

NORFOLK INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
SCOPE OF SERVICES

The Norfolk Airport Authority (“the Authority”) has contracted the services of CHA Consulting and its team of subconsultants to prepare a Master Plan Update (Study) for the Norfolk International Airport (ORF, or “the Airport”). This draft work program is developed consistent with the guidance provided in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. The outcome of the Study will provide planning and development guidance necessary to address landside and airside facilities and land development considerations for the next 20 years and beyond.

TASK 1: STUDY DESIGN

1.1: Project Definition and Schedule

The scope of services for the Master Plan Update will be reviewed by the Authority, the Federal Aviation Administration (FAA), and the Virginia Department of Aviation (DOAV). Following this review, the program will be further detailed and the level of effort and associated costs of accomplishing each component of this planning effort will be identified. Work activities under this task will include:

- Discussions with Authority, FAA, and DOAV staff;
- Discussions with team of subconsultants;
- Preparation of draft study design, budget, and schedule;
- Meeting with Authority, FAA, and DOAV to review draft work scope, budget, and schedule; and
- Preparation of final work program, budget, and schedule.

1.2: Organizational Meetings

Subsequent to finalizing the work program, establishing coordination procedures with the Authority and with the team of subconsultants will be required to define and clarify the mechanics of the scope of services. This is typically accomplished through a one-day set of “kick-off” meetings. All study participants will meet for a full day at the Airport. This will be followed by a meeting with the Authority, the FAA, and the DOAV to review the study organization and for a briefing on Authority requirements, identification of outside coordination points, identification of data sources, and agreement on community involvement.

1.3: Development of Master Plan Goals and Objectives

Study goals and objectives that reflect the needs and desires of the Authority will be documented. This task is critical in the development of the Master Plan Update, for it is these goals and objectives that will shape the conclusions of the overall work program. Specific issues to be addressed in the Study will be identified and prioritized. The Authority has indicated that the goals and objectives of the Master Plan Update should include, at a minimum, the following: airfield considerations with a focus on the runway/taxiway system to meet the long-term needs of ORF’s users; airfield safety and standards, such as Runway Safety Areas, Runway Protection Zones, etc.; key terminal building planning issues, such as functional, safety, security, aesthetic, sustainability, and economic concerns; land use/economic development issues, such as infrastructure, access, and use; surface access/parking considerations; environmental considerations, including air quality, stormwater management, and sustainability; and the financial viability of recommended actions. The final draft study design, including the overall methodology and goals of the study to meet the needs of the Authority in planning for the Airport will be accepted by the Authority. The FAA will review the study design to ensure it is identifying, applying, and is consistent with the appropriate federal resources and will be accepted by the FAA. Deliverables under each under each task of the work scope will be identified at the conclusion of each task description.

TASK 2: AIRPORT INVENTORY

2.1: Review Existing Planning Information and On-Going Studies

Existing reports and studies pertaining to Airport, land use, and transportation-related development will be compiled and reviewed by the Consultant Team. Such studies will provide essential background and reference information to enhance the understanding of existing and projected Airport and off-Airport development activities, as well as provide insight into relevant planning issues and constraints. Included among these previous and on-going planning efforts are the existing Airport Master Plan, on-

Airport land use and development studies, airport-related environmental studies, and other relevant planning efforts. A brief description of all recommendations, issues, or concerns presented in the various existing or on-going relevant studies will be described.

2.2: AGIS Inventory & Data Collection

The inventory and data collection effort includes a combination of survey control, aerial photography/imagery acquisition, and ground survey of runways and navigational aids (navaids) and verification of airfield facilities.

2.2.1: Imagery Acquisition

The following will be provided from the aerial photography: 12-inch color orthophotos of the conical surface area; 3-inch color orthophotos of the airport property; obstruction mapping for all VG surfaces; feature attribution data; 40-scale planimetrics of the defined airport property; one-foot contours of the defined airport property; and limited off-airport landmark planimetric mapping.

Reporting will include the FAA required Statement of Work, Imagery Plan, and Survey and Quality Control Plan. Content and format of these documents will follow the guidelines stated in the above ACs. The Consultant will identify and provide the control requirements early in the process. Control is to be surveyed in accordance with 16A and 18B specifications. In addition to the control; runway profiles, runway ends, and all Navaids are to be tied in accordance with 18B specifications. This surveys will be conducted by field crews, and will require the survey team to conduct training and obtain badges from the Authority.

The aerial photography will be completed with airborne GPS (ABGPS) control, which will be used for the base control for the geo-referencing of the aerial imagery. The Consultant will process the ABGPS data using COR stations and reference it to the project control datums:

- Horizontal: North American Datum of 1983/2007 (NAD 83/HARN), in the VA State Plane, South Zone Coordinate System in US survey feet; and
- Vertical: North American Vertical Datum of 1988 (NAVD 88) and ellipsoid heights.

2.2.2: Geodetic Control Survey

The existing Primary and Secondary Airport Control monuments (i.e., PACS and SACS) will be recovered and validated. Disturbed PACS and SACS will, with the approval of the FAA Eastern Region Airports Division, be reconstructed and positions will be determined in accordance with NGS guidelines. This reconstruction is not included in the current scope effort.

If additional or temporary geodetic control is needed, the newly installed stations will be tied to the NSRS through the NGS Online User Positioning System (OPUS). The GPS observation data will be submitted to the NGS OPUS web site for processing relative to the NSRS. The Geodetic Control Survey will follow all field, adjustment, and reporting specifications as stated in FAA AC 150/5300-16A.

At a minimum the ground control will perform the following tasks:

- The airport geodetic control validation of the existing airport PACS and SACS stations according to the guidelines established in AC 150/5300-16A;
- Obtaining all necessary ground control photo identifiable control check points required to validate the ABGPS control. The Consultant will provide information on the specific locations required to support the ABGPS control;
- Control of all the airport runway end positions;
- Collection of vertical profiles for instrument Runways 5-23 and 14-32;
- Collection of the position, elevation, and where required, the appropriate navigational aid perpendicular point of all electronic and visual navigational aids (NAVAIDS) located on the Airport and associated with any current instrument approach servicing the Airport;
- Control for any obstruction obstacles or airport planimetric features that cannot be collected by photogrammetric methods;
- Conversion of existing airport boundary data (property survey is not included in this scope);
- Complete map checks for feature attribute data and update the final map file attribution; and
- Capture of airport signage and markings (not collected from imagery).

2.2.3: Runway Data Survey

The Consultant will collect the runway end/threshold locations in the field. The GPS observations will need to be extended from the PACS and SACS. The data will be processed and adjusted using the appropriate manufacturer's software suite and verified by submitting

the data to the NGS OPUS-RS web site. Additional runway control surveys will need to be completed for the runway centerline and navigational aid abeam points using either RTK or Stop-and-Go kinematic GPS surveying techniques, and will be extended from control stations.

2.3: AGIS Development

The technical work associated with AGIS developing is described in this task.

2.3.1: Orthophoto Mapping

The Consultant will use the control solution and digital imagery to generate a digital elevation model (DEM) for the entire VG surfaces. The digital imagery will be processed into color digital orthophotos using the DEM to rectify the images. The orthophotos for the entire project will be delivered in a GeoTIFF file format on external hard drives. Reduced resolution versions will also be provided for use in planning and presentation tasks.

2.3.2: VGA Obstruction Survey

For the VGA Obstructions Surfaces production staff will satisfy the requirements of AC 150/5300-18B, Section 2.7.1.2 Analysis of Runways with Vertically Guided Operations.

The specific types and quantities of obstructions for each surface are outlined and clearly defined for the particular surface in each circular section. Any obstructions that meets the requirement of the circular, but are of a nature that elevations at the highest point of the obstruction are virtually impossible to read through photogrammetric methods (such as cell tower and electrical tower), will be identified by field survey.

The obstruction deliveries will include the off-airport landmark planimetric mapping and the airport planimetric mapping and attribution data. The attributes to be collected will be defined based on the FAA and airport requirements. The consultant will field survey feature attributions that cannot be completed by photogrammetric methods. The final data will be prepared in ArcGIS and also delivered in a format to work with AutoCAD. Feature attributes will be built into a spreadsheet (with key object identifiers).

2.3.3: Contour Development

The Consultant will develop 1-foot contours within the identified airport property boundary area, and key locations adjacent to the Airport.

2.3.4: Planimetric Mapping

The Consultant will provide planimetric mapping of the identified airport property with associated attributes.

2.3.5: Feature Extraction

The stereo compilation of the required planimetric features will be digitized using digital softcopy photogrammetric workstations. The required airport features will be collected in 3D relative to the ground control from aerial images. Control points generated during the aerotriangulation will be measured in every stereo model and adjacent models to ensure that horizontal and vertical accuracies are maintained. Any features that cannot be collected to the required accuracies will be identified and measured by field survey methods.

To verify the photogrammetry, specific features will be measured with both survey and photogrammetric methods. The surveyed positions of these features will be provided to the photogrammetrist. The positions from the survey and photogrammetry will be compared and the positional differences used to compute the spatial accuracy report (95% confidence level requirement).

2.3.6: Data Migration

Existing data will be researched and used to its fullest extents. Existing data (if available) would be obtained either directly through ORF staff or from the FAA Facility Aeronautical Data Distribution System. The existing data would only be used after it is spot checked using the initial field control surveys and verified with the remote sensing data. The remote sensing data would also be spot checked during the final airport surveys. If discrepancies are discovered between the remote sensing data and the control surveys, additional surveys would be required to resolve the discrepancy (not included in this scope).

2.3.7: Data Attributes

All collected data will be grouped and layered in accordance with the specifications defined in FAA AC 150/5300-18B. Feature attributes that cannot be determined by photogrammetric

methods will be collected from existing, verifiable documentation or by field verification methods. Data collection is performed utilizing DATEMs Summit Evolution softcopy workstations which uses MicroStation or AutoCAD as a driver. Only well trained personnel who are very knowledgeable of the 18B specifications will be assigned collection responsibilities.

Stereo models are set and collection is performed as per the 18B specifications. The planimetric and DTM data is translated to a proprietary data format where various macros are run on the data to enhance the topological structure of the data set. The data is then imported into ArcMap where rigorous checks are made for topology. Polygons and lines are refined to remove topological errors.

This data is then plotted on paper hard copies and reviewed for completeness using stereo imagery and various sources of data as a guide. The data is also super-imposed on a digital orthos and reviewed for accuracy and completeness. All edit calls are satisfied and the data once again goes through a final topology check in ArcMap. Attributes are populated to the extent possible using photogrammetric methods. The data is output to a geodatabase format and ported to a laptop. Additional attribution will be added through field inspection methods directly to this data set.

The obstruction analysis is also performed using DATEMs Summit Evolution. The Consultant team has a visual basic macro that runs within MicroStation which creates the OIS, Part 77 and other various surfaces and outputs the obstruction data to a .csv file with all required attribution. The collection routine queries the operator for required information such as measured height above ground for all manmade obstacles. A second technician will be used to confirm of the data output. The team will use a relational database that analyzes all obstruction data points collected against each AAA surface and data is sorted based on the 18B criteria for each distinct surface. This database sorts items such as highest manmade or highest natural features, most penetrating, etc.

The ARP and airport elevation are computed using the survey data provided and are checked by the editor. All Navaids are reviewed for proper positioning by superimposing them on a digital ortho. In addition, the Navaid data set is compared against all existing, published data for the Navaids to assure the data are present and are correctly identified.

2.4: Uploading to FAA Systems

At various stages in the data collection/manipulation process, data sets are submitted to the AGIS website's verification tool to ensure the data is properly structured. The Consultant team will support the Authority with each submission, as follows:

- AGIS project is created on the FAA AGIS website with assistance from ORF.
- The FAA Scope of Work (SOW) is developed and uploaded to the AGIS site. This plan must be approved prior to commencement of work on the project.
- Upon acceptance of SOW, the Imagery Plan and the Survey and QC Plan are prepared and uploaded to the AGIS website.
- Imagery data is delivered on a hard drive to FAA and documented on the AGIS website, which can be submitted upon acceptance of the plans listed above in step 3.
- Upon acceptance of the imagery data, the survey data can be uploaded; and lastly, the final report.
- The consultant will be responsible for uploading any and all data sets to the AGIS website. The consultant will follow 18B requirements for information regarding interviews and corresponding forms along with procedures for runway profiles, runway ends and Navaid field ties.

2.5: Inventory of Airport Facilities

A review of existing documents relating to the Airport and its surrounding area will be conducted including: ORF's existing Master Plan; relevant environmental studies; Airport Layout Plan and Airspace Plan; aeronautical surveys; applicable statewide aviation system planning studies; airport marketing and business plans; pertinent community plans; and recent newspaper or other media articles. Discussions will be held with airport management, local planning agencies, airport tenants and users, and other interested parties concerning airport activity and its relationship to the Airport's service area and airport needs. The existing inventory data will be analyzed for its validity in the planning exercise and will be utilized wherever appropriate. New AGIS planimetric data collected as part of this project will be used to update the inventory data as well.

2.5.1: Inventory of Airfield Facilities

A comprehensive inventory of existing airfield facilities at ORF will be conducted. This inventory effort will include a review of the 2008 ORF Master Plan. The focus of this inventory task will be to develop an updated catalog of airfield facilities, including runways, taxiways,

aprons, lighting, marking, signage, landing aids, navigational aids, runway protection zones, and modifications to standards. Information will be gathered from discussions with Authority staff and the runway rehabilitation consultant, review of existing drawings and photographs, and from limited onsite visual inspection. It is understood that this information will be provided by the Authority and will only require review by the Consultant Team.

2.5.2: Navigational Aids

The Consultant Team will review Environmental Impact Statement (EIS), Phase 1 for information on existing navigational aids. The current Airport Layout Plan and the published Standard Instrument Approach Procedures (SIAPs) will also be reviewed to identify the existing and planned airfield navigational aids. Staff will attend an on-site meeting with the FAA and the Authority to review existing and planned airfield navigational aids.

The Team will generate a summary report that documents the existing and planned airfield navigational aid facilities. This report will discuss the condition of the facilities, technical data for each facility, as well as any known site specific performance issues. Staff will also coordinate with the Airport GIS and Mapping to create an airport navigational facility reference sheet with the geographic coordinates (latitude & longitude) of the existing airfield navigational aids.

2.5.3: Existing Pavement Inventory

The Consultant Team will review ORF's current Pavement Management Plan (PMP) of the airfield and landside pavement owned and maintained by the Authority. The pavement inventory will consist of information provided in the PMP and identifying the pavement areas on the mapping prepared for the Master Plan. Close coordination between the Consultant Team and the Authority's design team for the rehabilitation of Runway 5-23 will be maintained during this task. The pavement areas will be correlated with the pavement sections and a map will be generated that identifies the extent of the pavements and their respective structural sections. A brief narrative report will be included in Working Paper No. 1 of the Master Plan.

2.5.4: Inventory of Passenger Terminal Area Facilities

The Consultant Team will review existing data and the terminal building conditions to establish an understanding of the current space utilization and operational characteristics of the

passenger terminal complex. Discussions will be held with Authority staff to document the on-going airline relocation program at ORF so that a better understanding of where each carrier's facilities will be located in the future is developed. The Consultant Team will undertake a cursory reconnaissance of the public and non-public areas of the entire terminal complex. Information on the location and usage of aircraft boarding gates, as well as hardstands and remote aircraft parking positions will be compiled. It is anticipated that the Authority will provide the Consultant Team with electronic CADD files of the ORF terminal complex, which will be supplemented by the data that is compiled by the Team's on-site inspection and on discussions with the Authority staff. The intent of this exercise is to develop an accurate and up-to-date layout plan of the terminal building as it currently exists and will ultimately exist after the airline relocation program has been completed.

2.5.5: Inventory of General Aviation and Support Facilities

A cursory desk-top inventory of the various general aviation and support facilities at ORF will be conducted. This effort will include general aviation facilities (including parking for aircraft and vehicles), air cargo facilities, military facilities, airport support facilities, and other areas not included in the aforementioned inventory tasks. It is understood that this information will be provided by the Authority and will only require review by the Consultant Team.

2.5.6: Inventory Access, Circulation, and Parking Facilities

An inventory of existing conditions will be undertaken to develop baseline information that will be used to test recommendations and alternatives. This baseline inventory will include utilization and economic information on all components on landside facilities and on discussions with the Authority staff and, as necessary, with its Landside Consultant Team.

Utilization information will include existing parking supply and demand by user groups including short term and long term public parking, rental car facilities, employee parking and commercial vehicles. In addition, information will be compiled on the existing on-airport roadway system, traffic circulation patterns, and curbside frontage and usage.

2.5.7: Inventory Other On-Airport Facilities

The purpose of this subtask will be to update the on-Airport facilities inventory to incorporate any new facilities that have been constructed or are planned to be built since the completion of the 2008 Master Plan. On-Airport aviation-related facilities, including general aviation, military,

airport support, and air cargo facilities, will be documented. Information will be obtained from existing drawings and photographs, discussions with Authority staff, discussions with other consultants working for the Authority, and limited onsite visual inspection. It is understood that this information will be provided by the Authority and will only require review by the Consultant Team.

2.6: Inventory of Operations Data

2.6.1: Inventory of Air Traffic Activity

Current data on passenger, cargo, and aircraft activities (air carrier, charter, cargo, general aviation, and military) at ORF will be collected to develop a profile of airport operations, including changes in use and levels of operations in recent years. Data sources will include but not be limited to: FAA Air Traffic Statistics; Tower Airport Statistics Handbook; Statistical Handbook of Aviation; Form 5010 and Terminal Area Forecasts; ORF's monthly and annual activity summaries; surveys of major passenger and cargo carriers at ORF, and discussions with air traffic control tower personnel. This material will include information to be obtained from the Authority, aircraft operators, and FAA records, and interviews.

2.6.2: Conduct Airfield Use Summary

An airfield use summary will be developed to identify runway and taxiway use patterns. Interviews with airline ground personnel, fixed-base operator personnel, and air traffic controllers will be conducted to establish this airfield use summary.

The following information, as available, will be collected for use in this effort: historical operations data; control tower logs; Standard Operating Procedures; airline flight schedules; and data from an electronic flight reporting service (i.e.: OAG, FlightAware, etc.). New wind and weather data for Norfolk International Airport (Station #13737) will be obtained from the National Oceanic and Atmospheric Administration for the most recent ten-year period that this information is available. This data will be utilized in developing new wind rose summaries for all weather, VFR, and IFR conditions, which will be analyzed in Task 4.

The data collected in this task will first be used to develop an inventory of operating practices and procedures at the Airport, including: all weather; visual and instrument operations; percent

occurrence of meteorological conditions; wind coverage with a series of crosswind limits; wind rose that summarizes wind coverage for each runway end; and existing runway operating configurations depending on traffic flow for both VFR and/or IFR conditions, as appropriate. Information will also be compiled with respect to aircraft circulation and taxi flows. Any constraints and/or limitations on aircraft circulation will be identified and documented. In addition, a review of the airspace environment in proximity to ORF will be conducted to determine what constraints and/or limitations surrounding airports and military facilities might have on aircraft operating procedures at ORF. These procedures and assumptions will provide the framework for the future airfield facility requirements.

2.7: Inventory of Socioeconomic, Land Use, and Community Data

Data on population, the local economy, existing land use, and land use planning and zoning regulations will be obtained for use in subsequent analyses. The primary source of the land use and population data will be the Authority, supplemented by other sources and agencies, as necessary. Socioeconomic data will be secured from Woods & Poole and will be verified with local government agencies. Information on historic resources in the study area will be obtained through the State Historic Preservation Office and local agencies. Information on local land use planning policies and regulations will be gathered through telephone interviews with local agencies.

Existing aerial photographs of the study area will also be compiled to provide a current source of land use data. The inventory of existing land uses will be developed through interpretation of aerial photographs supplemented by site visits and existing land use information from local sources, including data and maps available through local agencies.

2.8: Inventory of Airspace and Air Traffic Control Procedures

Information on the air traffic control (ATC) environment, aircraft operational procedures, airspace use, noise abatement procedures, and other operating conditions, as appropriate, will be collected for use in assessing the airspace capacity and potential conflicts in the Hampton Roads area. The primary source of this information will be the EIS, Phase 1 document. Materials describing the airspace structure and ATC procedures applicable to aircraft arriving and departing ORF will be assembled. This information will be confirmed and updated, as necessary from interviews with FAA ATCT personnel at ORF.

2.9: Inventory of Noise and Other Environmental Conditions and Concerns

The purpose of this subtask will be to collect and review information on environmental conditions and concerns for use in preliminary identification of potential Airport concepts. With Authority assistance, available studies, previous environmental analyses, reports and other documents that discuss and delineate environmental conditions at the Airport and its environs will be identified. These documents will be reviewed for factors relating to the natural environment (plant and animal life, topography, air and water quality, drainage, wetlands, historical, architectural, archaeological, and cultural resources, Section 4(f) property, threatened and endangered species, wetlands, farmland, and floodplains, etc.) and to the prevailing community environment (human settlement pattern, traffic conditions, noise levels, hazardous wastes, etc.).

It should be noted that no field work in obtaining any environmental data and information is included as a part of this task. The extent of work anticipated under this task is merely a “desk-top” review of all pertinent report, studies, and documents of environmental considerations that are pertinent to ORF and its surrounding area.

2.10: Inventory of Financial Data

The purpose of this subtask will be to inventory the current and historical financial conditions, as well as the provisions and restrictions under which the Authority operates. The current financial structure of the Authority and the capital financing used in the past will be described. The documents that govern and regulate the financial operation of the Authority will be analyzed. This information will be used in developing financing alternatives for the future development of ORF. It is understood that this information will be provided by the Authority and will only require review by the Consultant Team.

The following presents a sample of the financial information and documents that will be reviewed:

- Historical activity data for five years
- Comprehensive Annual Financial Reports for five years
- Rates and charges packages for the past five years
- Operating budget for the most recent year
- Airline agreement
- Federal grant applications and approvals
- Tenant agreements
- Bond resolution

- Outstanding debt service schedules
- Passenger Facility Charge (PFC) applications
- Any pertinent industry documents the Authority may have commissioned in the past year
- Any other pertinent data required to complete a financial feasibility unique to the Authority

2.11: Existing Airport Layout Base Map

Airport facilities will be represented on the Existing Airport Layout base map and the existing Exhibit “A” property map. New base mapping and survey information that is included in this scope of work will be utilized as the source for developing the new airport layout base maps. The most current versions of both of these base maps will be provided by the Authority and will be used for comparative purposes only. Technical personnel will meet with Authority staff to agree on the procedures for preparation of the digital records. Agreement on the materials to be digitized, the changes to be made, and the layering of the data will be discussed at that meeting. New base mapping of the airfield will be developed as a resource for this planning effort and for the future use of the Authority.

DELIVERABLE: Working Paper No. 1 will be developed at the conclusion of Task 2. This Working Paper will provide documentation (text, graphics, and plans) of the existing facilities and conditions at Norfolk International Airport and in its surrounding area. The final version of Working Paper No. 1 will comprise the Existing Facilities and Conditions section of the final Master Plan report document.

TASK 3: FORECASTS OF AVIATION DEMAND

Utilizing 2016 as the base year, new forecasts of aviation demand will be developed for the 5-, 10-, and 20-year planning horizons at ORF taking into consideration up-to-date conditions with respect to a number of variables, including, but not limited to: the dynamics of the airline industry; regional and national socioeconomic conditions; commercial service provided at other nearby airports; ground transportation; aircraft technology; etc. These new forecasts will build upon other recently-prepared projections of passenger, air cargo, general aviation, aircraft operations, and surface transportation at ORF. The on-going passenger surveys being conducted by the Authority will be utilized as means of developing passenger profiles and trends for this forecasting effort. The FAA’s Terminal Area Forecasts for ORF, in addition to other forecasts developed by the DOAV for the most recent Virginia Statewide Aviation System Plan and other recent forecasting efforts that are pertinent to ORF will be used for comparative purposes of the

specific forecasts that are prepared as a part of this work task. The following elements will be included in developing the Forecasts of Aviation Demand.

3.1: Develop Air Service Assumptions

The purpose of this effort is to develop reasonable air service scenarios to serve as the basis for projecting aviation activity for future planning horizons. Current air service investigations and marketing programs will be the primary source of information, including the ORF city-pair data that has been compiled by the Authority. Up to five forecasting scenarios will be developed and are expected to include the growth and/or decline of the following at ORF: legacy air carriers; low-cost airlines; regional carriers; impact of airline mergers/bankruptcies, and charter/international airlines.

Levels of Airport catchment area activity, including population and economic growth which affect demand (passenger, cargo and general aviation), will be identified and accounted for in the different forecast scenarios. Demographic data that has been compiled in the inventory/data collection effort will be used for this task. Estimates of passenger demand on ORF's top city-pairs will be developed for use in identifying the most viable origin-destination (O&D) points and how these O&D city-pairs might best be served. This O&D city-pair analysis will be an important tool in developing assumptions for the Master Plan Update.

3.2: Forecast Methodologies

The following FAA-approved methodologies will be used, as appropriate, to prepare the range of potential passenger enplanement forecast scenarios for ORF.

Historic Trend: A historic trend forecast is a simple time-series model that relies on extrapolating historic enplanements growth, specific to the Airport, into the future. Examining the historic growth rates and applying the historic Average Annual Growth Rate (AAGR) and projecting that growth rate throughout the forecast period provides a picture of growth should the market area and the state of the commercial passenger airline industry reflect past trends through the forecast period. For the historic trend scenario, the historic data will be pulled directly from Authority-provided records for the years 2008 – 2016, and projected forward through the forecast horizon.

Adjusted Market Share: A static market share forecast would assume that ORF will maintain its 2016 level of commercial enplanements and operations relative to current and forecast national activity throughout the planning period. A market share forecast essentially applies nationally and statewide

forecast growth rates to airport-specific market areas, assuming that ORF retains its current ratio (i.e., market share) of national and statewide enplanements through the forecast period. This methodology uses a reliable, larger aggregate forecast to derive forecasts for the Airport based on the assumption of a constant future share.

Regression Analysis Forecasts: A regression-based forecast examines aviation and passenger activity through the prism of current and historic activity levels, and seeks to find a relationship between the activity levels and the socioeconomic conditions prevalent during that time period. Causal relationships between population, employment, and income are examined to determine if there is a statistically valid relationship correlation that may assist in projecting future activity. The first step is to conduct a regression analysis to determine if there is a relationship between any of the socioeconomic factors (i.e., population, employment, and income) and the historic level of enplanements. The output of a regression analysis is the “coefficient of determination”, or R2, which ranges from 0 to 1.0. If the R2 of an analysis is a 0.8 or higher, there is a statistical correlation. In other words, the higher the R2 value, the stronger the correlation is between the two variables.

Time-Series Extrapolation: Time-series extrapolation, which is also known as linear regression or least squares, is based solely on historic trends. Because of the peaks and valleys that are inherent in historical activity levels, typically two linear regression analyses are conducted; one based on a longer view of the historical activity; and the other based on a shorter, more compressed period of time. The reasons for analyzing both sets of historical data are two-fold: 1) this methodology develops a straight-line growth trend based on past patterns; and 2) it takes into account any downward trends that were experienced during the Airport’s history.

3.3: Forecast Passenger and Commercial Carrier Operations

The Consultant Team will consider several varying growth scenarios using “trigger-point” activity levels. This approach will allow the Authority to have the greatest amount of flexibility in its overall development program and in its ability to carefully monitor what improvements may be needed and when. The baseline scenario will be derived from the most logical future growth scenario and extended through the 20-year planning horizon.

Forecasts for enplanements and commercial air carrier operations will reflect projected national (if a correlation is evident) and regional economic conditions, airline service levels, future fleet mix requirements, federal requirements, hubbing characteristics, and service by low-cost, scheduled charter,

international, and regional airlines. It will also utilize the demographic data that was obtained in Task 2.6. Standard forecasting methodologies, as discussed in Task 3.2, will be used in combination with judgmental assessments based mainly on discussions with the air carriers currently serving ORF and on air service assumptions developed in Task 3.1.

Direct input will be sought from commercial air carriers operating in the Norfolk market in order to gain any relevant insight on current and planned operations, market conditions, and/or constraints that may have an impact on the forecast assumptions or eventual enplanement and operations projections. Typically, air carriers are not willing to document their air service plans in a specific market in writing, but every attempt will be made to secure some form of commitment on future air service plans from each air carrier that is currently serving or plans to establish service at ORF.

3.4: Anticipated Commercial Carrier Fleet Mix

Derivative forecasts of aircraft departures, operations, seat departures, and fleet mix will be developed based on the enplanement forecasts and assumptions on aircraft size. Load factors will also be derived in this exercise. Future shifts in aircraft type and size will be based on individual air carrier current and projected fleets (aircraft type), and the requirement to meet forecasted enplanements, operations frequency, origin and destination pairs (destinations served), and target load factors. The air carriers serving ORF will be contacted to provide input on planned changes in their aircraft fleet mix at the Airport.

3.5: Forecast of Air Cargo Activity

A general overview of the air cargo industry will be provided in order to describe the environment and business conditions that affect the air cargo carriers and freight forwarders that currently, or have the potential to, use ORF for air cargo operations. This task is intended to evaluate the changing local, national, and global marketplace as a result of technological, economic, and competitive forces. Overall trends in the air cargo industry, including express cargo and freight, will be investigated. Factors to be examined will include the following:

- Industry consolidation
- Modal shift
- Lean manufacturing trends (Just-in-Time)
- International versus domestic growth
- Security requirements and impacts

The air cargo assets of ORF will be documented and described, current air cargo carriers and forwarders serving the Norfolk market will be identified, and current and historic operations and volume will be documented and described. Drawing data from the inventory section, as well as Airport operations data and national air cargo data sources, this task will provide the essential information and framework necessary for the air cargo activity forecast. A forecast of air cargo volume (enplaned and deplaned), number of operations, and cargo carrier fleet mix will be provided.

Two forecast scenarios for air cargo operations and volume will be presented; a baseline forecast and a high-growth scenario. The baseline scenario will be derived from the most reasonable forecast demand level and extended through the 20-year planning horizon. A second forecast scenario will be developed to provide the Airport with a reliable range of growth possibilities that accurately reflect current and projected local and national market conditions, markets area econometrics (demographic and economic conditions), and air cargo industry conditions. The following data will be used in the formulation of the ORF air cargo forecast scenarios:

- Historic Airport reported activity data
- Bureau of Transportation Statistics - T-100 data
- 2015 Boeing World Air Cargo Forecast
- 2015 FAA Aerospace Forecast

In addition to the above listed information, direct input will be sought from the integrated express carriers and freight forwarders operating in the Norfolk market in order to gain any relevant insight on current and planned operations, market conditions, and/or constraints that may have an impact on the forecast assumptions or eventual operations and volume projections.

3.6: Forecast of General Aviation Activity

The baseline general aviation activity forecast may be derived from previous forecasting efforts of general aviation activity at ORF, if they are proven to be valid. If they are, these projections will be extended through the 20-year planning horizon. Annual general aviation based aircraft and operations for ORF will be presented by the following aircraft type:

- Single-Engine Piston
- Multi-Engine Piston

- Turbo-Prop
- Jet
- Rotor

Historical aviation activity will be analyzed and the potential effects of recent changes, such as growth in corporate aviation, the increasing popularity of fractional aircraft ownership, and other recent trends in general aviation, will be evaluated. Forecasts will reflect projected national (if appropriate) and regional general aviation conditions. System development, including the potential use of other airports in the general aviation study area, will be considered and a most probable scenario will be identified, working closely with Authority staff.

3.7: Forecast of Military Aviation Activity

The baseline military aviation activity forecast will be derived from the current level of military activity performed at ORF and extended through the 20-year planning horizon. Itinerant military operations will be based on ATC tower reported operations and supplemented by Fixed-Base Operator (FBO) reported military operations (e.g., fueling records).

3.8: Identify and Summarize Preferred Forecast Scenario

Working closely with Authority staff, the Consultant Team will summarize and evaluate the different forecast scenarios for each operation type (passenger, cargo, general aviation, military), and arrive at the Preferred Forecast Scenario. This scenario will be used for the primary calculations of facility requirements, with the range of the other scenarios used to evaluate the extent of flexibility which must be built into subsequent plan development. The Consultant Team will strive to accommodate uncertainty in forecasts by developing alternative scenarios, which assume a variety of critical assumptions based on local ORF-specific considerations and within the base case forecasting framework.

3.9: Identify Peak Activity and Critical Aircraft

Annual, busy-day, and peak-hour passenger and aircraft activity levels for air carriers will be forecasted. Peak activity forecast will be derived from the Authority historical records on passenger and aircraft operational activity and will be based on the Average Day of the Peak Month (ADPM). These peaking assumptions will be extended through the 20-year planning horizon. Data obtained from the Authority and air carriers operating at ORF will be used to identify schedule peaks during a normal day of operations.

Peak-hour enplanement data will be used to establish the terminal and ancillary support facility planning requirements; peak operations will be used to establish airfield and terminal ramp requirements.

Using existing and forecasted operations aligned with the current and anticipated fleet mix (for passenger carrier, cargo carrier, and military operations), the critical aircraft to be used for airfield design standards will be identified for both, existing and future conditions.

3.10: Forecast of Surface Transportation Activity

The purpose of this subtask will be to define the landside activity levels which will result from the forecast growth in air passenger activity. The incremental growth in originating and terminating air passenger activity for each of the horizon years will be used as the basis for developing projections of surface transportation and parking activity demands. Using techniques established by the Consultant Team and the Authority's Landside Consultant, as well as nationally accepted procedures, the growth in vehicular traffic in and out of the Airport, and traffic at key locations as well as curb side activity, will be forecasted. The procedures will recognize that not all modes or components will increase at the same rate, making allowance for the differences in available reserve capacity among the different modes. In addition to vehicular activity and the growth in curb side activity, the growth in both rental car usage and parking - including hourly, daily, remote/economy, and employee - will also be projected. In order to provide realistic and accurate data on existing surface transportation activity, the Authority will be responsible for providing traffic counts at several critical points in ORF's vehicular roadway circulation system.

3.11: Forecast Review

The forecast horizon years will include 2022, 2027, 2032, and 2037. A preliminary forecast of all components covering the 20-year planning period will be prepared for Authority review. The forecasts will then be revised, if necessary, and transmitted to the FAA and DOAV for their review and approval. The forecast section will provide tables and graphics that depict the various forecast scenarios and the Terminal Area Forecast for comparative purposes to facilitate the review by the FAA and DOAV of the Master Plan forecasts. Following FAA and DOAV approval, the final forecast will be prepared.

DELIVERABLE: Working Paper No. 2 will provide a discussion of all of the work associated with developing the forecasts of aviation demand. It will include detailed text, tables, and graphs, as necessary, to readily illustrate the analyses that were performed and the conclusions that were derived. It will also facilitate review and approval by all interested agencies, including the Authority, the FAA, and the DOAV. The final version of Working Paper No. 2 will comprise the forecasting section of the final Master Plan report document.

TASK 4: DEMAND/CAPACITY ANALYSIS AND FACILITY REQUIREMENTS

4.1: Determine Airfield Requirements

4.1.1: Airfield Capacity and Delay

This subtask includes an evaluation of airfield capacity and associated aircraft delay, in consideration of airspace constraints, air traffic management procedures, airfield configuration, including runway orientation, parallel taxiways and exit taxiways, weather conditions, aircraft fleet mix, and aviation demand forecasts. This effort will include the use of Airport Cooperative Research Program (ACRP), *Evaluating Airfield Capacity*, Report 79 worksheet for determination of airfield capacity, include hourly capacity under visual and instrument meteorological conditions (VMC & IMC) and Annual Service Volume (ASV).

Report 79 includes guidance on selecting an appropriate capacity analysis method, including best practices in assessing existing and future airfield capacity based on airfield configuration, individual airfield components, and operational characteristics. The provided capacity spreadsheet models are designed as a planning tool with the flexibility to change input assumptions to represent site-specific conditions. It is not anticipated that use of advanced simulation modeling tools will be needed for this study.

The result of the assessment will be expressed in terms of hourly and ASV of the airfield, minutes of delay per aircraft operation, and total estimated annual delay, as appropriate. This assessment will evaluate the existing airfield configuration in terms of its adequacy to meet the anticipated operational demand in the baseline forecast and future planning levels, as well as the design group and approach categories of aircraft forecast to operate at ORF. This review will consider up to eight (8) separate alternative airfield improvement scenarios.

To support this effort, this task will include meetings and interview with local Air Traffic Control Tower (ATCT) and Terminal Radar Approach Control (TRACON) facility personnel to discuss operational configurations, runway end use percentages (during both VMC and IMC) validations of hourly capacity, including comparisons to existing arrival and departure called rates, and key areas of delays (i.e., choke points). Airspace issues will also be identified with ATCT personnel,

who have expressed concerns with the Runway 14-32 approach & departure routes due to airspace conflicts with nearby airports.

The results of this analysis will be compared to that using FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, Chapter 3, Airport Capacity and Aircraft Delay Calculations. Differences in the findings and local considerations will be documented. Local ATCT personnel will be asked to review and comment on the task findings, particularly as related to hourly capacity by configuration.

4.1.2: Runway Requirements

Based on the airport activity forecasts (Task 3), the existing and future “critical” aircraft in terms of runway length, strength, or clearance requirements will be identified for the primary and any secondary or crosswind runway. The design or critical aircraft is the model (or models) conducting and anticipated to conduct over 500 annual itinerant operations. This analysis will include “trigger point” milestones of projected activity levels that will help facilitate when certain runway requirements may be needed during the planning horizon.

The identified critical aircraft will be defined by the Aircraft Approach Category (AAC) and Airplane Design Group (ADG) to determine the Airport Reference Code (ARC) for the Airport as a whole (e.g., ARC D-IV for a Boeing 767). Additionally, the lowest justified visibility minimum will be identified in terms of Runway Visibility Range (RVR), to determine the Runway Design Code (RDC) for the primary, and any other runways identified (e.g., D-IV-2400). The runway design categories will be used throughout the remaining study tasks.

Consideration will be given to capacity, safety, and airfield reliability issues that are relevant to the continual operation of the airfield at ORF, while recognizing that the Authority’s goals regarding airfield reliability may not necessarily meet applicable FAA criteria for runway justification. Other requirements to be addressed include the runway width, strength, condition, and clearances from taxiways and structures. Runway Safety Area (RSA) standards will be reviewed, including grades, and available FAA RSA determinations.

Specific airfield considerations to be addressed include the following:

- Need for primary, secondary, and/or crosswind runways based on activity, crosswinds, airspace environment, segregation of airports user groups, and/or other factors if deemed reasonable (e.g., safety and reliability)

- Ability of aircraft needing crosswind coverage to be accommodated on the wider primary runway
- Evaluation of Runway 14-32 to serve as an ARC C-III or a B-II runway
- Cost/Benefit Analysis of Reconstructing vs. Closing Runway 14-32
- Timing and Phasing of Long-Term Reconstruction of Runway 5-23
- Improvements to Airfield Geometry to Meet FAA RIM Guidelines and all FAA Design Standards
- Review of Existing Modifications to FAA Standards
- Impact of Next Gen on Aircraft Operations and Procedures

4.1.3: Runway Length Requirements

The required runway length will be evaluated in this subtask for the “critical” aircraft of each runway identified or recommended for ORF. Runway length requirements will be determined for existing and forecast aircraft, calculated at 90 percent or maximum payloads for current stage lengths with substantive use, and anticipated destinations per the activity forecasts. The runway length evaluation will use the guidance of FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*, but supplemented with detailed information from aircraft manufacturer manuals, per Chapter 4 of the referenced AC.

The analysis will include both, aircraft used for air carrier and air cargo service, and thus will include existing aircraft in use at ORF (e.g., Boeing 737, 757, 767, Airbus A300/310, A320), as well as potential future models and derivatives (e.g., Boeing 787, Airbus A330), as applicable.

While numerous close-in trees/objects are present at ORF (as published in the airport data), the FAA has not published special takeoff minimums or obstacle departure procedures. As such, existing objects are not likely to impact departure performance. Nevertheless, discussions with ATCT personnel and airlines serving the Airport (to the extent possible) will be considered in the runway length evaluation. In addition, the wind and weather data obtained for ORF will be analyzed as a part of this task for their effect on runway length requirements. The identified runway length requirements will be compared to existing conditions to identify any deficiencies.

4.1.4: Runway Protection Zone (RPZ) Requirements

Existing and potential land uses within the RPZs will be evaluated in this subtask following the FAA's *Interim Guidance on Land Uses Within a Runway Protection Zones*, (memorandum dated September 27, 2012). This review will include the traditional evaluation for RPZ prohibited activities such as residences or any facility associated with the congregation of people. However, an additional examination will include review for the land uses listed in the memorandum for special consideration, including:

- All buildings, structures, and above ground infrastructure
- Recreational activities
- Transportation facilities
- Fuel storage and hazardous materials
- Wastewater treatment facilities

For any such land uses, the master plan activities will include coordination with the FAA Eastern Region, Washington ADO, as well as the FAA National Airport Planning and Environmental Division (APP-400). It is anticipated that this coordination can be conducted as part of other study meetings, or via teleconference. For any potential prohibited land uses that are proposed for the RPZ, or planned to remain in the RPZ, the review will include an explanation, justification, and/or initial feasibility assessment for review by the appropriate FAA offices.

The deliverables will include a list of all potential non-compatible land uses in each RPZ, the findings from the coordination with the various FAA offices, and recommendations.

4.1.5: Modification to FAA Design Standards Evaluation

The Consultant Team will evaluate the runways with respect to FAA design standards, including any existing approved modifications to design standards, and/or need for modifications. Recent changes to FAA AC 150/5300-13A include new standards for runway and taxiway intersection configurations and horizontal turn geometry. The Consultant Team will evaluate all airfield intersections between runways, taxiways, and aprons, as well as any identified hot spots and line-of-sight conditions. Deficiencies may include direct apron-runway access, end-around taxiway layout, four and five node intersections, surplus pavement areas, and other potentially ambiguous configurations that may increase the potential for runway incursions. The review will include all

locations within the Airfield Operations Area (AOA); deficiencies will be identified and documented.

This review will include a specific evaluation of the following:

- Runway standards (RSA, ROFA, OFZ, and RVZ)
- Runway width, gradients (transverse and longitudinal), and vertical curves
- Runway offsets (to runways, taxiways, taxi-lanes, and fixed or movable objects)
- Runway geometry, configuration, and intersections

Typical required geometry for the design aircraft (e.g., fillets, turn radii, etc.) will be illustrated with appropriate diagrams and compared to existing conditions. The deliverables will include a list of potential runway upgrades and/or modifications to FAA design standards for presentation, review, and comment.

Coordination on this subject will involve the airport operations staff, air traffic control, and FAA personnel. The outcome will be incorporated into the Airport Layout Plan (ALP) Drawing Set.

4.1.6: Taxiway Requirements

Taxiway requirements will include consideration of for following:

- Determination of the Taxiway Design Group (TDG) for the design aircraft
- Optimal location and requirements for operational safety and efficiency
- FAA design standards and requirements

The undercarriage dimension of the critical aircraft will be used to define the TDG, per FAA Advisory Circular 150/5300-13A. The key undercarriage components include the cockpit-to-main-gear distance and the main gear width. The TDG ranges from 1A to 7, and is used to determine the requirements for taxiway width, fillet standards, and separation requirements. For the ORF Master Plan, the TDG will be determined for the existing and forecast critical aircraft and existing and proposed taxiways.

For optimal safety and efficiency, taxiway configurations may include full parallel taxiways, dual-parallel taxiway/taxilanes, end-around taxiways, and other configurations that prevent aircraft

crossings of the active runway, directional conflicts (blockages), and tower line-of-sight issues. This subtask will include identification of any such shortfalls or safety deficiencies that should be addressed in the airport development alternatives. New, relocated, and supplemental taxiway systems can be a large component of the airfield capital plan; thus, requirements will be reviewed in detail. The evaluation will include coordination and review by airport operations personnel and ATC (similar to the runway evaluation).

Recent changes to FAA AC 150/5300-13A include new standards for taxiway intersection configurations and horizontal turn geometry. The Consultant Team will evaluate these requirements for intersections with other taxiways, taxilanes, and aprons. Deficiencies may include multi-node intersections, surplus pavement areas, and other ambiguous configurations that may increase the potential for pilot disorientation. The review will include all locations within the Airfield Operations Area (AOA), but excludes any private lease hold areas. Based on this analysis, deficiencies will be identified and documented. As the design aircraft for taxiways and aprons vary for air carrier, air cargo, military, and general aviation facilities, the required geometry (e.g., fillets, turn radii, etc.) for various aircraft will be illustrated with diagrams and compared to existing conditions.

4.1.7: Airfield Lighting Systems

The purpose of this subtask will be to examine the adequacy of the existing airfield lighting facilities to accommodate current and forecast levels of demand. Eligibility and FAA requirements will be employed to list the lighting requirements, existing facilities, and identified deficiencies. The potential for LED lighting and other new technology will also be addressed.

Items to be considered include:

- Runway and taxiway edge lighting
- Runway centerline lighting
- PAPI, REIL, and Threshold Lighting
- Runway Guard Lights

4.1.8: Apron Requirements

The purpose of this subtask will be to examine the adequacy of the existing apron areas to accommodate current and forecast fleet mix and levels of demand. The size, strength, and

condition of the apron areas will be addressed and additional/replacement facilities will be determined and reviewed with Authority staff. This effort will include areas for the passage of aircraft in the terminal area as well as air cargo area. Consideration will include:

- Taxi-lanes and lead-in offsets
- On-apron service roads
- Deicing areas
- Locations for service equipment

The review of apron facilities requirements will be integrated with the terminal area requirements of Task 4.2.

4.1.9: Identify Navigational and Landing Aid Requirements

The purpose of this subtask will be to examine the adequacy of the existing navigational and landing aid facilities to accommodate current and forecast levels of demand. The purpose of this analysis is to identify a means of reducing ORF's operating minimums to enhance the Airport's usability during inclement weather conditions. The existing complement of navigational and landing aid facilities and their adequacy and reliability will be reviewed. Additional/replacement facilities will be determined. The impact of new technology on airfield operations and navigational aid requirements will also be analyzed. Facility requirement considerations will include the following existing and future systems:

- Instrument Approach Systems (ILS localizers, glide slopes, RNAV, etc.)
- Runway Visibility Range (RVR) equipment
- Marker beacons
- Approach Lighting Systems (MALSR, ALSF-2)
- Touchdown Zone Lighting
- Approach Surveillance Radar (ASR)

In addition to review existing Airport base maps, topographic and property drawings, the Consultant Team will review available FAA as-built drawings for the ORF VORTAC facility to determine potential candidate relocation sites.

Based upon this information and the current Master Plan analysis, the Consultant Team will use FAA Order 6820.10 VOR, VOR/DME and VORTAC Siting Criteria to develop three (3) candidate sites for the equipment relocation. Each site will be developed and evaluated based on the following general considerations:

- Surrounding topography
- Property ownership and acquisition, if necessary
- Location of current and planned infrastructure and utilities (access, power, telephone)
- FAR Part 77, Airfield Design Standards, and VORTAC clear zone requirements
- VORTAC coverage requirements
- Potential multipath reflection assessment
- Soil conditions for the building and counterpoise
- Zoning requirements for the area around the equipment, if applicable

The Consultant Team will attend an on-site meeting with the Authority, FAA, and DOD to review each of the candidate equipment locations and obtain their input. This trip will also be used to visit the current VORTAC site and assess the condition of the existing VORTAC equipment and shelter to discuss possible replacement/relocation options and desires.

Based on this meeting comments, the Consultant Team will perform preliminary engineering for each of the candidate VORTAC sites and develop budgetary cost estimates and potential advantages/disadvantages for each site. As a result of this effort, the Consultant Team will recommend a proposed location for the VORTAC to be included as a part of the Master Plan Update.

4.2: Determine Gate and Terminal Space Requirements

4.2.1: Develop Terminal Goals and Objectives

The Consultant Team will ascertain the future terminal development goals and objectives at ORF and will become familiar with the preferred direction and guidelines established by the Authority for future terminal development.

4.2.2: Review Existing Terminal Planning Information and On-Going Terminal Studies

The Consultant Team will review all forecast data, updated annual and peak hour passenger enplanements and deplanements, peak hour aircraft operations, and aircraft fleet mix for forecast periods of 2022, 2027, and 2037. Forecast data will be provide for three scenarios; Baseline, Low-Growth, and High-Growth. Consideration will also be afforded to the on-going passenger security screening improvement project at ORF.

4.2.3: Develop Programmatic Requirements

Utilizing the forecast data as described in 4.2.2, the Consultant Team will develop general terminal space programs for each forecast period and for each scenario. The program analysis will provide space requirements for the following functional areas:

- Airline Support Functions
- CBP/FIS Facilities
- Secured Public Areas
- Concessions
- Service Animal Relief Areas
- Non-Secured Public Areas
- Non-Public Areas

This task will result in nine terminal space programs for the planning periods 2022, 2027 and 2037 for baseline, low-growth, and high-growth forecasts. These scenarios will be based on “trigger-point” milestones for each of the above terminal components so that the Authority can monitor activity levels and determine when certain facilities might be needed.

4.3: Determine Support Facility Requirements

An analysis of the current general aviation facilities, air cargo facilities, TSA cargo screening facilities, ultimate location of fuel farm facilities, future Aircraft Rescue and Firefighting (ARFF) facilities, hangar space, helicopter landing areas, and other aviation facilities will be made with respect to the service level provided for current operations. Based on collected inventory information and on interviews with users, planning factors for each facility will then be derived. Using forecasts derived for various aviation segments, future requirements for the individual facilities will be determined and compared to the size of facilities currently provided, with the shortcomings of each type of facility documented.

4.4: Determine Surface Transportation and Parking Requirements

Projections of future landside requirements will be based on projected growth in enplanements. Landside requirements will be based on existing curbside, parking, and rental car ratios related to enplanements. It should be noted that this analysis will assume that the existing rental car return lot will be relocated to the second level of Garage A. Milestones or trigger points will be recommended that describe actions to be taken necessary to accommodate future growth. Future requirements will address the following requirements:

- Short Term Public Parking
- Long Term Public Parking
- Rental Car Ready and Return Car Parking (CONRAC with QTA facility)
- Rental Car Vehicle Storage and Maintenance Facilities
- Employee Parking
- Access Roadways and Circulation
- Cashier Plaza Requirements
- Commercial Vehicle Requirements
- TNC Staging Area
- Curbside Circulation and Capacity
- Curbside Management Plan for Public Vehicles, TNCs, Taxis, Limos, & Courtesy Shuttles
- Light Rail Route from Military Highway

DELIVERABLE: Working Paper No. 3 will provide documentation on the findings of Task 4. It will include text, tables, and graphics, as necessary, to clearly describe the work effort. The final version of Working Paper No. 3 will comprise the forecasting section of the final Master Plan report document.

TASK 5: AIRPORT DEVELOPMENT CONCEPTS

In this task, the Consultant Team will establish the approach and criteria for evaluating Airport development concepts in a working session with the Authority for the airfield, terminal area, ground access, land use, and general aviation components of the Airport.

In working with the Authority, FAA, DOAV, and the Technical Advisory Committee, each of the evaluation factors identified in the subtasks below will be weighted with respect to their importance in achieving the goals and objectives of the overall development program and initiatives. An evaluation matrix will be

developed that will incorporate each of the factors and their assigned weighting. A scoring system will be developed that takes into consideration how each factor satisfies the goals and objectives of the Authority's development program.

5.1: Airfield Improvement Concepts

The purpose of this subtask is to identify and evaluate potential runway and taxiway improvements that will improve the overall capacity, efficiency, reliability, and safety of the airfield. It will also consider aircraft flows between the runway system and the various functional areas (terminal, air cargo, general aviation, military, etc.). Preliminary airfield concepts addressing runway and taxiway requirements will be developed. Schematic concept drawings and narrative descriptions will be provided for each concept. Runway and taxiway concepts will be screened through qualitative analyses of the following:

- Construction and operating costs;
- Spatial organization;
- Technological and operational changes;
- Construction impacts, including ease of phasing and construction;
- Airfield delays and other operational factors; and
- Environmental impacts.
- Operational benefit
- Capacity, Safety, and Reliability considerations
- Airspace considerations
- Environmental considerations
- Implementation costs/feasibility
- Community acceptance

After the evaluation criteria have been approved by the Authority, the Consultant Team will determine the proper weighting for each of the criteria (i.e., setting priorities for each of the criteria). Each alternative design concept will be evaluated by the criteria. The result of this evaluation will be the selection of the recommended general airfield concept design solution. Three alternative concept design solutions that satisfy all requirements to measure each alternative concept design solution, and one Preferred Concept Design Solution, will be evaluated. An order-of-magnitude construction cost estimate will be developed. The output of this analysis will be a recommended airfield layout for the existing airfield (runway and taxiway system) at the Airport.

5.2: Passenger Terminal Concepts

Utilizing the terminal space programs developed in Task 4.2, the Consultant Team will develop a broad range of concept alternatives (up to three concept design alternatives) for the future development of the terminal complex. The alternatives will require the Consultant Team to investigate a range of options for the terminal layout plan. The design concepts will be developed to:

- Satisfy the terminal space programs based on the forecasted passenger volumes;
- Provide terminal plans that offer operational flexibility, including possible increases security requirements;
- Accommodate future expansion of the terminal complex;
- Incorporate future technological improvements associated with airline and terminal operations;
- Incorporate sustainable architectural design;
- Accommodate other on-going ORF projects;
- Construction and operating costs;
- Spatial organization;
- Flexibility to accommodate future demand fluctuations in the terminal area;
- Technological and operational changes;
- Comfort and convenience of passengers in the terminal area;
- Availability and location of public parking;
- Construction impacts, including ease of phasing and construction;
- Level of concessions to maximize revenues; and
- Opportunities which are created for aviation-related, revenue-producing developments on airport property.

After the evaluation criteria have been approved by the Authority, the Consultant Team will determine the proper weighting for each of the criteria (i.e., setting priorities for each of the criteria). Each alternative design concept will be evaluated by the criteria. The result of this evaluation will be the selection of the recommended general terminal concept design solution. Three alternative concept design solutions that satisfy all requirements to measure each alternative concept design solution, and one Preferred Concept Design Solution, will be evaluated. An order-of-magnitude construction cost estimate will be developed.

5.3: Integrate General Aviation and Support Facility Concepts

The purpose of this subtask will be to add aviation-related support functions to the preferred terminal concept. Conceptual layouts of general locations, sizes, and configurations of general aviation, air cargo, military, support facilities, etc. will be developed. The layouts will reflect the projected facility requirements as well as opportunities for other development, consistent with the goals and objectives (aircraft maintenance, air cargo, aviation-related manufacturing, for example) established in Task 1.

5.4: Existing Land Use Review

The Consultant Team will complete an existing land use study for land within the planning area and adjacent lands. Using current data, aerial photography analyses, and site investigations, general land use areas will be classified, and the amount of land devoted to each of the land use categories will be quantified. This review will also identify any existing and proposed land use regulations that could impact development of on and near the Airport. This could include municipal zoning regulations, Airport development standards, and private covenants.

The Consultant Team will identify deficiencies and/or surpluses in the amount of developable land for each land use category, and prepare projections of future land use needs by general category based on population and employment projections. Utilizing a highest and best use analysis, the needs, assets, liabilities and operating characteristics for both existing and emerging industries whose presence at the Airport would be desirable will be identified.

The Consultant Team will prepare two conceptual land use plans based on the established goals and objectives. The conceptual land use plans will have generalized recommendations for the study area, regarding the development of land uses, future expansion, design features such as entrances and gateways, and general planning principles. Concepts will be presented to the Authority for review. The objective of this profile is to determine the mix of land uses that best optimizes total revenue and return on investment, providing for the integration of the Strategic Plan and associated development program within the region, in terms of both physical and fiscal impact, and at the same time retaining the flexibility required by the Authority to respond to future redevelopment opportunities. Additionally, areas to be protected, preserved and improved will be noted on the concept diagram. Notes will be incorporated into the concept design to highlight development opportunities that require or will be significantly enhanced by airfield access or immediate proximity to service or maintenance operations on the Airport.

5.5: Ground Access and Parking Concepts

For this subtask, the general feasibility and potential benefits of alternative ground access, curbside, parking, and rental car options will be evaluated. This task will review currently proposed access improvements and compare them to optimal curbside and access alternatives for the existing terminal area and other developed areas on the Airport. An important component of this task will be to assess a variety of vehicular parking concepts, including on-site structures, on-airport remote parking, and other potentially viable options. The purpose of this subtask will be to evaluate these options, and to make an initial assessment of the feasibility and desirability of each. The analysis will address:

- General description of the project, with potential alignments;
- Order-of-magnitude costs;
- Impact on revenue and operating expenses;
- Potential funding sources and assessment of probability of funding being available;
- Identification of customer service benefits (e.g., travel time, user cost, convenience);
- Implementation and phasing factors;
- Non-Airport traffic impacts;
- Construction and operating costs;
- Spatial organization;
- Flexibility to accommodate future demand fluctuations in the terminal area;
- Technological and operational changes;
- Availability and location of public parking;
- Ground access system support;
- Driving distances and times;
- Construction impacts, including ease of phasing and construction; and
- Environmental impacts.

A determination will be made with Authority staff as to which of these improvements will be included as integral components of the overall airport development program. Access and circulation needs will also be evaluated for areas outside the terminal area.

5.6: Environmental Analysis

The overall objective of this task is to conduct an environmental overview to identify any potential problem areas during the alternatives screening analysis on or near ORF. The environmental overview will consider the full range of typical environmental concerns associated with the development of the

Airport and identify those which may warrant further analysis. Previous environmental evaluations conducted for ORF will be utilized to the greatest extent possible. The entire range of potential environmental concerns identified in FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects* and FAA Order 1050.1F: *Environmental Impacts: Policies & Procedures* will be considered.

All projects recommended in the first five years of the planning horizon will be identified as being “Categorically Excluded” or in need of further evaluation in compliance with NEPA. If further analysis is indicated, the Consultant Team will identify the necessary steps and agency coordination that is required as part of this environmental review process.

5.7: Final Concept Development

The purpose of this subtask will be to evaluate each Airport development concept to guide the selection of a preferred concept for the Airport’s recommended improvement program. The intent of the development of the final concept is to identify the best means of achieving the goals and objectives of the Authority as stated in Task 1.3 and on other important factors that surface during the planning process. General factors in evaluating airside and landside components will include, overall passenger convenience, optimal use of available Airport land, order-of-magnitude construction and operating costs, engineering feasibility, ease of phasing and construction, and environmental factors. Additionally, airside factors will include taxi times and delays, safety, and air traffic control factors, including visibility of pavements from the air traffic control tower. Landside factors will include flexibility to accommodate future fluctuations in demand and changes in airline operations, comfort and passenger convenience (e.g., connection with surface transportation systems), and regional access and travel times. The opportunities for development of both aviation-related and other commercial revenue-producing investments on the Airport will be a major consideration in this evaluation.

The final evaluation process will include two meetings with the Authority, FAA, and DOAV. The first meeting will be to agree on criteria, and the second meeting will be to review preliminary analysis and to identify where additional work is needed. Final evaluations will be conducted in accordance with the agreed procedure and will reflect input from the Authority staff. Evaluation factors will be finalized and the final evaluation process implemented. The output of this subtask will be a recommended Airport development concept.

5.8: Refinement of Preferred Development Concept

The purpose of this subtask will be to adjust the Airport development concept selected in Task 5 to reflect comments from previous Working Papers and to incorporate findings of the refined financial analysis in the subsequent task. The output of this subtask will be an adjusted development concept for use as the basis for preparing the ALP and other Master Plan drawings.

5.8.1: Alternative Development Overlays

This task will focus on the establishment of development areas. For each area, a preferred development plan will be identified based on the baseline forecast. Additionally, up to two contingency options will be developed for each area, in the event that a demand for particular market segment evolves more quickly than assumed in the baseline forecast. To the extent possible, the preferred development plan and the contingency options will share common infrastructure plans to gain the best return on these investments.

5.8.2: Multiple Scenario and Alternative Development Overlays

While the facilities recommended in this Study should ideally result in a single, fixed development path, actual market conditions will make this highly unlikely. As one area is developed due to an immediate need, the Master Plan Update would logically have to change to accommodate the displaced area. A “multiple scenario” methodology is recommended to prepare the Authority for addressing these potential variations. A development program will be identified that meets anticipated demands but preserves for the Authority a range of options should actual demand require different development in a specific area. A multiple-scenario format will be designed to assist the Authority in making future development decisions. This multiple scenario approach will graphically integrate all potential airport projects and identify interrelationships between project types.

DELIVERABLE: Working Paper No. 4 will provide details on the work accomplished under Task 5. It will include text discussions, tables, and graphics, as necessary, to clearly describe how the findings were determined. The final version of Working Paper No. 4 will comprise the forecasting section of the final Master Plan report document.

TASK 6: SUSTAINABILITY MANAGEMENT PLAN

6.1: Sustainability

Although there is a perception that sustainability planning is costly to administer and implement, applying the “EONS” approach during the master planning process can ensure the long-term viability of ORF. As part of this task, a sustainability evaluation will be performed. To incorporate sustainability practices into the overall master planning process, the consultant team will work with ORF staff to establish a plan of both short-term and long-term goals that are included throughout the scope of this Master Plan Update. The Statewide Sustainability Plan that was recently completed by the Virginia Department of Aviation (DOAV) will be used as a starting point to help establish goals, objectives, and guidelines for this sustainability planning exercise. The following sub-tasks will be performed as part of this sustainability evaluation:

- The Consultant Team will conduct a baseline assessment to determine ORF’s resources, existing sustainable practices, and make recommendations where sustainable practices can be improved. It is anticipated that one meeting will take place with ORF staff to determine what resources should be included in the baseline study. The following is a list of resources that could be analyzed:
 - Air Quality Enhancement & Climate Change
 - Energy Conservation and Renewable Energy Use
 - Noise Abatement
 - Water Quality Protection/Conservation
 - Natural Resource Management
 - Hazardous Materials
 - Surface Transportation Management
 - Land Use Compatibility
 - Socioeconomics
- The findings of the baseline assessment will assist the Consultant Team in making decisions where improvements could be made. At this time goals and objectives will be established based on the findings and selected environmental categories agreed upon by ORF staff.
- Based on ORF’s current performance identified in the baseline assessment, the Consultant Team will again work with ORF staff to set performance targets to help meet the goals and objectives previously identified.

- The performance targets will then be analyzed with the master plan alternatives to make sustainability recommendations to carry forward. Any sustainable recommendation will also contain a cost estimate to establish a cost-benefit to any sustainable practice recommended.

6.2: Conduct Baseline Assessment

Conduct a baseline assessment to document the Airport's current resource consumption and determine the status of sustainability practices at ORF. This will be accomplished through an assessment of current policies, procedures, and programs.

6.2.1: Energy Efficiency Assessment

The Consultant will conduct an energy efficiency assessment of the passenger terminal, and other Authority-operated buildings (i.e., ARFF station, maintenance hangars, public safety buildings, equipment storage garages, motor pools, etc.). The screening will include a multi-day onsite investigation that will require access to each building included in the study. A summary will be provided for electric, natural gas, fuel oil, and gasoline/diesel use on the Airport.

6.2.2: Current Recycling Program

The 2012 FAA Reauthorization required master plans to address the feasibility of solid waste recycling at an airport, including options to minimize the generation of waste, establish operation and maintenance requirements, review waste management contracts, and evaluate the potential savings or revenue generation of a recycling program. This task will quantify the existing recycling program(s), if any, in place at ORF in consideration of the above parameters. This review will be incorporated in to the Recycling Plan included in this scope.

6.3: Sustainability Evaluation

The overall objective of this task is to identify current and potential long-term environmental considerations related to sustainability. As such, this review is limited to specific or supplemental issues related to implementation of sustainable measures as part of this Master Plan Update. The review topics are described below.

6.3.1: Energy Use Evaluation

Using the baseline energy screening, the Consultant will identify potential conservation measures for each Authority operated building/facility at ORF. The measures may include operational changes, maintenance items, and new or upgraded equipment and facilities that would result in energy savings.

The analysis will quantify the potential energy savings, associated cost savings, and the cost of implementation or construction. The value of this analysis is to determine which upgrades have a practical financial payback, as well as environmental benefits. Upon completion of the evaluation, each identified measure will be assigned a rating based on estimated costs and payback period. A summary report of the assessment will list the potential energy conservation measures in order of their rating.

6.3.2: Alternative/Renewable Energy Review

As ORF uses several million kilowatt hours (kWh) of electricity annually it may benefit from alternative or “green” energy production on site. This task will provide an initial high level feasibility assessment of developing alternative and renewable energy from several different sources at the Airport. For alternatives with a significant potential benefit, further detailed evaluation would be recommended. Alternatives to be considered include the following:

- Solar or photovoltaic (PV) systems – Common systems include PV panels installed on the roof of the airport terminal building, within existing airport parking lots, as well as on undeveloped airport property. The review will estimate system cost and anticipated utility savings based on the airport location and power needs.
- Wind turbines – Wind power systems range in size from small 1000-watt wind turbines mounted on existing buildings, to large tower-mounted systems. Similar to solar power, this review will investigate system options, feasibility (construction limitations), costs, and anticipated utility savings. The sensitive nature of having wind turbines located on airport property will be considered.
- Cogeneration – Cogeneration is common in industry, and its popularity in institutional users is growing. Advanced technologies have also reduced the scale necessary for cost-effective cogeneration, based on the heating and power needs within the Airport’s terminal area, as well as on-airport and adjacent off-airport developments. The sensitive nature of cogeneration at ORF will be considered.

The review of each of these alternatives will consider their short or long-range potential at ORF. Key considerations include site feasibility, development costs, estimated energy production, and resulting payback period.

6.3.3: Recycling Plan

Based on review of existing recycling program (baseline assessment), this task will outline a detailed recycling plan to be implemented at ORF that considers:

- Minimizing the generation of waste,
- Operation and maintenance requirements,
- Review waste management contracts, and
- Potential savings or revenue generation of a recycling program.

The plan will include the typical food service and office activity recycling program, but will also address items such as construction waste and material recycling (pavement, metals, etc.), grass clipping and tree obstruction removal, and recycling or composting. Implementation measures will be identified and described.

6.3.4: Review of Master Plan Recommendations

The ORF Airport Master Plan will include a series of recommendations. These recommendations will be reviewed against the above preliminary sustainability goals and baseline assessment. This task is not intended to change or refocus the Master Plan recommendations, rather implement and incorporate the sustainable opportunities of each recommendation. Specifically, this task will review the ORF Master Plan recommendations with regard to sustainability considerations of:

- Energy use and efficiency,
- Environmental impacts / protections,
- GHG emissions,
- Cost reductions/financial viability, and
- Other considerations identified by the Authority and the TAC.

6.4: Final Sustainability Initiatives

This task will review the baseline sustainability goals and principals and compare them against study findings. Thereafter, the formal list of sustainability initiatives will be documented and prioritized. FAA suggests the presentation of initiatives includes the sample format below:

- A. Goal (*sample*): Reduce energy consumption by 10% by 2022 (five years)
- B. Sustainable initiatives (*sample*):

- 1. Install motion detector for building lighting
- 2. Implement plan to “turn off computers, equipment, lights, etc. when not in use”
- 3. Clean and maintain furnace filters and equipment to improve efficiency
- 4. Convert to LED lighting where appropriate and cost effective

Upon review, preliminary goals and initiatives may be eliminated or refined based on the feasibility, costs, or the time required. The final recommended plan will include those initiatives deemed most viable and applicable at ORF.

6.5: Implementation Plan

A key consideration in recommending any sustainability goal should be “buy-in” by the airport stakeholders. The Authority and other stakeholders would be responsible for implementation and the plan must be realistic in order to be successful. The implementation plan will specifically define the following items:

- Specific party responsible (Authority, tenants, FAA, etc.) for implementation,
- List of required action items and schedule for each of the action items, and
- Cost and funding source (as applicable), and follow-up actions.

DELIVERABLE: Working Paper No. 5 will provide details on the work accomplished under Task 6. It will include text discussions, tables, and graphics, as necessary, to clearly describe how the findings were determined. The final version of Working Paper No. 5 will comprise the forecasting section of the final Master Plan report document.

TASK 7: AIRPORT LAND USE DEVELOPMENT PLAN

The Consultant Team will rely on high level analysis as well as information and data provided by the Authority on ORF property throughout the below work tasks.

7.1: Analysis of On-Airport Development Opportunities

The Consultant's approach to a long-term land use development plan begins with a thorough analysis of the physical land, key aeronautical activities and considerations, surrounding economical, aeronautical and infrastructure considerations, and legal/public sector considerations, and involves the following key elements:

7.1.1: Surplus Land Review

The Consultant Team will determine development potential and identify possible development challenges of surplus land owned by the Authority. Unique site attributes will also be identified and cataloged to mitigate development issues. Issues and documentation that are normally reviewed and addressed may include, among other:

- Existing infrastructure such as roads, water, sewer, electric, gas (location, capacity, etc.);
- Current site configuration(s);
- Traffic/ transportation/ access;
- Environmental conditions (review of EIS, Phase I & Phase II reports, if available).

7.1.2: Review of Existing Plans and Studies

Existing reports and studies pertaining to the Airport, land use, and transportation-related development will be compiled and reviewed by the Consultant Team. Such studies will provide essential background and reference information to enhance understanding of existing and projected on-airport development activities, as well as provide insight into relevant planning issues and constraints. A brief description of all recommendations, issues, or concerns presented in the various existing or on-going Airport, land use, and transportation planning studies will be described.

7.1.3: Existing Land Use Review

The Consultant Tem will complete an existing land use study for land within the Authority-owned land area. Using current data, aerial photography analyses, and site investigations, general land use

areas will be classified, and the amount of land devoted to each of the land use options will be quantified.

The Consultant Team will identify deficiencies and/or surpluses in the amount of developable land and prepare future land use needs. An opportunities and constraints map will be created that illustrates where potential new aviation and non-aviation expansion could occur at ORF based on constraints and height restrictions. This map will be created through the identification of existing attributes of the Airport, trends in general/corporate aviation, MRO (maintenance, repair, and overhaul) industry, air cargo activity, and other airports in the area, that drive current and forecasted airport usage. Additionally, non-aviation related development on Authority-owned land that could provide a stream of revenue based at the Airport will also be analyzed. Based on this opportunities and constraints analysis, appropriate and compatible specific land uses will be identified and others identified that should not be permitted to develop on the Airport.

7.2: Noise Land Reuse Analysis

When property is acquired with Airport Improvement Program (AIP) funds for land use and noise compatibility purposes, it is referred to as “noise land” and is subject to AIP Grant Assurance 31 – Disposal of Land. This assurance is based on 49 USC §47107(c)(2)(A), and is intended to assure that optimal use is made of the federal share of the proceeds from the disposal of the noise land property.

The noise land may no longer be needed once the incompatible use is removed; typically through purchasing homes (i.e., property and improvements), relocating the residents, and removing the houses (or other incompatible development). At this stage, the Airport must determine if the noise land is still needed for aviation-related purposes or how to dispose of the property. The assurance requires that when noise land is no longer needed for noise compatibility, the land will be disposed of and that the federal share of the proceeds will be either returned to the FAA’s Airport and Airway Trust Fund or will be used for another noise compatibility project. “Disposal” of noise land does not require the Airport to sell the property if it has another “FAA-eligible” purpose. It is the Sponsor’s determination and decision whether noise land is sold, retained by the Airport, leased for a compatible use, or exchanged; however, the decision must be evaluated in a Noise Land Inventory and Reuse Plan and approved by the FAA.

7.2.1: Update Noise Land Inventory

This task will expand, revise, and update the noise land inventory at ORF for the additional acquisitions completed in the past five years under the ongoing land acquisition program activities. In addition, the study will include and utilize the most recent approved Noise Exposure Maps (NEM) and DNL contours. An additional noise analysis is not anticipated as a part of this task, however, this study will use approved contours developed in previous planning projects.

This task will primarily include collecting and updating available information and compiling the updated Noise Land Inventory drawings and data tables, as appropriate. The update will include compiling of both maps and database (tables) of the noise land in a format preferred by Authority, FAA, and DOAV. It is assumed that records are available in digital format for compiling the data. The updated inventory information will be submitted to the Authority, FAA, and DOAV for review and comment. Appropriate revisions will be made throughout the course of this task.

7.2.2: Land Use Disposal Evaluation

Based on preceding tasks in the Master Plan Update and municipal planning activities, all noise land will be categorized for disposal. It is anticipated that airfield and terminal area recommendations will foster a recommendation to confirm most noise land parcels to AIP-eligible property needed for airport, terminal, access improvements, and airspace protection. Other properties may be dedicated to green space, to be retained by the Authority or transferred to a public entity. Each parcel of noise land will be reviewed to determine the appropriate disposal means, which will fall within one of three categories. These categories are also distinct steps in determining when and how to dispose of noise land, as follows:

- The first step is to determine whether the land will still be needed for continued noise compatibility (i.e., properties with a DNL above 65 dB).
- The next step is to determine whether the land is needed for airport use (i.e., AIP-eligible purposes), including terminal area, ground access, or aeronautical protection.
- Finally, all remaining parcels are considered unneeded noise land, to be disposed of in the most optimal means available.

7.2.3: Retain Land for Noise Compatibility

At ORF, few parcels, if any, will fall into this category that is primarily used to retain undeveloped noise land located within the DNL 75 dB contour, in order to ensure future noise compatibility. As most of the noise land at the Airport is below DNL 75 dB, it is anticipated that there will only be a small amount of land, if any, within this category.

Areas exposed to noise of this level do have compatible activities (e.g., transportation, parking, manufacturing, and others with conditions). In order to recommend that the property be retained, it must also be demonstrated that a compatible use is infeasible for the specific location. This task will confirm and document if any such noise land meets these requirements. Issues such as parcel size, access, and proximity to the airfield will be considered, and each may restrict the development feasibility.

In summary, this task will identify if any noise land is exposed to noise above DNL 75 dB, and whether it could be developed in a compatible manner.

7.2.4: Conversion to AIP-Eligible Airport Land

Noise land that is not recommended to be retained for noise compatibility is then reviewed for conversion to airport development land (i.e., AIP-eligible land). Parcels that fall within this category were typically acquired because the previous land use was not compatible with the airport noise level; however, the property may then be determined to be needed for airport development. Common occurrence of such conversion includes noise land that may be used for terminal area or landside development, transportation and parking, or is located within a Runway Protection Zone (RPZ).

As RPZs are locations of high airport noise, acquisitions under the noise program is common. As FAA standards recommend that the Sponsor own and control all property within the RPZ, conversion to AIP-eligible land (i.e., regular airport property) would be recommended for any such property.

For the reasons above, there are many parcels of noise land that will be appropriate for conversion to AIP-eligible airport land. Each of these parcels will be identified and the reason for the conversion will be specifically justified. Note that property needed to accommodate planned and documented airport expansions or improvements is a primary justification for conversion to airport development property.

7.2.5: Disposal through Sale, Lease, or Exchange

Noise land that does not meet either criterion above shall be disposed through sale in fee, long term lease, or exchanged for airport development land. Such lands must be disposed of for development that is compatible with future noise levels. The disposal must also include permanent aviation easements or other protections that identify airport noise, limit development heights, and provide the Airport with all rights for continued operation.

Properties in this category will be reviewed for their general market potential in consideration of (or the potential for) features such as ground access, utility availability, appropriate zoning and environmental conditions. A qualitative market assessment will be prepared for commercial and industrial reuse of each noise land location surrounding the Airport. Parcels will be further categorized and recommended for sale in fee, long term lease, or for an exchange for other developable land. The selection of the disposal method will be based on market conditions, site conditions, or other factors, as the goal is to return the property to an airport-compatible use.

Note that for all disposals in this category, the Airport must return the AIP grant funding to the FAA. More specifically, the federal share of the appraised Fair Market Value (FMV) of the land is returned to the Airport Trust Fund (so that it may be used for other noise program grants).

Properties in this category may be candidates for bundling, where small or irregularly-shaped properties are acquired, and then bundled into a larger parcel for disposal. The market for commercial or industrial property typically includes large parcels. Thus, bundling can increase the marketability (and FMV) and reduce the administrative efforts required to sell a large number of small lots. This task will identify any noise land appropriate for bundling, where the individual parcel identification is retained, although the overall larger disposal parcel will be renumbered.

7.3: On-Airport Land Use Plan

The Consultant Team will create an On-Airport Land Use Plan that fully incorporates the findings and conclusions of all work tasks noted above. It is our intent not only to recommend a vision with the corresponding plan, but also to convey the related action items that will lead to a timely and orderly implementation of the plan.

7.4: Implementation Plan

Although the Land Reuse Plan study is completed once it is approved by the FAA, the disposal of noise land will be a continuing process. The implementation plan will take the recommendations of Task 7.2, and provide a step-by-step guide to the required actions, anticipated schedule, and associated costs of the disposal process. Appropriate summary tables and flow chart diagrams will be developed. The implementation plan will:

- Outline the areas of each category of disposal;
- Identify any area for the assembly of parcels (i.e., bundling);
- Illustrate properties that have potential for exchange for noise land;
- Incorporate the planning activities of surrounding municipalities; and
- Provide a tentative schedule for:
 - Conducting property appraisals
 - Reserving property rights through easements, deed restrictions, or other means
 - Marketing / listing properties for sale or lease
 - Property leasing, transfers, and closing

DELIVERABLE: Working Paper No. 6 will provide documentation on the work effort and findings conducted in Task 7. It will include text discussions, tables, and graphics, as necessary, to clearly depict the work that has been accomplished as a part of this task. The final version of Working Paper No. 6 will comprise the forecasting section of the final Master Plan report document.

TASK 8: FINANCIAL PLAN

8.1: Data Collection of Financial Data

In consultation with the Authority, develop a understanding of the type, format and level of detail that will be most beneficial as a part of the economic and financial analyses conducted in the Master Plan. Identify the specific financial data and information necessary to provide adequate financial evaluations of any proposed development resulting from the planning process. This information will pertain primarily to the following, as it is available:

- Historical activity data for five years
- Comprehensive Annual Financial Reports for two years

- Rates and charges packages for the past two years
- Operating budget for the most recent year
- Airline agreements
- Federal grant applications and approvals
- Tenant agreements
- Bond resolution
- Outstanding debt service schedules
- Passenger Facility Charge (PFC) applications
- Pertinent industry documents the airport may have commissioned in the past year
- Other pertinent data required to complete a financial feasibility unique to the airport

A summary report will be prepared documenting findings and baseline information to be utilized for preparation of the Financial Plan.

8.2: Financing Plan of Recommended Development Program

The purpose of this element is to demonstrate the ability of ORF to fund the airport development requirements necessary to meet aviation activity demands during the forecast period. This will include the following subtasks:

8.2.1: Prepare Airport Capital Improvement Plan/Financial Program

The Consultant Team will prepare a recommended airport capital improvement plan (ACIP) with details and cost estimates for the short term projects, including all project to be funded with AIP, PFC, or other funding sources. The purpose of this effort is develop a viable financial plan to identify what projects can realistically be funded and by what means. For the period beyond five years, the mid and long-range ACIP will include all new projects as recommended in the Master Plan as well as average estimated costs for other capital projects, such as airfield pavement maintenance, building maintenance, rehabilitation of on-airport facilities, and maintenance of parking facilities and roadways, and equipment replacement capital costs. These other costs may comprise a sizable component of the overall ACIP.

The financial program will also include estimates of the amount of funds available from federal grant-in-aid programs to determine the net amount of capital funds required by ORF to accomplish each proposed stage of improvements for the airport. Analyze alternative financing

strategies that may be available for implementing the proposed development program (i.e. TIFIA) and determine which project components can be prioritized based on assumed funding scenarios. Analyze the sources and uses of all ORF funds that will be required to finance designated improvements and estimate the magnitude and timing of any bond issues and passenger facility charges (PFC) that may be required.

8.2.2: Prepare Airport Operational Cost Estimates

Prepare the ORF operational cost estimates to reflect the recommendations and schedule of development associated with the recommended airport concepts.

8.2.3: Prepare Revenue Projections

Prepare revenue projections to reflect the recommendations and schedule of development associated with the recommended airport concepts. Evaluate potential modifications in lease rates, airport charges and fees as well as airline rates and charges needed to develop net revenues sufficient to meet annual debt service requirements.

8.2.4: Prepare the Profit/ (Loss) Statement

Net operating expenses, capital expenditures, and debt service against revenues to determine a profit/ (loss) statement. Also included in this table is ORF's unrestricted cash balance. This analysis will determine if the preferred alternative produces a positive cash flow for ORF, and therefore if the project is feasible.

8.2.5: Refine Phasing Plan and Costs

The purpose of this subtask will be to refine the phasing plan and cost estimates consistent with the refined development concept. The Consultant Team will evaluate the financial feasibility of the phasing plan for facilities construction within the 5-year, 10-, and 20-year planning horizons developed for the preferred airport development concept. The focus will be to identify a funding strategy that will successfully implement the preferred development concept.

8.3: Implementation Plan

Once the recommended capital improvement program has been prioritized and finalized, the Consultant Team will develop an implementation plan. This plan will focus on the steps that need to be followed in order to implement each project from a procedural and approval standpoint. It will identify

what environmental review procedures need to be followed for each project, such as a Categorical Exclusion (CATEX) or an Environmental Assessment (EA). The implementation plan will also provide documentation on what advanced or enabling work may need to be undertaken to allow specific projects to move forward.

DELIVERABLE: Working Paper No. 7 will provide documentation on the work effort and findings conducted in Task 8. It will include text discussions, tables, and graphics, as necessary, to clearly depict the work that has been accomplished as a part of this task. The final version of Working Paper No. 7 will comprise the forecasting section of the final Master Plan report document.

TASK 9: AIRPORT PLANS

The ALP set will be developed by the Consultant Team following consultation with Authority staff and the FAA. It will be completed in compliance with FAA ARP Standard Operating Procedure (SOP) 2.00, Standard Procedure for FAA Review and Approval of Airport Layout Plans (ALPs), and dated October 1, 2013. The ALP sheets will be prepared in accordance with the FAA SOP ALP Review Checklist, which is provided in Appendix A of this document. The specific ALP sheets to be prepared are listed as subtasks 9.5.1 - 9.5.9. All planimetric data collected during the ALP and Aeronautical Surveys will be attributed in accordance with FAA AC 150/5300-18. The Consultant Team will develop all deliverables in a manner that will allow ORF to further develop an electronic Airport Layout Plan (eALP). Development of the eALP is not included in this scope of work.

9.1: Title Sheet

The title sheet will include the title of the project, location and vicinity maps, and a sheet index. Space will be provided on the Title Sheet so that the FAA approval letter to be scanned onto it.

9.2: Data Sheet

The data sheet will include wind roses, wind coverage tables, Airport data tables, and runway data tables.

9.3: Existing Airport Layout Plan

The Existing Airport Layout Plan will update the Existing Airport Facilities Plan from the 2008 Master Plan to reflect the current (2017) facilities and conditions at ORF. It will incorporate all projects and improvements that have been completed at the Airport since this last master planning exercise; including:

property acquisition; ground run-up enclosure; site work for Garage D; general aviation area improvements; and any other projects that have recently been completed at ORF.

9.4: Update Airport Layout Plan

The ALP will be updated in accordance with the previously-referenced FAA Advisory Circulars and will only depict existing and future airport development projects in schematic form on separate large-scale plans at a scale that will permit all Authority-owned property to be depicted. It is anticipated that the sheet size will either be 24" x 36" or 30" x 42". The ALPs will include basic information, such as topographic detail, runway data, RPZ data, safety areas, property lines, and the Airport Reference Point. The ALP will also include approval blocks and title and revision blocks.

9.5: Update Terminal Area Plans

The terminal area plans will be updated in accordance with the previously-referenced FAA Advisory Circulars. Terminal area plans will be developed for two (2) separate areas at ORF, including the air carrier passenger terminal facilities, general aviation facilities, and other facilities. Details not depicted on the ALP will be depicted on the individual terminal area plans. These plan sheets will include existing and future building data tables, known elevations of structures, taxiway details, and a legend. They will be prepared at a more readable scale than the ALPs, such as 1" = 200'.

9.6: Update Runway Approach and RPZ Plans

These plans will be prepared in accordance with the previously-referenced FAA Advisory Circulars. Obstruction information will be obtained from data that is being developed under Task 2. In addition, an Obstruction Action Plan will be prepared that identifies the course of action and timing of removing any identified obstructions within ORF's runway surface areas.

9.7: Prepare Airspace Plan and Height Zoning Map

This plan will be prepared in accordance with the previously-referenced FAA Advisory Circulars. Obstruction data will be obtained from the base mapping and surveying work undertaken in Task 2.

9.8: Develop On-Airport Land Use Plan

This plan will be prepared in accordance with the previously-referenced FAA Advisory Circulars. The land uses will be depicted by general use categories. This plan will be a key study product, since it will identify recommended uses for all areas under Airport control, including both aeronautical and commercial areas.

9.9: Develop Off-Airport Land Use Plan

An off-airport land use plan will be developed to depict existing land uses within areas that are impacted by airport operations, such as RSAs, RPZs, noise zones, and height restrictions. Recommendations for minimizing any impacts on off-airport land areas will be developed.

9.10: Exhibit "A" Property Map

The Consultant Team will utilize the existing airport property map for ORF based on data and information provided by the Authority. This task does not include the compilation of historical details on land acquisition and parcel data. The only work that is anticipated on the Exhibit "A" property map is to incorporate any land areas that are proposed for acquisition, either by the Authority or as a result of the recommendations included in this Master Plan Update. No additional research effort on any potential land acquisition areas is included in this work task.

DELIVERABLE: Working Paper No. 8 will provide documentation on the work effort and findings conducted in Task 9. It will include a complete set of Airport Layout Plan drawings (either 24" x 36" or 30" x 42"), as discussed above, that will clearly depict the work that has been accomplished as a part of this task. Hard copies (5 copies), pdf copies (5 copies), and electronic copies (10 copies) of the ALP set will be prepared and provided to the Authority, the FAA, and DOAV for review and approval purposes.

TASK 10: DOCUMENTATION

10.1: Master Plan Technical Report

10.1.1: Revisions to Master Plan Working Papers

The results of Tasks 1 - 9 will be documented in separate working papers to serve as the primary data reference for the Study. All working papers, which will include narratives and supporting tables, charts, and other appropriate graphic materials, throughout the development of the Master Plan Update will be distributed to the Authority, FAA, and DOAV for review and comments received

will be incorporated in a revised working paper to be included in the Study binders and on the Authority's web site.

10.1.2: Prepare Draft Master Plan Technical Report

The purpose of this task will be to provide the Authority and FAA with the opportunity for a final review prior to publication of the final report. Ten (10) hard copies and one electronic copy (pdf) of a draft Master Plan Update technical report, including color exhibits where appropriate, will be prepared and submitted for Authority, FAA, and DOAV review. The draft report will be amended as necessary based on this review and the comments provided.

10.1.3: Publish Final Master Plan Technical Report

The final Master Plan Update technical report will be published in an electronic format and twenty (20) hard copies will be provided to the Authority for distribution internally and to the FAA and DOAV. Reproduction of the document with offset lithographic printing and laser color copy process will be completed, as appropriate.

10.1.4: Electronic Format of Final Master Plan Technical Report

The Authority will be provided with five (5) copies of the electronic format of the final Master Plan Technical Report.

10.1.5: Additional Final Deliverables

The Consultant Team will also provide AGIS electronic survey information that will be uploaded into the Airports GIS website portal. In addition, the FAA ALP checklist (hard copy and pdf version) and the full ALP set of plans (draft and final) will be provided to the Authority for distribution internally and to the FAA and DOAV.

10.2: Executive Summary Report and Public Information Brochure

An executive summary of the Master Plan Update will be prepared for placement at the front of the final Master Plan Update technical report. The text will be formatted to allow for separate reproduction and distribution. It will include an overview of the analysis and findings, and a description of the

recommendations. Graphics and maps will be provided to facilitate understanding by a wide range of potential readers. The Authority will be provided with 200 copies of the Executive Summary Report.

TASK 11: PUBLIC INVOLVEMENT

The Consultant Team will work with the Authority during the course of the master planning exercise to implement a transparent and interactive community outreach program. The following components are included in this program.

11.1: Public Meetings/Workshops

Up to two public meetings, designed to inform the general public of study progress and findings as the study advances, and to provide the opportunity for public comment on the program, will be held. The public meetings will be structured either as "open house" type gatherings, workshops, or more formal meetings, as the situation demands. The intent is to involve both the local community affected by Airport development and the larger regional community more concerned with air service and economic development issues. Consultant Team activities will include:

- Secure meeting space
- Prepare public meeting notices (i.e.: newspaper ad, email, flyer, postcard, etc.)
- Develop and maintain a contact mailing list database to use for notification distribution (includes stakeholders, Title VI audiences, meeting participants, commenters)
- Ensure outreach to Title VI communities
- Coordinate communication with Public Information Officers (PIOS) including outreach to civic leagues via NextDoor, a private social network for Hampton Roads communities
- Issue press releases to the news media, as agreed to by the Authority
- Arrange editorial board meetings with select media outlets near kick off phase
- Outreach coordination with area Public Information Officers
- Prepare presentation materials and handouts
- Attend meetings
- Prepare record of meetings
- Identify items for which follow-up activities are required

11.2: Technical Advisory Committee Meetings

A Study Technical Advisory Committee (TAC) will be formed to provide guidance and advice on technical issues to the Authority and to the Consultant Team. It will consist of technical level representatives of the Authority, airlines, Airport tenants, general aviation uses, FAA, DOAV, and other key agencies and interest groups. The TAC will meet up to five (5) times during the course of the work program. It is anticipated that the TAC meetings will be held as part of coordinated series of meetings at key decision points in the Study process. Consultant Team activities will include:

- Invitation letters/phone calls, as needed;
- Preparation of presentation materials and briefing papers;
- Attendance at briefings; and
- Follow-up on issues raised at the briefings including comment review.

11.3: Community Advisory Committee Meetings

A separate Community Advisory Committee (CAC) will be formed to provide insight and information on non-technical issues that are pertinent to groups that have an interest in the Airport from a broader community perspective. The Consultant Team and the Authority will work together on identifying members of the CAC. Typically, the CAC will include representation from local municipalities, regional planning agencies, economic development organizations, land use and transportation planning groups, business-related organizations, and local neighborhood groups. The CAC will meet up to five (5) times during the course of the work program. These meetings will be programmed to occur after the TAC meetings, either on the same day or on the following day. It is anticipated that the CAC meetings will be held as part of coordinated series of meetings at key decision points in the study process. Consultant Team activities will include:

- Invitation letters/phone calls, as needed;
- Preparation of presentation materials and briefing papers;
- Attendance at briefings; and
- Follow-up on issues raised at the briefings including comment review.

11.4: Meetings on Technical Issues

In addition to the TAC meetings, individual meetings (up to two) will be held with the airlines, FAA, DOAV, and other key agencies and stakeholders, as required by specific analyses.

11.5: Briefings for Airport Authority Board

During the course of the Study, it is anticipated that the need will occur to brief the Airport Authority on areas of special concern or interest to them, ahead of broader public discussions and announcements. The program will include up to three (3) of these Board briefings. This task covers preparation for and attendance at these briefings. Consultant Team activities will include:

- Preparation of presentation materials and briefing papers;
- Attendance at briefings; and
- Follow-up on issues raised at the briefings including comment review.

11.6: Briefings for Special Interest Groups

As with Task 11.5, it is anticipated that briefings may be desirable for special interest groups, future airlines, chambers of commerce, neighboring civic organizations and/or others on items of special concern or interest to them. These may be held ahead of broader public discussions and announcements. This task covers preparation for and attendance at two (2) such briefings. Consultant Team activities will include:

- Invitation letters/phone calls; as needed;
- Preparation of presentation materials and briefing papers;
- Attendance at briefings; and
- Follow-up on issues raised at the briefing including comment review.

11.7: Master Plan Update Website

The Consultant Team will design, develop, and host a custom website well suited to the subject matter of the study. The website will be located on the Authority's website. This website will provide narrative and graphic information, and will be maintained and updated up to twelve times throughout the study duration. The goal of the website is to provide a readily accessible, convenient place where the public can access project specific information, such as project public meeting agendas, meeting announcements and minutes, contact information, working papers, and draft and final master plan reports.

The Consultant Team will assist the Authority with responses to email questions and comments. All email comments will be reviewed and saved as part of the formal record. To assist with day-to-day collaboration between Authority, FAA, DOAV, and consultant team members, a password protected page will be included on the website. This tool will operate as an online FTP site, providing a defined folder(s) to organize and centralize project data. This page avoids limitations on file size transfers via email, and provides for permanent storage and accessibility pre-draft documents.

An account will be created to be used by project team members, which will provide for both read and write capability. The site will be password protected; thus access is controlled by the Authority and Consultant Team. The page will be operational through the study period.

TASK 12: PROJECT MANAGEMENT

In order to effectively manage the Master Plan Update for Norfolk International Airport, certain procedures and activities need to occur during the entire planning process. The purpose of this task is to identify what actions are needed and how the Consultant Team intends to accomplish them. The success of the ORF Master Plan Update is largely attributable to effective project management and communications between the Consultant Team, the Authority, the FAA, and the DOAV. The following steps and actions will be undertaken as a part of this planning program.

12.1: Working Papers

As indicated throughout this scope of services, at the conclusion of each work task, the Consultant Team will be producing Working Papers. The purpose of these Working Papers is to document the analyses and findings that were developed as a part of each task. These Working Papers will include text discussions, tables, and graphics that are necessary to clearly represent the work that was accomplished. Each of these Working Papers will be distributed to all members of the Technical and Community Advisory Committees for their review. These documents will be provided to each member of these committees at least two weeks prior to the meeting so that they are fully prepared to discuss the work that was accomplished and included in the Working Paper.

12.2: Progress Meetings and Status Reports

As a means of keeping the lines of communication open between the Consultant Team, the Authority, the FAA, and the DOAV, monthly meetings will be conducted between these parties. Since it is not practical to conduct personal meetings on a monthly basis, a monthly teleconference will be held for the purposes of providing updates on work progress, addressing any questions or issues that may arise, identify any problems that have been encountered, and to discuss actions to be undertaken in the future.

In addition, as required by the FAA, project status reports will be developed and provided to the Authority, the FAA, and the DOAV on a quarterly and annual basis.

12.3: Invoicing Procedures

The Consultant Team will prepare invoices on a monthly basis. These invoices will be formatted to comply with the Authority's guidelines for invoicing. The invoices will be developed on a percent complete basis for each task. Included in the invoice package will be a monthly project status report that will discuss work accomplished during the past month, any issues or problems encountered, and the work that is anticipated to be accomplished in the next month.

12.4: Project Schedule

A project schedule has been developed to guide the progress of the Master Plan Update. The schedule, which covers a 20-month period starting in September 2017 (exclusive of the Study Design effort), provides the anticipated time line for each task. It identifies key milestones during the planning effort, such as TAC and CAC meetings, public meetings, Board briefings, Working Paper deliverables, and review periods.