# PROJECT ALTERNATIVES SUMMARY

The City of Portales, New Mexico, is developing a plan for meeting water supply needs for the next 20 years. The City's current and exclusive source of water supply is groundwater wells, which draw from the Ogallala aquifer. The Ogallala aquifer is being depleted, and this is causing the production from groundwater wells to decline. The water supply project is at the stage of alternatives evaluation and does not have a specific funding source.

The City of Portales is located in eastern New Mexico, in Roosevelt County. Portales is approximately 16 miles from the Texas border. In addition to serving the population within the city, the City's water system also serves rural users outside of City limits and Eastern New Mexico University. The location of Portales is shown on Figure 1, Vicinity Map and Figure 2, USGS Quad topo map.

The study area for this project extends to the north and east of the City to include the Blackwater Well Field and to the south of the City to encompass the existing wastewater treatment plant (WWTP). These extents reflect the areas affected by proposed infrastructure needed for meeting the needs of the City.

## Environmental Setting

The City of Portales is located within the level, treeless, elevated plains that are part of the Llano Estacado, a large caprock formation that covers part of eastern New Mexico and west Texas. The mesa or caprock rises in elevation from 3,750 to 5,300 feet above mean sea level (feet msl) over such a large area as to be almost imperceptible except in a few locations around the edge where cliffs drop off to the plains below. The Llano Estacado is the remnant of the Ogallala Formation, formed of Miocene-Pliocene sediments from the Southern Rockies, which at one time extended to the foot of the mountains but over time has eroded away, leaving behind the caliche caprock as the prominent geological feature of the eastern plains. The caliche caprock of the Llano Estacado overlies Jurassic rocks, which in turn rest on Triassic rocks (Chronic, 1987).

The area outside of the town limits has been used historically for rangeland, then for agricultural purposes to grow crops of wheat, corn, and other grain crops. The Portales Valley, an inset of the Llano Estacado, is located north of the city. The Blackwater Well Field is located within the sand hills and dune-dominated valley.

Floodplains

Portions of the study area are located within a Zone X or Zone AH (FEMA 2010). Zone X areas are subject to 0.2% annual chance floods; areas of 1% annual chance flood with an average depth of less than 1 foot or areas protected by levee from 5% annual chance of floods (FEMA 2010). Zone AH areas are a special flood hazard area subject to inundation by the 1% annual chance flood, flood depths of 1 to 3 feet (usually ponded areas) with base flood elevations determined (FEMA 2010). Areas outside of the city limits are undetermined.

## Wetlands

There are no designated wetlands within the study area.

## Water Resources

The study area contains scarce water resources. Surface water comes primarily from ephemeral springs, ephemeral streams, playas, stock tanks and irrigation wells.

Groundwater resources of the region primarily are sourced from the Ogallala aquifer. This regional aquifer underlies eastern New Mexico, and portions of Texas, Oklahoma, Kansas, Colorado, Nebraska and South Dakota. The Ogallala Aquifer is being pumped at a faster rate than it is being recharged, resulting in declining water levels, and reduced saturated thicknesses.

## Biological Resources

The study area is within the Llano Estacado, part of the level, treeless, elevated plains typical of eastern New Mexico and western Texas. The caprock is higher and drier than the central Great Plains to the east and is subject to high solar radiation and long windy periods, particularly during winter and early spring. The region historically was a vast grassland of shortgrass prairie species dominated by buffalo grass (*Buchloe dactyloides*), blue, hairy and sideoats grama (*Bouteloua spp.*), and little and silver bluestem (*Andropogon spp.*), mixed with herbaceous plants such as globe mallow (*Sphaeralcea parvifolia*), sunflower (*Helianthus annuus*), and purple prairie clover (*Dalea purpurea*) (Griffith et al., 2006). Shrubs including mesquite (*Prosopis glandulosa*), narrowleaf yucca (*Yucca glauca*), and Western soapberry (*Sapindus drummondii*) dot the shortgrass prairie.

Much of the area around Portales has been altered from its natural state for the production of crops and rural residential development and contains very little native prairie (Google Earth, 2013).

The area of the Blackwater Well Field is within the Shinnery Sands ecoregion. Vegetation associated with the sand dunes is dominated by the shin oak shrub (*Quercus havardii*) and sand sagebrush (*Artemisia filifolia*). Vegetation also includes broom snakeweed (*Gutierrezia sarothrae*) and yucca (*Yucca* spp.) as well as arid grassland species such as bush muhly (*Muhlenbergia porterii*), dropseed (*Sporobolus* spp.) and grama grasses.

## Cultural Resources

The study area has undergone a Class I review of records for cultural resources in the area. The record searches indicated that most of the study area has not been previously surveyed for the presence of cultural resources, although 15 previous cultural resource investigations intersect with one of the two potential alternatives, and 4 additional investigations are within 500 meters (1,640 feet) of one of the alternatives. One archaeological site (LA 181338) intersects with one of the two alternatives, and 7 additional sites and 4 register-listed properties are located within 500 meters (1,640 feet) of one of the project alternatives. Most of the buildings within Portales have been assessed during previous cultural

resource surveys, and 468 historic buildings are located within 500 meters (1,640 feet) of one of two project alternatives evaluated in the survey.

A large portion of the Blackwater Well Field is within the register-listed Blackwater Draw District (SR 2), which contains the Clovis type-site, one of the earliest and most well-known Paleoindian sites in North America. The Clovis site itself, with its stratified Clovis and Folsom remains, is located northwest of the current study area, in Blackwater Locality No. 1. However, the study area overlaps with Anderson Basin/Blackwater Draw Locality No. 2, which also includes a series of Paleoindian sites and preserved Pleistocene deposits containing the remains of extinct animals. The potential effect on this important register-listed property would thus have to be further assessed and a more detailed cultural resources evaluation conducted to determine the significance of the effect on cultural resources. Most of the project area will require Class III cultural resource survey when the Preferred Alternative is further designed. The area of potential effect (APE) will be defined in consultation with the State Historical Preservation Officer (SHPO) and other agencies (depending on funding sources) and in compliance with any applicable statutes for cultural resources as the design becomes further defined.

## Water Supply Project Alternatives

The Preliminary Engineering Report (PER) prepared for the City of Portales (DBS&A, 2015) evaluated four alternatives: 1) No Action, 2) Aquifer Storage and Recovery (ASR) , 3) Rehabilitating Existing Wells and Drilling New Wells, and 4) Water Conservation. Out of this evaluation the Preferred Alternative combines Alternative 2 with Alternatives 3 and 4 as described in the PER. The Preferred Alternative would accomplish storage of treated effluent during seasonal low demand months and recovery of that water during high demand times. It would extend the life of the well field by increasing recharge and lowering per capita demand, and would increase the capacity of the well field by rehabilitating existing wells and drilling additional wells.

### A. No Action Alternative

This alternative requires no improvements to existing facilities. The water supply from existing wells would continue to decline, which the water demand due to growth, would continue to increase.

### B. Preferred Alternative

The Preferred Action recommended in the PER combines elements from the second, third, and fourth alternatives described above. This Preferred Action would include: 1) rehabilitating existing wells and drilling new wells, 2) storage of treated effluent during seasonal low demand months and recovery of that water during high demand times using ASR, and 3) continuation and expansion of the City's conservation program. No environmental consequences are associated with the conservation component of the Preferred Action; therefore the focus for evaluation is on the well rehabilitation/drilling and ASR components.

## Description

The Preferred Alternative consists of additional treatment of treated wastewater effluent, a pump station, piping, and direct injection wells. The Preferred Alternative also includes rehabilitating existing wells and drilling new wells in the Blackwater Well Field. The area of potential effect would vary depending on the location of well construction and the type of construction (e.g., construction of the pump station vs. pipe installation). Figures 1 and 2 show the location of the study area and Figure 3 shows the layout of the components of the Preferred Action.

### *Rehabilitating Existing Wells and Drilling New Wells*

This part of the preferred action includes rehabilitating 8 existing wells and drilling 29 new wells in the current Blackwater Well Field area on City and State owned lands. An estimated 1,920 acres of additional property would also be acquired for drilling 20 additional new wells outside of the current Blackwater Well Field area. Figure 4 shows the area of acquistion. Test holes would be drilled in areas where new wells are to be constructed to characterize the exact lithology and saturation conditions at each location so that an appropriate well design can be developed. Test holes would also be drilled in the vicinity of wells to be rehabilitated in order to evaluate whether depleted or unfavorable aquifer conditions may be causing the observed low specific capacity in these wells. New wells would be drilled no farther than 5 to 10 feet from a test hole as subsurface conditions can vary significantly in a short distance within the Ogallala Aquifer. Unpaved access roads would be constructed to the new wells as necessary.

Recommended locations for test holes are shown on Figure 3. Additional wells beyond those that can be developed in the existing Blackwater Well Field will be needed to meet the projected 20 year demand. This will require acquisition of land for a new well field. Figure 4 shows the proposed location for land acquisition, west of the existing well field, south of the existing transmission pipeline. Three sections of land are estimated to be required for development of 20 wells. New wells would be drilled to the bottom of the Ogallala Aquifer, a depth of approximately 200 feet below ground surface. Based on the assumed production capacity, the new wells are sized at 8 inches in diameter with a 16-inch borehole. The water from the wells would be pumped to the Johnson Hills water storage tanks, west of the Blackwater Well Field, along U.S. Highway 70. Water would then be transported to the existing treatment plant in Portales through existing municipal water lines.

### *Aquifer Storage and Recovery (ASR) at Blackwater Well Field*

The ASR would consist of additional treatment of treated wastewater effluent, a pump station, piping, and 4 direct injection wells. Water would be supplied from the existing Waste Water Treatment Plant (WWTP) via a booster station from the reuse distribution system. The booster station would pump to an Advanced Water Treatment (AWT) facility that would be located within Portales city limits (Figure 3). From there, a second booster station will deliver the reuse water to the injection wells at the Blackwater well field (Figure 3). Private property would be acquired for the AWT facility.

The AWT facility upon receiving treated waste water from the WWTP would be designed to include membrane filtration or advanced oxidation, following by ultraviolet or chemical disinfection. The treated water released for injection to the aquifer would meet New Mexico Environment Department drinking water standards. In addition, treatment for unregulated trace constituents, or micro-constituents, including endocrine disrupting compounds (EDC's) and pharmaceuticals and personal care products (PPCPs) would be implemented.

A 75-horsepower (hp) booster station would be required for the direct injection at the Blackwater Well Field. Piping installed from the AWT to the well field would be 10-inch polyvinyl chloride (PVC) C900 piping. The piping would be constructed within existing road right-of-way or State lands. Access and easements would be coordinated with the County and/or NM State Land Office as necessary.

***Phasing***

The Preferred Action would be implemented in three phases. Phase 1, to be completed in the next five years would include test hole drilling, existing well rehabilitation and new well drilling, and a feasibility study for ASR. Phase 2, to be completed within 10 years, would include drilling additional new wells, constructing the AWT facility and installing the first direct injection well. Phase 3, to be completed in the next 20 years would include constructing additional new wells on property to be acquired outside of the current well field boundary. All phases of the Preferred Alternative would include water conservation, to continually lower the per capita demand through a variety of strategies including wastewater reuse, customer rebates and incentives to lower both indoor and outdoor water use, enforcement of existing ordinances related to water conservation and water waste, leak detection and repair, and an ongoing public education campaign.

***Land Requirements***

The City owns property at the Blackwater well fields, so land acquisition would not be required for the wells or pipelines within the existing well field. Land acquisition would be required once the existing well field is completely developed. Existing transmission pipelines from the well field to the Johnson Hill tanks can be used, and new pipelines are assumed to be located along existing roadways, within the right-of-way, on City-owned property, or on State leased land. Coordination with the State Land Office for access and a utility easement would be conducted. Access permits and temporary easements would be coordinated with and obtained from the City, County and/or New Mexico Department of Transportation (NMDOT) as required for any pipeline construction within the road right-of-ways. Land required for additional new wells outside of city-owned property and for the AWT facility would be located on private property and would be acquired from property owners as necessary. New wells are also proposed to be drilled on state lands adjacent to city-owned land. Leases would be negotiated with the NM State Land Office for any new wells to be located on state land.

***Cost Estimate***

The cost estimates for the Preferred Action would be phased over time as shown in the following table:

| Phase | Cost ($) | | | | |
|---|---|---|---|---|---|
| | Construction | Non-Construction | 25% Contingency | 8.1875% NMGRT | Total |
| 1 | 6,072,000 | 3,411,000 | 2,370,750 | 970,526 | 12,824,276 |
| 2 | 15,521,000 | 5,289,000 | 5,202,500 | 2,129,773 | 28,142,273 |
| 3 | 10,206,000 | 4,858,000 | 3,766,000 | 1,541,706 | 20,371,706 |

The total estimated cost for all 3 phases in 2015 dollars is $61,338,255.

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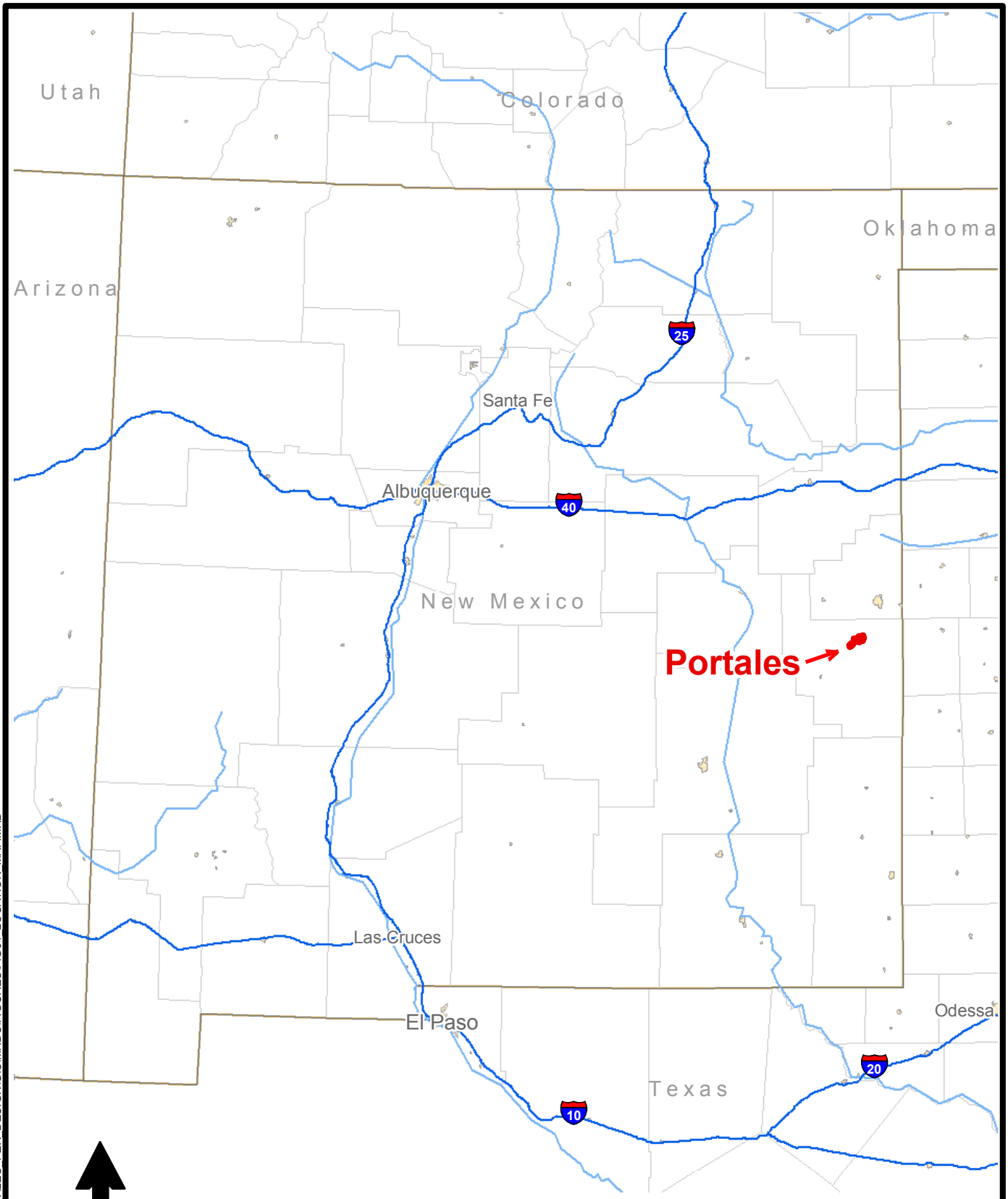


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JN NM15.0027

PORTALES PER DESIGN
**Location Map**
Figure 1

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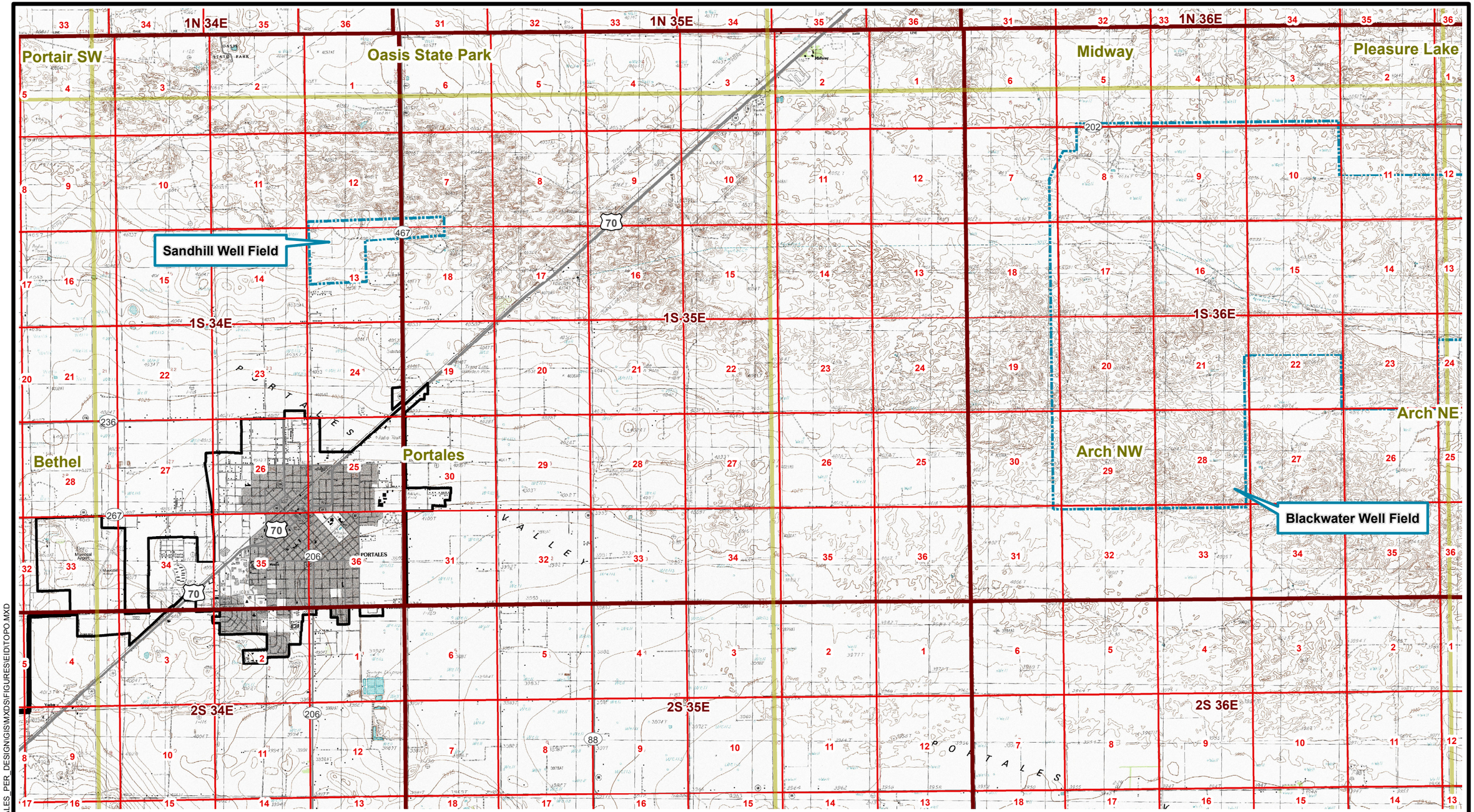


Source: USDA-NRCS-NCGC county mosaic of USGS 1:24,000 topographic maps.

N

0 0.5 1 Miles

**Explanation**

- City of Portales
- 2S 35E — Township and range
- 21 — Section
- Arch NW — USGS 7.5' quadrangle boundary

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PORTALES PER DESIGN

**Topographic Map**

Figure -

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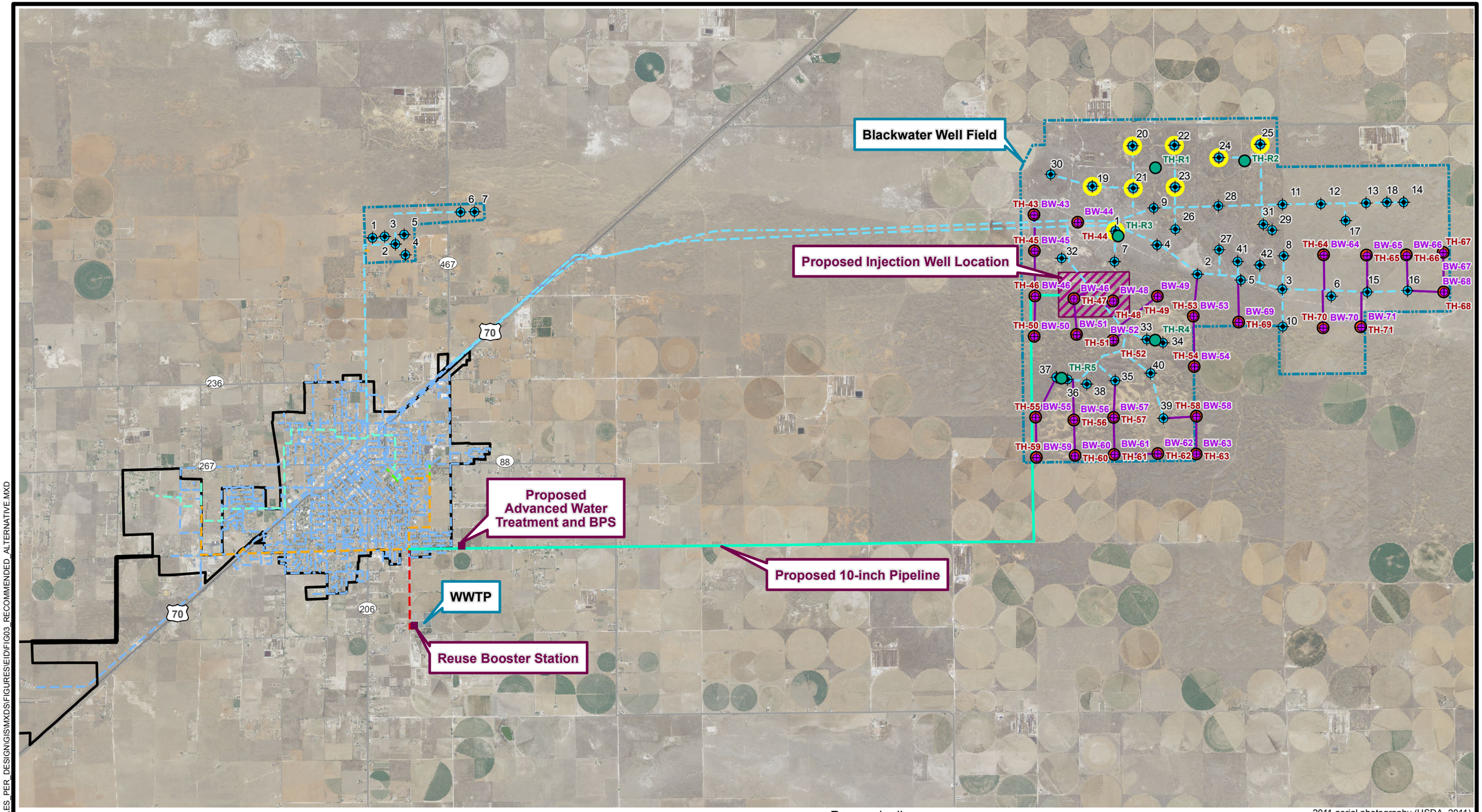


2011 aerial photography (USDA, 2011)

N

0 3000 6000 Feet

**Explanation**

- City of Portales
- Existing well
- Well to be rehabilitated
- Transmission line
- Water line
- Proposed well
- Exploratory test hole
- Rehabilitation evaluation test hole
- Proposed transmission line

Reuse pipeline Diameter (in)

- 4
- 6
- 8
- 10
- 12
- 16
- Existing pipeline

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CITY OF PORTALES WATER SUPPLY
PRELIMINARY ENGINEERING REPORT

**Recommended Alternative**

Figure 3

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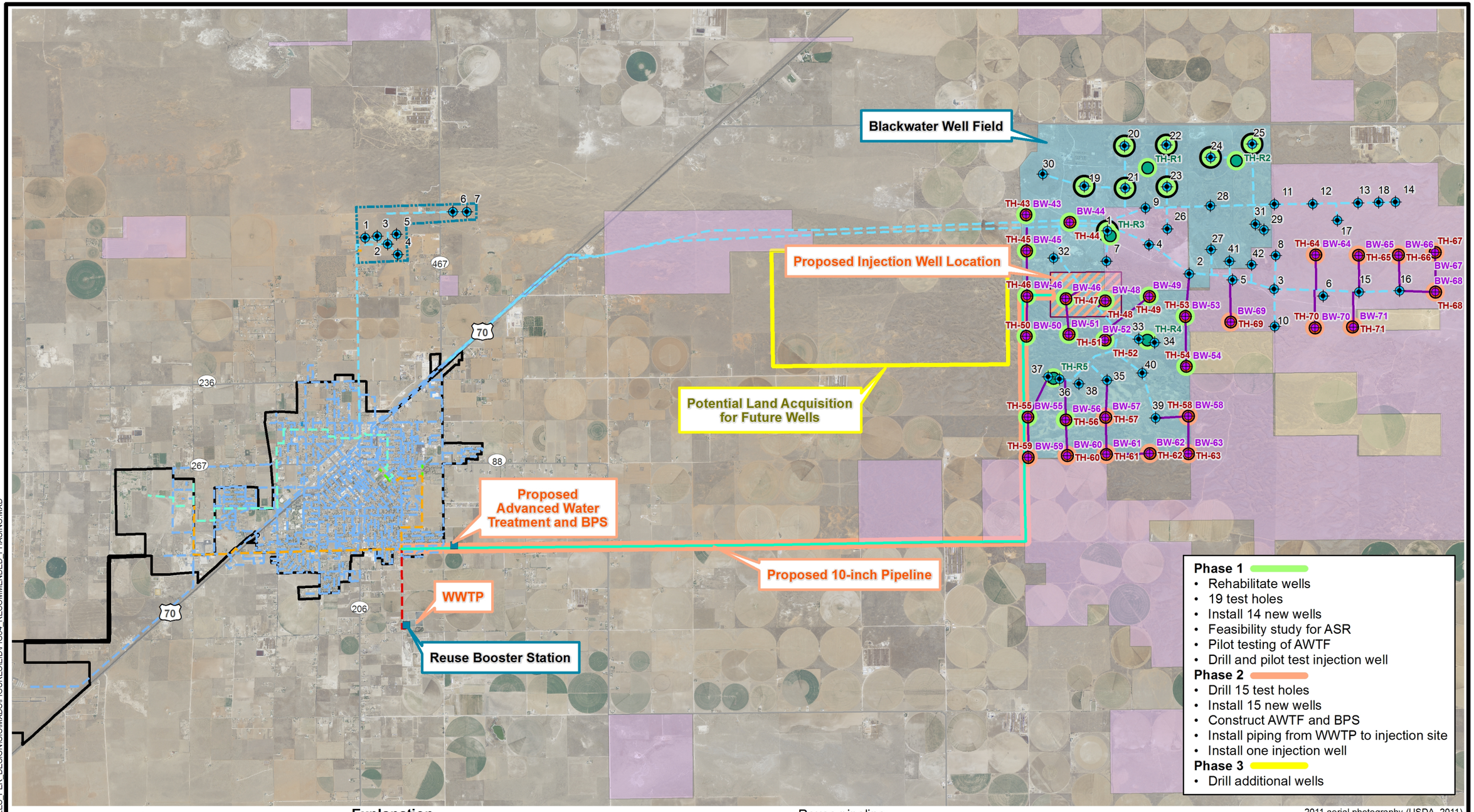


**Explanation**

- City of Portales
- Existing well
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- Proposed well
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- Proposed pipeline

Reuse pipeline Diameter (in)

- 4
- 6
- 8
- 10
- 12
- 16
- Existing pipeline

Land ownership

- City property
- State property
- Private property

N

0 3000 6000 Feet

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CITY OF PORTALES WATER SUPPLY
PRELIMINARY ENGINEERING REPORT

**Recommended Project Proposed Phasing**

Figure 4