

**EXHIBIT A**  
**SCOPE OF SERVICES**  
**For an**  
**AIRPORT MASTER PLAN STUDY**  
**AND AIRPORT LAYOUT PLAN (ALP) UPDATE**  
**For**  
**LAWRENCE MUNICIPAL AIRPORT**  
**LAWRENCE, KANSAS**

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**INTRODUCTION**

The Lawrence Municipal Airport Master Plan Scope of Services is being prepared prior to initiation of the study to establish the goals of the project and a framework from which all parties may refer. The objective of the Master Plan is to provide the Sponsor (City of Lawrence) with proper guidance for future development which will satisfy aviation demands and be wholly compatible with the environment.

Specific objectives of the Master Plan Scope of Services will be:

- To research factors likely to affect air transportation demands in the local area over the next twenty years and develop forecasts of aviation demand.
- To determine the projected needs of airport users for the next twenty years, taking into consideration recent revisions to FAA design standards, instrument approaches, and the impact of general aviation fleet transitions.
- To recommend improvements that will enhance the airport's ability to satisfy future aviation needs.
- To establish a schedule of development priorities and a program for improvements proposed in the Master Plan, consistent with the FAA's capital improvement program planning.
- To develop an Airport Layout Plan drawing set acceptable to the Federal Aviation Administration (FAA). The ALP will be developed utilizing survey data meeting the new standards set forth in Advisory Circulars 150/5300-16A, -17B, and -18B.

## **ELEMENT 1 - INITIATION**

### **Task 1.1 - Study Design**

**Description:** Detailed descriptions of each item of work required for completion of the Airport Master Plan for Lawrence Municipal Airport will be prepared. Guidelines provided by the City of Lawrence and those drawn from the Federal Aviation Administration (FAA) will be integrated into the scope of work. Initial and final draft copies of the work program will be prepared and delivered to City of Lawrence for comments. The final product of this task will be a scope of services which will be attached and made a part of the project contract documents.

Each task to be performed will be evaluated to estimate the number of person/days necessary to accomplish the work efforts and the cost per person/day based on the billing classifications of the planning professionals assigned. Expenses for materials, computer time, reproduction and printing, and miscellaneous study-related costs will also be estimated. When estimated person/days have been established, they will be used to provide input to the development of a project schedule identifying allowable time frames for major phases of the study. This schedule will also identify milestones for deliverables of each element to be submitted for review. A detailed element-by-element itemization of project person/days and costs with a final project time schedule in graph form will be attached to all copies of the final work scope.

Attend meeting(s) to define, clarify, and establish task descriptions, work efforts, responsibilities, and the overall requirements of the work scope. These meetings will be held in the offices of the sponsor, Coffman Associates, or the FAA, as appropriate.

#### ***Responsibilities:***

- Coffman:* Prepare description of each work item (task) included in the Scope of Services; establish project budget and schedule. Attend meetings to discuss project scope.
- Sponsor:* Review and negotiate the Scope of Services, project budget, and schedule to ensure proper attention is paid to critical areas. Attend meetings to discuss project scope.
- Product:* A refined description of the Scope of Services, budget, and schedule, which will be made a part of the project contract documents.

### **Task 1.2 - Establish Planning Advisory Committee**

**Description:** Potential members will be identified and asked to serve on a Planning Advisory Committee (PAC) for the master plan. The members of the PAC will be determined by the City of Lawrence in consultation with the Coffman Associates. Coffman Associates recommends the PAC include a diverse group of airport stakeholders including: a) representatives of local, regional, state, or federal agencies; b) airport users and tenants; c) local community representatives; d) the local business community; and e) the Airport Advisory Board (if applicable). The PAC, which is a non-

voting body, will advise Coffman Associates on the content and recommendations of the Master Plan study through meetings and review of draft chapters.

***Responsibilities:***

***Coffman:*** Assist Sponsor in selection of PAC members, providing all necessary coordination to ensure interested parties are contacted. Prepare and send invitations to potential committee members.

***Sponsor:*** Provide names and addresses of chosen members.

***Product:*** A Planning Advisory Committee which will meet during the course of the Master Plan Study.

**Task 1.3 – Project Website**

***Description:*** Various project materials will be hosted on a project specific website developed by Coffman Associates Associates in order to allow public access to project materials. During the planning process, all working draft materials, including each Phase Report, will be available for review and download on the website. The public will be able to utilize the website to make comments on the contents of the Phase Reports. All pertinent comments will be included within the Final Master Plan document.

***Responsibilities:***

***Coffman:*** Develop a project specific website. Host the project materials on the website for the duration of the project (until Lawrence City Commission approval).

***Sponsor:*** None.

***Product:*** Website access to project materials. Encourage use of the website to comment on the Draft Master Plan during the public comment period.

**ELEMENT 2 - INVENTORY**

The purpose of this study element is to assemble and organize relevant information, data and mapping to be used throughout the study in support of various analyses. This element will maximize the use of existing information and will prepare new data and documentation only when existing information is unavailable, incomplete, or outdated.

**Task 2.1 - Evaluate Existing Documents**

**Description:** Evaluate existing documents and/or previous planning efforts for their use in the Master Plan process. This will include recommendations from the Kansas State Aviation System Plan.

***Responsibilities:***

***Coffman:*** Review and evaluation of existing documents.

***Sponsor:*** The City staff shall assist the Coffman Associates in the procurement of existing documents.

***Product:*** Compilation of existing documents for input to future tasks.

**Task 2.2 - Airport Physical Facilities**

**Description:** Perform complete inventory of physical facilities and land uses which presently exist within the boundaries of the airport. The inventory will include an examination of plans and documents of the physical facility to determine its type, size, condition, and use. The work effort will make maximum use of existing information available from the City of Lawrence offices and the airport administrative offices. These inventories will identify and describe existing facilities, noting type (i.e., hangars, pavement, etc.), size (i.e., approximate dimensions or square-footage), condition (i.e., excellent, fair, poor), and use (i.e., current tenant, or the description of how the facility is being utilized). Existing utility service (water, electric, gas, and sanitary sewer) will be noted, by supplier. All current information will need to be researched. The following relevant areas are included as a minimum:

- a) AIRSIDE: Runways, Taxiways, Lighting and Signage, Navigational Aids, Safety Areas.
- b) LANDSIDE: General aviation terminal building, aprons, airport businesses, hangars and other buildings, automobile access and parking.
- c) SUPPORT: Utilities, maintenance equipment, fuel facilities, fencing/security, hangar utilization and airport tenant leases.

In addition, all available plans, specifications, maps, photographs, drawings and other data, including FAA Forms 5010-1 and NOAA Obstruction Charts will be collected, as available. Data and information pertaining to climate will be obtained including, as available, wind coverage, annual rain/snow fall, annual IRF vs. VFR days, etc.

***Responsibilities:***

***Coffman:*** Conduct a complete inventory of the airport's facilities to accumulate pertinent data.

***Sponsor:*** Provide the Coffman Associates access to airport property and airport records and files as necessary. Supply information on existing utility service and suppliers.

***Product:*** Airport facilities inventory for input to later tasks.

### **Task 2.3 - Inventory Air Traffic Activity, Airspace, Air Traffic Control, and Regional Airports**

**Description:** Air traffic activity data for the airport will be assembled and organized from various sources. Relevant data on general aviation activity will be collected. The assembled data will include, as available:

- a) Historical airline and commuter activity including passengers, origins/destinations, operations, aircraft type, loading factors, and air cargo.
- b) General aviation activity including operations (local and itinerant), and based aircraft.
- c) Military activity including operations (local and itinerant).
- d) Existing instrument approach capability and associated minima.

Review and perform inventories of airspace and air traffic procedures in the area of Lawrence Municipal Airport. Conduct interviews as appropriate to develop a complete description of aircraft operations and airspace in the vicinity of the airport. Identify and describe existing public airport facilities in the vicinity of Lawrence Municipal Airport.

#### ***Responsibilities:***

*Coffman:* Assemble data.

*Sponsor:* Assist Coffman Associates in obtaining available airport records.

*Product:* Input to subsequent tasks.

### **Task 2.4 - Inventory Socioeconomic Data and Vicinity Land Use and Controls**

**Description:** Obtain available statistical data on historical and forecast socioeconomic factors for the City of Lawrence and Douglas County, and other areas that may be included in the airport service area. These factors will include, at a minimum, employment, income, and population (as available), with emphasis placed upon the identification of specific socioeconomic characteristics of the developed areas in the local environs, as well as trends that have been established for future development and habitation.

Review existing local and state planning and land use regulations in order to ensure that the resultant Airport Master Plan will be compatible with local and state long-range planning goals, objectives, and policies. In addition, determine the strengths and weaknesses of local regulatory controls with regards to ensuring compatibility of the surrounding area with the airport.

#### ***Responsibilities:***

*Coffman:* Assemble data based on latest available information. Identify data source in master plan documents.

*Sponsor:* Assist in collection of data.

*Product:* Input to later analysis.

### **Task 2.5 - Obtain Tabulated Wind Data**

**Description:** Coffman Associates Associates will obtain the most recent ten years of wind data (nearest station) from the National Oceanic and Atmospheric Administration, National Climatic Center for use in preparing an updated wind rose for the airport layout plan. Both an All-Weather VFR and an IFR windrose will be developed.

#### ***Responsibilities:***

*Coffman:* Obtain tabulated wind data.

*Sponsor:* Coordinate with the Coffman Associates as necessary.

*Product:* Tabulated wind data for use in preparing updated VFR and IFR wind roses.

### **Task 2.6 - Obtain New Aerial Photography and Planimetric Mapping**

Coffman Associates will assemble new digital electronic color aerial photography and new topographic and planimetric mapping of the Lawrence Municipal Airport and its environs in accordance with FAA Advisory Circulars 150/5300-16A, *General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey*; 150/5300-17A, *General Guidance and Specifications for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey*; and 150/5300-18B, *General Guidance And Specifications For Submission Of Aeronautical Surveys To NGS: Field Data Collection And Geographic Information System (GIS) Standards*. Topographic and planimetric mapping of the surrounding area and aerial photography of the airport including any existing or potential future airport property, the departure surface for each runway end and the inner approach surface areas, will be obtained. The horizontal datum will be NAD83 and the vertical datum will be NAVD88.

Submit a Survey and Quality Control Plans to the Airport Surveying – GIS Program Manager via the Airports Geographic Information System website at <http://airports-gis.faa.gov> for review and approval. Tie the airport survey to the National Spatial Reference System (NSRS) using a permanent connection processed according to AC 150/5300-16.

#### ***Responsibilities:***

*Woolpert, Inc.:* Obtain new aerial photography and mapping.

*Coffman:* Coordinate with Sub-consultant (Woolpert, Inc.).

*Sponsor:* None.

***Product:*** Updated mapping for preparing the Airport Layout Plan Drawing set and study analysis.

### **Task 2.7 – Environmental Inventory**

**Description:** The purpose of this task is to obtain information regarding environmental sensitivities on or near airport property. Sources of information will include past environmental documents, agency maps, existing literature, and relevant internet sources. Examples of information to be gathered include wetlands, riparian areas, threatened or endangered species, floodplains, cultural resources, air quality, parks and natural resource areas, and prime farmland. Informal consultation with various federal and state agencies will occur only if needed information is not available through resources listed above. The information obtained in this task is intended to identify any significant environmental resources prior to the alternatives evaluation process in order to lessen or eliminate environmental requirements for potential project development.

#### ***Responsibilities:***

*Coffman:* Assemble data based on latest information available.

*Sponsor:* Assist in collection of data.

***Product:*** Input into later analysis.

## **ELEMENT 3 - FORECASTS**

This study element is intended to determine an estimate of future levels of air traffic by quantity and by characteristics that will identify the demand that must be met by Lawrence Municipal Airport and by the surrounding airport environs area. The work tasks to be carried out as part of the element include the following:

### **Task 3.1 - Review Regional Aviation and Socioeconomic Forecasts**

**Description:** Review and analyze current local and regional socioeconomic forecasts obtained in the inventory element. Obtain, review and analyze available regional and national aviation forecasts, including the FAA *Terminal Area Forecast*. In consultation with state, regional, and

local planning agencies and other local agency participants, select the forecasts which are most representative of expected future trends.

***Responsibilities:***

*Coffman:* Review all socioeconomic material pertaining to the study and the region.

*Sponsor:* Assist in identifying potential sources of information and assist Coffman Associates in obtaining identified socioeconomic material.

***Product:*** Forecasts of expected socioeconomic factors and aviation activity at Lawrence Municipal Airport and other regional airports.

**Task 3.2 - Prepare General Aviation Demand Forecasts**

**Description:** Develop aviation demand forecasts using both simple and more complex methodologies taking into consideration forecasts from other sources such as the FAA. Historical aviation activity statistics for the airport will be organized to evaluate airport peaking characteristics and fleet mix ratios. The methodology used in this analysis will involve a variety of techniques that will factor in national transportation statistics, local socioeconomic factors, as well as relevant airport data. Correlation analysis techniques will include relative simple graphical comparisons as well as more complex regression analysis. A final refinement of activity forecasts will be conducted to integrate the effects of changing technology and will result in estimates of aviation demand in five, 10, and 20-year increments. The forecasts will include:

- a) Based aircraft totals and fleet mix.
- b) Annual operations by classification (air taxi/charters, general aviation, military)
- e) Peaking characteristics.

***Responsibilities:***

*Coffman:* Prepare aviation demand forecasts for the airport.

*Sponsor:* Assist Coffman Associates in obtaining available local airport records.

***Product:*** Complete aviation forecasts for Lawrence Municipal Airport for existing, 5, 10, and 20-year increments. These forecasts will be coordinated with City of Lawrence, FAA, State, and other interests at this point to ensure that the study proceeds on the basis of generally supported assumptions.

**ELEMENT 4 - FACILITY REQUIREMENTS**



The purpose of this study element is to convert basic capacity needs into types and quantities of the actual physical facilities required to meet forecast demands in aviation activity, and to identify short-term corrective strategies for problems that demand immediate attention.

#### **Task 4.1 - Define Planning Horizon Activity Levels**

**Description:** Utilizing the aviation demand forecasts prepared in the previous element, identify activity levels which define the Short, Intermediate, and Long Term planning horizons. These planning horizons will be utilized throughout the remainder of the report to link future development needs to activity levels rather than points in time.

##### ***Responsibilities:***

*Coffman:* Identify planning horizon activity levels.

*Sponsor:* Review and comment.

*Product:* Input to later analysis.

#### **Task 4.2 – Establish Airport Physical Planning Criteria**

**Description:** Identify physical facility planning criteria for use in assessing the adequacy of various airport facilities to meet forecast demands. These criteria shall be based upon the latest FAA requirements and standards as they apply to the level of activity identified, new technology, and role of the airport. These criteria shall include dimensional standards for safety including runway separation, height restrictions, etc. In addition, these criteria shall include requirements to maintain airspace control including approach and runway protection zones, safety areas, and other general physical area requirements such as aprons, terminal operations, access circulation and parking, hangar and services, administrative, ARFF, rent-a-car, cargo, and other airport service and support facilities.

##### ***Responsibilities:***

*Coffman:* Finalize the elements to be included in the facility requirements evaluation.

*Sponsor:* Review and comment.

*Product:* Data for inclusion in the master plan.

#### **Task 4.3 -- Determine Airfield Capacity and Delay**

**Description:** Using the FAA's airfield capacity/delay model, estimate current and future levels of airfield capacity (annual service volume) and delay for Lawrence Municipal Airport. These analyses will be based on the existing airfield configuration, aviation demand forecasts, and an analysis of

airspace capacity potentials and constraints, and will involve the investigation of management and operational procedures in order to optimize the use of the total airside (runway, taxiway, and apron).

***Responsibilities:***

*Coffman:* Estimate airfield capacity and delay utilizing FAA guidance.

*Sponsor:* Review and comment.

***Product:*** Detailed description the airport annual service volume for the current, 5, 10, and 20-year timeframes.

**Task 4.4 - Prepare Airfield Facility Requirements**

**Description:** Using the results of the previous task, as well as relevant information from others, determine and prepare a preliminary list of facility requirements needed to meet projected demands for the airport for existing, 5, 10, and 20 year time frames. These facility requirements will be used in the later comparative evaluations and will be based upon both the airport physical planning criteria and the aviation forecasts.

Facility requirements to meet aviation demand for the airfield will include (but not be limited to) runways, taxiways, lighting, navigational aids, and marking and signage. These facility requirements will be developed in the form of gross areas and basic units and will be compared to those that presently exist to identify the future development items needed to maintain adequate service, function, and operations of the airport. In subsequent tasks, the above facility requirements will be translated into alternative plans for further evaluation in relation to established planning criteria. Because facility requirements are a function of airport concept possibilities (particularly in staging), these later analyses will be performed in coordination with other factors and may undergo modifications.

***Responsibilities:***

*Coffman:* Identify specific airfield facility needs for the airport.

*Sponsor:* Review and comment.

***Product:*** Detailed description of all airfield facilities required to meet aviation demands at the airport.

**Task 4.5 - Prepare Landside Facility Requirements**

**Description:** Using current FAA and industry planning criteria, develop a set of facility requirements addressing the landside facilities necessary to support the airfield and its related

activity. Requirements for facilities such as general aviation terminal building space, maintenance facilities, apron areas, auto parking, and storage hangars will be developed under this task. The adequacy of existing roadway access will be considered. Requirements will also be developed for other potential support facilities (such as fuel storage).

***Responsibilities:***

*Coffman:* Identify specific landside area facility needs for the airport.

*Sponsor:* Review and comment.

***Product:*** Detailed description of facility requirements necessary for landside development to support forecast aviation demand at the airport through the 20-year scope.

## **ELEMENT 5 – PHASE I REPORT**

### **Task 5.1 – Prepare Phase I Report**

**Description:** Upon completion of the work tasks in elements 1, 2, 3, and 4, a preliminary report will be prepared to outline the analysis, methodologies, and findings of the study efforts. The narrative report will include draft chapters of the work completed to date. A glossary and list of acronyms/abbreviations will be prepared and included as an appendix. Twenty (20) copies of the report will be submitted for review by the PAC, FAA, and City officials.

***Responsibilities:***

*Coffman:* Develop complete narrative and graphics for the Phase I report. Responsible for the distribution of the Phase I report to the PAC, FAA, , and City staff by U.S. mail. Host Phase I report on project web site until the “Draft” Final report is prepared.

*Sponsor:* Review and comment.

***Product:*** Twenty (20) copies of the Phase I report.

## **ELEMENT 6 - AIRPORT ALTERNATIVES**

Using the facility requirements determined under the previous element, alternative development scenarios for Lawrence Municipal Airport will be identified. These scenarios must take into account the development needs of the airport to meet projected aviation demand levels as determined in the forecasting element. These will also meet airfield, commercial, and general aviation area needs as established under the facility requirements element.

### **Task 6.1 – Alternative Development Issues**

**Description:** As a guide to alternative development, the key issues related to both landside and airside development will be identified. These issues will guide the alternatives development process. Each subsequent alternative will address these specific issues in combination.

***Responsibilities:***

*Coffman:* Develop alternatives issues.

*Sponsor:* Review and comment.

***Product:*** A list of alternative development issues.

**Task 6.2 - Identify Potential Airfield Alternatives**

**Description:** Based on the airfield facility requirements established in preceding elements, formulate airfield development alternatives. These alternatives will be based on concepts for development within existing airport boundaries or with the expansion of airport boundaries which show all necessary development during the planning period. This task will be conducted simultaneously with the following task and result in a series of overall development options for the airport to consider. Each alternative will be analyzed from the standpoint of efficiency, cost, environmental impacts, and airfield capacity.

***Responsibilities:***

*Coffman:* Develop up to three (3) airfield development options for the airport.

*Sponsor:* Review and comment.

***Product:*** A series of development options, each of which meets the forecast airfield facility demands.

**Task 6.3 - Identify Potential Landside Alternatives**

**Description:** Based on the landside facility requirements determined under the previous element, formulate preliminary development alternatives. These alternatives will be based on concepts for development within or beyond existing airport boundaries which show all necessary development during the planning period. Recommendations for the highest and best use for all of airport property will be presented, including the potential for revenue support from non-aviation uses.

***Responsibilities:***

*Coffman:* Develop up to three (3) landside development options for the airport.

*Sponsor:* Review and comment.

**Product:** A series of landside alternatives which fulfill the facility requirements to meet forecast demand levels.

## **ELEMENT 7 - PHASE II REPORT**

### **Task 7.1 - Prepare Phase II Report**

**Description:** Upon completion of the work tasks in Element 6, a draft report will be prepared to outline the analysis, methodologies, and findings of the airport alternatives chapter. Twenty (20) copies of the report will be submitted for review by the PAC, FAA, and City of Lawrence officials.

#### ***Responsibilities:***

**Coffman:** Develop complete narrative and graphics for the Phase II report. Responsible for the distribution of the Phase II report to the PAC, FAA, and City staff by U.S. mail. Host the Phase II report on project web site until the “Draft” Final report is prepared.

**Sponsor:** Review and comment.

**Product:** Twenty (20) copies of the Phase II report.

## **ELEMENT 8 - RECOMMENDED MASTER PLAN CONCEPT/FINANCIAL PROGRAM/ENVIRONMENTAL OVERVIEW**

The purpose of this study element is to describe the recommended direction for the future use and development of Lawrence Municipal Airport, establish a financial implementation program to provide for the airport development requirements necessary to meet aviation activity demands and other airport needs during the planning period at the airport, and collect preliminary information regarding potential environmental concerns that must be considered prior to program implementation.

### **Task 8.1 - Recommended Master Plan Concept**

**Description:** Following input from the PAC and City of Lawrence officials on the airside and landside alternatives prepared in the previous element, prepare a detailed comparative evaluation and the supporting rationale to sufficiently describe the single recommended program for development and use of airport facilities. The recommendation for the most prudent and feasible Master Plan concept will become the basis for the final refinement of development costs and scheduling.

#### ***Responsibilities:***

*Coffman:* Develop a recommended master plan concept.

*Sponsor:* Review and comment.

***Product:*** Recommended master plan concept for the airport.

### **Task 8.2 - Prepare Airport Development Schedules**

**Description:** Based upon the previous evaluations and technical meetings, prepare the airport development schedules to reflect economic feasibility and operational requirements of the recommended airport concepts.

***Responsibilities:***

*Coffman:* Prepare an airport development schedule for the airport.

*Sponsor:* Review and comment.

***Product:*** Development schedules for the improvements proposed as a part of the selected master plan concept.

### **Task 8.3 – Prepare Airport Development Cost Estimates**

**Description:** Based upon the recommended master plan concept, develop cost estimates for each project considered within the 20-year scope of the master plan.

***Responsibilities:***

*Coffman:* Define all development costs.

*Sponsor:* Review and comment.

***Product:*** Final cost estimates for the improvements proposed as a part of the selected master plan concept.

#### **Task 8.4 - Prepare Capital Improvement/Financial Program**

**Description:** Prepare a recommended airport capital improvement program for the airport which includes estimates of the amount of funds available from federal grant-in-aid programs to determine the net amount of capital funds required by the City to accomplish each proposed stage of improvements for the airport. Analyze alternative financing strategies that may be available for implementing the proposed development program.

##### ***Responsibilities:***

*Coffman:* Develop a detailed capital improvement/financial program for the airport.

*Sponsor:* Provide review and input.

**Product:** Capital Improvement/Financial Program for the selected master plan concept.

#### **Task 8.5 - Environmental Overview**

**Description:** Using data collected in the Environmental Inventory, a preliminary environmental overview will be conducted to identify any potential environmental concerns that must be addressed prior to program implementation. This evaluation will be structured in a table format and will include analysis of the potential impacts on environmental resources as defined within FAA Order 5050.4B, *Airport Environmental Handbook*. Projects which may require further National Environmental Policy Act (NEPA) analysis will be identified at this time. Existing and future (20 year) airport noise contours will be prepared. The Environmental Overview is not intended to serve as a formal Environmental Assessment under the NEPA. Instead it is intended to alert the airport to any potential significant environmental impacts posed by the airport development program. The environmental overview will follow guidance as described in FAA AC 150/5070-6, Section 605.

##### ***Responsibilities:***

*Coffman:* Assemble data based on latest information available.

*Sponsor:* Assist in collection of data.

**Product:** Input to later analysis.

## **ELEMENT 9 - PHASE III REPORT**

### **Task 9.1 - Prepare Phase III Report**

**Description:** Upon completion of the work tasks in Element 8, a draft report will be prepared to outline the analysis, methodologies, and findings of the recommended concept, development schedules, cost estimates and environmental overview. Twenty (20) copies of the report will be submitted for review by the PAC, FAA, and City of Lawrence officials.

#### ***Responsibilities:***

*Coffman:* Develop complete narrative and graphics for the Phase III report. Responsible for the distribution of the Phase III report to the PAC, FAA, and City staff by U.S. mail. Host the Phase III report on the project web site until the “Draft” Final report is prepared.

*Sponsor:* Review and comment.

*Product:* Twenty (20) copies of the Phase III report.

## **ELEMENT 10 - AIRPORT LAYOUT PLANS AND DRAWINGS**

The purpose of this study element is to develop a new set of Airport Layout Plans and Drawings for Lawrence Municipal Airport. All plans are prepared in a format that is readily acceptable to the FAA and can be utilized by City of Lawrence officials in carrying out implementation. All plans will be produced utilizing the most current version of AutoCAD software. The AutoCAD drawings will be a deliverable item to City of Lawrence at the completion of this project. The most current drawings at time of approval by the City of Lawrence will be included as an Appendix to the Final Master Plan Report. Two hard copy blackline prints (22" x 34") of the ALP set and one CD-ROM with a PDF of the ALP set will be provided to the FAA for airspace review. Additional copies of the ALP set will be provided as necessary for Sponsor and FAA review.

The ALP will be completed according to the FAA Central Region ALP checklist. The checklist will be filled out accordingly and submitted along with the ALP drawings for FAA review as a quality control measure.

### **Task 10.1 - Airport Layout Drawing**

**Description:** Following the Recommended Airport Master Plan Concept developed under Element 8 and FAA’s checklist (for items applicable to this project) an Airport Layout Drawing (ALD) for the airport will be prepared utilizing AutoCAD software. The existing CAD airport layout plan will be updated to reflect changing physical features, wind data, runway and taxiway data, and airport data. Development of ultimate airfield facilities will be based on current and long-range planning horizons which incorporate both airside and landside requirements. Development of ultimate



airfield facilities including runways and taxiways, property and runway protection zone boundaries; and revenue support areas will also be shown. Guidelines for the preparation of an airport layout plan as defined by the FAA Central Region Checklist for Master Plan and Airport Layout Plan (November 2009) will be followed. The ALD will follow guidance in FAA AC 150/5300-13, *Airport Design*, Change 15, and AC 150/5070-6B, *Airport Master Plans*, Change 1, Appendix D.

***Responsibilities:***

*Coffman:* Prepare the ALD for the airport.

*Sponsor:* Review and comment.

***Product:*** An updated ALD drawing for the airport which meets federal guidelines.

## **10.2 - Airport Layout Plan Data Features**

Collect and compile in a digital format acceptable to the FAA Airport Surveying–GIS Program feature data and attributes of the Airport Layout Plan in compliance with FAA AC 150/5300-18B, *General Guidance And Specifications For Submission Of Aeronautical Surveys To NGS: Field Data Collection And Geographic Information System (GIS) Standards*. The ultimate product will be a FAA-compliant Geographical Information System (GIS) detailing feature group and class required to be provided to the FAA. The data groups rendered into attributes will include data easily viewable via aerial photography and/or via site visit. The attributes to be put into the GIS product will be outlined in the work plan developed by Sub-consultant (Woolpert) and agreed upon with FAA. All feature classes are excluded from this effort.

***Responsibilities:***

*Coffman:* Prepare Geographical Information System.

*Sponsor:* Review and comment.

***Product:*** FAA-compliant Geographical Information System.

### **10.2.1 - Data Migration**

Submit Geographical Information System (GIS) to the FAA Airport Surveying GIS website. Obtain confirmation of successful migration.

***Responsibilities:***

*Coffman:* Submit Geographical Information System (GIS) to the FAA Airport Surveying GIS website.

*Sponsor:* Obtain username and password for Airport GIS website. Provide for Coffman Associates access to the website.

*Product:* FAA-compliant Geographical Information System.

### **Task 10.3 - Update Part 77, Approach Zone Profiles, and Inner Approach Surface Drawings**

**Description:** Update the Part 77, Inner Approach Zone Profiles, and Inner Approach Surface Drawings in accordance with FAA AC 150/5300-13, *Airport Design*, Change 15, and AC 150/5070-6B, *Airport Master Plans*, Change 1, Appendix D. Updated obstruction information will be derived from the aerial survey to be conducted in Element 2.8, and supplemented with U.S. Geological Survey (U.S.G.S.) base maps which will be super-imposed on the airspace drawing. Blackline prints (22" x 34") will be provided as necessary for Sponsor and FAA review.

#### ***Responsibilities:***

*Coffman:* Update Part 77, Approach Zone Profiles, and Inner Approach Surface Drawings for the airport.

*Sponsor:* Review and comment.

*Product:* Updated airspace and inner approach surface drawings for the airport which meet federal guidelines.

### **Task 10.4 - Prepare Landside Facility Drawing(s)**

**Description:** Prepare a landside facility drawing for the airport reflecting recommended development in the landside areas as resulting from the recommendations of this study. The terminal area will be included as part of this drawing. The landside facility drawing will be updated in accordance with FAA AC 150/5300-13, *Airport Design*, Change 15, and AC 150/5070-6B, *Airport Master Plans*, Change 1, Appendix D. Blackline prints (22" x 34") will be provided as necessary for Sponsor and FAA review.

#### ***Responsibilities:***

*Coffman:* Prepare landside facility drawing for the airport.

*Sponsor:* Review and comment.

*Product:* Updated plans reflecting the development of the landside areas at the airport.

### **Task 10.5 - Prepare Airport Land Use Plan**

**Description:** The Airport Land Use Plan will be prepared in accordance with FAA AC 150/5300-13, *Airport Design*, Change 15, and AC 150/5070-6B, *Airport Master Plans*, Change 1, Appendix D. The on- and off-airport land uses will be depicted by general use categories. A bounding line demarking the area surrounding the Airport Operations Area where possible hazardous wildlife attractants (ponds, landfills, etc.) are to be excluded will be shown in accordance with AC 150/5200-33, *Hazardous Wildlife Attractants on or Near Airports*, Section 1. Blackline prints (22" x 34") will be provided as necessary for Sponsor and FAA review.

***Responsibilities:***

*Coffman:* Prepare land use drawing for the airport.

*Sponsor:* Review and comment.

***Product:*** Updated plans reflecting updated land use on airport property.

**Task 10.6 - Prepare Exhibit A – Property Map**

**Description:** Titles/deeds/easements will be obtained either from the City of Lawrence and/or from a formal title search conducted by a local title company. These documents will be utilized to develop the Airport Property Map. Copies of the Property Titles/Deeds/Easements and Title Opinion will be included in the Master Plan as an appendix. This task does not include any new field surveys. If a title search is necessary, Optional Task 13.2 can be exercised. Blackline prints (22" x 34") will be provided as necessary for Sponsor and FAA review.

***Responsibilities:***

*Coffman:* Work with the sponsor to collect title/deed/easement information. Assist City attorney in the preparation of Title Opinion.

*Sponsor:* Provide title/deed/easement information to the greatest extent practicable in an appendix to the Master Plan. Provide City attorney to write the Title Opinion

***Product:*** Updated plans reflecting updated land use on airport property.

**Task 10.7 – Update Airport Property Map**

**Description:** Update the airport property map, incorporating the changes in existing and planned development. This map will include the appropriate information to indicate the type of acquisition (i.e. federal funds, surplus property, local funds only, etc.) of various land areas within the airport's boundaries. Details will be limited to the depiction of existing and future facilities (i.e. runways, taxiways, runway protection zones, terminal facilities, etc.) which justify the retention of airport property. This work effort will utilize information obtained in Task 10.6 to establish the current airport property. This drawing will also depict the long term airport property line as recommended.

.. The Airport Property Map will be updated in conformance with the standards of FAA AC 150/5300-13, *Airport Design*, Change 15, and AC 150/5070-6B, *Airport Master Plans*, Change 1, Appendix D. Blackline prints (22" x 34") will be provided as necessary for Sponsor and FAA review.

***Responsibilities:***

***Coffman:*** Update airport property map for the airport.

***Sponsor:*** Provide appropriate data and review property map. Provide copies of airport property deeds as needed.

***Product:*** Airport Property Map for the airport.

**Task 10.8 – Airport Departure Surfaces**

**Description:** Departure surface drawings will be produced following guidance provided by FAA AC 150/5300-13, *Airport Design*, Change 15, and AC 150/5070-6B, *Airport Master Plans*, Change 1, Appendix D.

The departure surface drawings will be produced based on the aerial surveys to be conducted in Element 2.8 and will be supplemented to the greatest extent practicable with other obstruction data sources such as the airport's Obstruction Chart (NOAA) and the FAA Digital Obstacle File. Base mapping, contours, and planametrics will be primarily derived from the aerial survey conducted in Element 2.8 and supplemented with the NOAA and FAA obstruction data files.

The departure surface drawings will include the 40:1 departure surface for the primary instrument runway. Blackline prints (22" x 34") will be provided as necessary for Sponsor and FAA review.

***Responsibilities:***

***Coffman:*** Develop departure surface drawings for the airport.

***Sponsor:*** Provide appropriate data and review departure surface drawings.

***Product:*** Departure surface drawing for all four runway ends.

**ELEMENT 11 – “DRAFT” FINAL MASTER PLAN REPORT**

**Task 11.1 - Prepare “Draft” Final Master Plan Report**

**Description:** Upon completion of the work tasks in Elements 5, 7, 9 and 10, a draft report will be prepared to outline the analysis, methodologies, and findings of the study efforts. Revised/updated narrative and graphics from the Phase I, II and III reports will be included. A Draft of the ALP set

will also be included. This document will incorporate appropriate comments and corrections received during previous reviews. Twenty (20) copies of the report will be submitted for review by the PAC, FAA, and City of Lawrence officials. This document is intended to be used for the necessary Master Plan approvals and reviews.

***Responsibilities:***

***Coffman:*** Update Phase I, II, and II report narratives and graphics. Host “Draft” Final report on the project web site. The “Draft” Final report will be removed from the project web site once final master plan approvals are obtained from the City of Lawrence.

***Sponsor:*** Review and comment.

***Product:*** Twenty (20) copies of the “Draft” Final Master Plan report.

## **ELEMENT 12 - FINAL DOCUMENTATION/MEETINGS/PUBLIC WORKSHOPS**

The purpose of this element is to provide documents which depict all the findings of the study effort and to present the study and its recommendations to the PAC, the public, and appropriate local organizations.

### **Task 12.1 - Prepare Final Master Plan Document**

**Description:** Coffman Associates will review comments received during the study process and incorporate them, as appropriate, into a final Master Plan document. This document shall incorporate the revisions to previous phase reports prepared under earlier elements into a usable Master Planning document. Twenty (20) copies of the Master Plan will be provided. Ten (10) copies of the Master Plan on CD-Rom (in Adobe Acrobat [.PDF] format) will also be provided. The Final Master Plan Document will contain the most current draft of the ALP set at the time of printing.

***Responsibilities:***

***Coffman:*** Prepare and print twenty (20) copies of the Master Plan document. Prepare ten (10) copies of the Master Plan document in Adobe Acrobat [.PDF] format and put on CD-ROM. Send a hard copy and CD-Rom directly to the FAA and the Kansas Department of Transportation – Division of Aviation. Send all remaining copies directly to the Sponsor by UPS Ground.

***Sponsor:*** Review and Comment.

***Product:*** Twenty-five (25) printed copies of the Master Plan document and ten (10) copies of the Master Plan document in Adobe Acrobat [.PDF] on CD-ROM.

## **Task 12.2 & Task 12.3 - Planning Advisory Committee (PAC) Meetings and Public Workshops**

**Description:** Prepare graphic displays and handout materials necessary to describe the evaluations and findings of phase reports prepared for the Master Plan Study. Meet with the PAC to review phase reports and to discuss study findings. Comments received during these meetings will be considered in preparing the final documents. PAC meetings are scheduled to kick-off the study and after the preparation of each of the draft Phase Reports for a total of four (4) meetings.

The “Draft” Master Plan will be presented to the general public at a public workshop. The workshop will be held after the last PAC meeting (on the same day). Advertising for the workshop will be accomplished using press releases, local newspaper advertising, and direct mailings to neighborhood associations and interested public groups in the Lawrence Municipal Airport area (as necessary). One (1) public workshop is budgeted for the study. The public information workshop is planned immediately after the Phase III report and PAC meeting.

### ***Responsibilities:***

*Coffman:* Distribute meeting notices to the PAC. Provide presentations and necessary graphics at the meetings.

*Sponsor:* Arrange for meeting room. Place advertisements. Coordinate jointly with Coffman Associates.

***Product:*** Three (4) PAC meetings for the Master Plan.  
One (1) public information workshop for the Master Plan

## **Task 12.4 – Obtain Master Plan and ALP Approvals**

**Description:** Obtain approval of the Airport Master Plan from the City of Lawrence and submit the ALP set to the FAA for their review and approval. Present the Master Plan to the City of Lawrence City Commission for approval as necessary. Respond to any FAA comments and suggestions and re-submit the ALP set as necessary. Obtain approval signatures on the ALP set from both the City of Lawrence and the FAA. Provide the City of Lawrence and the FAA with the final CAD drawing in native format.

### ***Responsibilities:***

*Coffman:* Attend City Council approval meeting and present the Airport Master Plan as necessary. Blackline prints (22" x 34") will be provided as necessary for FAA review.

*Sponsor:* Sign final ALP set and forward onto the FAA for signatures. Return one (1) approved and signed ALP set to Coffman Associates.

***Product:*** Signed final ALP set approved by the FAA. CD-ROM of ALP set drawing in native CAD format.

### **Task 12.5 -- Prepare Master Plan Summary Brochure**

**Description:** Prepare a summary brochure. The summary brochure is anticipated to be an overview of the master plan, as presented in the final report. Review comments from client and print for distribution. A bi-fold, four-pane, summary brochure is budgeted. Up to 500 copies of the summary report will be submitted to the City of Lawrence.

#### **Responsibilities:**

*Coffman:* Prepare Master Plan Summary Brochure.

*Sponsor:* Review and comment of draft summary brochure prior to final printing.

*Product:* 500 Master Plan Summary Brochures.

### **ELEMENT 13 - OPTIONAL TASKS**

The following optional tasks may be included under the Master Plan contract or contracted separately.

### **Task 13.2 – Title/Deed/Easement Research for Exhibit A Property Map**

**Description:** If during the data collection process for Task 10.6 it becomes apparent that not all title/deed/easement information for the airport is available then this task may be exercised upon approval of the Sponsor and the FAA. This task would involve hiring a Lawrence area title search company to fill any unknown title/deed/easement information for inclusion in the Exhibit A Property Map.

#### **Responsibilities:**

*Coffman:* Hire title research company. Include findings on the Exhibit A Property Map and include titles/deeds/easements will be included as an appendix to the Master Plan.

*Sponsor:* Assist Coffman Associates as necessary.

*Product:* Complete to the greatest extent practicable a collection of title/deed/easement property encompassing airport property. Information included in Appendix to the Master Plan.

**APPENDIX A**

**DETAIL SCOPE OF WORK**

**ELEMENT 2 – INVENTORY**

**Task 2.6**

**Obtain Aerial Photography and Mapping**

**Sub-Consultant**

**Woolpert, Inc.**



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# SCOPE OF SERVICES – AERONAUTICAL SURVEY TECHNICAL APPROACH FOR SURVEY AT LAWRENCE MUNICIPAL AIRPORT IN LAWRENCE, KC

Woolpert has been providing professional surveying services since 1911 and GPS services since 1987 and is consider an innovator in geospatial related technologies such as aerial photography/feature extraction, Information Technology, Geographic Information Systems (GIS), and Surveying/Global Positioning Systems (GPS). Woolpert is a pacesetter in these fields that is well recognized as a company that can perform and respond to the needs of their clients. With a pool of over 800 professional and technical personnel, Woolpert will provide the necessary resources to complete the tasks for successful airport procedure development.

The survey information collected during this project will be utilized to develop approach and departure procedures for incoming and outgoing aircraft. In order for this process to be completed without difficulty, Woolpert understands the necessity for completing a survey that meets the current specifications and accuracy requirements outlined in the reference materials.

Woolpert understands that LWC is in the process of preparing a new Master Plan and is requesting the development of new instrument approach and departure procedures into runway approaches 01/19 and 15/33. The FAA require aeronautical survey and mapping services that meets the standards outlined in the **FAA Advisory Circulars 150/5300-16A, -17B and -18B**, with further guidance from the FAA Central Region (ACE), and the Office of Airports Safety and Standards (AAS) in Washington, D.C.. The survey requirements will be completed for:

- Instrument Procedure Development
- Airport Layout Plan (ALP)

Woolpert will provide the deliverables required as identified in Table 2-1 of AC-18B. See Attachment A for the required tasks for the survey type.

## Survey Specifications and Standards

The FAA requires the use of the survey specifications and standards published as Advisory Circulars for all survey and relevant airport safety critical data. The specifications define the geodetic control, aerial imagery, survey, and data delivery requirements to the FAA for successful procedure development. The following Advisory Circulars will be used throughout the survey process:

- ➔ Federal Aviation Administration. *Advisory Circular: General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey*. AC No. 150/5300-16A. Washington: February 13, 2006. **Herein referred to as AC-16A.**
- ➔ Federal Aviation Administration. *Advisory Circular: General Guidance and Specifications for Aeronautical Surveys: Airport Imagery Acquisition and Submission to the National Geodetic Survey*. AC No. 150/5300-17B. Washington: September 29, 2008. **Herein referred to as AC-17B.**

- ➔ Federal Aviation Administration. *Advisory Circular: General Guidance and Specifications for Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards*. AC No. 150/5300-18B. Washington: May 21<sup>st</sup>, 2009. **Herein referred to as AC-18B.**

## Project Specifications and Deliverables

Table 1 defines the survey specifications required for this survey. The type of obstruction identification surfaces are outlined for each runway approach.

<b>Table 1: Survey Specification Breakdown</b>		
<b>Survey Locations</b>	<b>Survey Specifications Required</b>	<b>Comments</b>
<b>Runways 01/19 &amp; 15/33</b>	Vertically Guided Approach Surface (VGAS)	Approach surface extending 20,000 feet from end of the VGRPS.
<b>Additional Surfaces</b>	Vertically Guided Runway Primary Surface (VGRPS)	1,000 foot wide rectangular surface longitudinally centered on the runway centerline.
	Vertically Guided Primary Connection Surface (VGPCS)	Connection between the VGRPS and the VGATS.
	Vertically Guided Protection Surface (VGPS)	A trapezoidal surface sloping at 62.5:1 beginning at the threshold extending outward 6,000 feet.
	Vertically Guided Approach Transitional Surface (VGATS)	Surface aligned with VGPCS and sloping upward toward the VGHS.
	Vertically Guided Horizontal Surface (VGHS)	Horizontal plane established 150 feet above the airport elevation for a distance of 10,000 feet.
	Vertically Guided Conical Surface (VGCS)	Sloping surface extending upward and outward from the VGHS for a distance of 7,000 feet.

Table 2 provides a breakdown of the deliverable requirements defined in the Advisory Circulars and the scope of this project. The National Geodetic Survey (NGS) will receive copies of deliverables for validation of the survey. Due to the staggered deliveries required they have been placed in order and the triggers for each are identified.

<b>Table 2: Required Deliverables</b>		
<b>Deliverable</b>	<b>Initiation Information</b>	<b>Comments</b>
<b>Survey Work and Quality Control Plan</b>	Official Notice to Proceed, or Execution of contract	Defines survey and project operation details and quality control practices. Delivered to the FAA GIS system via the web portal.
<b>Imagery Acquisition Plan</b>	Official Notice to Proceed, or Execution of contract	Defines technical aspects for acquisition of the stereo aerial photography. Delivered to the FAA GIS system via the web portal.

<b>Aerial Photograph Report</b>	Completion of Aerial Triangulation	Required for the NGS to use during the validation of the survey data submitted to the FAA via external hard drive.
<b>Airport Survey Digital Data File</b>	Completion of Airside Survey and Imagery Analysis	AutoCAD data file delivered to Coffman Associates and LWC for review.
<b>Final Surveyors Report</b>	Coffman Associates and LWC approval of digital data file contents.	The report is a compilation of project summary and digital data collected during the survey project. Delivered to FAA GIS system via the web portal.
<b>Digital Data Delivery</b>	Coffman Associates and LWC approval of digital data file contents.	The survey data collected during the survey project will be formatted to allow the data to be digested directly into the FAA's Airport GIS system via the web portal. Submitted simultaneous to Final Surveyor Report.

## Survey Requirements

### Datum Reference

The surveys will be based on the North American Datum of 1983 (NAD83) horizontally, and the North American Vertical Datum (NAVD88) vertically. All survey measurements will be referenced to the Geodetic Reference System of 1980 (GRS-80) while utilizing the national geoidal model of 2003 (GEOID03) for orthometric height calculation.

### Preparations and Communications

Prior to and throughout the survey project, the Woolpert team will effectively communicate with appropriate airport officials to established safety, communication, airside restrictions and future airfield construction activity considerations. Woolpert will conduct interviews with key airport staff at the start of the field activities to solidify items to be considered throughout the survey project. Interviews with the airport manager, engineering staff, maintenance personnel, and FAA air traffic control will be conducted.

### Safety Considerations

Woolpert anticipates that additional site safety and coordination training may take place prior to the start of field activities. We will also use clearly identified company vehicles with integrated safety lighting to move safely about the airfield. All survey vehicles located on the airfield will be outfitted with two-way, air-band radios because communication with the air traffic is critical to guarantee safety.

### Summary of Survey Activities

- ➔ **Geodetic Control:** The necessary geodetic control stations will be defined on the airport to be used for the duration of the project. The control used will be directly tied to the National Spatial Reference System (NSRS) by use of the Continually Operating Reference System (CORS) and local vertical benchmarks.

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- ➔ **Aerial Photography:** Aerial imagery is required by both the NGS specifications and internally within Woolpert for both Quality Control (QC) purposes and efficient obstruction analysis. The Woolpert photogrammetry team will develop a flight plan, coordinate the acquisition of the photography, process and analyze the imagery.
  - ➔ **Aeronautical Survey:** Obstruction and airside surveys will be completed that encompass surfaces and procedures defined by the FAA in AC-18B. The survey will be completed utilizing multiple types of survey techniques for performing runway, NAVAID, control and obstruction observations. Once complete, the deliverable items listed above will be produced and delivered to the client.

## Survey Task A: Geodetic Control Survey

As part of our initial research for **Primary and/or Secondary Airport Control Stations (PACS/SACS)**, we reviewed the National Spatial Reference System (NSRS) database for evidence of existing geodetic control on the airfields. LWC does possess geodetic control marks published as PAC and SACS. Woolpert will attempt to recover the existing control marks and validate their geodetic physical status and geodetic positions in accordance with AC-18B. If the existing marks are found disturbed, unusable or destroyed, Woolpert will be able to provide a proposal to replace the marks upon request.

## Survey Task B: Aerial Photography Control and Acquisition

### Photogrammetric Control Surveys

All ground control shall be determined for optimum location, quality, and accuracy for controlling the aero-triangulation solution. Woolpert will determine the horizontal and vertical positions of each photo control point using Static and/or RTK GPS techniques. The control positions will be determined with direct ties to the PACS and SACS at LWC. After reviewing and identifying the required approach and obstruction surfaces for LWC, Woolpert photogrammetrists will build a flight layout based on the specifications outlined in the source materials.

### Aerial Photography Acquisition and Geo-Referencing

The capture of aerial photography will be completed once the ground control stations are set and the tree canopies are in full bloom, providing full 'leaf-on' conditions. The photography flight crew will collect the imagery as defined in the flight layout, encompassing the critical areas of the obstruction identification surfaces. Woolpert will collect imagery that will meet the specifications outlined in AC-17B. Woolpert will use color negative film (such as Kodak 2444) to ensure quality high resolution imagery, producing low contrast scan resolution. The imagery collected will be at a scale of 1" = 800'.

After the processing and development of the aforementioned aerial photography, the imagery will then be scanned to produce digital images of the photography. The resulting ground resolution of the scanned images will be 10-30 cm in size. The scanned image will then be geo-referenced (aerial-triangulated) in soft-copy format to fix the imagery to real-world coordinates by utilizing the previously established ground control features or targets. Once the imagery is geo-referenced, the stereo models produced will be utilized for obstruction analysis.

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## Task C: Runway Surveys

### Profile Surveys

Woolpert will perform an RTK GPS survey measuring the center profile survey, and reduced to provided points every 50 feet along the centerline of the two runways (in accordance with AC-18B for Non-Certified Part 139 airfields). The RTK base station will be set-up on the PACS or either of the SACS for conducting the profile survey. As a measure of quality control, the field team will make periodic RTK observation checks into either of the other two airport control stations. The profile survey will be conducted by performing two independent RTK GPS surveys, and then combined to produce the final alignment. The profile survey and deliverables will be conducted as accordance to AC-18B.

### Critical Point Surveys

If an existing runway endpoint monument does not already exist at each runway end, displaced threshold, and stop-way point, a survey nail and washer, pre-stamped with the letters 'WOOLPERT 2010' will be set to aid in future identification. A field recovery sketch and five digital photographs as required by AC-18B will be developed for each runway end, displaced threshold, and stop-way.

Woolpert will determine runway lengths from the positions of the runway end points using NGS' INVERSE3D software. Runway lengths will be computed while at the airport and will also be compared to the lengths published in the airport facility directory. If the computed length, rounded to the nearest foot, differs from the published length by more than a foot, Woolpert will contact the airport and Coffman Associates for further information on the reasons for the difference. If the lengths are consistent with the published length, no additional information will be required.

## Task D: Obstruction Survey and Analysis

Woolpert will utilize a combination of photogrammetric and ground survey measurements to concisely compile the obstruction information. The surfaces that will be analyzed and reported against are found in Table 1 of this proposal.

### Photogrammetric Surveys

Woolpert will utilize the ClearFlite software developed by BAE for dual purposes. One, to measure and record obstructions, and two, to quality control any obstruction analysis completed via ground survey. The triangulated stereo models generated from the imagery are inspected for features (points, lines and polygons) that penetrate the required surfaces. ClearFlite software is designed specifically for obstruction surface analysis and measurement, with the accuracy of measurements dependent on scale of photography and ground control measurements.

### Ground Surveys

Woolpert will utilize a variety of survey techniques for acquisition of features that are suspected of penetrating the obstruction identification surfaces. Direct measurement (angle and distance), triangulation (angles from multiple locations) or RTK-GPS survey operations are among the most commonly used. Field measurements will be tied directly to the PACS and SACS at LWC. The field surveyors will be

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armed with a digital terrain model of the obstruction surfaces loaded in the data collection system that will allow for real-time analysis of features.

## Obstruction Data Analysis

The obstruction data collected from the ground and photogrammetric surveys will be analyzed simultaneously in a 3D AutoCAD environment. The surfaces, points, lines and polygons collected will be inserted into AutoCAD and inspected to calculate and attribute the penetrations of the OIS. The obstructions will be inserted in the final deliverable to the FAA. Obstructions will be analyzed and delivered based on the as-built runway positions.

## Task E: Navigation Aids (NAVAIDS) Inventory

Woolpert will identify and survey all electronic and visual NAVAIDS associated to the airport that are required in AC-18B. Woolpert will utilize airport officials for assistance in identifying specific information about LWC's NAVAID systems. Assistance from the Airport Authority and FAA will be vital in identifying any additional NAVAIDS that have been recently constructed, planned construction or relocation. This assistance will be particularly important in identifying NAVAIDS located off the airport property or somehow unique.

Woolpert will determine the horizontal and/or vertical positions of each NAVAID using conventional total station surveys, RTK GPS, Static GPS, or a combination thereof. The type of survey technique will be determined by multiple considerations. These considerations are if particular NAVAIDS radio waves interfere with the GPS frequencies, location of NAVAID, and physical attributes of NAVAID structure.

## Task F: Progress Reporting and Final Project Completion Report

### Progress Reporting

The Woolpert project manager will be responsible for providing the airport and Coffman Associates a monthly progress report (or other agreed upon frequency) via email to effectively convey the team's progress throughout the project. Each progress report will contain progress updates and significant issues with the project including any deviations from the planned schedule.

### Survey Reports

Woolpert will deliver the data files and reports defined in AC 150/5300-16A, 17B, and 18B. The AC's require a geodetic control report to the NGS if new control is to be published, an aerial imagery report to the NGS for use in validation, and a final project completion report.

The final project completion report is an integral portion of the airport survey. The report is designed to convey all necessary survey information for the successful development of future approach/departure procedure development. The report will include a complete synopsis of each of the survey tasks listed above, the surveyor summary, runway/stopway specific surveys, NAVAIDS survey, obstruction survey, and control information.

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## Digital Survey Data File Delivery

Woolpert will develop a digital file deliverable in the appropriate format to be uploaded to the Airports GIS (<https://airports-gis.faa.gov/airportsgis/>). AC-18B outlines the requirements the FAA Feature Dictionary digital deliverable must follow. The data packet delivered will be in AutoCAD delivery file format. The digital deliverable will be delivered through the FAA Airports GIS web portal, and will also be provided to the airport and Coffman Associates separately. The data file will contain the critical items identified in Table 2-1 in AC-18B, and will also contain 3D topographic limits of the following airport features.

- ➔ Runways
- ➔ Taxiways
- ➔ Navigational Aids
- ➔ Obstructions (including obstruction areas)
- ➔ Landmark Features in the immediate vicinity and are considered features identifying critical components for navigation (railroads, roadways, shorelines, and above-ground powerlines)

## Task G: Development of Ortho Photography

### Requirements and Options

AC-17B requires the delivery of ortho photography over the area stereo aerial photography is collected for completing the airport airspace analysis. The pixel resolution of the orthos will be a minimum of 1-foot, dependent on the source. Woolpert is prepared to develop new ortho photography from the aerial photography collected in accordance with AC-17B; however, alternative sources may be available through the State-wide Ortho Photography Program, or recently acquired County-wide projects. Woolpert will attempt to retrieve existing ortho imagery that meets the specifications defined in AC-17B.

Woolpert will also capture one image at a photo scale of 2500, see Exhibit B. This image will be georectified to the ground control. It will be provided to the client as a georeferenced digital image with a native scanned resolution of approximately 1.37 feet Ground Sample Distance.

## Task F: Development of 2 Foot Contours

### Requirements and Options

AC-18B requires the creation of new contours or validation of existing contours. Woolpert will prepare 2 foot contours from the 800 photo scale photography. The limits of the 2 foot contours will be approximately 200 feet past the airport boundary as shown on the existing ALP. The ALP is Exhibit A.

## APPENDIX A – AC-18B, TABLE 2-1 TASKS

Intended End Use of the Data ➤	AC Reference	Airport Layout Plan (ALP)	Instrument Procedure Development
Required Tasks ▼			
Provide a Survey and Quality Control Plan	150/5300-16/17/18	•	•
Establish or validate Airport Geodetic Control	150/5300-16	•	•
Perform, document and report the tie to National Spatial Reference System (NSRS)	150/5300-16	•	•
Survey runway end(s)/threshold(s)	150/5300-18	•	•
Monument runway end(s)/threshold(s)	150/5300-18	•	•
Document runway end(s)/threshold location(s)	150/5300-18	•	•
Identify and survey any displaced threshold(s)	150/5300-18	•	•
Monument displaced threshold(s)	150/5300-18	•	•
Document displaced threshold(s) location	150/5300-18	•	•
Determine or validate runway length	150/5300-18	•	•
Determine or validate runway width	150/5300-18	•	•
Determine runway profile using 50 foot stations	150/5300-18	•	•
Determine runway profile using 10 foot stations	150/5300-18		
Determine the touchdown zone elevation (TDZE)	150/5300-18	•	•
Determine and document the intersection point of all specially prepared hard surface (SPHS) runways	150/5300-18	•	
Determine and document the horizontal extents of any Stopways	150/5300-18	•	•
Determine any Stopway profiles	150/5300-18	•	•
Determine if the runway has an associated clearway	150/5300-18	•	
Survey clearway to determine objects penetrating the slope	150/5300-18	•	•
Determine and document the taxiway intersection to threshold distance	150/5300-18	•	
Determine runway true azimuth	150/5300-18	•	•
Determine or validate and document the position of navigational aids	150/5300-18	•	•
Determine or validate and document the position of runway abeam points of navigational aids	150/5300-18		•
Determine potential navigational aid screening objects	150/5300-18		
Collect and document VOR receiver checkpoint location and associated data	150/5300-18		
Perform or validate and document an airport airspace analysis	150/5300-18	•	•
Collect and document helicopter touchdown lift off area (TLOF)	150/5300-18	•	•
Collect and document helicopter final approach and takeoff area (FATO)	150/5300-18	•	•
Collect or validate and document airport planimetric data	150/5300-18	•	
Determine or validate the elevation of the Air Traffic Control Tower Cab Floor (if one is on the airport)	150/5300-18	•	
Perform or validate a topographic survey	150/5300-18	•	•
Collect and document runway and taxiway lighting	150/5300-18	•	
Collect and document parking stand coordinates	150/5300-18		
Collect cultural and natural features of landmark value	150/5300-18	•	



Intended End Use of the Data ➤	AC Reference	Airport Layout Plan (ALP)	Instrument Procedure Development
Required Tasks ▼			
Determine elevation of roadways at the intersecting point of the Runway Protection Zone (RPZ) or the runway centerline extended	150/5300-18	•	
Determine all Land Use to 65 DNL contour	150/5300-18		
Document features requiring digital photographs	150/5300-18	•	•
Document features requiring sketches	150/5300-18	•	•
Collect position and type of runway markings	150/5300-18	•	
Collect position and type taxiway markings	150/5300-18		
Locate, collect, and document photo ID points	150/5300-17		
Identify collect, and document wetlands or environmentally sensitive areas	150/5300-18		
Collect imagery	150/5300-17	•	•
Provide a final Project Report	150/5300-16/18	•	•

• = Required Task

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## APPENDIX B – ADDITIONAL REFERENCES UTILIZED

- ➔ **AC 150/5300-16A** “General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey.”
- ➔ **AC 150/5300-17B** “General Guidance and Specifications for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey.”
- ➔ **AC 150-5300-18B** “General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards.”
- ➔ National Geodetic Survey. *Runway End, Stopway End, and Displaced Threshold Identification for Surveyors*. 1<sup>st</sup> ed. Washington: January 1998.
- ➔ Federal Aviation Administration. *Advisory Circular: Standards for Airport Markings* (Change 1 to Advisory Circular 150/5340-1H). AC # 150/5340-1H. Washington: December 2000.
- ➔ Federal Aviation Administration. *Advisory Circular: Ground Vehicle Operations on Airports*. AC # 150/5210-20. Washington: June 2002
- ➔ Federal Aviation Administration. *Advisory Circular: Standards for Airport Sign Systems*. AC # 150/5340-18C. Washington: July 1991.
- ➔ *Directory of Common Aviation Acronyms*. Carter & Burgess, 2003.
- ➔ Woolpert LLP. *Navigational Aids: Images of ILS Facilities and Other Surveyed Features* by NGS. June 2003.
- ➔ National Geodetic Survey. *Requirements for Digital Photographs of Survey Control*. Version 10. Washington: January 2002. Herein referred to as Digital Photo Requirements.

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## APPENDIX C – COST ESTIMATE

### Aeronautical Survey – Lump Sum Fee

- **Aeronautical Survey:** Completion of an aeronautical survey to the standards delivered in AC 150/5300-16, 17 and 18. .... **\$64,880.00**







Exhibit B  
Lawrence, KS (LWC)  
Limits of 2500 Scale Photo



**Lawrence Municipal Airport**[illegible]

Exhibit C									
Project Cost Summary									
Airport Master Plan Study and ALP Update									
Lawrence Municipal Airport									
Apr-10									
Draft ELEMENT/TASK	PERSON DAYS				Costs			TASK/ELEMENT TOTAL	
	Principal \$1,800	Senior Planner \$1,320	Planner \$1,000	Technical \$840	COFFMAN		SUB		
					LABOR	EXPENSES			
ELEMENT 1 - INITIATION									
1.1 Study Design	1	1	0	0	\$3,120	\$0	\$0	\$3,120	
1.2 Establish Planning Advisory Committee	0	1	0	0	1,320	0	0	1,320	
1.3 Develop Project Website	0	0	0	1	840	0	0	840	
SUBTOTAL - ELEMENT 1	1	2	0	1	\$5,280	\$0	\$0	\$5,280	
ELEMENT 2 - INVENTORY									
2.1 Evaluate Existing Documents	0	0	1	0	\$1,000	\$0	\$0	\$1,000	
2.2 Inventory Airport Physical Facilities	0	1	0	0	1,320	0	0	\$1,320	
2.3 Inventory Air Traffic Activity, Airspace, Air Traffic Control and Regional Airports	0	0	1	1	1,840	0	0	\$1,840	
2.4 Inventory Socioeconomic and Land Use Data	0	0	1	1	1,840	0	0	\$1,840	
2.5 Obtain Tabulated Wind Data	0	0	0	1	840	100	0	\$940	
2.6 Obtain Aerial Photographs and Mapping	0	0	0	1	840	0	64,880	\$65,720	
2.7 Environmental Inventory	0	0	1	1	1,840	0	0	\$1,840	
SUBTOTAL - ELEMENT 2	0	1	4	5	\$9,520	\$100	\$64,880	\$74,500	
ELEMENT 3 - FORECASTS									
3.1 Review Regional Aviation and Socioeconomic Forecasts	0	1	1	0	\$2,320	\$0	\$0	\$2,320	
3.2 Prepare General Aviation Forecasts	0	3	3	0	6,960	0	0	\$6,960	
SUBTOTAL - ELEMENT 3	0	4	4	0	\$9,280	\$0	\$0	\$9,280	
ELEMENT 4 - FACILITY REQUIREMENTS									
4.1 Define Planning Horizon Activity Levels	0	0	1	0	\$1,000	\$0	\$0	\$1,000	
4.2 Establish Airport Physical Planning Criteria	0	0	1	0	1,000	0	0	\$1,000	
4.3 Determine Airfield Capacity and Delay	0	1	0	0	1,320	0	0	\$1,320	
4.4 Prepare Airfield Facility Requirements	0	1	1	0	2,320	0	0	\$2,320	
4.5 Prepare Landside Facility Requirements	0	0	2	0	2,000	0	0	\$2,000	
SUBTOTAL - ELEMENT 4	0	2	5	0	\$7,640	\$0	\$0	\$7,640	
ELEMENT 5 - PHASE I REPORT									
5.1 Prepare Phase I Report (20)	1	1	4	5	\$11,320	\$1,000	\$0	\$1,000	
SUBTOTAL - ELEMENT 5	1	1	4	5	\$11,320	\$1,000	\$0	\$1,000	
ELEMENT 6 - AIRPORT ALTERNATIVES									
6.1 Alternative Development Issues	0	1	0	0	\$1,320	\$0	\$0	\$1,320	
6.2 Identify Potential Airfield Alternatives	0	1	2	1	4,160	0	0	\$4,160	
6.3 Identify Potential Landside Alternatives	0	1	2	1	4,160	0	0	\$4,160	
SUBTOTAL - ELEMENT 6	0	3	4	2	\$9,640	\$0	\$0	\$9,640	
ELEMENT 7 - PHASE II REPORT									
7.1 Prepare Phase II	1	1	1	4	\$7,480	\$600	\$0	\$8,080	
SUBTOTAL - ELEMENT 7	1	1	1	4	\$7,480	\$600	\$0	\$8,080	
ELEMENT 8 - MASTER PLAN CONCEPT/FINANCIAL PROGRAM									
8.1 Recommended Master Plan Concept	0	1	1	0	\$2,320	\$0	\$0	\$2,320	
8.2 Prepare Airport Development Schedules	0	1	1	0	2,320	0	0	\$2,320	
8.3 Prepare Airport Development Cost Estimates	0	1	1	0	2,320	0	4,000	\$6,320	
8.4 Prepare CIP/Financial Program	0	1	1	0	2,320	0	0	\$2,320	
8.5 Environmental Overview	0	1	1	0	2,320	0	0	\$2,320	
SUBTOTAL - ELEMENT 8	0	5	5	0	\$11,600	\$0	\$4,000	\$15,600	
ELEMENT 9 - PHASE III REPORT									
9.1 Prepare Phase III Report (20)	1	2	2	4	\$9,800	\$800	\$0	\$10,600	
SUBTOTAL - ELEMENT 9	1	2	2	4	\$9,800	\$800	\$0	\$10,600	
ELEMENT 10 - AIRPORT LAYOUT PLANS AND DRAWINGS									
10.1 Airport Layout Drawing	0	0	1	10	\$9,400	\$1,000	\$0	\$10,400	
10.2 ALP Data Features and Migration	0	0	2	10	10,400	0	0	\$10,400	
10.3 Update Part 77, Approach Zone Profiles and Inner Approach Surface Drawings	0	0	1	5	5,200	0	0	\$5,200	
10.4 Prepare Landside Facility Drawings	0	0	1	1	1,840	0	0	\$1,840	
10.5 Prepare Airport Land Use Drawing	0	0	1	1	1,840	0	0	\$1,840	
10.6 Prepare Exhibit A - Property Map	0	0	1	6	6,040	0	0	\$6,040	
10.7 Update Airport Property Map	0	0	1	2	2,680	0	0	\$2,680	
10.8 Airport Departure Surfaces	0	0	1	2	2,680	0	0	\$2,680	
SUBTOTAL - ELEMENT 10	0	0	9	37	\$40,080	\$1,000	\$0	\$41,080	
ELEMENT 11 - "DRAFT" FINAL MASTER PLAN REPORT									
11.1 Prepare "Draft" Final Master Plan Report (20)	0	1	0	4	\$4,680	\$1,600	\$0	\$6,280	
SUBTOTAL - ELEMENT 11	0	1	0	4	\$4,680	\$1,600	\$0	\$6,280	
ELEMENT 12 - FINAL DOCUMENTATION/MEETINGS/PUBLIC WORKSHOPS									
12.1 Prepare Final Master Plan Document (20)	0	1	0	0	\$1,320	\$1,600	\$0	\$2,920	
12.2 PAC Meetings (4)	4	4	0	0	12,480	1,600	0	\$14,080	
12.3 Public Workshop (1)	2	2	0	0	6,240	100	0	\$6,340	
12.4 Obtain Master Plan and ALP Approvals	3	3	0	4	12,720	400	0	\$13,120	
12.5 Executive Summary Brochure (500)	0	1	0	3	\$3,840	\$1,000	\$0	\$4,840	
SUBTOTAL - ELEMENT 12	9	11	0	7	\$36,600	\$3,700	\$0	\$36,460	
MASTER PLAN AND ALP UPDATE TOTAL COSTS									
	13	33	38	69	\$162,920	\$8,800	\$68,880	\$240,600	
ELEMENT 13 - OPTIONAL TASKS									
13.1 Title Search	0	0	1	0	\$1,000	\$7,500	\$0	\$8,500	
SUBTOTAL - ELEMENT 13	0	0	1	0	\$1,000	\$7,500	\$0	\$8,500	
PROJECT TOTAL WITH OPTIONALS									
	13	33	39	69	\$163,920	\$16,300	\$68,880	\$249,100	

Yellow is changes from version 1