Scope of Work

Puget Sound Regional Council NextGen Airspace Optimization Study

This Scope of Services describes the work required to successfully complete the NextGen Airspace Study for Puget Sound Regional Council (PSRC or Council). This study will result in products that can be used by PSRC to relay the benefits of NextGen to users and stakeholders, including 3D animations, PowerPoint presentations, and a report detailing the analysis and findings of the consultant team on how airports can facilitate NextGen implementation at their airports. Project management is integrated into each task.

These Tasks are outlined in the following Program of Services:

Task 0.   Study Management & Administration
Task 1.   Identify Key Issues and Verify Study Area
Task 2.   Review Existing Information
Task 3.   Identify Potential Actions to Address Airspace Issues
Task 4.   Evaluate Airspace Actions
Task 5.   Evaluate Controlling Airspace Surfaces for the Safe Operations of Aircraft Approaching and Departing Off the Ends of Runways at Selected Airports that Could Benefit from Procedure Improvements
Task 6.   Evaluate airports in the northern Puget Sound Region and prepare Summary Brochure and iPAD application

The following summarizes the detailed subtasks to complete these Tasks.

Task 0.1. Work Program
Consultant Team Implementation: The initial work effort is to review and refine the proposed Scope of Services presented herein into a detailed program and plan that meets the needs of the PSRC and interested Stakeholders. A description of each item of work required for completion of the Study will be prepared based on guidelines drawn from the PSRC’s proposed scope of work in its RFQ for NextGen Airspace Study. A task-by-task cost estimate and overall project schedule will be prepared that will be based on the billing classifications of the planning professionals assigned. Expenses for travel, subsistence, materials, reproduction and printing, and other Study-related costs will be provided. A project schedule identifying time frames for major phases of the Study also will be developed.

The product of Task 0.1 is a final Program of Services, which will be attached and made a part of the Study contract documents. A detailed task-by-task itemization of the Study staff hours, costs, and Study schedule will be included.

Task 0.2. Advisory Team Creation
Consultant Team Implementation: An Advisory Team will be created for input and feedback on the PSRC NextGen Airspace Study project. Throughout the NextGen Airspace Study process, the Advisory Team will be consulted to offer their opinion and guide the Study process. The Advisory Team is anticipated to include stakeholders in the Study Area, including: airport operators, airport users, major airport tenants, industry representatives, aircraft manufacturers, PSRC staff, consultant staff, and FAA staff from the local, region, and headquarter offices, including staff from the various organizations from the FAA including ATO and Airports. It is anticipated there will be two (2) Advisory Team meetings, the first meeting will be held after the completion of Tasks 1 and 2, and the second meeting after the completion of Task 5, before the final report. The Advisory Team will:

- Review documents and deliverables,
Provide input for project team on existing conditions, inventory, and existing issues, and
Provide input on future conditions.
The product of Task 0.2 is the establishment of an Advisory Team that will meet at specified intervals during
the Study. The consultant team will assist PSRC as required to create an Advisory Team that represents the
stakeholders for this study. Tasks include identifying members and preparing invitations.

**Task 0.3. Prepare for and Attend Project Meetings**

*Description:* The Consultant will prepare the required presentations and attend project-related meetings. The
following meetings will be held (scoped during each task of the Study, but listed here):

1. Kick-off meeting with PSRC and consultant staff (scoped and budgeted as part of Task 0.3)
   a. Attendees: Paul Dunholter and Cynthia Gibbs on site at the PSRC offices; WebEx by other
team members
2. PSRC staff briefings – meetings with PSRC staff to discuss project findings (scoped and budgeted as
   part of Task 0.3)
   a. Meetings held as required, on site at PSRC offices or via WebEx
3. Advisory Team Meeting - present initial findings (scoped and budgeted as part of Task 2.13)
   a. Attendees: Paul Dunholter and Leo Eldridge on site at PSRC offices
4. Stakeholder Meeting – meet with key air traffic and FAA staff (scoped and budgeted as part of Task
   3.1)
   a. Attendees: Paul Dunholter and Bill Seay on site at PSRC offices; WebEx by invited guests
      unable to attend in person
5. Advisory Team Meeting – present final document (scoped and budgeted as part of Task 5.10)
   a. Attendees: Paul Dunholter and Leo Eldridge on site at PSRC
6. Monthly WebEx meetings with PSRC (scoped and budgeted as part of Task 0.3)
   a. Attendees: Paul Dunholter, Cynthia Gibbs and other consultant team members required for
      the specific discussion.

*Consultant Team Implementation:* The product of Task 0.3 is meeting facilitation with PSRC staff and organization
at two (2) in-person, scheduled Advisory Team meetings.

**Element One. Identify Key Issues and Verify Study Area**

**Task 1.1. Evaluate Existing Documents**

*PSRC Description:* Prepare a quick review of the dimensions of NextGen (surveillance, navigation, and
communication) and how each figures into the airspace equation.

*Consultant Team Implementation:* Task 1.1 will use and summarize existing information that is available
through the FAA’s NextGen Office and the different program office that support the individual NextGen
programs. This task will present data at a summary level assuming basic knowledge of NextGen and will
highlight programs with the greatest potential for benefits in this Airspace Study factoring in costs,
benefits, and timeline for implementation.

The product of Task 1.1 will be a summary section to be included in the final report. The section will
include highlights and excerpts of existing documents and information pertaining to NextGen programs
and this Study that relate to General Aviation. This will include programs in surveillance, navigation,
communication, weather, NextGen data and ATC Automation systems. The task will build upon
information presented in the Phase 1 report with the focus being on General Aviation.
Task 1.2. Identify Key Airspace Issues

**PSRC Description:** Outline key issues affecting airspace in the central Puget Sound area, such as safety, congestion, efficiency, and key locations, focusing on General Aviation traffic patterns. Identify critical airspace interactions between airports (such as BFI, SEA, and RNT, or TIW, PLU, and JBLM) that could be improved.

**Consultant Team Implementation:** Global airspace issues within the Puget Sound Region for use in subsequent tasks will be identified and listed; for example, General Aviation departure delays or access problems in inclement weather. The reason for these issues will be identified later in Task 1.3 and these issues will be more precisely identified by airport once the Study Area is defined in Task 1.4.

The product of Task 1.2 will be a summary section to be included in the final report with matrices of each of the identified airspace issues that are affecting General Aviation operations within the Puget Sound Region. Once the Study Area and the airports within the Study Area are confirmed, these issues will be associated with each of the study airports.

Task 1.3. Causes of Airspace Issues

**PSRC Description:** Discuss the causes of the airspace issues in Task 1.2, such as high activity levels, weather patterns, airspace design and operations, limitations of equipment, scheduled traffic, existing procedures, MOA’s, traffic mix, etc.

**Consultant Team Implementation:** The cause of each of the airspace issues that have been presented in Task 1.2 will be identified within this task. This will be completed globally for airspace in the PSRC Region as well as each of the airports identified in the Study Area that will be completed in Task 1.4. These issues are often airport specific, such as terrain, airfield infrastructure, conflicts with Sea-Tac or other airports, etc.

The product of Task 1.3 will be a summary section to be included in the final report, listing each of the causes of airspace issues organized by type (i.e., missed approach at one airport constraining operations at another) and a matrix of the causes. This matrix will list the types of airspace issues (identified in Task 1.2) in the study area, the airports in the Study Area (identified in Task 1.4), and the cause of those issues (identified in this Task 1.3).

Task 1.4. Identify Study Area

**PSRC Description:** Verify the limits of the Study Area based on issues and causes discussed in Tasks 1.2 and 1.3. Identify possible airspace interactions with activity at key study airports listed below. Initial thinking is to study the area from downtown Seattle on the north, Olympia on the south, Bremerton on the west, and North Bend on the east. This area would generally capture airspace serving the following General Aviation airports:

- King County International – Boeing Field
- Crest Airpark (Kent)
- Pierce County Airport - Thun Field
- Tacoma Narrows Airport
- Harvey Field - Snohomish
- Renton Municipal Airport
- Auburn Municipal Airport
- Bremerton National Airport
- Snohomish County Airport/Paine Field
Consultant Team Implementation: Do to budget considerations, the Study Area and associated airports will remain as defined in the RFQ, described above. The enroute airspace may be expanded to account for any identified constraints such as congested entry points. The definition of the Study Area will be completed simultaneously with Tasks 1.2 and 1.3. The defined Study Area (including enroute airspace) can then be used to identify key issues and the causes. However, because there are common airports in the northern end of the Puget Sound (such as Paine Field and Harvey Field) that will share common fixes and procedures, they will also be considered in the study but not to the level of analysis that will be competed for the airports listed above.

The product of Task 1.4 will be a defined Study Area shown on an aerial map and list of airports and heliports will be provided.

Task 1.5. Identify heliports with instrument procedures
PSRC Description: Identify heliports with instrument procedures and review the procedures. Identify possible airspace interactions with activity at key study airports listed in task 1.4.

Consultant Team Implementation: The consultant team will identify any heliports at or separate from airports in the Study Area that have published instrument approach procedures.

The product of Task 1.5 will be a matrix, to be included in the final report, of the IAP helicopter procedures and a description of how they may interact with other airport operations within the Study Area. This will include both public procedures and any specials that have been developed for any heliports within the study area.

Element Two. Review Existing Information

Task 2 will collect and review relevant information, including the commercial and military operations regarding the following areas.

Task 2.1. Review Existing Activity Levels
PSRC Description: Existing activity levels and traffic mix (fleet mix) at study area airports.

Consultant Team Implementation: Much of this data can be obtained from the FAA’s database of NextGen performance snapshots which summarizes operational information at major and regional airports. This contains information on activity levels, aircraft type, runway use and PBN procedure utilization. For the smaller airports where this data is not available, the data will be obtained from tower counts and review of the radar data collected in Task 2.2. TFMSC data from ASPM will also be used to determine IFR operations.

The product of Task 2.1 will be a summary section to be included in the final report. It will be an inventory of existing aircraft activity levels at the Study airports presented in matrices with associated text.

Task 2.2. Collect Historic Radar Data
PSRC Description: Historic and current PDARS and radar data (historic information on flight tracks and altitudes).
**Consultant Team Implementation:** Historical radar data will be obtained for the project Study Area airports and Seattle TRACON boundary, including Sea-Tac flight data. The data source is SDAT data available from the FAA (assumes this data will be available from the FAA without cost for use on this study; National Offload Program (NOP) data is another option if the SDAT data is not available. The first five days of data each month for a continuous 12 month period starting with July 2013 through August 2014 will be collected. The radar data includes three dimensional track positions along with flight information including aircraft type, flight ID, origin airport and destination airport. The data will be imported into BridgeNet’s cloud database for analysis and display in the Volans software. This will allow the project team and the Advisory Team the ability to analyze and view the existing airspace both in terms of 3D flight paths and 3D fast time replay.

The product of Task 2.2 is a cloud-based database of procedures displayed in the Volans 3D application.

**Task 2.3. Determine Traffic Segregation by Operation**

*PSRC Description:* Where possible, using radar data or other information, split out traffic by aircraft type, north and south flows, and segregate IFR and VFR traffic. These data will be useful in assessing existing and potential enhanced airspace utilization, e.g., determine whether the traffic mix is a key factor or limitation in reducing airspace conflicts and increasing airspace efficiency.

*Consultant Team Implementation:* The SDAT radar data will be populated into a relational data base from the data in Task 2.2. This data will be analyzed and categorized in order to evaluate the different conditions that occur in the airspace. This includes flows that are driven by Sea-Tac (north flow/south flow) inclement weather conditions, and aircraft types/categories. This analysis gives the ability to more quickly identify the conditions under which constraints occur.

The product of Task 2.3 will be a cloud-based database that can be used to analyze and determine the conditions under which airspace constraints occur and the NextGen opportunities to relieve that constraint.

**Task 2.4. Assess General Aviation Flight Tracks**

*PSRC Description:* Assess the flight tracks of the General Aviation airports within the Study Area. Include:

- Choke points of flight tracks
- Interaction with commercial traffic
- Flight tracks in north flow and south flow
- Flight tracks in IFR and VFR conditions

Identify noise abatement procedures and flight tracks currently in use for study airports. Determine how these procedures and tracks impact overall air traffic flow – determine if noise abatement procedures contribute to congestion or add to miles flown (e.g., fuel burn). Analyze to determine if the impacts can be mitigated with PBN.

*Consultant Team Implementation:* The General Aviation radar data will be analyzed to identify constraint locations, and common fix locations. How PBN may improve efficiencies will be identified. Much of NextGen for General Aviation is focused on safety and access; less emphasis is placed on efficiency improvements, however these benefits will also be identified. Any existing noise abatement procedures (for the General Aviation airports) and their contribution to airspace constraints will be identified. The relational database of existing operations described in Task 2.3 will be used to present flight tracks used by General Aviation aircraft for the Study Area airports.
The product of Task 2.4 will be a summary section to be included in the final report that shows, with graphic and matrix data, the different flight paths for each of the airports and the interactions with other airports for the different flow/operational conditions within the region. A list of airports and constraints as identified within the graphics will be prepared that shows the airport, the type of operation, and where and why constraints occur.

Task 2.5. Define Airspace Interaction

*PSRC Description:* Airspace interactions between traffic using study area airports and other traffic using the regional airspace, including altitude restrictions (such as Class B Airspace, etc.) and their proximity to nearby airports.

*Consultant Team Implementation:* The focus of Task 2.5 is to identify airspace interactions such as airspace conflicts between Study Area airports as well as conflicts between regional airports (i.e., Sea-Tac). Often the primary commercial service airport in the region dictates how operations occur at the secondary airports, including altitude restrictions and airspace Class restrictions that can limit access to nearby airports. The three primary areas of review will be between Sea-Tac, Renton and Boeing Field where their close proximity causes many constraints. This task will analyze common departure fix congestion between major and secondary airports. This analysis is based upon an airspace monitoring tool that looks at common fix usage.

The product of Task 2.5 will be a summary section to be included in the final report that contains a graphical representation of the conflicts as well as a matrix that lists the source of the conflicts, the operational conditions when it occurs, and the type of conflict.

Task 2.6. Identify Military Operating Areas

*PSRC Description:* Military Operations Areas (MOAs) and their impact on commercial and recreational use of the airspace.

*Consultant Team Implementation:* The three dimensional MOAs within the Study Area will be identified and populated into the cloud-based database to show general aviation and commercial airport flight tracks with respect to the MOAs, and related interactions.

The product of Task 2.6 will be a summary section to be included in the final report that graphically and in matrix format defines constraint locations to commercial and general aviation with respect to the operational restrictions associated with MOAs.

Task 2.7. Inventory Weather

*PSRC Description:* Inventory current weather information – what is available for which airports and identify where important gaps exist.

*Consultant Team Implementation:* The different weather and data gap information available at each of the Study Area airports will be identified. This task includes the identification of weather information, and not the collection of historical weather data.

The product of Task 2.7 will be a matrix, to be included in the final report, of the weather information for each Study Area airport and related weather data gaps.
Task 2.8. Inventory Existing Airspace Facilities

**PSRC Description:** Existing facilities and equipment used to monitor and manage the airspace (radar, ADS-B, GBAS, WAAS, LAAS, ILS, etc.). Inventory all land based equipment and navigational aids in the study region. Document the age of the equipment as well as the annual maintenance costs allocated to maintain these legacy navigational systems. Include annual and long term cost savings to the FAA by upgrading the system to meet parameters of NextGen.

**Consultant Team Implementation:** Synchronize with tentative FAA plans for VOR and ILS minimum operating networks. The existing conventional and NextGen ground-based technology, as they relate to navigation and surveillance, within the Study Area will be identified and listed by: type, name, location, age, and airfield (where applicable). The facilities will focus on ILSs, radar, lighting, ADS-B and VORs, as well as generalized costs used by the FAA for VOR and ILS maintenance. VOR information will be derived from the FAA’s VOR MOD decommissioning project.

The product of Task 2.8 will include a summary text and matrix to be included in the final report that lists all ground based existing airspace facilities within the PSRC Study Area and the associated information about those facilities.

Task 2.9. Review Existing Procedures

**PSRC Description:** Review existing procedures (GPS, PBN, RNP, LPV, ILS, etc.) and determine gaps or need for changed, enhanced, or new procedures.

**Consultant Team Implementation:** The product of Task 2.9 will be a summary section, to be included in the final report, that graphically shows the existing procedures (IAP, STARS, SIDS) listed by airport(s) within the Study Area. The report will include a gap analysis of existing procedures at each airport and where new procedures could be beneficial to General Aviation.

Task 2.10. Inventory Avionics Equipage

**PSRC Description:** Prepare a summary inventory of existing aircraft avionics equipage and pilot training – determine if they contribute to the problem. With ATO input, discuss how the ADS-B Out mandated deadline (2020) and other equipage trends may help address airspace congestion.

**Consultant Team Implementation:** The product of Task 2.10 is a summary section, to be included in the final report, of aircraft equipage in the PSRC Region as well as pilot training and the use of the NextGen technology including both surveillance (ADS-B) and navigation (WAAS). It will present current equipage data and determine the efficacy of existing pilot training and its relation to ADS-B Out mandate.

Task 2.11. Identify Airspace Goals

**PSRC Description:** Using information collected in Tasks 1 and 2 identify airspace goals or objectives to be achieved by this study or future efforts. This sub-task is critical in evaluating the success of the study, and may also help to focus future airspace planning efforts.

**Consultant Team Implementation:** Prior to the data collection in Tasks 1 and 2, a charting effort will be undertaken with the consulting team and PSRC to define and identify the general goals of the study. Based upon the findings in Task 1 and 2; a list of more specific goals for airspace improvements for General Aviation will be identified along with the NextGen technology that offers the best opportunity to provide the benefit. These goals will be in relation to access improvement, safety improvement, efficiency and the environment, presented in a matrix format.
**Task 2.12. Prepare Draft Report**

*Consultant Team Implementation:* The product of Task 2.12 is a draft chapter report that includes the summary sections of Elements 1 and Elements 2. The draft chapter report will be distributed to PSRC and Advisory Team members for review and discussion at the Advisory Team Meeting as part of Task 2.13.

**Task 2.13. Advisory Team Meeting**

*Consultant Team Implementation:* The Consultant will attend a meeting of the Advisory Team to present the findings of Elements 1 and 2, the draft report, including, static graphics and documentation. Next steps will be discussed, including schedule and recommendations of the Advisory Team.

**Element Three. Identify Potential Actions to Address Airspace Issues**

**Task 3.1. Meeting Facilitation with FAA & ATC**

*PSRC Description:* Facilitate meeting with ATO controllers, airport sponsors, aircraft operators, and other FAA personnel to identify short and long-term airspace operational improvements, in consideration of the data gathered in Task 2. In person and telecom meetings will be held to discuss airspace improvements.

*Consultant Team Implementation:* The project team will meet with the various stakeholders in the region to obtain their input regarding short and long-term airspace improvements that have been identified in Tasks 1 and 2. The consulting team will present the findings and goals identified in these tasks to these stakeholders. Any changes to these recommendations based upon their input will be identified and updated their input.

The product of Task 3.1 will be notes summarizing the results of the meeting, with ideas obtained from the meeting incorporated into the project study. The notes summary will be an appendix to the final report.

**Task 3.2. Describe NextGen as a Solution**

*PSRC Description:* Briefly describe how NextGen (surveillance, navigation, and communication) could be used as part of a multi-pronged solution, in coordination with regional subject matter experts and ANG HQ portfolio managers or other technical staff. Assess how Performance Based Navigation (PBN) can be used to “de-conflict” airport and airspace traffic given the airport proximity to regional airspace flows, and aircraft equipage.

*Consultant Team Implementation:* The product of Task 3.2 will be a summary section for the final report that describes, in general, how NextGen for General Aviation can be used to address various airspace issues that have been identified within the Study Area. This includes de-confliction, poor weather access, and delay reductions.

**Task 3.3. Assess Use of GBAS**

*PSRC Description:* Assess the potential for using GBAS by multiple airports, as used by aircraft with GBAS equipage. Outline where installation of GBAS could fill gaps and enhance airspace efficiency.

*Consultant Team Implementation:* Since the time that the PSRC scope was originally drafted, the FAA concluded that GBAS for use by multiple airports is no longer considered viable. Therefore, this task will be limited to a brief qualitative discussion of the technology and how it is currently applied with respect to General Aviation.
The product of Task 3.3 will be a summary section to be included in the final report that briefly discusses, using qualitative metrics, current application of GBAS in the aviation community as a whole and to General Aviation operations in the Puget Sound Region.

**Task 3.4. Identify ADS-B Coverage**  
*PSRC Description:* Identify gaps in current ADS-B coverage and potential benefits of closing the gaps.

**Consultant Team Implementation:** The nationwide ADS-B ground station infrastructure is complete and operational. The ADS-B network was designed to provide the same or better coverage that exists with the current radar network. The project team will obtain maps of the predicted coverage of the ADS-B ground stations and provide a review of the coverage in the PSRC Region. Based upon this information, recommendations as to any additional ground stations within the region will be identified in order to enhance safety and access to these airports.

The product of Task 3.4 will be a summary section to be included in the final report that includes a graphical depiction of the ADS-B ground stations and a written section identifying what benefits would be derived (and where) if the ADS-B coverage gaps were eliminated.

**Task 3.5. Assess Need for New Procedures**  
*PSRC Description:* Assess the need for new procedures based on PBN, such as RNP, LPV, etc.

**Consultant Team Implementation:** Task 3.5 does not include procedure design, only identifying where a new procedure could provide a potential benefit. This task will identify the potential need for new procedures for each of the Study Area airports. These procedures may include STARS, SIDS or IAP. The IAP may be RNP, LPV, other WAAS procedures and charted visuals. All will be based upon PBN. Where a new procedure is proposed for consideration, the benefit and airspace issue that is being addressed will be identified. The product of Task 3.5 will be a summary section to be included in the final report using a matrix to show the procedures identified for implementation.

**Task 3.6. Define NextGen Cost-Benefit Metrics**  
*PSRC Description:* Explore the use of benefit-cost information on NextGen (PBN, RNP, etc.) for use in prioritizing funding (initial steps).

**Consultant Team Implementation:** The cost benefit analysis for PBN at commercial airports often was associated with reduction in delay time or efficiency improvements where a dollar value could be determined from those improvements. NextGen for General Aviation is more about improved access and safety where it is more difficult to assign a dollar value to that benefit. The project team will propose a methodology to the Advisory Team to help identify priorities of implementation where the cost of the implementation can be compared against the access and safety improvements. Where there are efficiency improvements the dollar value associated with that improvement will be estimated. However, no specific Cost Benefit matrix will be presented. The task will identify and list any identify costs and what the benefits are.

The product of Task 3.6 will be a summary section to be included in the final report. The section will present in matrix and written form the suggested methodology to determine cost benefits of General Aviation-related procedure implementation.
Task 3.7. Identify Critical Airspace
**PSRC Description:** Identify the most critical locations or sub-areas where airspace or NextGen applications could yield improvements.

**Consultant Team Implementation:** The product of Task 3.7 will be a summary section to be included in the final report summarizing locations within the Study Area that are most in need of NextGen applications.

Task 3.8. Identify Areas for Weather Data Improvement
**PSRC Description:** Identify locations where weather data coverage should be enhanced, and identify what type of weather data and equipment is needed. This sub-task would be coordinated with planned FAA NextGen weather sensor and forecasting improvement plans.

**Consultant Team Implementation:** This task would pull information from the FAA’s NextGen weather enhancement plan with respect to the Project Study area, identifying enhancements and where they are planned. Any recommendations for providing additional services will be listed.

The product of Task 3.8 will be a summary section to be included in the final document showing a matrix that describes the location of required weather enhancements.

Task 3.9. Identify Existing Procedures to be Removed
**PSRC Description:** As a quid pro quo, identify existing procedures which are little used and of marginal value to users. Determine whether these procedures might be removed as new procedures are added, to reduce potential FAA budget and work load impacts.

**Consultant Team Implementation:** The product of Task 3.9 will be a summary section to be included in the final report. The summary section will list, in matrix form, all the existing procedures at the Study Area airports and highlight those procedures that could potentially be removed if new PBN procedures are implemented. The new PBN replacing the conventional procedure would be noted in the matrix.

Element Four. Evaluate Airspace Actions

Task 4 will take the options identified in Task 3 and evaluate these actions from a technical perspective. This is the most rigorous task in the study, and will require in-depth involvement by staff from FAA Headquarters, the FAA Northwest Mountain Region Office, the Seattle Airports District Office, FAA Flight Procedures Team (FPT), FAA Air Traffic Organization (ATO) from the Western Service Area, high level FAA representative from Auburn ARTCC, key airport sponsors, and user groups (airlines, major General Aviation community users, etc.). This work will focus on initial concepts of airspace optimization, enhanced and new procedure development, and the use of NextGen enabling elements, and will include the following sub-tasks:

Task 4.1. Evaluate Use of NextGen Strategies
**PSRC Description:** Evaluate the use of NextGen strategies (surveillance, navigation, and communication) at specific locations within the study area and determine where these elements should be applied.

**Consultant Team Implementation:** The product of Task 4.1 will be a summary section to be included in the final report that contains a matrix and written description of feasible NextGen strategies, by type and use, within the Study Area. This task will build upon the information presented in the previous tasks, categorizing the potential strategies at each of the airports and key airspace locations within the Study Area.
Task 4.2. Assess Benefits of GBAS
PSRC Description: Assess potential benefits of new GBAS installations where there are gaps now.

Product: GBAS is a technology for use by commercial aircraft; General Aviation aircraft are not equipping with the required electronics for GBAS. However, Renton Airport and Boeing Field have significant commercial aircraft traffic due to Boeing activities and could benefit from GBAS. These potential benefits will be assessed in a qualitative review.

The product of Task 4.2 will be a summary section to be included in the final report that will qualitatively describe the options for GBAS at Renton and Boeing Field airports and what benefits it could provide that could make it a better option than other NextGen technologies or the conventional technology that exists today.

Task 4.3. Assess Benefits of ADS-B
PSRC Description: Assess potential benefits of enhanced ADS-B coverage.

Consultant Team Implementation: Based upon the ADS-B coverage information collected in Task 3.4, recommendations as to any additional ground stations within the Study Area will be identified in order to enhance safety and access to these airports. This analysis will not include a detailed coverage analysis, but will be based upon the methodology described in Task 3.4.

The product of Task 4.3 will be a summary section, using text and matrices, to be included in the final report. The section will detail the recommended ground stations.

Task 4.4. Identify New Procedures for Implementation
PSRC Description: Based on results of Task 3.3, provide recommendations to airport sponsors and the ADO, for them to consider requests to initiate the design of new procedures (PBN, RNP, WAAS, LAAS, LPV, etc.) where warranted.

Identify next steps required to implement the findings and conclusions of this study and define the additional work required, when, and by whom. This includes initiating FAA airspace design and operations changes that are identified in the course of this study. Identify new facilities and equipment required to support new procedures and airspace optimization, as appropriate. Identify actions required from others to implement any recommendations (e.g., airport sponsors, airlines, and pilots).

Consultant Team Implementation: In order to present new procedure concepts that are consider viable, preliminary analysis using TARGETS will be completed on a number of the options under consideration. Note that these are concepts and not specific designs or recommendations. Any specific designs would be completed in future detailed air space studies. From a project budget standpoint, the concept analysis will be limited to the four (4) options listed below. While other concepts may be proposed and the process presented, they would not have the same level of preliminary analysis completed as presented below. The preliminary analysis would be to present actual procedure concepts that are shown to have a benefit through preliminary modeling in TARGETS.

1. STAR/SID RNAV deconfliction between Sea-Tac/Renton/Boeing Field
2. RNP-AR arrival procedure at Renton Airport
3. LPV procedure with improved access and minimums at one General Aviation airport
4. Common departure fix congestion between Sea-Tac and Study Area airports
The product of Task 4.4 will be a summary section to be included in the final report that describes which new procedures should be requested for further study, design, and implementation, and define the process and stakeholder involvement required for procedure implementation.

Task 4.5. Modeling of Procedures and Airspace

**PSRC Description:** Using available and multiple data sources (terminal and enroute radar, published procedures, navigation charts, ATC sector charts, terrain), provide 3-dimensional video mapping and diagrams of the existing flight paths and procedures, to include choke points and interactions amongst all the commercial and general aviation airports within the region. In addition, provide a future state of flight tracks with proposed improvements. Future conditions modeling may require the use of reading and displaying data from modeling tools such as TARGETS, SIMMOD or TAAM. Model for both VFR and IFR conditions.

Create 3-dimensional diagram where surveillance, communication, navigational aids and procedures would provide more efficiencies when using NextGen technologies and programs. Diagram "tunnels" of ingress and egress using potential PBN-type procedures; highlighting de-conflictions and reduced air traffic control interaction. This task requires that the contractor provide animations that illustrate in 3D the airspace in the Seattle region showing aircraft in high speed playback and static images of aircraft operating from both the major commercial airports and general aviation airports. The display should provide for graphical representation in 3D of at least the following navigation elements for the Study Area and the airports in that region: airports, fixes, waypoints, STARs, SIDs, operating MOUs, Enroute structure, ILS, LPV tunnels, PBN tunnels, terrain, actual flight tracks, simulated flight tracks and ATC airspace sectors.

**Consultant Team Implementation:** The project team will use BridgeNet’s Volans software to graphically, in 3D, show the existing and potential procedures that can be implemented in order to provide benefits to the Study Area airspace. TAAM, SIMMOD or other air space modeling tools will not be used within this study. To accomplish this task, the existing procedures, potential new procedures, obstructions, navaids, waypoints, MOUs, enroute structure, ATC airspace sectors and terrain will be inputs to Volans. Graphical depictions of the procedures including tunnels and ILS paths will be displayed along with aircraft 3D models. The program can be used to playback the operations in fast-time that can be made into a video. This model can then be used to create various 3D images for many of the programs being proposed. The project team along with input from PSRC staff will select four (4) options for the development of animations. The four proposed preliminary concepts that will be visualized are listed below. Note again that these are preliminary concepts and any detailed designs would be part of future studies.

1. STAR/SID RNAV deconfliction between Sea-Tac/Renton/Boeing Field
2. RNP-AR arrival procedure at Renton Airport
3. LPV procedure with improved access and minimums at one General Aviation airport
4. Common departure fix congestion between Sea-Tac and Study Area airports

The products of Task 4.5 include up to four (4) 3D animations and an estimated 30 static graphics showing existing and proposed procedures within the Study Area.
Element Five. Evaluate controlling airspace surfaces for the safe operations of aircraft approaching and departing off the ends of runways at selected airports that could benefit from procedure improvements.

Task 5.1. Survey Data Inventory
PSRC Description: Gather and input survey data for possible approaches for existing and future runway ends, to include associated obstructions. Evaluate the data and input it into the FAA’s Airports GIS 20:1 tool. If existing survey data does not exist, it will be noted in the documentation that this information needs to be gathered; it will not be gathered as part of this project.

Consultant Team Implementation: As part of the Renton Master Plan Update, an aeronautical survey is being completed, which the consultant team will use for analysis at Renton Airport. For Boeing Field, an aeronautical survey was recently completed as part of a GBAS study, which will be used for evaluation. For other airports and runway ends in the Study Area, the consultant team will obtain any available surveys or use the published obstruction data from the FAA’s database. No new surveys will be performed within this project and when data is lacking, it will be noted in the report. The task will evaluate the obstruction data using the FAA’s Airports GIS 20:1 tool to determine approach conflicts with obstructions on each of the runway ends for the study airports.

The product of Task 5.1 includes a summary section to be included in the final report. The summary section will contain a matrix of runway ends and associated survey data from airports in the Study Area.

Task 5.2. Evaluate Runway Threshold Siting
PSRC Description: Evaluate threshold siting criteria for the scenario collected in Task 5.1 based on obstruction data sources.

Consultant Team Implementation: An evaluation of the threshold siting criteria for existing runway ends using available survey data will be prepared. The analysis will assume a new potential WAAS LPV approach procedure for airports/runways where one does not exist or evaluating the existing LPV procedure where one does exist for the approach minimums. Obstructions that influence the potential procedure will be identified for each runway end. This analysis will be completed for each of the General Aviation airports and runway ends in the Study Area.

The product of Task 5.2 will be a summary of controlling and other obstructions that can be used within the evaluations in Task 5.3.

Task 5.3. Evaluate TERPS Surfaces
PSRC Description: Evaluate best existing and future procedures data and use it to provide an analysis of approach and departure (including TERPS) surfaces off each runway end at selected airports.

Consultant Team Implementation: A preliminary TERPS analysis will be performed for each runway end assuming the development of a potential LPV or other NextGen WAAS/PBN procedure. The controlling obstacles or other airfield factors that constrain the implementation of such procedures, or procedures at desired minimums, will be determined.

The product of Task 5.3 will be a summary section to be included in the final document. The section will include a write up of the preliminary TERPS analysis and controlling obstructions or airfield constraints to implementation of PBN procedures.
Task 5.4. Describe Engine-Out Surfaces

PSRC Description: In addition to TERPS surface analysis provided in Task 5.3, provide maps and descriptions of one engine-out surfaces (62-½ :1) for any air carrier runway ends at selected airports.

Consultant Team Implementation: A listing of one engine-out surfaces for air carrier runway ends in the Study Area. This analysis will be limited to Boeing Field (main runway) and Renton Airport, for which there is air carrier aircraft activity related to the Boeing Company. Volans 3D software will be used to prepare 3D static graphics of these surfaces.

The product of Task 5.4 will be a summary section to be included in the final document. The section will include a matrix and graphics of engine-out surfaces.

Task 5.5. Evaluate Approach Efficiencies

PSRC Description: Evaluate possible efficiencies to approaches which could be gained with no changes to airport infrastructure or data.

Consultant Team Implementation: Documentation of approach efficiencies where possible assuming existing airport infrastructure. This analysis will present where existing or potential PBN approach efficiencies can be improved.

The product of Task 5.5 will be a summary section to be included in the final document. The section will include a description of any efficiencies which could be gained from changes to the approaches.

Task 5.6. 3D Obstruction Model

PSRC Description: Provide a 3D model of the obstruction penetrations within the TERPs surfaces for each procedure.

Consultant Team Implementation: Volans 3D software will be used to prepare 3D static graphics of airspace obstruction penetrations for each of the existing and potential NextGen WAAS/PBN procedures highlighting the controlling obstruction.

The product of Task 5.6 will be one overview graphic of the Study Area and approximately 15 zoomed-in static graphics.

Task 5.7. Develop Composite Airspace Map

PSRC Description: Develop a composite airspace map that combines all surfaces, including terminal radar, class of airspace, approach and departure surfaces for each airport in the Study Area.

Consultant Team Implementation: Volans software will be used to create a 3D graphic that combines all approach surface, classes, and MOAs for the airports and airspaces within the Study Area.

The product of Task 5.7 will be an airspace map showing all requested airspace and surface renderings.
Task 5.8. Recommend Land Uses

*PSRC Description:* Make recommendations for land uses related to the approach surfaces. Recommendations will be based on land use guidelines in FAA’s FAR Part 150 Land Use Compatibility Matrix and consultation with local land use guidelines.

*Consultant Team Implementation:* The land use at each airport will be reviewed with respect to suitability with maintaining and protecting the airport approach surfaces necessary for PBN procedures. Recommendations for each runway end will be presented within a section of the summary.

The product of Task 5.8 will be a summary section to be included in the final report. The summary section will include a matrix of land use recommendations by runway end. A qualitative discussion about land use consequences from a noise perspective as well as potential community reaction to potential changes will be included.

Task 5.9. Prepare Obstruction Removal Cost

*PSRC Description:* Develop a list of costs with associated required obstruction removal.

*Consultant Team Implementation:* An order of magnitude analysis will be completed that estimates the cost of removal of obstructions that limit the use of WAAS/PBN procedures at each runway end. A fixed cost will be assigned for each type of obstruction, (i.e., tree, light pole) times the number of those obstructions in each runway end.

The product of Task 5.9 will be a matrix with the runway end, obstruction, and cost estimate to remove.

Task 5.10. Advisory Team Meeting

*Consultant Team Implementation:* The Consultant will attend a meeting of the Advisory Team to present the findings of the project and the final report, including videos, static graphics, and documentation for each of the study tasks. A meeting of the Advisory Team will be completed at the end of the study. The findings of the study and the recommendations will be presented. This includes the final report, videos and graphics.

One of the goals of the Advisory Team Meeting is to discuss and identify the recommended next steps to ensure that the efforts of this study continue through the process of implementation of NextGen. The consulting team will present recommendations of NextGen programs to prioritize for which the committee can provide their input.

Task 5.11. Prepare Final Documentation

*Consultant Team Implementation:* The Consultant team will prepare a final report that combines all of the summary and interim reports, maps and graphics, matrices of task results, memoranda, and meeting notes from the project.

The product of Task 5.11 will be a final report for submittal to the PSRC. The report will be in a print-ready format as well as electronic documentation including PDF reports, static graphics, 3D animations, and PowerPoint presentations. Included in the final report will be a list of recommended next steps to further the process of incorporating NextGen into the General Aviation community of the Puget Sound Region.
Supplemental Tasks 6.0

Supplemental Task 6.1 - Evaluate Airports in the Northern Puget Sound Region.

The scope of work defined a set of airports in the most congested part of the Puget Sound Region, with a focus on the area between Seattle and Tacoma. This supplemental task will also include airports to the north and conduct the same level of analysis for these airports as will be done for the originally identified airports. The airports to be included in supplemental Task 6.1 are Paine Field and Harvey Field. These additional airports will be evaluated along with the original airports in each task within the scope of services. This task will include specific analysis at each airport and the runway ends for each airport. Task 6.1 will also include the collection of radar data for Paine Field and Harvey Field.

Supplemental Task 6.2 – Prepare Summary Brochure of findings and next steps.

This supplemental scope of work item is to prepare a summary brochure that presents the findings of the report and the next steps to continue to engage and promote NextGen. The brochure will be in color and will be designed in a graphical format. The product will be produced in print and electronic formats, allowing the brochure document to be downloaded from the PSRC web site. As an additional option, summary brochure information presenting the study (including animations and graphics) will be incorporated into an iPAD application. This will allow the FAA, GA community, and the general public to see in a more powerful and dramatic fashion the benefits of NextGen, and what they can do to capture those benefits. PSRC and the FAA can also use this iPAD product to promote the findings of the study and obtain funding for next step efforts. The iPAD is the chosen delivery method because of its broad use in the pilot community.