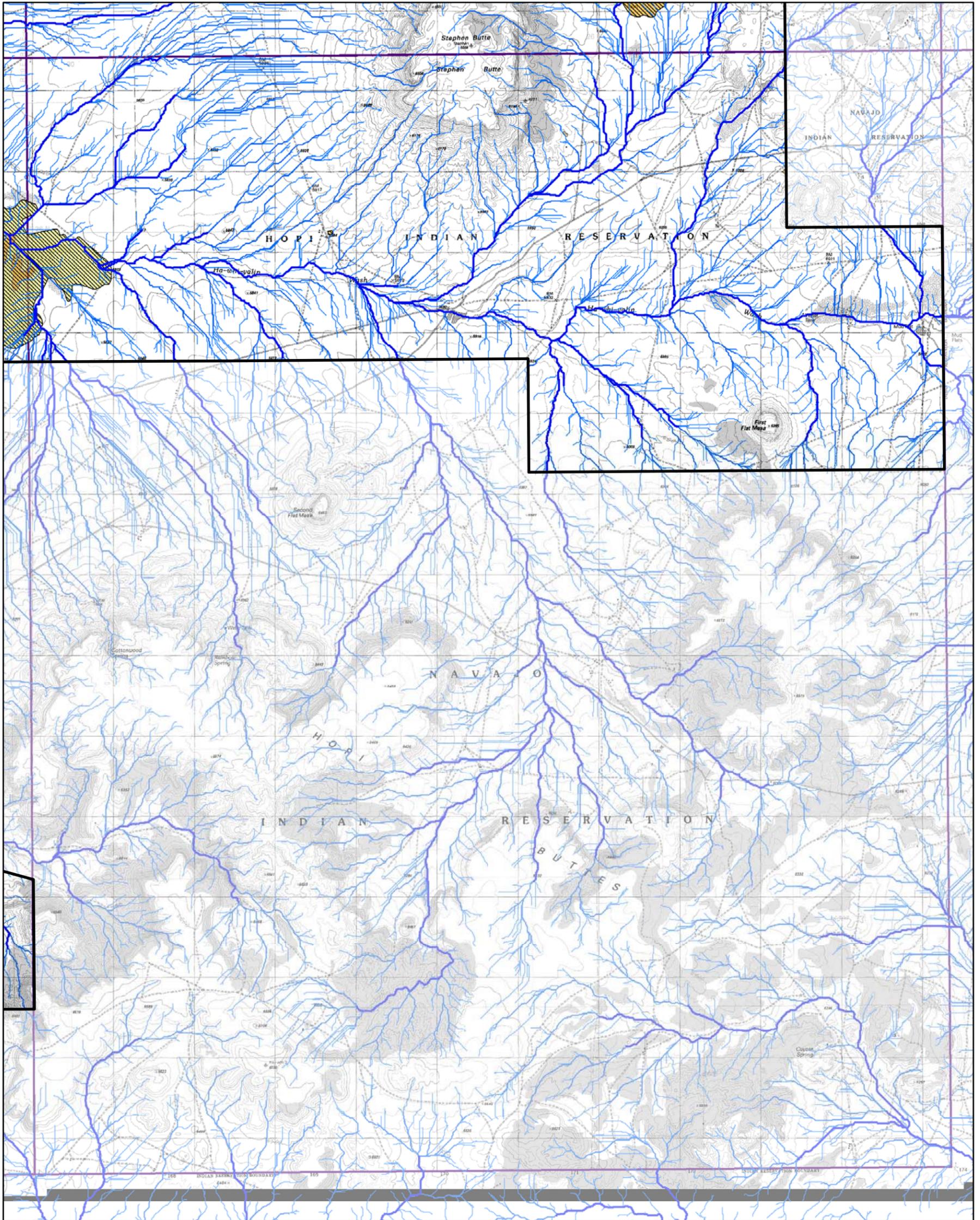
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (First Flat Mesa Quad)

Legend

Claimed Irrigation Type

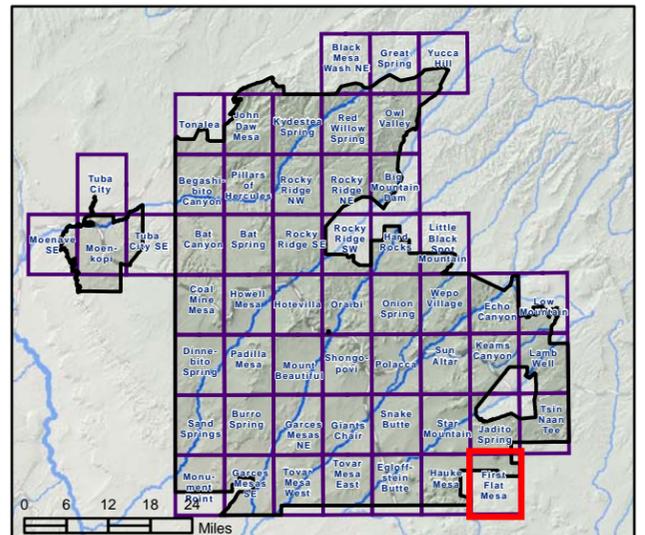
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

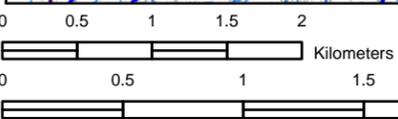
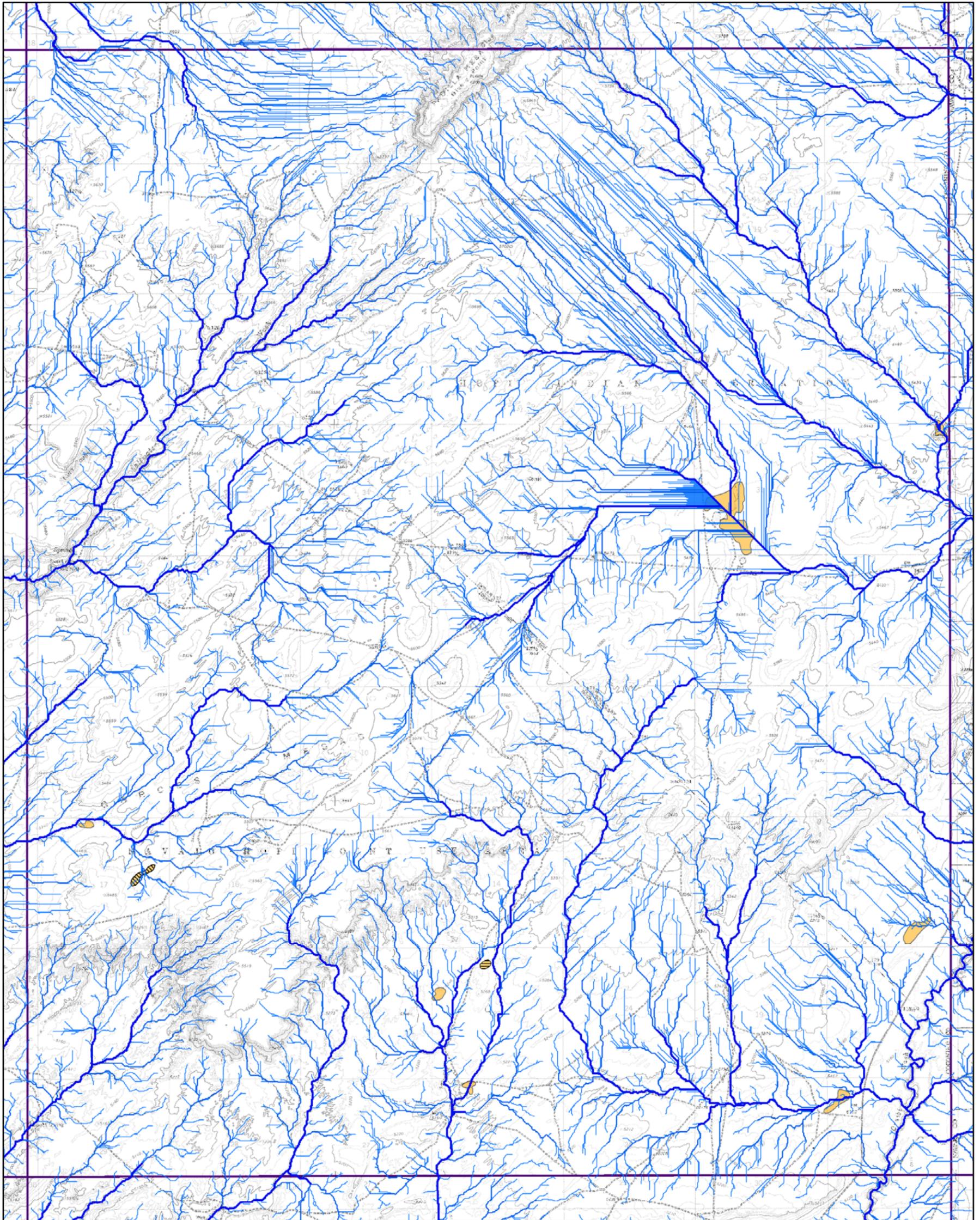
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Garces Mesas NE Quad)

Legend

Claimed Irrigation Type

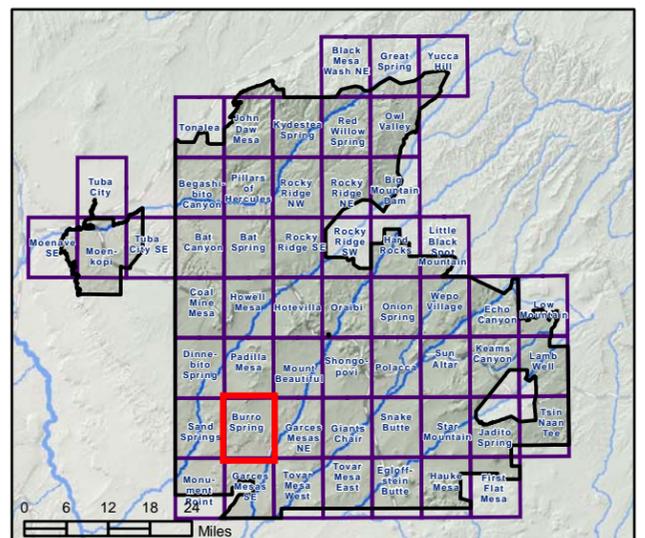
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

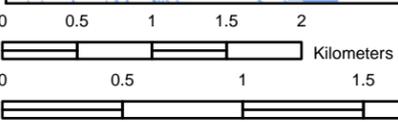
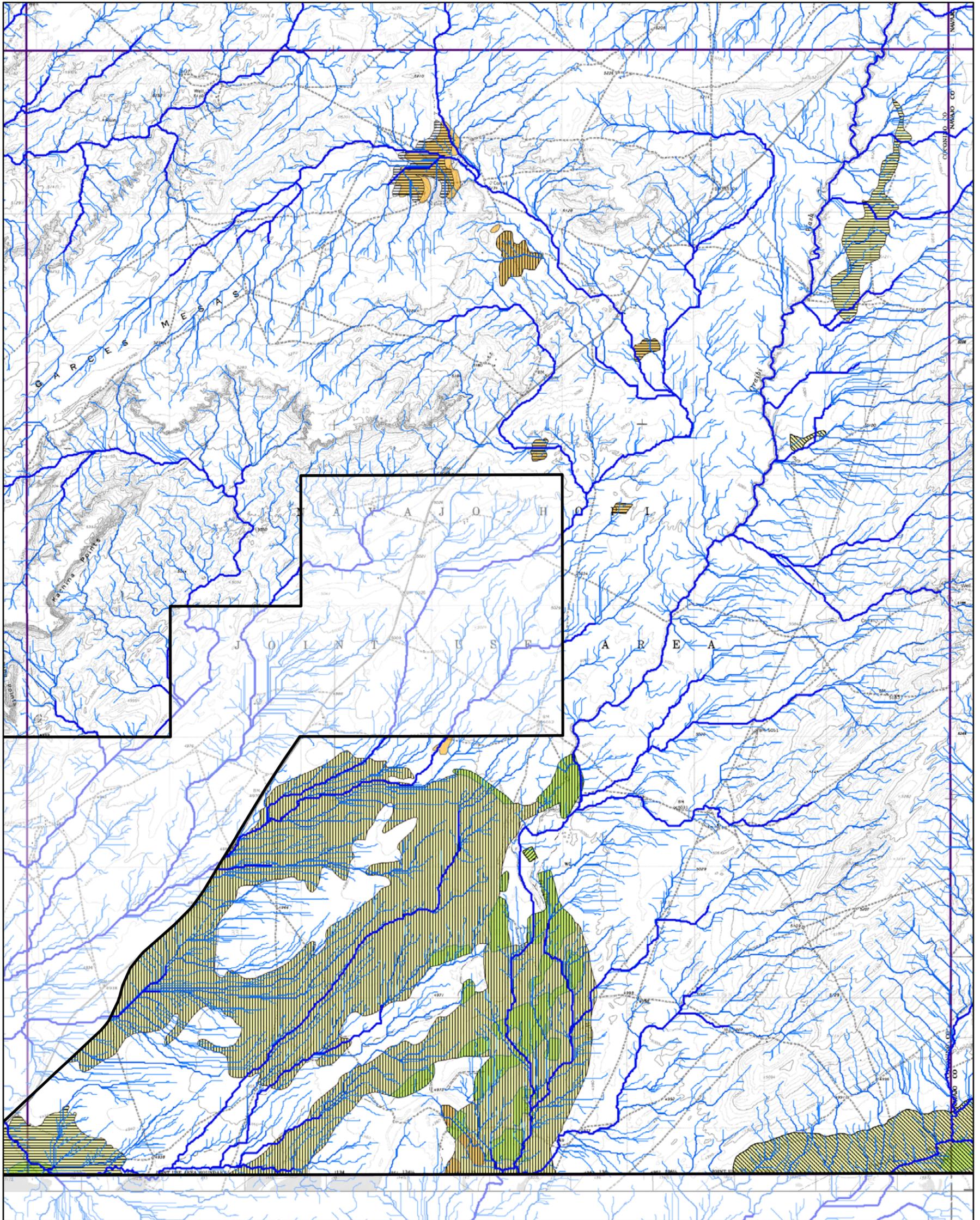
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Garces Mesas SE Quad)

Legend

Claimed Irrigation Type

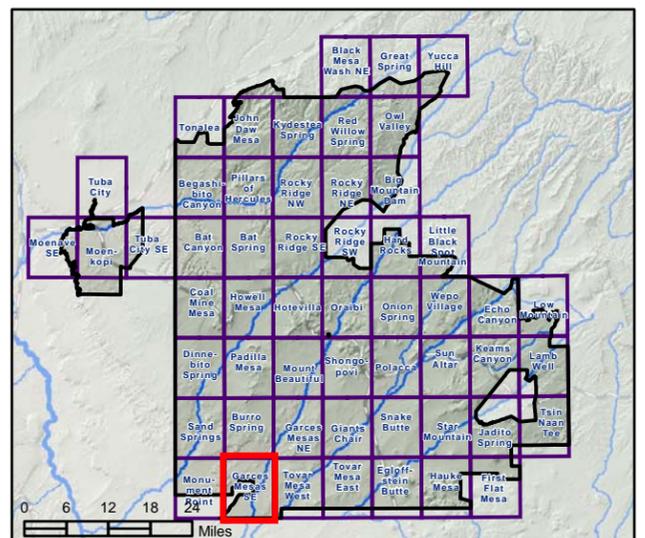
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

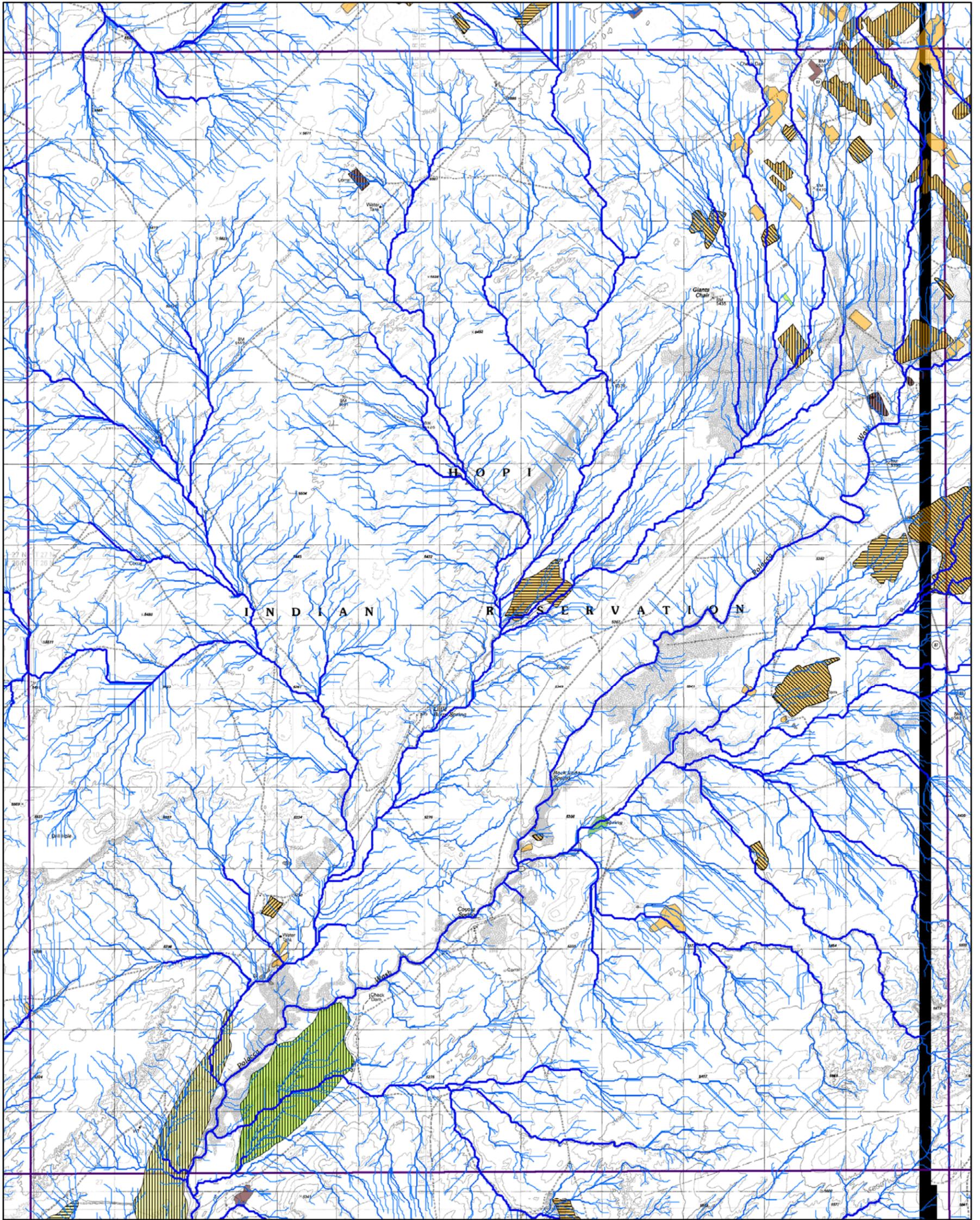
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Giants Chair Quad)

Legend

Claimed Irrigation Type

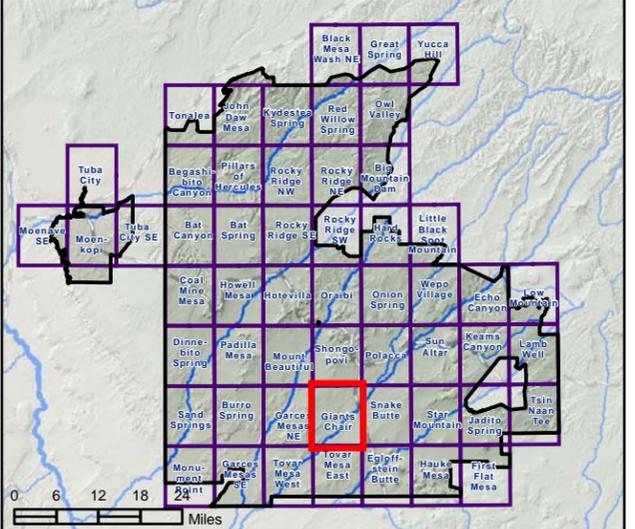
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

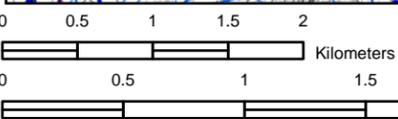
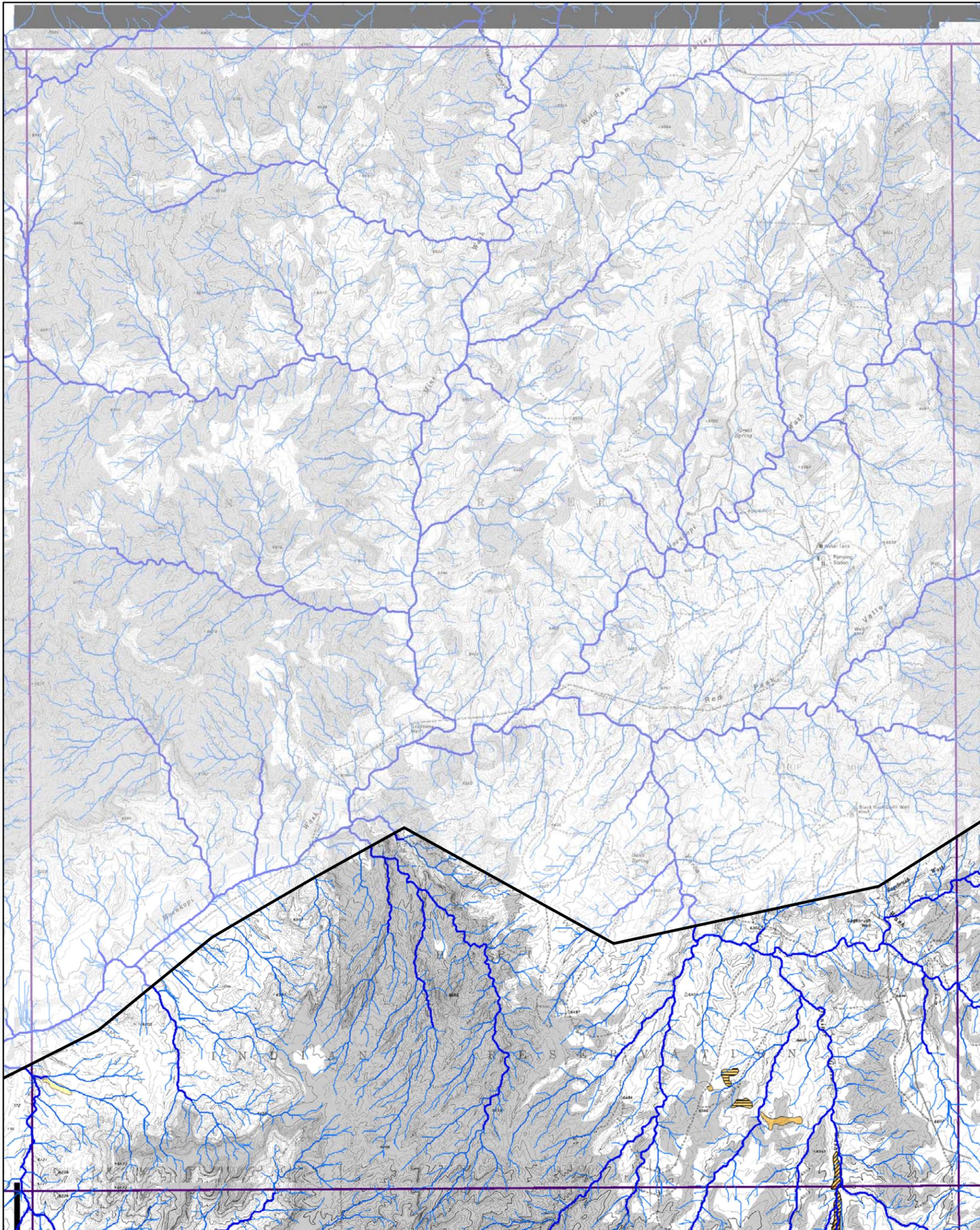
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Great Spring Quad)

Legend

Claimed Irrigation Type

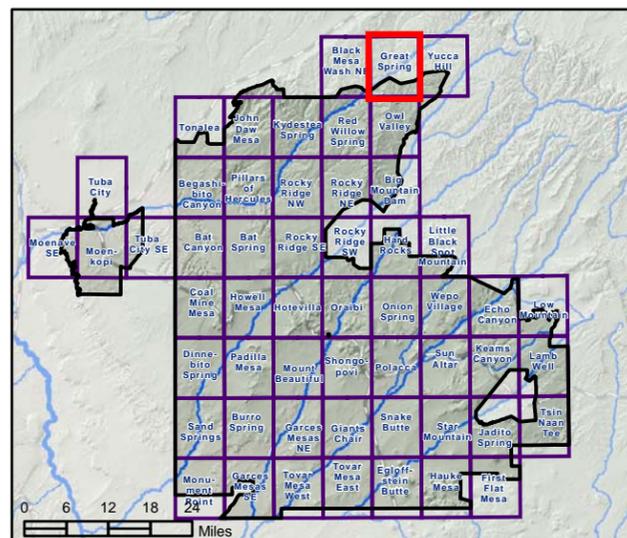
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

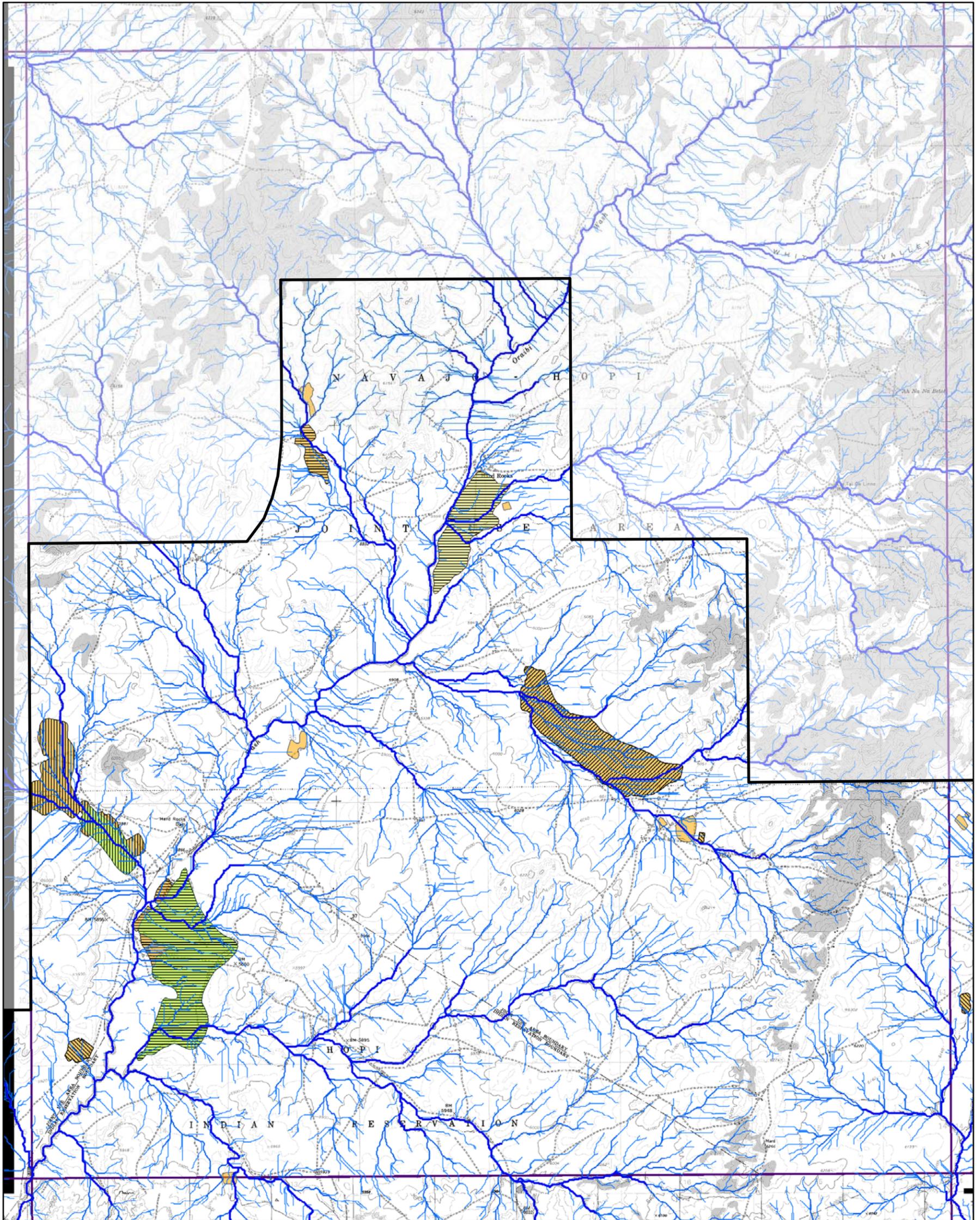
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Hard Rocks Quad)

Legend

Claimed Irrigation Type

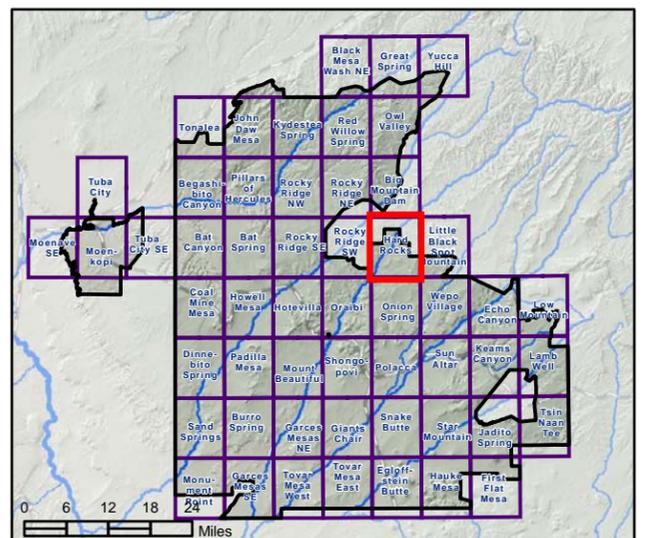
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

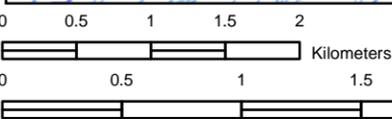
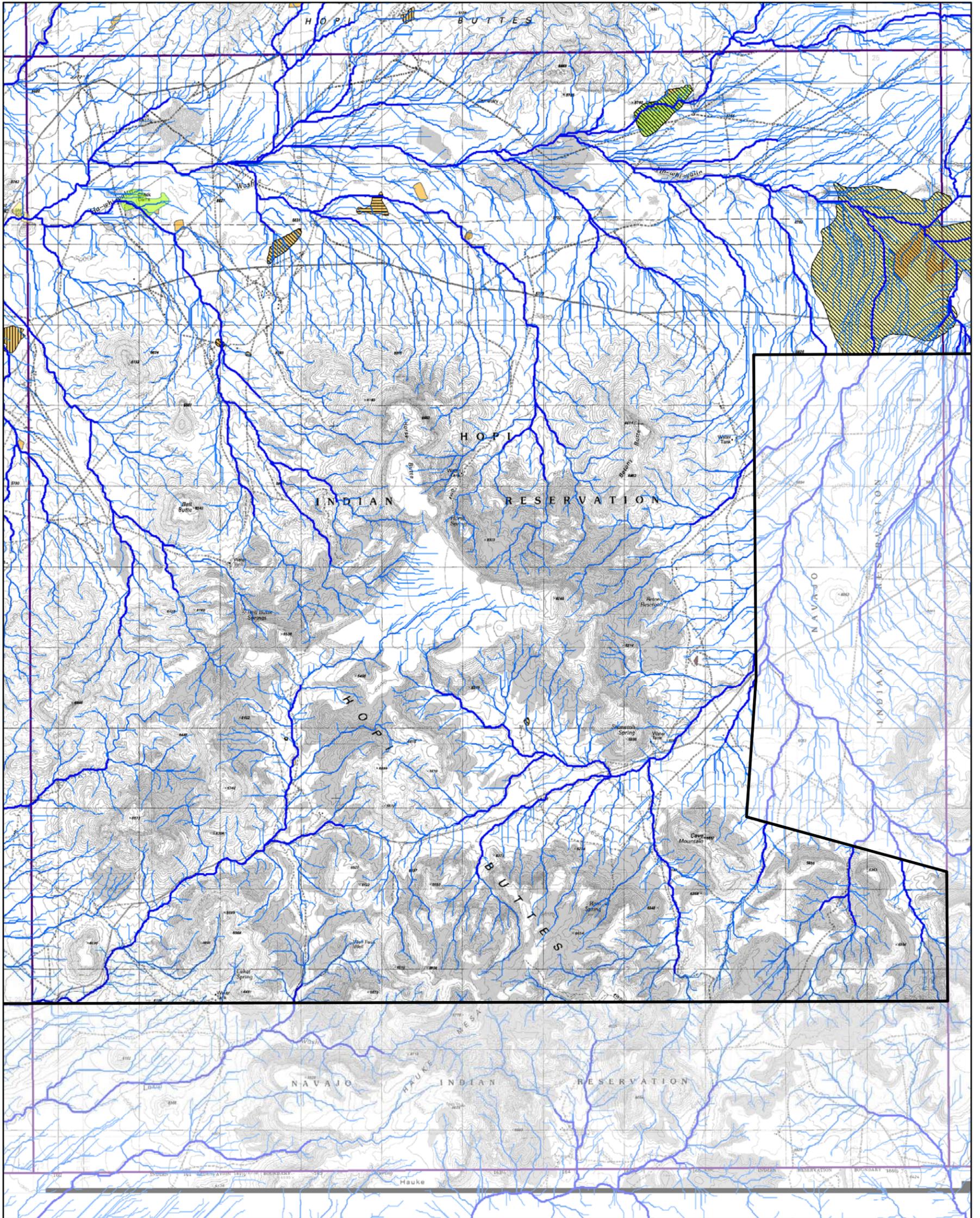
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Hauke Mesa Quad)

Legend

Claimed Irrigation Type

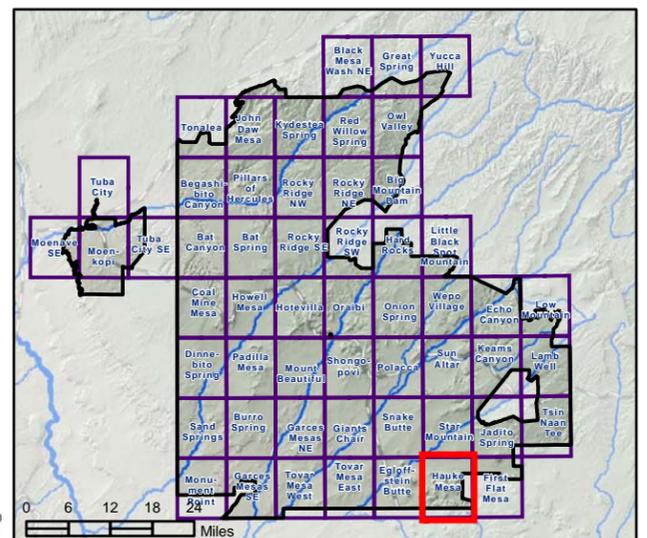
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

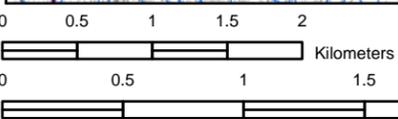
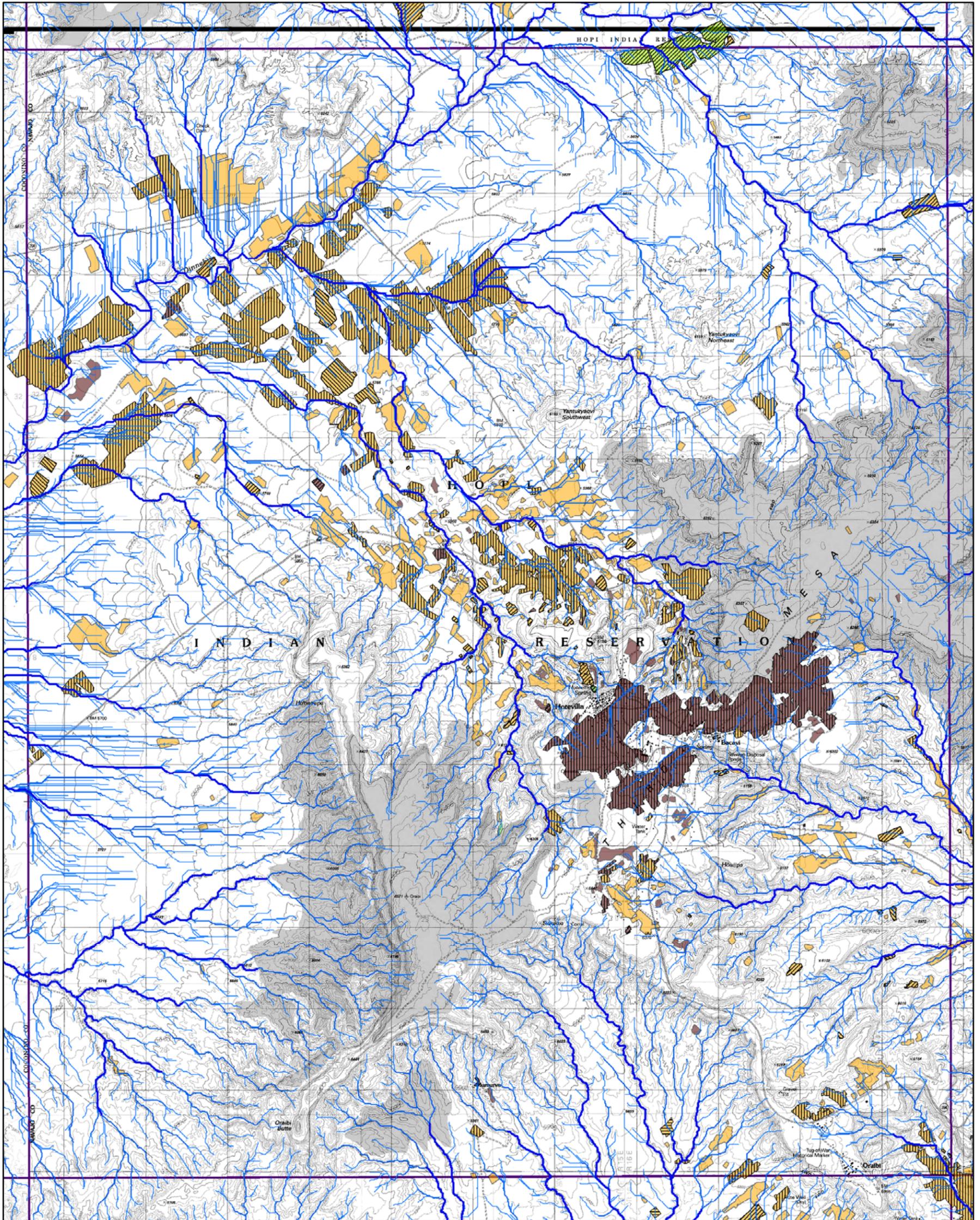
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Hotevilla Quad)

Legend

Claimed Irrigation Type

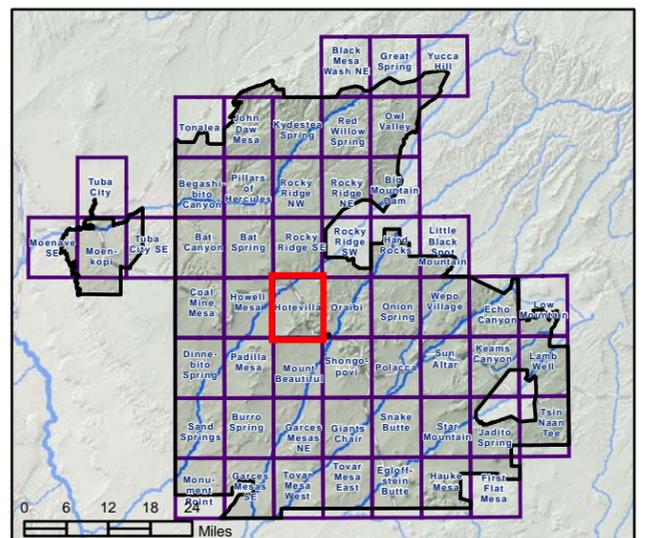
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

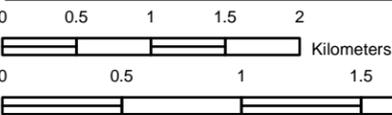
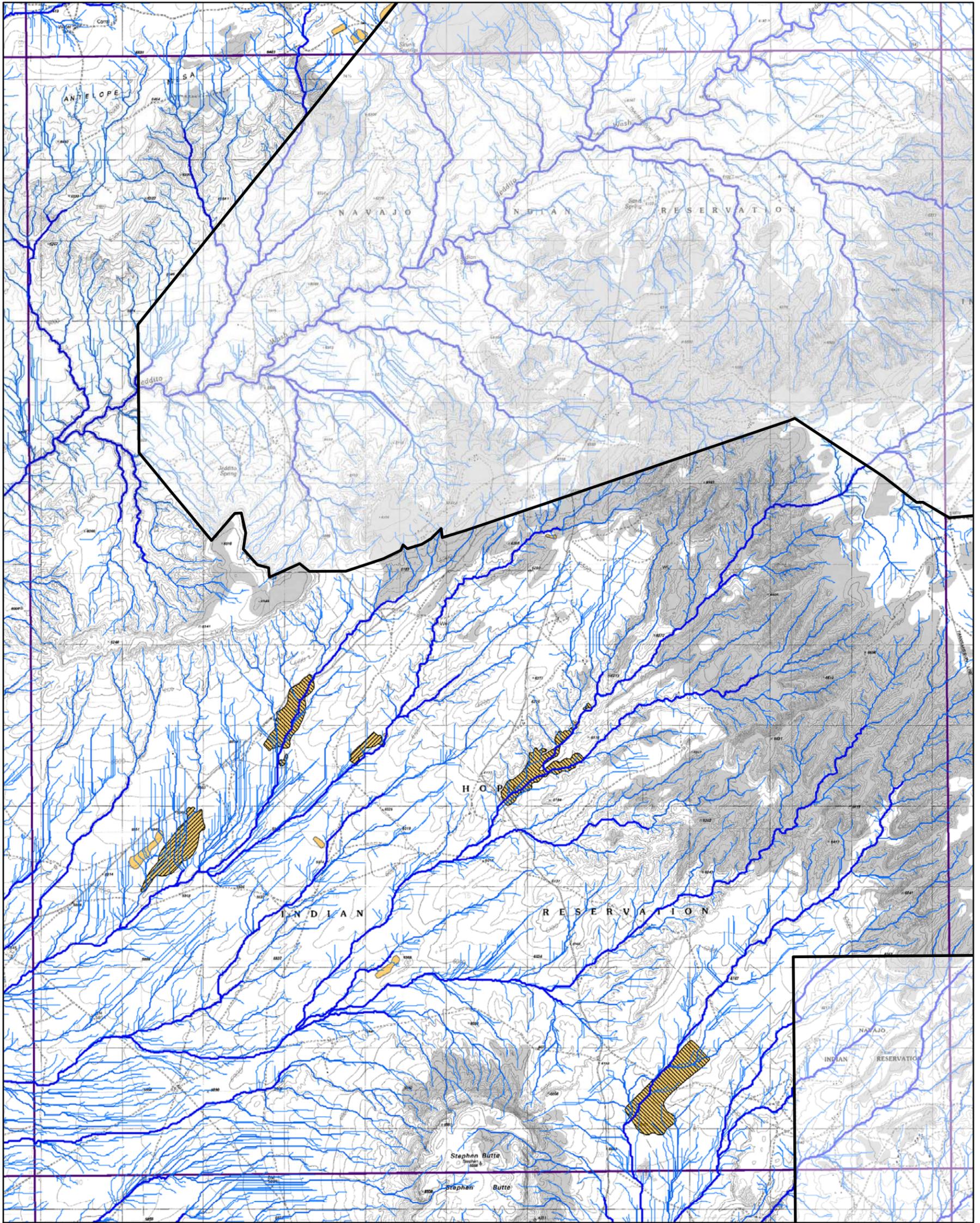
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Jadito Spring Quad)

Legend

Claimed Irrigation Type

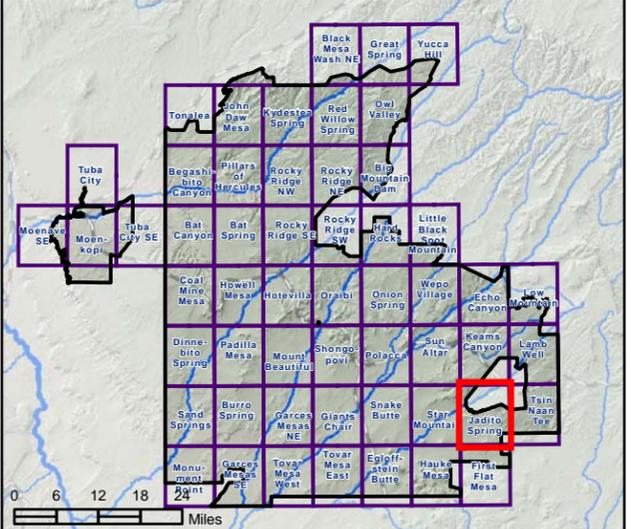
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

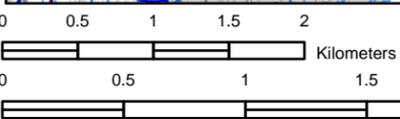
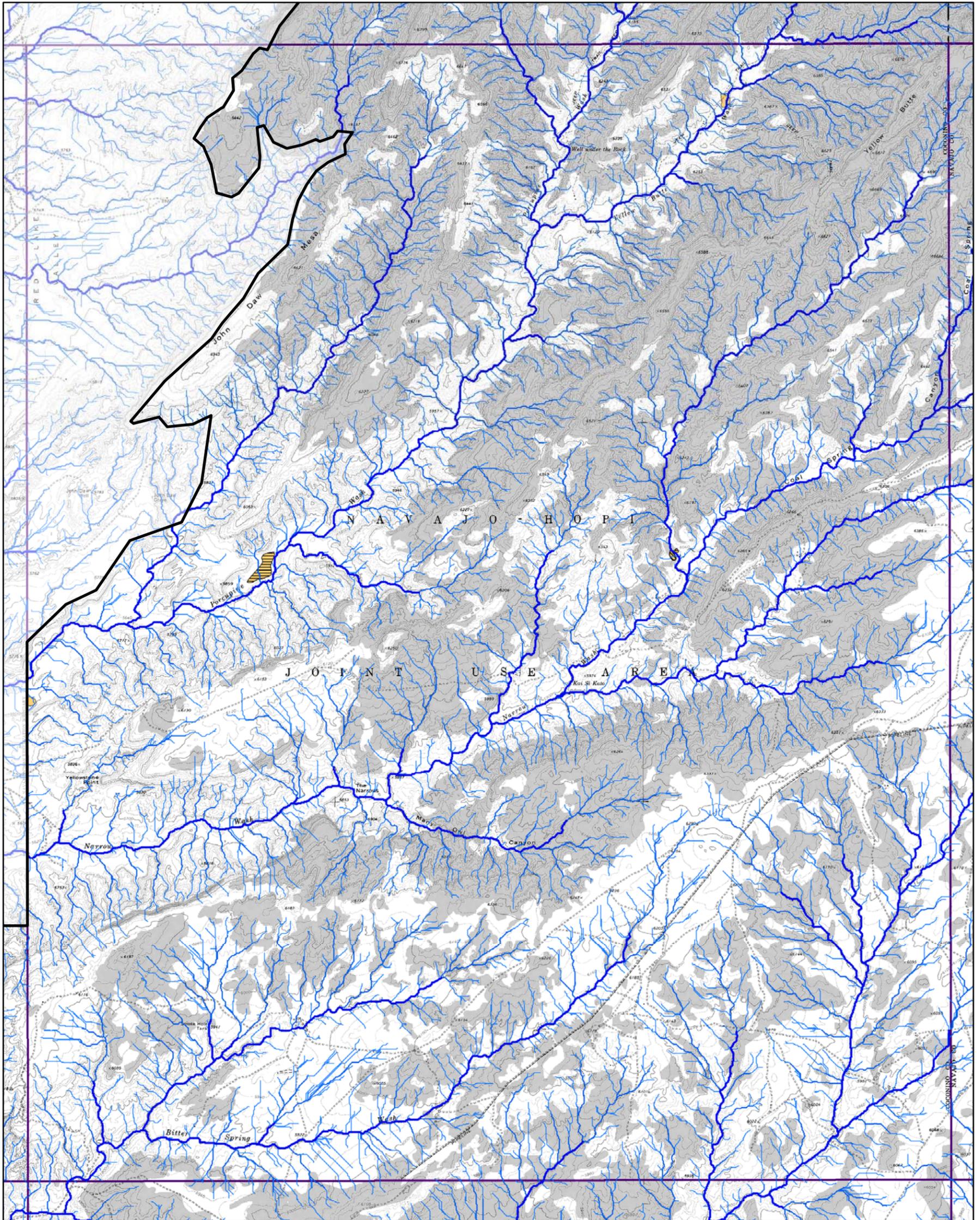
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (John Daw Mesa Quad)

Legend

Claimed Irrigation Type

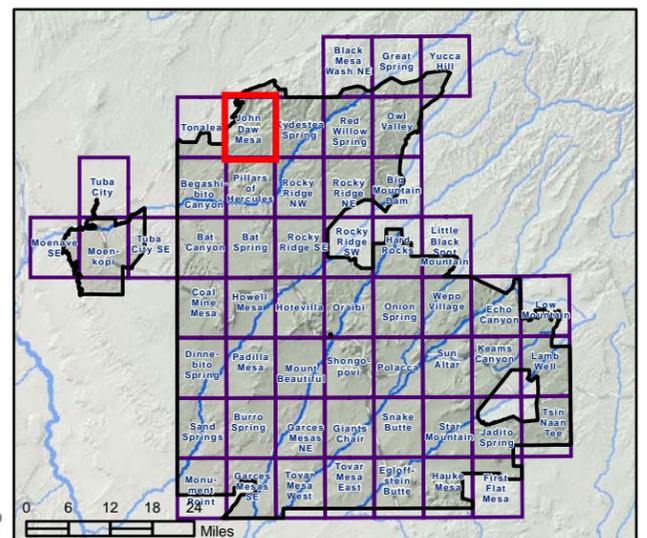
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

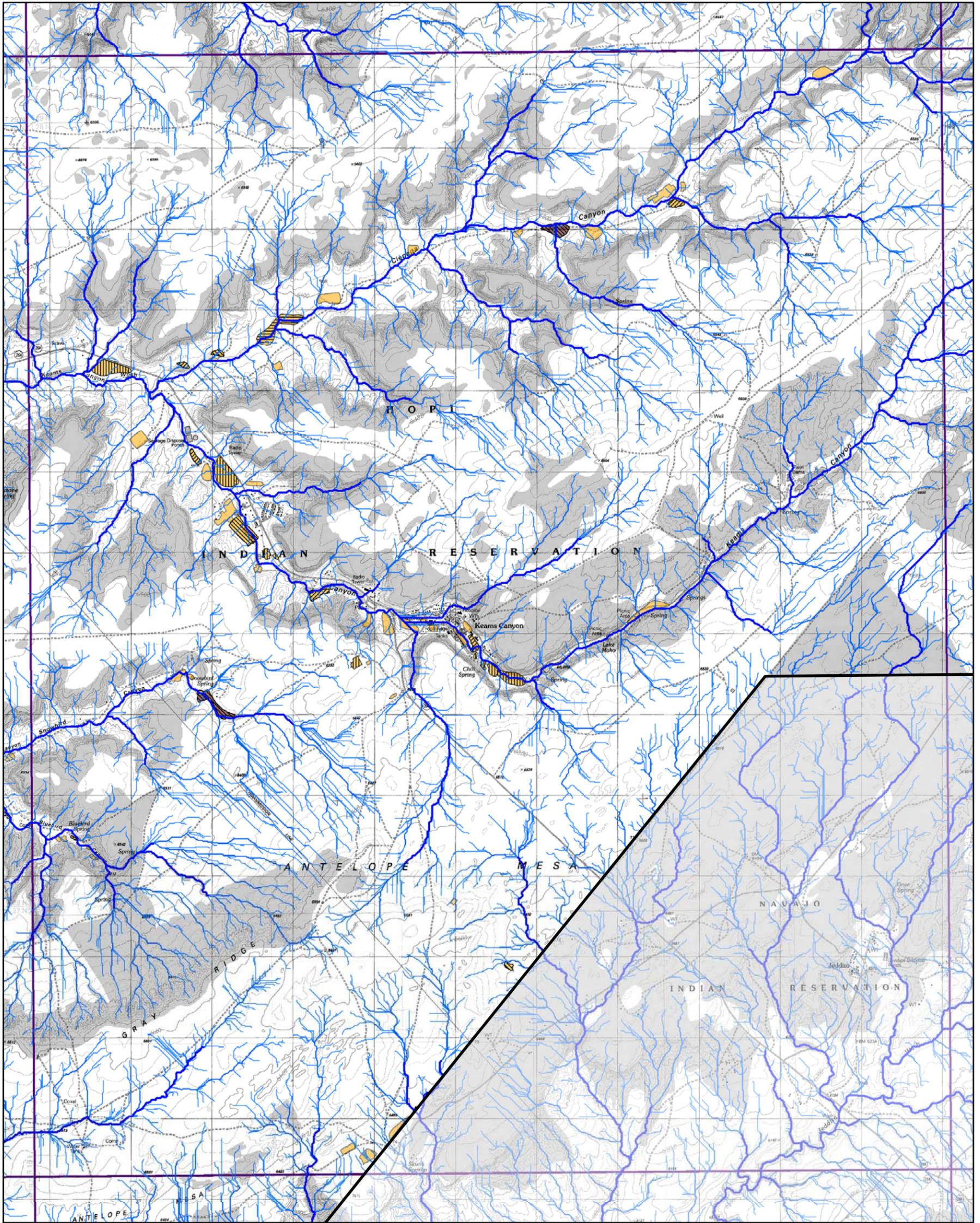
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Keams Canyon Quad)

Legend

Claimed Irrigation Type

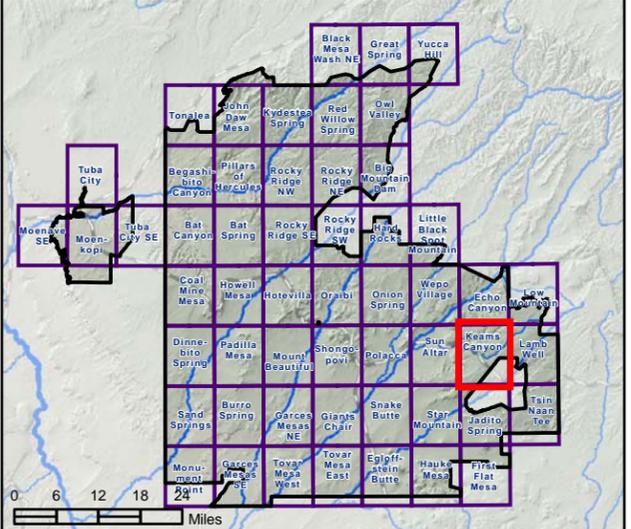
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

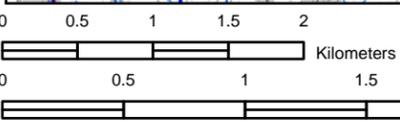
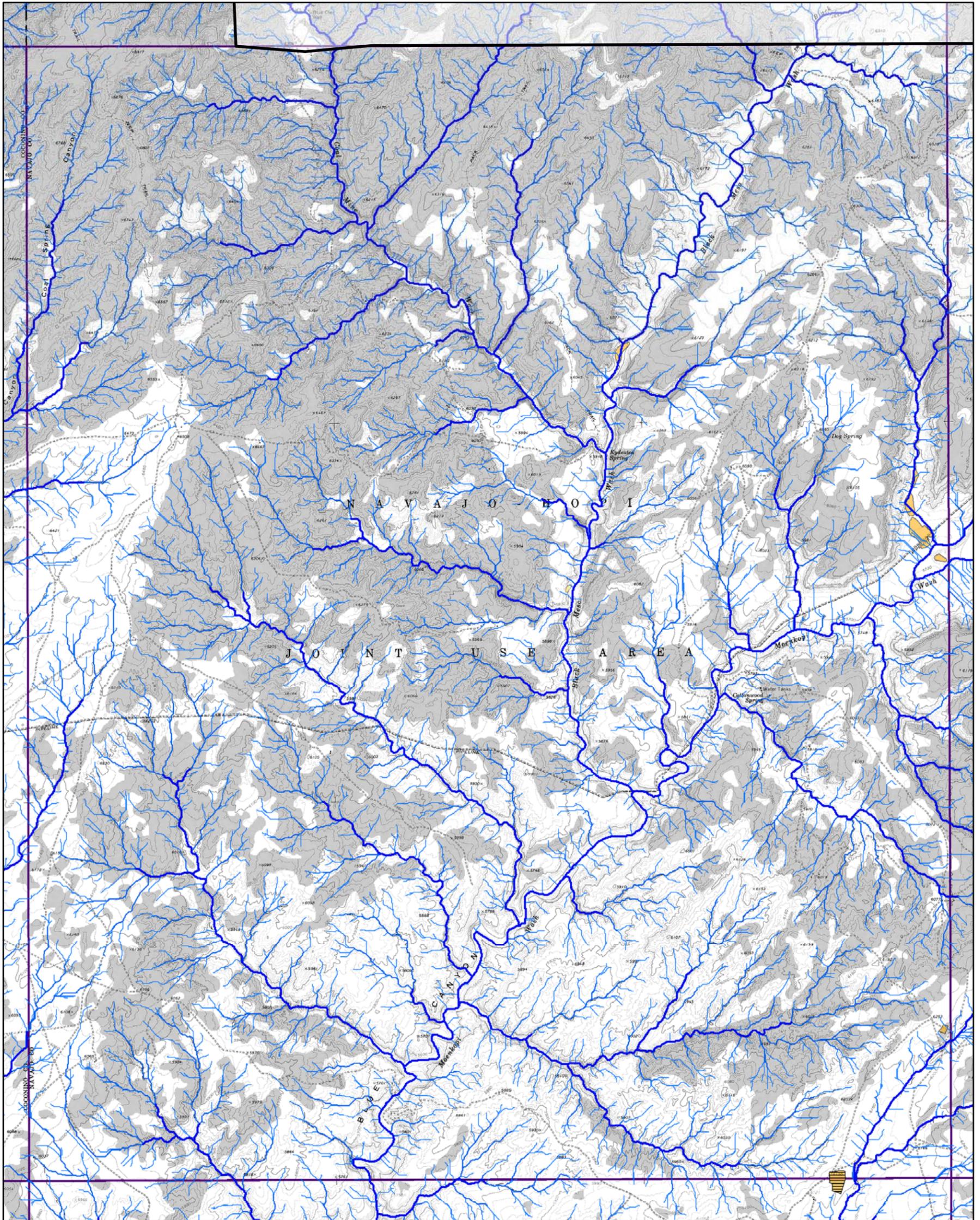
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Kydestea Spring Quad)

Legend

Claimed Irrigation Type

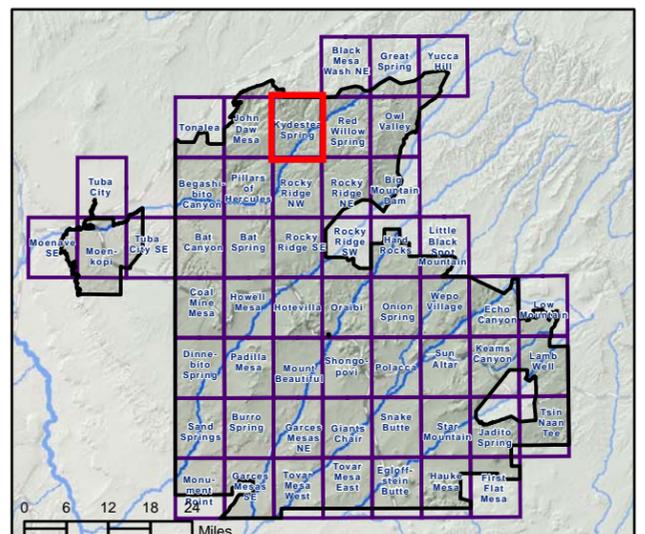
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

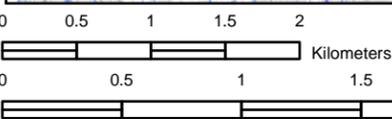
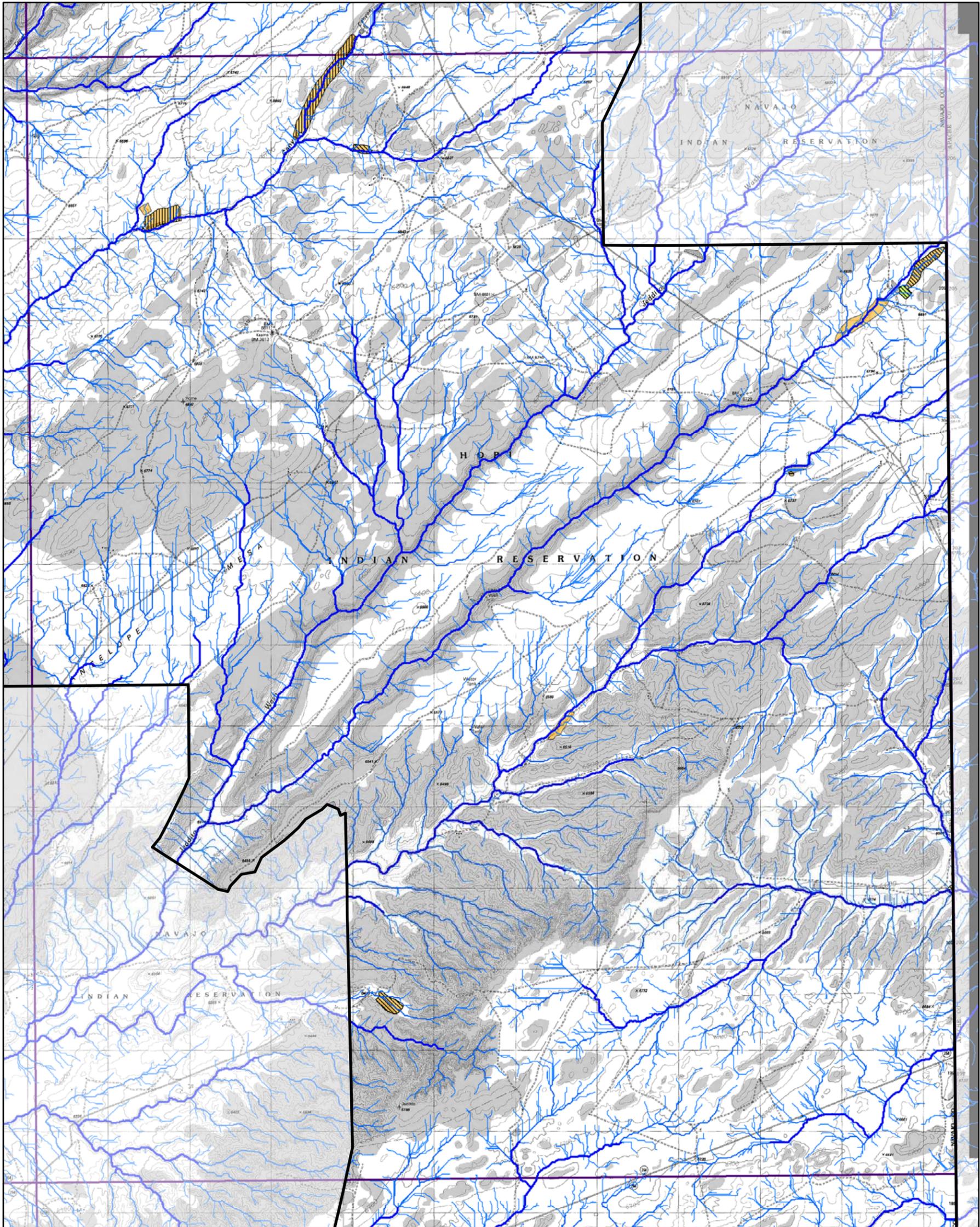
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Lamb Well Quad)

Legend

Claimed Irrigation Type

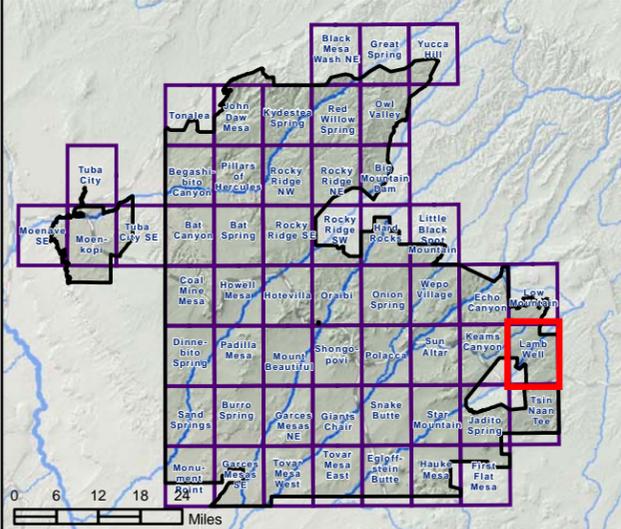
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

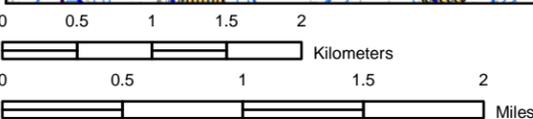
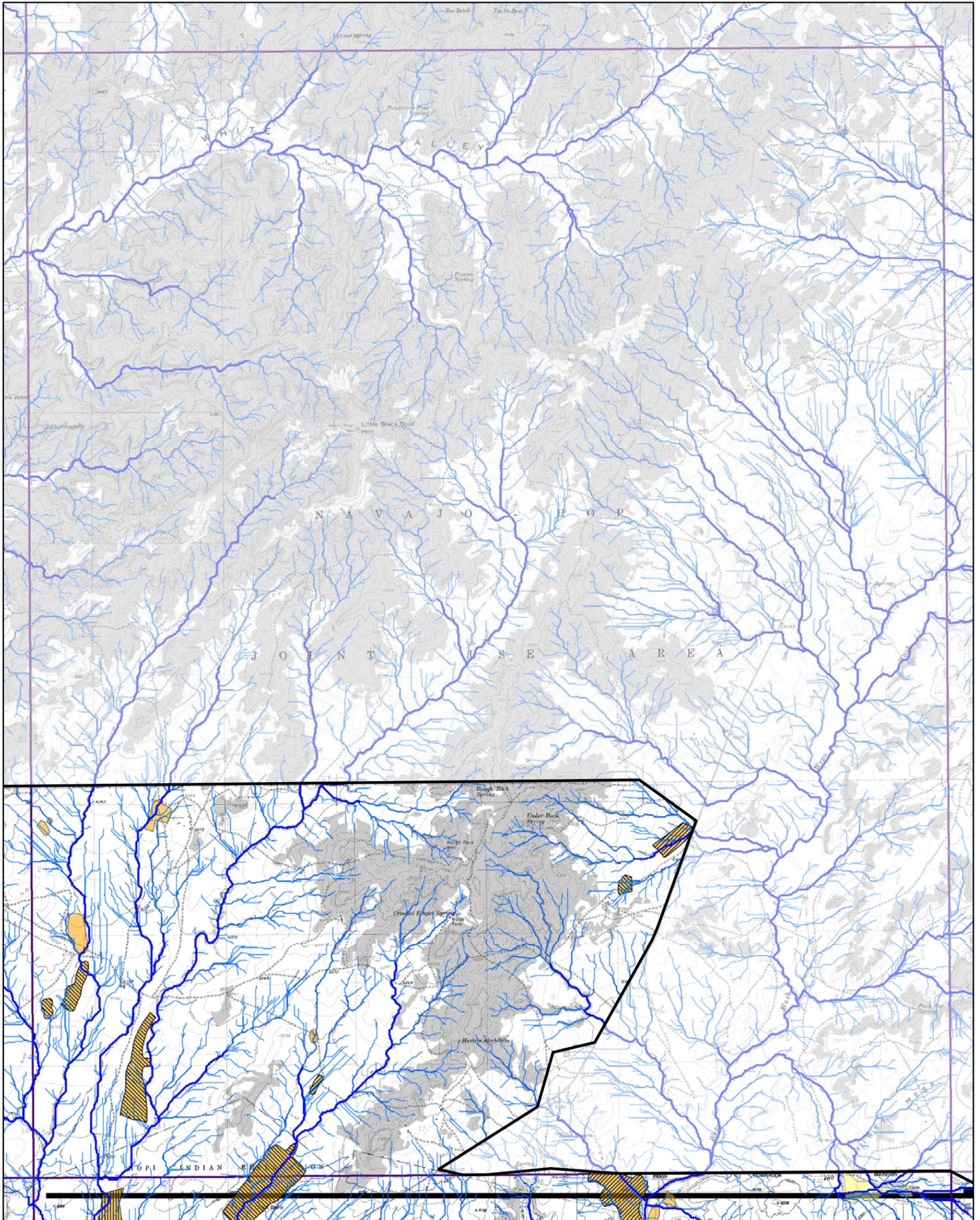
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Little Black Spot Mountain Quad)

Legend

Claimed Irrigation Type

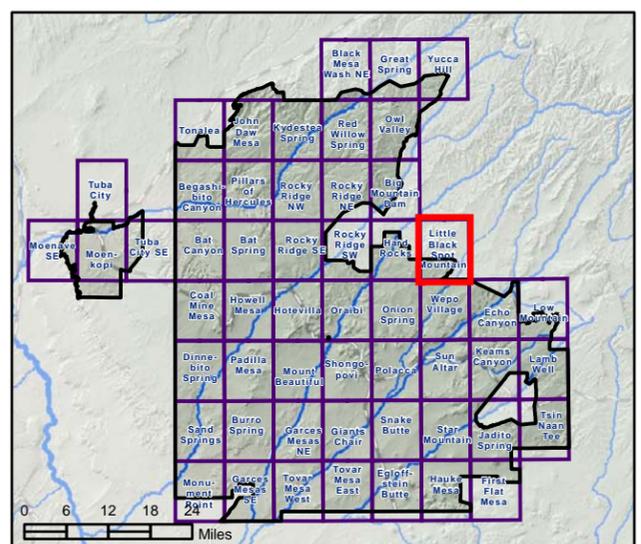
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

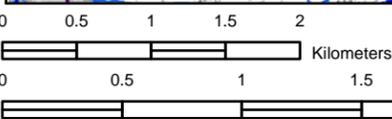
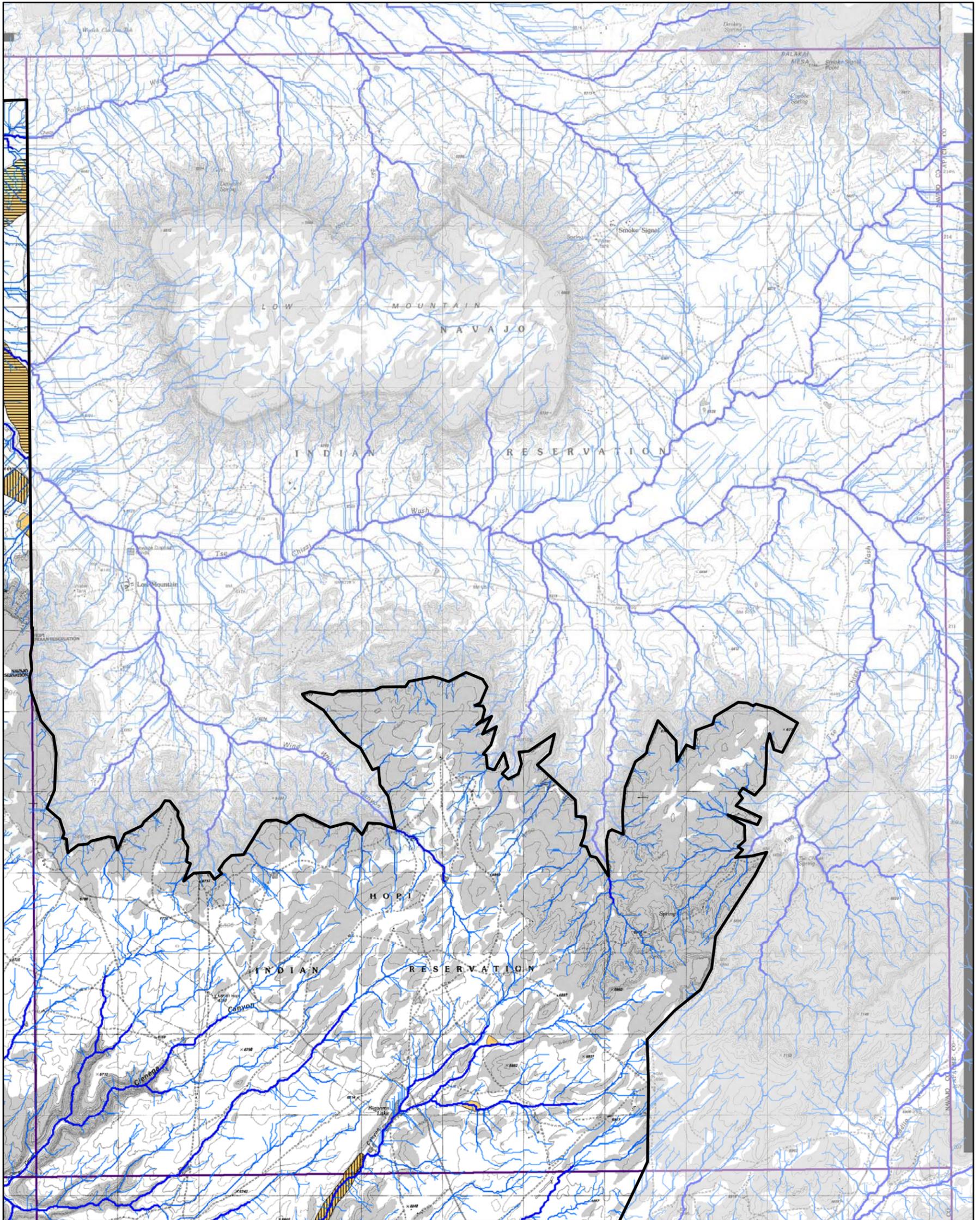
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Low Mountain Quad)

Legend

Claimed Irrigation Type

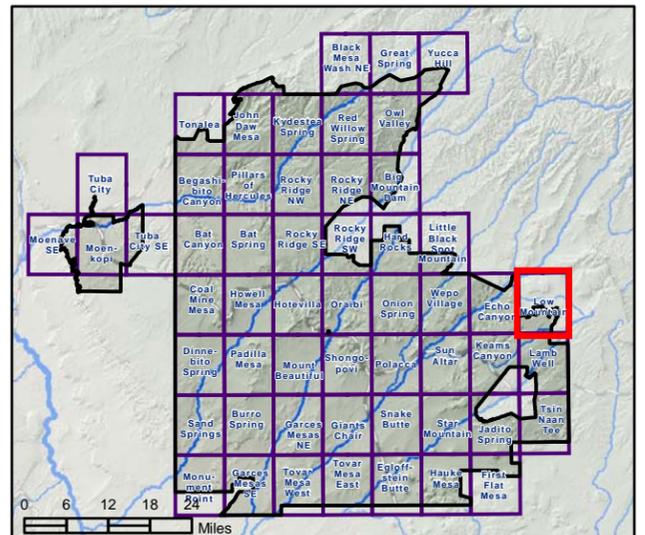
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

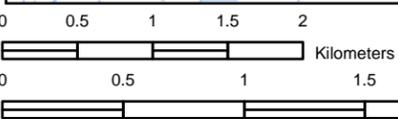
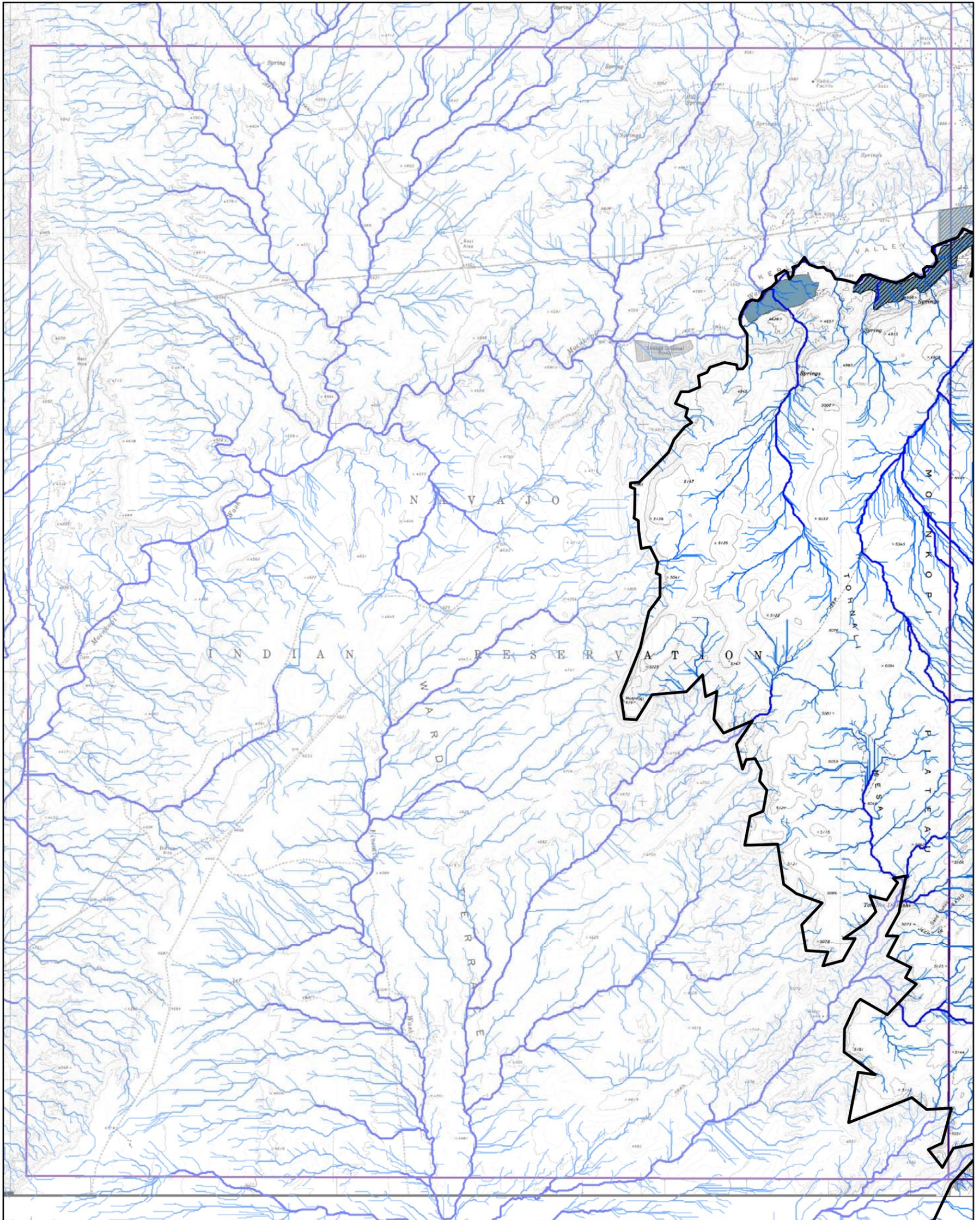
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Moenave SE Quad)

Legend

Claimed Irrigation Type

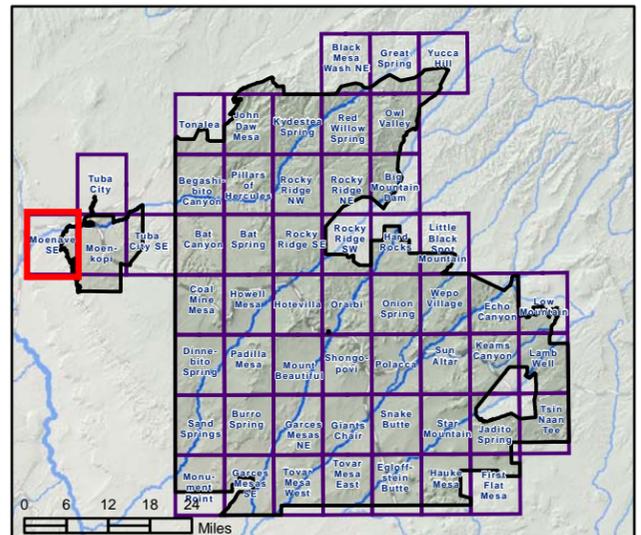
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

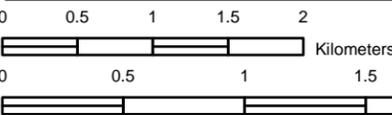
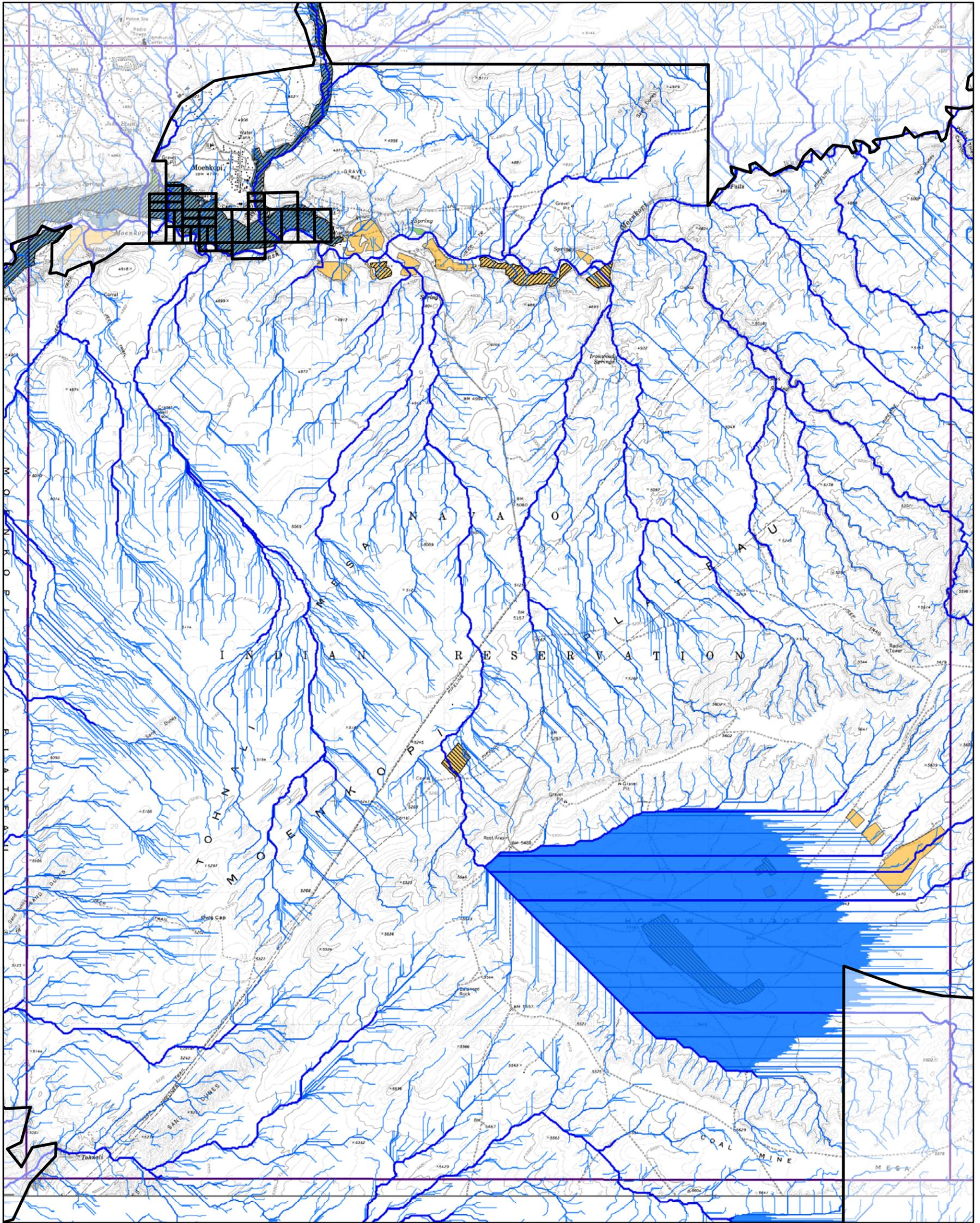
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Moenkopi Quad)

Legend

Claimed Irrigation Type

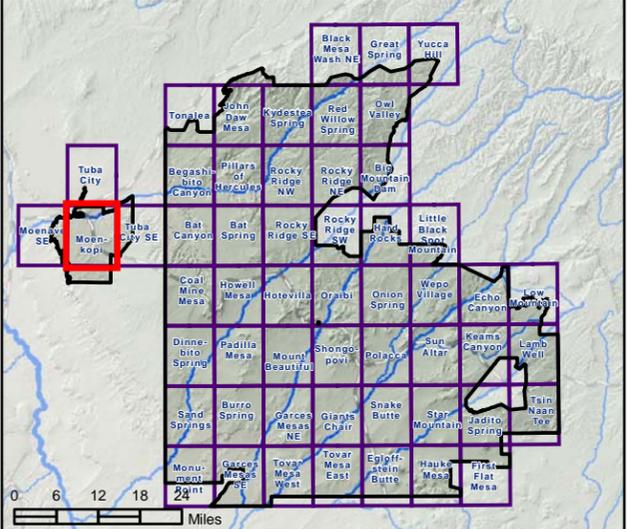
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

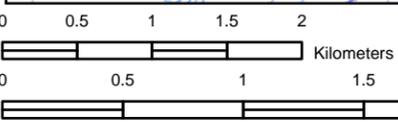
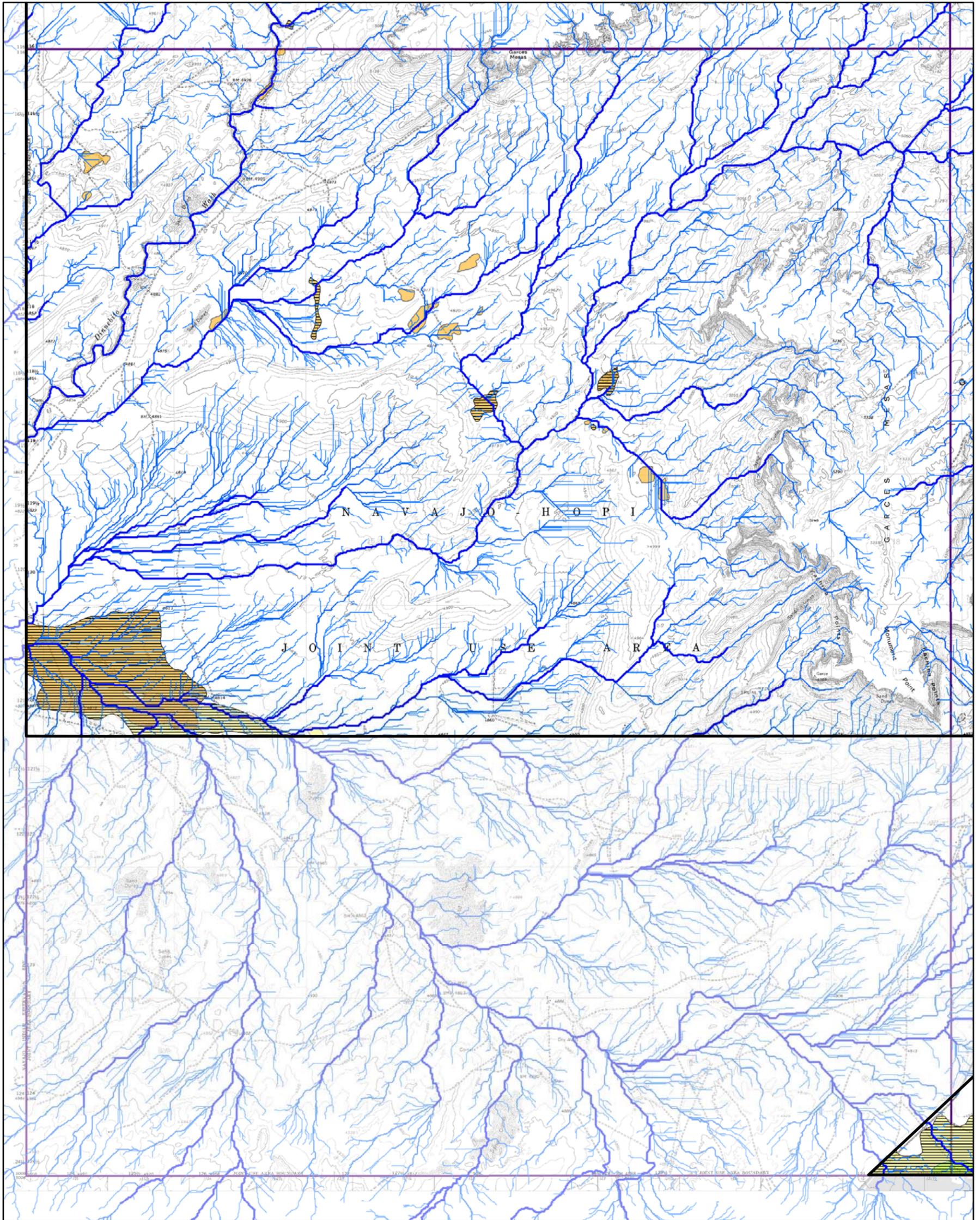
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Monument Point Quad)

Legend

Claimed Irrigation Type

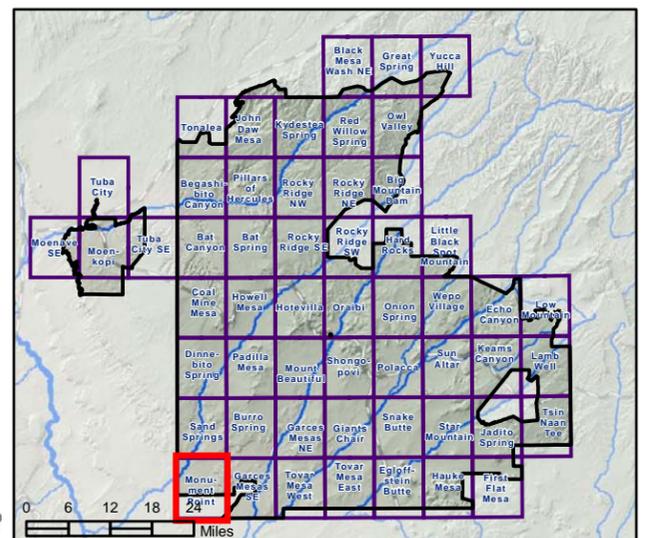
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

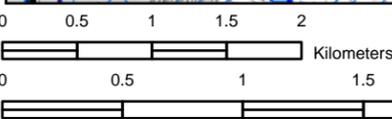
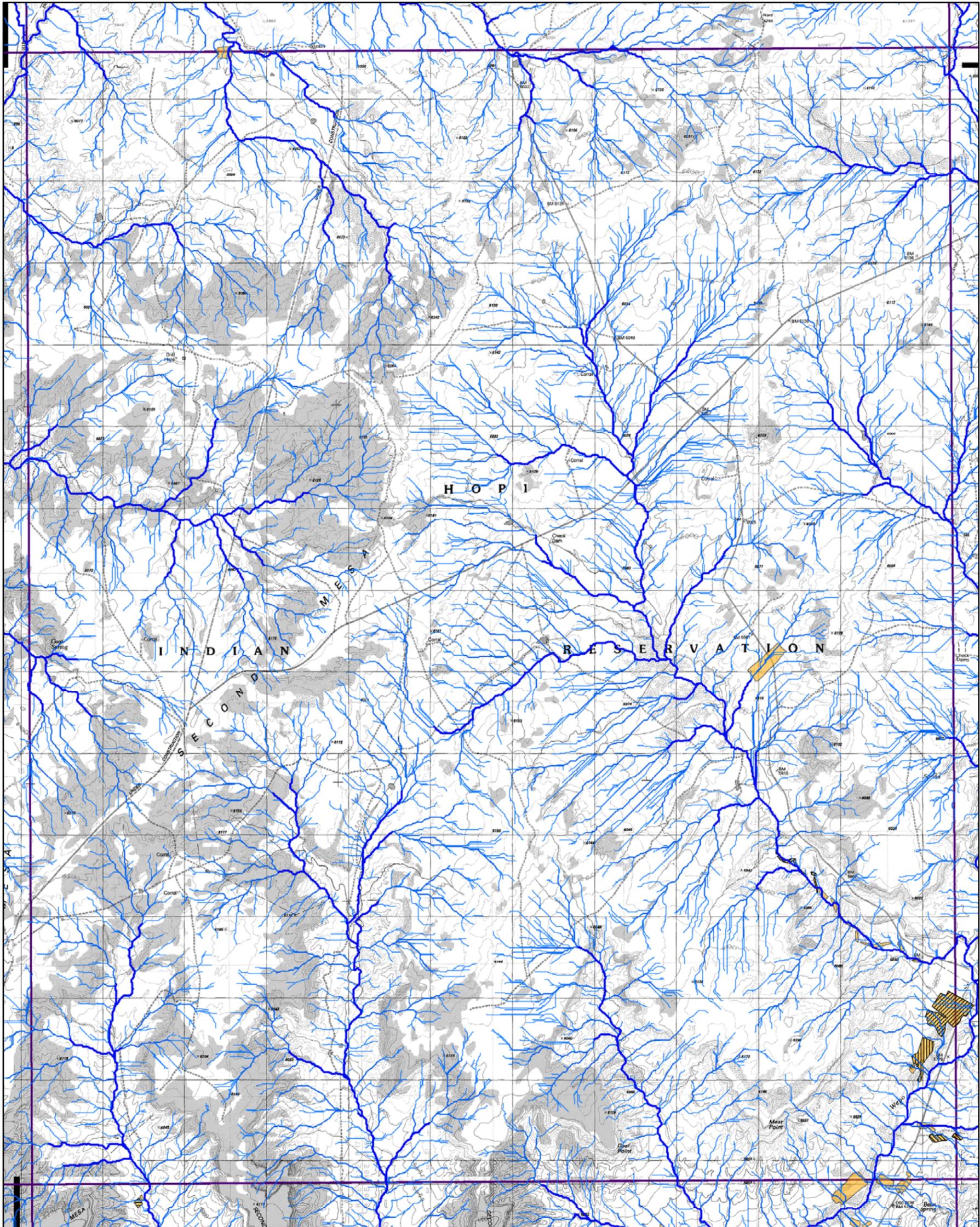
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Onion Spring Quad)

Legend

Claimed Irrigation Type

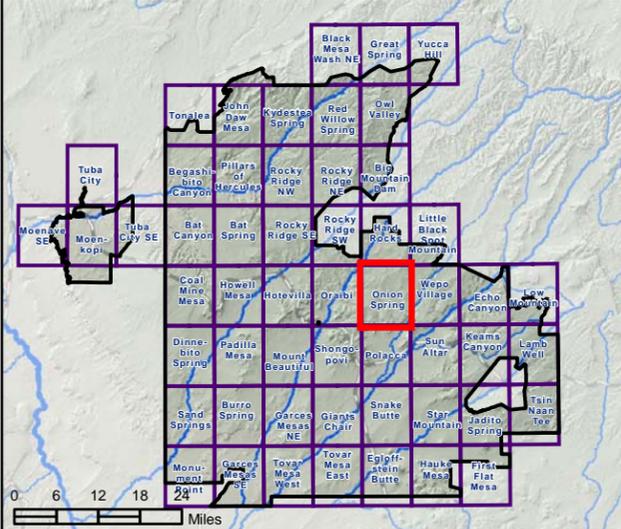
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

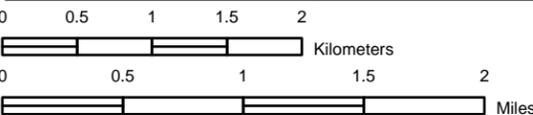
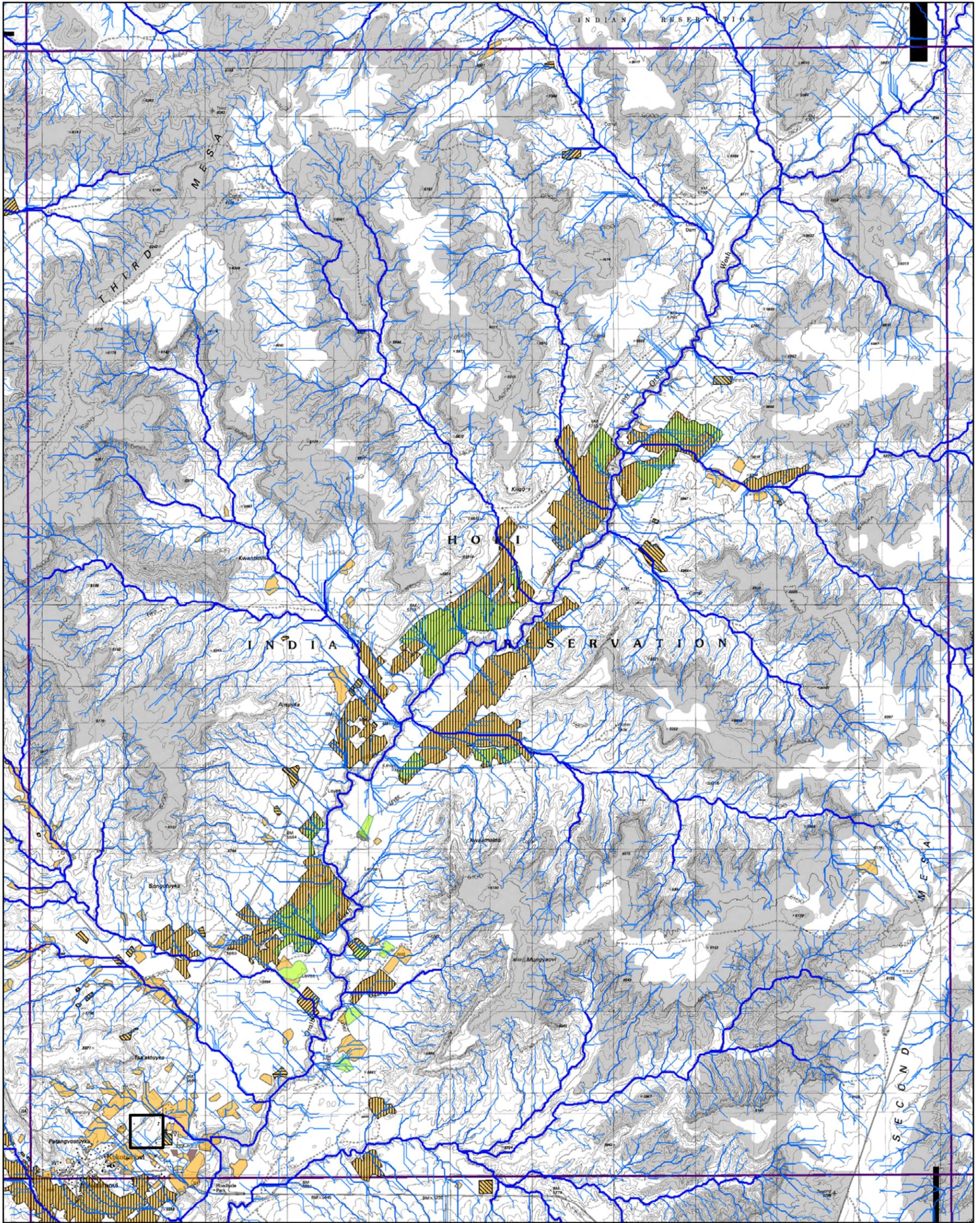
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Oraibi Quad)

Legend

Claimed Irrigation Type

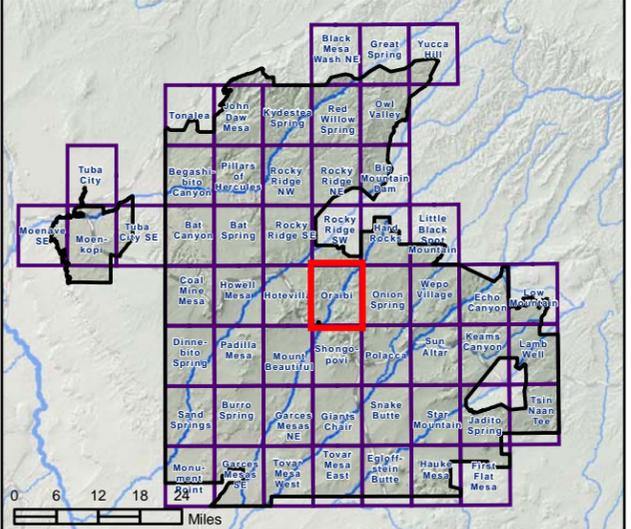
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

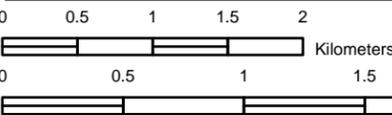
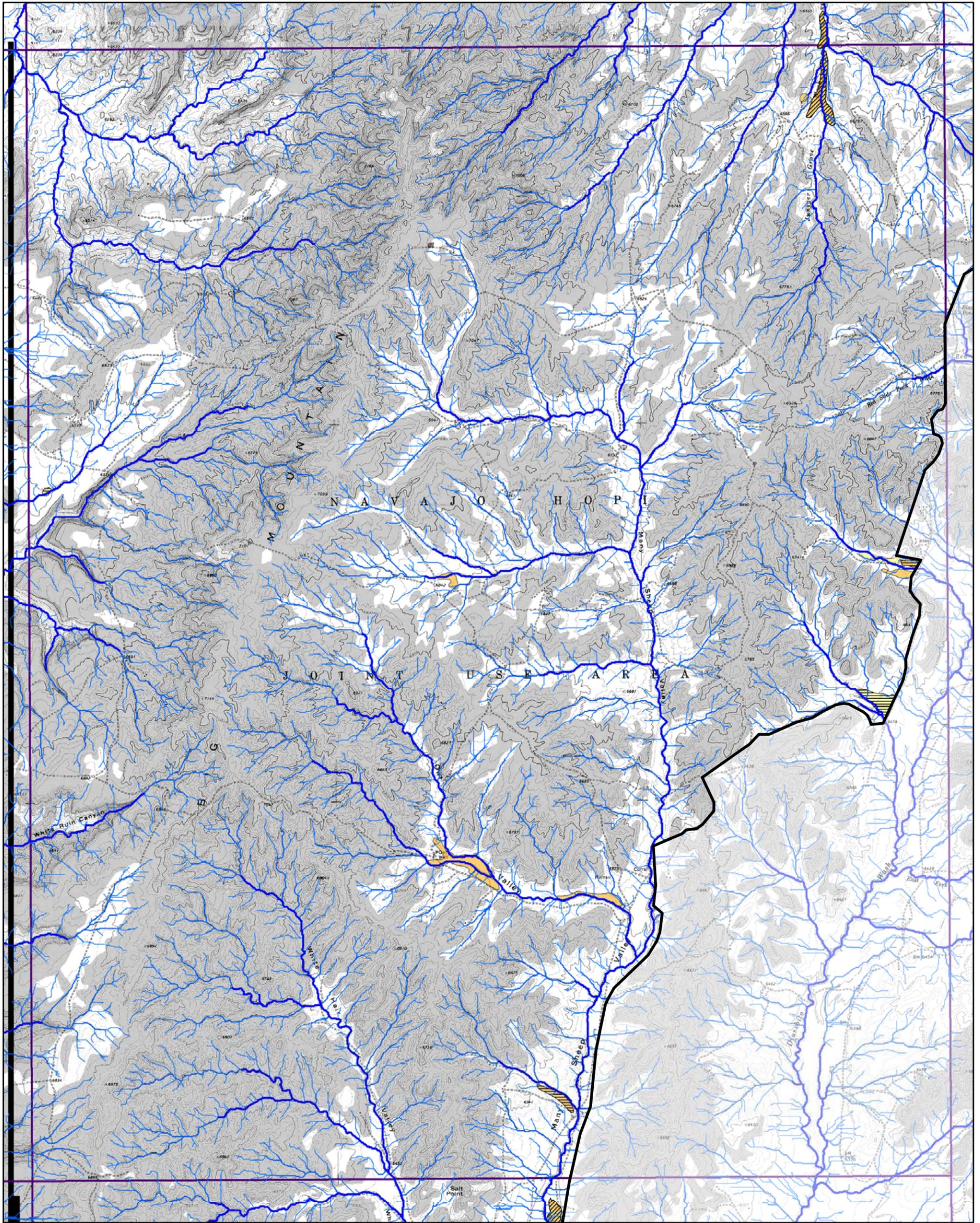
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Owl Valley Quad)

Legend

Claimed Irrigation Type

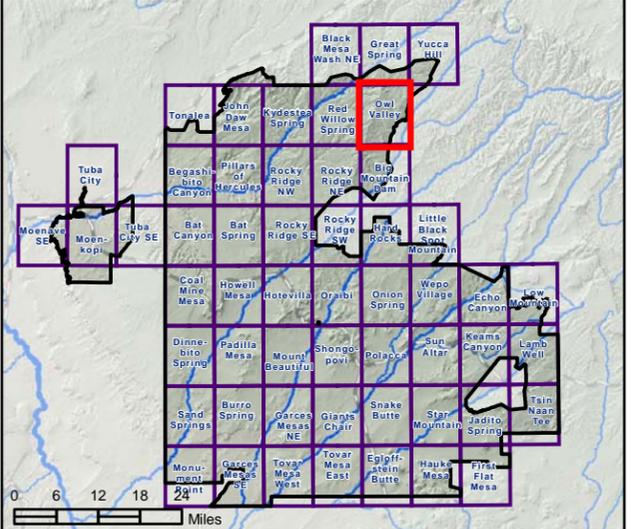
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

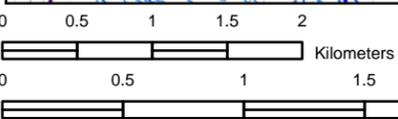
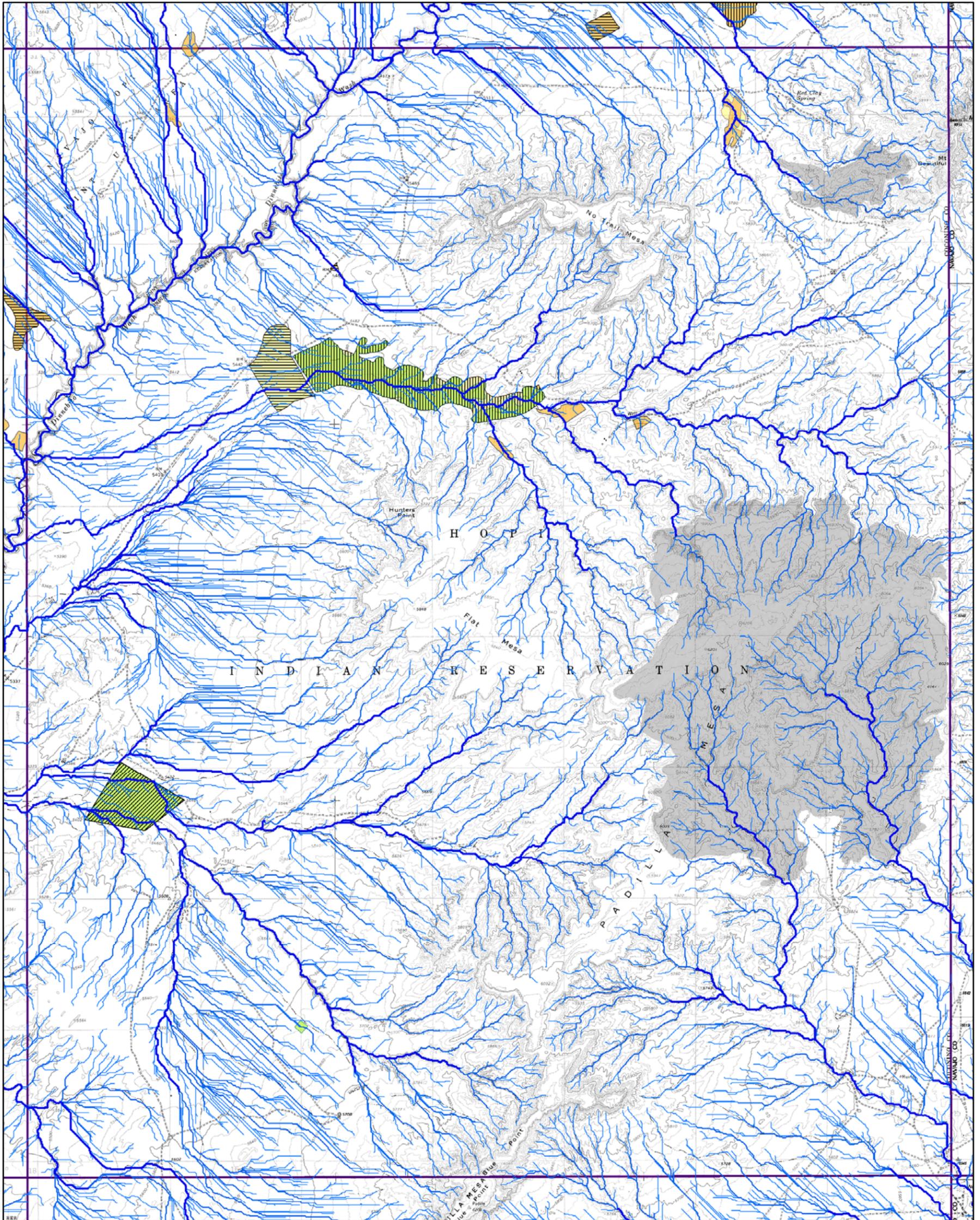
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Padilla Mesa Quad)

Legend

Claimed Irrigation Type

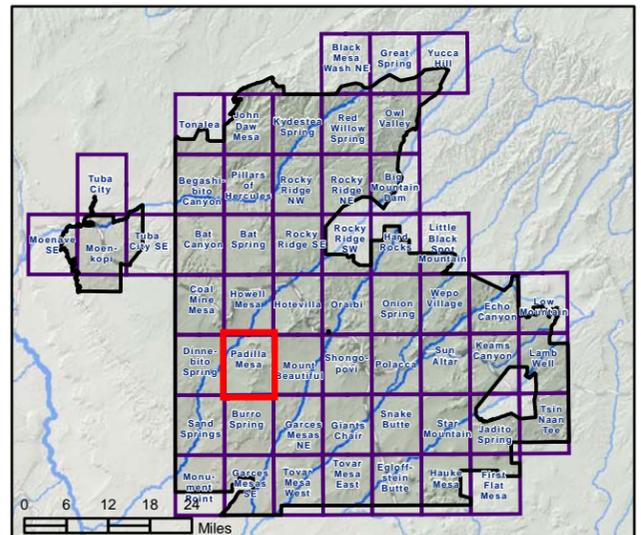
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

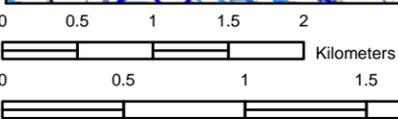
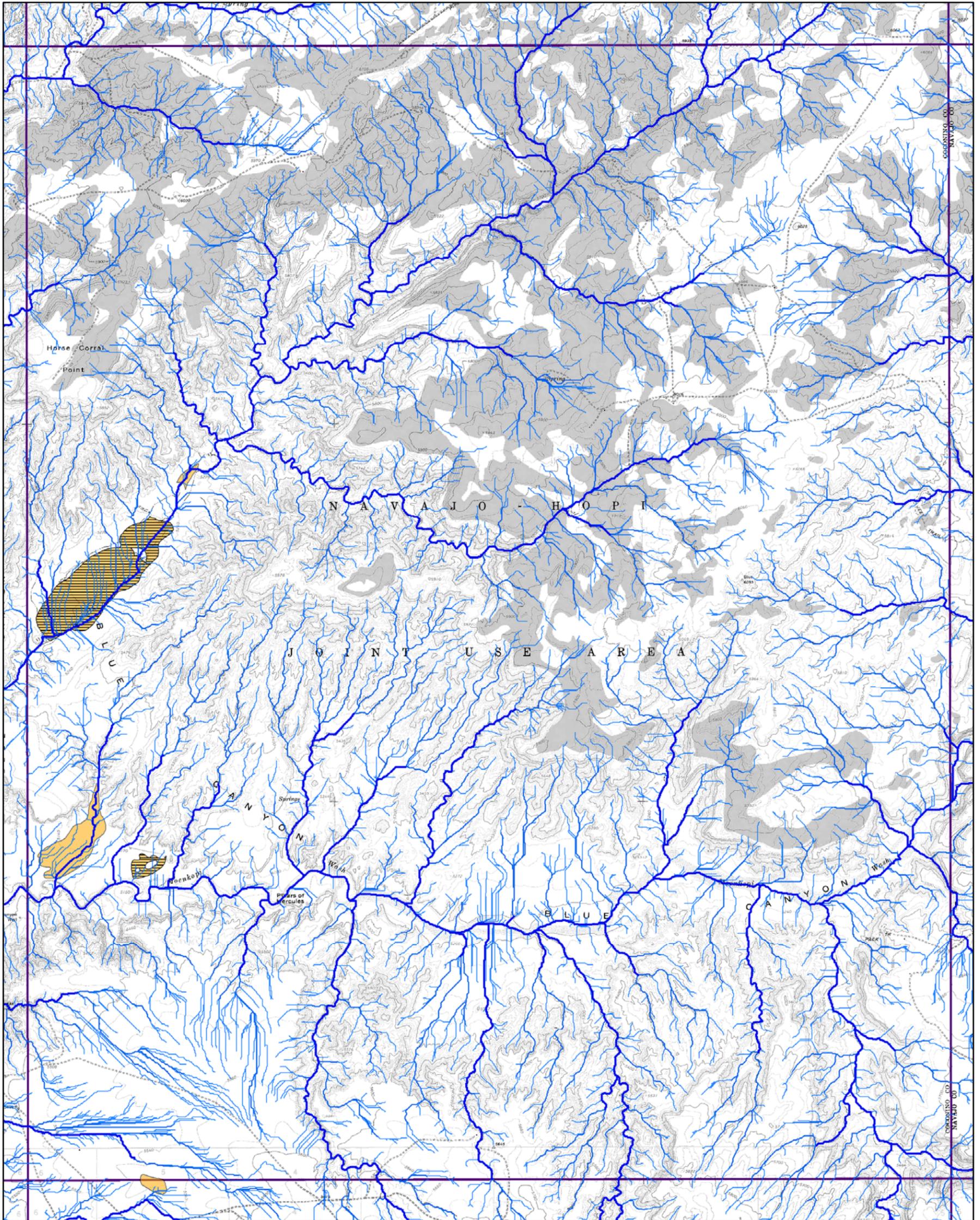
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Pillars of Hercules Quad)

Legend

Claimed Irrigation Type

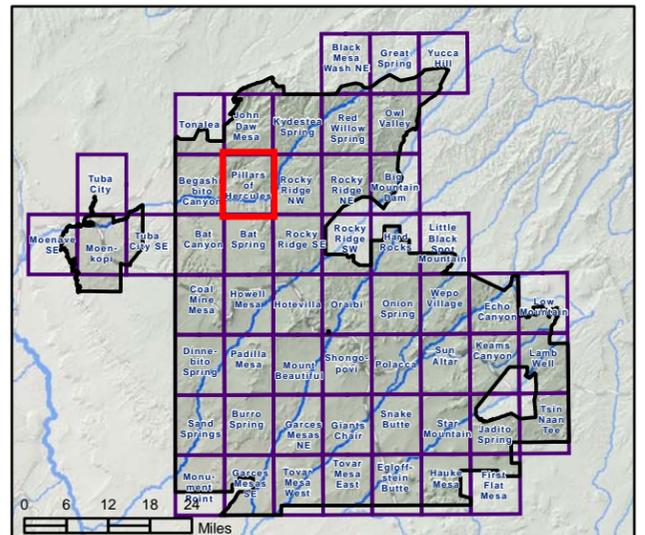
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

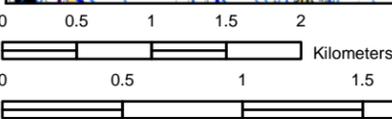
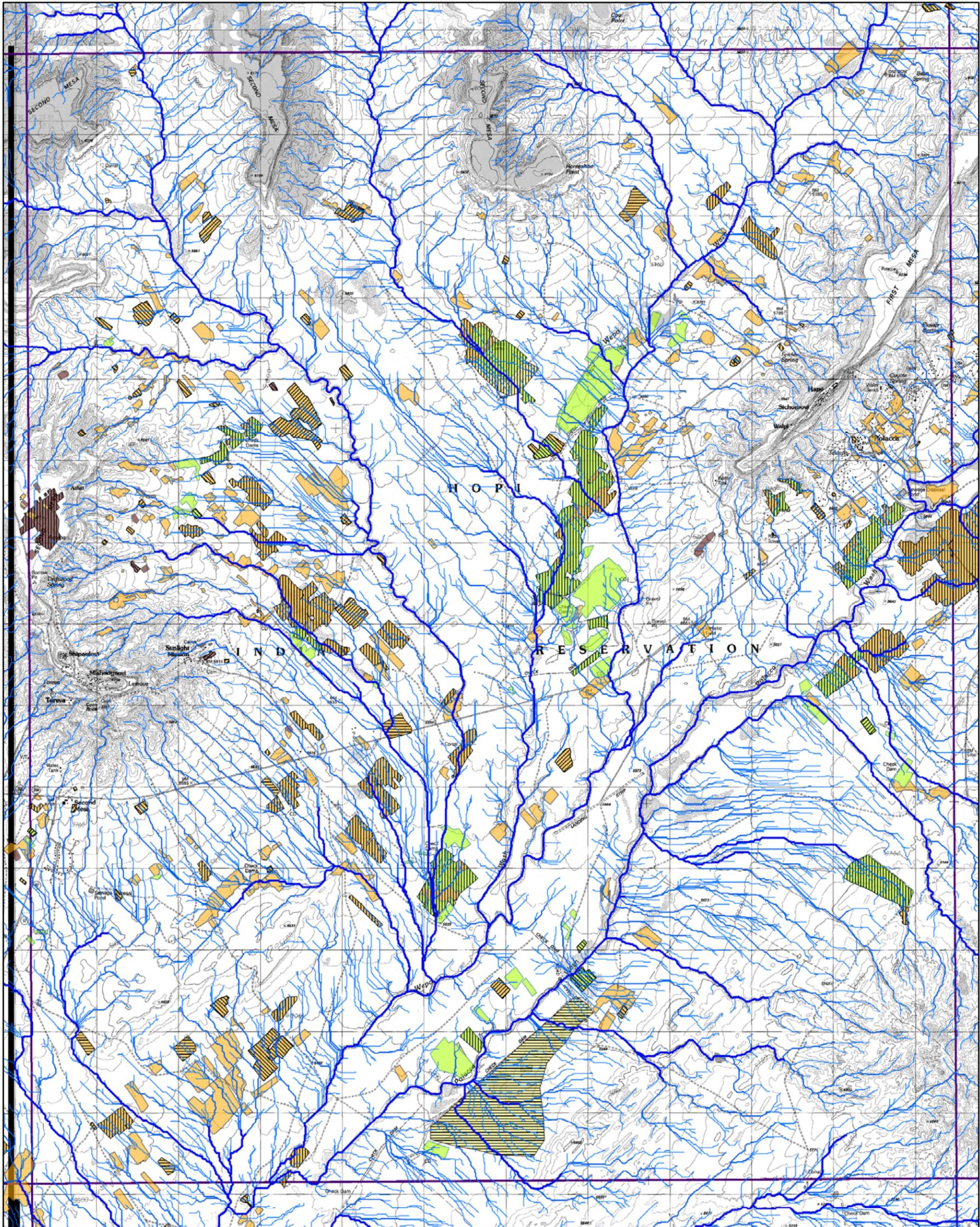
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Polacca Quad)

Legend

Claimed Irrigation Type

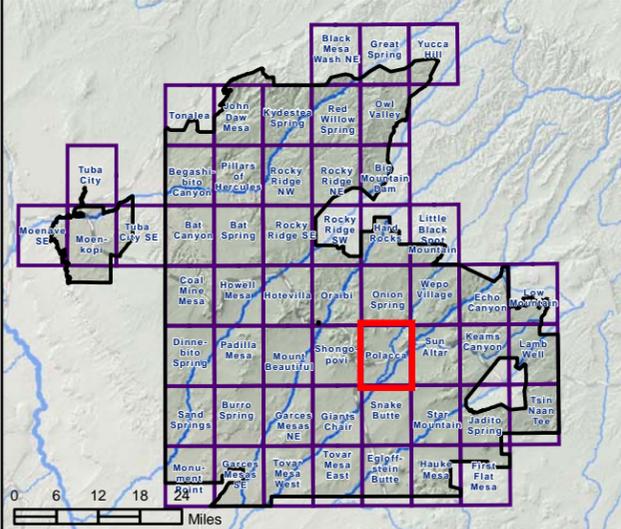
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

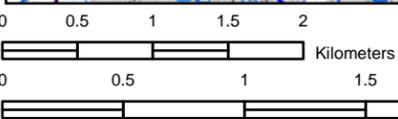
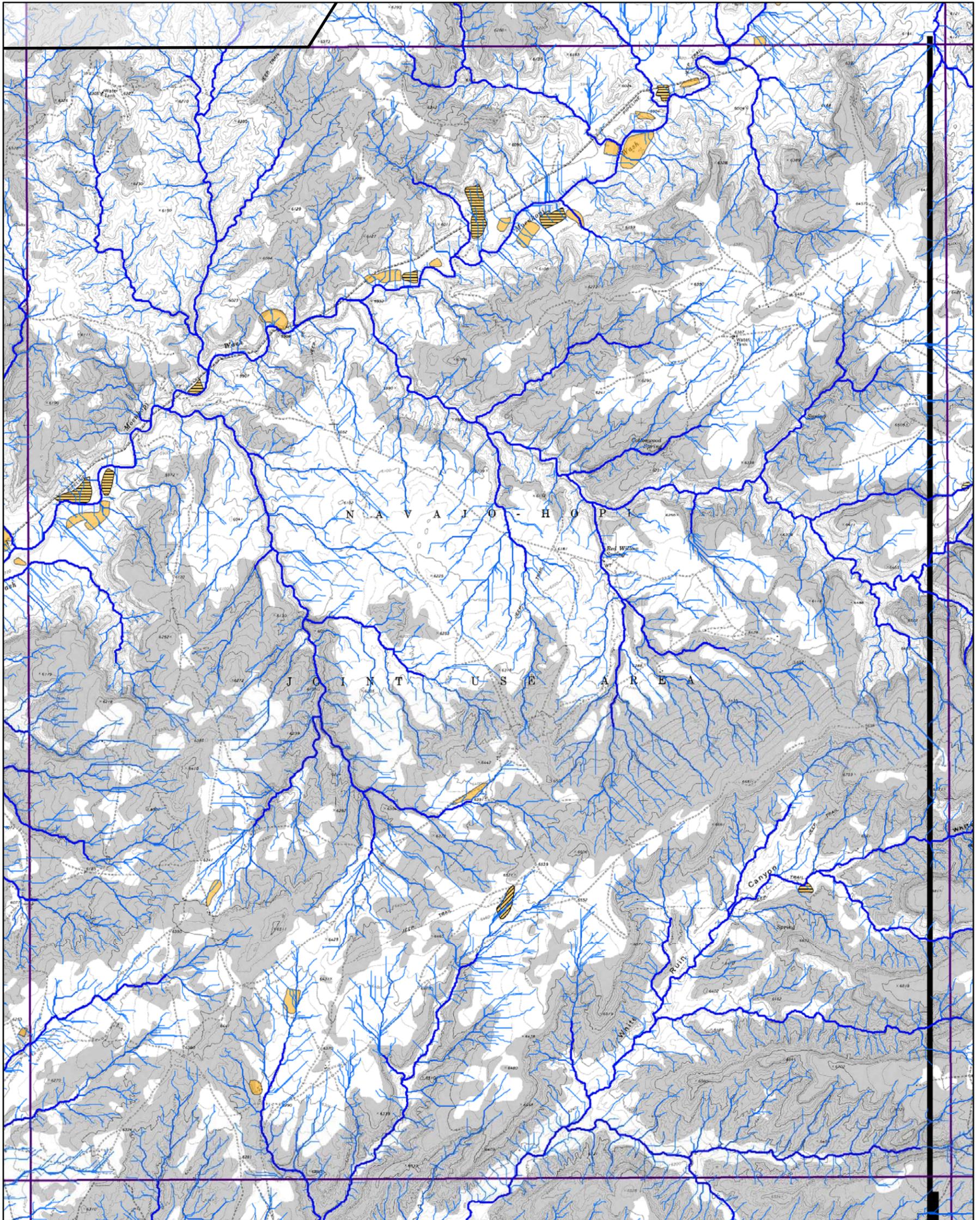
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Red Willow Spring Quad)

Legend

Claimed Irrigation Type

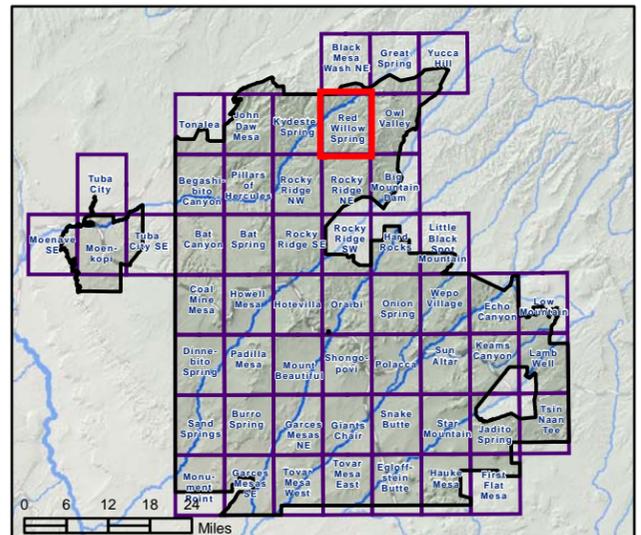
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

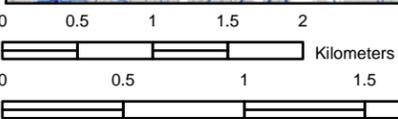
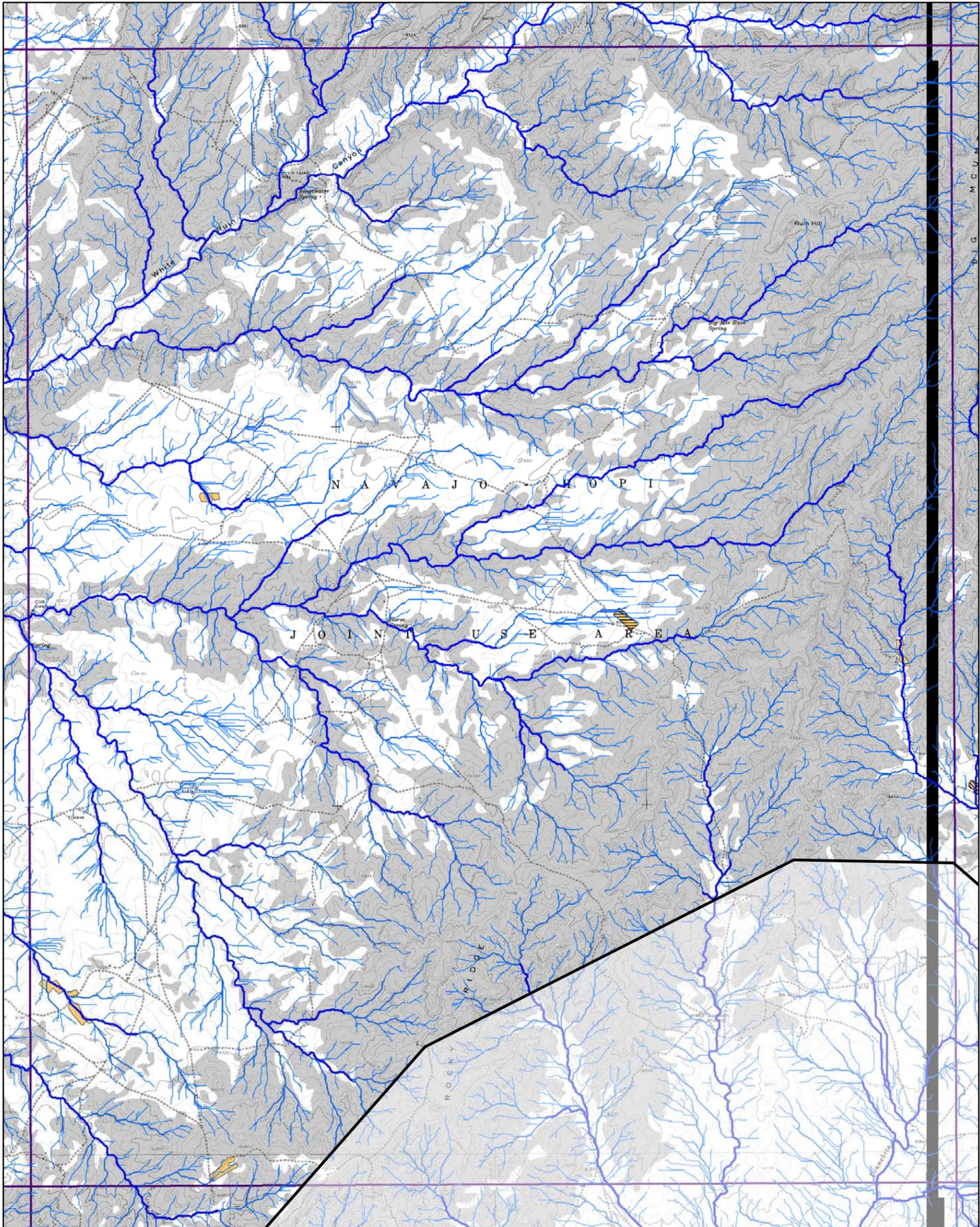
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Rocky Ridge NE Quad)

Legend

Claimed Irrigation Type

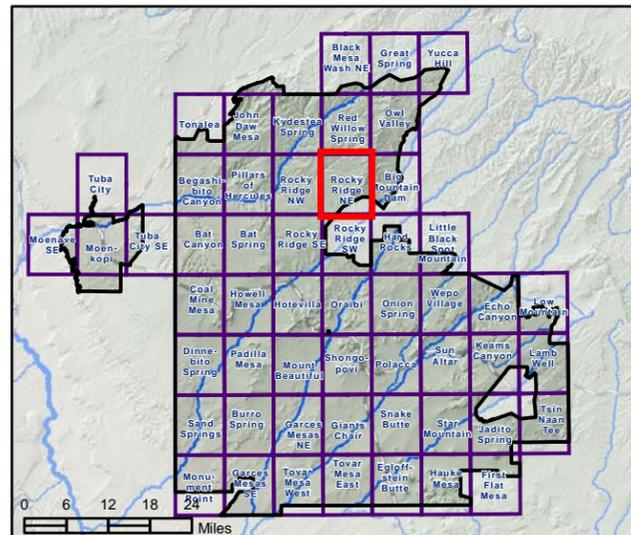
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

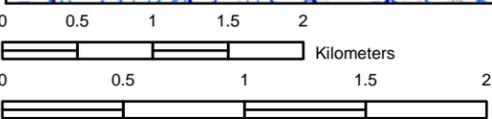
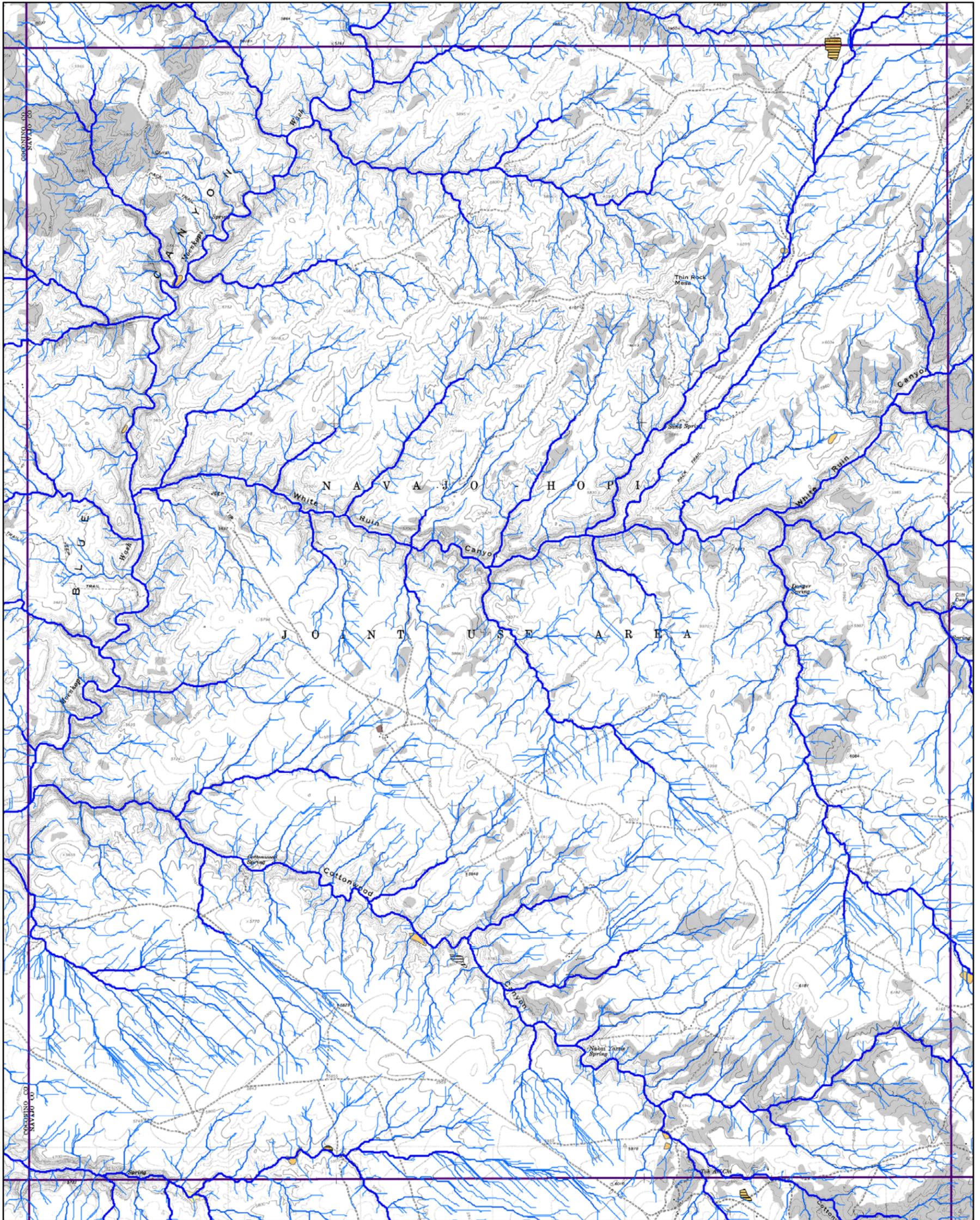
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Rocky Ridge NW Quad)

Legend

Claimed Irrigation Type

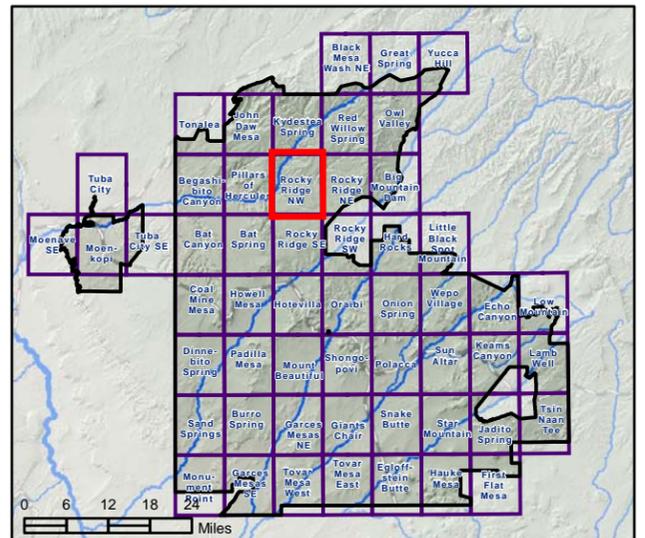
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

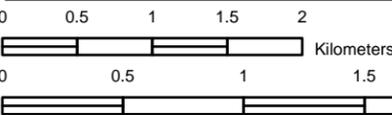
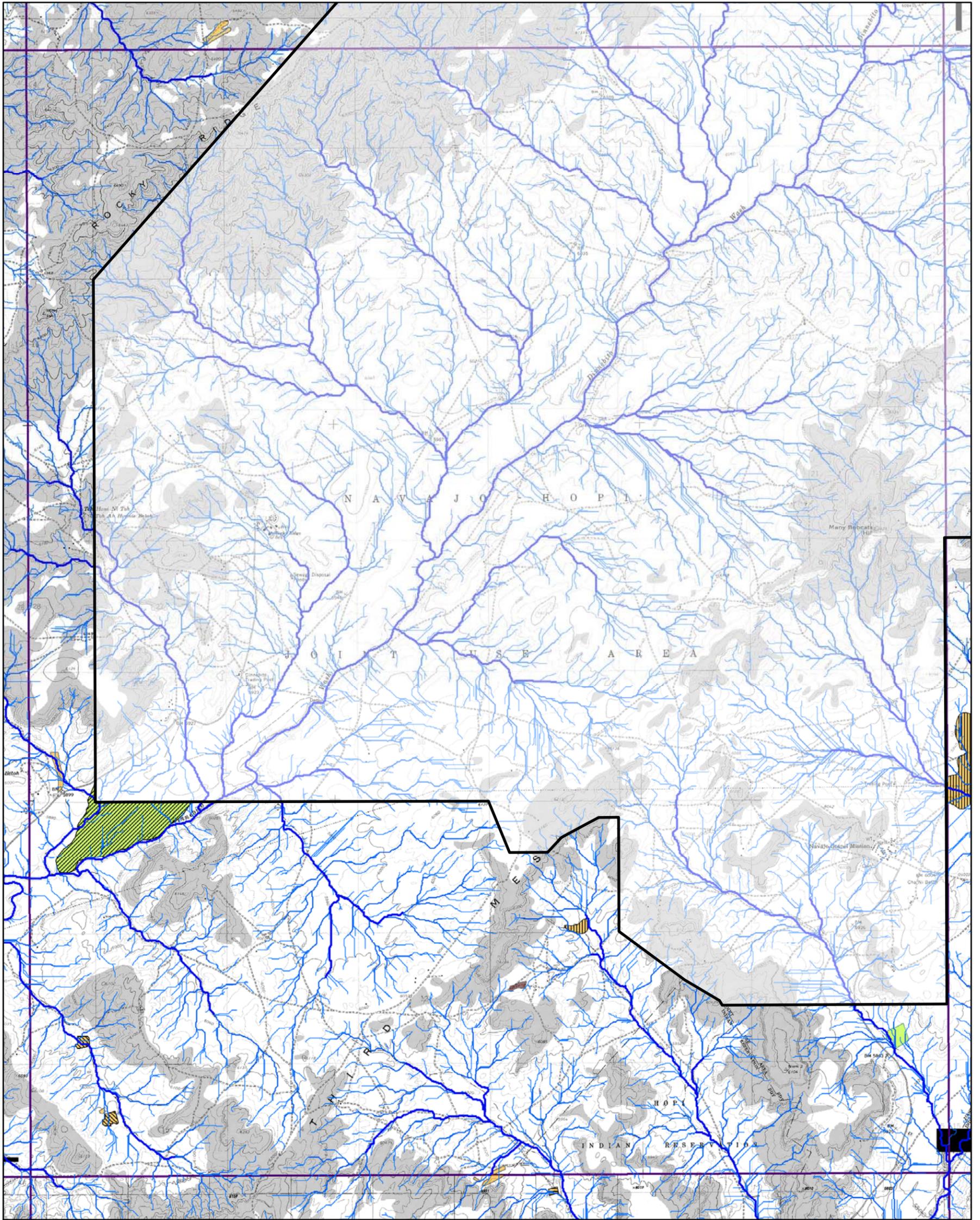
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Rocky Ridge SE Quad)

Legend

Claimed Irrigation Type

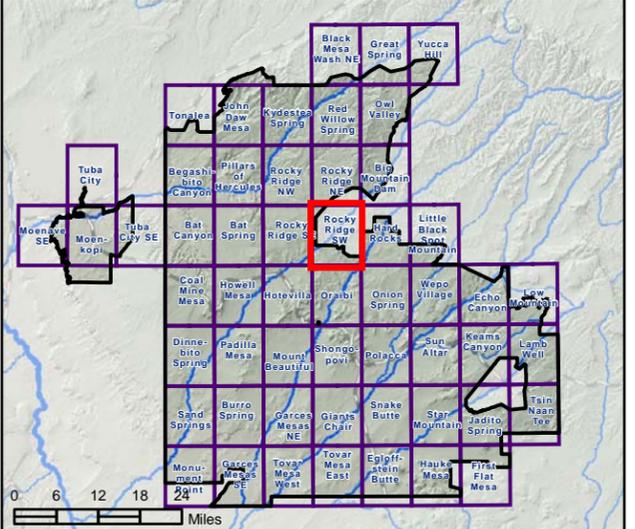
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

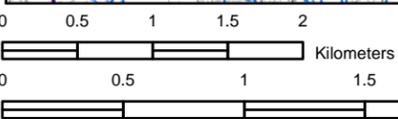
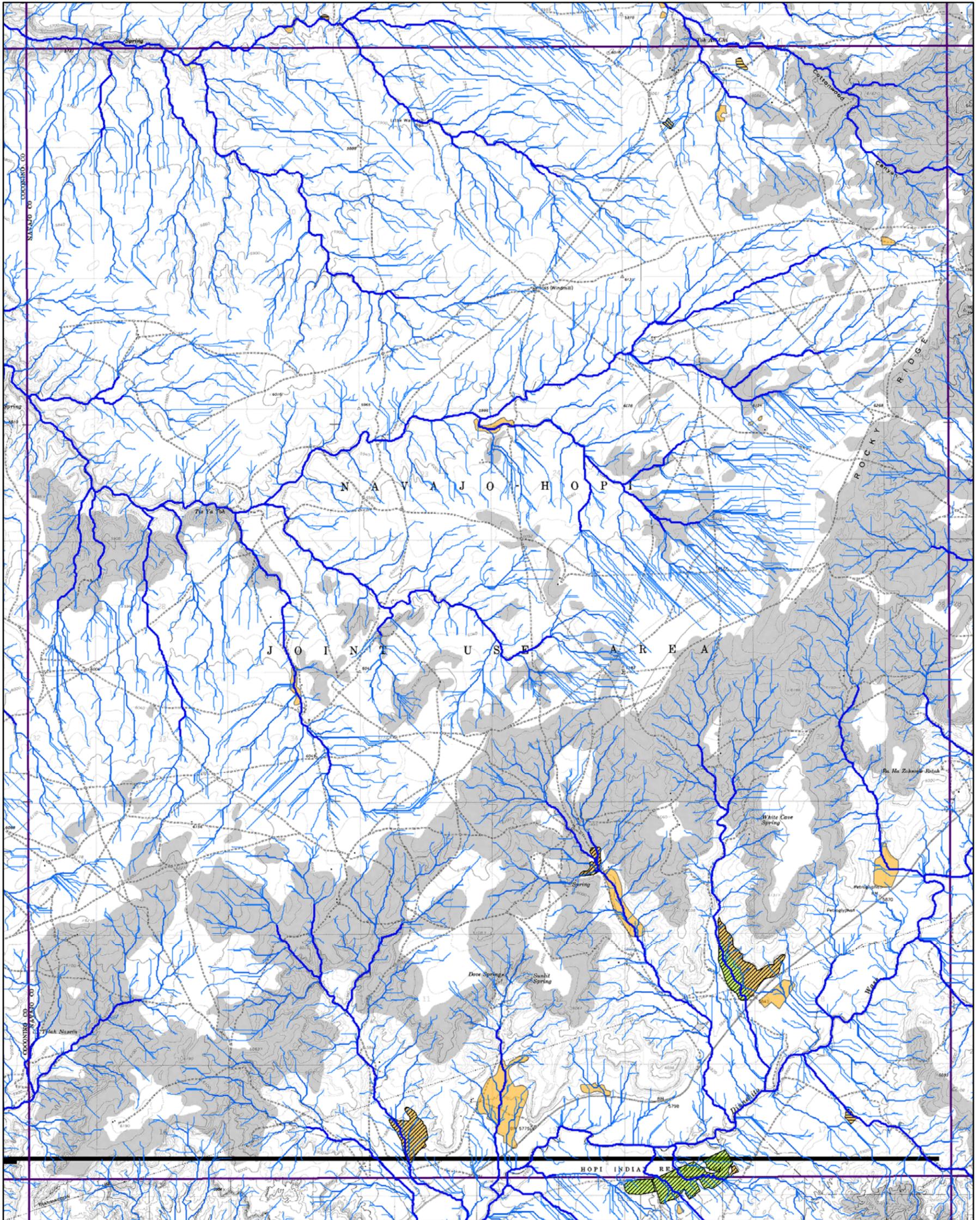
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Rocky Ridge SW Quad)

Legend

Claimed Irrigation Type

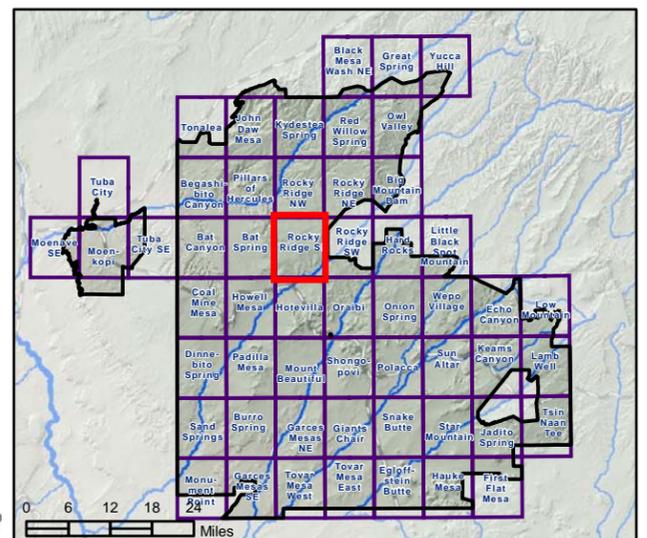
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

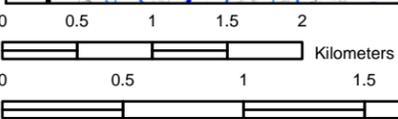
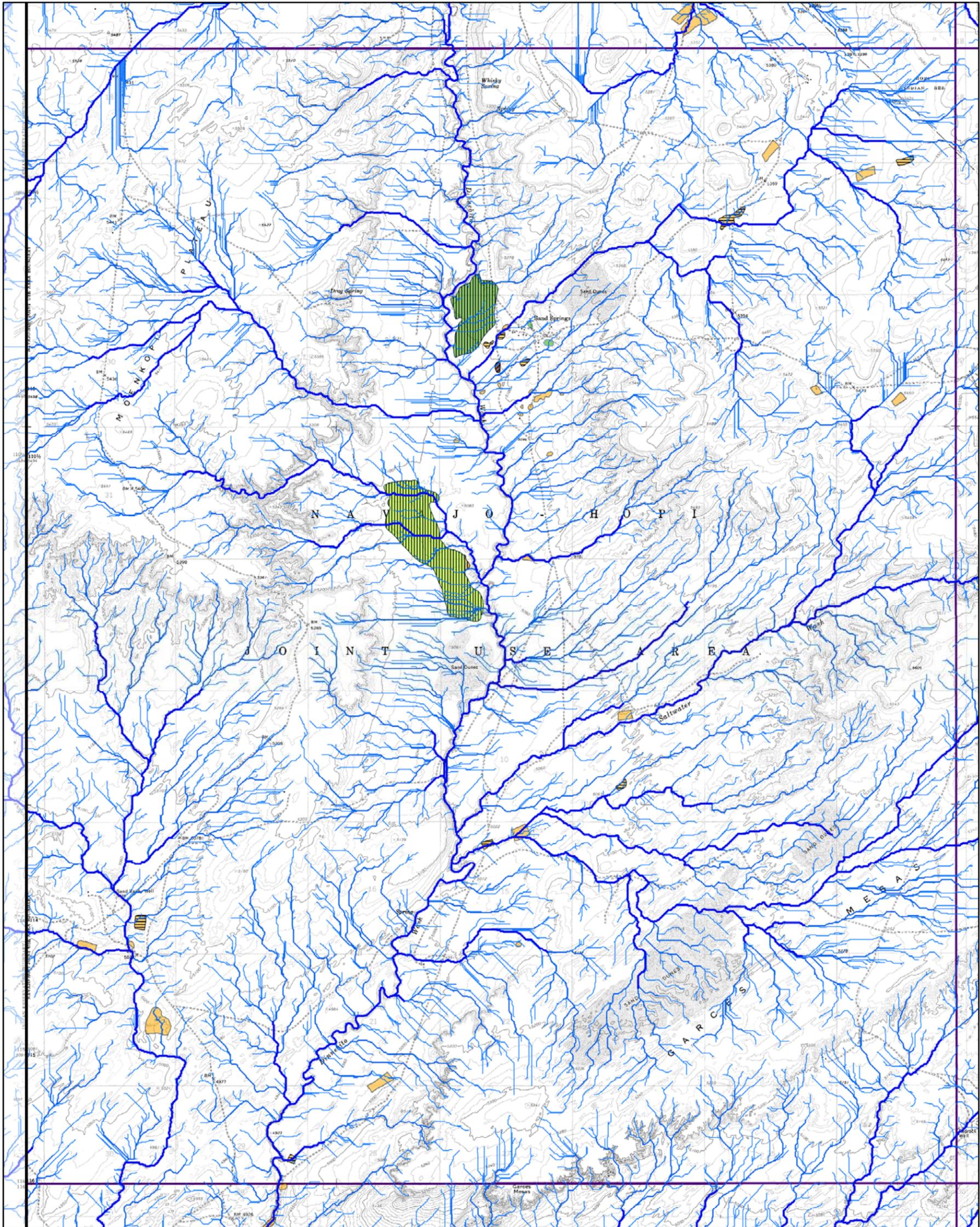
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Sand Springs Quad)

Legend

Claimed Irrigation Type

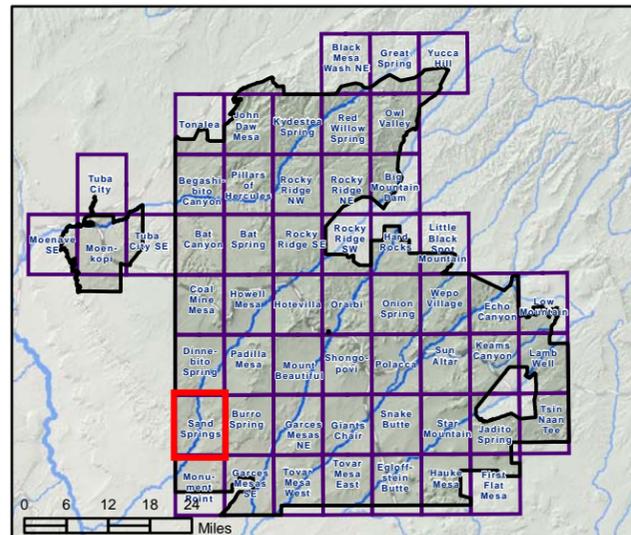
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

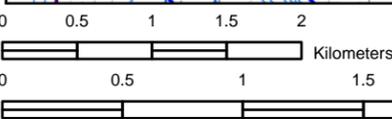
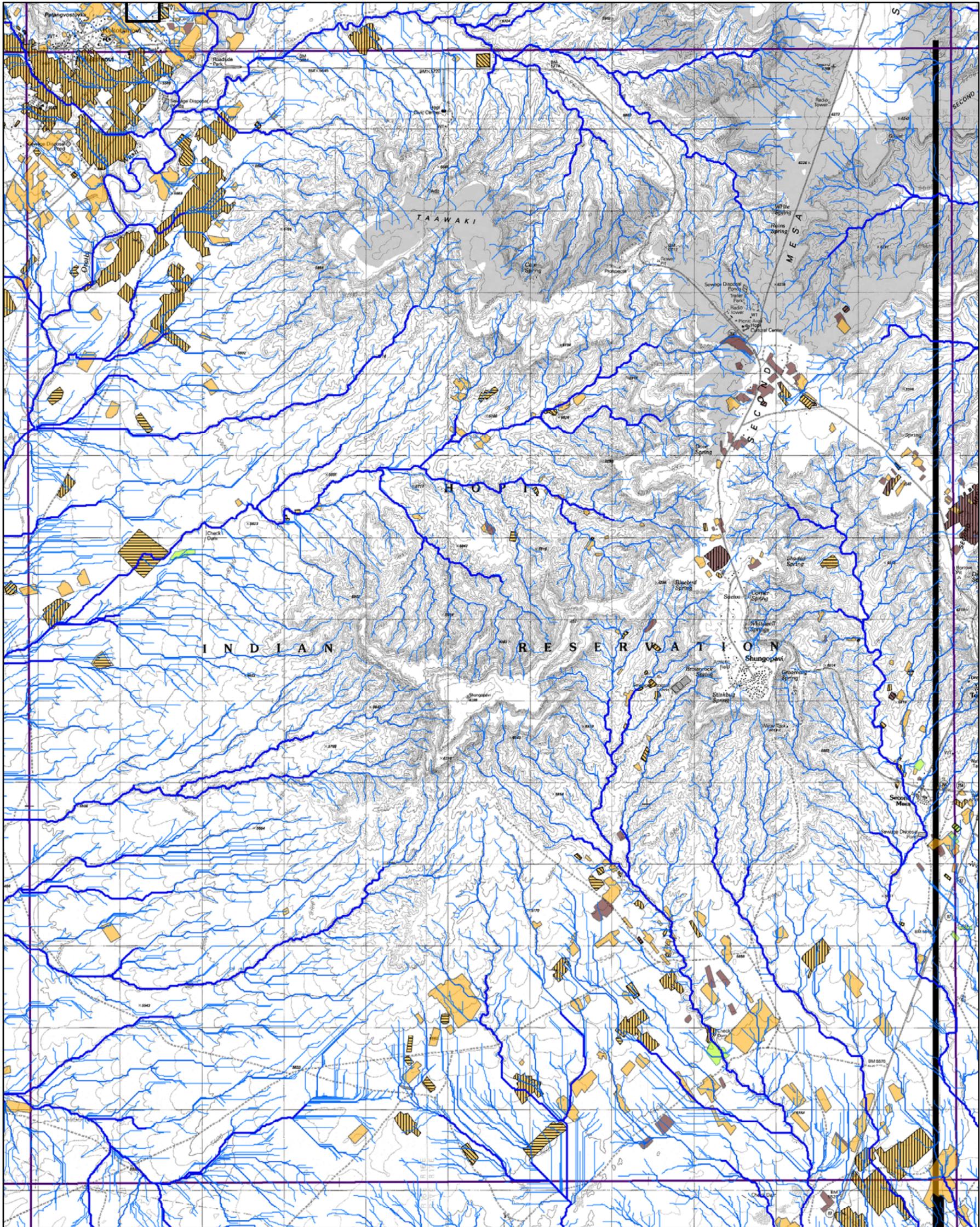
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Shongopovi Quad)

Legend

Claimed Irrigation Type

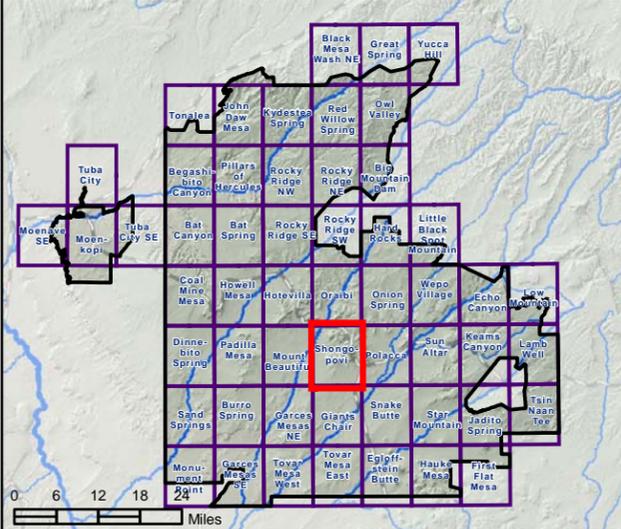
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

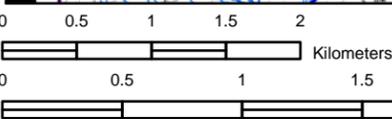
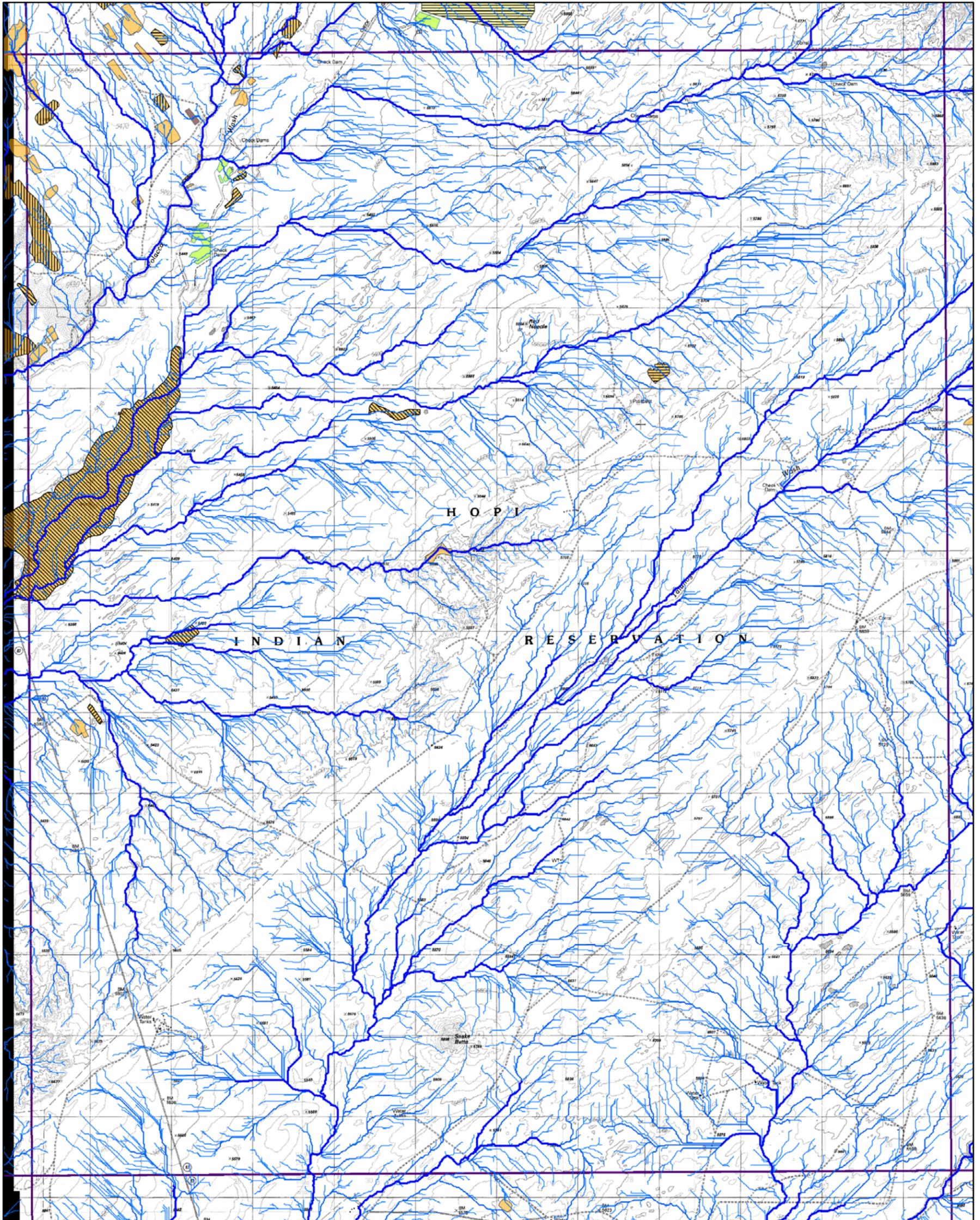
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Snake Butte Quad)

Legend

Claimed Irrigation Type

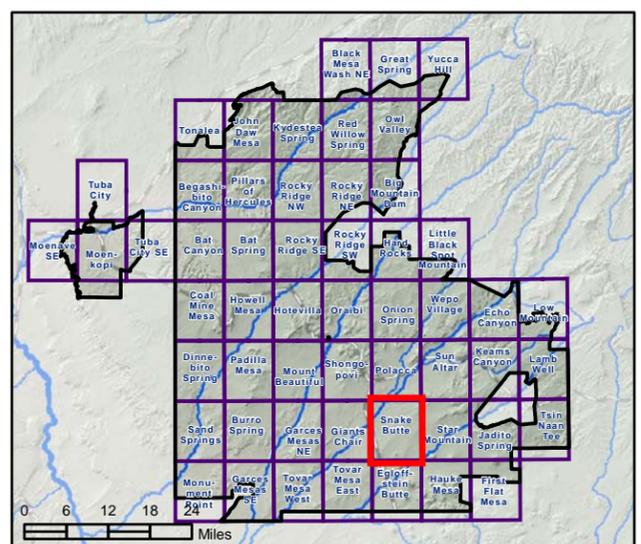
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

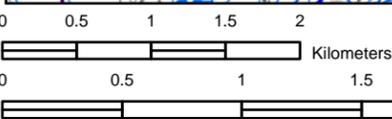
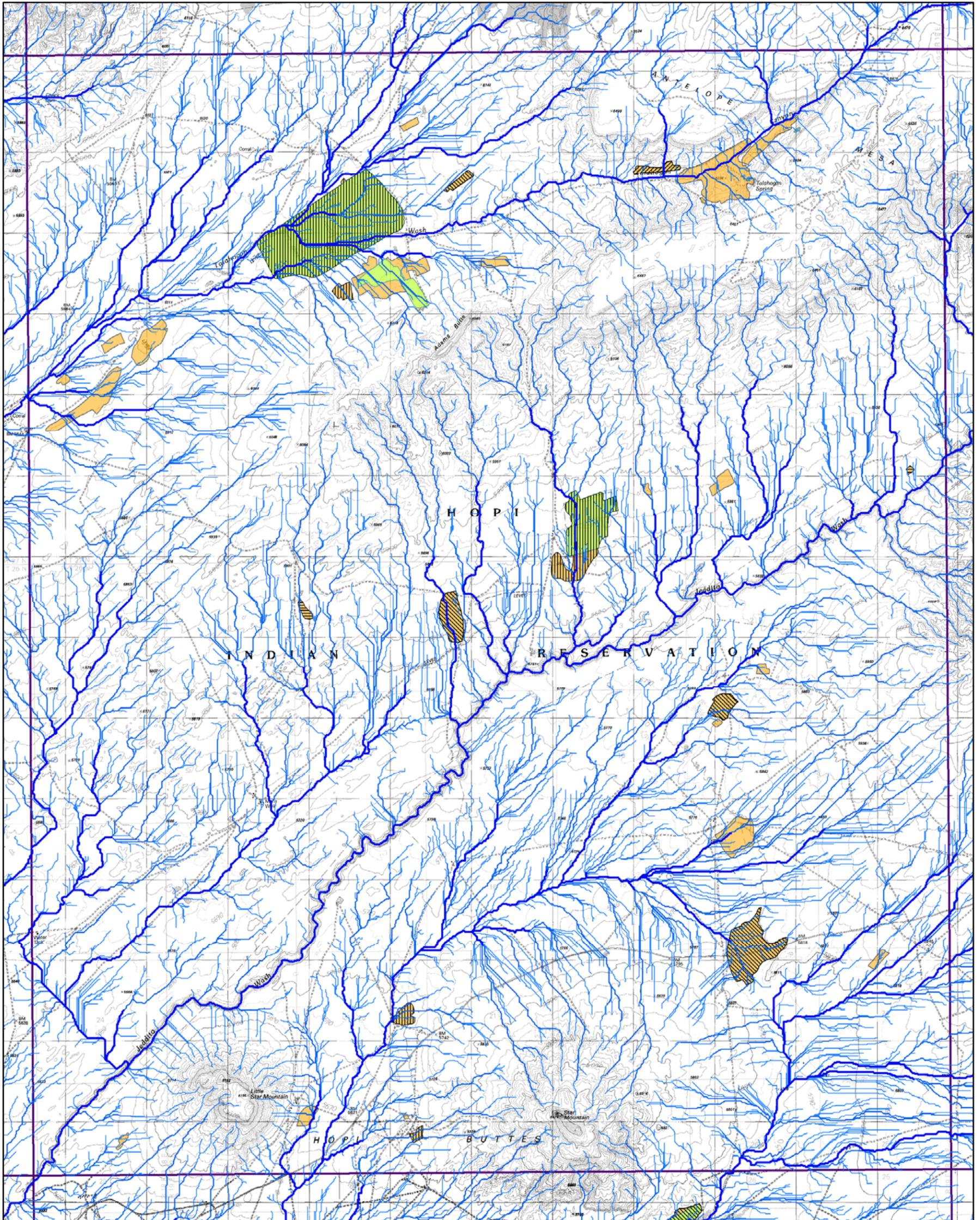
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Star Mountain Quad)

Legend

Claimed Irrigation Type

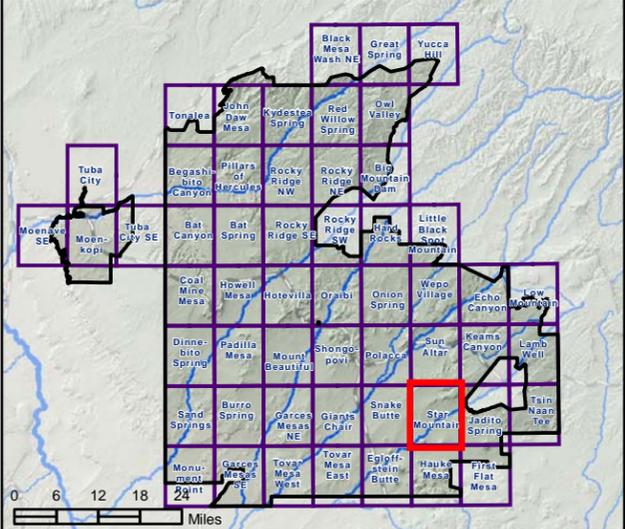
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

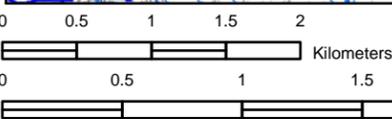
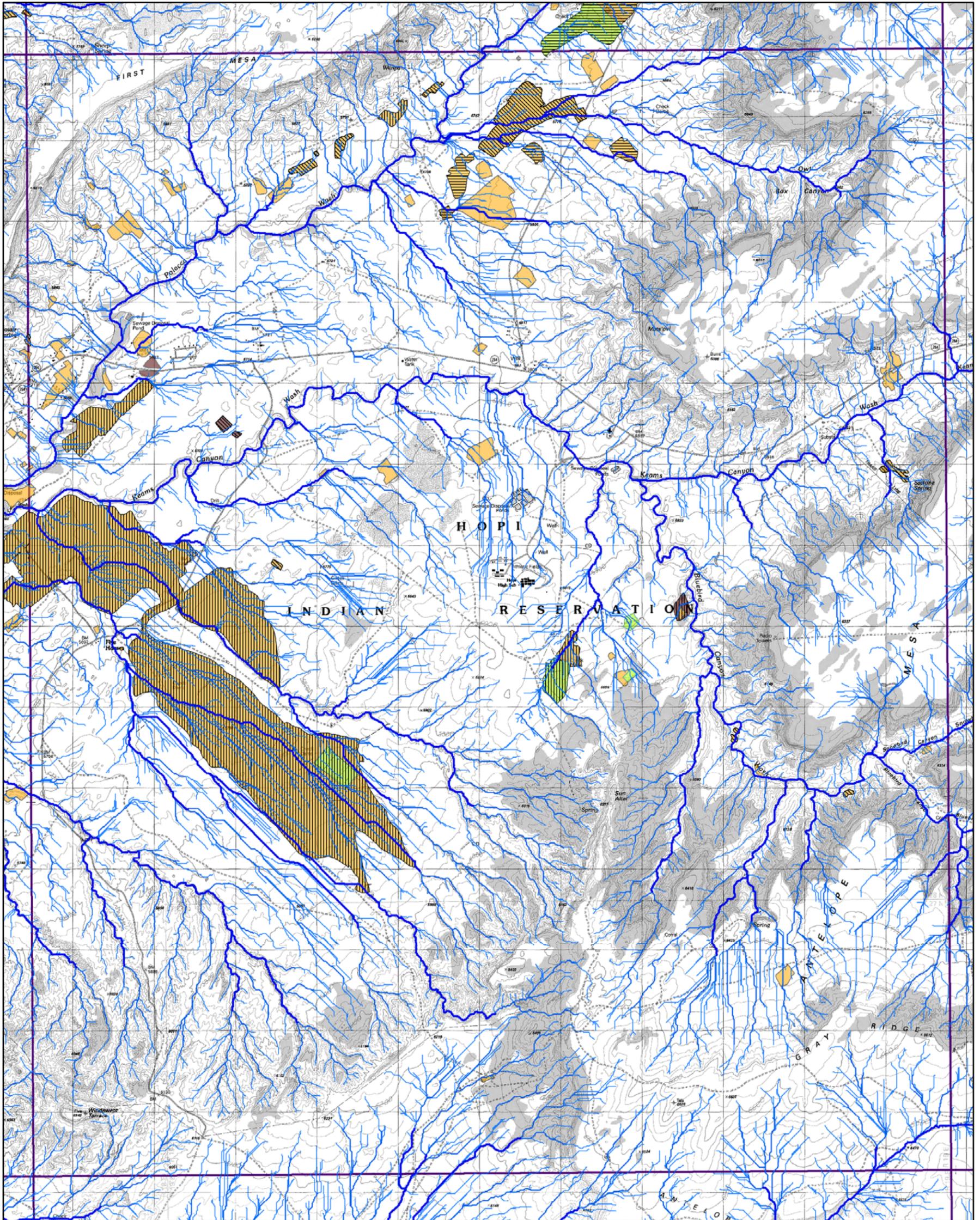
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Sun Altar Quad)

Legend

Claimed Irrigation Type

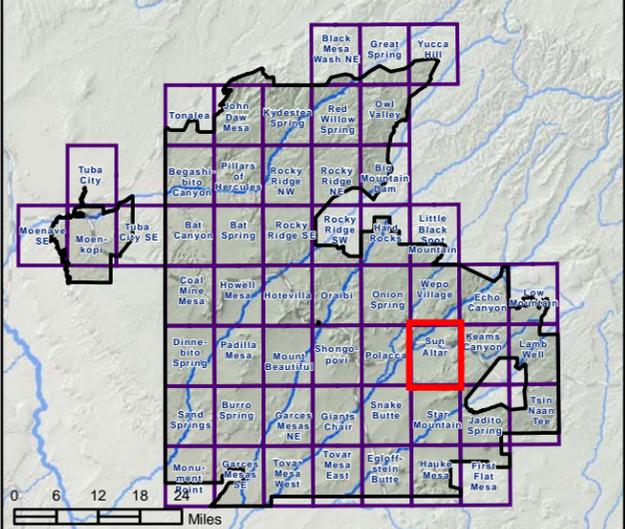
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

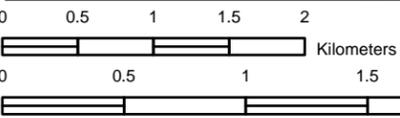
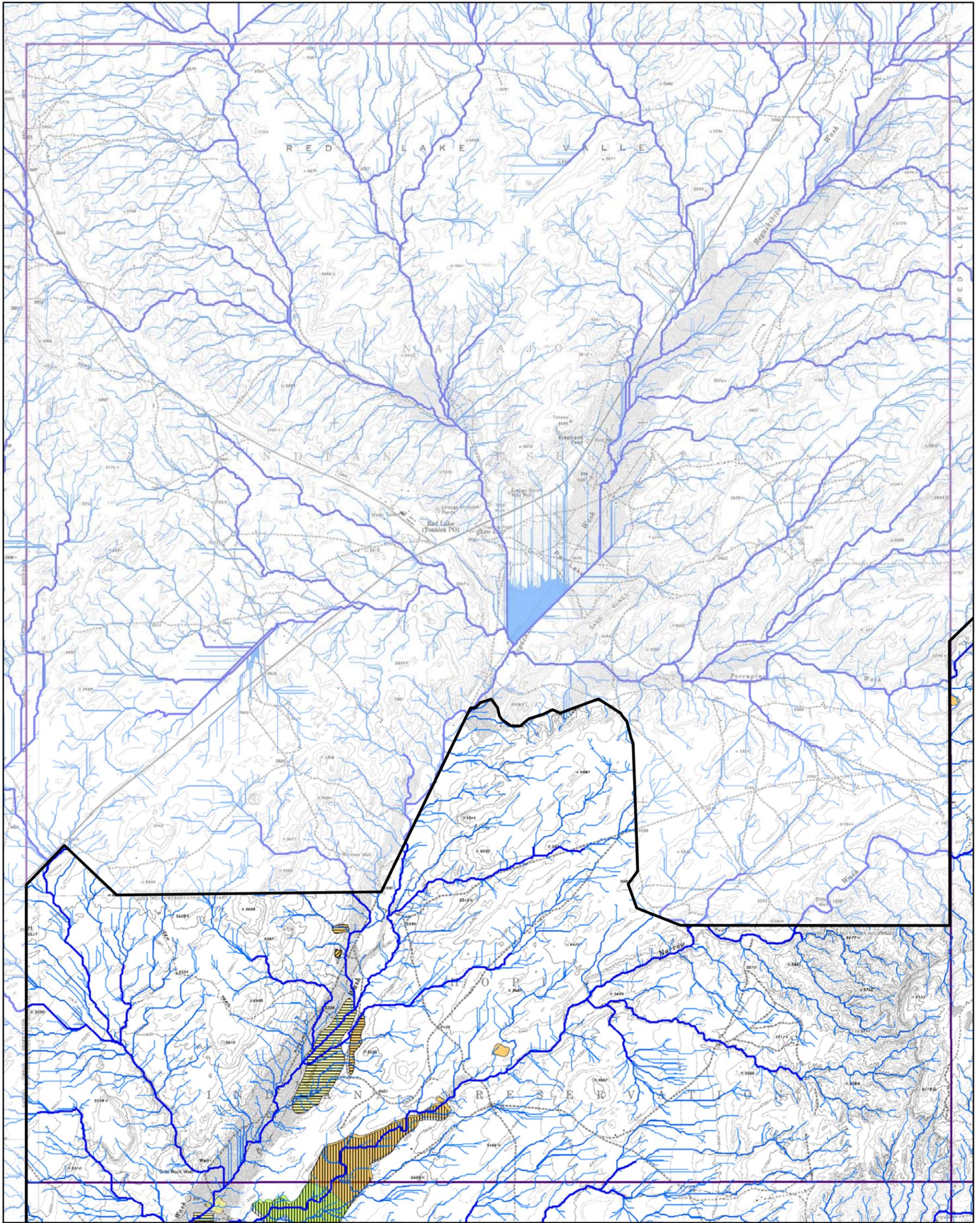
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Tonalea Quad)

Legend

Claimed Irrigation Type

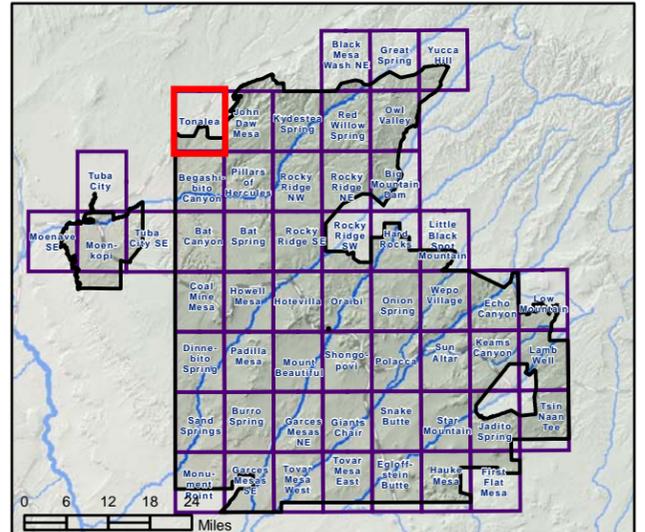
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

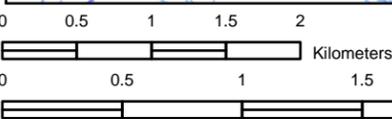
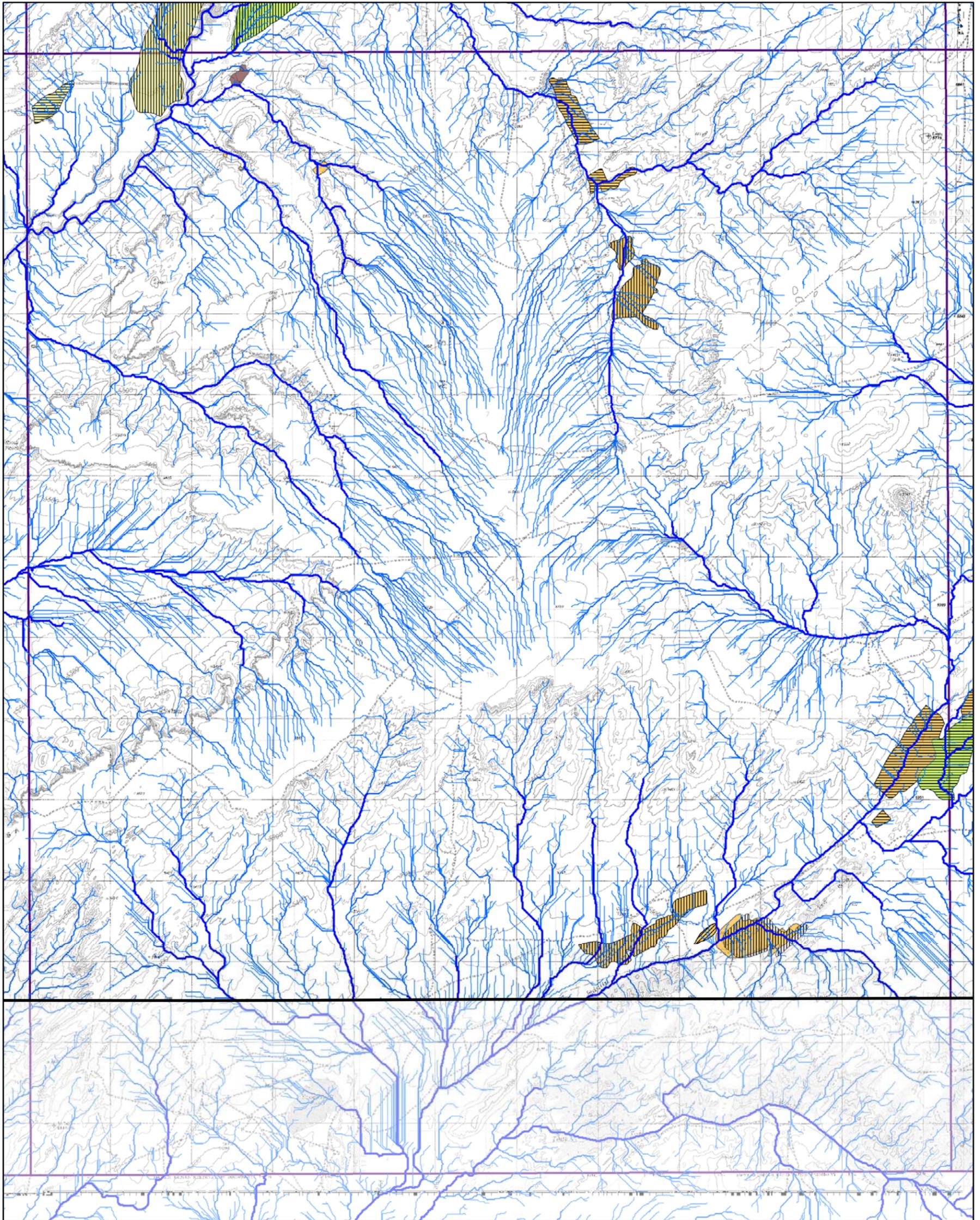
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Tovar Mesa East Quad)

Legend

Claimed Irrigation Type

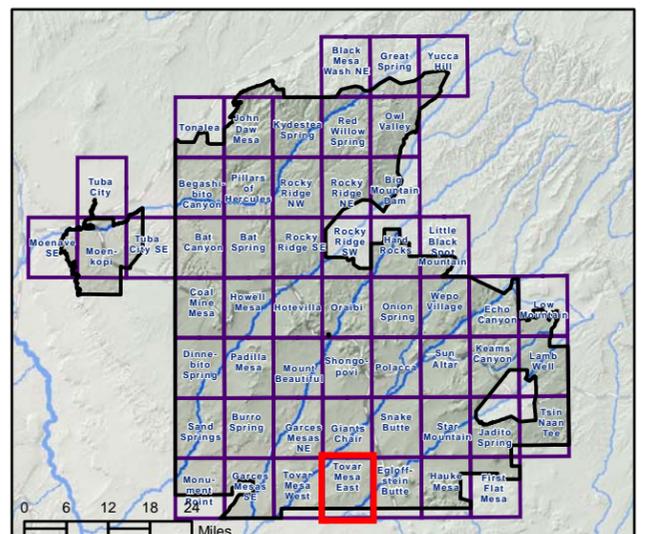
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

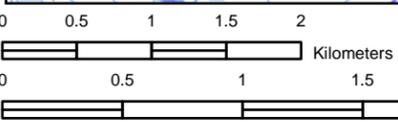
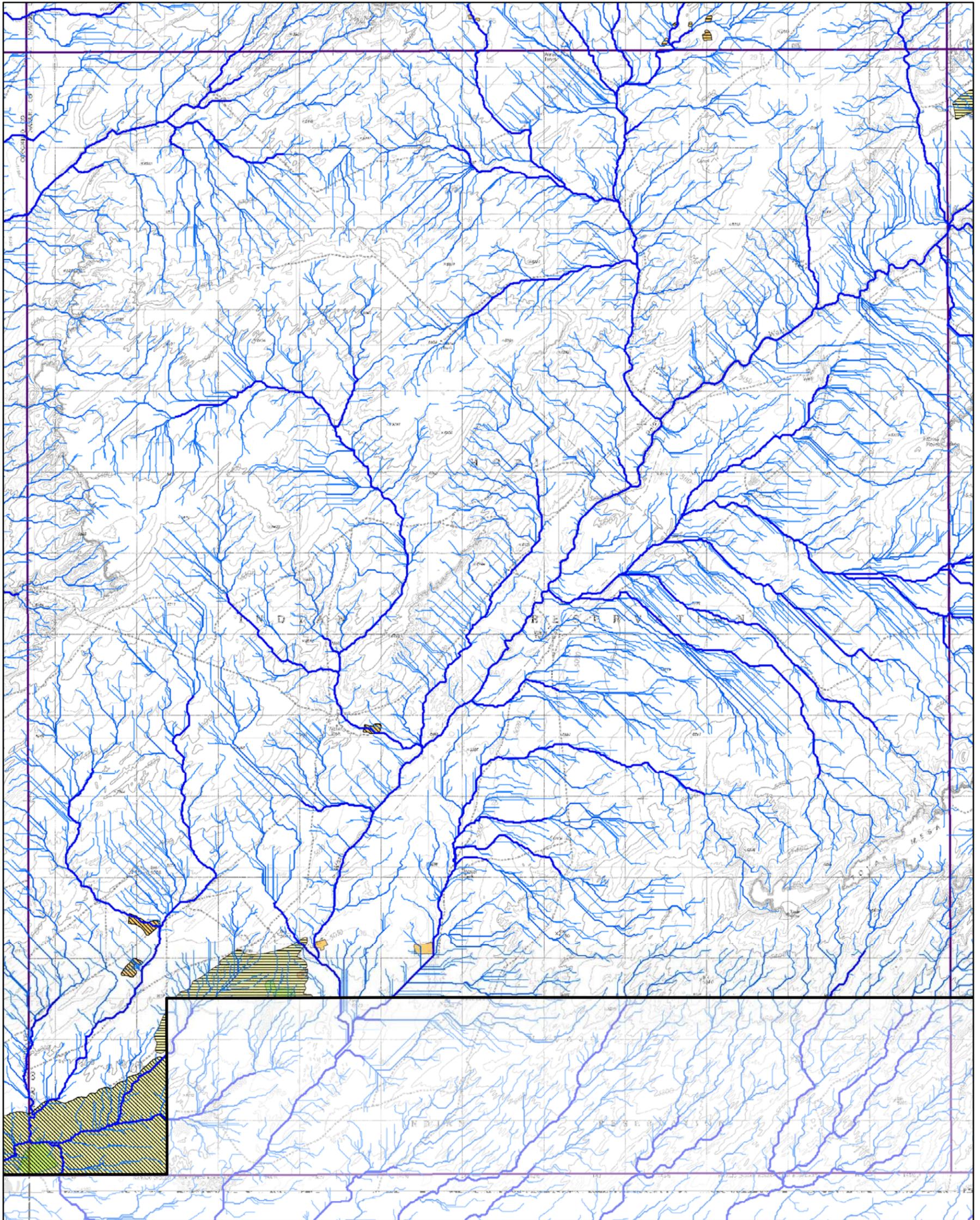
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Tovar Mesa West Quad)

Legend

Claimed Irrigation Type

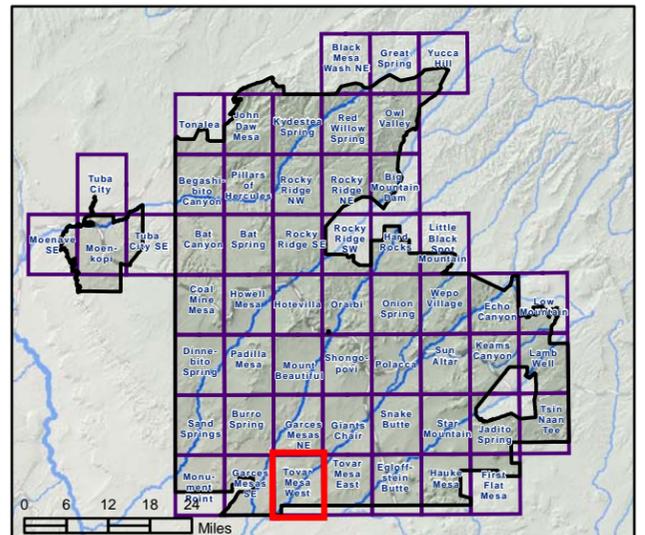
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

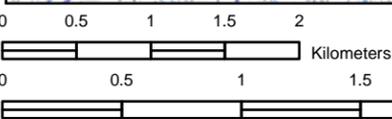
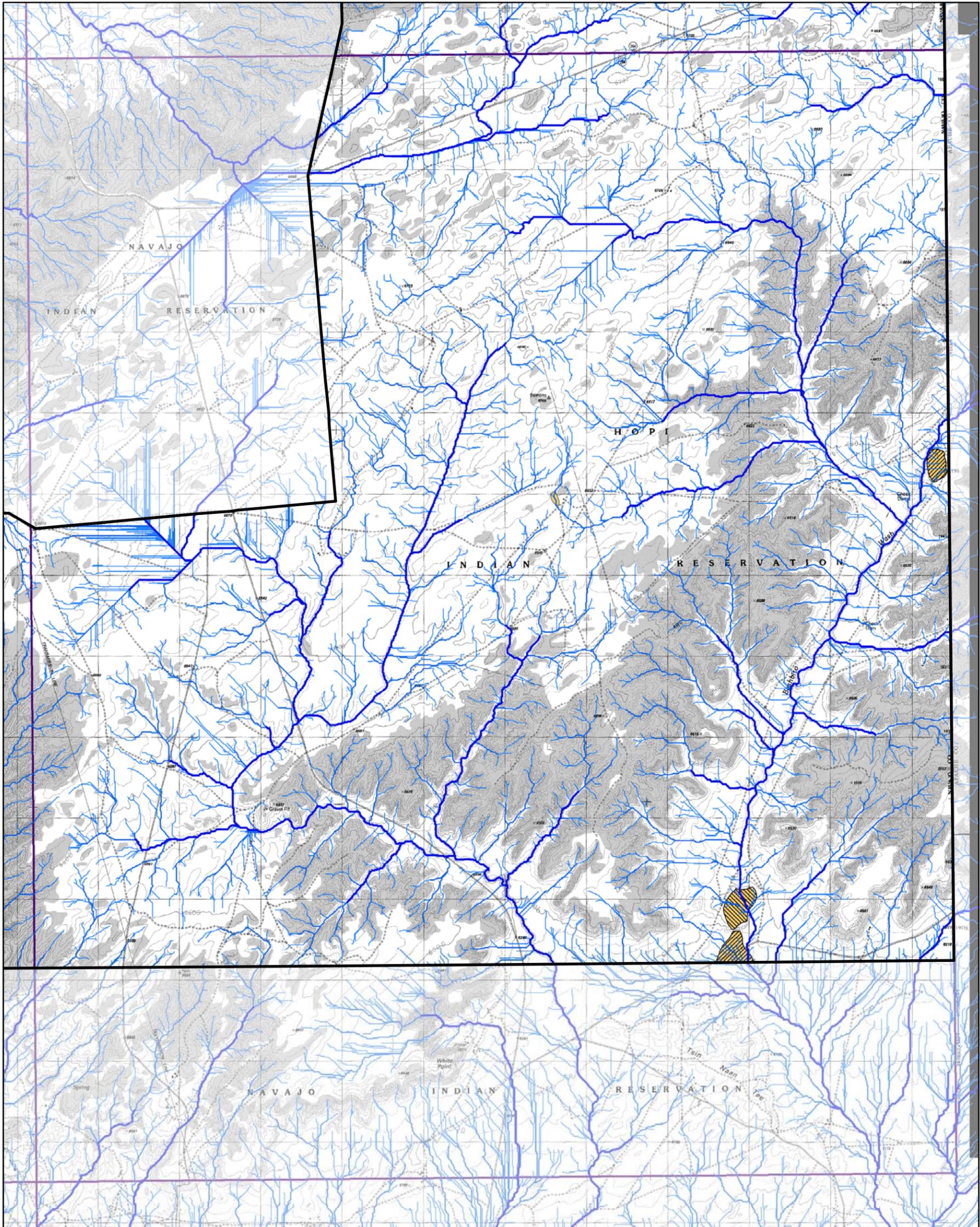
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Tsin Naan Tee Quad)

Legend

Claimed Irrigation Type

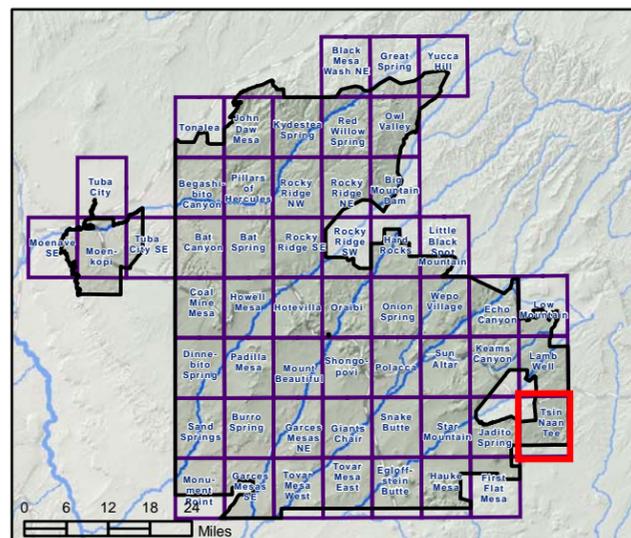
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

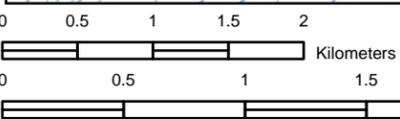
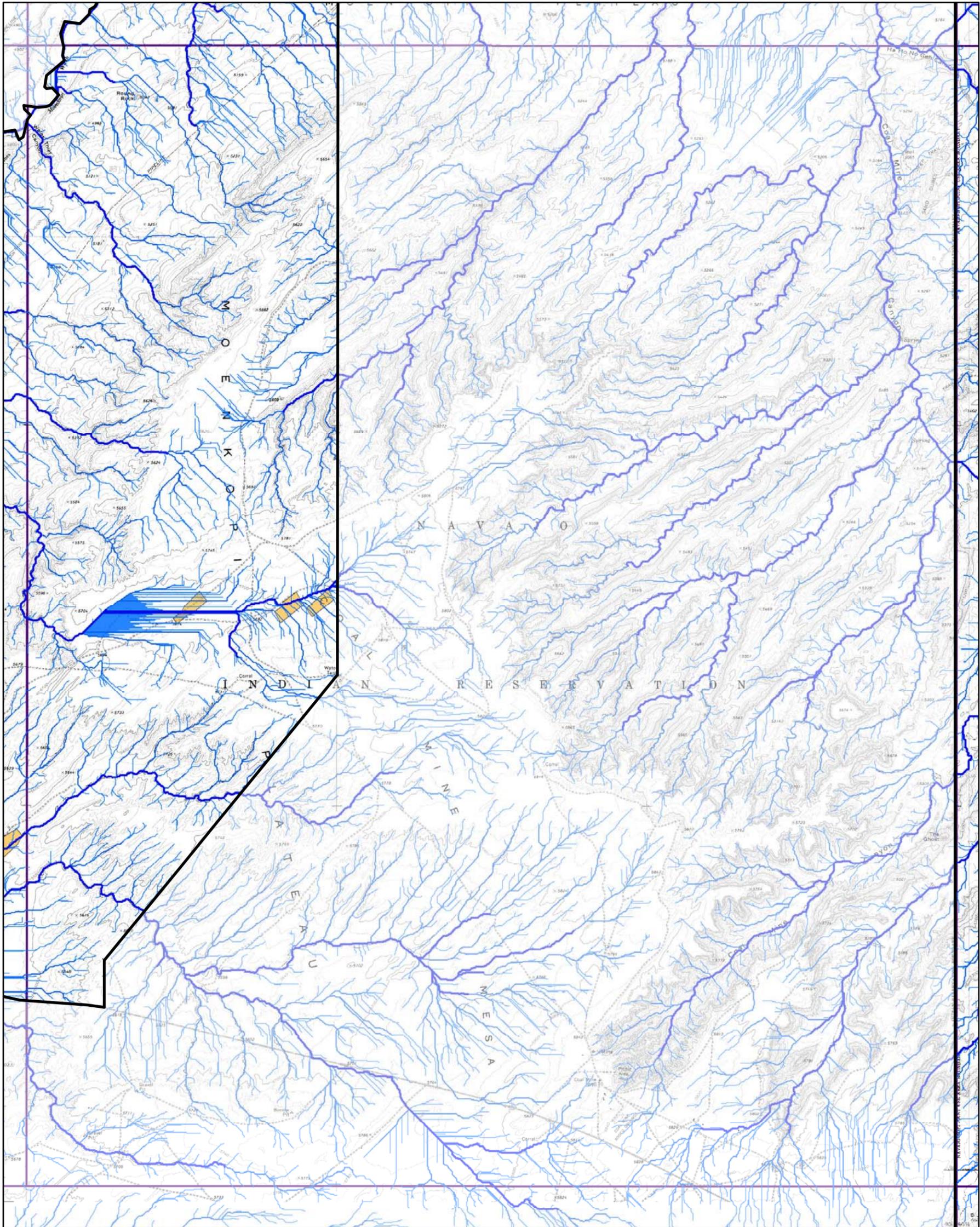
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Tuba City SE Quad)

Legend

Claimed Irrigation Type

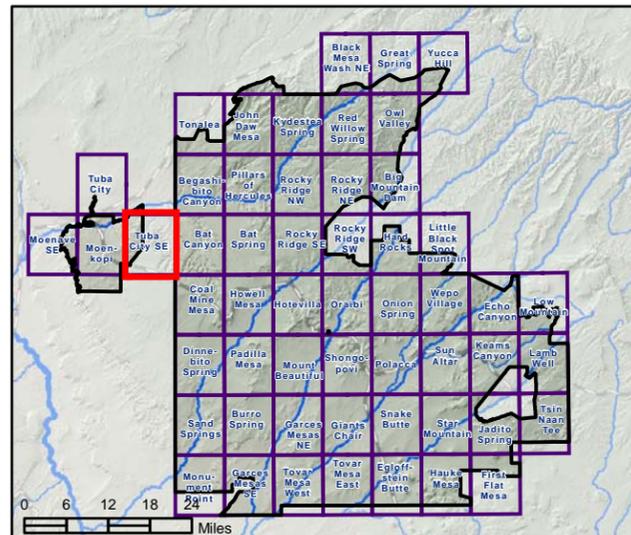
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

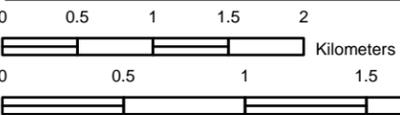
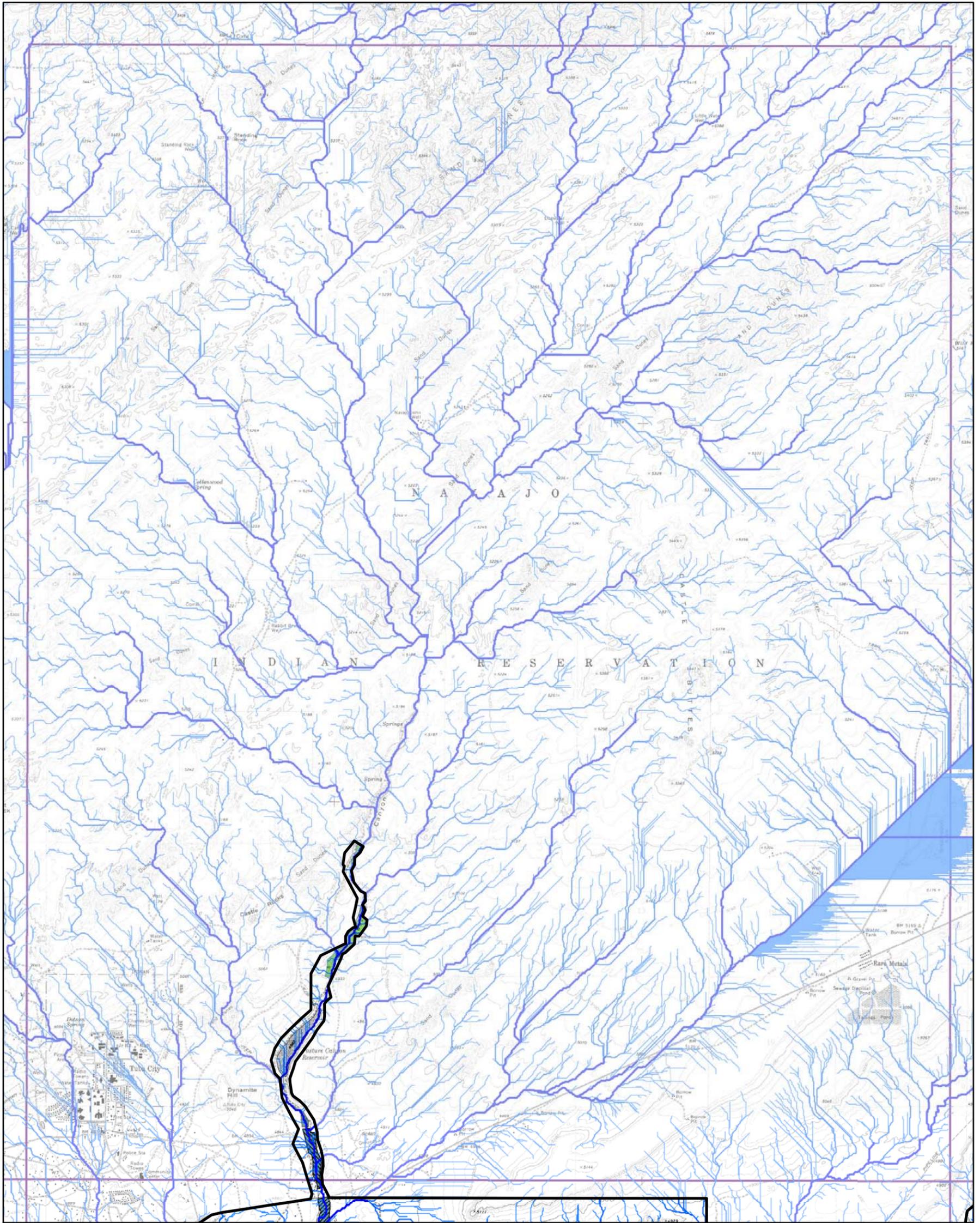
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Tuba City Quad)

Legend

Claimed Irrigation Type

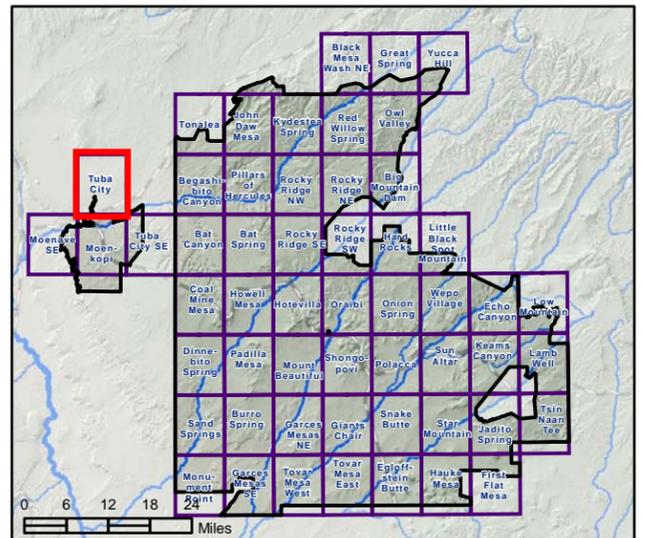
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

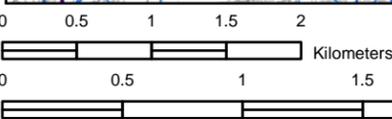
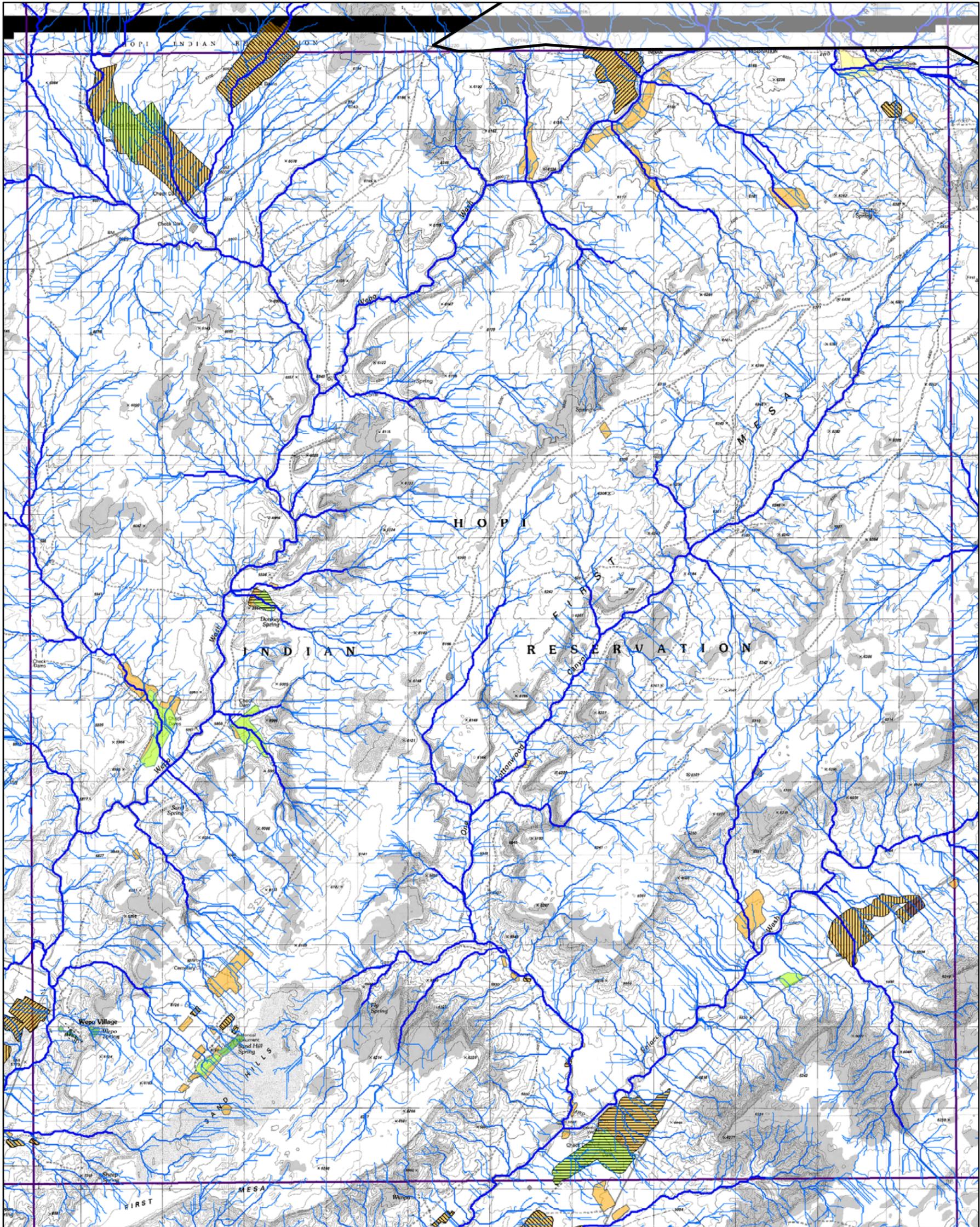
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Weipo Village Quad)

Legend

Claimed Irrigation Type

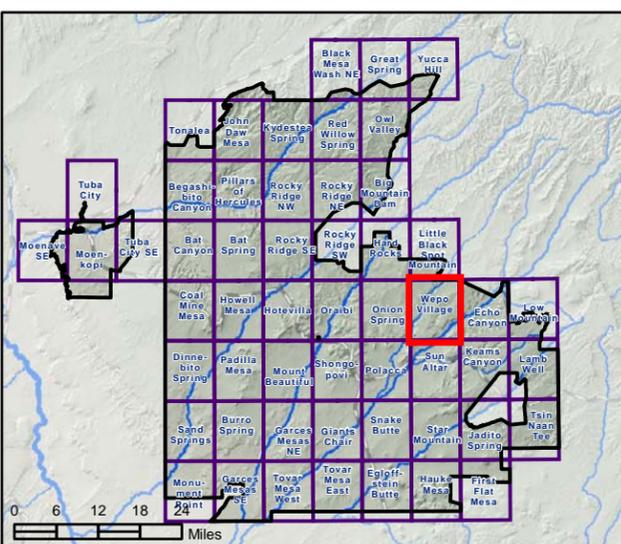
- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

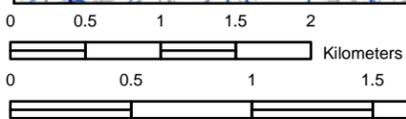
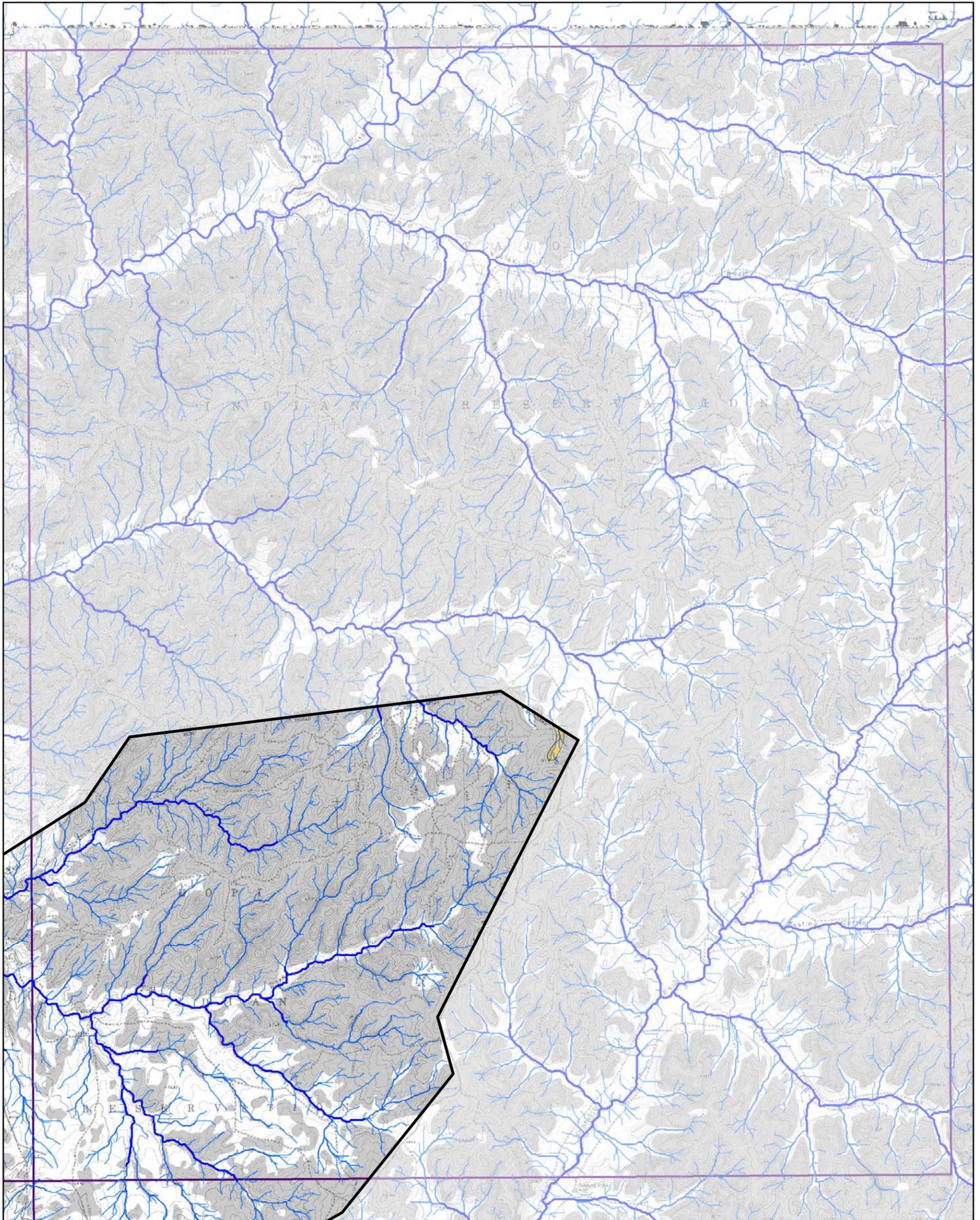
ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation





Appendix B

Claimed Agricultural Lands and Irrigation Types ADWR Verification Results (Yucca Hill Quad)

Legend

Claimed Irrigation Type

- Perennial
- Spring
- Seasonal
- Range Pasture
- Native
- Precipitation Farming

ADWR Verification Results

- Complete Evidence
- Partial Evidence
- Questionable Evidence
- No Evidence
- Did Not Attempt to Verify

Drainages Derived by ADWR Analysis

- = 1.0 km² runoff area
- = 0.1 km² runoff area
- = 0.01 km² runoff area
- Claimed spring near spring irrigated field
- USGS Topo Quad Boundary
- Hopi Reservation

