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Demographic Snapshot of the New Mexico Southwest Water Planning Region

Grant County Population 29,096
Persons below poverty level: 20.4%
Top Employer: Freeport McMoRan Copper & Gold
Unemployment Rate: 6.7%

Luna County Population 24,673
Persons below poverty level: 29.7%
Top Employer: Border Foods (Mizkan Foods)
Unemployment Rate: 21.8%

Hildago County Population 4,654
Persons below poverty level: 24.3%
Unemployment Rate: 6.6%

Catron County Population 3,556
Persons below poverty level: 19.7%
Unemployment Rate: 9.2%

New Mexico Population 2,085,572
Persons below poverty level: 20.4%
Unemployment Rate: 6.2%

New Mexico Water Uses

9.08% - Public Supplies, Domestic Use
5.43% Livestock, Commercial, Industrial, Mining, Power
6.87% Evaporation

78% - Irrigated Agriculture

6.8%
5.4%
9%
Substantial Improvement in Current Drought Status For New Mexico

Currently 47% Drought Free

Compared to 42% Exceptional Drought in July 2013

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period

Valid for May 21 - August 31, 2015
Released May 21, 2015

Author:
Adam Allgood
NOAA/NWS/NCEP/Climate Prediction Center
Current New Mexico Snotel Reports

New Mexico
SNOTEL Water Year (Oct 1) to Date Precipitation % of Normal

May 28, 2015

Water Year (Oct 1) to Date Precipitation Basin-wide Percent % of 1981-2010 Average

- unavailable *
- <50%
- 50 - 69%
- 70 - 89%
- 90 - 109%
- 110 - 129%
- 130 - 149%
- >=150%

* Data unavailable at time of posting or measurement is not representative at this time of year

Provisional Data Subject to Revision
Four County Study Map
Continental Divide

Continental Divide (on Highway 180) Elevation: 6,230 feet
Diversion Alternative 2 Elevation: 4,695 feet
Gila, NM Elevation: 4,557 feet
Silver City, NM Elevation: 5,895 feet
Deming, NM Elevation: 4,300 feet
Virden, NM Elevation: 3,763 feet
Stop 1: Upper Cliff Gila Valley Overlook
Stop 2: Brock Canyon Diversion Point

Gila River downstream of Turkey Creek
Stop 3: Spar Canyon
Stop 3: Spar Canyon

Tour
Gila River, NM
June 2015

Legend
- Proposed AWSA Spar Pump Station
- Stormwater Detention Ponds
- Proposed AWSA Storage Sites
- Conveyances

GILA PHASE II
ENGINEERING EVALUATION

FIGURE 15
COMBINED GRAVITY AND PUMPING SCENARIO
Stop 4: Gila Farms Ditch Point of Diversion
Stop 5: Highway 211 Bridge
Stop 6: Winn Canyon
Rendering of Potential
Winn Canyon Reservoir
Stop 7: Mogollon Creek Confluence
Stop 8: Stream Gauge Diversion Point
Stop 9: Sycamore Canyon
Stop 10: Pope Canyon
Stop 11: Greenwood Canyon
Stop 12: Bill Evan’s Diversion Structure, Lake
Reclamation Maps
Tour
Gila River, NM
June 2015

Diversion 2
Alternative
- Diversion 2
- Conveyance
- Storage

Storage Capacity in AF

Existing Diversions

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| 2 | 54226 | 18 | 4632 | 4711 | 999 | 1530 | 4683 | 4698 | 78 | 4712 | 52 |
| 3 | 66429 | 20 | 4774 | 4771 | 2159 | 1478 | 4658 | 4688 | 90 | 4735 | 101 |
| 4 | 67416 | 20 | 4759 | 4758 | 2216 | 1678 | 4658 | 4688 | 90 | 4735 | 101 |

**Garita Canyon:**

| 1 | 40600 | 12 | 4685 | 4876 | 839 | 1464 | 4606 | 4615 | 63 | 4686 | 49 |
| 2 | 69732 | 21 | 4673 | 4714 | 4095 | 2848 | 4628 | 4655 | 90 | 4713 | 124 |
| 3 | 43634 | 25 | 4749 | 4782 | 7499 | 2648 | 4647 | 4657 | 115 | 4760 | 203 |
| 4 | 57341 | 39 | 4759 | 4755 | 7499 | 2648 | 4647 | 4657 | 155 | 4790 | 259 |

**Northpole:**

| 1 | 70206 | 21 | 4647 | 4650 | 1163 | 930 | 4677 | 4687 | 83 | 4667 | 18 |
| 2 | 59652 | 29 | 4705 | 4718 | 2889 | 1391 | 4683 | 4628 | 105 | 4626 | 89 |
| 3 | 179335 | 33 | 4731 | 4734 | 1061 | 1580 | 4677 | 4687 | 77 | 4741 | 46 |
| 4 | 110112 | 35 | 4745 | 4757 | 1210 | 1603 | 4677 | 4687 | 80 | 4744 | 10 |

**Bears Creek:**

| 1 | 91406 | 27 | 4641 | 4682 | 22150 | 4598 | 4639 | 4640 | 115 | 4641 | 53 |
| 2 | 109611 | 35 | 4721 | 4714 | 4367 | 5531 | 4575 | 4585 | 139 | 4791 | 68 |
| 3 | 129240 | 36 | 4725 | 4751 | 61846 | 4759 | 4578 | 4588 | 173 | 4758 | 102 |
| 4 | 129671 | 39 | 4749 | 4751 | 61456 | 4793 | 4578 | 4588 | 175 | 4740 | 102 |

**Total Creek:**

<p>| 1 | 113750 | 42 | 4626 | 4693 | 7829 | 1998 | 4507 | 4517 | 120 | 4620 | 219 |
| 2 | 129680 | 45 | 4689 | 4782 | 6657 | 3241 | 4588 | 4588 | 114 | 4609 | 211 |</p>
<table>
<thead>
<tr>
<th>Tour Gila River, NM</th>
<th>June 2015</th>
<th>Page 31</th>
</tr>
</thead>
</table>

| 3 | 14038 | 52 | 4722 | 4755 | 1996 | 2999 | 6467 | 6657 | 88 | 4722 | 66 |
| 4 | 174675 | 56 | 4728 | 4756 | 1996 | 2999 | 6467 | 6657 | 89 | 4723 | 66 |

- **Greenwood Canyon**:
  1. 436900 | 49 | 4619 | 4632 | 25952 | 1412 | 4456 | 4468 | 176 | 4619 | 481 |
  2. 341795 | 48 | 4606 | 4673 | 46777 | 2993 | 4467 | 4477 | 206 | 4600 | 819 |
  3. 326407 | 55 | 4619 | 4673 | 46777 | 2993 | 4467 | 4477 | 206 | 4600 | 819 |
  4. 387270 | 60 | 4719 | 4673 | 2993 | 2993 | 4467 | 4477 | 206 | 4600 | 819 |

- **Dam Canyon**:
  1. 140325 | 56 | 4612 | 4625 | 4393 | 1979 | 4436 | 4446 | 189 | 4612 | 66 |
  2. 172519 | 52 | 4772 | 4685 | 9406 | 1715 | 4433 | 4448 | 257 | 4722 | 135 |
  3. 182412 | 69 | 4705 | 4718 | 7570 | 1739 | 4494 | 4564 | 224 | 4705 | 129 |
  4. 212878 | 74 | 4705 | 4718 | 7570 | 1739 | 4494 | 4564 | 224 | 4705 | 129 |

- **Spring Canyon**:
  1. 166285 | 64 | 4604 | 4610 | 2031 | 608 | 4481 | 4491 | 159 | 4627 | 42 |
  2. 210918 | 64 | 4590 | 4590 | 2031 | 608 | 4481 | 4491 | 159 | 4627 | 42 |
  3. 218339 | 60 | 4590 | 4590 | 2031 | 608 | 4481 | 4491 | 159 | 4627 | 42 |
  4. 249602 | 60 | 4590 | 4590 | 2031 | 608 | 4481 | 4491 | 159 | 4627 | 42 |

- **Mangas Creek**:
  1. 151720 | 73 | 4595 | 4608 | 9432 | 1462 | 4472 | 4482 | 135 | 4595 | 185 |
  2. 243366 | 83 | 4655 | 4684 | 21388 | 1613 | 4472 | 4482 | 135 | 4595 | 185 |
  3. 244665 | 87 | 4627 | 4700 | 3543 | 2664 | 4472 | 4482 | 135 | 4595 | 185 |
  4. 272928 | 92 | 4627 | 4700 | 3543 | 2664 | 4472 | 4482 | 135 | 4595 | 185 |

- **Schoolhouse Canyon**:
  1. 178360 | 74 | 4594 | 4607 | 4153 | 1291 | 4473 | 4483 | 134 | 4594 | 50 |
  2. 231128 | 86 | 4594 | 4607 | 4153 | 1291 | 4473 | 4483 | 134 | 4594 | 50 |
  3. 251984 | 92 | 4695 | 4695 | 15097 | 1849 | 4474 | 4484 | 221 | 4682 | 217 |
  4. 282047 | 97 | 4695 | 4695 | 15097 | 1849 | 4474 | 4484 | 221 | 4682 | 217 |

- **Penchis Canyon**:
  1. 187210 | 77 | 4595 | 4604 | 1524 | 1086 | 4475 | 4485 | 129 | 4591 | 36 |
  2. 236908 | 88 | 4606 | 4612 | 1524 | 1086 | 4475 | 4485 | 129 | 4591 | 36 |
  3. 271492 | 101 | 4675 | 4686 | 1157 | 1046 | 4546 | 4556 | 140 | 4673 | 21 |
  4. 302993 | 106 | 4675 | 4686 | 1157 | 1046 | 4546 | 4556 | 140 | 4673 | 21 |

- **Fatterson Canyon**:
  1. 20850 | 21 | 4587 | 4600 | 475 | 650 | 4662 | 4672 | 128 | 4697 | 8 |
  2. 209528 | 55 | 4629 | 4653 | 844 | 742 | 4665 | 4785 | 184 | 4639 | 16 |
  3. 295755 | 125 | 4569 | 4683 | 1262 | 1001 | 4477 | 4487 | 205 | 4699 | 20 |
  4. 316618 | 110 | 4569 | 4683 | 1262 | 1001 | 4477 | 4487 | 205 | 4699 | 20 |

- **Irre Canyon**:
  1. 20850 | 83 | 4580 | 4598 | 3757 | 1524 | 4398 | 4608 | 203 | 4580 | 55 |
  2. 207683 | 92 | 4627 | 4610 | 5960 | 1674 | 4410 | 4420 | 203 | 4627 | 79 |
  3. 246585 | 107 | 4692 | 4740 | 1747 | 4423 | 4433 | 257 | 4617 | 87 |
  4. 314614 | 112 | 4692 | 4740 | 1747 | 4423 | 4433 | 257 | 4617 | 87 |

- **Mangas Creek Pumpe**:
  4713 | 29444 | 1009 | 5133 | 4523 | 220 | 4720 | 438 |

- **Widens**:
  3795 | 57 | 690 | 3758 | 3768 | 38 | 3874 | 3

---

1. Cannot convey water into storage reservoir from Division 1.
2. Alternate dam site location chosen by analyzing contours.
3. Storage elevation is limited by terrain for conveyances from diversion 2, 3, and 4.
Pipeline to Deming
## Single Storage Site

<table>
<thead>
<tr>
<th>Multiple Storage Site</th>
<th>Construction Cost ($)</th>
<th>OM&amp;R ($/yr.)</th>
<th>Storage Volume (AF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spar Canyon</td>
<td>161,583,000</td>
<td>990,000</td>
<td>3,100</td>
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<tr>
<td>Winn Canyon</td>
<td>83,291,200</td>
<td>780,000</td>
<td>2,750</td>
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<tr>
<td>Pope Canyon</td>
<td>234,011,200</td>
<td>1,700,000</td>
<td>7,900</td>
</tr>
<tr>
<td>Greenwood Canyon</td>
<td>280,511,200</td>
<td>1,560,000</td>
<td>26,000</td>
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<tr>
<td>Dam Canyon</td>
<td>307,223,000</td>
<td>1,910,000</td>
<td>9,400</td>
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## Multiple Storage Configuration Options

<table>
<thead>
<tr>
<th>Multiple Storage Site</th>
<th>Construction Cost ($)</th>
<th>OM&amp;R ($/yr.)</th>
<th>Storage Volume (AF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenwood Canyon &amp; Sycamore Canyon (64,000 AF)</td>
<td>598,450,000</td>
<td>$4,470,000</td>
<td>62,900</td>
</tr>
<tr>
<td>Spar Canyon &amp; Garcia Canyon (10,000 AF)</td>
<td>294,373,000</td>
<td>2,525,000</td>
<td>10,600</td>
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<tr>
<td>Mogollon Canyon &amp; Wynn Canyon (14,000 AF)</td>
<td>307,303,000</td>
<td>2,684,000</td>
<td>14,250</td>
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</tbody>
</table>
BHI Alternatives
GILA PHASE II
ENGINEERING EVALUATION

FIGURE 4
ADDITIONAL POTENTIAL AWSA DIVERSION LOCATIONS

Legend
Potential AWSA Diversion Locations
- Pre Site Visit
- Recommended Site
- Site Visit
- Field Reconnaissance Reach
- Index Contour (50 ft)
- Intermediate Contour (10 ft)
Alternative 1:

<table>
<thead>
<tr>
<th>Canyon Name</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spar</td>
<td>1,642</td>
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<tr>
<td>Winn</td>
<td>10,713</td>
</tr>
<tr>
<td>Pope</td>
<td>8,732</td>
</tr>
<tr>
<td>Sycamore</td>
<td>44,330</td>
</tr>
</tbody>
</table>

**Total Volume**: 65,417
Alternative 2:

<table>
<thead>
<tr>
<th>Canyon Name</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spar</td>
<td>1,642</td>
</tr>
<tr>
<td>Winn</td>
<td>10,713</td>
</tr>
<tr>
<td>Pope</td>
<td>8,732</td>
</tr>
<tr>
<td>Sycamore</td>
<td>44,330</td>
</tr>
<tr>
<td><strong>Total Volume</strong></td>
<td><strong>65,417</strong></td>
</tr>
</tbody>
</table>

Legend
- Proposed AWSA Surface Diversion Point
- Proposed AWSA Drain Lines
- Proposed AWSA Collector Pipe
- Conveyances
- Proposed AWSA Irrigation Pump Station
- Proposed AWSA Irrigation Pipeline Alignment
- Proposed AWSA Storage Sites
- Stormwater Detention Ponds
Alternative 3:

<table>
<thead>
<tr>
<th>Canyon Name</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spar</td>
<td>46,037</td>
</tr>
<tr>
<td>Winn</td>
<td>10,713</td>
</tr>
<tr>
<td>Pope</td>
<td>8,732</td>
</tr>
<tr>
<td><strong>Total Volume</strong></td>
<td><strong>65,482</strong></td>
</tr>
</tbody>
</table>

Legend:
- Proposed AWSA Spar Pump Station
- Conveyances
- Proposed AWSA Storage Sites
- Stormwater Detention Ponds
IX. COST ESTIMATES

BHI prepared preliminary planning level cost estimates for all three alternatives. The cost estimates are included in Appendix J and are summarized in Table IX-1, below. Costs shown in the table are before New Mexico Gross Receipts Tax (NMGRT). Some unit costs are based on BHI's construction cost library of bid tabulations, as well as published unit cost data from the City of Albuquerque and New Mexico Department of Transportation. The pipeline unit costs are based on consultation with contractors experienced with installation of large diameter pipes in remote areas. Estimated construction costs for all alternatives include the costs for relocating NM 211 to accommodate the reservoir in proposed Pope Canyon and for relocating McCauley Road to accommodate the proposed reservoir in Sycamore Canyon. The portion of NM 211 south of Pope Canyon was assumed to be relocated to connect to US 180 approximately two miles to the west of the current intersection. The portion of McCauley Road crossing Sycamore Canyon was assumed to be relocated to the east to cross the embankment across Sycamore Canyon and reconnect to the existing McCauley Road to the north and to the south of Sycamore Canyon. Relocating both NM 211 and McCauley Road along the dam embankments at Sycamore and Pope Canyons will require consideration of alternate routes for emergency planning purposes.

Table IX-1 – Estimated Construction Costs

<table>
<thead>
<tr>
<th>Alternative (per Section VI)</th>
<th>Construction</th>
<th>Non-Construction</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>$581,341,000</td>
<td>$88,445,000</td>
<td>$669,786,000</td>
</tr>
<tr>
<td>1b</td>
<td>$583,522,000</td>
<td>$88,759,000</td>
<td>$672,281,000</td>
</tr>
<tr>
<td>2a</td>
<td>$604,438,000</td>
<td>$93,527,000</td>
<td>$697,965,000</td>
</tr>
<tr>
<td>2b</td>
<td>$606,622,000</td>
<td>$93,841,000</td>
<td>$700,463,000</td>
</tr>
<tr>
<td>3</td>
<td>$581,400,000</td>
<td>$81,104,000</td>
<td>$662,504,000</td>
</tr>
</tbody>
</table>

A. SURFACE DIVERSION

All alternatives include a surface diversion structure. The cost for the diversion structure is based on several assumptions. First, excavation earthwork spans the length of the structure and goes 1 foot deeper than the trough depth. Also, rock excavation is estimated at 30 percent of total excavation and traditional excavation at 70 percent of total excavation. Finally, the diversion structure cost includes such items as reinforced concrete, wingwalls, an apron, support piles driven to bedrock, a tilted wedge-wire screen, headgates and a pedestrian bridge for maintenance that will extend the length of the screen.
B. SUBSURFACE DIVERSION

Alternative 2 includes a subsurface diversion structure. The cost for the subsurface diversion structure is based on several assumptions. First, a temporary construction cofferdam and dewatering will be required at each diversion point along the infiltration gallery. Also, trenching will be required for each diversion point. Finally, the subsurface diversion structure cost includes such items as perforated pipe, blank casing for cleanouts and access ports, 24 inch to 66 inch collector pipes, and headgates.

C. TUNNEL

The estimated cost for the tunnel proposed in Alternatives 1 and 2 is based on consultation with a tunneling contractor that was documented in the April 2014 PER.

D. STORAGE RESERVOIRS

The estimated costs for the storage reservoirs are based on several assumptions, which are discussed below.

1. All dams will require a black, 60 mil, HDPE liner, or equivalent (described in more detail in Section IV.C.3 above). In addition to the HDPE liner at each dam, a 12-inch thick compacted clay subgrade is included. The cost estimate for Spar Canyon also includes a cost for a soil cement grade control slab across the bottom of the dam pool.

2. Floodpool grading will be required before placement of the impermeable liner. Earthwork has been optimized to better balance the cut and fill at each reservoir site. A balanced earthwork approach should be taken to facilitate potential construction phasing. Costs for excavation and backfill are based on the total excavation at each site. The only dam that requires import is Sycamore. This import is assumed to come from Winn and Pope, which both have excess material available. The grading could be refined during design to reduce the import required for construction of the dam at Sycamore and to reduce the excess earth generated from excavation at Winn and Pope.

3. A concrete emergency spillway is assumed to extend down the downstream side of each dam to convey flow over the top of the dam in the event of the Probable Maximum Flood (PMF) or other overtopping situations. In addition, the emergency spillway concrete is assumed to extend 5 feet down the upstream
side of the dam, overlapping the HDPE liner. The dam slopes were assumed to be 2:1 on the upstream side and 4:1 on the downstream side.

4. The cost for each reservoir site includes a cost for an upstream stormwater detention facility. The stormwater detention facility costs are based on a graph of dam storage vs. cost per acre-foot for previously constructed detention facilities, in 2014 dollars.

E. SPAR CANYON RESERVOIR CONCEPTUAL OUTLET WORKS

The cost for the Spar Canyon Reservoir conceptual outlet works includes reinforced concrete, wire-enclosed riprap at the orifice inlets, 72 inch pipe to convey 90 cfs to the Gila River, 30 inch pipe connecting the 90 cfs orifice inlets to the 90 cfs outlet pipe to the Gila River, and a ported riser for the 350 cfs outlet.

F. CONVEYANCE PIPES BETWEEN STORAGE RESERVOIRS

The estimated costs for conveyances between storage reservoirs are based on assumptions that were documented in the April 2014 PER, including expected rock trenching and excavation, as well as traditional excavation.

G. IRRIGATION PUMP STATION AT WINN CANYON

The cost for the 10 cfs irrigation pump station at Winn Canyon is based on several assumptions. The cost includes a 24 inch pipeline from Winn Canyon to the Upper Gila diversion site. Also included is a cast in place concrete clearwell, a 30 ft x 30 ft x 15 ft metal building, one 4,500 gpm pump, 50 hp motor, VFD pump control and SCADA system.

Alternatively, the cost for a 50 cfs irrigation pump station at Winn Canyon is based on a 42 inch pipeline from Winn Canyon to the Upper Gila diversion site. Also included is a cast in place concrete clearwell, a 30 ft x 30 ft x 15 ft metal building, one 22,500 gpm pump, 300 hp motor, VFD pump control and SCADA system. The cost for the 50 cfs irrigation pump station at Winn Canyon also includes a 100 kW solar array.

H. SPAR PUMP STATION

The cost for the 350 cfs pump station to Spar Canyon includes the following:

1. 108 inch pipeline from the diversion structure to the pump station
2. Four parallel 60 inch pipelines from the pump station to the storage dam
3. 180 ft x 30 ft x 20 ft cast in place concrete clear well
4. 150 ft x 80 ft x 30 ft pre-engineered metal building to house the pumps
5. 120 ft x 60 ft x 25 ft bridge crane system
6. 40 ft x 80 ft x 20 ft electrical/control building
7. Electrical components
8. Three 40,000 gpm pumps, 5,900 hp motors
9. Four 10,000 gpm pumps, 1,500 hp motors
10. Pump control and SCADA system
11. PNM substation and power line extension

I. SOUTHWEST REGIONAL WATER SUPPLY BOOSTER PUMP STATIONS

The cost for the SWRWS pipeline has been updated from the April 2014 PER to include the following items for each booster pump station:
1. 50 ft x 30 ft x 20 ft pre-engineered metal building
2. Two 3,100 gpm pumps, 500 hp motors
3. Electrical components
4. Pump control and SCADA system
5. PNM Power Extension
6. 1 MW solar array
J. ALTERNATIVE 1

For the purposes of the cost estimate, Alternative 1 was split into two alternatives: 1a and 1b. The alternatives are identical except for the irrigation pump station. Under Alternative 1a, the irrigation pump station would have a capacity of 10 cfs, while Alternative 1b proposes this pump station as a 50 cfs pump station.

Estimated costs for Alternative 1a, including planning, design, construction, and administration/oversight are summarized in Table IX-2, below.

Table IX-2 – Cost Estimate for Alternative 1a

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversion, Conveyance, and Reservoir Construction</td>
<td>$581,341,000</td>
</tr>
<tr>
<td>Design</td>
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<td>Topographic Survey</td>
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<tr>
<td>Right-of-Way Easement Development (Pipeline + Rural)</td>
<td>$439,000</td>
</tr>
<tr>
<td>Permitting, Environmental &amp; Geotechnical Investigations</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>Land Acquisition Services (Reservoirs + Pipeline + Booster Stations)</td>
<td>$90,000</td>
</tr>
<tr>
<td>Land Acquisition (Reservoirs + Pipeline + Booster Stations)</td>
<td>$6,672,000</td>
</tr>
<tr>
<td>Easement Acquisition (Pipeline + Channel)</td>
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<tr>
<td>Construction Observation and Management</td>
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<tr>
<td>Subtotal</td>
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<tr>
<td>NMGRT</td>
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<tr>
<td>Total</td>
<td>$711,229,000</td>
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</tbody>
</table>

The cost for Alternative 1a is based on the following:

1. 350 cfs gravity surface diversion at Site 6
2. Tunnel from the diversion to Spar
3. Storage in Spar, Winn, Pope and Sycamore Canyons
4. Pressure piping between storage sites
5. 10 cfs irrigation pump station at Winn Canyon
6. Pumping from Pope Canyon over the Continental Divide using SWRWS pipeline

In addition to the capital costs listed above, Alternative 1a will have annual operations and maintenance costs, which are included in Appendix J.
Estimated costs for Alternative 1b, including planning, design, construction, and administration/oversight are summarized in Table IX-3, below.

Table IX-3 – Cost Estimate for Alternative 1b

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<th>Cost</th>
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</thead>
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<td>Design</td>
<td>$28,786,000</td>
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<tr>
<td>Topographic Survey</td>
<td>$858,000</td>
</tr>
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<td>Right-of-Way Easement Development (Pipeline + Rural)</td>
<td>$439,000</td>
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<tr>
<td>Permitting, Environmental &amp; Geotechnical Investigations</td>
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<td>Land Acquisition (Reservoirs + Pipeline + Booster Stations)</td>
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<td>Easement Acquisition (Pipeline + Channel)</td>
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<td><strong>Total</strong></td>
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</table>

The cost for Alternative 1b is based on the following:
1. 350 cfs gravity surface diversion at Site 6
2. Tunnel from the diversion to Spar
3. Storage in Spar, Winn, Pope and Sycamore Canyons
4. Pressure piping between storage sites
5. 50 cfs irrigation pump station at Winn Canyon
6. Pumping from Pope Canyon over the Continental Divide using SWRWS pipeline

In addition to the capital costs listed above, Alternative 1b will have annual operations and maintenance costs, which are included in Appendix J.
K. ALTERNATIVE 2

For the purposes of the cost estimate, Alternative 2 was split into two alternatives: 2a and 2b. The alternatives are identical except for the irrigation pump station. Under Alternative 2a, the irrigation pump station would have a capacity of 10 cfs, while Alternative 2b proposes this pump station as a 50 cfs pump station.

Estimated costs for Alternative 2a, including planning, design, construction, and administration/oversight are summarized in Table IX-4, below.

<table>
<thead>
<tr>
<th>Table IX-4 – Cost Estimate for Alternative 2a</th>
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<td><strong>Item</strong></td>
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<td>Design</td>
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<td>Right-of-Way Easement Development (Pipeline + Rural)</td>
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<tr>
<td>Permitting, Environmental &amp; Geotechnical Investigations</td>
</tr>
<tr>
<td>Land Acquisition Services (Reservoirs + Pipeline + Booster Stations)</td>
</tr>
<tr>
<td>Land Acquisition (Reservoirs + Pipeline + Booster Stations)</td>
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<tr>
<td>Easement Acquisition (Pipeline)</td>
</tr>
<tr>
<td>Construction Observation and Management</td>
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<tr>
<td>NMGRT</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The cost for Alternative 2a is based on the following:

1. 150 cfs gravity subsurface diversion between Turkey Creek and Site 6
2. 200 cfs gravity surface diversion at Site 6
3. Tunnel from the diversion to Spar
4. Storage in Spar, Winn, Pope and Sycamore Canyons
5. Pressure piping between storage sites
6. 10 cfs irrigation pump station at Winn Canyon
7. Pumping from Pope Canyon over the Continental Divide using SWRWS pipeline

In addition to the capital costs listed above, Alternative 2a will have annual operations and maintenance costs, which are included in Appendix J.
Estimated costs for Alternative 2b, including planning, design, construction, and administration/oversight are summarized in Table IX-5, below.

Table IX-5 – Cost Estimate for Alternative 2b

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<td>Topographic Survey</td>
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<tr>
<td>Permitting, Environmental &amp; Geotechnical Investigations</td>
<td>$5,000,000</td>
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<tr>
<td>Land Acquisition Services (Reservoirs + Pipeline + Booster Stations)</td>
<td></td>
</tr>
<tr>
<td>Land Acquisition (Reservoirs + Pipeline + Booster Stations)</td>
<td>$6,672,000</td>
</tr>
<tr>
<td>Easement Acquisition (Pipeline)</td>
<td>$232,000</td>
</tr>
<tr>
<td>Construction Observation and Management</td>
<td>$48,530,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$700,463,000</td>
</tr>
<tr>
<td>NMGRT</td>
<td>$43,341,000</td>
</tr>
<tr>
<td>Total</td>
<td>$743,804,000</td>
</tr>
</tbody>
</table>

The cost for Alternative 2b is based on the following:

1. 150 cfs gravity subsurface diversion between Turkey Creek and Site 6
2. 200 cfs gravity surface diversion at Site 6
3. Tunnel from the diversion to Spar
4. Storage in Spar, Winn, Pope and Sycamore Canyons
5. Pressure piping between storage sites
6. 50 cfs irrigation pump station at Winn Canyon
7. Pumping from Pope Canyon over the Continental Divide using SWRWS pipeline

In addition to the capital costs listed above, Alternative 2b will have annual operations and maintenance costs, which are included in Appendix J.
L. ALTERNATIVE 3

Estimated costs for Alternative 3, including planning, design, construction, and administration/oversight are summarized in Table IX-6, below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversion, Conveyance, and Reservoir Construction</td>
<td>$581,400,000</td>
</tr>
<tr>
<td>Design</td>
<td>$22,523,000</td>
</tr>
<tr>
<td>Topographic Survey</td>
<td>$778,000</td>
</tr>
<tr>
<td>Right-of-Way Easement Development (Pipeline + Rural)</td>
<td>$415,000</td>
</tr>
<tr>
<td>Permitting, Environmental &amp; Geotechnical Investigations</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>Land Acquisition Services (Reservoirs + Pipeline + Booster Stations)</td>
<td>$63,000</td>
</tr>
<tr>
<td>Land Acquisition (Reservoirs + Pipeline + Booster Stations)</td>
<td>$5,598,000</td>
</tr>
<tr>
<td>Easement Acquisition (Pipeline)</td>
<td>$215,000</td>
</tr>
<tr>
<td>Construction Observation and Management</td>
<td>$46,512,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$662,504,000</td>
</tr>
<tr>
<td>NMGRT</td>
<td>$40,992,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$703,496,000</strong></td>
</tr>
</tbody>
</table>

The cost for Alternative 3 is based on the following:
1. 350 cfs pump station near Spar Canyon
2. Storage in Spar, Winn, and Pope Canyons
3. Pressure piping between storage sites
4. Pumping from Pope Canyon over the Continental Divide using SWRWS pipeline

In addition to the capital costs listed above, Alternative 3 will have annual operations and maintenance costs, which are included in Appendix J.

M. COMPARISON OF ALTERNATIVES

This Phase II PER identifies three alternatives related to diversion and storage of AWSA water in the side canyons along the Cliff-Gila Valley. The intent of the project is to provide a total water storage capacity of at least 65,000 AF. Table IX-7 below compares construction cost, annual O&M cost, and cost per AF for each alternative. The present value of the annual O&M costs is based on the assumption that the O&M costs increase by 3 percent every year. The present value is calculated for a 1.5 percent interest rate for 20 years. The cost estimates for all alternatives are included in Appendix J.
## Table IX-7 – Comparison of Alternatives

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
<th>Capital Cost before NMGRT</th>
<th>Annual O&amp;M Costs</th>
<th>Present Value of O&amp;M Costs</th>
<th>Total Capital and O&amp;M Costs</th>
<th>Total Storage (AF)</th>
<th>Cost per AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1a</td>
<td>Surface diversion at Site 6, tunnel from diversion to Spar Canyon, storage at Spar, Winn, Pope, and Sycamore Canyons, 10 cfs irrigation pump station at Winn Canyon</td>
<td>$669,786,000</td>
<td>$3,156,900</td>
<td>$41,065,000</td>
<td>$710,851,000</td>
<td>65,417</td>
<td>$10,866</td>
</tr>
<tr>
<td>Alternative 1b</td>
<td>Surface diversion at Site 6, tunnel from diversion to Spar Canyon, storage at Spar, Winn, Pope, and Sycamore Canyons, 50 cfs irrigation pump station at Winn Canyon</td>
<td>$672,281,000</td>
<td>$3,223,400</td>
<td>$41,930,000</td>
<td>$714,211,000</td>
<td>65,417</td>
<td>$10,918</td>
</tr>
<tr>
<td>Alternative 2a</td>
<td>Subsurface diversion for 150 cfs above Site 6 combined with surface diversion for 200 cfs at Site 6, tunnel from diversion to Spar Canyon, storage at Spar, Winn, Pope, and Sycamore Canyons, 10 cfs irrigation pump station at Winn Canyon</td>
<td>$697,965,000</td>
<td>$3,181,900</td>
<td>$41,390,000</td>
<td>$739,355,000</td>
<td>65,417</td>
<td>$11,302</td>
</tr>
<tr>
<td>Alternative 2b</td>
<td>Subsurface diversion for 150 cfs above Site 6 combined with surface diversion for 200 cfs at Site 6, tunnel from diversion to Spar Canyon, storage at Spar, Winn, Pope, and Sycamore Canyons, 50 cfs irrigation pump station at Winn Canyon</td>
<td>$700,463,000</td>
<td>$3,249,400</td>
<td>$42,268,000</td>
<td>$742,731,000</td>
<td>65,417</td>
<td>$11,354</td>
</tr>
<tr>
<td>Alternative 3</td>
<td>Diversion at elevation 4,640 (approximately 2,000 feet downstream of the confluence of Spar Canyon with the Gila River), pumping from diversion to Spar Canyon, storage at Spar, Winn and Pope Canyons</td>
<td>$662,504,000</td>
<td>$8,030,300</td>
<td>$104,458,000</td>
<td>$766,962,000</td>
<td>65,482</td>
<td>$11,713</td>
</tr>
</tbody>
</table>
X. CONCLUSION AND NEXT STEPS

A. CONCLUSION

This PER recommends one new diversion location, refines analysis of potential storage at Spar and Winn canyons, summarizes a new geomorphic review, an additional geophysical/geotechnical field campaign, and analyzes pumping options and sediment control measures. All of the alternatives meet the objective of the project to provide a total water storage capacity of at least 65,000 AF to produce a safe yield of approximately 10,000 AFY.

During this phase of work, BHI was able to refine some of the assumptions that form the basis for the cost estimates presented in Section IX above. The seismic survey at the diversion site, as well as the bathymetric survey by Tetra Tech, provided more detailed information on which to base the quantities and costs for the diversion structure. One major difference between this analysis and the April 2014 PER is the recommendation for liners at each of the reservoir sites. These liners and the associated earthwork increased the cost of each dam appreciably. However, due to some refinement of the assumptions that form the basis of the hydraulic profiles, the sizes, and therefore costs of some of the conveyances, are smaller than what was proposed in the April 2014 PER.

BHI investigated the price of a radial collector well system on the Gila River. High-level cost estimates for a radial collector well system on the Gila River were on the order of $100,000,000. As discussed in Section V.A.2 above, more detailed investigation is required if a radial collector well system remains a viable alternative on the Gila River. BHI has developed the three alternatives for diversion, conveyance, and storage of Gila River water. As described herein, each alternative meets the project objectives including the ability to provide a total water storage capacity of at least 65,000 AF to produce a safe yield of approximately 10,000 AFY with a minimum of 5,000 AF of storage near the top of the Cliff-Gila valley (from which releases to mitigate drying and all of the farmland in the valley can benefit).

B. NEXT STEPS

For this project to continue, the next steps would consist of more detailed environmental, geological, and geotechnical investigations and conceptual design of a selected Alternative. The environmental investigation should include field surveys, jurisdictional determination, and permitting. Geological and geotechnical investigations
should include physical sampling of subsurface conditions at the reservoir sites and diversion site in order to provide criteria for the conceptual design. The conceptual design would refine the conveyances and storage from the appraisal level concepts presented in this report. This would enable development of more certain project cost estimates for budgeting and funding purposes.

Provided the environmental and geotechnical investigations and conceptual design do not uncover any serious technical challenges to the viability of the project, the next steps would be to secure permitting, easements, or land acquisition of the reservoir sites, pipelines, and booster stations.

Once permitting, clearances and right-of-way or easements have been secured, design survey and preliminary and final design can commence, followed by construction and commissioning. The design and construction, while forming the bulk of the cost of the project, will likely require less time in the schedule than the pre-design (investigations, permits, and conceptual design) activities.
RJH Study
EXECUTIVE SUMMARY

This report contains the results of the Value Engineering Study of the Southwest Regional Water Supply (SWRWS) Project, proposed to the Interstate Stream Commission as part of the planning process under the 2004 Arizona Water Settlements Act (AWSA). The report is organized in a drill down format, that is, all items are presented first in summary format with increasing levels of detail as one delves (drills down) further into the report. This will allow the reader to easily obtain only the information he or she desires.

The goals for this VE Study were to: review the AWSA water availability including the AWSA diversion model, review the BHI and the BOR appraisal-level designs including the preferred configuration of components, and recommend further studies and/or investigations. Areas not included in this VE Study were: " quality control checks of the current appraisal level designs, review of the legal implication of the project, or independent cost estimate review of the current appraisal level designs.


The VE Team consisted of eight very senior technical specialists plus an equally senior value engineering facilitator. The technical specialties included: constructability and costing; hydraulic structures and conveyance; environmental permitting; geomorphology and sediment transport; dams, reservoirs and geotechnical; electrical; tunneling; hydrology, water modeling and yield; and value engineering and life-cycle costing.

The Value Engineering (VE) Team selected BHI's Preferred Alternative No. 2 as the base case against which to measure their VE Proposals. Therefore, all of the proposals and supplemental recommendations are measured against this design concept. This Value Engineering (VE) Study generated thirteen (13) proposals and seventeen (17) supplemental recommendations. These proposals and supplemental recommendations are categorized by following technical areas: Diversion, Sedimentation, Conveyance, Storage/Reservoirs, Distribution and Diversion Model Review.

For the purpose of this report, the Value Engineering Proposals are ideas that have the potential to save life-cycle costs, and Supplemental Recommendations are ideas that would improve the project, but don't easily fit into either of the previous category. The first section of the report contains an executive summary of all the value engineering proposals, their estimated savings, and their ultimate disposition. To obtain the backup information about the VE Proposal, or the Review Board (ISC staff) Decision reasoning regarding the VE Proposal, the hyperlinks shown in the summary table can be used. The second section of the report contains a brief project background, the VE Study Team Members, and a brief description of the methodology used. The third section contains detailed information about each VE Proposal. These individual proposal analyses are also organized in a drill down manner. Section Four contains a summary of all the supplemental recommendations, and their ultimate disposition. As mentioned above, these are ideas that the Team thought would add value to the project but do not necessarily reduce life-cycle costs. This section is further subdivided into four sections: AWSA Water Availability, Recommendations for Added Value, Recommendations for Further ISC Study, and Notes to Designer. To obtain the backup information about the VE Supplemental Recommendations, or the Review Board Decision reasoning regarding the VE Supplemental Recommendations, the hyperlinks shown in the summary table can be used. Section Five contains ideas analyzed by the Team, but either failed because they were thought to not be technically viable and/or did not save life-cycle costs. Section Six contains functions analyzed by the VE Team. Section Seven contains all of the brainstorming ideas ideated by the Team both prior to and during the workshop. Section Eight documents the ultimate disposition of the Team’s Proposals and Supplemental Recommendations as made by the Review Board.

A summary of findings of the VE Team are as follows:

AWSA Water Availability and Yield
• The ISC diversion model provides reasonable estimates of divertible flow for historical conditions. The average annual amount of divertible water is about 12,000 AF/yr. The ISC estimates of divertible flow under a climate change scenario are also reasonable for reconnaissance level planning purposes. *It is the VE Team’s opinion there will be future reductions in yield due to various permitting and operational requirements.*

• The amount of water that can be delivered from the Project will substantially increase if the reservoir is not operated on a strict “firm yield” basis. About 8,000 to 9,000 acre feet of water can be delivered from reservoir on an average annual basis, depending upon the capacity of storage that is constructed. *The above yield estimates are preliminary, reconnaissance level estimates for VE purposes only.* Pursuant to this supplemental recommendation, the development of an integrated water supply and operations model is recommended to refine the estimates of divertible flow and Project water yield.

**Preferred Configuration of Components (diversion, sedimentation, conveyance, storage/reservoirs, and distribution/delivery)**

• Use two diversion structures:
  – Coanda screens, expanding across the erosion area within the flood plain
  – Infiltration galleries or passive intake screens
  – Use BHI’s recommended diversion point

• Use two reservoirs with total capacity at least in the 45,000 AF range:
  – Small Spar (as proposed by BHI) (1642 AF)
  – Replace Winn, Pope, and Sycamore Reservoirs with:
    • A larger Spar Reservoir with a pump station (46,000 AF), or
    • Greenwood Reservoir with a pipeline to the Upper Gila Valley (47,000 AF)

• Reduce or eliminate the canyon sediment traps

• Conveyance:
  – From diversion point to small Spar:
    • Tunnel or
    • Steel buried pipe

• Delivery Over the Continental Divide:
  – Route:
    • Via Tyrone mine (Establish a cooperative agreement with FMI), or
    • Via Twin Sisters Canyon (Grant County Reservoir) along US Highway 180
  – Reduce the number of pump stations
  – Use hydro-generation as proposed by BHI

**Next Steps and Suggested Further Studies**

• Develop a definitive and concise purpose and need statement
• Conduct the following investigations:
  – Integrated simulation of water supply and key system operations elements (timing, amount, etc.)
  – Detailed hydraulic modeling of the diversion structures
  – Detailed assessment of climate change

• Refine the major components’ configurations and sizing
• Perform additional geotechnical investigations for selected reservoir sites
• Revisit the dam design and reservoir seepage design

**Final Conclusions**

• The VE Team believes the overall concept of diversion and storage is technically feasible.
• The VE Team feels permitting will be prolonged and challenging.
• Reusable return flows and tributary runoffs should be recaptured and/or exchanged.
VE PROPOSAL SUMMARY TABLE

Note: To obtain the backup information about the VE Proposal or the Review Board Decision reasoning regarding the VE Proposal, the hyperlinks shown in the summary table can be used.

<table>
<thead>
<tr>
<th>PROPOSAL NO.</th>
<th>VE PROPOSAL DESCRIPTION</th>
<th>REVIEW BOARD DECISIONS</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01-003</td>
<td>Collect, use, and account for surface flows from Gila River tributaries that flow into the system’s water storage reservoirs. Initial Est. Savings: ($20,000) Future Est. Savings: $1,580,000 Total Est. Savings: $1,560,000</td>
<td>TABLE Attractive idea and could be very helpful, but the legal issues are still undecided. The details would have to be worked out in accordance with Sub-term 1.10 of Exhibit 2.47 of Consumptive Use and Forbearance Agreement (CUFA). There are also other laws to which NM must adhere. The NM Office of the State Engineer (OSE) requires that dams release flood runoff within 96 hours.</td>
<td>3-1</td>
</tr>
<tr>
<td>P01-009</td>
<td>Use steel pipe to convey diverted water from the Coanda intake screens only at the BHI diversion structure through buried and elevated alignment along the Gila River for discharges into the Spar Reservoir. Initial Est. Savings: $5,200,000 Future Est. Savings: $0,000 Total Est. Savings: $5,200,000</td>
<td>DECLINE Due to environmental concerns and the higher risk of environmental disturbance. In addition, it is not aesthetically desired. It also requires maintenance access road. Construction access would be challenging.</td>
<td>3-6</td>
</tr>
<tr>
<td>P01-011</td>
<td>Include water conservation measures as a component of the project. Initial Est. Savings: $0,000 Future Est. Savings: $2,864,430 Total Est. Savings: $2,864,430</td>
<td>ACCEPT Water conservation measures will be included as required by OSE. Those measures are already being considered separately. It would be helpful to know whether or not the savings calculation takes into account the loss of return flows from the fields.</td>
<td>3-10</td>
</tr>
<tr>
<td>P01-013</td>
<td>Consolidate Pope and Sycamore reservoirs into one larger reservoir in Greenwood canyon. Initial Est. Savings: $70,000,000 Future Est. Savings: $0,000 Total Est. Savings: $70,000,000</td>
<td>ACCEPT Consolidate Pope and Sycamore reservoirs into one larger reservoir in Greenwood canyon.</td>
<td>3-13</td>
</tr>
<tr>
<td>P01-014</td>
<td>Eliminate Winn Reservoir and add a second reservoir in Spar Canyon. Initial Est. Savings: $17,000,000 Future Est. Savings: $0,000 Total Est. Savings: $17,000,000</td>
<td>ACCEPT</td>
<td>3-16</td>
</tr>
<tr>
<td>P01-015</td>
<td>Optimize the required number and size of pumping stations for Deming delivery flow (SWRWS) requirements. Initial Est. Savings: $1,650,000 Future Est. Savings: $0,000 Total Est. Savings: $1,650,000</td>
<td>ACCEPT</td>
<td>3-19</td>
</tr>
<tr>
<td>PROPOSAL NO.</td>
<td>VE PROPOSAL DESCRIPTION</td>
<td>REVIEW BOARD DECISIONS</td>
<td>PAGE NO.</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
</tbody>
</table>
| P01-031     | Use passive intake screens to replace the infiltration galleries in combination with Coanda screens at the BHI Gila River diversion point intake structure. Initial Est. Savings: $13,600,000 Future Est. Savings: $100,000 Total Est. Savings: $13,700,000 | TABLE  
This proposal appears to have a greater probability of long-term success than the infiltration gallery. In addition, the projected savings are large. However, USGS data indicates that when the flow is less than 50 cfs, the depth of the water at the gate is less than 5’ above 4654’. Looking at the Tetratech bathymetric sketches, these might not be covered during low flows. Finally, security issues need to be addressed. | 3-20     |
| P01-048     | Construct channels to allow tributary sediment to bypass the storage reservoirs. Initial Est. Savings: $6,000,000 Future Est. Savings: ($1,700,000) Total Est. Savings: $4,300,000                                                   | DECLINE  
Although this seems preferable to BHI’s stormwater detention facilities, sediment removal dams have been in place and to good effect for decades. 12 of the tributaries along the Gila have sediment/flood control dams. Winn Canyon is the largest, and Sycamore has a check dam. But there are no such dams on either Spar or Greenwood. | 3-27     |
| P01-055     | Modify the feature of the dam discharge to allow greater temperature control of releases. Initial Est. Savings: $0,000 Future Est. Savings: $0,000 Total Est. Savings: $0,000                                                                 | ACCEPT  
This will likely be required in order to protect aquatic species. | 3-32     |
| P01-060     | Use existing electrical infrastructure to feed the low horsepower pumps for Winn Reservoir. Initial Est. Savings: Not quantified Future Est. Savings: Not quantified Total Est. Savings: Not quantified | ACCEPT WITH MODIFICATIONS  
Although the costs/savings are unknown, it seems that the existing electrical infrastructure could be used, especially if there is a pump station for Larger Spar (P01-014), or Greenwood (P01-013). This could also be combined with SR01-030 to use FMI’s power infrastructure. | 3-35     |
| P01-061     | Use 12.47kV or 13.8kV rather than 4.16kV for the large pump motors. Initial Est. Savings: $2,000,000 Future Est. Savings: $0,000 Total Est. Savings: $2,000,000                                                         | ACCEPT  
Due to savings. | 3-37     |
| P01-062     | Connect into PNM’s 115kV source rather than the 69kV source voltage. Initial Est. Savings: Not Calculated Future Est. Savings: Not Calculated Total Est. Savings: Not Calculated | TABLE  
Costs/savings are unknown. Perhaps this could be studied further and some cost estimates generated. | 3-39     |
PROPOSAL NO. | VE PROPOSAL DESCRIPTION | REVIEW BOARD DECISIONS | PAGE NO.
P05-004 | Eliminate or move the original concept sedimentation basins from upstream of the off-channel reservoirs into the reservoir inundation area. 
Initial Est. Savings: $15,000,000 
Future Est. Savings: $0,000 
Total Est. Savings: $15,000,000 | ACCEPT 
The maintenance issues should be addressed. | 3-41

At the time of the VE Study the opinion of probable un-escalated construction bid including design contingency was $641,356,000^1.

Caveats:

- The cost savings shown for each proposal are measured against the raw cost estimates from the consulting firms at the current stage of design which was at 10% appraisal level. Therefore, for consistency’s sake the VE Team did not add escalation.

- All savings have been rounded to reflect the level of accuracy of the VE Proposals.

- Cost estimates made by the VE Team are intended to reflect relative values between alternatives. The estimated savings identified within each proposal are based upon comparison of the proposal to the preliminary design basis. Therefore, as is true with all cost estimates, the savings indicated are only an opinion of probable construction cost.

- Only potential savings are shown. As the proposals are implemented, additional costs or savings may result from redesign or modification.

- Some VE Proposals are mutually exclusive; a few are synergistic and could result in greater cost savings if implemented together. Therefore, the potential savings are not the simple sum of all the VE Proposals presented.

- The VE Team did not evaluate the economic viability of the project

The simple sum of the estimate of savings from the accepted VE Proposals is $106,514,430 (after making adjustments for overlapping savings) with an additional $15,260,000 in tabled (pending) savings.

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^1 Bohannan-Huston, Inc. (BHI) Draft Final Preliminary Engineering Report, Alternative No. 2, Option 1
The following ideas were generated by the VE Team and thought to have considerable merit. These ideas are thought to offer improvements, but either the economics were not calculable or the idea could not be developed because of insufficient information.

The VE Team suggests that these recommendations be carefully reviewed and given as much thought and effort as the formal VE Proposals.

### SUPPLEMENTAL RECOMMENDATIONS SUMMARY TABLE

<table>
<thead>
<tr>
<th>PROPOSAL NO.</th>
<th>VE PROPOSAL DESCRIPTION</th>
<th>REVIEW BOARD COMMENTS</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AWSA Water Availability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR01-064</td>
<td>Review and evaluate divertible water supply and project yield.</td>
<td>ACCEPT It is necessary.</td>
<td>4-5</td>
</tr>
<tr>
<td><strong>Recommendations for Added Value</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR01-012</td>
<td>Implement a staged project development plan that provides an initial Gila diversion and an initial or base level of storage, selected and designed to facilitate staged design and construction that is based on optimized supply potential versus current and projected demand.</td>
<td>ACCEPT Given the time involved and the financial resources, this appears to be a necessity.</td>
<td>4-12</td>
</tr>
<tr>
<td>SR01-026</td>
<td>Develop project objectives and operational criteria for diversion-storage alternatives.</td>
<td>ACCEPT</td>
<td>4-14</td>
</tr>
<tr>
<td>SR01-006</td>
<td>Divert Gila River return flow by exchange or recapture.</td>
<td>TABLE This is probably challenging due to CUFA constraints and/or non-point return flows. In addition, returns are needed by downstream users. If NM can demonstrate return flow, it could probably just negotiate a credit and divert water under CUFA terms. There are also questions regarding how this affects water rights and enforcement, and how it takes into account the excess water diverted to provide adequate pressure head.</td>
<td>4-16</td>
</tr>
<tr>
<td>SR01-019</td>
<td>Add additional erosion protection at the proposed diversion structures to prevent flanking of the structures by riverine erosion during large floods.</td>
<td>ACCEPT This would apparently be necessary for the project to continually accomplish its purpose.</td>
<td>4-19</td>
</tr>
<tr>
<td>SR01-020</td>
<td>Add an ALERT/SCADA system to enable optimized system operation and accounting of water flows into and out of the project.</td>
<td>ACCEPT NM may be able to partially fund this through (vii)(D)(2) Section 107 of the AWSA.</td>
<td>4-23</td>
</tr>
<tr>
<td>SR01-027</td>
<td>Align the technical (engineering), NEPA, and Section 404 alternatives development and evaluation processes.</td>
<td>ACCEPT This would appear to save a great deal of time and effort.</td>
<td>4-27</td>
</tr>
<tr>
<td>SR01-037</td>
<td>Develop purpose and need (P&amp;N) statement as foundation for alternatives development and evaluation.</td>
<td>ACCEPT This will be formulated as part of NEPA, if NM chooses to develop the AWSA water.</td>
<td>4-30</td>
</tr>
<tr>
<td>PROPOSAL NO.</td>
<td>VE PROPOSAL DESCRIPTION</td>
<td>REVIEW BOARD COMMENTS</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>SR01-030</td>
<td>Develop and/or expand and use the existing Freeport-McMoRan (FMI) Tyrone (Bill Evans Lake) facilities for water storage, pumping, and pipeline conveyance for Mimbres basin water requirements.</td>
<td><strong>TABLE</strong> FMI’s facilities are designed for the uses at the mine and for diversion of lower flows than those of AWSA. In addition, Bill Evans Lake likely does not have much additional capacity. Bill Evans Lake accepts only crystal clear, sediment free water. This might be solely to protect their pump impellers. They divert at low flows, whereas under the SWRWS project, sediment-laden water needs to be diverted at high flows. However, FMI’s existing power infrastructure could be used to serve pump stations for the reservoirs (e.g. Greenwood). In addition, the route along Mangas Creek through Tyrone Mine could be used for SWRWS pipeline to Deming.</td>
<td></td>
</tr>
<tr>
<td>SR02-004</td>
<td>Construct a low head dam at the BHI diversion point on the Gila River comprised of concrete fixed weir wall, piling cutoff walls, and sediment bypass sluiceway to provide sufficient water depth, clean water, and adequate supplies of water diversions into the intake screen area for conveyance to Spar Reservoir.</td>
<td><strong>DECLINE</strong> This seems more “invasive” of the channel than the Coanda screen, and the aesthetic appeal of the area might be lost. It is accepted, however, that something needs to be done to prevent flanking across the floodplain (SR01-019).</td>
<td></td>
</tr>
<tr>
<td>SR04-002</td>
<td>Do not provide a separate pipe or cast-in-place concrete lining for the tunnel.</td>
<td><strong>TABLE</strong> There needs to be additional geological/geotechnical information and research.</td>
<td></td>
</tr>
</tbody>
</table>

**Recommendations for Further Study by the ISC**

<table>
<thead>
<tr>
<th>PROPOSAL NO.</th>
<th>VE PROPOSAL DESCRIPTION</th>
<th>REVIEW BOARD COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR01-005</td>
<td>Establish a target delivery amount and location(s) for environmental flow augmentation.</td>
<td><strong>TABLE</strong> This would have to be done at some point. However, it would likely be done when consulting with the US Fish and Wildlife Service and during the NEPA process, if NM chooses to pursue this project.</td>
</tr>
<tr>
<td>SR01-052</td>
<td>Develop an integrated ground water/surface water model to help define operational parameters, to monitor the effectiveness of environmental bypass flows, and to account for non-point discharges of return flows into the Gila River that could be recaptured and reused.</td>
<td><strong>ACCEPT</strong> This could likely be built upon the model developed by SSPA.</td>
</tr>
<tr>
<td>PROPOSAL NO.</td>
<td>VE PROPOSAL DESCRIPTION</td>
<td>REVIEW BOARD COMMENTS</td>
</tr>
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<tr>
<td>SR01-007</td>
<td>Considering a) BHI’s single-liner lined reservoir, homogenous dam over and an unimproved alluvial foundation, and b) Reclamation’s zoned earthfill over a cutoff foundation without reservoir seepage control, additional alternative designs should be considered that robustly address dam safety and seepage management.</td>
<td>ACCEPT Safety and seepage would need additional attention in next design phase.</td>
</tr>
<tr>
<td>SR01-050</td>
<td>Perform additional detailed hydraulic modeling of the proposed diversion structure to assess its performance under a wider range of likely flow rate and sedimentation conditions.</td>
<td>ACCEPT This is necessary in the next design phase. Perhaps even a 3D scale model could be constructed in a laboratory.</td>
</tr>
<tr>
<td>SR01-021</td>
<td>Perform a Monte Carlo simulation of key system operations elements relating to the capture and delivery of AWSA waters to further demonstrate project feasibility, identify project vulnerabilities, and identify potential improvements in system performance.</td>
<td>ACCEPT This could be done In lieu of modifying the ISC CUFA model for additional climate variability (SR01-049).</td>
</tr>
<tr>
<td>SR01-049</td>
<td>Make the climate change impact analysis in the ISC water availability model more robust by including likely changes in seasonal flow rates due to climate change.</td>
<td>TABLE The seasonal flow rates have already been considered in the ISC model. This could be more expanded later.</td>
</tr>
<tr>
<td>SR01-035</td>
<td>Pump water from San Carlos Reservoir back to southwest New Mexico.</td>
<td>DECLINE With the AWSA, NM already has terms negotiated and ratified. Legal and physical aspects of this proposal are really challenging.</td>
</tr>
</tbody>
</table>
Thank you!
Contact Information

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