

RESOLUTION OF THE
RESOURCES AND DEVELOPMENT COMMITTEE
OF THE 23rd NAVAJO NATION COUNCIL --- FIRST YEAR, 2015

AN ACTION

RELATING TO RESOURCES AND DEVELOPMENT; APPROVING THE GRANT OF RIGHT-OF-WAY TO NAVAJO NATION DEPARTMENT OF WATER RESOURCES TO CONSTRUCT, OPERATE AND MAINTAIN THE GADII'AHÍ PHASE IV (UNDERGROUND) WATERLINE PIPELINE AND APPURTENANT FACILITIES TO REPLACE THE EXISTING CUDAHY DITCH SURFACE CANAL SYSTEM ON, OVER AND ACROSS NAVAJO NATION TRUST LANDS, IN THE VICINITY OF GADII'AHÍ/TO'KOI CHAPTER, NAVAJO NATION (SAN JUAN COUNTY, NEW MEXICO)

BE IT ENACTED:

Section One. Findings

- A. Pursuant to 2 N.N.C. §500, the Resources and Development Committee of the Navajo Nation Council is hereby established standing committee of the Navajo Nation; and
- B. Pursuant to 2 N.N.C. §501 B 2(a), the Resources and Development Committee of the Navajo Nation Council shall grant final approval of rights of way; and
- C. The Navajo Department of Water Resources, P.O. Box 678 Fort Defiance, Arizona 86504 has submitted an application for right-of-way for the Gadii'ahi Phase IV pipeline in the vicinity of Gadii'ahi/To'koi Chapter, New Mexico attached hereto as A; and
- D. The right-of-way is approximately 20,044.56 feet in length, 35 feet wide and consists of 16.106 acres, more or less, of Navajo Nation Trust Lands located in Section 4-5, Township 30 North, Range 18 West; Sections 31-32, Township 31 North, Range 18 West and Section 25 and 36, Township 31 North, Range 19 West, NMPM, San Juan County, New Mexico and the location is more particularly described on the survey map attached hereto and incorporated herein as Exhibit B; and
- E. The Project Review Section with the Navajo Land Department has determined that this existing Cudahy Ditch was built before the existence of grazing permits in the early 1900's, as shown by the Department of Interior correspondence and technical Historical Evaluation

documents attached hereto and made a part hereof as Exhibit "C"; and the Department of Interior, in letter dated March 13, 2015 states that a Finding of No Significant Impact (FONSI) has been determined for the proposed action, and the letter is attached with the documents in Exhibit C; and

F. All environmental and archaeological studies and clearances have been completed and are attached hereto and incorporated herein by this reference.

Section Two. Approval

- A. The Resources and Development Committee of the Navajo Nation Council hereby grants a right-of-way to Navajo Department of Water Resources to construct, operate and maintain the Gadii'ahi' Phase IV Pipeline on Navajo Trust Lands located in the vicinity of Gadii'ahi/To'koi Chapter (San Juan County, New Mexico). The location is more particularly described on the map attached hereto as Exhibit B.
- B. The Resources and Development Committee of the Navajo Nation Council hereby approves the right-of-way subject to, but not limited to, the following terms and conditions attached hereto and incorporated herein as Exhibit D.

CERTIFICATION

I, hereby, certify that the foregoing resolution was duly considered by the Resources and Development Committee of the 23rd Navajo Nation Council at a duly called meeting at Navajo Nation Council Chambers, Window Rock, Navajo Nation (Arizona), at which quorum was present and that same was passed by a vote of 4 in favor, 0 opposed, 0 abstain this 7th day of July, 2015.



Alton Joe Shepherd, Chairperson
Resources and Development Committee
Of the 23rd Navajo Nation Council

Motion: Honorable Benjamin Bennett
Second: Honorable Leonard Pete
Vote: 4-0 (Chairman Not Voting)



**THE NAVAJO NATION
DEPARTMENT OF WATER RESOURCES**

P. O. Box 678 • Fort Defiance, Arizona 86504 • (928) 729-4003 • FAX (928) 729-4029



**BEN SHELLY
PRESIDENT**

**REX LEE JIM
VICE PRESIDENT**

MEMORANDUM

To: Howard Draper, Programs and Projects Specialist
Navajo Nation Land Department

From: David Tallman
David Tallman, Civil Engineer
Technical Construction and Operations Branch

Date: February 13, 2015

Subject: Request for Right of Way approval for Gadii' Ahi' Phase IV pipeline in
To' koi', NM

Please find the following Application for formal Right of Way for the Gadii' Ahi' Phase IV pipeline in To' koi', NM.

Enclose are the pertinent project documents, Archaeological study with Cultural Compliance document and NEPA – Findings of No Significant Impact document.

If you should have any questions regarding this matter please feel free to contact me at 928-206-6399, or Najam H. Tariq at 928-729-4040.

CONCURRENCE

Najam H. Tariq
Najam H. Tariq, Principal Geologist/Branch Director
Technical, Construction and Operations Branch, DWR

Cc: R. Benally, NNDWR
M. Begay, TCOB – NNDWR

Encl: KB FINAL Assessment – Findings of No Significant Impact - NEPA document
Biological Resource Compliance Form – Review number 10DOEL01-A
Archaeological Form – NNAD 09 – 206
Cultural Resource Compliance Form – HPD – 09-758

**UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS**

RIGHT-OF-WAY APPLICATION

LANDOWNER NAME: NN, Department of Water Resources ALLOTMENT NUMBER: N/A
LEGAL DESCRIPTION: See attached

COMES NOW THE APPLICANT Navajo Nation, Department of Water Resources of this 29 day of January, 2015, who whereby petition(s) the Bureau of Indian Affairs and respectfully files under the terms and provisions of the Act of February 5, 1948 (62 Stat. 17; 25 USC 323-328), and Departmental Regulations 25 CFR 169, an application of a 100 (term of years) right-of-way for the following purposes and reasons: Ingress and Egress purposes on existing road.

Across the following described restricted land (easement description):

Said right-of-way to be 20,044.56 ft length, 35 ft width, and 16.106 in size (or area), as shown on attached map of definite location, attached hereto, and made a part hereof.

SAID APPLICANT UNDERSTANDS AND EXPRESSLY AGREES TO THE FOLLOWING STIPULATIONS:

1. To construct and maintain the right-of-way in a workmanlike manner.
2. To pay all damages and compensation, in addition to the deposit made pursuant to 169.4, determined by the Secretary to be due the landowners and authorized users and occupants of the land due to the survey, granting, construction and maintenance of the right-of-way.
3. To indemnify the landowners and authorized users and occupants against any liability for loss of life, personal injury and property damage arising from the construction, maintenance, occupancy or use of the lands by the applicant, his employees, contractors and their employees, or subcontractors and their employees.
4. To restore the lands as nearly as may be possible to their original condition upon the completion of construction, to the extent compatible with the purpose for which the right-of-way was granted.
5. To clear and keep clear the lands within the right-of-way to the extent compatible with the purpose of the right-of-way; and dispose of all vegetative and other material cut, uprooted or otherwise accumulated during construction and maintenance of the project.
6. To take soil and resources conservation protection measures, including weed control, on the land covered by the right-of-way.
7. To do everything reasonable within its power to prevent and suppress fires on or near the lands to be occupied under the right-of-way.
8. To build and repair such roads, fences and trails as may be destroyed or injured by construction work and to build and maintain necessary and suitable crossings for all roads and trails that intersect the works constructed, maintained, or operated under the right-of-way.
9. That upon revocation or termination of the right-of-way, the applicant shall, so far as in reasonably possible, restore the land to its original condition. The determination of "reasonably possible" is subject to Secretary's approval.
10. To at all times keep the Secretary informed of its address, and in case of corporations, of the address of its principal place of business and the names and addresses of its principal officers.
11. That the applicant will not interfere with the use of the lands by or under the authority of the landowners for any purpose not inconsistent with the primary purpose for which the right-of-way is granted.

12. During the term of this Grant of Easement, if any previously unidentified cultural resources are discovered within the easement area, work should be halted immediately and the BIA and/or Tribal Contractor should be contacted immediately.

THE APPLICANT FURTHER STIPULATES AND EXPRESSLY AGREES AS FOLLOWS:

To conform and to abide by all applicable requirements with respect to the right-of-way herein applied for. The applicant agrees to conform to and abide by the rules, regulations, and requirements contained in the *Code of Federal Regulations*, Title 25 Indians, Part 169, as amended, and by reference includes such rules, regulations and requirements as a part of this application to the same effect as if the same were herein set out in full.

DATE 1/29/15

APPLICANT David Tallman DAVID TALLMAN, CIVIL ENGINEER, Nagajo Nafin
Department of Interior Reson

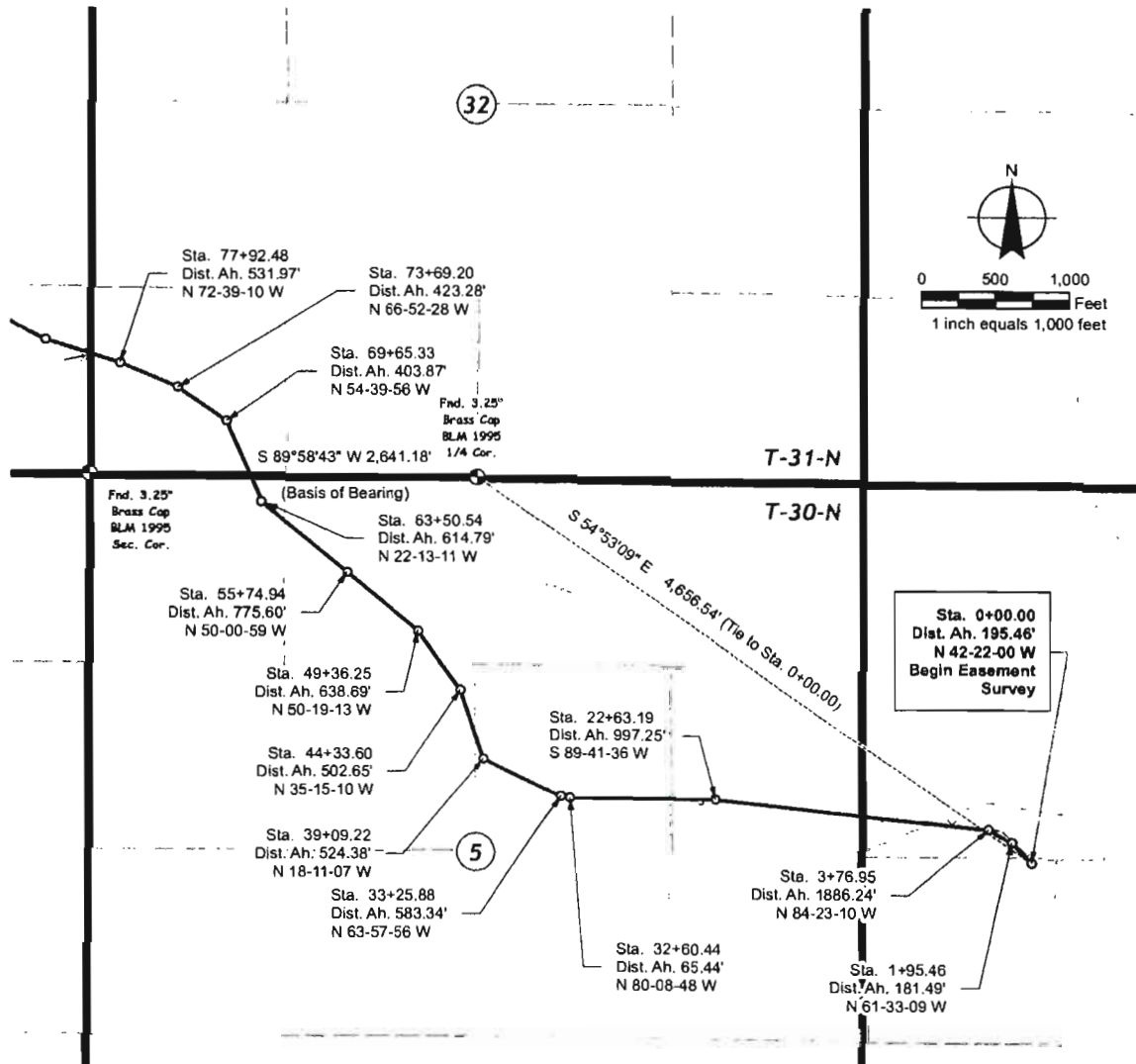
ATTEST _____

REQUIRED SUPPORTING DOCUMENTS:

1. () Written consent of landowner (ROW Form 94-7).
2. () Map (plats) of definite location (2 original mylars & 2 copies, See 25 CFR 169.6, 169.7, 169.8, 169.9, 169.10 and 169.11).
3. () Deposit of estimated damages or compensation (See 169.4 and 169.14).
4. () Evidence of Authority of Officers to Execute Papers (ROW Form 94-4)
5. () For corporation or business, requirements of 25 CFR 169.4 and 169.5 (unless previously filed):
 - () a. State certified copy of corporate charter or articles of incorporation.
 - () b. Certified copy of corporate resolution, by-laws, articles of partnership or association authorizing signatory to file the application.

GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 1 OF 5

LOCATED IN PORTIONS OF
SECTION 4 AND SECTION 5, TOWNSHIP 30 NORTH, RANGE 18 WEST,
SECTION 31 AND SECTION 32, TOWNSHIP 31 NORTH, RANGE 18 WEST,
SECTION 36 AND SECTION 25, TOWNSHIP 31 NORTH, RANGE 19 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO



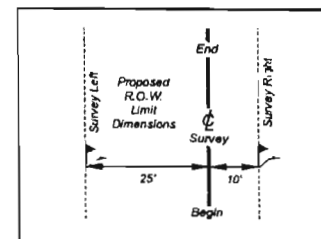
Basis of Bearing

AS MEASURED BY GPS BETWEEN MONUMENTS FOUND AT THE SOUTH
QUARTER CORNER AND THE SOUTHWEST CORNER OF SECTION 32.
T-31-N, R-18-W, N.M.P.M., LINE BEARS S 89°58'43" W A DISTANCE OF 2,641.18
FEET.

CERTIFICATION

I, DAVID A. JOHNSON, A REGISTERED PROFESSIONAL SURVEYOR UNDER THE
LAWS OF THE STATE OF NEW MEXICO, CERTIFY THAT THIS SURVEY PLAT WAS
PREPARED FROM AN ACTUAL GROUND SURVEY PERFORMED BY ME OR UNDER
MY DIRECT SUPERVISION, THAT I AM RESPONSIBLE FOR THIS SURVEY, THAT
THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE,
INFORMATION, AND BELIEF, AND THAT THIS PLAT AND THE FIELD BOOKS
WHICH IT IS BASED CONFORM TO THE "MINIMUM STANDARDS FOR PROFESSIONAL
SURVEYING IN NEW MEXICO"

DAVID A. JOHNSON
NEW MEXICO LICENSE NO. 14827



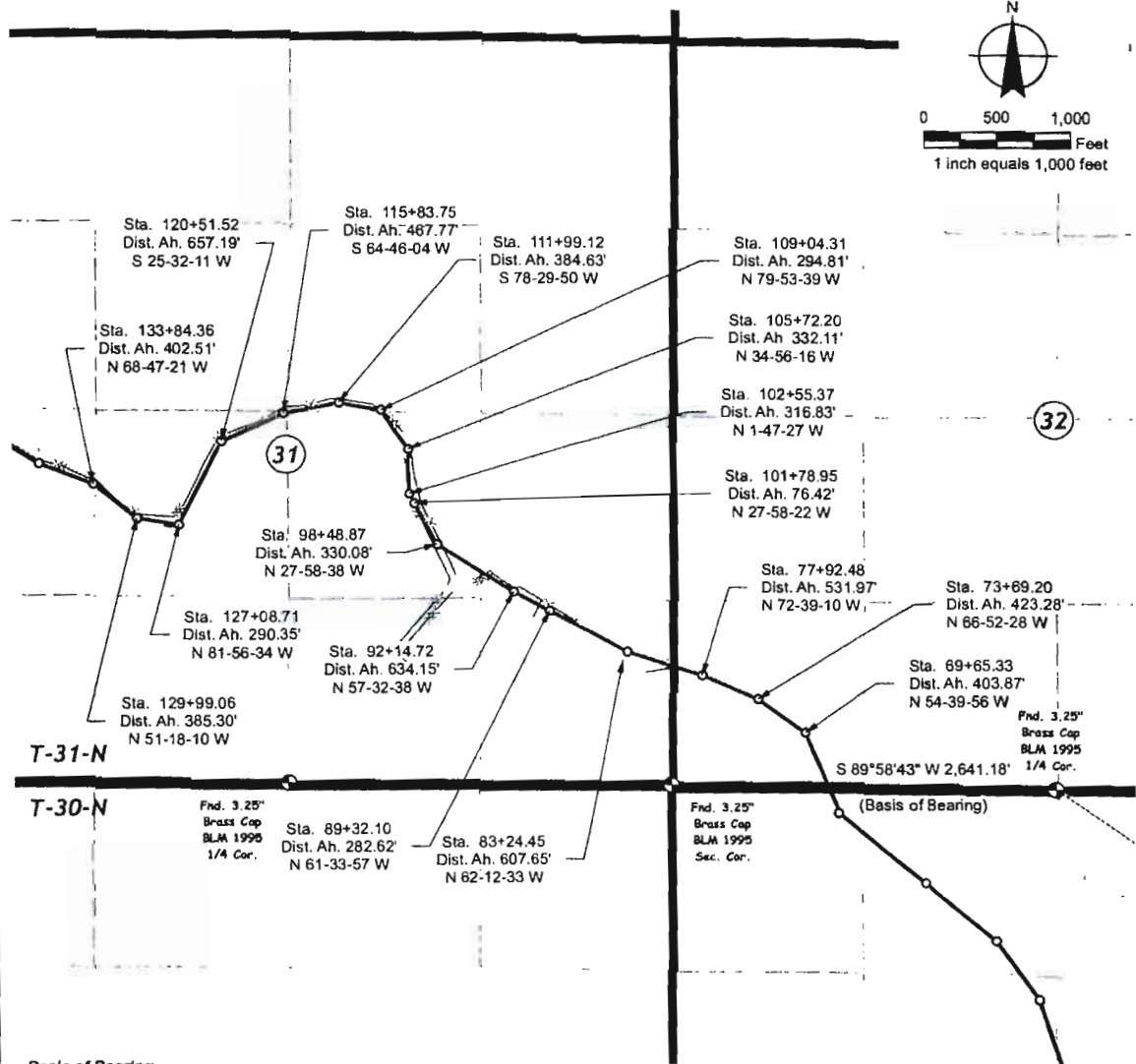
Detail R.O.W. Limits

CA ROW1.AXD 20150114



GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 2 OF 5

LOCATED IN PORTIONS OF
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Basis of Bearing

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CERTIFICATION

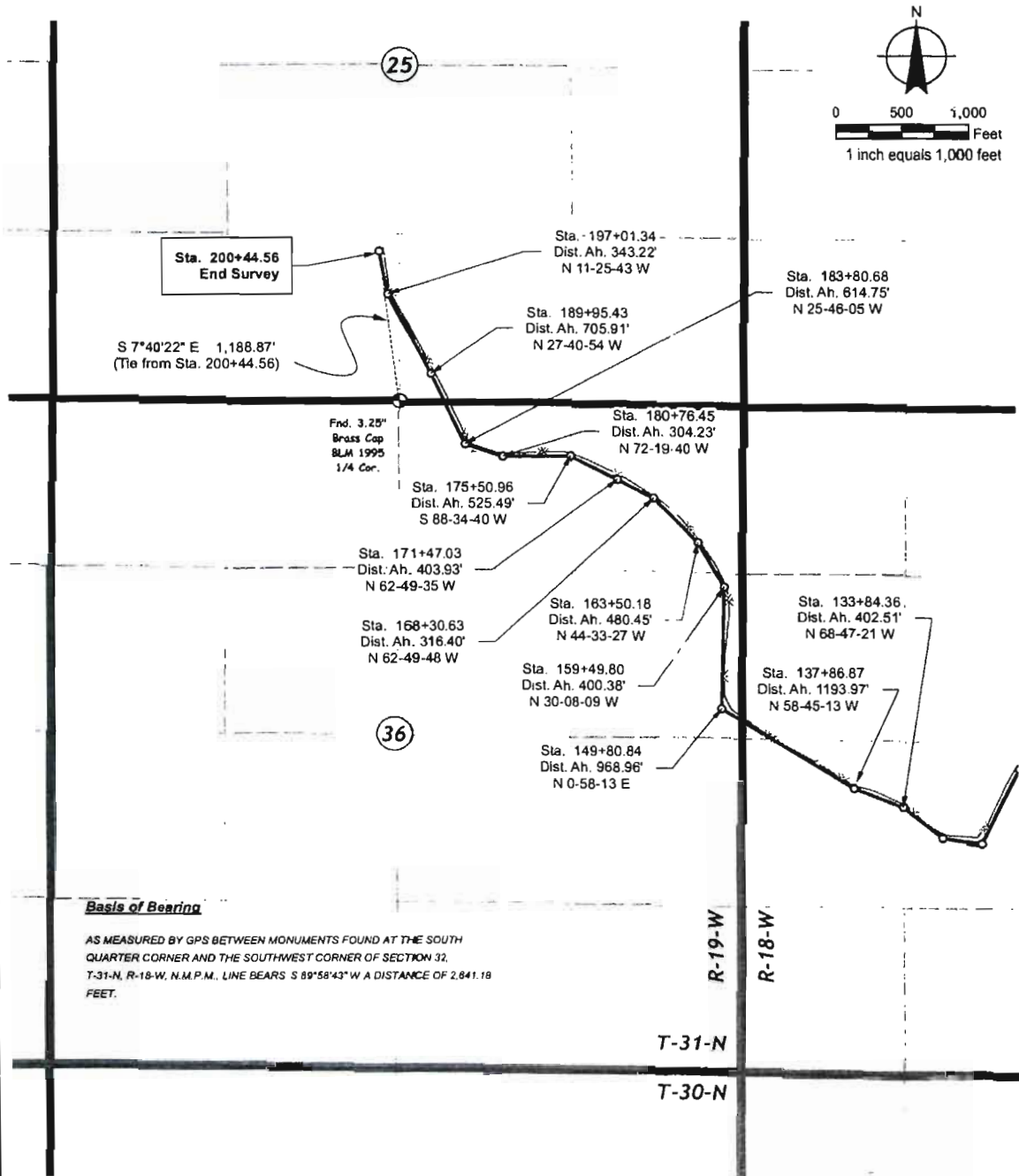
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GADII AHI IRRIGATION PIPELINE
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NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO



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DAVID A. JOHNSON
NEW MEXICO LICENSE NO. 14827



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GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 4 OF 5

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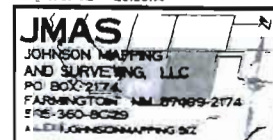
LEGAL DESCRIPTION

A strip of land thirty-five (35) feet in width, located in portions of Section 4 and Section 5 of Township 30 North, Range 18 West, and in portions of Section 31 and Section 32 of Township 31 North, Range 18 West, and in portions of Section 36 and Section 25 of Township 31 North, Range 19 West of the New Mexico Principal Meridian, San Juan County, State of New Mexico, said strip of land lying ten feet (10') to the northeasterly and twenty-five feet (25') to the southwesterly side of the following centerline:

COMMENCING at a 3.25" Brass Cap found for the North Quarter Corner of said Section 5, Township 30 North, Range 18 West, **THENCE** S 54°53'09" E a distance of 4,656.54 feet to a point in said Section 4, Township 30 North, Range 18 West, and being the **TRUE POINT OF BEGINNING** of this description and survey Station 0+00.00,

THENCE	N 42°22'00" W	a distance of	185.46	feet,	to survey Sta.	1+95.46
THENCE	N 61°33'09" W	a distance of	181.49	feet,	to survey Sta.	3+76.95
THENCE	N 84°23'10" W	a distance of	1,886.24	feet,	to survey Sta.	22+63.19
THENCE	S 89°41'36" W	a distance of	997.25	feet,	to survey Sta.	32+60.44
THENCE	N 80°08'48" W	a distance of	65.44	feet,	to survey Sta.	33+25.88
THENCE	N 63°57'56" W	a distance of	583.34	feet,	to survey Sta.	39+09.22
THENCE	N 18°11'07" W	a distance of	524.38	feet,	to survey Sta.	44+33.60
THENCE	N 35°15'10" W	a distance of	502.65	feet,	to survey Sta.	49+36.25
THENCE	N 50°19'13" W	a distance of	638.69	feet,	to survey Sta.	55+74.94
THENCE	N 50°00'59" W	a distance of	775.60	feet,	to survey Sta.	63+50.54
THENCE	N 22°13'11" W	a distance of	614.79	feet,	to survey Sta.	69+65.33
THENCE	N 54°39'56" W	a distance of	403.87	feet,	to survey Sta.	73+69.20
THENCE	N 66°52'28" W	a distance of	423.28	feet,	to survey Sta.	77+92.48
THENCE	N 72°39'10" W	a distance of	531.97	feet,	to survey Sta.	83+24.45
THENCE	N 62°12'33" W	a distance of	607.65	feet,	to survey Sta.	89+32.10
THENCE	N 61°33'57" W	a distance of	282.62	feet,	to survey Sta.	92+14.72
THENCE	N 57°32'38" W	a distance of	634.15	feet,	to survey Sta.	98+48.87
THENCE	N 27°58'38" W	a distance of	330.08	feet,	to survey Sta.	101+78.95
THENCE	N 27°58'22" W	a distance of	76.42	feet,	to survey Sta.	102+55.37
THENCE	N 1°47'27" W	a distance of	316.83	feet,	to survey Sta.	105+72.20
THENCE	N 34°56'16" W	a distance of	332.11	feet,	to survey Sta.	109+04.31
THENCE	N 79°53'39" W	a distance of	294.81	feet,	to survey Sta.	111+99.12
THENCE	S 78°29'50" W	a distance of	384.63	feet,	to survey Sta.	115+83.75
THENCE	S 64°46'04" W	a distance of	467.77	feet,	to survey Sta.	120+51.52
THENCE	S 25°32'11" W	a distance of	657.19	feet,	to survey Sta.	127+08.71
THENCE	N 81°56'34" W	a distance of	290.35	feet,	to survey Sta.	129+99.06
THENCE	N 51°18'10" W	a distance of	385.30	feet,	to survey Sta.	133+84.36
THENCE	N 68°47'21" W	a distance of	402.51	feet,	to survey Sta.	137+86.87
THENCE	N 58°45'13" W	a distance of	1,193.97	feet,	to survey Sta.	149+80.84
THENCE	N 0°58'13" E	a distance of	968.96	feet,	to survey Sta.	159+49.80
THENCE	N 30°08'09" W	a distance of	400.38	feet,	to survey Sta.	163+50.18
THENCE	N 44°33'27" W	a distance of	480.45	feet,	to survey Sta.	168+30.63
THENCE	N 62°49'48" W	a distance of	316.40	feet,	to survey Sta.	171+47.03
THENCE	N 62°49'35" W	a distance of	403.93	feet,	to survey Sta.	175+50.96

GA DECLMOD 20150114



GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 5 OF 5

LOCATED IN PORTIONS OF
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SECTION 36 AND SECTION 25, TOWNSHIP 31 NORTH, RANGE 19 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO

LEGAL DESCRIPTION CONTINUED

THENCE	S 88°34'40" W	a distance of	525.49	feet,	to survey Sta.	180+76.45
THENCE	N 72°19'40" W	a distance of	304.23	feet,	to survey Sta.	183+80.68
THENCE	N 25°46'05" W	a distance of	614.75	feet,	to survey Sta.	189+95.43
THENCE	N 27°40'54" W	a distance of	705.91	feet,	to survey Sta.	197+01.34
THENCE	N 11°25'43" W	a distance of	343.22	feet	to survey Sta.	200+44.58

which is the terminus of this description and from which point a 3.25" Brass Cap found for the South Quarter Corner of said Section 25 of Township 31 North, Range 19 West, bears S 7°40'22" E a distance of 1,188.87 feet.

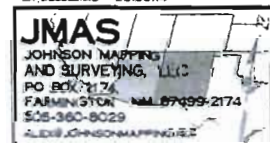
Totals: 20,044.56 feet 1214.82 rods 3.80 miles 16.106 acres +/-

This is to certify that I am a Licensed Professional Surveyor in the State of New Mexico, that the above description was prepared from field notes of an actual survey made by me or under my direction, and meets the Minimum Standards for Surveying in New Mexico.



David A. Johnson, P.S.
Licensed Professional Surveyor New Mexico Certificate No. 14827
c/o Johnson Mapping and Surveying, LLC
P.O. Box 2174
Farmington, New Mexico, 87499
(505) 360-8029

GA_DESC2.MXD 20150114



A_G_R_E_E_M_E_N_T

TRANSFER OF CERTAIN IRRIGATION PROJECTS WORKS ON THE NAVAJO RESERVATION

WHEREAS:

1. Pursuant to the Act of July 12, 1960, Public Law 86-636 (74 Stat. 470), the Secretary of the Interior is authorized to transfer to the Navajo Tribe all of the right, title, and interest of the United States to any irrigation project works, except the Reservoir Canyon and Moencopi Tuba project works, constructed or under construction by the United States within the Navajo Reservation prior to the date of approval of the Act, including machinery, equipment, tools, supplies, buildings, facilities, and improvements which are usable for the care, operation and maintenance of such works and which are not needed for the continued efficient operation of the irrigation construction program within the Navajo Reservation, subject to the prior approval of the Navajo Tribe.

2. By resolution of the Navajo Tribal Council CS-81-57, the Navajo Tribe assumed responsibility for the payment of operation and maintenance costs from and after January 1, 1958, and directed and empowered the officers of the Navajo Tribe to execute any and all agreements or other instruments which may be necessary, incidental, or advisable, to accept the responsibility for the operation and maintenance of the irrigation projects on the Navajo Reservation.

3. The fiscal year 1963 Navajo Tribal Budget provides Tribal Funds for the operation and maintenance of certain irrigation projects on the Navajo Reservation under the Irrigation Operation and Maintenance Department of the Navajo Tribe's Resources Division.



4. The Navajo Tribe represents that it now has a tribal organization known as the Irrigation Operation & Maintenance Department, sufficiently staffed with adequately trained personnel capable of efficiently operating and maintaining the irrigation project works and facilities to be transferred pursuant to the Act of July 12, 1960.

NOW, THEREFORE, it is agreed by and between the parties as follows:

1. Pursuant and subject to the Act of July 12, 1960, Public Law 86-636 (74 Stat. 470), the Secretary of the Interior, acting for the United States hereby transfers to the Navajo Tribe and the Navajo Tribe hereby accepts the right, title, and interest of the United States to the irrigation project works together with the machinery, equipment, tools, supplies, buildings, facilities, and improvements which are set forth and described in the Exhibit "A" entitled Description of Irrigation Project Works and Property List of Machinery, Equipment, Tools, Supplies, Buildings, Facilities, and Improvements, Being Transferred to the Navajo Tribe Under Public Law 86-636, Act of July 12, 1960, which Exhibit "A" is attached hereto and made a part of this Agreement, save and except the Secretary shall retain such title as may be necessary to validate expenditures of funds hereinafter appropriated to accomplish repairs and replacements set forth in paragraph 4 below.

The Navajo Tribe, in addition to acceptance hereof, agrees to assume responsibility for the continued efficient operation and maintenance of the irrigation project works conveyed herein without expense to the United States, the Navajo Tribe having a Plan of Operations dated July 1, 1962.

2. The Secretary of the Interior and the Navajo Tribe agree that this transfer shall be effective as of the 1st day of October 1962.

3. It is understood by the parties hereto, in the interest of the continued efficient operation and maintenance of the irrigation project works and facilities conveyed herein, that during the period of the construction of the Hogback Extension Project referred to in paragraph 7 hereof, the Secretary, subject to the approval of the Chairman, Navajo Tribal Council, will provide such personnel of the Department of the Interior as may be necessary and feasible to assist in acquainting tribal personnel with the more technical aspects and problems involved in the efficient operation and maintenance of the irrigation project works and facilities conveyed herein.

4. The Secretary of the Interior agrees, subject to the extent to which Congress appropriates funds to accomplish the work, to replace and/or repair the following major structures within the irrigation project works hereby transferred:

- (1) Fruitland Project: Long steel pipe siphon (1.9 miles long). Life Expectancy of this siphon is extremely questionable. Recommend replacement. Estimated cost \$275,000
- (2) Hogback Project:
 - (a) Repair of floor of desilting basin at Hogback Canal Headworks. Estimated cost \$ 6,000
 - (b) Extension of existing surface drain on Hogback Canal. Construct undershoot or overshoot across Hogback Main Canal and extend drainage channel to river. Estimated cost \$ 12,000
 - (c) B-Pump Area - Line B-pump ditch to reduce seepage losses. Estimated cost \$ 45,000

- (d) B-Pumping Plant - Revamp pumping plant and install proper pumps. (Investigate capacity required.)

Estimated cost \$ 14,500

- (3) Ganado Project: Siphon inlet 2.6 miles from diversion dam - rebuild retaining wall and install wasteway to protect structure and canal.

Estimated cost \$ 1,250

- (4) Red Lake Project: Increase capacity of diversion gates and line feeder canal.

Estimated cost \$ 18,500

5. The Navajo Tribe agrees to allow representatives of the Department of the Interior to enter upon the irrigation project works referred to in paragraph 4 above to accomplish the necessary rehabilitation, replacement, and/or repair called for in paragraph 4 of this Agreement, and for any other purposes consistent with the Act of July 12, 1960.

6. The Navajo Tribe agrees to furnish at the request of the Secretary of the Interior, or his authorized representative, all necessary data for the preparation by the Navajo Agency, Window Rock, Arizona, of the annual crop report.

7. It is agreed between the parties hereto that this transfer agreement shall not affect the project under construction known as the Hogback Extension Project, which project shall remain under the exclusive control of the Bureau of Indian Affairs, Department of the Interior, until the construction of this Project or segments thereof have been completed and transferred to the Navajo Tribe with its prior approval.

8. It is agreed by and between the parties hereto that in accordance with section 3 of the Act of July 12, 1960, the transfer to the Navajo Tribe pursuant to this Act of any irrigation project works located in whole or in part within the boundaries of the reservation established by executive order dated December 16, 1882, for the use and occupancy of the Moqui (Hopi) and

such other Indians as the Secretary of the Interior may see fit to settle thereon shall not be construed to affect in any way the merits of the conflicting claims of the Navajo and the Hopi Indians to the use or ownership of the lands within said 1882 reservation.

9. It is agreed by and between the parties hereto that section 4 of the Act of July 12, 1960, refers to the irrigation project works as such and does not refer to the irrigable land, and that, therefore, it is agreed that the proper interpretation of this section of this Act is that it relates only to the actual irrigation project works and "the land on which such works are located."

NOW, THEREFORE, the parties to this Agreement have subscribed hereto as of the 1st day of October 1962.

THE NAVAJO TRIBE OF INDIANS

By Paul Jones
Chairman, Navajo Tribal Council
Date JAN 1 1963

UNITED STATES DEPARTMENT OF THE INTERIOR

By John A. Cameron
Assistant Secretary of the Interior
Date APR 26 1963

The attached agreement is signed with the understanding that in the first sentence under "Description of Project Works" of Exhibit A which is attached to and made a part of this agreement, the word "two" means "five" and the number "61" is read "58." With this understanding, to which the Chairman of the Navajo Tribal Council agrees, the first sentence in Exhibit A reads as follows:

The irrigation project works included in this agreement are located in approximately 58 separate units which are identified in the attached list entitled "Navajo Indian Irrigation Projects" and the locations of which are shown on the attached plat entitled "Navajo Reservation Irrigation Projects, May 1938," except that the five projects which are colored red on the plat are excluded from the transfer under the Act of July 12, 1960.

UNITED STATES DEPARTMENT OF THE INTERIOR

By John A. Connor, Jr.
Secretary of the Interior

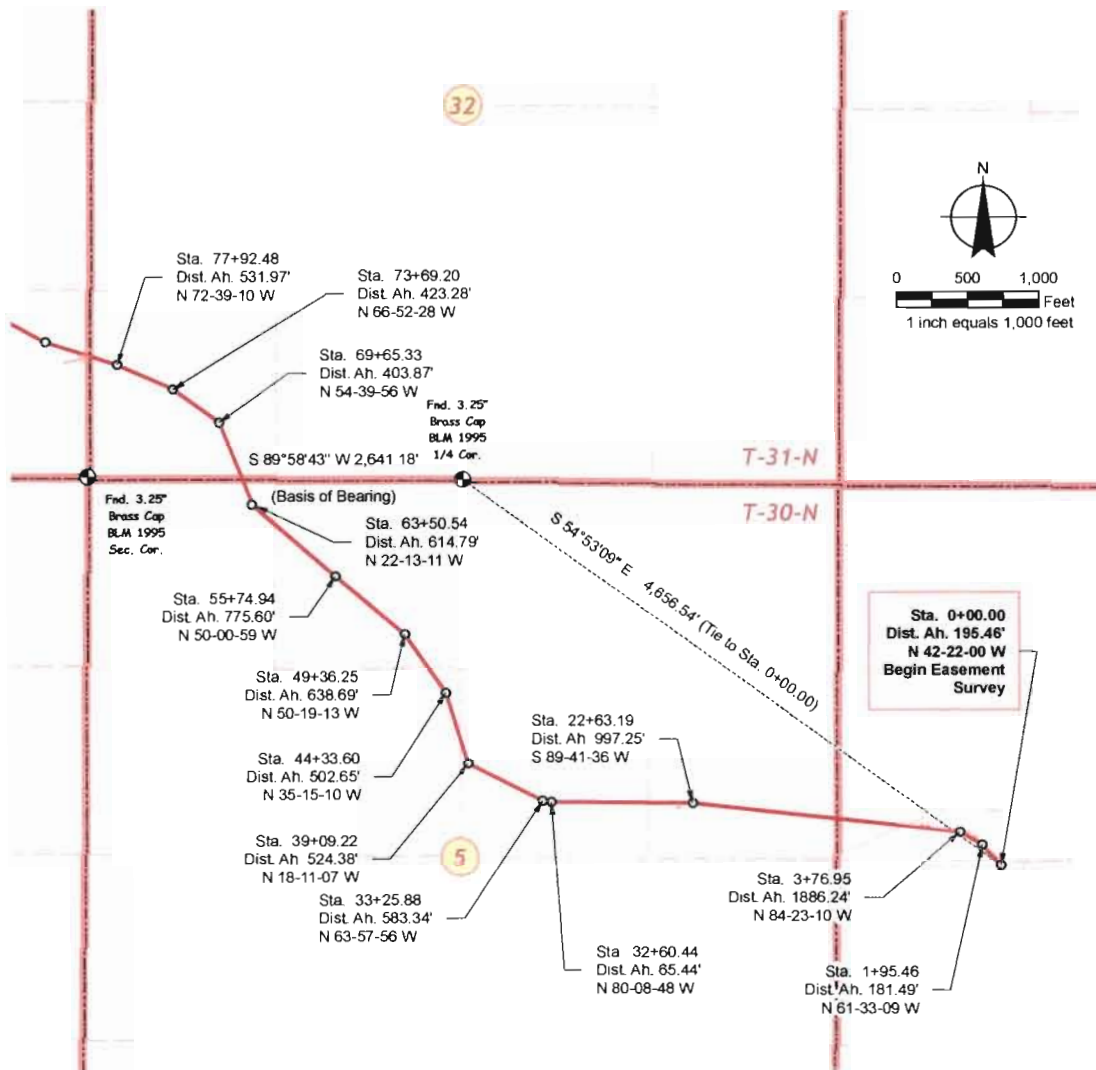
Date APR 26 1961

GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 1 OF 5

LOCATED IN PORTIONS OF
SECTION 4 AND SECTION 5, TOWNSHIP 30 NORTH, RANGE 18 WEST,
SECTION 31 AND SECTION 32, TOWNSHIP 31 NORTH, RANGE 18 WEST,
SECTION 36 AND SECTION 25, TOWNSHIP 31 NORTH, RANGE 19 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO

EXHIBIT

B



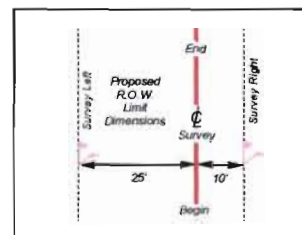
Basis of Bearing

AS MEASURED BY GPS BETWEEN MONUMENTS FOUND AT THE SOUTH
QUARTER CORNER AND THE SOUTHWEST CORNER OF SECTION 32.
T-31-N, R-18-W, N.M.P.M., LINE BEARS S 89°58'43" W A DISTANCE OF 2,641.18
FEET.

CERTIFICATION

I, DAVID A. JOHNSON, A REGISTERED PROFESSIONAL SURVEYOR UNDER THE
LAWS OF THE STATE OF NEW MEXICO, CERTIFY THAT THIS SURVEY PLAT WAS
PREPARED FROM AN ACTUAL GROUND SURVEY PERFORMED BY ME OR UNDER
MY DIRECT SUPERVISION, THAT I AM RESPONSIBLE FOR THIS SURVEY, THAT
THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE,
INFORMATION, AND BELIEF, AND THAT THIS PLAT AND THE FIELD CURVE
WHICH IT IS BASED CONFORM TO THE "MINIMUM STANDARD FOR
SURVEYING IN NEW MEXICO".

DAVID A. JOHNSON
NEW MEXICO LICENSE NO. 14827



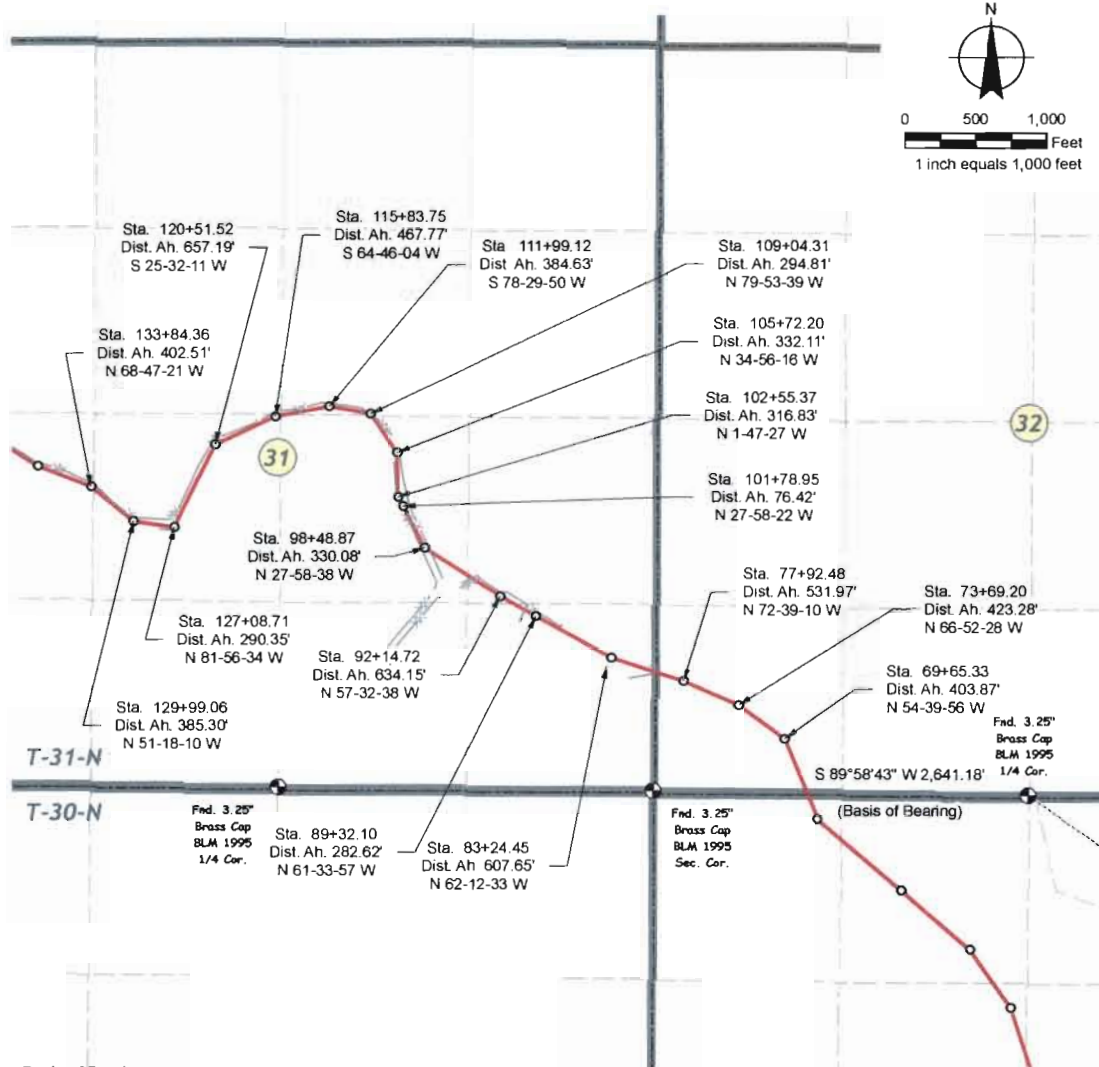
Detail R.O.W. Limits

GA ROW.MXD 20150114

JMAS
JOHNSON MAPPING
AND SURVEYING, LLC
PO BOX 2174
FARMINGTON NM 87499-2174
505-360-8029
ALEX@JOHNSONMAPPING.BIZ

GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 2 OF 5

LOCATED IN PORTIONS OF
SECTION 4 AND SECTION 5, TOWNSHIP 30 NORTH, RANGE 18 WEST,
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SECTION 36 AND SECTION 25, TOWNSHIP 31 NORTH, RANGE 19 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO



Basis of Bearing

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T-31-N, R-18-W, N.M.P.M., LINE BEARS S 89°58'43\"/>

CERTIFICATION

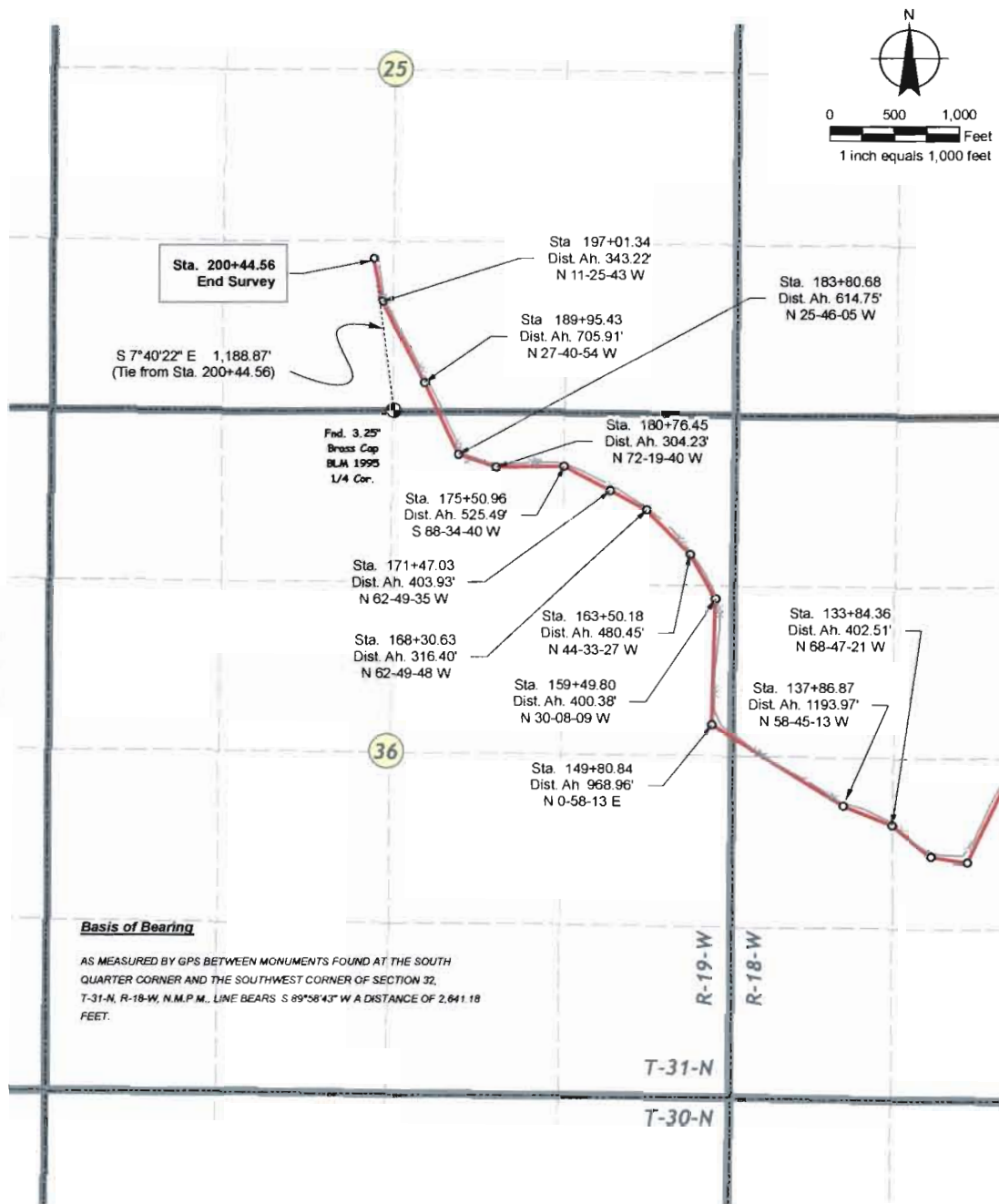
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MY DIRECT SUPERVISION, THAT I AM RESPONSIBLE FOR THIS SURVEY, THAT
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INFORMATION, AND BELIEF, AND THAT THIS PLAT AND THE RECORD THEREON
WHICH IT IS BASED CONFORM TO THE "MINIMUM STANDARDS FOR LAND
SURVEYING IN NEW MEXICO".

DAVID A. JOHNSON,
NEW MEXICO LICENSE NO. 14827



GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 3 OF 5

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SECTION 4 AND SECTION 5, TOWNSHIP 30 NORTH, RANGE 18 WEST,
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NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO



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INFORMATION, AND BELIEF, AND THAT THIS PLAT AND THE SURVEY IT
WHICH IT IS BASED CONFORM TO THE "MINIMUM STANDARDS FOR LAND
SURVEYING IN NEW MEXICO"

DAVID A. JOHNSON
NEW MEXICO LICENSE NO. 14827



GA_ROW3J00D 20150114



GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 4 OF 5

LOCATED IN PORTIONS OF
SECTION 4 AND SECTION 5, TOWNSHIP 30 NORTH, RANGE 18 WEST,
SECTION 31 AND SECTION 32, TOWNSHIP 31 NORTH, RANGE 18 WEST,
SECTION 36 AND SECTION 25, TOWNSHIP 31 NORTH, RANGE 19 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO

LEGAL DESCRIPTION

A strip of land thirty-five (35') feet in width, located in portions of Section 4 and Section 5 of Township 30 North, Range 18 West, and in portions of Section 31 and Section 32 of Township 31 North, Range 18 West, and in portions of Section 36 and Section 25 of Township 31 North, Range 19 West of the New Mexico Principal Meridian, San Juan County, State of New Mexico, said strip of land lying ten feet (10') to the northeasterly and twenty-five feet (25') to the southwesterly side of the following centerline:

COMMENCING at a 3.25" Brass Cap found for the North Quarter Corner of said Section 5, Township 30 North, Range 18 West, THENCE S 54°53'09" E a distance of 4,656.54 feet to a point in said Section 4, Township 30 North, Range 18 West, and being the TRUE POINT OF BEGINNING of this description and survey Station 0+00.00,

THENCE	N 42°22'00" W	a distance of	195.46	feet,	to survey Sta.	1+95.46
THENCE	N 61°33'09" W	a distance of	181.49	feet,	to survey Sta.	3+76.95
THENCE	N 84°23'10" W	a distance of	1,886.24	feet,	to survey Sta.	22+63.19
THENCE	S 89°41'36" W	a distance of	997.25	feet,	to survey Sta.	32+60.44
THENCE	N 80°08'48" W	a distance of	65.44	feet,	to survey Sta.	33+25.88
THENCE	N 63°57'56" W	a distance of	583.34	feet,	to survey Sta.	39+09.22
THENCE	N 18°11'07" W	a distance of	524.38	feet,	to survey Sta.	44+33.60
THENCE	N 35°15'10" W	a distance of	502.65	feet,	to survey Sta.	49+36.25
THENCE	N 50°19'13" W	a distance of	638.69	feet,	to survey Sta.	55+74.94
THENCE	N 50°00'59" W	a distance of	775.60	feet,	to survey Sta.	63+50.54
THENCE	N 22°13'11" W	a distance of	614.79	feet,	to survey Sta.	69+65.33
THENCE	N 54°39'56" W	a distance of	403.87	feet,	to survey Sta.	73+69.20
THENCE	N 66°52'28" W	a distance of	423.28	feet,	to survey Sta.	77+92.48
THENCE	N 72°39'10" W	a distance of	531.97	feet,	to survey Sta.	83+24.45
THENCE	N 62°12'33" W	a distance of	607.65	feet,	to survey Sta.	89+32.10
THENCE	N 61°33'57" W	a distance of	282.62	feet,	to survey Sta.	92+14.72
THENCE	N 57°32'38" W	a distance of	634.15	feet,	to survey Sta.	98+48.87
THENCE	N 27°58'38" W	a distance of	330.08	feet,	to survey Sta.	101+78.95
THENCE	N 27°58'22" W	a distance of	76.42	feet,	to survey Sta.	102+55.37
THENCE	N 1°47'27" W	a distance of	316.83	feet,	to survey Sta.	105+72.20
THENCE	N 34°56'16" W	a distance of	332.11	feet,	to survey Sta.	109+04.31
THENCE	N 79°53'39" W	a distance of	294.81	feet,	to survey Sta.	111+99.12
THENCE	S 78°29'50" W	a distance of	384.63	feet,	to survey Sta.	115+83.75
THENCE	S 64°46'04" W	a distance of	467.77	feet,	to survey Sta.	120+51.52
THENCE	S 25°32'11" W	a distance of	657.19	feet,	to survey Sta.	127+08.71
THENCE	N 81°56'34" W	a distance of	290.35	feet,	to survey Sta.	129+99.06
THENCE	N 51°18'10" W	a distance of	385.30	feet,	to survey Sta.	133+84.36
THENCE	N 68°47'21" W	a distance of	402.51	feet,	to survey Sta.	137+86.87
THENCE	N 58°45'13" W	a distance of	1,193.97	feet,	to survey Sta.	149+80.84
THENCE	N 0°58'13" E	a distance of	968.96	feet,	to survey Sta.	159+49.80
THENCE	N 30°08'09" W	a distance of	400.38	feet,	to survey Sta.	163+50.18
THENCE	N 44°33'27" W	a distance of	480.45	feet,	to survey Sta.	168+30.63
THENCE	N 62°49'48" W	a distance of	316.40	feet,	to survey Sta.	171+47.03
THENCE	N 62°49'35" W	a distance of	403.93	feet,	to survey Sta.	175+50.96

GA DESC1.MXD 20150114



GADII AHI IRRIGATION PIPELINE
R.O.W. SURVEY NAVAJO NATION LANDS
PAGE 5 OF 5

LOCATED IN PORTIONS OF
SECTION 4 AND SECTION 5, TOWNSHIP 30 NORTH, RANGE 18 WEST,
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SECTION 36 AND SECTION 25, TOWNSHIP 31 NORTH, RANGE 19 WEST,
NEW MEXICO PRINCIPAL MERIDIAN, SAN JUAN COUNTY, NEW MEXICO

LEGAL DESCRIPTION CONTINUED

THENCE S 88°34'40" W a distance of 525.49 feet, to survey Sta. 180+76.45
THENCE N 72°19'40" W a distance of 304.23 feet, to survey Sta. 183+80.68
THENCE N 25°46'05" W a distance of 614.75 feet, to survey Sta. 189+95.43
THENCE N 27°40'54" W a distance of 705.91 feet, to survey Sta. 197+01.34
THENCE N 11°25'43" W a distance of 343.22 feet, to survey Sta. 200+44.56

which is the terminus of this description and from which point a 3.25" Brass Cap found for the
South Quarter Corner of said Section 25 of Township 31 North, Range 19 West, bears
S 7°40'22" E a distance of 1,188.87 feet.

Totals: 20,044.56 feet 1214.82 rods 3.80 miles 16.106 acres +/-

This is to certify that I am a Licensed Professional Surveyor in the State of New Mexico, that
the above description was prepared from field notes of an actual survey made by me or under
my direction, and meets the Minimum Standards for Surveying in New Mexico.



David A. Johnson, P.S.
Licensed Professional Surveyor New Mexico Certificate No. 14827
c/o Johnson Mapping and Surveying, LLC
P.O. Box 2174
Farmington, New Mexico, 87499
(505) 360-8029



Subj: :
Relative to
Cudahy Ditch,
San Juan River.



DEPARTMENT OF THE INTERIOR,

UNITED STATES INDIAN SERVICE,

522 Bumiller Building,
Los Angeles, Calif.,

April 7th., 1909.

Mr. H. F. Robinson,
Supt. of Irrigation,
Albuquerque, New Mex.

Dear Sir:-

In reference to your letter of April 5th., enclosing report of Rollin Ritter, in connection with the so-called Cudahy Ditch, I do not believe it advisable for us to build any more temporary headings on the San Juan River. The Engineers of the Indian Service have already come in for a great deal of criticism due to the failure of ditches heretofore constructed, and any work that we do there now should be built so that it would stay.

I do not believe a safe heading can be constructed at the point suggested by Mr. Ritter, since the work contemplated assumes that the San Juan River will not only ~~get~~ a channel for herself, in the first instance, but will remain in that channel for all time, in order that our ditch along the foot of the perpendicular bluff for a distance of nearly 3/4 of a mile might remain intact. I looked at one or two headings which Mr. Sheldon pointed out to me, while I was up there, and I think he showed me this identical heading, which did not look good to me at all.

It will be much more to our credit, and to the benefit of the Indians, if we concentrate our efforts on one good ditch, rather than to spread around on temporary headings such as have

heretofore been built.

It is unfair to the Indian to ask him to settle and improve land under a ditch where the heading is not secure.


As soon as your maps and report reach here, Quinton and I will go over the same and advise you at once of our conclusions with reference to the Hogback Ditch. Mr. Quinton's ideas of a cement lined section may be good, in view of the silt problem. He tells me that the river was very silty at the time you were there, and I wish you would write us fully your views as to how the San Juan compares with the Salt River with respect to silt.

In the Salt River the trouble we had on the Consolidated was not occasioned by silt, but by the heavy drifting sand which moved along the bottom of the river during floods, and would pour through our headgates and creep down the ditch. The materials in suspension, or silt proper, would seem to move along all right where the velocity approximated $2\frac{1}{2}$ feet a second.

I wish Ritter had thought to take a few volumetric samples of the San Juan River water, and would suggest that you write your man there to do the same. He can take the samples in a glass jar and measure the deposit, and obtain an approximate percentage by volume, which will give us at least some idea.

The average floods in the Salt River did not show over 8% silt, and these samples were taken from the Mesa Canal in front of the Consolidated office.

Yours truly,


Chief Engineer.

EES.

September 12, 1956

Mr. Chairman and
Members of the Advisory Committee

- I am here with a request from the Cudele Farming Project.

The irrigation ditch that we have on this Project has been our own ditch since ~~Benque Redondo~~ days. The Government has never maintained it and we have always maintained it.

We have had trouble with the headgate and no water is in the irrigation ditch.

We have approached the Extension Service in connection with the Shiprock Indian Service, but they will not help us. They told us that we would probably have to go to the Tribe since that land is Tribal land.

We also approached the Extension Service of San Juan County at Aztec, New Mexico. They would help us but they told us they had no money to help out the farmers. They do have some money for development of water on the range for stock. Next year they will ask for some money to help the Navajo farmers and if they get the money it will be available from July on and they would help us then.

However, we want the water in the ditch real soon so that we can irrigate this Fall and plant our Fall wheat. The hay fields are going dry.

This project has over 400 acres and over 40 families live on it.

I have been informed that the Council has set aside \$7,500 for our area to repair the reservoirs and also help the farmers at Cudele, so it is our thought that this money might be available for helping us, and that is the reason I am here.

Sam Ahkeah

Cudei Appeals to Tribe for Canals

CUDEI — The small community of Cudei has appealed to various Navajo tribal agencies for assistance in establishing community facilities to serve some 50 families living along the San Juan River.

The community, consisting of small farms about nine miles northwest of Shiprock, contends that tribal and federal programs do not reach them and that they do not have influence at either Shiprock or Beclabito chapters, under whose jurisdiction they fall.

Bobby Charley, a young resident of the community, says Cudei is not on the map although it is the birthplace of former tribal chairman Sam Ahkeah and the place he returned to after completing his term of office. "Cudei,"

means juniper tree in Navajo and, according to local residents, was settled in 1873 soon after the Navajos returned from Ft. Sumner in the "Long Walk."

Charley, a graduate of Northern Arizona University,

said he organized meetings after appeals to Shiprock and Beclabito chapters did not produce desired results. Many tribal department heads attended the weekend meeting.

The community is specifically requesting a paved road from the main highway to the area, a distance of about six miles. Requests also include electricity, water and housing. Residents are placing greatest emphasis on a canal system for local farms, the primary livelihood.

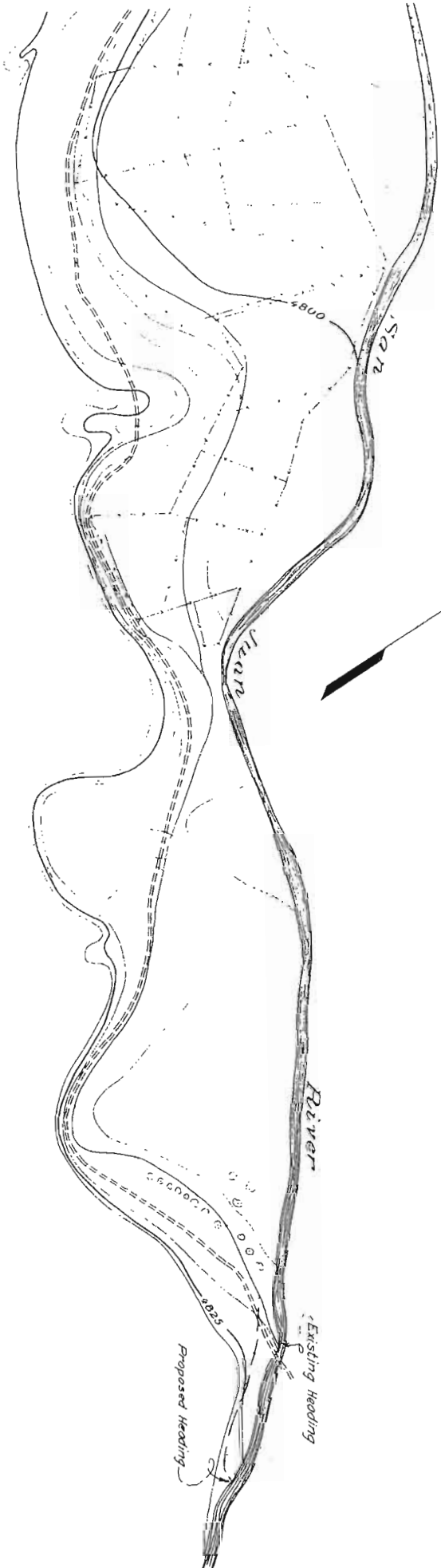
Tribal Chairman Peter MacDonald, who attended the meeting, praised the former chairman, citing his contribution to the future of the Navajo people, adding that his own community has been neglected for so long.

Indian Engineers in Demand

ALBUQUERQUE (AP) — American Indian engineers are in demand on the Navajo reservation and some 1,000 could be hired right away, said Navajo Tribal Chairman Peter MacDonald.

MacDonald made his remarks Wednesday to a meeting of Indian engineering students at the University of New Mexico.

"There are all kinds of opportunities for engineers today. You will be needed; I wish we had you today," he told the students. "There is a great need for Native American engineers on all reservation."



NOTE:
 MAP REDUCED FROM 1:50,000
 CONTOUR INTERVAL 5 FEET

DEPARTMENT OF THE INTERIOR
 U.S. INDIAN SERVICE
 NAVAJO AGENCY
 IRRIGATION DIVISION
CUDAI PROJECT
 NEW MEXICO



United States Department of the Interior
Bureau of Indian Affairs
Navajo Region
P. O. Box 1060
Gallup, New Mexico 87305



MC: 620 Division of Environmental, Cultural and Safety Management

Mr. Gilbert Harrison
Farm Board President
Post Office Box 1318
Shiprock, New Mexico 87420

MAR 13 2015

Dear Mr. Harrison,

The Environmental Assessment (EA), EA-15-8415, for the Navajo Nation Department of Water Resources, the San Juan Diné Water Users, Inc. and the Gadii'ahi Chapter proposed Gadii'ahi Farm Irrigation System Phase IV, located in the Gadii'ahi Chapter in San Juan County, New Mexico, has been reviewed in the Branch of Environmental Quality Act Compliance & Review, Navajo Regional Office. Gadii'ahi proposes to convert the canal system downstream of the Gadii'ahi siphon to pipeline. A Finding of No Significant Impact (FONSI) has been determined for the proposed action. It will not have a significant impact on the quality of the natural and human environment. An environmental impact statement for the proposed project is not required.

If you have questions, you may contact Ms. Harrilene J. Yazzie, Regional NEPA Coordinator, at (505) 863-8287.

Sincerely,

Regional Director, Navajo

Enclosure

cc: N461, Mr. Rudy Keedah, BIA-Safety of Dams

**FINDING OF NO SIGNIFICANT IMPACT
GADII'AHÍ FARM IRRIGATION SYSTEM PHASE IV EA-15-8415**

KELLER-BLIESNER ENGINEERING, LLC.

**Location: Rattlesnake, NM, Quadrangle, USGS 7.5 Minute Series Map
Section 31 & 36, T31N, R18&19W, NMPM
Gadii'ahi Chapter, San Juan County, New Mexico**

The proposed action is approval, by the Bureau of Indian Affairs, for a right-of-way (ROW) grant to convert, construct, operation and maintenance on an existing Canal to pipeline formerly known as Cudei. The length of the pipeline will be 7,373 feet within a 50-foot right-of-way affecting approximately 8.5 acres of Navajo Tribal Trust Land. The project site is located Gadii'ahi Chapter, San Juan County, New Mexico. The project is sponsored by the Gadii'ahi Chapter, P.O. Box 1318 Shiprock, New Mexico 87420.

The project environmental assessment (EA) was reviewed in the Branch of Environmental Quality Act Compliance & Review, Navajo Regional Office. Based on the environmental assessment and the mitigation measures specified in the document, it is determined that the proposed action will not have a significant impact on the natural and human environment. Therefore, in accordance with the National Environmental Policy Act, Section 102 (2) (C), an environmental impact statement will not be required.

The following references, incorporated in the environmental assessment, serve as the bases for this decision:

1. Agency and public involvement was solicited, and environmental issues relative to right-of-way approval for the proposed project were identified. Alternative courses of action and mitigation measures were developed in response to environmental concerns and issues.
2. The EA disclosed the environmental consequences of the proposed and "no action" alternatives.
3. In compliance with the Endangered Species Act, informal consultation was held with the Navajo Nation Department of Fish and Wildlife (NNDFW), Natural Heritage Program (NHP). The NNDFW issued a letter stating, "The project is not expected to affect any federally listed species or significantly impact any tribally listed species or other species of concern on the Rattlesnake, NM, USGS 7.5-Minute Quadrangle containing the project boundaries (October 28, 2014, Letter from the NNDFW-EA). According to the NNDFW Biological Resource Land Clearance Policies and Procedures (BRLCPP), the proposed project is located within a community developed zone. The NNDFW issued Biological Resources Compliance Form (BRCF), NNDFW Review No.14DOEL-05 indicating approval of the proposed action. The operator shall comply with the avoidance/mitigation measures and conditions of compliance cited in the BRCF (EA, BRCF).
4. Potential impacts to flood plains and wetlands by the proposed project have been evaluated in accordance with Executive Orders 11988 and 11990 respectively. The area is not located in a 100-year floodplain. There are no perennial streams or wetlands in the project area (EA, Appendix 3-1-Wildlife Species Report).

5. Water Resources – the proposed action would eliminate seepage and evaporation losses along the existing canal. There are no perennial streams, lakes, or ponds within the proposed project area and does not contain any wetlands or riparian habitats (EA, Part 3.3).

6. In compliance with the National Historic Preservation Act of 1966 as amended, Section 106 and 36 CFR 800.9 (b), a cultural resources inventory of the project area was conducted by Navajo Nation Archeology Department (NNAD). The Navajo Nation Historic Preservation Department (NNHPD) issued Cultural Resources Compliance Form (CRCF) NNHPD No. HPD-11-693 indicating, “No historic properties will be affected” (EA-CRCF).

In the event of a discovery [discovery means any previously unidentified or incorrectly identified cultural resources including, but not limited to, archaeological deposits, human remains, or locations reportedly associated with Native American religious/traditional beliefs or practices] all operations in the immediate vicinity of the discovery must cease, and the Navajo Nation Historic Preservation Department must be notified.

7. RCRA, Subtitle C, Hazardous Waste and Subtitle D, Non-Hazardous Solid Waste - generation of hazardous waste is not expected. If hazardous waste is inadvertently generated, the proper authorities shall be consulted regarding disposal of such waste.

8. Noxious Weeds – there were 5 noxious weeds present in the proposed project area. The operator shall ensure that noxious weeds do not spread over disturbed areas, and shall consult with the Navajo Nation Department of Agriculture (NNDA) regarding management and control of noxious weeds. The operator shall contact the Navajo Nation Environmental Protection Agency (NNEPA) Pesticide Enforcement and Development Program for a list of approved herbicides and applicators (EA, Part 3.6). The operator shall implement Best Management Practices to prevent the introduction of non-native, invasive plants to the project area.

9. Air Resources – there will be a short-term increase in dust during construction of the proposed action. This impact will subside as disturbed areas are reclaimed. Water shall be sprayed over disturbed areas for dust control if necessary. Surface disturbance and vehicular traffic will be limited; and compliance with the Clean Air Act and all applicable state, tribal and local regulations will occur.

10. Visual Resources – the proposed action will be constructed in a manner that will minimize its impact on the visual quality of the area. In the general vicinity of the proposed power line route, the natural and undisturbed visual environment is dominant, but utility lines fence lines and dirt roads are also highly visible elements of the landscape. Permanent impacts to visual quality will come from the overhead power line.

11. Public Health and Safety – short-term risks to the public associated with the construction of the pipeline would come from increased traffic on public roads. However, vehicle traffic will be restricted to approved areas.

12. Cumulative and secondary effects on soil, water, air, noise, vegetation, cultural resources, and wildlife resources (species and habitat) were considered, and the proposed mitigation measures were found to be acceptable.

13. In accordance with Executive Order 12898 on Environmental Justice, impacts to minority and low-income populations and communities have been considered by the Regional NEPA Coordinator, as have impacts to Indian Trust Resources.

The proposed action will allow the Navajo Nation Department Water Resources, the San Juan Diné Water Users, Inc. and the Gadii'ahi Chapter to utilize the pressurized irrigation water system to continue the support of farming in the local area.



Regional NEPA Coordinator

3/13/2015

Date



EXHIBIT "D"

NAVAJO NATION RIGHT-OF-WAY TERMS AND CONDITIONS:

NAVAJO NATION DIVISION OF WATER RESOURCES (GRANTEE)

1. The term of the right-of-way shall be for twenty (20) years, beginning on the date the right-of-way is granted by the Secretary of the Interior.
2. Consideration for the right-of-way is assessed at \$251,253.00. The Navajo Nation contributes this amount to the project to provide water to Navajo communities for irrigation.
3. The Grantee may develop, use and occupy the right-of-way for the purpose(s) of a water pipeline and apparent facilities. The Grantee may not develop, use or occupy the right-of-way for any other purpose without the prior written approval of the Navajo Nation and the Secretary of the Interior. The approval of the Navajo Nation may be granted, granted upon conditions or withheld in the sole discretion of the Navajo Nation. The Grantee may not develop, use or occupy the right-of-way for any unlawful purpose.
4. In all activities conducted by the Grantee within the Navajo Nation, the Grantee shall abide by all laws and regulations of the Navajo Nation and of the United States, now in force and effect or as hereafter may come into force and effect, including but not limited to the following:
 - a. Title 25, Code of Federal Regulations, Part 169;
 - b. All applicable federal and Navajo Nation antiquities laws and regulations, with the following additional condition: In the event of a discovery all operations in the immediate vicinity of the discovery must cease and the Navajo Nation Historic Preservation Department must be notified immediately. As used herein, "discovery" means any previously unidentified or incorrectly identified cultural resources, including but not limited to archeological deposits, human remains, or location reportedly associated with Native American religious/traditional beliefs or practices;
 - c. The Navajo Preference in Employment Act, 15 N.N.C. §§ 601 et seq., and the Navajo Nation Business Preference Law, 5 N.N.C. §§ 201 et seq.; and
 - d. The Navajo Nation Water Code, 22 N.N.C. § 1101 et seq.. Grantee shall apply for and submit all applicable permits and information to the Navajo Nation Water Resources Department, or its successor.
5. The Grantee shall ensure that the air quality of the Navajo Nation is not jeopardized due to violation of applicable laws and regulations by its operations pursuant to the right-of-way.
6. The Grantee shall clear and keep clear the lands within the right-of-way to the extent compatible with the purpose of the right-of-way, and shall dispose of all vegetation and other materials cut, uprooted, or otherwise accumulated during any surface disturbance activities.
7. The Grantee shall reclaim all surface lands disturbed related to the right-of-way, as outlined in a restoration and revegetation plan, which shall be prepared with the assistance of the Navajo Nation

Environmental Protection Agency, or its successors (NNEPA), and shall be submitted to and must be approved by NNEPA prior to any surface disturbance. The Grantee shall comply with all provisions of such restoration and revegetation plan and shall notify the Director of the NNEPA immediately upon completion of the surface disturbance activities so that a site inspection be can made.

8. The Grantee shall at all times during the term of the right-of-way and at the Grantee's sole cost and expense, maintain the land subject to the right-of-way and all improvements located thereon and make all necessary and reasonable repairs.
9. The Grantee shall obtain prior written permission to cross existing rights-of-way, if any, from the appropriate parties.
10. The Grantee shall be responsible for and promptly pay all damages when they are sustained.
11. The Grantee shall indemnify and hold harmless the Navajo Nation and the Secretary of the Interior and their respective authorized agents, employees, landusers and occupants, against any liability for loss of life, personal injury and property damages arising from the development, use or occupancy or use of right-of-way by the Grantee.
12. The Grantee shall not assign, convey or transfer, in any manner whatsoever, the right-of-way or any interest therein, or in or to any of the improvements on the land subject to the right-of-way, without the prior written consent of the Navajo Nation and the Secretary of the Interior. Any such attempted assignment, conveyance or transfer without such prior written consent shall be void and of no effect. The consent of the Navajo Nation may be granted, granted upon conditions or withheld in the sole discretion of the Navajo Nation.
13. The Navajo Nation may terminate the right-of-way for violation of any of the terms and conditions stated herein. In addition, the right-of-way shall be terminable in whole or part by the Navajo Nation for any of the following causes:
 - a. Failure to comply with any terms and conditions of the grant or of applicable laws or regulations;
 - b. A non-use of the right-of-way for the purpose for which it is granted for a consecutive two year period; and
 - c. The use of the land subject to the right-of-way for any purpose inconsistent with the purpose for which the right-of-way is granted.
14. At the termination of this right-of-way, the Grantee shall peaceably and without legal process deliver up the possession of the premises, in good condition, usual wear and tear excepted. Upon the written request of the Navajo Nation, the Grantee shall provide the Navajo Nation, at the Grantee's sole cost and expense, with an environmental audit assessment of the premises at least sixty (60) days prior to delivery of said premises.
15. Holding over by the Grantee after the termination of the right-of-way shall not constitute a renewal or extension thereof or give the Grantee any rights hereunder or in to the land subject to the right-of-way or to any improvements located thereon.

16. The Navajo Nation and the Secretary shall have the right, at any reasonable time during the term of the right-of-way, to enter upon the premises, or any part thereof, to inspect the same and any improvements located thereon.
17. By acceptance of the grant of right-of-way, the Grantee consents to the full territorial legislative, executive and judicial jurisdiction of the Navajo Nation, including but not limited to the jurisdiction to levy fines and to enter judgments for compensatory and punitive damages and injunctive relief, in connection with all activities conducted by the Grantee within the Navajo Nation or which have a proximate (legal) effect on persons or property within the Navajo Nation.
18. By acceptance of the grant of right-of-way, the Grantee covenants and agrees never to contest or challenge the legislative, executive or judicial jurisdiction of the Navajo Nation on the basis that such jurisdiction is inconsistent with the status of the Navajo Nation as an Indian nation, or that the Navajo Nation government is not a government of general jurisdiction, or that the Navajo Nation government does not possess full police power (i.e., the power to legislate and regulate for the general health and welfare) over all lands, persons and activities within its territorial boundaries, or on any other basis not generally applicable to a similar challenge to the jurisdiction of a state government. Nothing contained in this provision shall be construed to negate or impair federal responsibilities with respect to the land subject to the right-of-way or to the Navajo Nation.
19. Any action or proceeding brought by the Grantee against the Navajo Nation in connection with or arising out of the terms and conditions of the right-of-way shall be brought only in the Courts of the Navajo Nation, and no such action or proceeding shall be brought by the Grantee against the Navajo Nation in any court of any state.
20. Nothing contained herein shall be interpreted as constituting a waiver, express or implied, of the sovereign immunity of the Navajo Nation.
21. Except as prohibited by applicable federal law, the law of the Navajo Nation shall govern the construction, performance and enforcement of the terms and conditions contained herein.
22. The terms and conditions contained herein shall extend to and be binding upon the successors, heirs, assigns, executors, administrators, employees and agents, including all contractors and subcontractors, of the Grantee, and the term "Grantee," whenever used herein, shall be deemed to include all such successors, heirs, assigns, executors, administrators, employees and agents.
23. There is expressly reserved to the Navajo Nation full territorial legislative, executive and judicial jurisdiction over the right-of-way and all lands burdened by the right-of-way, including without limitation over all persons, including the public, and all activities conducted or otherwise occurring within the right-of-way; and the right-of-way and all lands burdened by the right-of-way shall be and forever remain Navajo Indian Country for purposes of Navajo Nation jurisdiction.
24. The applicant will record all water zones encountered during the drilling by depth, case and property seal to prevent any cross contamination of aquifers or loss of water on the surface due to artesian flow.
25. The applicant will provide all such information to the Navajo Nation Department of Water Resources.

- Doc # 003678

Rosita/Shirlene
Please Re-
type for a
clear copy.
Thx. ic

EXHIBIT "D"

NAVAJO NATION TERMS AND CONDITIONS
For Right-of-Way (ROW)

Navajo Nation Division of Water (GRANTEE)
Resumes

twenty 20

251,253.00

1. The term of the right-of-way shall be for twenty 20 years, beginning on the date the right-of-way (ROW) is granted by the Secretary of Interior.
2. Consideration for the right-of-way is assessed at \$ 251,253.00. The Navajo Nation contributes this amount to the project because the project will benefit Navajo residents. to provide water to Navajo communities for irrigation.
- ~~Consideration for the grant of the right-of-way is hereby waived.~~
~~☐ NO ☐ YES~~

~~Consideration for the right-of-way is assessed at \$. The Navajo Nation contributes this amount to the project because the project will benefit Navajo residents.~~

a water pipeline and appurtenant facilities

3. The Grantee may develop, use and occupy the right-of-way for the purpose(s) of . The Grantee may not develop, use or occupy the right-of-way for any other purpose without the prior written approval of the Navajo Nation and the Secretary of the Interior. The approval of the Navajo Nation may be granted, granted upon conditions or withheld in the sole discretion of the Navajo Nation. The Grantee may not develop, use or occupy the right-of-way for any unlawful purpose.
4. In all activities conducted by the Grantee within the Navajo Nation, the Grantee shall abide by all laws and regulations of the Navajo Nation and of the United States, now in force and effect or as hereafter may come into force and effect, including but not limited to the following:
- a. Title 25, Code of Federal Regulations, Part 169;
 - b. All applicable federal and Navajo Nation antiquities laws and regulations, with the following additional condition: In the event of a discovery all operations in the immediate vicinity of the discovery must cease and the Navajo Nation Historic Preservation Department must be notified immediately. As used herein, "discovery" means any previously unidentified or incorrectly identified cultural resources, including but not limited to archaeological deposits, human remains, or location reportedly associated with Native American religious/traditional beliefs or practices;
 - c. The Navajo Preference in Employment Act, 15 N.N.C. §§ 601 et seq., and the Navajo Nation Business Preference Law, 5 N.N.C. §§ 201 et seq.; and
 - d. The Navajo Nation Water Code, 22 N.N.C. § 1101 et seq. Grantee shall apply for and submit all applicable permits and information to the Navajo Nation Water Resources Department, or its successor.
5. The Grantee shall ensure that the air quality of the Navajo Nation is not jeopardized due to violation of applicable laws and regulations by its operations pursuant to the right-of-way.

6. The Grantee shall clear and keep clear the lands within the right-of-way to the extent compatible with the purpose of the right-of-way, and shall dispose of all vegetation and other materials cut, uprooted or otherwise accumulated during any surface disturbance activities.
7. The Grantee shall reclaim all surface lands disturbed related to the right-of-way, as outlined in a restoration and revegetation plan, which shall be prepared with the assistance of the Navajo Nation Environmental Protection Agency (NNEPA), and shall be submitted to and must be approved by NNEPA prior to any surface disturbance. The Grantee shall comply with all provisions of such restoration and revegetation plan and shall notify the Director of the NNEPA immediately upon completion of the surface disturbance activities so that a site inspection can be made.
8. The Grantee shall at all times during the term of the right-of-way and at the Grantee's sole cost and expense, maintain the land subject to the right-of-way and all improvements located thereon and make all necessary and reasonable repairs.
9. The Grantee shall obtain prior written permission to cross existing rights-of-way, if any, from the appropriate parties.
10. The Grantee shall be responsible for and promptly pay all damages when they are sustained.
11. The Grantee shall indemnify and hold harmless the Navajo Nation and the Secretary of the Interior and their respective authorized agents, employees, landusers and occupants against any liability for loss of life, personal injury and property damages arising from the development, use or occupancy or use of right-of-way by the Grantee.
12. The Grantee shall not assign, convey, transfer or sublet in any manner whatsoever, the right-of-way or any interest therein, or in or to any of the improvements on the land subject to the right-of-way, without the prior written consent of the Navajo Nation and the Secretary of the Interior. Any such attempted assignment, conveyance or transfer without such prior written consent shall be void and of no effect. The consent of the Navajo Nation may be granted, granted upon conditions or withheld in the sole discretion of the Navajo Nation.
13. The Navajo Nation may terminate the right-of-way for violation of any of the terms and conditions stated herein. In addition, the right-of-way shall be terminable in whole or part by the Navajo Nation for any of the following causes:
 - a. Failure to comply with any terms and conditions of the grant or of applicable laws or regulations;
 - b. A non-use of the right-of-way for the purpose for which it is granted for a consecutive two year period; and
 - c. The use of the land subject to the right-of-way for any purpose inconsistent with the purpose for which the right-of-way is granted.
14. At the termination of this right-of-way, the Grantee shall peaceably and without legal process deliver up the possession of the premises, in good condition, usual wear and tear excepted. Upon the written request of the Navajo Nation, the Grantee shall provide the Navajo Nation, at the Grantee's sole cost and expense, with an environmental audit assessment of the premises at least sixty (60) days prior to deliver of said premises.
15. Holding over by the Grantee after the termination of the right-of-way shall not constitute a renewal or extension thereof or give the Grantee any rights hereunder or in or to the land subject to the right-of-way or to any improvements located thereon.

16. The Navajo Nation and the Secretary shall have the right, at any reasonable time during the term of the right-of-way, to enter upon the premises, or any part thereof, to inspect the same and any improvements located therein.
17. By acceptance of the grant of right-of-way, the Grantee consents to the full territorial legislative, executive and judicial jurisdiction of the Navajo Nation, including but not limited to the jurisdiction of the Navajo Nation, including but not limited to the jurisdiction to levy fines and to enter judgments for compensatory and punitive damages and injunctive relief, in connection with all activities conducted by the Grantee within the Navajo Nation or which have a proximate (legal) effect on persons or property within the Navajo Nation.
18. By acceptance of the grant of right-of-way, the Grantee covenants and agrees never to contest or challenge the legislative, executive or judicial jurisdiction of the Navajo Nation on the basis that such jurisdiction is inconsistent with the status of the Navajo Nation as an Indian nation, or that the Navajo Nation government is not a government of general jurisdiction, or that the Navajo Nation government does not possess full police power (i.e., the power to legislate and regulate for the general health and welfare) over all lands, persons and activities within its territorial boundaries, or on any other basis not generally applicable to a similar challenge to the jurisdiction of a state government. Nothing contained in this provision shall be construed to negate or impair federal responsibilities with respect to the land subject to the right-of-way or to the Navajo Nation.
19. Any action or proceeding brought by the Grantee against the Navajo Nation in connection with or arising out of the terms and conditions of the right-of-way shall be brought only in the Courts of the Navajo Nation, and no such action or proceeding shall be brought by the Grantee against the Navajo Nation in any court of any state.
20. Nothing contained herein shall be interpreted as constituting a waiver, express or implied, of the sovereign immunity of the Navajo Nation.
21. Except as prohibited by applicable federal law, the law of the Navajo Nation shall govern the construction, performance and enforcement of the terms and conditions contained herein.
22. The terms and conditions contained herein shall extend to and be binding upon the successors, heirs, assigns, executors, administrators, employees and agents, including all contractors and subcontractors, of the Grantee, and the term "Grantee," whenever used herein, shall be deemed to include all such successors, heirs, assigns, executors, administrators, employees and agents.
23. There is expressly reserved to the Navajo Nation full territorial legislative, executive and judicial jurisdiction over the right-of-way and all lands burdened by the right-of-way, including without limitation over all persons, including the public, and all activities conducted or otherwise occurring within the right-of-way; and the right-of-way and all lands burdened by the right-of-way shall be and forever remain Navajo Indian Country for purposes of Navajo Nation jurisdiction.



ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF EXECUTIVE DIRECTOR/ADMINISTRATION

OFFICE OF ENVIRONMENTAL REVIEW


PO BOX 339 WINDOW ROCK ARIZONA 86515 Office: 928/871-7188 Fax: 928/871-7996

Website: www.navajonationnepa.org

M E M O R A N D U M

TO: Howard Draper, Program & Project Specialist
Project Review Office
Navajo Land Department
Division of Natural Resources

FROM:


Rita Whitehorse-Larsen, Senior Environmental Specialist
Office of Executive Director/Administration
Office of Environmental Review
NNEPA

DATE: April 16, 2015

SUBJECT: 164 EOR 003678 Right of Way Gadii'Ahi' Phase IV Project

The Navajo Nation Department of Water Resources, PO Box 678, Fort Defiance, Arizona, 86504, submitted an application for right-of-way (ROW) for the Gadii'Ahi' Phase IV pipeline in Cudei, New Mexico. The ROW is approximately 20,044.56 feet in length, 35 feet wide and consists of 16.106 acres. The ROW is located at Sections 4-5, T30N, R18W; Sections 31-32, T31N, R18W and Sections 25 and 36, T31N, R19W, NMPM, San Juan County, New Mexico.

The Navajo Nation Environmental Protection Agency (NNEPA) reviewed¹ and recommends ***conditional approval*** for the proposed action.

1. Navajo Nation Clean Water Act:

- a. **Section 401/404** - Requirements for Clean Water Action Sections 401 and 404 shall apply if construction occurred within waterways displaying ordinary high water mark. Utility poles not installed within drainages precludes need for 404 and 401. The grading and road development for access by NAVAJO NATION DEPARTMENT

¹ Keller-Bliesner Engineering LLC. Gadii'ahi Farm Irrigation System Phase IV Final Environmental Assessment and FONSI for Navajo Nation Department of Water Resources. January 2015.

OF WATER RESOURCES to the project site and crossing through jurisdictional waters will require 404 and 401 permits recommended by Patrick Antonio, Principal Hydrologist, NNEPA Water Quality Program.

- b.* **Section 402** – Land surface disturbance in excess of 1.0 acre will require compliance with the federal General Construction Permit requirements for storm water discharges. The project will disturb 16.106 acres of surface land including guy easements. NAVAJO NATION DEPARTMENT OF WATER RESOURCES is subject to apply for NPDES with USEPA Region 09. You will find information at <http://www.epa.gov/region9/water/npdes/permits.html>. You can also contact NNEPA Water Quality staff at 928/871-7690 for more information.

2. Navajo Nation Safe Drinking Water Act:

- a.* Ensure there are no existing drinking waterlines and/or domestic waste waterlines located within the premises of the proposed site to avoid significant impacts to Gadii'Ahi' (Cudei) and surrounding communities' safe drinking water resources before trenching and/or digging.

3. Navajo Nation Air Pollution Prevention and Control Act:

- a.* Apply water to control dust to lessen air impacts to community members and public located in or near the proposed action.

4. Navajo Nation Pesticide Act:

- a.* NAVAJO NATION DEPARTMENT OF WATER RESOURCES is subject to monitor and prevent invasive and noxious weeds either by manual or chemical control.
- b.* Before applying any chemicals, contact the NNEPA Pesticide Program at 928/871-7815/7810/7892 to ensure the product is in compliance and appropriately applied by a certified and licensed applicator.
- c.* Pesticide staff will also may need to be onsite to monitor during pesticide/herbicide application.

5. Navajo Nation Solid Waste Act:

- a.* Solid waste generated from the construction and operation activities will be collected and transported by contractor to a designated trash bins to minimize significant impacts to human and wildlife resources.
- b.* If a sub-contractor will be hired to transport waste, ensure the contractors are certified and licensed with the Navajo Nation Business Regulatory Office.
- c.* The contractor must submit a copy of the landfill receipt/ticket to guarantee the construction waste has been properly disposed.
- d.* Do not allow public to take construction and operation waste. Cumulatively NNEPA receives complaints and reports on illegal trash dumpings on rural areas and in the waters of the US and Navajo Nation.
- e.* All illegal waste currently on the proposed site is the responsibility of the land user.

6. Navajo Nation Comprehensive Environmental Response, Compensation and Liability Act (NRCERCLA)

- a.* No hazardous waste will be generated, stored and transported for the proposed action.

7. Navajo Nation Storage Tank Act:



- a.* Amended and approved by the Navajo Nation Council, CJA-09-12, February 2012, the aboveground tanks are included to be regulated.
 - b.* No underground or aboveground greater than 100 gallons is expected to be at the proposed site.
- 8. ***Others:***
 - a.* Avoid unnecessary ground disturbance and removal of vegetation within and adjacent to the ROW corridors.

If there are any questions you may contact Rita Whitehorse-Larsen at 928/871-7188. Thank you.

Cc: Navajo Nation Department of Water Resources, PO Box 678, Fort Defiance, Arizona,
86504
NNEPA Water Quality; PWSSP; Air Quality, OPP; Pesticides; Radon; RCRP; Storage Tank
Program; Superfund; Administration chrono file
Contact Person: David Tallman, 928-206-6399 or Najam H. Tariq, 928-729-4040

San Juan River Dineh Water Users, Inc.
Gadii'ahi Cash Flow

Operators	\$15.00
Laborers	\$11.00
Superintendent	\$18.00

Item	Week				
	1	2	3	4	5
diesel	\$1,250.00	\$1,250.00	\$1,250.00	\$1,250.00	\$1,250.00
Operators	\$3,622.50	\$3,622.50	\$3,622.50	\$3,622.50	\$3,622.50
Laborers	\$6,198.50	\$6,198.50	\$6,198.50	\$6,198.50	\$6,198.50
Superintendent	\$1,449.00	\$1,449.00	\$1,449.00	\$1,449.00	\$1,449.00
Equipment Rental	\$2,500.00	\$2,500.00	\$2,500.00	\$2,500.00	\$2,500.00
Survey & Grade Control	\$4,120.00	\$3,120.00	\$3,120.00	\$3,120.00	\$3,120.00
Pay back to Gadii'ahi	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total	\$19,140.00	\$18,140.00	\$18,140.00	\$18,140.00	\$18,140.00
Cumulative cost	\$19,140.00	\$37,280.00	\$55,420.00	\$73,560.00	\$91,700.00
Credit			Gadii'ahi \$60,000.00		NRCS advance \$100,000.00
Beginning balance	\$40,000.00	\$20,860.00	\$2,720.00	\$44,580.00	\$26,440.00
End Balance	\$20,860.00	\$2,720.00	\$44,580.00	\$26,440.00	\$108,300.00

6	7	8	9	10
\$1,250.00	\$1,250.00	\$0.00	\$0.00	\$0.00
\$3,622.50	\$3,622.50	\$0.00	\$0.00	\$0.00
\$6,198.50	\$6,198.50	\$0.00	\$0.00	\$0.00
\$1,449.00	\$1,449.00	\$0.00	\$0.00	\$0.00
\$2,500.00	\$2,500.00	\$0.00	\$0.00	\$0.00
\$3,120.00	\$3,120.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$60,500.00
\$18,140.00	\$18,140.00	\$0.00	\$0.00	\$60,500.00
\$109,840.00	\$127,980.00	\$127,980.00	\$127,980.00	\$188,480.00
			NRCS final	\$200,000.00
\$108,300.00	\$90,160.00	\$72,020.00	\$72,020.00	\$72,020.00
\$90,160.00	\$72,020.00	\$72,020.00	\$72,020.00	\$211,520.00

IRRIGATION PROJECT DATA

Calendar Year 1960

[illegible]

- (1) List of Crops Irrigated
- (2) Area irrigated by Indians
- (3) Area irrigated by Schools and Agency
- (4) Area irrigated by Missions and Traders

Решение:

SECRET

Acres

Crop Value

●

10

CROP REPORT

IRRIGATION PROJECT DATA

Project Chesed Unit 12Calendar Year 1999

(1) Crops Irrigated	Unit	(2) By Indians		(3) Agency and Schools		(4) Missions and Traders		TOTAL		Aver. Acre		Average Market Value per Unit Acre		Total Market Value
		Acres	Yield	Acres	Yield	Acres	Yield	Acres	Yield	Acre	Yield	Unit	Acre	
Alfalfa	Tons	192	601					192	601	5.6	12.00		43.20	\$292.00
Beans	Lbs.	5	878					5	878	178	.06		8.78	45.78
Corn, Indian	Bu.	224	4640					224	4640	81	1.00		21.00	4640.00
Corn Fodder	Tons	206	2847					206	2847	1.1	2.50		2.75	736.25
Corn, Imp.	Bu.	44	1090					44	1090	25	1.00		25.00	1090.00
Garden	Tons	5	5					5	5	1	40.00		40.00	200.00
Melons	Tons	28	28					28	28	1	40.00		40.00	1120.00
Potatoes	Bu.	1	15					1	15	15	1.00		15.00	15.00
Squash	Tons	157	137					157	137	1	40.00		40.00	540.00
Wheat	Bu.	62	1038					62	1038	17	1.00		17.00	1038.00
Alfalfa Seed	Lbs.	7	26					7	26	80	.30		18.00	7.80
Irrigable but Not Cropped		10						10						
Total Irri- gated		641						641						
Area Double Cropped		272						272						
Net area Irrigated		669						669						

Acres 669 Crop Value 17,942.80

- (1) List of Crops irrigated
 (2) Area irrigated by Indians
 (3) Area irrigated by Schools and Agency
 (4) Area irrigated by Missions and Traders

Remarks:

250 people on projects.

IRRIGATION PROJECT DATA

Calendar Year 1937

CROP REPORT

Project Cudal, New Mexico

Unit

Crops Irrigated (1)	Unit	By Indians (2)		By Lessees (3)		Other Land (4)		TOTAL		Aver. Acre Yield	Average Market Value per Acre		Total Market Value
		Acres	Yield	Acres	Yield	Acres	Yield	Acres	Yield		Unit	Acres	
Beans	Lbs.	1.75	1000					1.75	1000	571.3	.05	28.56	50.00
Corn	"	253.3	158672					253.3	158672	611.2	.0151	9.23	2398.97
Wheat	"	12.3	9840					12.3	9840	800	.015	12.00	147.60
Alfalfa	Tons	94.4	235					94.4	235	2.48	20.00	49.60	4700.00
Relons	"	13.65	46.15					13.65	46.15	3.38	20.00	67.60	923.00
Trig. Not cropped													
Total irrigated													
Area double cropped													
Net area irrigated		580.4											

Acres

Crop Value

580.4

\$ 8,219.57

- (1) See F.O. -3 for crop list to be reported.
- (2) Include Indian owned Fee Patented Land.
- (3) Include area irrigated by School and Agency.
- (4) Include area irrigated by Missions and Traders.

Remarks:

CROP REPORT

Project INDIAN PROJECT AREA

Unit

Irrigation

Calendar Year 193

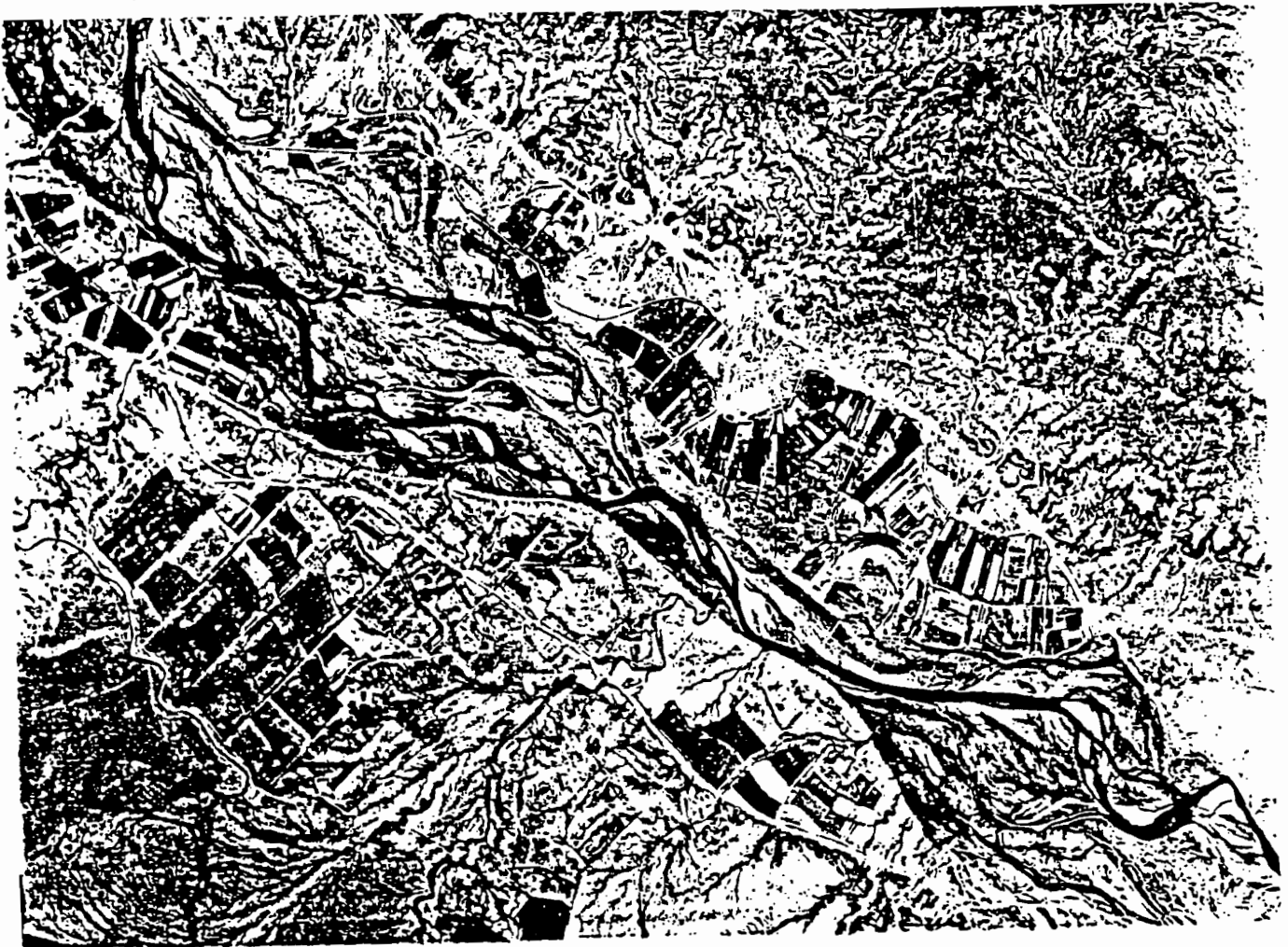
1 Crop Irrigated	Unit	(2)		(3)		(4)		TOTAL		Aver. Acre Yield	Average Market Value per		Total Market Value
		By Indians Acres	Yield	By Settlers Acres	Yield	Other Land Acres	Yield	Acres	Yield		Unit	Acre	
Wheat	bu	30	60,000					30 ✓	60,000	60,000	bu	60.00	\$600,000
Barley	bu	5	7,000					5 ✓	7,000	7,000	bu	20.00	\$100,000
Corn	bu	250	250,000					250 ✓	250,000	1,344	bu	20.28	\$435,000
Alfalfa	tons	70	280,000					70 ✓	280,000	6,000	tons	50.00	\$300,000
Irrig. Not Cropped													
Total Irrigated		30											
Area Double Cropped		70											
Net Area Irrigated		100											\$835,000

Acres

Crop Value

- (1) See F. O. -3 for crop list to be reported.
- (2) Include Indian owned Fee Patented Land.
- (3) Include area irrigated by School and Agency
- (4) Include area irrigated by Missions and Traders

REMARKS:



PROJECT EVALUATION POINTS

Project Name	Cudai
SWCD	Shiprock
System Type	5
Year Developed	1
Acres	8.25
Crops	2
Growing Season	2
Water Source	20
Distribution System	3
Soils	8.4
Topography	9
RESOURCE pts.	58.65
RESOURCE %	65
Probable Reasons for Abandonment	15.25
Reservation	0
People Benefited	11
SPONSORSHIP pts.	07.25
SPONSORSHIP %	62
Approximate Rehabilitation Cost \$	0
Cost/Acre \$	10
COST pts.	10
COST %	20
TOTAL PTS.	105.9
TOTAL %	62.95

Final

Gadii'ahi Phase IV Pipeline Design Report

Gadii'ahi Farm Irrigation System

Prepared for

Navajo Nation Department of Water Resources

Ft. Defiance, AZ

March 26, 2012



Keller-Bliesner Engineering, LLC

78 East Center
Logan, Utah 84321
(435) 753-5651

INTRODUCTION

Gadii'ahi Chapter entered into an EQIP contract with the United States Natural Resources Conservation Service (NRCS) to extend Gadii'ahi Pipeline 7,373 ft. Since the required engineering for the project could not be completed on a timely basis by NRCS due to other commitments, the Navajo Nation Department of Water Resources (NNDWR) contracted Keller-Bliesner Engineering, LLC, to complete the design as a contribution to the project. This report transmits design data.

Gadii'ahi Farm Irrigation System

Gadii'ahi Chapter, formerly known as Cudei, is a chapter of the Navajo Nation and a farm community with a total population of approximately 1,000 people located on the south bank of the San Juan River four miles west of Shiprock, NM. Gadii'ahi Chapter has a total of 668 acres of permitted irrigated land and 49 farmers listed as Land Use Permit holders.

Farmers from Gadii'ahi Chapter constructed Gadii'ahi Canal early in the 20th century. The original ditch was hand dug by chapter members using manual labor and draft animals. Later, the Bureau of Indian Affairs (BIA) followed by NNDWR improved the ditch and became responsible for the operation and maintenance of Gadii'ahi Canal. In 2003, the San Juan River Dineh Water Users, Inc. (SJRDWU) began to assist NNDWR in operating the canal.

Gadii'ahi Canal originally diverted water from the San Juan River via a rock diversion dam with a sluiceway structure and extended approximately 5.5 miles from the diversion structure to the end of the farmland. Sedimentation of the intake channel at the diversion structure and displacement of rocks in the dam during high flow events reduced the efficiency of the structure during low flow periods of the San Juan River. In 2000, the San Juan River Basin Recovery Implementation Program (SJ RIP) determined that the diversion structure was an impediment to endangered fish migration. In 2001, BIA replaced the diversion with an inverted siphon under the San Juan River connecting Gadii'ahi Canal to Hogback Canal as a contribution to SJ RIP and designed to aid in the recovery of endangered fish.

Gadii'ahi siphon consisted of a head gate on Hogback Canal, 7,341 ft of 21-inch PVC pipe, and an outlet structure to Gadii'ahi Canal. The siphon crosses under the San Juan River near the head of Gadii'ahi Canal. In 2003, Gadii'ahi Chapter commissioned a master plan that utilizes the siphon to develop a pressurized irrigation system for the chapter.

In 2006, SJRDWU using funding obtained by both Gadii'ahi Chapter and SJRDWU, pressurized the siphon by installing a valve on the end of the pipeline. SJRDWU also installed a filter station at the old end of the siphon and extended the pipeline 3,656 ft (Phase I). In 2008, SJRDWU extended the pipeline another 2,496 ft (Phase II). In 2012, Gadii'ahi Chapter under the EQIP program is assigning SJRDWU to extend the pipeline another 4,025 ft (Phase III). In 2011, Gadii'ahi Chapter entered into an EQIP contract with NRCS to extend the pipeline another 7,373 ft as Phase IV.

PHASE IV PERMITTING

The master plan recommended a linear route for the main pipeline that traversed across the farmland serving farmers on both sides of the route. This route required that Gadii'ahi Chapter obtain a legal easement which has proven difficult because the numerous steps required by both the Navajo Nation and BIA and because of non-cooperation by some impacted farmers. In 2009, Gadii'ahi Chapter decided to keep the pipeline within the right-of-way of the existing Gadii'ahi Canal. The San Juan River Farm Board, a division of Navajo Nation government and overseer of the irrigation systems, has defined the legal right-of-way of all irrigation ditches to be 25 ft each side of the center line of the ditch. Hence, if the new pipeline is located within that specified corridor, the conversion of an earthen ditch into an underground pipeline may be viewed as a maintenance item within an existing prescribed easement.

NNDWR is the owner of all irrigation ditches and collaborates with the San Juan River Farm Board to manage the ditches. Consequently, both NNDWR and the San Juan River Farm Board have to approve of any modifications to existing irrigation infrastructure. NNDWR will evaluate Phase IV for technical compliance. The San Juan River Farm Board will evaluate Phase IV for legal compliance. SJRDWU completes work on the irrigation system under the authorization of NNDWR and as funded by the San Juan River Farm Board. In the case of Phase IV, Gadii'ahi Chapter has selected SJRDWU to serve as the financial agent and installation contractor.

In 2010, Gadii'ahi Chapter, has completed an archeological survey of the entire canal and a biological assessment of converting the canal into an earthen ditch. The archeological survey is located in Appendix A and the Biological Resources Compliance Form issued by the Navajo Nation Department of Fish and Wildlife is located in Appendix B. Navajo Nation Department of Fish and Wildlife recommends that Phase IV construction be completed by April 15th to avoid impacting migratory birds.

DESIGN PARAMETERS

The master plan provides design parameters for Phase IV. However, some of these parameters required editing because of the route change, of updated permit records, and of the requirement to comply with NRCS standards.

Design Acreage - The design acreage for Gadii'ahi Chapter served by the entire siphon pipeline is 668 acres currently permitted and 133 acres of future development located on the west mesa. The total design acreage is 801.

Maximum Conveyance Capacity – The maximum conveyance capacity of the current siphon is 15 cfs or 6,732 gpm. This capacity is based on a 5 ft/sec velocity limit for pressurized PVC pipe. This provides a design capacity of about 8.4 gpm per acre.

Irrigation Type – Surveys received from Gadii'ahi farmers, 60 percent of the farmers will pursue sprinkler irrigation while 40 percent of the farmers will pursue surface irrigation practices during the preparation of the master plan.

Design Crop Mix – Figure 1 shows the crop mix used for designing the Gadii’ahi Farm Irrigation System. The crop mix was based on a survey given to Gadii’ahi farmers.

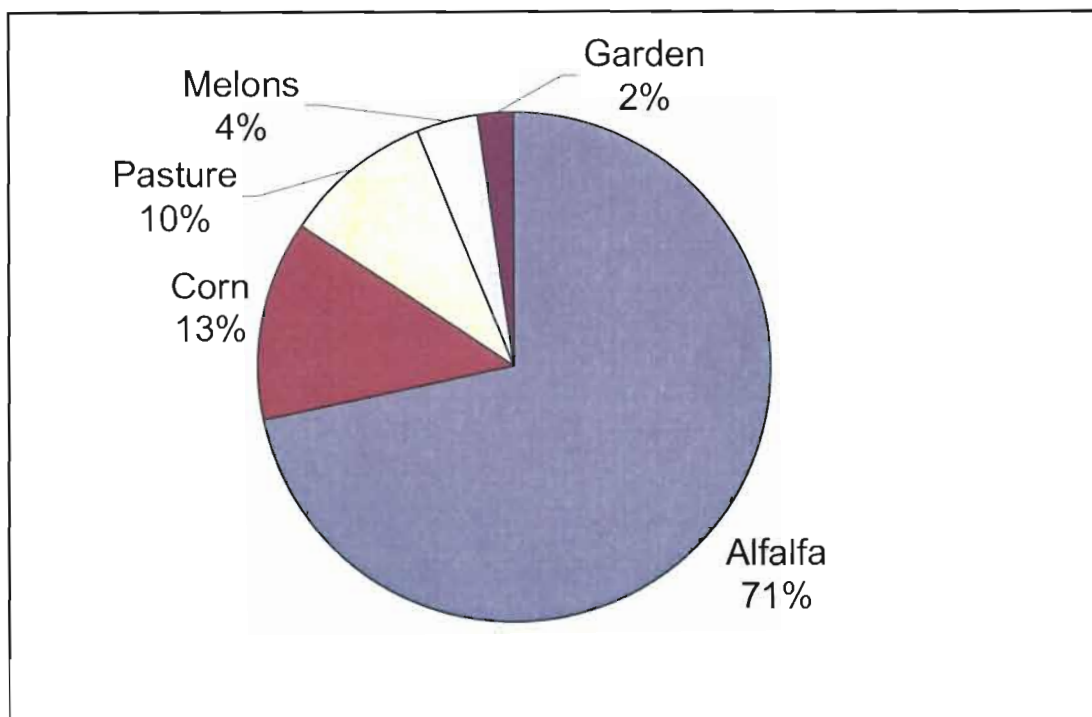


Figure 1. Design Crop Mix

Soil Water Storage Capacity – The soil water storage capacity (AW) and subsequent maximum allowable soil water depletion (AD) were calculated using the methods and values described in Allen, et. al. (1999). For the Gadii’ahi area, AW for moderately-fine textured sandy clay loam soils of 2.2 in/ft was assumed and the weighted average managed allowable depletion (MAD) for the design crop mix was determined to be 50%. Using these parameters, the AD was calculated as 4.4 in for a 4 ft effective crop root depth. Maximum interval between irrigations is 13.25 days.

Design Flow – The design flow for the Gadii’ahi Farm Irrigation System is 53 acres/cfs. This was calculated using a crop mix obtained from a survey of chapter farmers. Peak ET was estimated using data from NAPI, the Navajo owned farm. Application efficiencies assume that fields will be improved and that 65 percent of the farmers would use sprinkler irrigation with the remaining farmers using improved surface irrigation (irrigation practices also obtained from surveys). The Table 1 summarizes the peak demand estimate used in the design flow calculation.

Table 1. Summary of data used to determine the peak demand .

<i>Design Crop Mix</i>	Survey acres	Percent	Est. Annual Demand (in/acre)	Weighted Average	Est. Peak ET (in/acre)	Weighted Peak ET (in/acre)	Peak Application Efficiency	Peak Demand (in/acre)
Alfalfa	202	71.6%	42	30.09	0.34	0.24	74%	0.33
Corn	36	12.8%	30	3.83	0.33	0.04	74%	0.06
Pasture	27	9.6%	30	2.87	0.30	0.03	74%	0.04
Melons	11	3.9%	28	1.09	0.29	0.01	74%	0.02
Garden	6	2.1%	28	0.60	0.30	0.01	74%	0.01
Total	282			38.48		0.33		0.45

A 74 percent peak application efficiency is estimated for improved irrigation and is calculated by estimating 75 percent efficiency for sprinkler irrigation and 73 percent efficiency for surface irrigation (during peak periods). A design flow of 53 acres/cfs is required to meet peak demand.

System Operation – The pressurized irrigation system is designed as a limited rate on-demand system. This will require farmers to improve on-farm irrigation practices in order to operate the system as an on-demand system. If current irrigation practices remain, then the pipeline will have to be shared. The system has adequate flexibility to allow for sharing and temporary extra capacity until acreage is expanded on the west mesa. Both Phase III and Phase IV specify 12-inch tees to allow for future larger flows should a shared system be implemented.

Design Pressure – The master plan specifies a minimum delivery pressure of 40 psi at each turnout in order to accommodate sprinkler irrigation assuming an on-demand system.

Phase IV Acreage – Phase IV of the Gadii’ahi Farm Irrigation System will serve a total of 351 acres from 15 turnouts. Individual acreage by turnout is listed in Table 2. Included in Table 2 are turnout locations, outlet pipe diameter, acreage served, and design flows.

Table 2. Phase IV Acreage and Design Flow.

Turnout	Station	Valve Size (in)	Acres	Flow (cfs)
1	107+71	4	8.94	0.17
2	109+00	4	11.97	0.23
3	111+95	6	20.95	0.40
4	115+79	6	19.82	0.37
5	117+21	8	66.38	1.25
6	127+04	6	13.09	0.25

Turnout	Station	Valve Size (in)	Acres	Flow (cfs)
7	137+82	6	13.09	0.25
8	144+80	6	18.72	0.35
9	149+76	6	31.49	0.59
10	154+00	6	16.45	0.31
11*	159+44	8	32.91	0.62
12*	163+45	6	32.91	0.62
13	168+25	8	42.59	0.80
14	171+50	6	12.80	0.24
15	174+50	6	8.92	0.17
Total			351.03	6.62

*Turnout serves half of acreage of permit

DESIGN DRAWINGS

Design drawings for Phase IV are located in Appendix C. Drawing L400 shows the project location and provides an index for all Phase IV drawings. Drawing L420 shows the general layout of Phase IV. Drawings P430, P431 and P432 are plan and profile drawings for the pipeline. Drawings D450 and D451 shows details for the turnouts and other fittings. Drawing D452 details the earthwork and trenching for the pipeline. Drawing D440 details the earthwork and fittings for the outlet structure and the transition back to the existing canal.

MATERIALS

All material shall be new and of good quality. As a minimum, all material used for Phase IV shall meet or exceed NRCS standards. The transition structure was first installed at the end of Phase I. It was then moved and installed at the end of Phase II and later Phase III. It is the intent of this design to move the transition structure from end of Phase III to the end of Phase IV. To do this, careful excavation and demolition is required followed by close inspection. If the fittings and valves are found to be satisfactory, then they will be re-used. If deficiencies are detected, repair or replacement will be recommended. Material specifications are found in Appendix D.

Pipe. All PVC pipe shall be CL 125 PIP PVC that meets or exceeds NRCS specifications. The main pipeline for Phase IV shall have diameters of 24, 21 and 18 inches.

Fittings. All fittings shall be galvanized pre-fabricated steel fittings made by Clemmons or approved equal. The steel shall be 10 gauge. PVC to steel transitions shall be completed by compression rings that are welded onto the steel fitting.

Isolation Valves. Each turnout is isolated with a wafer style butterfly valve with a buried service operator. The wafer style butterfly valve is designed to be housed between two ½-inch 150 psi flanges. A 6-inch PVC access tube will be installed so that the valve can be turned on by a key. A key shall be fabricated and furnished for each turnout.

Riser Valves. Each turnout shall have a 4-inch galvanized steel riser topped with a stub valve as manufactured by Gheen Irrigation or approved equal. Each turnout will be furnished with a 4-inch valve turner for use by farmers.

Pressure Regulating Valve. Each turnout shall have a 4-inch cast iron globe valve with an operating wheel. The valve is designed so that a farmer can manually set the necessary flow while dissipating energy for surface irrigation fields.

Air vents. Mainline air vents shall be 4-inch diameter continuous acting air vents (CR101 manufactured by Waterman or approved equal). Turnout air vents shall be 2-inch diameter AV150 manufactured by Waterman or approved equal. All air vents shall be installed on a galvanized steel nipple.

INSPECTION PLAN

Design drawings and specifications shall be stamped by Mike Isaacson, Vice President of Keller-Bliesner Engineering, LLC. Approvals are required by Gadii'ahi Chapter, NNDWR, and NRCS. Final design that includes any appropriate edits shall be issued once each approving entity has responded. Included in the final design are drawings, specifications, and a material bid. Construction drawings will be issued prior to construction. Keller-Bliesner Engineering, LLC will stake out the Phase IV route and provide benchmarks once the existing canal has been cleaned and backfilled.

As a requirement of an engineering stamp, Keller-Bliesner Engineering, LLC shall provide daily inspection of the installation of the work. At the completion of the project, an inspection report shall be prepared and distributed detailing daily inspections. Keller-Bliesner Engineering, LLC will correlate inspection activities with all Gadii'ahi Chapter, NNDWR, and NRCS as required.

Inspection activities shall focus on grade, pipe installation, compaction, thrust blocks, and fitting installation. Daily surveys shall be made to verify grade. An in-place compaction test shall be conducted the first day of installation to assist the contractor to develop procedures that produce a finished product that meets specifications. Forms for the thrust blocks will require engineer approval prior to pouring to ensure bearing area, configuration and the proper coating of steel fittings. Installation specifications may be found in Appendix E.

REFERENCES

- Keller-Bliesner Engineering, LLC. 2005. Gadii'ahi Farm Irrigation System – Master Plan. Gadii'ahi Chapter.
- Keller-Bliesner Engineering, LLC. 2000. Final Draft – Environmental Assessment-Hogback Diversion Dam and Cudei Diversion Dam. United States Bureau of Indian Affairs – Navajo Indian Irrigation Project.
- Dodge Environmental, LLC. 2010. Biological Evaluation for the Proposed Gadii'ahi Chapter Irrigation Pipeline System Improvement Projects. Navajo Nation Heritage Program.
- Allen, Richard G., Keller, Jack, and Martin, Derrel. 1999. Center Pivot System Design, 2nd Edition. Irrigation Association. Fairfax, Virginia.
- USDA. (1993). "Salinity Verification: Phase 1 Final Report for Navajo Nation Unit, San Juan County, New Mexico Salinity Control Study." United States Department of Agriculture. Soil Conservation Service. Phoenix, AZ.

APPENDIX A

Phase IV Archaeological Report



**THE
NAVAJO
NATION
ARCHAEOLOGY DEPARTMENT**

COPY

% DINÉ COLLEGE, P.O. BOX 580, SHIPROCK, NEW MEXICO 87420

TELEPHONE: 505-368-1214, FAX: 505-368-1215

July 30, 2009

Gilbert Badoni, Chapter Coordinator
Gad'iahi Chapter
P.O. Box 1318
Shiprock, NM 87420

Dear Mr. Badoni:

Enclosed is a copy of the Navajo Nation Archaeology Department's survey report NNAD 09-206. The report details the results of the cultural resource inventory of the proposed Gad'iahi Chapter's existing irrigation canal project in Cudei, New Mexico.

During the inventory 1 new archaeological site, 1 isolated occurrence (IO), and 16 in-use areas (IUAs) were identified. One of the 16 IUAs (IUA A) and site NM-H-15-21 are considered to be Register-eligible properties. Both of these cultural resources are located within the project area. The archaeological site can be avoided if construction activities are restricted to the right-of-way. IUA A is the existing canal which is the focus of the project discussed herein, however, construction activities should not affect the significance of the Gad'iahi Canal. Further, although some IUAs may merit consideration under AIRFA, the IUAs belong to the farmers who have requested the services and the farmers are the recipients of the proposed undertaking. Archaeological approval has been recommended for the proposed construction of the piped canal system.

This report has been submitted to Navajo Nation Historic Preservation Department (NNHPD) in Window Rock, Arizona for review on behalf of the Bureau of Indian Affairs (BIA). Once a determination of archaeological approval has been made on the proposed undertaking, you will be notified by the NNHPD. Please note that receipt of this report does not constitute approval. If you have any questions regarding the report, please call Elaine Cleveland-Mason or me at (505) 368-1214.

Sincerely,


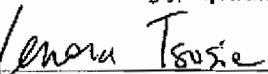
Lenora Tsosie,
Archaeologist

Enclosure



"Yesterday, Today, Tomorrow: Learning from our past to build our future"

ARCHAEOLOGICAL INVENTORY REPORT DOCUMENTATION PAGE (HPD JAN/91)

1. HPD REPORT NO.	2. (FOR HPD USE ONLY)	3. RECIPIENTS ACCESSION NO.
4. TITLE OF REPORT: A Cultural Resource Inventory of the Proposed Gad'iiahi Canal Irrigation System Modification in Gad'iiahi, San Juan County, New Mexico AUTHOR(S): Lenora Tsosie and Aloda Myerson		5. FIELDWORK DATES May 19, 22, & 26, and June 6 through 15, 2009
7. CONSULTANT NAME AND ADDRESS: Gen'l Charge: Robert M. Begay, Department Manager Org. Name: Navajo Nation Archaeology Department Org. Address: P. O. Box 689 Window Rock, Arizona 86515 Phone: (928) 871-6540		6. REPORT DATE July 30, 2009
10. SPONSOR NAME AND ADDRESS: Ind. Responsible: Gilbert Badoni, Chapter Coordinator Org. Name: Gad'iiahi/Tókéí Chapter Org. Address: P.O. Box 1318 Shiprock, New Mexico 87420 Phone: (505) 368-1070		8. Permit No. NTC
		9. Consultant Report No. NNAD 09-206
		11. SPONSOR PROJECT NO.
		12. AREA OF EFFECT: 17.47 acres (7.07 ha) AREA SURVEYED: 41.94 acres (16.98 ha)
13. LOCATION (MAP ATTACHED):		
a. Chapter: Gad'iiahi/Tókéí	e. Land Status: Navajo Trust Lands	
b. Agency: Shiprock	f. UTM Center: see Supplemental Sheet	
c. County: San Juan	g. Area: see Supplemental Sheet	
d. State: New Mexico	h. 7.5' Map Name(s): Rattlesnake, N.Mex. 1963	
14. REPORT /X/ OR SUMMARY (REPORT ATTACHED) //		
a. Description of Undertaking: see Supplemental Sheet		
b. Existing Data Review: see Supplemental Sheet		
c. Area Environmental & Cultural Setting: The project area is located in the Gad'iiahi Chapter along the San Juan River floodplain. The nearest major water source is the San Juan River located 2,000 feet (609.75 m) to the north. The elevations of the project area range from 4828 feet (1472 m) to 4796 feet (1462 m) above mean sea level. Soils in the general project area are composed of alluvial silt and clay. Vegetation observed in the project area includes tamarisk, Chinese elm, Russian olive, Navajo willow, rabbitbrush, four-wing saltbush, Russian thistle, shadscale, and various grasses. Development within the project area includes homesteads, agricultural fields, irrigation canals, utility services, maintenance roads, and Navajo Route 57.		
d. Field Methods: see Supplemental Sheet		
15. CULTURAL RESOURCE FINDINGS:		
a. Location/Identification of Each Resource: see Supplemental Sheet		
b. Evaluation of Significance of Each Resource (above): see Supplemental Sheet		
16. MANAGEMENT SUMMARY (RECOMMENDATIONS): : see Supplemental Sheet		
17. CERTIFICATION: SIGNATURE:  DATE: 7/30/09		
General Charge Name: Robert M. Begay, Department Manager		
SIGNATURE:  DATE: July 30, 2009		
Direct Charge Name: Lenora Tsosie, Archaeologist		

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13. LOCATION:

- f. UTM Center: see Table 1.
g. Area: see Table 1.

Table 1. Legal Descriptions and UTM Coordinates for the Project Area (Zone 12)

Project Area	Northing	Easting	¼ ¼ ¼	Sec.	Township	Range	Principal Meridian
Water Line							
Beginning of Line	4080287	699012	NW NW NE	5	30N	18W	NMPM
End of Line	4082351	696088	SW NE SE	25	31N	19W	"

14. REPORT:

- a. Description of Undertaking: Gad'iiahi Chapter is in the process of upgrading their open ditch irrigation system to an underground pipeline irrigation system. The upgrading process has been conducted in phases. Phase I of the irrigation upgrade has already been constructed and was inventoried for cultural resources in 2005 by the NNAD (Yazzie and Cleveland Mason 2005). Under this current upgrade (Phase III), the Gad'iiahi Chapter proposes to modify its existing irrigation canal with an underground piped irrigation system. Construction of the underground irrigation pipeline will entail blading and trenching with heavy equipment, installation of the pipeline, and backfilling the trench. Surface and subsurface disturbance will be extensive within the area of effect. The right-of-way for the pipeline is 50 feet (15.24 m) wide or 25 feet (7.62 m) on either side of the center line. The length of the underground irrigation system measures approximately 15,225 feet (4,641.76 m) long. The total area of affect for the proposed underground irrigation system is 17.47 acres (7.07 ha).

- b. Existing Data Review: A records check was conducted at the NNAD Shiprock office and the Navajo Nation Historic Preservation Department (NNHPD) office in Window Rock prior to the survey. The records check indicated that there have been 35 previous projects conducted within a 500-foot (152-m) radius of the project area. These projects include scattered homesites inventories with associated sewer lines and water lines, road inventories, and block surveys for agricultural farms. In addition, the first phase of the Gad'iiahi Chapter underground irrigation system was inventoried for cultural resources by Yazzie and Mason (2005) in a collaborative effort with Keller-Bliesner Engineering, LLC for the Gad'iiahi Chapter.

A check of Van Valkenburgh (1974) indicates that nearest recognized sacred place in the vicinity of the project area is Shiprock Pinnacle (*Tsé bit'a'i*—Winged Rock), located about 12 miles (19 km) to the south of the project area. Further, the San Juan River (*Sq' Bitoooh*—Old Age River) is considered a sacred river to the Navajo (Linford 2000). A pertinent overview for the project area can be found in Geib and Warburton (1991).

Geib, Phil R. and Miranda Warburton

1991 *A Class I Cultural Resources and Ethnographic Overview of the Glen Canyon-Shiprock Transmission Line Corridor*. NNAD Report 91-016. Navajo Nation Archaeology Department, Window Rock, Arizona.

Linford, Laurence D.

2000 *Navajo Places: History, Legend, Landscape*. The University of Utah Press, Salt Lake City, Utah.

Yazzie, Victoria, and Elaine Cleveland-Mason

2005 *A Cultural Resources Inventory of the Gad'iiahi Chapter Farm Irrigation Trunkline-Phase I for Keller-Bliesner Engineering in San Juan County, New Mexico*. NNAD Report 05-095. Navajo Nation Archaeology Department, Window Rock, Arizona.

Van Valkenburgh, Richard F.

1974 *Navajo Sacred Places*. In *Navajo Indians III*, edited by Clyde Kluckhohn, pp. 9-199. Garland Publishing, New York, New York.

- d. Field Methods: On May 19, 2009 project archaeologist, Julia Chavez met with Gad'iiahi Chapter Coordinator, Gilbert Badoni, and was shown the project area since the project areas was not staked. Instead, the project area was identified by the location of the existing irrigation ditch. The center of the existing irrigation ditch is considered the center line for the current project's right-of-way and center of the archaeological survey corridor. A 120-foot (36.59-m) wide survey corridor centered on the existing canal was inventoried under this project. The 120-foot-wide survey corridor consisted of a 50-foot (15-m) wide right-of-way with a 35-foot (10.67-m) wide buffer zone located on each side of the 50-foot right-of-way. The 120-foot-wide survey corridor was examined along the entire length of the 15,225-foot (4641.76-m) long proposed underground pipeline irrigation system.

14. REPORT:

d. Field Methods: —Continued

On May 22 and 26, 2009, Ms. Chavez, with Aleda Myerson and Matthew Pettigrew also with the NNAD conducted the archaeological inventory of the proposed irrigation pipeline system. The project area was inventoried by walking three parallel linear transects spaced about 6 m apart along both sides of the proposed irrigation canal. A total of 41.94 acres (16.98 ha) was examined during the Class III pedestrian survey of the proposed canal system. In addition, on June 15, 2009, Lenora Tsosie and Ms. Myerson conducted ethnographic interviews following the fieldwork as minimal local history was initially collected on the project area during the May 2009 fieldwork.

During the course of the survey, 1 archaeological site (NM-H-15-21), 1 isolated occurrence (IO), and 16 in-use areas (IUAs) were identified. The location of the site, the IO, and the IUAs were recorded using a hand-held Garmin GPS. Locational information was compiled to allow the archaeologists to establish the location of the cultural resources relative to the project area.

The archaeological site was mapped using a hand-held GPS unit. The data from the GPS was transferred onto a GIS software program once in-house. This data was utilized to produce the site map and project area map. Notes sufficient to complete a Navajo Nation Site Survey and Management form were also collected during the recordation of the site.

In accordance with NNAD policies concerning the right to privacy of individuals, currently occupied residences and other in-use features or areas were not fully documented during this project. Attempts were made to obtain information sufficient to allow for the evaluation of these resources under the pertinent legislation. Most of the interviews with the homesite clients and local residents were conducted in the Navajo and English languages by Mrs. Tsosie. The purpose of these interviews was to obtain information on potential traditional cultural properties (TCPs—herb gathering places, blessed and/or sacred places), burials, and archaeological sites in the area.

15. CULTURAL RESOURCE FINDINGS:

- a. Location/Identification of Each Resource: Sixteen IUAs, 1 IO, and 1 archaeological site were identified during the archaeological inventory. The IUAs consist of either existing homesites with associated houses and/or hogans, and/or farm equipment with associated features. One of the IUAs was the existing Gad'iiahi irrigation canal system (IUA A). Table 2 provides a list and description of the 16 IUAs.

Table 2. In-Use Areas (IUA) Encountered During the Inventory

IUA Designation	Summary Description	Home Owner
IUA A	Existing Gad'iiahi irrigation ditch	N/A
IUA B	1 house with features	Norman and Lorena Walters
IUA C	1 house and features	Stella Badoni
IUA D	1 house with features	Larry and Evelyn Jim
IUA E	Miscellaneous personal items	Roy Jones
IUA F	1 house with features	Edith Deléon
IUA G	2 mobile homes with features	Helena Kelleywood
IUA H	1 house with features	Steven John
IUA I	1 hogan	Mary Lou Tso
IUA J	Farm equipment	Andrew and Marlene Brady
IUA K	1 house with features	Tony Cudei
IUA L	Farm equipment and features	Ray Yabeny
IUA M	1 house, 1 hogan, and features	Carletta Lee
IUA N	1 house and features	Lorraine Jack
IUA O	2 houses and features	Sharon Bekis
IUA P	1 house with features	Annie Coleman

Although the existing Gad'iiahi irrigation canal system (IUA A) is being modified under this current project to adhere to the present southwest's soil and water conservation initiatives (proposed under Phase III of the Gad'iiahi upgrade irrigation canal system), the canal is also dealt with as a resource under this project since local history indicates that the Gad'iiahi canal system has been in existence since 1880 shortly after the Navajos return from Fort Sumner (Bailey and Bailey 1982). Therefore, this resource is considered an integral part of Navajo history.

15. CULTURAL RESOURCE FINDINGS:

a. Location/Identification of Each Resource: —Continued

One archaeological site, NM-H-15-21 was identified during the archaeological inventory of the Gad'iahi canal. NM-H-15-21 is identified as a specialized activity area dating between the Pueblo II and Pueblo III (A.D. 900-1300) temporal periods. Site NM-H-15-21 is located south of the project area and is situated on the southern terrace above the Gad'iahi canal system. The site area overlooks the farmlands and the San Juan River valley to the north. The site is located outside the right-of-way, but within the survey corridor (buffer zone). The UTM coordinates for the center point of the site are: Zone 12, 4080524 Northing, 698381 Easting.

One isolated occurrence (IO 09-209-1) was identified within the project area. The IO consists of a burned corral belonging to Helen Harrison and family. Ethnographic information obtained from Angela Deal, the daughter of Helen Harrison indicated that the late John Harrison built the corral out of shaped logs in 1978 for his horses which he used to conduct his farm work. Later when cattle were acquired, the pen was used for cattle roundups. The corral was eventually destroyed by fire by some local people who began hanging out at the corral while consuming alcohol. According to the informant, an open bonfire got out of control one night and burned the corral down. Another source implied that the burn was from a lightning strike. Additionally the informant, Angela Deal, assured the archaeologists that the cause of fire was from human recklessness and it did not occur from a lightning strike, therefore, it was not considered a TCP. The UTM coordinates for the IO are: Zone 12, 4080499 Northing, 698153 Easting. Further, no TCPs were identified during the survey or during the ethnographic interviews.

- b. Evaluation of Significance of Each Resource: Site NM-H-15-21 retains integrity of location and setting. It is probably not eligible for nomination to the National Register under criteria a, b, or c. It is eligible for nomination under criterion d on the basis of its research potential, and it does meet the 50-year eligibility guideline. Thus, NM-H-15-21 is considered a potentially Register-eligible property. The site is of archaeological interest and meets the 100-year age requirement for classification as an archaeological resource under ARPA. Thus, the site does merit protection under ARPA. The site does not appear to exhibit the qualities or characteristics that would make it eligible for protection under AIRFA.

The IO lacks integrity and recordation of the IO appears to have exhausted its research potential; therefore, the IO does not appear to be eligible for inclusion on the National Register of Historic Places under criteria a, b, c, and d. The IO does meet the 50-year eligibility guideline. The IO is no longer of archaeological interest but it does appear to meet the 100-year age requirement necessary for classification as an archaeological resource under ARPA. The IO does not appear to merit protection under ARPA. The IO lacks qualities that merit consideration under AIRFA.

IUA A appears to possess integrity of location, setting, materials, association, design, and workmanship. IUAs B through P appear to possess integrity of location, setting, and association. The IUAs are not eligible for nomination to the National Register under criteria a, b, or c; however, they may be eligible under criterion d as they could contribute information on local history. IUAs C, F, I, and P do meet the 50-year eligibility guideline; however, they are not Register-eligible properties. IUA A does meet the 50-year eligibility guideline and it does appear to be a Register-eligible property. IUAs B, D, E, G, H, J, K, L, M, N, and O do not meet the 50-year eligibility guideline, and therefore they do not appear to be Register-eligible properties. All IUAs with the exception of IUA A are not of archaeological interest. IUA A does meet the 100-year age requirement necessary for classification as an archaeological resource under ARPA. The remaining IUAs (B through P) do not meet the 100-year age requirement necessary for classification as an archaeological resource. Thus, IUA A does merit protection under ARPA. The remaining IUAs do not merit protection under ARPA. Finally, only IUA F, H, and M merit protection under AIRFA.

16. MANAGEMENT SUMMARY (RECOMMENDATIONS): Site NM-H-15-21, appears to be a Register-eligible property. Thus, it is recommended that a determination of no historic properties affected be made for the proposed undertaking in the area of the site provided that the site is avoided during construction activities. IUA A also appears to be a Register-eligible property, however, this resource is of the focus of the undertaking discussed herein. Because the proposed undertaking as designed will have no effect upon those qualities that lend significance to this property, it is recommended that a determination of no adverse effect on the IUA A be made for the proposed undertaking along the existing canal.

In regard to the IUAs, although some IUAs may merit consideration under AIRFA, the IUAs belong to the farmers who have requested services and are the recipients of the services that are proposed under this current project; therefore, AIRA consideration should not serve as a basis for denial of archaeological approval for the proposed undertaking on the canal. Therefore, a determination of no historic properties affected is recommended for the proposed undertaking in the areas of these IUAs.

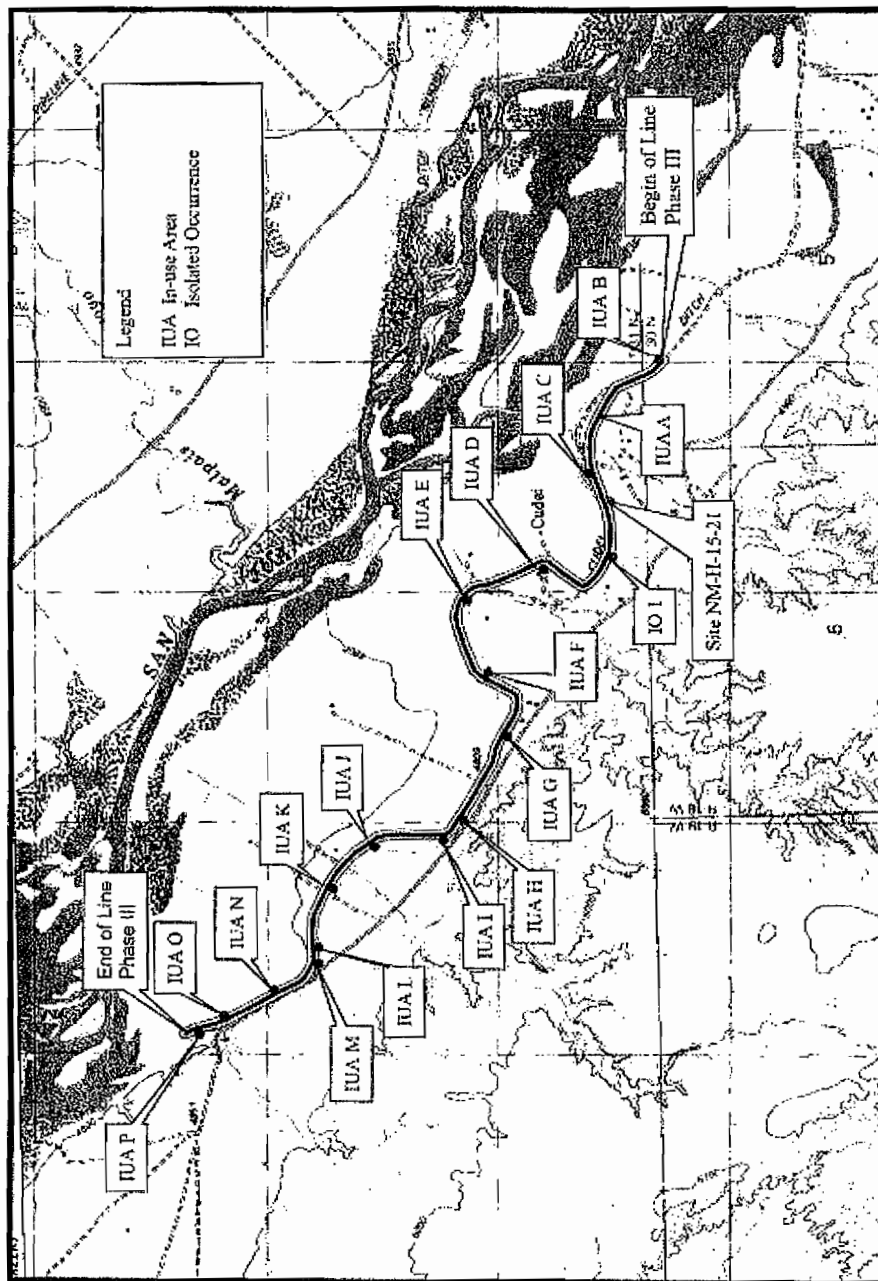


Figure 1. Location map showing the location of the project area and identified cultural resources. Rattlesnake, N. Mex., 1983, 7.5' series
USGS map: T.30N and T.31N, R.18W and R.19W, NNAD 09-206).

COPY

COPY

APPENDIX A

NNAD Site Survey and Management Form and USGS Map Location



NAVAJO NATION ARCHAEOLOGY DEPARTMENT

COPY

Site Survey and Management Form

SITE NO.: NM-H-15-21

FIELD OR OTHER NAME:

DATE RECORDED: 05-19-2009

PROJECT NUMBER & NAME: NNAD 09-206—A Cultural Resource Inventory of the Proposed Gad'iahi Canal Irrigation System Modification in Gad'iahi, San Juan County, New Mexico

ORGANIZATION: NNAD

ARCHAEOLOGIST(S): Julia Chavez, Matthew Pettigrew, Alceda Myerson, and Lenora Tsosie

USGS MAP REFERENCE: Rattlesnake, N.Mex., 1963, 7.5' series

LEGAL LOCATION: Unplatted Sections, T.31N, R.18W; NMPM

UTM: Zone 12; 4080524 Northing, 698381 Easting

STATE: New Mexico

COUNTY: San Juan

CHAPTER: Gad'iahi/Tókoí

LAND STATUS: Navajo Tribal Trust

GROUND VISIBILITY: Kind and extent of cover? Ground visibility 99%, vegetation coverage 1%

TOPOGRAPHY: The site is situated south of the project atop a clay bluff overlooking the San Juan River floodplain area and approximately 25 feet (7.62 m) above the irrigation canal project and valley bottom.

DRAINAGE: The nearest major water source is the San Juan River located north approximately 2,000 feet (609.75 m) to the north

ELEVATION (ft/m): 4828 feet/ 1472 m

SLOPE & DIRECTION: 20° sloping north

SOIL TYPE: Alluvial soil

OTHER: Aeolian sand

VEGETATION PRESENT: Russian thistle, salt cedar, desert scrub brush, and shadscale.

CULTURAL AFFILIATION: Anasazi

SITE TYPE: Specialized Activity Area—sherd and lithic scatter

PERIOD(S) OF OCCUPATION (Date, if known): PII-PIII (A.D. 900-1300)

HOW DATED: Ceramic typology

DIMENSIONS OF SITE (l x w): 52 m x 28 m

TOTAL AREA (sq. m): 1,144 sq. m—area of an oval

How Determined: Measured with a metric tape.

ARCHITECTURE PRESENT? No

ARTIFACTS OBSERVED/COUNTED: Observed—less than 100 ceramic artifacts and less than 40 lithic artifacts.

COLLECTIONS MADE? No

PHOTOS TAKEN: Yes

COLOR: Roll 09-206 (SR); Frame(s) h1521-1, 2, 3, 4, 5, 6, 7, 8, and 9

SITE DESCRIPTION: The site is located on the southern clay and shale-covered terrace located above the farmlands and the San Juan River valley. The site contains a scatter of lithic and ceramic artifacts that are scattered throughout the site area along the edge of the terrace edge. No features were noted in the site area. Less than 100 sherds were observed on the site. The ceramic assemblage consisted of plain gray wares, indented corrugated sherds, decorated black-on-white wares, and red wares. The temper of ceramic artifacts was either trachyte and/or sand. The sherds observed on this site were too small and therefore were unidentifiable as to type.

Forty or less lithic artifacts were noted on this site. The artifact assemblage consisted of secondary, tertiary, and microflakes. The lithic material types represented on this site consisted of siltstone, white chert, Brushy Basin chert, butterscotch chert, and quartzite.

The condition of the site is poor with erosion occurring throughout the site area. The soil throughout the site area is shallow with limited to no buried cultural material. The site is also situated amongst a clearing that is devoid of vegetation. Heavy equipment machinery associated with farming activities was noted to the south of the site. It appears that this machinery may have at one time cleared vegetation from the site area as limited to no vegetation is present on this site, but vegetation was noted in undisturbed areas located to the southeast and west of the site. The farm machinery belongs to Stella Badoni and family and the machinery are currently parked approximately 4 m (13.12 feet) south of the site.

This site appears to be a specialized activity area that may have functioned as a limited lithic reduction or tool procession area. In addition, the presence of the ceramics on this site suggests that possible food gathering activities may have also

occurred on this site. It is thought that this site may have been affiliated with farming activities as the location of the site would make an excellent lookout of the fields in the valley below.

CONDITION OF SITE: Poor **Causes of disturbance:** Natural erosion and clearing of vegetation with farming machinery for a current parking area/storage area.

LOCATION OF SITE RELATIVE TO PROJECT AREA: The site is located on the southern portion of the project area and within the southern side of the 35-foot (10.67-m) wide buffer zone. This site is also situated out of but less than 1 m south of the proposed canal 50-foot (15.24-m) wide right-of-way. The site is also situated about 25 feet (7.62 m) above the right-of-way as it is situated on a terrace above the project area.

EXTENT OF INVESTIGATION TO DATE: Survey records including site form, sketch map, and photographs.

RESEARCH POTENTIAL: The site may provide a limited amount of information regarding the local/regional prehistory of the Gad'iahi area.

RECOMMENDATIONS: Although the site appears to be less than 1 m at its closest point from the edge of the proposed canal right-of-way, the site is also located 25 feet (7.62 m) above the edge of the right-of-way. Given the elevation difference between the site and the irrigation system, it is recommended that the proposed undertaking as currently designed will have no effect on those qualities and characteristics that contribute to the significance of the site. Therefore, a determination of no historic properties affected be made for the proposed undertaking since the site can be avoided.

SITE ASSESSMENT UNDER 36 CFR 60.4 (National Register):

INTEGRITY: The site possesses integrity of location and setting. The qualities of design, feeling, materials, association, and workmanship do not appear to apply.

and **CRITERIA a-d:** The site does appear to represent a property which is potentially eligible for inclusion on the National Register of Historic Places under criteria a, b, or c. It may be eligible under criterion d as a result of its research potential.

EXCLUSIONS: The site does not appear to fall into categories a-g, thus it does not qualify as an exclusion. The site does meet the 50-year guideline.

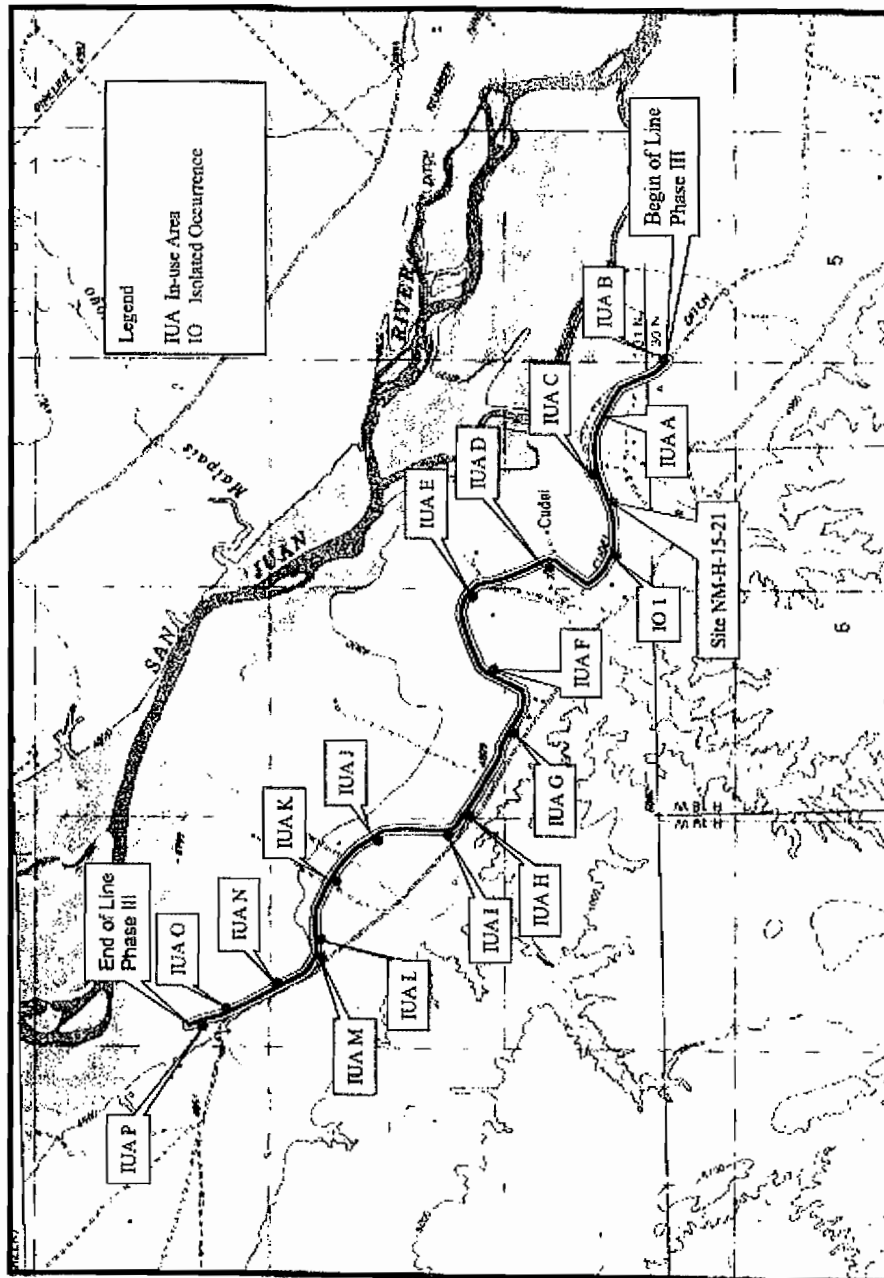
SITE ASSESSMENT UNDER 43 CFR 7.3 (Archaeological Resources Protection Act): The site is of archaeological interest. It does meet the 100-year age requirement. It does merit protection under ARPA.

SITE ASSESSMENT UNDER AIRFA (American Indian Religious Freedom Act): The site does not merit protection under the provisions of AIRFA.

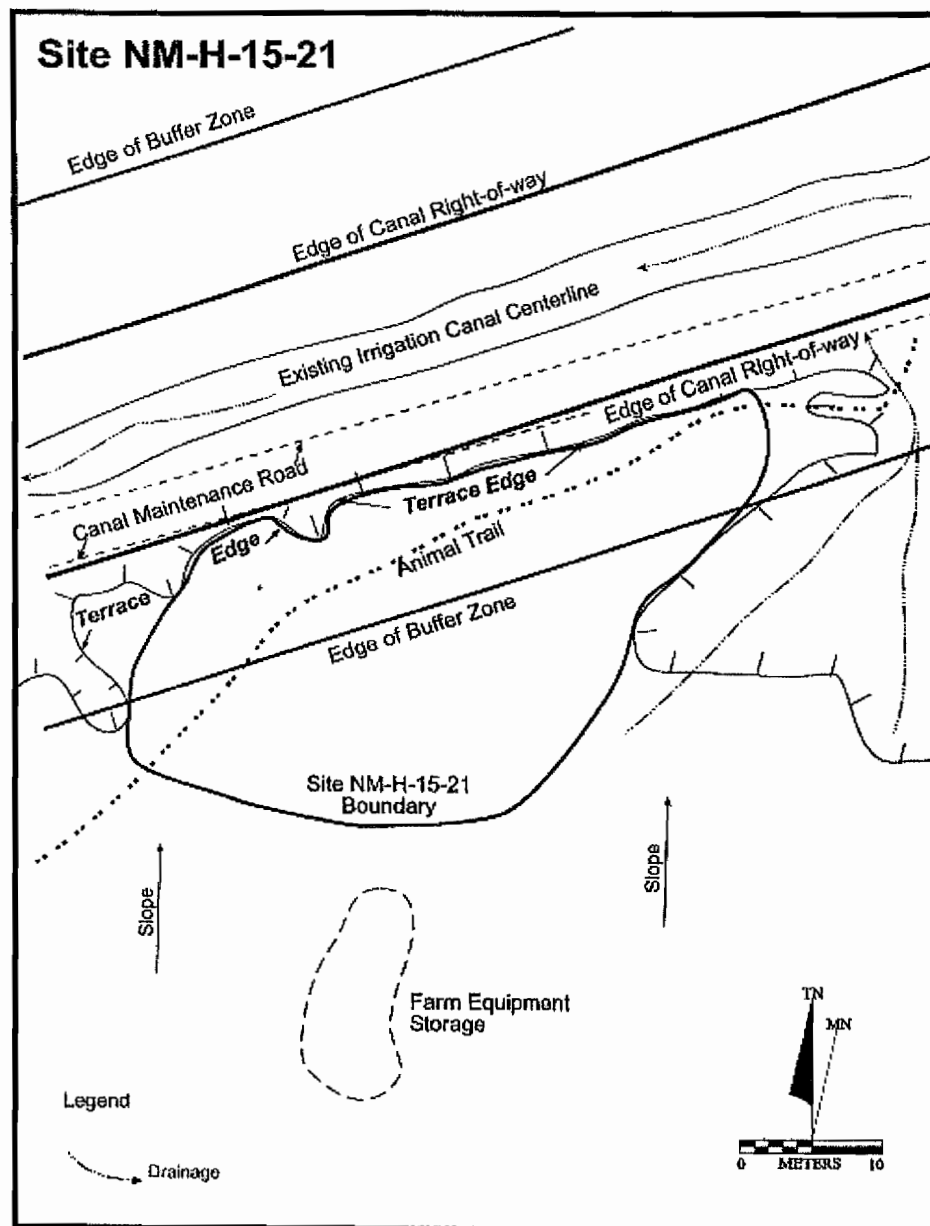
PROVIDE A SITE MAP (including site designation, north arrow, scale, recognizable features, landmarks, and relationship to project area).

HOW CAN THE SITE BE REACHED? (See attached USGS map.)

OTHER COMMENTS (Ethnographic data, etc.): None



Location map showing the location of the project area and identified cultural resources. Rattlesnake, N. Mex., 1983, 7.5' series USGS map; T. 30N and T. 31N, R. 18W and R. 19W, NMPM (NNAD 09-206).



General plan map, Site NM-H-15-21 (NNAD 09-206).

COPY

APPENDIX B

Historic Record of the Gad'li ahi Canal

A
AUG 2003
CHINA QUINCY
RECEIVED
FBI

COPY

HISTORIC RECORD OF THE GAD'IIAHI CANAL

NAME: A Cultural Resource Inventory of the Proposed Gad'iiahi Canal Irrigation System Modification in Gad'iiahi, San Juan County, New Mexico.

LOCATION: Beginning of Line: 4079808 Northing, 700786 Easting
End of Line: 4082350 Northing, 696086 Easting

SIGNIFICANCE: The Gad'iiahi canal is part of an integral part of the Navajo history focusing on the economy after the Navajo returned from Bosque Redondo post-1868.

DESCRIPTION: The Gad'iiahi canal is an open irrigation ditch constructed in 1880 by the Navajo community. Currently a portion of the canal remains unlined and is still an open ditch. Recently, the eastern portion of this canal system was converted to a piped underground irrigation system. While the western half of this canal remains an open ditch irrigation system. Head gates and inlets are some of the features that are located sporadically along the canal. Also noted along the ditch were several steel and wooden walkway bridges that allow for crossings across the open ditch.

HISTORY: According to Bailey and Bailey (1982) the Gad'iiahi canal was constructed in 1880. During the 1880s the canal system was maintained by the early Navajo inhabitants of the community. Bailey and Bailey (1982) indicated that numerous irrigation canals were in existence and were utilized by the Navajo by the late 1880s before the government-funded projects on the Navajo reservation in the 1890s. Local ethnographic interviews recall that the first irrigation canal in this community was dug manually by the Navajo community members upon their return from Fort Sumner. Apparently the canal or ditch was only a short length. The ditch was diverted south of the San Juan River and ran in a northwesterly direction from the present chapter house location. The ditch diverted back into the river directly north of the chapter (Robert Ahkeah, personal communication 2009). According to Bailey and Bailey (1982) the Cudai Ditch was located 5.5 miles downstream from the Shiprock School (possibly located east of the present day Shiprock Chapter House). The Cudai ditch was irrigating 832.2 acres of land in 1905 and it was carrying a capacity of 13.55 cubic feet per second.

Sometime after 1920, the Bureau of Indian Affairs began assisting with irrigation canal improvements by installing head gates at the inlets of canals from the San Juan River. Further development entailed clearing potential fields with dozers along either sides of the river. During the 1940s to the 1950s, Sam Ahkeah's tribal administration took great stride in securing improvements and further development of agricultural fields along the San Juan River in conjunction with the development of the Navajo Dam. According to local history, the farmland was possibly 1/3 its present size.

SOURCES:

Bailey, Garrick A., and Roberta G. Bailey
1982 *Historic Navajo Occupation of the Northern Chaco Plateau*. University of Tulsa, Oklahoma.

HISTORIAN: Lenora Tsosie

PROJECT INFORMATION: The open ditch irrigation practiced by the farmers has served its usefulness and now the community is striving to address conservation measures by employing a technologically modified controlled irrigation system. The piped irrigation system will hopefully minimize the overgrowth of unwanted thorn and scrub brush along the canal, and also manage the water usage. Recent work on the Gad'iiahi irrigation canal was conducted under Phase I of the Gad'iiahi irrigation canal system project (Yazzie and Cleveland-Mason 2005). Construction of Phase I created an underground segment of the Gad'iiahi irrigation canal system. Phase I construction occurred between 2005 and 2007. No information about Phase II, which is in preparation, is known at this time. Phase III of the Gad'iiahi irrigation canal system is considered the project discussed herein. The project is entitled *A Cultural Resource Inventory of the Proposed Gad'iiahi Canal Irrigation System Modification in Gad'iiahi, San Juan County, New Mexico*, which was conducted under the Navajo Nation Archaeology Department (NNAD) Report 09-206.

APPENDIX B

Biological Resources Compliance Form

Navajo Nation Department of Fish and Wildlife

BIOLOGICAL RESOURCES COMPLIANT FORM
NATIONAL DEPARTMENT OF FISH AND WILDLIFE
P.O. BOX 1450 WINDOW ROCK, ARIZONA 86515-1480

N31.17. 1185.1 1585V BEVMS1212 M03 260

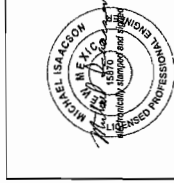
Appendix C

Drawings

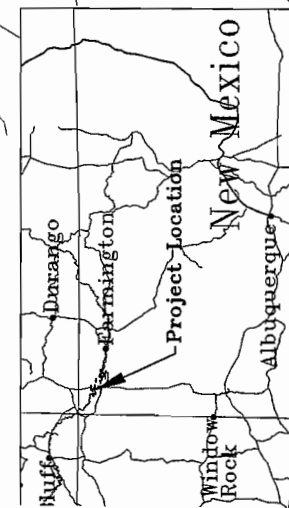
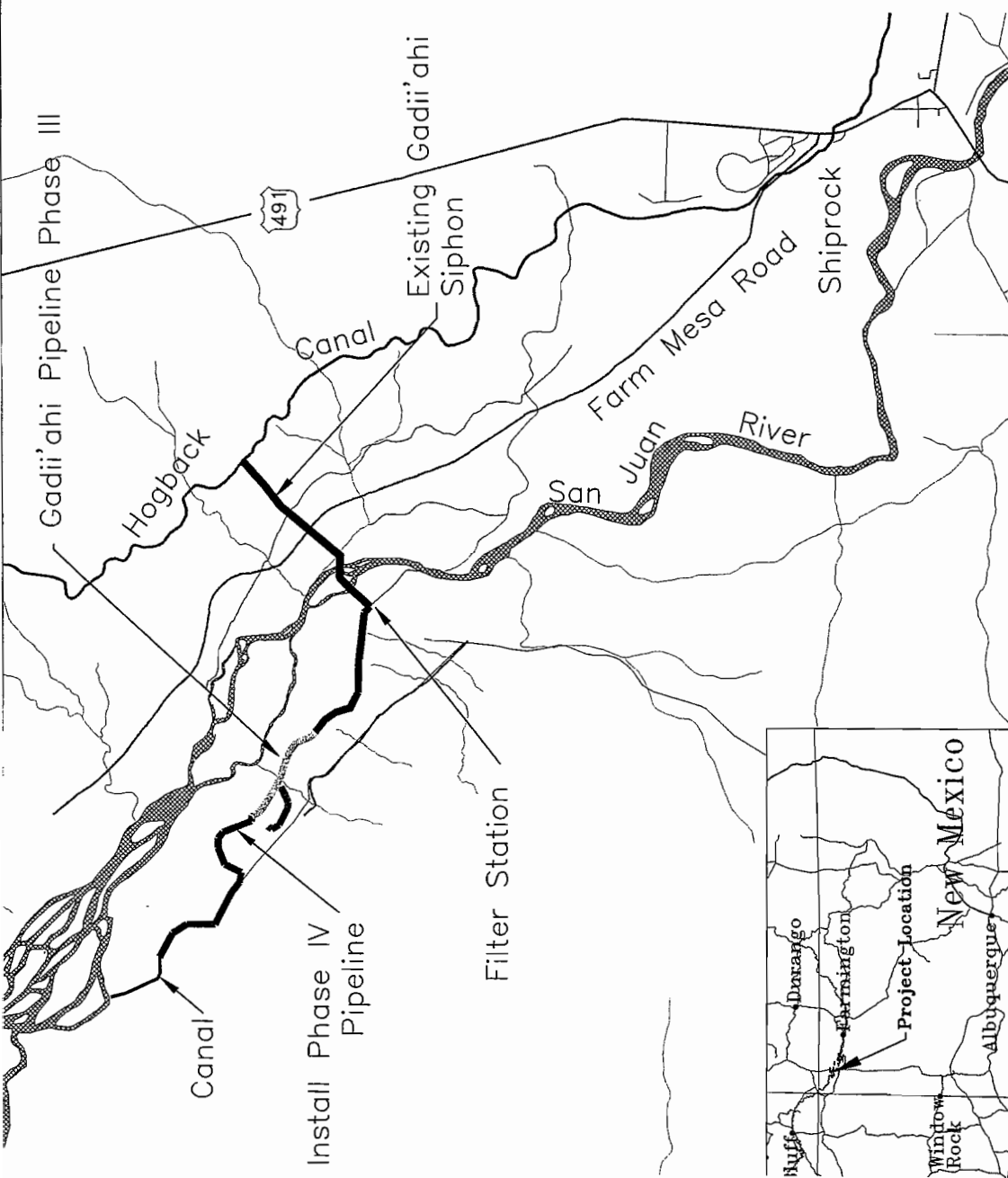
Phase IV Drawing Index

Sheet #	Sheet Name	Project Site	Revision #
L400	Phase IV Project Site		1
L420	Phase IV Layout		2
P430	Phase IV Plan & Profile		3
P431	Phase IV Plan & Profile	129+00 to 151+00	4
P432	Phase IV Plan & Profile	151+00 to 175+50	5
D440	Phase IV Outlet Structure Details		2
D450	Phase IV Fabricated Steel Fittings Details		2
D451	Phase IV Miscellaneous Details		2
D452	Phase IV Earthwork Details		2

Acknowledgement
I, Michael Isaacson, to the best of my professional knowledge and judgement believe that the design for Gadli'ahi Farm Irrigation System Phase IV meets the applicable standards of N.R.C.S.



IB Keller-Blesner Engineering Irrigation & Water Management 10000 N. 1st Ave. Suite 100 Albuquerque, NM 87112 Phone: (505) 261-1111 Fax: (505) 261-1112 Email: info@keller-blesner.com		New Mexico Dept. of Water Resources NRCS Farm Irrigation System Gadli'ahi Farm Irrigation System Phase IV Project Site	Job No. 77-004-07 Date: 07/29/11 Sheet 1 of 9 DRAWING NO. KEY L400
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Revision	Date	Revised By	Checked By
1	3/24/10	MI	MI
2	1/10/12	MI	MI
3	1/10/12	MI	MI
4	1/10/12	MI	MI
5	1/10/12	MI	MI
6	1/10/12	MI	MI
7	1/10/12	MI	MI
8	1/10/12	MI	MI
9	1/10/12	MI	MI
10	1/10/12	MI	MI
11	1/10/12	MI	MI
12	1/10/12	MI	MI
13	1/10/12	MI	MI
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19	1/10/12	MI	MI
20	1/10/12	MI	MI

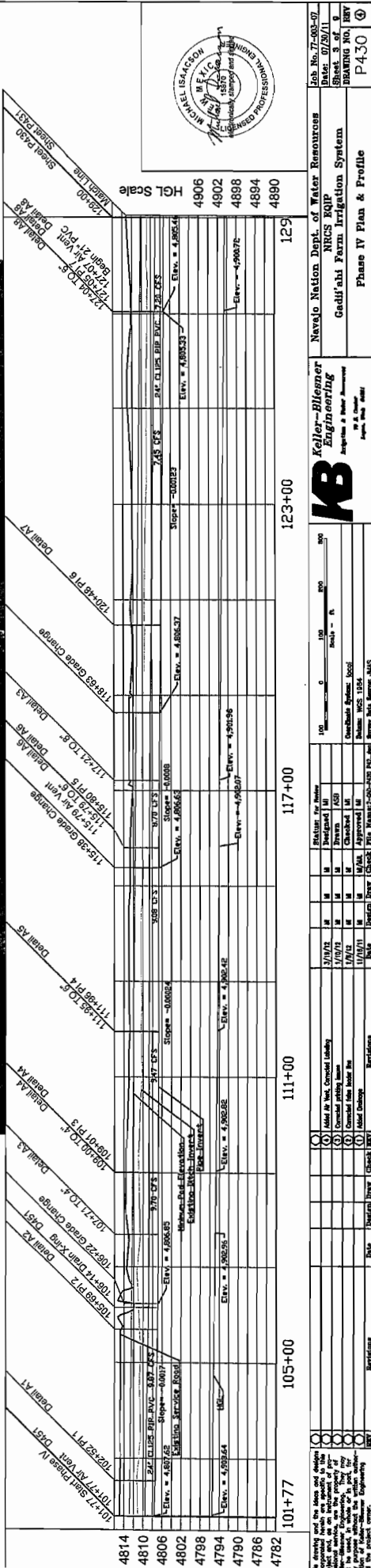
Legend

- 24" PVC
- 21" PVC
- 18" PVC

- Cut Storm Drain Ditch
- Install Turnout
- Drawing Match Line
- Construction Right of Way

Notes:

1. Mainline PVC shall be 24" 21" & 18" CL 125 RPP PVC pipe
2. Unless noted, Pipe Fittings and Tees shall be galvanized 10-gauge pre-laminated
3. All steel fitting shall be coated with an Amine-cured coal tar epoxy (Maco)
4. Existing canal shall be cleaned and filled with existing (unlaminated) material prior to pipe installation. Final bed elevation shall be equal to or higher than shown on this profile drawings.
5. Bell holes shall be excavated at each joint.
6. For irrigation grade equal or greater than 0.002 ft, no grade is shown in between
7. For irrigation grade less than 0.002 ft, no grade is shown (no main transition between high point and low point) shall not be greater than 0.1 ft.
8. Minimum ground cover over the top of pipe shall be 3 ft.
9. Spacing shall be 16' of stones larger than 3/4" in diameter from ground and face of ditch or organic material.
10. Trimming details shown on Drawing D-152.



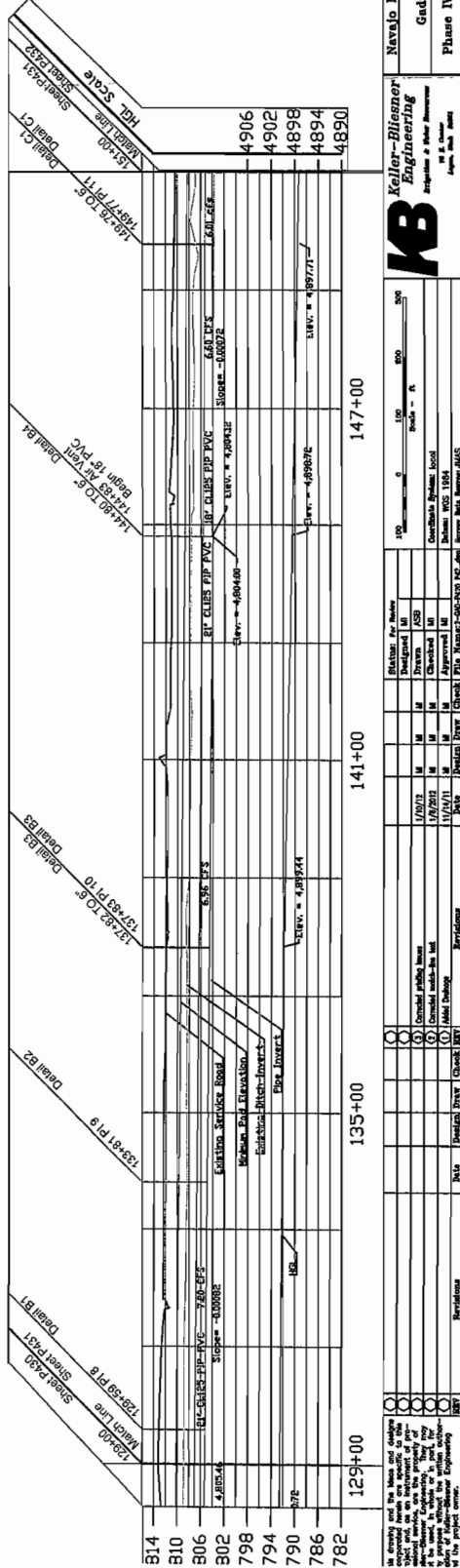
Notes:

1. Mainline PVC shall be 24" 21" 3, 18" @ CL125 R/P PVC pipe.
2. Unless noted, Steel Fittings and Tees shall be galvanized 10-gauge pre-laminated fittings.
3. All steel fitting shall be coated with an Arabin-coated coal tar epoxy coating.
4. Existing canal shall be dewatered and filled with existing sedimentation material prior to pipe installation. Final pad of color shall be equal to or higher than shown on the profile drawings.
5. Bell holes shall be excavated at each joint.
6. For pipeline grade equal or greater than 0.002 ft/l, no grade reversal is allowed.
7. For pipeline grade less than 0.002 ft/l, no grade reversal maximum deviation between high point and low point shall not be greater than 0.1 ft.
8. Minimum ground cover over the top of pipe shall be 3 ft.
9. Backfill shall be free of debris or organic material.
10. Trenching details shown on Drawing D-552

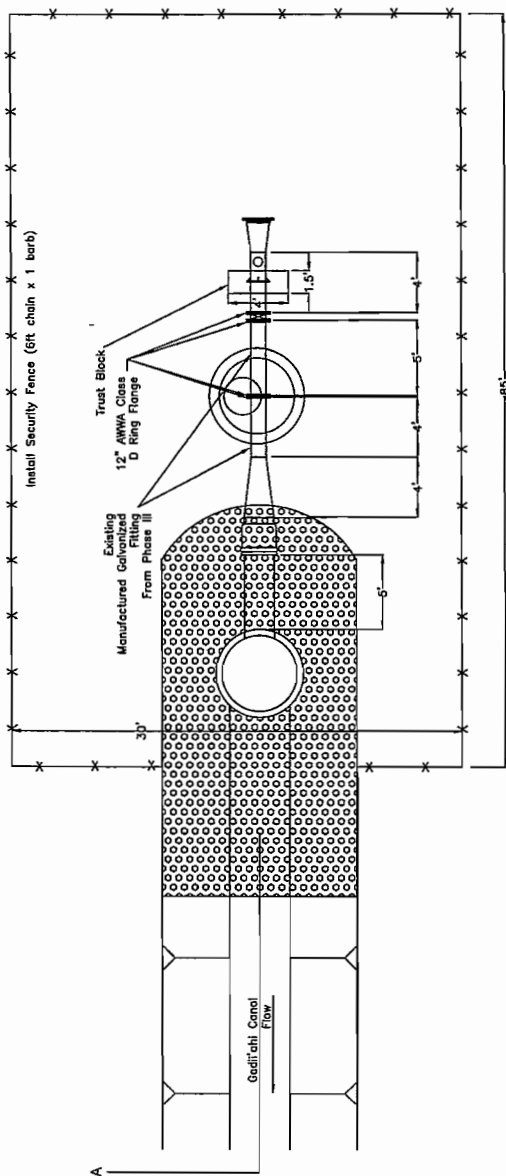
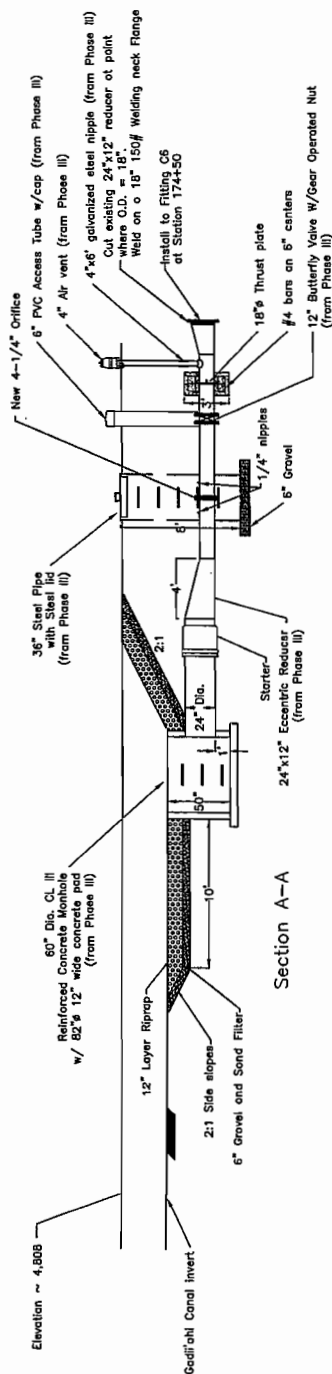
Legend

- 24" PVC
- 21" PVC
- 18" PVC

- Cut Storm Drain Ditch
- Install Turnout
- Drawing Match Line
- Construction Right of Way

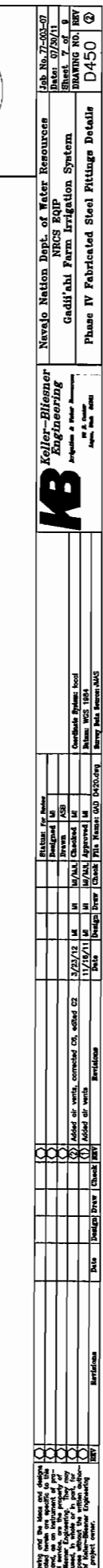


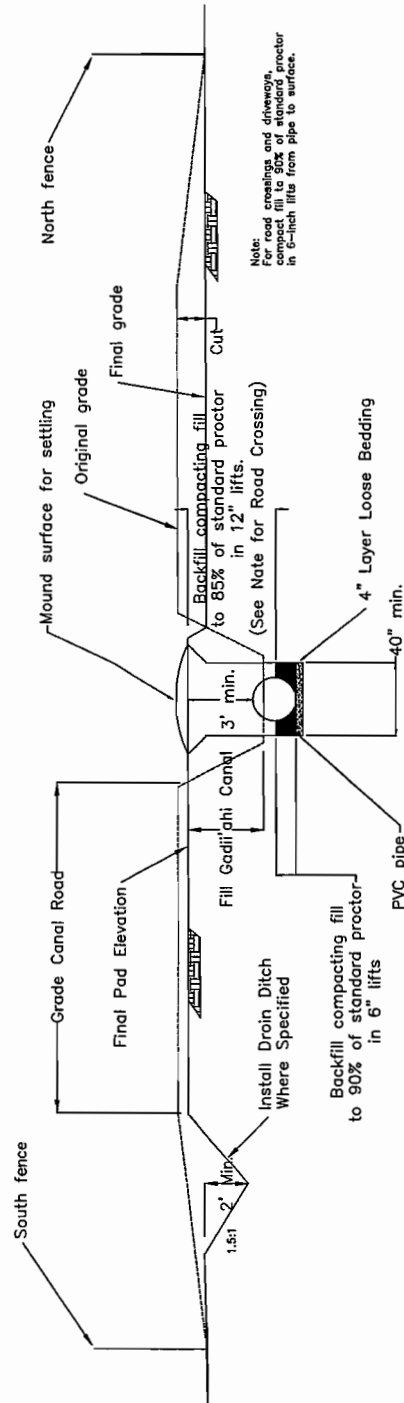
Navajo Nation Dept. of Water Resources		Job No. 7-95-07
NRCS EQIP		Date: 07/29/11
Gadil'ahli Farm Irrigation System		Sheet: 4 of 9
Phase IV Plan & Profile 129+00 to 161+00		DRAWING NO. NAV
		P4.51



- NOTES:
1. All Hittings obtained from existing end of Phase II pipeline.
 2. Carefully break concrete thrust blocks prior to removing steel fittings.
 3. All thrust blocks to be grouted in place.
 4. All underground pipe to be protected with cool tear epoxy.
 5. All Hittings to be AWMA Class D ring flanges.
 6. Backfill to be compacted to 95% of standard proctor in 6-inch lifts.
 7. All pipe above 8" in pipe dimensions, all pipe below 8" in pipe dimensions.
 8. Replace existing steel orifice plate with new 1/4-1/4" orifice plate.

[illegible]





Typical Trench Detail



The drawings and the ideas are designed to be used in the construction of a water conserving device, on the property of the National Bureau of Standards, and it is not to be used in other or in any other way without the written consent of the National Bureau of Standards.	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Irrigation Material Specifications-Rev2

**Gadii'ahi Farm Irrigation System
Phase IV**

Prepared for
Navajo Nation Department of Water Resources

Ft. Defiance, AZ

March 26, 2012

Keller-Bliesner Engineering, LLC

78 East Center
Logan, Utah 84321
(435) 753-5651

TABLE OF CONTENTS

1.0	PROJECT DESCRIPTION.....	1
2.0	VALVES.....	1
3.0	PRE-FABRICATED STEEL FITTINGS.....	1
	Special Pipe Fabrication.....	2
	Standard Steel Fittings.....	4
4.0	24-INCH, 21-INCH, 18-INCH, 8-INCH AND 6-INCH PVC PIPE	5
5.0	4-INCH PVC PIPE.....	5
6.0	DELIVERY SCHEDULE.....	6
7.0	COST PROPOSAL	6
	BID SCHEDULE	7

1.0 PROJECT DESCRIPTION

These specifications cover the fittings and appurtenances required for the installation of a 7,373 ft long irrigation pipeline in Gadii'ahi Chapter. The project is Phase 4 of the Gadii'ahi Farm Irrigation System.

2.0 VALVES

- A. Gate Valves with buried service operator. All gate valves shall have a resilient wedge design and rated for 250 psi. All cast ferrous components shall be ductile iron complying with AWWA/ANSI C515. Each valve shall be operated by a 2-inch nut. Each valve shall be supplied with the appropriate number of bolts, nuts, and washers to install the valve between two 150 lb ring flanges. All bolts, nuts, and washers shall be a minimum of grade 5 steel and shall be zinc coated.
- B. 4-inch Air Vents. Air/vacuum relief valves shall be 4 inch diameter, designed to discharge air until the line is filled and open as pressure drops below atmospheric pressure. They shall also be capable of releasing air under pressure through a 3/32" float-activated orifice. The valves shall be 4-inch Waterman CR100 or approved equal, with working pressure capability of 125 psi.
- C. 2-inch Air Vents. Air/vacuum relief valves shall be 2 inch diameter, designed to discharge air until the line is filled and open as pressure drops below atmospheric pressure. The valves shall be 2-inch Waterman AV150 or approved equal.
- D. Tee riser valves. All tee riser valves shall be a 8-inch by 8-inch by 4-inch, 6-inch by 6-inch by 4-inch, or 4-inch by 4-inch by 4-inch PIP galvanized steel tee riser valve with a 30-inch riser as manufactured by Gheen Irrigation Works, Inc. Model No. 7015 or approved equal. The fitting shall be epoxy coated.
- E. Stub valve opener. All stub valve openers shall be 4-inch by 4-inch galvanized steel EII valve openers with clamping hasp and gasket as manufactured by Gheen Irrigation Works, Inc. or approved equal.
- F. 4-inch Globe Valve. All 4-inch globe valves shall be fabricated from 316 Stainless Steel with a bolted bonnet, integrated metal seats, and fitted with 4-inch 150 lb steel flanges. The globe valves shall have a rising stem with a hand wheel.

3.0 PRE-FABRICATED STEEL FITTINGS

- A. General. The specifications listed here are for all fabricated steel fittings shown in Drawings D450.

- i. Pipe. All steel pipe, shall be of the diameter shown on the drawings (IPS dimensions, nominal diameters shown) with a minimum wall thickness of 0.1345 inches (10 ga.). All steel pipe shall meet the requirements of AWWA-C200.
- ii. Flanges. All steel flanges shall be ½-inch ring flanges with ANSI 150 drilling per AWWA C207 of the diameter shown on the drawings unless noted otherwise. All flanges shall be oriented as shown in Drawing D451.
- iii. Steel Plate. All steel plate shall meet the requirements of ASTM-A568.
- iv. Miters. Miter dimensions shall conform to AWWA C208.
- v. Welds. All steel-to-steel connections are welded unless otherwise noted. All welding to be in accordance with AWWA C206-97.
- vi. Materials. All materials, fittings and accessories required in the fabrication of items listed in these specifications and on the drawings shall be provided by the fabricator.

Special Pipe Fabrication

24-inch diameter 26 degree elbow. Details for this fitting can be found on Drawing D450, Detail A1. This fitting begins and ends with a 24-inch PIP starter coupler. The 26 degree elbow shall be a two piece mitered elbow. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter 33 degree elbow. Details for this fitting can be found on Drawing D450, Detail A2. The fitting begins and ends with a 24-inch PIP starter coupler. The 33 degree elbow shall be a two piece mitered elbow. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter 39 degree elbow. Details for this fitting can be found on Drawing D450, Detail A7. This fitting begins and ends with a 24-inch PIP starter coupler. The 39 degree elbow shall be a two piece mitered elbow. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter 45 degree elbow with tee. Details for this fitting can be found on Drawing D450, Detail A4. This fitting begins and ends with a 24-inch PIP starter coupler. The 45 degree elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow as seen on Drawing D450, Detail A4. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter by 12-inch tees. Details for these fittings can be found on Drawing D450, Detail A3. The fitting begins and ends with a 24-inch PIP starter coupler. The tee shall be completed by welding a 1 ft. long 12-inch standard steel pipe and a 12-inch 150 psi ½-inch steel ring flange as shown on Drawing D450, Detail A3. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter 14 degree elbow with a 12-inch tee. Details for this fitting can be found on Drawing D450, Detail A6. This fitting begins and ends with a 24-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow and a 4" fpt threadlet shall be installed on top as

seen on Drawing D450, Detail A6. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter 22 degree elbow with a 12-inch tee. Details for this fitting can be found on Drawing D450, Detail A5. This fitting begins and ends with a 24-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi flange shall be installed on the right side of the elbow as seen on Drawing D450, Detail A5. The fitting shall be galvanized with a thickness of 3.5 mil.

21- inch diameter by 31 degree elbow. Details for this fitting can be found on Drawing D450, Detail B1. This fitting begins and ends with a 21-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. The fitting shall be galvanized with a thickness of 3.5 mil.

Steel reducer. Details for these fittings can be found on Drawing D450, Details D1, D2, and D3. The fitting begins with a 150 psi ½-inch steel ring flange and ends with a 150 psi ½-inch steel ring flange sized for the pipe. The reducer shall be a cone reducer. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter by 4-inch tee. Details for this fitting can be found on Drawing D451, Air Vent Detail. The fitting begins and ends with a 24-inch PIP starter coupler. The tee shall be completed by welding a 4-inch fpt Schedule 40 steel coupler as shown on Drawing D451, Air Vent Detail. The fitting shall be galvanized with a thickness of 3.5 mil.

18-inch diameter by 12-inch tee. Details for these fittings can be found on Drawing D450, Detail C2. The fitting begins and ends with a 18-inch PIP Starter coupler. The tee shall be completed by welding a 1 ft. long 12-inch standard steel pipe and a 12-inch ½-inch 150 psi steel ring flange as shown on Drawing D450, Detail C2. The fitting shall be galvanized with a thickness of 3.5 mil.

18-inch diameter Starter by Flange. Details for this fitting can be found on Drawing D450, Detail C6. The fitting begins with a 18-inch PIP starter coupler and ends with a 18-inch 150 psi flange as shown on Drawing D450, Detail C6. The fitting shall be galvanized with a thickness of 3.5 mil.

21- inch diameter by 17 degree elbow. Details for this fitting can be found on Drawing D450, Detail B2. This fitting begins and ends with a 21-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. The fitting shall be galvanized with a thickness of 3.5 mil.

24-inch diameter x 21-inch by 73 degree elbow with tee. Details for this fitting can be found on Drawing D450, Detail A8. This fitting begins with a 24-inch PIP starter coupler and ends with a 21-inch PIP starter coupler. The elbow shall be a three piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow. The tee shall be completed by welding a 4-inch fpt Schedule 40 steel coupler as shown on Drawing D450, Detail A8. The fitting shall be galvanized with a thickness of 3.5 mil.

21-inch diameter 10 degree elbow with a 12-inch tee. Details for this fitting can be found on Drawing D450, Detail B3. This fitting begins and ends with a 21-inch

PIP starter coupler. The elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow as seen on Drawing D450, Detail B3. The fitting shall be galvanized with a thickness of 3.5 mil.

21-inch x 18-inch diameter by 12-inch tee. Details for this fitting can be found on Drawing D450, Detail B4. The fitting begins with a 21-inch PIP starter coupler and ends with a 18-inch PIP starter coupler. The tee shall be completed by welding a 1 ft. long 12-inch standard steel pipe with a 12-inch ½-inch 150 psi steel ring flange and a 4-inch fpt Schedule 40 steel coupler as shown on Drawing D450, Detail B4. The fitting shall be galvanized with a thickness of 3.5 mil.

18-inch diameter 60 degree elbow with a 12-inch tee. Details for this fitting can be found on Drawing D450, Detail C1. This fitting begins and ends with a 18-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow as seen on Drawing D450, Detail C1. The fitting shall be galvanized with a thickness of 3.5 mil.

18-inch diameter 31 degree elbow with a 12-inch tee. Details for this fitting can be found on Drawing D450, Detail C3. This fitting begins and ends with an 18-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow and a 4-inch fpt threadlet shall be installed on top as seen on Drawing D450, Detail C3. The fitting shall be galvanized with a thickness of 3.5 mil.

18-inch diameter 14 degree elbow with a 12-inch tee. Details for this fitting can be found on Drawing D450, Detail C4. This fitting begins and ends with a 18-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow as seen on Drawing D450, Detail C4. The fitting shall be galvanized with a thickness of 3.5 mil.

18-inch diameter 18 degree elbow with a 12-inch tee. Details for this fitting can be found on Drawing D450, Detail C5. This fitting begins and ends with a 18-inch PIP starter coupler. The elbow shall be a two piece mitered elbow. A 12-inch tee terminating with a 12-inch ½-inch 150 psi steel ring flange shall be installed on the right side of the elbow as seen on Drawing D450, Detail C5. The fitting shall be galvanized with a thickness of 3.5 mil.

Standard Steel Fittings

Steel to PVC Flange Adapters (Starter Coupler with flange). Steel to PVC adapters shall be constructed of mild steel, beveled for welding to the compatible diameter of pipe. The opposite end shall consist of a steel bell with chevron style gasket sized to accept PVC pipe at the specified dimensions. The flange shall be a ½-inch Ring Flange with ANSI 150 drilling per AWWA C207. The steel to PVC flange adapter shall be manufactured by Gheen Manufacturing Co.(Part No. 7262) or approved equal. The flange adapter shall be epoxy coated.

Service Tee with thread. All service tees shall be 8,6, or 4-inch by 2-inch PIP epoxy coated steel tee as manufactured by Gheen Manufacturing Co. (Part No. 7025) or approved equal. Each tee shall have a 2-inch fpt outlet.

8-inch, 6-inch and 4-inch End Plates. All end plates shall be 8-inch, 6-inch or 4-inch PIP epoxy coated steel end plates as manufactured by Gheen Manufacturing Co. (Part No. 7070) or approved equal.

mpt Adapter. All mpt adapters shall be 4-inch by 4-inch galvanized steel mpt adapters as manufactured by Gheen Manufacturing Co. (Part No. 2050) or approved equal.

Galvanized Coatings. Unless specified, all steel members, such as pipe, flanges and couplings, shall be hot-dipped galvanized to ASTM 123-73 specifications or approved equal. The thickness of galvanization shall not be less than 3.5 mils (0.0035 inches) average.

Threaded Flanges. Threaded steel flanges shall be a 4-inch ANSI B16.5 Class 150 Forged Steel Flanges. Each flange shall have fpt threads.

4.0 24-INCH, 21-INCH, 18-INCH, 8-INCH and 6-INCH PVC PIPE

A. Material Specifications. All 24-inch, 21-inch, 18-inch, 8-inch, and 6-inch PVC pipe shall be rigid polyvinyl chloride (PVC) extruded from Type 1, Grade 1 or 2 PVC resin with a hydrostatic design stress of 2,000 psi for water at 73.4EF, designated as PVC 1120 or PVC 1220 conforming to ASTM Standard D1784. Pipe included shall be either 24-inch, 21-inch, 18-inch, 8-inch, and 6-inch diameter PIP PVC, class 125 with a Standard Dimension Ratio (diameter over thickness) of not more than 32.5.

B. Pipe Dimensions. All PVC pipe unless noted shall conform to Plastic Irrigation Pipe (PIP) dimensions per SCS 430-DD, PVC 1120.

Pipe Joints. All pipe shall be furnished with integral bell gasket joints, conforming to ASTM Standard D3139, "Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals." The recommended lubricant for joining the pipe joints shall be furnished.

5.0 4-INCH PVC PIPE

A. Material Specifications. All 4-inch PVC pipe shall be rigid polyvinyl chloride (PVC) extruded from Type 1, Grade 1 or 2 PVC resin with a hydrostatic design stress of 2,000 psi for water at 73.4EF, designated as PVC 1120 or PVC 1220 conforming to ASTM Standard D1784. Pipe included shall be 4-inch diameter IPS PVC, class 125 with a Standard Dimension Ratio (diameter over thickness) of not more than 32.5.

- B. Pipe Dimensions. All PVC pipe unless noted shall conform to Iron Pipe Size (IPS) dimensions per SCS 430-DD, PVC 1120.
- C. Pipe Joints. All pipe joints shall be solvent weld joints.

6.0 DELIVERY SCHEDULE

All of the materials shall be delivered to:

Delivery shall be made 30 days after a purchase order has been issued. Please contact _____ a minimum of two (2) days prior to delivery so arrangements can be made to have unloading equipment available.

7.0 COST PROPOSAL

Pricing shall include all materials, fabrication and freight. Complete a cost proposal showing the item and extended net price. Show any additional terms and taxes on the cost proposal.

Return the cost proposal by _____ to:

For any technical questions regarding the material, please refer to:

Michael Isaacson
Keller-Bliesner Engineering, LLC
78 E. Center St.
Logan, UT 84321
Ph (435) 753-5651
Fax (435) 753-6139
Cell (505) 320-9916
mi@kelbli.com

BID SCHEDULE

Item	Quantity	Cost	Extension
1. 24-inch PIP 125 psi PVC pipe per 4.0 of these specifications.	2,540 ft		✓
2. 21-inch PIP 125 psi PVC pipe per 4.0 of these specifications.	1,800 ft		✓
3. 18-inch PIP 125 psi PVC pipe per 4.0 of these specifications.	3,120 ft		✓
4. 6-inch 250 psi resilient wedge ductile iron gate valve with 2-inch buried service operator <u>w/ all of the bolts, nuts, and washers</u> necessary to install the valve between two 6-inch standard ½-inch 150 psi ring flanges per 2.0 A of these specifications.	10 each		
5. 4-inch Waterman CR100 or approved equal air vent per 2.0 B of these specifications.	5 each		✓
6. 2-inch Waterman AV150 or approved equal air vent per 2.0 C of these specifications.	15 each		✓
7. 4-inch steel globe valve per 2.0 F of these specifications.	15 each		15
8. 24-inch galvanized 10 gauge 26 degree steel elbow (gasket x gasket) per 3.0 B.i. of these specifications and Drawing D450, Detail A1.	1 each		✓
9. 24-inch galvanized 10 gauge 33 degree steel elbow (gasket x gasket) per 3.0 B.ii. of these specifications and Drawing D450, Detail A2. (Already purchased and at chapter house)	1 each	X	X
10. 24-inch galvanized 10 gauge 39 degree steel elbow (gasket x gasket) per 3.0 B.iii. of these specifications and Drawing D450, Detail A7.	1 each		✓
11. 24-inch galvanized 10 gauge 45 degree steel elbow (gasket x gasket) with a 12-inch tee per 3.0 B.iv. of these specifications and Drawing D450, Detail A4.	1 each		✓
12. 24-inch x 12-inch galvanized 10 gauge steel tee (gasket x gasket x flange) per 3.0 B.v. of these specifications and Drawing D450, Detail A3.	2 each		✓

Model 35

6 each - some
several left over
from previous phase

1 each each

Item	Quantity	Cost	Extension
13. 21-inch galvanized 10 gauge 31 degree steel elbow (gasket x gasket) per 3.0 B.viii. of these specifications and Drawing D450, Detail B1.	1 each		✓
14. 12-inch x 6-inch galvanized 10 gauge steel reducer (flange x flange) per 3.0 B.ix. of these specifications and Drawing D450, Detail D1.	10 each		✓
15. 24-inch x 4-inch galvanized 10 gauge steel tee (gasket x gasket x fpt) per 3.0 B.x. of these specifications and Drawing D451, Air Vent Detail.	1 each		✓
16. 6-inch x 6-inch PIP PVC flange adapters per 3.0 C.i. of these specifications.	10 each		✓
17. 6-inch x 2-inch Gheen PIP epoxy coated steel service tee (Part 7025) per 3.0 C.ii. of these specifications.	10 each		✓
18. 4-inch x 4-inch Galvanized Ell Valve Opener per Section 2.0 E of these specifications.	15 each		✓
19. 4-inch x 4-inch IPS PVC flange adapters per 3.0 C.i. of these specifications.	2 each		✓
20. 18-inch PIP PVC starter x 18-inch 150 psi flange 3.0 B.xii of these Specifications and Drawing D450, Detail C6.	1 each		✓
21. 6-inch PIP CL 125 PVC pipe per Section 5.0 of these specifications.	600 ft		✓
22. 4-inch x 60-inch galvanized steel mpt. threaded nipple.	5 ea		
23. 2-inch x 60-inch galvanized steel mpt. threaded nipple.	15 ea		
24. 4-inch x 12-inch galvanized steel mpt. threaded nipple.	30 each		
25. 6-inch 150 psi flange gaskets.	20 each		
26. 4-inch threaded 150 psi steel flanges per 3.0 E of these specifications.	30 each		
27. 4-inch 150 psi flange kits (gaskets, bolts, nuts, and washers).	30 each		

~~1 each~~

None

None

None

None

None

None

Item	Quantity	Cost	Extension
28. 24-inch galvanized 10 gauge 14 degree steel elbow (gasket x gasket) with 12-inch tee and 4-inch fpt threadlet per 3.0 B.vi. of these specifications and Drawing D450, Detail A6.	1 each		✓
29. 24-inch galvanized 10 gauge 22 degree steel elbow (gasket x gasket) with 12-inch tee per 3.0 B.vii. of these specifications and Drawing D450, Detail A5.	1 each		✓
30. 12-inch x 8-inch galvanized 10 gauge steel reducer (flange x flange) per 3.0 B.ix. of these specifications and Drawing D450, Detail D2.	3 each		✓
31. 18-inch (gasket x gasket) by 12-inch tee (flange) fitting per 3.0 B.xi. of these specifications and Drawing D450, Detail C2.	3 each		✓
32. 8-inch x 2-inch Gheen PIP epoxy coated steel service tee (Part 7025) per 3.0 C.ii. of these specifications.	3 each		✓
33. 8-inch PIP CL 125 PVC pipe per Section 4.0 of these specifications.	180 ft		✓
34. 4-inch IPS CL 125 PVC pipe per Section 5.0 of these specifications.	120 ft		✓
35. 21-inch galvanized 10 gauge 17 degree steel elbow (gasket x gasket) per 3.0 B.xiii. of these specifications and Drawing D450, Detail B2.	1 each		✓
36. 24-inch galvanized 10 gauge 73 degree steel elbow (gasket x gasket) reduced down to 21-inch with 12-inch tee and 4-inch fpt coupler per 3.0 B.xiv. of these specifications and Drawing D450, Detail A8.	1 each		✓
37. 21-inch galvanized 10 gauge 10 degree steel elbow (gasket x gasket) with 12-inch tee per 3.0 B.xv. of these specifications and Drawing D450, Detail B3.	1 each		
38. 21-inch galvanized 10 gauge steel tee (gasket x gasket) reduced down to 18-inch with 12-inch tee and 4-inch fpt coupler per 3.0 B.xvi. of these specifications and Drawing D450, Detail B4.	1 each		✓

each

None

Item	Quantity	Cost	Extension
39. 18-inch galvanized 10 gauge 60 degree steel elbow (gasket x gasket) with 12-inch tee per 3.0 B.xvii. of these specifications and Drawing D450, Detail C1.	1 each		✓
40. 4-inch x 2-inch Gheen IPS epoxy coated steel service tee (Part 7025) per 3.0 C.ii. of these specifications.	2 each		✓
41. 18-inch galvanized 10 gauge 31 degree steel elbow (gasket x gasket) with 12-inch tee and 4" fpt threadlet per 3.0 B.xviii. of these specifications and Drawing D450, Detail C3.	1 each		✓ ✓
42. 18-inch galvanized 10 gauge 14 degree steel elbow (gasket x gasket) with 12-inch tee per 3.0 B.xix. of these specifications and Drawing D450, Detail C4.	1 each		✓
43. 18-inch galvanized 10 gauge 18 degree steel elbow (gasket x gasket) with 12-inch tee per 3.0 B.xx. of these specifications and Drawing D450, Detail C5.	1 each		✓
44. 12-inch x 4-inch galvanized 10 gauge steel reducer (flange x flange) per 3.0 B.ix. of these specifications and Drawing D450, Detail D3.	2 each		✓
45. 8-inch 250 psi resilient wedge ductile iron gate valve with 2-inch buried service operator <u>w/ all of the bolts, nuts, and washers</u> necessary to install the valve between two 8-inch standard ½-inch 150 psi ring flanges per 2.0 A of these specifications.	3 each		
46. 4-inch 250 psi resilient wedge ductile iron gate valve with 2-inch buried service operator <u>w/ all of the bolts, nuts, and washers</u> necessary to install the valve between two 4-inch standard ½-inch 150 psi ring flanges per 2.0 A of these specifications.	2 each		
47. 8-inch x 8-inch PIP PVC flange adapters per 3.0 C.i. of these specifications.	3 each		
48. 8-inch x 8-inch x 4-inch Gheen epoxy coated riser valve (part # 7015) or approved equal per 2.0 D of these specifications.	3 each		✓
49. 6-inch x 6-inch x 4-inch Gheen epoxy coated riser valve (part # 7015) or approved equal per 2.0 D of these specifications.	10 each		✓

~~None~~

15°

15°

None

6 each

150 stamped on side

2 each

Item	Quantity	Cost	Extension
50. 4-inch x 4-inch x 4-inch Gheen epoxy coated riser valve (part # 7015) or approved equal per 2.0 D of these specifications.	2 each		✓
51. 8-inch Gheen PIP epoxy steel end plate (Part #7070) or approved equal per 3.0 C.iii. of these specifications.	3 each		✓
52. 6-inch Gheen PIP epoxy steel end plate (Part #7070) or approved equal per 3.0 C.iii. of these specifications.	10 each		✓
53. 4-inch Gheen PIP epoxy steel end plate (Part #7070) or approved equal per 3.0 C.iii. of these specifications.	2 each		✓
54. 4-inch 150 psi flange gaskets.	4 each		
55. 8-inch 150 psi flange gaskets.	6 each		
56. 12-inch 150 psi flange kits (gasket, bolt, washer, and nut).	15 each		✓
57. 18-inch 150 psi flange kits (gasket, bolt, washer, and nut).	1 each		
Total			
Navajo Nation Tax (4%)			
Grand Total			

None

None

None

Appendix E

Installation Specifications

GADII'AH I FARM IRRIGATION SYSTEM

PHASE IV

INSTALLATION SCOPE OF WORK & SPECIFICATIONS

prepared for

**Navajo Nation Department of Water Resources
Water Management Branch
P.O. 678
Ft. Defiance, AZ 86504**

prepared by

**Keller-Bliesner Engineering, LLC
78 East Center
Logan, Utah 84321
(435) 753-5651**



November 18, 2011

PART 1: GENERAL

1.01 WORK INCLUDED

- A. This scope of work covers the cleaning and demolition of earthen canal, the underground installation of PVC pipe, the installation of fifteen turnouts, the relocation of the outlet structure and drainage work for Phase IV of the Gadii'ahi Farm Irrigation System.
- B. Scope. Work covered includes all earthwork, excavation, handling, installation, and backfill of PVC pipe and fittings. Work also includes all earthwork associated with the drainage system. All material, unless specified, are furnished by the Contractor.

1.02 GENERAL

- A. All materials, unless otherwise noted, shall be of new, first-quality manufacture, free from defects and suitable for the intended use. Where manufacture's names are used in the Specifications it is for the purpose of establishing the standard for quality and general configuration. Products of other manufacturers will be considered, provided they meet the same standards and the manufacture's name and product specifications are submitted to the Engineer for approval.
- B. Material specifications furnished under this contractor are found in the document titled "Irrigation Material Specifications – Gadii'ahi Farm Irrigation System Phase IV".
- C. The Contractor shall provide all permits, fees, labor, equipment and listed materials necessary to complete the work.
- D. All workmanship shall be of the highest quality.
- E. All work shall be performed in strict accordance with these Specifications, and the applicable national, state and tribal law, codes and regulations. In addition, manufacturer's instructions for all materials shall be strictly followed. In the event of disagreement between national, state or tribal codes and these Specifications, the codes shall prevail. Such situations shall be discussed with the Engineer prior to proceeding with the work in question.
- F. In the event of conflicts between Specifications, Drawings and field conditions, the Engineer shall be consulted. No changes in the design or construction method shall occur without the review and approval of the Engineer. If changes in the Drawings or Specifications are deemed necessary by the Contractor, details of such changes shall be submitted to the Engineer for review as soon as practical to allow time for review before installation.
- G. Materials damaged in the course of installation shall be repaired or replaced at the option of the Engineer. The Contractor shall be liable for damage during handling or installation of all materials, whether provided as a part of this Contract or provided by others, and shall repair or replace the material at the option of the Engineer at the Contractor's expense.

- H. Proper handling and storage of all materials and equipment prior to installation shall be the responsibility of the Contractor.
- I. Cost. The cost of all materials furnished by the Contractor and the cost of all work performed by the Contractor necessary to complete the project as described by the drawings and these specifications and the material specifications shall be included in the prices listed in the Bid Schedule.

1.03 WARRANTY

- A. Contractor shall warrant the work to be free from defects for a period of one year after completion of the project. Warranty shall cover all work performed by the Contractor and all materials provided by the Contractor.

PART 2 : SITE CONDITIONS, PREPARATION AND RESTORATION

2.01 GENERAL

- A. The pipeline route shall be staked every 100 ft and at all point of intersections. Elevation benchmarks are provided every 500 ft.
- B. During construction, disturbance of the area shall be minimized. Construction activity shall be kept to the right-of-way at all times. Activity outside the construction boundary shall be by permission from Gadii'ahi Chapter only. Keep project area neat and orderly at all times, free of rubbish and excess construction materials.
- C. Prevent contamination of the project area. Do not dump waste oil, fuel, rubbish or other similar contaminants on the ground or in any streambed. The Contractor shall avoid contamination of the aquifer, soil or streams with any contaminant and shall be liable for containment and cleanup of any such contamination at his own expense.
- D. Fence Gates. Access to parts of the project may be through existing gates in existing fences. The Contractor is responsible for keeping these gates closed during the project to prevent livestock movement.

2.02 ENVIRONMENTAL QUALITY PROTECTION

- A. Landscape Preservation. The Contractor shall be responsible for restoring any land disturbed by construction activities. This includes preserving the natural landscape by keeping construction impacts to a minimum, limiting all activity within the designated construction boundaries, cleaning the construction area during construction and after completion of the project, re-grading disturbed lands so natural contours are restored, and providing proper drainage to prevent erosion during and after construction. For agricultural fields, all ditches, furrows, and drainages shall be restored to original condition.
- B. Vegetation Preservation. The Contractor shall preserve and protect existing vegetation which is not required to be removed by construction activity
- C. Water Quality Management. The Contractor shall be responsible for any sediment and erosion control, wastewater control, and storm water management for all land within the construction boundary and any drainage to and from the construction boundary during the duration of the project. All Federal, State, and Tribal requirements for maintaining water quality during construction activity shall be met.
- D. Air Quality Management. The Contractor shall comply with any applicable Federal, State, or Tribal regulations governing air quality for construction activity for the duration of the project. This includes all equipment emissions and dust abatement.

- E. Cultural Preservation. The Contractor shall protect any sites identified by the Navajo Nation as having any historical, religious, scientific, pre-historical, or archeological significance warranting preservation. No such areas are known to be within the construction boundaries. Should the Contractor discover any additional historical, religious, scientific, pre-historical, or archeological findings, all work involving that site shall cease until clearance is obtained. Expenses incurred by the delay shall be negotiated. Any excess disturbances by the Contractor or any individual associated with the Contractor as judged by the Navajo Nation shall be subject to the full extent of the law.
- F. Payment. All material and labor costs associated with preserving environmental quality shall be included in the unit prices listed in the bid schedule.

2.03 SAFETY

- A. The Contractor shall fully comply with all Federal, State and Tribal safety regulations.

2.04 STAGING AND EQUIPMENT SERVICE AREA

- A. Gadii'ahi Chapter will designate a suitable equipment staging and service area for the Contractor within 2 miles of the project area. The staging and service area may be used for parking of equipment and storage of materials prior to installation. The Contractor shall be responsible for security at the staging area. Servicing of equipment and vehicles will be allowed only at the designated service area, except in cases where the repair must be performed on site before the equipment can be moved.
- B. Care shall be taken to avoid fuel and oil spills. All waste material, packaging and unused material shall be removed from the site upon completion of the Contract.
- C. The staging area shall be free of debris and re-graded to its original surface contour upon completion of the Contract.
- D. Payment. Costs associated with establishing and maintaining an equipment staging area shall be included with the unit prices listed in the bid schedule.

PART 3 – WORKMANSHIP

3.01 MATERIAL

- A. Specifications. See "Irrigation Material Specifications - Gadii'ahi Farm Irrigation System Phase IV".
- B. Payment. All costs for furnishing material as specified in "Irrigation Material Specifications – Gadii'ahi Farm Irrigation System Phase IV" shall be included in the applicable bid item.

3.02 CANAL CLEANING & DEMOLITION

- A. General. The existing canal where Phase IV pipeline shall be installed requires cleaning and demolition prior to pipe installation. Once demolition is completed, an earthen pad is formed that will be used for installing the underground pipeline. Each end of the section of canal to be cleaned and demolished shall be marked by others.
- B. Cleaning. All vegetation shall be removed from the existing canal. Vegetation shall be hauled to and disposed of by the filter station, approximately 2 miles east of the job site.
- C. Demolition. Once all vegetation has been removed, the canal shall be pushed in so that finished ground elevation is within 0.5 ft of the pad elevation shown on Drawings P430, P431 and P432.
- D. Payment. Payment for cleaning and demolishing the canal work per these Specifications and Drawings shall be included in the bid item 2.

3.03 EXCAVATION

- A. General. The Contractor shall be responsible for obtaining a one-call confirmation number from NM one call prior to any excavation.
- B. Survey. All point of intersections and the center line every 100 ft shall be staked by others. Elevation bench marks every 500 ft shall be set by others. All other survey requirements are furnished by the Contractor.
- C. Grade. Grade shall be controlled such that when the pipe is installed the invert elevation shall not deviate from that shown on Drawings P430, P431 and P432 by more than 0.1 ft. For slopes greater than 0.002 ft/ft, there shall be no reverse grades allowed. For slopes less than 0.002 ft/ft, there shall be no reverse grades greater than 0.1 ft (maximum deviation between high and low point).
- D. Trench Bottom Preparation. The bottom of the trench shall be clean and free from protruding stones larger than ½ inch in diameter, hard lumps, angular stones, or abrasive material, to allow the pipe to lie directly on earth in the bottom of the trench.
- E. Trench Width. The trench shall have a minimum width of the pipe diameter plus

8 inches on each side with the pipe centered in the trench. Up to the top of the pipe, the trench shall not be wider than the diameter of the pipe plus 12 inches on each side.

- F. Trench Depth. Unless specified, all pipe shall have a minimum cover depth of 3 feet. Over-excavation of a minimum of 2 inches may be required to prevent damage to the pipe by allowing room for bedding material.
- G. Bell Holes. Bell holes shall be excavated at each joint to prevent excess stress on the bell and to provide for proper joint alignment. The length of these bell holes shall be limited to that necessary to provide joint assembly.
- H. Safety. All appropriate and applicable safety precautions and regulations shall be followed during excavation, including trench shoring or sloped trench walls for protection of workers where required.

Open trenches shall be clearly marked with appropriate barricades when close to public access. All national, state and tribal safety regulations shall be followed.

- I. Payment. All costs associated with excavation per the Specifications and the Drawings shall be included in bid items 3, 4 and 5.

3.04 PVC PIPE INSTALLATION

- A. Handling. During installation, pipe shall be handled carefully to avoid any damage. Any damaged pipe during trenching and installation shall be replaced by the Contractor at the expense of the Contractor. Any debris in the pipe shall be removed prior to installation. During assembly, pipe ends shall not be left open when installation is not active at the open end. Keep the pipe ends blocked to prevent entry of foreign matter that might clog the system when flushing.
- B. Field Cutting. Where it is necessary to make field cuts in the pipe at fitting locations, the pipe may be cut using a hand saw, or power saw with a fine toothed blade or abrasive disk. Care should be taken to avoid chipping the pipe. If the pipe is chipped or cracked, it shall be re-cut to remove the damage area. After cutting, the pipe end shall be beveled to match the factory provided spigot end using a beveling tool, wood rasp, or power grinder. Prior to cutting or beveling, the pipe should be marked on its entire cut line to assure a straight cut. After cutting and beveling, the proper spigot penetration depth shall be marked on the pipe prior to assembly.
- C. Pipe Assembly. The assembly of the gasket jointed pipe shall be accomplished according to the manufacturer's specifications. Only manufacturer recommended lubricant shall be used. The gasket race, gasket, bell and spigot shall be thoroughly cleaned before assembly. Install the gasket prior to lubrication. Lubricate and assemble according to manufacturer's recommendations. Do not "bottom" the spigot in the bell during assembly. The proper depth of penetration will be marked on the pipe by the manufacturer. Assemble the joints in as straight an alignment as possible. The manufacturer's recommended maximum joint deflection shall not be exceeded at any time.

- D. Steel fittings. Unless specified, all direction changes shall be accomplished with a pre-fabricated steel elbow. Turnouts shall be accomplished by a pre-fabricated steel tee. The air vent at Station 101+77 shall be accomplished by a pre-fabricated steel tee.
- E. Steel Fitting Installation. Manufacturer directions shall be followed. All compression type couplers shall be tightened uniformly. Inspection is required of all compression couplers prior to wrapping. Once the inspection is completed, compression couplers shall be wrapped with plastic and duct tape to prevent moisture infiltration. All plastic wrapping material costs are included in this contract per 3.04H of these specifications.
- F. Steel Fitting Coating. All underground steel pipe (galvanized or epoxy included) shall be coated with an Amine-cured coal tar epoxy (black). A 3 mil. layer of coal tar epoxy shall be able to be applied in one application without using a primer. The coal tar epoxy shall be Amercoat 78HB or approved equal. All coating material costs are included in this contract per 3.04H of these specifications.
- G. Thrust Blocks. Thrust blocks are required for all horizontal tees, elbows, and termination ends. Concrete used for thrust blocks shall be a minimum 3,000 psi mix. Steel fittings shall be coated per 3.04F of these specifications. The thrust block shall be poured so that the bearing area specified in Drawing D451 is achieved. A minimum distance of 1 ft between the pipe and the undisturbed trench wall shall be maintained. Thrust blocks shall not be backfilled until 24 hours after they have been poured. All concrete material costs are included in this contract per 3.04H of these specifications.
- H. Payment. All costs associated with pipe installation per the Specifications and Drawings shall be included in bid items 3, 4 and 5.

3.05 BACKFILL

- A. General. Backfill shall follow shortly after the installation of the PVC. The material placed within the haunches of the pipe and at least 12 inches above the top of the pipe shall be free from stones larger than $\frac{3}{4}$ inch in diameter, angular stones, abrasive or frozen material, and free of debris or other organic materials. The backfill material shall be placed in a manner that minimizes voids throughout the trench but particularly around the pipe. Backfill below the haunches shall be compacted in 6-inch lifts to a density equal to 95 percent of a standard proctor. The final backfill (from at least 12" above the crown of the pipe to the top of the trench) shall be free from stones larger than 4 inches in diameter, clumps of frozen soil, rubble or other such material. In most cases, the material that was originally excavated can be used for final backfill. Following backfill of the trench, the surface shall be re-graded to the original ground surface with the trenched area mounded to allow for backfill settlement.
- B. Payment. The cost for backfilling the trench surface re-grading shall be included in bid items 3, 4 and 5.

3.06 TURNOUTS

- A. General. Turnouts consist of a 12-inch tee, a reducer from 12-inch to either 8-inch, 6-inch or 4-inch, a gate valve, PVC pipe, an air vent, a riser valve, and a globe valve as shown on Drawing D451.
- B. Location. Turnout locations shall be within 2 ft of the stationing shown on Drawings P430, P431 and P432.
- C. Gate Valve. The gate valve shall be installed as shown on Drawing D451. A small length of PVC pipe shall be installed on top of the gate valve nut operator and extended to the ground so that the top of the pipe is 12-inches above the ground surface.
- D. Steel Fittings. Steel fittings shall be installed as shown on Drawing D451 and comply with 3.04E of these specifications.
- E. Coating. All underground steel shall be coated per 3.04F of these specifications.
- F. Thrust Blocks. ½ yard thrust blocks shall be poured at the Turnout termination points as shown on Drawing D451. Thrust blocks shall comply with 3.04G of these specifications.
- G. Globe Valve Installation. Globe valves shall be installed as shown on Drawing D451. The globe valve shall rest upon a concrete block. Concrete blocks shall be included in the contract per 3.06H of these specifications.
- H. Payment. The cost for installing a turnout per the Drawings and Specifications shall be included in bid item 6.

3.07 DISASSEMBLY OF OUTLET STRUCTURE AND PRESSURE TEST

- A. General. Gadii'ahi Farm Irrigation System is being installed in phases. To accommodate this construction method, a temporary termination structure is at the end of Phase IV. Once installed, the pipeline may be pressure tested.
- B. Location and length. The pressure test shall be conducted at Station 174+50 as shown on Drawing D440. Total length of pipe tested is 17,450 ft.
- C. Transport. The Contractor shall carefully transport the steel pipe and fittings from the designated storage location. Any damage to the assembly during transporting shall be repaired or replaced by the Contractor at the expense of the Contractor.
- D. Assembly of Outlet Structure. Assembly of the outlet structure shall be completed as shown on Drawing D440. A new orifice plate with a 4-1/4 inch orifice shall replace the existing orifice plate. The manholes shall be installed first followed by the fitting and valves. Thrust blocks shall be poured as shown on Drawing D440 per 3.04G of these specifications. Prior to backfill, all steel shall be re-coated with coal tar epoxy. All backfill around the outlet structure

shall be compacted to 95 percent of standard proctor in 6-inch lifts. The transition between the manhole and the earthen ditch shall consist of a 6-inch sand and gravel filter and a 12-inch layer of well graded riprap as shown on Drawing D440.

- E. Air Test. All valves located at the filter station, at all turnouts, and at the outlet structure shall be closed. Air shall be injected into the pipeline until a pressure of 86 psi is reached. The air shall be shut off and the pipe monitored for 65-minutes. The test is successful if the decrease in pressure over the test period is less than 1 psig.
- F. Payment. The cost for completing the disassembly of the outlet structure per the Drawings and Specifications shall be included in bid item 7. The cost for pressure testing the pipeline per the Drawings and Specifications shall be included in bid item 10.

3.08 DRAINAGE

- A. General. Existing drain ditches shall be routed across the pipeline as shown on Drawings L420, D451, and D452. New drain ditches shall be constructed as shown on Drawing L420.
- B. Drainage Crossings at 106+14 and 166+47. These drainages are constructed over the top of the PVC pipeline as shown on Drawing D451 - Drain Crossing Detail. A concrete cap is poured over the top of the PVC pipe as shown on Drawing D451. All concrete material is included in this Contract per 3.04G of these Specifications.
- C. Drain Ditches. A two ft deep drain ditch shall be constructed on the south side of the construction right-of-way as shown on Drawing D452 in the locations shown on Drawing L420.
- D. Payment. The cost for completing drainage crossings at 106+14 and 166+47 per 3.08B of these Specifications and Drawing D451 shall be included in bid items 8 and 9. The costs for constructing new drain ditches per 3.08C of these Specifications and Drawing D452 shall be included in bid item 11.

END OF SECTION

BID SCHEDULE

No.	Description	Quantity	Unit Cost	Extension
1	Mobilization and Demobilization.	1 ea		
2	Clean and demolish existing earthen canal per these Specifications and Drawings.	7,373 ft		
3	Furnish and install 24-inch PVC pipeline per these Specifications and Drawings.	2,528 ft		
4	Furnish and install 21-inch PVC pipeline per these Specifications and Drawings.	1,775 ft		
5	Furnish and install 18-inch PVC pipeline per these Specifications and Drawings.	2,970 ft		
6	Furnish and install farm irrigation turnouts per these Specifications and Drawings.	15 ea.		
7	Disassemble the outlet structure per these Specifications and Drawings.	1 ea.		
8	Furnish and construct 106+14 drainage crossing per these Specifications and Drawings.	1 ea		
9	Furnish and construct 166+47 drainage crossing per these Specifications and Drawings.	1 ea		
10	Pressure test the pipeline per these Specifications and Drawings.	1 ea		
11	Construct new drain ditches per these Specifications and Drawings.	6,500 ft		
Total				
Navajo Nation Business Activity Tax (4%)				
Grand Total				

**GADII'AH I FARM IRRIGATION SYSTEM
PHASE IV**

**FINAL
ENVIRONMENTAL ASSESSMENT
AND
FINDING OF NO SIGNIFICANT IMPACT**

**Prepared for
Navajo Nation Department of Water Resources**

**Prepared by
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January 28, 2015



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**Navajo Nation
Department of Water Resources
Ft. Defiance, AZ**

FINDING OF NO SIGNIFICANT IMPACT

**Gadii'ahi Farm Irrigation System – Phase IV
San Juan County, New Mexico**

BIA-Navajo Region

Date

Director, NN Department of Water Resources

Date

Summary of the Proposed Action

The Gadii'ahi Chapter has received an EQIP contract from the Natural Resource Conservation District (NRCS) to convert 7,373 feet of the Gadii'ahi Canal into pipeline. The Chapter has also received materials purchased for the project by the Navajo Nation Department of Water Resources (NNDWR) using funding from the Bureau of Indian Affairs (BIA). This proposed action is Phase IV of an ongoing project that is classified as maintenance of the existing Gadii'ahi is converting the canal system downstream of the Gadii'ahi siphon to pipeline. This phase would serve 351 acres via 15 turnouts. The pipeline would follow the existing canal alignment and all construction activity would stay within a 50-foot construction right-of-way (ROW). The proposed action is considered maintenance of the existing Gadii'ahi Canal. The project is located on Navajo Trust Lands in the Gadii'ahi Chapter in San Juan County, New Mexico.

Background

This proposed action (Phase IV) is a continuation of the Gadii'ahi siphon project, formerly known as the Cudei siphon. The siphon project was funded by the San Juan River Basin Recovery Implementation Program (SJ RIP) in 2001 because it was determined that the original rock diversion dam was an impediment to endangered fish migration in the San Juan River. The siphon connected Gadii'ahi Canal to Hogback Canal and allowed for the removal of the rock diversion dam.

Environmental Impacts

The following factors were evaluated in detail for the Gadii'ahi Farm Irrigation System – Phase IV Environmental Assessment (EA). The factors evaluated include: land resources, water resources, air quality, vegetation and wildlife, noxious weeds, federal and state listed species, soil erosion, cultural and archaeological resources, Indian trust assets, socioeconomics, environmental justice, and visual resources. These resources are discussed in further detail in the EA document.

Land Resources

The proposed project follows the existing canal alignment and all construction activities would remain within a 50-foot corridor long recognized by the community as part of the canal. This corridor includes an access road running parallel to the canal. The lands adjacent to the canal and access roads primarily consist of Navajo Nation permitted farm leases with sporadic residential home site leases. No legal easement exists for Navajo owned canals and ditches and no legal descriptions exist for permitted farm leases. This project will apply for an easement for the completed pipeline.

Water Resources

The project area contains no lakes, ponds, or perennial streams nor does it contain wetlands or riparian habitats. The proposed pipeline would eliminate seepage that currently returns to the San Juan River. Eliminating this seepage would also reduce salt and selenium loading to the San Juan River. The project area does cross two drainages that flow during storm events and the existing canal intercepts storm run-off from adjacent lands. A new interceptor ditch would be constructed to protect downstream farm land and residences from storm water runoff that is currently captured by the Gadii'ahi canal.

Air Quality

Some fugitive dust is expected during construction. However, a water truck would be used to minimize dust during construction.

Vegetation and Wildlife

Soil and vegetation disturbance would be kept to a minimum during this project. All construction activities would be kept within a 50-foot construction ROW. Disturbed areas would be reseeded with native vegetation upon completion of the project. Numerous bird species have the potential to nest within the project area. However, the potential impacts to migratory birds is considered low because all construction activities are scheduled to occur outside the breeding bird season.

Noxious Weeds

Five Navajo Region class B noxious weed species have been identified in the project area. The proposed action has the potential to spread the seeds of the plants identified. However, proper removal of existing noxious weeds followed by an aggressive reseeding program would minimize the potential for reestablishment of noxious weeds in the project area. Furthermore, many of the noxious weeds currently rely on seepage water from the canal. By eliminating the canal seepage, it will be more difficult for future noxious weeds to become established.

Federal and State Listed Species

The proposed action would have no effect to endangered, threatened, or candidate species in the project area.

Soil Erosion

The project would be required to implement a Storm Water Pollution and Prevention Plan as required by Section 402 of the Clean Water Act. All soil and vegetation disturbance would be minimized and limited to the 50-foot construction ROW.

Cultural and Archaeological Resources

All cultural and archaeological sites that have been identified would be avoided by staying within the 50-foot construction ROW. If cultural or archaeological sites are encountered, all construction activities would stop and the Navajo Nation Historic Preservation Department would be contacted immediately.

Indian Trust Assets

There are no Indian Trust Assets within the project area.

Socioeconomics

The proposed action would provide pressurized irrigation water to 351 acres currently flood irrigated by Gadii'ahi farmers. This would allow farmers to utilize higher efficiency sprinkle irrigation methods, which provides the potential for increased crop yields and profits. The project will also utilize Navajo labor and equipment providing temporary construction jobs to an area with a higher than average unemployment rate.

Environmental Justice

The proposed action would not unequally affect any minority or low income populations in the project area.

Visual Resources

Temporary construction impacts would occur such as dust and noise, and the visual impacts of the construction equipment. The proposed action would have no lasting visual impacts and all lands would be properly graded and reseeded with native vegetation. Furthermore, the elimination of canal seepage would eliminate water currently being used by established noxious weeds, thereby making it more difficult for noxious weeds to reestablish.

Cumulative Impacts

Cumulative impacts of the proposed action would be short-term construction related impact such as soil and vegetation disturbance, dust, and noise. No long-term adverse impacts are expected. The proposed action would provide a long-term positive impact to the San Juan River by reducing salt and selenium loading from project area canal seepage. The project also reduces operations and maintenance costs for the Navajo Nation, better distributes water to farmers, provides pressurized irrigation, and creates temporary jobs for Navajo workers.

Conclusion

Based on the results of this EA, it has been found that there would be no significant impacts associated with the proposed action and makes the Finding of No Significant Impact (FONSI) pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Navajo Nation EPA NEPA compliance procedures (43 CFR Part 46). This EA concludes that the proposed action does not constitute a major Federal action that would significantly impact the environment. Thus, no environmental impact statement (EIS) is required for this proposed action.

TABLE OF CONTENTS

LIST OF TABLES	VI
LIST OF FIGURES.....	VI
1.0 PURPOSE OF AND NEED FOR ACTION	1
1.1 INTRODUCTION	1
1.2 BACKGROUND	1
1.3 PROPOSED ACTION	1
1.4 PURPOSE OF AND NEED FOR PROPOSED ACTION	1
2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES	3
2.1 INTRODUCTION	3
2.2 NO ACTION ALTERNATIVE	3
2.3 PROPOSED ACTION ALTERNATIVE	3
3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	6
3.1 INTRODUCTION	6
3.2 LAND RESOURCES	6
3.3 WATER RESOURCES	6
3.4 AIR QUALITY	6
3.5 VEGETATION AND WILDLIFE	6
3.6 NOXIOUS WEEDS	7
3.7 FEDERAL AND STATE LISTED SPECIES	7
3.8 SOIL EROSION	7
3.9 CULTURAL AND ARCHAEOLOGICAL RESOURCES	8
3.10 INDIAN TRUST ASSETS	8
3.11 SOCIOECONOMICS	8
3.12 ENVIRONMENTAL JUSTICE	8
3.13 VISUAL RESOURCES	8
3.14 CUMULATIVE IMPACTS	9
3.15 ENVIRONMENTAL COMMITMENTS	9
4.0 CONSULTATION AND COORDINATION	10
4.1 PERSONS AND AGENCIES CONSULTED	10
5.0 LIST OF PREPARERS	11
5.1 KELLER-BLIESNER ENGINEERING AND DODGE ENVIRONMENTAL CONTRIBUTORS	11
5.2 BUREAU OF INDIAN AFFAIRS CONTRIBUTORS	11
6.0 REFERENCES	12

APPENDIX A – THREATENED AND ENDANGERED SPECIES LISTS	13
APPENDIX B – PUBLIC AND AGENCY CORRESPONDENCE.....	22
APPENDIX C – DESIGN DRAWINGS	43
APPENDIX D – CUDEI SIPHON OWNER’S MANUAL	49

LIST OF TABLES

Table 1. Summary of Effects of Federally Listed Species (Dodge 2014).....	8
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LIST OF FIGURES

Figure 1. Gadli’ahi Irrigation System Phase IV Location Map.....	4
Figure 2. Gadli’ahi Irrigation System Phase IV Project Schedule	5

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The Gadii'ahi Canal was constructed by farmers from the Gadii'ahi Chapter in 1880. Over the years, numerous improvements have been made to the canal system to improve efficiency while mitigating negative impacts to endangered fish in the San Juan River. In 2001, an inverted siphon was used to tie Gadii'ahi Canal into the Hogback Canal. This allowed for the removal of the existing Gadii'ahi Canal diversion structure in the San Juan River that was impeding the migration of the endangered fish. Beginning in 2006, portions of the canal immediately downstream of the siphon have been converted to pipeline to provide pressurized irrigation water to Gadii'ahi farmers. Thus far, there have been 10,177 feet of canal that have been converted to pipeline.

1.2 BACKGROUND

Gadii'ahi Chapter, formerly known as Cudei, is a chapter of the Navajo Nation and a farm community with a total population of approximately 1,000 people located on the south bank of the San Juan River four miles west of Shiprock, NM. Gadii'ahi Chapter has a total of 668 acres of permitted irrigated land and 49 farmers listed as Land Use Permit holders.

The original Gadii'ahi canal was hand dug by chapter members using manual labor and draft animals. Later, the Bureau of Indian Affairs (BIA) followed by NNDWR improved the canal and became responsible for the operation and maintenance of the system. In 2003, the San Juan River Dineh Water Users, Inc. (SJRDU) began to assist NNDWR in operating the canal.

1.3 PROPOSED ACTION

In 2011, the Gadii'ahi Chapter entered into an EQIP contract with NRCS to convert an additional 7,373 feet of the Gadii'ahi Canal to pipeline (Phase IV). This proposed action further extends the pipeline downstream of the SJRIP funded Cudei siphon that was constructed to improve endangered fish migration on the San Juan River. This phase would serve 351 acres from 15 turnouts. The proposed pipeline follows the existing canal alignment and would stay within a 50-foot construction ROW. An easement for the completed pipeline will be obtained by NNDWR. The project is located on Navajo Trust Lands in the Gadii'ahi Chapter in San Juan County, New Mexico (Figure 1). The legal description is Township 31 North, Range 18 West of Section 31 and Township 31 North, Range 19 West of Section 36, New Mexico Principal Meridian.

1.4 PURPOSE OF AND NEED FOR PROPOSED ACTION

Gadii'ahi Canal originally diverted water from the San Juan River via a rock diversion dam with a sluiceway structure and extended approximately 5.5 miles from the diversion structure to the end of the farmland. Sedimentation of the intake channel at the diversion structure and displacement of rocks in the dam during high flow events reduced the efficiency of the structure during low flow periods of the San Juan River. In 2000, SJRIP determined that the diversion structure was an impediment to endangered fish migration. In 2001, BIA replaced the diversion with an inverted siphon under the San Juan River connecting Gadii'ahi Canal to Hogback Canal as a contribution to SJRIP and designed to aid in the recovery of endangered fish.

Summary of the Proposed Action

The Gadii'ahi Chapter has received an EQIP contract from the Natural Resource Conservation District (NRCS) to convert 7,373 feet of the Gadii'ahi Canal into pipeline. The Chapter has also received materials purchased for the project by the Navajo Nation Department of Water Resources (NNDWR) using funding from the Bureau of Indian Affairs (BIA). This proposed action is Phase IV of an ongoing project that is classified as maintenance of the existing Gadii'ahi is converting the canal system downstream of the Gadii'ahi siphon to pipeline. This phase would serve 351 acres via 15 turnouts. The pipeline would follow the existing canal alignment and all construction activity would stay within a 50-foot construction right-of-way (ROW). The proposed action is considered maintenance of the existing Gadii'ahi Canal. The project is located on Navajo Trust Lands in the Gadii'ahi Chapter in San Juan County, New Mexico.

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The following factors were evaluated in detail for the Gadii'ahi Farm Irrigation System – Phase IV Environmental Assessment (EA). The factors evaluated include: land resources, water resources, air quality, vegetation and wildlife, noxious weeds, federal and state listed species, soil erosion, cultural and archaeological resources, Indian trust assets, socioeconomics, environmental justice, and visual resources. These resources are discussed in further detail in the EA document.

Land Resources

The proposed project follows the existing canal alignment and all construction activities would remain within a 50-foot corridor long recognized by the community as part of the canal. This corridor includes an access road running parallel to the canal. The lands adjacent to the canal and access roads primarily consist of Navajo Nation permitted farm leases with sporadic residential home site leases. No legal easement exists for Navajo owned canals and ditches and no legal descriptions exist for permitted farm leases. This project will apply for an easement for the completed pipeline.

Water Resources

The project area contains no lakes, ponds, or perennial streams nor does it contain wetlands or riparian habitats. The proposed pipeline would eliminate seepage that currently returns to the San Juan River. Eliminating this seepage would also reduce salt and selenium loading to the San Juan River. The project area does cross two drainages that flow during storm events and the existing canal intercepts storm run-off from adjacent lands. A new interceptor ditch would be constructed to protect downstream farm land and residences from storm water runoff that is currently captured by the Gadii'ahi canal.

Air Quality

Some fugitive dust is expected during construction. However, a water truck would be used to minimize dust during construction.

Vegetation and Wildlife

Soil and vegetation disturbance would be kept to a minimum during this project. All construction activities would be kept within a 50-foot construction ROW. Disturbed areas would be reseeded with native vegetation upon completion of the project. Numerous bird species have the potential to nest within the project area. However, the potential impacts to migratory birds is considered low because all construction activities are scheduled to occur outside the breeding bird season.

Noxious Weeds

Five Navajo Region class B noxious weed species have been identified in the project area. The proposed action has the potential to spread the seeds of the plants identified. However, proper removal of existing noxious weeds followed by an aggressive reseeding program would minimize the potential for reestablishment of noxious weeds in the project area. Furthermore, many of the noxious weeds currently rely on seepage water from the canal. By eliminating the canal seepage, it will be more difficult for future noxious weeds to become established.

Federal and State Listed Species

The proposed action would have no effect to endangered, threatened, or candidate species in the project area.

Soil Erosion

The project would be required to implement a Storm Water Pollution and Prevention Plan as required by Section 402 of the Clean Water Act. All soil and vegetation disturbance would be minimized and limited to the 50-foot construction ROW.

Cultural and Archaeological Resources

All cultural and archaeological sites that have been identified would be avoided by staying within the 50-foot construction ROW. If cultural or archaeological sites are encountered, all construction activities would stop and the Navajo Nation Historic Preservation Department would be contacted immediately.

Indian Trust Assets

There are no Indian Trust Assets within the project area.

Socioeconomics

The proposed action would provide pressurized irrigation water to 351 acres currently flood irrigated by Gadii'ahi farmers. This would allow farmers to utilize higher efficiency sprinkle irrigation methods, which provides the potential for increased crop yields and profits. The project will also utilize Navajo labor and equipment providing temporary construction jobs to an area with a higher than average unemployment rate.

Environmental Justice

The proposed action would not unequally affect any minority or low income populations in the project area.

Visual Resources

Temporary construction impacts would occur such as dust and noise, and the visual impacts of the construction equipment. The proposed action would have no lasting visual impacts and all lands would be properly graded and reseeded with native vegetation. Furthermore, the elimination of canal seepage would eliminate water currently being used by established noxious weeds, thereby making it more difficult for noxious weeds to reestablish.

Cumulative Impacts

Cumulative impacts of the proposed action would be short-term construction related impact such as soil and vegetation disturbance, dust, and noise. No long-term adverse impacts are expected. The proposed action would provide a long-term positive impact to the San Juan River by reducing salt and selenium loading from project area canal seepage. The project also reduces operations and maintenance costs for the Navajo Nation, better distributes water to farmers, provides pressurized irrigation, and creates temporary jobs for Navajo workers.

Conclusion

Based on the results of this EA, it has been found that there would be no significant impacts associated with the proposed action and makes the Finding of No Significant Impact (FONSI) pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Navajo Nation EPA NEPA compliance procedures (43 CFR Part 46). This EA concludes that the proposed action does not constitute a major Federal action that would significantly impact the environment. Thus, no environmental impact statement (EIS) is required for this proposed action.

TABLE OF CONTENTS

LIST OF TABLES	VI
LIST OF FIGURES.....	VI
1.0 PURPOSE OF AND NEED FOR ACTION.....	1
1.1 INTRODUCTION.....	1
1.2 BACKGROUND.....	1
1.3 PROPOSED ACTION.....	1
1.4 PURPOSE OF AND NEED FOR PROPOSED ACTION.....	1
2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES.....	3
2.1 INTRODUCTION.....	3
2.2 NO ACTION ALTERNATIVE	3
2.3 PROPOSED ACTION ALTERNATIVE.....	3
3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	6
3.1 INTRODUCTION.....	6
3.2 LAND RESOURCES	6
3.3 WATER RESOURCES	6
3.4 AIR QUALITY	6
3.5 VEGETATION AND WILDLIFE.....	6
3.6 NOXIOUS WEEDS.....	7
3.7 FEDERAL AND STATE LISTED SPECIES	7
3.8 SOIL EROSION.....	7
3.9 CULTURAL AND ARCHAEOLOGICAL RESOURCES	8
3.10 INDIAN TRUST ASSETS.....	8
3.11 SOCIOECONOMICS.....	8
3.12 ENVIRONMENTAL JUSTICE	8
3.13 VISUAL RESOURCES	8
3.14 CUMULATIVE IMPACTS.....	9
3.15 ENVIRONMENTAL COMMITMENTS	9
4.0 CONSULTATION AND COORDINATION	10
4.1 PERSONS AND AGENCIES CONSULTED	10
5.0 LIST OF PREPARERS	11
5.1 KELLER-BLIESNER ENGINEERING AND DODGE ENVIRONMENTAL CONTRIBUTORS.....	11
5.2 BUREAU OF INDIAN AFFAIRS CONTRIBUTORS	11
6.0 REFERENCES.....	12

APPENDIX A – THREATENED AND ENDANGERED SPECIES LISTS	13
APPENDIX B – PUBLIC AND AGENCY CORRESPONDENCE.....	22
APPENDIX C – DESIGN DRAWINGS.....	43
APPENDIX D – CUDEI SIPHON OWNER’S MANUAL	49

LIST OF TABLES

Table 1. Summary of Effects of Federally Listed Species (Dodge 2014).....	8
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LIST OF FIGURES

Figure 1. Gadii’ahi Irrigation System Phase IV Location Map.....	4
Figure 2. Gadii’ahi Irrigation System Phase IV Project Schedule	5

Gadii'ahi siphon consists of a head gate on Hogback Canal, 7,341 feet of 21-inch PVC pipe, and an outlet structure to Gadii'ahi Canal. The siphon crosses under the San Juan River near the head of Gadii'ahi Canal. In 2003, Gadii'ahi Chapter commissioned a master plan that utilizes the siphon to develop a pressurized irrigation system for the chapter.

In 2006, SJRDWU using funding obtained by both Gadii'ahi Chapter and SJRDWU, pressurized the siphon by installing a valve on the end of the pipeline. SJRDWU also installed a filter station at the old end of the siphon and extended the pipeline 3,656 feet (Phase I). In 2008, SJRDWU extended the pipeline another 2,496 feet (Phase II). In 2012, SJRDWU extended the pipeline another 4,025 feet (Phase III).

Phase IV extends the pipeline downstream of the Gadii'ahi siphon by 7,373 feet and provides pressurized irrigation water to an additional 351 acres in the Gadii'ahi Chapter. The proposed action also has positive environmental consequences for the San Juan River by eliminating canal seepage. This seepage ultimately returns to the San Juan River with increased salt and selenium loading that is leached from soils along the flow path.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This section describes the two alternatives analyzed. The first is the No Action Alternative and the second is the Proposed Action Alternative. There were no other alternatives considered during the decision making process.

2.2 NO ACTION ALTERNATIVE

The No Action Alternative would continue to operate the existing Gadii'ahi Irrigation System in its current condition. This means gravity water would be delivered to the 351 acres that are affected by the proposed action. The canal seepage would continue to discharge to the San Juan River. The canal currently intercepts storm water runoff thereby providing some protection to adjacent farmland. Operation and maintenance costs will remain the same and water distribution will not be modified.

2.3 PROPOSED ACTION ALTERNATIVE

The Proposed Action Alternative would convert 7,373 feet of the Gadii'ahi Canal to pipeline. The proposed pipeline would be CL 125 PIP PVC in 24, 21 and 18-inch diameters and would stay within a 50-foot construction ROW following the alignment of the existing Gadii'ahi Canal (Figure 1). Appendix C contains the design drawings for the proposed project. This is Phase IV of canal to pipeline conversion. The project would be constructed according to the schedule shown in Figure 2.

The proposed action would provide pressurized irrigation water to an additional 351 acres. It also eliminates canal seepage and the salinity and selenium loading that is leached from the soil profile and discharged into the San Juan River.

A new interceptor ditch that collects storm water runoff would be constructed parallel to the canal in some sections since the canal is being replaced by the pipeline.

The Gadii'ahi farm irrigation system would continue to be operated and maintained as has been done previously and in accordance with the Cudei Siphon Owner's Manual (Appendix D). The NNDWR would continue to be responsible for the operation and maintenance of the conveyance system, assisted by SJRDWU.

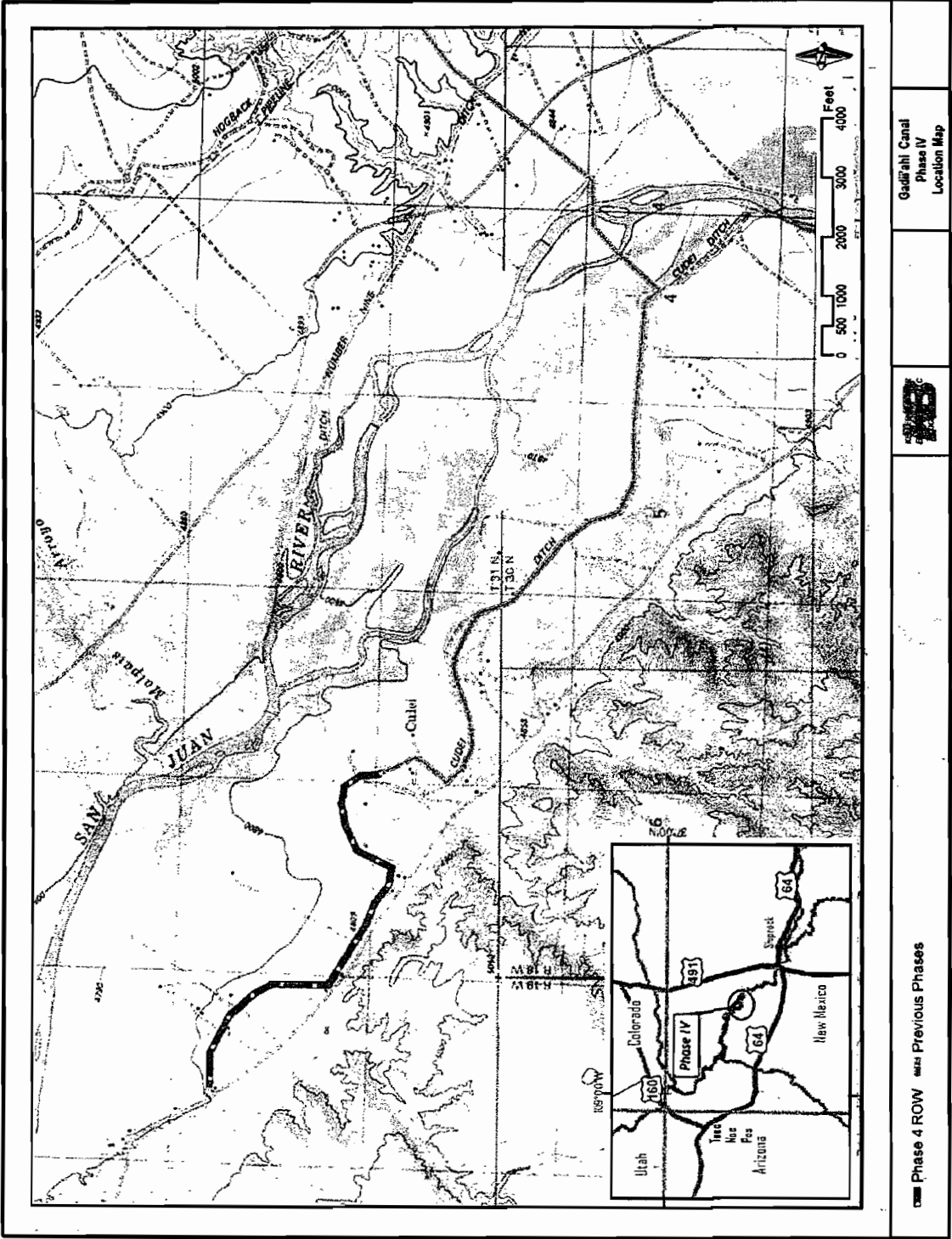


Figure 1. Gadi'ahi Irrigation System Phase IV Location Map

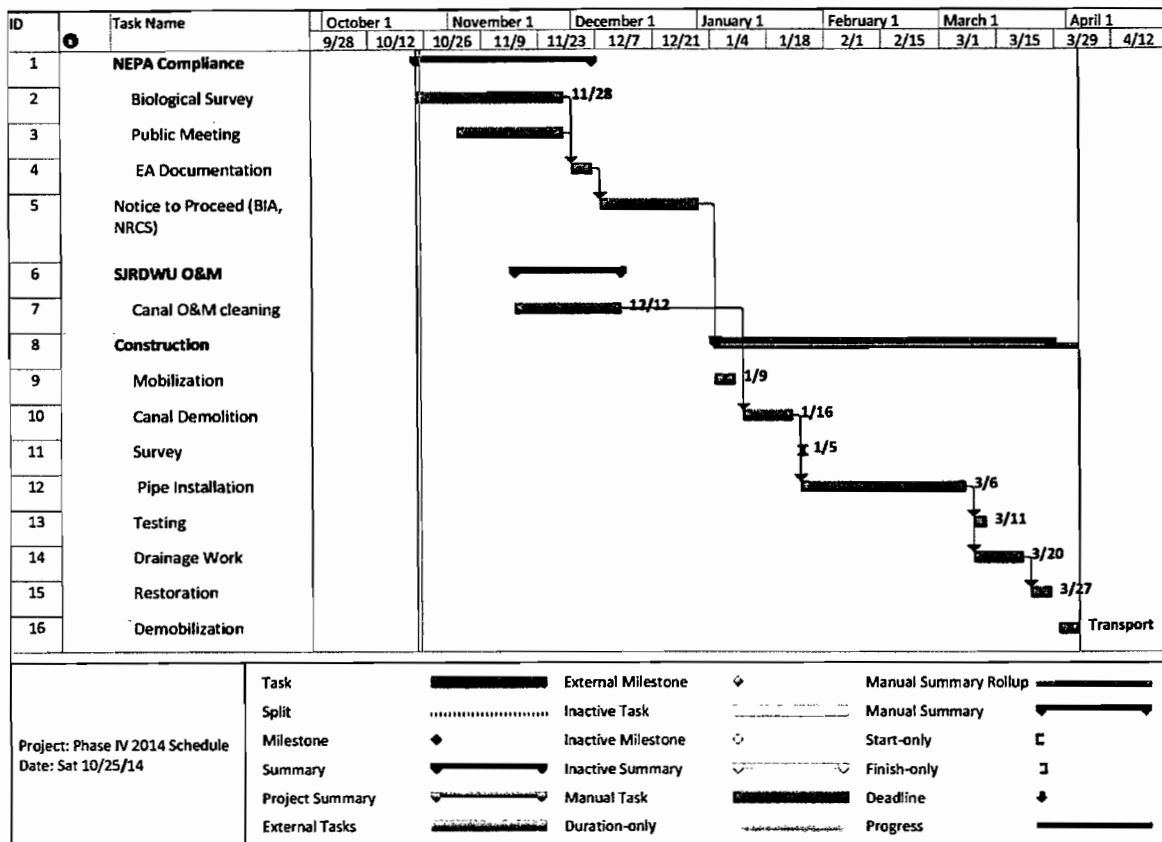


Figure 2. Gadli'ahi Irrigation System Phase IV Project Schedule

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This sections describes the condition of the environmental resources and the potential effects of the proposed action on those resources.

3.2 LAND RESOURCES

The proposed action is located on the south side of the San Juan River in the upper fluvial plain (Figure 1). The project area topography is flat terrain (0-1%) with a northerly aspect and an elevation of about 4,800 feet (Dodge 2014). The proposed project follows the existing canal alignment and would remain within a 50-foot corridor long recognized by the community as part of the canal. This corridor includes an access road running parallel to the canal. The lands adjacent to the canal and access roads primarily consist of Navajo Nation permitted farm leases with sporadic residential home site leases. No legal easement exists for Navajo owned canals and ditches and no legal descriptions exist for permitted farm leases. This project will apply for an easement for the completed pipeline. The soils are alluvium deposits that consist of sandy clay loams, to sand to fine sandy loam (Dodge 2014).

3.3 WATER RESOURCES

There are no perennial streams, lakes, or ponds within the proposed project area and does not contain any wetlands or riparian habitats (Dodge 2014). The proposed pipeline crosses two ephemeral drainages near Stations 106+14 and 166+47 (Drawings P4310 and P432, Appendix C).

The proposed action would eliminate seepage and evaporation losses along the 7,373 feet of existing canal. The action also increases the conveyance efficiency of the Gadii'ahi irrigation system while providing gravity pressurized irrigation water to 351 acres. The free pressurized irrigation water would allow farmers to use sprinkle irrigation technologies, which would increase irrigation efficiency. Furthermore, the elimination of canal seepage along the proposed project area would reduce salt and selenium loading to the San Juan River.

With the removal of the existing open canal system, a new interceptor ditch would be constructed as part of this proposed action. This ditch would help to protect downstream farm land and residential property from storm water runoff.

3.4 AIR QUALITY

During construction, the proposed action would cause temporary increases in dust. However, a water truck would be used to minimize dust during construction. No air-related permitting is required through the Navajo Nation EPA for the proposed action.

3.5 VEGETATION AND WILDLIFE

The proposed project area is classified as agricultural with irrigated land. The Dodge (2014) survey found that the project area vegetation is dominated by herbaceous species including quackgrass (*Elytrigia repens*), Italian ryegrass (*Lolium multiflorum*), and barnyard grass (*Echinochloa crus-galli*). No riparian vegetation was found in the survey. Dodge (2014) found that the dominant shrub and tree species are thin strips of coyote

willow (*Salix exigua*), cottonwood (*Populus deltoids* spp. *wislizeni*), and sporadic Chinese elm (*Ulmus pumila*).

Numerous bird species have the potential to nest within the proposed action area. No nests were identified during the Dodge (2014) survey. The potential impacts to migratory birds is generally low given the level of disturbance and the proposed construction schedule that is outside the breeding bird season (Dodge 2014). Should construction occur within the breeding bird season (April 15 to August 15), nest clearance surveys would be conducted as required by NNDFW.

3.6 NOXIOUS WEEDS

The Dodge (2014) survey of the proposed construction ROW identified russian knapweed (*Acroptilon repens*), musk thistle (*Carduus nutans*), spiny cocklebur (*Xanthium spinosum*), salt cedar (*Tamarix ramosissima*), and halogeton (*Halogeton glomeratus*) within the proposed project area. These five noxious weed plants are BIA Navajo Region class B species. For a more detailed description of the extent and location of the noxious weed species found within the proposed project area see the Dodge (2014) Biological Clearance letter.

3.7 FEDERAL AND STATE LISTED SPECIES

A biological resources survey for the proposed action area was conducted by Dodge Environmental, LLC (Dodge 2014). This survey concluded that the proposed project is located within the designated community development Area 4. The Navajo Nation Department of Fish and Wildlife (NNDFW) has determined that Area 4 does not support the habitat for Navajo Endangered Species List (NESL) species of concern and thus, Dodge Environmental concluded that the project can proceed without preparing a Biological Evaluation (BE) report (Dodge 2014). There are eight federally listed endangered or threatened species and one candidate species that have been designated for San Juan County, New Mexico. Table 1 shows the determination of effect for each of the listed species. Dodge (2014) determined that there would be no effect for any of the listed species. Furthermore, in the NNDFW consultation letter, dated October 28, 2014, concluded that the proposed action was not expected to affect any federally listed species or significantly impact any tribally listed species or other species of concern (Appendix B). A BE was completed for part of the Phase IV alignment in 2009 (Dodge 2009). The 2009 BE concluded that no endangered species were to be adversely affected by the project. A Biological Resources Compliance form was issued in 2014 as a result of this BE (Appendix B).

3.8 SOIL EROSION

The proposed action would keep soil and vegetation disturbance within the 50-foot construction ROW. The extent of vegetation disturbance would be minimized through preparing and implementing a Storm Water Pollution and Prevention Plan, required by Section 402 of the Clean Water Act. Furthermore, the proposed action would construct a new interceptor ditch to collect storm water runoff that currently is captured by the Gadil'ahi Canal.

Table 1. Summary of Effects of Federally Listed Species (Dodge 2014)

Species	Status	Determination of Effect
Birds		
Southwestern willow flycatcher	Endangered	No Effect
Sprague's pipit	Candidate	No Effect
Yellow-billed cuckoo	Threatened	No Effect
Fishes		
Colorado pikeminnow	Endangered	No Effect
Razorback sucker	Endangered	No Effect
Zuni bluehead sucker	Endangered	No Effect
Plants		
Knowlton's cactus	Endangered	No Effect
Mancos milk-vetch	Endangered	No Effect
Mesa Verde cactus	Threatened	No Effect

3.9 CULTURAL AND ARCHAEOLOGICAL RESOURCES

The archeological survey, dated July 30, 2009, and the Cultural Resources Compliance Form, both in Appendix B, covers the entire proposed project area. The survey located one new archaeological site, one isolated occurrence, and 16 in-use areas (IUAs) were identified. Two of these sites are considered register-eligible properties. However, these sites would be avoided because all construction activity would be limited to the 50-foot construction ROW.

3.10 INDIAN TRUST ASSETS

Indian Trust Assets (ITAs) are legal interests in assets held in trust by the U.S. Government for Native American tribes. These assets can include lands, water rights, minerals, money, claims, or other natural resources. The proposed project is located on the Navajo Nation Tribal Trust lands. There are no ITAs within the project area.

3.11 SOCIOECONOMICS

The proposed action would provide pressurized irrigation water to farmers of the 351 acres being served. This would allow farmers to implement higher efficiency sprinkle irrigation on these lands. Providing the potential for increases crop yields and profits. The project will also utilize Navajo labor and equipment providing temporary construction jobs to an area with a higher than average unemployment rate.

3.12 ENVIRONMENTAL JUSTICE

The proposed action is designed to serve the Gadaii'ahi Chapter of the Navajo Nation. Implementation of the proposed action does not unequally affect any low-income or minority communities in the project area.

3.13 VISUAL RESOURCES

The impacts of the proposed action include temporary construction impacts such as dust, noise, and the visual impacts of construction equipment. However, once completed the

proposed action would have no lasting visual impacts due to the buried pipeline. The land would be restored to a grade comparable to adjacent areas.

3.14 CUMULATIVE IMPACTS

The cumulative impacts of the proposed action would be short-term construction related impacts such as soil and vegetation disturbance, dust, and noise. No long-term adverse cumulative impacts are expected. The elimination of canal seepage would be a long-term positive impact for the San Juan River by eliminating the selenium and salinity loads returning to the river due to seepage.

The proposed action is not expected to significantly change storm water runoff management. Currently the Gadii'ahi Canal captures some storm water runoff. This would no longer be the case once the canal is converted to pipeline. However, a new interceptor ditch is included in the proposed action to capture storm water runoff.

The proposed project would also reduce operations and maintenance costs for the Navajo Nation, better distribute water to farmers, provide pressurized irrigation, and create temporary jobs for Navajo workers.

3.15 ENVIRONMENTAL COMMITMENTS

- Should archeological evidence, artifacts or remains be discovered during the proposed action, work would cease at that location and the Navajo Nation Historic Preservation Department would be immediately contacted.
- Upon completion of the proposed action, native grasses would be seeded in disturbed areas. All work areas would be cleaned up and all garbage, materials, and equipment would be removed.
- Soil erosion would be minimized by following typical construction BMPs during all construction activities.
- All construction activities would occur within the existing 50-foot canal corridor.
- A water truck would be used to control fugitive dust in disturbed areas where heavy equipment is working during dry conditions.
- Construction is scheduled to occur outside the breeding bird season (April 15 to August 15). Should the construction extend past April 15, nest clearance surveys would be required during construction as required by NNDFW. If nests are encountered during those surveys, 50-foot buffers would be established around the nests to protect them from construction-related activities.

4.0 CONSULTATION AND COORDINATION

This section contains the persons and agencies consulted in development of this EA. A Gadii'ahi Chapter public meeting was held on November 16, 2014 and all in attendance were in favor of the project. A resolution was passed authorizing chapter officials to proceed with an agreement with San Juan River Dineh Water Users to finance the construction project. Appendix B contains copies of public and agency correspondence.

4.1 PERSONS AND AGENCIES CONSULTED

- Carol Etcitty-Rogers, President, Gadii'ahi Chapter
- Rosie Frank, Vice President, Gadii'ahi Chapter
- Lenora Tsosie, Secretary/Treasurer, Gadii'ahi Chapter
- Sylvia Tyler, Coordinator, Gadii'ahi Chapter
- Gilbert Harrison, President, San Juan River Farm Board
- Rudy Keedah, Bureau of Indian Affairs
- Mary Lujan, Bureau of Indian Affairs, Shiprock Agency
- Gary Smith, Shiprock Office Conservationist, NRCS
- David Tallman, Civil Engineer, NNDWR
- Marlin Saggboy, Shiprock Irrigation Supervisor, NNDWR
- Morris Johnson, President, SJRDWU
- Martin Duncan, Superintendent, SJRDWU
- Steve Austin, Senior Hydrologist, Navajo EPA
- William Tsosie, Navajo Nation Archaeological Department
- Alan Downer, Navajo Nation Historical Preservation Officer

5.0 LIST OF PREPARERS

5.1 KELLER-BLIESNER ENGINEERING AND DODGE ENVIRONMENTAL CONTRIBUTORS

Name	Responsibility	Qualification	Participation
Mike Isaacson, Keller-Bliesner Engineering	Project Manager	Civil Engineering P.E.; B.S. Irrigation Engineering; 20 years professional experience	Project management and construction drawings.
Shawn Stout, Keller-Bliesner Engineering	Environmental and Water Resources Engineer	Civil Engineering P.E.; B.S. Environmental Engineering, M.S. Water Resources Engineering; 17 years professional experience	Document development and environmental analysis.
Marvin Lewis, Keller-Bliesner Engineering	GIS Analyst	Civil Engineering P.E.; B.S. Irrigation Engineering; 20 years professional experience	GIS Mapping
John Dodge, Dodge Environmental	Biologist	Principal Biologist	Threatened and Endangered species, wildlife and vegetation analysis.

5.2 BUREAU OF INDIAN AFFAIRS CONTRIBUTORS

- Harrilene Yazzie, Supervisory Environmental Protection Specialist
- Jacilyn Snyder, Environmental Protection Specialist

6.0 REFERENCES

Dodge Environmental, LLC (Dodge), 2014. Gadii'ahi Farm Irrigation System Phase IV Project Biological Resources Clearance. November 12, 2014.

Dodge Environmental, LLC (Dodge), 2009. Biological Evaluation Gadii'ahi Chapter Irrigation Pipeline System Improvement Project.

APPENDIX A – THREATENED AND ENDANGERED SPECIES LISTS



U.S. Fish and Wildlife Service

Trust Resources List

This resource list is to be used for planning purposes only — it is not an official species list.

Endangered Species Act species list information for your project is available online and listed below for the following FWS Field Offices:

New Mexico Ecological Services Field Office
2105 OSUNA ROAD NE
ALBUQUERQUE, NM 87113
(505) 346-2525
<http://www.fws.gov/southwest/es/NewMexico/>
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Project Name:

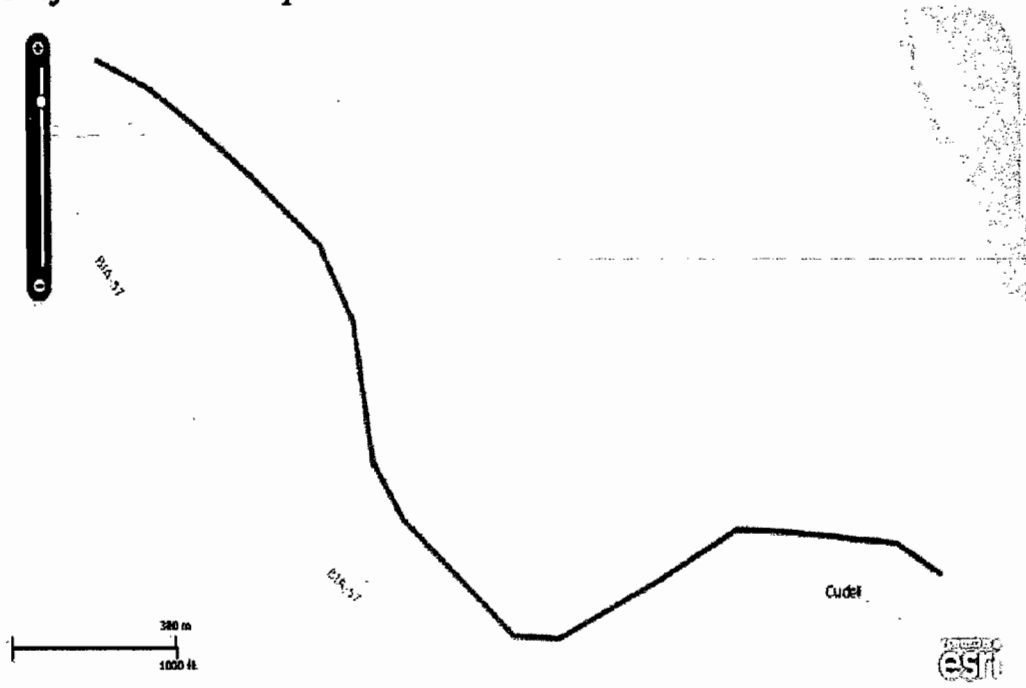
Gadii'ahi Farm Irrigation System Phase IV Project



U.S. Fish and Wildlife Service

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Project Location Map:



Project Counties:

San Juan, NM

11/07/2014

Information, Planning, and Conservation System (IPAC)

Page 2 of 8

Version 1.4



U.S. Fish and Wildlife Service

Trust Resources List

Geographic coordinates (Open Geospatial Consortium Well-Known Text, NAD83):

MULTIPOLYGON (((-108.7798755 36.8581499, -108.7819315 36.858287, -108.7831715 36.8583212, -108.7847554 36.8576704, -108.7847562 36.8576701, -108.7868591 36.8569147, -108.7868666 36.8569135, -108.7878107 36.8569478, -108.7878211 36.8569511, -108.7900956 36.858462, -108.7900999 36.8584659, -108.7907008 36.859187, -108.790705 36.8591956, -108.7910924 36.8610097, -108.7917722 36.8619662, -108.7931846 36.8628565, -108.7944283 36.8635427, -108.7953279 36.8639883, -108.7964424 36.8643656, -108.7964492 36.8643695, -108.7964539 36.8643756, -108.796456 36.8643832, -108.7964549 36.8643909, -108.796451 36.8643977, -108.7964449 36.8644024, -108.7964373 36.8644045, -108.7964296 36.8644034, -108.7953138 36.8640257, -108.7953113 36.8640247, -108.7944101 36.8635783, -108.7944093 36.8635779, -108.7931647 36.8628912, -108.7931637 36.8628906, -108.7917475 36.8619979, -108.7917419 36.8619926, -108.7910574 36.8610295, -108.7910541 36.8610221, -108.7906669 36.8592088, -108.790071 36.8584937, -108.7878036 36.8569876, -108.786869 36.8569536, -108.7847702 36.8577076, -108.7831828 36.8583598, -108.7831746 36.8583613, -108.78193 36.858327, -108.7819293 36.858327, -108.7798694 36.8581896, -108.7798627 36.8581879, -108.7789185 36.8577759, -108.7789121 36.8577715, -108.7789079 36.8577649, -108.7789065 36.8577572, -108.7789082 36.8577496, -108.7789126 36.8577432, -108.7789192 36.857739, -108.7789269 36.8577376, -108.7789345 36.8577393, -108.7798755 36.8581499)))

Project Type:

Land - Easement / Right-Of-Way

Endangered Species Act Species List (USFWS Endangered Species Program).

There are a total of 9 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fishes may appear on the species list because a project could cause downstream effects on the species. Critical habitats listed under the Has Critical Habitat column may or may not lie within your project area. See the Critical habitats within your project area section below for critical habitat that lies within your project area. Please contact the designated FWS office if you have questions.

Species that should be considered in an effects analysis for your project:

Birds	Status		Has Critical Habitat	Contact
Southwestern Willow flycatcher (<i>Empidonax traillii extimus</i>) Population: Entire	Endangered	species info	Final designated critical habitat	New Mexico Ecological Services Field Office



U.S. Fish and Wildlife Service

Trust Resources List

Sprague's Pipit (<i>Anthus spragueii</i>) Population:	Candidate	species info		New Mexico Ecological Services Field Office
Yellow-Billed Cuckoo (<i>Coccyzus americanus</i>) Population: Western U.S. DPS	Threatened	species info	Proposed critical habitat	New Mexico Ecological Services Field Office
Fishes				
Colorado pikeminnow (<i>Ptychocheilus lucius</i>) Population: Entire, except EXPN	Endangered	species info	Final designated critical habitat	New Mexico Ecological Services Field Office
Razorback sucker (<i>Xyrauchen texanus</i>) Population: Entire	Endangered	species info	Final designated critical habitat	New Mexico Ecological Services Field Office
Zuni Bluehead Sucker (<i>Catostomus discobolus yarrowi</i>)	Endangered	species info	Proposed critical habitat	New Mexico Ecological Services Field Office
Flowering Plants				
Knowlton's cactus (<i>Pediocactus knowltonii</i>)	Endangered	species info		New Mexico Ecological Services Field Office
Mancos milk-vetch (<i>Astragalus humillimus</i>)	Endangered	species info		New Mexico Ecological Services Field Office
Mesa Verde cactus (<i>Sclerocactus mesae-verdae</i>)	Threatened	species info		New Mexico Ecological Services Field Office

Critical habitats within your project area:

There are no critical habitats within your project area.

11/07/2014

Information, Planning, and Conservation System (IPAC)

Page 4 of 8

Version 1.4



U.S. Fish and Wildlife Service

Trust Resources List

FWS National Wildlife Refuges (USFWS National Wildlife Refuges Program).

There are no refuges found within the vicinity of your project.

FWS Migratory Birds (USFWS Migratory Bird Program).

The protection of birds is regulated by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. For more information regarding these Acts see: <http://www.fws.gov/migratorybirds/RegulationsandPolicies.html>.

All project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. To meet these conservation obligations, proponents should identify potential or existing project-related impacts to migratory birds and their habitat and develop and implement conservation measures that avoid, minimize, or compensate for these impacts. The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).

For information about Birds of Conservation Concern, go to:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html>.

To search and view summaries of year-round bird occurrence data within your project area, go to the Avian Knowledge Network Histogram Tool links in the Bird Conservation Tools section at: <http://www.fws.gov/migratorybirds/CCMB2.htm>.

For information about conservation measures that help avoid or minimize impacts to birds, please visit:

<http://www.fws.gov/migratorybirds/CCMB2.htm>.

Migratory birds of concern that may be affected by your project:

There are 19 birds on your Migratory birds of concern list. The underlying data layers used to generate the migratory bird list of concern will continue to be updated regularly as new and better information is obtained. User feedback is one method of identifying any needed improvements. Therefore, users are encouraged to submit comments about any questions regarding species ranges (e.g., a bird on the USFWS BCC list you know does not occur in the specified location appears on the list, or a BCC species that you know does occur there is not appearing on the list). Comments should be sent to [the ECOS Help Desk](#).



U.S. Fish and Wildlife Service

Trust Resources List

Species Name	Bird of Conservation Concern (BCC)	Species Profile	Seasonal Occurrence in Project Area
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Yes	species info	Wintering
Bendire's Thrasher (<i>Toxostoma bendirei</i>)	Yes	species info	Breeding
Brewer's Sparrow (<i>Spizella breweri</i>)	Yes	species info	Breeding
Burrowing Owl (<i>Athene cunicularia</i>)	Yes	species info	Breeding
Cassin's Finch (<i>Carpodacus cassinii</i>)	Yes	species info	Year-round
Flammulated owl (<i>Onus flammeolus</i>)	Yes	species info	Breeding
Golden eagle (<i>Aquila chrysaetos</i>)	Yes	species info	Year-round
Grace's Warbler (<i>Dendroica graciae</i>)	Yes	species info	Breeding
Gray vireo (<i>Vireo vicinior</i>)	Yes	species info	Breeding
Juniper Titmouse (<i>Baeolophus ridgwayi</i>)	Yes	species info	Year-round
Lewis's Woodpecker (<i>Melanerpes lewis</i>)	Yes	species info	Year-round
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	Yes	species info	Year-round
Olive-Sided flycatcher (<i>Contopus cooperi</i>)	Yes	species info	Breeding
Peregrine Falcon (<i>Falco peregrinus</i>)	Yes	species info	Breeding
Pinyon Jay (<i>Gymnorhinus cyanocephalus</i>)	Yes	species info	Year-round
Prairie Falcon (<i>Falco mexicanus</i>)	Yes	species info	Year-round
Swainson's hawk (<i>Buteo swainsoni</i>)	Yes	species info	Breeding

11/07/2014

Information, Planning, and Conservation System (IPAC)

Page 6 of 8

Version 1.4



U.S. Fish and Wildlife Service

Trust Resources List

Williamson's Sapsucker (<i>Sphyrapicus thyroideus</i>)	Yes	species info	Breeding
Willow Flycatcher (<i>Empidonax traillii</i>)	Yes	species info	Breeding

NWI Wetlands (USFWS National Wetlands Inventory).

The U.S. Fish and Wildlife Service is the principal Federal agency that provides information on the extent and status of wetlands in the U.S., via the National Wetlands Inventory Program (NWI). In addition to impacts to wetlands within your immediate project area, wetlands outside of your project area may need to be considered in any evaluation of project impacts, due to the hydrologic nature of wetlands (for example, project activities may affect local hydrology within, and outside of, your immediate project area). It may be helpful to refer to the USFWS National Wetland Inventory website. The designated FWS office can also assist you. Impacts to wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes. Project Proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

Data Limitations, Exclusions and Precautions

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery and/or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Exclusions - Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and



U.S. Fish and Wildlife Service

Trust Resources List

nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Precautions - Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

IPaC is unable to display wetland information at this time.

APPENDIX B – PUBLIC AND AGENCY CORRESPONDENCE

Dodge Environmental, LLC.

October 24, 2014

From Dodge Environmental, LLC
John Dodge, President/Biologist
P.O. Box 75
Fruitland, NM 87416
Phone: (505) 330-1361
Fax: (505) 327-9546
Email: dodgeenvironmental@yahoo.com

Subject: Data Request for Navajo Species of Concern Information

Project Name: Gadii'ahi Farm Irrigation System Phase IV Project

Location: Gadii'ahi/Tokei Chapter, Navajo Nation, San Juan County, New Mexico.

Legal description: Section 31 & 36, Township 31 North, Range 19 West, NMPM

UTM in NAD 27: Beginning of Line: 12S 0698059E and 4080975N;

End of Line: 12S 0696545E and 4081799N.

Summary Description Project: San Juan Dineh Water Users, Inc. (SJRDW) is proposing the construction, operation, and maintenance of a irrigation pipeline system to serve the irrigation water needs for farmlands in the Gadii'ahi Chapter area. The new irrigation pipeline would range in size of an approximately 18 to 24 inch diameter of polyvinylchloride (PVC) pipe. The total length of the proposed irrigation PVC pipe would measure an approximately 7,373 feet with a right-of-way (ROW) width of 50-feet. Total permitted irrigation ROW would be 8.5 acres.

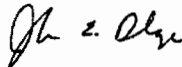
The proposed irrigation system would be located within Gadii'ahi existing irrigation open canal and traverse residence farmland; thereby, no new access road would be require. The PVC pipe would be bury at depth of an approximately 36 inches or as according to specifications. The trench width would be approximately 2 feet wide.

During construction, traffic to the proposed project area would consist of various construction equipment and utility trucks. Construction is tentatively scheduled to begin in the winter of 2014.

Map Name: Rattlesnake, New Mexico USGS 7.5-minute quadrangle map.

If you have any question, please feel free to contact me at your convenience at (505) 330-1361.

Sincerely,

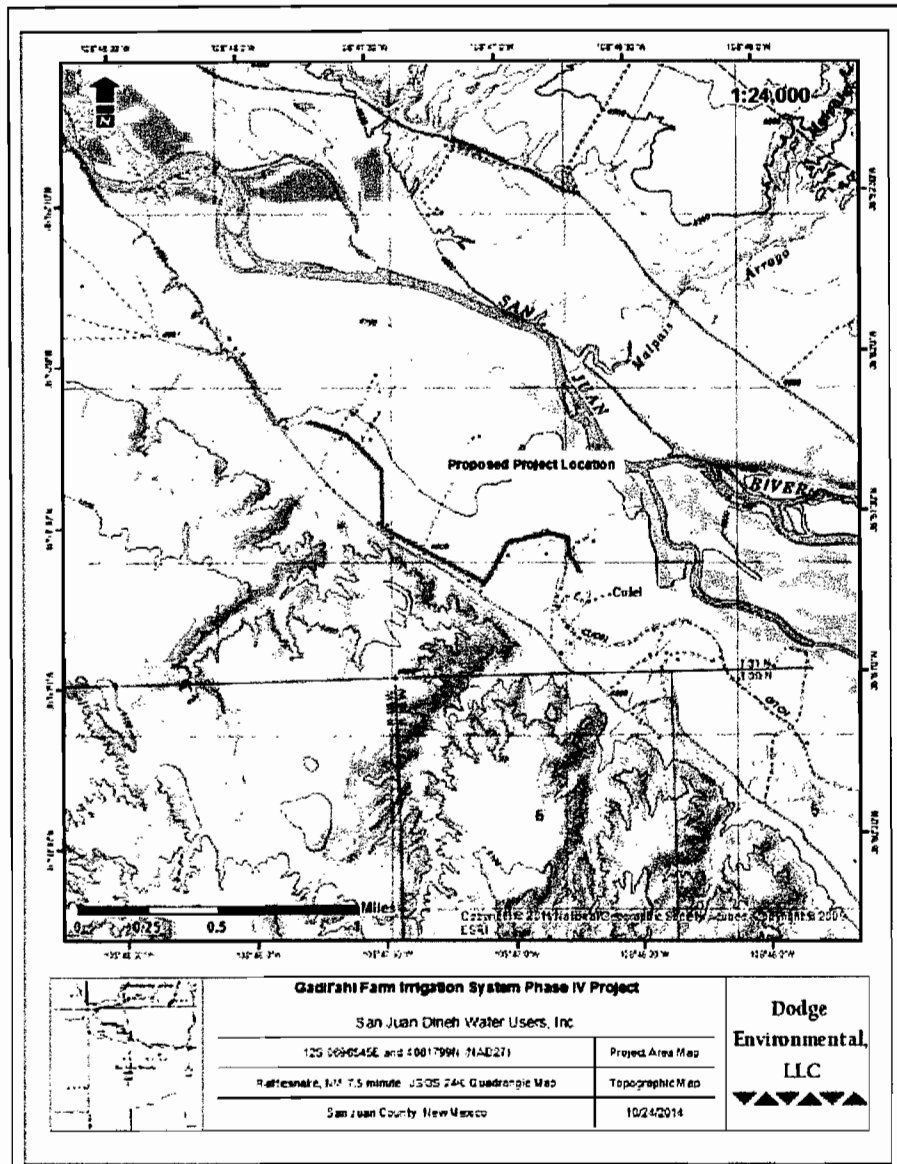


John E. Dodge,
Biologist/President

Cc: Marin Duncan, SJRDWU (electronic)
Mike Isaacson, P.E., Keller-Bliesner Engineering, LLC (electronic)

Dodge Environmental, LLC • P.O. Box 75 • Fruitland, NM 87416 • Phone (505) 330-1361 • Fax (505) 327-9546

1



Dodge Environmental, LLC • P.O. Box 75 • Fruitland, NM 87416 • Phone (505) 330-1361 • Fax (505) 327-9546



NAVAJO NATION
Department of Fish & Wildlife
Navajo Natural Heritage Program
P.O. Box 1480
Window Rock, AZ 86515



Phone: 928.871.6472 • Fax: 928.871.7603 • <http://nnhp.nndfw.org>

Ben Shelly, President

Rex Lee Jim, Vice-President

28 October 2014

File#14DOEL-05

John Dodge, President/Biologist
Dodge Environmental LLC
P.O. Box 75
Fruitland, NM 87416

NAVAJO ENDANGERED SPECIES LIST (NESL) INFORMATION FOR:

PROJECT: GADI'AHÍ FARM IRRIGATION SYSTEM PHASE IV PROJECT
LEGAL DESCRIPTION SEC. 31 & 36, T31N, R19W, NMPM
UTM
BOL: 0698059E, 4080975N
EOL: 0696545E, 4081799N
GADI'AHÍ/TOKEI CHAPTER, SAN JUAN COUNTY, NM

Mr. Dodge:

The following information on species of concern¹ is provided in response to your 24 October 2014 request concerning the subject project, which consists of the San Juan Dine Water User, Inc., (SJRDW) proposed construction, operation and maintenance of an irrigation pipeline system to serve the irrigation water needs for farmlands in the Gadii'ahi Chapter area. The new irrigation pipeline would range in size of an approximately 18 to 24 inch diameter of PVC pipe. The total length of the proposed irrigation PVC pipe would measure an approximately 7,373 feet with a right-of-way (ROW) width of 50-feet. Total permitted irrigation ROW would be 8.5 acres. The proposed irrigation system would be located within Gadii'ahi existing irrigation open canal and traverse residence farmland; thereby, no new access road would be required. The PVC pipe would be buried at depth of an approximately 3 inches or according to specifications. The trench would be approximately 2 feet wide.

The project is not expected to affect any federally listed species or significantly impact any tribally listed species or other species of concern.

¹"Species of concern" include protected, candidate, and other rare or otherwise sensitive species, including certain native species and species of economic or cultural significance. For each species, the following tribal and federal statuses are indicated: Navajo Endangered Species List (NESL), federal Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), and Eagle Protection Act (EPA). No legal protection is afforded species with only ESA candidate or NESL group 4 status; please be aware of these species during surveys and inform the NFWD of observations. Documentation that these species are more numerous or widespread than currently known, and addressing these species in project planning and management is important for conservation and may contribute to ensuring they will not be uplisted in the future. Species without ESA or NESL legal protection (e.g., NESL group 4 species) are only included in responses on a regular basis and may not be included in this response. Please refer to the NESL for a list of group 4 species; contact me if you need a copy.

AREA 4 of The Biological Resource Land Clearance Policies & Procedures

Area 4-Community Development. The Department has determined that areas around communities do not support the habitat for species of concern and therefore development can proceed without further biological evaluation. This applies to all development except that which may have significant impacts outside the community. (For detailed information regarding "Area 4" please refer to our website at nndfw.org).

Potential impacts to wetlands should also be evaluated. The U.S. Fish & Wildlife Service's National Wetlands Inventory (NWI) maps should be examined to determine whether areas classified as wetlands are located close enough to the project site(s) to be impacted. In cases where the maps are inconclusive (e.g., due to their small scale), field surveys must be completed. For field surveys, wetlands identification and delineation methodology contained in the 'Corps of Engineers Wetlands Delineation Manual' (Technical Report Y-87-1) should be used. When wetlands are present, potential impacts must be addressed in an environmental assessment and the Army Corps of Engineers, Phoenix office, must be contacted. NWI maps are available for examination at the NFWD's Natural Heritage Program (NHP) office, or may be purchased through the U.S. Geological Survey (order forms are available through the NHP). The NHP has complete coverage of the Navajo Nation, excluding Utah, at 1:100,000 scale; and coverage at 1:24,000 scale in the southwestern portion of the Navajo Nation.

This response is based on information in the Navajo Natural Heritage Program database; knowledge of staff biologists about the project area; the scope of the project; the USGS topographic map of the project area; and information you provided. Because the NFWD's information is continually updated, any given information response is only wholly appropriate for its respective request.

For a list of sensitive species on the Navajo Nation in addition to the species listed on the Navajo Endangered Species List (NESL) please refer to our website at www.nndfw.org.

An invoice for this information is attached.

If you have any questions I may be reached at (928) 871-6472.



Sonja Detson, Wildlife Tech.
Natural Heritage Program
Department of Fish and Wildlife

CONCURRENCE



Gloria M. Tom, Director
Department of Fish & Wildlife
Division of Natural Resources

xc: file/chrono

**BIOLOGICAL RESOURCES COMPLIANCE FORM
NAVAJO NATION DEPARTMENT OF FISH AND WILDLIFE
P.O. BOX 1480, WINDOW ROCK, ARIZONA 86515-1480**

It is the Department's opinion the project described below, with applicable conditions, is in compliance with Tribal and Federal laws protecting biological resources including the Navajo Endangered Species and Environmental Policy Codes, U.S. Endangered Species, Migratory Bird Treaty, Eagle Protection and National Environmental Policy Acts. This form does not preclude or replace consultation with the U.S. Fish and Wildlife Service if a Federally-listed species is affected.

PROJECT NAME & NO.: Gadii'ahi Farm Irrigation System Phase IV

DESCRIPTION: SJRDW proposes to construct, operate, and maintain a new subsurface irrigation pipeline that would replace the existing Gadii'ahi open irrigation canal. The new irrigation pipeline would be approximately 7,373 ft. in length with a ROW width of 50 ft. Total permitted ROW would be 8.5 acres.

LOCATION: Section 31, T31N, R18W, and Section 36, T31N, R19W, NMPM, Gadii'ahi Chapter, San Juan County, New Mexico

REPRESENTATIVE: John E. Dodge, Dodge Environmental, LLC for San Juan Dineh Water Users, Inc. (SJRDW)

ACTION AGENCY: Navajo Nation and Bureau of Indian Affairs

B.R. REPORT TITLE / DATE / PREPARER: Biological Resource Clearance letter for Gadii'ahi Farm Irrigation System Phase IV Project/12 NOV 2014/John E. Dodge

SIGNIFICANT BIOLOGICAL RESOURCES FOUND: Area 4.

POTENTIAL IMPACTS

NESL SPECIES POTENTIALLY IMPACTED: NA

FEDERALLY-LISTED SPECIES AFFECTED: NA

OTHER SIGNIFICANT IMPACTS TO BIOLOGICAL RESOURCES: NA


AVOIDANCE / MITIGATION MEASURES: [1] The NNDFW highly recommends implementing the mitigation measures outlined on pages 6 & 7 in the Biological Resources Clearance letter.

CONDITIONS OF COMPLIANCE*: NA

FORM PREPARED BY / DATE: Pamela A. Kyselka/10 DEC 2014

COPIES TO: (add categories as necessary)

☐ _____ ☐ _____

2 NTC § 164 Recommendation: <input checked="" type="checkbox"/> Approval <input type="checkbox"/> Conditional Approval (with memo) <input type="checkbox"/> Disapproval (with memo) <input type="checkbox"/> Categorical Exclusion (with request letter) <input type="checkbox"/> None (with memo)	Signature  Gloria M. Tom, Director, Navajo Nation Department of Fish and Wildlife	Date 12/11/14
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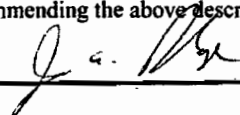
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Page 1 of 2

NNDFW-B.R.C.F.: FORM REVISED 12 NOV 2009

*I understand and accept the conditions of compliance, and acknowledge that lack of signature may be grounds for the Department not recommending the above described project for approval to the Tribal Decision-maker.

Representative's signature



Date 12/23/2014

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Page 2 of 2

NNDFW-B.R.C.F.: FORM REVISED 12 NOV 2009

CULTURAL RESOURCES COMPLIANCE FORM
HISTORIC PRESERVATION DEPARTMENT
PO BOX 4950
WINDOW ROCK, ARIZONA 86515

File
08/28/09

ROUTING: COPIES TO
NM SHPO
XX REAL PROPERTY MGT/330
NNAD

NNHPD NO. **HPD-09-758**
OTHER PROJECT NO.

NNAD 09-206

PROJECT TITLE: **A Cultural Resource Inventory of the Proposed Gad'iiahi Canal Irrigation System Modification in Gad'iiahi, San Juan County, New Mexico**

LEAD AGENCY: BIA/NR

SPONSORS: **Gilbert Badoni Gad'iiahi/Tokoi Chapter P.O. Box 1318 Shiprock, New Mexico 87420**

PROJECT DESCRIPTION: The proposed undertaking will involve the construction of an underground irrigation canal pipeline system with a 50 ft right-of-way, which is replacing the current open-ditch irrigation system already in-use with associated facilities within the 17.47 acre lease area. Ground disturbance will be extensive and intensive.

LAND STATUS: Navajo Tribal Trust

CHAPTER: Gad'iiahi/Tokoi

LOCATION: T.30N and T.31N, R.18W and R.19W; Sections 5 and 25; Rattlesnake Quadrangle; San Juan County, New Mexico; NMMP

PROJECT ARCHAEOLOGIST: **Lenora Tsosie and Aleda Myerson**
NAYAJO ANTIQUITIES PERMIT NO.: NTC

DATE INSPECTED: **5/19/09, 5/22/09, 5/26/09, 6/6/09 to 6/15/09**

DATE OF REPORT: **7/30/09**

TOTAL ACREAGE INSPECTED: **41.94**

METHOD OF INVESTIGATION: Class III pedestrian inventory with transects spaced 15 m apart.

LIST OF CULTURAL RESOURCES FOUND:

(16) In-Use Areas (IUA), (1) Isolated Occurrence (IO) and
(1) Site NM-H-15-21

LIST OF ELIGIBLE PROPERTIES:

(1) NM-H-15-21

LIST OF NON-ELIGIBLE PROPERTIES:

(16) IUA and (1) IO

LIST OF ARCHAEOLOGICAL RESOURCES:

(1) NM-H-15-21

EFFECT/CONDITIONS OF COMPLIANCE: **No historic properties affected, with the following conditions:**

Site NM-H-15-21:

1) The site has been avoided by the in-use, open-ditch canal system, and will continue to be avoided by the proposed undertaking.

2) The site is located on a terrace, above the irrigation system, therefore, it will be avoided by the proposed undertaking.

In the event of a discovery ["discovery" means any previously unidentified or incorrectly identified cultural resources including but not limited to archaeological deposits, human remains, or locations reportedly associated with Native American religious/traditional beliefs or practices], all operations in the immediate vicinity of the discovery must cease, and the Navajo Nation Historic Preservation Department must be notified at (928) 871-7148.

FORM PREPARED BY: **Ettie Anderson**

FINALIZED: **August 12, 2009**

Notification to
Proceed Recommended:
Conditions:

Yes XX No
Yes XX No

Alan S. Dowler
Alan S. Dowler
Navajo Nation Historic Preservation Officer

08/17/09
Date

Navajo Region Approval:

Yes p No

Barbara
Regional Director

8/25/09
Date

AP 8/24/09

CULTURAL RESOURCES COMPLIANCE FORM

THE NAVAJO NATION
HISTORIC PRESERVATION DEPARTMENT
PO BOX 4950
WINDOW ROCK, ARIZONA 86515

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Received
Paid

ROUTING: COPIES TO
NM SHPO
XX REAL PROPERTY MGT/330
NNAD

NNHPD NO. HPD-11-693
OTHER PROJECT NO.
NNAD 11-169

PROJECT TITLE: A Cultural Resources Inventory of the Proposed Underground Irrigation Pipeline in Gadii'ahi, San Juan County, New Mexico

LEAD AGENCY: BIA/NR

SPONSOR: Gilbert Bedonie, Community Service Coordinator, Gadii'ahi Chapter, PO Box 1318, Shiprock, New Mexico 87420

PROJECT DESCRIPTION: The proposed undertaking will involve the construction of an underground pipeline that measures 1,932.45-ft long by 50-ft wide. The area of effect is 2.22-acres. Ground disturbance will be intensive and extensive with the use of heavy equipment.

LAND STATUS: Navajo Tribal Trust
CHAPTER: Gadii'ahi & Tokoi
LOCATION: Unplatted & Projected T.31N, R.18W; Rattlesnake Quadrangle, San Juan County, New Mexico NMPM

PROJECT ARCHAEOLOGIST: William B. Tsosie Jr.
NAVAJO ANTIQUITIES PERMIT NO.: NTC

DATE INSPECTED: 07/12/11
DATE OF REPORT: 07/21/11
TOTAL ACREAGE INSPECTED: 6.65-ac

METHOD OF INVESTIGATION: Class III pedestrian inventory with transects spaced 9 m apart.

LIST OF CULTURAL RESOURCES FOUND: (1) Isolated Occurrence (IO) & (1) In-Use Area (IUA)
LIST OF ELIGIBLE PROPERTIES: None
LIST OF NON-ELIGIBLE PROPERTIES: (1) IO & (1) IUA
LIST OF ARCHAEOLOGICAL RESOURCES: None

EFFECT/CONDITIONS OF COMPLIANCE: No historic properties affected.

In the event of a discovery ["discovery" means any previously unidentified or incorrectly identified cultural resources including but not limited to archaeological deposits, human remains, or locations reportedly associated with Native American religious/traditional beliefs or practices], all operations in the immediate vicinity of the discovery must cease, and the Navajo Nation Historic Preservation Department must be notified at (928) 871-7148.

FORM PREPARED BY: Tamara Billie
FINALIZED: August 22, 2011

Notification to
Proceed Recommended: Yes XX No XX
Conditions: Yes XX No XX
Man S. Downer, Navajo Nation Historic Preservation Officer Date 8-22-11

Navajo Region Approval: Yes X No XX
BIA-Regional Director Date 8/26/11

TLN 8-26-11



**THE
NAVAJO
NATION
ARCHAEOLOGY DEPARTMENT**

COPY

% DINÉ COLLEGE, P.O. Box 580, SHIPROCK, NEW MEXICO 87420 TELEPHONE: 505-368-1214, FAX: 505-368-1215

July 30, 2009

Gilbert Badoni, Chapter Coordinator
Gad'iiahi Chapter
P.O. Box 1318
Shiprock, NM 87420

Dear Mr. Badoni:

Enclosed is a copy of the Navajo Nations Archaeology Department's survey report NNAD 09-206. The report details the results of the cultural resource inventory of the proposed Gad'iiahi Chapter's ~~proposed irrigation canal project in Cedar, New Mexico~~.

During the inventory 1 new archaeological site, 1 isolated occurrence (IO), and 16 in-use areas (IUAs) were identified. One of the 16 IUAs (IUA A) and site NM-H-15-21 are considered to be Register-eligible properties. Both of these cultural resources are located within the project area. The archaeological site can be avoided if construction activities are restricted to the right-of-way. IUA A is the existing canal which is the focus of the project discussed herein, however, construction activities should not affect the significance of the Gad'iiahi Canal. Further, although some IUAs may merit consideration under AIRFA, the IUAs belong to the farmers who have requested the services and the farmers are the recipients of the proposed undertaking. Archaeological approval has been recommended for the proposed construction of the piped canal system.

This report has been submitted to Navajo Nation Historic Preservation Department (NNHPD) in Window Rock, Arizona for review on behalf of the Bureau of Indian Affairs (BIA). Once a determination of archaeological approval has been made on the proposed undertaking, you will be notified by the NNHPD. Please note that receipt of this report does not constitute approval. If you have any questions regarding the report, please call Elaine Cleveland-Mason or me at (505) 368-1214.

Sincerely,

Lenora Tsosie


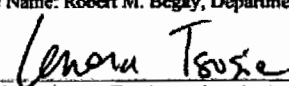
Lenora Tsosie,
Archaeologist

Enclosure



"Yesterday, Today, Tomorrow: Learning from our past to build our future"

ARCHAEOLOGICAL INVENTORY REPORT DOCUMENTATION PAGE (HPD JAN/91)

1. HPD REPORT NO.	2. (FOR HPD USE ONLY)	3. RECIPIENTS ACCESSION NO.
4. TITLE OF REPORT: A Cultural Resource Inventory of the Proposed Gad'iahi Canal Irrigation System Modification in Gad'iahi, San Juan County, New Mexico AUTHOR(S): Lenora Tsosie and Aleda Myerson		5. FIELDWORK DATES May 19, 22, & 26, and June 6 through 15, 2009 6. REPORT DATE July 30, 2009
7. CONSULTANT NAME AND ADDRESS: Gen'l Charge: Robert M. Begay, Department Manager Org. Name: Navajo Nation Archaeology Department Org. Address: P. O. Box 689 Window Rock, Arizona 86515 Phone: (928) 871-6540		8. Permit No. NTC 9. Consultant Report No. NNAD 09-206
10. SPONSOR NAME AND ADDRESS: Ind. Responsible: Gilbert Badoni, Chapter Coordinator Org. Name: Gad'iahi/Tólk'í Chapter Org. Address: P.O. Box 1318 Shiprock, New Mexico 87420 Phone: (505) 368-1070		11. SPONSOR PROJECT NO. 12. AREA OF EFFECT: 17.47 acres (7.07 ha) AREA SURVEYED: 41.94 acres (16.98 ha)
13. LOCATION (MAP ATTACHED): a. Chapter: Gad'iahi/Tólk'í b. Agency: Shiprock c. County: San Juan d. State: New Mexico e. Land Status: Navajo Trust Lands f. UTM Center: see Supplemental Sheet g. Area: see Supplemental Sheet h. 7.5' Map Name(s): Rattlesnake, N.Mex. 1963		
14. REPORT /X/ OR SUMMARY (REPORT ATTACHED) // a. Description of Undertaking: see Supplemental Sheet b. Existing Data Review: see Supplemental Sheet c. Area Environmental & Cultural Setting: The project area is located in the Gad'iahi Chapter along the San Juan River floodplain. The nearest major water source is the San Juan River located 2,000 feet (609.75 m) to the north. The elevations of the project area range from 4828 feet (1472 m) to 4796 feet (1462 m) above mean sea level. Soils in the general project area are composed of alluvial silt and clay. Vegetation observed in the project area includes tamarisk, Chinese elm, Russian olive, Navajo willow, rabbitbrush, four-wing saltbush, Russian thistle, shadscale, and various grasses. Development within the project area includes homesteads, agricultural fields, irrigation canals, utility services, maintenance roads, and Navajo Route 57. d. Field Methods: see Supplemental Sheet		
15. CULTURAL RESOURCE FINDINGS: a. Location/Identification of Each Resource: see Supplemental Sheet b. Evaluation of Significance of Each Resource (above): see Supplemental Sheet		
16. MANAGEMENT SUMMARY (RECOMMENDATIONS): : see Supplemental Sheet		
17. CERTIFICATION: SIGNATURE:  DATE: 7/20/09 General Charge Name: Robert M. Begay, Department Manager SIGNATURE:  DATE: July 30, 2009 Direct Charge Name: Lenora Tsosie, Archaeologist		

COPY

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13. LOCATION:

- f. UTM Center: see Table 1.
g. Area: see Table 1.

Table 1. Legal Descriptions and UTM Coordinates for the Project Area (Zone 12)

Project Area	Northing	Easting	¼ ¼ ¼	Sec.	Township	Range	Principal Meridian
Water Line							
Beginning of Line	4080287	699012	NW NW NE	5	30N	18W	NMPM
End of Line	4082351	696088	SW NE SE	25	31N	19W	"

14. REPORT:

- a. Description of Undertaking: Gad'iiahi Chapter is in the process of upgrading their open ditch irrigation system to an underground pipeline irrigation system. The upgrading process has been conducted in phases. Phase I of the irrigation upgrade has already been constructed and was inventoried for cultural resources in 2005 by the NNAD (Yazzie and Cleveland Mason 2005). Under this current upgrade (Phase III), the Gad'iiahi Chapter proposes to modify its existing irrigation canal with an underground piped irrigation system. Construction of the underground irrigation pipeline will entail blading and trenching with heavy equipment, installation of the pipeline, and backfilling the trench. Surface and subsurface disturbance will be extensive within the area of effect. The right-of-way for the pipeline is 50 feet (15.24 m) wide or 25 feet (7.62 m) on either side of the center line. The length of the underground irrigation system measures approximately 15,225 feet (4,641.76 m) long. The total area of affect for the proposed underground irrigation system is 17.47 acres (7.07 ha).

- b. Existing Data Review: A records check was conducted at the NNAD Shiprock office and the Navajo Nation Historic Preservation Department (NNHPD) office in Window Rock prior to the survey. The records check indicated that there have been 35 previous projects conducted within a 500-foot (152-m) radius of the project area. These projects include scattered homesites inventories with associated sewer lines and water lines, road inventories, and block surveys for agricultural farms. In addition, the first phase of the Gad'iiahi Chapter underground irrigation system was inventoried for cultural resources by Yazzie and Mason (2005) in a collaborative effort with Keller-Bliesner Engineering, LLC for the Gad'iiahi Chapter.

A check of Van Valkenburgh (1974) indicates that nearest recognized sacred place in the vicinity of the project area is Shiprock Pinnacle (*Tsé bit'a'i*—Winged Rock), located about 12 miles (19 km) to the south of the project area. Further, the San Juan River (*Sé Bitoooh*—Old Age River) is considered a sacred river to the Navajo (Linford 2000). A pertinent overview for the project area can be found in Geib and Warburton (1991).

Geib, Phil R. and Miranda Warburton

1991 *A Class I Cultural Resources and Ethnographic Overview of the Glen Canyon-Shiprock Transmission Line Corridor*. NNAD Report 91-016. Navajo Nation Archaeology Department, Window Rock, Arizona.

Linford, Laurance D.

2000 *Navajo Places: History, Legend, Landscape*. The University of Utah Press, Salt Lake City, Utah.

Yazzie, Victoria, and Elaine Cleveland-Mason

2005 *A Cultural Resources Inventory of the Gad'iiahi Chapter Farm Irrigation Trunkline-Phase I for Keller-Bliesner Engineering in San Juan County, New Mexico*. NNAD Report 05-095. Navajo Nation Archaeology Department, Window Rock, Arizona.

Van Valkenburgh, Richard F.

1974 *Navajo Sacred Places*. In *Navajo Indians III*, edited by Clyde Kluckhohn, pp. 9-199. Garland Publishing, New York, New York.

- d. Field Methods: On May 19, 2009 project archaeologist, Julia Chavez met with Gad'iiahi Chapter Coordinator, Gilbert Badoni, and was shown the project area since the project areas was not staked. Instead, the project area was identified by the location of the existing irrigation ditch. The center of the existing irrigation ditch is considered the center line for the current project's right-of-way and center of the archaeological survey corridor. A 120-foot (36.59-m) wide survey corridor centered on the existing canal was inventoried under this project. The 120-foot-wide survey corridor consisted of a 50-foot (15-m) wide right-of-way with a 35-foot (10.67-m) wide buffer zone located on each side of the 50-foot right-of-way. The 120-foot-wide survey corridor was examined along the entire length of the 15,225-foot (4641.76-m) long proposed underground pipeline irrigation system.

14. REPORT:**d. Field Methods: —Continued**

On May 22 and 26, 2009, Ms. Chavez, with Aleda Myerson and Matthew Pettigrew also with the NNAD conducted the archaeological inventory of the proposed irrigation pipeline system. The project area was inventoried by walking three parallel linear transects spaced about 6 m apart along both sides of the proposed irrigation canal. A total of 41.94 acres (16.98 ha) was examined during the Class III pedestrian survey of the proposed canal system. In addition, on June 15, 2009, Lenora Tsosie and Ms. Myerson conducted ethnographic interviews following the fieldwork as minimal local history was initially collected on the project area during the May 2009 fieldwork.

During the course of the survey, 1 archaeological site (NM-H-15-21), 1 isolated occurrence (IO), and 16 in-use areas (IUAs) were identified. The location of the site, the IO, and the IUAs were recorded using a hand-held Garmin GPS. Locational information was compiled to allow the archaeologists to establish the location of the cultural resources relative to the project area.

The archaeological site was mapped using a hand-held GPS unit. The data from the GPS was transferred onto a GIS software program once in-house. This data was utilized to produce the site map and project area map. Notes sufficient to complete a Navajo Nation Site Survey and Management form were also collected during the recordation of the site.

In accordance with NNAD policies concerning the right to privacy of individuals, currently occupied residences and other in-use features or areas were not fully documented during this project. Attempts were made to obtain information sufficient to allow for the evaluation of these resources under the pertinent legislation. Most of the interviews with the homesite clients and local residents were conducted in the Navajo and English languages by Mrs. Tsosie. The purpose of these interviews was to obtain information on potential traditional cultural properties (TCPs—herb gathering places, blessed and/or sacred places), burials, and archaeological sites in the area.

15. CULTURAL RESOURCE FINDINGS:

- a. **Location/Identification of Each Resource:** Sixteen IUAs, 1 IO, and 1 archaeological site were identified during the archaeological inventory. The IUAs consist of either existing homesites with associated houses and/or hogans, and/or farm equipment with associated features. One of the IUAs was the existing Gad'iiahi irrigation canal system (IUA A). Table 2 provides a list and description of the 16 IUAs.

Table 2. In-Use Areas (IUA) Encountered During the Inventory

IUA Designation	Summary Description	Home Owner
IUA A	Existing Gad'iiahi irrigation ditch	N/A
IUA B	1 house with features	Norman and Lorena Walters
IUA C	1 house and features	Stella Badoni
IUA D	1 house with features	Larry and Evelyn Jim
IUA E	Miscellaneous personal items	Roy Jones
IUA F	1 house with features	Edith Deléon
IUA G	2 mobile homes with features	Helena Kelleywood
IUA H	1 house with features	Steven John
IUA I	1 hogan	Mary Lou Tso
IUA J	Farm equipment	Andrew and Marlene Brady
IUA K	1 house with features	Tony Cudei
IUA L	Farm equipment and features	Ray Yabeny
IUA M	1 house, 1 hogan, and features	Carletta Lee
IUA N	1 house and features	Lorraine Jack
IUA O	2 houses and features	Sharon Bekis
IUA P	1 house with features	Annie Coleman

Although the existing Gad'iiahi irrigation canal system (IUA A) is being modified under this current project to adhere to the present southwest's soil and water conservation initiatives (proposed under Phase III of the Gad'iiahi upgrade irrigation canal system), the canal is also dealt with as a resource under this project since local history indicates that the Gad'iiahi canal system has been in existence since 1880 shortly after the Navajos return from Fort Sumner (Bailey and Bailey 1982). Therefore, this resource is considered an integral part of Navajo history.

15. CULTURAL RESOURCE FINDINGS:

a. Location/Identification of Each Resource: —Continued

One archaeological site, NM-H-15-21 was identified during the archaeological inventory of the Gad'iahi canal. NM-H-15-21 is identified as a specialized activity area dating between the Pueblo II and Pueblo III (A.D. 900-1300) temporal periods. Site NM-H-15-21 is located south of the project area and is situated on the southern terrace above the Gad'iahi canal system. The site area overlooks the farmlands and the San Juan River valley to the north. The site is located outside the right-of-way, but within the survey corridor (buffer zone). The UTM coordinates for the center point of the site are: Zone 12, 4080524 Northing, 698381 Easting.

One isolated occurrence (IO 09-209-1) was identified within the project area. The IO consists of a burned corral belonging to Helen Harrison and family. Ethnographic information obtained from Angela Deal, the daughter of Helen Harrison indicated that the late John Harrison built the corral out of shaped logs in 1978 for his horses which he used to conduct his farm work. Later when cattle were acquired, the pen was used for cattle roundups. The corral was eventually destroyed by fire by some local people who began hanging out at the corral while consuming alcohol. According to the informant, an open bonfire got out of control one night and burned the corral down. Another source implied that the burn was from a lightning strike. Additionally the informant, Angela Deal, assured the archaeologists that the cause of fire was from human recklessness and it did not occur from a lightning strike, therefore, it was not considered a TCP. The UTM coordinates for the IO are: Zone 12, 4080499 Northing, 698153 Easting. Further, no TCPs were identified during the survey or during the ethnographic interviews.

- b. Evaluation of Significance of Each Resource:** Site NM-H-15-21 retains integrity of location and setting. It is probably not eligible for nomination to the National Register under criteria a, b, or c. It is eligible for nomination under criterion d on the basis of its research potential, and it does meet the 50-year eligibility guideline. Thus, NM-H-15-21 is considered a potentially Register-eligible property. The site is of archaeological interest and meets the 100-year age requirement for classification as an archaeological resource under ARPA. Thus, the site does merit protection under ARPA. The site does not appear to exhibit the qualities or characteristics that would make it eligible for protection under AIRFA.

The IO lacks integrity and recordation of the IO appears to have exhausted its research potential; therefore, the IO does not appear to be eligible for inclusion on the National Register of Historic Places under criteria a, b, c, and d. The IO does meet the 50-year eligibility guideline. The IO is no longer of archaeological interest but it does appear to meet the 100-year age requirement necessary for classification as an archaeological resource under ARPA. The IO does not appear to merit protection under ARPA. The IO lacks qualities that merit consideration under AIRFA.

IUA A appears to possess integrity of location, setting, materials, association, design, and workmanship. IUAs B through P appear to possess integrity of location, setting, and association. The IUAs are not eligible for nomination to the National Register under criteria a, b, or c; however, they may be eligible under criterion d as they could contribute information on local history. IUAs C, F, I, and P do meet the 50-year eligibility guideline; however, they are not Register-eligible properties. IUA A does meet the 50-year eligibility guideline and it does appear to be a Register-eligible property. IUAs B, D, E, G, H, J, K, L, M, N, and O do not meet the 50-year eligibility guideline, and therefore they do not appear to be Register-eligible properties. All IUAs with the exception of IUA A are not of archaeological interest. IUA A does meet the 100-year age requirement necessary for classification as an archaeological resource under ARPA. The remaining IUAs (B through P) do not meet the 100-year age requirement necessary for classification as an archaeological resource. Thus, IUA A does merit protection under ARPA. The remaining IUAs do not merit protection under ARPA. Finally, only IUA F, H, and M merit protection under AIRFA.

- 16. MANAGEMENT SUMMARY (RECOMMENDATIONS):** Site NM-H-15-21, appears to be a Register-eligible property. Thus, it is recommended that a determination of no historic properties affected be made for the proposed undertaking in the area of the site provided that the site is avoided during construction activities. IUA A also appears to be a Register-eligible property, however, this resource is of the focus of the undertaking discussed herein. Because the proposed undertaking as designed will have no effect upon those qualities that lend significance to this property, it is recommended that a determination of no adverse effect on the IUA A be made for the proposed undertaking along the existing canal.

In regard to the IUAs, although some IUAs may merit consideration under AIRFA, the IUAs belong to the farmers who have requested services and are the recipients of the services that are proposed under this current project; therefore, AIRA consideration should not serve as a basis for denial of archaeological approval for the proposed undertaking on the canal. Therefore, a determination of no historic properties affected is recommended for the proposed undertaking in the areas of these IUAs.

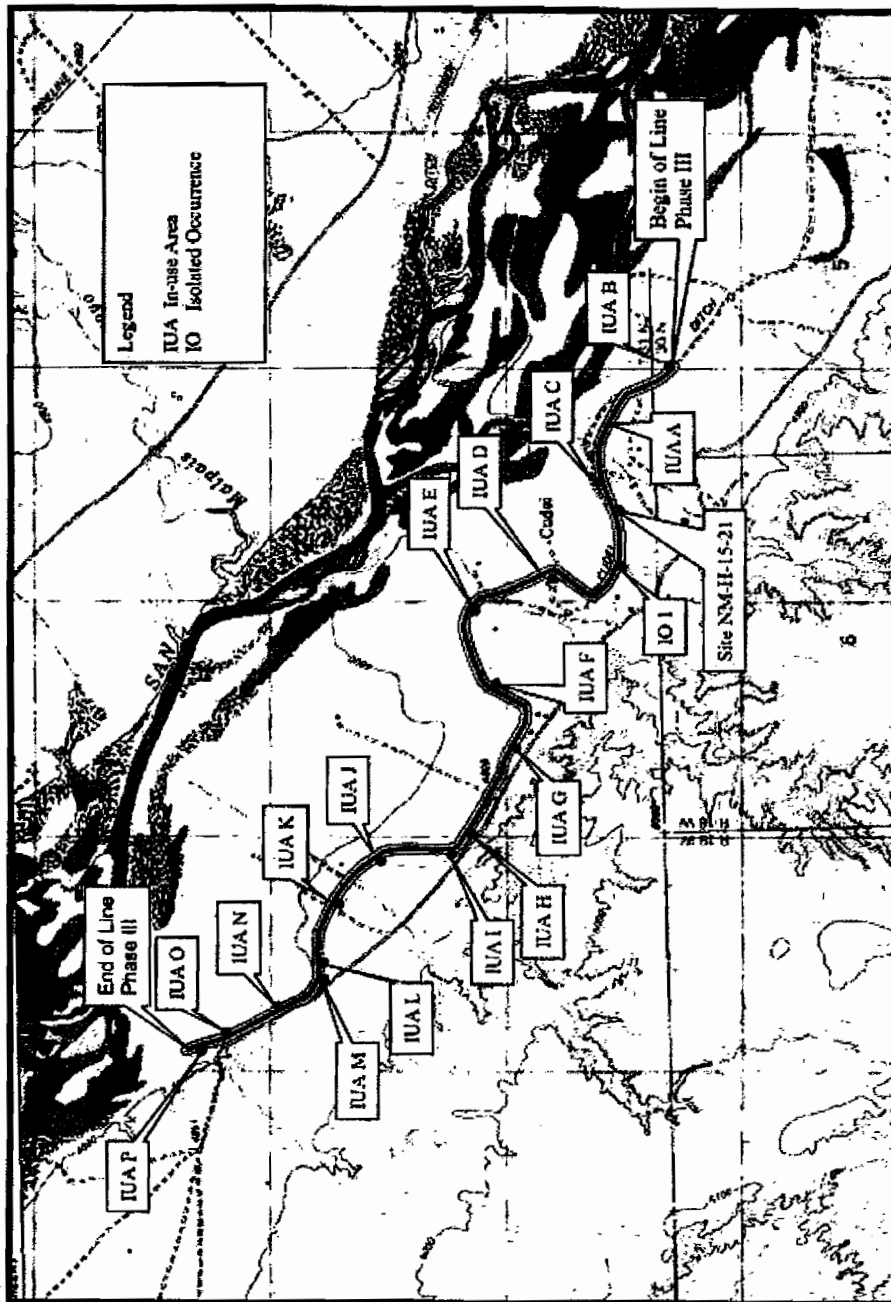


Figure 1. Location map showing the location of the project area and identified cultural resources. Rattlesnake, N. Mex., 1983; 7.5' series USGS map; T.30N and T.31N, R.18W and R.19W, NMPM (NNAD 09-2006).

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APPENDIX A

NNAD Site Survey and Management Form and USGS Map Location



NAVAJO NATION ARCHAEOLOGY DEPARTMENT

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Site Survey and Management Form

SITE NO.: NM-H-15-21 **FIELD OR OTHER NAME:** **DATE RECORDED:** 05-19-2009
PROJECT NUMBER & NAME: NNAD 09-206—A Cultural Resource Inventory of the Proposed Gad'iiahi Canal Irrigation System Modification in Gad'iiahi, San Juan County, New Mexico
ORGANIZATION: NNAD **ARCHAEOLOGIST(S):** Julia Chavez, Matthew Pettigrew, Alecia Myerson, and Lenora Tsosie
USGS MAP REFERENCE: Rattlesnake, N.Mex., 1963, 7.5' series
LEGAL LOCATION: Unplatted Sections, T.31N, R.18W; NMPM
UTM: Zone 12; 4080524 Northing, 698381 Easting
STATE: New Mexico **COUNTY:** San Juan **CHAPTER:** Gad'iiahi/Tókoí
LAND STATUS: Navajo Tribal Trust
GROUND VISIBILITY: Kind and extent of cover? Ground visibility 99%, vegetation coverage 1%
TOPOGRAPHY: The site is situated south of the project atop a clay bluff overlooking the San Juan River floodplain area and approximately 25 feet (7.62 m) above the irrigation canal project and valley bottom.
DRAINAGE: The nearest major water source is the San Juan River located north approximately 2,000 feet (609.75 m) to the north
ELEVATION (ft/m): 4828 feet/ 1472 m **SLOPE & DIRECTION:** 20° sloping north
SOIL TYPE: Alluvial soil **OTHER:** Aeolian sand
VEGETATION PRESENT: Russian thistle, salt cedar, desert scrub brush, and shadscale.
CULTURAL AFFILIATION: Anasazi **SITE TYPE:** Specialized Activity Area—sherd and lithic scatter
PERIOD(S) OF OCCUPATION (Date, if known): PII-PIII (A.D. 900-1300) **HOW DATED:** Ceramic typology
DIMENSIONS OF SITE (l x w): 52 m x 28 m **TOTAL AREA (sq. m):** 1,144 sq. m—area of an oval
How Determined: Measured with a metric tape.
ARCHITECTURE PRESENT? No
ARTIFACTS OBSERVED/COUNTED: Observed—less than 100 ceramic artifacts and less than 40 lithic artifacts.
COLLECTIONS MADE? No
PHOTOS TAKEN: Yes **COLOR:** Roll 09-206 (SR); Frame(s) h1521-1, 2, 3, 4, 5, 6, 7, 8, and 9
SITE DESCRIPTION: The site is located on the southern clay and shale-covered terrace located above the farmlands and the San Juan River valley. The site contains a scatter of lithic and ceramic artifacts that are scattered throughout the site area along the edge of the terrace edge. No features were noted in the site area. Less than 100 sherds were observed on the site. The ceramic assemblage consisted of plain gray wares, indented corrugated sherds, decorated black-on-white wares, and red wares. The temper of ceramic artifacts was either trachyte and/or sand. The sherds observed on this site were too small and therefore were unidentifiable as to type.
 Forty or less lithic artifacts were noted on this site. The artifact assemblage consisted of secondary, tertiary, and microflakes. The lithic material types represented on this site consisted of siltstone, white chert, Brushy Basin chert, butterscotch chert, and quartzite.
 The condition of the site is poor with erosion occurring throughout the site area. The soil throughout the site area is shallow with limited to no buried cultural material. The site is also situated amongst a clearing that is devoid of vegetation. Heavy equipment machinery associated with farming activities was noted to the south of the site. It appears that this machinery may have at one time cleared vegetation from the site area as limited to no vegetation is present on this site, but vegetation was noted in undisturbed areas located to the southeast and west of the site. The farm machinery belongs to Stella Badoni and family and the machinery are currently parked approximately 4 m (13.12 feet) south of the site.
 This site appears to be a specialized activity area that may have functioned as a limited lithic reduction or tool procession area. In addition, the presence of the ceramics on this site suggests that possible food gathering activities may have also

occurred on this site. It is thought that this site may have been affiliated with farming activities as the location of the site would make an excellent lookout of the fields in the valley below.

CONDITION OF SITE: Poor **Causes of disturbance:** Natural erosion and clearing of vegetation with farming machinery for a current parking area/storage area.

LOCATION OF SITE RELATIVE TO PROJECT AREA: The site is located on the southern portion of the project area and within the southern side of the 35-foot (10.67-m) wide buffer zone. This site is also situated out of but less than 1 m south of the proposed canal 50-foot (15.24-m) wide right-of-way. The site is also situated about 25 feet (7.62 m) above the right-of-way as it is situated on a terrace above the project area.

EXTENT OF INVESTIGATION TO DATE: Survey records including site form, sketch map, and photographs.

RESEARCH POTENTIAL: The site may provide a limited amount of information regarding the local/regional prehistory of the Gad'iahi area.

RECOMMENDATIONS: Although the site appears to be less than 1 m at its closest point from the edge of the proposed canal right-of-way, the site is also located 25 feet (7.62 m) above the edge of the right-of-way. Given the elevation difference between the site and the irrigation system, it is recommended that the proposed undertaking as currently designed will have no effect on those qualities and characteristics that contribute to the significance of the site. Therefore, a determination of no historic properties affected be made for the proposed undertaking since the site can be avoided.

SITE ASSESSMENT UNDER 36 CFR 60.4 (National Register):

INTEGRITY: The site possesses integrity of location and setting. The qualities of design, feeling, materials, association, and workmanship do not appear to apply.

and **CRITERIA a-d:** The site does appear to represent a property which is potentially eligible for inclusion on the National Register of Historic Places under criteria a, b, or c. It may be eligible under criterion d as a result of its research potential.

EXCLUSIONS: The site does not appear to fall into categories a-g, thus it does not qualify as an exclusion. The site does meet the 50-year guideline.

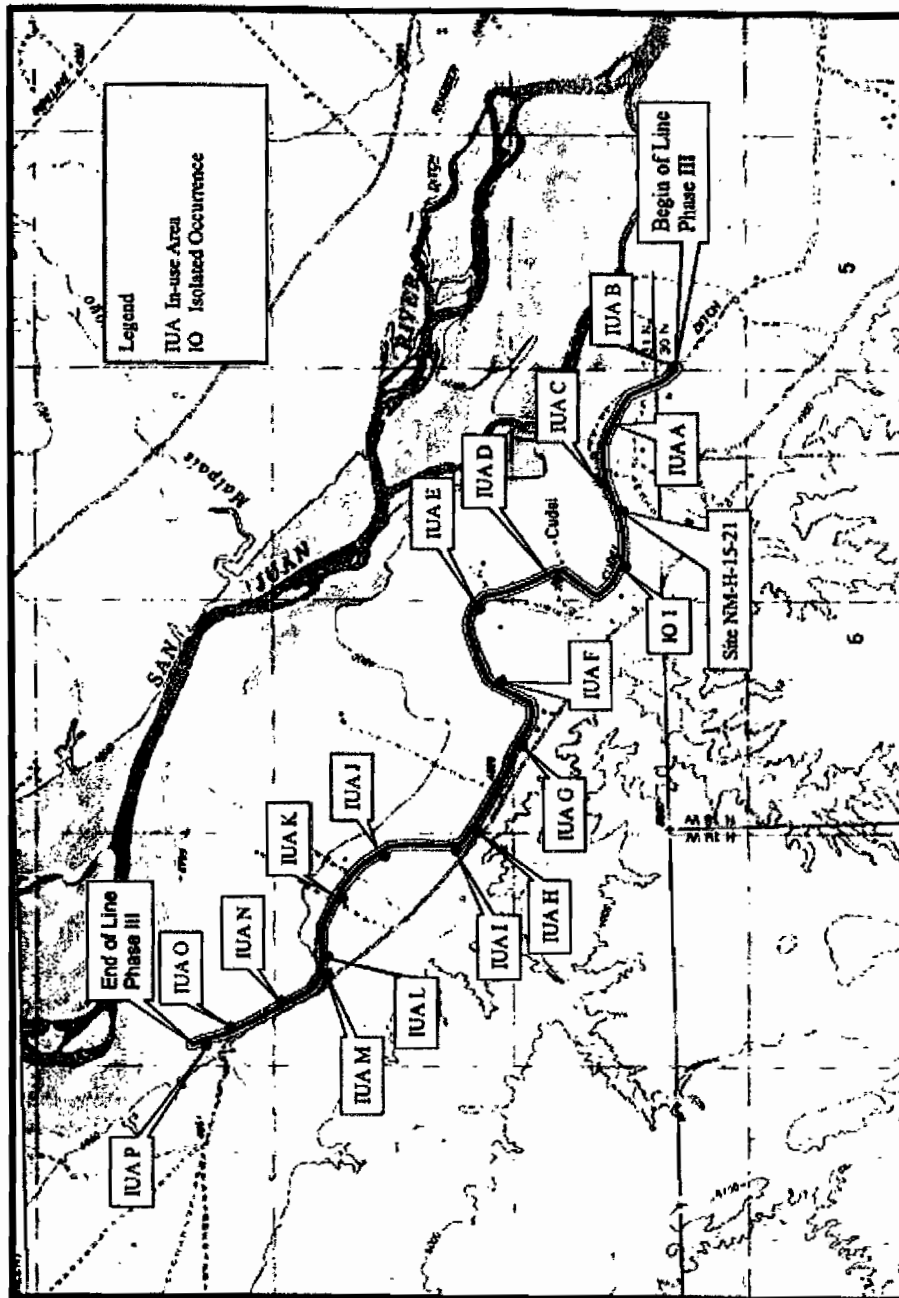
SITE ASSESSMENT UNDER 43 CFR 7.3 (Archaeological Resources Protection Act): The site is of archaeological interest. It does meet the 100-year age requirement. It does merit protection under ARPA.

SITE ASSESSMENT UNDER AIRFA (American Indian Religious Freedom Act): The site does not merit protection under the provisions of AIRFA.

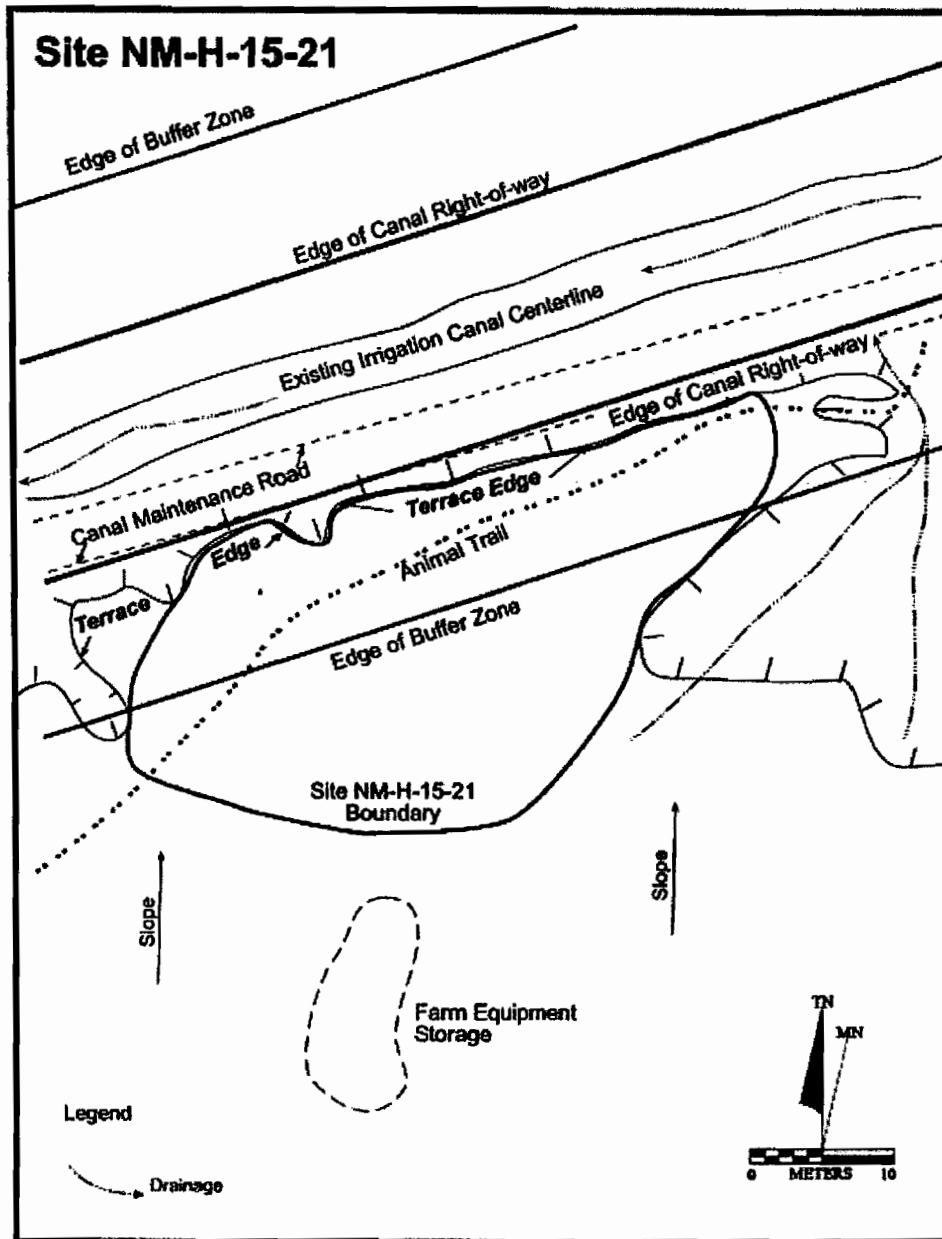
PROVIDE A SITE MAP (including site designation, north arrow, scale, recognizable features, landmarks, and relationship to project area).

HOW CAN THE SITE BE REACHED? (See attached USGS map.)

OTHER COMMENTS (Ethnographic data, etc.): None



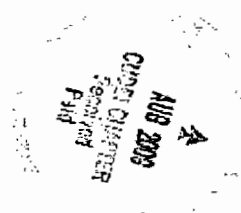
Location map showing the location of the project area and identified cultural resources. Rattlesnake, N. Mex., 1983, 7.5' series USGS map; T.30N and T.31N, R.18W and R.19W, NMMP (NNAD 09-206).



General plan map, Site NM-H-15-21 (NNAD 09-206).

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APPENDIX B
Historic Record of the Gad'li'ahi Canal



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HISTORIC RECORD OF THE GAD'IIAHI CANAL

NAME: A Cultural Resource Inventory of the Proposed Gad'iiahi Canal Irrigation System Modification in Gad'iiahi, San Juan County, New Mexico.

LOCATION: Beginning of Line: 4079808 Northing, 700786 Easting
End of Line: 4082350 Northing, 696086 Easting

SIGNIFICANCE: The Gad'iiahi canal is part of an integral part of the Navajo history focusing on the economy after the Navajo returned from Bosque Redondo post-1868.

DESCRIPTION: The Gad'iiahi canal is an open irrigation ditch constructed in 1880 by the Navajo community. Currently a portion of the canal remains unlined and is still an open ditch. Recently, the eastern portion of this canal system was converted to a piped underground irrigation system. While the western half of this canal remains an open ditch irrigation system. Head gates and inlets are some of the features that are located sporadically along the canal. Also noted along the ditch were several steel and wooden walkway bridges that allow for crossings across the open ditch.

HISTORY: According to Bailey and Bailey (1982) the Gad'iiahi canal was constructed in 1880. During the 1880s the canal system was maintained by the early Navajo inhabitants of the community. Bailey and Bailey (1982) indicated that numerous irrigation canals were in existence and were utilized by the Navajo by the late 1880s before the government-funded projects on the Navajo reservation in the 1890s. Local ethnographic interviews recall that the first irrigation canal in this community was dug manually by the Navajo community members upon their return from Fort Sumner. Apparently the canal or ditch was only a short length. The ditch was diverted south of the San Juan River and ran in a northwesterly direction from the present chapter house location. The ditch diverted back into the river directly north of the chapter (Robert Ahkeah, personal communication 2009). According to Bailey and Bailey (1982) the Cudai Ditch was located 5.5 miles downstream from the Shiprock School (possibly located east of the present day Shiprock Chapter House). The Cudai ditch was irrigating 832.2 acres of land in 1905 and it was carrying a capacity of 13.55 cubic feet per second.

Sometime after 1920, the Bureau of Indian Affairs began assisting with irrigation canal improvements by installing head gates at the inlets of canals from the San Juan River. Further development entailed clearing potential fields with dozers along either sides of the river. During the 1940s to the 1950s, Sam Ahkeah's tribal administration took great stride in securing improvements and further development of agricultural fields along the San Juan River in conjunction with the development of the Navajo Dam. According to local history, the farmland was possibly 1/3 its present size.

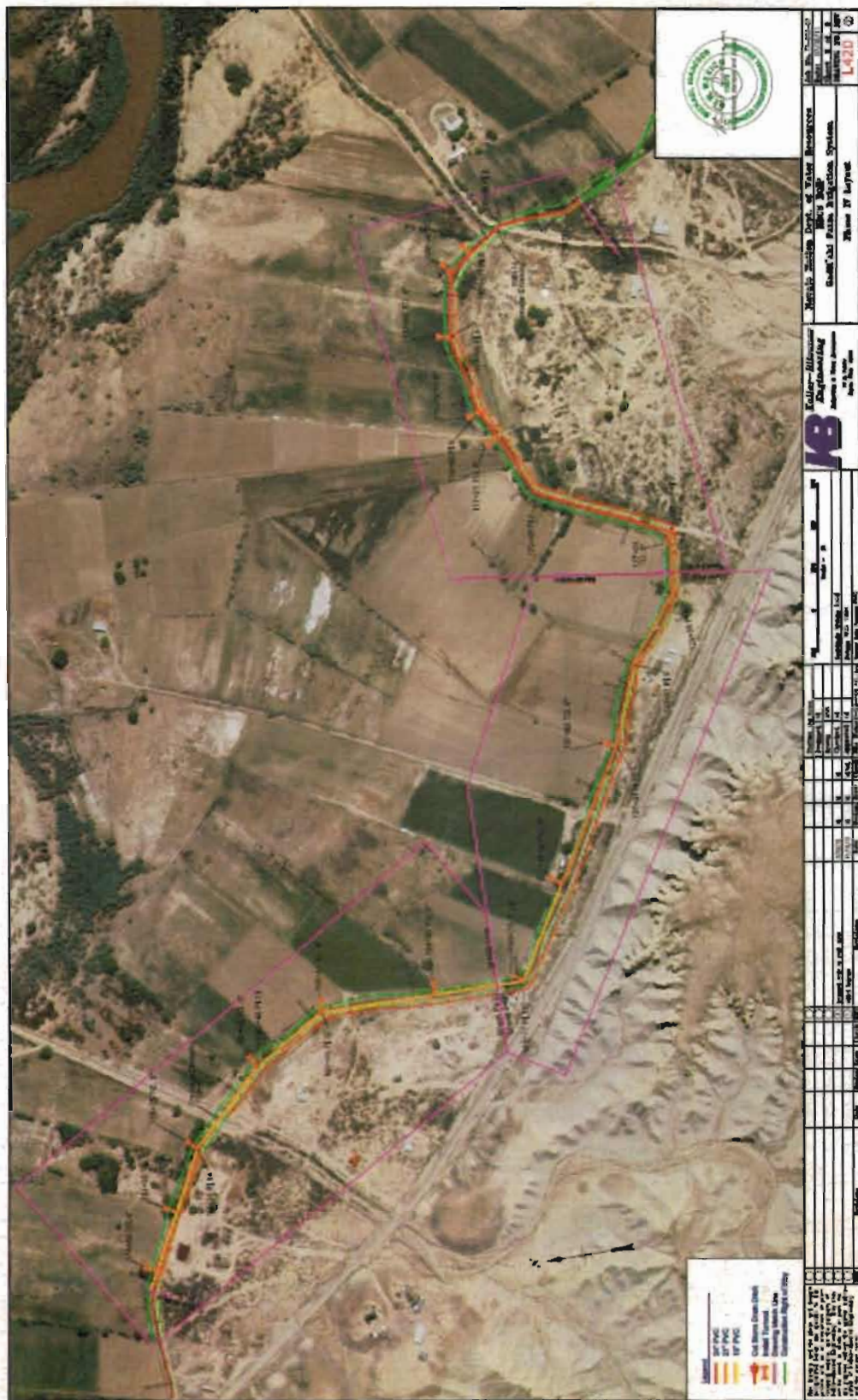
SOURCES:

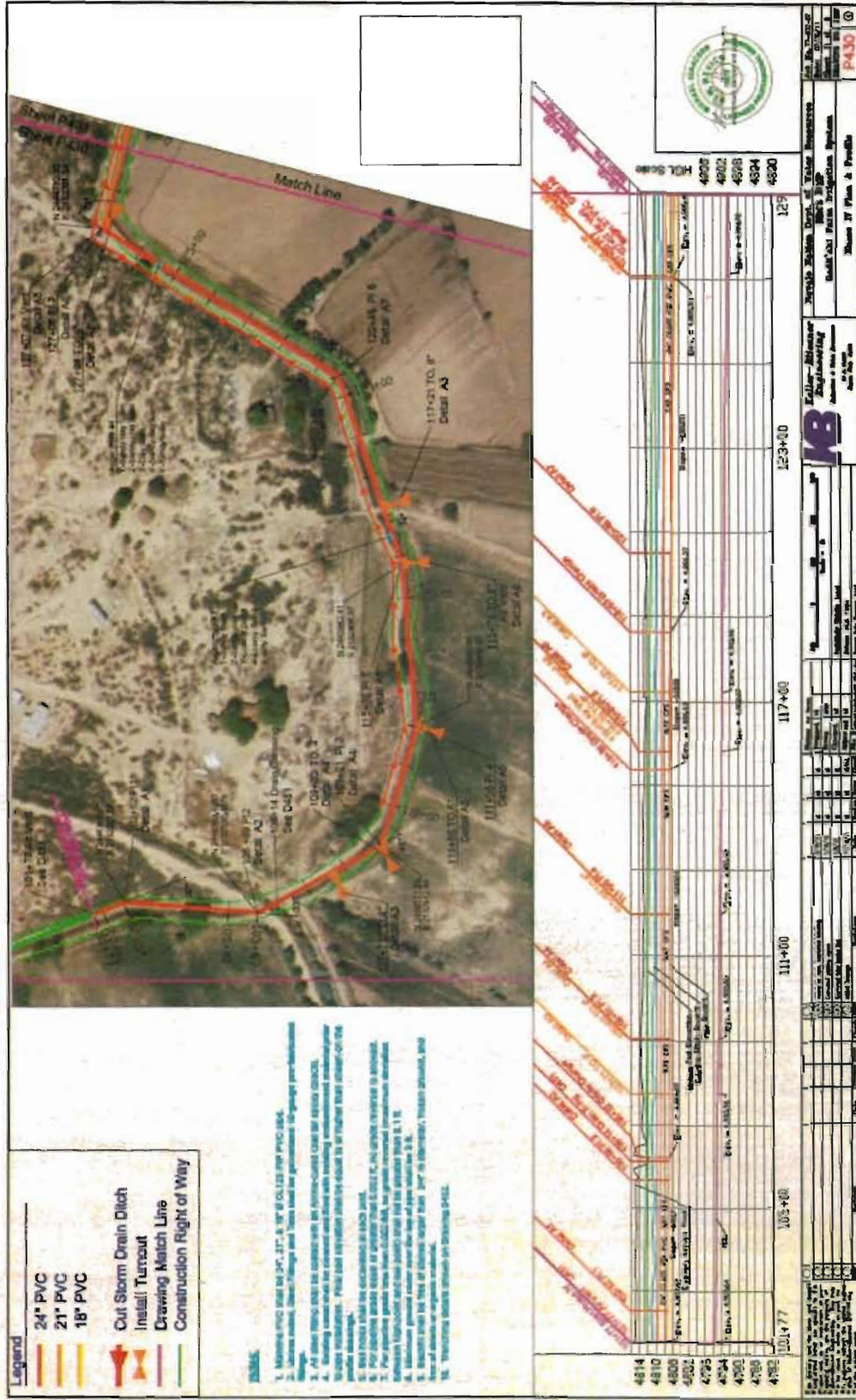
Bailey, Garrick A., and Roberta G. Bailey
1982 *Historic Navajo Occupation of the Northern Chaco Plateau*. University of Tulsa, Oklahoma.

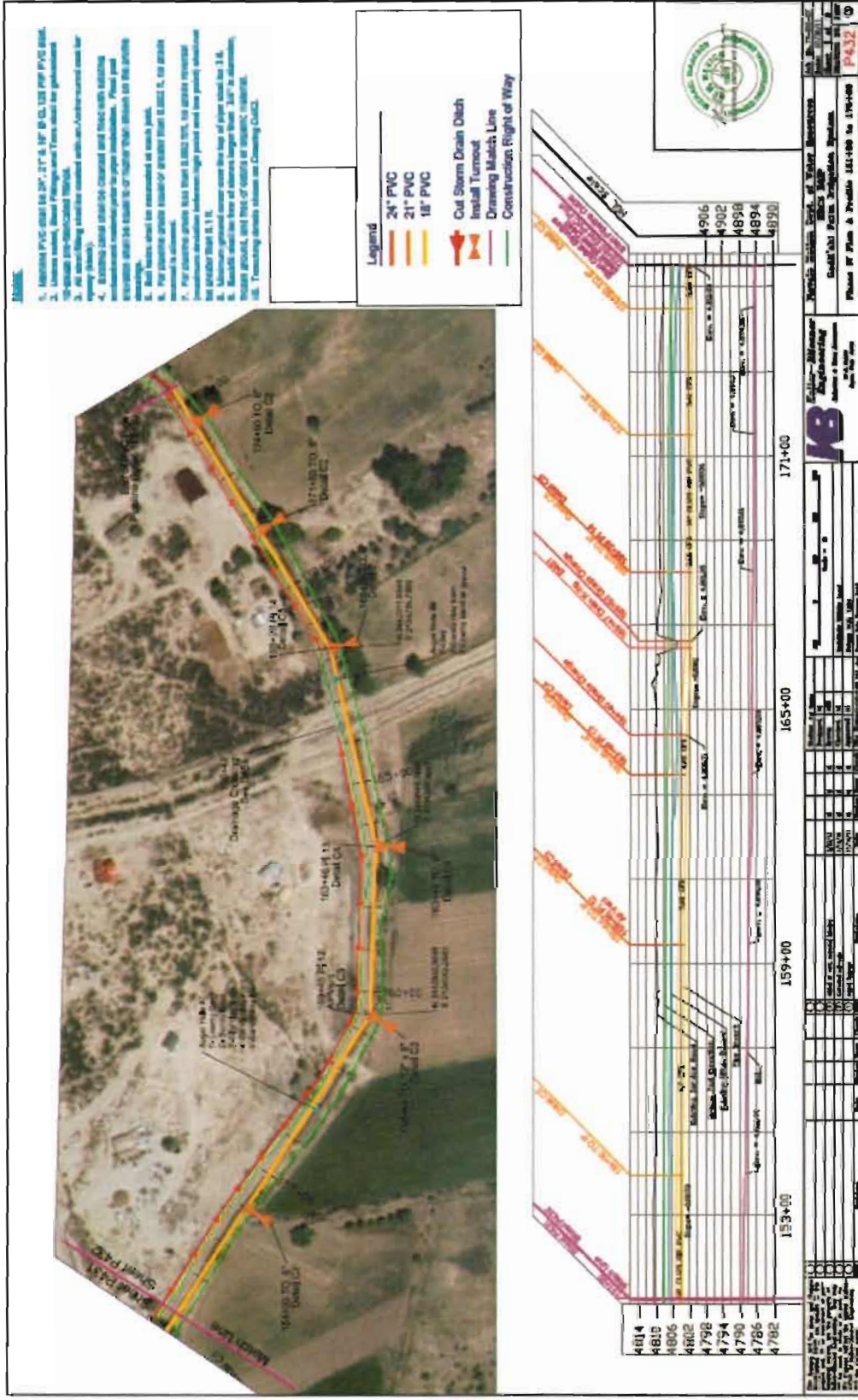
HISTORIAN: Lenora Tsosie

PROJECT INFORMATION: The open ditch irrigation practiced by the farmers has served its usefulness and now the community is striving to address conservation measures by employing a technologically modified controlled irrigation system. The piped irrigation system will hopefully minimize the overgrowth of unwanted thorn and scrub brush along the canal, and also manage the water usage. Recent work on the Gad'iiahi irrigation canal was conducted under Phase I of the Gad'iiahi irrigation canal system project (Yazzie and Cleveland-Mason 2005). Construction of Phase I created an underground segment of the Gad'iiahi irrigation canal system. Phase I construction occurred between 2005 and 2007. No information about Phase II, which is in preparation, is known at this time. Phase III of the Gad'iiahi irrigation canal system is considered the project discussed herein. The project is entitled *A Cultural Resource Inventory of the Proposed Gad'iiahi Canal Irrigation System Modification in Gad'iiahi, San Juan County, New Mexico*, which was conducted under the Navajo Nation Archaeology Department (NNAD) Report 09-206.

APPENDIX C – DESIGN DRAWINGS







APPENDIX D – CUDEI SIPHON OWNER’S MANUAL

Cudei Siphon Owner's Manual

This manual contains a design and construction report and all operation procedures and maintenance items required for operating the Cudei Siphon. Included are the following items:

- ☐ Section 1 - an overview describing the siphon, legal description, and design criteria
- ☐ Section 2 - discusses operation and maintenance of the entire system
- ☐ Section 3 – discusses strategies for delivering water to Cudei
- ☐ Section 4 - containing permits
- ☐ Section 5 - contains manufacturers' technical bulletins for all material
- ☐ Section 6 - contains tests conducted to ensure quality compliance during construction
- ☐ Section 7 - contains contract specifications
- ☐ Section 8 - contains as-built drawings

Carefully read through and make sure you understand all steps before starting to fill, drain or operate the system. Failure to do so can be dangerous, result in damage to the system, and wasted time. Remember **SAFETY FIRST**.

Section 1- Overview of the Cudei Siphon

1.1 Introduction

Prior to the installation of the Cudei Siphon, the Cudei Irrigation Project, an area consisting of 627 acres with 543 acres of crop land (NNDWR, 1998), diverted flow from the San Juan River via a diversion structure constructed of quarry rock. This diversion dam was identified by the San Juan River Basin Recovery Implementation Plan as an impediment to upstream fish migration in the San Juan River, particularly the endangered Colorado pikeminnow and razorback sucker. Hence, the diversion dam was removed on January, 2002, and replaced with a 21-inch PVC siphon which connected Cudei canal with Hogback Canal. As a result, water supply for irrigation at Cudei is now diverted from the San Juan River via the Hogback Diversion Dam.

Associated with the installation of the siphon were other projects to Hogback Canal designed to ensure reliability in water delivery to Cudei water users. These projects included replacing Hogback Diversion Dam with a new rock filled diversion, a trash rack at the mouth of Hogback Canal, improvements to sluicing gates along Hogback Canal, modifications to control structures, and various maintenance and repair projects.

Due to the installation of the Cudei Siphon, Cudei Canal operations have changed. These changes include the need to order water from Hogback Canal, increased flow in the canal, and greater available head. The operating procedures outlined in this manual deal with these new conditions.

1.2 Cudei Siphon Route

The siphon begins at a point on Hogback Canal approximately 4,200 ft downstream of Jim Canyon Siphon, commonly known as "second wash". The siphon then crosses an existing 16-inch oil pipeline owned and operated by Giant and continues 2,125 ft to the southwest following a ridge line. The siphon then angles southward and extends 2,854 ft, descending into the river plain via a small gully north of field 311. During this stretch, the pipeline crosses a small concrete ditch, agriculture land, two NTUA water lines, and Navajo route 364. The siphon then crosses the San Juan River by heading 790 ft to the west. The river crossing is located on the river where a small island divides the main channel into two channels. Once across the main channel, the siphon heads 612 ft to the southwest to the east edge of the Cudei wasteway canal where it crosses a secondary channel of the San Juan River. The siphon then extends 935 ft parallel to the waste-way canal until it intersects with the old Cudei Canal alignment just upstream of the wasteway canal. Then the pipeline runs 27 ft along the old canal alignment to the outlet box. Total length of the pipeline is 7,343 ft. Table 1-1 details the various road and utility crossings along the siphon route.

Table 1-1. Road and Utility Crossings for Cudei Siphon Pipeline.

Crossing	Cudei Siphon Station	Elevation Top Pipe of Cudei Siphon	Distance between Cudei siphon and entity	Comments
Giant-Cizinal ¹ 16" oil pipeline (see Section 4)	0+59	4,968.00	Oil pipe invert 3.5 ft above top of pipe	Oil pipeline ~30" below ground surface. Call oil company before digging in area.
Shiprock Irrigation Number 9 Ditch	25+12	4,952.38	Canal invert 8" above top pipe	2" concrete canal liner
NTUA 6" water line	25+35	4,952.39	NTUA Pipe invert 10" above top pipe	Capped siphon pipe and cased 6" w/ 1.5 cy concrete
NN364 road crossing (see Section 4)	34+76 to 35+36	4,838.34 to 4,838.07	Center of Pavement ~5 ft above top of pipe	Sleeved pipe w/ 30" HDPE culvert
NTUA 4" water line	37+92	4,835.74	NTUA pipe invert 13 inches above top pipe	Capped siphon pipe and cased 4" w/ 1.5 cy concrete

¹ Giant-Cinizal Pipeline was bought by the Navajo Nation in 2002.

1.3 Cudei Siphon Legal Description

A 50 ft right-of-way for operating and maintaining the siphon has been secured for the Navajo Nation Department of Natural Resources. This description slightly differs from the description submitted to the Navajo Nation (Revocable Use Permit DATE) in order to cross highway NN 364. Following is the revised legal description for the right-of-way:

A parcel of land generally situated in Sections 33 and 34 , Township 31 North, Range 18 West, and in Section 4, Township 30 North, Range 18 West, New Mexico Principal Meridian, Navajo Nation, State of New Mexico, the parcel is described as follows:

Commencing at the corner of sections 3, 4, 33, and 34, Townships 30 and 31 North, Range 18 West New Mexico Principle Meridian, being a Bureau of Land Management stainless steel post with brass cap dated 1995, from which the quarter section corner of sections 33 and 34, Township 31 North, Range 18 West, being a Bureau of Land Management stainless steel post with brass cap dated 1995, bears North 0° 02' West 2,640 feet; thence from said point of commencement North 0° 02' West 2,034.94 feet and East 1,153.70 feet to the point of beginning:

A Right-of-Way being 25 feet on either side of the following centerline;

Thence South 47° 12' 48" West 1,152.45 feet;

Thence South 52° 07' 52" West 983.90 feet;

Thence South 38° 39' 06" West 2,852.19 feet;

Thence North 89° 10' 16" West 791.36 feet;

Thence South 45° 11' 48" West 611.29 feet;

Thence South 41° 42' 39" West 923.64 feet, more or less to the North bank of an existing canal;

The above described Right-of-Way contains 8.40 acres.

1.4 Cudei Siphon Design

The siphon was designed based upon a flow of 18 cfs. This volume provides a unit capacity of 0.029 cfs per acre requiring a 42% peak irrigation efficiency for the project area. The pipe can actually safely convey 24 cfs under upstream control, because the pipe was oversized to provide surge protection to the pipeline in the event that downstream control ever occurred. Since the siphon will operate under upstream control, the turnout structure was designed to limit the flow to 24 cfs.

Presently, the siphon will operate under upstream control. This control scenario was chosen to reduce large pressure transients in the pipeline and for minimum energy dissipation at the outlet. The operating concept is that the pipeline will fill until it can deliver the desired flow rate to Cudei Canal. Due to the great elevation difference between the Hogback and Cudei canals (153 ft) with most of the descent occurring in the upper reaches of the pipeline, the upper third of the pipeline will operate under partially full pipe conditions.

The pipe was sized using the Hazen-Williams equation with a conservative constant of 140 for PVC and assuming downstream control. Downstream control was used to size the pipe to reflect all of the potential losses throughout the pipeline. The minimum diameter pipe for a design flow of 18 cfs is 18 inches. This size of pipe causes elevated velocity at design flow, resulting in higher magnitude pressure transients than desirable should downstream control ever be implemented. As a result, the next diameter size of 21 inches was chosen to provide a greater margin of safety.

The maximum pressure encountered in the siphon is less than 20 psi, located at the river crossing. Should downstream control ever be implemented, static pressure in the river crossing can reach as high as 70 psi and approximately 44 psi will have to be dissipated at the outlet of the siphon for a flow of 18 cfs. Installation of a valve at the end of the siphon for downstream control is not recommended unless energy dissipation features are added to the outlet structure at the Cudei canal.

1.4.1. Materials

The siphon consists of 21-inch diameter 125 psi PIP PVC pipe. PVC pipe was selected because of the low pressure encountered in the pipeline, the inert properties of PVC in a corrosive environment, the historic durability, the simplicity of installation, and the reduced costs of this type of pipe.

Lengthening the life of the siphon was one of the primary design goals. To extend the life of the pipeline as long as possible, non-ferrous materials were selected to avoid corrosion. Fittings used for tees and elbows for the pipeline consisted of 21-inch diameter 125 psi PIP PVC fabricated fittings manufactured by NACO Manufacturing Co.

Thrust blocks were constructed by pouring concrete between the pipe fitting and an undisturbed trench wall. Minimum bearing areas were calculated and are shown on the as-built Drawings. In addition, concrete weights were placed on top of the pipe in the river channel to prevent the pipe from floating up.

All materials used for constructing the siphon were of new, first-quality manufacture, free from defects and suitable for the intended use. Manufacturer's names were used in the Specifications for the purpose of establishing the standard for quality and general configuration. All material used for constructing the siphon were inspected and approved prior to installation. Table 1-2 lists all the material used for installing the siphon. Cut sheets for all materials are provided in Section 5.

Table 1-2. Material used to construct Cudei Siphon

Item	Location	Manufacture	Specifications
Welded Steel Grating	Hogback Canal Check Structure	McNicholes	GW 3'x1'x1/8" epoxy
Slide Gate	Hogback Canal Check Structure	Waterman	4-ft x 4-ft gate w/ 8-ft frame Crank operater
Canal Gate	Hogback Canal Turnout	Waterman C-10	24-inch wall mounted
24-inch PVC pipe	Hogback Canal Turnout	Diamond Plastic	24-inch 125 psi PIP
21-inch PVC pipe	siphon	Diamond Plastic	21-inch 125 psi PIP
21-inch x 4-inch PVC Tees	air vents	NACO Industries	21-inch x 4-inch fpt Tee. 125 psi PIP
21-inch x 4-inch Steel Saddle Tee	air vent 22+16	Ford Meter Box	21-inch x 4-inch fpt Enamel coated saddle with stainless-steel band
4-inch air vents	air vents	Waterman CR101	4-inch galvanized
45 deg PVC elbows	elbows	NACO Industries	21-inch 45 deg. 125 psi PIP
21-inch x 6-inch PVC Tee	Pumpout	NACO Industries	21-inch x 6-inch fpt Tee. 125 psi PIP
6-inch J-plug	Pumpout	Wellmaster Pipe and Supply	6-inch
90 deg PVC elbow	Cudei Canal	NACO Industries	21-inch 90 deg 125 psi PIP
Sluice Gate	Cudei Canal	Waterman	2-ft x 2-ft
Staff gauges	Cudei Canal	Stevens Water Monitoring Systems, Portland, OR	2-ft

Section 2 - Operation and Maintenance of Cudei Siphon

2.1 Spring Start-up and Siphon Filling

Before startup in the spring, canal personnel should clean out the debris caught in the turnout structure, lubricate the gates, check the air vents for debris, make sure the pump-out is closed, scoop out the remaining sediment deposited in the outlet box, and clean out Cudei Canal and the wasteway at the outlet. Regular inspection and maintenance of siphon components will ensure both the longevity and the safe operation of the siphon. Neglecting maintenance items may lead to damaging the siphon which can result reducing the life of the facility, causing injury or death to personnel, and loss of time and property.

2.1.1 Filling Hogback Canal

Prior to filling Cudei Siphon, Hogback Canal should be filled and fully operating between Jim Canyon Siphon and the spillway downstream of the Cudei Siphon turnout. Care should be taken to either sluice out or clean out the sediment from the canal in this reach. Prior to filling Hogback Canal, personnel should:

1. Inspect the check structure and turnout structure. Operate and lubricate the gates over the full range of operation.
2. Raise the 4-ft inline slide gate to the top to facilitate sluicing.
3. Close the turnout gate to Cudei Siphon.

Once these tasks have been completed, Hogback Canal can be filled. Allow Hogback Canal to sluice for a day prior to opening the siphon.

2.1.2. Filling Cudei Siphon

Once Hogback Canal is fully operating and has had time to sluice, Cudei Siphon can be filled. Prior to opening the siphon gate:

1. Inspect and clean the trash rack of the siphon.
2. Inspect the air vents along the siphon route for proper operation.
3. Slightly open the J-plug on the pump-out for venting.
4. Open the 2-ft sluice gate to the wasteway at Cudei Canal.
5. Inspect Cudei Canal and the wasteway to make sure that the canal is ready to receive water.

Read the staff gauge installed on the inline check in Hogback Canal and use Figure 1 to estimate the potential flow which can be diverted to Cudei Siphon. To operate the siphon, the water elevation in Hogback Canal should be set so a maximum flow of 18 cfs is achieved (a staff gauge reading of 1.8-ft). To adjust the water elevation in Hogback Canal:

1. Slowly move the 4-ft inline gate upwards or downwards until the satisfactory head is achieved.
2. Check the water elevation upstream in Hogback Canal once the flow has stabilized to ensure that there are no problems.

When filling the siphon, use the turnout gate to throttle the flow to the siphon. Measure the stem opening of the gate and use Figure 2 or Table 2-1 as a guide to estimate flow to the siphon. To fill the siphon:

1. Slowly open the 24-inch canal gate and set the gate so that a maximum flow of around 6 cfs is achieved.
2. Inspect all of the air vents for proper operation.
3. Inspect the pump-out and tighten the J-plug by using a wrench once water is visible in the riser.
4. When water is flowing out the end of the pipe and to the wasteway, flush out the siphon by slowly opening the turnout gate so that a flow of 16 to 18 cfs is achieved. Let the line flush out for a period of time until the water coming out of the end of the pipe appears to be free of debris and sediments and the outlet structure upstream of the weir is cleaned.
6. Once the line is flushed out, slowly close the 2 ft sluice gate at the Cudei outlet until a flow of 10 cfs is flowing over the outlet weir and into the canal. Use the staff gauge mounted on the outlet box and Figure 3 as a guide. If problems arise during canal filling, stop the flow to the canal by opening the sluice gate at the outlet and then by closing the inlet gate.
7. Once the Cudei Canal is filled, adjust the turnout gate so that the maximum desired flow rate is achieved. See Step 9.
8. Use the staff gauge installed at Cudei and Figure 3 as a guide in regulating flow to Cudei Canal. Adjust the 2-ft sluice gate at Cudei accordingly until the desired flow rate to the canal is achieved.
9. When throttling the intake with the 2-ft canal inlet gate, use a tape measure to measure the stem of the gate as shown in Figure 2-4 and Figure 2-2 or Table 2-1 to estimate the flow. Be careful to use the curve which corresponds with the staff gauge reading at Hogback. If the gate is wide open, Figure 2-1 may be used to estimate flow to Cudei. Be aware that debris on the inlet trash rack will reduce flow by as much as 30%.

2.2 In-Season Operation

In-season operation should include monitoring water deliveries to Cudei Canal. Flows delivered to Cudei should be checked each week and gates adjusted accordingly in order to conserve water. Criteria for acceptable return flow from Cudei Canal needs to be determined by the Canal Water User's Association. Use the staff gauges and the appropriate rating as a guide to set the siphon gates.

The best strategy for monitoring water deliveries to Cudei is to check the turnout gate located on Hogback Canal daily and to inspect Cudei Canal at least once a week. Checking the flow diverted to the turnout gate daily will enable canal operators to clean the trash rack and to note water delivered to Cudei Canal by using Figure 2-2 or Table 2-1. Flow delivered should be recorded daily to provide data for canal management using the form outlined in Table 2-2. Weekly inspections of Cudei Canal will allow canal operators to assess the water delivered and to make future gate adjustments.

2.2.1. Setting the turnout gate

When operating the siphon, the canal operator sets the turnout gate in Hogback Canal to the desired flow rate using Figure 2-2 or Table 2-1. With the turnout gate set, the canal operator can then adjust the flow to Cudei Canal via the sluice gate located in the Cudei outlet box (this task may also be delegated to Cudei farmers).

The following steps are used to set the turnout gate for the siphon:

1. Receive the water order from the Cudei Chapter Water User's Association.
2. In order to deliver the water order, trash on the turnout gate must be accounted for. It has been observed that trash will reduce the siphon intake by approximately 30%. To account for the trash, multiply the flow order by a factor of 1.3. This adjusted flow is used to set the gate.
3. Read the staff gauge mounted on the inline check in Hogback Canal.
4. Slowly adjust the turnout gate until the stem measurement delivers the adjusted flow from step 2 as shown on Figure 2-2 or Table 2-1. Measure the stem from the top of the hand wheel to the bottom of the nut as shown on Figure 2-4.

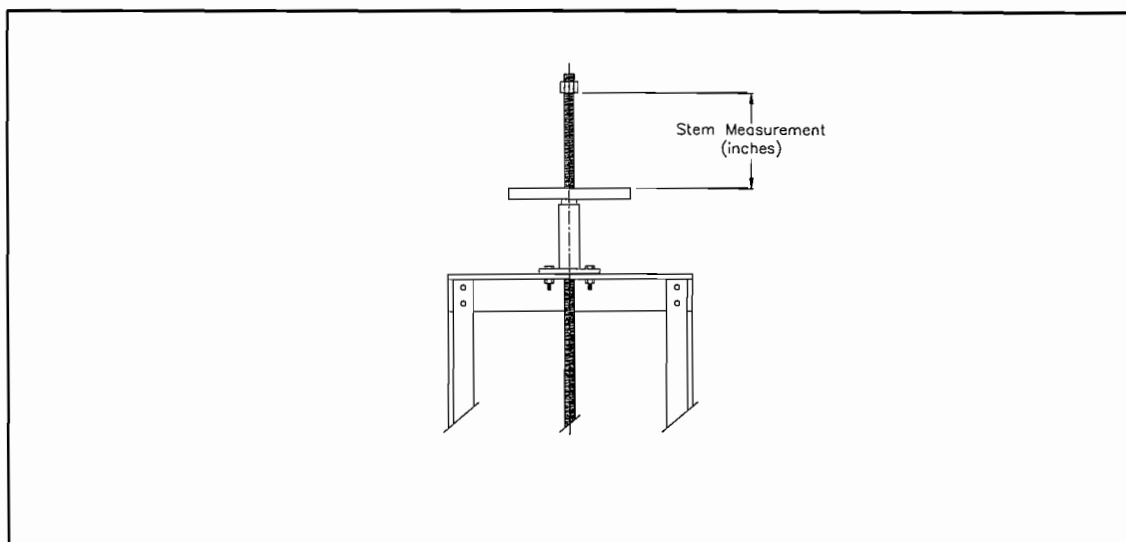


Figure 2-4. Location on gate stem where the stem measurement is taken to be used with Figure 2 or Table 2-1.

The following example is used to demonstrate this process. Suppose Cudei Chapter Water User's Association orders 13 cfs of water (Cudei staff gauge reading of 0.79 ft) for the coming weekend. In this example, 13 cfs multiplied by 1.3 is 16.9 cfs. Therefore, when setting the turnout gate, the gate should be set so that a flow of 16.9 cfs is diverted. By doing this, a minimum of 13 cfs should always be delivered to Cudei even when trash is deposited on the trash rack. Suppose in this example, a reading of 1.80 is observed on the staff gauge at Hogback

Canal. Using Figure 2-2 or Table 2-1, the turnout gate is adjusted so that a stem measurement shy of 13-inches is achieved.

2.3 Maintenance

Once the siphon has been filled, siphon operation and maintenance should be fairly passive throughout the season. Table 2-2 lists locations for system components while Table 2-3 presents a maintenance schedule for the siphon.

Each day during operation, the trash rack over the inlet should be cleaned. The debris fastened on the trash rack can reduce flow to the siphon by 30%. Because trash on the trash rack can reduce flow by upwards of 30%, pulling trash off of the trash rack is like instantaneously turning on a valve or a pump. For higher flows, this sudden increase in flow rate can trap air in the siphon which eventually will sweep the air to the outlet causing large air gushers. To avoid this problem, when cleaning the trash rack, use the following steps:

1. Measure the stem of the turnout gate from the top of the hand wheel to the bottom of the nut as shown on Figure 4.
2. Close the turnout gate 3-inches.
3. Remove the trash off of the trash rack.
4. Slowly open the turnout gate back to the original setting at a rate of 1-inch per minute.

The siphon route should be inspected for leaks and other problems each month. The inspection should include a visible check of all of the air vents and the pump-out. The siphon should be sluiced for a hour each month. Periodic sluicing will help keep the siphon clear of sediments and debris. A minimum flow of 16 cfs should be used when sluicing the siphon. Due to the turbulence in the outlet box created by opening the sluice gate, sluicing should be monitored by authorized personnel. When lubricating the gates, lubricate the gate over the entire range of operation.

Table 2-2. Location of System Components

Component	Description	Location and (Access)
Check structure slide gate	48" Crank Shaft slide gate	Hogback Canal (just downstream of Cudei inlet)
Turnout	24" screw lift canal gate	Hogback Canal
Air Vents (4 total)	4" air vents	1- 200 ft south of turnout (follow pipeline corridor from Hogback Canal) 2- 2,000 ft south of turnout (follow pipeline corridor from Hogback Canal) 1- In Field 309 (foot- follow pipeline corridor vehicle- through driveway of homesite to East (by permission only))
Pump-Out	6" access port	South bank of San Juan River (1,000 ft north of Cudei outlet, follow wasteway)
Outlet	24" screw lift sluice gate	Cudei Canal (past locked gate)

Table 2-3. Maintenance tasks for Cudei siphon.

Task	Description	Frequency
Clean trash rack	Clean inlet trash rack of debris	daily
Inspect route	Inspect siphon route for leaks or other problems	monthly
Sluice	Sluice out siphon through wasteway at Cudei	monthly
Lubricate gates	Lubricate riser stems for the entire range of operation	every season or as needed

2.4 Fall Shutdown

When shutting down the siphon at the end of the season:

1. Open the sluice gate at the outlet and sluice the siphon for 1 hour at a flow of 16 cfs or greater.
2. Slowly close the inlet gate. Open the inline slide gate in Hogback Canal.
3. Inspect all air vents for proper function (all should be opening and sucking air).
4. When flow out the sluice gate has stopped, pump out the siphon via the pump-out until the outlet pipe is drained of water. Only the last 20 ft of the siphon requires draining.
5. Block the exit of the siphon by bracing a plywood board against the concrete wall which houses the pipe. Keep the sluice gate open during the winter so that the outlet box drains.

Section 3 - Strategies for Delivering Water to Cudei

3.1 Purpose

Most canal companies regulate water deliveries to water users in order to optimize resources. By controlling deliveries, more acreage may be served by existing canal infrastructure. As acreage served by Hogback Canal expands westward, it will become critical to regulate water deliveries to ensure continuous deliveries to all Hogback Canal water users. In addition, during times of water shortages, having management practices established will ease the difficult task of allocating a sparse resource.

To regulate water successfully, management strategies should be derived and approved by the canal governing board, canal operators, ditch riders and a majority of water users. Canal regulations should be established by receiving wide input from all of these entities, by relying on documented data from system operations, and by tailoring regulations to fit a specific system. Therefore, the purpose of this section is to assist water managers in establishing water delivery regulations to Cudei Canal by explaining the system's limitations, establishing monitoring programs for data gathering, and developing general recommendations.

3.2 Cudei Siphon Limitations

Because the siphon has been designed to deliver water to Cudei Canal via gravity, it is affected by the water surface elevation in Hogback Canal. This results in unsteady flow (flow which varies over time) and will require continual adjustment to the siphon gate and continual cleaning of the trash rack in order to deliver a steady flow to Cudei over any length of time. Therefore, water delivery strategies should focus on delivering a range of flow rates rather than a specific flow rate. To accomplish this, a target flow rate is determined and assigned as the minimum flow rate. This flow rate is then multiplied by 1.3 (which accounts for blockage of flow by trash on the trash rack) to determine the maximum flow rate needed to assure the minimum required delivery. The gates are then set to divert this flow rate.

Since each end of the siphon is located on different sides of the San Juan River, monitoring the siphon closely will prove impractical. Traveling from one side to the other takes a minimum of 20 minutes. As a result, an operator could spend half a day on just setting the gate correctly. To improve the efficiency of regulating the siphon, management will have to train canal operators to set the inlet gate correctly and will have to trust the local water user's association in Cudei for policing the flow delivered to Cudei. By training canal operators to correctly set the inlet gate to a specified flow rate, delivering water to Cudei will be simplified and can be successfully accomplished from the Hogback Canal side of the river. This training should include proper gate operation, knowledge of system limitations, and familiarity of water users' needs. Correct gate operations are outlined in Section 2 of this manual. System limitations include the safe flow capacity of both the siphon and the canal. Operating the siphon to meet users' needs includes anticipating peak demand periods such as weekends.

Cudei water users' should report to canal management as required on the effectiveness of gate settings. This report should include the adequacy of water delivered, the amount of water returned to the river, and any other problems observed during water delivery. Cudei personnel can also be utilized to regulate flow into Cudei Canal by operating the sluiceway at the outlet box. Periodic inspections should be conducted by management in order to be familiar with challenges and to establish trust.

3.2 Recording Forms

In order to evaluate any system, record keeping is essential. Cudei siphon has provided a unique opportunity to begin to monitor and to record daily flows delivered to Cudei since the trash rack requires daily cleaning. If a daily record of gate stem measurement and staff gage reading is kept by the canal operator, useful data can be generated to assist management and water resource planners. Form 3-1 has been developed for this purpose. In addition, Form 3-2 has been developed for recording observations at Cudei.

To use Form 3-1, the operator simply reads the staff gauge to the nearest 0.01 ft and records it in the second column. The stem measurement as shown on Figure 2-4 is recorded in the third column. If desired, the stem measurement for the inline check is inputted in the fourth column. This measurement is taken like the stem measurement for the turnout gate. This measurement might be useful in determining Hogback Canal flow downstream of Cudei turnout. The last column is for recording the cleaning of the trash rack. Flows diverted can be determined later by using the values in the second and third columns with Figure 2-2 or Table 2-1.

To use Form 3-2, the operator simply reads the staff gauge at Cudei to the nearest 0.01 ft and records it in the second column. The third and fourth column is used to report whether or not the sluiceway is opened and whether or not the spillway is spilling. This data can be used to determine the effectiveness of the gate settings. Flows in Cudei Canal can be determined later by using the value in the second column with Figure 2-3.

Form 3-1. Monthly Cudei Turnout Report

Month:

Operator:

Day	Hogback Staff gage reading (ft)	Turnout Gate Measurement (inches)	Inline Check Measurement (inches)	Trash Rack Clean (<input type="checkbox"/>)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
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21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				

Form 3-2. Monthly Cudei Canal Report

Month:

Operator:

Day	Cudei Staff gage reading (ft)	Sluiceway Gate Measurement (inches)	Spillway Flowing (<input type="checkbox"/>)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
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30			
31			

3.3 General Recommendations

To be successful, a water delivery plan requires development internally with input from all of the players. As this system is new to most of the various entities involved, flexibility to the plan over time is required. It would not be wise to set rigid governing guidelines without any experience operating the new system. However, since the siphon is currently in operation, some general guidelines will be given to provide a starting point. Current operations should be observed and recorded to assist in evaluating these general guidelines and in development of a lasting plan of operation.

The first recommendation is that only trained and authorized canal personnel operate the turnout gate at Hogback Canal. Misuse of this gate can result in damaging both the Cudei system and Hogback Canal. In addition, individual water users may not fully understand the demands on Hogback Canal during times of water shortages or increased agricultural development.

The second recommendation would be for the water users' association in Cudei to order a minimum required flow for a future period of time and then have Hogback Canal personnel set the turnout gate accordingly. Cudei farmers can then sluice at the outlet box if minor and temporary adjustments are required. If greater adjustment is necessary, then a change in the water order can be made to Hogback Canal personnel.

The third recommendation would be to keep accurate daily records of gate settings and general observations of system performance. Documented data is a valuable tool when implementing future regulations or allocating water resources.

The last recommendation would be to place siphon maintenance under the scope of work for Hogback Canal personnel but directed by the Cudei water users' association. This will keep the association directly involved with management of this facility.