Update on Navajo Nation Regional Water Supply Projects

September 15, 2010

Water Management Branch of
Navajo Department of Water Resource
(928)729-4004

Navajo Nation Growth Centers

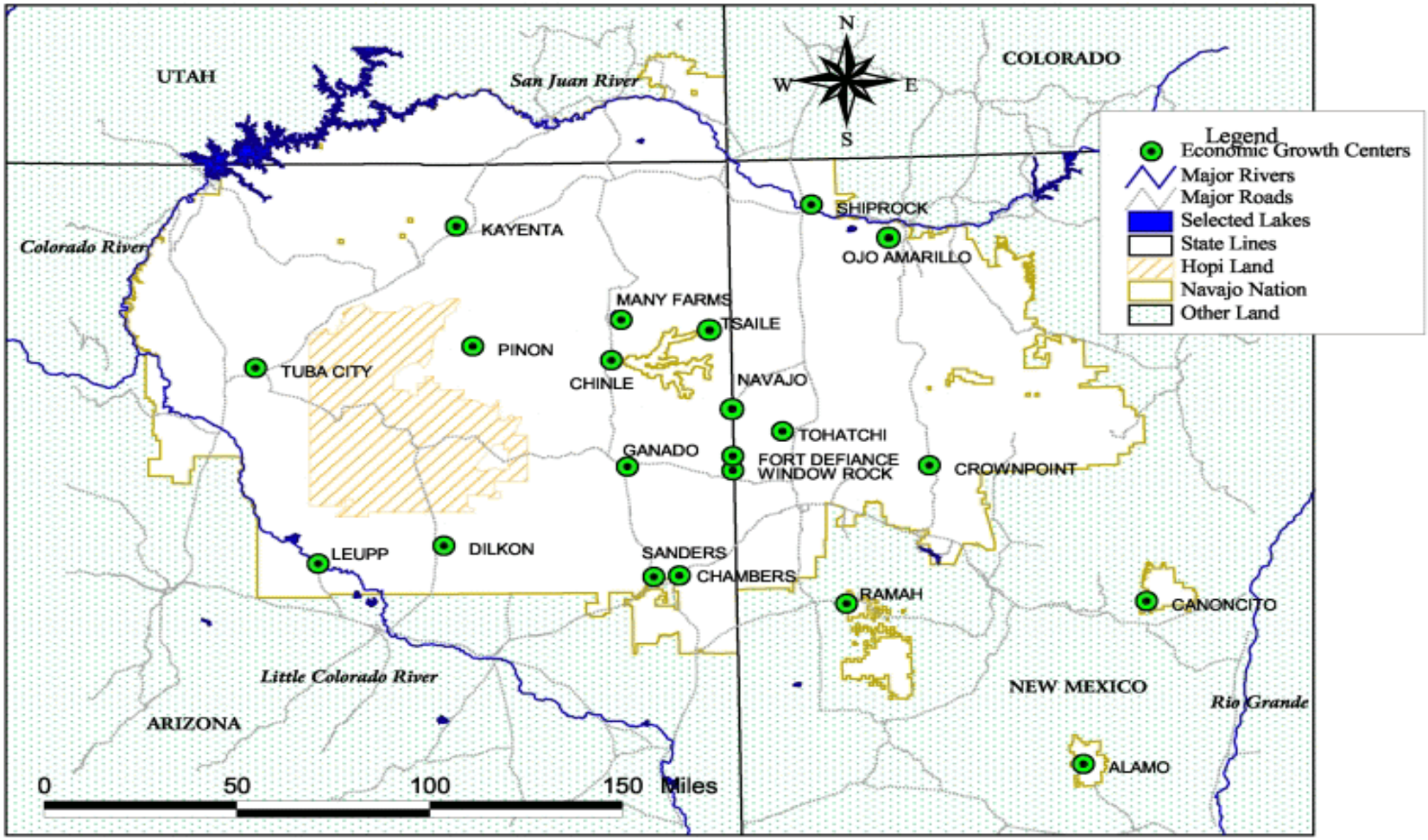


Figure 5.2 : Economic Growth Centers for the Navajo Nation (1999)

Future Growth Rates (Western Navajo Hopi Water Supply Study)

Low Demand Scenario, 2000-2050

The low end of the range of possible population growth rates for the period 2000 to 2050 is assumed to 1.3 percent. This reflects a possibility that the proposed settlement projects may not be built, or may be built but fail to provide the desired levels of economic development. The rate of 1.3 percent also reflects recent historical population trends in the Navajo Nation.

Midrange Demand Scenario, 2000-2050

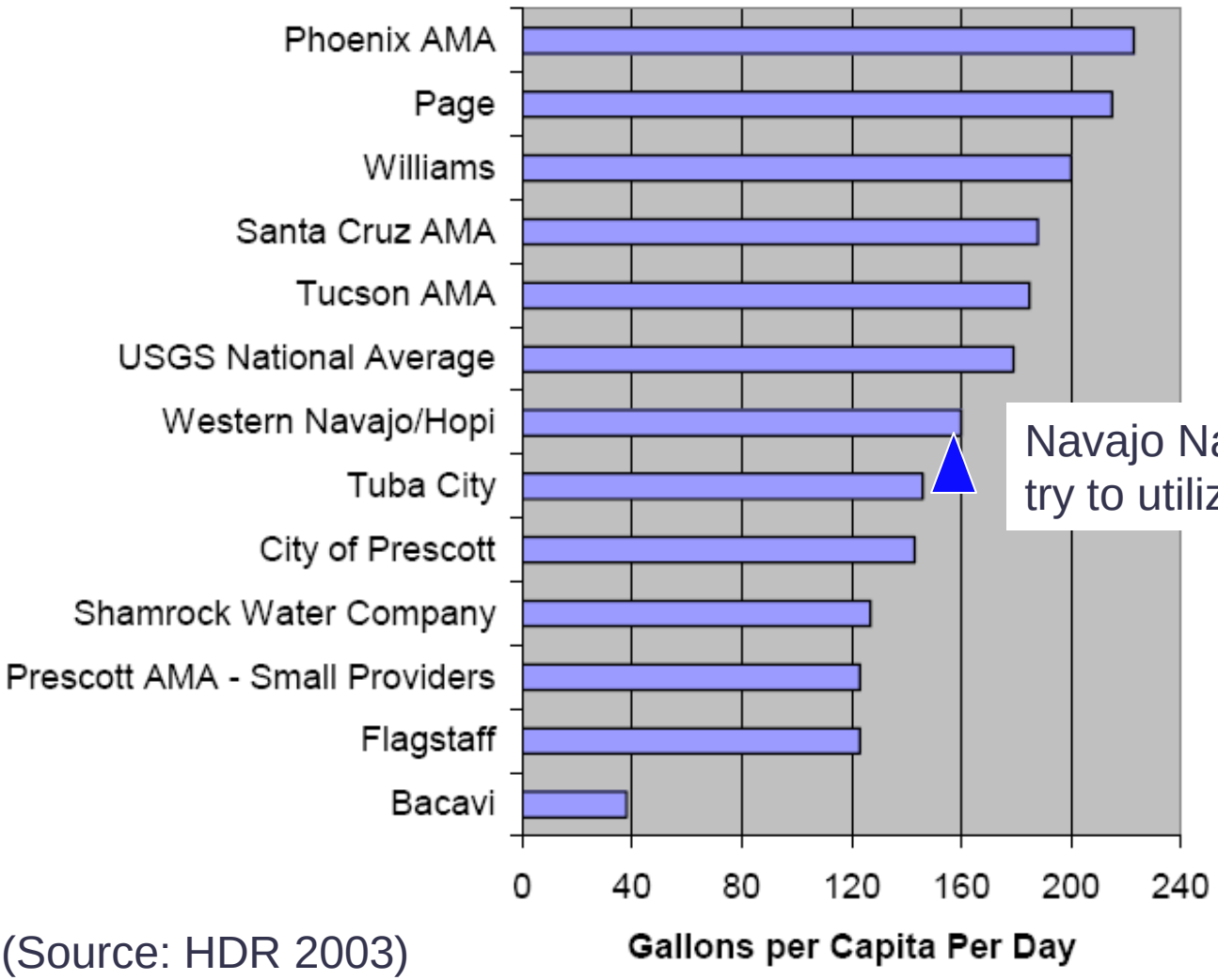
The midrange scenario was previously identified as NEA's estimate of the long-term population growth rate of 2.48 percent.

High Demand Scenario, 2000-2050

The population growth rate assumed in the high scenario is 2.75 percent. This high end boundary is not a calculated value but is intended to reflect a long-term condition in which Reservation out-migration is reduced and employment opportunity on the Reservations increases. The high-end growth rate implies that most Tribal members stay on the Reservation, and current fertility rates are maintained into the foreseeable future. From a historical perspective, a population growth rate this high has only been experienced twice for periods longer than 10 years in duration. One occurrence was between 1980 and 1990, when Reservation boundaries expanded, with the result of including additional population not counted in 1980, and the second occurrence was between 1978 and 1988.

Source: HDR, 2003

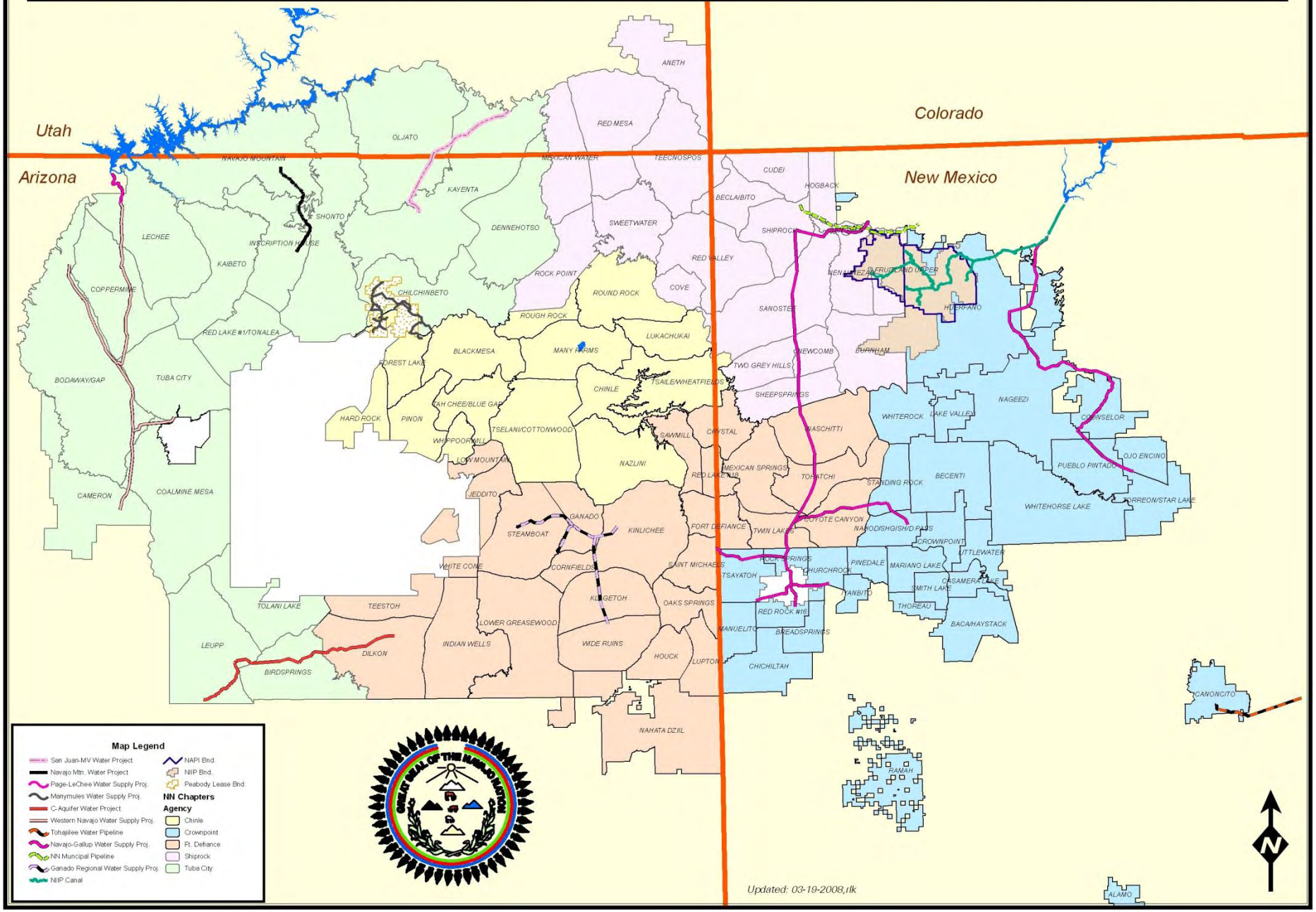
Per Capita Water Use



Navajo Nation Projects try to utilize 160 gpcd

(Source: HDR 2003)

Navajo Nation Regional (large and small) Water Supply Projects



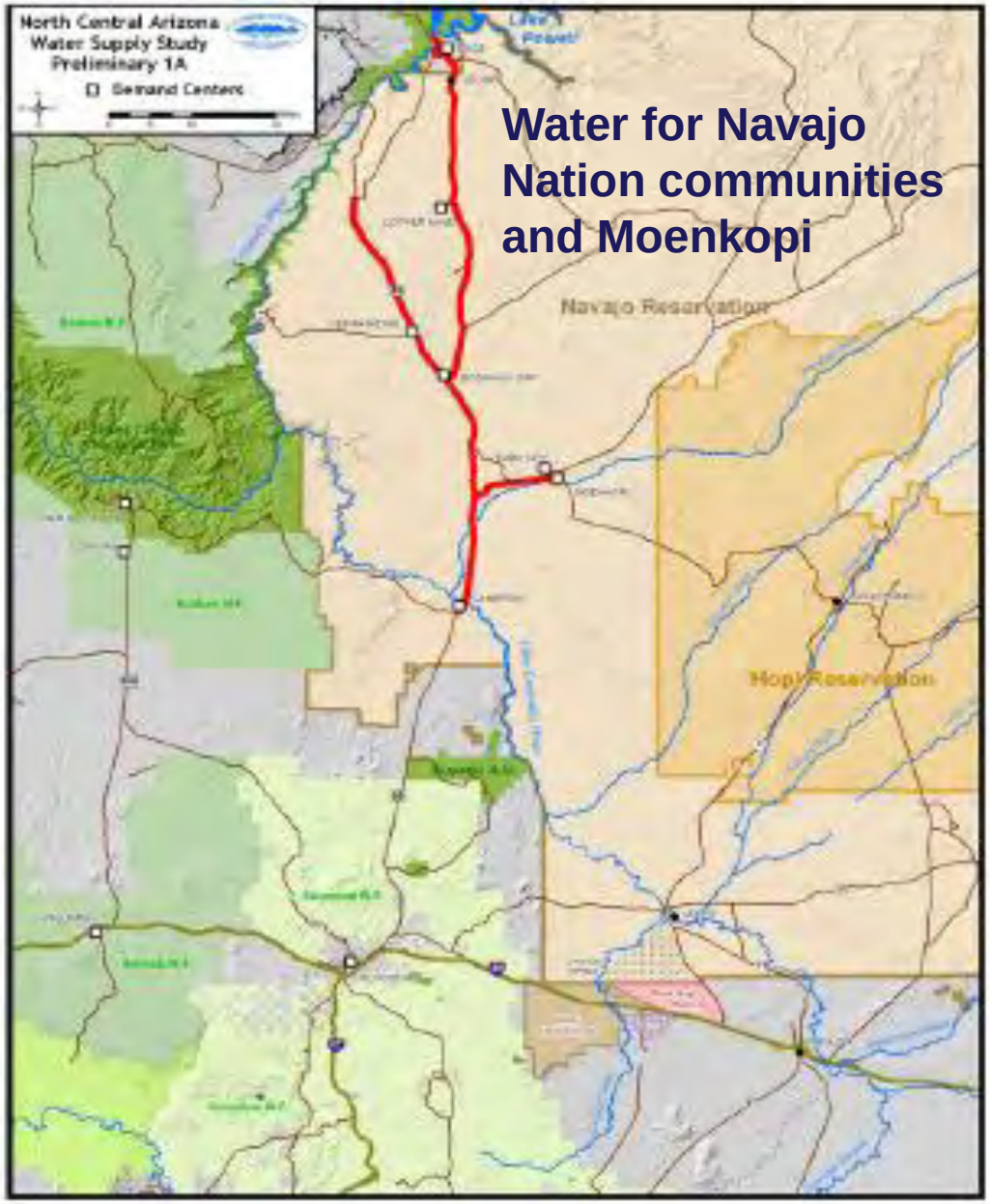
Navajo Nation Municipal and Domestic Water Projects

- Regional Water Projects
  - Lake Powell : Western Navajo (North Central Arizona Water Supply Project)
  - C aquifer : Leupp – Dilkon
  - C aquifer : Ganado Regional
  - San Juan River : Monument Valley
  - San Juan River : Montezuma Creek - Red Mesa
  - N aquifer : Inscription House – Navajo Mountain
  - San Juan River : Farmington – Shiprock
  - San Juan River : Navajo – Gallup Water Supply Project
  - Rio Grande : Albuquerque –Tohajiilee
  - Lake Powell: Page – LeChee

- Indian Health Service Projects
  - All chapters

Western Navajo Project as part of the North Central Arizona Water Supply Study

1.A Lake Powell Pipeline to Cameron



Other Documents:

Technical Memorandum, The Proposed Western Navajo Pipeline and the North Central Arizona Water Project, NNDWR, 1998

North Central Arizona Regional Water Study-Phase 1, ADWR, 1999

Appraisal Level Peer Review Study of the ADWR North Central Arizona Regional Water Study-Phase 1, USBR, 2000

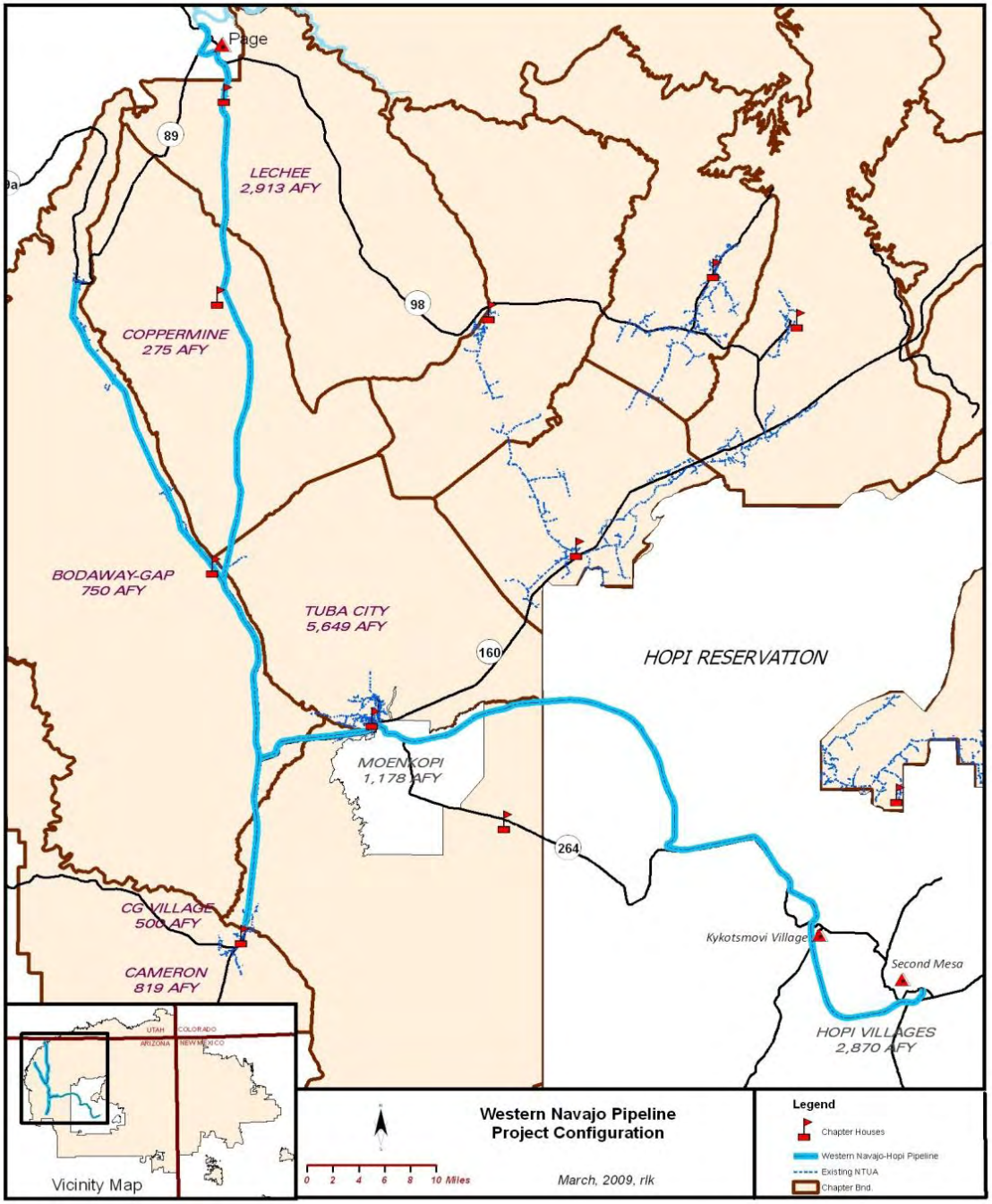
Western Hopi-Navajo Water Supply Needs, Alternatives, and Impacts, HDR, 2003

North Central Arizona Water Supply Project Report of Findings, USBR 2006

Western Navajo Project as part of the Northeastern Arizona Indian Water Rights Settlement Agreement

Navajo Nation:
10, 900 acre-feet/ year

Hopi Tribe: 4,000 acre-feet/year

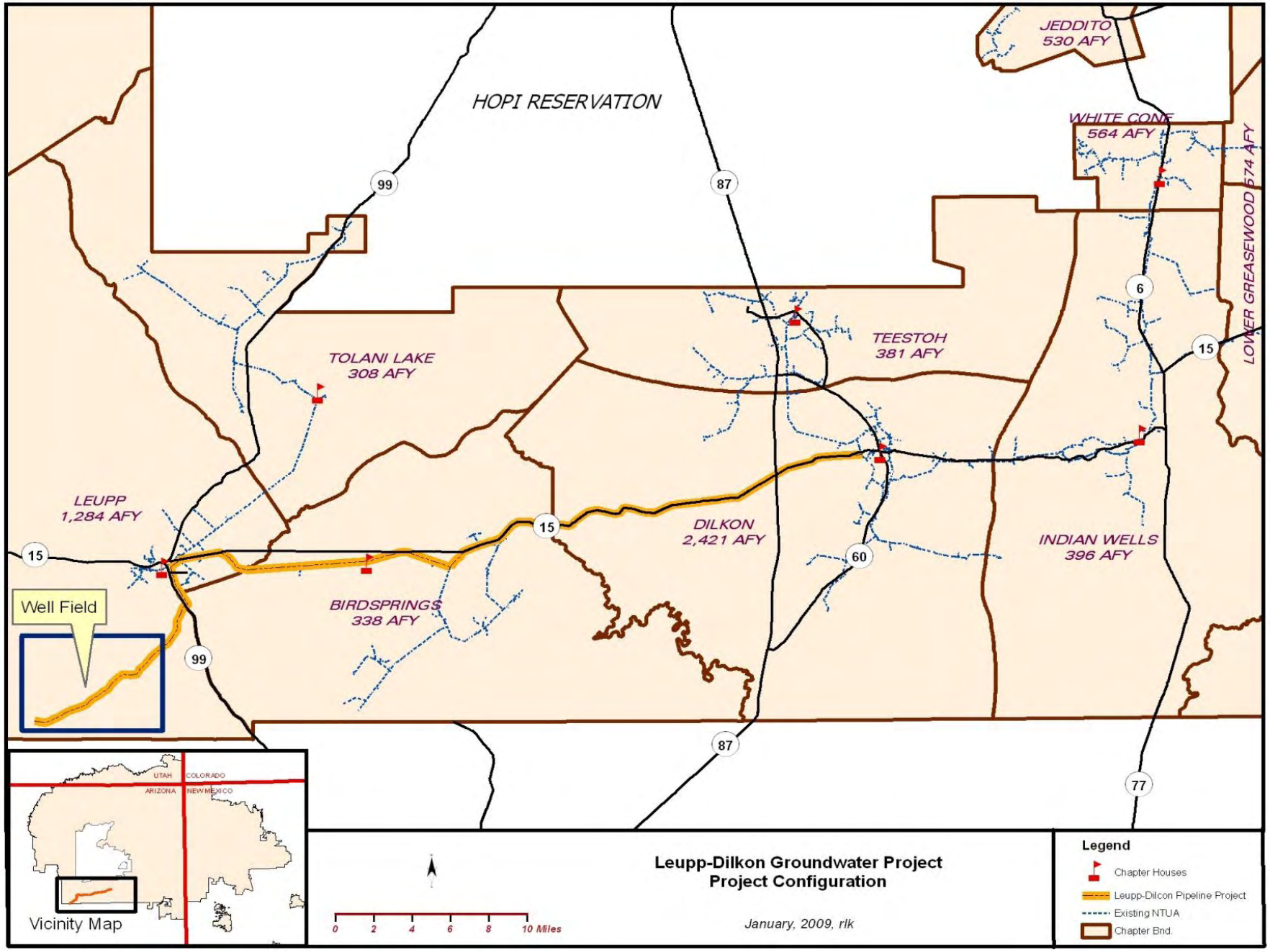


Navajo Nation Western Navajo Pipeline Population and Municipal Water Demand

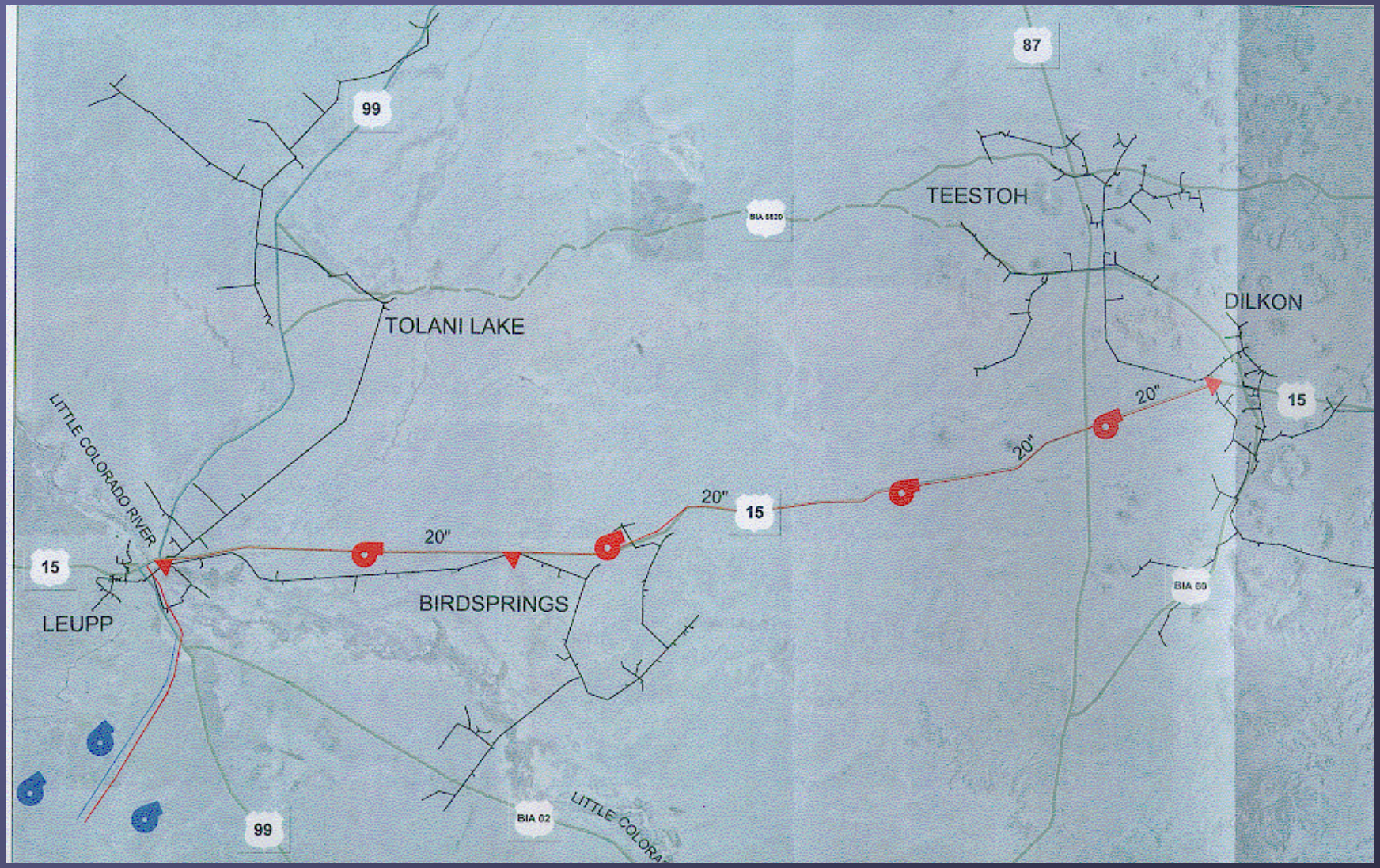
Chapter	Projected 2050 Population	Water Demand in Acre-Feet/Year	Equivalent Cubic Feet per Second	Flow with Peaking Factor of 2	Cumulative cfs Flow with Peaking Factor
LeChee	**16255**	**2913**	4.02	8.05	30.13
Coppermine	1533	**275**	0.38	0.76	22.08
Bodway/Gap	4183	**750**	1.04	2.07	21.32
Cameron	4568	**819**	1.13	2.26	3.64
Navajo Grand Canyon Village		**500**	0.69	1.38	1.38
Tuba City	31520	**5649**	7.80	15.61	15.61
Total	58059	**10906**	15.06	30.13	

(Source: NNWMB 2008 modified from HDR 2003)

Lechee and Tuba City are Economic Growth Centers. The Western Navajo Hopi Water Supply Study (HDR 2003) conducted an analysis of uniform growth among chapters and growth among chapters with certain chapters acting as Economic Growth Centers.


JEDDITO
530 AFY
HOPI RESERVATION
WHITE CONE
564 AFY
LOWER GREASEWOOD 674 AFY
99
87
6
15
TEESTOH
381 AFY
TOLANI LAKE
308 AFY
LEUPP
1,284 AFY
15
DILKON
2,421 AFY
60
INDIAN WELLS
396 AFY
Well Field
BIRDSPRINGS
338 AFY
99
87
77
UTAH
COLORADO
ARIZONA
NEW MEXICO
Vicinity Map
0 2 4 6 8 10 Miles
Leupp-Dilkon Groundwater Project
Project Configuration
January, 2009, rlk
Legend
Chapter Houses
Leupp-Dilcon Pipeline Project
Existing NTUA
Chapter Bnd.

Leupp to Dilkon C-Aquifer Ground Water Supply Project
July 2007 Brown & Caldwell DRAFT Study
Alternative C Alignment



Southwest Region Water Demands

Chapter	2050POP	AVG AFY	AVG CFS	PEAK CFS	CUMULATIVE
Leupp	7162	**1284**	1.77	3.55	18.78
Bird Springs	1888	**338**	0.47	0.93	15.23
Tolani Lake	1719	**308**	0.43	0.85	14.30
Teestoh	2127	**381**	0.53	1.05	13.45
Dilkon	13507	**2421**	3.34	6.69	12.39
Indian Wells	2209	**396**	0.55	1.09	5.70
Lower G.	3205	**574**	0.79	1.59	1.59
White Cone	3149	**564**	0.78	1.56	3.02
Jeddito	2958	**530**	0.73	1.46	1.46
Total	37924	**6797**	9.39	18.78	

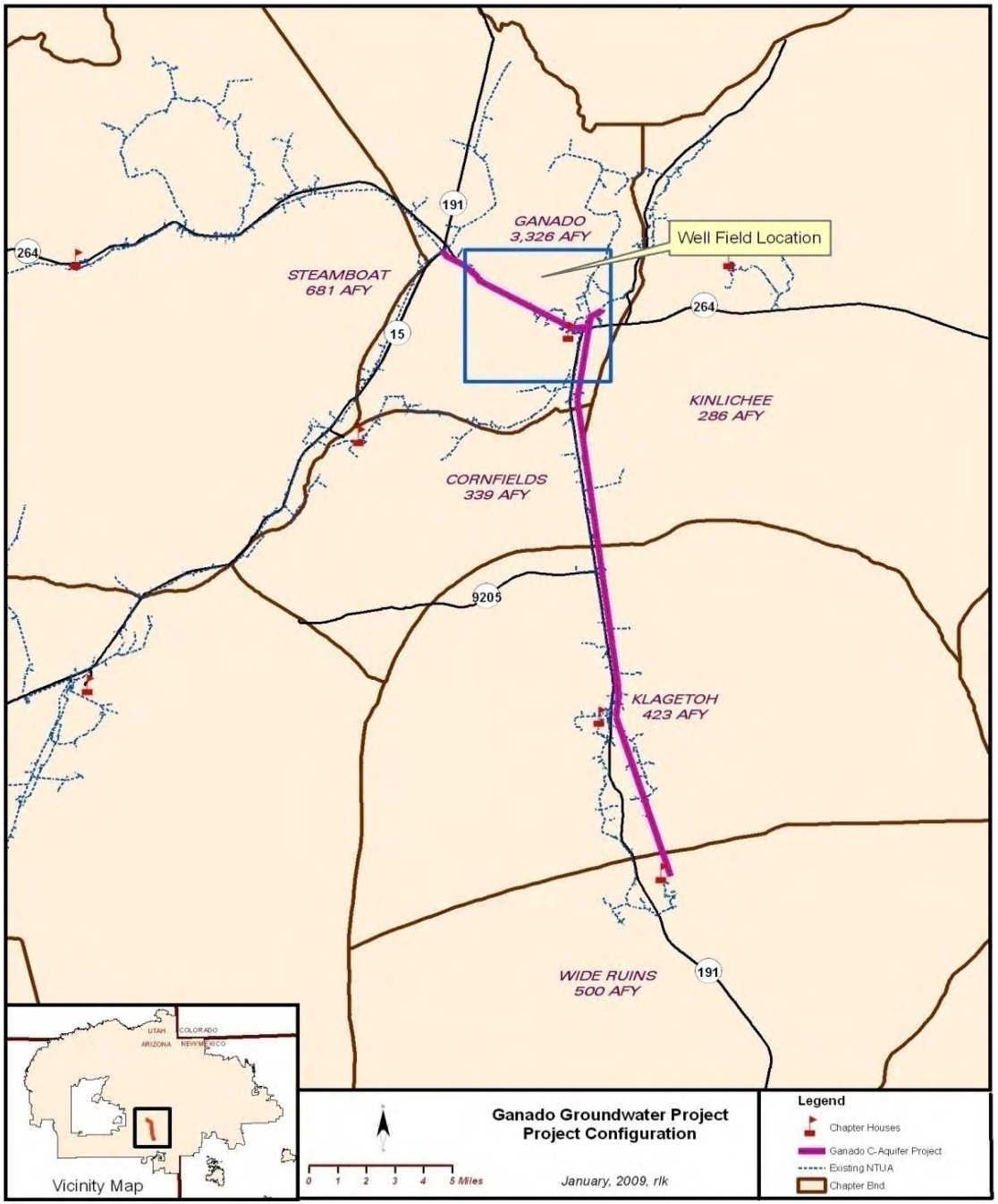
The projected water demands will be met with a combination of existing wells, upgrades to existing systems, new wells to fuel existing systems, and new Leupp to Dilkon water line. Jeddito will continue to obtain water from Ganado. Lower Greasewood, White Cone, and Indian Wells will continue to receive some amount of water from the Pueblo Colorado Wash. Leupp, Tolani Lake, and Birdsprings will obtain water from both existing sources and from Leupp-Dilkon Project.

Leupp to Dilkon C-Aquifer Ground Water Supply Project
July 2007 Brown & Caldwell DRAFT Study

Table 3
Conceptual Level Opinion of Probable Construction Costs
Alternative Pipeline Alignment C

Description	Quantity	Unit	Unit Cost*	Total Cost
Pipe				
24-Inch Pipe		lf	$ 195.00	$ -
20-Inch Pipe	236,160	lf	$ 160.00	$ 37,785,600.00
18-Inch Pipe		lf	$ 145.00	$ -
16-Inch Pipe		lf	$ 130.00	$ -
14-Inch Pipe		lf	$ 115.00	$ -
12-Inch Pipe		lf	$ 100.00	$ -
Appurtenances				
24-Inch Butterfly Valves (Isolation)		ea	$ 20,000.00	$ -
20-Inch Butterfly Valves (Isolation)	43	ea	$ 17,500.00	$ 752,500.00
Drain Manholes	22	ea	$ 8,500.00	$ 187,000.00
Air Release/Vacuum Valves and Vaults	43	ea	$ 5,500.00	$ 236,500.00
Miscellaneous Taps	3	ea	$ 10,000.00	$ 30,000.00
Booster Pumping				
Booster Pump Station	4	ls	$ 2,000,000.00	$ 8,000,000.00
Site Restoration				
Regrading**	280	ac	$ 120.00	$ 33,600.00
Reseeding**	280	ac	$ 65.00	$ 18,200.00
			Subtotal Costs	$ 47,043,400.00
			Mobilization (5%)	$ 2,352,170.00
			Unlisted Items (10%)	$ 4,704,340.00
			Contingencies (20%)	$ 9,408,680.00
			Total Opinion of Probable Construction Costs	***$ 63,506,590.00***

* All unit costs include delivery, storage, installation, and testing
** Assumes 50 foot wide work area



C-aquifer Ganado Ground Water Project

C-Aquifer Ganado Project

Navajo Chapter	2000 Population	2010	2020 (acre-feet)	2030 (acre-feet)	2040 (acre-feet)	2050 (acre-feet)	2100 (acre-feet)
Ganado	3,767	608	1,178	1,264	1,965	2,861	10,980
Kinlichee	1,906	149	231	338	481	573	1,409
Steamboat	2,122	177	274	402	571	681	1,674
Cornfields	794	88	136	584	748	803	1,297
Klagetoh	1,116	110	171	250	335	423	1,041
Wide Ruins	1,909	130	201	295	419	500	1,229
Region Total	11,613	1,262	2,191	3,133	4,519	5,841	17,638
Project Total	10,668	1,187	2,075	2,964	4,278	5,554	16,933

Note: HDR WNHWSS 2003, Volume 2, Table 9. Only half of the Kinlichee Chapter demand is served by the Project since other region served by separate system. Ganado is the Economic Growth Center and projected population is adjusted accordingly as described by HDR 2003.

C-aquifer Ganado Ground Water Project

Project Component	Capital Cost (Dollars)
1. C-Aquifer Well Field (20 wells including chlorine injection)	$4,800,000
2. Pumps, conveyance and storage	
Pumps	$530,000
Tanks	$5,267,000
Pipelines (Common Excavation)	$8,585,000
Pipelines (Rock Excavation)	$990,000
Major Items Sub-total	$20,986,000
3. Direct and Indirect Costs	
Unlisted (15% or 20 % for pipelines)	$3,505,000
Contract Add Ons (14.75%)	$3,095,000
Contract Cost Subtotal	$27,586,000
Contingency (25%)	$5,246,000
Construction Cost	$32,832,000
4. Non-contract (31%)	$10,178,000
Total Project Cost (2007)	$43,001,000
Total Project Cost (September 2008)	$45,580,000

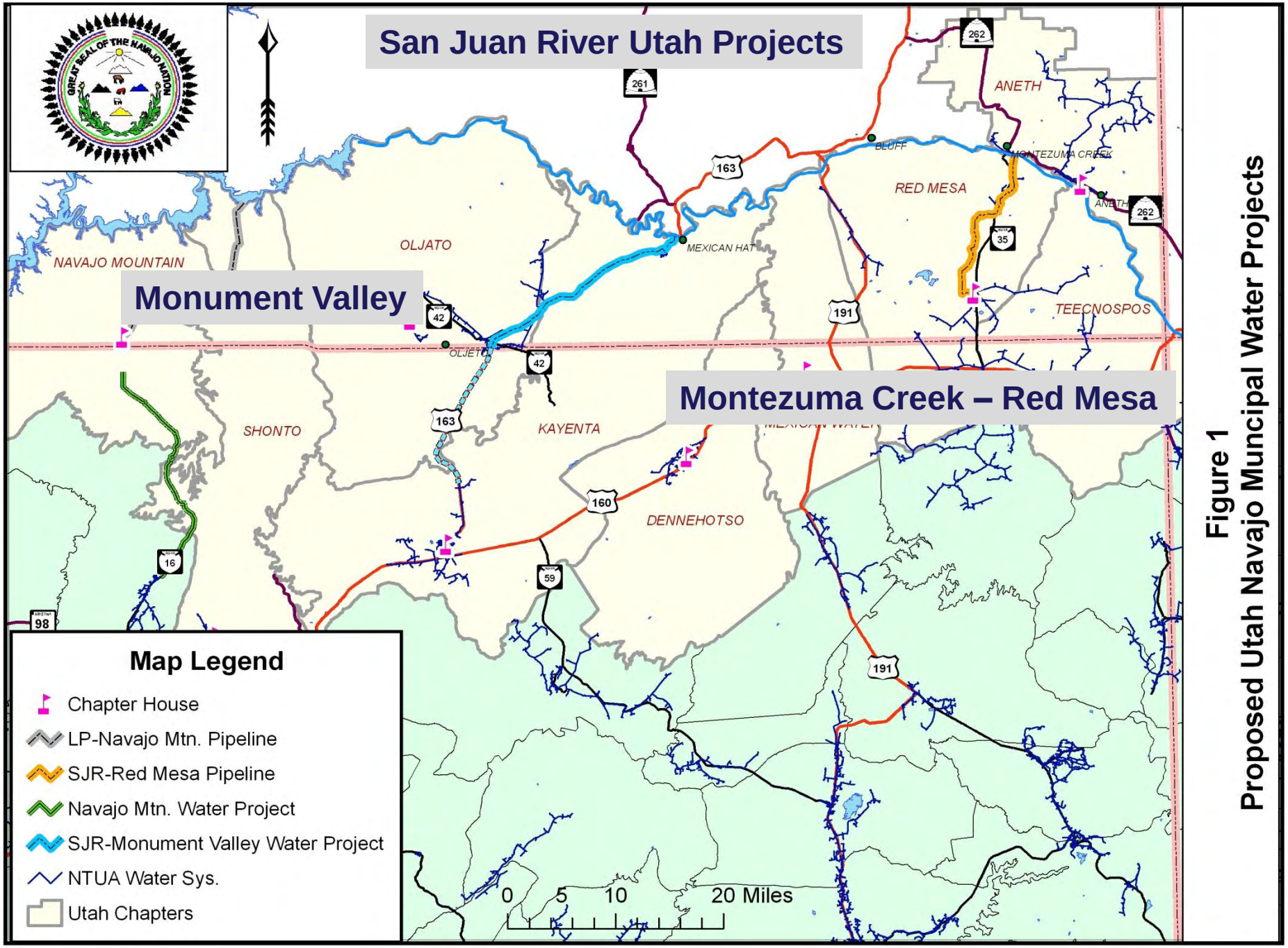


Figure 1
Proposed Utah Navajo Muncipal Water Projects

Utah San Juan River Projects

San Juan River-Monument Valley Project

Three versions of this project are described in this technical memorandum. The first version includes an intake, water treatment plant and waterline to the Oljato - Monument Valley area. The second version is an intake, water treatment plant and waterline to the Oljato Monument Valley area with adequate capacity in the waterline for an eventual extension to Kayenta. The third version is an intake, water treatment plant and waterline with adequate capacity for Oljato and Kayenta, and the extension to Kayenta.

San Juan River-Red Mesa Project

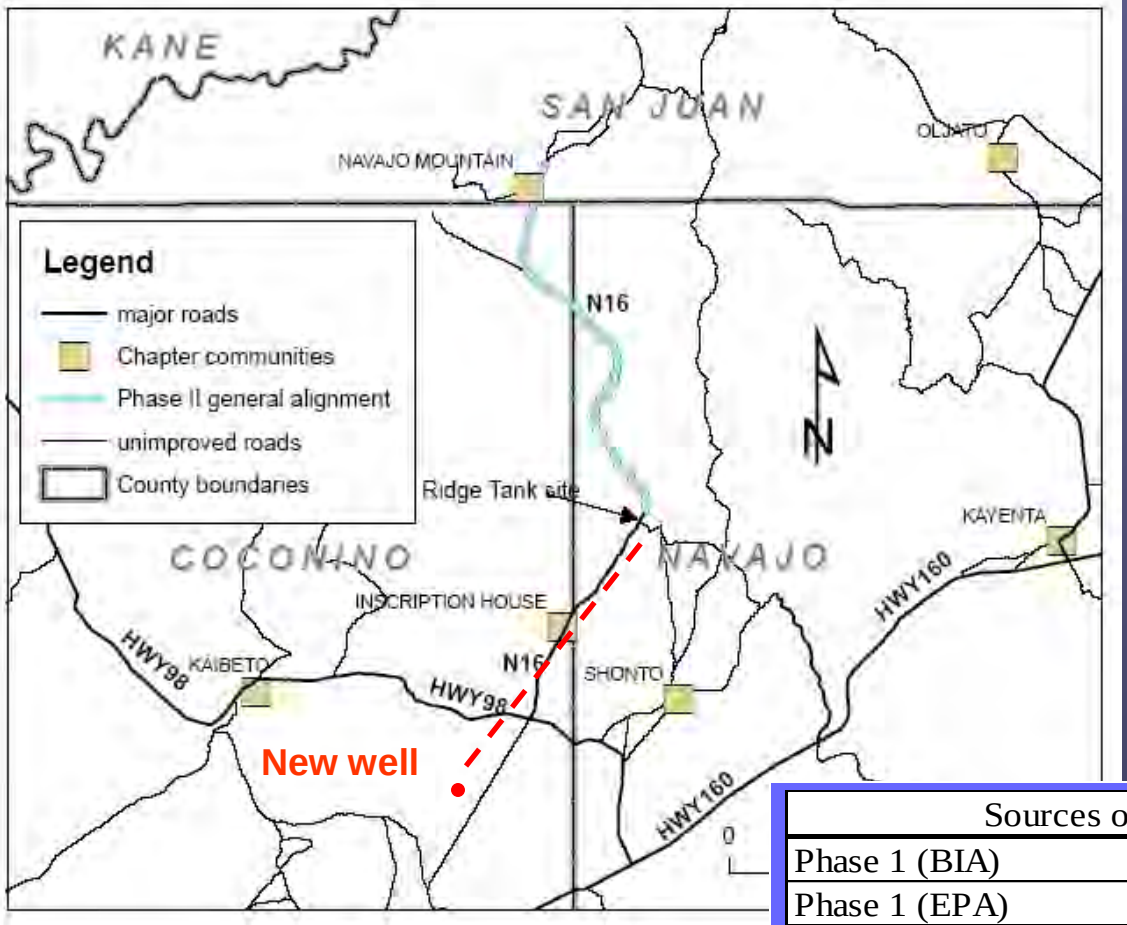
The project trunk line will consist of 17.96 miles of 10-inch pipeline and 5.8 million gallons of storage. Based on 2020 demands for Aneth Chapter, Red Mesa Chapter and parts of Teecnospos Chapter the project will serve 7,197 residents with a total of 1,290 acre-feet of water per year.

Utah San Juan River Projects

Project Components	(1) SJR Monument Valley Version 1	(2) SJR Monument Valley Version 2	(3) SJR Monument Valley Version 3	(4) SJR-Red Mesa
Intake-WTP	$497,529	$5,241,350	$5,241,350	$3,863,178
Pumps	$246,063	$691,460	$922,499	$177,748
Storage	$1,121,942	$3,202,735	$3,230,854	$967,288
Pipelines	$7,529,665	$11,929,631	$19,053,122	$5,523,987
Field Cost	**$12,890,047**	**$26,120,818**	**$35,275,302**	**$13,059,929**
Total Project Cost	**$20,301,824**	**$41,140,288**	**$55,558,601**	**$20,569,388**
Annual O&M and R	$268,887	$779,638	$898,560	$305,212
Annual Energy	$86,667	$249,741	$322,680	$79,294

1. Field costs includes Cathodic protection (1%), SCADA (3%) Mobilization (5%) and Unlisted items (15%)
2. Total Project Cost includes 25% for Contingency and 26% for Non-Contract Costs.

N-Aquifer: Inscription House – Navajo Mountain Alternative I Construction

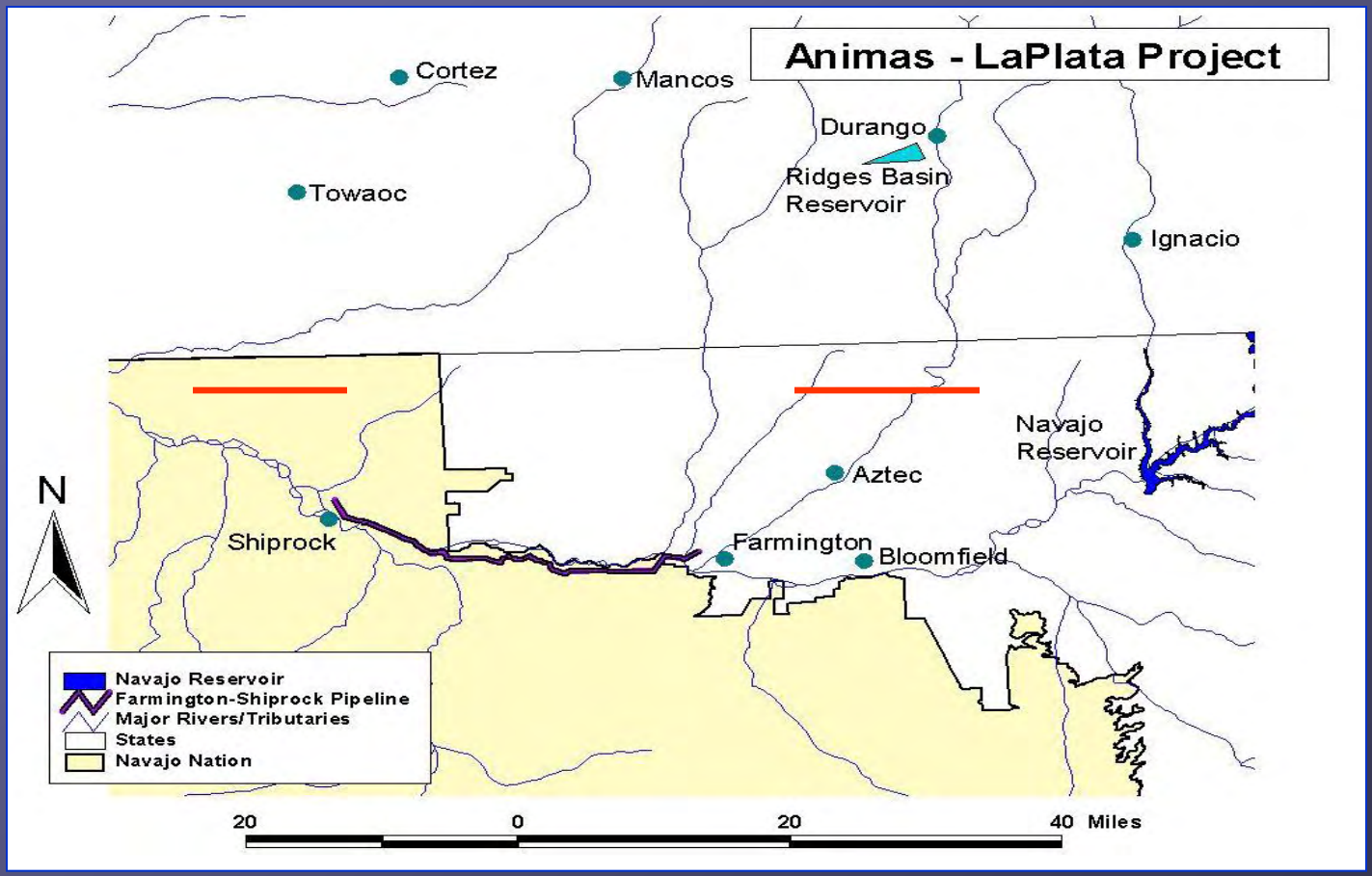


Phase I well, water lines

Construction is coordinated By Navajo Area IHS Office of Environmental Health & Engineering

Sources of Funds	Amount	Status
Phase 1 (BIA)	$1.7 million	funded
Phase 1 (EPA)	$0.9 million	funded
Phase 1 (NAIHS)	$0.1 million	funded
Phase 1 Total	**$2.7 million**	funded
Phase 2 (Navajo Nation)	$1.5 million	funded
Phase 2 (NAIHS and BIA)	$1.9 million	funded
Phase 2 Total	**$3.4 million**	funded
Alternative 1 Total	**$6.1 million**	

Farmington to Shiprock Pipeline



- Municipal water for Upper Fruitland, Nenahnezad, San Juan, Hogback, Shiprock, and Gadii'ahi.
- 4,680 acre-feet per year diversion

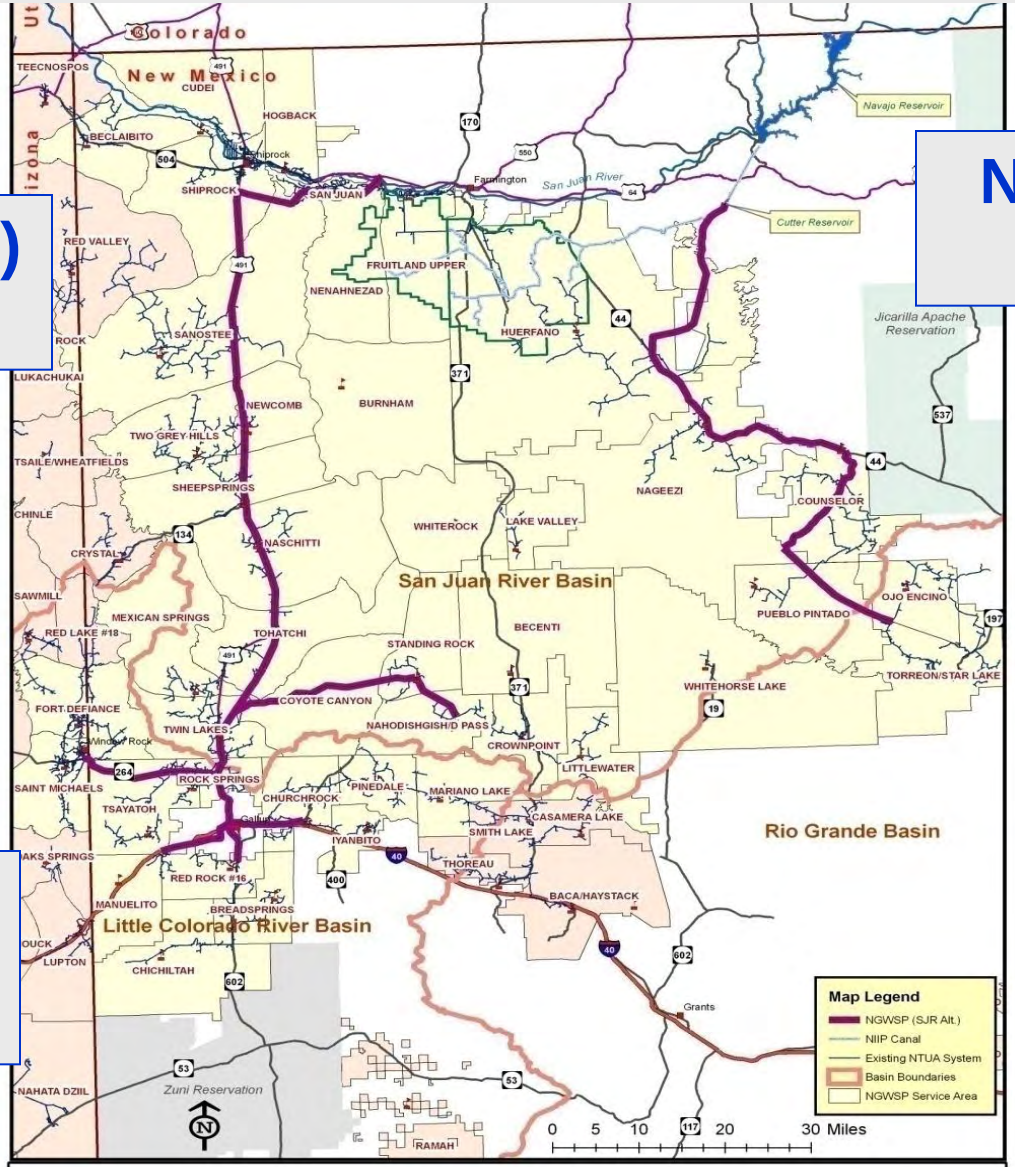
Navajo-Gallup Water Supply Project

Navajo (AZ)
6,410 af

Navajo (NM)
22,650 af

Jicarilla
1,200 af

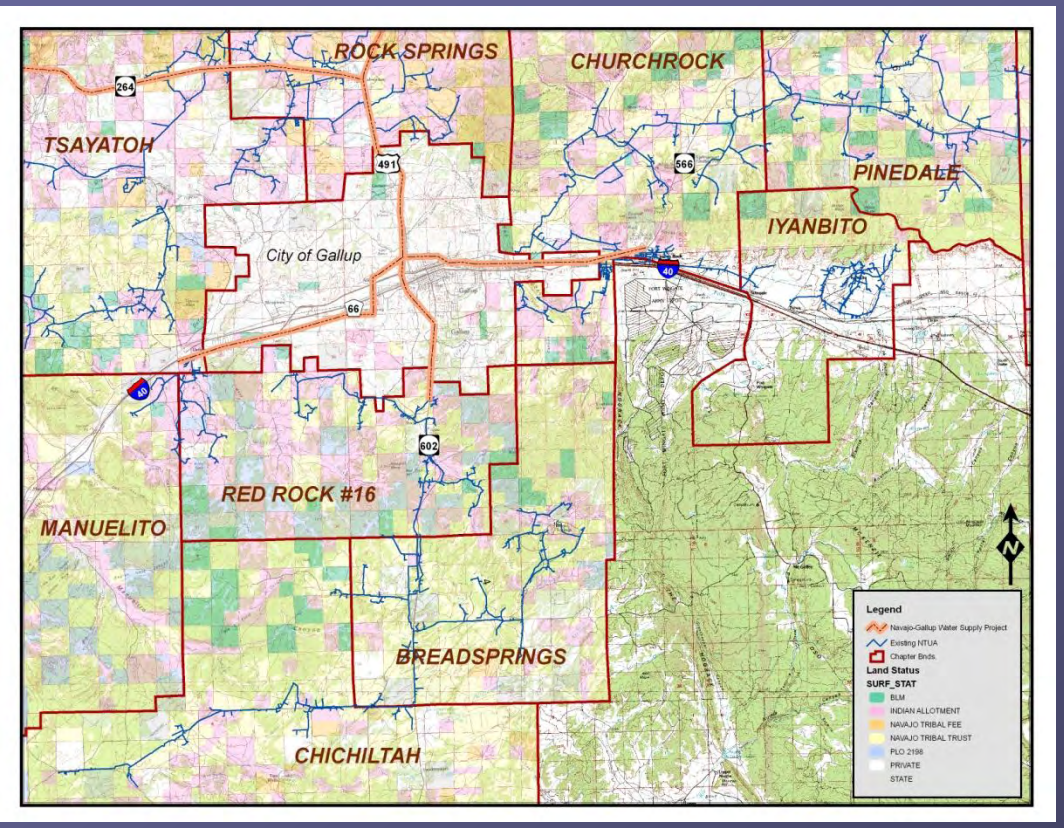
Gallup
(from Jicarilla)
7,500 af

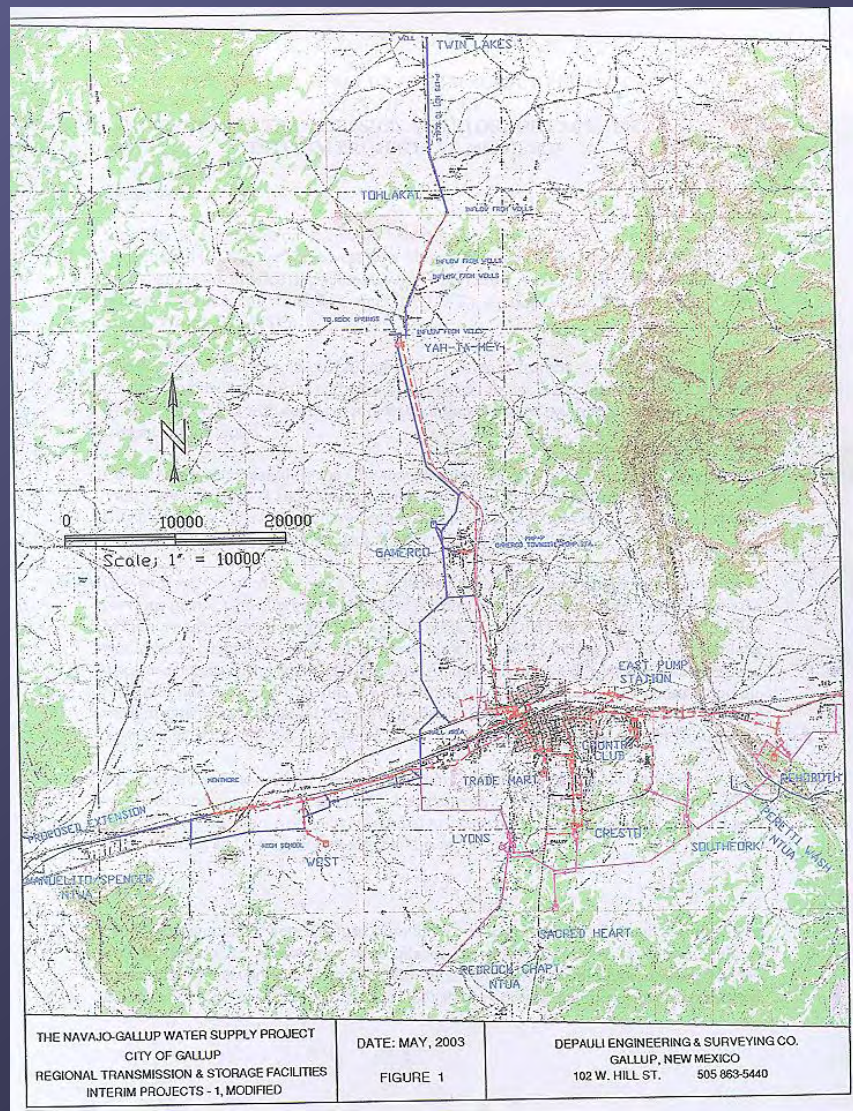


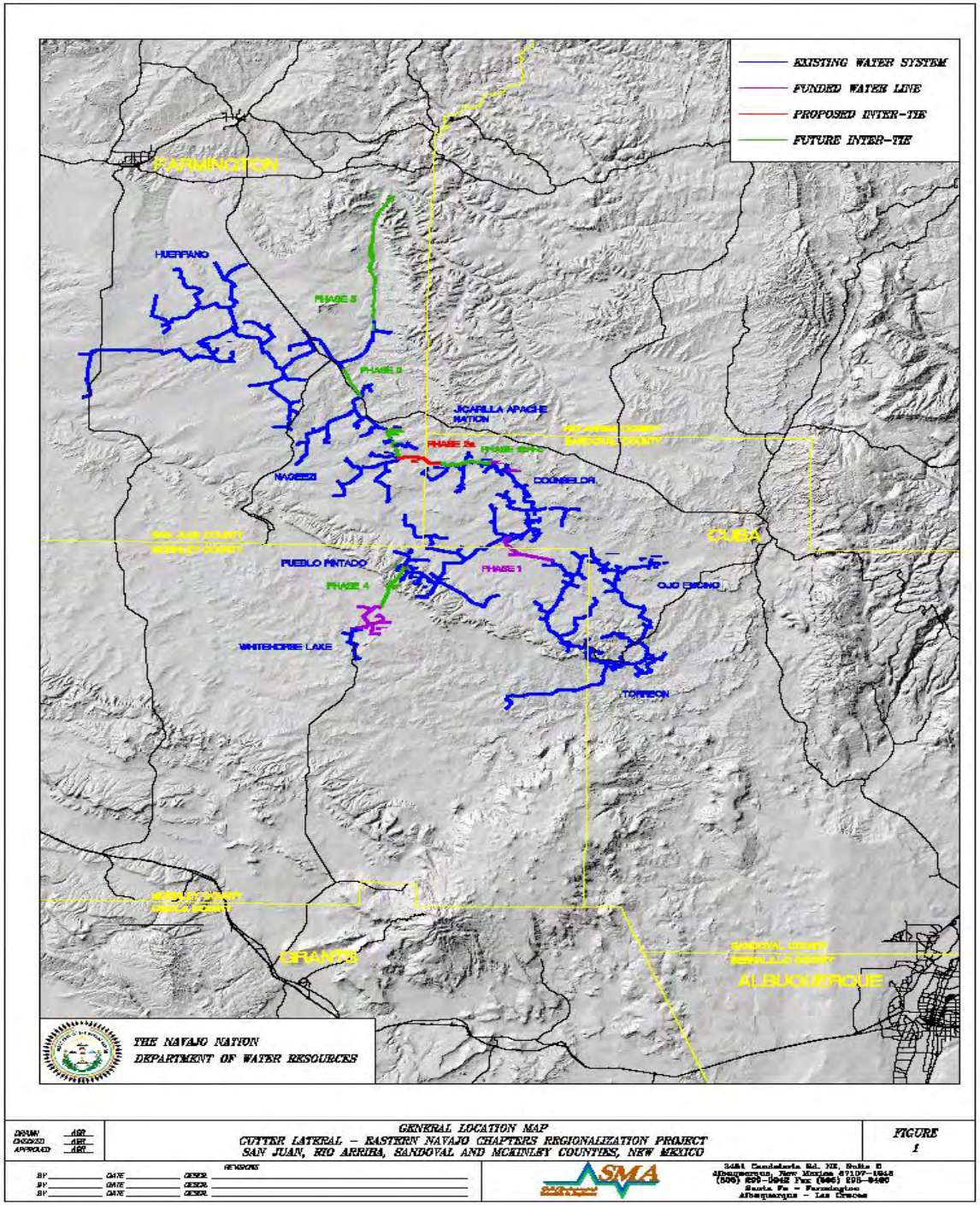
Navajo Nation
San Juan River Basin (New Mexico)
Navajo-Gallup Water Supply Project (NGWSP) Service Area

Total
37,760 af

Navajo Demands around the Gallup Regional System







Cutter Lateral Phases

2006-2007 New Mexico State Funding

$17,375,000

Preferred Alternative

Project Construction Cost

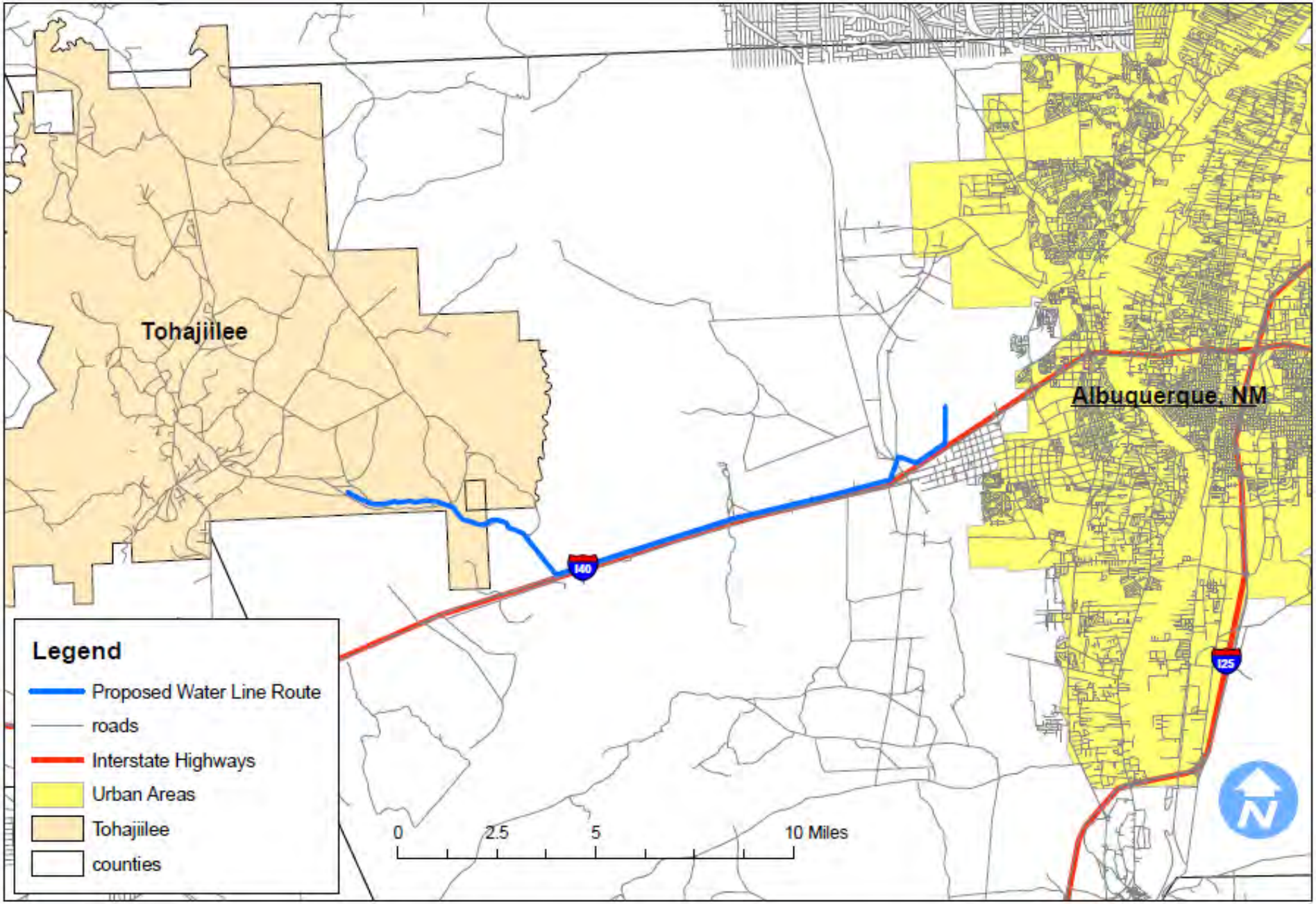
(2009 price)

$897,000,000

2002-2007 New Mexico State Funding

$24,982,576

For Gallup Regional System, Twin Lakes Well, and the Cutter Lateral



Proposed Albuquerque to Tohajiilee Water Line

Tohajiilee Water Supply Project

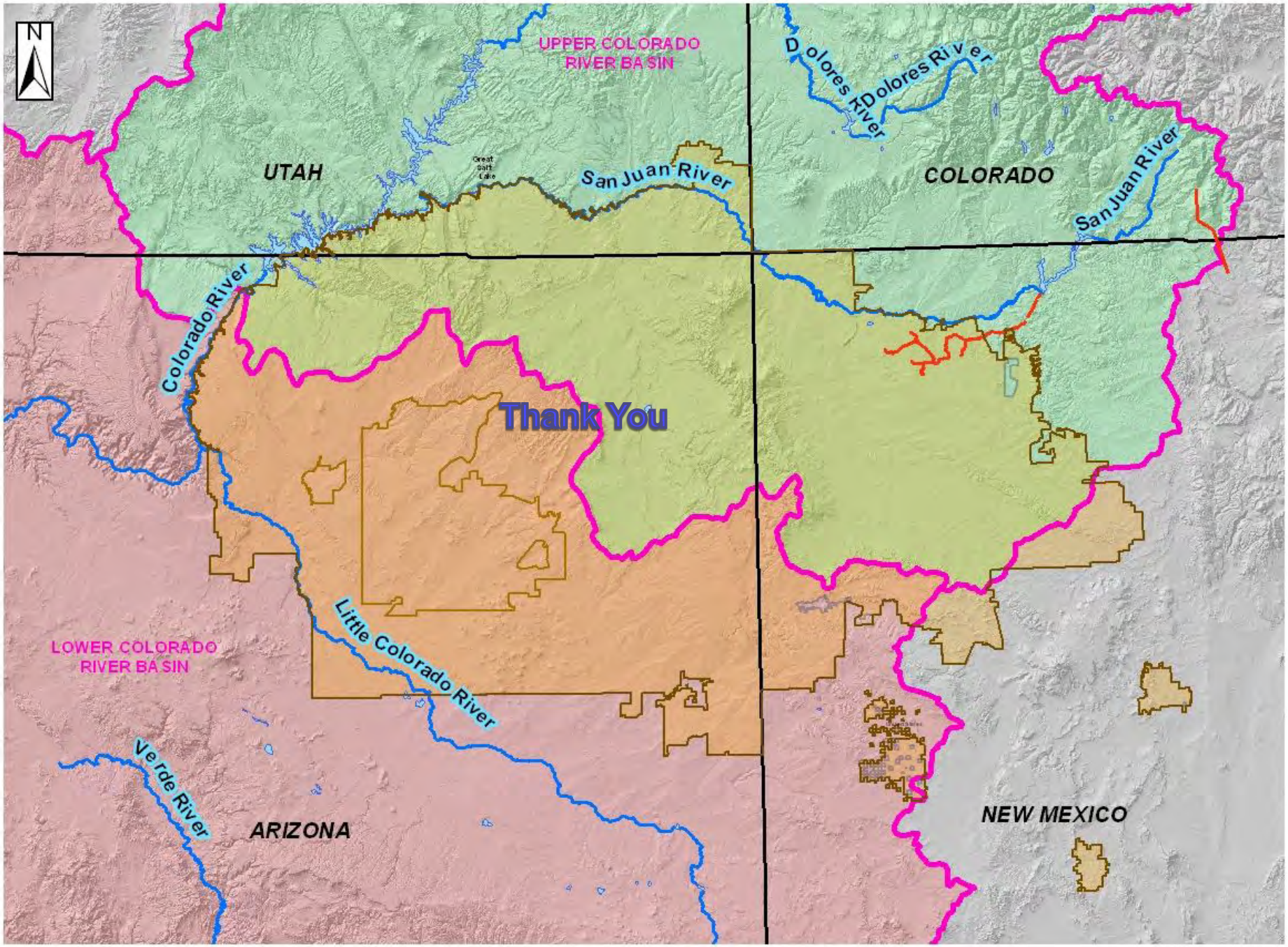
Table 5.3 To'hajiilee Potable Water Demand Summary

To'hajiilee Potable Water Demand Summary	*2010*	*2020*	*2030*	*2040*	*2050*
Average Daily Demand (mgd)	0.33	0.58	0.74	0.95	1.22
Average Daily Demand (gpm)	228	403	516	660	845
Annual Demand (ac-ft)	368	650	832	1065	1363
Maximum Day Demand (mgd)	0.66	1.16	1.48	1.90	2.43
Maximum Day Demand (gpm)	456	806	1031	1320	1690
Peak Hour Demand (gpm)	798	1410	1805	2310	2957

Table 9.1 Cost Comparison of Project Alternatives

	Route 40 Alignment		Groundwater Wells	Conjunctive Alternative	Reuse Alternative
	Scenario 1	Scenario 2			
Construction Cost	$6.8 M	$6.8 M	$6.6 M	$7.5 M	$13.8 M
Contingency @ 20%	$1.7 M	$1.7 M	$1.6 M	$1.9 M	$3.5 M
Direct Construction Cost	$8.5 M	$8.4 M	$8.2 M	$9.4 M	$17.2 M
Engineering @ 15%	$1.3 M	$1.3 M	$1.2 M	$1.4 M	$2.6 M
Total Construction & Engineering Cost	**$9.8 M**	**$9.7 M**	**$9.4 M**	**$10.8 M**	**$19.8 M**

Source: Tetra Tech (March 2010)


UPPER COLORADO
RIVER BASIN
UTAH
COLORADO
Dolores River
Dolores River
San Juan River
San Juan River
Colorado River
Thank You
LOWER COLORADO
RIVER BASIN
Little Colorado River
Verde River
ARIZONA
NEW MEXICO