Smith Reynolds Airport

Winston-Salem, NC

Short Environmental Assessment Form for Taxilane Extension Site Preparations and Terrain Obstruction Removal

May 2017

DRAFT

ClearWater Environmental Consultants, Inc.

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FEDERAL AVIATION ADMINISTRATION

Short Environmental Assessment Form for AIRPORT DEVELOPMENT PROJECTS

Airport Name: Smith Reynolds Airport Identifier: INT

Proposed Project: EA for taxilane L and hanger development, Runway 22 Safety Area, Taxiway Q and terrain obstruction removal.

This Environmental Assessment becomes a Federal document when evaluated, signed, and dated by the Responsible FAA official.

_____ _____

Responsible FAA Official Date

This form is to be used only for <u>limited</u> types of projects. It is strongly recommended that you contact your local Environmental Protection Specialist (EPS) before completing this form. See instructions page.

APPLICABILITY

This Form can be used if the proposed project meets the following criteria:

1) It is not categorically excluded (see paragraphs 303 and 307-312 in FAA Order 1050.1E) <u>or</u>

2) It is normally categorically excluded but, in this instance, involves at least one extraordinary circumstance that may significantly impact the human environment (see paragraph 304 and the applicable section in Appendix of 1050.1E) <u>or</u>

3) The action is one that normally requires an EA at a minimum (see paragraph 506 in FAA Order 5050.4B) <u>and</u>

4) The proposed project must fall under one of the following categories of Federal Airports Program actions:

(a) Approval of a project on an Airport Layout Plan (ALP).
(b) Approval of federal funding for airport development.
(c) Requests for conveyance of government land.
(d) Approval of release of airport land.
(e) Approval of the use of Passenger Facility Charges (PFC).
(f) Approval of development or construction on a federally obligated airport.

If you have questions as to whether the use of this form is appropriate for your project, contact your local EPS <u>BEFORE</u> using this form.

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Complete the following information:

Project Location

Airport Name: Smith Reynolds Airport Identifier: INT
Airport Address: 3801 North Liberty Street
City: Winston-Salem County: Forsyth State: NC Zip: 27105

Airport Sponsor Information

Point of Contact: Mark R. Davidson, AAE; Airport Director
Address: Same as above.
City: State: Zip:
Telephone: 336-767-6361 Fax: n/a
Email: mark.davidson@smithreynolds.org

Evaluation Form Preparer Information

Point of Contact: ClearWater Environmental Consultants, Inc.
Address: 32 Clayton Street
City: Asheville State: NC Zip: 28801
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1. Introduction/Background:

The Airport Commission of Forsyth County (ACFC), the manager and operator of the Smith Reynolds Airport (INT), completed a Master Plan Update (MPU) and associated Airport Layout Plan (ALP) update in 2012 (Attachment A). The MPU provides a comprehensive overview of the airport's needs over the next 20 years, including issues related to the timing of proposed development, development costs, methods of financing, and management options to provide a clear plan of action. This short Environmental Assessment (EA) form will evaluate impacts associated with the proposed taxilane extension site preparations and terrain obstruction removal as depicted in the MPU. The terrain obstruction removal area would be cleared and graded in a manner that would also support a future parallel taxiway.

INT is a Part 139 Certified airport located approximately 4 miles north of downtown Winston-Salem in Forsyth County, North Carolina. The NC Department of Transportation (DOT), Division of Aviation (DOA) developed the North Carolina Airports System Plan (NCASP) to understand the condition of the current North Carolina airport system and plan for its future needs. The plan provides standards for the DOA to prioritize the funding of eligible capital projects for all public-use general aviation airports in the North Carolina airports system. Airports are categorized into color groups according to several factors such as population, per capita income, and tourism characteristics. The NCSP classifies INT as a "red airport", which is the highest development color grouping for airports. The proposed project is intended to ensure that the airport is meeting the standards and serving the needs of the surrounding community and the statewide aviation system.

2. Project Description (List and clearly describe ALL components of project proposal including all connected actions). Attach a map or drawing of the area with the location(s) of the proposed action(s) identified:

The proposed projects will take place entirely on airport property and includes the following project components, all of which are shown on the approved ALP in conceptual form on the MPU (Attachment A).

1. Taxilane L Extension - Construction of a 1,600-foot taxilane extension to access developable land for potential airport tenants. Taxilane L will be a new taxiway located on the existing concrete ramp serving the MRO facility at INT.
2. Maintenance, Repair, and Overhaul (MRO) Facilities - Construction of three large aircraft hangars which would be utilized for future MRO facilities. Each building would contain approximately 50,000 square feet of space which have a collective capacity of 150,000 square feet.
3. Parking - In support of the three planned MRO facilities, an 85,000-square foot parking lot is proposed north and adjacent to the hangar facilities. Based on 500 square feet per space, the proposed lot would provide up to 170 spaces, or approximately 56 spaces per hangar.
4. Terrain Obstruction Removal - The existing terrain penetrates the runway object free area and imaginary surface planes as described in FAR Part 77 east of Runway 15-33. In total, approximately 24.2 acres of property would be re-graded to resolve this deficiency. The soil removed from this area would be utilized to prepare the 23.3-acre northeastern development site for MROs, air cargo, or corporate aircraft.
5. Runway 22 Safety Area Extension – The existing runway safety area for Runway 22 does not meet current FAA requirements for the length of the runway safety area that extends past the end of the runway. The runway safety area (RSA) would be extended to a total of 300 feet from the end of Runway 22 using material from the terrain obstruction removal project.
6. Correction of Taxiway A Separation - The terrain obstruction removal area would be cleared and graded in a manner that would also support a future parallel taxiway (Taxiway Q). A new parallel taxiway would be constructed east of Runway 15-33 in the location of the terrain obstruction removal area. This would correct existing runway/taxiway separation deficiencies.

3. Project Purpose and Need:

Per the National Environmental Policy Act (NEPA) and Federal Aviation Administration (FAA) Order 1050.1F, Environmental Impacts: Policies and Procedures, the Purpose and Need discussion identifies the problem facing the proponent (the need), the purpose of the action (the proposed solution), and the proposed timeframe for implementing the action.

The purpose of the Proposed Action at INT is to: meet long-term aviation demand, satisfy FAA standards, and improve efficiency or safety. The need for the project is the inability of current facilities to meet the forecasted future demand of the airport and the deficiency in meeting FAA standards.

The ACFC would construct a new taxilane to provide access to developable area designated for future aircraft MRO facilities. The existing MRO, formerly home of North State Aviation (NSA) facility

supports up to 6 large aircraft at the Smith Reynolds Airport. Additional growth is expected. The taxilane extension would provide access to land available for expansion and/or establishment of another aircraft MRO facility.

The 1000-foot wide "primary surface" of Runway 15-33 is cleared and graded. However, according to FAA FAR Part 77 (Primary and Transitional Surfaces), Instrument Land System (ILS) Runways, like Runway 15-33, have additional critical aeronautical surfaces around the runway that should be cleared and graded so as not to be a hazard to aircraft using the airport. Terrain obstruction removal would be a safety enhancement project that would satisfy FAA FAR Part 77 (Primary and Transitional Surfaces) and support future airfield projects.

The terrain obstruction removal area would be cleared and graded in a manner that would also support a future parallel taxiway. Per FAA standards, the required runway to taxiway centerline separation distance for group C-III runways is 400 feet. The current separation distance between Taxiway A and Runway 15-33 is approximately 281 feet. The existing taxiway would have to be shifted an additional 119 feet to the southwest in order to meet FAA standards. In lieu of the large taxiway shift, a new parallel taxiway would be constructed east of Runway 15-33 in the location of the terrain obstruction removal area. The runway to taxiway centerline separation requirement would be met.

RSA is "a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway." The current RSA for Runway 22 is 150 feet wide and 130 feet in length and the current RSA for FAA design standards require that the RSA for Runway 22 be 150 feet wide (75 feet on either side of the runway centerline) and 300 feet in length beyond the threshold. The safety area is proposed for construction in order to comply with current Federal Aviation Regulations (FAA); Part 139 – Certification and Operations: Land Airports Serving Certain Air Carriers.

4. Describe the affected environment (existing conditions) and land use in the vicinity of project:

The affected environment includes the airport property (approximately 757 acres). Specifically, the project areas are east of Runway 15-33 and north of Runway 4-22 (Figure 1). The airport property is mostly developed with aprons, taxiways, parking, hangers, buildings, other airfield structures, and maintained in-field grassed lawns. The airport study area contains 9,470 linear feet of streams and 1.8 acres of wetlands.

The "East/Northeast Winston-Salem Area Plan" (updated December 2008) identifies an East/Northeast Winston-Salem Planning Area (Planning Area) that includes approximately 4,389 acres (Attachment B). The Planning Area is home to the Smith Reynolds Airport. Although it is not currently used for commercial aviation, the Smith Reynolds Airport is close to downtown Winston-Salem and adds an important component to the City's business development.

The predominant land use in the Planning Area is residential, which accounts for approximately 25% of the total land area. Most of the Planning Area was developed prior to 1940 in the pattern of traditional urban neighborhoods with a mix of residential types and densities, along with a variety of other land uses including neighborhood business areas and commercial development. The Planning Area is home to some of the first major housing developments constructed in Winston-Salem which

includes Reynoldstown (1917), Dreamland (early 1920s), and City View (early 1920s). Single-family is the primary residential type in most neighborhoods.

Multifamily development accounts for approximately 6% of total land area. Concentrations of multifamily uses are located in: Piedmont Circle (southwest of INT), Ladeara Crest Estates Apartments (southwest of INT), Cleveland Avenue Homes (southwest of INT), Lakeside Apartments (southeast of INT), Rolling Hills Apartments (south of INT), and Forest Ridge; east of US 52 to Cleveland Avenue between Second and Fifth Streets; on Cleveland Avenue between Martin Luther King Jr. Drive and Twelfth Street; and on small sites scattered throughout the area. The Planning Area is a source of much of the City's public and assisted housing.

Approximately 115 acres, about 3% of the Planning Area, is developed with commercial uses. Liberty Street has been a traditional location for commercial uses since it developed as an extension of the downtown commercial area. Other commercial uses are located along major roads such as New Walkertown Road, Martin Luther King Jr. Drive, and Glenn Avenue. Scattered commercial development can be found in the Planning Area along Fifth Street and Old Greensboro Road. Other small pockets of commercial uses are dispersed throughout the Planning Area located in close proximity to residential uses, making it convenient for people to acquire necessary goods and services.

Industrial land use represents approximately 17% of the Planning Area. Industrial land uses are located at both north and south ends of the Planning Area. The Smith Reynolds Airport and industrial uses along rail lines facing Liberty Street and Glenn Avenue anchor the north end. At the south end, multiple industrial uses are located in the Lowery Street Business Park.

A large amount of land in the Planning Area is devoted to public and semi-public uses, including schools, churches, institutions, health and social services. The approximately 300 acres of institutional use accounts for about 9% of the land area. In addition to numerous schools and churches, there are a number of community services located in the Planning Area. Nine public parks and other open spaces account for approximately 8% of the land in the Planning Area.

About 15% of the Planning Area is devoted to utilities, road, and railroad rights-of-way.

Although it appears that there is a high percentage of unused land in the Planning Area (approximately 20%), few vacant parcels can actually be developed. With the exception of some vacant parcels in the Lowery Business Park, most of the vacant land in the Planning Area is not suitable for development because of steep slopes and drainage ways, or proximity to the Smith Reynolds Airport.

5. Alternatives to the Project: Describe any other reasonable actions that may feasibly substitute for the proposed project, <u>and</u> include a description of the "No Action" alternative. If there are no feasible or reasonable alternatives to the proposed project, explain why (attach alternatives drawings as applicable):

The ACFC considered multiple alternatives that had the potential to meet long-term aviation demand, satisfy FAA standards and/or improve efficiency and safety. Prior to identifying a preferred alternative, several criteria were evaluated. Each criteria is discussed below:

1. Operational – The selected development alternative should be capable of meeting the airport's facility needs as identified for the planning period. Preferred options should resolve any existing or future deficiencies as indicated by FAA design, safety, and security criteria.
2. Environmental – Airport growth and expansion may impact both the airport and surrounding environs; therefore, the selected plan should seek to mitigate impacts both within and adjacent to the airport property. Alternatives should also seek to obtain a reasonable balance between expansion needs and off-site acquisition and relocation needs while being sensitive to potential environmental impacts.
3. Cost – Some alternatives may result in excessive costs due to expansive construction, acquisition and/or other development requirements. In order for a preferred alternative to best serve the airport and the community, it must satisfy development needs at a reasonable cost.
4. Feasibility – The alternative concepts must be acceptable to the FAA, NCDOT Division of Aviation, and the ACFC. Consideration is also given to the community being served. In addition, the proposed developments should be economically feasible.

Alternatives considered are discussed below:

1. Taxilane L Extension and MRO Facilities with Auto Parking
   Runway 4/22 is served by the full-length Taxiway F. Currently, Taxiway F terminates at Runway 4 near the existing MRO facility which is a large maintenance hangar facility. Approximately 15 acres of developable land is located northeast of the existing facility which could be used for additional MRO facilities. Currently, there is no airfield access to this area.

   a. No Action - The No Action alternative assumes that no development (Taxilane L extension and MRO facilities with auto parking) would occur in the proposed project area and that conditions would remain as they exist in 2016. This would not allow for the expansion of the MRO and/or establishment of another aircraft MRO facility.

      The inability to establish another aircraft MRO facility could cause a loss of revenue through loss of leases and fuel sales. Expansion of the MRO would need additional facilities and employees. Without the ability to expand, larger MRO operations could be forced to explore other opportunities such as locating to another airport.

      Additionally, there would be no development of a community college-based accredited aviation maintenance and "hands-on" training school. In collaboration with INT, Forsyth Technical Community College would develop a technical program specializing in a curriculum to train future aircraft maintenance mechanics and technical support employees. One MRO facility would be dedicated to the school for use. This program would directly affect and increase the MRO workforce with many graduates of the program moving directly into the MRO facilities at INT.

      Aircraft maintenance is a large component of INT's operations with itinerant operations comprising over 70% of all operations at the airport. Moving forward with the No Action Alternative could limit the airport's growth potential due to inadequate or a lack of available facilities and/or capabilities. This would ultimately affect overall airport operations.

This alternative does not meet the stated purpose and need for the project; however, it has been included in the analysis per NEPA and FAA Order 1050.1F.

b. High Development Alternative – The High Development Alternative (Figure 2, Exhibit 6-3 in the MPU) reflects an unconstrained development scenario that provides improvements and allocations for new facilities as necessary to accommodate business and based aircraft well beyond the 20-year MPU planning period.

   i. Taxilane L Extension – A new, 1,650-foot taxilane extension would be constructed to provide access to the proposed north MRO facilities.
   ii. MRO Facilities – Two 50,000-square foot hangars and one 203,000-square foot hanger would be constructed and utilized for future MRO facilities. The complex would have a collective capacity of 303,000 square feet for use as additional aviation maintenance, cargo, or other aviation related activities. Also, within the MRO facility, a 546,000-square foot apron area would be constructed as needed for hangar frontage. MRO facilities would also include a community college-based class room and hangar facility to educate and train future airplane maintenance mechanics and technicians.
   iii. Auto Parking - In support of the three MRO facilities and educational facilities, an 85,000-square foot parking lot would be constructed adjacent to the hangar facilities. Based on 500 square feet per space, the proposed lot should provide up to 170 spaces, or approximately 56 spaces per hangar.

   The High Development Alternative is not feasible due to cost. Cost of the High Development Alternative is at least 35% greater than other alternatives discussed. This alternative does not meet the stated purpose and need for the project; however, it has been included in the analysis per NEPA and FAA Order 1050.1F.

c. Low Development Alternative/Preferred Development Alternative – The MPU includes a Low Development Alternative and a Preferred Development Alternative in the alternatives analysis. For discussions regarding the Taxilane L extension and MRO facilities with auto parking, these two alternatives are the same and therefore have been combined for this section. The Low Development Alternative/Preferred Development Alternative (Figure 3 and 4, Exhibit 6-2 and 6-5 in the MPU) reflects a development scenario that provides basic improvements and allocation for new facilities as necessary to accommodate business and based aircraft growth throughout the 20-year MPU planning period. Basic improvements associated with this EA include:

   i. Taxilane L Extension – A new, 1,650-foot taxilane extension would be constructed to provide access to the proposed north MRO facilities.
   ii. MRO Facilities - Three large hangars would be constructed and utilized for future MRO facilities. Each building would contain approximately 50,000 square feet of space. The complex would have a collective capacity of 150,000 square feet. Also, within the MRO facility, a 242,000-square foot apron area would be constructed as needed for hangar frontage. MRO facilities would

also include a community college-based class room and hangar facility to educate and train future airplane maintenance mechanics and technicians.

iii. Auto Parking - In support of the three MRO facilities and educational facilities, an 85,000 square foot parking lot would be constructed adjacent to the hangar facilities. Based on 500 square feet per space, the proposed lot should provide up to 170 spaces, or approximately 56 spaces per hangar.

The Low Development Alternative/Preferred Alternative includes the construction of a 1,650-foot Taxilane L extension to provide access to developable areas designated for future aircraft MRO facilities. The existing MRO facility supports up to six large aircraft and has had significant growth in the 5 years it has been located at INT. In 2014, NSA asked INT for more hangar space as all six hangar bays were in use. INT could not accommodate the request and NSA opened another facility in Kinston, NC. Additionally, over the past 6 years, INT has been approached by various MRO providers. On several occasions, the NC Department of Commerce has contacted INT to inquire about availability of hangar space. Demand for hangar space is present and ranges from corporate (Pike Electric and Flow Automotive to MRO (Boeing and Airbus)). The taxilane extension would provide access to land available for NSA expansion and/or establishment of another aircraft MRO facility. Additional MRO facilities could include three large hangars having a collective capacity of 150,000 square feet. Soils from terrain obstruction removal would be utilized as fill in this area.

One MRO facility would be dedicated for use by Forsyth Technical Community College. The aviation businesses in the region (HondaJet, HAECO, and Signature) have struggled to find a qualified workforce and have asked the local colleges for assistance. Although Gilford Technical Community College offers aviation maintenance classes, they are unable to keep up with demand. Forsyth Technical Community College has recently been approved to offer a similar curriculum and needs an educational facility for the program. This program would directly affect and increase the MRO workforce with many graduates of the program moving directly into the MRO facilities at INT. The goal of Forsyth Technical Community College is to support 125 students in the program with the ability to expand enrollment. Student facilities would include classrooms, hangar spaces, labs, and offices.

This alternative does meet the stated purpose and need for the project and it has been included in the analysis per NEPA and FAA Order 1050.1F.

2. Terrain Obstruction Removal

The FAA, in the Code of Federal Regulations (CFR), Title 14, Part 77, "Objects Affecting Navigable Airspace", has established standards for determining obstructions to navigable airspace, and their effect on the safe and efficient use of airspace. This regulation defines a system of imaginary surfaces designed to protect the critical airspace around an airport and allow for the safe operation of aircraft to and from the airport. At INT, it was determined that terrain obstructions are penetrating primary and transitional surfaces. Primary surfaces establish the limits of the obstruction clearance requirements for the immediate vicinity of the landing area. At INT, the required primary surface width is 500 feet from the centerline of

the runway for a total width of 1,000 feet. Currently, in several locations along the eastern side of Runway 15-33, the primary surface width is much less than the required 500 feet. In some locations, it is as narrow as 250 feet. Transitional surfaces connect the primary surfaces to other regulated surfaces. The slope of the transitional surface is 7 to 1 outward and upward at right angles to the runway centerline. These imaginary surfaces are fixed surfaces that do not move. Obstructions in the form of trees and terrain, east of Runway 15-33, were identified by Avcon, Inc. several years ago and were confirmed during the Airport Master Plan Study completed in 2012. Obstructions were also documented by the FAA during their annual FAR Part 139 Certification Inspection Program (Attachment C).

The existing terrain also penetrates the runway object free area (OFA). The runway OFA is an area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. At INT, the required runway OFA width is 400 feet from the centerline of the runway for a total width of 800 feet. Currently, in several locations along the eastern side of Runway 15-33, the OFA is much less than 400 feet. In some locations, it is as narrow as 250 feet.

Based on the available mapping and the on-site survey, there are known obstructions to the Runway 15-33 primary and transitional surfaces, and the runway OFA that include 24.2 acres of trees and excess terrain. As a result, the airport is not in compliance with federal regulations for maintaining runway OFA and FAR Part 77 surfaces clear of obstructions.

a. No Action - The No Action alternative assumes that no development (terrain obstruction removal) would occur in the proposed project area and that conditions would remain as they exist in 2016. There are identified obstructions to both the 14 CFR Part 77 surfaces and runway OFA which must be alleviated to assure safety and to meet federal requirements. If the terrain obstructions are not alleviated, safety for pilots may be compromised and the airport will not be in compliance with FAA regulations and federal grant assurances. INT would not be eligible for new grants and INT would have to repay grants awarded in the past.

   This alternative does not meet the stated purpose and need for the project; however, it has been included in the analysis per NEPA and FAA Order 1050.1F.

b. Preferred Alternative - The Preferred Alternative (Figure 4, Exhibit 6-5 in the MPU) assumes that the proposed terrain obstruction removal would occur and obstructions would be alleviated. In total, approximately 24.2 acres of property would be regraded to gain compliance with federal regulations for maintaining runway OFA and FAR Part 77 surfaces clear of obstructions.

3. Correction of Taxiway A Separation

Airport design standards are continuously developed and revised in support of one of the FAA's critical functions, which is maintaining safe operating conditions at airport facilities throughout the national aviation system. In the National Plan of Integrated Airport Systems (NPIAS), the FAA identifies certain public-use airports that are eligible to receive Federal Airport Improvement Program (AIP) grants due to their importance to the national aviation

system. Upon accepting AIP grants, these airports agree to meet FAA guidelines (assurances) for facility improvements. Commonly referenced FAA airport design standards focus on physical layout characteristics, such as runway/taxiway separation dimensions.

Advisory Circular 150/5300-13, paragraph 3 states: "For airport projects receiving Federal grant-in-aid assistance, the use of these standards is mandatory." Accordingly, the FAA requires federally obligated airports to correct non-standard design conditions when associated projects are initiated. Therefore, the proposed project must also rectify the existing separation between the centerline of Runway 15-33 and Taxiway A.

The FAA taxiway design standards are determined by the aircraft approach speeds and wingspans for the critical aircraft that routinely uses the taxiway. These standards allow an appropriate safety margin beyond the maximum wingspan for each Airplane Design Group. The critical aircraft for INT has been identified as C-III. Per FAA standards, the required runway to taxiway centerline separation distance for group C-III runways like Runway 15-33 is 400 feet. The current separation distance between Taxiway A and Runway 15-33 is approximately 281 feet. A "Taxiway A Relocation Study" (Relocation Study) is included for review (Attachment D).

a. No Action - The No Action alternative assumes that no development (Taxiway A construction) would occur in the proposed project area and that conditions would remain as they exist in 2016. The existing runway/taxiway centerline separation would not be corrected. In addition, the FAA requires federally obligated airports to correct non-standard design conditions when associated projects are initiated. By not correcting the separation deficiency to standards under the No Action alternative, INT would not be in compliance with FAA standards as required by the federal grant assurances.

   This alternative does not meet the stated purpose and need for the project; however, it has been included in the analysis per NEPA and FAA Order 1050.1F.

b. Rehabilitate Taxiway A Alternative – The Rehabilitate Taxiway A Alternative includes rehabilitation of the existing pavement on Taxiway A. The existing centerline separation distance from Runway 15-33 to Taxiway A does not meet the current FAA standards per FAA AC 150/5300-13, Airport Design. Currently, a 281-foot separation is present; a 400-foot separation is required. The Rehabilitate Taxiway A Alternative assumes that a Modification of Standards (MOS) or waiver would be approved by the NCDOA and the FAA which would allow the taxiway to remain in-place and continue to function as is. Both agencies confirmed that a MOS or waiver to the non-standard distance of 281 feet would not be granted.

   This alternative does not meet the stated purpose and need for the project; however, it has been included in the analysis per NEPA and FAA Order 1050.1F.

c. New Taxiway Construction (West) Alternative - The New Taxiway Construction (West) Alternative (Appendix C, Exhibit 2 in the Relocation Study) includes construction of a new parallel taxiway 400 feet west of Runway 15-33. This

alternative would have major operational impacts on departing and arriving aircraft movements on the airfield. Several active taxiways would eventually have to be temporarily closed to allow for necessary construction and connections to the relocated Taxiway A. Additionally, Taxiway A itself would require partial and temporary closures to aircraft movements to allow the relocated Taxiway A construction to occur, as well as the needed construction tie-ins to other airfield pavements. Overlapping taxiway safety areas between the existing and relocated Taxiway A preclude construction activities within that area during normal operational hours of the existing Taxiway A. As Taxiway A serves as the primary, and only, taxiway to Runway 15-33, aircraft generally using Taxiway A to use Runway 33 for departure, would be forced to "back-taxi" on the runway in some instances, creating a very unsafe, and unwanted condition. This alternative has major negative implications to airfield and aircraft operational safety.

This alternative does not meet the stated purpose and need for the project; however, it has been included in the analysis per NEPA and FAA Order 1050.1F.

d. New Taxiway Construction (East) Alternative/Preferred Alternative – The New Taxiway Construction (East) Alternative (Appendix C, Exhibit 10 in the Relocation Study) includes construction of a new parallel taxiway 400 feet east of Runway 15-33. This taxiway would extend from the limits of Taxiway F on the north to the threshold of Runway 33 on the south. The runway to taxiway centerline separation requirement would be met and Taxiway A would remain available for use by small aircraft. Operational impacts to the airfield and aircraft movements is minimized with this alternative, thereby enhancing airfield and aircraft operational safety.

4. Runway Safety Area Extension

FAA AC 150/5300-13 states that the RSA shall be: (a) cleared and graded and have no potentially hazardous ruts, humps, depressions, or surface variations; (b) drained by grading or storm sewers to prevent water accumulation; (c) capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment and the occasional passage of an aircraft without causing structural damage. The RSA must be free of objects, except for those that need to be located within the safety area due to their function.

The RSA required for any airport is based on the characteristics of the design or critical aircraft. These defining characteristics are expressed in the airport reference code ARC. According to FAA design criteria set forth in FAA Advisory Circular 150/5300-13, Runway 22, which is a Group B-II, requires a RSA 150 feet wide (75 feet on either side of the runway centerline) and 300 feet in length beyond the threshold. The current RSA for Runway 22 is 150 feet wide (meets FAA design criteria) and 130 feet in length (does not meet FAA design criteria).

The runway safety area associated with runway 22 is currently being encroached upon by a nearby fence, several trees and other types of vegetative growth. The trees and other vegetation should be cleared a distance of 300' from the runway end and the fence be relocated outward a distance of approximately 160' from its current location in order to meet FAA

standards. The entire runway protection zone is located within airport property and therefore complies with FAA standards.

a. No Action - The No Action alternative assumes that no development (safety area construction) would occur in the proposed project area, Runway 22, and that conditions would remain as they exist in 2016. There are identified deficiencies without the safety area FAA 150/5300 runway OFA which must be alleviated to assure safety and to meet federal requirements. If the Runway 22 safety area is not built, then safety for pilots may be compromised and the airport will not be in compliance with FAA regulations and federal grant assurances. INT would not be eligible for new grants and INT would have to repay grants awarded in the past.

   This alternative does not meet the stated purpose and need for the project; however, it has been included in the analysis per NEPA and FAA Order 1050.1F.

b. Preferred Alternative - The Preferred Alternative (Figure 4, Exhibit 6-5 in the MPU) assumes that the proposed construction of the safety area would occur and deficiencies would be alleviated. In total, approximately one acre of property would be regraded to gain compliance with federal regulations for maintaining RSA 22.

6. Environmental Consequences – Special Impact Categories (refer to the Instructions page and corresponding sections in Appendix A of 1050.1E and the Airports Desk Reference for more information and direction. The analysis under each section must comply with the requirements and significance thresholds as described in the Desk Reference).

Note: The responses below apply to all build alternatives considered unless otherwise specified. As the No Action alternative does not involve construction, no impacts to the environmental impact categories listed below are anticipated from that alternative.

(A) AIR QUALITY **(Please note this analysis must meet requirements for both NEPA review and Clean Air Act (CAA) requirements).**

Clean Air Act

(a) Is the proposed project located in a nonattainment or maintenance area for the National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act and does it result in direct emissions (including construction emissions)?(If **Yes,** go to (b), **No,** go to the NEPA section below.

NO

The National Ambient Air Quality Standards (NAAQS) were established by the USEPA under the Clean Air Act (CAA) to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. The NAAQS have been set for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM), and sulfur dioxide (SO2). For 2014, the USEPA Air Quality Standards are as follows:

Carbon Monoxide: 35 ppm (1-hour), 9 ppm (8-hour)
Nitrogen Dioxide: 100 ppb (1-hour), 53 ppb (annual)
Ozone: 0.12 ppm (1-hour), 0.070 ppm (8-hour)
Sulfur Dioxide: 75 ppb (1-hour), 140 ppb (24-hour), 30 ppb (annual)
PM2.5: 35 ug/m3 (24-hour), 12.0 ug/m3 (annual)
PM10: 150 ug/m3 (24-hour)
Lead: 0.15 ug/m3 (3-month avg)

In accordance with the CAA, all portions of North Carolina are designated as in attainment, non-attainment, or unclassifiable for meeting NAAQS standards. An area with air quality that is better than NAAQS standards is considered to be in attainment, while an area with air quality that is worse than NAAQS standards is designated as being in non-attainment. If there is a lack of information for determining an attainment status, the area is designated as unclassifiable. Each state determines which areas within its boundaries are designated to be in attainment or non-attainment, and must develop a State Implementation Plan to ensure that areas achieve and/or maintain attainment status for NAAQS standards.

The Greensboro/Winston-Salem/High Point area (referred to as the Triad area) was designated as moderate nonattainment for the 1-hour ozone NAAQS in November 1991. In November 1993, this area was redesignated to attainment/maintenance for the 1-hour ozone standard.

In December 2002, the Triad area signed an Early Action Compact (EAC) with the North Carolina Department of Environment and Natural Resources and the USEPA for the 1997 8-hour ozone standard. The EAC gave the area an opportunity to develop local control strategies to meet the 1997 8-hour ozone standard earlier than required by the Clean Air Act. In turn, the USEPA agreed to defer the effective date of the nonattainment designation for the EAC areas. If an EAC area attained the 1997 8-hour ozone standard by December 31, 2007 and met all of its EAC milestones, the USEPA agreed to designate the area as attainment.

In April 2004, the USEPA designated the Triad area for the 1997 8-hour ozone standard and deferred the effective date. The Triad EAC area met all of their milestones and attained the 1997 8-hour ozone standard by the December 2007 deadline. The USEPA designated the Triad area as attainment/unclassifiable in April 2008.

For 2016 (annual statistics for 2016 were finalized on May 1, 2017), Winston-Salem and Forsyth County were in attainment for all NAAQS criteria pollutants including ozone. Air Quality Statistics Reports supporting attainment findings are found below:

Air Quality Statistics Report

Geographic Area: Forsyth County, NC
Summary: by County
Year: 2016
Exceptional Events: Included (if any)
Statistics in red are above the level of the respective air quality standard

County	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Forsyth County, NC	.	.	36	7	0.08	0.07	6	1	0	15	7.7	33	12	.

Air Quality Statistics Report

Geographic Area: Winston-Salem, NC
Summary: by CBSA
Year: 2016
Exceptional Events: Included (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Winston-Salem, NC	.	.	36	7	0.08	0.07	6	1	0	25	8.5	33	12	.

The Air Quality Statistics Report displays air pollution values related to national standards for air quality. The report includes pertinent values for all six criteria pollutants. The report identifies if an area's maximum air quality statistics are above the level of the national standards for a particular year. Each row lists standards-related air pollution statistics for all six criteria pollutants, for a single area, for one year. The values shown are the highest reported during the year by all monitoring sites in the county or city. A statistic that exceeds the level of an air quality standard would be highlighted for identification purposes.

(b) Is the proposed project an "exempted action," under the General Conformity Rule or Presumed to Conform (See FRN, vol.72 no. 145, pg 41565)? (If **Yes**, cite exemption and go to NEPA section below; **No,** go to (c)).

N/A

(c) Would the proposed project result in a net total of direct and indirect emissions that exceed the threshold levels of the regulated air pollutants for which the project area is in non-attainment or maintenance? (Attach emissions inventory). (If **Yes,** consult with ADO).

N/A

NEPA

(a) Is the airport's activity levels below the FAA thresholds for requiring a NAAQS analysis? (If **Yes**, document activity levels and go to Item 2, **No,** go to (b)).

YES

Per FAA guidelines, an air quality analysis under NEPA is required for proposed actions at general aviation airports when there are 180,000 or more general aviation and air taxi annual operations. Although INT maintains a Class IV FAR Part 139 Airport Operating Certificate due to the existing level of activity by unscheduled large aircraft, the airport is designated as a general aviation airport by the National Plan of Integrated Airport Systems. INT experienced 44,828 total operations in 2015 which does not exceed the operation thresholds requiring air quality analysis.

(b) Do pollutant concentrations exceed NAAQS thresholds? (Attach emissions inventory).

N/A

(c) Is an air quality analysis needed with regard to state indirect source review?

N/A

(B) BIOTIC RESOURCES

Describe the potential of the proposed project to directly or indirectly impact plant communities and/or the displacement of wildlife. (This answer should also reference Section 19, Water Quality, if jurisdictional water bodies are present).

Biotic resources include various types of flora and fauna as well as streams, wetlands, forests, and other upland habitats. Habitats identified on site include:

- Virginia Pine Monoculture - This habitat is limited to dense younger generation (15-20 year old) Virginia Pine (*Pinus virginiana*) stands with little to no herbaceous vegetation.
- Virginia Pine Dominated Forest - This community is dominated by 25-35 year old Virginia pine stands. Other species observed include black cherry (*Prunus serotina*),

Eastern red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), yellow poplar (*Liriodendron tulipifera*), loblolly pine (*Pinus taeda*), winterberry (*Ilex verticillata*), and Chinese privet (*Ligustrum sinense*). The herbaceous layer consists of Japanese honeysuckle (*Lonicera japonica*), mahonia (*Mahonia sp.*), and greenbrier (*Smilax rotundifolia*).

- Stream Bank and Riparian Forest - These freshwater habitats include the streambeds and banks and immediate riparian areas of Brushy Fork and unnamed tributaries to Brushy Fork. Permanently rooted aquatic plants are practically non-existent in on-site streams. The unnamed tributaries are narrow systems varying from 2-6 feet wide. The majority of the streams on site are incised and bordered by a dense understory of Chinese privet, greenbrier, and Japanese honeysuckle. Other dominant species in the riparian community include red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), and poplar. Less dominant species observed in this community are white oak (*Quercus alba*), multiflora rose (*Rosa multiflora*), Eastern dogwood (*Cornus florida*), American holly, black walnut (*Juglans nigra*), poison ivy (*Toxicodendron radicans*), grapevine (*Vitis sp.*), periwinkle (*Vinca sp.*), mahonia, ebony spleenwort (*Asplenium platyneuron*), English ivy (*Hedera helix*), Eastern red cedar, sweetgum (*Liquidambar styraciflua*), elderberry (*Sambucus canadensis*), and Christmas fern (*Polystichum acrostichoides*).
- Mixed Hardwood/Virginia Pine Forest - The mixed hardwood/ pine community is dominated by oak species and poplar. Oak species include white oak, Northern red oak (*Quercus rubra),* Southern red oak (*Quercus falcata*), blackjack oak (*Quercus marilandica*), and post oak (*Quercus stellata*). Other less dominant species observed include sourwood (Oxydendron *arboreum*), red maple, American beech (*Fagus gradifolia*), running cedar (*Lycopodium sp.*), and Virginia pine.
- Wetlands - These wetland areas are stream-flow driven systems adjacent to or at the head of perennial streams. Dominant overstory species include red maple and black willow (*Salix nigra*). In addition to saplings of the above trees, species observed in the shrub layer include elderberry, silky dogwood (*Cornus amomum*), tag alder (*Alnus serrulata*), and Chinese privet. The herbaceous layer consists of rushes (*Juncus sp.*), sedges (*Carex sp.*), and jewelweed (*Impatiens capensis*).
- Maintained Grass Fields - This habitat consists of maintained grass fields adjacent to the runway. The dominant species observed were Fescue (*Festuca sp.*) and broomsedge (*Andropogon virginicus*).
- Abandon Field/Early Successional Scrub Community - This community is dominated by blackberry (*Rubus sp.*), multiflora rose, winged sumac (*Rhus copallinum*), and Chinese privet. Other species observed include broomsedge, greenbrier, and red maple sprouts. This is an early successional community.

Removal of trees is likely to impact the biotic communities present within the proposed project boundary. The FAA has not established a significance threshold for non-listed species; however, not all trees on airport property would be removed and the likelihood of adverse impacts to biological resources as a result of the proposed project is low.

Wildlife species inhabiting the site are limited to small mammals, birds, and aquatic species that may be present in the small streams on-site. The airport property is surrounded by fencing and a heavily maintained grass safety area. For airport safety, fencing restricts large wildlife

from entering the airport property. Aural impacts from airplane traffic also limits the amount of wildlife utilizing the area. Although site-specific studies and inventories documenting species utilization of the airport have not been conducted by CEC, general observations of wildlife use were recorded during the stream/wetland delineation and habitat evaluations.

The US Fish and Wildlife Service and the NC Natural Heritage Program did not provide comments during the scoping process. The NC Wildlife Resources Commission comments are included for review (Attachment E).

A database search from the NC Natural Heritage Program (NHP) dated August 15, 2016 provided existing data concerning the presence or potential occurrences of federally listed species in Forsyth County, North Carolina within five miles of the site. The NHP indicates that there are no federally listed species within five miles of the project. The NHP lists the following two state threatened species as occurring within five miles of the proposed project.

Common Name	Scientific Name	Status
Northern cup plant	Silphium perfoliatum	State Threatened
Purple fringeless orchid	Platanthera peramoena	State Threatened

No state-protected species were observed during field visits. It is the opinion of CEC that the proposed project would have no effect on state listed species. Federally threatened and endangered species are discussed in more detail in Section G.

(C) COASTAL RESOURCES

(a) Would the proposed project occur in a coastal zone, or affect the use of a coastal resource, as defined by your state's Coastal Zone Management Plan (CZMP)? Explain.

NO

Forsyth County is not located in a coastal region of North Carolina.

(b) If **Yes**, is the project consistent with the State's CZMP? (If applicable, attach the sponsor's consistency certification and the state's concurrence of that certification).

N/A

(c) Is the location of the proposed project within the Coastal Barrier Resources System? (If **Yes**, and the project would receive federal funding, coordinate with the FWS and attach record of consultation).

NO

Forsyth County is not located in a coastal region of North Carolina.

(D) COMPATIBLE LAND USE

(a) Would the proposed project result in other (besides noise) impacts that have land use ramifications, such as disruption of communities, relocation of residences or businesses, or impact natural resource areas? Explain.

YES

1. Taxiway L Extension and MRO Facilities with Auto Parking - The proposed project and the reasonable alternatives considered would occur entirely on airport property. The airport property is designated for Industrial use.

   No disruption of communities, or relocations of residences or businesses is anticipated.

   Natural resource areas in the form of streams and wetlands would be impacted on site. A total of 3,251 linear feet of stream and 0.34 acre of wetlands would be impacted by the proposed taxiway extension and MRO facilities project (Figure 1).

2. Terrain Obstruction Removal - The proposed project would occur entirely on airport property. Terrain obstruction removal is required by the FAA. Currently, the airport is not in compliance with federal regulations for maintaining runway OFA and FAR Part 77 surfaces clear of obstructions.

   No disruption of communities, or relocations of residences or businesses is anticipated.

   Natural resource areas in the form of wetlands would be impacted on site (same as the correction of Taxiway A separation below). A total of 0.38 acre of wetlands would be impacted by the proposed terrain obstruction project (Figure 1).

3. Runway 22 Safety Area Extension - The proposed project would occur entirely on airport property. Runway safety area extension is required by the FAA. Currently, the airport is not in compliance with federal regulations for maintaining adequate runway safety areas. The safety area is proposed for construction in order to comply with current FAA; Part 139 – Certification and Operations: Land Airports Serving Certain Air Carriers. The safety area will be designed using the FAA Advisory Circular 150/5300-13.

   No disruption of communities, or relocations of residences or businesses is anticipated.

   Natural resource areas in the form of wetlands would be impacted on site (same as the correction of Taxiway A separation below). A total of 0.41 acre of wetlands and 694 linear feet of stream would be impacted by the proposed safety area project (Figure 1).

4. Correct Taxiway A Separation – The Rehabilitation of Taxiway A Alternative and the New Taxiway Construction (East) Alternative/Preferred Alternative would occur entirely on airport property. The airport property is designated for Industrial use.

   No disruption of communities, or relocations of residences or businesses is anticipated.

Natural resource areas in the form of wetlands would be impacted on site (same as the terrain obstruction removal above). A total of 0.38 acre of wetlands would be impacted by the proposed project (Figure 1).

5. The New Taxiway Construction (West) Alternative – as proposed would occur entirely on airport property. The airport property is designated for Industrial use.

   Approximately 9 relocations would be anticipated.

   Natural resource areas in the form of streams and wetlands would be impacted on site. Approximately 1,500 linear feet of stream would be impacted by this alternative.

(b) Would the proposed project be located near or create a wildlife hazard as defined in FAA Advisory Circular 150/5200-33B, "Wildlife Hazards On and Near Airports"? Explain.

NO

Wildlife hazards would be managed in accordance with "Wildlife Hazard Management at Airports: A Manual for Airport Personnel – July 2005". Pursuant to CFR Title 14 FAR Part 139.337(e), the Airport Commission of Forsyth County developed a Wildlife Hazard Management Plan (Attachment F) in cooperation with the US Department of Agriculture Wildlife Services (WS) Program. The purpose of this plan is to make certain that INT meets or exceeds all FAA wildlife related safety regulations while insuring the safest possible environment for aircraft, crew, and passengers arriving to and departing from INT.

No changes to existing land uses are anticipated that would attract wildlife. The proposed project does not include new waste disposal operations, dredge spoil containment areas, agricultural activities, golf courses, or landscaping.

New stormwater management facilities would be proposed at the site. These facilities would be designed and operated so as not to create above-ground standing water. Any stormwater detention ponds would be designed, engineered, constructed, and maintained for a maximum 48-hour detention period after the design storm and remain completely dry between storms. Existing storm water runoff at the site is collected and transported using closed drainage systems. This system would be expanded to include new development areas. Drainage swales in grassed areas (outside of runway safety areas) would be used to direct storm water to the drainage system.

Streams and wetlands are located on airport property. Proposed impacts to streams and wetlands would eliminate the current wildlife hazard potential of these areas. Airport operators monitor wildlife use and habitat changes that could affect safe aircraft operations.

(E) CONSTRUCTION IMPACTS

Would construction of the proposed project increase ambient noise levels due to equipment operation; degrade local air quality due to dust, equipment exhausts and burning debris; deteriorate water quality when erosion and pollutant runoff occur; and/or disrupt off-site and local traffic patterns? Explain.

NO

As with any construction project, temporary construction impacts such as noise, construction dust, and increased traffic can be expected from implementation of the proposed project. However, no permanent impacts are anticipated and it is expected that construction noise would only occur during the daylight hours. Construction is estimated to last 12 months for the Taxiway L extension and 4 months for paving and lighting. Construction is estimated to last 12 months for correction of the Taxiway A separation.

On some parcels, construction would take place in close proximity to residences. Construction managers would be on-site to oversee work and to coordinate directly with property owners during construction.

Construction activity could result in short-term and temporary emissions of air pollutants from a variety of sources, such as exhaust from construction vehicles and equipment, and fugitive dust. Trucks hauling construction materials and solid waste to and from the site would release exhaust emissions over the area. Fugitive dust, which may be emitted during construction and as a result of wind erosion over exposed earth surfaces, offers the greatest nuisance potential. Contractors would be required to implement sufficient dust control measures to minimize airborne emissions and prevent dust from becoming a nuisance or safety hazard. Dust on-site would be controlled through a variety of methods. Dust control methods for the site could include: watering, establishing vegetative cover, mulching, wind breaks, temporary coverings (i.e. tarps), and modification of the active working area and operations during dry and windy conditions. If fugitive dust emissions are observed and observations indicate dust control measures are not achieving their intended purpose, then appropriate corrective actions will be taken. Nuisance dust would be temporary and should last only as long as construction occurs.

Construction activity could result in an increase in traffic; however, traffic as a result of construction would be minimal. Once construction equipment is mobilized, traffic should be minimal on surrounding roadways.

Construction and operation of new airport facilities may have short and long term impacts on surface and ground water quality. Impacts will be minimized by using Best Management Practices (BMPs) during construction (including proper erosion control). Proper coordination with Forsyth County would ensure that all permits were obtained and proper procedures followed. Depending on the amount of ground disturbance, a Stormwater Pollution Prevention Plan (SWPPP) may be required before construction can begin, which would include a BMP for stormwater control that addresses equipment storage within staging areas, and containment techniques in this area. The contractor, under the supervision of the sponsor, is responsible for complying with the requirements of the SWPPP.

In addition, construction impacts would be mitigated by the proposed adherence to applicable BMP specified in FAA AC 150/5370-10, Standards for Specifying Construction of Airports, Item P-156, “Temporary Air and Water Pollution, Soil Erosion, and Siltation Control.”

With the consideration that impacts from construction of the proposed project are expected to be temporary and that BMPs would be put in place during construction, no adverse impacts from construction are anticipated as a result of the proposed project.

(F) SECTION 4(f) RESOURCES

Does the proposed project have an impact on any publicly owned land from a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or an historic site of national, state, or local significance? (If **Yes**, contact FAA, contact appropriate agency and attach record of consultation).

NO

Section 4(f) of the *Department of Transportation Act of 1966* provides protection to publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites. Under Section 4(f), properties must not be impacted unless no prudent and feasible alternative exists and efforts to minimize impacts to the property are completed. Based on the desktop review of available sources, nearby public parks and recreation areas include: Piedmont Park located just southwest of the airport; Helen Nichols Park located approximately 0.53 mile northeast of the airport, adjacent to Carver High School; and Winston Lake Golf Course located approximately 0.33 mile southeast of Runway 33, just east of U.S. Route 311.

TRC completed an archaeological survey (May 2014) for the proposed improvements at INT (Attachment G). Background research determined that there were two previously recorded archaeological sites within the project areas. One site, 31FY269, was apparently destroyed by the time it was recorded. The other site, 31FY839, consisted of an isolated surface find and was revisited during the survey.

The survey identified the one previously recorded site, 31FY839, and two new archaeological sites, 31FY1193 and 31FY1194. Neither of the two new sites identified has the potential to provide substantial data concerning the prehistoric or historic occupation of the area, and both are recommended not eligible for the NRHP.

The site, 31FY839, is an apparent surviving remnant of the early- to mid-twentieth century Evergreen Cemetery, which was established in 1928 and used into the early 1940s when the property was acquired for airport expansion. Since 31FY1194 likely contains both marked and unmarked graves, it is recommended that no ground-disturbing activities be allowed within its boundaries. In the remainder of the Evergreen Cemetery area, it is possible that some graves remain in the former cemetery outside of the 31FY1194 boundary. Monitoring and additional investigations are recommended prior to any ground disturbance that would extend more than 18 inches below the existing grade. Archaeologists would be on-site during ground disturbance to monitor construction.

The NC State Historic Preservation Office provided comments during the scoping process (Attachment H).

TRC completed an additional archaeological survey (January 2017) and reconnaissance in association with proposed taxiway improvements and landfill remediation (Attachment G).

Archaeological survey of a 6.2-acre tract (Tract 1) northwest of previous survey areas identified no archaeological resources, and no additional investigations are recommended in that area.

Reconnaissance of a 66-acre tract (Tract 2) east of the intersection of Runways 4-22 and 15-33 determined that most of the uplands in that area are highly disturbed from past erosion (and possibly topsoil stripping), and that other portions have been used as a landfill; although two 20th century domestic sites (31FY1216 and 31FY1217) were identified in those areas, those sites and the surrounding areas are believed to have very limited archaeological potential, and no additional survey is recommended prior to proposed landfill remediation or other potential ground disturbances in those areas. The wooded drainages within the 66-acre tract appear to have some potential for intact soils and archaeological sites, however, and a systematic archaeological survey of those areas is recommended if ground disturbances are planned. The INT will not be disturbing these wooded drainage areas.

A small portion of the uplands areas that was apparently protected from mid- to late 20th century ground disturbances was found to contain a 20th-century cemetery, which was designated 31FY1218. This cemetery appears to contain at least 86 interments. At least some of those were likely moved to this location from the former County Home cemetery in 1918, but others may have been made earlier or as recently as 1939. Although 31FY1218 is not recommended eligible for the National Register, the graves are protected by North Carolina state statutes. A tentative cemetery boundary has been established based on the location of the visible graves and what is known about the former cemetery lot boundaries. It is recommended that this boundary be marked in the field, shown on the Airport Layout Plan, and preserved from future disturbance, and that use of the existing road through this area be discontinued and the area reseeded. If any remediation activities extend into the proposed cemetery boundary, it is recommended that ground disturbing activities in that area be monitored to ensure that no graves are disturbed. Archaeologists would be on- site during ground disturbance to monitor construction.

Finally, the work also included a field inspection of the surviving portion of the former Evergreen Cemetery (31FY1194). That inspection confirmed that the boundaries of the known graves have now been marked and that the graves were not disturbed by recent logging nearby. The INT will not be disturbing this cemetery.

(G) ENDANGERED AND THREATENED SPECIES
(a)Would the proposed project impact any federally or state-listed or proposed, endangered, or threatened species (ESA) of flora and fauna, or impact critical habitat? (Attach record of consultation with federal and state agencies as appropriate).

NO

ClearWater Environmental Consultants, Inc. (CEC) has conducted a file review of up-to-date records maintained by the US Fish and Wildlife Service (FWS) and the North Carolina Natural Heritage Program (NHP). The desktop literature review involved a review of the FWS list of protected species in Forsyth County; and the NHP Element Occurrence Data on which NHP identifies current and historic occurrences of listed species for a specific locale. The FWS lists 2 species as occurring in Forsyth County that are subject to Section 7 consultation. The NHP database identifies 0 element occurrences (EO) within a 5-mile radius of the project site that are subject to Section 7 consultation. The Federally listed species identified by the FWS are listed below.

Common Name	***Scientific Name***	**Federal Status**
Northern Long-Eared Bat	*Myotis septentrionalis*	T
Small-Anthered Bittercress	*Cardamine micranthera*	E

A protected species survey was conducted from March 31-April 1, 2014. Potential fauna were identified to the taxonomic unit level necessary to determine if the observed specimen was a protected species. Flora were identified to the lowest taxonomic level readily discernible in the field during the time of survey.

The proposed project site is within airport property. Regular maintenance and manipulation of the site has eliminated suitable habitat for any Federally listed species on most of the property. No Federally threatened or endangered species were observed on-site during the site visits. CEC consulted the FWS's "Northern Long-Eared Bat Consultation Areas" map website. The proposed project site is not in a county identified as having known occurrences of hibernation or maternity sites. It is the opinion of CEC that the project would have "no effect" on the Northern long-eared bat.

It is the opinion of CEC that Federally protected species are not likely to be present within the project area. As such, the proposed project is not likely to cause an adverse impact to any Federally threatened or endangered species or their critical habitat.

The FWS did not provide comments during the scoping process.

(b)Would the proposed project affect species protected under the Migratory Bird Act? (If **Yes**, contact FAA).

NO

As per NEPA and Order 1050.1F, the Migratory Bird Treaty Act prohibits private parties from intentionally taking a migratory bird, their eggs or nests. Take is defined as "pursue, hunt, shoot, wound, kill, capture or collect." The proposed project would not involve these activities.

(H) ENERGY SUPPLIES, NATURAL RESOURCES AND SUSTAINABLE DESIGN
What effect would the proposed project have on energy or other natural resource consumption? (Attach record of consultations with local public utilities or suppliers if appropriate)

Energy requirements associated with the proposed project can be classified into two categories: those relating to increased consumption from stationary facilities and those involving substantial increases in aircraft and ground vehicle movement and their related fuel consumption. Increases in energy consumption directly and indirectly caused by the proposed project would not result in significant impacts to the energy supply or to natural resources because the proposed projects would not involve additional energy sources to be added at the airport, increase aircraft operations, or involve the use of scarce or unusual materials.

(I) ENVIRONMENTAL JUSTICE

Would the proposed project have a disproportionate impact on minority and/or low-income communities? Consider human health, social, economic, and environmental issues in your evaluation. Explain.

NO

Executive Order 12898, *Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low Income Populations*, requires federal agencies to identify community issues of concern during the NEPA planning process, particularly those issues relating to decisions that may have a disproportionate impact on low-income or minority populations (EJ populations). The Environmental Protection Agency's EJSCREEN mapping tool was used to determine if there were environmental justice populations within 1 mile of INT. EJSCREEN uses 2010 Census data and 2010-2014 American Community Survey (ACS) data to determine the presence of EJ populations.

The EJSCREEN Report (Attachment I) generated for the INT estimates approximately 92% of the population within 1 mile of INT is in a minority population and approximately 69% of the population is low-income. Minority and low-income populations in Forsyth County, as a whole, comprise approximately 42% and 39% of the population, respectively. Therefore, EJ populations are present near INT.

The airport has been in existence since 1927 and improvements to the airport have occurred at steady intervals since that time. To be in compliance with FAA regulations, improvement must be made at the airport. All preferred alternatives would take place within existing airport property with no relocations or displacement of residents or businesses.

(J) FARMLANDS

Does the project involve acquisition of farmland, or use of farmland, that would be converted to non-agricultural use and is protected by the Federal Farmland Protection Policy Act (FPPA)? (If **Yes**, attach record of coordination with the Natural Resources Conservation Service (NRCS), including form AD-1006.)

NO

According to the Farmland Protection Policy Act (FPPA PL 97-98), lands already in or committed to urban development (such as airports), do not meet the definition of prime or unique farmlands.

(K) FLOODPLAINS
(a) Would the proposed project be located in, or would it encroach upon, any 100-year floodplains, as designated by the Federal Emergency Management Agency (FEMA)?

NO

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Forsyth County, North Carolina, Map Panel Numbers 3710684600J, 3710683600J, 3710683700J, and 3710684700J, effective date January 1, 2009, indicate the absence of floodplains within the project boundary (Figure 5).

(b) If Yes, attach the corresponding FEMA Flood Insurance Rate Map (FIRM) and describe the measures to be taken to comply with Executive Order 11988.

N/A

(L) HAZARDOUS MATERIALS
Would the proposed project involve the use of land that my contain hazardous materials or cause potential contamination from hazardous materials? (If **Yes**, attach record of consultation with appropriate agencies). Explain.

The area west of and adjacent to the future Taxiway Q project was determined to be a closed landfill area. The former landfill site (NC ID No. NONCD0000307) has been evaluated by CDM Smith and a summary of their report of findings is included in Attachment J. Discussions with the North Carolina Department of Environmental Quality, Pre-Regulatory Landfill Unit have determined that the area is not likely to pose a potential for contamination. The site boundaries were delineated by CDM and should be marked in the field, avoided, and protected. Prior to development of the terrain obstruction the landfill areas should be covered by an orange separation barrier and covered with a minimum of two feet of fill over the entire area of the landfill.

(M) HISTORIC, ARCHITECTURAL, ARCHEOLOGICAL OR CULTURAL PROPERTY
(a) Describe any impact the proposed project might have on any properties in or eligible for inclusion in the National Register of Historic Places. (Include a record of your consultation and response with the State or Tribal Historic Preservation Officer (S/THPO)).

TRC completed an archaeological survey for the proposed improvements at INT (Attachment G). Background research determined that there were two previously recorded archaeological sites within the project areas. One site, 31FY269, was apparently destroyed by the time it was recorded. The other site, 31FY839, consisted of an isolated surface find and was revisited during the survey.

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The NC State Historic Preservation Office provided comments during the scoping process (Attachment H).

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Archaeological survey of a 6.2-acre tract (Tract 1) northwest of previous survey areas identified no archaeological resources, and no additional investigations are recommended in that area.

Reconnaissance of a 66-acre tract (Tract 2) east of the intersection of Runways 4-22 and 15-33 determined that most of the uplands in that area are highly disturbed from past erosion (and possibly topsoil stripping), and that other portions have been used as a landfill; although two 20th century domestic sites (31FY1216 and 31FY1217) were identified in those areas, those sites and the surrounding areas are believed to have very limited archaeological potential, and no additional survey is recommended prior to proposed landfill remediation or other potential ground disturbances in those areas. The wooded drainages within the 66-acre tract appear to have some potential for intact soils and archaeological sites, however, and systematic archaeological survey of those areas is recommended if ground disturbances are planned. The INT will not be disturbing these wooded drainage areas.

A small portion of the upland area that was apparently protected from mid- to late 20th century ground disturbances, was found to contain a 20th-century cemetery, which was designated 31FY1218. This cemetery appears to contain at least 86 interments. At least some of those were likely moved to this location from the former County Home cemetery in 1918, but others may have been made earlier or as recently as 1939. Although 31FY1218 is not recommended eligible for the National Register, the graves are protected by North Carolina state statutes. A tentative cemetery boundary has been established based on the location of the visible graves and what is known about the former cemetery lot boundaries. It is recommended that this boundary be marked in the field, shown on the Airport Layout Plan, and preserved from future disturbance, and that use of the existing road through this area be discontinued and the area reseeded. If any remediation activities extend into the proposed cemetery boundary, it is

recommended that ground disturbing activities in that area be monitored to ensure that no graves are disturbed. Archaeologists would be on-site during ground disturbance to monitor construction.

Finally, the work also included a field inspection of the surviving portion of the former Evergreen Cemetery (31FY1194). That inspection confirmed that the boundaries of the known graves have now been marked and that the graves were not disturbed by recent logging nearby. The INT will not be disturbing this cemetery.

(b) Describe any impacts to archeological resources as a result of the proposed project. (Include a record of consultation with persons or organizations with relevant expertise, including the S/THPO, if applicable).

(N) INDUCED SOCIOECONOMIC IMPACTS
Would the proposed project cause induced, or secondary, socioeconomic impacts to surrounding communities, such as change business and economic activity in a community; impact public service demands; induce shifts in population movement and growth, etc.? Explain.

NO

The proposed development will take place within the airport property boundary. No public service demands or shifts in population movement or growth are anticipated as a result of the proposed project. The proposed project would not cause the relocation of residents or of businesses and is not anticipated to create a loss in community tax base. Changes in business activity, to the extent influenced by the new development, could be expected. The economic gains provided by the growth of the airport could include the short-term increase in construction jobs as well as longer-term direct and indirect economic benefits on a regional level from increased business activity (i.e., new airport users or tenants).

(O) LIGHT EMISSIONS AND VISUAL EFFECTS
Would the proposed project have the potential for airport-related lighting impacts on nearby residents? Explain.

NO

The proposed project does not involve any additional light sources and proposed lighting would be visually consistent with the current development at the airport. The lighting associated with the proposed project would be low-level, medium-intensity taxiway edge lighting. MRO facility lighting and apron area lighting would include pole or building mounted lighting in a downward configuration. The airport would maintain a wooded buffer between the airport and the adjacent residential areas.

(P) NOISE
Will the project, when compared to the No Action alternative for the same timeframe, cause noise sensitive areas located at or above DNL 65 dB to experience a noise increase of at least DNL 1.5

dB? (Use AEM as a screening tool and INM as appropriate. See Airports Desk Reference, Chapter 17, for further guidance).

NO

As part of this Master Plan Update for INT, an evaluation of existing and future noise exposure was conducted using the FAA's Integrated Noise Model (INM) computer program (Version 7.0b). Below is documentation of the assumptions, inputs, and findings of the INM analyses for the following two scenarios: 1) 2008 Existing, and 2) 2028 Future. These analyses should be viewed as a generalized evaluation of airport noise exposure for comparative purposes only. Moreover, the associated noise contours were not developed to the precision required for Federal Aviation Regulations (FAR) Part 150 Noise Studies.

The activity assumptions below were developed based on conversations with personnel from the INT Air Traffic Control Tower (ATCT) and review of ATCT records and FAA databases. They are intended to represent the most prevalent operating characteristics.

- Touch-and-Go Activity Flow – 60% Runway 4, 40% Runway 22
- Other Fixed-Wing Activity Flow – 30% Runway 15, 70% Runway 33
- Helicopter Activity – Begins and ends on Runway 4-22 near terminal apron
- Day/Night Activity Split – 95% Day, 5% Night

The FAA-approved operations forecast (presented earlier in Master Plan Update) was used to develop the INM inputs for years 2008 and 2028. The 2008 inputs by aircraft type were determined by reviewing FAA flight plan records from the Enhanced Traffic Management System Counts (ETMSC) database. In the INM software, 11 aircraft were selected to represent INT's existing and future activity mix. According to FAA flight plan records, the majority of INT's corporate jet activity is comprised of medium-sized jets which are best represented by the CNA55B (Citation V) aircraft. Although the airport still receives occasional operations by loud/old Stage 2 corporate jets like the Lear 25, the frequency of Stage 2 corporate jet operations is expected to decline year-to-year as the planes are retired from service (all new jets are subject to Stage 4 aircraft noise standards). Larger corporate jet activity is also common at INT by Citations, Gulfstreams, and Falcons, and a steady increase is expected during the forecast years because these longer-range jets are now the preferred option of many corporations due to longer-range, more passengers, reduced costs, etc. Daily operations by commercial jets are also expected to continue at a steady level through 2028, with older models (e.g., Boeing 737-200) gradually phased-out as airlines modernize their fleets. While some Very Light Jet (VLJ) activity is currently conducted at INT, this limited effort focused on aircraft that were most representative of INT's noise exposure.

Figure 6 illustrates the Day-Night Average Noise Level (DNL) 65 decibel (dB) noise contours for the existing and future scenarios, which represents the average annualized noise exposure of INT activity. The federal government considers noise levels below DNL 65 dB to be compatible with residential and other noise-sensitive developments (e.g., schools and places of worship). General findings of the INM analyses include:

- 2008 Existing Noise Contour – Due to current operations by loud/old State 2 commercial and corporate jets (e.g., Boeing 737-200 and Lear 25), the 2008 Existing DNL 65 dB noise contour extends over residential parcels near the Runway 33 end.

- 2028 Future Noise Contour – As louder and old Stage 2 commercial and corporate jets are phased out of service, the size of the 2028 Future DNL 65 dB noise contour is expected to decrease in size in comparison to the 2008 contours and subsequently produce no incompatible noise impacts to residential parcels. This is a common expectation at airports around the country even as activity levels are projected to increase.

Although some nearby residential parcels may currently be exposed to incompatible airport noise levels (i.e., greater than DNL 65 dB), the situation should continually improve as loud/old Stage 2 jets are phased out of service. Overall, the proposed project would not result in changes to the airport's noise exposure or aircraft fleet mix characteristics.

(Q) SOCIAL IMPACTS
Would the proposed project cause an alteration in surface traffic patterns, or cause a noticeable increase in surface traffic congestion or decrease in Level of Service?

Forsyth Tech would have 125 enrolled students and approximately 15 fulltime staff. Existing parking, three existing entrances to the site, and existing five lane, North Liberty Street, should be adequate to support the educational facility. Impact to traffic patterns would be minimal.

(R) SOLID WASTE
Would the operation and/or construction of the project generate significant amounts of solid waste? If **Yes**, are local disposal facilities capable of handling the additional volumes of waste resulting from the project? Explain.

A significant amount of solid waste would not be generated from the proposed project, other than that from construction. Additional trees removed during obstruction removal or construction would be disposed of by the contractor. Solid waste, including construction debris generated from the project, will be properly disposed of at a permitted solid waste facility. It is the responsibility of the contractor during construction to properly dispose of construction debris.

(S) WATER QUALITY
(a) Does the proposed project have the potential to impact water quality, including ground water, surface water bodies, and public water supply system or federal, state or tribal water quality standards? (If **Yes**, contact appropriate agency and include record of consultation).

YES

For the proposed project, risk to water quality during construction would be from erosion and siltation created during tree removal activities. Proposed impacts include 3,945 linear feet of stream impact and 1.13 acres of wetland impacts.

Impacts would be minimized by using BMPs during construction (including proper erosion control). Proper coordination with the NC Department of Environmental Quality and Forsyth County would ensure that all permits were obtained and proper procedures followed.

Temporary (i.e., silt fence, temporary seeding and mulching of disturbed areas) and permanent (seed and mulch, replanting, etc) erosion control devices would be installed as appropriate. Appropriate sediment and erosion control devices would be further detailed during the permitting phase and installed/constructed during the initial stage of construction.

In addition, construction impacts would be mitigated by the proposed adherence to applicable BMP specified in FAA AC 150/5370-10, Standards for Specifying Construction of Airports, Item P-156, "Temporary Air and Water Pollution, Soil Erosion, and Siltation Control."

(b) Is the project to be located over a designated Sole Source Aquifer? (If **Yes**, attach record of consultation with EPA).

NO

According to the EPA, there are no Sole Source Aquifers in North Carolina.

(T) WETLANDS
(a) Does the proposed project involve federal or state regulated or non-jurisdictional wetlands? (Contact USFWS or state agency if protected resources are affected) (Wetlands must be delineated using methods in the US Army Corps of Engineers 1987 Wetland Delineation Manual. Delineations must be performed by a person certified in wetlands delineation).

YES

Wetlands delineations for the site were conducted in April of 2014 and September of 2016. A total of 1.8 acres of jurisdictional wetland and 9,470 linear feet of stream were identified in the airport study area. The area delineated in April of 2014 was verified by the Corps in June of 2014 under Action ID 200900480 (Attachment K). The area delineated in September of 2016 was field verified by the Corps on February 9, 2017 (written verification has not been received). The proposed development project would impact approximately 1.13 acres of wetlands.

(b) If yes, does the project qualify for an Army Corps of Engineers General permit? (Document coordination with the Corps).

YES

In North Carolina, the proposed project would qualify for an Individual Permit (IP). IPs are generally reserved for projects with greater than or equal to 300 linear feet of stream impact and/or greater than or equal to ½ acre of wetland impacts. An IP requires a full public interest review, including public notices and coordination with involved agencies, interested parties, and the general public.

(U) WILD AND SCENIC RIVERS
Would the proposed project affect a river segment that is listed in the Wild and Scenic River System or National Rivers Inventory? (If **Yes**, coordinate with the jurisdictional agency and attach record of consultation).

NO

There are no Federally listed Wild and Scenic Rivers present near the proposed project.

(V) CUMULATIVE IMPACTS
Discuss impacts from past, present, and reasonably foreseeable future projects both on and off the airport. Would the proposed project produce a cumulative effect on any of the environmental impact categories above? Consider projects that are connected and may have common timing and/or location. For purposes of this Form, generally use 3 years for past projects and 5 years for future foreseeable projects.

According to management at INT, the past and future foreseeable projects include:

Past Projects

- Pavement Rehabilitation/Reconstruction for Runway 22 and a portion of Taxiway F (from Runway 22 to MRO apron) and the northwest section of Taxiway A.
- Taxiway A Drainage Study and Construction of Improvements (between Runway 15-33 and Taxiway A).
- Design for Terminal Apron Reconstruction.
- MRO facilities improvement.
- BB&T hanger improvement.
- Piedmont Propulsion improvement.
- NSA improvement.

Future Foreseeable Projects

- Construction of Terminal Apron Reconstruction and Rehabilitation of Runway 4 and Taxiway H pavements.
- Taxiway L Extension (site prep and paving/lighting) – proposed.
- Runway 22 Safety Area Extension
- Parallel Taxiway Q.
- Land acquisition.
- Airfield lighting and signage.
- Security and wildlife management fencing.

- Signature hanger.
- Signature FBO lobby improvement.
- Forsyth Tech aviation center – proposed.
- Additional projects are listed in the Capital Improvement Budget (Attachment L).

The collective group of on- and off-airport projects is not anticipated to result in the disruption to natural habitat, wildlife, or the surrounding environment. The use of BMPs during construction of these projects would minimize short-term impacts from earth disturbing activities. Consequently, no secondary or induced impacts are anticipated.

7. PERMITS

List all required permits for the proposed project. Has coordination with the appropriate agency commenced and what is the expected time frame of receiving a permit?

Agency	Permit Type	Issuing Timeframe	Coordination Started
US Army Corps of Engineers	404 Individual Permit	6 months to 1 year after application submittal	No
NC Department of Environmental Quality	401 Water Quality Certification	6 months to 1 year after application submittal	No
NC Department of Environmental Quality	SEC	6 months to 1 year after application submittal	No
City of Winston-Salem	SEC	6 months to 1 year after application submittal	No
City of Winston-Salem	Building Permits	6 months to 1 year after application submittal	No
Driveway Permit	NCDOT	6 months to 1 year after application submittal	No

8. MITIGATION

Describe those mitigation measures to be taken to avoid creation of significant impacts to a particular resource as a result of the proposed project, and include a discussion of any impacts that cannot be mitigated.

<u>Stream and Wetland Mitigation</u>

During the 404 and 401permitting process, mitigation of stream and wetlands impacts would occur as the permittee addresses the 404(b)1 guidelines- avoidance, minimization, and compensation. For unavoidable impacts, generally compensatory mitigation is required for all stream impacts greater than 150 linear feet and all wetland impacts greater than 1/10 acre. Compensatory mitigation can occur through four methods: restoration, creation, enhancement, or preservation. It is most likely that stream and wetland mitigation credits for this project would be purchased from an approved mitigation bank or in-lieu fee program. The amount of stream and wetland mitigation required would be finalized during the 404 and 401 permitting process.

Preparation of an Erosion and Sedimentation Control Plan

A Sediment and Erosion Control Plan would be completed for the proposed project. The plan is to include sufficient information to evaluate the site conditions, environmental characteristics of the affected areas, potential impacts of the proposed grading on water resources, and effectiveness and acceptability of measures proposed to minimize soil erosion and off-site sedimentation. The plan would be approved by the City of Winston-Salem.

Appropriate sediment and erosion control devices and temporary sediment basins and traps are to be installed/constructed as appropriate during the initial stage of construction and appropriate BMPs are to be utilized during and after construction.

Stormwater Management Plan

A Stormwater Management Plan would be completed as required. The plan would comply with State and local regulations.

Use of Best Management Practices (BMPs)

The implementation of BMPs would minimize construction impacts. BMPs are defined as a practice, or combination of practices, that are determined to be the most effective means of reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals. The design would include practices to minimize the impact on the surrounding areas. The use of erosion and sedimentation controls would be required throughout the construction period.

9. PUBLIC INVOLVEMENT

Describe the public review process and any comments received.

In order to secure the local match for the projects (Taxiway L Extension, Obstruction Removal, Runway 22 Safety Area Extension and Taxiway Q/Relocation of Taxiway A), the Airport Commission requested a loan from Forsyth County in the amount up to $1.5 million. The proposed projects were discussed at three Forsyth County Public Meetings and were broadcast on local television. One of the chairmen provided an overview of all the projects in a PowerPoint presentation. The County Commissioners voted in favor of financial support of the projects. In addition, the projects were discussed at several Airport Commission meetings which were also open to the public. The projects were discussed in several newspaper articles. The following is a list of meeting dates:

- June 23, 2015
- August 27, 2015
- September 28, 2015

10. LIST OF ATTACHMENTS

Attachment A	Master Plan Update
Attachment B	East/Northeast Winston-Salem Planning Area Plan
Attachment C	Letter of Correction and Letter of Investigation
Attachment D	Taxiway A Relocation Study
Attachment E	Wildlife Resources Commission Comments
Attachment F	Wildlife Hazard Management Plan
Attachment G	Cultural Resources Documentation (2014 and 2017)

Attachment H	State Historic Preservation Office Comments
Attachment I	EJSCREEN Report
Attachment J	Landfill Report
Attachment K	2014 Jurisdictional Determination Verification Letter
Attachment L	Capital Improvement Budget

Project Title:_____ **Identifier:**_____

11. PREPARER CERTIFICATION

I certify that the information I have provided above is, to the best of my knowledge, correct.

_____ _____

Signature Date

_____

Name

_____

Title

_____ _____

Affiliation Phone #

12. AIRPORT SPONSOR CERTIFICATION

I certify that the information I have provided above is, to the best of my knowledge, correct. I also recognize and agree that no construction activity, including but not limited to site preparation, demolition, or land disturbance, shall proceed for the above proposed project(s) until FAA issues a final environmental decision for the proposed project(s), and until compliance with all other applicable FAA approval actions (e.g., ALP approval, airspace approval, grant approval) has occurred.

_____ _____

Signature Date

_____

Name

_____

Title

_____ _____

Affiliation Phone #

INSTRUCTIONS

NOTE: This form was prepared by FAA Eastern Region Airports Division and is intended for use with proposed projects in this region only.

Introduction: This Short Environmental Assessment (EA), is based upon the guidance in Federal Aviation Administration (FAA) Orders 5050.4B – *NEPA Implementing Instructions for Airport Actions* and 1050.1E – *Environmental Impacts: Policies and Procedures*, and the *Environmental Desk Reference for Airport Actions*, which incorporate the Council on Environmental Quality's (CEQ) regulations for implementing NEPA, as well as US Department of Transportation environmental regulations, and many other federal statutes and regulations designed to protect the Nation's natural, historic, cultural, and archeological resources, etc. The information provided by sponsors and their consultants through the use of this form enables the FAA ADO offices to evaluate compliance with NEPA and the applicable special purpose laws.

Use: This Form is intended to be used when a project cannot be categorically excluded (CATEX) from a formal environmental assessment, but when the environmental impacts of the proposed project are expected to be insignificant and a detailed EA would not be appropriate. Accordingly, this Form is intended to meet the intent of a short EA while satisfying the regulatory requirements of an EA. Proper completion of the Form would allow the FAA to determine whether the proposed airport development project can be processed with a short EA, or whether a more detailed EA or EIS must be prepared.

If you have any questions on whether use of this form is appropriate for your project, or what information to provide, we recommend that you contact the environmental specialist in your local ADO.

This Form is to be used in conjunction with applicable Orders, laws, and guidance documents, and in consultation with the appropriate resource agencies. Sponsors and their consultants should review the requirements of special purpose laws (See 5050.4B, Table 1-1 for a summary of applicable laws). Sufficient documentation is necessary to enable the FAA to assure compliance with all applicable environmental requirements. Accordingly, any required consultations, findings or determinations by federal and state agencies, or tribal governments, are to be coordinated, and completed if necessary, prior to submitting this form to FAA for review. Coordination with Tribal governments must be conducted through the FAA. We encourage sponsors to begin coordination with these entities as early as possible to provide for sufficient review time. Complete information will help FAA expedite its review. **Please note: When requesting discretionary funding for an airport project, the appropriate environmental documentation should be submitted to the local Airports District Office by April 30th of the year preceding the year funding is requested**.

Availability: *An electronic version of this Short Form EA is available on-line at http://www.faa.gov/airports/eastern/environmental/media/C-10.DOC. Other sources of environmental information including guidance and regulatory documents are available on-line at http://www.faa.gov/airports/environmental.*

North

0' 100' 200' 400'

GRAPHIC SCALE IN FEET

LEGEND

STREAMS

WETLAND

Impact Totals
Stream Impacts - 3, 945 LF
Wetland Impacts - 1.13 AC

AIRPORT PROPERTY LINE

STREAM

WETLAND

LINEAR WETLAND

APPROXIMATE LIMITS OF DISTURBANCE

Impact #1 - 0.01AC

Impact #2 - 0.003AC

Impact #3 - 1,888LF (All Stream Segments)

Impact #4 - 0.23AC (4 Wetlands)

Impact #5 - 0.07AC

Impact #6 - 0.03AC

Impact #7 - 1,363LF (all stream segments)

Impact #8 - 0.02AC

Impact #9 - 0.27AC

Impact #10 - 0.12AC

Impact #11 - 496LF

Impact #12 - 198LF

Impact #13 - 0.38AC

RUNWAY 15-33

RUNWAY 4-22

TAXIWAY F

TAXIWAY H

SOUTHERN

NORTH OAK

DRIVE

LANSING

LIBERTY

P:\2016\2016.130.XX – SMITH REYNOLDS EA\WETLAND-STREAM IMPACTS-REV4-21-17.DWG 4/24/2017

AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
MALLARD CREEK III, SUITE 152
8604 CLIFF CAMERON DRIVE • CHARLOTTE, NC 28269
OFFICE: (704) 954-9008
www.avconinc.com

KEY PLAN

ENVIRONMENTAL ASSESSMENT

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:

DRAWN BY:

CHECKED BY:

APPROVED BY:

DATE:

STATE LICENSE NO. N.C. C-2450

AVCON PROJECT NO.

SHEET NUMBER

Figure 1

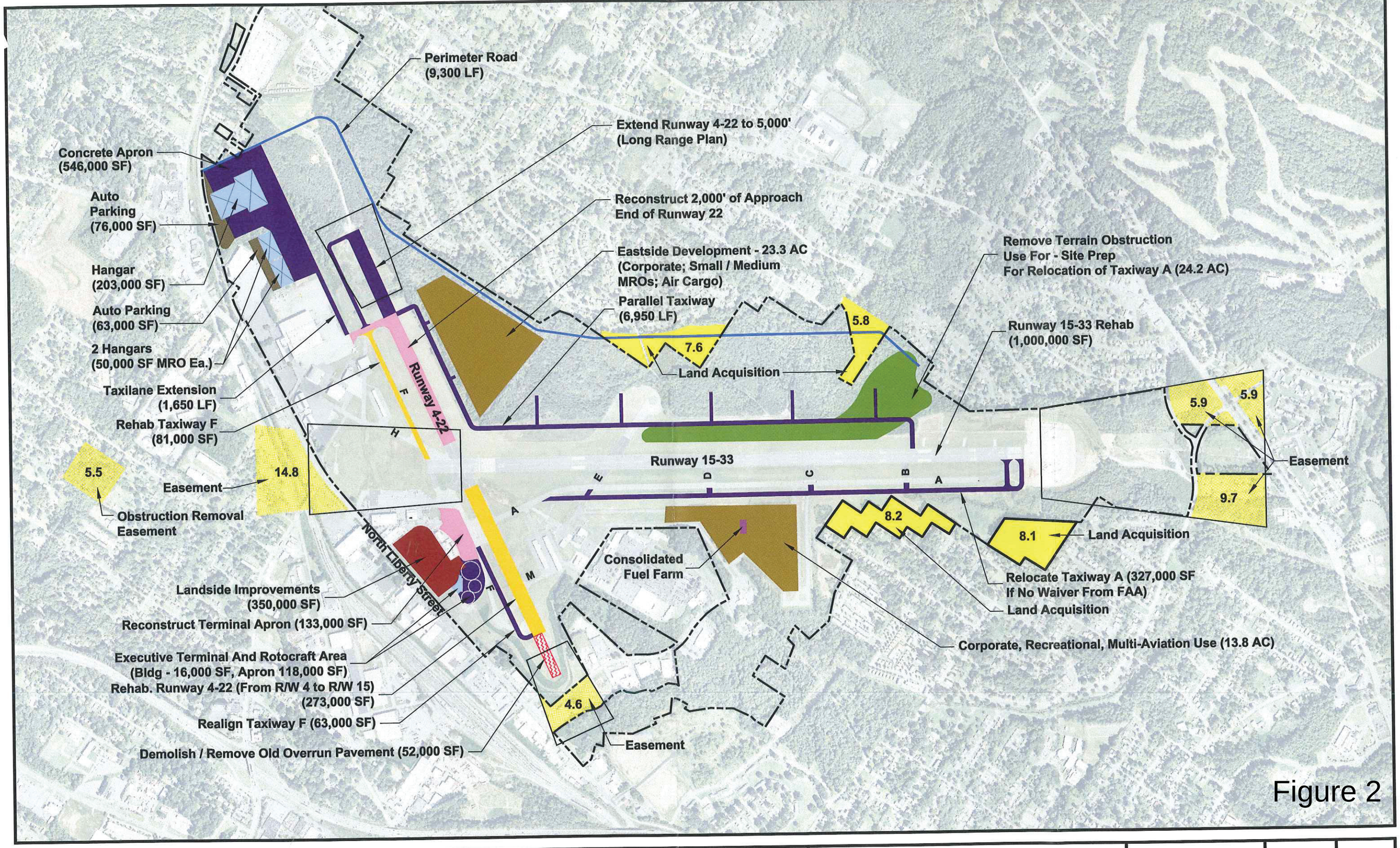


Figure 2

AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	High Development Alternative	0 500' 1,000' SCALE: 1" = 1,000'	6-3 DRAWING NO.

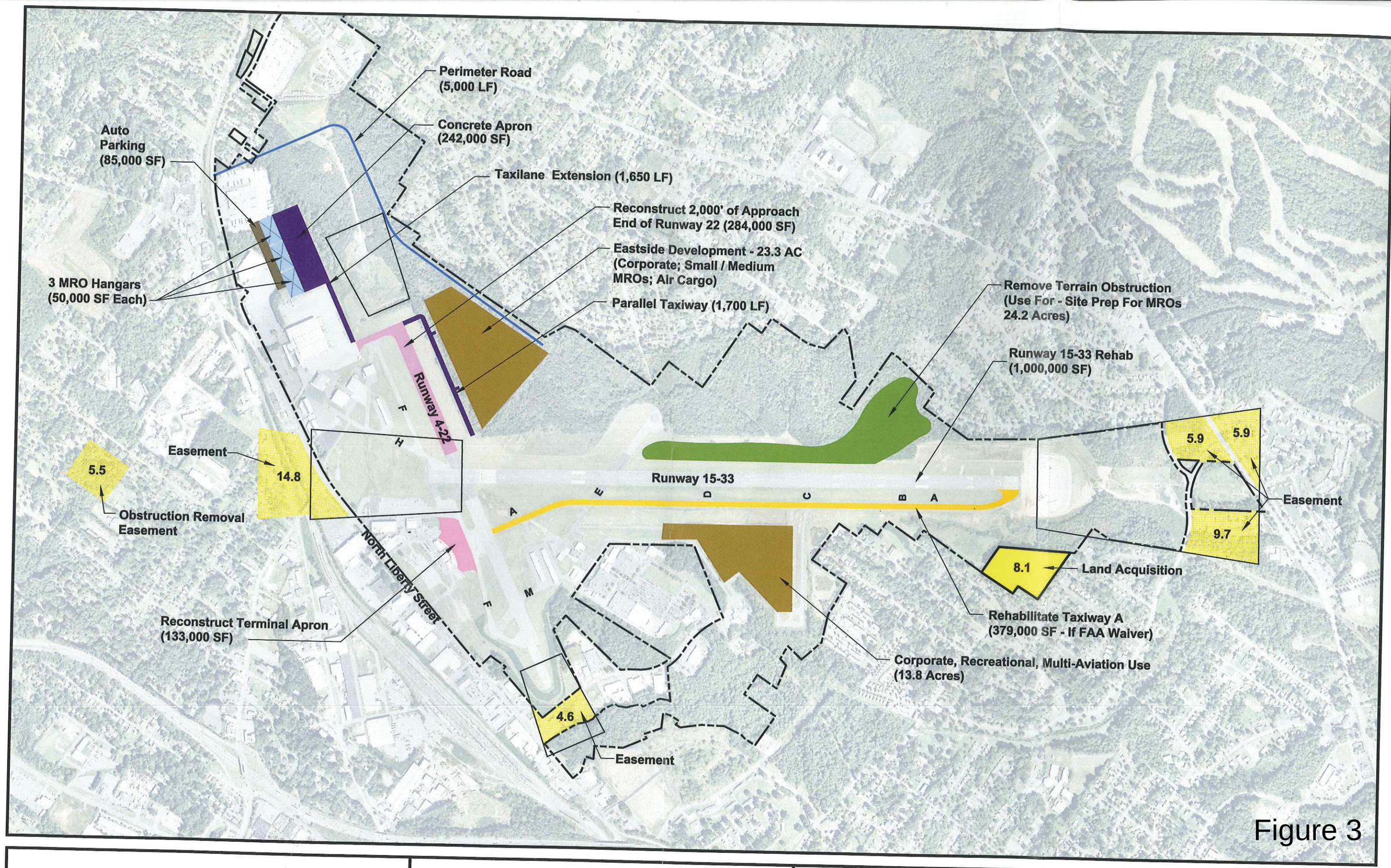


Figure 3

AVCON / LPA TEAM

SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

Low Development
Alternative

0 500' 1,000'
SCALE: 1" = 1,000'

6-2
DRAWING NO.

Perimeter Road
(9,300 LF ±)

Concrete Apron (242,000 SF)

Land Reserved for 1,062' Runway Extension

Reconstruct 2,000' of Approach
End of Runway 22

Auto Parking
(85,000 SF)

3 MROs
(50,000 SF
Each)

Taxilane Extension
(1,650 LF)

Rehab Taxiway F
(81,000 SF)

Eastside Development - 23.3 AC
(Corporate; Small / Medium
MROs; Air Cargo)

Land Acquisition

Remove Terrain Obstruction
(Use For - Site Prep For MROs
24.2 Acres)

Runway 15-33 Rehab
(1,000,000 SF)

Parallel Taxiway (6,950 LF±)

Runway 4-22

Runway 15-33

5.5

Easement

14.8

Obstruction Removal
Easement

PAPI

North Liberty Street

Reconstruct Terminal Apron
(133,000 SF)

Landside Improvements
(350,000 SF)

Executive Terminal And Rotocraft Area
(Bldg - 16,000 SF, Apron 118,000 SF)

Rehab. Runway 4-22 (From R/W 4 to R/W 15)
(273,000 SF)

Realign Taxiway F (63,000 SF)

Demolish / Remove Old Overrun Pavement (52,000 SF)

Consolidated
Fuel Farm

4.6

Easement

5.8

7.6

5.9

5.9

Easement

9.7

8.2

8.1

Land Acquisition

Rehabilitate Taxiway A (379,000 SF
If FAA Waiver)

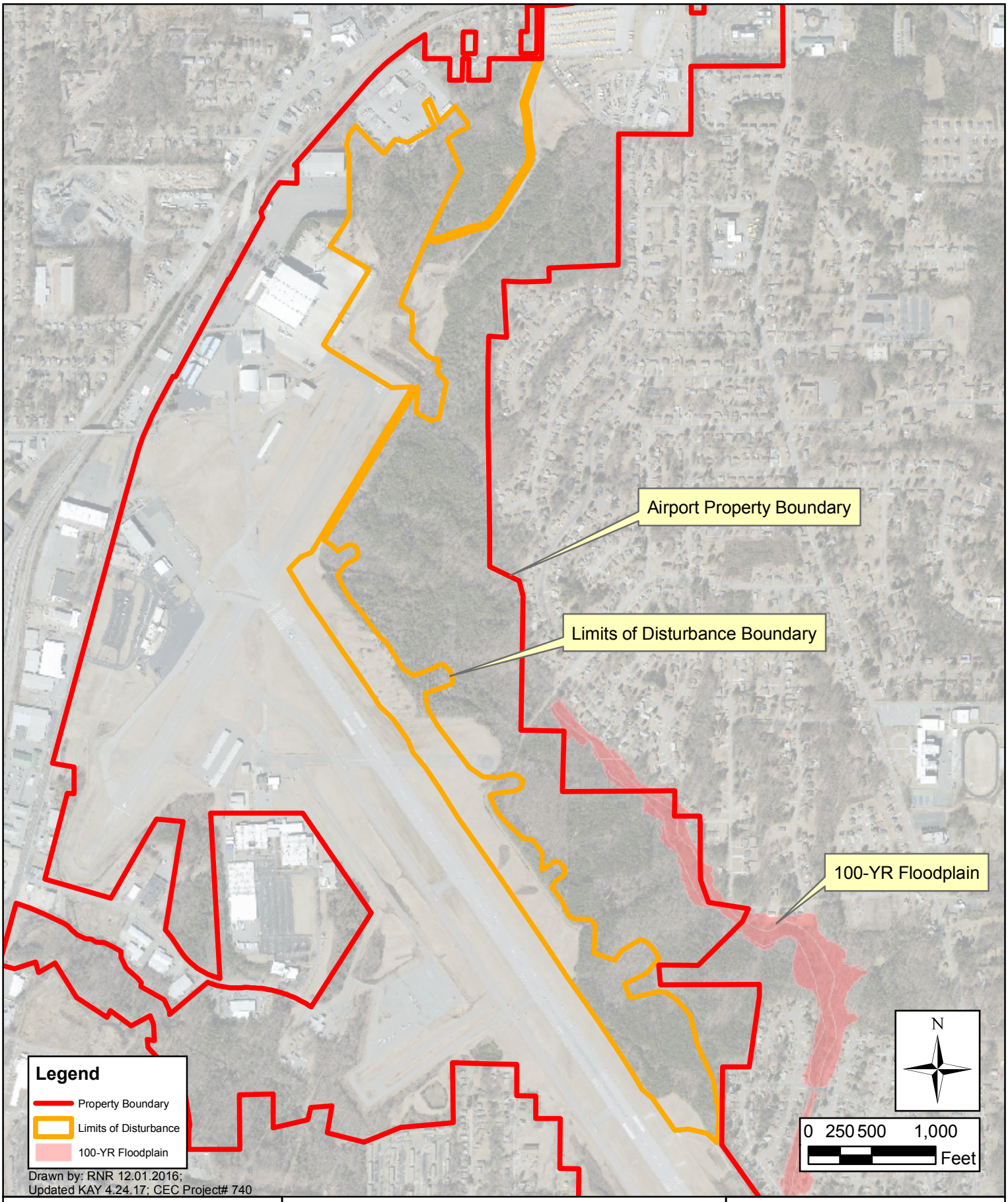
Land Acquisition

Corporate, Recreational, Multi-Aviation Use (13.8 AC)

Figure 4

AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	Preferred Airport Development Alternative	0 500' 1,000' SCALE: 1" = 1,000'		6-5 DRAWING NO.

Smith Reynolds Airport



Forsyth County,
North Carolina

ClearWater

32 Clayton Street
Asheville, North Carolina 28801

FEMA 100-YR Floodplain
3710684700J
3710684600J (eff. 01.02.09)
Figure 5

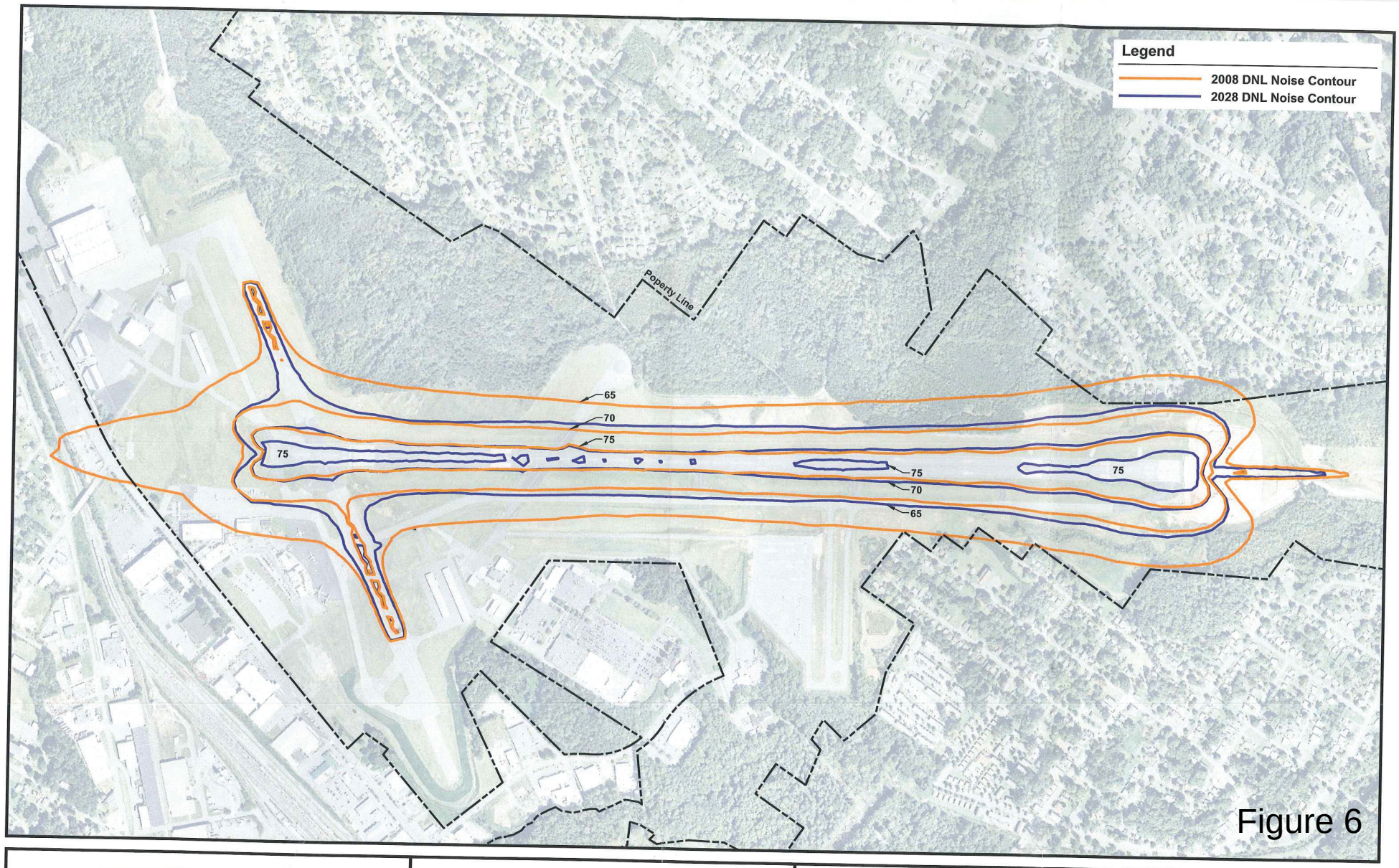


Figure 6

AVCON / LPA TEAM

SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

2008 and 2028 DNL Noise Contours

0 325 650
SCALE IN FEET

6-7
DRAWING NO.

Y:\Planning\NT ith Reynolds\MPU\Drawings\exhibits\Exhibit 6-7-noise contours.dwg May 11 2012-

Attachment A

Master Plan Update

MASTER PLAN UPDATE

Smith Reynolds Airport
Winston-Salem, North Carolina

Prepared For

The Airport Commission of Forsyth County






FINAL REPORT
MAY, 2012

Prepared By

AVCON

THE LPA GROUP
AVIATION CONSULTANTS

Table of Contents

Tables

Exhibits

Chapter 1
Introduction

1.0 OVERVIEW

Early in 2009, the Airport Commission of Forsyth County (ACFC) initiated an update to the Smith Reynolds Master Plan, which was last completed in 1994. The need for this update was essentially twofold. The primary reason was to create a plan that the ACFC could utilize as a guide as they continue moving forward with their development and marketing initiatives. Secondly, the update serves both the FAA's and state's requirements to conduct periodic updates to the airport's future development plan.

Although the development of a master plan and associated airport layout plan (ALP) set serves many objectives, one of the most significant purposes of this study is to allow the airport to meet federal assurances for grant funding eligibility. Back in 1982, the federal government adopted the Airport and Airway Improvement Act; this act allowed federal funds to be distributed through a grant program to airports throughout the country. These federal grants did not require repayment provided that certain rules were followed and adhered to (assurances). Over the years, the grant legislation has been revised, renamed, and expanded and presently includes 39 separate assurances that must be met in order to be considered "compliant". The current grant program, referred to as the AIP program, provides grant funding to cover up to 90% of costs required to address airport safety, capacity, security, or environmental concerns. Grant assurance number 29 states that the airport sponsor will develop and maintain an ALP which denotes the airport's boundaries along with all existing and future development within. The ALP and any revision or modification thereof must be reviewed and approved via signature by an authorized representative of the Secretary. The purpose of the master plan document is to identify in detail the justifications, methodologies, and reasoning for the developments shown within the airport layout plan set. In addition to grant funding, the airport's master plan serves a variety of functions, including projecting future aviation activity, being a tool for financial planning, and guiding adjacent land uses. The primary planning objective of this master plan update was to create a 20-year development program that would maintain a safe, efficient, economical, and environmentally acceptable airport facility for Forsyth County. By achieving this objective, the document should provide guidance to satisfy the aviation demand in a financially feasible and responsible manner, while at the same time addressing the aviation, environmental, and socioeconomic issues of the community. In support of this goal, the following objectives were considered:

- Identifying the needed airside, landside, and airspace improvements and recommend options to further optimize the economic aspects of the airport while enhancing the safety and operational capability.
- Establishing an implementation schedule for short-, intermediate-, and long-term improvements and insure that they are financially feasible.

- Identifying short-term requirements and recommend actions to optimize short-term funding opportunities.
- Ensuring that short-term actions and recommendations do not preclude long-range planning options.
- Incorporating the interests of the public and government agencies into the planning process.
- Remaining sensitive to the overall environmental characteristics and needs of the area surrounding the airport.
- Incorporating current comprehensive land use (both on- and off-airport property) and recommend developments that are compatible with existing and future land uses.

Multiple opportunities were available for community and governmental representatives to participate in this study through representatives serving on the study's master plan steering committee (MPSC) and through community workshop/public meetings. Additionally, a public meeting was conducted which allowed an opportunity for public comments on the presented study information. It is important to note that the study results and the future developments presented in this report represent a plan to guide the ACFC in meeting demands as they develop; therefore, no development should be undertaken until there is a clearly identified need for it.

1.1 KEY ISSUES

This master plan provides a comprehensive overview of the airport's needs over the next 20 years, including issues related to the timing of proposed development, development costs, methods of financing and management options to provide a clear plan of action. Prior to the start of this master plan update, there were a number of key issues identified by the ACFC that required particular attention. These items include but were not limited to:

- Evaluating airfield development options that address the primary and secondary runway length requirements, runway safety area standards, and future airfield capacity.
- Evaluating the Runway 15 approach and location of the runway's existing relocated threshold.
- Evaluating the long-term development options for general aviation and airport support facilities while maximizing access to these facilities.
- Evaluating the significance of Runway 4-22 to existing operations.
- Evaluating runway to taxiway separation and safety requirements for parallel Taxiway A.
- Evaluating the terminal landside area for improvements to access, parking, and circulation to the terminal complex, as well as to adjacent businesses.
- Discuss the need for a new terminal and control tower facilities and identify potential development areas for each.
- Develop and briefly discuss a plan for the airport to continue monitoring, updating, and implementing its pavement management program.
- Evaluating Taxiway F extension to open up and create developable land for potential airport tenants.
- Evaluate existing and alternative funding sources for airport development.

- Evaluating land acquisition associated with FAR Part 77 surfaces, specifically runway approaches and transitional surface areas; as well as for noise mitigation with neighboring residential areas.
- Building a strong public and political consensus as to the value of the airport; develop a public information and involvement program to further enhance the ACFC as a "good neighbor and good steward" of the airport.
- Organize and implement the use of a Master Plan Advisory Committee to facilitate the decision making process for the master planning process.
- Optimize the operational efficiency, effectiveness and safety of the airport.
- Create an approach and plan that identifies the best short-term, intermediate and long-range development for the airport.
- Create strong local and regional support from the business community.

1.2 PROCESS

This master plan update provides a systematic outline of the development actions required to maintain and further develop airfield and landside facilities. This process provides the officials responsible for the scheduling, budgeting, and ultimate funding of airport improvement projects with an advance notice of the future needs of the airport. By phasing the airport improvements, the development can be conducted in an orderly and timely fashion.

This airport master plan update for INT was prepared in accordance with the requirements of the FAA, the North Carolina Department of Aviation, and Forsyth County. All portions of this document are based on the criteria set forth in the FAA Advisory Circulars (AC) 150/5070-6B, Airport Master Plans, and AC 150/5300-13, Airport Design. To accomplish the objectives identified, the study has included the following tasks:

- Develop a 20-year capital improvement program that is technically correct, environmentally sound, financially viable, and implementable with particular attention given to the 5-year (short-term) development plan.
- Identify the role of the airport in the local, regional, and national aviation system; meeting the long-range aviation needs of the region while acting as an economic catalyst to the area.
- Develop alternative options for airport development that address current and future demand, including issues relating to the timing and costs of proposed development based upon appropriate activity triggers.
- Provide potential utilization of or re-use options for existing infrastructure and airport facilities.
- Provide overview of land use compatibility issues in the airport environs.
- Develop an Airport Layout Plan (ALP) drawing set meeting FAA and NCDOA criterion.
- Develop a process that allows for public participation.
- Optimize the airport's operational efficiency, safety, security, and effectiveness in serving the region.
- Establish guidelines to support a continuous planning process.

Throughout this process, reviews of this master plan report were conducted at key points such as at the completion of the forecasts and during the development of the alternatives. This ensured that input was received from key stakeholders, such as the Airport Commission of Forsyth County, NCDOA, and FAA. The individual report chapters provide a detailed explanation of these key steps. It should be noted that each step in the master plan process built upon information and decisions made during previous steps. Taken as a whole, they address the key issues identified above and demonstrate how study objectives were met.

Chapter 2
Inventory of Existing Conditions

2.0 BACKGROUND

The master planning process requires the gathering of information related to the existing conditions of the airport. This information serves as the basis for future steps in the planning process. As such, information related to the Smith Reynolds Airport (INT) and its surrounding areas was collected in order to identify future aviation needs of the community. Data collected in this phase provides an inventory of the following:

- Existing physical facilities: runways, taxiways, parking aprons, navigational aids, airport terminal, and facility areas for general aviation, corporate, air cargo, and aviation support.
- The airport's overall role in the Winston-Salem community: development history, location, and access relationship to other transportation modes.
- Existing community, airport, and regional plans and studies that contain information that may relate to the development and eventual implementation of the recommendations of the Master Plan. This information is particularly relevant to future industrial/business development on or adjacent to the airport.

An inventory addressing these and other issues required data from a variety of sources in order to obtain an accurate depiction of INT and its surrounding community, including:

- Interviews with INT management and staff
- Interviews with INT users and tenants
- Contacts with local, state, and federal agencies
- Research and review of previous airport planning analyses and studies
- Review of aerial photography, mapping, and airport and terminal plans
- Review of facility directories, approach plates, sectional charts, etc.
- Reference materials, such as FAA publications, activity data sites, flight strip information, and planning guidelines
- Review of airport and FAA statistical reports

2.1 HISTORY

Back in 1927, city officials learned that Winston-Salem was a scheduled stop for Charles Lindbergh and the "Spirit of St. Louis" during a cross-country tour to celebrate advances in aviation. Although there was an existing grass strip airfield within Winston-Salem at the time, officials felt that an improved airfield would be better suited to accommodate the greatest aviator of the time. As such, a portion of land located approximately 4 miles north of downtown Winston-Salem was identified as an ideal site for a paved airport facility. A contribution of $17,000 was made by Clint Miller to develop the new airport; as a result, the airport corporation

named the new airport Miller Municipal Airport. From 1927 to 1933 Reynolds Aviation, one of the airport's most active users, provided commuter flights to New York, Detroit, Philadelphia, and Baltimore with weekend taxi service to Wrightsville and Myrtle Beaches. In 1933, The New Deal developed a program known as the Civil Works Administration. This administration began extending each runway by 500 feet, shifted the approach lighting system, and added concrete floors to hangars. Additional projects that occurred during the 1930's included a new administration building, a third runway, and a new airfield lighting system. By 1938, additional property was acquired and a new fourth runway was constructed. In 1940, Eastern Airlines agreed to add Winston-Salem to its North-South route. In support of Eastern's action, the Z. Smith Reynolds Foundation donated funds to further modernize and expand the airport for additional commercial service. In 1942, Miller Municipal Airport was renamed the Smith Reynolds Airport in honor of the foundation responsible for its many contributions. In 1949, the Forsyth County Airport Commission was established to oversee the daily operation and development of the airport. From 1942 through 1945, the airport served as a training base for military pilots but continued its commercial and private airline service. In 1947, the Civil Aeronautics Board awarded Piedmont Aviation a temporary certificate for regional air service of four feeder line routes with DC-3 aircraft. The routes extended from Wilmington, North Carolina to Cincinnati, Ohio and serviced twenty-two additional airports throughout the U.S. During the span of 1957 through 1960, a fire station and ATCT were constructed, an approach lighting system was installed, and the terminal building was further expanded. By 1963, the airport witnessed a resounding 129,313 annual operations which made Smith Reynolds the most active airport within the state and the 85th most active in the entire country. During the late sixties and early seventies, the airport experienced steady regional airline service and witnessed flourishing general aviation activity. From 1978 to 1992, the Airport Commission of Forsyth County continued to maintain and improve its facilities by completing several projects such as: new fencing, terminal improvements, and pavement strengthening. During the 1990s, commercial enplanements continued to decline from 23,000 in 1990 to 7,000 in 1999. In the year 2000, USAir, the airport's only remaining commercial carrier, terminated service at INT.

Since the completion of the 1995 master plan, the ACFC has orchestrated several projects to improve and expand the airport. One notable project includes the construction of a general aviation tie-down apron (south apron) which is located west of Runway 15/33 near the end of Runway 33. The apron has an attached automobile parking area located to the west that was constructed for use by travelers. Another notable project includes the recent overlay of Runway 15/33 which occurred in 2008. In July 2010, an Engineered Material Arresting System (EMAS) was constructed near the approach end of Runway 33 to allow the runway to comply with FAA safety standards.

2.2 LOCATION / LOCALE

The Winston-Salem Chamber of Commerce defines the metropolitan statistical area (MSA) of Winston Salem to include 4-counties, Forsyth, Davie, Stokes, and Yadkin. In 2008, the population of Forsyth was reported as 343,000 and the population of the MSA was listed as 468,124. The Winston-Salem area is primarily recognized for its contributions to the education and health services industries. In 2007, the two top employers were Wake Forest University

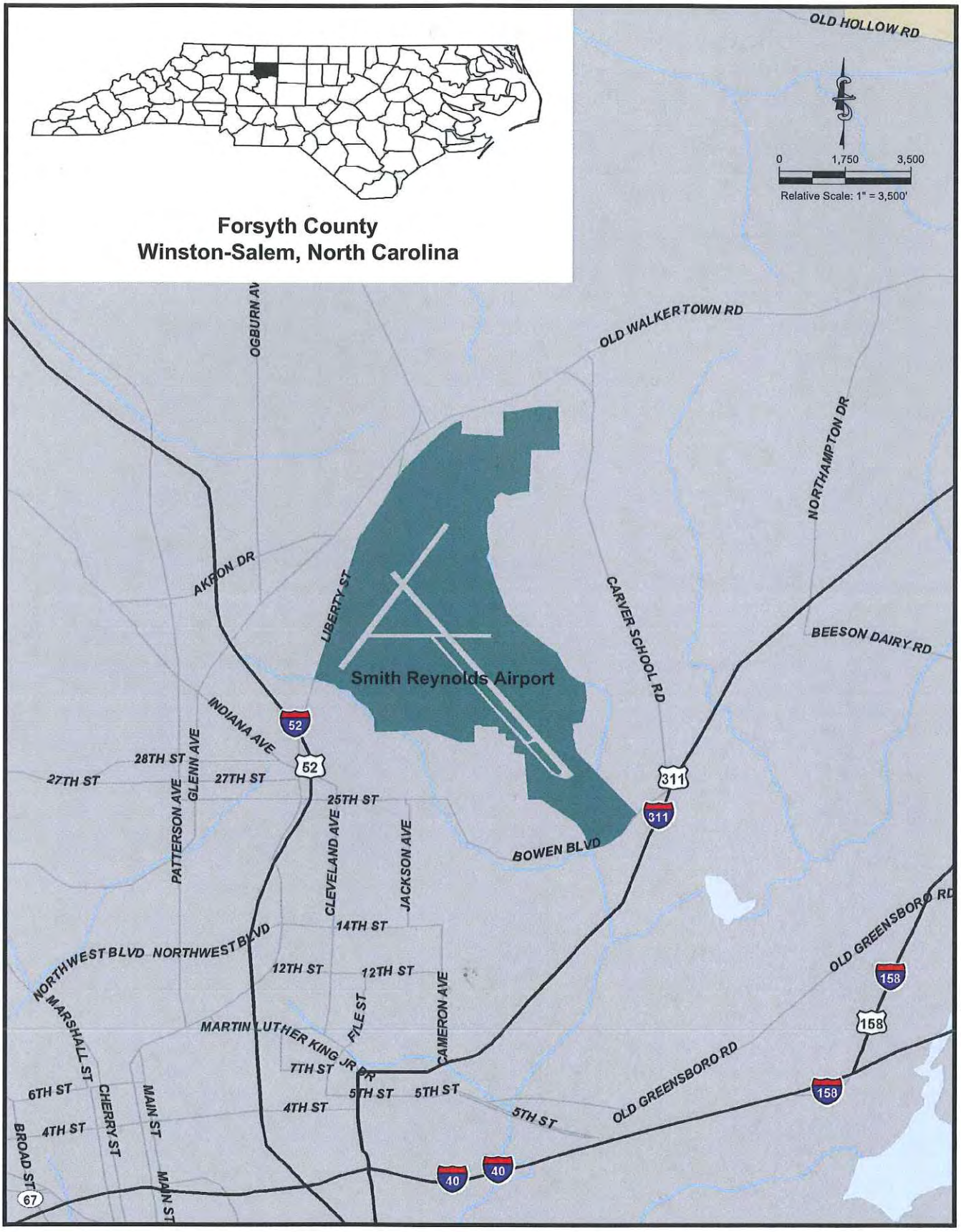
Baptist Medical Center (13,000 employees) and Novant Health (8,145 employees). Other top employers within the area include Reynolds American and Hanesbrands Inc. (manufacturing) and Wells Fargo / Wachovia and BB&T (financial activities). Corporate executives from these companies and others often travel into and out of Smith Reynolds Airport in order to conduct normal business between their home and satellite offices. For this reason, INT experiences a significant amount of corporate jet and large aircraft charter activity. In addition to business-related activity, several National Association of Stock Car Auto Racing (NASCAR) teams often travel to and from INT to conduct business and to attend the NASCAR series races that occur at the Bowman Gray Stadium which is located approximately 2 miles southeast of downtown Winston-Salem. North State Aviation, is a certified FAR Part 145 repair station with heavy maintenance, modification and repair capabilities for various models of 737 and 757 series aircraft. In 2008, Smith Reynolds accommodated approximately 51,839 operations and served as a home to 100 based aircraft. Of these based aircraft, 62 were single-engine piston, 20 were multi-engine piston, and 18 were comprised of jet aircraft.

Airport Access

Access to and from the Smith Reynolds Airport can easily be achieved by using one of several county roads and interstate highways which lead into and out of vicinity of the airport. The main access road leading to the airport, North Liberty St., travels in a north/south direction and perpendicular to the terminal's main entrance road (Norfleet Drive). Access to the airport's northernmost property can be achieved by traveling north on North Liberty until it splits into Lansing Dr. Lansing Dr. parallels the westernmost airport property and leads to several non-aviation related uses including tractor trailer storage, county bus parking, and to a community college. Access to the airport's southern facilities can be achieved by travelling south on N. Liberty St. until it intersects Fairchild Road. Fairchild road runs east until it turns into Aviation Drive which leads directly into the ARFF, small maintenance hangar, and t-hangar facilities. North Liberty St. also connects the airport to the nearby Highway 52 (John M Gold Freeway) which travels north from Winston Salem to Mount Airy and continues south until it intersects highway 40 (east/west) and continues further south to Lexington. **Exhibit 2-1** depicts a location and access map for the airport and surrounding areas.

Nearby Airport Facilities

There are several airports located within a 30 nautical mile radius of Smith Reynolds; however, many of these facilities are comprised of private facilities that were constructed to accommodate small aircraft flying clubs, fly-in communities, or are used solely for the use and benefit of the land owner. The nearest commercial service airport to Smith Reynolds is Piedmont Triad International (GSO) in Greensboro, which is located approximately 14 nm east. Several alternate public-use airports are also located within a 30-nm range of INT, as shown in **Table 2-1.**



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Smith Reynolds Airport - Master Plan Update

Location / Access Map

2-1

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Table 2-1
Airports In The Vicinity of Smith Reynolds

Airport	Distance from INT	Paved Runways	Published Instrument Approach Procedures
N63 Meadow Brook Field Airport	11 nm N	16/34 – 2,725 ft x 30 ft	VOR/DME
GSO - Piedmont Triad International Airport	14 nm E	5R/23L - 10,001 ft x 150 ft 5L/23R – 9,000 ft x 150 ft 14/32 – 6,380 ft x 150 ft	ILS, RNAV/GPS, VOR/DME, NDB
8A7 - Twin Lakes Airport	17 nm SW	2,943 X 50 ft	NONE
EXX - Davidson County Airport	22 nm S	6/24 – 5,004 ft x 99 ft	ILS, GPS, VOR/DME
MWK - Mount Airy/Surry County Airport	25 nm NW	18/36 – 4,301 ft x 75 ft	GPS, NDB

Source: Airport/Facility Directory, August 2009.

2.3 PART 139 CERTIFICATION

The FAA provides certification of airports for commercial operations under Federal Aviation Regulations (FAR) Part 139, *Certification of Airports*. Airports with scheduled and unscheduled air carrier service with at least 31 seats and scheduled air carrier service with 10 to 30 seats must hold a FAR Part 139 Airport Operating Certificate (AOC) and comply with FAR Part 139 stringent safety, facility, security, and recordkeeping requirements for the respective class and must also be inspected by the FAA. The FAR Part 139 certification categorizes airports into four classes, based on the type of air carrier operations at the facility, as shown in **Table 2-2**. Based on INT's existing level of activity by unscheduled large aircraft, (charter operations in aircraft with at least 31 seats), the airport is required to maintain a Class IV certificate; however, INT is categorized and maintains a Class I operating certificate and is open to all types of air carrier operations.

Table 2-2
FAR Part 139 Airport Classes

Type of Air Carrier Operation	Class I	Class II	Class III	Class IV
Large Air Carrier Aircraft (30+ seats)	X			
Unscheduled Large Air Carrier Aircraft (30+ seats)	X	X		X
Scheduled Small Air Carrier Aircraft (10-30 seats)	X	X	X	

Source: FAR Part 139, Certification of Airports, 2006.

2.4 AIRPORT COMMISSION OF FORSYTH COUNTY (ACFC)

The Smith Reynolds Airport is owned by Forsyth County; however, it is managed and operated by an independent unit of Forsyth known as the Airport Commission of Forsyth County (ACFC). Each of the five member commission is appointed by the Forsyth County Board of Commissioners for a term of two years. One member has the added responsibility of oversight and is a sitting commissioner of the Forsyth County Board of Commissioners. Six full-time

employees of the ACFC are responsible for the daily operation of INT. Administrative functions are performed by an Airport Director and Administrative Coordinator; whereas, airfield maintenance functions are performed by four employees, (a Maintenance supervisor along with three Maintenance Specialists). The INT airport maintenance building is located northwest of the ARFF facilities and provides airport fleet maintenance services, equipment storage, as well as airfield and landside facility maintenance. This building also acts as the headquarters for the maintenance department and therefore includes offices, restrooms, and a lounge for use by maintenance personnel.

2.5 AIRSPACE

The airspace which surrounds INT is classified as Class D. Class D airspace is otherwise referred to as "controlled" airspace which requires pilots to communicate and acquire permission from air traffic controllers prior to passing through, departing, or entering the Class D boundaries. The class D airspace generally extends horizontally a distance of four nautical miles from the airport center and vertically extends from the surface of the airport to 2,500' above airport elevation, 3,500' above mean sea level (AMSL). As mentioned earlier, Piedmont Triad International Airport (GSO) is located approximately 14 nautical miles east of INT. GSO is enclosed by class C airspace which is generally described as airspace above airports with an air traffic control tower that is serviced by radar approach control and that have a pre-established number of IFR operations or passenger enplanements. Class C airspace is sometimes referred to as an upside down wedding cake due to its differing inner and outer veil dimensions and elevations. **Exhibit 2-2** graphically depicts the differences between various airspace classes and **Exhibit 2-3** illustrates the aeronautical chart illustrating the airspace in the vicinity of INT.

Exhibit 2-2
Airspace Classes

Source: FAA 2008 Pilot's Handbook of Aeronautical Knowledge

2.6 PREVIOUS STUDIES

During the course of the Master Plan, previous studies are reviewed and utilized whenever possible in order to gain as much background information possible prior to developing forecast projections and development recommendations. Examples of these studies include but are not limited to previous Master Plans, National Plan of Integrated Airport Systems (NPIAS) studies, State System Plans, and prior activity forecasts. The following section provides an overview of the various studies used during the development of this Master Plan.

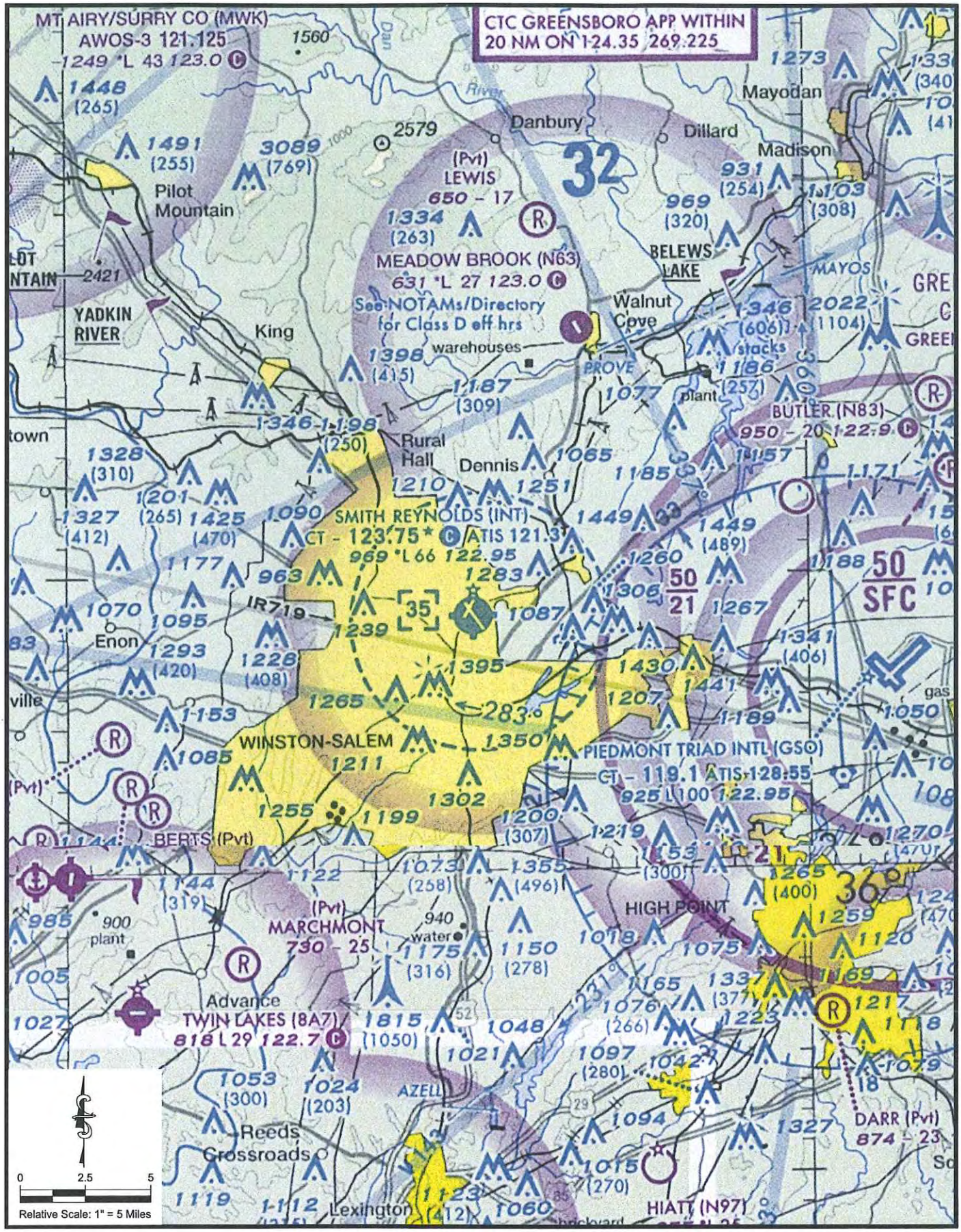
National Plan of Integrated Airport Systems (NPIAS)

The FAA's NPIAS is a five-year planning report submitted every two years to Congress which identifies anticipated development needs for certain airports throughout the U.S. There are over 19,815 airports in the U.S., of which 5,190 are open to the public. INT and 3,356 others have been determined by the FAA to be of significant interest to the nation's air transportation system, known as the National Airspace System. These 3,356 airports are included in the FAA's 2009-2013 NPIAS. The NPIAS defines the service role of each airport by one of four basic service levels. These levels describe the type of service that the airport currently serves and is expected to serve at the end of the NPIAS five-year planning period. Airports listed in the NPIAS are eligible for federal funding under the FAA's Airport Improvement Program (AIP). The 2009-2013 NPIAS report estimates that approximately $49.7 billion in AIP-eligible projects will be required by NPIAS airports within the next five years. It is important to note that this estimate of development costs is not FAA's commitment to fund any particular project; rather it is an estimate for budget planning and individual projects must be justified and approved before a grant is issued. The 2009-2013 NPIAS anticipates that INT will require more than $8 million in improvements during the five-year period. The NPIAS classifies INT as a general aviation airport for the FAA's 2009-2013 NPIAS planning period. A comparison of the NPIAS' various airport service level classifications is shown in **Table 2-3.**

Table 2-3
FAA NPIAS Airport Service Level Classification

Classification	Definition
Commercial Service - Primary	Public-use commercial airports enplaning more than 10,000 passengers annually.
Commercial Service – Non-Primary	Public-use commercial airports enplaning between 2,500 and 10,000 passengers annually
General Aviation - Reliever	A general aviation airport that serves to relieve operational congestion at a nearby commercial service airport. Must have at least 100 based aircraft or 25,000 itinerant operations
General Aviation	Other airports with fewer than 2,500 annual enplanements or that do not receive scheduled or unscheduled commercial service

Source: FAA Order 5090.3C, Field Formulation of the NPIAS, 2000.



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Smith Reynolds Airport - Master Plan Update

Aeronautical Chart

2-3

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North Carolina General Aviation Airport Development Plan

In 2003, the State of North Carolina published the North Carolina General Aviation Airport Development Plan (NCGAADP) which was later revised in 2006. The plan provides standards for the NCDOT/DOA to prioritize the funding of eligible capital projects for all public-use general aviation airports in the North Carolina airports system. Airports were categorized into color groups according to several factors including: population, per capita income, tourism characteristics, and NPIAS classification. The NCGAADP classified INT as a red group airport, which is the highest development color grouping for airports. A detailed discussion of the plan's recommendations for red group airports is further discussed in the facility requirements chapter of this report.

1995 Smith Reynolds Master Plan Update

The previous master plan update was performed back in 1995. At the time, the airport served as a feeder to USAir's hub in Charlotte and conducted regularly scheduled commercial service operations. Despite the airport's role change in 2000 due to its loss of airline service, the 1995 master plan provides useful information in identifying non-standard facilities and also presents the thought process and reasoning associated with proposed development recommendations. Thus, the 1995 master plan referred when necessary to gather missing data required as a part of this effort.

Smith Reynolds Airport Terminal Area Study

In 2000, a report was published that assessed the existing airport terminal along with its associated apron, access roads, and parking facilities and then provided recommendations to improve the facility such that it could meet future demand. The study concluded that due to high operational and maintenance costs, the existing terminal was not suitable for renovation. Rather, the study recommended that a new terminal be constructed in a site identified south of the existing terminal facility. This study was referenced to gather detailed information regarding the existing airport terminal and its facilities.

2.7 METEOROLOGICAL DATA

The weather associated with a particular area or region can potentially affect the performance of aircraft and ultimately influence airfield design recommendations. An overview of the climate and wind characteristics for the Winston-Salem area is presented in the following section.

Climate

The Smith Reynolds Airport is located in north central North Carolina where the climate is typically mild. The warmest month of the year is July which has an average high of 89 degrees Fahrenheit (F); whereas, the coldest month of the year is January which has an average low temperature of 29 degrees F. The area receives approximately 3.79" of precipitation per month and receives an average annual precipitation of 45.44". March was recognized as one of the wettest months with an average of 4.31" of precipitation.

Wind Coverage

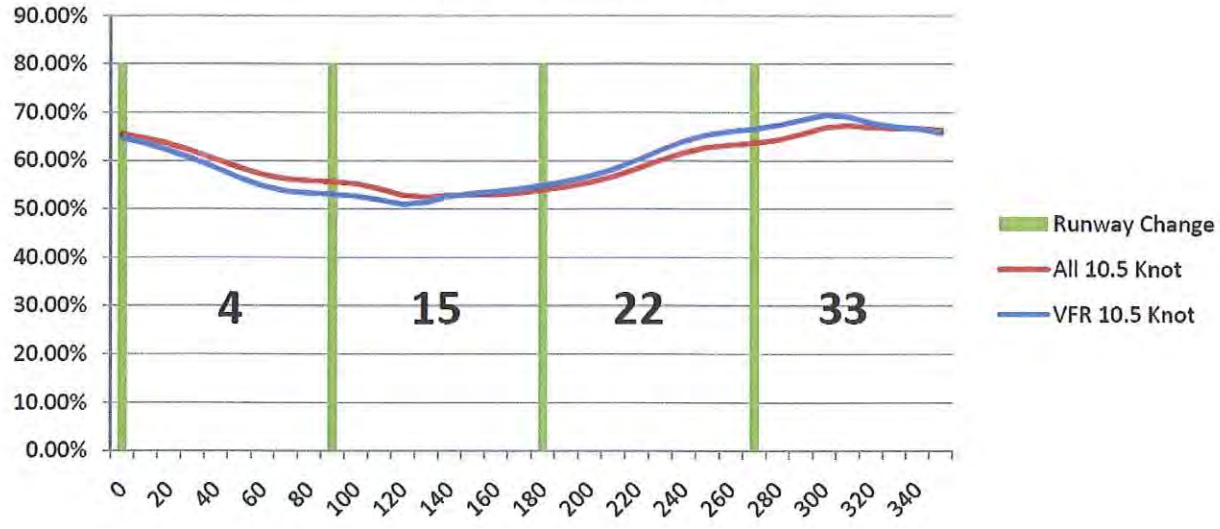
Historical wind conditions were evaluated to determine the percentage of wind coverage at INT. This element is important since pilots prefer to depart and land into the wind and as such runways should be oriented such that they face a direction to provide the maximum amount of coverage. The FAA recommends that runways achieve 95% wind coverage. The 95% wind coverage is computed based on the crosswind not exceeding:

- 10.5 kts (12 mph) for airport reference codes (ARC) of A-I and B-I;
- 13 kts (15 mph) for ARCs A-II and B-II;
- 16 kts (18 mph) for ARCs A-III, B-III, C-I through D-III; and
- 20 kts (23 mph) for ARCs A-IV through D-VI.

If the existing runways are unable to achieve the maximum crosswind component of the critical aircraft, then the addition of a crosswind runway or re-orientation of the existing runway should be considered. FAA Advisory Circular (AC) 150/5300-13, Airport Design, requires that a period of at least 10 consecutive years of wind data should be examined when evaluating airfield wind coverage. Wind data for INT was obtained through the National Oceanic and Atmospheric Administration's National Climatic Data Center located in Asheville, NC. In order to accurately assess wind coverage for a particular runway, data recorded during all-weather conditions as well as those observations recorded during instrument conditions are evaluated separately.

A 360 degree analysis of wind observations in comparison to 10.5 knot crosswind conditions revealed that wind conditions favor Runway 33, 22, 4, and then 15 respectively. **Exhibit 2-4** graphically illustrates the result of this analysis. Using the FAA's computer application Airport Design (Version 4.2D), an analysis of all weather, VFR and IFR wind coverage percentages was conducted. This information is presented in **Exhibit 2-5**, Wind Roses. Wind coverage is included for the crosswind speed that corresponds to the approach category and airplane design group that would utilize a runway. In the case of INT, 10.5 kts, 13 kts, and 16 kts crosswind components were analyzed. A review of INT's wind coverage during the last 10 years revealed that all runways meet the FAA's 95% milestone except during IFR conditions. During IFR conditions, Runway 15-33 only has coverage of 93.87% during 10.5 kt crosswind conditions. This issue will be further discussed during the facility requirements chapter.

Exhibit 2-4
IFR / VFR Wind Observations

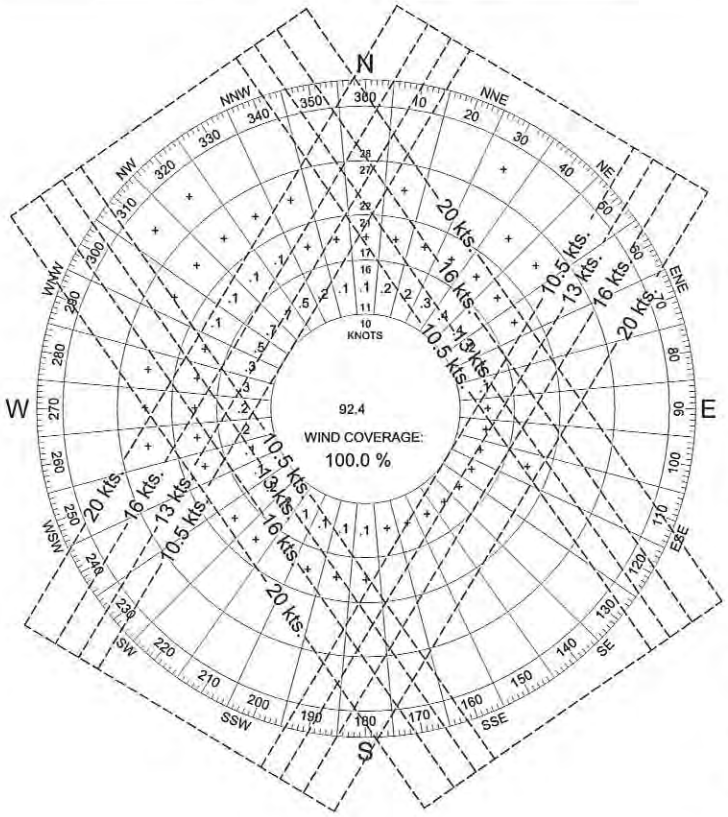


2.8 LANDSIDE INVENTORY

The inventory of airport landside facilities includes a discussion of all facilities located within the airport boundaries that are not required for aircraft movement and air navigation. Some examples of these facilities include but are not limited to hangar structures, parking, fuel storage and fueling facilities, fencing, and terminal facilities. The following sections detail the various landside facilities that currently exist at INT. **Exhibit 2-6** graphically depicts the various landside facilities at INT.

T-Hangars

There are currently three t-hangar structures located at INT that are utilized for the storage of general aviation aircraft. Hangar #26 and #27 are controlled and leased by the Airport Commission of Forsyth County; whereas, Hangar #9 is leased and sublet by the FBO – Landmark Aviation. Hangar #26 includes 15 small hangar units for lease primarily to small single-engine aircraft; whereas, hangar #27 includes 13 small units and 3 larger units that are utilized primarily for the storage of twin-engine and other mid-sized general aviation aircraft. Hangar #9 includes 10 small t-hangar units. **Table 2-4** illustrates a comprehensive list of structures at INT which have been sorted by function.



All Weather Windrose			
	Wind Coverage %		
Crosswind Component (kts)	Runway 4-22	Runway 15-33	Combined
10.5	96.15%	97.02%	99.55%
13	97.82%	98.49%	99.93%
16	99.49%	99.81%	99.99%
20	99.90%	99.99%	100.00%

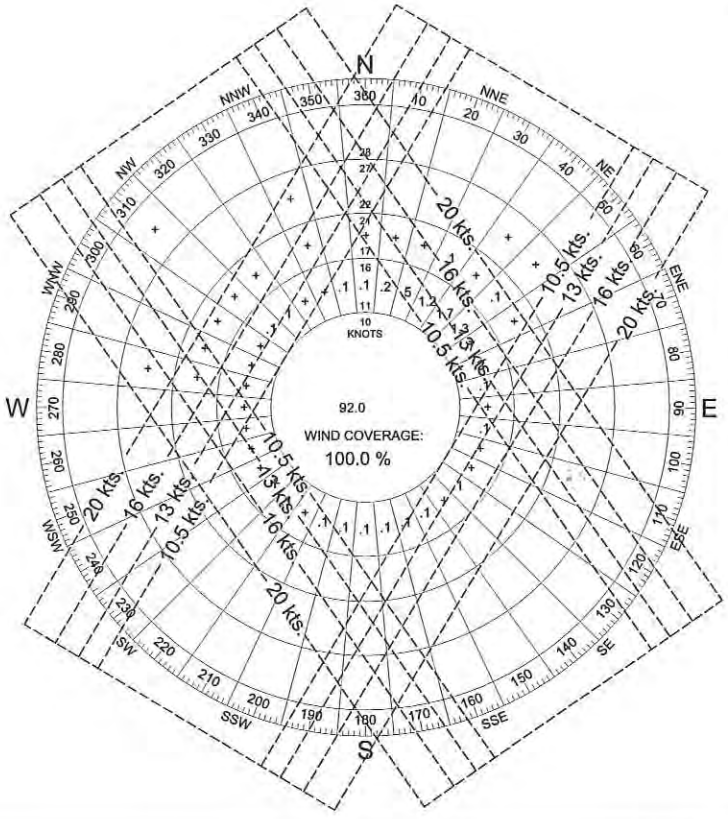
Based on 74,112 Observations

Wind Data Source:
National Climatic Data Center
Station 72319 - Winston-Salem, NC
Years (1999 - 2008)

Notes

Wind Roses generated using FAA Airport Design 4.2d.

All wind coverages were calculated using the runway's true bearing.



IFR Windrose			
	Wind Coverage %		
Crosswind Component (kts)	Runway 4-22	Runway 15-33	Combined
10.5	99.10%	93.87%	99.79%
13	99.54%	96.56%	99.97%
16	99.85%	99.51%	99.99%
20	99.95%	99.91%	100.00%

Based on 7,270 Observations

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Smith Reynolds Airport - Master Plan Update

All Weather and IFR Wind Roses

2-5

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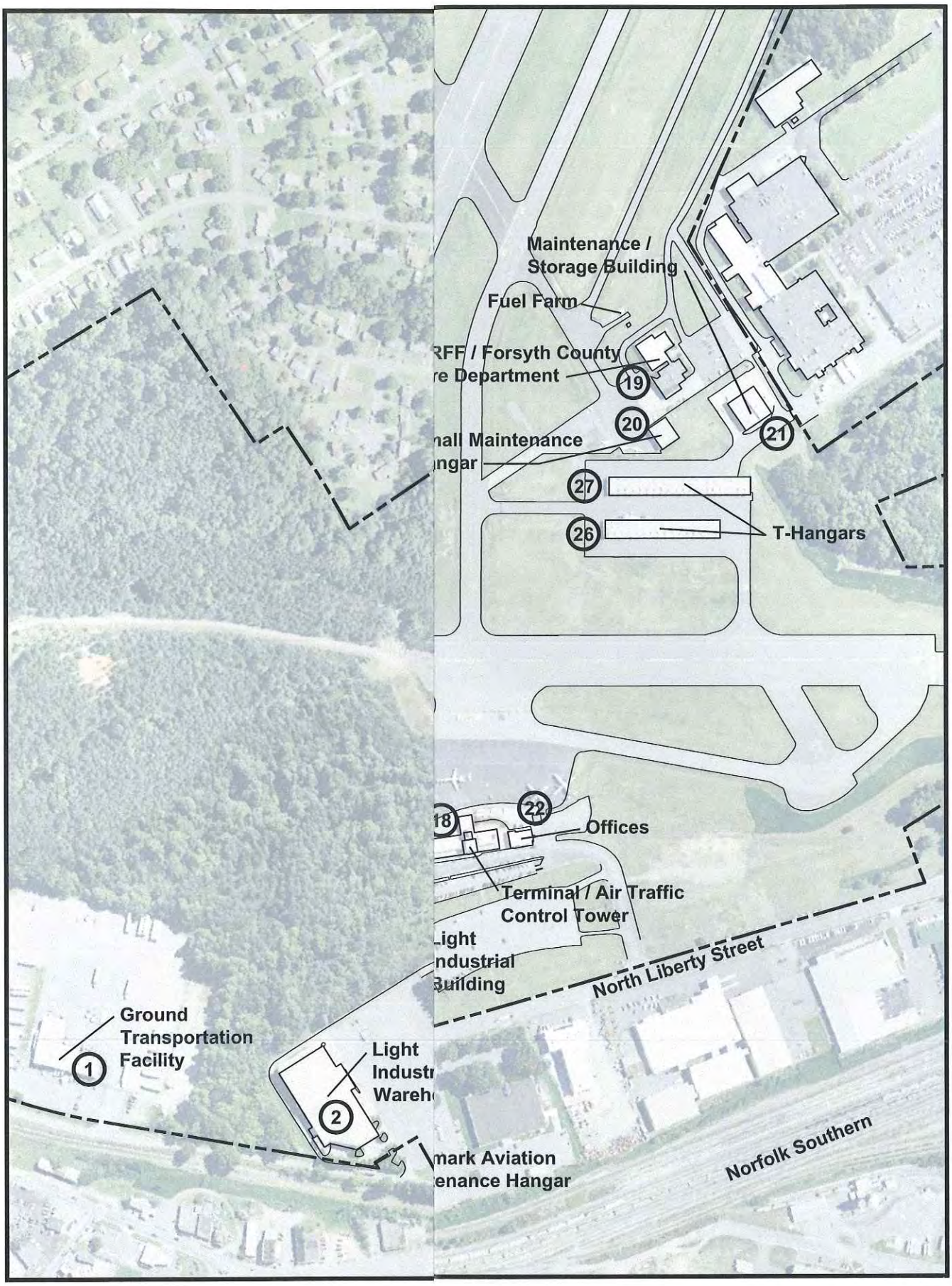

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0 200 400

SCALE: 1" = 400'

2-6

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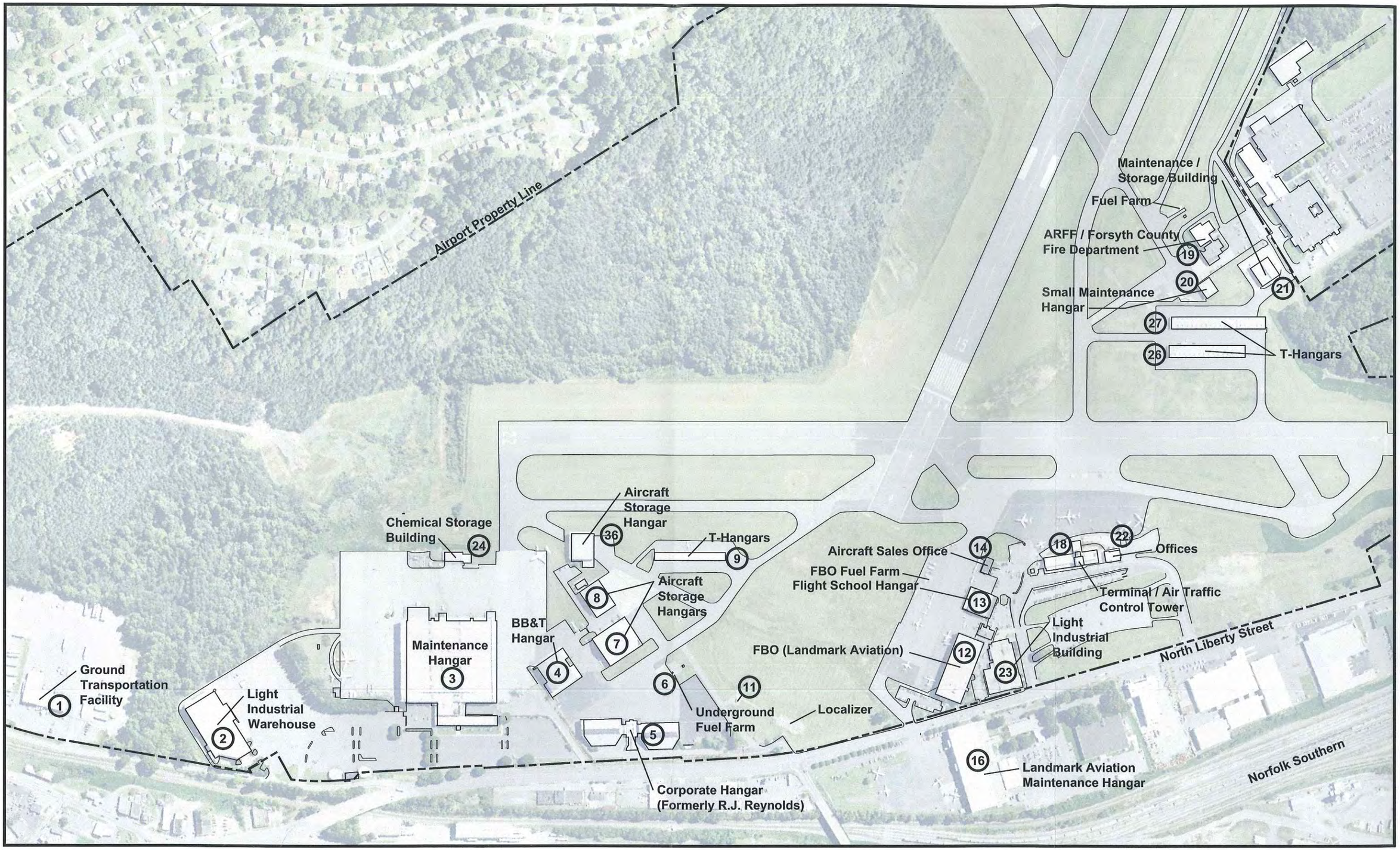

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SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

Landside Inventory

0 200 400
SCALE: 1" = 400'

2-6
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Large Hangars

In addition to t-hangar facilities, INT includes several large hangar facilities that are occupied by businesses that provide aircraft services or by corporate tenants that use hangars for storage of their larger jet aircraft. The hangar requirements for any future airport businesses is difficult to predict but aircraft storage facilities can be estimated based on the forecasted number of based aircraft. For the purpose of this study, hangars have been categorized by their use as either a maintenance facility or for aircraft storage. The large business hangars include the ACFC Maintenance Hangar and Landmark's facilities; whereas, the hangar storage includes BB&T's hangar and the larger hangars sublet by Landmark. **Table 2-4** illustrates a comprehensive list of structures at INT which are sorted by use.

Other Structures

In addition to hangars which are used for aircraft storage and servicing, there are several other types of buildings located throughout INT property. Some of these facilities such as the ARFF, ATCT, and airfield maintenance buildings serve as necessary aviation support facilities; whereas, others such as offices can serve multiple uses. Finally, some facilities are unrelated to the airport or to aviation functions. For the purpose of this study, facilities were categorized by its current or potential use. It is important to note that later chapters of this report evaluate the need for future aviation-related facilities. As such, requirements for facilities unrelated to the airport or aviation function will not be discussed and are therefore shown in **Table 2-4** for information purposes only.

Table 2-4
Airport Buildings Data Table – Sorted by Function

Bldg ID	Building Description	Use	Square Feet / Size
3	4001 N. Liberty – Large Hangar Facility	Aircraft Maintenance	322,280
12	FBO Headquarters / Hangar	Aircraft Maintenance	34,700
16	Landmark Aircraft Maint. Hangar	Aircraft Maintenance	64,000
20	Aircraft Maint. Hangar	Aircraft Maintenance	4,700
		Subtotal	**425,680**
4	Aircraft Hangar	Lg. Aircraft Storage	18,000
5	Corporate Hangar	Lg. Aircraft Storage	35,000 – (17,500 ea)
7	Aircraft Hangar	Lg. Aircraft Storage	22,400
8	Aircraft Hangar	Lg. Aircraft Storage	12,500
36	Aircraft Storage Hangar	Lg. Aircraft Storage	12,000
		Subtotal	**99,900**
9	North T-Hangar	Sm. Aircraft Storage	10 units (sm)
13	Flight School/Hangar	Sm. Aircraft Storage	13,100 (8 units - sm)
26	ACFC T-Hangars	Sm. Aircraft Storage	15 units (sm)
27	ACFC T-Hangars	Sm. Aircraft Storage	16 units (3 med, 13 sm.)
		Subtotal	**49 units**
2	Light Industrial Warehouse	Office / Other	42,300
14	Aircraft Sales Office	Office / Other	2,360
22	Offices	Office / Other	3,000
23	Components Facility	Office / Other	23,000
		Subtotal	**70,660**
18	Airport Terminal and ATCT	Aviation Support	34,620
19	ARFF Facility / Fire Dept. Hq. / 911 Center	Aviation Support	13,500
21	Airfield Maintenance / Lighting Vault	Aviation Support	8,000
24	Chemical Storage Building	Aviation Support	4,500
		Subtotal	**60,620**
1	Trucking Facility	Non-aviation related use	1,660
28	Rental House	Non-Aviation related use	816
30	Forsyth County Extension Agent Offices	Non-Aviation related use	23,000
31	Animal Control Facility (abandoned)	Non-Aviation related use	25,000
32	Forsyth County Sheriff – Maint.	Non-aviation related use	10,200
34	Winston-Salem School/Forsyth Co. System	Non-aviation related use	17,000
35	Forsyth Technical College	Non-aviation related use	39,100
		Subtotal	**116,776**
6	Underground fuel farm	Utility / Other	n/a
11	FAA Localizer Building	Utility / Other	130
		Subtotal	**130**
10 1	Modular Offices (removed)	Removed[1]	n/a
15 1	Airport Admin Office and ARFF (removed)	Removed[1]	n/a
17 1	Decommissioned Elec. Vault (removed)	Removed[1]	n/a
		Subtotal	**n/a**

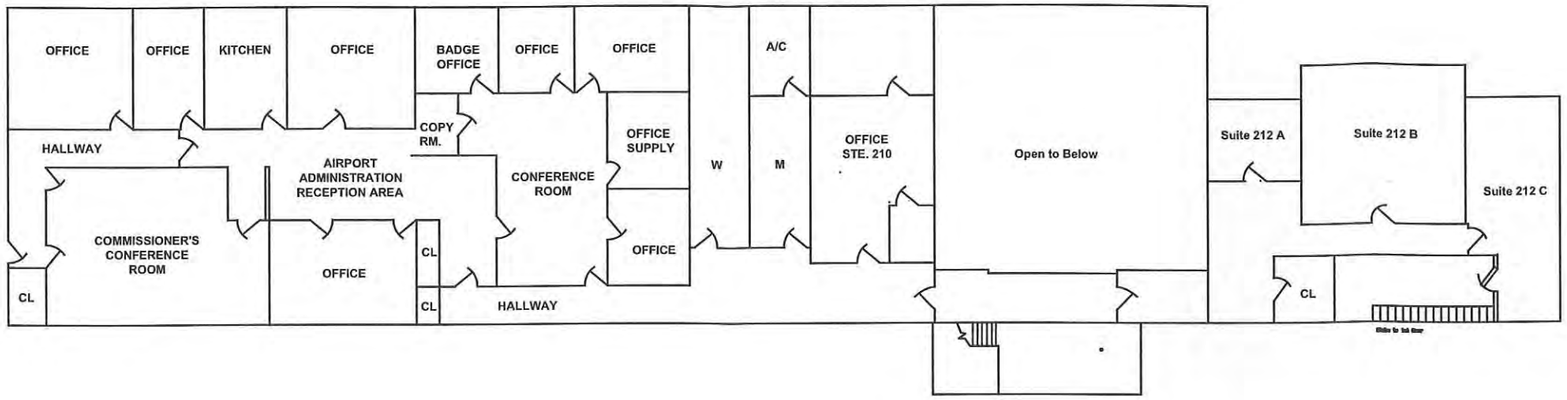
[1] *– Structure has been removed – shown for reference purposes only.*

Terminal

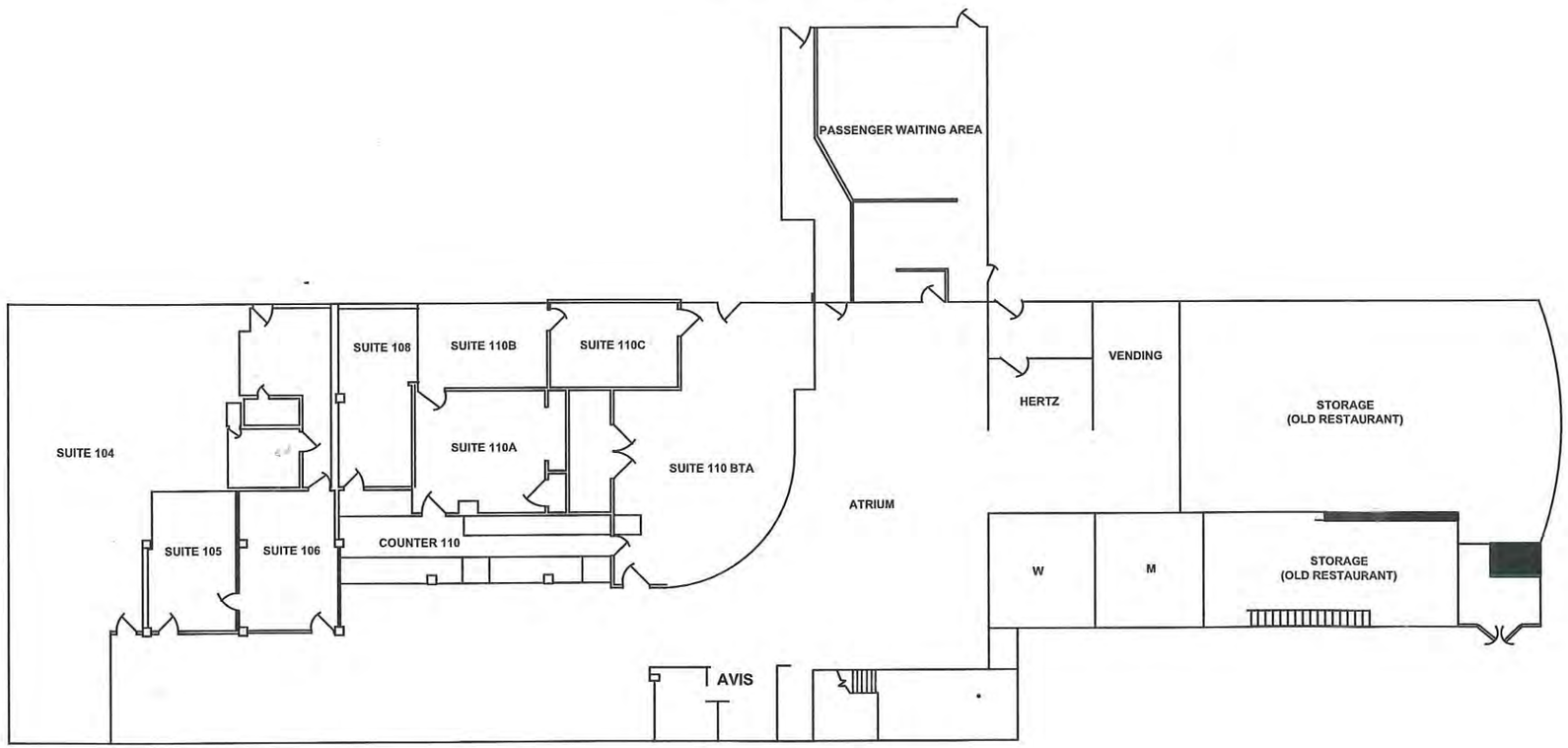
The terminal building was constructed in 1941 and is located on the west side of the airport, adjacent to Taxiway F, with surface access via Norfleet Street and Liberty Street. The terminal building was previously used by commercial airline passengers until 2000, when US Airways ceased commuter operations at INT. In total, the terminal building includes four levels and a basement. A majority of the basement space is occupied by boiler room and by air conditioning units while the remaining portion is utilized for storage. Level 1 of the terminal is the entrance (ground level) includes several offices that are leased by a variety of local business tenants and also by rental car providers. Level 1 also includes three previously-used airline ticket counters, an unusable baggage conveyor belt, a small vending area, and restroom facilities. In addition, Level one includes a large open area that leads to a 970 square-foot airside hold room area. The passenger waiting area is enclosed from the atrium with glass windows and doors, and provides airside access to the apron. Level two includes restrooms, airport administrative offices, and additional offices that are leased by airport tenants. Levels three and four are associated with the air traffic control tower operation. Several offices and a break room are located on level 3 for ATCT employee use; whereas, the top story consists of the ATCT cab. The total square footage of the terminal building area is approximately 34,620 SF, as follows:

- Basement: 13,500 SF
- Level 1 – Entrance Level: 11,900 SF
- Level 2 – Offices: 7,050 SF
- Level 3 – ATC Offices: 2,020 SF
- Control Tower: 150 SF

Airside access is gained through the terminal's central corridor which leads to a 970 SF hold room/passenger staging area that is commonly used by many large air taxi aircraft for passenger staging. In addition, approximately 88,000 SF of transient apron serves the terminal airside needs for aircraft parking. Levels 1 and 2 of the terminal are shown in **Exhibit 2-7**; whereas Level 3 and the ATCT are shown in **Exhibit 2-8**.



Terminal Level 2



Terminal Level 1

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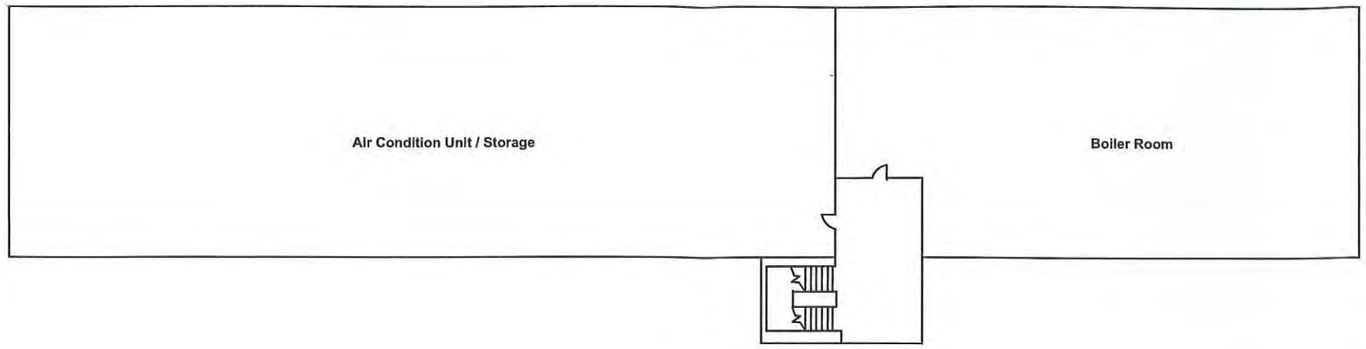
SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

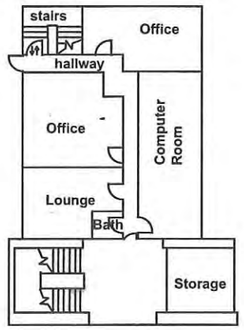
Terminal Layout Level 1 & 2

0 20' 40'
SCALE IN FEET

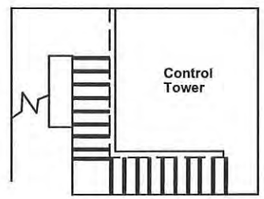
2-7
DRAWING NO.



Basement



Level 3



Level 4 (Air Traffic Control Tower)

SCALE: NTS

AVCON / LPA TEAM

SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

Terminal Layout Level 3, 4 & Air Traffic Control Tower

0 30' 60'
SCALE IN FEET

2-8
DRAWING NO.

Fixed Base Operator

A fixed base operator is generally described as an operation that provides services and facility amenities to aircraft, pilots, and passengers but most associate FBOs as suppliers of fuel. At Winston-Salem Airport Landmark Aviation is the sole provider of FBO services. Landmark is one of the largest FBO networks with 40 locations located throughout the United States, Canada, and in Western Europe. At INT, Landmark offers a number of amenities and services including:

Avgas and Jet-A Fuel	Rental Cars
Oxygen	Courtesy Transportation
De-Icing	Concierge Services
Ground Handling	Passenger Lobby
Aircraft Sales	Executive Conference Room
Aircraft Charter	Pilot's Lounge
Avionics	Flight Planning Room

In addition to the amenities and services listed, Landmark also has onsite equipment to de-ice aircraft, service lavatories, and stairs to unload passengers from larger aircraft. As pointed out earlier, Landmark also leases t-hangar units for small aircraft storage.

Aircraft Maintenance – Aircraft maintenance is a large component of Landmark Aviation's business at INT. Landmark conducts these activities within one of two separate airport facilities depending upon the size of the aircraft being serviced. A large hangar located on N. Liberty Street, across from Landmark's main FBO center facility, is utilized to service larger jet and turbine powered aircraft. A smaller hangar which is located north of the ARFF building, south of Taxiway A and the self-fuel facility is used specifically to service single-engine and small twin-engine aircraft. The small maintenance hangar includes approximately 3,500 square feet of space for small aircraft servicing. Aircraft covered under Landmark's repair station's certificate includes: Beech product line class IV repair and inspection, Piper and Cessna Line Class IV repair and inspection, Lear Jet Class IV repair and inspection, DeHavilland class IV repair and inspection.

Fuel Storage Facilities - All public sale of fuel is administered by the FBO, Landmark Aviation. Landmark owns and operates two underground storage tanks with 50,000 gallons of Jet A fuel, and 12,000 gallons of 100LL fuel. In addition, they operate a fleet of fuel trucks that contain additional capacity of 11,000 gal of Jet A and 1,700 gal of 100LL. The underground fuel tanks and fuel truck parking areas are centrally located along the edge of the FBO apron. The self-service facility is located near the ARFF facility on the east side of the airfield, along Taxiway E and includes a 6,000 gallon storage tank for 100LL fuel. **Table 2-5** illustrates the various fuel storage facilities at INT by type and size.

Table 2-5 Fuel Storage Facilities			
Fuel Type	**Underground**	**Self Serve**	**Trucks**
Jet A	50,000 gal	n/a	11,000 gal
100LL	12,000 gal	6,000 gal	1,700 gal
Total	62,000 gal	6,000 gal	12,700 gal

Source: Landmark Aviation, 2009.

Vehicular Parking

An inventory of INT's vehicular parking facilities was necessary in order to establish a baseline for further analysis during later chapters of this report. Although there are several acres of parking facilities located throughout airport property, most of these facilities were specifically constructed to serve the needs of associated business developments rather than to serve the needs of the travelling public. One purpose of this study is to assess existing aviation-related parking facilities in comparison to anticipated aviation demand. For this reason, only parking facilities that are related directly to the aviation function rather than to an individual business were evaluated as a part of the airport inventory. **Table 2-6** illustrates the various aviation-related public parking facilities that are currently in place at INT.

Table 2-6 Vehicular Parking	
Location / Description	**Parking Spaces**
Main Terminal Parking – Long-term / Short-Term	285* / 40 (4 Handicap)
Main Terminal Rental Car Return Lot	28
Main Terminal Designated Ready Spaces	12 (8-Avis, 4-Hertz)
South Apron Vehicular Parking Lot	49 (2 Handicap)
Employee Parking – North of Terminal	37*
FBO (Landmark) Parking Lot	38 (2 Handicap)
Total	**489**

** No dedicated Handicap Parking identified*

Fencing / Security

The entire perimeter of the airport is enclosed with a 6 foot fence. Airside access through secure areas is accomplished by using either remote transmitters, keypads, or with the use of proximity cards. Gates located at remote locations throughout the property are chained and locked shut and can only be accessed by airport personnel with the appropriate keys.

2.9 AIRSIDE INVENTORY

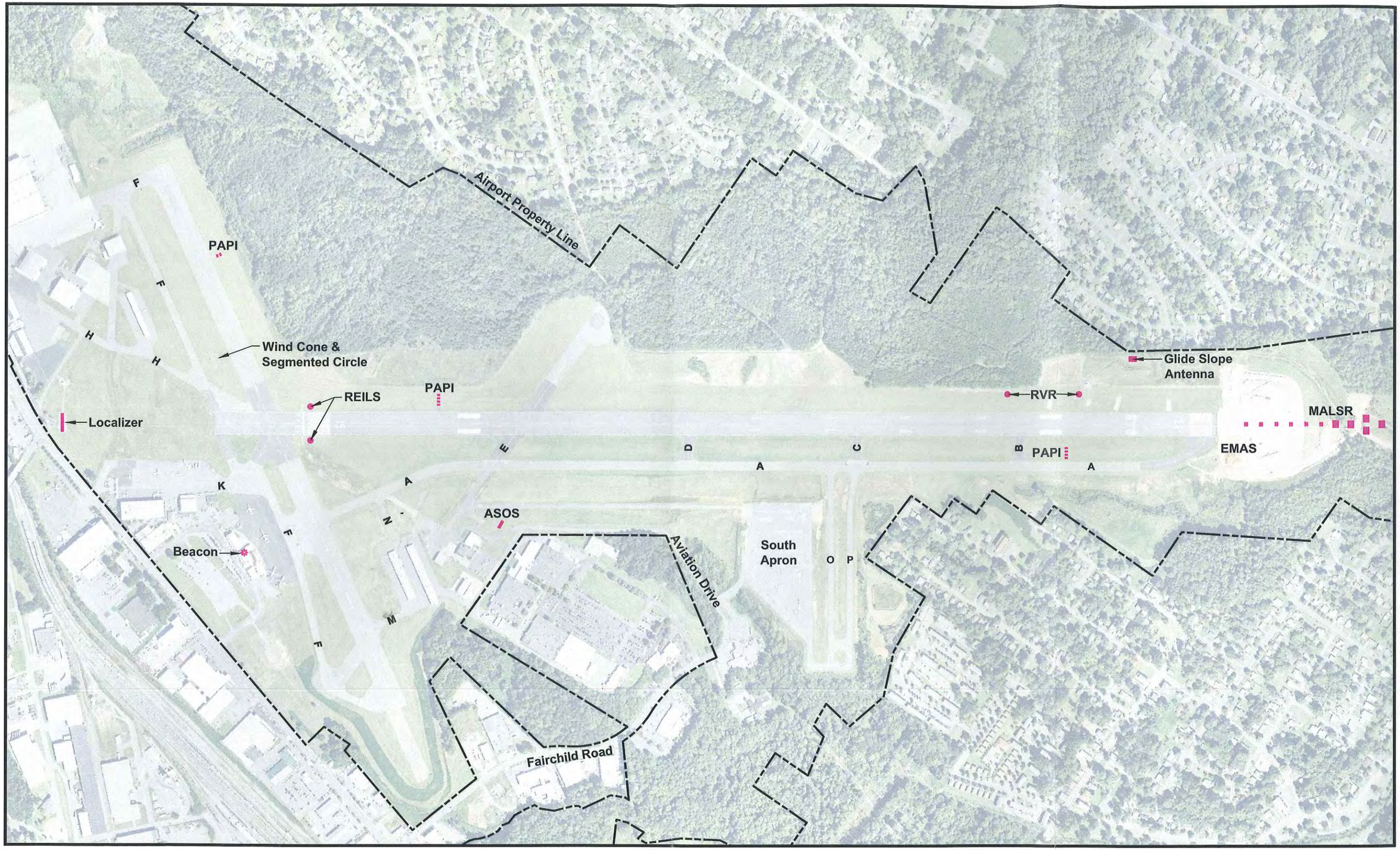
The airfield or airside facilities generally include all facilities required to support the movement, navigation, and operation of aircraft. These facilities include the airport's runways, taxiways, airfield lighting, and pavement markings. The existing airfield facilities at INT are discussed in the following sections. A graphic denoting the various airside facilities is illustrated in **Exhibit 2-9**.

Runway 15/33

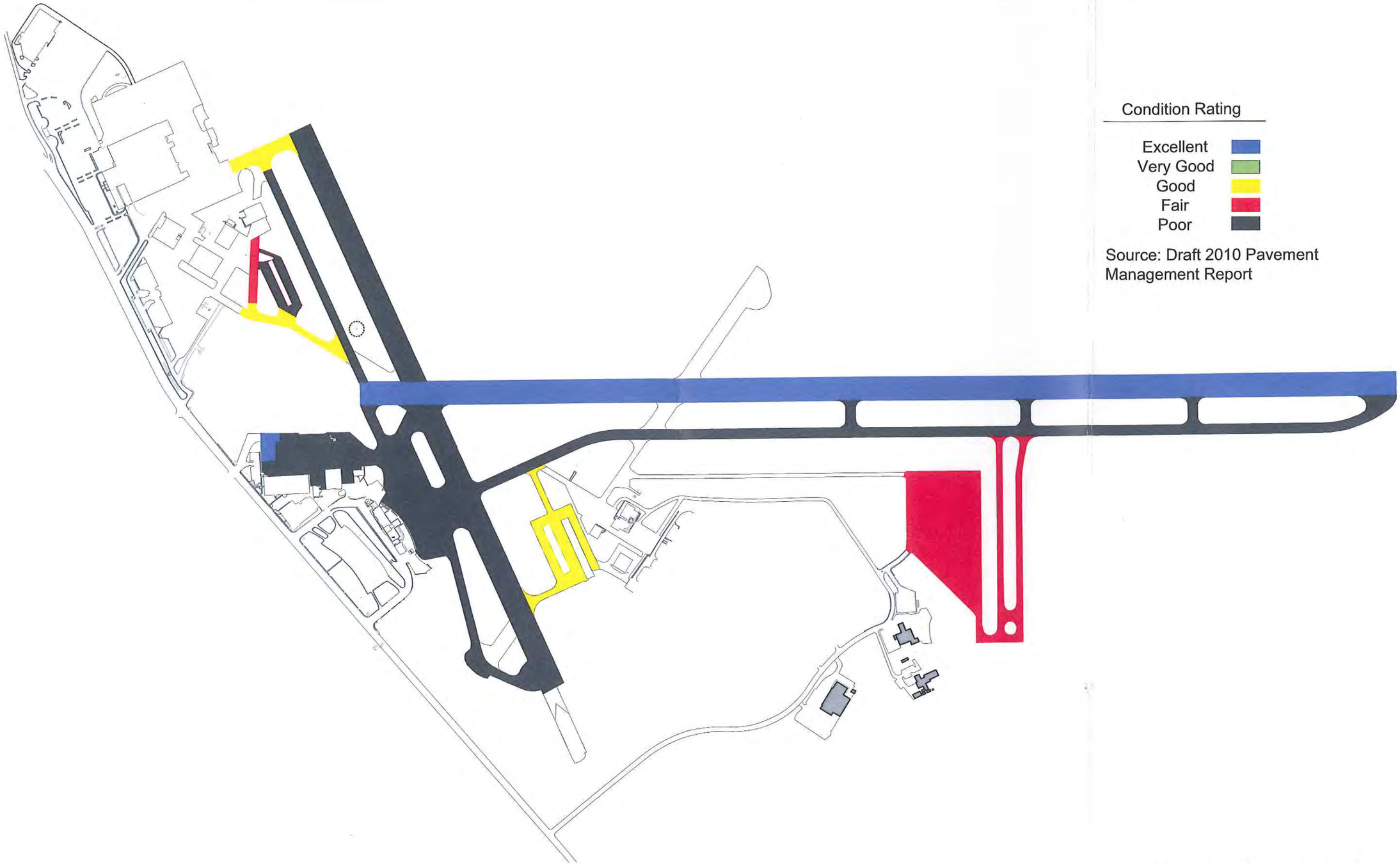
The primary runway at INT is Runway 15/33 which has a length of 6,655' long and a width of 150'. The runway is constructed of asphalt and is grooved to provide additional traction during wet weather conditions. In 2008, Runway 15/33 was rehabilitated with an asphalt overlay and was then re-marked with precision and non-precision markings. Hence, the runway and associated markings are in very good condition. Runway 15/33 currently incorporates FAA declared distance standards; these standards apply to runways that have differing landing and/or takeoff lengths due to a lack of adequate safety area or due to obstructions in the area. An analysis of structures in the vicinity revealed that the runway is displaced due to several buildings that exceed FAA safety criterion. Due to the intersecting of Runways 15/33 and 4/22, a hold bar is located near the end of Runway 15 near the displaced threshold marking. The hold bar represents the stop position for those aircraft landing at the end of Runway 33 that are performing land and hold short operations (LAHSO). LAHSO activity is monitored and controlled by the ATCT and is implemented while both runways are active in order to avoid an incursion. Additional information regarding Runway 15/33 is presented in **Table 2-7. Exhibit 2-9** illustrates the various taxiways and taxilane facilities at INT and **Exhibit 2-10** depicts the pavement conditions of the various runways and taxiways at INT.

Runway 4/22

Runway 4/22 is INT's crosswind runway which has a length of 3,938 ft and a width of 150 ft. The asphalt runway has been repaired with crack seal projects in the past but despite these efforts the pavement has continued to deteriorate and needs to be overlaid with a new asphaltic course. This runway is primarily used by small general aviation aircraft or by flight schools to conduct their training activities. The utilization of this runway by smaller aircraft allows pilots to avoid intermixing with the larger jet aircraft and associated wake vortices that are typically associated with the main runway. Although there are no designated right hand traffic patterns at INT, the ATCT often directs traffic to Runway 4 to fly a right-hand pattern. This pattern allows the ATCT to avoid potential conflicts between traffic departing Runway 33 and those performing a left downwind track to Runway 4. Runways 4 and 22 are both marked with basic markings that are in good condition. Additional information regarding Runway 4/22 is presented in **Table 2-7. Exhibit 2-9** illustrates the various taxiways and taxilane facilities at INT and **Exhibit 2-10** depicts the pavement conditions of the various runways and taxiways at INT.



AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	Airside Inventory	0 300 600 SCALE: 1" = 600'	2-9 DRAWING NO.



* NOTE: R/W 15-33 REHABILITATED IN 2008

AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	Pavement Condition Index (PCI)	0 300 600 SCALE: 1" = 600'		2-10 DRAWING NO.

Table 2-7 Runway Characteristics		
Characteristic	Runway	
	4-22	15-33
Length (ft)	3,938	6,655
Width (ft)	150	150
Surface Composition / condition	Asphalt / fair	Asphalt – grooved / good
Effective Gradient	.5%	1.0%
Shoulder Width (ft)	n/a	n/a
Blast Pad (L x W)	(4) – 100' x 480' (22) – n/a	(15) – n/a (33) – n/a
Load Bearing Capacity		
Single-Wheel (lbs)	40,000	110,000
Dual-Wheel (lbs)	55,000	135,000
Double Tandem (lbs)	90,000	230,000
Markings / condition	Basic / good	Precision / good
Airport Reference Code	B-II	C-III
Critical Aircraft	King Air C90	737-500
Approach Type	Visual (no approaches)	15-NPI, 33-PIR

Source: FAA AC 150/5300-13, Change 14 Airport Design, www.airnav.com.

Taxiways

Each runway at INT is supported by a full length parallel taxiway. Taxiway A serves Runway 15/33 to the west with taxiway connectors B, C, D, and E; whereas, Runway 4/22 is served by the full-length parallel Taxiway F and connector J. Taxiway A provides access to/from both runways to the terminal apron and Taxiway H provides access to/from the large maintenance hangar areas to taxiway F. Taxiways M and N provide access to the centrally located t-hangars. In addition to the above taxiways, there is an unnamed taxiway that parallels Taxiway A to the west. This taxiway leads to/from the south apron to the self-fuel and small maintenance hangar facilities. All taxiways that directly serve the main runways and those that lead to/from the large maintenance hangar facilities have a width of 50'. However, all taxiways that lead to/from the t-hangar and the south apron area have a width of 35'.

Two unnamed taxilanes provide airside access to/from the south general aviation apron. These taxilanes were constructed in this configuration to accommodate a dramatic change in grade in this area. The design of these taxilanes considers the importance of ingress and egress visibility zones to and from the apron in a non-movement area, or area that is not required to be controlled by the ATCT; therefore, each taxilane is designated with signage for one-way travel. **Exhibit 2-9** illustrates the various taxiways and taxilane facilities at INT and **Exhibit 2-10** depicts the pavement conditions of the various runways and taxiways at INT.

Airfield Lighting

Airfield lighting is necessary at all airports that accommodate operations during nighttime hours and/or during periods of low visibility. It allows pilots to identify the airport from the air as well

as maneuver safely on the ground during these conditions. The following section details the various airfield lighting currently employed at INT.

Runway Lighting – Runway 15/33 is equipped with High Intensity Runway Lighting (HIRL); whereas, Runway 4/22 is lighted with Medium Intensity Runway Lighting (MIRL). While the ATCT is closed, Runway 15/33 HIRLs are available via pilot-activation through the Common Traffic Advisory Frequency (CTAF). During hours of operation, the tower controls the lighting of Runway 4/22; however, the lights are inactive after 9:30pm, (after the tower is closed), in order to preclude intersecting operations.

Runway End Identifier Lights (REILs) – A REILs system is comprised of two bright white strobes, one located on each side of the runway threshold facing towards approaching traffic. REILs enable pilots to visually locate the runway threshold during poor visibility conditions. Runway 15 is equipped with Runway End Identifier Lights which are located approximately 110' outbound from the runway center line. The airport recently installed REILs at the end of Runway 15 that are scheduled to be operational prior to the completion of this report. For this reason, the REILs at this end will be shown and considered existing.

Taxiway and Apron Lighting – Each of the primary taxiways (A & F) and associated connector taxiways at INT are lit by Medium Intensity Taxiway Lighting (MITL). The terminal apron, FBO apron, and general aviation apron areas are all illuminated by security flood lighting mounted on poles.

Approach Lighting – Runway 33 is equipped with a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) to support the existing precision instrument approach. The MALSR consists of a combination of threshold identification lights, steady burning lights, and strobe flashing lights spaced in 200' intervals to 2,400 ft from the runway threshold. This approach lighting system provides visual transition and runway alignment height perception guidance information to pilots on approach in poor visibility to pilots on approach to landing.

Airport/Airfield Signage

INT has illuminated airfield signs which display position and guidance information to pilots, as required by FAA AC 150/5340-18D, Standards for Airport Sign Systems. There are three background colors used to define the type of signage being displayed. The following list illustrates the different types of signage along with an example of each:

- Mandatory instruction signs – red background and white inscription, such as a hold position sign for a runway;
- Directional signage – yellow background and black inscriptions, such as and entrance to a taxiway or exit from a runway;

- Location signage – black background and yellow inscriptions, identifying where an aircraft is located.

Weather Reporting Facilities

The weather reporting capability at INT is comprised of an Automated Weather Surface Observation System (ASOS) which is located on the west side of the airport, between Taxiway A and the ARFF facility. The ASOS is a modern weather reporting system that measures the following meteorological data:

- Wind velocity and direction
- Temperature and dew point
- Visibility
- Sky conditions,
- Altimeter setting, and
- Prevalent weather conditions (fog, thunderstorms, rain, snow)

The ASOS gathers and updates weather data at INT every minute – 24 hours a day. During business hours, tower personnel access the ASOS data by phone and record a more detailed message on the ATIS frequency which is updated every hour, or more frequently as needed for changing weather and operational conditions. The recorded message includes additional operational data such as the active runway, power outages, notice to airmen (NOTAMS) etc. When the tower is closed, the ASOS weather data is broadcast on the ATIS frequency (121.3). The current airport weather conditions are also accessible via telephone and through various aviation websites.

Instrument Approach Facilities

Instrument Landing System (ILS) – The ILS at Smith Reynolds consists of a localizer antenna, end-fire glide slope antenna, Medium Intensity Approach Lighting System (MALSR), and inner and middle distance markers. The localizer provides horizontal electronic course guidance, while the glide slope provides vertical electronic course guidance. Together the localizer and glideslope enable pilots to align the aircraft with the runway centerline and descend along a path clear of obstacles down to the runway threshold during low visibility conditions. The MALSR lighting system provides pilots a transition from aircraft instruments to the visual runway environment. The distance markers emit audible signals in the cockpit, indicating distance information from the runway threshold. At INT, the standard ILS approach provides guidance down to 1,141 ft MSL (200 ft AGL) and visibility of 2,400 ft RVR (~1/2 mile).

Runway Visual Range (RVR) – Runway visual range is defined as the horizontal distance that a pilot can see down the runway. RVR measuring equipment is installed at airports to record horizontal visibility distances and then to transmit the results to the air traffic control tower or to pilots directly via weather reports or through ATIS frequencies. The RVR equipment at INT is comprised of two devices, one lighted transmitter and one receiver; however, newer single-point RVRs utilize only a receiver which operates by measuring the luminance of nearby runway

lighting. The RVR measurement is significant as pilots approaching INT must obtain a horizontal visual reference of the runway at least ½ mile prior to landing or the approach is considered unlawful per FAA standards. RVR measurements are reported in either feet or meters and the maximum RVR measurement is 2,000 meters, 6,500'.

Very High Frequency Omni-Directional Range (VOR/DME) – The Greensboro VOR station, designated GSO, is located 13 mi east of INT. The VOR provides aircraft instruments with horizontal course information, to or from the station. It operates by emitting a steady 360° signal, as well as producing a rotating signal which compares aircraft position information with the steady signal in order to transmit course information back to the aircraft. Its low altitude standard service volume has a range of 40 nm between 1,000 ft and 18,000 ft MSL. The GSO VOR provides a non-precision instrument approach capability to Runway 15 at INT. The VOR approach minimums are 1,500 ft MSL (532 ft AGL) in 1-sm visibility. Distance Measuring Equipment (DME) is co-located with the GSO VOR and transmits on the same frequency. The DME ground station receives signals from aircraft transmitters, converts the information into distance and ground speed data, then transmits back to the aircraft. DME is limited to providing slant-range, or line-of-sight, distance information. It provides distance information to pilots navigating the VOR instrument approach to INT.

Global Positioning System (GPS) – The GPS is a space-based navigation system comprised of satellites, ground stations, and user receivers. An aircraft GPS receiver can track the position of the aircraft by calculating and comparing signal distance from several satellites. The system is reliable in all terrain and all weather conditions and is typically accurate within 100 ft. INT is currently served by GPS approaches to Runways 15 and 33.

Wide Area Augmentation System (WAAS) – WAAS is a GPS-based navigation system which augments the existing GPS signals to provide the user highly accurate position and tracking information. The Localizer Precision with Vertical Guidance (LPV) is an instrument approach procedure utilizing WAAS technology to provide both vertical and horizontal guidance to aircraft. Like basic GPS navigation, WAAS and LPV approaches are available in all weather and terrain conditions. INT received published LPV approach to Runway 33 that match the standard ILS minima. **Table 2-8** illustrates the various approaches and minima associated with Runway 15/33 at INT.

Table 2-8
INT Instrument Approach Summary

Instrument Approach	Lowest Minima	
	Descent	Horizontal Visibility
Runway 15		
RNAV GPS (LPV)	1,420 ft MSL (452 ft AGL)	1 SM
VOR/DME	1,500 ft MSL (532 ft AGL)	1 SM
Runway 33		
ILS Category I	1,141 ft. MSL (200 ft. AGL)	2,400 ft. RVR
RNAV GPS (LPV)	1,141 ft. MSL (200 ft. AGL)	2,400 ft. RVR

Source: US Terminal Procedures, August 2009.

Notes: AGL – Above Ground Level, MSL – Mean Sea Level, RVR – Runway Visual Range.

Precision Approach Path Indicator (PAPI) – A Precision Approach Path Indicator (PAPI) lighting system provides aircraft with a visual descent reference during approach. These lights are typically visible from five miles during the day and up to 20 miles or more at night. PAPIs use a light bar unit which contains white and red lights that are installed in a single row perpendicular to the runway edge. Depending on the aircraft angle in relation to these lights, the pilot will receive a combination that indicates his position relative to the desired glide slope. A white indication notifies pilots that their approach is too high; whereas, a red light indication alerts pilots that they their approach is too low. An indication of two white and two red lights reveals to pilots that they are on the correct approach slope. Runway 22 has a 2-light PAPI located left of the approach end, approximately 700' past the landing threshold. Runway 15 has a 4-light PAPI located left of the approach end, approximately 800' past the landing threshold.

Segmented Circle – A segmented circle and lighted wind cone is located on the north side of the airfield, between Runway 4/22 and Taxiway F, just east of Taxiway H.

Rotating Beacon – The airport is equipped with a rotating beacon located on the ATCT above the terminal building. Two high intensity lamps mounted on an assembly rotate 360° every six seconds, giving the illusion of emitting flashes of light. The designation for INT, a civilian land airport, is alternating green and white lights in equal duration and is often visible in excess of 30 nm on a clear night. The rotating beacon is operational from sunset to sunrise and during Instrument Meteorological Conditions (IMC).

Apron

Paved apron areas are required for the parking of based aircraft in the form of tie-downs and also for transient aircraft parking in the form of open ramp. There are multiple apron areas located throughout the airfield at INT for aircraft parking; however many of these aprons are directly associated with nearby hangars where private business is conducted. For the purpose of this study, only aircraft parking areas that are utilized by the travelling public were inventoried rather than those associated with private businesses. It is assumed that the future construction of hangars for private businesses will be constructed with adequate ramp to accommodate their operation. **Table 2-9** illustrates a description and size of the various public-use apron facilities at INT.

Table 2-9
Aircraft Parking Apron

Location / Description	Apron Area (s.f.)
Terminal / Transient Apron	88,480
FBO Apron (Landmark)	165,121
South General Aviation Apron	332,654
Small Maintenance Hangar / ARFF Apron	39,870
Total	**626,125**

Air Traffic Control Tower (ATCT)

The ATCT is a terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the airspace within the vicinity of an airport and also facilitates movements on the ground within designated control areas at commercial service airports. The ATCT at INT is a participant in the FAA contract tower program. This program was developed for airports that are generally classified as in need of a control tower; however, they are not fully eligible for ATCT tower funding. In 1999, congress added this cost-sharing provision which allowed airports that would normally not qualify to gain eligibility provided that the owner fund a portion of the tower's operational expenses. The ATCT at INT is referred to as a VFR only tower which denotes that it has no radar equipment and controllers must therefore provide air traffic management via visual cues only. Offices for tower personnel are located on the third floor of the terminal building. The ATCT is operational from 6:45 am to 9:30 pm, local time. Pilots can contact tower personnel on frequency 123.75 and can contact ground control on frequency 128.25.

Greensboro Terminal Radar Approach and Departure Control (TRACON) provides terminal air traffic services, clearance delivery, and also provides local control operations for INT pilots when the ATCT is closed. The Atlanta Air Route Traffic Control Center (ARTCC) provides enroute air traffic services, as well as approach and departure air traffic services when Greensboro TRACON is closed.

2.10 AIRPORT INFRASTRUCTURE

The facility requirements and development alternatives to be created as a component of this study are partially dependent upon the airport's ability to provide the essential utilities to service the area. During a site visit conducted early in this study, it was noted that a number of electrical, drainage, sanitary sewer, and water lines are available to the many structures located on airport property. These utilities currently provide service to the various terminal and hangar facilities that are located along N. Liberty St. However, additional utilities currently support the midfield development area which includes the ARFF, maintenance, and Heritage FBO facilities. Since these areas include the most realistic development areas for future airport expansions, it is assumed that obtaining the services necessary to support future development is a non-development consideration. Conversely, any proposed development located east of Runway 15-33 would likely incur additional infrastructure costs in order to run utilities to this area.

2.11 ENVIRONMENTAL OVERVIEW

An environmental overview was conducted as part of this Master Plan Update study in an effort to identify environmental considerations that could affect future airport development. This overview was based on a review of available resource materials and literature, which included the following:

- United States Environmental Protection Agency (USEPA) Green Book of Non-attainment Areas for Criteria Pollutants;
- U.S. Census Bureau, American Fact Finder database;
- United States Fish and Wildlife Service (USFWS) Endangered Species Program;
- United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey, Hydric Rating by Map Unit - Forsyth County, North Carolina;
- Federal Emergency Management Agency (FEMA) digital 100-year floodplain mapping;
- NC One Map, Geographic Data Serving a Statewide Community;
- North Carolina Department of Environment and Natural Resources (NCDENR) Data, Statistics, Reports, and Maps;
- North Carolina Natural Heritage Program Element Occurrence database; and,
- Environmental FirstSearch Report of known hazardous material sites.

Although this overview does not constitute an Environmental Assessment (EA), as defined by the Federal Aviation Administration (FAA) Order 5050.4B, the information included in this chapter was collected based upon the guidelines set forth in that FAA Order, entitled National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions, which includes 23 categories of potential areas of impact that must be addressed in compliance with NEPA. These categories are:

1. Air Quality
2. Biotic Resources
3. Coastal Barriers
4. Coastal Zone Management
5. Compatible Land Use
6. Construction
7. Section 4(f)
8. Federally Listed Endangered and Threatened Species
9. Energy Supplies, Natural Resources, and Sustainable Design
10. Environmental Justice
11. Farmlands
12. Floodplains
13. Hazardous Materials
14. Historic and Archaeological
15. Induced Socioeconomic
16. Light Emissions and Visual Effects
17. Noise
18. Social Impacts
19. Solid Waste
20. Water Quality
21. Wetlands
22. Wild and Scenic Rivers
23. Cumulative Impacts

For the purpose of this overview, only the environmental categories that may be applicable to Smith Reynolds Airport are addressed, with the goal of identifying natural features that could be affected by development projects identified in this Master Plan Update study. Environmental

considerations identified on and adjacent to airport property are depicted on **Exhibit 2-11**. After specific projects are identified in the master planning effort, guidelines provided in FAA Order 1050.1E, *Environmental Impacts and Procedures*, will be used in determining the level of environmental documentation needed to satisfy the requirements of NEPA.

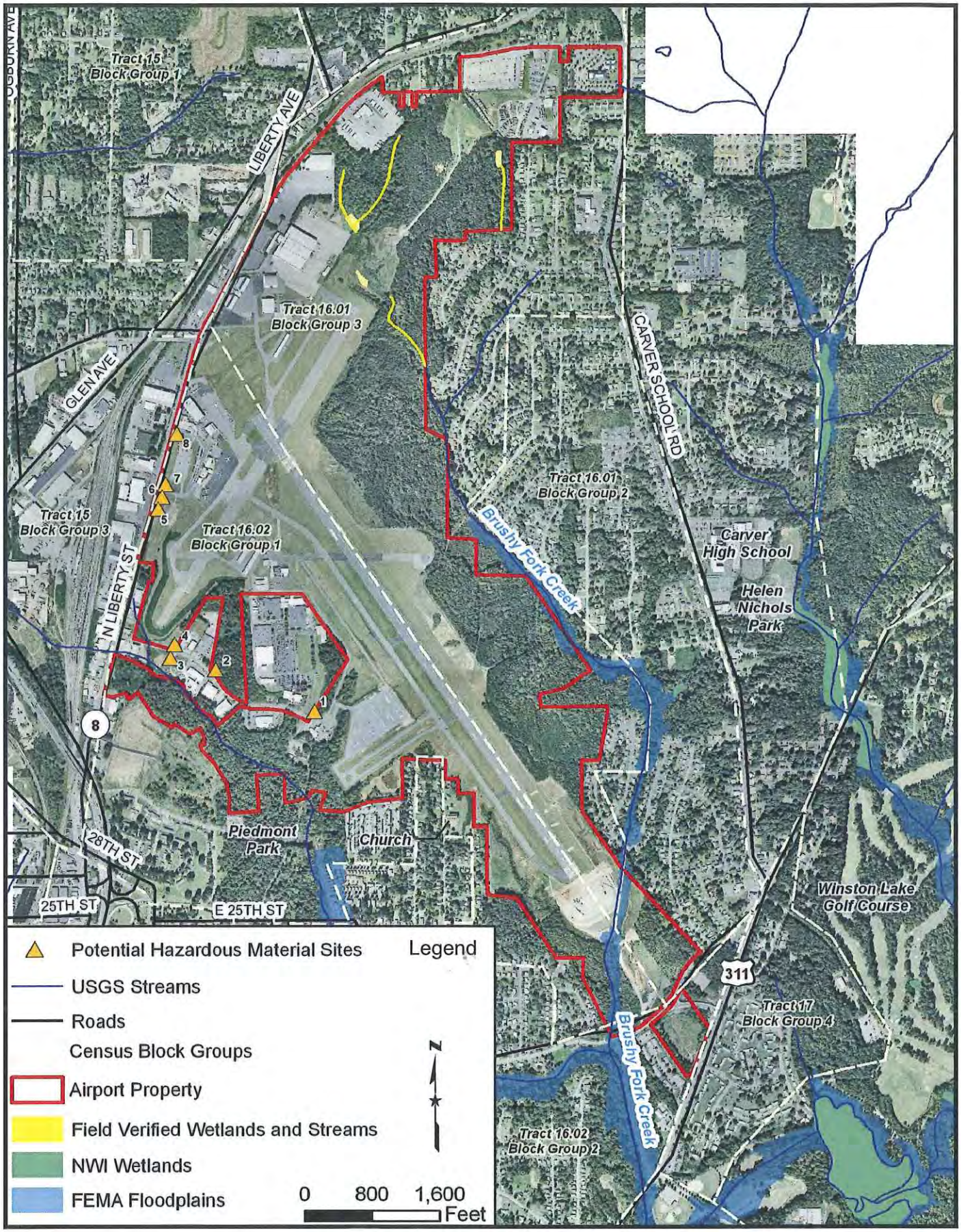
Air Quality

The National Ambient Air Quality Standards (NAAQS) were established by the USEPA under the Clean Air Act (CAA) to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. The NAAQS have been set for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM), and sulfur dioxide (SO2). The NAAQS primary standards that are to protect human health and the secondary standards that are to protect human welfare are listed in **Table 2-10**.

Table 2-10
National Ambient Air Quality Standards

Pollutant	Standard			
	Averaging Time	PPM[a]	µG/M^{3}[b]	Type of Standard[c]
Carbon monoxide (CO)	1-hour 8-hour	35 9	- -	Primary Secondary
Lead (Pb)	Rolling 3-month average	-	0.15	Primary & Secondary
Nitrogen dioxide (NO_2)	Annual mean 1-hour	0.053 0.100	- -	Primary & Secondary
Ozone (O_3)	8-hour	0.080[d]	-	Primary & Secondary
Particulate matter (diameter less than/equal to 10 µm, PM_{10})	24-hour	-	150	Primary & Secondary
Particulate matter (diameter less than/equal to 2.5 µm, $PM_{2.5}$)	24-hour Annual mean	- -	35 15	Primary & Secondary
Sulfur oxides (SO_x)	1-hour 3-hour	75PPB[e] 0.03	- -	Primary Secondary

Source: USEPA, Office of Air and Radiation, http://www.epa.gov/air/criteria.html (November 17, 2011).
[a] PPM = parts per million.
[b] µG/M^3 = micrograms per cubic meter.
[c] Primary standards are set to protect public health. Secondary standards are designed to protect public welfare.
[d] 1997 standard currently in place, pending re-evaluation of the 2008 standard by USEPA.
[e] PPB = parts per billion.



AVCON / LPA TEAM

Smith Reynolds Airport - Master Plan Update

Environmental Considerations

2-11

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Sources of NAAQS Air Pollutant Emissions – Air pollutants at airports can be released by aircraft, ground support equipment, ground access vehicles, and stationary sources. An airport's configuration can factor into the amount of air emissions and construction activities also have the potential to release air pollutants into the environment.

Current Status of Air Quality Attainment in the Project Area – In accordance with the CAA, all portions of North Carolina are designated as in attainment, non-attainment, or unclassifiable for meeting NAAQS standards. An area with air quality that is better than NAAQS standards is considered to be in attainment, while an area with air quality that is worse than NAAQS standards is designated as being in non-attainment.[1] If there is a lack of information for determining an attainment status, the area is designated as unclassifiable. Each state determines which areas within its boundaries are designated to be in attainment or non-attainment, and must develop a State Implementation Plan to ensure that areas achieve and/or maintain attainment status for NAAQS standards.

The airport is located in Forsyth County, which although currently in attainment for all NAAQS criteria pollutants, is one of 18 North Carolina counties attaining the 1997 standard for ozone but violating the stricter 2008 standard of 0.075 ppm.[2] As part of a 2002 Early Action Compact Area, Forsyth County voluntarily implemented air pollution control strategies and was designated as in attainment for the 1997 ozone standard on April 15, 2008. This designation will remain valid until spring 2012 when the USEPA will issue final designations of attainment regarding the 2008 ozone standards. Based on USEPA recommendation documents from December 2011, it is anticipated that Forsyth County will remain in attainment under the 2012 designation.[3]

Section 176(c) of the CAA requires that proposed actions by federal agencies conform to their respective State Implementation Plans. An air quality analysis is required for proposed actions at commercial service airports with greater than 1.3 million enplanements or more than 180,000 general aviation/air taxi operations.[4] Although INT maintains a Class IV FAR Part 139 Airport Operating Certificate due to the existing level of activity by unscheduled large aircraft, the airport is designated as a general aviation airport by the National Plan of Integrated Airport Systems and experienced 2,387 total enplanements and 42,403 total operations in 2009.[5] Thus, Smith Reynolds Airport does not exceed the enplanement or operation thresholds and air quality analysis would not be required for construction of airport improvement projects.

[1] USEPA, Office of Air and Radiation, "Cleaning Up Commonly Found Air Pollutants," (April 20, 2009).
[2] USEPA, Office of Air and Radiation, "Air Quality Information," (April 20, 2009).
[3] USEPA, "Area Designations for 2008 Ground-level Ozone Standards," http://www.epa.gov/ozonedesignations/2008standards/rec/region4R.htm (December 29, 2011).
[4] FAA, *Air Quality Handbook*, Figure 1, p. 8, (April 21, 2009).
[5] FAA, Terminal Area Forecast, December 2010.

Compatible Land Use

Land use compatibility is evaluated in association with the development of noise contours in Chapter 6 of this Master Plan Update.

Section 4(f)

Section 4(f) of the *Department of Transportation Act of 1966* provides protection to publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites. Under Section 4(f), properties must not be impacted unless no prudent and feasible alternative exists and efforts to minimize impacts to the property are completed. Based on the desktop review of available sources, nearby public parks and recreation areas include: Piedmont Park located just southwest of the airport; Helen Nichols Park located approximately 0.53 mile northeast of the airport, adjacent to Carver High School; and Winston Lake Golf Course located approximately 0.33 mile southeast of Runway 33, just east of U.S. Route 311.

Federally Listed Endangered and Threatened Species

Pursuant to Section 7 of the *Endangered Species Act* and the *Bald and Golden Eagle Protection Act,* a literature search was conducted to determine if any federally protected species are known to exist in the vicinity of the airport. **Table 2-11** is the USFWS list of protected species that are known to occur or possibly occur in Forsyth County.

Table 2-11
Federally Protected Species Known to Occur or Possibly Occur within Forsyth County, North Carolina

Common Name	Scientific Name	Status	Occurrence
Bog turtle	*Glyptemys muhlenbergii*	Threatened (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	Endangered	Historical
Small-anthered bittercress	*Cardamine micranthera*	Endangered	Historical

Notes: Threatened (S/A) = Threatened due to similarity of appearance; Current -= the species has been observed in Forsyth County within the last 50 years; Historical = The species was lat observed in Forsyth County more than 50 years ago.
Sources: USFWS, Endangered Species, Threatened Species, Federal Species of Concern, and Candidate Species, Forsyth County, North Carolina, September 22, 2010, http://www.fws.gov/nc-es/es/cntylist/forsyth.html (December 29, 2011)
The North Carolina, Natural Heritage Program database, updated on April 23, 2010, http://149.168.1.196/nhp/quad (December 29, 2011).

The North Carolina Natural Heritage Program's (NCNHP) online database was accessed to obtain more specific occurrence information for the species listed by the USFWS. This database provides online maps and/or lists of the rare species that fall within each county. Based on information from the NCNHP, there are known occurrences of three federally protected species within Forsyth County; two occurrences are classified as historical (observed over 50 years ago) and one is classified as current (observed within the last 50 years). Of these three known occurrences, one (the bog turtle) is located on the Winston-Salem East U.S. Geological Survey (USGS) 7.5-minute quadrangle map. Although the specific site location is not available to the public on the NCNHP website, this same quadrangle contains the airport also. However, the bog turtle in North Carolina is listed due to similarity of appearance with the northern population of

bog turtle found in New York and Massachusetts, south to Maryland. The southern population of bog turtle found in North Carolina is not considered biologically threatened and is not subject to consultation under Section 7 of the *Endangered Species Act*.[6]

As shown in **Exhibit 2-11**, existing airport property contains undeveloped areas and a perennial stream (Brushy Fork Creek) that have the potential to contain suitable habitat for protected species. Coordination with the USFWS regarding the need to survey for protected species or potentially suitable habitat should be completed prior to construction of airport improvements.

Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, requires federal agencies to identify community issues of concern during the NEPA planning process, particularly those issues relating to decisions that may have a disproportionate impact on low-income or minority populations. To determine if there were higher concentrations of environmental justice populations in the vicinity of Smith Reynolds Airport, socioeconomic data was evaluated (refer to **Table 2-12**). The percentage of low-income and minority populations in Forsyth County were used as thresholds for identifying environmental justice populations.

There are several residential areas located adjacent to the airport property. The 2000 United States Census Data was used at the Block Group (BG) level for determining population and housing characteristics in the vicinity of the airport. A BG is the smallest geographic division that is used by the United States Census Bureau to categorize data.[7] The airport is located within Census Tract (CT) 16.01 BG 3 and CT 16.02 BG 1 (refer to **Exhibit 2-11**). The demographic and housing characteristics of the population in the BGs adjacent to the airport, including CT 15 BGs 1 and 3, CT 16.01 BG 2, CT 16.02 BG 2, and CT 17 BG 4 (refer to **Exhibit 2-11**), are also included in **Table 2-12**.

CT 16.01 BG 3 and CT 16.02 BG 1, which contain the airport property, have a total population of 874 and 1,886 people, with 96.5 and 96.2 percent being African American, respectively. The percentage of the population living below the poverty level in these same two BGs is 10.0 and 50.3, respectively. Comparatively, African Americans comprise 25.6 percent of the total population of Forsyth County, and 10.7 percent of the County's total population lives below poverty level. As shown in **Table 2-12**, each of the adjacent BGs, with the exception of CT 16.01 BG 2, would exceed both the minority and poverty level percentages for Forsyth County. CT 16.01 BG 2 falls below the County threshold of 10.7 percent living below poverty level with only 5.1 percent. Notably, although at 17.4 percent CT 17 BG 4 falls below the County threshold of 25.6 percent African-American population, the percent for Other Races in CT 17 BG 4 is 53.8 percent and far exceeds the County's threshold of 3.1 percent for this category. Since each block group surrounding the airport contains environmental justice populations,

[6] USFWS, http://www.fws.gov/nc-es/es/cntylist/forsyth.html (December 29, 2011).
[7] United States Census Bureau, "Glossary," (May 9, 2009).

future projects at the airport will need to be evaluated to determine if there are disproportionate impacts to these populations.

Table 2-12
Select Population and Housing Characteristics in the Airport Vicinity

Category	CT 15		CT 16.01		CT 16.02		CT 17	Forsyth County	North Carolina
	BG 1	BG 3	BG 2	BG 3[c]	BG 1[c]	BG 2	BG 4		
POPULATION AND RACE									
Total Population	1,861	1,082	1,291	874	1,886	1,541	1,445	306,067	8,049,313
Percent White	39.3	40.4	0	3.5	2.3	0.5	21.3	68.5	72.1
Percent Black	53.6	45.2	98.4	96.5	96.2	99.0	17.4	25.6	21.5
Percent AIAN[a]	0	0.7	0	0	0	0	1.3	0.3	1.3
Percent Asian	0	0	0	0	0	0	0	1.1	1.4
Percent NHOPI[b]	0	0	0	0	0	0	0	0.03	0.1
Percent Other	6.3	5.7	1.6	0	1.4	0.5	53.8	3.1	2.3
Percent Two or More Races	0.8	8.0	0	0	0	0	6.2	1.4	1.4
AGE, HOUSEHOLD SIZE, AND INCOME									
Median Age	29.7	31.8	44.8	43.5	23.0	42.5	23.4	35.3	36.0
Average Household Size	2.87	2.81	2.49	2.43	2.66	2.24	4.02	2.49	2.39
Median Household Income (in dollars)	22,837	26,779	38,529	51,250	15,051	22,813	28,906	42,097	39,184
Percent Below Poverty Level	36.9	25.9	5.1	10.0	50.3	24.9	31.4	10.7	11.9
HOUSING CHARACTERISTICS									
Median Home Value (in dollars)	62,200	57,700	75,000	77,200	47,900	53,900	88,600	108,900	95,800
Number of Housing Units	699	390	570	355	863	770	387	133,093	3,523,944

[a]AIAN – American Indian and Alaskan Native
[b]NHOPI – Native Hawaiian or Other Pacific Islander
[c]Includes the airport.
Notes: CT – Census Tract; BG – Block Group
Source: United States Census Bureau, 2000 Census: Summary File 3.

Farmlands

According to the Farmland Protection Policy Act (FPPA P.L. 97-98), lands already committed to urban development such as the airport, do not meet the definition of prime or unique farmlands. Therefore, no additional analysis was necessary as a part of this effort.

Floodplains

According to Executive Order 11988, *Federal Floodplain Management*, agencies must reduce the risk of flood loss, minimize the impacts of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains. The 100-year floodplain is the area adjacent to any particular waterway that would be inundated by the base flood, which is an event that has a one-percent chance of occurring in any given year. Federal regulations permit development in the 100-year floodplain if it is demonstrated through a hydraulic analysis that the development would meet the requirements set forth by FEMA. Filling within the floodplain is discouraged, because it removes floodwater storage capacity.

Information on the floodplains in the vicinity of the airport was obtained from the FEMA Flood Insurance Rate Maps. As indicated on **Exhibit 2-11**, 100-year floodplains are associated with Brushy Fork Creek to the southeast of the airport and an unnamed tributary to Brushy Fork Creek southwest of the airport. Brushy Fork Creek crosses the Runway Safety Area (RSA) on the south end of Runway 15/33, approximately 766 feet from the edge of pavement. The floodplains associated with this portion of Brushy Fork Creek are approximately 251 feet wide at their widest point, but average approximately 145 feet wide. Projects that would require the placement of fill within the 100-year floodplain should be avoided or potential impacts minimized.

Hazardous Materials

Hazardous waste sites are regulated by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). In general, hazardous materials include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare, or to the environment, when released or otherwise improperly managed.[8]

A regulatory records search was performed by a specialized commercial vendor to identify known or potential hazardous material sites, hazardous waste generators, and hazardous material users. As listed in **Table 2-13**, and as depicted on **Exhibit 2-11**, the records search identified eight potentially hazardous material sites located within one half-mile radius of the airport.

[8] RCRA Subtitle C, 40 CFR Part 251.

Table 2-13
Potentially Hazardous Material Sites in the Airport Vicinity

Site No.	Name	Location from Airport	Database
1	B/E Aerospace, Inc.	0.30 mile southwest	RCRA TSD and COR, STATE, LUST
2	Forsyth County Garage	0.38 mile southwest	LUST
3	Wachovia Oil Company	0.45 mile southwest	LUST
4	Sun Chemical Specialty Tanks	0.46 mile southwest	LUST, NFRAP, Brownfield, STATE
5	Hertz Rental Car	0.49 mile northwest	LUST
6	Lowe's-Liberty Street	0.49 mile northwest	LUST
7	Airport Exxon	0.50 mile northwest	LUST
8	Piedmont Hawthorne	0.52 mile northwest	STATE

RCRA TSD and COR = Resource Conservation and Recovery Information System – Required Corrective Action, Transport, Storage and Disposal, Large Quantity Generators; STATE = NCDENR file; LUST = Leaking Underground Storage Tank; Brownfield = Brownfields Property Reuse Act.
Source: Environmental FirstSearch Technology Corporation, Job Number: PL725001-03, September 3, 2009

With the exception of B/E Aerospace, Inc., the potential sites are categorized as low risk. The B/E Aerospace manufacturing facility is classified as a large quantity generator, with over 1,000 kilograms (2,205 pounds) of hazardous waste generated per month. The facility received seven citations from NCDENR between 2001 and 2004, with an initial compliance order issued in April of 2005.

Piedmont Hawthorne is the only potentially hazardous material site identified in the airport vicinity that is not located down gradient from the airport.

Historic and Archaeological

Section 106 of the National Historic Preservation Act, Protection of Historic and Cultural Resources, requires agencies to consider the effects of their actions on sites listed on the National Register of Historic Places (NRHP) and sites that are eligible for listing. Historic and archaeological sites, including structures such as houses, churches, monuments, and cemeteries, as well as prehistoric sites, should be avoided wherever possible when constructing or performing improvements at airports. In addition, sites not formally eligible for listing and sites discovered during planning or construction of a project should also be considered.

The National Park Service's National Register Information System database, the National Register of Historic Places, and the North Carolina Office of State Archaeology contain records of documented historic and archaeological resources listed on or eligible for listing on the NRHP. A preliminary review of these sources indicates that there are no known properties recorded in the National Register of Historic Places within or near the airport.

Although no historical or archaeological sites listed on the NRHP are known within airport property, an archaeological field survey for potentially eligible NRHP sites may need to be performed by qualified personnel prior to construction of a specific improvement project and should be coordinated with the North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO).

Induced Socioeconomic

Induced socioeconomic impacts could result from airfield improvement projects, as local retailers and commercial establishments could directly benefit, particularly those providing construction equipment and materials. Although no appreciable changes in local population or employment patterns are anticipated, airport improvements could have a positive effect on industrial/commercial development in the vicinity of the airport.

Light Emissions and Visual Effects

Due to the residential development adjacent to the airport, it will be necessary to evaluate potential sources of annoyance to nearby residents. Preventative measures should be taken during the design and construction of future projects to minimize light annoyances and visual impacts to nearby residential areas.

Noise

Generation of noise contours and evaluation of land use compatibility will be completed in Chapter 6 of this Master Plan Update.

Social Impacts

Due to the dense residential development that exists adjacent to INT, future land acquisition could result in impacts to the "human environment." Proposed future land acquisition would require evaluation of potential social impacts including: effects on health and safety risks to children and socioeconomic impacts, such as residential and business relocations, disruption of established communities, and changes in local population or employment patterns.

Water Quality

The airport is located in the Yadkin-Pee Dee River Basin, Yadkin River Headwaters, 8-digit sub-basin 03040101.[9] Under the CWA, states are required to record the condition of surface waters in their respective jurisdictions by Section 305(b) and Section 303(d) documentation. The Section 305(b) documentation serves to evaluate the extent to which surface waters are supporting their designated uses for categories such as drinking water supply, aquatic life, recreation use, and fish consumption. NCDENR produces a Watershed Water Quality Assessment (WWQA) to meet the requirement under Section 305(b), with each basin in the state having an updated WWQA produced every five years. The most recent WWQA for the Yadkin-Pee Dee Basin was published in 2007.

The Section 303(d) documentation is a comprehensive list of impaired water bodies that do not support their designated use classifications. The NCDENR develops this priority list of water bodies, which includes those that do not meet state water quality standards after the application

[9] NCDENR, Division of Water Quality, Yadkin-Pee Dee River Basin, Ambient Monitoring System Report, January 1, 2002 through December 31, 2006.

of required controls for point and non-point source pollutants, as well as priority water bodies to which the NCDENR can direct its attention when developing required controls such as Total Maximum Daily Loads (TMDLs).[10] NCDENR evaluates surface waters based upon a permanent monitoring network of water quality sampling stations located throughout each watershed. The closest monitoring station to the airport is located approximately 3.2 miles south/southeast on Salem Creek. Based on information from the WWQA and the Draft 2008 303(d) List, Brushy Fork Creek is not listed as an impaired stream. However, water quality at station 12-94-12-(4) on Salem Creek is considered "impaired" for aquatic life uses due to the criteria for biological integrity not being met.[11] Biological integrity data are objective measurements typically involving aquatic insects, fish, or algae communities.

A National Pollutant Discharge Elimination System (NPDES) permit (or modification of an existing NPDES permit) may be required for the stormwater run-off associated with construction of airport improvement projects.

Wetlands

Executive Order 11990, Protection of Wetlands, requires federally supported projects to preserve wetlands and to avoid and minimize wetland impacts to the maximum extent practicable. An on-site determination of jurisdictional waters of the United States, including wetlands and streams, was conducted by the U.S. Army Corps of Engineers (USACE) and the NCDENR for the northern portion of INT in October 2008. National Wetland Inventory (NWI) mapping from the USFWS and the Web Soil Survey from the U.S. Department of Agriculture, Natural Resources Conservation Service were used to identify potential wetlands and other jurisdictional waters of the United States on the remainder of airport property.

As a result of the on-site determination, three wetland areas and four segments of perennial stream were determined to be jurisdictional waters of the United States (refer to **Exhibit 2-11**). A portion of the stream in this area, northeast of Runway 4-22, is piped and not considered jurisdictional.

The only wetlands identified on the NWI map are located east of airport property. Prior to construction activities, however, the southern portion of airport property that was not included in the October 2008 on-site determination should be field verified regarding the presence of jurisdictional wetlands, especially along Brushy Fork Creek and its tributaries. If jurisdictional wetlands are identified, a delineation may be required to determine the limits of each wetland and to assess the ecological quality and function of each area. If jurisdictional wetlands are identified on site, coordination with the USACE would be necessary prior to any filling, clearing, dredging, or land altering activities that may affect wetlands.

[10] NCDENR, Draft 2008 303(d) List – Integrated Report Category 5 Version -20080107, p. 86.
[11] Ibid.

Chapter 3
Forecasts of Aviation Activity

3.0 BACKGROUND

During the development of this Master Plan Update, the ongoing effects of an economic recession caused aviation activity levels to decline throughout the United States. Smith Reynolds Airport (INT) experienced record low activity levels in 2008 that were expected to decline even further by year-end 2009. Despite the declining projections, the airport experienced month-over-month operational increases during the first half of 2009 as illustrated in **Table 3-1**, which does not appear to resemble trends of previous years when several cycles of monthly growth and decline occurred. Because factors like these can be critical in the determination of aviation forecasts, this chapter presents a comprehensive analysis of ongoing and anticipated trends that could influence short- and long-term activity growth at INT.

Table 3-1
Month-Over-Month Operations Comparison (2001-2009)

Month	2001	2002	2003	2004	2005	2006	2007	2008	2009
January	31.96%	-9.91%	-7.11%	0.82%	-16.93%	-20.14%	-11.19%	21.14%	24.79%
February	8.58%	5.54%	-20.26%	-9.30%	13.99%	-2.07%	12.30%	-23.10%	3.41%
March	-12.91%	6.67%	31.55%	12.55%	9.35%	26.18%	21.25%	32.76%	5.18%
April	1.37%	8.00%	10.67%	22.28%	8.53%	-1.70%	-17.78%	-0.11%	2.97%
May	8.09%	5.21%	-10.19%	-7.25%	21.78%	-1.30%	25.88%	6.66%	0.59%
June	-3.52%	1.63%	11.87%	-7.16%	-19.69%	-4.78%	-9.97%	-6.49%	-15.99%
July	-6.99%	-12.02%	11.66%	7.33%	-10.21%	-0.58%	13.25%	-11.53%	11.25%
August	1.30%	-12.94%	-10.58%	4.60%	4.97%	9.11%	-22.87%	4.78%	N/A
September	-37.98%	-8.45%	20.46%	-6.01%	9.36%	-5.27%	17.11%	-16.48%	N/A
October	78.08%	4.12%	-10.74%	5.72%	-9.16%	1.00%	6.04%	31.33%	N/A
November	-11.96%	10.04%	-2.03%	8.53%	3.00%	-3.58%	-8.24%	-29.19%	N/A
December	-4.92%	-13.66%	-13.78%	-7.86%	0.42%	-5.82%	-29.25%	-16.67%	N/A
Annual Operations	69,136	63,533	52,868	55,036	63,129	59,528	59,569	51,839	44,158*
6-Month Declines (January-June)	2	1	3	3	2	5	3	3	1
12-Month Declines (January-December)	6	5	7	5	4	9	6	7	1

Sources: FAA Operations Network (OPSNET) database and The LPA Group Incorporated, September 2009.
Notes: Percentages in table represent month-over-month changes in operations. Decline values represent the number of months that a negative month-over-month change was observed.
** 2009 annual operations estimated from FAA's Draft 2009 Terminal Area Forecast (TAF). Operations counts for August-December 2009 were not available at the time of this writing.*

Considering the ongoing economic recession and the Federal Aviation Administration's (FAA's) updated projections of aviation activity, it was only reasonable to forecast conservative growth for INT during the 20-year planning period from 2008 to 2028. Still, the conservative growth forecasts allowed for a comprehensive master planning effort that addressed key goals of the

Airport Commission of Forsyth County (ACFC) and airport tenants. However, per the Scope of Services, this chapter does not identify forecasts for scheduled commercial airline service, nor does it investigate the potential for such service. Conversely, the ACFC's desire to preserve the ability to accommodate commercial airline service is discussed later in **Chapter 4**.

According to **FAA Advisory Circular (AC) 150/5070-6**, *Airport Master Plans*, aviation forecasting "should consider socioeconomic data, demographics, disposable income, geographic attributes, and external factors such as fuel costs and local attitudes towards aviation."[1] Particular attention was given to these factors during the development of the following forecasts:

- Operations Totals
- Annual Instrument Operations
- Operations by Flight Type
- Operations by Aircraft Type
- Based Aircraft Totals
- Based Aircraft by Type
- Peak Period Operations
- Air Carrier Charter Passengers

This chapter identifies forecast values for the 20-year planning period which extends from 2008 to 2028. The forecast base year was established as 2008 because it represented the most recent full-year of airport activity. Additionally, use of 2008 as the forecast base year allowed for the full impact of the economic recession to be illustrated. Milestone years for short-, mid-, and long-term growth include 2013, 2018, and 2028, respectively. Due to the presence of an on-site Air Traffic Control Tower (ATCT) and other FAA data sources, up-to-date and accurate activity data was incorporated into this forecasting effort.

3.1 NEEDS AND BENEFITS

Forecasts represent a key component of a master planning study because every subsequent decision related to the purpose, size, design, and location of any structure or equipment relies on estimated levels of activity. Failure to properly plan for the future can result in negative consequences to the capacity, activity, safety, and efficiency of the airport. Therefore, the forecast planning horizon term is 20 years to ensure that adequate facilities are in-place for the operator, the traveling public, and the surrounding community.

[1] FAA AC 150/5070-6B, Airport Master Plans, page 37.

3.2 FORECASTING LIMITATIONS

Forecasting aeronautical activity is a complex assessment based on a multitude of factors, both controllable and those beyond an airport's control. Forecasts are not to be confused with predictions of the future but rather an educated guess of future activity based upon a variety of predictors, mathematical formulae, assumptions, and subjective judgment.

The accuracy of the estimates decline as the planning term is extended, by unforeseen local or geo-political events, natural disasters, or longer-term weather or climatological events. These caveats notwithstanding, the forecasts provided in this chapter employ a variety of methodologies, which together constitute best practices in the industry.

3.3 AIRPORT SERVICE AREA AND SOCIOECONOMIC CONDITIONS

According to the report, *2006 Economic Impact of Airports in North Carolina*, Smith Reynolds Airport produced a total economic output of approximately $137 million in 2006 (including direct, indirect, and induced economic impacts). Therefore, INT is recognized as a very important economic generator within the Winston-Salem area. As described earlier in **Chapter 2**, the Winston-Salem Chamber of Commerce and the U.S. Census Bureau identifies the metropolitan statistical area (MSA) of Winston-Salem as the four-county area including Forsyth, Davie, Stokes, and Yadkin Counties. Smith Reynolds Airport is the only publicly-owned airport within this four-county area (see **Exhibit 3-1**). As such, the socioeconomic conditions of the MSA are expected to have the most influence over INT activity levels.

This section includes a review of historical and forecast socioeconomic conditions within the airport service area, which is referred to herein as the *Four-County Region*. The review evaluates whether correlations exist between historical airport activity levels and historical population, employment, and/or per capital personal income (PCPI) rates within the airport service area. This potential correlation is tested later in this chapter using regression analysis. Regardless of what is identified through regression, socioeconomic growth trends within an airport service area still represent one of the most important considerations of any aviation forecasting effort.

This evaluation incorporates socioeconomic data from Woods & Poole Economics – the *2010 Complete Economic and Demographic Data Source* – which is recognized as an acceptable source of economic forecasts in the FAA report, *Forecasting Aviation Activity by Airport, July 2001*. While some agencies of Forsyth County may utilize alternate sources of economic forecasts, the Woods & Poole data presents up-to-date forecasts of 121 economic variables through the year 2040, thus providing a singular, comprehensive data set for analysis herein.

Exhibit 3-1
Airport Service Area Map

Source: The LPA Group Incorporated, September 2009.

Population

Aviation demand is affected by a combination of many factors described throughout this chapter, including population growth or decline. **Table 3-2** illustrates that population growth consistently occurred in the U.S., North Carolina, and the *Four-County Region* since at least 1990. However, the population of North Carolina and the *Four-County Region* grew more rapidly than the rest of the U.S. from 1990-2008 – most notably in recent years (refer to **Exhibit 3-2**). Much of the recent population growth in North Carolina has been associated with a significant number of

business relocations. For example, Winston-Salem was ranked 18th in the U.S. on Forbes.com's 2009 list of *Best Places for Businesses and Careers*, based primarily on a favorable cost of living, climate, and relocation incentives. Further, Raleigh ranked 1st, Durham 3rd, Asheville 6th, Wilmington 13th, and Charlotte 19th.[2] According to the Woods & Poole forecasts, strong population growth is expected to continue in North Carolina through 2030, while growth in the *Four-County Region* is expected to be more in-line with U.S. growth rates.

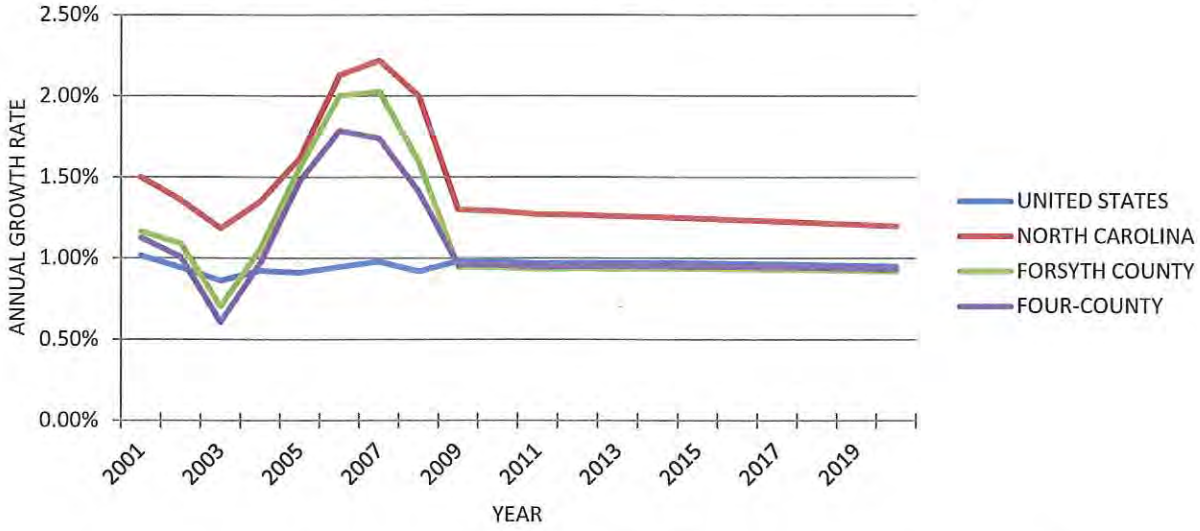
Table 3-2
Historical and Forecast Population (1990-2030)

Year	U.S.	NC	Forsyth	Yadkin	Davie	Stokes	Four-County
1990	249,622,814	6,664,016	266,855	30,576	28,032	37,396	362,859
1995	266,278,393	7,344,674	288,923	33,555	30,366	41,170	394,014
2000	282,171,936	8,078,824	306,933	36,508	35,058	44,833	423,332
2001	285,039,803	8,199,913	310,506	36,778	35,948	44,871	428,103
2002	287,726,647	8,311,263	313,897	37,178	36,523	44,822	432,420
2003	290,210,914	8,409,660	316,106	37,115	36,935	44,889	435,045
2004	292,892,127	8,523,199	319,441	37,019	37,656	45,157	439,273
2005	295,560,549	8,661,061	324,430	37,276	38,694	45,361	445,761
2006	298,362,973	8,845,343	330,926	37,514	39,583	45,699	453,722
2007	301,290,332	9,041,594	337,639	37,675	40,364	45,937	461,615
2008	304,059,724	9,222,414	343,028	37,954	40,971	46,171	468,124
2009	307,050,416	9,342,318	346,270	38,184	41,494	46,671	472,619
2013	319,189,413	9,826,916	359,439	39,129	43,609	48,697	490,874
2018	334,925,342	10,449,478	376,531	40,382	46,327	51,313	514,553
2025	357,582,283	11,340,472	401,159	42,211	50,216	55,070	548,656
2030	373,944,193	11,982,674	418,946	43,538	53,019	57,781	573,284
AAGR 1990-2000	1.23%	1.94%	1.41%	1.79%	2.26%	1.83%	1.55%
GROWTH 1990-2000	13.04%	21.23%	15.02%	19.40%	25.06%	19.89%	16.67%
AAGR 2000-2008	0.94%	1.67%	1.40%	0.49%	1.97%	0.37%	1.27%
GROWTH 2000-2008	7.76%	14.16%	11.76%	3.96%	16.87%	2.98%	10.58%
AAGR 2008-2013	0.98%	1.28%	0.94%	0.61%	1.26%	1.07%	0.95%
AAGR 2013-2018	0.97%	1.24%	0.93%	0.63%	1.22%	1.05%	0.95%
AAGR 2018-2030	0.92%	1.15%	0.89%	0.63%	1.13%	0.99%	0.90%
AAGR 2008-2030	0.94%	1.20%	0.91%	0.63%	1.18%	1.02%	0.93%
GROWTH 2008-2030	22.98%	29.93%	22.13%	14.71%	29.41%	25.15%	22.46%

Sources: Woods & Poole Economics 2010 CEEDS and The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

[2] Best Places for Businesses and Careers, Forbes.com, March 25, 2009.

Exhibit 3-2
Population Annual Growth Rate Comparison (2001-2020)



Sources: Woods & Poole Economics 2010 CEEDS and The LPA Group Incorporated, September 2009.

Employment

As employment grows (i.e., unemployment goes down), more people have money to spend on travel, personal aircraft, flight training, etc. Throughout the ongoing economic recession, the federal government has instituted programs to stimulate employment growth across the U.S. (and to help prevent further job losses that occurred in 2008 and 2009). As shown in **Table 3-3**, from 2000 to 2008 employment grew within the *Four-County Region* by nearly 16,500 jobs while at the same time the population grew by approximately 45,000. Between 2008 and 2030, the Woods & Poole forecasts illustrate approximately 69,000 new jobs for the *Four-County Region* and a population increase of more than 105,000 people.

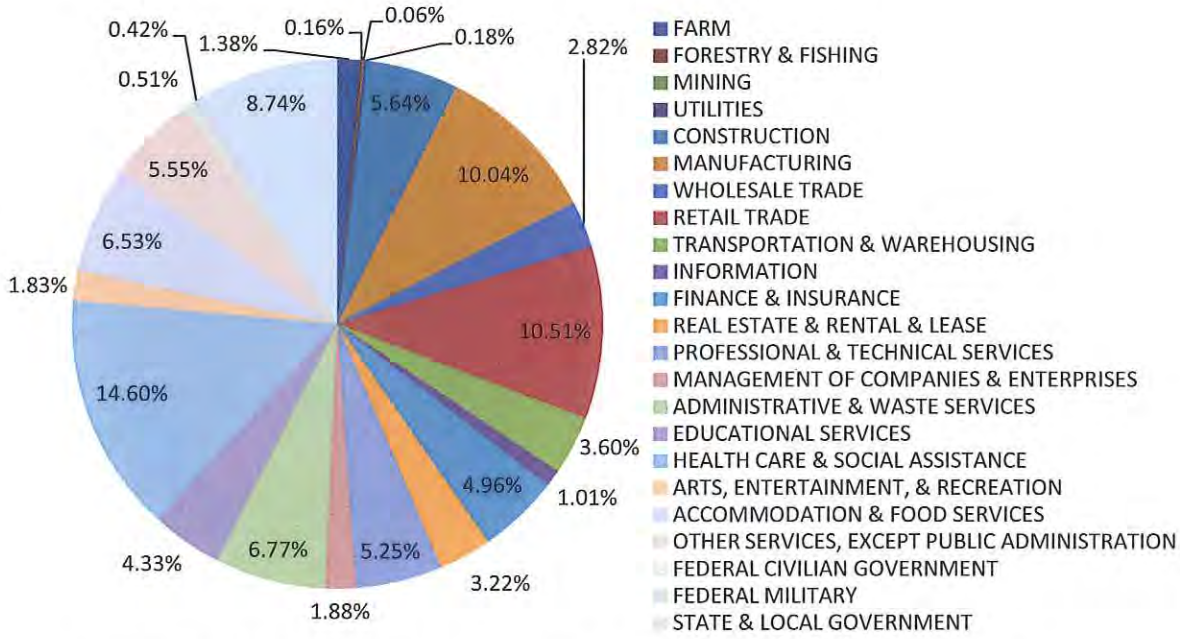
Exhibit 3-3 presents the 2008 employment distribution within the *Four-County Region*, with the top five employment sectors identified as: 1) health care, 2) retail trade, 3) manufacturing, 4) state and local government, and 5) administrative and waste services.

Table 3-3
Historical and Forecast Employment (1990-2030)

Year	U.S.	NC	Forsyth	Yadkin	Davie	Stokes	Four-County
1990	139,380,830	3,928,120	192,221	12,362	13,388	10,775	228,746
1995	148,982,936	4,380,521	203,551	14,056	14,976	12,238	244,821
2000	166,758,806	4,924,901	220,050	15,069	16,229	13,287	264,635
2001	167,014,653	4,885,070	217,450	14,714	15,859	13,031	261,054
2002	166,633,078	4,878,157	215,809	14,640	15,644	13,102	259,195
2003	167,553,481	4,891,145	216,506	14,220	15,582	12,975	259,283
2004	170,512,684	5,014,861	219,513	14,664	16,012	13,241	263,430
2005	174,228,321	5,145,883	225,501	14,979	16,418	13,242	270,140
2006	177,817,586	5,307,469	230,596	15,079	16,971	13,494	276,140
2007	180,943,811	5,460,851	235,782	14,698	17,390	13,718	281,588
2008	180,600,292	5,413,993	235,681	14,597	17,233	13,583	281,094
2009	177,667,193	5,275,824	229,815	14,079	16,643	13,131	273,668
2013	187,967,077	5,626,913	243,617	14,696	17,617	13,904	289,834
2018	199,022,617	6,013,862	257,719	15,184	18,530	14,708	306,141
2025	215,601,880	6,611,524	279,044	15,897	19,928	15,947	330,816
2030	228,283,967	7,082,285	295,503	16,424	21,013	16,930	349,870
AAGR 1990-2000	1.81%	2.29%	1.36%	2.00%	1.94%	2.12%	1.47%
GROWTH 1990-2000	19.64%	25.38%	14.48%	21.90%	21.22%	23.31%	15.69%
AAGR 2000-2008	1.00%	1.19%	0.86%	-0.40%	0.75%	0.28%	0.76%
GROWTH 2000-2008	8.30%	9.93%	7.10%	-3.13%	6.19%	2.23%	6.22%
AAGR 2008-2013	0.80%	0.77%	0.66%	0.14%	0.44%	0.47%	0.61%
AAGR 2013-2018	1.15%	1.34%	1.13%	0.66%	1.02%	1.13%	1.10%
AAGR 2018-2030	1.15%	1.37%	1.15%	0.66%	1.05%	1.18%	1.12%
AAGR 2008-2030	1.07%	1.23%	1.03%	0.54%	0.91%	1.01%	1.00%
GROWTH 2008-2030	26.40%	30.81%	25.38%	12.52%	21.93%	24.64%	24.47%

Sources: Woods & Poole Economics 2010 CEEDS and The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

Exhibit 3-3
2008 Four-County Region Employment Sector Distribution



Sources: Woods & Poole Economics 2010 CEEDS and The LPA Group Incorporated, September 2009.

Per Capita Personal Income (PCPI)

PCPI is a measurement of wealth that represents the average spending power for each individual among a sample population. PCPI is an important factor because higher per capital spending power typically correlates to increased activity within the aviation sector. As shown in **Table 3-4**, the PCPI of the U.S. grew at an average annual rate of 3.65 percent between 2000 and 2008. During the same period, the PCPIs of North Carolina and the *Four-County Region* grew at slower annual rates than the U.S.; however, stronger growth is forecast between 2008 and 2030. Additionally, the 2008 PCPI for Forsyth County is very similar to that of the U.S. and PCPI growth within the county is forecast to continue at about the same pace as the national rate.

Table 3-4
Historical and Forecast PCPI (1990-2030)

Year	U.S.	NC	Forsyth	Yadkin	Davie	Stokes	Four-County
1990	$19,477	$17,246	$22,185	$15,771	$19,105	$15,268	$20,694
1995	$23,076	$21,295	$25,860	$18,797	$23,237	$18,787	$24,317
2000	$29,847	$27,067	$31,013	$23,114	$29,277	$22,824	$29,321
2001	$30,582	$27,487	$31,004	$23,375	$28,803	$22,821	$29,306
2002	$30,838	$27,515	$31,372	$23,225	$28,915	$23,079	$29,604
2003	$31,530	$27,942	$31,915	$23,702	$29,366	$23,681	$30,148
2004	$33,157	$29,440	$34,052	$24,849	$30,763	$24,879	$32,052
2005	$34,690	$31,002	$35,070	$25,652	$31,846	$25,179	$32,996
2006	$36,794	$32,271	$35,938	$26,620	$33,236	$26,217	$33,953
2007	$38,615	$33,735	$37,600	$27,611	$34,594	$27,141	$35,481
2008	$39,755	$34,439	$38,775	$28,475	$35,621	$28,093	$36,610
2009	$40,255	$35,197	$39,928	$28,959	$35,959	$28,324	$37,547
2013	$47,577	$41,169	$47,563	$32,741	$41,889	$33,226	$44,455
2018	$59,841	$51,445	$59,767	$40,478	$51,940	$41,185	$55,695
2025	$84,559	$72,251	$84,443	$55,901	$72,183	$57,281	$78,399
2030	$109,512	$93,318	$109,429	$71,206	$92,561	$73,528	$101,348
AAGR 1990-2000	4.36%	4.61%	3.41%	3.90%	4.36%	4.10%	3.55%
GROWTH 1990-2000	53.24%	56.95%	39.79%	46.56%	53.24%	49.49%	41.69%
AAGR 2000-2008	3.65%	3.06%	2.83%	2.64%	2.48%	2.63%	2.81%
GROWTH 2000-2008	33.20%	27.24%	25.03%	23.19%	21.67%	23.09%	24.86%
AAGR 2008-2013	3.66%	3.63%	4.17%	2.83%	3.29%	3.41%	3.96%
AAGR 2013-2018	4.69%	4.56%	4.67%	4.33%	4.40%	4.39%	4.61%
AAGR 2018-2030	5.17%	5.09%	5.17%	4.82%	4.93%	4.95%	5.12%
AAGR 2008-2030	4.71%	4.64%	4.83%	4.25%	4.44%	4.47%	4.74%
GROWTH 2008-2030	175.47%	170.97%	182.22%	150.06%	159.85%	161.73%	176.83%

Sources: Woods & Poole Economics 2010 CEEDS and The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

3.4 HISTORICAL AND CURRENT AIRPORT ACTIVITY

Valuable clues about factors that could influence future activity levels may be revealed through a review of historical activity trends. For example, as part of the FAA's Terminal Area Forecast (TAF) for many general aviation airports, growth is projected according to nationwide economic and aviation trends. Thus, a review of historical airport activity might identify local factors that could be used to adjust the FAA's projections. Since INT has an on-site ATCT, historical activity has been well-documented by specific flight type (local and itinerant, air carrier, air taxi, general aviation, military, etc.). General aviation operations have consistently represented the majority of airport operations, but air carrier and corporate operations are also common at INT and therefore drive much of the demand for facilities and services. Although local activity has continually declined since the 1990s, flight training organizations like Piedmont Flight Training continue to lease facilities at the airport. Further, by reviewing historical based aircraft levels and the based aircraft fleet mix, past development trends for aprons, hangars, and other landside facilities can be examined to see if airport users were adequately served.

Historical and Current Operations

Smith Reynolds Airport maintains its Federal Aviation Regulations (FAR) Part 139 Certification due to existing charter activity with more than 31 seats, and therefore accommodates a mix of larger commercial, corporate, and general aviation traffic. The term general aviation essentially refers to pilot training, sightseeing, aerial photography, law enforcement, and medical flights, as well as business, corporate, and personal travel. All operations are divided into the categories of local or itinerant. Local operations are those arrivals or departures performed by aircraft that remain within the airport traffic pattern, or those that occur within sight of the airport – covering an area within a 20 nautical mile radius of the airfield. Local operations are most often associated with training activity and flight instruction (e.g., touch-and-gos).

The FAA defines an operation as either a single aircraft landing or takeoff. Under this definition, touch-and-go training procedures are considered two operations (one arrival and one departure) and are deemed local operations. Itinerant operations are typically comprised of private, business/corporate, and air taxi flight activity. Additionally, itinerant activity may include law enforcement and medical flights. As shown in **Table 3-5**, the FAA maintains historical operations counts for Smith Reynolds Airport as part of their Draft 2009 TAF. The FAA develops a TAF each year for all airports in the National Plan of Integrated Airport Systems (NPIAS). Depending upon the level of service provided at the subject airport (i.e., commercial/Part 139 or general aviation), the TAF may present forecasts of passenger enplanements, operations, and based aircraft. The FAA website indicates that the "TAF system is the official forecast of aviation activity at FAA facilities. These forecasts are prepared to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public."[3] As described later in this chapter, the TAF is used by the FAA as a benchmark for evaluating detailed airport forecasts.

At the time of this writing, the FAA's Draft 2009 TAF was determined to be most appropriate for analysis in this Master Plan Update. The FAA typically releases the Official TAF in December of each year, thus the Official 2008 TAF did not account for the effects of the economic recession to the same extent as the Draft 2009 TAF. Further, discussions with the FAA indicated that no drastic changes to the Draft 2009 TAF were anticipated before the release of the Official 2009 TAF. As shown in **Table 3-5**, INT experienced a record low number of operations in 2008, which is illustrative of the harsh effects of the economic recession. Still, past activity at INT has shown a strong resiliency to rebound quickly after periods of decline.

[3] http://aspm.faa.gov/main/taf.asp, accessed September 2009.

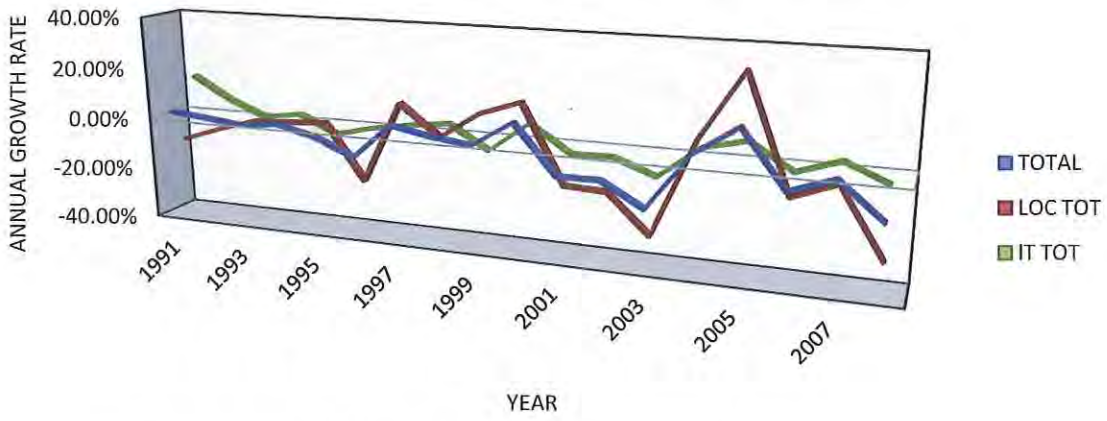
Table 3-5
Historical Airport Operations (1990-2008)

Year	Itinerant Operations					Local Operations			Total Operations
	Air Carrier	Air Taxi	GA	Military	Total	Civil	Military	Total	
1990	264	3,641	31,948	237	36,090	32,388	99	32,487	68,577
1991	212	4,352	36,589	82	41,235	29,150	144	29,294	70,529
1992	146	4,957	38,299	211	43,613	27,826	80	27,906	71,519
1993	180	4,446	38,687	178	43,491	27,770	45	27,815	71,306
1994	328	4,629	39,159	222	44,338	27,818	116	27,934	72,272
1995	235	2,966	38,853	178	42,232	28,247	109	28,356	70,588
1996	152	3,450	38,016	119	41,737	22,666	38	22,704	64,441
1997	242	2,800	39,094	122	42,258	25,236	50	25,286	67,544
1998	107	2,912	40,510	67	43,596	25,114	93	25,207	68,803
1999	31	2,541	38,351	127	41,050	27,644	61	27,705	68,755
2000	81	921	42,348	106	43,456	31,923	34	31,957	75,413
2001	211	955	40,234	238	41,638	27,350	148	27,498	69,136
2002	337	1,937	37,623	139	40,036	23,443	54	23,497	63,533
2003	414	2,078	33,456	271	36,219	16,539	110	16,649	52,868
2004	674	2,595	33,704	199	37,172	17,808	56	17,864	55,036
2005	542	2,947	35,795	203	39,487	23,475	167	23,642	63,129
2006	398	2,880	34,402	549	38,229	21,209	90	21,299	59,528
2007	419	2,864	35,567	195	39,045	20,488	36	20,524	59,569
2008	519	2,883	33,638	233	37,273	14,452	114	14,566	51,839
AAGR 1990-2000	-11.14%	-12.84%	2.86%	-7.73%	1.87%	-0.14%	-10.14%	-0.16%	0.95%
GROWTH 1990-2000	-69.32%	-74.70%	32.55%	-55.27%	20.41%	-1.44%	-65.66%	-1.63%	9.97%
AAGR 2000-2008	26.13%	15.33%	-2.84%	10.35%	-1.90%	-9.43%	16.33%	-9.35%	-4.58%
GROWTH 2000-2008	540.74%	213.03%	-20.57%	119.81%	-14.23%	-54.73%	235.29%	-54.42%	-31.26%

Source: FAA Draft 2009 TAF.
Note: The majority of INT's current Air Carrier activity includes passenger charters as well as airplanes undergoing maintenance.
AAGR – Average Annual Growth Rate

Exhibit 3-4 presents a comparison of annual growth rates for itinerant, local, and total operations at INT between 1991 and 2008.

Exhibit 3-4
Operations Annual Growth Rate Comparison (1991-2008)



Sources: FAA Draft 2009 TAF and The LPA Group Incorporated, September 2009.

By comparing this information to national and local trends in the economy and aviation industry, the following can be inferred about INT activity:

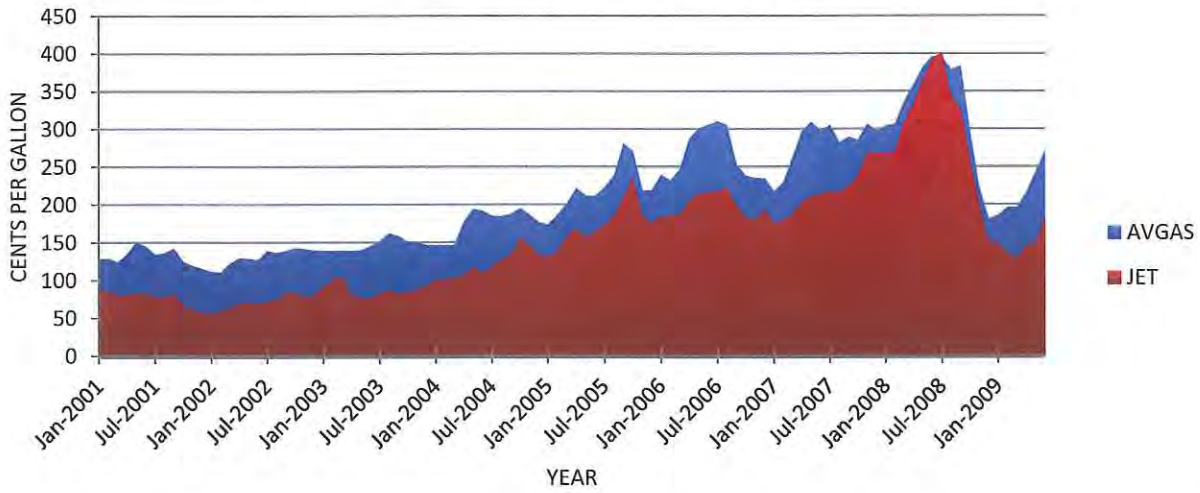
- Since 1991, three economic recessions have occurred in the U.S.: 1) July 1990 to March 1991, 2) March 2001 to November 2001, and 3) July 2007 to present.[4] It appears that INT activity was negatively affected by each of these economic recessions, most notably during the latter two. However, local activity experienced the greatest decline during these periods while itinerant traffic has been fairly consistent.
- In September 1996, Hurricane Fran "made landfall on the North Carolina coast as a category three hurricane on the Saffir/Simpson Hurricane Scale, resulting in significant storm surge flooding on the North Carolina coast, widespread wind damage over North Carolina and Virginia, and extensive flooding from the Carolinas to Pennsylvania." Fran caused an estimated $1.275 billion in damages to North Carolina.[5] Therefore, unforeseen weather events within the state may have the potential to impact aviation activity at INT.
- Scheduled airline service ended at Smith Reynolds Airport in 2000 following the pull-out of US Airways. At the time, there were a limited number of daily airline flights, but a noticeable decline in the number of annual air taxi flights still occurred in 2000 and 2001.
- All airport activity declined in the years immediately following the events of September 11, 2001, although a rapid rebound occurred in 2005.
- Hurricane Katrina hit the Gulf Coast of the U.S. in August 2005. As shown in **Exhibit 3-5**, a sharp increase in the price of aviation fuel occurred shortly thereafter because "Of the approximately 20 refineries and production facilities along the Gulf Coast – from Corpus Christi, Texas to Tampa, Florida – Katrina temporarily closed nine facilities and shut down two completely, reducing U.S. oil supplies by about 1.4 million barrels a day, or 8

[4] Recession.org.
[5] National Hurricane Center, Hurricane Fran Report.

percent of total U.S. production."[6] Consequently, increasing fuel prices negatively affected activity levels at Smith Reynolds Airport.

- Aircraft fuel prices remained high after 2005 and peaked during the summer of 2008. The U.S. Energy Information Administration predicts that the U.S. refined diesel fuels (such as jet fuel) will decrease slightly but remain relatively steady during 2012 due to an expected slowing of economic growth.[7]

Exhibit 3-5
Historical Aircraft Fuel Wholesale Price (2001-2009)

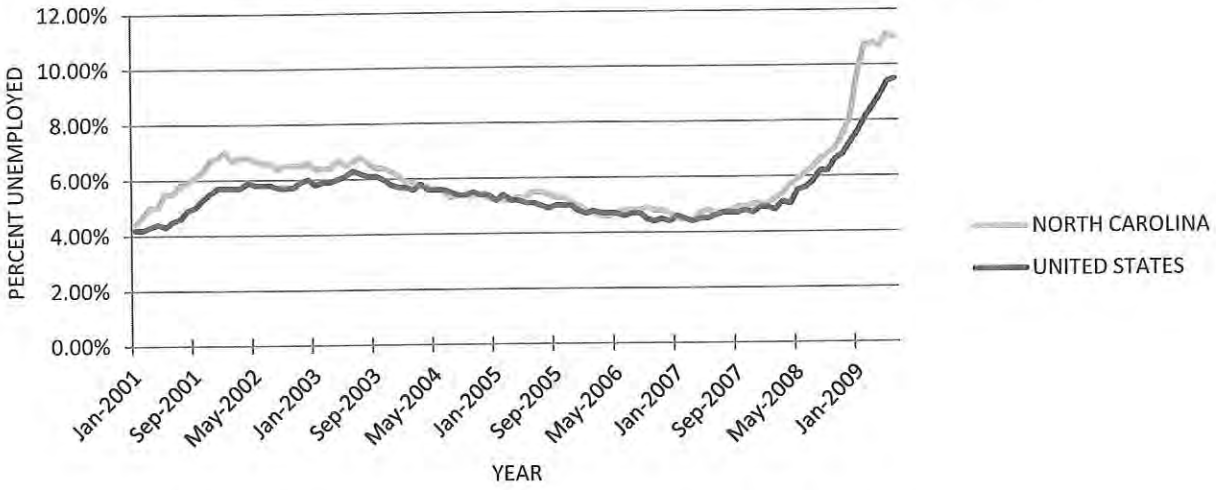


Sources: Energy Information Administration of the U.S. Department of Energy and The LPA Group Incorporated, September 2009.

- In September 2009, the U.S. was struggling through an economic recession. As shown in **Exhibit 3-6**, the U.S. unemployment rate was 9.50 percent in June 2009, which was approximately four points higher than June 2008. Unemployment levels in North Carolina have historically been similar to U.S. levels; however, many of the state's industrial and manufacturing companies recently conducted layoffs which contributed to the 11.00 percent unemployment rate in June 2009.

[6] Hurricane Katrina Underscores Tenuous State of U.S. Oil Refining Industry, PBS Online NewsHour, September 9, 2005.
[7] Short-Term Energy Outlook, Energy Information Administration, August 2009.

Exhibit 3-6
Seasonally Adjusted Historical Unemployment Rates (2001-2009)



Sources: U.S. Bureau of Labor Statistics and The LPA Group Incorporated, September 2009.

Historical and Current Based Aircraft

Historical based aircraft data for Smith Reynolds Airport was also obtained from the FAA's Draft 2009 TAF. As shown in **Table 3-6**, the 2008 mix of based aircraft included 68 single-engines, 23 multi-engines, 18 jets, and no helicopters. Historical based aircraft trends are discussed throughout this chapter, including the following general observations:

- **Single-Engines** – As large jet operations have increased since the early 1990s, local activity has continually decreased. Pilots of many smaller general aviation aircraft may be more comfortable flying to and from airports with less jet traffic, and may have relocated their planes to other local airports. Further, few projects have been conducted in recent years that would encourage based aircraft growth for single-engine piston aircraft at INT.
- **Multi-Engines** – Multi-engines may have experienced a similar trend as single-engines. Also, according to the *FAA Aerospace Forecast Fiscal Years 2009-2025*, the number of active multi-engine piston aircraft decreased by 9.30 percent across the U.S. between 2000 and 2008. The decline in the number of single- and multi-engines from 1996 to 1997 may have been related to Hurricane Fran which hit North Carolina in September 1996.
- **Jets** – Although the number of based jets at Smith Reynolds Airport grew from 8 in 1990 to 30 in 2007, this number recently decreased from 30 in 2007 to 18 in 2008. This decrease is mostly attributed to the recent economic recession which has caused some business owners to either sell their aircraft or to close their operation altogether.
- **Helicopters** – It is anticipated that the loss of based helicopters has been related to the same factors described under single-engines.

Table 3-6 Historical and Current Based Aircraft (1990-2008)					
Year	Single-Engine	Multi-Engine	Jet	Helicopter	Total
1990	82	45	8	3	138
1991	82	45	8	0	135
1992	80	46	10	0	136
1993	80	46	10	0	136
1994	80	46	10	0	136
1995	80	46	10	0	136
1996	80	46	10	0	136
1997	63	18	11	0	92
1998	63	18	11	0	92
1999	90	26	15	1	132
2000	90	26	15	1	132
2001	71	23	21	1	116
2002	71	23	21	1	116
2003	71	23	21	1	116
2004	60	10	30	0	100
2005	60	10	30	0	100
2006	60	10	30	0	100
2007	60	10	30	0	100
2008	68	23	18	0	109
AAGR 1990-2000	0.94%	-5.34%	6.49%	-10.40%	-0.44%
GROWTH 1990-2000	9.76%	-42.22%	87.50%	-66.67%	-4.35%
AAGR 2000-2008	-3.44%	-1.52%	2.31%	-100.00%	-2.36%
GROWTH 2000-2008	-24.44%	-11.54%	20.00%	-100.00%	-17.42%

Source: FAA Draft 2009 TAF.
AAGR – Average Annual Growth Rate

Direct Impacts of Aircraft Fleet Mix Changes

In most cases, general aviation airports with high levels of large jet traffic have less small aircraft activity (single- and multi-engine pistons). This is because pilots of small aircraft may conduct numerous operations at the same airport during an hour (i.e., touch-and-gos), while jets might only perform one takeoff and landing over the course of several hours. There are several reasons why pilots of smaller aircraft may avoid airports with frequent jet activity. Some avoid them due to the added danger of wake vortices (small tornadoes) that are produced by larger jet aircraft wings; whereas others may avoid these airports since they lie within controlled airspace which requires pilots to request permission and also to maintain a constant dialogue via radio communications. Despite the fact that INT's operations and based aircraft numbers have declined over the past ten years, the introduction of a larger aircraft fleet mix has increased fuel sales and has allowed the airport to recognize revenue potential that it would not otherwise be generated from smaller aircraft. This being said, the economic impact of the airport is less dictated by the total number of operations and based aircraft than it is by fleet mix indicators like jet activity and by the revenues recognized by the airport itself.

As shown in **Tables 3-5** and **3-6**, published historical data for Smith Reynolds Airport reveals that there has been an obvious reduction in both based aircraft and operational activity over the past ten years. Despite these declines, INT has consistently maintained more than 100 based aircraft and has experienced at least 51,000 annual operations through 2008. Furthermore, businesses such as Landmark Aviation, Piedmont Flight School, and several other airport tenants have been able to successfully maintain and grow their businesses based solely on airport traffic. A review of INT's historical data seems to reveal that the airport has become less and less active over the past two decades. While total operational and based aircraft numbers have declined, it should be acknowledged that INT experienced an identity change during this time that actually resulted in a growing economic output. A review of **Table 3-6** illustrates that both single- and multi-engine aircraft have declined since 1990, whereas the number of jets has significantly increased during the same timeframe. This decline occurred despite the fact that the airport constructed additional T-hangar facilities during the mid 1990s.

3.5 REGRESSION ANALYSIS AND SOCIOECONOMIC CORRELATION

Often times, a correlation can be made between historical airport activity and historical socioeconomic characteristics, which were presented in earlier sections of this chapter. In order to test if such a correlation exists, regression analysis is used to determine if an independent variable (*X*) can be used to predict a dependent variable (*Y*). Some regression analyses provide strong correlations (e.g., a comparison of automobile insurance rates to population within a square mile). The increased traffic in higher populated areas results in an additional number of accidents, thefts, etc., and therefore causes insurance rates to increase. In this example, the population per square mile would be the independent variable (*X*), whereas the cost of insurance would be the dependent variable (*Y*). In aviation forecasting, the independent variable is generally a socioeconomic characteristic (e.g., population or employment), while the dependent variable is passenger enplanements, airport operations, or based aircraft.

According to the FAA report, *Forecasting Aviation Activity by Airport, July 2001*, the ability of an independent variable to predict a dependent variable is measured by the Coefficient of Determination or R-Squared (R^2) regression statistic. "An R^2 of 0.00 indicates that there is no statistical relationship between changes in the independent and dependent variables. R^2 values near 1.00 mean there is a very strong statistical relationship." [8] The R^2 value "measures the percent of the variation in *Y* [e.g., historical change in airport activity] that is explained by the variation in *X* [e.g., historical change in population]."[9] In aviation forecasting, an R^2 value of 0.90 percent or greater should be achieved for the independent variable (*X*) to be considered a confident predictor of the dependent variable (*Y*).

For Smith Reynolds Airport, the independent variables (*X*) were population, employment, and PCPI for the *Four-County Region* service area (Forsyth, Davie, Stokes, and Yadkin Counties), and the dependent variables (*Y*) were the number of annual operations and based aircraft. The

[8] FAA Forecasting Aviation Activity by Airport, July 2001.
[9] Basic Statistics for Business and Economics, Third Edition, 2000.

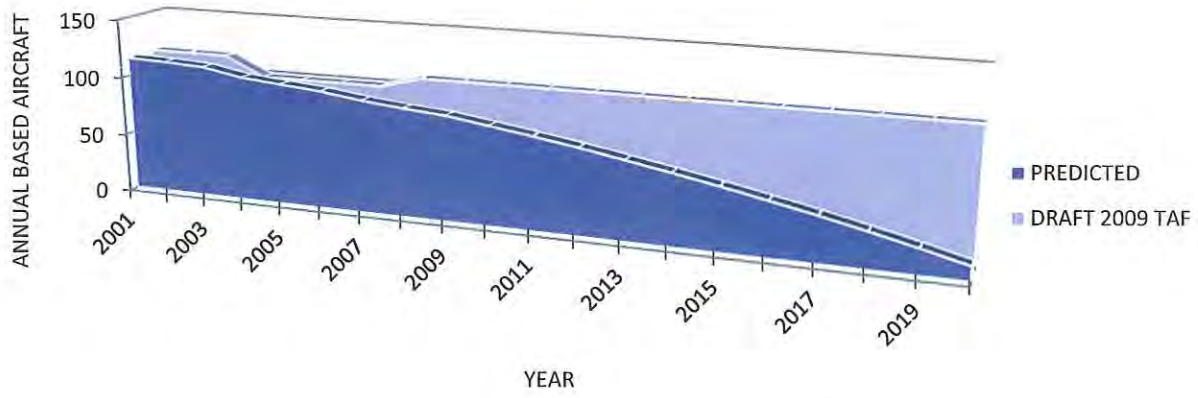
objective of the regression analyses was to determine if a correlation existed between historical socioeconomic variables and historical airport activity between the years 2001 and 2007 – this range was selected so that the outcomes would not be skewed by the significant airport activity decline in 2008. If such a correlation were to exist (i.e., producing an R^2 value close to 1.00), then it would be reasonable to assume that forecasts of the socioeconomic variables could be used to determine future airport activity. However, because of the large variation in historical airport operations and based aircraft levels year-to-year while all three socioeconomic characteristics generally showed consistent and positive growth, the regression analysis for total population and employment produced a low R^2 (correlation) value and were therefore deemed unusable for further forecast development. Conversely, the analysis of PCPI to based aircraft produced a strong correlation that was also rendered unusable due to an identified anomaly. Further investigation into this correlation confirmed that it was purely coincidental that the PCPI of the *Four-County Region* continued to increase from 2001 through 2007 while simultaneously the number of based aircraft decreased. As pointed out earlier, the reduction in based aircraft during this time period is attributed to a number of factors, thus any forecast developed utilizing this approach would illustrate a negative growth trend for based aircraft as demonstrated in **Exhibit 3-7**.

Table 3-7
Regression Analysis – Socioeconomic Characteristics

Socioeconomic Variable (X Variable)	Operations (Y Variable)	Conclusion	Based Aircraft (Y Variable)	Conclusion
Total Population – R^2 Value	0.06	Reject	0.65	Reject
Total Employment – R^2 Value	0.00	Reject	0.60	Reject
Total PCPI – R^2 Value	0.00	Reject	0.80	Reject

Source: The LPA Group Incorporated, September 2009.

Exhibit 3-7
Sample Regression – PCPI (X) to INT Based Aircraft (Y) (2001-2020)



Source: The LPA Group Incorporated, September 2009.

3.6 FACTORS AND OPPORTUNITIES AFFECTING ACTIVITY LEVELS

As described throughout this chapter, historical activity trends at Smith Reynolds Airport illustrate that economic events, aviation fuel prices, and natural disasters have the potential to influence operational demand – particularly local traffic levels. Although it is impossible to forecast many of these factors (e.g., hurricanes, economic recessions, terrorist attacks), these variables were considered in the evaluation and selection of the preferred forecasts. It is also important to identify ongoing and anticipated trends at INT, as well as within the *Four-County Region* airport service area and the U.S. aviation system as a whole.

Unanticipated Events

Unanticipated events like natural disasters and terrorist actions have the potential to influence aviation activity. For example, when Hurricane Katrina hit the Gulf Coast of the U.S. in August 2005, aviation fuel prices increased shortly thereafter which resulted in declining activity levels at INT. Nine years earlier, Hurricane Fran caused over a billion dollars in property damage across North Carolina that also negatively influenced airport activity. Therefore, the impacts of natural disasters must be recognized and considered in the development of long-term airport forecasts.

As evidenced by the events of September 11, 2001, and the British bomb plot in 2006 that resulted in liquids restrictions on commercial airlines, terrorism and security issues are a current and serious threat to aviation demand. The level and type of threats impacting all airports is constantly changing. Due in part to past terrorist actions, the Transportation Security Administration (TSA) is also considering stricter security measures for general aviation airports and aircraft operators that may affect future aviation demand.

FAA Next Generation Air Transportation System (NextGen)

In an effort to reduce congestion around the country, the FAA has begun to implement the Next Generation Air Transportation System (NextGen), which is a "plan to modernize the National Airspace System (NAS) through 2025. Through NextGen, the FAA is addressing the impact of air traffic growth while simultaneously improving safety, environmental impacts, and user access to the NAS."[10] The primary goals of NextGen are to provide order-of-magnitude improvements in the efficiency of the NAS by allowing aircraft to fly more direct routes (i.e., GPS-guided point-to-point paths), to safely reduce aircraft separation standards, and to provide more data to aircrews for operating their aircraft. The FAA's ongoing roll-out of NextGen initiatives should help to improve access and approach capability for airports around the country.

Aircraft Trends

Many general aviation activity trends presented in the *FAA Aerospace Forecast Fiscal Years 2009-2025* were drastically different than FAA predictions in previous years. This was due to factors like the ongoing economic recession, as well as several bankruptcies and business failures within the Very Light Jet (VLJ) sector that was previously expected to show rapid growth. Although the FAA has scaled-back their VLJ growth expectation to approximately 4,875 active aircraft by 2025, the demand for corporate jets is still expected to remain strong because "corporate safety/security concerns for corporate staff, combined with increasing flight delays at some U.S. airports have made factional, corporate, and on-demand charter flights practical alternatives to travel on commercial flights."[11] Therefore, this Master Plan Update assumes that there is strong potential for continued jet activity growth at Smith Reynolds Airport. Other nationwide activity trends from the *FAA Aerospace Forecast Fiscal Years 2009-2025* are referenced throughout this chapter.

3.7 REVIEW OF PREVIOUS FORECASTING EFFORTS

As previously described in **Section 3.6**, several factors and trends may negatively or positively affect future activity levels at Smith Reynolds Airport. Therefore, it is important to consider previous forecasting efforts to determine if they are consistent with current airport activity levels and anticipated trends. Previous forecasting efforts from the FAA's Draft 2009 TAF and the 1995 Master Plan Update are evaluated in this section.

Draft 2009 Terminal Area Forecast (TAF)

The FAA's Draft 2009 TAF was previously determined to be most appropriate for analysis in this Master Plan Update. As such, the Draft TAF shown in **Table 3-8** was used as a benchmark for evaluation in this updated forecasting effort. While Smith Reynolds Airport was expected to experience continued activity decline through year-end 2009, the Draft TAF illustrates a slow

[10] FAA NextGen Fact Sheet, October 29, 2008.
[11] FAA Aerospace Forecast Fiscal Years 2009-2025, page 41.

recovery in the short-term, followed by a modest recovery for the remainder of the 20-year planning period. However, the Draft TAF does not show total operations recovering to pre-2009 levels through the remainder of the planning period.

At the time of this writing, the Draft 2009 TAF did not include updated based aircraft forecasts for the years 2008 to 2028. Since the Official 2008 TAF held the number of based aircraft constant at 100 in every year of the forecast (i.e, the total number of based aircraft in 2007), an adjusted TAF forecast was developed for based aircraft by holding the number of based aircraft constant at 109 through 2028 as shown in **Table 3-8** (i.e, the total number of based aircraft in 2008).

Table 3-8
FAA Draft 2009 Terminal Area Forecast (2008-2028)

Year	Itinerant Operations					Local Operations			Total Operations	Total Based Aircraft*	OPBA
	Air Carrier	Air Taxi & Commuter	GA	Military	Total	GA	Military	Total			
2008	519	2,883	33,638	233	37,273	14,452	114	14,566	51,839	109	476
2009	481	2,549	28,563	446	32,039	11,832	287	12,119	44,158	109	405
2010	481	2,549	28,278	446	31,754	11,849	287	12,136	43,890	109	403
2011	481	2,549	28,658	446	32,134	11,866	287	12,153	44,287	109	406
2012	481	2,549	29,042	446	32,518	11,881	287	12,168	44,686	109	410
2013	481	2,549	29,431	446	32,907	11,896	287	12,183	45,090	109	414
2014	481	2,549	29,825	446	33,301	11,911	287	12,198	45,499	109	417
2015	481	2,549	30,153	446	33,629	11,926	287	12,213	45,842	109	421
2016	481	2,549	30,485	446	33,961	11,942	287	12,229	46,190	109	424
2017	481	2,549	30,820	446	34,296	11,958	287	12,245	46,541	109	427
2018	481	2,549	31,159	446	34,635	11,974	287	12,261	46,896	109	430
2019	481	2,549	31,502	446	34,978	11,990	287	12,277	47,255	109	434
2020	481	2,549	31,849	446	35,325	12,006	287	12,293	47,618	109	437
2021	481	2,549	32,199	446	35,675	12,022	287	12,309	47,984	109	440
2022	481	2,549	32,553	446	36,029	12,038	287	12,325	48,354	109	444
2023	481	2,549	32,911	446	36,387	12,054	287	12,341	48,728	109	447
2024	481	2,549	33,273	446	36,749	12,070	287	12,357	49,106	109	451
2025	481	2,549	33,639	446	37,115	12,086	287	12,373	49,488	109	454
2026	481	2,549	34,009	446	37,485	12,102	287	12,389	49,874	109	458
2027	481	2,549	34,383	446	37,859	12,118	287	12,405	50,264	109	461
2028	481	2,549	34,761	446	38,237	12,134	287	12,421	50,658	109	465
AAGR 2008-2013	-1.51%	-2.43%	-2.64%	13.87%	-2.46%	-3.82%	20.28%	-3.51%	-2.75%	0.00%	-2.75%
AAGR 2013-2018	0.00%	0.00%	1.15%	0.00%	1.03%	0.13%	0.00%	0.13%	0.79%	0.00%	0.79%
AAGR 2018-2023	0.00%	0.00%	1.10%	0.00%	0.99%	0.13%	0.00%	0.13%	0.77%	0.00%	0.77%
AAGR 2023-2028	0.00%	0.00%	1.10%	0.00%	1.00%	0.13%	0.00%	0.13%	0.78%	0.00%	0.78%
AAGR 2008-2028	-0.38%	-0.61%	0.16%	3.30%	0.13%	-0.87%	4.72%	-0.79%	-0.12%	0.00%	-0.12%
Growth 2008-2028	-7.32%	-11.59%	3.34%	91.42%	2.59%	-16.04%	151.75%	-14.73%	-2.28%	0.00%	-2.28%
Increase 2008-2028	-38	-334	1,123	213	964	-2,318	173	-2,145	-1,181	0	-11

Source: FAA Draft 2009 TAF.
Note: The majority of INT's current Air Carrier activity includes passenger charters as well as airplanes undergoing maintenance.
** Forecast adjusted per updated based aircraft counts in 2008.*
AAGR – Average Annual Growth Rate

1995 Master Plan Update

The operations and based aircraft forecasts from the 1995 Master Plan Update are summarized in **Table 3-9**. Although there have been various activity-related changes at Smith Reynolds Airport since the development of the previous plan, such as the loss of scheduled airline service, the techniques used to develop the previous forecasts can be examined for their relevance in this updated forecasting effort. Similar to the analysis herein, the 1995 Master Plan Update reviewed several forecasting techniques to derive a selected forecast, including forecasts from the 1987 Master Plan, FAA NPIAS 1990-1990, 1992 North Carolina Airports System Plan (NCASP), and 1992 TAF, as well as 1991 projections of population and PCPI. Although these previous forecasts of operations and based aircraft do not resemble current levels at INT, at the time they were considered reasonable projections of future activity. Where noted, some information from the 1995 Master Plan Update is incorporated into the analysis herein.

Table 3-9
1995 Master Plan Update Forecasts

Year	Airline	SEP	MEP	TP	Jet	Hel	Total
OPERATIONS							
1993	4,622	38,655	14,751	8,046	4,694	671	71,439
1998	5,364	42,067	16,233	8,854	5,534	1,007	79,059
2003	6,250	45,832	16,727	9,558	6,372	1,593	86,332
2013	8,556	53,054	18,956	10,989	7,692	2,656	101,903
AAGR 1993-2013	3.13%	1.60%	1.26%	1.57%	2.50%	7.12%	1.79%
GROWTH 1993-2013	85.11%	37.25%	28.51%	36.58%	63.87%	295.83%	42.64%
INCREASE 1993-2013	3,934	14,399	4,205	2,943	2,998	1,985	30,464
BASED AIRCRAFT							
1993	N/A	80	30	16	10	0	136
1998	N/A	85	33	18	12	2	150
2003	N/A	92	36	19	13	3	163
2013	N/A	107	40	22	16	5	190
AAGR 1993-2013	N/A	1.46%	1.45%	1.61%	2.38%	N/A	1.69%
GROWTH 1993-2013	N/A	33.75%	33.33%	37.50%	60.00%	N/A	39.71%
INCREASE 1993-2013	N/A	27	10	6	6	5	54

Source: 1995 Master Plan Update.
AAGR – Average Annual Growth Rate

3.8 FORECASTING METHODS CONSIDERED

The previous sections of this chapter introduced historical, present, and future trends that represent key considerations for this updated forecasting effort. Growth cannot be forecast for INT without recognizing factors that might influence growth. This section presents the results of the forecasting methods that were investigated for their reliability in determining future operations and based aircraft levels throughout the 20-year planning period. **FAA Advisory Circular 150/5070-6**, *Airport Master Plans*, identifies the following methods for aviation forecasting:

- "**Regression Analysis** – A statistical technique that ties aviation demand (dependent variables), such as enplanements, to economic measures (independent variables), such as population and income. Regression analysis should be restricted to relatively simple models with independent variables for which reliable forecasts are available.
- **Trend analysis and Extrapolation** – Typically uses the historical pattern of an activity and projects this trend into the future. This approach is useful where unusual local conditions differentiate the study airport from other airports in the region.
- **Market Share Analysis or Ratio Analysis** – This technique assumes a top-down relationship between national, regional, and local forecasts. Local forecasts are a market share (percentage) of regional forecasts, which are a market share (percentage) of national forecasts. Historical market shares are calculated and used as a basis for projecting future market shares. This type of forecast is useful when the activity to be forecast has a constant share of a larger aggregate forecast.
- **Smoothing** – A statistical technique applied to historical data, giving greater weight to the latest trend and conditions at the airport; it can be effective in generating short-term forecasts."[12]

Regression analysis was previously rejected from consideration as a forecasting method due to the poor correlations that were observed between historical socioeconomic variables and INT activity. Where applicable, the remaining forecasting methods were investigated.

Operations Forecasting Methods

According to the FAA's Draft 2009, 51,839 operations were conducted at Smith Reynolds Airport in 2008. Data from the ATCT (through July 2009) indicated that operations were expected to decline even further by year-end 2009. As previously shown in **Exhibit 3-4**, local operations have been generally decreasing since 1990, with mixed years of unpredictable growth and decline, while at the same time itinerant operations showed relative consistency. Factors contributing to this trend were described earlier in this chapter (airline service in the 1990s, increasing jet traffic and maintenance, natural disasters, etc.). **Table 3-10** illustrates the year-over-year percent growth or decline in annual operations since 1990. Although the economic recession had an impact on INT's operations in 2008 and 2009, factors like reduced fuel prices

[12] FAA Advisory Circular 150/5070-6B, Airport Master Plans, page 40.

and an estimated $8.6 billion infusion into North Carolina from the American Recovery and Reinvestment Act (ARRA) of 2009[13] should help stimulate growth in aviation activity throughout the U.S. Considering these factors, **Table 3-11** and **Exhibit 3-8** present the following operations forecasting methods for INT:

Growth Rate – As shown in **Table 3-10**, Smith Reynolds Airport has experienced cycles of growth and decline despite three economic recessions, hurricanes, loss of regularly-scheduled airline service, U.S. terrorist attacks, and the past temporary closure of the main runway for rehabilitation. While it is difficult to pinpoint the exact reasons for historical growth or decline, some general observations about airport operations can be inferred through this analysis. In the years immediately following cycles of activity decline (i.e., 1994, 1997, 2000, 2004, and 2007), operations rebounded an average of 4.0 percent. This indicates that the airport has been very resilient after periods of decline, showing quick ability to recover and once again grow. However, growth has not been quite as strong over the long-term due to the various reasons mentioned above. The FAA's Draft 2009 TAF illustrates negative growth through 2010, followed by slow recovery thereafter. However, as previously shown in **Table 3-1**, with the exception of June, activity in each month of 2009 has shown consistently positive growth over the previous month, which is a very different trend than has been experienced in past years. Also, consistent with historical growth after cycles of decline, activity in 2009 has grown at an average rate of 4.0 percent per month. During a conference on September 15, 2009, Federal Reserve Chairman Ben S. Bernake indicated that "From a technical perspective, the recession is very likely over at this point."[14] Therefore, considering the past resiliency of INT activity and the potential end of the economic recession, the Growth Rate Forecast took an alternative approach to the TAF and assumed a strong annual growth rate of 4.00 percent for 2010 and 2011 operations, but used a conservative annual growth rate of 0.95 percent for the remainder of the planning period to be consistent with historical long-term growth.

FAA Aerospace Forecast – The FAA publishes long-term forecasts of nationwide aviation demand each year. Although the FAA Aerospace Forecasts do not forecast general aviation operations, there is a forecast of *General Aviation Hours Flown* that is comparable to the anticipated growth in operations. According to the *FAA Aerospace Forecast Fiscal Years 2009-2025*, "The number of general aviation hours flown is projected to increase by 1.8 percent yearly over the forecast period."[15] The FAA further splits this forecast into the following periods and rates of annual growth, which were applied to operations throughout the 20-year planning period:

- 2008-2010 – 1.14% annual growth
- 2010-2020 – 1.77% annual growth
- 2020-2025 – 2.25% annual growth

[13] NCRecovery.gov.
[14] Fed Chief Says Recession Is 'Very Likely Over,' NYTimes.com, September 16, 2009.
[15] FAA Aerospace Forecast Fiscal Year 2009-2025, page 42.

Table 3-10
Historical Growth Summary (1990-2008)

Year	Total Operations	Actual Change	% Annual Change	Events
1990	68,577			
1991	70,529	1,952	2.85%	U.S. Recession (July 1990-March 1991)
1992	71,519	990	1.40%	
1993	71,306	-213	-0.30%	
1994	72,272	966	1.35%	
1995	70,588	-1,684	-2.33%	
1996	64,441	-6,147	-8.71%	NC Hurricanes Bertha (July) & Fran (September)
1997	67,544	3,103	4.82%	
1998	68,803	1,259	1.86%	NC Hurricanes Bonnie (August) & Floyd (September)
1999	68,755	-48	-0.07%	
2000	75,413	6,658	9.68%	US Airways Stops Service
2001	69,136	-6,277	-8.32%	U.S. Recession (March 2001-November 2001) & 9/11
2002	63,533	-5,603	-8.10%	
2003	52,868	-10,665	-16.79%	NC Hurricane Isabel (September)
2004	55,036	2,168	4.10%	NC Hurricanes Alex & Charley (both August)
2005	63,129	8,093	14.70%	Hurricane Katrina (August) & Increasing Fuel Prices
2006	59,528	-3,601	-5.70%	
2007	59,569	41	0.07%	U.S. Recession (July 2007-Present)
2008	51,839	-7,730	-12.98%	Runway 15-33 & South Apron Rehabilitation Projects
Avg. Growth After Decline Cycles			**4.00%** (avg. of growth that occurred in 1994, 1994, 2000, 2004, and 2007)	
Representative Long-Term Growth			**0.95%** (AAGR from 1990-2000 used to illustrate long-term growth)	

Source: The LPA Group Incorporated, September 2009.

Population Forecast – Although regression analysis illustrated no correlation between historical population and historical operations, the combined population of Forsyth, Davie, Stokes, and Yadkin Counties is forecast to grow at a similar rate to the historical long-term growth in operations (i.e., approximately 0.95 percent). Therefore, population may be a reasonable indicator of long-term activity growth at INT. As such, the following growth rates from Woods & Poole's population forecast of the *Four-County Region* were applied to operations:

- 2008-2013 – 0.95% annual growth
- 2013-2018 – 0.95% annual growth
- 2018-2028 – 0.90% annual growth

Employment Forecast – Similarly, regression analysis illustrated no correlation between historical employment and historical operations at INT. However, because employment forecasts show slow initial growth, which is representative of the ongoing economic recession, followed by steady growth thereafter, the Woods & Poole employment forecast for the *Four-County Region* was also applied to INT operations as follows:

- 2008-2013 – 0.61% annual growth
- 2013-2018 – 1.10% annual growth
- 2018-2028 – 1.12% annual growth

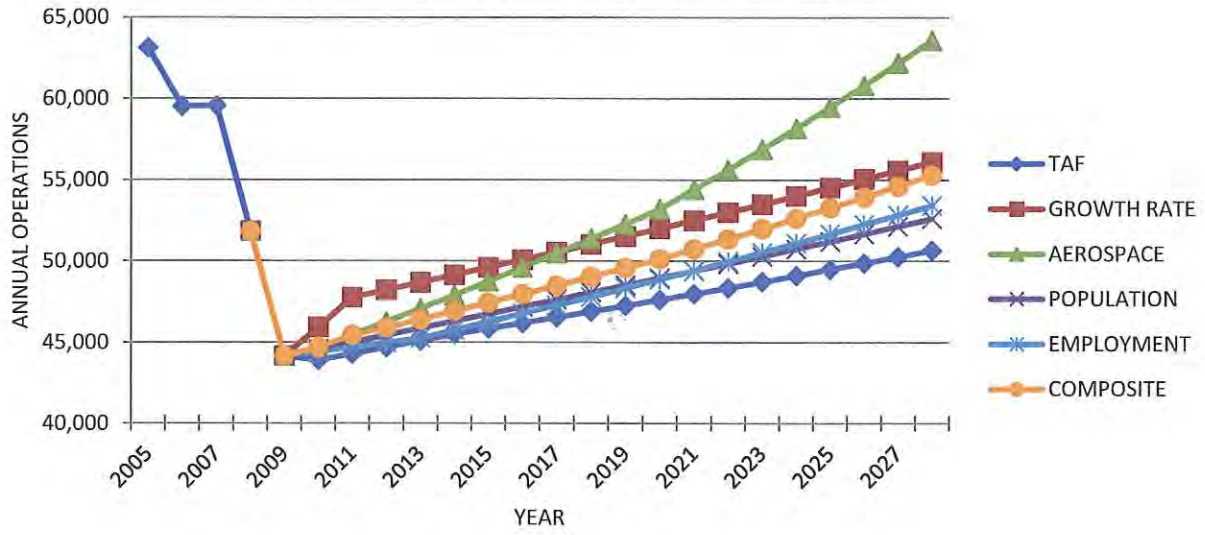
Composite Forecast – The Composite Forecast is the average of all forecasts presented including the FAA's Draft 2009 TAF, Growth Rate Forecast, FAA Aerospace Forecast, Population Forecast, and Employment Forecast. The Composite Forecast may be considered an applicable forecast because it incorporates anticipated growth rate trends on the local and national levels.

Table 3-11
Summary of Operations Forecasting Methods

Year	TAF	Growth Rate	Aerospace	Population	Employment	Composite
2008	51,839	51,839	51,839	51,839	51,839	51,839
2009	44,158	44,158	44,158	44,158	44,158	44,158
2013	45,090	48,677	47,068	45,867	45,253	46,391
2018	46,896	51,034	51,373	48,079	47,799	49,036
2023	48,728	53,505	56,881	50,294	50,534	51,988
2028	50,658	56,095	63,584	52,611	53,425	55,274
AAGR 2008-2013	-2.75%	-1.25%	-1.91%	-2.42%	-2.68%	-2.20%
AAGR 2013-2018	0.79%	0.95%	1.77%	0.95%	1.10%	1.12%
AAGR 2018-2023	0.77%	0.95%	2.06%	0.90%	1.12%	1.18%
AAGR 2023-2028	0.78%	0.95%	2.25%	0.90%	1.12%	1.23%
AAGR 2008-2028	-0.12%	0.40%	1.03%	0.07%	0.15%	0.32%
Growth 2008-2028	-2.28%	8.21%	22.66%	1.49%	3.06%	6.63%
Increase 2008-2028	-1,181	4,256	11,745	772	1,586	3,435

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

Exhibit 3-8
Summary of Operations Forecasting Methods



Source: The LPA Group Incorporated, September 2009.

Although month-to-month operational growth in 2009 may suggest a swifter short-term recovery at INT, there is still a great deal of uncertainty about when the U.S. economy, employment, and

aviation activity levels might rebound to pre-2008 levels. Therefore, it was determined that the Composite Forecast most realistically projected short- and long-term growth while remaining consistent with the FAA's national growth trends. Between 2008 and 2028, the Composite Forecast projects an average annual growth rate of 0.32 percent, which is below the FAA Aerospace rate of 1.03 percent. While the Composite Forecast is more optimistic than the FAA's Draft 2009 TAF, historical trends at INT show strong resiliency after cycles of decline that the TAF may not consider. Further, the Composite Forecast presents a conservative growth scenario because operations in 2028 are only predicted to grow by 3,435 over 2008 levels, and also because growth was projected from a record low number of operations in 2008 and 2009. Therefore, the Composite Forecast was identified as the *Preferred Operations Forecast*.

FAA TAF / Preferred Operations Forecast Comparison

According to the FAA memorandum, *Review and Approval of Aviation Forecasts June 2008*, "When reviewing a sponsor's forecast, FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecasting methods." The FAA also reviews forecasts for consistency with the TAF, with consistency defined as follows: "Forecasts differ by less than 10 percent in the five-year forecast period, and 15 percent in the ten-year forecast period."[16] As shown in **Table 3-12** and **Exhibit 3-9**, the Composite Forecast is consistent with the FAA's Draft 2009 TAF, per the above criteria. Therefore, the Composite Forecast is considered in-line with FAA projections and is used as the *Preferred Operations Forecast* throughout this chapter to calculate derivative operations forecasts (peak hour, operations by aircraft type, etc.).

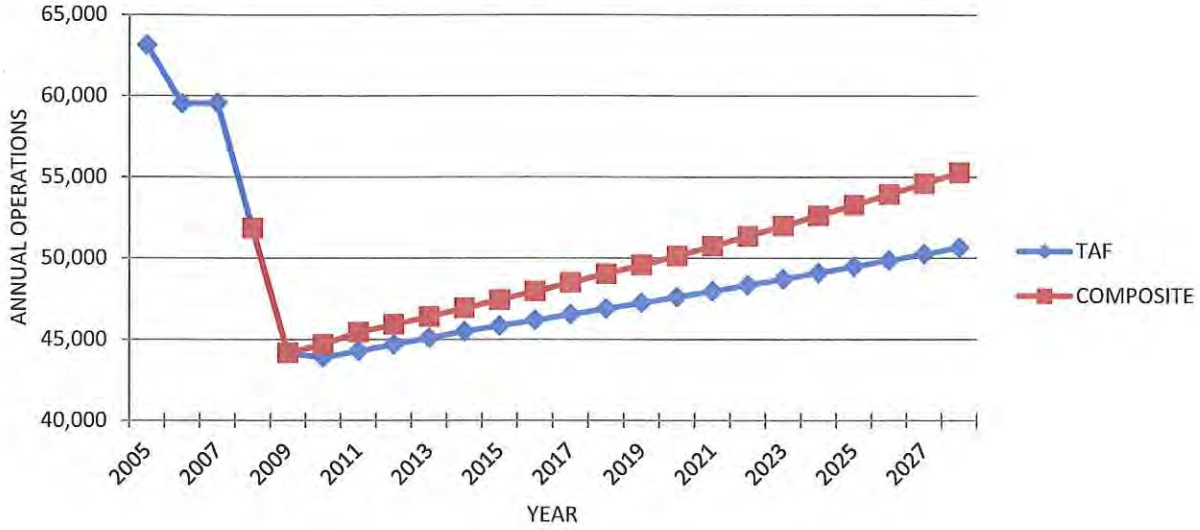
Table 3-12
FAA TAF / Preferred Operations Forecast Comparison

Year	TAF	Composite	Deviation From TAF
2008	51,839	51,839	0.00%
10% Deviation Acceptable in a Five-Year Period			
2009	44,158	44,158	0.00%
2013	45,090	46,391	2.89%
15% Deviation Acceptable in a Ten-Year Period			
2018	46,896	49,036	4.56%
No FAA Requirement for Last Ten Years			
2023	48,728	51,988	6.99%
2028	50,658	55,274	9.11%

Source: The LPA Group Incorporated, September 2009.

[16] FAA Memorandum, Review and Approval of Aviation Forecasts, June 2008.

Exhibit 3-9
FAA TAF / Preferred Operations Forecast Comparison



Source: The LPA Group Incorporated, September 2009.

Instrument Operations Forecast

According to the FAA report, *Forecasting Aviation Activity by Airport, July 2001*, instrument operations consist of "Arrivals, departures, and overflights conducted by an FAA approach control facility for aircraft with an Instrument Flight Rule (IFR) flight plan or special Visual Flight Rule procedures."[17] At INT, instrument operations generally consist of approaches and departures by aircraft with FAA filed flight plans (FAA Form 7233-1). By reviewing the FAA's Operations Network (OPSNET) database for the years 2001 through July 2009, it was determined that instrument operations historically represented an average of 27.70 percent of INT's annual activity (which was applied to 2008 activity). However, the *FAA Aerospace Forecast Fiscal Years 2009-2025* indicates that general aviation IFR activity is projected to grow at an average annual rate of 1.3 percent from 2008 to 2025. This is consistent with continuous upgrades to runway approach and departure procedures, aviation technologies, and the FAA's NextGen initiatives. Thus, as shown in **Table 3-13**, the 1.3 percent growth rate was applied to each year of the instrument operations forecast.

[17] Forecasting Aviation Activity by Airport, page A-2, July 2001.

Table 3-13 Instrument Operations Forecast			
Year	Preferred Operations	Instrument Operations	% Instrument Operations
2008	51,839	14,362	27.70%
2009	44,158	12,234	27.70%
2013	46,391	12,882	27.77%
2018	49,036	13,742	28.02%
2023	51,988	14,659	28.20%
2028	55,274	15,637	28.29%
AAGR 2008-2013	-2.20%	-2.15%	
AAGR 2013-2018	1.12%	1.30%	
AAGR 2018-2023	1.18%	1.30%	
AAGR 2023-2028	1.23%	1.30%	
AAGR 2008-2028	0.32%	0.43%	
GROWTH 2008-2028	6.63%	8.88%	
INCREASE 2008-2028	3,435	1,275	

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

Operations by Flight Type

As shown in **Table 3-14**, the FAA records airport activity according to flight type (air carrier, air taxi, general aviation, and military). It is important to forecast each flight category since each might have a specific function in the facility requirements analysis. This forecast was conducted for each flight category by applying the year-over-year activity splits from the FAA's Draft 2009 TAF (as a percent of total annual operations) to the *Preferred Operations Forecast*. Overall, there are two flight categories that are not forecast to exceed 2008 levels by 2028 – itinerant air taxi & commuter and local general aviation. The FAA purposely scaled-back their anticipated growth in air taxi & commuter activity due to recent bankruptcies and failures by VLJ manufacturers like Eclipse Aviation and VLJ on-demand service providers like DayJet. However, growth in jet activity is still expected at INT, as shown by the large increase in itinerant general aviation activity during the 20-year planning period. Similar to the historical trend in local general aviation operations since 1990, only very minor growth is expected for the local general aviation sector after 2009.

Table 3-14
Operations by Flight Type Forecast

Year	Preferred Operations	IT AC	IT AT	IT GA	IT MIL	IT TOT	LOC GA	LOC MIL	LOC TOT	IT SPLIT	LOC SPLIT
2008	51,839	519	2,883	33,638	233	37,273	14,452	114	14,566	71.90%	28.10%
2009	44,158	481	2,549	28,563	446	32,039	11,832	287	12,119	72.56%	27.44%
2013	46,391	495	2,623	30,280	459	33,857	12,239	295	12,535	72.98%	27.02%
2018	49,036	503	2,665	32,581	466	36,216	12,520	300	12,821	73.85%	26.15%
2023	51,988	513	2,720	35,113	476	38,822	12,860	306	13,167	74.67%	25.33%
2028	55,274	525	2,781	37,929	487	41,721	13,240	313	13,553	75.48%	24.52%
AAGR 2008-2013	-2.20%	-0.95%	-1.88%	-2.08%	14.52%	-1.90%	-3.27%	20.97%	-2.96%		
AAGR 2013-2018	1.12%	0.32%	0.32%	1.48%	0.32%	1.36%	0.46%	0.32%	0.45%		
AAGR 2018-2023	1.18%	0.40%	0.40%	1.51%	0.40%	1.40%	0.54%	0.40%	0.53%		
AAGR 2023-2028	1.23%	0.45%	0.45%	1.55%	0.45%	1.45%	0.58%	0.45%	0.58%		
AAGR 2008-2028	0.32%	0.06%	-0.18%	0.60%	3.75%	0.57%	-0.44%	5.18%	-0.36%		
GROWTH 2008-2028	6.63%	1.12%	-3.53%	12.76%	108.86%	11.93%	-8.39%	174.70%	-6.96%		
INCREASE 2008-2028	3,435	6	-102	4,291	254	4,448	-1,212	199	-1,013		

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

Operations by Aircraft Type

Jet operations at Smith Reynolds Airport drive much of the requirements for airfield facilities such as runway length, approach capability, and separation criteria. According to the *FAA Aerospace Forecast Fiscal Years 2009-2025*, "As the demand for business jets has grown over the past several years, the current forecast assumes that business use of general aviation aircraft will expand at a more rapid pace than that for personal/sport use."[18] As shown in **Table 3-15**, the FAA's Enhanced Traffic Management System Counts (ETMSC) database was used to query historical jet operations at INT during the years 2000 through 2008. The ETMSC database summarizes FAA filed flight plans and therefore records the majority of jet and turboprop activity. The decline in turboprop operations from 2000 to 2008 is consistent with INT's historical decline in based multi-engine aircraft. During the same time, the number of based jets generally increased at INT, which may indicate that several airport tenants decided to upgrade from turboprop to jet aircraft. **Chapter 4**, *Demand Capacity/Facility Requirements*, provides specific analysis of the types, sizes, and flight categories of jets operating at INT.

Table 3-15
Historical Jet and Turboprop Operations (2000-2008)

Year	Jet Operations	Turboprop Operations
2000	6,639	5,415
2001	5,622	5,827
2002	6,698	4,654
2003	6,353	4,378
2004	7,765	3,928
2005	7,019	3,668
2006	7,018	2,761
2007	6,971	2,701
2008	6,661	2,499

Source: FAA ETMSC database.

The FAA ETMSC database indicates that 6,661 jet operations and 2,499 turboprop operations occurred at INT in 2008. As presented in **Table 3-16**, the forecast of operations by each aircraft type was conducted as follows:

Jet and Turboprop Operations – Consistent with the decrease in total operations between 2008 and 2009, jet and turboprop operations were forecast to decline 14.28 percent in 2009. Thereafter, an annual growth rate of 1.83 percent was used to forecast jet and turboprop operations through 2028. In the *FAA Aerospace Forecast Fiscal Years 2009-2025*, this growth rate represented the forecast of *Total General Aviation Hours Flown*. Since many jets and turboprops can fly more hours than piston-powered aircraft, the specific *Hours Flown* growth rates for jets and turboprops were assumed to be less representative of the actual number of operations; whereas use of the *Total General Aviation Hours Flown* growth rate provided a more realistic depiction of future corporate aircraft activity levels at Smith Reynolds Airport.

[18] FAA Aerospace Forecast Fiscal Years 2009-2025, page 41.

Helicopter Operations – All-inclusive counts for helicopter and piston aircraft activity are not recorded by the FAA. Therefore, data from the 1995 Master Plan Update was used to produce the forecasts for these aircraft. According to the 1995 Master Plan Update, approximately 1.00 percent of total operations were conducted by helicopters in 1993, which was subsequently incorporated into the forecasting effort herein.

Piston Operations – Piston operations were calculated as the remainder of total operations after the forecasts of jets, turboprops, and helicopters were produced. However, the separation of single-engine and multi-engine piston operations was calculated according to the split from the 1995 Master Plan Update – approximately 73 percent single-engine and 27 percent multi-engine.

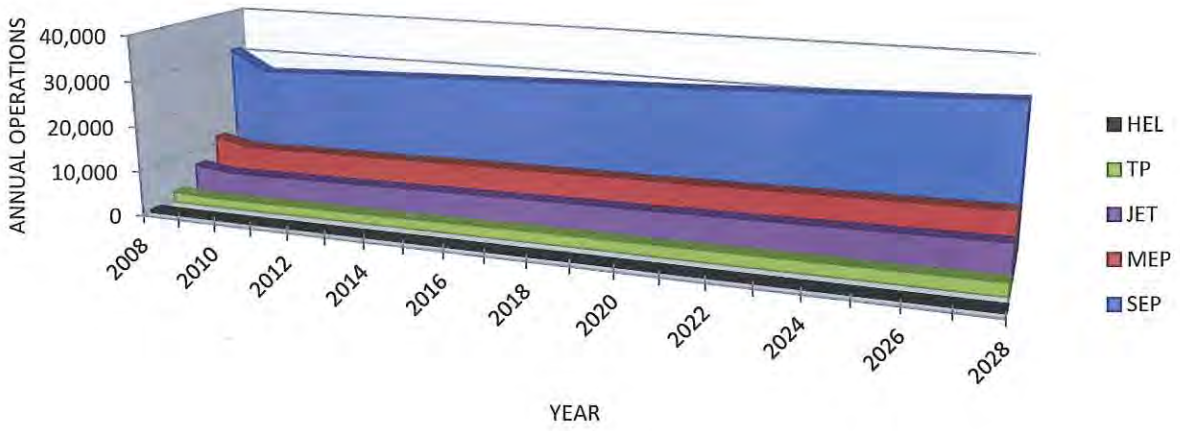
Table 3-16
Operations by Aircraft Type Forecast

Year	Preferred Operations	SEP	MEP	TP	Jet	Helicopter
2008	51,839	30,777	11,383	2,499	6,661	518
2009	44,158	26,217	9,697	2,129	5,674	442
2013	46,391	27,401	10,135	2,289	6,102	464
2018	49,036	28,730	10,626	2,507	6,683	490
2023	51,988	30,225	11,179	2,746	7,319	520
2028	55,274	31,901	11,799	3,007	8,015	553
AAGR 2008-2013	-2.20%	-2.30%	-2.30%	-1.74%	-1.74%	-2.20%
AAGR 2013-2018	1.12%	0.95%	0.95%	1.83%	1.83%	1.12%
AAGR 2018-2023	1.18%	1.02%	1.02%	1.83%	1.83%	1.18%
AAGR 2023-2028	1.23%	1.09%	1.09%	1.83%	1.83%	1.23%
AAGR 2008-2028	0.32%	0.18%	0.18%	0.93%	0.93%	0.32%
GROWTH 2008-2028	6.63%	3.65%	3.65%	20.33%	20.33%	6.63%
INCREASE 2008-2028	3,435	1,123	416	508	1,354	34

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

As shown in **Exhibit 3-10**, while single-engine piston aircraft are forecast to continue to comprise the majority of INT's operations, jet and turboprop operations are forecast to experience the highest average annual growth rate of 0.93 percent between 2008 and 2028. Still, 2028 is only projected to experience 1,354 more jet operations than were conducted in 2008.

Exhibit 3-10
Operations by Aircraft Type



Source: The LPA Group Incorporated, September 2009.

Based Aircraft Forecasting Methods

As Smith Reynolds Airport grew as a maintenance center for commercial jets during the 1990s and 2000s, based aircraft levels generally declined. In the early 1990s there were nearly as many local flights at INT as there were itinerant flights, while itinerant operations now comprise over 70 percent of operations. Consequently, this operational transformation may have caused a shift of smaller based aircraft to other nearby airports where general aviation pilots can operate independently from large jets. INT's based aircraft levels held stable at 109 in 2008 and 2009. The following based aircraft forecasting methods were investigated in this chapter as shown in **Table 3-17** and **Exhibit 3-11**:

Operations Per Based Aircraft Forecast (OPBA) – In 2008 there were 476 operations per based aircraft at Smith Reynolds Airport. For every year of the *Preferred Operations Forecast* that showed positive growth over 2008 (i.e., only 2021 through 2028), the number of annual operations was divided by 476 to determine the OPBA forecast.

FAA Aerospace Forecast – The *FAA Aerospace Forecast Fiscal Years 2009-2025* forecasts the *Active General Aviation Fleet* to increase at an average annual rate of 1.0 percent over the forecast period. The FAA further splits this forecast into the following periods and rates of annual growth, which were used to project INT's based aircraft growth from 2009 to 2028:

- 2008-2010 – 0.94% annual growth
- 2010-2020 – 0.94% annual growth
- 2020-2025 – 1.00% annual growth

Population Forecast – Similar to the operations forecasting method, the following growth rates from Woods & Poole's population forecast of the airport's *Four-County Region* service area were applied to based aircraft:

- 2008-2013 – 0.95% annual growth
- 2013-2018 – 0.95% annual growth
- 2018-2028 – 0.90% annual growth

Employment Forecast – Woods & Poole's employment forecast for the *Four-County Region* service was also used to project INT's based aircraft levels through 2028 as follows:

- 2008-2013 – 0.61% annual growth
- 2013-2018 – 1.10% annual growth
- 2018-2028 – 1.12% annual growth

Composite Forecast – The Composite Forecast is the average of all forecasts presented including the FAA's Draft 2009 TAF, OPBA Forecast, FAA Aerospace Forecast, Population Forecast, and Employment Forecast. The Composite Forecast may be considered an applicable forecast because it incorporates anticipated growth rate trends on the local and national levels.

Table 3-17
Summary of Based Aircraft Forecasting Methods

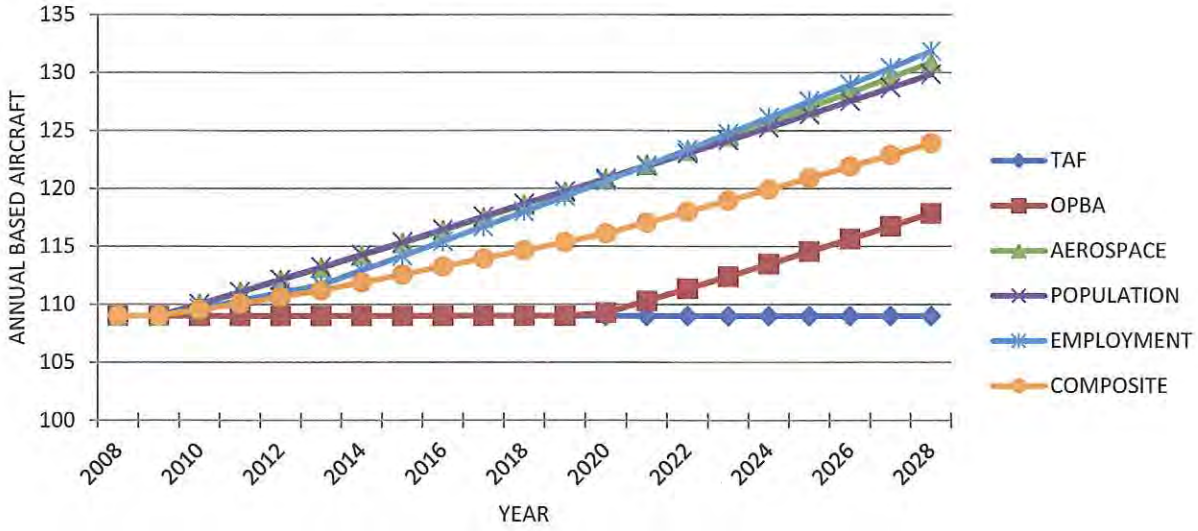
Year	TAF	OPBA	Aerospace	Population	Employment	Composite
2008	109	109	109	109	109	109
2009	109	109	109	109	109	109
2013	109	109	113	113	112	111
2018	109	109	119	119	118	115
2023	109	112	125	124	125	119
2028	109	118	131	130	132	124
AAGR 2008-2013	0.00%	0.00%	0.75%	0.76%	0.49%	0.40%
AAGR 2013-2018	0.00%	0.00%	0.94%	0.95%	1.10%	0.61%
AAGR 2018-2023	0.00%	0.62%	0.98%	0.90%	1.12%	0.74%
AAGR 2023-2028	0.00%	0.95%	1.00%	0.90%	1.12%	0.82%
AAGR 2008-2028	0.00%	0.39%	0.92%	0.88%	0.96%	0.64%
GROWTH 2008-2028	0.00%	8.12%	20.06%	19.14%	20.98%	13.66%
INCREASE 2008-2028	0	9	22	21	23	15

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

It is important to point out that the forecast of based aircraft directly affects future development recommendations in subsequent chapters of this report. It has been demonstrated that it is difficult to predict exactly what types and the number of aircraft that will reside at the airport in the next twenty years. However, from a planning perspective, it is in the airport's best interest to assume that additional aircraft and consequently additional facilities will be required. The airport currently maintains a hangar waiting list and also has plans to develop additional hangar facilities within the South Apron development area. As such, through careful consideration of historical based aircraft trends at INT, it was determined that the FAA Aerospace Forecast most realistically depicted future based growth trends at INT, and was therefore selected as the *Preferred Based Aircraft Forecast*. Overall, the *Preferred Based Aircraft Forecast* projects the

addition of 22 new based aircraft at Smith Reynolds Airport by the end of the twenty-year planning period.

Exhibit 3-11
Summary of Based Aircraft Forecasting Methods



Source: The LPA Group Incorporated, September 2009.

FAA TAF / Preferred Based Aircraft Forecast Comparison

Similar to the operations forecasts, the FAA also reviews based aircraft forecasts for consistency with the TAF. It should be noted that sufficient evidence must be available to support growth claims that are substantially greater than the FAA's 2009 TAF, thus the forecasts attempt to provide realistic, yet modest, growth expectations that still allow for a beneficial planning effort. According to the FAA memorandum, Review and Approval of Aviation Forecasts (June 2008), "when reviewing a sponsor's forecast, FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecasting methods." The FAA defines consistency with the TAF as follows: "Forecasts differ by less than 10 percent in the five-year forecast period, and 15 percent in the ten-year forecast period."[19] As shown in **Table 3-18**, the FAA Aerospace Forecast is consistent with the Adjusted TAF, per the above definition, and was therefore selected as the *Preferred Based Aircraft Forecast* for the Smith Reynolds Airport.

[19] FAA Memorandum, Review and Approval of Aviation Forecasts June 2008.

Table 3-18 FAA TAF / Preferred Based Aircraft Forecast Comparison			
Year	**TAF**	**Aerospace**	**Deviation From TAF**
2008	109	109	0.00%
10% Deviation Acceptable in a Five-Year Period			
2009	109	109	0.00%
2013	109	113	3.81%
15% Deviation Acceptable in a Ten-Year Period			
2018	109	119	8.79%
No FAA Requirement for Last Ten Years			
2023	109	125	14.22%
2028	109	131	20.06%

Source: The LPA Group Incorporated, September 2009.

Based Aircraft Forecast by Type

The previous sections of this chapter presented FAA based aircraft counts according to single-engines, multi-engines, jets, and helicopters. This section further splits the based aircraft forecasts by single-engine pistons, multi-engine pistons, turboprops, jets, and helicopters. The identification of turboprops is important because the dimensions and airfield design requirements of many turboprops are very different than piston-powered aircraft. The 2008 based aircraft mix at Smith Reynolds Airport included 109 aircraft: 66 single-engine pistons, 13 multi-engine pistons, 12 turboprops, 18 jets, and no helicopters. As shown in **Table 3-19** and **Exhibit 3-12**, the *Preferred Based Aircraft Forecast* grows to 131 with the addition of 22 based aircraft by 2028. The forecast of based aircraft by type was calculated as follows:

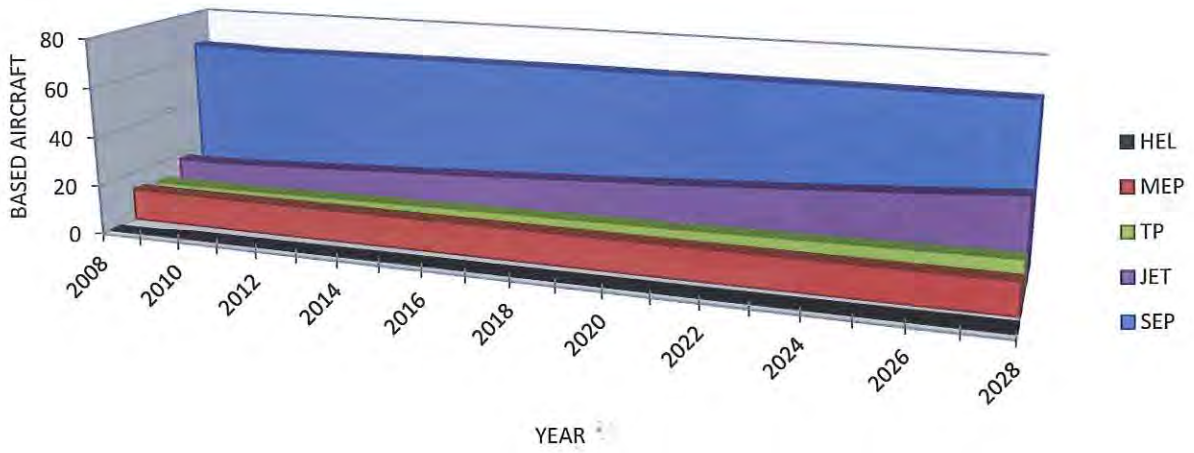
- **Jets** – Among all general aviation aircraft categories, the *FAA Aerospace Forecast Fiscal Years 2009-2025* predicts the strongest annual growth rate for the *Active Fleet* of jets. However, a more realistic projection of INT's based jet demand was achieved by applying an annual growth rate of 3.93 percent throughout the 20-year planning period, which represents the *Active Fleet Forecast* for all turbine-powered aircraft.
- **Turboprops** – The *FAA Aerospace Forecast Fiscal Years 2009-2025* forecasts the number of turboprops to grow at an average annual rate of 1.44 percent.
- **Helicopters** – Helicopters have been based at Smith Reynolds Airport in previous years. To sufficiently plan for helicopter storage, it was estimated that two helicopters would be based at INT by 2028.
- **Multi-Engine Pistons** – The *FAA Aerospace Forecast Fiscal Years 2009-2025* does not anticipate growth in the number of multi-engine piston aircraft.
- **Single-Engine Pistons** – The forecast of based single-engine pistons was determined as the remainder of total based aircraft after the calculations above were conducted.

Table 3-19
Based Aircraft Forecast by Type

Year	Preferred Based Aircraft	SEP	MEP	TP	Jet	HEL
2008	109	66	13	12	18	0
2009	109	66	13	12	18	0
2013	113	66	13	13	21	1
2018	119	66	13	14	24	1
2023	125	66	13	15	29	2
2028	131	66	13	16	34	2
AAGR 2008-2013	0.75%	-0.09%	0.00%	1.15%	2.75%	N/A
AAGR 2013-2018	0.94%	0.13%	0.00%	1.44%	3.45%	4.16%
AAGR 2018-2023	0.98%	0.02%	0.00%	1.44%	3.45%	4.16%
AAGR 2023-2028	1.00%	-0.12%	0.00%	1.44%	3.45%	3.32%
AAGR 2008-2028	0.92%	-0.02%	0.00%	1.37%	3.28%	N/A
GROWTH 2008-2028	20.06%	-0.31%	0.00%	31.26%	90.66%	N/A
INCREASE 2008-2028	22	0	0	4	16	2

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

Exhibit 3-12
Based Aircraft Forecast by Type



Source: The LPA Group Incorporated, September 2009.

3.9 PEAK PERIOD FORECASTS

As shown by the varying peak activity months in **Table 3-20**, historical peaking trends at INT do not reveal any strong seasonal correlation. This is because most of the activity is comprised of itinerant operations (e.g., air carrier, charter, corporate), versus local training operations which tend to drive-up activity levels during warmer months. Peak periods represent the times when the greatest amount of stress is placed on the airport. Peak period forecasts are used to determine

long-term requirements for airfield capacity, transient ramp, Fixed Base Operator (FBO) facilities, etc. The following procedures were used to develop the peak period forecasts for INT:

Table 3-20
Historical Peak Month Activity (2001-2008)

Peak Activity Month	Percent of Annual Activity
Feb-01	9.60%
Jun-02	10.06%
Sep-03	10.30%
Nov-04	9.57%
May-05	10.76%
Aug-06	9.03%
Jul-07	9.80%
May-08	9.96%
Average Peak Month	**9.88%**

Source: FAA OPSNET database.

- **Average Peak Month** – As shown in **Table 3-20**, monthly activity counts for INT were queried from the FAA's OPSNET database for the years 2001 through 2008. During this time, the peak month represented an average of 9.88 percent of annual activity, which was applied to the *Preferred Operations Forecast* to determine the average peak month operations throughout the 20-year planning period.
- **Average Peak Day** – Using the FAA's OPSNET database, the top 25 peak activity days were queried for 2008 operations at Smith Reynolds Airport. Subsequently, it was determined that the average peak day represented 0.50 percent of annual activity in 2008.
- **Average Peak Hour** – Through a review of records provided by the airport's ATCT, the average peak hour was determined to represent 20 percent of peak day operations.
- **Itinerant and Local Peak Hour** – Using the FAA's OPSNET database, the top 25 peak activity days were queried for 2008 itinerant and local general aviation operations. The data indicated that, on average in 2008, itinerant peak day operations represented 0.30 percent of annual operations and local peak day operations represented 0.21 percent. Accordingly, as a percentage of peak hour operations, itinerant peak hour operations represented 59.14 percent and local peak hour operations represented 40.86 percent.
- **Itinerant Peak Hour Passengers** – INT's itinerant operations range in size from small piston aircraft to medium jets. These aircraft carry anywhere from one to ten or more passengers, thus it was determined that an average of five passengers per itinerant operation would provide a realistic estimate considering the fleet mix variety. A forecast of air carrier charter passengers is presented in the next section (i.e., passengers that utilize the passenger terminal building as opposed to the FBO's facilities).

The results of the peak period forecasts are summarized in **Table 3-21**. As shown, itinerant peak hour operations are forecast to comprise the majority of peak hour activity throughout the 20-year planning period. Further analysis and breakdown of the peak period forecasts is presented in the facility requirements chapter.

Table 3-21
Peak Period Forecasts

Year	Preferred Operations	Average Peak Month	Average Peak Day	Average Peak Hour	IT Peak Hour	Local Peak Hour	IT Passengers
2008	51,839	5,124	259	52	31	21	153
2009	44,158	4,365	221	44	26	18	130
2013	46,391	4,586	232	46	27	19	137
2018	49,036	4,847	245	49	29	20	145
2023	51,988	5,139	260	52	31	21	154
2028	55,274	5,464	276	55	33	23	163
AAGR 2008-2013	-2.20%	-2.20%	-2.20%	-2.20%	-2.20%	-2.20%	-2.20%
AAGR 2013-2018	1.12%	1.12%	1.12%	1.12%	1.12%	1.12%	1.12%
AAGR 2018-2023	1.18%	1.18%	1.18%	1.18%	1.18%	1.18%	1.18%
AAGR 2023-2028	1.23%	1.23%	1.23%	1.23%	1.23%	1.23%	1.23%
AAGR 2008-2028	0.32%	0.32%	0.32%	0.32%	0.32%	0.32%	0.32%
GROWTH 2008-2028	6.63%	6.63%	6.63%	6.63%	6.63%	6.63%	6.63%
INCREASE 2008-2028	3,435	340	17	3	2	1	10

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

3.10 AIR CARRIER CHARTER PASSENGER FORECAST

Although the airport has not received scheduled commercial airline service since US Airways Express discontinued service in 2000, several hundred air carrier charter operations are still conducted to and from the airport each year by charter operations (e.g., by NASCAR teams, local corporations, and Wake Forest University athletic events). Thus, the airport continues to use the existing terminal building and count passenger activity.

The FAA records passenger enplanement data, or departing passengers, on the TAF. However, this analysis was focused on identifying all air carrier passenger activity, including enplanements and deplanements, which could be expected throughout the 20-year planning period. The Bureau of Transportation Statistics (BTS) maintains historical passenger activity data for all U.S. air carriers and airports, as shown for Smith Reynolds Airport in **Table 3-22**. By reviewing available BTS data for years without scheduled airline service at INT, an average of six passengers per air carrier operation was calculated (note that this number is low because of the high volume of air carrier aircraft that fly in and out of the airport for maintenance with no passengers, and is solely used for planning purposes). This value was applied to the forecast of air carrier operations through 2028 to determine the forecast shown in **Table 3-23**.

Table 3-22
Historical Air Carrier Charter Passengers (2002-2008)

Year	Arriving Passengers	Departing Passengers	Total Passengers	Air Carrier Operations	Passengers Per Operation
2002	1,134	1,036	2,170	337	6.44
2003	1,235	1,304	2,539	414	6.13
2004	3,141	3,217	6,358	674	9.43
2005	1,165	1,078	2,243	542	4.14
2006	864	716	1,580	398	3.97
2007	1,198	921	2,119	419	5.06
2008	1,718	1,883	3,601	519	6.94
Average Passengers Per Operation			**6.00**		

Sources: BTS database – Air Carriers: T-100 Domestic Market (U.S. Carriers) and FAA Draft 2009 TAF.

Table 3-23
Air Carrier Charter Passenger Forecast

Year	Preferred Operations	Air Carrier Operations	Part 139 Passengers
2008	51,839	519	3,601
2009	44,158	481	2,886
2013	46,391	495	2,969
2018	49,036	503	3,018
2023	51,988	513	3,079
2028	55,274	525	3,149
AAGR 2008-2013	-2.20%	-0.95%	-3.78%
AAGR 2013-2018	1.12%	0.32%	0.32%
AAGR 2018-2023	1.18%	0.40%	0.40%
AAGR 2023-2028	1.23%	0.45%	0.45%
AAGR 2008-2028	0.32%	0.06%	-0.67%
GROWTH 2008-2028	6.63%	1.12%	-12.55%
INCREASE 2008-2028	3,435	6	-452

Source: The LPA Group Incorporated, September 2009.
AAGR – Average Annual Growth Rate

A review of the passenger forecast data reveals that passenger activity at INT is expected to increase from 2009 through 2028; however, passenger activity is not expected to reach 2008 levels through the remainder of the planning period. This forecast was developed with the assumption that commercial service at INT is not expected to resume during the planning period. Despite this assumption, a further review of terminal requirements for commercial service is discussed later within the Facility Requirements chapter.

3.11 FORECAST SUMMARY

In summary, the data and methods used to forecast aviation demand for Smith Reynolds Airport are consistent with those used by the FAA and other airports in the State of North Carolina. The forecasts presented in this chapter, as summarized in **Table 3-24**, are considered to accurately reflect the activity anticipated at INT through 2028, provided that facilities necessary to accommodate the demand are made available. Also per FAA requirements, the comparisons to the TAF for the *Preferred Operations Forecast* and *Preferred Based Aircraft Forecast* are respectively shown in **Tables 3-12** and **3-18**.

Table 3-24
Airport Planning Forecasts
Forecast Levels and Growth Rates

Smith Reynolds Airport, Winston-Salem, North Carolina
Base Year: 2008

	Base Yr. Level 2008	Base Yr. + 1yr. 2009	Base Yr. + 5yrs. 2013	Base Yr. + 10yrs. 2018	Base Yr. + 15yrs. 2023	Base Yr. + 20yrs. 2028	Average Annual Compound Growth Rates: Base yr. to +1 2009	Base yr. to +5 2013	Base yr. to +10 2018	Base yr. to +15 2023	Base yr. to +20 2028
PART 139 PASSENGERS (ENPLANEMENTS + DEPLANEMENTS)											
TOTAL AIR CARRIER PASSENGERS	3,601	2,886	2,969	3,018	3,079	3,149	-19.86%	-3.78%	-1.75%	-1.04%	-0.67%
OPERATIONS											
Itinerant (IT) Operations:											
Air Carrier	519	481	495	503	513	525	-7.32%	-0.95%	-0.31%	-0.08%	0.06%
Air Taxi	2,883	2,549	2,623	2,665	2,720	2,781	-11.59%	-1.88%	-0.78%	-0.39%	-0.18%
GA	33,638	28,563	30,280	32,581	35,113	37,929	-15.09%	-2.08%	-0.32%	0.29%	0.60%
Military	233	446	459	466	476	487	91.42%	14.52%	7.19%	4.88%	3.75%
Total IT Operations	37,273	32,039	33,857	36,216	38,822	41,721	-14.04%	-1.90%	-0.29%	0.27%	0.57%
Local Operations:											
GA	14,452	11,832	12,239	12,520	12,860	13,240	-18.13%	-3.27%	-1.42%	-0.77%	-0.44%
Military	114	287	295	300	306	313	151.75%	20.97%	10.16%	6.81%	5.18%
Total Local Operations	14,566	12,119	12,535	12,821	13,167	13,553	-16.80%	-2.96%	-1.27%	-0.67%	-0.36%
TOTAL OPERATIONS	51,839	44,158	46,391	49,036	51,988	55,274	-14.82%	-2.20%	-0.55%	0.02%	0.32%
Instrument Ops	14,362	12,234	12,882	13,742	14,659	15,637	-14.82%	-2.15%	-0.44%	0.14%	0.43%
Peak Hour Ops	52	44	46	49	52	55	-14.82%	-2.20%	-0.55%	0.02%	0.32%
BASED AIRCRAFT											
Single-Engine Piston	66	66	66	66	66	66	0.00%	-0.09%	0.02%	0.02%	-0.02%
Multi-Engine Piston	13	13	13	13	13	13	0.00%	0.00%	0.00%	0.00%	0.00%
Turboprop	12	12	13	14	15	16	0.00%	1.15%	1.30%	1.35%	1.37%
Jet	18	18	21	24	29	34	0.00%	2.75%	3.10%	3.22%	3.28%
Helicopter	0	0	1	1	2	2	N/A	N/A	N/A	N/A	N/A
TOTAL BASED AC	109	109	113	119	125	131	0.00%	0.75%	0.85%	0.89%	0.92%
OPERATIONAL FACTORS											
Total GA OPBA	476	405	410	414	418	422	-14.82%	-2.93%	-1.39%	-0.86%	-0.59%
Local GA OPBA	134	111	111	108	106	104	-16.80%	-3.68%	-2.10%	-1.55%	-1.27%

Source: The LPA Group Incorporated, September 2009.

Chapter 4
Airfield Demand/Capacity Analysis

4.0 BACKGROUND

The purpose of performing a demand/capacity analysis is to compare the capacity of the existing airfield system to forecast operational demand, and to identify if and when capacity improvements may be required during the 20-year planning period. For Smith Reynolds Airport (INT), this was accomplished by comparing the theoretical capacity of the existing airfield system, as determined by the procedures outlined in **FAA Advisory Circular (AC) 150/5060-5**, *Airport Capacity and Delay*, to the *Forecasts of Aviation Demand* in **Chapter 3**. As described throughout this Master Plan Update, the Airport Commission of Forsyth County (ACFC) recognizes the importance of maintaining both Runways 15-33 and Runway 4-22 due in part to the following:

- The primary Runway 15-33 is surrounded on three sides by residential development (to the east, south, and west). In the past, nearby residents have expressed concerns about noise created by the jets that have regularly flown in and out of INT for maintenance.[1] Larger aircraft require the full length of the longer runway; however, smaller, lower flying aircraft have the option of using the smaller crosswind runway (Runway 4-22). Since smaller aircraft comprise a majority of repetitive flight training activity; the availability and utilization of a crosswind runway reduces noise impacts to nearby residential developments.

- "Another common practice is to assign individual primary runways to different airplane classes, such as, separating general aviation from non-general aviation customers, as a means to increase the airport's efficiency."[1] 6,661 jet operations were conducted at INT in 2008, many of which included commercial Boeing 737 jets which regularly visit the airport to undergo maintenance. Because jets fly at faster speeds and produce stronger wake turbulence than pistons, they require greater separations during approach and departure. As such, the ACFC wishes to maintain both runways so that a safe and efficient operating environment can be provided by creating a separation between larger (commercial and corporate) aircraft from smaller general aviation (recreational) aircraft.

Airport capacity is defined by the FAA as an estimate of the number of aircraft that can be processed through the airfield system during a specific period with acceptable levels of delay. As mentioned, airfield capacity was determined for Smith Reynolds Airport according to the procedures outlined in the *Airport Capacity and Delay AC*. This methodology does not account for every possible situation at an airport, but rather the most common situations observed at U.S. airports when the AC was adopted. Further, the *Airport Capacity and Delay AC* provides a

[1] FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, page 3.

methodology for determining the hourly runway capacity, the Annual Service Volume (ASV), and average expected delays. In this chapter, each of these factors was calculated for existing conditions and for every five-year interval of the 20-year planning period. An airport's hourly runway capacity expresses the maximum number of aircraft that can be accommodated under conditions of continuous demand during a one-hour period. It should be noted that the hourly capacity cannot be sustained for long periods or an airport will experience substantial increases in delay. The ASV estimates the annual number of operations that the airfield configuration should be capable of handling with minimal delays. The calculation of ASV considers the fact that a variety of conditions are experienced over a 12-month period, including periods of high and low volumes of activity. The average anticipated delay was based on a ratio of the forecast demand to the calculated ASV. These calculations, using the aforementioned FAA methodology, were based upon the airfield configuration as well as operational and meteorological characteristics, which are described in detail within the following sections.

4.1 AIRSPACE CAPACITY

The Air Traffic Control Tower (ATCT) at Smith Reynolds Airport is open every day from 6:45 a.m. to 9:30 p.m. The ATCT has the responsibility of coordinating aircraft approaches and departures within the airport's Class D airspace. The airport's class D airspace includes the airspace within four nautical miles of INT and extends from the surface to 2,500 feet above ground level (AGL). When the ATCT is closed and when aircraft are flying outside the coverage area, the FAA Terminal Radar Approach Control (TRACON) facility at Piedmont Triad International Airport (GSO) controls IFR traffic flying to and from INT. The main function of a TRACON facility is to control the airspace around airports with high traffic densities, which are typically associated by Class B and C airspaces. The TRACON coverage area includes airspace within a 30 to 50 mile radius up to 10,000 feet, as well as aircraft flying over that airspace.[2]

Discussions with INT's ATCT personnel revealed that there are occasional airspace conflicts between operational activity at INT and nearby GSO. Simultaneous aircraft approaches to Runway 33 at INT and to Runway 5R at GSO create traffic overlap and vertical separation (safety) concerns. It is important to note that GSO recently constructed a new parallel runway (Runway 5L-23R). Because of the new runway's orientation, its construction will not necessarily resolve existing conflicts and may actually cause additional problems in the future. However, ongoing upgrades to the national airspace system (NAS) and other technological developments such as NextGen and the associated satellite-based instrument approaches (e.g., Wide/Local Area Augmentation System), should provide positive contributions to safety and to the local and regional airspace capacity. The forecasted increases in activity levels should have little or no bearing on safety or the airspace capacity of INT.

[2] FAA Fact Sheet, Co-Located TRACONS, March 24, 2006.

4.2 AIRFIELD DEMAND/CAPACITY ANALYSIS

Airfield demand/capacity analyses seek to identify at what point, if any, during the 20-year planning period unacceptable levels of delay may be experienced by airport users, thereby triggering the need for airfield improvements such as additional taxiways, runways, or holding pads. The *Airport Capacity and Delay AC* provides a systematic approach for determining hourly runway and annual airfield capacities (i.e., the ASV), as well as the projected average hourly and annual delays. Each of these was calculated for existing conditions and for every five-year interval of the planning period. The results of the capacity calculations are presented in the following sections.

Hourly Runway Capacity

An airport's hourly runway capacity represents the maximum number of aircraft that can be accommodated under conditions of continuous demand during a one-hour period. It should be noted that typical hourly capacity cannot be sustained over long periods without substantially increasing delay. In evaluating hourly runway capacity, the following factors were considered:

- **Runway Configuration** – The number of runways at an airport and how they are positioned in relation to one another impacts how many arrivals and departures can occur within an hour. For example, if an airport has two runways that are oriented parallel to each other then it is generally possible to have arrivals and departures to both runways at the same time. However, if the two runways intersect, an aircraft departing from one runway must wait for operations on the other to be completed prior to starting its takeoff.

  Smith Reynolds Airport's existing airfield configuration consists of two intersecting runways, Runways 15-33 and 4-22. Both runways can be used simultaneously while land and hold short operations (LAHSO) are in effect. Specifically, LAHSO allows for Runway 33 approaches while operations are simultaneously being conducted on Runway 4-22. During LAHSO, the ATCT instructs pilots to land on Runway 33 and then to hold-short just before the intersection of the two runways until clearance to exit the runway is granted. Unlike a crosswind runway which is needed for weather-related purposes, the use of LAHSO on INT's intersecting runways allows for the simultaneous, but separated, operations by small flight training aircraft and large jets, thus providing enhanced capacity, reduced delays, and a more comfortable operating environment for all pilots.

  Based on discussions with ATCT personnel and a review of historical wind data, it was determined that the majority of INT's operations occur from the south on a northerly heading (i.e., takeoff and landing on Runway 33) or from the west on an easterly heading (i.e., takeoff and landing on Runway 4). This runway use configuration is best represented by **Diagram No. 75** in the *Airport Capacity and Delay AC, Figure 3-2.*

- **Runway Utilization** – The calculation of airfield capacity also considers runway utilization rates for Visual Flight Rules (VFR) and IFR conditions. The runway utilization rates shown in **Table 4-1** were determined through consultation with ATCT personnel and a review of

historical wind data. Since these runway utilization rates have the potential to change during the planning period, the airfield capacity calculations should be periodically reviewed for currency.

Table 4-1
Runway Utilization Rates

Runway End Use	VFR	IFR
15	15%	22%
33	40%	70%
4	25%	8%
22	20%	0%
Total	100.0%	100.0%

Source: The LPA Group Incorporated, September 2009.

- **Aircraft Mix Index** – In the *Airport Capacity and Delay AC*, the FAA classifies aircraft operations based on their Maximum Takeoff Weight (MTOW). The mix index is a calculated ratio of the aircraft fleet based upon the weight classification system shown in **Table 4-2**. As the number of heavier aircraft increases, so does the mix index. The hourly runway capacity generally decreases as the mix index increases because the FAA requires that heavier aircraft be spaced further apart from other aircraft for safety reasons (e.g., faster air speeds and greater wake turbulence).

  The aircraft mix index is calculated by adding the percent of Class "C" aircraft operations (in terms of total operations) to three times the percent of Class "D" aircraft operations (i.e., **C+3D**). During the planning period at Smith Reynolds Airport, no Class "D" operations are expected, but Class "C" operations are expected to comprise approximately 15 percent of total annual activity each year exclusively on Runway 15-33.

Table 4-2
Aircraft Fleet Mix Classifications

Aircraft Classification	Maximum Takeoff Weight (lbs)	Number of Engines	Wake Turbulence Classification	Sample Aircraft
A	12,500 or less	Single	Small	Cessna 172, Piper PA-28
B	12,500 or less	Multi	Small	Beechcraft King Air, Eclipse 500, Beech Baron
C	12,500-300,000	Multi	Large	Learjet, Gulfstream, Falcon, Boeing 737
D	Over 300,000	Multi	Heavy	B747, L1011, C-135 and C-141

Sources: FAA Advisory Circular 150/5060-5, Airport Capacity and Delay and The LPA Group Incorporated, September 2009.

- **Percentage of Aircraft Arrivals** – An arriving aircraft occupies a runway for a slightly longer period of time as compared to a departing aircraft. As such, the hourly runway capacity decreases as the percentage of aircraft arrivals increases. At INT, the percentage of aircraft arrivals is expected to remain at 50 percent throughout the planning period, or equal to the number of departures.

- **Percentage of Touch-and-Go Operations** – Pilots routinely practice landings and takeoffs by conducting touch-and-go operations, which involves an aircraft landing and then immediately departing without ever coming to a complete stop. This training exercise takes less time to conduct than normal landings where the aircraft departs the runway; therefore, as the number of touch-and-go operations increase, so too does the hourly runway capacity. Touch-and-go operations at INT are typically limited to small piston-powered aircraft. Based on a review of ATCT activity records for local operations, it was determined that touch-and-go operations generally represent 40 to 50 percent of all activity on Runway 4-22 and only a small fraction of Runway 15-33 activity.

- **Meteorological Conditions** – During periods of good visibility, pilots can operate based upon visual observation of other aircraft. As weather conditions deteriorate, (low visibility due to fog, clouds, or precipitation), pilots must rely on instrumentation to operate safely. The *Airport Capacity and Delay AC* considers two operating conditions based upon meteorological conditions – VFR and IFR. During IFR conditions, aircraft are spaced further apart, which lowers the hourly runway capacity. The inventory chapter included an analysis of historical wind data (years 1999 to 2008) from INT's on-site Automated Surface Observing System (ASOS). Since the existing airfield configuration was found to provide more than 95% wind coverage during All Weather, VFR, and IFR conditions, it can be assumed that the airfield configuration and location provide no significant limitations to capacity. Further, according to a review of historical wind data for the years 1999-2008, the airport experiences VFR, IFR, and Closed/Inoperable conditions approximately 88%, 10%, and 2% of the time, respectively.

- **Taxiway Configuration** – The number of taxiways available impacts the hourly runway capacity by influencing when an arriving aircraft will be able to exit the runway after slowing to a safe taxiing speed. The *Airport Capacity and Delay AC* defines optimum ranges for the distance a taxiway should be from the runway arrival end. Based on the methodology in the *Airport Capacity and Delay AC*, only Runway 33 arrivals are provided with enough exit taxiways to achieve the maximum "Exit Factor," which is used to calculate capacity. Therefore, if airfield capacity shortfalls were identified, the airport could benefit from additional exit taxiways. Further, any new development such as a taxiway, hold pad, or apron, may have the potential to improve capacity so long as it does not complicate the airfield configuration.

Considering the various input factors above, the methodology in the *Airport Capacity and Delay AC* was used to calculate the VFR and IFR hourly capacities for Smith Reynolds Airport as shown in **Table 4-3.** Then, based on operating conditions in year 2008, the VFR and IFR hourly capacities were used to calculate the weighted hourly runway capacity throughout the 20-year planning period. The weighted hourly runway capacity takes into account the percent of time each meteorological condition occurs (VFR, IFR, and Closed/Inoperable).

Table 4-3 Calculated Hourly Capacity			
Year	VFR	IFR	Weighted
2008	125	56	113
2013	125	56	113
2018	125	56	113
2023	125	56	113
2028	125	56	113

Source: The LPA Group Incorporated, September 2009.

Theoretical Annual Airfield Capacity

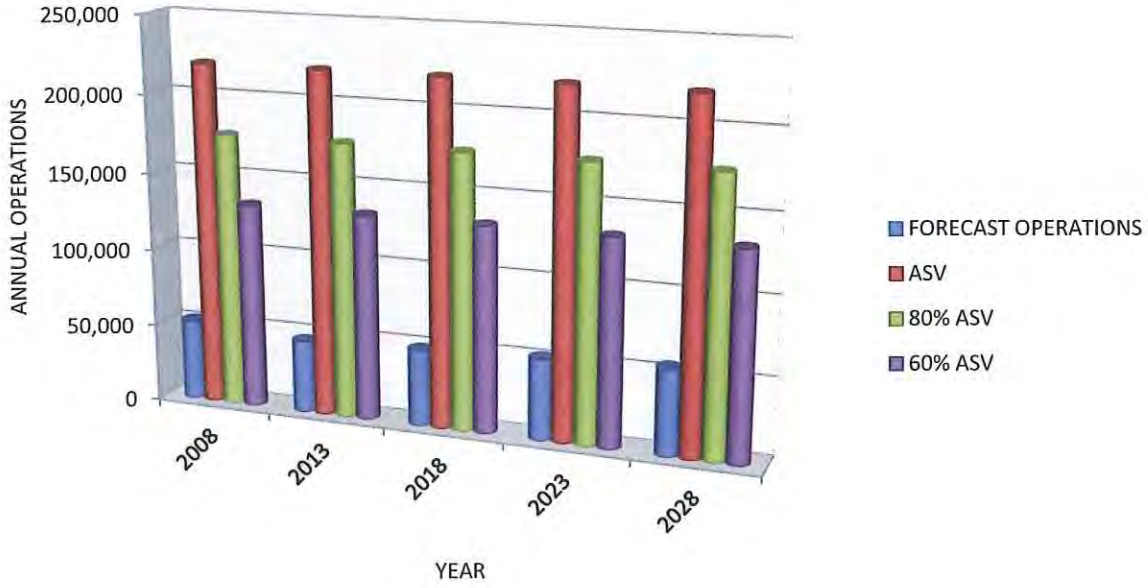
Using the calculated weighted hourly capacity, the *Airport Capacity and Delay AC* provides the methodology for determining the theoretical annual airfield capacity or the ASV. **Table 4-4** presents the results of the ASV calculations throughout the 20-year planning period. It is noted that the ASV is anticipated to remain stable because the mix of aircraft and operational characteristics of the airport are not expected to change drastically over the 20-year planning period.

Additionally, **Table 4-4** and **Exhibit 4-1** show the comparison of projected annual operational demand to theoretical ASV. According to the guidelines in **FAA Order 5090.3B**, *Field Formulation of the National Plan of Integrated Airport Systems*, once the actual demand exceeds 60 percent of the calculated ASV, planning studies should be undertaken to increase airfield capacity, and the construction of capacity improvements should begin once 80 percent of the calculated ASV has been reached. Due to the length of time it may take to implement some airfield improvements, this early planning facilitates the construction of capacity enhancing facilities to meet anticipated demands. As shown, airfield capacity is not expected to reach or exceed the 60 or 80 percent of ASV thresholds through the duration of the planning period.

Table 4-4 Calculated Annual Airfield Capacity			
Year	Annual Operations	ASV	Capacity Level
2008	51,839	210,000	23.56%
2013	46,391	210,000	21.09%
2018	49,036	210,000	22.29%
2023	51,988	210,000	23.63%
2028	55,274	210,000	25.12%

Source: The LPA Group Incorporated, September 2009.

Exhibit 4-1
Calculated Annual Airfield Capacity



Source: The LPA Group Incorporated, September 2009.

Annual Aircraft Delay

The average anticipated delay is based upon a ratio of the forecasted demand to the calculated ASV. In the *Airport Capacity and Delay AC*, the FAA acknowledges that the level of acceptable delay at one airport may differ from the level deemed acceptable at a similar airport. It is important to note that it is not only the delay time that determines acceptability, but also the frequency of delays.

Several methods exist for estimating anticipated delay levels. One method involves using a variety of charts in the *Airport Capacity and Delay AC* to estimate the average delay per aircraft based upon the ratio of annual demand to ASV. This delay per aircraft would then be used to calculate the annual delay for all operations. Another method utilizes software developed by the FAA *(Airport Design Software, Version 4.2d)* to determine the projected delay values. For this study, the anticipated delay values presented in **Table 4-5** were determined using the FAA software. As shown, the average delay per aircraft operation is expected to be minimal at INT throughout the planning period; therefore, the airfield should be able to function with limited congestion, which means that aircraft should be able to arrive and depart the airport with minimal queue times.

Table 4-5 Calculated Annual Airfield Capacity		
Year	Average Delay per Aircraft (Min)	Total Average Annual Delay (Hours)
2008	0.10	86.40
2013	0.10	77.32
2018	0.10	81.73
2023	0.10	86.65
2028	0.10	92.12

Source: The LPA Group Incorporated, September 2009.

Summary of Capacity and Delay

This chapter has indicated that the existing airfield system at Smith Reynolds Airport should be capable of handling projected capacity-related demands without the need for improvements during the 20-year planning period. A summary of these results is presented in **Table 4-6**. However, it should be noted that if activity exceeds forecast levels (such as a change in the aircraft fleet mix, airport's service role, etc.), a need for capacity enhancements such as additional taxiways, hold pads, aprons, etc. may ultimately arise.

Table 4-6 Summary of Airfield Capacity Analysis					
	2008	2013	2018	2023	2028
Hourly Capacity					
VFR Capacity Base	125	125	125	125	125
IFR Capacity Base	56	56	56	56	56
Weighted Hourly Capacity	113	113	113	113	113
Annual Airfield Capacity					
Annual Operations	51,839	46,391	49,036	51,988	55,274
ASV	210,000	210,000	210,000	210,000	210,000
%ASV	23.56%	21.09%	22.29%	23.63%	25.12%
Average Minutes of Delay per Aircraft Operation					
Low	0.10	0.10	0.10	0.10	0.10
High	0.10	0.10	0.10	0.10	0.10

Source: The LPA Group Incorporated, September 2009.

Chapter 5
Facility Requirements

An evaluation of aviation and non-aviation demand, operational requirements and capacity were identified to determine landside and airside facility requirements. This information provides the basis for the types and quantities of facilities necessary to meet both short and long-term needs over the twenty-year planning period. Using FAA guidance in conjunction with applicable local design standards and guidelines, airfield, support and landside facilities were identified in an effort to establish the long term role of the Smith Reynolds Airport within the State of North Carolina and the U.S. marketplace. This chapter identifies the adequacy of existing facilities, needed new facilities and the anticipated time frame for development in conjunction with the airport's long-range plans. This information would later be used to develop several airside and landside alternatives in Chapter 5.

5.0 AIRPORT REFERENCE CODE (ARC) CODE DETERMINATION

It is necessary to evaluate an airport's history of operational activities in order to determine the types of aircraft that currently operate at INT as well as those that are expected to operate regularly within the next 5 years. This determination is important because it establishes the required design and construction standards for both landside and airside facilities that will be recommended as a part of this master plan update. Rather than identifying a particular aircraft make and model, the FAA classifies aircraft into groups depending upon three factors including weight, wingspan, and aircraft approach speed. This identification and grouping of aircraft for a particular airport determines the airport reference code. FAA Advisory Circular (AC) 150/5300-13, Airport Design, defines Airport Reference Code (ARC) as the coding system used to relate airport design criteria to the operational and physical characteristics of aircraft operating or anticipated to operate at an airport. The ARC consists primarily of two components; the first component considers the aircraft approach speed which is depicted by a letter as shown in **Table 5-1** while the second component refers to the aircraft wingspan as shown in **Table 5-2.** As mentioned earlier, weight is also a factor that is often associated with ARC code. Aircraft weighing 12,500 lbs or less are classified as "small" aircraft; whereas, those aircraft weighing more than 12,500 lbs are considered "large" aircraft. At airports with small critical aircraft, the term "exclusively small aircraft" is referenced after the ARC code, i.e. ARC A-I (exclusively small aircraft).

Table 5-1 Aircraft Approach Categories	
Category A	Speed less than 91 knots.
Category B	Speed 91 knots or more but less than 121 knots.
Category C	Speed 121 knots or more but less than 141 knots.
Category D	Speed 141 knots or more but less than 166 knots.
Category E	Speed 166 knots or more.

**(Based on 1.3 times aircraft stall speed in landing configuration at maximum landing weight.)*
Source: AC 150-5300-13, Change 14.

Table 5-2 Airplane Design Group	
Group I	Wingspan up to but not including 49 feet.
Group II	49 feet up to but not including 79 feet.
Group III	79 feet up to but not including 118 feet.
Group IV	118 feet up to but not including 171 feet.
Group V	171 feet up to but not including 214 feet.
Group VI	214 feet up to but not including 262 feet.

Source: AC 150-5300-13, Change 14.

Typically, the critical aircraft is based on the aircraft with the longest wingspan and the highest approach speed that consistently makes substantial use of the airport. FAA Order 5090.3C, Field Formation of the NPIAS, defines substantial use as scheduled commercial service or 500 or more annual aircraft operations. The most recent Airport Layout Plan (1994) classified the Smith Reynolds Airport as a C-III which states that the airport's critical aircraft has an approach speed between 121kts and 140kts and has a wingspan between 79 feet to 117 feet. In order to verify the critical aircraft at INT, Enhance Traffic Management System Counts (ETMSC) were obtained from the FAA's website. ETMSC data recorded during 2007 and 2008 were specifically analyzed since this data comprised the latest two years of data recorded. A review of the 2007 and 2008 data revealed that the majority of operational activity at INT is performed by mid-sized jets and small privately owned aircraft. The mid-sized jet fleet includes such aircraft as the Cessna Citation II/Bravo/Encore, Bombardier Challenger 601, Falcon 2000, and the Learjet 60. The small privately owned aircraft fleet includes a variety of single-engine aircraft included Piper, Cessna, and Beechcraft models. However, a substantial amount of large commercial aircraft activity was performed by Boeing 737 aircraft. This activity is directly associated with the large maintenance hangar facility which performs a variety of services to this type of aircraft. A conclusive review of the data revealed that the Boeing 737 models performed the required 500 annual operations in both 2007 and in 2008. As such, the Boeing 737 was identified as the critical aircraft for INT which accurately verifies the C-III airport reference code. Runway 15-33 is used exclusively by 737 aircraft activity; therefore, this runway is designated as a C-III. Runway 4-22 was designed and constructed for smaller aircraft activity and is therefore designated as a B-II which has an approach speed between 91 knots and 120 knots and have wingspans ranging from 49' to 79'. **Exhibit 5-1** illustrates a sample of aircraft types within each approach category.

Aircraft - - - - - - - - - - - Cirrus SR22
Airport Reference Code - - - - - - - A-I
Wingspan - - - - - - - - - - - - - 38.3 ft
Length - - - - - - - - - - - - - - - 26.0 ft

Aircraft - - - - Beechcraft King Air 100
Airport Reference Code - - - - - - - B-I
Wingspan - - - - - - - - - - - - - 45.8 ft
Length - - - - - - - - - - - - - - - 39.9 ft

Aircraft - - - - - - Cessna Citation XLS
Airport Reference Code - - - - - - B-II
Wingspan - - - - - - - - - - - - - 56.3 ft
Length - - - - - - - - - - - - - - - 52.0 ft

Aircraft - - - - - - Hawker HS-125-700
Airport Reference Code - - - - - - - C-I
Wingspan - - - - - - - - - - - - - 47.0 ft
Length - - - - - - - - - - - - - - - 50.7 ft

Aircraft - - - - - - Bombardier CL-600
Airport Reference Code - - - - - - C-II
Wingspan - - - - - - - - - - - - - 61.8 ft
Length - - - - - - - - - - - - - - - 68.4 ft

Aircraft - - - - - - - - - Gulfstream G-V
Airport Reference Code - - - - - - D-III
Wingspan - - - - - - - - - - - - - 93.5 ft
Length - - - - - - - - - - - - - - - 96.4' ft

Aircraft - - - - - - - - - Boeing 737-500
Airport Reference Code - - - - - - C-III
Wingspan - - - - - - - - - - - - - 94.8' ft
Length - - - - - - - - - - - - - - - 119.6' ft

Aircraft - - - - - - - - - Boeing 757-200
Airport Reference Code - - - - - C-IV
Wingspan - - - - - - - - - - - - - 124.8' ft
Length - - - - - - - - - - - - - - - 155.3' ft

AVCON / LPA TEAM

Smith Reynolds Airport - Master Plan Update

Aircraft Fleet Mix and Associated Aircraft Reference Code (ARC)

5-1

DRAWING NO.

5.1 RUNWAY SYSTEM REQUIREMENTS

The most important component of any airfield is the runway. The runway must be of the proper length, width and strength to accommodate the critical aircraft safely. The FAA Advisory Circular AC 150/5300-13, Airport Design dictates the standards for runways at airports. FAA AC 150/5325-4B dictates the standards for determining runway length requirements at airports. The following sections reviews and evaluates the need for runway improvements at the Winston-Salem Airport.

Runway 15-33 Length Analysis

In order to identify the runway length requirements for INT, it was necessary to perform a runway length analysis in accordance with AC 150/5325-4B – Runway Length Requirements for Airport Design. The advisory circular requires that five steps be performed in order to identify the requirements for a particular facility. A summary of these requirements are listed below:

1) Identify the list of critical design airplanes that will make substantial use of the proposed runway for an established planning period of at least five years.
2) Identify the airplanes that will require the most demanding runway lengths at maximum certificated takeoff weight.
3) Apply the airplanes identified in step 2 to table 1-1 of AC 150/5325-4B in order to determine the appropriate grouping of aircraft and location of design guidelines.
4) Select the recommended runway length from the runway lengths obtained during step 3.
5) Apply necessary adjustments and/or correction factors to the obtained runway length generated previously during step 4.

Step 1 – Identify list of critical design airplanes

Although the Boeing 737 aircraft was identified earlier in this chapter as the critical aircraft for INT, it was important to review the runway length requirements for the business jet and commercial aircraft that regularly operate at the airport. **Table 5-3** illustrates a comparison of commercial and business jet that often operate at INT along with their associated performance and weights. As denoted in the table, the runway length and weight requirements associated with the larger commercial service aircraft superseded the requirements of the smaller business jet aircraft. The runway lengths shown are based on published lengths and assume standard aircraft weights and meteorological conditions.

Table 5-3 INT Aircraft Performance			
Aircraft	**Takeoff Performance (ft.)**	**Landing Performance (ft.)**	**Weight (lbs)**
Commercial Aircraft			
737-200(1)	6,680	4,580	116,000
737-300	6,660	4,580	124,500
737-400	7,730	4,880	138,500
737-500	6,100	4,450	115,500
737-700	6,700	4,500	154,500
Embraer ERJ 145EX	5,900	4,000	48,501
Business Jet Aircraft			
Astra 1125	5,300	3,500	23,500
Challenger 600,601,604	5,700	2,775	41,250
Citation III/VI/VII	5,150	3,220	23,000
Citation X	5,140	3,410	36,100
Falcon 900	4,680	5,880	45,500
Falcon 2000	5,240	5,220	35,800
Raytheon Hawker 800	5,380	4,500	28,000
Learjet 35	5,000	2,900	18,300
Learjet 60	5,360	3,420	23,500

Sources: Business Jet information obtained from FAA RGL 01-2, Commercial Aircraft information was obtained from Aviation Week & Space Technology, January 2001. Runway length requirements were calculated based on standard day +25d and maximum takeoff weight (MTOW).
(1) 737-200 with JT8D-15A Engines

Step 2 – Identify aircraft that require most demanding runway lengths

Some very large Boeing aircraft models such as the 757, 767, and the Boeing 737-900 aircraft regularly visit the airport; however, the combined total activity of these larger aircraft did not meet the FAA's requirements of 500 annual operations. For this reason, their associated performance and weights were not analyzed. A further review of the ETMSC data revealed that the Boeing 737-200 series aircraft was one of the most frequently utilized aircraft at INT. For this reason, the 737-200 series aircraft and its associated performance characteristics was used for further evaluation in steps 3 through 5.

Step 3 – Determine critical aircraft grouping

This 737 aircraft was applied to Table 1-1 shown on page 3 of AC 150/5325-4B to determine the critical aircraft grouping. This model falls into the category of aircraft weighing more than 60,000 lbs and therefore requires an analysis of individual aircraft performance data based on literature published by the aircraft manufacturer. **Table 5-4** illustrates the resulting analysis of takeoff length requirements and **Table 5-5** denotes the landing length performance as derived from Boeing's aircraft performance manuals. The length requirements of the aircraft shown in these tables are less than those shown previously in Table 5-3 because these runway length analyses took into consideration the weights of the aircraft that typically operate at INT. The Boeing 737 models that often visit INT are there for the purpose of receiving maintenance and upgrades that are performed at the ACFC Large Maintenance Hangar and therefore are not

carrying passengers. Hence, the runway lengths shown are based upon fully fueled aircraft without passengers.

Table 5-4 Aircraft Manufacturer Takeoff Performance		
Aircraft	**Weight (lbs)***	**Takeoff Performance (ft.)**
737-200	***92,000***	***5,200***
737-300	112,000	5,100
737-400	114,000	4,600
737-500	108,000	5,100
737-700	126,000	5,100

Source: Boeing aircraft performance manuals
Note: The takeoff performances shown are based on a fully-fueled aircraft without passengers during dry runway conditions (standard day+27°F).

Table 5-5 Aircraft Manufacturer Landing Performance	
Aircraft	**Landing Length Requirement (ft.)**
737-200	5,000'
737-300	5,300
737-400	5,400
737-500	5,300
737-700	***5,600***

Source: Boeing aircraft performance manuals
Note: The landing length requirements shown are based on the most demanding aircraft (engines) during wet runway conditions and at maximum design landing weight and with 40° flap settings.

Step 4 – Select recommended runway lengths from manufacturer performance data

As identified in the previous two tables, the two most demanding aircraft models are comprised of the 737-200 and 737-700 models. The 737-200 is the most demanding aircraft as far as takeoff performance is concerned with a requirement of 5,000 feet; whereas, the 737-700 had the most demanding landing performance requirements.

Step 5 – Apply adjustments to selected runway lengths

The final step of establishing runway length requirements involves taking the runway lengths determined in the previous step and then applying the necessary corrections to account for factors such as airport elevation, runway gradient, temperature, and also for wet runways. FAA AC 150/5325-4B states that wet runways should be used only to calculate landing length requirements; whereas, runway gradient differences are only applied to takeoff operations. However, temperature is applied to both landing and takeoff operational requirements. As noted in the footnotes of the landing performance table, the manufacturer charts had already taken into consideration wet runway conditions, temperature and airport elevation. Therefore, the only remaining variable to apply was the difference between runway centerline elevations (gradient).

The difference in elevation between runway ends 15 and 33 is 68'. The FAA recommends an additional 10 feet of runway length for each foot of runway elevation difference which therefore equates to an additional 680' of runway length for takeoff operations. The mean maximum temperature for the hottest month in Winston-Salem is 89°F. Since the aircraft performance charts already specified runway performance for a +27°F difference, the chart runway lengths were used to determine runway takeoff performance at INT. **Table 5-6** illustrates the resulting runway length adjustments for takeoff performance; whereas, **Table 5-7** illustrates the resulting runway length adjustment for landing performance, and **Table 5-8** illustrates the required standards for the B-II and C-III aircraft categories.

Table 5-6
Aircraft Manufacturer Takeoff Performance

Aircraft	Takeoff Performance (ft.) (A)	Runway Gradient (B)	Total Runway Length Requirement
737-200	5,200	+680'	5,880'

Source: Boeing aircraft performance manuals
The takeoff performances shown were based on a fully-fueled aircraft without passengers during dry runway conditions +27°F.

Table 5-7
Aircraft Manufacturer Landing Performance

Aircraft	Landing Length Requirement (ft.)(A)	Total Runway Length Requirement
737-700	5,600	5,600'

Source: Boeing aircraft performance manuals
Note: The landing length requirements shown are based on the most demanding model aircraft during wet runway conditions and at maximum fuel weight without passengers.

Tale 5-8
Runway Dimensional Standards

Item	B-II[1]	C-III
Runway Width	75 ft.	100 ft.
Runway Shoulder Width[2]	10 ft.	20 ft.
Runway Blast Pad Width	95 ft.	140 ft.
Runway Blast Pad Length	150 ft.	200 ft.
Runway Safety Area Width	150 ft.	500 ft.
Runway Safety Area Length Prior to Landing Threshold	300 ft.	600 ft.
Runway Safety Area Length Beyond RW End	300 ft.	1,000 ft.
Runway Object Free Area Width	500 ft.	800 ft.
Runway Object Free Area Length Beyond RW End	300 ft.	1,000 ft.

(1) Applies to Runways with not lower than ¾ mile approach visibility minimums.
(2) Design Groups V and VI normally required stabilized or paved shoulder surfaces.

A collective review of FAA criteria and individual aircraft performance revealed the runway length requirements at INT are adequate per FAA standards to accommodate the types of aircraft that currently operate and those that are forecasted to operate at the airport during the next 20 years. It should be noted that neither the ACFC, nor economists, nor airport planners have the ability to accurately predict which types of businesses and associated aircraft may operate regularly at INT in the future. As such, it is wise to make provisions to accommodate all

potential operational activity as a part of this study. A number of factors must be considered prior to extending or reconstructing the runway at INT including the cost to construct versus the financial gain attained by investing in an improvement of this magnitude. Therefore, it is recommended that the ACFC continue to monitor traffic in the future in order to reevaluate the need for extending Runway 15-33 in the future. Subsequent to identifying the need for a longer runway, the ACFC should conduct a cost-benefit analysis prior to committing to a specific extension length.

Runway 4-22 Length Analysis

Although the state will likely provide grant funding for ongoing maintenance and upkeep projects to Runway 4-22, it is unlikely that the airport will be able to obtain funds for an extension to this runway. Furthermore, Runway 4-22 is primarily used to accommodate small general aviation and corporate activity and is often utilized to conduct flight training activities. Larger general aviation aircraft that require more than the 3,938' of available runway are able use the main runway. For these reasons, no additional runway length is required nor recommended for Runway 4-22 at this time.

Runway Width Analysis

As mentioned earlier, Runway 15-33 is classified by FAA standards as a C-III runway; whereas Runway 4-22 is classified as a B-II runway. Per the FAA Advisory Circular AC/150 5300-13, the required runway width for a C-III runway is 100' and the required runway width for a B-II runway with not less than ¾ statute mile visibility minimums is 75'. Runway 4-22 has a width of 100' and Runway 15-33 has a width of 150'. As such, both runways currently exceed FAA standards for width.

Pavement Strength Analysis

It is vital that each runway be able to support the weight of the critical aircraft that regularly operate on the runway. The load of the aircraft comes to bear on the runway through the landing gear and these loads will be distributed differently depending upon the aircraft's wheel configuration. Because there are different landing gear configurations and because each configuration has a different footprint and load distribution, there are different expressions of maximum load bearing capacity of a runway. There are basically four descriptors used to delineate aircraft wheel loadings: S – Single Wheel (e.g. DC-3), D – Dual Wheel (e.g. 737), DT – Dual Tandem (e.g. 767), and DDT – Double Dual Tandem (e.g. 747).

Runway 15-33 – Most larger corporate jet and commercial aircraft that operate at INT utilize Runway 15-33 due to its available length. However, smaller single-wheel aircraft will also use this runway when weather conditions dictate. The airport's single-wheel strength is published at 110,000 lbs which is more than adequate to accommodate loads from these aircraft types. The airport's critical aircraft (Boeing 737) has a dual wheel gear configuration. The gross weights of this aircraft vary by model but generally range between 111,000 lbs. and 174,000 lbs. The heaviest of the fleet are comprised of the 800 and 900 series; however, the 200, 300, 400, 500,

and 700 series comprise a majority of 737 activities at Smith Reynolds. As mentioned earlier, most of the larger aircraft that regularly visit INT are visiting to receive maintenance and are therefore are not carrying passengers. As such, it is uncommon to see a 737 aircraft operating at gross weight. For this reason, the existing pavement strength is adequate for dual wheel activity. Although the airport is also given a dual-tandem rating for larger aircraft such as the Boeing 767, this type of aircraft activity is infrequent. The gross weight of the 767 aircraft varies by model from 300,000 lbs. to 450,000 lbs. However, as pointed out with the 737 aircraft, the 767s that visit INT are not carrying passengers and are therefore not operating at gross weight. Furthermore, the infrequency of these aircraft types do not dictate a design strength to support them since annually they perform less than 500 operations. This being said, the pavement strength for single wheel, dual wheel and dual tandem wheel aircraft is adequate to support the type of aircraft activities that are common at INT. It should be noted that although the pavement strength is given a rating that is associated with a type of wheel load, the pavement can support the occasional passage of aircraft with much a higher weight. However, if frequent passages by heavier aircraft are common, the pavement will likely deteriorate at a more rapid rate than was intended by design. The pavement strength for Runways 4-22 and 15-33 are displayed in **Table 5-9.**

Table 5-9
Pavement Strength

Landing Gear Configuration	Runway 4-22	Runway 15-33
Single Wheel Gear	40,000 lbs.	110,000 lbs.
Dual Wheel Gear	55,000 lbs.	135,000 lbs.
Dual Tandem Wheel Gear	90,000 lbs	230,000 lbs.

Source: The LPA Group Incorporated, March 2010.

Runway Safety Area Analysis

As a part of the runway safety area analyses, there are three runway safety area components that require review: Runway Safety Area (RSA), Runway Object Free Area (ROFA), and Runway Protection Zones (RPZ). The subsequent discussion details each safety area and presents potential resolutions to correct any non-standard conditions that were identified.

Runway Safety Area (RSA) – The RSA is centered on the runway center line and extends outward and beyond the runway ends. FAA AC 150/5300-13 states that the RSA shall be: (a) cleared and graded and have no potentially hazardous ruts, humps, depressions, or surface variations; (b) drained by grading or storm sewers to prevent water accumulation; (c) capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment and the occasional passage of an aircraft without causing structural damage. The RSA must be free of objects, except for those that need to be located within the safety area due to their function.

Runway Object Free Area (ROFA) – Similar to RSA, the ROFA is also centered on the runway center line and extends outward and beyond the runway ends. FAA standards for the ROFA require clearing the area of all ground objects protruding above the RSA edge elevation. Except

where precluded by other clearing standards, it is acceptable to place objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the ROFA. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the ROFA. This includes parked airplanes and agricultural equipment. **Table 5-10** illustrates the runway safety area and runway object free area dimensions and associated FAA standards for both runways at INT.

Table 5-10
Runway Safety Area Standards

	Runway 4-22			Runway 15-33		
	FAA Standards	**Runway 4**	**Runway 22**	**FAA Standards**	**Runway 15**	**Runway 33**
RSA						
Width	150'/75'(4)	150'/75'(4)	150'/75'(4)	500'/250'(4)	500'/250'(4)	(1)
Length (Beyond End)	300'	300'	***130'(2)***	1,000'	***980'(3)***	(1)
ROFA						
Width	500'/250'(4)	500'/250'(4)	500'/250'(4)	800'/400'(4)	800'/400'(4)	800'/400'(4)
Length (Beyond End)	300'	300'	***125'(2)***	1,000'	***865'(3)***	1,000'

Source: FAA AC 150/5300-13
(1) An engineered material arresting system was recently constructed at the end of Runway 33 which allows the runway to meet federal standards. The EMAS bed is 170ft. wide and 304 ft. long.
(2) Tree clearing and fence relocation required to meet RSA and ROFA standards at end of Runway 22
(3) Small portion of existing RSA and ROFA currently overlaps Liberty Street. near end of Runway 15
(4) Represents offset distance in each direction from runway centerline

Runway Protection Zone (RPZ) – The RPZ, or clear zone, is a two-dimensional trapezoidal shaped area beginning 200 feet from the runway's landing threshold. The primary function of this area is to preserve and enhance the protection of people and property on the ground. The size or dimension of the runway protection zone is dictated by guidelines set forth in FAA *AC 150/5300-13, Airport Design*. Airports are required to maintain control of each runway's RPZ. Such control includes keeping the area clear of incompatible objects and activities. While not required, this control is much easier to achieve and maintain through the acquisition of sufficient property interests in the RPZs. If the landowner and county cannot come to a sale agreement, property acquisition can be acquired through condemnation; however, this option should always be considered as a last resort due to the legal fees and associated delay that will be incurred as a component of this process. **Table 5-11** denotes the RPZ dimensions and associated FAA standards for both runways at INT.

Table 5-11
Runway Protection Zone Standards

	RW 4	RW 22	RW 15	RW 33
Inner Width	500'	500'	800'	1,000'
Outer Width	700'	700'	1,010'	1,750'
Length	1,000'	1,000'	1,700'	2,500'

Runway 15 – Approximately 20' of RSA currently extends beyond the airport property and into the vicinity of N. Liberty Street. This 20' could be recovered through the application of declared distances. Similarly, a small portion of ROFA (approximately 135') is currently being impacted by N. Liberty Street; however impacts to such a small section of the outer ROFA will likely be considered minor and may therefore be waived by the FAA. If not, the runway's declared distances, (Runway 33 landing and accelerate stop distance available) may have to be diminished to accommodate the entire ROFA and/or RSA. The ROFA associated with this runway currently appears to overlay aircraft parked along the northeast side of the ramp. However, due to the lower elevation of this ramp area, neither the aircraft nor the fuel farm in this area penetrates the invisible plain that defines the ROFA. For this reason, no corrective action is required.

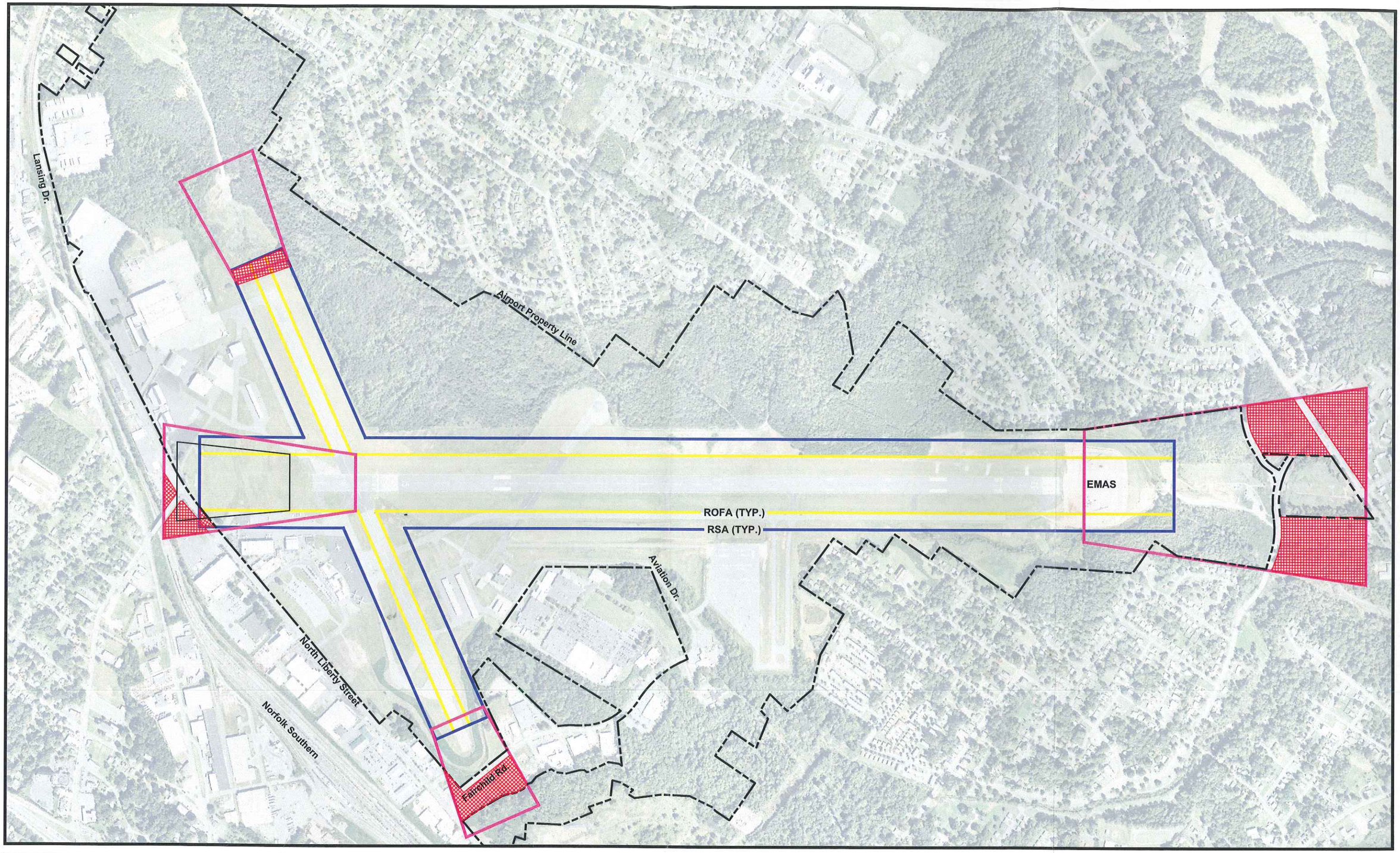
The associated runway protection zone (RPZ) currently covers several commercial / industrial businesses and residential properties that are located northwest of N. Liberty Street and in the vicinity of N. Glenn Ave. Since the airport property line terminates at N. Liberty Street, it is recommended that the airport either acquire easement over the adjacent properties or purchase these properties such that the airport retains an interest in the entire RPZ zone.

Runway 33 – Due to the recent construction of the engineering materials arresting system (EMAS), this runway now meets FAA requirements for runway safety area and runway object free area. However, the runway protection zone associated with this runway currently has some residences which are located south of Bowen Road and New Walkertown Road (311). It is recommended that the airport either purchase these properties or acquire easement to cover the entire RPZ area.

Runway 4 – This runway end meets the required safety and object free area requirements as stipulated by the FAA; however, the runway protection zone includes a few commercial / industrial buildings that should be located within airport property or within an airport easement. This being said, it is recommended that the airport either acquire an easement or purchase the properties located within the RPZ area.

Runway 22 – Both the runway safety area and object free area associated with this runway end are currently being encroached upon by a nearby fence and also by several trees and other types of vegetative growth. It is recommended that the trees and other vegetation be cleared a distance of 300' from the runway end and the fence be relocated outward a distance of approximately 160' from its current location in order to meet FAA standards. The entire runway protection zone is located within airport property and therefore complies with FAA standards.

Exhibit 5-2 graphically illustrates the evaluation of RSA, ROFA, and RPZ criterion.



AVCON / LPA TEAM

SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

Runway Safety Area Evaluation

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SCALE: 1" = 800'

5-2
DRAWING NO.

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5.2 TAXIWAY SYSTEM REQUIREMENTS

An efficient taxiway system is designed to provide freedom of movement to and from the runways and between the aviation related facilities and the runway systems of the airport. The taxiway system includes entrance and exit taxiways, taxiway run-up areas, apron taxiways and taxilanes. The FAA taxiway design standards are determined by the aircraft wingspan for the critical aircraft that routinely uses the taxiway. These standards allow an appropriate safety margin beyond the maximum wingspan for each Airplane Design Group. In the following section taxiways and their related connectors are analyzed for safety and compliance to FAA design standards. The standards for group I, II, and III aircraft wingspans are shown in **Table 5-12**; whereas, the existing taxiways, taxilanes, and associated connectors are detailed in **Table 5-13**.

Table 5-12
Taxiway Dimensional Standards

Item	I	II	III
Taxiway Width	25 ft.	35 ft.	50 ft.
Taxiway Shoulder Width	10 ft.	10 ft.	20 ft.
Taxiway Safety Area Width	49 ft.	79 ft.	118 ft.
Taxiway Object Free Area Width	89 ft.	131 ft.	186 ft.
Taxilane Object Free Area Width	79 ft.	115 ft.	162 ft.

Table 5-13
Existing Taxiway & Taxilane Inventory

Designator	Type	Width	Group Standard
A	TW	50 ft.	III
B	Connector	>50 ft.	III
C	Connector	>50 ft.	III
D	Connector	>50 ft.	III
E	Connector	>50 ft.	III
F	TW	50 ft.	III
H	TL	35–50 ft. (varies)	III
J	Connector	> 50 ft.	III
K	TL	35 ft.	II
M	Connector	35 ft.	II
N	Connector	35 ft.	II
O	TL	35 ft.	II
P	TL	35 ft.	II

A collective review of the various taxiways and taxilanes at INT revealed that most of the existing facilities currently comply with federal standards. However, taxiway H, which currently provides access to the nearby hangar structures, has a varying width from 35 ft. to 50'. Due to the number of large aircraft that would normally use this taxilane, it is recommended that the narrow sections of this taxiway be increased from 35' to 50' in the future such that it complies with group III standards.

Taxiway A Separation – Per FAA standards, the required runway to taxiway centerline separation distance for group C-III runways is 400'. The current separation distance between Taxiway A and Runway 15-33 is approximately 281'; thus, the existing taxiway would have to be shifted an additional 119' to the southwest order to meet FAA standards. The existing general aviation apron was constructed in consideration of these standards. As such, the ultimate relocation of Taxiway A will not encroach the required separation distance of the future taxiway alignment as related to the existing apron parking area. However, the FAA may choose to waive their published standards provided that the cost to comply is impracticable or provided that a determination is made that safety is not compromised. Any waiver of FAA standards would be documented and approved by the FAA in what is referred to as a "Modification To Agency Airport Design, Construction, And Equipment Standards". The request and process to submit such modifications is outlined in FAA Order 5300.1F.

5.3 AIRFIELD REQUIREMENTS

In addition to the runways and taxiways, other facilities and equipment help provide safe aircraft operations at INT. In this portion of the Facility Requirements chapter, each component of the airfield will be examined individually and evaluated in comparison to FAA criteria to identify safety deficiencies and substandard facilities. Additionally, improvements and upgrades that could improve service, capacity, or that may provide alternative benefits to the airport will also be discussed.

Instrument Approach Facilities

An important component to be evaluated involves an airport's ability to accommodate operations during instrument conditions. The following section compares the airport's current approach facilities to those currently available.

Runway 15/33 – Currently, the airport has an ILS or localizer approach to Runway 33, GPS approaches to Runways 15 and 33 and a VOR/DME approach to runway 15. To aid pilot visibility during instrument conditions, runway end identifier lights (REILs) are installed near the threshold of Runway 15; whereas, a medium intensity approach lighting system with runway alignment indicator lights (MALSR) is installed prior to the end of Runway 33. This runway currently has adequate approach instrumentation to meet demand through the planning period.

Runway 4/22 – Runway 4-22 currently does not have the instrumentation nor the lighting necessary to accommodate aircraft operations during instrument conditions. However, a GPS approach to both runway ends would benefit the traffic that normally use Runway 4-22 and could be implemented at a relatively low cost. Approach lighting would augment this approach by increasing runway visibility during IFR conditions. The most cost-feasible approach lighting solution is the runway end identifier lighting system (REILs) which are comprised of two flashing strobes positioned at the runway landing thresholds. For these reasons, it is recommended that the airport implement a GPS approach along with REILs to each runway end in the future. These improvements will be further discussed and investigated in the alternatives chapter of this report.

Airfield Lighting

Rotating Beacon – The rotating beacon at INT is located atop the Air Traffic Control Tower (ATCT) and stands approximately 35 feet above ground. The beacon is in good working condition and therefore requires no modifications or upgrades at this time.

Runway Edge Lights – Both active runways at INT have pavement edge lighting for increased visibility during nighttime and low-visibility operations. Runway 4-22 has medium intensity runway lighting (MIRL) installed on both sides of the runway, whereas Runway 15-33 has high intensity runway lighting (HIRL) installed. Because there is no air traffic control tower at the airport after 9:30 PM and before 6:45 AM, pilots can operate the runway lighting of Runway 15-33 through Common Traffic Advisory Frequency (CTAF). The lights on Runway 4-22 are not lighted while the tower is closed. The lights on both runways are in good condition and should only require ongoing maintenance throughout the remainder of the planning period.

Taxiway and Apron Lights – The primary taxiways (F & A) are equipped with Medium Intensity Taxiway Lighting (MITLs). The existing taxiway lights are in good condition. Any future taxiway improvements should include additional MITLs to supplement the existing system. Any future project required to repair or upgrade the existing system should also consider an upgrade to the more modern light emitting diodes (LED) lighting. This system uses less electricity than conventional taxiway lighting and the lights require very little maintenance. Outdoor fixtures and light poles currently provide lighting for apron areas. The existing lighting is adequate to allow aircraft to navigate the apron area. Any new or future apron improvements should include provisions for additional apron lighting.

Airfield Signage

Airfield signage at INT consists of lighted taxiway and runway signage and runway hold signage. Any future improvements to the airfield should include appropriate signage improvements as applicable. The existing signage at INT adequately provides pilots with the information required to safely navigate the airfield. Therefore, no improvements to existing signage is required or recommended at this time.

Pavement Markings

The existing airfield pavement markings are sufficient for both existing and future operations; however, the runway markings for Runway 4-22 should be upgraded in conjunction with the upgrade of future approaches. Specifically, if a GPS approach is implemented to Runways 4 or 22, the pavement should be re-marked to non-precision markings. Runway 15-33 is currently marked with non-precision and precision markings respectively. Thus, this runway is marked adequately for both existing and planned approaches throughout the remainder of the planning period.

Weather Instruments

The existing ASOS and wind cone equipment comprise the current on-field weather instruments at INT. This existing ASOS is adequate for the types of operational activity that frequently travel to and from INT. There are two wind cones located on the airfield; the first is co-located with the segmented circle on the north side of the airfield between Runway 22 and Taxiway F and the second is located near the end of Runway 33. Additional (supplemental) wind cones located at each runway end would provide additional crosswind information to pilots approaching and departing the runway ends.

Fuel Storage Requirements

As mentioned previously, Landmark Aviation is currently the sole provider of fuel at the Smith-Reynolds Airport. As shown in Table 5-14, Landmark maintains a combination of underground, above ground, and self-serve storage tanks that are collectively capable of storing up to 68,000 gallons of 100LL and Jet-A fuels.

Fuel sales data obtained from airport records denote that the typical ratio of Jet-A versus 100LL sold is approximately 91.58% and 8.42% respectively. Table 5-15 illustrates the fuel sales from November 2008 through October, 2009.

Table 5-14
FBO Existing Fuel Storage Facilities

Fuel Type	Fuel Storage Capacity
Jet A	50,000 gallons (2 tanks)
100LL	12,000 gallons (1 tank)
100LL (Self-Serve)	6,000 gallons (1 tank)
Total	68,000 gal

Source: Landmark Aviation, 2009.

Table 5-15
Fuel Flowage 2008 - 2009

Date	Total (gal)	100LL (gal.) (from truck)	100LL (self)	% 100LL (total)	Jet A (gal)	% Jet A
2008-Nov	87,207	4270	2200	7.42%	80,737	92.58%
2008-Dec	88,498	3773	1944	6.46%	82,781	93.54%
2009-Jan	88,498	3773	1944	6.46%	82,781	93.54%
2009-Feb	89,539	4145	2136	7.01%	83,258	92.99%
2009-Mar	80,491	4863	2505	9.15%	73,123	90.85%
2009-April	123,159	4364	2248	5.37%	116,547	94.63%
2009-May	100,462	4957	2553	7.48%	92,952	92.52%
2009-June	114,789	5670	2921	7.48%	106,198	92.52%
2009-July	95,498	5531	2849	8.78%	87,118	91.22%
2009-Aug	92,296	6525	3362	10.71%	82,409	89.29%
2009-Sept	77,798	8759	4512	17.06%	64,527	82.94%
2009-Oct	77,428	5370	2767	10.51%	69,291	89.49%
Total	**1,115,663**	**62,001**	**31,940**	**8.42%**	**1,021,722**	**91.58%**

Source: Airport Commission of Forsyth County (ACFC)

The historical operations data for INT stated that 51,839 operations occurred in 2008 and 44,158 are anticipated in 2009. The fuel sales data provided by the ACFC included 2 months in 2008 and 10 months in 2009. For this reason, a proportional relationship of operational activity was taken from each year to establish an operations number which reflects the fuel sales time period covered (45,437). Using this number, a ratio of fuel sold in gallons to number of annual operations was established (1.342 gallons of 100LL and 22.49 gallons of Jet-A). This ratio was then applied to the forecast of operational activity to determine the expected fuel sales through the remainder of the planning period. **Table 5-16** shows the anticipated annual and monthly fuel sales by type in relation to forecasted operational activity.

Table 5-16
Fuel Sales Forecast

Year	Ops Forecast	100 LL	Monthly Avg. 100 LL	Jet-A	Monthly Avg. Jet-A
2008	51,839	69,568	5,797	1,165,859	97,155
2009	44,158	59,260	4,938	993,113	82,759
2013	46,391	62,257	5,188	1,043,334	86,944
2018	49,036	65,806	5,484	1,102,820	91,902
2023	51,988	69,768	5,814	1,169,210	97,434
2028	55,274	74,178	6,181	1,243,112	103,593

As far as an airport's fuel storage capability is concerned, it is typically ideal to have adequate facilities to accommodate two weeks of fuel capacity during periods of normal demand. Under this assumption, fuel deliveries would occur regularly on a bi-weekly basis. Another way to view this is to assume that sufficient containment be provided to accommodate 50 percent of an average month's fuel sales by type. Based on the ratios established earlier and the number shown in Table 5-16, it was determined that the airport currently has adequate storage to accommodate 100LL sales through 2028; however a current deficiency of Jet-A storage exists. It should be noted that RJ Reynolds previously owned and maintained a private fuel farm which is located adjacent to their former hangar facility. Should an additional FBO be located at the airport in the future, this hangar and associated fuel storage facilities may be ideally suited to accommodate the airport's fuel storage requirements.

Based Aircraft Storage Requirements

This section evaluates INT's based aircraft storage requirements during the 20-year planning period. As described in Chapter 2, INT has a mix of hangar types and sizes (e.g., t-hangars, corporate hangars, and bulk hangars) and apron tiedown areas that accommodate the 109 based aircraft (comprised of 66 single-engine pistons, 13 multi-engine pistons, 12 turboprops, and 18 jet aircraft). This includes a total of 41 t-hangar bays, nearly 150,000 square feet of hangar space, and approximately 37,000 square yards of apron tiedown area. Based aircraft storage requirements are determined by developing a set of assumptions about storage preferences by aircraft type. As can be seen at INT, hangar storage is generally preferred to apron tiedown

storage because aircraft owners want to protect their expensive airplanes from harsh weather conditions, vandalism, and theft. Some degree of based aircraft tiedown storage is still desired for INT to accommodate the demands of recreational pilots and flight training organizations.

Table 5-17 presents the assumptions used to establish based aircraft storage requirements for INT's forecast of based aircraft. As shown, the construction of 22 t-hangar bays and 80,000 square feet of corporate hangar space would be needed to accommodate the forecast of 16 additional based aircraft by 2028. The existing based aircraft tiedown apron is more than sufficient to accommodate long-term demands. The calculated requirements are used as minimum evaluation thresholds in the alternatives analysis so that a variety of flexible development options can be presented.

Table 5-17
Based Aircraft Storage Requirements

Aircraft Type	Aircraft		Apron Tiedown %	T-Hangar %	Corporate Hangar %
	2008 Based	2028 Forecast			
Single-Engine Piston	66	66	20%	80%	
Multi-Engine Piston	13	13	20%	80%	
Turboprop	12	15			100%
Jet	18	29			100%
Helicopter	0	2			100%
Totals	**109**	**125**			
Requirement Per Aircraft (per current INT practices)			300 SY	1 Bay	5,000 SF
Existing Availability			37,000 SY	41 Bays	150,000 SF
2008 Requirement			4,800 SY	63 Bays	150,000 SF
2028 Requirement			4,800 SY	63 Bays	230,000 SF
2028 Deficiency			None	22 Bays	80,000 SF

Source: The LPA Group Incorporated, March 2010.
Note: Existing corporate hangar availability includes all aircraft storage hangars listed in Table 2-4, as well as the FBO hangar.

Aircraft Storage Requirements

Approximately 28,000 square yards of transient aircraft parking is provided on the aprons serving the passenger terminal building and Landmark Aviation. Requirements for transient aircraft parking are calculated as a percentage of peak day activity, depending upon the average length of stay for visiting aircraft. At INT, peaking events often require aircraft to remain parked for several hours if not overnight on the transient apron. According to **FAA AC 150/5300-13**, Airport Design, up to 50 percent of itinerant peak day operations may be used to calculate transient aircraft parking demand, with each aircraft requiring 360 square yards of apron area for parking and circulation. However, due to the volume of passenger drop-offs and pickups without an extended aircraft layover, a 40 percent itinerant peak day value was determined to be more appropriate for determining INT's transient aircraft parking requirement. Then, the calculated requirement was increased by a minimum of 10 percent to accommodate expansion needs for at

least the next two-year period. Using these procedures, **Table 5-18** presents the transient aircraft parking requirements for INT.

Table 5-18
Transient Aircraft Parking Requirements

Year	IT Peak Day Operations	Transient Requirement	Existing Availability	Deficit
2008	153	24,235 SY	28,000 SY	None
2013	137	21,701 SY	28,000 SY	None
2018	145	22,968 SY	28,000 SY	None
2023	154	24,394 SY	28,000 SY	None
2028	163	25,819 SY	28,000 SY	None

Source: The LPA Group Incorporated, March 2010.
Note: Itinerant peak day operations calculated as 59.14% of peak day operations from Table 3-21.

5.4 LANDSIDE REQUIREMENTS

The landside requirements include all facilities that are located along and beyond the airport perimeter and include criteria such as security fencing, passenger terminal, vehicular parking, and aircraft rescue and fire fighting (ARFF) requirements. The following sections detail the landside facility requirements for INT.

Airport Security

INT is categorized by the National Plan of Integrated Airports System (NPIAS) as a general aviation airport; however, as pointed out earlier, the airport maintains a FAR Part 139 Certificate due to the level of activity by unscheduled large aircraft, (charter operations in aircraft with at least 31 seats). There are prescribed requirements for those airports who maintain a FAR Part 139 certificate. Section 139.335 describes the requirements of public protection as follows:

> "§ 139.335 Public protection.
> (a) In a manner authorized by the Administrator, each certificate holder must provide—
> (1) Safeguards to prevent inadvertent entry to the movement area by unauthorized persons or vehicles; and
> (2) Reasonable protection of persons and property from aircraft blast.
> (b) Fencing that meets the requirements of applicable FAA and Transportation Security Administration security regulations in areas subject to these regulations is acceptable for meeting the requirements of paragraph (a)(l) of this section."

Due to the requirements associated with Part 139 certification, the airport currently meets or exceeds the security requirements prescribed for general aviation airports. Regardless, an analysis of security requirements as they apply to general aviation facilities is depicted in the following sections for reference.

In May of 2004, the Transportation Security Administration (TSA) developed Security Guidelines for General Aviation Airports. According to the TSA website, "this listing of recommended guidelines or "best practices" was designed to establish non-regulatory standards for general aviation airport security. Their primary purpose is to help prevent the unauthorized use of a general aviation aircraft in an act of terrorism against the United States" "Security Guidelines for General Aviation Airports constitutes a set of federally endorsed guidelines for enhancing airport security at GA facilities throughout the nation. It is intended to provide GA airport owners, operators, and users with guidelines and recommendations that address aviation security concepts, technology, and enhancements."

The Security Guidelines for General Aviation Airports provides a measurement tool that is used to assess vulnerability characteristics of each general aviation airport. The TSA's measurement tool applies points and ultimately a total score to each type of facility based on a variety of characteristics including its location relative to sensitive sites and to mass population areas, type and number of based aircraft, runway length, and also relative to the number and types of operations conducted. An evaluation of INT using the TSA's measurement tool revealed that due to the airport's proximity to downtown Winston-Salem and also due to the types and frequency of operational activity etc., the overall score given to INT was a **34**. By comparing this score (i.e., points) versus suggested guidelines shown in **Exhibit 5-3**, it is recommended that INT implement all security procedures and recommendations shown in the orange, green, and yellow categories. It should be reiterated that these are recommended best practices and not necessarily requirements; however, since the TSA document is the only guidance available for identifying security standards at general aviation airports, it was utilized to establish the security requirements for INT as a part of this master plan document.

Exhibit 5-3
TSA Suggested Security Enhancements for General Aviation Airports

Points/Suggested Guidelines			
>45	25-44	15-24	0-14
• **Fencing** (Section 3.3.3) • **Hangars** (Section 3.3.1) • **CCTV** (Section 3.4.5) • **Intrusion Detection System** (Section 3.4.6)			
• **Access Controls** (Section 3.3.3) • **Lighting System** (Section 3.3.4) • **Personnel ID system** (Section 3.3.6) • **Vehicle ID system** (Section 3.3.6) • **Challenge Procedures** (Section 3.4.1)			
• **LEO Support** (Section 3.4.4) • **Security Committee** (Section 3.4.3) • **Transient Pilot Sign-In/Out Procedures** (Section 3.1.4)			
• **Signs** (Section 3.3.5) • **Documented Security Procedures** (Section 3.5.1) • **Positive Passenger/Cargo/Baggage ID** (Section 3.1.1) • **All Aircraft Secured** (Section 3.2) • **Community Watch Program** (Section 3.4.1) • **Contact List** (Section 3.5.3)			

Source: TSA Security Guidelines for General Aviation Airports, Appendix B.

Passenger Terminal – Commercial Service Provisions

As stated earlier, commercial service was commonplace at INT from the 1940s through the year 2000. Although it is difficult to predict the future needs of the airlines in today's economy, the ACFC desires to preserve the airport's capability to accommodate regularly scheduled passenger service in preparation for any opportunities that may arise in the future. Thus, it was necessary to evaluate the existing landside and airside facilities in order to provide recommendations to satisfy commercial service activity needs. For the purpose of this discussion commercial service activity is defined as regularly scheduled airline service or on-demand charter service. It is important to note, that the sizing, location, and number of facilities that may be required will vary dependent upon a number of factors including: type of activity, size of aircraft being used, the frequency of daily flights, and the passenger throughput that will be satisfied on a daily/hourly basis. For the purpose of this evaluation, it was assumed that the terminal in its existing configuration has sufficient space to accommodate the passenger throughput demand generated by any future commercial activity.

An evaluation of INT's existing facilities revealed that there are a number of improvements that could be made to the existing terminal in order to better accommodate passengers. However, not all of the recommendations within will be required until activity increases such that it mandates an improvement to correct an identified deficiency. Thus, if commercial activity commences in the future, it is recommended that the ACFC re-assess its commercial service needs by way of a terminal and/or commercial service planning study. The following list of improvements would allow the airport to improve its capability to accommodate commercial service activity in the future:

Access Improvements – The existing parking lots and access roads are likely adequate to accommodate passenger needs throughout the remainder of the planning period; however, some traffic flow and access improvements would be beneficial. The entrance road, Norfleet Drive is currently two-way in front of the airport terminal and includes parking to the west for rental cars and parking to the east for tenants etc. The existing rental car and tenant curbside parking should be removed and the entrance road should be re-striped in order to provide two lanes of one-way traffic (loop). The easternmost lane would be dedicated to through traffic; whereas, the interior lane would be used for loading and unloading. The parking spaces adjacent the terminal would be dedicated to taxis and to other ground transportation services. By utilizing a portion of the existing lower level parking lot, an interior loop could be created thereby allowing terminal traffic to re-circulate without travelling back onto N. Liberty Street. Finally, as demand warrants, it may be prudent to consider installing a traffic lights at the entrance and exits of Norfleet Dr. and at N. Liberty Street in order to alleviate traffic congestion in the vicinity of the airport terminal during peak periods of enplanements and deplanements.

Baggage Improvements – The existing baggage belt located within the terminal is unusable and would therefore have to be upgraded or replaced, or an alternate method of delivering baggage would have to be implemented prior to initiating passenger service.

Smaller commercial aircraft activity could be accommodated by utilizing wheeled carts that are parked in a designated area for passenger pickups and drop-offs.

Pavilion / Covered Walkway – Passengers departing aircraft from the terminal ramp currently have no protection during poor weather conditions. Depending upon how the baggage improvements are accommodated, it may be beneficial to construct a pavilion structure outside the existing hold room area for baggage pickup and also such that shelter from elements could be provided for those passengers waiting to enter or for those exiting the hold room.

Hold Room Improvements – Security improvements developed following the events of September 11, 2001, require that passengers be sterile prior to entering the airside hold rooms. Thus, the Transportation Security Administration (TSA) screening area would be located between the existing terminal lobby and the hold room located on the eastern side of the terminal adjacent the ramp area. Unfortunately, the restrooms and vending areas are located on the unsecured side within the terminal lobby. As such, sterile passengers waiting for a departing flight have no access to restroom facilities or to food and drink. Thus, it is recommended that the airport construct new restrooms adjacent the existing hold room or that Hertz be relocated and the secure area be reconfigured to include the vending and restroom areas. The latter option will require the construction or the use of alternate restroom facilities to accommodate non-sterile personnel.

Signage Improvements – In conjunction with the previously recommended improvements, it may be necessary to install new exterior marking and signage to illustrate traffic flow and to indicate the location of ground transportation facilities. Furthermore, it may be necessary to install new interior signage as necessary to provide additional passenger information such as the locations of ticketing and restrooms etc.

Ticket Counters – The existing ticket counters are currently in good condition and are co-located with adjoining support offices that would be ideal for the administrative functions associated with on-demand charter and/or scheduled airline activity. Thus, the existing counters are likely adequate to meet both short and long-term commercial needs.

Auto Parking / Cell Phone Lot – The existing long-term parking lot which is located due west of the terminal contains approximately 285 spaces for use by passengers and by terminal employees. The existing parking area could potentially be utilized for passenger vehicles in its current configuration; however, a ticket spitter located at the parking lot entrance and perhaps a toll both located at the exit could generate additional revenues for the airport. These changes are only recommended if multiple commercial service flights occur weekly or if existing parking becomes a commodity during the planning period. Should commercial flights become a regular occurrence, it may also be necessary to identify an area within the auto parking lot for vehicles to park while they wait for arriving passengers. The identification of such would help alleviate congestion and

address security concerns associated with traffic parked along the terminal curbside for extended wait periods.

Vehicular Parking Requirements

The passenger terminal building at Smith Reynolds Airport comprises a total area of 34,620 square feet (including the ATCT) and is supported by 338 automobile parking spaces. According to the *Unified Development Ordinances of Winston-Salem/Forsyth County enacted July 7, 2008*, public airports require one parking space for every 200 square feet of waiting area. Therefore, even if the entire terminal building area was counted as waiting area, a maximum parking requirement of 173 spaces would be mandated. With the introduction of any new service such as commercial or on-demand charters based at INT, the most recent edition of the *Unified Development Ordinances of Winston-Salem/Forsyth County* should be reviewed to determine the appropriate parking space requirement. For all other airport facilities, the ordinance identifies parking requirements based on the principal use of each facility. For example, the parking requirement for many industrial facilities is one space per employee. Most facilities at INT are supported by a sufficient amount of parking to accommodate long-term demands. However, a deficiency was identified in the parking lot supporting Landmark's FBO/Maintenance facility which is frequently congested due to the small size and configuration of each lot. Opportunities to expand the parking lots around Landmark Aviation are investigated later in this Master Plan Update.

Air Rescue and Fire Fighting (ARFF) Requirements

The ARFF facility is located on the south side of the airfield between runways 4-22 and 15-33 and is accessible from N. Liberty Street by taking Fairchild Rd. to the west until it turns into Aviation drive. Aviation Drive leads directly to the ARFF facility, airport maintenance, the south t-hangar facilities, and also to the small maintenance hangar. The ARFF building includes three vehicle bays, as well as group bunkroom, a modern kitchen, and living quarters.

Since INT holds a FAR Part 139 airport operating certificate (AOC), it is required to provide ARFF services. ARFF equipment and staff requirements are based upon the longest passenger air carrier aircraft that has five or more daily departures at the airport. Smith Reynolds does not have five or more daily departures of any passenger air carrier aircraft; therefore, the airport is required to provide Index A capability - the most basic service required under FAR Part 139. **Table 5-19** illustrates the ARFF index determination based on aircraft length. Each higher index requires additional equipment and fire-fighting agents to handle progressively larger aircraft.

ARFF Index A - requires one vehicle with either 500 lbs of sodium-based dry chemical, halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of aqueous film forming foam (AFFF) to total 100 gallons for simultaneous dry chemical and AFFF application.

ARFF Index B – requires either one vehicle with 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF

for foam production or two vehicles, one equipped with 500 lbs of sodium-based dry chemical, halon 1211, or clean agent and one with an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons.

Table 5-19
FAR Part 139 ARFF Index Determination

Index	Aircraft Length
Index A	< 90 ft
Index B	90 ft – 125 ft
Index C	126 ft – 158 ft
Index D	159 ft – 199 ft
Index E	200+ ft

Source: FAR Part 139, Certification of Airports, 2006.

The ARFF equipment at INT includes one Oshkosh Striker ARFF truck equipped with 500 lbs of sodium-based dry chemicals, 210 gallons of AFFF agent for foam production, and 1,500 gal of water. Two additional trucks owned by Forsyth County are based at the ARFF station and typically respond to off-airport structural fires. One truck is equipped with a sufficient air supply for self-breathing apparatuses for firefighters and the other truck is equipped with additional fire suppression agents. These trucks also are available for airport emergency response, when necessary. It should be noted that Smith Reynolds maintains FAR Part 139 Index B ARFF requirements for equipment and agents; however, they do not for the number of staff on duty. The airport reports that additional staff can be scheduled if an air carrier requests Index B capabilities in advance.

The ARFF facility is staffed 24 hours per day and seven days per week by 11 ARFF certified firefighters that are employed by Forsyth County. At least three firefighters are on duty at any given time and two additional firefighters are available for swing-shifts. Six of the 11 employees are part-time firefighters. Additional Forsyth County firefighters may be available for airport emergency response, but they are not ARFF certified. The airport maintains mutual aid agreements with surrounding Forsyth County and City of Winston-Salem fire stations, should an emergency warrant additional response units. Forsyth County operates its central emergency services command center in facilities adjacent to the ARFF building. These facilities and associated personnel do not have airside access. Surface access to both the ARFF building and the emergency services building from Aviation Drive leads to Liberty Street.

5.5 SUMMARY

This section identified the facility requirements necessary to meet the twenty-year forecast of aviation demand. Prior to the physical layout of these facilities, specific refinement must be accomplished to enable the Airport to develop in a coherent and logical manner. **Table 5-20** provides a summary of the facility requirements that were determined necessary to satisfy the forecasts of aviation demand presented in this study. Additional development recommendations are provided within to either enhance the airport or to increase safety, revenues, or capacity.

Table 5-20 Summary of Facility Requirements	
Runway Safety Areas	
Runway Safety Areas (RSA)	Runway 22 end – clear trees and relocate fence in order to meet RSA requirements. Runway 15 end – implement/adjust declared distances to meet RSA requirements.
Runway Object Free Areas (ROFA)	Runway 22 end – clear trees and relocate fence to meet ROFA requirements. Runway 15 end – implement/adjust declared distances to meet ROFA requirements.
Runway Protection Zones (RPZ)	Recommend acquisition or purchase of easement to cover incompatible land uses within RPZs at runway ends 4,15, and 33.
Taxiways / Connectors	
Taxiway H	Increase width of Taxiway H from 35' to 50' to meet group III standards.
Taxiway A	Relocate Taxiway A to the southwest approximately 119' in order to meet FAA runway to taxiway center line separation standards
Approach Facilities	
Precision Approach	No recommendations
Non-Precision Approach	Implement GPS approaches to Runway 4 and 22 ends
Visual Landing Aids	Add runway end identifier lighting to both ends of Runway 4-22
Airfield Lighting	No recommendations
Airfield Signage	No recommendations
Pavement Markings	Upgrade Runway 4-22 pavement markings to reflect future approaches, non-precision markings.
Weather Instrumentation	Add supplemental wind cones to end of each runway 4,22,15, and 33
Fuel Storage	Install 50,000 gallon Jet-A tank or utilize RJ Reynolds farm in future.
Security Fencing	Secure / upgrade fencing in select locations as necessary to meet FAA standards.
Landside Facilities	
T-Hangar Facilities	Additional 22 Bays (minimum)
Corporate Hangar Facilities	Additional 80,000 SF (minimum)
Tie-Downs	No recommendations
Aircraft Parking Apron	
Transient Aircraft Apron	No recommendations
Based Aircraft Apron	No recommendations
Total Aircraft Parking Apron	No recommendations
General Aviation Terminal	No recommendations
Auto Parking	
Parking Lot	Expand parking lot in vicinity of Landmark FBO/Maintenance facility.

Source: The LPA Group Incorporated, March 2010.

Chapter 6
Alternatives Analysis

6.0 OVERVIEW

The primary objective of this chapter is to identify a preferred development alternative that the Airport Commission of Forsyth County (ACFC) can pursue for the Smith-Reynolds Airport (INT) to meet long-term aviation demand, satisfy FAA standards, and/or to improve efficiency or safety. The alternatives presented herein propose additional or replacement facilities as necessary to satisfy demand or to resolve the safety deficiencies that were both pointed out earlier in the forecast and facility requirements chapters. As a result, three functional areas were considered in identifying the development alternatives shown herein: 1) airside - runways, taxiways, and navigational aids, 2) landside - hangars, parking, access, etc., and 3) general airport requirements - ground access, support, and non-aviation land uses etc.

Because the number of possible of alternatives is virtually limitless, intuitive judgment was incorporated along with input received from the ACFC and airport management in order to produce development recommendations that provide the greatest potential for implementation.

6.1 DEVELOPMENT CONSIDERATIONS

In order to meet current and future aviation demand and to achieve the development goals of the ACFC, the airside and landside requirements that were previously identified were utilized as a baseline for future development. Prior to identifying a preferred development alternative, several criteria were evaluated. In general, similar criteria were used to measure the effectiveness and the feasibility of the various growth options available, and are grouped into four general categories:

- Operational – The selected development alternative should be capable of meeting the airport's facility needs as identified for the planning period. Preferred options should resolve any existing or future deficiencies as indicated by FAA design, safety, and security criteria.

- Environmental – Airport growth and expansion may impact both the airport and surrounding environs; therefore, the selected plan should seek to mitigate impacts both within and adjacent to the airport property. Alternatives should also seek to obtain a reasonable balance between expansion needs and off-site acquisition and relocation needs while being sensitive to potential environmental impacts.

- Cost – Some alternatives may result in excessive costs due to expansive construction, acquisition and/or other development requirements. In order for a preferred alternative to

best serve the airport and the community, it must satisfy development needs at a reasonable cost.

- Feasibility – The alternative concepts must be acceptable to the FAA, NCDOT Division of Aviation, Master Plan Steering Committee (MPSC), ACFC, and also by the community being served. In addition, the proposed developments should be economically feasible.

These evaluation criteria address economic, operational, environmental and other issues which are crucial to strategic long-term planning decisions. The following sections use these evaluation criteria to determine those alternatives which best meet the airport's long-term planning goals and development needs.

6.2 ORDER OF MAGNITUDE COST ESTIMATES

Because costs are always a factor when considering the proposed layout and subsequent selection of a preferred development alternative, order of magnitude estimates have been provided for each alternative presented. These costs were provided such that comparisons could be made between similar alternatives in order to facilitate the decision-making process. Linear costs were applied equally to all proposed developments despite the fact that real world per unit costs typically drop as the project size increases. The reasons for these drops include mobilization savings, increases in profit margins, and bid competitiveness relative to the project fee. For the purpose of these analyses and discussions it is most important that the construction values are applied equally for each type of development for all alternatives. In doing so, a fair comparison can be derived. For these reasons and because limited information was available during the time of these analyses, the costs provided are to be used for purposes of comparison only. More refined estimates of costs for the selected alternative will be provided later in the capital improvement chapter.

6.3 NO DEVELOPMENT ALTERNATIVE

Despite the identification of existing deficiencies and expected demand shown in earlier chapters of this report, one option that the airport may wish to consider is a no-development approach. This option does not resolve previously identified deficiencies and will not accommodate forecasted demand; however, this is always the lowest cost alternative due to the fact that the airport will not expend funds to construct improvements. Rather, airport expenditures will be limited to the rehabilitation, replacement, and/or maintenance of existing facilities only. This approach could limit the airport's growth potential and ultimately the forecasts of aviation activity presented earlier may be much less than forecasted due to inadequate or a lack of available facilities and/or capabilities.

6.4 INSTRUMENT APPROACH ALTERNATIVE

Prior to the development of landside alternatives, it was important to first establish the airport's planned improvements to the airport's instrument approach procedures. These improvements

could ultimately affect the size of the runway's Protection Zones (RPZs), safety and object free areas, and FAR Part 77 imaginary surfaces. The sizes of these protective zones and surfaces define the development boundaries that will be utilized later to establish the proposed location of future landside facilities.

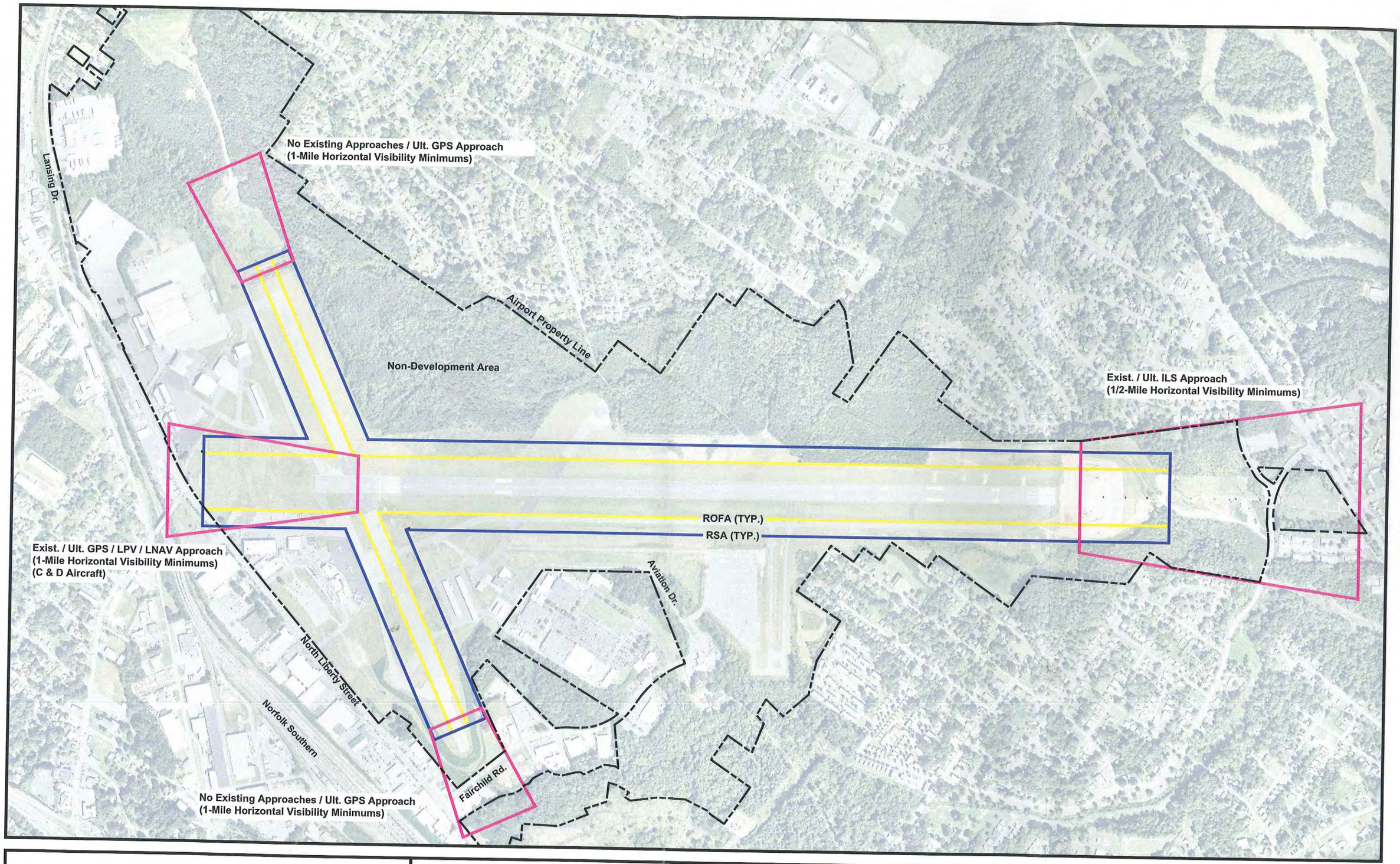
At INT, there are currently published approach procedures that pilots can utilize to navigate to Runways 15 and 33 during poor visibility conditions. The VOR/DME approach to Runway 15 is an approach procedure that allows pilots to use ground based VOR equipment to navigate to the vicinity of the airport. The visibility minimums for the VOR/DME approach are as low as 1 mile. Runways 15 and 33 also have multiple GPS approach procedures including a LPV, LNAV/VNAV, and GPS circling approaches. However, the Instrument Landing System (ILS) approach procedure for Runway 33 provides both vertical and horizontal navigation and allows pilots to navigate while horizontal visibility minimums are as low as 1/2 mile. INT's existing navigational capabilities to Runways 15 and 33 are currently sufficient for the types of activities that are conducted on the main runway; however, there are currently no published approach procedures which are available to Runways 4 or 22.

The installation of additional navigational aids and approach lighting to Runway 4-22 would allow the runway to be usable during low visibility conditions which could ultimately attract additional traffic. However, due to the proximity of the airport's terminal facilities, there is no feasible method to achieve minimums less than 1 mile for this runway. The reason for this is that doing so would increase the FAR Part 77 primary surface width from 500 feet to 1,000 feet which would then create a myriad of nonstandard conditions. Furthermore, reducing minimums lower than 1 mile would also increase the size of the RPZs which would also create incompatible land uses and additional nonstandard conditions. For these reasons, the recommended improvements to Runway 4-22's navigational aids and approaches are limited to the installation of a Runway End Indicator Lights (REILs) and Precision Approach Path Indicator (PAPI) lighting. The installation of such should allow the airport to implement GPS LPV approach procedures to the ends of Runway 4 and 22 which may allow the approach to achieve horizontal visibility minimums as low as 1 mile. It should be noted that any future recommendations within this study to illuminate, remove, or relocate existing obstructions may aid to improve (lower) the airport's decision height and/or horizontal minima. Hence, any planned navigational aid improvements should be performed in conjunction with any necessary tree removal or obstruction lighting and/or safety area improvements in order to achieve the lowest obtainable approach minimums. It should be noted that for the purposes of this planning study, it was assumed that both ends of Runway 4-22 would ultimately have approaches with minimums equal to or greater than 1 mile. **Exhibit 6-1** graphically depicts the existing and ultimate approaches and associated RPZs at INT and **Table 6-1** illustrates the RPZ dimensions as they relate to the approach speed and visibility minimums.

Table 6-1
Runway Protection Zone Dimensions

Approach Visibility Minimums	Facilities Expected To Serve	Dimensions			
		Length (L) feet	Inner Width (W1) feet	Outer Width (W2) feet	RPZ Acres
Visual and not lower than 1-mile	Small Aircraft Exclusively	1,000	250	450	8.035
	Aircraft Approach Categories A & B	1,000	500	700	13.770
	Aircraft Approach Categories C & D	1,700	500	1,010	29.465
Not lower than ¾ mile	All Aircraft	1,700	1,000	1,510	48.978
Lower than ¾ mile	All Aircraft	2,500	1,000	1,750	78.914

Source: FAA AC 150/5300-13.



AVCON / LPA TEAM

SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

Instrument Approach Alternative

0 400 800
SCALE: 1" = 800'

6-1
DRAWING NO.

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6.5 AIRSIDE AND LANDSIDE ALTERNATIVES ANALYSIS

As pointed out earlier in the facility requirements chapter, no additional runway length was deemed necessary to accommodate future activity at INT. For this reason, discussions of extending the airport's existing runways are limited within this chapter; however, the airport's intent to preserve such a capability is addressed within the high and preferred alternatives herein. Because all navigational aid and improvements to the airport's approach procedures had been discussed earlier, the only remaining planning elements to evaluate were the landside and airside facilities that would be necessary to accommodate future growth and demand through the remainder of the planning period. Because the development of such can directly affect one another, the remaining elements were evaluated and are therefore presented collectively in the following sections along with order of magnitude cost estimates. In order to facilitate the planning process, three development alternatives were discussed including: 1) a low development alternative, 2) a high development alternative, and 3) a preferred development alternative.

Low Development Alternative

The low development alternative reflects a constrained development scenario that provides basic improvements and allocations for new facilities as necessary to accommodate business and based aircraft growth throughout the 20-year planning period. The order of magnitude cost estimates for the low development alternative are shown in **Table 6-2**; whereas, a graphical depiction of the alternative is illustrated in **Exhibit 6-2**.

Commercial Hangar Development – On the northernmost portion of airport property, this alternative illustrates the proposed construction of three large hangars which are slated to be utilized for future Maintenance Repair and Overhaul (MRO) facilities. Each building contains approximately 50,000 square feet of space which collectively have a capacity of 150,000 square feet.

Auto Parking – In support of the three MRO facilities, an 85,000 square foot parking lot has been shown north and adjacent to the hangar facilities. Based on 500 square feet per space, the proposed lot should provide up to 170 spaces, or approximately 56 spaces per hangar.

Land Development – This alternative depicts two land development areas which are located on the west and northeastern portions of airport property. The western property includes approximately 13.8 acres of land that currently contains an apron area for general aviation aircraft parking. The future uses of this area include the construction of t-hangars, box hangars and additional apron as necessary to accommodate parking and aircraft storage for corporate and recreational aircraft types. The northeastern property is currently undeveloped and includes approximately 23.3 acres of property that can be utilized for corporate development, air cargo, and/or small to medium MRO facilities.

Access Improvements – A new access road has been shown which extends from

Lansing Drive in the vicinity of Conrad Street to the east side of the airfield. The two-lane road will extend a distance of approximately .9 miles and will provide access to future eastside development areas.

Land and Easement Acquisition – Because the low development alternative depicts a minimum development solution, only one 8.1 acre swath of land acquisition which is located near the end of Runway 33 has been depicted which would increase the airport's developable property. Conversely, there are multiple parcels of easement acquisition shown within the RPZs or as needed for obstruction removal which has been shown with a yellow net pattern. This land is to be acquired via easement or acquisition in order to ensure land use compatibility within the RPZs. In total, approximately 8.1 acres of land is shown to be acquired and approximately 46.4 acres of additional easement is shown to be acquired. It is important to note that these acquisitions can be avoided altogether if the county can demonstrate that appropriate zoning controls are in place that will prevent incompatible development in these areas.

Terrain Obstruction – The green area located east of Runway 15-33 illustrates where the terrain currently penetrates the runway object free area and imaginary surface planes as described in FAR Part 77. In total, approximately 24.2 acres of property needs to be re-graded to resolve this deficiency. The soil removed from this area could potentially be utilized to relocate Taxiway A and/or to prepare the 23.3 acre northeastern development site for MROs, air cargo, or corporate aircraft.

New Airfield Pavement Construction - All proposed new airfield pavement has been graphically illustrated in purple. In the northernmost portion of property, a new taxilane connector has been shown which provides access to the proposed north MRO facility. Also, within the MRO facility, the construction of a 242,000 square foot apron area is illustrated as needed for hangar frontage. Finally, a partial taxiway connector has been shown which leads from the end of Runway 22 to the proposed eastside development area. The proposed taxiway will allow aircraft to utilize to cross access existing facilities or utilize Runway 22 or Taxiway F to access alternate portions of the airfield.

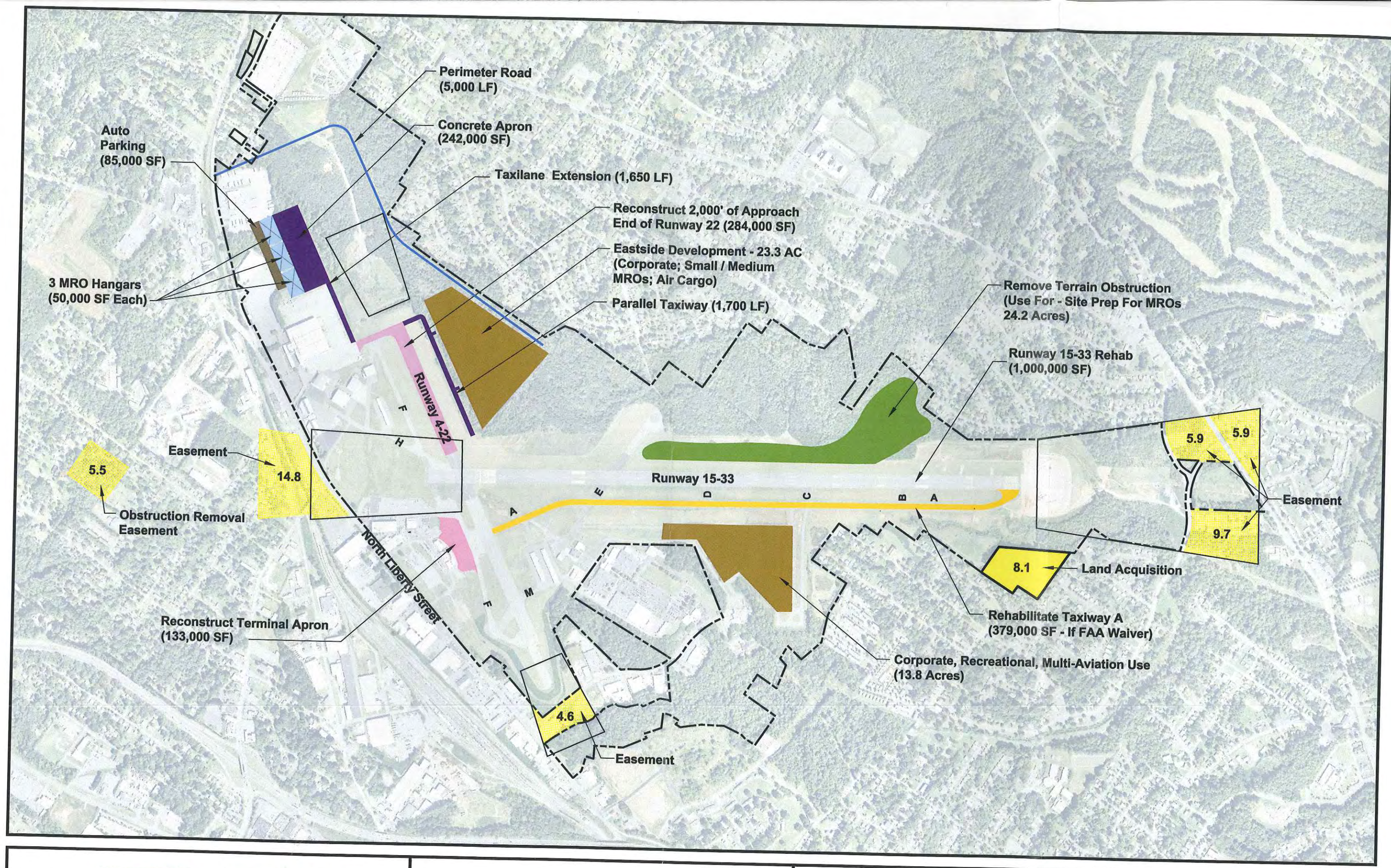
Pavement Rehabilitation – As pointed out earlier in the facility requirements chapter, the existing separation from Runway 15-33 to Taxiway A centerline is less than required per FAA AC 150/5300-13, Airport Design. However, the proposed scenario assumes that a modification of design standards waiver will be approved by the FAA which will allow the taxiway to remain in-place and continue to function as is. The entire length of Taxiway A, (approximately 379,000 square feet), is in need of rehabilitation and has therefore been depicted in orange.

Pavement Reconstruction – There are two pavement areas located on the airfield that are currently beyond repair and therefore need to be reconstructed. As depicted in pink, approximately 2,000 linear feet of pavement located near the end of Runway 22 is in poor condition and cannot be repaired. Similarly, the pavement located adjacent to the terminal

facility is also in poor condition and therefore needs to be reconstructed. In total, both projects include approximately 417,000 square feet (or 9.6 acres) of newly reconstructed asphalt pavement.

Table 6-2
Order of Magnitude Costs – Low Development Alternative

Quantity	Unit	Item Description	Unit Cost	Total Cost
133,000	SF	Reconstruct Terminal Apron	$8	$1,064,000
150,000	SF	Construct 3 Hangars (MROs – 50,000 SF EA)	$85	$12,750,000
82,500	SF	Taxilane Extension (1,650 LF)	$21	$1,732,500
85,000	SF	Construct Auto Parking	$7	$595,000
242,000	SF	Construct Concrete Apron North	$14	$3,388,000
108,000	SF	Construct Perimeter Access Road (5,000 LF)	$7	$756,000
284,000	SF	Reconstruct 2,000 LF Approach End - Runway 22	$8	$2,272,000
1,015,000	SF	Develop East Corporate, MROs, Air Cargo	$14	$14,210,000
84,000	SF	Construct East Parallel Taxiway	$21	$1,764,000
1,054,000	SF	Remove Terrain Obstruction / Site Prep	$2	$2,108,000
1,000,000	SF	Runway 15-33 Rehab	$8	$8,000,000
379,000	SF	Rehab Taxiway A (FAA waiver)	$8	$3,032,000
603,000	SF	Develop Corp, Rec, Multi-Aviation Use Facility	$14	$8,442,000
1	LS	Obstruction Removal Land Easement Acquisition	$20,000	$20,000
		Total – Low Development Alternative		**$60,133,500**



AVCON / LPA TEAM

SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

Low Development
Alternative

0 500' 1,000'
SCALE: 1" = 1,000'

6-2
DRAWING NO.

High Development Alternative

The high development alternative reflects an unconstrained development scenario that provides improvements and allocations for new facilities as necessary to accommodate business and based aircraft well beyond the 20-year planning period. The order of magnitude cost estimates for the high development alternative are shown in **Table 6-3**; whereas, a graphic depiction of the alternative is illustrated in **Exhibit 6-3**.

Commercial Hangar Development - On the northernmost portion of airport property, this development alternative illustrates the proposed construction of two 50,000 square foot hangars which are slated to be utilized for future MRO facilities. In addition, this alternative depicts another very large hangar (203,000 square foot) that mimics the airport's existing maintenance hangar which is occupied by Piedmont. Collectively, the three hangars will provide approximately 303,000 square feet of space for additional aviation maintenance, cargo, or other aviation related activities. In addition to hangar construction, this alternative illustrates the construction of a 16,000 square foot executive terminal which sis shown to the southwest of the existing terminal facility.

Auto Parking – In support of the commercial hangar developments, two parking lots are shown on the high development alternative. The northernmost provides parking for the large hangar and contains 76,000 square feet of space. Based on 500 square foot per vehicle space, the northernmost lot should provide up to 152 parking spaces. The lot to the south supports the two 50,000 square foot hangars and contains 63,000 square feet of space which should provide up to 126 spaces in total or 63 spaces for each hangar.

Land Development – Two land development areas are shown located on both the west and northeastern portions of airport property. The western property includes approximately 13.8 acres of land that currently contains an apron area for general aviation aircraft parking. The future uses of this area include the construction of t-hangars, box hangars and additional apron as necessary to accommodate parking and aircraft storage for corporate and recreational aircraft types. The northeastern property is currently undeveloped and includes approximately 23.3 acres of property that can be utilized for corporate development, air cargo, and/or small to medium MRO facilities.

Access Improvements – In support of the proposed developments shown to the east of Runway 15-33, a new access road has been depicted on this alternative which extends from Lansing Drive in the vicinity of Conrad Street to the east of Runway 33. The road which will have two lanes that will extend a distance of approximately 1.75 miles and will provide access to those facilities that are to be located to the east of Runway 15-33 and/or south of Runway 22.

Land and Easement Acquisition – Similar to the low development alternative, land acquisition related to those areas which are necessary to increase the airport's developable property has been shown in solid yellow; whereas, easement acquisitions are shown with a yellow net pattern. Land areas located within the RPZs or for construction removal are to

be acquired via easement or acquisition in order to ensure land use compatibility within the runway protection zones. Unlike the previous alternative, the high development alternative includes many additional parcels of land which will allow the airport to expand its developable property envelope. The high development alternative includes 29.7 acres of proposed property acquisitions and 46.4 acres of easement acquisition of those properties located within RPZs or as needed for obstruction removal.

Terrain Obstruction – A green area located east of Runway 15-33 illustrates where the terrain currently penetrates the runway object free area and imaginary surface planes as described in FAR Part 77. In total, approximately 24.2 acres of property needs to be re-graded to resolve this deficiency. The soil removed from this area could potentially be utilized to relocate Taxiway A and/or to prepare the 23.3 acre northeastern development site for MROs, air cargo, or corporate aircraft.

New Airfield Pavement Construction – In the northernmost portion of property, a new taxilane has been shown which provides access to the proposed north MRO facilities and associated apron areas. Collectively, the new taxiway and apron areas encompass approximately 623,000 square feet of additional pavement (14.3 acres). This exhibit also illustrates a 1,062 foot runway extension and associated parallel taxiway that will allow Runway 4-22 to reach an overall length of 5,000 feet. Also included is a parallel taxiway with connectors which is located east of Runway 15-33 and includes 430,000 square feet of new pavement. This taxiway and associated connectors will ultimately provide airfield access to future development areas to be located on the eastern side of the airfield. In addition, this exhibit illustrates the relocation and reconstruction of Taxiway A which is located west of Runway 15-33. The reconstruction resolves the nonstandard separation issue and would therefore avoid having to operate under a modification of design standards. Included in this alternative is a 118,000 square foot expansion of the existing terminal apron and realignment of Taxiway F which would remove the existing bulge and allow it to meet separation standards for ADG-II aircraft. In total, the high development alternative includes the addition of 1,453,300 square foot (33.36 acres) of additional runway, taxiway and apron area.

Pavement Rehabilitation – As indicated in orange, there are two pavement areas within this alternative that are proposed to be rehabilitated. Approximately 273,000 square feet of runway pavement located between the end of Runway 4 and the intersection of Runways 4/22 and 15/33 is shown to be rehabilitated along with approximately 81,000 square feet of Taxiway F.

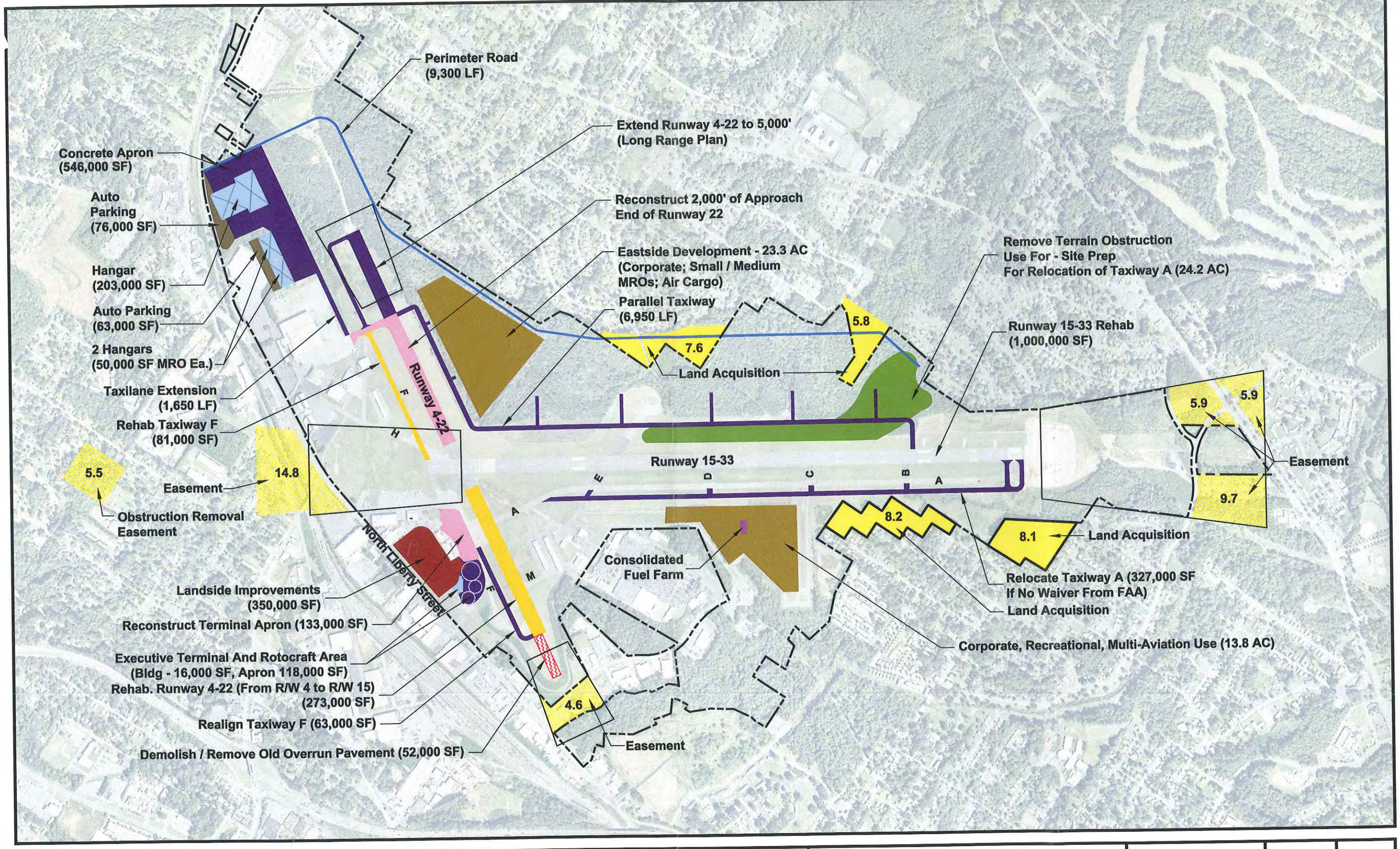
Pavement Reconstruction – There are two pavement areas located on the airfield that are currently beyond repair. As depicted in pink, approximately 2,000 linear feet of pavement located near the end of Runway 22 is in poor condition and is therefore in need of reconstruction. Similarly, the pavement located adjacent to the terminal facility is also in poor condition and therefore needs to be reconstructed. In total, both projects include approximately 417,000 square feet (or 9.6 acres) of asphalt reconstruction.

Terminal Landside Improvements - The proposed landside improvements shown on this alternative include a reconfiguration of the existing airport terminal parking and access. The proposed reconfiguration creates two exit lanes and one entrance lane within both the north and south terminal access roads. Furthermore, the proposed improvements include the creation of short and long-term parking facilities along with a defined curbside drop-off /access lane. These improvements are graphically depicted in **Exhibit 6-4**.

Pavement Removal – In addition to the aforementioned improvements, the high development alternative includes the removal of approximately 52,000 square feet of existing pavement which is located near the end of Runway 4. This pavement is in poor condition and is not required for safety area and is therefore not needed.

Consolidated Fuel Farm – 100LL and Jet-A fuel storage is currently located in multiple locations at INT. In the future, airport management would like to consolidate all of its fuel storage into one centralized location. For this reason, a location to accomplish this was identified within the corporate, recreational, multi-aviation use area depicted on the western side of the airfield, centered on Runway 15-33.

Table 6-3 Order of Magnitude Costs – High Development Alternative				
Quantity	**Unit**	**Item Description**	**Unit Cost**	**Total Cost**
133,000	SF	Reconstruct Terminal Apron	$8	$1,064,000
118,000	SF	Construct Rotorcraft Apron	$14	$1,652,000
273,000	SF	Rehab Runway 4 from 4 to RW 15	$8	$2,184,000
63,000	SF	Realign / Reconstruct Taxiway F	$8	$504,000
52,000	SF	Demolish Runway 22 Overrun Pavement	$4	$208,000
350,000	SF	Landside Improvements	$7	$2,450,000
100,000	SF	Construct 2 Hangars (MROs – 50,000 SF EA)	$85	$8,500,000
82,500	SF	Taxilane Extension (1,650 LF)	$21	$1,732,500
63,000	SF	Construct Auto Parking	$7	$441,000
76,000	SF	Construct Auto Parking	$7	$532,000
203,000	SF	Construct Large Hangar	$85	$17,255,000
16,000	SF	Executive Terminal	$85	$1,360,000
1	LS	Consolidated Fuel Farm	$700,000	$700,000
1,000,000	SF	Runway 15-33 Rehab	$8	$8,000,000
546,000	SF	Construct Concrete Apron North	$14	$7,644,000
215,000	SF	Construct Perimeter Access Road (9,300 LF)	$7	$1,505,000
284,000	SF	Reconstruct 2000 LF Approach end - Runway 22	$8	$2,272,000
160,000	SF	Extend Runway 22 by 1,062' to 5,000' (including taxiway extension)	$21	$3,360,000
81,000	SF	Rehab / Overlay Taxiway F	$8	$648,000
1,015,000	SF	Develop East Corporate, MROs, Air Cargo	$14	$14,210,000
344,000	SF	Construct East Parallel Taxiway	$21	$7,224,000
1,054,000	SF	Remove Terrain Obstruction / Site Prep	$2	$2,108,000
327,000	SF	Relocate / Reconstruct Taxiway A (no FAA waiver)	$8	$2,616,000
603,000	SF	Develop Corp, Rec, Multi-Aviation Use Facility	$14	$8,442,000
7.6	AC	Land Acquisition	$4,000	$30,400
5.8	AC	Land Acquisition	$4,000	$23,200
8.2	AC	Land Acquisition	$4,000	$32,800
8.1	AC	Land Acquisition	$4,000	$32,400
1	LS	Obstruction Removal Land Acquisition	$20,000	$20,000
		Total – High Development Alternative		**$96,750,300**



AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	High Development Alternative	0 500' 1,000' SCALE: 1" = 1,000'	6-3 DRAWING NO.

AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	Terminal Landside Development Alternative	0 40 80 SCALE IN FEET		6-4 DRAWING NO.

6.6 PREFERRED DEVELOPMENT ALTERNATIVE

The preferred development alternative is basically a hybrid of the previously illustrated high and low development alternatives but also includes some elements that were not previously discussed. This scenario provides improvements and allocations for new facilities as necessary to accommodate business and based aircraft beyond the 20-year planning period. The order of magnitude cost estimates for the high development alternative are shown in **Table 6-4**; whereas, a graphic depiction of the alternative is illustrated in **Exhibit 6-5**.

Commercial Hangar Development - On the northernmost portion of airport property, the preferred development alternative illustrates the proposed construction of three large hangars shown in light blue which are slated to be utilized for future MRO facilities. Each building contains approximately 50,000 square feet of space which have a collective capacity of 150,000 square feet. In addition to the northernmost hangar development, a 16,000 square foot Executive Terminal is shown north of the proposed rotorcraft apron and south of the landside improvements area. The intent of this building is to provide a facility for transient pilots and passengers to access restrooms, weather, and/or to relax while they are waiting for fuel or for their passengers to arrive.

Auto Parking – In support of the three planned MRO facilities, an 85,000 square foot parking lot has been shown north and adjacent to the hangar facilities. Based on 500 square foot per space, the proposed lot should provide up to 170 spaces, or approximately 56 spaces per hangar.

Land Development – Two land development areas are shown to be located on both the west and northeastern portions of airport property. The western property includes approximately 13.8 acres of land that currently contains an apron area for general aviation aircraft parking. The future uses of this area include the construction of t-hangars, box hangars and additional apron as necessary to accommodate parking and aircraft storage for corporate and recreational aircraft types. The northeastern property is currently undeveloped and includes approximately 23.3 acres of property that can be utilized for corporate development, air cargo, and/or small to medium MRO facilities.

Access Improvements – In support of the proposed eastern developments, a new access road has been shown which extends from Lansing Drive in the vicinity of Conrad Street. The proposed two-lane road will extend a distance of approximately 1.75 miles and will provide access to those facilities that are to be located to the east of Runway 15-33 and/or south of Runway 22.

Land and Easement Acquisition – Land acquisition related to areas which lie within the RPZs has been shown in yellow or with a net pattern. An easement or acquisition is necessary in these areas to ensure land use compatibility within the airport's RPZs. In addition to easements, the preferred development alternative includes the acquisition of additional parcels of land which will allow the airport to expand its developable property

envelope. In total, 46.4 acres of easement and 29.7 acres of property acquisition are shown on the preferred development alternative.

Terrain Obstruction – A green area located east of Runway 15-33 illustrates a location where the terrain currently penetrates the runway object free area and imaginary surface planes as described in FAR Part 77. In total, approximately 24.2 acres of property needs to be re-graded to resolve this deficiency. The soil removed from this area could potentially be utilized to prepare the 23.3 acre northeastern development site for MROs, air cargo, or corporate aircraft.

New Airfield Pavement Construction – In the northernmost portion of property, a new taxilane has been shown which provides access to the proposed north MRO facilities and associated apron areas. Collectively, the new taxiway and apron areas encompass approximately 324,500 square feet of additional pavement (7.45 acres). This exhibit also illustrates the proposed reserving of land for a 1,062 foot extension of Runway 4-22 that will ultimately allow the runway to reach a length of 5,000 feet. In addition, a parallel taxiway with connectors has been shown to the east of Runway 15-33 which includes 347,500 square feet of new pavement. This taxiway and associated connectors will ultimately provide airfield access to future development areas to be located on the eastern side of the airfield. Included in this alternative is a 118,000 square foot expansion of the existing terminal apron and realignment of Taxiway F (63,000 square foot) which removes the bulge in the taxiway and allows it to meet separation standards for ADG-II aircraft. In total, this exhibit includes the addition of 853,000 square foot (19.58 acres) of additional runway, taxiway and apron area.

Pavement Rehabilitation – As indicated in orange, there are three pavement areas within the proposed development alternative that are shown to be rehabilitated. These areas include Taxiway F (81,000 square feet) and a large section of Runway 4 pavement (273,000 square feet) which located between the intersection of Runway 15 and Runway 4. The third and final area includes an overlay of Taxiway A which consists of approximately 379,000 square feet of pavement. In total, the preferred development alternative includes the rehabilitation of approximately 740,000 square feet (16.9 Acres) of pavement.

Pavement Reconstruction – There are two pavement areas located on the airfield that are currently beyond repair and therefore need to be reconstructed. As depicted in pink, approximately 1,800 linear feet of pavement located near the end of Runway 22 is in poor condition and is therefore beyond repair. Similarly, the pavement located adjacent to the terminal facility is also in poor condition and therefore also needs to be reconstructed. In total, both projects include approximately 417,000 square feet (or 9.6 acres) of asphalt reconstruction.

Terminal Landside Improvements – The proposed landside improvements shown on this alternative include a reconfiguration of the existing airport terminal parking and access. The proposed reconfiguration creates two exit lanes and one entrance lane within both the north and south terminal access roads. Furthermore, the proposed improvements include the

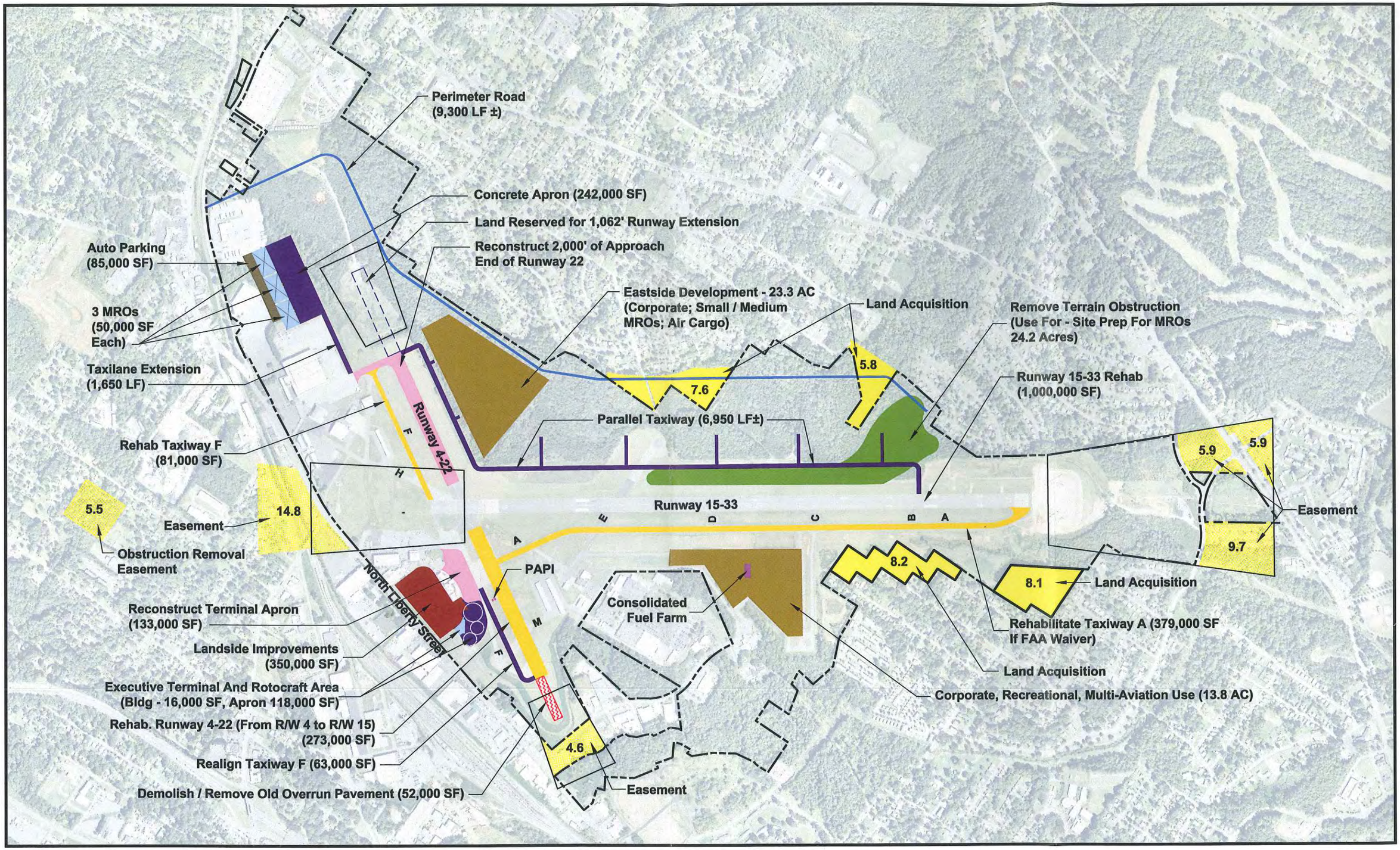
creation of short and long-term parking facilities along with a defined curbside drop-off /access lane. These improvements were graphically depicted earlier in **Exhibit 6-4**.

Pavement Removal – In addition to the aforementioned improvements, the high development alternative includes the removal of approximately 52,000 square feet of existing pavement which is located near the end of Runway 4. This pavement is in poor condition and is not required for safety area and is therefore not needed.

Consolidated Fuel Farm – 100LL and Jet-A fuel storage is currently located in multiple locations at INT. In the future, airport management would like to consolidate all of its fuel storage into one centralized location. For this reason, a location to accomplish this was identified within the corporate, recreational, multi-aviation use area depicted on the western side of the airfield, centered on Runway 15-33.

Table 6-4
Order of Magnitude Costs – Preferred Development Alternative

Quantity	Unit	Item Description	Unit Cost	Total Cost
133,000	SF	Reconstruct Terminal Apron	$8	$1,064,000
63,000	SF	Realign / Reconstruct Taxiway F	$6	$378,000
273,000	SF	Rehab Runway 4 from 4 to RW 15	$8	$2,184,000
52,000	SF	Demolish Runway 22 Overrun Pavement	$4	$208,000
118,000	SF	Construct Rotorcraft Apron	$14	$1,652,000
350,000	SF	Landside Improvements	$7	$2,450,000
150,000	SF	Construct 3 Hangars (MROs – 50,000 SF EA)	$85	$12,750,000
82,500	SF	Taxilane Extension (1,650 LF)	$21	$1,732,500
16,000	SF	Executive Terminal	$85	$1,360,000
85,000	SF	Construct Auto Parking	$7	$595,000
242,000	SF	Construct Concrete Apron North	$14	$3,388,000
215,000	SF	Construct Perimeter Access Road (9,300 LF)	$7	$1,505,000
284,000	SF	Reconstruct 2,000 LF Approach end – Runway 22	$8	$2,272,000
81,000	SF	Rehab / Overlay Taxiway F (north)	$8	$648,000
347,500	SF	Construct East Parallel Taxiway	$21	$7,297,500
1	LS	Consolidated Fuel Farm	$700,000	$700,000
1,000,000	SF	Runway 15-33 Rehab	$8	$8,000,000
1,015,000	SF	Develop East Corporate, MROs, Air Cargo	$14	$14,210,000
1,054,000	SF	Remove Terrain Obstruction / Site Prep	$2	$2,108,000
379,000	SF	Rehab Taxiway A (FAA waiver)	$8	$3,032,000
603,000	SF	Develop Corp, Rec, Multi-Aviation Use Facility	$14	$8,442,000
46,000	SF	Construct T-Hangars in Corp, Rec, Multi-Use Area	$20	$920,000
7.6	AC	Land Acquisition	$4,000	$30,400
5.8	AC	Land Acquisition	$4,000	$23,200
8.2	AC	Land Acquisition	$4,000	$32,800
8.1	AC	Land Acquisition	$4,000	$32,400
1	LS	Obstruction Removal Land Acquisition	$20,000	$20,000
		Total – Preferred Development Alternative		**$77,034,800**



AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	Preferred Airport Development Alternative	0 500' 1,000' SCALE: 1" = 1,000'	6-5 DRAWING NO.

6.7 POTENTIAL ENVIRONMENTAL IMPACTS

An environmental overview was conducted earlier as a component of Chapter 2 to identify those environmental considerations that could potentially affect future airport development. Resource categories of concern included water quality and wetlands, light emissions and visual effects, hazardous materials, social impacts such as environmental justice, and noise. Guidelines provided in FAA Order 1050.1E, Environmental Impacts and Procedures, were reviewed to determine the level of environmental documentation needed to satisfy the requirements of National Environmental Policy Act of 1969 (NEPA). The anticipated permitting requirements were also considered.

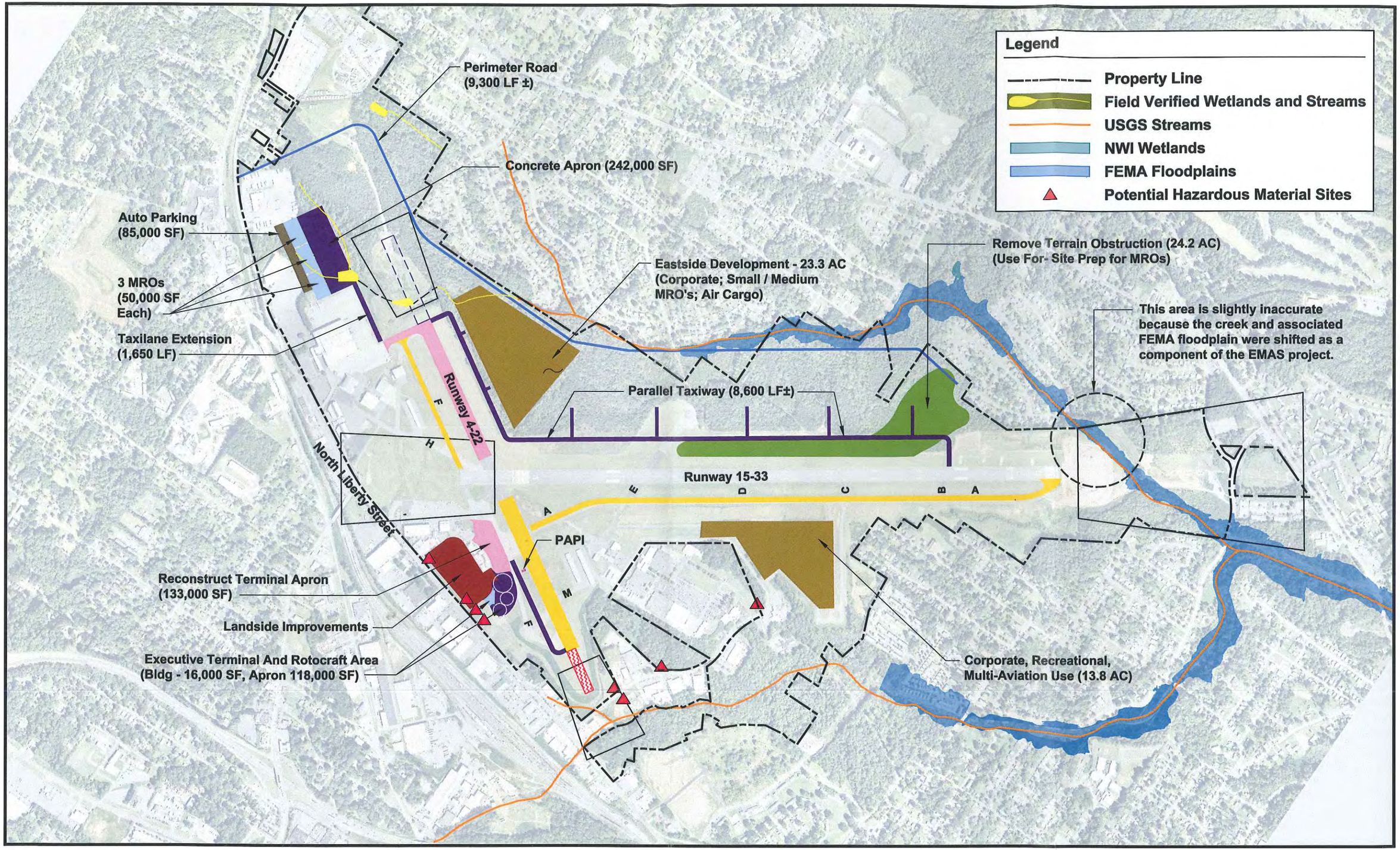
Preferred Airport Development

The preferred airport development alternative was evaluated relative to the environmental resources identified earlier in Chapter 2. Several of the projects depicted involve the reconstruction, overlay, or rehabilitation of existing airport facilities and thus any environmental impacts associated therewith would be minimal. It is important to note that although all projects shown on the preferred alternative were evaluated, only those that demonstrated the potential of causing environmental impacts are discussed in the following sections. Once identified, the steps required to address any environmental concerns have also been discussed. Those environmental considerations that were identified for each improvement project are discussed in the following sections.

Water Quality and Wetlands

One environmental consideration pertaining to new construction would be the potential water quality impacts associated with the creation of impervious surfaces at INT, which could result in additional stormwater management requirements. As indicated in **Exhibit 6-6**, the proposed new construction projects include:

- Auto Parking (85,000 square feet),
- MRO's (50,000 square feet),
- North Apron (242,000 square feet),
- Perimeter Road (9,300 linear feet),
- East Parallel Taxiway,
- Executive Terminal (16,000 square feet),
- Rotorcraft Area (118,000 square feet),
- Eastside Development Area, and
- Corporate, Recreational, Multi-aviation Use Development Area.



AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	Environmental Impacts	0 500' 1,000' SCALE: 1" = 1,000'	6-6 DRAWING NO.

Other proposed development could result in impacts to jurisdictional waters of the United States that are associated with Brushy Fork Creek, including construction of the following projects:

- Taxilane Construction (1,650 linear feet)
- North Apron (242,000 square feet)
- Perimeter Road (9,300 linear feet)

These impacts would occur to the north of the airport, where a jurisdictional determination has been previously verified by the USACE and NCDENR. The tributary to Brushy Fork Creek to the southwest is graphically depicted on **Exhibit 6-6** but has not been field verified.

Hazardous Materials

Based on the results of a regulatory records search,[1] the proposed improvements that would be located in close proximity to potential hazardous material sites or hazardous materials generators include:

- Corporate, Recreational, Multi-aviation Use Area
- Terminal Apron Reconstruction, Landside Improvements
- Executive Terminal and Rotorcraft Area

Additional investigations may be needed prior to construction activities in order to identify potential contamination.

Light Emissions and Visual Effects

The proposed improvement projects that would involve clearing of currently wooded areas on Airport property adjacent to residential development include:

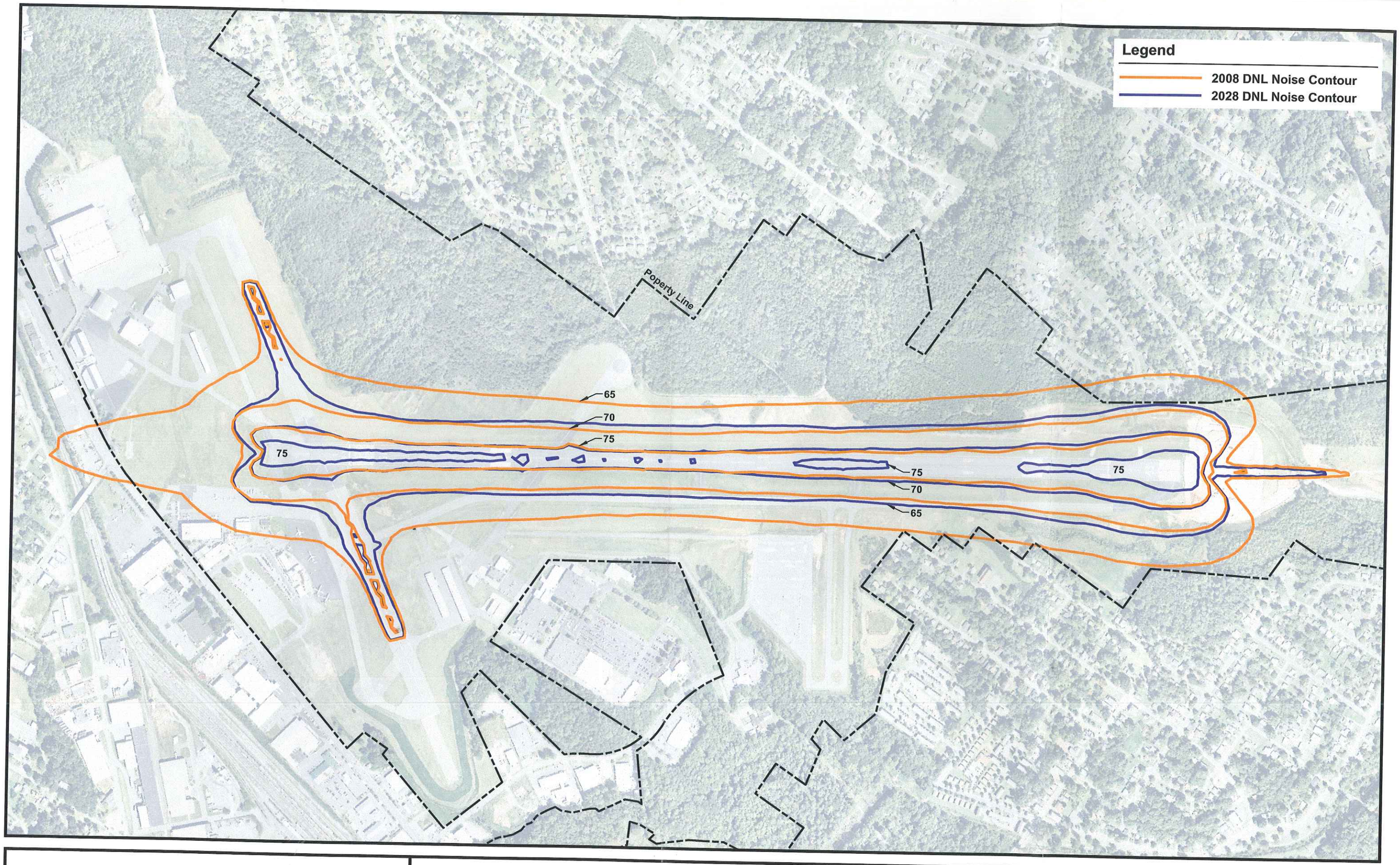
- Eastside Development Area
- East Parallel Taxiway
- Removal of Terrain Obstructions (24.2 acres)

Construction of the proposed parallel taxiway would provide access for additional future development to the east of the airport. Maintaining a wooded buffer between airport development and the adjacent residential areas would minimize the impact of light emissions off site.

Social Impacts and Environmental Justice

Due to the residential development adjacent to INT, proposed future land acquisition could result in social impacts, including the potential relocation of multiple residences and one church located south of the airport. In addition, minority and low-income environmental justice

[1] Environmental FirstSearch Technology Corporation, Job Number: PL725001-03, September 3, 2009.



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SMITH REYNOLDS AIRPORT
MASTER PLAN UPDATE

2008 and 2028 DNL Noise Contours

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SCALE IN FEET

6-7
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populations were identified adjacent to the airport[2] (refer to **Table 2-12** in Chapter 2). Proposed future land acquisition should be evaluated to determine if there are disproportionate impacts to these populations.

Noise Impacts

As part of this Master Plan Update for INT, an evaluation of existing and future noise exposure was conducted using the FAA's Integrated Noise Model (INM) computer program (Version 7.0b). The following sections document the assumptions, inputs, and findings of the INM analyses for the following two scenarios: 1) 2008 Existing, and 2) 2028 Future. These analyses should be viewed as a generalized evaluation of airport noise exposure for comparative purposes only. Moreover, the associated noise contours were not developed to the precision required for Federal Aviation Regulations (FAR) Part 150 Noise Studies.

The activity assumptions below were developed based on conversations with personnel from the INT Air Traffic Control Tower (ATCT) and review of ATCT records and FAA databases. They are intended to represent the most prevalent operating characteristics.

- Touch-and-Go Activity Flow – 60% Runway 4, 40% Runway 22
- Other Fixed-Wing Activity Flow – 30% Runway 15, 70% Runway 33
- Helicopter Activity – Begins and ends on Runway 4-22 near terminal apron
- Day/Night Activity Split – 95% Day, 5% Night

The FAA-approved operations forecast presented earlier in Chapter 3 was used to develop the INM inputs for years 2008 and 2028. As shown in **Table 6-5**, the 2008 inputs by aircraft type were determined by reviewing FAA flight plan records from the Enhanced Traffic Management System Counts (ETMSC) database. In the INM software, 11 aircraft were selected to represent INT's existing and future activity mix. According to FAA flight plan records, the majority of INT's corporate jet activity is comprised of medium-sized jets which are best represented by the CNA55B (Citation V) aircraft. Although the airport still receives occasional operations by loud/old Stage 2 corporate jets like the Lear 25, the frequency of Stage 2 corporate jet operations is expected to decline year-to-year as the planes are retired from service (all new jets are subject to Stage 4 aircraft noise standards). Larger corporate jet activity is also common at INT by Citations, Gulfstreams, and Falcons, and a steady increase is expected during the forecast years because these longer-range jets are now the preferred option of many corporations due to longer-range, more passengers, reduced costs, etc. Daily operations by commercial jets are also expected to continue at a steady level through 2028, with older models (e.g., Boeing 737-200) gradually phased-out as airlines modernize their fleets. While some Very Light Jet (VLJ) activity is currently conducted at INT, this limited effort focused on aircraft that were most representative of INT's noise exposure.

Exhibit 6-7 illustrates the Day-Night Average Noise Level (DNL) 65 decibel (dB) noise contours for the existing and future scenarios, which represents the average annualized noise

[2] United States Census Bureau, *2000 Census: Summary File 3.*

exposure of INT activity. The federal government considers noise levels below DNL 65 dB to be compatible with residential and other noise-sensitive developments (e.g., schools and places of worship). General findings of the INM analyses include:

- 2008 Existing Noise Contour – Due to current operations by loud/old State 2 commercial and corporate jets (e.g., Boeing 737-200 and Lear 25), the 2008 Existing DNL 65 dB noise contour extends over residential parcels near the Runway 33 end.

- 2028 Future Noise Contour – As louder and old Stage 2 commercial and corporate jets are phased out of service, the size of the 2028 Future DNL 65 dB noise contour is expected to decrease in size in comparison to the 2008 contours and subsequently produce no incompatible noise impacts to residential parcels. This is a common expectation at airports around the country even as activity levels are projected to increase.

Although some nearby residential parcels may currently be exposed to incompatible airport noise levels (i.e., greater than DNL 65 dB), the situation should continually improve as loud/old Stage 2 jets are phased out of service. Overall, the recommendations of the preferred airport development alternative would not result in changes to the airport's noise exposure or aircraft fleet mix characteristics.

Table 6-5
Integrated Noise Model Inputs 2008 and 2028

2008 EXISTING INM INPUTS											
INM CODE	**B260L**	**CNA172**	**GASEPF**	**BEC58P**	**CNA441**	**LEAR25**	**CNA55B**	**CNA750**	**GV**	**737700**	**737D17**
TYPE	HEL1	SEP	SEP-T&G	MEP	TP	JET (STAGE 2)	JET (MED)	JET (LARGE)	JET (>60K)	COMM-NEW	COMM-OLD
AIRCRAFT	BELL 206	CESSNA 172	SINGLE ENGINE	BEECH BARON	CONQUEST II	LEAR 25	CITATION V	CITATION X	GULFSTREAM V	737-700	737-200
TOTAL OPS	518	16,325	14,452	11,383	2,499	200	4,263	1,132	466	466	133
TOTAL DAILY OPS	1.4192	44.726	39.5945	31.1863	6.8466	0.5475	11.6796	3.1024	1.2775	1.2775	0.365
DAY ARR & DEP	0.6741	21.2449	37.6148	14.8135	3.2521	0.2601	5.5478	1.4736	0.6068	0.6068	0.1734
NIGHT ARR & DEP	0.0355	1.1182	1.9797	0.7797	0.1712	0.0137	0.292	0.0776	0.0319	0.0319	0.0091
2028 FUTURE INM INPUTS											
INM CODE	**B260L**	**CNA172**	**GASEPF**	**BEC58P**	**CNA441**	**LEAR25**	**CNA55B**	**CNA750**	**GV**	**737700**	**737D17**
TYPE	HEL1	SEP	SEP-T&G	MEP	TP	JET (STAGE 2)	JET (MED)	JET (LARGE)	JET (>60K)	COMM-NEW	COMM-OLD
AIRCRAFT	BELL 206	CESSNA 172	SINGLE ENGINE	BEECH BARON	CONQUEST II	LEAR 25	CITATION V	CITATION X	GULFSTREAM V	737-700	737-200
TOTAL OPS	553	18,661	13,240	11,799	3,007	0	5,130	1,443	721	721	0
TOTAL DAILY OPS	1.5151	51.126	36.274	32.326	8.2384	0	14.0537	3.9526	1.9763	1.9763	0
DAY ARR & DEP	0.7197	24.2849	34.4603	15.3549	3.9132	0	6.6755	1.8775	0.9387	0.9387	0
NIGHT ARR & DEP	0.0379	1.2782	1.8137	0.8082	0.206	0	0.3513	0.0988	0.0494	0.0494	0

6.8 ENVIRONMENTAL DOCUMENTATION & PERMITTING

In compliance with NEPA, and as outlined in FAA Order 1050.1E, Environmental Impacts: Policies and Procedures, and FAA Order 5050.4B, NEPA Implementing Instructions for Airport Actions, airport improvement projects that require environmental review and approval before implementation typically fall within one of three categories:

- Those actions that are normally categorically excluded, such as minor expansion of facilities where minimal or no additional land is required;
- Those actions requiring an Environmental Assessment (EA), such as a runway/taxiway extension project; or,
- Those actions normally requiring an Environmental Impact Statement (EIS), such as a new commercial service airport or a new runway to handle air carrier aircraft.

Under "extraordinary circumstances", an action that would typically be categorically excluded could require an EA or EIS. Such extraordinary circumstances occur when the proposed action may have a significant affect on a resource, such as residential areas, wetlands, floodplains, water quality, or hazardous materials.

Considered independently of one another, the majority of the improvement projects proposed as part of the preferred airport development alternative could be approved under the "Categorical Exclusions for Facility Siting, Construction and Maintenance" listed in FAA Order 1050.1E.[3] Due to the anticipated stream and wetland impacts associated with the north apron development projects and the potential social and environmental justice impacts associated with future land acquisition, it is likely that these airport improvements would involve extraordinary circumstances that would require the preparation of an EA. Based on guidance in FAA Order 1050.1E, land acquisition of three acres or less could be categorically excluded. As depicted on **Exhibit 6-6**, the parcels identified for future acquisition exceed this three-acre threshold. Finally, additional coordination with the FAA would be necessary to determine the appropriate level of NEPA documentation associated with construction of the proposed parallel taxiway. However, an EA may be requested to address potential impacts to the tributary to Brushy Fork Creek and the secondary impacts associated with providing access to the east side of airport property for future development.

Regulatory/Permitting Considerations

The following environmental permits and/or certifications may be required from local, state, and federal regulatory agencies for construction of future airport improvement projects.

[3] U.S. Department of Transportation, FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures,* March 20, 2006, Chapter 3, Paragraph 310, p. 3-10.

Clean Water Act Section 404 Permit

The USACE is authorized under Section 404 of the Clean Water Act (CWA) to issue permits for the placement of dredged or fill material into jurisdictional waters of the United States, including wetlands.

Clean Water Act Section 401 Certification

Projects requiring state or federal permits that would result in a discharge to wetlands and jurisdictional waters of the United States must also obtain a Section 401 Water Quality Certification from the NCDENR. Under Section 401 of the CWA, NCDENR must review the proposed action and analyze its potential impact to water quality, and ensure that any discharge into jurisdictional areas would be in accordance with State water quality standards.

Clean Water Act Section 402 Compliance

Section 402 of the CWA authorizes the USEPA to regulate stormwater discharges. This regulatory authority in North Carolina was given to the NCDENR through the Stormwater Management and Sediment Reduction Act of 1991. Stormwater discharges are regulated through the issuance of National Pollutant Discharge Elimination System (NPDES) permits. Section 402 compliance would be completed prior to construction of the proposed improvements. In addition to the NPDES permit, more stringent requirements from the City of Winston-Salem may be applicable.

Agency Coordination

The potential need to survey for federally protected species or cultural resources in the areas to be impacted by new construction should be coordinated with the USFWS and North Carolina SHPO, respectively, prior to land disturbance activities. In addition, as has already been completed to the north of Runway 4-22, areas to be impacted by new construction should be surveyed for jurisdictional waters of the United States and verified by the USACE and NCDENR.

Chapter 7
Implementation Plan

7.0 OVERVIEW

Smith Reynolds Airport (INT) is a significant economic catalyst for North Carolina and the triad area surrounding Winston-Salem and provides essential aviation services to meet community and regional demand; therefore, it is important that the Airport Commission of Forsyth County (ACFC) be able to undertake the Capital Improvement Program (CIP) discussed herein such that it can continue to develop, grow and provide these services to the community. The primary objective of this chapter is to analyze the financial feasibility of developing the projects included in the CIP for INT in Winston-Salem, North Carolina. The proposed implementation plan was developed after evaluating the basic financial structure and capability of the Smith Reynolds Airport and identifying potential sources of revenue that may be available to fund the various projects within the CIP. These funding sources were then matched with projects over an estimated phasing schedule to determine the financial implications of undertaking the recommended capital improvements. The implementation plan presented herein presents the sequencing and phasing of proposed improvements, and identifies various means of funding these improvements. It is the intent of this implementation plan to provide general financial guidance to the ACFC and airport staff in making policy decisions regarding the recommended development of the airport over the 20-year planning period.

7.1 PROJECT FEASIBILITY ASSESSMENT

The approach taken by the ACFC for airport and airfield development included improvement and development schemes that assessed low, middle and high cost options. From that initial assessment, a preferred alternative approach was established, adopted and pursued based on the development needs of the airport and cost considerations.

The preferred alternative, shown in Chapter 6, allows the ACFC to develop airport property and reserve existing and future identified land for the long term development of the airport. The preferred alternative, in comparison to the low and high cost options, allows the airport to pursue development alternatives while meeting the needs and demands of the airport, being fiscally responsible with development, as well as maintaining development flexibility for unexpected opportunities that may arise over the planning period.

It is important to note that the various funding sources identified in the following CIP plan are in no way a guarantee of funding. The availability of funding is dependent upon a number of factors including the federal, state and local budgets, revenue sources, nationwide needs of airports, identified demand, and also the type of projects being pursued, i.e. safety projects typically take priority over other types of development.

7.2 FINANCIAL PLAN

Estimates of airport operating revenues (income) and expenses provide a measure of an airport's ability to fund its operation. Airport revenues are derived from a variety of sources including activities conducted by aircraft users and businesses at the airport facility. Cost centers include airport administration/management, operation, maintenance and associated expense. Capital improvement projects funded with or without the support of state and federal grants are not included in the evaluation of an airport's operating expenses. Net operating income (revenues minus expenses) is available for direct payment for capital improvements, or for debt service programs used to implement capital improvement projects. Also available for future expenditures is net operating income surpluses realized and accumulated during the year, over accumulated over a period of time.

Operating Revenues (Income)

The Smith Reynolds Airport generates operating revenue (income) from a variety of sources, including, but not necessarily limited to:

- Rental of facilities owned by the airport such as Terminal Building space for rental car companies, air traffic control tower, and various office suites
- Income from T-hangar leases
- Income from tie-downs
- Income from other airport property facilities/leases/tenants, including FBO, corporate hangars, etc.
- Other income from fuel flowage and rental car commissions
- Miscellaneous other sources including aviation events, earnings on investments

Operating Expenses

The Smith Reynolds Airport incurs costs to manage, operate and maintain the facilities it owns. The larger categories of operating expenses for the airport include, but not necessarily limited to:

- Personnel (wages, salaries, and benefit costs)
- Property expenses, utilities, repairs and maintenance, equipment, fuel, etc.
- Administrative expenses, supplies, contracted services, promotion, insurance, etc.
- Other expenses (ACFC meetings, sales taxes, aviation event expenses, etc.

Operating expenses do not necessarily reflect and track operating revenues consistently. Unlike operating revenues that generally increase at rates associated to the consumer price index, the operating costs to manage, run and maintain the airport generally increase at different rates. The effects of the ever changing security rules and regulations, rates for insurance and utilities, staff increases and related costs, the maintenance and upgrades of airport facilities as they age (before replacement) all contribute to the fundamental reasons for increased growth rates in operating expenses over operating revenues. **Table 7-1** presents the airport's operating revenues and

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expenses for the last three years based on information provided by airport staff, as well as a 5-year projection of Total Income, Total Expenses and Net Operating Income.

7.3 PROBABLE DEVELOPMENT COSTS

The estimated total project costs presented for each identified airport improvement reflects a preliminary opinion of the probable implementation costs for the projects listed herein. In addition to the estimated construction costs, anticipated costs for design, construction phase services, permitting, surveying, geotechnical investigations and testing, and project administration have also been included in the overall estimate where applicable. Costs projections are based on constant 2011 dollars and include the above noted items, as well as a contingency. A contingency amount of 15 percent of the estimated construction cost was added to account for uncertainties and unknowns associated with each project at the time. A detailed environmental analysis may be required to recognize the full potential environmental and budgetary impacts associated with the proposed development. Some projects may also require mitigation measures to offset impacts to environmentally sensitive areas whereas others may require some level of environmental remediation based on conditions that may or may not have been identified during this planning study. For this reason, it is important to note that the estimates shown are planning level estimates, based on current industry standards and anticipated impacts calculated at the time of this writing and should be revisited with updated costs regularly to ensure an accurate CIP program.

7.4 TRANSPORTATION IMPROVEMENT PROGRAM (TIP)

The North Carolina Department of Transportation (NCDOT) administers federal funding for general aviation airports (including airports not served by air carriers, but still holding Part 139 Certification) under the Block Grant Program of the Federal Aviation Administration. Through an approved NCDOT Transportation Improvement Program (TIP), Smith Reynolds Airport is able to plan and develop the airport through criteria such as safety needs, forecast and demands, economic development, and financial feasibility. Smith Reynolds Airport's approved TIP is also the basis and mechanism used for funding projects through the NCDOT – Division of Aviation.

Based on the facility requirements and selected preferred alternative developed in previous chapters of this report, a CIP and phasing plan have been identified for the 20-year planning period. Although the planning period was previously defined as the time frame spanning 2008 through 2028, the CIP planning period in this chapter is defined as 2012 through 2032 and beyond. This adjustment was made to account for the time which had already elapsed during the Master Plan Update process. The Smith Reynolds Airport CIP has been developed to coincide with the NCDOT TIP.

Table 7-1
INT Operating Revenues and Expenses
Fiscal year July 1st to June 30th

	Actual FYE 2009	*Actual FYE 2010*	*Actual FYE 2011*	*Estimated FYE 2012*	*Projected FYE 2013*	*Projected FYE 2014*	*Projected FYE 2015*	*Projected FYE 2016*	*Notes:*
Income									
Total 4100 TERMINAL BUILDING	$75,524.04	$65,892.17	$79,010.72	$70,000.00	$72,000.00	$73,000.00	$74,000.00	$74,500.00	Restaurant
Total 4200 T-HANGAR	$92,547.10	$85,258.95	$91,644.50	$92,000.00	$92,000.00	$95,000.00	$95,000.00	$97,000.00	Modest increases in rent
Total 4300 TIE DOWN	$3,599.26	$2,650.04	$2,889.17	$3,300.00	$3,100.00	$3,100.00	$3,000.00	$3,000.00	Piston Engine market declining
Total 4400 PROPERTY INCOME	$2,365,771.08	$607,896.86	$818,566.31	$1,100,000.00	$1,260,000.00	$1,450,000.00	$1,750,000.00	$1,900,000.00	Piedmont Propulsion lease and North State Aviation growth
Total 4500 -4600 OTHER INCOME / SPECIAL EVENTS	$453,627.89	$690,559.70	$1,001,598.88	$750,000.00	$750,000.00	$750,000.00	$750,000.00	$750,000.00	Unknown - Includes Air Show
Total Income	$2,991,069.37	$1,452,257.72	$1,993,709.58	$2,015,300.00	$2,177,100.00	$2,371,100.00	$2,672,000.00	$2,824,500.00	
Expenses									
Total 5100 PERSONNEL	$704,222.33	$635,556.84	$768,965.35	$617,000.00	$650,000.00	$660,000.00	$680,000.00	$700,000.00	Salary increases and one new employee
Total 5200 PROPERTY EXPENSES	$968,739.16	$573,345.46	$661,966.71	$675,000.00	$675,000.00	$735,000.00	$745,000.00	$770,000.00	Increase expenses with full service lease
Total 5300 ADMINISTRATIVE EXPENSES	$601,053.06	$466,522.84	$250,428.59	$300,000.00	$350,000.00	$360,000.00	$380,000.00	$400,000.00	Increase expenses with full service lease
Total 5400 -5500 OTHER EXPENSES / SPECIAL EVENTS	$266,330.54	$303,358.83	$322,637.36	$350,000.00	$360,000.00	$370,000.00	$380,000.00	$390,000.00	Includes Air Show
Total Expenses	$2,540,344.09	$1,978,783.97	$2,003,998.01	$1,942,000.00	$2,035,000.00	$2,125,000.00	$2,185,000.00	$2,260,000.00	
Net Operating Income	$450,725.28	($526,526.25)	($10,288.43)	$73,300.00	$142,100.00	$246,100.00	$487,000.00	$564,500.00	

7.5 INT'S CAPITAL IMPROVEMENT PROGRAM (CIP)

Each project within the CIP has been assigned to a particular planning phase (i.e., short-term, intermediate term, and long-term). Phase I – Short Term Development period extends from 2012-2016; whereas Phase II – Intermediate Term Development extends from 2017-2021. Phase III – Long Term Development spans a 10 year time frame from 2021 through 2032 and Phase IV – Ultimate Development extends beyond 2032. Project cost information and phasing has been included for short-term projects; however, intermediate and long-term projects include only an estimated cost and "I" or "L" which represents that the project, as planned, would be scheduled for implementation sometime within the intermediate or long-term planning periods respectively. Cost estimates and sequencing of work for Phase IV – Ultimate Development were not calculated or specifically planned due to the development time frame of beyond the 20 year planning period of this Master Plan Update.

The Capital Improvement Plan (CIP) for the Smith Reynolds Airport for the years 2012 through 2016 is presented in **Table 7-2**. It should be noted that the CIP includes a number of maintenance type projects and equipment purchases that have not been covered in the Master Plan, and are not shown on the Airport Layout Plan (ALP) because there will be no change in layout. The CIP lists the Phase I Projects, the highest priority projects over the next five years, and identifies estimated project costs, and potential funding sources for each project. For general aviation airports within non-block grant states and for all commercial service airports that desire consideration for funding from the FAA, those airports must submit and/or update their five-year CIP to the FAA on an annual basis. For general aviation and non-commercial airports within North Carolina, the updated five-year CIPs are submitted to, and processed by the NCDOT-Division of Aviation (NCDOT-DOA). The annual CIP update process is used by NCDOT-DOA and the FAA to prioritize their funding programs on a state-wide basis in light of system-wide considerations. These planning-level cost estimates are used for program development. Projects which enhance airport and airfield safety and capacity, as well as projects that correct airfield design standard deficiencies remain high priority projects for both the FAA and NCDOT-DOA, and compete well for available, but limited, grant funds. The CIP does not constitute a commitment on behalf of the FAA, NCDOT-DOA or the airport sponsor to fund any of the projects, nor does it take into consideration any costs that may incurred as necessary to obtain any permits and/or environmental approvals.

7.6 PROJECT PHASING AND ESTIMATED COSTS

Although the Airport Master Plan Update charts a course for planned development, it must be emphasized that the planning and development of an airport is a continuous process. The rehabilitation of existing facilities and development of new facilities must be predicated on sustained demand, which justifies the costs of improvements. Therefore, periodic re-evaluation of project implementation schedules will be necessary to accommodate variations from the aviation forecasts and to adjust for other unexpected factors, such as economic development opportunities and the airport's direct attraction of businesses to the airport. This re-evaluation process will ensure flexibility in that any change in aviation demand or within the local area will be fully considered as the development of the Smith Reynolds Airport continues. It is also

possible that other improvements not identified within this study may also be required to facilitate safe and efficient airport operations. All future improvement projects identified in this report or otherwise shall be compatible with the development strategies proposed in the Airport ALP for INT. **Tables 7-2, 7-3**, and **7-4** illustrate the costs, phasing and funding sources for each development project shown in the program, excluding Phase IV – Ultimate Development.

As presented in **Tables 7-2, 7-3**, and **7-4**, the CIP includes a list of projects and their estimated cost for each phase of the 20-year planning period. These estimated costs were derived from various sources and are considered appropriate for planning purposes. Before construction of a specific project is commenced, the financial feasibility of the project should be re-examined and then detailed costs should be developed as part of a design and engineering study. The total probable cost for the 20-year planning period is estimated at approximately $82 million. This figure includes all studies, infrastructure improvements, and proposed construction costs necessary to achieve the developments shown on the Airport Layout Plan. The CIP includes the development schedule and project cost summaries in the following sections. The CIP for each period presents the improvements slated for during that period, but it does not assume how financially feasible it will be for INT to undertake those projects or whether or not funding will be available. Therefore these projections should be used for planning purposes only. All total project costs shown in the tables are based on 2012 dollar values.

Since actual activity levels may vary, it is important that staging of proposed improvement projects remain sensitive to such variations. Some projects may take precedence over others, depending on their level of priority or due to the availability of funding. Thus, a list of prioritized improvements was established based upon the urgency of need, ease of implementation, logic of project sequencing, and input from the ACFC and airport staff. The objective was to establish an efficient order for project development and implementation that exceeded the forecasted aviation activity for INT while meeting the needs of the ACFC. As mentioned earlier, the development schedule is divided into four general phases: Phase I – Short Term Development (2012-2016), Phase II – Intermediate Term Development (2017-2021), Phase III – Long Term Development (2021, 2032) and Phase IV – Ultimate Development (Beyond 2032). Cost estimates and sequencing of work for Phase IV – Ultimate Development were not calculated or specifically planned due to the development time frame of beyond the 20 year planning period of this Master Plan Update.

Table 7-2
Phase I - Short Term Development (2012-2016)

Year	Development Projects	Total Project Cost	NCDOT-DOA	Local	Other
2012	Reconstruct Runway 22 North (2,000')	$2,000,000	$1,800,000	$200,000	$0
2012	Land Acquisition (8.1 Acres)	$40,000	$36,000	$4,000	$0
2012	Obstruction Removal and Easement (Runway 15 Approach)	$100,000	$90,000	$10,000	$0
2013	Reconstruct Terminal Apron	$2,450,000	$2,205,000	$245,000	$0
2014	Runway 15-33 Terrain Obstruction Removal (includes fencing)	$2,100,000	$1,890,000	$210,000	$0
2015	Taxilane Extension (1,650') (Design and Site Prep)	$1,600,000	$1,440,000	$160,000	$0
2016	Landside Terminal Improvements	$400,000	$200,000	$100,000	$100,000
	Total Phase I Cost	**$8,690,000**	**$7,661,000**	**$929,00**	**$100,000**

Source: AVCON Inc.

Table 7-3
Phase II - Intermediate Term Development (2017-2021)

Year	Development Projects	Total Project Cost	NCDOT-DOA	Local	Other
I-0	Rehabilitate Taxiway A	$3,000,000	$2,700,000	$300,000	$0
I-1	Consolidated Fuel Farm	$700,000	$0	$700,000	$0
I-2	Taxilane Extension (1,650') (Paving & Lighting)	$1,300,000	$1,170,000	$130,000	$0
I-3	MRO Development Landside and Concrete Apron (Site Prep)	$2,000,000	$1,800,000	$200,000	$0
I-4	Rehabilitate/Overlay Taxiway F (North)	$600,000	$540,000	$60,000	$0
I-5	MRO Development Landside and Concrete Apron (Paving)	$2,700,000	$0	$2,700,000	$0
I-6	Pave MRO Development Landside Area	$500,000	$0	$500,000	$0
I-7	Construct MRO Facility (50,000 SF)	$4,250,000	$0	$0	$4,250,000
I-8	Rehabilitate Runway 4 (1,800') and Demolish Overrun Pavement	$1,725,000	$1,552,500	$172,500	$0
I-9	Develop Corporate, Rec. Multi-use Aviation Use Facility (Site Prep)	$1,000,000	$900,000	$100,000	$0
I-10	Develop Corporate, Rec. Multi-use Aviation Use Facility (Paving and Lighting)	$4,370,000	$2,433,000	$437,000	$1,500,000
I-11	Construct T-Hangars in Corp, Rec, Multi-Use Development Area	$400,000	$360,000	$40,000	
I-12	Land Easement (Runway 33 Approach, 21.4 Acres)	$150,000	$135,000	$15,000	$0
I-13	Land Easement (Runway 15 Approach, 14.8 Acres)	$100,000	$90,000	$10,000	$0
	Total Phase II Cost	**$22,795,000**	**$11,680,500**	**$5,364,500**	**$5,750,500**

Source: AVCON Inc.

Table 7-4 Phase III - Long Term Development (2022-2032)					
Year	**Development Projects**	**Total Project Cost**	**NCDOT-DOA**	**Local**	**Other**
L	Land Acquisition (13.4 Acres – Eastside Development Area)	$48,400	$43,560	$4,840	$0
L	Construct Eastside Perimeter Road (9,300')	$3,348,000	$3,013,200	$334,800	$0
L	Construct East Parallel Taxiway	$3,311,000	$2,979,900	$331,100	$0
L	Construct MRO Facilities (2 @ 50,000 SF)	$8,500,000	$0	$0	$8,500,000
L	Construct MRO Apron	$5,400,000	$0	$5,400,000	$0
L	Construction MRO Landside Facilities	$1,000,000	$0	$1,000,000	$0
L	Runway 15-33 Rehab	$4,000,000	$3,600,000	$400,000	$0
L	Develop East Corporate MRO and Air Cargo (Site Prep)	$5,000,000	$4,500,000	$500,000	$0
L	Develop East Corporate MRO and Air Cargo (Paving and Lighting)	$9,000,000	$0	$0	$9,000,000
L	Land Acquisition (8.2 Acres – West of Runway 15-33)	$4,000,000	$3,600,000	$400,000	$0
L	Realign/Reconstruct Taxiway F (South)	$373,800	$336,420	$37,380	$0
L	Construct Executive Terminal	$3,375,000	$3,037,500	$337,500	$0
L	Construct Executive Terminal Apron	$2,772,000	$2,494,800	$277,200	$0
L	Land Acquisition (4.6 Acres, Runway 4 Approach)	$40,000	$36,000	$4,000	$0
L	Construct T-Hangars in Corp, Rec, Multi-Use Development Area	$400,000	$360,000	$40,000	$0
	Total Phase III Cost	**$50,568,200**	**$24,001,380**	**$9,066,820**	**$17,500,000**

Source: AVCON Inc.

7.7 CIP SUMMARY

Having presented the highlights of each of these development periods, a summary of the related financial needs for these projects is presented in **Table 7-5**. This combined development program will provide the facilities needed at INT to meet the forecasted demands through the end of the 20-year planning period. This 20-year TIP is estimated to cost approximately $87 million. These estimated costs were determined in 2012 dollars; thus, as time goes by these values should be adjusted for the annual inflation rate, which can be accomplished by converting the interim change in the Consumer Price Index (CPI) into a multiplier ratio as follows:

CPI Multiplier Ratio = X / CPI

Where X = CPI in any given future year; and CPI = National CPI for 2011

By using the multiplier ratio approach above, any 2011 based cost or income figure presented in this study will yield the adjusted dollar amounts appropriate in any future year re-evaluation. However, only National CPI data should be used, as local or regional measures may vary.

Table 7-5 20-Year Capital Improvement Program Summary		
Development Phase	**Time Frame**	**Total Phase Cost**
Phase I – Short Term Development	(2012-2016)	$8,690,000
Phase II – Intermediate-Term Development	(2017-2021)	$22,795,000
Phase III – Long-Term Development	(2022-2032)	$50,568,200
Total Development Cost		**$82,053,200**

7.8 MEANS OF FINANCING PROJECT DEVELOPMENT

Smith Reynolds Airport is a valuable asset and key mechanism to the region's economic growth and development. As such, it is important that investments be made at the airport and adequate funding levels be maintained, or increased, to solidify and enhance its role in the region. Preserving and modernizing existing airport facilities, as well as building new airport development, facilities and infrastructure is vital to the future of Smith Reynolds Airport and the triad area.

Airport development is funded by a combination of public and private sources. Major sources may include the Airport Improvement Program (AIP), state and local funding programs, airport revenue bonds, and airport user charges. Generally speaking, state and federal grants comprise a majority of the capital funding, while user hangar revenues, fuel sales, and often local subsidies cover an airport's operating expenses and ideally its debt service.

Grants for airport capital improvements are generally financed from state and federally imposed user taxes, and from funds generated from airport operations, including fuel taxes, space-leasing fees and other similar sources. Airport capital improvements are not funded from tax levies on the general public. The airport CIP is typically budgeted separately and independently of the airport's operating fund. It is important to note that the sequencing of key subordinate projects such as permitting, utility infrastructure, environmental planning studies, drainage plans, and similar work generally must first be completed prior to the design and construction of dependent larger facilities such as runway improvements, taxiways, and hangar construction. For this reason, it may be prudent to break some projects into multiple phases. Four categories of potential funding sources exist for the capital improvements at INT. These categories include federal, state, local (sponsor) and private funding sources.

Federal Funding

In 1982, the passage of the Federal Airport and Airway Improvement Act enabled the federal government to provide financial assistance to airports in support of its broad objective to assist in the development of a nationwide system of public-use airports as necessary to meet projected growth of civil aviation. The Act provides funds for airport planning and development projects at airports included in the National Plan of Integrated Airport Systems (NPIAS) in the form of the AIP grants.

User fees collected under the Airport and Airway Trust Fund Act provide a source of revenues used to fund AIP projects. Entitlement funds are divided among primary airports, cargo service airports and state block grants based on aviation activity and service levels. Airports may receive AIP discretionary funding for federally eligible projects such as:

- New runways, taxiways and non-exclusive use aprons
- Reconstruction of runways, taxiways and non-exclusive aprons
- Navigation Aids
- Federal air traffic control towers (ATCT)
- Passenger terminal buildings (non-revenue areas only)
- Primary airport access roads, and
- Land acquisition

In North Carolina, Federal funding, via the means detailed above, is administered through the NCDOT – Division of Aviation under the Block Grant Program. The Block Grant Program for North Carolina is based on 90 percent State funding and 10 percent local match.

State Funding – North Carolina Department of Transportation Division of Aviation (NCDOT-DOA)

The NCDOT through the DOA administers federal funding for airports under the Block Grant Program of the Federal Aviation Administration. The intent of the Block Grant Program is to demonstrate the ability of the states to administer federal funds to airport throughout the state. Through an approved TIP, Smith Reynolds Airport is able to layout the needs of the airport through criteria such as safety needs, forecast and demands, and financial feasibility. Smith Reynolds Airport's approved TIP is also the basis for funding through the NCDOT.

The NCDOT provides grant funds for various types of airport maintenance and improvement projects; however, they do not participate in revenue-generating projects or for facilities that are not available to the aviation public. The amount of participation varies by type of project and also depending upon whether or not there is federal participation.

Local Match (Sponsor) Funding

Local or sponsor funding is otherwise referred to as the out-of-pocket expenses paid for by the airport owner. These funds can be obtained from a variety of sources including through airport revenues, the city/county's general fund, or capital can be acquired through the issuance of bonds. A bond is simply an 'IOU' in which an investor agrees to loan money in exchange for a predetermined interest rate. Investors purchase bonds with the understanding that the borrower will pay back their original principal (the amount loaned) plus any interest that is due by a set date, otherwise known as the "maturity" date.

Other Funding Sources and Opportunities

In addition to NCDOT assistance, additional funding may also available to INT. Some of these sources include:

Private Development – Capital improvement projects that benefit only a private tenant or group of private tenants will normally not be funded by the NCDOT or from the airport sponsor itself. However, projects that serve aviation functions and that have potential to generate self-sustaining revenues can be attractive to private investors. Although hangar developments for new on-airport aviation businesses are prime candidates for private funding, the potential of constructing t-hangars and corporate hangars is another method to increase activity and airport revenues without expending airport funds.

Other Grant Programs – There are a number of federal and state grant programs that can be utilized for transportation improvements, economic development, historic preservation, etc. that the ACFC can take advantage of to pay for various maintenance and construction improvements at or near the airport. The proper use of and execution of these grants is critical to preserving ACFC revenues for future CIP and TIP uses.

Land leasing – The leasing of airport land requires little to no investment by the ACFC and therefore provides a very positive return. Private developers of airport property typically require long-term leases that may extend more than 30 years in order for the developer to recover his investment costs. Improvements made by private developers typically revert to the airport at the end of the lease term. Since the average lifespan of a building is often more than 40 years, facilities reverted to the airport could potentially generate years of revenues provided that the airport maintain these reverted facilities. The ACFC should not maintain privately developed buildings until ownership has been transferred at the end of the land lease term.

Marketing – The ACFC should continue to market the airport and its surrounding property by using all available methods and resources. The effective marketing of airport property could potentially attract new airport tenants and ultimately lead to additional revenues for the airport.

Leases – Leases should be written responsibly with the airport's best interest in mind and should include escalation clauses to allow the airport recover cost of living and maintenance expenses. Furthermore, leases should require tenants to possess insurances to prevent the airport from any product or service liability. In addition, developers and on-airport investors should be required to have insurance to cover their payments should they become incapable of making them. Generally speaking, long-term leases should be avoided unless such a lease clearly demonstrates a benefit to the airport. One viable example of such a lease would include the development of a private hangar facility which would revert to the airport at the end of the lease term.

Non-Aviation Development – Many financially successful general aviation airports throughout the country have achieved financial independence through the collection of non-aviation related revenues. It is becoming increasingly common to see industrial/business parks, restaurants, gas stations, and retail outlets located within airport's boundaries of ownership. It is important to

note that although revenues could be recognized through the development of non-aviation facilities, these developments should not occur at the expense of meeting aviation-related demand. Non-aviation related developments are typically contracted through long-term land leases, similar to private party developments. All future non-aviation developments located near or on airport property should be compatible with aviation activities. In general, commercial, industrial, or agricultural developments are desired in comparison to schools, residences, or churches etc.

7.9 CONCLUSION

Smith Reynolds Airport is a significant economic catalyst to the Winston-Salem, Forsyth County and overall triad region of North Carolina. Although the airport's days serving as a commercial service airport have passed, it continues to provide an important and essential aviation service that meets the needs of the community. Airports, especially dependable, all-weather airports like INT are what businesses look for and rely on when considering locations/sites to start a new endeavor, or grow an existing business.

Based on the general financial information presented in this chapter, the ACFC will have to maximize and optimize all available outside potential funding sources to achieve the project implementation plan and schedule identified. As discussed earlier, the actual implementation schedule for the capital projects identified in the CIP may need to be adjusted according to development triggers and the actual demand experienced. As the airport seeks to move forward with these developments, an additional analysis may be required which takes into account the financial situation of the airport at that time. The actual funding for specific projects will be determined as implementation becomes more imminent, and will depend on the airport's development schedule, its financial health, and the overall local economic conditions.

Chapter 8
Airport Layout Plan Set

8.0 OVERVIEW

The purpose of an approved Airport Layout Plan (ALP) is to serve as the blueprint for future airport development. One condition of accepting and utilizing grant funding for airport improvement projects is to maintain an updated ALP. For the Smith Reynolds Airport (INT), the updated development recommendations presented in this Master Plan Update are pictorially summarized in the ALP Drawing Set and include the preferred concepts for airfield development (e.g., new taxiways), apron and hangar development, and other support facilities. The ALP Drawing Set represents a scaled, graphic presentation of INT's 20-year development program, thereby providing the Airport Commission of Forsyth County (ACFC) with a feasible improvement plan that would increase the capability and safety of aircraft operations, promote compatibility with existing and proposed developments, and further upgrade the airport to effectively serve the anticipated demand of general aviation, corporate, and commercial/Maintenance Repair and Overhaul (MRO) traffic. The drawings depict the recommendations of this Master Plan Update with regard to aviation development for the short, intermediate, and long-term planning periods.

The dimensional information provided in the drawings demonstrates compliance with minimum airport design standards established by federal, state, and local authorities. The ALP Drawing Set was developed in accordance with the guidance outlined in the FAA Advisory Circular (AC) 150/5070-6, Airport Master Plans, AC 150/5300-13, Airport Design, and other supporting circulars and orders.

The ALP Drawing Set includes the following individual drawing sheets:

- Cover Sheet (Sheet 1)
- Airport Layout Plan (Sheet 2)
- Terminal Area Plan (Sheets 3-4)
- Airport Airspace Drawings (Sheet 5-8)
- Runway Approach and Protection Zone Drawings (Sheets 9-12)
- Land Use Drawing (Sheet 13)
- Airport Property Map (Sheet 14)
- Runway Departure Surfaces Drawings (Sheets 15-17)

Reduced size reproductions of the drawing sheets are provided at the end of this chapter for illustration purposes only.

8.1 COVER SHEET (SHEET 1)

The Cover Sheet serves as the introduction to the ALP Drawing Set. It includes the airport name, a location map, vicinity map, and an index of drawings included in the ALP Drawing Set. Also highlighted on the Cover Sheet are the project name and the sponsor's name and logo.

8.2 AIRPORT LAYOUT PLAN (SHEET 2)

The Airport Layout Plan Drawing, also referred to as the ALP, depicts all existing facilities and proposed developments planned over the 20-year planning period at INT. These plans are reviewed by and must be approved by the FAA prior to authorizing federal funding for future improvement projects. The ALP provides clearance and dimensional information required to show conformance with applicable FAA design standards as outlined in FAA AC 150/5300-13, Airport Design. The ALP also reflects planned changes to physical features on the airport property and critical land use changes near the airport property that may impact navigable airspace or the ability of the airport to operate. The features of the ALP include, but are not limited to: runways, taxiways, lighting, navigational aids, terminal facilities, hangars, other airport buildings, aircraft parking areas, automobile parking, and airport access elements.

Key dimensional criteria for safety areas and facilities associated with Runway 15-33 were based on FAA design standards associated with Airport Reference Code (ARC) C-III (e.g., Boeing 737 aircraft) and an ARC of B-II was applied to Runway 4-22 (e.g., Beechcraft King Air aircraft). This criteria dictates the size of the runways and various taxiways, runway safety areas and runway object free areas, building restriction lines, and navigational aid critical areas, and other dimensional data recommended by the FAA. Airport coordinates, runway end elevations, runway high and low points, and true azimuths for each runway, are also included on the Airport Layout Plan Drawing. Supplemental tables, as required by the FAA ALP Checklist, are depicted on the Airport Layout Plan Drawing including the Airport Data Table, Runway Data Table, and Building Data Table.

8.3 TERMINAL AREA PLAN (SHEETS 3-4)

The Terminal Area Drawings present an enlarged view of the terminal area and therefore provide additional dimensional details, including apron areas (existing and proposed) that are not easily visible on the ALP. This drawing denotes the short and long-term developments and improvements within the vicinity of the terminal complex at INT.

8.4 AIRPORT AIRSPACE DRAWINGS (SHEETS 5-8)

Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace, prescribes airspace standards, which establish criteria for evaluating navigable airspace. Airport imaginary surfaces are established relative to the airport runways and types of approaches they provide. The size of each imaginary surface is based on the runway category with respect to the existing and proposed visual, non-precision, or precision approaches for that runway. The slope and dimensions of the respective approach surfaces are determined by the most demanding, existing

or proposed, approach for each runway. For Runway 15-33 at INT, the imaginary surfaces are primarily applicable to the precision Instrument Landing System (ILS) approach to the Runway 33 end. The approaches to Runway 4-22 are currently visual, but non-precision approach capability is recommended for both runway ends in the future. The imaginary surfaces definitions include:

- Primary Surface – A rectangular area symmetrically located about the runway centerline and extending a distance of 200 feet beyond each runway end. Its elevation is the same as the nearest point along the runway edge. The existing and ultimate primary surface widths are 1,000 feet for Runway 15-33 and 500 feet for Runway 4-22.

- Horizontal Surface – An oval shaped, flat area situated 150 feet above the published airport elevation of 969 feet at INT. Its dimensions are determined by using 10,000-foot arcs for non-utility runways (centered 200 feet beyond each runway end) connected with a line tangent to those arcs. The horizontal surface elevation for INT is 1,119 feet Above Mean Sea Level (AMSL).

- Conical Surface – A sloping area whose inner perimeter conforms to the shape of the horizontal surface. It extends outward for a distance of 4,000 feet measured horizontally, and slopes upward at a 20:1 ratio. INT's conical surface extends upward to an elevation of 1,319 feet AMSL.

- Transitional Surface – A sloping area beginning at the edges of the primary and approach surfaces and sloping upward and outward at a ratio of 7:1.

- Approach Surface – This surface begins at the ends of the primary surface and slopes upward at a predetermined ratio while at the same time flaring out horizontally. The width and elevation of the inner ends conform to that of the primary surface, while the slope, length, and outer width are determined by the runway service category and existing or proposed instrument approach procedures.

8.5 RUNWAY APPROACH AND PROTECTION ZONE DRAWINGS (SHEETS 9-12)

The Runway Approach and Protection Zone Drawings show both plan and profile views of the approach surfaces beyond each runway end. The purpose of these drawings is to locate and document existing objects, which represent obstructions to navigable airspace within the existing and proposed approach slopes for each runway. Additionally, the drawings show the ground profile and terrain features along the extended centerline of each runway end.

Any controlling structures, such as roadways, natural ground elevations, and trees, are also shown on the Inner Portion of the Approach Surface Drawings, if applicable. Additionally, fixed objects located along the extended runway centerlines are also illustrated on the sheets to provide an indication of the relative distance to the approach surfaces. Any known obstructions to

navigable airspace are listed in an Obstruction Data Table along with a recommended action for each obstruction.

8.6 LAND USE DRAWING (SHEET 13)

The Airport Land Use Drawing designates various sectors of the property for specific uses and also shows surrounding land uses. Additionally, the 2008 and 2028 noise contours developed as a component of this study have been superimposed on the drawing to ensure that appropriate aviation-compatible zoning is maintained. The FAA has established national guidelines for land use compatibility related to airport-generated noise impacts. In most cases, noise sensitive land uses are considered incompatible if located within the 65 DNL noise contour (or higher), unless noise mitigation measures are undertaken.

8.7 AIRPORT PROPERTY MAP (SHEET 14)

The Airport Property Map defines the existing and proposed airport boundaries in a graphical form. The purpose of the drawing and associated tables is to identify how property and easements have been acquired in the past as well as to illustrate properties and easements that should be obtained in the future as necessary to accommodate the proposed development plan. In general, the recommendation to acquire property is shown when additional land was necessary to accommodate future development. In other cases, when trees or other vegetation exist on nearby properties, the acquisition of an easement has been shown. The easement will allow the airport to restrict the height of development within these areas and also allow the airport to access the land to remove trees or other vegetation which penetrate the airport's imaginary surfaces. In order to promote compatible development, the acquisition of land or purchase of easement within all existing and future RPZs has been shown in this drawing.

8.8 RUNWAY DEPARTURE SURFACES DRAWINGS (SHEETS 15-17)

The Runway Departure Surfaces Drawings consist of large scale plan views of departure surfaces for all runway ends at INT. The Departure Surfaces Drawings depict the ground contour along the extended runway centerline plus any significant natural or non-natural objects located along the extended runway centerline and also provides a top elevation for these objects. Commonly shown objects include buildings, roads, railroads, ditches, and natural features such as mountains, trees, lakes, and rivers. Surface penetration and disposition information is included in the associated obstruction data tables.

8.9 SUMMARY

The ALP Drawing Set is intended to depict INT's capital development program in graphical form. Prior to incorporating the developments herein, preliminary plans were presented to the ACFC members and to the public for their review and approval. Thus, this plan set accurately reflects the goals and intentions of airport management and adjacent community throughout the 20-year planning period.

AIRPORT MASTER PLAN UPDATE

Smith Reynolds Airport

Winston-Salem, North Carolina

AIRPORT COMMISSION OF FORSYTH COUNTY

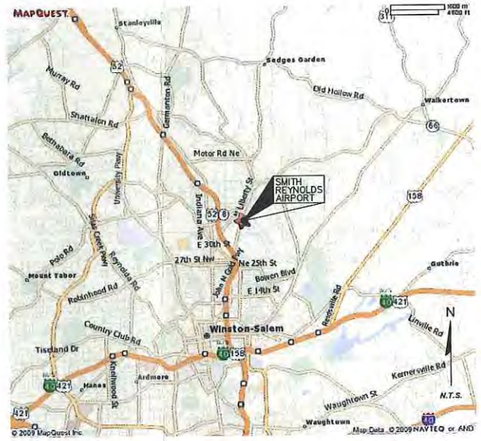
SMITH REYNOLDS AIRPORT

LOCATION MAP

PREPARED BY

AVCON / LPA TEAM

May 2012

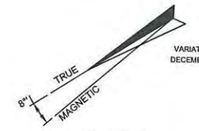


VICINITY MAP

INDEX OF DRAWINGS

Smith Reynolds Airport

3801 North Liberty Street, Suite 204
Winston-Salem, NC 27105
www.smithreynolds.org
Phone: 336-767-6361
Fax: 336-767-8556
Mark Davidson - Airport Director
Bev Shelton - Administrative Coordinator
David Shoaf - Airport Maint. Supervisor



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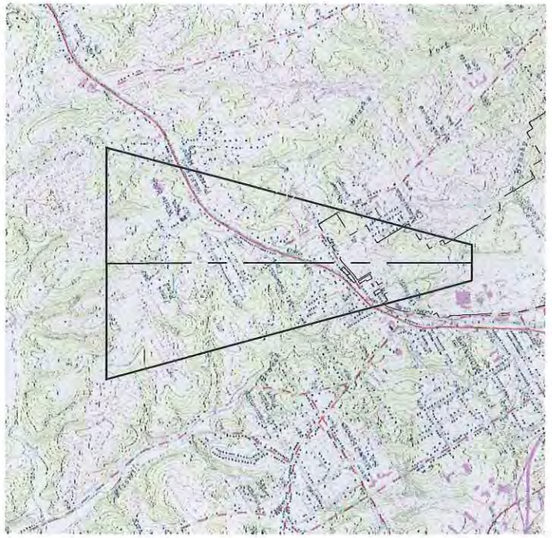
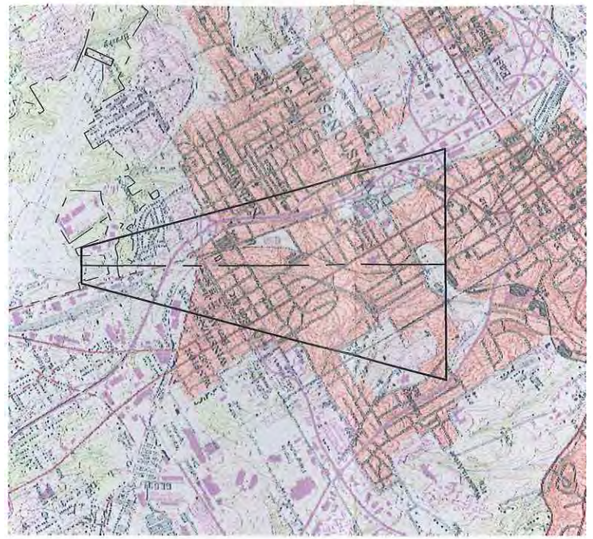


PLAN VIEW RUNWAY 4 DEPARTURE SURFACES



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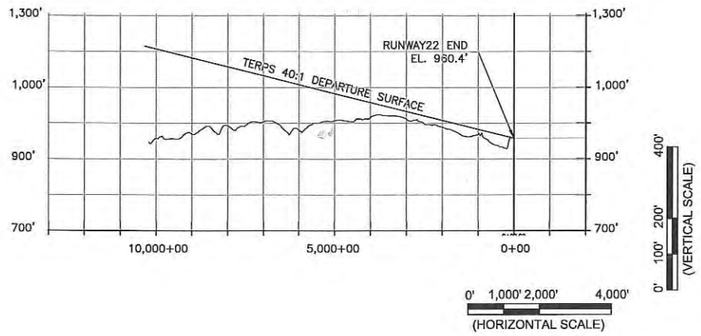
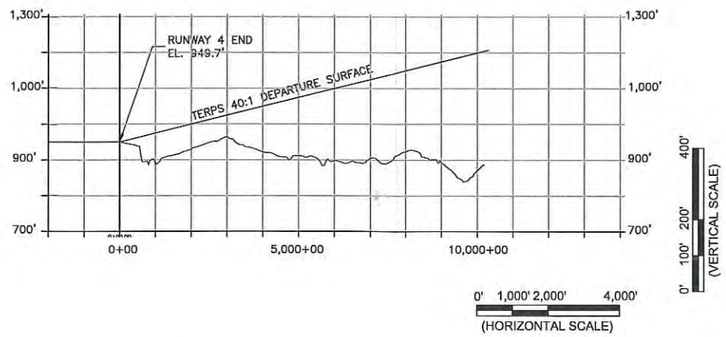


PROFILE VIEW RUNWAY 4 DEPARTURE SURFACES



PROFILE VIEW RUNWAY 22 DEPARTURE SURFACES

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REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
RUNWAY 4-22 DEPARTURE SURFACES DRAWING

PREPARED BY:
AVCON / LPA TEAM

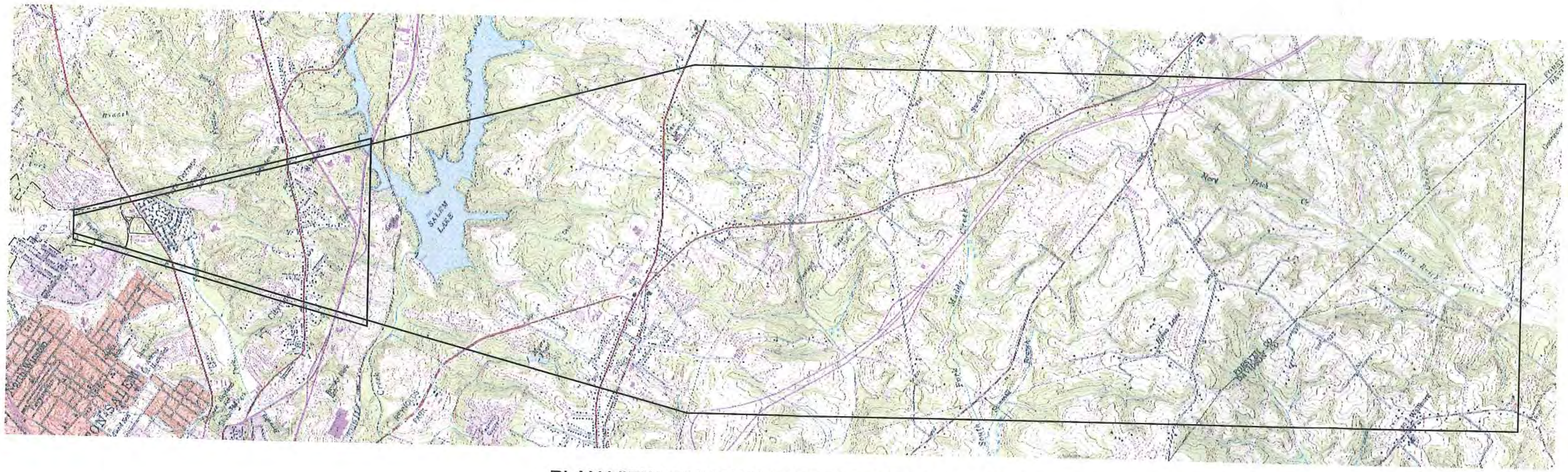
JOB NO.: 2009.130.01
DRAWN: WLJ
DESIGN: MAD
CHECKED: MAD
DATE: MAY 2012
SCALE:

SHEET 17 OF 17

8° TRUE MAGNETIC

VARIATION 8° 6' W
DECEMBER 14, 2011

RATE OF CHANGE
0° 3' W/YEAR
SOURCE: NATIONAL
GEOPHYSICAL DATA
CENTER
DECEMBER 14, 2011



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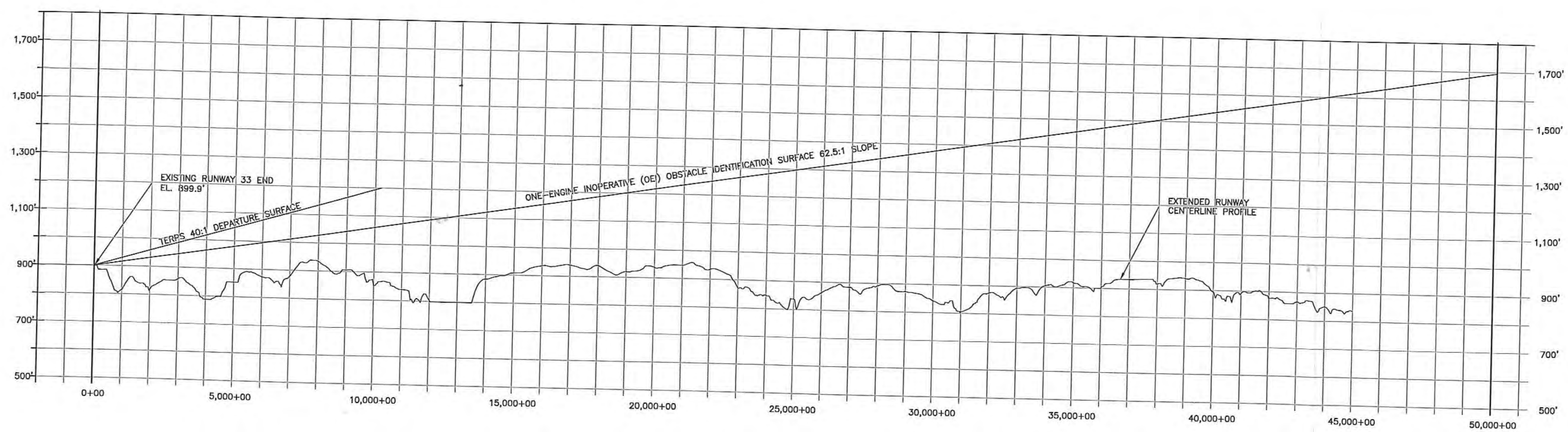

PROFILE VIEW RUNWAY 15 DEPARTURE SURFACES

0' 1,000' 2,000' 4,000'
(HORIZONTAL SCALE)

0' 100' 200' 400'
(VERTICAL SCALE)

REVISIONS	
DATE	DESCRIPTION

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SMITH REYNOLDS AIRPORT

PROJECT

AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE

RUNWAY 15 DEPARTURE SURFACES DRAWING

PREPARED BY:

AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 16 OF 17

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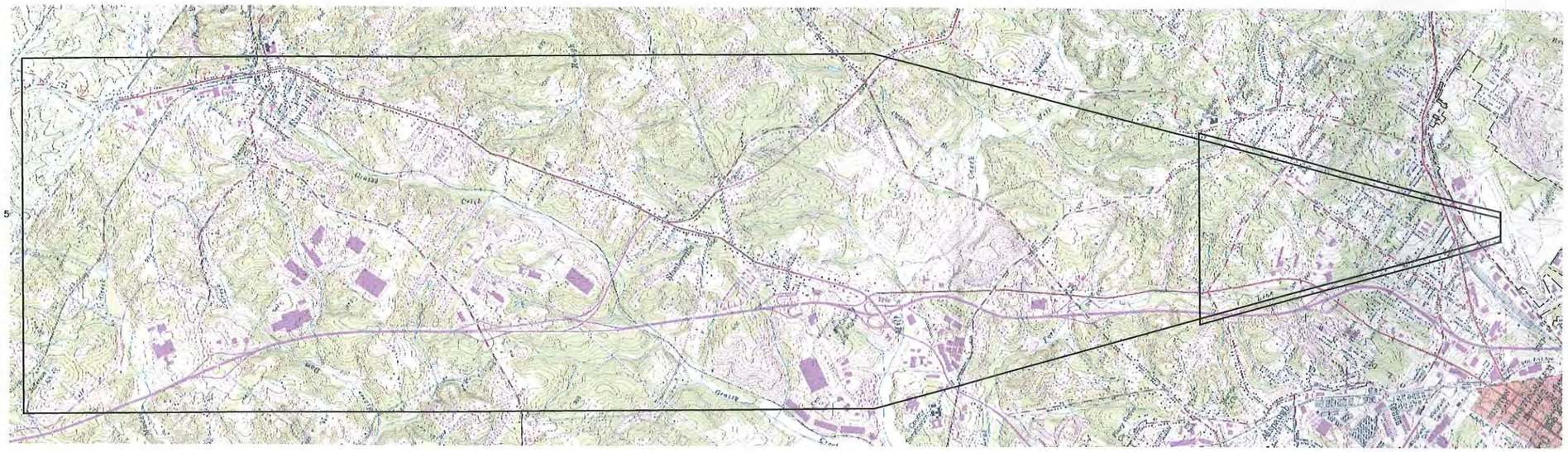
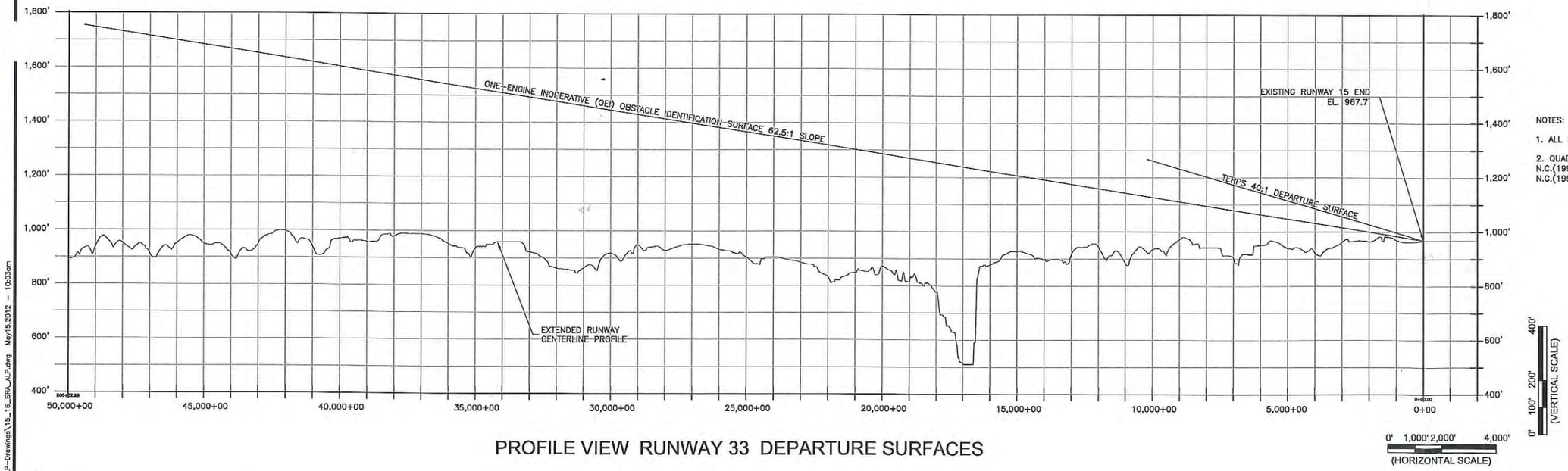


PLAN VIEW RUNWAY 33 DEPARTURE SURFACES



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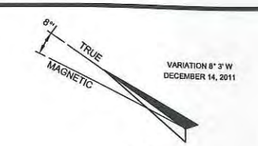

NOTES:

1. ALL ELEVATIONS SHOWN ARE ABOVE MEAN SEA LEVEL (AMSL).
2. QUAD MAPS SOURCE: HIGH POINT WEST, N.C.(1987), KERNERSVILLE, N.C.(1994), KING, N.C.(1996), MIDWAY, N.C.(1994), RURAL HALL, N.C.(1994), WALKERTOWN, N.C.(1986), WINSTON-SALEM, N.C.(1994)

Plotted By: wjones
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REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

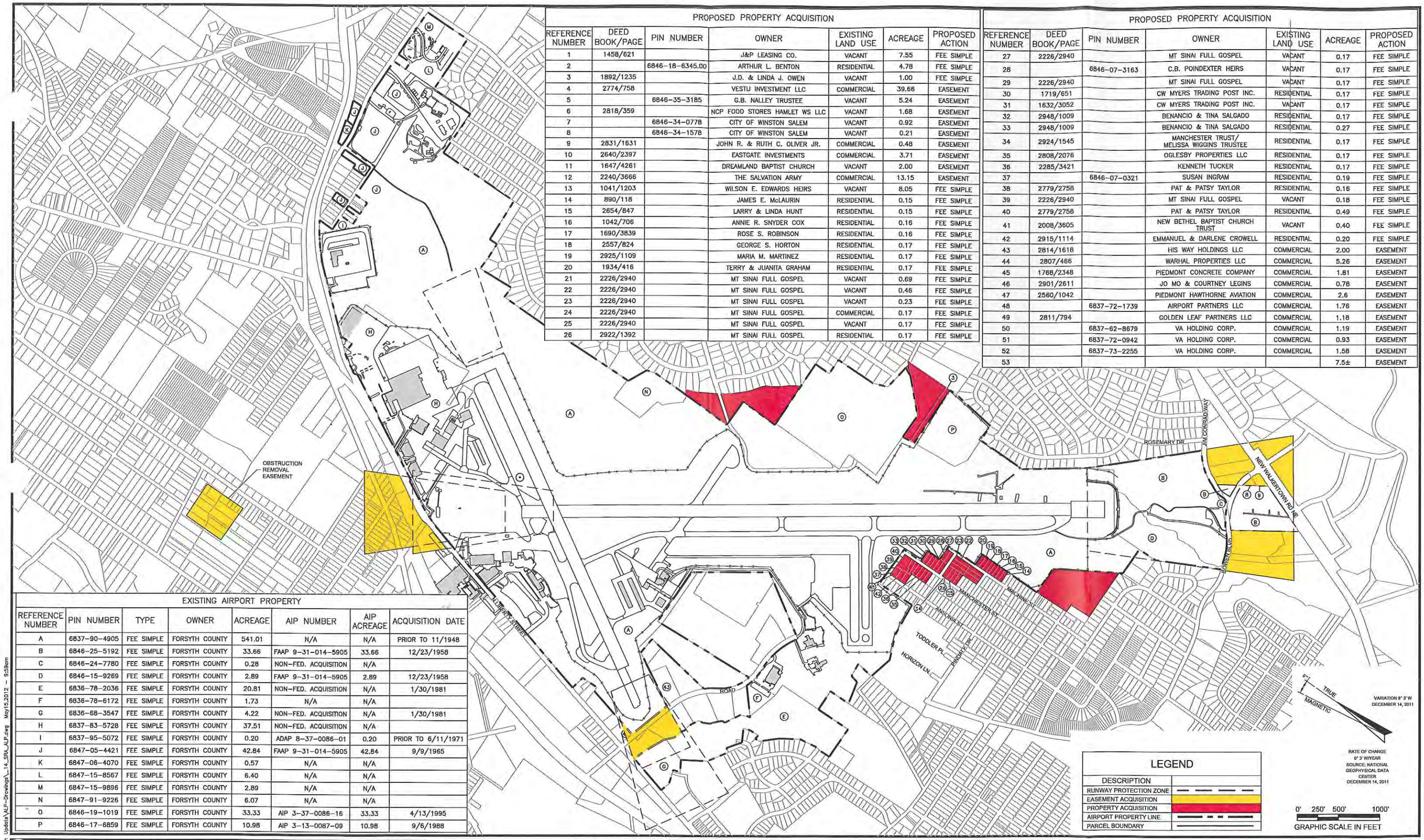
PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
RUNWAY 33 DEPARTURE SURFACES DRAWING

PREPARED BY:
AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 15 OF 17



PROPOSED PROPERTY ACQUISITION

REFERENCE NUMBER	DEED BOOK/PAGE	PIN NUMBER	OWNER	EXISTING LAND USE	ACREAGE	PROPOSED ACTION
1	1458/621		J&P LEASING CO.	VACANT	7.55	FEE SIMPLE
2		6846-18-6345.00	ARTHUR L. BENTON	RESIDENTIAL	4.78	FEE SIMPLE
3	1892/1235		J.D. & LINDA J. OWEN	VACANT	1.00	FEE SIMPLE
4	2774/758		VESTU INVESTMENT LLC	COMMERCIAL	39.66	EASEMENT
5		6846-35-3185	G.B. NALLEY TRUSTEE	VACANT	5.24	EASEMENT
6	2818/359		NCP FOOD STORES HAMLET WS LLC	VACANT	1.68	EASEMENT
7		6846-34-0778	CITY OF WINSTON SALEM	VACANT	0.92	EASEMENT
8		6846-34-1578	CITY OF WINSTON SALEM	VACANT	0.21	EASEMENT
9	2831/1631		JOHN R. & RUTH C. OLIVER JR.	COMMERCIAL	0.48	EASEMENT
10	2640/2397		EASTGATE INVESTMENTS	COMMERCIAL	3.71	EASEMENT
11	1647/4261		DREAMLAND BAPTIST CHURCH	VACANT	2.00	EASEMENT
12	2240/3666		THE SALVATION ARMY	COMMERCIAL	13.15	EASEMENT
13	1041/1203		WILSON E. EDWARDS HEIRS	VACANT	8.05	FEE SIMPLE
14	890/118		JAMES E. McLAURIN	RESIDENTIAL	0.15	FEE SIMPLE
15	2654/847		LARRY & LINDA HUNT	RESIDENTIAL	0.15	FEE SIMPLE
16	1042/706		ANNIE R. SNYDER COX	RESIDENTIAL	0.16	FEE SIMPLE
17	1690/3839		ROSE S. ROBINSON	RESIDENTIAL	0.16	FEE SIMPLE
18	2557/824		GEORGE S. HORTON	RESIDENTIAL	0.17	FEE SIMPLE
19	2925/1109		MARIA M. MARTINEZ	RESIDENTIAL	0.17	FEE SIMPLE
20	1934/416		TERRY & JUANITA GRAHAM	RESIDENTIAL	0.17	FEE SIMPLE
21	2226/2940		MT SINAI FULL GOSPEL	VACANT	0.69	FEE SIMPLE
22	2226/2940		MT SINAI FULL GOSPEL	VACANT	0.46	FEE SIMPLE
23	2226/2940		MT SINAI FULL GOSPEL	VACANT	0.23	FEE SIMPLE
24	2226/2940		MT SINAI FULL GOSPEL	COMMERCIAL	0.17	FEE SIMPLE
25	2226/2940		MT SINAI FULL GOSPEL	VACANT	0.17	FEE SIMPLE
26	2922/1392		MT SINAI FULL GOSPEL	RESIDENTIAL	0.17	FEE SIMPLE

PROPOSED PROPERTY ACQUISITION

REFERENCE NUMBER	DEED BOOK/PAGE	PIN NUMBER	OWNER	EXISTING LAND USE	ACREAGE	PROPOSED ACTION
27	2226/2940		MT SINAI FULL GOSPEL	VACANT	0.17	FEE SIMPLE
28		6846-07-3163	C.B. POINDEXTER HEIRS	VACANT	0.17	FEE SIMPLE
29	2226/2940		MT SINAI FULL GOSPEL	VACANT	0.17	FEE SIMPLE
30	1719/651		CW MYERS TRADING POST INC.	RESIDENTIAL	0.17	FEE SIMPLE
31	1632/3052		CW MYERS TRADING POST INC.	VACANT	0.17	FEE SIMPLE
32	2948/1009		BENANCIO & TINA SALGADO	RESIDENTIAL	0.17	FEE SIMPLE
33	2948/1009		BENANCIO & TINA SALGADO	RESIDENTIAL	0.27	FEE SIMPLE
34	2924/1545		MANCHESTER TRUST/ MELISSA WIGGINS TRUSTEE	RESIDENTIAL	0.17	FEE SIMPLE
35	2808/2076		OGLESBY PROPERTIES LLC	RESIDENTIAL	0.17	FEE SIMPLE
36	2285/3421		KENNETH TUCKER	RESIDENTIAL	0.17	FEE SIMPLE
37		6846-07-0321	SUSAN INGRAM	RESIDENTIAL	0.19	FEE SIMPLE
38	2779/2758		PAT & PATSY TAYLOR	RESIDENTIAL	0.16	FEE SIMPLE
39	2226/2940		MT SINAI FULL GOSPEL	VACANT	0.18	FEE SIMPLE
40	2779/2758		PAT & PATSY TAYLOR	RESIDENTIAL	0.49	FEE SIMPLE
41	2008/3605		NEW BETHEL BAPTIST CHURCH TRUST	VACANT	0.40	FEE SIMPLE
42	2915/1114		EMMANUEL & DARLENE CROWELL	RESIDENTIAL	0.20	FEE SIMPLE
43	2814/1618		HIS WAY HOLDINGS LLC	COMMERCIAL	2.00	EASEMENT
44	2807/466		WARHAL PROPERTIES LLC	COMMERCIAL	5.26	EASEMENT
45	1768/2348		PIEDMONT CONCRETE COMPANY	COMMERCIAL	1.81	EASEMENT
46	2901/2611		JO MO & COURTNEY LEGINS	COMMERCIAL	0.78	EASEMENT
47	2560/1042		PIEDMONT HAWTHORNE AVIATION	COMMERCIAL	2.6	EASEMENT
48		6837-72-1739	AIRPORT PARTNERS LLC	COMMERCIAL	1.76	EASEMENT
49	2811/794		GOLDEN LEAF PARTNERS LLC	COMMERCIAL	1.18	EASEMENT
50		6837-62-8679	VA HOLDING CORP.	COMMERCIAL	1.19	EASEMENT
51		6837-72-0942	VA HOLDING CORP.	COMMERCIAL	0.93	EASEMENT
52		6837-73-2255	VA HOLDING CORP.	COMMERCIAL	1.58	EASEMENT
53					7.5±	EASEMENT

EXISTING AIRPORT PROPERTY

REFERENCE NUMBER	PIN NUMBER	TYPE	OWNER	ACREAGE	AIP NUMBER	AIP ACREAGE	ACQUISITION DATE
A	6837-90-4905	FEE SIMPLE	FORSYTH COUNTY	541.01	N/A	N/A	PRIOR TO 11/1948
B	6846-25-5192	FEE SIMPLE	FORSYTH COUNTY	33.66	FAAP 9-31-014-5905	33.66	12/23/1958
C	6846-24-7780	FEE SIMPLE	FORSYTH COUNTY	0.28	NON-FED. ACQUISITION	N/A	
D	6846-15-9269	FEE SIMPLE	FORSYTH COUNTY	2.89	FAAP 9-31-014-5905	2.89	12/23/1958
E	6836-78-2036	FEE SIMPLE	FORSYTH COUNTY	20.81	NON-FED. ACQUISITION	N/A	1/30/1981
F	6836-78-6172	FEE SIMPLE	FORSYTH COUNTY	1.73	N/A	N/A	
G	6836-68-3547	FEE SIMPLE	FORSYTH COUNTY	4.22	NON-FED. ACQUISITION	N/A	1/30/1981
H	6837-83-5728	FEE SIMPLE	FORSYTH COUNTY	37.51	NON-FED. ACQUISITION	N/A	
I	6837-95-5072	FEE SIMPLE	FORSYTH COUNTY	0.20	ADAP 8-37-0086-01	0.20	PRIOR TO 6/11/1971
J	6847-05-4421	FEE SIMPLE	FORSYTH COUNTY	42.84	FAAP 9-31-014-5905	42.84	9/9/1965
K	6847-06-4070	FEE SIMPLE	FORSYTH COUNTY	0.57	N/A	N/A	
L	6847-15-8567	FEE SIMPLE	FORSYTH COUNTY	6.40	N/A	N/A	
M	6847-15-9896	FEE SIMPLE	FORSYTH COUNTY	2.89	N/A	N/A	
N	6847-91-9226	FEE SIMPLE	FORSYTH COUNTY	6.07	N/A	N/A	
O	6846-19-1019	FEE SIMPLE	FORSYTH COUNTY	33.33	AIP 3-37-0086-16	33.33	4/13/1995
P	6846-17-6859	FEE SIMPLE	FORSYTH COUNTY	10.98	AIP 3-13-0087-09	10.98	9/6/1988

LEGEND

DESCRIPTION
RUNWAY PROTECTION ZONE
EASEMENT ACQUISITION
PROPERTY ACQUISITION
AIRPORT PROPERTY LINE
PARCEL BOUNDARY

REVISIONS

DATE	DESCRIPTION

SPONSOR

AIRPORT COMMISSION OF FORSYTH COUNTY

SMITH REYNOLDS AIRPORT

PROJECT

AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE

AIRPORT PROPERTY MAP

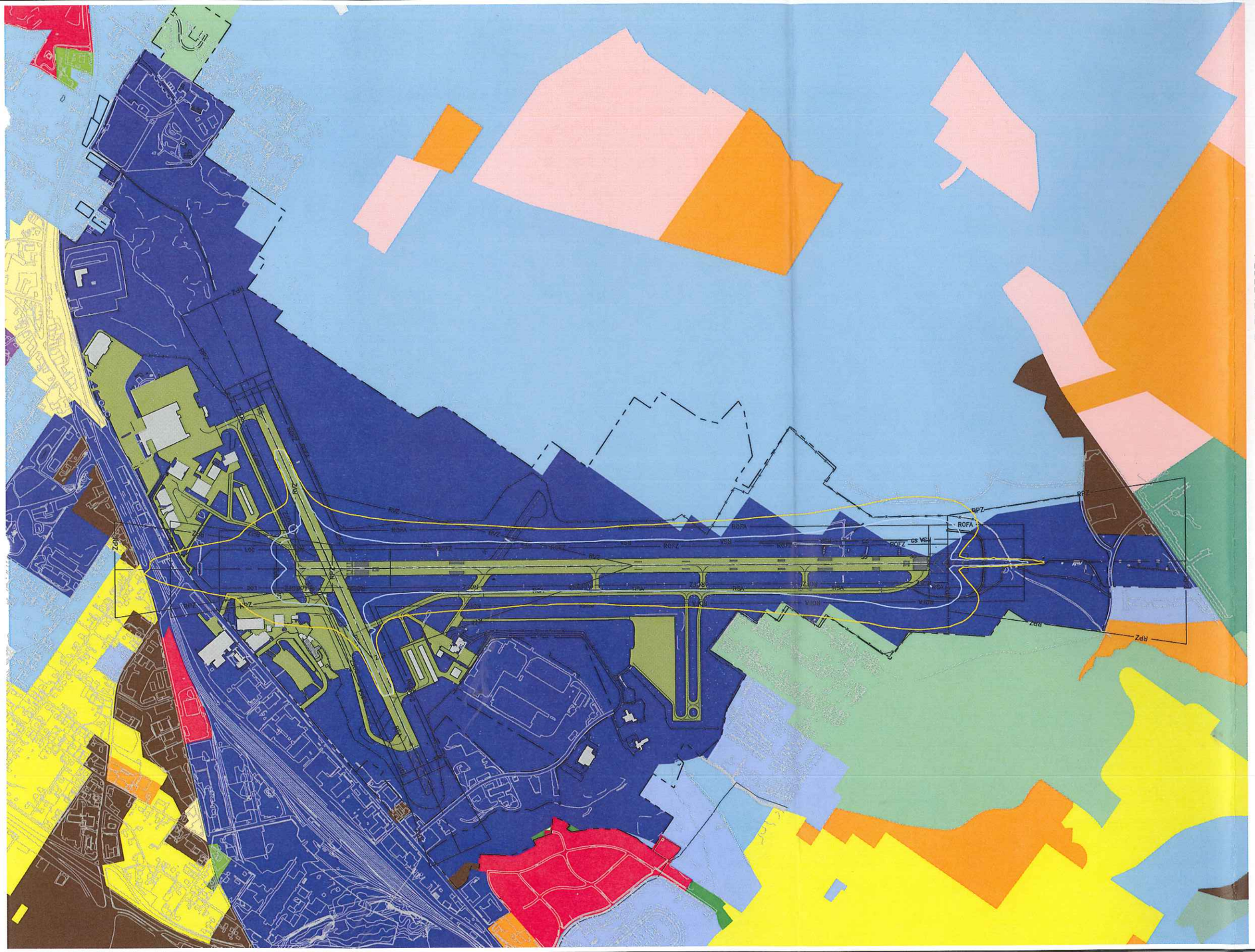
PREPARED BY:

AVCON / LPA TEAM

JOB NO.: 2009.130.01
DRAWN: WLJ
DESIGN: MAD
CHECKED: MAD
DATE: MAY 2012
SCALE:

SHEET 14 OF 17

Plotted By: klones
P:\2009\2009.130.01 Airport Master Plan Update\Drawings\14_SRA_ALP.dwg May15,2012 - 9:59am



ZONING LEGEND	
	ZONING DISTRICTS
GENERAL BUSINESS (GB)	
GENERAL INDUSTRIAL (GI)	
HIGHWAY BUSINESS (HB)	
INSTITUTIONAL & PUBLIC (IP)	
LIMITED BUSINESS (LB)	
LIMITED INDUSTRIAL (LI)	
LIMITED OFFICE (LO)	
MANUFACTURED HOUSING (MH)	
NEIGHBORHOOD OFFICE (NO)	
PEDESTRIAN BUSINESS (PB)	
RESIDENTIAL SINGLE FAMILY (RS-7)	
RESIDENTIAL SINGLE FAMILY (RS-9)	
RESIDENTIAL SINGLE FAMILY (RS-12)	
RESIDENTIAL MULTIFAMILY (RM-8)	
RESIDENTIAL MULTIFAMILY (RM-12)	
RESIDENTIAL MULTIFAMILY (RM-18)	
RESIDENTIAL SINGLE FAMILY QUADRAPLEX (RSQ)	

THE DESIGNATIONS CONTAINED IN THIS TABLE DO NOT CONSTITUTE A FEDERAL DETERMINATION THAT ANY USE OF LAND COVERED BY THE PROGRAM IS ACCEPTABLE OR UNACCEPTABLE UNDER FEDERAL, STATE, OR LOCAL LAW. THE RESPONSIBILITY FOR DETERMINING THE ACCEPTABLE AND PERMISSIBLE LAND USES AND THE RELATIONSHIP BETWEEN SPECIFIC PROPERTIES AND SPECIFIC NOISE CONTOURS RESTS WITH THE LOCAL AUTHORITIES. FAA DETERMINATIONS UNDER PART 150 ARE NOT INTENDED TO SUBSTITUTE FEDERALLY DETERMINED LAND USES FOR THOSE DETERMINED TO BE APPROPRIATE BY LOCAL AUTHORITIES IN RESPONSE TO LOCALLY DETERMINED NEEDS AND VALUES IN ACHIEVING NOISE COMPATIBLE LAND USES.

NOTES FOR DRAWING

1. FAR A150.101 SOUND EXPOSURE CONTOUR AND LAND USES. "(d) ALL LAND USES ARE NORMALLY COMPATIBLE WITH NOISE LEVELS LESS THAN 65 LDN. LOCAL NEEDS OR VALUES MAY DICTATE FURTHER DELINEATION BASED ON LOCAL REQUIREMENTS OR DETERMINATIONS.*
2. AIRCRAFT SOUND EXPOSURE CONTOURS WERE GENERATED USING FAA INTEGRATED NOISE MODEL (INM) VERSION 7.0B.
3. ADJACENT LAND USES TAKEN FROM THE OFFICIAL ZONING MAP FOR FORSYTH COUNTY, NORTH CAROLINA, DATED 2011

LEGEND	
	ZONING DISTRICTS
EXISTING 65 DNL NOISE CONTOUR (YEAR 2012)	
ULTIMATE 65 DNL NOISE CONTOUR (YEAR 2032)	
AIRFIELD PAVEMENT	
EXISTING BUILDINGS	

8°
TRUE
MAGNETIC

VARIATION 8° 3' W
DECEMBER 14, 2011

RATE OF CHANGE
0° 3' W/YEAR
SOURCE: NATIONAL GEOPHYSICAL DATA CENTER
DECEMBER 14, 2011

0' 250' 500' 1000'
GRAPHIC SCALE IN FEET

REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

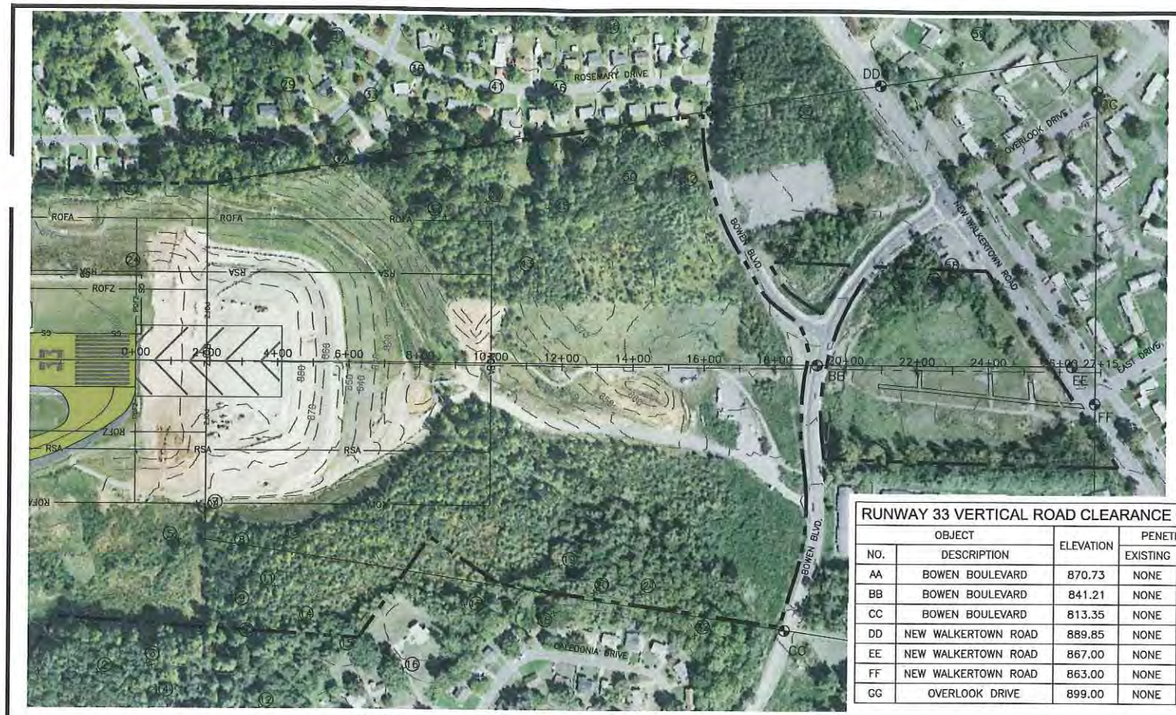
SHEET TITLE
LAND USE DRAWING

PREPARED BY:
AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 13 OF 17

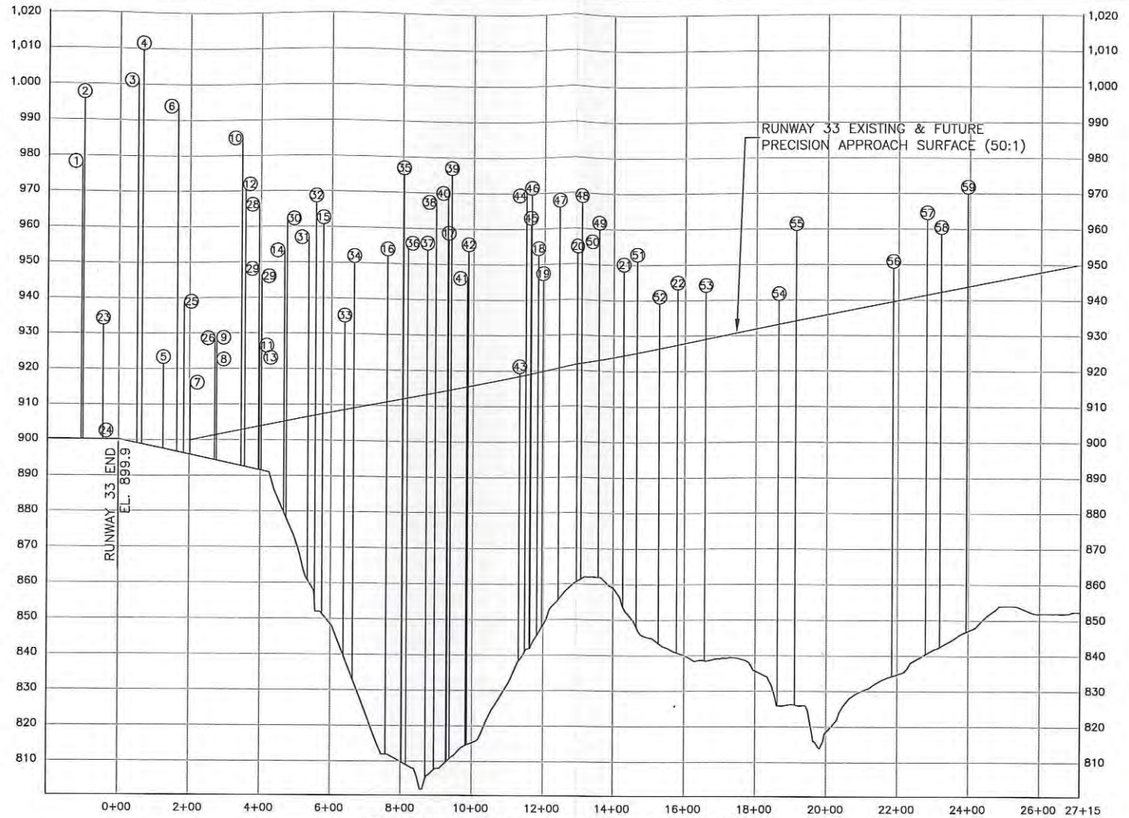
Plotted By: wjones
P:\2009\2009.130.01 Update\ALP--Drawings_13_SRA_ALP.dwg May15,2012 -- 9:58am



RUNWAY 33 INNER APPROACH PLAN VIEW

SCALE 1"=200'

RUNWAY 33 VERTICAL ROAD CLEARANCE CHART				
OBJECT		ELEVATION	PENETRATION	
NO.	DESCRIPTION		EXISTING	FUTURE
AA	BOWEN BOULEVARD	870.73	NONE	SAME
BB	BOWEN BOULEVARD	841.21	NONE	SAME
CC	BOWEN BOULEVARD	813.35	NONE	SAME
DD	NEW WALKERTOWN ROAD	889.85	NONE	SAME
EE	NEW WALKERTOWN ROAD	867.00	NONE	SAME
FF	NEW WALKERTOWN ROAD	863.00	NONE	SAME
GG	OVERLOOK DRIVE	899.00	NONE	SAME



RUNWAY 33 APPROACH PROFILE

SCALE 1"=200' HORIZ.
1"=20' VERT.

RUNWAY 33 OBSTRUCTION CHART						
OBJECT		ELEVATION	PART 77 SURFACE	PENETRATION	MITIGATION	
NO.	DESCRIPTION			EXISTING	EXISTING	FUTURE
1	TREE	978.30	TRANSITIONAL	43.09'	N/A	REMOVE
2	TREE	995.82	TRANSITIONAL	14.09'	N/A	REMOVE
3	GROUP OF TREES	1,001.20	TRANSITIONAL	50.65'	N/A	REMOVE
4	GROUP OF TREES	1,009.59	TRANSITIONAL	49.18'	N/A	REMOVE
5	TREE	921.43	TRANSITIONAL	21.21'	N/A	REMOVE
6	TREE	994.02	TRANSITIONAL	49.19'	N/A	REMOVE
7	TREE	916.08	APPROACH	16.58'	N/A	REMOVE
8	TREE	922.62	TRANSITIONAL	19.99'	N/A	REMOVE
9	TREE	928.74	TRANSITIONAL	6.84'	N/A	REMOVE
10	TREE	985.05	TRANSITIONAL	47.46'	N/A	REMOVE
11	TREE	926.51	TRANSITIONAL	8.12'	N/A	REMOVE
12	TREE	970.45	TRANSITIONAL	3.34'	N/A	REMOVE
13	TREE	921.16	APPROACH	16.70'	N/A	REMOVE
14	TREE	953.28	TRANSITIONAL	20.95'	N/A	REMOVE
15	TREE	960.72	TRANSITIONAL	16.91'	N/A	REMOVE
16	TREE	952.10	TRANSITIONAL	2.10'	N/A	REMOVE
17	TREE	956.89	TRANSITIONAL	32.46'	N/A	REMOVE
18	TREE	952.58	TRANSITIONAL	25.65'	N/A	REMOVE
19	TREE	945.49	APPROACH	25.67'	N/A	REMOVE
20	TREE	953.00	APPROACH	31.21'	N/A	REMOVE
21	TREE	948.20	APPROACH	23.76'	N/A	REMOVE
22	TREE	943.06	TRANSITIONAL	7.82'	N/A	REMOVE
23	TREE	932.46	PRIMARY	32.96'	N/A	REMOVE
24	TREE	900.67	PRIMARY	1.17'	N/A	REMOVE
25	TREE	938.94	TRANSITIONAL	24.13'	N/A	REMOVE
26	TREE	928.68	APPROACH	27.36'	N/A	REMOVE
27	TREE	948.10	TRANSITIONAL	33.51'	N/A	REMOVE
28	TREE	966.27	TRANSITIONAL	13.78'	N/A	REMOVE
29	TREE	946.03	TRANSITIONAL	9.82'	N/A	REMOVE
30	TREE	962.28	TRANSITIONAL	48.35'	N/A	REMOVE

RUNWAY 33 OBSTRUCTION CHART						
OBJECT		ELEVATION	PART 77 SURFACE	PENETRATION	MITIGATION	
NO.	DESCRIPTION			EXISTING	EXISTING	FUTURE
31	TREE	956.97	TRANSITIONAL	0.85'	N/A	REMOVE
32	TREE	966.83	APPROACH	59.82'	N/A	REMOVE
33	TREE	933.22	TRANSITIONAL	1.95'	N/A	REMOVE
34	TREE	951.13	APPROACH	41.97'	N/A	REMOVE
35	TREE	974.96	TRANSITIONAL	55.65'	N/A	REMOVE
36	TREE	955.40	TRANSITIONAL	12.66'	N/A	REMOVE
37	TREE	955.12	APPROACH	41.84'	N/A	REMOVE
38	TREE	967.52	APPROACH	53.76'	N/A	REMOVE
39	TREE	975.09	APPROACH	60.45'	N/A	REMOVE
40	TREE	968.69	TRANSITIONAL	5.08'	N/A	REMOVE
41	TREE	946.03	TRANSITIONAL	9.70'	N/A	REMOVE
42	TREE	954.15	APPROACH	39.24'	N/A	REMOVE
43	TREE	919.35	APPROACH	0.83'	N/A	REMOVE
44	TREE	969.58	APPROACH	50.71'	N/A	REMOVE
45	TREE	961.18	APPROACH	42.07'	N/A	REMOVE
46	TREE	969.58	TRANSITIONAL	34.20'	N/A	REMOVE
47	TREE	966.00	APPROACH	45.25'	N/A	REMOVE
48	TREE	967.24	TRANSITIONAL	3.88'	N/A	REMOVE
49	TREE	959.81	APPROACH	36.76'	N/A	REMOVE
50	TREE	956.50	APPROACH	31.31'	N/A	REMOVE
51	TREE	950.99	APPROACH	27.94'	N/A	REMOVE
52	TREE	939.14	APPROACH	12.69'	N/A	REMOVE
53	TREE	942.31	TRANSITIONAL	1.56'	N/A	REMOVE
54	TREE	939.83	APPROACH	6.68'	N/A	REMOVE
55	TREE	959.53	APPROACH	25.41'	N/A	REMOVE
56	TREE	949.00	APPROACH	9.40'	N/A	REMOVE
57	TREE	962.69	APPROACH	21.21'	N/A	REMOVE
58	TREE	958.56	APPROACH	16.27'	N/A	REMOVE
59	TREE	969.93	TRANSITIONAL	8.30'	N/A	REMOVE

LEGEND		
	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	N/C
RUNWAY PROTECTION ZONE	RPZ	N/C
RUNWAY SAFETY AREA (RSA)	RSA	N/C
OBSTACLE FREE ZONE (OFZ)	ROFZ	N/C
OBJECT FREE AREA (OFA)	ROFA	N/C
RUNWAY VISIBILITY ZONE	RVZ	N/C
PRECISION OBSTACLE FREE ZONE (POFZ)	POFZ	N/C
LOCALIZER CRITICAL AREA	LOC	N/C
GLIDESLOPE CRITICAL AREA	GS	N/C
AIRFIELD PAVEMENT		N/C
BUILDINGS		
ROADS		
FENCING		
GROUND CONTOUR	2100	N/C
WOODED AREA		N/C
DITCH/CREEK		N/C
AIRPORT REFERENCE POINT		N/C
ROTATING BEACON		N/C

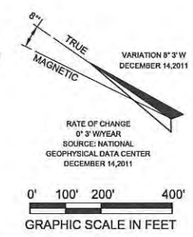
N/C = NO CHANGE

NOTES:

1. NUMBER DENOTES OBSTRUCTION. DOUBLE LETTER DENOTES VERTICAL ROAD CLEARANCE.
2. ALL ELEVATIONS ARE IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS. SPOT ELEVATIONS AND GROUND CONTOURS ARE DERIVED FROM AERIAL PHOTOGRAMMETRY AND ARE APPROXIMATE. GROUND SURVEYS ARE REQUIRED TO VERIFY ACCURACY OF OBSTRUCTIONS.
3. ALL ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

   GROUND CONTOURS AND OBSTRUCTION ELEVATIONS ARE BASED UPON AERIAL PHOTOGRAPHY PREPARED BY:

   WOOLPERT, INC.
   8731 RED OAK BOULEVARD, SUITE 101
   CHARLOTTE, NC 28217
   MARCH 2010
4. ALL POTENTIAL OBSTRUCTIONS ARE WITHIN 5 FEET OF FAR PART 77 SURFACE AND SHOULD BE FIELD VERIFIED.
5. FAR PART 77 REQUIRES THE FOLLOWING CLEARANCES:
   10 FEET ABOVE PRIVATE ROAD
   15 FEET ABOVE PUBLICROADS
   17 FEET ABOVE INTERSTATE HIGHWAYS
   23 FEET ABOVE RAILROADS



0' 100' 200' 400'
GRAPHIC SCALE IN FEET

REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
RUNWAY 33
APPROACH PROFILE
AND PROTECTION ZONE

PREPARED BY:
AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 12 OF 17

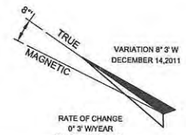
Plotted By: wjones
P:\2009\2009.130.01 on Update\ALP-Drawings_11_12_SRA_ALP.dwg May15,2012 - 11:09am

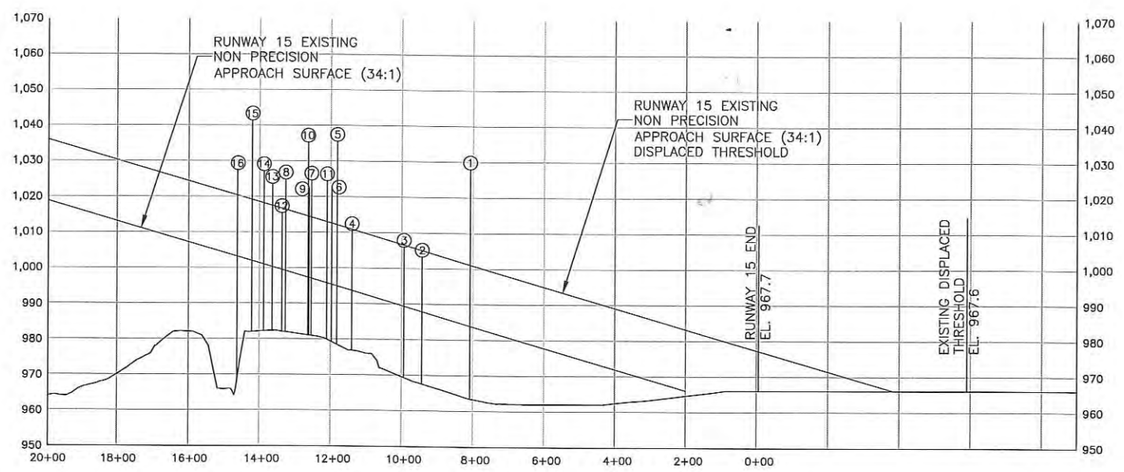
RUNWAY 15 INNER APPROACH PLAN VIEW

SCALE 1"=200'

RUNWAY 15 VERTICAL ROAD CLEARANCE CHART				
OBJECT		ELEVATION	PENETRATION	
NO.	DESCRIPTION		EXISTING	FUTURE
AA	NORTH LIBERTY STREET	985.30	NONE	SAME
BB	NORTH LIBERTY STREET	995.00	NONE	SAME
CC	NORTH LIBERTY STREET	1,001.58	NONE	SAME
DD	NORFOLK & WESTERN RR	985.00	NONE	SAME
EE	GLENN AVENUE	1003.00	NONE	SAME

RUNWAY15 OBSTRUCTION CHART					
OBJECT		ELEVATION	PART 77 SURFACE	PENETRATION	MITIGATION	
NO.	DESCRIPTION			EXISTING	EXISTING	FUTURE
1	TREE	1,027.87	TRANSITIONAL	24.16'	N/A	REMOVE
2	TREE	1,003.22	APPROACH	−4.44'	N/A	REMOVE
3	TREE	1,005.92	TRANSITIONAL	−3.24'	N/A	REMOVE
4	GROUP OF TREES	1,010.43	APPROACH	−3.05'	N/A	REMOVE
5	TREE	1,035.48	APPROACH	20.77'	N/A	REMOVE
6	GROUP OF TREES	1,022.52	APPROACH	6.58'	N/A	REMOVE
7	BUILDING	1,024.54	TRANSITIONAL	7.70'	N/A	LIGHT
8	BUILDING	1,024.81	TRANSITIONAL	1.87'	N/A	LIGHT
9	TREE	1,022.20	APPROACH	5.17'	N/A	REMOVE
10	TREE	1,035.20	APPROACH	18.08'	N/A	REMOVE
11	TREE	1,024.39	TRANSITIONAL	8.85'	N/A	REMOVE
12	TREE	1,015.36	APPROACH	−3.91'	N/A	REMOVE
13	TREE	1,023.57	APPROACH	3.50'	N/A	REMOVE
14	TREE	1,027.13	APPROACH	6.37'	N/A	REMOVE
15	GROUP OF TREES	1,041.36	APPROACH	19.60'	N/A	REMOVE
16	TREE	1,027.40	APPROACH	4.45'	N/A	REMOVE





RUNWAY 15 APPROACH PROFILE

SCALE 1"=200' HORIZ.
1"=20' VERT.

LEGEND		
	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	N/C
RUNWAY PROTECTION ZONE	RPZ	N/C
RUNWAY SAFETY AREA (RSA)	RSA	N/C
OBSTACLE FREE ZONE (OFZ)	ROFZ	N/C
OBJECT FREE AREA (OFA)	ROFA	N/C
RUNWAY VISIBILITY ZONE	RVZ	N/C
PRECISION OBSTACLE FREE ZONE (POFZ)	POFZ	N/C
LOCALIZER CRITICAL AREA	LOC	N/C
GLIDESLOPE CRITICAL AREA	GS	N/C
AIRFIELD PAVEMENT		N/C
BUILDINGS		
ROADS		
FENCING		
GROUND CONTOUR	2100	N/C
WOODED AREA		N/C
DITCH/CREEK		N/C
AIRPORT REFERENCE POINT		N/C
ROTATING BEACON		N/C

N/C = NO CHANGE

NOTES:

1. NUMBER DENOTES OBSTRUCTION. DOUBLE LETTER DENOTES VERTICAL ROAD CLEARANCE.
2. ALL ELEVATIONS ARE IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS. SPOT ELEVATIONS AND GROUND CONTOURS ARE DERIVED FROM AERIAL PHOTOGRAMMETRY AND ARE APPROXIMATE. GROUND SURVEYS ARE REQUIRED TO VERIFY ACCURACY OF OBSTRUCTIONS.
3. ALL ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

   GROUND CONTOURS AND OBSTRUCTION ELEVATIONS ARE BASED UPON AERIAL PHOTOGRAPHY PREPARED BY:

   WOOLPERT, INC.
   8731 RED OAK BOULEVARD, SUITE 101
   CHARLOTTE, NC 28217
   MARCH 2010
4. ALL POTENTIAL OBSTRUCTIONS ARE WITHIN 5 FEET OF FAR PART 77 SURFACE AND SHOULD BE FIELD VERIFIED.
5. FAR PART 77 REQUIRES THE FOLLOWING CLEARANCES:
   10 FEET ABOVE PRIVATE ROADS
   15 FEET ABOVE PUBLIC ROADS
   17 FEET ABOVE INTERSTATE HIGHWAYS
   23 FEET ABOVE RAILROADS

0' 100' 200' 400'
GRAPHIC SCALE IN FEET

Plotted By: wjones
P:\2009\2009.130.01 Update\ALP-Drawings_11_12_SRA_ALP.dwg May15,2012 - 11:08am

REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

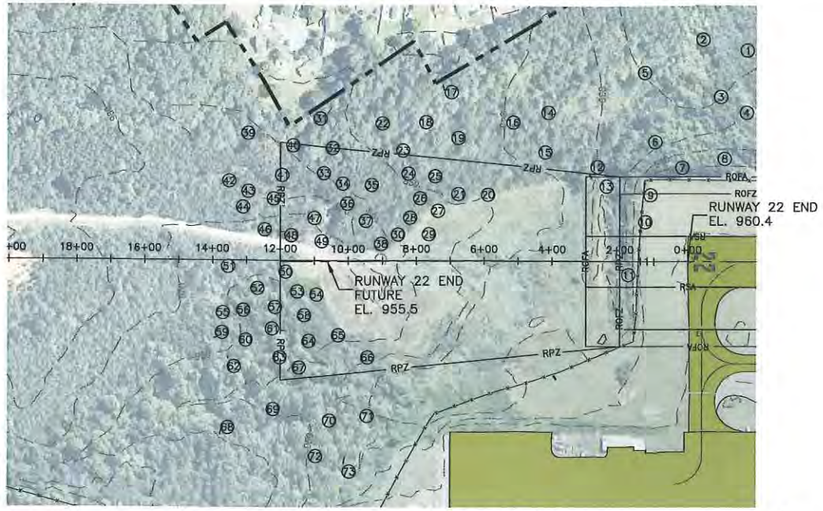
PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
RUNWAY 15
APPROACH PROFILE
AND PROTECTION ZONE

PREPARED BY:
AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 11 OF 17



RUNWAY 22 PROTECTION ZONE

SCALE 1"=200'

RUNWAY 22 APPROACH PROFILE

SCALE 1"=200' HORIZ.
1"=20' VERT.

RUNWAY 22 OBSTRUCTION CHART

OBJECT NO.	OBJECT DESCRIPTION	ELEVATION	PART 77 SURFACE	PENETRATION EXISTING	MITIGATION EXISTING	MITIGATION FUTURE
1	TREE	1,012.78	TRANSITIONAL	−1.57'	N/A	REMOVE
2	TREE	1,022.23	TRANSITIONAL	−2.41'	N/A	REMOVE
3	TREE	1,018.94	TRANSITIONAL	18.94'	N/A	REMOVE
4	TREE	1,005.25	TRANSITIONAL	17.28'	N/A	REMOVE
5	TREE	1,011.96	TRANSITIONAL	−4.36'	N/A	REMOVE
6	TREE	1,009.77	TRANSITIONAL	23.21'	N/A	REMOVE
7	TREE	1,005.66	TRANSITIONAL	31.98'	N/A	REMOVE
8	TREE	1,001.97	TRANSITIONAL	28.67'	N/A	REMOVE
9	TREE	987.39	PRIMARY	26.89'	N/A	REMOVE
10	TREE	972.22	PRIMARY	11.72'	N/A	REMOVE
11	TREE	961.39	PRIMARY	0.89'	N/A	REMOVE
12	TREE	1,020.32	TRANSITIONAL	38.55'	N/A	REMOVE
13	TREE	1,004.46	TRANSITIONAL	29.57'	N/A	REMOVE
14	TREE	1,006.42	TRANSITIONAL	−3.53'	N/A	REMOVE
15	TREE	1,000.68	TRANSITIONAL	8.30'	N/A	REMOVE
16	TREE	1,011.18	TRANSITIONAL	3.56'	N/A	REMOVE
17	TREE	1,044.95	TRANSITIONAL	12.85'	N/A	REMOVE
18	TREE	1,049.63	TRANSITIONAL	26.86'	N/A	REMOVE
19	TREE	1,024.79	TRANSITIONAL	16.15'	N/A	REMOVE
20	GROUP OF TREES	994.34	TRANSITIONAL	5.92'	N/A	REMOVE
21	GROUP OF TREES	1,003.44	TRANSITIONAL	15.66'	N/A	REMOVE
22	TREE	1,042.91	TRANSITIONAL	16.15'	N/A	REMOVE
23	TREE	1,041.28	TRANSITIONAL	31.08'	N/A	REMOVE
24	TREE	1,020.88	TRANSITIONAL	23.02'	N/A	REMOVE
25	TREE	1,004.80	TRANSITIONAL	13.06'	N/A	REMOVE
26	TREE	1,010.84	APPROACH	19.37'	N/A	REMOVE
27	TREE	998.35	APPROACH	9.38'	N/A	REMOVE
28	GROUP OF TREES	1,015.11	APPROACH	22.75'	N/A	REMOVE
29	TREE	994.14	APPROACH	4.14'	N/A	REMOVE
30	TREE	995.90	APPROACH	3.93'	N/A	REMOVE
31	TREE	1,047.32	TRANSITIONAL	15.97'	N/A	REMOVE
32	TREE	1,047.87	TRANSITIONAL	30.70'	N/A	REMOVE
33	TREE	1,038.80	TRANSITIONAL	31.46'	N/A	REMOVE
34	TREE	1,035.81	APPROACH	33.16'	N/A	REMOVE
35	GROUP OF TREES	1,032.83	TRANSITIONAL	32.83'	N/A	REMOVE
36	GROUP OF TREES	1,030.86	APPROACH	31.30'	N/A	REMOVE
37	GROUP OF TREES	1,008.39	APPROACH	9.02'	N/A	REMOVE

RUNWAY 22 OBSTRUCTION CHART

OBJECT NO.	OBJECT DESCRIPTION	ELEVATION	PART 77 SURFACE	PENETRATION EXISTING	MITIGATION EXISTING	MITIGATION FUTURE
38	GROUP OF TREES	1,008.39	APPROACH	11.96'	N/A	REMOVE
39	TREE	1,050.58	TRANSITIONAL	19.67'	N/A	REMOVE
40	TREE	1,046.71	TRANSITIONAL	25.91'	N/A	REMOVE
41	GROUP OF TREES	1,043.08	TRANSITIONAL	28.25'	N/A	REMOVE
42	GROUP OF TREES	1,044.43	APPROACH	27.30'	N/A	REMOVE
43	TREE	1,019.25	APPROACH	5.05'	N/A	REMOVE
44	TREE	1,016.40	APPROACH	−0.83'	N/A	REMOVE
45	GROUP OF TREES	1,020.41	APPROACH	6.79'	N/A	REMOVE
46	GROUP OF TREES	1,016.94	APPROACH	3.72'	N/A	REMOVE
47	GROUP OF TREES	1,021.76	APPROACH	15.50'	N/A	REMOVE
48	TREE	1,006.15	APPROACH	−4.37'	N/A	REMOVE
49	TREE	1,003.23	APPROACH	−2.60'	N/A	REMOVE
50	GROUP OF TREES	1,022.31	APPROACH	10.98'	N/A	REMOVE
51	TREE	1,015.52	APPROACH	−4.09	N/A	REMOVE
52	GROUP OF TREES	1,022.71	APPROACH	7.31'	N/A	REMOVE
53	TREE	1,025.29	APPROACH	16.29'	N/A	REMOVE
54	GROUP OF TREES	1,025.29	APPROACH	18.76'	N/A	REMOVE
55	GROUP OF TREES	1,045.59	APPROACH	26.05'	N/A	REMOVE
56	GROUP OF TREES	1,031.40	APPROACH	16.38'	N/A	REMOVE
57	GROUP OF TREES	1,031.47	APPROACH	19.66'	N/A	REMOVE
58	GROUP OF TREES	1,029.37	APPROACH	21.11'	N/A	REMOVE
59	TREE	1,035.41	APPROACH	25.10'	N/A	REMOVE
60	GROUP OF TREES	1,025.77	APPROACH	−1.19'	N/A	REMOVE
61	TREE	1,045.93	TRANSITIONAL	33.43'	N/A	REMOVE
62	TREE	1,043.62	TRANSITIONAL	23.13'	N/A	REMOVE
63	GROUP OF TREES	1,045.93	TRANSITIONAL	33.43'	N/A	REMOVE
64	GROUP OF TREES	1,032.22	APPROACH	23.76'	N/A	REMOVE
65	GROUP OF TREES	1,023.12	APPROACH	19.84'	N/A	REMOVE
66	TREE	1,002.22	TRANSITIONAL	−1.84'	N/A	REMOVE
67	TREE	1,053.42	TRANSITIONAL	32.17'	N/A	REMOVE
68	TREE	1,058.44	TRANSITIONAL	6.01'	N/A	REMOVE
69	TREE	1,057.90	TRANSITIONAL	17.70'	N/A	REMOVE
70	TREE	1,061.43	TRANSITIONAL	28.31'	N/A	REMOVE
71	TREE	1,050.57	TRANSITIONAL	22.54'	N/A	REMOVE
72	TREE	1,060.62	TRANSITIONAL	11.53'	N/A	REMOVE
73	TREE	1,050.92	TRANSITIONAL	−1.26'	N/A	REMOVE

LEGEND

	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	N/C
RUNWAY PROTECTION ZONE	RPZ	N/C
RUNWAY SAFETY AREA (RSA)	RSA	N/C
OBSTACLE FREE ZONE (OFZ)	ROFZ	N/C
OBJECT FREE AREA (OFA)	ROFA	N/C
RUNWAY VISIBILITY ZONE	RVZ	N/C
PRECISION OBSTACLE FREE ZONE (POFZ)	POFZ	N/C
LOCALIZER CRITICAL AREA	LOC	N/C
GLIDESLOPE CRITICAL AREA	GS	N/C
AIRFIELD PAVEMENT		N/C
BUILDINGS		
ROADS		
FENCING		
GROUND CONTOUR	2100	N/C
WOODED AREA		N/C
DITCH/CREEK		N/C
AIRPORT REFERENCE POINT		N/C
ROTATING BEACON		N/C

N/C = NO CHANGE

NOTES:

1. NUMBER DENOTES OBSTRUCTION. DOUBLE LETTER DENOTES VERTICAL ROAD CLEARANCE.
2. ALL ELEVATIONS ARE IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS. SPOT ELEVATIONS AND GROUND CONTOURS ARE DERIVED FROM AERIAL PHOTOGRAMMETRY AND ARE APPROXIMATE. GROUND SURVEYS ARE REQUIRED TO VERIFY ACCURACY OF OBSTRUCTIONS.
3. ALL ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

   GROUND CONTOURS AND OBSTRUCTION ELEVATIONS ARE BASED UPON AERIAL PHOTOGRAPHY PREPARED BY:

   WOOLPERT, INC.
   8731 RED OAK BOULEVARD, SUITE 101
   CHARLOTTE, NC 28217
   MARCH 2010
4. ALL POTENTIAL OBSTRUCTIONS ARE WITHIN 5 FEET OF FAR PART 77 SURFACE AND SHOULD BE FIELD VERIFIED.
5. ULTIMATE RUNWAY 22 EXTENSION, OBSTRUCTIONS, NOR RPZ ARE SHOWN. OBSTRUCTIONS SHOULD BE CHECKED AND VERIFIED ALONG WITH THE JUSTIFICATION FOR THE RUNWAY EXTENSION.
6. FAR PART 77 REQUIRES THE FOLLOWING CLEARANCES:
   10 FEET ABOVE PRIVATE ROADS
   15 FEET ABOVE PUBLIC ROADS
   17 FEET ABOVE INTERSTATE HIGHWAYS
   23 FEET ABOVE RAILROADS

0' 100' 200' 400'
GRAPHIC SCALE IN FEET

REVISIONS DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
RUNWAY 22
APPROACH PROFILE
AND PROTECTION ZONE

PREPARED BY:
AVCON / LPA TEAM

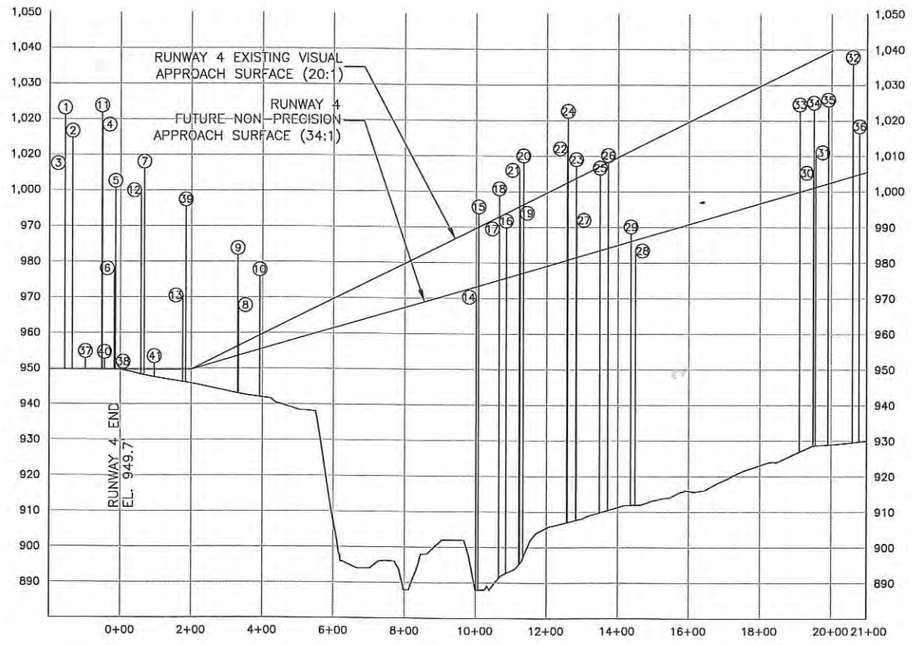
JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 10 OF 17

Plotted By: wjones
P:\2009\2009.130.01 Master Plan Update\ALP-Drawings_09_10_SRA_ALP.dwg May15,2012 - 9:54am

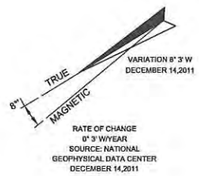
RUNWAY 4 PROTECTION ZONE

SCALE 1"=200'



RUNWAY 4 APPROACH PROFILE

SCALE 1"=200' HORIZ.
1"=20' VERT.



VERTICAL ROAD CLEARANCE CHART

OBJECT NO.	OBJECT DESCRIPTION	ELEVATION	PENETRATION EXISTING	PENETRATION FUTURE
AA	FAIRCHILD ROAD	916.67	NONE	SAME
BB	FAIRCHILD ROAD	911.16	NONE	SAME
CC	FAIRCHILD ROAD	919.02	NONE	SAME
DD	NORTH LIBERTY STREET	919.90	NONE	SAME
EE	NORTH LIBERTY STREET	921.82	NONE	SAME

LEGEND	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	N/C
RUNWAY PROTECTION ZONE	RPZ	N/C
RUNWAY SAFETY AREA (RSA)	RSA	N/C
OBSTACLE FREE ZONE (OFZ)	ROFZ	N/C
OBJECT FREE AREA (OFA)	ROFA	N/C
RUNWAY VISIBILITY ZONE	RVZ	N/C
PRECISION OBSTACLE FREE ZONE (POFZ)	POFZ	N/C
LOCALIZER CRITICAL AREA	LOC	N/C
GLIDESLOPE CRITICAL AREA	GS	N/C
AIRFIELD PAVEMENT		N/C
BUILDINGS		
ROADS		
FENCING		
GROUND CONTOUR	2100	N/C
WOODED AREA		N/C
DITCH/CREEK		N/C
AIRPORT REFERENCE POINT		N/C
ROTATING BEACON		N/C

N/C = NO CHANGE

RUNWAY 4 OBSTRUCTION CHART

OBJECT NO.	OBJECT DESCRIPTION	ELEVATION	PART 77 SURFACE	PENETRATION EXISTING	MITIGATION EXISTING	MITIGATION FUTURE
1	TREE	1,021.23	TRANSITIONAL	11.23'	N/A	REMOVE
2	TREE	1,014.73	TRANSITIONAL	21.57'	N/A	REMOVE
3	TREE	1,007.54	TRANSITIONAL	46.57'	N/A	REMOVE
4	TREE	1,018.42	TRANSITIONAL	8.42'	N/A	REMOVE
5	TREE	1,000.70	TRANSITIONAL	11.75'	N/A	REMOVE
6	TREE	978.05	TRANSITIONAL	2.18'	N/A	REMOVE
7	TREE	1,006.11	TRANSITIONAL	49.53'	N/A	REMOVE
8	TREE	967.73	APPROACH	39.38'	N/A	REMOVE
9	TREE	981.83	APPROACH	53.74'	N/A	REMOVE
10	TREE	975.84	APPROACH	39.92'	N/A	REMOVE
11	TREE	1,021.88	TRANSITIONAL	44.71'	N/A	REMOVE
12	TREE	1,019.15	TRANSITIONAL	40.08	N/A	REMOVE
13	TREE	970.43	TRANSITIONAL	−3.40'	N/A	REMOVE
14	TREE	970.32	APPROACH	−2.82'	N/A	REMOVE
15	TREE	993.76	APPROACH	20.42'	N/A	REMOVE
16	TREE	989.81	APPROACH	14.18'	N/A	REMOVE
17	TREE	989.54	APPROACH	14.50'	N/A	REMOVE
18	TREE	998.87	TRANSITIONAL	16.75'	N/A	REMOVE
19	TREE	993.96	TRANSITIONAL	−3.94'	N/A	REMOVE
20	TREE	1,008.14	APPROACH	31.09'	N/A	REMOVE
21	GROUP OF TREES	1,006.03	APPROACH	29.32'	N/A	REMOVE
22	TREE	1,012.09	TRANSITIONAL	20.23'	N/A	REMOVE
23	TREE	1,006.98	APPROACH	25.56'	N/A	REMOVE
24	TREE	1,020.68	APPROACH	39.95'	N/A	REMOVE
25	TREE	1,004.73	APPROACH	21.35'	N/A	REMOVE
26	TREE	1,008.27	TRANSITIONAL	−0.93'	N/A	REMOVE
27	TREE	991.99	APPROACH	10.53	N/A	REMOVE
28	TREE	983.41	APPROACH	−2.91'	N/A	REMOVE
29	TREE	988.18	APPROACH	2.24'	N/A	REMOVE
30	TREE	1,000.49	APPROACH	4.31'	N/A	REMOVE
31	TREE	1,005.35	APPROACH	9.86	N/A	REMOVE
32	GROUP OF TREES	1,011.07	APPROACH	31.59'	N/A	REMOVE
33	TREE	1,035.88	TRANSITIONAL	12.28'	N/A	REMOVE
34	TREE	1,022.58	TRANSITIONAL	−1.64'	N/A	REMOVE
35	TREE	1,023.08	APPROACH	21.68'	N/A	REMOVE
36	BILLBOARD	1,023.94	APPROACH	11.60'	N/A	LIGHT
37	TREE	952.90	PRIMARY	3.30'	N/A	REMOVE
38	TREE	949.89	PRIMARY	0.29'	N/A	REMOVE
39	TREE	995.50	PRIMARY	45.90'	N/A	REMOVE
40	TREE	952.63	PRIMARY	3.03'	N/A	REMOVE
41	TREE	951.46	PRIMARY	1.86'	N/A	REMOVE

NOTES:

1. NUMBER DENOTES OBSTRUCTION. DOUBLE LETTER DENOTES VERTICAL ROAD CLEARANCE.
2. ALL ELEVATIONS ARE IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS. SPOT ELEVATIONS AND GROUND CONTOURS ARE DERIVED FROM AERIAL PHOTOGRAMMETRY AND ARE APPROXIMATE. GROUND SURVEYS ARE REQUIRED TO VERIFY ACCURACY OF OBSTRUCTIONS.
3. ALL ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

   GROUND CONTOURS AND OBSTRUCTION ELEVATIONS ARE BASED UPON AERIAL PHOTOGRAPHY PREPARED BY:

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   CHARLOTTE, NC 28217
   MARCH 2010
4. ALL POTENTIAL OBSTRUCTIONS ARE WITHIN 5 FEET OF FAR PART 77 SURFACE AND SHOULD BE FIELD VERIFIED.
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   - 10 FEET ABOVE PRIVATE ROADS
   - 15 FEET ABOVE PUBLIC ROADS
   - 17 FEET ABOVE INTERSTATE HIGHWAYS
   - 23 FEET ABOVE RAILROADS

0' 100' 200' 400'
GRAPHIC SCALE IN FEET

REVISIONS DATE	DESCRIPTION

SPONSOR: AIRPORT COMMISSION OF FORSYTH COUNTY — SMITH REYNOLDS AIRPORT

PROJECT: AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE: RUNWAY 4
APPROACH PROFILE
AND PROTECTION ZONE

PREPARED BY: AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 9 OF 17

Plotted By: wjones
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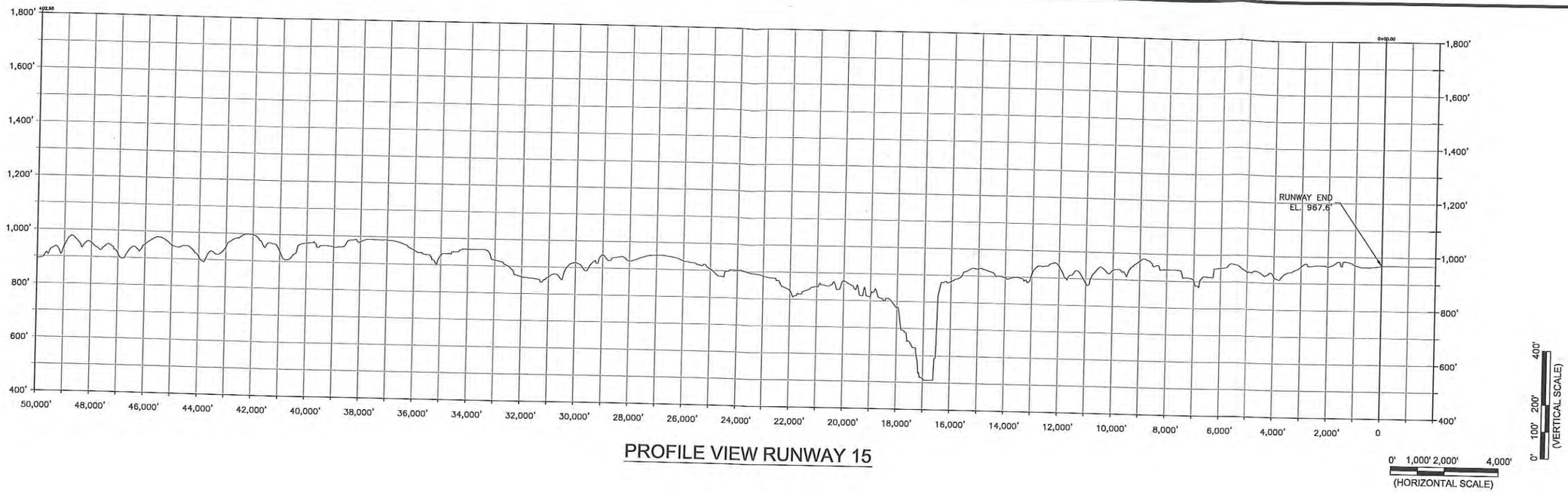
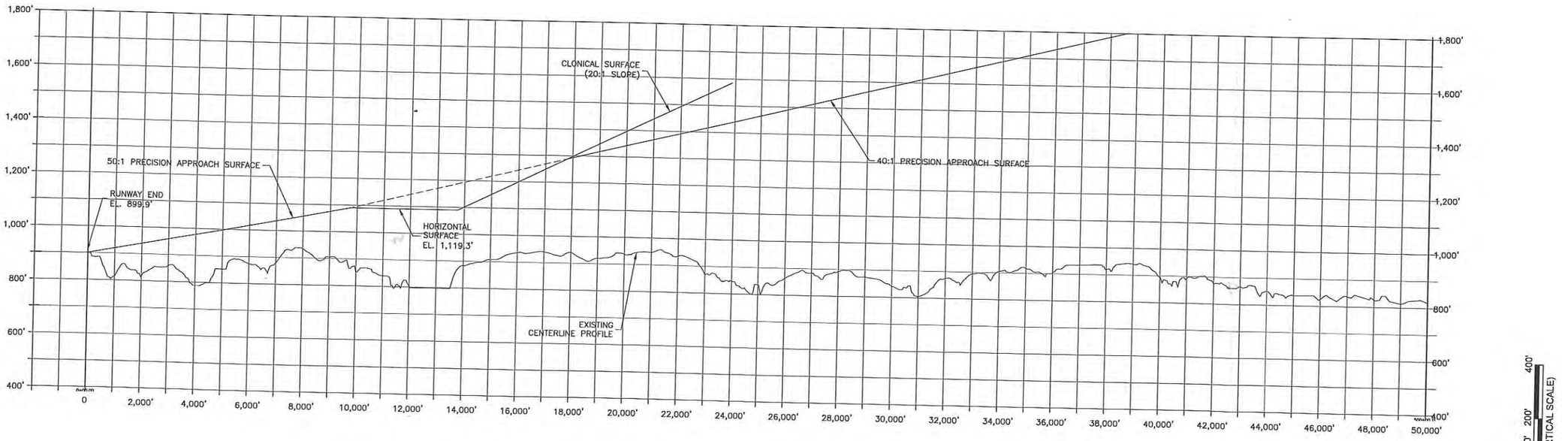


PROFILE VIEW RUNWAY 15



PROFILE VIEW RUNWAY 33

Update\ALP-Drawings_05_06_07_08_SRA_ALP.dwg May15,2012 - 9:08am

Plotted By: wjones
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REVISIONS	
DATE	DESCRIPTION

SPONSOR

AIRPORT COMMISSION OF FORSYTH COUNTY

SMITH REYNOLDS AIRPORT

PROJECT

AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE

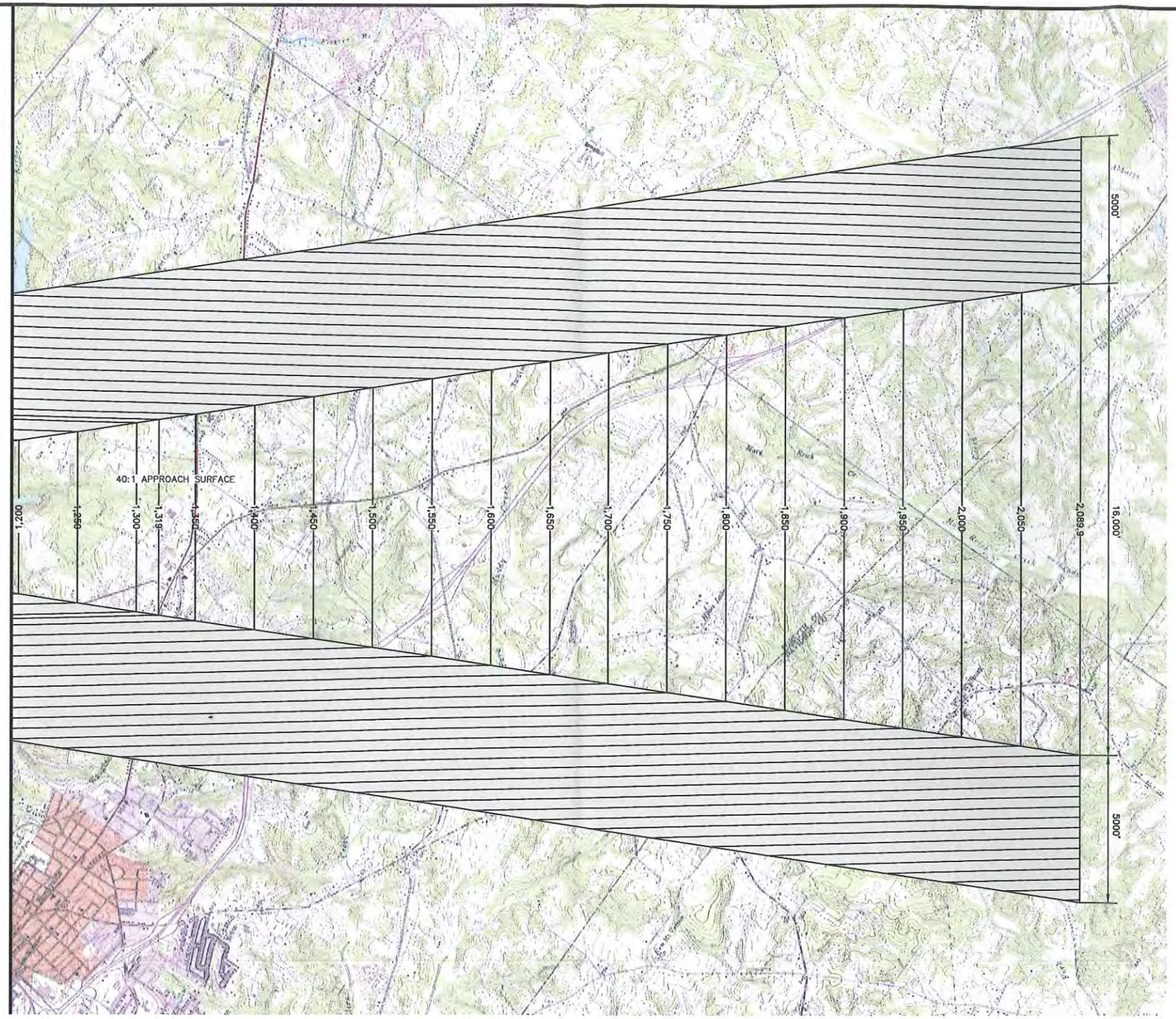
AIRPORT AIRSPACE DRAWING
RUNWAY 15-33
PROFILE
(SHEET 3 OF 3)

PREPARED BY:

AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

MATCHLINE SHEET 6



PLAN VIEW RUNWAY 15-33

6°
TRUE
MAGNETIC
VARIATION 8° 3' W
DECEMBER 14,2011

RATE OF CHANGE
0° 3' W/YEAR
SOURCE: NATIONAL
GEOPHYSICAL DATA CENTER
DECEMBER 14,2011

0' 1,000' 2,000' 4,000'
GRAPHIC SCALE IN FEET

Plotted By: wjones
P:\2009\2009.130.01 Ma
Update\ALP-Drawings_05_06_07_08_SRA_ALP.dwg May 5,2012 - 9:06am

REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

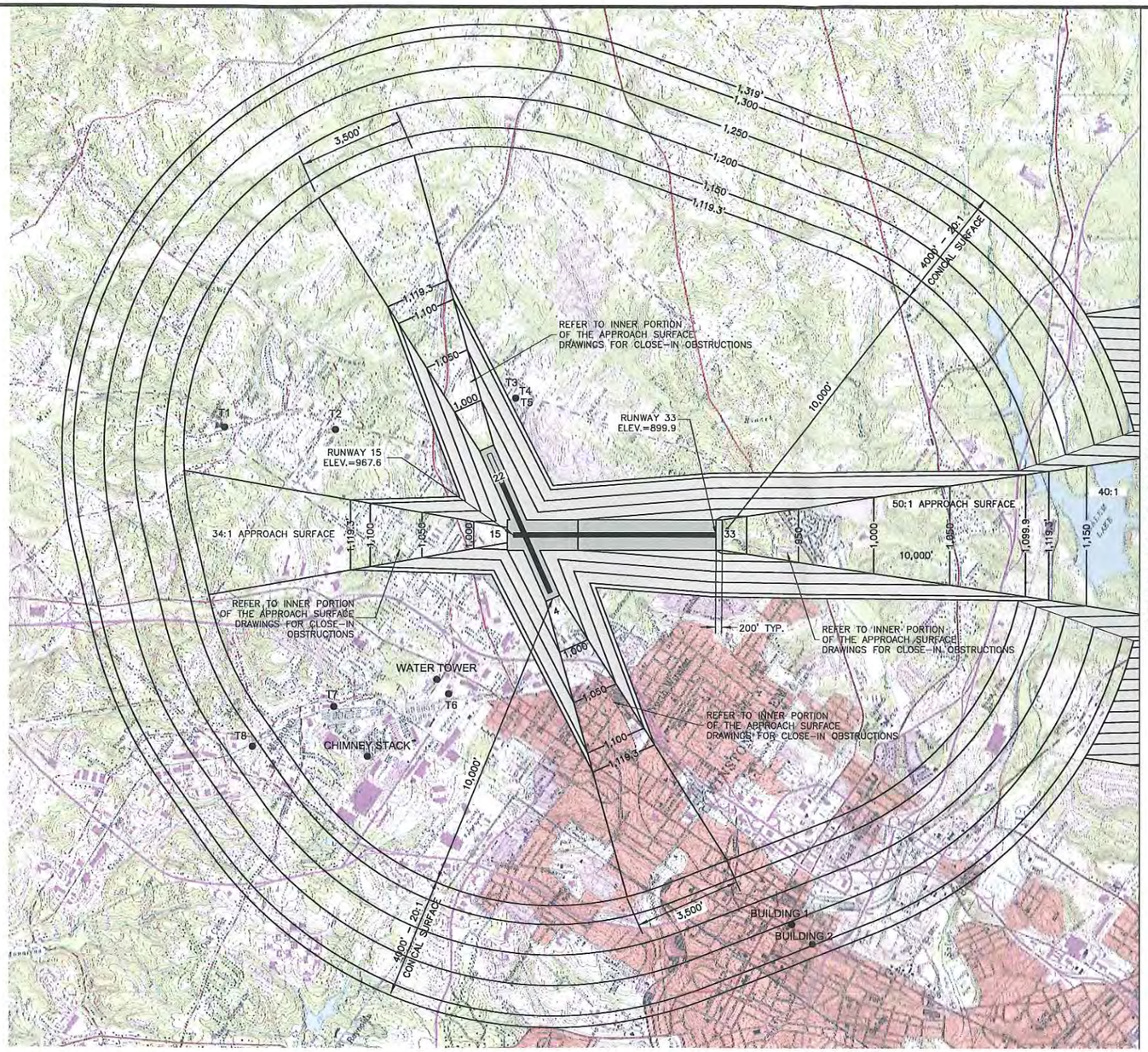
PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
AIRPORT AIRSPACE DRAWING
RUNWAY 15-33
PLAN
(SHEET 2 OF 3)

PREPARED BY:
AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 7 OF 17



PLAN VIEW RUNWAY 15-33

MATCHLINE SHEET 7

OBSTRUCTION DATA TABLE

ITEM	COUNTY	TYPE	ELEVATION (IN FEET)	AGL (IN FEET)	LIGHTING
T1	FORSYTH	TOWER	1,156.60	160.89	NONE
T2	FORSYTH	TOWER	1,141.08	152.21	NONE
T3	FORSYTH	TOWER	1,135.24	155.93	NONE
T4	FORSYTH	TOWER	1,133.31	153.64	YES
T5	FORSYTH	TOWER	1,132.97	153.31	YES
T6	FORSYTH	TOWER	1,136.00	0	NONE
T7	FORSYTH	TOWER	1,158.26	166.78	NONE
T8	FORSYTH	TOWER	1,160.82	199.95	NONE
BUILDING 1	FORSYTH	BUILDING	1,373.51	439.02	NONE
BUILDING 2	FORSYTH	BUILDING	1,380.68	475.63	NONE
CHIMNEY STACK	FORSYTH	STACK	1,144.60	0	NONE
WATER TOWER	FORSYTH	TOWER	1,143.11	0	NONE

NOTES:

1. SEE SHEET 8 OF 17 FOR PROFILE VIEW RUNWAY 15–33.
2. OBSTRUCTIONS SHOWN ABOVE PENETRATE THE FAR PART 77 SURFACE OBTAINED FROM THE DATA PROVIDED FROM DIGITAL OBSTACLE FILE (DOF) DATED 2009.

6°
TRUE
MAGNETIC
VARIATION 8° 3' W
DECEMBER 14,2011

RATE OF CHANGE
0° 3' W/YEAR
SOURCE: NATIONAL
GEOPHYSICAL DATA CENTER
DECEMBER 14,2011

0' 1,000' 2,000' 4,000'
GRAPHIC SCALE IN FEET

Update\ALP_Drawings_05_06_07_08_SRA_ALP.dwg May 15,2012 - 8:50am

Plotted By: wjones
P:\2009\2009.130.01 M

REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

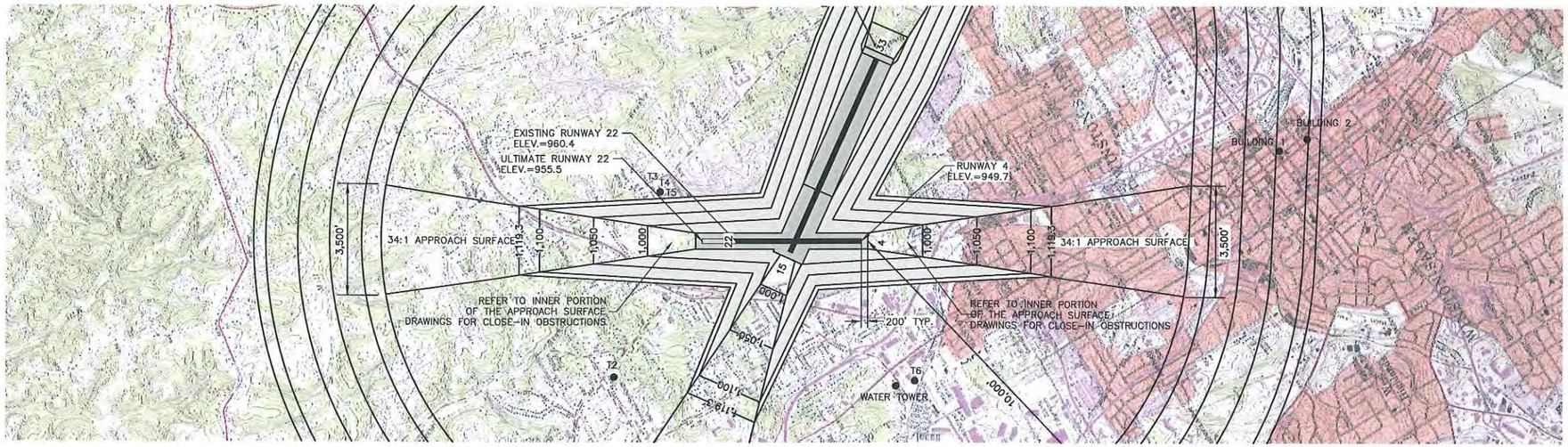
PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
AIRPORT AIRSPACE DRAWING
RUNWAY 15-33
PLAN
(SHEET 1 OF 3)

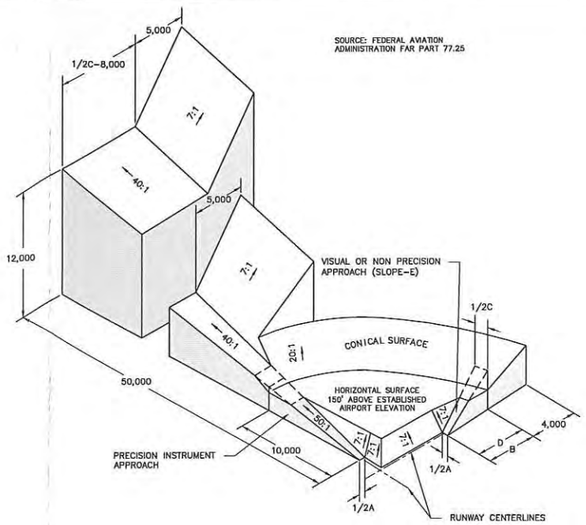
PREPARED BY:
AVCON / LPA TEAM

JOB NO.: 2009.130.01
DRAWN: WLJ
DESIGN: MAD
CHECKED: MAD
DATE: MAY 2012
SCALE:

SHEET 6 OF 17



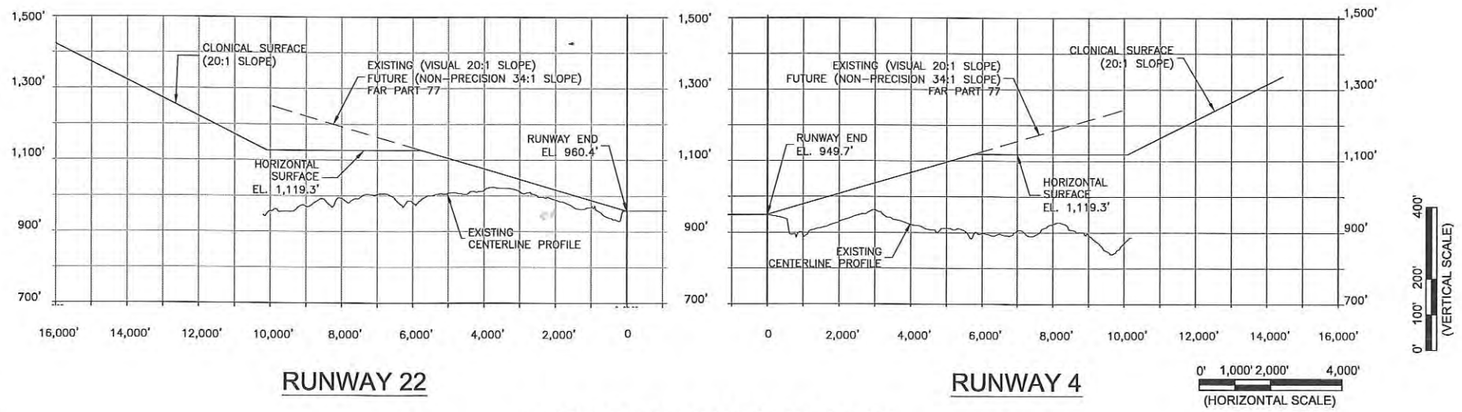
PLAN VIEW RUNWAY 4-22



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	250	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A – UTILITY RUNWAYS
B – RUNWAYS LARGER THAN UTILITY
C – VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D – VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* – PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR ADDITIONAL 40,000 FEET.

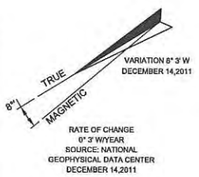
ISOMETRIC VIEW OF AIRPORT IMAGINARY SURFACES



PROFILE VIEW RUNWAY 4-22

OBSTRUCTION DATA TABLE

ITEM	COUNTY	TYPE	ELEVATION (IN FEET)	AGL (IN FEET)	LIGHTING
T1	FORSYTH	TOWER	1,156.60	160.89	NONE
T2	FORSYTH	TOWER	1,141.08	152.21	NONE
T3	FORSYTH	TOWER	1,135.24	155.93	NONE
T4	FORSYTH	TOWER	1,133.31	153.64	YES
T5	FORSYTH	TOWER	1,132.97	153.31	YES
T6	FORSYTH	TOWER	1,136.00	0	NONE
T7	FORSYTH	TOWER	1,158.26	166.78	NONE
T8	FORSYTH	TOWER	1,160.82	199.95	NONE
BUILDING 1	FORSYTH	BUILDING	1,373.51	439.02	NONE
BUILDING 2	FORSYTH	BUILDING	1,380.68	475.63	NONE
CHIMNEY STACK	FORSYTH	STACK	1,144.60	0	NONE
WATER TOWER	FORSYTH	TOWER	1,143.11	0	NONE



NOTES:

1. SEE SHEET 8 OF 17 FOR PROFILE VIEW RUNWAY 15–33.
2. OBSTRUCTIONS SHOWN ABOVE PENETRATE THE FAR PART 77 SURFACE OBTAINED FROM THE DATA PROVIDED FROM DIGITAL OBSTACLE FILE (DOF) DATED 2009.

REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
AIRPORT AIRSPACE DRAWING
RUNWAY 4-22
PLAN AND PROFILE

PREPARED BY:
AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 5 OF 17

Plotted By: wjones
P:\2009\2009.130.01 - Update\ALP-Drawings_05_06_07_08_SRA_ALP.dwg May15,2012 - 8:19am

LEGEND	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	N/C
RUNWAY PROTECTION ZONE	RPZ	N/C
RUNWAY SAFETY AREA (RSA)	RSA	N/C
OBSTACLE FREE ZONE (OFZ)	ROFZ	N/C
OBJECT FREE AREA (OFA)	ROFA	N/C
RUNWAY VISIBILITY ZONE	RVZ	N/C
PRECISION OBSTACLE FREE ZONE (POFZ)	POFZ	N/C
LOCALIZER CRITICAL AREA	LOC	N/C
GLIDESLOPE CRITICAL AREA	GS	N/C
AIRFIELD PAVEMENT		N/C
BUILDINGS		
ROADS		
FENCING		
GROUND CONTOUR	2100	N/C
WOODED AREA		N/C
DITCH/CREEK		N/C
AIRPORT REFERENCE POINT		N/C
ROTATING BEACON		N/C

N/C = NO CHANGE

EXISTING BUILDINGS DATA TABLE		
	DESCRIPTION	TOP. ELEV.
12	FBO HEADQUARTERS / HANGAR	1,009.0
13	FLIGHT SCHOOL / HANGAR	972.9
14	AIRCRAFT SALES OFFICE	978.0
18	AIRPORT TERMINAL AND ATCT	1,021.5
19	ARFF FACILITY/FIRE DEPT. HEADQUARTERS/911 CENTER	987.0
20	SMALL AIRCRAFT MAINTENANCE/HANGAR	983.7
21	AIRFIELD MAINTENANCE FACILITY/LIGHTING VAULT	988.4
22	OFFICES	981.8
23	COMPONENTS FACILITY	975.8
26	ACFC T-HANGARS - 15 SMALL UNITS	982.3
27	ACFC T-HANGARS - 3 LARGE / 13 SMALL UNITS	984.1

MATCHLINE "A" THIS SHEET

TAXIWAY N
TAXIWAY A
TAXIWAY M
TAXIWAY F
TAXIWAY K
REHAB RUNWAY 4-22 (FROM R/W4 TO R/W15)
RUNWAY 15-33
RE-ALIGN TAXIWAY F
DEMOLISH/REMOVE OLD OVERUN PAVEMENT
RECONSTRUCT TERMINAL APRON
EXECUTIVE TERMINAL AND ROTOCRAFT AREA
LANDSIDE IMPROVEMENTS
NORTH LIBERTY STREET
250.00'
200.00'
200.00'
200.00'
150.00'
500.00'
960
950
940
930
920
910
900

TRUE
6°
MAGNETIC

0' 50' 100' 200'
GRAPHIC SCALE IN FEET

DEVELOPMENT PROGRAM	FUTURE
PHASE I - SHORT TERM DEVELOPMENT (2012-2016)	
PHASE II - INTERMEDIATE TERM DEVELOPMENT (2017-2021)	
PHASE III - LONG TERM DEVELOPMENT (2022-2032)	

MATCHLINE "A"

REVISIONS	
DATE	DESCRIPTION

SPONSOR

AIRPORT COMMISSION OF FORSYTH COUNTY

SMITH REYNOLDS AIRPORT

PROJECT

AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE

TERMINAL AREA PLAN
(SHEET 2 OF 2)

PREPARED BY:

AVCON / LPA TEAM

JOB NO.:	2009.130.01
DRAWN:	WLJ
DESIGN:	MAD
CHECKED:	MAD
DATE:	MAY 2012
SCALE:	

SHEET 4 OF 17

Plotted By: wjones
P:\2009\2009.130.01 Master Plan Update\ALP--Drawings_03_04_SRA_ALP.dwg May15,2012 - 9:36am

LEGEND	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	N/C
RUNWAY PROTECTION ZONE	RPZ	N/C
RUNWAY SAFETY AREA (RSA)	RSA	N/C
OBSTACLE FREE ZONE (OFZ)	ROFZ	N/C
OBJECT FREE AREA (OFA)	ROFA	N/C
RUNWAY VISIBILITY ZONE	RVZ	N/C
PRECISION OBSTACLE FREE ZONE (POFZ)	POFZ	N/C
LOCALIZER CRITICAL AREA		N/C
GLIDESLOPE CRITICAL AREA		N/C
AIRFIELD PAVEMENT		N/C
BUILDINGS		
ROADS		
FENCING		
GROUND CONTOUR	2100	N/C
WOODED AREA		N/C
DITCH/CREEK		N/C
AIRPORT REFERENCE POINT		N/C
ROTATING BEACON		N/C

N/C = NO CHANGE

EXISTING BUILDINGS DATA TABLE		
NO.	DESCRIPTION	TOP. ELEV.
②	LIGHT INDUSTRIAL WAREHOUSE	1,025.1
③	4001 N. LIBERTY FACILITY - LARGE HANGAR FACILITY	1,053.5
④	AIRCRAFT HANGAR	1,015.2
⑤	CORPORATE HANGAR	1,025.1
⑦	AIRCRAFT HANGAR	1,012.5
⑧	AIRCRAFT HANGAR	995.4
⑨	NORTH T-HANGAR - LANDMARK	980.7
㉔	CHEMICAL STORAGE BUILDING	984.1
Ⓜ	AIRCRAFT STORAGE HANGAR	997.6

FUTURE BUILDING DATA TABLE	
NO.	DESCRIPTION
Ⓐ	50,000 S.F. HANGAR
Ⓑ	50,000 S.F. HANGAR
Ⓒ	50,000 S.F. HANGAR

0' 50' 100' 200'
GRAPHIC SCALE IN FEET

8° TRUE MAGNETIC

PARRALLEL TAXIWAY
RECONSTRUCT APPROACH END OF RUNWAY 22
EXISTING WINDSOCK
RECONSTRUCT TAXIWAY F
TAXILANE EXTENSION
CONCRETE APRON
FUTURE BUILDING (A)
FUTURE BUILDING (B)
FUTURE BUILDING (C)
AUTO PARKING
TAXIWAY H
NORTH LIBERTY STREET
500.00'
150.00'
400.00'
250.00'

DEVELOPMENT PROGRAM	FUTURE
PHASE I - SHORT TERM DEVELOPMENT (2012-2016)	
PHASE II - INTERMEDIATE TERM DEVELOPMENT (2017-2021)	
PHASE III - LONG TERM DEVELOPMENT (2022-2032)	

Plotted By: kjones
P:\2009\2009.130.01 Master Plan Update\ALP--Drawings_03_04--SRA_ALP.dwg May 15,2012 - 9:35am

REVISIONS	
DATE	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
TERMINAL AREA PLAN
(SHEET 1 OF 2)

PREPARED BY:
AVCON / LPA TEAM

JOB NO.: 2009.130.01
DRAWN: WLJ
DESIGN: MAD
CHECKED: MAD
DATE: MAY 2012
SCALE:

SHEET 3 OF 17

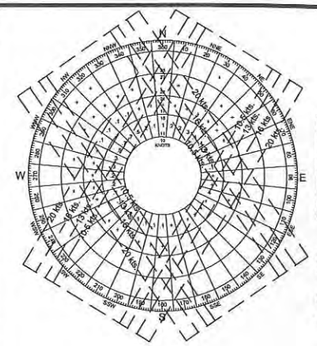
ABBREVIATIONS	
ROFA	RUNWAY OBJECT FREE AREA
TOFA	TAXIWAY OBJECT FREE AREA
RSA	RUNWAY SAFETY AREA
RPZ	RUNWAY PROTECTION ZONE
RVZ	RUNWAY VISIBILITY ZONE
REIL	RUNWAY END IDENTIFIER LIGHTS
PAPI	PRECISION APPROACH PATH INDICATOR
ASOS	AUTOMATED SURFACE OBSERVING SYSTEM
MIRL	MEDIUM INTENSITY RUNWAY LIGHT
MITL	MEDIUM INTENSITY TAXIWAY LIGHT
MALSR	MEDIUM INTENSITY APPROACH LIGHTING SYSTEM
RAIL	RUNWAY ALIGNMENT INDICATOR LIGHTS
EMAS	ENGINEERED MATERIAL ARRESTING SYSTEM
TORA	TAKEOFF RUNWAY AVAILABLE
TODA	TAKEOFF DISTANCE AVAILABLE
ASDA	ACCELERATE-STOP DISTANCE AVAILABLE
LDA	LANDING DISTANCE AVAILABLE

	RUNWAY DATA 15-33		RUNWAY DATA 4-22	
	EXISTING	FUTURE	EXISTING	FUTURE
RUNWAY LENGTH & WIDTH	6,655' X 150'	N/C	3,938' X 150'	N/C
EFFECTIVE GRADIENT (%)	1.00%	N/C	0.3%	N/C
SURFACE MATERIAL	ASPHALT	N/C	ASPHALT	N/C
PAVEMENT STRENGTH (IN POUNDS)				
SINGLE WHEEL GEAR	110,000	N/C	40,000	N/C
DUAL WHEEL GEAR	135 ,000	N/C	55,000	N/C
DOUBLE TANDEM WHEEL GEAR	230,000	N/C	90,000	N/C
RUNWAY LIGHTING	HIRL	N/C	MIRL	N/C
RUNWAY MARKING	PRECISION	N/C	BASIC	NON-PRECISION
% WIND COVERAGE (ALL WEATHER)	10.5 KTS - 97.02% 13 KTS - 98.49%	N/C	10.5 KTS - 93.87% 13 KTS - 96.56%	N/C
VISUAL NAVAIDS	REIL (RW15) PAPI (RW15) MALSR (RW33) PAPI RW33)	N/C	PAPI (RW22)	PAPI (RW4)
OBJECT FREE AREA	8,655' X 800'	N/C	4,538' X 500'	N/C
RUNWAY SAFETY AREA	8,655 X 500'	N/C	4,538' X 150'	N/C
APPROACH CAT/INSTRUMENT TYPE	INSTRUMENT	N/C	VISUAL	NON-PRECISION
APPROACH TYPE	RW15 (NON-PRECISION) RW33 (PRECISION)	N/C	VISUAL	NON-PRECISION
APPROACH SLOPE	RW15 (34:1) / RW33 (50:1)	N/C	RW4 (20:1) / RW22 (20:1)	RW4 (34:1) / RW22 (34:1)
AIRPORT REFERENCE CODE	C-III	N/C	B-II	N/C
DESIGN AIRCRAFT	BOEING 737-500	N/C	KINGAIR C90	N/C

N/C = NO CHANGE

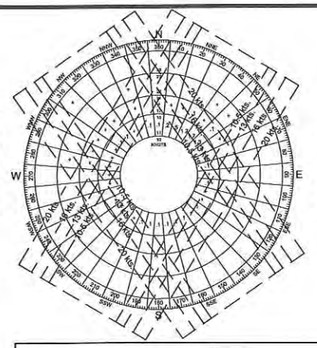
RUNWAY END LATITUDE AND LONGITUDE (NAD83)		
	EXISTING	FUTURE
RUNWAY END 15 COORDINATES	LAT. 36° 08' 19.70" N LONG. 80° 13' 34.65" W	N/C
RUNWAY END 15 COORDINATES (DISPLACED THRESHOLD)	LAT. 36° 08' 14.97" N LONG. 80° 13' 30.51" W	N/C
RUNWAY END 33 COORDINATES	LAT. 36° 07' 26.04" N LONG. 80° 12' 47.69" W	N/C
RUNWAY END 4 COORDINATES	LAT. 36° 07' 59.01" N LONG. 80° 13' 44.91" W	N/C
RUNWAY END 22 COORDINATES	LAT. 36° 08' 32.48" N LONG. 80° 13' 20.38" W	N/C

N/C = NO CHANGE



All Weather Windrose			
	Wind Coverage %		
Crosswind Component (kts)	Runway 4-22	Runway 15-33	Combined
10.5	96.15%	97.02%	99.55%
13	97.82%	98.49%	99.93%
16	99.49%	99.81%	99.99%
20	99.90%	99.99%	100.00%

Based on 74,112 Observations



IFR Windrose			
	Wind Coverage %		
Crosswind Component (kts)	Runway 4-22	Runway 15-33	Combined
10.5	99.10%	93.87%	99.79%
13	99.54%	96.56%	99.97%
16	99.85%	99.51%	99.99%
20	99.95%	99.91%	100.00%

Based on 7,270 Observations

Wind Data Source:
National Climatic Data Center
Station: 72319 - Winston-Salem, NC
Years (1999 - 2008)

Notes:
Wind Roses generated using FAA Airport Design 4.2d.
All wind coverages were calculated using the runway's true bearing.

NOTES:

1. FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF THE FUTURE FACILITIES DEPICTED. DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS AND EXTERIOR FINISHES OF STRUCTURES. FAA'S CONCERNS ARE OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS AND ADVERSE EFFECT OF CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENTS, WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY OR UTILITY OF THE AIRPORT. BUILDINGS MAY NOT BE CONSTRUCTED WHICH FALL WITHIN RUNWAY PROTECTION ZONES, RUNWAY OBJECT FREE AREAS, RUNWAY VISIBILITY ZONES, NAVAID CRITICAL AREAS; IMPAIR THE AIR TRAFFIC CONTROL TOWER'S CLEAR LINE OF SITE TO RUNWAYS OR TAXIWAYS; OR PENETRATE FAR PART 77 SURFACES.
2. ALL ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL .
3. JUSTIFICATION FOR EXTENSION OF RUNWAY 4-22 TO 5,000 FEET MUST BE PROVIDED FOR IT TO BECOME ELIGIBLE FOR FEDERAL PARTICIPATION.

LEGEND		
	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	N/C
RUNWAY PROTECTION ZONE	RPZ	N/C
RUNWAY SAFETY AREA (RSA)	RSA	N/C
OBSTACLE FREE ZONE (OFZ)	ROFZ	N/C
OBJECT FREE AREA (OFA)	ROFA	N/C
RUNWAY VISIBILITY ZONE	RVZ	N/C
PRECISION OBSTACLE FREE ZONE (POFZ)	POFZ	N/C
LOCALIZER CRITICAL AREA	LOC	N/C
GLIDESLOPE CRITICAL AREA	GS	N/C
AIRFIELD PAVEMENT		N/C
BUILDINGS		
PROPOSED EASEMENT		
ROADS		
FENCING		
GROUND CONTOUR	2100	N/C
WOODED AREA		N/C
DITCH/CREEK		N/C
AIRPORT REFERENCE POINT		N/C
ROTATING BEACON		N/C

N/C = NO CHANGE

DECLARED DISTANCES								
	EXISTING				FUTURE			
DISTANCES	R/W 4	R/W 22	R/W 15	R/W 33	R/W 4	R/W 22	R/W 15	R/W 33
TORA	3,938	3,938	6,655	6,655	N/C	N/C	N/C	N/C
TODA	3,938	3,938	6,655	6,655	N/C	N/C	N/C	N/C
ASDA	3,938	3,938	6,655	6,655	N/C	N/C	N/C	N/C
LDA	3,938	3,938	6,069	6,655	N/C	N/C	N/C	N/C

N/C = NO CHANGE

DEVELOPMENT PROGRAM	
	FUTURE
PHASE I - SHORT TERM DEVELOPMENT (2012-2016)	
PHASE II - INTERMEDIATE TERM DEVELOPMENT (2017-2021)	
PHASE III - LONG TERM DEVELOPMENT (2022-2032)	

N/C = NO CHANGE

GENERAL AIRPORT DATA		
	EXISTING	FUTURE
AIRPORT REFERENCE CODE	C-III	N/C
ESTABLISHED AIRPORT ELEV.	969.3'	N/C
MEAN DAILY MAX. TEMPERATURE	89 ° F	N/C
AIRPORT REFERENCE POINT (ARP) NAD83	LAT. 36° 08' 01.37" N LONG. 80° 13' 19.16" W	N/C
TAXIWAY LIGHTING	MITL	N/C
TAXIWAY MARKING	BASIC	N/C
AIRPORT NAVAIDS	ILS,GPS	N/C
RUNWAY 15 END ELEVATION	967.7'	N/C
RUNWAY 33 END ELEVATION	899.9'	N/C
RUNWAY 4 END ELEVATION	949.7'	N/C
RUNWAY 22 END ELEVATION	960.4'	N/C

N/C = NO CHANGE

TAXIWAY DATA TABLE		
	EXISTING	FUTURE
TAXIWAY WIDTH	35'/50'	N/C
TAXIWAY/RUNWAY SEPARATION		
RUNWAY 15-33	280'	N/C
RUNWAY 4-22	240'	N/C
TAXIWAY/APRON PARKING		
RUNWAY 15-33	535'	N/C
RUNWAY 4-22	300'	N/C

N/C = NO CHANGE

EXISTING AND FUTURE RUNWAY PROTECTION ZONE 500'X700'X1000'
FUTURE PERIMETER ROAD
EXISTING RUNWAY 22 END ELEV. = 960.4' LAT. 36°08'32.48" N LONG 80°13'20.38"W
EXISTING RUNWAY 15 END ELEV. = 967.7' LAT. 36°08'19.70" N LONG 80°13'34.65" W
EXISTING RUNWAY 4-22/15-33 INTERSECTION/HIGH POINT ELEV.= 969.3' LAT. 36°08'16.09" N LONG 80°13'32.29" W
EXISTING DISPLACED THRESHOLD ELEV. = 967.6' LAT. 36°08'14.97" N LONG 80°13'30.51" W
FUTURE HANGARS AND APRON DEVELOPMENT AREA
1,600' TAXILANE EXTENSION
PAPI
WINDSOCK
FUTURE LAND ACQUISITION (7.6 ACRES)
FUTURE LAND ACQUISITION (6.8 ACRES)
REMOVE TERRAIN OBSTRUCTIONS
RUNWAY 15 TOUCHDOWN ZONE ELEV. 967.6
EXISTING AIRPORT REFERENCE POINT
FUTURE PARALLEL TAXIWAY
RUNWAY 33 TOUCHDOWN ZONE ELEV. 914.7'
GLIDESLOPE CRITICAL AREA (END FIRE)
EXISTING RUNWAY 33 END THRESHOLD (LOW POINT) ELEV. = 899.9' LAT. 36°07'26.04" N LONG 80°12'47.69" W
JIM CONRAD WAY
ROSEMARY DR.
PROPOSED EASEMENT
NEW WALKERTOWN RD NE
BROWN BLVD
LOCALIZER CRITICAL AREA
LOCALIZER
REILS
EXISTING 15-33 6,655X150 TRUE N30° 57' 00" W
EMAS
EXISTING MALSR
PROPOSED EASEMENT
EXISTING AND FUTURE DEPARTURE RUNWAY PROTECTION ZONE 500'X1010'X1700'
EXISTING AND FUTURE APPROACH RUNWAY PROTECTION ZONE 500'X1010'X1700'
ASOS
AVIATION AVENUE
FUTURE DEVELOPMENT
CONSOLIDATED FUEL FARM
TERMINAL APRON RECONSTRUCTION
TERMINAL LANDSIDE IMPROVEMENTS
EXECUTIVE TERMINAL AND ROTOCRAFT AREA
N. LIBERTY STREET
TWY P
TWY Q
TWY A
RUNWAY 4 PAPI
TAXIWAY F REALIGNMENT
ROAD
BLAST PAD REMOVAL
PROPOSED EASEMENT
FAIRFIELD
EXISTING AND FUTURE RUNWAY PROTECTION ZONE 500'X700'X1000'
EXISTING RUNWAY 4 END THRESHOLD (LOW POINT) ELEV. = 949.7' LAT. 36°07'59.01" N LONG 80°13'44.91" W
ANSONIA ST.
TODDLER PL.
NORIZON LN.
PINDALE DR.
MANCHESTER ST.
MACHINE ST.
FUTURE LAND ACQUISITION (8.1 ACRES)
FUTURE LAND ACQUISITION (8.2 ACRES)
EXISTING AND FUTURE RUNWAY PROTECTION ZONE 1000'X1750'X2500'

8° 3' W
TRUE
MAGNETIC
MAGNETIC DECLINATION 8° 3' W DECEMBER 14, 2011
RATE OF CHANGE 0° 3' WEST/YEAR
SOURCE: NATIONAL GEOPHYSICAL DATA CENTER DECEMBER 14, 2011

FAA DISCLAIMER
THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS PLAN BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH THE APPROPRIATE PUBLIC LAWS.

CONSTRUCTION DISCLAIMER
TO PROTECT OPERATIONAL SAFETY AND ULTIMATE DEVELOPMENT, ALL PROPOSED CONSTRUCTION ON THE AIRPORT MUST BE COORDINATED BY THE AIRPORT OWNER WITH THE FAA AIRPORTS DISTRICT OFFICE PRIOR TO CONSTRUCTION. FAA'S REVIEW TAKES APPROXIMATELY 60 DAYS.

0' 250' 500' 1000'
GRAPHIC SCALE IN FEET

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
CHAIRMAN DATE
NORTH CAROLINA DIVISION OF AVIATION
DIRECTOR DATE
FEDERAL AVIATION ADMINISTRATION – ATLANTA
MANAGER

REVISIONS	
NO.	DESCRIPTION

SPONSOR
AIRPORT COMMISSION OF FORSYTH COUNTY
SMITH REYNOLDS AIRPORT

PROJECT
AIRPORT MASTER PLAN UPDATE
SMITH REYNOLDS AIRPORT
WINSTON SALEM, NORTH CAROLINA

SHEET TITLE
AIRPORT LAYOUT PLAN

PREPARED BY:
AVCON / LPA TEAM

JOB NO.: 2009.130.01
DRAWN: WLJ
DESIGN: MAD
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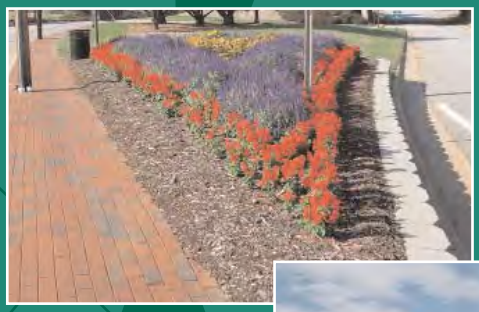
Attachment B

East/Northeast Winston-Salem Planning Area Plan

East Northeast

Winston-Salem Area Plan



City-County Planning BOARD

FORSYTH COUNTY & WINSTON-SALEM NORTH CAROLINA

Preface

Under special State enabling legislation, the City-County Planning Board of Forsyth County and Winston-Salem is responsible for preparing and maintaining a comprehensive plan for Forsyth County. The *Legacy Development Guide*, the current comprehensive plan, was adopted in 2001. Comprehensive plans take a broad, communitywide perspective for guiding growth and development. *Legacy* includes chapters on growth management, transportation alternatives, regional planning and development, economic vitality, environmental quality, open space, parks and recreation, city and town centers, building better neighborhoods, community character, community life, and active citizenship.

The Planning Board prepares a series of Area Plans for the city and county in an effort to translate *Legacy* into more precise terms which can be followed on a community level. An Area Plan generally contains information about the Planning Area's existing conditions and recommendations for guiding future growth and development. Citizen participation is an important part of the Area Plan process, and a Citizen's Advisory Committee is created by the Planning Board to work with staff as they interpret *Legacy* for each individual community.

Area Plan boundaries are determined, in part, by the Growth Management Plan in *Legacy*. Six Plans cover the **Urban Neighborhoods** as defined in the *Legacy* plan. **Urban Neighborhoods** are older neighborhoods and commercial, industrial, and institutional development built mostly before 1940 that surround the Center City of Winston-Salem. The **Urban Neighborhoods** area has been divided into study areas based on geography and common features.

An Area Plan does not change the zoning of an area. The Plan contains guidelines to help the Planning Board, governing bodies, community leaders, and neighborhoods of Forsyth County make decisions on zoning, public investment, and private initiatives. Upon adoption, each Area Plan becomes a part of the comprehensive plan, *Legacy*. While the Area Plan process seeks the extensive involvement on the part of residents, property owners, and investors, the Planning Board has the responsibility to see that each Area Plan is consistent with the broad public interest and with the elements of the comprehensive plan.

To assure implementation of the recommendations of Area Plans, an Annual Status Report will be completed for each Area Plan adopted under *Legacy*. The report includes the status of each action/project listed in the implementation schedule.

The East/Northeast Winston-Salem Area Plan

City-County Planning Board
FORSYTH COUNTY & WINSTON-SALEM NORTH CAROLINA

Adopted by City-County Planning Board: March 13, 2008
Adopted by Winston-Salem City Council: May 5, 2008

Publication Date: December 2008

Table of Contents

Introduction

Boundaries of the Study Area

The East/Northeast Winston-Salem Planning Area (which will be referred to as the Planning Area throughout this Plan), as shown on **Map 1,** encompasses approximately 4,389 acres. The Planning Area is generally bounded on the north by Akron Drive and the start of Lansing Drive; on the east by Brushy Fork Branch and US 158; on the south by the Southern Railway; and on the west by US 52. Currently, the Planning Area has land area in two City Council Wards. Approximately one-half the Planning Area is the East Ward while the other half is in the Northeast Ward.

Relationship to *Legacy*

The *Legacy Development Guide*, Forsyth County's comprehensive plan, serves as the framework on which all Area Plans are built, both geographically and as a policy guideline. Most of the Planning Area is designated in the Urban Neighborhoods (GMA 2) of the Growth Management Plan of *Legacy*. Two small portions around Davis Garage and the area inside the intersection of Martin Luther King, Jr. Drive, Fifth Street, and US 52 are designated as Center City (GMA 1) in *Legacy*. **Map 5** shows the Growth Management Areas in the Planning Area.

Area Plan Process

Citizen participation is a critical part of the Area Plan process. A Citizens' Advisory Committee (CAC) is set up for each plan to work with staff throughout the planning process. The CAC includes a variety of people concerned about the Planning Area including residents, merchants, business people, property owners, and representatives of institutions and organizations. An Interdepartmental Committee from various City and County departments is also formed to give input into the process and review the final recommendations.

The first step of the planning process is the assessment of current conditions and the consolidation of existing plans. A handbook is created for the CAC

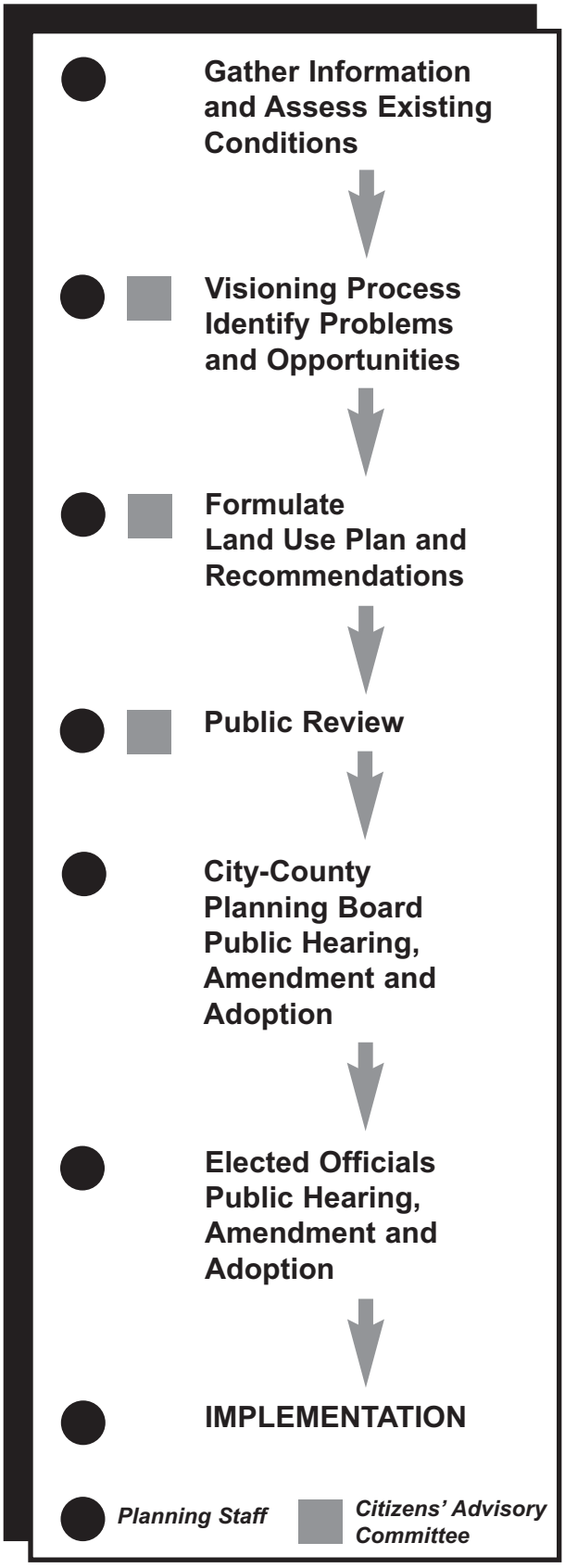


Figure 1. Area Plan Process

containing information the CAC may need to make recommendations for the Planning Area (see **Figure 1**).

Staff conducts a Visioning Process in the community. Staff facilities this process to assist themselves and the CAC in determining what the citizens of an area want their community to be like at a specific point in the future. Once the Vision is defined, goals, objectives, obstacles, and opportunities toward reaching the Vision are discussed with the CAC. These discussions, along with the policies spelled out in *Legacy*, served as the basis for the next step in the process, the formulation of recommendations by both the Citizens' Advisory Committee and the Planning staff. Staff and the Committee attempt to reach consensus in their recommendations; however, if no consensus is reached, both sets of recommendations will be presented to the City-County Planning Board.

The Planning Board reviews the recommendations for consistency with the broad public interest and with *Legacy*. The Planning Board holds a public hearing to consider the Plan and make amendments, as appropriate, before recommending the Plan for adoption. The document is then forwarded to the City Council for consideration and adoption after a public hearing. The adopted plan is used on an ongoing basis by the Planning Board and City Council to guide land use, infrastructure, and public investment decisions. An implementation Plan is formulated to outline tasks and timing needed for each recommendation, which is shown in the Implementation Schedule section of this Plan.

Existing homes on East Fourth Street

Existing Conditions

General Character

Most of the East/Northeast Planning Area was developed prior to 1940 in the pattern of traditional urban neighborhoods with a mix of residential types and densities, along with a variety of other land uses including neighborhood business areas and commercial development. The East/Northeast Planning Area is home to some of the first major housing developments constructed in Winston-Salem which includes Reynoldstown (1917), Dreamland (early 1920s), and City View (early 1920s). Known as being the African-American side of Winston-Salem, the area has begun to see an increase in its Hispanic population since the late 1990s.

Most of the Planning Area is experiencing the challenges faced by older neighborhoods elsewhere including aging building stock and infrastructure, declining commercial areas, and conflicts between land uses. The City of Winston-Salem has taken a great interest in encouraging reinvestment in the Planning Area and has been at the focal point of numerous redevelopment and housing improvement initiatives. Urban redevelopment has had a significant impact on the Planning Area since the late 1950s, removing most concentrations of blighted housing. Although urban renewal made remarkable physical improvements, a large number of substandard housing units remain in the area. Poor housing conditions have been addressed recently by code enforcement and community development programs.

The area is home to the Smith Reynolds Airport, a general aviation airport that occupies over 600 acres in the northern section of the Planning Area. Although it is not currently used for commercial aviation, the Smith Reynolds Airport has a runway large enough to handle any but the largest jets and is close to downtown Winston-Salem, adding an important component to the City's business development.

Most of the Planning Area is already developed making redevelopment of existing sites and structures more likely to happen. A challenge for the future of the Planning Area is to ensure that redevelopment and expansions compliment and blend with existing development.

Existing homes on Wheeler Street

Demographics

Based on the 2000 census, approximately 16,500 people live in the East/Northeast Planning Area, an increase of approximately 4% from the 1990 census. A significant demographic change since 1990 has been the increase in the percentage of persons of Hispanic origin living in the Planning Area, an increase from less than 1% in 1990 to approximately 11% in 2000 (see **Table 1**).

Land Use

Most of the East/Northeast Planning Area was developed prior to1940 and includes a diverse mix of land uses common to older urban areas which were developed prior to the dominance of the automobile. Residential development consists of mostly single-family units although multifamily units have captured an increasingly larger share of the total housing units over the years. Commercial uses are developed along major roads including Liberty Street, Martin Luther King Jr. Drive and New Walkertown Road. Other small pockets of commercial uses are dispersed throughout the area located in close proximity to residential uses, making it convenient for people to acquire necessary goods and services. Industrial uses are located at Smith Reynolds Airport and Lowery Street Business Park at the north and south ends of the Planning Area. Institutional uses including churches, schools, a library, and social services facilities are dispersed throughout the area. Much of the original pattern of development has been maintained in the Planning Area, except for areas of redevelopment where a more suburban-type of development is taking place.

Map 2 shows the existing land use pattern in the Planning Area today. **Table 2** shows existing land use by acreage and percent of total area.

Table 1. East/Northeast Planning Area: Demographic Trends/Comparisons

Population		2000	1990	%Change (1990 - 2000)
Planning Area		16,499	15,812	4.30
Winston-Salem		185,776	143,485	29.50
Race		**2000**	**1990**	**%Change (1990 - 2000)**
Planning Area	White	826	414	99.50
	Black or African-American	14,313	15,331	-6.70
	Asian	9	6	50.00
	Other	1,351	61	2,114.80
	*Hispanic	1,768	40	4,321.00
Winston-Salem	White	103,243	85,330	21.00
	Black or African-American	68,924	56,328	22.40
	Asian	2,108	1,097	92.20
	Other	11,501	730	1,475.50
	*Hispanic	16,043	1,236	1,198.00
Housing Units		**2000**	**1990**	**%Change (1990 - 2000)**
Planning Area	Total Number of Housing Units	7,070	7,463	-5.30
	Owner Occupied	2,114	2,190	-3.50
	Renter Occupied	4,312	4,278	0.80
	Vacant	644	995	-35.30
Winston-Salem	Total Number of Housing Units	82,593	65,631	25.90
	Owner Occupied	42,539	31,055	37.00
	Renter Occupied	33,708	28,864	17.80
	Vacant	6,346	5,712	11.10

Table 2. East/Northeast Planning Area Existing Land Use Summary

General Land Use	Acres	%
Residential		
Single-Family/Duplex	926	21
Multifamily	246	6
Office	30	1
Commercial	118	3
Industrial	789	17
Institutional	413	9
Parks and Open Space	337	8
Utilities/Right-of-Way	669	15
Total Developed Land	3,528	80
Total Vacant Land	861	20
Total Land Area	**4,389**	**100**

Source: Survey by City-County Planning staff, Spring 2006

RESIDENTIAL

The predominant land use in the Planning Area is residential, which accounts for approximately one-quarter of the total land area. Single-family is the primary residential type in most neighborhoods. For the purposes of mapping, single-family and duplex uses have been grouped together. There are few duplexes, with most located in the southwestern portion of the Planning Area.

Multifamily development accounts for approximately 6% of total land area. Concentrations of multifamily uses are located in: Piedmont Circle, Ladeara Crest Estates Apartments, Cleveland Avenue Homes, Lakeside Apartments, Rolling Hills Apartments, and Forest Ridge; east of US 52 to Cleveland Avenue between Second and Fifth Streets; on Cleveland Avenue between Martin Luther King Jr. Drive and Twelfth Street; and on small sites scattered throughout the area. The Planning Area is a source of much of the City's public and assisted housing.

OFFICE

Office land use accounts for less than 1% of the land area. Office uses are concentrated in the southern portion of the Planning Area on Martin Luther King Jr. Drive, Fifth Street, and New Walkertown Road. The northern portion of the Planning Area has some office uses on Fairchild Drive.

COMMERCIAL

Approximately 115 acres, about 3% of the land area, is developed with commercial uses. Liberty Street has been a traditional location for commercial uses since it developed as an extension of the downtown commercial area. Other commercial uses are located along major roads such as New Walkertown Road, Martin Luther King Jr. Drive, and Glenn Avenue. Scattered commercial development can be found in the Planning Area along Fifth Street and Old Greensboro Road. There are also small commercial areas in neighborhoods throughout the Planning Area.

INSTITUTIONAL

A large amount of land in the Planning Area is devoted to public and semi-public uses, including schools, churches, institutions, health and social services. The approximately 300 acres of institutional use accounts for about 9% of the land in the area. In addition to numerous schools and churches, there are a number of community services located in the Planning Area.

PARKS AND OPEN SPACE

Parks and open space account for approximately 8% of the land in the Planning Area. The nine public parks with their respective acreage and facilities are discussed more in detail in the Community Facilities Section.

INDUSTRIAL

Industrial land use represents a significant portion of the Planning Area with 17% of the total area. Industrial land uses are located at both north and south ends of the Planning Area. The Smith Reynolds Airport and industrial uses along rail lines facing Liberty Street and Glenn Avenue anchor the north end. At the south end, multiple industrial uses are located in the Lowery Street Business Park.

UTILITIES AND RIGHTS-OF-WAY

About 15% of the land area of the East/Northeast Planning Area is devoted to utilities, road and railroad rights-of-way.

VACANT

Although it appears that there is a high percentage of unused land in the Planning Area (20%), few vacant parcels can actually be developed. With the exception of some vacant parcels in the Lowery Business Park, most of the vacant land in the Planning Area is not suitable for development because of steep slopes and drainageways or proximity to the Smith Reynolds Airport. There are however, two larger vacant parcels of land expected to be developed in the near future, the Airport Business Park, and residential development next to Winston Lake.

ZONING

Rezoning cases since 1990 have affected the character and pattern of development in the Planning Area. Two of the most significant rezonings have been initiated by the City consistent with adopted plans in the area: 1) the rezoning of a portion of the Liberty Street Corridor from a highway-oriented business district to a pedestrian-oriented business district; and 2) the rezoning and redevelopment of the former Brookwood Neighborhood for the Airport Business Park.

Another significant change has been the rezoning of about 50 acres of Winston Lake Park to allow a residential development.

TRANSPORTATION FEATURES

Existing transportation features include roads, streets, bus routes, sidewalks, and greenways. The location and function of transportation features has a significant impact on land use decisions (see **Map 3**).

ROADS

Overall Street Pattern

The general street pattern reflects development time with the older section of the Planning Area being primarily a grid pattern (rectangular blocks) and newer areas around Old Greensboro Road and Carver School Road having curvilinear blocks.

Road Types

Every street and highway is classified to identify its function as part of an overall street network:

- ***Interstate Highways*** are controlled-access facilities with four or more lanes carrying traffic between cities and states.
- ***Freeways/Expressways*** are usually controlled-access facilities with four or more lanes that provide fast and efficient movement of large volumes of traffic.
- ***Thoroughfares*** function as the primary traffic arteries or "arterials" of a community.
- ***Major Thoroughfares*** move traffic both within cities and between cities, yet may also provide access to abutting properties. They range in size from two lanes to six lanes.
- ***Minor Thoroughfares*** converge traffic from *collector* and *local* streets to move it to *major thoroughfares* or highways.
- ***Collector*** streets carry traffic from local streets to thoroughfares in addition to providing access to adjoining property.
- ***Local*** streets are used predominantly to provide access to abutting property.

CURRENT PROPOSED STREET AND HIGHWAY IMPROVEMENTS

Forsyth County has several long-range transportation plans/processes: the Thoroughfare Plan, the Long Range Transportation Plan (LRTP), the Comprehensive Transportation Plan (CTP) and the Metropolitan Transportation Improvement Program (MTIP).

The Thoroughfare Plan has long served as the street and highway master plan for the urban area by identifying both existing roads and the general location of future planned roads. The Thoroughfare Plan is not fiscally constrained, as it shows all desired road projects – both funded and unfunded road projects.

While the Thoroughfare Plan deals with streets and highways, the Long Range Transportation Plan (LRTP) includes all modes of transportation. The LRTP is fiscally constrained, as it only includes projects for which funding is anticipated. The LRTP is required under federal provisions and must include an assessment of air quality impacts.

An additional State transportation planning requirement is the Comprehensive Transportation Plan (CTP). The CTP is a long-range plan for all modes of transportation and is not fiscally constrained. The Thoroughfare Plan will become the street and highway component of the CTP.

The Metropolitan Transportation Improvement Program (MTIP) is the official transportation investment schedule for State and federally funded surface transportation projects planned within the metropolitan area. The Winston-Salem Metropolitan Area includes most of Forsyth County and portions of Stokes, Davie and Davidson counties. The MTIP programs project funding for a seven-year period for all modes of transportation.

The Proposed Transportation Improvements are shown on **Map 8** and **Table 8** in the Transportation Recommendations section of this plan.

Table 3. East/Northeast Planning Area: Road Classification and Features

Interstate or Divided Highways	Direction	Description	2005 ADT (Average Daily Traffic)
Interstate 40	East-West	4-Lane, Median-Divided, Controlled Access	46,000-92,000
US 52	North-South	4-Lane, Median-Divided, Controlled Access	NA
Major Thoroughfares	**Direction**	**Description**	**2005 ADT**
Akron Drive	East-West	2-3 Lane Road	7,400-17,000
Fifth Street	East-West	3-Lane Road	5,400-9,600
Fourth Street	East-West	2-Lane Road	3,100
Liberty Street	North-South	2-4 Lane Road	6,200-16,000
Martin Luther King Jr. Drive	North-South	4-Lane, Median-Divided	13,000-22,000
New Walkertown Road/US 311	North-South	3-4 Lane Road	13,000-16,000
Northwest Boulevard	East-West	3-Lane Road	2,500
Reidsville Road/US 158	North-South	4-Lane, Median-Divided	14,000
Minor Thoroughfares	**Direction**	**Description**	**2005 ADT (Average Daily Traffic)**
Attucks Avenue	North-South	2-Lane Road	2,00
Bowen Boulevard	East-West	2-Lane Road	3,600
Carver School Road	North-South	2-Lane Road	7,600-8,400
Cleveland Avenue	North-South	2-Lane Road	4,700
Fourteenth Street	East-West	3-Lane Road	3,100-8,400
Glenn Avenue	North-South	2-Lane Road	3,700
Ogburn Avenue	North-South	2-Lane Road	1,100
Old Greensboro Road	East-West	2-Lane Road	6,800
Third Street	East-West	4-Lane Road	1,100-2,800
Twenty-Fifth Street	East-West	2-Lane Road	4,700-6,000
Waterworks Road	North-South	3-Lane Road	4,500

PUBLIC TRANSPORTATION

Local Bus Routes

The Winston-Salem Transit Authority currently provides bus service within the East/Northeast Planning Area on six routes originating from the downtown terminal. **Table 4** and **Map 3** describe the routes in more detail.

BICYCLE FACILITIES

Bicycle Routes

The Planning Area has one signed bike route described in **Table 5** and shown on **Map 3**. A signed bike route is a shared roadway which has been designated by signing as a preferred route for bicycle use.

Two streets in the Planning Area are also included in the proposed bicycle route for the North Carolina Mountains to Sea Trail; Fifth Street and Old Greensboro Road.

PEDESTRIAN FACILITIES

With the adoption of the multimodal transportation plans, enhancing and improving the pedestrian infrastructure throughout the county has become a transportation priority.

Sidewalks

The *Winston-Salem Urban Area Sidewalk and Pedestrian Facilities Plan*, adopted in 2007, takes a comprehensive look at pedestrian needs including sidewalk policies, sidewalk standards, existing sidewalks needing repair, and recommendations for locations of new sidewalks. Because funding is limited, sidewalk ranking criteria was developed as part of the *Pedestrian Plan* to help determine which recommended sidewalks are most needed. Criteria includes street type, school locations, location of "pedestrian generators" such as stores and parks, connectivity to the overall pedestrian system, and location of bus stops.

Sidewalks are found in the Planning Area in a good number of residential and commercial areas that were developed before 1940. Generally, the areas that have sidewalks are located west of New Walkertown Road and west of the intersection of Fifth Street and Old Greensboro Road. Areas developed after 1950 do not have the same level of pedestrian facilities. These developments are generally located between Brushy Fork Creek and Business 40.

Area Plans may make additional recommendations for sidewalks beyond what the *Pedestrian Plan* currently recommends. As each Area Plan is adopted, the additional recommendations become part of the *Pedestrian Plan*. All proposed sidewalks in the *Pedestrian Plan* are evaluated on an annual basis and ranked for future constructions.

The *Pedestrian Plan* identified all existing sidewalks located in the Planning Area as well as those sidewalk projects that are funded through the year 2015. Funded sidewalk projects include: Addison Avenue between New Walkertown Road and Twelfth Street, Emerald Street between Dellabrook Road and El Dora Street, and Caledonia Drive to connect at both ends with Elbon Drive. A sidewalk along the east side of New Walkertown Road between Winston Lake Road and Waterworks Road has been completed.

The City of Winston-Salem and Forsyth County have adopted street design standards for new developments that include requirements for sidewalks.

Greenways

Greenways are linear parks that provide pedestrian and bicycle access to community facilities and neighborhoods. Greenways are discussed in more detail in the Community Facilities section.

There are two constructed greenway trails in the Planning Area, the Virginia K. Newell/Ann Massey Trail, and a section of the Bowen Branch Trail which serves as a neighborhood connector.

RAIL

The Piedmont Authority for Regional Transportation, PART, is the agency in charge of administering and developing rail service studies in the Triad. *The Intercity Rail Study* examines the feasibility of providing intercity rail travel between Raleigh and Asheville through Winston-Salem generally along the Interstate I-40 corridor. *The Commuter Rail Study* examines the major travel corridors within the Triad to determine which corridors can support a major transit capital investment to enhance public transit.

A possible site for the Winston-Salem Intercity Passenger Rail Station would be the historic Union Station situated east of the city center, at Martin Luther King Jr. Drive. This location is under consideration in the Southeast Corridor high-speed rail study. The Winston-Salem station would include a

Table 4. East/Northeast Planning Area: Local Bus Routes

Route Number	Direction	General Route
1	North-South	**Downtown to Oakridge.** Begins along Fourth Street to Cleveland Avenue, Martin Luther King Jr. Drive, US 311, Ferrell Avenue, Tenth Street, Cameron Avenue, Twelfth Street to US 311 before continuing on Carver School Road out of the Planning Area to Butterfield Drive. Evening service is provided from 6:30 p.m. to midnight on extended route #1.
2	East-West	**Downtown to Castle Heights.** Begins along Martin Luther King Jr. Drive to Highland Avenue, Fourteenth Street, Jackson Avenue, Twenty-Fifth Street, Ansonia Street, Manchester Street, Twenty-Fourth Street, Douglas Hill Drive, Bowen Boulevard and Rosemary Drive.
3	North-South	**Downtown to Happy Hill Gardens.** Begins along Third Street to Martin Luther King Jr. Drive out of the Planning Area to Happy Hill Gardens.
17	North-South	**Downtown to Cleveland Avenue.** Begins along Fourth Street to Highland Avenue, Martin Luther King Jr. Drive, File Street, Claremont Avenue, Tenth Street, Cleveland Avenue to Twenty-Sixth Street. Evening service is provided from 6:30 p.m. to midnight on extended route #17.
25	East-West	**Downtown to Old Greensboro Road.** Begins along Third Street to Jackson Avenue, First Street, Maryland Avenue before continuing along Old Greensboro Road to East Forsyth High School.

Table 5. East/Northeast Planning Area: Bicycle Routes

Route Number	Direction	General Route
4	Loop	**East Winston Loop.** This route is laid out along existing roads where bicyclists can be served by sharing the travel lanes with motor vehicles. The route includes Liberty Street, Fourteenth Street, Cleveland Avenue, Twenty-Third Street, Bowen Boulevard, Waterworks Road, and Fifth and Third Streets. Off-road trails in the area are also used in this route including the Bowen Branch Trail and the Virginia Newell/Ann Massey Trail.

Cyclist enjoys a ride on one of Winston-Salem's greenways

waiting room for 25 to 50 passengers, restrooms, ticket office, and baggage/mail areas. The parking lot would accommodate 75 parking spaces, and there would be parking for taxis, buses, and shuttles. A new platform, canopy, and service track would be built. The station could be designed to incorporate other uses such as a visitor center, retail shops, etc.

AIRPORTS

Air traffic in Winston-Salem and Forsyth County departs or originates at the Smith Reynolds Airport. This airport, operated by the Airport Commission of Forsyth County, serves the local citizens as a general aviation airport with limited commuter flights. The airport has good access to US 52 and is located approximately three miles northeast of downtown Winston-Salem.

The Piedmont Triad International Airport (PTIA) is located approximately 20 miles east of downtown Winston-Salem in Guilford County. PTIA provides the region with direct and connecting commercial air passenger and air freight service to national and international destinations. The Mid-Atlantic FEDEX hub will open at PTIA in 2009.

COMMUNITY FACILITIES

The East/Northeast Area Plan has a number of facilities that serve the community including parks, schools, churches, and other institutional uses.

SCHOOLS

The Winston-Salem/Forsyth County Board of Education uses a "controlled choice" plan to assign students to schools. The plan gives parents and students a choice between their residential school and several others within the same zone. The State of North Carolina also funds charter schools, privately run and publicly funded schools to provide students with additional educational options at no cost to the student. There are five public schools in the Planning Area, with one school housing middle as well as high school students. There are two elementary schools, Ashley Elementary Magnet School and David H. Petree Elementary School; two middle schools, the J.F. Kennedy Learning Center and the Winston-Salem Preparatory Academy; and two high schools, Atkins Academic and Technology High School Complex and the Winston-Salem Preparatory Academy.

There is one private school in the Planning Area: Ephesus Junior Academy.

RECREATION FACILITIES

Parks

The *2015 Parks and Open Space Plan* was adopted in 2007. This Plan discusses existing parks, community park needs, existing open space and open space needs, park proposals and recommended facilities. Nine public parks are currently located in the East/Northeast Planning Area. Parks are classified based on their size, facilities, and function. **Table 6** lists recreation facilities in the East/Northeast Planning Area by type with acreage and major facilities. Based on the service area analysis completed for the *Winston-Salem and Forsyth County 2015 Parks and Open Space Plan*, the East/Northeast Planning Area is adequately served by parks and community center facilities.

Greenways

Greenways are linear open space corridors that can be managed for conservation, recreation, and/or transportation purposes. Many greenways have paved trails and accompanying land that provide pedestrian and bicycle access to neighborhoods and community facilities in addition to waterways of Forsyth County. In 2002, the *2015 Greenway Plan for Winston-Salem and Forsyth County* was adopted. The Plan covers greenway trail design, priorities for greenway construction, operational policies and procedures, funding issues, and citizen involvement. Greenway easements along creeks and other linear features have been requested through the zoning and subdivision process in Forsyth County for over 20 years.

There are two existing greenway trails in the Planning Area:

Bowen Branch Trail is 0.3 miles of paved path running along Brushy Creek from Bowen Boulevard to US Highway 311. It is accessible to pedestrians, cyclists, and skaters/rollerbladers.

The **Virginia K. Newell/Ann Massey Trail** is 1.0 mile paved path that connects Old Greensboro Road and Waterworks Road near the entrance of Winston Lake. It is accessible for pedestrians, cyclists and skaters/rollerbladers.

Table 6. East/Northeast Planning Area: Recreation Facilities

Park Type	Acreage	Major Facilities
Mini/Ornamental Parks: Small facilities designed to serve a specific population segment or to be primarily ornamental in nature.		
Clark/Mickens Park	1.0	Playground
Neighborhood Parks: Provide intense recreational activities accessible to neighborhoods.		
Harambee Park	1.1	Walking Trail
Kingston Greens Park	0.7	Playground
Fairview Park	2.1	Playground, Softball Field, Basketball Court
Skyland Park	17.8	Picnic Shelter, Playground, Fitness Trail, Basketball Court, Restrooms
Community Parks: Provide active recreational opportunities drawing people from multiple neighborhoods.		
Bowen Boulevard/ Hansel B. Thomas Park	17.5	Playground, Fitness Trail, Restrooms
Fourteenth Street Park	6.9	Playground, Softball Field, Tennis Courts (3), Restrooms, Recreation Center
Rupert Bell Park	19.0	Picnic Shelter, Playground, Softball Field, Restrooms, Basketball Court (2), Recreation Center
District Park: Provide recreation opportunities focusing on one or more specialized activities such as golf or tennis.		
Winston Lake Park	467.0	Picnic Shelter (5), Playground (3), Softball Field (4), Fitness Trail, Restrooms, Football Field, Fishing

The *Greenway Plan* recommends construction of the following greenways in the Planning Area:

Brushy Fork Creek Greenway Trail (south), a paved recreation and transportation trail, 1.2 miles in length, connecting the Virginia K. Newell/Ann Massey Trail on Old Greensboro Road to the Salem Creek Trail east of Winston-Salem State University.

Brushy Fork Creek Greenway Trail (north), a paved recreation and transportation trail connecting the Virginia K. Newell/Ann Massey Trail with Winston Lake, Helen Nichols Park, Carver High School, Crawford Park to end at the Mazie Woodruff Center and Library on Lansing Drive.

LIBRARY FACILITIES

There is a branch library facility in the East/Northeast Planning Area, the Malloy/Jordan East Winston Heritage Center located on east Seventh Street at Cleveland Avenue.

FIRE STATIONS

There are two fire stations in the East/Northeast Planning Area:

Fire Station #3, the Liberty North Fire Station, covers the area in and around Smith Reynolds Airport and serves a mixture of industrial and residential areas.

Fire Station #4, the Lester E. Irvin Fire Station, covers the areas in and around Winston Salem State University, Bowman Gray Stadium and the Business 40/Highway 52 interchange.

OTHER COMMUNITY FACILITIES

Health Facilities

The East/Northeast Planning Area has a number of health related facilities as follows:

Forsyth County Department of Social Services – Highland Avenue

The Forsyth County Department of Social Services is located in the former Reynolds Hospital building on Highland Avenue. The Department of Social Services provides a wide range of services to families, adults and children in the community.

Forsyth County Department of Public Health – Highland Avenue

The Forsyth County Department of Public Health offers a number of clinics, from Family Planning to Teen Clinic, at its facility located on Highland Avenue. These clinics are staffed daily by registered nurses, physician assistants and other professional staff. These clinics do not provide primary physician care or sick care. Also located on Highland Avenue is the Behavioral Health Plaza.

Forsyth County Emergency Services – Fifth Street

Established in 1968, Forsyth County Emergency Medical Services has grown from a small, basic life support provider into a high-volume, EMT-Paramedic service. Forsyth County EMS (FCEMS) provides 24 hour-a-day advanced life support, pre-hospital emergency medical care for Winston-Salem and Forsyth County residents. With an annual call volume in excess of 33,000 responses, FCEMS operates a minimum of thirteen Advance Life support (ALS) ambulances and two ALS Quick Response Vehicles each day.

Wake Forest University Baptist Medical Center Community Physicians (formerly Aegis Family Health Center) – Winston East Pediatrics – Fourteenth Street

Wake Forest University Baptist Medical Center Community Physicians was formed in 1994 as a not-for-profit joint venture between the Wake Forest University School of Medicine and North Carolina Baptist Hospital. It was initially incorporated under the name of Primary Care Corporation (PCC); however, in December 1995, the name was changed to Aegis Family Health Centers, and on July 1, 2007, was changed to Wake Forest University Baptist Medical Center Community Physicians. This name change was made to more closely align it with Wake Forest University Baptist Medical Center.

Wake Forest Baptist Community Physicians is a group of neighborhood health care practices serving communities in northwestern North Carolina. They provide affordable, preventive medicine and patient education with 40 providers (34 physicians and six mid-level practitioners) in 14 medical offices, one of them located on Fourteenth Street and serving the East/Northeast Planning Area.

Winston-Salem Forsyth County Board of Education Homebound/Hospital Education Center – Twelfth Street

The Homebound/Hospital School provides instruction to students who are unable to attend school due to critical injury, serious illness, or other authorized out-of-school placement.

Cemeteries

Evergreen Cemetery

The Evergreen Cemetery is located on a 47-acre plot of land located on New Walkertown Road. It was opened in 1944 to take place of the former Evergreen Cemetery located in the Liberty Street area, backing up to Smith Reynolds Airport. It had to be moved in the early 1940s because the airport needed to expand runways in order to ship goods during WWII. The cemetery was expanded in the late 1960s to 32.5 acres. In 1998, the cemetery was again expanded to 48 acres, increasing the cemetery's capacity for future interments.

The Proposed Community Facilities map (see **Map 9**) in the Community Facilities Recommendations section shows existing facilities as well as additional facility improvements identified in the other plans discussed above or during the planning process.

Brown Boulevard/Hansel B. Thomas Park fitness trail

Housing and Community Development

GENERAL INFORMATION

According to the 2000 Census, there are approximately 7,070 housing units within the East/Northeast Planning Area. The Census shows 6,426 units (91%) are occupied while 644 units (9%) are vacant. Of the 6,426 occupied housing units ("households"), approximately 2,114 units (33%) are owner-occupied, while 4,312 units (67%) are renter-occupied. This is significantly different than the average for Winston-Salem where 56% of housing units are owner-occupied and 44% of units are renter-occupied.

Housing strategies for the Planning Area since the 1960s include: the rehabilitation of existing houses through the designation of some areas as Rehabilitation, Conservation and Reconditioning Areas eligible for Community Development Block Grant (CDBG) money and other funds; demolition of dilapidated homes which cannot be repaired economically; certification of areas for redevelopment; and programs to increase the rate of homeownership among Planning Area residents.

HOUSING IMPROVEMENT EFFORTS

Housing conditions vary in the Planning Area with some neighborhoods having moderate-to-well-maintained housing units and other neighborhoods having individual streets with deteriorated structures. The City's primary means of maintaining housing conditions is enforcement of its minimum housing code. The City also uses federal community development and local housing funds to assist both owner-occupants and investor-owners to rehabilitate residential structures. Most of these funds are provided to property owners in the form of low-interest loans.

As of 2004, the City of Winston-Salem has targeted its community development funds to the Neighborhood Revitalization Strategy Area (NRSA), an area designated based on the rate of poverty. All of the East/Northeast Planning Area is located in the NRSA.

In areas where housing conditions are extremely deteriorated and code enforcement/rehabilitation efforts have been unsuccessful, the City-County Planning Board can certify the area as a *Redevelopment Area* based on the provisions of North Carolina Redevelopment Law. Blight Certification allows the City to acquire property through the power of eminent domain (condemnation) based on an adopted redevelopment plan. Due to the regulations and processes that must be followed, including the relocation of occupants, City redevelopment efforts can be expensive and slow.

Redevelopment authority has been used in Winston-Salem since the late 1960s to acquire and clear blighted housing. While early urban redevelopment projects acquired and cleared large areas, recent efforts to improve housing conditions focus more on code enforcement, encouragement of rehabilitation, and include only limited acquisition and clearance. This change occurred mainly due to reductions in federal community development funding, but also due to recognition that wholesale clearance can have many negative impacts on a community.

Recent City Redevelopment Efforts

A significant number of homes in the Planning Area have been demolished through redevelopment and through code enforcement. Since the 1960s, most of the Planning Area has been included at various times in different public development and redevelopment projects. Public projects have varied from urban renewal, to neighborhood improvement/code enforcement, to community development (see **Map 4**).

East Winston General Neighborhood Renewal Plan

The East Winston General Neighborhood Renewal Plan (GNRP) was the first urban renewal program undertaken by the City of Winston-Salem. In 1957, the City designated 718 acres within the East/Northeast Planning Area to be considered for urban renewal activities. The GNRP was subdivided into four project areas for separate treatment strategies:

- **Project 1.** Began September 1, 1961, and officially ended October 14, 1966. Eighty percent (80%) of the redeveloped land in Project 1 provided sites for public facilities and highway construction including US 52, J.F. Kennedy Middle School, the Forsyth County Health and Social Services Center, and new housing located within the area.

- **Project 2.** Began July 1963 and covered 217 acres on both sides of US 52. New development in the area included 80 single-family dwellings

and 600 multifamily units. Public facilities included the Winston-Salem Housing Authority Administrative Center, the Reynolds Health Center, and the Forsyth-Stokes Counties Mental Health Complex. A commercial site was developed, including a shopping center, fast food restaurants, and office. Numerous sites were provided for new construction and for expansion of existing churches. Redevelopment also made 15 new industrial locations available including sites for Reynolds Industries, Piedmont Natural Gas, and the Greyhound Bus Terminal.

- **Project 3.** Begun in September 1969 covering 156 acres of which 70 were designated for rehabilitation rather than clearance. Nineteen acres were assembled for the development of Rupert Bell Park. Another 12 acres, often referred to as the "7th and Graham Site," were developed as well.

- **Project 4.** A *Neighborhood Development Plan* was submitted for a part of the GNRP Project 4 area on April 1, 1972. Seven acres between Tenth and Eleventh Streets were acquired, cleared, and redeveloped for construction of 23 single-family units.

Neighborhood Improvement Program East (NIPE)

East/Northeast Planning Area neighborhoods outside the GNRP project areas were assisted through the Neighborhood Improvement Program East (NIPE), a systematic housing code enforcement program that provided direct federal grants and loans to eligible property owners for rehabilitation of substandard housing. Operating from 1970 to 1973, NIPE included three areas in the Planning Area contiguous with the redeveloped GNRP area: Old City Hospital, Eleventh Street, and Dreamland. Street improvements and expanded recreational facilities in the Brushy Fork area were also provided by NIPE funds and private donations. The total area of 526 acres designated as NIPE also included the City View neighborhood.

Community Development Programs

The Community Development Act of 1974 superseded previous urban renewal grant programs, allocating annual block grants to cities for general redevelopment activities. The remainder of GNRP Project 4, not addressed in earlier plans, was designated East Winston #4 under the Community Development Program.

- **East Winston #4.** This area was certified in 1975 and includes the area from Eleventh to Fourteenth Streets between Cameron and Cleveland Avenues. The initial development activity cleared a 25-acre tract between Eleventh and Twelfth Streets. Fourteen (14) acres of this area were developed for Summit Square and the remainder was redeveloped for single-family housing. The area between Twelfth and Fourteenth Streets was rehabilitated selectively rather than totally cleared. The remainder of the project area was acquired in 1988 and has now been completely redeveloped.

- **East Winston #5.** East Winston #5, certified in 1988, is bounded by Eighteenth Street on the north, Jackson Avenue on the east, Fourteenth Street on the south, and Cleveland Avenue on the west. The area contains 42 acres and was found to have 136 residential structures and 11 nonresidential with only 18 of them rated as standard, needing no repairs. *The Redevelopment Plan* included the relocation of 164 families and individuals and three businesses as well as the demolition of 137 structures. Single-family homes were built for homeownership, existing churches were expanded, and commercial businesses located along Fourteenth Street between Claremont and Jackson Avenue. The total estimated project cost was $7,554,000.

- **Northeast Winston #1.** Northeast Winston #1 Redevelopment Area was certified in 1989 and is bounded by the rear lot lines north of Twenty-First Street on the north, Eighteenth Street on the south, the rear lot lines east of Lafayette Street on the east, and Cleveland Avenue on the west. Northeast #1 included recommendations for the acquisition of 61 parcels, relocation of 104 families and individuals, and the demolition of 73 structures.

- **Northeast Winston #2.** Certified as a blighted area in 1988, the area is bounded on the north by the rear property lines of homes fronting on Twenty First Street , on the south by New Hope Lane, on the east by Cleveland Avenue, and on the west by US 52/Liberty Street. *The Redevelopment Plan* called for the acquisition and clearance of 42 parcels, the relocation of 28 families and two businesses, the demolition of up to 25 structures, the construction of two new streets, and the construction or rehabilitation

of approximately 25 single-family homes designated for homeownership. Preferred developers have been selected but new homes have not been built to date.

- **Northeast Winston #3.** Northeast Winston #3 was certified in October 1999 as Rehabilitation, Reconditioning and Conservation Area with the western portion certified as a Redevelopment Subarea. This rehabilitation project was designed to improve the housing quality in an area where no new housing has been built since 1985. The area is generally bounded on the west by US 52, on the north by Twenty-Sixth Street, on the east by Bowen Park, and on the south by the rear property lines of homes on Twenty-Second Street. Northeast Winston #3 encompasses 104 acres with a total of 385 structures. Forty-eight of the structures were classified as substandard and in need of repair. Work on the Northeast Winston #3 Rehabilitation Area has yet to begin. Northeast Winston #3 Subarea encompasses 26 acres with a total of 73 structures. Seventy percent of the structures were classified as substandard. Redevelopment work has also not yet begun.

- **Brookwood.** The Brookwood Area was certified as a blighted area in 2000. Brookwood includes 77 acres located south of the Smith Reynolds Airport and immediately north and east of the Piedmont Circle public housing development. The area had 155 structures, mostly single-family homes, with almost 70% of the structures found to be substandard and in need of repair or demolition. *The Brookwood Redevelopment Plan* included the acquisition and clearance of 155 structures and redevelopment of the site as an airport-oriented industrial park. Acquisition and clearance has been completed.

- **Liberty Street.** The Liberty Street Area is predominantly nonresidential with 74% of the land developed for commercial uses. To assist with the revitalization efforts, the area was certified as a Nonresidential Redevelopment Area in 2005, giving the City the ability to use the power of eminent domain to acquire properties based on a redevelopment plan. At that time, 63% of the total structures were classified as nonstandard. The plan includes acquisition of four structures and four vacant lots to be demolished and replaced with new structures.

Assistance from Habitat for Humanity

The City of Winston-Salem has worked to expand opportunities for affordable housing and promotion of home ownership in a variety of ways. In addition to assisting with the rehabilitation of multifamily units, the City has provided funding to Habitat for Humanity to assist them to build single-family houses for low-income persons. In the East/Northeast Planning Area, most of these units have been in redevelopment areas. The City also provided

Habitat For Humanity single-family homes on Nash Avenue

funding assistance to scattered-site new home construction by Habitat for Humanity at various sites in the East/Northeast Planning Area.

Certified Areas

At various times, entire neighborhoods or areas have been certified as Rehabilitation, Conservation and Reconditioning including: City View, Bowen Park, Short Street, Eleventh Street, Old City Hospital, and Dreamland. Programs including concentrated code enforcement and rehabilitation loan and grant assistance were developed for these areas. Other areas, Dreamland, Old City Hospital and Eleventh Street, have been recertified for participation in the City's "Buy-Rehab Program." This program attempted to increase homeownership within the certified areas and ensure that the newly purchased houses were brought up to standard.

PUBLIC AND ASSISTED HOUSING

There are a number of public and assisted housing developments throughout the East/Northeast Planning Area. Most are small and serve specific populations, including elderly and handicapped persons, low-income families and homeless persons. There are three assisted or public housing developments with more than 100 units in the Planning Area as follows:

Cleveland Avenue Homes

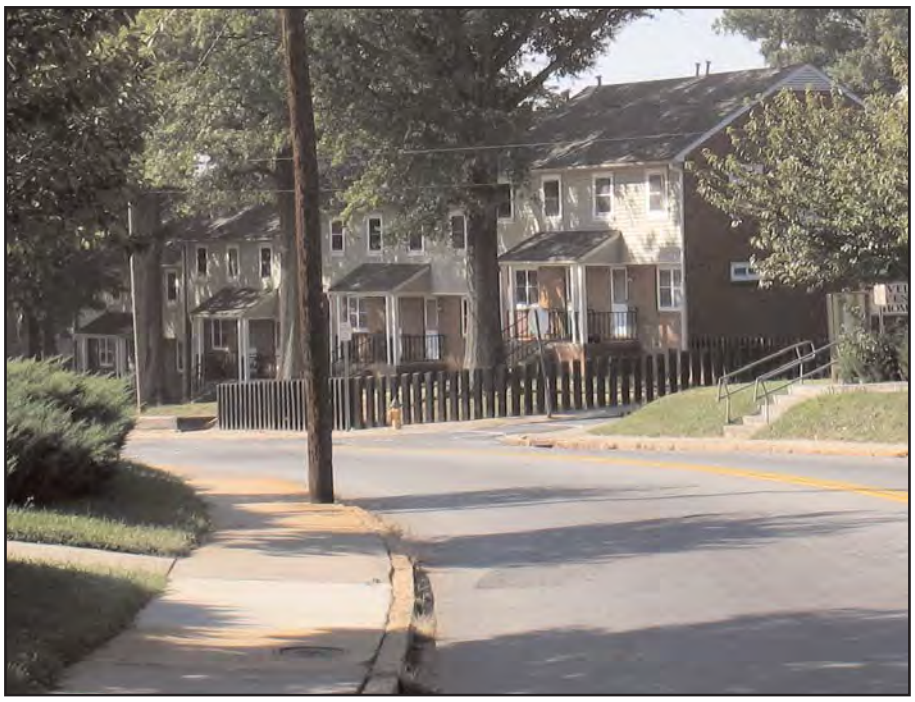
Cleveland Avenue Homes is a 244-unit development built in 1953 along Cleveland Avenue between Fifteenth and Seventeenth Streets. This complex is owned and operated by the Housing Authority of Winston-Salem and together with Piedmont Park; provide the two types of low-rent public housing family developments found in the East/Northeast Planning Area.

Piedmont Park

Piedmont Park is a 240-unit development built in 1952 and located on Twenty-Eighth Street between US 52 and Claremont Avenue. This complex is owned and operated by the Housing Authority of Winston-Salem.

Sunrise Tower

Sunrise Tower is located at the intersection of Martin Luther King Jr. Drive and Cleveland Avenue. Residents have a choice of single-room occupancy in an efficiency or one-bedroom unit. This tower is owned and operated by the Housing Authority of Winston-Salem and provides high-rise living accommodations. Rental rates for both conventional and high-rise living are based on income or a flat rate is charged depending on the number of bedrooms needed.



Homes on Cleveland Avenue

Design and Appearance

Urban design is intended to bring, order, clarity, and pleasing harmony to the network of public spaces, streets, parks, and sidewalks. The character of the public spaces is formed by the arrangement and details of the elements that define them, such as the storefronts along a commercial street or the dwellings that line a residential street.

Part of the East/Northeast Planning Area was developed prior to 1940 and the dominance of the automobile. Street widths were minimal, buildings were placed close to the street and there was a mix of land uses. Nonresidential uses, including retail stores, institutions, and industries were generally small and designed to serve or employ nearby residents. This original development pattern created a special character and sense of community. However, the nature and scale of businesses and institutions have changed over time, creating urban design issues and land use challenges in the Planning Area including: assuring compatibility between land uses; maintaining (and creating) mixed-use neighborhoods; assuring that roads move traffic but remain pedestrian-friendly; reusing vacant/abandoned industrial and commercial sites; allowing businesses and institutions to grow without harming the surrounding neighborhoods; and preserving historic character while adapting to current needs.

In general, there is poor maintenance of existing businesses and parking lots in the East/Northeast Planning Area, giving commercial streets a neglected appearance. The same can be said with residential areas where the character varies from good to neglected, depending on location. The area lacks community focal points, places where residents can meet and mingle freely. A comprehensive approach is needed where building design, landscaping, streetscape, and open space are considered together to give a distinctive image and character.

The Proposed Design and Appearance map (see **Map 10**) in the Design and Appearance Recommendations section shows existing efforts listed above and additional improvements identified in the planning process.

APPEARANCE INITIATIVES

The City has developed a number of initiatives to improve the appearance and pedestrian-orientation of neighborhoods and commercial areas in Winston-Salem. City efforts are usually, but not always, undertaken in the right-of-way and can include: landscaping and tree planting where appropriate, adding new sidewalks or crosswalks, and adding improvements to make pedestrians feel more comfortable including benches, trash receptacles, decorative pedestrian lighting among others. Three specific initiatives in the East/Northeast Area include:

Martin Luther King Jr. Drive

Martin Luther King Jr. Drive is a prominent road in the East/Northeast Planning Area. In the 1990s, the City contracted a landscape architect to design streetscape improvements along the corridor from Highland Avenue to Business 40. Work has been completed adding street trees, brick pavers and ground covers on both sides of the road, crosswalks, and updating of traffic signals. These improvements were added at an estimated cost of over 1 million dollars.

Liberty Street

The City has and continues to invest in infrastructure improvements to enhance the attractiveness and function of the Liberty Street Corridor. Among the improvements completed to date are: new pedestrian-oriented street lighting, sidewalk repair, and the addition of pavers and landscaping at most intersections, and general landscaping along the corridor. The estimated cost for the improvements was over 2 million dollars.

Community Roots Day

Community Roots Day is an annual springtime tree planting project held at a different location in the City each year. Roots Day is coordinated by Keep Winston-Salem Beautiful with assistance from the Winston-Salem/ Forsyth County Community Appearance Commission, the Vegetation Management Division of the City, and a variety of local sponsors. The program brings together community volunteers to plant hundreds of trees at the selected location. Not only does the planting of trees enhance the overall appearance and environmental health of our city, it also fosters community spirit. Five East/Northeast Planning Areas have been Community Roots Day target areas:

- 1995 – Northwest Boulevard
- 1998 – Atkins Middle School
- 2000 – East Winston
- 2003 – Kennedy Middle School
- 2006 – Fifth Street Corridor

HISTORIC RESOURCES

A number of designations exist for the preservation of historic resources. District designations include the National Register of Historic Places, Historic District (H), and Historic Overlay District (HO). The National Registrar Program is administered by the State, and does not impose regulations on property owners unless federal or state funding is involved or federal income tax benefits are applied for. The Historic and Historic Overlay Districts are local zoning districts and do require specific guidelines be met when altering, constructing, moving, or demolishing properties.

Individual property designations are also available for qualifying sites. The National Register Program can be used for individual structures or sites and follows the same regulations as National Register Districts. Local Historic Landmark designation is available for highly significant structures and sites within Forsyth County, and provides local property tax benefits.

Three major studies/surveys have been completed: *Forsyth County Architecture: From Frontier to Factory*: *An Architectural History of Forsyth County*, a survey completed by Gwynne Taylor in 1981; and, *Winston-Salem's African-American Neighborhoods 1870-1950,* by Langdon E. Oppermann in 1993; and, *Spanning the Past, a Survey of Selected Historic Bridges in Winston-Salem*. Forsyth County Historic Resource Commission (HRC) staff reviewed these three major studies/surveys and completed a windshield survey of the Planning Area. Forsyth County also possesses a limited amount of information about archaeological resources in the Planning Area. Although these studies provide some information on the East/Northeast Planning Area, a complete historical/architectural study of every section of the Planning Area has not been completed.

Appendix A includes of brief discussion of neighborhoods and properties identified as historically significant and potentially eligible for listing on the National Register of Historic Places (NRHP) and/or local designation based on the staff review and survey. Also included in the Appendix is a listing of other properties in the Planning Area surveyed in *Frontier to Factory,* and *Winston-Salem's African-American Neighborhoods 1870-1950.* HRC staff is conducting an update of the countywide architectural survey, which should provide additional information about historically significant properties.

The East/Northeast Planning Area is fortunate to possess a number of historic resources, generally dating from the early-20th century through the mid-20th century. Sadly, several of the earliest properties and areas have been lost; some of these dated to a time prior to the merger of Winston and Salem in 1913. Remaining historic resources tell the story of a developing and expanding city. These historic properties vary in type and form; there are individual buildings of note as well as entire neighborhoods. Additional resources include graveyards, bridges, and potential archaeological resources. Comprising a significant portion of the built environment, these resources help to tell the story of a burgeoning city and serve as a tangible reminder of Winston-Salem's outstanding history.

Since the early 1900s, the East/Northeast Planning Area has been an area of transition. The area's initial population was predominantly white. However, the first dramatic change in the racial composition occurred during World War I, when R.J. Reynolds brought in trainloads of workers from farther south. Most were African-American and settled in portions of what is today the East/Northeast Planning Area. During the mid-20th century, entire neighborhoods transitioned from all white to all African-American communities.

HISTORIC DISTRICTS

The East/Northeast Planning Area includes a district listed on the National Register of Historic Places, Reynoldstown, and three areas/structures that have been determined eligible for the National Register of Historic Places, (former) Fairview Moravian Church, Northeast Winston #2 Redevelopment Area, and a portion of East Winston (see **Appendix A**).

HISTORIC PROPERTIES AND OTHER CULTURAL RESOURCES

The East/Northeast Planning Area includes many historically significant areas and properties including cemeteries and bridges. Some may be eligible for listing on the National Register of Historic Places, either individually or along with other properties, while others may not be eligible for the National Register but are still significant to the cultural or historic development of Winston-Salem and Forsyth County. These properties may be worthy of designation as a Local Historic Landmark or at least recognition through documentation or

placement of a historic plaque or marker. Additional research and greater understanding will help determine the appropriate level of recognition.

The Existing and Proposed Historic Resources map in the Historic Preservation Recommendations section (see **Map 11**) shows the existing significant historic resources.

ECONOMIC DEVELOPMENT

A primary purpose of a community's economic development programs is to increase the wealth, job opportunities, and prosperity of its citizens. Strategies to accomplish this purpose are typically programs designed to help business and industry generate new higher-paying jobs, or retain existing jobs that may be threatened. Oftentimes, programs involve the proffer of low-interest loans or no-interest grants anticipated to be repaid through revenues from an increased tax base.

ECONOMIC OPPORTUNITY AREAS

Vacant industrial/commercial properties or buildings offer an opportunity to attract new business/industry or allow for the expansion of existing business and industry, creating new jobs and providing needed goods and services to residents of the Planning Area, the city, and the Piedmont Triad. Some existing corridors/areas in the Planning Area offer opportunities for economic development because they have a good number of industrial or commercial sites, are zoned for business and have good road access connecting them to the rest of the community. Corridors in the Planning Area include:

- The Liberty Street Corridor
- Martin Luther King Jr. Drive
- New Walkertown Road
- Carver School Road

Two business parks in the Planning Area also offer opportunities for attracting new businesses and creating new jobs in the area. The Lowery Business Park, south of Business 40, and the Airport Business Park located close to the Smith Reynolds Airport. The City is currently receiving bids for the construction of Phase I of the Airport Business Park.

EXISTING ECONOMIC DEVELOPMENT PROGRAMS

The City of Winston-Salem offers a variety of programs to help businesses create jobs and expand the tax base. Most programs are low-interest, long-term loans. Depending on the program, funds can be used for buying properties, site or facility improvements, rehabilitation of older buildings, purchase of equipment and/or working capital.

A limited number of programs are available citywide. However, most are designed to induce business to locate in and create jobs in distressed areas of the city. As of 2003, the City of Winston-Salem has targeted most of its business loan programs to the Neighborhood Revitalization Strategy Area (NRSA), an area designated based on the rate of poverty.

Some of the City's economic assistance programs are designated for specific geographic areas within the NRSA. The following is a summary of the existing City economic development programs available in the East/Northeast Planning Area:

Economic Development Revolving Loan Program

The Revolving Loan Program provides financial assistance to small businesses that create or retain jobs for low- to moderate-income persons. The business or industry must be located in or doing work in the NRSA. Funds can be used to purchase, build or rehabilitate structures; to purchase equipment and fixtures; and/or for working capital/operational funds. Loans are made only to businesses unable to secure full financing from conventional lending sources. Loans averaging $50,000 are provided at 7% interest, usually for a 10-year term and must be secured with collateral. The loan application requires extensive information, including a business plan.

Business Training Program

The City of Winston-Salem offers a ten-week training program to provide participants with the basic skills necessary to become owners/operators of small businesses. Participants learn how to write a business plan and about a wide range of issues, including legal, insurance and management/ marketing. The program is offered free of charge to minority and women business owners, low-income persons or employers of low-income persons.

Nonprofit Technical Assistance

The City of Winston-Salem provides technical assistance and pre-development funding assistance to community development corporations (CDCs) – private nonprofit community-based organizations working to redevelop and revitalize distressed areas of Winston-Salem through housing production and maintenance. The City also provides assistance to economic development organizations. In 1999, the City helped create the Liberty CDC, an organization dedicated to rebuilding the Liberty Street Corridor.

Revitalizing Urban Commercial Areas (RUCAs)

As part of the City Council's strategic plan, staff formulated revitalization strategies for older commercial areas in Winston-Salem. Twelve Revitalizing Urban Commercial Areas (RUCAs) have been identified as qualifying for the first round of funding; other declining commercial areas have been identified as well. An overall strategy has been developed for such areas that include public improvements, private site improvements, and regulatory strategies. Two of the identified top 12 RUCAs are located in the East/Northeast Planning Area: Liberty Street and Old Greensboro Road/ Barbara Jane Avenue. The City Council has awarded $1.5 million to RUCA improvements starting in Fiscal Year 2006-2007. The three RUCAs selected for the first round of funding are: Liberty Street in the East/Northeast Planning Area, Waughtown Street in the Southeast Planning Area, and Washington Park in the South Central Planning Area.

Other RUCA locations identified in East/Northeast Planning Area are:

- East Winston
- Fourteenth Street/New Walkertown Road
- Glenn Avenue/Ogburn Avenue
- Jetway
- New Walkertown/Carver School Road
- Reynoldstown

Infrastructure Improvements

The City may use voter approved bonds and other resources to complete targeted landscaping, gateway construction, and streetscape improvements. In 1999, the City began installation of such improvements along the Liberty Street Corridor at an estimated cost of more than $2 million.

Building Improvement Rehabilitation Program

The Building Improvement Rehabilitation Program was designed to provide private building owners inducements to rehabilitate commercial and industrial properties in distressed areas. This program can be used throughout the NRSA outside of downtown. Under the program, the City provides funding of up to $10,000 based on the amount of private investment. The loan repayment is deferred for five years and the balance is forgiven in full if the property has been properly maintained.

Target Area Business Assistance Program

The Target Area Business Assistance Program provides loans or grants up $50,000 to businesses locating within targeted distressed areas of the City. The amount, type of funding and terms are based on the number of jobs and tax base created. Six target areas have been approved based on building conditions and vacancy rates. One of the areas eligible for this program located in the East/Northeast Planning Area is Liberty Street from Twelfth Street to Twenty-First Street.

RUCA improvements to business on Liberty and Fourteenth Street

Brownfields

The U.S. Environmental Protection Agency (EPA) defines "brownfields" as "abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination." A grant from the EPA Brownfields Assessment Program has been used to identify, assess and promote the development of selected brownfield sites along the Liberty Street Corridor. The City has also received funding for a brownfields revolving loan program and a job training program.

The Environment

A number of environmental issues are of concern in the Planning Area including floodplains and brownfields (see paragraph above).

FLOODPLAINS

Floodplains are broad, flat, flood-prone lands adjacent to streams where development is limited. There are approximately 38,000 linear feet of floodplain in the East/Northeast Planning Area. Portions of Brushy Fork Creek, Frazier Creek, Brushy Fork Branch and Bowen Boulevard Branch have identified mapped flood-prone areas.

Existing Plans In Study Area

The following past plans have been completed in the Planning Area:

EAST WINSTON AREA PLAN

(Adopted 1987)

Adopted in September 1987 by the Board of Alderman, the East Winston Area Plan includes most of the land currently being studied in the East/Northeast Planning Area. Most of the recommendations of the original East Winston Area Plan have been implemented.

LIBERTY STREET CORRIDOR STUDY

(Adopted 1995)

Adopted in January 1995 by the Board of Alderman, the *Liberty Street Corridor Study* runs north of the downtown area to the Smith Reynolds Airport. Two subareas of the East/Northeast Planning Area were part of the Liberty Street study: 1) a portion of the Central Segment from US 52 to Twenty-First Street recommended for neighborhood serving businesses; and 2) Northern Segment from Twenty-Ninth Street to Smith Reynolds Airport recommended for heavy industrial and airport related businesses.

LIBERTY STREET MASTER PLAN

(Adopted 1997)

The *Liberty Street Master Plan* report was finalized in 1997 for the area covered in the *Liberty Street Corridor Study*. The Master Plan was prepared by a consultant to detail some of the recommendations in the Corridor Plan, especially those concerning design. The Master Plan calls for area amenities, an urban development pattern, and transportation improvements.

Based on the recommendations of the Corridor Study and Master Plan, the City has made infrastructure improvements along the Liberty Street corridor using voter approved bonds and other funds.

REVITALIZING URBAN COMMERCIAL AREAS (RUCAS)

(2006)

As part of the City Council's strategic plan, staff formulated revitalization strategies for older commercial areas in Winston-Salem. Twelve Revitalizing Urban Commercial Areas (RUCAs) have been identified. Two RUCAs are located in the East/Northeast Planning Area: Liberty Street and Barbara Jane Avenue.

An overall strategy has been developed that includes public improvements, private site improvements and regulatory strategies. The City Council has committed $1.5 million to RUCA improvements for Fiscal Year 2006-2007. Three RUCAs have been selected for the first round funding: Liberty Street, Waughtown Street and Washington Park.

SALEM LAKE AREA PLAN

(Adopted 1986)

The *Salem Lake Area Plan* defined a water quality sensitive area close to Salem Lake that limits development to mostly low-density residential uses. A small portion of that water quality sensitive area overlaps the East/Northeast Planning Area at its eastern extremity. State watershed regulations have been adopted since completion of this Area Plan.

US 52 LAND USE AND TRANSPORTATION STUDY

(Adopted 2003 by the City-County Planning Board and the Winston-Salem Urban Area Metropolitan Planning Organization)

This study developed a comprehensive, long-range land use and transportation plan to guide the overall development and improvement of the entire Winston-Salem portion of the US 52 corridor. The study focuses not only on how to improve the safety and efficiency of US 52, but also on its potential ability to be a catalyst for future land use development and economic revitalization along its corridor.

WINSTON-SALEM STATE UNIVERSITY (WSSU) CAMPUS MASTER PLAN

(Developed 1989; Updated 2001)

A Master Plan was developed for the campus in 1989 providing a long-range planning tool to facilitate the orderly growth of WSSU. To date, a number of projects have been completed: Haywood Residence Hall, designated pedestrian crossing areas on Martin Luther King Jr. Drive, pedestrian promenades around campus, parking improvements, and the Student Center.

A consultant was hired in 2001 to analyze the campus and prepare a Master Plan outlining a list of projects to be undertaken. The Master Plan has been completed and project implementation has begun.

Fast food restaurant on Liberty Street

Legacy Recommendations

The *Legacy Development Guide* is a general, long-range policy guide for decisions concerning the overall growth and development of the community. The recommendations for development patterns contained in *Legacy* are general in nature, rather than focused on decisions for land use at specific sites. *Legacy* is adopted as an official public document but is not a development ordinance. Because the comprehensive plan is broad in nature, detailed plans such as the *East/Northeast Area Plan* are needed to provide more specific guidance for future growth, appropriate land uses, and infrastructure at a community and neighborhood level (see **Map 5**, Growth Management Plan).

Planning Concepts Identified in *Legacy*

GROWTH MANAGEMENT PLAN

The approach proposed in *Legacy* for managing growth and development is not whether our community will grow, but how. The predominant development pattern in the city and county over the past fifty years has been auto dependent, low-density residential development with large-scale commercial projects at the urban fringe (urban sprawl). With a limited supply of raw land for development, a new development model must be created that will allow us to grow, maintain our economic vitality and achieve a high quality of life. The Growth Management Plan is proposed to manage growth, create a more compact and balanced urban development pattern, and preserve open space and rural character.

The Growth Management Plan divides the county into three major Planning Areas: 1) the Municipal Services Area, 2) the Future Growth Area, and 3) the Rural Area. The entire Planning Area is included in the Municipal Services Area.

Municipal Services Area

The Municipal Services Area is generally described as the area within the Muddy Creek drainage basin and includes a large portion of Forsyth County that is currently served by adequate infrastructure and services, especially public sewer. The Municipal Services Area is further divided into subareas: Center City, Urban Neighborhoods, Suburban Neighborhoods, and Town Centers. In addition, Metro Activity Centers, Urban Boulevards and Rail Corridors/Stations may overlay any of these subareas. Following is a description of the subareas and other components of the Growth Management Plan found in the Planning Area.

Center City (GMA 1)

The Center City of Winston-Salem is intended to be the focus of development in the county and where the most intense urban development will take place. It is a major employment center as well as a hub for the arts, cultural activities, and the convention and tourism business. Increasing residential development is crucial to the success of the Center City. Ultimately, the Center City should have a rich mix of office, service, health, retail and residential uses.

Urban Neighborhoods (GMA 2)

The Urban Neighborhoods Area contains older neighborhoods and commercial, industrial, and institutional development that surrounds the Center City. Smaller lots, houses set close to the street, sidewalks, interconnected streets, and the mixture of residential, commercial, and institutional uses give this area an urban feel. Quality infill development, increased residential densities where appropriate, neighborhood business, and community services should be encouraged in Urban Neighborhoods. Historic preservation, rehabilitation, and the reuse of existing structures should also be encouraged here.

Urban Boulevards

Urban Boulevards are special corridors along selected major arterial roads that connect the Center City with selected Metro Activity Centers. The purposes of Urban Boulevards are to: 1) create attractive urban gateways leading into Downtown Winston-Salem; 2) provide locations for the concentration of jobs, retail, and higher-density housing; 3) promote high-quality transit service and pedestrian access by increasing densities at specific location along these corridors; and 4) incorporate design features that support pedestrian activity and provide a sense of place.

Rail Transit Lines and Transit Stations

Transportation alternatives are essential to our future, and high-speed rail passenger service is almost certainly part of that future. *The Growth Management Plan* identifies three major rail corridors and some specific station locations. The station locations have the potential to become Activity Centers around which more intense mixed-use development occurs. Such developments are frequently referred to as Transit-Oriented Developments. Residents living close to rail stations can benefit from convenient access to jobs and other destinations. Infill development and redevelopment that occurs around stations can increase ridership potential and the use of transit.

Metro Activity Centers

Legacy recommends the development of compact, mixed-use regional centers for retail, office, civic, and residential activity. These areas, called Metro Activity Centers (MACs), are focal points for a diverse mix of community activities that include living, working, shopping, education, recreation, civic, cultural, and spiritual activities. These Activity Centers, with their more intense concentrations of employment, are intended to be the hub of daily activity for those who live in surrounding neighborhoods. A goal for each MAC is to have residential density high enough to support transit service. For this reason, all of the MACs are planned for areas that are within a quarter-mile of the intersection of major roads.

The ideal MAC has a densely developed Core Area surrounded by a less densely developed "support" area. The Core Area is the focus for commercial, institutional, office, and high-density residential uses, while the surrounding support area would be made up of high- and medium-density residential uses that would support the activities of the Core Area. The support area also acts as a buffer between the more intense uses of the Core Area and the lower-density residential uses beyond the boundaries of the MAC.

Not just a center for commerce, a MAC is also a busy neighborhood center that is designed for a safe and comfortable pedestrian experience. A unique sense of place should be created by the attention given to the appropriate scale and placement of buildings, the creation of green and public spaces, and attractive architectural detailing.

Neighborhood and Community Activity Centers

Legacy calls for the identification of Neighborhood Activity Centers (NACs) and Community Activity Centers (CACs) during the Area Plan process. NACs and CACs should be designed using similar principles as those recommended for MACs, such as mixing uses, connecting the street network, and providing a pedestrian-friendly environment.

NACs are small, pedestrian-friendly business and office districts providing needed services within walking distance of residential areas and with easy vehicular and bicycle access. A number of commercial uses that serve the daily shopping/service needs of nearby residents and are considered appropriate for NACs include: video rentals, dry cleaners, bakeries, specialty food shops, cafes, sit-down restaurants, service stations, medical offices, insurance offices, churches, synagogues, and day care centers.

CACs are scaled and designed to provide daily and weekly shopping/service needs and services, as well as recreation, offices, institutional facilities and a social gathering place. CACs are pedestrian-friendly developments that accommodate the automobile and they are about one-quarter mile in diameter. Their center or Core Area is most appropriate for the more intense uses suggested for these mixed-use developments. Along with the uses suggested for NACs, a number of additional uses are considered appropriate for the Core Area of CACs including: large supermarkets, large drugstores, hotels, restaurants, movie theaters, entertainment spots, medium-sized offices, schools, large day care centers, and large churches.

Other Planning Concepts

SMART GROWTH

Smart Growth is a comprehensive approach to improve how communities grow and develop. Elements of Smart Growth include: a range of housing opportunities, walkable neighborhoods, a mixture of land uses, compact building design, the preservation of open space and rural areas, transportation choices including transit, and sound environmental practices. Smart growth is an alternative to the more typical "sprawl" model many communities are experiencing today.

MIXED-USE DEVELOPMENT

The appropriate vertical and horizontal mixing of compatible commercial, office, residential, institutional, and recreational uses can reduce automobile trips and trip length, facilitate pedestrian activity and transit use, promote revitalization, and enhance aging Activity Centers. For a mixed-use development to function effectively, detailed attention must be given to the design and layout of the project. Effective urban design techniques are necessary to ensure different uses are cohesively integrated. Additionally, street connectivity is essential to reduce the travel distance between destinations and to encourage pedestrian trips.

Successful mixed-use developments allow people to choose to walk, bike, or drive to a destination. People can choose to live near where they work or where their daily needs are within walking distance. A successful mixed-use development provides options – options not available in single-use developments.

TRANSIT-ORIENTED DEVELOPMENT

Transit-Oriented Developments (TODs) integrate transit stations with a mixture of complementary land uses and design elements that encourage transit ridership. TODs are cohesive developments that facilitate pedestrian activity through a connected transportation network with streets, sidewalks, and pathways, increased residential densities, a pedestrian-friendly streetscape, and neighborhood environments with a strong sense of place.

Figure 2. Transit-Oriented Development Compared to Automobile-Oriented Development

TODs can also be instrumental in stimulating economic development opportunities by revitalizing existing Town Centers and neighborhoods and by creating focused Activity Centers. TODs can be an attractive location for companies that seek an alternative to the suburban office park or those that would like to locate near a transit station enabling employees across a metropolitan area to have efficient access to and from their workplace.

BROWNFIELDS

The United States Environmental Protection Agency defines brownfields as real property that if expanded, redeveloped, or reused may have complicating factors due to the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off undeveloped land while improving and protecting the environment.

GREYFIELDS

Comparable to "brownfields," greyfields are derelict or declining commercial centers that are suited for redevelopment. Typically, greyfields are characterized by large tracts of land having nondescript, decaying, and often long-term vacant commercial structures surrounded by acres of parking lots and asphalt. However, greyfields usually do not have the environmental difficulties associated with brownfields and can therefore be more appealing to potential developers. Greyfield redevelopment is essentially a unique type of infill redevelopment. It can help to revitalize a struggling commercial area by introducing a well-designed development with a mixture of uses to nearby neighborhoods.

BIG BOX/LARGE-SCALE RETAIL DEVELOPMENT

A large portion of all the new retail space being built in America today is for Big Box retailers. Big Box retailers, or superstores, are industrial-scale structures that range in size from 75,000 to 250,000 square feet. These buildings are often designed with homogeneous architecture and appear to be multiple stories tall, but only contain one story of floor space. The sites have large parking lots and are built on less costly greenfield sites on the fringes of town. Big Box retailers have demonstrated an ability to provide a wide selection of goods and services at extremely competitive prices. They have undoubtedly provided sizeable benefits to consumers and have significantly impacted national and global economies. However, Big Box retailers

are frequently criticized nationally for contributing to the struggle of downtowns and loss of community identity, supplanting locally-owned businesses, providing low-paying jobs, creating traffic congestion, increasing the cost for public infrastructure, and consuming vast amounts of open space and farmland.

Big Box stores, as described above, are generally found in suburban, or even rural, locations. However, in recent years many Big Box retailers have increasingly sought sites in more urban locations. In doing so, they have demonstrated flexibility adapting their suburban store prototype to the urban environment. For example, Big Box retailers have built multilevel stores compatible with their urban location, provided alternative product selections to satisfy the preferences of urban consumers, and offered increased delivery services to compensate for relatively less parking.

These changes may not impact some of the social and economic implications of Big Box retailers, both positive and negative, but from a land use perspective the Urban Big Box Model should be promoted as communities seek to encourage commercial development and redevelopment in compact Activity Centers.

LIGHT RAIL

The new *Downtown Plan* for Winston-Salem discusses the possibility of a light rail system serving the downtown area and surrounding close-in neighborhoods. Both a north-south line from Wake Forest University to North Carolina School of the Arts and an east-west route from Baptist Hospital to east Winston/Winston-Salem State University are tentatively being studied.

Winston-Salem Journal plant on East Fifth Street

Vision

Process

Over 35 citizens participated in a community discussion on the Planning Area in the fall of 2006. Staff gathered the ideas from this meeting and then conducted a Visioning exercise with the East/Northeast Winston-Salem Citizens' Advisory Committee to generate ideas on how to make the Planning Area a better place in the future. A scenario was presented and participants listed their ideas about how their community would look in the future. The East/Northeast Citizens' Advisory Committee and planning staff synthesized the information into the following overall vision statements for the Planning Area.

In the year 2022, we envision….

The East/Northeast area of Winston-Salem is a thriving and desirable place to live, work and do business.

Land Use

The Planning Area has a variety of land uses that support the needs of the residents. New retail, industrial, and office uses enhance the area with their consistent look and variety of services provided. Older revitalized neighborhoods and quality new ones contain compatible mixed-uses that provide housing, employment, convenient goods and services, entertainment, cultural activities, and open spaces within walking distance.

Transportation

The East/Northeast Planning Area has a convenient and interconnected transportation system that includes the good roads, public transportation, bicycle and pedestrian facilities, and rail. The highways that serve the area are efficient and are designed to minimize traffic congestion. Local streets are safe and friendly. The public transit system is accessible, well designed, reliable, and understandable. Sidewalks throughout the area and a bike trail system connect all neighborhoods in the Planning Area.

Community Facilities

Community facilities in the area provide gathering places for young and old alike to develop their skills and share their talents with others. The Planning Area has a mix of green spaces, parks, and recreational facilities that provide opportunities for outdoor cultural events, musical concerts, entertainment activities, and sport competitions. Parks and recreation centers support the families living in the area with their wide range of amenities and supervised programs for all ages. A system of safe and attractive greenway trails connecting schools, parks, and neighborhoods is enjoyed by all residents wanting to walk or ride their bicycle.

Housing and Neighborhoods

Neighborhoods in the Planning Area are safe, secure, and peaceful with litter-free streets and well-kept yards. Neighborhoods are free of crime and drugs, and have adequate public safety personnel and involved citizens including police, neighborhood watch programs and community policing. The area provides a diversity of housing choices for all ages and income groups within well-planned and attractive new and redeveloped communities. There is constant enforcement of housing and sanitation codes, and resources and assistance is available for the rehabilitation and preservation of existing older homes in the area. There is a high rate of home ownership and rental properties are well-maintained.

Community Character, Design and Appearance

The East/Northeast Planning Area is a community of clean, tree-lined streets, attractive commercial signage, and buildings of architectural distinction surrounded by properly designed and well-maintained landscaping. The community is physically attractive to its residents making it a good place to raise a family and provides a positive self-image and strong pride of the area residents call home.

Visitors are attracted to the area to participate in the community's celebrations of their traditions, rich heritage and diversity.

Historic Resources

The Planning Area is recognized by the entire community for the area's rich history and significant heritage. Preservation and sensitive rehabilitation of the historic resources in the area provide a strong sense of place and history. There are many neighborhoods that have been recognized as historic and placed on the National Register of Historic Places.

Economic Development

The East/Northeast Planning Area is a thriving community where citizens know, understand and support a diverse business environment. Old and new buildings for commercial, office and industrial development are well maintained and provide employment with a wide range of job opportunities for local residents. Community partnerships between commercial, service, manufacturing, and educational institutions provide a framework for developing skills in young, work-ready residents as well as the prospect of continual advancement for more established workers. Many locally-owned businesses serve the area and are conveniently located within walking distance from residences.

Sense of Community

There is a strong sense of community in the East/Northeast Planning Area. Ethnically and economically diverse neighborhoods work together to solve problems in the community and to keep it safe. Older residents and newcomers appreciate the interests of a diverse population where children, youth, seniors and other segments of the population feel welcome and understand each other. Neighbors often gather on sidewalks and front porches and work together to maintain strong neighborhood associations.

Community meeting at Rupert Bell Park Neighborhood Recreation Center

East/Northeast Area Plan Recommendations

General policies from *Legacy* provide the framework for recommendations in all Area Plans. Specific recommendations for the *East/Northeast Area Plan* were developed through the Visioning exercise and the work of the Citizens' Advisory Committee, the Interdepartmental Committee, and Planning staff.

Land Use Recommendations

Land use recommendations serve as a guide for future development and zoning decisions in the Planning Area. As directed by *Legacy*, land use recommendations designate locations and formulate policies for compatible residential development, commercial and office uses, Mixed-Use Opportunity Areas, industrial uses, and Activity Centers (see **Map 6**).

GENERAL RECOMMENDATIONS

Planning policies used to develop land use recommendations for the East/Northeast Area are:

- To encourage efficient development patterns that help preserve green space and sensitive environmental features.
- To encourage mixed-use developments with residential, retail, and employment uses that meet the daily needs of their residents, offer a high quality of life, and reduce the need for automobile trips by facilitating walking, bicycling, and the use of public transportation.
- To direct needed commercial services to the Metro Activity Center, Neighborhood Activity Centers and along transit corridors in areas already zoned for commercial development.
- To apply Traditional Neighborhood Design principles and standards to new and existing neighborhoods and to neighborhood commercial areas.
- To promote greater flexibility in land use while having more design controls over site design to create mixed-use, variety-rich neighborhoods.

SPECIAL LAND USE CONDITIONS

The Proposed Land Use Changes map (see **Map 6**) shows recommended land uses for all vacant property in the Planning Area and changes in land use for some developed sites. In some circumstances, there are special conditions or prohibitions of certain land uses. These situations are referenced on the map with a (*) and a small case letter and are described in detail on **page 56**.

Residential

Legacy recommends a variety of housing types throughout the county. Residential recommendations are made for housing densities, and in some cases, types of housing. Factors such as the amount of land available, surrounding land uses, proximity to major roads and services, and access to utilities are all considered in determining recommendations for residential uses**.** The following are general descriptions for the various categories of recommended residential land uses in this Plan.

Low-Density Residential
Low-density development has a density of 0 to 5 dwelling units per acre and consists mostly of single-family, detached units.

Urban Residential
Urban residential development is a mix of single-family, duplex, triplex, quadraplex, and townhouse units at varying densities. Generally, urban residential land is recommended for smaller sites in urban areas of Winston-Salem and small towns.

Moderate-Density Residential
Moderate-density residential development has a density of 5 to 8 dwelling units per acre. Generally, moderate-density residential land use is recommended for sites greater than two acres that are most appropriately developed with multifamily, townhouses or clustered single-family structures.

Intermediate-Density Residential
Intermediate-density multifamily residential development has a density of 8 to 12 dwelling units per acre. Generally, intermediate-density residential land use is recommended for larger sites that are most appropriately developed with multifamily or townhouses structures.

SPECIFIC RESIDENTIAL LAND USE RECOMMENDATIONS

This Plan includes recommendations for residential land use at small sites and for designated Residential Infill and Redevelopment Opportunity Sites. The following is a summary of the residential land use recommendation in the North Central Planning Area:

This Plan includes recommendations for residential land use on small sites and designated Residential Infill and Redevelopment Opportunity Areas. The following is a summary of the residential land use recommendations for the East/Northeast Planning Area.

Low Density

- Low-density, typically single-family infill is recommended for existing individual lots and very small tracts of land in existing single-family neighborhoods.
- Larger vacant tracts recommended for single-family development are: Eldora Street and Emerald Street, Barbara Jane Avenue and Woodrow Powell Drive, Barbara Jane Avenue and Tanders Street, Business 40 and Mount Vernon Avenue, Business 40 and Stratton Avenue/Mason Street, Ross Street and Reidsville Road, Fries Drive and Blaine Street, and Old Greensboro Road and Churchland Drive.

Higher Densities

- Urban residential development, including single-family, duplex, triplex, quadraplex and townhouse units is recommended for an area developed with a mix of residential types; in areas zoned RSQ or RM5; and as a transitional use between lower- and higher-intensity uses. Vacant tracts recommended for urban residential development are located at the intersection of Glenn Avenue, Hanes Avenue and Hemlock Drive.
- Moderate-density residential uses are recommended at the periphery of single-family areas; at sites with existing multifamily zoning; and near commercial, institutional and other nonresidential uses. Larger vacant tracts recommended for moderate-density residential development are: Waterworks Road across from the Winston Lake YMCA's Branch and Fourteenth Street and Addison Avenue.
- Intermediate-density residential uses are recommended along the designated Urban Boulevards and other major roads; at sites with existing multifamily zoning; at the Mixed-Use Opportunity Areas, the East Winston Metro Activity Center, and near commercial, institutional and other nonresidential uses. A large track recommended for intermediate density development is Old Greensboro Road and Reidsville Road.

RESIDENTIAL INFILL OPPORTUNITY SITES

This Plan identifies larger sites (greater than 2.5 acres) in the Planning Area that are appropriate for residential infill, rehabilitation, and redevelopment for residential use, or a combination of infill and rehab/redevelopment. The text below describes each site and provides development recommendations including recommended densities, dwelling types, and in some cases, site development recommendations. The sites are shown on the Proposed Land Use Changes map (see **Map 6**).

Site A. Eldora Street and Emerald Street

These two sites (partially owned by the City) with approximately 13.5 acres are located: 1) along Eldora Street, and 2) between Emerald Street and Brushy Fork Creek. Approximately two-thirds of the site, mostly the City-owned portion, is currently zoned RS-9 with the remaining portion zoned RS-7. Three unopened streets, Eldora, Dunbar, and Booker Streets, would provide access to the larger portion of this site that runs along Brushy Fork Creek.

Opportunities

The City owns approximately 9.17 acres on the eastern portion of the site along Brushy Fork Creek. The site is currently vacant and the property is near the Brushy Fork Creek Greenway.

Constraints

A large portion of the two sites is in the floodplain, considerably limiting development. Eldora, Dunbar, and Booker Streets east of Emerald Street are not opened. Some deteriorated residential structures exist in the surrounding neighborhood and there is steeply sloping topography.

Development Recommendations

Develop the site to accommodate low-density, single-family residential development as a Planned Residential Development (PRD) based on surrounding RS-7 zoning. A PRD is a residentially-zoned area that is planned and developed as a unit and

uses flexible development standards that allows structures to be clustered due to site constraints. Separate access points may need to be provided to the development by extending Eldora Street and Dunbar or Booker Streets.

Site B. Barbara Jane Avenue and Woodrow Powell Drive

This approximately 9.80-acre site is located along Barbara Jane Avenue, between Woodrow Powell Drive and the back property lines of houses along Chandler Street and Amanda Place. The site is currently owned by a local church and zoned RS-9.

Opportunities

The site is vacant with no significant topographic limitations, has good access via Barbara Jane Avenue to Old Greensboro Road, and is in single ownership.

Constraints

The site is heavily wooded and there is uncertainty about the church's plans to develop the site.

Development Recommendations

Develop the site based on existing RS-9 zoning requirements to accommodate low-density, single-family residential. Provide a street connection to the east to Amanda Place.

Site C. Barbara Jane Avenue and Tanders Street

This approximately 6.85-acre site is located along Barbara Jane Avenue west of Galaxy Court and north of the back property lines of houses facing Mount Vernon Avenue. The site is currently zoned RS-9.

Opportunities

The site is vacant with a buildable portion in the front facing Barbara Jane Avenue and good access via Barbara Jane Avenue.

Constraints

There is a drainageway through the back portion of the site and adjacent steep slopes. There is an awkward lotting configuration and the site is in multiple ownership.

Development Recommendations

Develop the site to accommodate low-density, single-family residential as a Planned Residential Development (PRD) based on existing RS-9 zoning. Due to site constraints, structures will need to be clustered in the front portion of the site facing Barbara Jane Avenue.

Site D. Business 40 and Mount Vernon Avenue

This approximately 6.2-acre site is located along Business 40 between Belews Creek Road and Mount Vernon Avenue. The site is currently zoned RS-9. An unopened street and an access easement would provide access to both Belews Creek Road and Old Greensboro Road.

Opportunities

The site is vacant and in single ownership.

Constraints

Accesses to Belews Creek Road and Old Greensboro Road are not constructed. There are some steep slopes in the middle of the site and noise is an issue due to proximity to Business 40.

Development Recommendations

Develop the site to accommodate low-density, single-family residential as a Planned Residential Development (PRD) based on existing zoning. Development should be clustered on the northern portion of the site to buffer new homes from Business 40. Access to the site should be off Belews Creek Road rather than through the easement to Old Greensboro Road. A connection to Mount Vernon Avenue is desirable as a secondary option.

Infill development along East Tenth Street

Site E. Business 40 and Stratton Avenue/Mason Street

This approximately 9.78-acre site is located along Business 40 between Barbara Jane Avenue and Mason Street. The site is currently zoned RS-9. The site has direct access off Barbara Jane Avenue and could be accessed also by extending Stratton Avenue.

Opportunities

The area is already seeing some new construction by Habitat for Humanity along Nash Avenue. The site has easy access via Barbara Jane and Stratton Avenues to Old Greensboro Road and is currently vacant.

Constraints

There are some steep slopes towards the middle of the site. The site has an awkward lot configuration with a triangular shape and noise is an issue due to proximity to Business 40.

Development Recommendations

Develop the site to accommodate low-density, single-family residential as a Planned Residential Development (PRD) based on existing zoning. Development should be clustered closer to Barbara Jane Avenue with an additional access to Stratton Avenue.

Site F. Ross Street and Reidsville Road (US 158)

This approximately 3.65-acre site is located at the end of Ross Street and backs up onto Reidsville Road (US 158). The site is currently zoned RS-9.

Opportunities

The property is in single ownership. There are some recently built homes in the vicinity and there is good access via Ross Street to Old Greensboro Road.

Constraints

There are steep slopes throughout the entire site. There is no access to Reidsville Road (US 158), and noise is an issue due to proximity to US 158.

Development Recommendations

Develop the site to accommodate low-density, single-family residential as a Planned Residential Development (PRD) based on existing zoning with homes clustered on the western portion of the site.

Site G. Fries Drive and Blaine Street

This approximately 17.70-acre site is located along Earl Street between Fries Drive and Blaine Street. The site is currently zoned RS-9. The site is already platted and a road system with both paved and unpaved roads is in place. The area was annexed into the City in 2006.

Opportunities

The area is already platted as a subdivision and few homes have been built to date. Access is good via Harvest Drive to Old Greensboro Road.

Constraints

There are steep slopes along Earl Street that impact a number of lots and portions of Earl Street, Blaine Street, and Fries Drive are unpaved.

Development Recommendations

Develop as originally platted to accommodate low-density, single-family residential. Extend Harvest Drive north to connect to Kittering Lane as new development occurs as recommended in the *Collector Street Plan.*

Site H. Old Greensboro Road and Churchland Drive

This approximately 15-acre site is split by the Area Plan boundaries with approximately 6.2 acres within the Planning Area. This site is located along Reidsville Road (US 158) between back property lines of the homes facing Churchland Drive and the Human Service Alliance on Old Greensboro Road. The entire site is currently zoned RS-9.

Opportunities

The site is currently vacant, in single ownership and, has direct access to Reidsville Road (US 158).

Homes in the Lake Park Subdivision

Constraints
A stream/drainageway divides the site into two sections. The site is located behind existing residential homes. There is a need for road improvements on Reidsville Road (US 158) for left turn access into the site for northbound traffic and noise is an issue due to the high volume of traffic on this road.

Development Recommendations
Develop the site to accommodate low-density, single-family residential based on existing zoning if the existing stream/drainageway can be piped. Otherwise, develop the site to accommodate low-density, single-family residential as a Planned Residential Development (PRD) based on existing zoning with homes clustered behind the existing houses along Churchland Drive and Lakeland Avenue with access off the existing easement.

Site I. Waterworks Road
This approximately 14.6-acre site is located along Waterworks Road across from the Winston Lake YMCA. The site is currently zoned RS-9.

Opportunities
This is a large, vacant site in single ownership with good road access. The site was cleared few years ago of mature, large vegetation although some has grown back.

Constraints
A drainageway runs through the middle of the site. There are some steep slopes towards the back property line of homes facing Wallingford Road. The lot configuration is long and narrow. The site is located along a three-lane road. There is objection from surrounding residents for higher-density development.

Development Recommendations
Develop site with compatible duplex, quadraplex, small footprint townhouse development or clustered single-family structures at a moderate-density, up to 8 dwelling units per acre. This proposed density is comparable to the one found across the street on the Senior Residence Inc./Ivy Acres development. Site design should be compatible with the adjacent single-family neighborhood, possibly including quadraplex or small footprint townhouse development located along Waterworks Road and lower-density development next to existing homes facing Wallingford Road.

Site J. Old Greensboro Road and Reidsville Road
This approximately 22.7-acre site is located at the intersection of Old Greensboro Road and Reidsville Road (US 158). The entire site is currently zoned RS-9 except for a small tract at the intersection of Old Greensboro and Reidsville Roads zoned LO-S.

Opportunities
Good road frontage exists along Old Greensboro and Reidsville Roads (US 158) and the site is contiguous to an RM-12 site to the southwest currently under renovation, Forest Ridge Apartments.

Constraints
The land is in multiple ownership. There are some steep slopes along Reidsville Road (US 158). There is no access onto Reidsville Road (US 158) and the traffic noise may be an issue. Possible development restrictions may exist due to the Salem Lake Watershed Regulations.

Development Recommendations
Redevelop site with compatible multifamily or townhouse structures at intermediate-density, up to 12 dwelling units per acre. Require site design that continues the existing pattern in the neighborhood of buildings with street frontage along Old Greensboro Road. Parking areas need to be broken into several small lots, screened from view, and located behind buildings fronting Old Greensboro Road.

Multifamily housing on East Third Street

Site K. Fourteenth Street and Addison Avenue

This approximately 8.4-acre site is located at the intersection of Fourteen Street and Addison Avenue. The entire site is currently zoned RS-9 except for three lots on the east side of Addison Avenue zoned RS-7.

Opportunities

Good frontage road exists along Fourteenth Street and the site is contiguous to an LO site to the east currently being developed with small-scale office buildings.

Constraints

The land is in multiple ownership. There are some steep slopes on the southern portion of the site next to an existing drainageway.

Development Recommendations

This plan recommends two possible developments for this site, residential or office: 1) Develop site with compatible duplex, quadraplex, small footprint townhouse development or clustered single-family structures at a moderate-density, up to 8 dwelling units per acre; or 2) Develop both side of Fourteenth Street with small-scale office comparable in size to the existing development on Premier Park.

Office and Commercial

This Plan recommends the consolidation of commercial and office uses at existing commercial/office locations and in designated Activity Centers and Mixed-Use Opportunity Areas. All new and redeveloped commercial and office uses should be designed and developed in such a manner which makes them compatible with nearby residential uses.

OFFICE

Office uses typically have few negative impacts on adjacent land uses and can provide services to area residents, making them an appropriate transitional use between residential uses and more intense uses. Small-scale office development is recommended at:

- Various Neighborhood Activity Centers (see Mixed-Use Land Use Categories).
- On vacant land along Fourteenth Street between Winston East Pediatrics and Addison Avenue.

Large-scale office development is recommended at:

- Mixed-Use Opportunity Areas and at the East Winston Metro Activity Center (see Mixed-Use Land Categories).

This Plan also recommends some sites for possible conversion from residential to office use. Some single-family homes next to commercial uses are heavily impacted by the nonresidential use. Likewise, single-family homes along some portions of major thoroughfares are impacted by high traffic volumes. Areas recommended for conversion of existing single-family structures to office use with the retention of the existing structure include (See **Appendix B.** Standards for Conversion of Existing Homes to Office or Commercial Use):

- East Twenty-Fifth Street between Ansonia and Manchester Streets.
- Glenn Avenue south of Sherbrooke Drive.

OFFICE/LOW-INTENSITY COMMERCIAL

Office and low-intensity commercial uses provide services to area residents, often with minimal negative impact on adjacent residential uses. This land use category includes all office uses and the uses listed on **Table 7**.

Medical offices on Cleveland Avenue

Table 7. Office/Low-Intensity Commercial Uses

Includes:
- Adult Day Care
- Arts and Craft Studio
- Banking and Financial Services
- Bed and Breakfast
- Child Day Care Center
- Child Care Drop-in
- Combined Use
- Food or Drug Store, without Drive-Through
- Funeral Home
- Furniture/Home Furnishing Stores
- General Merchandise Store
- Government Offices
- Hardware Store
- Medical and Surgical Offices
- Museum or Art Gallery
- Neighborhood Organization
- Non-store Retailer
- Offices, Miscellaneous
- Post Office
- Professional Offices
- Recreation Services, Indoor
- Residential Building, Multifamily
- Residential Building, Townhouse
- Residential Building, Urban
- Restaurant without Drive-Through
- Retail Store, Specialty or Miscellaneous
- Services, Business A
- Services, Personal
- Veterinary Services

Excludes:
- ABC Store
- Auto-related uses
- Car Wash
- Convenience Store
- Club/Bar
- Motor Vehicle Repair and Maintenance
- Outdoor Display Retail (car lot)
- Restaurant with Drive-Through
- Rooming and Boarding House
- Uses with Drive-Throughs

The expected growth in the area, together with planned developments in the downtown, Piedmont Triad Research Park, and Winston-Salem State University, present opportunities for additional office/low-intensity commercial development in the Planning Area. This Plan recommends the following areas for development of office and limited commercial uses:

- Martin Luther King Jr. Drive from Business 40 to New Walkertown Road.
- Fifth Street from Cameron Avenue to Highland Avenue.
- Fourteenth Street north of Winston East Pediatrics to east of Addison Avenue.

COMMERCIAL

Generally, the reuse of vacant buildings and the redevelopment of existing vacant and underutilized sites are recommended as an alternative to rezoning land for additional commercial development. Commercial areas should be compact with limited access onto major thoroughfares and should not promote strip development. This Plan recommends the consolidation of commercial uses at existing locations as an alternative to rezoning additional land for nonresidential development. However, some additional land is recommended for expansion of commercial uses in the Metro and Neighborhood Activity Centers, in the Mixed-Use Opportunity Areas, and along the Martin Luther King Jr. Drive corridor (see Mixed-Use Land Use Categories).

INSTITUTIONAL

Institutional uses in the Planning Area are an important aspect of the character, vitality, and future of the area. Institutional uses include schools, churches, community organizations, and nonprofit agencies. Existing institutions should be permitted to grow and expand in a manner that is compatible with surrounding neighborhoods.

Institutional lands uses are typically found adjacent to residential land uses and often serve to stabilize the neighborhoods they are located in. As the institutional uses grow, they typically need to expand into adjacent residential areas putting development pressure on the surrounding neighborhoods they serve. This Plan recommends maintaining all institutional uses within their current boundaries while paying special attention to requests for expansion into surrounding residential neighborhoods. Since it is not possible to indicate all properties that would be appropriate for institutional use nor show all of them on the Land Use Changes map, this Plan establishes policies for the expansion of institutional uses. These policies are intended to assure that institutions can grow and expand in a manner that is compatible with the surrounding neighborhoods (see **Appendix D.** Institutional Expansion Design Guidelines).

Parks/Open Space

The Proposed Land Use Changes map (**Map 6**) shows a limited number of sites for parks or open space. The sites identified typically have environmental constraints since they are found along streams where floodplains, steep slopes and no direct or difficult road access make them unsuitable for development. All the properties shown for open space are owned by the City of Winston-Salem or the State of North Carolina. One additional park site has been identified at Fourteenth Street and Jackson Avenue on a City-owned tract of land (see Community Facilities for detailed park recommendations).

Industrial

This Plan recommends the consolidation of industrial uses at existing locations as well as the development of two new industrial sites. Reuse of existing buildings and redevelopment of vacant or underutilized sites is recommended instead of rezoning additional land for industrial use. New and redeveloped industrial uses should be designed in a manner which makes them compatible with nearby residential uses.

One small residential area is recommended for possible industrial expansion, a small neighborhood inside the Lowery Business Park. This area is currently zoned for single-family, residential use and is recognized as providing affordable housing opportunities in the Planning Area. However, because of the area's location and surrounding conditions, it should be allowed to be rezoned for industrial use if developed comprehensively (see **Map 6**).

Properties located between Business 40 and the Lowery Business Park should be allowed to rezone for industrial use only if: comprehensively redeveloped with adjacent properties in the Business Park and developed in conformance with the Industrial Expansion Design Guidelines (see **Appendix E**). The view from Business 40 should be given special consideration for the redevelopment of the area. No piecemeal zoning should be approved. See **page 62 (*f)** for Special Land Use Conditions.

Mixed-Use Land Use Categories

MIXED-USE OPPORTUNITY AREAS

Mixed-use development may contain varied residential types and densities, commercial and office uses, and the incorporation of institutional facilities. Mixing uses can provide for a higher level of supporting services central to residents and businesses, as well as provide for an economical and convenient sharing of parking and other resources. For more detail on the Mixed-Use Development Concept, see section on Planning Concepts identified in *Legacy*.

This Plan recommends four general locations for mixed-use development described below and shown on the Proposed Land Use Changes map (see **Map 6**). Development or redevelopment of these areas should be consistent with *Legacy* and the MU-S (Mixed Use-Special) District requirements of the *Unified Development Ordinances* (UDO). However, the concept of mixing uses is not limited to these areas only. Other locations may be appropriate and will need to be evaluated individually on how they are integrated with and complement the surrounding neighborhoods.

Union Station Mixed-Use Area

The Piedmont Authority for Regional Transportation (PART) is responsible for a major transportation planning effort in the Winston-Salem area that includes regional commuter rail transit service anticipated to be operational by 2015. One of the rail corridors identified runs from Clemmons to Burlington, with a stop at the former Winston-Salem Union Station on Martin Luther King Jr. Drive. A Multi-modal Regional Transportation Center to include passenger rail, local and regional bus systems is currently being discussed at this location. A private development initiative for this site that includes development of the transit station as well as additional space for a commercial, office and residential uses is currently being presented to gather public support (see **Figure 3**).

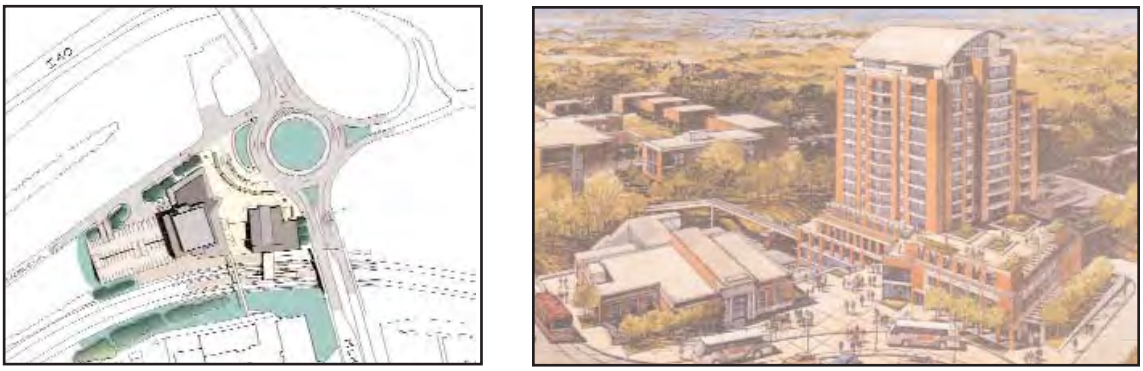


Figure 3. Mixed-Use Opportunity Area: Private Development Initiative

Changes to land use patterns adjacent to the future transit station are necessary in order to support the proposed new service. A planning concept identified in *Legacy*, Transit-Oriented Development (TOD), calls for a compact, pedestrian-friendly, transit-supportive development to include opportunities for walking, bicycling, light rail transit, bus, and the automobile.

Development Recommendations

- Allow the Union Station site and vacant tract on the east side of Martin Luther King Jr. Drive between the railroad tracts and Business 40 to rezone to MU-S (Mixed Use-Special) District (see **Map 6.**) See **page 62 (*e)** for Special Land Use Conditions.
- Develop the area around Union Station (within ¼ mile) with a mixture of residential, commercial, retail and institutional uses at higher levels of intensity, where appropriate. Use a vertical-oriented mix of distinct land uses at the core area.
- Protect homes on Excelsior Street unless properties are part of a comprehensive development.
- Allow retail/commercial uses that attract pedestrian traffic throughout the day and night, creating a more lively and secure environment. Do not allow auto-dependent uses such as auto sales, service stations, and drive-through businesses.
- Locate new buildings close to the street with entrances oriented to the public street following the pattern established by the Union Station building and new development by WSSU along Martin Luther King Jr. Drive.
- Locate low-intensity commercial uses on the ground level to capture trade from transit users. Locate office uses at the ground level or upstairs over commercial uses. Do not locate residential units on the ground level of mixed-use buildings.
- Design parking to be visually unobtrusive and pedestrian-friendly. Locate parking beside/behind buildings or in a parking deck.
- Provide safe and adequate access for pedestrians and bicyclists. Use signalized crosswalks at key locations and/or pedestrian bridges along Martin Luther King Jr. Drive to connect the station area with new development and Winston-Salem State University (WSSU) on the east side of the road.
- Design streetscapes around station area to be pleasant and secure to increase users' willingness to walk in the area. Streetscape should include street trees, street furniture, pedestrian-level lighting, easily understood and visible signage, artwork, banners, and other pedestrian area amenities.

Conference Center Mixed-Use Area

This approximately 35-acre tract of land located between Old Greensboro Road, Byerly Road and Business 40 is owned by Delta Visions Inc. A site plan prepared for this site shows the retention of two existing structures on Old Greensboro Road, new single-family homes, multifamily development, and a conference center facing Business 40.

This Plan is supportive of the mixture of uses proposed at this location. However, the existing site plan does not show sufficient connections to surrounding neighborhoods and has some cross-access problems. A site plan that includes the same mixture of uses with the addition of limited commercial development along Old Greensboro Road and a different road arrangement will work better at this location (see **Figure 4**).

Existing Site Plan

Proposed Land Uses

Figure 4. Mixed-Use Opportunity Area: Conference Center Concept

Development Recommendations

- Develop site with a mix of uses including commercial, office, and residential uses under an urban village concept.
- Allow office/low-intensity commercial uses fronting Old Greensboro Road. Emphasize uses which serve the proposed development as well as surrounding neighborhoods and institutions.
- Design office/low-intensity commercial uses that front Old Greensboro Road to be sensitive to the residential development across the street. Small, residentially-scaled buildings should front Old Greensboro Road designed with façades that enhance the pedestrian environment by including display windows, main entrances facing the street, and architectural components such as porches, columns or awnings. Parking to the back or side and screened from public view by buildings/landscaping (see **Appendix C - Standards for New Office/Low-Intensity Commercial Development**).
- Align access to the site with Waterworks Road. Locate an automated flashing light at the intersection of Old Greensboro Road and Waterworks Road. Explore feasibility of a traffic light at this intersection once development of this site occurs.
- Moderate-density multifamily development in the form of townhouse or small apartment buildings should be located between commercial development and single-family homes to act as a transition from high-intensity to low-intensity uses.
- Locate new single-family residential to face existing homes along Byerly Street and behind homes along Mason Street. Extend Buick Street and Travis Street to connect surrounding neighborhoods with new single-family development.
- Locate conference center or other institutional land use at the intersection of Byerly Street and Business 40 and use existing drainage way to buffer nonresidential use from single-family development.
- Improve the intersection of Byerly Street and Reidsville Road (US 158) and explore providing a left-turn lane on northbound Reidsville Road (US 158).

New Walkertown/Dellabrook Road Mixed-Use Area

New Walkertown Road (US 311) is a major thoroughfare with four traffic lanes and a center turning lane that carries approximately 15,000 vehicles per day around its intersection with Fourteenth Street. New Walkertown Road's current capacity is 34,600 vehicles per day and is expected to have a traffic volume of 20,900 vehicles per day by 2025. Although the existing capacity exceeds the projected volumes of traffic, single-family residential homes facing New Walkertown Road between the New Walkertown/Fourteenth Street Neighborhood Activity Center and Waterworks Road are heavily impacted not only by heavy traffic, but also by adjacent commercial and recreational uses.

This Plan recommends creating a mixed-use area east of the New Walkertown Road/Fourteenth Street Neighborhood Activity Center to Waterworks Road. The site is divided in two by New Walkertown Road, with the south side comprising approximately 12 acres, and the north section containing six acres.

The south section is in multiple ownership, making it more difficult to assemble the entire site, while the north portion is in single ownership. The market will dictate how the entire site is developed, but it appears that the south portion is more conductive to be developed with a mixture of commercial and office uses continuing the existing pattern found in the Neighborhood Activity Center. The north portion of the site should include some limited commercial development mixed with office and moderate-density residential.

Development Recommendations

- Develop the site comprehensively with a mixture of uses to include low-intensity commercial, office, institutional and multifamily residential at a moderate-density (8 dwelling units per acre). These uses should be integrated as much as possible, even within the same building.
- Orient commercial/office buildings towards New Walkertown Road and design public entrances facing the road.
- Locate parking to the back or side of structures and use buildings or landscaping to screen parking from public view.
- Provide access to parking areas located behind buildings to avoid multiple curb cuts along New Walkertown Road. Align entrance to the south portion of the site with Dellabrook Road to take advantage of existing traffic light.
- Incorporate access to existing Virginia K. Newell/Ann Massey Greenway into the mixed-use development.

MLK Jr. Drive/Cleveland Avenue/ New Hope Lane Mixed-Use Area

The Housing Authority of the City of Winston-Salem (HAWS) is interested in the redevelopment of a large portion of the Planning Area that includes a number of multifamily developments owned by them or privately-owned: Sunrise Towers Apartments, Cleveland Avenue Homes, Colony Place Apartments, Summit Square Gardens Apartments, Johnson Square Apartments, and Scales Manor Apartments. HAWS' vision for this area includes a mixture of uses that includes low-income and market rate housing, office and commercial developments with a strong pedestrian orientation. The redevelopment of this area could take place through the creation of new public/ private partnerships.

Master Plan Development Recommendations

- Develop a Master Plan that includes a pedestrian-friendly, mixed-use and mixed-income housing that is integrated with the existing neighborhoods. New developments should include low-rise units for elderly housing, public housing, market-rate housing for homeownership, and economic development business activities in a traditional neighborhood setting.
- Preserve and rehabilitate existing single-family residential neighborhoods and identify new housing opportunities areas and how to best fit these areas with existing communities.
- Make sure streets in the area are pedestrian-friendly and include features that add to pedestrian comfort such as street trees, benches, and street level lighting. On-street parking should be allowed on most streets and traffic calming devices used where needed.
- Review traffic patterns in the area and make necessary adjustments to have an interconnected network of streets that minimizes walking and cycling distances. Ensure mass transit is provided and bus stops are clearly defined along bus routes.
- Include the Liberty Street corridor as an area that could provide the necessary commercial component to the redevelopment of this area. Make recommendations on how to strengthen existing businesses and identify locations for new commercial and retail businesses.
- Designate locations for vertical mixed use having commercial/office space located on the ground floor and residential use above.
- Incorporate community facilities, recreation areas, medical and other support facilities and design village centers with public spaces that become gathering spots and the focus of public life and activity. Identify large, mature, existing trees in the redeveloped areas and preserve as many as possible.
- Include new urbanism principles in the design of new housing:
  - Divide superblocks into smaller blocks and replace high-rise buildings with mix of housing types to include townhouses, single homes, and/or small apartment buildings.
  - New homes should be located close to the street, designed with front porches to encourage neighbor interaction and provide "eyes on the street."
  - Each unit should have its own entrance.
  - Front and/or back yards should be designed to belong to individual units.

NEIGHBORHOOD ACTIVITY CENTERS (NACS)

Neighborhood Activity Centers (NACs) are compact, pedestrian-oriented, neighborhood business areas which provide needed services within walking distance of residential areas. NACs may serve as neighborhood gathering places. For more detail on NACs, see section on *Legacy*, **page 23**.

Five Neighborhood Activity Centers (NACs) have been designated in the East/Northeast Planning Area. The Proposed Land Use Changes map shows the boundaries of the NACs (see **Map 6**). Two new NACs, Reynoldstown and Glenn Avenue/ Ogburn Avenue, were identified through the Area Plan process. Current business use, zoning of the property, and services provided to surrounding residential uses were the determining factors for the designation of these new NACs.

A major infusion of public money has been given to Liberty Street and property owners are currently seeking funding for improvements. Other NACs in the Planning Area have no funds committed for revitalization. However, for these areas to continue to be desirable shopping/service destinations, public and private improvements are needed. Funding sources and a phasing schedule for spreading out the costs over a multiyear period for public facilities/services improvements, and incentives and assistance for private sites is recommended.

Below is a summary of each NAC, with a list of needed land uses and public/private improvements necessary to redevelop and strengthen these Neighborhood Activity Centers to better serve the surrounding neighborhood. As mentioned above, the following proposed public/private improvements are not funded and, therefore, a financing schedule has not been prepared nor have property owners been contacted. They are presented here as a guide of what is needed at each location so if funding is provided, and there is willingness on the part of property owners to not only apply for such funding but to self-finance a portion of the improvements, necessary changes can be completed.

Liberty Street Neighborhood Activity Center

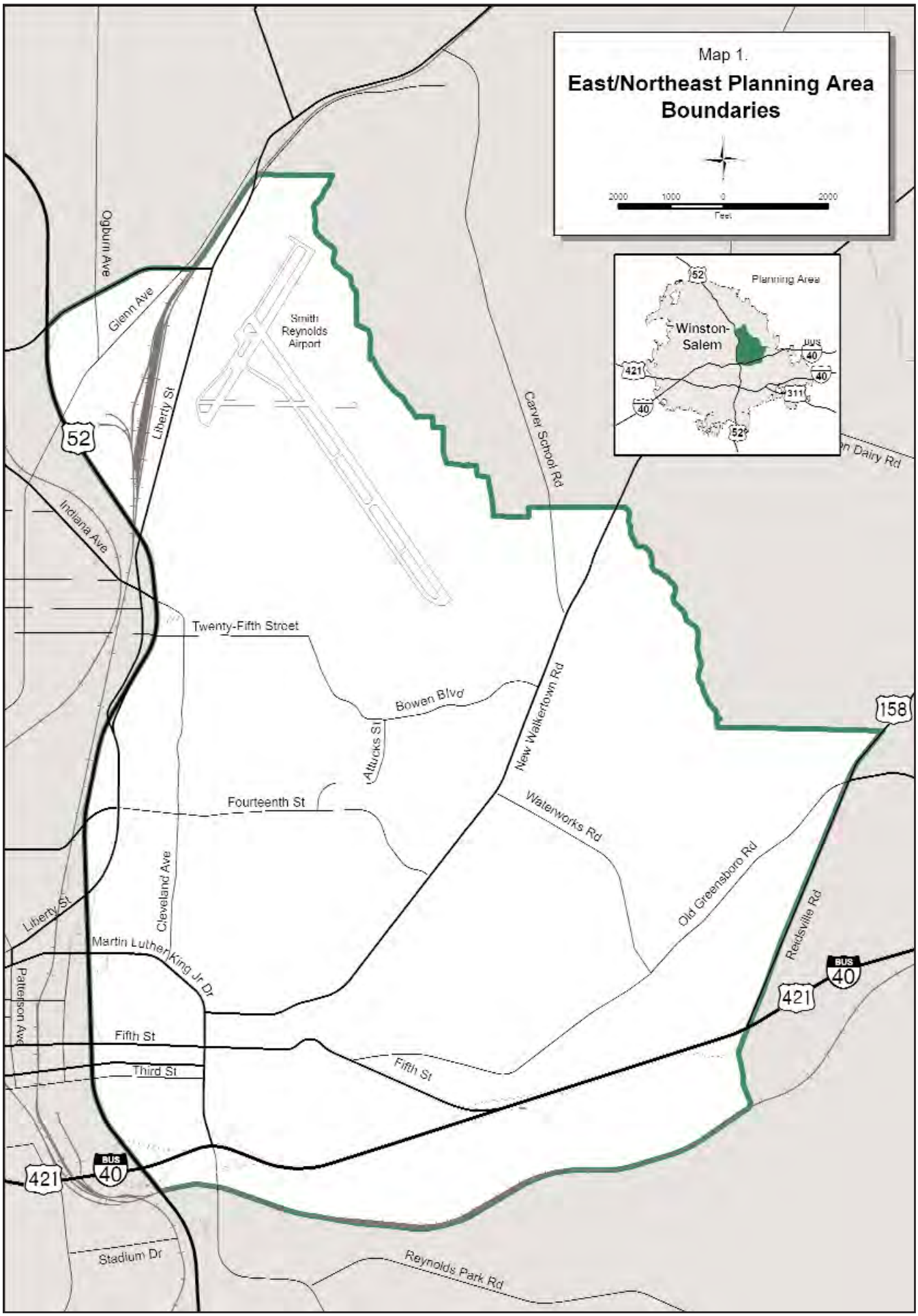
The Liberty Street NAC (approximately 35 acres) is located immediately east of US 52 and runs along Liberty Street from approximately Twelfth Street to Bethlehem Lane. This NAC serves the surrounding neighborhoods and is zoned for commercial use. The area has a variety of land uses including a fast food restaurant, furniture store, drug store, convenience store, building supplies, a funeral home, auto repair, and service stations.

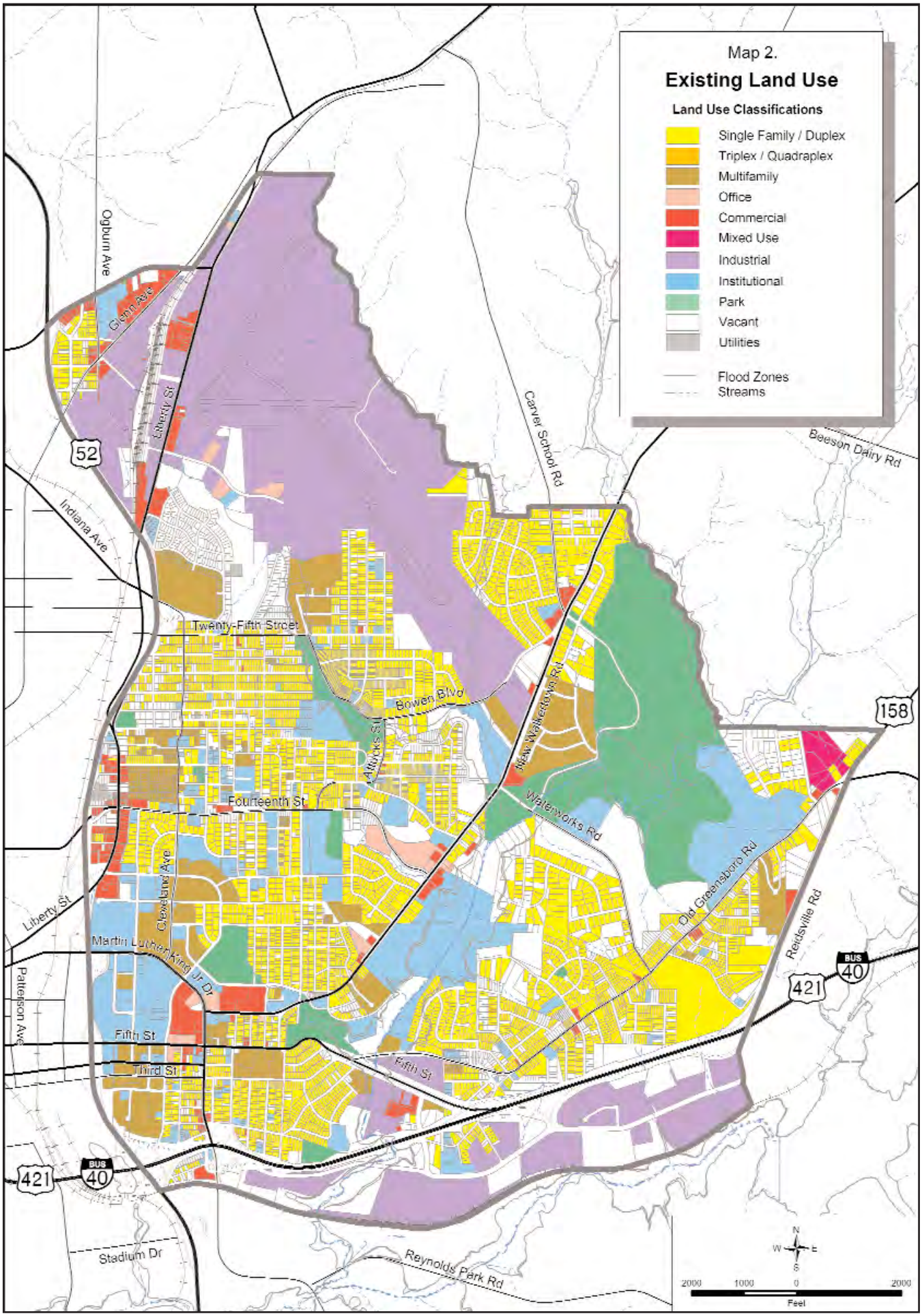
To help implement existing plans, the Liberty Street Community Development Corporation (CDC) was formed and charged with the revitalization of the Liberty Street Corridor. The Liberty Street CDC has adopted the National Main Street Initiative model of economic development and initiated its "Liberty Street Main Street Program" for its revitalization target area which is consistent with the NAC boundaries.

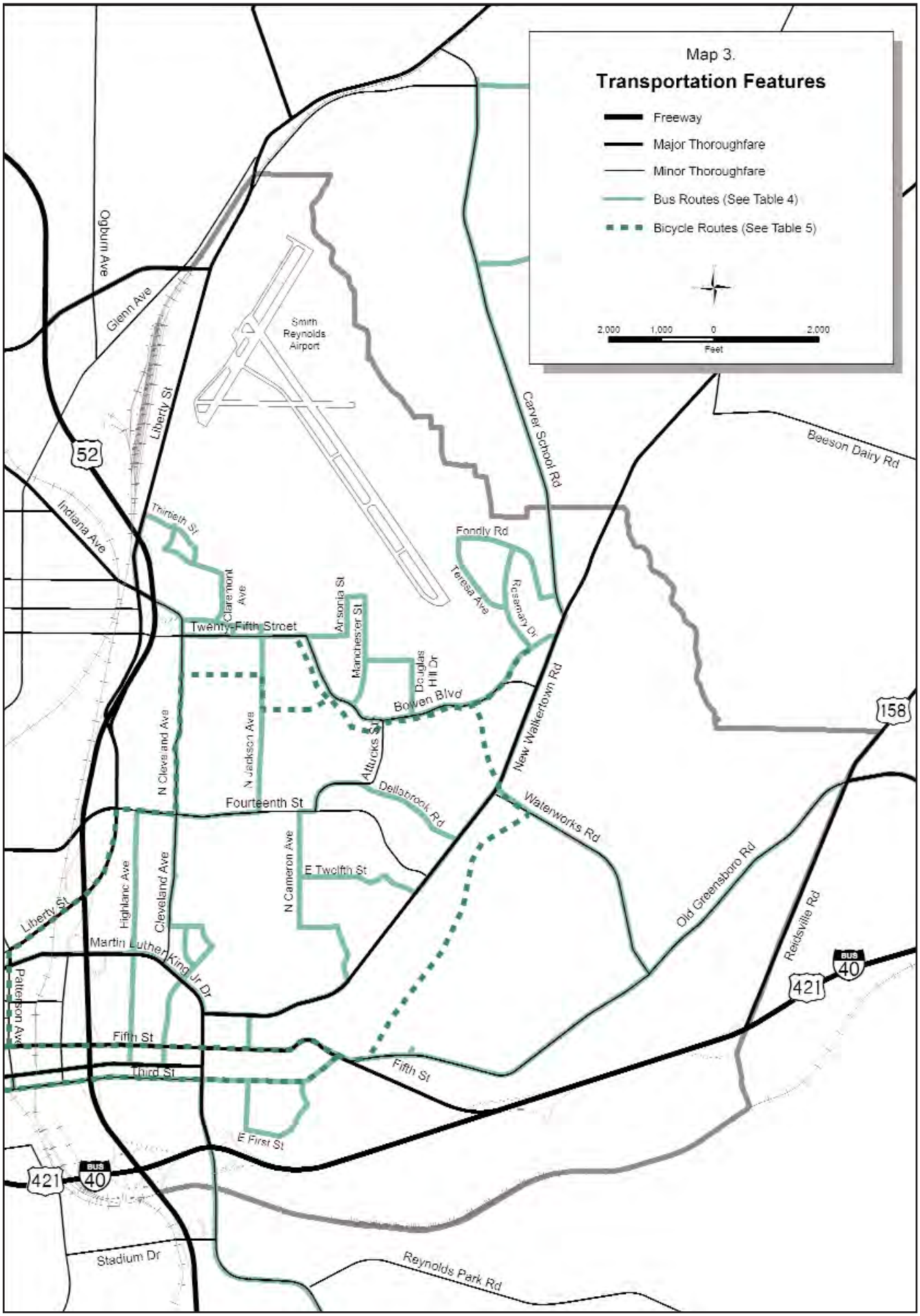
Strengths and Opportunities: Liberty Street provides easy access to US 52 and it is a major corridor into downtown connecting the Center City with the Smith Reynolds Airport. The Liberty Street NAC is in close proximity to the downtown area, the Goler Heights "New Town Downtown" Mixed-Use Area, Research Park, and the proposed Patterson Avenue/Thomasville Furniture Plant Retail/Residential Mixed-Use Area (*North Central Winston-Salem Area Plan*). There are a number of established businesses in this NAC and public facility improvements along the right-of-way have been completed including sidewalks, brick pavers, landscaping, pedestrian lighting, banners and street trees.

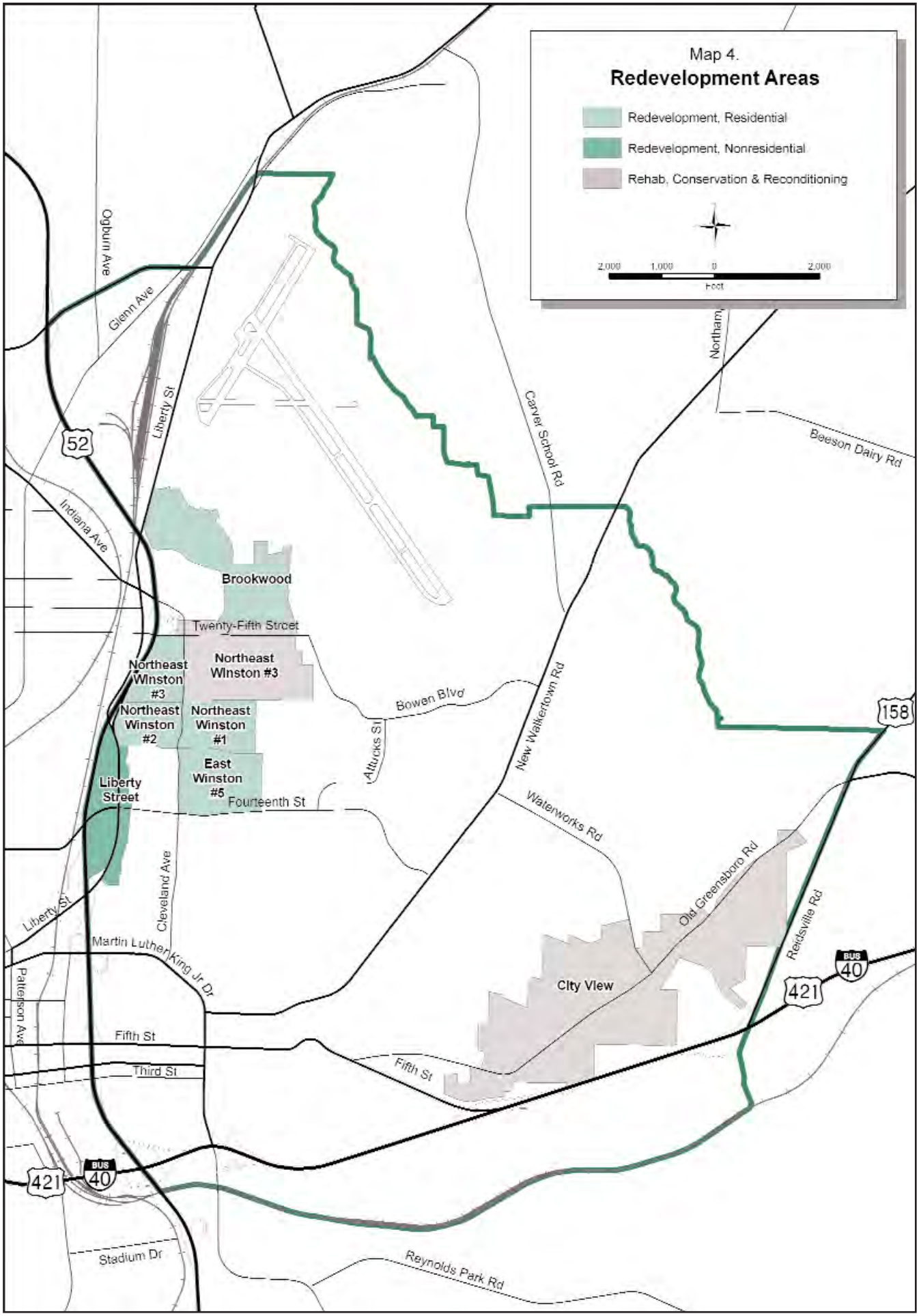
Constraints and Issues: There is a large amount of crime reported in the area. Numerous dilapidated or deteriorated structures exists as well as a number of businesses with site issues such as unsafe curb cuts, parking availability issues, no buffering between businesses and residential uses. There is also a proliferation of unsightly auto-related uses.

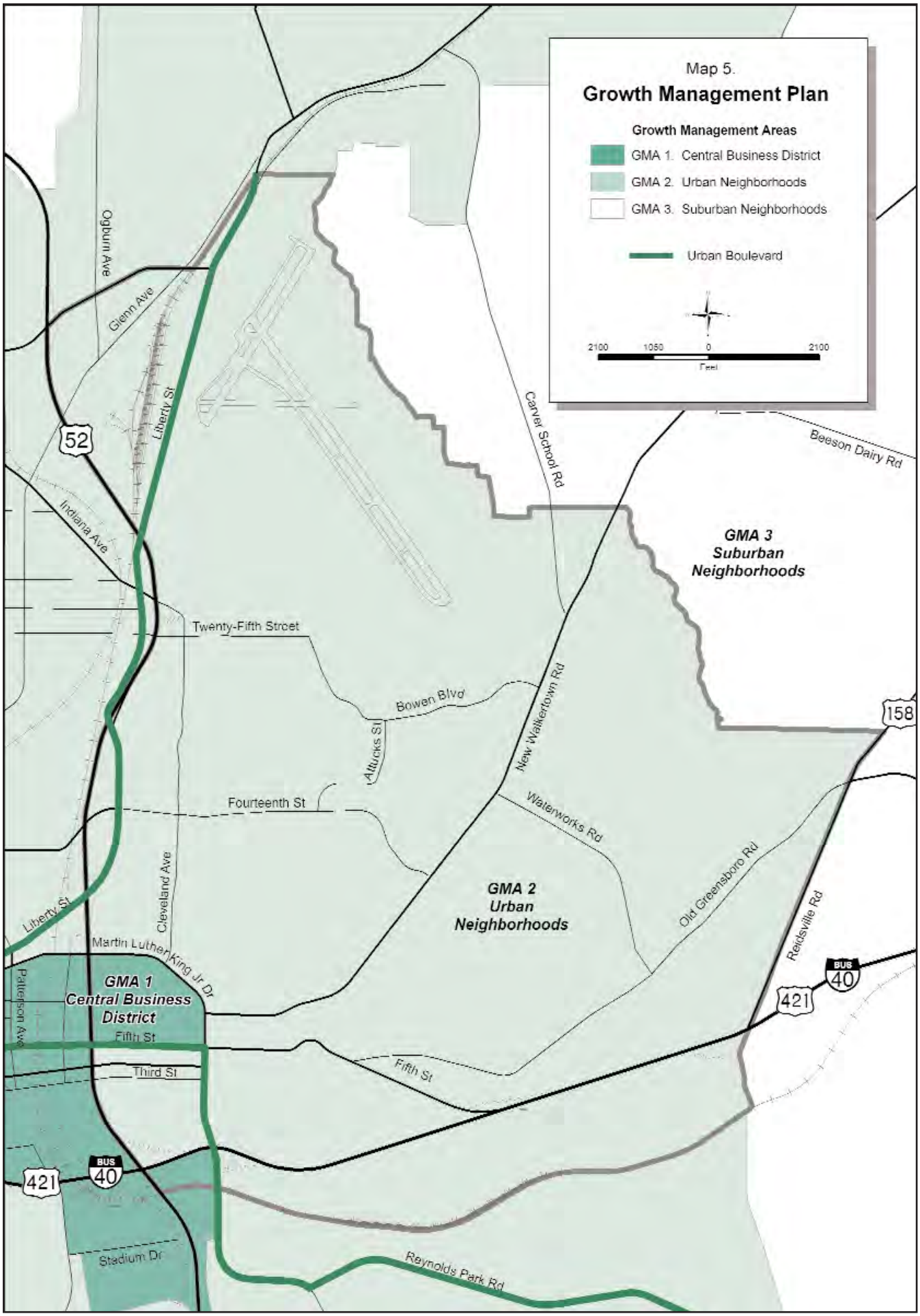
Needed Land Uses Include: Grocery store, drug store, hardware store, clothing store, restaurants (fast food and sit-in)/outdoor dining/entertainment, discount department/variety stores, dance/theater/ drama/martial arts instruction, culinary school, amusement/recreation center, fitness facility, business/professional/medical offices, office supply store, specialty shops, video store, newsstand, and higher-density residential uses.

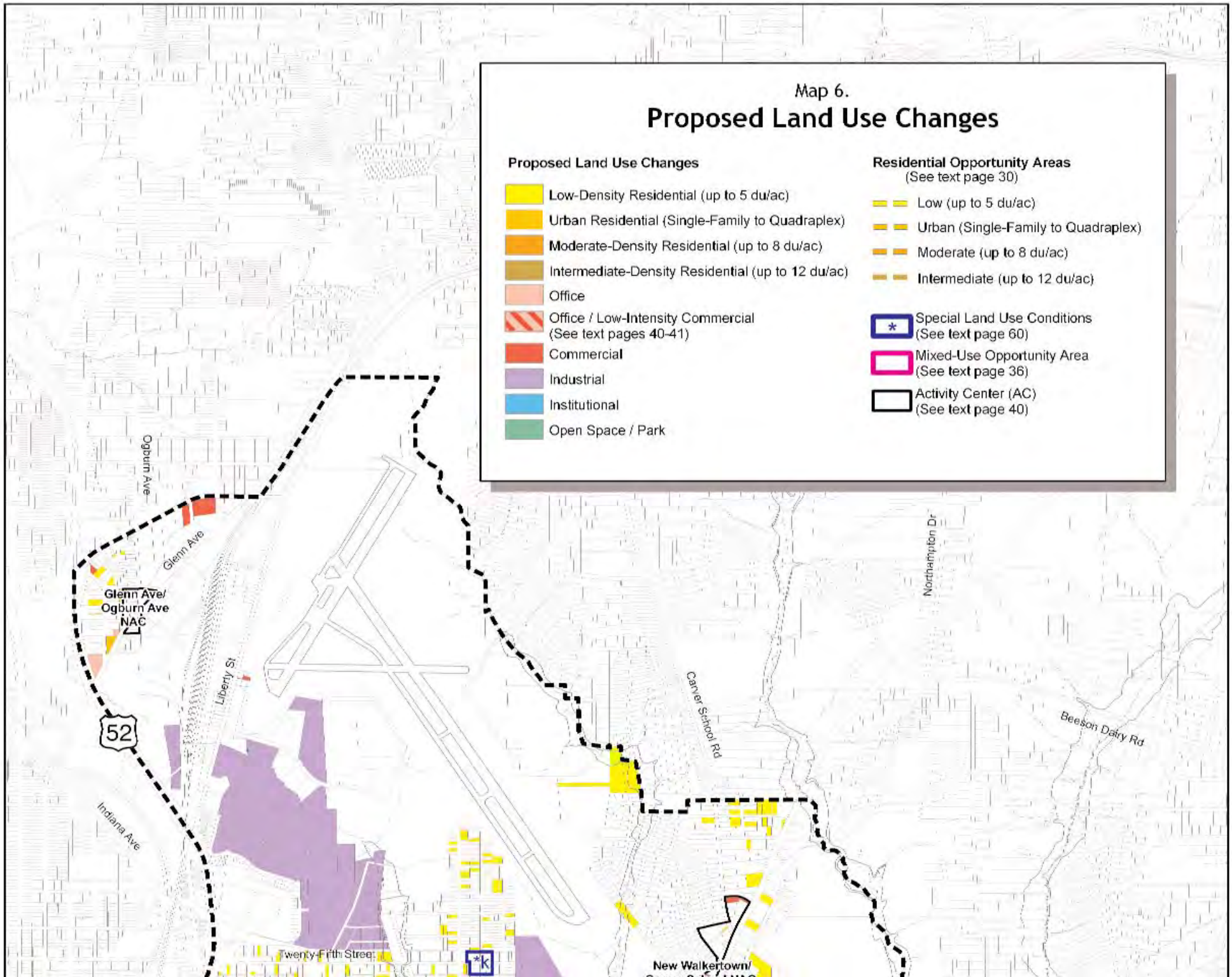

Map 1.
East/Northeast Planning Area Boundaries
2000
1000
0
2000
Feet
Planning Area
Winston-Salem
52
421
40
311
Ogburn Ave
Glenn Ave
Liberty St
Smith Reynolds Airport
Carver School Rd
Indiana Ave
Twenty-Fifth Street
Bowen Blvd
Attucks St
New Walkertown Rd
158
Fourteenth St
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
Cleveland Ave
Martin Luther King Jr Dr
Patterson Ave
Fifth St
Third St
Stadium Dr
Reynolds Park Rd
BUS

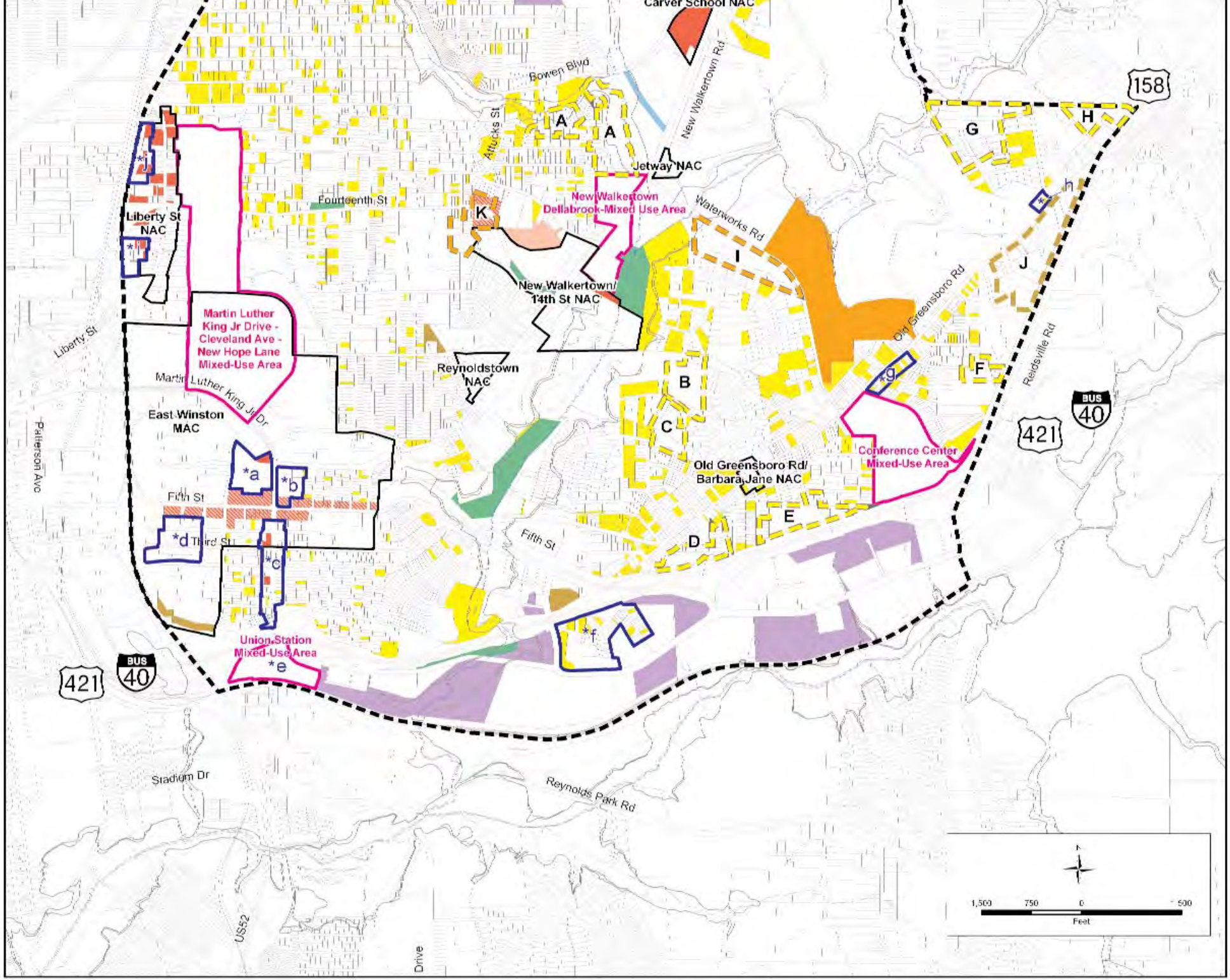

Map 2.
Existing Land Use
Land Use Classifications
Single Family / Duplex
Triplex / Quadraplex
Multifamily
Office
Commercial
Mixed Use
Industrial
Institutional
Park
Vacant
Utilities
Flood Zones
Streams
Ogburn Ave
Glenn Ave
Liberty St
52
Carver School Rd
Beeson Dairy Rd
Indiana Ave
Twenty-Fifth Street
Bowen Blvd
Attucks St
New Walkertown Rd
158
Fourteenth St
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
Liberty St
Cleveland Ave
Martin Luther King Jr Dr
Patterson Ave
Fifth St
Third St
Fifth St
BUS 40
421
BUS 40
421
Stadium Dr
Reynolds Park Rd
N
W
E
S
2000
1000
0
2000
Feet

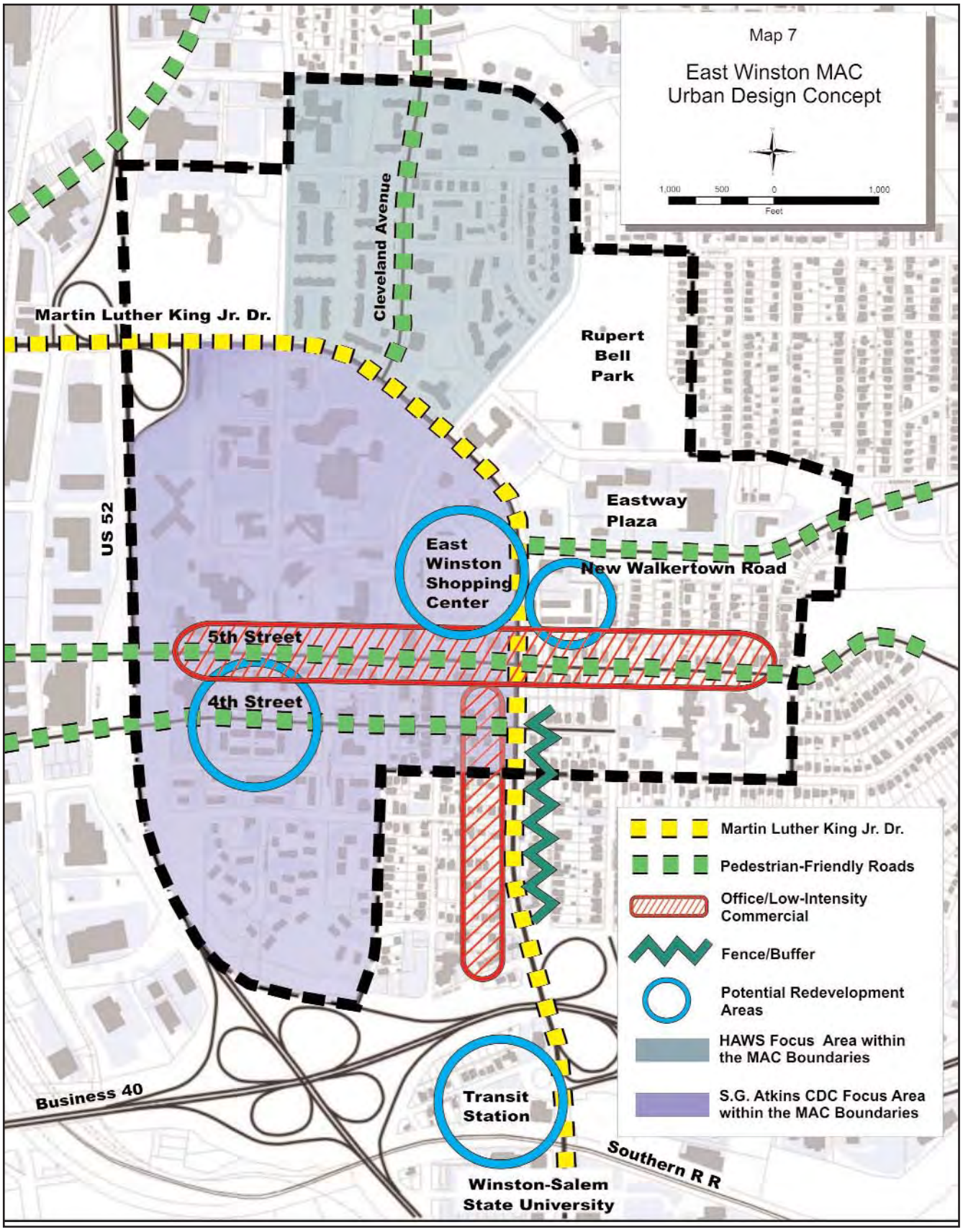

Map 3.
Transportation Features
Freeway
Major Thoroughfare
Minor Thoroughfare
Bus Routes (See Table 4)
Bicycle Routes (See Table 5)
2,000 1,000 0 2,000
Feet
Ogburn Ave
Glenn Ave
Liberty St
Smith Reynolds Airport
Carver School Rd
Beeson Dairy Rd
52
Indiana Ave
Thirtieth St
Claremont Ave
Twenty-Fifth Street
Arsonia St
Manchester St
Fondly Rd
Teresa Ave
Rosemary Dr
Douglas Hill Dr
Bowen Blvd
New Walkertown Rd
158
N Cleveland Ave
N Jackson Ave
Attucks St
Fourteenth St
Dellabrook Rd
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
N Cameron Ave
E Twelfth St
Liberty St
Highland Ave
Cleveland Ave
Martin Luther King Jr Dr
Patterson Ave
Fifth St
Third St
Fifth St
E First St
421
BUS 40
Stadium Dr
Reynolds Park Rd

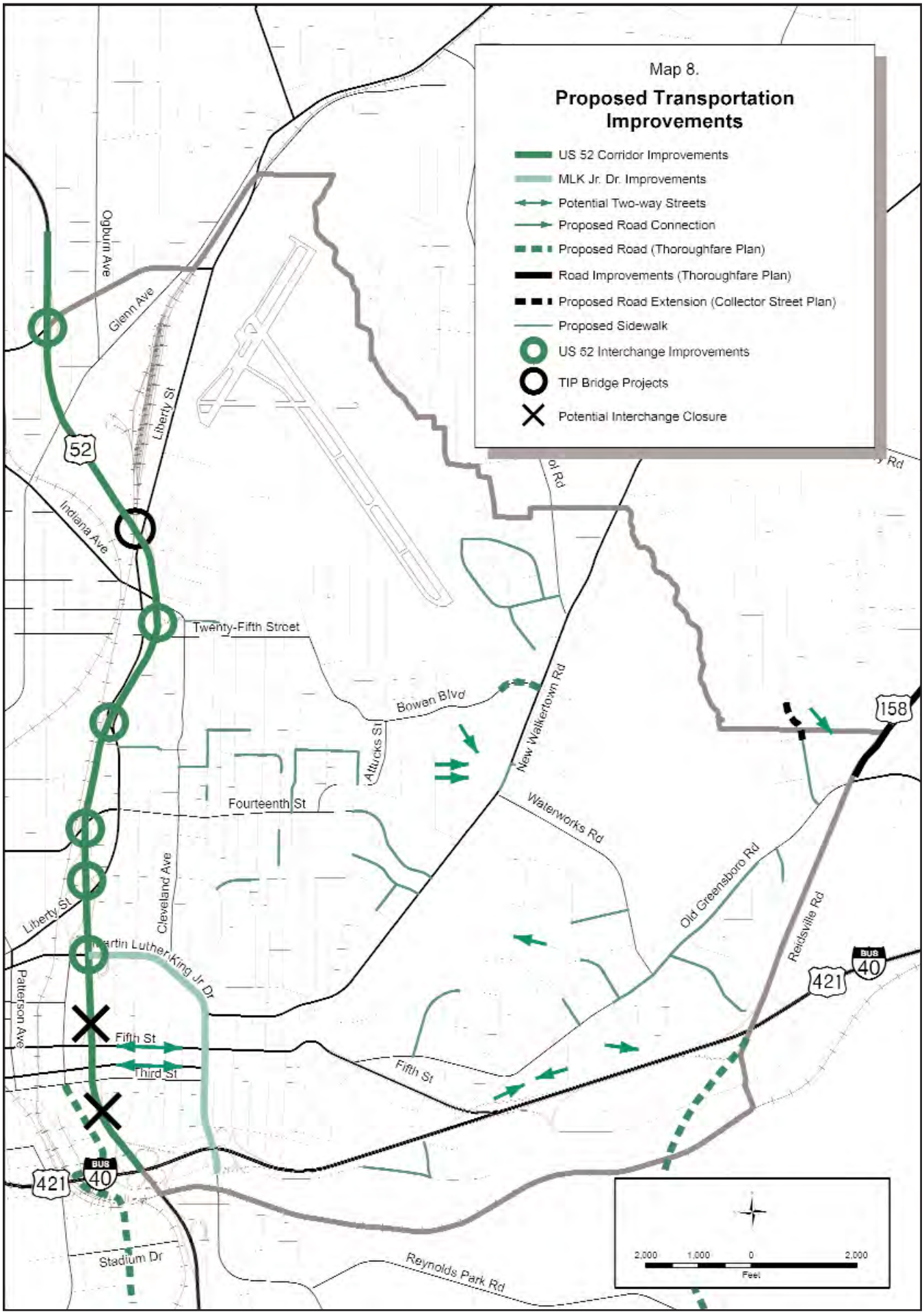

Map 4.
Redevelopment Areas
Redevelopment, Residential
Redevelopment, Nonresidential
Rehab, Conservation & Reconditioning
2,000 1,000 0 2,000
Feet
Ogburn Ave
Glenn Ave
Liberty St
52
Indiana Ave
Brookwood
Twenty-Fifth Street
Northeast Winston #3
Northeast Winston #3
Northeast Winston #2
Northeast Winston #1
East Winston #5
Liberty Street
Fourteenth St
Bowen Blvd
Attucks St
Carver School Rd
Northam
Beeson Dairy Rd
New Walkertown Rd
158
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
City View
BUS 40
421
Cleveland Ave
Martin Luther King Jr Dr
Patterson Ave
Fifth St
Third St
Stadium Dr
Reynolds Park Rd

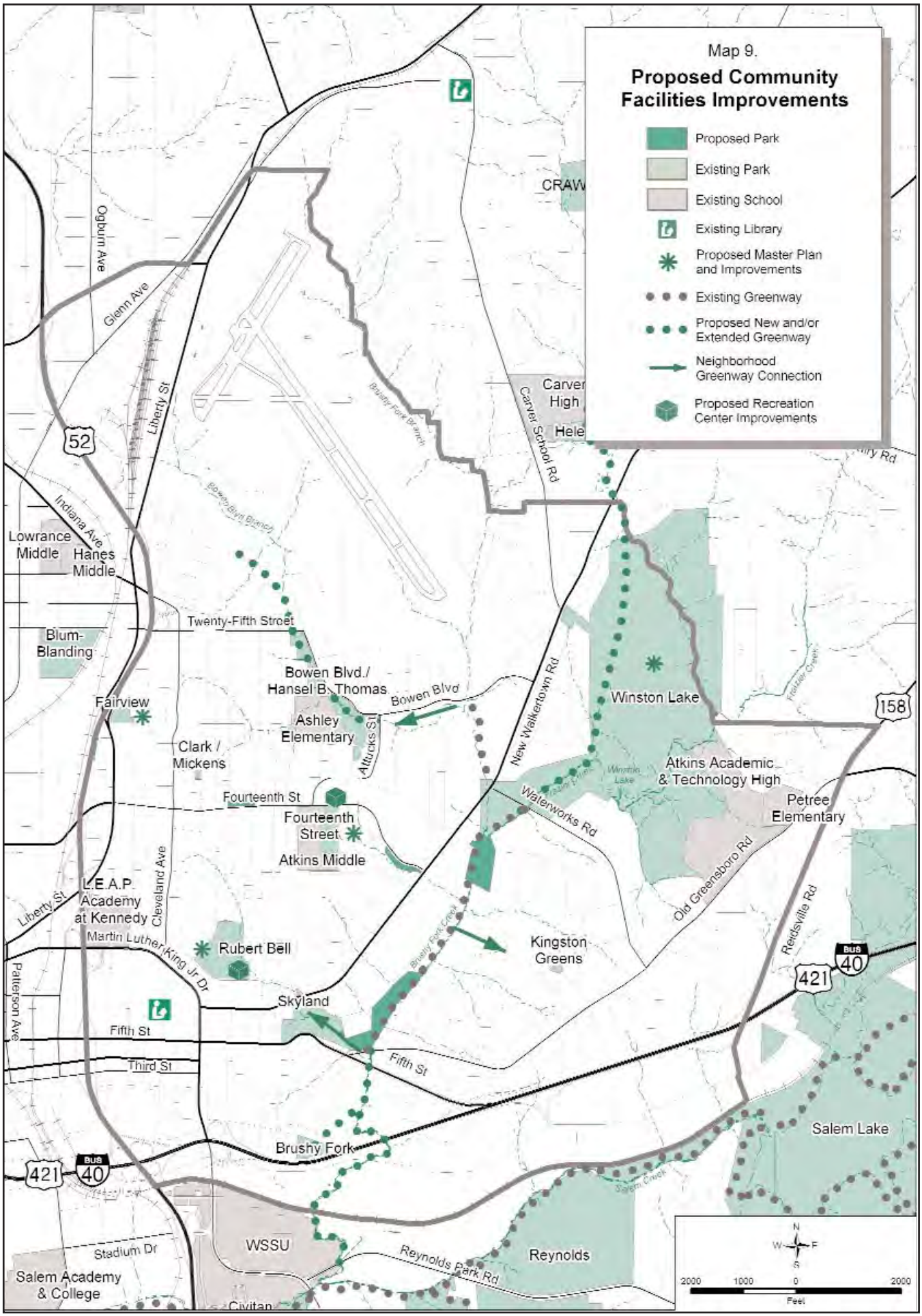

Map 5.
Growth Management Plan
Growth Management Areas
GMA 1. Central Business District
GMA 2. Urban Neighborhoods
GMA 3. Suburban Neighborhoods
Urban Boulevard
2100 1050 0 2100
Feet
Ogburn Ave
Glenn Ave
Liberty St
52
Indiana Ave
Carver School Rd
Beeson Dairy Rd
GMA 3
Suburban
Neighborhoods
Twenty-Fifth Street
Bowen Blvd
Attucks St
New Walkertown Rd
158
Fourteenth St
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
Cleveland Ave
Liberty St
GMA 2
Urban
Neighborhoods
Martin Luther King Jr Dr
Patterson Ave
GMA 1
Central Business
District
Fifth St
Third St
Fifth St
BUS
40
421
Stadium Dr
Reynolds Park Rd

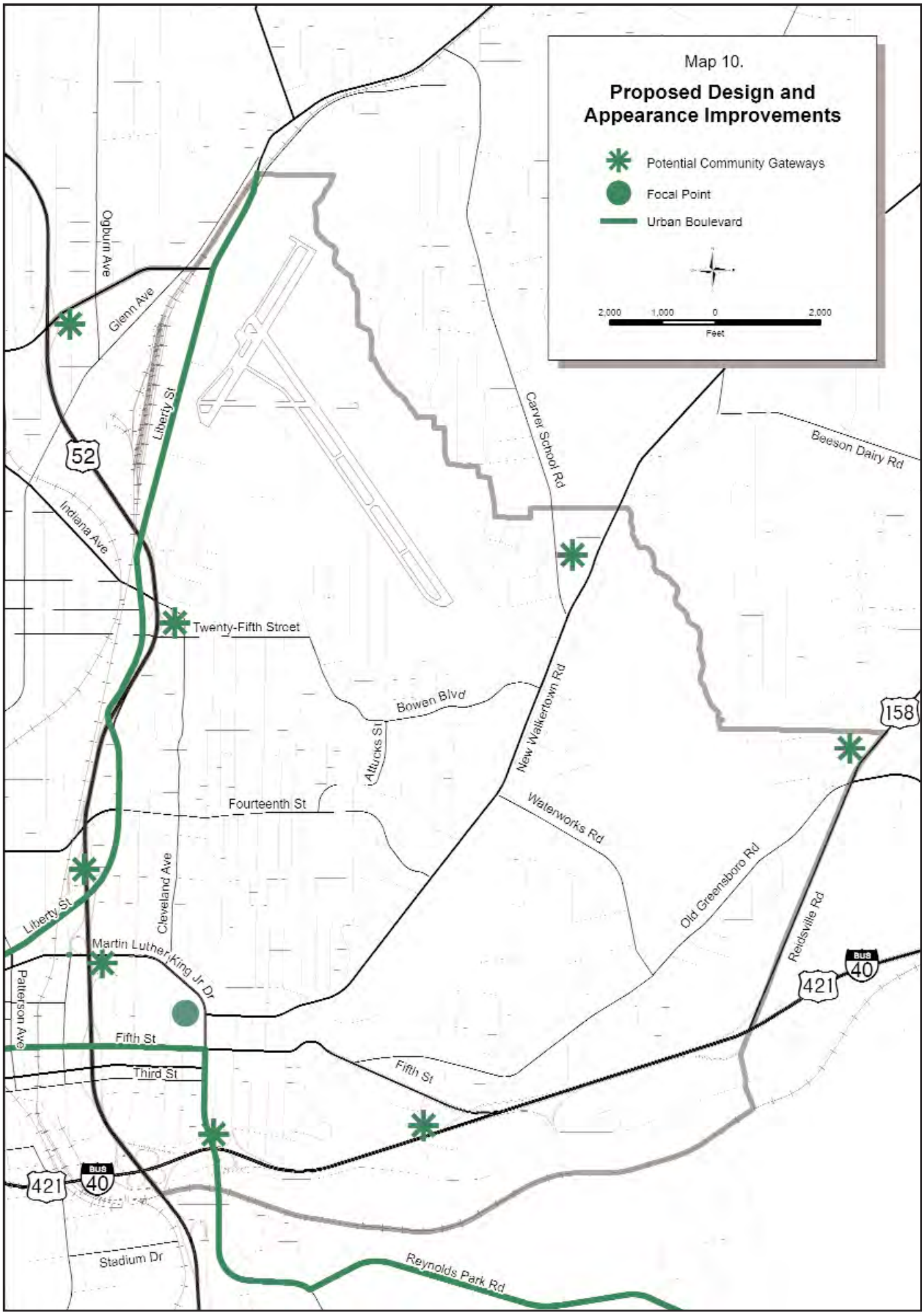

Map 6.
Proposed Land Use Changes
Proposed Land Use Changes
Low-Density Residential (up to 5 du/ac)
Urban Residential (Single-Family to Quadraplex)
Moderate-Density Residential (up to 8 du/ac)
Intermediate-Density Residential (up to 12 du/ac)
Office
Office / Low-Intensity Commercial (See text pages 40-41)
Commercial
Industrial
Institutional
Open Space / Park
Residential Opportunity Areas (See text page 30)
Low (up to 5 du/ac)
Urban (Single-Family to Quadraplex)
Moderate (up to 8 du/ac)
Intermediate (up to 12 du/ac)
Special Land Use Conditions (See text page 60)
Mixed-Use Opportunity Area (See text page 36)
Activity Center (AC) (See text page 40)
Ogburn Ave
Glenn Ave
Glenn Ave/ Ogburn Ave NAC
Liberty St
52
Indiana Ave
Twenty-Fifth Street
*k
Carver School Rd
Northampton Dr
Beeson Dairy Rd
New Walkertown/

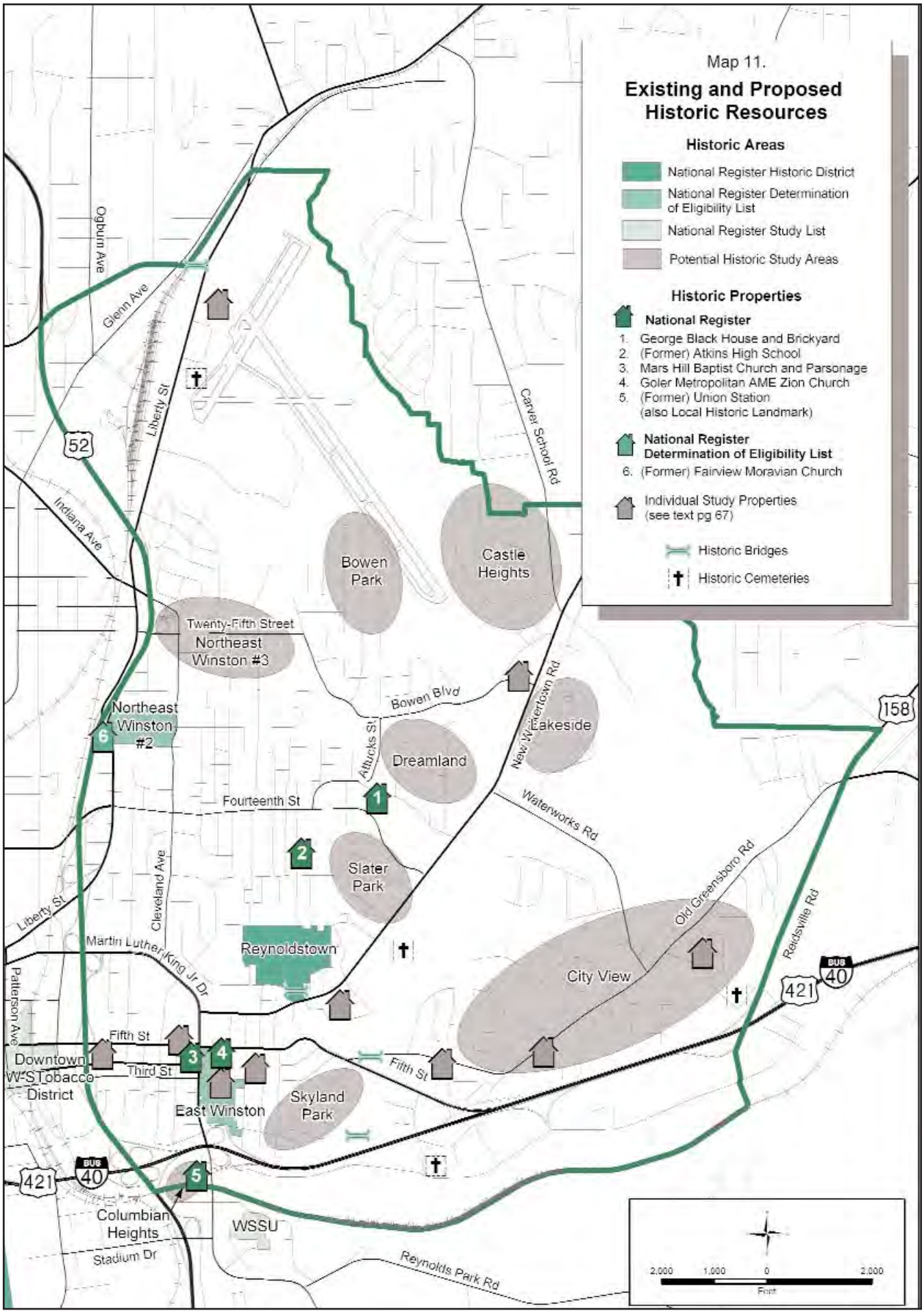

Carver School NAC
Bowen Blvd
New Walkertown Rd
158
Attucks St
A
A
G
H
Jetway NAC
Liberty St NAC
Fourteenth St
K
New Walkertown Dellabrook-Mixed Use Area
Waterworks Rd
h
I
J
New Walkertown/ 14th St NAC
Old Greensboro Rd
Martin Luther King Jr Drive - Cleveland Ave - New Hope Lane Mixed-Use Area
Liberty St
Reynoldstown NAC
B
*g
F
Reidsville Rd
Martin Luther King Jr Dr
East Winston MAC
C
BUS 40
421
Conference Center Mixed-Use Area
Patterson Ave
*a
*b
Fifth St
Old Greensboro Rd/ Barbara Jane NAC
E
*d
Third St
*c
Fifth St
D
*f
Union Station Mixed-Use Area
*e
421
BUS 40
Stadium Dr
Reynolds Park Rd
US52
Drive
1,500
750
0
500
Feet


Map 7
East Winston MAC
Urban Design Concept
1,000 500 0 1,000
Feet
Martin Luther King Jr. Dr.
Cleveland Avenue
Rupert Bell Park
US 52
Eastway Plaza
East Winston Shopping Center
New Walkertown Road
5th Street
4th Street
Business 40
Transit Station
Winston-Salem State University
Southern R R
Martin Luther King Jr. Dr.
Pedestrian-Friendly Roads
Office/Low-Intensity Commercial
Fence/Buffer
Potential Redevelopment Areas
HAWS Focus Area within the MAC Boundaries
S.G. Atkins CDC Focus Area within the MAC Boundaries


Map 8.
Proposed Transportation Improvements
US 52 Corridor Improvements
MLK Jr. Dr. Improvements
Potential Two-way Streets
Proposed Road Connection
Proposed Road (Thoroughfare Plan)
Road Improvements (Thoroughfare Plan)
Proposed Road Extension (Collector Street Plan)
Proposed Sidewalk
US 52 Interchange Improvements
TIP Bridge Projects
Potential Interchange Closure
Ogburn Ave
Glenn Ave
Liberty St
52
Indiana Ave
Twenty-Fifth Street
Bowen Blvd
Attucks St
New Walkertown Rd
158
Fourteenth St
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
Cleveland Ave
Liberty St
Martin Luther King Jr Dr
Patterson Ave
Fifth St
Third St
Fifth St
BUS 40
421
Stadium Dr
Reynolds Park Rd
2,000 1,000 0 2,000
Feet


Map 9.
Proposed Community Facilities Improvements
Proposed Park
Existing Park
Existing School
Existing Library
Proposed Master Plan and Improvements
Existing Greenway
Proposed New and/or Extended Greenway
Neighborhood Greenway Connection
Proposed Recreation Center Improvements
Ogburn Ave
Glenn Ave
Liberty St
52
Indiana Ave
Lowrance Middle
Hanes Middle
Blum-Blanding
Twenty-Fifth Street
Fairview
Bowen Blvd./ Hansel B. Thomas
Bowen Blvd
Ashley Elementary
Attucks St
Clark / Mickens
Fourteenth St
Fourteenth Street
Atkins Middle
L.E.A.P. Academy at Kennedy
Cleveland Ave
Martin Luther King Jr Dr
Rubert Bell
Patterson Ave
Skyland
Fifth St
Third St
Brushy Fork
421
Bus 40
Stadium Dr
Salem Academy & College
WSSU
Civitan
Reynolds Park Rd
Reynolds
Kingston Greens
Carver High
Carver School Rd
New Walkertown Rd
Winston Lake
158
Atkins Academic & Technology High
Petree Elementary
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
Salem Lake
N
W
E
S
2000
1000
0
2000
Feet


Map 10.
Proposed Design and Appearance Improvements
Potential Community Gateways
Focal Point
Urban Boulevard
2,000 1,000 0 2,000
Feet
Ogburn Ave
Glenn Ave
Liberty St
52
Indiana Ave
Twenty-Fifth Street
Carver School Rd
Beeson Dairy Rd
Bowen Blvd
Attucks St
New Walkertown Rd
158
Fourteenth St
Waterworks Rd
Old Greensboro Rd
Reidsville Rd
Cleveland Ave
Liberty St
Martin Luther King Jr Dr
Patterson Ave
Fifth St
Third St
Fifth St
421
BUS 40
Stadium Dr
Reynolds Park Rd


Map 11.
Existing and Proposed Historic Resources
Historic Areas
National Register Historic District
National Register Determination of Eligibility List
National Register Study List
Potential Historic Study Areas
Historic Properties
National Register
1. George Black House and Brickyard
2. (Former) Atkins High School
3. Mars Hill Baptist Church and Parsonage
4. Goler Metropolitan AME Zion Church
5. (Former) Union Station (also Local Historic Landmark)
National Register Determination of Eligibility List
6. (Former) Fairview Moravian Church
Individual Study Properties (see text pg 67)
Historic Bridges
Historic Cemeteries
Ogburn Ave
Glenn Ave
Liberty St
52
Indiana Ave
Carver School Rd
Bowen Park
Castle Heights
Twenty-Fifth Street Northeast Winston #3
Northeast Winston #2
Bowen Blvd
New Walkertown Rd
Lakeside
Attucks St
Dreamland
Fourteenth St
Waterworks Rd
158
Slater Park
Cleveland Ave
Liberty St
Martin Luther King Jr Dr
Reynoldstown
Old Greensboro Rd
Reidsville Rd
City View
421
BUS 40
Patterson Ave
Fifth St
Downtown W-S Tobacco District
Third St
East Winston
Skyland Park
Columbian Heights
WSSU
Stadium Dr
Reynolds Park Rd
2,000 1,000 0 2,000
Feet

Public Improvement Recommendations:

- Build sidewalks on both sides of New Hope Lane east of Liberty Street.
- Provide striped crosswalks along Liberty Street at intersections from Twelfth Street to Seventeenth Street.
- Assess need for bus route along Liberty Street.
- Place bike racks near the proposed focal point at Fourteenth and Liberty Streets.
- Create on-street parking where feasible.
- Provide bike lanes along Liberty Street.

Private Site Improvement Needs: Encourage private improvements through incentives and regulatory measure as follows:

- Close/change curb cuts.
- Screen dumpsters, grease traps, and loading docks.
- Use vegetation or fencing to screen view of commercial areas from residential uses.
- Improve parking lot areas by resurfacing, defining spaces, redesigning and adding landscaping.
- Improve appearance of security or opaque fencing.
- Improve building façades
- Remove excessive signage and replace damaged/out-of-date signage.
- Improve structural condition of auto repair/ storage sites.

Development/Zoning Recommendations:

- **(*i)** Allow properties located between US 52 and the Liberty Street Neighborhood Activity Center from Twelve and one-half to Thirteenth Streets to rezone from General Business (GB) District to office/low-intensity commercial use and become part of the Liberty Street NAC (see **Map 6**). Rezoning to the PB-S (Pedestrian Business-Special Use) is recommended to continue the urban commercial character along Liberty Street. Creating an inviting view from US 52 should be given special consideration for the redevelopment of this area. By using the PB-S (Pedestrian Business-Special Use District), property owners are exempt from the General Dimensional Requirements, have no minimum lot area or setbacks, and have a 30% reduction on off-street parking requirements.

- **(*j)** Allow properties located between US 52 and the Liberty Street Neighborhood Activity Center from Fifteenth to Eighteenth Streets to be rezoned from General Business (GB) District to office/low intensity commercial use and become part of the NAC (see **Map 6**). Rezoning to the PB-S (Pedestrian Business-Special Use) is recommended to continue the urban commercial character along Liberty Street. Creating an inviting view from US 52 should be given special consideration for the redevelopment of this area. By using the PB-S (Pedestrian Business-Special Use), property owners are exempt from minimum lot area or setbacks, and have a 30% reduction on off-street parking requirements.

Reynoldstown Neighborhood Activity Center

The Reynoldstown NAC (approximately 8 acres) is located along New Walkertown Road between Ferrell and Addison Avenues and directly across from the City's Evergreen Cemetery. The NAC has a mixture of zoning districts including single-family, multifamily residential and commercial. This NAC serves the East Winston community with hair salons, a market, the Community Care Center, a multifamily building, and new single-family homes.

Strengths and Opportunities: This NAC has good road access, sidewalks on main roads, and it is in close proximity to established neighborhoods. Existing development includes a well-maintained health care center, an elderly housing complex within walking distance, recently constructed single-family homes, and a planned townhouse development on a RM12-S tract of land.

Constraints and Issues: There are businesses with site issues such as deteriorated buildings, façades, and parking lots, and unsafe curb cuts. There is little landscaping on private property and no street trees. Traffic moves fast on New Walkertown Road.

Needed Land Uses Include: Additional low-intensity commercial uses.

Public Improvement Recommendations:

- Repair sidewalk along New Walkertown Road.
- Investigate use of traffic calming.
- Plant street trees along New Walkertown Road in front of the Community Care Center.

Private Site Improvement Needs: Encourage private improvements through incentives and regulatory measure as follows:

- Close/change curb cuts at the hair salon and market properties.
- Screen dumpsters.

- Use vegetation or fencing to screen view of commercial areas from residential uses.
- Improve parking lot by resurfacing, defining spaces, and adding landscaping along the edge and internally.
- Improve building and building façades.
- Remove or replace damaged/out-of-date signage.
- Clean up trash and overgrown vegetation on private property.

The Reynoldstown NAC is in close proximity, approximately 600 feet, to the New Walkertown/ Fourteenth Street NAC. This Plan recommends that these two areas remain separated, with existing residential uses in between them. Rezoning to nonresidential uses along New Walkertown from Addison Avenue to Fourteenth Street should not be allowed.

New Walkertown/Fourteenth Street Neighborhood Activity Center

The New Walkertown/Fourteenth Street NAC (approximately 54 acres) is located along New Walkertown Road between Fourteenth Street and Dellabrook Road. This NAC serves the surrounding neighborhoods with a variety of land uses. The NAC has a mix of zoning districts including commercial, office, institutional, and residential with the majority being zoned for commercial land use under HB (Highway Business). The existing land uses in the NAC include: gas stations, car wash, restaurant, bank, art gallery, cemetery, office, health care center, single-family homes, and a church.

Strengths and Opportunities: There is good road access and there are sidewalks within the NAC and from surrounding neighborhoods. A good number of businesses with well-maintained structures provide a variety of services to the community. There is vacant land surrounding the NAC, which provides additional opportunities for new development to serve surrounding neighborhoods.

Constraints and Issues: This NAC has a highway business orientation with high volumes of traffic and a number of curb cuts along New Walkertown Road. The existing topography does not allow properties on the north side of New Walkertown Road to be accessed by sidewalk along the road. There are some appearance issues particularly the chain-link fencing next to the right-of-way. The depth of some properties on south side of New Walkertown Road is not conductive to business development.

Needed Land Uses Include: Suggested land uses include: sit-down restaurant, laundry, additional office uses, and multifamily residential.

Public Improvement Recommendations:
- Repair sidewalk along New Walkertown Road.
- Build sidewalks on west side of Fourteenth Street from Addison Avenue to New Walkertown Road and along Gerald Street from Addison Avenue to New Walkertown Road.
- Provide striped crosswalks at New Walkertown Road and Fourteenth Street and at Dellabrook Road.
- Investigate use of traffic calming.

Private Site Improvement Needs: Encourage private improvements through incentives and regulatory measure as follows:
- Close/change curb cuts at the two gas stations.
- Screen dumpsters, grease traps, and loading docks.
- Improve parking lot areas by resurfacing, defining spaces, redesigning, and adding landscaping.
- Improve appearance of chain-link fencing close to right-of-way.
- Improve building façades.
- Remove excessive signage and replace damaged/out-of-date signage.
- Add landscaping on banks to prevent erosion and improve appearance.

Jetway Neighborhood Activity Center

The Jetway NAC (approximately 2.5 acres) is located at the intersection of Waterworks Road and New Walkertown Road. Although small, this strip development style of NAC serves surrounding neighborhoods with a variety of land uses and is zoned Limited Business. Land uses found in this NAC include: laundry, hair/barber/beauty salons, toy shop, shoe store, clothing store, restaurant, and convenience store (see **Figure 5**).

Strengths and Opportunities: NAC has good road access and good location at the intersection of two major roads. NAC is served by existing bus route on New Walkertown Road with a bus stop across the street. There is a high-density multifamily residential and an elderly housing complex in close proximity with a good number of potential users. The NAC provides a variety of services in a small and compact form and is fully occupied.

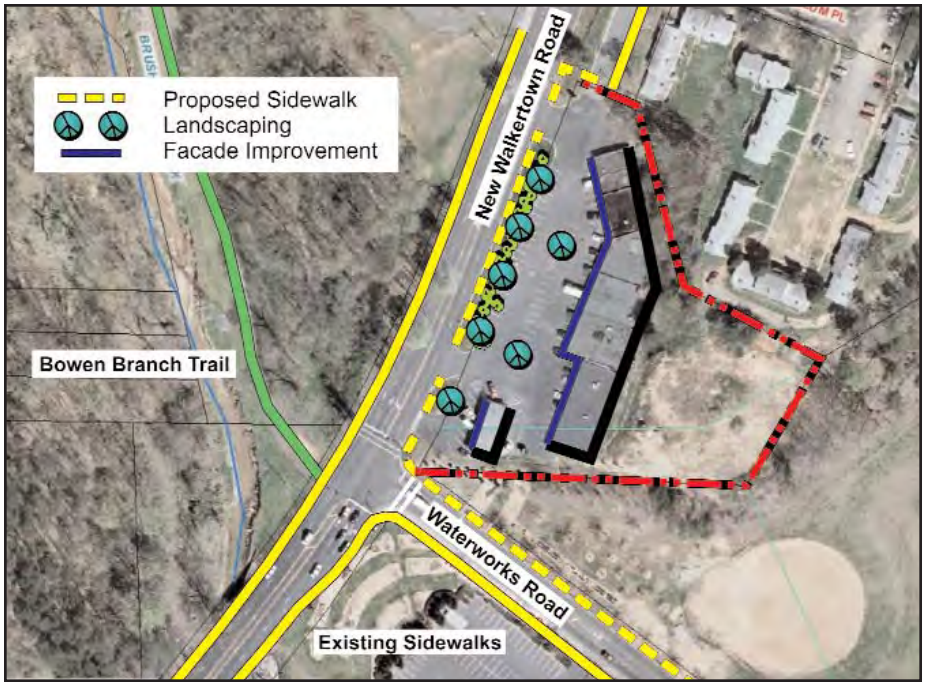


Figure 5. Conceptual Design for Jetway Neighborhood Activity Center

Constraints and Issues: The existing topography and fast moving traffic on New Walkertown Road make it difficult to access the NAC. There is limited pedestrian access due to the lack of sidewalks leading to the NAC. The strip center has some site problems such as deteriorated buildings, façades, and, parking lot. There is no landscaping on property and no street trees. Expansion options are limited due to steep slope on the back of the property. The proximity to Lakeside Apartments is challenging because of the age of the complex, maintenance, and safety issues.

Needed Land Uses Include: This NAC has a good variety and mix of uses.

Public Improvement Recommendations:

- Build sidewalk on east side of New Walkertown Road from Waterworks Road to tie with existing one on New Walkertown Avenue at Kellum Place.
- Investigate use of traffic calming.

Private Site Improvement Needs: Encourage private improvements through incentives and regulatory measures as follows:

- Close/change curb cuts.
- Improve parking lot areas by resurfacing, defining spaces, redesigning and adding landscaping.
- Improve building facades.
- Remove excessive signage and replace damaged/ out-of-date signage.

New Walkertown/ Carver School Road Neighborhood Activity Center

The New Walkertown/Carver School Road NAC (approximately 14 acres) is located along New Walkertown Road and includes businesses fronting on Carver School Road and Bowen Boulevard. This NAC serves the adjoining neighborhoods with most of the land zoned for commercial use. The area has a variety of land uses including: Nail/hair salon, restaurant, dry cleaner store, convenience store, church, and auto repair. However, a good number of businesses on the northern section of the NAC are vacant.

Strengths and Opportunities: The NAC has approximately eight acres of undeveloped land. Road access is good as well as the location at the intersection of New Walkertown Road and Carver School. There are sidewalks within the NAC connecting to surrounding neighborhoods. The realignment of Bowen Boulevard presents an opportunity for redevelopment. There is a bus route on New Walkertown Road and Bowen Boulevard serving the site.

Constraints and Issues: The NAC is in close proximity to the Smith Reynolds landing strip. It is difficult to make a left turn into sites along New Walkertown Road closer to Carver School Road. The NAC has dilapidated or deteriorated buildings and façades and business sites have numerous site issues such as unsafe curb cuts, no buffering between businesses and residential uses,

parking lots in need of repaving; dumpsters not screened from public view, and signage damaged or out-of-date. There may be a perception that the area is not good for business because of high vacancy rate.

Needed Land Uses Include: Suggested new land uses include: convenience store, restaurant, specialty shops and video store.

Public Improvement Recommendations:

- Build new sidewalk on both sides of the proposed Bowen Boulevard realignment.
- Repair sidewalk along New Walkertown Road.
- Provide striped crosswalks at Bowen Boulevard and Carver School Road.
- Place bike racks near the intersection of Carver School Road and New Walkertown Road.
- Redesign intersection of New Walkertown Road and Carver School Road to allow easy left turns into properties and consider study for a traffic light at the intersection.

Private Site Improvement Needs: Encourage private improvements through incentives and regulatory measure as follows:

- Close/change curb cuts.
- Screen dumpsters, grease traps, and loading docks.
- Use vegetation or fencing to screen view of commercial areas from residential uses.
- Improve parking lot areas by resurfacing, defining spaces, redesigning and adding landscaping.
- Improve building façades.
- Remove excessive signage and replace damaged/out-of-date signage.

Old Greensboro Road/Barbara Jane Neighborhood Activity Center

The Old Greensboro Road/Barbara Jane NAC (approximately 3 acres) is located just southwest of Winston Lake Park and the new Atkins High School. When first identified, this NAC was serving the City View neighborhood with all the land zoned for commercial use. However, the Baby Milk Store has closed and the church was demolished. Remaining land uses include a funeral home and three residential structures (one boarded up).

Strengths and Opportunities: This NAC is surrounded with a large number of residences and is in close proximity to Atkins High School and Winston Lake Park. There is a bus route running along Old Greensboro Road. The entire NAC is already zoned for commercial use and the majority of properties are either gone or dilapidated, presenting an opportunity for redevelopment.

Constraints and Issues: A number of drug offenses have been reported in the surrounding neighborhood. Some structures are dilapidated or vacant and have numerous site problems.

Needed Land Uses Include: Suggested new land uses include: general/variety/convenience store, restaurant, hair/barber/beauty shop, and laundry or dry cleaners.

Public Improvement Recommendations:

- Repair/maintain sidewalks on west side of Barbara Jane Avenue north of Old Greensboro Road.
- Build sidewalks on east side of Barbara Jane Avenue from Old Greensboro Road to Lunar Court and on south side of Old Greensboro Road from Barbara Jane Avenue to Glenbrook Drive.
- Provide striped crosswalks at Old Greensboro Road and Barbara Jane Avenue.
- Add bus bench to bus stops if warranted.
- Place bike racks on redeveloped sites south of Old Greensboro Road.
- Plant street trees on both sides of Old Greensboro Road in the NAC area.

Private Site Improvement Needs: Encourage private improvements through incentives and regulatory measure as follows:

- Close/change curb cuts.
- Use vegetation or fencing to screen view of commercial areas from residential uses.
- Improve parking lot areas by resurfacing, defining spaces, redesigning and adding landscaping.
- Improve building façades.
- Remove excessive signage and replace damaged/out-of-date signage.

Glenn Avenue/Ogburn Avenue Neighborhood Activity Center

The Glenn Avenue/Ogburn Avenue NAC (approximately 5 acres) is located along Glenn Avenue between Delaware Avenue and south of nonresidential uses facing Sherbrooke Drive. This NAC serves the adjoining neighborhood, and all of its land is zoned for commercial use. Uses found in the NAC are a hair/barber salon, a couple of churches, the Veterans of Foreign Wars building, some single-family homes and a vacant building.

Strengths and Opportunities: This NAC is located between residential and industrial areas with a potential to serve residents as well as employees. The NAC has good road access from Glenn and Ogburn Avenues, and it is in close proximity to the US 52 interchange at Akron Drive.

Constraints and Issues: There are dilapidated or deteriorated structures and some businesses with site issues such as unsafe curb cuts, unmarked/ undefined parking areas, no buffering between businesses and residential uses. The industrial/ warehouse character of Glenn Avenue is not conductive to pedestrian traffic. There may be competition from other commercial areas nearby.

Needed Land Uses Include: Suggested new land uses include: laundry and office uses.

Public Improvement Recommendations:

- Build sidewalks on both sides of Glenn Avenue from US 52 to Gaynor Street and on both sides of Ogburn Avenue from Gaynor Street to Akron Drive.
- Provide striped crosswalks at intersection of Glenn and Ogburn Avenues.
- Assess need for bus route along Glenn Avenue.
- Plant street trees where feasible.
- Create on-street parking, where feasible.

Private Site Improvement Needs: Encourage private improvements through incentives and regulatory measure as follows:

- Close/change curb cuts.
- Use vegetation or fencing to screen view of commercial areas from residential uses.
- Improve parking lot areas by resurfacing, defining spaces, redesigning and adding landscaping.
- Improve building façades.
- Remove excessive signage and replace damaged/out-of-date signage.

METRO ACTIVITY CENTERS (MACS)

MACs are compact, mixed-use regional centers for retail, office, civic, and residential activity. MACs have both a Core Area containing business and institutional uses and a Support Area comprised of higher-density housing. The Core Area has land uses, street configurations, and design features that create a "Town Center." For more detail on MACs, see section on *Legacy*. The City-County Planning Board's *Metro Activity Center Design Guidelines* address specific recommendations that should be incorporated into MACs.

Businesses in the Jetway Shopping Center

East Winston Metro Activity Center (MAC)

The East Winston MAC is bounded to the north by Twelfth Street, to the south by Third and the northbound ramp from Business 40 to US 52, to the east by Cameron and Jackson Avenues, and to the west by US 52. This MAC serves a regional area and surrounding neighborhoods with a variety of land uses. The MAC has a mix of zoning districts including commercial, office, institutional, multi-family and single-family residential. The existing land uses consist of: shopping opportunities, including two shopping centers; several offices, including two office towers; day care facilities; churches; institutional uses, including a school and a library; health-related services for Forsyth County; a community park; and high-density residential developments. Single-family residential uses encircle the area except on the west side, which is bounded by US 52.

Strengths and Opportunities: Road access is good via Business 40 and US 52 and there are good connections with downtown and surrounding residential neighborhoods. The proposed improvements to Martin Luther King Jr. Drive and US 52 could attract new development to the area to provide additional needed uses. There is a proposed rail stop at the former Union Station site (Davis Garage). Public transportation is available throughout this area including four bus routes. Sidewalks exist throughout the area connecting downtown and the WSSU Campus to the MAC. There is a good mix of land uses serving a large population. Nonprofit agencies are targeting portions of the MAC to improve multifamily and single-family residential areas. The Simon Green Atkins Community Development Corporation is developing a master plan that includes a portion of the MAC.

Constraints and Issues: There is a need for development that is more concentrated and more pedestrian-friendly in character for this area to function as a MAC. There are few entertainment venues, sit-down restaurants, and additional retail and office is needed to bring more people and activity to the area. There are dilapidated multi-family and single-family developments as well as deteriorated and outdated signage and façades. The MAC does not have a discernable "center" identifying the area and making it unique and lacks places for public gathering such as plazas or squares and natural open space.

Needed Land Uses Include: Suggested additional land uses include: more intense mixed-use, pedestrian-friendly commercial areas, office/low-intensity commercial development, and a variety of housing types including townhomes and multifamily units for different income levels to provide a range of affordable housing.

Public Improvement Recommendations:

- Repair sidewalks throughout the area, particularly some sections along Fourth Street.
- Plant street trees:
  - On sections of Third, Fourth, and Fifth Streets where street trees are missing.
  - On both sides of File Street, Mount Zion Place, Claremont Avenue and Highland Avenue north of Eighth, Eleventh, and Twelfth Streets.
- Create on-street parking, where feasible.
- Add bus stop bench and shelter at the East Winston Shopping Center and along Martin Luther King Jr. Drive between First and Fifth Streets when this section is redeveloped.
- Add bike racks at the East Winston and Eastway Plaza Shopping Centers.
- Ongoing maintenance of the public right-of-way.

Private Improvement Recommendations:
Encourage private improvements through incentives and regulatory measure as follows:

- Screen dumpsters particularly in multifamily areas.
- Use vegetation or fencing to screen view of commercial areas from residential uses.
- Improve the appearance and circulation of parking lots by resurfacing, defining spaces, and adding landscaping.
- Improve building façades and fix boarded-up multifamily units.
- Fix crumbling/in-need-of-repair retaining walls.
- Remove or replace damaged/out-of-date signage.
- Identify locations for building neighborhood entry signs and design them with resident input.
- Repair/paint chain-link and wood fences that are located next to the public right-of-way.
- Clean area facing Business 40 and US 52 of kudzu.
- Ongoing maintenance of yards and trash pick up.

Development Recommendations:

- Add more concentrated development by retrofitting and redeveloping existing sites and by bringing new mixed-use development to help this area to function better as a Metro Activity Center.

- Encourage more retail, office, and entertainment developments to serve the existing neighborhoods and to bring more people from surrounding areas such as the Research Park and WSSU.
- Create a pedestrian-friendly character through the development/redevelopment of properties by making sure buildings and streets are designed for pedestrian comfort.
- Locate buildings close to the street to create an interesting and inviting public/private streetscape and locate parking to the rear or side of primary structures to de-emphasize vehicles (see **Figure 6**).
- Design building façades to add interest to the street and have pedestrian-friendly features, such as awnings, porches, columns, recessed doors, and no blank walls facing main roads.

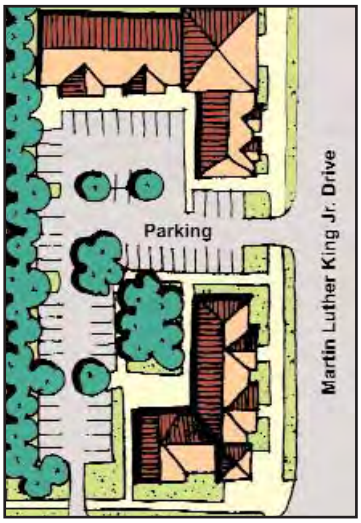


Figure 6. Proposed Character for Martin Luther King Jr. Drive

- Add street trees, on-street parking, wide sidewalks, street furniture, special paving areas, attractively-scaled lighting fixtures, and planting areas/planters with flowers or evergreen plants where feasible.
- Make main roads connecting to and from the East Winston MAC pedestrian-friendly with features such as street trees and on-street parking, where feasible. Main roads include Fourth and Fifth Streets, connecting to the downtown/ Research Park areas, and New Walkertown Road, Third Street, Liberty Street and Cleveland Avenue, connecting surrounding neighborhoods to the East Winston MAC.
- Take advantage of existing plans/redevelopment proposals in close proximity to the East Winston MAC such as the Research Park, the proposed Transit Station, Goler Heights, the Patterson Avenue/Thomasville Furniture Plant Mixed-Use Area, and the improvements to Martin Luther King Jr. Drive to make this road the main connector in the area.
- Redevelop Martin Luther King Jr. Drive from Business 40 to US 52 with a mixture of uses and a special character to attract people from adjoining and surrounding areas and for economic development purposes. Development recommendations for this corridor include:
  - Create a more intense, pedestrian-friendly center of activity in and around the East Winston Shopping Center. Encourage redevelopment of these properties to have an urban mix of uses to include retail, office, entertainment, institutional, and residential land uses. Encourage use of multi-story and multi-use buildings at this location (see **Figure 7**).
  - Provide a public gathering place, such as a pedestrian plaza or public open space, around the intersection of Martin Luther King Jr. Drive and New Walkertown Road. A Plaza or square with some natural open space at this busy intersection will promote human interaction and will provide a special identity to the MAC.
  - Allow office/low-intensity commercial on the west side of Martin Luther King Jr. Drive from First to Fifth Streets while protecting existing historic homes on the east side of the road facing Wheeler and Fourth Streets.
- Allow the conversion of existing homes facing Fifth Street from Martin Luther King Jr. Drive to Cameron Avenue to office/low-intensity commercial use with the retention of the existing structure (see **Appendix B.** Standards for Conversion of Existing Homes to Office or Commercial Use).
- Allow the properties facing Fifth Street from Highland Avenue to Martin Luther King Jr. Drive to redevelop to office/low-intensity commercial development (see **Appendix C.** Standards for New Office/Low-Intensity Commercial Development).
- Identify possible sites for redevelopment for higher-density residential in close proximity to the Research Park development. These sites could absorb future demand for housing for Research Park employees as the need spills over adjacent areas. One possible area includes existing multifamily housing between Second and Fifith Streets from US 52 to Woodland Avenue.

An Urban Design Concept summarizing the development recommendations for the East Winston Metro Activity Center (MAC) is shown on **Map 7**.

Figure 7. Conceptual Design for the East Winston Shopping Center Area

Special Land Use Conditions

The Proposed Land Use Changes Map (see **Map 6**) shows recommended land uses for all vacant property in the Planning Area and changes in land use for some developed sites. In some circumstances, there are special conditions or prohibitions of certain uses. These situations are referenced on the map with a blue ★ (star) and a small case letter as follows:

***a. East Winston Shopping Center.** The general area that includes the shopping center, parcels in front of shopping center along Martin Luther King Jr. Drive, and a vacant tract next to Mechanics and Farmers Bank is zoned Highway Business (HB). This property could be redeveloped with a mixture of uses including commercial, office and residential under the MU-S (Mixed Use-Special Use) District to become the "core" of the MAC. Vertical mixed use and multistory buildings are encouraged at this location to increase the level of activity and to take advantage of topographic features to possibly access upper levels through Cleveland Avenue the same way Eastway Shopping Center accesses Mount Zion Place. If the area does not undergo a complete redevelopment, a second option is the rezoning to the PB-S (Pedestrian Business-Special Use District) because of the district's flexible dimensional requirements, reduced parking requirements, and limitations on land uses. Auto-related uses, stores that sell alcohol, and clubs/bars are

discouraged at this location because of their negative visual impact and possible negative neighborhood impact (See **Figure 7**).

***b. Martin Luther King Jr. Drive and Fifth Street.** The RM-18 multifamily residential site across the street from the East Winston Shopping Center is recommended for redevelopment for office/low-intensity commercial development. The special use zoning process is recommended to limit the land uses, to assure that the design of the site complements the Martin Luther King Jr. Drive Corridor and proposed redevelopment of the East Winston Shopping Center, and protect single-family residential homes on the back of the site. A church located at the intersection of Martin Luther King Jr. Drive and New Walkertown Road, Galilee Baptist Church, could be redeveloped similarly to the multi-family site described above only if church members so desire (see **Figure 7**).

***c. Martin Luther King Jr. Drive between Business 40 and New Walkertown Road.** Properties along Martin Luther King Jr. Drive between Business 40 and Fifth Street currently have a mix of zoning districts. Office/low-intensity commercial land use is recommended for the properties located on the west side of Martin Luther King Jr. Drive (see **Figure 8**). Rezoning to the PB-S (Pedestrian Business-Special Use District) is needed to create a pedestrian-friendly character with buildings closer to the street and parking to the side or rear of buildings and to discourage uses that could have a negative visual or neighborhood impact. Existing homes on the east side of Martin Luther King Jr. Drive, facing Wheeler Street, Third and Fourth Streets, should be protected and not rezoned to a more intense zoning district. These homes have been determined to have historic significance and are eligible to be placed in the National Register of Historic Places. This Plan recommends building a decorative fencing and screening back and side yards of these homes as part as the proposed improvements to Martin Luther King Jr. Drive.

***d. Fifth and Second Streets between US 52 and Woodland Avenue.** The Planning Area is in close proximity to downtown and to the Piedmont Triad Research Park. The Master Plan for the Research Park shows a mixture

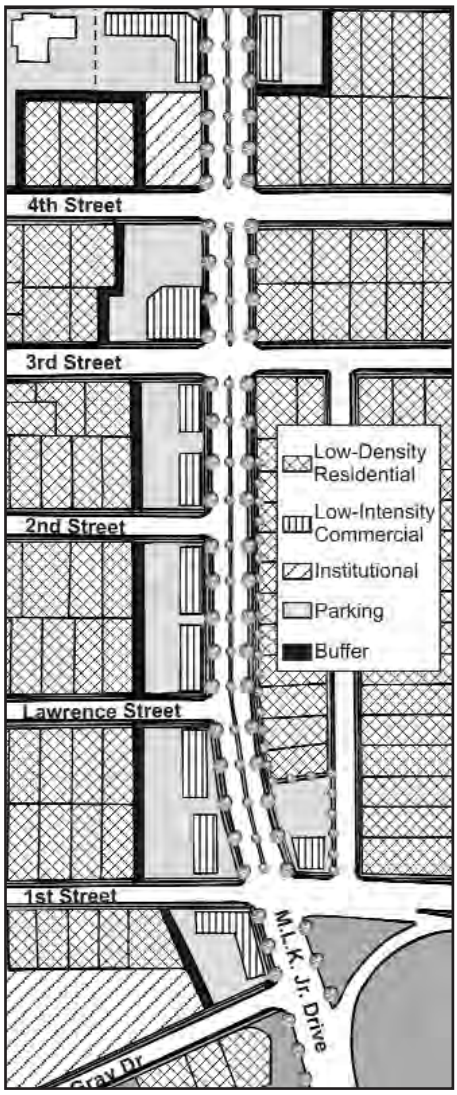


Figure 8. Proposed Land Uses along Martin Luther King Jr. Drive

of research facilities with office buildings as well as retail, restaurants and residential structures. Mixed-use development along Third and Fourth Streets is intended to link the Research Park with downtown and East Winston. Additional residential development in close proximity to the park will most likely be needed in the future as the park develops. No vacant parcels of land are nearby, making redevelopment of existing sites a possibility. RM-18 zoning tracts developed for multifamily between Fifth and Second Streets from US 52 to Woodland Avenue could redevelop with the existing multifamily density to capture the potential housing market not only for the Research Park, but for the downtown as well. Multistory buildings with public amenities and sufficient open space in the form of plazas or squares could fill that future need.

***e. Union Station.**

- Allow the Union Station site and vacant tract on the east side of Martin Luther King, Jr. Drive between the railroad tracts and Business 40 to rezone to the MU-S (Mixed Use-Special District).
- Develop the area around Union Station (within ¼ mile) with a mixture of residential, commercial, retail, and institutional uses at higher levels of intensity, where appropriate. Use a vertically-oriented mix of distinct land uses at the core area.
- Protect homes on Excelsior Street unless properties are part of a comprehensive development.
- Allow retail/commercial uses that attract pedestrian traffic throughout the day and night, creating a more lively and secure environment. Do not allow auto-dependent uses such as auto sales, service stations and drive-through businesses.
- Locate new buildings close to the street with entrances oriented to the public street following the pattern established by the Union Station building and new development by WSSU along Martin Luther King Jr. Drive.
- Locate low-intensity commercial uses on the ground level to capture trade from transit users. Locate office uses at the ground level or upstairs over commercial uses. Do not locate residential units on the ground level of mixed-use buildings.
- Design parking to be visually unobtrusive and pedestrian-friendly. Locate parking beside/behind buildings or in a parking deck.
- Provide safe and adequate access for pedestrians and bicyclists. Use signalized crosswalks at key locations and/or pedestrian bridges along Martin Luther King Jr. Drive to connect the station area with new development and WSSU on the east side of the road.
- Design streetscapes around the station area to be pleasant and secure increasing user's willingness to walk in the area. Streetscape should include street trees, street furniture, pedestrian-level lighting, easily understood and visible signage, artwork, banners, and other pedestrian area amenities.

***f. Lowery Street between Lowery Court and Hicks Street.** Properties located between Business 40 and the Lowery Business Park should be allowed to rezone for industrial use only if: comprehensively redeveloped with adjacent properties in the Business Park; and developed in conformance with the Industrial Expansion Design Guidelines (see **Appendix E**). The view from Business 40 should be given special consideration for the redevelopment of the area. No piecemeal zoning should be approved.

***g. Old Greensboro Road between Byerly Road and Ross Street.** The properties on the south side of Old Greensboro Road are currently zoned Limited Business (LB) although most of them have single-family residential uses. Office/low-intensity commercial land use is recommended at this location. Comprehensive redevelopment of these sites is required to minimize curb cuts on Old Greensboro Road and to coordinate development. Internal access between sites is recommended.

***h. Old Greensboro Road and Harvest Drive.** Four lots on the north side of Old Greensboro Road between Petree Elementary and Harvest Drive are currently zoned for single-family residential. This site is recommended for office/low-intensity commercial or institutional land use done comprehensively. Special use zoning should be required to limit uses and to assure the site is developed in a manner that is compatible with adjacent uses.

***i. US 52 between Twelfth and Thirteenth Streets.** Allow properties located between US 52 and the Liberty Street Neighborhood Activity Center from Twelfth to Thirteenth Streets to rezone from General Business (GB) District to office/low-intensity commercial use and become part of the NAC. Rezoning to the PB-S (Pedestrian Business-Special Use) is recommended to continue the character along Liberty Street of an urban commercial district. Creating an inviting view from US 52 should be given special consideration for the redevelopment of this area.

***j. US 52 between Fifteenth and Eighteenth Streets.** Allow properties located between US 52 and the Liberty Street Neighborhood Activity Center from Fifteenth to Eighteenth Streets to be rezoned from General Business (GB) District to office/low-intensity commercial use and become part of the NAC. Rezoning to the PB-S (Pedestrian Business-Special Use District) is recommended to continue the

character found along Liberty Street of an urban commercial district. Creating an inviting view from US 52 should be given special consideration for the redevelopment of this area.

***k. Manchester and Twenty-Fifth Streets.** A small area around the intersection of Manchester and Twenty-Fifth Streets is zoned LB (Limited Business). Uses include a laundry, a grocery store, churches and single-family homes. Office/low intensity commercial land use is recommended for this area. Rezoning to the PB-S (Pedestrian Business-Special Use) is recommended to continue the character established by the existing grocery store and laundry mat. No expansion of the current zoning boundary is recommended, except for Block 1338 Lot 1207, which should be allowed to convert to office use in the existing structure under the NO-S (Neighborhood Office-Special Use) Zoning District.

TRANSPORTATION RECOMMENDATIONS

Legacy calls for a balanced, sustainable network of all transportation modes that provide choices for travel needs. Street networks should be developed in a manner that is consistent with the land use plan and promote connectivity in communities. A more compact pattern of growth as outlined in the land use recommendations will allow public transportation to compete with the automobile. Developing walkable neighborhoods and creating a network of bikeways, sidewalks, and greenways will provide for needed transportation choices for all segments of the population **(**see **Map 8**).

ROAD IMPROVEMENTS

- Complete the Proposed US 52 Interim Improvements to manage high volumes of traffic on this highway and reduce the current high accident rate.
- Design Martin Luther King Jr. Drive from First to Fifth Streets as an attractive boulevard incorporating some of the pedestrian-oriented features found elsewhere along the corridor north of Fifth Street and south near WSSU. Features to consider include:
  - Widening of roadway to extend existing left-turn lanes at First, Third, and Fifth Streets to improve traffic flow.
  - Landscaping median from First to Fifth Streets.
  - Planting strips between the sidewalk and the roadway at least 24 inches in width.
  - Planting street trees on both sides of the street to establish a tree canopy.
  - Installing textured crosswalks at all intersections.
  - Adding pedestrian lighting.
  - Providing pedestrian features such as benches, trash receptacles, and banners.
  - Installing buffers and decorative fencing along
  - back properties lines of houses facing Wheeler Street and side yards of houses fronting Third and Fourth Streets on the east side of Martin Luther King Jr. Drive.
- Coordinate road and transportation improvements with the *Downtown Plan, Piedmont Triad Research Park Master Plan*, and *Winston-Salem State University Master Plan.*
- Complete road improvements and new roads in the Thoroughfare Plan as listed in **Table 8**.
- Incorporate attractive, pedestrian-oriented features on all new and improved roads by providing landscaping, sidewalks on both sides of the road, and landscaped medians where there is sufficient right-of-way.
- Minimize the use of dead ends and cul-de-sacs in new subdivisions and redeveloped areas.
- Require connections of local streets when developing or redeveloping sites unless extreme topography makes it unfeasible.
- Develop the newly adopted *Collector Street Plan* recommendations.
- Educate and encourage residents and neighborhood associations to use the City's Traffic Calming Policy. Under the program, identified local streets with high traffic speeds are evaluated for possible physical improvements or other measures to slow down traffic and make the streets safer.
- Include pedestrian-oriented features along Fourth and Fifth Streets such as street trees and on-street parking.

Table 8. East/Northeast Planning Area: Future Street and Highway Projects

Location	Description	Current Status	Completion
Road Widening and Improvements			
Bowen Boulevard	Realign existing 2-lane intersection, 0.2 miles north of New Walkertown Road.	Planning began in 2005	Construction in 2009
US 52	Widen and upgrade a 4-6 lane freeway to a 6-lane interstate with auxiliary lanes, covering 12 miles. Create an I-40 Bypass to proposed Northern Beltway (Western Loop) Interchange.	Planning to begin in 2021	Construction in 2030
US 158	Widen the existing 2-lane road into a 4-lane divided road covering 4.5 miles in Phase A.	Planning began in 2005	Construction in 2014
Waterworks Road	Convert a 2-lane road to a 3-lane road from Winston Lake to Old Greensboro Road, 0.8 miles	Planning began in 2005	Completed

Source: *Winston-Salem Thoroughfare Plan*

TRANSIT

- Utilize the former Winston-Salem Union Station site as a stop for the proposed regional commuter rail transit system connecting Burlington with Clemmons. Design this site as a multi-modal regional transportation center to include passenger rail, local, and regional bus systems.
- Explore extending the proposed Street Car line from the Piedmont Research Park to Baptist Hospital to connect with the East Winston Metro Activity Center.
- Continue the level of transit service now provided to the Planning Area.
- Study increasing public transportation service provided at night and on weekends.
- Make sure sidewalks are in place to provide safe access to transit.
- Identify locations for potential new bus shelters and bus stops to better serve the community.

PEDESTRIAN/BICYCLE

- Provide sidewalks on at least one side of all roads and on both sides of roads that provide access to institutions and public facilities.
- Develop and implement a pedestrian and bicycle plan for Martin Luther King Jr. Drive as part as the proposed roadway improvements to safely connect Winston-Salem State University with the East Winston Metro Activity Center.
- Accommodate bicycles and pedestrians in road construction and modification of projects.
- Review the following sidewalks for inclusion in the City's sidewalk program:
  - Twenty-Sixth Street from Cleveland Avenue to Claremont Avenue (north side) and beyond to the Airport Business Park when developed (north side)
  - Dunleith Avenue from Twenty-Second Street to Twenty-Fifth Street (either side)
  - Gray Avenue from Fourteenth Street to Eighteenth Street (either side)
  - Eighteenth Street from Gray Avenue to Orlando Street (either side)
  - Orlando Street from Eighteenth Street to Dellabrook Road (either side)
  - Fourteenth Street from Addison Avenue to New Walkertown Road (west side)
  - Gerald Street from Addison Avenue to New Walkertown Road (either side)
  - Slater Avenue from Addison Avenue to Gerald Street (either side)
  - Teresa Avenue from Carver School Road to Fondly Road and back to Teresa Avenue (either side)
  - Rosemary Drive from Bowen Boulevard to Teresa Avenue (either side)
  - Kinard Drive from Old Greensboro Road to Crawford Street (either side)
  - Chandler Street from Old Greensboro Road to Apollo Drive (west side)
  - Kingsgate Drive from Waterworks Road to Beechmont Street (either side)

– Byerly Street from Old Greensboro Road to unnamed cemetery (west side)
– Old Greensboro Road from Chandler Street to Freedom Street (south side)
– Harvest Drive from Old Greensboro Road to Earl Street and to connect with Kittering Lane once constructed (either side)
– Lowery Street from Brushy Fork Creek Trail to Lowery Court (either side)
– Lowery Court from Lowery Street to Business 40

Extend existing sidewalk or complete missing section:

– Bethlehem Lane from Claremont Avenue to Lafayette Avenue (south side)
– Claremont Avenue from Bethlehem Lane to Seventeenth Street (west side) and section between Willie Davis Drive and Fifteenth Street (west side)
– Section along New Hope Lane from Liberty Street to connect with existing sidewalk (south side)
– Hattie Avenue to Jackson Avenue (west side)
– Section of Hattie Avenue Between Twelfth and Fourteenth Streets (west side)
– Twelfth Street from File Street to Jackson Avenue (south side)
– Seventeenth Street between Cleveland Avenue and Claremont Avenue (south side)
– New Walkertown Road from Waterworks Road to Kellum Place (east side)
– Barbara Jane Avenue from Old Greensboro Road to connect with existing sidewalk (east side)
– Barry Street section to connect with Old Greensboro Road (east side)

- Increase bicycle ridership by encouraging civic groups and neighborhood associations to hold "bike days" along the existing East Winston Loop, greenways, or in area neighborhoods.
- Implement the bicycle recommendations in the *Winston-Salem Urban Area Bicycle Plan* for the Planning Area. Add bike lanes on the following streets:
  – Cleveland Avenue from Martin Luther King Jr. Drive to Fourteenth Street
  – Bowen Boulevard from Twenty-Fifth Street to new realignment with New Walkertown Road
  – Old Greensboro Road from Brushy Fork Creek to Reidsville Road
- Create better pedestrian and bicycle linkages between the East Winston Metro Activity Center and Winston-Salem State University and the Piedmont Triad Research Park by providing wider sidewalks or bike lanes.

Community Facilities Recommendations

Both public and private community facilities such as schools, parks, medical offices, and day care providers should be easily accessible to all segments of the population (see **Map 9**). *Legacy* promotes the sharing of institutional facilities as a way to meet the various needs of the community. An important recommendation from *Legacy* is the creation of the central public space in all communities to serve as an urban reference point and the focus of civic and community life.

SCHOOLS

- Establish better links between the school system/schools in the area for the use of school property and facilities for community events and recreational activities.
- Consider funding the upgrade or expansion of existing schools in the area as part of a future school bond issue.

RECREATION FACILITIES

- Assess usage of existing facilities and programs and provide additional programs as needed, and or/target special groups in the community that are not yet covered.
- Improve the new neighborhood park on the City-owned tract of land at the intersection of Fourteenth Street and Jackson Avenue. The new park should include a walking trail and on-street parking as the first phase. Landscaping, shrubbery and hardscape elements should be added at a later phase with additional funding.
- Explore planting street trees at the new Fourteenth Street Park through the Community Roots Day tree planting program. If not feasible at this time, consider plantings in future years.
- Encourage community members and neighborhood associations to assist in the upkeep of this new park and any other existing parks by participating in the City's "Adopt-a-Park" program.
- Develop Master Plans for the following parks to upgrade, re-design and better integrate existing park facilities:

– **Fairview Park:** located next to Northeast Winston #2 and Northeast #3 Redevelopment Areas, the master plan should look at providing a multiuse, multiage neighborhood park to serve the surrounding neighborhoods.
– **Rupert Bell:** located within the boundaries of the East Winston Metro Activity Center, the master plan should look at the feasibility of turning this site into a focal point for the community by providing, activities not currently being offered in the area such as a place for community gatherings, musical events, and entertainment activities for different age groups. The master plan should also look at the feasibility of building a water play facility that the community has expressed a desire to have in the Planning Area.
– **Fourteenth Street Recreation Center:** located in close proximity to the Rupert Bell Recreation Center, the master plan should look at how to better integrate the two recreation centers to avoid duplication of services to the community.
– **Winston Lake Park:** the master plan should look at how to better integrate all the existing park facilities, possibilities for new ones, and connections to surrounding areas/services.

GREENWAYS

- Link trails in parks with existing/proposed external sidewalks, bike routes, and greenway trails where feasible.
- Extend the Brushy Fork Creek Trail north to connect to Helen Nichols Park, Carver High School, Crawford Park, the Mazie Woodruff Center and Library, and surrounding neighborhoods.
- Extend the Brushy Fork Creek Trail south to connect to the Salem Creek Trail. Make a connection to the Brushy Fork Park.
- Provide neighborhood connections from the Virginia K. Newell/Ann Massey Trail east to the City View and Skyland neighborhoods, and north through Skyland Park to Reynoldstown and surrounding neighborhoods.
- Extend the Bowen Boulevard walking trail north to connect to the Airport Business Park currently being developed south of Fairchild Road.

LIBRARY FACILITIES

- Maintain the existing library facility at Cleveland Avenue and Seventh Street and renovate/expand if feasible. Improve access to this facility to better serve surrounding neighborhoods.

CEMETERIES

- Protect existing cemeteries from vandalism.

HOUSING AND COMMUNITY DEVELOPMENT RECOMMENDATIONS

Legacy recommends that neighborhoods offer a variety of quality housing types for different income levels, family size, and types that reduce the segregation of neighborhoods by race, age, and income. Affordable housing should be promoted throughout the city and county by providing incentives, utilizing cost-effective site design, and permitting accessory dwellings and congregate care facilities.

GENERAL RECOMMENDATIONS

- Maintain and improve the quality of housing stock in the area by promoting home ownership, supporting rehabilitation of existing homes, and through code enforcement.
- Develop a variety of housing types for different income levels, family sizes, and personal preferences in the Planning Area to provide a mixture of housing opportunities.
- Expand the City's Neighborhood Improvement Program to educate existing residents and newcomers about the City's regulations related to zoning, sanitation ordinances, and minimum housing code, and encourage neighborhood associations to participate.
- Make the training materials from the Neighborhood Improvement Program available to civic groups, neighborhood associations and landlords in the Planning Area.
- Encourage residents and neighborhood associations having problems with abandoned vehicles and graffiti to participate in the Trash Busters and Graffiti Programs the City offers.
- Incorporate Traditional Neighborhood Development concepts in the development and redevelopment of the Planning Area. includes a mixture of housing types, well-designed commercial areas in and near neighborhoods, and reducing the role of the automobile by incorporating walkability and connections to other neighborhoods.
- Enforce Infill Development Regulations to ensure that new infill development and redevelopment activities complement the character of the existing surrounding neighborhoods.

- Develop the identified Residential Infill Opportunity Areas to complement the existing character of the surrounding old neighborhoods (see Residential Recommendations)

AFFORDABLE HOUSING

- Continue to support existing efforts by Community Development Corporations in providing affordable housing opportunities in the Planning Area and encourage for-profit developers to build affordable housing units.
- Encourage other not-for-profit developers, including the WS/FC Housing Partnership and Habitat for Humanity, to develop more housing in the Planning Area.
- Make sure new affordable housing units are compatible with the existing character of older neighborhoods.
- Use existing programs or develop new ones to assist community development and nonprofit housing organizations in providing affordable housing opportunities.

REHABILITATION AND REDEVELOPMENT EFFORTS

- Complete implementation of the adopted Northeast Winston #2 Redevelopment Area. New housing units will bring necessary investment in the area and new residents in need of goods and services.
- Ensure that new housing designs are compatible with the historic character of the area and incorporates design elements found elsewhere in the neighborhood such as front porches, columns and railing, façades with more than one bay, and similar roof pitch.
- Find additional funding for the implementation of the adopted Northeast Winston #3 Redevelopment Subarea and continue efforts to rehabilitate existing residences in the Northeast Winston #3 Rehabilitation, Conservation, and Reconditioning Area.
- Market the City's programs for rehabilitation of owner-occupied or investor-owned housing units in the Planning Area as well as first-time homebuyers program with an emphasis in the section north of Twenty-First Street between US 52 and Caledonia Drive. Encourage not-for-profit developers to concentrate efforts to build more housing in this section of the Planning Area.

DESIGN AND APPEARANCE RECOMMENDATIONS

The creation of attractive gateways, business districts, and corridors through the use of regulation or physical improvements is recommended by *Legacy*. Design and appearance improvements create a positive visual image and encourage private reinvestment in an area (see **Map 10**).

GENERAL RECOMMENDATIONS

- Enhance the physical appearance of the commercial districts identified in the East Winston Metro Activity Center and all the Neighborhood Activity Centers by:
  - Rehabilitating existing buildings and sites to support a walkable and visually appealing community.
  - Expanding and funding the Façade Improvement Program to improve the appearance of existing buildings. Also marketing the program to business in the Planning Area.
- Revitalize older multifamily areas to improve the image of the area
- Encourage a mix of outdoor cafes, small stores, and services at a pedestrian scale that meet the needs of all residents in the area.
- Ensure that housing, sanitation, and weeded lot ordinances are strictly enforced in the Planning Area to eliminate blighted structures and maintain vacant lots.
- Encourage residents and neighborhood associations to participate in the different programs offered by Keep Winston-Salem Beautiful to improve the appearance of the Planning Area; Adopt-A-Flower Bed, Adopt-A-Stream, or Adopt-A-Street.
- Encourage adoption of regulatory changes proposed by the *Revitalizing Urban Commercial Areas* (RUCA) Study.
- Fund additional RUCAs.
- Identify areas of right-of-way at neighborhood entrances that can be used for the Flower Bed Program. Free annual plants are given every year to neighborhood associations or other groups.
- Develop a pedestrian-friendly environment by providing the following:
  - Planting strips between the sidewalk and the street on all roadway and redevelopment projects.

– Planting appropriate street trees on all existing and new planting strips.
– Providing marked, on-street parking to serve adjacent properties and for traffic calming purposes.

- Promote the use of art that reflects local cultures in public spaces such as parks, recreation centers, and other public areas where residents gather together.

TRANSIT STATIONS

See recommendations in the Mixed-Use Land Use Categories under Union Station Mixed-Use Area.

- Prepare a Master Plan for the proposed Transit Station and surrounding Mixed-Use Area. The Master Plan should reflect the Transit-Oriented Development planning concept identified in *Legacy*.

URBAN BOULEVARDS

Urban Boulevards are special corridors along selected major arterial roads that connect the Center City with Metro Activity Centers. For more detail on Urban Boulevards, see section on *Legacy* Recommendations.

Two roads leaving downtown and passing through the Planning Area have been identified as Urban Boulevards in *Legacy:* Liberty Street connecting to the Smith Reynolds Airport area, and Fifth Street to Martin Luther King Jr. Drive, connecting to Reynolds Park Road and the 311 Connector.

- Implement *Legacy's* recommendations for the Urban Boulevards in the Planning Area.
- Continue Implementation of the *Liberty Street Corridor Study* and adopted *Liberty Corridor Master Plan.*
- Convert Fifth Street to two-way traffic as part as the US 52 Interim Improvements, and make it pedestrian and bike friendly by providing on-street parking, a bike lane, street trees and street furniture.
- Complete proposed improvements to Martin Luther King Jr. Drive as part as the US 52 Interim Improvements to include widening of the road to accommodate left turn lanes, and a median between First and Fifth Street (see Transportation Recommendations under Road Improvements). Expand the proposed improvements to include the following:
  – Enhancement of proposed improvements by the North Carolina Department of Transportation along the right-of-way to possibly include sidewalk treatment, pedestrian crosswalks; building planting strips between the sidewalk and the roadway, landscaping of medians, and adding street trees.
  – Establishment of an attractive entrance to the community from Business 40.
  – Pedestrian and bike connections to the proposed Transit Station and redeveloped East Winston Shopping Center.
  – Comprehensive redevelopment of the west side of Martin Luther King Jr. Drive with possible types of businesses, building and parking locations, and public amenities such as small plazas or pocket parks.
  – Protection of existing houses along the east side of Martin Luther King Jr. Drive to possibly include buffering and fencing of back and side yards.

GATEWAYS/ENTRY POINTS

- Create attractive entrances to the Planning Area from Business 40 and US 52 with the use of special landscaping/planting areas. Potential locations for community gateways are:
  – Business 40 at Fifth Street (around the Winston-Salem Journal plant)
  – Business 40 at Martin Luther King Jr. Drive
  – US 52 at Martin Luther King Jr. Drive, Liberty Street; Twenty-Fifth/Twenty-eight Streets and Akron Drive
  – US 158, Reidsville Road, at Old Greensboro Road
  – US 311, New Walkertown Road, at Carver School Road
- Establish neighborhood gateways that include signage, planting areas, and/or public art. The nature and location of neighborhood gateways should be established by neighborhood organizations working with the City. Gateway features should be incorporated when other public improvements are undertaken.

FOCAL POINT

A community focal point is proposed in the East Winston Shopping Center area (see Metro Activity Center MAC under Mixed-Use Land Use Categories).

- Design a focal point in the East Winston Shopping Center to encourage people to gather in a place that is unique and has a special character. Design elements should include:
  – A combination of special paving materials

for hardscape areas, and trees, shrubbery and flowers for landscaped areas.
  – Buildings surrounding the focal point with facades that add interest, activity, and comfort to the general area.
  – Street furniture that includes benches, trash receptacles, bike racks, and pedestrian lighting.
  – Public art that reflects the history and special qualities of the Planning Area.

Historic Preservation Recommendations

Legacy promotes historic preservation because of its contribution to the aesthetic, social, historical, cultural, and environmental quality of communities as well as its contribution to a community's economic development.

Significant historic resources have been identified in the East/Northeast Area Plan boundaries as indicated in initial surveys (see **Appendix A**). Following are recommendations to ensure that the potential of these resources are fully explored and that the community takes steps to preserve its historic assets (see **Map 11**).

GENERAL RECOMMENDATIONS

- Retain historic resources, including residential homes and neighborhoods, commercial structures, institutional buildings, and bridges.
- Recognize buildings, events, or areas of historical, cultural, or architectural significance with signage, plaques, or markers.
- Initiate public outreach programs involving property owners and community organizations on the importance and economic benefits of preserving historic resources. Examples of potential workshops include: 1) how and why to nominate a structure, site, or area to the National Register of Historic Places; 2) how to use the historic preservation rehabilitation tax credit program; and, 3) issue-related topics such as how to maintain an older or historic building, historic bridge preservation, and historic cemetery preservation.
- Encourage property owners to research and recognize the history and significance of their properties and the area in which they live.
- Assist property owners in the Reynoldstown neighborhood seeking federal or State funding or federal income tax benefits once the area is listed in the National Register of Historic Places.

PROPOSED STUDIES

- Identify additional historic resources in the Planning Area as part of the update of the countywide architectural inventory currently being completed by Historic Resources staff and a historic preservation consultant.
- Encourage/assist property owners and organizations to undertake or commission studies of individual properties with uniqueness to learn more about them and determine whether they are eligible for historic designations (see **Appendix A**):
  – City Memorial Hospital
  – Fast Food Stand on New Walkertown Road
  – (Former) Fire Station #4
  – House at 2842 Old Greensboro Road
  – Progressive Apostolic Church
  – (Former) Skyland Elementary School
  – Smith Reynolds Airport
  – United Metropolitan Missionary Baptist Church
  – Winston Mutual Building
  – Winston-Salem Tourist Village
- Encourage/assist property owners and organizations to undertake or commission studies of the following neighborhoods dating from the early to mid-20th century to learn more about them and to determine whether they are eligible for historic designations (see **Appendix A**):
  – Bowen Park
  – Castle Heights
  – City View
  – Columbian Heights
  – Dreamland Park
  – East Winston
  – Lakeside
  – Skyland Park
  – Slater Park
- In cooperation and partnership with property owners, seek State and local grants or other funding to complete studies and National Register nominations for the following eligible properties or areas:
  – (Former) Fairview Moravian Church
  – Northeast Winston #2 Redevelopment Area
  – Northeast #3 Rehabilitation Area
  – East Winston (First and Fifth Streets between Martin Luther King Jr. Drive and back property lines of houses fronting on Dunleith Avenue)
- Encourage property owners to seek National Register and Local Historic Landmark designation for eligible properties.

Economic Development Recommendations

Economic development activity provides a broad range of employment opportunities and a high quality of life for the citizens of Forsyth County. Economic development efforts should be compatible with existing development and should include improvements to existing facilities as well as new businesses.

GENERAL RECOMMENDATIONS

- Encourage and market the development/ redevelopment of business and industrial sites identified in this Plan to create new jobs and improve appearance of the area.
- Align the efforts of property owners, realtors, business owners and the community to strengthen business development efforts.
- Implement the recommendations of this Plan related to public improvements for the Metro and Neighborhood Activity Centers and direct funding to implement such public improvements.
- Encourage nonprofits and existing Community Development Corporations to target the Activity Centers for revitalization and to seek funding for these efforts through the City's RUCA Program.
- Revitalize older multifamily areas to improve the image they currently present to residents and nonresidents in the area.
- Encourage a broad mix of new retail stores and services in accordance with land use plan, varying in size and type celebrating the diversity of the Planning Area.
- Recognize and support business opportunities associated with the growing diversity of cultures.
- Support community/business organizations such as business watch programs. Explore creating a Merchants Association as more businesses come into the area.

APPLICABLE CITY PROGRAMS

- Strengthen existing businesses and attract new ones by utilizing, promoting and marketing the City's Economic Development Revolving Loan Program currently available in the area. Promote the State Development Zone Area Program applicable to the Planning Area.
- Encourage use of the Target Area Business Assistance Program, now in place for sections of Liberty Street, in the Planning Area which provides incentives for business location in certain areas of the city to create jobs opportunities. Explore extending this program to possibly target Activity Centers.
- Market and hold workshops to promote City business training and building rehabilitation loan programs for the purchase or rehabilitation of structures to local/potential merchants particularly in the designated Activity Centers.
- Implement the recommendations of the RUCA Report and extend program beyond the current funding.
- Identify brownfield sites in the Planning Area and provide Brownfield Assessment Grant funding to assess sites for environmental problems and, if necessary, assist potential developers in cleaning up problem sites.

Brickmaker, George Black House

Implementation Schedule

Note: The recommendations of this Plan serve as a guide to future action and decision making and are not a commitment to funding. Funding for specific projects/actions will be allocated by the Winston-Salem City Council based on the availability of funding and consideration of citywide priorities.

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
Land Use Recommendations		
General		
Follow proposed Land Use Plan, land use policies and Special Land Use Conditions (page 29).	CCPB, WSCC	Ongoing
Apply traditional neighborhood design principles and standards to residential and commercial areas (page 29).	CCPB, WSCC	Ongoing
Encourage revitalization of underutilized commercial sites (page 35).	CCPB, WSCC	Ongoing
Encourage concentration of nonresidential land use in designated Neighborhood and Metro Activity Centers and recommended commercial areas (page 40).	CCPB, WSCC	Ongoing
Transportation Recommendations		
General		
Identify local streets with high traffic speeds for traffic calming (page 63).	Neighborhood, WSDOT	Ongoing
Minimize the use of dead ends or cul-de-sacs in new subdivisions and redeveloped areas (page 63).	CCPB, WSDOT	Ongoing
Require connections of local streets as shown on **Map 8** (page 49).	CCPB, WSDOT	Ongoing
Roads/Interchanges/Intersections		
Widen and upgrade US 52 to a 6-lane freeway (Table 8, page 64).	NCDOT	Long Range
Widen Reidsville Rd. to a 4-lane divided highway (Table 8, page 64).	NCDOT	Long Range
Realign Bowen Boulevard intersection with New Walkertown Rd. (Table 8, page 64).	WSDOT	Immediate
Redesign intersection of New Walkertown Road and Carver School Rd. (page 56).	WSDOT	Medium Range

**Timing: Immediate: 1-2 years Short Range: 3-5 years Medium Range: 6-10 years Long Range: 10 years or more*

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
(Roads/Interchanges/Intersections, continued...)		
Extend Harvest Dr. as recommended on the *Collector Street Plan* (page 32).	WSDOT	Medium Range
Complete US 52 Interim Improvements (page 63).	WSDOT, NCDOT	Immediate
Complete improvements to Martin Luther King Jr. Dr. (page 63).	WSDOT, WSCC, NCDOT, VM	Immediate
Transit		
Design a multimodal, regional transportation center at the former Union Station site (page 64).	PART, WSDOT, WSCC	Medium Range
Develop a Master Plan for the Transit Station and surrounding Mixed-Use Area (page 36).	CCPB, PART, WSCC	Medium Range
Extend planned street car line from Research Park to East Winston MAC (page 64).	WSDOT, WSCC	Long Range
Pedestrian		
Build sidewalk along Lowery St. and Lowery Court from Brushy Fork Creek Trail to E. 1st St. (page 65).	WSDOT	Immediate
Review identified sidewalk projects under the City's sidewalk priority funding system (pages 64-65):		
• 26th St from Cleveland Ave. to Claremont Ave.	WSDOT	Long Range
• Gray Ave. from 14th St. to 18th St.	WSDOT	Long Range
• 18th St. from Gray Ave. to Orlando St.	WSDOT	Long Range
• Orlando St. from 18th St. to Dellabrook Rd.	WSDOT	Long Range
• 14th Street from Addison Ave. to New Walkertown Rd.	WSDOT	Long Range
• Gerald St. from Addison Ave. to New Walkertown Rd.	WSDOT	Long Range
• Slater Ave. from Addison Ave. to Gerald St.	WSDOT	Long Range
• Teresa Ave. from Carver School Rd. to Fondly Rd. and back to Teresa Ave.	WSDOT	Long Range
• Rosemary Dr. from Bowen Blvd. to Teresa Ave.	WSDOT	Long Range
• Kinard Dr. from Old Greensboro Rd. to Crawford St.	WSDOT	Long Range
• Chandler St. from Old Greensboro Rd. to Apollo Dr.	WSDOT	Long Range
• Kingsgate Dr. from Waterworks Rd. to Beechmont St.	WSDOT	Long Range
• Byerly St. from Old Greensboro Rd. to unnamed cemetery	WSDOT	Long Range

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
(Pedestrian, continued...)		
• Old Greensboro Rd. from Chandler St. to Freedom St.	WSDOT	Long Range
• Harvest Dr. from Old Greensboro Rd. to Earl St. and later to Kittering Lane	WSDOT	Long Range
Review identified missing sections of sidewalk projects under the City's sidewalk priority funding system (page).	WSDOT	Long Range
• Bethlehem Lane from Claremont Ave. to Lafayette Ave.	WSDOT	Long Range
• Claremont Ave. from Bethlehem Lane to 17th St.	WSDOT	Long Range
• Hattie Ave. to Jackson Ave.	WSDOT	Long Range
• Hattie Ave. between 12th St. and 14th St.	WSDOT	Long Range
• 12th St. from File St. to Jackson Ave.	WSDOT	Long Range
• 17th St. Between Cleveland Ave. and Claremont Ave.	WSDOT	Long Range
• New Walkertown Rd. from Waterworks Rd. to Kellum Place	WSDOT	Long Range
• Barbara Jane Ave. north from Old Greensboro Rd.	WSDOT	Long Range
• Barry St. to connect with Old Greensboro Rd.	WSDOT	Long Range
Bicycle		
Add bike lanes on the following streets as recommended in the Winston-Salem Urban Area Bicycle Plan (page 65):		
• Cleveland Ave. from Martin Luther King Jr. Dr. to 14th St.	WSDOT	Long Range
• Bowen Blvd. from 25th St. to New Walkertown Rd.	WSDOT	Long Range
• Carver School Rd. from New Walkertown Rd. to Lansing Dr.	WSDOT	Immediate
• Old Greensboro Rd. from Brushy Fork Creek to Reidsville Rd.	WSDOT	Long Range
Accommodate bicycles and pedestrians in road construction and modification projects (page 64).	WSDOT	Ongoing

Community Facilities Recommendations

Schools

Encourage the use of educational facilities for community events and neighborhood services (page 65).	WS/FC Schools; Area Institutions, NAs	Immediate

**Timing: Immediate: 1-2 years Short Range: 3-5 years Medium Range: 6-10 years Long Range: 10 years or more*

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
(Community Facility Recommendations, continued...)		
Recreation Facilities		
Continue development of the 14th Street Park (page 66).	WSRP	Underway, Short Range
Develop a Master Plan for Fairview Park (page 65).	WSRP, WSCC	Medium Range
Develop a Master Plan for the Rupert Bell Recreation Center (page 66).	WSRP, WSCC	Short Range
Develop a Master Plan for the 14th Street Recreation Center (page 66).	WSRP, WSCC	Medium Range
Develop a Master Plan for the Winston Lake Park (page 66).	WSRP, WSCC	Short Range
Encourage participation in the City's Adopt-a-Park Program (page 65).	WSRP	Immediate
Greenways		
Extend the Brushy Fork Creek Trail north to the Mazie Woodruff Center and Library (page 66).	WSCC, WSDOT, WSRP	Medium Range
Extend the Brushy Fork Creek Trail south to connect to the Salem Creek Trail (page 66).	WSCC, WSDOT, WSRP	Short Range
Extend the Bowen Boulevard walking trail north to connect to the Airport Business Park (page 66).	WSCC, WSDOT, WSRP	Short Range
Provide neighborhood connections from the Virginia K. Newell/Ann Massey Trail to surrounding neighborhoods (page 66).	WSCC, WSDOT, WSRP	Short Range
Library Facilities		
Improve access to the Malloy/Jordan East Winston Heritage Center (page 66).	FCLB	Short Range
Housing and Community Development		
General		
Maintain and improve the quality of housing stock in the Planning Area (page 66).	HND, NS, NAs, Property Owners	Ongoing/ Immediate
Develop a variety of housing types to provide a mixture of housing opportunities (page 66).	CDCs, HND, Nonprofit and For-profit Developers	Ongoing/ Immediate

**Timing: Immediate: 1-2 years Short Range: 3-5 years Medium Range: 6-10 years Long Range: 10 years or more*

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
(Housing and Community Development, continued...)		
Expand the City's Neighborhood Improvement Program (page 66).	NS	Short Range
Encourage residents and neighborhood associations to participate in the Trash Busters and Graffiti Programs (page 66).	NS, Residents, NAs	Ongoing
Develop the identified Residential Infill Opportunity Areas (page 66).	CDCs, HND, Nonprofit and For-profit Developers	Ongoing/ Immediate
Affordable Housing and Home Ownership		
Support efforts in providing affordable housing opportunities (page 67).	Builders, CDCs, CCPB, HND	Ongoing/ Immediate
Make sure new affordable housing is compatible with existing character (page 67).	Builders, CDCs, CCPB, HND	Ongoing/ Immediate
Redevelopment and Rehabilitation Efforts		
Market the City's rehabilitation and home-buyer programs (page 67).	HND	Immediate
Complete implementation of Northeast Winston #2 Redevelopment Plan (page 67).	CCPB, HND, WSCC	Short Range
Implement the adopted Northeast Winston #3 Redevelopment Subarea (page 67).	CCPB, HND, WSCC	Short Range
Continue efforts to rehabilitate existing residences in the Northeast Winston #3 Rehabilitation, Conservation and Reconditioning Area (page 67).	CCPB, HND, WSCC	Short Range
Design and Appearance Recommendations		
General		
Revitalize older multifamily areas to improve the image of the area (page 67).	CDCs, HAWS, Property Owners	Ongoing
Enhance the physical appearance of commercial districts (pages 67-68).	Property Owners, WSCC	Ongoing
Expand the Façade Improvement Program in the Planning Area (page 67).	Development Office, WSCC	Immediate
Promote the use of art that reflects local cultures in public spaces (page 68).	Arts Council, Area Institutions, NAs, WSRP	Short Range

**Timing: Immediate: 1-2 years Short Range: 3-5 years Medium Range: 6-10 years Long Range: 10 years or more*

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
(Design and Appearance Recommendations, continued...)		
Gateways		
Develop gateways at the following locations (page 68):		
• US 52 and Martin Luther King Jr. Dr.	VM, WSDOT	Short Range
• US 52 and Liberty St.	VM, WSDOT	Short Range
• US 52 and 25th – 28th Sts.	VM, WSDOT	Short Range
• US 52 and Akron Dr.	VM, WSDOT	Short Range
• Business I-40 and 5th St.	VM, WSDOT	Short Range
• Business I-40 and Martin Luther King Jr. Dr.	VM, WSDOT	Short Range
• US 158 at Old Greensboro Rd.	VM, WSDOT	Long Range
• US 311 at Carver School Rd.	VM, WSDOT	Medium Range
Establish neighborhood gateways (page 68).	NAs, VM, WSDOT	Short to Long Range
Create a focal point in the area around the intersection of Martin Luther King Jr. Dr. and New Walkertown Rd. (page 68).	CCPB, Property owners, VM	Short Range
Corridor Improvements		
Incorporate attractive and pedestrian-oriented features to Martin Luther King Jr. Dr. Improvement Project (page 68).	NCDOT, VM, WSDOT	Immediate
Incorporate attractive and pedestrian-oriented features along 4th and 5th Sts. (page 59).	VM, WSDOT	Short Range
Incorporate attractive and pedestrian-oriented features to New Walkertown Rd., Liberty St., 3rd St., and Cleveland Ave. (page 59).	VM, WSDOT	Medium Range

Commercial development along New Walkertown Road

 **Timing: Immediate: 1-2 years Short Range: 3-5 years Medium Range: 6-10 years Long Range: 10 years or more*

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
(Design and Appearance Recommendations, continued...)		
RUCA		
Implement the recommendations of the RUCA Report and expand funding beyond 2006-2007 (page 67).	CCPB, Development Office, WSCC	Underway and Immediate
Implement recommended public and private improvements for Neighborhood Activity Centers (page 67).	Development Office, CCPB, WSCC, Property Owners	Immediate to Short Range
Historic Preservation Recommendations		
General		
Retain existing historic resources (page 69).	CCPB, CDCs, HND, Property Owners	Ongoing
Place markers to identify historic places or events (page 69).	HRC, Community Organizations, Property Owners	Ongoing
Initiate public outreach programs on the benefits of preserving historic resources (page 69).	HRC, Community Organizations	Ongoing
Encourage organizations and property owners to research and recognize the history and significance of properties (page 69).	HRC, Community Organizations, Property Owners	Ongoing
Encourage property owners to seek National Register and Local Historic Landmark designation for eligible properties (page 69).	NAs, HRC	Immediate – when determined eligible
Assist property owners in Reynoldstown seeking income tax benefits or funding for rehabilitation (page 69).	HRC	Ongoing
Proposed Studies		
Identify additional historic resources in the Planning Area as part of the update of the countywide architectural inventory (page 69).	HRC, Consultant	Ongoing
Seek grants and other funding to complete National Register nominations for identified properties and neighborhoods (page 69).	HRC, Property Owners, Community Organizations	Immediate to Short Range
Encourage/assist property owners and organizations to undertake or commission studies for identified historic properties and neighborhoods (page 69).	HRC, Property Owners, Community Organizations	Immediate to Medium Range

ACTION/PROJECT	RESPONSIBLE AGENCY†	TIMING*
(Historic Preservation Recommendations, continued...)		
Proposed Districts		
Seek National Historic Register District designation for eligible areas (page 69).	NAs, HRC	Immediate to Short Range

Economic Development Recommendations

General		
Encourage and market the development/ redevelopment of identified business and industrial sites in the Planning Area (page 70).	CCPB, Development Office, WSCC	Immediate
Continue development of Airport Business Park as proposed in master plan (page 69).	Development Office, WSCC	Immediate
Complete public improvements identified for Activity Centers (page 70).	PW	Short Range
Support business organizations and community watch programs (page 69).	Area Businesses, Chamber, NAs, WSPD	Ongoing
Encourage nonprofits and CDCs to target areas for revitalization (page 70).	CDCs, Organizations	Ongoing
Identify and assess potential brownfield sites; assist developers to obtain funding for site clean up (page 70).	Development Office	Short Range
Other Recommendations		
Market City economic development programs in Activity Centers (page 70).	Development Office	Immediate
Encourage use of Target Area Business Assistance Program (page 70).	Development Office, WSCC	Short Range

†Abbreviations Used in the Implementation Schedule:

CAC: Community Appearance Commission
CCPB: City-County Planning Board
CDC: Community Development Corporation
Chamber: Greater Winston-Salem Chamber of Commerce
FCLB: Forsyth County Library Board
HAWS: Housing Authority of Winston-Salem
HND: Winston-Salem Housing & Neighborhood Development
HRC: Winston-Salem/Forsyth County Historic Resources Commission
NCDOT: North Carolina Department of Transportation
NAs: Neighborhood Associations
NS: Neighborhood Services
PART: Piedmont Authority for Regional Transportation
PW: Winston-Salem Public Works Department
RUCA: Revitalizing Urban Commercial Areas Program
VM: Winston-Salem Vegetation Management
WSCC: Winston-Salem City Council
WSDOT: Winston-Salem Department of Transportation
WSPD: Winston-Salem Police Department
WSRP: Winston-Salem Recreation and Parks Department

Appendix A. Historic Resources

NATIONAL REGISTER OF HISTORIC PLACES LISTINGS

The East/Northeast Planning Area includes five properties listed in the National Register of Historic Places. The National Register is the nation's official list of buildings, structures, objects, sites, and districts worthy of preservation for their significance in American history, architecture, archaeology, and culture. As such, it is a high honor for a property to be listed in the National Register. It is important to note that National Register designation does not impose regulations or requirements on property owners unless they plan to use federal or state funds in development activities or obtain federal and/or state income tax credits for rehabilitation of their properties.

(Former) Atkins High School
1215 North Cameron Avenue

The former Atkins High School dates from 1930-1931 and is of statewide significance in the areas of education, African-American heritage, and architecture. This is due to its important role in the development of black education in North Carolina during the first half of the 20th century and because architecturally, it was a state-of-the-art school facility. Atkins High School also symbolizes local and national philanthropic efforts to improve education for African-Americans. Of significance is Atkins' place as an experiment of the Rosenwald Fund, which supported construction of schools for rural African-American children in the South: the construction of Atkins High School in 1930 and 1931 marked the first use of Rosenwald Funds for an urban high school in the state and a departure from the fund's traditional philosophy of training black students for success in "Negro jobs." Atkins was noted for its comprehensiveness in a variety of vocational training and academic preparation. Architecturally, it was a "modern" design, the first building in Winston-Salem with steel frame construction and unit ventilation. The building was designed by local architect Harold Macklin, working with a consulting architect for the Rosenwald Fund, and is a fine example of the institutional Classical Revival style.

George Black House and Brickyard
111 Dellabrook Road

The George Black House and Brickyard served as the home and brickyard of the well-known brickmaker George H. Black from 1934 until his death in 1980 at the age of 101. The property was listed in the National Register as possessing national significance, which is extremely rare. Black, son of a former slave, came to Winston-Salem as a boy, hauled bricks for a white brickmaker, and soon after started his own brickyard. He continued to make bricks in the traditional way, by hand, for many decades of his century-long life. Black also taught others the dying craft even into his nineties. He established a reputation for bricks of quality and durability. As a result, his bricks were used in Winston-Salem's finest houses, churches, banks, businesses, and hospitals. Black's work is also seen at Colonial Williamsburg and Old Salem, in walls and walks in Winston-Salem, and across the state and the Southeast. He was a sought-after brickmaker as early as the 1920s. In the 20th century he became nationally and internationally recognized for his 18th and 19th century craft. Initially, handmade "soft-mud" bricks were produced in molds by hand. By the mid-19th century, however, machines were invented that duplicated the hand molding process. By the 20th century, most brickmakers were using very efficient brick-making machines and hand molding had become uncommon. In spite of these advances, George Black continued to make bricks as they had been made in the preceding centuries. His traditional technique took him to Colonial Williamsburg in 1931 to work as a brickmaker in the early years of restoration there. His continued success took him back to Williamsburg in the 1970s to serve as a consultant. Without question, George Black was an individual whose bricks and brick-making technique were an outstanding contribution to the nation's history.

Goler Metropolitan AME Zion Church
1435 East Fourth Street

Goler Metropolitan AME Zion Church was erected in 1924 to serve the white congregation of the East Fourth Street Baptist Church when this part of East Winston was still a white neighborhood. The church housed the worship services of the white Baptist

congregation for almost 20 years until 1942, when that congregation disbanded and sold the building. Acquired by an African-American congregation of the AME denomination that had recently split from its fire-damaged home church (Goler Memorial AME Zion Church), the building was renovated for the new congregation and opened for worship and religious education as Goler Metropolitan AME Zion Church in March 1942. Goler Metropolitan represents an important aspect of the religious, social, and political life of Winston-Salem. The property is significant in the contexts of social history and African-American heritage. It reflects the growth of the African-American population in Winston-Salem as it spread to the north and east from Depot Street and Columbian Heights, establishing new neighborhoods and adopting formerly white neighborhoods and churches for new congregations. Goler Metropolitan is a reminder of the extraordinary transformation of East Winston from a successful white neighborhood to an equally successful African-American neighborhood in less than two years. The building is also important architecturally as an intact example of the Classical Revival style in religious architecture. It is one of only a few pre-1948 Classical Revival church buildings in Winston-Salem.

Mars Hill Baptist Church and Parsonage
1331 East Fourth Street

Mars Hill Baptist Church was built in 1915 for a white Moravian congregation, but its primary historical significance is its association with the African-American Mars Hill Baptist Church, the congregation that purchased the building in 1944. The Mars Hill congregation was established in 1937 as a split from another church, and met in private houses and locations in the East Winston neighborhood before moving to its present site. Mars Hill has been an institution active in the East Winston neighborhood since 1944, during the few years when African-Americans moved in and white residents left. Mars Hill is representative of the transition, in only a few years, of the East Winston neighborhood as the city's African-American population grew and became more affluent. It also reflects the ability, in the midst of World War II, of an African-American congregation to acquire and maintain an imposing, dignified church building. The building is important as a little-changed representative of the Gothic Revival style of church architecture. The impressive church has a corner tower anchoring the gable-front façade, and pointed-arch windows with stained glass, and buttresses. Next door to the church is the parsonage, a pebble-dash Queen Anne style house built about 1915.

(Former) Union Station
300 Martin Luther King Jr. Drive

Winston-Salem's former Union Station, when completed in 1926, was proclaimed "one of the most complete and attractive stations in the South." The building was designed by Fellheimer and Wagner, a New York architectural firm known for designing many prominent railroad stations in the eastern United States in the years between the two world wars. Union Station is architecturally significant in Winston-Salem as a handsome example of the Beaux Arts style of architecture and as an embodiment of the characteristic features of the well-equipped, efficient, and comfortable passenger stations popular in America's cities during the period. Union Station is also significant for its place in Winston-Salem's transportation history, representing the fulfillment of the long-time city goal of providing the traveling public with better

Former Atkins High School

facilities and serving as the city's sole passenger train station between 1926 and 1970. The grandest and most sophisticated of Winston-Salem's passenger stations, it is also the only one that remains.

Reynoldstown

The Reynoldstown neighborhood was placed on the Study List for the National Register in 1995. During 2005, the City-County Planning Board retained a consultant to prepare a National Register nomination for the neighborhood. Final National Register listing for the neighborhood was achieved in early 2008.

The area known today as Reynoldstown was established by the R.J. Reynolds Tobacco Company. The development was started during World War I for the purpose of reducing the housing shortage in the fast-growing industrial city. In 1917, the company purchased about 85 acres known as the Old Cameron Lands, and the area was first known as Cameron Park. Although residents were employed by Reynolds Tobacco Company, Reynoldstown was never a "mill village" or industrial village in location or purpose. The neighborhood was far from the tobacco factories and was designed to help tobacco workers become homeowners. When first occupied ca. 1920, Reynoldstown was a development primarily for whites adjoining the East Winston area that was also predominantly white. However, the 1931 construction of Atkins High School for African-Americans three blocks north of Reynoldstown had a profound effect on the neighborhood. White residents left immediately. Just a year later, the city directory shows the entire neighborhood populated by African-Americans. Reynoldstown is significant in the history of Winston-Salem as a residential neighborhood that developed from the success of the tobacco industry and the city's growth into a leading manufacturing center in the South. The district further reflects the city's increasingly urban character and the growing numbers of African-Americans in middle- and upper-income brackets. The neighborhood retains to an extraordinary degree its original layout, and a high proportion of intact buildings. Within the district is a collection of residences constructed in ca. 1920 and another collection of ca. 1940 residences, with representative examples of stylish Craftsman bungalows, and the later Tudor Revival and Minimal Traditional styles of architecture.

Historic Reynoldstown neighborhood

NATIONAL REGISTER OF HISTORIC PLACES DETERMINATION OF ELIGIBILITY

(Former) Fairview Moravian Church
1800 Liberty Street

In 2006, the State Historic Preservation Office (SHPO) determined that this property was eligible for the National Register as part of a North Carolina Department of Transportation study for US 52. Home to Canaan Missionary Baptist Church since 1974, the church was originally built as Fairview Moravian. The church is eligible for the National Register as a unique and significant example of a Moravian church designed in the Neoclassical Revival-style of architecture. Most other Moravian churches in North Carolina were designed in the "Salem Revival" style, mimicking architectural features such as the arched entrance hoods. Additionally, the design of the monumental Neoclassical Revival façade of the former Fairview Moravian Church is a reflection of the growth and prosperity of Winston-Salem during the 1920s.

Northeast Winston #2 Redevelopment Area

During 1999, City-County Planning Board staff worked with the City's Department of Housing and Neighborhood Development to study these two areas as Redevelopment and Rehabilitation Areas. Because federal funding was planned for use in the area, the State Historic Preservation Office (SHPO) was consulted about the historic nature of this general area. The SHPO made a formal National Register Determination of Eligibility for the Northeast Winston #2 Redevelopment Area. This area included the neighborhood bounded on the west by US 52; on the north by the rear property lines of houses fronting East Twenty-First Street; on the east by Cleveland Avenue; and, on the s outh by New Hope Lane. This area retains its historic layout and is made up largely of intact 1890-1930-era residential construction, with most of the structures appearing to be of mid-1920s construction.

East Winston

A small portion of the East Winston Area is eligible for listing in the National Register of Historic Places. The are eligible is roughly bounded by East Fifth Street on the north, Martin Luther King Jr. Drive on the west, East First Street on the south, and Dunleith Avenue on the east. This area encompasses the best and highest concentration of historic resources associated with the development of East Winston.

HISTORIC NEIGHBORHOODS

While the Planning Area is rich with history, in some instances there is not enough known information about certain properties or neighborhoods. Additional research will be required to explore the future possibilities for historic determination about the following areas.

Bowen Park

Bowen Park contains housing that ranges from early 20th-century frame vernacular houses to modest post-war Minimal Traditional style housing types. The neighborhood is bounded on the west by the rear property lines of houses fronting Ansonia Street; on the north by Frazier View Lane; on the east by the rear property lines of houses fronting Machine Street; and, on the south by East Twenty-Fifth Street.

Former Fire Station #4

Castle Heights
Located on the west side of Carver School Road and to the north of Bowen Boulevard, lies the Castle Heights subdivision. Developed in the early 1950s, Castle Heights is a traditional African-American neighborhood with a solid collection of mid-20th century Ranch-style houses. Castle Heights became a popular place to live among African-American residents due to 30-year mortgages that the development offered on new houses to encourage home ownership in the neighborhood.

City View
The City View area is located north of Business 40, along Old Greensboro Road. Primarily residential in character, the area features some early 20th century houses. Several individual properties of note are located within City View.

Columbian Heights
Columbian Heights was an early neighborhood built for African-American professionals. The concept of a neighborhood for blacks only was initiated by Simon Green Atkins. In 1891, a year after moving to the community, Atkins appeared before the local Board of Trade to request assistance for establishing a college and suggested the development of a suburb for the increasing number of African-American professionals in the city. The purpose was to promote black home ownership. Atkins was successful; in 1891 the Inside Land and Improvement Company was formed. This group assembled the land that was to become Columbian Heights, and a plat was drawn by Jacob Lott Ludlow (the city engineer who also drew the plats for West End and Washington Park). The plat was filed in January 1892 and is recorded in the plat books. Columbian Heights was a success. It soon became the place for African-Americans to live. City directories show among its residents lawyers, doctors, teachers, ministers, as well as skilled craftsmen. Simon Atkins himself appears to have been one of the first residents.

Today, only a small vestige remains of the fine neighborhood that was Columbian Heights. A small one-block section of Excelsior Street stands today just south of Business 40 and west of Martin Luther King Jr. Drive. The remaining buildings are residential and date from the first and second quarters of the 20th century.

Dreamland Park
Dreamland Park is a small, secluded neighborhood northeast of East Fourteenth Street. It was begun in the 1920s and has always been predominantly African-American. Streets today include Attucks, Dunbar, Booker and Emerald Street, Eldora Boulevard, Douglas Avenue, and part of Dellabrook Road. In the 1920s and 1930s, individual lots were sold to African-Americans by the white Byerly family who owned land there and on Mickey Mill Road (now Dellabrook) where they lived. They owned a neighborhood store on Dellabrook at the corner of Attucks. Land was also owned by the Smithdeal Realty Company. The new owners lived in frame houses built in the 1920s and 1930s, some quite small, others sizable 1½-story bungalows. Residents worked in tobacco factories, including those of R.J. Reynolds, Brown & Williamson, and Taylor Brothers. Others worked for railroads, including Norfolk & Western and Southern Railroads. Many of these houses remain today. Even though the neighborhood began to develop, it still retained a rural atmosphere, retaining woods, pigpens, strawberry and blackberry patches. For many years, the city limits stopped at Attucks Street. Residents of Dreamland Park got their mail at a grocery store at East Fourteenth Street and Cameron Avenue. Just before World War II, Dreamland Park was placed on the mail route and residents could put up mailboxes on the corner of Attucks and East Fourteenth Street. Perhaps the new mail route was the reason the neighborhood's streets began appearing in city directories in 1941.

Existing homes on Dunleith Avenue

East Winston
The name East Winston has denoted different areas at different times, reflecting the growth and expansion of the area. East Winston developed as a continuation of the grid pattern and numbered streets of downtown Winston. At the turn of the 20th century and in its early years, houses for whites had been built along East Third, Fourth, and Fifth Streets. The area remained generally rural; farther east were farms including that of R.J. Reynolds at what is now the corner of First Street and Cameron Avenue. His trotting horses exercised on a track between present Third and Fifth Streets where City Hospital was later built; north of Fifth Street were trees and fields.

Construction in East Winston flourished in the next decades with the erection of several institutions and hundreds of houses. City Hospital was built in 1913-1914 (a north wing for black patients was added in 1922), Skyland School was built in 1924 with its park and outdoor swimming pool, in 1925 the new Union Station was built on Claremont Avenue at Excelsior Street, and in 1928 the Junior League Hospital for Incurables was built on Kentucky Avenue on the eastern edge of East Winston. The presence of these institutions reflected the stability and growth of the white neighborhood of East Winston at the time.

However, changes were underway in the area. African-American residents occupied the Columbian Heights neighborhood and other areas south of the white section. As the black community grew with the increasing mechanization of the tobacco factories and with the availability of jobs vacated by white servicemen during World War I, it expanded north of the white section to Seventh and Eighth Streets. Eventually, African-American residential areas grew up on all sides of the white section. However, white residents were comfortable in "their" East Winston and irritated by the encroachment of blacks, even though at first the black expansion did not directly infringe upon the white section. By the late 1910s, African-American residents began to cross the "color line." By 1920, a few whites recognized that the growing black community would continue to expand within East Winston, and they sold their houses to African-Americans. However, it was not until 1941 that the first black purchased a house in the white community around City Hospital. As a result, white residents began a mass exodus in 1942 and "most all were gone in 12 months." This story is confirmed by the city directories of the early 1940s, which show an amazingly rapid turnover from whites to blacks. Lawrence Street, for example, had 14 houses, which in two or three years switched from all white to all black occupants.

Lakeside
Built in 1951, Lakeside Apartments sits upon the high ground overlooking Winston Lake and Winston Lake Park. Originally inhabited by whites in the 1950s, it slowly became considered by African-Americans as the place to live. In the late 1960s and early 1970s, Lakeside transitioned from predominantly white to black. For more than 30 years, it was home to a large segment of African-Americans due to its popular location, and attractive and roomy apartments.

Northeast Winston #3 Rehabilitation Area
During 1999, City-County Planning Board staff studied this area for its historical and architectural significance. This was done in conjunction with the staff's study of the Northeast Winston #2 Redevelopment Area. While the Northeast Winston #3 Rehabilitation Area (bounded on the west by US 52; on the north by East Twenty-Sixth Street; on the east by Bowen Park; and, on the south by the rear property lines of houses on East Twenty-Second Street) did not receive a formal Determination of Eligibility, additional study and research may determine the area as a potential candidate for National Register listing.

Fast food stand on New Walkertown Road

Skyland Park
Skyland Park was an area of East Winston made up of Maryland, Kentucky, and Terrace Avenues. Originally the area had been a farm owned by the white alderman J. Wilbur Crews (Salem Ward alderman 1931-1943). In 1928, the Junior League Hospital for Incurables was built on Kentucky Avenue in the neighborhood east of City Hospital. The earliest houses are bungalows, built for and originally lived in by whites when both hospitals and this part of East Winston were exclusively white. City directories inaccurately show only whites living there as late as 1949; however, residents report that African-Americans began to move in during the 1940s. By the late 1940s, it was predominantly black and many new houses were being built. Deeds and tax records reflect this as well. Only three families, all white, are shown to live here from 1926 to 1940; their occupations are shown as a salesman, a locomotive engineer, and an electrician. By 1951, the city directories show many families here, most in new houses. All were African-American.

Slater Park
Located northeast of Reynoldstown and including Slater, Twelfth and Gerald Streets and Addison Avenue, Slater Park was developed in the 1940s for professional and well-to-do African-Americans. By this time, a large number of African-Americans in Winston-Salem drove cars, had phones and bank accounts and owned houses, as reflected by the houses of Slater Park.

INDIVIDUAL PROPERTIES

In addition to the East/Northeast Area's historic neighborhoods are also individual properties of note. The following describes several of the buildings with architectural and historical merit.

City Memorial Hospital
1621 East Fourth Street

In 1914, the City Hospital was built, and in 1915, a nurses' home was constructed. Later, a large sum of money was bequeathed to the city by R.J. Reynolds for building two additions to the hospital. In 1922, the North Reynolds Wing for African-American patients was completed.

Fast Food Stand
3064 New Walkertown Road
Located on New Walkertown Road, this small drive-up food stand is an excellent example of mid-20th century roadside architecture. The term *roadside architecture* applies to buildings and other structures associated with the proliferation of road and highway systems of the mid-20th century. Examples include restaurants, motels, gas stations, signs, shopping centers, and amusement parks.

(Former) Fire Station #4
214 Dunleith Avenue

Fire Station #4 is one of only two 1920s station buildings remaining in Winston-Salem. It was the home of the first African-American fire company in Winston-Salem.

House
2842 Old Greensboro Road

Located in the general area of City View, this two-story house dates from the late 19th century, but appears to feature an earlier log rear ell.

Progressive Apostolic Church
432 Crews Street

Identified in Forsyth County's 1981 architectural survey, the Progressive Apostolic Church is located in the City View area. It is a one-story, frame, L-shaped church that dates from ca. 1930 and features Gothic-arched windows. The church is a good example of the Carpenter Gothic style of architecture.

(Former) Skyland Elementary School
(Former 1851 East End Boulevard)
2050 Big House Gaines Boulevard
The former Skyland Elementary School is a three-story brick structure typical of 1920s school architecture. The building is prominently sited and features Classical-style architectural detailing.

Smith Reynolds Airport
3801 North Liberty Street

After World War I, a group of local leaders pooled their talent and resources to construct an aviation facility for the City of Winston-Salem and Forsyth County. Despite the fact that Maynard Field south of Winston-Salem was in use, these leaders recognized the need for a convenient and efficient full-service airport located close to the City of Winston-Salem. A committee searched for new sites and settled upon one 2.8 miles northeast of Winston-Salem. The current terminal building was built in 1941 as a Works Progress Administration (WPA) project.

United Metropolitan Missionary Baptist Church
450 Metropolitan Drive

Designed by architect Robert Arey in 1965, the United Metropolitan Missionary Baptist Church is an outstanding example of contemporary ecclesiastical architecture. Prominently sited just east of US 52, the original building is a visual landmark for the local community.

Winston Mutual Building
1225 East Fifth Street

Located at 1225 East Fifth Street, the Winston Mutual Building was constructed sometime between 1969 and 1970. It is a late example of the International-style of commercial architecture. The Winston Mutual Company is significant to the history of Winston-Salem as a large African-American-owned insurance company. E.E. Hill served as President of Winston Mutual for many years. Originally a teacher, Hill resigned from teaching in 1951 to devote himself full-time to the insurance business. In 1954, he was elected President of Winston Mutual. Hill died in 1967; his obituary states that Winston Mutual was in the planning phases of building a new skyscraper home office in East Winston. City Directories show the office located at its new location on East Fifth Street in 1970.

Winston-Salem Tourist Village
2500 Old Greensboro Road

Located on Old Greensboro Road, the Winston-Salem Tourist Village advertised that visitors could "sleep in safety and comfort without extravagance." The advertisement also described the "modern cottages and rooms, with private baths and free garages." The tourist village was owned by United Motor Courts and was managed at one time by Charles A. Dobbins, who also managed the Summit Street Pharmacy.

BRIDGES

Bridges are bearers of history and culture just the same as buildings, though they are not typically the kind of structure considered when thinking of what to preserve. Bridges, like the roads they carry, are reminders of a city's expansion and changing landscape. In Winston-Salem, many extant bridges originate from the two decades after the merger of Winston and Salem in 1913, at a time when the city witnessed a boom in population and expanded its city limits. At the same time, specifically from 1915 to 1930, Winston-Salem was actually the largest city in North Carolina, as well as the hub of the nation's tobacco and textile industries. People were continuously streaming into the city and goods were streaming out. Bridges quietly remind us of these points of history. Further, bridges, like other works of architecture, are examples of style. It is important to remember that the National Register and other preservation honors are not just for buildings, but for all cultural landscape elements that tell something about the history of people and the places where they live.

Within the East/Northeast Planning Area are four bridges identified in the 2004-2006 study of Winston-Salem's historic bridges:

Akron Drive Bridge

Dating from 1928, the Akron Drive Bridge carries two lanes of auto traffic and two sidewalks over six lines of the Norfolk & Western Railroad. The six-span concrete bridge is most notable for two features: its long, dramatic arched form and its embedded lampposts. The end posts and central mid-posts are broad, square shafts topped with flat slabs, each decorated with a blind panel. Obelisk-shaped lampposts top the posts and exposed metal-filled holes near the top of these posts indicate where the lighting mechanisms were once housed. The Akron Drive Bridge is one of only two known extant bridges in Winston-Salem with these unique lampposts.

Winston-Salem Tourist Village
on Old Greensboro Road

Cameron Avenue Bridge
The Cameron Avenue Bridge crosses a creek between New Walkertown Road and Eighth Street, lying just inside the boundary of the proposed Reynoldstown National Register Historic District. Dating from 1920, the bridge carries two lanes of auto traffic and two sidewalks. Constructed of concrete and metal, it is a continuous slab bridge with a unique concrete substructure. The North Carolina Department of Transportation (NCDOT) believes that the substructure of this bridge makes it particularly unique. The NCDOT calls it "a rare, nicely detailed, and technologically significant example of slab bridge construction with mushroom columns." Additionally, this bridge is the only bridge of mushroom column design in North Carolina, and one of the few known examples in the eastern United States.

Old First Street Bridge
The earliest known bridge remaining outside of the historic bridges of Salem is the former First Street Bridge. Crossing high above Brushy Fork Creek, the now-abandoned bridge dates from 1910 and measures one hundred feet in length. Remarkably, the bridge footings are constructed of granite stones stacked together before leading into the concrete form of the bridge itself. These granite footings create speculation on the origins of the bridge form, and suggest that there may have been an earlier bridge on the site. The unique style of the bridge and its unusual granite footings contribute to the bridge's historical importance to Winston-Salem.

Old Greensboro Road Bridge
The 1950 Old Greensboro Road Bridge crosses Brushy Fork Creek at Old Greensboro Road. This two-span bridge is stylistically simple; each span contains seven pierced, arched panels with chamfered edges. The Old Greensboro Road Bridge is similar to several other bridges in Winston-Salem that date from the 1930s.

Old First Street Bridge

CEMETERIES

In addition to the various neighborhoods in the East/Northeast Planning Area, there are several cemeteries that served the citizens of Winston-Salem and are an important part of the social and cultural history of the city. Four have been identified.

Brushy Fork Cemetery

The Brushy Fork Cemetery is located at the south end of Sidney Street, near Brushy Fork Creek, and immediately north of Lowery Street. This was the masons' cemetery, and also served the African-American community of Brushy Fork. Use of the Brushy Fork Cemetery began to decline after Evergreen Cemetery was opened in the 1940s. At that time, upkeep began to wane, and the graveyard has declined ever since. Although the cemetery is neglected and many stones have fallen, several remain standing and legible.

Evergreen Cemetery

Today's Evergreen Cemetery on Highway 311 is actually the second Evergreen Cemetery, started about 1940. The first Evergreen, also known as Foy's Graveyard, was at today's Smith Reynolds Airport. An African-American named Rufus Foy had owned much of the land for the airport. In 1941, the runways were expanded and the new Smith Reynolds terminal built. The Airport acquired the Evergreen Cemetery property. The new airport was built as a Works Progress Administration (WPA) project and the removal of the bodies from the old to the new cemetery was included in the project. Thus, the new Evergreen Cemetery was established at that time and graves from the old cemetery were moved here. In 1944, the City took over the ownership and operation of the new Evergreen.

Foy's Graveyard

As stated above, at Smith Reynolds Airport was a black cemetery known as Foy's Graveyard, or Evergreen. The name was taken from an African-American named Rufus Foy, who had owned much of the land for the airport. In 1941, all the graves from Foy's Graveyard were moved to the new Evergreen due to the airport's expansion.

Unnamed Cemetery

Located at the end of Byerly Street in the City View area is located a small graveyard containing approximately 75 graves. Most of the names on the grave markers are "Crews" and "Masten." Several of the gravestones indicate individuals born prior to 1800.

ARCHAEOLOGY

It is important not to limit the discussion of the East/Northeast Planning Area historic resources to structures or planned developments. Eleven archaeological sites have been identified within the boundaries of the Planning Area. One of the sites, the George Black Brickyard, is listed in the National Register of Historic Places. The other sites have either been determined not National Register-eligible or have not been assessed. Some of the sites are likely prehistoric in time period and type. The history of the East/Northeast Planning Area begins long before the Moravians came to Forsyth County in the 18th century. Various Native American groups inhabited the area for centuries prior to the county's historical development. The North Carolina Office of State Archaeology maintains files on each of the eleven sites identified within the Planning Area.

Unnamed cemetery on Byerly Street

Appendix B. Standards for Conversion of Existing Homes to Office or Commercial Use

Building Integrity

- The exterior appearance of the existing single-family home should be preserved as intact as possible to continue the residential character of the street.
- Keep porches open. If enclosure is necessary, transparent materials, such as glass or screening, should be installed behind the original railing and/or columns.
- Design handicapped features so there is minimal visual impact on the existing structure.
- Locate exterior stairs to the side or the rear of the structure.
- Locate mechanical equipment to the side or the rear of the structure.
- Locate trash containers and metal outbuildings in the rear yard.

Parking

- New parking areas should be designed to minimize their impact on the existing environment and have a neighborhood character.
- Locate new parking areas behind existing buildings or to the side of the structure.
- Screen parking areas from public view.
- Retain existing vegetation, such as mature trees, and incorporate them into the parking lot design.
- Share driveways, whenever practical, to minimize curb cuts.

Access

- Entrances and steps serve as an important first view of the property and should be preserved as they were originally built.
- Maintain the main entrance to the building at the street frontage.

Signage

- Signs have a strong impact in the quality and appearance of individual buildings and on the streetscape as a whole. Graphic simplicity and compatibility with the building architecture is important.
- If a sign is located on a residential building, it should be a small identification panel at the entrance.
- Soft, indirect lighting is recommended. Internally illuminated signs are not recommended.

Landscaping

- Landscaped areas should be carefully maintained.
- Prune trees judiciously to maintain their health and to maintain the visual integrity of the streetscape.

Ellise-Marie Boutique on Laura Wall Boulevard

BB&T Bank Branch on New Walkertown Road

Medicap Pharmacy on Liberty Street

Appendix C. Standards for Office/Low-Intensity Commercial

- **Building Placement.** New buildings shall front the main road to create a continuity of building facades along the corridor. The main entrances to all buildings shall be at the street frontage.
- **Building Scale and Proportion.** New structures shall take on the proportions, rhythm, scale, and visual integrity of existing structures. This does not imply a direct copy of existing structures. It does refer to the use of existing patterns in the built environment.
- **Building Materials.** Preferred materials are brick and wood. Building materials, such as artificial brick or stone, artificial siding, exposed and/or painted concrete blocks or cinder blocks, and plate glass walls, are not recommended.
- **Façades.** The façade shall enhance the pedestrian environment by use of features such as porches, columns, and cornices. Solid walls and blank exterior facades are discouraged.
- **Canopies and Awnings.** These features shall complement the streetscape and other structures in the immediate area. Awnings or other devices shall be installed for solar protection and to emphasize the human scale of the ground level spaces.
- **Color.** Earth tone colors are encouraged, and bright colors shall only be used as accents to overall building.
- **Outside Storage.** Outside storage shall be permitted only if screened from view from the main road. The outside storage shall not occupy an area larger than one-half of the area covered by the principal use.
- **Loading/Unloading and Garage Bays.** All loading areas and entrances to motor vehicle repair bays shall be screened from public view from the main road.
- **Off-Street Parking.** Parking shall be located only in the side or rear yards with exceptions noted for each segment. On corner lots, parking on the street side corner of the lot shall be avoided. New parking lots shall be designed to minimize their effects on the existing streetscape. Areas of circulation and parking need to be clearly defined using appropriate markings and materials. Large expanses of paving shall be divided into smaller components with interior planting areas.
- **On-Site Utilities.** All public utilities and related facilities, heating, ventilation and air conditioning (HVAC) units, including onground and rooftop mechanical systems, and dumpsters, shall be so located and/or shielded so as to not be visible from the public right-of-way.
- **Site Amenities.** Include site furnishings such as bollards, seating, trash containers, tree grates, special features, fencing and any special lighting to enhance pedestrian areas.
- **Architectural Characteristics.** Buildings within this area shall encourage the following additional architectural characteristics:
  - Display windows on the street/first level
  - Lighting shall be provided in all display windows
  - The use of cornice canopies, balconies, and arcades to delineate between the ground/street level and upper levels
  - Larger buildings to be broken into smaller scale components at the ground/street level

House converted into offices on Liberty Street

Atkins High School on Old Greensboro Road

Elva J. Jones Computer Science Building, Winston-Salem State University

Appendix D. Institutional Expansion Design Guidelines

Institutional uses include schools, churches, community health clubs and organizations, nonprofit agencies, and governments. Institutions have played vital roles in the development of Forsyth County. In some instances, historic neighborhoods were formed around institutions and their character and aesthetics were derived from that of the central institution. Because they are often integrated with existing neighborhoods, institutions seeking to expand their facilities should carefully examine how their plans may impact nearby residences.

Institutions are valued land uses and should be allowed to grow. However, a balance between existing neighborhoods and institutional uses, which now often serve a larger community, should be maintained. Institutional expansion in established neighborhoods may be more expensive and site options are likely to be more limited than in undeveloped areas. Creative solutions, including adaptive rehabilitation of existing structures, construction of subfloors or underground parking, establishment of satellite facilities or parking areas, and development of multiuse or shared facilities may be necessary to grow compatibly with surrounding neighborhoods.

Institutions are a unique land use, able to be compatible with surrounding residential uses and often serving to support and stabilize the neighborhoods in which they are located. The UDO provides special zoning districts, uses, and conditions to allow institutions to compatibly exist in and near neighborhoods.

GENERAL RECOMMENDATIONS

- Institutions are strongly encouraged to involve community residents, neighborhood associations, and City/County staff in the development of their master plans.
- Prior to seeking property rezoning, special use approvals, demolition permits, or major building permits, area institutions should work with neighborhood associations and/or residents about the proposed project. Institutions should first initiate communication about proposed projects with neighborhood associations. In the absence of an association or organization of neighbors, institutions should contact and work with immediate and peripheral property owners that may be impacted by proposed work.
- When condemnation of property is considered, an open public process should be initiated by the public entity, in conjunction with local government, prior to any decision to condemn land for acquisition or expansion. All public entities capable of condemnation should follow an open public review process, inclusive of local, state, and federal government; local schools and public learning institutions; and, collective development authorities.
- Rezoning of residential property for higher-density residential or nonresidential institutional development should be considered only when appropriate vacant or underutilized land is not available, when vacant or underutilized nonresidential buildings are not available, or when the area is not a part of an established neighborhood.
- Reuse of existing structures is strongly encouraged. Historic structures, particularly those designated as local historic landmarks, should be adaptively reused or relocated to an appropriate site in the neighborhood.
- Rehabilitation of existing structures, particularly when those structures are historic in nature, should focus on maintaining the historic character of the structure and its surroundings. This should include limited use of artificial or replacement components (such as artificial sidings, windows, etc.); avoidance of enclosing or removing original porches or vestibules; and, retention of significant architectural features such as dormers, columns, rails, window and door details, and chimneys.
- Conversion of public park land for exclusive use by private institutions is strongly discouraged.
- Before considering the addition of new parking areas and locations, institutions should work with the neighborhood and other adjacent institutions to determine the ability for timesharing parking areas.
- The construction of compatible parking decks is preferable to multiple or large expanses of surface parking.
- On-street parking in residential areas should be designed to better accommodate noninstitutional residents. The establishment of permitted parking and time limits for parking should occur

wherever institutional uses impact residential streets. Enforcement of parking restrictions should be a task of institutional security operations in addition to governmental enforcement measures.

- Road or alley closures to accommodate institutional expansions should only be considered after a thorough public review process and only if the road closure will not isolate portions of a neighborhood, will not remove a traditionally significant access point into an area, or will not result in historic structures being removed from their street-oriented context.

SITE DESIGN RECOMMENDATIONS

- Site design should repeat site patterns already established in the neighborhood; retain existing positive features (trees, stone/brick walls, substantial shrubbery), whenever possible; and, retain existing mature canopy of trees.
- Oversized structures or intense uses should be located away from residential areas or screened with vegetation.
- Operational facilities and other "back door" uses should be designed and maintained to the same standard as public areas when the operational or back door uses are located in neighborhoods or are visible from roadways.
- Service components (such as trash dumpsters, mechanical/technical equipment, and loading docks) should be screened from public view.
- Heat pumps, air conditioners and other noise producing equipment should be chosen for quiet operation. To limit impact on surrounding residential uses, equipment should be located away from residential uses (such as on the top of structures) or surrounded by vegetation.
- Parking areas should be located to the rear or to the sides of buildings and should be attractively screened with fences and plantings designed to be compatible with the surrounding neighborhood. Large expanses of paving should be divided into smaller components with interior planting areas and alternating materials (brick pavers areas, staining, etc.).
- Sidewalks should be maintained for safety and their widths and materials should blend with the neighborhood.
- Public street furniture and lighting fixtures should be designed to blend with or enhance the surrounding streetscape. The use of period lighting is encouraged over contemporary street lighting when placed in historically designated areas.
- Fences and walls should use traditional materials (such as brick, stone, cast iron, or wood); the height, scale, design and location of fences or walled areas should not adversely affect the character of the surrounding area (such as chain-link fencing, razor wire, or exposed concrete block). Fences or walls that create a fortress-like environment are strongly discouraged.

Mars Hill Baptist Church on Martin Luther King Jr. Drive

NEW CONSTRUCTION RECOMMENDATIONS

New construction adjacent to residential areas should be complimentary to the surrounding character of the neighborhood. The following concepts should be applied:

- **Lot Coverage and Spacing.** New construction should conform to established spacing and lot coverage patterns of the neighborhood, whenever possible.
- **Setback.** Setbacks for new construction should be consistent with existing buildings on the street. The setback should be within 20% of the average setback along the block.
- **Orientation.** New construction should face the same direction as existing structures on the block.
- **Height.** The height of new construction should be consistent with existing structures on the block**.** The height should be within 30% of the average height of structures in the block.
- **Scale.** The scale of new construction should be compatible with existing and/or surrounding structures in the neighborhood.
- **Basic Shape and Form.** New construction should be compatible in basic shape and form with existing and/or surrounding structures along the street.
- **Roof Types.** Roof form and pitch should be similar to that of existing structures on the block; roofing materials should be compatible with those of existing structures.
- **Exterior Architectural Components.** Architectural design components (cornices, lintels, foundations, window patterns) should provide a sense of unity and cohesion with the existing structures on the street.
- **Materials and Textures.** Exterior materials (such as wood, brick, stone, stucco) and textures should be compatible with surrounding structures. Modern materials may be used as alternatives to prevalent traditional materials, but oversized brick, exposed concrete blocks, or glass block/plate glass walls should be avoided if such materials are not prevalent on surrounding structures; exterior colors should blend with surrounding natural and built features.

United Metropolitan Baptist Church on East Fourth Street

Appendix E. Industrial Expansion Design Guidelines

- Prior to seeking property rezoning, industrial property owners should meet with neighborhood associations and/or residents about the proposed expansion plans.
- Rezonings for expansions should only be approved when appropriately zoned vacant or underutilized sites are not available or when the expansion area is not a part of an established neighborhood.
- To the greatest extent practical, site expansion areas and new buildings should be designed to compliment and blend with the surrounding neighborhood.
- Large structures, intense uses, and noise producing uses should be located away from residential areas.
- Access drives should be located to direct traffic, especially truck traffic, away from residential areas.
- All facilities and outside storage areas should be appropriately screened with vegetation.
- Mature vegetation and unique site features should be retained whenever possible.
- Parking areas should be attractively screened with fences and plantings designed to be compatible with the surrounding neighborhood; large expanses of paving should be divided into smaller components with interior planting areas.
- Fences and walls should use traditional materials such as brick, stone, cast iron, or wood; the height, scale, design and location of fences or walled areas should not adversely affect the character of the surrounding area; chain-link fencing should be located away from public view; and, the use of razor wire and other materials with a fortress quality is strongly discouraged.
- Service components (such as trash dumpsters, mechanical/technical equipment, and loading docks) should be located away from residential uses and screened from public view.

Lowery Street Business Park

Acknowledgments

Citizens' Advisory Committee

Ronnie Abernathy
Assistant Chief, Police Department
Dorothy Archie
Resident, Reynoldstown Neighborhood
Alexander Barber
Resident
Estella Brown
Resident
Wesley Curtis
City-County Planning Board
Carol Davis
Simon Green Atkins Community Development Corporation
Teracia Hairston
Resident
Lois Hanes
East Winston Restoration
Emma Ingram
Resident, Winston Lake Estates
Gloria Lowery
Resident, North East Winston Neighborhood
Billy Paul
Resident
Marva Reid
Resident, President North East Winston Neighborhood Assoc.
Ivan Robinson
Developer/Liberty Street
Marie Robinson
Resident, Dreamland Park Neighborhood
Jim Shaw
Liberty Community Development Corporation
Shirley Spease
Resident
Jeanette Terry
Resident
Joe Walters
Resident
Dee Washington
Resident, Reynoldstown Neighborhood
Beverly Watson
Resident

Winston-Salem City Council

Allen Joines
Mayor
***Vivian H. Burke**
Mayor Pro Tempore, Northeast Ward
Daniel V. Besse
Southwest Ward
Robert C. Clark
West Ward
***Joycelyn V. Johnson**
East Ward
Molly Leight
South Ward
***Nelson L. Malloy Jr**.
North Ward
Wanda Merschel
Northwest Ward
Evelyn A. Terry
Southeast Ward
Lee Garrity
City Manager

**Council member for the Planning Area*

City-County Planning Board

Arnold King
Chairman
Jerry L. Clark
L. Wesley Curtis
Carol Eickmeyer
Arthur T. King
Clarence R. Lamb Jr.
Lynne Mitchell
Paul W. Mullican
Brenda Smith

City-County Planning Staff

Paul Norby, FAICP, Director of Planning
Glynis Jordan, AICP, Deputy Director
Judy A. Hunt, AICP, Principal Planner
Wendy J. Miller, ASLA, Principal Planner
C. Lynn Ruscher, AICP, GISP, Principal Planner
***Marco Andrade,** Project Planner
Steve Smotherman, AICP, Project Planner
LeAnn Pegram, Project Planner
Chuck Davidson, Project Planner
Donna Myers, Planning Graphics Coordinator

**Project Leader*

Interdepartmental Committee

Tabetha Bailey
Inspections Department
Timothy A. Grant
Recreation & Parks
Fredrick Haith
Transportation Department
Mellin L. Parker
Housing/Neighborhood Development
Stephanie Stimpson
Neighborhood Services

Legacy

Making it work!

For more information about the

East/Northeast Winston-Salem Area Plan

Contact:

City-County Planning Board
Telephone: 336-727-8000
Fax: 336-748-3163
E-mail: planning@cityofws.org
Web site: www.cityofws.org/planning

Attachment C

Letter of Correction and Letter of Investigation

U.S. Department
of Transportation
Federal Aviation
Administration

Southern Region

Airports Division (ASO-620)
P.O Box 20636
Atlanta, Georgia 30320-0636
404-305-6716 FAX: 404-305-6730
e-mail: patrick.rogers@faa.gov

May 14, 2013

EIR Number: 2014SO800048

Mr. Mark R. Davidson, A.A.E.
Airport Director
Smith Reynolds Airport
3801 N. Liberty Street
Winston-Salem, NC 27105

Dear Mr. Davidson:

Smith Reynolds Airport
Winston-Salem, North Carolina
Letter of Correction

The periodic airport certification inspection of the Smith Reynolds Airport was conducted on May 8-9, 2014. The inspection was conducted to determine compliance with 14 CFR part 139, the Airport Certification Manual, and the Airport Operating Certificate. The inspection revealed that the airport was not operating in compliance with all of the requirements of Part 139. The following discrepancies to Part 139 were noted during the inspection, and those that are unresolved must be corrected by the dates indicated:

1. 139.201 (b) (1) – General requirements

The Airport Certification Manual is not current. Revision should include the following:

- Pg. 14, remove "except weekends and holidays" and add your current procedures(ex. Firefighters conduct inspections)

- Pg. 15, describe your runway safety areas in detail to include where they are deficient and why. Remove the "except weekends and holidays" phrase.

- Pg. 16, either add the Precision Approach Path Indicator for all runways or remove reference to this altogether.

-Pg. 17, old Advisory Circular reference. List what lights/signs function with Pilot Controlled Lighting(when the tower is closed).

-Pg. 21, remove the comment about "anticipated scheduled service".

-Pg. 22, add the condition to your Aircraft Rescue and Fire Fighting vehicle.

-Pg. 23, add "unscheduled" to paragraph D.

- Pg. 31, add the firefighters to the inspection program, as is your current procedure.

- Airport Sign and Marking Plan

  - Sheet 3, no-entry sign is wrong color

  - Sheet 4, no-entry sign is wrong color

  - Sheet 6, black numerals on red signs should be white, the Runway 22 • 15 direction sign should be yellow with a black inscription(as on the airfield), the Taxiway J intersection must have both runway designations(15-33 and 22-4), the Taxiway E location sign at the 33-15 hold position is the wrong color.

- The fuel inspection checklists should be updated

- Add all Letters of Agreement, currently in use, to the manual.

Planned Correction Date: 6/9/14

2. 139.303 (d) – Personnel

Personnel training records are unorganized and difficult to inspect. It was not easy to determine who has completed training within 12 consecutive calendar months and in which subject. Re-organize all records associated with Part 139.329, .327, .321, .337, .and 339.

Planned Correction Date: 6/9/14

3. 139.309 (b) (1) – Safety areas

Humps, ruts, and holes found in the Runway 15-33 safety area. These include an open light can in which the lid was torn-off by a mower, adjacent to Taxiway E, a hump of grass and dirt that was pushed-up adjacent to the runway edge marking near the glideslope road, and a shallow drainage ditch near the same area.

Planned Correction Date: 6/9/14

4. 139.309 (b) (1) – Safety areas

Wooden grates are located in the Runway 15-33 safety area that may not support the occasional passage of air carrier aircraft. The one inspected was 60 feet from the runway edge stripe near Taxiway E.

Planned Correction Date: 9/1/14

5. 139.309 (b) (4) – Paved Areas

Trees are growing in the Runway 15-33 safety area and Object Free Area 238' from the runway centerline, on the North side of the runway, from about 1000 feet to 2500 feet down the runway.

Planned Correction Date: 9/1/14

6. 139.311 (d) – Marking, signs, and lighting

Airfield markings are not being properly maintained. The following issues were noted:

- Runway 15-33 edge stripes yellowing and grass growing over them in some locations.

- Runway 15-33 aiming point and edge markings are wearing-off and missing paint in multiple locations.

- Taxiway centerlines leading off of Runway 15-33 at Taxiway E, D, C, and B, do not connect to the intersecting taxiway centerline on Taxiway A properly.

- The taxiway centerline coming off the Landmark Aviation ramp does not properly interrupt the non-movement area boundary marking.

- The runway 4-22 holding position marking, at Taxiway F was not re-painted after crack seal was applied over the yellow paint. This marking is barely visible.

- The Land and Hold Short marking on runway 15-33 is not painted over the runway edge markings as required by FAA Advisory Circular 150 5340-1L, Standards for Airport Markings.

Planned Correction Date: 9/1/14

7. 139.321 (c) – Handling and storing of hazardous substances and materials

The fueling agent, Landmark Aviation, was not operating in compliance with the fuel fire safety standards as detailed in National Fire Protection Association code 407. The following issues were noted:

- Avgas truck had a hole in the spark arrestor

- Emergency Fuel Shut Offs at the avgas tank near the race hangar, tank #17 and tank #18 on the North ramp, and the fuel farm on the North ramp, are faded, not maintained, and not located at least 7 feet above grade.

- A rope-style dead-man control was found tied-off in the tank #17 and tank #18 farm, dry pine needles were around the tanks, a partially-filled bucket of jet fuel was left in the farm, and the required placards were either faded or missing.

Planned Correction Date: 6/9/14

8. 139.321 (f) – Handling and storing of hazardous substances

The written confirmation, from the airport tenant fueling agent, detailing that fuel fire safety training was accomplished for their employees, was not available for 2013. The 2014 letter was written during the inspection.

Planned Correction Date: 5/9/14 Discrepancy closed.

9. 139.325 (g) (4) – Airport emergency plan

The airport poorly documented the review of the Airport Emergency Plan which is required at least once every 12 consecutive calendar months.

Planned Correction Date: 6/9/14

Please advise in writing when the unresolved discrepancies are corrected. Correction dates were mutually agreed to during the Post-inspection Out-briefing on 5/9/14. If you are unable to meet these dates, please notify me as soon as possible. We will expect your future compliance with the regulations.

Sincerely,

Patrick L. Rogers II
Lead, Airport Certification Safety Inspector
FAA Southern Region, Airports Division

U.S. Department
of Transportation
**Federal Aviation
Administration**

Airports Division
P.O. Box 20636
Atlanta, GA 30320-0631
Email: denson.stasher@faa.gov
Phone: 40· 305 6717

August 24, 2015

Mr. Mark R. Davidson, A.A.E.
Airport Director
Smith Reynolds Airport
3801 N. Liberty Street
Winston-Salem, NC 27105

Re: Letter of Investigation (EIR Number: 2015SO800095)

Dear Mr. Davidson:

I am in receipt of your July 1, 2015 letter, in response to the previously issued Letter of Investigation issued on June 23, 2015 following the annual part 139 airport certification inspection. Your letter detail actions taken by the Airport Commission of Forsyth County (ACFC) to include preparing two different training modules as a correction to the Movement Area Training discrepancy. You also indicated a removal project has been budgeted and approved for FYE June 2016, with funding from the North Carolina Department of Transportation fo· the discrepancy of trees growing within Runway 15/33 Object Free Area.

Regarding the discrepancy of the trees growing within Runway 15/33 Object Free Area, we are requesting more specifics:

Specifically, what consideration(s) has ACFC given to a more immediate mitigation of these trees due to the continued safety hazard they present?

Thank you for your cooperation.

Sincerely,

Denson E. Stasher
Airport Certification Safety Inspector
FAA Southern Region, Airports Division

U.S. Department
of Transportation
**Federal Aviation
Administration**

Airports Division
P.O. Box 20636
Atlanta, GA 30320-0631
Email: denson.stasher@faa.gov
Phone: 404-305-6717

June 23, 2015

EIR Number: 2015SO800095

Mr. Mark R. Davidson, A.A.E.
Airport Director
Smith Reynolds Airport
3801 N. Liberty Street
Winston-Salem, NC 27105

Dear Mr. Davidson:

Smith Reynolds Airport
Winston-Salem, North Carolina
Letter of Investigation

The annual 14 CFR Part 139 inspection of Smith Reynolds Airport was conducted on June 10, 2015. The following issues were identified in addition to the items noted on the Letter of Correction dated June 23, 2015. Movement Area training was not conducted at least once every 12 consecutive calendar months for several tenants, for example Landmark Aviation, Federal Aviation Administration and North State Aviation . Trees are growing within Runway 15/33 Object Free Area approximately 275 feet from the runway centerline, on the North side of the runway, approximately 1000 feet to 2500 feet down the runway. These items appear to be violations of 14 CFR parts 139.303(c) and 139.309 (b) (4). Additionally, these items are repeat discrepancies that were identified in the May 2014 inspection.

This letter is to inform you that this incident is under investigation by the Federal Aviation Administration. We offer you an opportunity to submit a written statement on this matter. If you desire to do this, you should submit the statement, postmarked within 10 days following receipt of this letter. Your statement should contain all pertinent facts and any extenuating or mitigating circumstances that you feel might have a bearing on this incident from an airport-related viewpoint.

If we do not hear from you within the specified time, our report on this matter will be processed for action without the benefit of your statement. Please contact you Certification Inspector, Denson E. Stasher with your response and any questions you may have.

Sincerely,

for Steven Hicks
Deputy Division Manager
FAA Southern Region, Airports Division

Darcangelo, Mike

From: Mark Davidson <mark.davidson@smithreynolds.org>
Sent: Thursday, April 21, 2016 10:23 AM
To: Darcangelo, Mike
Subject: FAA Letter of Investigation
Attachments: 20160421100138895.pdf

Obstruction Removal.

Mark R. Davidson, A.A.E.
Airport Director
Airport Commission of Forsyth County
3801 N. Liberty Street
Winston-Salem, NC 27105
Office: 336-767-6361
Cell: 336-528-8217
mark.davidson@smithreynolds.org

Attachment D

Taxiway A Relocation Study

AIRPORT COMMISSION OF FORSYTH COUNTY

SMITH REYNOLDS AIRPORT

TAXIWAY 'A' RELOCATION STUDY

Prepared for

Airport Commission of Forsyth County

AUGUST 2015

FINAL

Prepared by

AVCON, INC.

Mallard Creek III, Suite 152

8604 Cliff Cameron Drive

Charlotte, NC 28269

704.954.9008

www.avconinc.com

2015.130.01

TABLE OF CONTENTS

LIST OF APPENDICES

TAXIWAY 'A' RELOCATION STUDY
SMITH REYNOLDS AIRPORT

SECTION I. PURPOSE/BACKGROUND

Parallel Taxiway 'A' is the primary taxiway serving ILS Runway 15-33 at Smith Reynolds Airport (INT). It is approximately 6,000 feet long and 60 feet wide. The taxiway pavement is primarily an asphalt surface and base section, with some stone and subbase, with a portion of the taxiway underlain with 7 inches of concrete (from around 1966). The taxiway pavement was last addressed with a strengthening project in 1983 to meet the demands at that time. Since then, only limited pavement maintenance (crack sealing) has occurred. In the 2007 timeframe the need for a Taxiway 'A' pavement rehabilitation/reconstruction project was identified and included in the North Carolina Division of Aviation (NCDOA) TIP Program for potential funding and implementation.

In May 2012 the Airport Master Plan Update (MPU) was finalized and confirmed the need to rehabilitate/reconstruct Taxiway 'A', based upon increased airport activities and the success of the new large aircraft Maintenance/Repair/Overhaul (MRO) facility of North State Aviation (NSA). The MPU also documented the existing centerline separation distance from Runway 15-33 to Taxiway 'A' did not meet current Federal Aviation Administration (FAA) standards for a runway with an Instrument Landing System (ILS), that being a 400-foot separation versus the existing 281-foot separation. Inasmuch as safety continues to be a priority issue with the FAA and NCDOA, both funding agencies have been reluctant to fund the Taxiway 'A' pavement rehabilitation project in its current location. Recently, both the FAA and NCDOA confirmed that a waiver or Modifications of Standards (MOS) to the non-standard separation distance of 281 feet would not be granted, and that alternatives for Taxiway 'A' should be studied and evaluated first before any funding was applied to rehabilitating Taxiway 'A'.

After consultation with the NCDOA (who also discussed the issue on multiple occasions with the FAA) it was determined an overview study would be performed for parallel Taxiway 'A' to determine what reasonable and viable options were available to the Airport Commission of Forsyth County (ACFC) and INT, the FAA, and NCDOA in lieu of rehabilitation and/or reconstruction of Taxiway 'A' at its current location. It was determined the Taxiway 'A' Study would include the evaluation of three (3) options deemed viable, those being:

(1) Rehabilitate Taxiway 'A' at its current location with Air Traffic Control Tower (ATCT) rules, operational procedures and controls for the movement of aircraft developed and implemented for safe operations along Taxiway 'A',

(2) Relocate/construct a new Taxiway 'A' immediately west of its current position in order to obtain a compliant 400-foot centerline separation from ILS Runway 5-33,

(3) Construct a new full parallel taxiway 400 feet east of Runway 15-33, with the general limits extending from Taxiway 'F' on the north to the threshold of Runway 33 on the south. This option would have to assess any impacts to the existing Runway 33 glide slope facility.

Included in the Taxiway 'A' Study was the assessment of the existing drainage grates within the infield area between Runway 15-33 and Taxiway A. In May 2014 the FAA's Part 139 Certification Inspection Report identified existing wooden drainage grates located within the runway safety area and questioned the grates ability to support the occasional passage of an air carrier aircraft (similar to those utilizing the on airport MRO facility). It was determined the first element of the Study would focus on the existing infield drainage grates (11±) which would be evaluated for size and hydraulics, and replacement with new metal frames and grates to satisfy the referenced certification inspection report.

SECTION II. DESIGN CRITERIA AND STANDARDS

As indicated in Section I, the centerline to centerline separation distance from ILS Runway 15-33 to full parallel Taxiway 'A' is 281 feet. The Taxiway 'A' pavement condition has a lower than acceptable Pavement Condition Index (PCI) rating than what is required and expected at a facility like INT that serves large aircraft. Accordingly, Taxiway 'A' rehabilitation and/or reconstruction has been warranted and planned for several years already. However, due to the non-compliant separation distance from ILS Runway 15-33, other alternatives must be considered.

With the success of the NSA MRO Facility at INT, the airport has, and continues to experience many operations of large aircraft. Below is an informational matrix (provided by NSA 2 years ago) regarding aircraft operations, frequencies of operations, mix of fleet and the FAA design/standard categories those aircraft belong to:

Large Aircraft Operating at INT	Group					Operational Frequency			
	Wingspan (ft.)	Tail Height (ft.)	Aircraft Approach (AAC)	Airplane Design (ADG	T/W Design (TDG)	# Annual Ops	% of Annual Ops	Cockpit to Main Gear Distance (CMG)	Main Gear Width (MGW
727-200/200W	107.9 - 109.3	34.9	C	III	4	4	1	70.2	23.3
737-200 to 700W	93.2 – 117.5	36.8 – 41.7	C	III	3	12	4	42.7-52.2	21-23
737-800 to 900	112.5 – 117.5	41.2	D	III	3	250	87	56.4-61.7	23
757-200	125.0	45.1	C	IV	4	3	1	72.2	28.2
757-300	125.0	44.9	D	IV	4	10	4	85.3	28.2
767-200/300	156.2	52.6 – 52.9	C	IV	5	6	2	79.7-89.9	35.4-35.8
767-400	170.3	55.8	D	IV	5	2	1	92	36
Total Projected						287	100		

Notes Regarding Paved Shoulders:

1. Paved shoulders are required for runways accommodating ADG-IV and higher aircraft, and are recommended for runways accommodating ADG-III aircraft (per paragraph 304c. Runway Geometry, Runway Shoulders, of FAA Design AC 150/5300-13A, dated 9/28/12 and updated 2/26/14).

2. Paved shoulders are required for taxiways, taxilanes and aprons accommodating ADG-IV and higher aircraft, and are recommended for taxiways, taxilanes and aprons accommodating ADG-III aircraft (per paragraph 417. Taxiway Shoulders, of FAA Design AC 150/5300-13A, dated 9/28/12 and updated 2/26/14).

The following current FAA design criteria and standards were considered and used for this Taxiway A Relocation Study, as well as the Drainage Grates issue located within the infield of Runway 15-33 and Taxiway A:

Criteria	ADG IV	ADG V
Taxiway A Safety Area Width	171 ft.	214 ft.
Taxiway A Object Free Area Width	259 ft.	320 ft.
Taxiway A Wingtip Clearance	44 ft.	53 ft.
Taxiway A Centerline to Fixed Object	129.5 ft.	160 ft.
Runway 15-33 to Taxiway A Centerline	400 ft.	400 ft.
Runway 15-33 Width	150 ft.	150 ft.
Runway 15-33 Safety Area Length	1000 ft.	1000 ft.
Runway 15-33 Safety Area Width	500 ft.	500 ft.
Runway 15-33 Object Free Area (width)	800 ft.	800 ft.
	TDG 4	**TDG 5**
Taxiway Width	50 ft.	75 ft.
Taxiway Edge Safety Margin	10 ft.	15 ft.
Taxiway Shoulder Width	20 ft.	30 ft.
Runway and Taxiway Safety Area Grades as Related to Existing Drainage Grate Issue		
Turfed Runway Shoulder	5% for 10ft.	5% for 10ft.
RSA	1.5% to 3%	1.5% to 3%
Turfed Taxiway Shoulder	5% for 10ft.	5% for 10ft.
TSA	1.5% to 3%	1.5% to 3%

SECTION III. Existing Infield Drainage Grates

General

As part of the Smith Reynolds Airport annual FAA certification inspection conducted to determined compliance with 14 CFR Part 139, the Airport Certification Manual, and the Airport Operating Certificate, a Letter of Correction from the FAA was submitted to the Smith Reynolds Airport on May 14, 2013. The Letter of Correction included discrepancies to Part 139 that were to be corrected by the airport. One of the discrepancies noted was the airport's use of wooden grates located within the Runway 15-33 safety area (RSA) and the ability of those grates to support the occasional passage of air carrier aircraft.

As part of the review process related to the wooden grates, AVCON was contracted to review the location and condition of each structure/grate as well as to make a recommendation for the airport to correct the discrepancy.

AVCON completed two site visits to review the location and condition of the drainage structures/grates. During the initial site visit, only seven structures were located onsite. The seven structures located all had wooden grates. It was determined during the second site visit that there were additional structures to be considered during the study, ultimately bringing the total number of structures to 13.

Existing Structures

Smith Reynolds Airport has 13 drainage structures located in the infield area between Runway 15-33 and parallel Taxiway A, within 250 feet of the Runway 15-33 centerline, thus within the RSA. The structures are generally located longitudinally from the western edge of the Taxiway A connector at Runway 33 to just west of the Taxiway E connector. Appendix A contains an exhibit for the location of each structure and some photos of the existing wooden drainage grates. The structures include nine 19' x 2'-10" (grate size) concrete structures with wooden grates and four 24" x 24" (grate size) concrete structures with metal grates. The actual dimensions of the structures vary.

Condition of Existing Structures

A visual review of the condition of the structures was completed by AVCON with the aid of S&ME, Inc. AVCON reviewed the condition of the wooden grates as well as concrete drainage structures. Based on information provided by the airport and AVCON's years of experience at the airport, the structures appear to be a minimum of 25 years old. There is no indication of when the wooden grates were installed or if there were different grates installed prior to the installation of the wooden grates.

The wooden grates have deteriorated such that the wood is rotting and has become brittle in many of the structures. Several of the wooden grates are missing sections of the grate, thus exposing the concrete structure below. The airport staff avoids running vehicles or maintenance equipment over the wooden grates due to their condition.

The concrete structures are made up of both brick and concrete, and a combination of both. Brick makes up a section of the side walls in at least two of the structures. There appears to be minor deterioration of the concrete from weather, exposure, and water. Although deterioration is evident by observation, there does not appear to be major failure of any of the structures at this time. S&ME was asked to review the drainage structures in a similar manner as AVCON, and S&ME shared a similar review of the structures, although no formal submittal of their review was made.

Structural Integrity of Existing Drainage Structures

With the existing drainage structures located within the safety area of Runway 15-33, the structures should be rated such that they are able to withstand the occasional passage of air carrier aircraft per the FAA's Letter of Correction. S&ME reviewed the condition of the structures in order to determine a suitable means for determining the strength of each structure, condition of the concrete, and the amount and configuration of any steel reinforcement of the structure. That information would then potentially allow AVCON to develop a means of determining if the structures met the strength and loading requirements to be located within the RSA.

S&ME reported that more thorough visual inspections of the structures, coring of the concrete walls, floors and lids would be needed to help try and determine individual structure strengths and compositions, and that testing to determine rebar location and spacing would be needed each structure. Although these items would give AVCON additional information about each structure, the limited information would not guarantee consistency within any individual structure nor allow AVCON to back-calculate and report the original design criteria used to construct the original structures in order to determine their suitability for location within the RSA.

Recommendation

It was the recommendation of AVCON (and supported by S&ME) that due to the lack of information regarding the original design and construction of the drainage structures, the inability to reliably test and determine the loading strength for each structure, and due to their locations within the RSA, that two options be considered by the Airport.

> Drainage Option 1 would require each wooden grated structure to be removed and replaced with new aircraft rated structure, metal frame and grate.
>
> Drainage Option 2 would require each structure, wooden or metal grated, to be removed and replaced with new aircraft rated structure, metal frame and grate.

Relocating the drainage structures outside the RSA was not considered a viable option based on the ongoing Taxiway A Relocation Study, and the apparent move to relocate Taxiway A to comply with FAA standards. AVCON recommended moving forward with Drainage Option 2, installing the new aircraft rated structures in the same location as the existing structures and tying them into the existing drainage pipe systems accordingly.

Accordingly, as the drainage structures are located within the RSA for Runway 15-33, any work associated with the removal and installation of the drainage structures must be completed when Runway 15-33 is closed to operations. The completion of this work should be scheduled with the Airport, with both day and night work expected.

Airfield Rated Drainage Structures Design and Construction

The airfield rated drainage structures should be precast and designed such that they can withstand a 200,000 pound aircraft. Use of precast structures will reduce the times for construction and runway closures. To meet surface runoff needs, the structures will be equipped with single, double and/or triple grates.

Runway 15-33 is the airport's main runway handling all large aircraft for the airport, and as such, must remain operational as long as possible, yet still allowing construction of the new drainage structures/inlets to occur. The decision was made to utilize 'around the clock weekend construction techniques', with Runway 15-33 closed, to accomplish both goals at a reasonable cost.

SECTION IV. TAXIWAY A PAVEMENT REHABILITATION OPTIONS

Three (3) Taxiway A Pavement Rehabilitation Alternatives were evaluated including:

(1) Rehabilitate Taxiway 'A' in its current location, with ATCT special operational procedures in place for the movement of aircraft (***see note***),

(2) Relocate/construct a new Taxiway 'A' immediately west of its current position, with a 400-foot separation from Runway 15-33,

(3) Construct a full parallel taxiway on the east side of Runway 15-33, with a 400-foot separation from Runway 15-33

Note: Smith Reynolds Airport is currently a participant in the FAA contract tower program. The Air Traffic Control Tower (ATCT) is open and operational from 6:45am to 9:30pm seven days a week. The ATCT is referred to as a VFR only tower which denotes that it has no radar equipment and controllers must therefore provide air traffic management via visual cues only. The ATCT at Smith Reynolds Airport has positive control of the airfield during this period through established procedures and protocol, creating, maintaining and ensuring a safe operational environment at the airport. Pilots can contact tower personnel on frequency 123.75 and can contact ground control on frequency 128.25. Discussions were held between the staffs of Smith Reynolds Airport and the Contract Tower to discuss this alternative. The consensus derived from those discussions indicated the ATCT staff could implement additional positive control measures and coordinated operational movement criteria to further enhance the airport's overall safety.

Alternative (3), Construct a full parallel taxiway on the east side of Runway 15-33, was further evaluated using criteria including various cut/fill slopes; assessing the taxiway tie-in to Runway 33; with and without the use of a retaining wall; ATCT operational controls and procedures, etc.

The table below summarizes the various scenarios (16) considered for Option (3):

Scenario	Description	With Cut/Fill Slopes	
2A	400 ft. West of R/W 15-33	3:1	2:1
2B	Partial Relocation to 400 ft. West of R/W 15-33, then Transition to Exist. T/W Past South Apron; ATCT Control of Movements	3:1	2:1
3A	400 ft. East of R/W 15-33	3:1	2:1
3A	400 ft. East of R/W 15-33 (w/Ret. Wall)	3:1	2:1
3B	400 ft. East of R/W 15-33 (w/Skewed T/W to 33)	3:1	2:1
3B	400 ft. East of R/W 15-33 (w/Skewed T/W to 33 and Ret. Wall)	3:1	
3C	400 ft. East of R/W 15-33 (w/Skewed T/W to 33)	3:1	2:1
3C	400 ft. East of R/W 15-33 (w/Skewed T/W to 33 and Ret. Wall)	3:1	
4	400 ft. East & West of R/W 15-33 (w/crossover 1,300 ft. from 33)	3:1	2:1

The 16 scenarios considered for Option (3) were then pared down to 6 (see Appendix B) for cost estimating purposes. The matrix that follows presents the order of magnitude cost estimates for the 6 scenarios carried forward:

MATRIX OF OPTIONS

Option #	Description	Key Factors for Consideration								
		Construction Slopes	Environmental Mitigation	Land Acquisition	Relocations	Retaining Wall	Major Culvert	G.S. Impact	Earthwork (CY)	Estimated Project Cost
Shortlisted Options for Further Considerations (and as Presented to NCDOA at April 7th Meeting)										
2A	400 ft. West of R/W 15-33	3:1	yes (1,500 LF±)	yes	9	no	no	no	365,000	$13.01M
3A	400 ft. East of R/W 15-33	3:1	yes (500 LF±)	yes	15	no	yes (500 LF±)	yes	510,000	$15.06M
3A	400 ft. East of R/W 15-33 (w/Ret. Wall)	3:1	no	no	no	yes (975 LF±)	no	yes	310,000	$15.11M
3B	400 ft. East of R/W 15-33 (w/Skewed T/W to 33)	3:1	no	yes	9	no	no	yes	288,000	$11.01M
3B	400 ft. East of R/W 15-33 (w/Skewed T/W to 33 and Ret. Wall)	3:1	no	no	no	yes (730 LF±)	no	yes	236,000	$11.80M
4	400 ft. East & West of R/W 15-33 (w/crossover 1,300 ft. from 33)	3:1	yes (1,500 LF±)	no	no	no	no	yes	390,000	$11.57M
Existing	Rehabilitate Taxiway A (at current location 281 ft. ± from R/W 15-33, using ATCT Control of Movements); ***However not sanctioned by FAA or NCDOA***	existing	no	no	no	no	no	no	no	$3.88M

Ultimately, to move forward for a comparative evaluation of the three Taxiway A Pavement Rehabilitation Alternatives, Option 3B (with 3:1 slopes) was selected by ACFC (on 4/7/15) as the best option of the 6 options considered for a full parallel

taxiway on the east side of Runway 15-33 to be move forward, which was then presented to, and subsequently supported by the NCDOA.

Exhibits of the three (3) Alternatives

Exhibits of the three (3) Alternatives, including the 6 scenarios for Alternative 3, Construct a full parallel taxiway on the east side of Runway 15-33, are included in Appendix C.

Order of Magnitude Total Project Cost Estimates

Order of magnitude total project cost estimates were developed for the three (3) Taxiway A Pavement Rehabilitation Alternatives with the results as follows:

(1) Rehabilitate Taxiway 'A' in its current location, with ATCT special operational procedures in place for the movement of aircraft.
Total Project Cost - $3,880,000

(2) Relocate/construct a new Taxiway 'A' immediately west of its current position, with a 400-foot separation from Runway 15-33.
Total Project Cost - $13,011,000

(3) Construct a full parallel taxiway on the east side of Runway 15-33, maintaining a 400-foot separation from Runway 15-33 (Option 3B).
Total Project Cost - $11,803,000

Appendix D contains order of magnitude cost estimates.

SECTION V. SUMMARY

This study was completed in a coordinated and collaborative effort with the Airport Commission of Forsyth County, The North Carolina Division of Aviation, The Federal Aviation Administration, and AVCON. In summary:

- The drainage structures/grates issue identified in the FAA's May 2014 certification inspection will be corrected through the removal of the structures/grates within the RSA of Runway 15-33, and the subsequent replacement with new structures/grates rated for heavy aircraft wheel loads. Runway 15-33 will be closed over a weekend period to allow expeditious construction while minimizing operational impacts to the airport.

- Parallel Taxiway A will be relocated to the east side of Runway 15-33, at an FAA compliant separation distance of 400-feet centerline to centerline (Option 3B). As this is a critical project for the enhancement of operational safety at Smith Reynolds Airport, the FAA, NCDOA and ACFC have made this a top priority project, to be implemented within the next 3 years±. Accordingly, the rehabilitation of existing Taxiway A pavement has been put on hold. The future status of Taxiway A will be discussed among ACFC, NCDOA and the FAA, with options considered for its use as a general aviation taxiway servicing the south aircraft ramp and facilities west of Runway 15-33, as well as routing of general/corporate aviation aircraft to and from Runway 33. Some modifications to geometrics, lighting, signage and pavement parameters will be addressed.

APPENDIX A

EXISTING DRAINAGE STRUCTURES/GRATES LOCATION EXHIBIT AND PHOTOS

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SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

TAXIWAY A DRAINAGE STUDY

EXISTING DRAINAGE INLETS

SCALE:

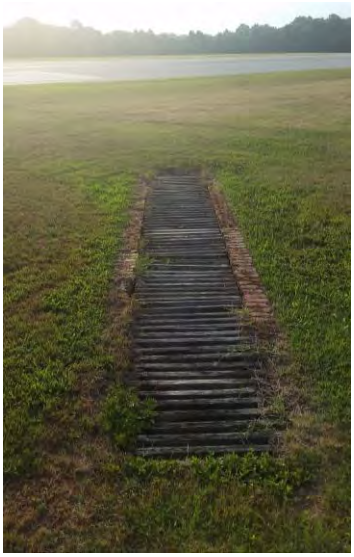
REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:	
DRAWN BY:	W.L.J.
CHECKED BY:	J.M.M.
APPROVED BY:	J.M.M.
DATE:	MARCH 2015
STATE LICENSE	N.C. C-2450
PROJECT NO.	2014.130.03

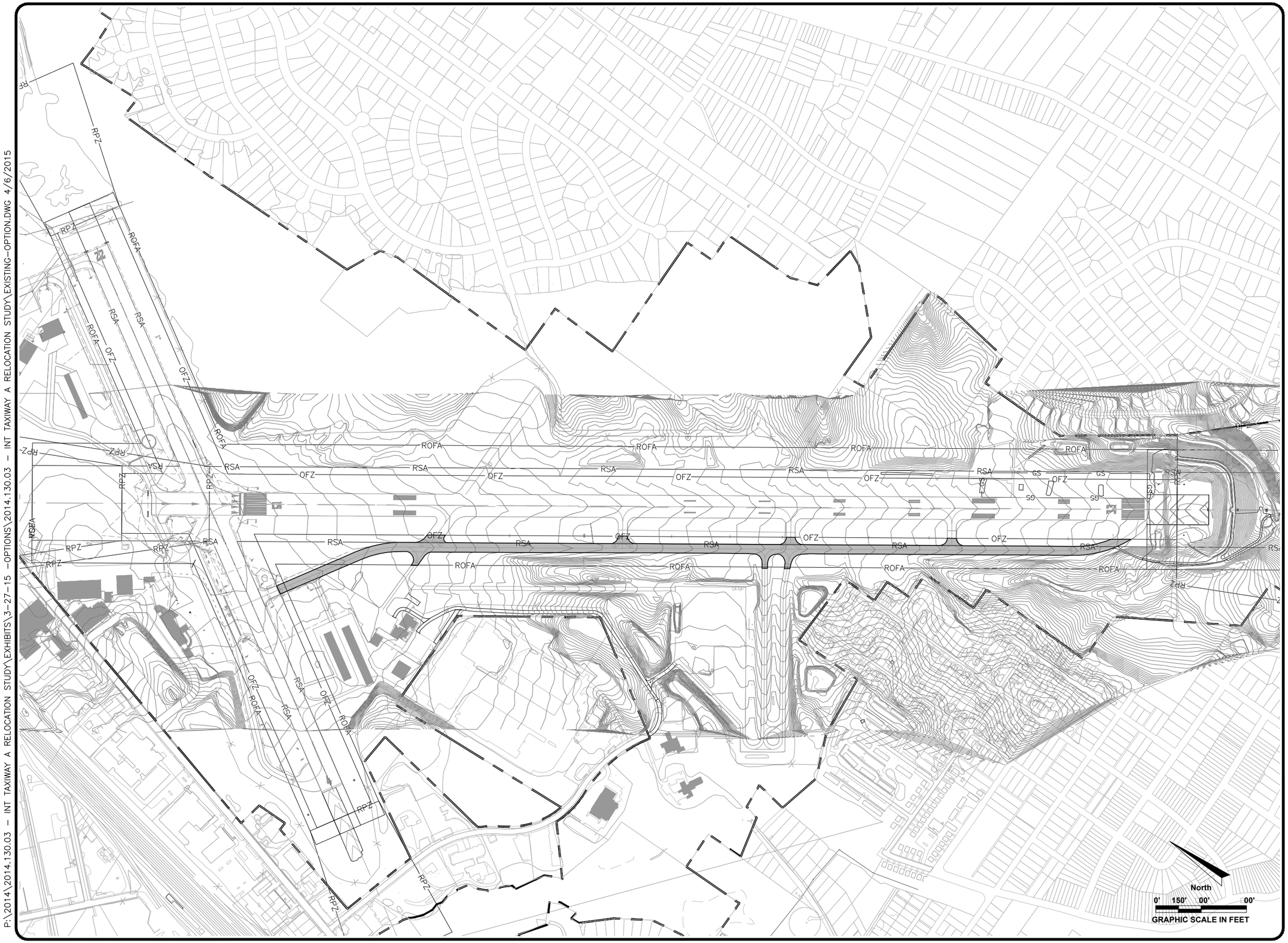
SHEET NUMBER
EXHIBIT

SOME PHOTOS OF EXISTING WOODEN DRAINAGE GRATES AT INT



APPENDIX B

SIX OPTIONS EVALUATED FOR A NEW PARALLEL TAXIWAY EAST OF RUNWAY 15-33



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PRELIMINARY DRAWING NOT RELEASED FOR CONSTRUCTION

TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

EXISTING OPTION

SCALE: AS NOTED

REVISIONS:

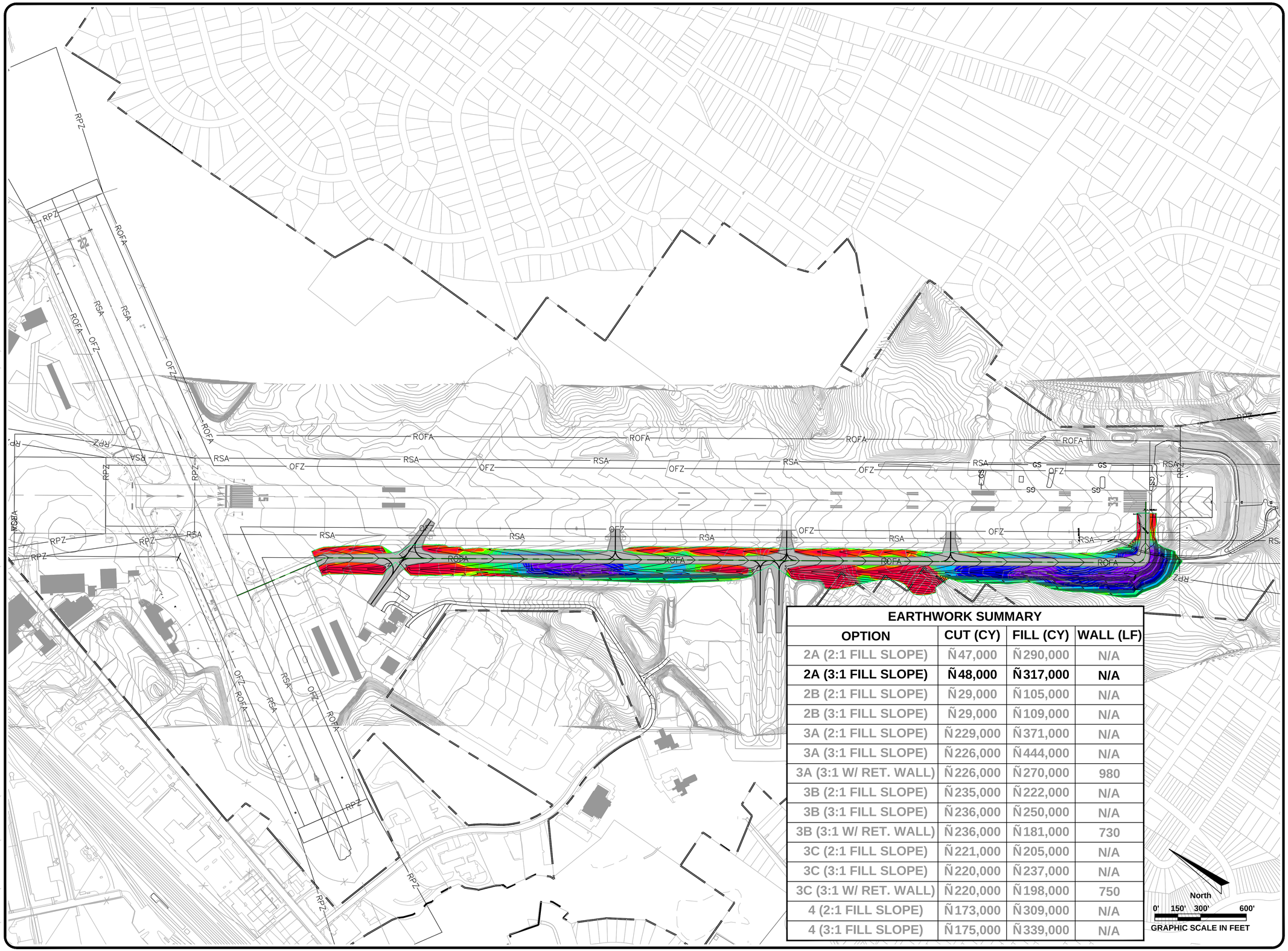
NO.	DATE	BY	DESCRIPTION

DESIGNED BY:
DRAWN BY:
CHECKED BY: M.A.D.
APPROVED BY: M.A.D.
DATE: JANUARY 2015

STATE LICENSE NO. N.C. C-2450
AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT



EARTHWORK SUMMARY

OPTION	CUT (CY)	FILL (CY)	WALL (LF)
2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
2A (3:1 FILL SLOPE)	**Ñ48,000**	**Ñ317,000**	**N/A**
2B (2:1 FILL SLOPE)	Ñ29,000	Ñ105,000	N/A
2B (3:1 FILL SLOPE)	Ñ29,000	Ñ109,000	N/A
3A (2:1 FILL SLOPE)	Ñ229,000	Ñ371,000	N/A
3A (3:1 FILL SLOPE)	Ñ226,000	Ñ444,000	N/A
3A (3:1 W/ RET. WALL)	Ñ226,000	Ñ270,000	980
3B (2:1 FILL SLOPE)	Ñ235,000	Ñ222,000	N/A
3B (3:1 FILL SLOPE)	Ñ236,000	Ñ250,000	N/A
3B (3:1 W/ RET. WALL)	Ñ236,000	Ñ181,000	730
3C (2:1 FILL SLOPE)	Ñ221,000	Ñ205,000	N/A
3C (3:1 FILL SLOPE)	Ñ220,000	Ñ237,000	N/A
3C (3:1 W/ RET. WALL)	Ñ220,000	Ñ198,000	750
4 (2:1 FILL SLOPE)	Ñ173,000	Ñ309,000	N/A
4 (3:1 FILL SLOPE)	Ñ175,000	Ñ339,000	N/A

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PRELIMINARY DRAWING NOT RELEASED FOR CONSTRUCTION

TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT WINSTON-SALEM NORTH CAROLINA

OPTION 2A (3:1 FILL SLOPE)

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

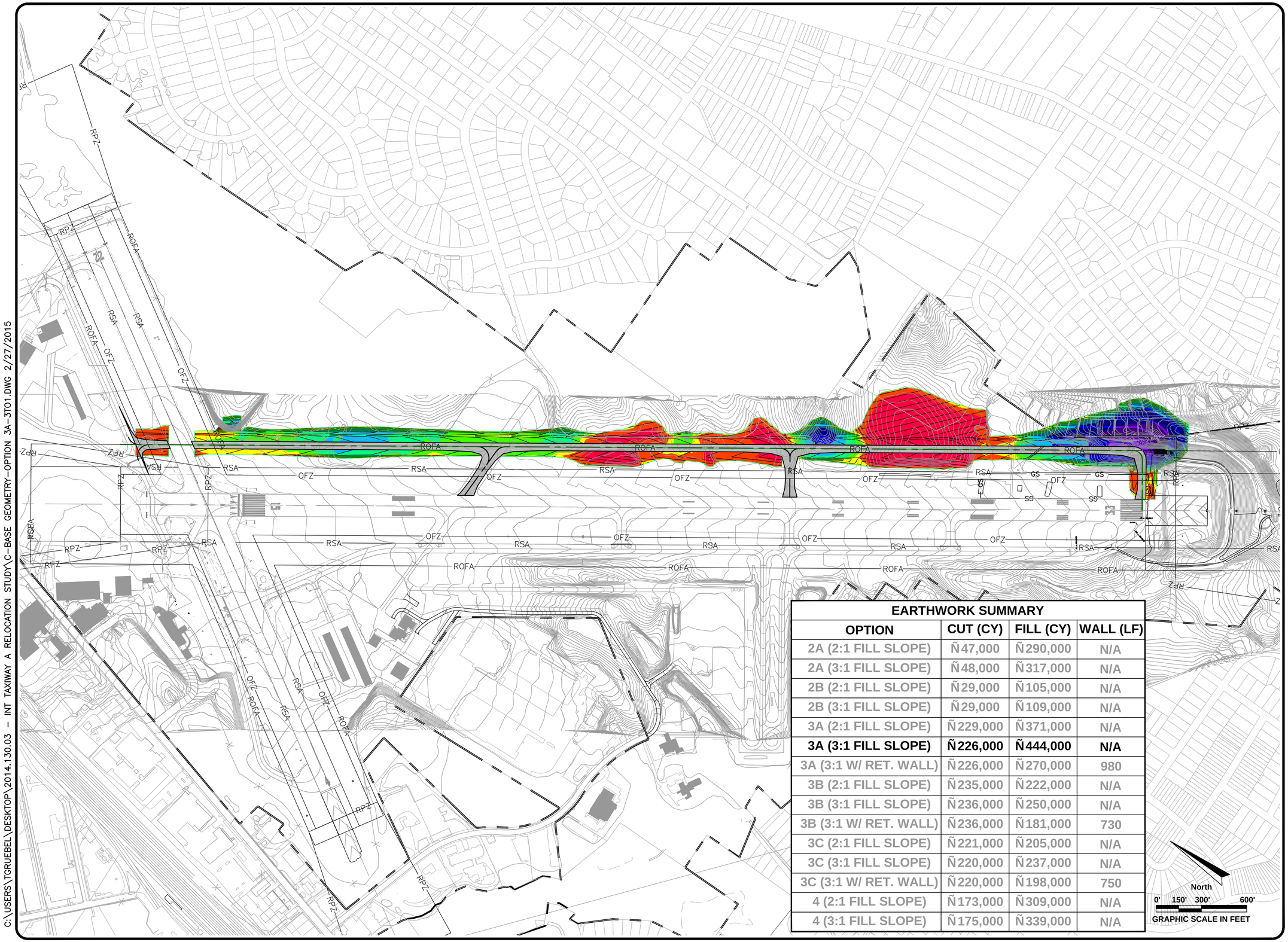
DESIGNED BY:
DRAWN BY:
CHECKED BY: M.A.D.
APPROVED BY: M.A.D.
DATE: JANUARY 2015

STATE LICENSE NO. N.C. C-2450
AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 2

C:\USERS\TGRUEBEL\DESKTOP\2014.130.03 – INT TAXIWAY A RELOCATION STUDY\C–BASE GEOMETRY–OPTION 3A–3T01.DWG 2/27/2015



EARTHWORK SUMMARY			
OPTION	CUT (CY)	FILL (CY)	WALL (LF)
2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
2A (3:1 FILL SLOPE)	Ñ48,000	Ñ317,000	N/A
2B (2:1 FILL SLOPE)	Ñ29,000	Ñ105,000	N/A
2B (3:1 FILL SLOPE)	Ñ29,000	Ñ109,000	N/A
3A (2:1 FILL SLOPE)	Ñ229,000	Ñ371,000	N/A
3A (3:1 FILL SLOPE)	**Ñ226,000**	**Ñ444,000**	**N/A**
3A (3:1 W/ RET. WALL)	Ñ226,000	Ñ270,000	980
3B (2:1 FILL SLOPE)	Ñ235,000	Ñ222,000	N/A
3B (3:1 FILL SLOPE)	Ñ236,000	Ñ250,000	N/A
3B (3:1 W/ RET. WALL)	Ñ236,000	Ñ181,000	730
3C (2:1 FILL SLOPE)	Ñ221,000	Ñ205,000	N/A
3C (3:1 FILL SLOPE)	Ñ220,000	Ñ237,000	N/A
3C (3:1 W/ RET. WALL)	Ñ220,000	Ñ198,000	750
4 (2:1 FILL SLOPE)	Ñ173,000	Ñ309,000	N/A
4 (3:1 FILL SLOPE)	Ñ175,000	Ñ339,000	N/A

North

0' 150' 300' 600'

GRAPHIC SCALE IN FEET

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TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

OPTION 3A
(3:1 FILL SLOPE)

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:

DRAWN BY:

CHECKED BY: M.A.D.

APPROVED BY: M.A.D.

DATE: JANUARY 2015

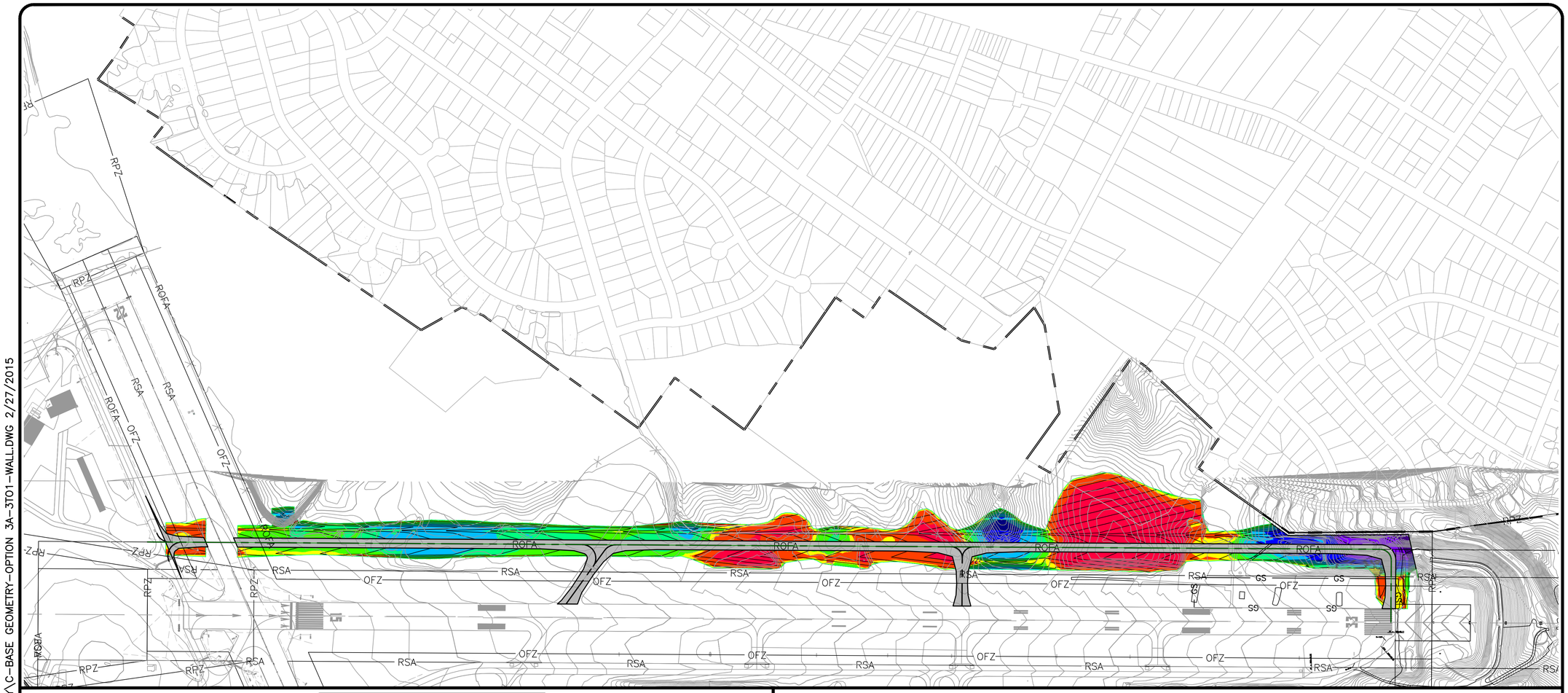
STATE LICENSE NO. N.C. C-2450

AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 6

C:\USERS\TGRUEBEL\DESKTOP\2014.130.03 - INT TAXIWAY A RELOCATION STUDY\C-BASE GEOMETRY-OPTION 3A-3T01-WALL.DWG 2/27/2015



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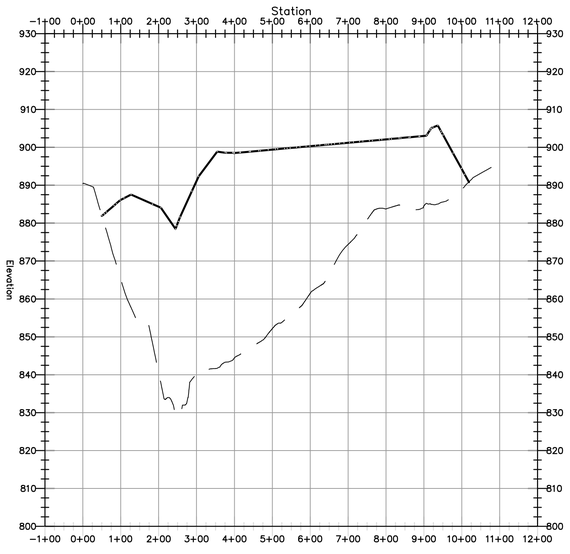

EARTHWORK SUMMARY			
OPTION	CUT (CY)	FILL (CY)	WALL (LF)
2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
2A (3:1 FILL SLOPE)	Ñ48,000	Ñ317,000	N/A
2B (2:1 FILL SLOPE)	Ñ29,000	Ñ105,000	N/A
2B (3:1 FILL SLOPE)	Ñ29,000	Ñ109,000	N/A
3A (2:1 FILL SLOPE)	Ñ229,000	Ñ371,000	N/A
3A (3:1 FILL SLOPE)	Ñ226,000	Ñ444,000	N/A
3A (3:1 W/ RET. WALL)	**Ñ226,000**	**Ñ270,000**	**980**
3B (2:1 FILL SLOPE)	Ñ235,000	Ñ222,000	N/A
3B (3:1 FILL SLOPE)	Ñ236,000	Ñ250,000	N/A
3B (3:1 W/ RET. WALL)	Ñ236,000	Ñ181,000	730
3C (2:1 FILL SLOPE)	Ñ221,000	Ñ205,000	N/A
3C (3:1 FILL SLOPE)	Ñ220,000	Ñ237,000	N/A
3C (3:1 W/ RET. WALL)	Ñ220,000	Ñ198,000	750
4 (2:1 FILL SLOPE)	Ñ173,000	Ñ309,000	N/A
4 (3:1 FILL SLOPE)	Ñ175,000	Ñ339,000	N/A

North

0' 150' 300' 600'

GRAPHIC SCALE IN FEET

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TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

OPTION 3A
(3:1 W/ RET. WALL)

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:

DRAWN BY:

CHECKED BY: M.A.D.

APPROVED BY: M.A.D.

DATE: JANUARY 2015

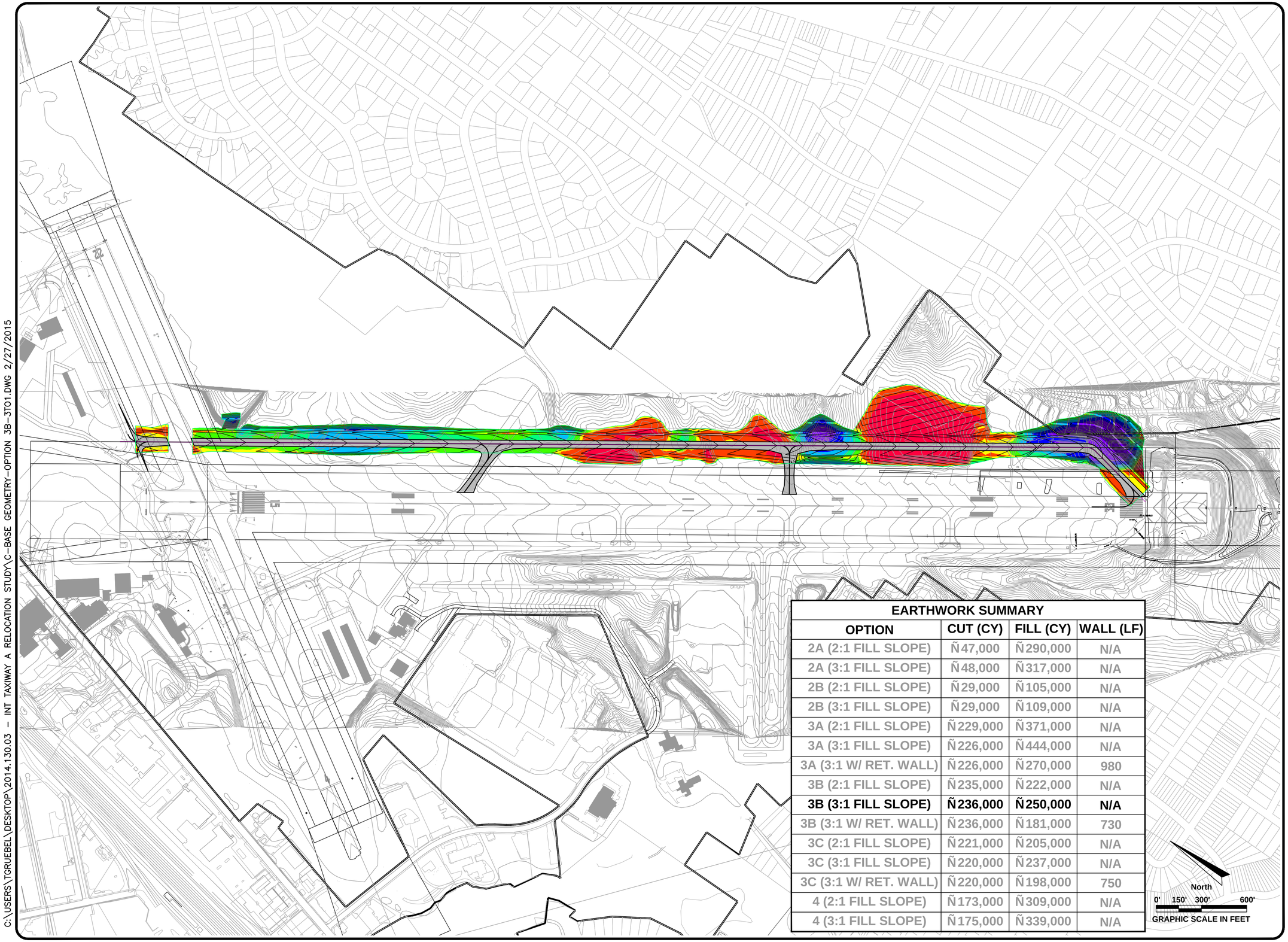
STATE LICENSE NO. N.C. C-2450

AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 7

C:\USERS\TGRUEBEL\DESKTOP\2014.130.03 - INT TAXIWAY A RELOCATION STUDY\C-BASE GEOMETRY-OPTION 3B-3T01.DWG 2/27/2015



EARTHWORK SUMMARY

OPTION	CUT (CY)	FILL (CY)	WALL (LF)
2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
2A (3:1 FILL SLOPE)	Ñ48,000	Ñ317,000	N/A
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TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

OPTION 3B
(3:1 FILL SLOPE)

SCALE: AS NOTED

REVISIONS:

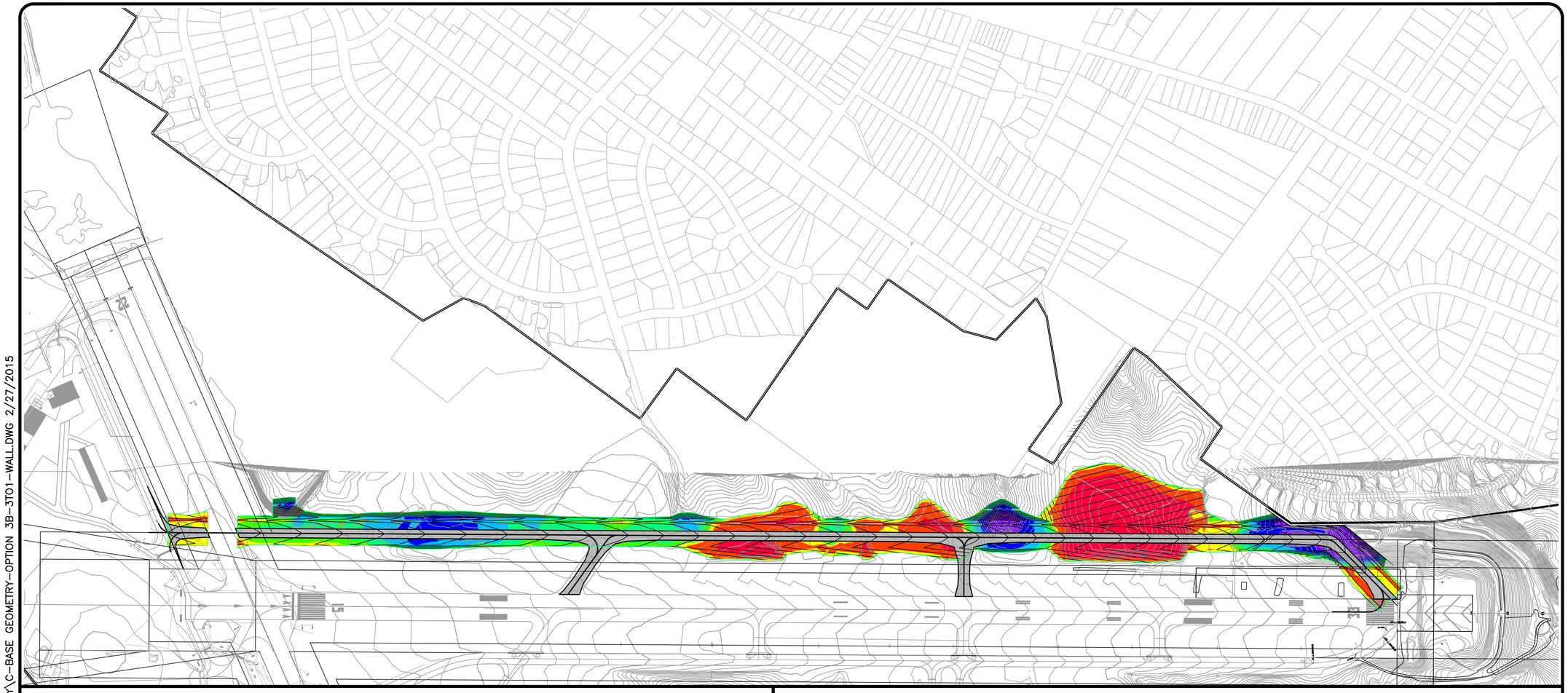
NO.	DATE	BY	DESCRIPTION

DESIGNED BY:
DRAWN BY:
CHECKED BY: M.A.D.
APPROVED BY: M.A.D.
DATE: JANUARY 2015

STATE LICENSE NO. N.C. C-2450
AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 9



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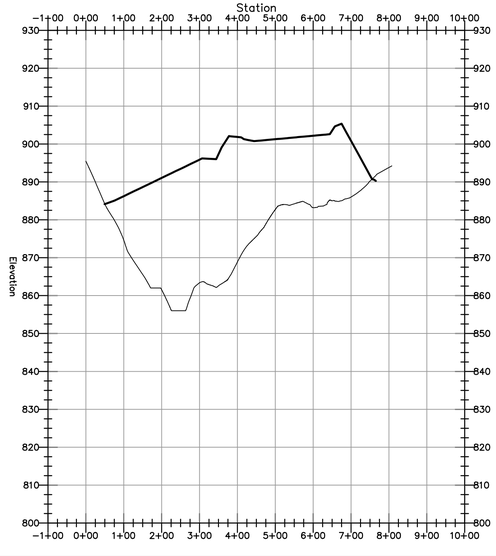
RETAINING WALL PROFILE



EARTHWORK SUMMARY			
OPTION	**CUT (CY)**	**FILL (CY)**	**WALL (LF)**
2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
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4 (2:1 FILL SLOPE)	Ñ173,000	Ñ309,000	N/A
4 (3:1 FILL SLOPE)	Ñ175,000	Ñ339,000	N/A

North

0' 150' 300' 600'

GRAPHIC SCALE IN FEET

AVCON

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PRELIMINARY DRAWING NOT RELEASED FOR CONSTRUCTION

TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

OPTION 3B
(3:1 W/ RET. WALL)

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:

DRAWN BY:

CHECKED BY: M.A.D.

APPROVED BY: M.A.D.

DATE: JANUARY 2015

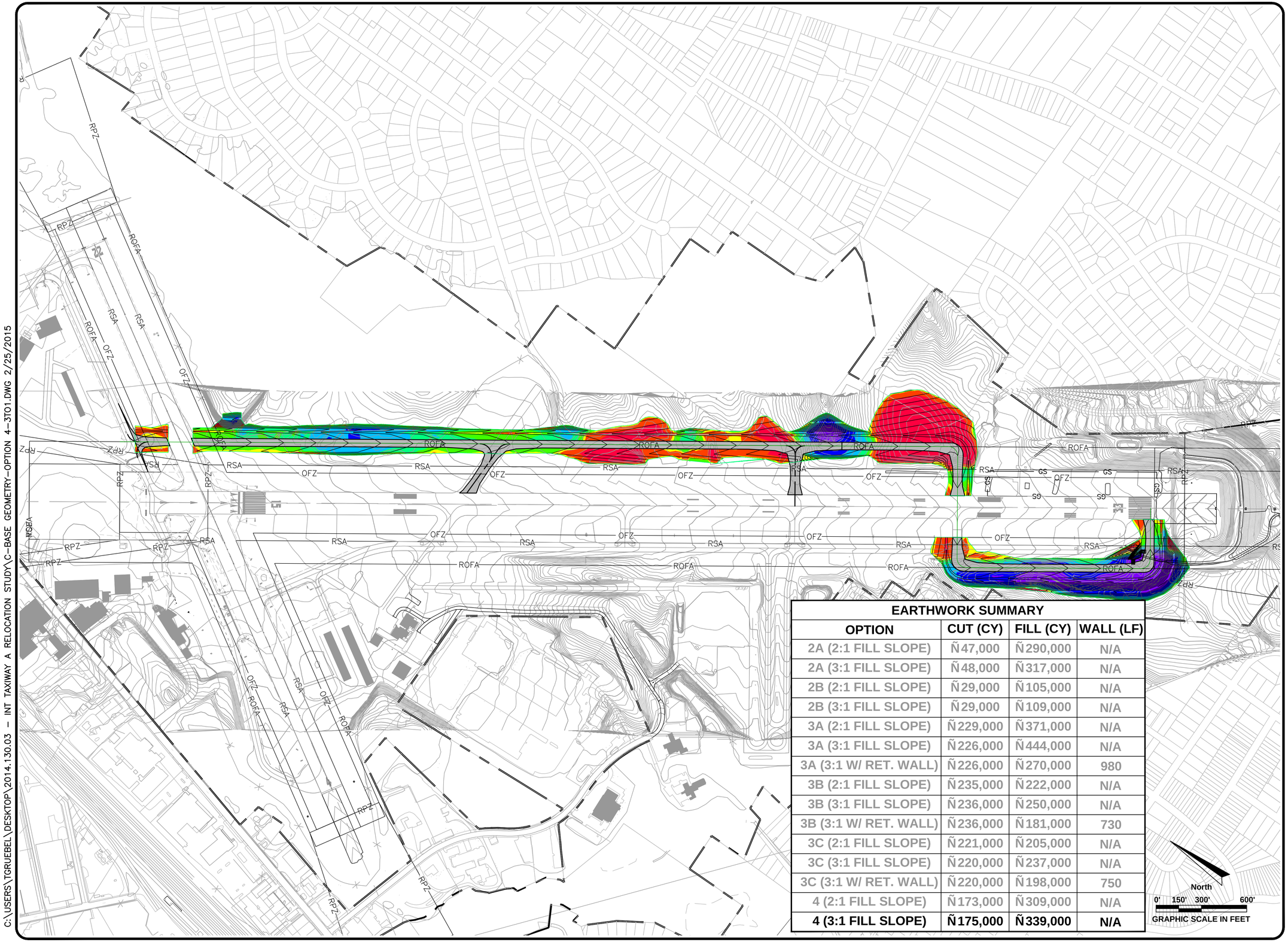
STATE LICENSE NO. N.C. C-2450

AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 10

C:\USERS\TGRUEBEL\DESKTOP\2014.130.03 – INT TAXIWAY A RELOCATION STUDY\C–BASE GEOMETRY–OPTION 4–3TO1.DWG 2/25/2015



EARTHWORK SUMMARY			
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2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
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TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

OPTION 4 (3:1 FILL SLOPE)

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:
DRAWN BY:
CHECKED BY: M.A.D.
APPROVED BY: M.A.D.
DATE: JANUARY 2015

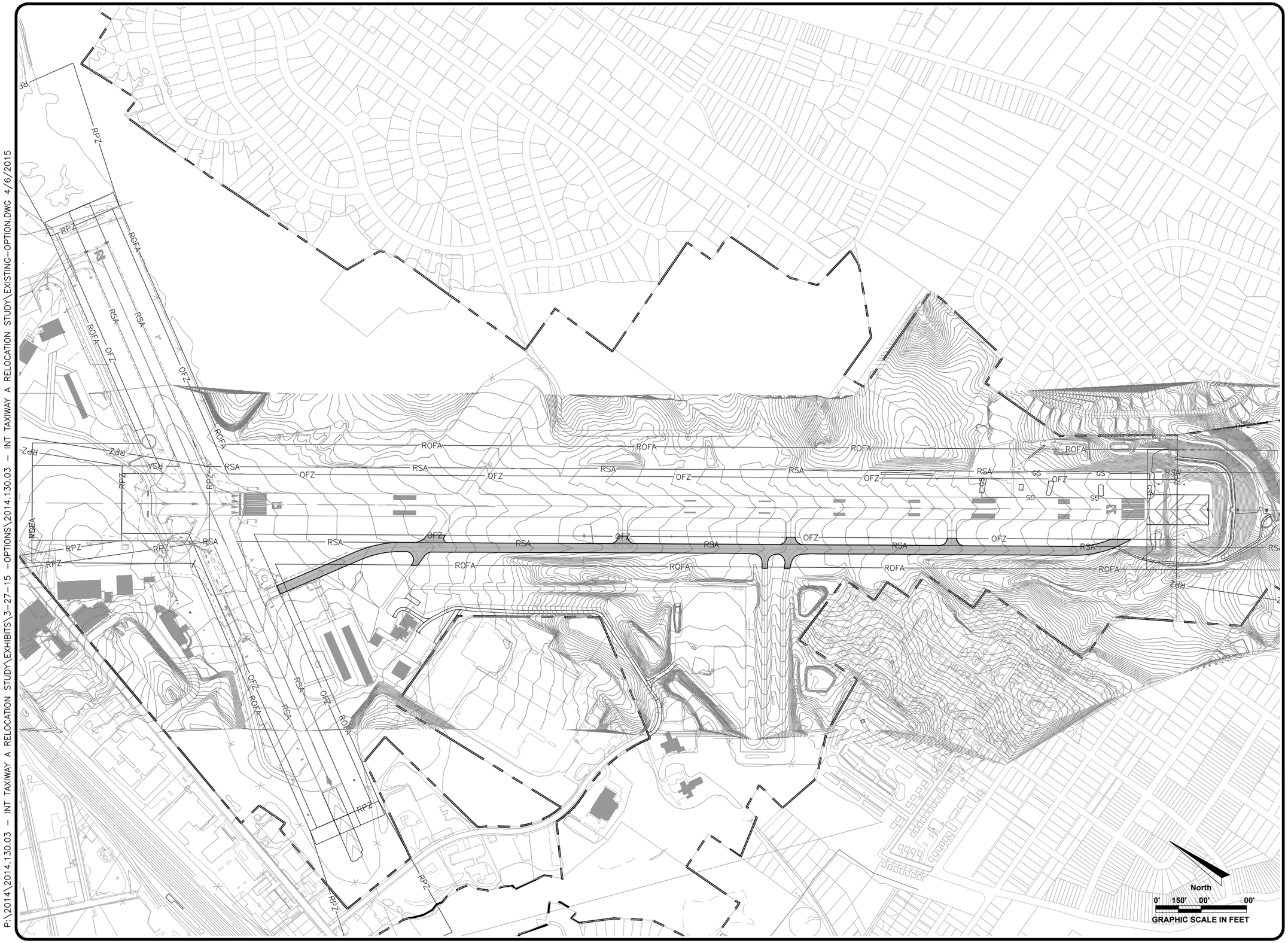
STATE LICENSE NO. N.C. C-2450
AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 15

APPENDIX C

THREE ALTERNATIVES EVALUATED FOR PARALLEL TAXIWAY A



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TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

EXISTING OPTION

SCALE: AS NOTED

REVISIONS:

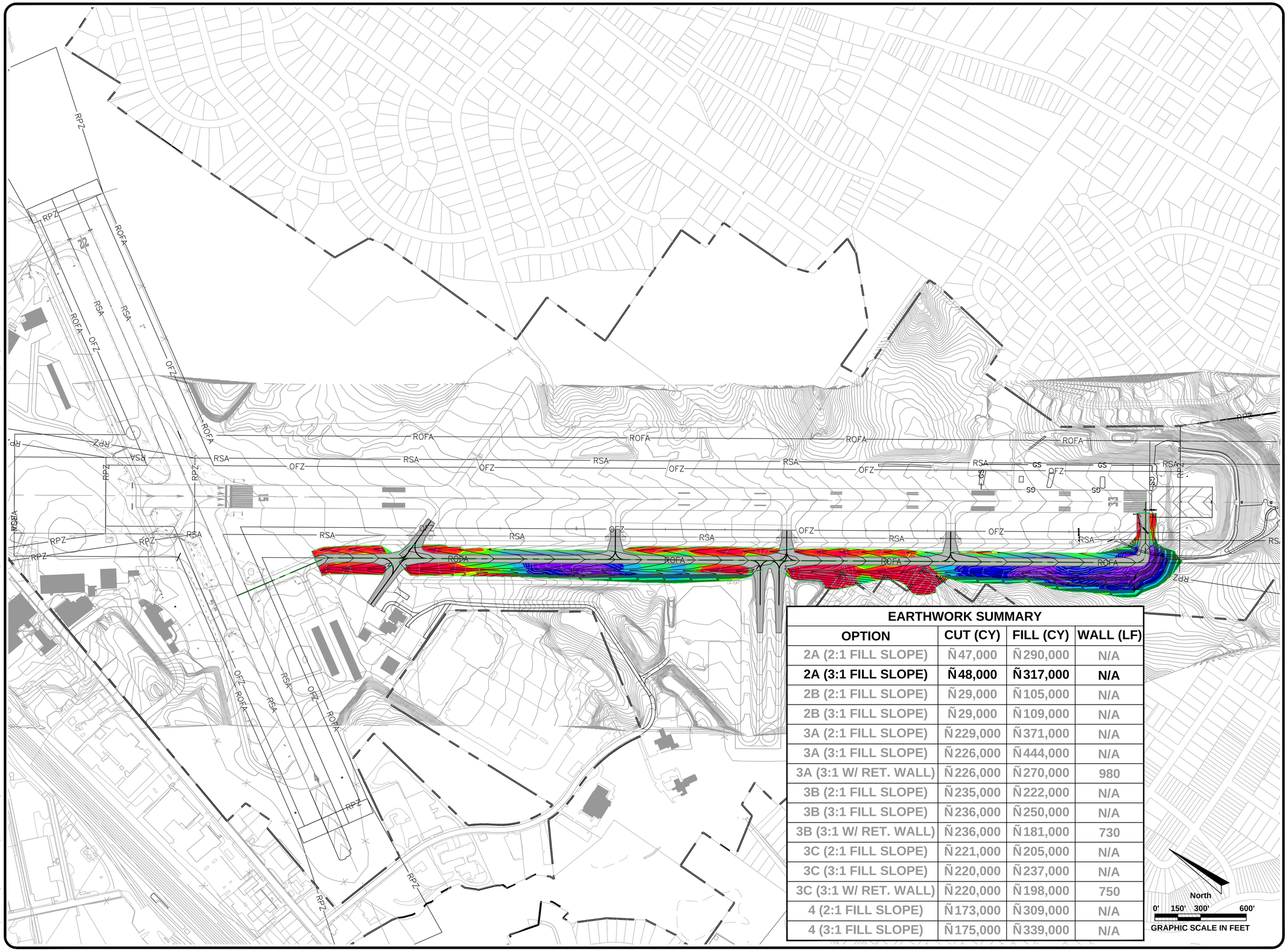
NO.	DATE	BY	DESCRIPTION

DESIGNED BY:
DRAWN BY:
CHECKED BY: M.A.D.
APPROVED BY: M.A.D.
DATE: JANUARY 2015

STATE LICENSE NO. N.C. C-2450
AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT



EARTHWORK SUMMARY

OPTION	CUT (CY)	FILL (CY)	WALL (LF)
2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
2A (3:1 FILL SLOPE)	**Ñ48,000**	**Ñ317,000**	**N/A**
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PRELIMINARY DRAWING NOT RELEASED FOR CONSTRUCTION

TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT WINSTON-SALEM NORTH CAROLINA

OPTION 2A (3:1 FILL SLOPE)

SCALE: AS NOTED

REVISIONS:

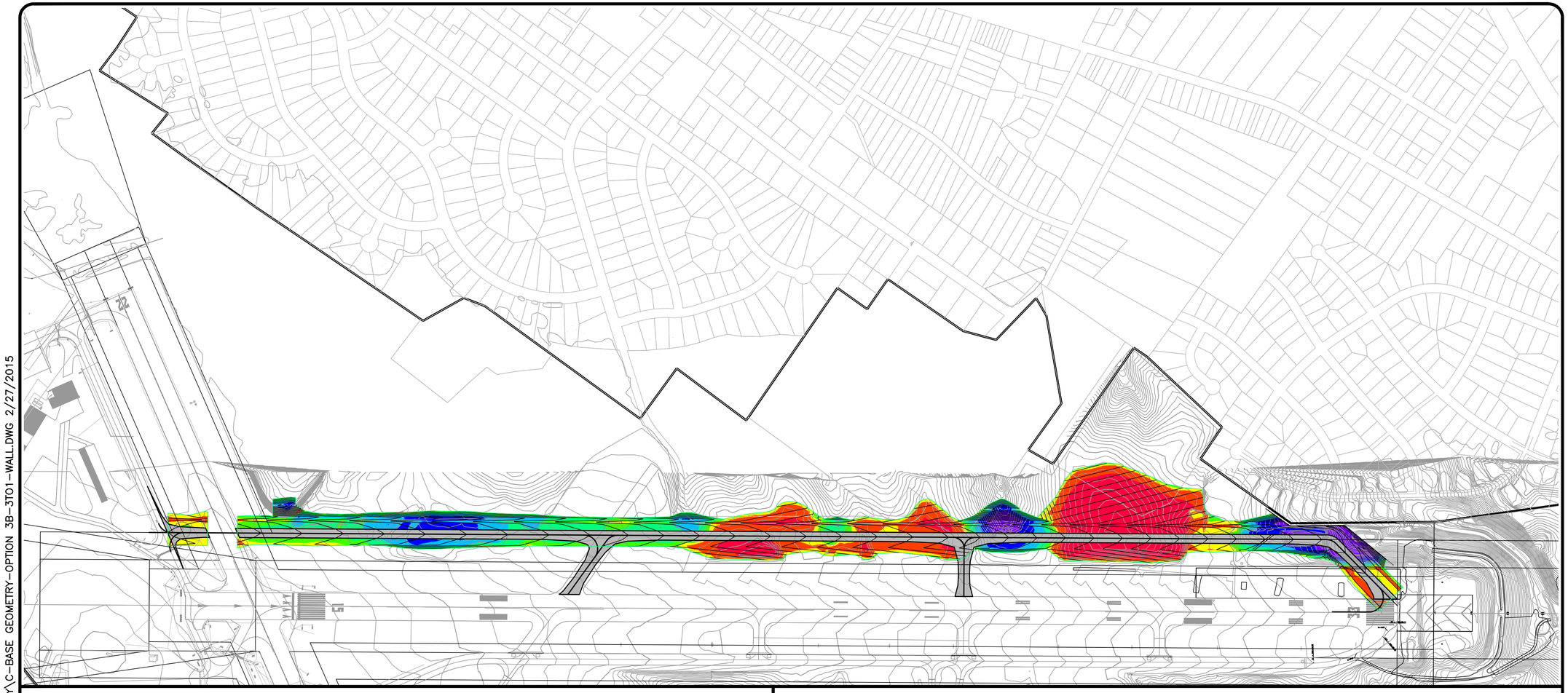
NO.	DATE	BY	DESCRIPTION

DESIGNED BY:
DRAWN BY:
CHECKED BY: M.A.D.
APPROVED BY: M.A.D.
DATE: JANUARY 2015

STATE LICENSE NO. N.C. C-2450
AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 2



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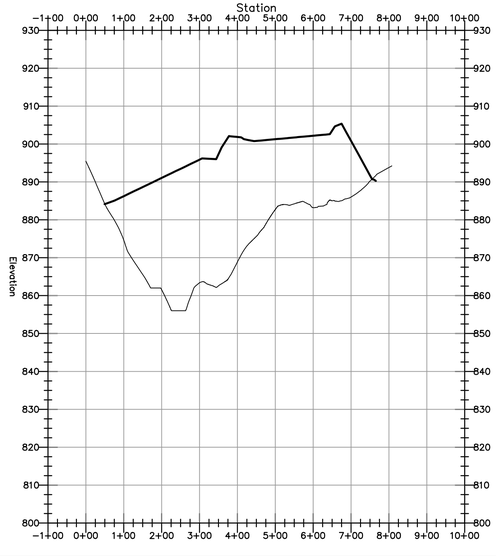
RETAINING WALL PROFILE



EARTHWORK SUMMARY			
OPTION	**CUT (CY)**	**FILL (CY)**	**WALL (LF)**
2A (2:1 FILL SLOPE)	Ñ47,000	Ñ290,000	N/A
2A (3:1 FILL SLOPE)	Ñ48,000	Ñ317,000	N/A
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North

0' 150' 300' 600'

GRAPHIC SCALE IN FEET

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TAXIWAY "A" RELOCATION STUDY

SMITH REYNOLDS AIRPORT
WINSTON-SALEM
NORTH CAROLINA

OPTION 3B
(3:1 W/ RET. WALL)

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:

DRAWN BY:

CHECKED BY: M.A.D.

APPROVED BY: M.A.D.

DATE: JANUARY 2015

STATE LICENSE NO. N.C. C-2450

AVCON PROJECT NO. 2014.130.03

SHEET NUMBER

EXHIBIT 10

APPENDIX D

ORDER OF MAGNITUDE COST ESTIMATES FOR THE THREE ALTERNATIVES EVALUATED

SMITH REYNOLDS AIRPORT
TAXIWAY A STUDY
March 19, 2015

ORDER OF MAGNITUDE PROJECT COST ESTIMATE *(in 2015 dollars)*

(This estimate assumes 1 construction package for comparing options.)

OPTION - REHABILITATE TAXIWAY A In Place (281 ft. from RW C/L to TW C/L; Same Configuration)

ITEM NO.	SPEC NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED TOTAL
1		MOBILIZATION	1	LS	$214,000.00	$214,000.00
2		ENGINEER'S FIELD OFFICE	1	LS	$30,000.00	$30,000.00
3	P-101	PAVEMENT MILLING (6"±)	45,000	SY	$8.00	$360,000.00
4	P-101	CRACK SEALING	1	LS	$30,000.00	$30,000.00
5	P-101	UNSUITABLE EXCAVATION AND BACKFILL *(say 1000 CY)*	1,000	CY	$25.00	$25,000.00
6	S-140	ELECTRICAL DEMOLITION	1	LS	$30,000.00	$30,000.00
7	P-401	BITUMINOUS SURFACE COURSE (3")	7,900	TON	$100.00	$790,000.00
8	P-403	BITUMINOUS BASE COURSE (3")	7,900	TON	$100.00	$790,000.00
9	P-602	BITUMINOUS PRIME COAT	13,500	Gal	$2.50	$33,750.00
10	P-603	BITUMINOUS TACK COAT	9,000	Gal	$2.50	$22,500.00
11	P-620	PAVEMENT MARKINGS	1	LS	$30,000.00	$30,000.00
12	D-701	DRAINAGE SYSTEM IMPROVEMENTS	1	LS	$150,000.00	$150,000.00
13	T-901	SEEDING/MULCHING/MATTING	8	AC	$5,000.00	$40,000.00
14	L-125	TAXIWAY EDGE LIGHT SYSTEM *(lights, cans, cable, conduit, trenching, signs, vault modifications, etc.)*	5,800	LF	$90.00	$522,000.00
15		CONTINGENCY *(10% for detailed design)*	1	LS	$307,000.00	$307,000.00
		TOTAL BASE BID				**$3,374,250.00**

Note: If project is separated into two (2) projects, a Site Prep Project and then a Paving & Lighting Project, the total program cost could increase by at least 10%±.

Professional Services

All Professional Services (including survey, geotechnical investigations/testing, CatEx doumentation, design, bidding, construction administration, inspection, and QA material testing during construction)	***say 15% of construction***	**$506,000.00**
Special FEMA Analysis, Pre/Post Modeling, Permitting, Associated Env. Work, etc.		**$0.00**
Land Acquisitions and Relocations (approx. 0 at $150,000 each)		**$0.00**
	Total Project Cost	**$3,880,250.00**

SMITH REYNOLDS AIRPORT

TAXIWAY A STUDY

March 19, 2015

ORDER OF MAGNITUDE PROJECT COST ESTIMATE *(in 2015 dollars)*

(This estimate assumes 1 construction package for comparing options with the presumption the project could likely be constructed as two projects, the first a site prep project and the second a paving & lighting project)

OPTION 2A - Relocate to 400 ft. West of Runway 15-33 (3:1 Fill Slopes)

ITEM NO.	SPEC NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED TOTAL
1		MOBILIZATION	1	LS	$644,000.00	$644,000.00
2		ENGINEER'S FIELD OFFICE	1	LS	$30,000.00	$30,000.00
3	S-140	SITE (CIVIL) DEMOLITION *(include existing TW A (≈ 5,600 lf)*	1	LS	$100,000.00	$100,000.00
4	S-140	ELECTRICAL DEMOLITION *(include existing TW A (≈ 5,900 lf)*	1	LS	$30,000.00	$30,000.00
5	P-151	CLEARING & GRUBBING	25	AC	$10,000.00	$250,000.00
6	P-152	EMBANKMENT IN PLACE *(including +15% factor for borrow quantity to embankment in place quantity)*	365,000	CY	$5.00	$1,825,000.00
7	P-152	UNSUITABLE EXCAVATION AND BACKFILL	5,000	CY	$25.00	$125,000.00
8	P-156	EROSION AND SEDIMENT CONTROL	1	LS	$75,000.00	$75,000.00
9	P-209	CRUSHED AGGREGATE BASE COURSE *(subbase course)*	15,000	CY	$55.00	$825,000.00
10	P-401	BITUMINOUS ASHPALT PAVEMENT *(surface course)*	11,500	TON	$100.00	$1,150,000.00
11	P-403	BITUMINOUS ASHPALT PAVEMENT *(base course)*	18,000	TON	$100.00	$1,800,000.00
12	P-602	BITUMINOUS PRIME COAT	15,600	GAL	$2.50	$39,000.00
13	P-603	BITUMINOUS TACK COAT	15,000	GAL	$2.50	$37,500.00
14	P-620	PAVEMENT MARKINGS	1	LS	$30,000.00	$30,000.00
15	F-162	FENCE (NEW AND/OR RELOCATED)	3,000	LF	$20.00	$60,000.00
16	D-701	AIRFEILD DRAINAGE SYSTEM *(pipes, structures, etc.)*	1	LS	$500,000.00	$500,000.00
17	D-701	SPECIAL / LARGE DRAINAGE CULVERTS	0	LF	$1,400.00	$0.00
18	D-701	STREAM MITIGATION COSTS *(estimated in lieu payment)*	1,500	LF	$381.00	$571,500.00
19	T-901	SEEDING/MULCHING/MATTING	82	AC	$5,000.00	$410,000.00
20	L-110	4 WAY 2" SCHEDULE 40 PVC CONCRETE ENCASED DUCT	1,600	LF	$60.00	$96,000.00
21	L-125	TAXIWAY EDGE LIGHT SYSTEM *(lights, cans, cable, conduit, trenching, signs, vault modifications, etc.)*	6,000	LF	$90.00	$540,000.00
22	UTL-100	WATER LINE UTILITY RELOCATION / ADJUSTMENTS	1	LS	$50,000.00	$50,000.00
23	UTL-200	UTILITY WORK DUE TO LAND ACQ AND RELOCATIONS	6	EA	$5,000.00	$30,000.00
24	GS-100	RUNWAY 33 GLIDE SLOPE SUPPORT FACILITIES - RELOCATE/ADJUST	1	LS	$0.00	$0.00
25		CONTINGENCY *(10% for detailed design)*	1	LS	$922,000.00	$922,000.00
		TOTAL BASE BID				**$10,140,000.00**

Note: If project is separated into two (2) projects, a Site Prep Project and then a Paving & Lighting Project, the total program cost could increase by at least 10%±.

Professional Services

All Professional Services (including survey, geotechnical investigations/testing, CatEx doumentation, design, bidding, construction administration, inspection, and QA material testing during construction)	***say 15% of construction***	**$1,521,000.00**
Special FEMA Analysis, Pre/Post Modeling, Permitting, Associated Env. Work, etc.		**$0.00**
Land Acquisitions and Relocations (approx. 9 at $150,000 each)		**$1,350,000.00**
	Total Project Cost	**$13,011,000.00**

SMITH REYNOLDS AIRPORT
TAXIWAY A STUDY
March 19, 2015

ORDER OF MAGNITUDE PROJECT COST ESTIMATE *(in 2015 dollars)*

(This estimate assumes 1 construction package for comparing options with the presumption the project could likely be constructed as two projects, the first a site prep project and the second a paving & lighting project)

OPTION 3B - Relocate to 400 ft. East of Runway 15-33 (3:1 Fill Slopes w/retaining wall and 45° skewed connector to RW 33)

ITEM NO.	SPEC NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED TOTAL
1		MOBILIZATION	1	LS	$651,000.00	$651,000.00
2		ENGINEER'S FIELD OFFICE	1	LS	$30,000.00	$30,000.00
3	S-140	SITE (CIVIL) DEMOLITION *(include southern section of TW A (≈ 2,300 lf)*	1	LS	$50,000.00	$50,000.00
4	S-140	ELECTRICAL DEMOLITION *(include southern section of TW A (≈ 2,300 lf)*	1	LS	$10,000.00	$10,000.00
5	P-151	CLEARING & GRUBBING	24	AC	$10,000.00	$240,000.00
6	P-152	EMBANKMENT IN PLACE *(including +15% factor for borrow quantity to embankment in place quantity)*	236,000	CY	$5.00	$1,180,000.00
7	P-152	UNSUITABLE EXCAVATION AND BACKFILL	5,000	CY	$25.00	$125,000.00
8	P-156	EROSION AND SEDIMENT CONTROL	1	LS	$100,000.00	$100,000.00
9	P-209	CRUSHED AGGREGATE BASE COURSE *(subbase course)*	13,000	CY	$55.00	$715,000.00
10	P-401	BITUMINOUS ASHPALT PAVEMENT *(surface course)*	10,500	TON	$100.00	$1,050,000.00
11	P-403	BITUMINOUS ASHPALT PAVEMENT *(base course)*	16,000	TON	$100.00	$1,600,000.00
12	P-602	BITUMINOUS PRIME COAT	14,000	GAL	$2.50	$35,000.00
13	P-603	BITUMINOUS TACK COAT	13,500	GAL	$2.50	$33,750.00
14	P-620	PAVEMENT MARKINGS	1	LS	$30,000.00	$30,000.00
15	F-162	FENCE (NEW AND/OR RELOCATED)	3,200	LF	$20.00	$64,000.00
16	D-701	AIRFEILD DRAINAGE SYSTEM *(pipes, structures, etc.)*	1	LS	$500,000.00	$500,000.00
17	D-701	SPECIAL / LARGE DRAINAGE CULVERTS	0	LF	$1,400.00	$0.00
18	D-701	STREAM MITIGATION COSTS *(estimated in lieu payment)*	0	LF	$381.00	$0.00
19	T-901	SEEDING/MULCHING/MATTING	49	AC	$5,000.00	$245,000.00
20	L-110	4 WAY 2" SCHEDULE 40 PVC CONCRETE ENCASED DUCT	1,600	LF	$60.00	$96,000.00
21	L-125	TAXIWAY EDGE LIGHT SYSTEM *(lights, cans, cable, conduit, trenching, signs, vault modifications, etc.)*	6,700	LF	$90.00	$603,000.00
22	UTL-200	UTILITY WORK DUE TO LAND ACQ AND RELOCATIONS	0	EA	$5,000.00	$0.00
23	GS-100	RUNWAY 33 GLIDE SLOPE SUPPORT FACILITIES - RELOCATE/ADJUST	1	LS	$75,000.00	$75,000.00
24	RW-100	RETAINING WALL	18,980	SF	$100.00	$1,898,000.00
25		CONTINGENCY *(10% for detailed design)*	1	LS	$933,000.00	$933,000.00
		TOTAL BASE BID				**$10,263,750.00**

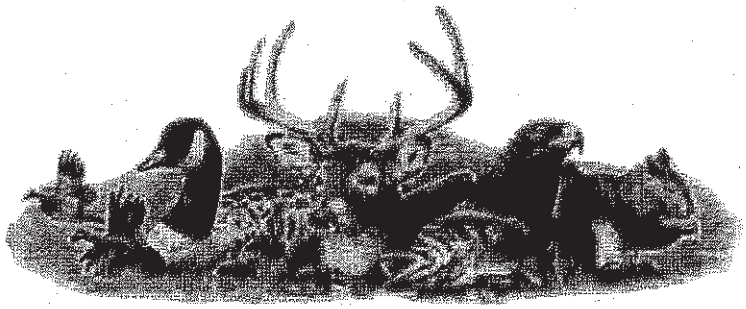
Note: If project is separated into two (2) projects, a Site Prep Project and then a Paving & Lighting Project, the total program cost could increase by at least 10%±.

Professional Services

All Professional Services (including survey, geotechnical investigations/testing, CatEx doumentation, design, bidding, construction administration, inspection, and QA material testing during construction)	***say 15% of construction***	**$1,540,000.00**
Special FEMA Analysis, Pre/Post Modeling, Permitting, Associated Env. Work, etc.		**$0.00**
Land Acquisitions and Relocations (approx. 0 at $150,000 each)		**$0.00**
	Total Project Cost	**$11,803,750.00**

Attachment E

Wildlife Resources Commission Comments



North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

MEMORANDUM

TO: Lyn Hardison, Environmental Assistance and SEPA Coordinator
NCDEQ Division of Environmental Assistance and Customer Services

FROM: Shari L. Bryant, Western Piedmont Coordinator
Habitat Conservation Division

DATE: 5 January 2016

SUBJECT: Scoping for Environmental Assessment for Taxilane Extension and Terrain Obstruction Removal at Smith-Reynolds Airport, Forsyth County. DEQ Project No. 16-0169

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the subject document and we are familiar with the habitat values of the area. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e), and North Carolina General Statutes (G.S. 113-131 et seq.).

The Airport Commission of Forsyth County proposes to construct an approximately 1,650 linear foot taxilane extension and remove terrain obstructions. The taxilane extension would provide access to a developable area designated for future aircraft maintenance, repair and overhaul facilities. The terrain obstruction removal would be a safety enhancement project and would support future airfield projects.

The project area drains to Brushy Fork in the Yadkin-Pee Dee River Basin. The U.S. Fish and Wildlife Service recently listed the Northern long-eared bat (*Myotis septentrionalis*) as threatened under the Endangered Species Act. The Northern long-eared bat may be present within or in the vicinity of the project site. Therefore, the project may impact this species and consultation with the U.S. Fish and Wildlife Service may be required. For more information, please see http://www.fws.gov/midwest/endangered/mammals/nleb/Interim4dRuleKeyNLEB.html or contact the U.S. Fish and Wildlife Service at (828) 258-3939 to ensure that any issues related to this species are addressed.

The environmental document should include a detailed assessment of existing natural resources within the project area and should discuss the potential of mitigating impacts to wetlands, waters, and high quality upland habitat. We encourage the applicant to consult the Department of Environmental Quality's *Guidance for Preparing SEPA Documents and Addressing Secondary and Cumulative Impacts* (http://portal.ncdenr.org/web/deao/sepa) in preparing the environmental document. To facilitate our review of proposed project impacts on aquatic and terrestrial wildlife resources, we request the following information is included in the environmental document. Although some of the information, requests and

Mailing Address: Habitat Conservation • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

comments below may not be applicable to this project, these should facilitate preparation of an environmental document that addresses impacts to aquatic and terrestrial wildlife resources.

1. Include descriptions of aquatic and terrestrial wildlife resources within the project area, and a listing of federally or state designated threatened, endangered or special concern species. A listing of designated species can be found on the N.C. Natural Heritage Program's website at http://www.ncnhp.org.
2. Surveys should be conducted by biologists with both state and federal endangered species permits.
3. Include descriptions of any streams or wetlands affected by the project.
4. Include project maps identifying wetland areas. Identification of wetlands may be accomplished through coordination with the U.S. Army Corps of Engineers (USACE). If the USACE is not consulted, the person delineating wetlands should be identified and criteria listed.
5. Provide information on existing, planned, and projected sewer and water infrastructure service throughout the service area. A map showing the location of the existing and projected lines and areas containing special resources should be included.
6. Define the service area for the project, including any ETJs (extra-territorial jurisdiction), and provide a map of the service area.
7. Provide a description of project activities that will occur within wetlands, such as fill or channel alteration. Acreage of wetlands impacted by alternative project designs should be listed.
8. Provide a description and a cover type map showing acreage of upland wildlife habitat impacted by the project.
9. Discuss the extent to which the project will result in loss, degradation or fragmentation of wildlife habitat (wetlands and uplands).
10. Discuss any measures proposed to avoid or reduce impacts of the project or to mitigate unavoidable habitat losses.
11. Discuss the cumulative impacts of secondary development facilitated by the proposed project. Such discussion should weigh the economic benefits of such growth against the costs of associated environmental impact.
    (a) Include specific measures (e.g., local ordinances) that will be used to address stormwater and sedimentation at the source. Include specific requirements for both residential and industrial developments and Best Management Practices (BMPs) that will be required.
    (b) Include specific measures (e.g., local ordinances) that will be used to protect stream corridors, riparian habitat, and a minimum of the 100-year floodplain from filling and development. Commitments by the project sponsors to protect area streams with riparian buffers through purchase or conservation easement are of particular interest.
12. Include a list of document preparers that shows each individual's professional background and qualifications.

At this time, the information provided is not sufficient for our staff to make definitive recommendations or conclusions concerning this project. Thank you for the opportunity to provide input in the early planning stages for this project. If we can be of further assistance, please contact our office at (336) 449-7625 or shari.bryant@ncwildlife.org.

ec: Allen Ratzlaff, USFWS

Attachment F

Wildlife Hazard Management Plan

Smith-Reynolds Airport (INT)
WILDLIFE HAZARD MANAGEMENT PLAN

CFR Title 14 FAR Part 139.337

Developed by:

Airport Commission of Forsyth County
3801 North Liberty Street
Winston-Salem, NC 27105

In Cooperation with:

USDA

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services
6213-E Angus Drive
Raleigh, NC 27617

April 2013

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Pursuant to Code of Federal Regulations (CFR) Title 14 Federal Aviation Regulations (FAR) Part 139.337(e), the Airport Commission of Forsyth County developed this Wildlife Hazard Management Plan (WHMP) in cooperation with the U.S. Department of Agriculture Wildlife Services (WS) Program. The purpose of this plan is to make certain that Smith Reynolds Airport (INT) meets or exceeds all FAA wildlife related safety regulations while insuring the safest possible environment for aircraft, crew, and passengers arriving to and departing from INT.

Designated, qualified, and properly trained personnel at INT will take immediate measures to identify and mitigate wildlife hazards whenever they are detected. This WHMP outlines steps for monitoring, documenting, and reporting potential wildlife hazards and strikes. Protocols for responding to hazardous wildlife situations are presented, including roles and responsibilities of various airport personnel. Wildlife control procedures for birds and mammals are also included in this management plan.

Habitat on and around the airfield at INT will be managed in a manner that reduces the attractiveness to wildlife. This is the keystone method for minimizing wildlife hazards at airports. Direct control of wildlife populations will then be used to further reduce the likelihood of wildlife and aircraft interactions. This WHMP outlines priorities for wildlife habitat management and wildlife population management for species identified during the recently completed Wildlife Hazard Assessment (WHA) to be of greatest concern, including Eastern wild turkey, rock dove (pigeon), European starling, Red-tailed hawks, American crow, and white-tailed deer. Management of mourning doves should be a priority during the autumn migratory period. American crows were observed in large numbers in the winter at INT. Supplies and equipment for direct control activities will be maintained by the Wildlife Coordinator, an individual appointed by the Airport Director to oversee all wildlife management related operations. These materials should include, but are not limited to pyrotechnics, traps, nets, exclusion devices, firearms, binoculars, wildlife log, copies of depredation permits, and bird and mammal field guides.

The effectiveness of the wildlife hazard management program at INT and an annual review of this WHMP will be addressed by an Airport Director appointed Wildlife Hazard Working Group (WHWG). This group will meet at least two times per year with the Wildlife Coordinator being responsible for developing an agenda and providing a summary of wildlife management activities since the previous meeting. All changes made to this WHMP will be forwarded to the Federal Aviation Administration (FAA) for approval and included in the Table of Revisions of this document.

SIGNATORIES

The following Wildlife Hazard Management Plan for INT has been reviewed and accepted by the Airport Commission of Forsyth County. It will be become effective with the following signature:

Airport Director, Smith-Reynolds Airport **Date** 11/26/13

FEDERAL AVIATION ADMINISTRATION
DEC 23 2013
PLR
INSPECTOR

PREFACE

This Wildlife Hazard Management Plan was prepared to assist in insuring the safety of aircraft, crew, and air travelers arriving to and departing from Smith-Reynolds Airport and to fulfill the requirements of CFR Title 14 FAR Part 139.337(e).

DISTRIBUTION OF WILDLIFE HAZARD MANAGEMENT PLAN

NAME / POSITION / PHONE	AGENCY / ADDRESS
Director of Aviation 919-840-0112	NC Division of Aviation, 1560 Mail Service Center, Raleigh NC, 27699-1560
Airport Certification Safety Inspector 404-305-6715	FAA Southern Regional Office 1701 Columbia Ave, College Park, GA 30337
Environmental Protection Specialist 901-322-8192	FAA – Memphis Airports District Office 2600 Thousand Oaks Blvd., Suite 2250 Memphis, TN 38118

FEDERAL AVIATION ADMINISTRATION

DEC 23 2013

PLR
INSPECTOR

 FAA approved _____

TABLE OF REVISIONS

This Wildlife Hazard Management Plan will be incorporated into the INT Airport Certification Manual. Updated pages containing future revisions will be date stamped to insure that the most recent revisions are included during inspections and decision making activities. Revisions to this plan will be recorded on this page in the table below.

DATE	PAGE	REVISION
7/15/14	23	Deleted the word Firearm
7/15/14	24	Deleted the word Firearm

FEDERAL AVIATION ADMINISTRATION

DEC 23 2013

PLR
INSPECTOR

LIST OF ACRONYMS

AC	Advisory Circular
AGL	Above Ground Level
AOA	Aircraft Operations Area
APHIS	Animal and Plant Health Inspection Service
ATC	Air Traffic Control Tower
CFR	Code of Federal Regulations
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FOD	Foreign Object Debris
ILS	Instrument Landing System
MBTA	Migratory Bird Treaty Act
NC	North Carolina
NCWRC	North Carolina Wildlife Resources Commission
NCDOA	North Carolina Department of Transportation Division of Aviation
NOTAM	Notice to Airmen
RWY	Runway
INT	Smith-Reynolds Airport
T&E	Threatened and Endangered
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WHA	Wildlife Hazard Assessment
WHMP	Wildlife Hazard Management Plan
WHWG	Wildlife Hazard Working Group
WS	Wildlife Services

Figure 1. INT aerial photo with airport property and other notable features.

INTRODUCTION

Wildlife hazard management plans address the responsibilities, policies, and procedures necessary to minimize wildlife hazards at airports. Recognizing potential hazards that wildlife species present to aircraft and human lives, the Federal Aviation Administration (FAA) requires airports that have experienced a significant wildlife strike or have documented wildlife of a size, or in numbers considered hazardous to aircraft operations to develop and implement a WHMP according to CFR Title 14 FAR Part 139.337 (Appendix A). This WHMP includes seven components that are specifically required by the FAA (Sections 1-7) plus additional, pertinent information related to operations at INT and other Appendix documents that are useful resources for properly managing wildlife hazards at airports.

This WHMP was developed based on the sample outline found in the FAA CertAlert (No. 97-09) and recommended to insure compliance with CFR Title 14 FAR Part 139.337. A copy of this CertAlert is included in Appendix B.

HAZARDOUS SPECIES AND ATTRACTIVE WILDLIFE HABITATS

Wildlife species observed during the WHA data collection period that posed the greatest hazards to aviation included American crows, Rock doves, Wild turkey, European starlings, Red-tailed hawks, and white-tailed deer. These species were present in critical areas in numbers that presented the most immediate concerns. Other bird and mammal species may cause hazardous conditions in the future and will be monitored for possible management needs.

The most important wildlife habitats determined to be attractants on-site during the WHA included shrubland, woodlands, and man-made structures. These attractants can be modified to reduce the amount of wildlife using the area. Areas immediately adjacent to the runways and taxiways within the perimeter fence at INT are maintained as grassland. Areas near the terminal, along active surface edges, and around lights/signs are mowed frequently. Due to well-drained soils, mowing frequency on much of the grassland at INT is not dependent upon low soil moisture.

Small areas of shrubs are scattered across INT and surrounding areas. Most shrub dominated sites are strips of dense vegetation located along ditch banks and areas that are difficult to mow. There are large tracts of woodland cover inside the perimeter fence at INT. Most of these woodlands are comprised of mixed pine/hardwood cover. Private property immediately surrounding airport property is in residential or light industrial use. INT is located in Forsyth County and is within the city limits of Winston-Salem. Private property immediately surrounding airport property is in residential or light industrial use. Several commercial and industrial facilities are located in this area. The downtown area of Winton-Salem is located approximately two miles southwest of INT. Residential areas are located approximately two-hundred yards East and West of various points of RWY 15/33.

REPORTED WILDLIFE STRIKES AT INT

A total of 5 wildlife strikes were reported at INT between June 1991 and present. Wild turkey, White-tailed deer, vultures, and a Red-tailed hawk were identified in strike incidents during this period. Unknown small, birds were also listed when no species was determined. One strike was reported during the decent, two during landing role, one during the climb and one during take-off run.

PURPOSE AND SCOPE

Enhancing safe air carrier operations is a primary objective of INT and the FAA. To improve air carrier safety related to wildlife hazards, INT will implement and maintain this WHMP according to CFR Title 14 FAR Part 139.337(e). In addition to addressing general wildlife hazards, this plan provides specific protocols for monitoring and responding to unforeseen wildlife hazards that may arise.

It is important to note that Part 139.337(f) underscores the need for a flexible plan that can be quickly adapted to changing circumstances. During rare circumstances, immediate actions not addressed in this WHMP may be necessary to insure the safety of passengers, crew, and aircraft. This WHMP provides INT with the discretion and capability to respond to these situations, while providing guidance for compliance with applicable Federal and State laws and regulations. The latitude afforded INT operations when administering this plan is discussed in CFR Title 14 Part 139.113 - Deviations, which states that:

> ***"In emergency conditions requiring immediate action for the protection of life or property, involving the transportation of persons by air carriers, the certificate holder may deviate from any requirement of Subpart D of this part to the extent required to meet that emergency. Each certificate holder who deviates from a requirement under this paragraph shall, as soon as practicable, but no later than 14 days after the emergency, report in writing to the Regional Airports Division Manager stating the nature, extent, and duration of the deviation."***

This WHMP will be reviewed at least once every 12 consecutive calendar months to insure its relevance to conditions at the time of review. It may also be reviewed more often if situations arise or hazard conditions change that merit evaluation.

SECTION 1 – AUTHORITIES AND RESPONSIBILITIES

FAR 139.337(f)(1) ***A list of the individuals having authority and responsibility for implementing each aspect of the plan.***

The Airport Director at INT has the authority and responsibility of designating a Wildlife Coordinator to implement the WHMP. Each department at INT has responsibilities outlined in the WHMP and will incorporate them into their programs. Clear communication among airport personnel is essential for this WHMP to be fully effective. Personnel working at the airport will communicate resource needs, recommendations, and progress to the designated Wildlife Coordinator. The Airport Director will insure that the WHMP is approved by the FAA and that the WHMP and amendments comply with Federal, State and local laws and regulations.

PERSONNEL WITH AUTHORITY AND RESPONSIBILITY FOR WHMP IMPLEMENTATION

Airport Director. The Airport Director (or a designee) will:

- Insure that the WHMP and its amendments adhere to Federal, State and local laws and regulations, and is approved by the FAA
- Designate a Wildlife Coordinator to monitor all wildlife related activities and implement all management activities that occur at INT as described in the WHMP
- Assist Wildlife Coordinator in designation of personnel who will be trained and equipped to conduct wildlife control activities
- Establish a WHWG that will oversee, monitor and/ or implement the WHMP
- Conduct bi-annual meetings of the WHWG to review all management activities and coordinate a review of the WHMP
- Take appropriate measures, if necessary, until wildlife hazards can be alleviated
- Provide public relations and neighboring landowner partnerships for wildlife control activities
- Review proposals involving land-use changes within the 5 mile critical zone of INT
- Develop and implement a "No Feeding" of wildlife policy on airport property

Wildlife Coordinator. The Wildlife Coordinator will:

- Assist Airport Director in insuring that this WHMP, and its amendments, adhere to Federal, State and local laws and regulations, and is approved by the FAA
- Coordinate all wildlife management related activities as described in the WHMP
- Provide Airport Director with routine updates of wildlife hazard management activities
- Work cooperatively with other airport personnel to insure that wildlife hazards to aviation are minimized
- Coordinate and chair bi-annual WHWG meetings and revise WHMP, as needed
- Submit a report at each WHWG meeting regarding wildlife habit and wildlife population work accomplished since the previous meeting
- Annually obtain Federal and State wildlife depredation permits, annually compile all management records and complete depredation permit reports

- Maintain equipment and supplies for conducting wildlife control activities
- Work with all INT airfield staff to insure all hazardous wildlife activity is documented and managed
- Communicate the importance of wildlife strike reporting to all operations personnel, pilots, maintenance staff, and others, and inform them of strike reporting procedures
- Insure that all strikes are reported to the FAA and that all strike remains are sent to the Smithsonian Feather ID Lab for positive identification
- Review proposals involving landscaping, site development, security, mowing, building construction, maintenance, and other activities to insure that wildlife attractants are not created
- Assist Airport Director in review of proposals involving land-use changes within the 5 mile critical zone of INT
- Complete annual FAA mandated wildlife hazard management training course and attend Birdstrike USA/Canada meetings, as practical

Airport Law Enforcement. Airport law enforcement and security personnel will:

- Smith-Reynolds airport currently does not employ airport police.

Airport Fire Department. Airport fire department personnel will:

- Assist the Wildlife Coordinator with wildlife control activities
- Contact the Wildlife Coordinator if any specific, critical wildlife hazards are detected on or around the airfield
- Inspect runways and taxiways for wildlife activity and strikes, as part of normal surface checks
- Collect bird and other animal remains found during airfield inspections for identification by the Wildlife Coordinator
- Respond to and/or communicate wildlife-related emergency situations and the presence of hazardous wildlife to the Wildlife Coordinator
- Conduct or assist the Wildlife Coordinator with wildlife control activities
- Complete annual FAA mandated wildlife hazard management training course
- Participate in WHWG meetings

Airfield Maintenance. Airfield maintenance personnel will:

- Maintain the perimeter fence to exclude mammals such as deer, coyotes, and feral dogs
- Assist with habitat modification
- Minimize pooling of water on the AOA by maintaining proper drainage
- Complete annual FAA mandated wildlife hazard management training course
- Coordinate landscaping changes with the Wildlife Coordinator to insure attractive wildlife habitat is minimized
- Assist the Wildlife Coordinator with wildlife control activities
- Participate in WHWG meetings

Terminal Operations. Staff operating in the terminal areas at INT will:

- Inform operations personnel of any violations of the INT "No Feeding" policy by individuals in and around the terminal
- Inform the Wildlife Coordinator of the presence of birds or other hazardous wildlife within the terminal area
- Participate in WHWG meetings

FAA Airports Division. The FAA will:

- Review and provide recommendations during periodic reviews of the WHMP developed for INT
- Assist INT in reviewing proposed land-use changes, construction plans, and mitigation projects for potential wildlife hazards to aircraft
- Participate in WHWG meetings, upon request from the Airport Director or Wildlife Coordinator

FBO, Airline Representatives and Pilots. All airline personnel, working either full-time or transient at INT will:

- Inform the Wildlife Coordinator of the presence of birds or other hazardous wildlife within the AOA and/or terminal areas
- Record strikes on the Wildlife Strike Report Form, FAA 5200-7 and forward the completed form to the Wildlife Coordinator for submission to the FAA
- Participate in WHWG meetings, upon request from the Airport Director or Wildlife Coordinator

USDA APHIS Wildlife Services. WS involvement in wildlife control at INT will depend on the need for assistance and funding resources. Assistance from WS may include:

- Participation in WHWG meetings
- Advice, recommendations, and training regarding identification and management of wildlife hazards at INT
- Wildlife hazard management activities
- Recommendations for updates to the WHMP

Wildlife Hazard Working Group. The WHWG will:

- Meet at least 2 times annually and more frequently, if necessary
- Annually review the WHMP and recommend any needed amendments
- Monitor wildlife strike reports and wildlife control activities and make recommendations to the Wildlife Coordinator
- Consist of the Wildlife Coordinator (Chair), Airport Director, and least one individual from Airport Fire Department, Airfield Maintenance, and Terminal Operations
- Include the airline or FBO representatives, and surrounding landowners.

SECTION 2 – WILDLIFE MANAGEMENT AND LAND-USE CHANGES

FAR 139.337(f)(2) ***A list prioritizing the following actions identified in the wildlife hazard assessment and target dates for their initiation and completion: (i) Wildlife population management; (ii) Habitat modification; and (iii) Land use changes.***

Wildlife population and wildlife habitat management are key components of an effective, integrated wildlife hazard management program. Population management generally involves wildlife harassment and/or removal. Habitat management includes alteration of wildlife habitat and attractants, including exclusion from heavily used locations. Land-use changes are continuous in the landscape both on and surrounding INT property. Designing airport expansion projects that address wildlife hazards and working cooperatively with neighboring landowners and others within the 5 mile critical zone are crucial components of wildlife hazard management. The FAA/USDA Manual, *Wildlife Hazard Management at Airports* (http://wildlife.pr.erau.edu/EnglishManual/2005_FAA_Manual_complete.pdf) provides specific information on wildlife hazard management techniques.

Table 1. Wildlife population management, wildlife habitat management, and land use change practices related to reducing wildlife hazards at INT.

Wildlife Population Management Practices at INT	
Maintain zero tolerance policy toward deer, coyotes, wild turkeys, American crows, Rock doves, turkey vultures, European starlings, and Red-tailed hawks, at a minimum, harass these species whenever they are observed on the AOA	Continuous
Lethally remove all deer, coyotes, and Rock doves geese, when safe to do so	Continuous
Encourage/assist adjoining landowners in to trap and remove Rock doves.	Continuous
Insure that all animal carcasses related to aircraft strikes and lethal removal under depredation permits are properly buried to minimize attraction of vultures	Continuous
Reduce turkey vulture activity by routinely patrolling local roads within a five mile radius of the INT and remove road-killed animals. Lethally remove turkey vultures as needed and operate only under conditions specified within depredation permits issued by USFWS	Continuous
Actively harass wild turkeys with pyrotechnics. Lethally remove wild turkey as needed and operate only under conditions specified within depredation permits issued by NCWRC	Continuous
Obtain and maintain a USFWS migratory bird depredation permit. This	Continuous

permit will allow you to use lethal removal when needed of wildlife hazards such as Red-tailed hawks, turkey vultures, and mourning doves.	
Wildlife Habitat Management Practices at INT	
Shrubland:	
Remove all shrubs along ditch banks by selective herbicide treatment, herbicide application will minimize the need for mowing in these areas and decrease available wildlife food and cover near active areas, herbicides with the active ingredient triclopyr will kill shrubs while not harming soil stabilizing grasses	Any month, 2014-2018
Spot treat with herbicide to keep shrub cover to a minimum	As needed
Grassland:	
Follow guidelines located in FAA Certalert No. 98-05 (Appendix C)	Continuous
Continue maintenance of grassland areas and clear zones through periodic mowing, grass height of 8 to 12 inches is recommended	Continuous
Do not use brown-top millet, pearl millet, winter wheat, ryegrass, or any other bird seed producing grasses for soil stabilization or other purposes during future improvements	Continuous
Gradually convert as much of the airfield grassland as practical to tall fescue, fescue is one of the least attractive sod grasses to many wildlife species	Continuous
Airfield Operations Area:	
All potholes and large mudholes should be filled and maintained so as not to hold water, standing water serves as an added attractant on the AOA	Continuous
Insure that no airport personnel or members of the public intentionally feed any wildlife on INT property	Continuous
Routinely monitor dumpsters, inform personnel to keep lids closed when not in use	Continuous
Stormwater ponds:	
Work cooperatively with NC Department of Environment and Natural Resources to minimize new stormwater ponds associated with any potential airport expansion	Continuous
Structural Modifications:	
Reduce structure nesting birds, such as Rock doves, European starlings and house sparrows, by minimizing access to hangars, the passenger terminal, and other buildings	Continuous
Reduce perching sites for red-tailed hawks, American kestrels, eastern meadowlarks, and other birds by installing bird spikes, bird coils, and other exclusion devices to communications towers, ILS equipment, lights, and signs	Any month, 2013
As practical and when any new sections of perimeter fence are constructed, increase fence height to a minimum of 10 feet above ground with barbed wire outriggers and bury at least 1 foot below ground, this will drastically reduce the ability of deer to jump over the fence and discourage coyotes from digging under	Continuous

Terminal Area:	
Consult USDA Wildlife Services personnel prior to establishment of any new ornamental landscaping plants, review wildlife attractiveness of already established planting	Continuous
Land-Use Change Practices at INT and Surrounding Area	
Insure that all new structures, landscaping, and soil stabilization practices associated with planned airport expansion are designed to be compatible with minimizing wildlife hazards	Continuous
Evaluate feasibility of purchasing adjacent private property or entering into land use agreements or land rental	Continuous
Identify landowners around INT to determine attitudes toward high numbers of Rock doves and possible control	Any month, 2014-2018

SECTION 3 – PERMITS AND REGULATIONS

FAR 139.337(f)(3) ***Requirements for and, where applicable, copies of local, State, and Federal wildlife control permits.***

Most forms of wildlife and their habitat are protected by one or more Federal, State, and/or Municipal laws. Prior to implementing control actions involving wildlife, the legal status and permit requirements of the target species must be determined. INT is responsible for adhering to the current regulations regarding wildlife management and for obtaining the appropriate permits to take wildlife. The Wildlife Coordinator at INT is responsible for obtaining and maintaining appropriate wildlife permits, and may be assisted in this process by a WS Wildlife Biologist. Permits to take wildlife in North Carolina are issued by the North Carolina Wildlife Resources Commission (NCWRC) and United States Fish and Wildlife Service (USFWS).

NCWRC REGULATIONS

North Carolina wildlife laws involving birds, mammals, reptiles, and amphibians, as well as State threatened and endangered (T&E) species are administered by the NCWRC. Permits are issued on an annual basis and typically follow the calendar year. A copy of the current NCWRC depredation permit for the take of State regulated wildlife species is located in Appendix D.

USFWS REGULATIONS

Several Federal regulations, including the Migratory Bird Treaty Act (MBTA), the Lacey Act, the Endangered Species Act, the Bald and Golden Eagle Protection Act, the Clean Water Act, and the Federal Insecticide, Fungicide, and Rodenticide Act regulate various aspects of wildlife management activities at INT. While NCWRC permits take for deer, turkeys, and other State jurisdiction species, the United States Fish and Wildlife Service (USFWS) manage depredation permits for migratory birds. Permits from the USFWS must also be updated annually, unless otherwise stated on the permit. A copy of the current USFWS depredation permit for the take of Federal regulated wildlife species is located in Appendix E.

NEPA REGULATIONS

In addition, it should be noted that capital projects on the airfield that impact wildlife or require habitat modifications, may require review under the National Environmental Policy Act. The regulations apply to both federal funded projects and projects funded with local dollars.

SECTION 4 - RESOURCES

FAR 139.337(f)(4) ***Identification of resources that the certificate holder will provide to implement the plan.***

Habitat management and wildlife control supplies and equipment can be purchased from commercial sources. An adequate supply of equipment will be maintained at INT at all times for use by trained personnel.

AIRPORT SUPPLIES

Wildlife Identification, Strike Collection, and Record Keeping Supplies.

- Bird and mammal field guides
- Clipboard with blank copies of Wildlife Management Log and FAA Wildlife Strike Form 5200-7
- Digital camera
- 10 X 42 binoculars
- Latex gloves, alcohol wipes, zip-loc bags, and Sharpie markers for strike remains collection
- Black garbage bags for collecting carcasses of depredated and/or struck wildlife
- Airport VHF radio

Wildlife Population Management Supplies.

- 15 mm pyrotechnics launcher
- 15 mm bird bangers and screamers
- Airport VHG radio

Wildlife Attractant/Habitat Management Supplies.

- Tractor with bat wing mower for larger areas
- ZTR mower for smaller, more manicured areas
- Back pack type sprayer
- Herbicide with active ingredient triclopyr

Resources Maintained in the Office of the Wildlife Coordinator.

- INT Wildlife Hazard Management Plan
- INT Wildlife Hazard Assessment
- FAA/WS manual *Wildlife Hazard Management at Airport*

USDA WILDLIFE SERVICES ASSISTANCE

INT can request assistance from Wildlife Services personnel in harassing or removing wildlife from the airport and/or providing technical assistance. Funding for this assistance may or may not be available through the North Carolina Department of Transportation, Division of Aviation (NCDOA). Contact the WS Northeastern District SupervINTr (252-902-1755) for more information regarding available assistance.

SOURCES OF WILDLIFE MANAGEMENT SUPPLIES AND EQUIPMENT

The following list contains contact information for numerous wildlife management equipment suppliers and/or manufacturers. This list was compiled to assist INT personnel in obtaining wildlife management supplies, equipment, and information and does not represent any endorsement of any device type, manufacturer, or distributor.

Metal exclusion devices and netting

Bird-B-Gone
24362 Via Madrugada
Mission Viejo, CA 92692
800-392-6915
www.birdbgone.com

Bird Barrier
20925 Chico St.
Carson, CA 90746
800-503-5444
www.birdbarrier.com

Bird Barrier America
300 Calbert Ave.
Alexandria, VA 22301
800-662-4737
www.birdbarrier.com

Bird-X, Inc.
300 N. Elizabeth St.
Chicago, IL 6067
800-662-5021
www.bird-x.com

Cat Claw Inc.
P.O. Box 3778
Johnstown, PA 15994
814-266-5544
www.catclaw.com

Nixalite of America
417 25th St.
Moline, IL 61265
800-624-1189
www.nixalite.com

Nylon Net Co.
845 N. Main St. P.O. Box 592
Memphis, TN 38101
800-238-7529
www.nylonnet.com

Wildlife Control Technology, Inc
2501 N. Sunnyside
Fresno, CA 93727
800-235-0262
www.wildlife-control.com

Other exclusionary devices

Airport Surface Technologies
53 E. Jackson Blvd. Suite 1524
Chicago, IL 60604
312-692-1962
(AvTurf)
www.avturf.com

Euro-Matic Plastics, Inc.
2201 Old Stantonsburg Rd.
Wilson, NC 27893
919-206-1400
(Bird balls)
www.euro-matic.com

Wildlife Control Technology
2501 N. Sunnyside Ave.
Fresno, CA 93727
800-235-0262
(Bird balls)
www.wildlife-control.com

Pyrotechnic devices

Reed-Joseph International
800 Main St. P.O. Box 894
Greenville, MS 38702
800-647-5554
www.reedjoseph.com

Margo Supplies, Ltd.
P.O. Box 5400
High River, Alberta, Canada T1V 1M5
403-652-1932
www.margosupplies.com

Traps and trapping supplies

Forestry Suppliers, Inc.
205 W. Rankin Street
P.O. Box 8397
Jackson, MS 39284
800-360-7788
www.forestry-suppliers.com

Ketch-All Company
4149 Santa Fe Road #2
San Luis Obispo, CA 93401
805-543-7223
www.ketch-all.com

Minnesota Trapline Products
7444 County Rd. 27 N.W.
Pennock, MN 56279
320-599-4176
www.minntrapprod.com

Montgomery Fur
1539 W. 3375 S.
Ogden, UT 84401
801-394-4686
www.montgomeryfur.com

Tomahawk Live Trap, Co.
P.O. Box 323
Tomahawk, WI 54487
800-272-8727
www.livetrap.com

SECTION 5 - WILDLIFE HAZARD MANAGEMENT PROCEDURES

FAR 139.337(f)(5) Procedures to be followed during air carrier operations that at a minimum includes:

139.337(f)(5)(i) Designation of personnel responsible for implementing the procedures;

Personnel responsibilities are described in Section 1 – Authorities and Responsibilities. The Airport Director and Wildlife Coordinator will insure that all designated personnel are trained, qualified, and proficient in managing wildlife hazards at INT.

139.337(f)(5)(ii) Provisions to conduct physical inspections of the aircraft movement areas and other areas critical to successfully manage known wildlife hazards before air carrier operations begin;

INT operations, law enforcement, and fire personnel should survey movement areas and other areas critical for wildlife related hazards as part of daily surface and security checks. Any direct, immediate hazards will be reported to the Wildlife Coordinator and will be resolved as soon as possible and prior to upcoming aircraft arrivals and departures. All movement area surveys will be documented in the wildlife log, regardless if any wildlife species are noted. During periods of exceptionally heavy wildlife activity, the Wildlife Coordinator will consult with the Airport Director concerning issuance of a Notice to Airmen (NOTAM) for specific locations and wildlife species.

139.337(f)(5)(iii) Wildlife hazard control measures;

Although wildlife habitat alteration is the keystone wildlife hazard reduction method at INT, direct control techniques which are safe, effective, legal, and environmentally responsible will be used, as directed by the Wildlife Coordinator and permitted by NCWRC and USFWS. Direct control efforts will be applied primarily to resolve emergency situations and to increase the effectiveness of pyrotechnics and other harassment techniques. The FAA/WS manual, *Wildlife Hazard Management at Airports,* should be used as a basic guide for effectively managing wildlife through habitat alteration and direct control methods. This manual will be available in the Wildlife Coordinator's office and can be found online at *www.wildlife-mitigation.tc.faa.gov.* The remaining portions of this section contain both wildlife habitat and wildlife population management activities specifically developed for the most hazardous species at INT. Timely application of these activities will insure a safer environment related to wildlife strikes.

WILDLIFE PATROL

INT personnel will conduct at least two wildlife patrols during the daylight hours, preferably one each during the morning and evening periods. Nighttime spotlight surveys will be conducted along the entire perimeter and cover the AOA. These surveys will be completed at least two

times per month and more frequently if deer and coyote numbers appear to be increasing on the airfield. All wildlife patrols and spotlight surveys will be documented in the wildlife log, with date, time, weather, species, location, number, and disposition being noted.

Runway sweeps will be conducted at least once daily. Any carcasses found on the runway or within 250 feet of the runway centerline or 1,000 feet off the end of each runway, will be considered strikes and recorded on FAA Form 5200-7 (Appendix F). In addition, any carcasses found on taxiway or anywhere else on or off the airport that the Airport Director has reason to believe was the result of a strike with an aircraft will also be recorded on FAA Form 5200-7. Bird or mammal remains found should be placed in a plastic freezer bag and sent to the Smithsonian Feather ID Lab, with a copy of the strike report attached. In addition to carcasses found on the airport, wildlife strikes also include: (1) strikes reported by pilots, (2) evidence of wildlife strikes found and reported by aircraft maintenance personnel, and (3) direct observation of any strikes by INT personnel. All wildlife strike forms will be submitted to the Wildlife Coordinator for reporting to the FAA. Wildlife strike forms may be submitted electronically to the FAA at *www.wildlife-mitigation.tc.faa.gov*. Printouts of FAA strike reports should be maintained by the Wildlife Coordinator.

BIRD HAZARD MANAGEMENT

Smith-Reynolds Airport must obtain and maintain a USFWS migratory bird depredation permit before lethally removing any federally regulated bird. As of November 2013, the application (Form 3-200-13) has been submitted to the Department of Interior, U.S. Fish and Wildlife Service. A total of 46 species of birds were recorded at INT during the year-long WHA data collection period. Most of these species present only the smallest concerns related to aviation safety while a few are of major concern. American crow, Rock doves, Wild turkeys, European starlings, and Red-tailed hawks, were determined to be the most hazardous bird species at INT due to combinations of individual size, individual density, flock size, and behavior. An integration of multiple methods will be employed for maximum effectiveness. Properly applied, the techniques listed in this WHMP and in the FAA/WS document *Wildlife Hazard Management at Airports* would reduce most hazards involving species of concern at INT. On occasion, species other than the ones specified below may be deemed hazards to aviation. If any of these other species are present in numbers and locations determined to be hazardous, harassment and lethal control will be used in accordance with standard protocol and depredation permits.

American Crow. The following techniques and procedures will be utilized to manage hazards from American crows at INT:

- Maintain a zero tolerance policy toward American crow, at a minimum, harass with pyrotechnics and/or vehicle chase, lethally remove in emergency situations and to improve the effectiveness of pyrotechnics
- Record all observations, harassment methods, and depredation activities in the wildlife log

Red-tailed hawk management. The following techniques and procedures will be utilized to manage hazards from Red-tailed hawk at INT:

- Maintain a zero tolerance policy toward Red-tailed hawks, harass with pyrotechnics whenever possible and lethally remove, anytime it is safe to do so, to improve the effectiveness of pyrotechnics and quickly reduce hawk numbers in the area
- Ensure that seed producing grasses, such as brown-top millet, proso millet, winter wheat, winter ryes, and oats, are not used for soil stabilization during construction projects. These grasses provide food for rodents that hawks eat.
- Follow all requirements listed in the USFWS depredation permit for depredation of mourning doves
- Exclude Red-tailed hawks from perching on lights, signs, towers, and other structures using bird spikes, zip ties, and other devices
- Record all observations, harassment methods, and depredation activities in the wildlife log

European starling management. The following techniques and procedures will be utilized to manage hazards from European starlings at INT:

- Maintain a zero tolerance policy toward all starlings, harass with pyrotechnics whenever possible, lethally remove in emergency situations and to improve the effectiveness of pyrotechnics, when safe to do so
- Ensure that seed producing grasses, such as brown-top millet, proso millet, winter wheat, winter rye, and oats, are not used for soil stabilization during construction projects.
- Exclude starlings from nesting in the terminal buildings and hangars using netting, hardware cloth, or other permanent material
- Exclude starlings from perching on lights, signs, towers, and other structures using bird spikes, zip ties, and other devices
- Record all observations, harassment methods, and depredation activities in the wildlife log

Rock dove management. The following techniques and procedures will be utilized to manage hazards from starlings at INT:

- Maintain a zero tolerance policy toward Rock doves, lethally remove anytime it is safe to do so, harass with pyrotechnics and vehicle chase where lethal removal is not practical
- Remove all trash from AOA when located.
- Exclude Rock doves from nesting in the terminal buildings and hangars using netting, hardware cloth, or other permanent material
- Exclude Rock doves from perching on lights, signs, towers, and other structures using bird spikes, zip ties, and other devices
- Record all observations, harassment methods, and depredation activities in the wildlife log

Wild Turkey management. The following techniques and procedures will be utilized to manage hazards from red-winged blackbirds at INT:

- Maintain a zero tolerance policy toward Wild turkeys, harass with pyrotechnics whenever possible. **Lethal removal is only permitted with a special permit. Lethal removal of Wild turkeys is not lawful with a standard airport depredation permit.**
- Follow all requirements listed in the NCWRC depredation permit for depredation of Wild turkeys.
- Record all observations, harassment methods, and depredation activities in the wildlife log

MAMMAL HAZARD MANAGEMENT

Surveys conducted by WS personnel during the WHA indicated that white-tailed deer and coyotes were the two most likely mammal species to present safety hazards at INT. Although other species including bobcat, coyote, eastern cottontail rabbit, feral cat, feral dog, gray fox, raccoon were observed, deer and coyotes will be the focus of mammal management at INT. Other mammal species at INT will also be managed if they become more numerous or are found in critical locations in the future.

White-tailed deer management. The following techniques and procedures will be utilized to manage hazards from deer at INT:

- Do not feed or bait deer on airport property.
- Maintain a zero tolerance policy toward white-tailed deer, lethally remove anytime it is safe to do so
- Maintain AOA grass heights of 8 to 12 inches to minimize attractiveness to most hazardous bird species while not providing enough cover for bedding deer
- Remove all shrub areas inside the perimeter fence by mowing or with herbicide in areas that cannot be mowed. Triclopyr is the preferred active herbicide ingredient
- Work with NCDOT-DOA and FAA to obtain grant to purchase and install perimeter fence with minimum 10 foot fence with at least 1 foot buried in the ground, as current fence sections are replaced and/or new fencing is installed. To be included in Capital Improvement Program Fiscal Year Ending 2016.
- Work with City government to allow professional marksmen to cull the deer herd on airport property.
- Follow all requirements listed in the NCWRC depredation permit for depredation of deer. The permit is requested by the Airport Director each year from the North Carolina Wildlife Resource Commission Division of Wildlife Management with the authority under Statue GS113-274.
- Record all observations, harassment methods, and depredation activities in the wildlife log

Coyote management. The following techniques and procedures will be utilized to manage hazards from coyotes at INT:

- Maintain a zero tolerance policy toward coyotes, lethally remove with snares and foot hold traps anytime it is safe to do so
- Remove all shrub areas inside the perimeter fence by mowing or with herbicide in areas that cannot be mowed, such as ditch banks. Triclopyr is the preferred active herbicide ingredient
- Work with NCDOT-DOA and FAA to obtain grant to purchase and install perimeter fence with minimum 10 foot fence with at least 1 foot buried in the ground, as current fence sections are replaced and/or new fencing is installed. To be included in Capital Improvement Program Fiscal Year Ending 2016.
- Insure that all coyote digs under fences are filled as soon as they are discovered
- Maintain exclusion fencing over openings in culverts and other access points onto the AOA
- Follow all requirements listed in the NCWRC depredation permit for depredation of coyotes. The permit is requested by the Airport Director each year from the North Carolina Wildlife Resource Commission Division of Wildlife Management with the authority under Statue GS113-274.
- Record all observations, harassment methods, and depredation activities in the wildlife log

139.337(f)(5)(iv) ***Ways to communicate effectively between personnel conducting wildlife control or observing wildlife hazards and the air traffic control tower.***

Air Traffic Control Tower.

- Warn pilots of observed or reported wildlife hazards by issuing NOTAMs over the ATIS.
- Delay aircraft movements, if necessary, to avoid wildlife strikes.
- Record strikes on the Wildlife Strike Report Form, FAA 5200-7, and forward the completed form to the Wildlife Coordinator for submission to the FAA.
- Notify the Wildlife Coordinator of all wildlife activity observed on or around the airfield by completing and submitting the Daily Wildlife Activity Report Form.
- Participate in WHWG meetings, upon request.
- The Air Traffic Control Tower maintains a phone list including mobile phones in order to contact Airport employees and/or personnel conducting wildlife control for the removal of wildlife from airfield.
- The Air Traffic Control Tower may also use two way radios to contact Airport employees and/or personnel conducting wildlife control that are monitoring the ground or air traffic control frequency to direct them to wildlife hazards.

SECTION 6 - EVALUATION

FAR 139.337(f)(6) ***Procedures to review and evaluate the wildlife hazard management plan every 12 consecutive months or following an event described in (b)(1), (b)(2), and (b)(3) of this section, including: (i) The plan's effectiveness in dealing with known wildlife hazards on and in the airport's vicinity and (ii) Aspects of the wildlife hazards described in the wildlife hazard assessment that should be reevaluated.***

This WHMP will be reviewed at least once every 12 consecutive calendar months or following a triggering event. The WHWG will determine the effectiveness of the WHMP at reducing wildlife strikes at INT and monitor the status of hazard reduction projects, including their completion dates.

MEETINGS

The WHWG will meet at least twice each year, but the group may meet more frequently if situations arise, as determined by the Wildlife Coordinator. The group will examine the effectiveness of the WHMP in reducing wildlife hazards at INT.

MONITORING

The Wildlife Coordinator will insure that all operations personnel working on the AOA be proficient in completing a standardized wildlife observation and management log. Recording wildlife presence, management techniques applied, results of management practices, and other detailed information will result in important information for future expectations and management. All information from annual depredation permit reports can also be derived from the wildlife management log and other monitoring activities.

WILDLIFE STRIKE DATABASE

The Wildlife Coordinator is responsible for documentation of wildlife population monitoring, hazard management, and strikes at INT. The Wildlife Coordinator will insure that all operations personnel, tenant personnel, and any other individuals dealing directly with flights and aircraft maintenance, know to contact operations in the event of any known strike. Encouraging improved strike reporting is the key to knowing what species are most in need of management at INT. FAA Form 5200-7 will be completed and submitted electronically by the Wildlife Coordinator as soon as possible after a strike is reported. A printed copy of each strike Form and the airport wildlife log will be maintained by the Wildlife Coordinator. A summary of wildlife strikes and management activities will be prepared by the Wildlife Coordinator and presented to the WHWG at each meeting for review. This summary will be developed based on airfield wildlife observation data and list wildlife species involved in strikes and identify trends in wildlife activity.

SECTION 7 - TRAINING

FAR 139.337(f)(7) ***A training program conducted by a qualified wildlife damage management biologists to provide airport personnel with the knowledge and skills needed to successfully carry out the wildlife hazard management plan required by paragraph (d) of this section.***

Training is essential for personnel involved with implementing this WHMP. The Wildlife Coordinator and Airport Director will insure that all personnel conducting wildlife damage management are properly trained in the wise selection and application of control methods.

FAA MANDATED TRAINING

All wildlife control personnel will receive, at least once every 12 consecutive calendar months, training in identifying and mitigating wildlife hazards at airports, including an overview of laws associated with wildlife control, management techniques, effective use of firearms and pyrotechnics, and wildlife identification and dispersal procedures. NCDOA, in cooperation with USDA Wildlife Services, provides annual FAA certified training courses throughout North Carolina. The Wildlife Coordinator will maintain a record of all personnel attending this annual training. Training must be conducted in accordance with FAA AC 150/5200-36A.

BIRD STRIKE COMMITTEE USA ANNUAL CONFERENCE

As practical, the Wildlife Coordinator will attend the Bird Strike Committee USA annual conference. This conference is held in alternating years between the United States and Canada. This conference provides airport wildlife management personnel with a forum to meet with airport managers and discuss issues from throughout North America and the world. Technical sessions generally focus on results and management implications from recent research related to wildlife management at airports. Practical management strategies can be developed from the detailed information gathered at these conferences.

AGENCY DIRECTORY

Permitting

U.S. Fish and Wildlife Service (USFWS)
Wildlife Permitting
Migratory Bird Permit Office
P.O. Box 49208
Atlanta, GA 30359
404-679-7049
www.fws.gov

North Carolina Wildlife Resources Commission (NCWRC)
Wildlife Permitting
Division of Wildlife Management
1724 Mail Service Center
Raleigh, NC 27699-1724
919-707-0060
www.ncwildlife.org

Technical assistance

Federal Aviation Administration (FAA)
Southern Regional Office
1701 Columbia Avenue
College Park, GA 30337
404-305-5002
www.faa.gov

FAA Staff Wildlife Biologist
FAA Air Safety and Compliance
800 Independence Ave., SW
Washington, DC 20591
202-267-3389
www.faa.gov

USDA/ APHIS – Wildlife Services
6213-E Angus Drive
Raleigh, NC 27617
919-786-4480
866-487-3297 (North Carolina residents)
www.aphis.usda.gov

Attachment G

Cultural Resources Documentation

(2014 and 2017)

ARCHAEOLOGICAL SURVEY FOR PROPOSED IMPROVEMENTS AT SMITH REYNOLDS AIRPORT (FAA LOCATION IDENTIFIER: INT), WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

DRAFT REPORT

Submitted to:

AVCON, INC.
8604 Cliff Cameron Drive, Suite 145
Charlotte, North Carolina 28629

By:

TRC ENVIRONMENTAL CORPORATION
50101 Governors Drive, Suite 250
Chapel Hill, North Carolina 27517

Authored by:

Bruce Idol

May 2014

ABSTRACT

TRC Environmental Corporation (TRC) has completed an archaeological survey for proposed improvements at Smith Reynolds Airport in Winston-Salem, Forsyth County, North Carolina, on behalf of AVCON, Inc. The project area consists of two tracts on the existing airport property that total 86.6 acres, including a 59.5 acre area mainly located north of Runway 4-22 (the northern project tract) and a 27.1 acre area (southern project tract) situated east of Runway 15-33. Both tracts will be affected by proposed improvements according to the updated Smith Reynolds Airport Master Plan.

One archaeological site (31FY839) had been previously recorded within the southern project tract. 31FY839 produced a single nondiagnostic artifact associated with an unidentified prehistoric component during a previous visit (Hargrove 1993) and was revisited during the present work. An additional site (31FY269) recorded in the early 1970s is mapped within the northern project tract, but was reported destroyed by construction at that time. That site was not encountered by the current survey. Available early- to mid-20th century maps depict a single structure inside the northern project tract. This structure appears on the 1913 county soils map and is situated in an area near a Winston-Salem/Forsyth County school maintenance facility that has been graded and filled. At least two structures appear in a 1939 aerial photograph near present Runway 4-22, and there appear to be additional structures in the northern and western part of the tract on that photograph. None of these are shown on the 1951 quadrangle, however. Similarly, no structures are shown in the southern project tract on the 1948 aerial or the 1951 quadrangle. Two related structures appear on a 1971 aerial photograph in or near the southeastern part of that tract.

There is documentary evidence that at least two cemeteries were formerly located in the airport vicinity. The Foy Cemetery was an early twentieth century private cemetery located on the property of J. Rufus Foy, and its location and status are unknown. The Evergreen Cemetery was established in 1928 (see below).

The field survey was conducted from March 26–April 4, 2014, and was directed by Bruce Idol. The survey included the excavation of 298 shovel tests (including delineation tests), as well as inspection of eroded surfaces. Most of the project area is undeveloped and wooded, and is characterized by eroded to severely eroded soils. Extensive parts of the area north of Runway 4-22 have been graded and are partly in fill, and a small portion near a large hangar is filled and paved. Most of the area east of Runway 15-33 is undeveloped and wooded; a small area adjacent to the runway area has been cut well below grade.

The survey identified one previously recorded site (31FY839) and two new archaeological sites (31FY1193 and 31FY1194) within the two project tracts. Two of the three identified archaeological sites are situated within the southern project area. 31FY839 produced two lithic artifacts representing an unidentified prehistoric component. 31FY1193 is a 20th century modern site represented by landscaped vegetation, scattered architectural debris and other artifacts related to domestic occupation, and a contemporary trash dump. No intact subsurface deposits or identifiable foundation remains were encountered, and the site appears related to one or both structures shown on the 1971 aerial photo. TRC recommends that these two resources be determined not eligible for the National Register of Historic Places (NRHP), and recommends no additional archaeological investigation in association with this project.

The third site (31FY1194) is a portion of an abandoned 20th century cemetery identified near the eastern edge of the northern project tract. The site represents the visible remnants of the former Evergreen Cemetery, a large cemetery established in 1928 for African-Americans and used into the early 1940s, when the property was acquired for airport expansion. Although a large number of graves were moved from the cemetery in 1943 or early 1944 (City of Winston-Salem Government Meeting Notes 1944),

detailed records of the grave removal could not be located, and the extent of the area from which graves were removed is presently uncertain.

The surviving portion of the cemetery is represented by standing and broken stone, cement, and metal grave markers, along with grave shaft depressions. It seems reasonable to assume that at least some of the graves in this area were not removed, and based on this assumption, this portion of the former cemetery area has been designated archaeological site 31FY1194 (following the OSA guidelines for treatment of abandoned cemeteries). Although 31FY1194 is not recommended eligible for the NRHP, any surviving graves are protected by North Carolina state statutes, minimally including G.S. 14-148 (*Defacing or desecrating grave sites*), 14-149 (*Desecrating, plowing over or covering up graves; desecrating human remains*), and Chapter 70, Article 3 (*The Unmarked Human Burial and Human Skeletal Remains Protection Act*) (see Appendix 1).

Since 31FY1194 likely contains both marked and unmarked graves, it is recommended that no ground-disturbing activities be allowed within its boundaries, and that the 31FY1194 location and a surrounding 50-foot buffer be marked in the field and shown on the Airport Layout Plan. In the event that any disturbances are planned within the buffer area, additional investigations are recommended to ensure that no graves are present in that area.

Although it is likely that most – if not all – graves were removed from the rest of the former Evergreen Cemetery area, it is possible that some graves remain in the former cemetery outside 31FY1194. Consequently, monitoring or additional investigations (to identify the potential for surviving interments) is recommended prior to any ground disturbance that would extend more than 18 inches (1.5 ft) below the existing grade in that portion of the former cemetery outside of 31FY1194 and its associated buffer, as shown on Figure 6.1. Finally, in the event of any discoveries of human remains, funerary hardware (casket handles, etc.), or grave markers within that area or elsewhere on airport property, work in the immediate vicinity should stop immediately, and the State Archaeologist should be notified according to the provisions of *The Unmarked Human Burial and Human Skeletal Remains Protection Act*.

ACKNOWLEDGMENTS

We would like to thank Mike Darcangelo and James Moose of AVCON, Inc. for facilitating the fieldwork. Smith Reynolds Airport personnel, including Steve Flippin and David Shoaf, provided additional background information on the area and accommodated the survey in every way. The investigation also benefited from conversations with Scotty Speas, Cemetery Supervisor for the City of Winston-Salem Properties and Facilities Management Cemetery Office, the staffs of the Forsyth County Public Library (North Carolina Room) and the Forsyth County Register of Deeds, and with Debra Blake of the North Carolina Division of Archives and Records.

At TRC, Johann Furbacher, Jeff Johnson, and Andrius Valiunas assisted with the fieldwork. Background research was performed by Johann Furbacher, Jeff Holland, Bruce Idol, and Paul Webb. Matt Paré prepared the figures and photographs, and Heather Millis copyedited the report.

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FIGURES

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1. INTRODUCTION

TRC Environmental Corporation (TRC) has completed an archaeological survey for proposed improvements at Smith Reynolds Airport in Winston-Salem, Forsyth County, North Carolina (Figures 1.1 and 1.2). The study was undertaken to inventory archaeological resources that might be affected by proposed development projects and to determine if any additional archaeological investigations might be necessary. The field survey was conducted from March 26–April 4, 2014, and was directed by Bruce Idol.

The project area consists of two irregular tracts totaling 86.6 acres in northeast Winston-Salem in Forsyth County (Figure 1.3). Topographically, the project areas include parts of broad upland ridge toes, associated side slopes, and wetland areas adjacent to Brushy Fork Creek. The northern project tract is undeveloped, but includes large cleared areas that are graded and filled in the vicinity of Runway 4-22, including an associated hangar area, and in the northernmost part of the tract next to a Winston-Salem/Forsyth County schools facility. The rest of that area is wooded. The southern tract is located east of Runway 15-33 and is mostly wooded. A smaller section that adjoins the cleared runway area has been cut well below the existing grade.

This report is organized in the following way. Chapter 2 provides information on the natural environment. Chapter 3 presents a summary of the culture history of the project region, including information on local history and previous research in the area. Chapter 4 specifies the research goals and methods, and the results of the background research and field survey are presented in Chapter 5. The conclusions and recommendations are provided in Chapter 6, which is followed by a list of references cited. Selected North Carolina General Statutes related to cemeteries have been attached as Appendix 1. Appendix 2 is a transcription of identified headstones from the surviving portion of Evergreen Cemetery, and Appendix 3 contains the artifact inventory. North Carolina state archaeological site forms have been provided under separate cover.

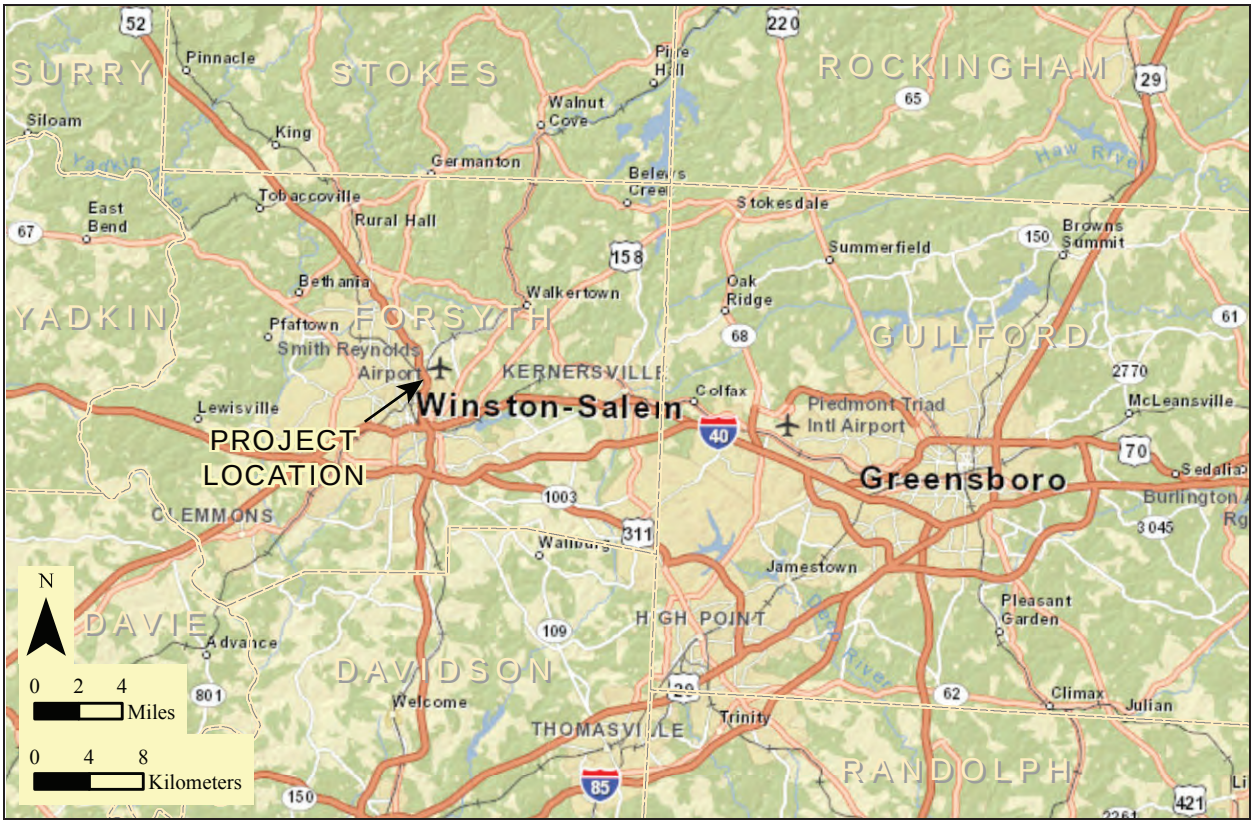

Figure 1.1. Location of Smith Reynolds Airport in the North Carolina Piedmont.

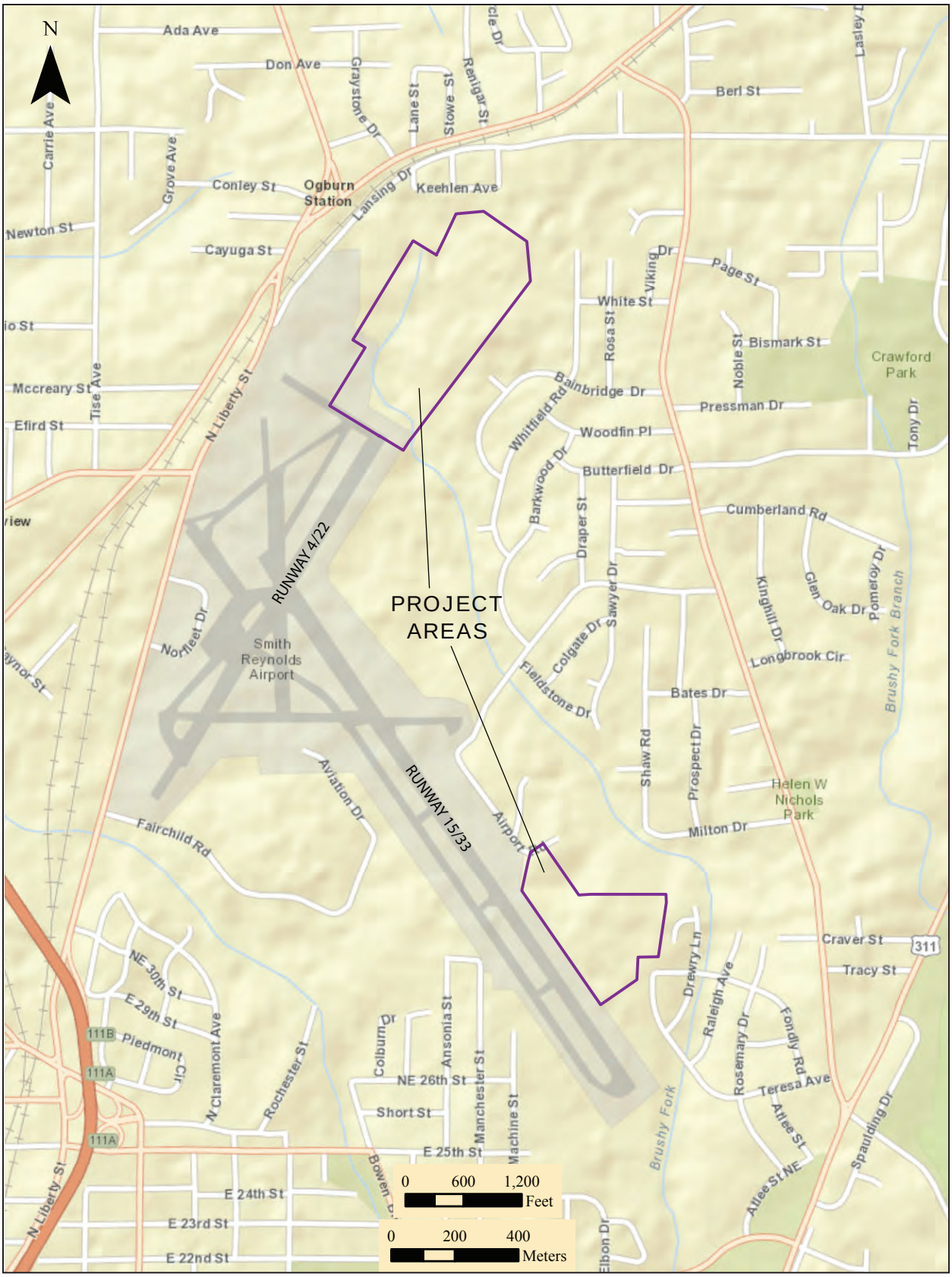

Figure 1.2. Location of the Smith Reynolds Airport project tracts in Winston-Salem, North Carolina.

Figure 1.3. The airport project tracts and surrounding topography shown on an aerial photograph (2010).

2. ENVIRONMENTAL SETTING

PROJECT SETTING

The Smith Reynolds Airport is located in the City of Winston-Salem in the central part of Forsyth County in the North Carolina Piedmont. The survey area is divided into two tracts encompassing a total of 86.6 acres. The first of these (northern tract) is situated mainly north of Runway 4-22, but includes a small part of the runway grade and a paved hangar area (see Figure 1.3). Most of the northern tract is undeveloped and wooded (Figures 2.1 and 2.2). Large cleared areas near the runway and adjacent to a Winston-Salem/Forsyth County schools facility have been graded and were found to contain fill (Figures 2.3 and 2.4). The northern tract also includes the northern end of Runway 4-22 and a paved hangar apron to the west (Figures 2.5 and 2.6); both of these areas are filled well above the natural grade. A graded and graveled access road bisects the northern tract. The southern tract located east of Runway 15-33 is undeveloped and wooded (Figures 2.7 and 2.8) except for a small section abutting the runway area. That area has been cut well below grade.

The topography consists of upland ridge sections and associated side slopes with incised first and second-order drainages. Higher resolution (2 ft) LIDAR-based contour map overlays used during the survey reveal gentle to steep side slopes, broad toe ridges, and a low knoll or ridge top remnant in the southern tract. Wooded areas on the property include large swaths of pines on the ridges and side slopes and a pine/hardwood mix around streams and lower elevations. Understory growth varies from sparse (in the southern tract) to near-impenetrable in large sections of the northern tract, especially around Brushy Fork Creek and around much of the eastern edge, and these conditions were compounded by tree fall. Surface visibility throughout the project area was limited to heavily disturbed or eroded areas.

PHYSIOGRAPHY, HYDROLOGY, GEOLOGY, AND SOILS

The study area is situated in the north-central region of the Piedmont physiographic province (Stuckey 1965:7). In North Carolina, the Piedmont stretches from the Coastal Plain to the Blue Ridge escarpment, which borders the Piedmont at the Brevard fault in the west (Orr and Stuart 2000:18–19). Piedmont topography is generally described as the result of Miocene peneplain erosion by Pliocene streams, the effects of which are accentuated by variation in the underlying rock (Kesel 1974; Soller and Mills 1991:305). Elevations in Forsyth County range from less than 700 ft above mean sea level (AMSL) in the southwestern corner where the Yadkin River exits the county to about 1,100 ft AMSL at certain locations around Kernersville and Rural Hall; the county is in the Yadkin River basin and is characterized by gently sloping to rolling topography with broad ridges (Zimmerman 1976:1).

Geologically, the project area is within the Charlotte Belt (North Carolina Geological Survey [NCGS] 1985), and is underlain by biotite gneiss and schist with small masses of granitic rock (NCGS 1985). Metavolcanic stone was important in prehistoric times for the manufacture of stone tools and can be found throughout the Carolina Slate Belt to the south and east of the study area in varying density and quality. Quartz and quartzite can be obtained from streams or upland outcrops and likely served to supplement metavolcanic materials. Soapstone outcrops also occur in the Piedmont, but are not plentiful.

The project area is situated on a divide between two branches of Brushy Fork Creek. The airport property is drained by the western branch of that stream, which flows south and empties into Salem Creek. Salem Creek flows southwest to its confluence with Muddy Creek, which empties into the Yadkin River southwest of Winston-Salem in Davidson County. The Yadkin joins the Uwharrie River in Montgomery County to form the Pee Dee, which flows southeast to the Atlantic Ocean near Georgetown, South Carolina.

Figure 2.1. Woods east of access road in northern tract, view to southeast.

Figure 2.2. Woods near creek west of access road in northern tract, view to west.

Figure 2.3. Cleared area near runway in northern tract with push piles, view to east.

Figure 2.4. Cleared area near school facility in northern tract, view to northeast.

Figure 2.5. Runway 4-22 area, view to south.

Figure 2.6. Hanger apron area, view to northwest.

Figure 2.7. Woods in southern tract (site 31FY839 area), view to east.

Figure 2.8. Woods in southern tract (near site 31FY1193 area), view to east.

Mapped soils within the project areas primarily consist of Appling sandy loam, Pacolet fine sandy loam, and Pacolet clay loam (Zimmerman 1976). Appling sandy loam (ApB, ApC) is a well-drained, upland soil with a light yellowish brown sandy loam surface layer and yellowish brown or strong brown clay loam subsoil found on gentle slopes (Zimmerman 1976:6–7). Pacolet fine sandy loam (PaC, PaD) is a well-drained soil found on gently sloping to steep slopes of the uplands with a dark yellowish brown surface layer and yellowish red clay loam subsoil (Zimmerman 1976:20). Pacolet clay loam (PcC2, PcD2) is a well-drained soil found on gently sloping to steep slopes of the uplands with a reddish brown or yellowish red surface layer and red or yellowish red clay loam or clay subsoil (Zimmerman 1976:20–21). Appling and Pacolet series soils were formed in residuum from weathered granite, gneiss, and other acidic rock (Zimmerman 1976:6).

FLORA AND FAUNA

The study area is located in the Atlantic Slope section of the Oak-Pine Forest region (Braun 1950; Oosting 1942), where mature forest vegetation occurs only in isolated stands. Presently, oak (*Quercus* spp.) and pine (*Pinus* spp.) are the most common species in upland communities, with hickory (*Carya* spp.), white poplar (*Populus alba*), red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), and dogwood (*Cornus* spp.) all common.

In addition to arboreal species, the forests supported a variety of undergrowth species. The latter included several varieties of edible berries, such as blackberries and raspberries (*Rubus* spp.) and huckleberries (*Gaylussacia* spp.), as well as numerous other species used for food and medicinal purposes.

The varied environments in the area would have supported a substantial and diverse fauna prior to Euro-American settlements (Lefler 1967). Potential game species include white-tailed deer (*Odocoileus virginianus*), turkey (*Meleagris gallopavo*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), opossum (*Didelphis marsupialis*), gray squirrel (*Sciurus carolinensis*), and fox squirrel (*Sciurus niger*). Deer and turkey would have been especially numerous in sub-climax forest settings such as clearings created by forest burning. Other species present include beaver (*Castor canadensis*), gray fox (*Urocyon cinereoargenteus*), otter (*Lutra canadensis*), muskrat (*Ondatra zibethica*), wolf (*Canis* sp.), panther (*Felis concolor*), bobcat (*Lynx rufus*), and box turtle (*Terrapene carolina*) (Shelford 1963). The Yadkin River would have provided a variety of fish, including catfish (Ictaluridae), sunfish (Centrarchidae), and largemouth (*Micropterus salmoides*) and smallmouth (*Micropterus dolomieui*) bass.

3. CULTURAL BACKGROUND

PREHISTORIC OVERVIEW

North Carolina has been inhabited for over 12,000 years and has experienced several major changes in the cultural traditions of its residents. The discussion that follows is a brief outline of the major recognized prehistoric and historic periods of this area of the state. Much of the earlier part of the cultural sequence for the region is based on Coe's (1964) investigations of the prehistoric cultures of North Carolina, combined with more recent research. Archaeological work conducted by the Research Laboratories of Archaeology (RLA) at the University of North Carolina at Chapel Hill and the Wake Forest University Archeology Laboratories has added greatly to the understanding of prehistoric lifeways is this region, particularly concerning the later part of the prehistoric sequence. Late prehistoric to historic contact occupations of the central North Carolina Piedmont have been discussed by Ward and Davis (1993, 1999), Woodall (1990) and others.

The prehistory of the project area can be divided into four basic periods: Paleoindian, Archaic, Woodland, and Late Prehistoric (Protohistoric) to Contact. Much of our knowledge concerning Protohistoric and early historic lifeways and material culture comes from the northeast-central Piedmont along the Haw, Eno, and Dan rivers (e.g., Ward and Davis 1993). Excavations in these valleys have documented later trends and developments in native societies, including evidence for direct or indirect contact with European (mainly English) traders.

Paleoindian Period (ca. 10,000–8000 B.C.)

The first indisputable evidence for human occupation in the southeastern United States dates to the Paleoindian period, from approximately 10,000 to 8000 B.C. The Paleoindian occupation of the Southeast is known predominantly from surface sites. Key diagnostic artifacts of this period are fluted (such as Clovis) and unfluted lanceolate projectile points; a variety of flake tools, such as endscrapers, gravers, retouched blades, and burins, are also associated. The later Paleoindian phase appears to include Dalton (Goodyear 1982) and Hardaway (Ward 1983) points. Available dates for early side-notched points follow closely behind those associated with fluted points (e.g., Driskell 1996; Goodyear 1982).

Paleoindian groups are presumed to have been highly mobile with a subsistence strategy primarily focused on migratory large animals (horse, bison, mammoth), but also strongly emphasizing other plant and animal food resources, such as seeds, fruits, nuts, and small animals (Meltzer and Smith 1986). Settlements are thought to have included small temporary camps and less common base camps occupied by loosely organized bands. Although Paleoindian projectile points in private collections are uncommon, they are comparatively well represented in the North Carolina Piedmont (e.g., Daniel 2005).

Archaic Period (ca. 8000–1000 B.C.)

The Archaic period began with the onset of Holocene, post-glacial climatic conditions in the Southeast, when warmer global temperatures resulted in warmer and wetter conditions and has been subdivided into three subperiods: Early, Middle, and Late. As a whole, this period is characterized by a general increase in the density and dispersal of archaeological remains, more regionally distinct tool forms, continued reliance on game animals and wild plant resources, increased use of locally available lithic raw materials, and subsistence settlement strategies contingent to specific environments. Group organization (as modeled for hunter-gatherers) is presumed to have been highly mobile. In some regions there is evidence for intensification of the economic base, with much more permanent occupations, development of trade

networks, and inter-group or interpersonal violence. Architectural evidence is rare, indicating that most structures were not substantial constructions.

The Early Archaic period, ca. 8000–6000 B.C., is marked by the end of the glacial climate and the extinction of numerous large animals. This period is usually subdivided into the earlier corner-notched (Palmer and Kirk) and later bifurcate traditions (St. Albans and LeCroy). A transitional type between the earlier Hardaway and the Palmer is also now recognized that has characteristics of both types, and is referred to as a "small Dalton" (Ward and Davis 1999). No artifacts of non-lithic raw materials have been found to represent this cultural tradition. There are striking lithic artifact similarities throughout the Southeast for this period, but tremendous variety in site size, content, and function. The Early Archaic period tool kit included adzes, gravers, drills, and perforators (Ward and Davis 1999).

Some Piedmont investigations, such as those at the Haw River sites in Chatham County, North Carolina, suggest a tendency toward a collector-gatherer strategy (Claggett and Cable 1982). Other research supports the theory that a forager strategy was employed, particularly one that centered on the procurement of lithic material (Daniel 1998). Populations appear to have been highly mobile and could have coalesced around available resources during the winter months (Anderson and Hanson 1988). Hunting forays would have been made by small groups to supply the base camp through the winter. Groups may have moved exclusively along drainages, crossing large drainages only on special occasions for macroband gatherings (Anderson and Hanson 1988). Daniel (1998) suggests that quality raw material sources, particularly Uwharrie rhyolite outcrops, were the focal point of the settlement patterns. The forests of the Piedmont would have provided a reliable source and good variety of food, perhaps allowing groups to focus their settlement patterns on less widely available resources, such as high quality lithic material. Anderson (1996:173) suggests that there was an increase in the use of seasonal camps during this period.

Much of our understanding of the Middle Archaic period, ca. 6000–3000 B.C., in Piedmont North Carolina comes from research conducted at a few well stratified floodplain sites along the Roanoke and Yadkin rivers, such as Doerschuk, Gaston, and Lowders Ferry. Numerous studies have added settlement pattern information.

The Middle Archaic period can be distinguished from the Early Archaic by the more frequent recovery of ground stone artifacts and a less diverse chipped stone tool kit. Diagnostic bifaces that are associated with this period include Stanly, Morrow Mountain, and Guilford types (Blanton and Sassaman 1989; Coe 1964). Bannerstones or atlatl weights first appeared during this period and are associated with the Stanly occupation. It is assumed that population density increased during the Middle Archaic period, but small hunting and gathering bands probably still formed the primary social and economic units. Populations during this period appear to have relied primarily on a foraging-based economy (Anderson 1996:174). Larger sites tend to occur near or along river floodplains, but numerous small sites, probably utilized for specialized resource extraction, are characteristic of upland locales. A larger number of Middle Archaic sites are known in the Piedmont region than in the Coastal Plain, a fact that Anderson (1996:174) attributes to the spread of pine during the Middle Holocene.

The Late Archaic period is generally dated between ca. 3000–1000 B.C. in the North Carolina Piedmont. Like Middle Archaic sites, Late Archaic sites are common in the study area, although few have been the primary focus of archaeological investigations. The lower Southeast in general saw an increase in sites from the Middle to Late Archaic, and most researchers agree that a population increase is reflected in these data (Anderson 1996).

The existence of formal base camps occupied seasonally or longer is inferred, together with a range of smaller resource-exploitation sites, such as hunting, fishing, or plant collecting stations (Claggett and

Cable 1982; Mathis 1979; Ward 1983). Large Late Archaic sites are found in river floodplains, as at the Gaston, Doerschuk, and Lowders Ferry sites, and some of these have characteristics of intensive occupations not seen in earlier periods, in the form of occupation middens, high feature density, and circular pit hearths (Coe 1964:119). Feature types associated with Late Archaic occupations in North Carolina and Virginia include rock hearths (or heated rock dumps) and small pits.

Late Archaic occupations in the Piedmont are marked by a variety of large to small stemmed points. The most prominent and recognizable of these is the Savannah River stemmed type, a large, broad-bladed, square stemmed point that appears ca. 3000 B.C. and lasts to ca. 1500 B.C. Subsequent Late Archaic sites frequently contain slightly smaller stemmed points (Ward and Davis 1999:71).

Grinding implements, polished stone tools, and carved soapstone bowls became fairly common, suggesting increased use of plant resources, and possibly changes in subsistence strategies and cooking technologies. Although regional evidence is minimal, the first experiments with horticulture probably occurred at this time.

Woodland Period (ca. 500 B.C. to A.D. 1450)

The Woodland period in the North Carolina Piedmont began around 500 B.C., corresponding with dated evidence for the earliest use of ceramics in the area. Subsistence strategies may have included increased reliance on the cultivation of native and non-native (tropical) plants, although evidence for plant cultivation is (at best) scanty until the Late Woodland transition. Ceramics became more diversified with respect to temper and surface decoration, and sub-regional differences are evident. Triangular projectile points are diagnostic of the later Middle and Late Woodland periods, linked to the introduction of bow and arrow technology, the timing and nature of which probably varied across the region (Nassaney and Pyle 1999). In the later part of the Woodland sequence, occupations are characterized by an increasing focus on riverine floodplain locations.

The Early Woodland (ca. 500 B.C. to ca. A.D. 400) period has been the subject of few focused studies. In the absence of clearly stratified sequences, separation of materials from this period with that of later intervals is often difficult. Early Woodland period occupations in the Piedmont are represented by the Badin and Yadkin ceramic series, which appear to overlap in time (Ward and Davis 1999:85; Webb and Leigh 1995).

Badin ceramics are sand tempered and stamped with either a cord wrapped or fabric wrapped paddle (Coe 1964:27–29). This ceramic type has similarities to the coastal type, Deep Creek. Yadkin ceramics are finished with cord wrapped and fabric wrapped paddles, but also with carved paddles producing designs such as check stamping, linear check stamping, and simple stamping, and are tempered with crushed quartz (Coe 1964:30–32). Ceramic manufacturing techniques continued into the subsequent Middle Woodland period, characterized by different combinations of elements—cord marking, fabric impression, and check stamping surface treatment, and coarse sand or crushed quartz temper (Coe 1964:30–32).

Associated projectile points mainly conform to two separate traditions. The first of these is defined by a reduction in size of the earlier Late Archaic styles. Gypsy stemmed points appear to represent a continued trend toward diminution in size for stemmed points, essentially developing out of the small Savannah River stemmed type (Oliver 1981:188–189). Other varieties related to Early Woodland occupations include small, contracting stemmed points similar to the Piscataway and Rossville types, and similar points have been recovered from Early Woodland contexts in North Carolina (Kirchen 2001:44). Early use of triangular points likely accompanied the continued use of stemmed points for some time.

The lifeways of these peoples seem to have changed little from those of their Late Archaic period predecessors (Davis 1987; Kirchen 2001). A settlement pattern characterized by relatively permanent river-bottom base camps and specialized upland exploitation camps is inferred (Mathis 1979). Early Woodland use of certain cultigens may have increased from earlier times; however, the main staples were still nuts and other wild plants and the large animals, such as white-tailed deer.

The Middle Woodland period (ca. A.D. 400 to 1000) in the North Carolina Piedmont can be understood as an arbitrary construct until changes in artifact styles and settlement patterns can be distinguished from that of the preceding period. It appears that gradual changes occurred, so that the later part of the Middle Woodland more closely resembled the subsequent period than the preceding interval. Ceramic artifacts dating to this period include a continuation of the Yadkin series and the introduction of the Uwharrie series. Uwharrie ceramics, used into the early Late Woodland period, are fabric, cord, or net impressed, quartz tempered, usually interior scraped, and occasionally crudely incised. Uwharrie phase sites in the region reflect more intensive and long-term occupations. During this time, triangular point types (such as Yadkin Large Triangular) represent the continued refinement of bow and arrow technology in the region.

Horticulture is thought to have assumed increasing importance, and the cultivation of maize may have been initiated at this time, although it did not gain prominence until much later. Compared to previous periods, it appears that site density increased considerably, especially along river floodplains (Ward and Davis 1993; Woodall 1984). Numerous large and small sites have been found dating to this period, suggesting periodic aggregation and dispersion, or some kind of a village/base camp dichotomy in the settlement patterning.

In central North Carolina, the Late Woodland (ca. A.D. 1000–1450) is characterized by large and small horticultural-based sites focused on the floodplains of major streams. Woodland Piedmont groups are presumed to have had an egalitarian social organization based on kinship ties, and do not appear to have been integrated into chiefly hierarchies. Subsistence evidence indicates a mix of hunting, gathering, and cultivation, and faunal assemblages include a variety of climax forest and forest edge species.

Throughout much of the Piedmont, the Late Woodland period marks the later stages of the Badin-Yadkin-Uwharrie sequence proposed by Coe (1964). The Late Woodland period in the central Piedmont is divided into the Haw River and Dan River phases (Ward and Davis 1999). The Dan River phase is contemporary with the Haw River phase, but is focused around the Dan River drainage system of the northern Piedmont. Large storage pits are found at sites from both these phases. Early Dan River settlement appears to have been similar to Haw River settlements, and early Dan River pottery is similar to Uwharrie in a number of characteristics (Ward and Davis 1999:105–106). The second half of the Dan River phase, however, is characterized by a noticeable increase in site size and population density. Most of the later phase pottery is net impressed, and while the interiors are usually still scraped, sand replaced crushed quartz as the tempering agent. A wide variety of bone, shell, and clay objects were added to the assemblage, including awls, pins, needles, fishhooks, gouges, bowls, cups, spoons, dippers, beads, pendants, and smoking pipes. Small triangular arrow points appear ubiquitous sometime after ca. A.D. 1000.

Late Prehistoric and Early Contact Period (ca. A.D. 1450–1650)

In the Yadkin Valley, late prehistoric to early contact period occupations have not been isolated from earlier materials. Excavations at Donnaha and sites farther upstream have documented manifestations closely similar to those encountered in the Dan River Valley to the northeast (Woodall 1984; 1990). The archaeological record is largely lacking of evidence of any late 17th century or early 18th century occupation in the Yadkin Valley, as has been documented east of the study area, and the region may have been largely depopulated by that time (Davis 2002:141). Douglas Right's reports of trade beads

(presumably glass trade beads) collected at or around Donnaha and at another large site (Rights 1947:272) hint that some such occupation may have occurred, however.

Elsewhere, the late prehistoric to early contact period Native American occupation of the North Carolina Piedmont is represented by archaeological manifestations of the Hillsboro, Early Saratown, and Caraway phases. Early Saratown phase sites contain refuse pits similar to earlier Dan River phase sites in the Dan River Valley, but they are filled with noticeably more refuse. A broader based subsistence practice is also indicated for the Early Saratown phase by the faunal remains (Ward and Davis 1999:117). Only a few burials associated with this phase are known, but these contained a variety of funerary offerings and were placed in both shaft and chamber pits and simple pits.

The Caraway phase groups late prehistoric (protohistoric) and contact period occupations of the southern North Carolina Piedmont (Coe 1964; Ward and Davis 1999) remain poorly defined. Excavations in the 1930s at the Poole site (31RD1) in Randolph County revealed several burials (associated with items such as shell beads and gorgets) and other pit features, but only one excavated feature yielded European trade items (Coe 1937). Caraway pottery has been characterized as a mix of northern (net impressed) and southern (stamped) styles. Plain (smoothed) and burnished wares dominate the latter half of the sequence with an admixture of complicated stamped and simple stamped surface treatments (Ward and Davis 1999:137). This is similar to contemporary manifestations to the north characterized by the Oldtown series (Early Saratown Phase) and reflected in later assemblages at the Lower Saratown, Wall, and Hairston sites (Ward and Davis 1999:137; Wilson 1983). This blending of characteristics may speak to both the nature of late prehistoric interaction and dissolution during the later period of contact with Euro-Americans, but it is difficult to differentiate the remains of later contact period remains at the Poole site with the apparent earlier materials present (Ward and Davis 1999:137).

The historic period Native American occupation of the North Carolina Piedmont has been documented both through historic documents and through excavations at several sites, including Keyauwee Town in Randolph County (Coe 1937) and the Fredericks site (Occaneechi Town) in Orange County (Davis and Ward 1991; Davis et al. 1998). Lawson's 1714 journal notes a ca. 1711 encounter with the Keyauwee that may have occurred near Caraway Creek in Randolph County (Lefler 1967:56–58). Lawson described Keyauwee as a palisaded village surrounded by cornfields. The Fredericks site, which is located along the Eno River in Hillsborough, was one of several towns visited by John Lawson when he passed through the area in 1701. Another town visited by Lawson was Adshusheer, which has not been relocated, but was apparently in what is now Durham County (Lefler 1967). A number of Siouan villages were reported by other early explorers, such as John Lederer in 1670, James Needham and Gabriel Arthur in 1673, and William Byrd in 1728. The Mitchum site on the Haw River in northern Chatham County is thought to represent a village site of the Sissipaw Indians in the mid-17th century. The Jenrette site on the Eno River in Hillsborough is believed to be the late 17th-century village of the Shakori Indians. Adjacent to this site is the location of the Fredericks site, also known as Occaneechi Town, an early 18th-century village site.

As Merrell (1987:20–21, 1989) and other researchers have noted, the early historic period was marked by extensive epidemics among the Native American populations of the area, which, along with the increasing Euro-American intrusions, forced the surviving groups to relocate and regroup. By the 1740s local Native American groups had amalgamated with other groups to the north and south and no longer appear as distinct tribes in the historical record. For example, shortly after Lawson's visit, the Keyauwee appear to have merged with other Piedmont groups such as the Saponi, Saura, and others and later integrated with the Catawba between 1726 and 1739 (Mooney 1894; Rights 1947). By the time of Euro-American settlement, the west-central Piedmont region was largely depopulated of its native inhabitants. Descendants of some of these groups continue to inhabit the Piedmont, however, and in recent years have begun to reassert their identity.

HISTORIC CONTEXT

Euro-American Settlement

No European settlements were established in what is now North Carolina until 1585 (Corbitt 1996; Quinn 1955), and settlement remained largely confined to coastal areas until the 18th century. Settlers gradually began to enter the area in the 1740s, primarily from already well-populated regions north of North Carolina, especially along the Great Wagon Road. Most came from Maryland or Pennsylvania in search of available farm land and were of Scotch-Irish or German descent (Fries et al. 1976:8–9; Powell 1989:122). In 1752, a Moravian settlement was established on a large tract purchased from John, Lord Carteret, Earl Granville, and known as Wachovia (Hartley 1987). The Wachovia tract occupied the center of present-day Forsyth County, and the Moravians established a succession of communities: Bethabara in 1753, Bethania in 1759, and Salem in 1766. Salem's location on trading routes leading east toward Fayetteville and Wilmington and to northern centers helped it become the largest town in the region.

In 1849 Forsyth County was formed from Stokes County, and a new county seat was established at Winston, located just north of Salem, on land purchased from the Moravians. In 1850, the economy of Forsyth County was characterized as predominately agricultural with a small and diverse manufacturing base employing almost 300 people (Fries et al. 1976; Oppermann 1998). Corn, wheat, and rye were the major crops (Oppermann 1998). Tobacco was not widely grown before the late 1850s; in 1850 James Ogburn began producing plug tobacco north of Winston (Fries et al. 1976:94, 96). Commercial crop production increased mid-century, especially after completion of the Fayetteville and Western Road (the Plank Road) to Bethania in 1854 (Fries et al. 1976:106–107, 129).

The effects of the Civil War on the region were more economic and social than military, as the lack of capital and destruction of transportation systems impacted the region's economy (Powell 1989). The county was spared the direct effects of the Civil War until April 10, 1865, when Union cavalry entered the area in force and occupied Salem.

By 1870 Winston was still a small town with a population of only 473, and tobacco manufacturing was strictly a small-scale industry. Local manufacturing was largely confined to three wagon works, a textile mill, a flour mill, and two carriage works in the three towns of Salem, Winston, and Waughtown (Oppermann 1998). Development accelerated dramatically after the completion of the railroad connection from Greensboro in 1873. In 1875, Richard J. Reynolds opened a factory that eventually became the largest manufacturer of plug tobacco in the world. By 1880, over 1,000 persons were employed in the tobacco industry, and Winston's population nearly quadrupled by 1890 (Fries et al. 1976:179–196; Oppermann 1998).

In 1913 the cities of Salem and Winston were formally merged, and the Reynolds Tobacco Company began production of Camel cigarettes, which became the most popular brand in the country (Oppermann 1994; Tursi 1994:198). From this time and through the 1920s Winston-Salem experienced unprecedented growth and prosperity. By 1920 it was the most populous city in the state, and in 1924 was the largest manufacturer in the world of tobacco products and a leader in the manufacture of men's knit underwear, knit and woolen goods, and wagons (Oppermann 1994).

During this period of growth, the city drew large numbers of African-Americans, who were readily embraced by most of the local industries and who quickly developed a prosperous middle class economy (Oppermann 1994). African-American settlement was especially concentrated in the northern and eastern parts of the city near the tobacco factories (Oppermann 1994). Jordan Foy was a prominent carpenter in the area who constructed several houses in East Winston from 1900 to 1920. The Foytown section from

Jackson to Woodland Avenue was named in his honor (Fries 1976:261–262). His father, Rufus Foy, owned property near Mickey Mill Road and Bowen Boulevard by 1886.

Ogburn Station, shown on the 1951 quadrangle, was a mid-19th century farm community that developed into a trading center after the Roanoke and Southern Railroad built a line through Walkertown in 1888. Livestock and other commodities were unloaded at this location, and residents from surrounding parts of the county were able to buy goods shipped by rail (City-County Planning Board 2011; Fearnbach 2009).

What is now Smith Reynolds Airport began as a paved airfield constructed in 1927 in advance of Charles Lindbergh's cross-country tour (the facility replaced a grass strip airfield, Maynard Field, located a few miles away and constructed in 1919) (Airport Commission of Forsyth County n.d.; Fries et al. 1976). The new airport was constructed on a ca. 90-acre tract situated just outside the city limits (Norfleet 1942). At least part of the acquired land was owned by Rufus Foy, and part was acquired from a county reformatory (the Forsyth County Home) (Oppermann 1994; Reynolds and Schachtman 1989). A 1,600 foot runway was constructed by shearing off a hilltop and leveling the surrounding area (Norfleet 1942).

The new airport was named Miller Municipal Airport after a major financial contributor and served as the base for commuter flights by Reynolds Aviation from 1927–1933. During the 1930s, the existing runways were extended and other improvements were made under Civil Works Administration programs. By 1938, additional property had been acquired and a fourth runway was constructed. The airport was renamed the Smith Reynolds Airport in 1942 after the Z. Smith Reynolds Foundation donated funds for improvements to attract additional commercial service.

From 1942–1945 the airport was used as a training facility for military pilots. In 1941 the main runway was extended to 4,000 feet. From 1943 to 1945 the WPA and the Z. Smith Reynolds Foundation provided funds to acquire additional land and improve the runways and other facilities. During this time, the U.S. Army Air Corps expanded the main runway to 6,654 feet.

By 1963 Smith Reynolds was the most active airport in North Carolina. It was host to a variety of commercial carriers, including Piedmont Airlines from the time of its organization in the 1940s to 1983 (Turner n.d.), until the last commercial carrier ended its service at the airport in 2000. Today the airport continues to serve a vital role in the local economy.

PREVIOUS ARCHAEOLOGICAL RESEARCH

North Carolina has been the subject of archaeological research for over a century, and most trends in the history of North American archaeology are reflected in the region. Although the earliest investigations occurred west of the Piedmont, interest in the archaeology of the North Carolina Piedmont was stimulated in 1933 by the organization of the Archaeological Society of North Carolina by the Reverend Douglas Rights. In 1936 a young student named Joffre Coe began the first systematic archaeological study at what is thought to be the Keyauwee village in Randolph County (Coe 1937). This was followed by WPA-funded excavations at the Frutchey (Town Creek) Mound in Montgomery County, several grant-funded projects designed to investigate the origins of the Siouan speaking societies encountered by 18th century European explorers, and excavations at several stratified sites along the lower Yadkin River (Ward and Davis 1999:13–14, 16) where the basic chronological outline of the Archaic period was documented. These investigations laid the foundation on which all subsequent regional research is based.

Beginning in the 1970s, the establishment of Federal cultural resources legislation and management procedures resulted in an increasing number of archaeological projects in North Carolina. In Forsyth and surrounding counties, most of these are small-scale surveys related to transportation improvements or other activities.

4. RESEARCH GOALS AND METHODS

RESEARCH GOALS

The primary goal of the survey was to systematically gather data on any archaeological resources present within the project area for the purpose of regulatory compliance. In addition, as much as feasible the archaeological field data were to be combined with information obtained in the background research to address the nature of the prehistoric and historic period occupations of the area.

RESEARCH METHODS

Specific research methods were utilized for the background studies, field research, analysis, and reporting stages of the project. The methods used in each stage of research are outlined below.

Background Research

Background literature review was conducted to gather information on any known cultural resources on and adjacent to the tract and included examination of the following materials:

- Archaeological site files and reports at the North Carolina Office of State Archaeology in Raleigh;
- Documents available online from the Forsyth County Register of Deeds
- Documents available online from the Forsyth County Public Library
- Documents available online from the Forsyth County Historical Association
- Cemetery information available online, conversations with Scotty Speas of the Winston-Salem Property Facilities Management Cemetery office, data provided by airport staff, and
- Historical maps and other data available online, in the UNC-Chapel Hill North Carolina Collection, the North Carolina State Archives, and in TRC's collection.

Field Methods

The archaeological survey complied with all pertinent state and federal regulations, including the North Carolina Office of State Archaeology's (OSA) *Guidelines for Preparation of Archaeological Survey Reports in North Carolina.* The field survey was conducted by a team of two to three persons, consisting of the Field Director and two Archaeological Technicians.

Shovel tests were excavated at 30-m intervals in all areas that did not exhibit evidence of substantial disturbance, 10% or greater slopes, standing water, or hydric soils, with closer order (15-m and 10-m interval) shovel testing conducted as appropriate for site delineation. A small number of supplemental 5-m interval shovel tests were excavated at one site. Additional shovel tests were judgmentally excavated on favorable micro-landforms that were deemed inadequately sampled by transect lines. All shovel tests measured ca. 30 cm in diameter and were excavated to sterile subsoil or the water table. All soil was screened through ¼ inch screen for uniform artifact recovery. The depth and stratigraphy and artifact content (when applicable) were recorded for each shovel test. In addition to the shovel testing, surface exposures were examined for artifacts or other indications of archaeological sites. Surface inspection was accomplished by pedestrian survey consisting of a general walkover of isolated exposed surfaces within the project area.

Notes were made on the survey methods and environmental conditions. All resources were photographed, and additional representative photographs of the project area were taken with a digital camera to document the general topography, vegetation, and disturbance.

LABORATORY METHODS

Artifact Analysis

The recovered artifacts were returned to TRC's laboratory for processing, where they were cleaned and catalogued according to established regional typologies. No temporally diagnostic prehistoric artifacts were found by the survey.

Prehistoric Artifacts. Prehistoric artifacts recovered by the survey are limited to two pieces of debitage. Debitage fragments are the byproduct of lithic tool manufacture. Counts, weight, raw material, and size category were recorded for debitage, and presence or absence of cortex was noted.

Raw Material Identifications. Raw materials for chipped stone artifacts have been identified based on macroscopic characteristics, and in this instance are limited to metavolcanic stone. Metavolcanic stone, including dacite (more commonly known as rhyolite), is found throughout the Carolina Slate Belt (e.g., Daniel and Butler 1996; Steponaitis et al. 2006).

Historic Artifacts. Historic artifacts were initially divided into principal categories based on composition (i.e., ceramic, glass, metal, etc.) and then classified according to published artifact descriptions. Modern artifacts encountered during the survey were noted, but not generally collected.

Curation

The project materials are being prepared for curation in accordance with OSA standards and are currently stored in the TRC office. The artifacts will ultimately be curated at the Office of State Archaeology Research Center (OSARC) in Raleigh.

5. RESULTS

BACKGROUND RESEARCH

Previously Identified Resources

Archaeological Surveys and Sites. A review of files and records at the OSA revealed there have been no prior compliance surveys performed at the airport, although a few such projects have been conducted in the near vicinity (Table 5.1). A reconnaissance-level survey of the airport property was made in 1993 (Hargrove 1993), however, and encompassed the current (2014) project tracts. One archaeological site (31FY839) was recorded in the wooded area east of Runway 15-33 and was revisited during the current work (Table 5.1). Four other sites are represented by artifacts collected by a local resident, Harold W. Hinshaw, prior to or during construction of the airport and later donated to Wake Forest University (Snavely and Gorin 1972). That collection consisted of artifacts mixed from the four sites and included a Morrow Mountain projectile point (representing Middle Archaic period occupation), two Yadkin points (Early to Middle Woodland period), and two unclassified or broken points (Snavely and Gorin 1972). One of these sites (31FY269) is mapped within the northern project tract; the three other sites are mapped outside the two survey areas; and all four were reported destroyed by construction (Hargrove 1993; Snavely and Gorin 1972). Three other known sites are within a 1-kilometer (km) radius and include two small, low-density prehistoric lithic scatters and a National Register listed property (the George Black house and brickyard).

Table 5.1. Previously Recorded Archaeological Sites on or within One Kilometer of the Airport.

Site No.	Description	NRHP Eligibility	Reference
31FY266	Prehistoric lithic	Unassessed; presumed destroyed	OSA files
31FY267	Prehistoric lithic	Unassessed; presumed destroyed	OSA files
31FY268	Prehistoric lithic	Unassessed; presumed destroyed	OSA files
31FY269	Prehistoric lithic	Unassessed; presumed destroyed	OSA files
31FY460	Prehistoric lithic	Not Eligible	OSA files
31FY804	George Black house; brickyard	National Register Property	Lautzenheiser 1990; NCSHPO 2000
31FY805	Prehistoric lithic	Not Eligible	Lautzenheiser 1990
31FY839	Prehistoric lithic	Unassessed	Hargrove 1993

Structures. Review of the North Carolina State Historic Preservation Office online database (HPOWEB 2014) indicated that there are no previously recorded historic structures on or immediately adjacent to the two survey tracts. The George Black property is situated approximately 1.2 km south of Runway 15-33 and will not be affected by the proposed improvements.

Cemeteries. The North Carolina Cemetery Survey records at the North Carolina State Archives and other sources do not list any cemeteries on or adjacent to the survey tracts (e.g., Cemetery Census 2014). Airport personnel reported a cemetery in the vicinity of the northern project tract at the beginning of the fieldwork, however, and later directed the survey team to its location. This abandoned cemetery was recorded as site 31FY1194 during the present survey. Additional background information on this cemetery is presented below.

History of the Project Area

Historic Map Review. A series of historic maps dating from the late 19th century into the 20th century were consulted to identify potential former structure locations within or adjacent to the project area. (No 18th century or earlier 19th century maps show any detail of the project area). An 1898 county map does not show any detail of the project area in the Middle Fork Township except for major roads and the Roanoke & Southern Railroad (http://dc.lib.unc.edu/cdm/singleitem/collection/ncmaps/id/777/rec/9). A fairly detailed 1907 county map (Miller 1907) depicts multiple structures in the vicinity of the airport, but it is not clear if any of these are within the 2014 project areas (discrepancies result from attempts to overlay maps produced at different scales) (Figure 5.1). That map shows the County Home west of Liberty Street and several houses along that road and east of the airport.

The earliest detailed map of the project area is the 1913 Forsyth County soils map (Figure 5.2) (Allen and Jurney 1914). That map depicts increasing development along a road corresponding to present North Liberty Street, as well as a network of unimproved roads extending through the present runway area, with a few scattered structures along these roads. One of these structures, associated with a partially improved road on the northern end of the airport property appears to be within the northern project tract. The airport is shown on the 1927 county map, with a number of scattered houses situated east of Brushy Fork Creek (Miller 1927) (Figure 5.3), but the airport and vicinity is not depicted in any detail on the 1928 city map (Spinks 1928) (Figure 5.4) or on any subsequent maps until 1951 when the airport first appears on USGS topographic quadrangle maps (USGS 1950, 1951) (Figure 5.5). No structures are shown inside either of the project tracts on those maps.

Aerial Photographs. A 1939 aerial photograph oriented to the northeast and taken at an airshow (Digital Forsyth 2014; http://www.digitalforsyth.org/jpg/uzz/mir/uzz_mir_04265.jpg) shows much of the project tract north of present Runway 4-22, apparently prior to runway expansion (Figure 5.6). Two structures (apparent houses) are shown off the southwestern end of the runway at that time. Additional houses are shown in the vicinity of the northeastern and northwestern corners of that project tract. A large cemetery, much more clearly shown in a later aerial photograph, is visible in the background of the 1939 photograph (see below).

A March 5, 1948 aerial photograph that encompasses the airport shows the runways and existing airport facilities, as well as a network of unimproved roads across the property (Figures 5.7 and 5.8). Runways corresponding to present Runway 4-22 and 15-33 appear completed by this time. Additional runway configurations are also shown, reflecting the dynamic period of expansion in the 1930s and 1940s. No houses are shown in either of the two project tracts on that photograph, however. In addition, the 1948 photograph clearly shows a former cemetery (the Evergreen Cemetery, see 31FY1194 discussion) extending across the area northeast of Runway 4-22 and well within the northern project tract (Figure 5.7).

A 1971 aerial photograph shows traces of the cemetery area, which by then has been mainly cleared, and possibly graded (Figure 5.9). Two structures (two houses, or a house and a large outbuilding) are shown in the southeastern corner of the southern project tract (Figure 5.10), and correspond to site 31FY1193 (below). By 1993, the airport area appears much as it does at present (Figures 5.11 and 12).

Deed Research. A search of the Register of Deed's online database records produced several entries related to airport development and expansion for the period from 1927 to 1944 (http://www.co.forsyth.nc.us/rod/default.aspx?StoryID=18988). Several of these deeds were examined during the present project. The index first records a 1927 listing for North Carolina as grantee of a lease from Miller Municipal Airport Inc. for a lot on Claremont Avenue (Forsyth County Deed of Trust Book 231:100).

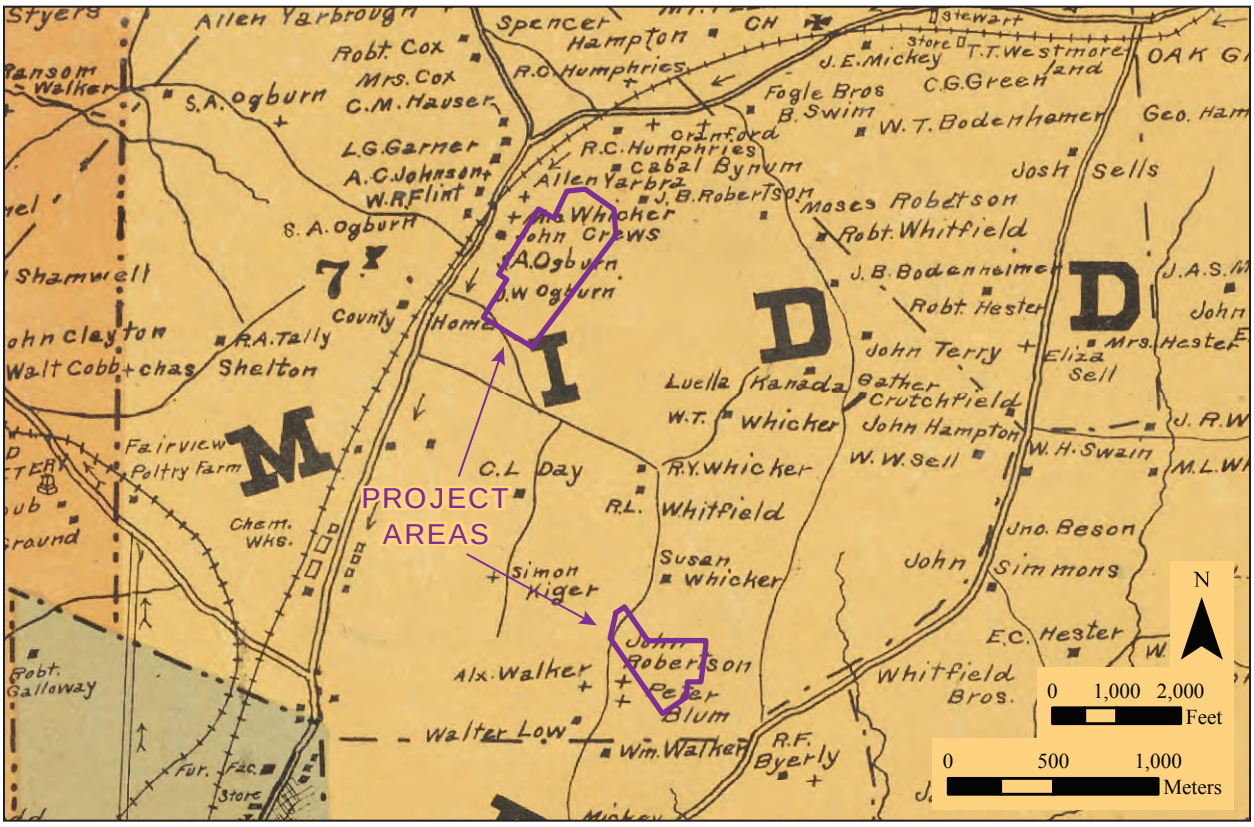

Figure 5.1. Portion of the 1907 Forsyth County Map showing the project areas.

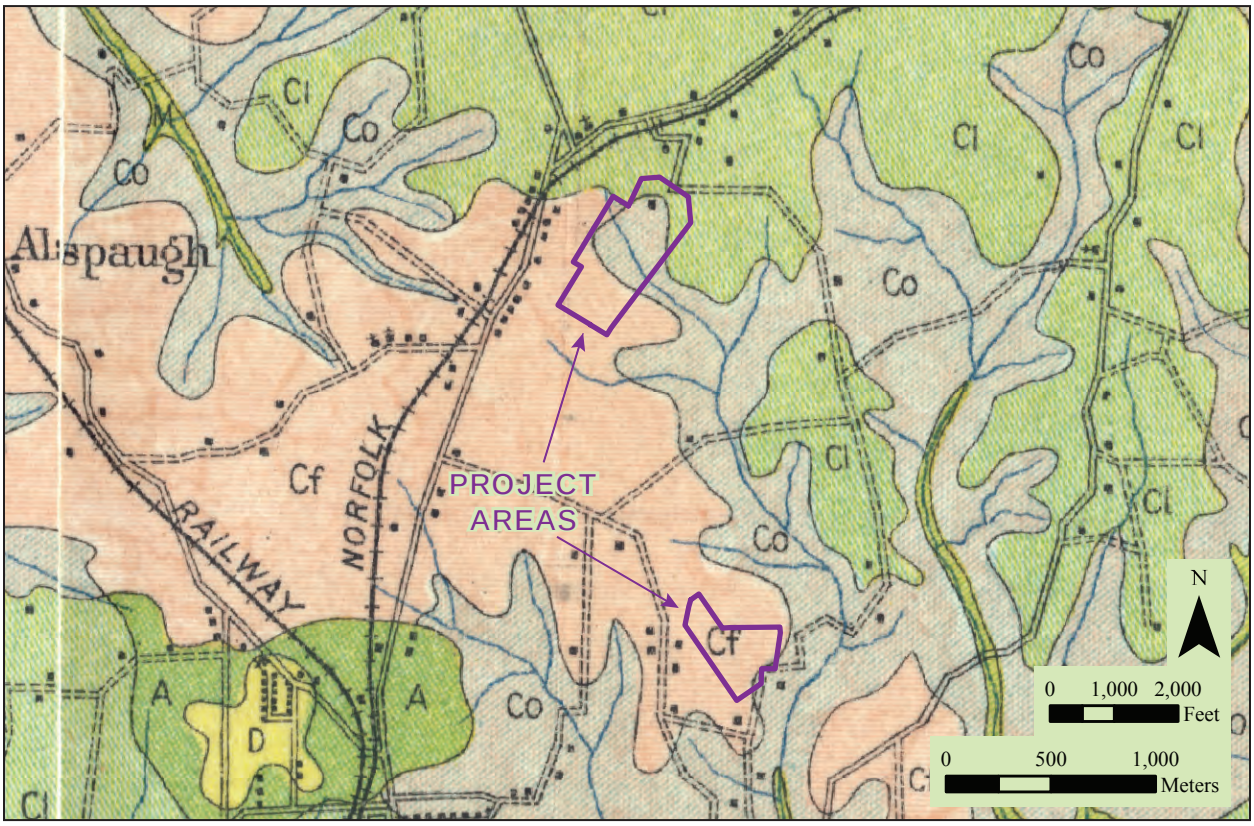

Figure 5.2. Portion of the 1913 Forsyth County Soil Map showing the project areas.

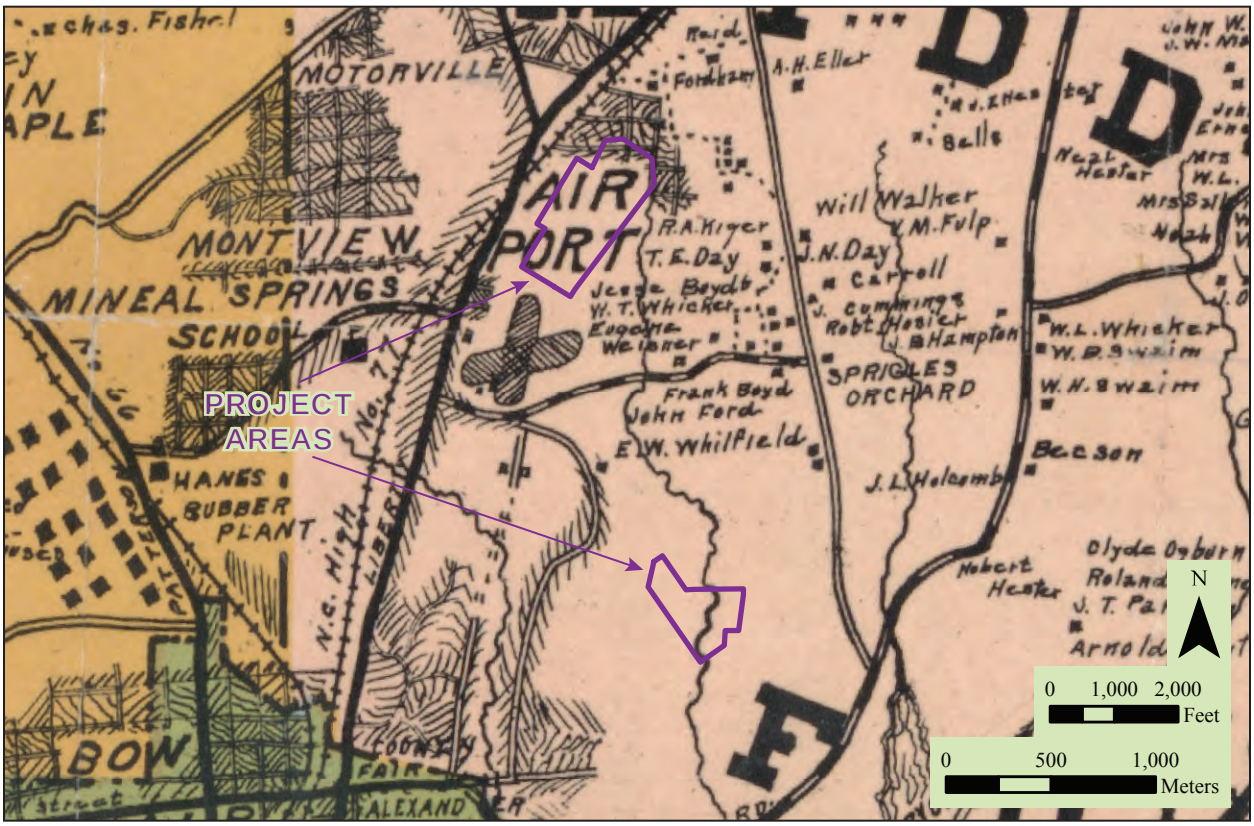

Figure 5.3. Portion of the 1927 Forsyth County Map showing the project areas.

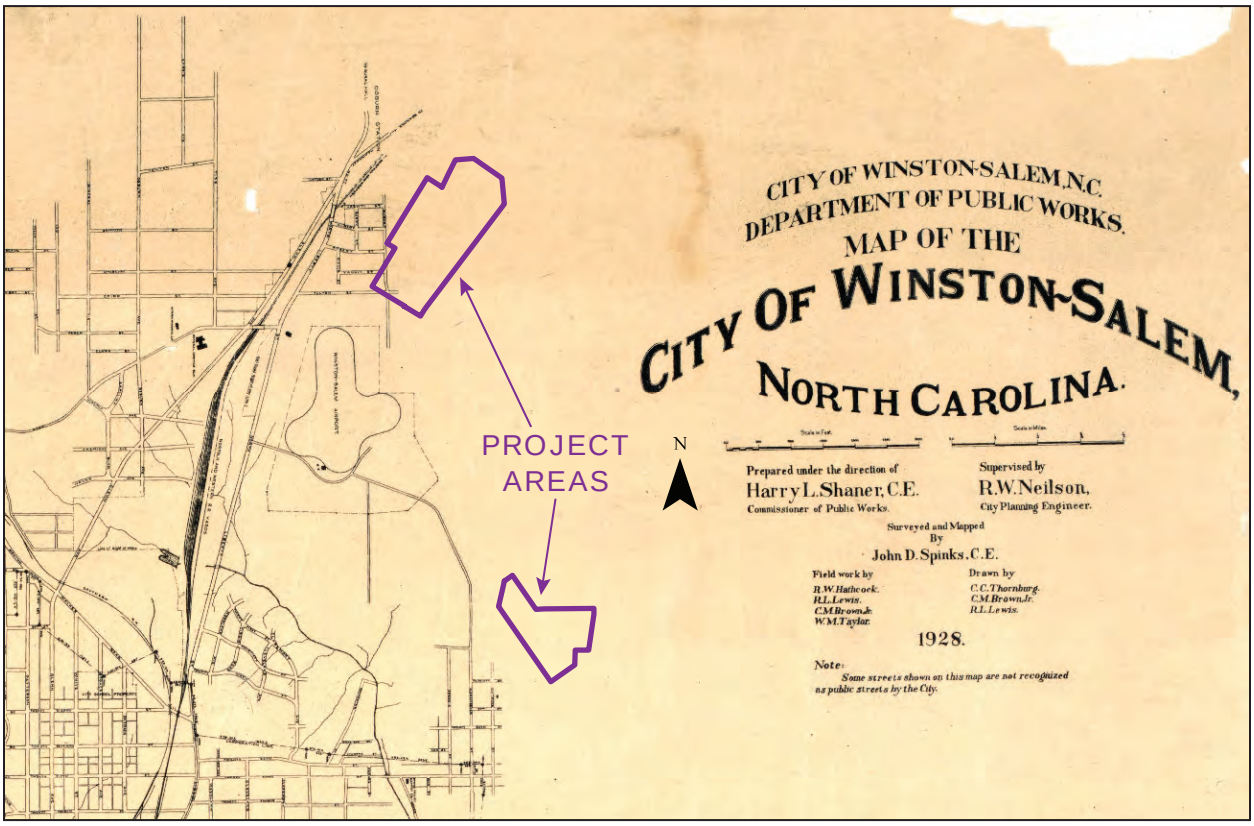

Figure 5.4. Portion of the 1928 Winston-Salem City Map showing the project areas.

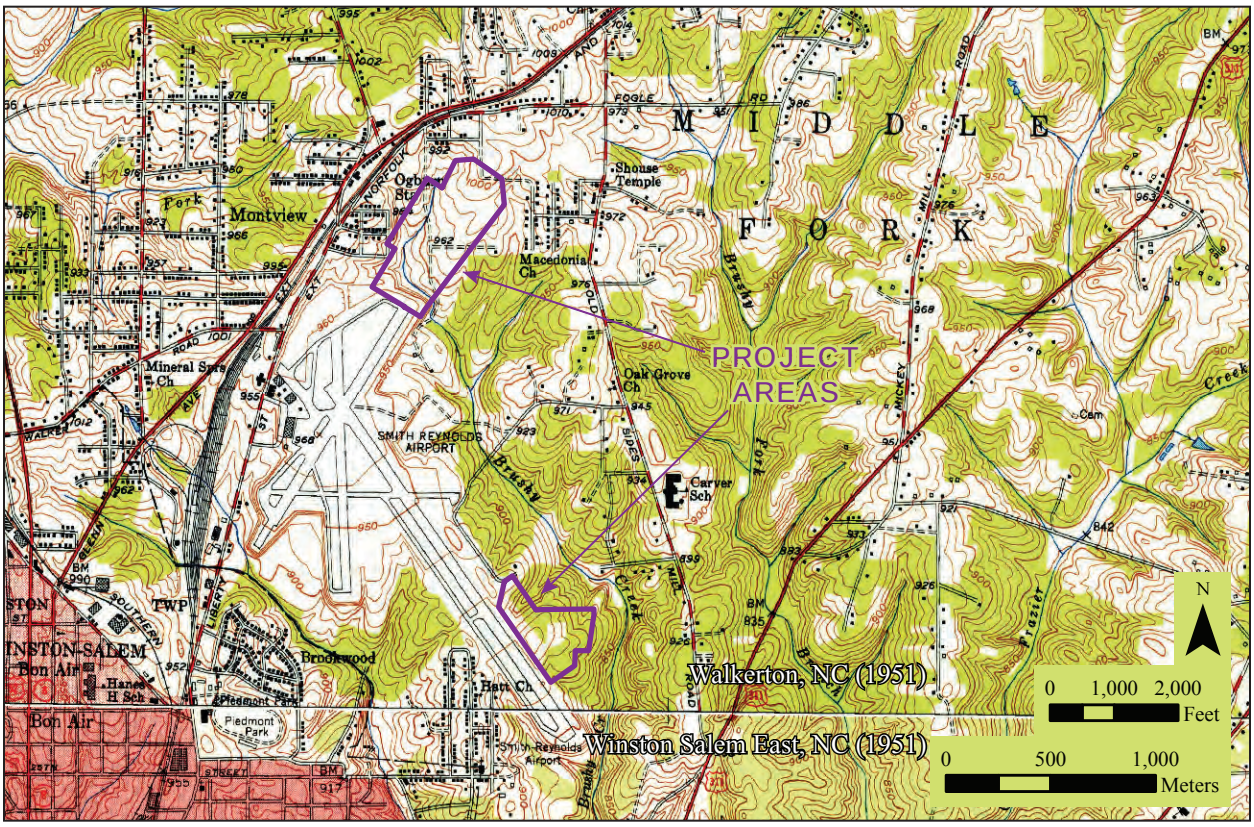

Figure 5.5. Portion of the 1951 USGS quadrangle maps showing the project areas.

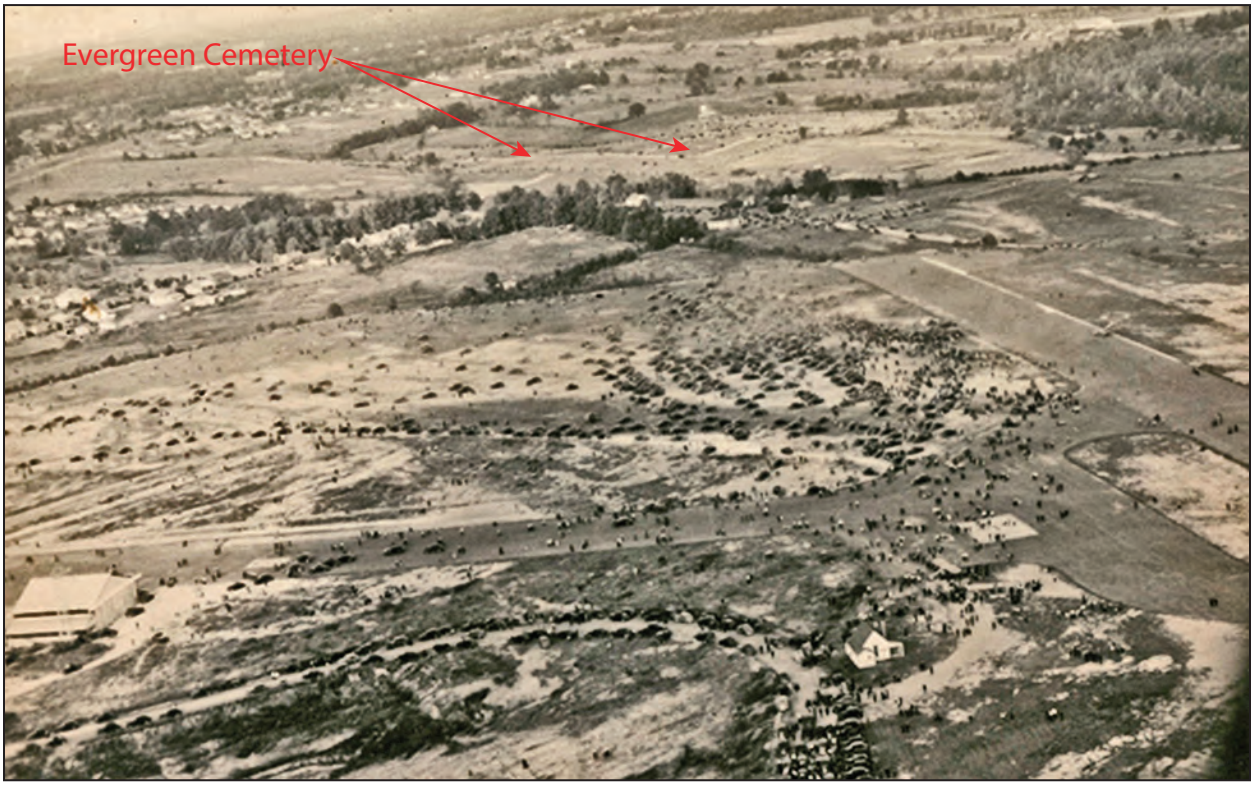

Figure 5.6. 1939 aerial photograph (runway approach with cemetery in background).

Figure 5.7. Northern project tract shown on 1948 aerial photographs.

Figure 5.8. Southern project tract shown on 1948 aerial photograph.

Figure 5.9. Northern project tract shown on 1971 aerial photograph.

Figure 5.10. Southern project tract shown on 1971 aerial photograph.

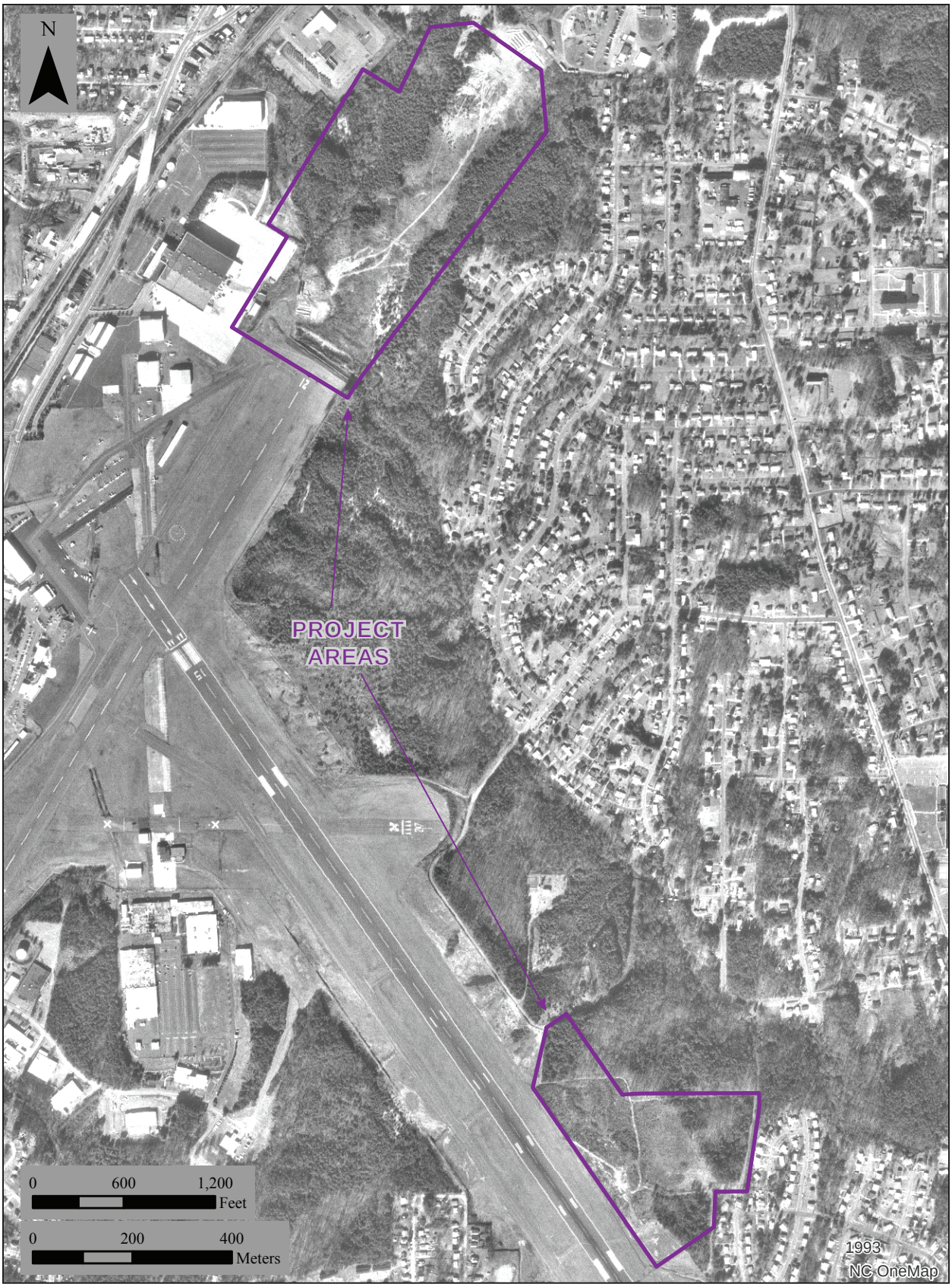

Figure 5.11. Project tracts shown on 1993 aerial photograph.

Figure 5.12. Project tracts shown on 2000 aerial photograph.

A 1935 entry lists North Carolina as the grantee of "100 acres, Proposed Extension of Miller Municipal Airport Claremont Avenue Tract" with Wachovia Bank & Trust as the grantor (Forsyth County Deed Book 373:31).

Eighteen separate entries were recorded in 1943 for properties acquired by the county (grantors are in parentheses) and described as part of the "Forsyth County Airport Extension Property" (Forsyth County Deed Books 503:278 [W.G. and Leonora Snow], 503:326 [N.R. Hedgecock et al.], 503:345 [Oscar L. Foy and Edna Foy Williams], 503:398 [Odie V. Foy], 503:407 [Edward Whitfield estate], 504:32 [Bertie M. Jones], 505:298 [Barbara and George Fulp], 503:63 [C.G. and Helen Varner], 503:65 [A.C. and Laura Motsinger], 503:82 [J.P. Self et al.], 503:94 [William S. and Maude Burns], 503:100 [C.N. and Mary Brooks], 503:102 [Roney F. and Marie Jenkins]. 503:119 [J.W. Irvin and Kathleen Whicker], 503:130 [Alexander Walker et al.], 503:158 [Mary Lowe et al.], 503:231 [R.M. Walker], 503:242 [H.A. Spencer]). A master plat associated with the Forsyth County airport extension property is referenced in all of these deeds without an accompanying plat book reference. A search performed at the Forsyth County Register of Deeds facility failed to locate any such document on file there.

ARCHAEOLOGICAL FIELD SURVEY

A total of 298 shovel tests, including transect, judgmental, and site delineation, were excavated within the project boundaries. Shovel test transects were oriented along the axes of major landforms, and in most instances provided adequate coverage of discrete landforms. Although most of the northern and southern tracts are undeveloped, both areas exhibit abundant evidence of prior disturbance. In the northern tract, push piles of varying size were encountered over much of the area, particularly east of the access road. The cleared area immediately north of the runway contains several large push piles and refuse piles composed chiefly of construction debris, including asphalt, cement, and brick (both modern and handmade). Shovel tests and probes indicate that all of that area has been heavily graded and substantially filled in many parts. Similarly, the cleared area at the northern edge of the property has been graded and filled.

Disturbance in the wooded parts of the southern tract is less extensive and includes push piles and road cuts. Modern refuse piles were encountered on the low knoll along the western edge. The undeveloped parts of the tract are characterized by moderately to severely eroded soils. Most shovel tests encountered A/B sequences consistent with the mapped upland soil types, including those of the Appling and Pacolet series. Erosion is much more pronounced in the northern tract; other than the filled areas, many shovel tests encountered the clayey B horizon directly below the modern humus, and in some areas soils were eroded to degraded saprolitic rock.

Typical sequences encountered in the northern tract consisted of a 10 to 15 cm thick, dark yellowish brown (10YR 3/6) or brown (10YR 5/3) sandy loam A/E horizon overlying the yellowish red (5YR 4/6), red (2.5YR 4/8), or strong brown (7.5YR 4/6) clay loam B horizon. Large areas of hydric (and occasional true wetland) soils were encountered in the vicinity of Brushy Fork Creek west of the access road. A single shovel test excavated in the wooded area directly east of the runway encountered a natural E/B sequence (and a whiteware sherd) below a 36 cm thick layer of clay fill.

Soils were generally less eroded in the southern tract despite evidence for more recent clear-cutting (resulting in a younger stand of pines). Sequences there generally consisted of a leached A/E horizon (occasionally up to 45 cm thick) down to the B horizon subsoil. Typical sequences encountered in the southern tract consisted of a 20 to 45 cm thick, dark yellowish brown (10YR 3/6) A/E horizon overlying yellowish red (5YR 4/6) or yellowish brown (10YR 5/6) subsoil. The cleared area adjacent to the runway has been graded and cut well below grade.

The survey identified one previously recorded site (31FY839) and two new archaeological sites (31FY1193 and 31FY1194) (Table 5.2; Figures 5.13 and 5.14). One of these resources (31FY1194, part of the 20th century Evergreen Cemetery) extends outside the northern project tract.

Table 5.2. Summary of Resources Identified.

Site/Resource	Component	Recommendation
31FY839	Prehistoric unidentified lithic	Not NRHP eligible; no further work
31FY1193	Historic 20th c	Not NRHP eligible; no further work
31FY1194	Historic 20th c (cemetery)	Not NRHP eligible; avoidance and preservation of visible cemetery area and surrounding 50-foot buffer; monitoring of disturbances extending more than 1.5 ft below surface in remainder of former cemetery area

Site numbers were not assigned to extensive but dispersed scatters of 20th century artifacts in the northern project tract (mainly north of, but also alongside Runway 4-22). These artifacts appear partly attributable to two or more former structures that are shown on the 1939 aerial photo. These former structure areas have been extensively graded, and artifacts appear to be broadly dispersed across most of the tract. A few subsurface artifacts (including clear and green bottle or other container glass, handmade and machine-made brick, asphalt shingles, ceramic tile, and Styrofoam insulation) were found in the cleared area north of Runway 4-22 and along the southern part of a low ridge and toe slope in the woods east of the access road (modern bottle glass, unidentified metal, whiteware, porcelain, crown bottle caps, plastic, nylon or similar fabric, and a condom foil pack). Two piers or foundation remnants made of handmade bricks and mortar were encountered in the cleared area near the runway (Figures 5.15 and 5.16). These appeared *in situ*, but it is not clear if they relate to former houses.

Artifacts were also encountered farther north along the same landform to the east side of the northern clearing (including greenish lead-glazed earthenware (redware), undecorated whiteware, clear and green container glass, unidentified nails, asbestos siding, mortar, and plastic). Disturbed soils and construction debris there may have been deposited when the adjacent cleared area was graded (a structure shown on the 1913 soils map appears to have been situated in that [now-graded] area, and it is possible that more structures were present by 1939). Finally, a single whiteware sherd was found below the fill in a single shovel test located in the wooded area east of the runway fence. That artifact appears redeposited at that location. Surface artifacts (including a small dump of mid-20th century medicine, soft drink, and liquor bottles) were also encountered in wooded areas around the creek west of the access road, and isolated examples were occasionally encountered east of that road.

Similarly, no site number was assigned to dispersed surface and subsurface artifact scatters encountered over the western part of the southern project tract. These artifacts are of 20th century to modern origin and most are attributable to refuse disposal on airport property (and are not diagnostic of pre-modern occupation). A dispersed scatter situated in the southeastern part of the tract is likely associated with a former 20th century house area and has been included as part of 31FY1193.

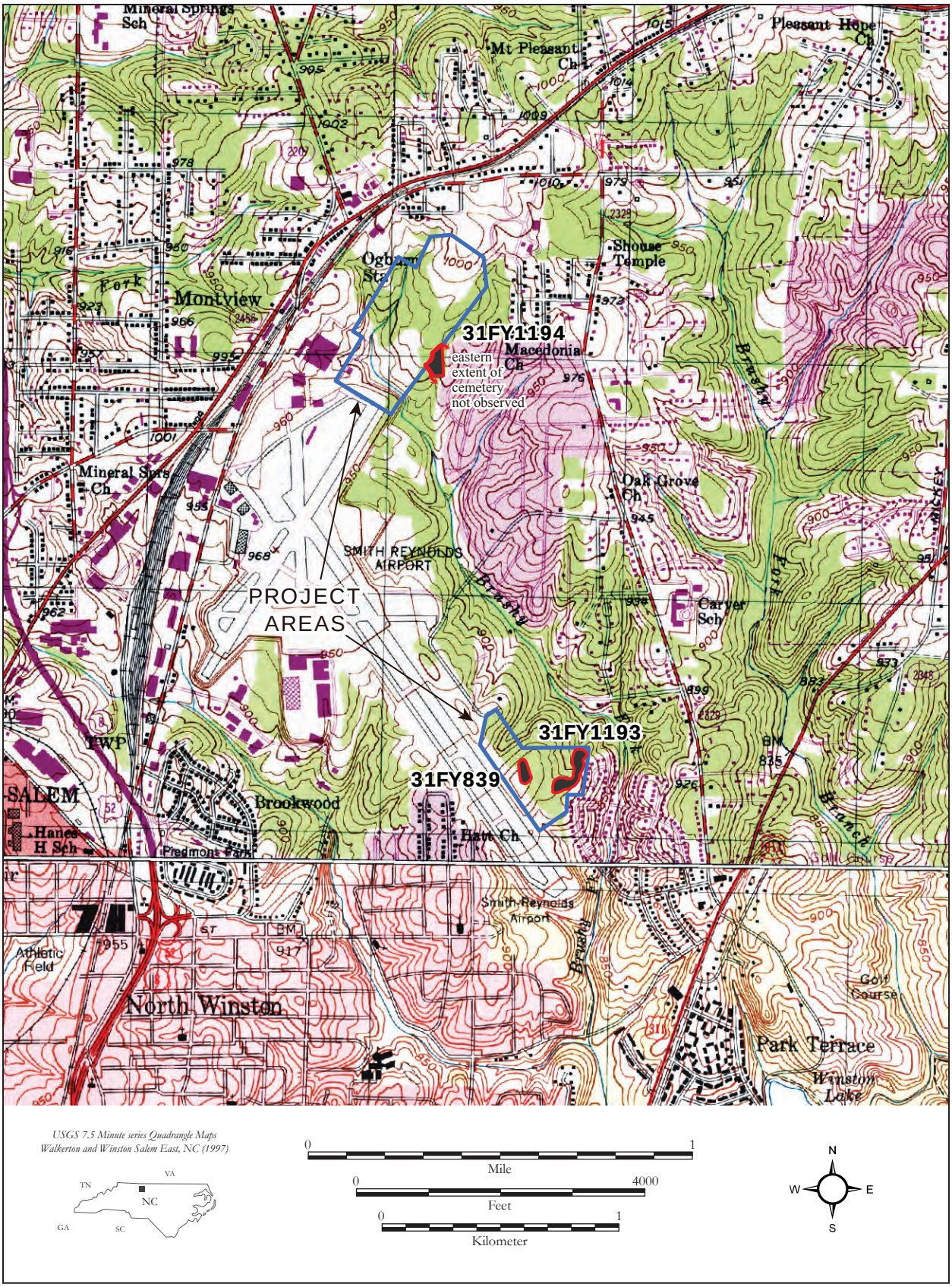

Figure 5.13. USGS topographic maps showing project area and identi ed archaeological resources.

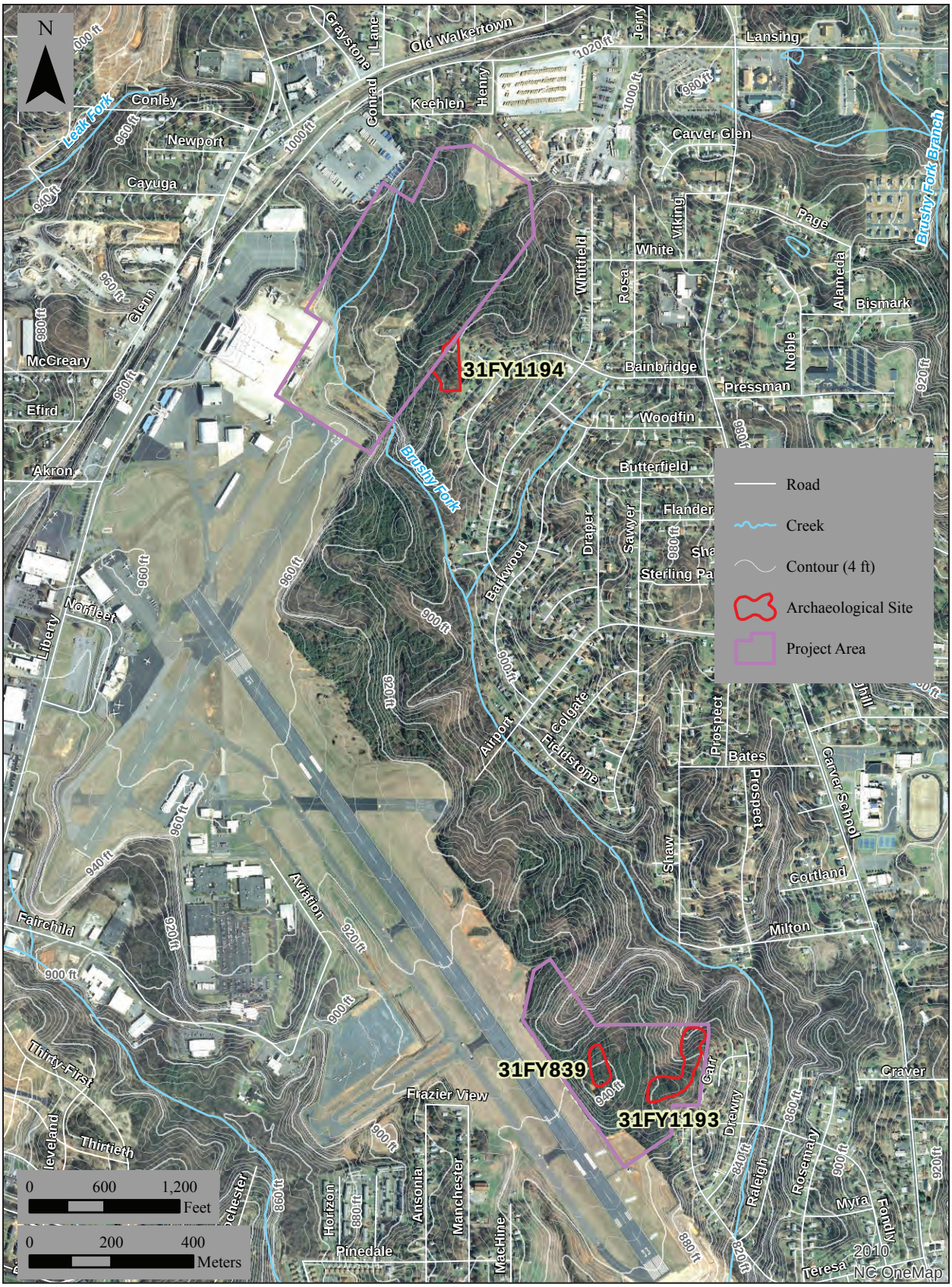

Figure 5.14. Aerial photograph showing project area and identi ed archaeological resources.

Figure 5.15. Plan view of brick and mortar pier or foundation section in cleared area near runway.

Figure 5.16. Plan view of second brick and mortar pier or foundation section in area near runway.

31FY839

Component:	Prehistoric (Unidentified Lithic)
USGS quadrangle:	Walkertown, NC 1951
UTMs (NAD 27):	E570611 N3998271
Site area:	3,722 m^2
Landform:	Ridge Toe
Elevation:	932–940 ft AMSL
Soil Type:	Appling sandy loam, 2–6% slopes
Recommendation:	Not eligible

31FY839 is a low-density prehistoric lithic subsurface artifact scatter located on the northeast side of a knoll remnant adjacent to the Runway 15-33 cut (Figure 5.17; see Figures 5.13 and 5.14). The site is situated within a wooded area covered in young pines (Figure 5.18). The site was previously recorded in 1993, when a single metavolcanic flake was collected from an exposed road surface. No subsurface testing appears to have been performed at that time, and the NRHP-eligibility status of 31FY839 was not assessed. As mapped in OSA files, the location of the 1993 surface find is about 70 m northeast of the 2014 finds, although both locations are on the same landform and likely represent a once-continuous low-density scatter.

As defined by the current work, the site measures approximately 20 m north-south by 20 m east-west and is bounded by negative shovel tests. Much of the site area was disturbed by road cuts and associated push piles, and surface visibility during the current investigation was limited to a deep road cut across the western end of the knoll; no artifacts were found in this eroded area. The soils across the site were variable in composition, compaction, and depth to subsoil due to differential effects of disturbance, but generally represent related sequences.

The uppermost horizon consisted of a thin humic zone capping a dark yellowish brown (10YR 4/6) sandy loam remnant A (or E) horizon that was leached of organic material. This zone overlay yellowish red (5YR 4/6) or strong brown (7.5YR 4/6) clay loam. The gradational boundary between the A/E horizon and the clay subsoil suggests that the former is part of a natural soil sequence. Graded clayey fill or disturbed soils occasionally were encountered in the vicinity of the western road cut, overlying the native soil sequence. Across the site, subsoil was found at depths of from 14 to 29 cm below surface (cmbs).

Only two lithic artifacts were recovered from two of 25 shovel tests (including all transect and delineation shovel tests situated within 20 m) during the 2014 investigation. All of the artifacts derived from the top 14 cm of the A/E horizon.

The 2014 investigation produced two small pieces of unmodified debitage and no temporally diagnostic artifacts. Both artifacts are of similar gray material resembling varieties of porphyritic rhyolite containing small quartz inclusions that have been documented in the Uwharries region (see Daniel and Butler 1996; Steponaitis et al. 2006).

In summary, 31FY839 is a site with an unidentified prehistoric (lithic) component. The site occurs on an upland landform composed of soils formed in residuum and lacks potential for any deep burial. The results of the 1993 and 2014 investigations suggest a low-density site with a fairly low probability of detection. The combined investigations have generated only three lithic artifacts. 31FY839 likely represents a low-density scatter across the landform, resulting from a limited number of site visits during the prehistoric past, and likely reflects general foraging-related activities (including stone tool production) in upland settings.

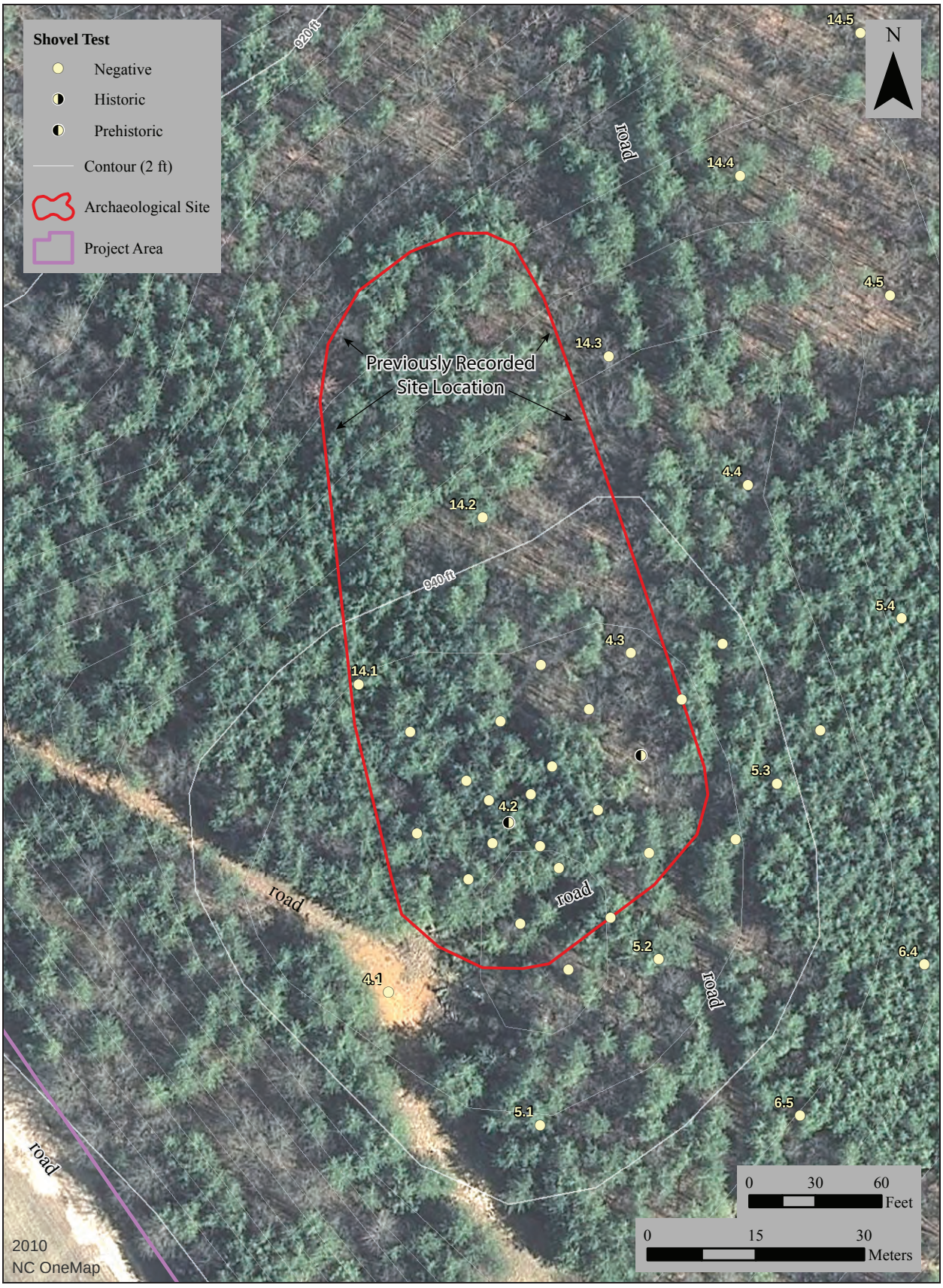

Figure 5.17. Plan map of 31FY839.

Figure 5.18. Overview of 31FY839, view to west.

The few subsurface artifacts were found in relatively shallow contexts, and the associated artifact types are not typically correlated with subsurface features or other significant archaeological patterns in eroded upland settings. 31FY839 appears to lack the potential to yield further information about local prehistoric occupations and is recommended not eligible for the NRHP. No further archaeological assessment appears necessary for regulatory purposes.

31FY1193

Component:	Historic (20th c)
Site area:	9,659 m^2
UTMs (NAD 27):	E570808 N3998271
Landform:	Ridge Toe and Toe Slope
Elevation:	880–920 ft AMSL
Soil Type:	Pacolet clay loam, 10–15% slopes
Recommendation:	Not eligible

31FY1193 is a 20th century historic site located at the eastern spur of a low upland ridge toe in the southeastern corner of the tract (Figure 5.19; see Figures 5.13 and 5.14). The site extends west onto an east-oriented ridge toe and is also represented by surface refuse found in an adjacent ravine. The site area is wooded, in mixed hardwoods and pines. Site boundaries were determined mainly by the distribution of surface artifacts and architectural debris, and by the graded road adjacent to the property boundary fence. Aerial photographic evidence indicates that most of the site materials are related to a post-1948 occupation.

Most associated artifacts, including architectural debris, are found distributed over a ca. 40 × 60 m area on a northeastern oriented toe and slope (Figures 5.20–5.25; see Figure 5.19). Although no intact architectural remains (e.g., foundations, well) were encountered, the distribution and type of refuse, combined with ornamental bushes, flowers, *Vinca*, large oaks, and a driveway or access road trace suggest former domestic use or occupation. Larger artifacts include two intact iron swing sets, a gas-powered lawnmower, a porcelain bathroom sink, a large metal mailbox bearing a painted name or address "3434 Wilson," and a refrigerator. Most surface artifacts were found in the adjacent ravine and on side slopes, and include early 20th century machine-made stoneware, enamelware buckets and bowls, Atlas Mason fruit jars, soft drink bottles, metal fuel and other cans, and plastic doll parts. At least two utility poles strung with wire extend across part of the site area. Most of the artifacts reflect 1920 to post-1960 manufacture dates. Surface artifacts appear related to the occupation, but it is possible that some items were discarded there at a later date. Handmade bricks suggest earlier 20th century (if not earlier) derivation, but machine-made bricks and cement blocks are also present.

Shovel tests in the main debris area encountered an A–B horizon sequence consisting of an 11 to 18 cm thick top zone of dark brown (10YR 4/3) sandy loam that overlay yellowish red (5YR 5/6) clay loam. These tests yielded a wire nail, an unidentifiable cut or wire nail, colorless, green, and brown container glass, tinted and clear unidentifiable flat glass, molded plastic, a brick fragment, and a piece of asbestos roofing or siding. Lacking surface evidence of a well, foundation, or other intact architectural evidence, this may represent a near-structure yard area (it is possible that the former structure was situated just outside the property and is now encompassed by modern development).

Shovel tests on the east-oriented ridge toe outside the main debris concentration encountered similar A–B sequences or thicker E horizon soils that extended from 20 to 35 cm to yellowish red or yellowish brown clay loam. In at least one instance, a disturbed A horizon (as from tilling or tree removal) was encountered.

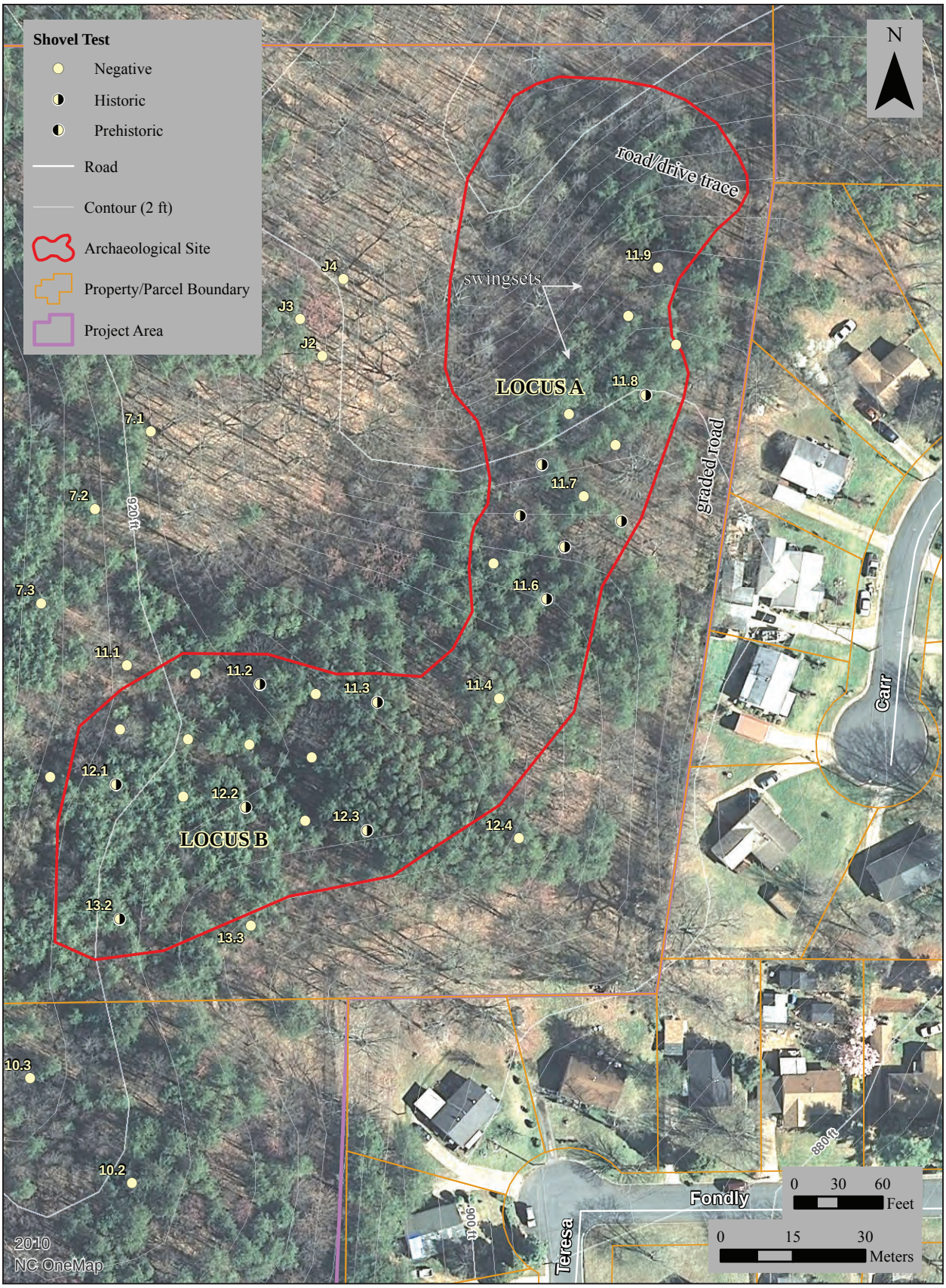

Figure 5.19. Plan map of 31FY1193.

Figure 5.20. Overview of 31FY1193 main debris area with oaks and utility pole, view to north.

Figure 5.21. Overview of 31FY1193 main debris area with *Vinca*, view to northeast.

Figure 5.22. Overview of refuse in ravine at 31FY1193 view to northeast.

Figure 5.23. One of two swing sets at 31FY1193, view to west.

Figure 5.24. Plan view of handmade bricks set in cement footer for swing set.

's stamp.

Most, if not all, of the surface and subsurface artifacts encountered in this area likely relate to former nearby habitation and include clear and brown container glass, two large animal bone fragments from the disturbed A horizon (likely from a domestic pig, *Sus scrofa*, or cow, *Bos taurus*), and an unusual artifact: a one-cent mill scrip token made of nickel or brass. The stamped inscription is APPLETON MILL STORE 1 in MDSE. ANDERSON, SC on the obverse, and on the reverse MASTER METAL SCRIP 1 INGLE-SCHIERLOH CO DAYTON O IN TRADE (Figure 5.26). Most similar tokens were all produced prior to WWII (Chibbaro 1990). Surface artifacts in this area consisted of at least two handmade bricks, including a fire or paving brick made by the Graves Brick Company (see Figure 5.25), which produced bricks in Birmingham, Alabama from ca. 1901–1920 (http://brickcollector.blogspot.com/2011/02/graves-bham-al.html). It is possible that these and some identical handmade bricks found in the main debris area could have been repurposed for other use (for example, two handmade bricks were found embedded in one of the swing set's cement footers [see Figure 5.24]).

A 1948 aerial photograph shows a few houses to the east of the location, but none within the project tract, and none appears on the 1951 Walkertown quadrangle (which is based on a 1948 aerial photograph). A 1971 aerial photograph shows two structures at the location (a house and a large outbuilding or a second house), along with an associated yard or field area. One of these structures is shown on the 1986 photo-revised Walkertown quadrangle (USGS 1951/1986). A tag on one utility pole indicates inspection or replacement in 1988. No structures are shown at the location on a 1993 aerial photograph of the location (see Figure 5.11).

In summary, 31FY1193 is represented by early to late 20th century architectural and other debris attributable to former habitation, but appears to represent modern (post-1948) occupation. Aerial photographs and the early 1950 quadrangle map indicate that an associated house was built sometime after 1948 and had been demolished by 1993. The main debris area is clearly related to former habitation, but no structure footprint was identified within the project area, and no intact subsurface contexts were encountered. 31FY1193 appears to lack the potential to yield further information about local historic occupations, and it is recommended not eligible for the NRHP. No further archaeological assessment appears necessary.

31FY1194

Component:	Historic Cemetery (20th c)
Site area:	Unknown; minimally 5,582 m^2
UTMs (NAD 27):	E570210 N3999971
Landform:	Toe Slope
Elevation:	928–938 ft AMSL
Soil Type:	Appling sandy loam, 2–6% slopes
Recommendation:	Not eligible; recommend avoidance of visible cemetery area and a surrounding 50-foot buffer, and monitoring of, or additional assessment prior to any ground disturbance extending more than 1.5 ft below surface in the remainder of the former cemetery

31FY1194 is a surviving portion of the former Evergreen Cemetery and is situated in the northeastern part of the airport property (see Figures 5.13 and 5.14). The site area is wooded and heavily overgrown (Figures 5.27 and 5.28); a series of aerial photographs indicates that the cemetery once extended across much of the project area and into the present Runway 4-22 flight path (below). Most of the remaining identifiable cemetery area is outside of the northern project tract, although the cemetery boundaries are not clearly demarcated, and it appears that a small part of this cemetery extends into the project area. For reasons that are discussed below, the status of the cemetery is not fully clear; and although most graves were removed from the cemetery during the 1940s, it appears likely that some interments remain.

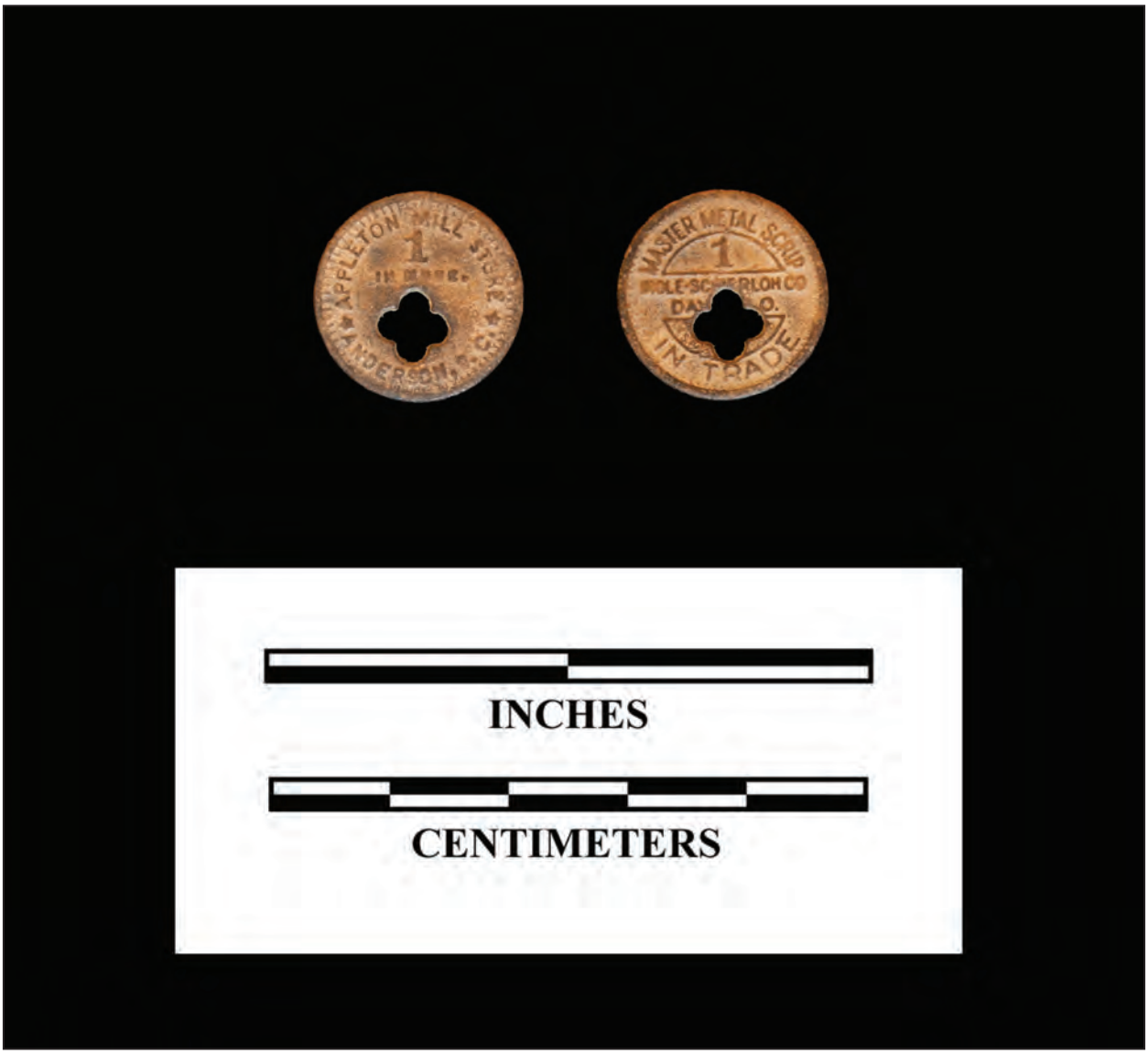

Figure 5.26. Two sides of Appleton Mill Store token.

Evergreen Cemetery does not appear on any of the city or county maps examined from the early 20th century, and not recorded during prior cemetery surveys, or during Hargrove's 1993 reconnaissance of the airport. It is depicted clearly on a 1948 aerial photograph, however, and also appears on a 1939 aerial photograph. The 1948 aerial photograph shows an extensive, landscaped cemetery, which, coupled with other documentary sources, indicates that the cemetery identified by the 2014 survey is part of the former Evergreen Cemetery ("old" Evergreen Cemetery).

A May 1928 deed records a ca. 13-acre purchase by Evergreen Cemetery Association Inc. from John Banner et al. (his wife Johnie and J.W. and Gladys Lovill) for $10 and other valuable considerations (Forsyth County Deed Book 296:305). The deed refers to the property as part of the old Bodenhammer (sic) tract, in the vicinity of Ogburn Station, and adjoining the lands of Flynn Renegar (or Renigar). The 1907 county map shows J.B. Bodenheimer's house on the opposite side of the eastern branch of Brushy Fork Creek (see Figure 5.1).

A 1928 Winston-Salem Journal and Sentinel (WSJ&S) article in the "News of Colored People" column (authored by Hoyt Wiseman Sr., an African-American journalist) provides a detailed description of Evergreen Cemetery (Figure 5.29). According to that article, Evergreen Cemetery was to be established in July, 1928 for use by the African-American community. It was established by the Evergreen Cemetery Association and was located on Walkertown Road (Walkertown Road, now Old Walkertown Road, is located ca. 350 m from the site location, and would have been the closest improved road at that time). As planned, Evergreen Cemetery was a 13-acre, "L-shaped" cemetery surrounded by a steel fence, with a stone entrance gate, paved drives and walkways, and an underground drainage and irrigation system. Other features included an eight-foot-tall fountain and a pool 12 feet in diameter in the central section. The corner of each lot was to be marked with sunken granite blocks, and metal markers were also used (Wiseman 1928). A special plot was to be donated to the Morris Slaughter post of the American Legion for a memorial to those who had died in the World War. A schematic depiction of the cemetery "as it will appear when completed" also appears in the same issue of the newspaper (Figure 5.30).

A receiver's deed recorded on July 30, 1938 finalizes the sale "in the proceeding entitled John Banner vs. Evergreen Association, Inc., party of the first part, to Evergreen Cemetery Corporation, party of the second part…" (Forsyth County Deed Book 436:188). The documents refers to the sale (finalized after a 10 day waiting period for any upset bids) of 13 acres that had been developed into the Evergreen Cemetery, excepting several lots or parts of lots that had already been sold, for the amount of $4,000 (Forsyth County Deed Book 436:188). That document refers to a plat that shows the cemetery as it was surveyed in July 1928 (Forsyth County Plat Book 7:55) (Figure 5.31).

The plat map shows an L-shaped cemetery with the long-axis oriented north-south (Figure 5.31). An access road extended from the direction of Walkertown Road (now Old Walkertown Road) and entered the cemetery through a gate on the north end. A small branch and retention pond are shown outside the northeastern corner of the cemetery, along with a small pump and tool house. The cemetery was divided into seven sections designated by the letters A–G, but also included a large undesignated section containing numerous lots on the northwestern side. The sections of the cemetery were divided into numbered blocks containing numbered lots. A circular pool is shown in the center of section A where the two axes of the "L" joined, and an American Legion plot is shown in section B, block 19, on the western side of the cemetery. The sections were all rectangular, with squared or rounded (in the case of section A) corners, except for section G, which designates a linear array of lots adjacent to the perimeter fence. Section G extends discontinuously around much of the cemetery. When geo-referenced the cemetery as depicted on the plat encompasses ca. 12.3 acres.

Figure 5.27. Overview of 31FY1194, visible cemetery area, view to east.

Figure 5.28. Overview of 31FY1194, visible cemetery area, view to southeast.

WINSTON-SALEM (N. C.) JOURNAL AND SENTINEL, SUNDAY, MAY 27, 1928.

News of Colored People

By H. A. WISEMAN. Phone 3316.

The Evergreen Cemetery

On the first or second Sunday in July, one of the most beautiful cemeteries in North Carolina will be dedicated to the colored people of Winston-Salem. This cemetery is now under construction on Walkertown Road, and is only a few miles from the Courthouse Square.

Nothing is being ommitted to make the Evergreen Cemetery as it has been designated, the finest cemetery in the State. Extreme care has been exercised by those responsible for the development and their long experience in similar efforts has assisted them in providing for the colored people of the Twin City a cemetery that will be a fitting memorial to their dead.

The Evergreen Cemtery is about three miles from the city and comprises thirteen acres. It is "L"-shaped, with the main entrance at the end of the longest side. This entrance, first to attract the eye of of the visitor, will be a huge gate of native stone, most attractively designed. On each main pillar will be a granite marker, one carrying the name of the cemetery and the other serving as a corner stone or dedicatory stone. The cemetery will be surrounded with a heavy hurricane steel fence.

The entire tract is being graded to conform to the architect's plan. All walkways and driveways are to be of rolled granite screens. The driveways will be twenty-six feet wide and the walkways will have a width of six feet. The corners of each lot will be marked with sunken granite blocks and metal lot markers will be used.

All of the lawn area will be sown to Bermuda, and an elaborate use of evergreen and other shubbery assures a touch that will be a most impressive picture of nature. At the corner of each block there will be Chinese Arbor Vitea, and other species will be distributed throughout the enclosure.

One of the features of the development will be the watering system. From a natural lake at one edge of the property a motor pumping system will take water to a twelve-thousand gallon reserve tank. This tank will be high enough to assure a force feed, through an under-ground system of piping, to all parts of the cemetery. At regular intervals, outlets will be placed, and from all these parts of the cemetery will be sprinkled each afternoon. A complete system of underground drainage also is being installed.

A living fountain, eight feet in height, and a pool, twelve feet in diameter, will be placed in the center of the central section, of the cemetery and will be visable from all parts of the developments.

A special plot has been donated to the Morris Slaughter Post of the American Legion and a suitable monument will be erected in memory of those who lost their lives in the World War. A deed to this plot will be given to the Morris Slaughter Post when the corner stone of the cemetery is laid and the monument unveiled.

A trust fund is being created, which will be more than sufficient to care for the property annually and which will be administered by a board of trustees, selected from among the colored representatives of the community. The new cemetery is being established by the Evergreen Cemetery Association, Inc., chartered under the laws of North Carolina. R. H. Logan, vice-president and general manager, is directing the development and his office at 418 East Sixth Street, is in the New Bruce Building.

The development is to be completed before any lots will be offered for sale. Mr. Logan, states and a program is to be rendered. Mrs. Sara E. Reynolds, is secretary of the organization. The office will be opened Sunday at 4 o'clock and remain open throughout the week for inspection. The cemetery when completed will cost around 46,000.

Figure 5.29. Winston-Salem Journal and Sentinel article "The Evergreen Cemetery."

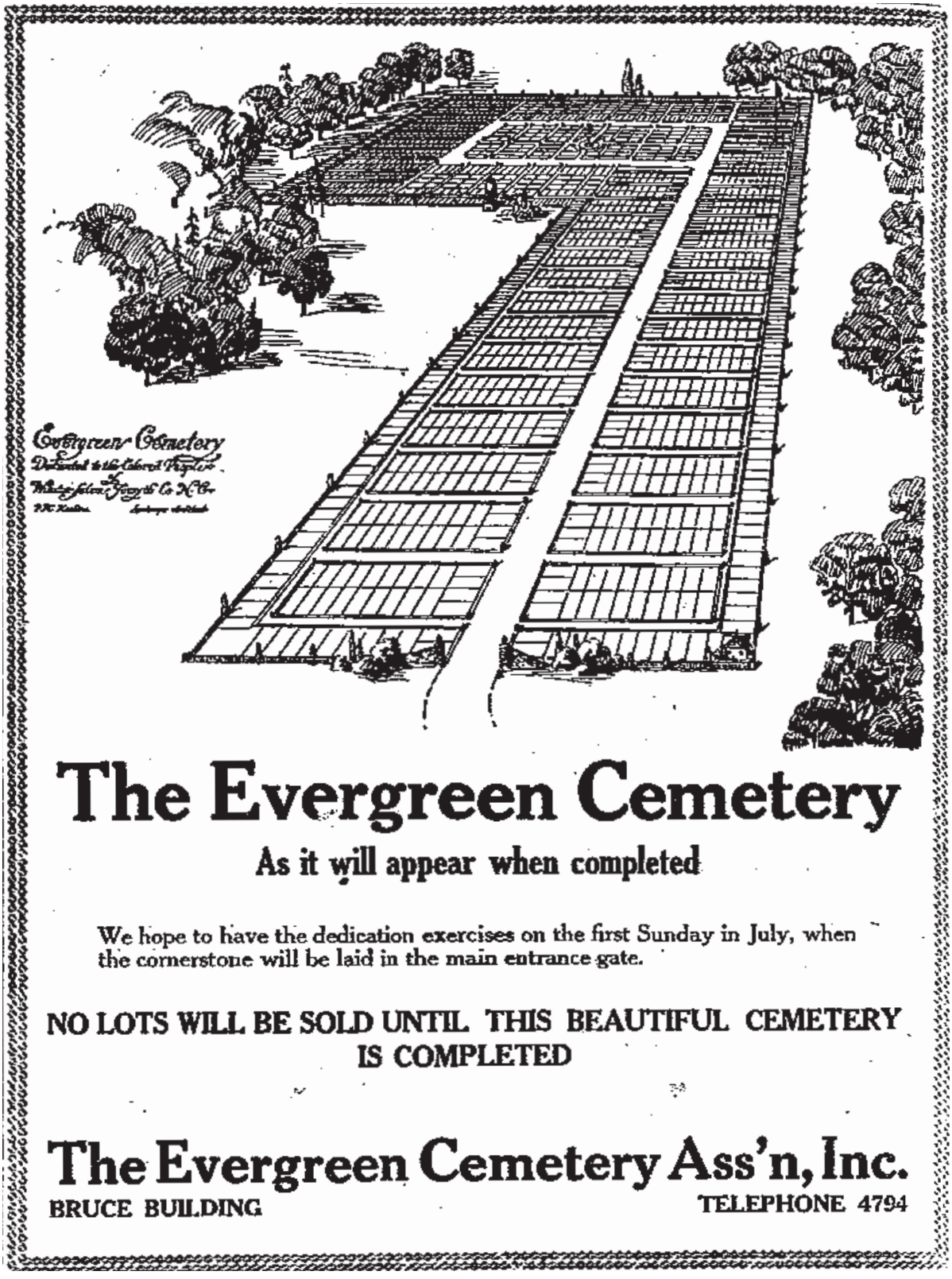

Figure 5.30. Schematic map of cemetery as it appeared in a 1928 newspaper article.

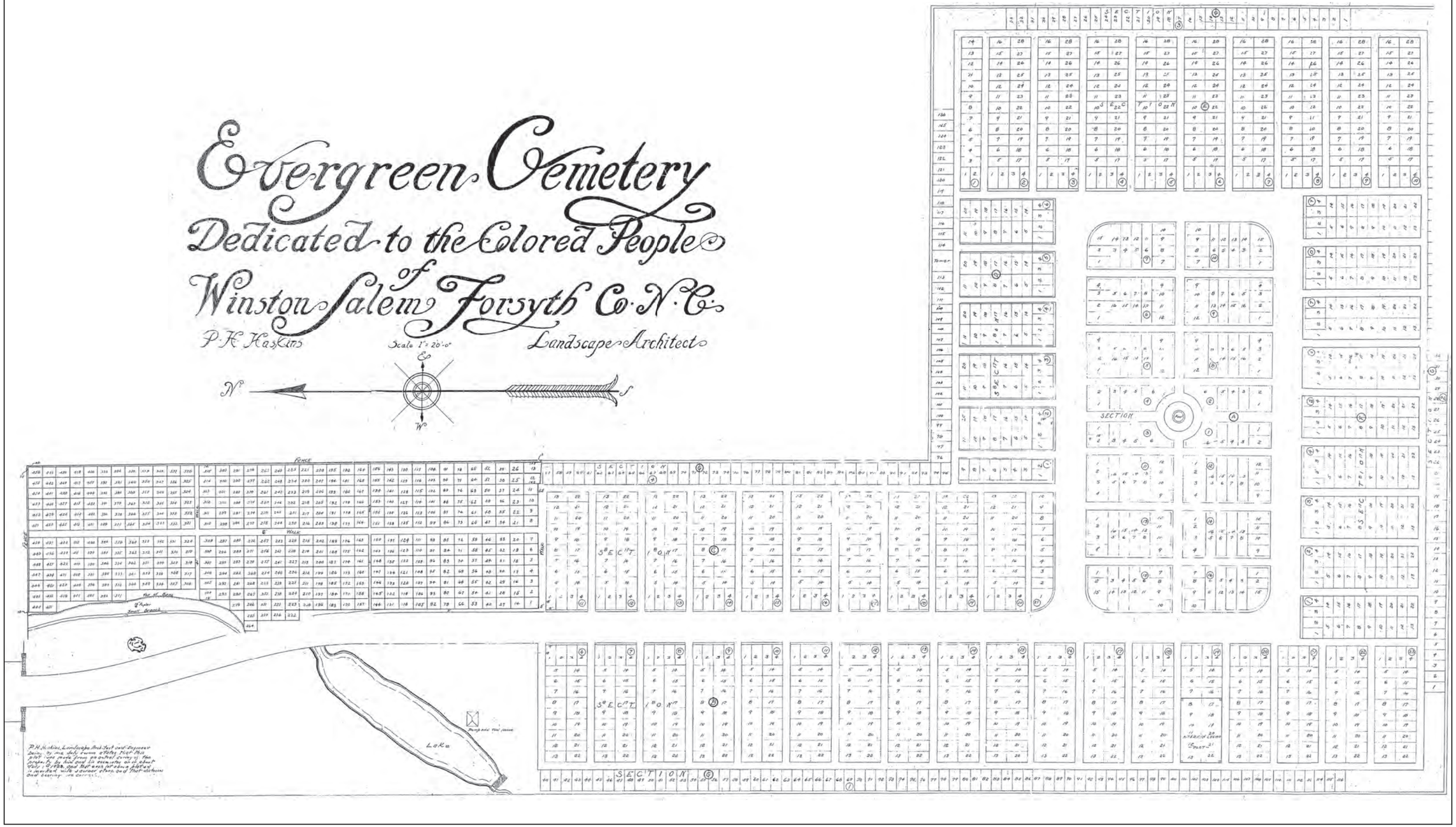

Figure 5.31. Plat map showing cemetery layout in 1928.

Over 100 deeds filed from 1928 to 1942 for cemetery lots list Evergreen Cemetery Association (by 1938, Evergreen Cemetery Corporation) as grantor. In 1941, the Evergreen Cemetery Corporation was deeded additional property (a 1.1 acre tract from John and Johnie Banner [Forsyth County Deed Book 486:85]) and in the same year John Banner was granted right of way access to cemetery driveways by Evergreen (Forsyth County Deed Book 488:367).

A 1941 deed records an option to purchase land consisting of a 7.79-acre parcel (including a brick chapel and office building) by Evergreen Cemetery Corporation (or its successors) from Mr. and Mrs. Banner (Forsyth County Deed Book 496:268). This appears to correspond with a plat filed in 1941 for "Evergreen Cemetery Corp." based on a 1940 survey. That plat shows five contiguous tracts east of an L-shaped cemetery and includes an office building, apparently the one referenced in the 1941 deed. The 1941 deed refers to a description of that (apparently adjoining) property based on an earlier 1932 deed that records acquisition of the property by John Banner from L.T. and Josie Long (Forsyth County Deed Book 352:268). No earlier associated plat is referenced in the 1932 or 1941 deeds. The earlier deed describes a property adjoining the holdings of R.F. Whicker, J.W. Crews, J.D. Bodenhamer (sic), and York Hairston (Forsyth County Deed Book 352:268). The option to purchase was set to expire January 1, 1945. The nature of this (apparently adjoining) parcel and the function of the office building are unclear. Although partially obscured by the time stamp on the 1948 aerial photograph (see below), an apparent structure ringed by trees is shown in an area that appears to correspond to its location on the 1941 plat. It is likely that this building functioned as the cemetery office.

On July 23, 1943 a settlement in a civil action (Estelle F. Wall vs. Evergreen Cemetery Corporation) was reached, in which Evergreen Cemetery was directed to sell two tracts to Forsyth County for the sum of $5,200 (Forsyth County Deed Book 506:316). The first tract is composed of some 12.8 acres (the 13 acres more or less referenced in the original sale deed), and the second tract consists of 1.1 acres, which is described as a parcel formerly conveyed by Mr. and Mrs. Banner to Wayne M. Nelson (Forsyth County Deed Book 490:351). In addition to the land, the deeds also conveyed the personal property of the cemetery, including "an old lawn mower, an old truck, some office equipment… (Forsyth County Deed Book 506:316).

The cemetery appears to have been active until the cemetery property was acquired by the county. City records (see below) indicate the at least most graves at the cemetery were removed as part of a WPA (Works Progress Administration) project, presumably in 1943 or early 1944 (City of Winston-Salem Government Meeting Notes 1944). The following appears under the heading "New Evergreen Cemetery" in the City of Winston-Salem Government Meeting notes (http://www.cityofws.org/portals/0/pdf/marketing-and-communications/History/Winston-Salem%201940-1949.pdf):

> Feb 29, 1944 - The Mayor reported that the Finance and Public Works Committee had held a joint meeting and had conferred with Charles E. Norfleet, representing the Winston-Salem Foundation, with respect to the City taking over New Evergreen Cemetery on Walkerton Rd, adjacent to the city limits (31-30)
>
> The old "Evergreen Cemetery" was on property acquired for the lengthening of the runway of Smith Reynolds Airport and it was necessary to remove the bodies to a new location. The new airport was being constructed through a WPA project and the removal of the bodies was included as part of the project.
>
> The Mayor stated that the Winston-Salem Foundation had spent approximately $15,000 in the establishment of the cemetery and there was still some grading and surfacing to be done. The capacity of the [new] cemetery was approximately 16,000 grave sites. 700 bodies had already been moved from Evergreen Cemetery, and about 300 or 400 were still to be moved at Foundation expense.

Rules and regulations concerning New Evergreen and Woodland Cemeteries were proposed December 12 1944 (31-283).

No other documentation related to the removal of graves from Evergreen (between 1,000 and 1,100 individuals, according to the above source) has been located. It is possible that additional documentation may exist in Civil Works Administration (CWA), Federal Emergency Relief Administration (FERA), WPA, or National Archives and Records (NARA) documents, the records of the Winston-Salem Foundation, additional documents filed at the Forsyth County Register of Deeds, or in contemporary newspaper accounts. A city website states that the new Evergreen cemetery was constructed in 1943 (Winston-Salem 2014–http://www.cityofws.org/ portals/0/pdf/budget/coerc/Compiled%20Answers.pdf). In 1946 a deed for burial rights on multiple lots in New Evergreen Cemetery was granted to Mrs. G.L. Dillehunt (Forsyth County Deed Book 547:238), indicating that the new facility was indeed active by that time. Today the new cemetery is known as Evergreen Cemetery, but is often referred to as New Evergreen Cemetery.

Aerial photographs from 1939, 1948, and 1971 record the old Evergreen Cemetery and its (at least partial) destruction. A 1939 aerial photograph incidentally shows the cemetery during an air show fly-over, evidently prior to the expansion of the runway (see Figure 5.6). Although taken from an oblique angle, the cemetery borders are clearly visible in the photograph, as are markers and other cemetery features. This is the only photograph found that shows the cemetery prior to the removal of any graves.

A 1948 aerial photograph shows the cemetery in the area north and northeast of the runway at that time (Figure 5.32). This photograph depicts an extensive L-shaped cemetery with a north-south long axis and tree or tree and shrub-lined borders. These trees appear evenly spaced, and in some areas a trace of a fence line can be discerned. Parallel driveways intersect access roads on the east and west sides (although it is not clear if at least some of these are roads constructed to facilitate airport expansion projects). The entire cemetery is crossed by gridded pathways that bracket disjointed rows of what appear to be headstones and other markers, near-parallel back dirt piles, or open shafts. A large circular object that appears to be the cemetery's central fountain and pool is very prominent in that photograph. An overlay of the 1928 plat map and the 1948 aerial shows closely similar configurations, down to the location of the fountain (Figure 5.33). The cemetery itself is in a cleared area (with a few trees situated inside), but other than potential construction access roads, does not appear to have been graded by that time. The photograph shows that surrounding clearing or grading had stopped at the southern and western cemetery borders.

The cemetery is not shown on the 1951 quadrangle and is unrecognizable in a 1971 aerial photograph, although traces of associated access roads are discernable even at that time (Figure 5.34). None of the features prominent on the older photograph are present by 1971, however, including the pool/fountain. Except for the narrow wooded strip adjacent to a new subdivision (which would have encompassed part of the eastern end of the short axis of the "L"), the cemetery and surrounding area has been cleared in the flight path. No trace of the cemetery is evident on later 1993 and 2000 aerial photographs, in which most of the cleared areas have reverted to forest (Figures 5.35 and 5.36).

The aerial photographs appear sufficient to erase any doubt that the cemetery recorded by the 2014 survey is the Evergreen Cemetery that was established in 1928 and shown on a plat map produced in that year. It is unclear why the cemetery appears relatively intact in the 1948 aerial, apparently some years after the removal operation. The outline of what appear to be individual grave markers and/or back dirt piles suggests that removal of individual graves was accomplished by hand, leaving much of the cemetery and its related architecture, plan, and surrounding enclosure temporarily intact.

Figure 5.32. Tiled portions of aerial photographs from 1948 showing the cemetery.

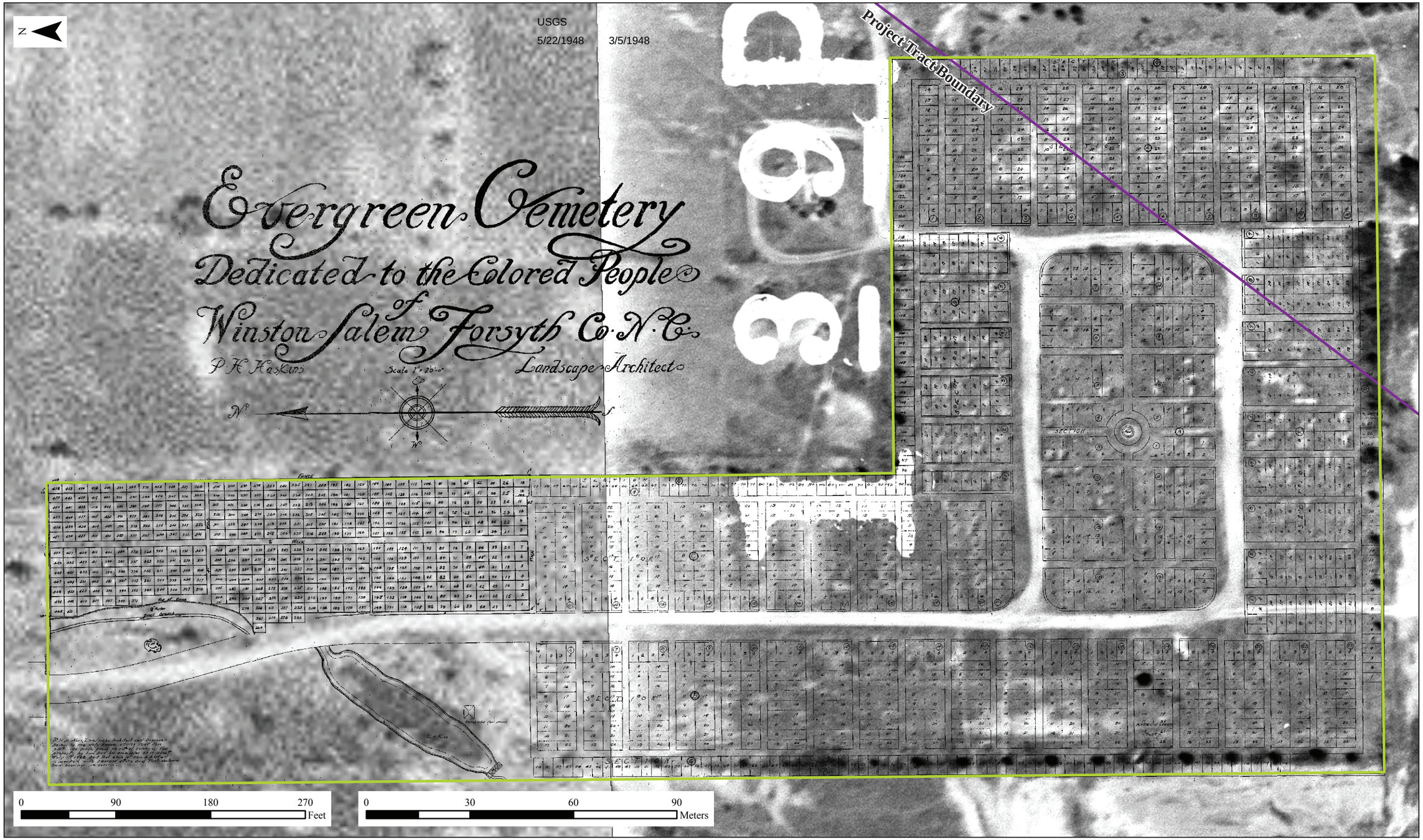

Figure 5.33. Overlay of the 1928 plat map and 1948 aerial photographs.

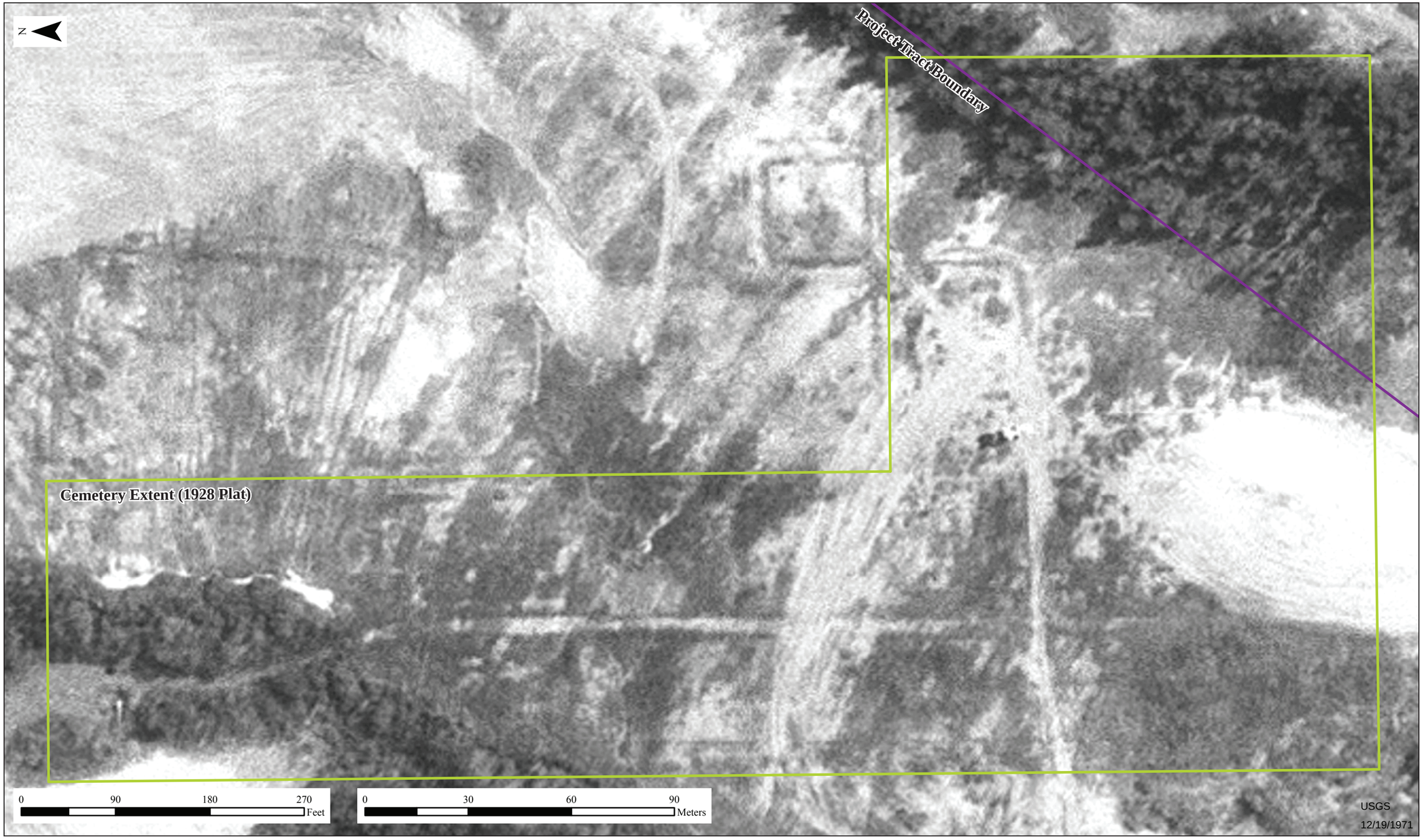

Figure 5.34. Aerial photograph from 1971 showing the cemetery area as depicted on the 1928 plat map.

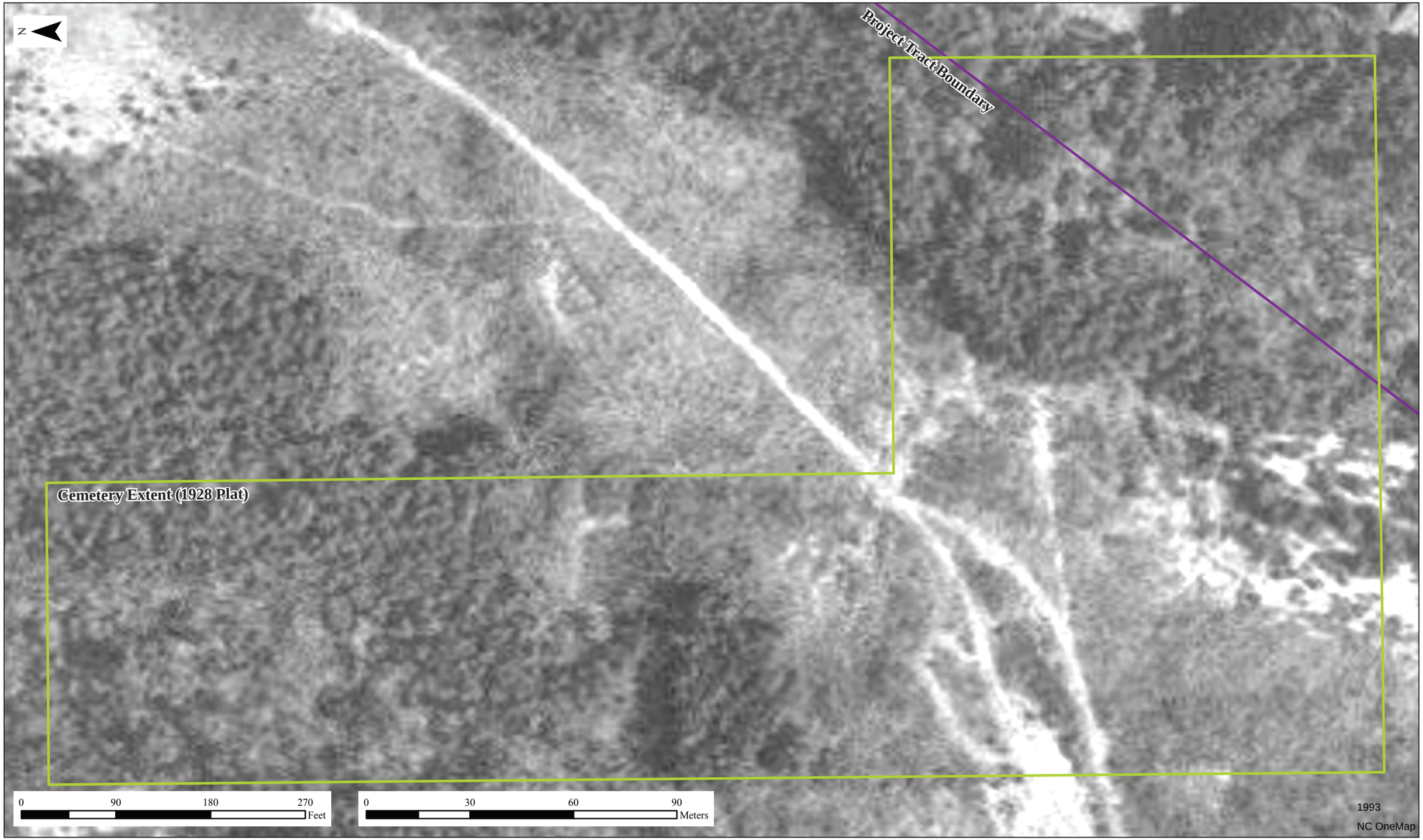

Figure 5.35. Aerial photograph from 1993 showing the cemetery area as depicted on the 1928 plat map.

Figure 5.36. Aerial photograph from 2000 showing the cemetery area as depicted on the 1928 plat map.

In at least one instance, Evergreen Cemetery is reported to be identical to an early cemetery known as Foy's Cemetery. Foy's Cemetery, or Foy's Graveyard, appears to have been on land acquired by the airport, according to the Forsyth County Historical Association website (http://www.forsythnchistory.com/cemfoy.html) and a 1993 city planning report (Oppermann 1994). The website states that part of the property owned by Rufus Foy was used as a cemetery for African-Americans until it was sold to the Smith Reynolds Airport, and also provides a list of 32 individuals interred there along with their dates of death. That list indicates burial by multiple families between 1910 and 1933, with only a single interment after 1919 (http://www.forsythnchistory.com/cemfoy.html). A compilation of 1886 Forsyth county landowners has a two-acre (or possibly two-tract) listing (or 42 acres, according to Fries et al. 1976:261) for Rufus Foy of Walkertown (with an asterisk denoting his race) (Fisher 2007, http://files.usgwarchives.net/nc /forsyth/history/other/forsythc103gms.txt).

Foy's Graveyard is shown on a 1919 plat as a rectangular 0.73 acre plot bordering an unnamed road (Forsyth County Plat Book 3:37A). The cemetery is designated as lot 4 and is situated among additional Rufus Foy holdings (lots 1–5) totaling some 30.32 acres. These are bounded by Whitfield's and William Walker heir's lines to the north, Byerly's line to the east, Whitfield and Byerly's lines to the south, and Daniel's and Crawford's lines to the west. Lot 4 appears to have been created from part of lot 1 specifically for the cemetery; it is separated from lot 1 to the east by an unnamed road, but lot 1 appears to extend across the road on the south side of the cemetery. Lot 2 is south of lot 1, and contains a house.

A 1918 death certificate for Amanda Foy, wife of John R. (J. Rufus) Foy (USCB 1900), lists "Foy Cem." as the place of burial (Death Certificate for Amanda Foy filed 30 July 1918, Register No. 595), although she does not appear on a list of individuals buried there (http://www.forsythnchistory.com/cemfoy.html). The cemetery (or lot 4 of the Rufus Foy estate) is referenced in three 1943 deeds (Forsyth County Deed Books 503:407, 505:298, 504:32).

Back references to individual lots within the Rufus Foy estate in subsequent deeds suggest that all but the largest of the individual lots remained intact after the deaths of Rufus and Amanda Foy. The 17.18-acre lot (lot 5 of the partitioned J. Rufus Foy lands) shown on the 1919 plat matches property sold at public auction in 1919 to G.W. Hill (Forsyth County Deed Book 173:132); lot 4 and Whitfield's corner is mentioned in that, deed but there is no specific reference to the cemetery. The cemetery (specifically, the Foy Cemetery lot) is mentioned again in 1943, when Forsyth County obtained a ca. 10-acre parcel (tract "V" on the Plat of Forsyth County Airport Extension Property) from the Edward Whitfield estate (Forsyth County Deed Book 503:407). From the description, the cemetery lot appears to adjoin the sale tract, but is not contained within it.

The ultimate fate of lot 4 of the Rufus Foy estate, and its location, have not been established. The surrounding lots all appear to have been acquired by the county in 1943. Lot 1 was designated as the 4.21-acre-sized lot (Forsyth County Deed Book 504:32) or tract (Forsyth County Deed Book 505:298) "X" of the airport extension property (as recorded on the master plat of the airport extension), lot 2 (3.88 acres) as tract "Y" (Forsyth County Deed Book 503:345), lot 3 (Forsyth County Deed Book 4.32 acres) as tract "Z" (Forsyth County Deed Books 503:398; 503:242), and lot 5 appears to have been part of the 10-acre parcel out of the Edward Whitfield estate conveyed as tract "V" (Forsyth County Deed Book 503:407). Incidentally, the accompanying survey description of lot 1 appears to exclude the smaller lot 4 parcel, so it does not appear that lot 4 was ever considered part of lot 1 (Forsyth County Deed Book 505:298). Lot 4 (the Foy Cemetery lot) is the only parcel of the former Rufus Foy lands for which no reference can be found of its acquisition by the county as part of the airport extension property.

According to one source (Oppermann 1994:60, 65–66), Foy's Cemetery and Evergreen Cemetery were the same cemetery, "a black cemetery known as Foy's Graveyard, or Evergreen." In 1941, according to Oppermann (1994), a new Evergreen Cemetery was established on Highway 311 when the airport was

expanded and the new terminal built (US 311 is New Walkertown Road); the Evergreen Cemetery property was acquired at that time. Oppermann (1994) further states that all of the graves were moved to the new Evergreen.

The location and status of Foy's cemetery is not presently known. Because Evergreen Cemetery (the old Evergreen) was a planned cemetery, newly graded, with irrigation and original landscaping, it is unlikely that it incorporated an existing cemetery (and Foy's cemetery appears to have been recognizable as an individual entity as late as 1943). Although it is possible that the names of two separate cemeteries, both associated with the airport, are occasionally conflated as a single entity, until further documentation is found, the location and present status of Foy's cemetery, and its relationship to old Evergreen Cemetery (if any) will not be certain.

The location of old Evergreen cemetery was indicated by airport personnel, who expressed concern over its status and present condition. Multiple grave depressions and a variety of grave markers, including headstones, are present in an area that corresponds with the eastern part of the short axis of the "L" of the cemetery as shown on the 1928 plat map and 1948 aerial photograph (see Figure 5.33). Visible grave depressions and markers are limited to a low area adjacent to a southeast-northwest trending toe slope. A dense groundcover of *Vinca minor* extends from the areas containing identifiable shaft depressions and markers onto the lower part of the adjacent toe slope and well into the current project tract. The 2014 visit found no surface evidence of cemetery architecture other than grave markers, with the possible exception of a square cement pier or marker (possibly *in situ*) that was encountered in the northern part of the visible cemetery area. It is also possible that two brick and mortar piers or foundation remains found in the cleared area to the west are associated with the cemetery (see Figures 5.15 and 5.16). Aside from the periwinkle ground cover, no ornamental vegetation was apparent, and there was no surface evidence of a former enclosure.

Mid-20th century to modern refuse was found across the southern area and around the edge of the adjacent low ridge. Identifiable grave depressions extend minimally over an area measuring 115 m north-south (see Figure 5.14); no attempt was made to define the eastern boundary of the cemetery (establishment of precise boundaries and interior structure appear impossible to define under the current vegetation conditions, which include fallen trees and dense greenbriar thickets). These depressions vary in spacing, but include apparent clusters of aligned graves (e.g., Figures 5.37 and 5.38). Grave markers were encountered over much of the southern part of the identifiable cemetery; some of these were askew, entirely toppled, or broken, but several remain standing (Figures 5.37–5.51). These include temporary metal markers, cement, granite, and marble headstones, and smaller granite blocks (footstones?). A few cylindrical markers made of cement were also present, and at least one bore some trace of an inscription across its top (e.g., Figure 5.39). Based on the 1928 plat, the portion of the cemetery that remains includes part of section G, block G (lots 1–33 in block 3, adjacent to the eastern perimeter) and part of section E, a rectangular section containing multiple lots in blocks 1–10.

At least nine headstones were encountered across the area during the 2014 visit, including toppled, broken, and partially buried examples. Most exhibited illegible or partially legible inscriptions. No rubbings or other attempts to augment inscription visibility were made, and toppled or partially buried headstones were left unexamined to avoid damage. Legible headstones encountered by the 2014 survey mark the interments of Hellen Fuller (d. 1932), Cora Reid Gladden (d. 1936), and Murry Welch (d. 1936). (A transcription of these headstones is presented as Appendix 2). Two headstones identify the graves of World War I veterans, including the Welch grave (808th Pioneer Infantry) and that of an additional individual (422nd Labor Battalion) nearby (Figures 5.44–5.46).

Figure 5.37. Grave depression (with headstone in background), view to west.

Figure 5.38. Metal marker with grave depressions, view to west.

Figure 5.39. Plan view of cylindrical cement marker.

Figure 5.40. Broken marble headstone with metal marker in background, view to west.

Figure 5.41. Toppled headstone, view to south.

Figure 5.42. Partially buried headstone, view to northwest.

Figure 5.43. Plan view of isolated granite block (footstone?).

Figure 5.44. Headstones of Murry Welch and another unidentified WWI veteran, view to east.

Figure 5.45. Headstone of Murry Welch, view to east.


WWI veteran from South Carolina, view to east.

Figure 5.47. Headstone of Cora Reid Gladden, view to east.

Figure 5.48. Headstone of Hellen Fuller, view to west.

Figure 5.49. Illegible cement headstone, view to east.

Figure 5.50. Illegible cement headstone, view to east.

Figure 5.51. Broken headstone with legible inscription, view to east

Death certificates located for Murry Welch and Cora Reid Gladden (Death Certificate for Cora Reid Gladden, filed 15 March 1936, Certificate No. 238; Death Certificate for Murry Welch, filed 20 October 1936, Certificate No. 812) list Evergreen Cemetery as their place of burial.

Photographs on file at the airport depict additional markers that were not encountered during the present work, including headstones for Fred Avery (d. 1938), Amanda Mangum (d. 1938), and Jenniel McCullum (d. 1943). The McCullum headstone appears to represent a burial (ca. May 8th) that just precedes the cemetery's acquisition in July of that year. None of the individuals identified by the small number of headstones so far recorded at the site location match burial records on file at New Evergreen Cemetery. Most of the burials removed from the old cemetery are located in Section B at the new cemetery (Scotty Speas, personal communication 2014).

To summarize, 31FY1194 is an abandoned cemetery with clear and patterned grave depressions and some associated *in situ* stone, cement, and metal markers. Available evidence indicates that the cemetery is part of the original Evergreen Cemetery that was constructed in 1928 and was in use until its acquisition by the county. Overlays of the 1928 survey plat, the 1948 aerial photograph, and later aerial photographs indicate that the present visible cemetery area is the eastern edge of Evergreen Cemetery. In 1948 this area was cleared and retained its original landscaping, but by 1971 this portion was situated in a wooded area along the edge of the property. These aerial photographs indicate that the cemetery once extended well into the runway approach (the runway currently designated as Runway 4-22) and therefore well into the northern project tract.

The cemetery property was acquired in 1943 by the county to facilitate expansion. Graves from Evergreen Cemetery were apparently disinterred and moved to the (New) Evergreen cemetery by the WPA sometime between the cemetery's acquisition in July 1943 and February 29, 1944 (City of Winston-Salem Government Meeting Notes 1944). Although over half of the graves were reported moved by the WPA (the 700 bodies), the remainder (300 to 400) were to be moved at the expense of the Winston-Salem Foundation.

At this time no documentation of the removal (such as procedures followed, inventory of graves removed) has been found. Without such documentation it is not possible to know if all of the graves were removed from the cemetery, but given the formal layout and relatively recent date of the cemetery (at the time of the grave removal it was only about 15 years old) it seems likely that grave removal was thorough, at least within the area from which interments were moved. It is unusual for headstones and other markers to be left behind after disinterment, however, and those headstones from the old Evergreen Cemetery appear to have been transported to the new Evergreen cemetery location. Consequently, it appears likely that at least some graves located in the 31FY1194 area and not directly in the runway approach were never removed.

Documentation of the cemetery during the present work was far from comprehensive. The boundaries and interior plan of the cemetery has not been established; any such effort would require extensive clearing inside and outside the limits of the current project boundary. GPS points obtained along the western perimeter of identifiable grave shafts indicate that the visible cemetery area partially extends into the northern project tract, although most identifiable grave depressions and all of the markers encountered appear some 10 to 20 m east of the project tract boundary. Three small, and rectangular, granite blocks (apparent footstone-type markers), including two that appear displaced, were encountered within the project tract, and at least one similar displaced stone was observed west of the present access road. Isolated patches of *Vinca* were also encountered between the identifiable part of the cemetery and the present access road, although no surface evidence of unmarked graves was present outside of the visible cemetery area. The status of the former cemetery area outside the present visible portion is not clear.

Although all of those graves were presumably removed in the 1940s, the possibility exists that some unmarked interments are present in those areas formerly encompassed by the cemetery.

The identifiable portion of the cemetery is not currently being affected by any on-going airport activities, and airport personnel are aware of its location and regard the area with sensitivity. A small portion of the visible cemetery area is within the project tract, however, and may be impacted by proposed improvements.

Although 31FY1194 is not recommended eligible for the NRHP, any surviving graves are protected by North Carolina state statutes, minimally including G.S. 14-148 (*Defacing or desecrating grave sites*), 14-149 (*Desecrating, plowing over or covering up graves; desecrating human remains*), and Chapter 70, Article 3 (*The Unmarked Human Burial and Human Skeletal Remains Protection Act*) (see Appendix 1). Since 31FY1194 likely contains both marked and unmarked graves, it is recommended that no ground-disturbing activities be allowed within its boundaries, and that the 31FY1194 location and a surrounding 50-foot buffer be marked in the field and shown on the Airport Layout Plan. In the event that any disturbances are planned within the buffer area, additional investigations are recommended to ensure that no graves are present in that area.

Although it is likely that most – if not all – graves were removed from the remainder of the former Evergreen Cemetery area, it is possible that some graves remain in the former cemetery outside 31FY1194. Consequently, monitoring or additional investigations (to identify the potential for surviving interments) is recommended prior to any ground disturbance that would extend more than 18 inches (1.5 ft) below the existing grade in that portion of the former cemetery outside of 31FY1194 and its associated buffer. Finally, in the event of any discoveries of human remains, funerary hardware (casket handles, etc.), or grave markers within that area or elsewhere on airport property, work in the immediate vicinity should stop immediately, and the State Archaeologist should be notified according to the provisions of *The Unmarked Human Burial and Human Skeletal Remains Protection Act*.

6. SUMMARY AND RECOMMENDATIONS

TRC has completed an archaeological survey for proposed improvements at Smith Reynolds Airport in Winston-Salem, Forsyth County, North Carolina. The project area consists of two tracts totaling 86.6 acres, including a 59.5 acre tract mainly located north of Runway 4–22 and a 27.1 acre tract situated east of Runway 15–33. Background research determined that there were two previously recorded archaeological sites within the project areas. One of these (31FY269) was apparently destroyed by the time it was recorded. The other (31FY839) consisted of an isolated surface find and was revisited during the current study.

Early twentieth-century maps depict a single structure within the project area prior to the mid-20th century. That house appears to have been situated in an area that has since been graded and filled. Examination of aerial photographs and maps dating from 1939 to 1971 show that two or more structures were situated in parts of the northern tract in 1939, but had apparently been removed by 1951. In addition, the 1948 aerial photograph shows the former Evergreen Cemetery situated in part of the northern project area, a small part of this cemetery contains grave markers and is believed to be intact, and was recorded as 31FY1194 (see below). No structures are documented in the southern project tract until sometime after 1948 (they appear on a 1971 aerial photograph).

The survey included a systematic pedestrian walkover and the excavation of 298 shovel tests. Most of the project area is in undeveloped wooded areas, and shovel tests in those areas encountered moderately to severely eroded soils. The northern project tract includes large cleared areas in the vicinity of Runway 4-22 and near a city and county school maintenance facility. These areas were characterized by severely deflated or disturbed soil sequences. The southern project area includes a section adjacent to the cleared runway that has been cut well below grade.

No site numbers were not assigned to a dispersed scatter of mainly mid-20th century to modern artifacts scattered across much of the northern project tract or to a similar dispersed scatter encountered in the southern project tract. These artifacts result from a combination of modern discard and former 20th century occupation of these areas.

The survey identified one previously recorded site (31FY839) and two new archaeological sites (31FY1193 and 31FY1194). One site, 31FY839, is attributed to an unidentified prehistoric occupation and yielded two non-diagnostic lithic artifacts during the current study. A second site, 31FY1193, is attributed to modern (post-1948) occupation. Neither site has the potential to provide substantial data concerning the prehistoric or historic occupation of the area, and both are recommended not eligible for the NRHP.

The third site, 31FY1194, is an apparent surviving remnant of the early- to mid-twentieth century Evergreen Cemetery, which was established in 1928 and was used into the early 1940s when the property was acquired for airport expansion. Documentary evidence (discussed in Chapter 5) indicates that at least 700 graves had been moved from the cemetery (to New Evergreen Cemetery) by February of 1944, and that an additional 300 to 400 graves remained to be moved at that time. Although no map or detailed records of the cemetery removal have been located, it seems likely that graves were removed from at least the northern and western parts of the cemetery, including a large expanse that was later affected by grading and other disturbances. Given the formal layout and relatively recent date of the cemetery (at the time of the grave removal it was only about 15 years old) it seems likely that grave removal within that area was thorough, and it is considered unlikely that interments remain in that area.

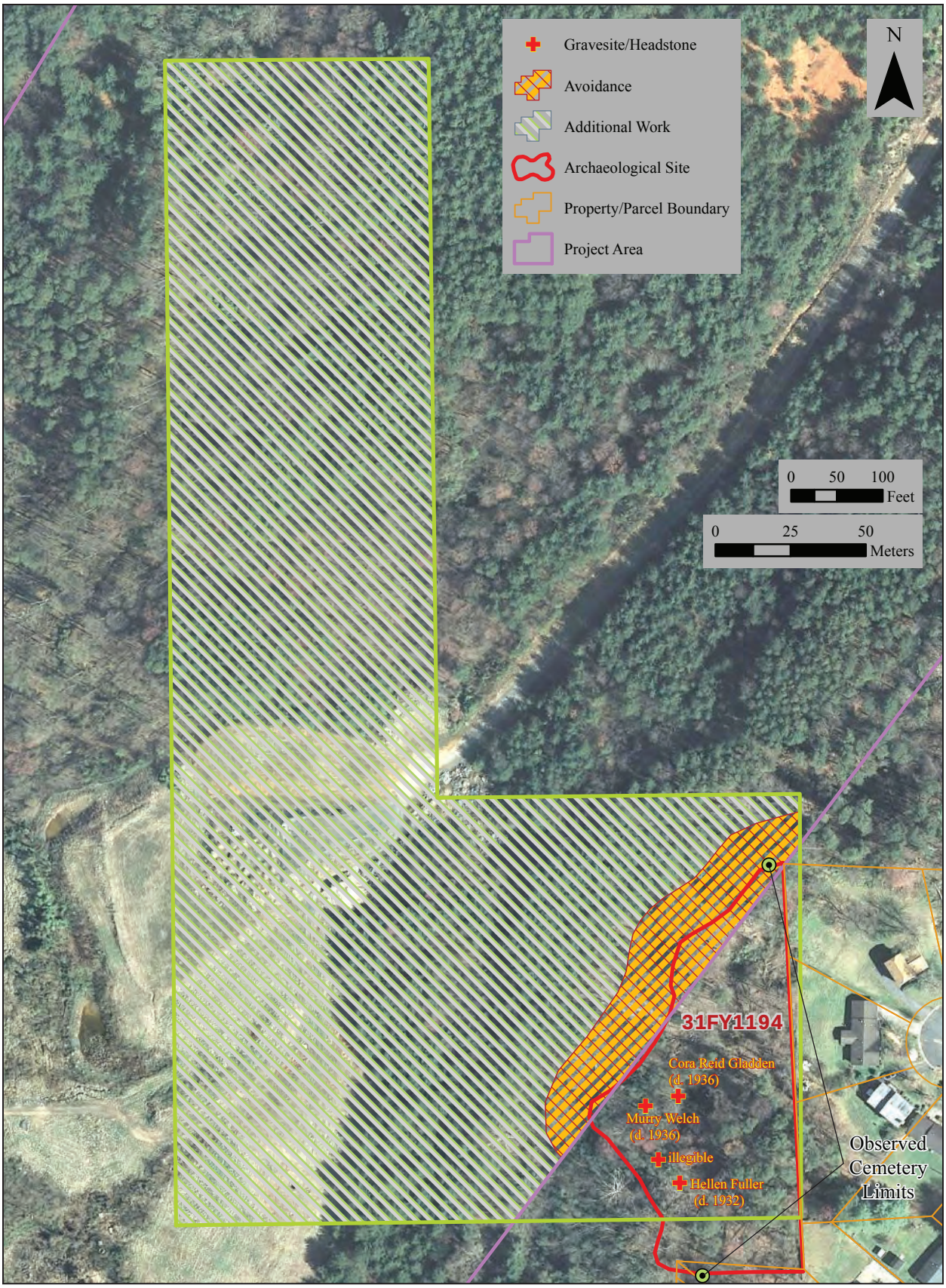

Figure 6.1. Recommendations for 31FY1194 and the surrounding former cemetery area.

In contrast, the southeastern corner of the former cemetery area contains a number of upright grave markers in association with apparent grave depressions, and has been allowed to grow up in vegetation since the late 1940s or 1950s. Given the presence of multiple grave markers in this area, it seems reasonable to assume that at least some of the graves in this area were not removed. Based on this assumption, this portion of the former cemetery area has been designated archaeological site 31FY1194 (following the OSA guidelines for treatment of abandoned cemeteries.) Although 31FY1194 is not recommended eligible for the NRHP, any surviving graves are protected by North Carolina state statutes, minimally including G.S. 14-148 (*Defacing or desecrating grave sites*), 14-149 (*Desecrating, plowing over or covering up graves; desecrating human remains*), and Chapter 70, Article 3 (*The Unmarked Human Burial and Human Skeletal Remains Protection Act*) (see Appendix 1).

Since 31FY1194 likely contains both marked and unmarked graves, it is recommended that no ground-disturbing activities be allowed within its boundaries, and that the 31FY1194 location and a surrounding 50-foot buffer be marked in the field and shown on the Airport Layout Plan. In the event that any disturbances are planned within the buffer area, additional investigations are recommended to ensure that no graves are present in that area.

Although it is likely that most – if not all – graves were removed from the remainder of the former Evergreen Cemetery area, it is possible that some graves remain in the former cemetery outside 31FY1194. Consequently, monitoring or additional investigations (to identify the potential for surviving interments) is recommended prior to any ground disturbance that would extend more than 18 inches (1.5 ft) below the existing grade in that portion of the former cemetery outside of 31FY1194 and its associated buffer, as shown on Figure 6.1. Finally, in the event of any discoveries of human remains, funerary hardware (casket handles, etc.), or grave markers within that area or elsewhere on airport property, work in the immediate vicinity should stop immediately, and the State Archaeologist should be notified according to the provisions of *The Unmarked Human Burial and Human Skeletal Remains Protection Act*.

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APPENDIX 1: NORTH CAROLINA STATUTES CONCERNING CEMETERIES

APPENDIX 1. SELECTED NORTH CAROLINA GENERAL STATUTES RELATING TO CEMETERIES

§ 14-148. Defacing or desecrating grave sites.

(a) It is unlawful to willfully:

(1) Throw, place or put any refuse, garbage or trash in or on any cemetery.

(2) Take away, disturb, vandalize, destroy or change the location of any stone, brick, iron or other material or fence enclosing a cemetery without authorization of law or consent of the surviving spouse or next of kin of the deceased.

(3) Take away, disturb, vandalize, destroy, or tamper with any shrubbery, flowers, plants or other articles planted or placed within any cemetery to designate where human remains are interred or to preserve and perpetuate the memory and name of any person, without authorization of law or the consent of the surviving spouse or next of kin.

(b) The provisions of this section shall not apply to:

(1) Ordinary maintenance and care of a cemetery by the owner, caretaker, or other person acting to facilitate cemetery operations by keeping the cemetery free from accumulated debris or other signs of neglect.

(2) Conduct that is punishable under G.S. 14-149.

(3) A professional archaeologist as defined in G.S. 70-28(4) acting pursuant to the provisions of Article 3 of Chapter 70 of the General Statutes.

(c) Violation of this section is a Class I felony if the damage caused by the violation is one thousand dollars ($1,000) or more. Any other violation of this section is a Class 1 misdemeanor. In passing sentence, the court shall consider the appropriateness of restitution or reparation as a condition of probation under G.S. 15A-1343(b)(9) as an alternative to actual imposition of a fine, jail term, or both. (1840, c. 6; R.C., c. 34, s. 102; Code, s. 1088; Rev., s. 3680; C.S., s. 4320; 1969, c. 987; 1981, c. 752, s. 1; c. 853, s. 4; 1993, c. 539, s. 87; 1994, Ex. Sess., c. 24, s. 14(c); 2007-122, s. 1.)

§ 14-149. Desecrating, plowing over or covering up graves; desecrating human remains.

(a) It is a Class I felony, without authorization of law or the consent of the surviving spouse or next of kin of the deceased, to knowingly and willfully:

(1) Open, disturb, destroy, remove, vandalize or desecrate any casket or other repository of any human remains, by any means including plowing under, tearing up, covering over or otherwise obliterating or removing any grave or any portion thereof.

(2) Take away, disturb, vandalize, destroy, tamper with, or deface any tombstone, headstone, monument, grave marker, grave ornamentation, or grave artifacts erected or placed within any cemetery to designate the place where human remains are interred or to preserve and perpetuate the memory and the name of any person. This subdivision shall not apply to the ordinary maintenance and care of a cemetery.

(3) Repealed by Session Laws 2007-122, s. 2, effective December 1, 2007, and applicable to offenses committed on or after that date.

(a1) It is a Class H felony, without authorization of law or the consent of the surviving spouse or next of kin of the deceased, to knowingly and willfully disturb, destroy, remove, vandalize, or desecrate any human remains that have been interred in a cemetery.

(b) The provisions of this section shall not apply to a professional archaeologist as defined in G.S. 70-28(4) acting pursuant to the provisions of Article 3 of Chapter 70 of the General Statutes. (1889, c. 130; Rev., s. 3681; 1919, c. 218; C.S., s. 4321; 1981, c. 752, s. 2; c. 853, s. 5; 2007-122, s. 2.)

Chapter 65.
Cemeteries.

Article 12.
Abandoned and Neglected Cemeteries.
Part 1. General.

§ 65-85. Definitions.

As used in this Article, the following terms mean:

(1) Abandoned. – Ceased from maintenance or use by the person with legal right to the real property with the intent of not again maintaining the real property in the foreseeable future.

(2) Cemetery. – A tract of land used for burial of multiple graves.

(3) Department. – The Department of Cultural Resources.

(4) Grave. – A place of burial for a single decedent.

(5) Neglected. – Left unattended or uncared for through carelessness or intention and lacking a caretaker.

(6) Public cemetery. – A cemetery for which there is no qualification to purchase, own, or come into possession of a grave in that cemetery. (2007-118, s. 1.)

Part 3. Access to and Maintenance of Abandoned or Neglected Cemeteries.

§ 65-101. Entering public or private property to maintain or visit with consent.

Any of the following persons, with the consent of the public or private landowner, may enter the property of another to discover, restore, maintain, or visit a grave or abandoned public cemetery:

(1) A descendant of the person whose remains are reasonably believed to be interred in the grave or abandoned public cemetery.

(2) A descendant's designee.

(3) Any other person who has a special personal interest in the grave or abandoned public cemetery. (1987, c. 686, s. 1; 1991, c. 36, s. 1; 2007-118, s. 1.)

§ 65-102. Entering public or private property to maintain or visit without consent.

(a) If the consent of the landowner cannot be obtained, any person listed in G.S. 65-101(1), (2), or (3) may commence a special proceeding by petitioning the clerk of superior court of the county in which the petitioner has reasonable grounds to believe the grave or abandoned public cemetery is located for an order allowing the petitioner to enter the property to discover, restore, maintain, or visit the grave or abandoned public cemetery. The petition shall be verified. The special proceeding shall be in accordance with the provisions of Articles 27A and 33 of Chapter 1 of the General Statutes. The clerk shall issue an order allowing the petitioner to enter the property if the clerk finds all of the following:

(1) There are reasonable grounds to believe that the grave or abandoned public cemetery is located on the property or it is reasonably necessary to enter or cross the landowner's property to reach the grave or abandoned public cemetery.

(2) The petitioner, or the petitioner's designee, is a descendant of the deceased, or the petitioner has a legitimate historical, genealogical, or governmental interest in the grave or abandoned public cemetery.

(3) The entry on the property would not unreasonably interfere with the enjoyment of the property by the landowner.

(b) The clerk's order may state one or more of the following:

(1) Specify the dates and the daylight hours that the petitioner may enter and remain on the property.

(2) Grant the petitioner the right to enter the landowner's property periodically, as specified in the order, after the time needed for initial restoration of the grave or abandoned public cemetery.

(3) Specify a reasonable route from which the petitioner may not deviate in all entries and exits from the property. (1987, c. 686, s. 1; 1991, c. 36, s. 1; 1999-216, s. 12; 2007-118, s. 1.)

Part 4. Removal of Graves.

§ 65-106. Removal of graves; who may disinter, move, and reinter; notice; certificate filed; reinterment expenses; due care required.

(a) The State of North Carolina and any of its agencies, public institutions, or political subdivisions, the United States of America or any agency thereof, any church, electric power or lighting company, or any person, firm, or corporation may effect the disinterment, removal, and reinterment of graves as follows:

(1) By the State of North Carolina or any of its agencies, public institutions, or political subdivisions, the United States of America or any agency thereof, when it shall determine and certify to the board of county commissioners in the county from which the bodies are to be disinterred that such removal is reasonably necessary to perform its governmental functions and the duties delegated to it by law.

(2) By any church authority in order to erect a new church, parish house, parsonage, or any other facility owned and operated exclusively by such church; in order to expand or enlarge an existing church facility; or better to care for and maintain graves not located in a regular cemetery for which such church has assumed responsibility of care and custody.

(3) By an electric power or lighting company when it owns land on which graves are located, and the land is to be used as a reservoir.

(4) By any person, firm, or corporation who owns land on which an abandoned cemetery is located after first securing the consent of the governing body of the municipality or county in which the abandoned cemetery is located.

(b) The party effecting the disinterment, removal, and reinterment of a grave containing a decedent's remains under the provisions of this Part shall, before disinterment, give 30 days' written notice of such intention to the next of kin of the decedent, if known or subject to being ascertained by reasonable search and inquiry, and shall cause notice of such disinterment, removal, and reinterment to be published at least once per week for four successive weeks in a newspaper of general circulation in the county where such grave is located, and the first publication shall be not less than 30 days before disinterment. Any remains disinterred and removed hereunder shall be reinterred in a suitable cemetery.

(c) The party removing or causing the removal of all such graves shall, within 30 days after completion of the removal and reinterment, file with the register of deeds of the county from which the graves were removed and with the register of deeds of the county in which reinterment is made, a written certificate of the removal facts. Such certificate shall contain the full name, if known or reasonably ascertainable, of each decedent whose grave is moved, a precise description of the site from which such grave was removed, a precise description of the site and specific location where the decedent's remains have been reinterred, the full and correct name of the party effecting the removal, and a brief description of the statutory basis or bases upon which such removal or reinterment was effected. If the full name of any decedent cannot reasonably be ascertained, the removing party shall set forth all additional reasonably ascertainable facts about the decedent including birth date, death date, and family name.

The fee for recording instruments in general, as provided in G.S. 161-10(a)(1), for registering a certificate of removal facts shall be paid to the register of deeds of each county in which such certificate is filed for registration.

(d) All expenses of disinterment, removal, and acquisition of the new burial site and reinterment shall be borne by the party effecting such disinterment, removal, and reinterment, including the actual reasonable expense of one of the next of kin incurred in attending the same, not to exceed the sum of two hundred dollars ($200.00).

(e) The Office of Vital Records of North Carolina shall promulgate regulations affecting the registration and indexing of the written certificate of the removal facts, including the form of that certificate.

(f) The party effecting the disinterment, removal, and reinterment of a decedent's remains under the provisions of this Part shall ensure that the site in which reinterment is accomplished shall be of such suitable dimensions to accommodate the remains of that decedent only and that such site shall be reasonably accessible to all relatives of that decedent, provided that the remains may be reinterred in a common grave where written consent is obtained from the next of kin. If under the authority of this Part, disinterment, removal, and reinterment are effected by the State of North Carolina or any of its agencies, public institutions, or political subdivisions, the United States of America or any agency thereof, any electric power or lighting company, then such disinterment, removal, and reinterment shall be performed by a funeral director duly licensed as a "funeral director" or a "funeral service licensee" under the provisions of Article 13A of Chapter 90 of the General Statutes.

(g) All disinterment, removal, and reinterment under the provisions of this Part shall be made under the supervision and direction of the county board of commissioners or other appropriate official, including the local health director, appointed by such board for the county where the disinterment, removal, and reinterment take place.

the deceased whose remains are disinterred, then the disinterment and removal shall be made under the supervision and direction of the county board of commissioners or other appropriate official, including the local health director, appointed by such board for the county of the disinterment, and the reinterment shall be made under the supervision and direction of the county board of commissioners or other appropriate official, including the local health director, appointed by such board for the county of reinterment.

Due care shall be taken to do said work in a proper and decent manner, and, if necessary, to furnish suitable coffins or boxes for reinterring such remains. Due care shall also be taken to remove, protect, and replace all tombstones or other markers, so as to leave such tombstones or other markers in as good condition as that prior to disinterment. Provided that in cases where the remains are to be moved to a perpetual care cemetery or other cemetery where upright tombstones are not permitted, a suitable replacement marker shall be provided.

(h) Nothing contained in this Part shall be construed to grant or confer the power or authority of eminent domain, or to impair the right of the next of kin of a decedent to remove or cause the removal, at his or their expense, of the remains or grave of such decedent. (1919, c. 245; C.S., ss. 5030, 5030(a); Ex. Sess. 1920, c. 46; 1927, c. 23, s. 1; c. 175, s. 1; 1937, c. 3; 1947, cc. 168, 576; 1961, c. 457; 1963, c. 915, s. 1; 1965, c. 71; 1971, c. 797, s. 1; 1977, c. 311, s. 1; 2001-390, s. 3; 2007-118, s. 1.)

Chapter 70.
Indian Antiquities, Archaeological Resources and Unmarked Human Skeletal Remains Protection.

Article 3.
Unmarked Human Burial and Human Skeletal Remains Protection Act.

§ 70-26. Short title.

This Article shall be known as "The Unmarked Human Burial and Human Skeletal Remains Protection Act." (1981, c. 853, s. 2.)

§ 70-27. Findings and purpose.

(a) The General Assembly finds that:

(1) Unmarked human burials and human skeletal remains are subject to vandalism and inadvertent destruction at an ever-increasing rate;

(2) Existing State laws do not provide adequate protection to prevent damage to and destruction of these remains;

(3) There is a great deal of scientific information to be gained from the proper excavation, study and analysis of human skeletal remains recovered from such burials; and

(4) There has been no procedure for descendants or other interested individuals to make known their concerns regarding disposition of these remains.

(b) The purpose of this Article is (i) to provide adequate protection from vandalism for unmarked human burials and human skeletal remains, (ii) to provide adequate protection for unmarked human burials and human skeletal remains not within the jurisdiction of the medical examiner pursuant to G.S. 130A-383 that are encountered during archaeological excavation, construction, or other ground disturbing activities, found anywhere within the State except on federal land, and (iii) to provide for adequate skeletal analysis of remains removed or excavated from unmarked human burials if the analysis would result in valuable scientific information. (1981, c. 853, s. 2; 2007-484, s. 11(a).)

§ 70-28. Definitions.

As used in this Article:

(1) "State Archaeologist" means the head of the Office of State Archaeology section of the Office of Archives and History, Department of Cultural Resources.

(2) "Executive Director" means the Executive Director of the North Carolina Commission of Indian Affairs.

(3) "Human skeletal remains" or "remains" means any part of the body of a deceased human being in any stage of decomposition.

(4) "Professional archaeologist" means a person having (i) a postgraduate degree in archaeology, anthropology, history, or another related field with a specialization in archaeology, (ii) a minimum of one year's experience in conducting basic archaeological field research, including the excavation and removal of human skeletal remains, and (iii) designed and

executed an archaeological study and presented the written results and interpretations of such study.

(5) "Skeletal analyst" means any person having (i) a postgraduate degree in a field involving the study of the human skeleton such as skeletal biology, forensic osteology or other relevant aspects of physical anthropology or medicine, (ii) a minimum of one year's experience in conducting laboratory reconstruction and analysis of skeletal remains, including the differentiation of the physical characteristics denoting cultural or biological affinity, and (iii) designed and executed a skeletal analysis, and presented the written results and interpretations of such analysis.

(6) "Unmarked human burial" means any interment of human skeletal remains for which there exists no grave marker or any other historical documentation providing information as to the identity of the deceased. (1981, c. 853, s. 2; 2002-159, s. 35(a); 2007-484, s. 10(a).)

§ 70-29. Discovery of remains and notification of authorities.

(a) Any person knowing or having reasonable grounds to believe that unmarked human burials or human skeletal remains are being disturbed, destroyed, defaced, mutilated, removed, or exposed, shall notify immediately the medical examiner of the county in which the remains are encountered.

(b) If the unmarked human burials or human skeletal remains are encountered as a result of construction or agricultural activities, disturbance of the remains shall cease immediately and shall not resume without authorization from either the county medical examiner or the State Archaeologist, under the provisions of G.S. 70-30(c) or 70-30(d).

(c) (1) If the unmarked human burials or human skeletal remains are encountered by a professional archaeologist, as a result of survey or test excavations, the remains may be excavated and other activities may resume after notification, by telephone or registered letter, is provided to the State Archaeologist. The treatment, analysis and disposition of the remains shall come under the provisions of G.S. 70-34 and 70-35.

(2) If a professional archaeologist directing long-term (research designed to continue for one or more field seasons of four or more weeks' duration) systematic archaeological research sponsored by any accredited college or university in North Carolina, as a part of his research, recovers Native American skeletal remains, he may be exempted from the provisions of G.S. 70-30, 70-31, 70-32, 70-33, 70-34 and 70-35(c) of this Article so long as he:

a. Notifies the Executive Director within five working days of the initial discovery of Native American skeletal remains;

b. Reports to the Executive Director, at agreed upon intervals, the status of the project;

c. Curates the skeletal remains prior to ultimate disposition; and

d. Conducts no destructive skeletal analysis without the express permission of the Executive Director.

Upon completion of the project fieldwork, the professional archaeologist, in consultation with the skeletal analyst and the Executive Director, shall determine the schedule for the completion of the skeletal analysis. In the event of a disagreement, the time for completion of the skeletal analysis shall not exceed four years. The Executive Director shall have authority concerning the ultimate disposition of the Native American skeletal remains after analysis is completed in accordance with G.S. 70-35(a) and 70-36(b) and (c).

(d) The State Archaeologist shall notify the Chief, Medical Examiner Section, Division of Health Services, Department of Health and Human Services, of any reported human skeletal remains discovered by a professional archaeologist. (1981, c. 853, s. 2; 1997-443, s. 11A.118(a); 2007-484, s. 10(b).)

§ 70-30. Jurisdiction over remains.

(a) Subsequent to notification of the discovery of an unmarked human burial or human skeletal remains, the medical examiner of the county in which the remains were encountered shall determine as soon as possible whether the remains are subject to the provisions of G.S. 130A-383.

(b) If the county medical examiner determines that the remains are subject to the provisions of G.S. 130A-383, the county medical examiner will immediately proceed with the investigation.

(c) If the county medical examiner determines that the remains are not subject to the provisions of G.S. 130A-383, the county medical examiner shall so notify the Chief Medical Examiner. The Chief Medical Examiner

shall notify the State Archaeologist of the discovery of the human skeletal remains and the findings of the county medical examiner. The State Archaeologist shall immediately take charge of the remains.

(d) Subsequent to taking charge of the human skeletal remains, the State Archaeologist shall have 48 hours to make arrangements with the landowner for the protection or removal of the unmarked human burial or human skeletal remains. The State Archaeologist shall have no authority over the remains at the end of the 48-hour period and may not prohibit the resumption of the construction or agricultural activities without the permission of the landowner. (1981, c. 853, s. 2; 2007-484, ss. 10(c), 11(b).)

§ 70-31. Archaeological investigation of human skeletal remains.

(a) If an agreement is reached with the landowner for the excavation of the human skeletal remains, the State Archaeologist shall either designate a member of his staff or authorize another professional archaeologist to excavate or supervise the excavation.

(b) The professional archaeologist excavating human skeletal remains shall report to the State Archaeologist, either in writing or by telephone, his opinion on the cultural and biological characteristics of the remains. This report shall be transmitted as soon as possible after the commencement of excavation, but no later than two full business days after the removal of a burial.

(c) The State Archaeologist, in consultation with the professional archaeologist excavating the remains, shall determine where the remains shall be held subsequent to excavation, pending other arrangements according to G.S. 70-32 or 70-33.

(d) The Department of Cultural Resources may obtain administrative inspection warrants pursuant to the provisions of Chapter 15, Article 4A of the General Statutes to enforce the provisions of this Article, provided that prior to the requesting of the administrative warrant, the Department shall contact the affected landowners and request their consent for access to their land for the purpose of gathering such information. If consent is not granted, the Department shall give reasonable notice of the time, place and before whom the administrative warrant will be requested so that the owner or owners may have an opportunity to be heard. (1981, c. 853, s. 2; 2007-484, s. 10(d).)

§ 70-32. Consultation with the Native American Community.

(a) If the professional archaeologist determines that the human skeletal remains are Native American, the State Archaeologist shall immediately notify the Executive Director of the North Carolina Commission of Indian Affairs. The Executive Director shall notify and consult with the Eastern Band of Cherokee or other appropriate tribal group or community.

(b) Within four weeks of the notification, the Executive Director shall communicate in writing to the State Archaeologist, the concerns of the Commission of Indian Affairs and an appropriate tribal group or community with regard to the treatment and ultimate disposition of the Native American skeletal remains.

(c) Within 90 days of receipt of the concerns of the Commission of Indian Affairs, the State Archaeologist and the Executive Director, with the approval of the principal tribal official of an appropriate tribe, shall prepare a written agreement concerning the treatment and ultimate disposition of the Native American skeletal remains. The written agreement shall include the following:

(1) Designation of a qualified skeletal analyst to work on the skeletal remains;

(2) The type of analysis and the specific period of time to be provided for analysis of the skeletal remains;

(3) The timetable for written progress reports and the final report concerning the skeletal analysis to be provided to the State Archaeologist and the Executive Director by the skeletal analyst; and

(4) A plan for the ultimate disposition of the Native American remains subsequent to the completion of adequate skeletal analysis.

If no agreement is reached within 90 days, the Archaeological Advisory Committee shall determine the terms of the agreement. (1981, c. 853, s. 2; 2007-484, s. 10(e).)

§ 70-33. Consultation with other individuals.

(a) If the professional archaeologist determines that the human skeletal remains are other than Native American, the State Archaeologist shall publish notice that excavation of the remains has occurred, at least once per week for four successive weeks in a newspaper of general circulation in the county where the burials or skeletal remains were situated, in an effort to determine the identity or next of kin or both of the deceased.

(b) If the next of kin are located, within 90 days the State Archaeologist in consultation with the next of kin shall prepare a written agreement concerning the treatment and ultimate disposition of the skeletal remains. The written agreement shall include:

(1) Designation of a qualified skeletal analyst to work on the skeletal remains;
(2) The type of analysis and the specific period of time to be provided for analysis of the skeletal remains;
(3) The timetable for written progress reports and the final report concerning the skeletal analysis to be provided to the State Archaeologist and the next of kin by the skeletal analyst; and
(4) A plan for the ultimate disposition of the skeletal remains subsequent to the completion of adequate skeletal analysis.

If no agreement is reached, the remains shall be handled according to the wishes of the next of kin. (1981, c. 853, s. 2; 2007-484, s. 10(f).)

§ 70-34. Skeletal analysis.

(a) Skeletal analysis conducted under the provisions of this Article shall only be accomplished by persons having those qualifications expressed in G.S. 70-28(5).

(b) Prior to the execution of the written agreements outlined in G.S. 70-32(c) and 70-33(b), the State Archaeologist shall consult with both the professional archaeologist and the skeletal analyst investigating the remains.

(c) The professional archaeologist and the skeletal analyst shall submit a proposal to the State Archaeologist within the 90-day period set forth in G.S. 70-32(c) and 70-33(b), including:

(1) Methodology and techniques to be utilized;
(2) Research objectives;
(3) Proposed time schedule for completion of the analysis; and
(4) Proposed time intervals for written progress reports and the final report to be submitted.

(d) If the terms of the written agreement are not substantially met, the Executive Director or the next of kin, after consultation with the State Archaeologist, may take possession of the skeletal remains. In such case, the State Archaeologist may ensure that appropriate skeletal analysis is conducted by another qualified skeletal analyst prior to ultimate disposition of the skeletal remains. (1981, c. 853, s. 2; 2007-484, s. 10(g).)

§ 70-35. Disposition of human skeletal remains.

(a) If the skeletal remains are Native American, the Executive Director, after consultation with an appropriate tribal group or community, shall determine the ultimate disposition of the remains after the analysis.

(b) If the skeletal remains are other than Native American and the next of kin have been identified, the next of kin shall have authority concerning the ultimate disposition of the remains after the analysis.

(c) If the State Archaeologist has received no information or communication concerning the identity or next of kin of the deceased, the skeletal remains shall be transferred to the State Archaeologist and permanently curated according to standard museum procedures after adequate skeletal analysis. (1981, c. 853, s. 2; 2007-484, s. 10(h).)

§ 70-36. Financial responsibility.

(a) The provisions of this Article shall not require that the owner of the land on which the unmarked human burials or human skeletal remains are found, bear the cost of excavation, removal, analysis or disposition.

(b) If a determination is made by the Executive Director, in consultation with an appropriate tribal group or community, that Native American skeletal remains shall be reinterred following the completion of skeletal analysis, an appropriate tribal group or community may provide a suitable burial location. If it elects not to do so, it shall be the responsibility of the North Carolina Commission of Indian Affairs to provide a suitable burial location.

(c) The expense of transportation of Native American remains to the reburial location shall be borne by the party conducting the excavation and removal of the skeletal remains. The reburial ceremony may be provided by an appropriate tribal group or community. If it elects not to do so, the reburial ceremony shall be the responsibility of the Commission of Indian Affairs. (1981, c. 853, s. 2.)

§ 70-37. Prohibited acts.

(a) No person, unless acting under the provisions of G.S. 130-198 through G.S. 130-201, shall:

(1) Knowingly acquire any human skeletal remains removed from unmarked burials in North Carolina after October 1, 1981, except in accordance with the provisions of this Article;

(2) Knowingly exhibit or sell any human skeletal remains acquired from unmarked burials in North Carolina; or

(3) Knowingly retain human skeletal remains acquired from unmarked burials in North Carolina after October 1, 1981, for scientific analysis beyond a period of time provided for such analysis pursuant to the provisions of G.S. 70-32, 70-33 and 70-34, with the exception of those skeletal remains curated under the provisions of G.S. 70-35.

(b) Other provisions of criminal law concerning vandalism of unmarked human burials or human skeletal remains may be found in G.S. 14-149. (1981, c. 853, s. 2.)

§ 70-40. Penalties.

(a) Violation of the provisions of G.S. 70-29 is a Class 1 misdemeanor.

(b) Violation of the provisions of G.S. 70-37(a) is a Class H felony. (1981, c. 853, s. 2; 1993, c. 539, s. 543; 1994, Ex. Sess., c. 24, s. 14(c).)

APPENDIX 2: TRANSCRIPTION OF HEADSTONES FROM 31FY1194

Appendix 2. Transcription of Headstones from Site 31FY1194

Recorded During March-April 2014 Survey

1-Headstone of Murry Welch:

Murry Welch
North Carolina
Pvt. 1 Cl.
808 Pioneer Inf.
October 19, 1936
Notes: The headstone appears to be of marble. The upper part of the headstone depicts a cross inside a recessed circle.

2-Headstone of unidentified individual:

Illegible
South Carolina
Pvt. 1 Cl. 422 Res.
Labor BN
November *5?*, 1936
Notes: The headstone appears to be of marble and is located a few meters southwest of the Murry Welch headstone. The upper part of the headstone depicts a cross inside a recessed circle.

3-Headstone of Hellen Fuller:

Hellen Fuller
Born Jan 8, 1910
Died April 14, 1932
At Rest
Notes: The headstone is made of cement.

4-Headstone of Cora Reid Gladden:

Cora Reid Gladden
June 4, 1895
March 15, 1936
She hath done what she could
Notes: The headstone is made of cement. The upper part of the headstone is inscribed with a floral pattern and scroll.

5-Headstone of unidentified individual (broken):

(broken) *1913?*
July 1, 1936
Gone, but not forgotten
Notes: The headstone is made of marble.

From photos provided by Smith Reynolds Airport personnel

6-Headstone of Amanda Mangum:

Amanda Mangum
1889–1938
Notes: The headstone is an apparent rectangular granite block.

7-Headstone of Fred Avery:

1902–1938
Gone, But Not Forgotten
Notes: The headstone is nearly identical to that of the Amanda Mangum headstone.

8-Headstone of Jenniel McCullum:

Jenniel McCullum
Jan 26, 1925
May 8, 1943
Notes: The headstone is made of cement.

APPENDIX 3: ARTIFACT CATALOG

Appendix 3. Smith Reynolds Airport Two-Tract Survey Artifact Inventory.

Site	Acc#	Bag#	Provenience	Strat/Hor	Cmbs	Ct	Wt	Category	Type	RawMat	Comments
31FY839	2014.0080	18	T-4 ST-2	1/E	6–14	1	0.4	debitage	flake, broken	rhyolite	
31FY839	2014.0080	27	N320 E310	1/E	0–10	1	0.2	debitage	flake fragment	rhyolite	
31FY1193	2014.0081	19	T-11 ST-2	1/E	5–15	1	2.0	historic	metal scrip token	brass/nickel?	
31FY1193	2014.0081	20	T-11 ST-3	1/surface	0–0	1	650.0	historic	brick, handm		
31FY1193	2014.0081	21	T-11 ST-6	1/A	0–5	1	9.6	historic	cont glass	green	main locus
31FY1193	2014.0081	21	T-11 ST-6	1/A	0–5	1	5.2	historic	flat glass	tinted	main locus
31FY1193	2014.0081	22	T-11 ST-8	1/A	0–19	3	4.7	historic	cont glass	clear	main locus
31FY1193	2014.0081	23	T-12 ST-1	1/disturbed	0–25	2	109.2	faunal	bone, cow or pig		
31FY1193	2014.0081	23	T-12 ST-1	1/disturbed	0–25	1	4.7	historic	cont glass	clear	
31FY1193	2014.0081	24	T-12 ST-2	1/A	0–5	1	0.9	historic	cont glass	clear	
31FY1193	2014.0081	25	T-12 ST-3	1/A	0–7	1	3.8	historic	cont glass	brown	
31FY1193	2014.0081	25	T-12 ST-3	1/A	0–7	2	2.7	historic	cont glass	clear	
31FY1193	2014.0081	26	T-13 ST-2	1/A	0–11	10	65.4	historic	cont glass	clear	
31FY1193	2014.0081	28	N185 E200	1/A	0–12	1	n/r	historic	ud	asbestos	main locus
31FY1193	2014.0081	28	N185 E200	1/A	0–12	1	1.0	historic	plastic, ud		main locus
31FY1193	2014.0081	28	N185 E200	1/A	0–12	1	4.5	historic	nail, cut/wire		main locus
31FY1193	2014.0081	28	N185 E200	1/A	0–12	1	1.0	historic	cont glass	green	main locus
31FY1193	2014.0081	28	N185 E200	1/A	0–12	1	2.8	historic	brick, ud		main locus
31FY1193	2014.0081	29	N185 E185	1/A	0–15	2	2.1	historic	ud flat glass	clear	main locus
31FY1193	2014.0081	29	N185 E185	1/A	0–15	1	0.3	historic	cont glass	green	main locus
31FY1193	2014.0081	30	N200 E215	1/A	0–15	1	0.2	historic	cont glass	brown	main locus
31FY1193	2014.0081	31	N200 E185	1/A	0–15	1	4.9	historic	nail, wire		main locus
n/a	n/a	1	T1 ST-3	1/fill	0–10	1	n/r	historic	cont glass	green	4-22 cleared area
n/a	n/a	1	T1 ST-3	1/fill	0–10	2	n/r	historic	cont glass	clear	4-22 cleared area
n/a	n/a	2	T3 ST-17	1/A	0–10	1	n/r	historic	molded glass	tint green	northwest woods
n/a	n/a	4	T4 ST-3/4	1/surface	0–0	1	n/r	historic	brick, handm		4-22 cleared area
n/a	n/a	5	T4 ST-5	1/fill	0–19	5	n/r	historic	cont glass	colorless	4-22 cleared area
n/a	n/a	5	T4 ST-5	1/fill	0–19	1	n/r	historic	brick, ud		4-22 cleared area
n/a	n/a	5	T4 ST-5	1/fill	0–19	3	n/r	historic	tile	white	4-22 cleared area
n/a	n/a	5	T4 ST-5	1/fill	0–19	2	n/r	historic	shingle	asphalt	4-22 cleared area
n/a	n/a	6	T4 ST-5	2/fill-dist	19–37	1	n/r	historic	insulation	styrofoam	4-22 cleared area
n/a	n/a	6	T4 ST-5	2/fill-dist	19–37	1	n/r	historic	shingle	asphalt	4-22 cleared area
n/a	n/a	6	T4 ST-5	2/fill-dist	19–37	1	n/r	historic	tile	white	4-22 cleared area
n/a	n/a	7	T4 ST-9	1/?	0–27	1	n/r	historic	tile		west woods
n/a	n/a	8	T4 ST-10	1/?	0–16	1	n/r	historic	cont glass	clear	west woods
n/a	n/a	9	T-A-5 ST-5	1/?	18–30	1	n/r	historic	foil pack condom case	alunimum	east woods
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	2	n/r	historic	crown bottle caps	metal	near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	9	n/r	historic	ud bojects	metal	near cemetery

Appendix 3. Smith Reynolds Airport Two-Tract Survey Artifact Inventory.

Site	Acc#	Bag#	Provenience	Strat/Hor	Cmbs	Ct	Wt	Category	Type	RawMat	Comments
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	2	n/r	historic	ceramic, whiteware		near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	1	n/r	historic	ceramic, porcelain		near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	1	n/r	historic	ceramic, earthenware (brick?)		near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	2	n/r	historic	cont glass	green	near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	3	n/r	historic	cont glass	brown	near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	2	n/r	historic	cont glass	tint green	near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	16	n/r	historic	cont glass	clear/colorless	near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	2	n/r	historic	plastic, ud	yellow, white	near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	1	n/r	historic	plastic, bag		near cemetery
n/a	n/a	10	T-A-5 ST-10	1/disturbed	0–21	1	n/r	historic	nylon, ud swatch		near cemetery
n/a	n/a	11	T-11 ST-4	1/?	0–18	1	n/r	historic	ceramic, whiteware		northeast woods
n/a	n/a	12	T-12 ST-3	1/?	0–10	1	n/r	historic	ceramic, redware lead-glazed		northeast woods
n/a	n/a	13	T-12 ST-4	1/E	10–20	1	n/r	historic	cont glass	clear	northeast woods
n/a	n/a	14	T-13 ST-3	I/E	0–11	2	n/r	historic	nail, ud		northeast woods
n/a	n/a	14	T-13 ST-3	I/E	0–11	1	n/r	historic	cont glass	clear	northeast woods
n/a	n/a	14	T-13 ST-3	I/E	0–11	3	n/r	historic	coal/coke		northeast woods
n/a	n/a	15	T-13 ST-4	I/E	0–10	1	n/r	historic	cont glass	clear	northeast woods
n/a	n/a	16	T-13 ST-6	1/disturbed	0–8	0	n/r	historic	siding	asbestos	northeast woods
n/a	n/a	16	T-13 ST-6	1/disturbed	0–8	1	n/r	historic	cont glass	green	northeast woods
n/a	n/a	16	T-13 ST-6	1/disturbed	0–8	1	n/r	historic	ceramic, earthenware (tile or pot)		northeast woods
n/a	n/a	16	T-13 ST-6	1/disturbed	0–8	1	n/r	historic	insulation wire coating	plastic	northeast woods
n/a	n/a	16	T-13 ST-6	1/disturbed	0–8	0	n/r	historic	mortar		northeast woods
n/a	n/a	17	J east of runway	2/E	36–43	1	n/r	historic	ceramic, whiteware		east of 4-22

Attachment H

State Historic Preservation Office Comments

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

February 2, 2016

Rebekah N. Reid
ClearWater
32 Clayton Street
Asheville, NC 28801

rebekah@cwenv.com

Re: Taxilane Extension at Smith Reynolds Airport, Winston-Salem, Forsyth County, CH 15-2872

Dear Ms. Reid:

Thank you for your email of January 20, 2016, regarding the above-referenced undertaking. We have reviewed the materials submitted and offer the following comments.

There are no known archaeological sites within the proposed project area. Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no archaeological investigation be conducted in connection with this project.

According to plans for the project area, it appears terrain east of runway 15-33, which abuts the National Register-eligible Castle Heights Historic District (FY4174) will be cleared and graded to remove possible obstructions. However, it is uncertain if the clear zone for runway 15-33 will be enlarged as a result of the work. Therefore, additional information regarding possible effects to the clear zone is necessary prior to determining how the proposed actions may effect properties within the Castle Heights Historic District.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

Attachment I

EJSCREEN Report

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0-mile radius
Description: Forsyth County

Summary of ACS Estimates	2010 - 2014
Population	358,130
Population Density (per sq. mile)	877
Minority Population	149,791
% Minority	42%
Households	141,901
Housing Units	158,744
Housing Units Built Before 1950	18,069
Per Capita Income	26,730
Land Area (sq. miles) (Source: SF1)	408.17
% Land Area	100%
Water Area (sq. miles) (Source: SF1)	0.00
% Water Area	0%

	2010 - 2014 ACS Estimates	Percent	MOE (±)
Population by Race			
Total	358,130	100%	948
Population Reporting One Race	352,111	98%	2,755
White	239,125	67%	1,034
Black	93,612	26%	569
American Indian	806	0%	120
Asian	7,393	2%	334
Pacific Islander	106	0%	177
Some Other Race	11,069	3%	521
Population Reporting Two or More Races	6,019	2%	377
Total Hispanic Population	43,929	12%	992
Total Non-Hispanic Population	314,201		
White Alone	208,339	58%	587
Black Alone	92,253	26%	569
American Indian Alone	738	0%	120
Non-Hispanic Asian Alone	7,291	2%	334
Pacific Islander Alone	93	0%	177
Other Race Alone	849	0%	231
Two or More Races Alone	4,638	1%	226
Population by Sex			
Male	170,038	47%	625
Female	188,092	53%	572
Population by Age			
Age 0-4	23,463	7%	276
Age 0-17	85,826	24%	460
Age 18+	272,304	76%	691
Age 65+	48,826	14%	238

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race. N/A means not available.
Source: U.S. Census Bureau, American Community Survey (ACS) 2010 - 2014.

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0-mile radius
Description: Forsyth County

	2010 - 2014 ACS Estimates	Percent	MOE (±)
Population 25+ by Educational Attainment			
Total	236,409	100%	537
Less than 9th Grade	12,392	5%	320
9th - 12th Grade, No Diploma	18,777	8%	247
High School Graduate	61,764	26%	343
Some College, No Degree	67,486	29%	312
Associate Degree	18,229	8%	186
Bachelor's Degree or more	75,990	32%	372
Population Age 5+ Years by Ability to Speak English			
Total	334,667	100%	771
Speak only English	287,451	86%	556
Non-English at Home[1+2+3+4]	47,216	14%	751
[1]Speak English "very well"	24,543	7%	586
[2]Speak English "well"	8,915	3%	254
[3]Speak English "not well"	8,493	3%	379
[4]Speak English "not at all"	5,265	2%	365
[3+4]Speak English "less than well"	13,758	4%	514
[2+3+4]Speak English "less than very well"	22,673	7%	523
Linguistically Isolated Households*			
Total	4,554	100%	181
Speak Spanish	4,024	88%	180
Speak Other Indo-European Languages	209	5%	61
Speak Asian-Pacific Island Languages	269	6%	64
Speak Other Languages	52	1%	26
Households by Household Income			
Household Income Base	141,901	100%	245
< $15,000	19,703	14%	258
$15,000 - $25,000	17,933	13%	241
$25,000 - $50,000	38,217	27%	259
$50,000 - $75,000	24,720	17%	210
$75,000 +	41,328	29%	265
Occupied Housing Units by Tenure			
Total	141,901	100%	245
Owner Occupied	89,518	63%	212
Renter Occupied	52,383	37%	263
Employed Population Age 16+ Years			
Total	281,931	100%	588
In Labor Force	178,747	63%	570
Civilian Unemployed in Labor Force	17,440	6%	289
Not In Labor Force	103,184	37%	514

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race. N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2010 - 2014.

*Households in which no one 14 and over speaks English "very well" or speaks English only.

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0-mile radius
Description: Forsyth County

	2010 - 2014 ACS Estimates	Percent	MOE (±)
Population by Language Spoken at Home*			
Total (persons age 5 and above)	334,667	100%	771
English	287,451	86%	666
Spanish	36,507	11%	852
French	697	0%	100
French Creole	34	0%	44
Italian	430	0%	206
Portuguese	154	0%	54
German	657	0%	80
Yiddish	0	0%	17
Other West Germanic	79	0%	68
Scandinavian	121	0%	49
Greek	1,122	0%	399
Russian	152	0%	43
Polish	144	0%	42
Serbo-Croatian	136	0%	102
Other Slavic	73	0%	31
Armenian	8	0%	17
Persian	197	0%	79
Gujarathi	402	0%	285
Hindi	606	0%	174
Urdu	36	0%	41
Other Indic	207	0%	98
Other Indo-European	413	0%	125
Chinese	1,139	0%	191
Japanese	129	0%	59
Korean	237	0%	67
Mon-Khmer, Cambodian	170	0%	171
Hmong	21	0%	35
Thai	78	0%	75
Laotian	74	0%	81
Vietnamese	521	0%	128
Other Asian	736	0%	279
Tagalog	725	0%	141
Other Pacific Island	140	0%	113
Navajo	0	0%	17
Other Native American	10	0%	17
Hungarian	92	0%	74
Arabic	377	0%	206
Hebrew	7	0%	17
African	448	0%	133
Other and non-specified	137	0%	126
Total Non-English	47,216	14%	1,008

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race. N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2010 - 2014.
*Population by Language Spoken at Home is available at the census tract summary level and up.

EJSCREEN Census 2010 Summary Report

Location: User-specified polygonal location
Ring (buffer): 0-mile radius
Description: Forsyth County

Summary	Census 2010
Population	350,670
Population Density (per sq. mile)	859
Minority Population	144,736
% Minority	41%
Households	141,163
Housing Units	156,872
Land Area (sq. miles)	408.15
% Land Area	99%
Water Area (sq. miles)	4.55
% Water Area	1%

Population by Race	Number	Percent
Total	350,670	-------
Population Reporting One Race	343,086	98%
White	218,517	62%
Black	91,227	26%
American Indian	1,457	0%
Asian	6,495	2%
Pacific Islander	223	0%
Some Other Race	25,167	7%
Population Reporting Two or More Races	7,584	2%
Total Hispanic Population	41,775	12%
Total Non-Hispanic Population	308,895	88%
White Alone	205,934	59%
Black Alone	89,533	26%
American Indian Alone	894	0%
Non-Hispanic Asian Alone	6,427	2%
Pacific Islander Alone	156	0%
Other Race Alone	696	0%
Two or More Races Alone	5,255	1%

Population by Sex	Number	Percent
Male	166,419	47%
Female	184,251	53%

Population by Age	Number	Percent
Age 0-4	23,861	7%
Age 0-17	85,401	24%
Age 18+	265,269	76%
Age 65+	45,511	13%

Households by Tenure	Number	Percent
Total	141,163	
Owner Occupied	90,188	64%
Renter Occupied	50,975	36%

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, Census 2010 Summary File 1.

EJSCREEN Report (Version 2016)

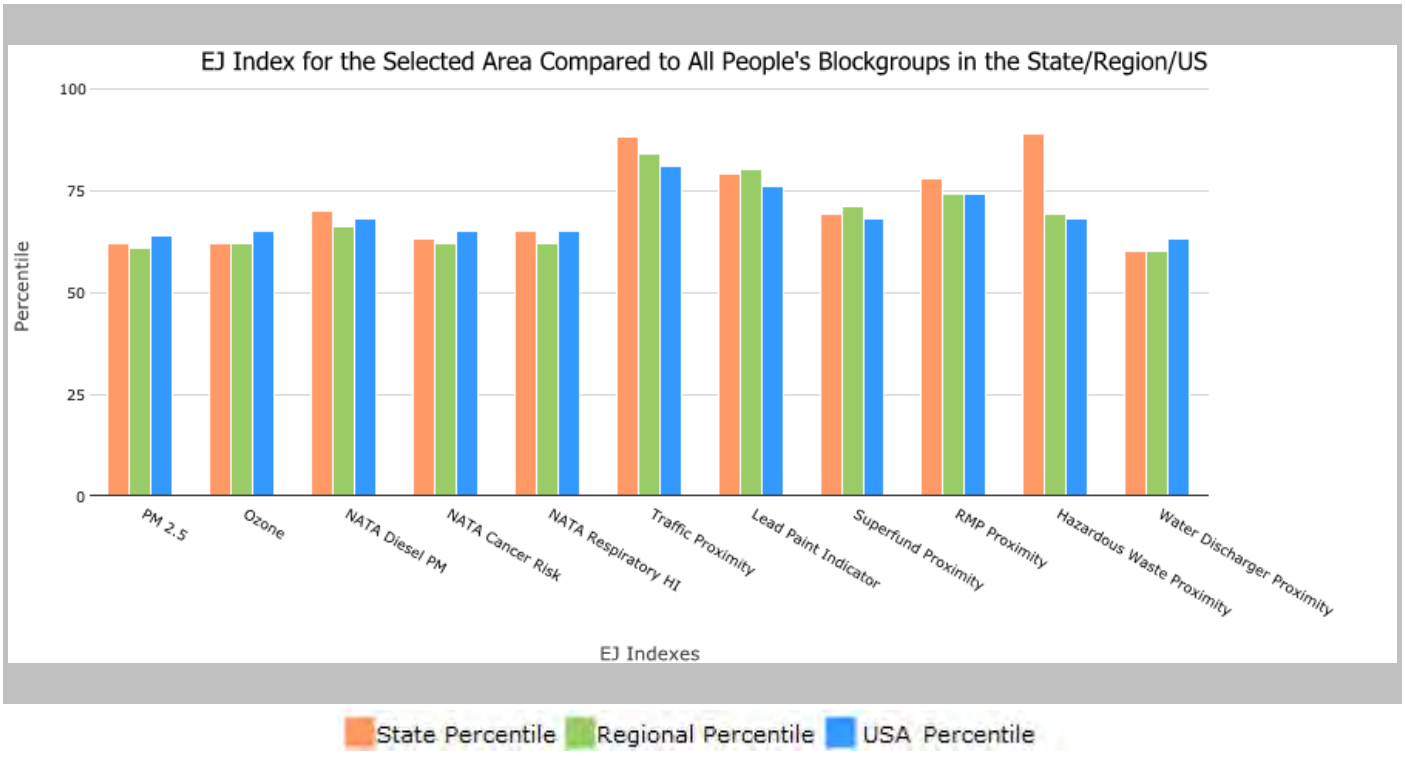
the User Specified Area, NORTH CAROLINA, EPA Region 4

Approximate Population: 358,056

Input Area (sq. miles): 411.30

Forsyth County

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	62	61	64
EJ Index for Ozone	62	62	65
EJ Index for NATA* Diesel PM	70	66	68
EJ Index for NATA* Air Toxics Cancer Risk	63	62	65
EJ Index for NATA* Respiratory Hazard Index	65	62	65
EJ Index for Traffic Proximity and Volume	88	84	81
EJ Index for Lead Paint Indicator	79	80	76
EJ Index for Superfund Proximity	69	71	68
EJ Index for RMP Proximity	78	74	74
EJ Index for Hazardous Waste Proximity	89	69	68
EJ Index for Water Discharger Proximity	60	60	63



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

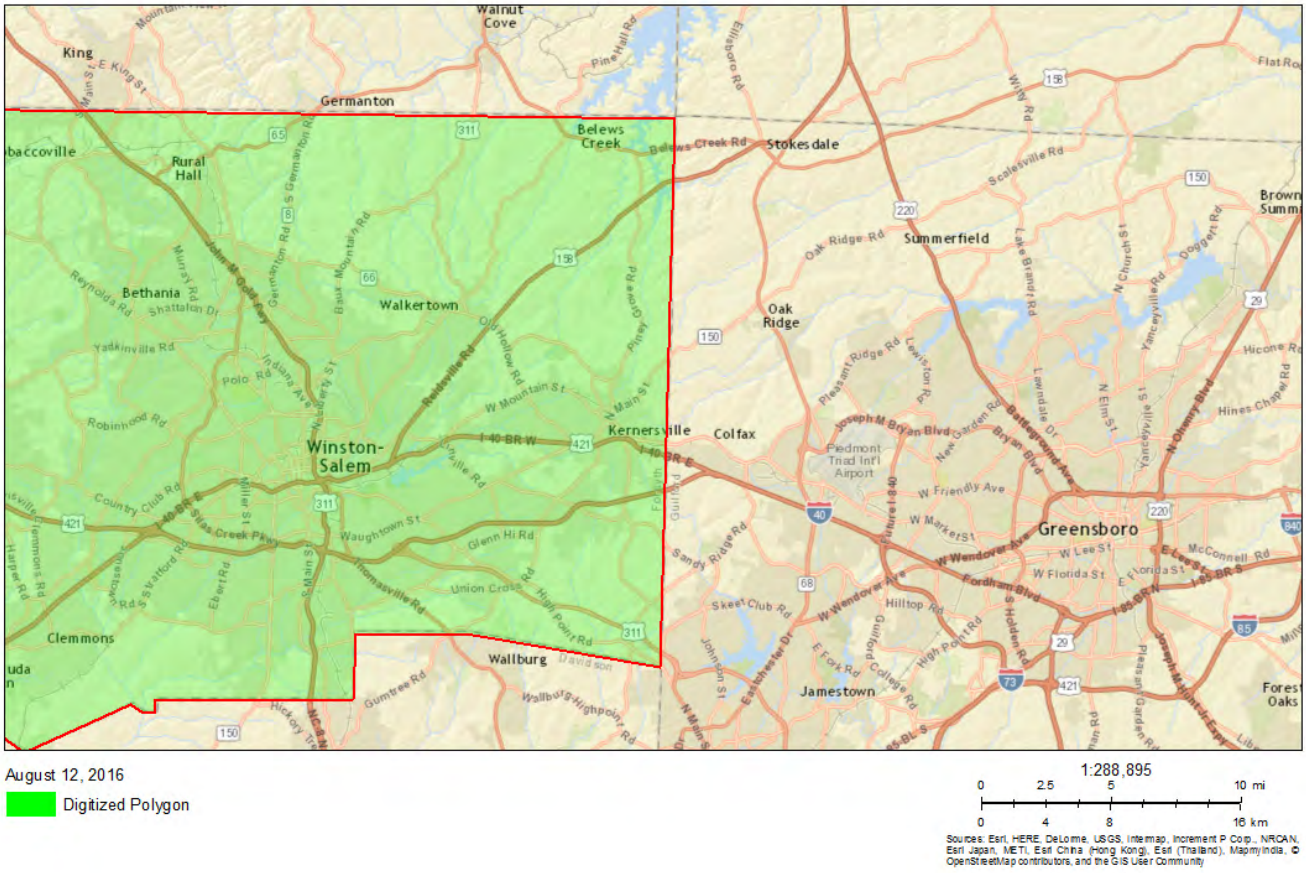
EJSCREEN Report (Version 2016)

the User Specified Area, NORTH CAROLINA, EPA Region 4

Approximate Population: 358,056

Input Area (sq. miles): 411.30

Forsyth County



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0
National Pollutant Discharge Elimination System (NPDES)	2

EJSCREEN Report (Version 2016)

the User Specified Area, NORTH CAROLINA, EPA Region 4

Approximate Population: 358,056

Input Area (sq. miles): 411.30

Forsyth County

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m^3)	9.34	9.13	65	8.9	52	9.32	46
Ozone (ppb)	49.5	46.4	86	42.4	82	47.4	57
NATA* Diesel PM (µg/m^3)	0.65	0.636	61	0.752	50-60th	0.937	<50th
NATA* Cancer Risk (lifetime risk per million)	44	41	61	42	50-60th	40	60-70th
NATA* Respiratory Hazard Index	1.5	1.4	63	1.7	<50th	1.8	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	300	170	83	290	78	590	69
Lead Paint Indicator (% Pre-1960 Housing)	0.22	0.17	73	0.16	75	0.3	53
Superfund Proximity (site count/km distance)	0.025	0.078	28	0.077	39	0.13	22
RMP Proximity (facility count/km distance)	0.17	0.26	63	0.32	57	0.43	49
Hazardous Waste Proximity (facility count/km distance)	0.0041	0.011	77	0.044	37	0.072	27
Water Discharger Proximity (facility count/km distance)	0.13	0.19	52	0.2	54	0.31	44
Demographic Indicators							
Demographic Index	41%	37%	62	38%	61	36%	64
Minority Population	42%	35%	64	37%	62	37%	62
Low Income Population	39%	39%	52	39%	51	35%	61
Linguistically Isolated Population	3%	3%	74	3%	71	5%	64
Population With Less Than High School Education	13%	15%	51	15%	51	14%	59
Population Under 5 years of age	7%	6%	57	6%	58	6%	56
Population over 64 years of age	14%	14%	55	15%	54	14%	57

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 1-mile radius
Description: Smith Reynolds Airport

Summary of ACS Estimates	2010 - 2014
Population	16,007
Population Density (per sq. mile)	1,909
Minority Population	14,733
% Minority	92%
Households	5,506
Housing Units	6,652
Housing Units Built Before 1950	1,701
Per Capita Income	13,666
Land Area (sq. miles) (Source: SF1)	8.38
% Land Area	100%
Water Area (sq. miles) (Source: SF1)	0.00
% Water Area	0%

	2010 - 2014 ACS Estimates	Percent	MOE (±)
Population by Race			
Total	16,007	100%	463
Population Reporting One Race	15,833	99%	1,518
White	3,228	20%	483
Black	11,553	72%	468
American Indian	13	0%	34
Asian	18	0%	61
Pacific Islander	76	0%	177
Some Other Race	946	6%	295
Population Reporting Two or More Races	174	1%	95
Total Hispanic Population	2,933	18%	478
Total Non-Hispanic Population	13,075		
White Alone	1,274	8%	240
Black Alone	11,504	72%	468
American Indian Alone	13	0%	34
Non-Hispanic Asian Alone	14	0%	61
Pacific Islander Alone	76	0%	177
Other Race Alone	53	0%	90
Two or More Races Alone	140	1%	95
Population by Sex			
Male	7,361	46%	271
Female	8,646	54%	282
Population by Age			
Age 0-4	1,926	12%	169
Age 0-17	5,332	33%	238
Age 18+	10,675	67%	262
Age 65+	1,783	11%	110

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race. N/A means not available.
Source: U.S. Census Bureau, American Community Survey (ACS) 2010 - 2014.

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 1-mile radius
Description: Smith Reynolds Airport

	2010 - 2014 ACS Estimates	Percent	MOE (±)
Population 25+ by Educational Attainment			
Total	9,192	100%	293
Less than 9th Grade	754	8%	93
9th - 12th Grade, No Diploma	1,565	17%	105
High School Graduate	3,136	34%	196
Some College, No Degree	2,716	30%	258
Associate Degree	421	5%	98
Bachelor's Degree or more	1,021	11%	107
Population Age 5+ Years by Ability to Speak English			
Total	14,081	100%	390
Speak only English	11,547	82%	309
Non-English at Home[1+2+3+4]	2,533	18%	261
[1]Speak English "very well"	1,068	8%	175
[2]Speak English "well"	658	5%	115
[3]Speak English "not well"	661	5%	111
[4]Speak English "not at all"	146	1%	104
[3+4]Speak English "less than well"	808	6%	134
[2+3+4]Speak English "less than very well"	1,465	10%	147
Linguistically Isolated Households*			
Total	306	100%	66
Speak Spanish	296	97%	65
Speak Other Indo-European Languages	0	0%	12
Speak Asian-Pacific Island Languages	9	3%	20
Speak Other Languages	0	0%	12
Households by Household Income			
Household Income Base	5,506	100%	123
< $15,000	1,468	27%	111
$15,000 - $25,000	1,215	22%	109
$25,000 - $50,000	1,601	29%	110
$50,000 - $75,000	587	11%	80
$75,000 +	635	12%	94
Occupied Housing Units by Tenure			
Total	5,506	100%	123
Owner Occupied	2,271	41%	119
Renter Occupied	3,235	59%	131
Employed Population Age 16+ Years			
Total	11,235	100%	310
In Labor Force	6,405	57%	260
Civilian Unemployed in Labor Force	1,332	12%	199
Not In Labor Force	4,830	43%	209

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race. N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2010 - 2014.

*Households in which no one 14 and over speaks English "very well" or speaks English only.

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 1-mile radius
Description: Smith Reynolds Airport

	2010 - 2014 ACS Estimates	Percent	MOE (±)
Population by Language Spoken at Home*			
Total (persons age 5 and above)	14,081	100%	390
English	N/A	N/A	N/A
Spanish	N/A	N/A	N/A
French	N/A	N/A	N/A
French Creole	N/A	N/A	N/A
Italian	N/A	N/A	N/A
Portuguese	N/A	N/A	N/A
German	N/A	N/A	N/A
Yiddish	N/A	N/A	N/A
Other West Germanic	N/A	N/A	N/A
Scandinavian	N/A	N/A	N/A
Greek	N/A	N/A	N/A
Russian	N/A	N/A	N/A
Polish	N/A	N/A	N/A
Serbo-Croatian	N/A	N/A	N/A
Other Slavic	N/A	N/A	N/A
Armenian	N/A	N/A	N/A
Persian	N/A	N/A	N/A
Gujarathi	N/A	N/A	N/A
Hindi	N/A	N/A	N/A
Urdu	N/A	N/A	N/A
Other Indic	N/A	N/A	N/A
Other Indo-European	N/A	N/A	N/A
Chinese	N/A	N/A	N/A
Japanese	N/A	N/A	N/A
Korean	N/A	N/A	N/A
Mon-Khmer, Cambodian	N/A	N/A	N/A
Hmong	N/A	N/A	N/A
Thai	N/A	N/A	N/A
Laotian	N/A	N/A	N/A
Vietnamese	N/A	N/A	N/A
Other Asian	N/A	N/A	N/A
Tagalog	N/A	N/A	N/A
Other Pacific Island	N/A	N/A	N/A
Navajo	N/A	N/A	N/A
Other Native American	N/A	N/A	N/A
Hungarian	N/A	N/A	N/A
Arabic	N/A	N/A	N/A
Hebrew	N/A	N/A	N/A
African	N/A	N/A	N/A
Other and non-specified	N/A	N/A	N/A
Total Non-English	N/A	N/A	N/A

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race. N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2010 - 2014.
*Population by Language Spoken at Home is available at the census tract summary level and up.

EJSCREEN Census 2010 Summary Report

Location: User-specified polygonal location
Ring (buffer): 1-mile radius
Description: Smith Reynolds Airport

Summary	Census 2010
Population	14,551
Population Density (per sq. mile)	1,736
Minority Population	13,313
% Minority	91%
Households	5,420
Housing Units	6,449
Land Area (sq. miles)	8.38
% Land Area	100%
Water Area (sq. miles)	0.01
% Water Area	0%

Population by Race	Number	Percent
Total	14,551	-------
Population Reporting One Race	14,228	98%
White	1,724	12%
Black	10,450	72%
American Indian	79	1%
Asian	31	0%
Pacific Islander	12	0%
Some Other Race	1,931	13%
Population Reporting Two or More Races	323	2%
Total Hispanic Population	2,692	19%
Total Non-Hispanic Population	11,859	81%
White Alone	1,238	9%
Black Alone	10,296	71%
American Indian Alone	38	0%
Non-Hispanic Asian Alone	24	0%
Pacific Islander Alone	7	0%
Other Race Alone	35	0%
Two or More Races Alone	222	2%

Population by Sex	Number	Percent
Male	6,790	47%
Female	7,761	53%

Population by Age	Number	Percent
Age 0-4	1,251	9%
Age 0-17	4,284	29%
Age 18+	10,267	71%
Age 65+	1,814	12%

Households by Tenure	Number	Percent
Total	5,420	
Owner Occupied	2,475	46%
Renter Occupied	2,946	54%

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, Census 2010 Summary File 1.

EJSCREEN Report (Version 2016)

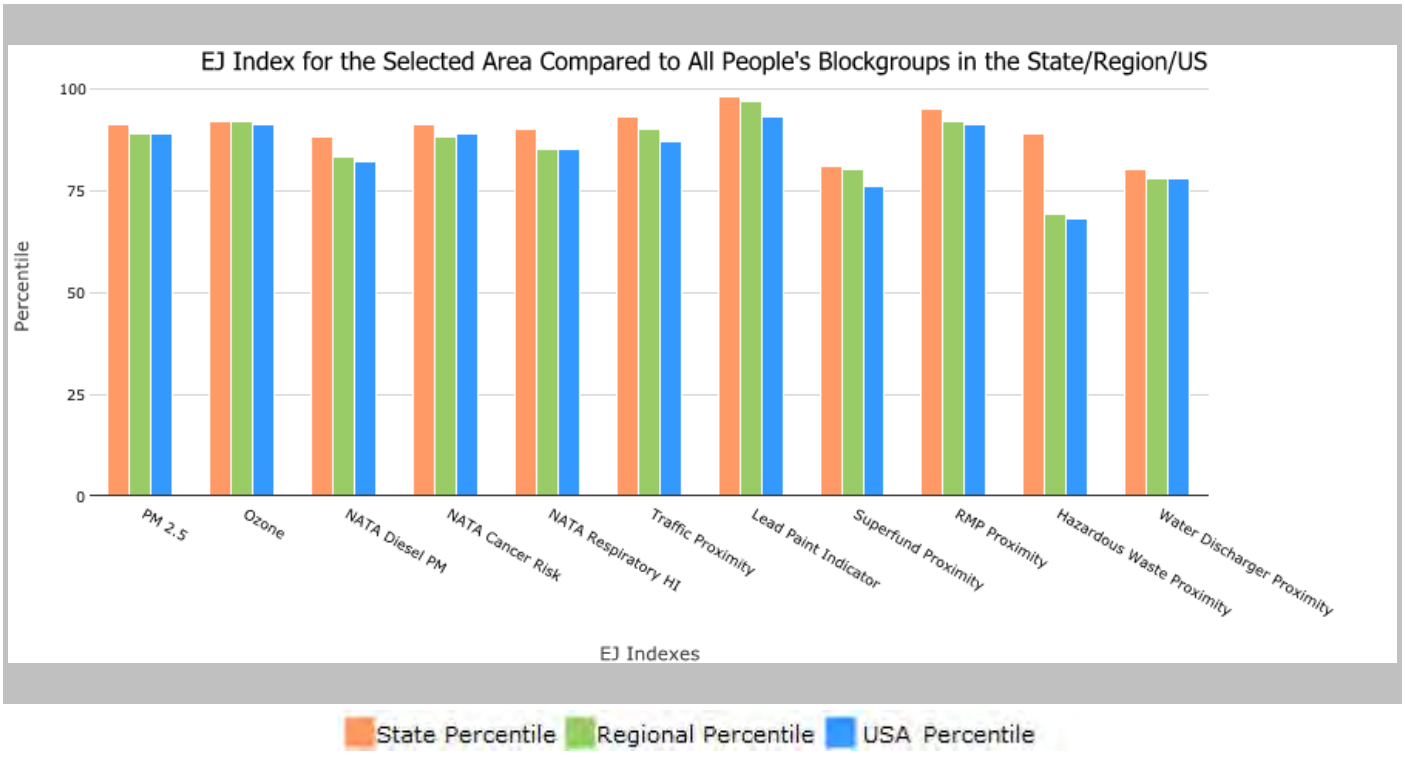
1 mile Ring around the Area, NORTH CAROLINA, EPA Region 4

Approximate Population: 16,007

Input Area (sq. miles): 8.14

Smith Reynolds Airport

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	91	89	89
EJ Index for Ozone	92	92	91
EJ Index for NATA* Diesel PM	88	83	82
EJ Index for NATA* Air Toxics Cancer Risk	91	88	89
EJ Index for NATA* Respiratory Hazard Index	90	85	85
EJ Index for Traffic Proximity and Volume	93	90	87
EJ Index for Lead Paint Indicator	98	97	93
EJ Index for Superfund Proximity	81	80	76
EJ Index for RMP Proximity	95	92	91
EJ Index for Hazardous Waste Proximity	89	69	68
EJ Index for Water Discharger Proximity	80	78	78



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

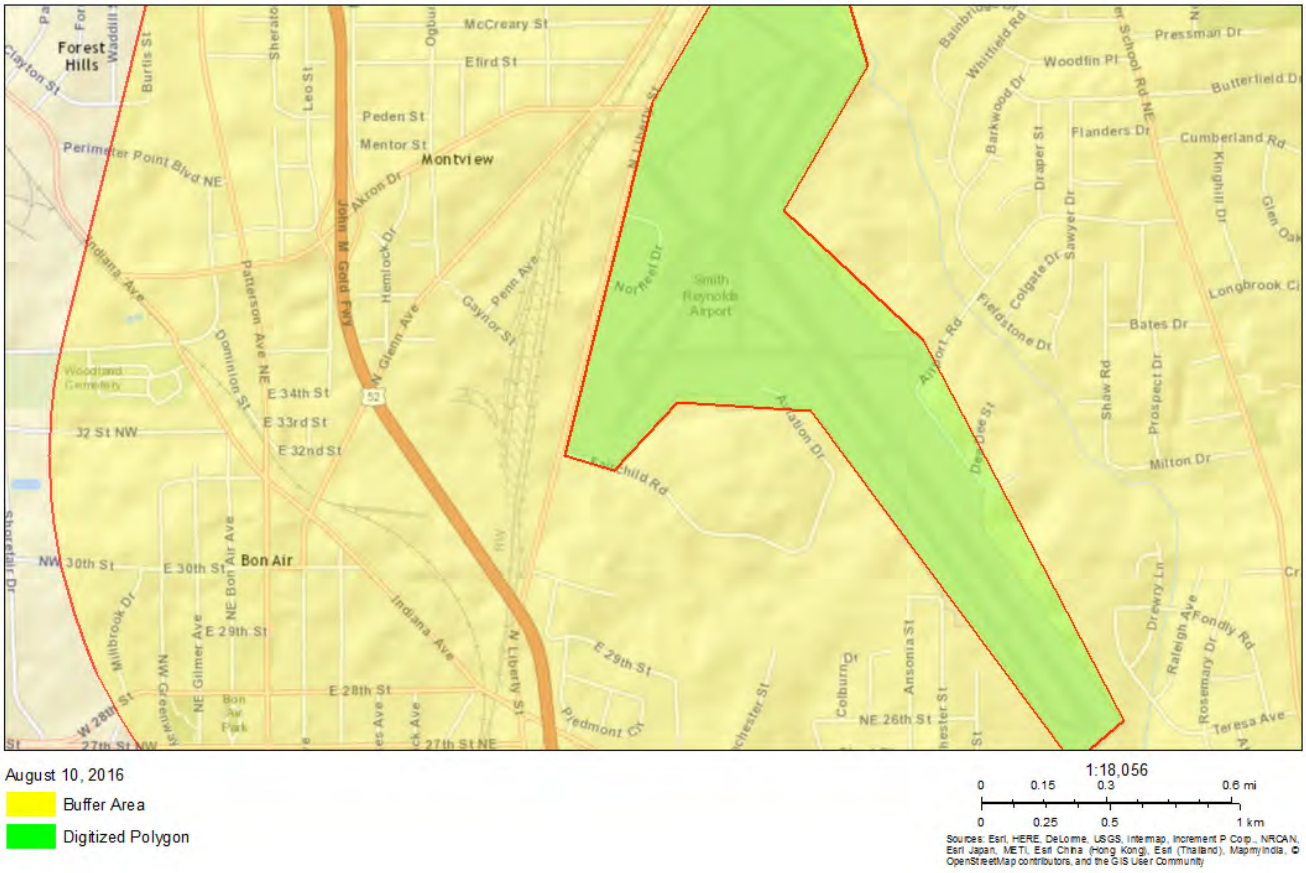
EJSCREEN Report (Version 2016)

1 mile Ring around the Area, NORTH CAROLINA, EPA Region 4

Approximate Population: 16,007

Input Area (sq. miles): 8.14

Smith Reynolds Airport



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0
National Pollutant Discharge Elimination System (NPDES)	0

EJSCREEN Report (Version 2016)

1 mile Ring around the Area, NORTH CAROLINA, EPA Region 4

Approximate Population: 16,007

Input Area (sq. miles): 8.14

Smith Reynolds Airport

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m^3)	9.28	9.13	60	8.9	50	9.32	45
Ozone (ppb)	49.8	46.4	90	42.4	84	47.4	59
NATA* Diesel PM (µg/m^3)	0.644	0.636	60	0.752	<50th	0.937	<50th
NATA* Cancer Risk (lifetime risk per million)	44	41	65	42	50-60th	40	60-70th
NATA* Respiratory Hazard Index	1.6	1.4	66	1.7	<50th	1.8	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	360	170	86	290	81	590	72
Lead Paint Indicator (% Pre-1960 Housing)	0.48	0.17	93	0.16	91	0.3	74
Superfund Proximity (site count/km distance)	0.025	0.078	28	0.077	39	0.13	22
RMP Proximity (facility count/km distance)	0.54	0.26	88	0.32	84	0.43	77
Hazardous Waste Proximity (facility count/km distance)	4.5E-05	0.011	76	0.044	36	0.072	26
Water Discharger Proximity (facility count/km distance)	0.077	0.19	18	0.2	26	0.31	20
Demographic Indicators							
Demographic Index	80%	37%	96	38%	95	36%	95
Minority Population	92%	35%	96	37%	93	37%	91
Low Income Population	69%	39%	91	39%	90	35%	91
Linguistically Isolated Population	6%	3%	84	3%	80	5%	73
Population With Less Than High School Education	25%	15%	82	15%	82	14%	83
Population Under 5 years of age	12%	6%	92	6%	92	6%	91
Population over 64 years of age	11%	14%	40	15%	39	14%	43

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

Attachment J

Landfill Report

5400 Glenwood Avenue, Suite 400
Raleigh, North Carolina 27612
tel: 919 325-3500
fax: 919 781-5730

February 28, 2017

Mr. Brian Wright, P.G.
North Carolina Department of
Environmental Quality
Pre-Regulatory Landfill Unit
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Subject: Remedial Investigation - Area Delineation and Media Sampling
Airport Landfill
1200 Fairchild Road
Winston-Salem, Forsyth County, North Carolina
Site Identification Number: NONCD0000307
Task Order 307DP-3

Dear Mr. Wright:

CDM Smith Inc. (CDM Smith) is pleased to submit this Remedial Investigation - Area Delineation and Media Sampling report for the Airport Landfill (site) located in Winston-Salem, Forsyth County, North Carolina, in accordance with Task Order 307DP-3. The investigation was performed in accordance with Task Orders 307DP-1 and -2 and the Work Plan approved by the North Carolina Department of Environmental Quality's (NCDEQ) Division of Waste Management - Superfund Section - Inactive Hazardous Sites Branch (IHSB) - Pre-Regulatory Landfill Unit on September 26, 2016. All field activities were performed in accordance with CDM Smith's Standard Operating Procedures and Quality Assurance (SOPQA) manual.

Field activities were completed on October 26-28, 31, and November 1-4 and 7-9, 2016, as summarized in the field notes provided in **Appendix A**. Drilling and laboratory services were performed by North Carolina licensed and certified subcontractors. Field activities, sampling results, and Work Plan variances are discussed below.

Waste Boundary Delineation

Borings B-1 through -20 were advanced along the perimeter of the estimated waste disposal boundary on October 26-28 and 31, 2016. Borings were advanced to the top of waste or 10 feet below ground surface (bgs) using hollow-stem auger (HSA) drilling techniques. Additional borings were offset towards or away from the initial boring depending on the presence or absence of waste. The cover soil thickness at each boring location was recorded along with a description of the type of

waste encountered. Total volatile organic compounds (VOCs) were measured using a photoionization detector (PID) from the cover soil and top of waste.

Cover soil thickness ranged from 0.5 (boring B-1-G) to 5 feet (boring B-11-A) in borings where waste was present. In these borings, cover soil PID measurements ranged from 0 parts per million (ppm) to 12.2 ppm (boring B-14). VOCs measured in the waste ranged from 0 ppm to 182.2 ppm (boring B-10-B). Boring locations and the waste disposal boundary are provided on **Figure 1**. Results from the waste delineation borings are summarized in **Table 1**.

Aboveground Vapor

The potential for aboveground vapors was evaluated by collecting landfill gas measurements across the waste disposal area on a 100-foot grid as shown on **Figure 2**. Measurements of methane, oxygen, carbon dioxide, and hydrogen sulfide were collected within each grid using a Landtec GEM 2000 Plus (GEM). Total VOCs were also measured using a PID. The GEM and PID were calibrated prior to initiating the screening in accordance with the manufacturer's instructions and bump tested periodically during the screening. Calibration and bump test results are provided in the field notes located in Appendix A.

Measurements were collected three to six inches above land surface and each instrument was allowed to run for approximately 30 seconds at each location prior to recording the measurements. A total of 73 locations were screened and no methane, hydrogen sulfide, or total VOCs were detected.

Cover Soil Investigation

Soil borings CSB-1 through -44 were advanced on October 28, 31, and November 1-3, 2016, using direct-push drilling and hand auger techniques to determine the thickness and composition of cover soil above waste. The borings were advanced on a 100-foot grid within the waste disposal area. Each boring was advanced to 3 feet bgs or to the top of waste if encountered first. Cover soils were screened with a PID prior to sample collection. The highest PID measurement within the recovered soil cores was recorded. Cover soil boring locations are provided on **Figure 3** and cover soil thicknesses are provided on **Figure 4**.

Cover soil thickness ranged from 0.5 feet at several locations to 4 feet at boring CSB-35. Total VOCs in the cover soil ranged from 0 ppm to 20.4 ppm in CSB-32. Table 1 summarizes the cover soil thickness as well as the type of waste encountered in each boring.

Cover soil samples were collected from the borings as shown on **Figure 5**. Samples were collected at 6 inches bgs from each boring location where waste was present and cover soil was greater than or equal to 6 inches, but less than 2 feet. Where cover soil was greater than or equal to 2 feet, soil samples were also collected at 18 inches bgs. All cover soil samples were analyzed for VOCs by U.S. Environmental Protection Agency (EPA) Method 8260B, 1,4-dioxane by EPA Method 8260B selective ion monitoring, semi-VOCs by EPA Method 8270D, total metals (i.e. antimony, arsenic, beryllium, cadmium, chromium, copper, iron, manganese, nickel, selenium, silver, thallium, and zinc) by EPA Method 6020B, mercury by EPA Method 7471B, ammonia by Standard Method 4500, and nitrate and

sulfate by EPA Method 9056A. Tentatively Identified Compounds (TICs) for the 10 largest peaks identified by the 8260B and 8270D analyses were reported for all samples.

No VOCs, TICs, or general chemistry analytes were detected above the Industrial IHSB's Preliminary Soil Remediation Goals (PSRGs). Arsenic was detected above the Industrial PSRG in a majority of the cover soil samples. Benzo(a)pyrene was detected above the Industrial PSRG in samples collected from CSB-4 and CSB-44. These samples were collected at 1.5 feet bgs. Cover soil analytical results are summarized in **Table 2** and Industrial PSRG exceedances are provided on **Figures 5A** and **5B**. TICs detected in the cover soil samples are provided in **Appendix B**. Laboratory analytical data reports are provided in **Appendix C**.

Waste Characterization

Soil borings SB-1 through -7 were advanced on October 31 and November 1-3, 2016, to determine the cover soil and waste thickness and to characterize lithology. Each boring was advanced to the waste and native soil interface using HSA drilling techniques. Split-spoon samples were collected continuously using Standard Penetration Testing to the waste and native soil interface. The lithology of the cover soil and soils mixed with waste was characterized using the Unified Soil Classification System. A PID was used to screen all samples. Soil boing locations are provided on Figure 3. A summary of the cover soil and waste thickness, as well as the type of waste encountered for each boring is provided in Table 1. Boring logs with PID measurements are provided in **Appendix D**.

Waste thickness ranged from 11 to 25.5 feet and total VOCs within waste ranged from 14.2 ppm to 48.9 ppm. Waste encountered consisted of plastic, wood chips, metal, metal wire, asphalt, glass, fabric, rubber, brick, and carpet.

Soil mixed with waste was collected at 5-foot intervals beginning at the top of waste to the waste and native soil interface. The soil samples were temporarily containerized and screened with a PID. The sample interval with the highest PID measurement was submitted for laboratory analysis. Samples were also collected from the waste and native soil interface, and from native soil located approximately 2 feet beneath waste. The waste characterization samples were analyzed using the same analyses as the cover soils.

No VOCs, TICs, or general chemistry analytes were detected in the waste characterization samples above Industrial PSRGs. Arsenic was detected above the Industrial PSRG in a majority of the waste characterization samples. Iron was detected above the Industrial PSRG in the duplicate sample collected from SB-6 at 25 feet bgs. SVOCs detected above their respective Industrial PSRG are summarized below. The waste characterization analytical results are summarized in **Table 3** and Industrial PSRG exceedances are shown on **Figure 6**. TICs detected in the waste characterization samples are provided in Appendix B. Laboratory analytical data reports are provided in Appendix C.

Waste Characterization SVOCs Exceeding Industrial PSRGs

- Benzo(a)anthracene SB-2 (1-6)
- Benzo(a)pyrene SB-2 (1-6) and SB-5 (13-18)
- Benzo(b)fluoranthene SB2 (1-6)

- Bis(2-ethylhexyl)phthalate SB-3 (29)
- Dibenzo(a,h)anthracene SB2 (1-6)
- Indeno(1,2,3-cd)pyrene SB-2 (1-6)

Surface Water, Sediment, and Seep Investigation

No surface water, sediment, or seep samples were collected as the sampling locations were dry.

Groundwater Investigation

Four temporary Type II groundwater monitoring wells (TW-1 through -4) were installed on November 3, 4, and 8, 2016, using HSA drilling techniques. TW-2 and -4 were installed to a depth of 28 feet bgs and TW-1 and -3 were installed to a depth of 10 and 15 feet bgs, respectively. Temporary monitoring well locations are provided on Figure 3. Boring logs with PID measurements for each temporary monitoring well are provided in Appendix D.

Each temporary groundwater monitoring well was constructed using 1-inch diameter Schedule 40 polyvinyl chloride (PVC) riser flush threaded to 10 feet of 1-inch diameter 0.01-inch mill slotted Schedule 40 PVC pre-packed screen, with the exception of TW-1. TW-1 was installed with 5 feet of screen. A filter pack consisting of #2 sand was installed 2 feet above the screen. A bentonite annular seal was installed 2 feet above the filter pack and hydrated with potable water. Following installation, each well was developed to remove suspended solids from the water column until the development water was visually clear. Following installation and development, the wells were allowed to equilibrate for at least 24 hours. Well construction details are summarized in **Table 4**.

Prior to purging, the water level and total depth of each well was measured using an electronic water level indicator with an accuracy of 0.01 feet. The top of casing and ground elevation was surveyed by CDM Smith using a survey rod and level. Water level measurements are provided in **Table 5** and were used to construct the potentiometric surface map provided on **Figure 7**. Based on the groundwater elevations shown on Figure 7, groundwater flows east toward Brushy Fork.

Prior to sample collection, each temporary monitoring well was purged. Per the SOPQA manual, water quality parameters pH, conductivity, and temperature were monitored during purging using a YSI-63 multi-parameter water quality meter and a HACH turbidity meter. Each water quality meter was calibrated in accordance with the manufacturer's instructions prior to initiating sampling activities. The water quality measurements at the time of sample collection are presented in Table 5. Following stabilization of the purge parameters, groundwater samples were collected using low-flow sampling techniques.

Groundwater samples were collected from each well on November 4, 7, and 9, 2016, and analyzed using the same analyses and analytical methods as the cover soil samples with the exception of mercury. Mercury was analyzed using EPA Method 7470A. TICs for the 10 largest peaks identified by the 8260B and 8270D analyses were reported for each sample. SVOCs and TICS were not analyzed for TW-2 and its associated duplicate due to laboratory error. 3/4-Methylphenol was detected at a low-level below the 15A NCAC 02L .0202 (NC 2L) Groundwater Quality Standard in TW-4 and was the only SVOC detected in the temporary monitoring wells. Temporary monitoring well TW-2 was not

reinstalled and sampled because no SVOCs were detected above the NC 2L Standards and only 3/4-methylphenol was detected at a low-level.

No VOCs or SVOCs were detected in the groundwater samples above the NC 2L Groundwater Quality Standards. No TICs were detected by the 8260B and 8270D analyses. Ammonia was detected in TW-4 and the associated duplicate above the Groundwater Protection Standard. Metals detected above the NC 2L or Groundwater Protection Standard are summarized below. Laboratory analytical results are provided in **Table 6** and analytes exceeding the standards are shown on **Figure 8.** Laboratory analytical data reports are provided in Appendix C.

Groundwater Metals Exceeding NC 2L Standards

- Arsenic TW-4
- Cadmium TW-3
- Iron TW-1, -3, and -4
- Manganese TW-1, -2, -3, and -4

Groundwater Metals Exceeding Groundwater Protection Standards

- Beryllium TW-1 and -3
- Thallium TW-1, -2, -3, and -4

Following sample collection, each temporary monitoring well was abandoned by pulling the PVC riser and screen followed by filling the remaining annular space with a Portland cement and bentonite grout mixture to land surface.

Landfill Gas Probe Installation and Screening

Landfill gas (LFG) probes GP-1 through -7 were installed on November 3, 2016, at the same locations as waste characterization borings SB-1 through -7 as shown on Figure 3. The LFG probes were installed using HSA drilling techniques to 11 feet bgs, with the exceptions of GP-5 and -6. GP-5 was not installed due to shallow groundwater and GP-6 was installed to a depth of 6 feet bgs.

LFG probes GP-1 through-4 and -7 were constructed with five feet of 1-inch diameter Schedule 40 PVC riser flush-threaded to six feet of 0.01-inch machine slotted PVC screen. GP-6 was constructed with five feet of PVC riser flush-threaded to one foot of PVC screen. The annular space was backfilled with a #2 sand filter extending 1-foot above the screen, with the exception of GP-6. The annular space in GP-6 was backfilled with a sand filter to the top of the screen. A 2-foot thick hydrated bentonite seal was installed above the sand filter. The remainder of the borehole annulus was completed with a Portland cement and bentonite grout mixture to land surface. Each LFG probe was completed with a steel above-grade protective cover, 2-foot by 2-foot concrete pad, stopcock valve, and an identification placard. LFG probe construction details are summarized in **Table 7**.

LFG probes GP-1 through -4, -6, and -7 were screened on November 4, 2016, at least 24 hours after installation, for methane, hydrogen sulfide, oxygen, carbon dioxide, and VOCs using a GEM and PID. The GP-5 location was screened using a flux chamber. Water levels were measured at each LFG probe using an electronic water level indicator with an accuracy of 0.01 feet. The GEM and PID were

calibrated prior to initiating the screening in accordance with the manufacturer's instructions. Barometric pressure, ambient temperature, and humidity were recorded at the beginning of screening activities. A hygrometer was used to measure humidity and ambient temperature and the GEM was used to measure barometric pressure.

Methane was detected at all LFG probe locations ranging from 3.3 percent at GP-7 to 59.3 percent at GP-4. Hydrogen sulfide was detected in GP-2 and -3 at 4 and 9 ppm, respectively. Total VOCs ranged from 1-11.1 ppm and were measured in all LFG probe locations except for GP-5 and -6. No groundwater was measured in any of the LFG probes as shown in **Table 8**. LFG probe screening results are summarized in **Table 9** and on **Figure 9**.

Quality Control/Quality Assurance

Upon collection, all samples were labeled and placed in a chilled cooler. Standard chain-of-custody procedures were followed to document the handling of the samples. Sample coolers were shipped daily to the laboratory. The laboratory analytical results were evaluated by CDM Smith to determine the validity of the data and were determined to be useable. The laboratory data evaluation is provided in Appendix C.

The analytical results were reported to the laboratory specific method detection limit (MDL) and are quantifiable at or below the practical quantification limit. Analytical results above the MDL, but below the practical quantification limit were qualified as estimated or "J" flags. Several samples had "B" flags which indicate the analyte was detected in the method blank and "BH" flags indicating that the method blank was greater than one half of the reporting limit, but the sample concentrations were greater than ten times the method blank.

Duplicate samples were collected daily from each media during sampling activities for laboratory quality control. The duplicate samples were analyzed for the same parameters as the primary samples. The following duplicate samples were collected:

- Four cover soil boring samples (CSB-13-0.5, CSB-19-0.5, CSB-28-0.5, and CSB-44-0.5);
- Four waste characterization boring samples (SB-2-1-6, SB-3-8.5-13.5), SB-6-25, and SB-7-6-11); and
- Three groundwater samples (TW-1, -2, and -4).

In general, the relative percent different (RPD) between the parent and duplicate samples showed good laboratory precision. The RPD results for several analytes widely varied indicating potential influence from the homogeneity of the matrix, turbidity, sampling or laboratory procedures, or laboratory instrumentation.

Eight trip blanks were analyzed for VOCs for quality control. No VOCs were detected in the trip blanks above the MDL.

Survey

All borings were surveyed for northing and easting using a handheld Global Positioning System (GPS) unit. GPS coordinates are reported in decimal degrees to the seventh order using the North American

Datum of 1983 with accuracy in the thousandths of a meter following differential correction. Latitude and longitude coordinates are also reported for each survey location using the World Geodetic System 1984 format. Northing and easting coordinates for all borings are provided in **Appendix E**.

GPS coordinates were collected along the entire waste disposal boundary at 50-foot intervals upon the completion of the waste disposal boundary activities. The coordinates, provided in Appendix E, were collected starting at the most northern point of the waste disposal boundary and continue in a clockwise progression around the perimeter.

Following the installation of temporary monitoring wells TW-1 through -4, the top of casing and ground elevation were surveyed by CDM Smith using a survey rod and level. The elevation data was used to prepare the potentiometric surface map and determine groundwater flow direction. Survey results are provided in Table 5.

Investigative-Derived Waste

Investigative-derived waste (IDW) generated during drilling and sampling activities consisted of soil, rock, waste, and water generated from decontamination, well development and well purging activities. IDW from the waste characterization borings was deemed non-hazardous. Cover soil cuttings and waste was used to backfill the waste characterization borings. Cover soil was stockpiled separately from the waste cuttings to ensure the cover soil remained free of waste. Cover soil cuttings from the installation of the LFG probes were spread on the ground surface within the waste disposal area. Hydrated bentonite chips were used for backfill in instances where there was not enough soil or waste cuttings to complete backfilling flush with the adjacent land elevation.

Soil cores from the cover soil investigation borings was used for backfill as well as hydrated bentonite chips. Cuttings generated during the installation of the temporary groundwater monitoring wells were spread on the ground surface. All groundwater monitoring well development and purge water was discharged directly to the ground, adjacent and downgradient of the well.

Decontamination activities were completed within the waste disposal area at a location designated by CDM Smith. HSAs and tooling was decontaminated between each waste characterization boring using high-pressured potable water. Split-spoon samplers were decontaminated between each sample interval using potable water and a detergent. The hand auger was decontaminated between each cover soil location using potable water and a detergent. Spent personal protective equipment and sampling supplies was assumed to be non-hazardous and disposed on in a dumpster at the CDM Smith office located in Raleigh, North Carolina.

Report Certification

The report certification as specified in the *Inactive Hazardous Sites Program, Guidelines for Addressing Pre-Regulatory Landfills & Dumps, November 2015* is provided in **Appendix F**.

Sole Use Statement

This report is solely intended for use by the NCDEQ for the services that were performed in accordance with CDM Smith's proposal dated September 7, 2016, as authorized by NCDEQ Task Order 307DP-3 dated September 26, 2016.

If you have any questions or require further explanation, please do not hesitate to call me at (919) 325-3569 or by email to colonemf@cdmsmith.com.

Very truly yours,

Mathew F. Colone, P.G.
CDM Smith Inc.

cc: Aaron Weispfenning, CDM Smith
Daniel Forbes, CDM Smith

Tables

Table 1
Cover Soil and Waste Boring Summary
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Soil Boring Code	Estimated Cover Soil Thickness (feet)	Estimated Waste Thickness (feet)	Total VOCs Measured in Cover Soil/Waste (ppm)	Waste Present (Yes/No)	Waste Description
B-1	NA	--[7]	0	No	--
B-1-A	NA	--[7]	5.4[2]	No	--
B-1-B	NA	--[7]	33.6[2]	No	--
B-1-C	NA	--[7]	0.8[2]	No	--
B-1-D	NA	--[7]	0.2[2]	No	--
B-1-E	NA	--[7]	0	No	--
B-1-F	3.0	--[7]	1.6	Yes	Fabric, glass, plastic
B-1-G	0.5	--[7]	1.8	Yes	Glass, plastic, string, fabric
B-1-H	3.0	--[7]	6.0	Yes	Metal, plastic, fabric
B-2	NA	--[7]	0.1[2]	No	--
B-2-A	2.0	--[7]	0	Yes	Plastic, paper
B-3	NA	--[7]	5.5[2]	No	--
B-3-A	NA	--[7]	1.8[2]	No	--
B-3-B	3.0	--[7]	0.6[3]	Yes	Plastic, fabric
B-4	NA	--[7]	0.1[2]	No	--
B-4-A	2.0	--[7]	4.3[3]	Yes	Fabric
B-5	NA	--[7]	12.3[2]	No	--
B-5-A	2.0	--[7]	0.2[3]	Yes	Rubber
B-6	NA	--[7]	1.5[2]	No	--
B-6-A	NA	--[7]	0	No	--
B-6-B	2.0	--[7]	0	Yes	Glass, plastic
B-7	NA	--[7]	0	No	--
B-7-A	NA	--[7]	0	No	--
B-7-B	1.0	--[7]	0	Yes	Plastic, fabric
B-8	NA	--[7]	0	No	--
B-8-A	NA	--[7]	2.9[2]	No	--
B-8-B	NA	--[7]	0	No	--
B-8-C	NA	--[7]	0	No	--
B-8-D	1.0	--[7]	0	Yes	Plastic, paper
B-9	NA	--[7]	10[2]	No	--
B-9-A	NA	--[7]	0.4[2]	No	--
B-9-B	NA	--[7]	0.1[2]	No	--
B-9-C	NA	--[7]	0	No	--
B-9-D	3.0	--[7]	0	Yes	Plastic
B-10	NA	--[7]	0	No	--
B-10-A	NA	--[7]	0	No	--
B-10-B	2.0	--[7]	182.2[3]	Yes	Yarn, plastic
B-11	1.0	--[7]	0	Yes	Plastic, wood, glass
B-11-A	5.0	--[7]	3.2	Yes	Plastic, metal, garbage odor
B-11-B	NA	--[7]	0	No	--
B-12	2.0	--[7]	4.0[3]	Yes	Plastic
B-13	2.0	--[7]	0.2	Yes	Plastic, fabric
B-14	3.0	--[7]	12.2[3]	Yes	Plastic, metal, fabric
B-15	1.0	--[7]	0	Yes	Glass, fabric
B-16	2.0	--[7]	2.6	Yes	Plastic
B-17	2.5	--[7]	1.2	Yes	Plastic, fabric
B-18	2.5	--[7]	0.2[3]	Yes	Plastic
B-18-A	NA	--[7]	12.0[2]	No	--
B-19	2.0	--[7]	13.2[3]	Yes	Metal, plastic
B-19-A	1.5	--[7]	0.2[3]	Yes	Plastic
B-19-B	NA	--[7]	0	No	--
B-20	NA	--[7]	1.1[2]	No	--
B-20-A	3.0	--[7]	4.8[2]	Yes	Plastic
CSB-1	1.5	--[7]	13.4[2]	Yes	Plastic
CSB-2	3.0	--[7]	0.1[2]	Yes	Plastic, wood
CSB-3	1.5	--[7]	0.1[2]	Yes	Plastic
CSB-5	2.0	--[7]	0	Yes	Wire, plastic, fabric
CSB-6	1.0	--[7]	0	Yes	Glass, plastic
CSB-8	1.0	--[7]	1.8[2]	Yes	Fabric
CSB-9	1.5	--[7]	2.1[2]	Yes	Fabric, plastic
CSB-10	1.0	--[7]	2.4[2]	Yes	Fabric

Table 1
Cover Soil and Waste Boring Summary
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Soil Boring Code	Estimated Cover Soil Thickness (feet)	Estimated Waste Thickness (feet)	Total VOCs Measured in Cover Soil/Waste (ppm)	Waste Present (Yes/No)	Waste Description
CSB-11	0.7	--(7)	2.0(2)	Yes	Plastic
CSB-12	1.0	--(7)	0	Yes	Plastic
CSB-13	0.8	--(7)	0	Yes	Plastic
CSB-14	2.5	--(7)	1.7(2)	Yes	Plastic
CSB-15	0.8	--(7)	2.0(2)	Yes	Plastic, glass
CSB-16	2.0	--(7)	1.6(2)	Yes	Plastic
CSB-17	1.5	--(7)	2.0(2)	Yes	Fabric, plastic
CSB-19	1.0	--(7)	0	Yes	Plastic, glass
CSB-20	1.0	--(7)	0.3(2)	Yes	Plastic, glass
CSB-22	1.5	--(7)	2.0(2)	Yes	Plastic
CSB-23	1.0	--(7)	0.4(2)	Yes	Plastic
CSB-24	0.5	--(7)	0.5(2)	Yes	Fabric, wood chips
CSB-25	2.0	--(7)	0.2(2)	Yes	Plastic
CSB-26	1.5	--(7)	1.0(2)	Yes	Fabric
CSB-27	1.5	--(7)	0	Yes	Plastic
CSB-28	1.5	--(7)	0.8(2)	Yes	Fabric
CSB-29	3.0	--(7)	2.3(2)	Yes	Plastic
CSB-30	0.5	--(7)	0.4(2)	Yes	Plastic
CSB-31	0.5	--(7)	0.3(2)	Yes	Plastic
CSB-32	1.5	--(7)	20.4(2)	Yes	Wood chips, plastic
CSB-34	1.5	--(7)	0.7(2)	Yes	Plastic
CSB-36	1.0	--(7)	0.2(2)	Yes	Glass, plastic
CSB-37	2.0	--(7)	2.9(2)	Yes	Glass
CSB-38	0.5	--(7)	0.4(2)	Yes	Plastic
CSB-39	0.5	--(7)	0.3(2)	Yes	Fabric
CSB-40	1.5	--(7)	0.9(2)	Yes	Glass
CSB-41	1.0	--(7)	0.1(2)	Yes	Plastic
CSB-42	2.0	--(7)	17.7(3)	Yes	Glass, plastic, paper
CSB-44	3.0	--(7)	2.9(3)	Yes	Wood, plastic, concrete
SB-1/CSB-4	3.0	22.0	17.3(3)	Yes	Plastic, wood chips, metal, metal wire, asphalt, glass, fabric
SB-2/CSB-7	1.0	18.0	29.0(3)	Yes	Plastic, wood chips, metal, fabric, glass
SB-3/CSB-18	3.5	25.5	62.3(3)	Yes	Glass, plastic, metal, wood chips, asphalt, metal wire, garbage odor
SB-4/CSB-21	1.0	15.0	48.9(3)	Yes	Plastic, glass, metal, wood chips
SB-5/CSB-33	3.0	23.0	33.0(3)	Yes	Metal, rubber, glass, plastic, wood chips
SB-6/CSB-35	4.0	21.0	42.9(3)	Yes	Wood chips, plastic, glass, brick, metal, wood, fabric
SB-7/CSB-43	1.0	11.0	14.2(3)	Yes	Carpet, plastic, wood chips, rubber, metal, fabric, glass

Notes:

1. Waste delineation borings (B) were advanced on October 26-28, and 31, 2016. Cover soil borings (CSB) were completed October 28, 31, and November 1-3, 2016. Waste characterization borings (SB) were completed October 31 and November 1-3, 2016.
2. (2) - Total volatile organic compounds (VOCs) measured in cover soil.
3. (3) - Total VOCs measured in cover soil and waste. Highest recorded measurement is listed.
4. No VOCs were detcted in the cover soil borings with the exception of those noted in the table.
5. ppm - parts per million
6. -- No waste present.
7. (7) - Waste thickness not estimated. Boring was used to determine the presence of waste and thickness of cover soil above waste.
8. NA - Not Applicable

Table 2a
Detected Cover Soil Boring Constituents - Metals
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Antimony	Arsenic	Beryllium	Cadmium	Chromium [4]	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Health-Based Industrial PSRG [3]		**94**	**3.0**	**460**	**196**	**100,000**	**9,400**	**100,000**	**800**	**5,200**	**3.13**	**4,400**	**1,160**	**1,160**	**2.4**	**70,000**
CSB-1-0.5	3-Nov-16	--	5.8	0.43	--	15	18	22,000	35	100 BH,B	0.081	3.8	0.59	--	0.26	43
CSB-2-0.5	3-Nov-16	--	3.9	0.27	--	13	17	18,000	32	89 BH,B	0.056	3.7	0.46	--	0.26	25
CSB-2-1.5	3-Nov-16	--	5.6	0.22	--	2.8	22	15,000	64	140	0.014	1.4	0.22	--	--	18
CSB-3-0.5	31-Oct-16	0.23	4.3	0.25	--	9.9 BH,B	13	12,000	21	46 BH,B	0.037	3.7	0.31	--	0.21	23
CSB-4-0.5	31-Oct-16	--	1.7	0.26	--	6.9	4.7	8,700	8.5	19 BH,B	0.0019	2.9	0.29	--	0.13	15
CSB-4-1.5	31-Oct-16	--	10	0.75	--	13	15	19,000	35	110 BH,B	0.045	4.7	0.30	--	0.20	47
CSB-5-0.5	31-Oct-16	0.17	5.1	0.36	--	16 BH,B	18	24,000	25	90 BH,B	0.073	4.4	0.40	--	0.25	30
CSB-5-1.5	31-Oct-16	0.17	11	0.46	--	18 BH,B	17	30,000	27	85 BH,B	0.083	4.4	0.41	--	0.24	30
CSB-6-0.5	3-Nov-16	--	4.6	0.54	--	15	11	23,000	16	90 BH,B	0.098	4.6	0.69	--	0.25	24
CSB-7-0.5	31-Oct-16	0.13	4.5	0.45	0.23	15	14	9,100	32	270 BH,B	0.051	4.7	0.36	0.13	0.25	47
CSB-8-0.5	1-Nov-16	--	5.4	0.47	--	8.7	15	18,000 BH,B	21 BH,B	120 BH,B	0.035	2.8	0.44	--	0.24	20
CSB-9-0.5	1-Nov-16	--	2.8	0.55	--	2.0	15	13,000 BH,B	27 BH,B	340 BH,B	0.0013	1.0	0.31	--	0.30	24
CSB-10-0.5	1-Nov-16	--	1.2	0.50	--	3.7	12	15,000	23	270	0.026	1.1	0.37	--	0.18	57
CSB-11-0.5	1-Nov-16	--	2.2	0.61	1.0	9.0	15	17,000	28	150	0.023	3.5	0.29	0.21	0.22	59
CSB-12-0.5	3-Nov-16	--	3.2	0.67	--	8.9	12	21,000	24	160 BH,B	0.040	2.9	0.52	--	0.34	42
CSB-13-0.5	31-Oct-16	--	5	0.42	--	14	27	27,000	41	93 BH,B	0.030	4.7	0.41	--	0.23	33
CSB-13-0.5 (dup)	31-Oct-16	--	3.6	0.33	--	13	13	19,000	22	48 BH,B	0.075	3.6	0.39	--	0.19	21
CSB-14-0.5	1-Nov-16	--	4.6	0.26	--	13	9.1	16,000	14	89	0.041	3.8	0.44	--	0.18	20
CSB-14-1.5	1-Nov-16	0.17	11	0.37	--	10	15	18,000 BH,B	29 BH,B	76 BH,B	0.036	2.9	0.42	--	0.24	25
CSB-15-0.5	1-Nov-16	--	31	0.65	--	3.8	16	21,000	27	380	0.0074	2.4	0.34	--	0.20	32
CSB-16-0.5	1-Nov-16	--	12	0.54	--	4.3	8.4	12,000 BH,B	21	230 BH,B	--	1.6	0.22	--	0.25	19
CSB-16-1.5	1-Nov-16	--	12	0.58	--	5.3	13	17,000 BH,B	25	280 BH,B	0.0021	2.4	0.24	--	0.20	30
CSB-17-0.5	1-Nov-16	0.17	4.2	0.61	--	9.8	16	20,000	40	340	0.033	3.5	0.43	--	0.24	52
CSB-18-0.5	1-Nov-16	--	3.1	0.67	--	5.4 BH,B	14	18,000	42	490 BH,B	0.038	1.9	0.49	--	0.25	51
CSB-18-1.5	1-Nov-16	--	1.4	0.67	--	2.5 A,B	8.9	14,000	48	190 BH,B	0.023	1.3	0.38	--	0.17	34
CSB-19-0.5	1-Nov-16	0.14	3.2	0.54	--	7.2	15	19,000	27	270	0.023	3.4	0.30	--	0.21	53
CSB-19-0.5 (dup)	1-Nov-16	--	4.2	0.55	--	23	17	20,000 BH,B	27 BH,B	260 BH,B	0.030	26	0.27	--	0.23	51
CSB-20-0.5	2-Nov-16	--	5.8	0.68	--	7.0	22	19,000 BH,B	34	360 BH,B	0.011	3.7	0.27	--	0.24	40
CSB-21-0.5	1-Nov-16	--	4.2	0.56	--	2.3	29	16,000	39	1,100	0.0026	2.3	0.13	--	0.62	80
CSB-22-0.5	1-Nov-16	--	5.6	0.51	--	2.7	16	16,000 BH,B	24	480 BH,B	0.0037	1.4	0.33	--	0.30	31
CSB-23-0.5	3-Nov-16	--	4.5	0.73	--	12	14	23,000	38	290 BH,B	0.020	3.2	0.63	--	0.29	41
CSB-24-0.5	3-Nov-16	0.14	2.4	0.50	--	5.7	7.6	13,000	17	100 BH,B	0.017	2.5	0.43	--	0.14	25
CSB-25-0.5	2-Nov-16	--	2.7	0.63	--	1.8	18	16,000 BH,B	29	400 BH,B	--	1.9	0.24	--	0.20	33
CSB-25-1.5	2-Nov-16	--	5.7	0.72	--	1.5	34	19,000 BH,B	42	620 BH,B	--	1.3	0.40	--	0.40	69
CSB-26-0.5	2-Nov-16	--	3.4	0.54	--	7.9	11	16,000 BH,B	19	300 BH,B	0.034	2.5	0.31	--	0.24	18
CSB-27-0.5	3-Nov-16	--	34	1.2	0.48	11	11	33,000	28	800 BH,B	0.0085	5.6	0.47	--	0.32	310

Table 2a
Detected Cover Soil Boring Constituents - Metals
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Antimony	Arsenic	Beryllium	Cadmium	Chromium [4]	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Health-Based Industrial PSRG [3]		**94**	**3.0**	**460**	**196**	**100,000**	**9,400**	**100,000**	**800**	**5,200**	**3.13**	**4,400**	**1,160**	**1,160**	**2.4**	**70,000**
CSB-28-0.5	2-Nov-16	--	2.3	0.68	--	15	23	24,000 BH,B	27	660 BH,B	0.011	9.9	0.14	--	0.17	91
CSB-28-0.5 (dup)	2-Nov-16	--	1.8	0.56	--	13	22	21,000 BH,B	25	580 BH,B	0.015	12	0.13	--	0.17	59
CSB-29-0.5	2-Nov-16	--	3.3	0.70	--	1.7	20	16,000 BH,B	46	590 BH,B	0.0032	0.97	0.39	--	0.28	71
CSB-29-1.5	2-Nov-16	--	2.4	0.63	--	1.1	19	14,000 BH,B	74	470 BH,B	--	0.69	0.25	--	0.23	110
CSB-30-0.5	2-Nov-16	--	5	0.74	0.14	5.6	11	12,000 BH,B	42	95 BH,B	0.017	1.9	0.50	0.31	0.22	26
CSB-31-0.5	2-Nov-16	--	3.9	0.58	--	6.0	15	18,000 BH,B	26	290 BH,B	0.017	2.8	0.35	--	0.21	34
CSB-32-0.5	3-Nov-16	--	6.8	0.98	--	7.7	8.3	19,000	23	250 BH,B	0.020	2.7	0.48	--	0.27	19
CSB-33-0.5	2-Nov-16	0.19	3.3	0.56	--	1.5	20	17,000 BH,B	80	310 BH,B	--	1.0	0.34	--	0.23	76
CSB-33-1.5	2-Nov-16	--	5.2	0.43	--	2.9	19	17,000 BH,B	39	360 BH,B	0.0032	1.3	0.54	--	0.13	40
CSB-34-0.5	2-Nov-16	--	6.9	0.56	--	4.5	45	22,000 BH,B	29	430 BH,B	0.026	1.7	0.43	--	0.30	47
CSB-35-0.5	1-Nov-16	--	2.9	0.74	--	7.4	11	17,000 BH,B	20	230 BH,B	0.023	2.5	0.38	--	0.25	18
CSB-35-1.5	1-Nov-16	--	7.3	0.79	--	11	25	22,000 BH,B	23	340 BH,B	0.024	3.4	0.38	--	0.28	35
CSB-36-0.5	3-Nov-16	--	6.9	0.67	--	47	18	20,000	58	570 BH,B	0.016	4.1	0.55	--	0.41	26
CSB-37-0.5	3-Nov-16	--	4.2	0.73	--	2.8 A,B	16	15,000	74	550 BH,B	0.0040	0.73	0.33	--	0.23	82
CSB-37-1.5	3-Nov-16	--	3.9	0.80	--	4.4 BH,B	22	29,000	55	730 BH,B	0.010	2.0	0.43	--	0.56	68
CSB-38-0.5	3-Nov-16	--	6.3	0.57	--	9.0 BH,B	17	19,000	27	73 BH,B	0.039	3.6	0.37	--	0.24	44
CSB-39-0.5	3-Nov-16	0.52	7.6	0.58	1.3	43 BH,B	52	30,000	100	350 BH,B	0.22	30	0.23	0.48	0.21	150
CSB-40-0.5	3-Nov-16	--	5.3	0.47	--	8.9 BH,B	24	24,000	51	280 BH,B	0.023	3.3	0.41	--	0.28	48
CSB-41-0.5	3-Nov-16	--	6.8	0.51	--	14 BH,B	21	24,000	22	55 BH,B	0.049	3.4	0.53	--	0.21	27
CSB-42-0.5	28-Oct-16	--	3.7	0.35	--	13	9.1	19,000 BH,B	15	56	0.085	5.2	0.22	--	0.19	27
CSB-42-1.5	28-Oct-16	--	3.9	0.35	0.23	15	15	17,000 BH,B	24	61	0.057	5.2	0.34	0.55	0.20	40
CSB-43-0.5	2-Nov-16	--	28	0.81	--	7.1	13	25,000 BH,B	43	330 BH,B	0.0081	3.3	0.64	--	0.37	44
CSB-44-0.5	28-Oct-16	--	6.1	0.83	--	13	17	35,000 BH,B	32	150	0.064	5.0	0.66	--	0.35	44
CSB-44-0.5 (dup)	28-Oct-16	--	9.1	0.50	--	34	20	37,000 BH,B	14	49	0.12	8.4	0.82	--	0.39	30
CSB-44-1.5	28-Oct-16	--	15	0.68	0.22	17	19	17,000 BH,B	64	190	0.027	6.2	0.17	--	0.23	47

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - duplicate sample
3. [3] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016
4. [4] - A PSRG for total chromium has not been established. The values provided are for chromium (III).
5. BH - The method blank is greater than one half of the reporting limit, but the sample concentrations are greater than ten times the method blank.
6. B - Analyte detected in the method blank.
7. A - The method blank is greater than one half od the reporting limit.

- Concentration exceeds Industrial PSRG
-- - Indicates the result is below the detection limit.

Table 2b
Detected Cover Soil Boring Constituents - Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Volatile Organic Compounds				
		Acetone	Bromomethane	Carbon Disulfide	Methyl Acetate	Methyl Ethyl Ketone (2-Butanone)
Health-Based Industrial PSRG [3]		**100,000**	**6.00**	**700**	**29,000**	**28,400**
CSB-1-0.5	3-Nov-16	0.10	--	--	--	--
CSB-2-0.5	3-Nov-16	0.079	--	--	--	--
CSB-2-1.5	3-Nov-16	0.071	--	--	--	--
CSB-3-0.5	31-Oct-16	0.094	--	--	--	--
CSB-4-0.5	31-Oct-16	0.14	--	--	--	--
CSB-4-1.5	31-Oct-16	0.0099	--	--	--	--
CSB-5-0.5	31-Oct-16	0.15	--	--	--	--
CSB-5-1.5	31-Oct-16	0.096	--	--	--	--
CSB-6-0.5	3-Nov-16	0.087	--	--	--	--
CSB-7-0.5	31-Oct-16	0.045	--	--	--	--
CSB-8-0.5	1-Nov-16	0.12	--	--	--	--
CSB-9-0.5	1-Nov-16	0.091	--	--	--	--
CSB-10-0.5	1-Nov-16	0.091	--	--	--	--
CSB-11-0.5	1-Nov-16	0.040	--	--	--	--
CSB-12-0.5	3-Nov-16	0.092	--	--	--	--
CSB-13-0.5	31-Oct-16	0.039	--	--	--	--
CSB-13-0.5 (dup)	31-Oct-16	0.061	--	--	--	--
CSB-14-0.5	1-Nov-16	0.14	--	--	--	0.0049
CSB-14-1.5	1-Nov-16	0.056	--	--	--	--
CSB-15-0.5	1-Nov-16	0.15	--	--	--	--
CSB-16-0.5	1-Nov-16	0.087	--	--	--	--
CSB-16-1.5	1-Nov-16	0.069	--	--	--	--
CSB-17-0.5	1-Nov-16	0.099	--	--	--	--
CSB-18-0.5	1-Nov-16	0.12	0.0049	--	--	0.017
CSB-18-1.5	1-Nov-16	0.026	--	--	--	--
CSB-19-0.5	1-Nov-16	0.058	--	--	--	--
CSB-19-0.5 (dup)	1-Nov-16	0.058	--	--	--	--
CSB-20-0.5	2-Nov-16	0.21	--	--	0.017	--
CSB-21-0.5	1-Nov-16	0.14	--	--	--	0.012
CSB-22-0.5	1-Nov-16	0.19	--	--	--	--
CSB-23-0.5	3-Nov-16	0.060	--	--	--	--
CSB-24-0.5	3-Nov-16	0.20	--	--	--	--
CSB-25-0.5	2-Nov-16	0.17	0.0046	--	--	0.023
CSB-25-1.5	2-Nov-16	0.20	0.0029	--	--	0.024
CSB-26-0.5	2-Nov-16	0.37	--	--	--	0.025
CSB-27-0.5	3-Nov-16	0.13	--	--	--	--
CSB-28-0.5	2-Nov-16	0.023	--	0.0050	--	--
CSB-28-0.5 (dup)	2-Nov-16	0.082	--	0.0045	--	--
CSB-29-0.5	2-Nov-16	0.24	--	--	--	--
CSB-29-1.5	2-Nov-16	0.14	0.0036	--	--	0.019

Table 2b
Detected Cover Soil Boring Constituents - Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Volatile Organic Compounds				
		Acetone	Bromomethane	Carbon Disulfide	Methyl Acetate	Methyl Ethyl Ketone (2-Butanone)
Health-Based Industrial PSRG [3]		**100,000**	**6.00**	**700**	**29,000**	**28,400**
CSB-30-0.5	2-Nov-16	0.12	--	--	--	--
CSB-31-0.5	2-Nov-16	0.10	--	--	0.0056	--
CSB-32-0.5	3-Nov-16	0.13		--	0.0088	--
CSB-33-0.5	2-Nov-16	0.059	--	--	--	--
CSB-33-1.5	2-Nov-16	0.043	--	--	0.029	--
CSB-34-0.5	2-Nov-16	0.27	--	--	--	0.013
CSB-35-0.5	1-Nov-16	0.085	--	--	0.0074	--
CSB-35-1.5	1-Nov-16	0.18	--	--	0.020	--
CSB-36-0.5	3-Nov-16	0.37	--	--	0.0075	0.026
CSB-37-0.5	3-Nov-16	0.17	--	--	--	--
CSB-37-1.5	3-Nov-16	0.072	--	--	--	--
CSB-38-0.5	3-Nov-16	0.063	--	--	--	--
CSB-39-0.5	3-Nov-16	0.43	--	--	0.21	--
CSB-40-0.5	3-Nov-16	0.061	--	--	--	--
CSB-41-0.5	3-Nov-16	0.063	--	--	--	0.0080
CSB-42-0.5	28-Oct-16	0.066	--	--	--	--
CSB-42-1.5	28-Oct-16	0.032	--	--	--	--
CSB-43-0.5	2-Nov-16	0.33	--	--	0.017	--
CSB-44-0.5	28-Oct-16	0.049	--	--	--	--
CSB-44-0.5 (dup)	28-Oct-16	0.050	--	--	--	--
CSB-44-1.5	28-Oct-16	0.028	--	--	--	--

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - Duplicate Sample
3. [3] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016

	- Concentration exceeds Industrial PSRG
--	- Indicates the result is below detection limits.

Table 2c
Detected Cover Soil Boring Constituents - Semi-Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Semi-Volatile Organic Compounds																
		4-Bromophenyl Phenyl Ether	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-Ethylhexyl)phthalate	Butyl Benzyl Phthalate	Chrysene	Dibenzo(a,h)anthracene	Dibenzofuran	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
Health-Based Industrial PSRG [4]		NS	NS	46,000	2.9	0.29	2.9	NS	29	160	1,200	290	0.29	200	6,000	2.9	NS	4,600
CSB-1-0.5	3-Nov-16	--	--	--	0.14	0.11	0.17	--	--	--	--	0.14	--	--	0.16	--	--	0.16
CSB-2-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-2-1.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-3-0.5	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-4-0.5	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-4-1.5	31-Oct-16	--	0.24	0.27	1.5	1.0	1.6	0.64	0.49	--	--	1.5	0.20	--	2.2	0.78	0.43	2.0
CSB-5-0.5	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-5-1.5	31-Oct-16	--	--	--	--	--	0.14	--	--	--	--	--	--	--	--	--	--	--
CSB-6-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-7-0.5	31-Oct-16	--	--	--	0.13	0.14	0.22	0.11	--	--	--	0.15	--	--	0.13	0.13	--	0.13
CSB-8-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-9-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-10-0.5	1-Nov-16	--	--	--	--	--	--	--	--	0.16	0.097	--	--	--	--	--	--	--
CSB-11-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-12-0.5	3-Nov-16	--	--	--	--	--	0.14	--	--	--	--	--	--	--	--	--	--	--
CSB-13-0.5	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-13-0.5 (dup)	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-14-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-14-1.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-15-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-16-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-16-1.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-17-0.5	1-Nov-16	0.095	--	0.11	0.21	0.15	0.21	0.10	0.10	0.12	--	0.22	--	0.094	0.35	0.12	0.24	0.33
CSB-18-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-18-1.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-19-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-19-0.5 (dup)	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-20-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-21-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-22-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-23-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-24-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-25-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-25-1.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-26-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-27-0.5	3-Nov-16	--	--	--	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--
CSB-28-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--	--
CSB-28-0.5 (dup)	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-29-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-29-1.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-30-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-31-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-32-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 2c
Detected Cover Soil Boring Constituents - Semi-Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Semi-Volatile Organic Compounds																
		4-Bromophenyl Phenyl Ether	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-Ethylhexyl)phthalate	Butyl Benzyl Phthalate	Chrysene	Dibenzo(a,h)anthracene	Dibenzofuran	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
Health-Based Industrial PSRG [(4)]		**NS**	**NS**	**46,000**	**2.9**	**0.29**	**2.9**	**NS**	**29**	**160**	**1,200**	**290**	**0.29**	**200**	**6,000**	**2.9**	**NS**	**4,600**
CSB-33-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-33-1.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-34-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-35-0.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-35-1.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-36-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-37-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-37-1.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-38-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-39-0.5	3-Nov-16	--	--	--	0.11	--	0.12	--	--	2.0	--	--	--	--	--	--	--	0.16
CSB-40-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-41-0.5	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-42-0.5	28-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-42-1.5	28-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-43-0.5	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-44-0.5	28-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CSB-44-0.5 (dup)	28-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16	--	0.12	0.16
CSB-44-1.5	28-Oct-16	--	0.12	--	0.36	0.36	0.61	0.30	0.18	--	--	0.44	--	--	0.52	0.33	0.17	0.52

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - Duplicate Sample
3. NS - No Standard
4. [(4)] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016

- Concentration exceeds Industrial PSRG
-- - Indicates the result is below detection limits.

Table 2d
Detected Cover Soil Boring Constituents - General Chemistry
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Ammonia	Nitrate	Sulfate
Health-Based Industrial PSRG [4]		**NS**	**100,000**	**NS**
CSB-1-0.5	3-Nov-16	2.9	2.0	92
CSB-2-0.5	3-Nov-16	2.6	1.3	11
CSB-2-1.5	3-Nov-16	3.9	3.1	24
CSB-3-0.5	31-Oct-16	--	0.85	79
CSB-4-0.5	31-Oct-16	5.3	1.0	63
CSB-4-1.5	31-Oct-16	5.0	0.96	30
CSB-5-0.5	31-Oct-16	--	2.9	18
CSB-5-1.5	31-Oct-16	2.3	1.5	32
CSB-6-0.5	3-Nov-16	3.8	3.4	85
CSB-7-0.5	31-Oct-16	3.2	2.5	41
CSB-8-0.5	1-Nov-16	7.4	1.7	75
CSB-9-0.5	1-Nov-16	4.7	2.5	87
CSB-10-0.5	1-Nov-16	4.5	2.7	93
CSB-11-0.5	1-Nov-16	4.3	--	53
CSB-12-0.5	3-Nov-16	4.5	--	69
CSB-13-0.5	31-Oct-16	7.7	5.1	46
CSB-13-0.5 (dup)	31-Oct-16	4.3	1.1	84
CSB-14-0.5	1-Nov-16	4.3	1.4	92
CSB-14-1.5	1-Nov-16	23	0.83	25
CSB-15-0.5	1-Nov-16	4.5	3.3	87
CSB-16-0.5	1-Nov-16	6.0	2.0	160
CSB-16-1.5	1-Nov-16	25	1.4	40
CSB-17-0.5	1-Nov-16	--	1.0	47
CSB-18-0.5	1-Nov-16	--	33	24
CSB-18-1.5	1-Nov-16	2.7	1.3	20
CSB-19-0.5	1-Nov-16	6.2	1.4	20
CSB-19-0.5 (dup)	1-Nov-16	4.8	2.2	37
CSB-20-0.5	2-Nov-16	--	9.7	47
CSB-21-0.5	1-Nov-16	4.6	0.78	40
CSB-22-0.5	1-Nov-16	2.9	1.4	64
CSB-23-0.5	3-Nov-16	3.5	--	81
CSB-24-0.5	3-Nov-16	3.2	--	100
CSB-25-0.5	2-Nov-16	2.2	3.2	100
CSB-25-1.5	2-Nov-16	--	2.9	63
CSB-26-0.5	2-Nov-16	2.5	2.8	48
CSB-27-0.5	3-Nov-16	3.0	3.0	34
CSB-28-0.5	2-Nov-16	33	0.88	32
CSB-28-0.5 (dup)	2-Nov-16	33	0.75	27
CSB-29-0.5	2-Nov-16	2.6	0.76	94
CSB-29-1.5	2-Nov-16	2.5	1.2	100
CSB-30-0.5	2-Nov-16	29	3.5	73
CSB-31-0.5	2-Nov-16	9.7	2.6	90
CSB-32-0.5	3-Nov-16	3.1	23	31
CSB-33-0.5	2-Nov-16	2.6	1.8	100
CSB-33-1.5	2-Nov-16	--	1.7	43
CSB-34-0.5	2-Nov-16	2.2	1.1	82
CSB-35-0.5	1-Nov-16	2.5	4.5	110
CSB-35-1.5	1-Nov-16	--	1.1	53
CSB-36-0.5	3-Nov-16	4.3	5.5	100

Table 2d
Detected Cover Soil Boring Constituents - General Chemistry
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Cover Soil Boring Sample Code	Sample Date	Ammonia	Nitrate	Sulfate
Health-Based Industrial PSRG [(4)]		**NS**	**100,000**	**NS**
CSB-37-0.5	3-Nov-16	--	0.85	15
CSB-37-1.5	3-Nov-16	5.4	0.77	--
CSB-38-0.5	3-Nov-16	--	3.1	98
CSB-39-0.5	3-Nov-16	--	2.2	140
CSB-40-0.5	3-Nov-16	--	1.9	72
CSB-41-0.5	3-Nov-16	--	1.4	130
CSB-42-0.5	28-Oct-16	4.0	1.5	51
CSB-42-1.5	28-Oct-16	4.3	2.3	89
CSB-43-0.5	2-Nov-16	3.3	0.96	53
CSB-44-0.5	28-Oct-16	3.8	2.3	44
CSB-44-0.5 (dup)	28-Oct-16	4.7	2.5	150
CSB-44-1.5	28-Oct-16	5.3	5.6	11

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - Duplicate Sample
3. NS - No Standard
4. [(4)] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016
5. B - Analyte detected in the method blank.

	- Concentration exceeds Industrial PSRG
--	- Indicates the result is below the detection limit.

Table 3a
Detected Waste Characterization Boring Constituents - Metals
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Waste Characterization Boring Sample Code	Sample Date	Antimony	Arsenic	Beryllium	Cadmium	Chromium [4]	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Health-Based Industrial PSRG [3]		**94**	**3.0**	**460**	**196**	**100,000**	**9,400**	**100,000**	**800**	**5,200**	**3.13**	**4,400**	**1,160**	**1,160**	**2.4**	**70,000**
SB-1-13-18	31-Oct-16	0.84	7.7	0.55	2.7	110	56	25,000 BH,B	88 BH,B	300 BH,B	0.33	22	--	5.5	0.19	290
SB-1-25	31-Oct-16	0.68	17	0.48	6.7	380	85	33,000 BH,B	160 BH,B	310 BH,B	0.38	50	--	18	--	440
SB-1-27	31-Oct-16	--	1.5	0.54	0.14	4.4	12	13,000 BH,B	22 BH,B	52 BH,B	--	1.9	--	0.29	--	71
SB-2-1-6	31-Oct-16	2.6	12	0.87	1.8	130	86	81,000	170	570 BH,B	0.63	33	0.60	1.4	0.44	1,400
SB-2-1-6 (dup)	31-Oct-16	0.14	4.5	0.44	0.51	58	32	25,000	49	240 BH,B	0.31	12	0.23	0.51	0.21	270
SB-2-19	31-Oct-16	--	3.7	0.69	1.0	20	33	27,000	39	290 BH,B	0.084	4.6	0.18	--	0.23	81
SB-2-21	31-Oct-16	--	0.17	0.82	--	2.2	5.6	16,000	31	35 BH,B	--	1.1	--	--	0.12	17
SB-3-8.5-13.5	1-Nov-16	0.34	5.3	0.40	0.29	27	24	38,000 BH,B	65 BH,B	980 BH,B	0.021	8.1	0.20	--	0.46	100
SB-3-8.5-13.5 (dup)	1-Nov-16	--	2.6	0.52	0.16	7.3	17	14,000 BH,B	60 BH,B	140 BH,B	0.11	3.1	0.15	--	0.28	70
SB-3-29	1-Nov-16	2.5	3	0.77	1.0	440	130	34,000 BH,B	86 BH,B	390 BH,B	0.096	24	0.30	0.73	0.18	6,200
SB-3-31	1-Nov-16	--	1.4	0.75	--	0.73	7.1	5,800 BH,B	7.0 BH,B	270 BH,B	--	1.6	0.16	--	0.28	140
SB-4-6-11	1-Nov-16	0.43	110	1.2	2.8	29	70	48,000 BH,B	78 BH,B	500 BH,B	1.2	36	0.21	--	0.24	170
SB-4-16	1-Nov-16	0.28	40	1.1	3.1	30	42	25,000 BH,B	76 BH,B	280 BH,B	0.10	11	0.34	0.29	0.22	230
SB-4-19	1-Nov-16	--	23	1.1	--	1.5	2.4	9,800 BH,B	7.8 BH,B	290 BH,B	--	1.7	0.57	--	0.16	53
SB-5-13-18	2-Nov-16	0.35	7.1	0.61	0.83	32	58	53,000	110	660 BH,B	0.26	44	1.0	0.45	0.30	440
SB-5-26	2-Nov-16	0.26	3.3	0.73	0.31	99	17	24,000	62	360 BH,B	0.073	11	0.41	--	0.20	130
SB-5-28	2-Nov-16	--	3.3	1.4	--	15	15	28,000	39	420 BH,B	0.014	6.5	0.46	--	0.51	94
SB-6-14-19	2-Nov-16	0.17	5.4	0.80	--	7.8	29	21,000 BH,B	34	410 BH,B	0.035	3.5	0.31	--	0.31	52
SB-6-25	2-Nov-16	0.17	16	1.1	0.50	38	24	8,600 BH,B	430	95 BH,B	1.2	7.3	0.13	0.82	0.15	97
SB-6-25 (dup)	2-Nov-16	1.4	33	1.2	0.27	140	200	120,000 BH,B	38	1,200 BH,B	0.48	73	0.34	0.18	0.17	74
SB-6-27	2-Nov-16	0.24	89	5.2	1.3	10	7.9	29,000 BH,B	38	1,600 BH,B	0.016	2.9	0.24	0.16	0.29	130
SB-7-6-11	3-Nov-16	0.29	47	1.4	0.41	29 BH,B	22	27,000	87	250 BH,B	0.42	13	0.36	0.97	0.44	170
SB-7-6-11 (dup)	3-Nov-16	0.23	43	1.1	0.44	19 BH,B	30	29,000	67	270 BH,B	0.24	9.4	0.36	1.2	0.42	220
SB-7-12	3-Nov-16	0.21	68	1.6	0.17	11 BH,B	5.3	33,000	25	510 BH,B	0.010	2.9	0.41	--	0.46	69
SB-7-14	3-Nov-16	--	47	1.1	0.28	9.2 BH,B	4.4	27,000	32	410 BH,B	--	2.6	0.25	0.15	0.83	69

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - duplicate sample
3. [3] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016
4. [4] - A PSRG for total chromium has not been established. The values provided are for chromium (III).
5. BH - The method blank is greater than one half of the reporting limit, but the sample concentrations are greater than ten times the method blank.
6. B - Analyte detected in the method blank.

	- Concentration exceeds Industrial PSRG
--	- Indicates the result is below the detection limit.

Table 3b
Detected Waste Characterization Boring Constituents - Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Waste Characterization Boring Sample Code	Sample Date	Volatile Organic Compounds																					
		1,2-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dioxane	Acetone	Benzene	Carbon Disulfide	Chlorobenzene	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropylbenzene (Cumene)	Methyl Acetate	Methylcyclohexane	Methyl Butyl Ketone (2-Hexanone)	Methyl Ethyl Ketone (2-Butanone)	Methyl Isobutyl Ketone	Styrene	Tetrachloroethylene	Trichlorofluoromethane	Toluene	m,p-Xylenes	o-Xylene	Xylenes, total
Health-Based Industrial PSRG [4]		**376**	**11**	**24**	**100,000**	**5.10**	**700**	**260**	**117**	**74**	**25**	**268**	**29,000**	**NS**	**260**	**28,400**	**3,360**	**867**	**78**	**1,230**	**818**	**388**	**434**	**260**
SB-1-13-18	31-Oct-16	--	--	--	0.19	0.011	0.027	--	0.016	--	0.098	0.014	0.082	0.018	--	--	--	--	--	--	0.0071	0.012	--	0.012
SB-1-25	31-Oct-16	--	0.18	--	0.24	0.031	0.10	--	0.076	--	0.42	0.062	--	0.068	--	0.053	--	--	--	--	0.0068	0.037	--	0.037
SB-1-27	31-Oct-16	--	--	--	0.036	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-2-1-6	31-Oct-16	--	--	--	0.24	--	--	0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	0.013	--	0.013
SB-2-1-6 (dup)	31-Oct-16	--	--	--	0.094	--	--	0.19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-2-19	31-Oct-16	--	--	0.0035	0.083	--	0.015	0.045	--	--	--	0.0044	--	--	--	0.014	--	--	--	--	--	0.012	--	0.012
SB-2-21	31-Oct-16	--	--	--	0.034	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-3-8.5-13.5	1-Nov-16	--	6.4	--	0.41	--	0.016	--	--	--	0.12	0.018	--	--	0.036	0.29	0.034	--	--	--	0.018	0.29	0.046	0.34
SB-3-8.5-13.5 (dup)	1-Nov-16	--	3.9	--	0.28	--	0.014	--	--	--	0.10	0.016	--	--	--	0.15	--	--	--	--	0.015	0.24	0.043	0.28
SB-3-29	1-Nov-16	--	--	0.017	0.063	0.0050	0.027	0.023	0.0081	--	0.019	0.010	--	--	--	0.017	0.0087	--	--	--	0.016	0.076	0.014	0.089
SB-3-31	1-Nov-16	--	--	--	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4-6-11	1-Nov-16	0.024	0.14	--	0.21	0.0072	0.097	1.5	0.0042	--	0.052	0.032	--	--	--	0.039	--	--	0.0030	--	0.039	0.12	0.017	0.13
SB-4-16	1-Nov-16	0.0076	0.093	--	1.8 LL	0.0078	0.051	0.24	0.0044	--	0.016	0.029	--	0.011	--	0.032	--	0.0029	0.0032	--	0.011	0.070	0.0059	0.076
SB-4-19	1-Nov-16	--	--	--	0.017	--	0.0058	--	--	--	--	--	--	--	--	0.0029	--	--	--	--	--	--	--	--
SB-5-13-18	2-Nov-16	--	0.089	0.012	0.20	0.0075	0.048	0.074	--	--	0.054	0.044	--	--	--		--	--	--	--	0.026	0.49	0.034	0.53
SB-5-26	2-Nov-16	0.0073	0.035	--	0.081	0.0046	0.072	0.021	--	--	0.0071	0.0099	--	--	--	0.023	--	--	--	--	0.0038	0.036	0.0047	0.041
SB-5-28	2-Nov-16	--	--	--	0.025	--	0.013	0.013	--	--	--	--	0.0040	--	--	--	--	--	--	--	--	0.0028	--	0.0028
SB-6-14-19	2-Nov-16	--	0.024	--	0.12	--	0.073	0.029	--	0.063	--	0.0054	0.026	--	--	0.016	--	--	--	--	--	0.0026	--	0.0026
SB-6-25	2-Nov-16	--	--	0.011	0.037	0.0041	0.026	0.025	--	--	0.0026	0.0088	0.034	--	--	0.0099	--	--	--	--	--	0.0052	0.0032	0.0084
SB-6-25 (dup)	2-Nov-16	--	--	0.0068	0.056	0.0038	0.032	0.016	--	--	0.0030	0.0077	--	--	--	0.0088	--	--	--	--	--	0.0050	0.0042	0.0092
SB-6-27	2-Nov-16	--	--	--	0.043	--	0.0047	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-7-6-11	3-Nov-16	--	--	--	0.15	--	0.024	--	--	--	--	0.0035	0.056	--	--	--	--	--	--	0.0044	--	0.0048	--	0.0048
SB-7-6-11 (dup)	3-Nov-16	--	--	--	0.28	--	0.059	--	--	--	--	0.0068	0.036	--	--	--	--	--	--	0.016	--	0.0067	--	0.0067
SB-7-12	3-Nov-16	--	--	--	0.060	--	0.0039	--	--	--	--	--	0.023	--	--	--	--	--	--	0.0052	--	--	--	--
SB-7-14	3-Nov-16	--	--	--	0.037	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - Duplicate Sample
3. NS - No Standard
4. [4] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016
5. LL - Medium level analysis result below the reporting limit. Low level analysis reported estimated above the calibration range.

	- Concentration exceeds Industrial PSRG
--	- Indicates the result is below the detection limit.

Table 3c
Detected Waste Characterization Boring Constituents - Semi-Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Waste Characterization Boring Sample Code	Sample Date	Semi-Volatile Organic Compounds													
		1,1'-Biphenyl	2-Methylnaphthalene	3/4-Methylphenol	4-Chloro-3-methylphenol	Acenaphthene	Acenaphthylene	Anthracene	Benzaldehyde	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-Ethylhexyl)phthalate
Health-Based Industrial PSRG [4]		**40**	**600**	**16,400**	**16,400**	**9,000**	**NS**	**46,000**	**820**	**2.9**	**0.29**	**2.9**	**NS**	**29**	**160**
SB-1-13-18	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	34
SB-1-25	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	82
SB-1-27	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40
SB-2-1-6	31-Oct-16	1.2	5.8	--	--	5.6	3.5	7.0	--	15	12	18	7.1	5.7	16
SB-2-1-6 (dup)	31-Oct-16	2.6	9.8	--	--	26	--	52	--	75	59	81	31	24	4.9
SB-2-19	31-Oct-16	--	--	--	--	--	--	0.15	--	0.27	0.19	0.31	0.13	0.12	1.9
SB-2-21	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	0.88
SB-3-8.5-13.5	1-Nov-16	--	--	0.12	0.18	--	--	--	--	--	--	--	--	--	3.4
SB-3-8.5-13.5 (dup)	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-3-29	1-Nov-16	--	--	--	--	--	--	3.0	--	1.6	--	1.8	--	--	410
SB-3-31	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16
SB-4-6-11	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	4.1
SB-4-16	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	6.5
SB-4-19	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16
SB-5-13-18	2-Nov-16	--	0.24	--	--	--	--	0.21	--	0.43	0.47	0.54	0.22	0.22	--
SB-5-26	2-Nov-16	--	0.38	0.20	--	--	--	0.23	0.74	0.16	0.17	0.24	--	--	1.4
SB-5-28	2-Nov-16	--	0.42	--	--	--	--	--	--	--	--	--	--	--	0.24
SB-6-14-19	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	2.6
SB-6-25	2-Nov-16	--	0.65	--	--	--	--	--	--	--	--	--	--	--	16
SB-6-25 (dup)	2-Nov-16	--	0.80	--	--	--	--	--	--	--	--	--	--	--	9.5
SB-6-27	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	8.7
SB-7-6-11	3-Nov-16	--	0.32	--	--	--	--	--	--	--	--	--	--	--	2.7
SB-7-6-11 (dup)	3-Nov-16	0.42	2.1	--	--	--	--	--	--	--	--	--	--	--	6.6
SB-7-12	3-Nov-16	--	0.17	--	--	--	--	--	--	--	--	--	--	--	0.64
SB-7-14	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3c
Detected Waste Characterization Boring Constituents - Semi-Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Waste Characterization Boring Sample Code	Sample Date	Semi-Volatile Organic Compounds													
		Butyl benzyl phthalate	Carbazole	Chrysene	Dibenzo(a,h)anthracene	Dibenzofuran	Di-n-butyl phthalate	Di-n-octyl phthalate	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	N-Nitrosodiphenylamine	Phenanthrene	Pyrene
Health-Based Industrial PSRG [4]		**1,200**	**NS**	**290**	**0.29**	**200**	**16,400**	**1,640**	**6,000**	**6,000**	**2.9**	**17.0**	**470**	**NS**	**4,600**
SB-1-13-18	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-1-25	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-1-27	31-Oct-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-2-1-6	31-Oct-16	--	6.5	17	1.7	4.3	--	--	37	7.0	7.9	6.2	1.7	32	32
SB-2-1-6 (dup)	31-Oct-16	--	21	72	10	21	--	--	170	30	38	6.6	--	190	150
SB-2-19	31-Oct-16	--	--	0.29	--	--	--	--	0.45	--	0.16	--	--	0.47	0.40
SB-2-21	31-Oct-16	--	--	--	--	--	--	--	--	--	--	0.11	--	--	--
SB-3-8.5-13.5	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	0.14	--
SB-3-8.5-13.5 (dup)	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-3-29	1-Nov-16	110	--	1.5	--	--	2.0	--	2.7	--	--	1.5	--	3.7	2.6
SB-3-31	1-Nov-16		--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4-6-11	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4-16	1-Nov-16	2.2	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4-19	1-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-5-13-18	2-Nov-16	--	--	0.45	--	--	0.19	--	0.99	--	0.27	0.96	--	0.75	0.84
SB-5-26	2-Nov-16	--	0.27	0.21	--	--	--	--	0.48	0.17	--	0.51	0.30	0.88	0.39
SB-5-28	2-Nov-16	--	--	--	--	--	--	--	--	--	--	0.26	--	0.12	--
SB-6-14-19	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-6-25	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-6-25 (dup)	2-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-6-27	2-Nov-16	--	--	--	--	--	--	0.59	--	--	--	--	--	--	--
SB-7-6-11	3-Nov-16	--	--	--	--	--	0.13	--	--	--	--	0.12	--	0.14	--
SB-7-6-11 (dup)	3-Nov-16	--	--	--	--	--	0.25	--	--	0.26	--	0.71	--	0.52	--
SB-7-12	3-Nov-16	--	--	--	--	--	0.25	--	--	--	--	--	--	0.13	--
SB-7-14	3-Nov-16	--	--	--	--	--	--	--	--	--	--	--	--		--

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - Duplicate Sample
3. NS - No Standard
4. [4] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016

	- Concentration exceeds Industrial PSRG
--	- Indicates the result is below the detection limit.

Table 3d
Detected Waste Characterization Boring Constituents - General Chemistry
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Waste Characterization Boring Sample Code	Sample Date	Ammonia	Nitrate	Sulfate
Health-Based Industrial PSRG [(4)]		**NS**	**100,000**	**NS**
SB-1-13-18	31-Oct-16	58	1.8	36
SB-1-25	31-Oct-16	91	1.9	19
SB-1-27	31-Oct-16	86	0.72	--
SB-2-1-6	31-Oct-16	59	3.6	130
SB-2-1-6 (dup)	31-Oct-16	7.8	3.7	57
SB-2-19	31-Oct-16	190	0.88	5.3
SB-2-21	31-Oct-16	130	--	--
SB-3-8.5-13.5	1-Nov-16	45	1.8	13
SB-3-8.5-13.5 (dup)	1-Nov-16	44	1.1	60
SB-3-29	1-Nov-16	76	2.4	20
SB-3-31	1-Nov-16	53	1.1	--
SB-4-6-11	1-Nov-16	49	1.7	51
SB-4-16	1-Nov-16	6.9	1.8	10
SB-4-19	1-Nov-16	190	0.82	--
SB-5-13-18	2-Nov-16	51	2.5	27
SB-5-26	2-Nov-16	58	1.7	19
SB-5-28	2-Nov-16	93	1.1	--
SB-6-14-19	2-Nov-16	41	2.0	83
SB-6-25	2-Nov-16	88	1.4	22
SB-6-25 (dup)	2-Nov-16	42	1.6	24
SB-6-27	2-Nov-16	56	1.9	9.1
SB-7-6-11	3-Nov-16	45	0.83	8.1
SB-7-6-11 (dup)	3-Nov-16	47	1.3	29
SB-7-12	3-Nov-16	79	--	--
SB-7-14	3-Nov-16	50	0.82	--

Notes:

1. All units are in milligrams per kilogram (parts per million).
2. dup - Duplicate Sample
3. NS - No Standard
4. [(4)] - Inactive Hazardous Sites Branch Preliminary Soil Remediation Goal (PSRG) - October 2016

	- Concentration exceeds Industrial PSRG
--	- Indicates the result is below the detection limit.

Table 4
Temporary Groundwater Monitoring Well Construction Summary
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Temporary Groundwater Well Code	Completion Date	Drilling Method	Screened Lithology	Total Depth (feet bgs)	Depths (feet bgs)			Borehole Diameter (inches)
					Screen Interval	Filter Interval	Seal Interval	
TW-1	4-Nov-16	HSA	Regolith	10.0	5.0 - 10.0	3.0 - 10.0	1.0 - 3.0	3
TW-2	8-Nov-16	HSA	Regolith	28.0	18.0 - 28.0	16.0 - 28.0	14.0 - 16.0	3
TW-3	3-Nov-16	HSA	Regolith	15.0	5.0 - 15.0	3.0 - 5.0	1.0 - 3.0	3
TW-4	3-Nov-16	HSA	Regolith	28.0	18.0 - 28.0	16.0 - 28.0	14.0 - 16.0	3

Notes:

1. bgs - below ground surface
2. Northing and Easting Coordinates - North American Datum 1983 State Plane Feet North Carolina
3. Latitude and Longitude Coordinates - World Geodetic System 1984
4. HSA - Hollow-Stem Auger
5. Each temporary well was constructed of 1-inch diameter Schedule 40 polyvinylchloride (PVC) riser flush-threaded to 0.01-inch mill slotted pre-packed Schedule 40 PVC screen.

Table 5
Water Quality Measurements and Groundwater Elevations
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Monitoring Well Code	Water Quality Measurements				Groundwater Elevations				
	pH	Conductivity	Temperature	Turbidity	Ground Elevation	Height of Casing Above Ground	TOC Elevation	Depth to Groundwater	Groundwater Elevation
	(S.U.)	(µS/cm)	(degrees Celsius)	(NTUs)	(feet)	(feet)	(feet)	(feet BTOC)	(feet)
TW-1	4.73	40	18.4	4.2	523.43	1.00	524.43	6.34	518.09
TW-2	4.73	94	16.8	4.8	511.89	2.00	513.89	22.48	491.41
TW-3	4.88	184	18.5	8.4	499.45	0.55	500.00	8.59	491.41
TW-4	5.76	60	17.0	6.5	526.43	1.87	528.30	16.63	511.67

Notes:

1. Water levels were collected on November 7, 2016.
2. Water quality mesurements and samples were collected on November 4, 7, and 9, 2016.
3. S.U. - Standard Units
4. µS/cm - Microsiemens per centimeter
5. NTUs - Nephelometric Turbidity Units
6. TOC - Top of Casing
7. BTOC - Below Top of Casing
9. Turbidity was measured at the time of sample collection.
10. Ground elevation and TOC elevation surveyed by CDM Smith on November 4, 2016, using a survey rod and level.
11. An arbitrary top of casing elevation of 500.00 was assumed for TW-3.

Table 6a
Detected Groundwater Constituents - Metals
Airport Landfill
Winston Salem, Forsyth County, North Carolina

Monitoring Well Code	Sample Date	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
North Carolina 2L or Groundwater Protection Standard		**1[3]**	**10**	**4[3]**	**2**	**10**	**1,000**	**300**	**15**	**50**	**1**	**100**	**20**	**20**	**0.2[4]**	**1,000**
TW-1	7-Nov-16	--	--	0.21	0.59	0.97 B	0.82 B	1,500 BH,B	1.1 B	2,700	--	2.9	0.37	0.013	1.1	16
TW-1 (dup)	7-Nov-16	--	--	0.26	4.2	0.87 B	0.78 B	2,200 BH,B	1.1 B	2,300	--	1.9	0.35	0.016	0.95	36
TW-2	9-Nov-16	0.27 BL	1.3	0.23	0.34	1.0	8.6	66	0.74 B	360	--	4.0	0.44	0.055	0.36	40
TW-2 (dup)	9-Nov-16	0.14 BL	0.29	0.17	0.33	0.90	7.0	35	0.50 B	300	--	3.3	--	0.055	0.40	34
TW-3	4-Nov-16	0.11	2.9	9.1	3.5	1.5 B	15	1,000 BH,B	1.7 B	2,000	--	15	1.2	0.13	0.26	180 BH,B
TW-4	4-Nov-16	0.073	31	0.076	0.11	1.1 B	0.99 B	4,200 BH,B	0.40 B	4,400	--	4.9	--	0.038	0.63	19
TW-4 (dup)	4-Nov-16	--	31	0.073	0.080	1.6 B	0.91 B	4,200 BH,B	0.33 B	4,500	--	4.8	0.37	0.028	0.62	19 B

Notes:

1. All units are in micrograms per liter (parts per billion).
2. dup - duplicate sample
3. [3] - Groundwater Protection Standard
4. [4] - Interim Maximum Allowable Concentration for the Groundwater Protection Standard
5. B - Analyte detected in the method blank.
6. BH - The method blank is greater than one half of the reporting limit, but the sample concentrations are greater than ten times the method blank.
7. BL - The method blank is greater than one half of the reporting limit, but the sample concentrations are less than the reporting limit.

	- Concentration exceeds the 15A NCAC 02L .0202 or Groundwater Protection Standard.
--	- Indicates the result is below the detection limit.

Table 6b
Detected Groundwater Constituents - Volatile and Semi-Volatile Organic Compounds
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Monitoring Well Code	Sample Date	Volatile Organic Compounds			SVOC
		Acetone	1,4-Dichlorobenzene	Chlorobenzene	3/4-Methylphenol
North Carolina 2L Standard		**6,000**	**6**	**50**	**40**
TW-1	7-Nov-16	--	--	--	--
TW-1 (dup)	7-Nov-16	--	--	--	--
TW-2	9-Nov-16	--	1.1	3.4	NA
TW-2 (dup)	9-Nov-16	--	1.3	3.6	NA
TW-3	4-Nov-16	--	--	--	--
TW-4	4-Nov-16	6.9	--	--	2.6
TW-4 (dup)	4-Nov-16	6.0	--	--	2.7

Notes:

1. All units are in micrograms per liter (parts per billion)
2. SVOC - Semi-Volatile Organic Compound
3. dup - duplicate sample
4. NA - Not Analyzed due to laboratory error.

-- - Indicates the result is below the detection limit.

Table 6c
Detected Groundwater Constituents - General Chemistry
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Monitoring Well Code	Sample Date	Ammonia	Nitrate	Sulfate
North Carolina 2L or Groundwater Protection Standard		**1,500[(3)]**	**10,000**	**250,000**
TW-1	7-Nov-16	650	730	8,200
TW-1 (dup)	7-Nov-16	670	700	7,600
TW-2	9-Nov-16	65	960	1,700
TW-2 (dup)	9-Nov-16	71	940	1,800
TW-3	4-Nov-16	56	250	4,200
TW-4	4-Nov-16	12,000	190	5,000
TW-4 (dup)	4-Nov-16	12,000	170	4,900

Notes:

1. All units are in micrograms per liter (parts per billion).
2. dup - duplicate sample
3. [(3)] - Groundwater Protection Standard

- Concentration exceeds the 15A NCAC 02L .0202 or Groundwater Protection Standard

-- - Indicates the result is below the detection limit.

Table 7
Landfill Gas Probe Construction Summary
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Landfill Gas Probe Code	Completion Date	Drilling Method	Screened Lithology	Total Depth (feet bgs)	Depths (feet bgs)			Borehole Diameter (inches)
					Screen Interval	Filter Interval	Seal Interval	
GP-1	11/3/2016	HSA	Regolith	11.0	5.0 - 11.0	4.0 - 11.0	2.0 - 4.0	3
GP-2	11/3/2016	HSA	Regolith	11.0	5.0 - 11.0	4.0 - 11.0	2.0 - 4.0	3
GP-3	11/3/2016	HSA	Regolith	11.0	5.0 - 11.0	4.0 - 11.0	2.0 - 4.0	3
GP-4	11/3/2016	HSA	Regolith	11.0	5.0 - 11.0	4.0 - 11.0	2.0 - 4.0	3
GP-6	11/3/2016	HSA	Regolith	6.0	5.0 - 6.0	5.0 - 6.0	3.0 - 5.0	3
GP-7	11/3/2016	HSA	Regolith	11.0	5.0 - 11.0	5.0 - 11.0	3.0 - 5.0	3

Notes:

1. bgs - below ground surface
2. HSA - Hollow-stem auger
3. Northing and Easting Coordinates - North American Datum 1983 State Plane Feet North Carolina
4. Latitude and Longitude Coordinates - World Geodetic System 1984
5. Well is an above grade 1-inch diameter Schedule 40 PVC riser flush-threaded to 0.01-inch mill slotted Schedule 40 PVC screen. Completed with a protective cover.

Table 8
Landfill Gas Probe Groundwater Measurements
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

Landfill Gas Probe Code	Date	Depth to Water from Top of Casing (feet)	Screen Interval (feet BTOC)
GP-1	11/4/2016	Dry	5.79 - 11.79
GP-2	11/4/2016	Dry	8.02 - 14.02
GP-3	11/4/2016	Dry	8.34 - 14.34
GP-4	11/4/2016	Dry	8.02 - 14.02
GP-6	11/4/2016	Dry	8.24 - 9.24
GP-7	11/4/2016	Dry	7.61 - 13.61

Notes:

1. BTOC - below top of casing
2. Depth to water was measured from the top of the polyvinylchloride riser.
3. The screen interval for each probe is based on the depth below top of casing.

Table 9
Landfill Gas Probe Screening Measurements
Airport Landfill
Winston-Salem, Forsyth County, North Carolina

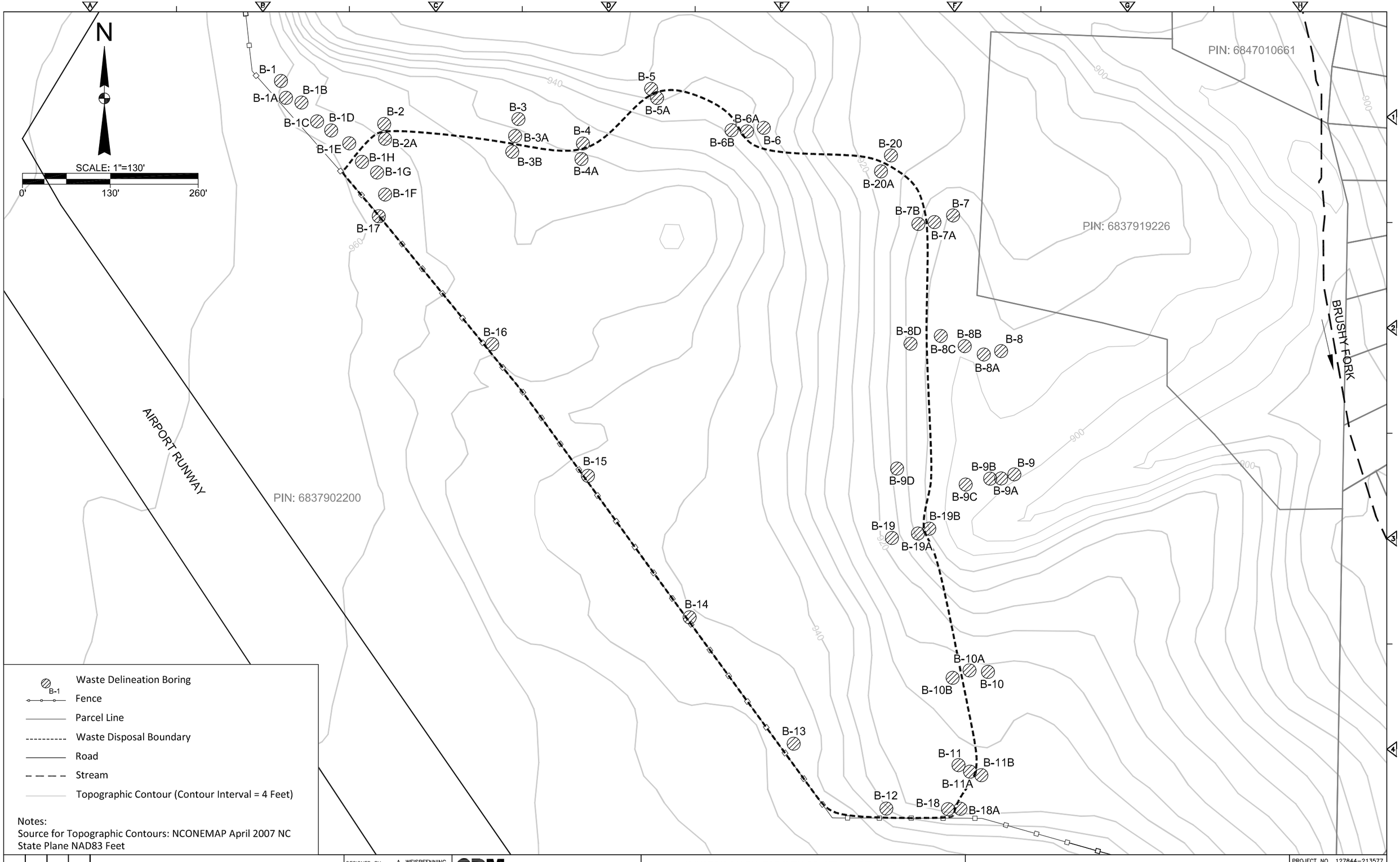
Landfill Gas Probe Code	Screening Date	Time	Methane			Carbon Dioxide (%)	Oxygen (%)	Hydrogen Sulfide (ppm)	Total VOCs (ppm)
			(%)	($\mu g/m^3$)	LEL (%)				
GP-1	11/4/2016	1504	7.3	4,794,922	>100	11.1	1.1	0	5.5
GP-2	11/4/2016	1515	8.4	5,517,445	>100	22.4	0	4	11.1
GP-3	11/4/2016	1530	7.4	4,860,606	>100	21.8	0	9	6.9
GP-4	11/4/2016	1545	59.3	38,950,532	>100	37.8	0	0	1.0
GP-5[(6)]	11/4/2016	1537	10.4	6,831,122	>100	4.0	16.9	0	0
GP-6	11/4/2016	1520	3.3	2,167,568	66.0	19.0	0.4	0	0
GP-7	11/4/2016	1541	29.4	19,311,057	>100	26.5	0	0	1.0

Notes:

1. Methane ($\mu g/m^3$) was calculated using the following formula: = [((% by volume)*16.04)/24.42]*1,000,000
   Formula variables:
   16.04 grams/mol - the molecular weight of methane
   24.45 - conversion factor that represents the volume of one mole of gas at a temperature of 25° C and a pressure of 1 atmosphere (29.9" of Hg)
   1,000,000 - coversion factor from g to µg
2. LEL - lower explosive limit
3. VOCs - volatile organic compounds
4. ppm - parts per million
5. (%) - percent
6. [(6)] - GP-5 location was screened using a flux chamber due to groundwater at 6 feet below ground surface.
7. 11/4/2016 Weather Conditions: Temperature = 70°F, Barometric Pressure = 30.15" Hg, Humidity = 25%

Figures

Figures



Notes:
Source for Topographic Contours: NCONEMAP April 2007 NC
State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: M. COLONE
APPROVED BY: D. FORBES
DATE: DECEMBER 2016

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NC F-1255

WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

WASTE DISPOSAL BOUNDARY DELINEATION

PROJECT NO. 127844-213577
FILE NAME: FIGURE 1.DWG

FIGURE
1

Notes:
1. Vapor screening completed November 2-4, 2016.
2. Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: M. COLONE
APPROVED BY: D. FORBES
DATE: DECEMBER 2016

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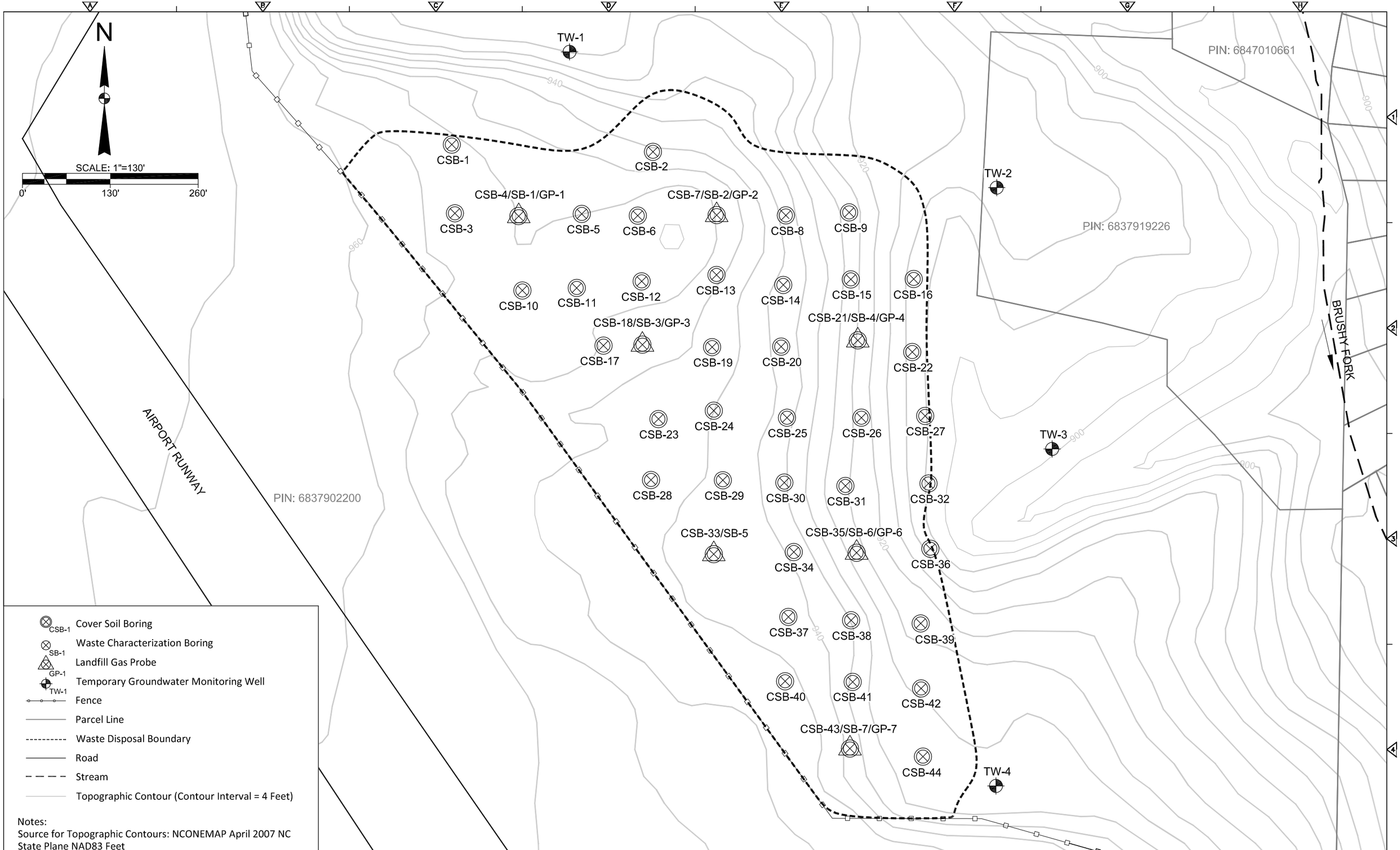
WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

ABOVEGROUND VAPOR SCREENING LOCATIONS

PROJECT NO. 127844-213577
FILE NAME: FIGURE 2.DWG
FIGURE
2



Notes:
Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
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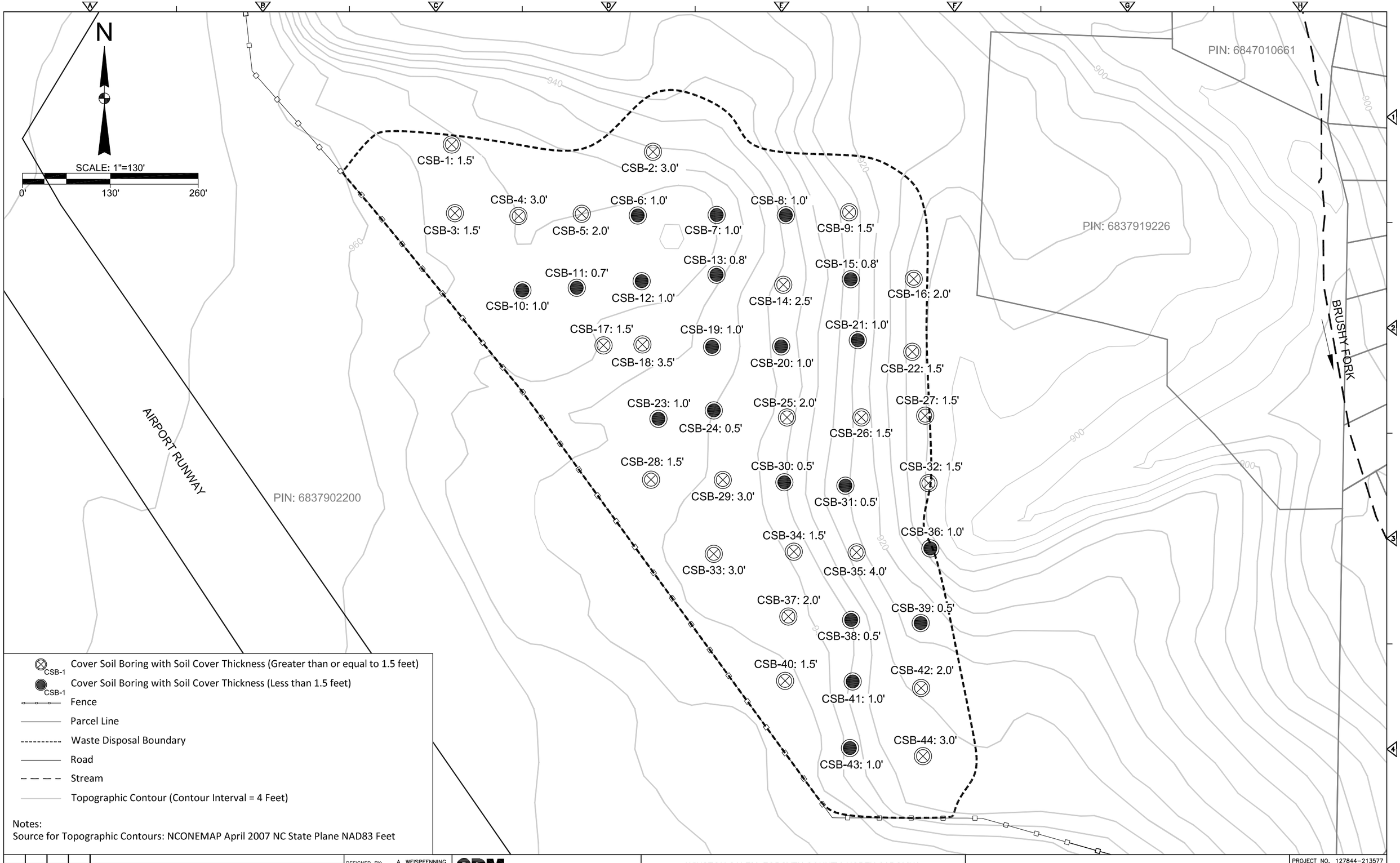
WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

SITE MAP

PROJECT NO. 127844-213577
FILE NAME: FIGURE 3.DWG

FIGURE
3



Notes:
Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
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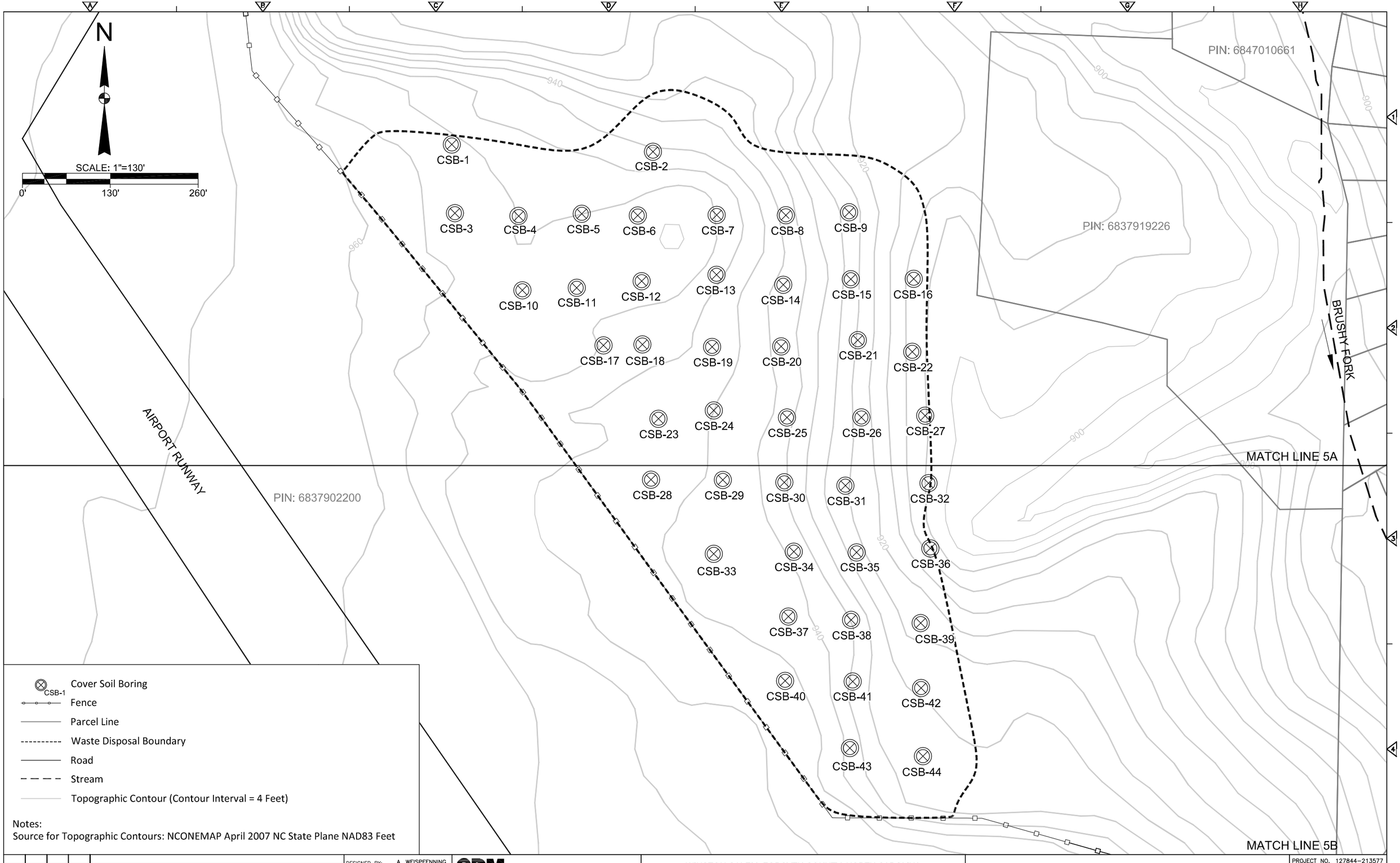
WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

COVER SOIL THICKNESS MAP

PROJECT NO. 127844-213577
FILE NAME: FIGURE 4.DWG

FIGURE
4



Notes:
Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
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WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

COVER SOIL BORING LOCATIONS

PROJECT NO. 127844-213577
FILE NAME: FIGURE 5.DWG

FIGURE
5

N

SCALE: 1"=55'

0' 55' 110'

CSB-1 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.8

CSB-1

CSB-2 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.9
CSB-2 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.6

CSB-2

CSB-3 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.3

CSB-3

CSB-4 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	10
Benzo(a)pyrene	1.0

CSB-4

CSB-5 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.1
CSB-5 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	11

CSB-5

CSB-6 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.6

CSB-6

CSB-7 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.5

CSB-7

CSB-8 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.4

CSB-8

CSB-9

CSB-10 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.4

CSB-10

CSB-11 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.2

CSB-11

CSB-12 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.2

CSB-12

CSB-13 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.0

CSB-13

CSB-14 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.6
CSB-14 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	11

CSB-14

CSB-15 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	31

CSB-15

CSB-16 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	12
CSB-16 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	12

CSB-16

CSB-17 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.2

CSB-17

CSB-18 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.1

CSB-18

CSB-19 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.2

CSB-19

CSB-20 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.8

CSB-20

CSB-21 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.2

CSB-21

CSB-22 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.6

CSB-22

CSB-23 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.5

CSB-23

CSB-24

CSB-25 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.7

CSB-25

CSB-26 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.4

CSB-26

CSB-27 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	34

CSB-27

960

920

CSB-1 Cover Soil Boring

Fence

Parcel Line

Waste Disposal Boundary

Road

Stream

Topographic Contour (Contour Interval = 4 Feet)

Notes:
1. Cover soil samples collected on October 28, 31, and November 1-3, 2016.
2. Only concentrations that exceeded NCDEQ Industrial PSRG Standards are listed.
3. Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: M. COLONE
APPROVED BY: D. FORBES
DATE: FEBRUARY 2017

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WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

COVER SOIL BORING ANALYTICAL RESULTS

PROJECT NO. 127844-213577
FILE NAME: FIGURE 5A.DWG

FIGURE
5A

N

SCALE: 1"=55'

0' 55' 110'

CSB-28

CSB-29

CSB-29 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.3

CSB-30

CSB-30 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.0

CSB-31

CSB-31 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.9

CSB-32

CSB-32 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	6.8

CSB-33

CSB-33 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.3
CSB-33 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.2

CSB-34

CSB-34 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	6.9

CSB-35

CSB-35 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	7.3

CSB-36

CSB-36 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	6.9

CSB-37

CSB-37 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	4.2
CSB-37 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.9

CSB-38

CSB-38 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	6.3

CSB-39

CSB-39 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	7.6

CSB-40

CSB-40 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	5.3

CSB-41

CSB-41 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	6.8

CSB-42

CSB-42 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.7
CSB-42 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	3.9

CSB-43

CSB-43 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	28

CSB-44

CSB-44 (0.5 ft)	
Constituent	Result (mg/kg)
Arsenic	6.1
CSB-44 (1.5 ft)	
Constituent	Result (mg/kg)
Arsenic	15
Benzo(a)pyrene	0.36

920

940

CSB-1 Cover Soil Boring

Fence

Parcel Line

Waste Disposal Boundary

Road

Stream

Topographic Contour (Contour Interval = 4 Feet)

Notes:
1. Cover soil samples collected on October 28, 31, and November 1-3, 2016.
2. Only concentrations that exceeded NCDEQ Industrial PSRG Standards are listed.
3. Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: M. COLONE
APPROVED BY: D. FORBES
DATE: FEBRUARY 2017

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NC F-1255

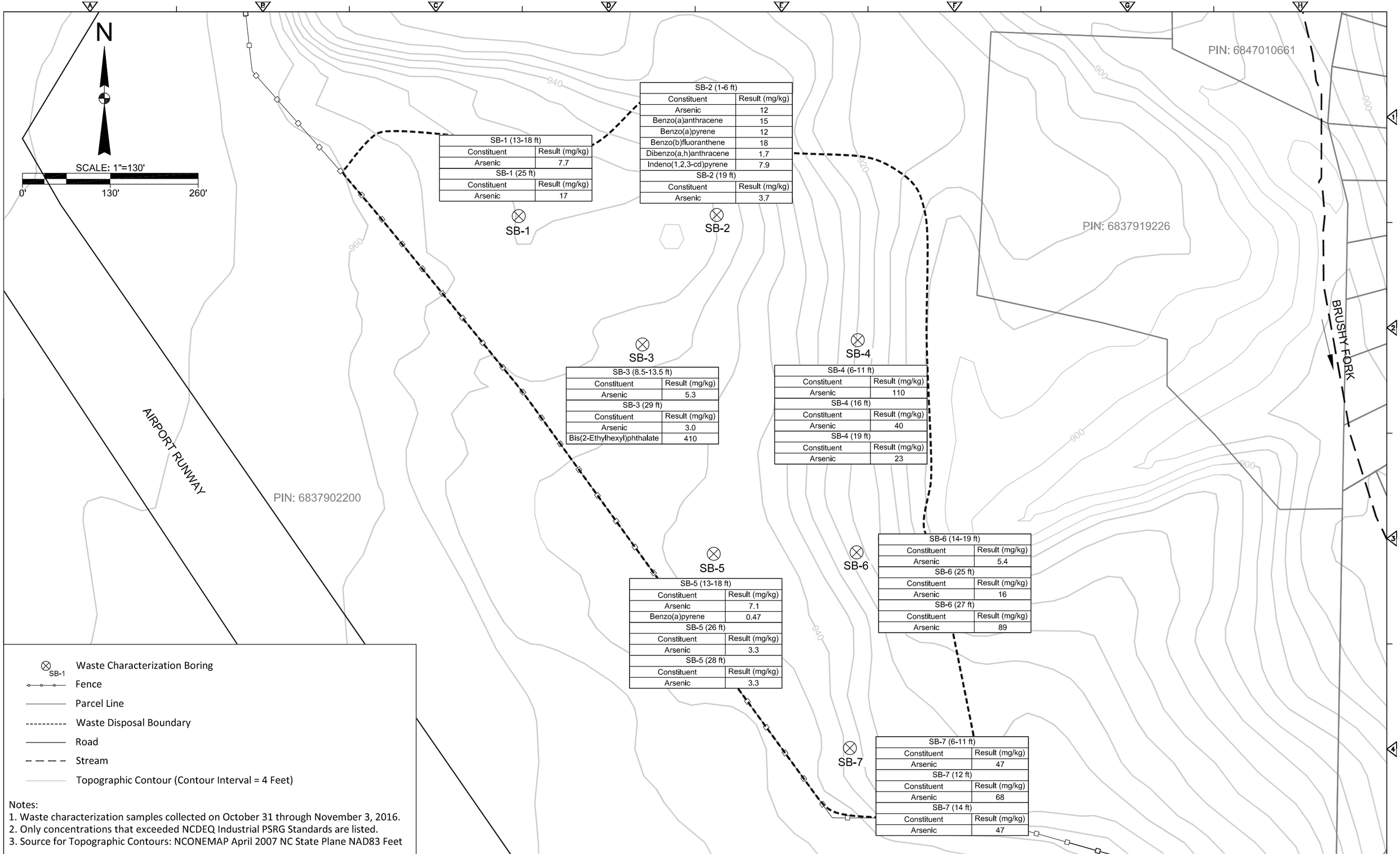
WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

COVER SOIL BORING ANALYTICAL RESULTS

PROJECT NO. 127844-213577
FILE NAME: FIGURE 5B.DWG

FIGURE
5B



Notes:
1. Waste characterization samples collected on October 31 through November 3, 2016.
2. Only concentrations that exceeded NCDEQ Industrial PSRG Standards are listed.
3. Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: M. COLONE
APPROVED BY: D. FORBES
DATE: FEBRUARY 2017

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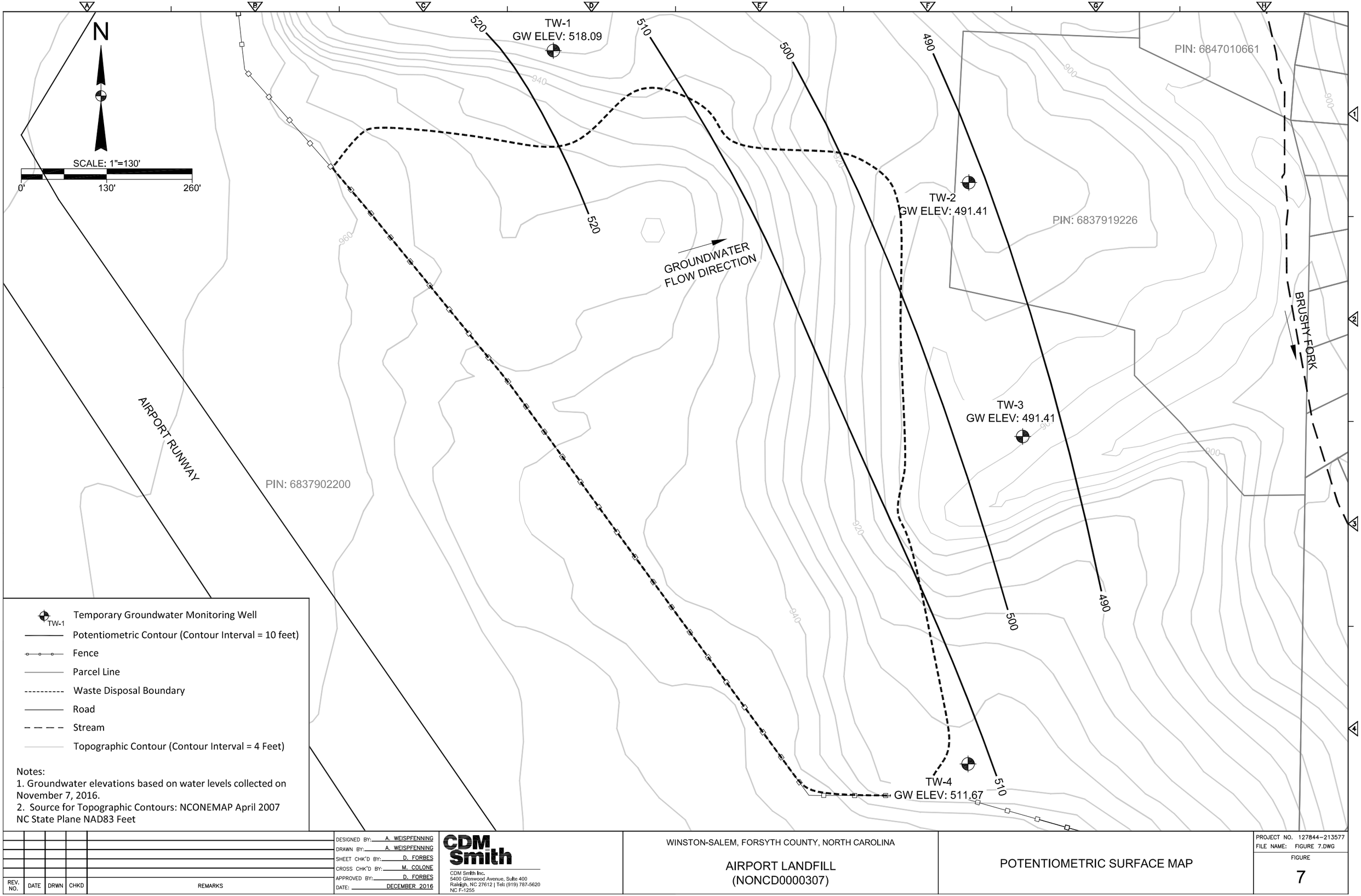
WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

WASTE CHARACTERIZATION BORING ANALYTICAL RESULTS

PROJECT NO. 127844-213577
FILE NAME: FIGURE 6.DWG

FIGURE
6



TW-1 Temporary Groundwater Monitoring Well

Potentiometric Contour (Contour Interval = 10 feet)

Fence

Parcel Line

Waste Disposal Boundary

Road

Stream

Topographic Contour (Contour Interval = 4 Feet)

Notes:
1. Groundwater elevations based on water levels collected on November 7, 2016.
2. Source for Topographic Contours: NCONEMAP April 2007
NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: M. COLONE
APPROVED BY: D. FORBES
DATE: DECEMBER 2016

CDM Smith
CDM Smith Inc.
5400 Glenwood Avenue, Suite 400
Raleigh, NC 27612 | Tel: (919) 787-5620
NC F-1255

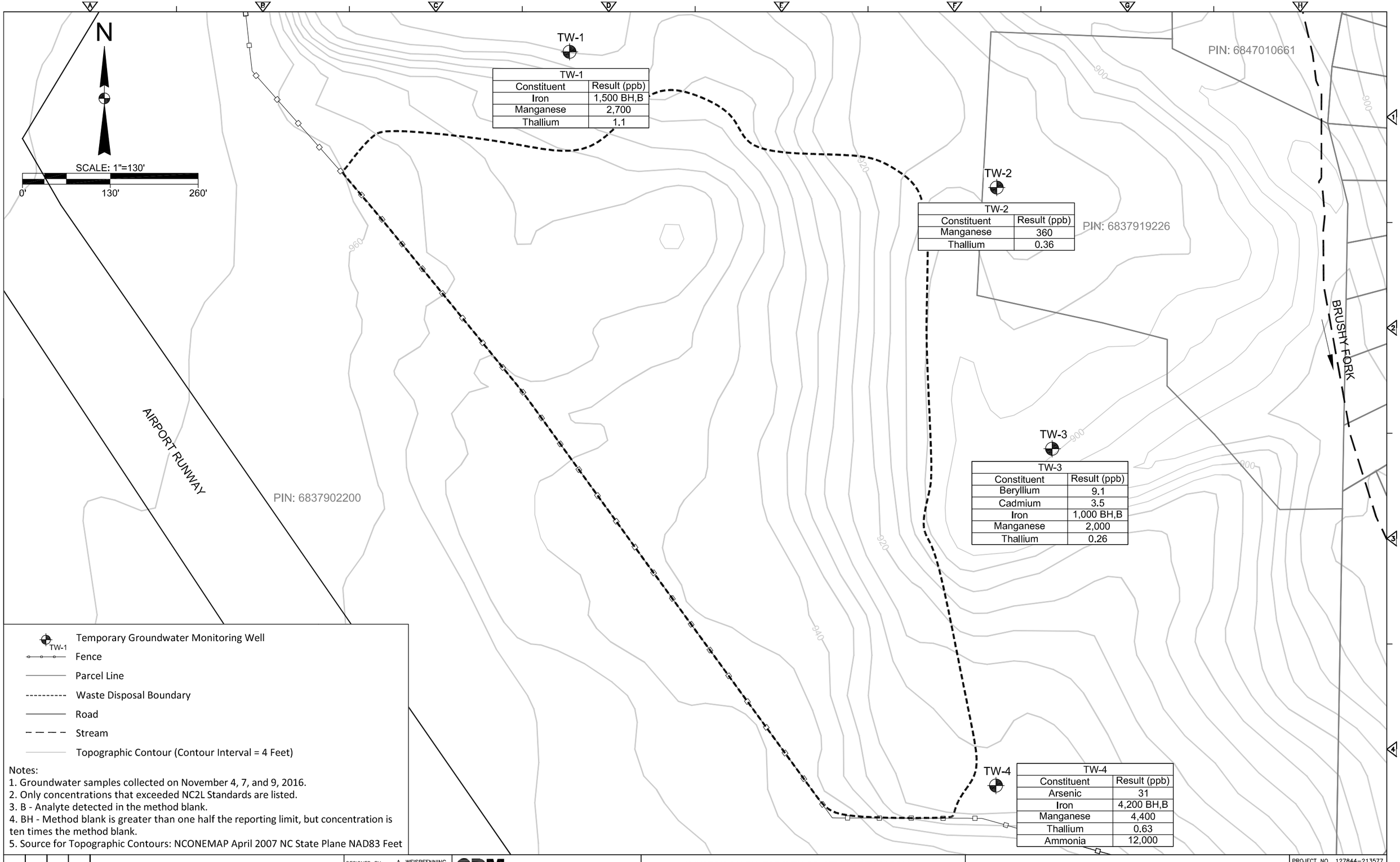
WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

POTENTIOMETRIC SURFACE MAP

PROJECT NO. 127844-213577
FILE NAME: FIGURE 7.DWG

FIGURE
7



Notes:
1. Groundwater samples collected on November 4, 7, and 9, 2016.
2. Only concentrations that exceeded NC2L Standards are listed.
3. B - Analyte detected in the method blank.
4. BH - Method blank is greater than one half the reporting limit, but concentration is ten times the method blank.
5. Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: M. COLONE
APPROVED BY: D. FORBES
DATE: DECEMBER 2016

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AIRPORT LANDFILL
(NONCD0000307)

GROUNDWATER ANALYTICAL RESULTS

PROJECT NO. 127844-213577
FILE NAME: FIGURE 8.DWG

FIGURE
8

N

SCALE: 1"=130'

0' 130' 260'

PIN: 6847010661

PIN: 6837919226

PIN: 6837902200

AIRPORT RUNWAY

BRUSHY FORK

940 960 920 900

GP-1

GP-1	
Constituent	Result
Methane	7.3 %
Hydrogen Sulfide	0 ppm
Total VOCs	5.5 ppm

GP-2

GP-2	
Constituent	Result
Methane	8.4 %
Hydrogen Sulfide	4 ppm
Total VOCs	11.1 ppm

GP-3

GP-3	
Constituent	Result
Methane	7.4 %
Hydrogen Sulfide	9 ppm
Total VOCs	6.9 ppm

GP-4

GP-4	
Constituent	Result
Methane	59.3 %
Hydrogen Sulfide	0 ppm
Total VOCs	1.0 ppm

GP-5

GP-5	
Constituent	Result
Methane	10.4 %
Hydrogen Sulfide	0 ppm
Total VOCs	0 ppm

GP-6

GP-6	
Constituent	Result
Methane	3.3 %
Hydrogen Sulfide	0 ppm
Total VOCs	0 ppm

GP-7

GP-7	
Constituent	Result
Methane	29.4 %
Hydrogen Sulfide	0 ppm
Total VOCs	1.0 ppm

GP-1 Landfill Gas Probe

Fence

Parcel Line

Waste Disposal Boundary

Road

Stream

Topographic Contour (Contour Interval = 4 Feet)

Notes:
1. Landfill gas probes screened on November 4, 2016.
2. GP-5 location was screening using a flux chamber.
3. Source for Topographic Contours: NCONEMAP April 2007 NC State Plane NAD83 Feet

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. WEISPFENNING
DRAWN BY: A. WEISPFENNING
SHEET CHK'D BY: D. FORBES
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WINSTON-SALEM, FORSYTH COUNTY, NORTH CAROLINA

AIRPORT LANDFILL
(NONCD0000307)

LANDFILL GAS PROBE SCREENING RESULTS

PROJECT NO. 127844-213577
FILE NAME: FIGURE 9.DWG

FIGURE
9

Attachment K

2014 Jurisdictional Determination Verification Letter

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. 200900480 County: Forsyth U.S.G.S. Quad: Winston-Salem East

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: Smith Reynolds Airport Commission
Address: 3801 North Liberty Street

Winston-Salem, NC 27105
Telephone No.: _____

Property description:
Size (acres) 165 Nearest Town Winston-Salem
Nearest Waterway Brushy Fork River Basin Yadkin River
USGS HUC 03040101 Coordinates N 36.1424 W -80.2208
Location description Existing airport facility north end runway adjacent to Brushy Fork, in Winston-Salem, Forsyth County, North Carolina.

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331).

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X There are waters of the U.S. including wetlands on the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

X The waters of the U.S. including wetland on your project area have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Washington, NC, at (252) 946-6481 to determine their requirements.

Action ID: _____

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **John Thomas** at **919 554-4884 ext. 25**.

C. Basis For Determination

There are stream channels within your project site which are tributaries of Brushy Fork Creek which flows into the Yadkin River and the Atlantic Ocean.

D. Remarks

_____

E. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

District Engineer, Wilmington Regulatory Division
Attn:Jean Gibby, Project Manager,
Raleigh Regulatory Field Office
3331 Heritage Trade Drive, Suite 105
Raleigh, North Carolina 27615

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the District Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **August 6, 2014**.

It is not necessary to submit an RFA form to the District Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: _____

Date **06/06/2014** Expiration Date **06/06/2019**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at our website at http://regulatory.usacesurvey.com/ to complete the survey online.

Copy furnished:
R. Clement Riddle, ClearWater Environmental Consultants, Inc., 224 South Grove Street, Suite F, Hendersonville, NC 28792

Attachment L

Capital Improvement Budget

Smith Reynolds Airport
Airport Commission of Forsyth County
APPROVED Capital Improvement Budget FYE June 30, 2017

Project Number	Priority	Project Name	Source of Funding: Local	City/County Contributions	Private Investment / Secured Loan	NCDOT-DOA	Total - FYE 2017
SRA-236	1	Acquire Land and Clear Terrain Obstructions East of RW 15-33 (Construction 25%)	$52,500			$472,500	$525,000
SRA-244	3	Terminal Ramp Construction	$175,000	$125,000		$2,700,000	$3,000,000
SRA-213	4	Taxiway F and Terrain Obtruction Removal (Design)	$12,500			$112,500	$125,000
SRA-245	5	Airfield Signage and Lighting Improvements (Design)	$25,000			$225,000	$250,000
SRA-255	6	Runway 4-22 Reconstruction 1,100 Feet (Design)	$8,500			$76,500	$85,000
SRA-247	7	Replace Slope Drain TW Alpha	$9,850				$9,850
SRA-249	8	Kubota Mower Replacement Deck 2560	$7,000				$7,000
SRA-248	9	Corporate Hangar - Signature Flight Support		$125,000	$4,000,000		$4,125,000
SRA-247	10	Resurface 4001 N. Liberty Parking Lot	$90,000				$90,000
SRA-205	11	Terminal Building Improvements		$25,000			$25,000
SRA-250	12	Trailer - P&J Model T6292	$6,000				$6,000
SRA-251	13	Snow Pusher Model SPUSH84 - Skid Steer	$3,000				$3,000
SRA-252	14	FOD Mat	$15,000				$15,000
SRA-255	15	4001 N. Liberty HVAC Variable Speed Drives	$7,500				$7,500
SRA-253	16	Kubota RTVX 1100 C	$25,000				$25,000
SRA-254	17	Upgrade Control Software and Computer HVAC System	$10,000				$10,000
SRA-256	18	4001 N. Liberty - Hangar Painting	$170,000				$170,000
SRA-225	19	Carolina Air and Auto Center (HVAC)	$5,500		$5,500		$11,000
		Total	**$622,350**	**$275,000**	**$4,005,500**	**$3,586,500**	**$8,489,350**

Funding Commitment to FYE 2018 - Multi Year Project		**Local**	**NCDOT-DOA**	**Total FYE 2016**
SRA-236	Acquire Land and Clear Terrain Obstructions East of RW 15-33 (Construction 75%)	$157,500	$1,417,500	$1,575,000
SRA-255	Runway 4-22 Reconstruction 1,100 Feet (Construction 100%)	$96,500	$868,500	$965,000
SRA-245	Airfield Signage and Lighting Improvements (Construction 100%)	$160,000	$1,440,000	$1,600,000