EMERALD MANOR

FEASIBILITY REPORT

Prepared By:
TRE & Associates, LLC.
110 Mesa Park Drive, Suite 200
El Paso, Texas 79912
TBPE Firm # 13987

Prepared For:
Investment Builders, Inc.
7400 Viscount Blvd.
El Paso, Texas 79925

February 28, 2018
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EXECUTIVE SUMMARY

TRE & Associates LLC (TRE), completed a Feasibility Report for the Emerald Manor Development located in the Town of Horizon City (TOHC). The intention of this study is to assist Investment Builders Inc. in meeting the 2018 Housing Tax Credit (HTC) requirements for an engineering analysis of the proposed development. TRE performed due diligence by coordinating with the TOHC, El Paso Electric, Texas Gas, Horizon Regional Municipal District (HRMUD) and AT&T when conducting this report. The site was analyzed for development within the year of 2018.

Emerald Manor is a multi-family development that will be located at the intersection of Horizon Boulevard and Rifton Street. It is proposed to be a new tax credit development which will consist of 100 units and recreational areas. Each of proposed buildings will contain units that range from 670 square feet to 1440 square feet in size. The club house is proposed to be 2,065 square feet and will contain a covered patio, fitness center, community room, as well as other amenities. The site is abutted by three roadways, providing adequate access. There are no adverse soil or environmental conditions and the site is abutted by existing electric, gas, water and wastewater utilities. The Emerald Manor Project is in close proximity to schools and commercial services as seen in Figure 1 below, which illustrates the site as well as places of interest nearby.

Figure 1: Vicinity Map
All aspects of the site development are anticipated to be in compliance with the applicable guidelines, ordinances and codes of TOHC. Platting and subdivision improvement plans will need to be presented to the TOHC Planning and Zoning Commission and City Council, in order to obtain approval. The report identifies the permits and fees that are required in order to develop the complex. After careful review and study of the proposed development, it was determined that there are no apparent concerns. Therefore, this report was written in support of the multi-family development.
Introduction

Investment Builders Inc. is preparing an application for 2018 HTC. Emerald Manor is a proposed multi-family development which will consist of 578,273 square feet (13.28 acres). The proposed development will include 100 units of 1, 2, 3 and 4 bedrooms as well as a club house. The Site is located in Horizon City, Texas. Ordinances, guidelines and codes from the Town of Horizon City were utilized in preparation of this report. The site, existing conditions and subdivision requirements were the areas of focus for the study.

Site

Location

The site is located in Horizon City, Texas which is illustrated in Figure 2 below. The site is located north of Horizon Blvd., in-between Rifton Street and Anderpont Street. The site is bound by vacant land to the west and south and residential development surrounds the site to the east and north.

Figure 2: Location Map
Table 1 below lists the 2017 millage rate per $100 and the entities associated with each rate.

**Table 1: 2015 Millage Rates**

<table>
<thead>
<tr>
<th>Entity</th>
<th>Millage Rate per $100</th>
<th>Appraised/Taxable Value</th>
<th>Estimated Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizon City</td>
<td>0.492</td>
<td>$136,726</td>
<td>$672.36</td>
</tr>
<tr>
<td>El Paso County</td>
<td>0.453</td>
<td>$136,726</td>
<td>$618.95</td>
</tr>
<tr>
<td>Clint I.S.D</td>
<td>1.407</td>
<td>$136,726</td>
<td>$1,923.19</td>
</tr>
<tr>
<td>El Paso Community College</td>
<td>0.142</td>
<td>$136,726</td>
<td>$193.66</td>
</tr>
<tr>
<td>Emergency Services District #1</td>
<td>0.100</td>
<td>$136,726</td>
<td>$136.00</td>
</tr>
<tr>
<td>University Medical Center</td>
<td>0.252</td>
<td>$136,726</td>
<td>$344.47</td>
</tr>
<tr>
<td>Horizon Mud</td>
<td>0.512</td>
<td>$136,726</td>
<td>$700.05</td>
</tr>
<tr>
<td><strong>Total Tax Rate</strong></td>
<td><strong>3.356</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Taxes w/Current Exemptions</strong></td>
<td></td>
<td></td>
<td><strong>$4,588.68</strong></td>
</tr>
<tr>
<td><strong>Taxes w/o Exemptions</strong></td>
<td></td>
<td></td>
<td><strong>$4,588.68</strong></td>
</tr>
</tbody>
</table>
The site consists of approximately 13.28 acres, which is currently being platted as a parcel shown in Figure 3, below. The legal description is as follows: Being a Portion of Tract 4, Section 32, Block 78, Township 3, Texas and Pacific Railroad Company Surveys, Town of Horizon City, El Paso County, Texas. The property identification number from the El Paso Central Appraisal District for Emerald Manor is 219272.
Zoning and Proposed Uses

According to Zoning Ordinance #0102 Section 502, A-1 (Multi-family) Zoning allows for multi-family dwelling including rental apartments, cooperative apartments, and condominiums. Currently the site is zoned A-1, which allows for multi-family development within the current zoning category. The site will be used to develop an apartment complex. Figure 4 below illustrates the proposed site plan. The site plan below is anticipated to adhere to all applicable zoning, site development, and building code ordinances set by the TOHC.

Figure 4: Site Layout
EXISTING CONDITIONS

ENVIRONMENTAL ASSESSMENT

Construction & Environmental Consultants, Inc. (CECI) conducted the Phase I environmental site assessment dated February 26, 2018 which can be referenced in the application for the Texas Department of Housing Authority submittal. The study performed in accordance with all ASTM site assessment standards, which included the site as well as surrounding areas. The intent of the assessment was to identify potential environmental concerns. CECI accounted for historical, regulatory, on-site recognized as well as off-site recognized environmental concerns while preparing their assessment. The historical review indicated that there was no evidence revealing prior industrial use for the proposed site. Federal and State environmental regulatory lists were utilized to determine that there are no regulatory environmental concerns. Further assessments as well as site reconnaissance aided in determining that there is no concern for off-site or on-site environmental conditions. Overall, the findings indicated that no environmental conditions exist for the site at this time.

SOIL REPORT

A soils report for the area of interest was obtained from the United States Department of Agriculture and can be referenced in Appendix C. The soil for the area of study is composed of 45% Hueco and similar soils, 35% Wink and similar soils and 20% of minor components. The soils are classified as Group B from the ASHTO classification system. This type of soil consists of fine loamy, poorly graded sand with intermittent pockets of caliche approximately 24 inches below the surface. According to the report, the soil is well drained and there is no frequency of flooding or ponding associated with the soils. The report also indicates that there are no soil limitations that would affect the site.

SURVEY/TOPOGRAPHY

A survey of the site was prepared by H2O Terra and can be referenced in Appendix B. The survey includes topographic information which shows contours that indicate the project area is gently sloping down in a south-western direction.
Utilities

El Paso Electric Company currently supplies overhead electric service near the site. The existing overhead electric distribution system is fully capable of supporting the new development. Texas Gas Service Company is able to provide natural gas service through existing gas mains along Horizon Blvd., Rifton St. and Anderpont St., which are all adjacent to the site. AT&T also has facilities nearby which will provide service to the new development. The Horizon Regional Municipal Utility District provides water and wastewater service to the area. There are existing water and wastewater lines along Rifton St. with confirmed capacity that the site will be able to tie into. Utility commitment letters with corresponding asbuilts can be referenced in Appendix A.

Flood Zone

The site currently lies in Flood Zone X. Flood Zone X is defined as an area determined outside of the 500 year flood plain as per FIRM No. 4802120250B dated September 4, 1991.

Subdivision Requirements

Local Requirements

It will be necessary that the site be in compliance with all codes, ordinances, regulations and standards set by the TOHC. A URL link has been provided in the reference section of this report which contains the City’s development codes. HRMUD rules and regulations must be followed for water and wastewater. In addition, all building plans must conform to the International Building Code 2003 2nd Edition as adopted by the TOHC.
**REQUIRED APPROVALS, PERMITS AND FEES**

*Table 2* below lists the required reviews, approvals, permits and fees for the development of Emerald Manor.

*Table 2:* List of Required Approvals, Permits and Fees.

<table>
<thead>
<tr>
<th>Review</th>
<th>Approval</th>
<th>Permit</th>
<th>Fees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Permit</td>
<td>Town of Horizon and Town Engineer</td>
<td>Town of Horizon</td>
<td>$25,400 not including trade permits</td>
</tr>
<tr>
<td>Construction</td>
<td>N/A</td>
<td>N/A</td>
<td>$1,000,000 liability coverage, $10,000 surety bond and $50 registration fee</td>
</tr>
<tr>
<td>Grading</td>
<td>Town Engineer</td>
<td>Town Engineer</td>
<td>$560</td>
</tr>
<tr>
<td>Parkland</td>
<td>N/A</td>
<td>Council</td>
<td>N/A</td>
</tr>
<tr>
<td>Platting</td>
<td>Town Engineer and Town of Horizon</td>
<td>P&amp;Z Council</td>
<td>$1,480 includes, preliminary, final and recording</td>
</tr>
<tr>
<td>Subdivision Improvement Plans</td>
<td>TOH Engineer, Public Works Director &amp; Fire Marshal</td>
<td>Town Engineer</td>
<td>Included in platting fees. A $120/hr. fee would incur in the case of TOHC overages</td>
</tr>
<tr>
<td>Water and Wastewater Plans</td>
<td>HRMUD</td>
<td>HRMUD</td>
<td>$7,500 deposit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N/A</td>
<td>$6,362 facility reimbursement fee</td>
</tr>
</tbody>
</table>

**TIMELINE**

*Table 3* below lists the activities required to complete the development of the site along with the anticipated beginning and ending dates.

*Table 3:* Activities and Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Begin Date</th>
<th>End Date</th>
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</thead>
<tbody>
<tr>
<td>Preliminary Platting</td>
<td>April 2018</td>
<td>June 2018</td>
</tr>
<tr>
<td>Final Platting</td>
<td>June 2018</td>
<td>July 2018</td>
</tr>
<tr>
<td>Subdivision Plan Approval</td>
<td>June 2018</td>
<td>July 2018</td>
</tr>
<tr>
<td>Grading Permit</td>
<td>August 2018</td>
<td>August 2018</td>
</tr>
<tr>
<td>Recording of Plat</td>
<td>August 2018</td>
<td>August 2018</td>
</tr>
<tr>
<td>Building Plan Approval</td>
<td>August 2018</td>
<td>August 2018</td>
</tr>
<tr>
<td>Building Plan Permits</td>
<td>September 2018</td>
<td>September 2018</td>
</tr>
<tr>
<td>Construction</td>
<td>September 2018</td>
<td>October 2018</td>
</tr>
</tbody>
</table>
Ingress and Egress

Section 502 of the Zoning ordinance code, states that all vehicular access shall be restricted to collector or arterial streets. One access point will be provided to the site on the west by an existing collector street named Rifton Street.

Onsite Requirements

Subdivision Ordinance 305 for the TOHC requires that the site be provided with water, wastewater, electric and AT&T utilities. Furthermore, the ordinance requires that the site retain its own stormwater runoff. A comprehensive description of proposed drainage improvements can be found in the subsection entitled Drainage Requirements of this report. As per Section 502 of the Town of Horizon Zoning ordinance, it is required that central washroom/dryer facilities be provided, unless all individual residential units have washer and dryer connections. As per the site plan, washer and dryer connections are proposed to be provided in all individual units. Also, no less than two parking spaces shall be provided per apartment. The current site plan has incorporated 243 spaces, satisfying the local ordinance requirements.

Offsite Requirements

No offsite developments or improvements are required for this development.

Set-Back Requirements

<table>
<thead>
<tr>
<th>502.6.3</th>
<th>Yard Standards (Minimum in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front Yard</td>
</tr>
<tr>
<td>Apartments</td>
<td>20</td>
</tr>
</tbody>
</table>

Fire Department Requirements

Emergency Service District #1 requires that the International Fire Code (2009) be met.
As stated previously, the TOHC requires that the site retain its runoff. Therefore this section discusses proposed drainage improvements in order to comply with the TOHC ordinance. Desert Breeze Unit 1, an existing subdivision to the north, has a pond located near its southern boundary illustrated in Figure 5. This pond retains the runoff for the entire subdivision. It is proposed that the pond be expanded with the addition of a flume in order to serve Emerald Manor. The storm water in Emerald Manor will be conveyed through curb and gutter into the expanded retention pond.
CONCLUSION

The Emerald Manor tax credit development will provide 100 units to the TOHC. The property will have one access point providing adequate access through Rifton St. onto Horizon Boulevard. The surrounding development supports the multi-family development with nearby schools and commercial services in close proximity. Adjacent to the property is Horizon High School. Desert Hills Elementary School and Horizon Middle School are also within walking distance. Through the Safe Routes to School Program, surrounding areas near the site will be equipped with hike and bike paths so that students may arrive to school safely. There are no adverse soil or environmental conditions and the site is abutted by existing electric, gas, water and wastewater utilities. The site will also provide for adequate drainage with the proposed expansion of the existing pond to the north. On the basis of review of the information obtained during our assessment, it is our professional opinion that the development for the proposed site is feasible.
REFERENCES

- City Development Codes

- United States Department of Agriculture

- Paseo Del Norte Mapa
  - http://www.pdnmapa.org/

- El Paso Central Appraisal District
  - http://www.epcad.org/
Appendix A

Utility Commitment Letters and Asbuilts
February 18, 2016

ATTN: Changho Yi, EIT
TRE & ASSOCIATES, LLC
110 Mesa Park Drive, Suite 200
El Paso, TX 79912
Office: 915.852.9093
Fax: 915.629.8506
cyi@tr-eng.com

Re: Emerald Manor Subdivision

This letter is to provide information concerning utility availability for the indicated property.

AT&T Texas has facilities nearby, which will provide service to the above mentioned property.

Please feel free to contact my direct number below if any further information is needed.

Also, if possible please provide any future site plans as they become available.

Sincerely,

Donnie Duncan
Mgr. Engineering (Design)
AT&T Texas
(915) 595-5140
11200 Pellicano Dr.
El Paso, Texas 79935
February 22, 2016

Changho Yi, EIT
TRE & Associates, LLC
110 Mesa Park Drive, Suite 200
El Paso, Texas 79912

Dear Mr. Yi:

CONFIRMATION OF ELECTRIC SERVICE TO PROPERTY DESCRIBED AS EMERALD MANOR

This letter is in response to your email dated February 22, 2016, requesting confirmation of electric service to property described in the reference line above and more specifically, located near the intersection of Horizon Boulevard and Rifton Street.

El Paso Electric Company (EPE) currently supplies overhead electric service near the South property line and the West property line of the property described as Emerald Manor. This existing overhead electric distribution system is fully capable of continuing to supply the electrical requirements at this property. Any new or additional electrical facilities that may be required to supply electric service to this property will be designed and constructed in compliance with EPE’s Distribution Design and Construction Standards and in compliance with EPE’s Line Extension Policy approved by the Public Utility Commission of Texas. If you have any questions or if you need more information, please call me at 543-4106.

Sincerely,

Margaret G. Ontiveros
Supervisor, Distribution Design
February 18, 2016

Changho Yi, EIT
TRE & Associates, LLC
110 Mesa Park Drive, Suite 200
El Paso, TX 79912

Re: Utility Availability for Emerald Manor

Dear Mr. Yi,

Texas Gas Service has existing natural gas services to the above-referenced area from an existing 6" PE IP gas main previously installed along Horizon Blvd. located south or from the existing 4" PE IP mains previously installed along Rifton St. & Boderlon Pl. towards the East and West of the proposed development.

It is the consultant and/or surveyor responsibility to illustrate the lines on the plans and to notify TGS if the proposed improvements will be in conflict with our existing facilities. It is the contractor responsibility to call for line spots before digging.

Mainline extensions, retirements, relocations or new service line requests would need to be directed to our Customer Development Department. Texas Gas Service recommends that a request for gas service be submitted as soon as possible (approx. 6 months prior to construction) followed by all required paperwork by Texas Gas Service. The actual cost and points of service will be determined upon review of the final site plan and required gas capacity. The developer and/or customer will be responsible for any fees, cost of construction, permitting, etc. that will be incurred to extend and provide gas service. The gas extension to serve the above-mentioned property has been based on the rules and regulation of Texas Gas Service Company.

Please submit any questions, comments and all gas service requests to our Customer Development Group at elpasonewbusiness@txgas.com.

Sincerely,

Laura Cecilia Ruiz
Engineer I
DISCLAIMER: This document and information herein is a visual representation and approximation of ONE Gas facilities and is subject to revision at any time without notice. It is an informational tool and is not guaranteed, warranted, or represented to be to scale, complete, accurate, or depicting depth. ONE Gas disclaims any and all liability for same. Call 811 by dialing 811 prior to excavation.
February 16, 2016

Mr. Changho Yi
TRE & Associates, LLC
110 Mesa Park Dr., Ste. 200
El Paso, Texas 79912

Re: Emerald Manor

Dear Mr. Yi:

The above referenced property lies within the boundaries of the Horizon Regional Municipal Utility District, and the District will be the provider for water and wastewater services subject to its rules and regulations.

Water and wastewater are available from Horizon Blvd. to the South. However, prior to any approval for water or sewer service to a new development, a commitment application must be filed at the District's office, along with a base deposit of $500, plus $100 per LUE. The commitment process will provide you with information on service availability, the need for upgrades or extensions, and connection details. A development plan and a plat should be filed with your application. The District's engineers will review your application and respond within 30 days of receipt.

The District's rules state that no construction shall begin on any water and sewer improvements until all construction plans and specifications have been reviewed and approved by the District's engineer. This rule is in place to assure that the integrity of the District's water and wastewater system is not compromised. Onset of construction prior to approval could result in additional expense to the developer if modification to their plans is required.

Please call at (915)852-3557 if you require further information.

Sincerely,

Charlie McGinnis
General Manager

cc: Board of Directors, Horizon Regional M.U.D.
Ms. Linda C. Troncoso, P.E.; TRE & Associates, LLC
Appendix B

H2O Terra Survey
PREPARED FOR: HUNT HORIZON CROSSING, LLC.
Being a Portion of Tract 4, Section 32, Block 78, Township 3, Texas and Pacific
Railroad Company Surveys, Town of Horizon City, El Paso County, Texas
W.O. 012615-8
February 18, 2015
Updated February 21, 2018

PROPERTY DESCRIPTION
(Emerald Manor)

Description of a 13.275 acre parcel of land Being a Portion of Tract 4, Section 32, Block 78, Township 3, Texas and Pacific Railroad Company Surveys, Town of Horizon City, El Paso County, Texas and being more particularly described by metes and bounds as follows to wit:

Starting at an existing city monument located at the centerline intersection of Rifton Street and Cactus View Court, Thence South 00°31'50" East along the centerline of Rifton Street a distance of 395.26 feet to a point, Thence North 89°28'10" East a distance of 30.00 feet to a found nail on rockwall, said nail being the "TRUE POINT OF BEGINNING";

Thence North 89°55'56" East along the southerly boundary line of Desert Breeze Unit 1, Block 1, a distance of 889.31 feet to a nail on rockwall;

Thence South 00°31'50" East a distance of 630.30 feet to a found 5/8" rebar with cap stamped TX, 2449, Roe Engineering, L.C., said rebar lying along the westerly right-of-way line of Andrepont Street;

Thence along an arc of a curve to the right a distance of 31.58 feet, whose radius 20.00 feet, whose central angle is 90°27'46" and whose chord bears South 44°42'03" West a distance of 28.40 feet to a found 5/8" rebar with cap stamped TX, 2449, Roe Engineering, L.C., said rebar lying along the northerly right-of-way line of Horizon Boulevard;

Thence South 89°55'56" West along said northerly right-of-way -line of Horizon Boulevard a distance of 849.31 feet to a found 5/8" rebar with cap stamped TX, 2449, Roe Engineering, L.C.;

Thence along an arc of a curve to the right a distance of 31.25 feet, whose radius 20.00 feet, whose central angle is 89°32'14" and whose chord bears North 45°17'57" West a distance of 28.17 feet to a found 5/8" rebar with cap stamped TX, 2449, Roe Engineering, L.C., said rebar lying along the Easterly right-of-way line of Rifton Street;

Thence North 00°31'50" West along said Easterly right-of-way line of Rifton Street a distance of 630.62 feet back to the "TRUE POINT BEGINNING" and said parcel containing 578,272 square feet or 13.275 acres of land more or less.

Charles Henry Gutierrez
R.P., L.S. 5572
H2O Terra

Not a ground survey
This survey may be subject to other easements and covenants of record not shown.
A title report was not furnished for this survey when updated.
Appendix C

United States Department of Agriculture Soil’s Report
Custom Soil Resource Report for El Paso County, Texas (Main Part)
Emerald Manor

February 16, 2018
Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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<td>5</td>
</tr>
<tr>
<td>Soil Map</td>
<td>8</td>
</tr>
<tr>
<td>Soil Map</td>
<td>9</td>
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<tr>
<td>Legend</td>
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<tr>
<td>Map Unit Legend</td>
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<tr>
<td>Map Unit Descriptions</td>
<td>11</td>
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<td>13</td>
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<tr>
<td>HW—Hueco-Wink association, hummocky</td>
<td>13</td>
</tr>
<tr>
<td>References</td>
<td>15</td>
</tr>
</tbody>
</table>
How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil
scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.
The soil surveys that comprise your AOI were mapped at 1:31,700.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County, Texas (Main Part)
Survey Area Data: Version 15, Nov 7, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 13, 2014—Feb 5, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.
Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW</td>
<td>Hueco-Wink association, hummocky</td>
<td>14.1</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td><strong>Totals for Area of Interest</strong></td>
<td><strong>14.1</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.
An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.
El Paso County, Texas (Main Part)

HW—Hueco-Wink association, hummocky

Map Unit Setting

- National map unit symbol: \text{rcww}
- Elevation: 2,700 to 4,500 feet
- Mean annual precipitation: 5 to 12 inches
- Mean annual air temperature: 57 to 70 degrees F
- Frost-free period: 210 to 260 days
- Farmland classification: Not prime farmland

Map Unit Composition

- Hueco and similar soils: 45 percent
- Wink and similar soils: 35 percent
- Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hueco

Setting

- Landform: Sand sheets
- Landform position (three-dimensional): Rise
- Down-slope shape: Convex
- Across-slope shape: Convex
- Parent material: Pleistocene-age coarse-loamy alluvium

Typical profile

- \text{H1} - 0 to 4 inches: loamy fine sand
- \text{H2} - 4 to 26 inches: fine sandy loam
- \text{H3} - 26 to 58 inches: cemented material
- \text{H4} - 58 to 80 inches: variable

Properties and qualities

- Slope: 0 to 3 percent
- Depth to restrictive feature: 20 to 40 inches to petrocalcic
- Natural drainage class: Well drained
- Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
- Depth to water table: More than 80 inches
- Frequency of flooding: None
- Frequency of ponding: None
- Calcium carbonate, maximum in profile: 15 percent
- Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

- Land capability classification (irrigated): 4e
- Land capability classification (nonirrigated): 7e
- Hydrologic Soil Group: B
- Ecological site: Loamy Sand (Desert Shrub) (R042XY268TX)
- Hydric soil rating: No

Description of Wink

Setting

- Landform: Sand sheets
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Pleistocene-age coarse-loamy alluvium

Typical profile
- H1 - 0 to 6 inches: fine sandy loam
- H2 - 6 to 24 inches: fine sandy loam
- H3 - 24 to 73 inches: variable
- H4 - 73 to 80 inches: very gravelly loam

Properties and qualities
- Slope: 0 to 3 percent
- Depth to restrictive feature: More than 80 inches
- Natural drainage class: Well drained
- Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
- Depth to water table: More than 80 inches
- Frequency of flooding: None
- Frequency of ponding: None
- Calcium carbonate, maximum in profile: 40 percent
- Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- Available water storage in profile: Low (about 4.9 inches)

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 7e
- Hydrologic Soil Group: A
- Ecological site: Sandy Loam (Desert Shrub) (R042XY271TX)
- Hydric soil rating: No

Minor Components
- Unnamed, minor components
  - Percent of map unit: 20 percent
  - Hydric soil rating: No
References


