RECLAMATION

Managing Water in the West

Bureau of Reclamation
Appraisal Level Report
Engineering Assessment of the AWSA Act Tier-2 Diversion Proposals & Other Diversion and Storage Configurations

July 21, 2014

Phoenix Area Office
& Denver Technical Service Center

U.S. Department of the Interior
Bureau of Reclamation

2004 AWSA Modified CAP Upper Gila Exchange Requirements

- NM to decide whether to construct a New Mexico Unit and notify the Secretary by December 31, 2014
- NM can exchange up to an annual average of 14,000 acre-feet /year from the Gila & San Francisco Rivers
- $66 million transferred to New Mexico to pay costs of the Unit *or other water utilization alternatives* (payable over 10 years starting in 2012)
- Up to an additional $62 million is available IF NM chooses to build a Unit for the exchange

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Reclamation's Role in AWSA Implementation

- Provide oversight/support for the Secretary of Interior
- Manage the Lower Colorado River Basin Development Fund (LCRBDF)
  - Deposit LCRBD Funds into a New Mexico Unit Fund
- Assure Environmental Compliance of NM Unit

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Reclamation Appraisal Level Report Tasks

- MOU with ISC on May 7, 2013
- Appraisal level work
  - Engineering Assessment of the Three Tier 2 Diversion & Storage Proposals
  - Identification & Engineering Assessment of Other Diversion & Storage Options
  - Economic Analyses of Tier 2 Proposals & Other Diversion & Storage Options
  - Environmental Review for Potential Effects on Diversion and Storage Proposals
  - July 31, 2014 for Final Report to ISC

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AWSA Tier 2 Proposals

Non-Diversion Proposals
Grant Co. Water Commission Infrastructure & Reuse
Grant County Recharge and Reservoir
City of Deming Wastewater Reuse
Municipal Conservation
Pleasanton Ditch Improvements
Luna Ditch Improvements
Sunset/New Mexico New Model Pipeline
San Francisco Watershed Restoration
New Mexico Forest Industry Association Watershed Restoration
New Mexico State University Watershed Restoration
Grant Soil & Water Conservation District Forest Restoration
U.S. Forest Service Watershed Restoration

Diversion Proposals
Southwest New Mexico Regional Water Supply (Deming Surface Water Diversion)
Gila Basin Irrigation Commission Diversion and Storage
Hidalgo County Off-Stream

Other Diversion & Storage Options

Single Canyon Storage Options

Greenwood Canyon (26,000 ac-ft, Diversion 1)
Spar Canyon (3,100 ac-ft, Diversion 4)
Winn Canyon (2,750 ac-ft, Diversion 1)
Pope Canyon (7,900 ac-ft, Diversion 1)
Dam Canyon (4,400 ac-ft, Diversion 1)

Multiple Canyon Storage Options

Greenwood Canyon & Sycamore Canyon (62,900 ac-ft, Diversion 1)
Mogollon Canyon & Winn Canyon (14,250 ac-ft, Diversion 4)
Spar Canyon & Garcia Canyon (10,600 ac-ft, Diversion 4)

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Tier 2 Diversion Analyses

- Gila Basin Irrigation Commission (GBIC)
- Southwest New Mexico Regional Water Supply Project (City of Deming)
- Hidalgo County Off- Stream Project

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GBIC

- Principle Components:
  - Diversion
  - Open Channel Conveyance
  - Underground Storage

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GBIC

- 2 Diversion Structures
  - Confluence of Mogollon Creek and Gila River
  - Existing Gila Farms diversion location

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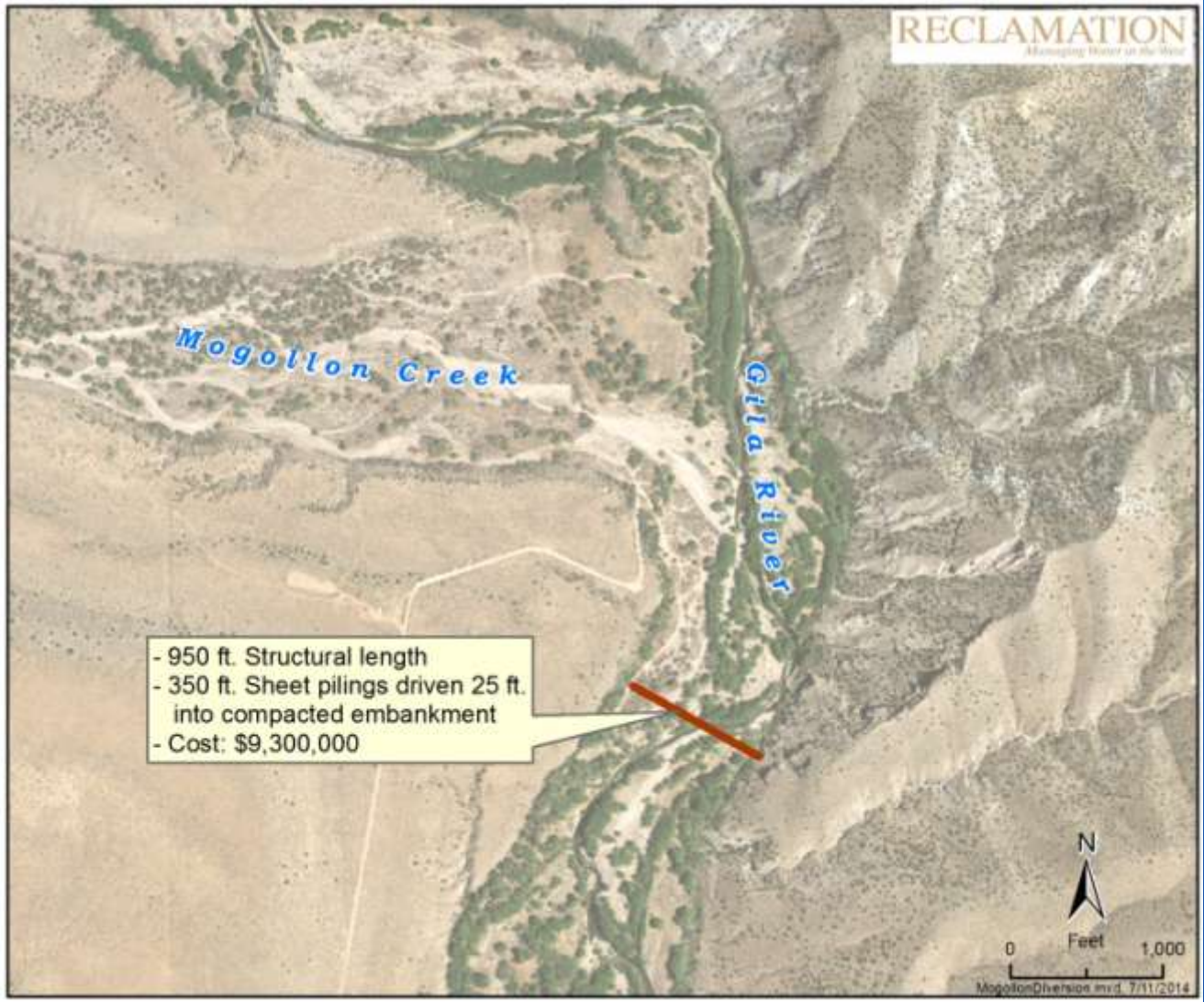
GBIC Upper Diversion



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GBIC Conveyance

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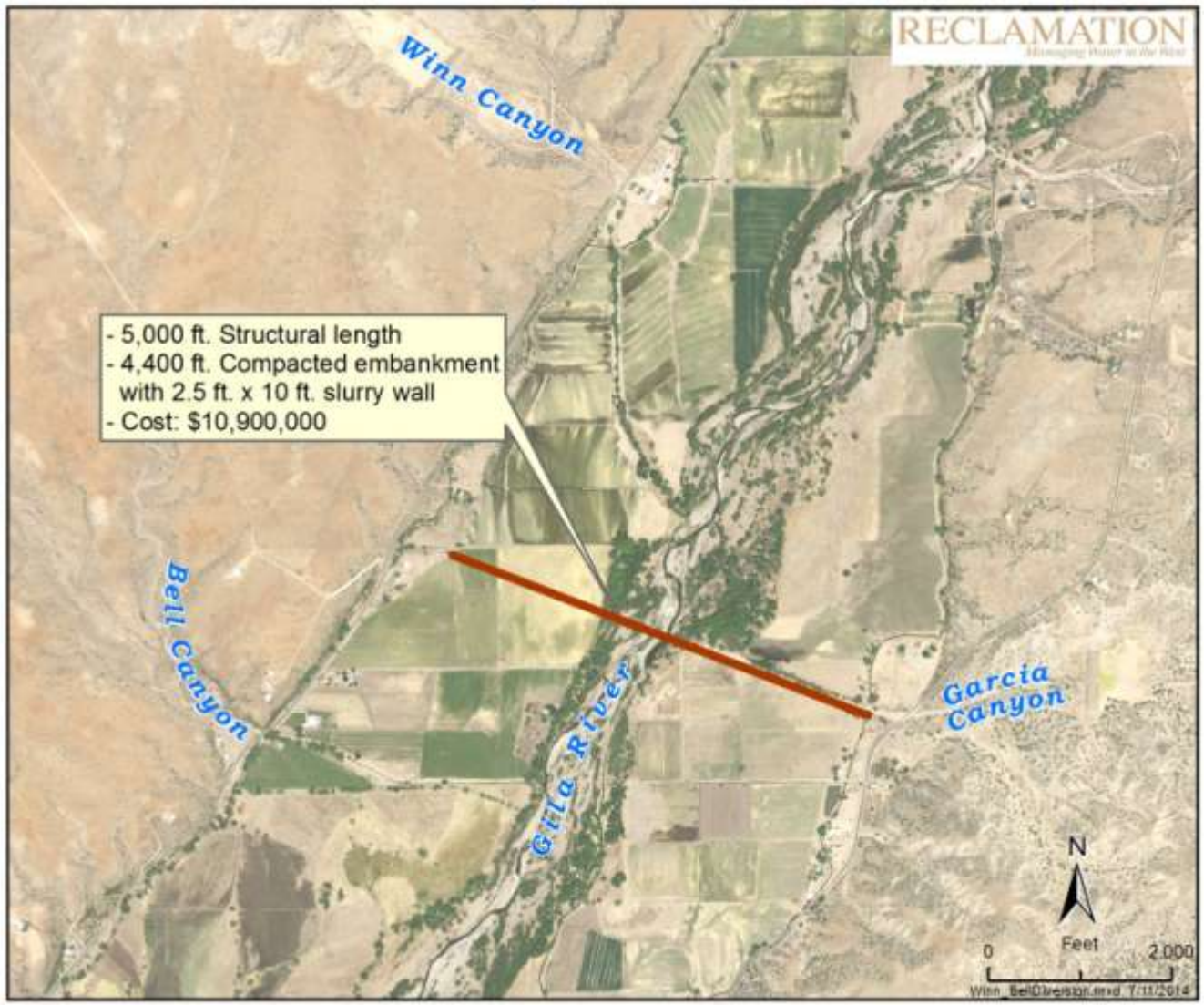
GBIC Lower Diversion



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GBIC Storage

- Infiltration Gallery
  - Recharge System
  - Collection System
- On Farm Storage
- Injection/Pumping Wells

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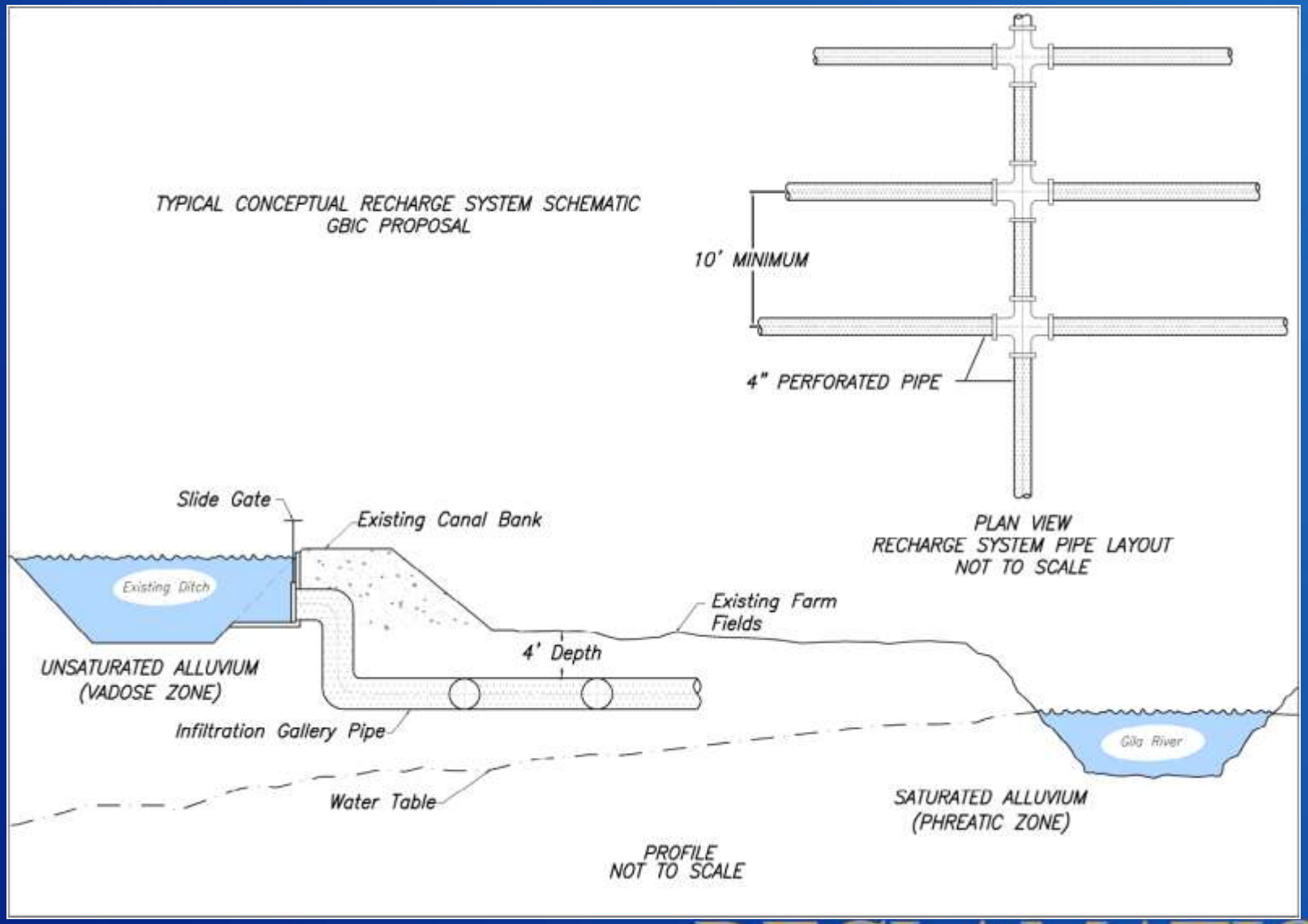
GBIC Recharge System



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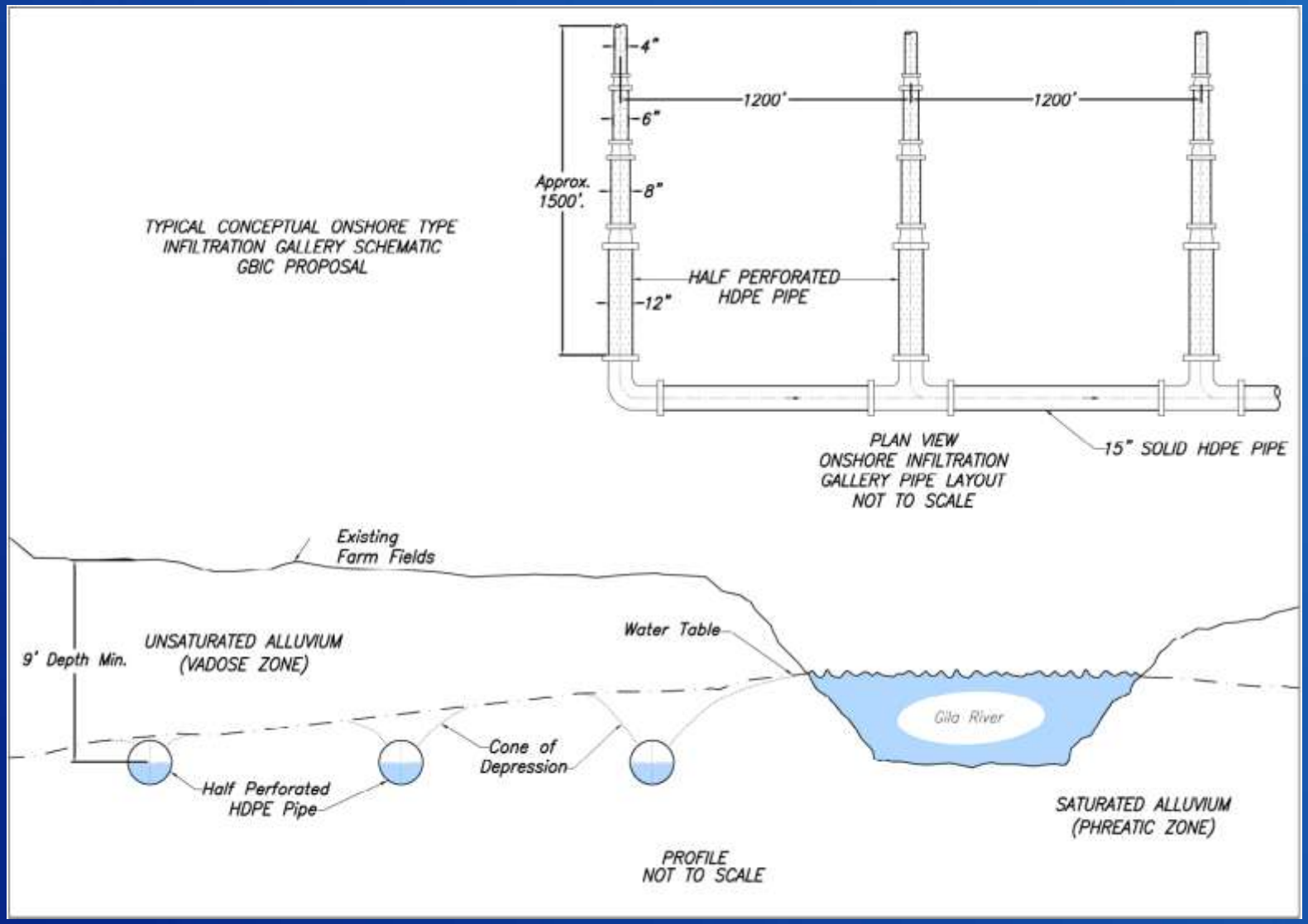
GBIC Collection System



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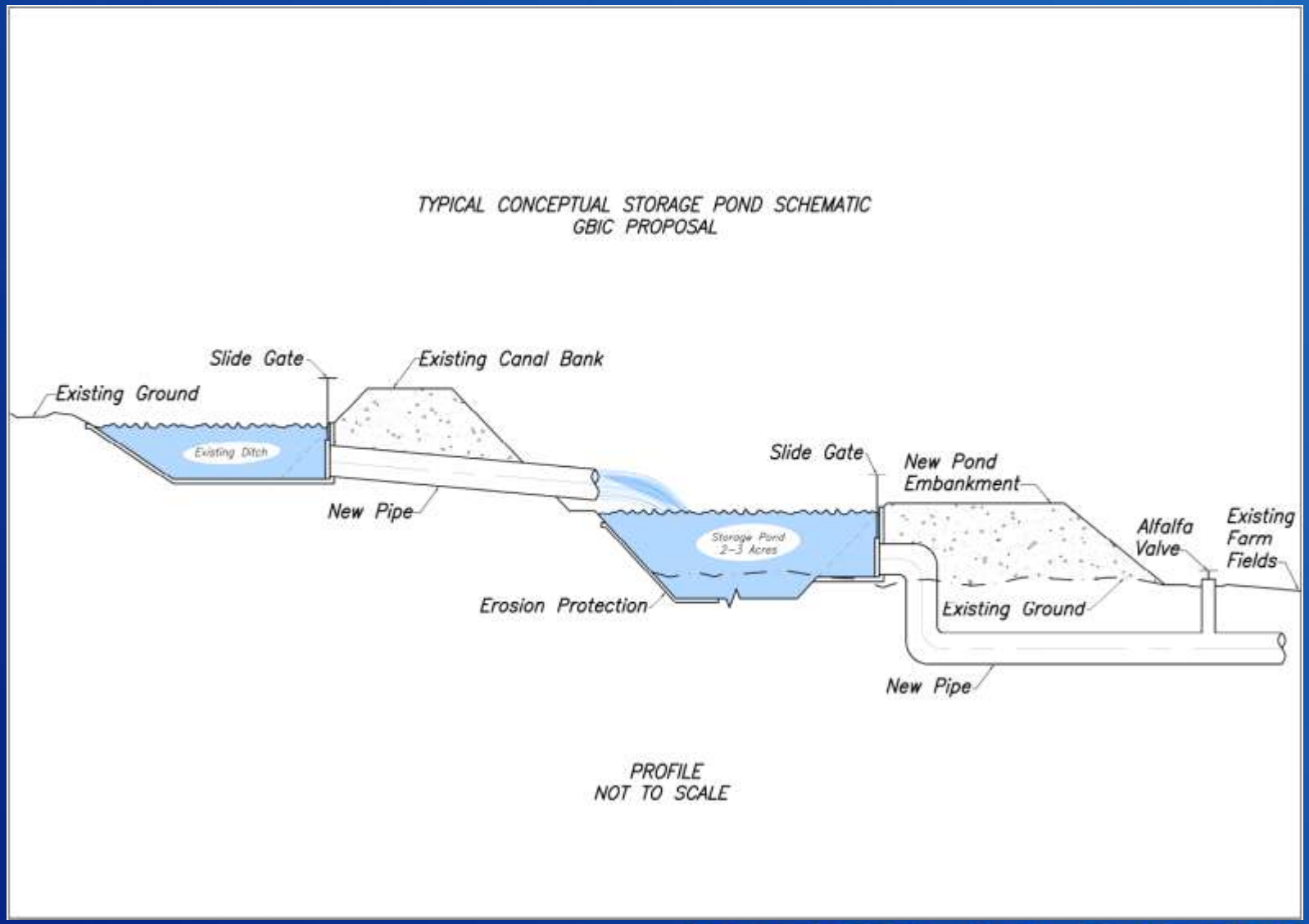
GBIC On Farm Storage



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GBIC Cost

- The total project cost is estimated at $41,800,000

– Upper diversion structure	$9,300,000
– Gila Farms diversion structure	$10,800,000
– Connection ditches (2 @ 350 cfs)	$4,860,000
– Upsize existing ditches	$1,000,000
– Storage ponds (10)	$3,800,000
– Pipeline recharge system	$10,900,000
– Infiltration Gallery	$1,100,000
	$41,800,000

- OM&R @1.4% of total project cost is $585,000/yr

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City of Deming

- **Principle Components:**
  - **Diversion**
  - **Storage Reservoirs**
  - **Closed Conduit (Pipeline) Conveyance**

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City of Deming

- 2 Diversion Components
  - Captured Flows
  - Subsurface Diversions

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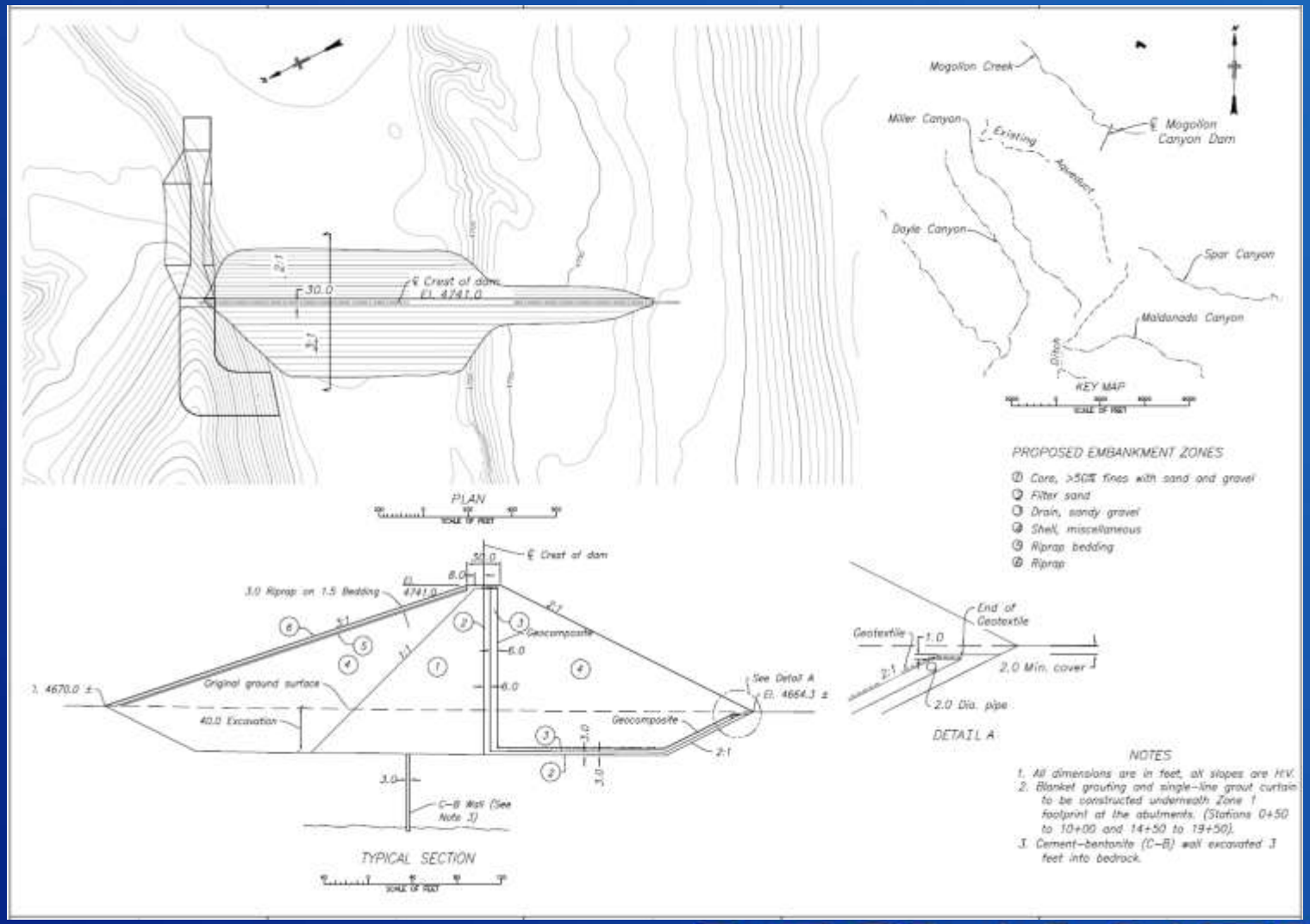
Mogollon Creek



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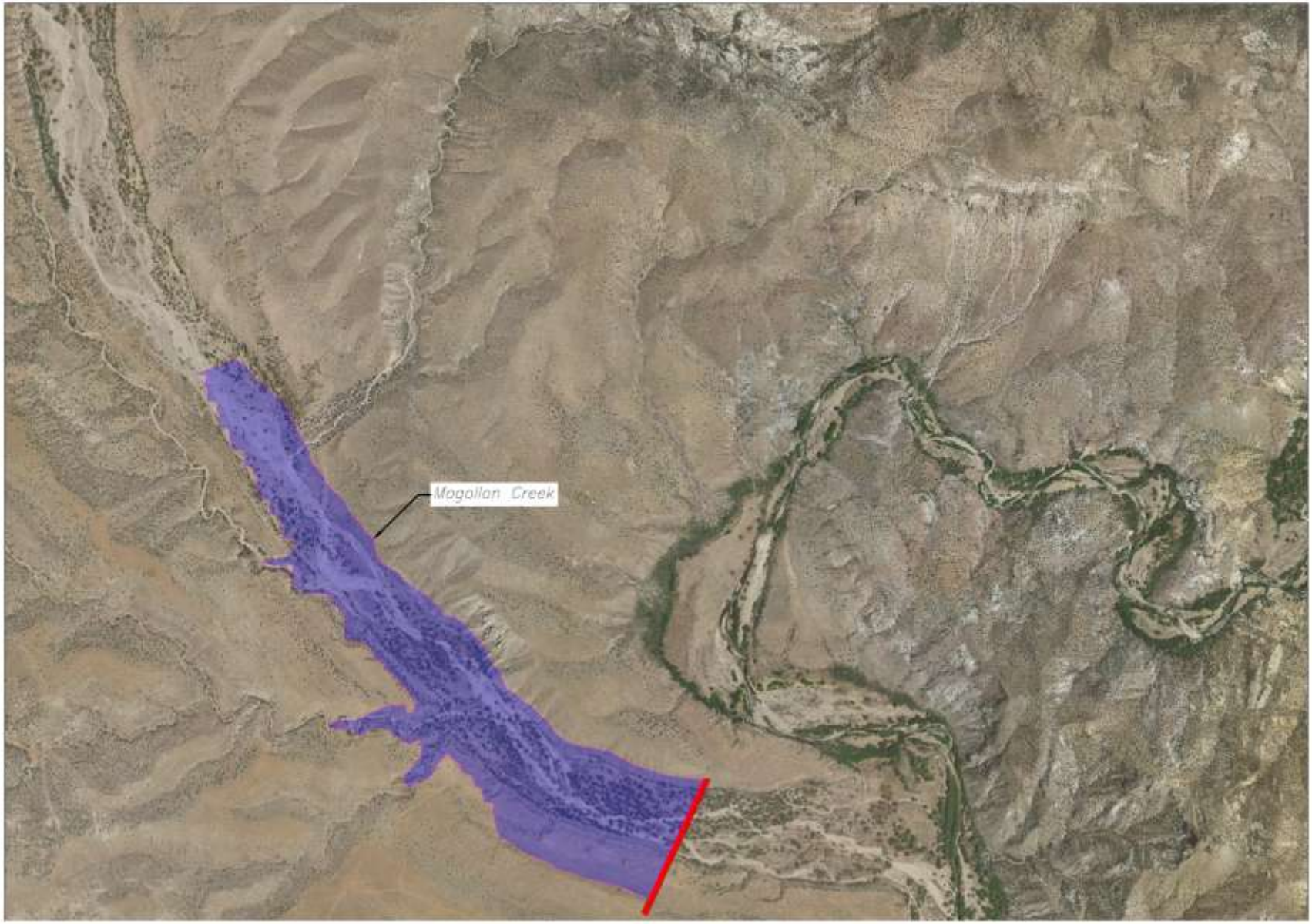
Mogollon Reservoir



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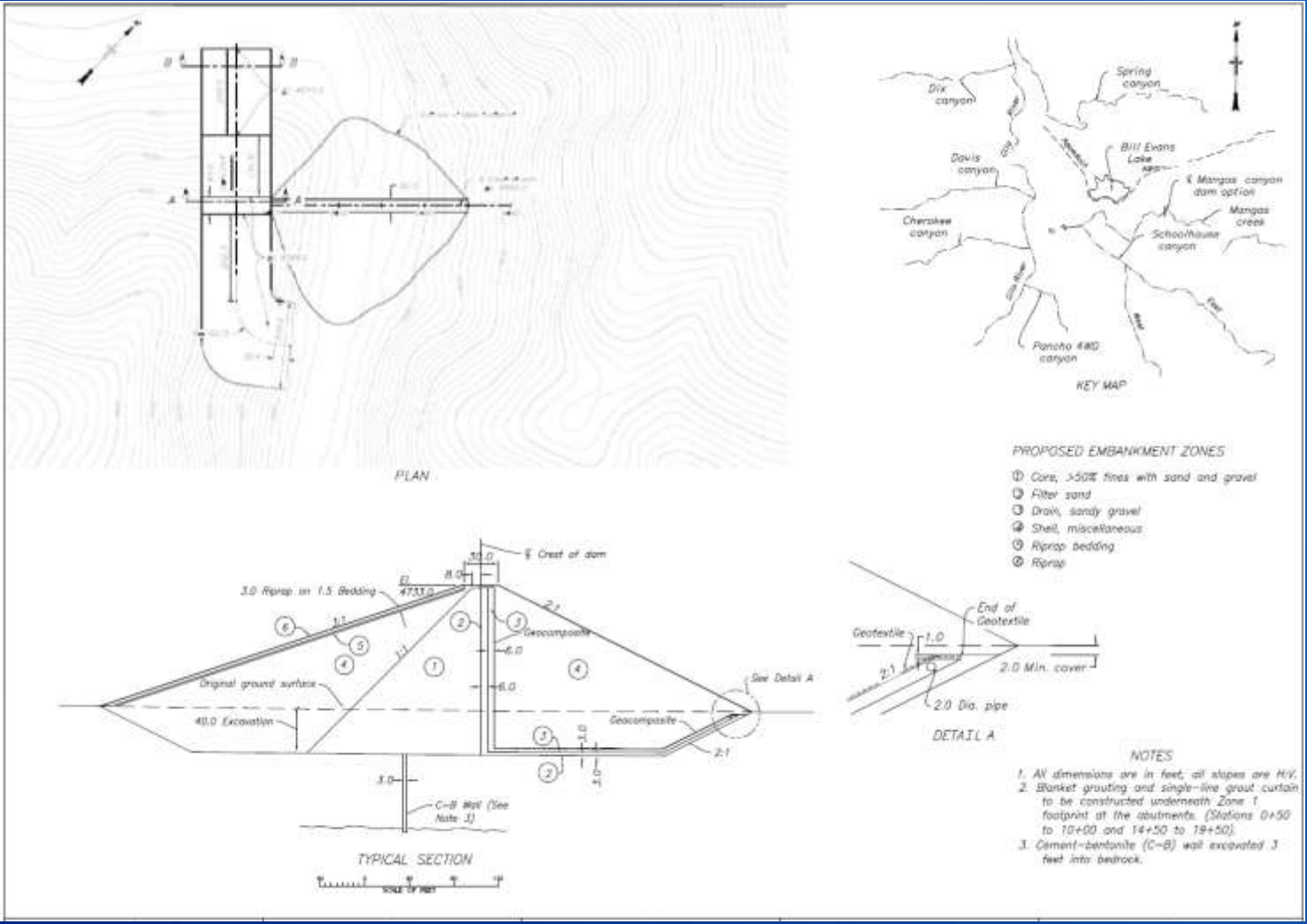
Mangas Creek



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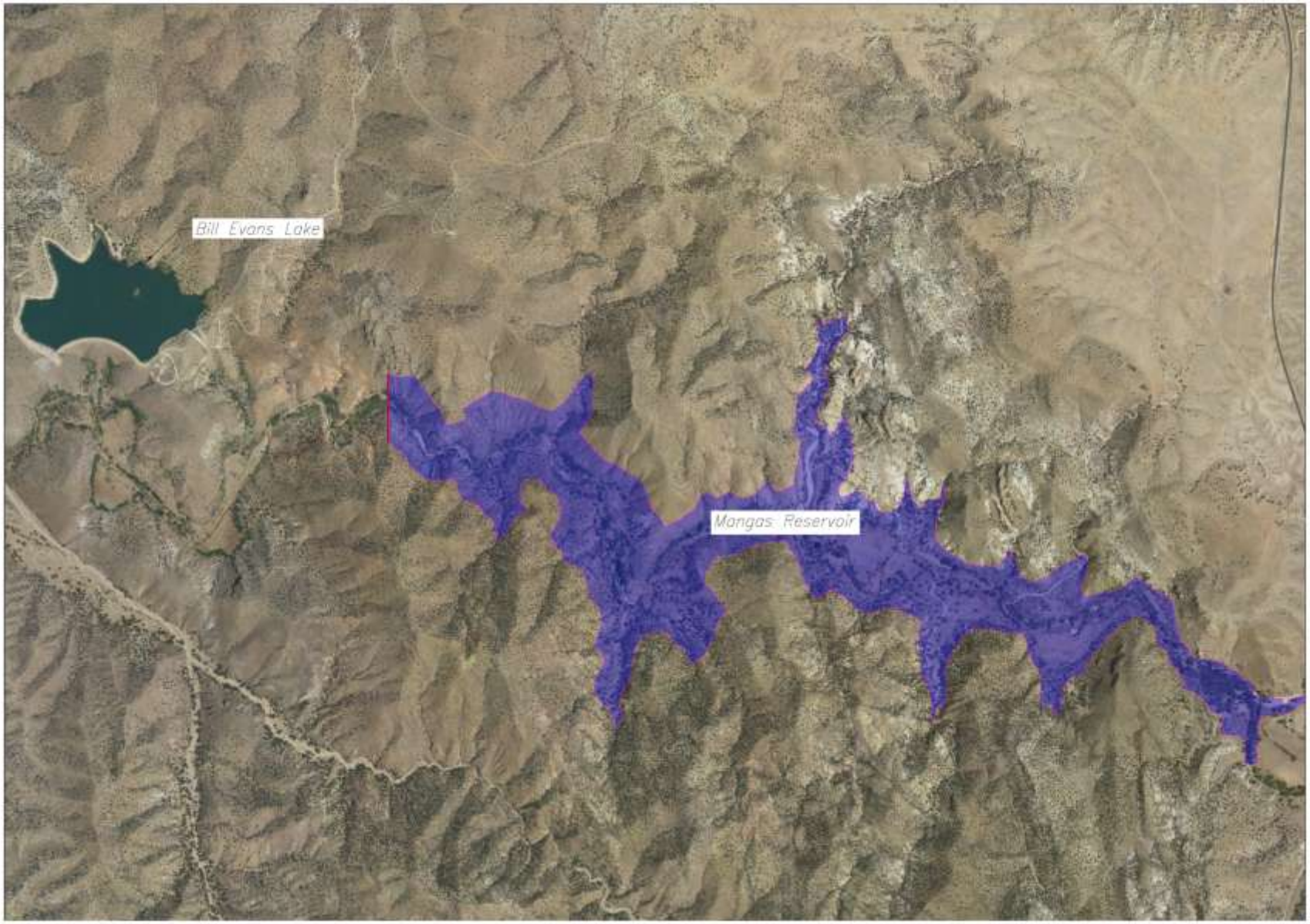
Mangas Reservoir



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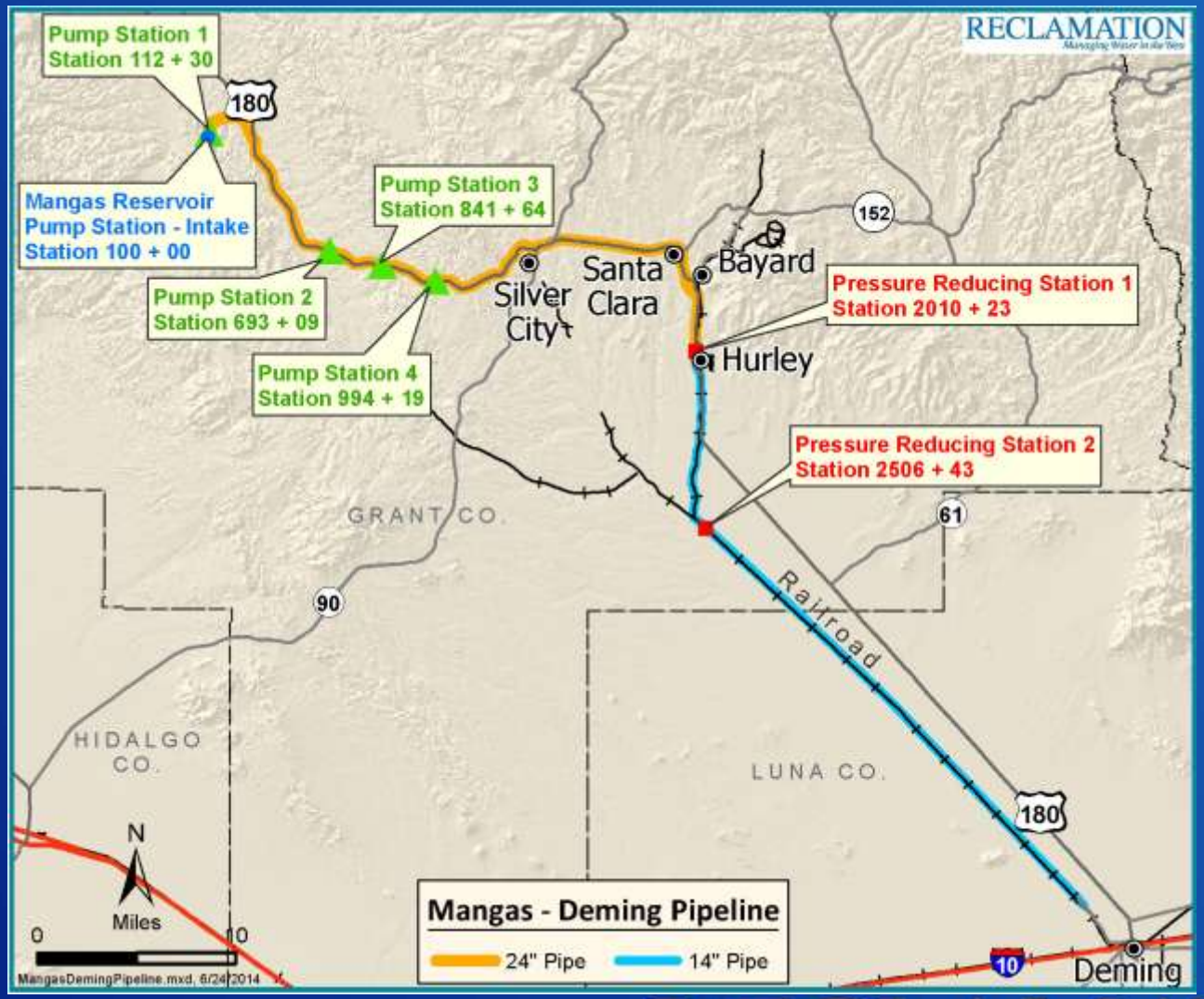
Pipeline to Deming



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City of Deming Cost

- The total project cost is estimated at $503,100,000

– Mogollon dam	$158,000,000
– Infiltration Gallery and Pumping Plant	$34,100,000
– Mangas dam	$155,000,000
– Pipeline to Deming	$156,000,000
	$503,100,000

OM&R is estimated to cost $8,850,000/yr

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Hidalgo County Off-Stream Project

- Principle Components:
  - Diversion
  - Open Channel Conveyance
  - Storage Reservoirs

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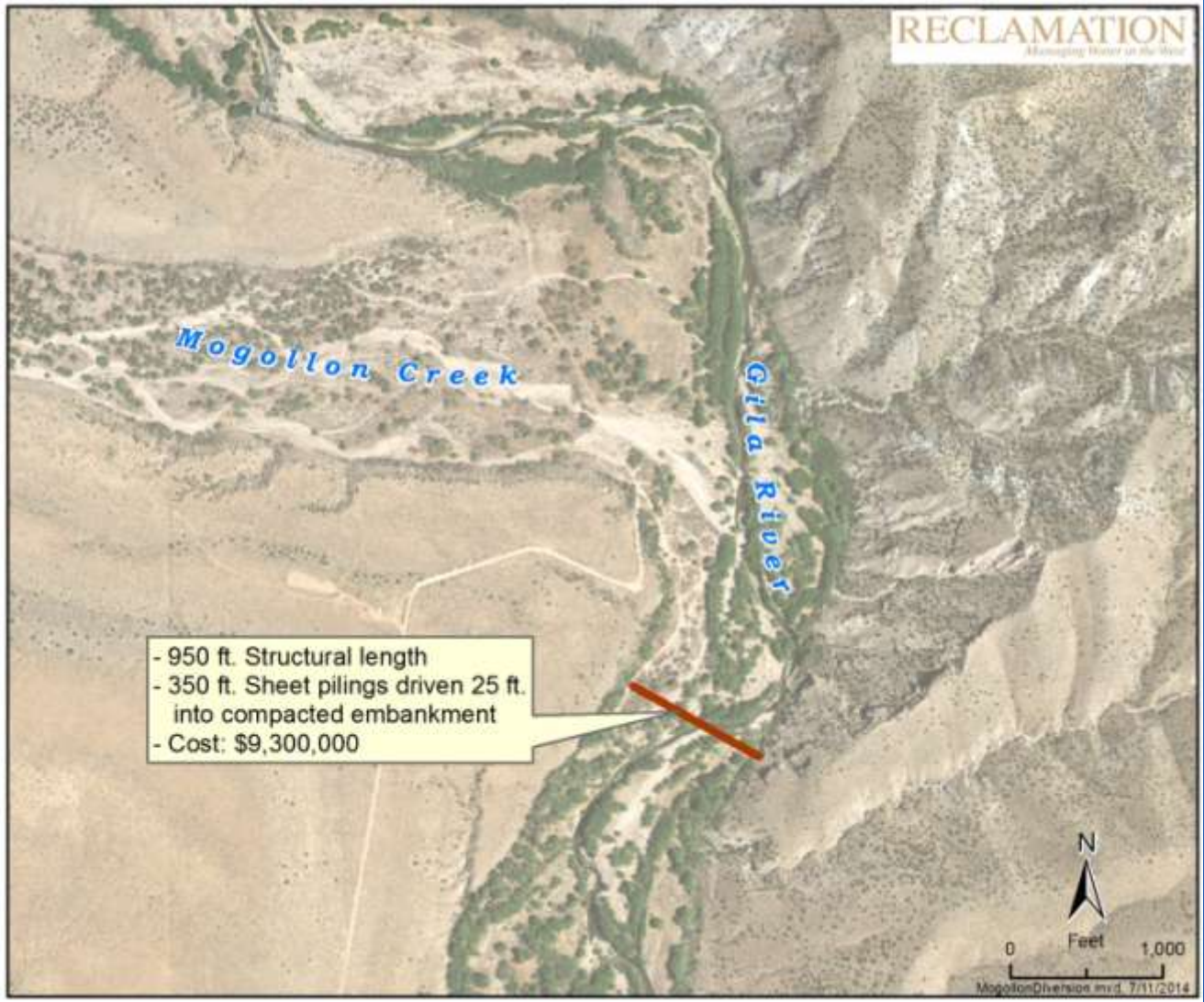
Hidalgo Diversion



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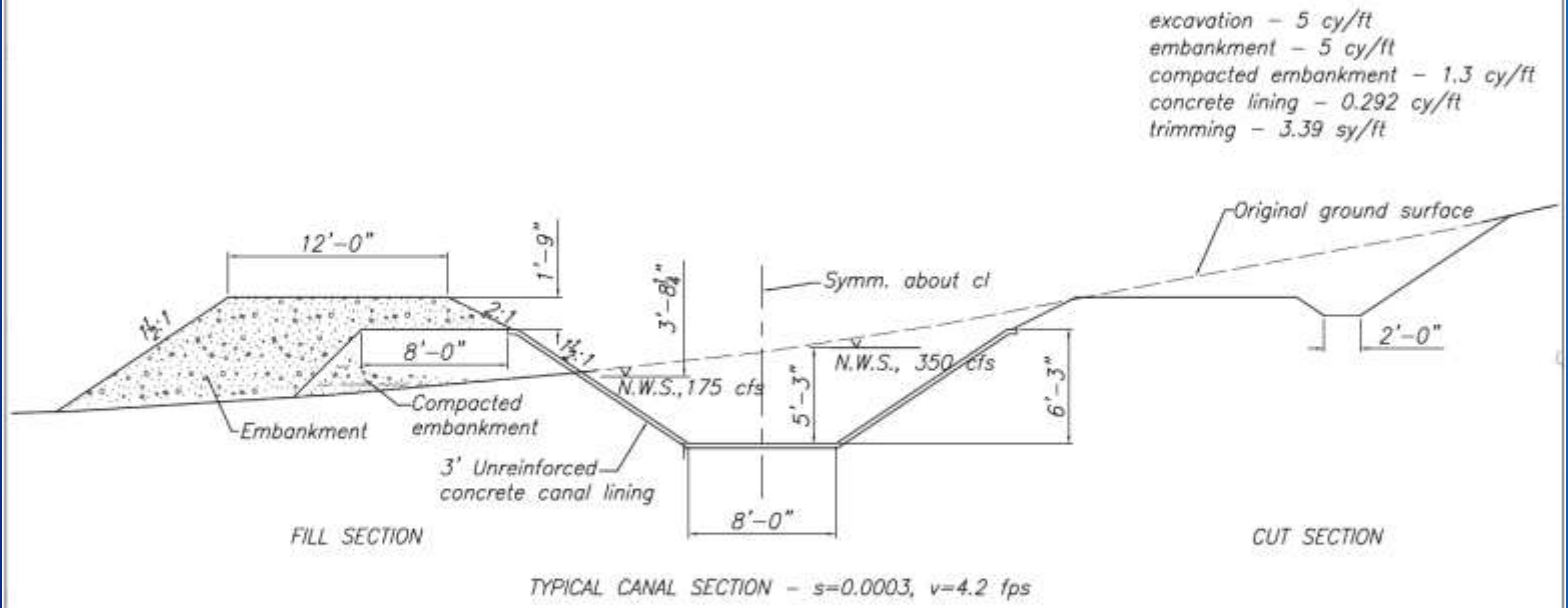
Hidalgo Conveyance



TYPICAL CANAL SECTION – s=0.0003, v=4.2 fps

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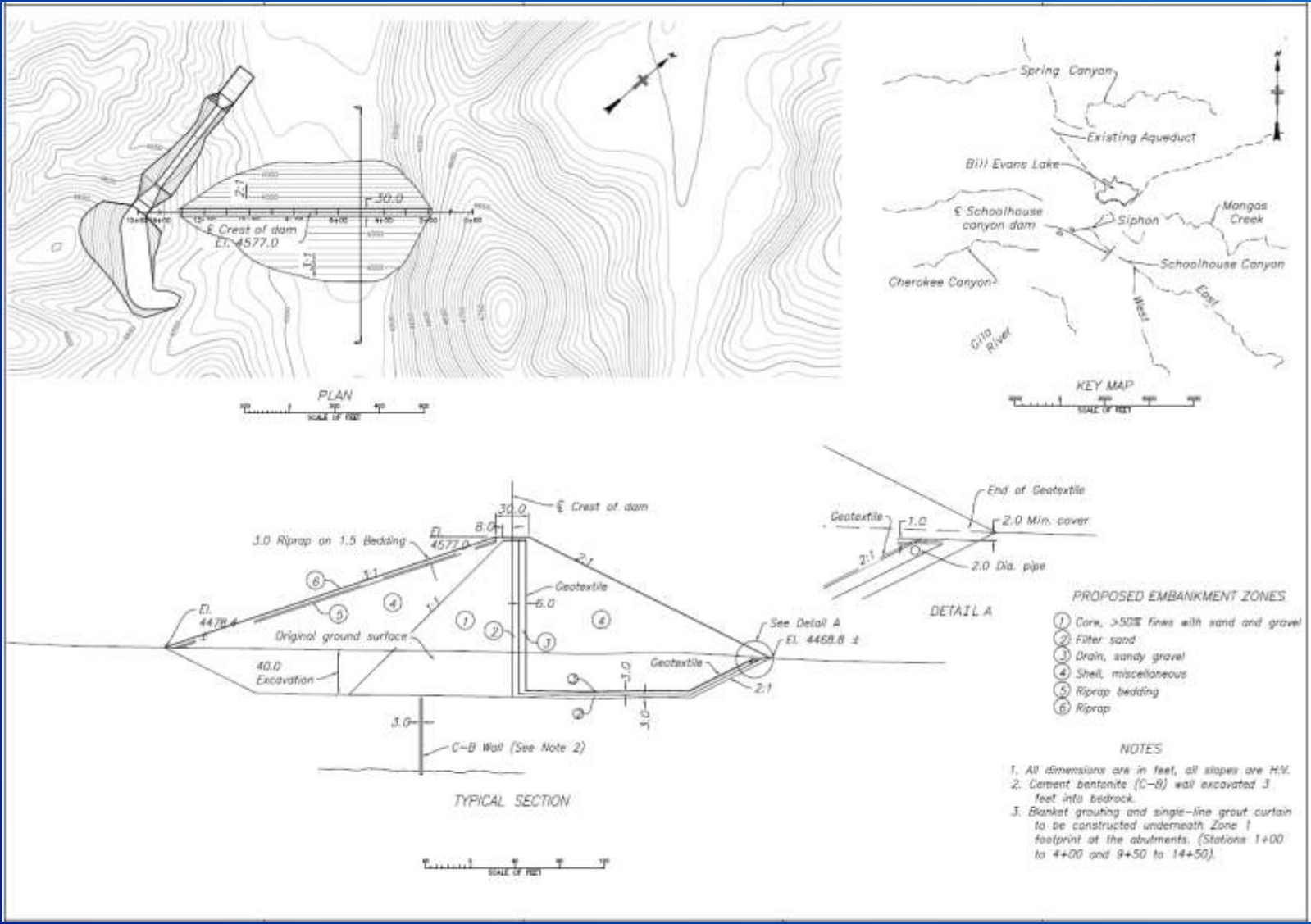
Schoolhouse Canyon



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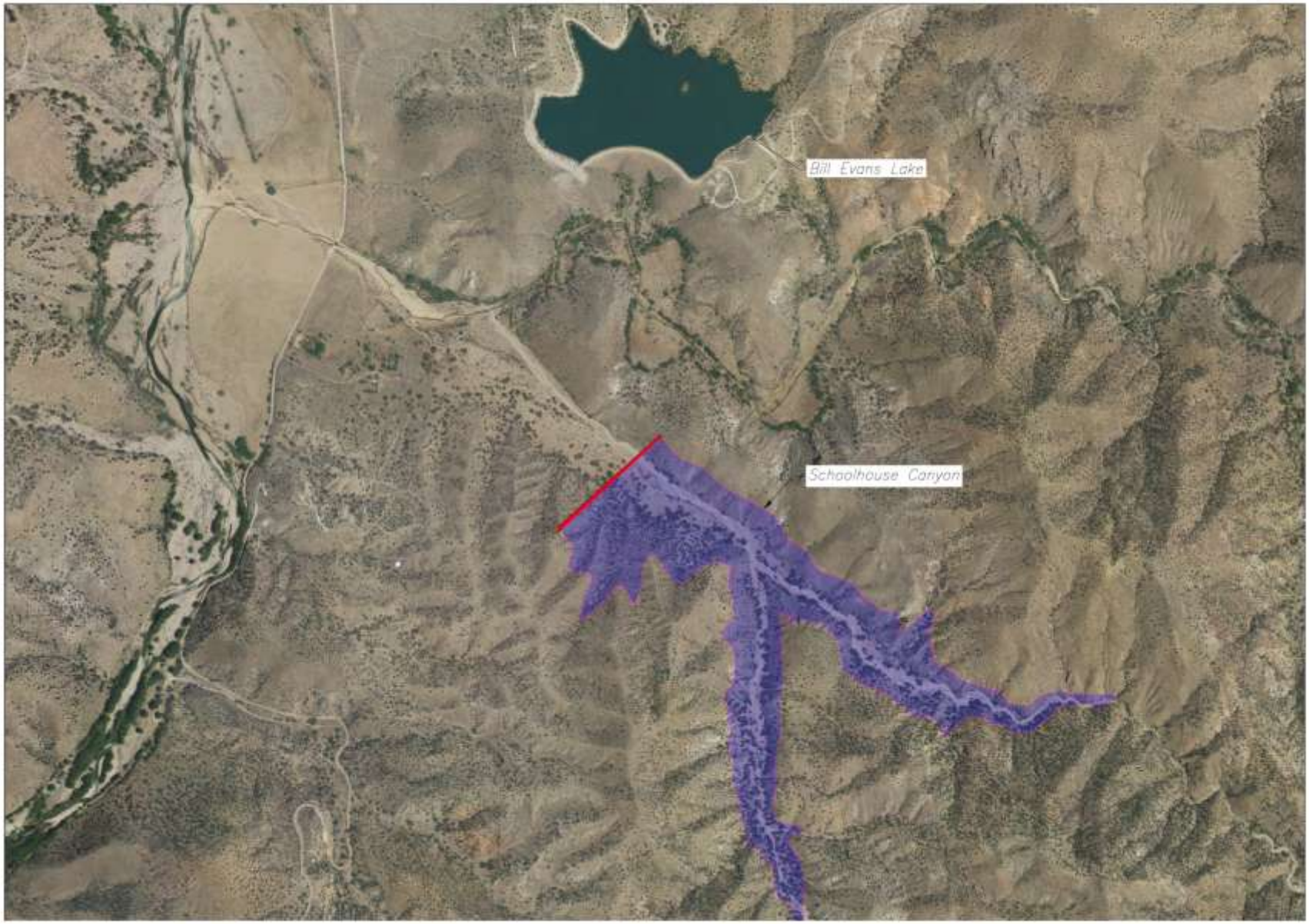
Schoolhouse Canyon



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Virden Storage Facility

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Hidalgo County Cost

- The total project cost is estimated at $235,000,000

– Diversion Dam and Canal	$115,000,000
– Schoolhouse Dam	$105,000,000
– Virden Dam	$14,700,000
	$234,700,000

OM&R is estimated to cost $1,530,000/yr

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Other Diversion and Storage Options

- 4 Diversion Locations
- 24 Storage Locations
  - 7 Locations Selected for Further Analyses
  - 3 Storage Configurations Presented

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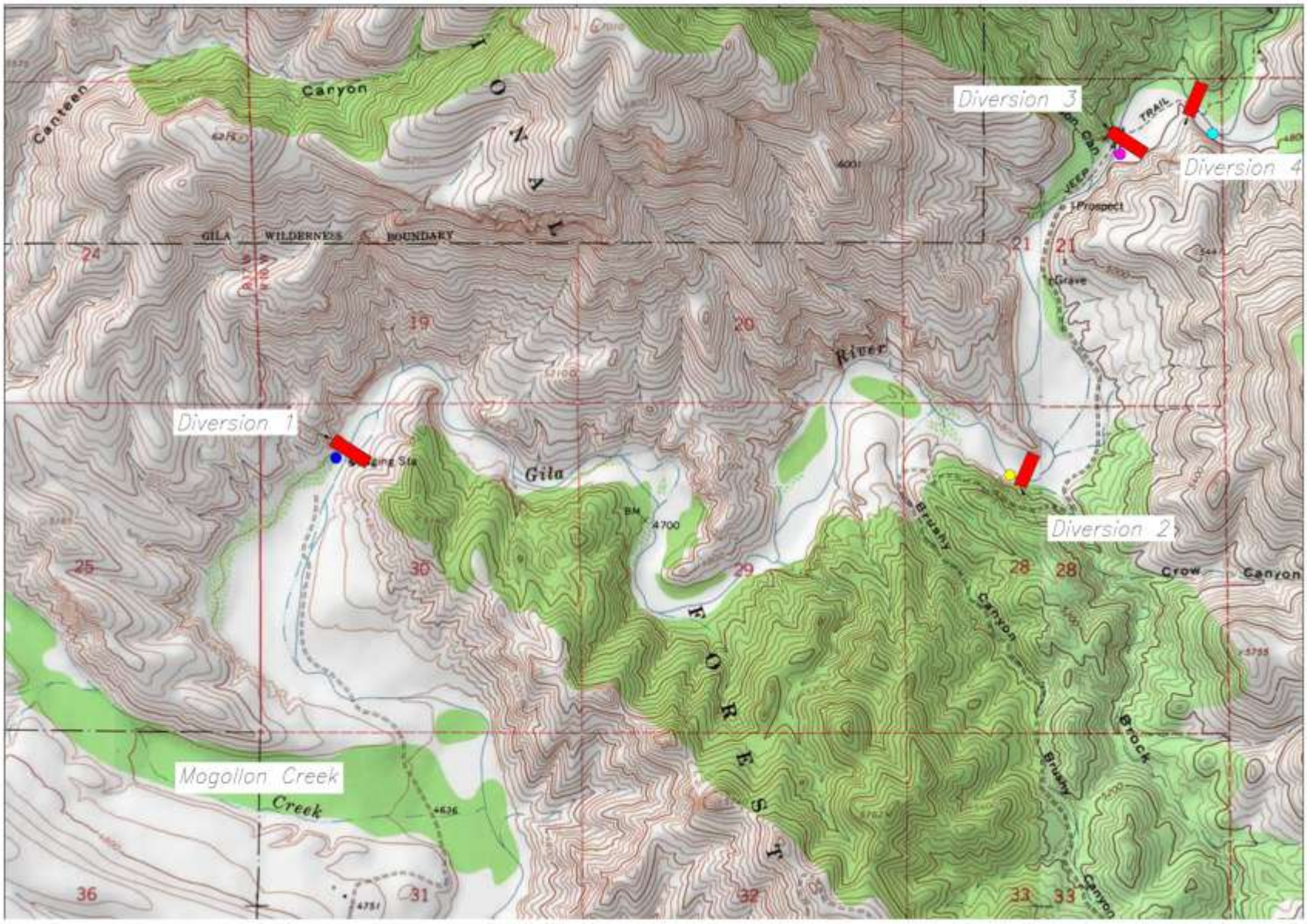
Diversion Locations



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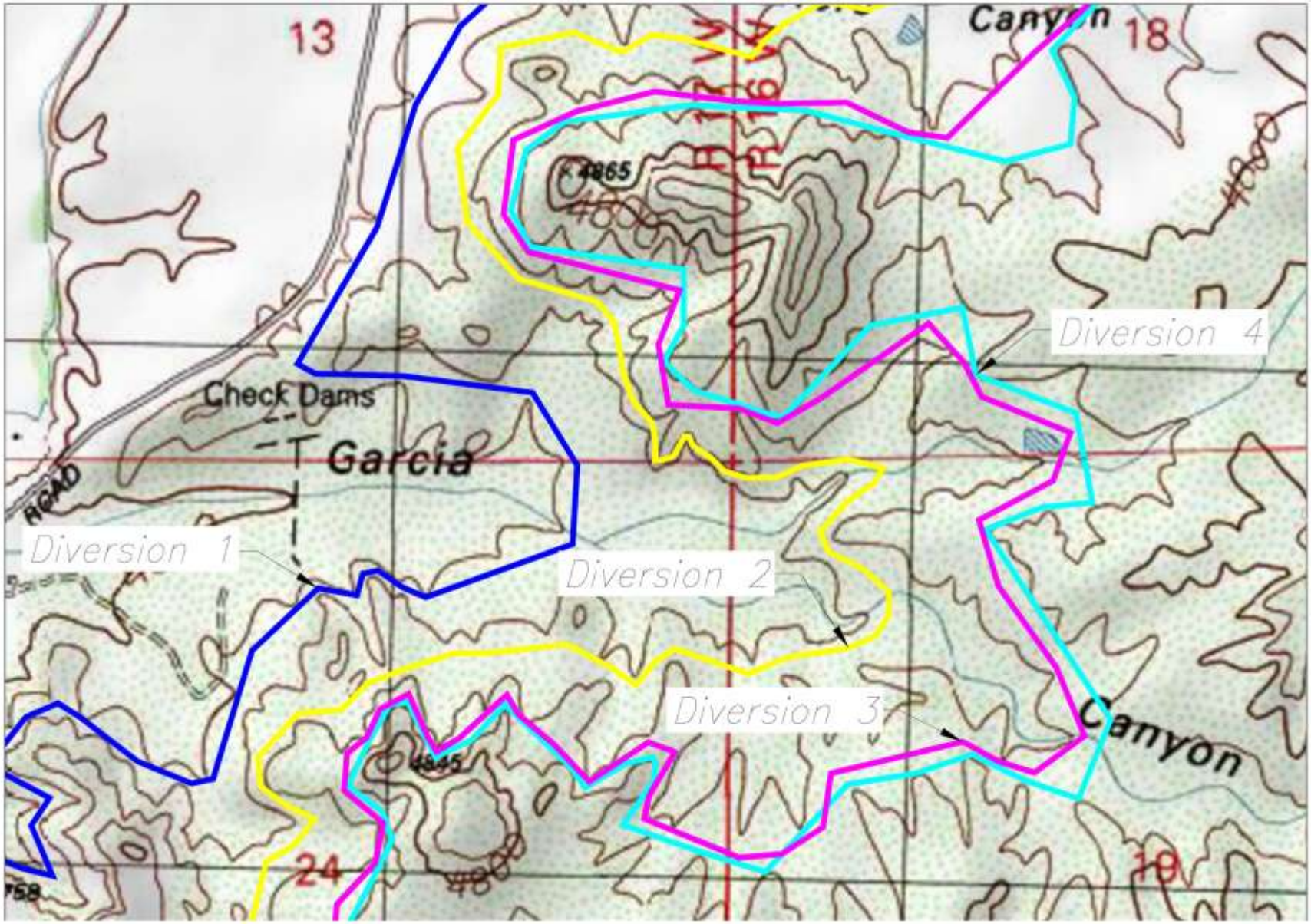
Conveyance Routes



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Diversion 1

- **4 Storage Sites**
  - **Winn Canyon**
  - **Pope Canyon**
  - **Sycamore Canyon**
  - **Greenwood Canyon**

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Winn Canyon

- Storage capacity- 2,750 ac-ft
- Reservoir area- 109 acres
- Dam structural height- 81 ft
- Embankment dam crest length- 1500 ft
- Dam crest elevation- 4670 ft
- Embankment dam volume- 829,000 yd^3
- Canal conveyance length from Diversion 1 to reservoir of 42,230 ft

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Pope Canyon

- Storage capacity- 7,900 ac-ft
- Reservoir area- 219 acres
- Dam structural height- 126 ft
- Embankment dam crest length- 1500 ft
- Dam crest elevation- 4633 ft
- Embankment dam volume- 2,440,000 yd^3
- Canal conveyance length from Diversion 1 to reservoir of 113,750 ft

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Sycamore Canyon

- Storage capacity- 36,900 ac-ft
- Reservoir area- 583 acres
- Dam structural height- 186 ft
- Embankment dam crest length- 4400 ft
- Dam crest elevation- 4623 ft
- Embankment dam volume- 6,800,000 yd^3
- Canal conveyance length from Diversion 1 to reservoir of 118,950 ft

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Greenwood Canyon

- Storage capacity- 26,000 ac-ft
- Reservoir area- 481 acres
- Dam structural height- 176 ft
- Embankment dam crest length- 1412 ft
- Dam crest elevation- 4632 ft
- Embankment dam volume- 3,035,000 yd^3
- Canal conveyance length from Diversion 1 to reservoir of 136,600 ft

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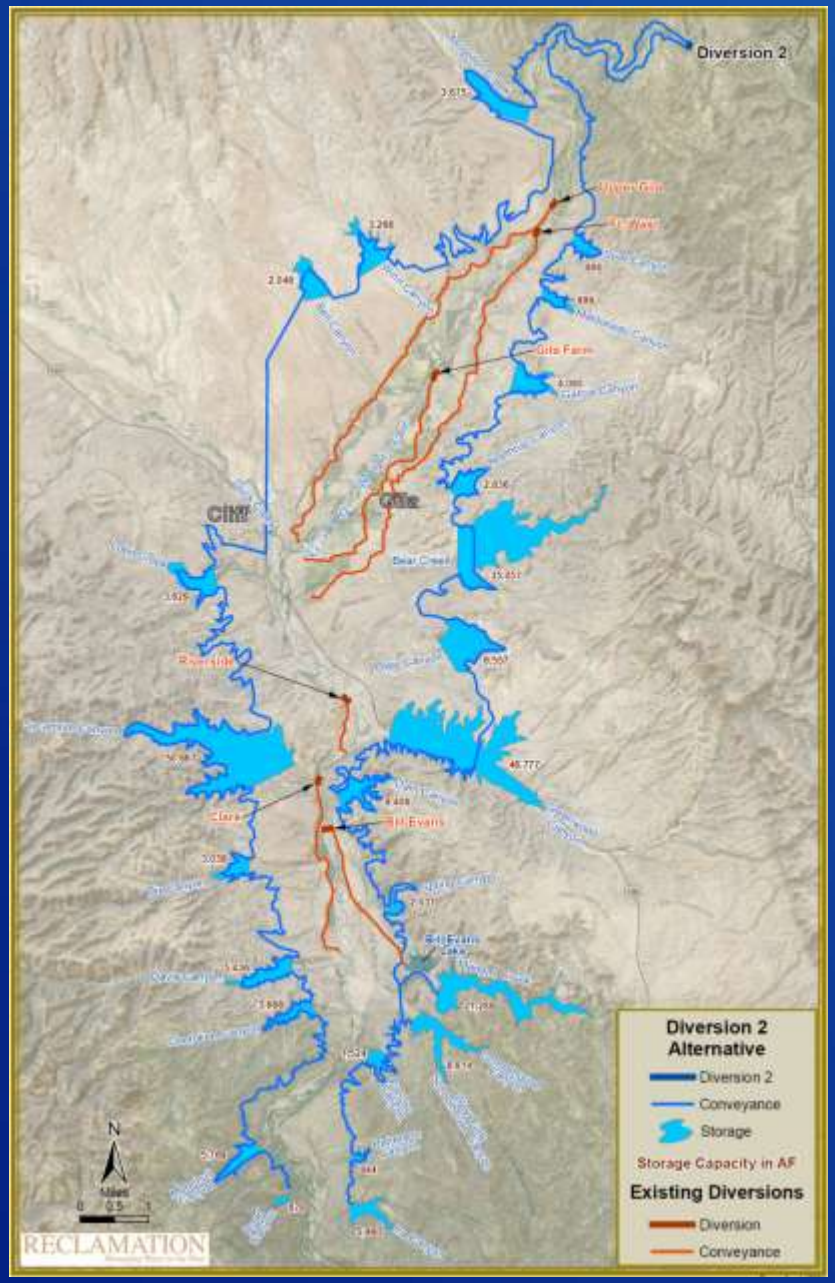
Diversion 2



- **1 Storage Site**
  - **Dam Canyon**

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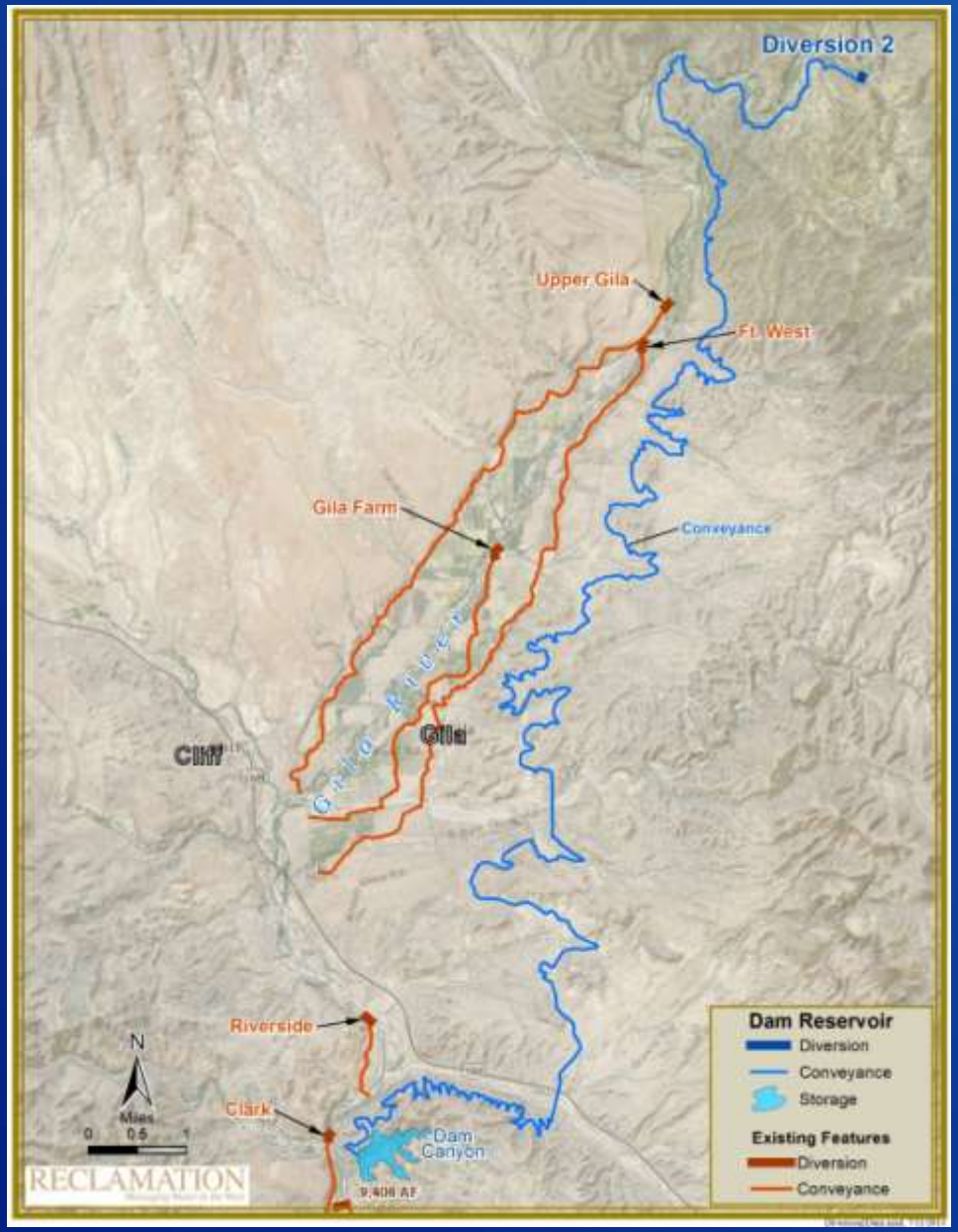
Dam Canyon



- Storage capacity- 9,400 ac-ft
- Reservoir area- 135 acres
- Dam structural height- 247 ft
- Embankment dam crest length- 1715 ft
- Dam crest elevation- 4685 ft
- Embankment dam volume- 4,290,000 yd^3
- Canal conveyance length from Diversion 2 to reservoir of 172,900 ft

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Diversion 3

- **1 Storage Site**
  - **Garcia Canyon**

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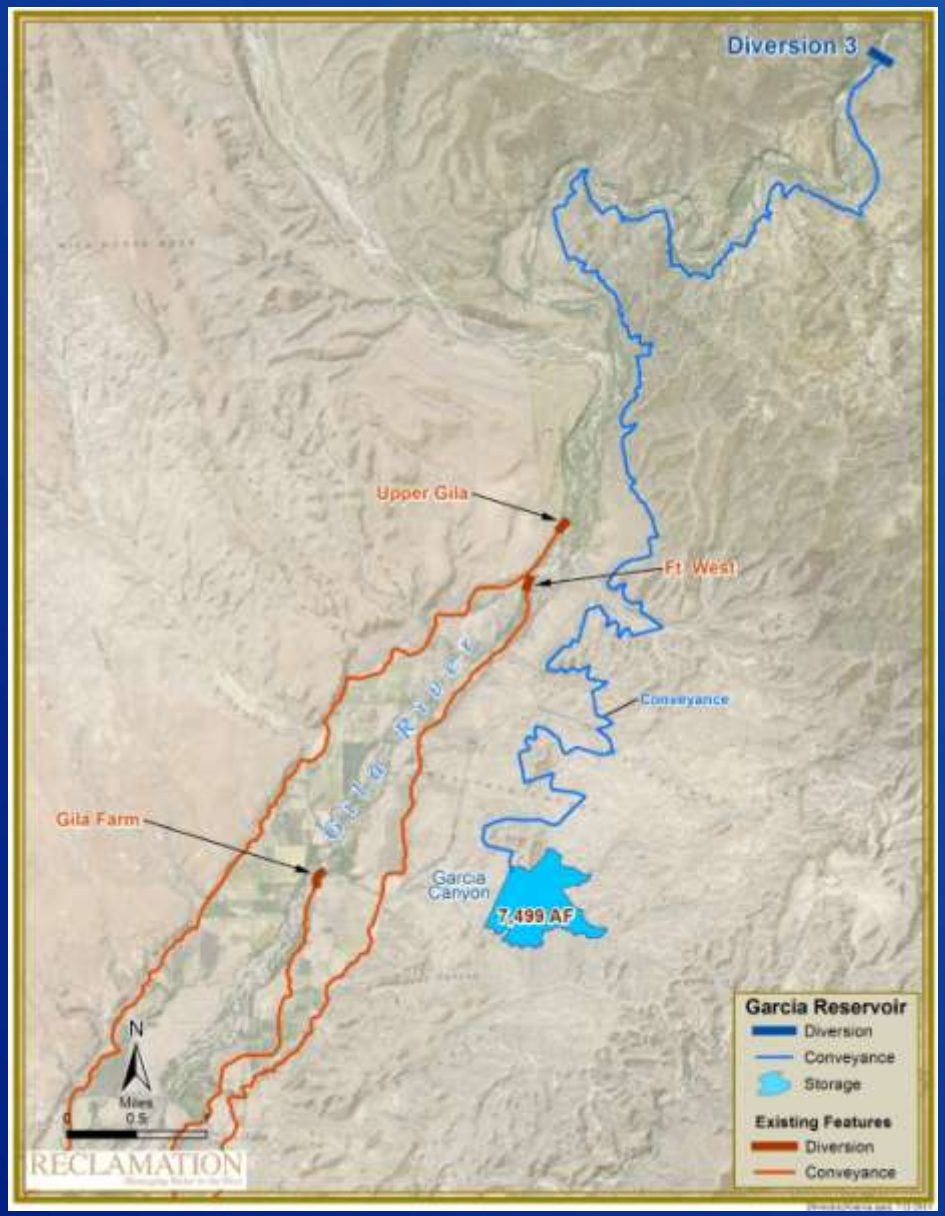
Garcia Canyon



- Storage capacity- 7,500 ac-ft
- Reservoir area- 203 acres
- Dam structural height- 115 ft
- Embankment dam crest length- 2650 ft
- Dam crest elevation- 4762 ft
- Embankment dam volume- 2,120,000 yd^3
- Canal conveyance length from Diversion 3 to reservoir of 87,800 ft

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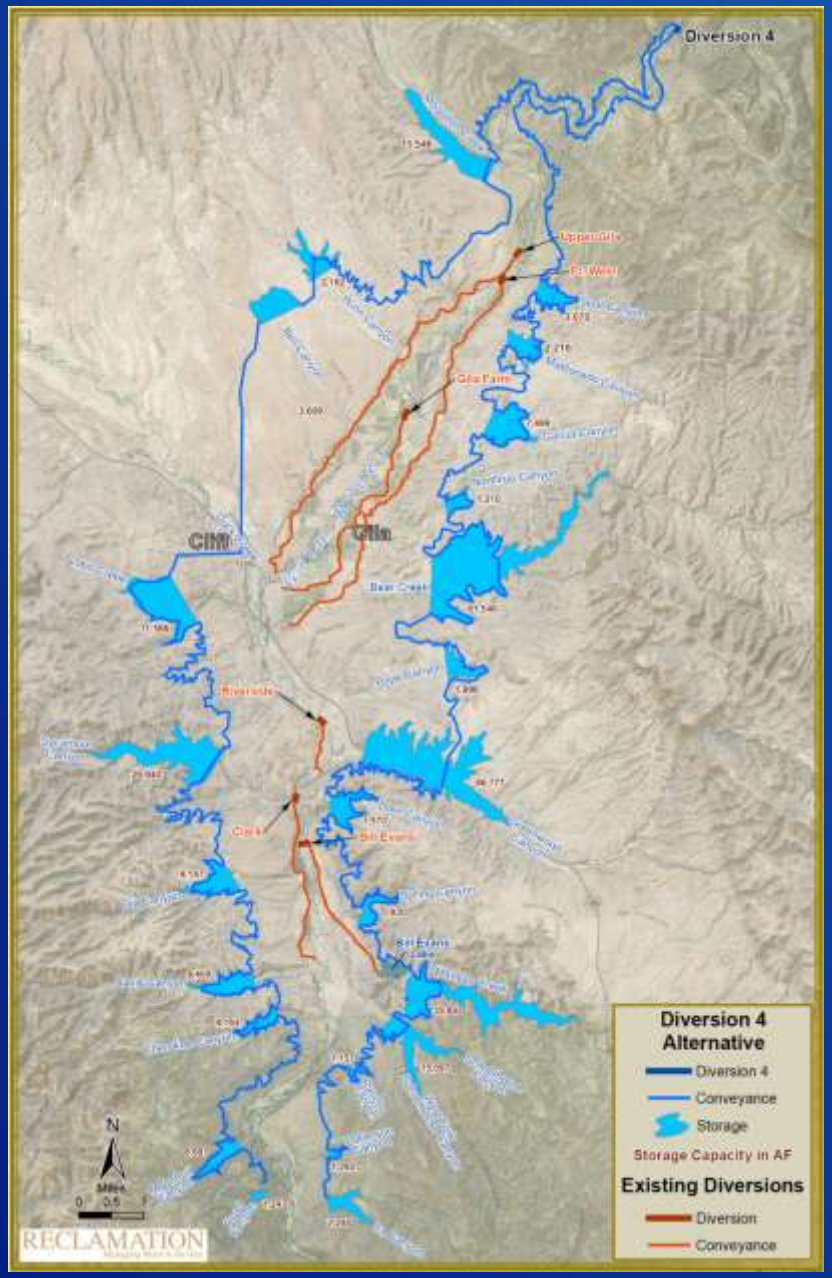
Diversion 4



- **1 Storage Site**
  - **Spar Canyon**

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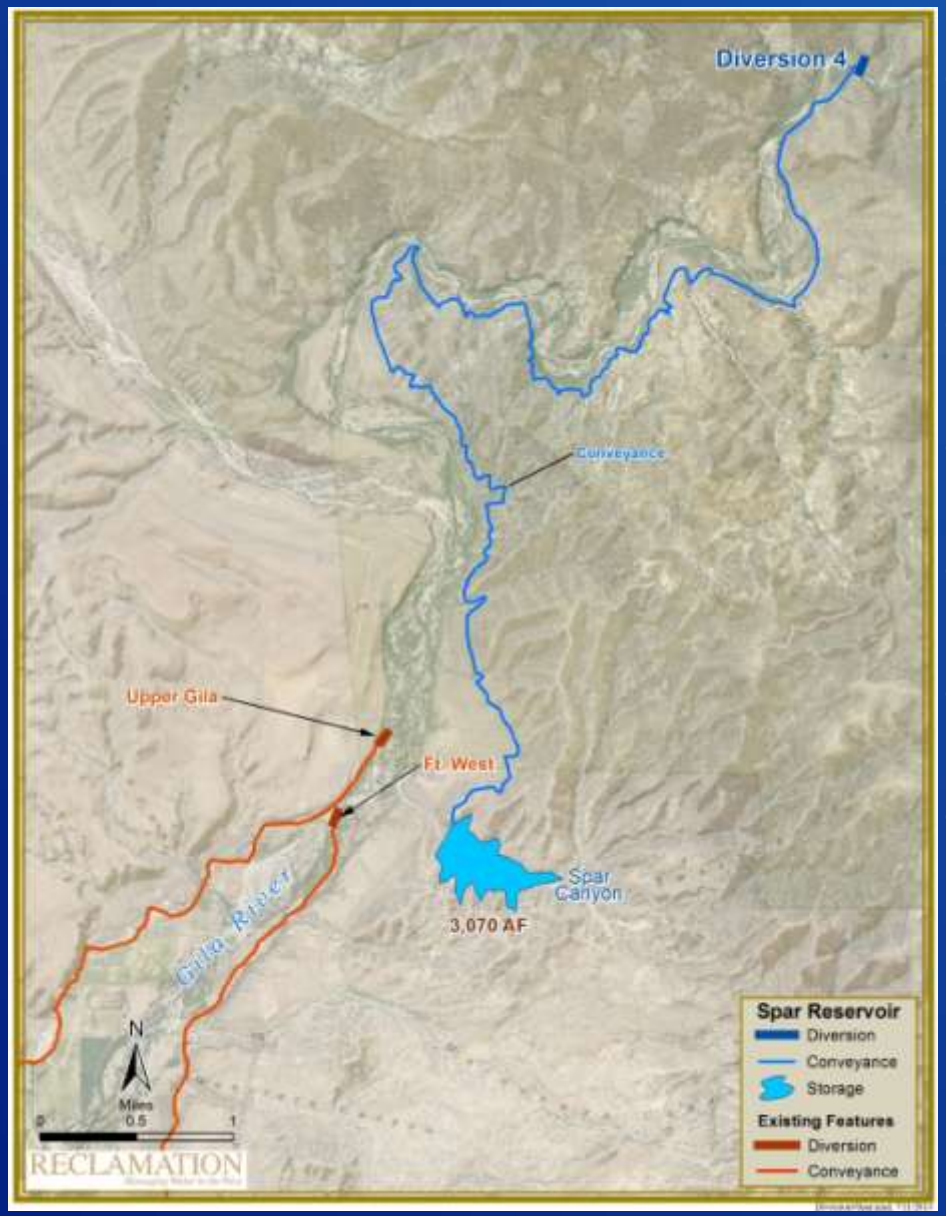
Spar Canyon



- Storage capacity- 9,400 ac-ft
- Reservoir area- 135 acres
- Dam structural height- 247 ft
- Embankment dam crest length- 1715 ft
- Dam crest elevation- 4685 ft
- Embankment dam volume- 4,290,000 yd^3
- Canal conveyance length from Diversion 2 to reservoir of 172,900 ft

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Other Diversion and Storage Options Cost

Storage site	Construction Cost ($)	Storage Volume (AF)	Cost per AF
Spar	161,583,000	3,100	52,100
Winn	83,291,200	2,750	30,300
Garcia	207,933,000	7,500	27,700
Pope	234,011,200	7,900	29,600
Greenwood	280,511,200	26,000	10,800
Sycamore	363,601,200	36,900	9,900
Dam	307,223,000	9,400	32,700

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Storage Options

- Storage Configurations:
  - Alternative 1: 64,000 AF
  - Alternative 2: 10,000 AF
  - Alternative 3: 14,000 AF

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Alternative 1

- Cost: $598,450,000

– Sycamore	36,900 AF
– Greenwood	26,000 AF
	62,900 AF

- OM&R: $4,470,000/yr

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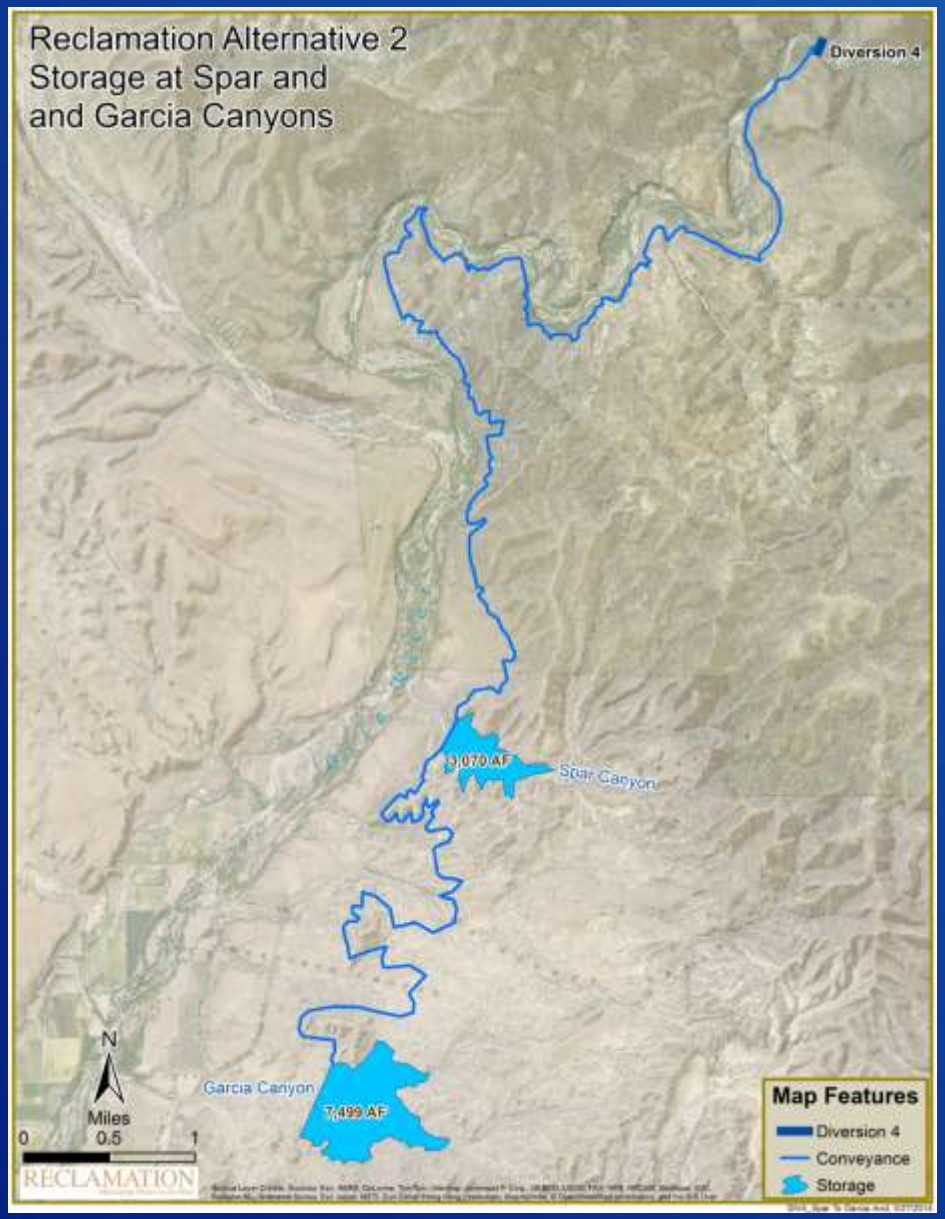
Alternative 2



- Cost: $294,373,000
  - Spar 3,100 AF
  - Garcia 7,500 AF
  - 10,600 AF
- OM&R: 2,525,000/yr

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Alternative 3

- Cost: $307,303,000
  - Mogollon 11,500 AF
  - Winn 2,750 AF
  - 14,250 AF
- OM&R: 2,684,000/yr

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Other Diversion and Storage Options Cost

Storage Sites	Storage Volume (AF)	Construction Cost ($)	Cost per AF
Sycamore & Greenwood	62,900	$598,450,000	$9,514.31
Mogollon & Winn	14,250	$307,303,000	$21,565.10
Spar & Garcia	10,600	$294,373,000	$27,771.00

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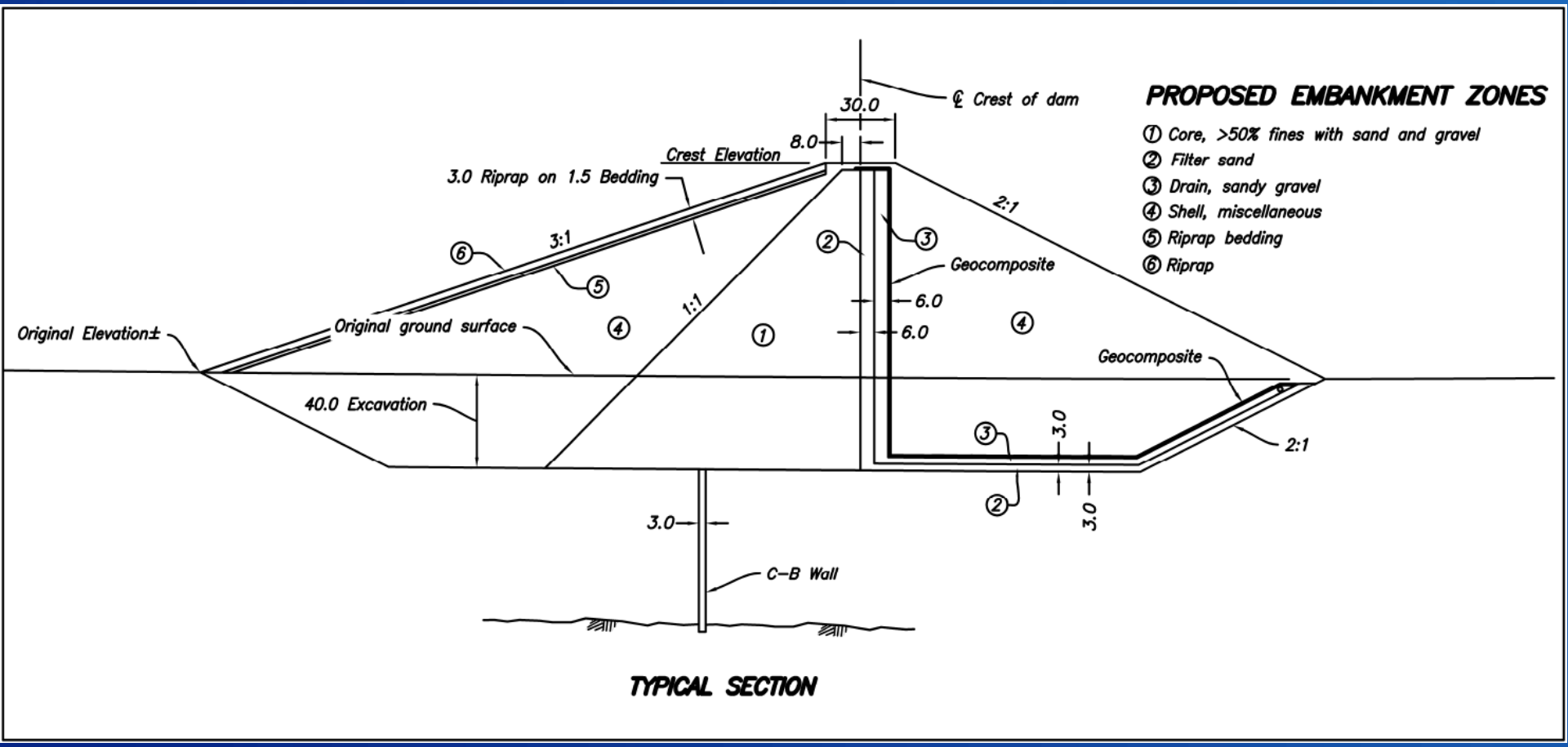
Typical Embankment Dam



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Miscellaneous Considerations

- ***Replace diversion structures with infiltration gallery***
  - ***Diversion structure $9 Million vs $16.2 Million for Infiltration gallery***
- ***Cost of water treatment at the Deming pipeline termination***
  - ***$21.1 Million for Deming's municipal use of 3,900 acre-ft per year***
- ***Tunnel versus open channel water conveyance***
- ***Lining reservoirs***
  - ***At $1.74 / sq. ft, $163,000 for 2 acre pond, $9.1 Million for Winn Canyon***

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Questions?

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