PUC DOCKET NO. 45601

APPLICATION OF LCRA TRANSMISSION SERVICES CORPORATION TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE PROPOSED ZORN-TO-MARION 345-KV TRANSMISSION LINE IN GUADALUPE COUNTY, TEXAS

BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS

DIRECT TESTIMONY AND EXHIBITS

OF

AIMEE L. PASQUARELLA, P.E. 107629

ON BEHALF OF

APPLICANT

LCRA TRANSMISSION SERVICES CORPORATION

March 1, 2016
PUC DOCKET NO. 45601
DIRECT TESTIMONY AND EXHIBITS OF AIMEE L. PASQUARELLA

TABLE OF CONTENTS

I. INTRODUCTION .......................................................................................................................... 3
II. SCOPE AND PURPOSE OF TESTIMONY .................................................................................. 4
III. DESCRIPTION OF THE PROJECT ............................................................................................ 5
IV. STRUCTURE TYPE AND ROW WIDTH ..................................................................................... 6
V. ENGINEERING CONSIDERATIONS ............................................................................................ 7
VI. COST ESTIMATES FOR THE PROJECT .................................................................................... 11
VII. SUMMARY AND CONCLUSIONS .............................................................................................. 13

EXHIBITS

Exhibit ALP-1: FA&A Report

Exhibit ALP-2: Electric and Magnetic Field Calculations
I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.
A. My name is Aimee L. Pasquarella. My business address is: Lower Colorado River Authority (LCRA), 3505 Montopolis Drive, Bldg D, Austin, Texas 78744.

Q. WHAT IS YOUR CURRENT OCCUPATION?
A. I am an Engineer employed by the LCRA in the Line and Structural Engineering Department.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.
A. I earned a Bachelor of Science Degree in Architectural Engineering from The University of Texas at Austin in 2005. I am a licensed professional engineer in the State of Texas (License No. 107629).

From 2005 to 2013, I worked in the building design industry as a structural engineer. I was responsible for the analysis, design, and construction document preparation of the primary structural system for buildings and other structures. I was in charge of procuring structural materials, project proposal estimates, obtaining consulting services, and construction oversight. In addition, I coordinated with architects and other design professionals throughout each of the projects.

In 2013, I joined the Line and Structural Engineering Department at LCRA.

Q. PLEASE STATE YOUR CURRENT JOB RESPONSIBILITIES.
A. I provide professional services related to the engineering design of electric transmission lines owned and operated by LCRA Transmission Services Corporation (LCRA TSC). I am responsible for organizing, executing, and managing various types of transmission line projects and ensuring that the designs address the provisions and requirements of applicable engineering regulations, guidelines, and standards. I prepare cost estimates, perform engineering calculations, procure consulting services, structures, and other
materials, prepare construction documents (drawings, specifications, and cost estimates),
provide construction support and oversight, and provide engineering support to
maintenance and operations. I am in charge of maintaining and producing ratings for all
LCRA TSC transmission line conductors, as well as managing a team of engineers who
provide facility ratings for use by LCRA TSC.

Q. HAVE YOU TESTIFIED PREVIOUSLY BEFORE THE PUBLIC UTILITY
COMMISSION OF TEXAS (PUC OR COMMISSION)?
A. No, I have not.

II. SCOPE AND PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?
A. The purpose of my testimony is to describe the engineering, design, and cost aspects of
LCRA TSC’s proposed Zorn to Marion 345-kilovolt (kV) transmission line in Guadalupe
County, Texas (the Project), including:
(1) the design of the proposed transmission line facilities;
(2) how the proposed structures and right-of-way (ROW) widths were selected;
(3) engineering considerations and permits for the proposed transmission line
facilities; and
(4) estimated costs for the proposed transmission line facilities.

Q. WHAT PORTIONS OF LCRA TSC’S APPLICATION TO AMEND ITS
CERTIFICATE OF CONVENIENCE AND NECESSITY (CCN) FOR THE
PROJECT (APPLICATION) DO YOU SPONSOR?
A. I sponsor the answers to Questions 5, 7, 8, and 13 in the Application. I also co-sponsor
the answers to Questions 6, 20, and 23 with Mr. Rob Reid, and Questions 4 and 11 with
Ms. Roxanne Hernandez and Mr. Charles DeWitt. I sponsor Section 1 of the
Environmental Assessment and Alternative Route Analysis for the Proposed Zorn to
Marion 345-kV Transmission Line Project within Guadalupe County, Texas (EA)
prepared by POWER Engineers, Inc. (POWER) (except Section 1.2, which is sponsored
by Mr. DeWitt).
Q. WAS YOUR TESTIMONY AND THE INFORMATION YOU HAVE BEEN IDENTIFIED AS SPONSORING OR CO-SPONSORING PREPARED BY YOU OR BY KNOWLEDGEABLE PERSONS UPON WHOSE EXPERTISE, JUDGMENT, AND OPINIONS YOU RELY IN PERFORMING YOUR DUTIES?
A. Yes, it was.

Q. IS THE INFORMATION CONTAINED IN YOUR TESTIMONY AND THE INFORMATION YOU ARE SPONSORING TRUE AND CORRECT TO THE BEST OF YOUR KNOWLEDGE AND BELIEF?
A. Yes, it is.

III. DESCRIPTION OF THE PROJECT

Q. PLEASE DESCRIBE THE PROJECT.
A. LCRA TSC proposes to construct and operate a new 345-kV electric transmission line between the existing LCRA TSC Zorn and Marion substations in Guadalupe County. A portion of the transmission line will be constructed on an open position of LCRA TSC’s existing structures beginning at the Zorn substation and continuing to a location near the existing LCRA TSC Clear Springs substation. The remaining portion of the transmission line will require the construction of new 345-kV double-circuit capable structures from the vicinity of the Clear Springs substation to the Marion substation. LCRA TSC will initially install one 345-kV circuit on the new structures with the provision for a second circuit to be installed in the future. The entire project will be approximately 19 to 23 miles in length, depending on the final route selected. The portion requiring new structures on new ROW will be approximately 10 to 14 miles in length.

The initial 345-kV circuit will consist of two 959.6 kcmil 26/7 ACSS/TW “Suwannee” conductors per phase, and will be shielded with a fiber optic ground wire (OPGW). The circuit will be rated for operation at 3,288 amperes, yielding a nominal 1,965 mega-Volt amperes (MVA) capacity. Typical spans between structures are estimated to range from approximately 900 to 1,500 feet. In some areas, spans could be more or less than the typical spans, depending upon terrain and other engineering constraints. New transmission structures will be constructed on new easements, typically
160-feet wide but varying from an estimated minimum of 120 feet, to an estimated maximum of 200 feet, depending on span length and other engineering constraints.

IV. STRUCTURE TYPE AND ROW WIDTH

Q. WHAT TYPICAL STRUCTURE TYPE AND ROW WIDTH DOES LCRA TSC PROPOSE TO USE FOR THIS PROJECT AND WHY?

A. LCRA TSC proposes to use steel or concrete poles for the Project. In evaluating whether to use pole or lattice tower structures, I considered the following information: public input, cost, nominal distance between structures (i.e., span length), ROW requirements, potential land use impacts, potential environmental impacts, engineering constraints, construction and maintenance issues, and schedule. A detailed explanation of these variables can be found in the response to Question 5 of the Application. The geometries of the alternative structure types are shown in Figures 1-4 through 1-10 of the EA.

The determination of material type (concrete or steel) will be made during the detailed design phase of the Project, considering factors such as location accessibility, terrain, cost, schedule and other factors. In some areas, such as distribution line crossings, transmission line crossings, highway crossings, and near airports, lower than typical, higher than typical, or alternative structure types may be required. In accordance with the specific ordering language of the Commission, LCRA TSC could, in some locations, use other alternative structure types, including H-frames and lattice towers.

The portion of the Project requiring new structures will typically require 160-foot wide easements, utilizing spans that typically range from approximately 900 to 1,500 feet. In some areas, spans could be more or less than the typical spans, depending on terrain and other engineering constraints with easement widths varying to address similar concerns. These easement widths are estimates. Actual widths will be determined during the detailed design phase of the Project. Access easements and/or temporary construction easements may be needed in some areas as well.
Q. WHAT IMPACT WILL THE NEW BRAUNFELS MUNICIPAL AIRPORT HAVE ON THE PROPOSED STRUCTURE TYPE AND ROW WIDTH?
A. Along some proposed alternative route segments located near the New Braunfels Municipal Airport, LCRA TSC may be required to use low profile structures, such as H-frame structures, to meet FAA criteria. The decision as to the use of specific structure types will be determined in discussions with the FAA after the Commission selects a final route. For estimating purposes, at the locations where LCRA TSC anticipates a need to use low profile structures, I included the cost for H-frame structures in the cost estimates.

Low-profile structures are arranged with all the conductor wires at the same elevation in a horizontal configuration. This configuration has a wider footprint than typical pole or lattice tower structures, which have the conductor wires stacked in a vertical configuration. Therefore, a 200-foot wide easement is estimated at all locations where H-frame structures are anticipated. These locations include routes near the New Braunfels Municipal Airport as well as locations where another transmission line is expected to be crossed.

V. ENGINEERING CONSIDERATIONS

Q. WHAT ENGINEERING CONSIDERATIONS WILL BE USED IN THE DESIGN OF THE PROJECT?
A. LCRA TSC will design the Project to meet or exceed nationally recognized guidelines and specifications for operating the transmission facilities in a safe and reliable manner, including the Rural Utilities Service (RUS) “Design Manual for High Voltage Transmission Lines.” LCRA TSC will design the Project to meet or exceed the requirements of the applicable version of the National Electrical Safety Code (NESC). The Project will also comply with all applicable state and federal statutes and regulations as well as LCRA TSC’s Transmission Line Engineering Standards.

Q. HOW WILL LCRA TSC DETERMINE THE FINAL ALIGNMENT OF THE ROUTE APPROVED BY THE COMMISSION?
A. Following Commission approval, engineers for LCRA TSC will begin detailed design of the Project and develop an alignment based on the approved route. This will involve
gathering detailed survey information, including locations of above-ground, at-grade, and
sub-surface constraints and precise property line locations, as well as any locations of
environmental and cultural resources. In accordance with allowances set forth in the
Commission’s order, minor adjustments may still be made during construction if needed.

Q. WILL LCRA TSC CONTINUE TO WORK WITH LANDOWNERS TO MAKE
MINOR ROUTE ADJUSTMENTS AFTER COMMISSION APPROVAL?
A. Yes. In accordance with allowances set forth in the Commission’s order, LCRA TSC
will work with landowners on routing modifications in designing the location of the
structures.

Q. PLEASE DESCRIBE THE TYPICAL CONSTRUCTION, OPERATION, AND
MAINTENANCE PROCESS FOR A TRANSMISSION LINE OF THE TYPE
PROPOSED FOR THE PROJECT.
A. Projects of this type require surveying, ROW clearing, foundation installation, structure
assembly and erection, conductor and shield wire installation, and cleanup. Periodic
inspection of the ROW, structures, and wires will be performed following construction.
These activities are described further in Sections 1.5 and 1.6 of the EA.

Q. DOES LCRA TSC MITIGATE THE POTENTIAL IMPACTS OF THE
CONSTRUCTION, OPERATION, AND MAINTENANCE OF TRANSMISSION
LINES ON THE PUBLIC?
A. Yes. LCRA TSC utilizes a number of standard practices to mitigate vegetation removal,
construction, and maintenance impacts. These practices are discussed in detail in
Sections 1.3, 1.5, and 1.6 of the EA.

Q. DOES LCRA TSC PLAN TO CONSTRUCT ANY OF THE PROJECT IN ROAD
ROW?
A. No. LCRA TSC does not propose to place any structures of the transmission line within
any road ROW. Consistent with LCRA TSC’s typical practice, where the proposed
transmission line is parallel to roads, LCRA TSC will place the transmission line
structures on private property and not within the road ROW. Where the proposed
transmission line crosses a state- or county-maintained road or highway, LCRA TSC will obtain a crossing permit from the appropriate agency. In addition, if any portion of the transmission line will be accessed from a state- or county-maintained road or highway, LCRA TSC will obtain the appropriate permit from the appropriate agency if required.

Q. **DO YOU HAVE ANY CONCERNS WITH THE FEASIBILITY OF PROPOSED ALTERNATIVE ROUTE SEGMENTS LOCATED IN PROXIMITY TO THE NEW BRAUNFELS MUNICIPAL AIRPORT?**

A. No. I consulted with Federal Airways and Airspace (FA&A), consulting experts for FAA matters, to understand the airspace limitations around the New Braunfels Municipal Airport, in addition to several other FAA facilities within or near the Project study area. In some locations, and along certain route segments located near the New Braunfels Municipal Airport, it is possible that LCRA TSC could use a low profile structure type, such as H-frames, to avoid potential interference. Based on my consultations, all of the proposed alternative route segments can be designed and constructed to fit below the FAA airspace constraints, if necessary. The report prepared by FA&A is attached as Exhibit ALP-1.

Q. **CAN LCRA TSC SAFELY AND RELIABLY CONSTRUCT, OPERATE, AND MAINTAIN A TRANSMISSION LINE THAT CROSSES A FLOODPLAIN?**

A. Yes. LCRA TSC has constructed, operates, and maintains transmission lines within the 100-year floodplain in numerous locations throughout its system. The presence of a 100-year floodplain along the path of a transmission line is taken into account during design of the facilities and does not prevent the safe and reliable construction, operation, and maintenance of a properly designed and constructed transmission line.

Q. **WILL ANY ADDITIONAL PERMITS OR APPROVALS BE REQUIRED FOR THE PROJECT AND, IF SO, WHEN WILL THEY BE OBTAINED?**

A. Yes. Following Commission approval of the Project, permits or other agency actions will be required and will be obtained during the design phase of the Project, when specific structure locations and heights have been determined, and prior to construction. Permits or regulatory approval may be required from the following agencies:
The potential permits or regulatory approvals are described in more detail in Section 1.3 of the EA.

Q. DID YOU HAVE ANY CALCULATIONS PERFORMED RELATED TO THE PROJECT’S ELECTRIC AND MAGNETIC FIELDS (EMF)?

A. Yes. I calculated EMF for two line configurations based on expected Electric Reliability Council of Texas (ERCOT) transmission line load flows. The line configurations included:

- A vertical configuration double-circuit pole or lattice tower with a 35’ minimum ground clearance (only one circuit installed).
- A vertical configuration double-circuit pole or lattice tower with a 35’ minimum ground clearance (two circuits installed).

I calculated magnetic fields in milliGauss (mG) and electric fields in kV per meter (kV/m). The results, at various distances from the centerline, are presented in Exhibit ALP-2.

Q. WHAT ARE THE UNDERLYING ASSUMPTIONS FOR THESE EMF CALCULATIONS?

A. The EMF calculations presented in Exhibit ALP-2 assume peak loading. The calculation results are taken at a mid-span cross-section where the conductors are at their maximum sag, which results in calculating the highest potential EMF for the span. At most times and in most places, the EMF will be less than those presented in the exhibit.
Q. DID LCRA TSC’S EMF CALCULATIONS REVEAL ANY CONCLUSIONS THAT AFFECT THE ROUTING OF THE LINE?
A. No. The calculated EMF levels are comparable to other lines of this type.

VI. COST ESTIMATES FOR THE PROJECT

Q. WHAT ARE LCRA TSC’S ESTIMATED COSTS FOR THE PROJECT?
A. LCRA TSC’s estimated costs for the Project range from $47.7 million to $61.6 million, with new route lengths ranging from 9.9 to 13.6 miles and total route lengths ranging from 18.4 to 23.6 miles. The estimated costs are tabulated in Attachment 2 of the Application.

Q. WHAT INFORMATION WAS USED AS A BASIS FOR GENERATING THE COST ESTIMATES?
A. I used information from a variety of sources, including segment data from the EA and geographic information system (GIS) analysis, preliminary designs and costs from LCRA TSC vendors and contractors based on long-term contract pricing models, and construction cost estimates based on a review of the Project area. Estimates are based on current pricing.

Q. ARE THERE DIFFERENCES IN THE COST OF THE ROUTES?
A. Yes. For this Project, differences in the cost of the routes were primarily due to line length and number of angles or turns on the line. Because cost items such as surveying, engineering, and wire are a function of line length, and cost items such as materials and construction are generally a function of line length (among other things), shorter routes will generally have lower costs and longer routes will generally have higher costs. However, just because a route is the shortest does not mean that it will be the least costly. There are other factors to consider, such as number of angles or turns on the route. A route with more turns will require more angle and dead-end type structures, which are more costly to procure and construct than tangent structures. In addition, dead-end hardware (and terminating or “dead-ending” the wire) is more costly than angle and tangent hardware, both to procure and to install. Other factors that influence the cost of a
route could include, but are not limited to, the number of other transmission line crossings, number of structures within the floodplain, potential airport airspace restrictions, and differences in estimated real estate costs.

Q. WHAT METHOD WAS USED FOR GENERATING THE REAL ESTATE COST ESTIMATES?

A. The real estate cost estimates for the Project were developed using the following steps:

- Identify the parcels crossed by the estimated transmission line easement for each segment, and determine the estimated easement acreage on each parcel.
- Obtain the county tax appraisal market value for each parcel. Use the tax appraisal value to determine the cost per acre for each parcel.
- Calculate the estimated easement cost on each parcel by multiplying the estimated easement acreage on the parcel by the tax appraisal market value per acre.
- For each segment, sum the estimated easement cost per parcel to obtain the total estimated easement cost for the segment.
- The estimated easement cost is then multiplied by a factor of 3. The factor accounts for additional costs associated with items not specifically included in the estimated cost of the easement on a per parcel basis. These items include, but are not limited to, temporary construction easements, damages to the remainder, construction damages, temporary or permanent off ROW access easements, changes in land use and/or land value during the period of time between the preparation of the estimate and acquisition, and additional compensation required as an outcome of litigation.

Q. DOES THE REAL ESTATE ESTIMATED COST PER ACRE DETERMINE THE ROW AND LAND ACQUISITION COST FOR A PARCEL?

A. No. Upon selection of a final route by the Commission, LCRA TSC will determine the precise placement of the alignment on each parcel and use property values based on an independent appraisal to develop actual easement acquisition costs for each parcel. The ROW costs presented in the Application that are used for Project cost estimating purposes should not be viewed or considered as appraised, calculated costs to obtain
individual parcels. The data I used to estimate ROW costs for the Project were based on
publicly available, reproducible, and verifiable information. Using this public data
ensured that LCRA TSC applied a consistent method for the purpose of comparing
relative overall cost estimates among all the proposed alternative routes.

Q. DO YOU FIND THE COST ESTIMATES TO BE REASONABLE?
A. Yes, I do. The estimates were prepared using input from LCRA TSC staff with expertise
in different disciplines, including real estate and construction. I reviewed the components
of the transmission line cost estimates and found the cost estimates for the various routes
to be reasonable and consistent with engineering practices and market conditions in effect
on the filing date.

Q. ARE THERE FACTORS THAT COULD AFFECT THE ESTIMATED COSTS
PRESENTED IN THE APPLICATION?
A. Yes. Changes in market conditions, including construction labor and/or the cost of
metals or other natural resources, as well as changes in land use, could increase or
decrease costs above or below the estimates contained in the Application. Over time,
these and other factors could change, resulting in increased or decreased actual costs.

VII. SUMMARY AND CONCLUSION

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.
A. LCRA TSC is proposing to construct a 345-kV electric transmission line from the
existing Zorn substation to the existing Marion substation in Guadalupe County. A
portion of the initially installed circuit will be constructed on existing structures and
ROW and the remaining portion will be constructed with new structures on new ROW.
The entire length of the Project will be approximately 19 to 23 miles, depending on the
final route selected. The Project can feasibly be constructed along any of the proposed
alternative routes presented in the Application.

The initial 345-kV circuit will consist of two 959.6 kcmil 26/7 ACSS/TW
“Suwannee” conductors per phase, and will be shielded with a fiber optic ground wire.
The circuit will be rated for operation at 3,288 amperes, yielding a nominal 1,965 MVA capacity.

Steel or concrete poles are the proposed structure type for the Project on typical 160-foot wide easements. At some locations, specifically in the vicinity of the New Braunfels Municipal Airport, H-frame or other low profile type structures on typical 200-foot wide easements may be used. H-frame structures, on 200-foot wide easements, may also be used at transmission line crossing locations. In some areas, depending on terrain and other engineering constraints, easement widths may be more or less than typical. Actual widths will be determined during the detailed design phase of the Project.

The Project cost estimates are reasonable and consistent with engineering practices and market conditions in effect on the filing date.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.
Aeronautical Impact Statement (AIS)

Document No.: 2015-AIS-1866-OE
Site: Zorn to Marion

Prepared for: LCRA
Date: 19 January 2016
This Aeronautical Impact Statement (AIS) was prepared by Federal Airways & Airspace (FA&A) for LCRA on January 19, 2016.

2015-AIS-1866-OE identifies all potential aeronautical impacts within study area surrounding New Braunfels Regional Airport, for placement of multiple Preliminary Alternative Transmission Line Segments with structure heights of 180 feet AMSL.

Notice and Obstruction Criteria established by Title 14 CFR Part 77, Safe, Efficient Use of the Navigable Airspace were applied¹.

This Aeronautical Impact Statement provides a baseline study establishing the relationship between the National Airspace System (NAS) ² and the preliminary alternative transmission line segments.

Changes to structure height and configuration, coordinates, and the aeronautical environment will warrant a Revision to Document 2015-AIS-1866-OE.

The National Airspace System (NAS) is a dynamic and intricate network of invisible aeronautical surfaces, navigational facilities and landing facilities and is subject to constant revision. Aeronautical datasets are updated regularly at 28 and 56 day intervals. At a minimum, all Aeronautical Impact Statements should be updated annually. The aeronautical environment is also subject to change at any given time as the direct result of new data regarding existing structures and structures for which FAA Form 7460-2, Notice of Actual Construction or Alteration, have been filed. Alterations to the aeronautical environment cannot be anticipated. It is recommended that 2015-AIS-1866-OE be reviewed and a revision published prior to filing FAA Form 7460-1 if more than 56 days elapse between the date of this report and the date that these forms are submitted to the FAA.

The Background Summary of the Final Rule for Title 14 CFR Part 77 states that the FAA is now applying an expanded range of Notice Criteria, and that the FAA web site https://oeaaa.faa.gov must be consulted to determine notice requirements for structures near all airports listed on the web site. Because the web site performs its calculations using the FAA’s Digital Obstacle File (DOF) and OE/AAA Automated System Airport Runway Database, both of which are documented to contain errors and omissions, it is not advisable to consult the FAA website to determine notice requirements. This AIS was compiled using FA&A’s Airspace and TERPS software, which are supported by independent, proprietary obstacle and airport/runway databases in addition to FAA administrated airport/runway data.

¹ Title 14 Code of Federal Regulations Federal Aviation Regulation Part 77, Safe, Efficient Use of the Navigable Airspace, was published in the Federal Register on 21 July 2010 and became effective 18 January 2011.
² Aeronautical Data updates are published every 56 days.
Aeronautical Impact Statement
Zorn to Marion

Table of Contents
Parameters and Assumptions ........................................................................................................... 5
Study area Corner Points & Center Point .......................................................................................... 6
  Preliminary Alternative Transmission Line Segments .................................................................. 7
Aeronautical Environment .................................................................................................................. 8
  Private Landing Facilities ............................................................................................................ 8
  Public Landing Facilities ............................................................................................................. 9
  IFR Notice Criteria .................................................................................................................... 10
Title 14 CFR Part 77 Surfaces ........................................................................................................... 11
  Part 77 Obstruction Surfaces (BAZ) ............................................................................................ 12
    77.17(a) (2) - VFR Transitional Surface .................................................................................. 12
    FAR 77.19(a) and (b) VFR Horizontal and Conical Surfaces ...................................................... 13
    FAR 77.19(a) and (b) IFR Horizontal and Conical Surfaces ...................................................... 14
  BAZ Approach Surface ................................................................................................................. 15
  Randolf Air force Base Auxiliary (SEQ) Approach Surface ........................................................ 16
  BAZ VFR Traffic Pattern Airspace .............................................................................................. 17
  Huber Airpark E70 VFR Traffic Pattern Airspace ...................................................................... 18
New Braunfels Regional Airport Instrument Approach Procedures ................................................ 19
  BAZ LNAV RWY 13 Procedure .................................................................................................... 19
  BAZ VNAV RWY 13 Procedure .................................................................................................... 20
  BAZ LPV RWY 13 Procedure ...................................................................................................... 21
  BAZ LNAV RWY 17 Procedure .................................................................................................... 22
  BAZ LNAV RWY 31 Procedure .................................................................................................... 23
  BAZ VNAV RWY 31 Procedure .................................................................................................... 24
  BAZ LPV RWY 31 Procedure ...................................................................................................... 25
  BAZ LNAV RWY 35 Procedure .................................................................................................... 26
  BAZ VNAV RWY 35 Procedure .................................................................................................... 27
  BAZ LPV RWY 35 Procedure ...................................................................................................... 28
  BAZ VOR/DME -A Procedure ..................................................................................................... 29
  BAZ Circling Areas ....................................................................................................................... 30
  BAZ Runway 13 Initial Climb Area ............................................................................................. 31
Parameters and Assumptions

The defined study area, located in Texas, will be analyzed to determine the maximum allowable heights surrounding multiple proposed Preliminary Alternative Transmission Line Segments within the study area boundaries for construction of numerous 180 foot AGL preliminary alternative transmission structures. Line sections which could potentially impact the studied surfaces are listed on each page. The ground elevation was analyzed within each surface to accurately identify these line sections.

Project Statistics

There are 2 public-use, and 22 private-use airports within approximately 10 Nautical Miles of the study area. Additionally, there are 5 public-use Instrument Approach Procedures currently in use at New Braunfels Regional Airport (BAZ), as well as Part 77 surfaces at Huber Airpark (E70) within the surrounding area that will require analysis.

Aeronautical Impact Analysis

The following will be reviewed for the public-use airports:

- Federal Notice Criteria limits over property
- Obstacle Criteria height limits over property
- Near airport surfaces
- VFR Traffic Pattern limits
- TERPS/Instrument Approach Procedures

En Route Airways, Minimum Safe Altitude (MSA) and Minimum Vector Altitude (MVA) will also be assessed.

Each private-use airport will be investigated for special/private instrument procedures that are protected by the FAA and would impose height restrictions upon the study area.

Lastly, impact of the proposed transmission line within the study area to NEXRAD Weather Radar, Air Route Surveillance Radar (ARSR), Airport Surveillance Radar (ASR), Military Operations Areas (MOA) and potential impacts to other air navigation facilities will be reviewed.
## Study area Corner Points & Center Point

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Latitude (N)</th>
<th>Longitude (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corner 1</td>
<td>29-41-59.01</td>
<td>98-00-09.39</td>
</tr>
<tr>
<td>Corner 2</td>
<td>29-42-08.85</td>
<td>98-03-46.57</td>
</tr>
<tr>
<td>Corner 3</td>
<td>29-40-03.89</td>
<td>98-06-29.79</td>
</tr>
<tr>
<td>Corner 4</td>
<td>29-38-02.36</td>
<td>98-10-34.41</td>
</tr>
<tr>
<td>Corner 5</td>
<td>29-35-29.05</td>
<td>98-08-55.88</td>
</tr>
<tr>
<td>Corner 7</td>
<td>29-35-14.92</td>
<td>98-02-57.54</td>
</tr>
<tr>
<td>Corner 8</td>
<td>29-35-53.03</td>
<td>98-01-22.92</td>
</tr>
<tr>
<td>Corner 9</td>
<td>29-36-24.73</td>
<td>98-00-53.04</td>
</tr>
<tr>
<td>Corner 10</td>
<td>29-37-02.41</td>
<td>97-59-23.31</td>
</tr>
<tr>
<td>Corner 11</td>
<td>29-38-37.04</td>
<td>97-59-21.36</td>
</tr>
<tr>
<td>Corner 12</td>
<td>29-39-03.60</td>
<td>98-00-05.47</td>
</tr>
<tr>
<td>Fictitious Center Point</td>
<td>29-38-07.82</td>
<td>98-04-32.62</td>
</tr>
</tbody>
</table>

### Table 1: Parameters of Study area
Preliminary Alternative Transmission Line Segments

Figure 1: Proposed Preliminary Alternative Transmission Line Segments within Study area

The above image shows the proposed preliminary alternative transmission lines segments referenced within this report.
Aeronautical Environment

The Zorn to Marion Transmission Line Project study area was analyzed for the maximum allowable heights surrounding multiple proposed preliminary alternative transmission line segments at 180 feet AGL. Two fictitious center points were used for analysis purposes and they are defined in the preceding table 1.

Private Landing Facilities

There are 20 Private Landing Facilities located within 10 NM of the study area and 2 Private Military Landing Facilities (SEQ & RND) as labeled within Figure 2. One of these Landing Facilities has Special Procedures associated with it as of the date of this document. Additionally, there are 3 private airstrips located within the study area that are not open to the public and thus are not given protections covered within FAR Part 77. The proposed preliminary alternative transmission line segments within the study area will not be affected by these facilities.

Figure 2: Private Landing Facilities within 10 NM of study area as labeled
Public Landing Facilities

There is 2 Public Landing Facilities located within 10 NM of study area as labeled in Figure 3. One of these facilities, New Braunfels Regional Airport (BAZ), has IFR Procedures associated with it as of the date of this document. The other public facility, Huber Airpark (E70), has no IFR procedures associated with it. The proposed preliminary alternative transmission line segments within the study area may impact the IFR procedures at BAZ. Obstruction Surfaces and aircraft operations at E70 will not affect the proposed preliminary alternative transmission line segments.

Figure 3: Public Landing Facilities within 10 NM of study area as labeled
IFR Notice Criteria

Figure 4: IFR Notice Criteria for New Braunfels Regional Airport (BAZ)

The IFR notice criteria area for New Braunfels Regional Airport (BAZ) and Huber Airpark (E70), CFR Title 14 Part 77.9(b), dictates that notice is required for any construction or alteration that exceeds an imaginary surface extending outward and upward at a slope of 100 to 1 for any horizontal distance of 20,000 feet from the nearest point of the nearest runway of a public use instrument procedure airport with its longest runway more than 3,200 feet AMSL. The pink outlined circle depicts the 77.9(b) requirement. Locating within the pink outlined area or within the outlined procedure areas will likely require notice to the FAA.

Preliminary alternative Transmission Line segments which will likely require notice are: N1, O1, R1, U1, S1, T1, X1, K1, W1, V1, Y1, Z1, A2, B2, C2, D2, E2, F2, G2, H2, I2, J2, K2, L2, M2, N2, O2, P2, Q2, U2, and W2.
Aeronautical Impact Statement
Zorn to Marion

Title 14 CFR Part 77 Surfaces

The Title 14 CFR Part 77.17(a) (2) Visual Flight Rule (VFR) Transitional Surfaces are represented by the four set of concentric rings surrounding airports that have at least one runway exceeding 3,200 feet in length. The VFR Transitional Surface begins 200 feet above the ground elevation of the Airport Reference Point (ARP) for each corresponding airport, extends for a radius of 3 NM, and then increases at a slope of 100 feet per nautical mile, ending 5.99 NM from the ARP. The 77.19(a) (2) IFR Horizontal Surface and Conical Surface are also shown, represented by the cyan and yellow circles surrounding the airports. Additionally, two military outer horizontal surfaces are depicted in dark green.
Part 77 Obstruction Surfaces (BAZ)

77.17(a) (2) - VFR Transitional Surface

The New Braunfels Regional Airport (BAZ) Part 77.17(a) (2) VFR Transitional Surface is a surface which extends 5.99 NM from the Airport Reference Point (ARP). The VFR Transitional Surface maximum allowable height starts at 200 feet above the ARP or ground elevation, whichever is greater. The maximum allowable height within the red highlighted circle is 858 feet AMSL. Each grey circle beyond the red circle represents an increase to this height of 100 feet AMSL. The outermost grey circle has a maximum allowable height range of 1058 feet AMSL to 1158 feet AMSL. The typical mitigation to penetration of this surface is use of obstruction lighting on the structure. The proposed preliminary alternative transmission line segments shall have no effect upon the VFR Transitional Surface as they are all less than 200 feet AGL.
FAR 77.19(a) and (b) VFR Horizontal and Conical Surfaces

Figure 7: VFR Horizontal and Conical Surfaces at BAZ

The study area is partially located within the VFR Horizontal & Conical Surfaces. The heights of these surfaces range from 808 feet AMSL to 1008 feet AMSL. Typically, the FAA objects strongly to penetrations to VFR Surfaces. FAA Order 7400.2K, Change 1 states that penetration of the VFR Conical Surface would be an adverse effect. If permitted by the FAA, the mitigation to penetration of this surface by a transmission line structure is obstruction lighting.

Preliminary Alternative Transmission Line Segments which may have an impact upon the VFR Horizontal and Conical Surfaces are: D2, N1 and C2.
FAR 77.19(a) and (b) IFR Horizontal and Conical Surfaces

Figure 8: IFR Horizontal and Conical Surfaces at BAZ

The New Braunfels Regional Airport (BAZ) Part 77.19(a) Horizontal Surface, highlighted in cyan, is a flat surface that starts 200 feet off the end of each runway then extends outward for 10,000 feet. Part 77.19(b) Conical Surface, highlighted in yellow, is a 20:1 sloping surface that begins as the end of the Horizontal Surface and extends outward and upward for 4,000 feet. The maximum allowable height within the Horizontal Surface is 808 feet AMSL. The maximum allowable height within the Conical Surface ranges from 808 feet AMSL to 1008 feet AMSL. The typical mitigation to penetration of this surface is use of obstruction lighting and marking.

Preliminary Alternative Transmission Line Segments which may impact the Part 77.19 (a) & (b) surfaces: Q1, N1, C2, D2, B2, E2, L2, F2, G2, P2, N2, U1, A1, M2, I2, J2, and K2.
The Approach Obstacle Surfaces at the New Braunfels Regional (BAZ) airport are denoted by the blue hashed areas. The Approach Surface is a 34:1 sloping surface which begins 200 feet from the runway end then extends 3000 feet outward. The maximum allowable height within these areas ranges from 643 feet AMSL to 808 feet AMSL. Construction of preliminary alternative transmission line segments which penetrate this surface would adversely impact the AOS and is unlikely to be approved by the FAA.

Preliminary Alternative Transmission Line Segments which may have an impact upon the AOS are: D2, Q1, B2, N1 and C2.
Randolf Air force Base Auxiliary (SEQ) Approach Surface

The Approach Obstacle Surfaces at the Randolf Air force Base Auxiliary (SEQ) airport are denoted by the blue outlined areas. The Military Approach Surface is a 50:1 sloping surface which begins 200 feet from the runway end then extends 50,000 feet outward. The surface becomes a flat surface once the maximum allowable height reaches a height of 500 feet above airport elevation. This point is indicated by a black line drawn across the surface. The maximum allowable height within the portion extending over the study area is 1025 feet AMSL. Construction of preliminary alternative transmission line segments which penetrate this surface would adversely impact the AOS and is unlikely to be approved by the FAA.

Preliminary Alternative Transmission Line Segments will have no effect upon the Approach Obstacle Surfaces at SEQ.
BAZ VFR Traffic Pattern Airspace

Figure 11: BAZ VFR Traffic Pattern Airspace

The VFR Traffic Pattern Airspace is made up of the VFR Horizontal, VFR Conical, and Climb & Descend Areas. The VFR Climb & Descend area at the New Braunfels Regional (BAZ) airport extends over the study area. The maximum allowable height within the VFR Climb & Descend Area is 1008 feet AMSL. The FAA is usually very hesitant to allow penetrations to the Climb & Descend area. If any preliminary alternative transmission line segments are located within the VFR Traffic Pattern Airspace they would likely have an adverse impact upon it.

Preliminary Alternative Transmission Line Segments will have no effect upon VFR Climb and Descend areas at BAZ.
Huber Airpark E70 VFR Traffic Pattern Airspace

The VFR Traffic Pattern Airspace is made up of the VFR Horizontal, VFR Conical, and Climb & Descend Areas. The VFR Climb & Descend area at the Huber Airpark (E70) airport extends over the study area. The maximum allowable height within the VFR Climb & Descend Area is 906 feet AMSL. The FAA is usually very hesitant to allow penetrations to the Climb & Descend area. If any preliminary alternative transmission line segments are located within the VFR Traffic Pattern Airspace they would likely have an adverse impact upon it.

Preliminary Alternative Transmission Line Segments will have no effect upon VFR Climb and Descend areas at E70.
New Braunfels Regional Airport Instrument Approach Procedures

BAZ LNAV RWY 13 Procedure

The Runway 13 LNAV Procedure for the New Braunfels Regional Airport (BAZ) is shown extending over the study area. The maximum allowable height within the Missed Approach Flat Surface Area for the LNAV Runway 13 Procedure, highlighted in blue, is 1060 feet AMSL. The maximum allowable height within the Missed Approach for the LNAV Runway 13 Procedure, highlighted in green, ranges from 1060 feet AMSL to 1809 feet AMSL. Construction of the preliminary alternative transmission line segments will have no adverse affect upon this procedure.
BAZ VNAV RWY 13 Procedure

The Runway 13 VNAV Procedure for the New Braunfels Regional Airport (BAZ) is shown extending over the study area. The maximum allowable height within the Missed Approach Flat Surface Area for the VNAV Runway 13 Procedure, highlighted in blue, is 878 feet AMSL. The maximum allowable height within the Missed Approach for the VNAV Runway 13 Procedure, highlighted in green, ranges from 878 feet AMSL to 1711 feet AMSL. Construction of the preliminary alternative transmission line segments will have no adverse affect upon this procedure.
BAZ LPV RWY 13 Procedure

The Runway 13 LPV Procedure for the New Braunfels Regional (BAZ) Airport is a 3-dimensional procedure that extends over the study area. The LPV primary area has 3 distinct obstruction surfaces (W, X and Y), in addition to two missed approach areas. The maximum allowable height within the 1B Missed Approach Surface, highlighted in blue, ranges from 920 feet AMSL to 1018 feet AMSL. The maximum allowable height within the Missed Approach Surface, highlighted in green, ranges from 1018 feet AMSL to 1831 feet AMSL. Construction of the preliminary alternative transmission line segments will have no adverse effect upon this procedure.
The Runway 17 LNAV Procedure for the New Braunfels Regional Airport (BAZ) is shown extending over the study area. The maximum allowable height within the Missed Approach Flat Surface Area for the LNAV Runway 17 Procedure, highlighted in blue, is 1120 feet AMSL. The maximum allowable height within the Missed Approach for the LNAV Runway 17 Procedure, highlighted in green, ranges from 1120 feet AMSL to 2100 feet AMSL. Construction of the preliminary alternative transmission line segments will have no adverse affect upon this procedure.
The Runway 31 LNAV Procedure for the New Braunfels Regional Airport (BAZ) is shown extending over the study area. The maximum allowable height within the Primary Area for the LNAV Runway 31 Procedure, highlighted in red, is 830 feet AMSL. The maximum allowable height within the Secondary Area for the LNAV Runway 31 Procedure, highlighted in yellow, ranges from 830 feet AMSL to 1080 feet AMSL. The maximum allowable height within the Missed Approach Flat Surface Area for the LNAV Runway 31 Procedure, highlighted in green, is 980 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely impact the Runway 31 LNAV Approach to BAZ.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 31 LNAV are: D2, G2, and I2.
BAZ VNAV RWY 31 Procedure

The Runway 31 VNAV Procedure for the New Braunfels Regional Airport (BAZ) is shown extending over the study area. The maximum allowable height within the Primary Area for the VNAV Runway 31 Procedure, highlighted in orange, ranges from 801 feet AMSL to 1646 feet AMSL. The maximum allowable height within the Secondary Area for the VNAV Runway 31 Procedure, highlighted in yellow, ranges from 801 feet AMSL to 1551 feet AMSL. The maximum allowable area within the Glide Slope Qualification Surface (GQS), highlighted in red, ranges from 644 feet AMSL to 844 feet AMSL. The maximum allowable height within the Missed Approach Flat Surface Area for the VNAV Runway 31 Procedure, highlighted in green, is 907 feet AMSL. The maximum allowable height within the Missed Approach for the VNAV Runway 31 Procedure, highlighted in blue, ranges from 907 feet AMSL to 1015 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely impact the Runway 31 VNAV Approach to BAZ.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 31 VNAV are: D2, G2, and I2.
BAZ LPV RWY 31 Procedure

Figure 19: BAZ Runway 31 LPV Procedure

The Runway 31 LPV Procedure for the New Braunfels Regional (BAZ) Airport is a 3-dimensional procedure that extends over the study area. The LPV primary area has 3 distinct obstruction surfaces (W, X and Y), in addition to two missed approach areas. The maximum allowable height within the ‘W’ Primary surface, highlighted in red, ranges from 740 feet AMSL to 1106 feet AMSL. The maximum allowable height within the ‘X’ Primary surface, highlighted in grey, ranges from 740 feet AMSL to 1535 feet AMSL. The maximum allowable height within the ‘Y’ Primary surface, highlighted in green, ranges from 883 feet AMSL to 1759 feet AMSL. The maximum allowable height within the Glide Slope Qualification Surface (GQS), highlighted in black, ranges from 644 feet AMSL to 800 feet AMSL. The maximum allowable height within the 1B Missed Approach Surface, highlighted in blue, ranges from 713 feet AMSL to 884 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely impact the Runway 31 LPV Approach at BAZ.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 31 LPV are: D2.
BAZ LNAV RWY 35 Procedure

The Runway 35 LNAV Procedure for the New Braunfels Regional Airport (BAZ) is shown extending over the study area. The maximum allowable height within the Primary Area for the LNAV Runway 35 Procedure, highlighted in red, is 890 feet AMSL. The maximum allowable height within the Secondary Area for the LNAV Runway 35 Procedure, highlighted in green, ranges from 890 feet AMSL to 1140 feet AMSL. The maximum allowable height within the LNAV Visual Segment, highlighted in orange, ranges from 644 feet AMSL to 939 feet AMSL. The maximum allowable height within the Missed Approach Flat Surface Area for the LNAV Runway 35 Procedure, highlighted in blue, is 1040 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely impact the Runway 35 LNAV Approach to BAZ.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 35 LNAV are: N1 and C2.
BAZ VNAV RWY 35 Procedure

The Runway 35 VNAV Procedure for the New Braunfels Regional Airport (BAZ) is shown extending over the study area. The maximum allowable height within the Primary Area for the VNAV Runway 35 Procedure, highlighted in red, ranges from 822 feet AMSL to 1665 feet AMSL. The maximum allowable height within the Secondary Area for the VNAV Runway 35 Procedure, highlighted in green, ranges from 822 feet AMSL to 1899 feet AMSL. The maximum allowable area within the Glide Slope Qualification Surface (GQS), highlighted in orange, ranges from 644 feet AMSL to 800 feet AMSL. The maximum allowable height within the Missed Approach Flat Surface Area for the VNAV Runway 35 Procedure, highlighted in blue, is 949 feet AMSL. The maximum allowable height within the Missed Approach for the VNAV Runway 35 Procedure, highlighted in purple, ranges from 949 feet AMSL to 1100 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely impact the Runway 35 VNAV Approach to BAZ.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 35 VNAV are: N1, Q1, B2, F2, E2 and L2.
BAZ LPV RWY 35 Procedure

The Runway 35 LPV Procedure for the New Braunfels Regional (BAZ) Airport is a 3-dimensional procedure that extends over the study area. The LPV primary area has 3 distinct obstruction surfaces (W, X and Y), in addition to two missed approach areas. The maximum allowable height within the ‘W’ Primary surface, highlighted in red, ranges from 737 feet AMSL to 1660 feet AMSL. The maximum allowable height within the ‘X’ Primary surface, highlighted in grey, ranges from 737 feet AMSL to 2314 feet AMSL. The maximum allowable height within the ‘Y’ Primary surface, highlighted in green, ranges from 916 feet AMSL to 2593 feet AMSL. The maximum allowable height within the Glideslope Qualification Surface (GQS), highlighted in orange, ranges from 644 feet AMSL to 800 feet AMSL. The maximum allowable height within the 1B Missed Approach Surface, highlighted in blue, ranges from 729 feet AMSL to 938 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely impact the Runway 35 LPV Approach at BAZ.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 35 LPV are: N1, Q1, C2, and B2
The VOR/DME-A Procedure for the New Braunfels Regional (BAZ) extends over the study area. The maximum allowable height within the Primary Area, highlighted in red, is 890 feet AMSL. The maximum allowable height within the Secondary Area, highlighted in green, ranges from 890 feet AMSL to 1280 feet AMSL. Construction of the preliminary alternative transmission line segments will have no adverse affect upon this procedure.
BAZ Circling Areas

Figure 24: Categories A – D Circling Areas at BAZ

The Category A, B, C, and D Circling areas at New Braunfels Regional Airport extend over the study area. The maximum allowable height within the Category A circling area is 800 feet AMSL. The maximum allowable height within the Category B circling area is 840 feet AMSL. The maximum allowable height within both Categories C & D circling areas is 980 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely impact the circling procedures at BAZ.

Preliminary Alternative Transmission Line Segments which will likely have an impact upon the Circling Approach procedures at BAZ are: N1, Q1, B2, D2, D2, E2, F2, G2, and H2.
BAZ Runway 13 Initial Climb Area

Figure 25: BAZ Runway 13 Departure Surface

The Runway 13 Initial Climb Area at New Braunfels Regional Airport (BAZ) extends over the study area. The Initial Climb Area is made up of the primary area and two diverse areas, A & B. The maximum allowable height within the Runway 13 Initial Climb Area, highlighted in red, ranges from 642 feet AMSL to 850 feet AMSL. The maximum allowable height for the remainder of the initial climb area ranges from 850 feet AMSL to 953 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely affect the red shaded portion of the Runway 13 Initial Climb Area.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Initial Climb Area for Runway 13 are: and D2.
BAZ Runway 17 Initial Climb Area

Figure 26: BAZ Runway 17 Departure Surface

The Runway 17 Initial Climb Area at New Braunfels Regional Airport (BAZ) extends over the study area. The Initial Climb Area is made up of the primary area and two diverse areas, A & B. The maximum allowable height within the Runway 17 Initial Climb Area, highlighted in red, ranges from 645 feet AMSL to 850 feet AMSL. The maximum allowable height for the remainder of the initial climb area ranges from 850 feet AMSL to 945 feet AMSL. Construction of some of the preliminary alternative transmission line segments may adversely affect the red shaded portion of the Runway 17 Initial Climb Area.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Initial Climb Area for Runway 17 are: N1, Q1, B2, and C2
Radio Communication Link (RCL) Propagation Path

The line of site for an existing RCL (Radio Communication Link) Propagation Path runs directly through the study area. The RCL’s Fresnel Zone Notice Area, highlighted in red, is 500 feet either side of the line of site or centerline. Transmission structures to be located within this area will require notice to the FAA for further study. Structures located inside the Fresnel Zone may adversely impact the integrity of this communication link and may not be approved by the FAA. Transmission line wires traversing the RCLR notice area will have no effect upon the RCLR.

Exemptions can be granted on a case by case basis dependant on the location of the structure within the Fresnel zone and the height of the actual Fresnel Zone. Height of the Fresnel Zone can be calculated throughout the study area using the distance between the two communications towers and frequencies in use by the RCLR. Exemption criteria will also depend on the height of the penetrating object and the width of the object within the RCLR path. For Fresnel Zone Analysis please see Appendix H.

Preliminary Alternative Transmission Line Segments which may have an impact upon the RCLR Propagation Path are: H, I, G, U, F1, P1, X1, and K1.
The study area is within the 60 NM operational range of the San Antonio Terminal Radar Approach Control (TRACON) facility (SAT). The maximum allowable height within the study area is 1500 feet AMSL. Construction of preliminary alternative transmission line segments will not adversely impact the SAT MVA.
RADAR Screening Analysis

ARSR Long Range Radar Screening

Figure 29: Impact of the San Antonio Air Route Surveillance Radar (ARSR) facilities to study area

The potential impact of the study area to Air Route Surveillance Radar (ARSR) Long Range Radar facilities was analyzed using both FA&A’s proprietary Radar Screening Tool and the FAA/DoD Preliminary screening tool. The nearest ARSR Radar Facility is located approximately 28 NM from the study area. The maximum allowable height at the closest study area point to the ARSR is 2340 feet AMSL. Construction of preliminary alternative line segments will not impact the SAT ARSR.
National Weather Service (NWS) Radar Screening

The potential impact of the study area to EWX National Weather Service (NWS) Weather Radar was analyzed using both the FAA/DoD Preliminary Screening Tool and FA&A’s proprietary Radar Screening Tool. The EWX NWS Radar Facility is less than 1NM from the study area. Based upon the grazing angle of the antenna, in relation to the preliminary alternative transmission line segments, there will be no significant impact upon the EWX NWS Weather Radar.
Airport Surveillance Radar (ASR) Radar Screening

Figure 31: Impact of the San Antonio (SAT) Airport Surveillance Radar (ASR) to study area

The potential impact of the study area to the nearest ASR Radar was analyzed using FA&A’s proprietary Radar Screening Tool. The nearest ASR Radar Facility is San Antonio (SAT) located approximately 16 NM from the study area. The estimated maximum allowable height at this distance is approximately 1778 feet AMSL. Construction of the preliminary alternative line segments will not adversely impact the SAT ASR.
Military Operations Area (MOA) Screening

Figure 32: Impact of the Military Operation Areas to study area

Above depicts a graphical representation of the 638 Military Operations Areas (MOA) located partially within the study area boundary. Military Operations Areas are not covered under Title 14 CFR Part 77 and thus are not afforded protections by the FAA. During the study of the Military areas, the FAA’s DoD notice tool was utilized. It did not indicate that there would be an impact within this area (Appendix I).

Consequently, there would not be any construction constraints placed upon the preliminary alternative transmission line segments by the FAA if located within the 638 MOA. However, notice to the military should be made prior to the start of construction for Transmission Line Structures located within the MOA. This can be done two different ways; submission of a 7460-1 application to the FAA for structures within this area which do not exceed notice requirements or by contacting the military contact(s) for this area directly. Their contact information for this specific MOA is listed in Appendix I.

Preliminary Alternative Transmission Line Segments which may have an impact upon the 638 MOA are: I1, J1, K1, X1, and P1.
New Braunfels Regional Airport (BAZ) Local Zoning Ordinance

Horizontal and Conical Zones are identical to the Title 14 CFR Part 77.19 (a) & (b) surfaces located within page 14 of this report. The mitigation for penetrating this surface is the same as the FAA’s mitigation, obstruction marking and lighting.

*Preliminary Alternative Transmission Line Segments which may impact the local zoning Horizontal & Conical surfaces are: Q1, N1, C2, D2, B2, E2, L2, F2, G2, P2, N2, U1, A1, M2, I2, J2, and K2.*

The Primary and Transitional approach zones are the same as the FAR 77.19(d) Approach Obstacle Surface for precision instrument category runway. The primary area is a sloping surface which starts 200 feet beyond the end of the runway at runway level, and slopes upwards at a 50:1 slope for 10,000 feet. The surface continues to slope outward to a total of 50,000 feet from this point using a 40:1 slope. The prescribed mitigation for penetration of this local zoning surface is obstruction marking and lighting.

*Preliminary Alternative Transmission Line Segments which may have an impact upon the local zoning approach surfaces are: N1, Q1, B2, C2, and D2.*

The Inner Turning Zone is located 200 feet from the runway end and extends out at 45 degree angles to form a semi-circle 5000 feet in radius. The maximum allowable height starts at runway elevation and rises at a 50:1 slope out to the 5000 foot mark. The maximum allowable height within the Runway 35 inner turning zone ranges from 644 feet AMSL to 746 feet AMSL.

*Preliminary Alternative Transmission Line Segments which may have an impact upon the local zoning approach surfaces are: N1.*
Figure 33 depicts all of the local zoning areas surrounding the New Braunfels Regional Airport (BAZ). The majority of these surfaces mirror the FAA Title 14 Part 77 Obstruction Surfaces. There are two prominent differences between the FAA obstruction surfaces and the Local Zoning surfaces at BAZ.

The first difference is the application of a precision instrument approach obstacle surface, which extends out 50,000 instead of 10,000 feet and is referred to as the Outer Precision Approach zone. This surface is the one which extends south through the entire property. This surface does not impact any preliminary alternative transmission line segments more than the AOS discussed on page 15 of this report.

The only surfaces which are not enforced by the FAA are the inner turning zones. The runway 35 inner turning zone is depicted in Figure 33 at the end of Runway 35 in the shape of a pink highlighted semi-circle. One preliminary alternative transmission line segment may adversely affect this surface; N1.
Conclusion

This Aeronautical Impact Statement (AIS) of the study area has identified the most restrictive aeronautical surfaces that extend over the study area and which preliminary alternative transmission line segments could potentially impact these surfaces.

Notice Criteria

Some of the preliminary alternative transmission line segments overall AMSL height and distance to the nearest airport exceed Title 14 CFR Part 77.9:

   a) Any construction or alteration that exceeds an imaginary surface extending outward and upward at 100:1 for 20,000 feet.

   Notice to the FAA will be required for part or all of segments: N1, O1, R1, U1, S1, T1, X1, K1, W1, V1, Y1, Z1, A2, B2, C2, D2, E2, F2, G2, H2, I2, J2, K2, L2, M2, N2, O2, P2, Q2, U2, and W2.

Obstruction Criteria

The New Braunfels Regional Airport (BAZ) Part 77.19 IFR Horizontal & Conical Surfaces partially extend over the study area. The maximum allowable height within this area ranges from 808 feet AMSL to 1008 feet AMSL.

   Preliminary Alternative Transmission Line Segments which may impact the Part 77.19 (a) & (b) surfaces: Q1, N1, C2, D2, B2, E2, L2, F2, G2, P2, N2, U1, A1, M2, I2, J2, and K2. Use of obstruction marking and/or lighting will mitigate these impacts.

The New Braunfels Regional Airport (BAZ) Part 77.19 VFR Horizontal & Conical Surfaces partially extend over the study area. The maximum allowable height within this area ranges from 808 feet AMSL to 1008 feet AMSL.

   Preliminary Alternative Transmission Line Segments which may have an impact upon the VFR Horizontal and Conical Surfaces are: D2, N1 and C2. The FAA is usually hesitant to approve penetrations to the VFR Horizontal and Conical surfaces.

The New Braunfels Regional Airport (BAZ) Approach Obstacle Surfaces extend partially over the study area. The maximum allowable height within this area ranges from 643 feet AMSL to 808 feet AMSL.

   Preliminary Alternative Transmission Line Segments which may have an impact upon the AOS are: D2, Q1, B2, N1 and C2. The FAA typically does not approve penetrations to the Approach Obstacle Surfaces because penetrations will exceed the visibility minimums rendering visual approaches to the airport unusable.

Several local zoning surfaces at New Braunfels Regional Airport overlap with the FAR PART 77 obstruction surfaces. Penetrating transmission line sections must acquire local zoning approval in
addition to FAA approval. Negotiations with the New Braunfels Regional Airport will be required to gain approval. Once approved, the mitigation for penetration of the local zoning areas is obstruction marking and lighting.

Preliminary Alternative Transmission Line Segments which may impact the local zoning areas are: Q1, N1, C2, D2, B2, E2, L2, F2, G2, P2, N2, U1, A1, M2, I2, J2, and K2.

TERPS Criteria

The New Braunfels Regional Airport (BAZ) Runway 31 LNAV procedure extends over the study area. The maximum allowable heights within this procedure range from 830 feet AMSL to 1080 feet AMSL.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 31 LNAV are: D2, G2, and I2. The FAA is highly unlikely to approve penetrations to Instrument Approach Procedures.

The New Braunfels Regional Airport (BAZ) Runway 31 VNAV procedure extends over the study area. The maximum allowable heights within this procedure range from 644 feet AMSL to 1930 feet AMSL.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 31 VNAV are: D2, G2, and I2.

The New Braunfels Regional Airport (BAZ) Runway 31 LPV procedure extends over the study area. The maximum allowable heights within this procedure range from 644 feet AMSL to 1759 feet AMSL.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 31 LPV are: D2.

The New Braunfels Regional Airport (BAZ) Runway 35 LNAV procedure extends over the study area. The maximum allowable heights within this procedure range from 644 feet AMSL to 1899 feet AMSL.

Preliminary Alternative Transmission Line Segments which may have an impact upon the Runway 35 LNAV are: N1 and C2.

The New Braunfels Regional Airport (BAZ) Runway 35 VNAV procedure extends over the study area. The maximum allowable heights within this procedure range from 644 feet AMSL to 1899 feet AMSL.

Preliminary Alternative Transmission Line Segments which will likely have an impact upon the Runway 35 VNAV are: N1, Q1, B2, F2, E2 and L2.

The New Braunfels Regional Airport (BAZ) Runway 35 LPV procedure extends over the study area. The maximum allowable heights within this procedure range from 644 feet AMSL to 2593 feet AMSL.
Preliminary Alternative Transmission Line Segments which will likely have an impact upon the Runway 35 LPV are: N1, Q1, C2, and B2.

The New Braunfels Regional Airport (BAZ) Circling approach procedures extend over the study area. The maximum allowable heights within these procedures range from 800 feet AMSL to 980 feet AMSL.

Preliminary Alternative Transmission Line Segments which will likely have an impact upon the Circling Approach procedures at BAZ are: N1, Q1, B2, D2, D2, E2, F2, G2, and H2.

The New Braunfels Regional Airport (BAZ) Departure Initial Climb Areas for Runway 13 and Runway 17 extend over the study area. The initial climb areas are comprised of sloping surfaces with a height range over the study area of 642 feet to 953 feet AMSL.

Preliminary Alternative Transmission Line Segments which will likely have an impact upon the Initial Climb Area for Runway 13 are: and D2.

Preliminary Alternative Transmission Line Segments which will likely have an impact upon the Initial Climb Area for Runway 17 are: N1, Q1, B2, and C2.

The line of sight for a RCL (Radio Communication Link) Propagation Path crosses through the study area. The path is 1000 feet wide and any structures located within the path could potentially adversely impact the RCLR’s integrity. Further analysis is required to determine the impacts, if any.

Preliminary Alternative Transmission Line Segments which may have an impact upon the RCLR Propagation Path are: H, I, G, U, F1, P1, X1, and K1.

The 638 Military Operations Area (MOA) is located partially within the study area. Operations within this area occur from surface to 3000 feet AMSL and any structures located within this area will negatively affect these operations. The DOD Notice tool used by the FAA indicated that there would be no impacts within this area. We cannot verify the accuracy of their data or software and thus unable to determine if this will be an issue or not.

Preliminary Alternative Transmission Line Segments which will likely have an impact upon the 638 MOA are: I1, J1, K1, X1, and P1. The FAA will typically coordinate with the military to alleviate the impacts upon MOA’s by new construction; however, their response to this specific case is unknown at this time.
Recommendations

Once a transmission line route is approved and transmission line structure locations developed, we recommend a full airspace point study be completed for each transmission line structure identified as causing possible impacts. We also recommended a ‘1A’ civil survey (±3’ vertical, ±20’ horizontal) for all final structure locations be commissioned and submitted to the FAA.

Approved,

James P. Walker
Airspace Technician

Clyde J. Pittman
Director of Engineering

Federal Airways & Airspace
Appendix
Appendix B: RNAV (GPS) 17 BAZ Approach Plate

NEW BRAUNFELS, TEXAS
AL 6080 (FAA)

RNAV (GPS) RWY 17
NEW BRAUNFELS RGNL (BAZ)

When local altimeter *Bling not received, *Son Marcos Mani okinweer sailing and increase all MDA's 60 ft. Increase 10 1/2 mils V.D.Y. miles when using Son Marcos MDA altimeter sailing. **EMERC**

ATIS 119.325
SAN ANTONIO API* CON 12445 335.625
NEW BRAUNFELS TOWS 07 120175
GND CON 134.75
ONC DEL 122.7
UNICOM 127.05
RAF 127.05

ProcedureNA for Wads at SHEFE va V17 southwest bound.

ACGET 310°

Procedure on NA

**EMERC**

When local altimeter *Bling not received, *Son Marcos Mani okinweer sailing and increase all MDA's 60 ft. Increase 10 1/2 mils V.D.Y. miles when using Son Marcos MDA altimeter sailing. **EMERC**
## Appendix C: RNAV (GPS) RWY 31 BAZ Approach Plate

### NEW BRAUNFELS, TEXAS

<table>
<thead>
<tr>
<th>ARTS</th>
<th>WAO</th>
<th>119,325</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAVANTONIOAPP CON</td>
<td>12445 335.625</td>
<td>127.05 285.4</td>
</tr>
<tr>
<td>NEWBRAUNELSTOWER (Gal)</td>
<td>CON</td>
<td>120.175</td>
</tr>
<tr>
<td>CLNC DR</td>
<td>120.175</td>
<td>120.175</td>
</tr>
<tr>
<td>UNICOM</td>
<td>122.7</td>
<td>127.05 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CIR</th>
<th>ELEV</th>
<th>A1:6080 (FAA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW BRAUNFELS RGNL (BAZ)</td>
<td>15176</td>
<td>RNAV (GPS) RWY 31</td>
</tr>
</tbody>
</table>

### WAAS 018,005 W31A

#### APCS 3 Ap E1 648

- **DME/DME RNP 03 NA:** When local climatic setting not received, use Son Marcos altitude
- **Zoning and increase all DA of 43 feet and add MDA @ 60 feet, and increase L/D of 0.016**, INAV/VNAV
  - all Cols, and Carding Cols C and D visibility 14 male, and LNAV Cols C and D visibility 14 male. For uncompensated B/LMDV systems, INAV/VNAV/NA below 0.25/0.25 reduces
  - Sonos VNAV and VDPNA when using Son Marcos complex setting. Improves/keeps reduction

### ARTS

<table>
<thead>
<tr>
<th>ARTS</th>
<th>WAO</th>
<th>119,325</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAVANTONIOAPP CON</td>
<td>12445 335.625</td>
<td>127.05 285.4</td>
</tr>
<tr>
<td>NEWBRAUNELSTOWER (Gal)</td>
<td>CON</td>
<td>120.175</td>
</tr>
<tr>
<td>CLNC DR</td>
<td>120.175</td>
<td>120.175</td>
</tr>
<tr>
<td>UNICOM</td>
<td>122.7</td>
<td>127.05 0</td>
</tr>
</tbody>
</table>

### ELEV 658

<table>
<thead>
<tr>
<th>TOZA 6-46</th>
</tr>
</thead>
<tbody>
<tr>
<td>A760 t</td>
</tr>
<tr>
<td>0000</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

### RWY31

- **2000/311°**
- **2500**
- **TCH 45**
- **2**

### CATEGORY

<table>
<thead>
<tr>
<th>A</th>
<th>I</th>
<th>B</th>
<th>C</th>
<th>I</th>
<th>0</th>
</tr>
</thead>
</table>

### NEW EIRAUIN TBS, 11XAS

<table>
<thead>
<tr>
<th>Ana</th>
<th>30APR15</th>
<th>29°47N 98°02W</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNAV (GPS) RWY 31</td>
<td>NEW BRAUNFELS RGNL (BAZ)</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix D: RNAV (GPS) 35 BAZ Approach Plate

<table>
<thead>
<tr>
<th>NEW BRAMMIS, TEXAS</th>
<th>AL 6060 (FAA)</th>
<th>15176</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNAV (GPS) RWY 35</td>
<td>NEW BRAUNFELS RGNL (BAZ)</td>
<td></td>
</tr>
</tbody>
</table>

When local altimeter signs not received, use Son Marcola Muni altimeter setting and V intro alt 42 feet LPV visibility. All Cts, Mmps, all MDA's 60 feet LNAV and A ording Visibility Cat C and D. VDP and Bore NAV/NA whom using San Marcola WMT altitude setting. For uncompensated Baro NAV/NA whom using San Marcos la WAAS CH 93900 W35A APP CRS 353° Rwy Idg 6384 Apt Elev 651

<table>
<thead>
<tr>
<th>ATIS</th>
<th>119.325</th>
<th>NEW BRAUNFELS MP CON NEW BRAUNFELS TOWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND CON</td>
<td>120.175</td>
<td>127.05 2854</td>
</tr>
</tbody>
</table>

### RNAV (GPS) RWY 35

- **NEW BRAUNFELS, TEXAS**: AL 6060 (FAA)
- **RNAV (GPS) RWY 35**: NEW BRAUNFELS RGNL (BAZ)

### Misapproach

When local altimeter signs not received, use Son Marcola Muni altimeter setting and V intro, all DAs 42 Feet LPV visibility. All Cts, Mmps, all MDA's 60 feet LNAV and A ording Visibility Cat C and D. VDP and Bore NAV/NA whom using San Marcola WMT altitude setting. For uncompensated Baro NAV/NA whom using San Marcola la WAAS CH 93900 W35A APP CRS 353° Rwy Idg 6384 Apt Elev 651

### RNAV (GPS) RWY 35

When local altimeter signs not received, use Son Marcola Muni altimeter setting and V intro, all DAs 42 Feet LPV visibility. All Cts, Mmps, all MDA's 60 feet LNAV and A ording Visibility Cat C and D. VDP and Bore NAV/NA whom using San Marcola WMT altitude setting. For uncompensated Baro NAV/NA whom using San Marcola la WAAS CH 93900 W35A APP CRS 353° Rwy Idg 6384 Apt Elev 651
## Appendix E: Private Airport List

### Remarks:

- **TYP**: Indicates type of the landing facility, either heliport or airport
- **Bearing and Range**: Calculation from the fictitious center point
- **FAR P77**: Indicates if FAR Part 77 criteria would be applicable to the private landing facility
- **FAA IFR**: Indicator flag if the landing facility has any special procedures associated. Blank means no special procedures

<table>
<thead>
<tr>
<th>FACILITY</th>
<th>TYP/HRE</th>
<th>SURFACE</th>
<th>RANGE</th>
<th>DECK/STR</th>
<th>FAR P77</th>
<th>FAA IFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zorn to Marion</td>
<td>Helipad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reeves Medical Center</td>
<td>Heliport</td>
<td>Hospital Helipad</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Largo Medical Center</td>
<td>Heliport</td>
<td>Hospital Helipad</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Jude Medical Center</td>
<td>Heliport</td>
<td>Hospital Helipad</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ave Maria Village</td>
<td>Heliport</td>
<td>Retirement Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evergreen Village</td>
<td>Heliport</td>
<td>Retirement Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fernfield Village</td>
<td>Heliport</td>
<td>Retirement Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oakwood Village</td>
<td>Heliport</td>
<td>Retirement Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maplewood Village</td>
<td>Heliport</td>
<td>Retirement Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pineview Village</td>
<td>Heliport</td>
<td>Retirement Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Willowgreen Village</td>
<td>Heliport</td>
<td>Retirement Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.jp1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.jp2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The mathematical equations used by this program are derived directly from Federal Aviation Regulations Part 77, subpart C.*
Appendix F: Public Airport List

Remarks:
All public use landing facilities within 20NM; applicable FAR Part 77 notice criteria as well as specific obstruction criteria for runways greater than 3,200 feet in length is identified for each public landing facility.

<table>
<thead>
<tr>
<th>FACIL</th>
<th>IDNT</th>
<th>TYP</th>
<th>ELEV</th>
<th>DEP</th>
<th>RUN</th>
<th>TAIL</th>
<th>BLDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAE</td>
<td>AIR</td>
<td>NEW CORNWELL LONG</td>
<td>76.6</td>
<td>736</td>
<td>-129.6</td>
<td>VE2</td>
<td></td>
</tr>
</tbody>
</table>

This facility has at least one runway over 3,200 feet in length.

Your actual NM FAR (7,948) or AIM (7,948) Notice criteria for this airport. However, you may NOT use other Notice Standards. As a minimum, please review the appropriate FAR Part 77 obstruction distance, FAR Navigation and Communication Table Line.

You are 2,002 feet from the nearest runway threshold and the threshold elevation is 844 feet. Please review runway and wind for remaining wind component.

This airport uses both Standard and Nonstandart Instrument Procedures. Please review published US Terminal (TERPS) Approach Procedures for this landing facility.

51° 50' 17" N ; 97° 21' 11" W

Category 'D' Circling Approach. Area extends 1,500' NM from each runway.

<table>
<thead>
<tr>
<th>FACIL</th>
<th>IDNT</th>
<th>TYP</th>
<th>ELEV</th>
<th>DEP</th>
<th>RUN</th>
<th>TAIL</th>
<th>BLDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFR</td>
<td>AIR</td>
<td>BONNIE HAGGARD</td>
<td>113.0</td>
<td>737</td>
<td>374</td>
<td>VE2</td>
<td></td>
</tr>
</tbody>
</table>

It is located more than 1,000 feet in length.

Your procedure 51° 50' 17" N ; 97° 21' 11" W Notice Standards for this airport. However, you may NOT use other Notice Standards. As a minimum, please review the appropriate FAR Part 77 obstruction distance for navigation and Communication Table Line.

You are 986 feet from the nearest runway threshold and the threshold elevation is 451 feet. Please review runway and wind for remaining wind component.

This facility has a circling approach procedure. Circling procedures have a straight in pattern. The pilot can be out of the circling approach area and still be in the terminal approach pattern. Please review published US Terminal (TERPS) Approach Procedures for this airport to determine what aspect of any this site has on the procedure(s) and/or airport.

51° 50' 17" N ; 97° 21' 11" W

Category 'A' Circling Area extends 1,500' NM from each runway.
Aeronautical Impact Statement
Zorn to Marion

Category 'B' Circling Area extends 1.84 NM from all runways.
Category 'C' Circling Area extends 2.89 NM from all runways.
Category 'D' Circling Area extends 3.78 NM from all runways.
Category 'E' Circling Area extends 4.73 NM from all runways.

<table>
<thead>
<tr>
<th>FACIL IDENT TYP NAME</th>
<th>BEARING DISTANCE DELTA ARP FAR</th>
<th>To FACIL IN N.M.</th>
<th>ELEVATION P77</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADS2 HEL GUADALUPE HOSPITAL</td>
<td>111.11 7.005 +248</td>
<td>163</td>
<td></td>
</tr>
</tbody>
</table>

Your structure DOES NOT EXCEED FAR 77.9(b) Notice Criteria for this heliport. You are not locating within 5,000 feet of facility. You are beyond limit by 42898.02 feet.

<table>
<thead>
<tr>
<th>FACIL IDENT TYP NAME</th>
<th>BEARING DISTANCE DELTA ARP FAR</th>
<th>To FACIL IN N.M.</th>
<th>ELEVATION P77</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEQ AIR RANDOLPH AFB AUX</td>
<td>115.51 9.698 +253</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

This facility has at least one runway over 3,200 feet in length. 

Your structure DNE FAR 77.9(a) or 77.9(b) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 56884 feet from the nearest runway threshold and the threshold elevation is 528 feet. Please review runway analysis for remaining airport surfaces.

This facility has a circling approach procedure. Circling procedures have a Straight-In segment. The site can be out of the circling approach area and still be in the straight in approach segment. Please review published US Terminal Procedures for this landing facility to determine what impact (if any) this site has on the procedure(s) and/or airport.

DNE 77.9 IFR Notice Criteria SEQ

Category 'A' Circling Area extends 1.30 NM from all runways.
Category 'B' Circling Area extends 1.84 NM from all runways.
Category 'C' Circling Area extends 2.89 NM from all runways.
Category 'D' Circling Area extends 3.78 NM from all runways.
Category 'E' Circling Area extends 4.73 NM from all runways.

<table>
<thead>
<tr>
<th>FACIL IDENT TYP NAME</th>
<th>BEARING DISTANCE DELTA ARP FAR</th>
<th>To FACIL IN N.M.</th>
<th>ELEVATION P77</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNU AIR RANDOLPH AFB</td>
<td>3:38.0 12.30 +17</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

This facility has at least one runway over 3,200 feet in length. 

Your structure DNE FAR 77.9(a) or 77.9(b) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 72026 feet from the nearest runway threshold and the threshold elevation is 743 feet. Please review runway analysis for remaining
This airport has both Circling and Straight-In Instrument Procedures. Please review published US Terminal (TERPS®) Approach Procedures for this landing facility.

DNE 77.9 IFR Notice Criteria RND Category 'E' Circling Approach Area extends 4.73 NM from each runway.

<table>
<thead>
<tr>
<th>FACIL</th>
<th>BEARING DISTANCE</th>
<th>DELTA ARP</th>
<th>FAR IDENT TYP NAME</th>
<th>To FACIL IN N.M.</th>
<th>ELEVATION P77</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYI</td>
<td>AIR SAN MARCOS MUNI</td>
<td>35.75</td>
<td>18.995</td>
<td>+183.3</td>
<td>YES</td>
</tr>
</tbody>
</table>

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.9(a) or 77.9(b) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 112519 feet from the nearest runway threshold and the threshold elevation is 588 feet. Please review runway analysis for remaining airport surfaces.

This airport has Instrument Procedures. Please review published US Terminal (TERPS®) Approach Procedures for this landing facility to determine impact.

<table>
<thead>
<tr>
<th>FACIL</th>
<th>BEARING DISTANCE</th>
<th>DELTA ARP</th>
<th>FAR IDENT TYP NAME</th>
<th>To FACIL IN N.M.</th>
<th>ELEVATION P77</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDA</td>
<td>HEL MARTINDALE AHP</td>
<td>232.23</td>
<td>19.979</td>
<td>+104</td>
<td>YES</td>
</tr>
</tbody>
</table>

Your structure DOES NOT EXCEED FAR 77.9(b) Notice Criteria for this heliport. You are not locating within 5,000 feet of facility. You are beyond limit by: 116394.7 feet.

<table>
<thead>
<tr>
<th>FACIL</th>
<th>BEARING DISTANCE</th>
<th>DELTA ARP</th>
<th>FAR IDENT TYP NAME</th>
<th>To FACIL IN N.M.</th>
<th>ELEVATION P77</th>
</tr>
</thead>
<tbody>
<tr>
<td>A177</td>
<td>AIR BULVERDE AIRPARK</td>
<td>217.94</td>
<td>-21.395</td>
<td>-577</td>
<td>YES</td>
</tr>
</tbody>
</table>

This facility does not have a runway over 3,200 feet in length.

Your structure DNE FAR 77.9(a) or 77.9(b) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 124456 feet from the nearest runway threshold and the threshold elevation is 1075 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected TERPS® impact.
This facility does not have a runway over 3,200 feet in length.

Your structure DNE FAR 77.9(a) or 77.9(b) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 126384 feet from the nearest runway threshold and the threshold elevation is 834 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected TERPS® impact.

THE NEAREST AIRPORT TO CASE COORDINATES IS: BAZ

NEW BRAUNFELS RGNL is an Airport type landing facility and is associated with the city of NEW BRAUNFELS, TX. The facility is eligible for Study under FAR Part 77 sub-Part C.

Its Reference Point (ARP) elevation is: 658.4 feet AMSL and you are locating 27567 feet from this landing facility.
## Appendix G: Public Airport Runway Part 77 Classification.

<table>
<thead>
<tr>
<th>Ident</th>
<th>Landing Facility Name</th>
<th>Runway BE</th>
<th>Classification Type</th>
<th>Runway RE</th>
<th>Classification Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAZ</td>
<td>New Braunfels Rgnl</td>
<td>13</td>
<td>C</td>
<td>31</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>C</td>
<td>35</td>
<td>C</td>
</tr>
<tr>
<td>E70</td>
<td>Huber Airport Civic Club LLC</td>
<td>16</td>
<td>A(V)</td>
<td>34</td>
<td>A(V)</td>
</tr>
<tr>
<td>XS98</td>
<td>Guadalupe Hospital</td>
<td>H1</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SEQ</td>
<td>Randolph AFB Aux</td>
<td>13</td>
<td>PIR</td>
<td>31</td>
<td>PIR</td>
</tr>
<tr>
<td>RND</td>
<td>Randolph AFB</td>
<td>14L</td>
<td>PIR</td>
<td>32R</td>
<td>PIR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14R</td>
<td>PIR</td>
<td>32L</td>
<td>PIR</td>
</tr>
<tr>
<td>HYI</td>
<td>San Marcos Muni</td>
<td>08</td>
<td>D</td>
<td>26</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>PIR</td>
<td>31</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>C</td>
<td>35</td>
<td>D</td>
</tr>
<tr>
<td>MDA</td>
<td>Martindale AHP</td>
<td>18</td>
<td>UNK</td>
<td>36</td>
<td>UNK</td>
</tr>
<tr>
<td>T94</td>
<td>Twin-Oaks</td>
<td>12</td>
<td>A(V)</td>
<td>30</td>
<td>A(V)</td>
</tr>
<tr>
<td>1T8</td>
<td>Bulverde Airpark</td>
<td>16</td>
<td>A(V)</td>
<td>34</td>
<td>A(V)</td>
</tr>
</tbody>
</table>
Federal Airways & Airspace

Executive Summary

Date: October 30, 2015
Subject: RCLR Fresnel Zone Analysis
Project: 2015-AIS-1866-OE
Site ID: Zorn to Marion

The analysis for the width of the QT5 to QT6 RCLR Microwave Link is complete. The below information should be used to plan the Zorn to Marion power connectivity.

**QT5 RCLR**

Location: N. Latitude 29° 40’ 54.30” and W. Longitude 97° 53’ 59.88”
Ground Elevation: 731’ AMSL (USGS)
AGL: 157’
Overall Elevation: 888’ AMSL

**QT6 RCLR**

Location: N. Latitude 29° 32’ 39.40” and W. Longitude 98° 21’ 39.40”
Ground Elevation: 1016’ AMSL (USGS)
AGL: 150’ (estimated)
Overall Elevation: 1166’ AMSL

Distance Between 0.T5 and QT6: 46,664.73 meters

Frequency: 7500 MHz

First Fresnel Zone radius: 21.6 meters (Widest Point)

Wire Spans through the Fist Fresnel Zone will be insignificant with respect to signal attenuation. Power Pole should be no closer than the radius at its widest point which is at 23.33 km from QT5. KML documents (QT5-East, 0.16-West and 055-QT6_RCLR) can be loaded into Google Earth for a visual presentation.
Appendix I: FAA Military Screening Results

Preliminary screening tool - Desk Reference Guide V_2014.2.0

Disclaimer:

The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is 100% optional and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. The use of this tool does not in any way replace the official FAA processes/procedures.

Instructions:

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  - Air Defense and Homeland Security radars (Long Range Radar)
  - Weather Surveillance Radar 1988 Doppler radars (NEXRAD)
  - Military Operations

Enter either a single point or a polygon and click submit to generate a long range radar analysis map. Military Operations is only available for a single point.

At least three points are required for a polygon, with an optional fourth point.

The largest polygon allowed has a maximum perimeter of 100 miles.

<table>
<thead>
<tr>
<th>Screening Type: Military Operations</th>
<th>Geometry Type: Single Point</th>
</tr>
</thead>
</table>

Deq  | Min  | Sec  | Dir  | Deg  | Min  | Sec  | Dir  |
-----|------|------|------|------|------|------|------|
 129  | 112  | 148.97 | 1  | 191  | 315  | 48  | W   |

Horizontal Datum: NAD83

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact the US Navy Representative, FAA Central Service Area at the USN Regional Environmental Coordinator at (817) 222-5930 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact LTC Owen B. Castlemain at the USA Regional Environmental Coordinator at (817) 222-5921 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact LTC Owen B. Castlemain at the USA Regional Environmental Coordinator at (817) 222-5921 for confirmation and documentation.

Any questions interpreting the map, please email Steve Sample with your question/s and phone number at steven.sample@pentagon.atmi.
### Glossary of Terms & Acronyms

**AGL** – *Above Ground Level* – Refers to a structure’s height above ground level.

**AMSL** – *Above Mean Sea Level* – Elevation or altitude of any object relative to the average sea level.

**FAR** – *Federal Aviation Regulations* – Rules prescribed by the FAA that govern all aviation activities in the United States. The FAR’s are part of Title 14 of the Code of Federal Regulations.

**IFR** – *Instrument Flight Rules* – Flight rules used when conditions are not suitable for VFR flying.

**MSL** – *Mean Sea Level* – Refers to the average sea level.

**MEA** – *Minimum En Route Altitude* – is the lowest published altitude between radio navigation fixes that assures acceptable navigational signal coverage and meets obstacle clearance requirements (MOCA) between those fixes.

**MOCA** – *Minimum Obstacle Clearance Altitude* – The MOCA provides the required clearance above obstacles contained inside the obstacle clearance areas.

**MVA** – *Minimum Vectoring Altitudes* - The lowest MSL altitude at which an IFR aircraft will be vectored by a radar controller, except as otherwise authorized for radar approaches, departures, and missed approaches. The altitude meets IFR obstacle clearance criteria.


**RCL** – *Radio Communications Link* – Microwave Path for radio communications

**TERPS** – *Terminal Instrument Procedures* – IFR procedures and procedure areas associated with an airport. TERPS can also refer to the Aeronautical CAD program produced and used by Federal Airways & Airspace.


**VFR** – *Visual Flight Rules* – Flights rules used in fair to excellent flying conditions and under certain limitation. See Title 14 CFR Part 91.

**VOR** – *VHF Omni directional Radio Range* - Short range radio navigation system using land based transmitters. VORs can be used as guidance along a route or for Instrument Approach Procedure guidance.
### Exhibit ALP-2: Electric and Magnetic Field Calculations

**Zorn-Marion 345-kV**

#### Table ALP-1a: Electric Fields Summary

<table>
<thead>
<tr>
<th>Transmission Line Configuration</th>
<th>Maximum at CL (kV/m)</th>
<th>Maximum 20 ft from CL (kV/m)</th>
<th>Maximum 40 ft from CL (kV/m)</th>
<th>Maximum 60 ft from CL (kV/m)</th>
<th>Maximum 80 ft from CL (kV/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Configuration with One Circuit Installed</td>
<td>4.06</td>
<td>3.51</td>
<td>3.90</td>
<td>2.17</td>
<td>0.76</td>
</tr>
<tr>
<td>Vertical Configuration with Two Circuits Installed</td>
<td>2.91</td>
<td>2.31</td>
<td>2.91</td>
<td>1.85</td>
<td>0.74</td>
</tr>
</tbody>
</table>

#### Table ALP-1b: Magnetic Fields Summary

<table>
<thead>
<tr>
<th>Transmission Line Configuration</th>
<th>Maximum at CL (mG)</th>
<th>Maximum 20 ft from CL (mG)</th>
<th>Maximum 40 ft from CL (mG)</th>
<th>Maximum 60 ft from CL (mG)</th>
<th>Maximum 80 ft from CL (mG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Configuration with One Circuit Installed</td>
<td>16.30</td>
<td>15.27</td>
<td>16.00</td>
<td>12.48</td>
<td>8.62</td>
</tr>
<tr>
<td>Vertical Configuration with Two Circuits Installed</td>
<td>15.03</td>
<td>13.72</td>
<td>14.68</td>
<td>11.13</td>
<td>7.47</td>
</tr>
</tbody>
</table>

#### Notes:

Electric fields calculated in kilovolts per meter (kV/m).

Magnetic fields calculated in milliGauss (mG).

For a visual representation of the typical vertical tangent configuration, please see Figure 1-7 of the EA.

CL = Centerline of Structure