Modification #4, Alternatives Refinement and Analysis, Rio Grande Salinity Management Program, Contract Number W912PP-09-D-0016, Task Order Number 0005

Refinement of Site Screening Criteria TM (Task B)

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Introduction

The United States Army Corps of Engineers (USACE) has entered into an agreement with the New Mexico Interstate Stream Commission (ISC) and the state of Texas under Section 729 of the Water Resources Development Act (WRDA) of 2007 to implement projects associated with the Rio Grande Salinity Management Program (Program). The purpose of the Program is to study, account for, and ultimately intercept sources of salinity in the Upper Rio Grande Basin—focusing from San Acacia, New Mexico, to Fort Quitman, Texas—that adversely affect water quality and limit full utilization of the water resources in the basin. A previous study prepared for USACE identified the Distal Mesilla site as one of three preferred sites for additional investigation of the feasibility of capturing water and treating it to reduce salinity (CH2M HILL, 2011). A follow-up study entitled *Alternatives Refinement and Analysis* was contracted to CH2M HILL by USACE with the objectives of refining the conceptual hydrogeologic model for the Distal Mesilla site, establishing site selection criteria, and providing further opportunities for stakeholder participation.

In accordance with the statement of work for Task B of the Alternatives Refinement and Analysis follow-up study (Refinement of Site Screening Criteria), CH2M HILL compiled and mapped geographic information system (GIS) data at and near the Distal Mesilla site showing areas potentially suitable for facilities for groundwater extraction, treatment, and evaporation ponds for disposal of concentrate. Data coverages were developed for the site areas, existing and adjacent land uses, types of land cover, proximity to power supply, proximity to saline groundwater sources, and other factors. This Technical Memorandum (TM) summarizes the GIS data compilation and provides a description of the factors to be considered in selecting sites for groundwater extraction, treatment, and disposal within the Distal Mesilla project vicinity. A preliminary approach to site characterization, analysis, and ranking is also presented.

Project Background

Detailed information on the geology, hydrogeology, and site groundwater quality was previously assembled and summarized in the Alternative Analysis (CH2M HILL, 2011). The overview presented below has been developed from this prior summary.

The Mesilla Basin extends from several miles north of Las Cruces, New Mexico, to El Paso, Texas, in the southeast, and well into Mexico in the southwest. In this region, groundwater generally flows from north to south toward the Rio Grande. The southern/distal end of the Mesilla Basin at the northern end of El Paso is defined by a convergence of the east and west bedrock basin boundaries (Franklin Mountains and Sierra Juarez-Cerro de Cristo Rey uplift). The Rio Grande flows through an erosional/structural gap between these highlands called “El Paso del Norte” or “El Paso Narrows.” This bedrock constriction is recognized to be an effective barrier to underflow discharge of groundwater from the Mesilla Basin to the Hueco Bolson aquifer to the south.

Accordingly, deep groundwater brines are forced up to the surface in this location and then discharge to the Rio Grande (Moyer et al., 2009). The Distal Mesilla Basin site is defined as this relatively localized upwelling of saline waters just north of the El Paso Narrows. The Distal Mesilla site appears to contribute 10 to 15 percent of the annual chloride load observed at El Paso (6,500 to 9,750 tons of chloride per year).

The area within the vicinity of the Distal Mesilla site is relatively well developed, with population ranging from approximately 821,000 in El Paso County, Texas, to 214,000 in Doña Ana County, New Mexico (U.S. Census Bureau, 2011). Within the project vicinity, the Rio Grande is approximately 200 to 500 feet in width with historic flows ranging from 0.8 to 2,130 cubic feet per second (cfs) and an average flow of 268 cfs (USGS, 2012). Flows are managed seasonally to provide irrigation water for agricultural purposes. During low-flow periods, the salinity in the river increases through the contribution of natural upwelling and geothermal sources at the distal (downstream) reach of the Mesilla Basin.

As defined in the Alternatives Analysis (CH2M HILL, 2011), the capture, treatment, and disposal of saline groundwater sources in the project area can be expected to lead to a decrease in river salinity and therefore provide an economic benefit to users of the river. To accomplish this objective, new facilities would be required, including wells for groundwater extraction, a water treatment plant (WTP) for salinity removal, and evaporation ponds for concentrate disposal from the two water treatment options under evaluation.

The number of wells, depth, and pumping rate would be determined during later phases of study. Conceptually, multiple wells would be installed perpendicular to the direction of saline water flow to create a “wall” of low-flow capture wells. The goal would be to remove the most concentrated saline water at a pumping rate low enough to minimize dilution caused by lower-salinity groundwater drawn from the upper aquifer into the well’s cone of depression.

Water treatment options evaluated for salinity removal include reverse osmosis (RO) and electrodialysis reversal (EDR). With RO, a semi-permeable membrane is used to retain ions (salts) in the saline water while passing water to produce a low salinity permeate. Pressure is used as the driving force for water flow through the membrane. The permeate stream contains between 2 and 5 percent of the ions in the saline water. A portion of the saline water that remains on the feed side of the membrane containing the retained salts is called concentrate. The saline water is desalinated by passing the water through a semi-permeable membrane at pressures of 150-800 psig depending on salinity level. In contrast, with EDR the saline water is passed across the surface of ion exchange (IX) membranes and under an applied electric potential difference, the ions are pulled through the IX membranes, creating an ion-diluted stream (product water) and a an ion-concentrated stream (concentrate). Depending on the specific design, the product water contains between 10 and 25 percent of the ions originally present in the saline water. Product water from EDR treatment would be of a lesser quality (higher total dissolved solids [TDS] concentration) than RO permeate; however if a high-purity (extremely low TDS concentration) desalinated water is not required a lower volume of concentrate water may be achieved with EDR treatment than with RO treatment. The groundwater TDS concentration and desalinated water quality goals must be better refined in order to more accurately estimate concentrate production rates and size facilities.

Desalinated water (RO permeate or EDR product water) could either be used in industry or manufacturing, used for irrigation, or discharged to the river, thereby providing an additional dilution benefit. RO treatment would provide high-purity water best suited for use in industry or manufacturing. Conceptual alternatives for concentrate disposal include the use of evaporation ponds with or without the use of constructed brackish wetlands or other enhanced evaporation techniques, such as turbomisters and wind aided evaporation (WAIV), to enhance evaporation. Long-term system maintenance would require the periodic removal of dried salts from the ponds. Additional investigations, notably refining estimates of saline mass flux, are required to assess the feasibility of these sites for a potential salinity control project.

Approach to Development of Siting Criteria

Locating potential sites for project facilities within the Distal Mesilla vicinity will require a detailed analysis of the benefits and constraints of different sites, where the engineering requirements and construction and operations and maintenance (O&M) costs can be weighed against the environmental benefits and minimization of total project impacts. This analysis would be expected to result in a prioritized list of sites.

Figure 1 shows the location and extent of three potential salinity capture areas (potential capture areas) within the Distal Mesilla area. Details on how these potential capture areas were identified are presented in "Distal Mesilla Conceptual Site Model" (CH2M HILL, 2012). The potential capture areas, labeled 1, 2S, and 2N, have areas of 565; 1,137; and 1,705 acres, respectively.

To determine potential site locations for project facilities, site selection criteria were developed that could be used to assess and rank site alternatives. The following site selection criteria were identified:

- Proximity to saline groundwater sources
- Topography
- Selected constraints (for example, jurisdictional wetlands, U.S. Environmental Protection Agency [EPA] brownfield sites, International Boundary & Water Commission [IBWC] right-of-way and restoration sites, public recreation, parks, railroads, and rivers)
- Zoning
- Land ownership
- Land use
- Proximity to electrical power
- Available area
- Considerations for construction and O&M

Data coverages were collected to quantify site selection criteria and were mapped using ArcGIS (maps are presented as figures at the end of this TM). This TM discusses the site selection criteria and the data coverages for the Distal Mesilla area, and provides a preliminary description of the analytical procedures recommended for site selection.

Site Selection Criteria

Preliminary criteria were developed to describe characteristics of the conceptual facility sites that will pose constraints on site selection within the three potential capture areas. A description of each criterion is provided below (figures of corresponding GIS coverage data are presented at the end of this TM).

Proximity to Saline Groundwater Sources

The depth to saline groundwater within potential capture areas 1, 2S, and 2N (Figure 1) is believed to be 50 to 400 feet depending on the source of salinity. The direction, rate of flow, and salinity or TDS concentration of saline groundwater within the aquifer will determine the positioning and size of wells within the potential capture area to capture the greatest amount of saline water as it moves through the aquifer. The salinity or TDS concentration of the groundwater in the selected capture area would affect the WTP design and power requirements. A detailed determination of the depth to the saline source water, salinity or TDS concentration, and flow characteristics would be refined in the next phase of study.

Ideally, multiple low-flow wells would be positioned in a linear formation within the potential capture area to create a "wall" perpendicular to the direction of saline water flow and thereby maximize the total salinity captured. Aquifer permeability could affect site selection if it limited the well pumping rate, resulting in an increased number of wells required for the project; however, the pumping rate of the wells will most likely be low enough that aquifer permeability will not affect site selection.

Aside from the wells, all project facilities could be sited outside the potential capture area; however, minimizing the distance between project facilities will reduce piping and pumping costs. The evaporation pond for

concentrate disposal would likely be the most challenging facility to site with its relatively large footprint and potential for negative public perception. Furthermore, siting the evaporation pond further from the WTP, increases concentrate pumping costs as well as O&M costs associated with precipitation of salts within the pipeline.

Topography

The topography of the region is illustrated in Figure 2. The potential capture areas are located adjacent to the Rio Grande. The river basin is bounded by the Franklin Mountains to the northeast and mesas formed by historic lava flows to the southwest. The Sierra de Cristo Rey mountain is located on the Mexican border, east of potential capture area 2S. In potential capture areas 1 and 2N, the topography is relatively flat, ranging from approximately 3,730 feet at the river to 3,850 feet near the Sunland Park Mall in potential capture area 2N. Potential capture area 2S is more steeply graded as the terrain approaches the mesa to the south with a maximum elevation of approximately 4,130 feet.

The topographic position of a capture site is expected to be an important determinant of the suitability of location. The elevation of a site would be expected to have an effect on the depth to saline groundwater, which in turn would influence well depth and the cost to construct and operate the well. Deeper wells are more expensive to construct, require larger pumps, and require more energy for pumping during operations.

A significant difference in elevation between capture and disposal sites could lead to increased conveyance costs and possibly increased construction costs. For example, if sites for desalinated water utilization and/or concentrate disposal were identified in areas at higher elevation than capture and treatment sites, it would cost more to pump these flows for disposal than if they were at the same or lower elevations than the WTP. During the site screening analysis, considerations would be taken for the flow rate and elevation change required to utilize various site options. For example, the concentrate flow for RO treatment would be approximately 15 percent of the influent flow from the wells; in contrast, the desalinated water flow would be approximately 85 percent, representing a significantly greater O&M cost to utilize desalinated water at a site with higher elevation than to utilize desalinated water at a site of the same elevation.

Selected Constraints

Selected constraints were identified throughout the project areas and are presented in Figure 3, overlaid on an aerial image of the land surface. Selected constraints include wetlands, EPA Brownfield sites, IBWC right-of-way and restoration sites, public recreation, parks, railroad, and the river. A selected constraint located near a potential project facility site suggests that further investigation would be required. A selected constraint, such as the proximity to known wetlands, could become a constraint as a result of environmental permitting requirements; however, an adjacent brownfield site could be a constraint if it limits construction, or it could be a benefit if the facility could be sited and designed to complement land redevelopment objectives.

Jurisdictional Wetlands

The U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) (USFWS, 2012) was accessed electronically to identify USFWS NWI wetlands that may be subject to the USACE jurisdiction under Section 404 of the Clean Water Act (CWA) as waters of the U.S., and subject to the review authority of the New Mexico Environment Department's Surface Water Quality Bureau (NMED-SWQB) and the Texas Commission on Environmental Quality for certification under Section 401 of the CWA as waters in the state. GIS data from the NWI is presented in Figure 3. A literature review of wetlands in the Distal Mesilla area is presented in "Distal Mesilla Conceptual Site Model" of this report (CH2M HILL, 2012).

The types of wetlands located in the project area include lakes (L1UBHx, L2USA, and L2USAh), freshwater ponds (PAB3Hx), freshwater emergent wetlands (PEM1A, PEM1Ah, PEM1Ax, and PEM1Cx), freshwater forested/shrub wetlands (PFO1A, PSS2A, PSS2Ah, PSS2J, and PSS2Jh), freshwater ponds (PUBHx, PUSA, PUSAh, PUSAx, PUSCx, and PUSJh), and riverine (R4SBA and R4SBCx). Wetlands in the Distal Mesilla area are shown in Figure 3. There are approximately 7, 1, and 9 wetlands in potential capture areas 1, 2S, and 2N, respectively. Wetlands cover approximately 32.5, 0.04, and 144.0 acres in potential capture areas 1, 2S, and 2N, respectively.

EPA Brownfield Sites

A remediated EPA brownfield site could present an opportunity for siting project facilities. These sites could be viewed as less desirable for facility siting because of legacy soil or groundwater concerns; however, these sites would be less frequented by the public and might also be located in industrial areas, making them more desirable for facility siting. A factor to be considered during assessment of an EPA brownfield site is whether the site has been fully remediated, because the need for further remediation would lead to increased overall project cost and extended time to put the project into service. The locations of EPA brownfield sites are presented in Figure 3. No EPA brownfield sites are located within the potential capture areas. One EPA brownfield site is located within the Distal Mesilla area presented in Figure 3; this site is approximately 700 feet southwest of potential capture area 1.

IBWC Right-of-Way and Restoration Sites

The Rio Grande Canalization Project is an IBWC project ongoing along the Rio Grande from Caballo Dam to El Paso. Several IBWC restoration sites resulting from this project are located in the Distal Mesilla area, including the Nemexas Siphon or Alternative Site, Country Club East, Sunland Park, and Anapra Bridge restoration sites. None of these sites are listed as Southwestern Willow Flycatcher critical habitat; however, in the monitoring period between 2009 and 2011, Southwestern Willow Flycatcher territories were detected in the Sunland Park restoration site (FWS, 2012). IBWC restorations sites most likely would not be available for siting project facilities and may present a constraint to adjacent sites. The IBWC right-of-way (ROW) is also presented in Figure 3 as working within this ROW would require additional permitting and possibly added constraints to facility siting.

Public Recreation

Public recreation facilities could conceivably present a negative to constraint to siting a capture, treatment, or disposal facility such as an evaporation pond. The WTP would also require the use of hazardous chemicals, such as sulfuric acid, that would need to be delivered by truck possibly presenting a siting issue near public recreation facilities. The locations of public recreation facilities in the project vicinity are identified and are presented in Figure 3. Wells and the WTP could be designed to maintain aesthetics and complement local architectural or land use requirements to avoid an adverse effect on recreational site use. No public recreation sites are located within the potential capture areas. However, four public recreation sites are located within the Distal Mesilla area (Figure 3). One of these public recreation sites is located in a park approximately 1,700 feet northwest of potential capture area 2N. The other three public recreation sites are located in a park approximately 3,200 feet northeast of potential capture area 2N.

Parks

Parks provide a public attraction and are often heavily visited; however, a large park might offer a buffer between residences and project facilities. The locations of parks are identified and presented in Figure 3. Siting project facilities near a park would require further study to ensure that project facilities complement or otherwise do not affect park use or aesthetics. Parks near the river may also be providing habitat for the Southwestern Willow Flycatcher, such sites would likely not be available for siting project facilities. There are 21 parks located within the Distal Mesilla area (Figure 3). One park is located along the river within potential capture area 1. Three parks are located within potential capture area 2N. No parks were identified within potential capture area 2S or on the southwestern side of potential capture area 1.

Railroads

Obtaining permission to construct within, or otherwise cross, a railroad easement would pose a challenge to siting pipelines, and would likely require tunneling that would increase the project cost. As a result, the presence of railways is considered a constraint. The location of railroad infrastructure is presented in Figure 3. No rail infrastructure is located in potential capture area 1; a railroad track runs through the southern portion of potential capture area 2S; and a railroad track and a rail yard are located in the northern portion of potential capture area 2N.

Rivers

Constructing pipeline(s) across a river would present a significant siting constraint because environmental permitting to construct and work in the riparian area immediately adjacent to the river would likely be expensive and time consuming. As shown in Figure 3, the Rio Grande runs north to south through potential capture area 1 and along the southern boundary of potential capture area 2N. Potential capture area 2S includes riparian area because the river runs along its northern boundary.

Zoning

Zoning data provide information on adjacent land use, which may present constraints to facility siting. Preferred locations for the evaporation pond would likely be away from lots zoned as residential and commercial, and possibly more typically in or adjacent to lots zoned as industrial and rural. Zoning maps are presented in Figures 4, 5, and 6 for potential capture areas 1, 2S, and 2N, respectively.

In potential capture area 1, most of the land in El Paso County is zoned and planned as residential, with a 34-acre commercially zoned area south of Country Club Road west of the Rio Grande. Most of the land in Doña Ana County is zoned rural residential, with an approximately 18-acre area zoned commercial located on the southwestern boundary.

In potential capture area 2S, all of the land is in Doña Ana County. The land on the northern boundary of the site adjacent to the river is zoned as floodplain, with an area of commercial zoning between the floodplain and McNutt Road. Most of the area between McNutt Road and the railroad tracks is zoned residential, with an area of mixed commercial and light industrial on the southeastern border of the site. The area south of the railroad tracks is zoned light industrial and commercial.

In potential capture area 2N, most of the land is in El Paso County. A small area zoned floodplain on the southern side of the river is in Doña Ana County. The area between the river and Futurity Road is zoned light manufacturing (industrial). The area between Futurity Road and the railroad tracks is zoned residential and commercial, with the parcels east of Racetrack Road zoned light manufacturing (industrial). Most of the parcels north of the railroad tracks are zoned commercial, with a pocket of parcels zoned residential on the northern end of the site and several manufacturing (industrial) lots on the eastern side of the site north of the railroad tracks.

Land Ownership

Public lands could present a siting constraint, or they could provide leasable open spaces. A map illustrating the location of public lands is presented in Figure 7. In potential capture area 1, public lands are located along the river and irrigation ditches. In potential capture area 2S, one area is designated as public land on the northeastern side of the site in the river floodplain, and four areas are designated as public land within the area between McNutt Road and the railroad tracks. In potential capture area 2N, public lands are located along several irrigation ditches and sections of the railroad tracks.

Land Use

Land use of adjacent parcels could present a siting constraint when identifying whether the proposed project facilities are compatible. Parcel land use data were acquired from El Paso and Doña Ana Counties to identify compatibility of potential sites with the surrounding properties. These layers are presented in Figures 8, 9, and 10 for potential capture areas 1, 2S, and 2N, respectively.

Each municipality uses different nomenclature for describing land use. For the purpose of this analysis, land use categories considered compatible for neighboring an evaporation pond include *No Structure*, *Shed, Farm Buildings, or Agricultural Facilities*, *Utility or Other Nonbuilding Structures*, and *Specialized Military Structures* (depending on the type of structure). Incompatible land uses for neighboring an evaporation pond include *Commercial Buildings and Other Specialized Structures*, *Institutional or Community Facilities*, *Public Assembly Structures*, and *Residential Buildings*. Sites with land use labeled as *No Structure*, and *Shed, Farm Buildings, or Agricultural Facilities* were considered to be potentially available for siting of project facilities. All types of land

use were considered compatible for siting of wells and the WTP because these can be housed indoors with noise-dampening devices and will require a low volume of truck traffic for servicing.

Land use data can also be used to identify potential desalinated water utilization sites. Desalinated water may be of interest for industry/manufacturing or irrigation, which could be identified through land use data such as *Shed, Farm Buildings, or Agricultural Facilities*, *Industrial and/or Railyards*, or *Agriculture.*

Proximity to Electrical Power

Water treatment for removal of salinity and pumping (wells and distribution) will require power. To avoid increased project cost for electrical service extensions, an effort would be made to site project facilities near existing power supplies. Details on the location and capacity (phase 1, 2, or 3) of power lines are presented in Figure 11. The three potential capture areas are located in populated areas with access to 1- and 2-phase power. In general, more power sources are available in residential, commercial, and industrial areas, while power sources are limited in rural or unpopulated areas. In potential capture area 1, fewer power connections are in the open space on the southern end of the site. Potential capture area 2N has the highest density of available power, and the Rio Grande Power Company is also located on the eastern boundary of potential capture area 2N. In potential capture area 2S, limited power is available south of the railroad tracks; however, power is available throughout the area north of the railroad tracks.

Available Area

The identified potential capture areas are near or within the El Paso Metro Area. Obtaining adequate space for the project facilities could present a challenge. For the purposes of this analysis, the following available area requirements were assumed:

- Each well site will require an open lot with a minimum size of approximately 30 by 30 feet (900 square feet or 0.02 acre) for an electric pump, or 40 by 30 feet for a diesel pump. Because the potential capture areas are within the El Paso Metro Area, it was assumed that electricity would be available and electric pumps would be used.
- The previous study estimated that the Distal Mesilla location would require a WTP with approximately 500 gallons per minute (gpm) capacity (CH2M HILL, 2011), and results of the current study are consistent with that estimated rate (CH2M HILL, 2012). The WTP would utilize either an RO or an EDR package plant. This facility would require an open lot with an estimated minimum size of approximately 90 by 60 feet (5,400 square feet or 0.12 acre).
- Evaporation ponds will vary in area based on the treatment method selected and the flow rate of saline water in the aquifer. Previously, it was assumed that the wells would be sized to pump at approximately the same flow rate as the flow of saline water through the aquifer (CH2M HILL, 2011). Because the saline groundwater flow rate and salinity concentration is not yet known, a minimum and maximum flow rate (Tables 1 and 2) was estimated for each potential capture area. For RO groundwater treatment it was estimated that the concentrate flow would be approximately 15 percent of the estimated influent flow to the WTP. In potential capture area 1, with an estimated influent flow rate of 100 to 500 gpm, the evaporation pond would require approximately 7 to 34 acres. In potential capture areas 2S and 2N, with an estimated influent flow rate of 250 to 1,000 gpm, the evaporation pond would require approximately 17 to 68 acres (Table 1). For EDR groundwater treatment, it was estimated that the concentrate flow would be approximately 20 percent of the influent flow to the WTP; therefore, with the flow assumptions stated above, the evaporation pond would require approximately 9 to 45 acres in potential capture area 1, or 23 to 91 acres in potential capture areas 2S and 2N (Table 2). These estimates assume that the evaporation pond has a capacity of 2.2 gpm per acre (CH2M HILL, 2011).

TABLE 1
Evaporation Pond Size Estimate for RO Concentrate Disposal*

Potential Capture Area	Estimated Saline Groundwater Flow (gpm)		Estimated Concentrate Disposal Flow (gpm)		Estimated Required Evaporation Pond Area (acres)	
Range	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1	100	500	15	75	7	34
2S	250	1,000	37.5	150	17	68
2N	250	1,000	37.5	150	17	68

*The area required for the evaporation pond was estimated for the purpose of analyzing the availability of potential sites in the potential capture areas.

NOTE: Well pumping capacity would be similar to the estimated flow of saline water in the aquifer. Size estimate assumes that the evaporation pond has a capacity of 2.2 gpm per acre. For RO treatment, assumed concentrate flow is 15 percent of influent flow.

TABLE 2
Evaporation Pond Size Estimate for EDR Concentrate Disposal*

Potential Capture Area	Estimated Saline Groundwater Flow (gpm)		Estimated Concentrate Disposal Flow (gpm)		Estimated Required Evaporation Pond Area (acres)	
Range	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1	100	500	20	100	9	45
2S	250	1,000	50	200	23	91
2N	250	1,000	50	200	23	91

*The area required for the evaporation pond was estimated for the purpose of analyzing the availability of potential sites in the potential capture areas.

NOTE: Well pumping capacity would be similar to the estimated flow of salt water in the aquifer. Size estimate assumes that the evaporation pond has a capacity of 2.2 gpm per acre. For EDR treatment, assumed concentrate flow is 20 percent of influent flow.

Open lots of the sizes described above were identified within the potential capture areas to evaluate land availability. Figures 12, 13, and 14 show open lots identified for potential capture areas 1, 2S, and 2N, respectively. Sites that are large enough to house a well (greater than or equal to 0.02 acre) and WTP (greater than or equal to 0.12 acre) are shaded pink and yellow, respectively. All of the available sites identified were large enough to site the WTP, so no pink areas appear in the figures. Sites that are greater than or equal to 7 acres were considered to be potentially large enough to locate an evaporation pond; these areas are shaded green, and the available acreage is listed on the map. Several landmarks are labeled in potential capture area 2N to highlight the location of the Rio Grande Power Company, the racetrack and casino, and an amusement park.

Considerations for Construction and O&M

By minimizing the distance between project facilities and the desalinated water utilization location, shorter pipe runs would be required to transfer water. Minimizing pipe lengths would reduce the overall project cost by reducing material costs, excavation distances, and the number of easements to be acquired. Minimizing pipe runs would also reduce friction losses and, consequently, would reduce pumping costs during operations. Cost minimization of piping between the WTP and the desalinated water utilization location would be weighed against optimizing the location of the WTP relative to the location of the evaporation pond. Longer concentrate pipe runs may increase the risk of mineral scaling of the concentrate line and the need for increased O&M cost to clean or pig the concentrate pipeline.

Summary of Site Selection Criteria

The information presented in Table 3 summarizes the Site Selection Criteria and observations on whether this factor would affect site selection. Observations are based on the data currently available, presented in Figures 1 through 14.

TABLE 3
Summary of Site Selection Criteria

Site Selection Criteria	Overview	Would this factor affect site selection?*		
		Area 1	Area 2S	Area 2N
Proximity to Saline Groundwater Sources	The saline groundwater source is believed to be located 50 to 400 feet below ground surface. Exact sources of salinity, TDS concentration, and flow characteristics have yet to be determined.	Additional study required	Additional study required	Additional study required
Topography	Increased elevation equates to deeper wells and increased cost to pump between project facilities. Elevation gain in potential capture area 2S could present a negative constraint on site selection.	No	Yes, negative	No
Selected Constraints:				
Jurisdictional Wetlands	USFWS NWI wetlands were identified in the Distal Mesilla area. Jurisdictional wetlands located in the southeast corner of potential capture area 2N may present a negative constraint on evaporation pond site selection.	Not likely	Not likely	Potentially, negative
EPA Brownfield Sites	Legacy soil or groundwater concerns may make EPA brownfield sites less desirable to the public and more readily available for siting of project facilities. Remediation schedule could delay project implementation, presenting a negative constraint. One EPA Brownfield Sites is located approximately 700 feet southwest of potential capture area 1.	Yes	No	No
IBWC ROW and Restoration Sites	Rio Grande Canalization Project is ongoing along the Rio Grande from Caballo Dam to El Paso. Siting project facilities within the IBWC ROW will involve additional permitting and could present additional negative constraints to siting. IBWC restoration sites would not be available for siting project facilities and may present a negative constraint on adjacent sites. IBWC restoration sites are located in potential capture area 2N and immediately south of potential capture area 1. IBWC ROW located along the river within the levee in potential capture areas 1, 2S, and 2N.	Potentially, negative	Potentially, negative	Potentially, negative
Public Recreation	Public recreation locations could present a negative constraint to siting capture, treatment, or disposal facilities, especially an evaporation pond. An evaporation pond, if properly constructed and maintained, could be seen as an amenity to a public space. One public recreation site has been identified approximately 1,700 feet northwest of potential capture area 2N. Three public recreation sites have been identified approximately 3,200 feet northeast of potential capture area 2N.	Not likely	Not likely	Potentially
Parks	Parks are a public attraction and project facilities may be viewed negatively if completed poorly. An evaporation pond, if constructed and maintained properly, could be seen as an amenity to a large park. A large park could provide a potential buffer between residences and project facilities. Parks near the river may also be providing habitat for the Southwestern Willow Flycatcher, such sites would likely not be available for siting project facilities. Siting project facilities near a park would require further study to ensure project facilities did not	Yes, negative (This park is located along the river and may be providing habitat.)	No	Yes, positive (May be potential for siting evaporation pond at one of the large parks.)

TABLE 3
Summary of Site Selection Criteria

Site Selection Criteria	Overview	Would this factor affect site selection?*		
		Area 1	Area 2S	Area 2N
	negatively impact park aesthetics. One park is located along the river within potential capture area 1. Two parks are located within potential capture area 2N. Two large parks are located northwest of potential capture area 2N.			
Railroads	Obtaining permission to construct within, or otherwise cross, a railroad easement would increase project costs. If project facilities were to be sited on either side of a railroad, a pipeline crossing would likely be required, so the railroad would present a negative constraint. Railroad tracks are present in potential capture areas 2S and 2N.	No	Yes, negative	Yes, negative
Rivers	Environmental permitting and challenging construction involved in a river crossing would present a significant negative constraint. The Rio Grande runs through the middle of potential capture area 1. The Rio Grande runs along the southern boundary of potential capture area 2N, but a river crossing would likely not be necessary.	Yes, negative	No	No
Zoning	Preferred locations for the evaporation pond would be in and adjacent to lots zoned industrial and rural, away from lots zoned residential and commercial. Most of the land within potential capture area 1 is zoned residential, with two areas zoned commercial on the west side of the river. In potential capture area 2S, land adjacent to the river is zoned floodplain, with an area zoned commercial between the floodplain and McNutt Road. McNutt Road to the railroad tracks is zoned mostly residential, with an area zoned mixed commercial and light industrial on the southeast border. South of the railroad tracks is zoned light industrial and commercial. In potential capture area 2N, land adjacent to the river is zoned floodplain. Between the river and Futurity Road is zoned light manufacturing (industrial). Futurity Road to the railroad tracks is zoned residential and commercial, with parcels east of Racetrack Road zoned light manufacturing (industrial). Most of the parcels north of the railroad tracks are zoned commercial, with a pocket of parcels zoned residential on the north end of the site and several lots zoned manufacturing (industrial) on the east side of the site north of the railroad tracks.	Yes, negative (difficult evaporation pond siting and potentially difficult siting other project facilities in residential areas)	Not Likely (probably not a large impact to site selection)	Potentially (potentially difficult evaporation pond siting)
Land Ownership	Public lands could present a siting constraint, or they could provide leasable open spaces depending on their use and availability. In potential capture area 1, several public lands located along the river and irrigation ditches. In potential capture area 2S, public lands along the river floodplain to the northeast, and four areas between McNutt Road and the railroad tracks. In potential capture area 2N, public lands along some irrigation ditches and sections of the railroad tracks.	Not likely	Potentially, further evaluation required	Not likely
Land Use	Land use data is useful in determining whether a parcel might be available for siting a project facility. Further investigation of adjacent land use could identify either negative or positive siting constraints. Land use categories for neighboring an evaporation pond:	Negative (difficult evaporation pond siting on east side	Positive (Figure 9 presents many parcels with	Positive (Figure 10 presents many parcels

TABLE 3
Summary of Site Selection Criteria

Site Selection Criteria	Overview	Would this factor affect site selection?*		
		Area 1	Area 2S	Area 2N
	Compatible land uses include: - *No Structure* - *Shed, Farm Buildings, or Agricultural Facilities* - *Utility or Other Non-building Structures* - *Specialized Military Structures* Incompatible land uses include: - *Commercial Buildings and Other Specialized Structures* - *Institutional or Community Facilities* - *Public Assembly Structures* - *Residential Buildings* Sites considered potentially available for siting of project facilities include: - *No Structure* - *Shed, Farm Buildings, or Agricultural Facilities* All types of land use were considered compatible for siting wells and WTP because these can be housed indoors with noise-dampening devices and will require a low volume of truck traffic for servicing. Land use data can also be used to identify potential desalinated water utilization sites. Desalinated water may be of interest for industry/manufacturing or irrigation, which could be identified through land use data such as: - *Shed, Farm Buildings, or Agricultural Facilities* - *Industrial and/or Rail yards* - *Agriculture*	of river)	*No Structure*)	with *No Structure)*
Proximity to Electrical Power	Site project facilities near existing power supplies to avoid increased project cost for electrical service extensions. Power is available throughout the potential capture areas. In general, power sources are more readily available in residential, commercial, and industrial areas, while power sources are more limited in rural or unpopulated areas.	Not Likely	Not Likely	No

Available Area	Estimated Facility Area Requirements:
	• Well = 0.02 acre
	• WTP = 0.12 acre
	• Evaporation ponds
	  • Potential capture area 1 =
	  7 to 34 acres (for RO)
	  9 to 45 acres (for EDR)
	  • Potential capture area 2S =
	  17 to 68 acres (for RO)
	  23 to 91 acres (for EDR)
	  • Potential capture area 2N =
	  17 to 68 acres (for RO)
	  23 to 91 acres (for EDR)
		Yes, negative (Limited evaporation pond siting options on east side of river)	Not likely	Yes, negative (Limited evaporation pond siting options)

Considerations for Construction and O&M	Minimizing the distance between project facilities would result in shorter pipe runs and likely reduce project construction and O&M costs. Longer concentrate pipe runs may increase the risk of mineral scaling of the concentrate line, leading to increased O&M costs.	To be determined in Site Screening Analysis	To be determined in Site Screening Analysis	To be determined in Site Screening Analysis

* Observations of whether a factor might affect site selection is based on the currently available GIS data presented in Figures 1 through 14. An estimation of whether the constraint would have a negative or positive impact on site selection is also provided.

Site Screening Analysis Procedures

The next step for identifying sites for project facilities would be to complete a site screening analysis. The site screening analysis would evaluate and rank project facility configurations based on available locations. Procedures for the site screening analysis are presented in a preliminary process flow represented by the diagram in Figure 15. Six steps are envisioned for this analysis, beginning with identifying open sites and then iteratively evaluating each candidate site and successively reducing the number of sites to a subset that meets a range of attributes corresponding to potentially feasible sites. Step 5 corresponds to an analysis of the engineering aspects of each of the sites in the reduced subset. Sites would be ranked by overall suitability for a number of factors, including the amount of salinity reduction expected, land area required, land cost, and opportunities to combine site components into a single facility. In a parallel effort, conceptual costs would be developed for facility configurations for each site to support a direct comparison with the suitability of a site. Each site cost would reflect a configuration intended to minimize permitting, easement acquisition, construction costs, and power requirements, as well as to identify an appropriate location for utilization of desalinated water. In the final step, Step 6, a reduced subset of sites would be developed that reflects a range of optimal characteristics, and a final short list of candidate sites would be developed. The candidate sites would be chosen based on the smallest areal footprint and/or lowest land cost, closest proximity between capture and treatment facilities, and most/least compatibility with adjacent land uses. Detailed descriptions of these steps are provided in Figure 15.

Step 1: Identify Open Sites

Open sites were identified and presented for potential capture areas 1, 2S, and 2N in Figures 12, 13, and 14, respectively. Open sites were identified by observing whether structures were present on each parcel in the satellite image. A site was considered to be open if structures were present on less than 90 percent of the parcel.

Step 2: Identify Constraints

The selected constraints identified and described in the earlier sections of this TM would be used to closely evaluate each of the available sites. Selected constraints included wetlands, industrial sites, EPA brownfield sites, public recreation areas, parks, railroad, and the river. A selected constraint located near a potential project facility site could affect location selection or placement of conveyance infrastructure. For example, wells, WTP, and utilization sites for desalinated water and disposal of concentrate would preferably be located on the same side of the Rio Grande to avoid challenging and expensive environmental permitting and construction involved with constructing one or more pipeline crossings. If wells need to be located on either side of the river, duplicate project facilities would need to be installed to treat and dispose of water on either side of the river. Conversely, an industrial area may be seen as an ideal location for siting project facilities; in that case, the presence of an industrial site may be seen as a benefit.

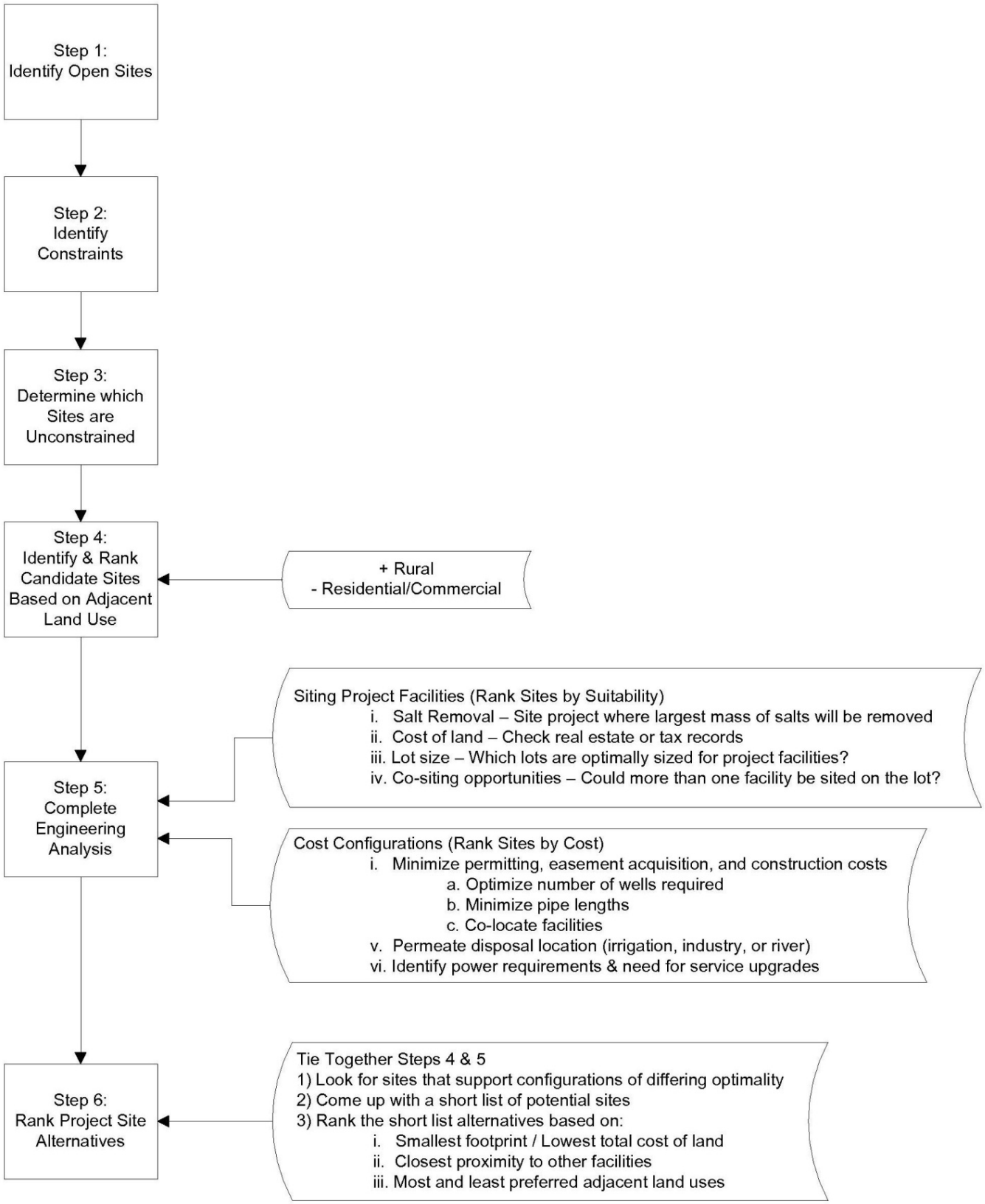
Step 3: Determine Which Sites are Unconstrained

The open sites identified in Step 1 would be evaluated based on the evaluation in Step 2, and constrained sites would be removed from the evaluation.

Step 4: Identify and Rank Candidate Sites Based on Adjacent Land Use

The unconstrained sites (as identified in Step 3) would be evaluated and ranked based on suitable adjacent land use for the proposed facilities. Conceptually, a rural or industrial adjacent land use would be assigned a positive ranking, while a residential or commercial adjacent land use would receive a negative ranking. Siting a well or WTP might not be greatly affected by the adjacent land use because these facilities are contained within buildings and would not present a nuisance to the public, whereas siting an evaporation pond in a rural or non-residential setting would be more feasible.

FIGURE 15
Site Screening Analysis Process Flow Diagram



Step 5: Complete Engineering Analysis

An engineering analysis would be completed for each site identified in Step 4 to develop a preferred or optimally performing project, a conceptual facility plan for the complete system, and an estimate of total project cost. Sites would be evaluated and ranked by suitability, as described below, and conceptual cost estimates would then be prepared and used to rank each site. Rankings for each site may be direct, based on absolute criterion ranking or relative and normalized to the range of criterion values estimated.

Siting Project Facilities—Rank Sites by Suitability

Each of the unconstrained sites would be evaluated and ranked for site suitability using the following criteria:

- **Salinity Removal:** The ultimate goal of the project is to remove salinity from the groundwater before it enters the Rio Grande. Project facilities would be sited to optimize salt removal. To the extent that sites may vary in their extent of saline groundwater capture, sites would be given positive scores for greater impact on salinity removal. It should be noted that increased salt removal would require increased capital and energy costs of WTP, so project cost would be rated against salinity removal.
- **Cost of Land:** The cost of land would be evaluated through real estate or tax records. Sites would be ranked to reflect the anticipated cost of acquiring the land.
- **Parcel Size:** Ideally, selected lots would be appropriately sized for each facility. A parcel too big for the proposed facility would receive a lower ranking if the additional land would lead to increased project cost.
- **Co-Siting Opportunities:** Parcels with a total area that supports a conceptual configuration that includes all or most of the project components would be ranked higher than other parcels. For example, it is conceivable that one site could provide enough space for a well, WTP, and evaporation pond, which would minimize pipe lengths and the need for acquiring multiple lots for the same facilities. This would be considered a benefit to the project and would be ranked accordingly.

Cost Configurations—Rank Sites by Cost

To optimize the total project cost/benefit ratio, siting alternatives would be developed and evaluated. A systems approach would be used to site wells, WTP, concentrate disposal (evaporation pond), and desalinated water utilization to develop an optimal system layout and evaluate options based on the total system cost.

To minimize permitting, easement acquisition, and construction costs, site alternatives would minimize the number of wells required for salinity removal, as well as minimize pipe lengths between wells, WTP, and disposal locations, while maximizing salinity removal and facility operability. Facilities would be co-located where possible and appropriate. Co-locating facilities would (1) minimize permitting costs by reducing the need for easement acquisition involved in installing pipe between multiple lots; and (2) reduce land acquisition expenses by reducing the number of lots needing to be acquired.

Desalinated water utilization alternatives would be evaluated, because desalinated water could be used for a variety of applications including irrigation and industry. Desalinated water flows could also be discharged to the Rio Grande to supplement river flows; however, the discharge will be relatively small (<1,000 gpm) compared to typical river flows (approximately 268 cfs or 120,000 gpm). Permeate use for industry would receive the highest rating, as low-salinity high-purity product water is often of great value to industry. Irrigation would receive the next highest rating; however, desalinated water would need to be blended with concentrate to provide water suitable for irrigation. River discharge would be the least beneficial use as the value of producing low-salinity high-purity product water would be lost.

Power requirements for each facility would be identified, and the need for service upgrades would be evaluated based on service availability. El Paso Electric provided a data coverage illustrating power lines by phase (Figure 11). This data and direct communications with the power company would help determine whether power is available at each site or whether additional funding would be required to extend service to project facilities.

Step 6: Rank Project Site Alternatives

The rankings determined in Steps 4 and 5 would be combined to provide a total ranking for project site alternatives. This would be accomplished by doing the following:

1) Identifying sites that support configurations of differing optimality.
2) Developing a short list of potential sites.
3) Ranking the short list alternatives would be based on the following:
   a) Volume of salt to be removed
   b) Smallest footprint/lowest total cost of land
   c) Closest proximity to other facilities
   d) Most- and least-preferred adjacent land uses
   e) Ease of permitting

The engineering analysis would result in several site alternatives being ranked based on the criteria described above.

Conclusions

Identification of a location appropriate for construction of saline groundwater capture, conveyance to treatment and disposal, and final disposal via evaporation ponds within the Distal Mesilla project location will require a stepwise analysis of multiple parameters, including:

- Available parcels and their respective suitability in terms of construction cost
- Achievement of project objectives
- Compatibility with adjacent land uses

Preliminary site data coverages, selection criteria, and the required process steps have been described in this TM. Preferred sites would exhibit the greatest compatibility with adjacent land use at a minimum construction cost and facility footprint. Input from local and regional stakeholders and final planning and design steps would afford opportunities to construct groundwater capture, treatment and disposal facilities with a minimal aesthetic impact, and where possible, would include features considered by the public to be community amenities such as constructed brackish wetlands, environmental educational facilities, and new and extended open areas.

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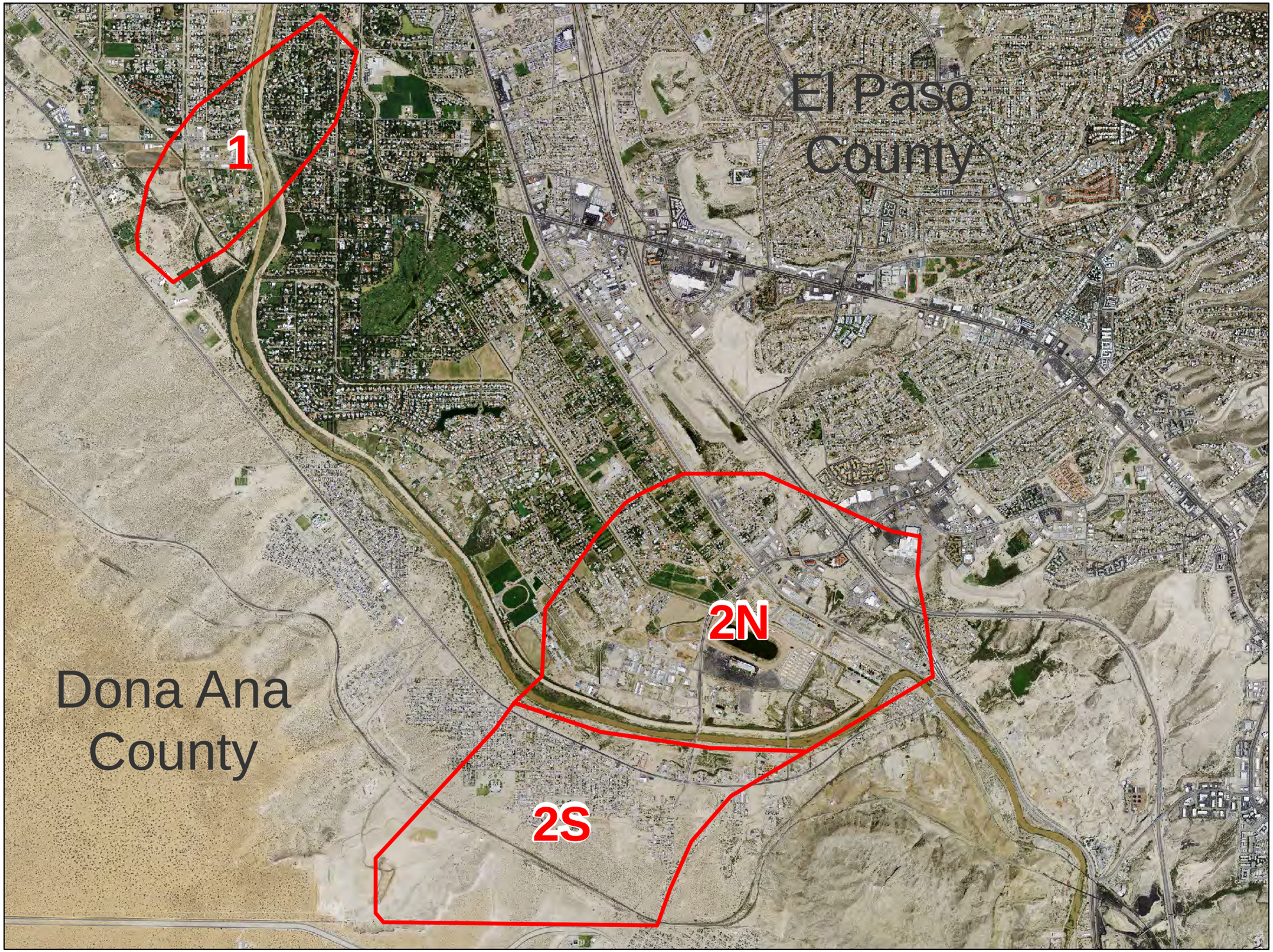
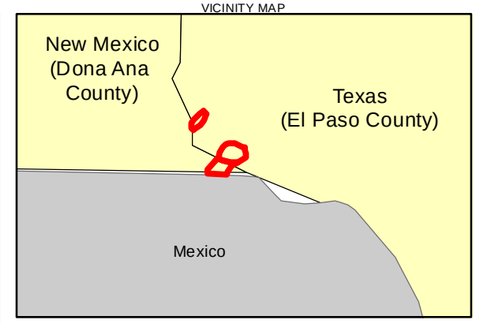
Figures



VICINITY MAP



LEGEND

Potential Capture

Notes:
1. Area of interest subject to change.
2. Source: USDA 2012 Agriculture Imagery

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Miles

FIGURE 1
SITE MAP WITH POTENTIAL SALINITY CAPTURE AREAS
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

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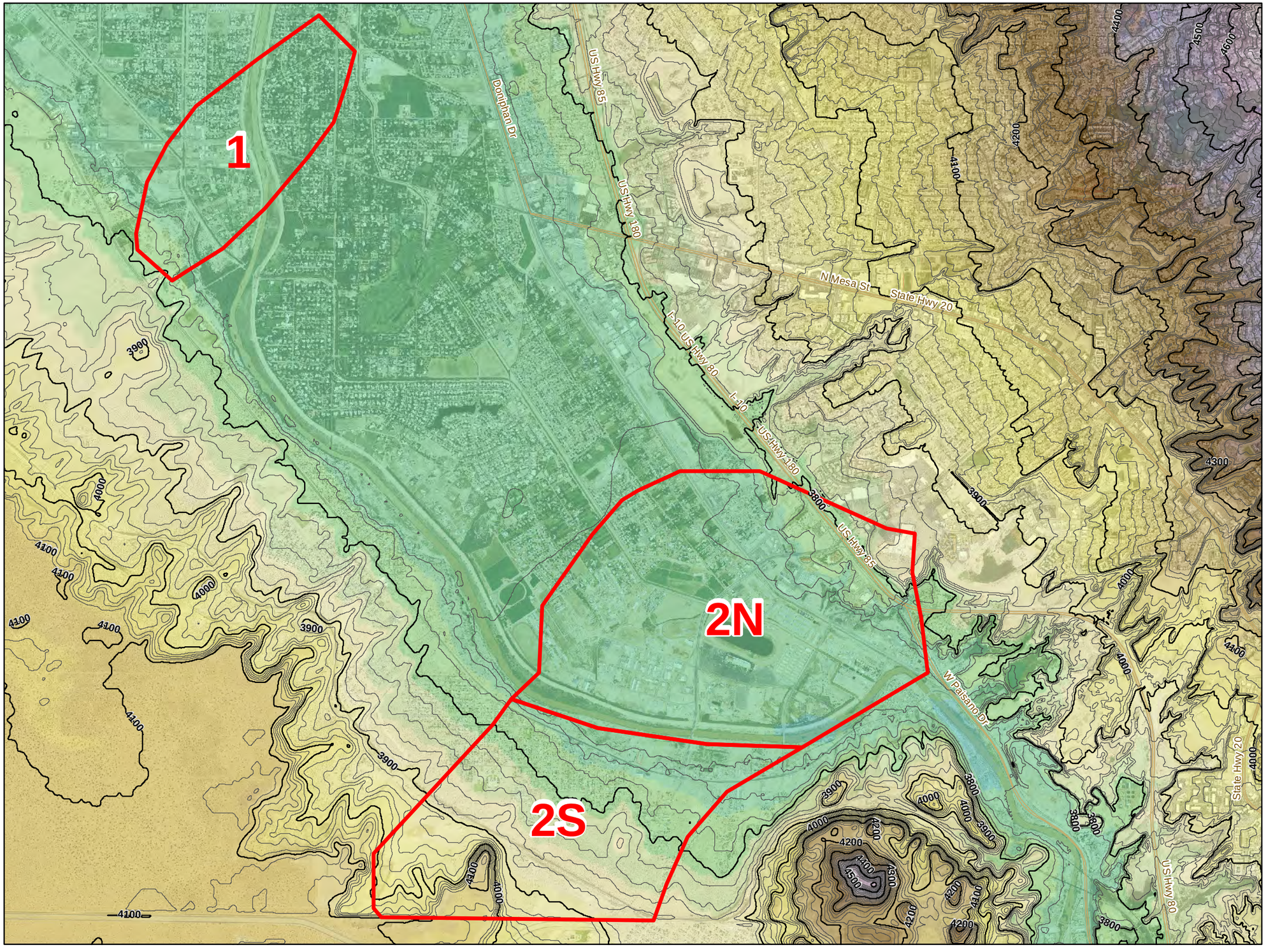
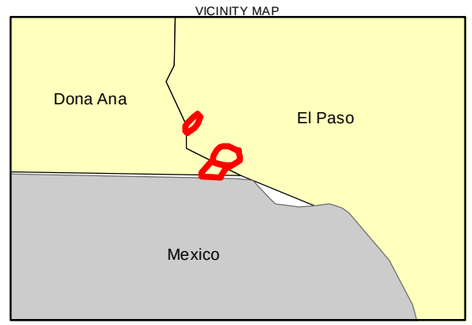




LEGEND

- 20ft Land Surface Contours
- 100ft Land Surface Contours
- Major Roads
- Potential Capture

Land Surface Elevation (ft)

<VALUE>

- 3,728 - 3,730
- 3,730 - 3,770
- 3,770 - 3,810
- 3,810 - 3,850
- 3,850 - 3,890
- 3,890 - 3,930
- 3,930- 3,970
- 3,970 - 4,010
- 4,010 - 4,050
- 4,050 - 4,090
- 4,090 - 4,130
- 4,130 - 4,170
- 4,170 - 4,210
- 4,210 - 4,250
- 4,250 - 4,290
- 4,290 - 4,330
- 4,330 - 4,370
- 4,370 - 4,410
- 4,410 - 4,450
- 4,450 - 4,490
- 4,490 - 4,530
- 4,530 - 4,570
- 4,570 - 4,610
- 4,610 - 4,650
- 4,650 - 4,690
- 4,690 - 4,730
- 4,730 - 4,770

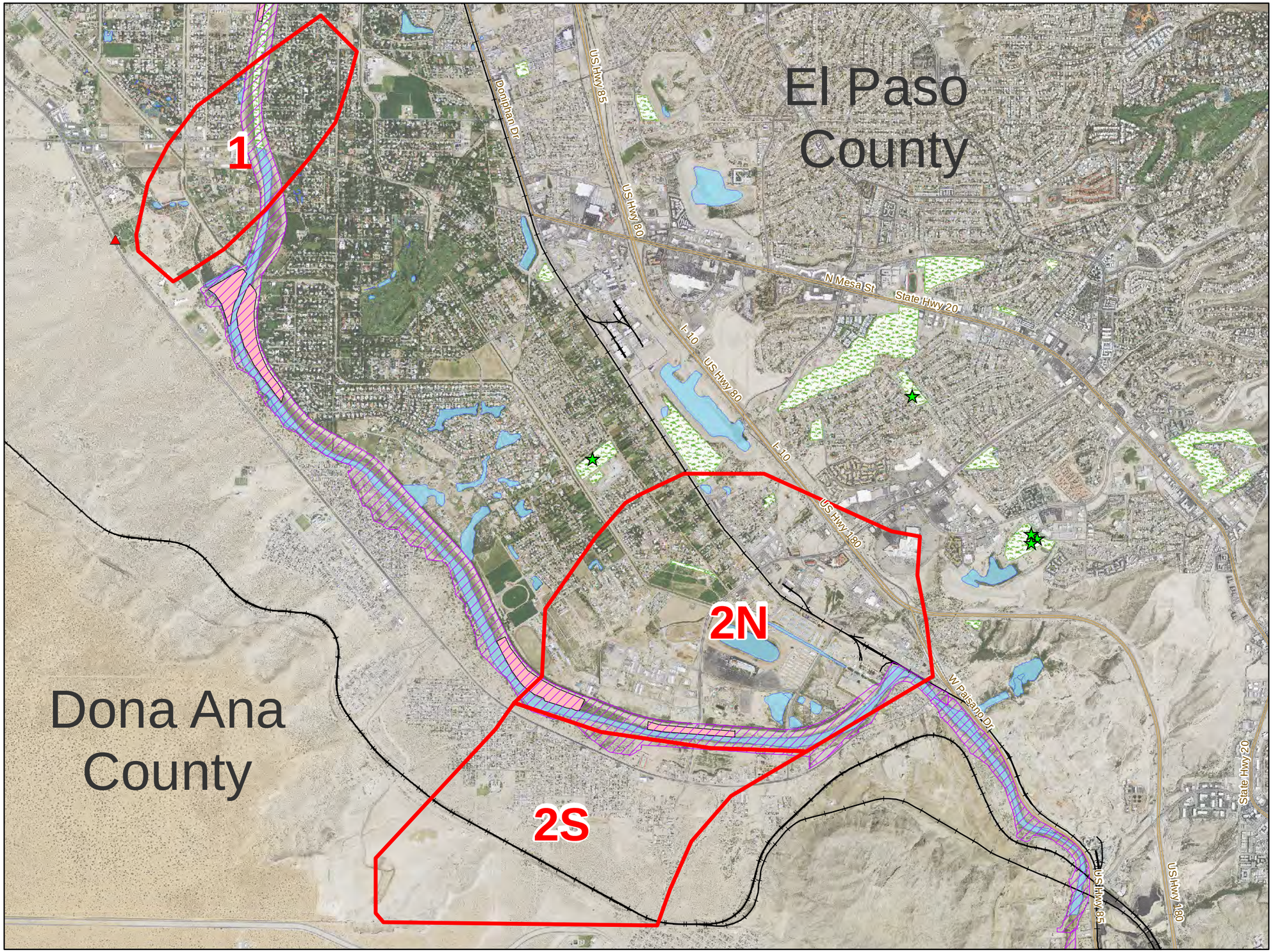
Notes:

1. Area of interest subject to change.
2. Source: USGS National Elevation Dataset (NED)
3. Digital Elevation Model (DEM)
4. DEM converted from meters to feet using a factor of 3.280833.

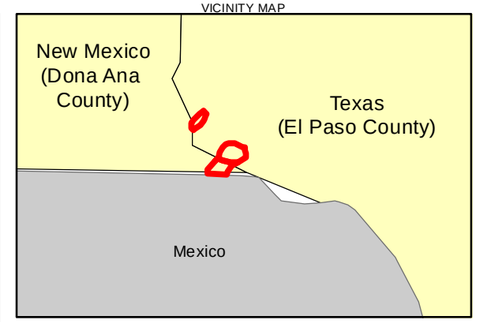
N

0 0.25 0.5
Miles

FIGURE 2
ELEVATION MAP
Rio Grande Salinity Study Task B
Rio Grande Salinity Study



VICINITY MAP



LEGEND

- EPA Brownfield Site
- Public Recreation
- Potential Capture Area
- Draft IBWC Right-of-Way
- Draft IBWC Right-of-Way (Additional land acquired for IBWC ROW)
- IBWC Restoration Sites (IBWC is considering removal from the study)
- IBWC Restoration Sites
- Railroad
- Major Roads
- Parks
- National Wetland Inventory (NWI)

Notes:

1. Area of interest subject to change.
2. Source: USDA 2012 Agriculture Imagery
3. Sources: El Paso County GIS Department, and the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center.

N

0 0.25 0.5
Miles

FIGURE 3
SELECTED CONSTRAINTS
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

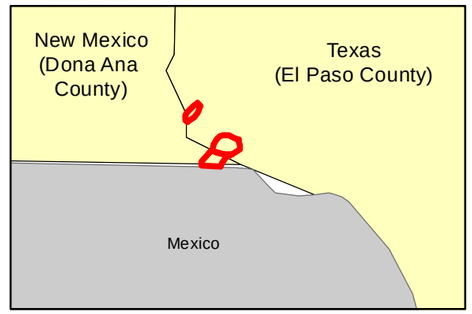
Zoning Definitions for El Paso and Dona Ana County

Code	Description
A-1, A-2, A-3, A-0	Medium Density Residential Apartment Districts
A-4, A-3/0, and A-M	High Density Residential Planned Appartment Districts
C-1	Commercial District
C-2 and C-3	Community Commercial District
C-4	Regional Commercial District
C-5	Regional Commercial Central Business District
C-OP	Commercial Office Park
M-1	Light Manufacturing District
M-2	Heavy Manufacturing District
M-3	Unrestricted Manufacturing District
PMD	Planned Mountain Development District
P-R-I	Planned Residential District I
P-R-II	Planned Residential District II
Q	Quarry District
R-1, R-2, R-2A, R-3, R-3A, R-4, R-5	Light Density Residential Districts
R-F	Ranch and Farm District
RMH	Residential Mobile Home District
S-D	Special Development District
U-P	Union Plaza District

El Paso County

Dona Ana County

VICINITY MAP



LEGEND

- Potential Capture Area
- Local Streets
- Railroad

City of Sunland Park Zoning

- C1 LIGHT COMMERCIAL
- C2 GENERAL COMMERCIAL
- F1 FLOOD PLAIN
- G1 PARKS
- G2 MUNICIPAL LAND; OFFICES
- H1 HORSE RACING
- M1 LIGHT INDUSTRIAL
- M1/SUP LIGHT INDUSTRIAL/SPECIAL USE
- M2 HEAVY INDSUTRIAL
- MR MIXED RESIDENTIAL
- PD PRESERVATION DISTRICT & STEEP SLOPE
- R1 SINGLE RESIDENTIAL
- R1 MF TC RESIDENTIAL, MULTI-FAMILY
- RCPUD RESIDENTIAL/COMMERCIAL PLANNED DEVELOPMENT
- RE RESIDENTIAL ESTATES
- RE1 RURAL ESTATE
- RE1 RURAL ESTATE

El Paso County Zoning

- A-1
- A-2
- A-3
- A-3/O
- A-4
- A-M
- A-O
- AO
- C-1
- C-2
- C-3
- C-4
- C-5
- C-OP
- GMU
- M-1
- M-2
- M-3
- P-C
- P-I
- P-R 1
- P-R 2
- PMD
- Q
- R-1
- R-2
- R-2A
- R-3
- R-3A
- R-4
- R-5
- R-F
- RMH
- RMU
- S-D
- SRR
- U-P

Notes:
1. Area of interest subject to change.
2. USDA 2012 Agriculture Imagery
3. Source: zoning provided by City of Sunland Park.
4. Source: City of El Paso and Dona Ana County from the University of Texas at El Paso Regional Geospatial Service Center.

N

0 250 500 1,000 1,500
Feet

FIGURE 4
ZONING: AREA 1
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

CH2MHILL

Zoning Definitions for El Paso and Dona Ana County

Code	Description
A-1, A-2, A-3, A-0	Medium Density Residential Apartment Districts
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M-2	Heavy Manufacturing District
M-3	Unrestricted Manufacturing District
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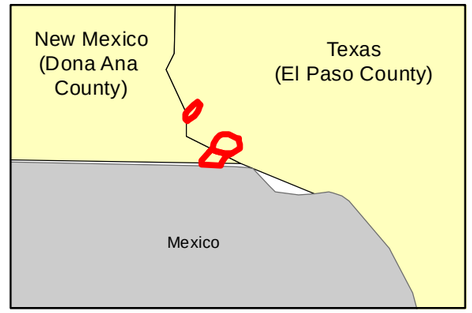
P-R-I	Planned Residential District I
P-R-II	Planned Residential District II
Q	Quarry District
R-1, R-2, R-2A, R-3, R-3A, R-4, R-5	Light Density Residential Districts
R-F	Ranch and Farm District
RMH	Residential Mobile Home District
S-D	Special Development District
U-P	Union Plaza District

El Paso County

Dona Ana County

VICINITY MAP



LEGEND

- Potential Capture Area
- Local Streets
- Railroad

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- C2 GENERAL COMMERCIAL
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- MR MIXED RESIDENTIAL
- PD PRESERVATION DISTRICT & STEEP SLOPE
- R1 SINGLE RESIDENTIAL
- R1 MF TC RESIDENTIAL, MULTI-FAMILY
- RCPUD RESIDENTIAL/COMMERCIAL PLANNED DEVELOPMENT
- RE RESIDENTIAL ESTATES
- RE1 RURAL ESTATE
- RE1 RURAL ESTATE

El Paso County Zoning

- A-1
- A-2
- A-3
- A-3/O
- A-4
- A-M
- A-O
- AO
- C-1
- C-2
- C-3
- C-4
- C-5
- C-OP
- GMU
- M-1
- M-2
- M-3
- P-C
- P-I
- P-R 1
- P-R 2
- PMD
- Q
- R-1
- R-2
- R-2A
- R-3
- R-3A
- R-4
- R-5
- R-F
- RMH
- RMU
- S-D
- SRR
- U-P

Notes:

1. Area of interest subject to change.
2. USDA 2012 Agriculture Imagery
3. Source: zoning provided by City of Sunland Park.
4. Source: City of El Paso and Dona Ana County from the University of Texas at El Paso Regional Geospatial Service Center.

N

0 250 500 1,000 1,500
Feet

FIGURE 5
ZONING: AREA 2S
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

Zoning Definitions for El Paso and Dona Ana County

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A-1, A-2, A-3, A-0	Medium Density Residential Apartment Districts
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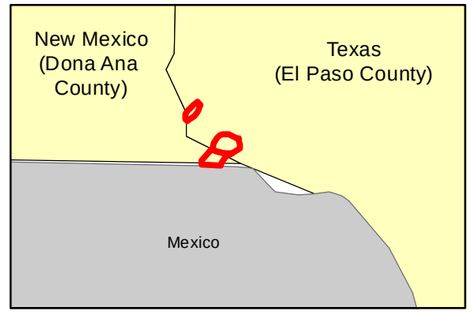
R-F	Ranch and Farm District
RMH	Residential Mobile Home District
S-D	Special Development District
U-P	Union Plaza District

El Paso County

Dona Ana County

VICINITY MAP



LEGEND

- Potential Capture Area
- Local Streets
- Railroad

City of Sunland Park Zoning

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- H1 HORSE RACING
- M1 LIGHT INDUSTRIAL
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- M2 HEAVY INDSUTRIAL
- MR MIXED RESIDENTIAL
- PD PRESERVATION DISTRICT & STEEP SLOPE
- R1 SINGLE RESIDENTIAL
- R1 MF TC RESIDENTIAL, MULTI-FAMILY
- RCPUD RESIDENTIAL/COMMERCIAL PLANNED DEVELOPMENT
- RE RESIDENTIAL ESTATES
- RE1 RURAL ESTATE
- RE1 RURAL ESTATE

El Paso County Zoning

- A-1
- A-2
- A-3
- A-3/O
- A-4
- A-M
- A-O
- AO
- C-1
- C-2
- C-3
- C-4
- C-5
- C-OP
- GMU
- M-1
- M-2
- M-3
- P-C
- P-I
- P-R 1
- P-R 2
- PMD
- Q
- R-1
- R-2
- R-2A
- R-3
- R-3A
- R-4
- R-5
- R-F
- RMH
- RMU
- S-D
- SRR
- U-P

Notes:

1. Area of interest subject to change.
2. USDA 2012 Agriculture Imagery
3. Source: zoning provided by City of Sunland Park.
4. Source: City of El Paso and Dona Ana County from the University of Texas at El Paso Regional Geospatial Service Center.

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Feet

FIGURE 6
ZONING: AREA 2N
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

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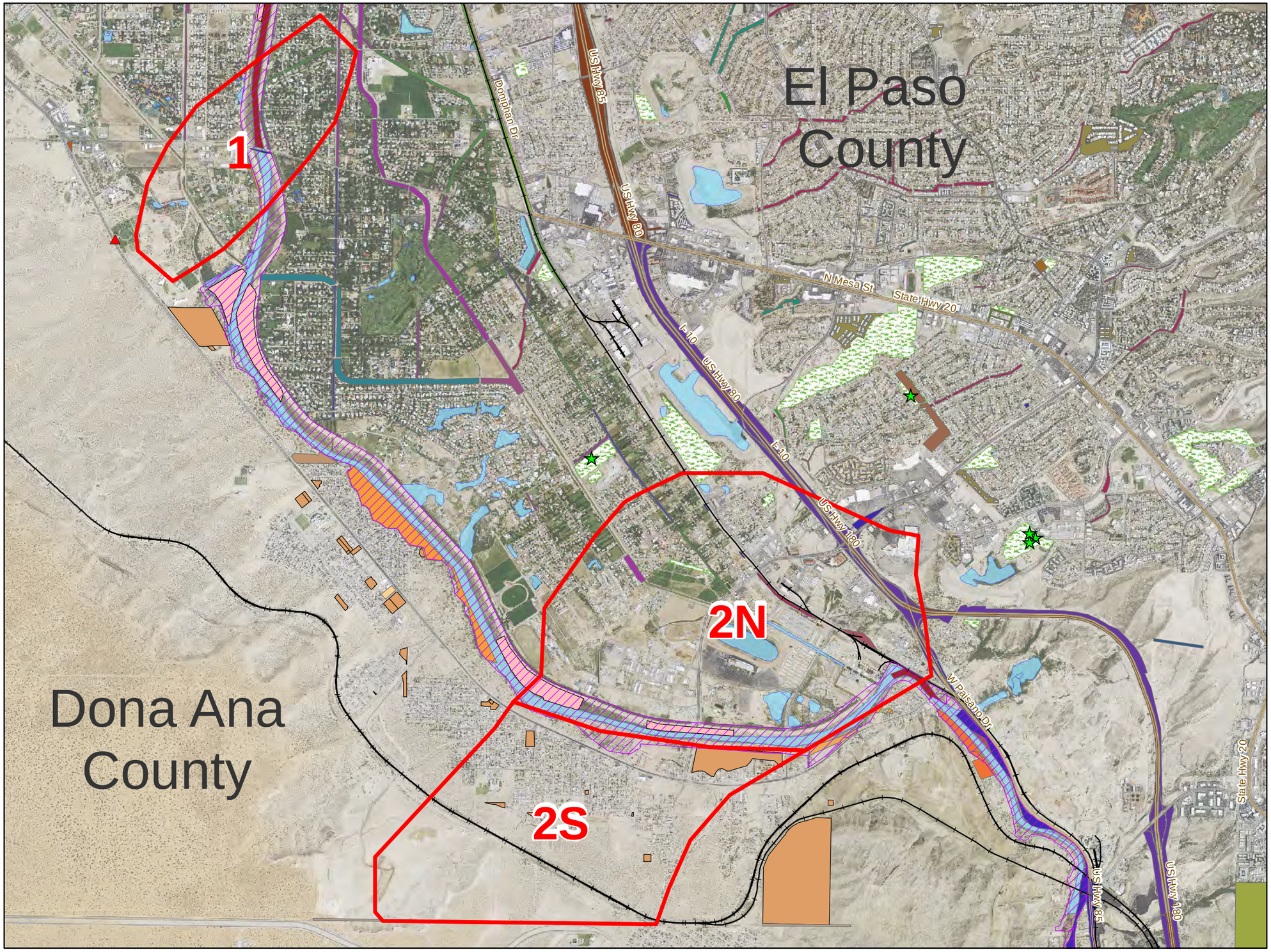
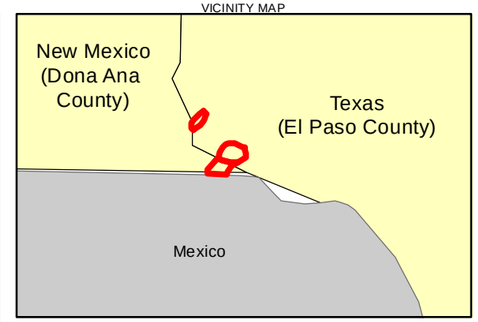


VICINITY MAP



LEGEND

- EPA Brownfield Site
- Public Recreation
- Railroad
- Draft IBWC Right-of-Way
- Draft IBWC Right-of-Way (Additional land acquired for IBWC ROW)
- IBWC Restoration Sites (IBWC is considering removal from the study)
- IBWC Restoration Sites
- Major Roads
- Potential Capture Area
- Parks
- National Wetland Inventory (NWI)

Public Lands City of Sunland Park

- CITY OF SUNLAND PARK
- CSP HOUSING AUTHORITY
- INTERNATIONAL BOUNDARY
- STATE BOUNDARY
- NEW MEXICO CDS LLC
- NEW MEXICO ST HWY
- NEW MEXICO STATE HIGHWAY
- UNITED STATES GOVERNMENT

Public Lands El Paso

- COMMON AREA
- City of El Paso
- DRAINAGE
- E.P.E.C. EASMENT
- E.P.N.G. ROW
- EASEMENT
- Interstate 10
- MONTOYA DRAIN
- MONTOYA LATERAL
- MONTOYA MAIN CANAL
- University of Texas
- MONTOYA MAIN LATERAL
- MONTOYA SPUR DRAIN
- NEMEXAS DRAIN
- OUTSIDE CITY LIMITS
- P.S.B. ROW
- P.S.B. SITE
- RIO GRANDE RIVER
- ROW
- Railroad Properties
- State of Texas
- U.S.A.
- UTILITY EASEMENT

Notes:

1. Area of interest subject to change.
2. Source: USDA 2012 Agriculture Imagery
3. Sources: El Paso County GIS Department, and the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center.
4. Source: City of Sunland Park Zoning

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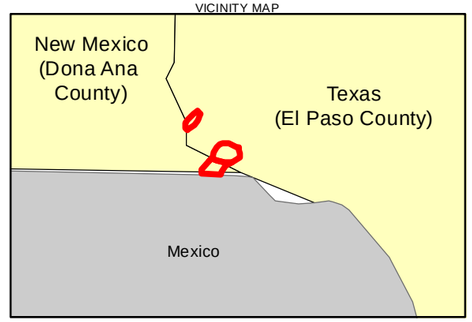
Miles

FIGURE 7
PUBLIC LANDS
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

Wetland Definitions

Label	Type
L1UBHx	Lake
L2USA	Lake
L2USAh	Lake
PAB3Hx	Freshwater Pond
PEM1A	Freshwater Emergent Wetland
PEM1Ah	Freshwater Emergent Wetland
PEM1Ax	Freshwater Emergent Wetland
PEM1Cx	Freshwater Emergent Wetland
PFO1A	Freshwater Forested/Shrub Wetland
PSS2A	Freshwater Forested/Shrub Wetland
PSS2Ah	Freshwater Forested/Shrub Wetland
PSS2J	Freshwater Forested/Shrub Wetland
PSS2Jh	Freshwater Forested/Shrub Wetland
PUBHx	Freshwater Pond
PUSA	Freshwater Pond
PUSAh	Freshwater Pond
PUSAx	Freshwater Pond
PUSCx	Freshwater Pond
PUSJh	Freshwater Pond
R4SBA	Riverine
R4SBCx	Riverine

VICINITY MAP



LEGEND

- Potential Capture Area
- Local Streets
- EPA Brownfield Site
- Public Recreation
- Railroad
- Parks
- National Wetland Inventory (NWI)
- Draft IBWC Right-of-Way
- Draft IBWC Right-of-Way (Additional land acquired for IBWC ROW)
- IBWC Restoration Sites (IBWC is considering removal from the study)
- IBWC Restoration Sites

El Paso Parcels with Land Use

- G1 - Downtown
- G2 - Traditional Neighborhood (Walkable)
- G3 - Post-War
- G4 - Suburban (Walkable)
- G5 - Independent City
- G6 - Rural Settlement (Remote)
- G7 - Industrial and/or Railyards
- G8 - Fort Bliss Mixed Use (Airport)
- G9 - Fort Bliss Military
- O1 - Preserve
- O2 - Natural
- O3 - Agriculture
- O4 - Military Reserve
- O5 - Remote
- O6 - Potential Annexation
- O7 - Urban Expansion

Dona Ana Parcels with Land Use

- 1 - Residential buildings
- 2 - Commercial/other structures
- 3 - Public assembly structures
- 4 - Institutional or community facilities
- 5 - Transportation-related facilities
- 6 - Utility and nonbuilding structures
- 7 - Specialized military structures
- 8 - Sheds, farm, or agricultural facilities
- 9 - No structure

Notes:
1. Area of interest subject to change.
2. Sources: Dona Ana County GIS Division, El Paso County GIS Department, and the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center.

N

0 250 500 1,000 1,500
Feet

FIGURE 8
LAND USE: AREA 1

Rio Grande Salinity Study Task B

Rio Grande Salinity Study

Wetland Definitions

Label	Type
L1UBHx	Lake
L2USA	Lake
L2USAh	Lake
PAB3Hx	Freshwater Pond
PEM1A	Freshwater Emergent Wetland
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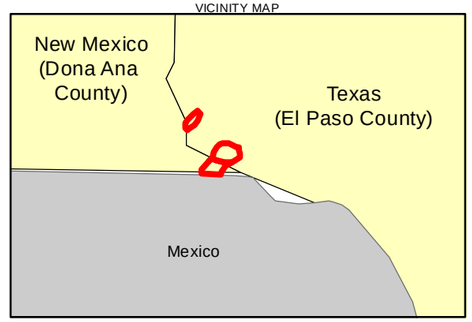
PEM1Ax	Freshwater Emergent Wetland
PEM1Cx	Freshwater Emergent Wetland
PFO1A	Freshwater Forested/Shrub Wetland
PSS2A	Freshwater Forested/Shrub Wetland
PSS2Ah	Freshwater Forested/Shrub Wetland
PSS2J	Freshwater Forested/Shrub Wetland
PSS2Jh	Freshwater Forested/Shrub Wetland
PUBHx	Freshwater Pond
PUSA	Freshwater Pond
PUSAh	Freshwater Pond
PUSAx	Freshwater Pond
PUSCx	Freshwater Pond
PUSJh	Freshwater Pond
R4SBA	Riverine
R4SBCx	Riverine

VICINITY MAP



LEGEND

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- Local Streets
- EPA Brownfield Site
- Public Recreation
- Railroad
- Parks
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Notes:
1. Area of interest subject to change.
2. Sources: Dona Ana County GIS Division, El Paso County GIS Department, and the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center.

N

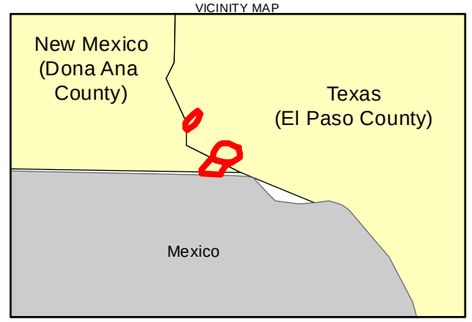
0 250 500 1,000 1,500
Feet

FIGURE 9
LAND USE: AREA 2S
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

Wetland Definitions

Label	Type
L1UBHx	Lake
L2USA	Lake
L2USAh	Lake
PAB3Hx	Freshwater Pond
PEM1A	Freshwater Emergent Wetland
PEM1Ah	Freshwater Emergent Wetland
PEM1Ax	Freshwater Emergent Wetland
PEM1Cx	Freshwater Emergent Wetland
PFO1A	Freshwater Forested/Shrub Wetland
PSS2A	Freshwater Forested/Shrub Wetland
PSS2Ah	Freshwater Forested/Shrub Wetland
PSS2J	Freshwater Forested/Shrub Wetland
PSS2Jh	Freshwater Forested/Shrub Wetland
PUBHx	Freshwater Pond
PUSA	Freshwater Pond
PUSAh	Freshwater Pond
PUSAx	Freshwater Pond
PUSCx	Freshwater Pond
PUSJh	Freshwater Pond
R4SBA	Riverine
R4SBCx	Riverine

VICINITY MAP



LEGEND

- Potential Capture Area
- Local Streets
- EPA Brownfield Site
- Public Recreation
- Railroad
- Parks
- National Wetland Inventory (NWI)
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- Draft IBWC Right-of-Way (Additional land acquired for IBWC ROW)
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- 3 - Public assembly structures
- 4 - Institutional or community facilities
- 5 - Transportation-related facilities
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- 8 - Sheds, farm, or agricultural facilities
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Notes:
1. Area of interest subject to change.
2. Sources: Dona Ana County GIS Division, El Paso County GIS Department, and the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center.

N

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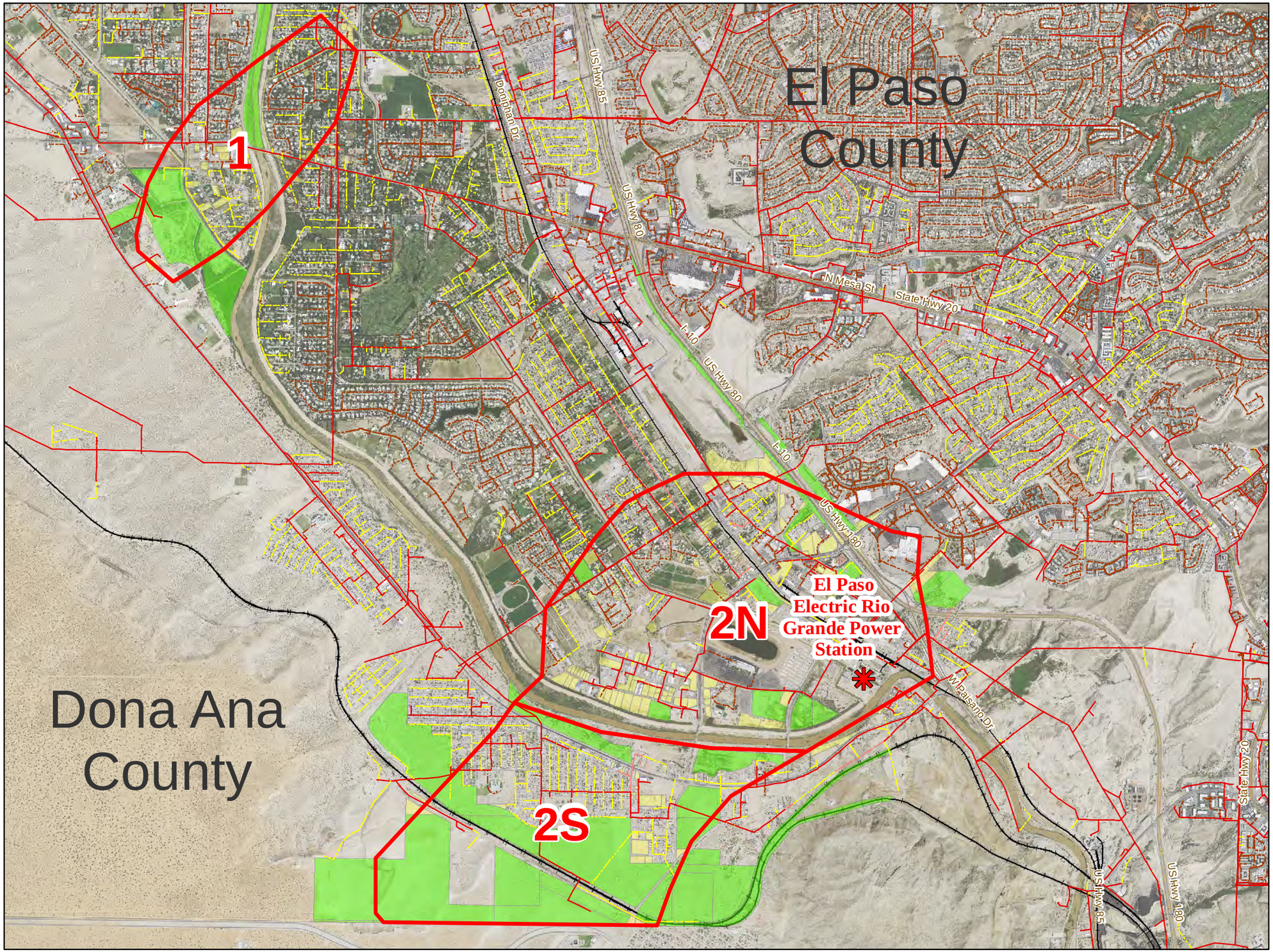
Feet

FIGURE 10
LAND USE: AREA 2N
Rio Grande Salinity Study Task B
Rio Grande Salinity Study



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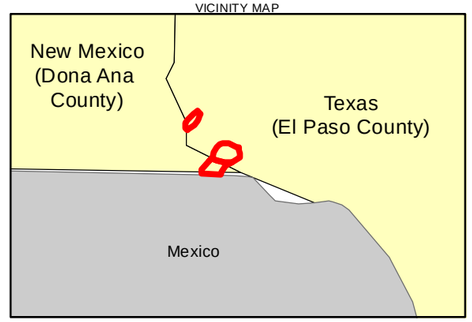

LEGEND

- Major Roads
- Railroad
- Potential Capture Area

Power Lines

Type

- Power Lines - Underground
- Power Lines - Over Head Phase 1
- Power Lines - Over Head Phase 2
- Power Lines - Over Head Phase 3

Vacant Parcels

Suitability

- EVAPORATION POND
- WATER TREATMENT PLANT
- WELL SITE

Notes:

1. Area of interest subject to change.
2. Source: USDA 2012 Agriculture Imagery
3. Sources: El Paso County GIS Department, and the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center.
4. Source: El Paso Electric power lines.

N

0 0.25 0.5
Miles

FIGURE 11
POWER LINES
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

Wetland Definitions

Label	Type
L1UBHx	Lake
L2USA	Lake
L2USAh	Lake
PAB3Hx	Freshwater Pond
PEM1A	Freshwater Emergent Wetland
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PUSCx	Freshwater Pond
PUSJh	Freshwater Pond
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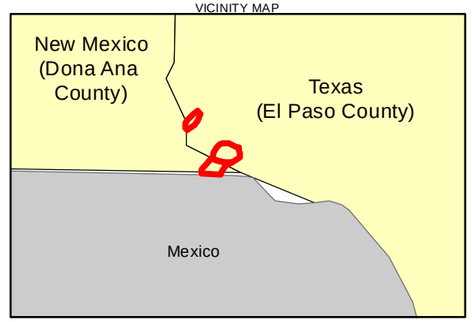
R4SBCx	Riverine

VICINITY MAP



LEGEND

- EPA Brownfield Site
- Public Recreation
- Facilities
- Railroad
- Local Streets
- Potential Capture Area
- National Wetland Inventory (NWI)
- Parks
- Parcels
- Draft IBWC Right-of-Way
- Draft IBWC Right-of-Way (Additional land acquired for IBWC ROW)
- IBWC Restoration Sites (IBWC is considering removal from the study)
- IBWC Restoration Sites

Vacant Parcels

Suitability per acres

- WELL SITE (equal to or greater than 0.02 ac)
- WATER TREATMENT PLANT (equal to or greater than 0.123 ac)
- NOT SUITED
- EVAPORATION POND (equal to or greater than 7 ac)

Notes:
1. Area of interest subject to change.
2. Source: USDA 2012 Agriculture Imagery
3. Sources: the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center, and photointerpretation from the USDA 2012 Agricultural Imagery and Bing Maps.

N

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Feet

FIGURE 12
AVAILABLE AREA AND SELECTED CONSTRAINTS: AREA 1
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

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Wetland Definitions

Label	Type
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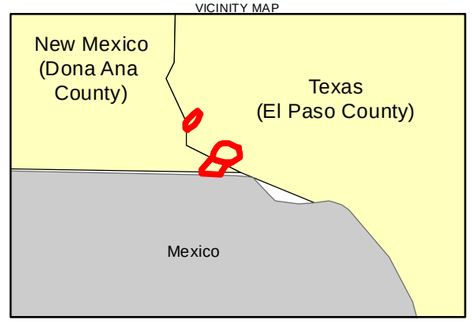
VICINITY MAP



LEGEND

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2. Source: USDA 2012 Agriculture Imagery
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N

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Feet

FIGURE 13
AVAILABLE AREA AND SELECTED CONSTRAINTS: AREA 2S
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

CH2MHILL

Wetland Definitions

Label	Type
L1UBHx	Lake
L2USA	Lake
L2USAh	Lake
PAB3Hx	Freshwater Pond
PEM1A	Freshwater Emergent Wetland
PEM1Ah	Freshwater Emergent Wetland
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PUSA	Freshwater Pond
PUSAh	Freshwater Pond
PUSAx	Freshwater Pond
PUSCx	Freshwater Pond
PUSJh	Freshwater Pond
R4SBA	Riverine
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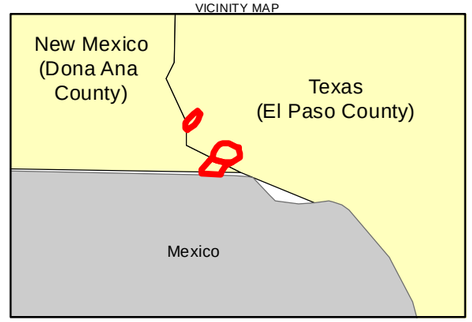
VICINITY MAP



LEGEND

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2. Source: USDA 2012 Agriculture Imagery
3. Sources: the City of El Paso from the University of Texas at El Paso Regional Geospatial Service Center, and photointerpretation from the USDA 2012 Agricultural Imagery and Bing Maps.

N

0 250 500 1,000 1,500
Feet

FIGURE 14
AVAILABLE AREA AND SELECTED CONSTRAINTS: AREA 2N
Rio Grande Salinity Study Task B
Rio Grande Salinity Study

CH2MHILL

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