Application for Certificates of Environmental Compatibility

TEP Reciprocating Internal Combustion Engine Generation Project

and

Irvington 138kV Transmission Line Relocation Project

Prepared for:

Arizona Power Plant and
Transmission Line Siting Committee

Submitted by:

Tucson Electric Power Company

Date: December 8, 2017
Case No. 000000

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BEFORE THE

ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

In the matter of the Application of Tucson Electric Power Company (TEP), in conformance with the requirements of Arizona Revised Statutes §§ 40-360, et seq., for Certificates of Environmental Compatibility authorizing the construction of the Reciprocating Internal Combustion Engine Generation Project and the Irvington 138kV Transmission Line Relocation Project, including the installation of ten (10) modular approximately 20 MW reciprocating internal combustion engine generators and construction of approximately 2.2 miles of new 138kV transmission lines located within TEP's Irvington Campus, Section 3, Township 15 South, Range 14 East, Pima County, Arizona.	Docket No. _____ Case No. _____

APPLICATION FOR

CERTIFICATES OF ENVIRONMENTAL COMPATIBILITY

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TABLE OF CONTENTS

TABLE OF CONTENTS iii
LIST OF FIGURES v
LIST OF TABLES v
LIST OF EXHIBITS vi
LIST OF ACRONYMS AND ABBREVIATIONS vii
1.0 INTRODUCTION 1
2.0 APPLICATION FOR CERTIFICATES OF ENVIRONMENTAL COMPATIBILITY 2
2.1 Project Information 2
EXHIBIT A: LOCATION AND LAND USE MAPS A-1
EXHIBIT B: ENVIRONMENTAL REPORT B-1
B.1 Introduction B-1
B.2 Environmental Planning Process B-1
B.2.1 Overview B-1
B.3 Environmental Statements B-2
B.3.1 US Fish and Wildlife Service B-2
B.3.2 City of Tucson Historic Preservation Program B-2
B.3.3 U.S. Army Corps of Engineers B-2
B.3.4 Federal Aviation Administration B-2
B.3.5 Department of Defense B-2
B.3.6 Air Quality Permit (EPA, ADEQ, PDEQ) B-2
EXHIBIT C: AREAS OF BIOLOGICAL WEALTH C-1
C.1 Biological Wealth C-1
C.1.1 Introduction C-1
C.2 Special Status Species C-1
C.3 Important Riparian Areas C-1
C.4 Potential Impacts C-1
C.5 Conclusion C-2
C.6 References C-2
EXHIBIT D: BIOLOGICAL RESOURCES D-1

D.1 General Project Setting D-1
D.2 Biological Resources D-1
D.3 Impacts D-2
D.4 Conclusion D-2
D.5 References D-2
EXHIBIT E: SCENIC AREAS, HISTORIC SITES AND STRUCTURES, AND ARCHAEOLOGICAL SITES E-1
E.1 Scenic Areas and Visual Resources E-1
E.1.1 Overview E-1
E.1.2 Inventory Methods E-1
E.1.3 Inventory Results E-1
E.2 Historic Sites and Structures, and Archaeological Sites E-2
E.2.1 Overview E-2
E.2.2 Inventory Methods and Results E-2
EXHIBIT F: RECREATIONAL PURPOSES AND ASPECTS F-1
EXHIBIT G: CONCEPTS OF PROPOSED FACILITIES G-1
EXHIBIT H: EXISTING PLANS H-1
H.1 Federal H-1
H.2 State H-1
H.3 City H-1
H.4 County H-1
H.5 Private H-1
H.6 Land Use H-2
H.6.1 Overview H-2
H.6.2 Inventory H-2
H.6.3 Impact Assessment and Results H-3
H.7 Conclusion H-3
H.8 References H-3
EXHIBIT I: ANTICIPATED NOISE AND INTERFERENCE WITH COMMUNICATION SIGNALS I-1
I.1 Corona and Audible Noise I-1
I.2 Radio Interference I-3
I.3 Television Interference I-3

I.4 Electric and Magnetic Field Effects I-3
I.5 References I-4
EXHIBIT J: SPECIAL FACTORS J-1
J.1 Introduction J-1
J.2 Public Involvement Program Summary J-1
J.2.1 Stakeholder Briefings J-1
J.2.2 Fact Sheet/Newsletters J-4
J.2.3 Public Open House J-5
J.2.4 Telephone Information Line J-5
J.2.5 Internet Web Site J-5
J.2.6 Comment Tracking Database J-5
J.3 Comments Received J-6

LIST OF FIGURES

Figure 2-1. Renewable Energy and RICE Output 4
Figure 2-2. TEP's Existing 10-Minute Ramping Capacity versus Projected Requirements 4
Figure 2-3. Route #1 8
Figure 2-4. EMFs from Various Sources I-4

LIST OF TABLES

Table 2-1. Estimated Fuel Consumption by RICE Generators 5
Table 2-2. Future Plans in the Study Area H-3
Table 2-3. EMF Strength of Various Electrical Sources at Various Distances I-4
Table 2-4. Stakeholder List J-2

LIST OF EXHIBITS

A-1	RICE Generation Plant – Location
A-2	RICE Generation Plant – Land Use
A-3	138 kV Transmission Line – Location
A-4	138 kV Transmission Line – Land Use
B-1	USACE AJD letter
C-1	Biological Map
C-2	Biological Evaluation
C-3	USFWS Section 7 letter
C-4	Important Riparian Area Memo
E-1	Cultural Resources Inventory (Redacted)
E-2	COT Cultural Resources Concurrence letter
F-1	Recreation Map
G-1	Schematic Plan
G-2	Schematic Elevation
G-3	Structure Drawings
G-4	Visual Simulations
H-1	UPRR letter to TEP
H-2	UPRR: response from TEP
H-3	Utility Inventory
I-1	Sundt RICE Sound Study
J-1	Legal Description
J-2	Newsletter #1
J-3	Comment Form
J-4	Open House Posters
J-5	Fact Sheet
J-6	Open House Sign-In Sheet
J-7	Open House Comments
J-8	ADOT Stakeholder Meeting Notes
J-9	AZGFD Letter of Confirmation
J-10	Comments Received

LIST OF ACRONYMS AND ABBREVIATIONS

3d	3-dimensional
A	Amperes
AAC	Arizona Administrative Code
ACC	Arizona Corporation Commission
ADOT	Arizona Department of Transportation
AM	Amplitude modulation
AN	Audible noise
APE	Area of Potential Effect
ASLD	Arizona State Land Department
ASM	Arizona State Museum
AZGFD	Arizona Game and Fish Department
BE	Biological Evaluation
CEC	Certificate of Environmental Compatibility
Committee	Arizona Power Plant and Transmission Line Siting Committee
COT	City of Tucson
dBA	A-weighted decibels
DMAFB	Davis-Monthan Air Force Base
DOD	U.S. Department of Defense
EMF	Electric and Magnetic Fields
EPA	Environmental Protection Agency
EPNG	El Paso Natural Gas
^{o}F	Degrees Fahrenheit
FAA	Federal Aviation Administration
FM	Frequency modulation
GIS	Gas-insulated substation
HCP	Habitat Conservation Plan
HDMS	Heritage Data Management System

I-10	Interstate 10
IPaC	Information for Planning and Consultation
IRA	Important Riparian Area
IRP	Integrated Resource Plan
KOP	Key Observation Point
kV	Kilovolts
MW	Megawatts
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
PAD	Planned Area Development
PDEQ	Pima County Department of Environmental Quality
Projects	Reciprocating Internal Combustion Engine Generation Project and the Irvington 138 kV Transmission Line Relocation Project
PSD	Prevention of Significant Deterioration
PV	Photovoltaic
RICE	Reciprocating Internal Combustion Engine
ROW	Right-of-way
SDCP	Sonoran Desert Conservation Plan
SHPO	State Historic Preservation Office
TEP	Tucson Electric Power Company
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
V	Volts

1.0 INTRODUCTION

Tucson Electric Power Company (TEP) requests that the Arizona Power Plant and Transmission Line Siting Committee (Committee) issue two Certificates of Environmental Compatibility (CEC) granting authority to construct the Reciprocating Internal Combustion Engine Generation Project (RICE Generation Project) and the Irvington 138 kV Transmission Line Relocation Project (Transmission Line Project), (collectively called Projects).

The RICE Generation Project involves a new natural gas-fired, RICE generation plant located on TEP's Irvington Campus (Irvington Campus) at South Contractors Way and East Irvington Road in Tucson, Arizona. The RICE Generation Project is composed of ten (10) natural gas-powered units capable of producing approximately 20 MW each, for a build-out total of 200 MW. The RICE will provide necessary fast-ramping, thermal resources and replace aging steam generation units (Sundt Units 1 and 2) in furtherance of TEP's goal of reaching 30% renewables by 2030. Incorporating RICE technology will also result in meaningful reductions in air emissions and water consumption. RICE generation has been identified by TEP as the most efficient resource to help TEP regulate and balance its electrical grid to meet the changes in demand during peak energy usage. The RICE Generation Project is part of TEP's long-term resource plan and was identified in its Integrated Resource Plan (IRP) filed with the Arizona Corporation Commission (ACC) on April 3, 2017.

The Transmission Line Project will consist of both new and modified 138 kV transmission lines totaling approximately 2.6 miles, to (i) connect the RICE Generation Project to TEP's transmission system and (ii) enable the construction of a new 138 kV substation (which is replacing an existing substation).

The Projects will be located wholly within the Irvington Campus.

The relief requested in this Application balances, in the broad public interest, the need for an adequate, economical, and reliable supply of electric power with the desire to minimize impacts on the environment and ecology of the state of Arizona. The RICE Generation and Transmission Line Projects will greatly enhance the reliability of the electric grid and support TEP's expanded use of renewable resources. As noted above, the Projects will be located at the same site as four (4) existing generating units (Sundt Units 1-4) and will result in no adverse impacts on factors to be considered by the Committee pursuant to A.R.S. §§ 40-360.06 and 40-360.13, including, but not limited to, existing land use plans; fish, wildlife, and plant life; areas unique because of biological wealth; scenic areas, historic sites and structures and archaeological sites; and the total environment of the area. As such, TEP respectfully requests that the Committee grant, and the ACC approve, the requested CECs for the RICE Generation Project and the Transmission Line Project.

2.0 APPLICATION FOR CERTIFICATES OF ENVIRONMENTAL COMPATIBILITY

(Pursuant to A.R.S. § 40-360.03 and 40-360.06)

2.1 Project Information

1. ***Name and address of Applicant:***

   Tucson Electric Power Company (TEP)
   88 East Broadway Blvd, Tucson, AZ 85701
   PO Box 711, Tucson, AZ 85702

2. ***Name, address and telephone number of a representative of Applicant who has access to technical knowledge and background information concerning this application, and who will be available to answer questions or furnish additional information:***

   Ed Beck
   Director, Transmission Development
   Tucson Electric Power
   88 East Broadway Blvd, Tucson, AZ 85701
   PO Box 711, Tucson, AZ 85702
   Phone: (520) 884-3615

3. ***Dates on which Applicant filed a Ten-Year Plan in compliance with A.R.S. § 40-360.02, and designate each such filing in which the facilities for which this application is made were described. If they have not been previously described in a Ten-Year Plan, state the reasons therefore:***

   TEP filed its current 2017-2026 Ten-Year Plan in January of 2017. These Projects were not included in the 2017-2026 Ten Year Plan. TEP identified the RICE Generation Project in its 2017 IRP filed in April of 2017. On September 15, TEP filed a supplement to its Ten-Year Plan to include both the RICE Generation Project as well as the Transmission Line Project.

4. ***Description of the proposed generation facilities:***
   a. ***Description of electric generating plant:***

      The RICE Generation Project consists of ten (10) natural gas-powered units capable of producing approximately 20 MW each, for a build-out total of 200 MW. The purpose of the RICE Generation Project is to provide TEP's system with new fast start, fast ramping thermal resources with mechanical inertia. These resources will help balance grid operations, enhance renewable energy production, and increase system reliability and sustainability of electrical power for TEP customers. For the last 50 years, TEP has relied on coal plants to meet the majority of its customers' energy needs. Currently, resource economics and environmental considerations have shifted the historically strong preference for coal to a more balanced use of coal, natural gas, and renewable resources.

To meet changing customer use patterns and more stringent operating requirements, TEP has developed a long-term portfolio diversification strategy, in which TEP is reducing its reliance on coal. By mid-2022, TEP will reduce its coal-fired capacity by 508 MW through planned retirements. These reductions in coal resources will result in significant cost savings for TEP's customers as well as meaningful reductions in air emissions and water consumption.

TEP will continue to expand its portfolio of renewable energy resources as a component of the overall resource diversification plan as well as meeting its targeted goal of serving 30% of retail load with renewable energy by 2030. Utility-scale solar photovoltaic (PV) that is tied to the distribution grid has substantial benefits, and if properly planned and sited may contribute to reduced line losses, apportioned capacity reductions (generation and transmission), along with environmental benefits. However, an increasing amount of utility-scale and customer-sited solar PV in TEP's portfolio introduces operational challenges (see Figure 2-1). It is critical for TEP to maintain adequate resources that can balance load and generation, especially as the increased use of renewable energy leads to greater intermittency of generation and greater ramping requirements of non-renewable energy resources. TEP's portfolio does not currently have sufficient ramping capacity to meet its projected requirements as indicated in the chart in Figure 2-2. TEP has identified RICE generation technology as its preferred technology to provide capacity and assist in mitigating renewable energy intermittency and variability as outlined in TEP's IRP.

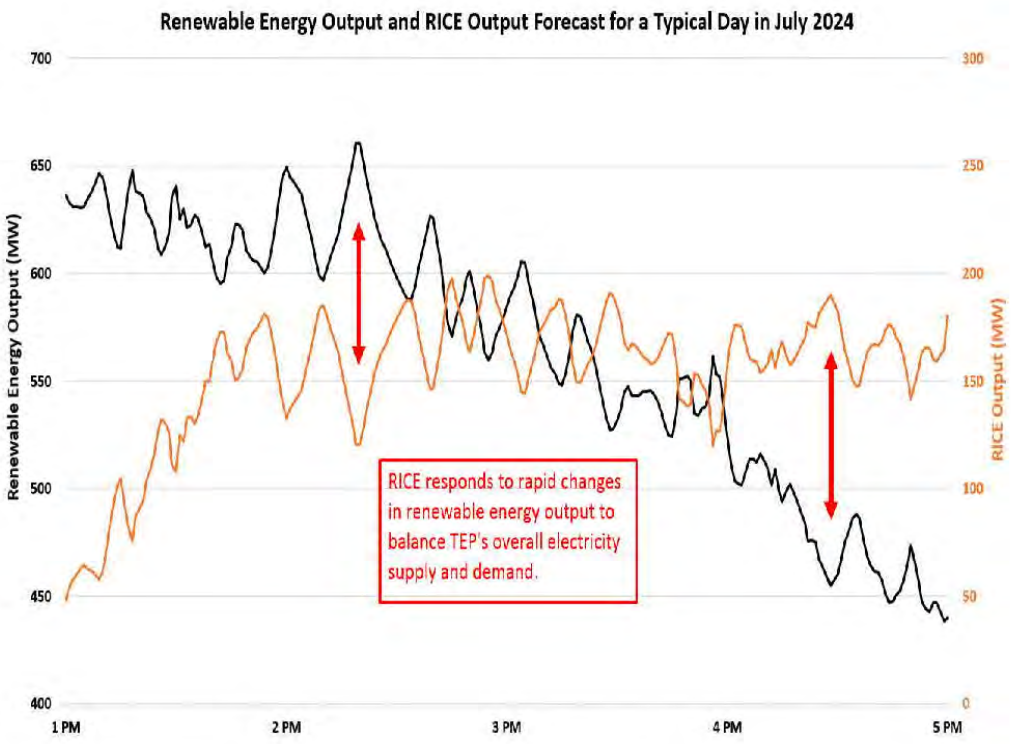

Figure 2-1. Renewable Energy and RICE Output

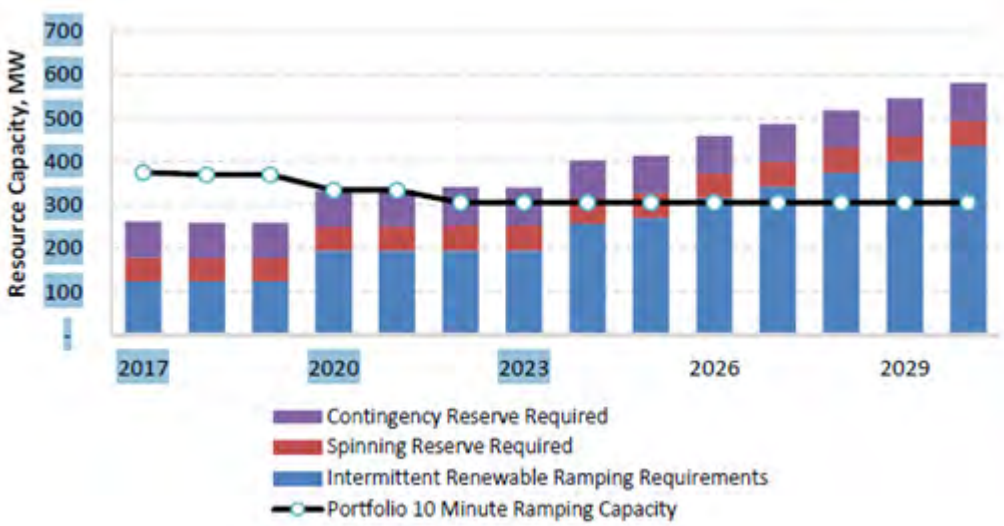

Figure 2-2. TEP's Existing 10-Minute Ramping Capacity versus Projected Requirements

b. Number and size of proposed units:

Ten (10) units producing approximately 20 MW each, for a total production of approximately 200 MW.

c. The source and type of fuel to be utilized, including approximate analysis of fossil fuels:

The units will use natural gas supplied through the same facilities currently serving the existing Sundt Generating units.

d. Amount of fuel to be utilized daily, monthly, yearly:

The estimated natural gas fuel consumption for all ten (10) units is shown below in Table 2-1.

Table 2-1. Estimated Fuel Consumption by RICE Generators

	MINIMUM	MAXIMUM
Daily	2,399	29,094
Monthly	77,982	675,975
Yearly	935,784	8,111,703

**All values in Gbtu = 1000 mmbtu*

e. Type of cooling to be utilized and source of any water to be utilized:

Cooling for the RICE Generation Project will be via a closed radiator system as opposed to cooling towers. Water supply for the RICE Generation Project will be obtained from existing TEP water wells serving the existing Sundt location and will utilize existing treatment and recycling systems on the site. Water use will be minimal compared to the existing thermal generation that is being retired as part of the installation of the RICE generation. This will result in the site using 70% less water than it has historically utilized.

No additional incremental water allotments from the aquifer or the City of Tucson (COT) water system will be required to serve the RICE Generation Project.

f. Proposed height of stacks and number of stacks, if any:

Ten (10) stacks, approximately 160 feet tall, in clusters of five (5). See Exhibits G-2 and G-4.

g. Dates for scheduled start-up and firm operation of each unit and date construction must commence in order to meet schedules:

The first five (5) units (approximately 100 MW) are scheduled to be in operation by June 1, 2019. The balance of the units will be in operation within the first quarter of 2020. The planned construction start date is April 2, 2018.

h. To the extent available, the estimated costs of the proposed facilities and site, stated separately. (If application contains alternative sites, furnish an estimate for each site and a brief description of the reasons for any variations in estimates.)

The RICE Generation Project is currently estimated to cost approximately $180 million for all 200 MW of capacity. There are no land acquisition costs.

i. Legal description of proposed site. (If application contains alternative sites, list sites in order of applicant's preference with a summary of reasons for such order of preference and any changes such alternative sites would require in the plans reflected in (i) through (viii) hereof.)

The proposed site is on Irvington Campus located in Section 3, Township 15 South, Range 14 East of the Gila and Salt River Baseline and Meridian, Pima County, Arizona. Assessor's Parcel Numbers:

140-02-002A	140-02-0080	140-02-023C
140-02-003C	140-02-0090	140-02-0200
140-02-0040	140-02-010A	140-02-0210
140-02-0050	140-02-010A	140-02-0220
140-02-0060	140-02-0110	140-02-023B
140-02-0070	140-02-0130	140-02-024A

See Exhibit J-1 for complete Legal Description.

5. Description of the proposed transmission line:

a. Nominal voltage for which the lines are designed:

138 kV alternating current

b. Description of the proposed structures and switchyards or substations associated therewith:

The Transmission Line Project entails the construction of 2.2 miles of new 138 kV transmission lines, which requires approximately 24 new 138 kV transmission structures (based upon an estimate of 600-foot spans). Structures will be a mixture of tangents, double deadend angle, and deadend steel poles. An additional 0.4 miles of existing 138 kV transmission line will be repurposed.

See Exhibits G-1, G-2, andG-3 for layouts and typical structures.

c. Purpose for constructing said transmission line:

The purpose of the Transmission Line Project is to support the new Irvington 138 kV Substation, which will replace the existing, aged main and transfer and ring bus configuration with a new breaker and a half configuration, thereby providing improved

reliability for TEP's system. This Transmission Line Project has been accelerated to coincide with and support the RICE Generation Project.

d. Description of geographical points between which the transmission line will run, the straight-line distance between such points and the length of the transmission line for each alternative route for which application is made:

Two alternative routes were initially identified through engineering and environmental review. When reviewed from an operational perspective, only Route #1, the Preferred Route, was found to be functional by TEP. Route #2 for the transmission lines was initially the primary option, but it was not viable, due to the location of the new substation.

Route #1 – Preferred

The preferred Route #1 is approximately 2.6 miles long, of which 2.2 miles are new 138 kV transmission lines and 0.4 miles are an existing 138 kV transmission line that is being repurposed. The preferred route is contained within the Irvington Campus. The new transmission lines will begin at the location of the existing substation and extend east to connect to the new substation (Figure 2-3). Only the preferred route (Route #1) meets TEP's combination of engineering and operational system requirements, and environmental, constructability, and cost considerations.

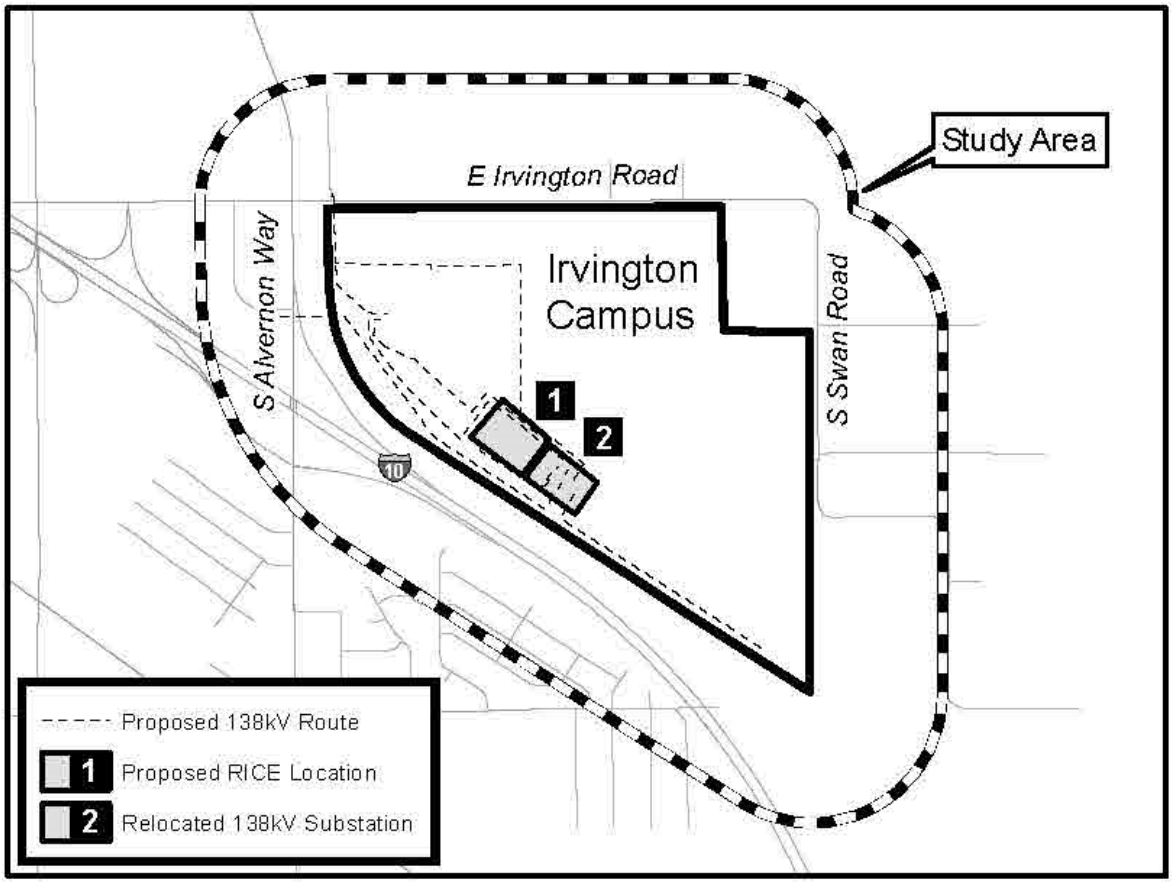

Figure 2-3. Route #1

Route #2 - Dismissed

TEP considered building the new substation immediately west of the existing yard, which resulted in Route #2 for the transmission line. The footprint of a new air insulated, or a smaller gas insulated substation, however, are too large to fit in the area available. As a result, Route #2 is not a viable option.

- Line 101, Line 102, Line 105 (Vail, Robert Bills, and South Loop)
  - Remove and replace structure 5, and drop approximately 400 feet northeast into the new substation. All structures on this line to the west of structure 5 will be utilized by Line 111, Line 130, and Line 131 after completion of this drop-in.
    - Straight line distance = Transmission line length = 400 feet
- Line 111, Line 130, Line 131 (Tucson, Santa Cruz, Drexel)
  - Remove and replace structure 1 and turn southwest to join existing lattice towers formerly a part of Line 101, Line 102 and Line 105. Continue until new triple circuit deadend structure installed east of existing structure 4, and drop northeast approximately 400 feet into the substation
    - Straight line distance = 0.50 miles
    - Transmission line length = 0.6 miles
      - 85% of this line is existing
- New Double Circuit 138kV Lines to serve RICE Phase 1 and RICE Phase 2
  - Southwest from substation deadend to new substation fence line, then follow the fenceline northwest until one circuit drops northeast for RICE Phase 1, while the second circuit continues another 300 feet before dropping northeast into RICE Phase 2.
    - Straight light distance RICE Phase 1 = approximately 500 feet
    - Transmission Line length RICE Phase 1 = approximately 725 feet
    - Straight line distance RICE Phase 2 = approximately 800 feet
    - Transmission line length RICE Phase 2 approximately 1,000 feet
      - RICE Phase 2 line is on common structures with RICE Phase 1 line for the first 650 feet. This 1,000 feet distance is the total length, including shared portions of the line.
- Line 140 (22nd) and Unit 3
  - Head northeast out of the substation until crossing the existing above ground pipeline and conveyor belt. Proceed northwest until reaching the western boundary of the existing solar concentrator array. Continue north near the western boundary of the solar concentrator array until reaching on-campus road. Proceed west until rejoining the existing line to 22nd street Substation alignment

where the 22nd Street line will turn north. Unit 3 line will proceed south and east to the generator.
  - Straight line distance = approximately 0.60 miles
  - Transmission line length = approximately 0.85 miles

- Connection to Unit 4 and 138kV Distribution Sub
  - Head northeast from substation until reaching the northern substation fence line. Proceed northwest along the fence line until approximately 150 feet beyond the RICE yard fence line. Turn southwest to until south of cooling tower 4. Proceed northwest until reaching the distribution substation and Unit 4.
    - Straight line distance = approximately 0.30 miles
    - Transmission line length = approximately 0.55 miles
- Connection to existing Internal Combustion Turbine & Future
  - Head northeast from substation until approximately 60 feet before the substation northern fence line. Proceed northwest until beyond the RICE yard fence line. Turn southwest and proceed to existing cable tray. Turn north west and proceed until reaching the existing substation boundary, then turn north until reaching approximate latitude of Unit 4. Proceed east to drop until reaching step up transformers.
    - Straight line distance = approximately 0.45 miles
    - Transmission line length = 0.65 miles

e. Nominal width of right-of-way required:

No new right-of-way is required for these Projects. The transmission lines will be constructed on property already owned by TEP.

f. Nominal length of spans:

600 – 800 feet

g. Maximum height of supporting structures and minimum height of conductor above ground:

199 feet maximum structure height. 25 feet minimum ground clearance.

h. To the extent available, the estimated costs of proposed transmission line and route, stated separately. (If application contains alternative routes, furnish an estimate for each route and a brief description of the reasons for any variations in such estimates.):

Approximately $850,000 per mile

i. Description of proposed route and switchyard locations. (If application contains alternative routes, list routes in order of applicant's preference with a summary of

reasons for such order of preference and any changes such alternative routes would require in the plans reflected in (i) through (iv) hereof.):

TEP identified a study area for analysis as the Projects were being considered. TEP examined the study area to identify possible locations where the Projects could be located on Irvington Campus, based on the following factors:

- biological wealth
- biological resources
- land use
- existing land rights
- existing plans
- visual impacts
- cultural resources
- engineering and operational feasibility
- construction, operation, and maintenance costs

This analysis resulted in the identification of two routes for consideration. Only the preferred route (Route #1) meets TEP's combination of engineering and operational system requirements, and environmental, constructability, and cost considerations. This route results in no impacts to the factors listed in A.R.S. § 40-360.06. For additional information on the environmental studies prepared for this application, see Exhibit B.

The preferred route will extend between the existing 138 kV Irvington Substation and the new Irvington 138 kV Substation located approximately 2,000 feet east and 1,650 feet south of the existing substation. See section 2.1.5.d for additional details.

j. For each alternative route for which application is made, list the ownership percentages of land traversed by the entire route (federal, state, Indian, private, etc.):

100% private (owned by TEP)

6. List the areas of jurisdiction [as defined in A.R.S. § 40-360(1)] affected by each alternative site or route and designate those proposed sites or routes, if any, which are contrary to the zoning ordinances or master plans of any of such areas of jurisdiction.

Route #1 (preferred route) lies wholly on TEP property (Irvington Campus) within the COT. This property has contained electric utility facilities since 1950. In 1995 the COT annexed the area including the Irvington Campus. As part of TEP's larger Irvington Modernization Project, the COT has requested that TEP prepare a Planned Area Development (PAD) plan and rezoning application. TEP is in the process of preparing the plan and application for submittal to the COT.

7. Describe any environmental studies applicant has performed or caused to be performed in connection with this application or intends to perform or cause to be performed in such connection, including the contemplated date of completion.

TEP has conducted environmental studies, including field studies and impact assessments, to support this application. Information on these study efforts are contained in the following exhibits:

Exhibit A	Location and Land Use Maps
Exhibit B	Environmental Report
Exhibit C	Areas of Biological Wealth
Exhibit D	Biological Resources
Exhibit E	Scenic Areas, Historic Sites and Structures, and Archaeological Sites
Exhibit F	Recreational Purposes and Aspects
Exhibit G	Concepts of Proposed Facilities
Exhibit H	Existing Plans
Exhibit I	Anticipated Noise and Interference with Communication Signals
Exhibit J	Special Factors (Includes Public Involvement)

EXHIBIT A

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EXHIBIT A: LOCATION AND LAND USE MAPS

Arizona Administrative Code (AAC) R-14-3-219:

> *Where commercially available,** a topographic map, 1:250,000 scale, showing the proposed plant site and the adjacent area within 20 miles thereof. If application is made for alternative plant sites, all sites may be shown on the same map, if practicable, designated by applicant's order of preference.*

EXHIBIT	CONTENTS
A-1	RICE Generation Project – Location
A-2	RICE Generation Project – Land Use
A-3	138 kV Transmission Line Project – Location
A-4	138 kV Transmission Line Project – Land Use

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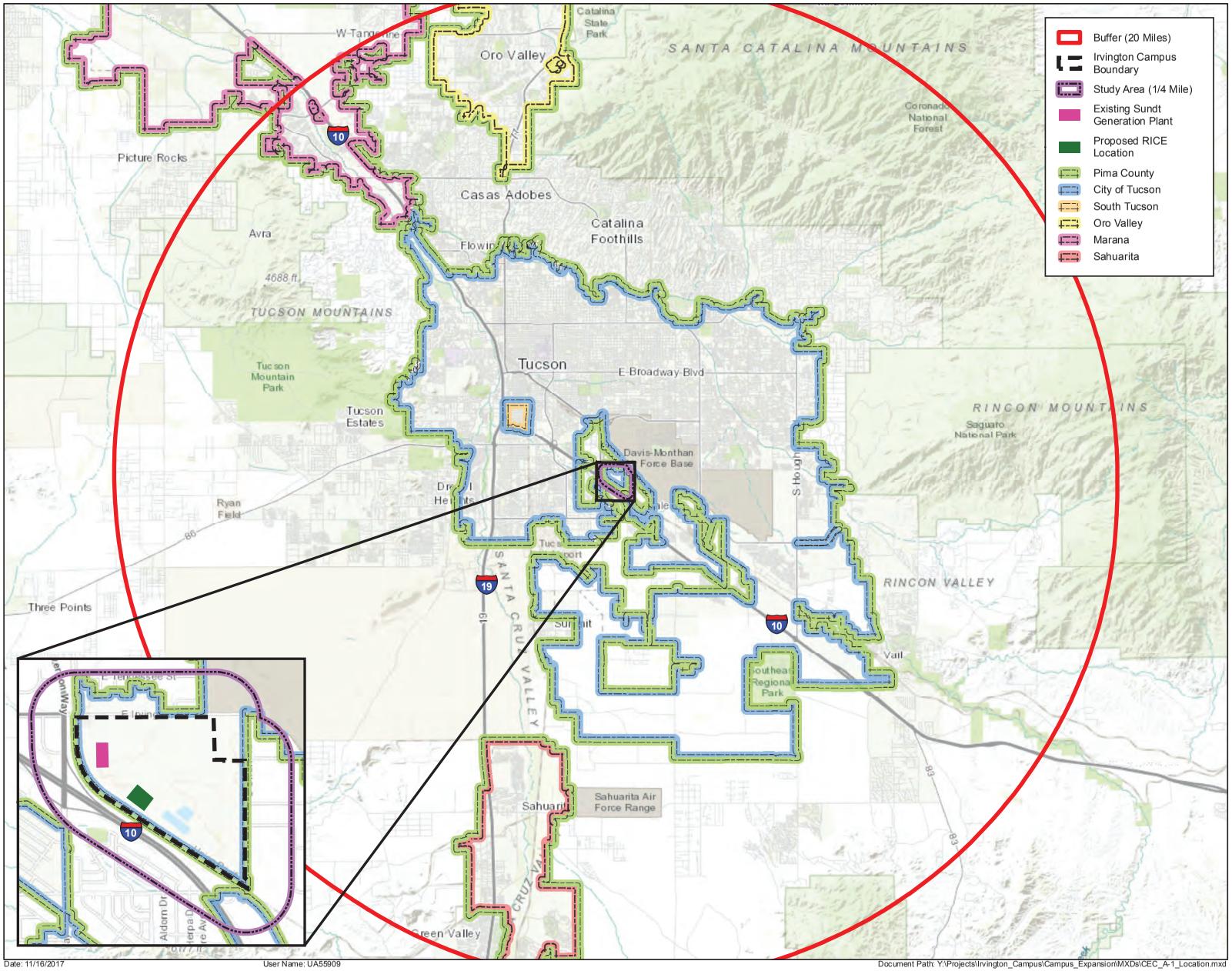

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Tucson Electric Power

TEP Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138kV Transmission Line Relocation Projects

RICE Generation Project Location

Exhibit A-1

N W E S

0 2 4
Miles

1:250,000

Sources: ESRI, Tucson Electric Power, Pima County, City of Tucson, and Arizona State Land Department.
Projection: NAD 1983 UTM Zone 12N
Basemap: ESRI World Topographic Map

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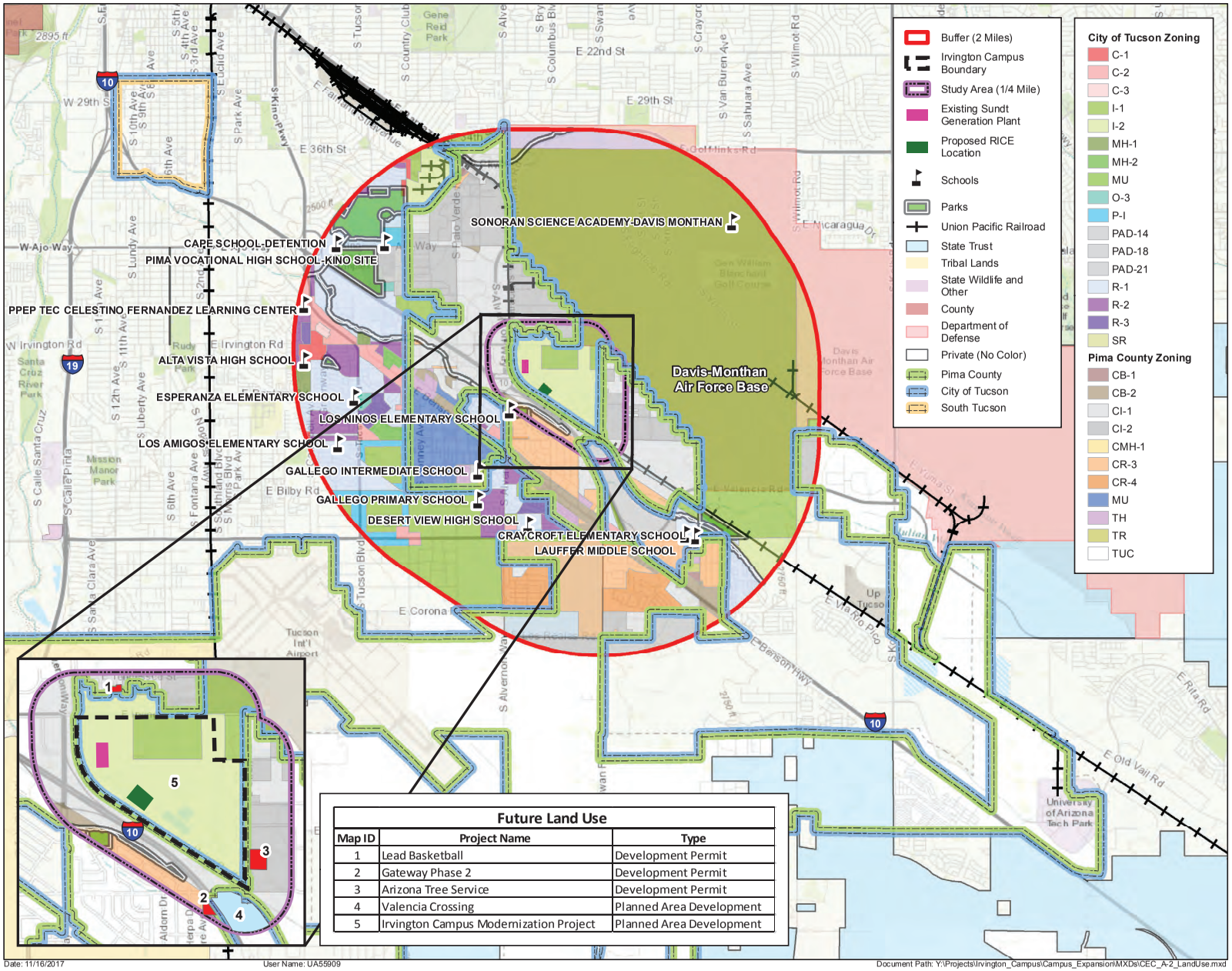
Created on 07 Nov 2017
Revised on 16 Nov 2017



Future Land Use		
Map ID	Project Name	Type
1	Lead Basketball	Development Permit
2	Gateway Phase 2	Development Permit
3	Arizona Tree Service	Development Permit
4	Valencia Crossing	Planned Area Development
5	Irvington Campus Modernization Project	Planned Area Development

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Tucson Electric Power

TEP Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138kV Transmission Line Relocation Projects

RICE Generation Project Land Use

Exhibit A-2

0 0.5 1 Miles

1:62,500

Sources: ESRI, Tucson Electric Power, Pima County, City of Tucson, and Arizona State Land Department.
Projection: NAD 1983 UTM Zone 12N
Basemap: ESRI World Topographic Map

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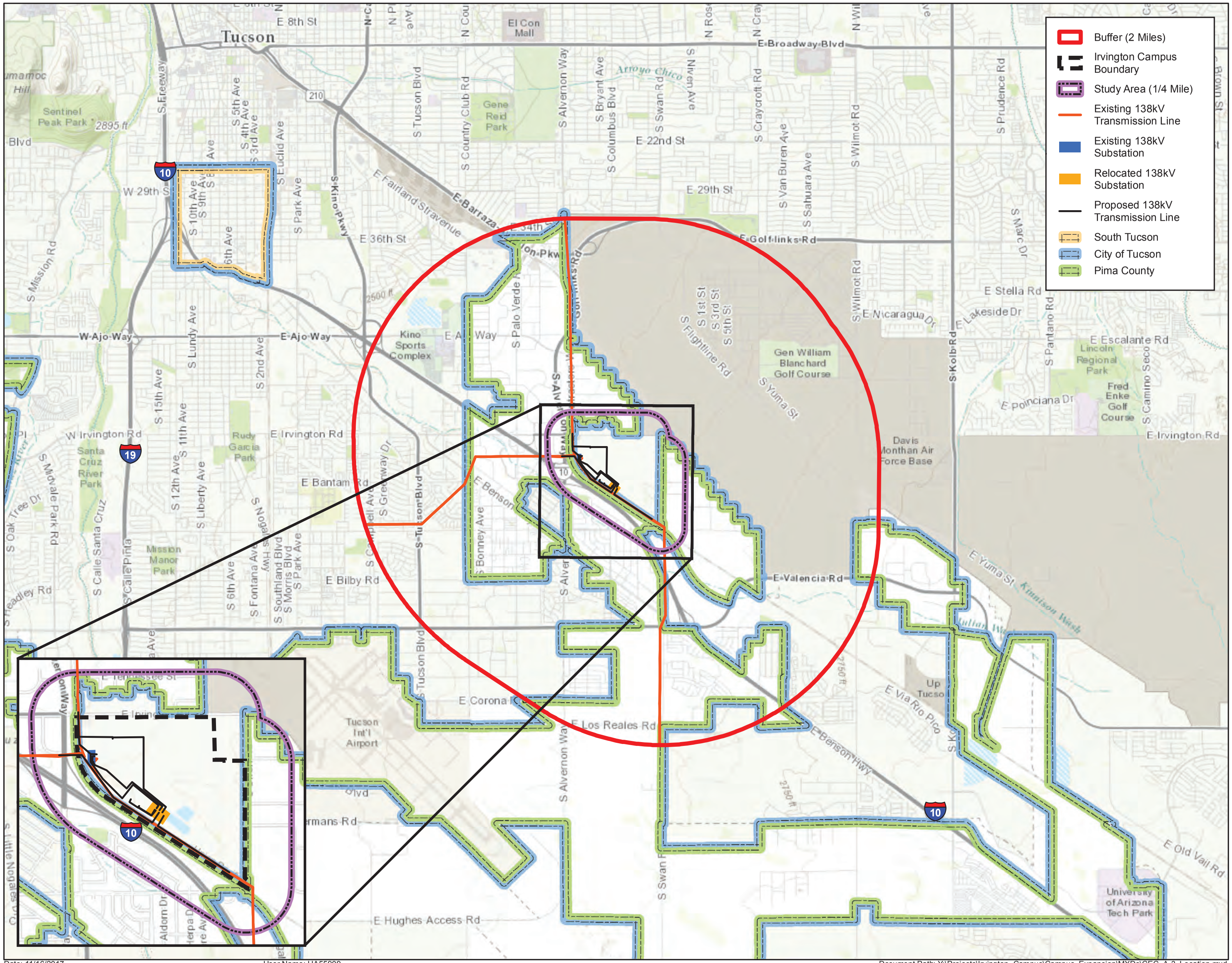
Created on 07 Nov 2017
Revised on 16 Nov 2017



Date: 11/16/2017 User Name: UA55909 Document Path: Y:\Projects\Irvington_Campus\Campus_Expansion\MXDs\CEC_A-3_Location.mxd

Tucson Electric Power

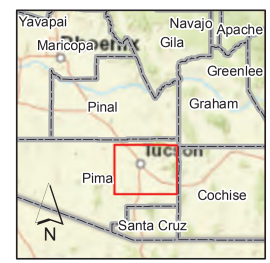
TEP Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138kV Transmission Line Relocation Projects

138kV Transmission Line Project - Location

Exhibit A-3

0 0.5 1
Miles

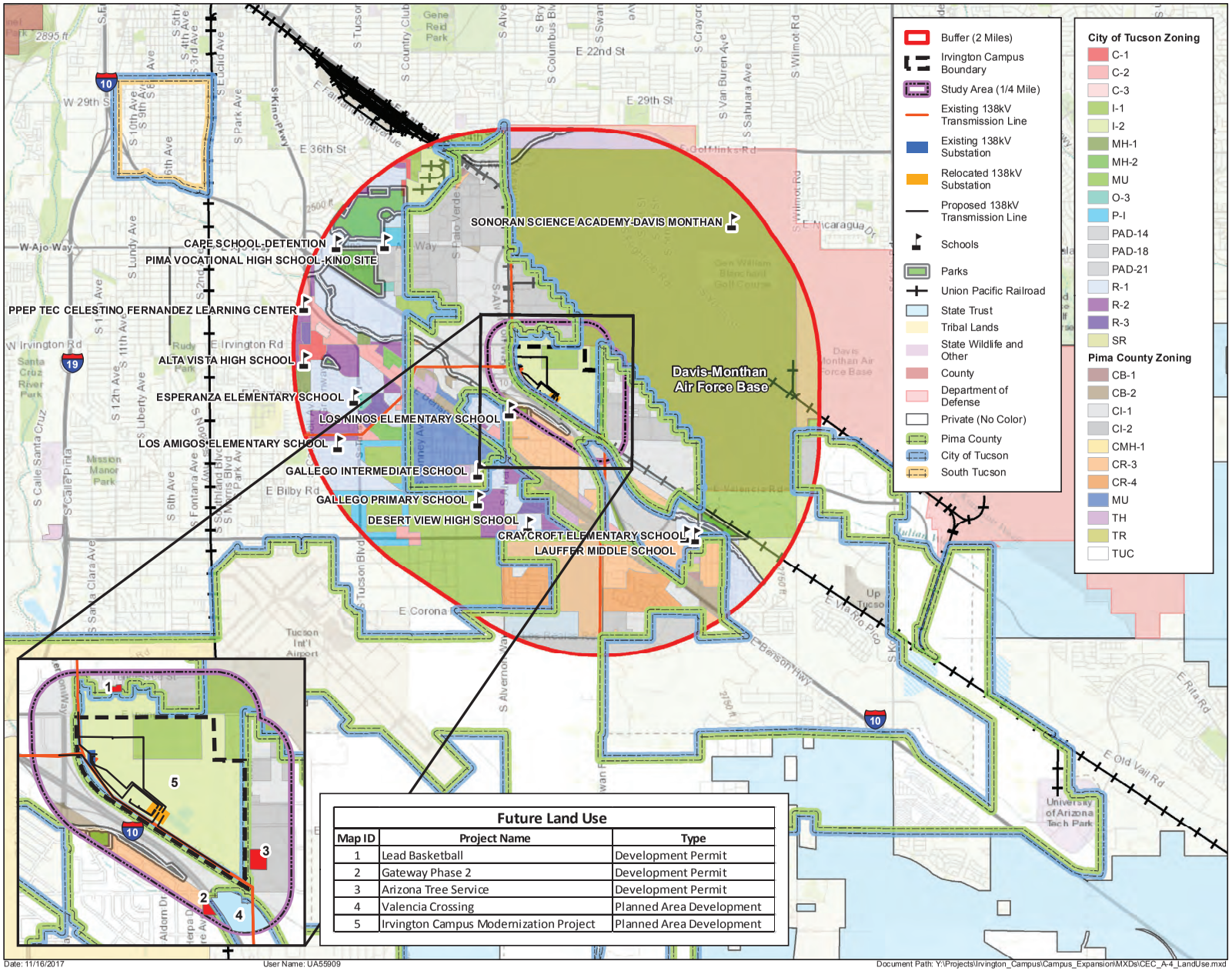
1:62,500



Sources: ESRI, Tucson Electric Power, Pima County, City of Tucson, and Arizona State Land Department.
Projection: NAD 1983 UTM Zone 12N
Basemap: ESRI World Topographic Map

This map is for planning purposes only. TEP and UNS Energy make no warranty of its accuracy.

Created on 07 Nov 2017
Revised on 16 Nov 2017



Future Land Use		
Map ID	Project Name	Type
1	Lead Basketball	Development Permit
2	Gateway Phase 2	Development Permit
3	Arizona Tree Service	Development Permit
4	Valencia Crossing	Planned Area Development
5	Irvington Campus Modernization Project	Planned Area Development

Date: 11/16/2017 User Name: UA55909 Document Path: Y:\Projects\Irvington_Campus\Campus_Expansion\MXDs\CEC_A-4_LandUse.mxd

Tucson Electric Power

TEP Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138kV Transmission Line Relocation Projects

138kV Transmission Line Project - Land Use

Exhibit A-4

0 0.5 1 Miles

1:62,500

Sources: ESRI, Tucson Electric Power, Pima County, City of Tucson, and Arizona State Land Department.
Projection: NAD 1983 UTM Zone 12N
Basemap: ESRI World Topographic Map

This map is for planning purposes only. TEP and UNS Energy make no warranty of its accuracy.

Created on 07 Nov 2017
Revised on 16 Nov 2017

EXHIBIT B

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EXHIBIT B: ENVIRONMENTAL REPORT

AAC R-14-3-219:

> *Attach any environmental studies which applicant has made or obtained in connection with the proposed site(s) or route(s). If an environmental report has been prepared for any federal agency or if a federal agency has prepared an environmental statement pursuant to Section 102 of the National Environmental Policy Act, a copy shall be included as a part of this exhibit.*

B.1 Introduction

Environmental studies were conducted for the Projects in 2017 and included biological resources, cultural resources, land use, and visual resources. The environmental planning process is described below. The biological, visual, cultural resource and land use studies are discussed in detail in Exhibits C, D, E, and H.

Of note, it has been determined that the Projects are not subject to the National Environmental Policy Act (NEPA) because:

1) The Environmental Protection Agency (EPA), in issuing an air quality permit, is exempt from compliance with NEPA per Section 7(c) of the Energy Supply and Environmental Coordination Act of 1974 (15 U.S.C. 793(c)(1)), which exempts all EPA actions under the Clean Air Act from the requirements of NEPA.
2) Other Federal agencies having potential jurisdiction over the Projects have determined that they do not affect the resources they manage. See Section B.3 below for additional information.

B.2 Environmental Planning Process

B.2.1 Overview

Following the selection of the RICE technology and identification of a suitable site on Irvington Campus, TEP determined through an evaluation of its engineering and operational system requirements, the need for upgrades to the existing Irvington 138 kV substation. It was further determined that the existing 138 kV substation site was not suitable as there was not enough adjacent land to expand the facility. As a result, a new location was identified in proximity to the RICE Generation Project. The relocation of the 138 kV substation requires the extension and modification of the existing 138 kV transmission lines on the Irvington Campus to support the 138 kV substation relocation and construction of the RICE Generation Project.

A study area was identified to include the entire Irvington Campus and all property within one-quarter mile of the Irvington Campus. The study area includes land under the jurisdiction of the COT, Pima County, and the Department of Defense (DOD) Davis-Monthan Air Force Base (DMAFB).

B.3 Environmental Statements

B.3.1 US Fish and Wildlife Service

TEP submitted a Biological Evaluation (BE) to the USFWS (see Exhibit C-2). The USFWS issued a statement indicating concurrence with the determination that the Projects will not have an effect on special status species or critical habitats (see Exhibit C-3).

B.3.2 City of Tucson Historic Preservation Program

TEP submitted a Cultural Resources Inventory and Historic Building Assessment to Pima County and the COT in conjunction with the Air Quality Permit application (see Exhibit E-1 for a copy of the redacted report). Pima County Office of Sustainability and Conservation and the COT Historic Preservation Program issued their concurrence with the recommendations in the cultural report, of no impact to cultural or historic sites, and exempted the El Paso Natural Gas Pipeline (EPNG) Pipeline site (the one site in the Study Area eligible for listing in the National Register of Historic Places (NRHP)) from County cultural resources compliance requirements (Exhibit E-2).

B.3.3 U.S. Army Corps of Engineers

TEP applied for an Approved Jurisdictional Determination of no jurisdictional waters, wetlands, or navigable waters in the project area. The U.S. Army Corps of Engineers (USACE) issued their determination of no jurisdiction on the Irvington Campus on September 8, 2017 (see Exhibit B-1).

B.3.4 Federal Aviation Administration

TEP applied to the Federal Aviation Administration (FAA) for an obstruction evaluation of the new transmission line towers and RICE Generation Project stacks. This evaluation is still in process.

B.3.5 Department of Defense

TEP consulted with the DOD and neighboring DMAFB concerning the new structures and stack heights. DMAFB determined that the Projects can proceed under an airfield waiver for penetration of the Inner Horizontal Surfaces. Preparation of the waiver is in process by DMAFB.

B.3.6 Air Quality Permit (EPA, ADEQ, PDEQ)

TEP applied for an Air Quality Permit from Pima County Department of Environmental Quality (PDEQ) for the RICE Generation Project. Associated with the review of the application, PDEQ consulted with the U.S. Fish and Wildlife Service (USFWS) and the COT Historic Preservation Program. Receipt of an approved Pima County Air Quality permit is anticipated by December 31, 2017.

EXHIBIT B-1

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DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, U.S. ARMY CORPS OF ENGINEERS
3636 N. CENTRAL AVE, SUITE 900
PHOENIX, AZ 85012-1939

September 8, 2017

SUBJECT: Approved Jurisdictional Determination

Cheryl Eamick
Tucson Electric Power Company
88 East Broadway
Tucson, Arizona 85702

Dear Ms. Eamick:

I am responding to your request (File No. SPL-2017-00578-MWL) dated August 18, 2017, for an approved Department of the Army jurisdictional determination (JD) for the TEP-Irvington Campus project site (lat. 32.1598°N, long. -110.9035°W) located within the city of Tucson, Pima County, Arizona.

Based on available information, I have determined waters of the United States do not occur on the project site. The basis for our determination can be found in the enclosed Approved Jurisdictional Determination (JD) form(s).

This letter includes an approved jurisdictional determination for the TEP-Irvington Campus project site. If you wish to submit new information regarding this jurisdictional determination, please do so within 60 days. We will consider any new information so submitted and respond within 60 days by either revising the prior determination, if appropriate, or reissuing the prior determination. If you object to this or any revised or reissued jurisdictional determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you wish to appeal this decision, you must submit a completed RFA form within 60 days of the date on the NAP to the Corps South Pacific Division Office at the following address:

Tom Cavanaugh
Administrative Appeal Review Officer
U.S. Army Corps of Engineers
South Pacific Division, CESPD-PDS-O, 2042B
1455 Market Street
San Francisco, California 94103-1399

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5 (see below), and that it has been received by the Division Office by November 7, 2017.

This determination has been conducted to identify the extent of the Corps' Clean Water Act jurisdiction on the particular project site identified in your request, and is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

Thank you for participating in the regulatory program. If you have any questions, please contact Michael Langley at (602) 230-6953 or via e-mail at Michael.W.Langley@usace.army.mil. Please help me to evaluate and improve the regulatory experience for others by completing the customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

Sallie Diebolt

Sallie Diebolt
Chief, Arizona Branch
Regulatory Division

Enclosure(s)

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL		
Applicant: , Attn: Ms.	File No.: SPL-2017-00578-MWL	Date: September 8, 2017
Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at *http://www.usace.army.mil/cecw/pages/reg_materials.aspx* or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

Michael W. Langley
Senior Project Manager
U.S. Army Corps of Engineers

Phone: (602) 230-6953, FAX 916-557-7803
Email: Michael.W.Langley@usace.army.mil

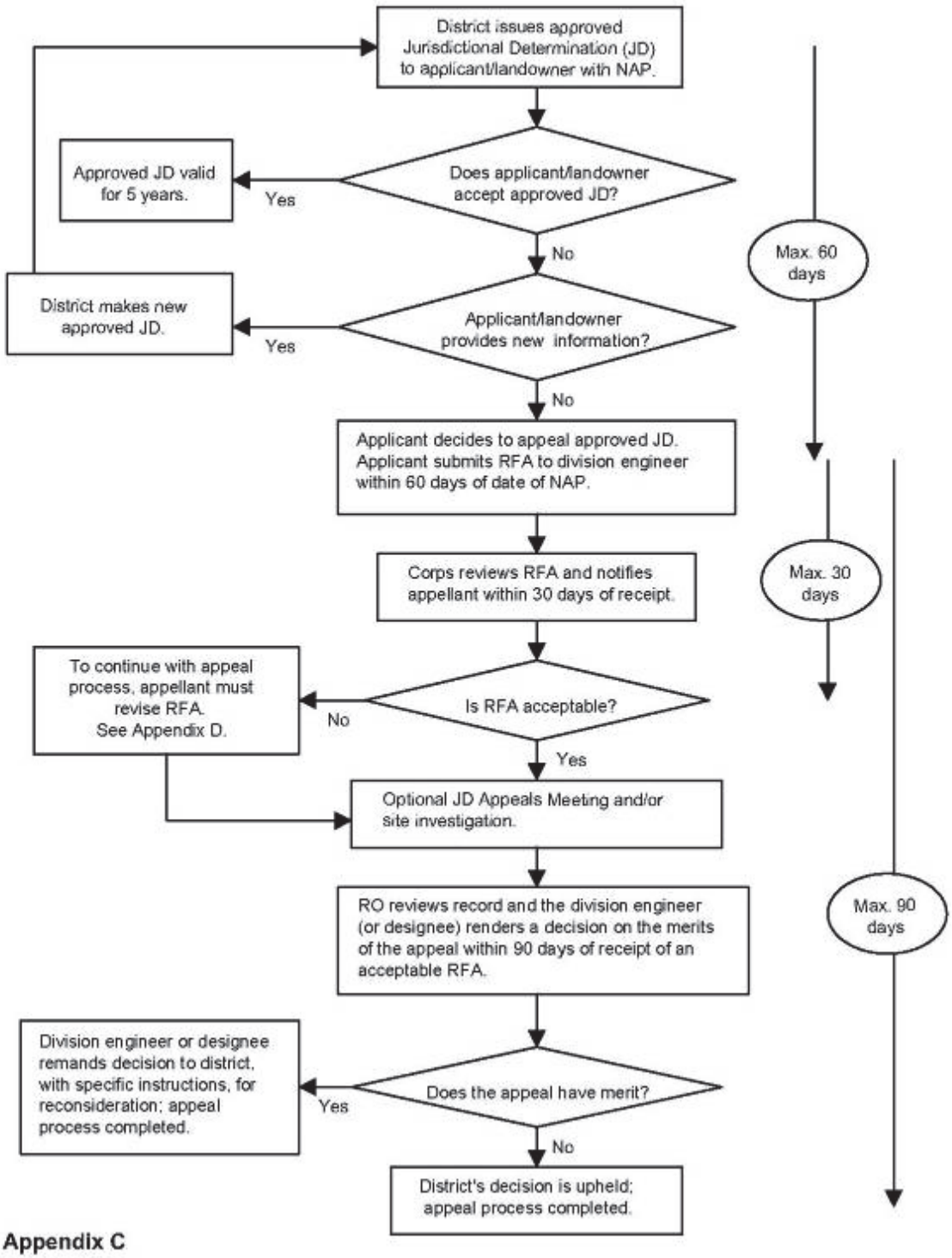
If you only have questions regarding the appeal process you may also contact:

Thomas J. Cavanaugh
Administrative Appeal Review Officer
U.S. Army Corps of Engineers
South Pacific Division
1455 Market Street, 2052B
San Francisco, California 94103-1399
Phone: 415-503-6574, FAX 415-503-6646)
Email: Thomas.J.Cavanaugh@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

Administrative Appeal Process for Approved Jurisdictional Determinations



Appendix C

§ 331.5 Criteria.

(a) *Criteria for appeal* —(1) *Submission of RFA.* The appellant must submit a completed RFA (as defined at §331.2) to the appropriate division office in order to appeal an approved JD, a permit denial, or a declined permit. An individual permit that has been signed by the applicant, and subsequently unilaterally modified by the district engineer pursuant to 33 CFR 325.7, may be appealed under this process, provided that the applicant has not started work in waters of the United States authorized by the permit. The RFA must be received by the division engineer within 60 days of the date of the NAP.

(2) *Reasons for appeal.* The reason(s) for requesting an appeal of an approved JD, a permit denial, or a declined permit must be specifically stated in the RFA and must be more than a simple request for appeal because the affected party did not like the approved JD, permit decision, or the permit conditions. Examples of reasons for appeals include, but are not limited to, the following: A procedural error; an incorrect application of law, regulation or officially promulgated policy; omission of material fact; incorrect application of the current regulatory criteria and associated guidance for identifying and delineating wetlands; incorrect application of the Section 404(b)(1) Guidelines (see 40 CFR Part 230); or use of incorrect data. The reasons for appealing a permit denial or a declined permit may include jurisdiction issues, whether or not a previous approved JD was appealed.

(b) *Actions not appealable.* An action or decision is not subject to an administrative appeal under this part if it falls into one or more of the following categories:

(1) An individual permit decision (including a letter of permission or a standard permit with special conditions), where the permit has been accepted and signed by the permittee. By signing the permit, the applicant waives all rights to appeal the terms and conditions of the permit, unless the authorized work has not started in waters of the United States and that issued permit is subsequently modified by the district engineer pursuant to 33 CFR 325.7;

(2) Any site-specific matter that has been the subject of a final decision of the Federal courts;

(3) A final Corps decision that has resulted from additional analysis and evaluation, as directed by a final appeal decision;

(4) A permit denial without prejudice or a declined permit, where the controlling factor cannot be changed by the Corps decision maker (e.g., the requirements of a binding statute, regulation, state Section 401 water quality certification, state coastal zone management disapproval, etc. (See 33 CFR 320.4(j));

(5) A permit denial case where the applicant has subsequently modified the proposed project, because this would constitute an amended application that would require a new public interest review, rather than an appeal of the existing record and decision;

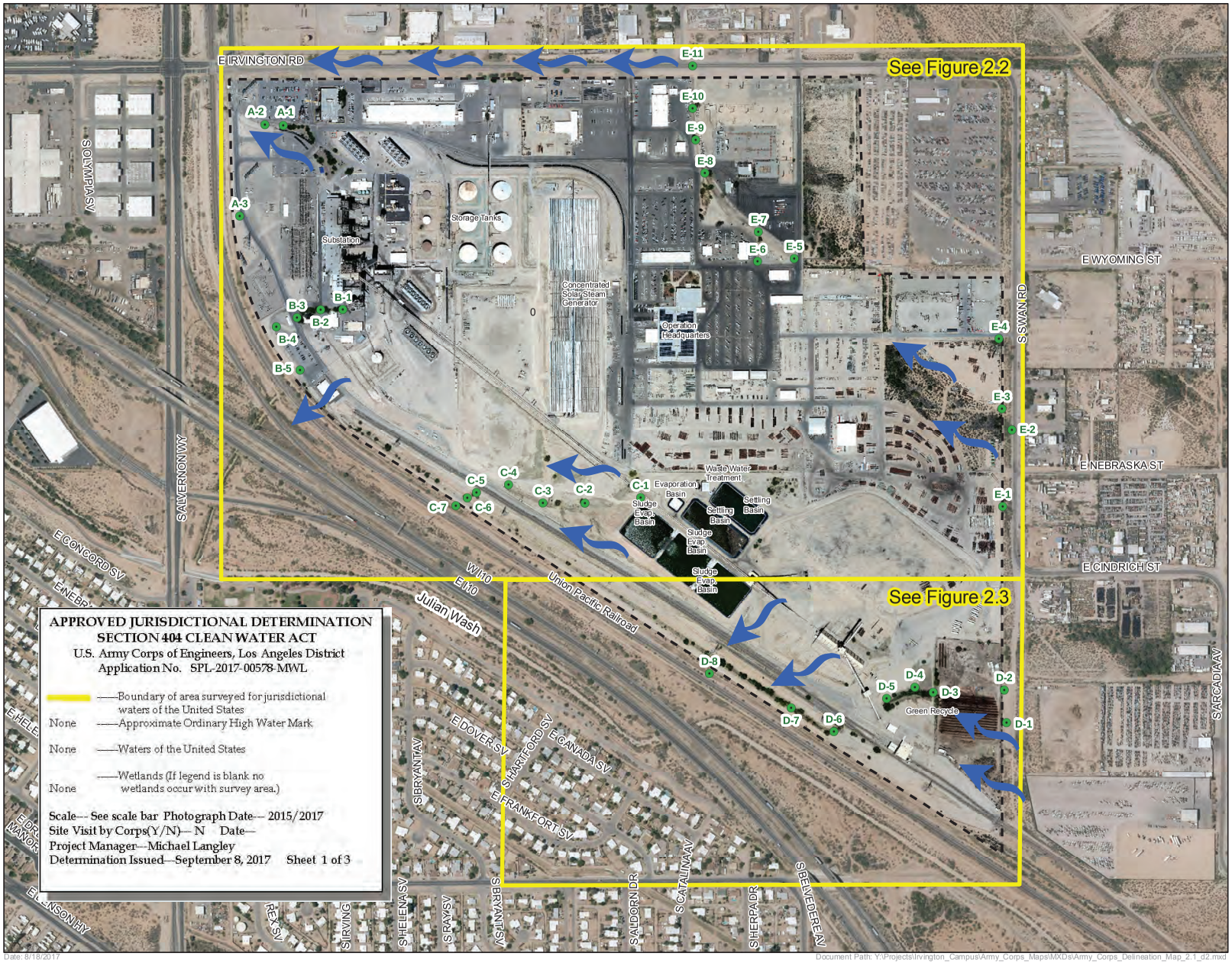
(6) Any request for the appeal of an approved JD, a denied permit, or a declined permit where the RFA has not been received by the division engineer within 60 days of the date of the NAP;

(7) A previously approved JD that has been superceded by another approved JD based on new information or data submitted by the applicant. The new approved JD is an appealable action;

(8) An approved JD associated with an individual permit where the permit has been accepted and signed by the permittee;

(9) A preliminary JD; or

(10) A JD associated with unauthorized activities except as provided in §331.11.



Tucson Electric Power

Figure 2.1: Delineation Map

TEP Irvington Campus Redevelopment

- Data Point
- Study Area
- Project Area Boundary
- Stormwater Flow Direction

N W E S

1 inch = 600 feet

600 300 0 600

Feet

Sources: TEP, ESRI, and USGS
Coordinate System: NAD 1983 HARN
StatePlane Arizona Central
FIPS 0202 Feet Intl
Projection: Transverse Mercator
Datum: D North America 1983 HARN
Basemap: Cooper Aerial May 2017
and PAG Ortho 2015

Created on 14 June 2017
Revised on 18 Aug 2017

Patrick Dubberly, GIS Intern
Land Resources
Tucson Electric Power
88 East Broadway Blvd.
Tucson, Arizona 85701

This map is for planning purposes only. TEP and UNS Energy make no warranty of its accuracy.

APPROVED JURISDICTIONAL DETERMINATION
SECTION 404 CLEAN WATER ACT
U.S. Army Corps of Engineers, Los Angeles District
Application No. SPL-2017-00578-MWL

—Boundary of area surveyed for jurisdictional waters of the United States
None —Approximate Ordinary High Water Mark
None —Waters of the United States
None —Wetlands (If legend is blank no wetlands occur with survey area.)

Scale— See scale bar Photograph date— 2015/2017
Site Visit by Corps(Y/N)— N Date—
Project Manager— Michael Langley
Determination Issued—September 8, 2017 Sheet 2 of 3

Tucson Electric Power

Figure 2.2: Delineation Map

TEP Irvington Campus Redevelopment

- Data Point
- Delineation
- Delineation Width
- Study Area
- Project Area Boundary
- Stormwater Flow Direction

N W E S

1 inch = 400 feet

400 200 0 400
Feet

Sources: TEP, ESRI, and USGS
Coordinate System: NAD 1983 HARN
StatePlane Arizona Central
FIPS 0202 Feet Intl
Projection: Transverse Mercator
Datum: D North America 1983 HARN
Basemap: Cooper Aerial May 2017
and PAG Ortho 2015

Created on 14 June 2017
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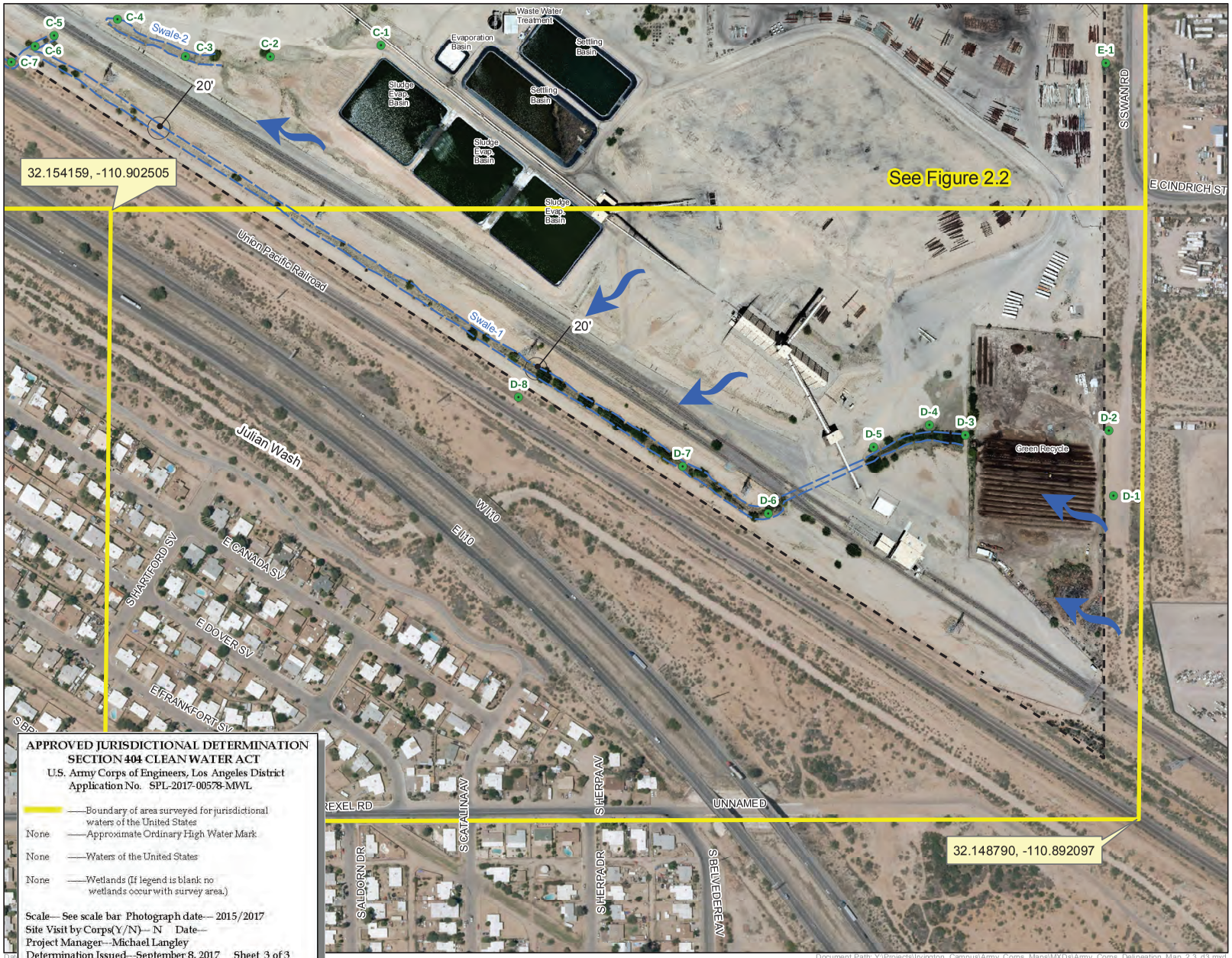

APPROVED JURISDICTIONAL DETERMINATION
SECTION 404 CLEAN WATER ACT
U.S. Army Corps of Engineers, Los Angeles District
Application No. SPL-2017-00578-MWL

——Boundary of area surveyed for jurisdictional waters of the United States
None ——Approximate Ordinary High Water Mark
None ——Waters of the United States
None ——Wetlands (If legend is blank no wetlands occur with survey area.)

Scale—See scale bar Photograph date—2015/2017
Site Visit by Corps(Y/N)—N Date—
Project Manager—Michael Langley
Determination Issued—September 8, 2017 Sheet 3 of 3

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User Name: UA55909

Tucson Electric Power

Figure 2.3: Delineation Map

TEP Irvington Campus Redevelopment

- Data Point
- Delineation
- Delineation Width
- Study Area
- Project Area Boundary
- Stormwater Flow Direction

N W E S

1 inch = 300 feet

300 150 0 300
Feet

Sources: TEP, ESRI, and USGS
Coordinate System: NAD 1983 HARN
StatePlane Arizona Central
FIPS 0202 Feet Intl
Projection: Transverse Mercator
Datum: D North America 1983 HARN
Basemap: Cooper Aerial May 2017
and PAG Ortho 2015

Created on 14 June 2017
Revised on 18 Aug 2017

Patrick Dubberly, GIS Intern
Land Resources
Tucson Electric Power
88 East Broadway Blvd.
Tucson, Arizona 85701

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DRY LAND APPROVED JURISDICTIONAL DETERMINATION FORM[1]
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): August 18, 2017

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Tucson Electric Power Irvington Campus (SPL-2017-0578-MWL)

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: AZ County/parish/borough: Pima County City: Tucson
Center coordinates of site (lat/long in degree decimal format): Lat. 32.1598 °, Long. -110.9035 °
Universal Transverse Mercator: *Click here to enter text.*
Name of nearest waterbody: Julian Wash
Name of watershed or Hydrologic Unit Code (HUC): Julian Wash (HUC: 150503010904)

- [x] Check if map/diagram of review area is available upon request.
- [ ] Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

- [x] Office (Desk) Determination. Date: September 8, 2017
- [ ] Field Determination. Date(s): *Click here to enter a date.*

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area.

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area.

SECTION III: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

- [x] Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: *Click here to enter text.*
- [x] Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - [ ] Office concurs with data sheets/delineation report.
  - [ ] Office does not concur with data sheets/delineation report.
- [ ] Data sheets prepared by the Corps: *Click here to enter text.*
- [ ] U.S. Geological Survey Hydrologic Atlas: *Click here to enter text.*
  - [ ] USGS NHD data.
  - [ ] USGS 8 and 12 digit HUC maps.
- [x] U.S. Geological Survey map(s). Cite scale & quad name: Tucson, AZ 7.5' topographic quadrangle
- [ ] USDA Natural Resources Conservation Service Soil Survey. Citation: *Click here to enter text.*
- [ ] National wetlands inventory map(s). Cite name: *Click here to enter text.*
- [ ] State/Local wetland inventory map(s): *Click here to enter text.*
- [ ] FEMA/FIRM maps: *Click here to enter text.*
- [ ] 100-year Floodplain Elevation is: *Click here to enter text.* (National Geodetic Vertical Datum of 1929)
- [x] Photographs: [x] Aerial (Name & Date): Google Earth 2016
  - [ ] or [x] Other (Name & Date): Ground-based photographs
- [ ] Previous determination(s). File no. and date of response letter: *Click here to enter text.*
- [ ] Applicable/supporting case law: *Click here to enter text.*
- [ ] Applicable/supporting scientific literature: *Click here to enter text.*
- [ ] Other information (please specify): *Click here to enter text.*

B. REQUIRED ADDITIONAL COMMENTS TO SUPPORT JD. EXPLAIN RATIONALE FOR DETERMINATION THAT THE REVIEW AREA ONLY INCLUDES DRY LAND: *Click here to enter text.*

---

[1] This form is for use only in recording approved JDs involving dry land. It extracts the relevant elements of the longer approved JD form in use since 2007 for aquatic areas and adds no new fields.

EXHIBIT C

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EXHIBIT C: AREAS OF BIOLOGICAL WEALTH

AAC R-14-3-219:

> *"Describe any areas in the vicinity of the proposed site or route which are unique because of biological wealth or because they are habitats for rare and endangered species. Describe the biological wealth or species involved and state the effects, if any, the proposed facilities will have thereon."*

C.1 Biological Wealth

C.1.1 Introduction

This section provides a general description of the existing environment with respect to vegetation, wildlife, and the potential for special status species to occur in the Study Area, as detailed in BE, see Exhibit C-2 (BEC, 2017). The study area for the BE is the Irvington Campus plus a 1-mile buffer around the Irvington Campus Perimeter (Exhibit C-1). The information provided includes a list of special status species obtained from the USFWS Information for Planning and Consultation (IPaC) online database, and species lists, ranges and habitat data obtained from the Arizona Game and Fish Department (AZGFD) Heritage Database Management System (HDMS) On-line Environmental Review tool, review of habitat and life history requirements, and a field reconnaissance. The field visit evaluated the study area's potential to support the special status species identified by the database search. The AZGFD also provided input during the early planning of the Projects (Exhibit C-2).

C.2 Special Status Species

Based upon the desktop research and field visit, seven special status species were identified as potentially occurring within the study area. A detailed screening analysis on each species life history, habitat requirements, known range and distribution, and known locality information determined that none of these species has the potential to occur in the study area or vicinity.

The USFWS issued a statement indicating concurrence with the determination that the Projects will not have an effect on special status species or critical habitats (see Exhibit C-3).

C.3 Important Riparian Areas

There is COT designated Important Riparian Area (IRA) within the project area. As part of the PAD rezoning application, TEP is working with the COT to remove this designation because there is no habitat connectivity, and vegetation density does not meet COT criteria of IRA (see Exhibit C-4).

C.4 Potential Impacts

The potential for the Projects' activities to affect any of the special status species was evaluated in the BE. Based on the findings that there are no special status species in the study area, the Projects would have no effect on special status species, or potential candidate species, or on proposed or designated critical habitat.

C.5 Conclusion

The Projects would have no effect on areas of biological wealth, special status species, designated critical habitat, or IRAs, as these are not present on the site.

C.6 References

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EXHIBIT C-1

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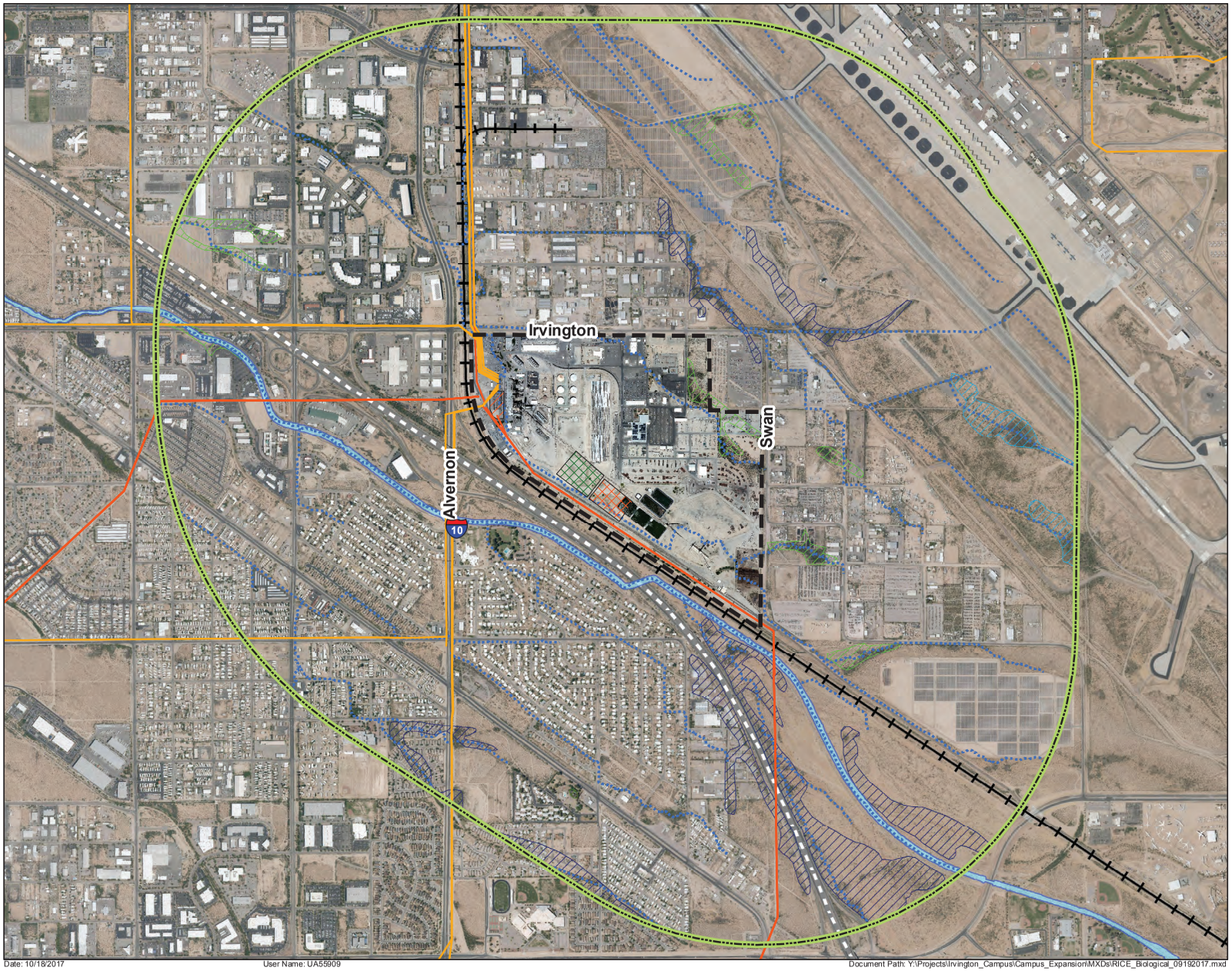

Tucson Electric Power

TEP Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138kV Transmission Line Relocation Projects

Biological

Exhibit C-1

- Irvington Campus Boundary
- Existing 138kV Transmission Line
- Existing 46kV Distribution Line
- Existing 138kV Substation
- Relocated 138kV Substation
- Proposed RICE Location
- Study Area (1 Mile)
- Union Pacific Railroad
- Interstate
- Washes
- Julian Wash

Riparian Habitat

- Xeroriparian A
- Xeroriparian B
- Xeroriparian C
- Xeroriparian D

N W E S

0 800 1,600
Feet

1 inch = 1,600 feet

Sources: ESRI, Tucson Electric Power, Pima County, City of Tucson, and Arizona State Land Department.
Projection: NAD 1983 UTM Zone 12N
Basemap: ESRI World Imagery and Cooper Aerial Imagery 2017

This map is for planning purposes only. TEP and UNS Energy make no warranty of its accuracy.

Created on 19 Sep 2017
Revised on 18 Oct 2017

Date: 10/18/2017 User Name: UA55909 Document Path: Y:\Projects\Irvington_Campus\Campus_Expansion\MXDs\RICE_Biological_09192017.mxd

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EXHIBIT C-2

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BIOLOGICAL EVALUATION

TUCSON ELECTRIC POWER COMPANY
IRVINGTON CAMPUS REDEVELOPMENT

Prepared for:

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August 30, 2017

Table of Contents

1.0 INTRODUCTION **1**

2.0 PROJECT LOCATION AND DESCRIPTION **1**

3.0 ECOLOGICAL OVERVIEW **4**

4.0 SCREENING ANALYSIS FOR THREATENED AND ENDANGERED SPECIES **5**

4.1 SPECIES SCREENING ANALYSIS METHODS 5

4.2 SCREENING ANALYSIS RESULTS 6

4.2.1 Habitat Characteristics *6*

4.2.2 Federally Listed Species *7*

4.2.3 AGFD HDMS Results *10*

4.2.4 Screening Analysis Summary *10*

5.0 MIGRATORY BIRD TREATY ACT **12**

6.0 CONSERVATION MEASURES **13**

7.0 SUMMARY AND CONCLUSIONS **13**

8.0 REFERENCES AND CITED LITERATURE **13**

TABLES

Table 1. Common Plants Observed on the Project Area 9
Table 2. Common Wildlife Observed on the Project Area 10
Table 3. TES Screening Analysis 10

FIGURES

Figure 1. Project location & topographic map 3
Figure 2. Aerial overview map of the project area 5
Figure 3. Landscaped area near the center of the Irvington Campus 8
Figure 4. Stormwater basin with mixed native and non-native plants 8
Figure 5. Overview of the project area showing existing development 9

APPENDICES

Appendix A. USFWS Information for Planning and Conservation Resource Report
Appendix B. Arizona Game and Fish Department On-line Environmental Review Tool Report

1.0 INTRODUCTION

Bowers Environmental Consulting LLC (BEC) was retained by Tucson Electric Power Company (TEP) to conduct a Biological Evaluation (BE) in support of proposed development activities at the Sundt power generation facility located on Irvington Road in the City of Tucson, Arizona (the "Irvington Campus"). The study area for this BE encompasses the entire foot-print of the Irvington Campus and all land located within a 1-mile buffer around the perimeter as depicted in Figure 1. The purpose of the BE is to facilitate compliance with the Endangered Species Act (ESA), and any other local, state, or federal ordinances, regulations or laws applicable to the proposed project.

The BE includes a brief project description; ecological overview of the study area; a screening analysis of the potential for occurrence of federally listed, proposed listed, threatened or endangered species (TES) within or near the project area; and an evaluation of potential for project activities conducted within the project area to impact TES and their proposed or designated critical habitat. TES include species listed or proposed for listing by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA). Species that are listed with "Candidate" status by the USFWS are also considered in this BE, because they may become listed as threatened or endangered within the build-out period of the project. The scope of work for this BE follows standard protocol that is commonly used by to evaluate the potential presence of TES species and identify potential impacts of project activities on these species. BEC's scope of work included the following steps:

- Review of the USFWS information, Planning, and Conservation System (IPaC) database.
- Search of the Arizona Game and Fish Department (AGFD) Heritage Data Management System (HDMS) using the Arizona Online Environmental Review Tool.
- Field reconnaissance to identify vegetation and habitat on the project area.
- Screening analysis to evaluate potential for occurrence and project impacts on TES or Candidate species.

2.0 PROJECT LOCATION AND DESCRIPTION

The Irvington Campus is located in the center of the study area on private land within Township 15 South, Range 14 East, Section 3; southeast of the Gila and Salt River Baseline and Meridian, Pima County, Arizona (the "project area"). This area is bounded on the north by E. Irvington Road, on the east by S. Swan Road, on the south by Interstate 10 and on the west by S. Alvernon Way. Geographic coordinates for the center of the project area are latitude 32.158166^0, longitude -110.899451^0.

Property within the study area is mostly zoned for commercial and light and heavy industrial use. These land uses occur generally north of Interstate 10 and include TEP's power plant facilities, warehouses, auto wrecking and scrap yards, recycling facilities, storage and rental facilities, metal fabrication shops, the Union Pacific Railroad, and recreational vehicle storage and sales lots. The north

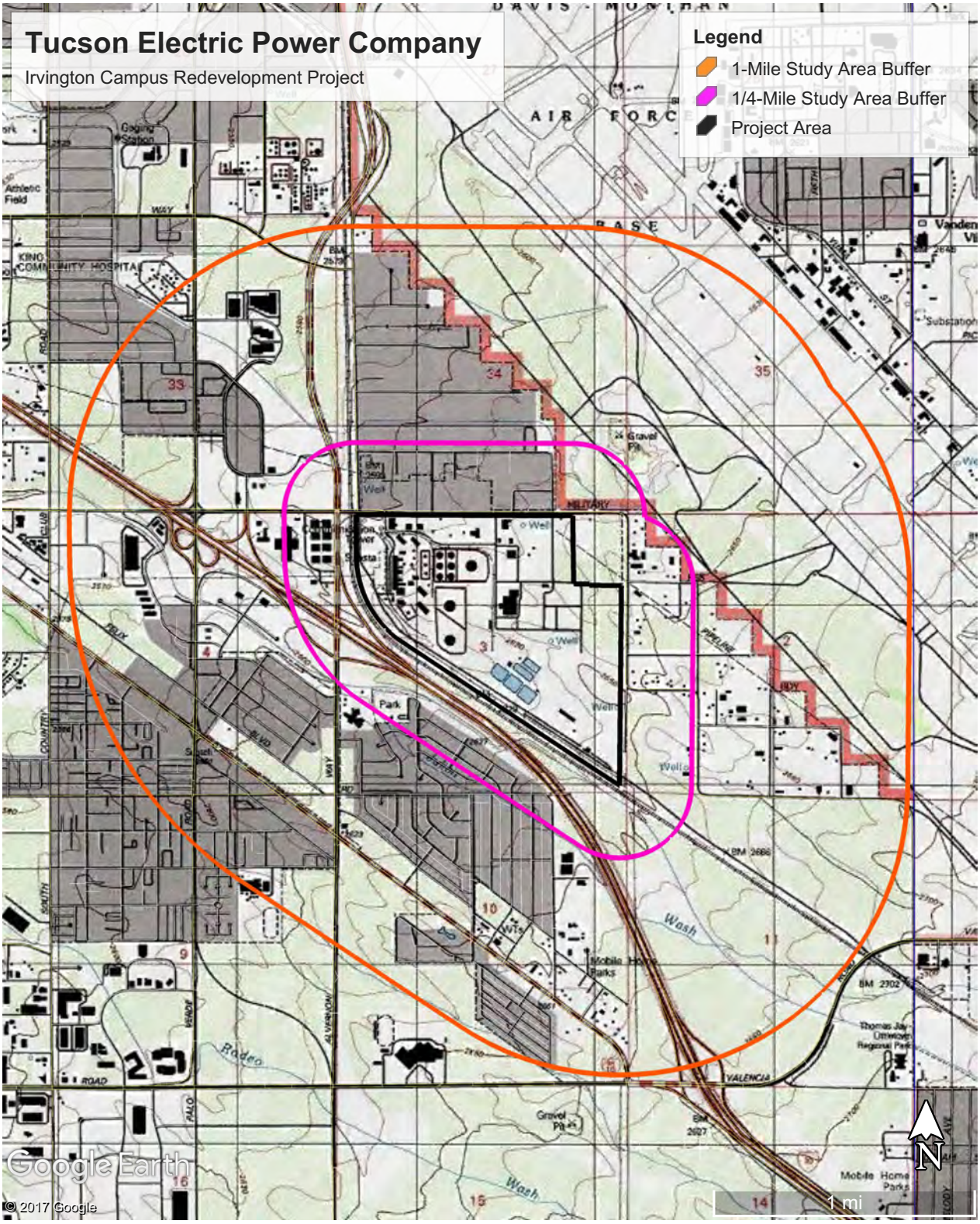

Figure 1. Project location & topographic map of the study area.

portion of the study area also encompasses a small portion of the Davis-Monthan Air Force Base located south of the main runway that is used by the 355th Fighter Wing for A-10 Thunderbolt II and F-16 fighter jet training. Some residential zoning occurs witin the study area south of Interstate 10. This area includes the Hilton Road Community Association that consists of a planned development of single-family residences and the Augie Acuna Los Ninos Neighborhood Park.

TEP proposes to redevelop the Irvington Campus by re-configuring material storage and laydown yards, and constructing several new facilities including a 200 megawatt reciprocating internal combustion engine system, 138kV and 46kV substations, 138kV transmission line extension, mulit-use shops building, and a new office building. These facilities will be constructed in areas that are already developed. Redevelopment activities would occur in phases beginning in 2017 with the initiation of feasibility and baseline studies followed by planning, design and permitting, and finally construction of new facilities. Proposed in-service dates for these new facilities range from the end of the second quarter of 2018 through the fourth quarter of 2022. A brief description of each component of redevelopment is provided in the following paragraphs.

Reciprocating Internal Combustion Engines (RICE) – RICE is state of the art technology for providing fast, flexible power generation to supply TEP's electrical distribution/generation system, and mitigate intermittency of electrical generation when renewable generation facilities, such as solar and wind, are reduced. This technology uses a series of 20 megawatt, natural gas burning engines that run automatically when renewable generation is reduced. The RICE would be constructed in two phases on vacant land located in the southern portion of the project area. The 100 MW phase would be completed before the end of 2018, and the second 100 MW phase completed by the fourth quarter of 2022.

138kV and 46 KV Substations, Switch Yard, and 138kV Transmission Line – New substations would be built on vacant land near the southern portion of the project area near the RICE. The new substations would be constructed concurrently with the RICE, and consist of new transformers, switching equipment, 138kV transmission line extension, and drop-in structures. TEP anticipates the in-service date for the new substation is the third quarter of 2020. A 345kV substation would be constructed as part of a future expansion of the 345kV transmission circuit.

Laydown Yard – The existing laydown yard would be moved to a new location within the Irvington Campus to allow for construction of the new multi-use shops facility. The proposed location for the new laydown yard is on top of the former coal storage area in the southern portion of the project area, which has been removed from service. The laydown yard would be completed in the second quarter of 2018 in order to make room for the shops facility and office building.

Shops Facility – The new shops building would encompass approximately 80,000 square feet that would house the ERTF, Metering, Substation Construction and Maintenance, Communications and Relay, Construction Line and Heat, Outside Services, and Asset Management departments. This facility would be constructed on the eastern portion of the project area after the laydown yard has been moved. TEP anticipates construction of this facility would begin the first quarter of 2018 and take approximately 8 to 10 months, to be in-service by the fourth quarter of 2018.

Administration Office Building – A new 150,000 square-foot office building would be built north of the shops facility. The office building would house call center staff, engineers and other department staff, totaling approximately 450 employees. Design, planning and construction of this facility would take approximately 3 years.

3.0 ECOLOGICAL OVERVIEW

The study area lies within the Basin and Range Physiographic Province of southern Arizona at 2,632 feet above mean sea level. This province is characterized by linear, north to south trending alluvial filled basins surrounded by normal fault-block mountain ranges. Topography slopes generally from southeast to northwest across the study area. Stormwater runoff from most of the study area drains in a west-northwesterly direction and is mostly directed into regional flood control structures located west and south of the project area. Surface drainage from the southwestern portion of the project area drains into the Julian Wash, which flows along the southern boundary. Surface drainage eventually is discharged into the Santa Cruz River.

Geologic maps describe the area as unconsolidated to strongly consolidated alluvial and eolian deposits. These deposits consists of coarse, poorly sorted alluvial fan and terrace deposits on middle and upper piedmonts and along large drainages; sand, silt, and clay on alluvial plains and playas; and windblown sand deposits (Hendricks 1934). The National Resources Conservation Service (NRCS 2017) classifies soils on the project area as “Cave and urban land, 0 to 8 percent slopes (Map Unit 11), and Mohave soils and urban land, 1 to 8 percent slopes (Map Unit 47). These designations are typical of the basin fill soils found near the project area. Map Unit 11 soils consist of well-drained, very limy, mixed alluvium, and Map Unit 47 soils consist of well-drained loamy soil.

Climate in the study area and vicinity is characterized as semi-arid with temperatures ranging from 37 to 105+ degrees Fahrenheit and precipitation averaging 12 inches annually. Native vegetation typically found in the region is consistent with the Arizona Upland subdivision of the Sonoran desertscrub biotic community (Brown 1994). This subdivision consists of a scrubland or low woodland of leguminous trees with an understory of shrubs and perennial succulents on upland areas. Xeroriparian habitat, which includes many of the same plants that are found on the upland areas, but

with much more robust growth, occurs along the network of ephemeral washes that are found throughout the subdivision.

4.0 SCREENING ANALYSIS FOR THREATENED AND ENDANGERED SPECIES

The potential for TES to occur on the study area was evaluated through a screening analysis that consists of a systematic three step process that includes: 1) background research of wildlife agency databases, to identify TES that may occur in the vicinity; 2) assessment of habitat that occurs on the project area; and 3) analysis of information collected in steps 1 and 2, to determine the species potential for occurrence in the project area. Potential effects of proposed project activities, such as the loss of habitat and construction noise, on TES that have a potential to occur in the study area are also evaluated and categorized based on effects categories listed in the ESA Handbook for Section 7 consultations. Screening analysis methods are described in the following section.

4.1 SPECIES SCREENING ANALYSIS METHODS

Species Identification - The list of TES for the study area was obtained from the USFWS IPaC online database (***Appendix A***). Species range and habitat data was obtained from information provided on the USFWS and the Arizona Game & Fish Department (AGFD) Heritage Database Management System (HDMS) abstracts. Natural history for each of these species was reviewed to determine habitat and life history requirements, and to identify the parameters requiring investigation during the field reconnaissance. The HDMS On-line Environmental Review Tool (***Appendix B***) was also searched, to identify any known accounts of TES that may occur within a 3-mile radius of the project area. A more rigorous literature review and evaluation was conducted for any TES species that have known ranges or proposed or designated critical habitat within or near the project area***.***

Habitat Assessment - A field reconnaissance was conducted on May 3, 2017, to identify vegetation and habitat types, and evaluate the study area's potential to support any of the TES identified by the database search. Dominant plant and wildlife species, and ground-level photographs were recorded, as well as significant habitat resources (i.e., ephemeral drainages, caves, rock outcrops, mine adits, snags, wetlands etc.).

Potential for Occurrence and Effects Evaluation - Information from the species identification and field reconnaissance was used to facilitate the screening analysis and determine the potential for TES and Candidate species to occur on or in the study area. Species were eliminated from detailed evaluation, if the study area is located outside of the known range or if required habitat components are not present for the species. The presence or absence of proposed or designated critical habitat was also reviewed for each species. The potential for occurrence of each species was then carefully evaluated using the following list of occurrence categories:

- ***Known to occur***—the species is documented to occur in the study area or vicinity.
- ***May occur***—the project area is within the species' known range or distribution and vegetation communities, habitat, soils, or other biotic and abiotic indicators resemble those known to support the lifecycle and/or natural history requirements of the species.
- ***Unlikely to occur***—the study area is within the species' known range or distribution, but vegetation communities, soils, and other biotic and abiotic indicators do not resemble those known to support the lifecycle and/or natural history requirements of the species.
- ***Does not Occur*** – the study area is not within the known range or distribution and other biotic and abiotic indicators do not resemble those known to support the lifecycle and/or natural history requirements of the species.

Potential Affects Evaluation – The potential for the project activities to affect any of the TES or Candidate species identified as potentially occurring in Pima County is also considered in this BE. This affects evaluation is similar in nature to the affects determination described in the Endangered Species Act Handbook for Section 7 consultations. The three affects categories used in this BE are defined below:

- ***May affect, is likely to adversely affect***—the project is likely to adversely affect a species if: 1) the species is known to occur in the project area; and 2) project activities would disturb areas or habitat elements known to be used by the species, or would directly affect an individual.
- ***May affect, is not likely to adversely affect***—the project is not likely to adversely affect a species if: 1) the species may occur but its presence has not been documented; and 2) project activities would not result in disturbance to areas or habitat elements known to be used by the species.
- ***No effect***—the project will have no effect on a species if: 1) the species is considered unlikely to occur (range, vegetation, etc., are inappropriate); and 2) the species or its sign was not observed during surveys of the project area.

4.2 Screening Analysis Results

4.2.1 Habitat Characteristics

Native vegetation in the study area is consistent with the Arizona Upland Subdivision of the Sonoran Desertscrub biotic community (Brown 1994). However, existing vegetation in the study area is largely absent. Most of the project area has been graded and altered, since the original site was developed as an industrial facility in the 1950's. Several landscaped areas are scattered around the Irvington Campus, and a few small patches of native vegetation are found near the southeast quadrant and perimeter of the project area. Grasses, and other ground cover species are nearly absent from the study area and project area, and there are no large snags, permanent surface water, cliffs, caves,

adits or other habitat features that would provide nesting, breeding, cover or forage opportunities for wildlife. Figure 2 is an aerial overview map that shows the existing conditions within the study area.

The small patches of native habitat found on the study area and project area are disconnected from larger undeveloped tracks of natural desert land, as the entire Irvington Campus is surrounded by industrial, commercial and residential developments. Native plants found in these areas, and wildlife observed during the field reconnaissance are listed in Tables 1 and 2. Figures 3, 4 and 5 provide ground-level perspectives of current disturbance and the patches of habitat found on the Irvington Campus.

Non-native plants are found in landscaped areas around the Irvington campus and several stormwater retention basins have a mixture of native and non-native plant species. Noxious grasses including buffelgrass (*Pennisetum cilliare*), and Johnson's grass (*Sorghum halepense*) were observed in disturbed areas throughout the Irvington Campus.

Table 1. Native Plants Observed on the Project Area

Common Name	Scientific Name
Velvet mesquite	*Prosopis velutina*
Foothills palo verde	*Cercidium microphyllum*
Creosote bush	*Larrea tridentate*
Triangle-leaf bursage	*Ambrosia deltoidea*
Englemann prickly pear cactus	*Opuntia phaeacantha var. discata*
Fishhook barrel cactus	*Ferocactus wislizenii*
Teddy bear cholla cactus	*Cylindropuntia bigelovii*

Table 2. Common Wildlife Observed on the Project Area

Common Name	Scientific Name
Gamebl's Quail	*Callipepla gambelii*
Mourning Dove	*Zenaida macroura*
White-winged dove	*Zenaida asiatica*
Desert Cottontail rabbit	*Sylvilagus audubonii*
Cactus wren	*Campylorhynchus brunnedicapillus*
Desert spiny lizard	*Sceloporus magister*
Pack rat	*Neotoma cinerea*

4.2.2 Federally Listed Species

Based on the IPaC database search, seven TES potentially occur on or near the project area (***Appendix A***). These species include the California least tern (*Sterna antillarum browni*), yellow-billed cuckoo (*Coccyzus americanus*), Pima pineapple cactus (Coryphantha scheeri var. robustispina), jaguar (*Panther onca*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), northern Mexican gartersnake (*Thamnophis eques megalops*) and Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*).

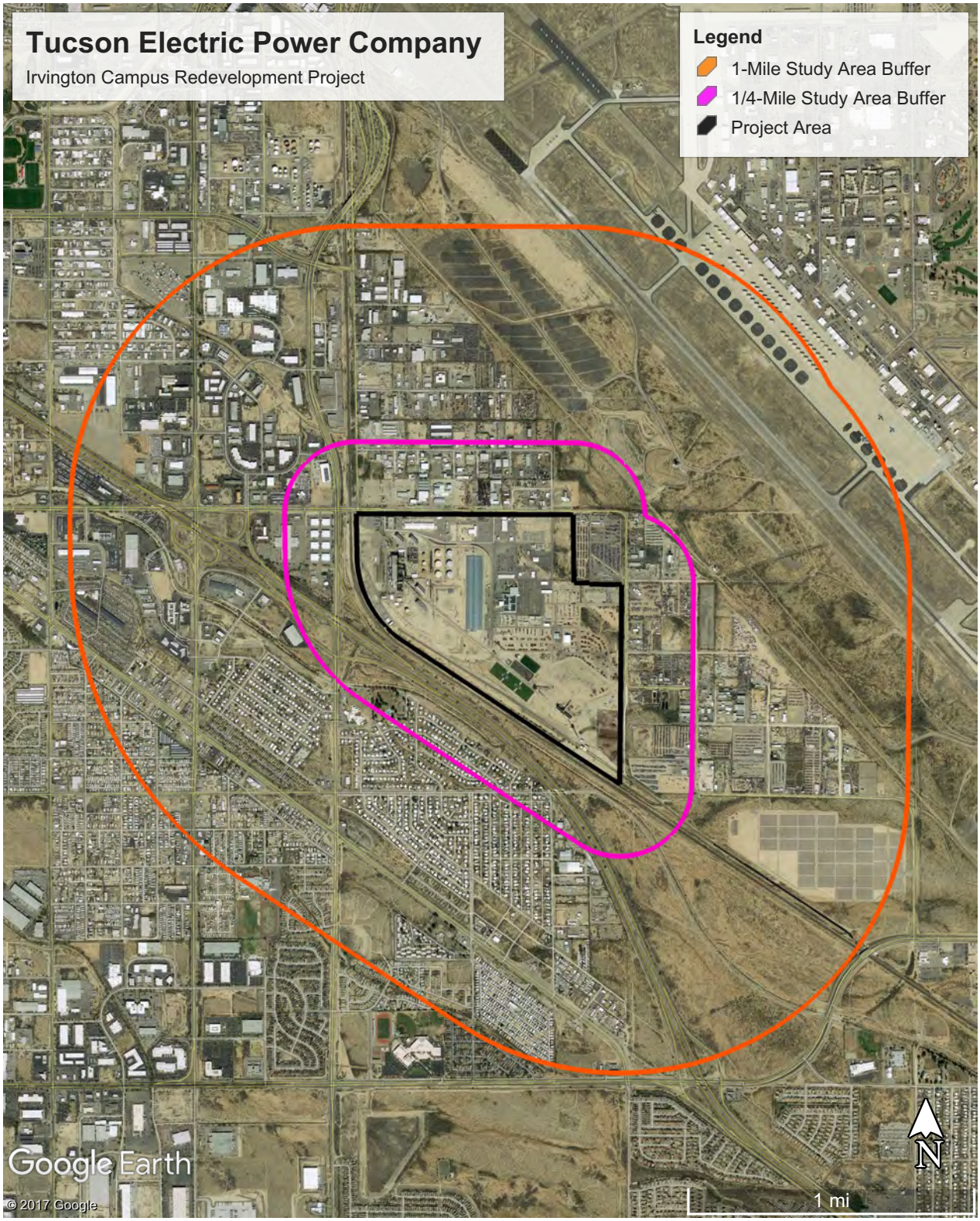

Figure 2. Aerial overview map of the study area.

Figure 3. Landscaped area near the center of the Irvington Campus

Figure 4. Stormwater basin with mixed native and non-native plants

Figure 5. Overview of the project area showing existing development

4.2.3 AGFD HDMS Results

Results of the AGFD HDMS on-line environmental review tool query indicate that Pima pineapple cactus may occur within five-miles of the project area. None of the other six TES were identified as potentially occurring in the area, and no designated or proposed critical habitat resources are located on or in the vicinity of the project area.

4.2.4 Screening Analysis Summary

Screening criteria, such as known range and habitat requirements, were used to identify whether any TES, Candidate species, or critical habitat potentially occur in the study area. Species with distribution ranges that are known to be far from the area, or species that occupy habitats not found within or adjacent to the study area were eliminated from detailed evaluation. Results of the screening analysis are summarized in Table 3. Only the Pima pineapple cactus, identified by the IPaC and AGFD Heritage Data Management System report, has the potential to occur within five-miles of the study area. These results are based on the lack of habitat elements on the study area that are required to support the life history requirements (i.e., breeding, nesting, forage, shelter) for these species, and/or the study area is outside of the known range and distribution of these species in Pima County.

Table 3. TES Screening Analysis for the Irvington Campus Redevelopment Project

Common Name (*Species Name*)	Status*	Range or Habitat Requirements	Potential for Occurrence in Study Area	Determination of Effect
BIRDS				
California least tern (*Sterna antillarum browni*)	E	Least terns are shorebirds that require bare or sparsely vegetated sandbars, gravel pits, or exposed flats along shorelines of inland rivers, lakes, reservoirs, or drainage systems. Reference(s): USFWS 1985	**Does not occur**. No aquatic habitat is located on the study area or in the vicinity.	**No effect**.
Yellow-billed cuckoo (*Coccyzus americanus*)	T	Found in riparian woodland vegetation (cottonwood, willow, or tamarisk) at elevations below 6,600 feet. Dense understory foliage appears to be an important factor in nest site selection. The highest concentrations in Arizona are along the Agua Fria, San Pedro, upper Santa Cruz, and Verde rivers and Cienega and Sonoita creeks. Reference(s): AGFD 2011b	**Does not occur**. No dense riparian habitat is located the study area or vicinity.	**No effect**.
PLANTS				
Pima pineapple cactus (Coryphantha scheeri var. robustispina)	E	Found from 2,300 -4,500 feet elevation on alluvial basins and hillsides in semi-desert grasslands, desert scrub, and the transition are between the two. Most commonly found on open areas on flat ridge-tops or slopes of less than 10-15 percent. Soils range from shallow to deep and silty to rocky.	**Does not occur.** Most of the study area has been developed, and there is no habitat for the species in the vicinity.	**No effect.**
MAMMALS				
Jaguar (*Panther onca*)	E	This species has been found in Sonoran Desertscrub through subalpine conifer forests. Jaguars were probably closely associated with rivers and cienegas (marshes), once prominent in southern Arizona. Reference(s): AGFD 2004	**Does not occur**. Jaguar critical habitat is located over 40 miles to the south of the study area.	**No effect**.

Table 3. TES Screening Analysis for the Irvington Campus Redevelopment Project

Common Name (*Species Name*)	Status*	Range or Habitat Requirements	Potential for Occurrence in Study Area	Determination of Effect
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)	E	Ranges from the Picacho Mountains southwesterly to the Agua Dulce Mountains and southeasterly to the Galiuro and Chiricahua mountains at elevations between 1,600 and 11,500 feet. Roosts in caves, abandoned mines, and unoccupied buildings at the base of mountains where agave, saguaro, and organ pipe cacti are present. Forages on nectar, pollen, and fruit of agaves and columnar cacti. Reference(s): USFWS 2014d, AGFD 2011c	**Known to occur**. The study area and surrounding land are within the known range for this species.	**No effect.** No forage habitat for this species is found within the study area.
REPTILES				
Northern Mexican gartersnake (*Thamnophis eques megalops*)	T	This snake inhabits cienegas, stock tanks and riparian areas between 130 and 8,500 feet elevation. The core populations for this species in Arizona are found in the Verde River drainage, Tonto Creek, and San Rafael Valley. Reference (s): AGFD 2011a	**Does not occur**. No riparian or other aquatic habitats are located in the study area.	**No effect**.
Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*)	PE	Found only in pond and stream habitat at Quitobaquito Springs in the Organ Pipe Cactus National Monument. This area is over 100 miles southwest of the project area. Reference(s): USFWS 2014i	**Does not occur**. No aquatic habitat is located in the study area.	**No effect**.

*USFWS Status Definitions:

E = Endangered. The ESA specifically prohibits the take of a species listed as endangered. Take is defined by the ESA as: to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct.

T = Threatened. The ESA specifically prohibits the take of a species listed as threatened. Take is defined by the ESA as: to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct.

PE = Proposed Endangered. These species are those for which USFWS has sufficient information on biological vulnerability and threats to support a listing as an endangered species under the ESA.

Range or habitat information is from the following sources: Heritage Data Management System (HDMS 2016); USFWS Arizona Ecological Services Field Office (USFWS 2016); *Arizona Rare Plant Field Guide* (Arizona Rare Plant Committee); and Corman and Wise-Gervais (2005).

5.0 MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed therein. The statute does not discriminate between live or dead birds and grants protection to feathers, eggs, and nests. A take does not include habitat destruction or alteration, as

long as there is not a direct taking of birds, nests, eggs, or parts thereof. Birds protected under the Act include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, and swallows; feathers, plumes, nests, and eggs are also protected. A complete list of protected species is found in Code of Federal Regulations Title 50, Part 10.13.

Several known burrowing owls (*Athene cunicularia*) located on the Irvington Campus were recently captured and relocated offsite, and the burrows have been collapsed, to prevent owls from returning or use by other wildlife. The small patches of native vegetation within the study area and Irvington Campus may support breeding and nesting of migratory birds. Removal of vegetation as a part of clearing and grading has the potential to impact nesting birds protected under the MBTA if this occurs during the breeding season (February 15 to August 31).

6.0 CONSERVATION MEASURES

The following measures are proposed to promote the conservation of native vegetation, and other wildlife resources that occur in the project area.

- Avoid vegetation removal during the nesting season for migratory birds between February 15 and August 31.
- Conduct a nesting bird survey 2 weeks prior to clearing and grading, if these activities will occur during the nesting season.

7.0 SUMMARY AND CONCLUSIONS

Seven TES were identified as potentially occurring on the study area or vicinity. However, a detailed screening analysis on each species life history, habitat requirements, known range and distribution, and known locality information indicates that none of these species has the potential to occur in the project area or vicinity. Based on these findings, the proposed project would have no effect on TES or potential Candidate species, or on proposed or designated critical habitat.

8.0 REFERENCES AND CITED LITERATURE

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_____.1997b. Recovery Plan for Lesser Long-nosed Bat, *Leptonycteris curasoae yerbabuenae*. Prepared for U.S. Fish and Wildlife Service Region 2, Albuquerque, New Mexico. 49 pp.

_____. 2012). Lesser long nosed bat (*Leptonycteris sanborni*). General Species Information Abstract; Arizona Ecological Services Field Office. http://www.fws.gov/southwest/es/arizona/Documents/Redbook/Lesser%20Long-nosed%20bat%20RB.pdf

_____. 2013a. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northern Mexican Gartersnake and Narrow-headed Gartersnake; Proposed Rule. Federal Register 78(132): 41550-41605.

_____. 2014c. Species Fact Sheet: Western yellow-billed cuckoo (*Coccyzus americanus*). http://www.fws.gov/sacramento/outreach/Public-Advisories/WesternYellow-BilledCuckoo/docs/WYBC-factsheet-southwestlearning.pdf

_____. 2014d. Environmental Conservation Online System: Lesser Long-Nosed bat (*Leptonycteris curasoae yerbabuenae*). http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0AD#lifeHistory

_____. 2014e. Endangered and Threatened Wildlife and Plants; Threatened Status for the Northern Mexican Gartersnake and Narrow-headed Gartersnake; Final Rule. Federal Register 79(130): 38678-38746.

_____. 2014f. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*); Final Rule. Federal Register 79(192): 59992-60038.

_____. 2017. USFWS Critical Habitat Portal. Available at: http://ecos.fws.gov/crithab/. Accessed October 2016.

_____. 2014g. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Western Distinct Population Segment of the Yellow-Billed Cuckoo; Proposed Rule. Federal Register 79(158): 48548-48652.

_____. 2014h. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Jaguar; Final Rule. Federal Register 79(43): 12572-12654.

_____. 2014i. USFWS Species Assessment and Listing Priority Assignment Form. *Kinosternon sonoriense longifemorale* (Sonoyta Mud Turtle). 2014. http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/SonoytaMudTurtle/SonoytaCandidateForm.pdf

APPENDIX A

U.S. FISH AND WILDLIFE SERVICE
INFORMATION, PLANNING, AND CONSERVATION SYSTEM
DATABASE REPORT

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

TEP

LOCATION

Pima County, Arizona

Not for consultation

DESCRIPTION

Industrial Facility

Local office

Arizona Ecological Services Field Office

(602) 242-0210
(602) 242-2513

9828 North 31st Ave
#c3
Phoenix, AZ 85051-2517

http://www.fws.gov/southwest/es/arizona/
http://www.fws.gov/southwest/es/EndangeredSpecies_Main.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] are managed by the Endangered Species Program of the U.S. Fish and Wildlife Service.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
California Least Tern Sterna antillarum browni No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Yellow-billed Cuckoo Coccyzus americanus There is a **proposed** critical habitat for this species. Your location is outside the proposed critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Flowering Plants

NAME	STATUS
Pima Pineapple Cactus Coryphantha scheeri var. robustispina No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4919	Endangered

Mammals

NAME	STATUS
Jaguar Panthera onca There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/3944	Endangered
Lesser Long-nosed Bat Leptonycteris curasoae yerbabuenae No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3245	Endangered

Reptiles

NAME	STATUS
Northern Mexican Gartersnake Thamnophis eques megalops There is a **proposed** critical habitat for this species. Your location is outside the proposed critical habitat. https://ecos.fws.gov/ecp/species/7655	Threatened
Sonoyta Mud Turtle Kinosternon sonoriense longifemorale No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7276	Proposed Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service[3]. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data http://www.birdscanada.org/birdmon/default/datasummaries.jsp

The migratory birds species listed below are species of particular conservation concern (e.g. Birds of Conservation Concern) that may be potentially affected by activities in this location. It is not a list of every bird species you may find in this location, nor a guarantee that all of the bird species on this list will be found on or near this location. Although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern. To view available data on other bird species that may occur in your project area, please visit the AKN Histogram Tools and Other Bird Data Resources. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

NAME	SEASON(S)
Allen's Hummingbird *Selasphorus sasin* https://ecos.fws.gov/ecp/species/9637	Migrating
Bald Eagle *Haliaeetus leucocephalus* https://ecos.fws.gov/ecp/species/1626	Wintering
Bell's Vireo *Vireo bellii* https://ecos.fws.gov/ecp/species/9507	Breeding
Bendire's Thrasher *Toxostoma bendirei* https://ecos.fws.gov/ecp/species/9435	Year-round
Black-chinned Sparrow *Spizella atrogularis* https://ecos.fws.gov/ecp/species/9447	Wintering
Blue-throated Hummingbird *Lampornis clemenciae*	Breeding

Brewer's Sparrow Spizella breweri https://ecos.fws.gov/ecp/species/9291	Wintering
Burrowing Owl Athene cunicularia https://ecos.fws.gov/ecp/species/9737	Year-round
Calliope Hummingbird Stellula calliope https://ecos.fws.gov/ecp/species/9526	Migrating
Chestnut-collared Longspur Calcarius ornatus	Wintering
Common Black-hawk Buteogallus anthracinus	Breeding
Costa's Hummingbird Calypte costae https://ecos.fws.gov/ecp/species/9470	Year-round
Elegant Trogon Trogon elegans	Year-round
Elf Owl Micrathene whitneyi https://ecos.fws.gov/ecp/species/9085	Breeding
Fox Sparrow Passerella iliaca	Wintering
Gila Woodpecker Melanerpes uropygialis https://ecos.fws.gov/ecp/species/5960	Year-round
Gilded Flicker Colaptes chrysoides https://ecos.fws.gov/ecp/species/2960	Year-round
Golden Eagle Aquila chrysaetos https://ecos.fws.gov/ecp/species/1680	Year-round
Gray Vireo Vireo vicinior https://ecos.fws.gov/ecp/species/8680	Wintering
Lawrence's Goldfinch Carduelis lawrencei https://ecos.fws.gov/ecp/species/9464	Year-round
Lewis's Woodpecker Melanerpes lewis https://ecos.fws.gov/ecp/species/9408	Wintering
Loggerhead Shrike Lanius ludovicianus https://ecos.fws.gov/ecp/species/8833	Year-round
Long-billed Curlew Numenius americanus https://ecos.fws.gov/ecp/species/5511	Wintering
Lucifer Hummingbird Calothorax lucifer	Breeding
Lucy's Warbler Vermivora luciae https://ecos.fws.gov/ecp/species/6626	Breeding
Mccown's Longspur Calcarius mccownii https://ecos.fws.gov/ecp/species/9292	Wintering

Mountain Plover Charadrius montanus https://ecos.fws.gov/ecp/species/3638	Wintering
Northern Beardless-tyrannulet Camptostoma imberbe	Breeding
Peregrine Falcon Falco peregrinus https://ecos.fws.gov/ecp/species/8831	Year-round
Prairie Falcon Falco mexicanus https://ecos.fws.gov/ecp/species/4736	Year-round
Red-faced Warbler Cardellina rubrifrons	Breeding
Rufous Hummingbird selasphorus rufus https://ecos.fws.gov/ecp/species/8002	Migrating
Rufous-crowned Sparrow Aimophila ruficeps https://ecos.fws.gov/ecp/species/9718	Year-round
Rufous-winged Sparrow Aimophila carpalis	Year-round
Short-eared Owl Asio flammeus https://ecos.fws.gov/ecp/species/9295	Wintering
Sonoran Yellow Warbler Dendroica petechia ssp. sonorana https://ecos.fws.gov/ecp/species/2893	Breeding
Sprague's Pipit Anthus spragueii https://ecos.fws.gov/ecp/species/8964	Wintering
Swainson's Hawk Buteo swainsoni https://ecos.fws.gov/ecp/species/1098	Breeding
Varied Bunting Passerina versicolor	Breeding
Willow Flycatcher Empidonax traillii https://ecos.fws.gov/ecp/species/3482	Breeding

What does IPaC use to generate the list of migratory bird species potentially occurring in my specified location?

Landbirds:

Migratory birds that are displayed on the IPaC species list are based on ranges in the latest edition of the National Geographic Guide, Birds of North America (6th Edition, 2011 by Jon L. Dunn, and Jonathan Alderfer). Although these ranges are coarse in nature, a number of U.S. Fish and Wildlife Service migratory bird biologists agree that these maps are some of the best range maps to date. These ranges were clipped to a specific Bird Conservation Region (BCR) or USFWS Region/Regions, if it was indicated in the 2008 list of Birds of Conservation Concern (BCC) that a species was a BCC species only in a particular Region/Regions. Additional modifications have been made to some ranges based on more local or refined range information and/or information provided by U.S. Fish and Wildlife Service biologists with species expertise. All migratory birds that show in areas on land in IPaC are those that appear in the 2008 Birds of Conservation Concern report.

Atlantic Seabirds:

Ranges in IPaC for birds off the Atlantic coast are derived from species distribution models developed by the National Oceanic and Atmospheric Association (NOAA) National Centers for Coastal Ocean Science (NCCOS) using the best available seabird survey data for the offshore Atlantic Coastal region to date. NOAANCCOS assisted USFWS in developing seasonal species ranges from their models for specific use in IPaC. Some of these birds are not BCC species but were of interest for inclusion because they may occur in high abundance off the coast at different times throughout the year, which potentially makes them more susceptible to certain types of development and activities taking place in that area. For more refined details about the abundance and richness of bird species within your project area off the Atlantic Coast, see the Northeast Ocean Data Portal. The Portal also offers data and information about other types of taxa that may be helpful in your project review.

About the NOAANCCOS models: the models were developed as part of the NOAANCCOS project: Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf. The models resulting from this project are being used in a number of decision-support/mapping products in order to help guide decision-making on activities off the Atlantic Coast with the goal of reducing impacts to migratory birds. One such product is the Northeast

Ocean Data Portal, which can be used to explore details about the relative occurrence and abundance of bird species in a particular area off the Atlantic Coast.

All migratory bird range maps within IPaC are continuously being updated as new and better information becomes available.

Can I get additional information about the levels of occurrence in my project area of specific birds or groups of birds listed in IPaC?

Landbirds:

The Avian Knowledge Network (AKN) provides a tool currently called the "Histogram Tool", which draws from the data within the AKN (latest,survey, point count, citizen science datasets) to create a view of relative abundance of species within a particular location over the course of the year. The results of the tool depict the frequency of detection of a species in survey events, averaged between multiple datasets within AKN in a particular week of the year. You may access the histogram tools through the Migratory Bird Programs AKN Histogram Tools webpage.

The tool is currently available for 4 regions (California, Northeast U.S., Southeast U.S. and Midwest), which encompasses the following 32 states: Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North, Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin.

In the near future, there are plans to expand this tool nationwide within the AKN, and allow the graphs produced to appear with the list of trust resources generated by IPaC, providing you with an additional level of detail about the level of occurrence of the species of particular concern potentially occurring in your project area throughout the course of the year.

Atlantic Seabirds:

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAANCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Facilities

Wildlife refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGES AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX B

ARIZONA GAME AND FISH DEPARTMENT
ON-LINE ENVIRONMENTAL REVIEW TOOL REPORT

Arizona Environmental Online Review Tool Report

Arizona Game and Fish Department Mission
To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.

Project Name:
TEP

Project Description:
Industrial Facility

Project Type:
Energy Storage/Production/Transfer, Energy Production (generation), gas power plant (expansion/modification)

Contact Person:
Rion Bowers

Organization:
Bowers Environmental Consulting, LLC

On Behalf Of:
OTHER_FED

Project ID:
HGIS-05372

Please review the entire report for project type and/or species recommendations for the location information entered. Please retain a copy for future reference.

Disclaimer:

1. This Environmental Review is based on the project study area that was entered. The report must be updated if the project study area, location, or the type of project changes.
2. This is a preliminary environmental screening tool. It is not a substitute for the potential knowledge gained by having a biologist conduct a field survey of the project area. This review is also not intended to replace environmental consultation (including federal consultation under the Endangered Species Act), land use permitting, or the Departments review of site-specific projects.
3. The Departments Heritage Data Management System (HDMS) data is not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. HDMS data contains information about species occurrences that have actually been reported to the Department. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity. Such surveys may reveal previously undocumented population of species of special concern.
4. HabiMap Arizona data, specifically Species of Greatest Conservation Need (SGCN) under our State Wildlife Action Plan (SWAP) and Species of Economic and Recreational Importance (SERI), represent potential species distribution models for the State of Arizona which are subject to ongoing change, modification and refinement. The status of a wildlife resource can change quickly, and the availability of new data will necessitate a refined assessment.

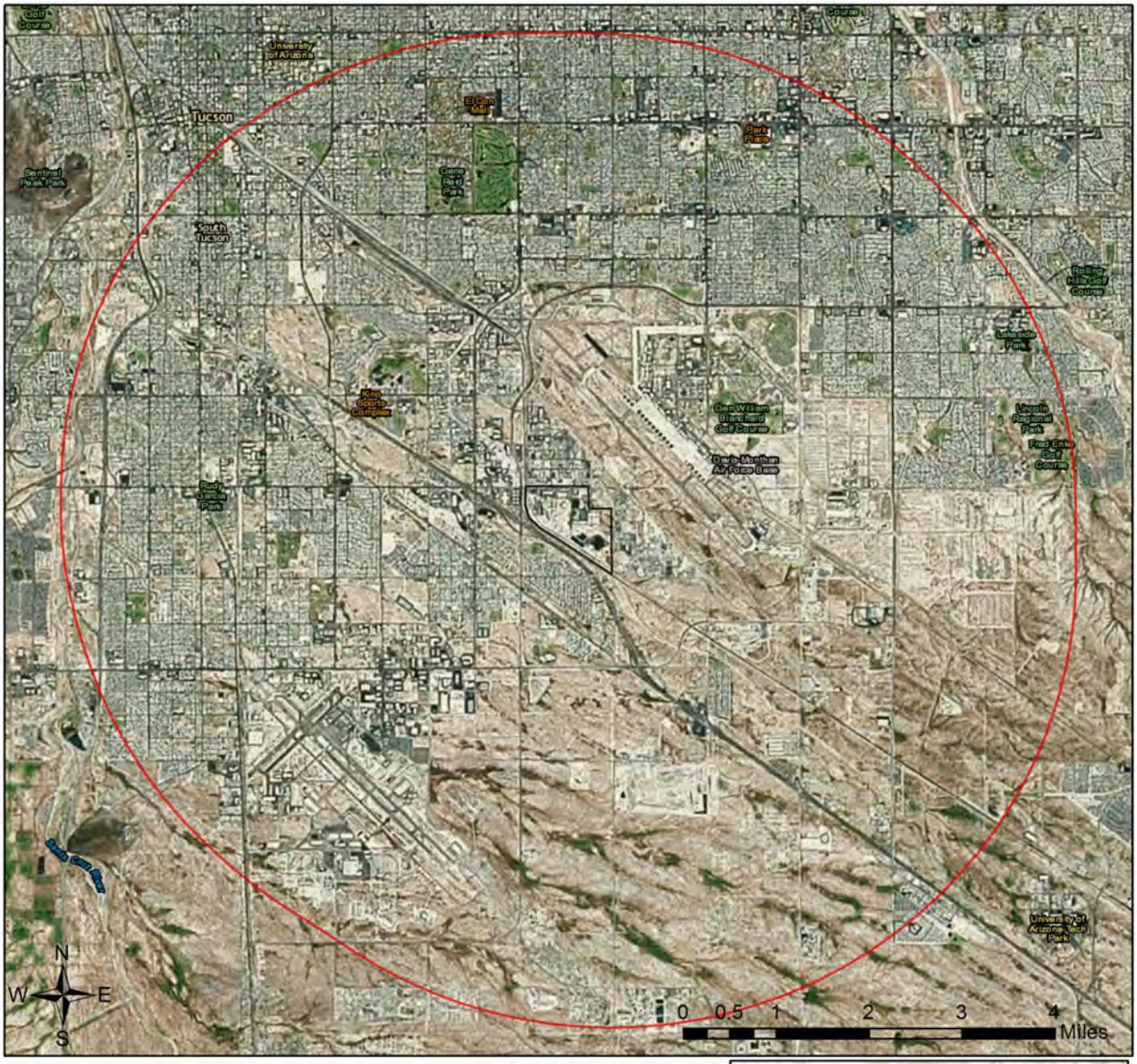
Locations Accuracy Disclaimer:
Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Report is solely responsible for the project location and thus the correctness of the Project Review Report content.

Recommendations Disclaimer:

1. The Department is interested in the conservation of all fish and wildlife resources, including those species listed in this report and those that may have not been documented within the project vicinity as well as other game and nongame wildlife.
2. Recommendations have been made by the Department, under authority of Arizona Revised Statutes Title 5 (Amusements and Sports), 17 (Game and Fish), and 28 (Transportation).
3. Potential impacts to fish and wildlife resources may be minimized or avoided by the recommendations generated from information submitted for your proposed project. These recommendations are preliminary in scope, designed to provide early considerations on all species of wildlife.
4. Making this information directly available does not substitute for the Department's review of project proposals, and should not decrease our opportunity to review and evaluate additional project information and/or new project proposals.
5. Further coordination with the Department requires the submittal of this Environmental Review Report with a cover letter and project plans or documentation that includes project narrative, acreage to be impacted, how construction or project activity(s) are to be accomplished, and project locality information (including site map). Once AGFD had received the information, please allow 30 days for completion of project reviews. Send requests to:
   Project Evaluation Program, Habitat Branch
   Arizona Game and Fish Department
   5000 West Carefree Highway
   Phoenix, Arizona 85086-5000
   Phone Number: (623) 236-7600
   Fax Number: (623) 236-7366
   Or
   PEP@azgfd.gov
6. Coordination may also be necessary under the National Environmental Policy Act (NEPA) and/or Endangered Species Act (ESA). Site specific recommendations may be proposed during further NEPA/ESA analysis or through coordination with affected agencies

TEP

Aerial Image Basemap With Locator Map



Project Boundary

Buffered Project Boundary

Project Size (acres): 349.50

Lat/Long (DD): 32.1575 / -110.8993

County(s): Pima

AGFD Region(s): Tucson

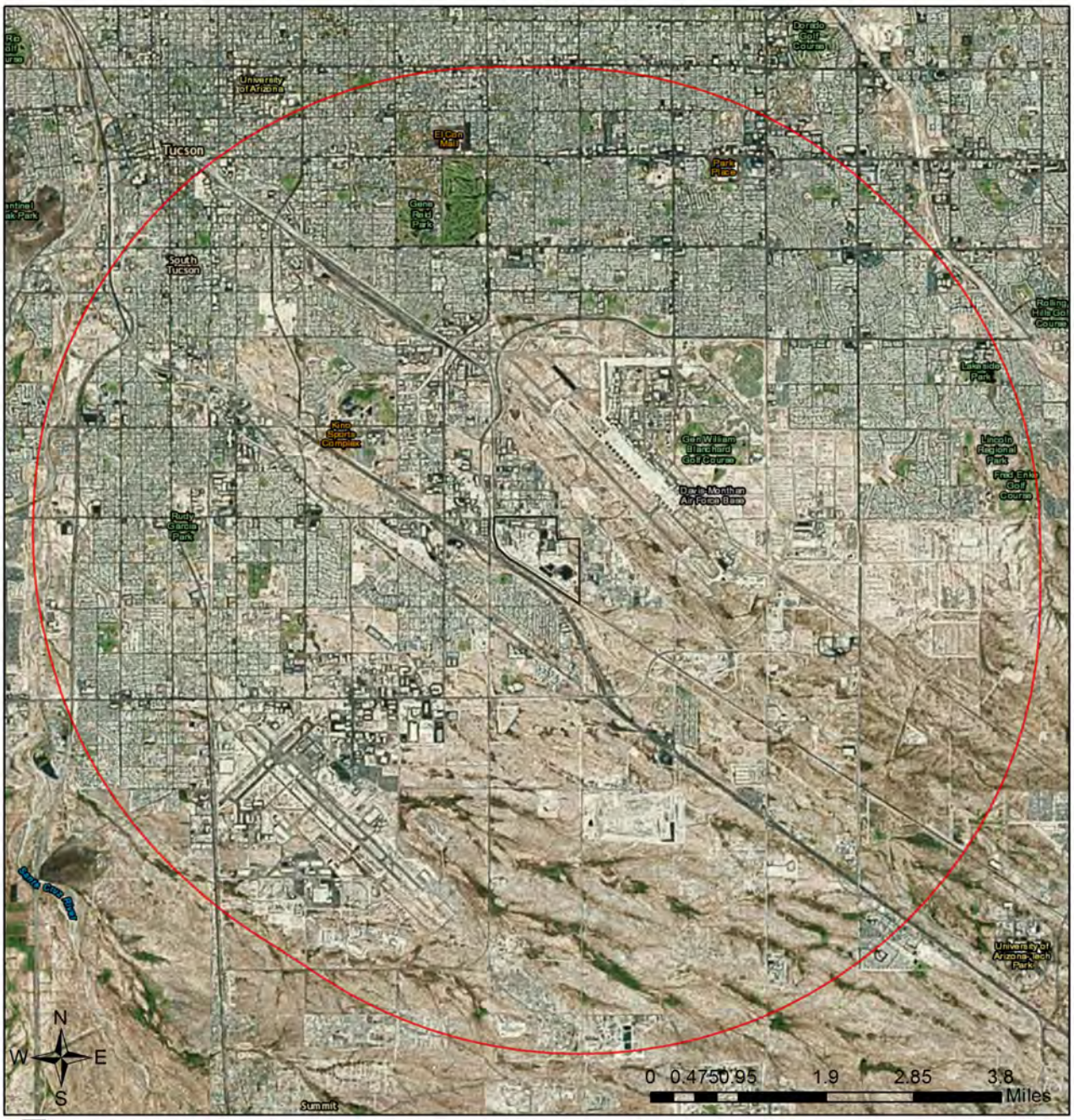
Township/Range(s): T15S, R14E

USGS Quad(s): TUCSON

Service Layer Credits: Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong),

TEP

Web Map As Submitted By User



Project Boundary

Buffered Project Boundary

Project Size (acres): 349.50

Lat/Long (DD): 32.1575 / -110.8993

County(s): Pima

AGFD Region(s): Tucson

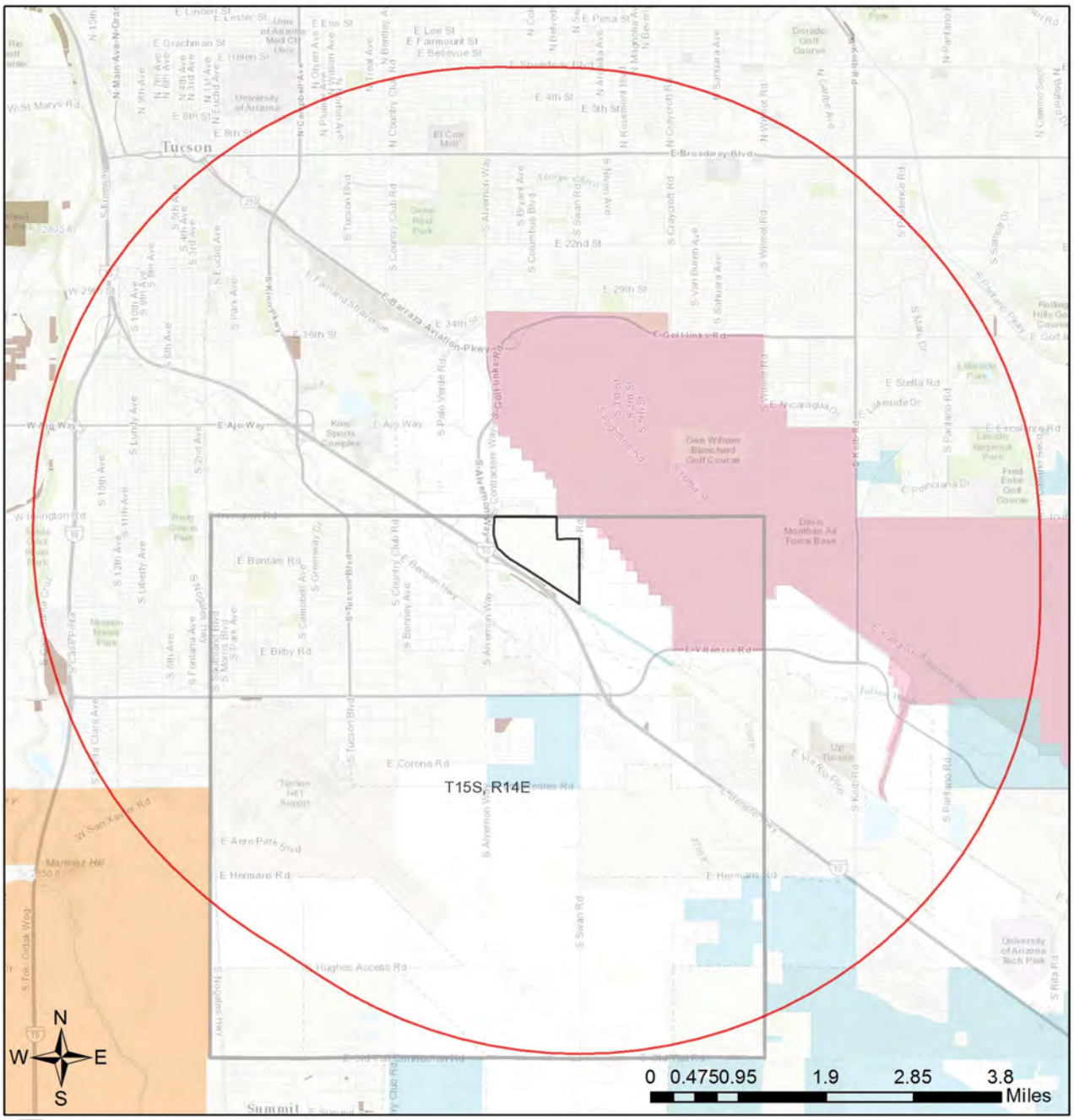
Township/Range(s): T15S, R14E

USGS Quad(s): TUCSON

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

TEP

Topo Basemap With Township/Ranges and Land Ownership



Project Boundary	Mixed/Other	Project Size (acres): 349.50
Buffered Project Boundary	National Park/Mon.	Lat/Long (DD): 32.1575 / -110.8993
Township/Ranges	Private	County(s): Pima
AZ Game and Fish Dept.	State and Regional Parks	AGFD Region(s): Tucson
BLM	State Trust	Township/Range(s): T15S, R14E
BOR	US Forest Service	USGS Quad(s): TUCSON
Indian Res.	Wildlife Area/Refuge	
Military		

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Special Status Species and Special Areas Documented within 5 Miles of Project Vicinity

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Athene cunicularia hypugaea	Western Burrowing Owl	SC	S	S		1B
Bat Colony						
Choeronycteris mexicana	Mexican Long-tongued Bat	SC	S	S		1C
Coryphantha scheeri var. robustispina	Pima Pineapple Cactus	LE			HS	
Gastrophryne olivacea	Western Narrow-mouthed Toad			S		1C
Heloderma suspectum suspectum	Reticulate Gila Monster					1A
San Xavier Indian Reservation	San Xavier Indian Reservation					

Note: Status code definitions can be found at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/
.

Species of Greatest Conservation Need
Predicted within Project Vicinity based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Aix sponsa	Wood Duck					1B
Amazilia violiceps	Violet-crowned Hummingbird		S			1B
Ammospermophilus harrisii	Harris' Antelope Squirrel					1B
Anaxyrus retiformis	Sonoran Green Toad			S		1B
Anthus spragueii	Sprague's Pipit	SC				1A
Antrostomus ridgwayi	Buff-collared Nightjar		S			1B
Aquila chrysaetos	Golden Eagle			S		1B
Aspidoscelis stictogramma	Giant Spotted Whiptail	SC	S			1B
Athene cunicularia hypugaea	Western Burrowing Owl	SC	S	S		1B
Botaurus lentiginosus	American Bittern					1B
Buteo regalis	Ferruginous Hawk	SC		S		1B
Chilomeniscus stramineus	Variable Sandsnake					1B
Colaptes chrysoides	Gilded Flicker			S		1B
Coluber bilineatus	Sonoran Whipsnake					1B
Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S	S		1B
Crotalus tigris	Tiger Rattlesnake					1B
Cynanthus latirostris	Broad-billed Hummingbird		S			1B
Cynomys ludovicianus	Black-tailed Prairie Dog	CCA		S		1A
Cyprinodon macularius	Desert Pupfish	LE				1A
Dipodomys spectabilis	Banner-tailed Kangaroo Rat			S		1B
Euderma maculatum	Spotted Bat	SC	S	S		1B
Eumops perotis californicus	Greater Western Bonneted Bat	SC		S		1B
Falco peregrinus anatum	American Peregrine Falcon	SC	S	S		1A
Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy-owl	SC	S	S		1B
Gopherus morafkai	Sonoran Desert Tortoise	CCA	S			1A

Species of Greatest Conservation Need
Predicted within Project Vicinity based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Haliaeetus leucocephalus	Bald Eagle	SC	S	S		1A
Heloderma suspectum	Gila Monster					1A
Incilius alvarius	Sonoran Desert Toad					1B
Kinosternon sonoriense sonoriense	Desert Mud Turtle			S		1B
Lasiurus blossevillii	Western Red Bat		S			1B
Lasiurus xanthinus	Western Yellow Bat		S			1B
Leopardus pardalis	Ocelot	LE				1A
Leptonycteris curasoae yerbabuenae	Lesser Long-nosed Bat	LE				1A
Lepus alleni	Antelope Jackrabbit					1B
Lithobates yavapaiensis	Lowland Leopard Frog	SC	S	S		1A
Macrotus californicus	California Leaf-nosed Bat	SC		S		1B
Melanerpes uropygialis	Gila Woodpecker					1B
Melospiza lincolnii	Lincoln's Sparrow					1B
Melozone aberti	Abert's Towhee		S			1B
Micruroides euryxanthus	Sonoran Coralsnake					1B
Myotis occultus	Arizona Myotis	SC		S		1B
Myotis velifer	Cave Myotis	SC		S		1B
Myotis yumanensis	Yuma Myotis	SC				1B
Notiosorex cockrumi	Cockrum's Desert Shrew					1B
Nyctinomops femorosaccus	Pocketed Free-tailed Bat					1B
Panthera onca	Jaguar	LE				1A
Passerculus sandwichensis	Savannah Sparrow					1B
Perognathus amplus	Arizona Pocket Mouse					1B
Peucaea carpalis	Rufous-winged Sparrow					1B
Phrynosoma solare	Regal Horned Lizard					1B
Phyllorhynchus browni	Saddled Leaf-nosed Snake					1B
Poeciliopsis occidentalis occidentalis	Gila Topminnow	LE				1A
Progne subis hesperia	Desert Purple Martin			S		1B
Setophaga petechia	Yellow Warbler					1B
Sonorella papagorum	Black Mountain Talussnail					1B
Tadarida brasiliensis	Brazilian Free-tailed Bat					1B
Thomomys umbrinus intermedius	Southern Pocket Gopher					1B
Troglodytes pacificus	Pacific Wren					1B
Vireo bellii arizonae	Arizona Bell's Vireo					1B
Vulpes macrotis	Kit Fox	No Status				1B

Species of Economic and Recreation Importance Predicted within Project Vicinity

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Callipepla gambelii	Gambel's Quail					
Callipepla squamata	Scaled Quail					1C
Odocoileus hemionus	Mule Deer					
Pecari tajacu	Javelina					
Puma concolor	Mountain Lion					
Zenaida asiatica	White-winged Dove					
Zenaida macroura	Mourning Dove					

Project Type: Energy Storage/Production/Transfer, Energy Production (generation), gas power plant (expansion/modification)

Project Type Recommendations:

Consider impacts of outdoor lighting on wildlife and develop measures or alternatives that can be taken to increase human safety while minimizing potential impacts to wildlife. Conduct wildlife surveys to determine species within project area, and evaluate proposed activities based on species biology and natural history to determine if artificial lighting may disrupt behavior patterns or habitat use. Use only the minimum amount of light needed for safety. Narrow spectrum bulbs should be used as often as possible to lower the range of species affected by lighting. All lighting should be shielded, canted, or cut to ensure that light reaches only areas needing illumination.

Minimize potential introduction or spread of exotic invasive species. Invasive species can be plants, animals (exotic snails), and other organisms (e.g., microbes), which may cause alteration to ecological functions or compete with or prey upon native species and can cause social impacts (e.g., livestock forage reduction, increase wildfire risk). The terms noxious weed or invasive plants are often used interchangeably. Precautions should be taken to wash all equipment utilized in the project activities before leaving the site. Arizona has noxious weed regulations (Arizona Revised Statutes, Rules R3-4-244 and R3-4-245). See Arizona Department of Agriculture website for restricted plants, https://agriculture.az.gov/. Additionally, the U.S. Department of Agriculture has information regarding pest and invasive plant control methods including: pesticide, herbicide, biological control agents, and mechanical control, http://www.usda.gov/wps/portal/usdahome. The Department regulates the importation, purchasing, and transportation of wildlife and fish (Restricted Live Wildlife), please refer to the hunting regulations for further information https://www.azgfd.com/hunting/regulations.

Follow manufacturer's recommended application guidelines for all chemical treatments. The U.S. Fish and Wildlife Service, Region 2, Environmental Contaminants Program has a reference document that serves as their regional pesticide recommendations for protecting wildlife and fisheries resources, titled "Recommended Protection Measures for Pesticide Applications in Region 2 of the USFWS", http://www.fws.gov/southwest/es/arizona/Documents/ECReports/RPMPA_2007.pdf. The Department recommends that direct or indirect impacts to sensitive species and their forage base from the application of chemical pesticides or herbicides be considered carefully.

Minimization and mitigation of impacts to wildlife and fish species due to changes in water quality, quantity, chemistry, temperature, and alteration to flow regimes (timing, magnitude, duration, and frequency of floods) should be evaluated. Minimize impacts to springs, in-stream flow, and consider irrigation improvements to decrease water use. If dredging is a project component, consider timing of the project in order to minimize impacts to spawning fish and other aquatic species (include spawning seasons), and to reduce spread of exotic invasive species. We recommend early direct coordination with Project Evaluation Program for projects that could impact water resources, wetlands, streams, springs, and/or riparian habitats.

Based on the project type entered, coordination with the Environmental Protection Agency may be required (http://www.epa.gov/).

For any powerlines built, proper design and construction of the transmission line is necessary to prevent or minimize risk of electrocution of raptors, owls, vultures, and golden or bald eagles, which are protected under state and federal laws. Limit project activities during the breeding season for birds, generally May through late August, depending on species in the local area (raptors breed in early February through May). Conduct avian surveys to determine bird species that may be utilizing the area and develop a plan to avoid disturbance during the nesting season. For underground powerlines, trenches should be covered or back-filled as soon as possible. Incorporate escape ramps in ditches or fencing along the perimeter to deter small mammals and herptefauna (snakes, lizards, tortoise) from entering ditches. In addition, indirect affects to wildlife due to construction (timing of activity, clearing of rights-of-way, associated bridges and culverts, affects to wetlands, fences) should also be considered and mitigated.

Based on the project type entered, coordination with State Historic Preservation Office may be required (http://azstateparks.com/SHPO/index.html).

Based on the project type entered, coordination with Arizona Department of Environmental Quality may be required (http://www.azdeq.gov/).

Based on the project type entered, coordination with Arizona Department of Water Resources may be required (http://www.azwater.gov/azdwr/default.aspx).

Vegetation restoration projects (including treatments of invasive or exotic species) should have a completed site-evaluation plan (identifying environmental conditions necessary to re-establish native vegetation), a revegetation plan (species, density, method of establishment), a short and long-term monitoring plan, including adaptive management guidelines to address needs for replacement vegetation.

The Department requests further coordination to provide project/species specific recommendations, please contact Project Evaluation Program directly. PEP@azgfd.gov

Avoid/minimize wildlife impacts related to contacting hazardous and other human-made substances in facility water collection/storage basins, evaporation or settling ponds and/or facility storage yards. Design slopes to discourage wading birds and use fencing, netting, hazing or other measures to exclude wildlife.

The Department encourages the use of technology that requires minimal amounts of water, preferably dry cooling. In the desert, water is very scarce and reducing consumption will lessen impacts on wildlife as well as the public.

Project Location and/or Species Recommendations:

HDMS records indicate that one or more listed, proposed, or candidate species or Critical Habitat (Designated or Proposed) have been documented in the vicinity of your project. The Endangered Species Act (ESA) gives the US Fish and Wildlife Service (USFWS) regulatory authority over all federally listed species. Please contact USFWS Ecological Services Offices at http://www.fws.gov/southwest/es/arizona/ or:

Phoenix Main Office
2321 W. Royal Palm Rd, Suite 103
Phoenix, AZ 85021
Phone: 602-242-0210
Fax: 602-242-2513

Tucson Sub-Office
201 N. Bonita Suite 141
Tucson, AZ 85745
Phone: 520-670-6144
Fax: 520-670-6155

Flagstaff Sub-Office
SW Forest Science Complex
2500 S. Pine Knoll Dr.
Flagstaff, AZ 86001
Phone: 928-556-2157
Fax: 928-556-2121

HDMS records indicate that Western Burrowing Owls have been documented within the vicinity of your project area. Please review the western burrowing owl resource page at:
https://www.azgfd.com/wildlife/speciesofgreatestconservneed/burrowingowlmanagement/.

Tribal Lands are within the vicinity of your project area and may require further coordination. Please contact:
Tohono O'odham Nation
PO Box 837
Sells, AZ 85634
(520) 383-2028
(520) 383-3379 (fax)

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EXHIBIT C-3

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PIMA COUNTY
ENVIRONMENTAL QUALITY
33 N. Stone Ave., Suite 700
Tucson, Arizona 85701-1429
www.deq.pima.gov

Ursula Kramer Nelson, P.E.
Director

(520) 724-7400
FAX (520) 838-7432

14 September 2017

Mr. Conrad Spencer
Director, Tucson Power Production
Tucson Electric Power Company
88 East Broadway Boulevard, Mail Stop HQW602
Tucson, Arizona 85702

Subject: Section 7 Endangered Species Act (ESA)
Irvington Generating Station
Permit No. 1052

Dear Mr. Spencer:

On 11 August 2017, the Pima County Department of Environmental Quality (PDEQ) received the Section 7 Endangered Species Act (ESA) Analysis to support the Application for a Prevention of Significant Deterioration (PSD) Authorization and Significant Revision to Class I Air Quality Permit for the Irvington Generating Station (IGS) located at 3950 East Irvington Road in Tucson, Arizona. PDEQ forwarded the ESA analysis to several Federal Land Managers. Scott Richardson of the U.S. Fish and Wildlife Service has provided the following summarized response regarding the ESA analysis:

> *We found that the section 7 analysis was well done and included the appropriate identification of potentially affected species and critical habitats. The appropriate types of modeling were applied and explained in the document. The conclusions of the analysis appear reasonable based on the information presented in the section 7 analysis. Based on our review, we concur with the conclusion of the Section 7 analysis that the proposed action will not affect any species or critical habitats listed under the Endangered Species Act.*

The complete correspondence from Mr. Richardson is attached for your record. Should you have any questions or need additional information please do not hesitate to contact me at 520-724-7341.

Sincerely,

Rupesh Patel

Rupesh Patel
PDEQ Air Permit Engineering Manager

Printed on recycled paper

September 14, 2017
RE: Section 7 Endangered Species Act – U.S. Fish and Wildlife Service

Attachment: U.S. Fish and Wildlife Service Review received September 6, 2017

Copies to: Charles W Komadina, Tucson Electric Power
Suzanne Kennedy, Geosyntec Consultants
Kate Graf, Geosyntec Consultants
Scott McCann, Geosyntec Consultants
Shelia (Ya-Ting) Tsai, EPA R9
Eugene Chen, EPA R9
Cleve Holladay, EPA R9

Printed on recycled paper

Rupesh Patel

From:	Richardson, Scott <scott_richardson@fws.gov>
Sent:	Wednesday, September 6, 2017 10:08 AM
To:	Rupesh Patel
Cc:	Kimberly Baeza; Richard Grimaldi
Subject:	Re: Request for concurrence with determination

Dear Mr. Patel,

Thank you for your correspondence of August 28, 2017 requesting our review and concurrence for the Section 7 Analysis in Support of Significant Deterioration (PSD) Authorization and Significant Revision to Class I Air Quality Permit for Irvington Generating Station. Tucson Electric Power is proposing to install ten reciprocating internal combustion engines at the existing Irvington Generating Station (the proposed action), located on private land in the City of Tucson, north of Interstate 10 and east of Alvernon. We have reviewed the materials you provided in your August 28th correspondence.

We found that the section 7 analysis was well done and included the appropriate identification of potentially affected species and critical habitats. The appropriate types of modeling were applied and explained in the document. The conclusions of the analysis appear reasonable based on the information presented in the section 7 analysis. Based on our review, we concur with the conclusion of the Section 7 analysis that the proposed action will not affect any species or critical habitats listed under the Endangered Species Act.

We appreciate the opportunity to review and provide input on the proposed action. Please contact me if you have any further questions or need any further assistance. Thank you for your consideration of endangered species.

Sincerely,

Scott Richardson
U.S. Fish and Wildlife Service
Tucson Suboffice
(520) 670-6150 x 242

On Mon, Aug 28, 2017 at 2:22 PM, Rupesh Patel <Rupesh.Patel@pima.gov> wrote:

Dear Mr. Richardson:

Tucson Electric Power (TEP) has submitted a Prevention of Significant Deterioration (PSD) air permit application to its existing Title V Irvington Generating Station (IGS) Permit No. 1052 located at 3950 East Irvington Rd, Tucson 85714, Pima County, Arizona, latitude: 32.1581660, longitude: 110.8994510.

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EXHIBIT C-4

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DRAFT TECHNICAL MEMORANDUM

Prepared for: Tucson Electric Power Company
PO Box 711 Mail Stop HQW602
Tucson, Arizona 85702

Prepared by: Bowers Environmental Consulting, LLC
2164 N Jacana Loop
Tucson, Arizona 85745

Date: October 11, 2017

Re: Riparian Habitat Assessment on Parcels 140-02-002A and -003C Located on the Tucson Electric Power Company's Irvington Campus in Pima County, Arizona

INTRODUCTION

Bowers Environmental Consulting LLC (BEC) conducted a riparian habitat assessment on parcels 140-02-002A and -003C that are located in Section 3, Township, 15S, Range 14E, southeast of the Gila and Salt River Baseline and Meridian in Pima County, Arizona (the Study Area; Figure 1). The purpose of this assessment is to determine if vegetation located on the 37.06-acre Study Area would be considered Protected Riparian Area (PRA) under the City of Tucson (COT) Floodplain, WASH and Environmental Resource Zone (ERZ) Standard (Development Standard 9-06-0). This assessment include a description of the Study Area, review of background information including aerial photography and publically available data, and field reconnaissance to record dominant vegetation on the Study Area.

STUDY AREA DESCRIPTION

General Context - The Study Area is located within the eastern boundary of the Tucson Electric Power Company's (TEP) Irvington Campus (Figure 2). The Irvington Campus includes the Sundt electrical generation facility, office buildings, maintenance shops, laydown yards, equipment storage and parking areas, power substation, solar testing and generation facilities, and other features that support transmission and distribution of

electrical power. Land use in the Study Area and surrounding lands is mostly zoned for commercial, and light and heavy industrial use. These land uses occur generally north of Interstate 10 and include warehouses, auto wrecking and scrap yards, recycling facilities, storage and rental facilities, metal fabrication shops, the Union Pacific Railway, and recreational vehicle storage and sales lots. Davis Monthan Air force Base is located less than one-mile northeast of the Study Area and some residential zoning occurs south of Interstate 10. Aerial photography indicates that the Study Area and surrounding lands have been significantly altered from the various land use activities described above, and only a few small patches of vegetation remain.

Parcel 140-02-002A – This parcel is used by TEP for material storage and solar panel testing. Over half of the site has been graded, but a strip of sparse vegetation bisects the parcel diagonally. Drainage appears to sheet flow across this parcel towards the northwest, and is then conveyed through swales across the Irvington Campus.

Parcel 140-02-003C – This parcel, which was recently acquired by TEP, is the site of a former car wrecking facility. Except for a concrete foundation on the north side of the parcel, all of the structures and vehicles have been removed. Most of the parcel is sparsely vegetated or bare, with only a few large trees in the southwest corner. There is no visible evidence of a drainage channel on aerial photography that shows this parcel.

Ecological Context – The Study Area lies within the Basin and Range Physiographic Province of southern Arizona at approximately 2,632 feet above mean sea level. This province is characterized by linear, north to south trending alluvial filled basins surrounded by fault-block mountain ranges. Topography slopes generally from southeast to northwest across the Study Area. Stormwater runoff from most of the Study Area sheet flows in a west-northwesterly direction and is directed into stormwater swales located west and north of the Study Area. Climate in the Study Area is characterized as semi-arid with temperatures ranging from 37 to 105+ degrees Fahrenheit and precipitation averaging 12 inches annually.

Geological maps describe the Study Area as unconsolidated to strongly consolidated alluvial and eolian deposits. These deposits consists of coarse, poorly sorted alluvial fan and terrace deposits on middle and upper piedmonts and along large drainages; sand, silt, and clay on alluvial plains and playas; and windblown sand deposits (Hendricks 1934). The National Resources Conservation Service (NRCS 2017) classifies soils on the Study Area as “Cave and urban land, 0 to 8 percent slopes (Map Unit 11), and Mohave soils and urban land, 1 to 8 percent slopes (Map Unit 47). These designations are typical of the basin fill soils found near the Study Area. Map Unit 11 soils consist of well-drained, very limy, mixed alluvium, and Map Unit 47 soils consist of well-drained loamy soil.

Native vegetation typically found in the region is consistent with the Arizona Upland subdivision of the Sonoran desertscrub biotic community (Brown 1994). This subdivision consists of a scrubland or low woodland of leguminous trees with an understory of shrubs

and perennial succulents on upland areas. Xeroriparian habitat, which includes many of the same plants that are found on the upland areas, but with much more robust growth, occurs along the network of ephemeral washes that are found throughout the subdivision.

REVIEW OF BACKGROUND INFORMATION

BEC reviewed several publicly available maps that show the Study Area and location of protected natural resources, including riparian areas, within the City of Tucson. These maps include critical habitat maps prepared by Pima County Department of Transportation, maps included in the TSMS Phase II Stormwater Master Plan, the Critical and Sensitive Wildlife Habitat Map, and Pima County Riparian Classification Maps (RCM).

Based on this review, no designated PRA or other critical or sensitive resources have been designated on the Study Area by COT. However, Pima County has mapped approximately 8.68 acres of vegetation on the Study Area as Xeroriparian C habitat (Figure 3).

FIELD RECONNAISSANCE

BEC biologist conducted a field reconnaissance on September 8 and 15, 2017, to inventory trees and cactus in the Study Area. During the reconnaissance, the biologist also documented common plant species and evaluated the vegetation community located on the Study Area that occurs within the boundary of Xeroriparian C habitat mapped by Pima County. During the reconnaissance common plant species were identified, GPS locations for all trees and cactus were recorded, and representative photographs were taken to document existing vegetation on the Study Area. Table 1 lists plants identified on the Study Area, and Figures 4, 5 and 6 show the location of trees identified within the Xeroriparian C habitat boundary.

Table 1. Plant Species Observed on the Study Area

Common Name	Scientific Name	Abundance
Velvet mesquite	*Prosopis velutina* (PV)	Uncommon
Foothill palo verde	*Cercidium microphyllum* (CM)	Uncommon
Mexican palo verde	*Cercidium aculeate* (CA)	Uncommon
Blue palo verde	*Cercidium floridium* (CF)	Uncommon
Hackberry	*Cletis pallida* (CP)	Uncommon
Sweet acacia	*Acacia farmesiana* (AF)	Uncommon
Catclaw acacia	*Acacia greggii* (AG)	Uncommon
Desert willow	*Chilopsis linearis* (CL)	Uncommon
African sumacc	Rhus lancia (RL)	Uncommon
Creosotebush	*Larrea tridentate* (LT)	Very Common
Triangle-leaf bursage	*Ambrosia deltoidea* (AD)	Very Common
Desertbroom	*Baccharis sarothroides* (BS)	Very Common
White bursage	*Ambrosia dumosa* (AD)	Common
Ocatillo	*Foquieria splendends* (FS)	Uncommon

Common Name	Scientific Name	Abundance
Englemann prickly pear cactus	*Opuntia engelmannii* (OE)	Common
Fish hook barrel cactus	*Ferocactus wislizenii* (FW)	Common
Teddy Bear cholla cactus	*Cylindropuntia bigelovii* (COB)	Common
Buckthorn cholla	*Cylindropuntia acanthocarpa* (COA)	Common
Christmas cholla	*Cylindropuntia leptocaulis* (COL)	Common
Johnson grass*	*Sorghum halepense*	Very Common
Buffelgrass*	*Pennisetum ciliare*	Very Common

*Non-native, invasive species found commonly throughout the Study Area.

Vegetation on the Study Area is highly disturbed and consists mostly of shrubs and non-native grass species with a few patches of widely spaced native and non-native trees (see attached photographs). Nine velvet mesquite trees, and one Mexican palo verde tree are located on the portion of Parcel 140-02-002A that is mapped as Xeroriparian C by Pima County (Figure 5). Most of this area is covered with creosotebush and dense stands of desert broom, buffelgrass and Johnson grass. Seventeen wildly scattered trees were documented on Parcel 140-02-003C (Figure 6). This includes seven velvet mesquites, three hackberry, one Mexican palo verde, four blue palo verde, one sweet acacia, and one catclaw. Creosotebush and triangle leaf bursage is common, and buffelgrass covers nearly all the ground surface around the trees.

CONCLUSIONS

Results of this assessment indicates that vegetation on the Study Area is heavily disturbed from historic and current land use activities on the Study Area and surrounding lands. These land uses have altered the natural topography, and drainage patterns, and heavily disrupted native plant communities. Vegetation observed within the Study Area is not consistent with the description of Protected Riparian Area (PRA) under City of Tucson Development Standard 9-06.0. The small patches of native trees found on the Study Area, within and adjacent to the Pima County mapped Xeroriparian C habitat, are disconnected from larger undeveloped tracks of natural desert land, as the entire area is surrounded by industrial, commercial and residential developments. No hydroriparian or mesoriparian plant species occur on the Study Area, and over-story vegetation is spare and widely spaced. Understory vegetation consists of nearly pure stands of desert broom, triangle-leaf bursage, creosote bush, buffelgrass and Johnson grass. Vegetation found in the Study Area does not provide significant habitat structure and function that would provide forage, shelter, nesting and breeding areas for native wildlife species typically associated with unaltered Xeroriparian habitat. Furthermore, this isolated patch of vegetation would not aid in supporting wildlife connectivity, and does not provide functional erosion control or help to improve stormwater quality off-site or in the Study Area.

RCMs that are sometimes relied upon by COT were produced by Pima County to meet the purpose of the County's Floodplain and Erosion Hazard Management Ordinance No. 2010-FC5. The RCMs were produced at a scale of 1" = 2,000 using digital

orthophotography, 2000 LANDSAT satellite imagery, and data prepared for the Sonoran Desert Conservation Plan. These maps provide a general location of Regulated Riparian Habitat (RRH) within unincorporated Pima County. Due to photo rectification issues, and the scale at which the RCM were created, habitat boundaries shown on the GIS-based maps, as in this and many other cases, do not accurately reflect the actual on-the-ground conditions or identify the actual vegetation community. Additionally, the xeroriparian classification system is based on the Total Vegetation Volume (TVV) of riparian habitat within Pima County, which was measured from satellite imagery and averaged for each RRH classification, resulting in average values across the landscape.

BEC concludes that the vegetation found on the Study Area would not be considered Regulated Riparian Habitat by the City of Tucson because it lacks certain primary constituent elements that are required for an ecologically functional habitat. Finally, if left in its current state, this isolated patch of vegetation would continue to degrade with the infestation and spread of non-native, invasive species on the Study Area and surrounding lands.

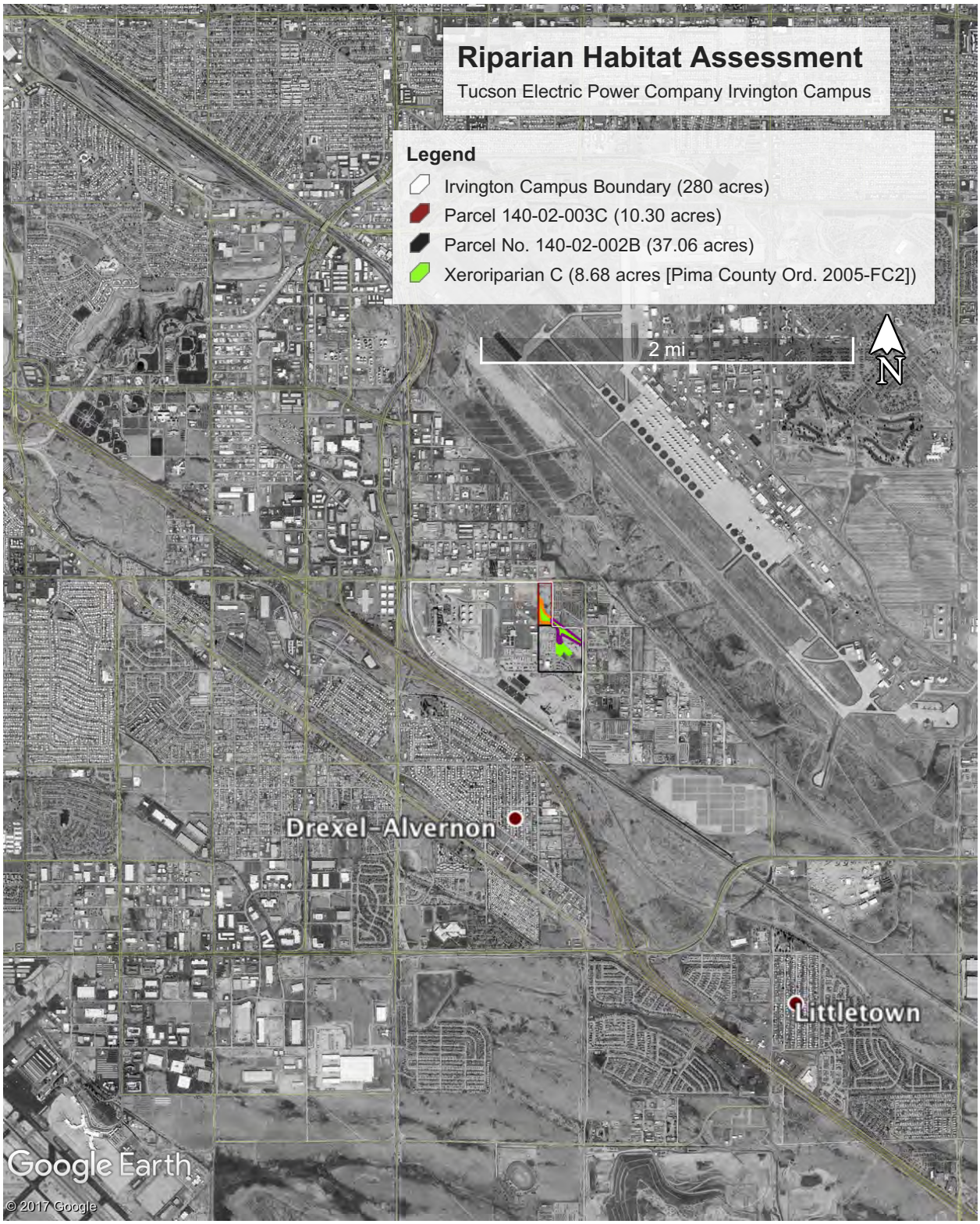

Figure 1. Project Location Map

Figure 2. Aerial Overview of the Irvington Campus and Study Area

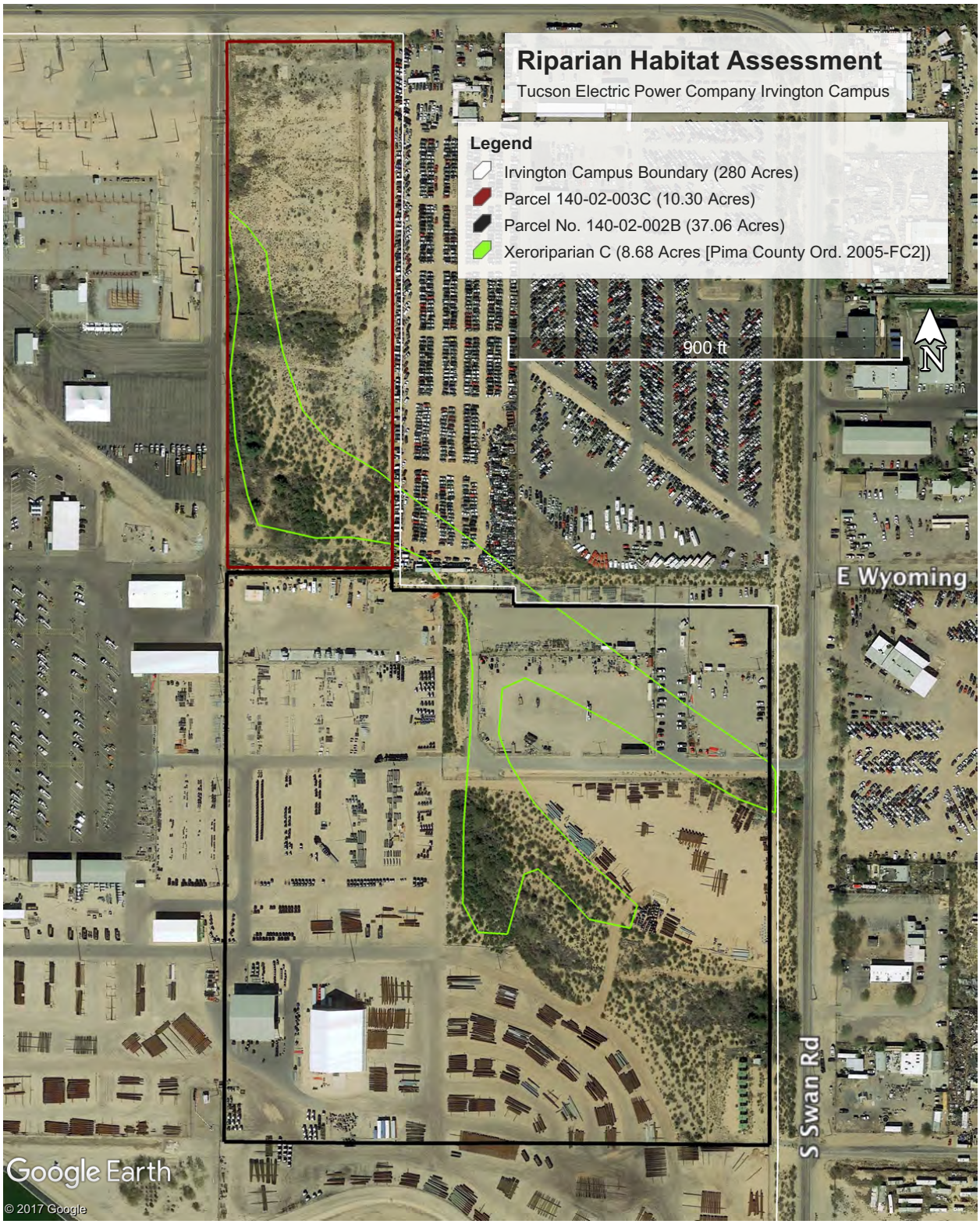

Figure 3. Pima County Mapped Xeroriparian C Vegetation on the Study Area

Figure 4. Overview of Trees Located on the Study Area.

Figure 5. Location of Trees on Parcel 140-02-002B

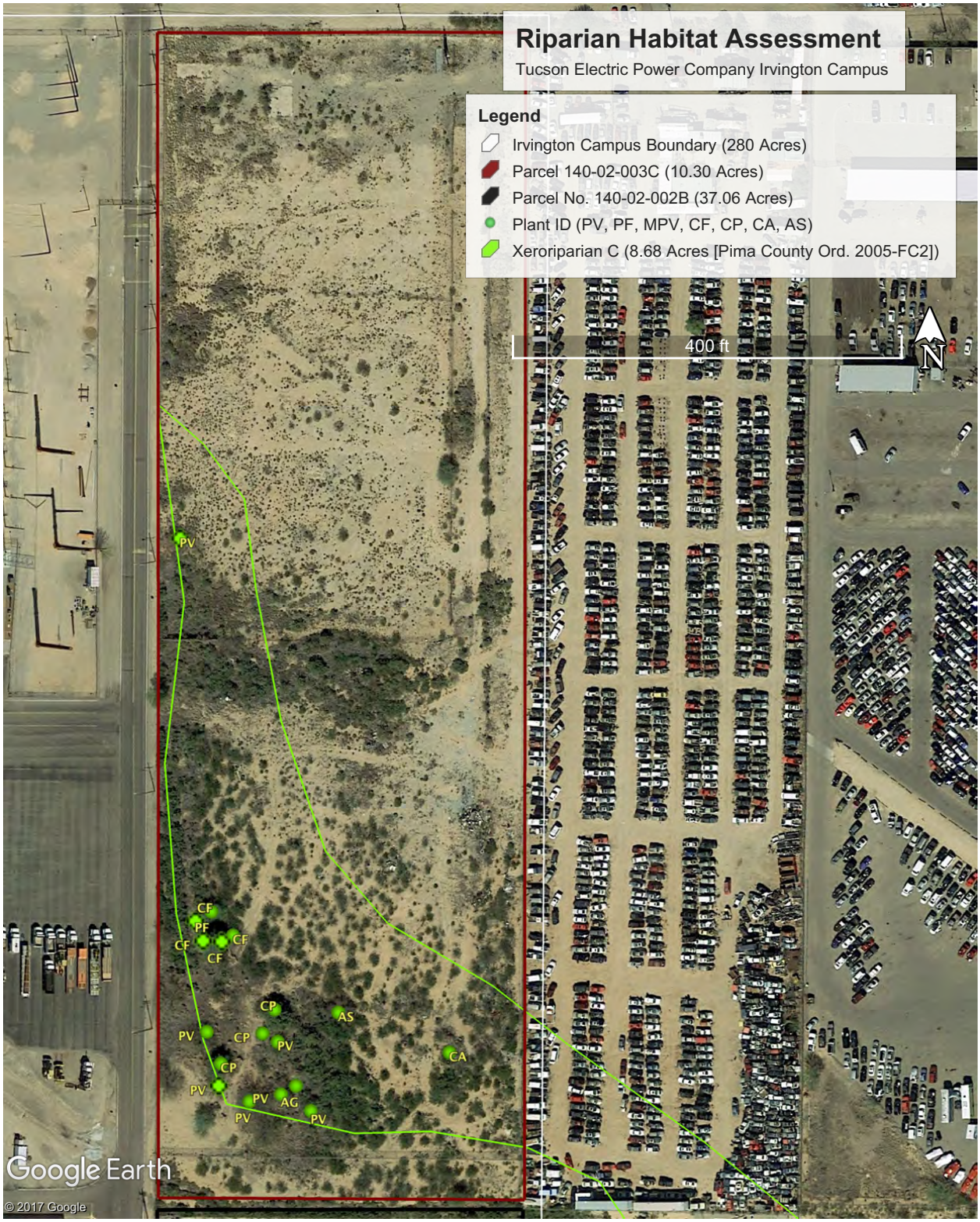

Figure 6. Location of Trees on Parcel 140-02-003C

REPRESENTATIVE PHOTOS OF THE STUDY AREA

Photo 1. View north. Vegetation in the southern portion of the Study Area

Photo 2. View South. Vegetation in the Southern portion of the Study Area

REPRESENTATIVE PHOTOS OF THE STUDY AREA

Photo 3. View west. Vegetation in the southern portion of the Study Area

Photo 4. View north. Vegetation in the northern portion of the Study Area.

REPRESENTATIVE PHOTOS OF THE STUDY AREA

Photo 5. View North. Vegetation in the northern portion of the Study Area.

Photo 6. View East. Vegetation on the northern portion of the Study Area.

EXHIBIT D

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EXHIBIT D: BIOLOGICAL RESOURCES

AAC R-14-3-219:

> *List the fish, wildlife, plant life and associated forms of life in the vicinity of the proposed site or route and describe the effects, if any, the proposed facilities will have thereon.*

D.1 General Project Setting

The Projects will be constructed in an urban area within the COT. Approximate elevations within the study area range from 2,600 to 2,675 feet above mean sea level, sloping from southeast down to the northwest. Annual precipitation recorded in Tucson, Arizona is 11.7 inches (WRCC, 2005). Nearly half of the annual rainfall occurs during the summer monsoon season (July to September); the remainder is spread over the balance of the year, with approximately one quarter of the total occurring during the winter rainy season (December to February). High summer temperature in June and July are consistently just over 100 degrees Fahrenheit (°F), with winter highs approximately 68 °F (WRCC, 2005). Terrain is low profile valley floor, adjacent to the Julian Wash Greenway, the Union Pacific Railroad (UPRR), and Interstate 10 (I-10). Soils in the study area are unconsolidated to strongly consolidated alluvial and aeolian deposits. Stormwater runoff generally drains in a west-northwest direction and is directed into regional flood control structures located west and south of Irvington Campus.

D.2 Biological Resources

A brief discussion of vegetation and wildlife resources potentially occurring within the study area and the potential impacts to them from the proposed Projects are outlined below and described in more detail in the BE (BEC, 2017), Exhibit C-2.

Vegetation

Native vegetation in the study area is consistent with the Arizona Upland Division of the Sonoran Desertscrub biotic community (Brown, 1994). However, there is very little native vegetation on Irvington Campus. Most of Irvington Campus has been graded and altered, as the site was originally developed in the 1950s. Several landscaped areas are scattered around Irvington Campus, and a few small patches of native vegetation are found near the southeast quadrant and perimeter. Grasses, and other ground cover species are nearly absent from the study area.

Wildlife

There are no large snags, permanent surface water, cliffs, caves, adits, or other habitat features that would provide nesting, breeding, cover, or forage opportunities for wildlife. Most of the wildlife habitat within the study area has been developed for urban use. The wildlife observed on Irvington Campus is typical of an urban setting (see Exhibit C-2 for list).

D.3 Impacts

Removal of vegetation associated with clearing and grading has the potential to impact nesting birds protected under the Migratory Bird Treaty Act (MBTA). There is no vegetation in areas to be disturbed, therefore there will be no impacts to vegetation or wildlife.

D.4 Conclusion

There is no vegetation in the areas to be disturbed, and construction of the Projects will use existing access. There will be no vegetation or habitat loss.

D.5 References

BEC. (2017). *Biological Evaluation Tucson Electric Power Company Irvington Campus Redevelopment.* Tucson, AZ: Bowers Environmental Consulting.

Brown, D. E. (1994). *Biotic Communities: Southwestern United States and Northwestern Mexico.* Salt Lake City: University of Utah Press.

King, A. M., & Buckles, A. (2017). *A Cultural Resources Inventory and Historic Building Assessment for Tucson Electric Power's Irvington Campus, Tucson, Pima County, Arizona.* Tucson, AZ: Westland Resources.

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EXHIBIT E

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EXHIBIT E: SCENIC AREAS, HISTORIC SITES AND STRUCTURES, AND ARCHAEOLOGICAL SITES

AAC R14-3-219:

> *Describe any existing scenic areas, historic sites and structures or archaeological sites in the vicinity of the proposed facilities and state the effects, if any, the proposed facilities will have thereon.*

Exhibit E includes summaries of existing visual (scenic), historic sites and structures, and cultural resources, as well as the potential impacts the proposed Projects may have on each resource.

E.1 Scenic Areas and Visual Resources

E.1.1 Overview

Existing structures on the Irvington Campus that are visible to the general public include the existing gas-fired generation units, the coal barn, T-3 transfer tower, conveyor belts, cooling towers, Sundt Solar Boost Project, 46 kV and 138 kV substations, and transmission towers. Visible actions of the Projects include the relocation of the existing 138 kV and 46 kV substations, the addition and relocation of 138 kV and 46 kV transmission structures, and the addition of the RICE generation and associated 160-foot-tall exhaust stacks. TEP is planning to remove the T-3 transfer tower and associated coal conveyor belts as part of these Projects.

TEP prepared visual simulations to compare the visual impact of the proposed facilities with the existing facilities on Irvington Campus. The simulations were included in materials distributed to the public, such as newsletters, public open house displays, and flyers.

E.1.2 Inventory Methods

Field work was conducted to photograph the existing conditions from various locations on the perimeter of Irvington Campus. Four (4) Key Observation Points (KOPs) were selected which best captured the view that could be impacted by construction of the new and relocated facilities. The view of individuals traveling through the area on I-10, users of the neighborhood park and trail on the south side of I-10, and the residents in the neighborhood to the south were taken into account in selection of the KOPs.

A georeferenced 3-dimensional (3d) model was created, using the engineered site plan and elevation, in conjunction with a photo of a similar existing facility. The model included the proposed RICE Generation Project (including the enclosures for the generators and the exhaust stacks), 138 kV and 46 kV transmission lines and towers, and the 138 kV and 46 kV substation in their new locations. Four (4) visual simulations were created of the proposed condition to illustrate what the Projects would look like from I-10 and the adjacent parks and residential neighborhood to the south.

E.1.3 Inventory Results

See Exhibit G-4 for simulations of the proposed facilities, and Exhibit J-4 for the visual simulations in the format provided to the public.

E.2 Historic Sites and Structures, and Archaeological Sites

E.2.1 Overview

A cultural resource inventory and historic building assessment was conducted by Westland Resources, to assess the nature of historic and cultural resources that may potentially be affected by the construction of the proposed Projects (King & Buckles, 2017), see Exhibit E-1. The goal of the study was to identify prior historic and cultural resource surveys and recorded historical and archaeological sites in the Area of Potential Effects (APE), which is Irvington Campus.

E.2.2 Inventory Methods and Results

The study included a Class I records review at the following agencies and research institutions: State Historic Preservation Office (SHPO); Arizona State Museum (ASM) AZSITE Database; and the NRHP. The records review identified 44 cultural resource studies conducted within the Class I study area, which is the APE plus a 0.5-mile buffer. These studies span the last several decades and were prepared mostly for linear road-related projects and utility improvements. Other surveys were conducted that were not listed on AZSITE.

The records review identified nine (9) previously recorded sites, two (2) of which are within the APE, and identified one (1) newly recorded site (see Exhibit E-1). Of these, only the EPNG Pipeline No. 1007 (Site AZ AA:12:875(ASM)) has been determined eligible for listing in the NRHP, however, it will not be disturbed by these Projects.

Recommendations

The archaeologist's recommendations for the Projects are to avoid the EPNG Pipeline, and to abide by the requirements of A.R.S. § 41-865 should any human remains or cultural materials be discovered during ground-disturbing activities.

PDEQ also reviewed the cultural resources inventory as part of the Application for a Prevention of Significant Deterioration (PSD) Authorization and Significant Revision to Class I Air Quality Permit for the RICE Generation Project. Pima County's Office of Sustainability and Conservation and the COT Historic Preservation Program issued their concurrence with the recommendations in the report, and exempts the EPNG Pipeline site from County cultural resources compliance requirements (Exhibit E-2).

EXHIBIT E-1

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A CULTURAL RESOURCES INVENTORY AND HISTORIC BUILDING ASSESSMENT FOR TUCSON ELECTRIC POWER'S IRVINGTON CAMPUS, TUCSON, PIMA COUNTY, ARIZONA

Tucson Electric Power

Prepared by:
Anna M. King and Avi Buckles

Reviewed and submitted by:
Fred Huntington

Cultural Resources Report 2017-46
ASM Accession No. 2017-202

June 8, 2017
Project Number: 1610.204

WestLand Resources

WestLand Resources, Inc. • 4001 E. Paradise Falls Drive • Tucson, Arizona 85712 • 520•206•9585

STATEMENT OF CONFIDENTIALITY

Disclosure of the locations of historic properties to the public may be in violation of both federal and state laws. Applicable United States laws include, but may not be limited to, Section 304 of the National Historic Preservation Act (16 U.S.C. 470w-3) and the Archaeological Resources Protection Act (16 U.S.C. §470hh). In Arizona, applicable state laws include, but may not be limited to, Arizona Revised Statute Title 39, Section 125.

TABLE OF CONTENTS

STATEMENT OF CONFIDENTIALITY i
STATE HISTORIC PRESERVATION OFFICE REPORT ABSTRACT iv
INTRODUCTION AND PROJECT BACKGROUND 1
ARCHAEOLOGICAL RESEARCH AND RECORDS SEARCH 4
Historical Map and Aerial Photograph Review 4
PHYSIOGRAPHIC CONTEXT 9
Modern Disturbances 10
CULTURE HISTORY 11
Electrical Power Generation and the History of Tucson's Utilities 15
Electrical Power Generation 15
The Development of Tucson's Utilities 18
Modern Developments at the Irvington Generating Station 21
SURVEY METHODS 22
Field Survey 22
Building and Structure Definitions 22
Archival Research 22
Arizona State Museum Site Criteria 23
Isolated Occurrences 24
SURVEY FINDINGS 25
Previous Site That is No Longer Present 25
AZ BB:13:854(ASM) 25
Site Descriptions 26
AZ AA:12:875(ASM) – EPNG Pipeline No. 1007 26
AZ BB:13:895(ASM) – Irvington Generating Station 28
Isolated Finds 41
NATIONAL REGISTER OF HISTORIC PLACES EVALUATIONS AND RECOMMENDATIONS 42
AZ AA:12:875(ASM) – EPNG Pipeline No. 1007 42
AZ BB:13:895(ASM) – Irvington Generating Station 43
MANAGEMENT SUMMARY 44
REFERENCES 45

FIGURES

Figure 1. Vicinity map 2
Figure 2. Project location showing surface management 3
Figure 3. Cultural chronology for the Tucson Basin and surrounding regions 12
Figure 4. AZ BB:13:895(ASM) 28a

PHOTOGRAPHS

Cover Photo. Overview of the Irvington Generating Station, facing southwest
Photo 1. Overview of the western portion of the Irvington Campus from its southwestern edge, looking northeast 1
Photo 2. 1958 aerial photograph of the Irvington Generating Station 6
Photo 3. 1967 aerial photograph of the Irvington Generating Station 7
Photo 4. Overview of an undeveloped portion of the eastern project area, looking southeast 9
Photo 5. Overview of the former location of AZ BB:13:854(ASM), looking north 25
Photo 6. Overview of AZ AA:12:875(ASM) where it intersects the northeastern portion of the project area, facing southeast 26
Photo 7. Overview of a portion of the Irvington Generating Station, showing Cooling Tower #1 (at left), the Unit #1 Boiler and Stack (mid-ground, center), and the northern portion of the Generating Building, housing Unit #1 (at right) 28
Photo 8. Boiler #2 (at right) and Boiler #3 (at left), facing west 31
Photo 9. Stacks for Boilers #1 through #3 and Water Tower, facing north 32
Photo 10. Overview of the Generating Building, facing southeast, showing the original 1957–1958 portion of the building 33
Photo 11. Cooling Towers #1 (at right) and #2 (at left), facing east-southeast 34
Photo 12. Switchyard #2, facing east 34
Photo 13. Substation at the northwestern corner of the Irvington Generating Station, original to the 1957–1958 construction of the plant, facing northwest 35
Photo 14. Railroad spur tracks in the northern portion of the Irvington Generating Station, facing west 36
Photo 15. Overview of the west (front) façade of the Service Center, facing northeast 37
Photo 16. Overview of the original, western portion of the Communications/Relay Building, facing northeast 37
Photo 17. Overview of the Facilities Management Building, facing north 38
Photo 18. Detail of IO 1 sherds 41

TABLES

Table 1. Extant historical buildings and structures at the Irvington Generating Station, AZ BB:13:895(ASM) 30

APPENDICES

Appendix A. Archaeological Records Search
Appendix B. Results of Archaeological Survey
Appendix C. Historical Maps of the Project Area

STATE HISTORIC PRESERVATION OFFICE REPORT ABSTRACT

REPORT TITLE: A Cultural Resources Inventory and Historic Building Assessment for Tucson Electric Power's Irvington Campus, Tucson, Pima County, Arizona

REPORT DATE: June 8, 2017

PROJECT NAME: TEP Irvington Campus Survey

PROJECT LOCATION: Tucson, Pima County, Arizona

PROJECT LOCATOR UTM: 3558497m N; 508668m E

PROJECT SPONSOR: Tucson Electric Power

SPONSOR PROJECT NUMBER(S): n/a

LEAD AGENCY: n/a

OTHER INVOLVED AGENCIES: n/a

APPLICABLE REGULATIONS: n/a

FUNDING SOURCE: Private – Tucson Electric Power

ASLD ROW APPLICATION NUMBER: n/a

DESCRIPTION OF THE PROJECT/UNDERTAKING: Tucson Electric Power (TEP) is planning future improvements at its Irvington Campus, a power-generating facility located in Tucson, Pima County, Arizona. TEP contracted WestLand Resources, Inc. (WestLand), to conduct a cultural resources inventory of the facility for TEP's internal planning purposes. As initial construction and use of the Irvington Generating Station began in 1957–1958, WestLand was also contracted to provide a historic building assessment to identify any standing buildings over 50 years old that might be of historical or architectural significance.

PROJECT AREA/AREA OF POTENTIAL EFFECTS (APE): TEP's Irvington Campus (the project area) is an irregularly shaped 344-acre parcel located at the intersection of Alvernon Way and Irvington Road in the city of Tucson, Pima County, Arizona.

LEGAL DESCRIPTION: Township 15 South, Range 14 East, a portion of Section 3

USGS 7.5' QUADRANGLE(S): Tucson

LAND JURISDICTION: Private – Tucson Electric Power

TOTAL ACRES: 344

ACRES SURVEYED: 344

ACRES NOT SURVEYED: 0

CONSULTANT FIRM/ORGANIZATION: WestLand Resources, Inc.

PROJECT NUMBER: 1610.204

PERMIT NUMBER(S): n/a (private land)

DATE(S) OF FIELDWORK: May 15 and 16, 2017

NUMBER OF IOS RECORDED: 1

NUMBER OF SITES RECORDED: 2 – AZ AA:12:875(ASM) and AZ BB:13:895(ASM)

ELIGIBLE SITES: 1

INELIGIBLE SITES: 1

UNEVALUATED SITES: 0

SITES NOT RELOCATED: 1 – AZ BB:13:854(ASM)

Site summary table

Land Jurisdiction	Identification Status	Site Number/ Property Address	Eligibility Status/ Criterion/Criteria	Recommended Treatment
Private	Previously recorded	AZ AA:12:875(ASM)	Determined eligible – SHPO 2004–2012	Avoid – no adverse effect
Private	Previously recorded	AZ BB:13:854(ASM)	Previously recommended ineligible	Site is no longer present; none
Private	New	AZ BB:13:895(ASM)	Recommended ineligible	None

COMMENTS: WestLand's cultural resources inventory resulted in the re-assessment of two previously recorded archaeological sites and the identification of one new archaeological site and one isolated occurrence. One of the previous sites, AZ AA:12:875(ASM), El Paso Natural Gas pipeline No. 1007, has been determined eligible for inclusion in the National Register of Historic Places (NRHP) by the Arizona State Historic Preservation Office under Criteria (c) and (d). WestLand recommends that this site be avoided during any future improvement projects at the Irvington Campus.

The other previously recorded site, AZ BB:13:854(ASM), a Historic period waste pile, was previously recommended ineligible for the NRHP (Buckles 2013). This site has subsequently been destroyed by the construction of a contractor's yard and no further work is recommended.

The newly recorded site, AZ BB:13:895(ASM), the historical component of the Irvington Campus known as the Irvington Generating Station, is recommended ineligible for inclusion in the NRHP. No further architectural or historical documentation is recommended at this site prior to any improvements to the Irvington Campus.

WestLand also provides the general recommendation that all ground-disturbing activities have the potential to unearth human remains and cultural materials, and that any such discoveries must be treated in accordance with Arizona Revised Statute §41-865.

INTRODUCTION AND PROJECT BACKGROUND

Tucson Electric Power (TEP) is planning future improvements at the Irvington Campus, a power-generating facility located in Tucson, Pima County, Arizona. TEP contracted WestLand Resources, Inc. (WestLand), to conduct a cultural resources inventory of the facility for TEP's internal planning purposes. As initial construction and use of the Irvington Generating Station began in 1957–1958, WestLand was also contracted to provide a historic building assessment to identify any standing buildings over 50 years old that might be of historical or architectural significance. While this report was prepared for TEP's internal planning purposes and a reviewing agency has not yet been identified for proposed future improvements, it has been prepared in compliance with the Arizona Antiquities Act reporting standards and Arizona State Historic Preservation Office (SHPO) guidelines (rev. January 2016; Arizona SHPO 2016).

TEP's Irvington Campus (the project area) is an irregularly shaped 344-acre parcel at the intersection of Alvernon Way and Irvington Road in the city of Tucson, Pima County, Arizona. More specifically, it is located in Township 15 South, Range 14 East, a portion of Section 3 (Tucson 7.5' USGS quadrangle) **(Photo 1; Figures 1 and 2; see also cover photo)**.

Photo 1. Overview of the western portion of the Irvington Campus from its southwestern edge, looking northeast

The cultural resources inventory fieldwork was conducted by WestLand archaeologists Anna King and Rebecca Caroli on May 15 and 16, 2017, under the direction of Fred Huntington, who served as project manager. WestLand historian Avi Buckles accompanied the field crew and conducted an oral interview with a longtime TEP employee. The inventory resulted in the re-assessment of two previously recorded archaeological sites and the identification of one new archaeological site and one isolated occurrence of cultural materials.

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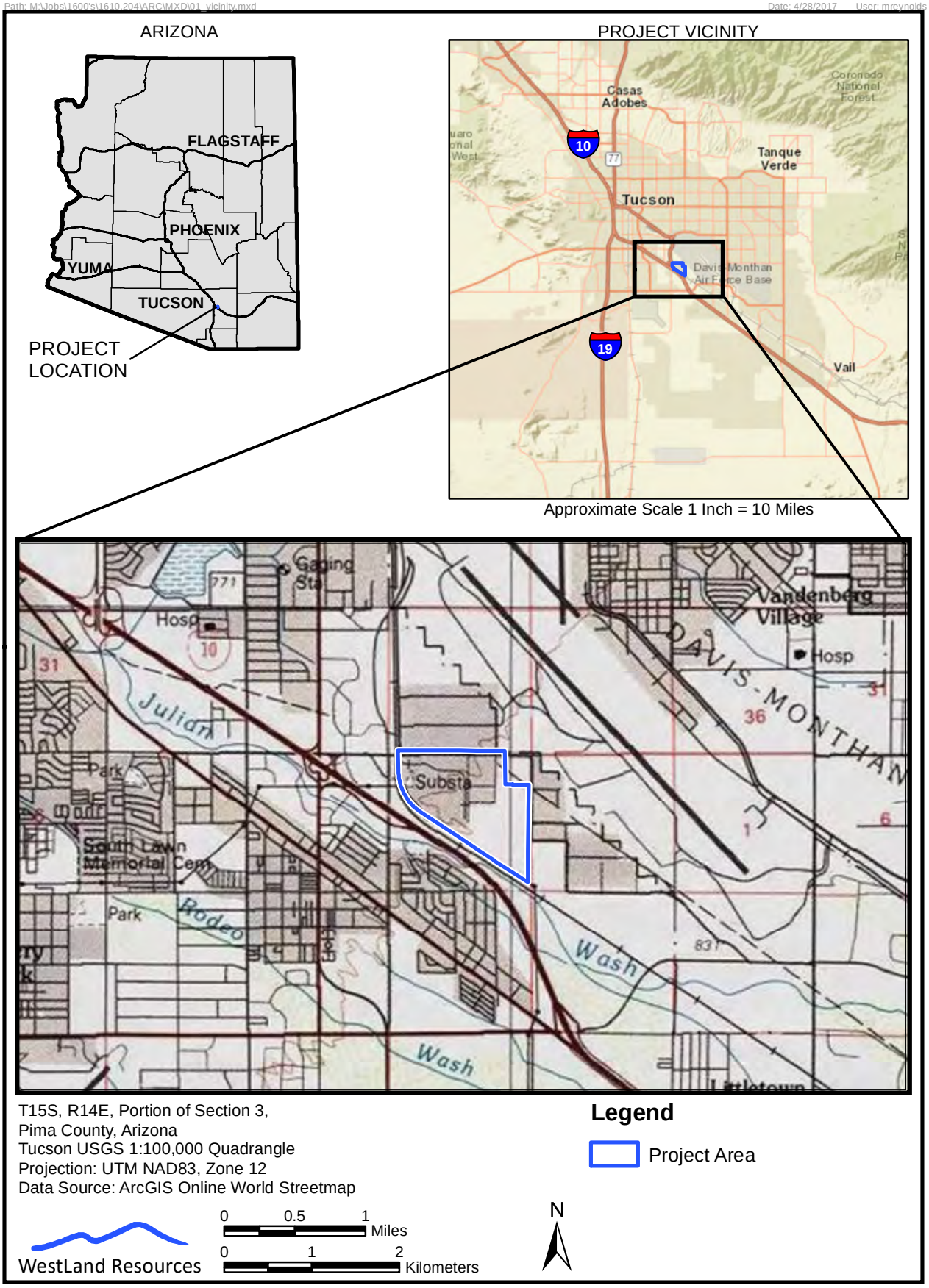

Figure 1. Vicinity map

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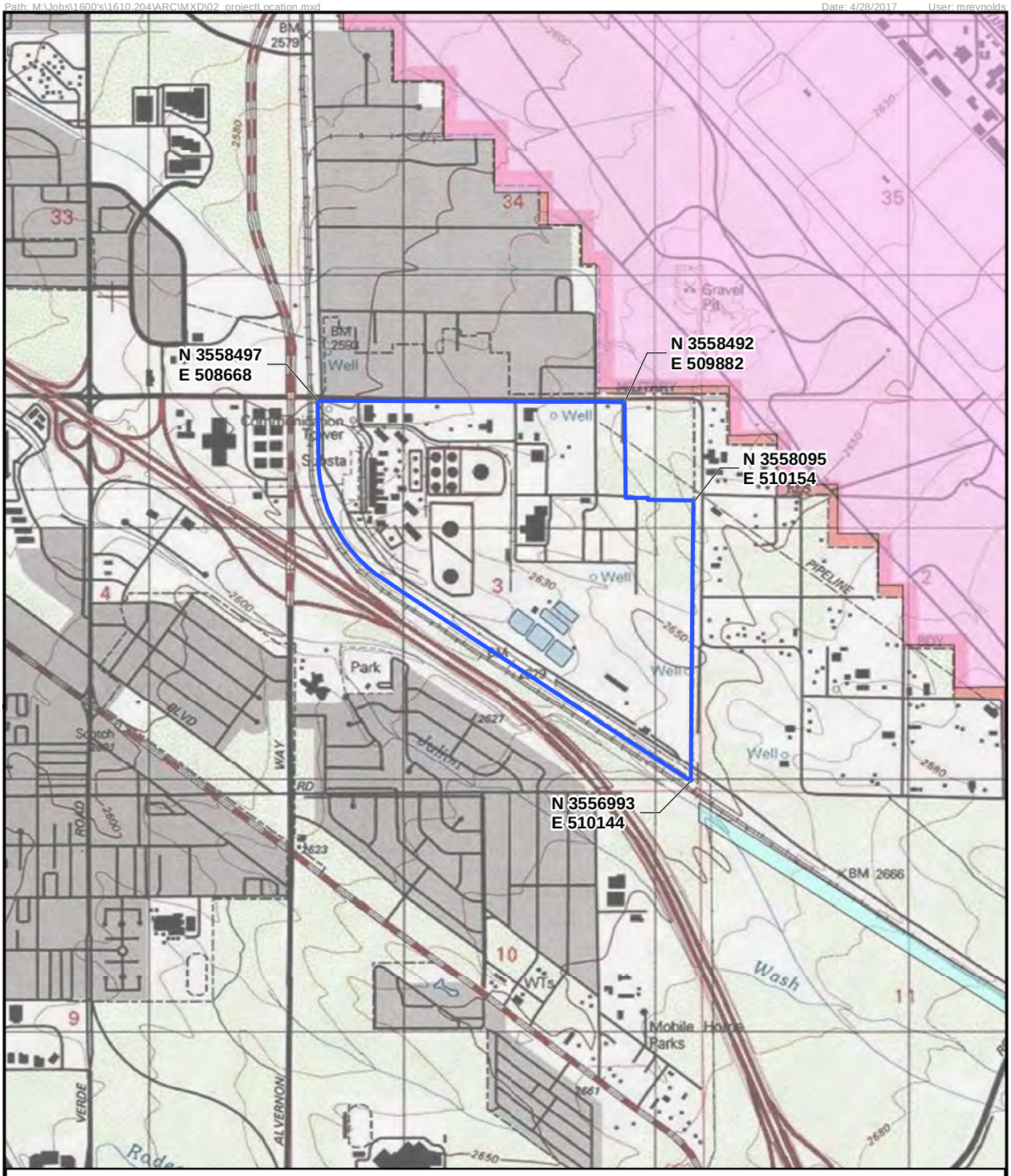

T15S, R14E, Portion of Section 3,
Pima County, Arizona
Tucson USGS 7.5' Quadrangle
Projection: UTM NAD83, Zone 12
Data Source: BLM Surface Management (2014)

WestLand Resources

0 1,000 2,000 Feet

0 500 1,000 Meters

N

Legend

Project Area

Surface Management

Military

Private Land (No Color)

State Trust Land

Figure 2. Project location showing surface management

ARCHAEOLOGICAL RESEARCH AND RECORDS SEARCH

Prior to fieldwork, WestLand performed an archaeological records check for the project area. Site record files were searched in the Arizona State Museum (ASM) online database (AZSITE) for information on previously recorded sites and projects within the project area and a surrounding 0.8-km (0.5-mile) buffer[1]. According to AZSITE records, 44 cultural resources inventories have been conducted within the buffer surrounding the project area **(Table A.1; Figure A.1** [Appendix A]**)**. Ten of these projects intersect the project area. The cultural resources inventories span the past several decades and were conducted mostly for linear road-related projects and utility improvements. One important project not shown on AZSITE is a 1981 Environmental Assessment (EA) conducted at the Irvington Generating Station ahead of a conversion to the use of coal in fueling the plant's generators (USDOE 1981). As a component of the EA, archaeologist John P. Wilson examined the Irvington Generating Station for cultural resources and historical sites, but none were found (USDOE 1981:47–48). Additionally, in recent years, WestLand has conducted small surveys within undeveloped portions of the TEP Irvington Campus (Buckles 2013; Chamorro 2014) and for small utility projects nearby (King 2014).

AZSITE documents nine previously recorded archaeological sites within the 0.8-km (0.5-mile) buffer surrounding the project area; of these, two sites are located in the project area. Sites in the vicinity are primarily Historic period transportation sites, although some prehistoric sites have been identified in the area. AZSITE documents that the majority of these prehistoric sites have been destroyed by infrastructure improvements. The two sites previously recorded in the project area are a natural gas pipeline and a Historic period waste pile.

HISTORICAL MAP AND AERIAL PHOTOGRAPH REVIEW

The following historical maps were reviewed prior to performing the field survey. The maps that show areas pertinent to the current project are presented in **Appendix C**.

- General Land Office (GLO) plat for Township 15 South, Range 14 East, approved in 1873
- 1905 Tucson 30' U.S. Geological Survey (USGS) quadrangle
- 1948 Tucson 15' USGS quadrangle
- 1957 Tucson 7.5' USGS quadrangle

Examination of the historical maps as well as aerial photographs revealed the ongoing growth of Tucson southward and eastward into the vicinity of the project area during the late nineteenth

[1] According to 2016 Arizona State Historic Preservation Office standards, within urban areas a 0.5-mile buffer may be used for Archaeological Records Search research areas rather than the typical 1-mile buffer (Arizona SHPO 2016).

and early twentieth centuries. The specific trends of development in the project area are discussed in greater detail in the following sections; however, a brief overview of the features depicted on the historical maps is provided below.

The 1873 T15S R14E GLO plat depicts one feature in the northeastern portion of the project area: a road labeled "Tucson and Apache Pass." During the current cultural resources survey, no traces of this route were observed in the project area, likely due to the ongoing industrial development of the land. The 1905 Tucson 30' USGS quadrangle shows somewhat less detail and may be slightly distorted in the vicinity of the project area due to its scale; nevertheless, it, too, shows a road intersecting the northeastern portion of the project area. This road was not relocated during the survey.

The 1948 Tucson 15' and the 1957 7.5' USGS quadrangles both depict the build-out of transportation systems in the vicinity of the project area as well as the development of what would become Davis-Monthan Air Force Base to the north. These maps show (1) the railroad alignment that delineates the western and southwestern boundaries of the TEP Irvington Campus (labeled as part of the Southern Pacific system); (2) U.S. Highway 80 paralleling the railroad to the south; and (3) Irvington Road along the northern boundary of the project area. Additionally, the road that would eventually become Alvernon Way extends southerly along the western edge of the project area and then turns to travel southeasterly through the center of the project area. On the 1957 7.5' USGS quadrangle, this road is labeled "Old Vail Road." Development of the Irvington Campus infrastructure has obscured all traces of the road. Another road shown on the 1957 quadrangle intersects the far northeastern corner of the project area. This road is labeled "Pipeline" and is the access road for El Paso Natural Gas (EPNG) pipeline No. 1007, recorded as AZ AA:12:875(ASM). This pipeline is discussed in the **Site Descriptions** section of this report.

The 1957 Tucson 7.5' USGS quadrangle also shows several features within the Irvington Campus itself. These include three short railroad spur tracks, a road system, and four unlabeled structures. This suggests that at the time of map preparation, construction had already begun on the Irvington Campus. Development of the facility is discussed further in the **Culture History** and **Site Descriptions** sections of this report.

Historical aerial photographs taken in the years 1936, 1941, 1958, and 1967 were examined for additional historical features; to confirm the presence of the historical features shown on the above-referenced maps; and to assist in dating the features identified in the project area. The photographs from 1958 **(Photo 2)** and 1967 **(Photo 3)** are particularly germane to the current project because they show the original iteration of the plant when it first opened in 1958 as well as the buildings that can be confirmed to be 50 years old or older (i.e., those visible on the 1967 photograph). Aerial photographs from more recent years (i.e., 1972, 1980, 1990, and 2004) were also examined to compare the modern landscape to that of the Historic period.

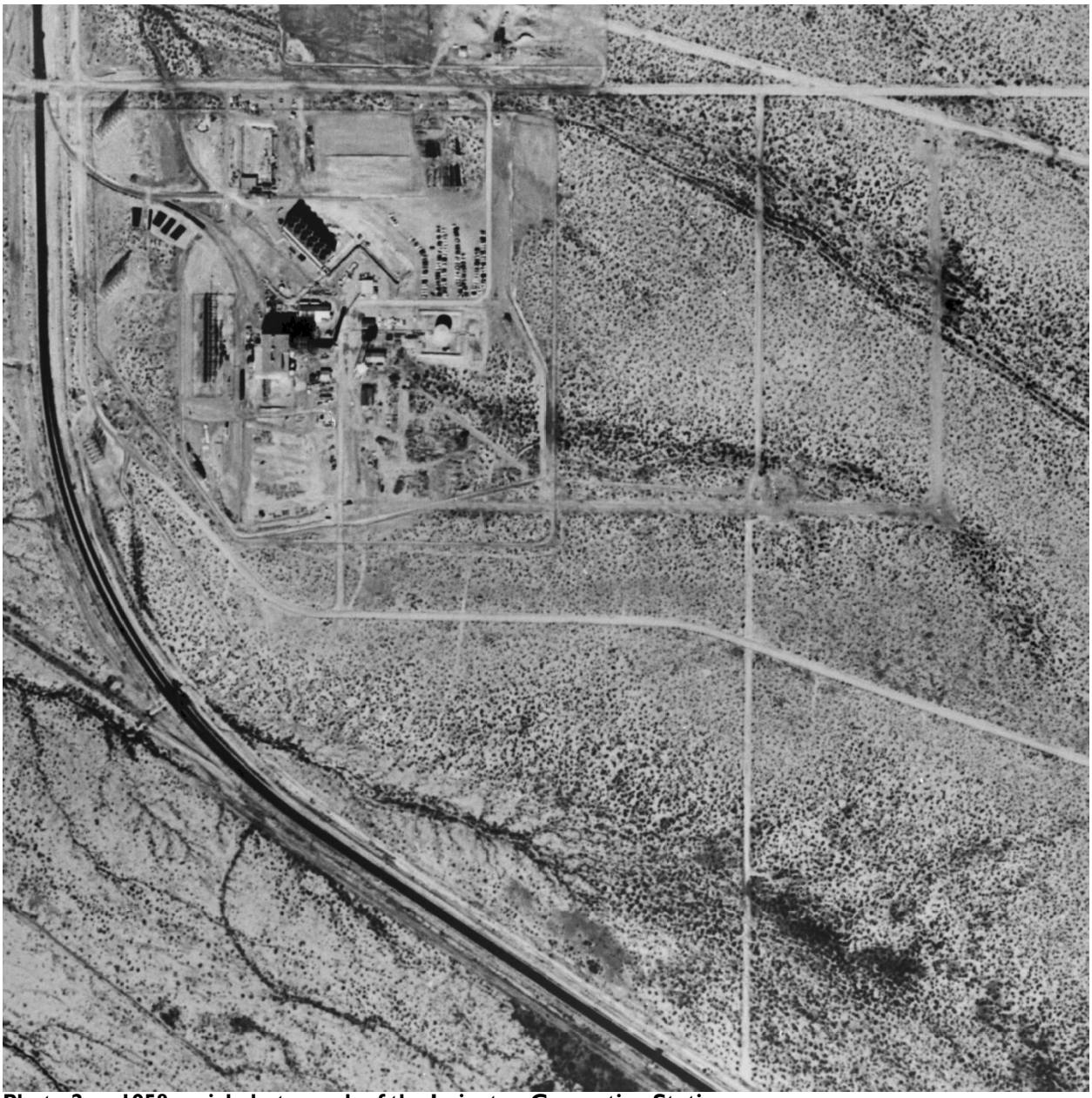

Photo 2. 1958 aerial photograph of the Irvington Generating Station

Photo 3. 1967 aerial photograph of the Irvington Generating Station

The 1936 and 1941 aerial photographs confirm that Irvington Road was present by this time (albeit a dirt road), as were the railroad alignments south and west of the project area, the EPNG pipeline, and Old Vail Road. However, the majority of the Irvington Campus area was unmodified desert during this period. By 1958, aerial photographs show the construction of the Irvington Campus well under way, including three buildings, 12 structures[2], three railroad spur lines, and parking areas. By 1967, the plant had expanded to include a total of seven buildings and 27 structures. These historical components of the infrastructure at the plant are discussed further in the **Culture History** and **Site Descriptions** sections of this report.

[2] Following *National Register Bulletin 15*, "buildings" are defined here as features created principally to shelter any form of human activity, in this case the generation of electricity and associated administrative activities. "Structures" are defined here as functional constructions made for purposes other than human shelter; at the generating plant, these would include fuel tanks, cooling towers, substations, and the like.

PHYSIOGRAPHIC CONTEXT

Geologically, the project area is situated in the Basin and Range physiographic province, a region characterized by southeast-to-northwest-trending mountain ranges with intervening valleys and basins filled with younger alluvium. Specifically, it is located in the central portion of the Tucson Basin, a broad basin where the flows of several drainage systems and rivers converge. The Santa Cruz River lies approximately 5 miles to the west. The channelized alignment of Julian Wash flows northwesterly south of the project area, and small, now discontinuous ephemeral drainages cross unmodified portions of the eastern project area. Elevations range from 2,605 to 2,650 feet above mean sea level (amsl).

The project area is heavily developed, and no vestige of the native landscape remains. Prior to development, this portion of the Tucson Basin would have contained vegetation typical of the Arizona Upland subdivision of the Sonoran Desertscrub biotic community (Brown 1994), including mesquite (*Prosopis* sp.), palo verde (*Cercidium microphyllum*), creosote (*Larrea tridentata*), saguaro (*Carnegiea gigantea*), prickly pear (*Opuntia phaeacantha*), fish-hook barrel (*Ferocactus wislizenii*), various cholla species (*Opuntia* sp.), and numerous seasonal grasses and forbs. Currently, the vegetation in the project area is well-managed in the working industrial areas of the plant, but where present in the undeveloped areas to the east it is dominated by creosote bushes and seasonal grasses and weeds, with scattered mesquite and palo verde trees and sparse prickly pear cacti **(Photo 4)**. Much of this vegetation grows along the ephemeral drainage courses. In the northwestern portion of the plant near the main administration buildings, landscaped trees and shrubs line the driveways and public areas.

Photo 4. Overview of an undeveloped portion of the eastern project area, looking southeast

In terms of soils, the project area is located on the middle bajada leading down to the Santa Cruz River to the west. The ground surface has been altered by development, but the native substratum likely consists of rocky deposits typical of the bajada landform. Sediment deposition is minimal on the bajada, and archaeological deposits, if present, would be surficial or located at shallow depths.

MODERN DISTURBANCES

The project area is located in a portion of Tucson that has long been used as a transportation corridor linking Tucson to parts east. Interstate 10 passes just to the south and follows the approximate routes of its predecessors U.S. Highway 80, Old Vail Road, and the road from "Tucson and Apache Pass" that is shown on the historical maps of the area. Specific disturbances to the project area include historical and modern buildings, parking lots, driveways, a pair of parallel railroad spur tracks along the southern edge of the Irvington Campus, laydown yards, a large solar-power concentrating facility (the "solar boost" system; see further discussion in the **Culture History** section below), retention basins, drainage channels, and other infrastructure. Additionally, landscaped plants and decorative gravel are present in common areas and along driveways. In those areas that are not currently covered with imported materials or infrastructure, construction activities over the years have impacted the native ground surface through grading, cutting, and filling.

CULTURE HISTORY

Arizona is a geographically diverse landscape from the high desert Colorado Plateau in the northeast, across the rugged central mountainous zone, to the southern and western lowland desert Basin and Range territories. Archaeological evidence indicates that people have inhabited this diverse landscape for more than 12,000 years. Over the tenure of human history, the environment has changed radically from the cooler and moister conditions of the late Pleistocene epoch to the warmer and drier conditions of today. As the environment changed, and as human populations increased over time, a variety of human cultures developed. Although these cultures did not arise and develop in isolation from cultures in other regions, it is evident that cultures in different geographic regions followed unique trajectories. Humans have responded in a variety of ways to the biological, geological, hydrological, geographical, and physiographical diversity of Arizona. The long tenure of human prehistory and history in Arizona is divided here into five major periods representing shifts in the human cultural adaptation: Paleoindian (11,500–8500 B.C.), Archaic (8500 B.C.–A.D. 1), Formative (A.D. 1–1450), Protohistoric (A.D. 1450–1691), and Historic (A.D. 1691–1967). These five main periods are often subdivided into briefer phases to represent cultural trends and developments specific to the various regions across Arizona **(Figure 3)**.

The earliest evidence of people inhabiting Arizona is attributed to the Paleoindian period. Paleoindians are perceived as migratory, nomadic "big game" hunters who roamed North America at the end of the Pleistocene epoch. Using spears tipped with characteristically large fluted lanceolate projectile points, they hunted the now extinct megafauna of the terminal Pleistocene, particularly mammoth (*Mammuthus* spp.) and ancient bison (*Bison antiquus*) (Faught and Freeman 1998; Reid and Whittlesey 1997:30–37). The extinction of the large mammals and the warming and drying conditions of the Holocene epoch ushered in the Archaic period. Human populations responded to changes in the environment and resources by diversifying subsistence strategies, including hunting a wider range of animal resources and gathering a broad spectrum of wild plants (Mabry 1998; Mabry and Faught 1998). The Archaic period was punctuated by the hot and dry conditions of the middle Holocene "Altithermal" (Mabry 1998:30), leading to a virtual withdrawal from the lowlands and a reduced occupation of the highlands (Mabry 1998:65). Between about 3300 and 600 B.C., as temperatures cooled and rainfall increased, the number of Archaic period sites increased (Mabry 1998:29, 73).

The next significant step in the cultural development of Arizona was the introduction and development of agriculture. Current dating evidence places maize securely in the Southwest by 2100 B.C. (Merrill et al. 2009), but the transition to an agriculture-based subsistence adaptation developed later, around 1700–900 B.C. (Mabry 1998:73). The introduction of maize and the development of agriculture set the foundation for the cultural developments that followed. As a general statement, the ensuing Formative period is characterized by increases in population and the differentiation of those populations into the regionally distinctive cultural groups that we identify as the primary archaeological cultures of late prehistory, notably Ancestral Pueblo (Anasazi), Mogollon, Hohokam, Trincheras, and Casas Grandes.

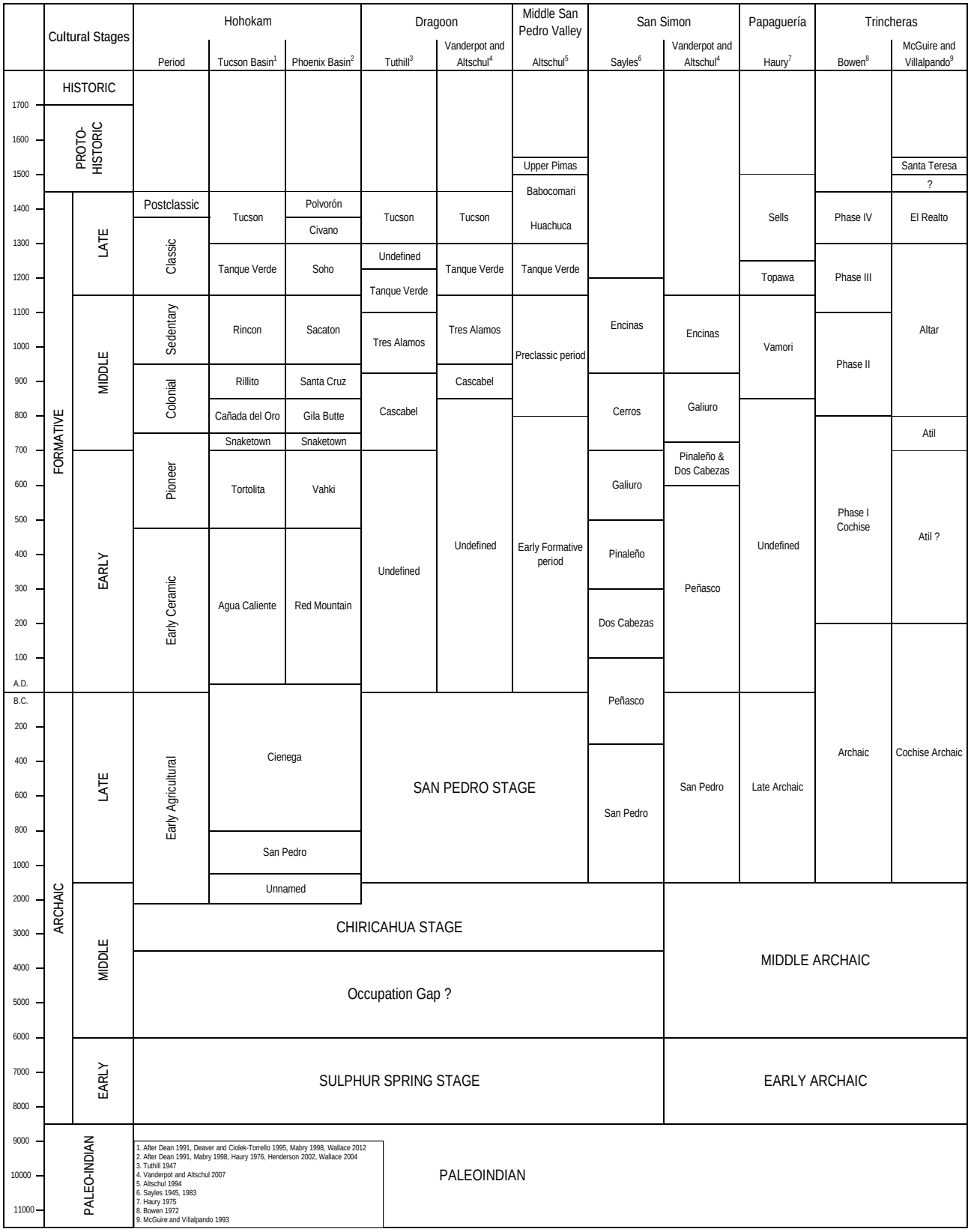

Figure 3. Cultural chronology for the Tucson Basin and surrounding regions

Prehistory in southern Arizona ends with the collapse of the late Formative period cultures and an apparent depopulation of the region. The subsequent Protohistoric period is poorly understood. Central and southern Arizona were sparsely occupied at first Spanish contact.

Early Spanish accounts of southern Arizona and the people provide the framework for what we know about the Protohistoric period. Spanish missionaries identified the peoples they encountered along the upper Santa Cruz and San Pedro Rivers as the Sobaipuri (Doelle and Wallace 1984, 1990; Gilpin and Phillips 1998:32; Masse 1981). The Sobaipuri apparently had occupied the territory since the end of prehistory and are hypothesized to have been the descendants of the prehistoric archaeological cultures in the region. The Athabaskan-speaking Apache occupied the vast mountainous regions below the Mogollon Rim in central and southeastern Arizona north and east of the Sobaipuri (Gilpin and Phillips 1998:68–70; Whittlesey 2003:243). The Apache probably entered the American Southwest late in prehistory and expanded their territory south across eastern Arizona. This expansion eventually brought them into direct conflict with the Sobaipuri and, later, European settlers who were also expanding and colonizing southern Arizona. The Historic period commences with the arrival of Jesuit missionary Eusebio Kino and the establishment of Spanish missions and presidios in the Santa Cruz and San Pedro River Valleys in 1691. The Historic period can be characterized by increasing Euroamerican colonization, settlement, expansion, industrialization, and conflict (Spicer 1962). The Historic period is conventionally subdivided into Spanish, Mexican, and American periods reflecting shifts in governmental authority.

In 1757, Father Bernard Middendorf, a Jesuit, arrived in the Tucson area, re-establishing a Spanish presence there. By the early 1770s, a mission church—San Agustín—had been built by the newly arrived Franciscans at the base of Sentinel Peak near the Sobaipuri village *sTjulshon* (Dobyns 1964, 1976). In 1775, the Presidio of Tucson was established by an Irishman, Hugo O'Conor, along the eastern bank of the Santa Cruz River opposite the newly constructed church (Dobyns 1964). The establishment of this presidio marked Tucson's humble beginnings. Defensive and residential structures were built in what is now downtown Tucson, and soldiers from the presidio at Tubac were moved north to Tucson to defend it against Apache raiding, which had become a serious problem in the region (Dobyns 1964). Spanish colonists and Native American farmers were attracted to the area by the farmland, the water provided by the Santa Cruz River, and the relative safety offered by the presidio (Dobyns 1976; Officer 1987). The San Agustín Mission appears to have been abandoned by 1831 (Elson and Doelle 1987). However, the inhabitants of the region continued to use the Tucson presidio for protection (Officer 1987).

The Treaty of Guadalupe-Hidalgo, signed in 1848 following the conclusion of the Mexican-American War, ceded that portion of (what is now) Arizona lying north of the Gila River to the United States. In 1853, the Gadsden Purchase expanded Arizona from the Gila River south to the present-day Mexican border. Although the lands included in the Gadsden Purchase had been used for ranching in the past, Arizona's ranges were now open for ranching activities on a large scale. The increase in population in California since 1849 had resulted in a significant beef

market, and Arizona became a thoroughfare for cattle driven from Texas to California. In 1858, the Butterfield Overland Mail Company was formed, providing stagecoach transportation across the region (Stein 1994). The U.S. Army arrived in Tucson in 1856 and founded the original Fort Lowell southeast of the old Spanish presidio in 1866. As with the presidio, Fort Lowell's main purpose was to protect settlers from ongoing Apache raiding. The surrender of Geronimo and defeat of the Apache in 1886 brought boom times to southern Arizona. In 1877, the city of Tucson was incorporated and an engineered townsite plat was prepared, transforming the original layout of Tucson's city core with its irregular streets and lots into a rectilinear grid pattern typical of Euroamerican city planning (Parkhurst et al. 2002). The grid pattern was accomplished through the lengthening and straightening of existing streets and filling in the resultant blocks with a series of 12 identical lots separated by alleys emanating outward from the city core. Near downtown Tucson, the block system was built around pre-established irregularly oriented streets, making some blocks irregular in shape (Parkhurst et al. 2002).

The Southern Pacific Railroad arrived in 1880, carrying with it a flood of Angloamerican settlers. Subsequent rail lines such as the Twin Buttes, Tucson and Nogales, and EP&SW Railroads brought the products of mining and cattle ranching to Tucson, making the city a hub for these rapidly growing industries (Sonnichsen 1987). The original townsite of Tucson, clustered around the old Spanish presidio in what is now downtown, was the site of most residential and business development for much of the nineteenth century. With the 1891 establishment of the University of Arizona 3 miles east of downtown, however, Tucson saw its first significant expansion eastward. By the first decade of the following century, new homes, businesses, and residential subdivisions were established around this new economic node (Sonnichsen 1987). In 1912, Arizona became the last state in the continental United States to achieve statehood.

Businesses in Tucson gained traction during the early 1900s, and by the 1920s the city was booming. Economic growth was based primarily on commerce, with support from tourism, farming, mining, and ranching. Tucson's population also expanded during this decade, and new subdivisions sprang up north, south, and east of the old city core. Most of these early subdivisions were established without regulatory oversight by individuals or couples who later sold to builders or soon-to-be homeowners. This era of expansion and economic well-being would soon come to an end, however, with the stock market crash of 1929 and the Great Depression (Akros et al. 2007; Sonnichsen 1987), which put a hold on Tucson residential development and homebuilding.

During the late 1930s, Tucson slowly crept out of the economic downturn, and subdivisions gradually began filling up with new homes. Financing for many of these homes was made possible by the creation of the Federal Housing Administration in 1934, which significantly lowered the interest rate on mortgages and brought stability to housing production (Akros et al. 2007; Assessor's tax records; Sonnichsen 1987).

With the onset of the Second World War (WWII), the military and the aviation industry became two of the primary drivers of economic growth in Tucson. During the 1940s and into the 1950s, the population of the city exploded, and homes began cropping up in new subdivisions

surrounding the old corporate city limits. Many of the new arrivals to Tucson were not only attracted to the city because of available jobs, but by the cheap housing and mild climate as well. There were, however, painful lulls in the military- and aviation-related industries, which resulted in periods of boom and bust in Tucson during the post-WWII era. Luckily for Tucson, economic growth was soon taken up by an expansion of the university, retirement communities, and tourism, a trend that continues to this day. By the 1960s, there were over 275 subdivisions in Tucson north, south, and east of the old downtown core, and at the end of the decade the population stood at 263,000 (Akros et al. 2007; Sonnichsen 1987).

Electrical Power Generation and the History of Tucson's Utilities

The following section provides a historical context for the resources in the project area. It discusses the methods used to produce electricity at an electrical plant (such as the Irvington Generating Station) followed by a general overview of the development of utilities systems in Tucson. The particular focus of the discussion will be on the two key players in the industry—the forerunners of Tucson Electric Power and El Paso Natural Gas.

Electrical Power Generation

At their most basic, fossil-fuel-powered electrical power plants, including the Irvington Generating Station, burn fossil fuels to create steam, which is then used to rotate a turbine, which in turn powers a generator to create electricity. Spent steam is cooled and condensed back to liquid water, then redirected to begin the process again. Meanwhile, the generated electricity is converted to an appropriate voltage and transmitted to residential, commercial, agricultural, and industrial properties. The key components of this system are **fuel supply systems**, **generating systems** (boilers, turbines, generators, condensers, and cooling towers), **transmission systems** (electrical switchyards, substations, transmission lines, and distribution lines), **administration systems** (administrative, maintenance, storage, and control buildings), and **transportation systems**. These are described below following a basic outline of power generation and fossil-fuel-powered generating plants taken from McVarish (2008:170–184).

Fuel Supply Systems

Fossil-fuel-powered generating plants make use of petroleum oil, natural gas, or coal to generate the heat needed to create high-pressure steam. Fuel is supplied to, and transported within, the plant by various means depending on the fuel type. Oil is typically delivered via railroad tanker cars and contained in storage tanks, then supplied to the boilers via a series of pipelines. Natural gas is typically supplied via systems of high-pressure pipelines and feeder pipelines, and regulated by valves. Coal is delivered via railroad car, truck, or barge and is often stored onsite. To allow the coal to burn similarly to a gas, and for easy firing, the coal is conveyed to a series of pulverizer systems wherein it is crushed to a uniform size and ground into a fine powder. The powder is often transported via piped air to the boiler or furnace.

Electrical Generating System

Electrical power generation at a fossil-fuel-powered facility relies on the fossil fuel supplies described above to create high-pressure, high-temperature steam, which is used to rotate a turbine and electromagnetic generator, which creates electrical power

- **Boilers:** Boilers function to heat water to generate high-temperature and high-pressure steam using fossil fuels delivered via the systems described above. Historically, boilers—also called steam generators—were of two types: (1) the fire tube boiler and (2) the water tube boiler. The former type, not commonly used in large-scale electrical generating plants, consists of a large water-filled cylinder through which tubes containing hot gases—the result of fuel combustion in an attached furnace—run. The hot gas-filled tubes heat the water in the cylinder to convert it into steam. The safer and thus more commonly used system in large-scale generating plants—the water tube system—is the rough inverse of the fire tube system. Vertical tubes containing water make up the sides of a box within which the fuel is burned. Heat is transferred into the water tubes, generating steam. A super-heater intended to raise the temperature of the created steam to temperatures significantly above water's critical point is often found at the top end of water tube boilers. Boilers also often make use of heat-exchanger systems that capture the escaping hot gases (flue gases) created during combustion and use them to pre-heat incoming combustion air. Further, heat economizers extract heat from the flue gases discharged by the super-heater at the top of the boiler. This heat is then transferred into the feed-water system that fills the water tubes. Excess flue gases and steam not used by the system are discharged through attached stacks.

- **Turbines:** At a basic level, turbines convert the thermal energy created by the boilers and carried by steam into mechanical energy or shaft torque. Often turbines are solidly coupled with generators within a closed system that operates as a unit, sometimes called a turbo-generator (more about generators below). Turbines consist of a series of fins or vanes (much like those on a windmill) attached to a rotating shaft. Steam is piped into the turbine units and pushes against the vanes, turning the rotor shaft. Many turbo-generators are compound units consisting of one high-pressure unit and one or two low-pressure units placed in line with rotor shafts coupled together and thence connected to the generator.

- **Generators:** A generator is a device that transforms mechanical energy from the turbines (i.e., torque on a rotating shaft) into electrical energy. This is accomplished through the use of rotating magnetic fields interacting with stationary conductors (or stators). A generator consists of a rotor coupled to the turbine output shaft. This rotor is essentially a large electro-magnet energized by a stationary external exciter coupled through rotating contacts (or, in some cases, inductive coupling). The exciter induces a current in the rotor that, in turn, creates a rotating magnetic field that encompasses the stationary conductors of the stator. The interaction of the rotating magnetic field and the stationary conductors induces electric currents in the stationary conductors. These currents, in turn, are carried by cabling to the

switchyard, external to the generating system, where transformers change the generator's relatively low output voltage to higher voltages suitable for transmission over long distances.

- **Condensers:** Condensers are heat exchangers that remove the last vestiges of heat from the "spent" steam coming from the turbines. They convert the turbine's output steam back to low-pressure liquid water. In the case of the Irvington Generation Station, the condensers are cooled by water circulated through the plant's cooling towers. Note that the water passing through the boiler/turbine/condenser system is separate from that circulating through the cooling towers.

- **Cooling Towers:** Cooling towers are well-ventilated open-topped structures. Piped water from the condensers is transmitted to the top of the cooling tower structures and is allowed to trickle down. Air is passed through the tower structure and across the surface of the water to cool it.

- **Boiler Feed Water System:** Once the spent steam has been condensed to liquid water in the condensers, it is returned to the boilers/steam generators by means of feed-water pumps. These pumps are multi-stage devices whose output is often in the 1,500 to 3,000 psi range with the input in the sub-atmospheric (7 psi) range.

Electrical Transmission System

The switchyard, mentioned above, combines the output of multiple generating units and, in turn, steps it up to a voltage suitable for the transmission system. Alternatively, power from the generators can be diverted, at a lower voltage, to a local distribution system and transmitted to homes and businesses via the electrical grid. These systems consist of components that are located within the plant but connect to the electrical grid outside the facility.

- **Electrical Switchyards:** Following its creation in the generator, electrical power is immediately transmitted to transformers and the electrical switchyard. Generators are limited in their operational voltage since the wires are close together and insulation can break down, causing a short circuit and damage to the generator. To prevent this damage, many utility-scale generators operate in the 10-kV (10,000-volt) range, then step up the voltage as close as possible to the generator using a transformer usually located in an electrical switchyard. Switchyards are responsible for joining power produced by multiple generators in a complex set of switches and transformers until the desired voltage output (often between 50,000 and 500,000 volts) is reached.

- **Substations, Transmission Lines, and Distribution Lines:** From the switchyard, electrical power is transmitted to the local electrical grid through a series of transmission and distribution lines regulated through substations. The substations step the high voltage created at the switchyard down to voltages that are more useful to local needs. The electrical power is

transmitted through a distribution network connected to smaller transformers at each home or business that turn it into 220-240 V power suitable for homes and smaller businesses where it is further split into two 110-120 V circuits to power outlets and lights.

Administration Systems

Supporting systems at an electrical generating plant include administrative, maintenance, storage, and control buildings. These systems cater to each plant's specific needs.

Transportation Systems

Transportation systems at electrical plants often consist of railroad spurs used to haul in heavy equipment and fuel as well as internal roads that connect the various portions of the plant. Like the administration systems, transportation networks cater to each plant's specific needs.

The Development of Tucson's Utilities

The first lights to illuminate the streets of downtown Tucson in 1882 were fed by manufactured gas—a locally derived fuel generated as a by-product of heating coal—and distributed via a limited municipal pipeline system (Burdett 1993:6; Steely and Newsome 2008:E-8). Soon after, in 1883, an entrepreneur named Al Johnson supplied the power and led the charge to convert the gas streetlamps and lights in some homes and municipal buildings to electricity (Burdett 1993:6; Sonnichsen 1987:108). Johnson, who operated an ice manufacturing plant in Tucson, installed a steam-operated direct current Edison bipolar unit generator to power his ice house and the fledgling electrical power grid in Tucson (Sonnichsen 1987:108, 110). Unfortunately, this initial electrical venture went under within 2 years, returning Tucson's streetlights to manufactured gas (Burdett 1993:6; Sonnichsen 1987:110).

Interest in electrical power in Tucson resumed in 1892 with the incorporation of the Electric Light and Power Company and the construction of a one-story power-generating facility on North Church Street in the block that now houses Tucson's Main Library. The generators in this facility were fueled by burning local mesquite wood (Burdett 1993:6, 11; TEP 2017). In 1896, the Electric Light and Power Company purchased the Tucson Gas Company to diversify the utilities managed by the company, but continued to focus on electrical power. This is reflected in their decision to leave the gas plant idle and in disrepair for 5 years following high winds that nearly destroyed it in 1898 (Burdett 1993:11).

In 1902, the company was sold to a new operator out of Colorado, and the name was changed to the Tucson Gas, Electric Light and Power Company (TGEL&P Co.). By 1903, the gas plant had been rebuilt and returned to service using the pre-existing gas mains, and the following year the primary electrical generating operations were moved to a new power house on Sixth Street (Burdett 1993:13, 15). The original plant on Church Street was sold to help defray the cost of

the move. Under the charismatic influence of its first manager, Frank E. "Red" Russell, TGEL&P Co. expanded its influence in both the public and private spheres, promoting the utility of the gas stove over the old wood-fired stove in Tucson households and providing electrical power to Tucson's first streetcar system (Burdett 1993:18–20). Improvements in technology fueled the growth of the utility, and in 1915 the steam-driven generators at the Sixth Street plant were replaced by 500-horsepower Fulton-Tosi diesel-powered generators. These improvements in efficiency and fuel consumption allowed TGEL&P Co. to enter the agricultural sector by selling power to farmers on the outskirts of the city to run their irrigation systems (Burdett 1993:22).

During the 1920s, TGEL&P Co. was beset by some troubles in the form of a bad fire at the gas plant and a subsequent workers' strike; nevertheless, the company was able to rebuild its gas plant and satisfy its workers while keeping the lights on with no interruption of service (Burdett 1993:25–26). "Red" Russel managed the company until his final days in 1923 and at the last thanked his colleagues for their many years of service and cooperation (Burdett 1993:27). The Great Depression years of the 1930s hit TGEL&P Co. as it did many other industries in the form of staff layoffs and forced rate reductions (Burdett 1993:32). The 1930s also saw the arrival of a new utility to Tucson—natural gas supplied by the El Paso Natural Gas Company.

EPNG, founded in 1928, began in the oil fields of west Texas and east New Mexico, bringing natural gas first to the city of El Paso and later to Arizona and California (Steely and Newsome 2008:E-8, E-16–E-19). Despite the stock market crash of 1929, EPNG found a reliable customer in the city of El Paso and an eager new market in the copper mines and smelters of the Southwest. By 1931, EPNG pipelines extended from Texas to Douglas and Bisbee, Arizona, and Cananea, Sonora (Steely and Newsome 2008:E-19–E-20). Already the strains of the Great Depression were being felt by the copper mines, and in 1932 EPNG developed a "grow or die" strategy, setting their sights on the large municipalities of Tucson and Phoenix (Mangan 1977 qtd. in Steely and Newsome 2008:E-22). TGEL&P Co., in conjunction with Tucson city leaders, was also strongly interested in this expansion of EPNG and spearheaded efforts to bring the new utility to Tucson. EPNG's No. 1007 line from Douglas reached Tucson in December 1933 (to much fanfare) (Burdett 1993:32) and Phoenix in January 1934 (Steely and Newsome 2008:E-21). In Tucson, the first weeks of 1934 saw the hasty conversion of thousands of appliances across the city from manufactured to natural gas (Burdett 1993:32).

In the late 1930s and 1940s, Tucson's utilities continued to expand with the conversion to a new turbine steam generator, the construction of more than 170 miles of new transmission and distribution lines, and the installation of numerous new substations (Burdett 1993:33). TGEL&P Co.'s expansion helped make Arizona one of the most electrified states in the nation with 35 to 40 percent of rural farms electrified by 1935 (Nye 1992:299–301; Figure 7.2). As demand outstripped local production, the first imported power was brought to Tucson in 1943 from the U.S. Bureau of Reclamation's Parker Dam on the Colorado River via a 290-mile transmission line (Burdett 1993:34). TGEL&P Co.'s system served a wide variety of

customers, ranging from individual families in Tucson to large corporations. By 1945, the company's largest customers were the Consolidated Aircraft Company, the Cortaro Farms Company, the Eagle Pitcher Mining and Smelting Company, the Southern Pacific Railroad, and the Home Ice Company (Burdett 1993:34). By 1948, demand had reached an all-time high as a result of the post-war growth of Tucson. In response, the DeMoss-Petrie Generating Station was constructed at what is now Grant Road and Interstate 10 and opened for business in early 1950 (Burdett 1993:45).

Further expansion was announced in 1955 with plans to construct the new Irvington Generating Station on a 280-acre plot southeast of Tucson (Burdett 1993:49). A company brochure—*From Cactus to Kilowatts*—proclaimed "Early in 1957, the calm of the desert 8 miles southeast of Tucson's downtown suddenly gave way before the onslaught of heavy construction machinery… Underway was the most complicated and costly construction program in Tucson's history" (qtd. in Burdett 1993:50). By 1958, the first generating unit, initially designed to burn natural gas or oil, was operational at the Irvington plant, with additional generating units added in 1960, 1962, and 1967, for a total of four (Burdett 1993:50). The company also used new technologies to supply the Irvington Generating Station with water, making use of new deep-drilling methods to tap groundwater at a depth of 2,500 feet to supply the plant (Burdett 1993:50).

The site of the Irvington Generating Station was chosen for its advantageous location near both EPNG Line No. 1007 and the Southern Pacific Railroad mainline. The railroad curves around the southern and western boundaries of the plant site, part of a 1925 connector track that linked the "south line" (formerly part of the El Paso and Southwestern Railroad) to the original 1880 Southern Pacific mainline, allowing the railroad to bypass the airfield that would eventually become Davis-Monthan (Myrick 1975). In the decades prior, the railroad and utility companies had become intrinsically linked, as by 1945 Southern Pacific was one of TGEL&P Co.'s largest consumers, using electrical power to run its depot, yard, and shops (Burdett 1993:34). Historical aerial photos show that by 1958 the railroad was linked via several short spur lines to the Irvington Generating Station. The spur tracks initially served to provide the oil and other supplies needed to generate the electricity, but they were also used to transport the large components that made up the infrastructure at the new generating facility during its construction.

Until the mid-1960s, TGEL&P Co. was considered an "isolated" system; that is, despite being connected to the Parker Dam system, the company shared no links with other utility companies to facilitate power exchanges or to supplement power in case of emergencies. This changed in 1964 when a 138-kV line was constructed to the Arizona Public Service Saguaro Generating Station near Red Rock, Arizona (Burdett 1993:55). Also in 1964, the company's name was changed to Tucson Gas and Electric (TG&E) and its official domicile was moved from Colorado to Arizona (Burdett 1993:56). In 1969, TG&E stocks began to be traded on the New York Stock Exchange (Burdett 1993:57).

Modern Developments at the Irvington Generating Station

TG&E continued to expand operations through the 1970s and 1980s despite the sale of the gas department and another name change (to Tucson Electric Power) in 1979 (Burdett 1993:57–64). As a result of the oil embargo in the previous decade, in 1988 changes were made at the Irvington Generating Station to convert Generating Unit 4 to coal, although the ability to use natural gas or oil in Units 1 through 3 was retained (Burdett 1993:77; TEP 2015). This conversion complied with a 1982 Department of Energy order pursuant to the Power Plant and Industrial Fuel Use Act of 1978, which sought to reduce the consumption of domestic natural gas supplies (TEP 2015).

In 2003, the Irvington Generating Station's name was changed to the H. Wilson Sundt Generating Station to mark the retirement of this longtime TEP board member and Tucson community and business leader (Satterfield and Boyd 2011:49). By 2015, following new federal requirements and an agreement with the Environmental Protection Agency, TEP had ended its use of coal to fire the generators at the Irvington plant and returned them to natural gas supplemented with landfill gas and a unique "solar boost" system (TEP 2015). The solar boost system consists of rows of flat mirrors that reflect sunlight onto a receiver suspended above; water contained in pipes inside the receiver is super-heated by the reflected sunlight and is converted into high-pressure steam that is then used in the generating units (TEP and Areva 2012). The plant also now includes a green recycling area that supplies mulch and compost to local plant nurseries supplied by the tree-trimming along TEP's power lines (Arizona Geological Society 2013).

SURVEY METHODS

FIELD SURVEY

WestLand's survey methods were influenced by the nature of the expected archaeological resources, the character of the landscape, and the expectation that archaeological sites are often masked or obscured by ongoing modern land use, particularly in industrialized areas such as the Irvington Campus. A detailed review of historical maps and aerial photographs was performed prior to the field survey to help identify Historic period buildings and structures that might still exist as archaeological sites. Any potential finds were keyed on field maps and then "ground-proofed" in the field by the archaeological survey team. Extant historical structures were mapped using a Trimble global positioning system (GPS) unit and photographed. Oral interviews with a longtime TEP employee guided WestLand's assessments and interpretations of building functions. Building architectural styles were assessed and identified in the field. In undeveloped areas of the project area, pedestrian archaeological survey was conducted using standard field survey procedures. Crew members aligned abreast at 20-m intervals walked parallel transects back and forth across the project area until the entire undeveloped portion of the project area had been examined for archaeological resources. Topographic maps, surveying compasses, GPS units, and pin flags were used to ensure complete coverage.

The initial expectation was that much of the evidence of human use of the area would reside in historical industrial buildings and structures. Secondarily, archaeological artifacts, features, and sites, if still present, would probably be attributable to Formative and Protohistoric period Native American and Historic period Euroamerican land-use patterns. The field methods focused on collecting basic information about the historical buildings, historical structures, individual artifacts, and the sites as a whole, including their age, cultural affiliation, and presumed function. Basic metric data were also recorded. Field observations were compiled on standardized forms and later entered into WestLand's Archaeological Information Management System for analysis.

Building and Structure Definitions

As noted earlier, WestLand used the definitions for buildings and structures that are provided in *National Register Bulletin 15*. "Buildings" are defined here as features created principally to shelter any form of human activity, in this case the generation of electricity and associated administrative activities. "Structures" are defined here as functional constructions made for purposes other than human shelter. At the generating plant, these would include fuel tanks, boilers, boiler stacks, water towers, generating units, cooling towers, switchyards, substations, transmission towers, and railroad spurs.

ARCHIVAL RESEARCH

In addition to the field survey, WestLand archaeologists conducted archival research to learn about the history of the project area. This research used several primary and secondary sources,

including internal TEP documents and plan drawings, published histories on the history of TEP, and texts concerning electrical power generation. Lastly, WestLand took a tour of the Irvington Campus and conducted an oral history interview with the former plant manager, Mr. Reland Kane, who was a TEP employee from 1973 to 2016.

ARIZONA STATE MUSEUM SITE CRITERIA

Evidence of past human activities exists on the landscape in objects, sites, districts, buildings, and structures. The archaeological survey anticipated finding three categories of archaeological resources: (1) artifacts, (2) artifact scatters, and (3) features. The first two categories consist of portable objects left behind on the landscape by various activities. The third is made up of non-portable purposeful constructions, excavations, and deposits.

The ASM provides guidelines that identify what is minimally considered an archaeological site. Upon initial discovery of an archaeological artifact, artifact scatter, or feature, the archaeological survey team converged on that find to determine whether other associated archaeological materials were present. Once fully defined, the ASM guidelines (1995) were applied to determine whether the archaeological find should be designated and recorded as an archaeological site. According to the ASM, a site is any:

1. Physical remains of past human activity that are at least 50 years old.

Additionally, sites should consist of at least one of the following:

2. 30+ artifacts of a single class (i.e., 30 sherds, 30 lithics, 30 tin cans) within an area 15 m (50 ft) in diameter, except when all pieces appear to originate from a single source (i.e., one ceramic pot, one core, one glass bottle).

3. 20+ artifacts which include at least 2 classes of artifact types (i.e., sherds, ground stone, nails, glass) within an area 15 m (50 ft) in diameter.

4. One or more archaeological features in temporal association with any number of artifacts.

5. Two or more temporally associated archaeological features without artifacts.

All resources satisfying these minimum criteria were designated as archaeological sites and recorded as specified in the ASM site recording manual (ASM 1993). Archaeological resources that did not meet these criteria were designated as non-site isolated occurrences. Site recording generated the following records: written descriptions, photographs, and electronic data collection with a Trimble Geoexplorer. UTM coordinates were electronically recorded for each site with sub-meter accuracy and initialized to the NAD83 CONUS datum. Within each archaeological site, the locations of any features or diagnostic tools were mapped. For each

newly discovered site, an ASM site number was obtained from the Arizona State Museum Site Files Office (University of Arizona, Tucson) and an ASM site card was completed and returned to the ASM for entry into their site files records and database (AZSITE).

ISOLATED OCCURRENCES

This category includes all archaeological resources that are not identified as archaeological sites. During survey, the location of each isolated occurrence is recorded with a hand-held GPS unit and to the extent possible it is categorized into a conventional typological category and attributed to an archaeological culture, chronological period, and activity.

SURVEY FINDINGS

WestLand's cultural resources inventory resulted in the re-assessment of two previously recorded archaeological sites and the identification of one new archaeological site and one isolated occurrence of cultural materials in the project area **(Tables B.1 and B.2; Figure B.1** [Appendix B]**)**.

PREVIOUS SITE THAT IS NO LONGER PRESENT

One site previously recorded in the project area has been removed by infrastructure improvements at the Irvington Campus.

AZ BB:13:854(ASM)

AZ BB:13:854(ASM) was discovered and recorded by WestLand in 2013 (Buckles 2013) ahead of the construction of a contractor's yard on TEP property within the Irvington Campus. The site was described as an early-1950s era waste-disposal site consisting of domestic refuse. Such piles, often referred to as "wildcat dumps," typically represent a single episode of waste disposal away from the source property and are common throughout the West. The site was located near South Swan Road and, more than likely, the artifacts were trucked off the road and dumped in what was at the time open desert. The waste pile contained approximately 75 metal artifacts, mainly cans; about 800 glass shards representing a minimum of 30 bottles; 2 ceramic artifacts; and 5 plastic artifacts. Several examples of bottles manufactured in 1951 and 1953 refined the date of the assemblage to the early 1950s.

Photo 5. Overview of the former location of AZ BB:13:854(ASM), looking north

Following the discovery of AZ BB:13:854 (ASM) in 2013, WestLand recommended it ineligible for inclusion in the NRHP in conformance with a context statement on historical waste management properties prepared by the Arizona SHPO Advisory Committee on Historical Archaeology, which states that "if the associated source property or context cannot be identified, the waste pile cannot be determined eligible for the State and National Registers of Historic Places" (Sullivan and Griffith 2005:32). In 2013, WestLand recommended that TEP proceed with their planned infrastructure improvements and that no further archaeological work was needed for the site. Between 2013 and 2014, upon construction of the laydown yard, the artifacts comprising the waste dump were removed from the site area. During the current survey, WestLand archaeologists visually inspected the former location of AZ BB:13:854(ASM) and found that it is now a paved driveway and parking lot **(Photo 5)**. No traces of the site remain.

SITE DESCRIPTIONS

AZ AA:12:875(ASM) – EPNG Pipeline No. 1007

OTHER SITE NUMBER: n/a

WESTLAND FIELD SITE NUMBER: WRI 2

CULTURAL AFFILIATION: Euroamerican

AGE: Historic (A.D. 1933–present)

TYPE: Linear site: natural gas pipeline

DIMENSIONS: 388 × 13 m (5,012 square meters) within the project area. Overall pipeline extends approximately 217 miles from Douglas to Phoenix, Arizona

ELEVATION: 2,625–2,645 feet amsl within the project area

NATIONAL REGISTER OF HISTORIC PLACES ELIGIBILITY RECOMMENDATION: Portions determined eligible (c), (d) – Arizona SHPO 2004–2012

SITE DESCRIPTION: AZ AA:12:875(ASM) is EPNG pipeline No. 1007 **(Photo 6; Figure B.1** [Appendix B]**)**. The site is a buried 10-inch high-pressure gas pipeline (Steely and Newsome 2008) that crosses the northeastern portion of the project area. The pipeline is detectable in some portions of the project area as swathes of disturbed ground marked by yellow signs and indicator paddles. Other portions of the pipeline through the project area are covered by parking lots or other infrastructure, and no indications of the buried pipeline beneath are visible on the surface.

Photo 6. Overview of AZ AA:12:875(ASM) where it intersects the northeastern portion of the project area, facing southeast

Since 2001, AZ AA:12:875(ASM) has been recorded by numerous archaeological surveys (ASM site card). Particularly germane to the current project are several surveys conducted along the pipeline alignment by SWCA in the mid- and late-2000s (Hesse and Chenault 2003; Hesse and Gutierrez 2004; Hesse et al. 2009). Various site numbers had been assigned to the pipeline by its previous recorders, but all segments were consolidated under site number AZ AA:12:875(ASM) in 2005. Recently, SWCA prepared a historic context and compiled an NRHP Multiple Property Documentation Form for EPNG's mainline pipelines across the southwestern United States (Steely and Newsome 2008).

INTERPRETATION: EPNG pipeline No. 1007 was one of the first long-distance high-pressure natural gas pipelines in the United States and was the first natural gas pipeline between Tucson and Phoenix. Its construction was considered an engineering challenge and set industry standards for its time. Pipeline No. 1007 was constructed during the Great Depression of the early 1930s to extend natural gas service from the copper mines of Bisbee/Douglas to Tucson and Phoenix (ASM site card; Mangan 1977; Steely and Newsome 2008:E-22). The pipeline was built using a federal Reconstruction Finance Corporation loan, which resulted in the use of pick-and-shovel labor to dig the trenches. Phelps-Dodge Corporation cut back copper production as the Depression worsened, leaving EPNG with an unused capacity. The company took this surplus and used it to exploit an untapped market for natural gas in Tucson and Phoenix (Mangan 1977; Steely and Newsome 2008:E-22). The pipeline construction reached Tucson on December 11, 1933, and Phoenix 1 month later (Mangan 1977; Steely and Newsome 2008:E-23).

In the context of this particular project, the EPNG pipeline's arrival in Tucson at the end of 1933 marked an important turning point for TEP's (then TGEL&P Co.'s) utility prospects in Tucson, and the two companies began an important partnership: EPNG supplied the natural gas and TGEL&P Co. metered and distributed it to local markets. The availability of piped-in natural gas also meant that locally produced manufactured gas was no longer needed (Burdett 1993:32). Further, the presence of the pipeline nearby almost certainly played a role in siting the new generating facility at the Irvington Campus, as initial electricity generation at the plant used natural gas and oil as fuel. Following a conversion to coal during the period spanning the 1980s to the early 2010s, today natural gas is once again the primary fuel at the Irvington Campus.

NATIONAL REGISTER OF HISTORIC PLACES ELIGIBILITY EVALUATION: In accordance with a determination made by the Advisory Council on Historic Preservation, historical natural gas pipelines are exempt from review under Section 106 of the National Historic Preservation Act of 1966, except in cases where a historical pipeline is to be abandoned (ACHP 2002). Nonetheless, portions of AZ AA:12:875(ASM) have been determined eligible for inclusion in the NRHP under Criteria (c) and (d) by the Arizona SHPO at various time between 2004 and 2012.

AZ BB:13:895(ASM) – Irvington Generating Station

OTHER SITE NUMBER: n/a

WESTLAND FIELD SITE NUMBER: WRI 1

CULTURAL AFFILIATION: Euroamerican

AGE: Historic (A.D. 1957–present)

TYPE: Features: electrical generating facility

DIMENSIONS: 685 × 675 m (364,528 square meters)

ELEVATION: 2,600–2,625 feet amsl

NATIONAL REGISTER OF HISTORIC PLACES ELIGIBILITY RECOMMENDATION: Recommended ineligible

SITE DESCRIPTION: AZ BB:13:895(ASM) designates the historical Irvington Generating Station, which is located at the southeast corner of Irvington Road and Alvernon Way. The station itself is situated on the western side of the modern Irvington Campus **(Photo 7; Figure 4; see also cover photo and Photo 1)**. The archaeological site boundary of AZ BB:13:895(ASM) encompasses the historical extent of the plant as shown on a 1967 aerial photograph **(see Photo 3)**.

Photo 7. Overview of a portion of the Irvington Generating Station, showing Cooling Tower #1 (at left), the Unit #1 Boiler and Stack (mid-ground, center), and the northern portion of the Generating Building, housing Unit #1 (at right)

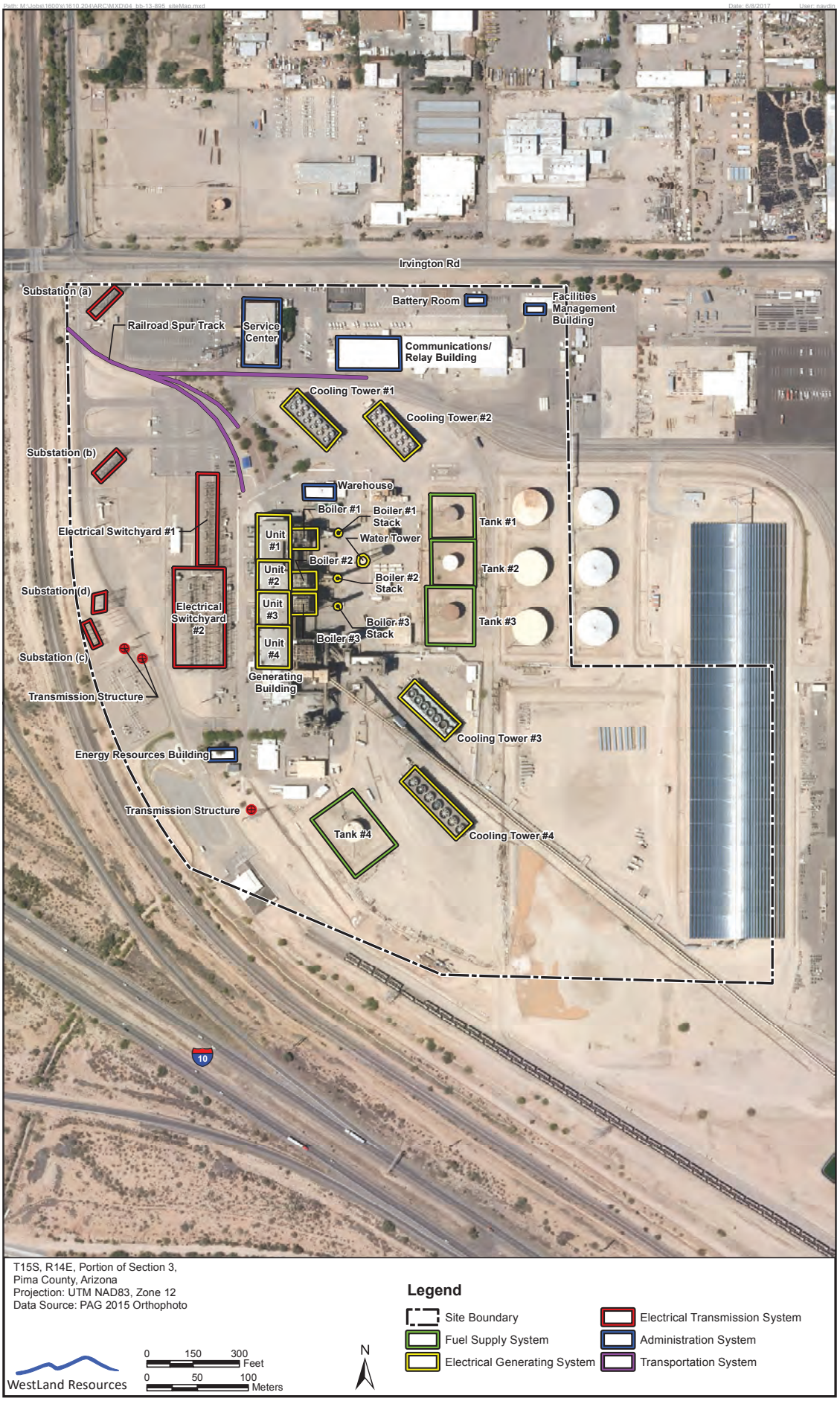

Figure 4. AZ BB:13:895(ASM)

The industrial system in use at the Irvington Generating Station is typical of fossil-fuel-powered electrical generating plants and mirrors the mode of electrical power generation described in the **Culture History** section. Specifically, it consists of a series of systems—fuel supply, generating, transmission, administration, and transportation—that are used in concert to supply electrical power to the local Tucson market. Fuel systems at the Irvington Generating Station were originally constructed to use petroleum oil or natural gas, with a later (1980s-era) addition of a coal system. The electrical generating system consists of four near-identical power-generating units arranged in a parallel system. These are named Units 1, 2, 3, and 4. Unit 1 was the original power-generating unit constructed at the plant in 1957 and in operation by 1958. In 1960, Unit 2 was installed, followed by Units 3 and 4 (both slightly larger than the original two) in 1962 and 1967, respectively. Each power-generating unit contains its own set of boilers, turbines, generators, condensers, and cooling towers. These components are connected to the plant's electrical transmission system through a shared electrical switchyard and from there to a series of substations, transmission lines, and distribution lines that lead from the plant to the electrical grid. Additionally, the Irvington Generating Station contains a series of administrative buildings and structures that aid in the operation of the plant. These include a service center, maintenance facilities, control buildings, and warehouses. Finally, a transportation system provides access for both vehicles and pedestrians to various parts of the plant through a series of roads. There is also a system of railroad spur lines connected to the mainline just west of the plant that provides supplies via railroad and was likely used during the construction of the facility to transport and install the large, heavy equipment components of the generating system. Specific components at the plant that are related to these systems—and are historical in age (i.e., they were installed during or prior to 1967)—are detailed in the **Features** section below.

TOPOGRAPHIC AND ENVIRONMENTAL SETTING: TEP's Irvington Generating Station is located in the central Tucson Basin, a relatively flat expanse of deep basin fill cut by numerous small to large drainages. It is situated on the southeastern outskirts of urban Tucson in an area that has long been used as an industrial/military/transportation corridor. As such, much of the native topography and vegetation has been modified to suit the needs of each respective facility in the area. Indeed, at the Irvington Generating Station, the ground surface has been leveled and graded; native vegetation has been removed; and drainages have been channelized and redirected to accommodate the infrastructure of the plant. Driveways and parking lots have been paved in bituminous asphalt, and in other open areas the ground surface is capped with gravel. Near office buildings and in other administrative areas, landscaped trees have been planted and are being maintained. Overall, the Generating Station retains a clean, industrial appearance with few remaining vestiges of the native landscape.

FEATURES: The Irvington Generating Station contains seven extant buildings and 27 extant structures that are more than 50 years old; three of these buildings and 12 of the structures are original to the plant's 1957–1958 construction. These features are divided here into functional categories based on their role in the electrical generating process. The functional types used here consist of the components of: (1) the fuel supply system, (2) the electrical generating system,

(3) the electrical transmission system, (4) the administration system, and (5) the transportation system. The features at the site are detailed in **Table 1**.

Table 1. Extant historical buildings and structures at the Irvington Generating Station, AZ BB:13:895(ASM)

TEP Building/ Structure Designation	Construction Date	Function at Plant	Notes
FUEL SUPPLY SYSTEM			
Tank #1	1957–1958	Fuel-oil storage	Associated with generating Unit 1, original to plant
Tank #2	1960	Fuel-oil storage	Associated with generating Unit 2
Tank #3	1962	Fuel-oil storage	Associated with generating Unit 3
Tank #4	1967	Fuel-oil storage	Associated with generating Unit 4
ELECTRICAL GENERATING SYSTEM			
Boiler #1	1957–1958	Steam-generating boiler	Associated with generating Unit 1, original to plant
Boiler #1 Stack	1957–1958	Combustion products discharge	Associated with generating Unit 1, original to plant
Boiler #2	1960	Steam-generating boiler	Associated with generating Unit 2 (**Photo 8**)
Boiler #2 Stack	1960	Combustion products discharge	Associated with generating Unit 2
Boiler #3	1962	Steam-generating boiler	Associated with generating Unit 3
Boiler #3 Stack	1962	Combustion products discharge	Associated with generating Unit 3
Water Tower	1957–1958	Water storage	Original to plant, supplies generating Units 1–4
Unit #1*	1957–1958	Electrical power generation, steam condensation	Incorporates Westinghouse turbo-generator (top floor) and condenser associated with Unit 1 (lower floor) in Generating Building
Unit #2*	1960	Electrical power generation, steam condensation	Incorporates General Electric turbo-generator (top floor) and condenser associated with Unit 2 (lower floor) in Generating Building
Unit #3*	1962	Electrical power generation, steam condensation	Incorporates Allis-Chalmers turbo-generator (top floor) and condenser associated with Unit 3 (lower floor) in Generating Building
Unit #4*	1967	Electrical power generation, steam condensation	Incorporates Westinghouse turbo-generator (top floor) and condenser associated with Unit 4 (lower floor) in Generating Building
Cooling Tower #1	1957–1958	Water cooling	Associated with generating Unit 1, original to plant
Cooling Tower #2	1960	Water cooling	Associated with generating Unit 2
Cooling Tower #3	1962	Water cooling	Associated with generating Unit 3
Cooling Tower #4	1967	Water cooling	Associated with generating Unit 4
ELECTRICAL TRANSMISSION SYSTEM			
Electrical Switchyard #1	1957–1958	Voltage regulation	Original to plant, associated with generating Unit 1, after 1960, also associated with generating Unit 2
Electrical Switchyard #2	by 1967	Voltage regulation	Associated with generating Units 3 and 4
Substation (a)	1957–1958	Voltage regulation	Original to plant
Substation (b)	1957–1958	Voltage regulation	Original to plant
Substation (c)	1957–1958	Voltage regulation	Original to plant
Substation (d)	by 1967	Voltage regulation	–
Transmission structures	by 1967	Electrical transmission	Three structures observed within site area, although line extends outside site; line currently links Irvington Generating Station to Vail Substation
ADMINISTRATION SYSTEM			
Service Center	after 1958	Plant operations, customer service	Appears under construction on 1958 aerial
Communications/Relay Building	by 1967	Communications	Building expanded to west after 1967
Battery Room	by 1967	Backup power	–
Facilities Management Building	by 1967	Facilities management	Building expanded to north after 1967
Warehouse	1957–1958	Storage	Original to plant
Energy Resources Building	by 1967	Unknown	–
TRANSPORTATION SYSTEM			
Railroad Spur Tracks	1957–1958	Transportation of fuel, supplies, and construction materials	Three lines

* These components are all housed inside the Generating Building

Photo 8. Boiler #2 (at right) and Boiler #3 (at left), facing west

The Fuel Supply System:

Historical fuel systems at the TEP Irvington Generating Station were initially designed to handle petroleum oil and natural gas. Extant historical features related to this system include four large oil storage tanks. Also present is a series of buried oil pipelines that convey the oil to the boilers. These were not visible on the ground surface and thus not mapped during the current field effort. Similarly, the natural gas fuel supply system is still extant as a series of buried pipelines with above-ground valves and outlets. The natural gas is supplied by EPNG pipeline No. 1007 from a tap located on Contractor's Way north of the Irvington Generating Station.

In the late 1980s, a coal fuel supply and processing system replaced the original oil and natural gas fuel supply infrastructure in Unit 4, the southernmost generating unit.

The Electrical Generating System:

The electrical generating system is the heart of the Irvington Generating Station. This system is composed of four steam-powered generating units, each with a series of near-identical parts. The main components of the generating system for each of the four units, with the exception of the boilers, cooling towers, and tanks, are all housed in a large three-story building, herein referred to as the Generating Building.

- **Boilers:** Each generating unit has its own attached boiler **(Photo 9)**. Originally, all were intended to use petroleum oil or natural gas; however, the Unit 4 boiler was converted to coal in the mid-1980s. The boilers for Units 1 through 3 each consist of tall arrays of vertically suspended pipes within which water is heated to create steam. A furnace is located at the base of each unit and a super-heater system is located at the top. Each boiler also contains Lungstrom Regenerative System heat-exchangers, which capture flue gases and recirculate the pre-heated air back into the boiler. Each of the Units 1 through 3 boilers has an attached stack for exhaust. A 150-foot-tall water tower supplies water to the boilers **(see Photo 9)**.

Photo 9. Stacks for Boilers #1 through #3 and Water Tower, facing north

- **The Generating Building:** The Generating Building houses the steam turbines, generators, condensers, and various valves, meters, and other control components for Units 1 through 4. The northern portion of the building, housing the generating components of Unit 1, was originally constructed in 1957–1958 **(Photo 10)**. As the plant grew through the 1960s, the building was expanded to house the additional generating equipment for Units 2 through 4.

Photo 10. Overview of the Generating Building, facing southeast, showing the original 1957–1958 portion of the building

Steam from each of the four boilers powers one of four turbo-generators located on the third floor of the Generating Building. The turbo-generators all share a similar design and appearance: each has high-pressure, intermediate-pressure, and low-pressure turbines arranged in a series and all are connected by a rotating shaft to a generator and exciter. Although they share similar technologies, various brands of turbo-generators are in use at the plant: Units 1 and 4 were made by Westinghouse, Unit 2 was made by General Electric, and Unit 3 was made by Allis-Chalmers.

The lower stories of the Generating Building contain condensers for each unit that convert spent steam back into liquid water via a cooling process supported by the cooling towers and return it to the boilers/steam generators. This part of the process is operated and managed from an attached control room at the southern end of the building. This area was an addition made to the Generating Building after 1967.

- **Cooling Towers:** Four cooling towers, in conjunction with the condenser systems, reduce the temperature of the spent steam to the liquefaction point (i.e., liquid water) before recirculating the water back into the system to begin again. The cooling towers for Units 1 and 2 are located north of the Generating Building **(Photo 11** [next page]**)**, while the cooling towers for Units 3 and 4 are located to the southeast.

Photo 11. Cooling Towers #1 (at right) and #2 (at left), facing east-southeast

<u>The Electrical Transmission System</u>:

The voltage output emanating from the four generating units is combined in two electrical switchyards located immediately west of and adjacent to the Generating Building. The more northerly of these was installed during initial plant construction in 1957–1958. The southern switchyard is larger and was in place by 1967 **(Photo 12)**.

Photo 12. Switchyard #2, facing east

From the switchyard, the power is conveyed to one of several A-frame substations **(Photo 13)**. At least three of these were in place following initial plant construction in 1957–1958. By 1967, three new substations had been added, with additional ones installed during the modern period.

Photo 13. Substation at the northwestern corner of the Irvington Generating Station, original to the 1957–1958 construction of the plant, facing northwest

From the substations, the power is conveyed outside the plant by various transmission and distribution lines. At least one large-scale transmission line was in place at the plant by 1967. It is located along the plant's southwestern margin. This line sends power from the Irvington Generating Station to parts east, currently terminating at the Vail Substation.

The Administration System:

Accompanying the main power-generating facilities at the Irvington Generating Station is a series of administration buildings that houses the personnel who manage, regulate, and support operations at the plant. The administration buildings that are historical in age are the Service Center, the western portion of the Communications/Relay Building (the eastern portion of this building was added after 1967), a warehouse, the Facilities Management Building, the Battery Room, and the Energy Resources Building.

The Transportation System:

A series of roads and driveways links the various process areas within the Generating Station. Many of these have been in place since initial construction in 1957–1958, although they were not mapped as part of the current study. Additionally, three railroad spur tracks original to the 1957–1958 construction of the facility connect the railroad mainline to the Generating Building as well as the administrative area in the northern portion of the facility **(Photo 14)**.

Photo 14. Railroad spur tracks in the northern portion of the Irvington Generating Station, facing west

HISTORIC BUILDINGS ASSESSMENT: As part of the current project, a historical building assessment was conducted on the historical buildings at the Irvington Generating Station. The seven examined buildings are described below. All the buildings assessed at the Irvington Generating Station reflect a modernist, vernacular functional-industrial design that does not represent any defined architectural style. More than anything, the style of the buildings emphasizes function over form, which is not surprising given the industrial nature of the facility.

- The **Generating Building**, which houses all four generating units and some of their accompanying infrastructure, is a large (approximately 470-by-75 foot) three-story building. The northernmost portion of the building, which houses Unit 1, is original to the 1957–1958 construction of the plant. Prior to 1967, the building was expanded southward to accommodate Units 2 through 4 as they were added to the facility. The exterior façade is characterized by unpainted corrugated metal siding with tall banks of louvered windows **(see Photo 10)**. The trim and doors are painted blue. The interior walls are composed of stone-look concrete block and the interior floors are red-dyed concrete.

- The **Service Center**, which handles the administrative tasks for the facility, is the sole brick structure at the Irvington Generating Station **(Photo 15)**. The 1958 aerial photograph appears to show this building under construction. The building is two stories and measures 195 by 110 feet in plan. The western façade—containing the front entrance—is characterized by parallel rows of small windows flanking an enframed window wall composed of two large centralized window banks, one on each story, separated by a small awning. The trim is a light yellow color.

Photo 15. Overview of the west (front) façade of the Service Center, facing northeast

- The **Communications/Relay Building** is another component of the facility's administration system. The western portion (200 by 100 feet) of this building was in place by 1967. The building is a single-story gabled warehouse whose exterior façade is characterized by white-painted metal panels and corrugated metal siding with few windows and red trim **(Photo 16)**.

Photo 16. Overview of the original, western portion of the Communications/Relay Building, facing northeast

- The **Battery Room** is a small building that was in place by 1967 and forms part of the administration system. It is a 60-by-20-foot single-story gabled warehouse with white-painted metal panel siding and red trim. The building is similar to the Communications/Relay Building.

- The **Facilities Management Building** is another component of the administration system and emulates the style described above for the Communications/Relay Building and the Battery Room. The southern portion of the building was in place by 1967, but it appears to have been added to more recently. The building measures 60 by 30 feet and is single story. It features a gabled warehouse-style with white-painted metal siding and red trim **(Photo 17)**.

Photo 17. Overview of the Facilities Management Building, facing north

- The **Warehouse**, used for the storage of supplies and equipment, is another component of the administration system and has been in place since initial plant construction in 1957–1958. The architecture of the building mirrors (or perhaps is precursor to) the other building types described above. It has a gabled roof and white-painted metal panel siding. The Warehouse is single story and measures approximately 110 by 45 feet.

- The **Energy Resources Building**, located south of the main generating infrastructure, is also part of the administration system. It measures 85 by 35 feet and is a single-story, slightly gabled warehouse-style building with beige-painted metal siding. This building was in place by 1967.

The Architects:

According to the 1957 original building plan sets retained by TEP on site at the Irvington Campus, Scholer and Fuller Architects of Tucson and Phoenix designed the Generator Building, with mechanical engineering provided by John Paul Jones. It is unclear whether these architects designed the Service Center or other buildings at the facility. Scholer and Fuller Architects was a partnership between architects Emerson C. Scholer and Santry C. Fuller. Prior to 1956, the firm was known as Scholer, Sakellar and Fuller Architects, with a third partner, architect Nicholas Sakellar. In the early 1950s, Scholer, Sakellar and Fuller were known for designing such buildings as Catalina High School on Dodge Boulevard and the Tucson Clinic on Tucson Boulevard and 10th Street (Evans and Jeffrey 2005; MAPP 2017a). In 1956, Nicholas Sakellar left the firm and struck out on his own, becoming famous for sculptural-modernist Tucson buildings such as the Continental Building on Broadway Boulevard and the Wilmot Branch Library (AIA Southern Arizona 2016). Following the departure of Sakellar, Scholer and Fuller Architects designed Rincon Congregational Church on Craycroft Road and the Generator Building at the Irvington Generating Station (MAPP 2017b). Generally, Scholer and Fuller never rose to the prominence achieved by their former partner, although their designs maintain a modest presence in Tucson's modernist architecture scene.

John Paul Jones was born in 1890 in Washington D.C. A former collegiate world-record holder for the 1-mile run and an Olympian at the 1912 Stockholm Games, Jones retired from running and graduated from Cornell University in 1913 with a degree in mechanical engineering (Henry 2005). Following service in the U.S. Army during World War I, he embarked on a successful mechanical engineering career in Washington, D.C., Pennsylvania, and Ohio, retiring to Tucson in the early 1950s (Tucson Daily Citizen 1970). He quickly found that he was not suited to a life of leisure, and in 1953 he started a new mechanical engineering firm in partnership with his son-in-law Dick Palmer (Henry 2005; Palmer Engineers, Inc. 2013). In 1957, he designed the mechanical components used at the Irvington Generating Station. Jones passed away in 1970 and was survived by his wife Ruth, 4 children, and 10 grandchildren (*Tucson Daily Citizen* 1970). The engineering firm Jones started in Tucson was left to his son-in-law and, later, his grandson. It is now known as Palmer Engineers, Inc. (Palmer Engineers, Inc. 2013).

CONDITION: While modifications have been made to some of the historical infrastructure, largely associated with the 1980's conversion to the use of coal at Unit 4 and other modern expansions, many of the original components of the Generating Station are still extant. Where historical buildings and structures are present, the Irvington Generating Station retains much of its historical character. The plant sees frequent maintenance and is kept tidy and functional.

INTERPRETATION: AZ BB:13:895(ASM) is the Irvington Generating Station, initially constructed in 1957 with one generating unit that was put into use in 1958. By 1967, the plant had expanded to include three additional generating units and associated infrastructure. A detailed history of the plant is provided earlier in this report.

NATIONAL REGISTER OF HISTORIC PLACES ELIGIBILITY EVALUATION: AZ BB:13:895(ASM), the Irvington Generating Station, is representative of many mid-twentieth century fossil-fuel-powered electrical generating plants. WestLand recommends that the site is ineligible for inclusion in the NRHP because it lacks significance under the NRHP criteria. The site represents the expansion of Tucson's utilities system in the latter half of the twentieth century; however, it was not Tucson's first electrical generating plant. The plant is not associated with any individuals important in national, state, or local history. The plant's architecture represents vernacular industrial-functional design that cannot be assigned to any defined architectural style. Further, the plant does not represent a unique or innovative system of electrical power generation, the study of which would provide important information about such systems. As such, the site cannot be (a) associated with events that have made a significant contribution to the broad patterns of our history; (b) associated with the lives of persons significant in our past; (c) shown to embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or (d) shown to have yielded, or likely to yield, information important in prehistory and history.

ISOLATED FINDS

One isolated occurrence was identified during the field survey in an undeveloped area on the eastern margin of the Irvington Campus. IO 1 is a scatter of two prehistoric Native American plain ware ceramic sherds found in a 5-m-diameter area **(Photo 18; see Figure B.1** [Appendix B]**)**. Both sherds have a medium-textured brown paste with coarse sand temper.

Photo 18. Detail of IO 1 sherds

NATIONAL REGISTER OF HISTORIC PLACES EVALUATIONS AND RECOMMENDATIONS

The significance of cultural resources is evaluated according to the implementing regulations of Section 106 of the National Historic Preservation Act. Federal regulation 36 CFR 60.4 defines the criteria for determining whether or not cultural resources have significance in American history.

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) that are associated with the lives of persons significant in our past; or
>
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) that have yielded, or may be likely to yield, information important in prehistory and history.

The two extant sites within the Irvington Campus are both related to the specific research theme (or historic context) of *Electrical Power Generation and the History of Tucson's Utilities* developed in the **Culture History** section of this report. The following section summarizes the sites, evaluates them against the defined historic context, and provides an NRHP eligibility recommendation for each. **Table B.1** [Appendix B] presents summary data on the archaeological sites and provides eligibility recommendations for them. The site that is no longer present in the project area, AZ BB:13:854(ASM), is excluded from this assessment. It should be noted that the isolated occurrence is recommended ineligible for inclusion in the NRHP owing to a lack of significance.

AZ AA:12:875(ASM) – EPNG PIPELINE NO. 1007

AZ AA:12:875(ASM), EPNG pipeline No. 1007, is representative of the historical expansion of utilities and their delivery to the Tucson market in the twentieth century. Installed in 1933, the site represents the first mainline natural gas pipeline to serve the Tucson area. A determination made by the Advisory Council on Historic Preservation states that historical natural gas pipelines are exempt from review under Section 106 of the National Historic Preservation Act of 1966, except in cases where a historical pipeline is to be abandoned (ACHP 2002).

Nonetheless, portions of AZ AA:12:875(ASM) have been determined eligible for inclusion in the NRHP under Criteria (c) and (d) by the Arizona SHPO at various time between 2004 and 2012.

AZ BB:13:895(ASM) – Irvington Generating Station

AZ BB:13:895(ASM), the Irvington Generating Station, is also representative of the historical expansion of utilities and their delivery to the Tucson market in the twentieth century. However, WestLand recommends that the site is ineligible for inclusion in the NRHP because it lacks significance under the NRHP criteria. For one, the site is typical of many mid-twentieth century fossil-fuel-powered electrical generating plants found throughout the nation and is therefore not unique. While it represents the expansion of Tucson's utilities systems in the latter half of the twentieth century, it was not Tucson's first electrical generating plant. Further, the plant is not associated with any individuals important in national, state, or local history. The plant's architecture is of a vernacular industrial-functional design that cannot be assigned to any defined style. Lastly, the plant does not represent a unique or innovative system of electrical power generation, the study of which would provide important information about such systems.

MANAGEMENT SUMMARY

TEP is planning future improvements to the Irvington Campus, a power-generating facility located in Tucson, Pima County, Arizona. As part of TEP's internal planning process, WestLand performed a cultural resources inventory and historic building assessment of the project area. WestLand's cultural resources inventory resulted in the re-assessment of two previously recorded archaeological sites and the identification of one new archaeological site and one isolated occurrence.

One of the previous sites, AZ AA:12:875(ASM), El Paso Natural Gas pipeline No. 1007, has been determined eligible for inclusion in the NRHP numerous times between 2004 and 2012 by the Arizona SHPO under Criteria (c) and (d). WestLand recommends that this site be avoided by any future improvement projects on the Irvington Campus.

The other previously recorded site, AZ BB:13:854(ASM), a Historic period waste pile, was previously recommended ineligible for inclusion in the NRHP (Buckles 2013). The site has subsequently been destroyed by the construction of a contractor's yard and no further work is recommended for it.

The newly recorded site, AZ BB:13:895(ASM), known as the Irvington Generating Station, is recommended ineligible for inclusion in the NRHP. No further architectural or historical documentation is recommended at the site prior to improvements to the Irvington Campus.

WestLand also provides the general recommendation that all ground-disturbing activities have the potential to unearth human remains and cultural materials, and that any such discoveries must be treated in accordance with Arizona Revised Statute §41-865.

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APPENDIX A

ARCHAEOLOGICAL RECORDS SEARCH

Table A.1. Previous archaeological surveys within the project area and vicinity

Table A.2. Known archaeological sites within the project area and vicinity

Figure A.1. Previously recorded archaeological sites and projects within 0.8 km (0.5 mile) of the project area

Class I References

The following information is considered sensitive; may be protected under federal, state, and local laws; and may be removed from the report.

APPENDIX B

RESULTS OF ARCHAEOLOGICAL SURVEY

Table B.1. Site management summary

Table B.2. Isolated occurrence

Figure B.1. Results of the archaeological survey

The following information is considered sensitive; may be protected under federal, state, and local laws; and may be removed from the report.

APPENDIX C

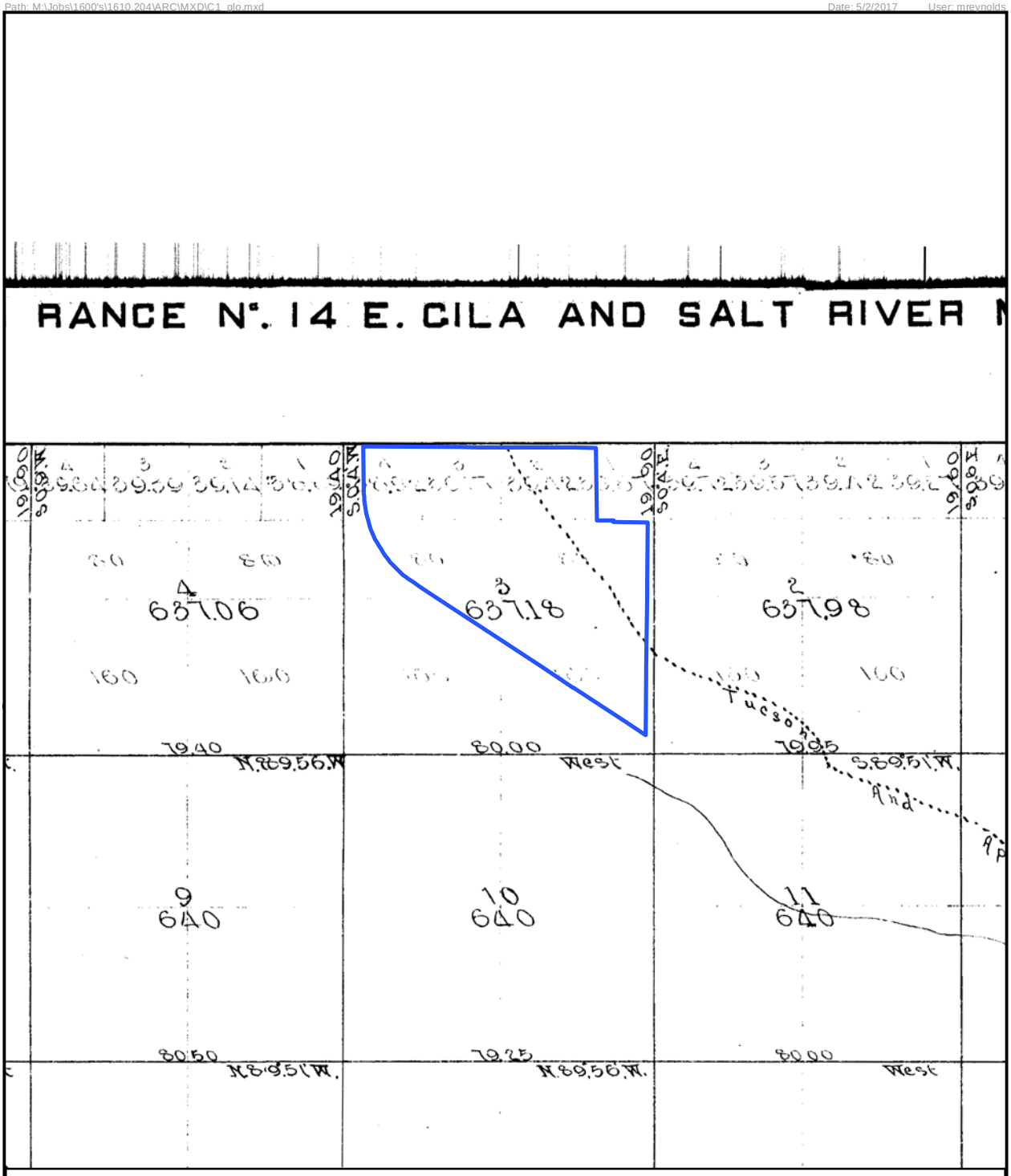
HISTORICAL MAPS OF THE PROJECT AREA

Figure C.1. **Overlay of project area on 1873 Township 15 South, Range 14 East GLO Plat**

Figure C.2. **Overlay of project area on 1905 Tucson 30' USGS Quadrangle**

Figure C.3. **Overlay of project area on 1948 Tucson 15' USGS Quadrangle**

Figure C.4. **Overlay of project area on 1957 Tucson 7.5' USGS Quadrangle**



T15S, R14E, Portion of Section 3,
Pima County, Arizona
Projection: UTM NAD83, Zone 12

Legend

Project Area

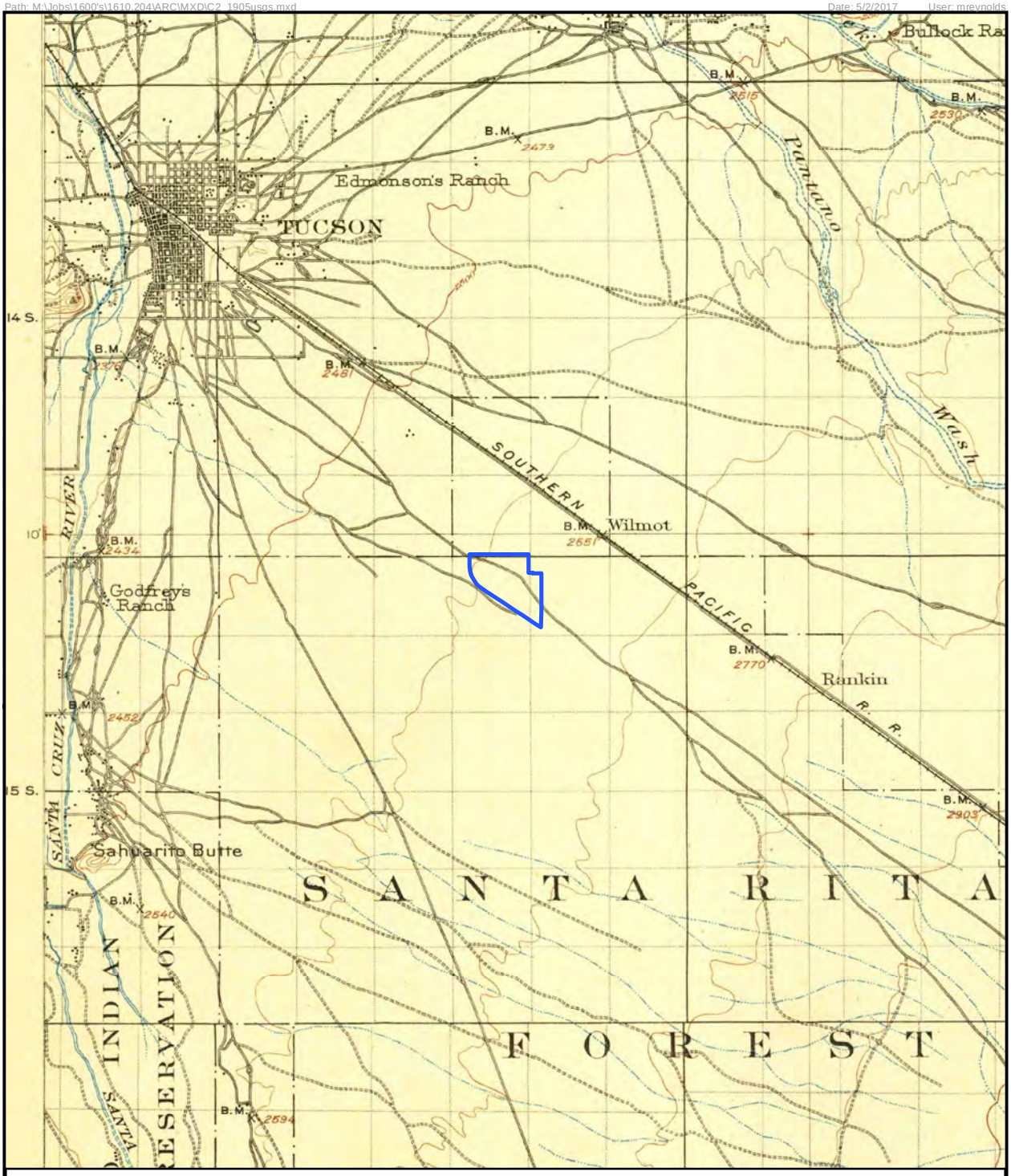
WestLand Resources

0 0.25 0.5 Miles

0 0.5 1 Kilometers

N

Figure C.1. Overlay of project area on 1873 Township 15 South, Range 14 East GLO Plat



T15S, R14E, Portion of Section 3,
Pima County, Arizona
Projection: UTM NAD83, Zone 12

Legend

Project Area

WestLand Resources

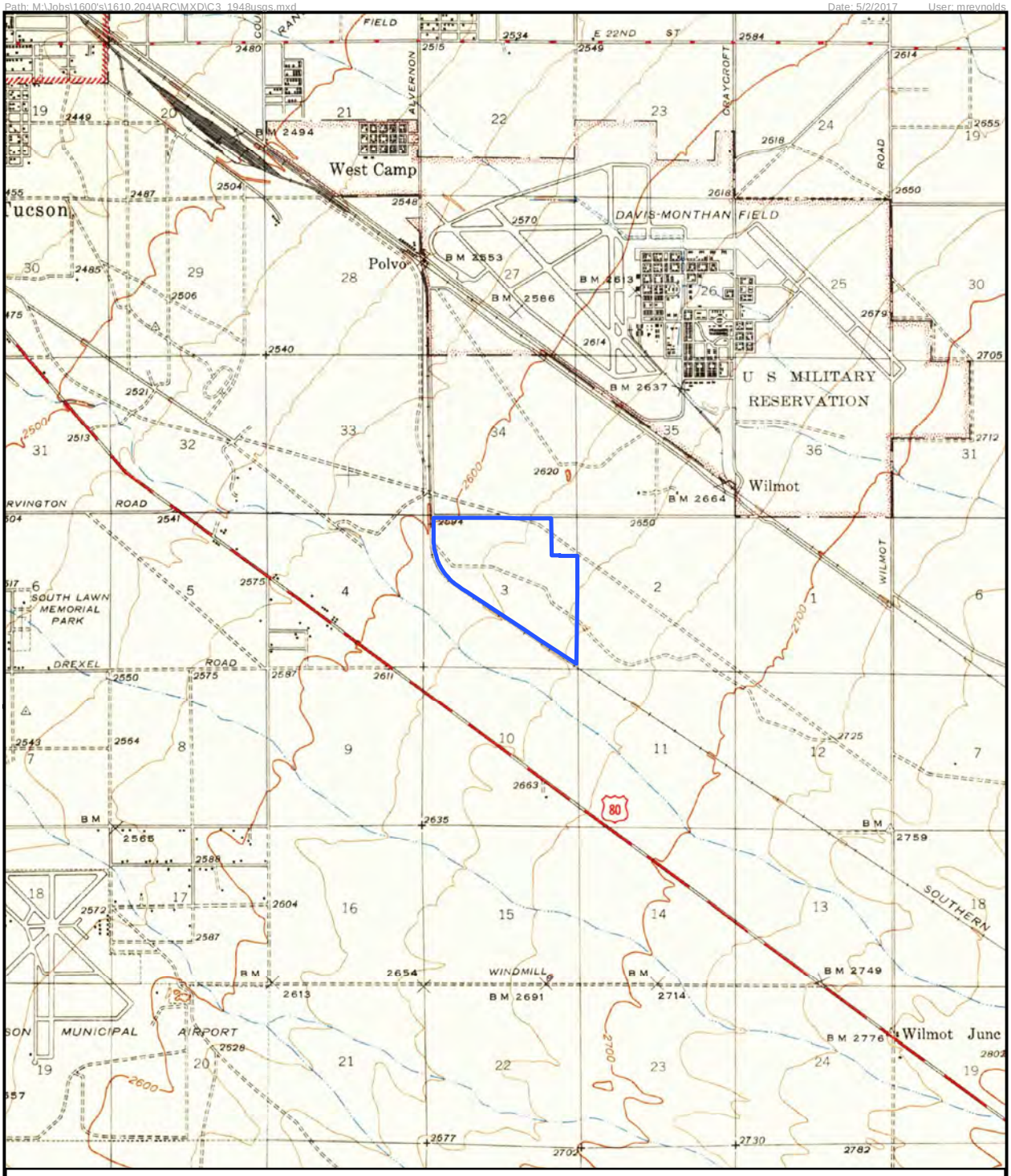
0 1 2 Miles

0 2 4 Kilometers

N

Figure C.2. Overlay of project area on 1905 Tucson 30' USGS Quadrangle

Path: M:\Jobs\1600's\1610.204\ARC\MXD\C3_1948usgs.mxd Date: 5/2/2017 User: mreynolds



T15S, R14E, Portion of Section 3,
Pima County, Arizona
Projection: UTM NAD83, Zone 12

Legend

Project Area

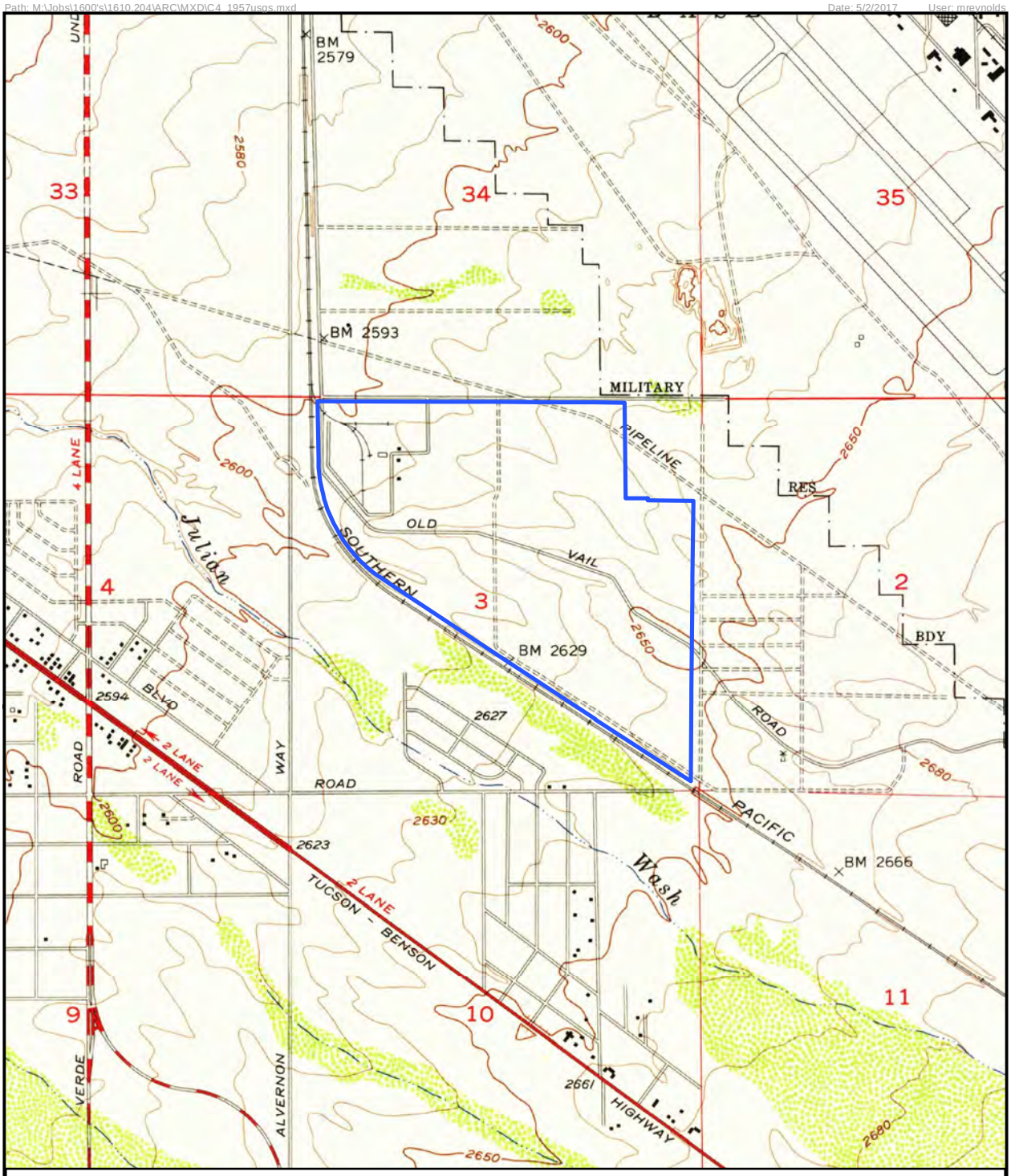
WestLand Resources

0 0.5 1 Miles

0 1 2 Kilometers

N

Figure C.3. Overlay of project area on 1948 Tucson 15' USGS Quadrangle



T15S, R14E, Portion of Section 3,
Pima County, Arizona
Projection: UTM NAD83, Zone 12

Legend

Project Area

WestLand Resources

0 1,000 2,000 Feet

0 500 1,000 Meters

N

Figure C.4. Overlay of project area on 1957 Tucson 7.5' USGS Quadrangle

EXHIBIT E-2

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PIMA COUNTY
ENVIRONMENTAL QUALITY
33 N. Stone Ave., Suite 700
Tucson, Arizona 85701-1429
www.deq.pima.gov

Ursula Kramer Nelson, P.E.
Director FAX (520) 838-7432
(520) 724-7400

12 September 2017

Mr. Conrad Spencer
Director, Tucson Power Production
Tucson Electric Power Company
88 East Broadway Boulevard, Mail Stop HQW602
Tucson, Arizona 85702

Subject: Cultural Resources Inventory and Historic Building Assessment
Irvington Generating Station
Permit No. 1052

Dear Mr. Spencer:

On 28 August 2017, the Pima County Department of Environmental Quality (PDEQ) received the Cultural Resources Inventory and Historic Building Assessment prepared by WestLand Resources to support the Application for a Prevention of Significant Deterioration (PSD) Authorization and Significant Revision to Class I Air Quality Permit for the Irvington Generating Station (IGS) located at 3950 East Irvington Road in Tucson, Arizona. PDEQ forwarded WestLand's assessment (dated 8 June 2017) to the Pima County Office of Sustainability and Conservation (PCOSC) and the City of Tucson (COT) Historic Preservation Program for their review and comment. A summary of the PCOSC and COT findings is presented below:

1. Comments from Roger Anyon of PCOSC (email message dated 31 August 2017)

I concur with the recommendations of the report:

1. *Site AZ AA:12:875(ASM), the in service El Paso Natural Gas Pipeline No. 1007, is exempted from cultural resources compliance requirements by the Advisory Council on Historic Preservation,*
2. *Archaeological site AZ BB:13:854(ASM) is no longer extant and thus warrants no further consideration,*
3. *Site AZ BB:13:895, the Irvington Generating Station, is ineligible to either the Arizona or National Registers of Historic Places, and that no further cultural resources work is needed, and*
4. *TEP and its contractors must abide by the requirements of ARS 41-865 should any human remains be discovered during construction activities.*

From the perspective of Pima County cultural resources compliance requirements, TEP may proceed with any demolition and construction.

2. Comments from Allison Diehl of the COT Historic Preservation Program (email message dated 9 September 2017)

> *The City of Tucson Historic Preservation Office has reviewed this report. It is a very interesting read, and some of the information dovetails nicely with our ongoing historic streetlight research. There are no deficiencies from our standpoint.*

The emails from Roger Anyon and Allison Diehl are attached for your record. PDEQ is not requesting any additional information or revisions to the Cultural Resources Inventory and Historic Building Assessment. Should you have any questions or need additional information please do not hesitate to contact me at 520-724-7341.

Sincerely,

Rupesh Patel
PDEQ Air Permit Engineering Manager

Attachment A PCOSC and COT Correspondence

Copies to: Charles W Komadina, Tucson Electric Power
Suzanne Kennedy, Geosyntec Consultants
Kate Graf, Geosyntec Consultants
Scott McCann, Geosyntec Consultants
Shelia (Ya-Ting) Tsai, EPA R9
Eugene Chen, EPA R9
Cleve Holladay, EPA R9

Attachment A
PCOSC and COT Correspondence

From: Roger Anyon
To: Rupesh Patel
Cc: Kimberly Baeza
Subject: RE: Tucson Electric Power - Cultural Resources Inventory and Historic Building Assessment
Date: Thursday, August 31, 2017 5:24:07 PM

Hi Rupesh:

Thank you for submitting this report for my review (WestLand Cultural Resources Report 2017-202, dated June 8, 2017). I concur with the recommendations of the report:

1. Site AZ AA:12:875(ASM), the in service El Paso Natural Gas Pipeline No. 1007, is exempted from cultural resources compliance requirements by the Advisory Council on Historic Preservation,
2. Archaeological site AZ BB:13:854(ASM) is no longer extant and thus no warrants no further consideration,
3. Site AZ BB:13:895, the Irvington Generating Station, is ineligible to either the Arizona or National Registers of Historic Places, and that no further cultural resources work is needed, and
4. TEP and its contractors must abide by the requirements of ARS 41-865 should any human remains be discovered during construction activities.

From the perspective of Pima County cultural resources compliance requirements, TEP may proceed with any demolition and construction.

I note that the IGS is within the City of Tucson, and thus the City Historic Preservation Officer may be interested in this report and its recommendations. The contact for the City is Jonathan Mabry who can be reached at Jonathan.Mabry@tucsonaz.gov

Roger Anyon
Office of Sustainability and Conservation
520-724-6405.

From: Rupesh Patel
Sent: Thursday, August 31, 2017 2:56 PM
To: Roger Anyon <Roger.Anyon@pima.gov>
Cc: Kimberly Baeza <Kimberly.Baeza@pima.gov>
Subject: Tucson Electric Power - Cultural Resources Inventory and Historic Building Assessment

Good afternoon Roger,

Tucson Electric Power Company (TEP) operates its Irvington Generating Station (IGS) under Class I Air Quality Operating Permit No. 1052 issued by the Pima County Department of Environmental Quality (PDEQ). IGS consists mainly of four steam boiler generating units, namely, Unit I, Unit 2, Unit 3 and Unit 4. As you may aware, TEP is proposing to modernize the station by replacing two 1950's era steam units (i.e., Units 1 and 2) with ten high-efficiency, fast-responding, state-of-the-art reciprocating internal combustion engines (RICE), each having a generating capacity of nearly 19

From: Allison Diehl
To: Rupesh Patel
Cc: Roger Anyon; Jonathan Mabry
Subject: Tucson Electric Power Irvington Station Cultural Report
Date: Thursday, September 7, 2017 12:09:44 PM

Hello Rupesh,

The City of Tucson Historic Preservation Office has reviewed this report. It is a very interesting read, and some of the information dovetails nicely with our ongoing historic streetlight research. There are no deficiencies from our standpoint.

If this had been done for the City's on-call, we would have asked for the removal of federal terms from the abstract and questioned the assignment of a site number to the in-use electrical generating station (per ASM's "Policy and Procedures Regarding Historical Sites and Features," December 2016). Also, it would be interesting to see more discussion on the "Tucson and Apache Pass" road found on GLO maps and its possible connection with the old Butterfield stage route.

Thank you for forwarding this.

Allison

Allison Diehl
City of Tucson Historic Preservation Program
(520) 837-6022

Diehl Research, LLC
(520) 444-5638

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EXHIBIT F

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EXHIBIT F: RECREATIONAL PURPOSES AND ASPECTS

AAC R14-3-219:

> *State the extent, if any, the proposed site or route will be available to the public for recreational purposes, consistent with safety considerations and regulations and attach any plans the applicant may have concerning the development of the recreational aspects of the proposed site or route.*

There are no plans to develop recreational facilities within the Irvington Campus. The campus is a secured site and for safety and security reasons no public access will be made available.

There are several recreational facilities within the study area. Located south of I-10 are the Augie Acuna Los Ninos Neighborhood Park, the Julian Wash Greenway, and several trailheads (see Exhibit F-1). The Julian Wash Greenway runs along the south bank of the Julian Wash and is part of The Loop, a shared-use trail complex throughout Pima County and COT, that has both soft and hard surface trails. Pima County is developing "The Loop" around metropolitan Tucson with links to Marana, Oro Valley, and South Tucson. Pima County residents and visitors on foot, bikes, skates, and horses can enjoy the more than 120 miles of shared-use paths that have already been completed.

These recreational facilities are in close proximity to Irvington Campus, and visitors would experience an impact from the added structures in the viewshed (see visual simulations in Exhibit G-4). The existing structures within view of the recreational facilities include the railroad, I-10, and the Sundt Generating Station, therefore the impact of the Projects' additional structures is indirect and negligible.

The proposed Projects would not directly impact the facilities or any of the current recreation uses.

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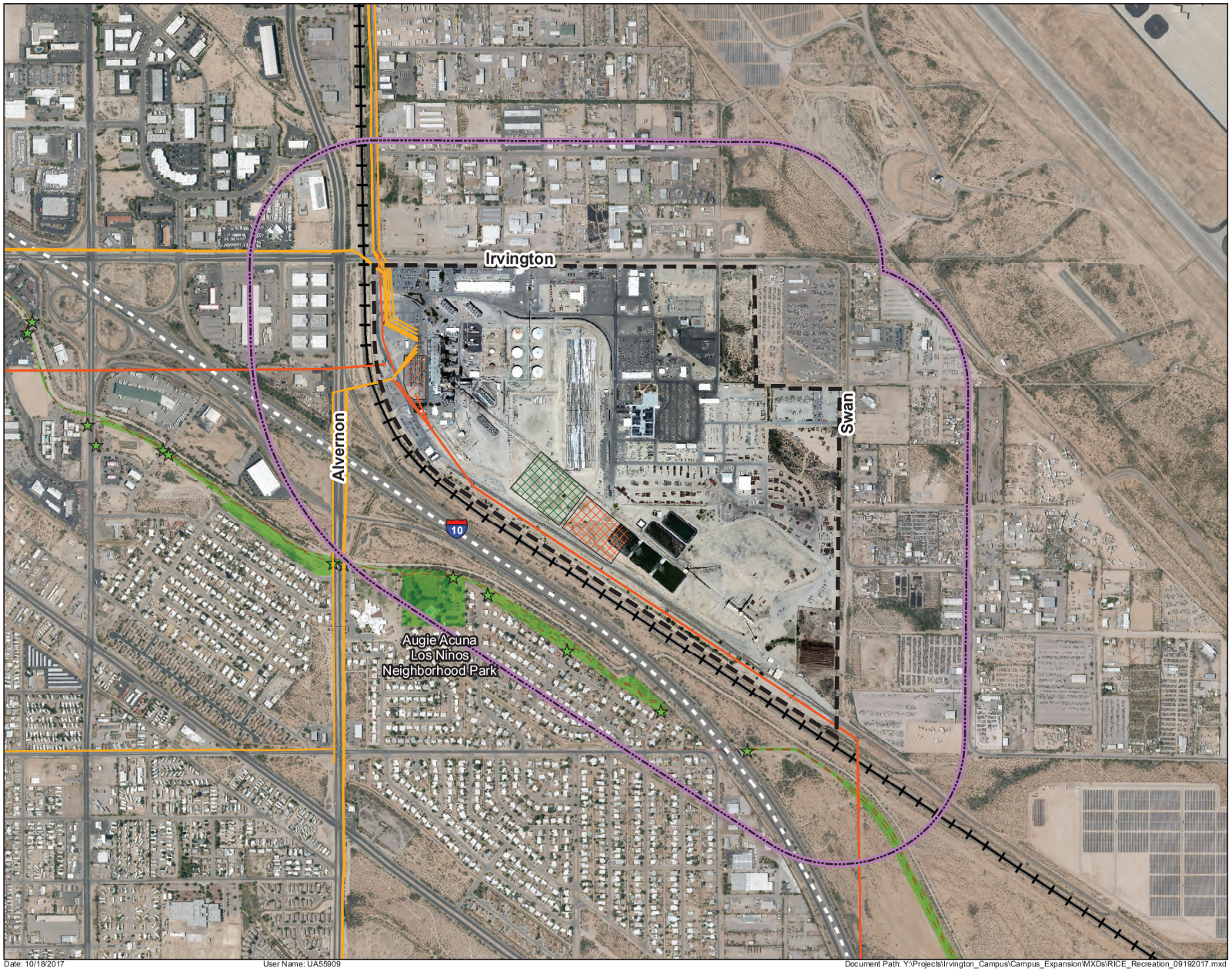

Tucson Electric Power

TEP Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138kV Transmission Line Relocation Projects

Recreation

Exhibit F-1

- Irvington Campus Boundary
- Existing 138kV Transmission Line
- Existing 46kV Distribution Line
- Existing 138kV Substation
- Relocated 138kV Substation
- Proposed RICE Location
- Study Area (1/4 Mile)
- Union Pacific Railroad
- Interstate
- Trail Heads
- Trails
- Parks

N W E S

0 500 1,000
Feet

1 inch = 1,000 feet

Sources: ESRI, Tucson Electric Power, Pima County, City of Tucson, and Arizona State Land Department.
Projection: NAD 1983 UTM Zone 12N
Basemap: ESRI World Imagery and Cooper Aerial Imagery 2017

This map is for planning purposes only. TEP and UNS Energy make no warranty of its accuracy.

Created on 19 Sep 2017
Revised on 18 Oct 2017

Date: 10/18/2017 User Name: UA55909 Document Path: Y:\Projects\Irvington_Campus\Campus_Expansion\MXDs\RICE_Recreation_09192017.mxd

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EXHIBIT G

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EXHIBIT G: CONCEPTS OF PROPOSED FACILITIES

AAC R14-3-219:

Attach any artist's or architect's conception of the proposed plant or transmission line structures and switchyards, which applicant believes may be informative to the Committee.

EXHIBIT	CONTENTS
G-1	Schematic Site Plan
G-2	Schematic Elevation
G-3.1	Single Circuit Deadend
G-3.2	Single Circuit Tangent – Option 1
G-3.3	Single Circuit Tangent – Option 2
G-3.4	Double Circuit Tangent
G-3.5	Double Circuit Tangent – Modified
G-3.6	Double Circuit Deadend
G-3.7	Triple Circuit Double Bay Deadend
G-3.8	Existing Lattice
G-4.1	Visual Simulations KOP Map
G-4.2	Visual Simulation KOP #1
G-4.3	Visual Simulation KOP #2
G-4.4	Visual Simulation KOP #3
G-4.5	Visual Simulation KOP #4

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EXHIBIT G-1

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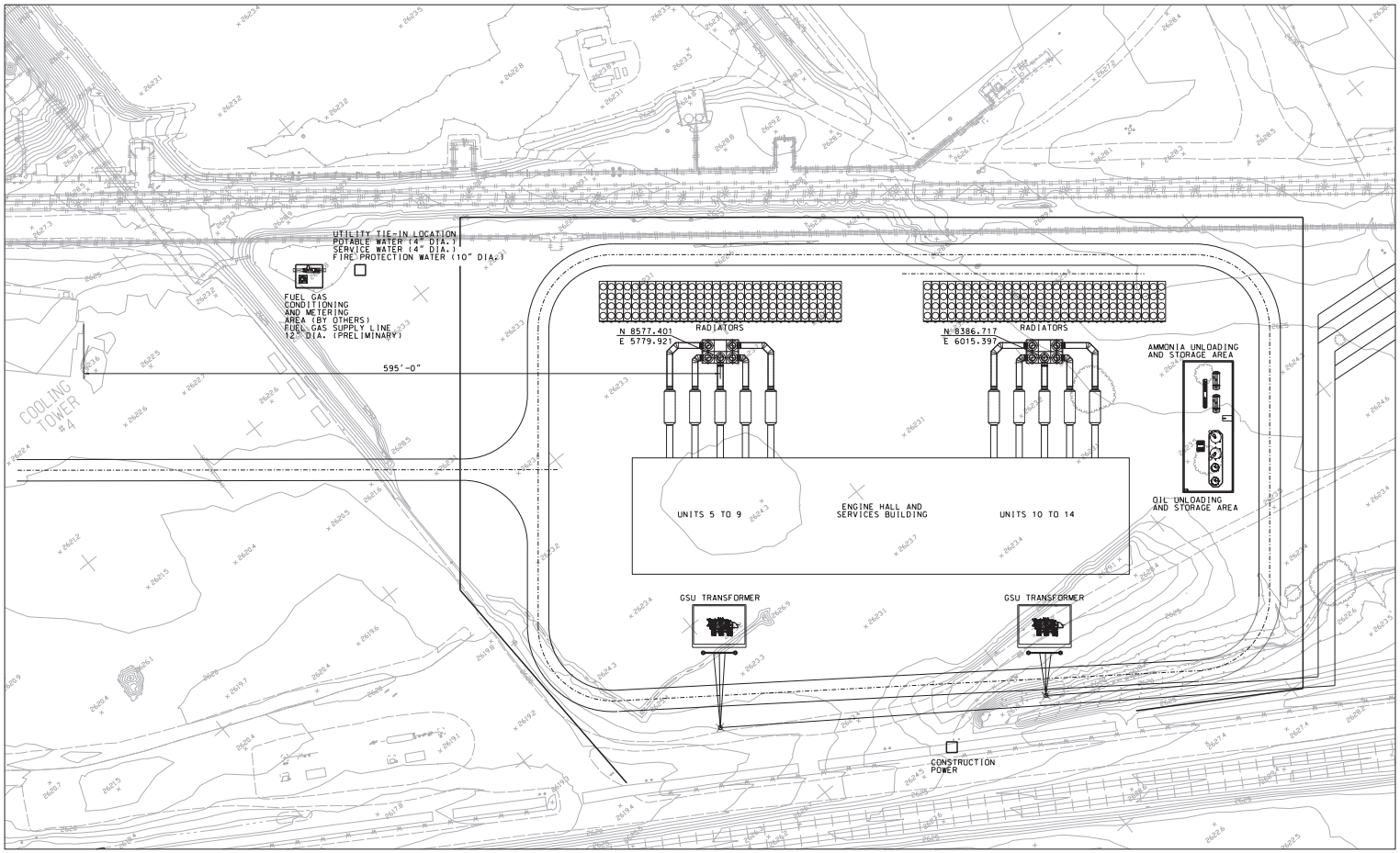

NORTH

50' 0' 50' 100'
GRAPHIC SCALE
1" = 40'-0"

HOLD INFORMATION	
NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB -CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION		
REV.	DATE	DESCRIPTION
0	06-23-2017	FOR INFORMATION

ISSUE PURPOSE: ISSUE PURP

SPECIFICATION: SPEC

PROJECT NO.: PROJECT NO

CAD FILE NAME: TEP-GA-01.DGN

PREPARED BY: V. SHAH

REVIEWED BY: W. ROSENQUIST

APPROVED BY:

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.

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SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

TEP
Tucson Electric Power

PROJECT

H.W. SUNDT GENERATION STATION
PLANT GENERATION
MODERNIZATION PROJECT
TUCSON ELECTRIC POWER

DRAWING TITLE

SITE ARRANGEMENT

DRAWING NUMBER	REVISION
GA-01	0
SHEET OF	

EXHIBIT G-1

ZL10766/01D976/D1*TEP Sundt 5 X 2 RICE*TEP-RCE-GA-01.dgn
Form GDG-0401-01-08, ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A. Revision Date: 04-30-2010

TEP-RCE-GA-01.dgn 6/23/2017 4:07:07 PM

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EXHIBIT G-2

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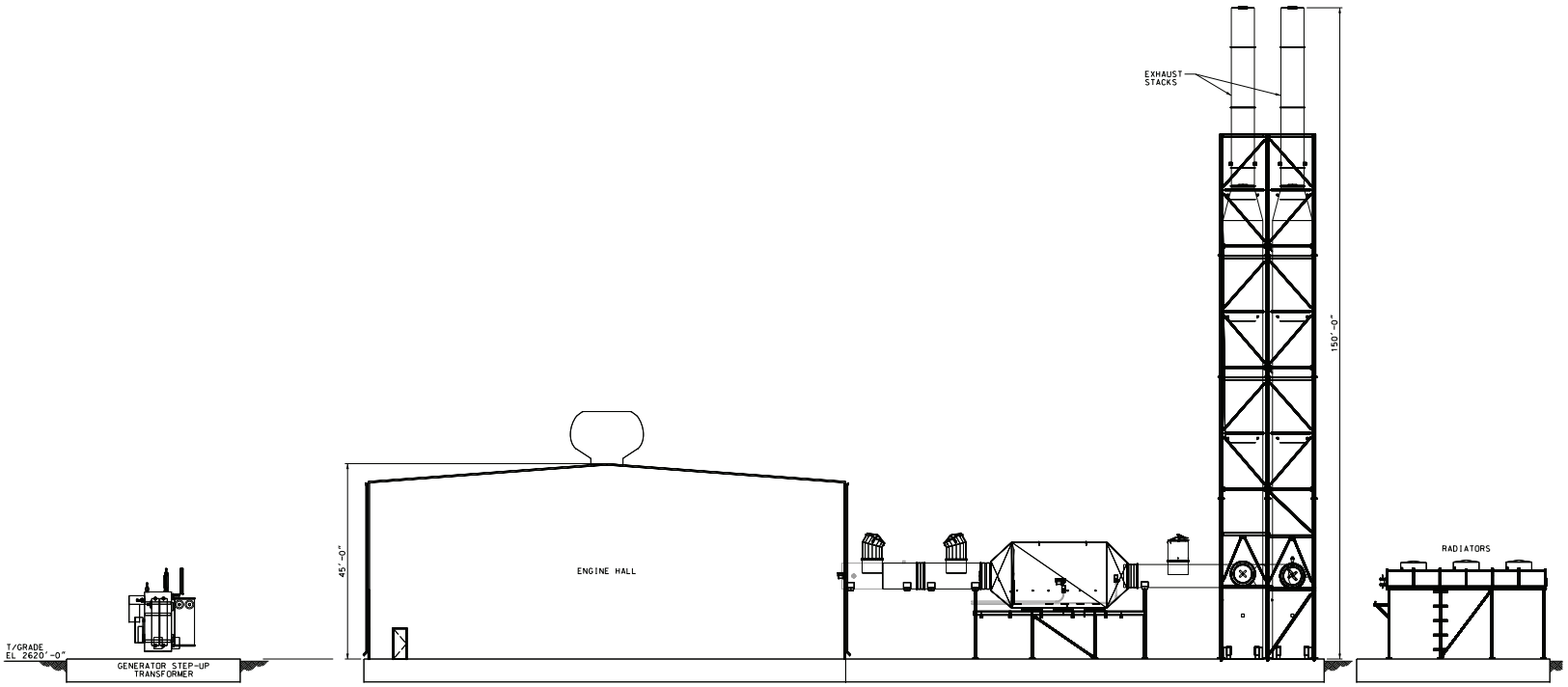

NOTES:

FOR INFORMATION ONLY
ALL DIMENSION TO BE VERIFIED DURING DETAILED DESIGN.

NOT FOR CONSTRUCTION

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	08/22/2017	FOR INFORMATION

ISSUE PURPOSE: FOR INFORMATION
SPECIFICATION: --
PROJECT NO.: 13357-302

CAD FILE NAME: TEP-GA-02.DGN
PREPARED BY: R. PONIATOWSKI
REVIEWED BY: V. SHAH
APPROVED BY: -

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Sargent & Lundy LLC

SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

TEP
Tucson Electric Power

PROJECT

H.W. SUNDT GENERATION STATION
PLANT GENERATION
MODERNIZATION PROJECT
TUCSON ELECTRIC POWER

DRAWING TITLE

ELEVATION

DRAWING NUMBER	REVISION
GA-02	0
SHEET - OF -	

EXHIBIT G-2

ZD9656/OuD008/D:#NONE#Sg:#TEP GA#TEP-RCE-GA-02.dgn
Form GDG-0401-01-08, ANSI (Imperial) Microstation Border - Size E - 34 x 44
Revision 11A, Revision Date: 04-30-2010

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EXHIBIT G-3

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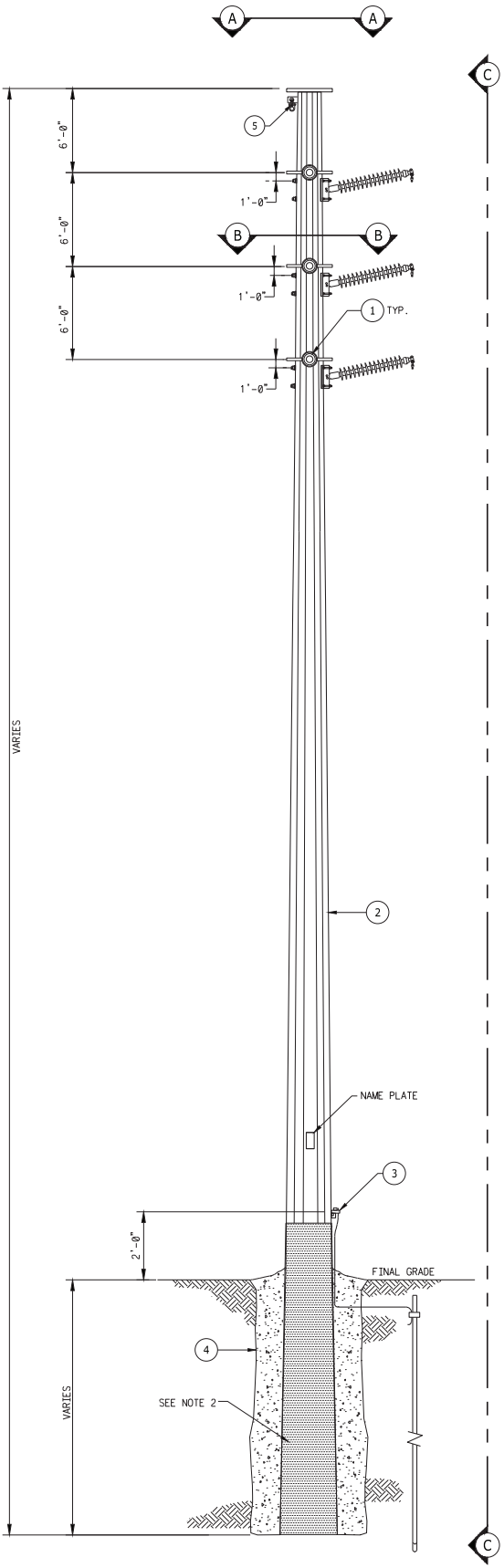
SINGLE CIRCUIT DEADEND

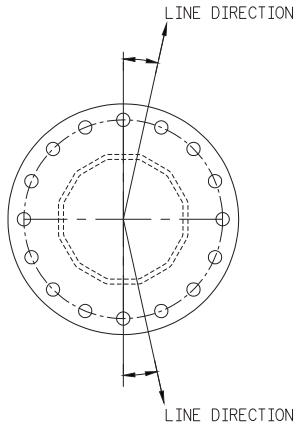
EXHIBIT G-3.1

Tucson Electric Power

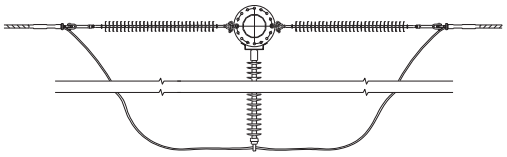
UniSourceEnergy Services



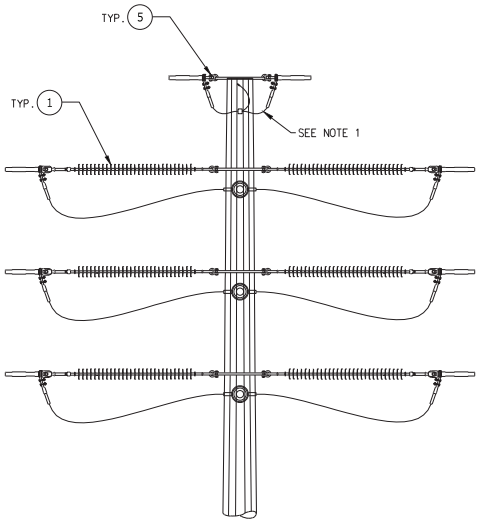
DDE ON RING VANGS, SINGLE CIRCUIT VERTICAL46/69/138kV W/OUT DIST.



VIEW A-A



VIEW B-B



VIEW C-C

GENERAL NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF IT'S SUBCONTRACTOR(S) PERFORMING THE WORK).

2. EMBEDDED PORTION OF POLE PLUS 1'-6" COATED W/ CORROCOTE II CLASSIC PNT 219A & 219B, 40MILS THICK.

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	ASSEMBLY DRAWINGS
1	DEADEND ON POLE	3	TL0501.003
2	STEEL POLE	1	SEE CTE
3	GROUNDING ASSEMBLY	1	TL0500.001
4	FOUNDATION DETAIL	1	TL0700.002 TL0700.003 TL0700.005
5	OPGW/STATIC DDE ASSEMBLY	1	TL0504.004 TL0504.005 TL0504.006

FRAMING, SINGLE CIRCUIT VERTICAL

DOUBLE DEADEND ON RING VANGS, 46/69/138kV

TRANSMISSION STANDARD

INITIATED MF

EFFECTIVE DATE 12/31/11

TL0320.001-R00

Tucson Electric Power

UniSourceEnergy Services

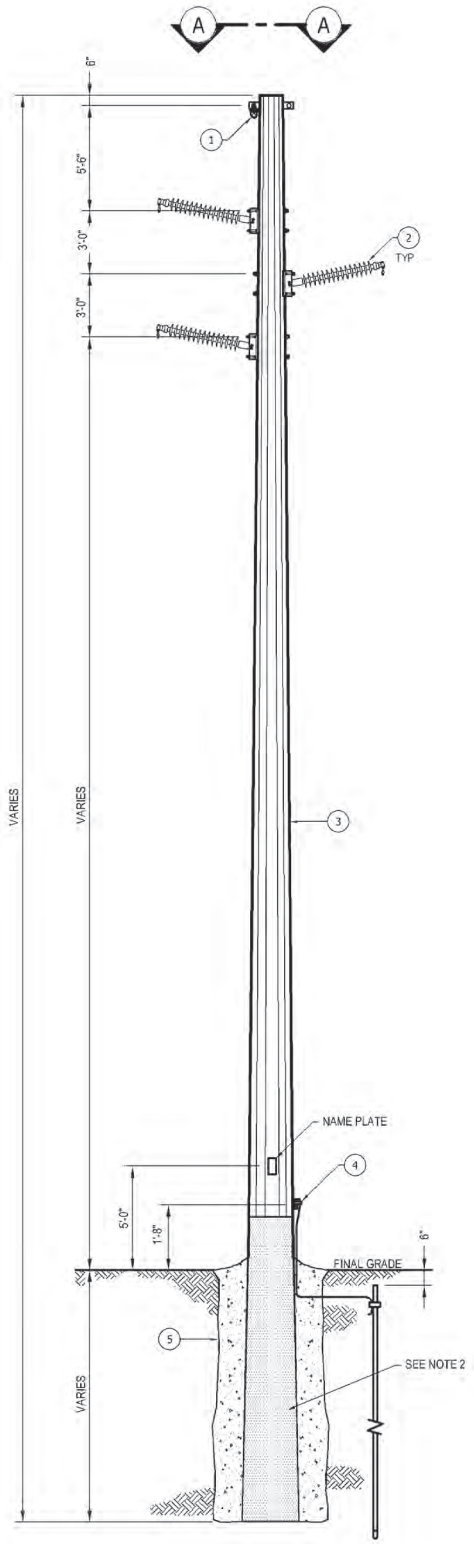
FRAMING, SINGLE CIRCUIT DELTA

TANGENT (0-3 DEGREES), 46/69/138KV
TRANSMISSION STANDARD

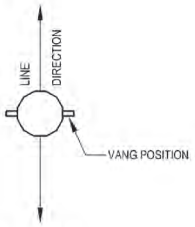
INITIATED MF

EFFECTIVE DATE 5/6/14

TL0300.005-R01



TANGENT 0-3°, SINGLE CIRCUIT DELTA 46/69/138KV W/OUT DIST.



VIEW A-A

GENERAL NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF IT'S SUBCONTRACTOR(S) PERFORMING THE WORK).
2. EMBEDDED PORTION OF POLE PLUS 1'-6" COATED W/ CORROCOTE II CLASSIC PNT 219A & 219B, OR MEYERCLAD PNT 218A & 218B, 40 MILS. THICK.

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	DRAWING ASSEMBLY
1	OPGW/STATIC SUSP. ASSEMBLY	1	TL0504.001 (OPGW) TL0506.001 (STATIC)
2	POST INSULATOR ASSEMBLY	3	TL0502.003
3	STEEL POLE	1	SEE CTE
4	GROUNDING ASSEMBLY	1	TL0500.001
5	FOUNDATION DETAIL	1	TL0700.005

SINGLE CIRCUIT TANGENT - OPTION 2

EXHIBIT G-3.3

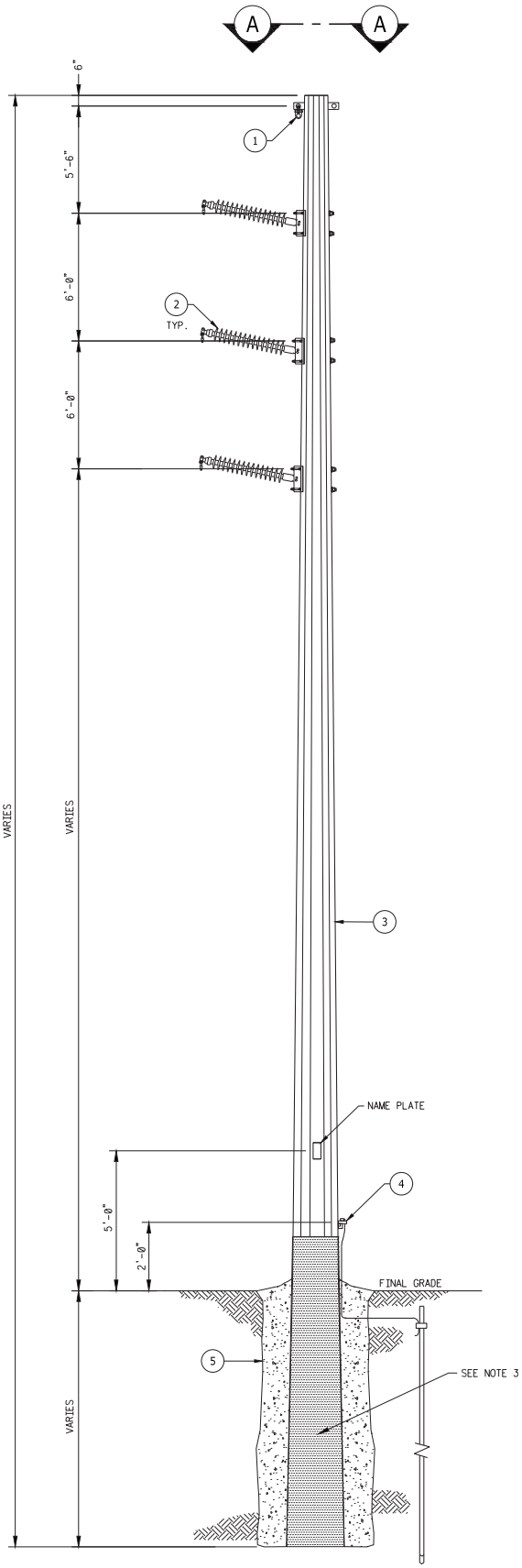
Tucson Electric Power

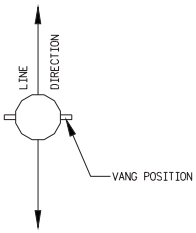
UniSourceEnergy Services

FRAMING, SINGLE CIRCUIT VERTICAL

TANGENT (0-3 DEGREES) 46/69/138kV

TRANSMISSION STANDARD





VIEW A-A

TANGENT 0-3°, SINGLE CIRCUIT VERTICAL 46/69/138kV

GENERAL NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF IT'S SUBCONTRACTOR(S) PERFORMING THE WORK).

2. EMBEDDED PORTION OF POLE PLUS 1'-6" COATED W/ CORROCOTE II CLASSIC PNT 219A & 219B, 40MILS THICK.

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	DRAWING ASSEMBLY
1	OPGW/STATIC SUSP. ASSEMBLY	1	TL0504.001 TL0506.001
2	POST INSULATOR ASSEMBLY	3	TL0502.003 TL0502.004
3	STEEL POLE	1	SEE CTE
4	GROUNDING ASSEMBLY	1	TL0502.001
5	FOUNDATION DETAIL	1	TL0700.005

INITIATED	MF
EFFECTIVE DATE	12/31/11

TL0305.005-R00

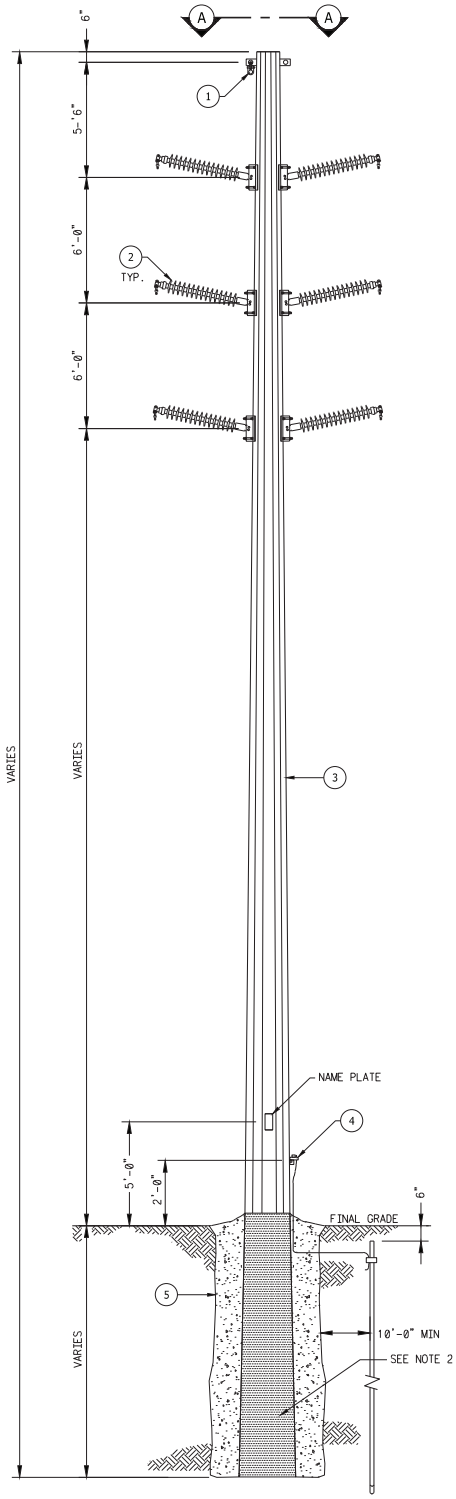
DOUBLE CIRCUIT TANGENT

EXHIBIT G-3.4

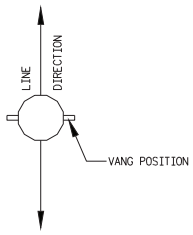
Tucson Electric Power

UniSourceEnergy Services

FRAMING, DOUBLE CIRCUIT
TANGENT (0-3 DEGREES), 46/69/138kV
TRANSMISSION STANDARD



ELEVATION



VIEW A-A

TANGENT 0-3°, DOUBLE CIRCUIT 46/69/138kV
W/OUT DIST.

GENERAL NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF IT'S SUBCONTRACTOR(S) PERFORMING THE WORK).

2. EMBEDDED PORTION OF POLE PLUS 1'-6" COATED W/ CORROCOTE II CLASSIC PNT 219A & 219B, 40MILS THICK.

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	ASSEMBLY DRAWINGS
1	OPGW/STATIC SUSP.ASSEMBLY	1	TL0504.001 TL0506.001
2	POST INSULATOR ASSEMBLY	6	TL0502.001 TL0502.002
3	STEEL POLE	1	SEE CTE
4	GROUNDING ASSEMBLY	1	TL0500.001
5	FOUNDATION DETAIL	1	TL0700.005

INITIATED	MF
EFFECTIVE DATE	12/31/11

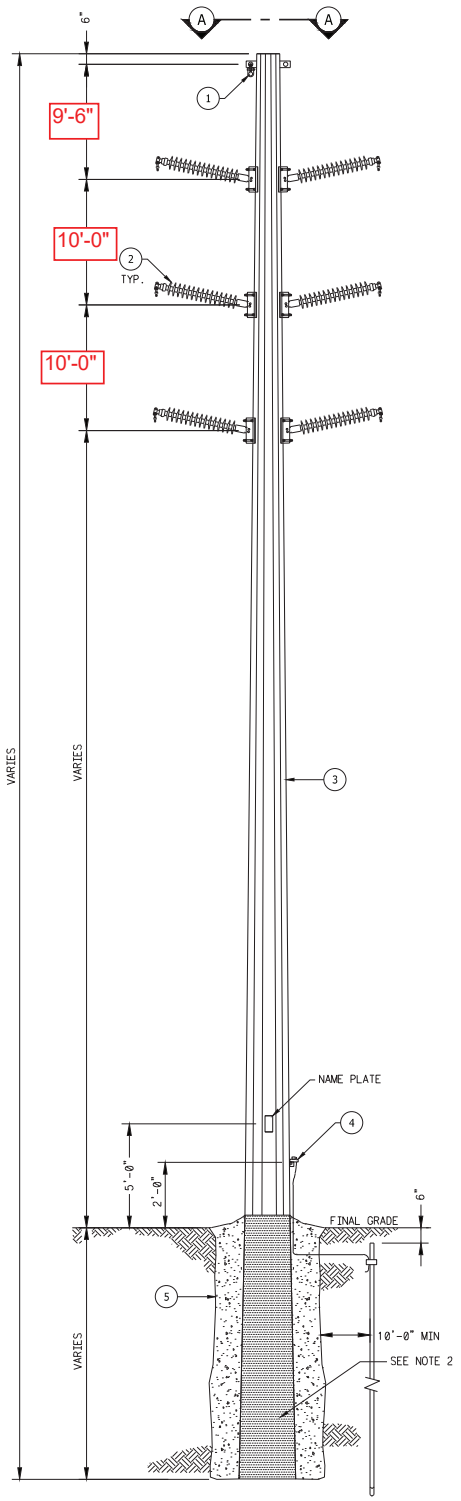
TL0310.005-R00

DOUBLE CIRCUIT TANGENT - MODIFIED

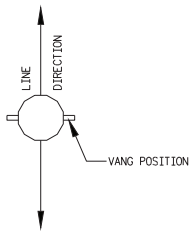
EXHIBIT G-3.5

Tucson Electric Power

UniSourceEnergy Services



ELEVATION



VIEW A-A

TANGENT 0-3°, DOUBLE CIRCUIT 46/69/138kV
W/OUT DIST.

GENERAL NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF IT'S SUBCONTRACTOR(S) PERFORMING THE WORK).

2. EMBEDDED PORTION OF POLE PLUS 1'-6" COATED W/ CORROCOTE II CLASSIC PNT 219A & 219B, 40MILS THICK.

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	ASSEMBLY DRAWINGS
1	OPGW/STATIC SUSP.ASSEMBLY	1	TL0504.001 TL0506.001
2	POST INSULATOR ASSEMBLY	6	TL0502.001 TL0502.002
3	STEEL POLE	1	SEE CTE
4	GROUNDING ASSEMBLY	1	TL0500.001
5	FOUNDATION DETAIL	1	TL0700.005

FRAMING, DOUBLE CIRCUIT
TANGENT (0-3 DEGREES), 46/69/138kV
TRANSMISSION STANDARD

INITIATED	MF
EFFECTIVE DATE	12/31/11

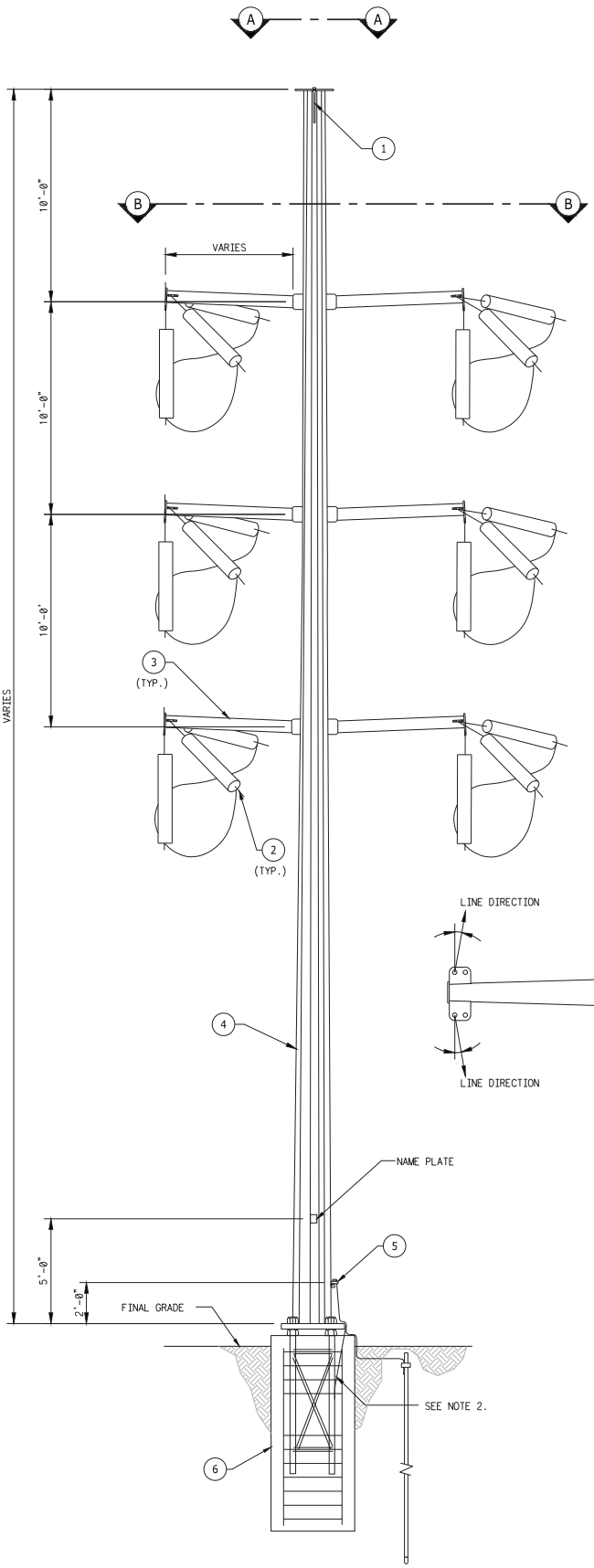
TL0310.005-R00

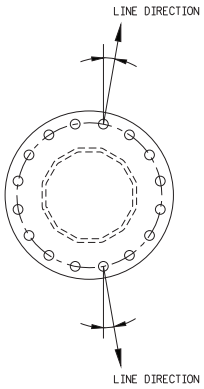
DOUBLE CIRCUIT DEADEND

EXHIBIT G-3.6

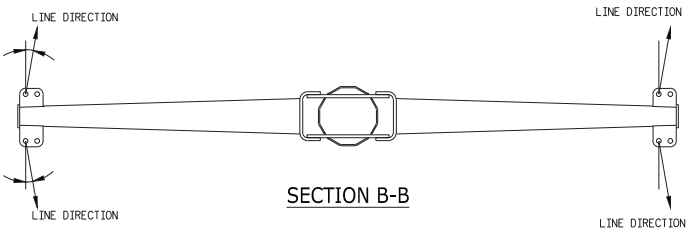
Tucson Electric Power

UniSourceEnergy Services





SECTION A-A



SECTION B-B

DE OR DDE ON ARMS, DOUBLE CIRCUIT 46/69/138kV W/OUT DIST.

NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF IT'S SUBCONTRACTOR(S) PERFORMING THE WORK.
2. TIE GROUNDING ASSEMBLY TO REINFORCING REBAR CAGE OF FOUNDATION.

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	ASSEMBLY DRAWINGS
1	OPGW/STATIC DDE ASSEMBLY	1	TL0504.002 TL0504.004 TL0504.006
2	D.E. INSULATOR ASSEMBLY	6	TL0501.005 TL0501.006
3	TUBULAR DAVIT ARM	6	SEE CTE
4	STEEL POLE	1	SEE CTE
5	GROUND ASSEMBLY	1	TL0500.001
6	FOUNDATION	1	TL0700.003 TL0700.004

FRAMING, DOUBLE CIRCUIT

DEADEND OR DOUBLE DEADEND ON ARMS, 46/69/138kV TRANSMISSION STANDARD

INITIATED MF

EFFECTIVE DATE 12/31/11

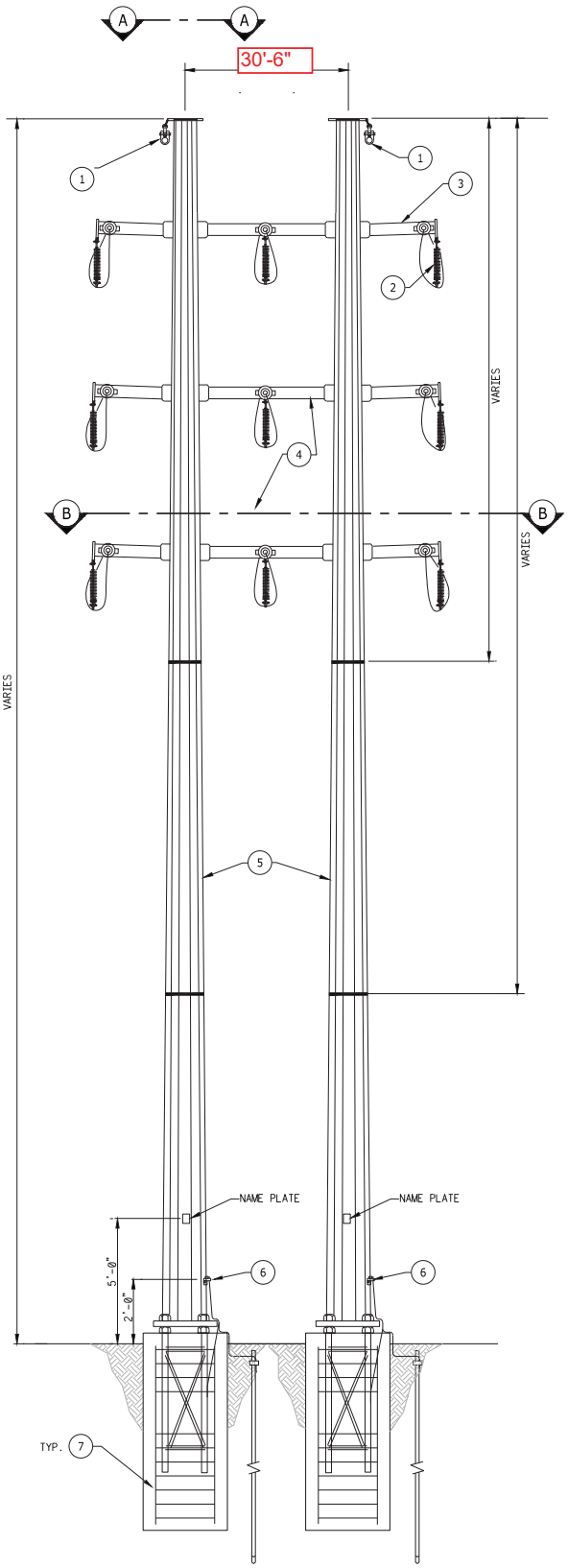
TL0325.001-R00

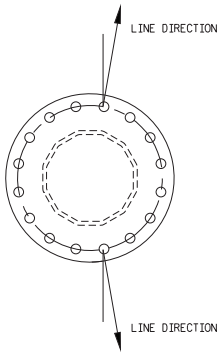
TRIPLE CIRCUIT DOUBLE BAY DEADEND

EXHIBIT G-3.7

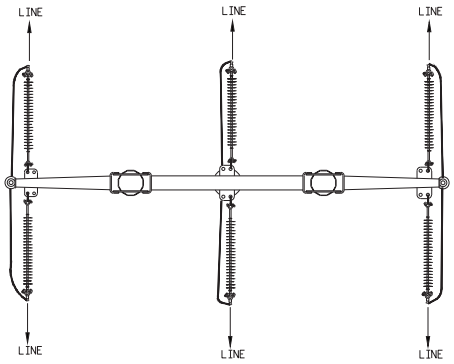
Tucson Electric Power

UniSourceEnergy Services





VIEW A-A



SECTION B-B

NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF IT'S SUBCONTRACTOR(S) PERFORMING THE WORK.
2. TIE GROUNDING ASSEMBLY TO REINFORCING REBAR CAGE OF FOUNDATION.

DE OR DDE 0-60°, H-FRAME REPLACEMENT 138kV

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	ASSEMBLY DRAWING
1	OPGW/STATIC DDE ASSEMBLY	2	TL0504.002 TL0504.004 TL0504.006
2	DE ON ARM W/JUMPER ASSEMBLY	9	TL0501.005 TL0501.006
3	TUBULAR DAVIT ARM	6	SEE CTE
4	STEEL CROSS ARM	3	SEE CTE
5	STEEL POLE	2	SEE CTE
6	GROUNDING ASSEMBLY	2	TL0500.001
7	FOUNDATION	2	TL0700.003 TL0700.004

FRAMING, TRIPLE CIRCUIT H-FRAME

DEADEND OR DOUBLE DEADEND (0-60 DEGREES), 138kV

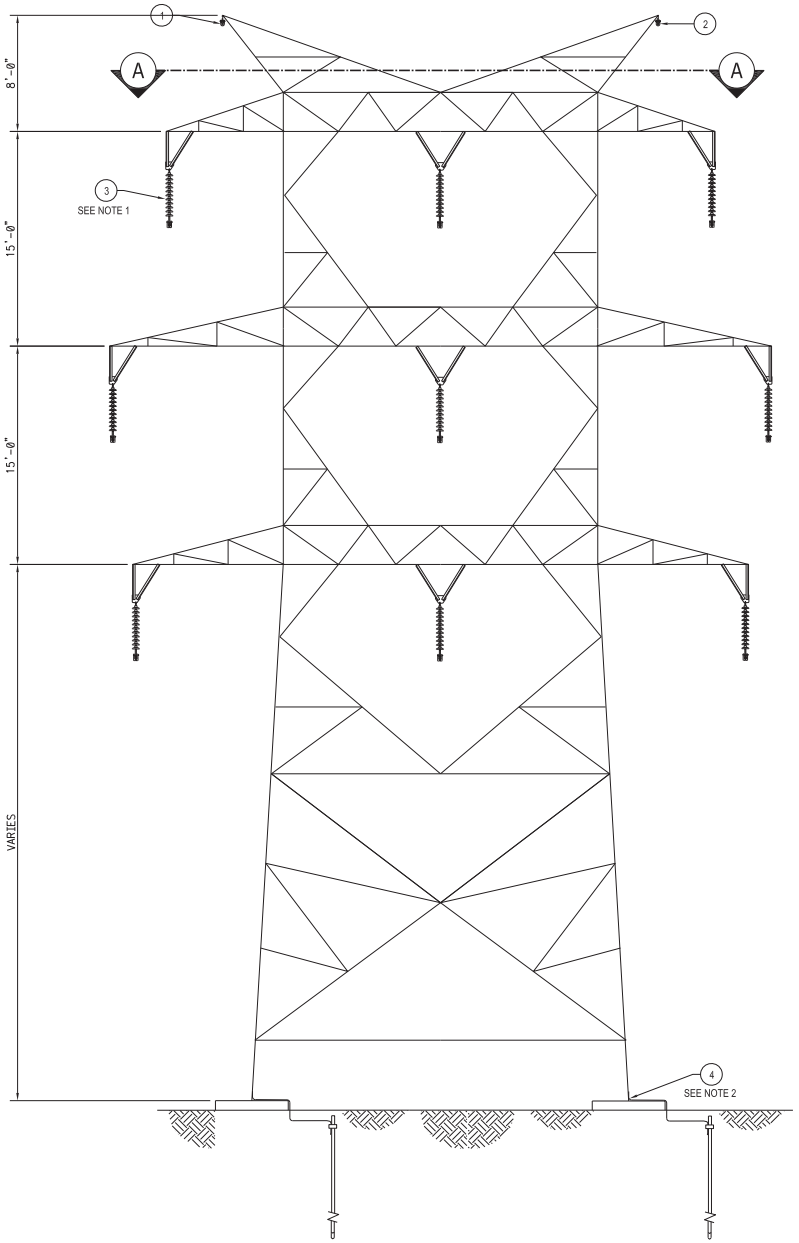
TRANSMISSION STANDARD

INITIATED	MF	
EFFECTIVE DATE	12/31/11	

TL0340.002-R00

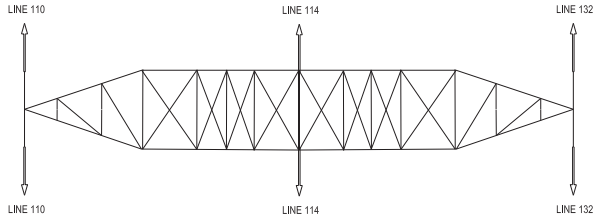
EXHIBIT G-3.8

EXISTING LATTICE



TRIPLE CIRCUIT TANGENT LATTICE, THREE SWING BRACKETS

STRUCTURES: 134, 140, 141, 142, 146, 147, 152, 157, 161, 167, 168, 169, 170, 171



SECTION A-A
LINE ORIENTATION

NOTE:

1. EXISTING SUSPENSION CLAMP TO BE REMOVED AND REPLACED. VERIFY REMAINING ASSEMBLY IS IN GOOD CONDITION AND REPLACE PARTS AS NEEDED.
2. FIELD VERIFY EXISTING GROUND CONNECTIONS ARE INTACT AND RESTORE ANY MISSING OR COMPROMISED GROUNDS.

BILL OF MATERIAL

ITEM.	DESCRIPTION	QTY.	ASSEMBLY DRAWING
1	96-FIBER OPGW SUSPENSION ASSEMBLY	1	0410-138-25-0039
2	3/8" EHS STATIC SUSPENSION ASSEMBLY	1	0410-138-25-0040
3	I-STRING SUSPENSION ASSEMBLY	3	0410-138-25-0037
4	GROUNDING ASSEMBLY	4	0410-138-25-0042

REVISIONS

DATE	ENG	TECH	REV
12-01-2014	K. VARGA	A.OLIVAS	00

DESCRIPTION:
ISSUE FOR CONSTRUCTION
JOB 7281.00/ EC 77700
138kV RECONDUCTOR, PHASE 2

BEING REVISED / UNDER CONSTRUCTION
R.E. K. VARGA TECH./DFTR. PETE OLIVAS
JOB # 7281.00 REV. # SEE REV NOTE
CHECK WITH R.E. BEFORE PRINTING OR REVISING

AUTOCADD

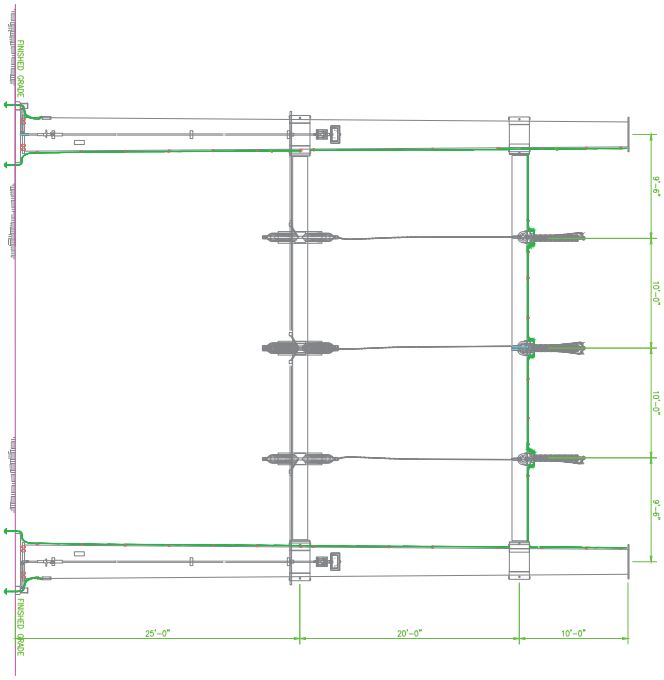
Tucson Electric Power Company
TUCSON, ARIZONA

TITLE: TRANSMISSION LINE
FRAMING DRAWINGS; TC TAN, LATTICE, THREE SWING BRACKETS
LINE 110 - DeMOSS PETRIE SUBST. TO NORTH LOOP SUBST.

TRSQ
REF #
N/A
DRAWING
0410-138-07-0036
REV 00
SHEET T47

SINGLE BAY H-FRAME

EXHIBIT G-3.9



Tucson Electric Power Company
TUCSON, ARIZONA

TITLE: SINGLE BAY H-FRAME

TEMPLATE DRAWING

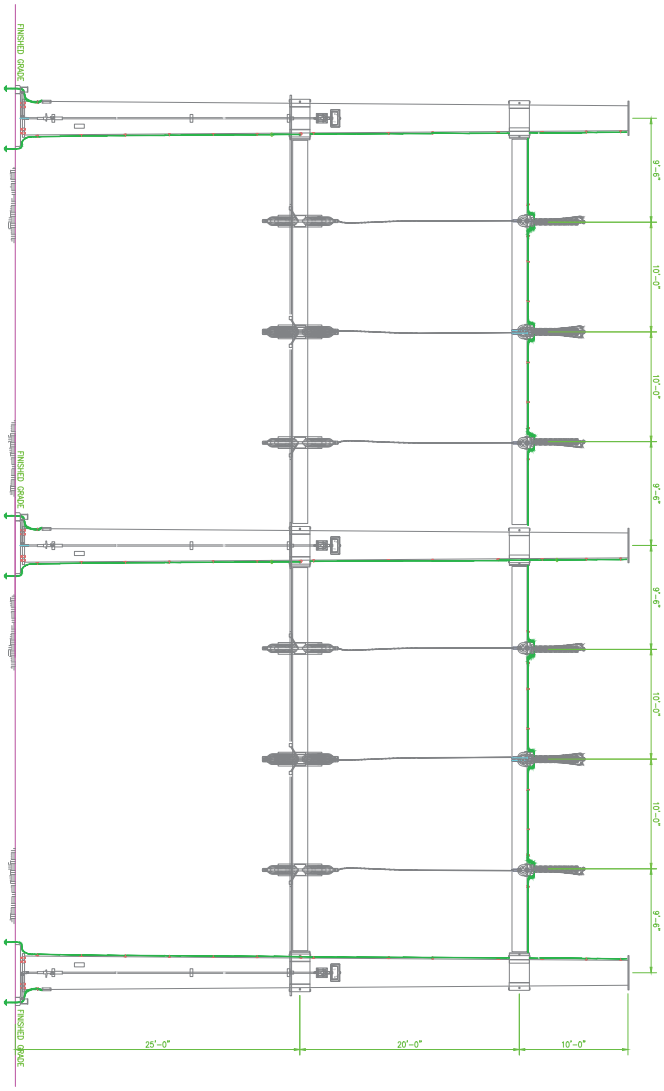
AUTOCADD

REVISIONS

00

DOUBLE BAY H-FRAME

EXHIBIT G-3.10



Tucson Electric Power Company
TUCSON, ARIZONA

TITLE: DOUBLE BAY H-FRAME

TEMPLATE DRAWING

AUTOCADD

REVISIONS

EXHIBIT G-4

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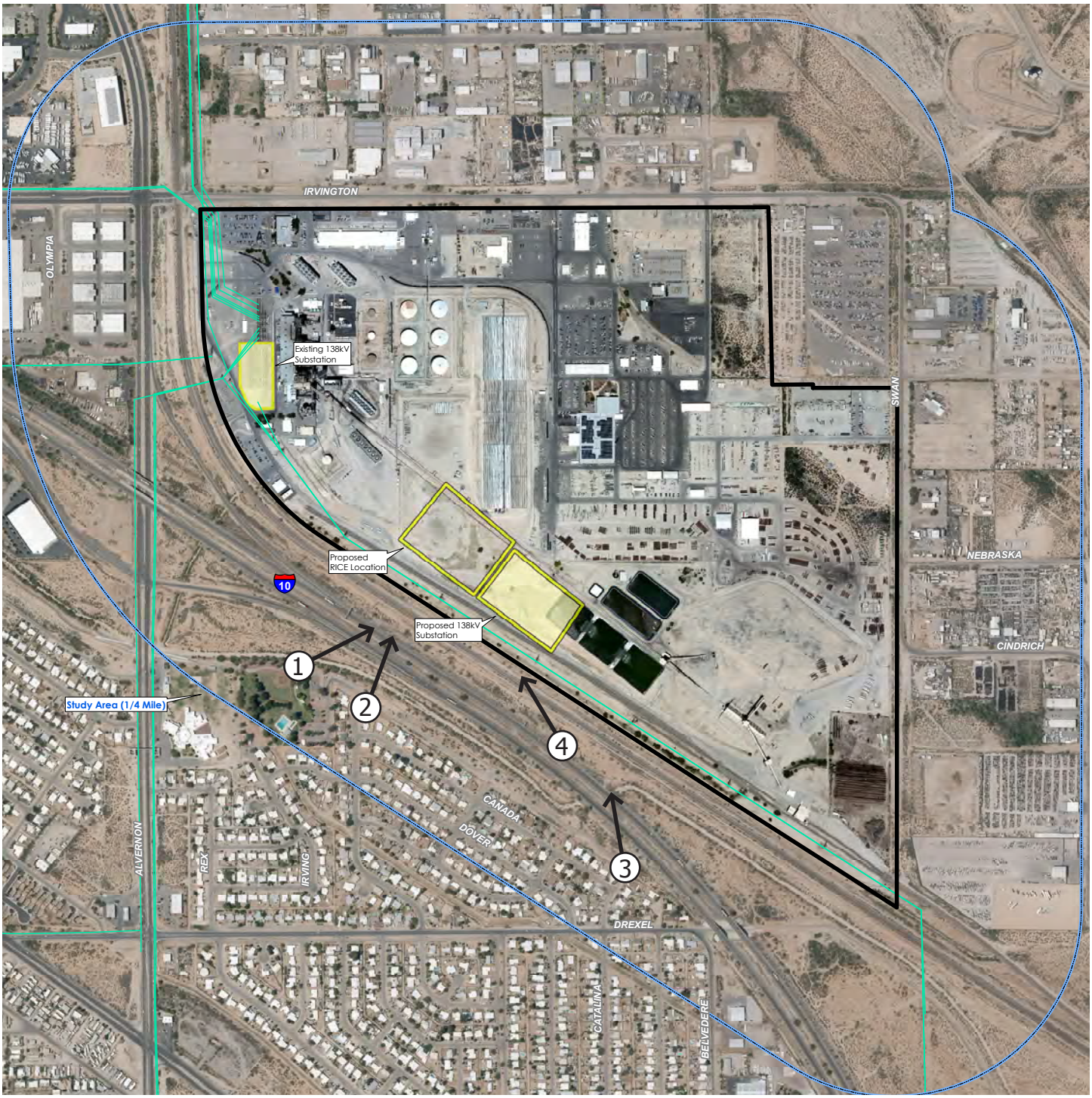
EXHIBIT G-4.1

Tucson Electric Power
Irvington R.I.C.E. and Substation

Key Observation Point (KOP) - Key Map



↑ north

not to scale

EXHIBIT G-4.2

Tucson Electric Power
Irvington R.I.C.E. and Substation
KOP 1 - Julian Wash Greenway

Existing View

Visual Simulation

Camera Location
Latitude: 32.153597 N
Longitude: 110.905160 W
Elevation: 2,586 ft.

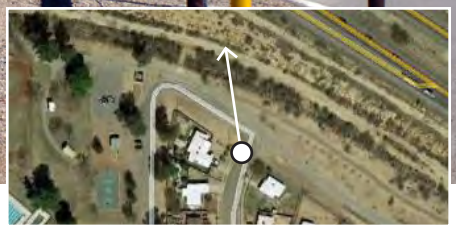
EXHIBIT G-4.3

Tucson Electric Power
Irvington R.I.C.E. and Substation

KOP 2 - Bryan Avenue

Existing View

Visual Simulation



Camera Location
Latitude: 32.153245 N
Longitude: 110.904336 W
Elevation: 2,575 ft.

EXHIBIT G-4.4

Tucson Electric Power
Irvington R.I.C.E. and Substation

KOP 3 - Catalina Avenue

Existing View

Visual Simulation

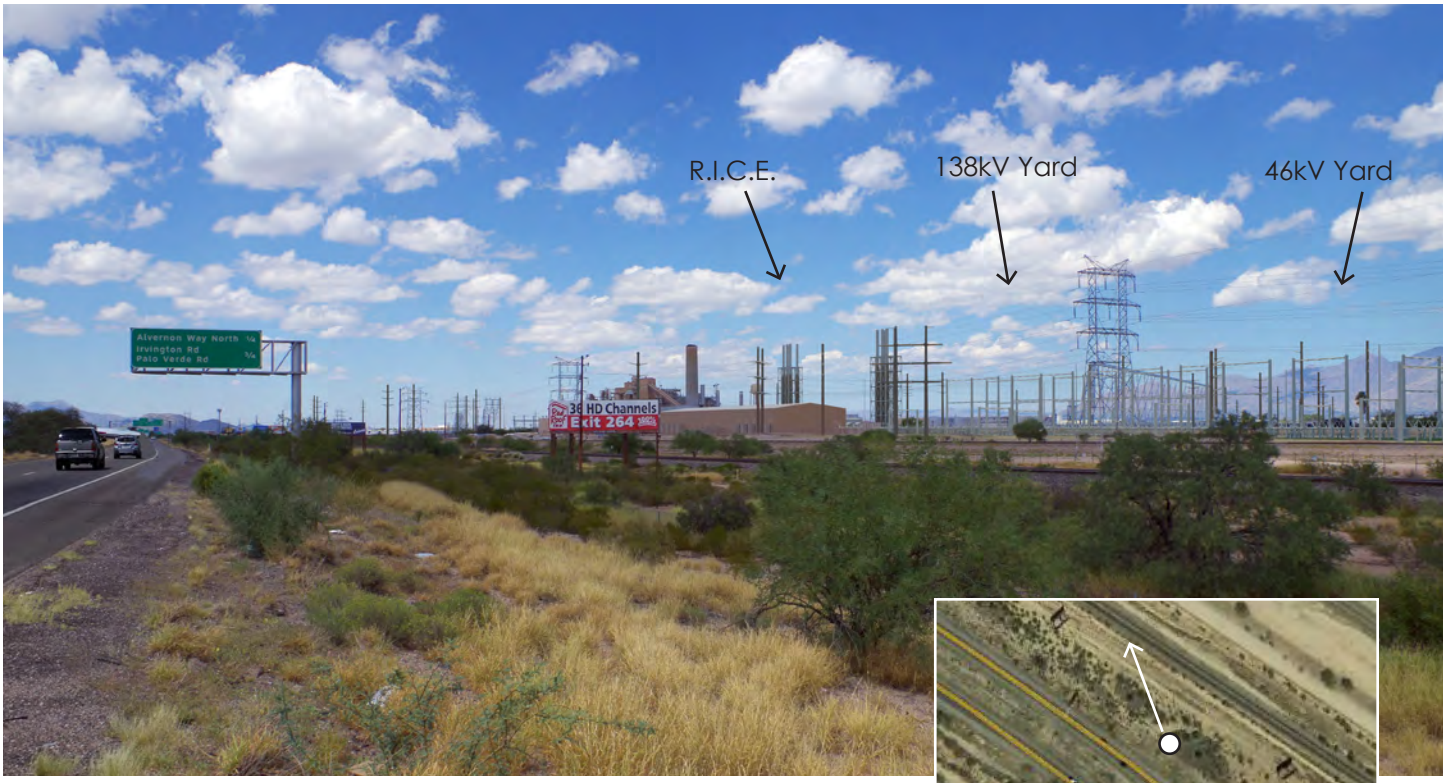
Camera Location
Latitude: 32.149894 N
Longitude: 110.898439 W
Elevation: 2,629 ft.

EXHIBIT G-4.5

Tucson Electric Power
Irvington R.I.C.E. and Substation

KOP 4 - Interstate 10

Existing View



Visual Simulation

Camera Location
Latitude: 32.152463 N
Longitude: 110.900106 W
Elevation: 2,635 ft.

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EXHIBIT H

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EXHIBIT H: EXISTING PLANS

AAC R14-3-219:

> *To the extent applicant is able to determine, state the existing plans of the state, local government and private entities for other developments at or in the vicinity of the proposed site or route.*

H.1 Federal

TEP consulted with DMAFB personnel regarding the Projects, and it was determined that the RICE Generation Project stacks penetrate the airfield's Inner Horizontal Surfaces, one of several imaginary surfaces which determine whether an object is an obstruction to air navigation. The Inner Horizontal Surface is a horizontal plane 150 feet above the established airport elevation. The DMAFB will be issuing an airfield waiver for this penetration.

H.2 State

The Arizona Department of Transportation (ADOT) plans to reconfigure the I-10 connection to the State Route 210 (Aviation Parkway) corridor south and west of Irvington Campus. Since the UPRR tracks are situated between I-10 and the south and west boundaries of Irvington Campus, ADOT's plans will have no direct impacts to Irvington Campus.

There is land owned by the Arizona State Land Department (ASLD) southeast of Irvington Campus. There are no known ASLD plans for this area.

H.3 City

The COT is preparing a Habitat Conservation Plan (HCP) to support the COT's Incidental Take Permit to minimize and mitigate the impacts of take related to planned urban development, water supply and capital improvement projects. The Projects' study area is outside the HCP Planning Area.

H.4 County

The Pima County Sonoran Desert Conservation Plan (SDCP) guides the balance of conservation and protection of cultural and natural resources with the region's efforts to develop and grow economically. The SDCP considered critical habitats, biological corridors, important riparian areas, mountain parks, historical and cultural preservation, and ranch conservation in forming a land management plan for Pima County. The Pima County Comprehensive Land Use Plan was updated in 2011, and integrated the SDCP as well as the Conservation Lands System. The project area is outside the Conservation Lands System.

H.5 Private

The Projects are wholly contained on land owned by TEP. TEP is developing a campus wide plan that includes the facilities identified in this application as part of its overall Irvington Campus Modernization Project.

An active UPRR line is adjacent to the project area to the south. TEP is in the process of coordinating with UPRR to resolve concerns about the proximity of transmission lines to UPRR communication lines. See Exhibit H-1 for their comments, and Exhibit H-2 for TEP's response.

H.6 Land Use

H.6.1 Overview

TEP conducted a land use inventory and an assessment of potential impacts that may occur as a result of construction and operation of the Projects.

H.6.2 Inventory

The land use inventory included land jurisdiction and ownership, and existing and future land uses. Methods used for the land use inventory included comprehensive plans, area land use plans, review and interpretation of maps, aerial imagery, other documents, field verification, and communication with governmental agencies within the study area.

Jurisdiction and Land Ownership

The study area includes land under the jurisdiction of the COT, Pima County, ASLD, and the DOD (see Exhibit A-1). The Projects are wholly contained within the COT, on land owned by TEP.

Existing Land Use

Existing land uses are mapped in Exhibit A-2. Overall, the study area is a developed urban area with UPRR and I-10 marking the southern boundary of the project area. Industrial development defines the majority of the study area. The land use categories identified in Exhibit A-2 are described below.

Residential: Residential land uses primarily include medium density single-family residential areas and mobile home parks.

Office/Business Park: The Palo Verde Business Park, and the Coronado Pointe Commerce Center are located on the west side of Alvernon Road.

Industry/Light Industry: Industrial land uses are heavily concentrated within the project area and to the north along Irvington Road. The study area includes warehouse businesses, storage facilities, manufacturing companies, utility uses, and other industrial uses. TEP's Irvington Campus houses support facilities, headquarters, other office buildings, fueling and equipment washing stations, laydown yards, equipment parking and storage areas, vehicle maintenance and specialized shops, training facilities, and customer call center. DMAFB is located within the study area, adjacent to and northeast of the project area.

Utilities: Electrical generating stations, substations, transmission lines, and solar plants are present in the study area. Irvington Campus is home to the Sundt Generating Station, which went into service in 1958, as well as substations, distribution and transmission lines, switch yards, and laydown yards. Both 138 kV and 46 kV lines leave substations on Irvington Campus along Alvernon and Irvington Roads to the west, and to the southeast along Swan Road.

EPNG has an active gas pipeline crossing the northeast corner of the Irvington Campus.

See Initial Utility Infrastructure Inventory for Irvington Campus Redevelopment, Exhibit H-3.

Public/Quasi-public: Los Ninos Elementary School is located within the study area, to the southwest of the project area along Alvernon Road on the south side of I-10.

Transportation: Major arterials in the study area include I-10, Alvernon Way, and Irvington Road. A UPRR line is located between I-10 and the project area, connecting Texas to Phoenix.

Vacant/Undeveloped Land: Vacant land within the study area is limited to the TEP parcel within the Irvington Campus, a portion of DMAFB to the northeast of the project area, and part of the Julian Wash Greenway east of the residential neighborhood south of I-10, to the southeast of the project area.

Municipal Parks/Recreation Complex: The Augie Acuna Los Ninos Neighborhood Park and the Julian Wash Greenway are located in the Study Area south of I-10.

Future Land Use

Future Land Uses (see Exhibit A-3) within the Study Area are expected to be similar to existing land uses, as the study area is nearly fully developed. Within the corporate limits of the COT, the zoning is light and heavy industrial. Known future plans in the Study Area are listed in Table 2-2, and mapped on Exhibit A-3.

Table 2-2. Future Plans in the Study Area

Lead Basketball	Development Permit
Gateway Phase 2	Development Permit
Arizona Tree Service	Development Permit
Valencia Crossing	Planned Area Development

H.6.3 Impact Assessment and Results

Land use impacts may be defined primarily as 1) restrictions on a land use that would result from the construction or operation of the proposed Projects or 2) incompatibility with existing plans. Typically, restrictions on land use would result from ROW or easement acquisition across a property. Land use impacts will be negligible, as the Projects are wholly contained within TEP property. The effect of the Projects on adjacent land use within the study area would also be negligible, as the Projects are compatible with existing plans.

H.7 Conclusion

The proposed Projects will have a positive indirect impact on both current and future land use in the region by improving the availability of reliable electric service. There will be no direct impacts to area land use. The Projects are consistent with local and regional land use plans, including the COT and Pima County.

H.8 References

Pima County, 2017: Geographic Information Systems: PimaMaps Main.

City of Tucson, 2017: City of Tucson Habitat Conservation Plan. https://www.tucsonaz.gov/pdsd/city-tucson-habitat-conservation-plan-hcp

Pima County, 1998: The Sonoran Desert Conservation Plan. http://webcms.pima.gov/government/sustainability_and_conservation/conservation_science/the_sonoran_desert_conservation_plan/

Pima County, 2016. Multi-species Conservation Plan for Pima County, Arizona: Final. Submitted to the Arizona Ecological Services office of the U.S. Fish and Wildlife Service, Tucson, Arizona.

Pima County, 2017. Pima Prospers, Pima County Comprehensive Plan Initiative. http://www.pimaprospers.com/.

EXHIBIT H-1

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Tuesday, October 10, 2017

Tucson Electric Power Company
Attn. Renee Darling- Senior Environmental & Land Use Planner
Land Resources – RC131
3950 Irvington Road
Tucson, AZ 85714-2114

Sent via electronic mail (rdarling@tep.com)

Subject: **Proposed Irvington to Kino 138 kV Transmission Line, 138 kV Kino Substation, 138 kV Irvington Campus Substation, and RICE Generation Facility in South Tucson, AZ**

Dear Ms. Renee Darling,

Union Pacific Railroad Company ("UPRR") received notice of Tucson Electric Power's proposed construction of the following projects: the 138 kV transmission line from Irvington to Kino, the 138 kV Kino Substation, and the 138 kV Irvington Campus Substation and its associated RICE generation facility. While the exact route of the transmission lines has yet to be selected, due to the proximity of the proposed lines and substations to active UPRR track we expect that the route contemplates multiple crossings and/or parallels of UPRR's right of way. UPRR will not be able to have a representative at the informational meetings but submits these comments and concerns for Tucson Electric Power's consideration.

UPRR objects to any transmission line route that runs parallel within three hundred (300) feet of railroad right of way, measured from the centerline of our track. All parallel lines must be three hundred (300) feet off of track. UPRR also objects to any route that crosses its right-of-way. UPRR will only allow crossings of railroad right of way at a degree of ninety (90°), or as close to ninety degrees (90°) as possible without going beyond the degree range of forty-five (45°). UPRR does not allow for any structures to be erected on railroad right of way. All crossings and parallel lines will require a future agreement with UPRR as to how to construct and maintain.

This objection is based upon the lack of detailed information to fully understand the project and the impact these substations and wirelines may have on Railroad property. If the above conditions cannot be met, all consideration of the project should be subject to a full mitigation study at the expense of Tucson Electric Power. Any concerns resulting from the mitigation study must be required to be addressed to avoid any damage to UPRR's signal and communication facilities.

Safety is the primary driver for this requested requirement. Unmitigated high voltage power lines in close proximity to railroad tracks can have an adverse affect upon railroad signals, especially grade crossing warning devices. For crossings in the vicinity of switches or signal facilities (especially when not crossing at a 90 degree angle), inductive interference has the potential to disrupt signal system in the track, causing failure in track signals, including highway grade crossing warning devices. In general, the more power that flows through the wires, the greater effect it has upon the railroad equipment. UPRR reviews proposed installations on or near its right of way by examining factors such as the distance between the wire and the rails and how far the power line parallels the tracks to evaluate the potential for the power lines to affect the safe operation of railroad signaling equipment.

Other adverse affects on railroad equipment come from ground fault events. These events cause a great deal of energy to flow through the ground from the power company's towers and/or substations, through the rails, and directly into signal equipment. Such events can cause tens or hundreds of thousands of dollars worth of damages during a single event. These occurrences can cause the destruction of railroad equipment for several miles. In one area, well documented events have repeatedly destroyed grade crossing warning devices for several miles. In addition to the potential to cause damage to railroad equipment, railroad personnel or anyone else touching the rails can be subject to injury from electrical shock.

Information and application forms concerning requests for wireline crossings across UPRR's property may be found on the internet at: http://www.up.com/real_estate/utilities/index.htm. Engineering specifications regarding crossings can be found as well at http://www.up.com/real_estate/utilities/wireline/wirespecs/index.htm. Proposals that call for placement of improvements on or under our property require greater evaluation and tend to be more difficult to approve, particularly where wirelines parallel our tracks with voltage. Further information regarding requests for such encroachments may be found on our website at: www.uprr.com/reus/encroach/procedur.shtml and www.uprr.com/reus/encroach/encguide.shtml. In all instances, there must also be a meeting of the minds on compensation for the right to cross the property.

By this letter, UPRR requests Tucson Electric Power to abide by the conditions presented above. If it has questions on requirements, please encourage its representatives to reach out to me. UPRR reserves its rights to present additional comments on the proposal and to seek any legal, administrative, and other remedies that may be necessary to preserve UPRR's franchise and property rights.

Cordially,

Renay J. Robison
UNION PACIFIC RAILROAD
1400 Douglas Street, Stop 1690
Omaha, Nebraska 68179-1690
P: 402-544-8658 F: 402-501-0340

EXHIBIT H-2

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Tucson Electric Power
P.O. Box 711, Mail Stop HQE613
Tucson, AZ 85702

Telephone: 520-884-3642
Fax: 520-545-1419

November 17, 2017

Union Pacific Railroad
Attn: Renay J. Robison
1400 Douglas Street, Stop 1690
Omaha, Nebraska 68179-1690

Subject: Proposed Irvington to Kino 138 kV Transmission Line, 138 kV Kino Substation, 138 kV Irvington Campus Substation, and RICE Generation Facility in South Tucson, AZ

Dear Ms. Robison,

Tucson Electric Power (TEP) received your comments dated October 10, 2017 on behalf of the UPRR regarding TEP's proposed projects identified in the subject line of this letter.

TEP's siting for the proposed 138 kV transmission lines is governed by the Arizona Corporation Commission (ACC) who approves the location of such lines. TEP is relying on its stakeholder and public outreach process to identify potential locations for the lines to present to the ACC for decision. I would like to thank you for the comments you have provided and invite you or other UPRR representatives to participate in future opportunities related to these siting efforts. Our open process is intended to assist TEP in developing the best overall location for the lines for consideration by the ACC.

TEP understands UPRR's concerns regarding potential transmission line impacts to UPRR operations and its objections to transmission lines that run parallel, within 300 feet of the track centerline and crossings that are not at 90 degrees, however given the locations of TEP's existing facilities and construction constraints on campus, encroachments within this 300-foot-buffer are anticipated for the RICE generation project's associated transmission line relocations.

<u>138 kV Irvington Campus Substation, and RICE Generation Facility</u>
Most of the new facilities related to the RICE gerneration project, which includes the relocated 138 kV substation, the relocated 46 kV substation and the relocated 138 kV and 46 kV transmission lines, will be installed within the Irvington Campus, on property owned by TEP. The preferred locations of these facilities are shown on the attached figure. Potential effects to UPRR include:

- New 138 kV structures to be constructed within the existing 138 kV transmission line alignment, however no additional 138 kV conductor will be added in the buffer zone.

- New 46 kV (1200 amp) double-circuit transmission line and underground double-circuit 46 kV (600 amp) transmission line to be installed along TEP's fenceline from the

relocated 46 kV substation west to its existing alignment – all located within the 300-ft buffer.

- Rebuild existing UPRR and Alvernon Way crossings west of TEP Campus, as shown on attached figure. Three existing crossings are not at 90 degrees.

Following ACC's decision of the transmission line route location, TEP will provide its design to UPRR for your review and determination of any requirements and will apply for any applicable maintenance reviews or crossing agreements necessary.

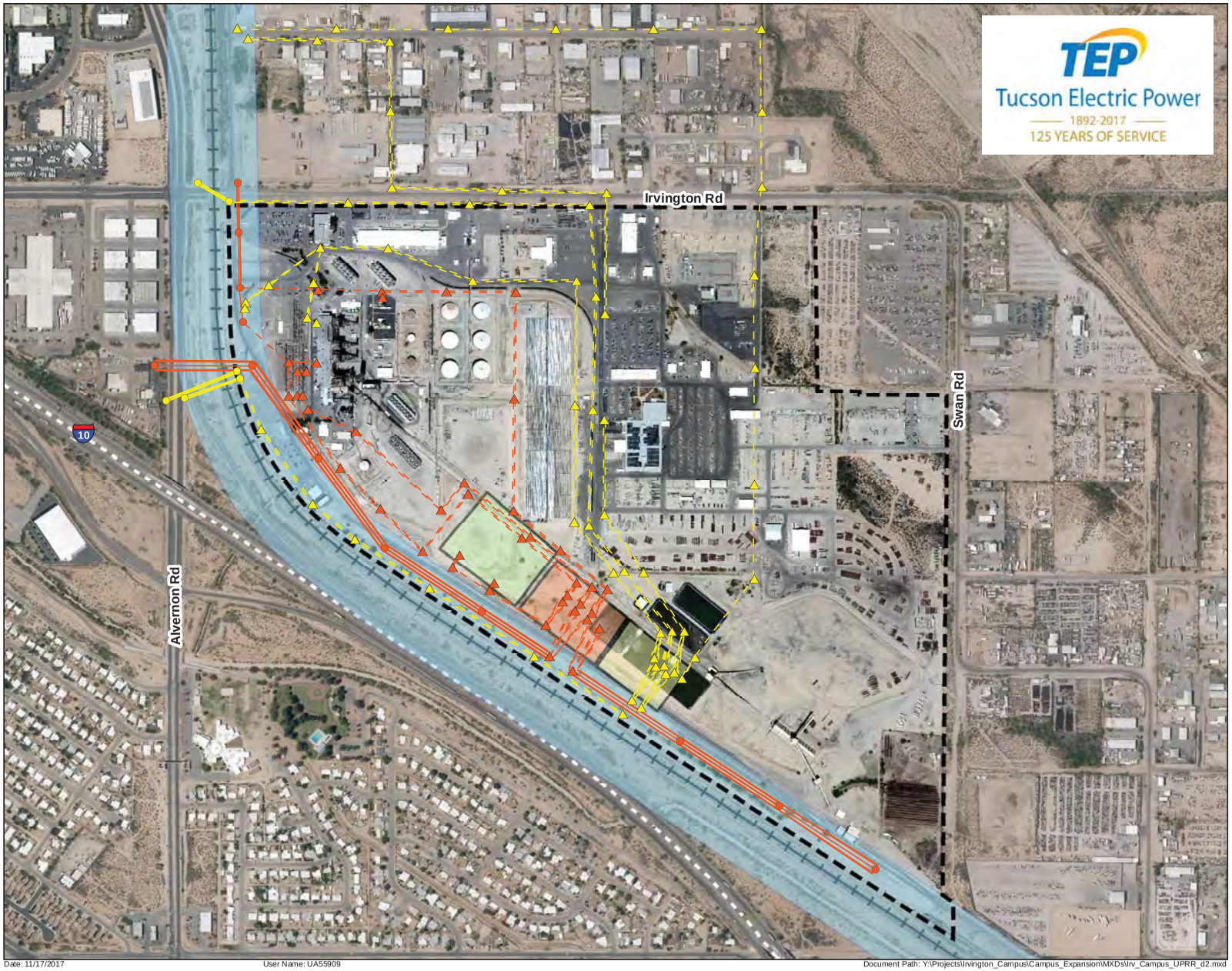
Proposed Irvington to Kino 138 kV Transmission Line, 138 kV Kino Substation
The Irvington to Kino 138 kV transmission line will require a new UPRR crossing. As the designs for this project progresses TEP will provide UPRR the location and design parameters for UPRR review.

Please feel free to call me with any additional questions or concerns. I can be reached at (520) 884-3642 or via email at rdarling@tep.com.

Respectfully,

Renee Darling
Senior Environmental and Land Use Planner
Tucson Electric Power Company,
a Fortis Company

Enclosure: Map of proposed RICE generation project and associated facilities in relation to UPRR facilities



TEP Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138kV Transmission Line Relocation Projects

UPRR Analysis

- Irvington Campus Boundary
- Proposed RICE Location
- Relocated 46kV Substation
- Relocated 138kV Substation
- Union Pacific Railroad
- UPRR Buffer (600 ft)
- Interstate

46kV Reroute
- Existing / Repurposed Poles
- Proposed / New Poles
- Existing / Repurposed Lines
- Proposed / New Lines

138kV Reroute
- Existing / Repurposed Poles
- Proposed / New Poles
- Existing / Repurposed Lines
- Proposed / New Lines

N W E S

0 325 650
Feet

1 inch = 650 feet

Sources: ESRI, TEP, Pima County GIS, and UPRR.
Projection: NAD 1983 UTM Zone 12N
Basemap: ESRI World Imagery and Cooper Aerial Imagery 2017

This map is for planning purposes only. TEP and UNS Energy make no warranty of its accuracy.

Created on 16 Oct 2017
Revised on 17 Nov 2017

Date: 11/17/2017 User Name: UA55909 Document Path: Y:\Projects\Irvington_Campus\Campus_Expansion\MXDs\Irv_Campus_UPRR_d2.mxd

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EXHIBIT H-3

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Presidio
ENGINEERING, INC.
190 S. STRATFORD DR., SUITE #105, TUCSON, ARIZONA 85716
(520) 795-7255 FAX (520) 795-6747

MEMORANDUM

TO: Ms. Cheryl Eamick
Tucson Electric Power, a UNS Energy Corporation

FROM: John D. Wood, P.E., LEED-AP

DATE: July 11, 2017

SUBJECT: Initial Utility Infrastructure Inventory for
Irvington Campus Redevelopment, MSA No. 78793

COPIES TO: Tanya Washington, Presidio Engineering
File 117005-01-0010

Presidio has concluded an initial utility infrastructure inventory of the Irvington Campus and adjacent areas. The inventory was conducted primarily to attempt to identify existing utility facilities related to site land development as well as to identify those facilities for which additional on-site as-built field verification is needed.

Our focus was primarily on the following utilities:

- Sanitary sewer conveyance.
- Domestic and fire flow water distribution.
- Natural gas service.
- Communications/cable service.

Our inventory was based solely upon information (plans, documents and base maps) supplied by TEP staff and public utility providers.

The results of our efforts are detailed within the attached "draft" inventory summary sheets.

It is important to note that our inventory is not based upon Blue Stake, private utility locator information and/or detailed field design survey verification.

We are now in the process of delineating, where possible, the inventoried utilities on the recent ALTA/Topographic Survey as provided by PLS Surveying as a part of this MSA.

Note that the intent is to compile base map exhibits for your review, confirmation and/or use to guide additional on-site field verification efforts.

We will provide you with a .pdf copy of the inventoried documents and our draft exhibits shortly.

Let us know if you have any questions or if you require any additional information.

Attachments

JDW/taw

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Site Plan
Inventory
Last Updated: July 10, 2017

Inventory ID No.	Plan Description	Plan No. Plan Date	Owner/Operator	Location	Plan Provided By/File Name and Date	Comments
SP1	TEP Power Plan Site Plan	02085.002 5/13/15	TEP	Campus	TEP, Box 1_PP_Site Plan 3/31/17	➢ Marked preliminary not for construction ➢ Contains parking and F.A.R. calculations ➢ See new 6/15/17 ALTA/Topo
SP2	Tucson Electric Power Co. Existing Site Plan w/ Topo	02085.002 11/7/06	TEP	Campus	TEP, Box 1_TEP_Site Plan 01 3/31/17	Not readable
SP3	Tucson Electric Power Co. Existing Site Plan w/o Topo	02085.002 11/22/06	TEP	Campus	TEP, Box 1_TEP_Site Plan 02 3/31/17	Out of date, see SP1
SP4	Site Preparation Parking & Landscape Between O.H. & Training Irvington Switch Yard	00-05-0017 11/22/04	TEP	O.H. & Training	TEP, 00-05-0017-04-4-1 3/22/17	➢ Status unknown ➢ Last rev. date 3/30/11
SP5	Site Plan AREVA TEP SSG-5	C1-1 8/23/11	TEP	Solar Steam Generator Area	TEP, AREVA 1 3/31/17	➢ Status unknown ➢ Last rev. date 6/27/11
SP6	Master Site Plan Service Building	1127A 8-11-71/ 11/21/86	TEP	Campus	TEP, Box 2 TEP Master Site Plan 01 & 2 J—3-001 3/31/17	Out of date, see SP1
SP7	Proposed Transportation Parking, Irvington Station	97-03-0118-1-4 3/26/97	TEP	East Maintenance Garage	TEP, J-3-001 3/31/17	➢ Status unknown ➢ Last rev. date 8/28/01
SP8	Underground Utility Plan Temp Modular Add for Office Transition	00-05-0016-1-4 8/28/01	TEP	Admin Bldg	TEP, K-1 002 3/31/17	Status unknown
SP9	Proposed Modular Locations Temp Modular Add for Office Transition	00-01-0117-1-4 8/28/01	TEP	Admin Bldg	TEP, K-1, 003 3/31/17	Status unknown
SP10	Site Plan Temp Modular Add for Office Transition Irvington Station	00-05-0017-01-4 8/28/01	TEP	Admin Bldg	TEP, K-1, 004 3/31/17	Status unknown
SP11	TEP Parking Lot Existing Conditions and Proposed Conditions Exhibit	No Job No. 9/09	TEP	Unknown	TEP, Box_1_Parking_01 3/31/17	Status unknown
SP12	Tucson Electric Power Co. Existing Site Plan w/ Topo	02085.002 11/22/06	TEP	Campus	TEP, C1 Site Plan w/ Topo 5/24/17	Out of date, see SP1
SP13	Tucson Electric Power Co. Existing Site Plan w/o Topo	02085.002 11/22/06	TEP	Campus	TEP, C1 Site Plan 5/24/17	Out of date, see SP1
SP14	Site Mechanical Plot Plan	58-06-2360-10-5 6/27/85	TEP	Sundt Generating Station	TEP, 58-06-2360-10-5 3/22/17	Status unknown
SP15	Tucson Electric Power Tucson Irvington Road Plant Strip Topo	No Job No. 5/10	TEP	Sundt Generating Station	TEP, Box_1_TUC_IRV_Strip_Topo 01	Status unknown

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Inventory ID No.	Plan Description	Plan No. Plan Date	Owner/Operator	Location	Plan Provided By/ Date	Comments
SP16	No Title Survey Control Strip Topo	No Plan No. No Date	TEP	Generating Station	TEP, Box_1_Tuc_Irv_Strip_Topo 03 3/31/17	Status unknown
SP17	COT Photo/Topo	No Plan No. 4/20/88	COT	Campus	TEP, Box_1_Tucs Sec 03 3/31/17	Out of date, see SP1 and 6/15/17 ALTA/Topo
SP18	No Title "Filed Book Notes"	BS 115 No Date	TEP	Well Site	TEP, Scan 002 3/31/17	Status unknown
SP19	Tie-Down of Sewer MH & Water Stub Out – Field Book Notes	No Plan No. 7/2/87	TEP	Well Site	TEP Scan 003 3/31/17	Status unknown
SP20	Irvington Project Site Site Boundary Survey (Sheets 2 and 3)	87-12-110-0-4 1/8/88	TEP	Campus	TEP, 87-12-0110-00-4 87-12-0111-00-4 3/22/17	➢ Partial site boundary ➢ See new 6/15/17 ALTA
SP21	No Title "Topo and Aerial DWG"	No Plan No. No Date	TEP	Campus	TEP, 050601-3d.dwg* 3/22/17	Out of date, see 6/15/17 ALTA/Topo
SP22	No Title "DTM"	No Plan No. No Date	TEP	Campus	TEP, 050601-DTM.dwg* 3/22/17	Out of date, see 6/15/17 ALTA/Topo
SP23	No Title "Aerial"	No Plan No. No Date	TEP	Campus	TEP, 050601or.tif 3/22/17	Out of date, see 6/15/17 ALTA/Topo/Aerial
SP24	No Title "Survey Control.dwg"	No Plan No. No Date	TEP	North Campus	TEP, 99031_topo.dwg* 3/22/17	Out of date, see 6/15/17 ALTA/Topo
SP25	No Title "Survey Control.dwg"	Ref Eng.dwg.76-08-0322-00-04 No Date	TEP	Contractor Staging Area	TEP, 99043_as-built.dwg* 3/22/17	Status unknown
SP26	No Plan Title "Survey Control.dwg"	Ref Eng.dwg.76-08-0322-00-04 No Date	TEP	Contractor Staging Area	TEP, Irvington_Boundary_2005.dwg* 3/22/17	Out of date, see 6/15/17 ALTA/Topo
SP27	No Plan Title "Survey Control Points"	No Plan No. No Date	TEP	Unknown	TEP, IRV_APM-JRR_1989 3/22/17	Status unknown
SP28	Irvington Coal Handling Facilities "Field Book Notes Survey Control Sketch"	No Plan No. No Date	TEP	Coal Handling Facilities	TEP, IRV_Control Sketch 3/22/17	Status unknown
SP29	TEP Irvington Generation Plant Site "Field Book Notes"	No Plan No. 7/19/89	TEP	Generation Plant Site	TEP, Irv_GEN_Control_1989 3/22/17	Status unknown
SP30	No Plan Title "Campus Aerial"	No Plan No. No Date	TEP	Campus	TEP, Box 2 TEP Map 3/31/17	Out of date, see 6/15/17 ALTA/Topo/Aerial
SP31	No Plan Title "Campus Aerial"	No Plan No. No Date	TEP	Campus	TEP, Box 2 TEP Map 3/31/17	Out of date, see 6/15/17 ALTA/Topo/Aerial

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Sanitary Sewer Conveyance Facilities
Inventory
Last Updated: July 10, 2017

Inventory ID No.	Plan Description	Plan No. Plan Date	Owner/Operator	Location/Service Area	Plan Provided by/File Name and Date	Comments
S1	Sanitary Sewer Service Area	6/20/17	*PCRWRD	Off-site and campus	*PCRWRD/PC MapGuide 6/20/17	Campus within basin group: Roger and Basin No. 11
S2	Public Sewer Base Map	6/20/17	*PCRWRD	Off-site	*PCRWRD/PC MapGuide 6/20/17	12" public off-site sewer located within Irvington Road ROW, see S3 for plans
S3	Sewerage Project Sanitary District No. 1 of Pima County, Arizona	C-037/G-24 6/3/57	*PCRWRD	Irvington Road, entire campus	*PCRWRD/PC MapGuide 6/20/17	12" Public main located within Irvington Road – in service
S4	MH# 8142-38 and MH# 8142-39 print outs	6/20/17	*PCRWRD	Off-site and campus	*PCRWRD/PC MapGuide 6/20/17	Detailed offsite public MH data
S5	Chevron – Tucson Asphalt Plant 4100 Site – Private Sewer	PV-93-005 5/93	Private/See Comments	North end of campus	*PCRWRD 6/20/17	➢ 6" PVC private sewer originally constructed for Chevron, USA ➢ Service status unknown
S6	Irvington Station Overall Sewer Plan	83/03/0169/02/4 3/83	TG&E	Irvington Campus	TEP, Box1_IRV_Sewer 02 3/31/17	➢ Private sewer ➢ Last updated 8/22/95 ➢ Accuracy unknown
S7	Irvington Station Overall Sewer Plan	83/03/0169/01/4 6/27/83	TG&E	Irvington Campus	Roll 1 004 3/31/17	➢ Private sewer ➢ Out of date, see S6
S8	Sewer and Water Improvements, Irvington Station	2294-9 6/2/71	TG&E	North Campus	TEP, 76-08-0321 and 76-08-0322 3/31/17	➢ 8" private sewer ➢ Service status unknown
S9	Untitled Sheet	N/A	TEP	Unknown	TEP, Scan 001 3/31/17	➢ 4" and 6" private sewer ➢ Service status unknown

*Pima County Regional Wastewater Reclamation District

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Water Distribution Facilities
Inventory
Last Updated: July 10, 2017

Inventory ID No.	Plan Description	Plan No. Plan Date	Owner/ Operator	Location	Service Area	Plan Provided By/File Name and Date	Comments
W1	Tucson Water Base Maps	N/A	Tucson Water	NW031514 NE031514 SE031514 SW031514	Sect. 3, T15S, R14E	Tucson Water 6/20/17	➢ In service ➢ 8" Public distribution main within Irvington Rd w/ 6" stub into TEP mains along PRV connection ➢ 12" public main within Swan Road
W2	Liberty/Palmdale Main Replacement	1-228-094-91 9/94	Tucson Water	Irvington Road	Irvington Road	Tucson Water 6/20/17	➢ In service ➢ Added FHs along Irvington and Swan
W3	Irvington Road and Tennessee Street Supply Line	80-73 9/73	Tucson Water	Irvington Road	Irvington Road	Tucson Water 6/20/17	➢ In service ➢ 8" public main installation in Irvington Rd
W4	Alvernon & Irvington "C" – "B" Zone Meter Replacement	29-005-060-2001 4/01	Tucson Water	NW Corner Campus	N/A	Tucson Water 6/20/17	➢ In service ➢ 8" meter/PRV
W5	Distribution System Work Order	WO3902 2/60	Tucson Water	Irvington Road	To TEP Campus	Tucson Water 6/20/17	➢ 4" and 6" public distribution system work
W6	Water Transmission Main	35-63 8/63	Tucson Water	NW Corner Irvington Rd. & Alvernon Way	N/A	Tucson Water 6/20/17	➢ In service ➢ 48" public main at NW corner of site
W7	Untitled Sheet	N/A	TEP	Unknown	Unknown	TEP, Scan 001 3/31/2017	➢ Service status unknown ➢ Private 3" and 4" watermains
W8	Sewer and Water Improvements Irvington Station	2294-9 6/2/71	TG&E	North Campus	North Campus	TEP, 76-08-0321 3/31/17	➢ Service status unknown ➢ 6" AC private water
W9	City Water Installation Irvington Road Plant Piping Site Plan Sht 03140-P1 As-Built	M3-PN03140 6/16/08	TEP	NW Campus	Portions of NW North Campus	TEP, Box 1 – Water Plant Piping 3/31/17	➢ Service status unknown ➢ 2", 4" and 12" private mains ➢ As-built sheet
W10	City Water Installation Irvington Road Plant (Full Plan Set)	M3-PN03140 10/06/06	TEP	NW Campus	Portions of NW Campus	TEP, COT Water 001 3/31/17	➢ Service status unknown ➢ 2", 4" and 12" private mains
W11	Utility Locations	TRSQ 07-02-0051 02/07	TEP	Campus Wide	Campus Wide	TEP, COT Water 018 3/31/17	➢ Service status unknown ➢ Dry and wet utilities
W12	Partial Sheet – No Title	N/A	TEP	Unknown	Unknown	TEP, Scan 005 3/31/17	➢ Service status unknown ➢ 12" private water line
W13	Potable Water to Bldg "K", City Water Installation Irvington Road Plant Piping Site Plan Sht 03140-P1 Modified Pothole	M3-PN03140 9/10/08	TEP	North Campus	Bldg "K"	TEP, Roll 22 Irvington Plant Piping 3/31/17	➢ Service status unknown

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Inventory ID No.	Plan Description	Plan No. Plan Date	Owner/ Operator	Location	Service Area	Plan Provided By/File Name and Date	Comments
W14	Survey Report/ Well Locations	1610.37 2/26/14	TEP	Campus Wide	Campus Wide	TEP, 3/17/17	➢ Survey report of well sites
W15	Well Site DW9B-S Sundt/Irvington Common	58-03-0334 12/16/14	TEP	Off-Site Well w/ On-Site Piping Adjacent to Swan Road	Supply to On-Site 16" Main at the SE Corner of Campus	TEP/WestLand 3/15/17	➢ Service status unknown ➢ Private well and 16" private supply line piping
W16	No Title Survey Control Well Site DW9B-S.Dwg	No Plan No. Open for date	TEP	Off-Site Well	Supply to On-Site 16" Main at the SE Corner of Campus	TEP, TEP_Survey_Base 3/20/17	➢ Service status unknown
W17	Untitled Sheet	N/A	TEP	Off-Site	Supply to On-Site 16" Main at SE Corner of Campus	TEP, TEP Survey Base 3/20/17	➢ Appears to be CAD drawing plot and not a CD document of a well site
W18	Well Site #2 Equipment Relocation Site Plan	58-02-8964 8/24/2011	TEP	Well Site #2 on Campus	Campus	TEP, Roll 124 AREVA 2 3/31/17	➢ Service status unknown ➢ Well site equipment relocation plan
W19	Well Site #2 Equipment Relocation Site Work	58-02-8965 8/24/2011	TEP	Well Site #2 on Campus	Campus	TEP, Roll 124 AREVA 3 3/31/17	➢ Service status unknown ➢ Well site equipment relocation plan

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Combined Utility Site Plan
Inventory
Last Updated: July 10, 2017

Inventory ID No.	Plan Description	Utility	Plan No. Plan Date	Owner/Operator	Location	Plan Provided By/File Name and Date	Comments
C.U.1	Utility Locations Electric, Gas, Water, Sewer and Fiber/Qwest Lines Irvington Support Facilities Substation	S, W, G, E & Comm	07-02-0051 2/8/07	TEP	Campus Wide	TEP, Box 2 Utility Lines 03 3/31/17	Service status unknown
C.U.2	Site Preparation Irvington Yard – Utility Plan Irvington Support Facilities	S, W, G, E & Comm	99-08-0103 3/30/04	TEP	Campus Wide	TEP, Box 2 Irv Yard UTL 01 3/31/17	Service status unknown
C.U.3	Site Preparation Irvington Yard – Utility Plan Irvington Support Facilities	S, W, G, E & Comm	00-00-SCOT 3/18/04	TEP	Campus Wide	TEP, Box 2 TEP Util Lines 02 3/31/17	Service status unknown
C.U.4	Site Preparation Irvington Yard – Utility Plan Irvington Support Facilities	S, W, G, E & Comm	99-08-0103 12/09/03	TEP	Campus Wide	TEP, Scan 99-08-0103 Color 3/31/17	Service status unknown
C.U.5	Plot Plan Showing U.G. Utilities Discovered in Field	S, W, G, E & Comm	87-10-159-03-5 5/96	TEP	Campus Wide	TEP, 87-10-0159 3/22/17	Service status unknown
C.U.6	Plot Plan Showing U.G. Utilities Discovered in Field	S, W, G, E & Comm	87-10-159-03-5 3/8/94	TEP	Campus Wide	Roll 1 001 3/31/17	Service status unknown
C.U.7	No Plan Title	S, E	No Plan No. 11/21/85	TG&E	Unknown	TEP, Scan 006 3/31/17	Service status unknown
C.U.8	Underground Utility Plan New Modular Addition Irvington Support Facilities	S, W, E & Com	04-04-0099 4/22/04	TEP	New Design Build Modular	TEP, 04-04-0099 02-04 3/22/17	Service status unknown
C.U.9	Plot Plan Irvington Station	W, E	58-01-0206-06-4 2/6/97	TG&E	NW Corner of Campus	TEP, Box 2, Plot Plan 3/31/17	Service status unknown

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Dry Utilities
(Electric, Voice/Data, Gas)
Inventory
Last Updated: July 10, 2017

Inventory ID No.	Plan Description	Facilities	Plan No. Plan Date	Owner/Operator	Location	Service Area	Plan Provided By/File Name and Date	Comments
E1	Facilities Base Maps	Electric Service	N/A	TEP	Overall Campus	Sect. 3, T15S, R14E	TEP 3/22/17	Base map reference only
G1	Southwest Gas Base Map	Natural Gas	6/23/07	SW Gas	North Campus	Sect. 3, T15S, R14E	SWG 6/23/07	Base map reference only
G2	Tucson Electric Power Master Meter Split	Natural Gas	W.R. No. 9202504963 2/21/92	SW Gas	North Campus		TEP, Scan 004 3/31/17	Service status unknown
C1	CenturyLink Base Map	Voice/Data	6/28/17	CenturyLink	Adjacent to and within campus	Campus	CenturyLink 6/28/17	Base map reference only
C2	Cox Communications Base Map	Voice/Data	6/23/17	Cox Communications	Adjacent to and within campus	Campus	Cox Communications 6/23/17	Base map reference only
C3	Fiber Optic Locations Overall Irvington Yard Irvington Support Facilities Substation	Voice/Data (F.O.)	07-12-0176 2/12/07	TEP	Campus	Campus	TEP, Box_1_TEP_Site Plan 04	Service status unknown
C4	Irvington Communications Tie for the New Operations Headquarters	Voice/Data	79080189024 9/79	TEP	Operations Headquarters	Operations Headquarters	TEP, 79-08-0189 3/22/17	Service status unknown

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Miscellaneous Facilities
(Pipelines, Utility Duct Banks and Cable Trench Facilities)
Inventory
Last Updated: July 10, 2017

Inventory ID No.	Plan Description	Facilities	Plan No. Plan Date	Owner/ Operator	Location	Service Area	Plan Provided By/File Name and Date	Comments
MF1	12" Oil Pipeline – SP Term to Irvington Sta.	Oil Line	71 11 0611 01 3 2/72	TG&E	NW Corner of Campus	NW Corner of Campus	TEP, 71-11-0611-01-3 3/22/17	Status - Unknown
MF2	New Design Exhibit TEP Irvington Plant (Sheets 2 & 3 only)	Pipeline	No Plan No. 2/2013	TEP	Tank Farm		TEP, Box 2 TEP Util Lines 05 3/31/17	Status - Unknown
MF3	Demin Line	Pipeline	No Plan No. 2/14/13	TEP	Tank Farm		TP, Box 2 TEP Util Lines 06 3/31/17	Status - Unknown
MF4	Cable Trench Layout Site Plan	Cable Trench	58-06-3000-04-5 4/11/83	TEP	SW Corner Sundt Generating Station Site	N/A	TEP, Box 2 Cable Trench 3/31/17	Status - Unknown
MF5	Underground Duct Banks Site Plan	Duct Banks	58-06-2999-07-5 3/3/83	TEP	SW Corner Sundt Generating Station Site	N/A	TEP, Box 2 UG Duct Work	Status - Unknown
MF6	Below Grade Conduit & Grounding Switch Gear Bldg	Conduit/ Grounding	58-06-3002-08-5 3/8/83	TEP	Switchgear Bldg	N/A	TEP, Job 3686 5/24/17	Status - Unknown
MF7	Below Grade Conduit & Grounding Bottom Ash & Fly Ash Silo Area	Conduit/ Grounding	58-06-3002-08-5 1/27/89	TEP	Bottom Ash & Fly Ash Silo	N/A	TEP, Job 3686 5/24/17	Status - Unknown
MF8	Below Grade Conduit & Grounding Control Building and Surrounding Area	Conduit/ Grounding	58-06-3004-03-5 6/88	TEP	Control Building and Surrounding Area	N/A	TEP, Job 3686 5/24/17	Status - Unknown
MF9	Duct Bank Profiles Sheet 1	Duct Bank	58-06-3016-05-5 5/20/88	TEP	Unknown	N/A	TEP, Job 3686 5/24/17	Status - Unknown
MF10	Duct Bank Sections AA – BE	Duct Bank	58-06-3014-05-5 5/20/88	TEP	Unknown	N/A	TEP, Job 3686 5/24/17	Status - Unknown
MF11	Duct Bank Sections BF – CP	Duct Bank	58-06-3015-04-5 5/20/88	TEP	Unknown	N/A	TEP, Job 3686 5/24/17	Status - Unknown
MF12	Manholes MH CC01 – MHCC08	Duct Bank MH	58-06-3004-04-05 5/89	TEP	Unknown	N/A	TEP, Job 3686 5/24/17	Status - Unknown

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EXHIBIT I

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EXHIBIT I: ANTICIPATED NOISE AND INTERFERENCE WITH COMMUNICATION SIGNALS

AAC R14-3-219:

> *Describe the anticipated noise emission levels and any interference with communication signals which will emanate from the proposed facilities.*

The Projects largely consist of replacing existing lines and generation facilities, therefore these Projects would not have any incremental noise impacts above what already exists.

I.1 Corona and Audible Noise

Noise emanating from a transmission line is caused by corona. Corona is the electrical ionization of the air that occurs near the surface of the energized conductor and suspension hardware due to very high electric field strength. Certain electromagnetic effects are inherently associated with overhead transmission of electrical power at high voltage. These effects are produced by the electric and magnetic fields (EMF) of the transmission line with one of the primary effects being corona discharge. Corona effects are manifested as audible noise (AN), radio interference, and television interference. These particular effects will be minimized by line location, line design, and construction practices. Results presented in this exhibit are based on consideration of the various possible construction configurations along the line route (see Exhibit I-1). Corona may result in AN being produced by a transmission line.

The amount of corona produced by a transmission line is a function of the voltage of the line, the diameter of the conductors, the locations of the conductors in relation to each other, the elevation of the line above sea level, the condition of the conductors and hardware, and the local weather conditions. Corona typically becomes a design concern for transmission lines at 345 kV and above and is less noticeable from lines that are operated at lower voltages, such as this proposed 138 kV transmission line.

The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors have lower electric field gradients at the conductor surface; hence, lower corona than smaller conductors, everything else being equal. The conductors for the Projects would be selected to have large diameters, and thus a reduced potential to create AN. Irregularities (such as nicks and scrapes on the conductor surface or sharp edges on suspension hardware) concentrate the electric field at these locations, increasing the electric field gradient and the resulting corona at these spots. Similarly, foreign objects on the conductor surface, such as dust or insects, can cause irregularities on the surface that are a source for corona.

Corona also increases at higher elevations where the density of the atmosphere is less than at sea level. AN varies with elevation with the relationship of A/300, where A is the elevation of the line above sea level measured in meters (EPRI 2005). AN at a 600-meter (1,968.5 feet) elevation would be twice the AN at 300 meters (984.25 feet) all other things being equal.

Raindrops, snow, fog, hoarfrost, and condensation accumulated on the conductor surface are also sources of surface irregularities that can increase corona. During fair weather, the number of these condensed

water droplets or ice crystals is usually small and the corona effect is also small. However, during wet weather, the number of these sources increases (e.g., due to rain drops standing on the conductor) and corona effects are therefore greater. During wet or foul weather conditions, the conductor would produce the greatest amount of corona noise; yet noise generated by heavy rain hitting the ground would typically be greater than the noise generated by corona, thus masking the AN from the transmission line.

Corona produced on a transmission line can be reduced by the design of the transmission line and the selection of hardware and conductors used for the construction of the line; for instance, the use of conductor hangers that have rounded rather than sharp edges and no protruding bolts with sharp edges would reduce corona. The conductors themselves can be made with larger diameters and handled so that they have smooth surfaces without nicks, burrs, or scrapes in the conductor strands.

The transmission line proposed here will be designed to reduce corona generation. Baseline ambient noise levels were estimated using the relationship between population density and noise levels. Populations for the majority of the area immediately adjacent to the proposed Projects' facilities are urban, with a population density of 1,200 to 2,000 people per square mile; typical ambient noise levels range from 43 to 70 A-weighted decibels (dBA) (Burns McDonnell, 2017). Sources of noise along the proposed Projects' alignment primarily relate to transportation sources and include local access traffic, aircraft from DMAFB, traffic on I-10, and noise from the UPRR. Both I-10 and the UPRR separate the residential area from the project area. Residential noise would also contribute to noise levels. No hospitals are located within the vicinity of the Projects; however, sensitive noise receptors such as parks and schools are located in the study area.

Los Niños Elementary School and Augie Acuña Los Niños Neighborhood Park are located adjacent to I-10, south of Irvington Campus. Some level of noise will result from transmission line construction, operation, and maintenance. During construction, equipment used for assembly and erection of structures, wire pulling and splicing, and rehabilitation activities will generate noise. Noise from construction activities would be audible, particularly to the closest residents. This construction noise, however, would not be considered to be a major impact because construction would occur during daytime hours when tolerance to noise is higher, and would be temporary, lasting only a few days at a time in any one location. Long-term noise impacts from transmission line operation and maintenance activities are expected to be minimal.

A sound study was conducted for the Projects in August, 2017 (Burns & McDonnell, 2017). Two layouts were analyzed in the study. Based on the study's results, TEP selected the Alternative layout as it generated the lowest dBA at the property line. The study concluded that with the implementation of recommended mitigation measures, the Projects would meet the COT Noise Ordinance limits at the adjacent industrial and residential properties. These limits are 70 dBA (10pm-7am); 85 dBA (7am-10pm) (COT Code of Ordinances Section 16-31 Excessive Noise). The RICEs will be housed in a building shell that will mitigate noise. Additional mitigation measures recommended by the sound study include standard-noise radiators, exhaust stack silencers, and air intake silencers.

I.2 Radio Interference

Corona-generated radio interference is most likely to affect the amplitude modulation (AM) radio broadcast band (535 to 1,605 kilohertz); frequency modulation (FM) radio is rarely affected. Only AM receivers located very near to transmission lines that are tuned to a weak station have the potential to be affected by radio interference. An example is the humming noise on an AM radio that happens when the radio is near a power line, but diminishes as the radio moves away from the line. FM radio is rarely affected by transmission lines. FM radio receivers usually do not pick up interference from transmission lines, because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88 to 108 megahertz). In addition, the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude-type disturbances.

Residential areas located in the vicinity of the Projects' alternative alignments are in close proximity to the existing 138 kV line; therefore, additional radio interference as a result of the Projects' implementation is not expected. There are two communication towers within the study area, one of which is owned by TEP. No radio interference is anticipated from the proposed Projects. Potential impacts will be further assessed following design and any impacts mitigated as needed.

Potential impacts to UPRR communication lines are discussed in Section H.5.

I.3 Television Interference

Interference with traditional television reception from the transmission line's corona effects may occur during periods of bad weather, but is usually only a concern for transmission lines of 345 kV or greater and only for receivers within 500 feet of the line. Because the voltage would not exceed 138 kV, television interference is not expected. No television interference is anticipated from the RICE generation.

I.4 Electric and Magnetic Field Effects

EMF are produced by power lines, not so much from the RICE generators. These fields would induce voltages and currents on nearby conductive objects. Electric fields are produced whenever a conductor is connected to a source of electrical voltage. An example of this is the plugging of a lamp into a wall outlet in a home. When the lamp is plugged in, a voltage is induced in the cord to the lamp, which causes an electric field to be created around the cord. Magnetic fields are produced whenever an electrical current flows in a conductor. In the lamp example, if the lamp is turned on (allowing electricity to flow to the lamp), a magnetic field is created around the lamp cord in addition to the electric field. These fields exist around overhead and underground power lines, house wiring, computers, power tools, appliances, and anything that carries or uses electricity. Table 2-3 demonstrates examples of EMF levels from various electrical sources (see also Figure 2-4).

Both current and voltage are required to transmit electrical energy over a transmission line. The current, a flow of electrical charge, measured in amperes (A), creates a magnetic field. This can fluctuate with the amount of line loading at any given time. The voltage (force or pressure that causes the current to flow), measured in units of volts (V) or kV, creates an electric field. Though an electric field is present anytime a line is energized, even from one end, the magnetic field exists only when electricity flows. It is general

practice to consider both fields together as EMF values in assessing the amount of effect at the outer edge of a transmission line's right-of-way (ROW).

Table 2-3. EMF Strength of Various Electrical Sources at Various Distances

EMF Source [1]	Distance	Strength	Distance	Strength	Distance	Strength
Microwave Oven	0.5 feet	200 mG	1.0 feet	4 mG	4.0 feet	2 mG
Vacuum Cleaner	0.5 feet	300 mG	1.0 feet	60 mG	4.0 feet	1 mG
Hair Dryer	0.5 feet	300 mG	1.0 feet	1 mG	4.0 feet	0 mG
Electric Shaver	0.5 feet	100 mG	1.0 feet	20 mG	4.0 feet	0 mG
138-kV Transmission Line, vertical [2]	0 feet	40 mG	50 feet	11 mG	300 feet	0.4 mG

[1] Appliance magnetic field strengths are median values in milliGauss (mG) for typical 60 Hz electrical current (source: USNIEHS 1999, DOE 1995
[2] 138kV power line ROW is 100 feet wide; 0-feet values represent directly below the lines at lowest point of sag

EMF decreases in strength with increased distance from the source. In addition, electric fields are further weakened by obstacles such as walls, roofs, trees, and vegetation. However, magnetic fields are not easily shielded by most materials and are primarily reduced in strength by distance alone. Based upon computer modeling of these Projects by TEP for various operational conditions, the EMF values associated with these Projects are expected to be comparable to other 138 kV transmission lines in the state, and are expected to be within generally accepted standards at the edge of the project area.

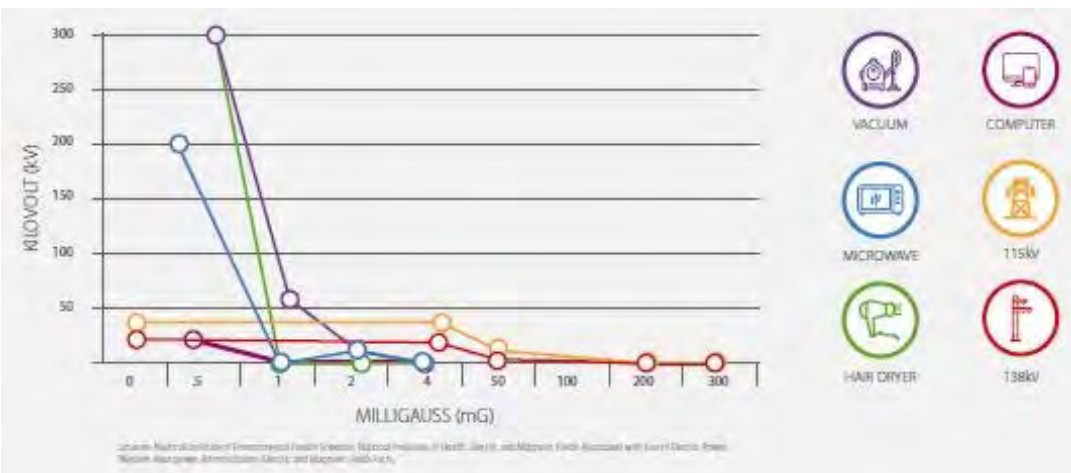

Figure 2-4. EMFs from Various Sources

I.5 References

Burns & McDonnell 2017. Sundt Reciprocating Engine Sound Study.

IEEE/ANSI Standard C2-2007. National Electrical Safety Code.

National Academy of Sciences 1977. Guidelines for Preparing Environmental Impact Statements on Noise. Washington D.C.

National Academy of Sciences 1996. Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. National Research Council.

National Institute of Environmental Health Sciences 1999. Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields.

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EXHIBIT I-1

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Sundt Reciprocating Engine - Sound Study

Tucson Electric Power

Sundt Reciprocating Engine Sound Study
Project No. 99016

Revision 0
8/16/2017

Sundt Reciprocating Engine - Sound Study

prepared for

Tucson Electric Power
Sundt Reciprocating Engine Sound Study
Tucson, Arizona

Project No. 99016

Revision 0
8/16/2017

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, MO

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TABLE OF CONTENTS

Page No.

1.0 EXECUTIVE SUMMARY 1-1

2.0 ACOUSTICAL TERMINOLOGY 2-1

3.0 APPLICABLE REGULATIONS 3-1

4.0 SOUND SURVEY 4-1
4.1 Sound Survey Methodology and Conditions 4-1
4.2 Sound Level Measurements 4-1

5.0 PREDICTIVE MODELING 5-1
5.1 Modeling Assumptions 5-1
5.2 Reciprocating Engine Plant Model – Base Layout 5-4
5.3 Reciprocating Engine Plant Model – Alternative Layout 5-7

6.0 CONCLUSION 6-1

APPENDIX A – MODEL SOUND LEVEL INPUTS

LIST OF TABLES

Page No.

Table 2-1: Typical Sound Pressure Levels Associated with Common Sound Sources 2-2
Table 3-1: Tucson Maximum Permissible Sound Levels at the Property Receiving Sound 3-1
Table 4-1: Average Meteorological Conditions during Sound Measurements 4-1
Table 4-2: Ambient Sound-Level Measurements 4-4
Table 5-1: Predicted Sound Pressure Levels from the Project 5-5
Table 5-2: Predicted Sound Pressure Levels from the Project – Alternative Layout 5-8

LIST OF FIGURES

Page No.

Figure 4-1: Noise Measurement Point Locations 4-3
Figure 5-1: Project Layout 5-2
Figure 5-2: Modeled Receiver Locations 5-3
Figure 5-3: Sound Level Contours 5-6
Figure 5-4: Sound Level Contours – Alternative Layout 5-9

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ANSI	American National Standards Institute
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
dB	decibels
dBA	decibel A-weighted
CadnaA	Computer Aided Design for Noise Abatement
Hz	Hertz
ISO	International Organization for Standardization
L_{90}	sound level exceeded 90 percent of a given time period
L_{eq}	equivalent sound level
L_x	exceedance sound level
MP	measurement point
MW	megawatt
Project	Sundt Reciprocating Engines
RES	residential receiver
TEP	Tucson Electric Power

1.0 EXECUTIVE SUMMARY

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) has performed a facility noise assessment study for Tucson Electric Power's (TEP) proposed reciprocating engine power plant (Project). TEP is proposing to install the Project at the south end of their existing H. Wilson Sundt Generating Station in Tucson, Arizona (Facility). The Project will be constructed in two phases. The first phase includes the installation of five 20-megawatt (MW) nominal reciprocating engines with associated radiators and auxiliary equipment. The second phase will include the addition of five more 20-MW nominal reciprocating engines, as well as a second set of radiators and auxiliary equipment. In total, the project will consist of ten 20-MW nominal reciprocating engines and associated equipment. TEP contracted Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) to conduct a sound assessment study for the Project.

The objectives of this study were as follows:

- Identify State and local standards, if any, that may potentially be applicable to the Facility
- Measure ambient sound levels in the vicinity of the proposed Project
- Estimate the operational sound levels from the Project, using an industry-accepted, three-dimensional sound modeling program
- Determine if operation of the Project will be in compliance with the applicable regulatory standards for noise

The State of Arizona does not have applicable state-wide noise regulations and has delegated the authority to the individual counties and cities. Chapter 16 of the Tucson Arizona Code of Ordinances defines prohibited activities that produce sound pressure levels exceeding certain limits based on land use of the receiving property.

Two layouts were analyzed for the Project. Based on modeling results, charge air inlet and exhaust stack silencers would be required to operate at or under the property line limits. Low-noise radiators would be required for the Base layout. Standard-noise radiators would be required for the Alternative layout.

Both Project layouts are expected to meet the Tucson Noise Ordinance limits at the adjacent industrial and residential properties, provided the mitigation measures established within this report are followed.

The following chapters detail the sound assessment study that was performed for the Project.

2.0 ACOUSTICAL TERMINOLOGY

The terms “noise level” and “sound level” are often used interchangeably to describe two different sound characteristics called sound power and sound pressure. Every source that produces sound has a sound power level. The sound power level is the acoustical energy emitted by a sound source and is an absolute number that is not affected by the environment. The acoustical energy produced by a source propagates through the air as air pressure fluctuations. These pressure fluctuations, also called sound pressure, are what human ears hear and microphones measure.

Sound energy is physically characterized by amplitude and frequency. Sound amplitude is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 microPascals). The reference sound pressure corresponds to the typical threshold of human hearing. A 3-dB change in a continuous broadband sound level is generally considered “just barely perceptible” to the average listener. A 6-dB change is generally considered “clearly noticeable,” and a 10-dB change is generally considered a doubling (or halving, if the sound is decreasing) of the apparent loudness.

Frequency is measured in Hertz (Hz), which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in dBA. For reference, the sound pressure level and subjective loudness associated with some common sound sources are listed in Table 2-1.

Sound in the environment is constantly fluctuating, for example, when a car drives by, a dog barks, or a plane passes overhead. Although an instantaneous sound level measured in dBA may indicate the level of noise experienced by an observer at that point in time, environmental noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from some identifiable sources plus a relatively steady background noise where no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used to describe sound that is constant or changing in level. The L_{eq} is the average sound level for a specific time period. It is the “equivalent” constant sound level that would have to be produced by a given constant source to equal the acoustic energy contained in the fluctuating sound level measured during the time period.

Table 2-1: Typical Sound Pressure Levels Associated with Common Sound Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 ft	--
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 ft	--
120	Threshold of feeling	Elevated train	Hard rock band
110	--	Jet flyover at 1,000 ft	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 ft, auto horn at 10 ft, crowd noise at football game	--
90	--	Propeller plane flyover at 1,000 ft, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph) at 50 ft	Inside auto at high speed, garbage disposal
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner
60	Moderate	Air-conditioner condenser at 15 ft, near highway traffic	General office
50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--

Source:
(1) Adapted from *Architectural Acoustics*, M. David Egan, 1988
(2) *Architectural Graphic Standards*, Ramsey and Sleeper, 1994

To describe the time-varying character of environmental noise, statistical noise descriptors can be used. The exceedance sound level, L_x, is the sound level exceeded "x" percent of the sampling period and is referred to as a statistical sound level. The most common L_x values are L_{eq} and L_{90}. L_{eq} is the equivalent – or average – sound level. L_{90} is the sound level equaled or exceeded during 90 percent of a given time interval.

3.0 APPLICABLE REGULATIONS

The State of Arizona does not have applicable statewide noise regulations and has delegated authority to the individual counties and cities. The Project is located in the city of Tucson, in Pima County, and it is within impact range of unincorporated areas of Arizona. The Project area is industrial and there are residences to the southwest within the City of Tucson. These residences are located across the railroad and highway next to the southwestern border of the facility. To the south of the Project there are residences in an unincorporated area of Pima County, Arizona.

Chapter 16 of the Tucson, Arizona Code of Ordinances prohibits activities that produce sound pressure levels exceeding certain limits. Section 16-31 of the ordinance provides the maximum permissible A-weighted sound pressure levels at receiving properties based on use between the hours of 10:00 P.M. and 7:00 A.M. (nighttime) as well as between the hours of 7:00 A.M. and 10:00 P.M. (daytime). The maximum permissible sound levels for each time period and receiving property type are shown in Table 3-1. The Project will be located in an industrial area so the Industrial limits apply near the Project and the Residential limits apply at the residences to the southwest.

Table 3-1: Tucson Maximum Permissible Sound Levels at the Property Receiving Sound

Property Use	Sound Pressure Level Limit	
	7:00 a.m. to 10 p.m.	10:00 p.m. to 7:00 a.m.
Residential	70	62
Commercial	72	65
Industrial	85	70

Source: Tucson Code of Ordinances Section 16-31

The Pima County Code of Ordinances Chapter 9.30 prohibits “any excessive, unnecessary or offensive noise which disturbs the peace or quiet of any neighborhood or which causes discomfort or annoyance to any reasonable person of normal sensitivity residing in the area.” The ordinance does not have specific sound pressure level limits, and Section 9.30.080 specifically exempts power plant equipment during normal operation. Therefore, the Tucson Code of Ordinances limits will be used for all of the surrounding areas of the Facility.

4.0 SOUND SURVEY

Burns & McDonnell noise specialists conducted a sound survey on April 12 and 13, 2017, near the proposed Project. Burns & McDonnell personnel obtained ambient sound level measurements to establish baseline sound levels at various locations near the site. Residential properties are located south and southeast of the proposed Project. The properties are within two housing developments. The development to the south is in the City of Tucson while the development to the southwest is outside of the city limits. To the west, north, and east, the facility is bordered by various industrial properties. The Davis-Monthan Air Force Base is located on the northeast side of the Facility.

4.1 Sound Survey Methodology and Conditions

Measurements were taken using an American National Standards Institute (ANSI) S1.4 type 1 sound level meter (Larson Davis Model 831). The sound level meter was field calibrated before and after each set of measurements. None of the calibration level changes exceeded ± 0.5 dB, which is within the acceptable variance per ANSI guidance. A windscreen was used at all times on the microphone to avoid the influence of wind-induced sound increases.

Short-term ambient measurements were taken during four time periods over a 24-hour span on April 12 and 13, 2017. All measurements were taken during times when meteorological conditions were favorable for conducting sound measurements. Meteorological conditions were obtained using a Kestrel 5000 anemometer and are presented in Table 4-1.

Table 4-1: Average Meteorological Conditions during Sound Measurements

Date	Time Period	Temperature (°F)	Relative Humidity (%)	Wind Speed (mph)	Sky Cover
4-12-2017	11:00 A.M.	83	26	2	Clear
4-12-2017	5:00 P.M.	87	18	2 - 5	Clear
4-13-2017	12:00 A.M.	69	30	calm	Clear
4-13-2017	7:00 A.M.	68	20	3 - 6	Clear

4.2 Sound Level Measurements

Ambient, sound level measurements were made at six locations, labeled Measurement Point (MP) 1 through MP6, as shown in Figure 4-1. The measurement locations were selected because they were accessible and representative of noise-sensitive receivers. The short-term sound level measurement periods were 5 minutes long, and measured values were logged by the sound meter at each measurement

location. The sound levels varied at each measurement point due to the extraneous sounds that occurred during each measurement.

During the ambient measurements, the existing power plant was operating one of the four boilers, but it was not at full load. Extraneous sounds during the measurement periods included sound associated with boiler 4 and its cooling tower, vehicular traffic from nearby roads and highways (including large trucks and motorcycles), trains, nearby industry, birds, and airplanes flying overhead. The measured, A-weighted L_{eq} and L_{90} sound levels are presented in Table 4-2. Ambient A-weighted L_{eq} sound levels varied from a low of 49.8 dBA at MP5 during the midnight measurements to a high of 69.6 dBA at MP3 during the noon measurements. Ambient A-weighted L_{90} sound levels varied from a low of 43.0 dBA at MP5 during the afternoon measurements to a high of 61.2 dBA at MP1 during the morning measurements.

Path: G:\Air-Noise Dept\Project Files\TEP\Sundt Noise Study\GIS\Figure 4-1 Noise Measurement Point Locations.mxd gweger 5/12/2017

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Measurement Points

NORTH

1,000 500 0 1,000

Scale in Feet

BURNS McDONNELL

Figure 4-1

Tucson Electric Power
Noise Measurement Point
Locations

Source: Burns & McDonnell Engineering Company, Inc.

Issued: 5/12/2017

Table 4-2: Ambient Sound-Level Measurements

Time Period	Measurement Point	Measured L_{eq} (dBA)	Measured L_{90} (dBA)	Extraneous Noises
April 12, 2017 11:00 AM	MP1	60.0	57.4	Boiler 4 at baseload - Boiler and cooling tower audible, traffic constant, large trucks
	MP2	56.9	54.7	Boiler audible, traffic constant, large trucks, motorcycle
	MP3	69.6	55.3	Boiler audible, building cooling units (dominant), local traffic constant, jet overhead (low and loud)
	MP4	66.4	52.8	Boiler audible, traffic constant, back-up alarm, train horn
	MP5	52.9	44.6	Boiler not audible, local and highway traffic, birds, nearby equipment at junk yard
	MP6	58.0	53.7	Boiler not audible, traffic dominant, children playing
April 12, 2017 5:00 PM	MP1	60.9	58.8	Boiler and cooling tower audible, traffic constant, large trucks, car horn
	MP2	58.7	54.9	Boiler audible, traffic constant, large trucks
	MP3	66.3	56.1	Boiler audible, building cooling units (dominant), local traffic, large trucks
	MP4	65.1	50.2	Boiler audible, traffic
	MP5	55.6	43.0	Boiler audible, local and highway traffic, birds
	MP6	62.0	59.6	Boiler not audible, traffic dominant, children playing, pumps
April 13, 2017 12:00 AM	MP1	60.3	57.6	Boiler and cooling tower audible, traffic constant
	MP2	57.2	55.2	Boiler audible, traffic constant, large trucks
	MP3	64.5	59.3	Boiler audible, building cooling units (dominant), local traffic, train and train horn
	MP4	55.6	54.5	Boiler audible and dominant, distant traffic, distant train horn
	MP5	49.8	45.4	Boiler audible, local and highway traffic dominant, distant train horn
	MP6	58.2	53.4	Boiler barely audible, traffic dominant, dog barking, insects
April 13, 2017 5:00 AM	MP1	62.8	61.2	Boiler and cooling tower audible, traffic constant and dominant
	MP2	58.6	57.3	Boiler audible and dominant, highway and local traffic, large trucks
	MP3	68.3	57.4	Boiler not audible, building cooling units (dominant), local traffic, large trucks
	MP4	65.9	54.7	Boiler audible at times, traffic dominant, back-up alarm
	MP5	58.2	51.4	Boiler audible, local and highway traffic
	MP6	59.9	56.9	Boiler not audible, traffic dominant, dog barking

5.0 PREDICTIVE MODELING

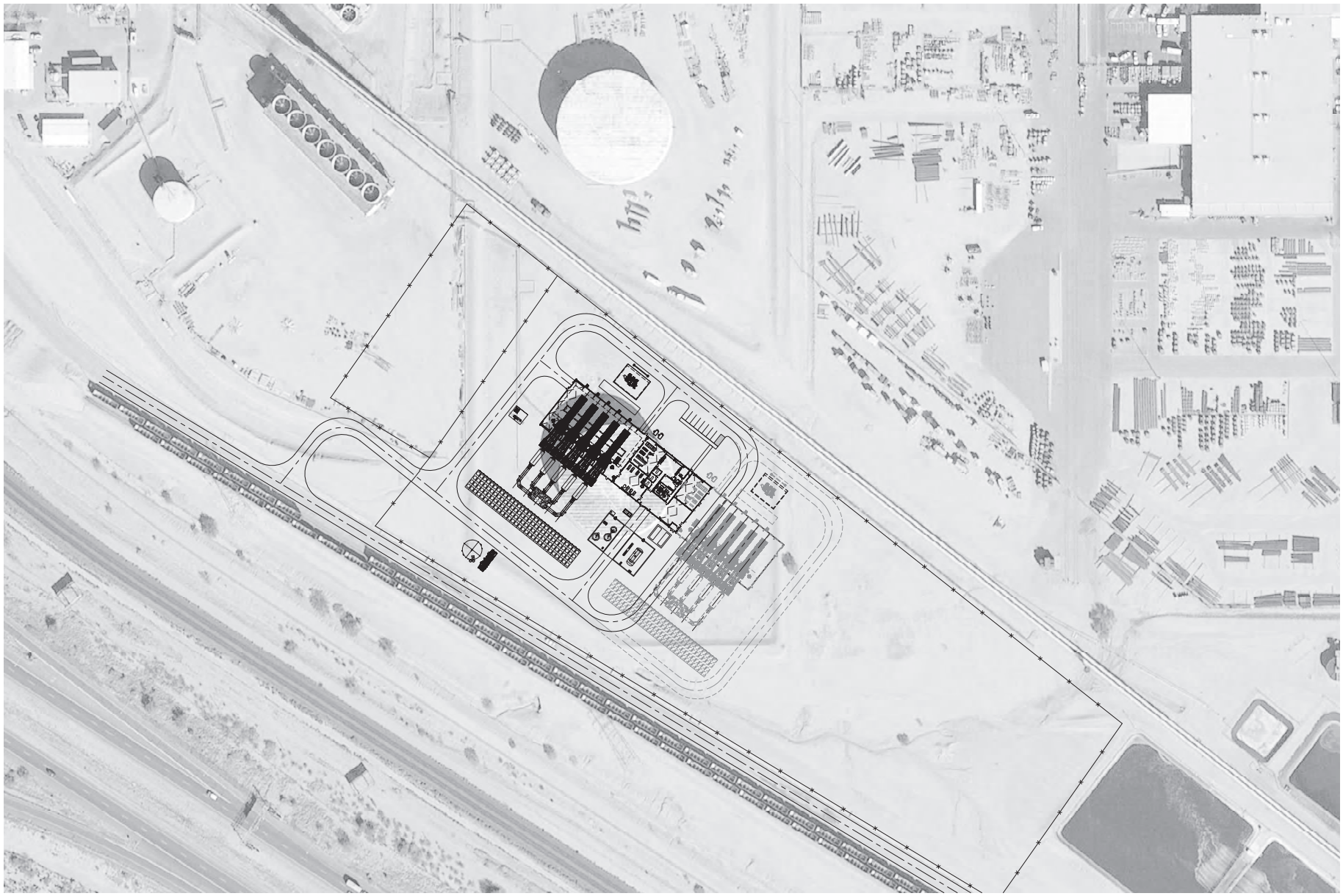
5.1 Modeling Assumptions

Burns & McDonnell performed predictive sound modeling for the proposed Project using the Computer Aided Design for Noise Abatement (CadnaA), Version 2017, published by DataKustik, Ltd., Munich, Germany. Air absorption, ground absorption, and reflections and shielding for each piece of sound-emitting equipment were considered per International Organization for Standardization (ISO) 9613-2, Acoustics – Sound Attenuation during Propagation Outdoors.

The ISO standard considers sound propagation and directivity. The sound-modeling software uses omnidirectional, downwind sound propagation and worst-case directivity factors. In other words, the model assumes that each piece of equipment propagates its maximum sound level in all directions at all times. Empirical studies accepted within the industry have demonstrated that modeling may over-predict sound levels in certain directions, and as a result, modeling results are generally considered a conservative prediction of the Facility's actual sound level.

The modeled atmospheric conditions were assumed to be calm, and the temperature and relative humidity were left at the program's default values. Reflections and shielding were considered for sound waves encountering physical structures. Sound levels around the Facility can be influenced by the sound reflections from physical structures onsite. The physical structures onsite were modeled with structured facades, which accounts for sound reflected and the amount of sound absorbed by the structure itself. The area surrounding the Facility has a mild amount of elevation change, which scatters and absorbs the sound waves. Thus, terrain was included to account for surface effects such as ground absorption and surface reflections. Ground absorption was set at a value of 0.5 for all areas surrounding the Facility, meaning only half the available ground absorption was considered. The Project elevation, based on United States Geological Survey 3D Elevation Program data, was included in the model. The Project basis of design layout is provided in Figure 5-1.

Measurement points (MP) from the sound survey, selected fenceline receivers (FL), and off-site residential receivers (RES) in the vicinity of the Project were included in the model. The modeled receiver locations are provided in Figure 5-2.



OVERALL SITE LAYOUT

0 32' 64' 128'

SCALE IN FEET

NORTH

CONFIDENTIAL

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description	no.	date	by	ckd	description
A	09/12/16	WRL		PRELIMINARY					

Figure 5-1
Tucson Electric Power

Project Base Layout

designed

detailed W. LESNIAK

5 ENGINE GENERATION PLANT
SITE PLAN

project 90779 | contract

drawing **GA010** – rev. **A**

sheet of sheets

file TEP_5ENG-GA010.DWG

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Path: G:\Air-Noise Dept\Project Files\TEP\Sundt Noise Study\GIS\Figure 5-2 Modeled Receiver Locations.mxd gweger 5/12/2017

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Residential Receiver

Fenceline Receivers

Measurement Points

NORTH

1,000 500 0 1,000

Scale in Feet

BURNS McDONNELL

Figure 5-2
Tucson Electric Power

Modeled Receiver Locations

Source: Burns & McDonnell Engineering Company, Inc.

Issued: 5/12/2017

5.2 Reciprocating Engine Plant Model – Base Layout

Predictive modeling was completed using historical data for the Wärtsilä W18V50SG engine for the base layout, as shown in Figure 5-1. Project-specific sound power levels from the engine manufacturer would need to be confirmed prior to construction. Appendix A contains sound data previously provided by Wärtsilä for the engines, air inlets, engine exhausts, and radiators. Silencer performance for the charge air inlets and exhaust stacks were provided by JTK Power to Wärtsilä for a previous installation, and are also included Appendix A. Other sources onsite were estimated based on historical data for similarly sized projects.

Each piece of equipment associated with the proposed Project was modeled with expected sound power levels applied to them. All equipment, not identified below, were adjusted to meet a sound pressure level of 85 dBA at 3 feet horizontally from the sound emitting equipment. The input sound power levels used as a basis for modeling are provided in Appendix A.

Initial modeling, based on standard Wärtsilä equipment (i.e., radiators, non-silenced stacks, etc.), showed that the Base layout would exceed the identified noise limits. As such, the following assumptions were used to develop the Base model to achieve compliance.

- Low-noise radiators (56 dBA at 40 meters per radiator, four radiators required per engine)
- Engine hall acoustical walls (STC=47)
- Engine hall acoustical roof (STC=33)
- Wärtsilä vertical exhaust stack silencers (45-dBA reduction)
- Wärtsilä charge air intake silencers (45-dBA reduction)
- Building intake vent fans (85 dBA at 3 feet)
- Building exhaust vent fans (85 dBA at 3 feet)

The Base layout's estimated sound pressure levels are based on the equipment data shown in Appendix A and the mitigation measures defined above. The majority of the noise received by neighboring properties would be emitted from the exhaust stacks and radiators. The Base layout modeling results are provided below in Table 5-1.

Table 5-1: Predicted Sound Pressure Levels from the Project

Location	Receiver Type	Predicted Project Sound Levels (dBA)	City of Tucson Sound Level Limit (dBA)
MP1[a]	Monitoring Point	72.0	NA
MP2	Monitoring Point	46.1	70
MP3	Monitoring Point	47.4	70
MP4	Monitoring Point	47.1	70
MP5	Monitoring Point	46.2	70
MP6	Monitoring Point	58.7	62
FL1	Fenceline Receiver	65.0	70
FL2	Fenceline Receiver	68.8	70
FL3	Fenceline Receiver	65.2	70
RES	Residential Receiver	58.7	62

(a) Measurement point MP1 is within the TEP property line.

The predicted sound pressure levels of the Project are shown as 5-dB contours in Figure 5-3. The contours are the expected sound pressure levels of the new equipment only, and do not include any contributions from ambient sound sources, or other TEP sound sources at the H. Wilson Sundt Generating Station.

Due to the fact that ambient measurements could not be taken with the existing plant at full load, the maximum contribution of the existing plant to property line sound levels is uncertain. It is assumed that the new reciprocating engine plant will dominate sound levels at the property line directly south of it. Provided the existing plant would not exceed 64 dBA at the property line directly south of the Project, it is anticipated that the combination of sound levels with the new Project installed would not exceed the City of Tucson property line limits.

The estimated sound pressure levels are based on the equipment data and the mitigation measures defined within this report. Charge air inlet and exhaust stack silencers would be required to meet the property line limits. The majority of the noise received offsite, with the air inlet and exhaust noise mitigated, would be emitted from the radiators. Low noise radiators designed to meet a sound pressure level of 56 dBA at 40 meters would be required. The low noise radiators are designed such that each engine requires four radiators. Additional noise attenuation could be applied to further reduce noise emitted by the Project and experienced in the surrounding community. However, the Project Base layout is expected to meet the Tucson Noise Ordinance limits at the nearby industrial and residential properties after the application of the identified mitigation.

Path: G:\Air-Noise Dept\Project Files\TEP\Sundt Noise Study\GIS\Figure 5-3 Sound Level Contours.mxd gweger 5/15/2017

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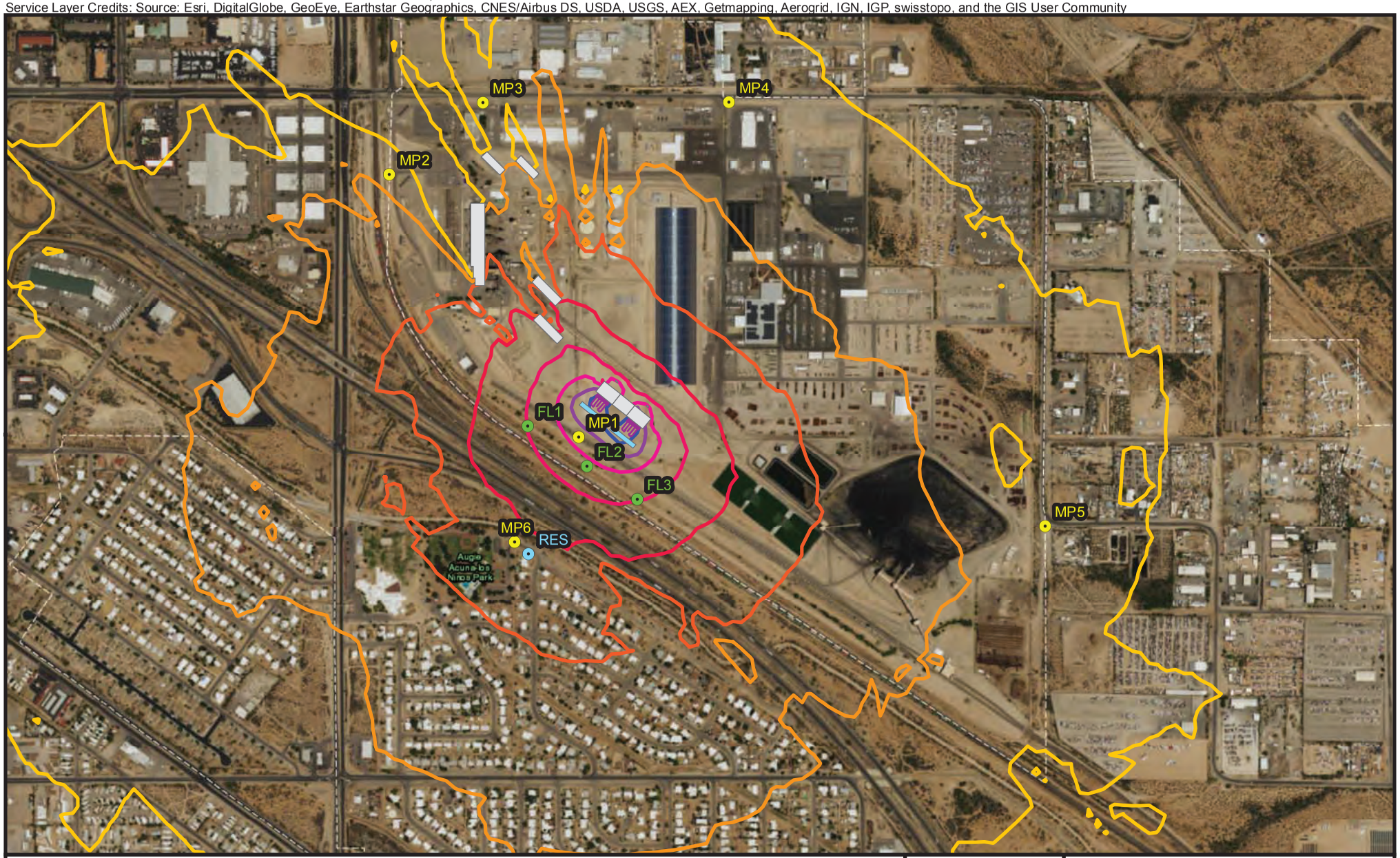

45 dBA
50 dBA
55 dBA
60 dBA
65 dBA
70 dBA
75 dBA
80 dBA

NORTH

1,000 500 0 1,000

Scale in Feet

BURNS McDONNELL

Figure 5-3
Tucson Electric Power

Sound Level Contours

Source: Burns & McDonnell Engineering Company, Inc.

Issued: 5/15/2017

5.3 Reciprocating Engine Plant Model – Alternative Layout

In an attempt to reduce Project costs, predictive modeling was repeated for an alternative layout. The sound sources associated with the Project would not change, but the general arrangement would be rotated approximately 180 degrees. This would move the dominant sound sources – the exhaust stacks and radiators – away from the nearest property line on the south side of the Facility. Moving the dominant sound sources farther from the property line allows sound to attenuate more by the time it reaches the property line.

The same analysis as was performed in Chapter 5.2 was performed for the Alternative layout. All pieces of equipment, not identified below, were adjusted to meet 85 dBA at 3 feet horizontally from the sound emitting equipment. The input sound levels used as a basis for modeling are provided in Appendix A. The following assumptions were used to develop the Alternative layout model based on.

- Standard-noise radiators (64 dBA at 40 meters per radiator, four radiators required per engine)
- Engine hall acoustical walls (STC=47)
- Engine hall acoustical roof (STC=33)
- Wärtsilä vertical exhaust stack silencers (45-dBA reduction)
- Wärtsilä charge air intake silencers (45-dBA reduction)
- Building intake vent fans (85 dBA at 3 feet)
- Building exhaust vent fans (85 dBA at 3 feet)

The Alternative layout's estimated sound pressure levels are based on the equipment data shown in Appendix A and the mitigation measures defined above. The Alternative layout modeling results are provided below in Table 5-2.

Table 5-2: Predicted Sound Pressure Levels from the Project – Alternative Layout

Location	Receiver Type	Predicted Project Sound Levels (dBA)	City of Tucson Sound Level Limit (dBA)
MP1[a]	Monitoring Point	63.8	NA
MP2	Monitoring Point	48.6	70
MP3	Monitoring Point	55.8	70
MP4	Monitoring Point	57.5	70
MP5	Monitoring Point	50.0	70
MP6	Monitoring Point	55.3	62
FL1	Fenceline Receiver	63.2	70
FL2	Fenceline Receiver	61.8	70
FL3	Fenceline Receiver	64.2	70
RES	Residential Receiver	55.6	62

(b) Measurement point MP1 is within the TEP property line.

Graphical sound-level contours were generated for the proposed Project. The sound levels of the Project are shown as 5-dB contours in Figure 5-4. The contours are the expected sound pressure levels of the new equipment only, and do not include any contributions from ambient sound sources or other TEP sound sources at the H. Wilson Sundt Generating Station.

The estimated sound levels are based on the equipment data and the mitigation measures defined within this section of the report. Charge air inlet and exhaust stack silencers would be required to meet the property line limits with the alternative layout. The majority of the noise received offsite, with the air inlet and exhaust noise mitigated, would be emitted from the radiators. Standard-noise radiators, designed to meet a sound pressure level of 64 dBA at 40 meters, could be installed to meet the property line limits prescribed by the Tucson Noise Ordinance. The standard radiators are designed such that each engine requires four radiators. Additional noise attenuation could be applied to further reduce noise emitted by the Project and experienced in the surrounding community. However, the Alternative layout as designed is expected to meet the Tucson Noise Ordinance limits for the adjacent industrial and residential properties after the application of the identified mitigation.

Similarly to the Base layout, the Alternative layout as described above, in combination with the existing facility operating at 64 dBA or less, will meet the identified limits.

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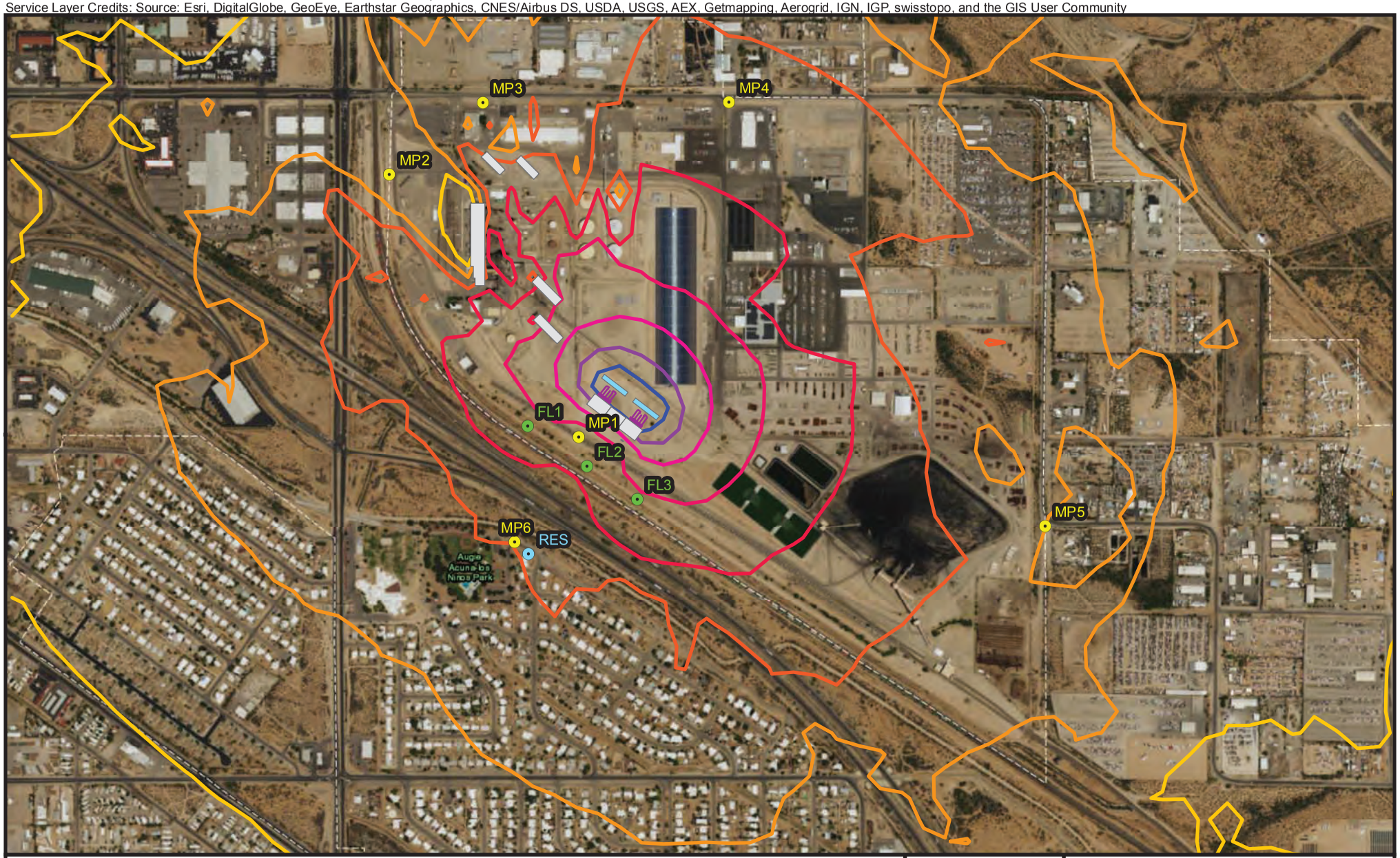

45 dBA
50 dBA
55 dBA
60 dBA
65 dBA
70 dBA
75 dBA
80 dBA

NORTH

1,000 500 0 1,000

Scale in Feet

BURNS McDONNELL

Figure 5-4
Tucson Electric Power

Alternative Layout
Sound Level Contours

Source: Burns & McDonnell Engineering Company, Inc.

Issued: 5/12/2017

6.0 CONCLUSION

Burns & McDonnell performed a sound assessment for TEP's proposed reciprocating engine Project in Tucson, Arizona. The sound assessment included quantification of the existing acoustical environment and sound modeling to predict sound pressure levels in the community as a result of the operation of the proposed Project. The Project is proposed to be located on the south side of the existing H. Wilson Sundt Generating Station in Tucson, Arizona. The Project, as designed, will be constructed in two phases, each comprised of five five 20-MW nominal reciprocating engines with associated radiators and auxiliary equipment.

The State of Arizona does not have applicable state-wide noise regulations and has delegated the authority to the individual counties and cities. Chapter 16 of the Tucson Arizona Code of Ordinances defines prohibited activities that produce sound pressure levels exceeding certain limits based on land use of the receiving property. The Project is limited to 70 dBA at TEP's property line and to 62 dBA at the nearest residential property line.

Ambient measurements were collected on April 12 and 13, 2017. The measurements established semi-operational sound levels at the fenceline and in the surrounding community. Extraneous sounds during the measurement periods included sound associated with Boiler 4 and its cooling tower, vehicular traffic from nearby roads and highways (including large trucks and motorcycles), trains, nearby industry, birds, and airplanes flying overhead.

Predictive modeling was completed using historical data for Wärtsilä W18V50SG. Project-specific sound power levels from the engine manufacturer would need to be confirmed prior to construction. Silencer performance for the charge air inlets and exhaust stacks were provided by JTK Power. Other sources onsite were estimated based on historical data for similarly sized projects.

Two layouts were analyzed for the Project. Based on modeling results, charge air inlet and exhaust stack silencers would be required to meet the property line limits for either layout. The majority of the noise received offsite, with the air inlet and exhaust noise mitigated, would be emitted from the radiators. Low-noise radiators would be required for the Base layout. Standard-noise radiators would be required for the Alternative layout.

Both Project layouts are expected to meet the Tucson Noise Ordinance limits at the adjacent industrial and residential properties, provided the mitigation measures established within this report are followed.

EXHIBIT J

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EXHIBIT J: SPECIAL FACTORS

AAC R14-3-219:

> *Describe any special factors not previously covered herein, which applicant believes to be relevant to an informed decision on its application.*

J.1 Introduction

A public involvement program was initiated in September 2017 and continued through November 2017 to notify and educate the public, agencies, community leaders, and other affected stakeholders about the proposed Projects.

J.2 Public Involvement Program Summary

Public participation is an important part of TEP's environmental planning process. Public involvement and communications activities were conducted as part of the Projects to inform the public of the need and benefits of the Projects, and to solicit public input.

The public involvement activities took place in September and October 2017, with agencies, community leaders, residents, and other affected stakeholders. TEP sent newsletters to 636 residents and stakeholders, and held briefings with individual stakeholders in person and by telephone. In addition, TEP set up a telephone information line, an email address, and a webpage for the Projects, all of which accepted comments from the public. These public involvement activities culminated in a public open house on October 18, 2017. Feedback was solicited on the Projects throughout the process. Exhibit J contains additional details of public participation activities and feedback results for the Projects.

The public planning process was intended to ensure effective and timely communication among TEP staff, the public, agencies, and stakeholders. TEP used several different public outreach efforts to inform the affected members of the community in the Study Area. Those efforts included:

- *Briefings with community leaders, agencies, and jurisdictions*
- *Individual stakeholder meetings*
- *Newsletter mailings, including comment forms*
- *Public open house*
- *Project telephone information line*
- *Project email address*
- *Project Internet website, including an online comment form*

The outreach effort was designed to offer interested parties an opportunity to gain information and provide input. The public was provided the opportunity to review and comment on the Projects. The various methods of communication and public interaction listed above are explained below.

J.2.1 Stakeholder Briefings

In order to introduce the proposed Projects, gauge the level of public concern, and identify potential issues, briefings were conducted with key individuals within the various jurisdictions and agencies. At

these briefings, the Projects' team members explained the purpose and need of the Projects, provided the Projects' descriptions and the environmental siting process, and asked for suggestions and opinions. In return, the community leaders provided TEP with their input on public concerns and sensitive resource areas within the study area. Community leaders that were briefed are included in Table J-1.

Table 2-4. Stakeholder List

AGENCY/ORGANIZATION	NAME	AREA OF INTEREST/TITLE
US Elected Officials and Staff		
US Senator	Flake (c/o Bob Brubaker)	
US Senator	John McCain	
US Congresswoman	Martha McSally (c/o CJ Karamargin)	District #2 (Congressional district)
US Congressman	Raul Grijalva (c/o Ruben Reyes)	District #3 (Congressional district)
Federal Agencies		
Department of Defense Davis Monthan Air Force Base	Edmond Lubbers (Ed)	Deputy Chief of Operations
Department of Defense Davis Monthan Air Force Base	Michael Toriello	355th Civil Engineer Squadron deputy commander
Department of Defense Davis Monthan Air Force Base	Bonnie Kacey Carter	Base Community Planner
Department of Defense Davis Monthan Air Force Base	Nicholas Germanos	
USFWS	Jean Calhoun	Asst Field Director for So. AZ
Department of Energy		
State Elected Officials and Staff		
Arizona Governor's Office	Doug Ducey (Becky Freeman)	
Arizona Corporation Commissioners and Policy Staff	Elijah Abinah	Utilities Division, Director
Arizona Senator	Andrea Dalessandro	District 2
Arizona Representative	Daniel Hernandez	District 2
Arizona Representative	Rosanna Gabaldón	District 2

AGENCY/ORGANIZATION	NAME	AREA OF INTEREST/TITLE
State Agencies		
Arizona Department of Transportation	Rod Lane	District Engineer
Arizona Department of Transportation	Jeremy Moore	Assistant District Engineer
Arizona Department of Transportation	Rudy Perez	Planning Program Manager Major Projects Group
Arizona Department of Transportation	Priscilla F. Thompson, PE	Utility Engineering Coordinator Utility and Railroad Engineering
Arizona Game and Fish Department	Kristin Terpening	Habitat Specialist
County Elected Officials and Staff		
Pima County	Chuck Huckleberry	Administrator
Pima County	Sharon Bronson	Chair
Pima County Board of Supervisors	Ramon Valadez	District #2
Pima County Board of Supervisors	Julie Castaneda	Clerk of the Board
Pima County Public Works	Carmine DeBonis, Jr.	Deputy County Administrator
Pima County Real Property Services	Tim Murphy	Supervisor, Property Management Section
Pima County	Diana Durazo	Special Projects Manager
City Elected Officials and Staff		
City of Tucson	Jonathan Rothschild	Mayor
City of Tucson	Michael Ortega	Manager
City of Tucson	Richard Fimbres	Ward #5 Representative
City of Tucson	Daryl Cole	Transportation
City of Tucson	Jim Rossi	Real Estate Services, Division Administrator
City of Tucson	Scott Clark	Interim Development Services Director

AGENCY/ORGANIZATION	NAME	AREA OF INTEREST/TITLE
Others		
Metropolitan Pima Alliance	Amber Smith	
Union Pacific Railroad	Renay Robison	Real Estate Manager
Neighborhood/Community Associations		
Hilton Road Community Association		
Mortimore Neighborhood Asscn	Patricia Smith	
Cielito Lindo De Tubac HOA	Tammy Whitington	Community Association Manager

J.2.1.1 Department of Defense Davis Monthan Air Force Base

TEP met with DMAFB on September 19, 2017. DMAFB indicated that their main concern was that the Projects were within DMAFB's Inner Horizontal Surface, which has a 150-foot ceiling that should not be penetrated by structures. DMAFB is currently processing an Airfield Waiver to allow for the approximately 160-foot tall stacks in their proposed location.

J.2.1.2 Arizona Department of Transportation Meeting

TEP met with ADOT on October 12, 2017. Meeting minutes are located in Exhibit J-8. A letter of support is located in Exhibit H-2. ADOT noted that the Alvernon Way elevation would increase approximately 30 feet when Alvernon Way was rebuilt to SR210.

J.2.1.3 Arizona Game and Fish Department

TEP met with Kristin Terpening of AZGFD on October 20, 2017 and gave her a tour of the project area. Ms. Terpening indicated following the meeting that she had no concerns with the Projects and would provide a letter of confirmation (Exhibit J-9).

J.2.2 Fact Sheet/Newsletters

TEP prepared a newsletter announcing the Projects and the public open house (Exhibit J-2). The newsletter was mailed to all adjacent residents and landowners, agency and elected officials, and stakeholders. A fact sheet was also prepared for additional distribution at the open house and at stakeholder meetings (Exhibit J-5).

J.2.3 Public Open House

A public open house was held at Mulcahy YMCA (2805 E Ajo Way, Tucson, AZ 85713) on October 18, 2017.

Ten (10) members of the public attended the open house meeting. Questions asked at the meeting were in relation to: how RICE technology works and is it safe to use; the potential benefits of RICE technology; location of the transmission lines; visually what would the Projects as completed look like; and any potential increase noise in the area. In addition, one written comment was received and is included in Exhibit J-7.

See Exhibits J-1, J-2, J-3, and J-4 for materials that were on display at the open house, and Exhibits J-6 for sign-in sheet and J-7 for comments received.

J.2.4 Telephone Information Line

A toll-free telephone information line was established for the Projects. The automated message, in English and Spanish, provided basic information and encouraged callers to leave a message requesting more information or a return call. The Projects' website addresses were also provided for the public to access updated information. The telephone number was advertised in the newsletters and on the Projects' websites. The information line voicemail was checked regularly (and more frequently following newsletter mailings and public open house); all messages that required a response were answered by one of the appropriate project team members. To date a total of zero (0) voicemails were received. All messages received were entered into the comment tracking database.

J.2.5 Internet Web Site

The Internet has evolved into a primary source of information, therefore TEP maintains a website featuring their various projects throughout southeastern Arizona. The site address is http://www.tep.com. The specific Projects' page is https://www.tep.com/projects/. A page devoted to the proposed RICE Generation Project and the Transmission Line Project was added to the TEP website before other public participation activities commenced, and has been updated throughout the planning process.

The Projects' websites were updated regularly to include both general and specific information on the Projects, including the latest maps and each of the Projects' newsletters. After the public open house, the displays and graphics presented were added to the Projects' web page. The site also enabled people to submit comments via an online public comment form, or to request more information by providing the toll-free project information line number.

The online public comment form offered another method for the public to provide comments, along with a mechanism to track and trend all comments received. The automated comment tracking database served as a platform and universal location for all Projects' comments to be stored. Comments submitted through the website were entered into the database.

J.2.6 Comment Tracking Database

At the time of preparation of the application, two (2) comments were received regarding the proposed Projects. Comments submitted through the website were entered directly into the database. Additional comments received outside of the website were also entered into the database and included:

- *messages from the telephone information line*
- *input received during the public open house*
- *letters*
- *emails from the public, agencies, jurisdictions, and other interested parties*
- *any other form of input regarding the Projects*

Through the comment database, comments were sorted by jurisdiction, agency, etc., as well as by issue/concern (e.g., land use, property values, health and safety, visual). This information was used to better understand the concerns of the community in regard to these Projects and incorporate the concerns into TEP's plans where possible.

J.3 Comments Received

See Exhibit J-10 for table of comments received and proposed resolutions.

EXHIBIT J-1

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EXHIBIT A

LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF PIMA, STATE OF ARIZONA, AND IS DESCRIBED AS FOLLOWS:

Parcel No. 1:

A portion of the West half of Lot 1, Section 3 Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona and described in Docket 11796, Page 2350, records of Pima County, Arizona, more particularly described as follows:

The West 378.95 feet of said Lot 1;

EXCEPT the North 75 feet lying within Irvington Road as established March 19, 1957 in Proceedings No. 948, Pima County Highway Department, and further set forth in Book 8 of Road Maps, Page 5; and

FURTHER EXCEPT the South 50 feet as set forth in Deed to Pima County, Arizona recorded in March 6, 1978 in Docket 5726, Page 880.

Parcel No. 2:

A portion of the West 378.95 feet of Lot 1, Section 3 Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona, conveyed from Pima County, Arizona recorded in Recording No. 2011-1870353, records of Pima County, Arizona, more particularly described as follows:

Commencing at the Southeast corner (found brass cap survey monument marked PCHD) of the Northeast quarter of Section 3, Township 15 South, Range 14 East, Gila and Salt River Meridian, Pima County, Arizona;

Thence North 00 degrees 33 minutes 11 seconds East along the East line of said Northeast quarter, 1237.69 feet;

Thence leaving said easterly line, North 89 degrees 26 minutes 49 seconds West, 75.00 feet to a point on the Westerly right of way line of Swan Road and the Southerly line of Wyoming Street to the True Point of Beginning;

Thence North 89 degrees 17 minutes 47 seconds West, along said southerly line, 1251.90 feet to the Westerly line of Wyoming Street;

Thence North 00 degrees 27 minutes 03 seconds East, along said westerly line 100.00 feet to the Northerly line of Wyoming Street and also being the southwest corner of that parcel of land described in Docket 12761, Page 838 (found ½" iron pin RLS 12537);

Thence South 89 degrees 17 minutes 47 seconds East, along the Northerly line of Wyoming Street, 378.92 feet to the Southwest corner of that parcel of land described in Docket 12783, Page 6293 (set 1/2" iron pin RLS 12537);

Thence South 00 degrees 27 minutes 12 seconds West, along the Southerly prolongation of the Westerly line of said parcel described in Docket 12783, Page 6293, a distance of 50.00 feet to a set ½" iron pin RLS 12537:

Thence South 89 degrees 17 minutes 47 seconds East, 284.55 feet to the Southwest corner of that parcel described in Docket 4037, Page 232 (set ½" iron pin RLS 12537);

Thence South 00 degrees 30 minutes 09 seconds West, along the Southerly prolongation of the westerly line of said parcel described in Docket 4037, Page 232, a distance of 25.00 feet to a set ½" iron pin RLS 12537;

Thence South 89 degrees 17 minutes 47 seconds East and parallel with the Southerly line of said Wyoming Street, 588.49 feet to a point on the Westerly right of way line of Swan Road (set ½" iron pin RLS 12537);

EXHIBIT A
(Continued)

Thence South 00 degrees 33 minutes 11 seconds West, along said Westerly line, 25.00 feet to the Trust Point of Beginning.

Parcel No. 3:

The East half of Lot 2, Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

Except the Northerly 75 feet of the East half of Lot 2.

Parcel No. 4:

The West half of Lot 2, Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

EXCEPT that portion lying with Irvington Road thereof.

Parcel No. 5:

The East half of the East half of Lot 3, Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

EXCEPT the North 75 feet thereof within the right of way of Irvington Road.

Parcel No. 6:

The West half of the East half of Lot 3, Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

EXCEPT the North 75 feet thereof within the right of way of Irvington Road.

Parcel No. 7:

All of Lot 4, Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona, lying East of the Southern Pacific Railroad right of way.

Parcel No. 8:

The West half of Lot 3, Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona.

Parcel No. 9:

The Southeast quarter of the Northeast quarter of Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

Except the North 50 feet thereof; and

Except the East 75 feet thereof.

Parcel No. 10:

A portion of the Southeast quarter of the Northeast quarter of Section 3 Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona, conveyed from Pima County, Arizona recorded in Recording No. 2011-1870353, records of Pima County, Arizona, more particularly described as follows:

EXHIBIT A
(Continued)

Commencing at the Southeast corner (found brass cap survey monument marked PCHD) of the Northeast quarter of Section 3, Township 15 South, Range 14 East, Gila and Salt River Meridian, Pima County, Arizona;

Thence North 00 degrees 33 minutes 11 seconds East along the East line of said Northeast quarter, 1237.69 feet;

Thence leaving said easterly line, North 89 degrees 26 minutes 49 seconds West, 75.00 feet to a point on the Westerly right of way line of Swan Road and the Southerly line of Wyoming Street to the True Point of Beginning;

Thence North 89 degrees 17 minutes 47 seconds West, along said southerly line, 1251.90 feet to the Westerly line of Wyoming Street;

Thence North 00 degrees 27 minutes 03 seconds East, along said westerly line 100.00 feet to the Northerly line of Wyoming Street and also being the southwest corner of that parcel of land described in Docket 12761, Page 838 (found ½" iron pin RLS 12537);

Thence South 89 degrees 17 minutes 47 seconds East, along the Northerly line of Wyoming Street, 378.92 feet to the Southwest corner of that parcel of land described in Docket 12783, Page 6293 (set 1/2" iron pin RLS 12537);

Thence South 00 degrees 27 minutes 12 seconds West, along the Southerly prolongation of the Westerly line of said parcel described in Docket 12783, Page 6293, a distance of 50.00 feet to a set ½" iron pin RLS 12537;

Thence South 89 degrees 17 minutes 47 seconds East, 284.55 feet to the Southwest corner of that parcel described in Docket 4037, Page 232 (set ½" iron pin RLS 12537);

Thence South 00 degrees 30 minutes 09 seconds West, along the Southerly prolongation of the westerly line of said parcel described in Docket 4037, Page 232, a distance of 25.00 feet to a set ½" iron pin RLS 12537;

Thence South 89 degrees 17 minutes 47 seconds East and parallel with the Southerly line of said Wyoming Street, 588.49 feet to a point on the Westerly right of way line of Swan Road (set ½" iron pin RLS 12537);

Thence South 00 degrees 33 minutes 11 seconds West, along said Westerly line, 25.00 feet to the Trust Point of Beginning.

Parcel No. 11:

The Southwest quarter of the Northeast quarter of Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona.

Parcel No. 12:

The Southeast quarter of the Northwest quarter of Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona.

Parcel No. 13:

That portion of the Southwest quarter of the Northwest quarter of Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona, lying Northerly and Easterly of the most Easterly right of way of the Southern Pacific Railroad Company in said Southwest quarter of the Northwest quarter.

Parcel No. 14:

The Northeast quarter of the Southeast quarter of Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

EXHIBIT A
(Continued)

EXCEPT the Easterly 75 feet thereof.

Parcel No. 15:

The Northwest quarter of the Southeast quarter of Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

EXCEPT railroad right of way; and

EXCEPT any portion lying Southwesterly of the Southwesterly right-of-way line of the Southern Pacific Railroad Company.

Parcel No. 16:

That portion of the Northeast quarter of the Southwest quarter of Section 3, Township 15 South, Range 14 East of the Gila and Salt River Base and Meridian, Pima County, Arizona, lying Northeasterly of the Northeasterly right of way line of the Southern Pacific Railroad.

Parcel No. 17:

The Southeast quarter of the Southeast quarter of Section 3, Township 15 South, Range 14 East, of the Gila and Salt River Base and Meridian, Pima County, Arizona, lying Northeasterly of the Northeasterly right-of-way of the Southern Pacific Railroad Company;

EXCEPTING therefrom that portion thereof, occupied and used the Southern Pacific Railroad Company as a railroad right-of-way; and

FURTHER EXCEPTING the following described property as described in deed recorded in Docket 644, Page 541:

All that portion of said Southeast quarter of the Southeast quarter of Section 3, described as follows:

COMMENCING at the Northeast corner of said Southeast quarter of the Southeast quarter of Section 3;

Thence South 89°49’ West along the North line of said Southeast quarter of the Southeast quarter of Section 3, a distance of 412.00 feet;

Thence South 00°04’08” East, a distance of 922.75 feet, more of less, to the Northerly right-of-way line of the Southern Pacific Railroad Company;

Thence South 57°05’30” East along said right-of-way line, a distance of 491.12 feet, more or less, to a point on the East line of said Southeast quarter of the Southeast quarter of Section 3;

Thence North 00°04’08” West, a distance of 1190.90 feet, more or less, to the TRUE POINT OF BEGINNING;

EXCEPT the North 40.00 feet thereof; and

EXCEPT the East 75.00 feet thereof; and

FURTHER EXCEPTING the East 75.00 feet of the North 40.00 feet of said Southeast quarter of the Southeast quarter of Section 3.

Parcel No. 18:

EXHIBIT A
(Continued)

All of that portion of the Southwest quarter of the Southeast quarter of Section 3, Township, 15 South, Range 14 East, of the Gila and Salt River Base and Meridian, Pima County, Arizona, lying Northeasterly of the Northeasterly right of- way of the Southern Pacific Railroad Company.

Parcel No. 19:

All that portion of the Southeast quarter of the Southeast quarter of Section 3, Township 15 South, Range 14 East, of the Gila and Salt River Base and Meridian, Pima County, Arizona, described as follows:

COMMENCING at the Northeast corner of said Southeast quarter of the Southeast quarter of Section 3;

Thence South 89°49’ West along the North line of said Southeast quarter of the Southeast quarter of Section 3, a distance of 412.00 feet;

Thence South 00°04’08” East, a distance of 922.75 feet, more or less, to the Northerly right-of-way line of the Southern Pacific Railroad Company;

Thence South 57°05’30” East along said right-of-way line of said Southeast quarter of the Southeast quarter of Section 3;

Thence North 00°04’08” West, a distance of 1190.90 feet, more or less, to the TRUE POINT OF BEGINNING;

EXCEPTING the North 40.00 feet thereof; and

EXCEPTING the East 75.00 feet thereof.

Parcel No. 20:

That portion of abandonment of Swan Road under Proceedings No. 2420 in Resolution and Order No. 1981-151 recorded in Docket 6636, Page 664, records of Pima County, Arizona.

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EXHIBIT J-2

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TUCSON ELECTRIC POWER (TEP) RECIPROCATING INTERNAL COMBUSTION ENGINE (RICE) GENERATION AND IRVINGTON 138-KILOVOLT (kV) TRANSMISSION LINE RELOCATION PROJECTS

Tucson Electric Power (TEP por sus siglas en inglés) Motor de Combustión Internal (RICE por sus siglas en inglés) y Reubicación de Línea De Transmisión de 138-Kilovoltios Proyectos Irvington

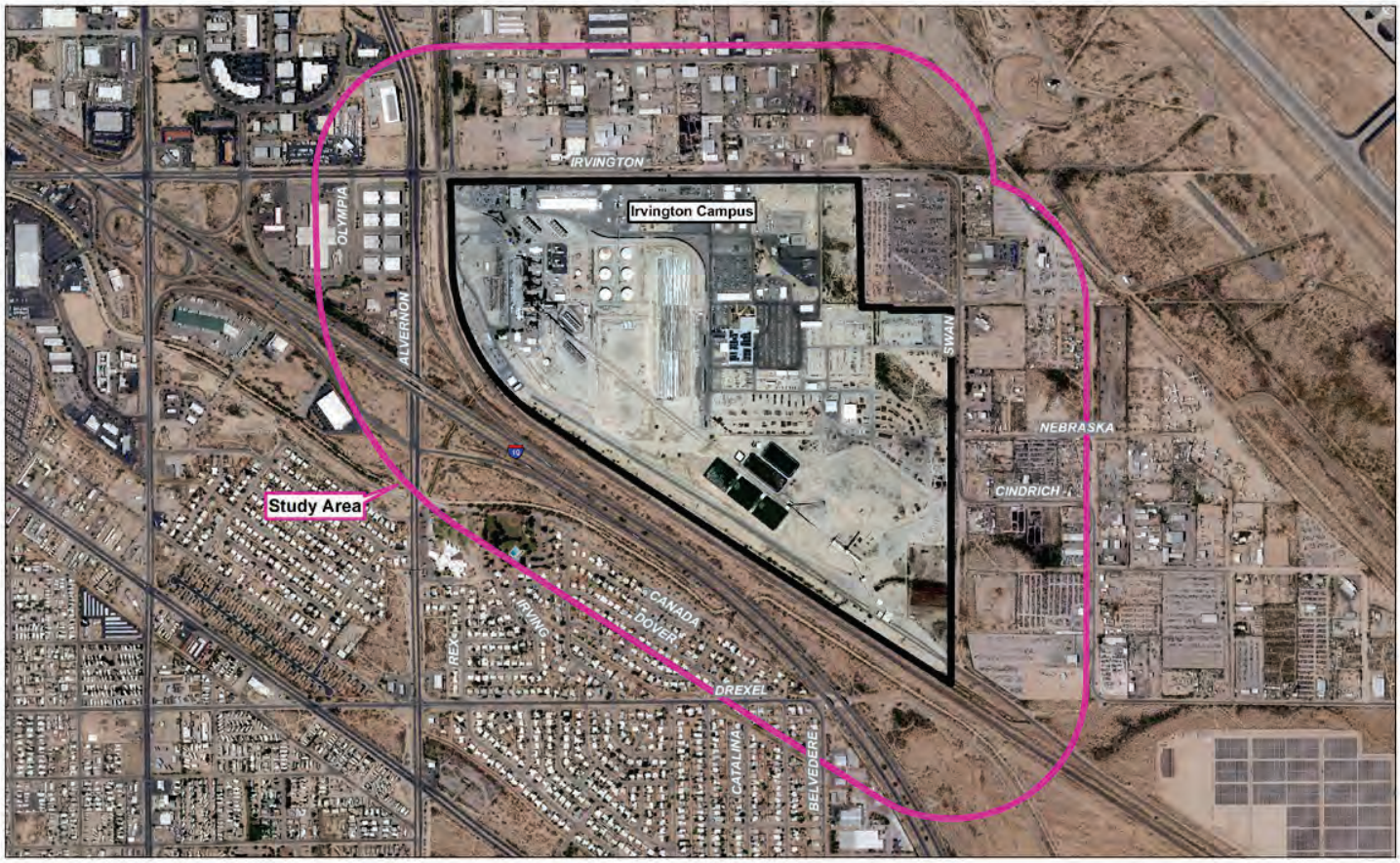
PROJECT NEWSLETTER # 1 - OCTOBER 2017

Tucson Electric Power Company (TEP) is planning to upgrade and relocate its existing 138-kilovolt (kV) substation and extend several 138 kV transmission lines within the company's Irvington Campus, located at South Contractors Way and East Irvington Road. These improvements will support TEP's plans to build new facilities and utilize modern technologies to improve operations, expand its use of renewable energy and maintain affordable, reliable electric service for customers.

These projects will coincide with the installation of reciprocating internal combustion engine (RICE) generators at the H. Wilson Sundt Generating Station located on the Irvington Campus.

The RICEs will replace aging steam units near the end of their useful lives. They were first identified as part of the company's long-term resource planning in its Integrated Resource Plan filed with the Arizona Corporation Commission (ACC) on April 3, 2017.

The transmission lines will be extended southeast to connect with the new substation, which will be built adjacent to the new RICEs.



TEP RECIPROCATING INTERNAL COMBUSTION ENGINE (RICE) GENERATION AND IRVINGTON 138-KILOVOLT (kV) TRANSMISSION LINE RELOCATION PROJECTS

PURPOSE AND NEED

Tucson Electric Power (TEP) is working to deliver at least 30 percent of its power from renewable resources by 2030, doubling the Arizona Corporation Commission's (ACC) 2025 mandate. TEP has enough renewable generating capacity to meet the annual electric needs of about 115,000 homes. Currently, about 11 percent of the power delivered to customers comes from renewable resources. RICEs are designed to compensate for power fluctuations and other challenges associated with TEP's expanded use of renewable energy.

TEP plans to install resilient, fuel-efficient RICEs that use natural gas to power up quickly and supplement wind generators and solar panels when conditions for those resources are not favorable. RICEs also can help to meet peak energy demand. New generating resources also will result in fewer emissions and lower water use. The new facilities are expected to be in service in 2019.

ACC REVIEW

Arizona Revised Statutes 40-360 requires that TEP secure the ACC's approval of a Certificate of Environmental Compatibility (CEC) for the projects prior to construction. TEP's CEC applications for the new lines and the RICEs will be reviewed by the Arizona Power Plant and Transmission Line Siting Committee, which will forward a recommendation to the ACC following a public hearing.

PUBLIC PARTICIPATION

TEP is seeking public input on these projects and invites you to attend a public open house on Wednesday, October 18, 2017 from 6-7:30 p.m. at Mulcahy YMCA Community Center, 2805 E. Ajo Way. This is an open house format, so please feel free to drop by when it is convenient. During the open house, representatives of TEP will be available to provide information and answer any questions you may have.

MORE INFORMATION AND PUBLIC COMMENTS

For more information about this project, please visit tep.com/projects. Please submit comments by:

- Leaving the enclosed comment form at the public open house.
- Mailing the enclosed comment form or a letter to the return address on this newsletter.
- Emailing comments to Renee Darling, RDarling@tep.com.
- Visiting www.tep.com/projects and filling out an online comment form.
- Calling 1-866-236-2114 and leaving a voicemail message.

Personas que requieren materiales en español deben ponerse en contacto con Renee Darling al 520.884-3642 o RDarling@tep.com. Las solicitudes deben de hacerse lo más pronto posible para asegurar que el equipo encargado tenga la oportunidad de hacer los arreglos necesarios.

Tucson Electric Power

A SUSTAINABLE ENERGY FUTURE

As our community grows and changes, TEP will satisfy customers' future energy needs by investing in efficient, innovative technologies to build a stronger, more flexible and responsive electric grid.

SOLAR AND RENEWABLE POWER

TEP is expanding solar and wind systems with a goal of delivering at least 30 percent of its power from renewable resources by 2030 – twice the level required by 2025 under Arizona's Renewable Energy Standard. TEP will buy solar energy at a historically low price from a new 100-megawatt (MW) solar array and an accompanying 30 MW energy storage system. This new, local system will provide power for 21,000 homes.

TRANSMISSION RESOURCE IMPROVEMENTS

New and upgraded transmission resources strengthen the local electric system and offer greater flexibility to reduce the length and frequency of service outages. New transmission resources would support economic development while enabling TEP to deliver power from more diverse and sustainable resources.

FLEXIBLE, EFFICIENT NATURAL GAS RESOURCES

TEP plans to invest in flexible, fast-responding natural gas generating resources that provide an affordable way to manage power fluctuations associated with intermittent renewable resources. These efficient new resources will help ensure the delivery of reliable electric service to customers.

MOVING AWAY FROM COAL

TEP continues its efforts to retire and replace some coal-fired generating resources with Unit 2 at the San Juan Generating Station in New Mexico, scheduled to be shut down by the end of this year.

2540 N. Tucson Blvd.
Tucson, AZ 85716

PRSRT STD
U.S. POSTAGE
PAID
TUCSON, AZ
PERMIT NO. 21

TEP
Tucson Electric Power

PUBLIC OPEN HOUSE

Reunión Pública

WEDNESDAY, OCTOBER 18, 2017 | 6 - 7:30 P.M.

Miércoles, 18 de octubre del 2017 | 6 - 7:30 p.m.

MULCAHY YMCA AT KINO COMMUNITY CENTER
2805 E. AJO WAY
TUCSON, AZ 85713

EXHIBIT J-3

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TEP RECIPROCATING INTERNAL COMBUSTION ENGINE (RICE) GENERATION AND IRVINGTON 138-KILOVOLT (kV) TRANSMISSION LINE RELOCATION PROJECTS

Tucson Electric Power (TEP por sus siglas en inglés) Motor de Combustión Alternativo (RICE por sus siglas en inglés) y Reubicación de Línea De Transmisión de 138-Kilovoltios Proyectos Irvington

Comments submitted will become part of the project record.
Comentarios seran parte de los archivos del proyecto

NAME
Nombre

ADDRESS
Dirección

CITY/STATE/ZIPCODE
Ciudad/Estado/Código Postal

EMAIL
Correo Electrónico

PHONE
Teléfono

- ☐ Resident in Study Area
  Residente dentro del área de estudio
- ☐ Business Owner in Study Area
  Empresario dentro del área de estudio
- ☐ Live/Work Near Study Area
  Vive/Trabaja cerca del área de estudio
- ☐ Special Interest Group
  Grupo de interés
- ☐ Other Interested Party
  Otro partido de interés

1. Please indicate any issues that are important to you in evaluating the RICE and transmission line projects:
Por favor cuéntenos sus preocupaciones y temas importantes para usted en su evaluación de los proyectos

2. Is there any additional Information that you would like TEP to consider when designing these projects:
Alguna información adicional que le gustaría contribuir para que TEP considere en el diseño de los proyectos

3. I would like additional information about:
Me gustaría información adicional sobre

4. I heard about these projects through:
Aprendí sobre los proyectos atreves de

- ☐ Project Website
  El sitio de internet del proyecto
- ☐ Newsletter Mailing
  Boletín enviado por la oficina de correo
- ☐ Public Meeting
  Reunión Pública
- ☐ Word of Mouth
  Boca en boca
- ☐ Other
  Otro

TEP
Tucson Electric Power

Tucson Electric Power

TUCSON ELECTRIC POWER (TEP) RECIPROCATING INTERNAL COMBUSTION ENGINE (RICE) GENERATION AND 138-KILOVOLT (kV) TRANSMISSION LINE RELOCATION PROJECTS

Tucson Electric Power (TEP por sus siglas en inglés) Motor de Combustión Alternativo (RICE por sus siglas en inglés) y Reubicación de Línea De Transmisión de 138-Kilovoltios Proyectos Irvington

Please submit comments by: *(Por favor someta sus comentarios atreves de una de las siguientes maneras)*

- Leave this form at the public open house
  Deje ésta página de comentarios en la Reunión Pública
- Mail the form or a letter to the address on back
  Envié ésta página o una carta por correo postal a la dirección de tras de la página
- E-mail comments to RDarling@tep.com
  Por correo electrónico a RDarling@tep.com
- Visit www.tep.com/projects and fill out the form online
  Visite www.tep.com/projects y llene la hoja en línea
- Call 1-866-236-2114 and leave voicemail message
  Llame a 1-866-236-2114 y deje un mensaje

THANK YOU FOR YOUR PARTICIPATION!

Gracias por su participación

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Attn: Project Manager
2540 N. Tucson Blvd.
Tucson, AZ 85716
RE: TEP RICE Generation and Irvington 138kV Transmission Line Relocation Projects

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2540 N. Tucson Blvd.
Tucson, AZ 85716

EXHIBIT J-4

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TEP
Tucson Electric Power

WELCOME

PLEASE SIGN IN

BIENVENIDOS

(Hablamos español)

POR FAVOR REGÍSTRESE

FOR MORE INFORMATION/PARA MÁS INFORMACIÓN:
www.tep.com/projects

TEP
Tucson Electric Power

PUBLIC PARTICIPATION
GET INVOLVED!

Tucson Electric Power (TEP) values your input and has made it easy and convenient to get involved in the process!

Public Participation Process

Public open house

Stakeholder, Agency and Elected Official meetings

Public Participation Methods

Website

Fact Sheet

Newsletter

Newspaper Advertisements

How to Get Involved:

Fill out a comment form

Submit a comment form in person, online, or mail later

Email comments to rdarling@tep.com

Call 1-866-236-2114 and leave a voicemail message

TEP will document and summarize all comments as part of the public participation process.

Thank you for your interest in these projects!

CENTRAL POWER PLANTS

- Generate power around the clock to satisfy minimum energy demands.
- Designed to minimize system operating costs.
- Typically are thermal resources that run on fossil fuels.

SOLAR RESOURCES

- Use of one of Arizona's greatest natural resources – sunshine – to produce power while lowering emissions.
- TEP continues to expand its renewable portfolio, which can power more than 115,000 homes for a year.
- Intermittency presents challenges including power fluctuations and voltage issues.

RICE GENERATION

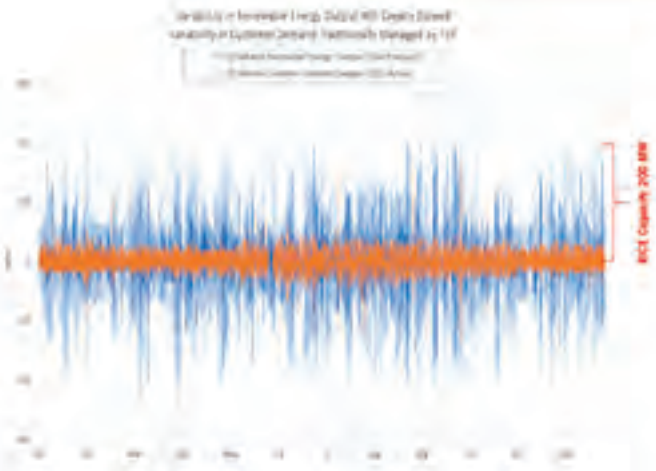
- Reciprocating internal combustion engines operate like car engines, using pistons to generate power instead of combustion turbines.
- Can generate power about 2-3 times faster than a combustion turbine.
- RICE units can ramp up and ramp down quickly to compensate for frequent changes in power production of wind and solar resources, and to satisfy peak demand.
- Reliably produce power even in high temperatures.
- Will reduce total water consumption by more than 70 percent.
- Will reduce total nitrous oxide (NOx) emissions by 60 percent. TEP working with Pima County to obtain an air quality permit.
- Building shell will mitigate noise, help plant to operate at levels below City of Tucson requirements.

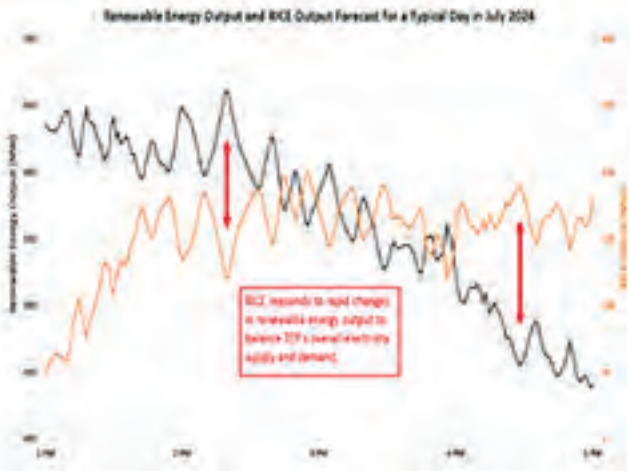
SUBSTATION

Power from generation sources is transmitted to substations, where voltage is lowered and power is prepared for delivery.

DELIVERY TO CUSTOMERS

Power is delivered to homes and businesses from the substation. The demand for power varies considerably depending on time of day, season and other factors.





Tucson Electric Power

Tucson Electric Power
Irvington R.I.C.E. and Substation

Key Observation Point (KOP) - Key Map

↑ north

not to scale

Tucson Electric Power

Tucson Electric Power
Irvington R.I.C.E. and Substation

KOP 1 - Julian Wash Greenway

Existing View

Visual Simulation

Camera Location
Latitude: 32.153597 N
Longitude: 110.906160 W
Elevation: 2,586 ft.

Tucson Electric Power

Tucson Electric Power
Irvington R.I.C.E. and Substation

KOP 2 - Bryan Avenue

Existing View

Visual Simulation

Camera Location
Latitude: 32.153245 N
Longitude: 110.904336 W
Elevation: 2,575 ft

Tucson Electric Power

Tucson Electric Power
Irvington R.I.C.E. and Substation

KOP 3 - Catalina Avenue

Existing View

Visual Simulation

Camera Location
Latitude: 32.149894 N
Longitude: 110.898439 W
Elevation: 2,629 ft.

Tucson Electric Power

Tucson Electric Power
Irvington R.I.C.E. and Substation

KOP 4 - Interstate 10

Existing View

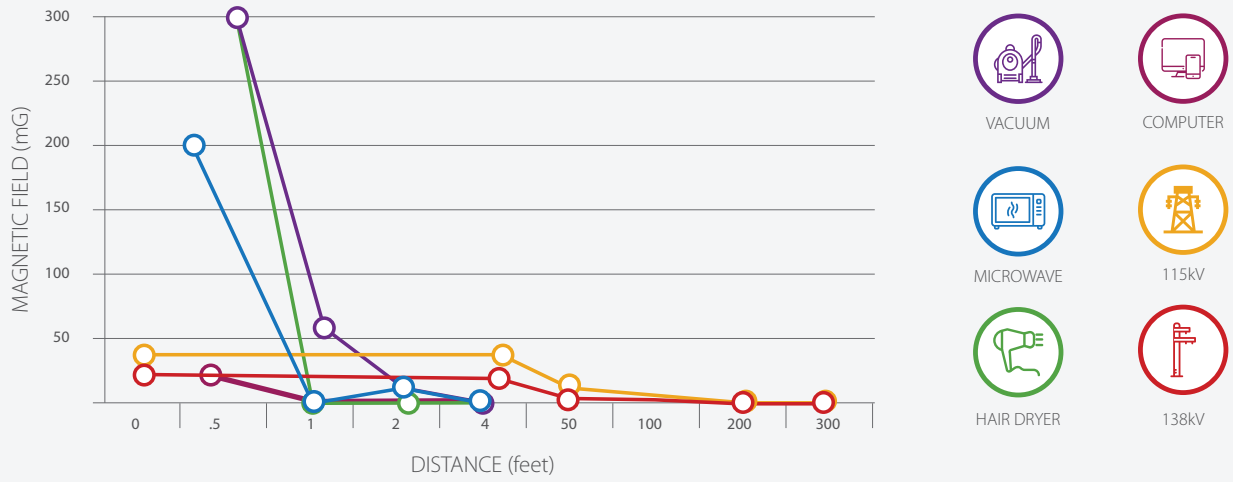
Visual Simulation

Camera Location
Latitude: 32.152463 N
Longitude: 110.900106 W
Elevation: 2,635 ft.

Tucson Electric Power

WHAT ARE ELECTROMAGNETIC FIELDS (EMFs)?

Electromagnetic fields (EMFs) are invisible forces which surround any electrical device such as power lines, electrical wiring, cell phones or electrical appliances. Everyone is exposed to them daily to various degrees. Extensive research into the effects on both humans and animals has confirmed no health risks are associated with EMFs.



Sources: National Institute of Environmental Health Sciences, National Institutes of Health. Electric and Magnetic Fields Associated with Use of Electric Power; Western Area power Administration. Electric and Magnetic Fields Facts.

EMFs are typically measured with special instruments and computer programs. Generally, magnetic fields from power lines are less than those produced in a typical residence.

ELECTRIC FIELDS

Produced by voltage
Increases in strength as voltage increases
Decreases in strength with distance
Weakened by walls, roofs, and vegetation

VS.

MAGNETIC FIELDS

Produced as current flows through wires or electrical devices
Increases in strength as current increases
Decreases in strength with distance
Obstacles do not weaken magnetic field strength

TEP
Tucson Electric Power

HOW ELECTRICITY GETS TO YOU

1. **Power Plant** – where electricity is generated utilizing resources such as natural gas, the sun, wind or coal

2. **Extra High Voltage (EHV) Transmission System** – system of wires connecting power plant generators to bulk switchyards

3. **Bulk Switchyards** – connect EHV transmission lines to High Voltage (HV) transmission lines

4. **High Voltage Transmission System** – system of wires connecting bulk switchyards to distribution substations

5. **Substations** – reduce or "step down" transmission line voltage and connect high voltage transmission lines to lower voltage distribution lines

6. **13.8-kV Distribution Lines** – where power is safely distributed overhead or underground

7. **Customer** – Safe, reliable power delivered to your door

Tucson Electric Power

A SUSTAINABLE ENERGY FUTURE

As our community grows and changes, TEP will satisfy customers' future energy needs by investing in efficient, innovative technologies to build a stronger, more flexible and responsive electric grid.

TRANSMISSION RESOURCE IMPROVEMENTS

New and upgraded transmission resources strengthen the local electric system and offer greater flexibility to reduce the length and frequency of service outages.

TEP is evaluating more than a dozen 138 kilovolt (kV) transmission line projects over the next decade.

New transmission resources would support economic development while enabling TEP to deliver power from more diverse and sustainable resources.

ENERGY STORAGE

TEP also expects to make greater use of energy storage systems, which can boost power output levels quickly to help maintain the required balance between energy demand and supply.

FLEXIBLE, EFFICIENT NATURAL GAS RESOURCES

TEP plans to invest in flexible, fast-responding natural gas reciprocating internal combustion engines that provide an affordable way to manage power fluctuations associated with intermittent renewable resources.

These efficient new resources will be built here in our community to help ensure the delivery of reliable electric service to customers.

SOLAR AND RENEWABLE POWER

TEP is expanding solar and wind systems with a goal of delivering at least 30 percent of its power from renewable resources by 2030 – twice the level required by 2025 under Arizona's Renewable Energy Standard.

TEP will buy solar energy at a historically low price from a new 100-megawatt (MW) solar array and an accompanying 30-MW energy storage system. This new, local system will provide power for 21,000 homes.

MOVING AWAY FROM COAL

TEP continues its efforts to retire and replace some coal-fired generating resources with Unit 2 at the San Juan Generating Station in New Mexico, scheduled to be shut down by the end of this year.

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EXHIBIT J-5

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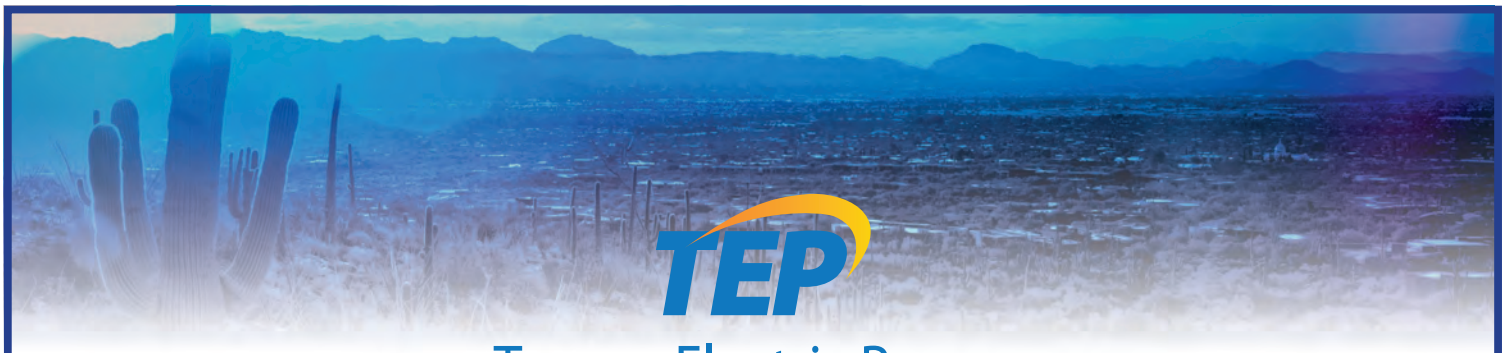

Tucson Electric Power

Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138-Kilovolt (kV) Transmission Line Relocation Projects

Frequently Asked Questions (FAQs)

Tucson Electric Power Company (TEP) is planning to upgrade and relocate its existing 138-kilovolt (kV) substation and extend several 138 kV transmission lines within the company's Irvington Campus, located at South Contractors Way and East Irvington Road. These improvements will support TEP's plans to build new facilities and utilize modern technologies to improve operations, expand its use of renewable energy and maintain affordable, reliable electric service for customers. These projects will coincide with the installation of reciprocating internal combustion engine (RICE) generators at the H. Wilson Sundt Generating Station located on the Irvington Campus.

Why are these projects needed?

TEP is working to deliver at least 30 percent of its power from renewable resources by 2030, doubling the Arizona Corporation Commission's (ACC) 2025 mandate. TEP plans to install resilient, fuel-efficient RICEs that use natural gas to power up quickly and supplement wind generators and solar panels when conditions for those resources are not favorable. The RICEs, which also can help to meet peak energy demands, will replace aging steam units near the end of their useful lives.

How will residents and businesses in the area benefit from these projects?

New and upgraded facilities will:

- help increase reliability to customers by reducing the duration and frequency of power outages.
- help strengthen the electric system that delivers power to customers while helping to meet future capacity requirements.
- result in fewer emissions and lower water use.

When will the new facilities be in service?

The new facilities are expected to be in service in 2019.

What are the next steps?

Arizona Revised Statutes 40-360 requires that TEP secure the ACC's approval of a Certificate of Environmental Compatibility (CEC) for the projects prior to construction. TEP's CEC applications for the new lines and the RICEs will be reviewed by the Arizona Power Plant and Transmission Line Siting Committee, which will forward a recommendation to the ACC following a public hearing.

Do electric and magnetic fields (EMFs) present health concerns?

According to a large body of research, there are no confirmed health risks associated with exposure to low-level EMFs. For more than 30 years, scientists and researchers from universities, national laboratories, health organizations, the Department of Energy and the World Health Organization have conducted research into possible adverse health effects of EMFs – invisible fields produced by equipment and devices that use or produce electricity. EMFs are part of our modern, everyday lives because we rely on electricity for lighting, for cooling and heating our homes and modern forms of communication. Power lines, household wiring, appliances and other devices produce low-level EMFs.

Will the RICE generators produce excessive noise?

The RICE generators will comply with the City of Tucson's noise emission requirements, which are 70 decibels at the parcel boundary.

For more information: www.tep.com/projects

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Tucson Electric Power

Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138-Kilovolt (kV) Transmission Line Relocation Projects

Public Open House | Reunión Pública

Wednesday, October 18, 2017 (Miércoles, 18 de Octubre de 2017) | 6 to 7:30 p.m.

Mulcahy YMCA at Kino Community Center | Tucson, AZ

PUBLIC SIGN-IN SHEET (REGISTRO PÚBLICO)

	Name (Nombre)	Address, City, ZIP Code (Dirección, Ciudad, Código Postal)	Email (Correo Electrónico)
1.	Christine Hernandez	4309 E. Dover Strav 85706	edtina@outlook.com
2.	Celeste Quiroz	" " "	
3.	Keri Silvyn	5983 E. Grant Rd. 85712	Ksilvyn@lsblandlaw.com
4.	Eddie Hernandez	4309 E. Dover Stra 85706	eddieh2457@gmail
5.	[illegible]	941 W calle francia 85706	[illegible]@gmail.com
6.			
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Please print

Completion of this sign-in sheet is voluntary and helps the study team keep an accurate record of meeting attendance.
Under state law, any identifying information provided above will become part of the public record and, as such, must be released to any individual upon request.

Tucson Electric Power

Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138-Kilovolt (kV) Transmission Line Relocation Projects

Public Open House | Reunión Pública

Wednesday, October 18, 2017 (Miércoles, 18 de Octubre de 2017) | 6 to 7:30 p.m.

Mulcahy YMCA at Kino Community Center | Tucson, AZ

PUBLIC SIGN-IN SHEET (REGISTRO PÚBLICO)

	Name (Nombre)	Address, City, ZIP Code (Dirección, Ciudad, Código Postal)	Email (Correo Electrónico)
1.	Indy Dawson	1551 E Benson Hwy. #25 85714	jdawson2@cox.net
2.	John Dawson	1551 E Benson Hwy. #25 85714	
3.	Robin Large	5183 E. Grant Rd., Ste. 290 85712	rlarge@lshlandlaw.com
4.	Cheryl Ziemick	3950 E. Irvington Road 85714	Cziemick@tep.com
5.			
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Tucson Electric Power

Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138-Kilovolt (kV) Transmission Line Relocation Projects

Public Open House | Reunión Pública

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PUBLIC SIGN-IN SHEET (REGISTRO PÚBLICO)

	Name (Nombre)	Address, City, ZIP Code (Dirección, Ciudad, Código Postal)	Email (Correo Electrónico)
1.	David Pawson	1551 E Benson Hwy #25 Tucson 85714	None
2.	Aracelí Martinez	4166 E. Frankfort St Tucson 85706	
3.	Dan O'Neal	Box 42258 Tucson 85715	
4.	Earl O'Neal	" "	
5.	Jan Gordley	2540 N. Tucson Blvd 85716	jan@gordleygroup.com
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Please print

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EXHIBIT J-7

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TEP RECIPROCATING INTERNAL COMBUSTION ENGINE (RICE) GENERATION AND IRVINGTON 138-KILOVOLT (kV) TRANSMISSION LINE RELOCATION PROJECTS

Tucson Electric Power (TEP por sus siglas en inglés) Motor de Combustión Internal (RICE por sus siglas en inglés) y Reubicación de Línea De Transmisión de 138-Kilovoltios Proyectos Irvington

Comments submitted will become part of the project record.
Comentarios seran parte de los archivos del proyecto

NAME Christine & Edward Hernandez
Nombre

ADDRESS 4309 E. Dover Strav
Dirección

CITY/STATE/ZIP CODE Tucson AZ 85706
Ciudad/Estado/Código Postal

EMAIL edtina@outlook.com
Correo Electrónico

PHONE 520-9990363
Teléfono

- [x] Resident in Study Area *Residente dentro del área de estudio*
- [ ] Business Owner in Study Area *Empresario dentro del área de estudio*
- [ ] Live/Work Near Study Area *Vive/Trabaja cerca del área de estudio*
- [ ] Special Interest Group *Grupo de interés*
- [ ] Other Interested Party *Otro partido de interés*

1. Please indicate any issues that are important to you in evaluating the RICE and transmission line projects:
Por favor cuéntenos sus preocupaciones y temas importantes para usted en su evaluación de los proyectos

~~Any~~ concerns : noise, disruptions

2. Is there any additional information that you would like TEP to consider when designing these projects?
¿Alguna información adicional que le gustaría contribuir para que TEP considere en el diseño de los proyectos?

Keep residents informed

3. I would like additional information about:
Me gustaría información adicional sobre

4. I heard about these projects through:
Aprendí sobre los proyectos atreves de

- [ ] Project Website *El sitio de internet del proyecto*
- [x] Newsletter Mailing *Boletín enviado por la oficina de correo*
- [ ] Public Meeting *Reunión Pública*
- [ ] Word of Mouth *Boca en boca*
- [ ] Other *Otro*

TEP
Tucson Electric Power

Tucson Electric Power

TUCSON ELECTRIC POWER (TEP) RECIPROCATING INTERNAL COMBUSTION ENGINE (RICE) GENERATION AND 138-KILOVOLT (kV) TRANSMISSION LINE RELOCATION PROJECTS

Tucson Electric Power (TEP por sus siglas en inglés) Motor de Combustión Internal (RICE por sus siglas en inglés) y Reubicación de Línea De Transmisión de 138-Kilovoltios Proyectos Irvington

Please submit comments by: *(Por favor someta sus comentarios atreves de una de las siguientes maneras)*

- Leave this form at the public open house
  Deje ésta página de comentarios en la Reunión Pública
- Mail the form or a letter to the address on back
  Envié ésta página o una carta por correo postal a la dirección de tras de la página
- Email comments to RDarling@tep.com
  Por correo electrónico a RDarling@tep.com
- Visit www.tep.com/projects and fill out the form online
  Visite www.tep.com/projects y llene la hoja en línea
- Call 1-866-236-2114 and leave voicemail message
  Llame a 1-866-236-2114 y deje un mensaje

THANK YOU FOR YOUR PARTICIPATION!

Gracias por su participación

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Attn: Project Manager
2540 N. Tucson Blvd.
Tucson, AZ 85716
RE: TEP RICE Generation and Irvington 138kV Transmission Line Relocation Projects

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2540 N. Tucson Blvd.
Tucson, AZ 85716

EXHIBIT J-8

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ARIZONA DEPARTMENT OF TRANSPORTATION
205 S. 17th Avenue, Mail Drop 605E
Phoenix, AZ 85007

TEP COORDINATION MEETING NOTES (Revised)

I-10, I-19 to Kolb Road & SR 210, Golf Links to I-10

Project No. 010 PM 260 H7825 01L

October 12, 2017

TO: **Meeting Attendees**
Rudy Perez, ADOT Project Manager
Sarah Karasz, ADOT Senior Environmental Planner
Priscilla Thompson, ADOT District Utility Coordinator
Renee Darling, Tucson Electric Power Company Senior Environmental & Land Use Planner
Brad Olbert, Jacobs Project Manager

FROM:
Brad Olbert, Jacobs Project Manager

SUBJECT:
TEP I-10 Coordination Meeting Notes
I-10, I-19 to Kolb Road & SR 210, Golf Links to I-10
Project No. 010 PM 260 H7825 01L
PHASE II (I-10/SR 210) Design Concept Report and Environmental Assessment

INTRODUCTION

The coordination meeting was held at 2:10 PM October 12, 2017 at the ADOT Southcentral District conference room. The meeting ended at 3:10 PM.

SUMMARY

Rudy Perez, ADOT Project Manager opened the meeting at 2:10 PM. Self-introductions were made by all attendees.

Brad Olbert, Jacobs Project Manager, presented an overview of the I-10, I-19 to Kolb Road and SR 210 project area. Brad handed out packets of information which included seven plan sheets that showed Alternative I along I-10 from the Country Club Road TI to the Valencia Road TI and along SR 210. In addition, roadway profile information was provided to Renee for all of the I-10 mainline, I-19 to Kolb Road and SR 210.

At the last TEP coordination meeting, TEP requested a route for their service vehicles to use if UPRR train cars would cause a blockage of both Irvington Road and Ajo Way. Currently TEP would use Contractors Way to go north up to Alvernon Way. Brad showed Renee a paved maintenance roadway that utilizes parts of the old northbound segment of Contractors Way as a means to go north to Alvernon Way. The maintenance roadway will have locked gates so the roadway is not used by the public, however, the roadway would be available to bicycles. TEP would be given a set of keys for their emergency use of the roadway. A similar maintenance

roadway is located along the UPRR railroad right-of-way. This paved maintenance roadway also utilizes parts of the old southbound segment of Contractors Way as a means for access to the area near the railroad. TEP and Tucson Water will have access to the roadway by means of a locked gate. Sarah Karasz, ADOT Senior Environmental Planner, said from ADOT's perspective the northbound maintenance roadway should not be labeled a bicycle route. Bicycle routes can become part of the formal bicycle system and can fall into a Section 4(f) category for parks. Sarah will forward information to Jacobs on this issue. Jacobs will be careful to label the route as a maintenance road.

Renee Darling provided handout information for two planning projects. The first planning project involves master planning for the Irvington Campus. The campus will upgrade and relocate its existing 138 kV substation and extend several 138 kV transmission lines within the campus. TEP is planning to construct new reciprocating internal combustion engine (RICE) generators on the Irvington Campus. TEP also plans to construct a new office building on the site and potentially widen Irvington Road to facilitate employee traffic turning movements into the site. One 138 kV transmission line crosses Alvernon Way along Irvington Road. TEPs main concern with the transmission line is to provide adequate clearance for the 138kV transmission line over our improvements and needed roadway profile information. Brad went over the roadway plan and profile information provided and showed Renee how to find the information TEP needed.

Renee covered the second planning project which involved a new 138 kV transmission line route that needs to go from their new 138 kV switching yard to a proposed substation located near 36th Street and Kino Parkway. There were a number of routes that could be taken including one through the Alvernon Way / I-10 system interchange. Brad said he will provide additional ramp profile information in the interchange area because the ramps are at different elevations than the I-10 mainline. Jacobs is developing a drainage concept using retention basins that are not shown in the plan views provided. Power poles could potentially be located within the basins the foundations will need to be a few feet taller and deeper to account for the water. Jacobs will provide the drainage concept when it is available.

Renee requested that someone from ADOT be present at the stakeholder meeting on October 23rd to represent ADOT's position on their facilities including the planned improvements to I-10 and SR 210. Pricilla Thompson said she would be available for the meeting. Renee also requested a letter of support from ADOT for the RICE project. The letter should identify the need for coordination with power transmission lines crossing the proposed I-10 / SR 210 alignments.

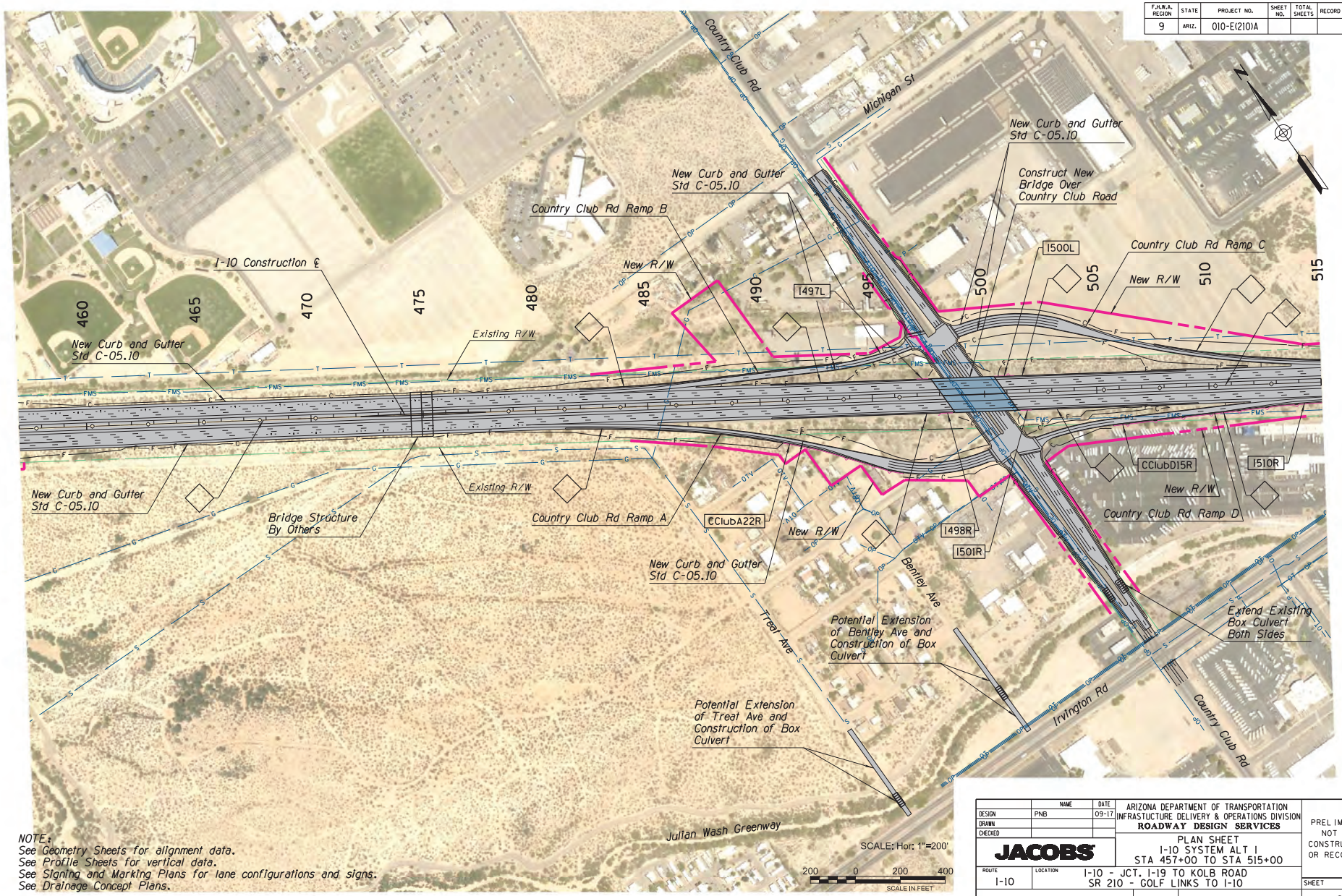
ACTION ITEM LIST

- Jacobs to provide additional I-10 to SR 210 ramp profile information as soon as it becomes available to TEP.
- Jacobs to provide the drainage design concept as soon as it is available to TEP.
- Sarah Karasz to provide Jacobs with information regarding labeling of bicycle routes within ADOT right-of-way.
- Rudy Perez will author the letter of support for the RICE project and reach out to find the appropriate individual within ADOT to sign the letter.

Signed: Brad Olbert
Brad Olbert, PE, Project Manager

Attachments

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	010-E(210)A			



NOTE:
See Geometry Sheets for alignment data.
See Profile Sheets for vertical data.
See Signing and Marking Plans for lane configurations and signs.
See Drainage Concept Plans.

	NAME	DATE
DESIGN	PNB	09-17
DRAWN		
CHECKED		

JACOBS

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTUCTURE DELIVERY & OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

PLAN SHEET
I-10 SYSTEM ALT I
STA 457+00 TO STA 515+00

ROUTE: I-10
LOCATION: I-10 - JCT. I-19 TO KOLB ROAD
SR 210 - GOLF LINKS TO I-10

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

SHEET ____ OF ____

TRACS NO. H7825 01L | 010-E(210)A

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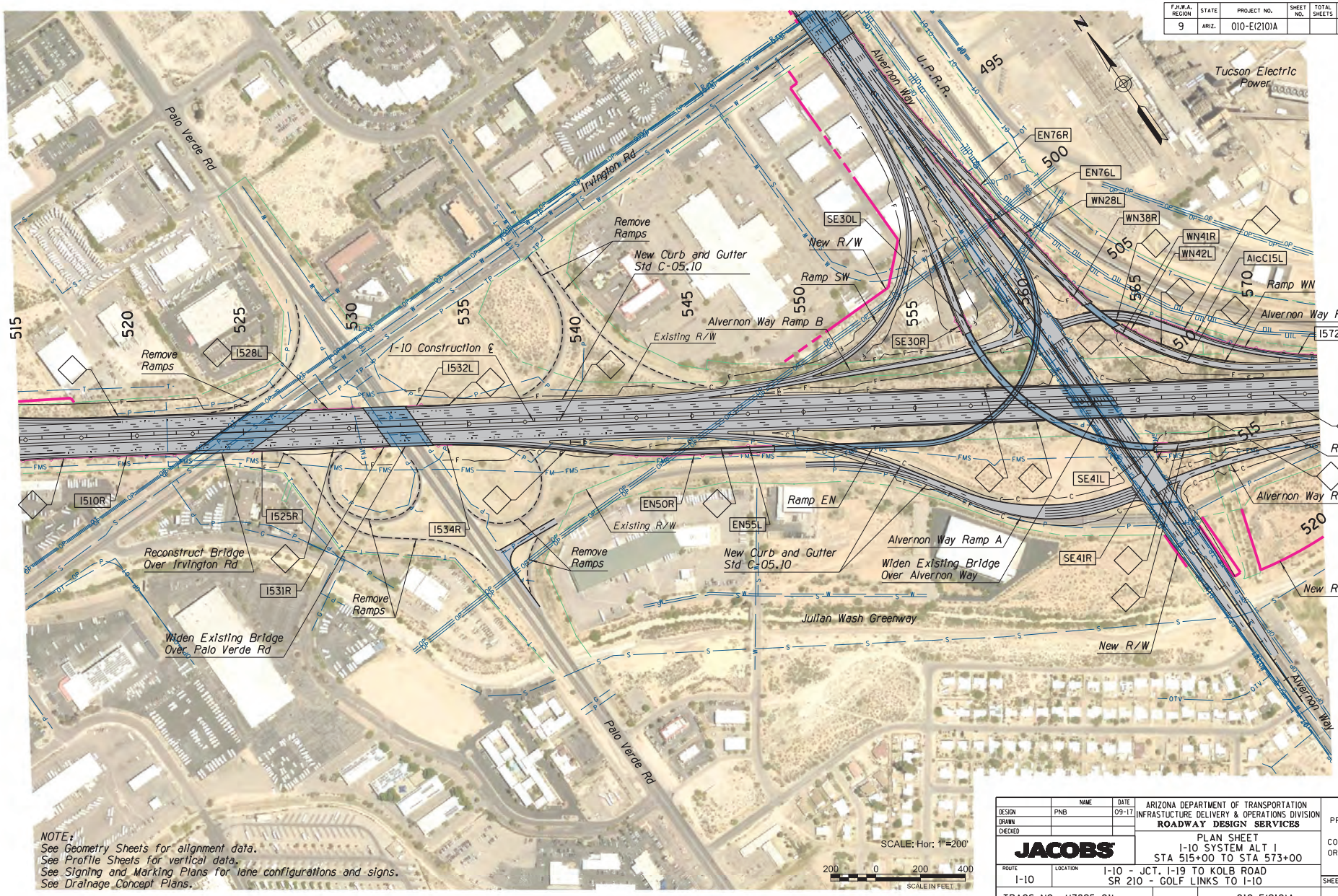

NOTE:
See Geometry Sheets for alignment data.
See Profile Sheets for vertical data.
See Signing and Marking Plans for lane configurations and signs.
See Drainage Concept Plans.

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SCALE IN FEET

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JACOBS

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTUCTURE DELIVERY & OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

PLAN SHEET
I-10 SYSTEM ALT I
STA 515+00 TO STA 573+00

ROUTE: I-10
LOCATION: I-10 - JCT. I-19 TO KOLB ROAD
SR 210 - GOLF LINKS TO I-10

PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

SHEET ___ OF ___

TRACS NO. H7825 01L | 010-E(210)A

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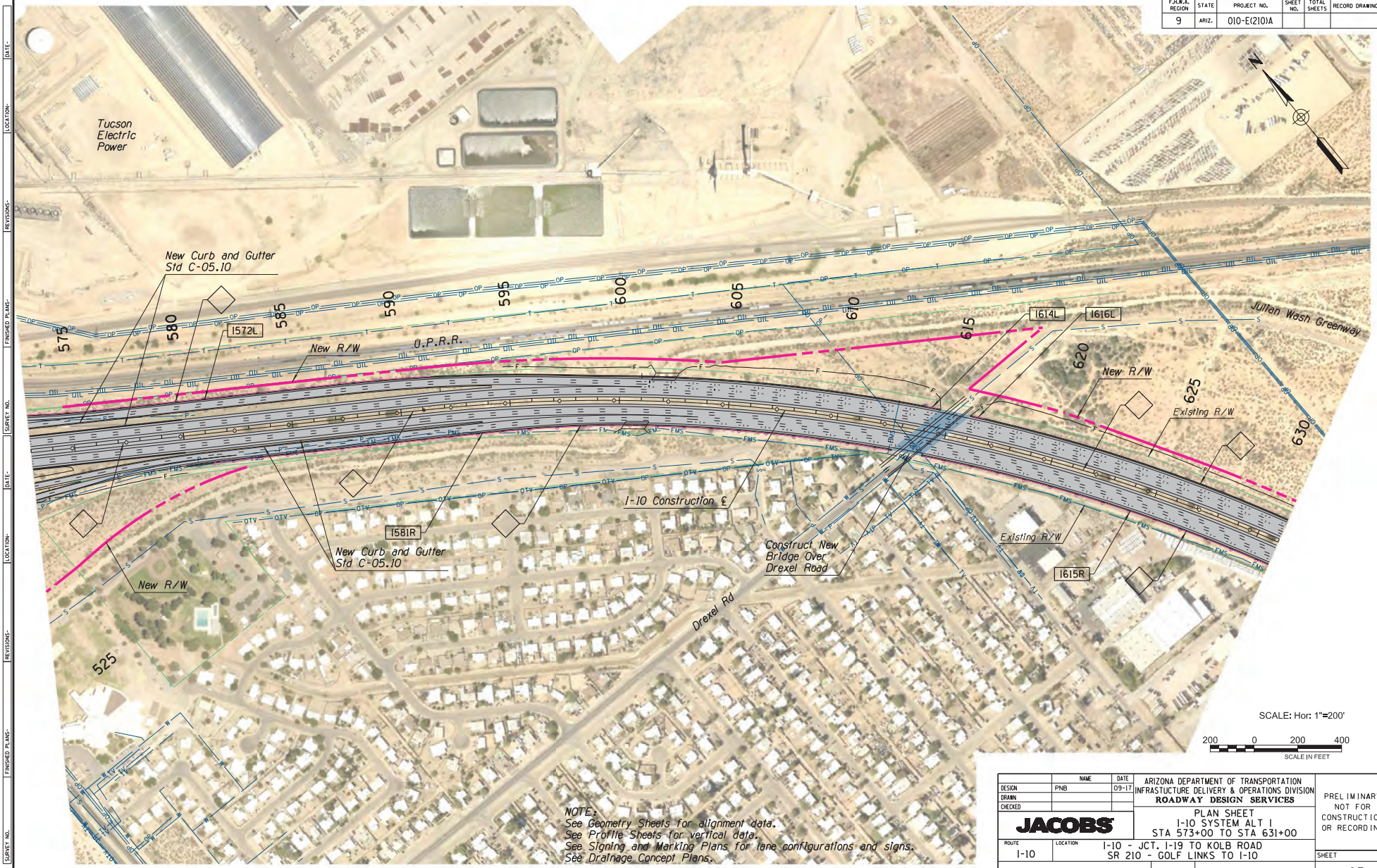

NOTE:
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See Drainage Concept Plans.

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JACOBS

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTUCTURE DELIVERY & OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

PLAN SHEET
I-10 SYSTEM ALT I
STA 573+00 TO STA 631+00

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION
I-10	I-10 - JCT. I-19 TO KOLB ROAD SR 210 - GOLF LINKS TO I-10

SHEET ___ OF ___

TRACS NO. H7825 01L | 010-E(210)A

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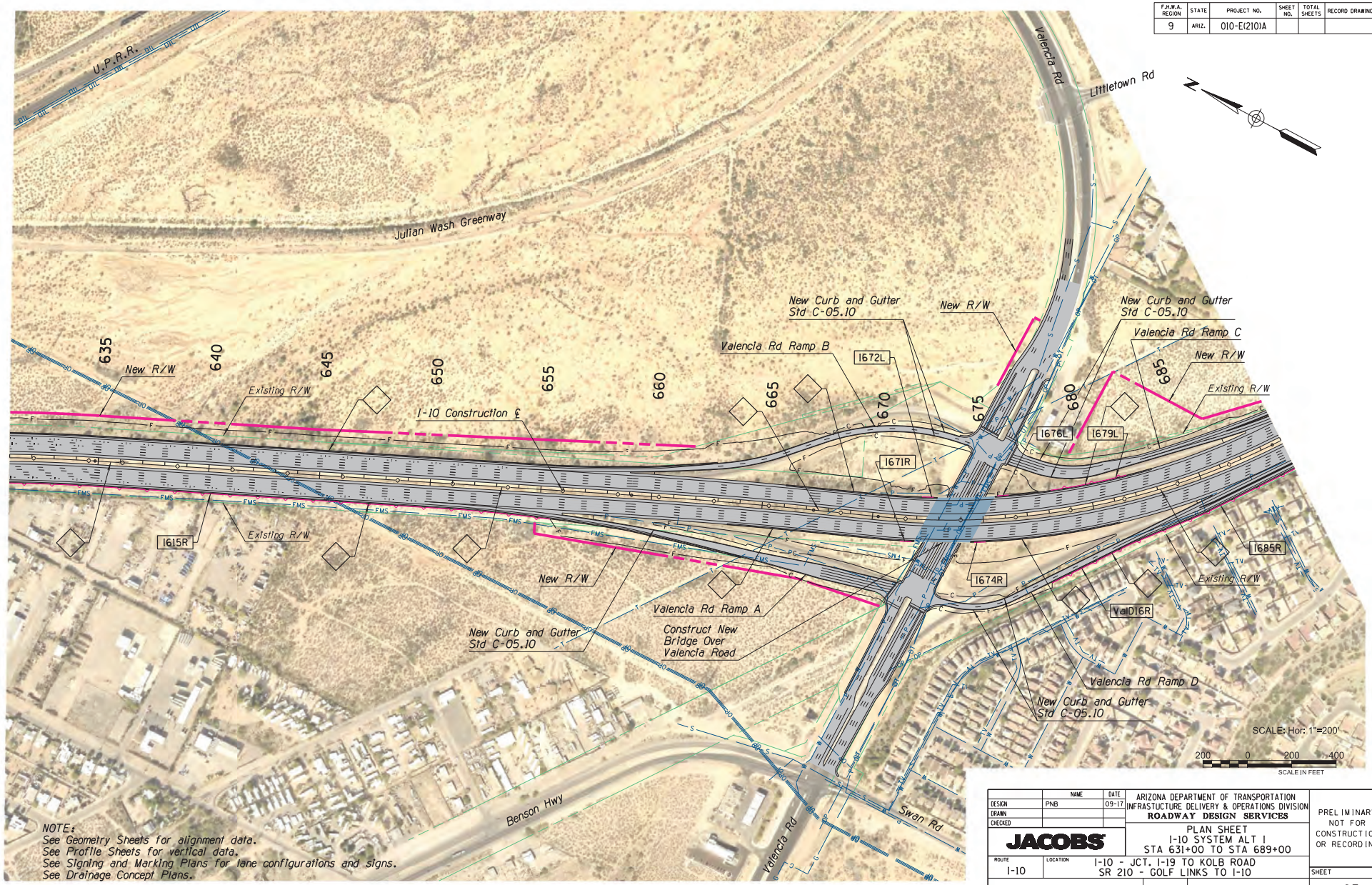

NOTE:
See Geometry Sheets for alignment data.
See Profile Sheets for vertical data.
See Signing and Marking Plans for lane configurations and signs.
See Drainage Concept Plans.

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DESIGN	PNB	09-17
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JACOBS

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTUCTURE DELIVERY & OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

PLAN SHEET
I-10 SYSTEM ALT I
STA 631+00 TO STA 689+00

ROUTE: I-10
LOCATION: I-10 - JCT. I-19 TO KOLB ROAD
SR 210 - GOLF LINKS TO I-10

PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

SHEET ___ OF ___

TRACS NO. H7825 01L | 010-E(210)A

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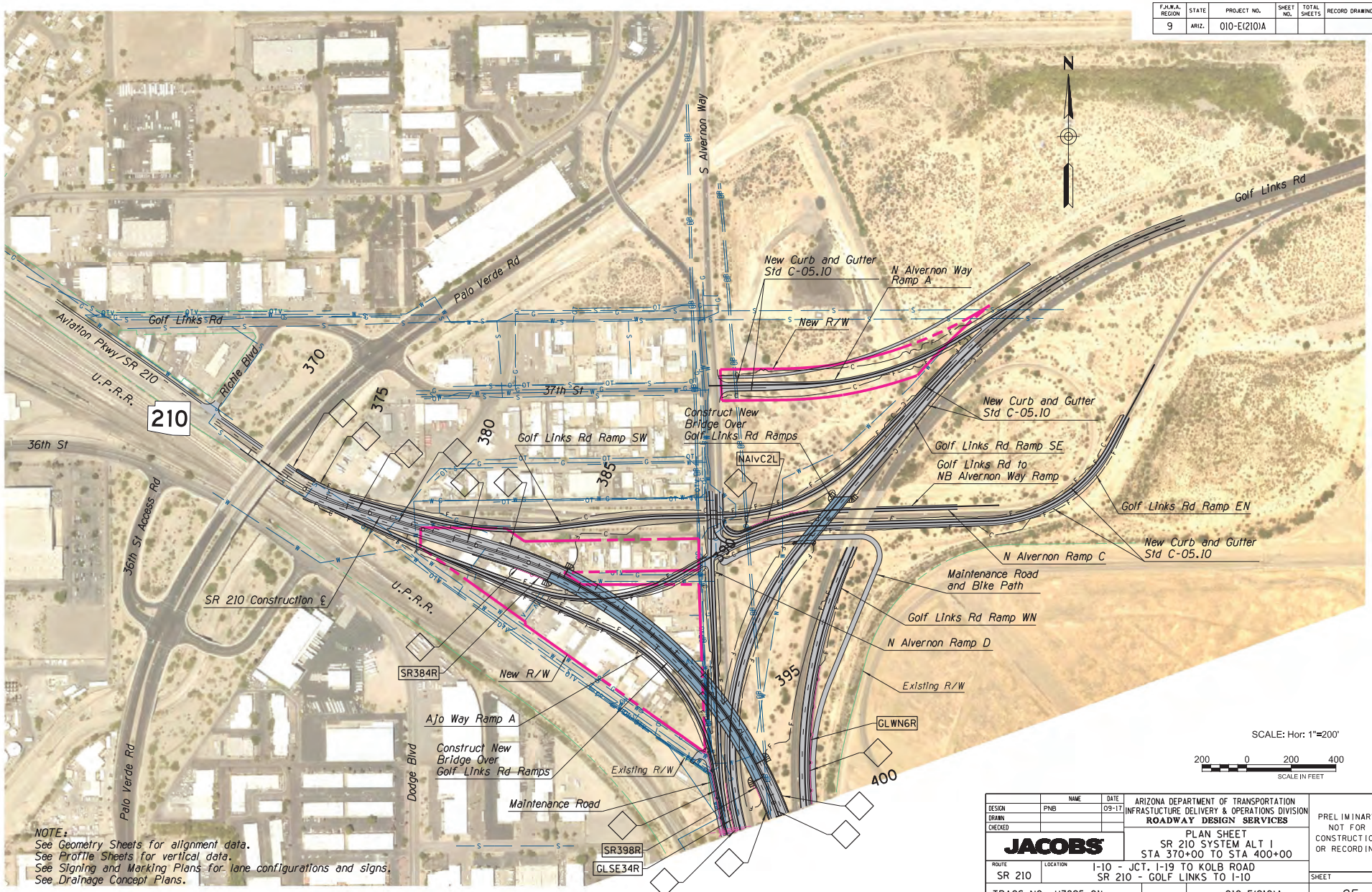

NOTE:
See Geometry Sheets for alignment data.
See Profile Sheets for vertical data.
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See Drainage Concept Plans.

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JACOBS

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTUCTURE DELIVERY & OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

PLAN SHEET
SR 210 SYSTEM ALT I
STA 370+00 TO STA 400+00

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 210
LOCATION: I-10 - JCT. I-19 TO KOLB ROAD
SR 210 - GOLF LINKS TO I-10

SHEET ____ OF ____

TRACS NO. H7825 01L | 010-E(210)A

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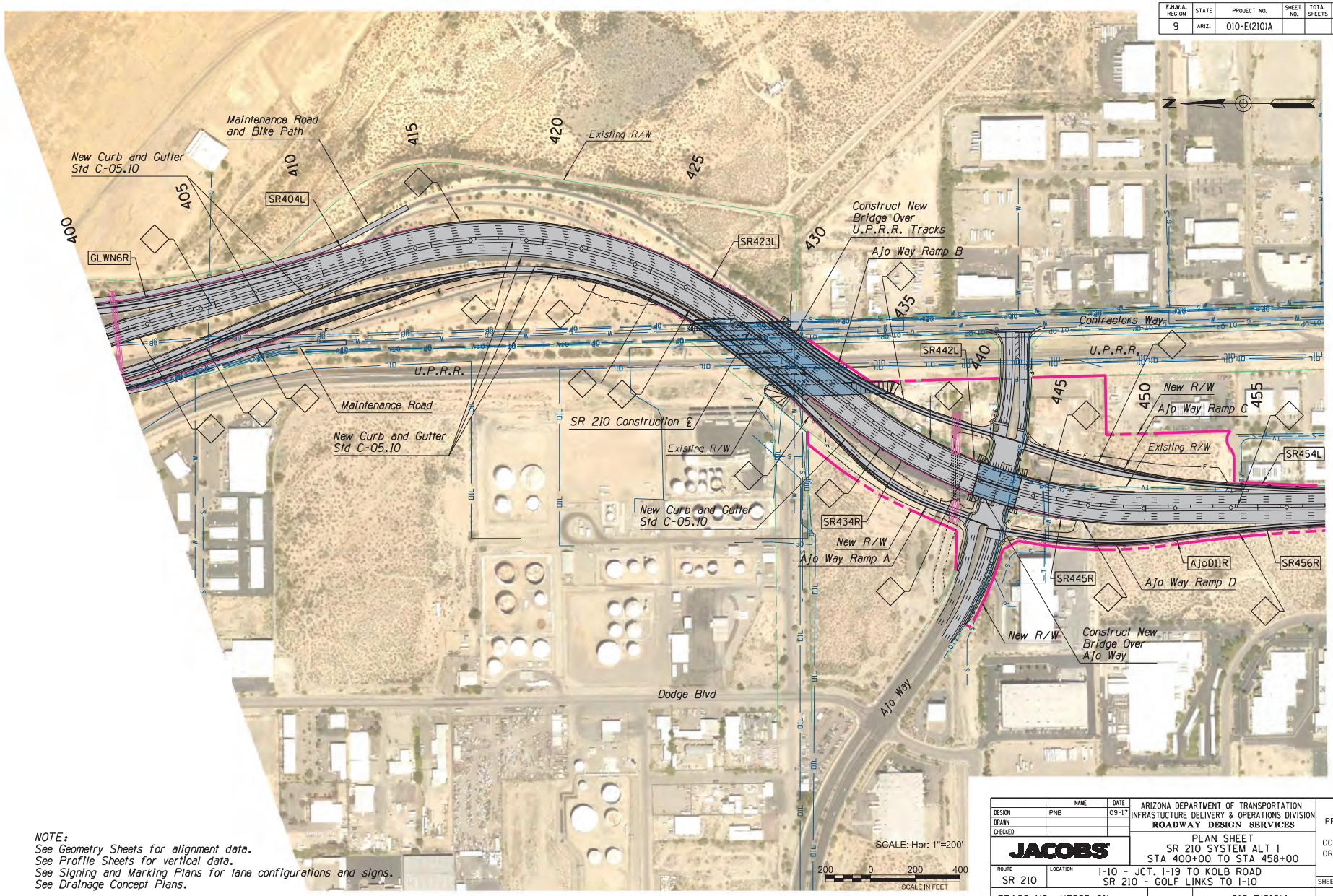

NOTE:
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DESIGN	PNB	09-17
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JACOBS

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTUCTURE DELIVERY & OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

PLAN SHEET
SR 210 SYSTEM ALT I
STA 400+00 TO STA 458+00

ROUTE: SR 210
LOCATION: I-10 - JCT. I-19 TO KOLB ROAD
SR 210 - GOLF LINKS TO I-10

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

SHEET ___ OF ___

TRACS NO. H7825 01L | 010-E(210)A

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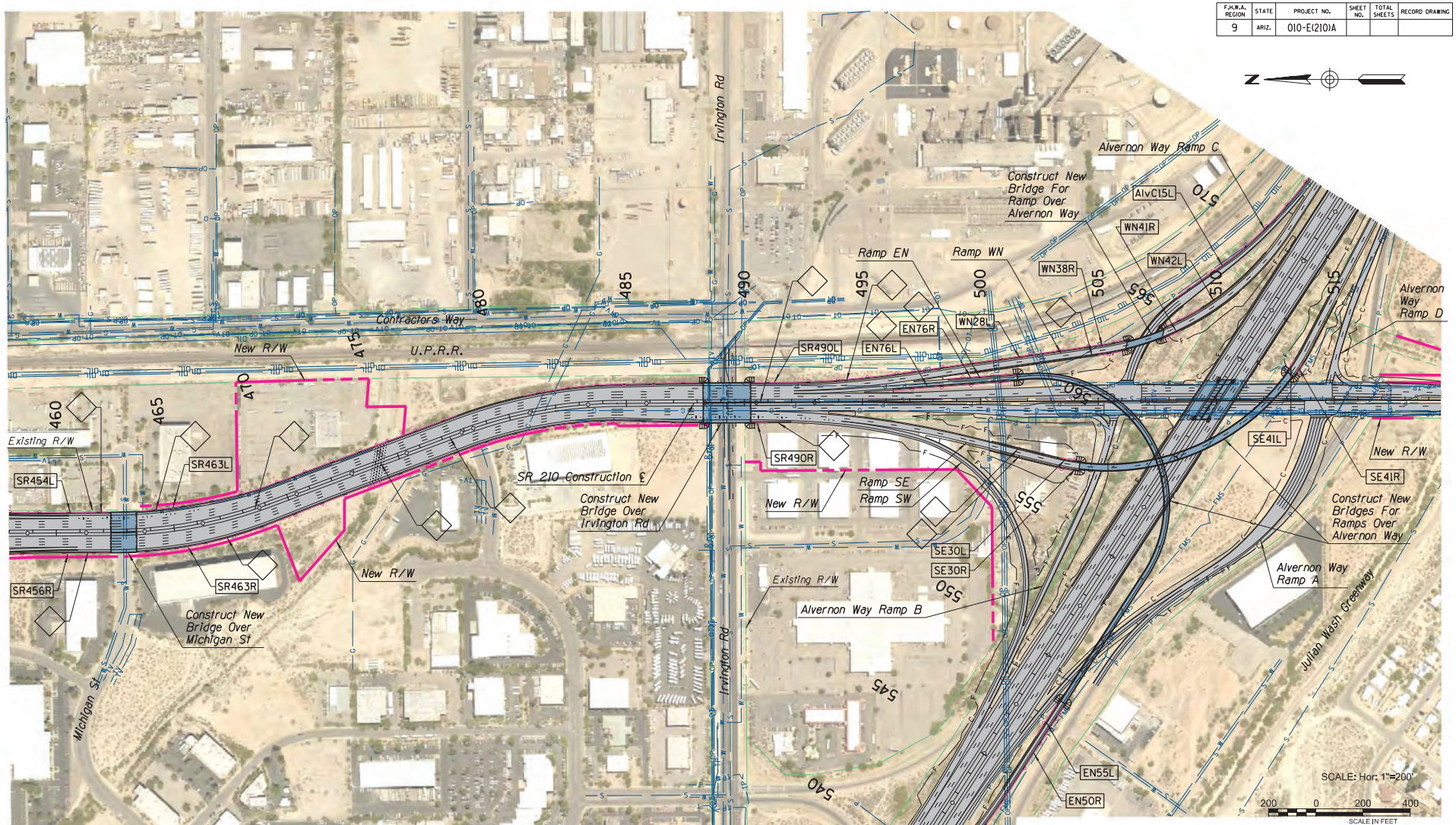

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JACOBS

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTUCTURE DELIVERY & OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

PLAN SHEET
SR 210 SYSTEM ALT I
STA 458+00 TO STA 520+00

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 210
LOCATION: I-10 - JCT. I-19 TO KOLB ROAD
SR 210 - GOLF LINKS TO I-10

SHEET ___ OF ___

TRACS NO. H7825 01L | 010-E(210)A

10/10/2017 P:\W7X89402 I-10 DCR-EA\700 PROJTEC\710CIVIL\702ADGN\H7825p15.dgn

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EXHIBIT J-9

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THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
5000 W. CAREFREE HIGHWAY
PHOENIX, AZ 85086-5000
(602) 942-3000 • WWW.AZGFD.GOV
REGION V, 555 N. GREASEWOOD ROAD, TUCSON, AZ 85745

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DIRECTOR
TY E. GRAY
DEPUTY DIRECTOR
TOM P. FINLEY

October 30, 2017

Ms. Renee Darling
Senior Environmental & Land Use Planner
Tucson Electric Power Company
Land Resources – RC131
3950 E Irvington Rd
Tucson, AZ 85714-2114

Re: Tucson Electric Power Reciprocating Internal Combustion Engine Generation and Irvington 138-kV Transmission Line Relocation Projects

Dear Ms. Darling:

Thank you for providing information for the Tucson Electric Power (TEP) Reciprocating Internal Combustion Engine (RICE) Generation and Irvington 138-kV Transmission Line Relocation Projects, and for meeting with me on site for further discussion of the projects.

Due to the urban/industrial location of the projects and absence of wildlife habitat, and TEP's standard best management practices (BMPs), the Arizona Game and Fish Department currently has no concerns regarding potential impacts to wildlife or wildlife habitat posed by these two associated projects.

The Department appreciates your continuing coordination on this and additional future projects. As development of these projects continue, please contact me if anything new arises that you feel may impact wildlife. I can be reached at kterpening@azgfd.gov, or 520-388-4447.

Sincerely,

Kristin Terpening
Habitat, Evaluation & Lands Program Specialist, Region V

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EXHIBIT J-10

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Reciprocating Internal Combustion Engine Generation Project and Irvington 138kV Transmission Line Relocation Projects - Comments						
Comment No.	**Date**	**Method**	**Category**	**Please indicate any issues that are important to you in evaluating the RICE and transmission line projects:**	**Is there any additional Information that you would like TEP to consider when designing these projects:**	**Response/Action**
1	10/18/2017	Comment Form at Public Meeting	Noise	Noise	Keep residents informed	Discussed current and future noise levels with the Hernandez' at public meeting
2a	10/14/2017	Email	Technical/Cost	1. What's the expected LCOE per kWh for RICE? 2. What's the expected years of life for RICE? 3. And what % increase in LCOE is expected over the life of that equipment? 4. What are the major cost components & % of cost(I.e., O & M? Natural Gas?) 5. How many hours a year does TEP plan to use the equipment? 6. Are there any heat trapping or health related emissions created by the demand for natural gas(mining) and combustion of the natural gas? 7. Will current rapid response peaker equipment capacity be stranded? If so, what is the amount or value of the loss and will that be charged to ratepayers?		Thank you for reaching out to TEP regarding the RICE project. I apologize for the delayed response. The public meeting went well. We had 10 attendees. The primary areas of interest were how the RICE technology works, what it looks like, and what are the noise levels. Below is TEP's response to your questions 1-7, dated 10/16/17 and question 8, dated 10/17/17; which included; 1. What's the expected LCOE per kWh for RICE? 2. What's the expected years of life for RICE? 3. And what % increase in LCOE is expected over the life of that equipment? 4. What are the major cost components & % of cost(I.e., O & M? Natural Gas?) 5. How many hours a year does TEP plan to use the equipment? 6. Are there any heat trapping or health related emissions created by the demand for natural gas(mining) and combustion of the natural gas? 7. Will current rapid response peaker equipment capacity be stranded? If so, what is the amount or value of the loss and will that be charged to ratepayers? 8. What's the current energy storage price/kWh and what's the projected price/kWh in 5-years? Assume kWh discharged for the expected life of the asset. Presume its something like 2c/kWh based on the recent TEP PPA for solar + storage. For your questions regarding the levelized costs of energy and battery storage, please take a look at our 2017 Integrated Resource Plan (IRP), which is posted on our website at https://www.tep.com/wp-content/uploads/2017/04/TEP-2017-Integrated-Resource.pdf. Cost details are available in Chapter 4. For example, the IRP considers fuel, capital, property tax and insurance, and operations and maintenance costs to provide a levelized cost of $130 per megawatt hour (MWh) for reciprocating internal combustion engines (RICE) with a resource life of 30 years. Levelized costs do not change over the life of an asset. We file a new IRP every two years and may recalculate levelized costs based on new assumptions as technologies advance and costs change.
						The RICE units will replace two aging natural gas-fired steam boilers that were built in the 1950s and are nearing the end of their useful lives. As mentioned in our other materials, RICE units are designed to be fast and flexible, so they're well-equipped to support our expanding renewable portfolio by addressing variability and other issues. We're working to deliver at least 30 percent renewable power to customers by 2030. Steam boilers don't have that same flexibility as RICE units to support this expansion. RICE units also are more efficient, so we expect less natural gas burn, lower emissions, and lower water use. For questions about natural gas production, you may want to visit the U.S. Energy Information Administration website at https://www.eia.gov/energyexplained/index.cfm?page=natural_gas_environment. Finally, regarding the impact to ratepayers, the capital costs associated with adding the RICE units could be considered in a future rate case and would be subject to Arizona Corporation Commission approval like other system resources that provide service to customers. Customer rates are based on costs of service. A portion of fuel costs are passed along to customers without markup through the Purchased Power and Fuel Adjustment Charge. Regarding current TEP rapid response peaking equipment, it will continue to be used in to the foreseeable future. In summary, answers related to Questions 1-5 & 8 can be found in TEP's IRP, information related to Question 6 can be found on the U.S Energy Information website, and answer to Question 7 is in the text above.
2b	10/17/2017	Email	Technical/Cost	What's the current energy storage price/kWh and what's the projected price/kWh in 5-years? Assume kWh discharged for the expected life of the asset. Presume its something like 2c/kWh based on the recent TEP PPA for solar + storage.		See above.
2c	10/17/2017	Email	Technical/Cost	I like the promise of RICE, and of course, multiple fixed cost local Utility scale solar with energy storage....at substation circuit level, with cyber and demand response functionality.....store-sell excess SGS energy for sale at retail$....create higher wage local jobs, population growth, more ratepayers-taxpayers, revenues without need to increase rates-taxes.		n/a
2d	10/27/2017	Email	Technical/Cost	Can you provide LCOS-LCOE for energy storage equivalent comparable to the LCOE for RICE($135/mwh)? I could not find it in the IRP.		I believe what you are looking for is in our IRP. Pages 90-91 provide an overview. You can find cost details in two charts on pages 93 and 101, and in a table on page 100."

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