Portland International Jetport (PWM)
Notional Flight Procedures and Preliminary Noise Analysis

(May 9, 2023)

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Identification and Evaluation of Strategies to Reduce Aircraft Noise Impacts

A Community-Based Approach

Executive Summary

All too often, communities are faced with the daunting task of having to deal with aircraft noise but find themselves with the same old ineffective tools to get the job done. While roundtables and lawsuits are the conventional ways of attempting to address these issues, they rarely result in effective solutions. Communities find themselves spending thousands of dollars on consultants and lawyers just to be left with a technical report or a failed lawsuit.

Vianair takes a unique approach to aircraft noise abatement/mitigation by working directly with the impacted communities to help them identify viable solutions. Our approach leverages collaboration among both community and industry stakeholders, and incorporates our extensive technical expertise through a collaborative, regional effort, resulting in actionable, implementable, and effective solutions.

A core component of the PWM Project is the collaboration with key industry stakeholders including the Federal Aviation Administration's (FAA) Portland Air Traffic Control Tower (ATCT) and Airport Management, in addition to the Noise Advisory Committee (NAC) Design Working Group. The Design Working Group was a subcommittee of the NAC which included representatives from communities surrounding the airport.

Through collaboration with these stakeholders, Vianair was able to develop notional flight procedures with community support which are believed to be implementable within a reasonable timeframe.

Based on the community noise impacts attributed to the existing flight procedures, the NAC Design Team focused primarily on two (2) Standard Instrument Departures (SIDs) and three (3) Standard Instrument Approach Procedures (SIAPs).

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The two (2) Area Navigation (RNAV) departures of interest to the Design Team were HSKEL THREE (RNAV) and NUBLE FOUR (RNAV). The RNAV Approaches considered by the team included the existing RNAV Visual RWY 29 Approach, the Harbor Visual RWY 29 Approach, and the ILS RWY OR LOC RWY 29 Approach.

Vianair took a holistic approach to the process beginning with ensuring the team had a clear understanding of the airspace, aircraft noise exposure levels, and primary community concerns. An airspace and operations analysis included review of existing flight procedures, existing noise abatement program elements, and air traffic control procedures. This process involved extensive engagement with community representatives participating in addition to input from the Airport and Portland Air Traffic Control.

The result of these efforts culminated in recommendations to design two (2) RNP SIDS and one (1) RNP approach. Another notional RNAV approach concept was designed but ultimately rejected by the Design Group due to the likelihood of aircraft being vectored to the final approach, which would result in increased noise over the islands.

The Design Working Group began the process by adopting a "Design Philosophy." Development of a design philosophy helps establish guidelines for prioritization when considering revisions to existing procedures and the design of new procedures. For example, maximizing overflight of water. The design philosophy is established early in the process and adopted based on a consensus of the working group.

In most cases, Vianair recommends that working groups adopt a Design Philosophy before initiating procedure design. During the design process, the intent is to make decisions that remain consistent with the agreed upon design philosophy. The design philosophy represents what "success" looks like, in terms of the final procedure designs. This approach helps reduce the tendency to determine success based on the effect the final designs would have on a particular area, neighborhood, or home. Instead, success is measured using specific metrics which can be applied to the design philosophy. Using the previous example, this could include a comparison of overflight of the water based on the new design in comparison to the original or existing procedures. The final notional designs are compared to the Design Philosophy to validate that the goals established by the Design Working Group had been achieved.

The consensus of the Design Working Group is that the final notional procedures are consistent with the design philosophy. Specifically, the notional designs will support the goal of reducing noise in the areas of concern including West End, South Portland, and the Islands. The procedures were also acceptable to the Airport.

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Initial reviews by the local air traffic control facility indicated there were no immediate concerns based on the notional designs. Final review of the procedures will be conducted at a PBN Implementation Working Group meeting scheduled for May 23-25, 2023. Ultimately, approval of the designs will require review by the PBM Implementation Workgroup, who will confirm the procedures meet FAA criteria, airline operational specifications, safety analysis, environmental analysis, and air traffic operational requirements in accordance with FAA Order 7100.41A and other federal regulations. If approved, implementation could take 18-24 months or more.

Vianair recommends that the NAC request periodic updates by the FAA on the progress of the flight procedures as they progress through the PBN Implementation process.

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Introduction

The communities surrounding the Portland International Jetport have experienced aircraft noise impacts for many years. Although there are efforts in place by the airport to reduce those impacts, there are opportunities to revise flight procedures in order to further reduce noise impacts to the communities surrounding the Portland JetPort, particularly the West End, South Portland, and Island communities.

Vianair was hired to identify potential changes to flight procedures to reduce community noise impacts to the extent possible, within the bounds of safe and efficient operations at the airport.

Vianair's tasking included:

Task Objectives:

- Engage directly with impacted communities to ensure an understanding of the primary concerns and impacts associated with aircraft operations and to work collaboratively to identify solutions.
- Identify strategies to reduce aircraft noise impacts including noise program measures and flight procedure design.
- Review existing approach and departure procedures to identify opportunities to reduce community noise impacts.
- Work collaboratively with industry stakeholders including the Airport, airlines, and air traffic control to ensure the viability of operational recommendations.
- Review notional designs for arrivals/departures.
- Determine Flight procedure development schedule.
- Preliminary Noise evaluation of proposed procedures.

Community Engagement:

- Develop plans for public engagement.
- Community-focused approach from start to finish.
- Consensus-based design based on community input and "fairness".
- A **design philosophy (priorities)** will be established with community input to serve as the basis for procedure design/modifications. The design philosophy will identify the community "priorities" for addressing aircraft noise issues and procedure design.
- Priorities should be hierarchical; if priority #1 cannot be accomplished, refer to priority#2, and so on.
- The design philosophy will be used as the "measure of success" and flight procedure design decisions must map directly back to an agreed upon priority.

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Industry Engagement:

- Coordinate with Airport and FAA air traffic control to collect feedback and to provide alternative designs if necessary (Address community concerns).
- Procedure revisions, modifications, and new designs will be reviewed with Airport, airlines, and air traffic control prior finalizing proposal and submission.

NOTE- *Each of these areas is discussed later in this report.*

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The Process

Vianair utilizes a unique approach with respect to community involvement. When there are expected competing interests (as is usually the case), Vianair applies the NowGEN® Model for Noise Mitigation $(NM)^2$ Process.[1] The $(NM)^2$ Model is a process whereby key stakeholder groups identify, discuss, and prioritize their issues, goals, constraints, etc., enabling determination of the most cost-effective approaches with the highest likelihood of successful implementation. Once the priorities are established, Vianair utilizes a similar approach to problem resolution and procedure design as is described in FAA Order 7100.41A, *Performance Based Navigation (PBN) Implementation Process*. Vianair's approach differs from others in that it incorporates direct community involvement in the procedure design process. PWM already had the framework in place with their longstanding and well-functioning roundtable, the NAC. The next step was to develop consensus among all stakeholders represented on the roundtable, using this proven approach.

Initially, Vianair performed a baseline study which included reviewing the airspace, history of flight procedures, airport noise program, Part 150 studies, environmental analyses, master plans, etc. The baseline study was summarized in a report which was completed in November 2021. The baseline analysis also included review community input from surveys, noise complaints, community meeting summaries, NAC meeting summaries, media reports, and other data sources. This was accomplished prior to any engagement, so that our team could gain an understanding of the unique conditions and issues and be prepared to assist the community in effectively advocating for their goals.

Once the baseline review was completed, Vianair developed initial concepts of notional procedures and practices. At that time, the NAC Design Committee representatives were brought into the procedure design process. Vianair believes that direct community involvement in the design process leads to a deeper understanding of all the considerations including the complex operational constraints that go into procedure design. This includes compliance with FAA criteria, rules, and regulations, and applying firsthand knowledge to address noise impacts on their communities. Passed experience has shown that it is very useful when those impacted are also engaged in developing solutions and get a first-hand view of the process.

[1] The NowGEN® Model for Noise Mitigation $(NM)^2$ Process is a proprietary process of ABCx2, LLC. Copyright © 2018, All Rights Reserved.

Community involvement usually comes in the form of a Procedure Design Working Group, which was utilized here. Vianair hosted several Design Working Group Sessions to discuss the issues identified in the Baseline Study and by the community. The Procedure Design Working Group included community representatives from West End, South Portland, Gorham, and the Islands. This ensured that all communities potentially affected by the proposed designs were represented on the design team.

Methodology

The Design Working Group Sessions were conducted utilizing the Vianair proprietary software, *Airspace Information Modeling* (AIM). AIM is unique as it combines flight procedure design capabilities, airspace modeling, noise analysis, real-time flight performance criteria validation, and intuitive visualization. The use of AIM allows community members, who may not be familiar with flight procedure design, to understand the process as well as implication of design decisions (including the effect to noise exposure and conformance with FAA criteria). AIM provides the ability to make informed judgements as to the effectiveness and conformity to criteria of the design proposed, thereby giving community members the capability to come to consensus on a design that meets the objectives of the Design Philosophy. AIM also enables real-time assessment and validation of FAA criteria, aircraft performance/flyability, and potential impacts to safety, efficiency, fuel-burn, flight time, etc.

Design Philosophy

The Design Philosophy is one of the most important parts of the Vianair process. This is where the community representatives identify the major objectives and priorities and help define "success." The Design Philosophy consists of guiding principles that point the team in the direction of a "successful outcome." As an example, guiding principles may include:

- Prioritizing flight procedures that overfly compatible land uses, such as industrial complexes, interstates, or open areas with little or no residential neighborhoods;
- Avoidance of hospitals, schools and/or places of worship;
- "Equitable" distribution of noise between certain populations, such as between counties, states, or neighborhoods;
- Consistency with historic flight paths or patterns;
- Reduce concentrations of flights or increase flight track variability when practical

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It is important for the group to agree to this Design Philosophy up front to discourage special interests, or "NIMBYism."[2] Once the Design Philosophy is agreed upon, the design process can begin with a common goal in mind: successful implementation Ultimately, procedure design recommendations must be consistent with agreed upon Design Philosophy. Once achieved, the group can remain focused on the agreed upon criteria for determining what constitutes a successful design.

The Working Group's Design Philosophy for this project was as follows:

Primary Objective
Maximize overflight of "compatible" areas such as non-residential areas, commercial/industrial areas, the Fore River and waters of Casco Bay.

Where it is not possible to avoid residential neighborhood areas, strive to share the noise burden according to the following considerations:

Consideration #1
Design procedures that limit the exposure to any affected community so that no single area is disproportionalty burdened by the highest cumulative noise exposure.

Consideration #2
Design procedures that minimize overflight of othe most impacted areas (Portland Peninsula, South Portland, Peaks and Diamond Island).

Consideration #3
Design procedures to avoid residential areas from 10:00 PM – 7:00 AM.

Consideration #4
Consider historical flight patterns and conditions prior to recent airspace changes since 2019.

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[2] NIMBYism is a colloquialism used to express interest in one's own circumstances without consideration of the whole process or issues affect the broader community. NIMBY meaning – "Not In My Back Yard."

Collaboration and Implementation

Implementation of the recommended procedures requires collaboration with industry stakeholders including the airport, airlines, FAA, etc. The only way to get to implementation is to ensure that the FAA's mandate to "*provide a safe and efficient National Airspace System (NAS)"* is also considered. This requires compliance with FAA criteria, consideration of Air Traffic Control operational requirements and controller workload, and compliance with airspace and terrain and obstruction clearance criteria. The FAA is also tasked with ensuring system "efficiency". This means they must consider the impact on the National Airspace System (NAS) and system users/operators. For example, if the design significantly increases flight time or mileage, the FAA may not approve the procedure due to the impact on efficiency. Flight procedures need to be optimized, meaning that all aspects of the procedure; safety, efficiency, and environmental impacts, are fully understood and considered.

Our experience suggests that the most effective path to successful implementation of flight procedures includes regular dialogue with the appropriate air traffic control facility affected by the proposed changes. Collaboration at the front-end of the process leads to a higher likelihood of successful implementation. During this project, collaboration with the FAA began through the NAC. The request was made through the NAC, and the FAA designated a point of contact (POC) at PWM ATCT for the Technical Expert (Vianair) to work with directly. Generally, the POC should be an operational person, such as an Airspace and Procedures Operations Support Specialist, who is responsible for the specific area within the ATC facility that will be affected by the proposals of the Design Group. This enables the free and open exchange of information between the Design Group and the FAA resulting in the highest likelihood of implementation of the proposed procedures or revisions. It is important for the technical expert to speak the FAA's language and know when it is possible to respond to a "non-acceptance" with viable alternatives that enable the FAA to move from "No" to "Yes, if…"

For this project, Vianair worked collaboratively with the PWM ATCT Manager to determine the feasibility of the procedures being proposed. Several of the procedures, especially the approaches, were determined to be feasible. Through a collaborative effort, both the community and the FAA proposed mutually acceptable modifications to the proposed arrival procedures that are expected to result in a win-win scenario when the procedures are implemented.

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It should be noted that collaboration with the local air traffic facility (PWM) to determine feasibility of a procedure does not constitute approval of a procedure. This initial review is merely an indicator that the proposed solution is more likely to be implemented than if proposals had been submitted to the FAA without pre-coordination and collaboration.

As a result of collaboration with PWM ATCT the following recommendations/action items will be evaluated by the FAA PBN Team:

1. Modification/Overlay of the HSKEL THREE RNAV SID with an RNP SID.

2. Modification/Overlay of the NUBLE FOUR RNAV SID with an RNP SID.

3. Design of an RNP-AR Approach to Runway 29 as an alternative to the Harbor Visual RWY 29, the RNAV Visual RWY 29, and/or the ILS OR LOC RWY 29 approaches.

NOTE- *A fourth RNAV (GPS) approach was considered by the NAC Design Working Group but ultimately rejected.*

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Recommendations for Consideration by the NAC

Based on the design philosophy adopted by the NAC Design Working Group, Vianair facilitated several design team meetings which included procedure subject matter experts from the Vianair Team as well as representatives from the various communities represented on the NAC.

Initial discussions included a review of the design philosophy and key issues and concerns expressed by the community. These community issues as they relate to the existing flight procedures and noise impacts served as the basis for the discussions about modifications to existing procedures and the development of new procedures. Key goals included; reducing concentration of operations (and the unfair burden to any one community), avoiding dense residential areas and overflying "compatible areas" (i.e., water) when able, and increasing altitudes over residential areas. The following elements were developed as a result of the planning and design work conducted by the design team.

Design of RNP-AR Runway 29 Approach - Alternative to the Harbor Visual RWY 29, the RNAV Visual RWY 29, and/or the ILS OR LOC RWY 29 approaches

Two of the top priorities established by the NAC Design Working Group were to minimize overflight of residential areas and to reduce concentrations of operations so no one community is unfairly burdened. This resulted in the exploration of a new RNP-AR approach to Runway 29. An RNP would enable tighter turns and more precise flightpaths over water.

Flying the existing approaches, aircraft landing at PWM initially fly a Standard Terminal Arrival Procedure (STAR) into the PWM airspace, then fly the Harbor Visual Approach, the RNAV Visual Approach or an ILS approach procedure to Runway 29. Most arrival procedures to Runway 29 overfly noise sensitive areas (i.e., land) over South Portland or the Islands. (See Figure 1).

To address these issues a new RNP-AR approach was designed to maximize time over water, thereby reducing noise impacts to several communities.

The new RNP-AR approach begins at the SAPPE Waypoint, the termination waypoint of both the CDOGG and SCOGS STAR. The procedure then proceeds west over the water and curves through the islands minimizing time over land, then turning down the mouth of the Fore River then turning toward into the airport at the last possible moment thereby minimizing time over land (noise sensitive areas). (See Figure 2)

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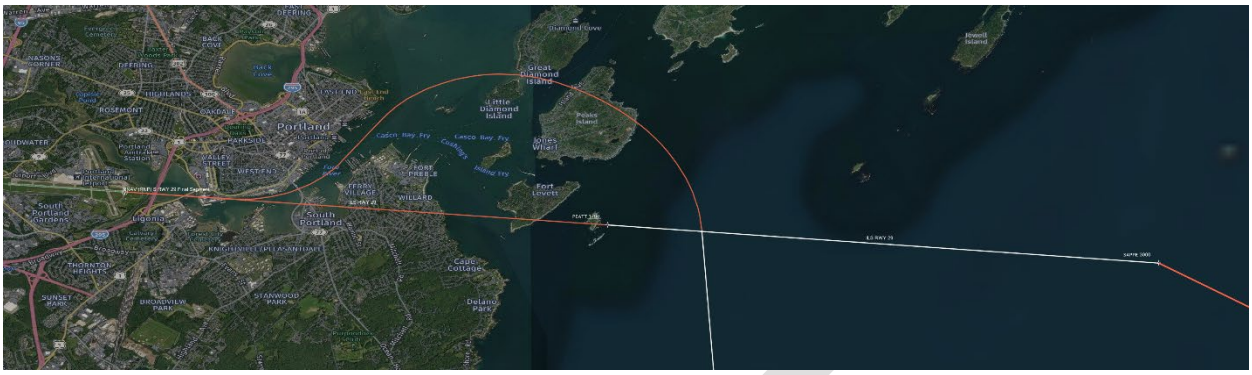

***Figure 1**. Existing Condition. STARs, RNAV Visual RWY 29 and ILS OR LOC RWY 29 approaches*

Figures 2, 3, and 4 (below) below depict the Notional RNAV (RNP) RWY 29 Approach. Note that this approach begins at the SAPPE waypoint, which is the termination of the STARs. Additional Initial Approach Fixes (IAFs) may be designed if operationally advantageous.

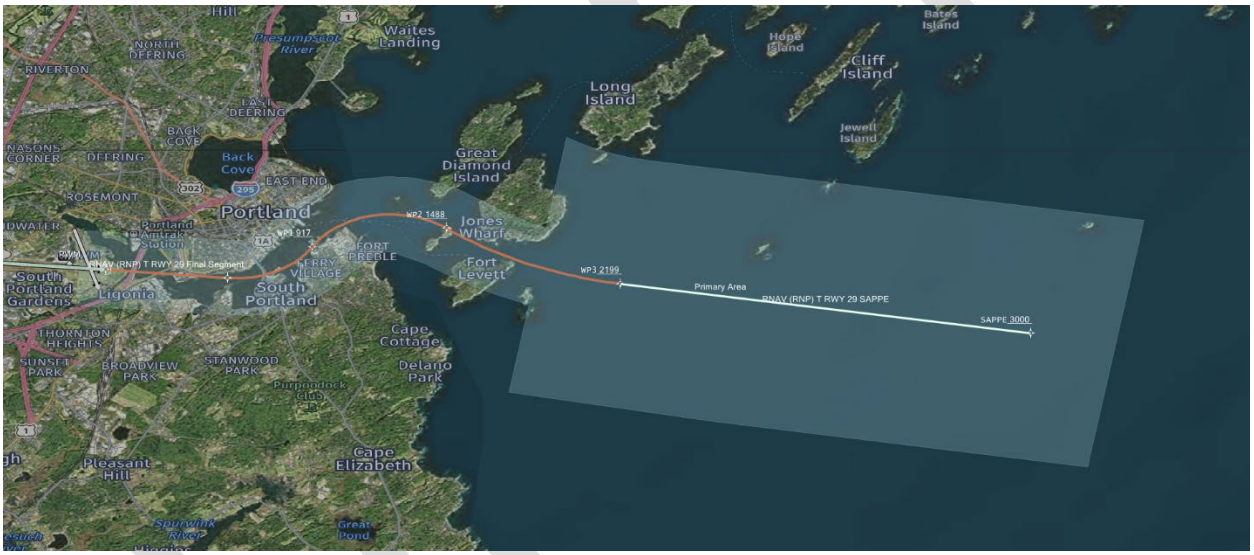

***Figure 2**. Notional RNAV (RNP) RWY 29 Approach – Wide View*

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The objective was to maximize time over water (to avoid noise-sensitive areas) as much as possible in accordance with the Design Philosophy. This design utilizes a triple RF Turn to avoid overflight of land as much as possible in accordance with the Primary Objective.

NOTE- *The grey areas depicted Figure 3 (below) are the Obstacle Evaluation Areas.*

Figure 3*. Notional RNAV (RNP) RWY 29 Approach – Close View*

Figure 4 shows the entire route from the IAF to the runway.

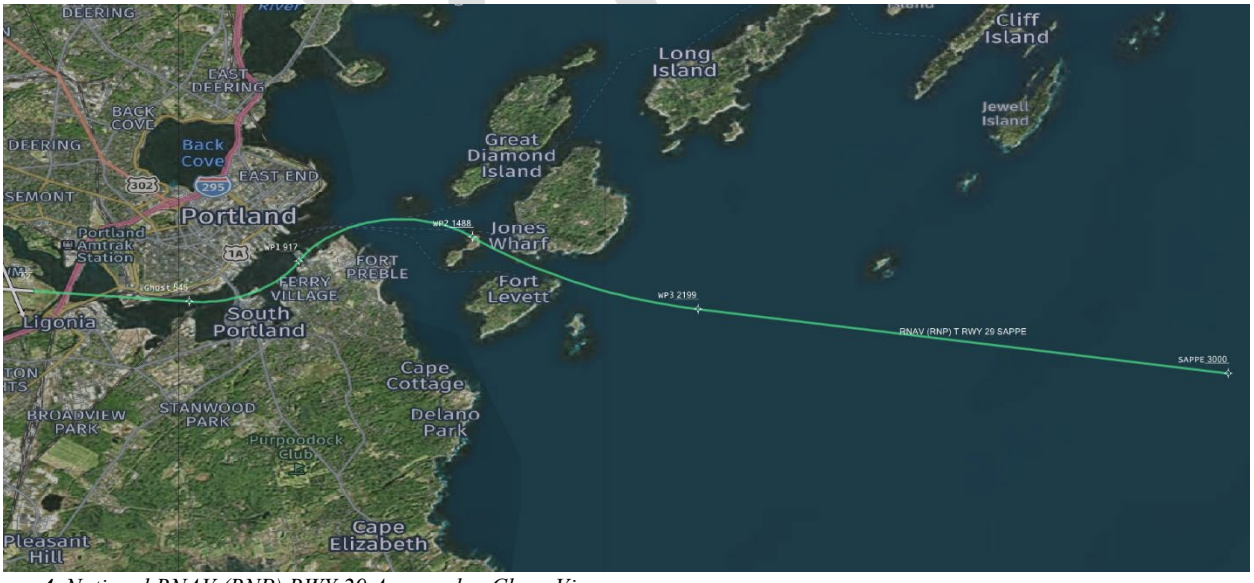

Figure 4*. Notional RNAV (RNP) RWY 29 Approach – Clean View*

Modification /Overlay of the RNAV SIDs with RNP SIDs.

The next three figures below depict the existing configuration of the RNAV departures. The red lines in Figures 6 and 7 depict the modeled flight path that the aircraft would follow when flying the departure procedures.

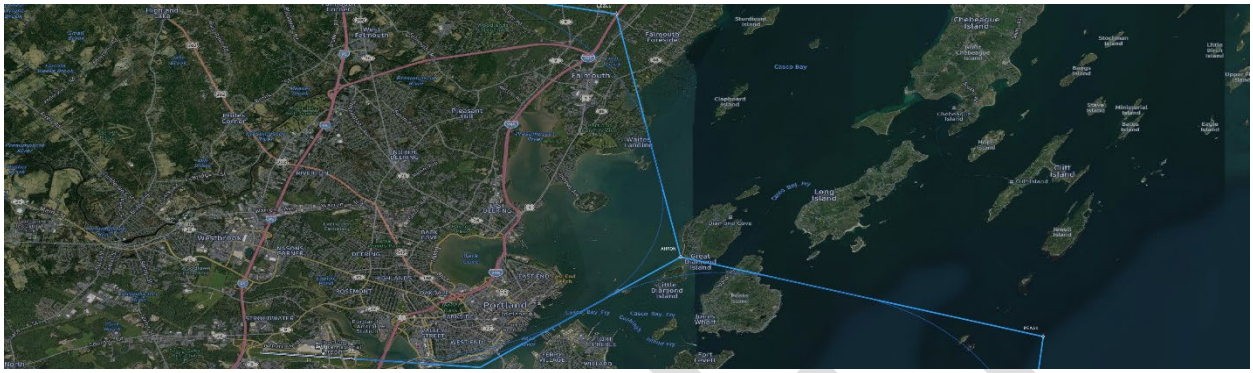

Figure 5. *Existing Condition. - RNAV SIDs HSKEL and NUBLE*

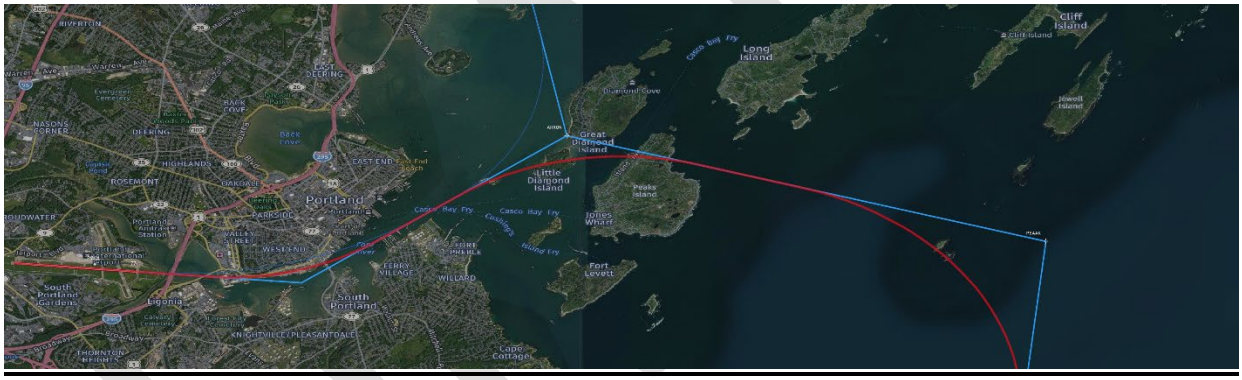

Figure 6. *Existing Condition. NUBLE FOUR RNAV SID – Predicted Flight Track in Red*

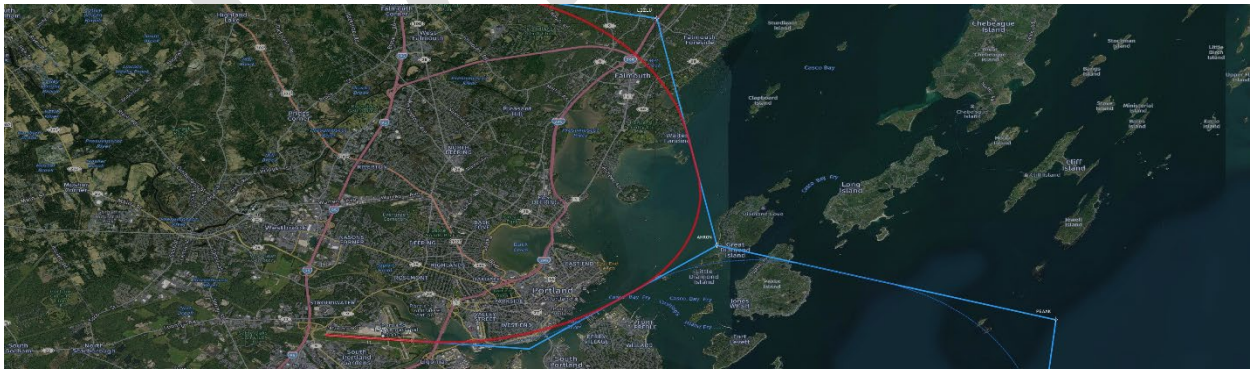

Figure 7. *Existing Condition. HSKEL THREE RNAV SID – Predicted Flight Track in Red*

Modification /Overlay of the NUBLE FOUR RNAV SID with and RNP SID

Figure 8 depicts the notional NUBLE RNP SID in a wide view from the airport outward to over the water east of the mainland. This design minimizes overflight of land (noise sensitive areas) thereby minimizing overflight of residential areas.

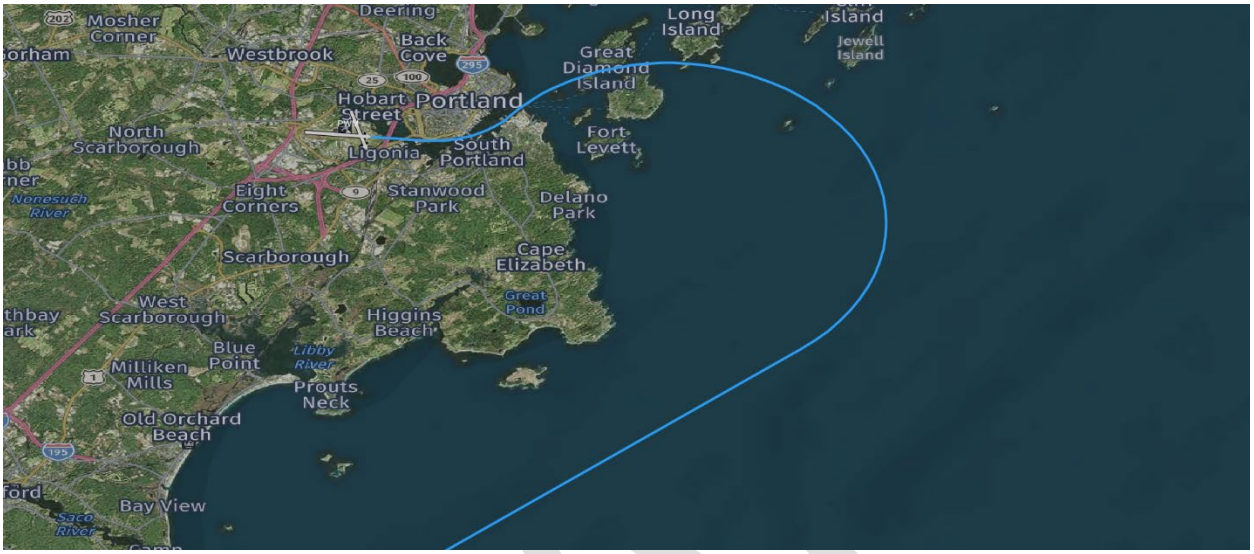

***Figure 8**. Proposed NUBLE RNP SID – Wide*

While there was discussion of an early turn from Runway 11 to the south, this design was ultimately chosen by the Design Group because it was the most consistent with the primary objective of the Design Philosophy by maximizing time over water. Overflight of residential areas is almost completely avoided. In addition, this design provides some relief to residents in the West End area as discussed in the Preliminary Noise Analysis below.

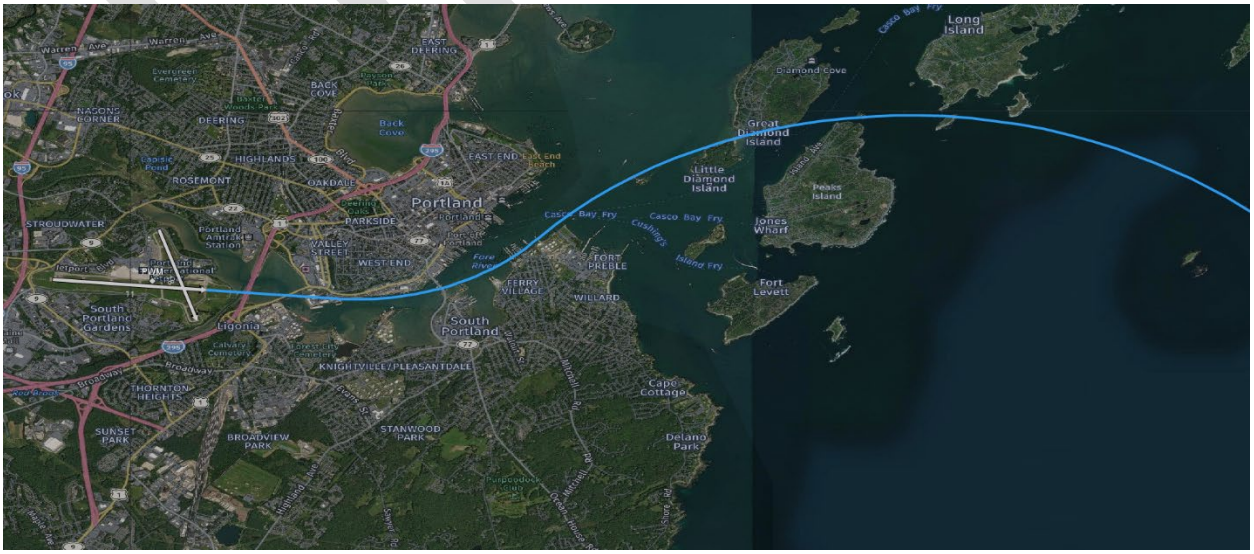

***Figure 9**. Proposed NUBLE RNP SID - Close*

Modification /Overlay of the HSKEL THREE RNAV SID with and RNP SID

Figure 10 shows the notional HSKEL RNP SID in a wide view from the airport outbound to the north and west. This design provides the least overflight of land during the initial take-off and climb out.

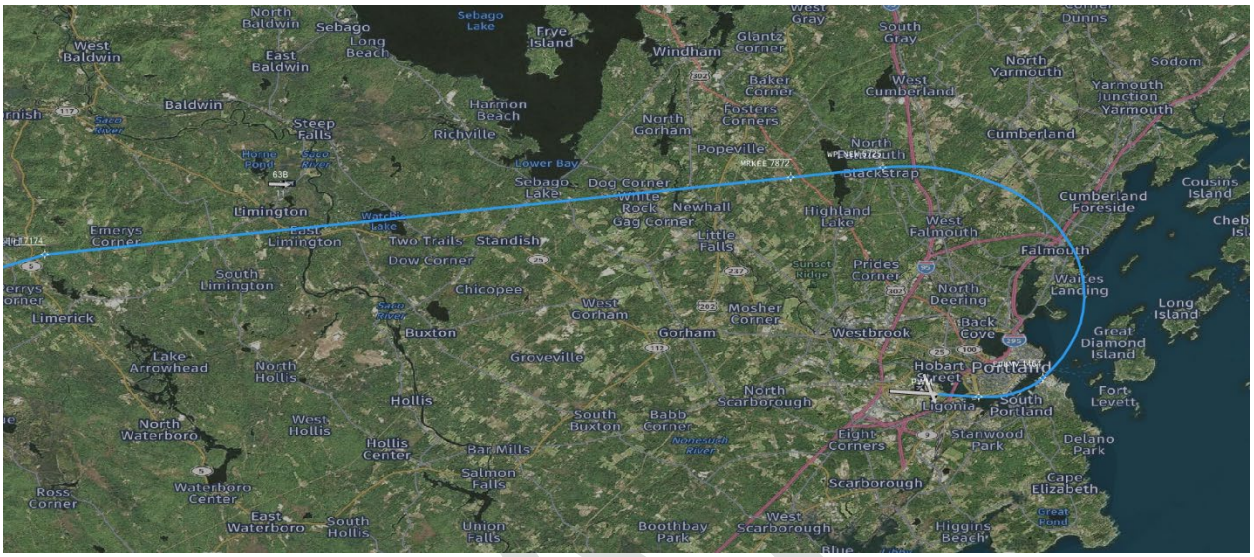

***Figure 10**. Proposed HSKEL RNP SID – Wide*

Another objective was to reduce the amount of residential areas overflown by the SID. The arc radius was adjusted to move the ground track slightly to the east and northeast over less densely populated areas. This is discussed further in the Preliminary Noise Analysis below.

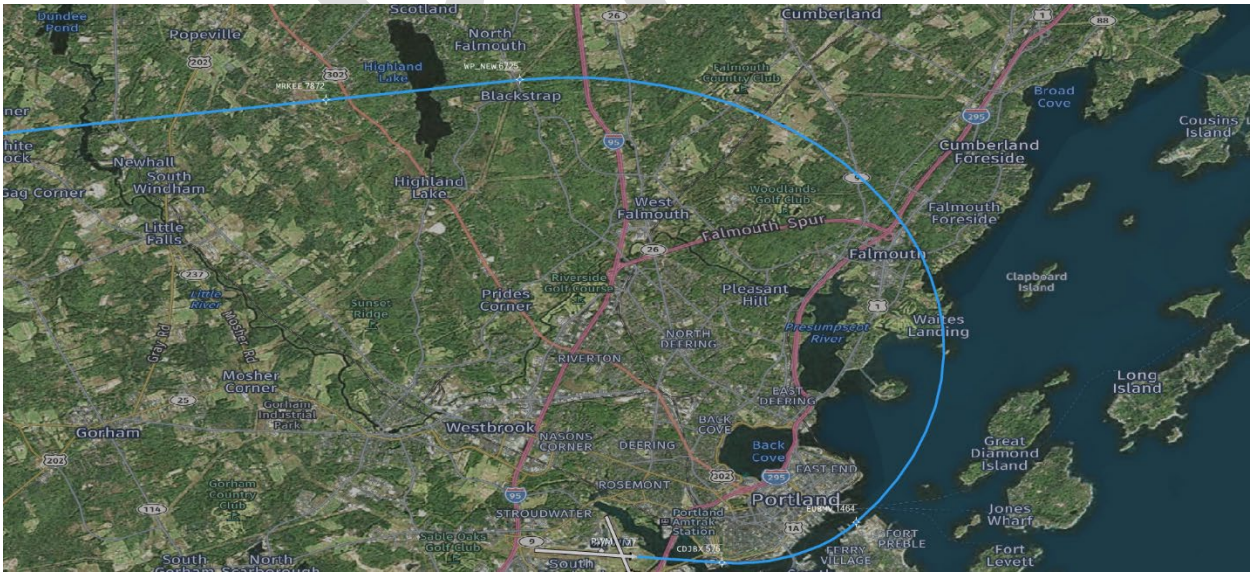

***Figure 11**. Proposed HSKEL RNP SID – Close*

Preliminary Noise Analysis

The following descriptions should be taken as a whole to understand the overall benefit of the proposed procedures. In other words, if only one procedure is reviewed, there will be definite advantages and disadvantages to implementation of the single proposed flight procedures. However, when taken as a whole, the project provides benefits to virtually all neighborhoods in the Portland area at one time or another and during various weather conditions.

For example, the notional RNP Approach to Runway 29 will produce less noise for South Portland than the existing ILS – and – it will produce less noise for the island communities than the existing Southwest RNAV Visual Approach. If aircraft fly the RNP during good weather days, the island communities will benefit. If aircraft fly the RNP during bad weather days, South Portland will see reduced overflights and noise.

The proposed RNP SIDs provide benefits to almost all communities with slight increases in overflight in the few areas that are closer to the shoreline as compared to the existing SIDs.

Each of the notional flight procedures can be mapped back to the Design Philosophy and taken as a system that will provide an overall benefit to the City of Portland and the surrounding communities.

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Approach Comparisons

In Figures 12-16 below, red indicates a net increase in noise when comparing the proposed procedure to the existing procedures. Green indicates a net decrease in noise. The LAmax metric is used. The LAmax metric indicates the highest instantaneous noise level experienced by an observer at the given location. Additionally, the relative size of the dot is proportional to the net difference in volume of the noise. The larger the dot, the greater the difference.

Notional RNP Approach Compared to the ILS or LOC RWY 29

Figure 12 depicts the difference in noise when the notional RNP approach is compared to the existing ILS or LOC RWY 29 Approach. The RNP would provide as much as 22 dbA relief over some areas of South Portland and up to 16 dbA relief to some areas of Cushing Island. The reciprocal increase in noise is mostly over the water, shifting the overflight and noise to non-noise sensitive areas, which is consistent with the Design Philosophy.

NOTE- *The proposed notional RNP Approach is located along the flight path of the existing Harbor Visual RWY 29 Approach path to the maximum extent possible. The noise experienced by aircraft flying the notional RNP Approach will be virtually identical to the noise experienced by the Harbor Visual Approach.*

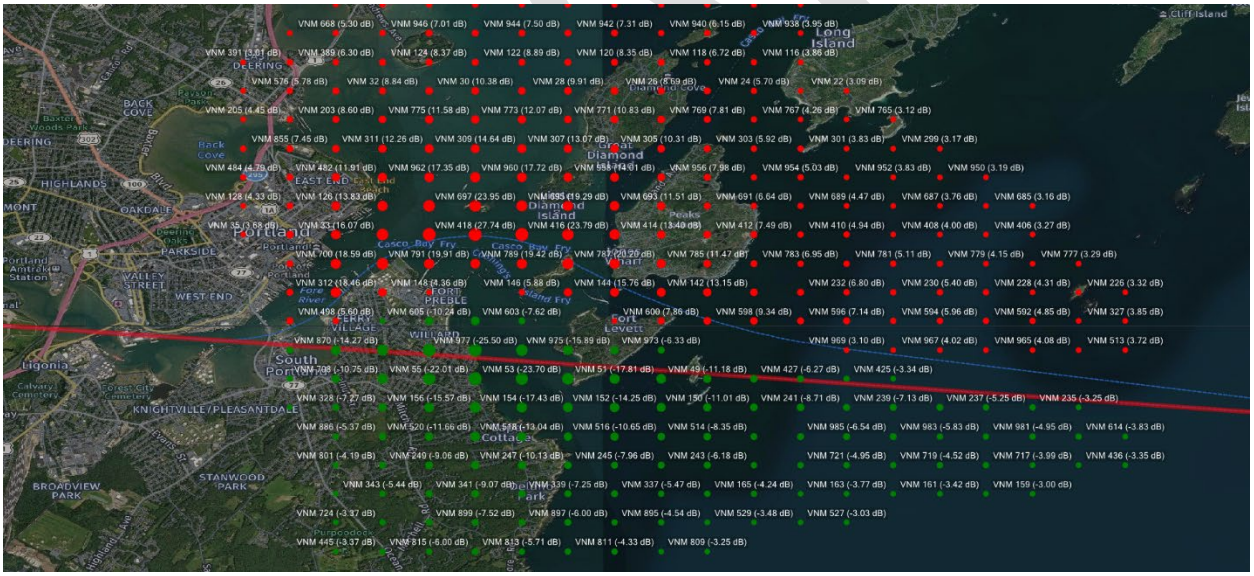

Figure 12. *Proposed RNP Approach Compared to ILS – ILS is Baseline*

Notional RNP Approach Compared to the RNAV Visual RWY 29

Figure 13 depicts the difference in noise when the notional RNP approach is compared to the existing Southwest RNAV Visual RWY 29 Approach. The RNP would provide as much as 22 dbA relief over some areas of Peaks Island and Great Diamond Island. The reciprocal increase in noise is mostly over the water and Cushing Island which is consistent with Consideration #2 of the Design Philosophy.

NOTE- *Cushing Island would be virtually unchanged when compared to the Harbor Visual Approach which flies approximately the same route as the RNP. However, the RNP is more likely to remain offshore due to the higher accuracy of the flight track when compared to the existing Harbor Visual Approach tracks.*

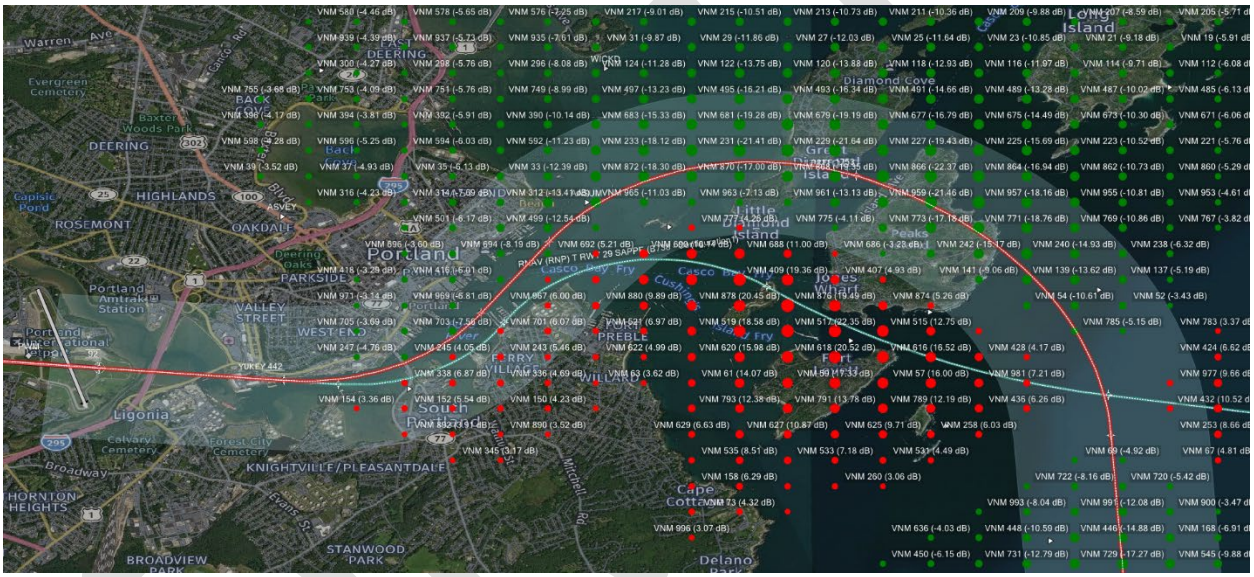

Figure 13*. Proposed RNP Approach Compared to RNAV Visual Approach – RNAV Visual is Baseline*

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Figures 14-16 provide close-up depictions of the noise analysis to show the comparison of the Notional RNP Approach compared to the existing RNAV Visual Approach.

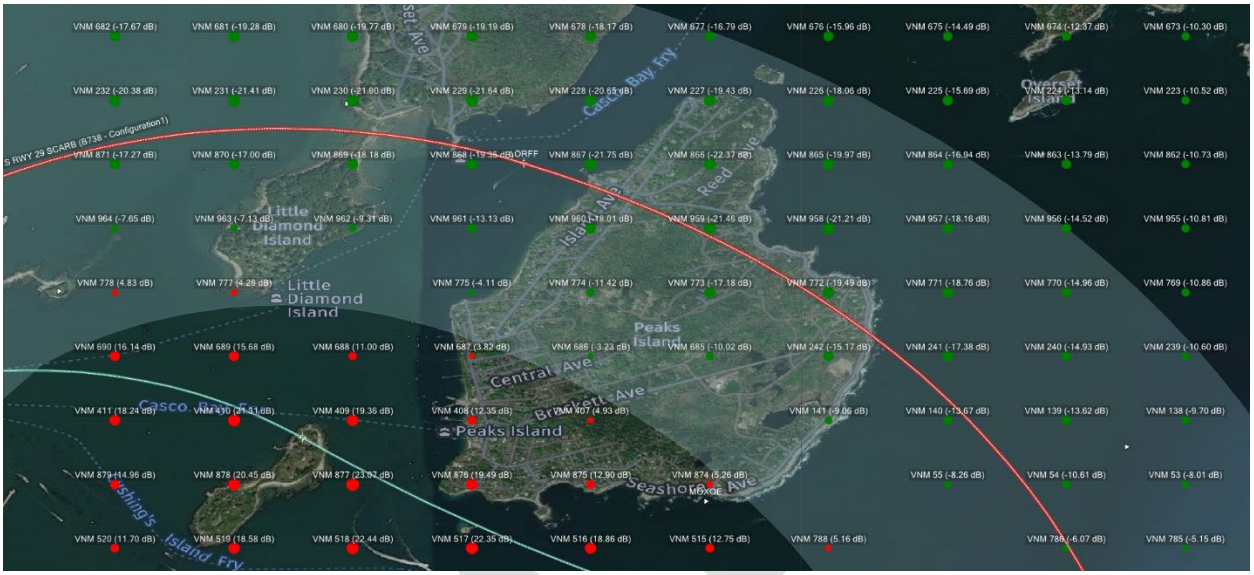

***Figure 14**. Proposed RNP Approach Compared to RNAV Visual Approach - Peaks Island – RNAV Visual is Baseline*

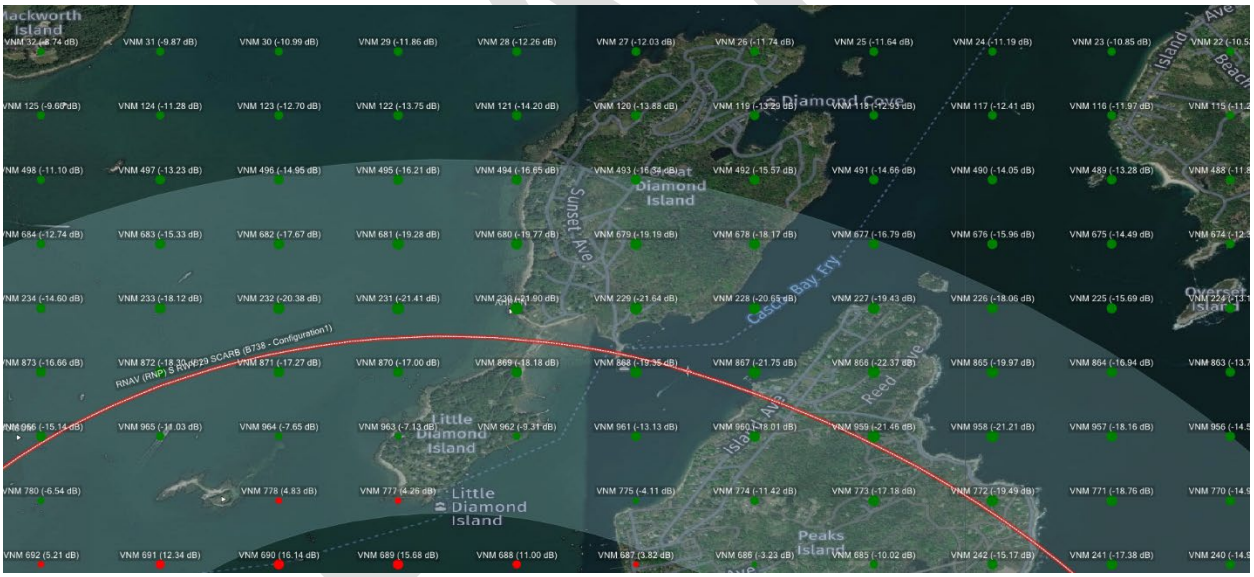

***Figure 15**. Proposed RNP Approach Compared to RNAV Visual Approach - Diamond Islands – RNAV Visual is Baseline*

NOTE- *Long Island received as much as a 12 dbA reduction from the proposed notional RNP Approach (Figure 16) but an approximate 6 dbA increase from the proposed notional RNP SID (Figure 19). This was described in the section describing the NUBLE RNP SID. However, if both procedures are implemented, Long Island will experience a net benefit (reduction in overflights and noise) from the new procedures.*

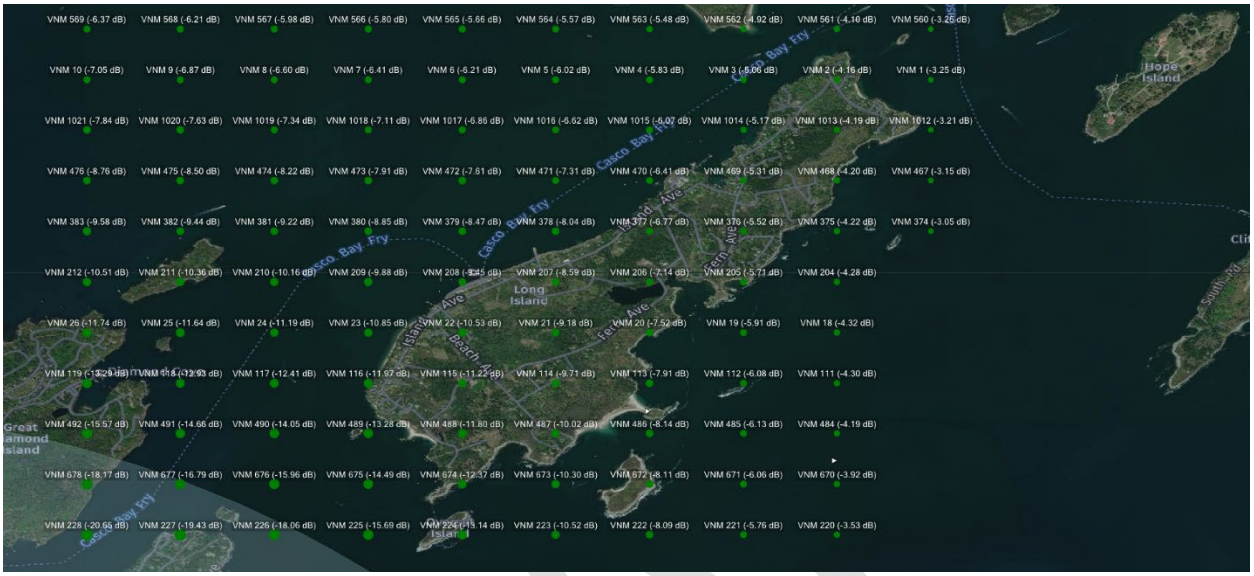

Figure 16. *Proposed RNP Approach Compared to RNAV Visual Approach - Long Island – RNAV Visual is Baseline*

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Departure Comparisons

In the following graphics, VNMs are only depicted where the difference in noise is equal to or greater than 3 decibels when compared to the existing procedures. In areas where no VNMs are depicted, the change in noise is less than 3 decibels and most likely imperceptible to the human ear.

NUBLE RNP SID vs. Existing RNAV Track

In Figure 17, the red line represents the existing flight track centerline of the NUBLE SID. The grey line is the centerline of the proposed notional NUBLE RNP SID. The RNP SID would provide as much as 5 dbA relief over some areas of Peaks Island.

***Figure 17**. Proposed NUBLE RNP SID vs Existing NUBLE RNAV Track - Peaks*

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The reciprocal increase in noise depicted in Figure 18 and 19 is mostly over the water and the less densely populated Long Island, which is consistent with the Design Philosophy.

Figure 18. *Proposed NUBLE RNP SID vs Existing NUBLE RNAV Track – Great Diamond*

NOTE- *Long Island received as much as a 12 dbA noise reduction from the proposed notional RNP Approach (Figure 16) but an approximate 6 dbA increase from the proposed notional RNP SID (Figure 19). This is detailed in the section describing the NUBLE RNP SID. However, if both procedures are implemented, Long Island will experience a net benefit from the new procedures.*

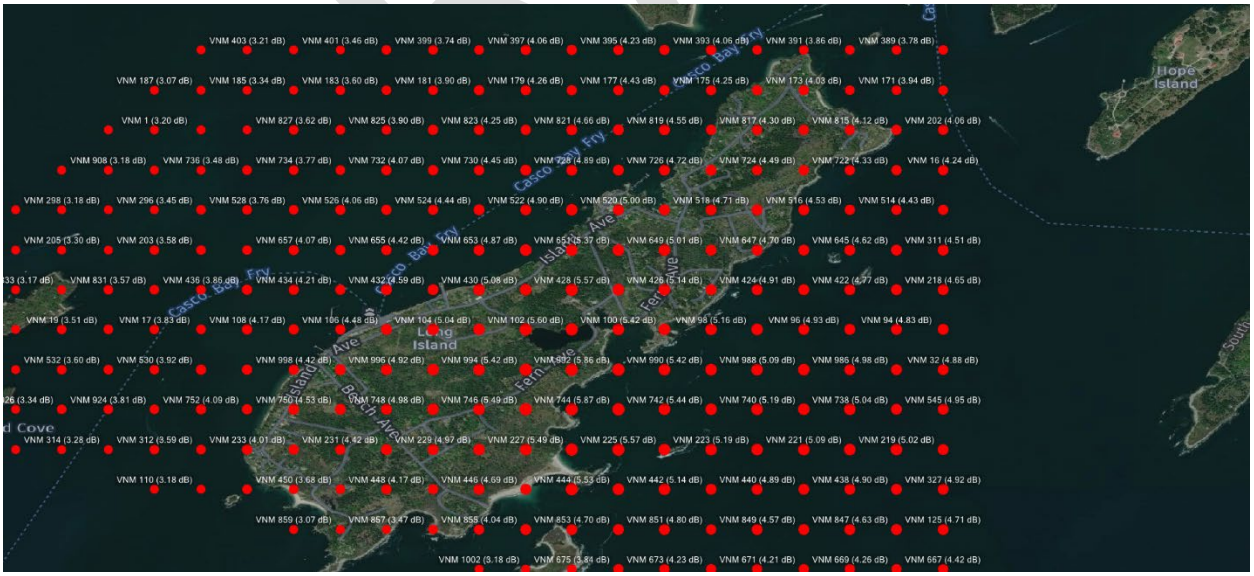

Figure 19. *Proposed NUBLE RNP SID vs Existing NUBLE RNAV Track – Long*

In closer to the airport, the proposed notional RNP SIDs will provide up to a 4 dbA benefit to the West End area while. Areas with increase noise 3 dbA or greater) is over water which is consistent with the Design Philosophy.

NOTE- *The initial segment of both the NUBLE and HSKEL RNP SIDs are coincidental as depicted below in Blue.*

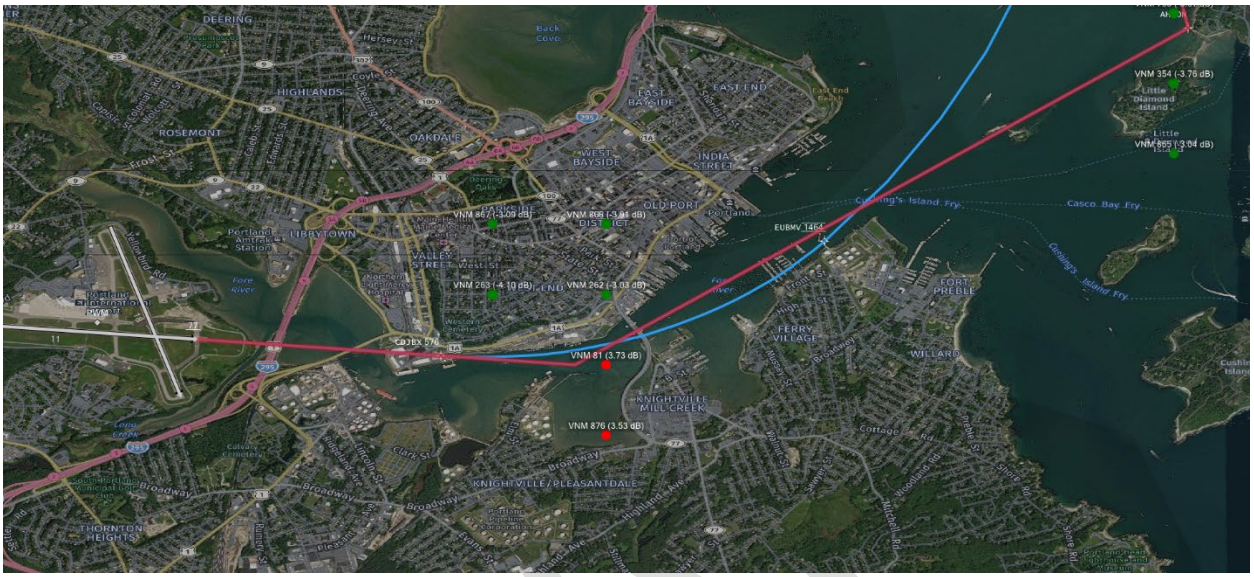

Figure 20. *Proposed NUBLE RNP SID vs Existing NUBLE RNAV Track – West End*

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HSKEL RNP SID vs. Existing RNAV Track

Figures 21-24 depict the difference in noise when the notional RNP SID is compared to the existing HSKEL RNAV SID flight track. The RNP SID would provide as much as 5 dbA relief over some areas of Falmouth and Great Diamond Island. The reciprocal increase in noise is mostly over the water and less densely populated areas north and west of Falmouth which is consistent with the Design Philosophy.

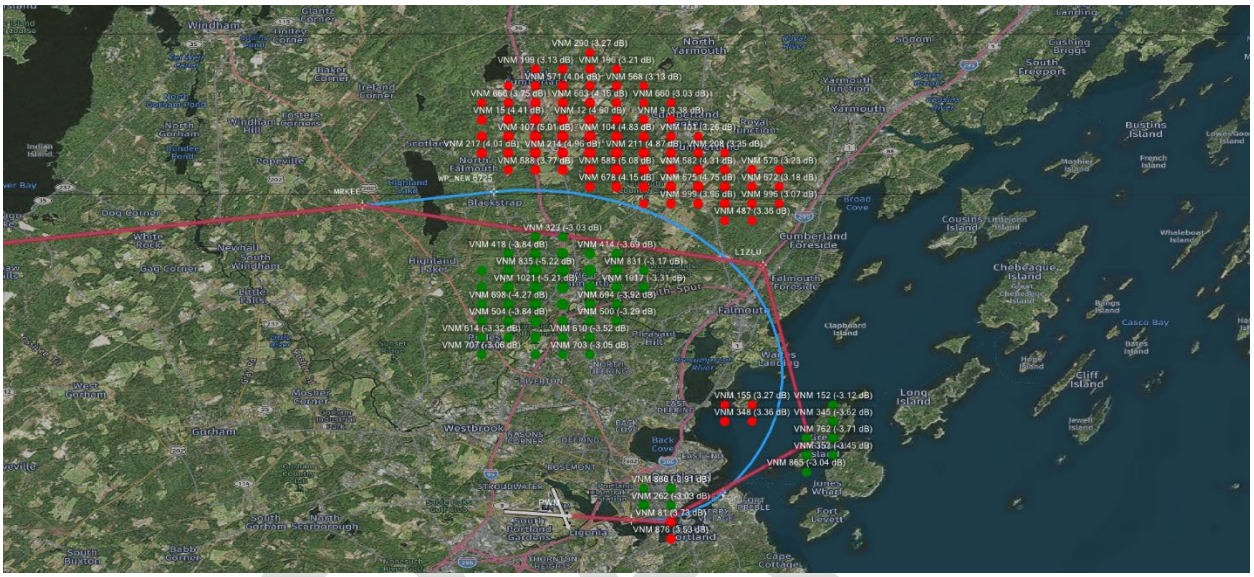

Figure 21. *Proposed HSKEL RNP SID vs Existing HSKEL RNAV Track – Wide View*

Figure 22. *Proposed HSKEL RNP SID vs Existing HSKEL RNAV Track – Great Diamond Area*

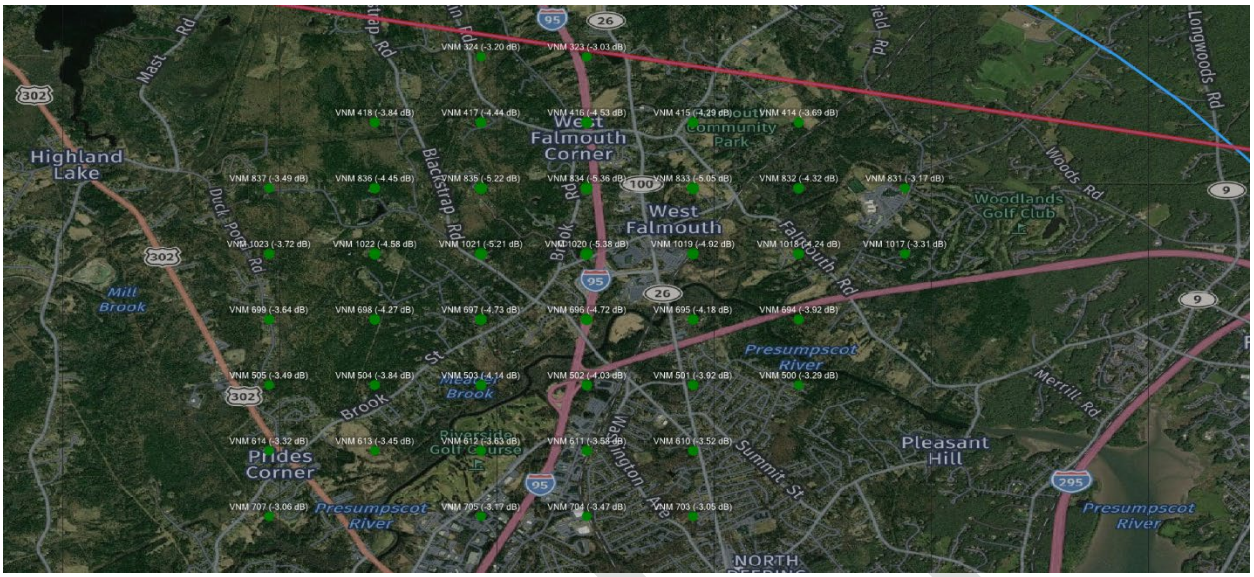

Figure 23. *Proposed HSKEL RNP SID vs Existing HSKEL RNAV Track – West Falmouth Area*

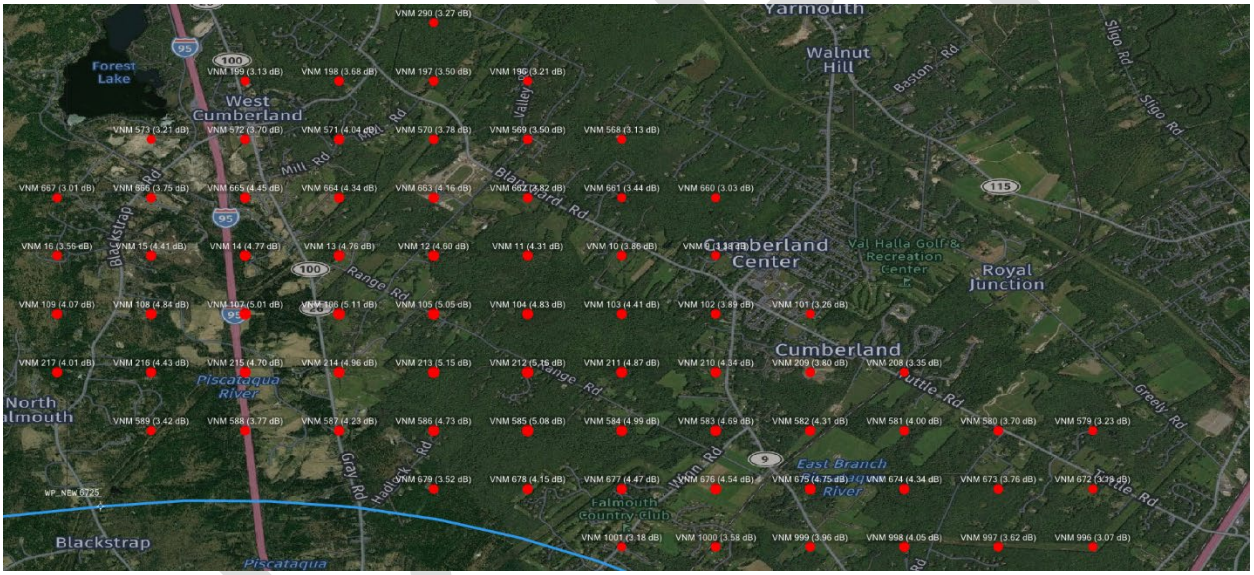

Figure 24. *Proposed HSKEL RNP SID vs Existing HSKEL RNAV Track – Cumberland Area*

Existing Condition (Baseline Noise)

Baseline noise was calculated using a B737-800 aircraft and calculating the highest instantaneous noise at a given point using the LAmax noise metric. The noise comparisons above were calculated as a delta (+/-) noise change when the notional flight procedure is compared to the baseline noise depicted in Figures 25-28.

NOTE- *These are high resolution graphics and may be expanded to enable viewing on the VNM values.*

Figure 25*. Southwest Airlines RNAV Visual Flight Procedure*

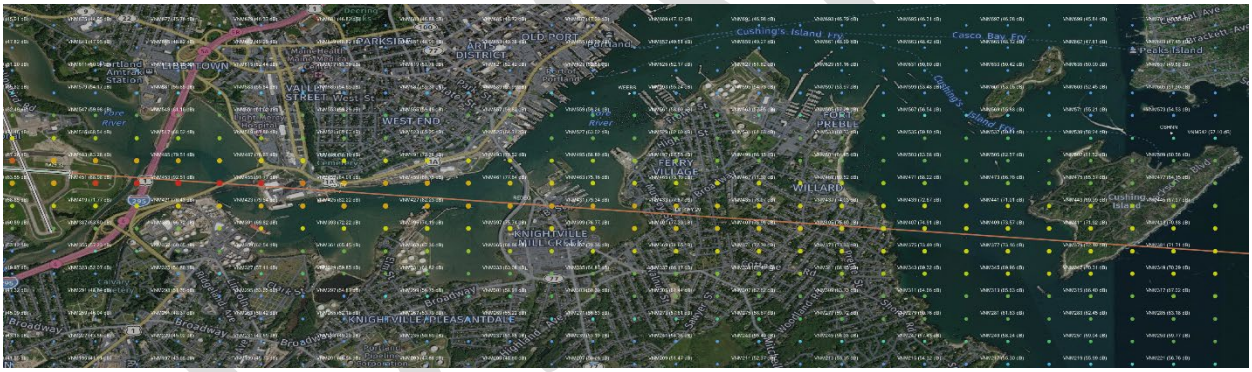

Figure 26*. ILS OR LOC RWY 29 Approach*

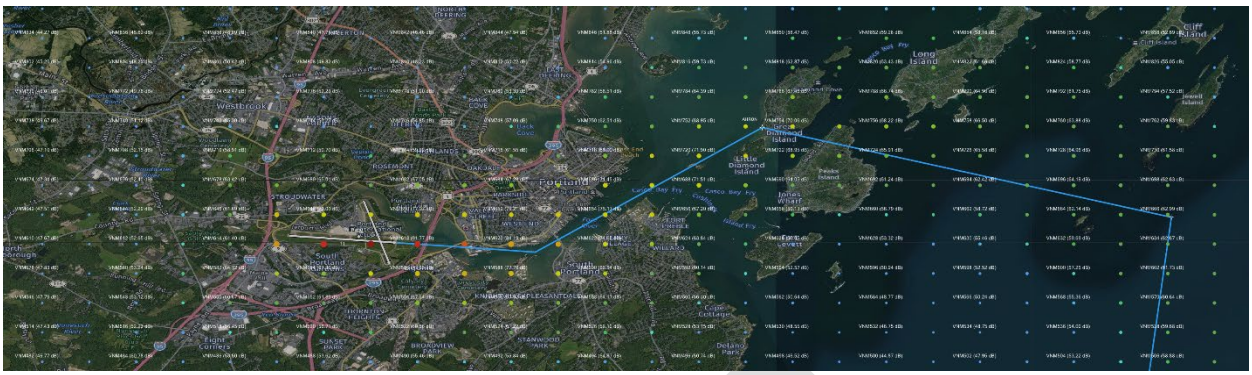

***Figure 27**. Baseline Existing NUBLE RNAV Track*

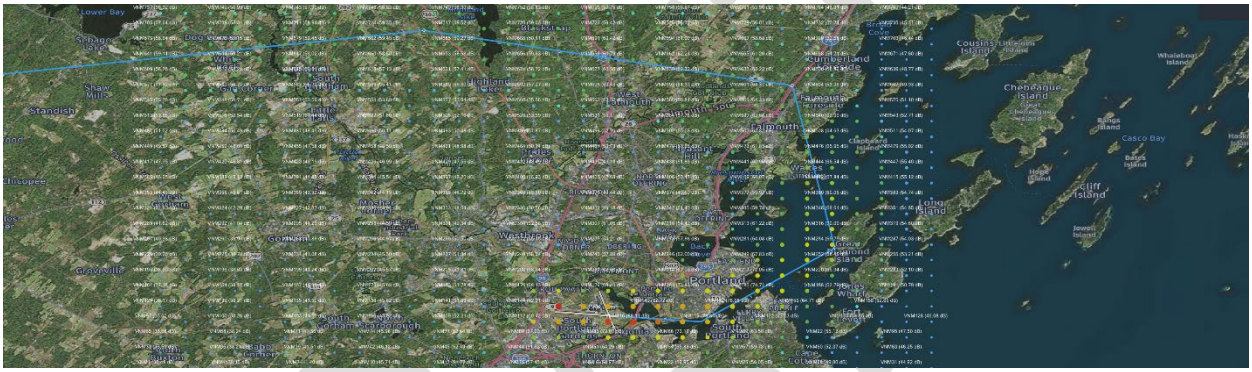

***Figure 28**. Baseline Existing HSKEL RNAV Track*

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Glossary

A-RNP - Advanced Required Navigation Performance

ATC – Air Traffic Control

ATIS – Automatic Terminal Information Service. Broadcast service at airports which provides non-control airport/terminal area and meteorological information to pilots.

CONVENTIONAL PROCEDURE – An instrument flight procedure that requires ground based navigational aids (NAVAID) to provide course guidance for an instrument approach to an airport or a departure procedure from an airport.

GPS – Global Positioning System – A satellite-based navigational aid.

IAF – Initial Approach Fix

IFP – Instrument Flight Procedure

IMC – Instrument Meteorological Conditions – Instrument meteorological conditions means weather conditions below the minimums prescribed for flight under Visual Flight Rules (VFR).

Localizer – A ground-based directional aid that provides precision lateral guidance to an airport or runway.

PBN – Performance Based Navigation – A very precise navigational criteria or standard by which instrument flight procedures are designed allowing the use of RNAV and/or GPS to fly very accurate arrival and departure routes.

PWM ATCT – Portland Airport Traffic Control Tower is the Air Traffic Control facility that handles flights into and out of Portland Jetport.

RF – Radius-To-Fix – A type of RNAV leg or approach segment of an IFP that is made up of two waypoints connected by an arc or uniform curved flight path.

RNAV – Area Navigation – RNAV can be one of several kinds of systems (including GPS) used by aircraft to navigate point to point without having to fly directly to/from a NAVAID.

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RNP – Required Navigation Performance – RNP is a very precise version of RNAV that is normally used for instrument approach procedures but that may also be used in other instrument flight procedures.

RWY – Runway

SIAP – Standard Instrument Approach Procedure

SID – Standard Instrument Departure

SOP – Standard Operating Procedure

STAR – Standard Terminal Arrival Route

TERPS – Terminal Procedures – The criteria by which the FAA designs instrument flight procedures.

TF – Track-To-Fix - A type of RNAV leg or approach segment of an IFP that is made up of two waypoints connected by a straight-line flight path.

VFR – Visual Flight Rules - Weather conditions reported as less than 3 statute miles visibility, or the ceiling is less than 1000 feet above the ground.

VNM – Virtual Noise Monitor

WP – Waypoint – A point in space that aircraft can navigate to using RNAV.

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