



## Preliminary Route Analysis

# SR 60 W UTILITY EXPANSION

*Prepared for:*

**The City of Lake Wales**

*Prepared by:*

**Kimley-Horn and Associates, Inc.**

046149023

May 2014

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Ocala, Florida 34471

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**Kimley»Horn**

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THIS IS TO CERTIFY THAT THE  
ENCLOSED ENGINEERING  
CALCULATIONS WERE PERFORMED BY  
ME OR UNDER MY DIRECT SUPERVISION.

---

Malcolm L. Bryant, PE  
Florida Registration Number 65582  
CA 00000696

**Kimley»Horn**

Date: \_\_\_\_\_

## Table of Contents

|                                     |    |
|-------------------------------------|----|
| INTRODUCTION .....                  | 1  |
| BACKGROUND .....                    | 1  |
| SR 60 W SERVICE AREA.....           | 3  |
| DEMAND PROJECTIONS .....            | 5  |
| Existing Demands .....              | 5  |
| Future Demands.....                 | 5  |
| ROUTE ALTERNATIVES .....            | 6  |
| Water .....                         | 6  |
| Water Route Alternative A .....     | 7  |
| Water Route Alternative B .....     | 9  |
| Wastewater.....                     | 11 |
| Wastewater Route Alternative A..... | 12 |
| Wastewater Route Alternative B..... | 14 |
| Reclaimed Water .....               | 16 |
| RECOMMENDATIONS .....               | 18 |

## List of Figures

|  |    |
|--|----|
| Figure 1: Lake Wales Service Area Map.....                   | 2  |
| Figure 2: Lake Wales Western Development Expansion Map ..... | 4  |
| Figure 3: Water Alternative A .....                          | 8  |
| Figure 4: Water Alternative B .....                          | 10 |
| Figure 5: Wastewater Alternative A .....                     | 13 |
| Figure 6: Wastewater Alternative B .....                     | 15 |
| Figure 7: Reclaimed Water .....                              | 17 |

## List of Tables

|               |    |
|---------------|----|
| Table 1 ..... | 3  |
| Table 2.....  | 5  |
| Table 3.....  | 6  |
| Table 4.....  | 11 |

## Appendix

Conceptual Overall Route  
Site Pictures

## **INTRODUCTION**

The City of Lake Wales (City) is proposing to expand the City's potable water, sanitary sewer, and reclaimed water service approximately 4.5 miles westerly along SR 60 W from US 27 to the limits of the City's service boundary. This utility expansion is to accommodate potential future development and existing customers along the SR 60 W corridor. Prior to preparing construction plans and permit applications for the utility expansion, the City requested Kimley-Horn and Associates, Inc. (Kimley-Horn) to conduct a route analysis to identify route alternatives, permitting requirements, demand estimates, and establish line sizes. This report presents the findings of the route analysis.

## **BACKGROUND**

The area served by the City's existing water and wastewater system currently encompasses approximately 19 square miles from Stokes Road on the east to US 27 on the west. It expands from Hunt Brothers Road on the south to Eagle Ridge Mall on the north. The City has also established a service territory that defines the boundary where the City has first right of refusal to provide water and wastewater services. This service territory boundary extends beyond the City limits and encompasses approximately 77 square miles. **Figure 1** shows the limits of the existing utility infrastructure, the City limits, and the City's service territory boundary.

To encourage future development and urban expansion along the SR 60 W corridor, the City wants to expand the potable water, sewer, and reclaim water service along SR 60 W from the existing terminal points near the SR 60 and US 27 intersection westward approximately 4.5 miles to the CSX railroad crossing just west of W. Lake Wallace Road. This corridor is mostly vacant agricultural and conservation land with some commercial, industrial, and residential development outside the City limits. The City's airport is also located within the SR 60 W corridor. The existing commercial, industrial, and residential developments are served by well and septic systems.



**SR 60 W SERVICE AREA**

To determine future utility demands for the SR 60 W corridor, a service area was defined based on proximity to SR 60, parcel ownership, and geographic features. **Figure 2** is a map of the SR 60 W service area. The SR 60 W service area encompasses approximately 2,652 acres. Approximately 812 acres of the service area is developed and approximately 1,840 acres is undeveloped. The existing development within this service area is primarily residential, commercial and light industrial. Most of the undeveloped land is located in the County with a future land use designation of “Rural Development Area” (RDA).

Table 1 below presents a breakdown of the existing and future land uses within the SR 60 service area.

**Table 1**

| Land Use                             | Development Density | Units |
|--------------------------------------|---------------------|-------|
| Existing Residential                 | 168                 | ERU   |
| Existing Commercial                  | 57                  | Acres |
| Existing Industrial                  | 208                 | Acres |
| Airport (includes conservation land) | 446                 | Acres |
| Rural Development Area (Vacant)      | 1,773               | Acres |

Feet  
0 375 750 1,500  
Date: May 2014

**Legend**

- Service Territory Boundary
- City Limit
- SR\_60\_W\_Service\_Area\_Revised
- Lake Wales Parcels

**ZONING**

- BP
- BP/C-5
- C-1
- C-1A
- C-2
- C-2R
- C-3
- C-4
- C-5
- CN
- I-1
- I-2
- LCI
- PENDING
- PF
- R
- R-1A
- R-1B
- R-1C
- R-1D
- R-2
- R-3
- ROW
- RR
- SEE FLU
- WATER

**County Land Use**

- CITY
- NUSA
- RDA
- SDA
- TSDA
- UEA
- UGA

SR 60 W Service Area

City Limit

Service Territory Boundary

Figure 2, Page 4

**LAKE WALES WESTERN EXPANSION MAP**

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**DEMAND PROJECTIONS**

**Existing Demands**

The existing development is composed primarily of residential, commercial, and industrial uses. These demands are presently served by well and septic systems. According to City Ordinance 2008-42, “all persons or corporations living or doing business within the City utility service area shall be required to connect, when available, with the City utility system and shall be subject to all rules, regulations and rates provided by this chapter.” The City will have the option to encourage existing customers to connect to the utility extensions once they are constructed.

Should the City decide to connect the existing developed parcels, their water and wastewater demands will need to be considered in sizing the distribution system. Historically, the City has used water demands of 122 gallons per day (gpd) per customer and 100 gpd for sewer. Given that the typical household size in Lake Wales is 2.4 people (2010 Census), the demands from a typical residential unit can be defined as 292.8 gpd for water and 240 gpd for sewer. These typical residential unit demands can be used to convert uses other than residential (such as commercial and industrial) to common unit called an Equivalent Residential Unit (ERU). The following table presents the existing development water demands in common terms of ERU’s.

**Table 2**

| Land Use          | Number | Units | Floor Area Ratio | ERU Conversion | Total ERU  |
|-------------------|--------|-------|------------------|----------------|------------|
| Residential Units | 168    | ERU   | N/A              | N/A            | 168        |
| Commercial        | 57     | Acres | 0.2              | 7.0 ERU/Acre   | 80         |
| Light Industrial  | 126    | Acres | 0.2              | 5.5 ERU/Acre   | 139        |
| Airport           | 446    | Acres | N/A              | N/A            | 10         |
| <b>TOTAL</b>      |        |       |                  |                | <b>392</b> |

\*2010 Census 2.44 people per household.

\*ERU/Acre conversions: Commercial = Acreage \* FAR \* 2,040 gpd/acre / 292.8gpd/ERU; Industrial = Acreage \* FAR \* 1,620 gpd/acre / 292.8 gpd/ERU

**Future Demands**

The future demands for the SR 60 W corridor can be estimated from future land use maps. This method typically applies a utility demand per unit area of land use which can be reported as either demand in gallons per day or ERU equivalents. Approximately 1,840 acres of the 2,652 acre SR 60 W service area is undeveloped. Most of the undeveloped land is located in the County with a future land use designation of “Rural Development Area” (RDA). According to Section 2.180 of the Future Land Use element, the maximum density without land use amendments is 2 residential units per acre. The RDA does allow for some commercial and industrial uses as well within the RDA. Assuming the maximum density of 2 units is applied to the undeveloped area within the SR 60 W corridor, the maximum “full buildout” density is calculated below:

$$\text{Future development} = 1,840 \text{ acres undeveloped} \times 2 \text{ ERU/acre} = 3,680 \text{ ERU}$$

$$\text{Existing development} = 392$$

$$\text{Total Future plus Existing Utility Demands} = 3,680 + 392 = 4,072 \text{ ERU}$$

**ROUTE ALTERNATIVES**

The route alternatives described below are based on field observations, property appraiser GIS data review, and discussions with existing utility owners and the Florida Department of Transportation (FDOT). No survey data were available for the analysis. Because of some congested conditions and limited right of way (ROW) along the SR 60 corridor, the final utility locations can only be determined with the use of survey data.

**Water**

Two potable water system route alternatives were considered for the SR 60 W service area. Both alternatives focused on providing a potable water system “backbone” to serve as the main distribution line where future and existing developments can connect. Local potable water distribution systems internal to future development were not considered as they should be designed to fit the specific developments.

To aid the City in determining what size water main should be initially constructed, a water system hydraulic model (WaterCAD) was used to determine the maximum available capacity various pipe sizes could deliver to the farthest point in the system under the route alternatives. **Table 3** below shows the results of the modeling effort. The results reflect the new SR 60 W water main connected to the existing 12-inch water main just west of Henry Street. The “available flow @ 20 psi” column shows the maximum flow rate with a residual pressure of 20 psi (the minimum allowable pressure). The next column shows the number of ERU’s that can be supported (with the system being able to support maximum day demands and a 1,000 gpm fire flow rate). The last column shows the lowest available fire flow rate throughout the City’s system under the full build out demands.

**Table 3**

| Nominal Pipe Diameter | SR 60 W Service Area Available Flow @ 20 psi (GPM) | Number of ERU’s that can be supplied | City Wide System Minimum Fire Flow Available Throughout System |
|-----------------------|--|--------------------------------------|--|
| 8"                    | 651  | (838)                                | 1,003  |
| 10"                   | 1,089  | 214                                  | 981  |
| 12"                   | 1,597  | 1,433                                | 975  |
| 14"                   | 2,199  | 2,878                                | 958  |
| 16"                   | 2,735  | 4,164                                | 604  |
| 18"                   | 3,192  | 5,261                                | 561  |

As seen in the table, an 8-inch water main along SR 60 W will not be able to support the City’s minimum required fire flow of 1,000 gpm. The 10-inch, 12-inch, and 14-inch water mains can support up to 214, 1,433, and 2,878 ERU’s respectively. But, as seen in the last column, all these line sizes cause the available fire flows in the City to drop below the 1,000 gpm minimum. However, the locations of the low fire flows are on the extreme eastern edge of the City where the water model was under predicting actual flows. The last two line sizes, 16-inch and 18-inch, are able to support the estimated “full build out” demand except the fire flows in the City at multiple locations throughout the City fall below the minimum fire flow requirement.

**Water Route Alternative A**

Water route alternative A consists of routing the proposed water main (WM) from the existing 12" WM on Mulberry Street, through the City cemetery, WWTF site, and the "Lightsey Easement" to the airport property. The WM would then continue north and west through the airport property eventually out to SR 60 at Airport Road. The WM would then cross SR 60 and continue along the northern SR 60 ROW to a terminal point near the CSX railroad crossing. The total length of alternative A is approximately 4.75 miles. **Figure 3** shows water route alternative A.

*Benefits – The following are benefits for water alternative A.*

- *The route will avoid construction along SR 60 which is congested and has limited ROW.*
- *No additional easements required from Mulberry St. to the airport (need to confirm with survey)*

*Detriments – The following are detriments for water alternative A.*

- *May still require utility and/or construction easements for the airport property and along SR 60 W from the airport to Godwin Road.*
- *Water alternative A route is approximately 0.75 miles longer than alternative B.*
- *Will require additional water main along SR 60 W to serve existing and future customers between the Airport Road and Henry Street.*

*Easements - The following easements may be required for water alternative A.*

- *Utility easement through the airport property*
- *Additional utility and construction easements may be needed based on the final survey and design.*

*Permits – The following permits will be required for alternative A.*

- *Polk County Health Department*
- *FDOT / Polk County Right of Way*
- *Florida Midland Railroad Crossing*
- *FDEP NPDES (NOI)*

*Special Studies – The following special studies will be required for Alternative A.*

- *Environmental Phase I (sand skinks)*
- *Sand Skink Coverboards & Mitigation (possible requirement)*

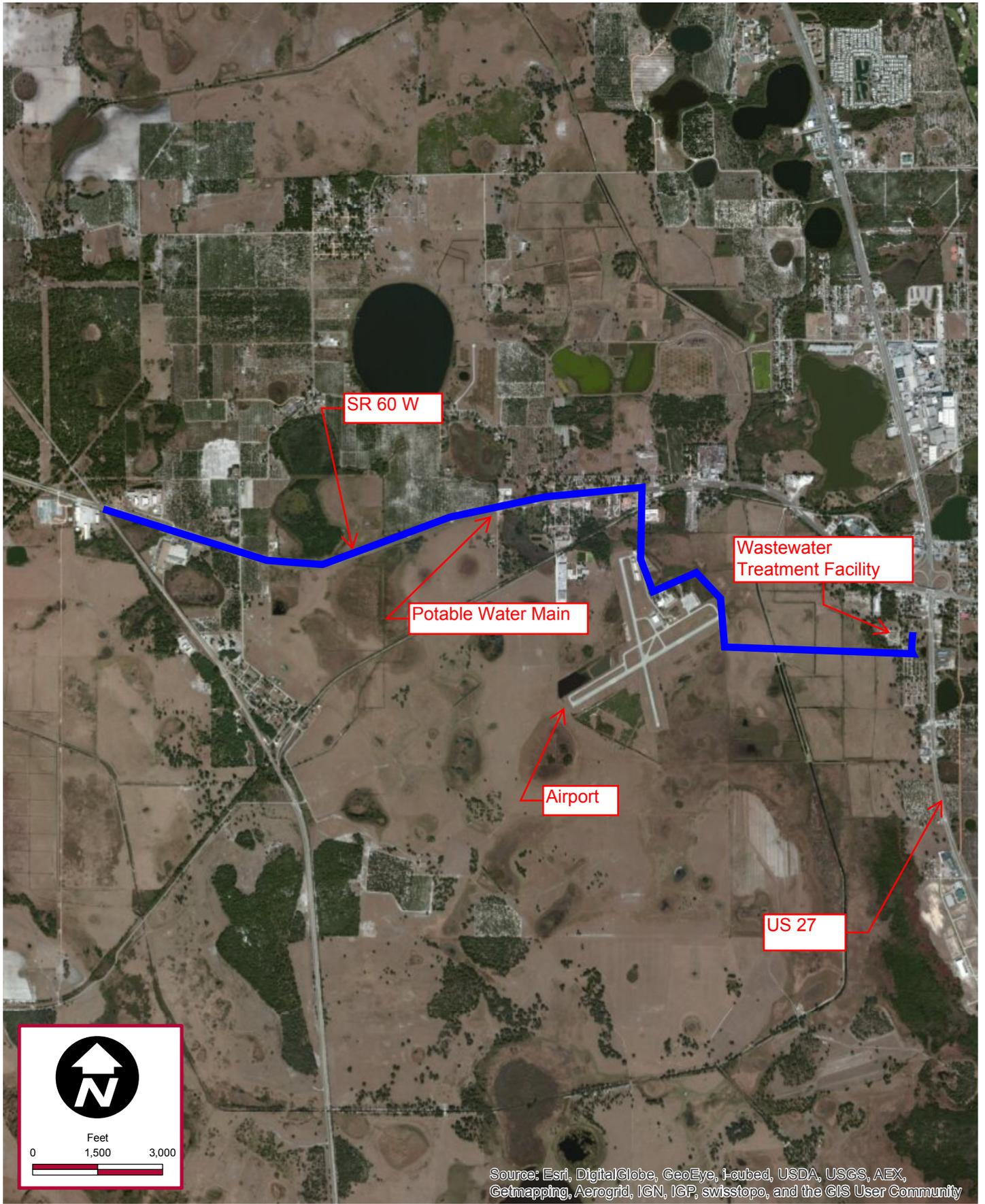
*Special Construction – The following special construction techniques may be required for Alternative A.*

- *Horizontal directional bore for SR 60, wetland and drainage canal crossings*
- *Jack and bore for railroad crossing.*

*Approximate Project Cost -*

- *12" WM - \$2,300,000*

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Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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AERIAL MAP

WATER ALTERNATIVE A  
LAKE WALES, FLORIDA

Scale: As Noted

Page 8

May 2014

Figure 3

**Water Route Alternative B**

Water route alternative B consists of routing the WM along the south side of the SR 60 W alignment from the connection point just west of Henry Street westward to the CSX railroad. A 6" service would be provided to the airport along Airport Road. To avoid congestion and limited ROW, the WM would cross SR 60 to the north at Airport road and then continue along the northern SR 60 W ROW to the terminal point at the CSX railroad crossing. The total length of Alternative B is approximately 4 miles. **Figure 4** shows water alternative B.

*Benefits – The following are benefits for water alternative B.*

- *This route is approximately 0.75 miles shorter than Alternative A.*
- *Provides water service to customers along SR 60 W from Henry Street to Airport Road.*

*Detriments – The following are detriments for water alternative B.*

- *May require utility and/or construction easements from Henry Street to Godwin Road (survey required)*
- *May require horizontal directional drill construction along SR 60 W from Henry Street to Godwin Road.*
- *Will require a 6" water service to connect the airport.*

*Easements - The following easements may be required for Alternative B.*

- *Potential utility and/or construction easements needed from Henry Street to Godwin Street.*
- *Additional utility and construction easements may be needed based on final survey and design.*

*Permits – The following permits will be required for Alternative B.*

- *Polk County Health Department*
- *FDEP NPDES (NOI)*
- *FDOT/Polk County Right of Way*
- *Florida Midland Railroad Crossing*

*Special Studies – The following special studies will be required for Alternative B.*

- *Environmental Phase I (sand skinks)*
- *Sand Skink Coverboard and Mitigation(possible requirement)*

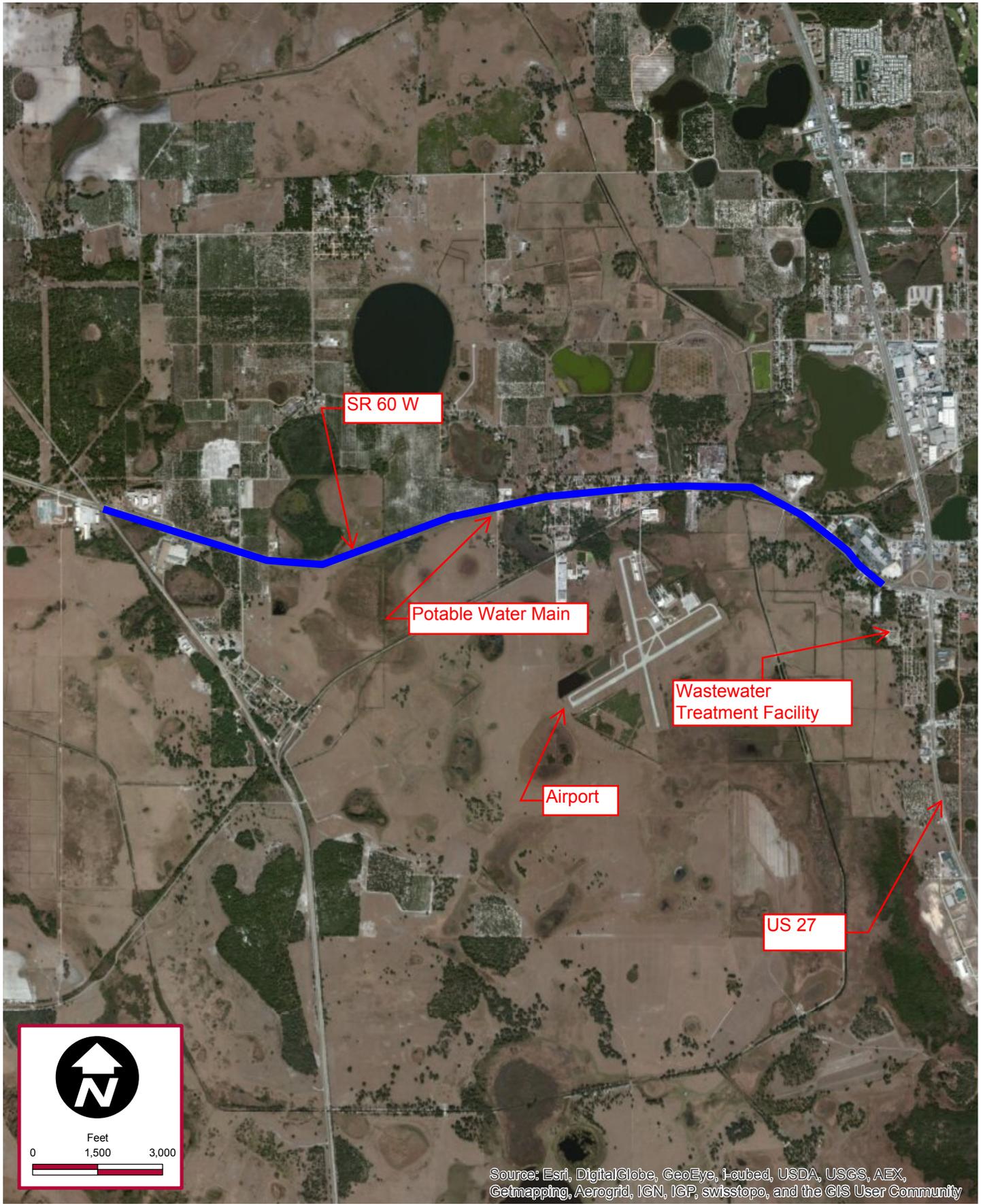
*Special Construction – The following special construction techniques may be required for Alternative B.*

- *Horizontal directional drill for SR 60 W from Henry Street to Godwin Street*
- *Horizontal directional drill for SR 60 W , wetlands, and drainage canal crossings*
- *Jack and bore for railroad crossing.*

*Approximate Project Cost -*

- *12" WM - \$2,100,000 (includes \$100,000 for service to airport)*

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AERIAL MAP

WATER ALTERNATIVE A  
LAKE WALES, FLORIDA

Scale: As Noted

Page 10

May 2014

Figure 4

## Wastewater

Two route alternatives were considered for the SR 60 W service area. Both alternatives focused on providing a lift station and force main collection system to deliver wastewater to the City's wastewater treatment facility (WWTF) located just east of the City's airport. Local collection systems internal to future development were not considered as they should be designed to fit the specific developments. The wastewater collection system routes and pipe sizes are based on a final "full build-out" scenario. However, the collection system should be constructed in a phased approach to match expected development.

In sizing sanitary sewer collection systems, the following parameters must be considered.

- Demands generated by the development.
- Force main velocity should be 2 ft/s or greater.
- Long collection systems with relatively low flows could create septic conditions resulting in odor issues.
- Lift stations should be sized to produce minimum forcemain velocities and support peak demands.

Since no specific development is planned at this point and since only a generalized future land use plan is available, selecting the proper line size is problematic. On one hand, if a conservatively large diameter forcemain is constructed, meeting minimum flow velocities and preventing septic conditions will be difficult. On the other hand, selecting a forcemain diameter that is too small could result in not enough available capacity for large scale developments and/or the need to construct additional force mains in the near future.

To aid the City in determining what size force main should be initially constructed, the following table was prepared. This table lists the number of equivalent residential units (ERU's) that can be served based on various force main diameters. This table assumes that the initial forcemain will be constructed from the WWTF all the way to the CSX crossing. Both route alternative lengths were analyzed.

**Table 4**

| Nominal Pipe Diameter | Route 1 FM Flow Rate (gpm) | Route 1 ERU's Served | Route 2 FM Flow Rate (gpm) | Route 2 ERU's Served | Route 1 FM Velocity | Route 2 FM Velocity |
|-----------------------|----------------------------|----------------------|----------------------------|----------------------|---------------------|---------------------|
| 6"                    | 263                        | 395                  | 253                        | 380                  | 2.98                | 2.86                |
| 8"                    | 560                        | 840                  | 537                        | 806                  | 3.58                | 3.42                |
| 10"                   | 1,008                      | 1,512                | 965                        | 1,448                | 4.12                | 3.94                |
| 12"                   | 1,627                      | 2,441                | 1,559                      | 2,339                | 4.62                | 4.42                |
| 14"                   | 2,441                      | 3,662                | 2,338                      | 3,507                | 5.09                | 4.87                |
| 16"                   | 3,468                      | 5,202                | 3,322                      | 4,983                | 5.53                | 5.3                 |
| 18"                   | 4,728                      | 7,092                | 4,528                      | 6,792                | 5.96                | 5.71                |

\*Table assumes 240 gpd/ERU ADF or 0.667 gpm/ERU peak hour flow

**Wastewater Route Alternative A**

Alternative A consists of routing the proposed forcemain (FM) from the WWTF westward through the "Lightsey Easement" to the airport property. The FM would then continue north and west through the airport property eventually out to SR 60 at Airport Road. The FM would then continue west along SR 60 to a terminal point near the CSX railroad crossing. Lift stations along the route would be determined as development plans are received. The total length of Alternative A is approximately 4.75 miles. See Figure 5.

*Benefits – The following are benefits for Alternative A.*

- *The route will avoid construction along SR 60 which is congested and has limited ROW.*
- *No additional easements required from Mulberry St. to the airport (need to confirm with survey)*

*Detriments – The following are detriments for Alternative A.*

- *May still require utility and/or construction easements for the airport property and along SR 60 W from the airport to Godwin Road.*
- *Route is approximately 0.25 miles longer than alternative B.*
- *Will require additional FM along SR 60 W to serve existing and future customers between the Airport Road and Henry Street.*

*Easements - The following easements may be required for alternative A.*

- *Utility easement through the airport property*
- *Additional utility and construction easements may be needed based on the final survey and design.*

*Permits – The following permits will be required for alternative A.*

- *Polk County Health Department*
- *FDOT / Polk County Right of Way*
- *Florida Midland Railroad Crossing*
- *FDEP NPDES (NOI)*
- *Florida Midland Railroad Crossing*

*Special Studies – The following special studies will be required for Alternative A.*

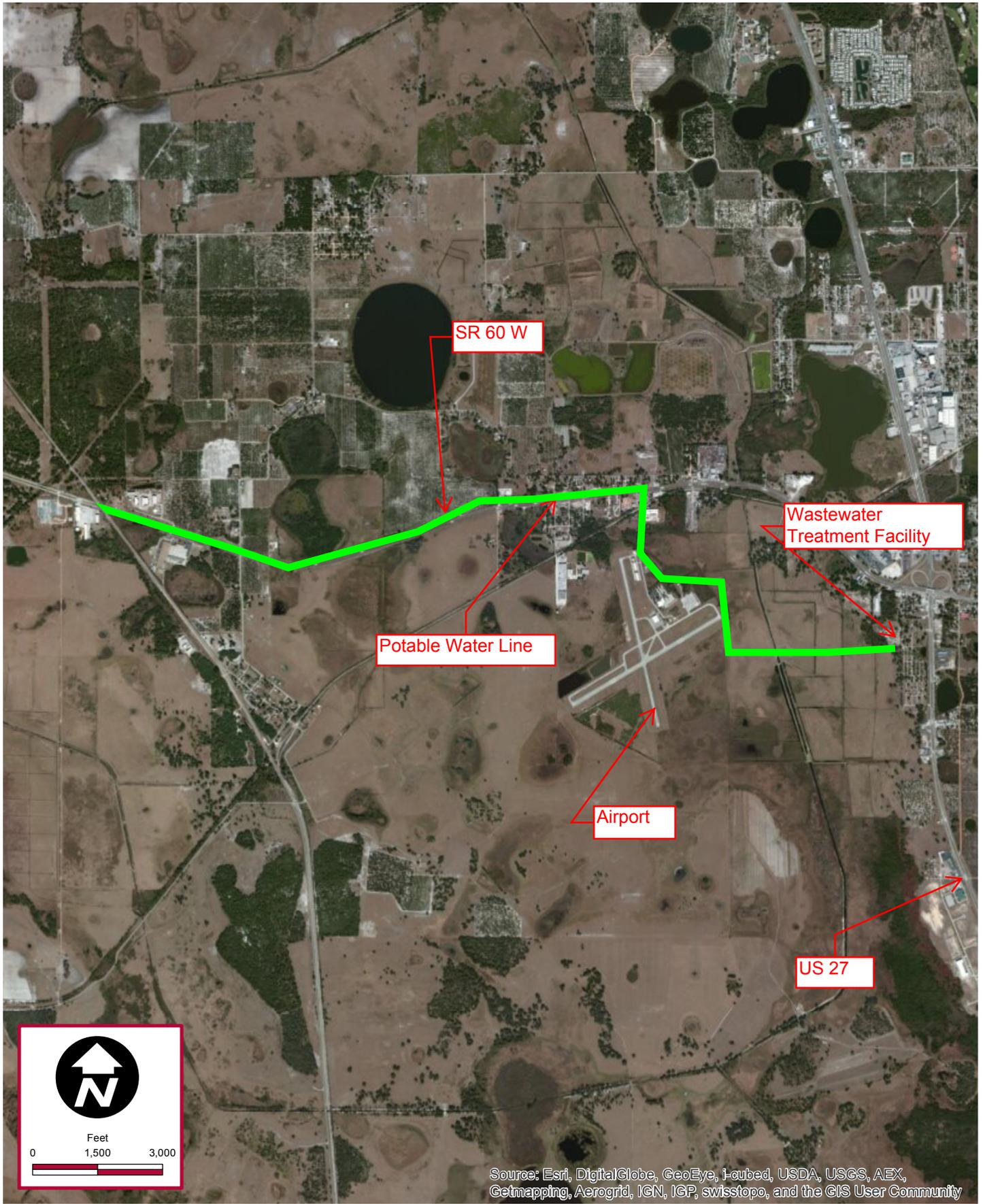
- *Environmental Phase I (sand skinks)*
- *Sand Skink Coverboards & Mitigation (possible requirement)*

*Special Construction – The following special construction techniques may be required for Alternative A.*

- *Horizontal directional bore for SR 60, wetland and drainage canal crossings*
- *Jack and bore for railroad crossing.*

*Approximate Construction Cost -*

- *6" FM - \$1,600,000*



Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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AERIAL MAP

**WASTEWATER ALTERNATIVE A  
LAKE WALES, FLORIDA**

**Wastewater Route Alternative B**

Alternative B consists of routing the proposed FM from the WWTF northward along Huey Street to SR 60. The FM would then continue west along SR 60 to a terminal point near the CSX railroad crossing. Lift stations along the route would be determined as development plans are received. The total length of Alternative B is approximately 4.5 miles. See **Figure 6**.

*Benefits – The following are benefits for alternative B.*

- This route is approximately 0.25 miles shorter than Alternative A.
- Provides water service to customers along SR 60 W from Henry Street to Airport Road.

*Detriments – The following are detriments for alternative B.*

- May require utility and/or construction easements from Henry Street to Godwin Road (survey required)
- May require horizontal directional drill construction along SR 60 W from Henry Street to Godwin Road.
- Will require a service to connect the airport.

*Easements - The following easements may be required for alternative B.*

- Utility easement through the airport property
- Additional utility and construction easements may be needed based on the final design.

*Permits – The following permits will be required for alternative B.*

- Polk County Health Department
- FDEP NPDES (NOI)
- FDOT/Polk County Right of Way
- Florida Midland Railroad Crossing

*Special Studies – The following special studies will be required for Alternative B.*

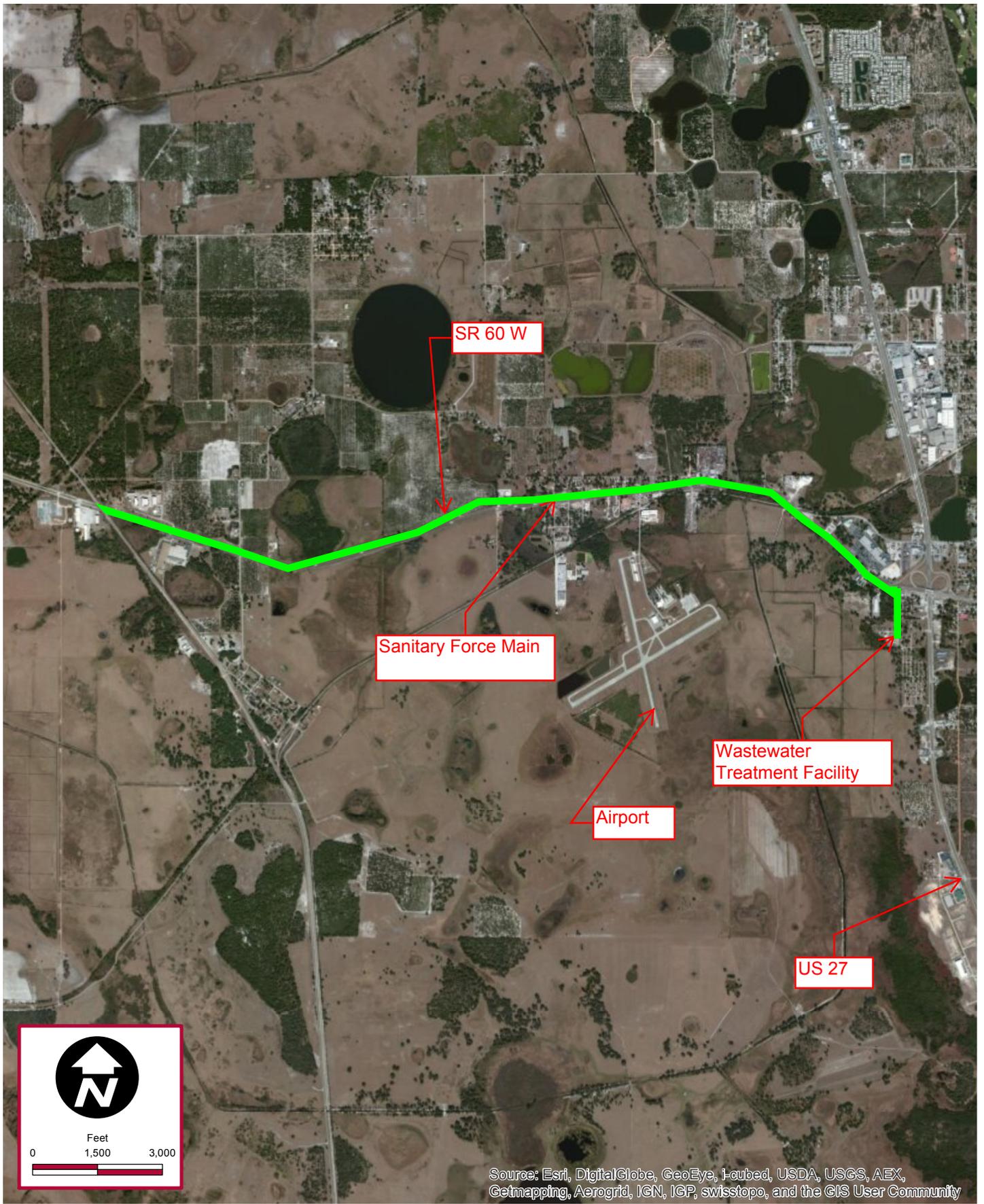
- Environmental Phase I (sand skinks)
- Sand Skink Coverboard and Mitigation(possible requirement)

*Special Construction – The following special construction techniques may be required for Alternative B.*

- Horizontal directional bore for SR 60, wetland and drainage canal crossings
- Jack and bore for railroad crossing.

*Approximate Project Cost -*

- 6" FM - \$1,500,000



AERIAL MAP

WASTEWATER ALTERNATIVE A  
LAKE WALES, FLORIDA

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## Reclaimed Water

The City's reclaim water system currently provides service to customers west of US 27. At present, the City has approximately 2.11 MGD of reclaimed water commitment. The WWTF is producing approximately 1.078 MGD. The City cannot provide additional customer demands until flow increase at the WWTF. According to discussions with the operations staff, the City is meeting the current reclaimed water demand. As flows to the wastewater treatment plant increase, additional reclaim customers may be available close to the existing reclaimed water distribution system.

Since additional reclaim water customers have not been identified west of US 27, only one alternative was analyzed for a future reclaimed water system. For simplification, this alternative assumes that the new reclaim water main would connect to the existing 18" reclaim line leaving the WWTF and run westward through the "Lightsey Easement" to the Airport property. The City has existing property on the airport that can accommodate a future ground storage tank and pumping system that can be properly sized to meet the demands once they are identified. See **Figure 7**.

*Easements - The following easements may be required for alternative A.*

- *Utility easement through the airport property*

*Permits – The following permits will be required for alternative A.*

- *Possible update to the City's WWTF operating permit.*

*Special Studies – The following special studies will be required for Alternative A.*

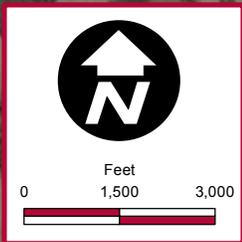
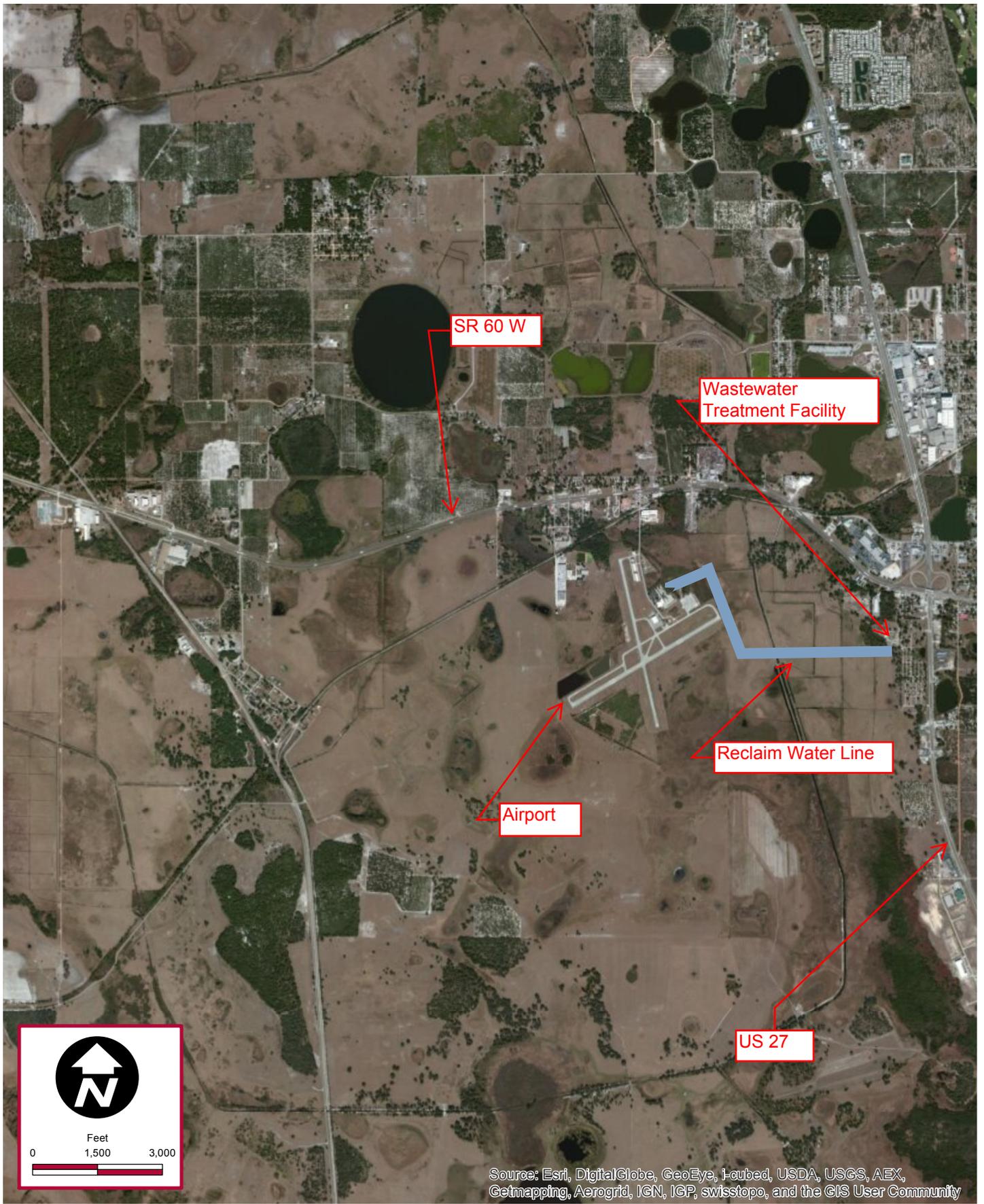
- *Environmental Phase I (sand skinks)*
- *Sand Skink Assessment (possible requirement)*

*Special Construction – The following special construction techniques may be required for Alternative A.*

- *Horizontal directional bore for wetland and drainage canal crossings*

*Approximate Construction Cost -*

- 18" RCW - \$1,000,000



Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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**AERIAL MAP**

**RECLAIMED WATER  
 LAKE WALES, FLORIDA**

## RECOMMENDATIONS

This analysis is intended to be a planning level study for the SR 60 W utility expansion. It was based on a review of the current City of Lake Wales and Polk County future land use maps and discussions with City and County planning staff. The water model used in this report was calibrated to within 15% of actual field measurements in most locations but some uncertainties exist with the underlying water distribution mapping.

- Typically, utility systems are sized for specific demands based on either known or anticipated demands. Most of the SR 60 W service area has an existing land use of Rural Development Area which has a maximum density of 2 ERU/acre. To ensure the City's utilities are sized properly, careful and deliberate thought should be put into visioning the way the City wants to encourage development in this area. From that visioning, a more precise utility demand and spatial distribution of that demand can be estimated. Therefore, the City is strongly encouraged to consider master planning the SR 60 service area prior to designing/constructing utilities along the SR 60 W corridor.
- If the City prefers to construct either force main alternative prior to specific developments or preparing detailed land plans with population growth projections, it would be best to construct only the force main and not construct lift stations. The lift stations can be properly located and sized once the demands are identified.
- The City can select either a 6" or 8" force main and convert to a reuse line in the future if additional capacity is needed.
- Until a customer is identified, the City should not construct the ground storage tank or the pumping facilities because they will be highly dependent on the demands. Likewise, the City should consider postponing construction of the 18-inch reclaim water line until the demand has been identified.

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# APPENDIX

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## Conceptual Overall Route

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## Site Pictures

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FIGURE 9



FIGURE 10



FIGURE 11



FIGURE 12



FIGURE 13



FIGURE 14



FIGURE 15

STATE ROAD 60  
WESTERLY UTILITY  
EXPANSION

CITY OF LAKE WALES FLORIDA

SHEET NUMBER  
3

SITE PICTURES

KHA PROJECT  
046149023  
DATE  
MAY 21, 2014  
SCALE AS SHOWN  
DESIGNED BY  
DRAWN BY  
CHECKED BY

LICENSED PROFESSIONAL  
ELISA H. TURNER, P.E.  
FLORIDA LICENSE NUMBER  
65710  
DATE:

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No. REVISIONS

DATE BY