

SCOPE OF WORK

November 6, 2009

The following presents Landrum & Brown's (L&B) recommended scope of work for a 14 CFR Part 150 Noise Compatibility Study Update at Seattle-Tacoma International Airport (SEA) for the Port of Seattle (POS). This scope of work has been tailored to the specific issues and concerns at SEA.

TASK 1: STUDY MOBILIZATION

Description: L&B will develop a detailed work program that balances the needs and concerns of POS and other interested parties. The detailed work program will include the following:

- Scope of Work – A detailed description of each item of work required for completion of the study will be prepared based on guidelines drawn from appropriate Federal Aviation Regulations, Advisory Circulars, and guidance from POS.
- Schedule - A project schedule identifying time frames for major phases of the study will be developed.

L&B will submit the proposed work program to POS. After POS has had time to review the proposed work program, necessary members of L&B staff will meet with POS in Seattle for a working session to discuss the scope and schedule. Some items will not be completely defined (e.g., supplemental metrics, public outreach approaches, etc.). The initial kickoff meeting with the public (Subtask 2.2) will help to provide more definition of these issues. After that meeting, the scope and schedule will be refined and a final detailed work program will be developed.

Deliverables: Proposed scope and schedule will be delivered in electronic format directly to POS.

TASK 2: STAKEHOLDER INVOLVEMENT

Subtask 2.1: Develop Stakeholder Involvement Program

Description: Based upon several decades of controversy about aircraft noise issues at SEA, the inclusion of comprehensive stakeholder participation in this study is essential to the credibility of its outcomes. To be successful, the planning process must be inclusive and transparent, while providing meaningful opportunities for participation to all stakeholders. The focus of these meetings will be to seek community input into the appropriate approaches to address significant aircraft noise impacts from operations at SEA.

L&B will produce a comprehensive public involvement plan for the two-year Part 150 process. The plan will include an overview of the project and process, and will provide goals for the public involvement program. The plan will detail the role, meeting schedule, and goals for the advisory committee, as well as the schedule

and goals for each public meeting. The plan will include a list of all community groups, elected officials, and other stakeholder interests that may want to be included in the Part 150 process. The plan will describe the intent of various publications and role of the project website, in both disseminating information and in providing a venue for the public to submit comments on the project.

The plan will be provided to the Port Commissioners and made available to the public by posting it on the Part 150 Study website. It will be designed to reassure the public that the Part 150 process will be open, transparent, and fully receptive to public input. It will also serve as a “blueprint” for the POS and L&B to work together to carry out the public involvement program.

Deliverables: L&B will produce a detailed plan for public involvement, inclusive of the information specified above. It will include techniques for presenting information at public meetings and gaining public feedback, information to be published on the project web site, the development and composition of the Technical Advisory Committee (TAC), a methodology for keeping elected officials apprised of the study progress, and the process for assuring that notices of meetings are communicated to participants. The remainder of Section 2 of this Scope of Work will serve as a framework upon which the involvement plan will be constructed.

Subtask 2.2: Public Workshops

Description: To facilitate public participation in the Part 150 Study process, six (6) public workshop sessions will be conducted over the course of the study. To minimize travel expenses, public workshops will be held on the same or consecutive days as the scheduled TAC meetings.

Public Workshops will be designed to facilitate public review and input to the planning process. Each workshop will include a general introductory presentation of not more than 30 minutes highlighting the findings of the project to date and the next steps of the planning process. The presentation will be followed by a 45-minute breakout period during which the attendees will divide into facilitated smaller groups for discussion of topics critical to the next phase of the study. The small groups will reassemble to hear summary reports by the facilitators of the topics and issues raised within each group. The summarization will be followed by a general question and response period prior to adjournment. The meetings will be scheduled for 3 hours., but the workshop room will be opened to review material and displays 1 hour before the opening of the meeting.

Public workshops will coincide with the completion of specific milestones of the Part 150 Project. L&B will distribute Public Workshop notices via email, the project website, and text message not less than four weeks prior to the meeting and repeated two weeks, one week and one day prior to the Workshop to all members of the public who have opted into an e-mail notification system through registration at previous Workshops, through the project website, or through the POS *Constant Contact* communication utility. A Public Workshop announcement will be published in the **local newspaper** at least ten days prior to the Workshop. Similarly, an advertisement of the meeting will be displayed at www.highlinetimes.com. L&B will

provide a press release to the POS Project Manager regarding the content of the meeting not less than one week prior to the meeting so that POS Public Relations staff can distribute the information to the media.

A typical workshop would include:

- Registration station
- Presentation of findings to date
 - Operational data
 - Noise measurements
 - Forecasts of future operations
- Breakout groups to review material and brainstorm potential noise abatement and mitigation actions (Facilitated by L&B team and/or POS staff. Record and consider all ideas, no rejections by facilitators or POS staff at this meeting)
- Reassembly to summarize the concepts evolving from breakout groups (no findings here – subsequently address all and post review) (led by facilitators or appointed spokespersons)
- Static information stations providing greater detail on operational data and forecast projections (for reference during breakout discussions)
- Written comment station

The workshops will be held in semi-formal audience-based format on mid-week evenings. Representatives from the POS and L&B team will attend each Workshop to participate in the discussions, assist in facilitation of the breakout groups, and respond to questions. Representatives of the TAC membership will also be encouraged to attend to assist in the discussions. Citizens will also be afforded the opportunity to make written comments which will be reviewed and considered by the L&B and POS during subsequent portions of the study.

L&B will furnish PowerPoint presentations and display graphics (maps, charts, etc.) to display the issues, alternatives, analysis, etc. relevant to the each workshop. L&B will also provide the presentations and handout materials to be posted on the project web site at least two weeks prior to each meeting. Not more than thirty copies of each handout will be provided at each workshop. L&B will record and maintain a summary of all recorded comments from the workshops. L&B will provide snacks and beverages for attendees as appropriate for the time and duration of the meeting¹.

¹ Snacks and beverages are not eligible for AIP funding.

Accommodations for Spanish language speaking guests will be made through the provision of interpreters at each meeting. General meeting information and announcements will be provided in Spanish language, but technical information will be provided only in English.

The Airport will provide for and bear the costs of the meeting facility and set-up, including necessary equipment such as electronic projectors, screens, chairs and tables, and POS project staff required to participate in the workshops. Workshops will be held at convenient locations within the study area as determined by the POS.

Deliverables: L&B will manage six (6) public workshops. L&B will post electronic copies of all presentation and handout material after each meeting for publication on the SEA Part 150 website and in a "Public Involvement" appendix to the Final Part 150 Document.

Subtask 2.3: Public Hearing/Responses

Description: One formal Public Hearing will be conducted in conjunction with the final public workshop (Subtask 2.2). Verbatim transcripts of the Public Hearing will be prepared for inclusion in the final noise compatibility program document. Notice of the Hearing will be distributed through publication in the **Seattle Times**, the **Highline Times**, and the Puget Sound Business Journal, and posted on the project web site, and e-messed to all participants in the e-mail or text message outreach programs described in Subtask 2.2. Published notices will be distributed not less than 30 days prior to the first scheduled Hearing date. E-messages will be sent to those who have signed-up for the e-messaging 30 days, two weeks and one week prior to the Public Hearing date.

L&B will provide media materials, a public hearing officer, and transcriptionist for the Hearing. If feasible, the POS will provide for the Hearing to be webcast live on the internet (and/or public television), with a mechanism to receive written comments via e-mail at any time during the open comment period. The webcasts, if conducted, will also be saved and posted to the project website for later viewing by interested parties. POS will provide meeting facilities for the Hearing and accompanying Workshop.

Deliverables: A formal Public Hearing to be held in conjunction with the last Public Information Workshops. A written summary of the Public Hearings will be included in the final Part 150 Study document, as will a transcript of the oral testimony. Responses to the comments made at the public hearings and during the public comment period will be included in a "Public Involvement" appendix to the Final Part 150 Report (see Subtask 2.4).

Subtask 2.4: Prepare Comment Responses

Description: L&B will review, categorize, and prepare responses to public comments (oral and written testimony received within the public comment period) for inclusion in the final document. Individual responses will not be provided to those who have commented. Responses to comments received during Public

Hearing or via the mail, e-mail or posting on the project web site during the official project comment period will be included in a "Public Involvement" appendix to the Final Part 150 Study document.

Deliverables: Responses to public and agency comments received during the public review period for the draft document. Budgeting estimates will be made on the assumption that responses to 100 substantive comments will be provided. Preparing responses to substantive comments beyond 100 will be the subject of an amendment.

Subtask 2.5: Establish Technical Advisory Committee

Description: A Technical Advisory Committee (TAC) will be convened for in the duration of the Part 150 Study. The TAC will advise the POS and L&B on the technical evaluations and recommendations of the study through review of interim and draft reports and participation in regular committee meetings. The principal purpose of the committees will be to provide a forum in which the experts in land use, airport and aircraft operations, air traffic control, etc can discuss and review the draft work and provide informed feedback for L&B's recommendations to the POS.

Potential members of the TAC will be identified and invited to serve by POS staff. L&B, if directed to do so by the POS, will contact prospective members of the committee to establish their interest and availability to participate. Members of any similar previous committees of these types will be considered for appointment, where appropriate. Membership for the committees will be determined from a consensus of POS staff, the FAA, and L&B.

The TAC will consist of, but not be limited to, representatives the following aviation and land planning stakeholder groups:

- ➔ Representatives of the Planning Departments of each local jurisdiction within the 2004 DNL 65 dBA contour, and the Highline Forum Communities
- ➔ FAA Airports, Air Traffic, Flight Standards, and Flight Procedures Office Representatives
- ➔ Passenger, Cargo, and Commuter Airlines
- ➔ General aviation fixed base operator and other airport tenants
- ➔ Washington State DOT
- ➔ Puget Sound Regional Council
- ➔ Representative from King County - Boeing Field Airport

Deliverables: L&B will develop and maintain a roster of TAC membership, which will be provided to POS and to each member of the committee at the committee meetings. L&B will provide the committee membership roster to the managers of the project website (see Subtask 2.9) in electronic format to develop automated announcements of meetings and the availability of project reports and meeting information on the website.

Subtask 2.6: Technical Advisory Committee Meetings

Description: POS and L&B will work with the members of the TAC established as part of the Part 150 Study. The committee will be non-voting and will serve as the principal forum for obtaining review and input from local land use officials and aviation interests. The committee will be advisory only. L&B team member Norton Arnold Company (NAC) will facilitate and provide support services to the committee, and be further supported by all L&B team members necessary to convey the technical information under discussion. All direction to L&B regarding the final recommendations in the plan will come from the POS Project Manager, after consideration and review by the TAC.

Up to eight (8) TAC meetings will be conducted. The following lists nine opportunities for such meetings. The POS and L&B will select eight from these nine:

- 1) Kick-off meeting to introduce the study and seek input to noise measurement locations;
- 2) Review of baseline and future flight tracks, runway use, and noise measurement data;
- 3) Review of operational forecasts and the draft Noise Exposure Map for existing baseline noise levels;
- 4) Review current and future Noise Exposure Maps and discuss general noise abatement and preliminary mitigation concepts;
- 5) Review and discussion of preliminary aviation alternative findings;
- 6) Review and discussion of preliminary land use alternative findings; this meeting may be combined with the previous meeting if project conditions warrant)
- 7) Review and discussion of preliminary recommendations of the consultant;
- 8) Review and discussion of recommendations which will be presented for Public Hearing. This meeting will be conducted only if the two alternatives meetings (5 and 6) are combined;
- 9) A final meeting after the Public Hearing but before the Final Part 150 document is submitted to the FAA to discuss the final outcome and next steps.

L&B will distribute committee meeting notices via email, posting on the project website, and text message not less than four weeks prior to the meeting and repeated two weeks, one week and one day prior to the meeting. Review materials will be posted on the project web site at least two weeks prior to the meeting date. L&B will provide an agenda and prepare and make presentations on agenda items and provide meeting notes. To minimize travel expenses, TAC meetings will occur either on the same day (morning of) or on consecutive days with Public Workshops whenever possible. For cost purposes, it is assumed that six of the TAC meetings will be in conjunction with other meetings and two are independent of other meetings.

The meetings will combine a background presentation by L&B staff and committee group working sessions, as appropriate. In general, presentations will be used to disseminate information to the committees for consideration and small working groups within the TAC will be used to review the data and brainstorm concepts related to abatement alternative concepts. L&B will facilitate the presentations and working group meetings, prepare and present the background presentations, and keep meeting records.

Deliverables: L&B will provide draft meeting agendas presentation materials to the POS project manager for review not less than 24 calendar days prior to the meeting date. The POS project manager will provide comments or revisions to L&B not less than 17 calendar days prior to the scheduled meeting date so that revisions may be made prior to posting on the project web site. L&B will post the meeting agenda and any appropriate pre-meeting material on the project web site two weeks prior to the committee meetings, and L&B will notify all TAC committee members of its availability for download. After committee meetings, L&B will distribute draft committee meeting summaries to committee members via e-mail. After a comment period of two weeks, the summaries will be made final and posted on the website. Meeting summaries and handout materials will also be included by L&B in a "Stakeholder Involvement" appendix to the Draft and Final Part 150 Study document.

Subtask 2.7: Special Presentations and Focus Group Meetings

Description: Special presentations and focus group meetings will be held throughout the course of the Part 150 study to communicate the process and findings to elected officials, advocacy groups, and other organized interest groups. Upon request, the L&B team will offer up to twelve (12) consultant "person-meetings" for participation in these meetings. "Person-meetings" refers to the number of people attending the total number of meetings. For example, if the POS requests one person from the L&B team to participate at a meeting, that equals one "person-meeting". However, if the POS requests two people from the L&B team to participate in a meeting, that equals two "person-meetings". "Focus groups" are those organized entities that have a special interest in the study, either as users of SEA or as affected neighbors or community advocacy groups. Unless otherwise agreed to by the Port, the consultant will provide notes of those meetings of which they are a part. To minimize travel expenses, most of the technical consultant participation under this Subtask will occur by locally based consultants or during the same trip to Seattle as those conducted for TAC meetings or Public Workshops. Non-technical meetings may be accommodated with Seattle-based members of the consultant team upon request by the POS.

Upon request by the POS Project Manager the L&B team will respond to any comments and requests made during the course of these discussions, if within the scope of this Statement of Work.

Deliverables: Participation for up to twelve (12) "person-meetings" with public bodies and focus groups. After special presentations or focus group meetings, the consultant will assist with preparing meeting summaries by providing his/her notes. L&B will be responsible for publishing all summaries and appropriate meeting

documents to the project website once they have been reviewed by the POS. Any meeting summaries and handout material distributed during the meetings will be included in the "Public Involvement" or "Stakeholder Involvement" appendix (whichever is appropriate) to the Draft and Final Part 150 Study document.

Subtask 2.8: Port Commission Briefings

Description: During the course of the study, the POS Project Manager will provide periodic briefings to the Port of Seattle Commission at regularly scheduled meetings. The L&B team Project Manager will be available to attend one of these meetings early during the project to explain the study process and at a second meeting late during the study to respond to questions about the recommended program actions.

Deliverables: Consultant attendance at two (2) briefings to the Port of Seattle Commission on project status and findings.

Subtask 2.9: Project Website

Description: In an effort to quickly and efficiently distribute project-related announcements and technical information, L&B will create, host, and maintain a website for the Part 150 Study. The POS may establish a direct linkage from its website to the project website to enable ready access to all project data that has been published. Prior to posting, L&B will coordinate with POS project management on appropriate content and format for web publication.

The site will provide announcements of meetings and data availability, project meeting handouts, project reports, and other text and graphic material as may contribute to the understanding of the project process or technical assessments. The website will serve as a primary access point for the public to download and review the final Noise Compatibility Plan prior to the required Public Hearing.

The website will include functionality that will allow public comments to be submitted on-line. On-line comments will be automatically forwarded to a SEA Part 150 email address which will be maintained and actively monitored by L&B. L&B will forward those comments to appropriate POS staff in a timely manner, and POS will be responsible for sending responses via email. POS will electronically carbon copy responses to the SEA Part 150 email address so that they are recorded for the project's administrative record.

To maximize the success of the website for the use by TAC members, as well as the involvement of the general citizenry, the site will include a mechanism through the Port's *Constant Contact* utility for members of the public to register receive meeting notifications and other current information on the Part 150 study by email.

Deliverables: L&B will provide POS with electronic copies of meeting handouts and displays, meeting notices and summaries, working papers, reports, and presentations for review prior to posting to the SEA Part 150 Study website.

Subtask 2.10: Project Periodicals

Description: In addition to the digital postings provided by the project website (Subtask 2.9), special editions of the airport's **Air Mail** newsletter for airport neighbors will be distributed. Up to four (4) special editions will be produced, with content anticipated to focus on the initiation of the project, the development of the Noise Exposure Maps, the consideration of abatement alternatives, and the recommended Noise Compatibility Program. The POS will be responsible for all logistics, including content and working with a local contractor for design, production, printing and mailing. The printed editions will follow the format already established by the newsletter (two-sided printing with half page fold, addressed on back).

L&B will be responsible for processing invoices incurred by the local contractor. A Spanish language translation of each edition will be available for delivery via e-mail or postal delivery upon request.

Deliverables: L&B to administer the production of four editions of **Air Mail** focused on Part 150 issues.

TASK 3: INVENTORY OF EXISTING CONDITIONS

L&B will evaluate existing documents, records, previous planning efforts, airport physical facilities, air traffic operations activity, airspace and air traffic control procedures, radar data, noise monitoring data, current noise abatement programs, complaint history, engine run-up data, existing community land use, and previously approved land use mitigation program areas.

Subtask 3.1: Research/Evaluate Previous Studies and Reports

Description: L&B will review and evaluate recent studies and reports which may pertain to the SEA Part 150 Study. Findings from these documents may influence multiple aspects of this study. The documents will include but may not be limited to:

- The most recently completed SEA Part 150 Study approved in June 2002 and the associated FAA Record of Approval
- The Supplemental EIS for the new runway at SEA and the associated FAA Record of Decision
- Airport Noise Program Publications
- Airport Noise Technical Reports
- Summaries and documentation from meetings and presentations made by SEA/POS since the opening of the new runway

Deliverables: A summary of the significant and pertinent findings from each reviewed document will be provided in the Draft and Final Part 150 Reports.

Subtask 3.2: Existing Airfield Facilities and Operations

Description: The physical facilities of the airfield will be identified as to their utility in the definition of noise patterns in the airport environs.

Current operations data will be collected from any necessary sources which may include the ANOMS (Airport Noise and Operations Monitoring System) system database, Official Airline Guide (OAG) data, Airport Traffic Control Tower (ATCT) statistics, airline landing fee reports, FBO operational reports, military operational reports, and archived radar data. This information will include existing and recent historical records of operations by aircraft type, time of day, runway used, aircraft weight and engine type (where available), origin/destination, and based aircraft ownership.

L&B will take into consideration the 2009 runway reconstruction project for Runway 16L/34R SEA in the analysis and presentation of existing runway use for SEA. L&B will clearly delineate runway usage statistics during times of construction versus times of full runway operation.

Deliverables: A summary of existing airfield facilities and operations will be included in the Draft and Final Part 150 Reports.

Subtask 3.3: Existing Airspace/ATC Procedures

Description: Airspace procedures have a significant influence on the shape and extent of the overall noise exposure around an airport. L&B will research and analyze the currently published visual and instrument flight procedures applicable to SEA such that various aspects the current noise exposure may be understood in the context of the current airspace design. L&B may request assistance from the FAA Air Traffic personnel if necessary to understand specific elements of the current airspace procedures.

Deliverables: A summary of existing airspace/ATC procedures will be included in the Draft and Final Part 150 Reports.

Subtask 3.4: Existing Noise Abatement Procedures

Description: By definition, noise abatement procedures have an influence on the existing noise exposure around an airport. L&B will research and analyze the existing noise abatement procedures utilized at SEA. L&B will primarily obtain information from the most recently completed Part 150 study at SEA, and will follow up with POS, SEA, and FAA staff to determine which procedures were implemented, to what degree they are currently used, and why.

Deliverables: A summary of existing noise abatement procedures at SEA will be included in the Draft and Final Part 150 Reports.

Subtask 3.5: Existing Radar Data

Description: L&B with the endorsement of POS will request authorization from FAA to receive selected archived radar data to be provided in digital format. This data

will be used to enable an evaluation of flight tracks with respect to 3-dimensional spatial characteristics and frequency of usage by various categories of aircraft. This information will allow for an initial verification of aircraft flight tracks and operating characteristics unique to certain user groups. A sample size adequate to represent with statistical significance the flight track usage proportionality of an entire year will be compiled. This task includes a detailed deconstruction and analysis of radar data by flight route and aircraft category which will be a basis for the preparation of noise model input in Task 6.

Deliverables: A summary of existing radar data including graphical representation will be included in the Draft and Final Part 150 Reports and will be presented at committee and public meetings.

Subtask 3.6: Existing Noise Monitoring Data

Description: SEA currently has in place a system of 25 permanent noise monitors and two portable noise monitors in communities surrounding the airport. L&B will request available data from the 25 permanent monitors for the most recent 12 month period. The type of data requested may include any available daily/weekly/monthly summaries of noise metrics such as L_{50} , L_{90} , DNL, DNL aircraft, L_{eq} , L_{eq-day} , $L_{eq-night}$ and also may include any databases of noise-correlated flight information and associated radar data if available. L&B will organize this data in preparation for the comparisons of noise measurements to noise modeling which will be made as part of Task 6.

Deliverables: A summary of the existing noise monitoring program data and how it was used will be included in the Draft and Final Part 150 Reports.

Subtask 3.7: Existing Engine Run-Ups

Description: Engine run-ups for maintenance or testing are often particularly intrusive and a sensitive issue for communities surrounding airports, especially those run-ups performed at night. L&B will consult with SEA, FAA, and airline personnel to determine with as much accuracy as possible the frequency, time of day, aircraft types, engine settings, locations, and aircraft directionality for run-up activity at SEA. This data will be used as input for noise modeling in the INM in Task 6, and will be used to support the development of alternative(s) related to construction of a Ground Run-up Enclosure (GRE) at SEA.

Deliverables: A summary of engine run-up activity at SEA will be included in the Draft and Final Part 150 Reports.

Subtask 3.8: Evaluate Noise Complaint History

Description: The SEA noise abatement office records all noise complaints received from citizens surrounding the airport which are made either via telephone or via a form on the SEA website. L&B will request and analyze all available records and summaries of such complaints in an effort to increase understanding of the history of noise concerns at SEA and the implications of any recent actions including implementation of noise abatement procedures and construction of the newest runway. The analysis will be with respect to location and time period of complaints.

Deliverables: A summary and analysis of the noise complaint history at SEA will be included in the Draft and Final Part 150 Reports.

Subtask 3.9: Study Area Definition

Description: The boundaries of the area selected for detailed analysis and land use mapping will be established by L&B in consultation with POS staff. The study area, generally following the boundaries of locally established census tracts, will encompass an area somewhat larger than the anticipated 65 dB Day-Night Level (DNL) contours of the Noise Exposure Maps (NEMs). The area will be somewhat larger than the 65 DNL contour to account for potential changes in the contour's shape/size as a result of alternative operating procedures and to allow for study of supplemental metrics and overflight characteristics beyond the 65 DNL.

Deliverables: A summary of the rationale for determining the study area will be included in the Draft and Final Part 150 Reports. The study area boundary will be depicted clearly on all relevant maps presented during the course of the study.

Subtask 3.10: Existing Land Use Map

Description: Existing comprehensive plans, land use plans, land use maps, aerial photography, GIS data, zoning ordinances and other documentation pertaining to land use planning and management in the study area will be obtained from local planning agencies and reviewed. Information will be verified where necessary by means of small-scale field surveys of the environs of SEA and through meetings with local planning agencies. Anticipated development actions known within the Study Area will be identified and their phasing determined.

An updated land use map for the study area will be prepared showing compatible land uses as well as noise-sensitive uses. Maps will be prepared at the largest practical scale for report purposes and will be used as base maps throughout the entire study. The maps will show the study area boundary, updated SEA property lines, existing political jurisdictions, noise-sensitive uses, transportation systems, physical constraints, and the current status of properties in POS mitigation programs.

The properties that are or were eligible for the current noise mitigation program will be highlighted with different colors/patterns. For these homes, the database will include what program the home was eligible for, which phase of the program they were in, if they accepted the mitigation, and what year the home received the

mitigation. The mapping and data will be used in the assessment of homes impacted and in determining number of homes left to be mitigated.

Deliverables: L&B will produce:

- A GIS land use base map depicting the most current existing land uses in the defined study area including the status of properties involved in SEA mitigation programs
- A GIS database of summary table of noise-sensitive land uses in the study area
- A summary of the local plans and ordinances pertaining to land use control

TASK 4: PREPARE AVIATION DEMAND FORECASTS

L&B will develop a forecast of future aviation characteristics and operating levels with enough detail necessary to support the requirements of the Part 150 planning process. To help ensure FAA acceptance of the forecast, the Part 150 forecast will be compared to the FAA's most current Terminal Area Forecast (TAF), and any discrepancies will be resolved with the FAA Northwest Mountain Region and the FAA Office of Aviation Policy and Plans. The year 2009 will be used as the base year for planning and noise analysis purposes. The key benchmark years for the forecast will be 2016 and 2021 corresponding to 5-year and 10-year projections from the anticipated year of submittal of the Noise Exposure Map (NEM) and Noise Compatibility Plan (NCP).

Subtask 4.1: Historical/Background Data Collection

Description: L&B will gather local and regional information and data addressing historical, current, and projected business trends; population changes; employment trends by sector; and income changes including data on a municipality-by-municipality basis for communities in the vicinity of SEA. This data will be used as input to the development of regression-based forecast models as well as for supporting documentation for assessing the impact of recent improvements on adjacent communities and for identifying trends that could influence growth characteristics in the airport environs.

L&B will define and compile a thorough historical base of data for airport-related operational data by type of operation (commercial passenger, air cargo, air taxi, general aviation, and military), passenger base (O&D versus connecting, domestic versus international), load factors, yield, cargo and mail tonnages for an extended historical period for use in the development of future aircraft operations projections for the Part 150 study. This data will be used as input to the development of regression-based forecast models for future aviation activity.

Information concerning the level of activity by commercial airlines including enplanements and operations, any mail and/or cargo volumes; general aviation operations by local and itinerant categories; military operations, and based aircraft by aircraft type will be sought. Information concerning peak hourly operations, daily, monthly, and annual activity will be quantified to the extent feasible from radar data and other available data sources. Data will be obtained from Airport

records including landing reports and monthly Airport operations statistics, Fixed Base Operators (FBOs), and FAA ATCT tower counts.

Deliverables: As part of the Aviation Forecast working paper, and of the Draft and Final Part 150 Reports, L&B will provide a narrative and tabular overview of the historical trends in aviation activity at SEA. This will include a discussion of fluctuations in activity that has occurred over time and their potential relationship to events in the aviation industry or the national and/or local market.

Subtask 4.2: Review Existing Forecasts

Description: As an initial step in the planning process, recent forecasts developed for SEA will be identified and reviewed to define their applicability to the Part 150 Study and to provide a base of comparison for this forecast effort. Other forecasts which will be considered for analysis include those prepared in 2007 and 2003, and the most current FAA Terminal Area Forecast (TAF) at the time that the forecasts are prepared.

As a part of this review process L&B will work with the Seattle ADO and FAA Headquarters Branch Forecast Group to review the basis for the most recent TAF and to discuss any pending revisions and adjustments that the agency may be considering to their TAF for SEA. Adjustments in the TAF can significantly influence the FAA's acceptance of proposed development activities at an airport, should the projections on which these development actions are based deviate by more than 10 percent from the TAF within the five-year forecast period or more than 15 percent within the ten-year forecast period.

Deliverables: As part of the Aviation Forecast working paper, and of the Draft and Final Part 150 Reports, L&B will provide a narrative overview with supporting graphics describing previous forecasts developed for SEA including a brief overview of the supporting methodology and rationale on which these analyses of demand were based.

Subtask 4.3: Commercial Passenger Service Activity Forecast

Description: L&B will develop baseline projections of future passenger enplanements within the market area along with the definition of both passenger and operations levels by mainline carrier, regional commuter carrier, and charter carrier further divided by international versus domestic service and by origin destination versus connecting passengers. A projection of fleet mix will also be developed for the various planning time frames over the course of the 10-year horizon.

The commercial passenger service activity forecast will be prepared for a base-, five-, and ten-year planning horizons. Where data allows the commercial forecast will include revised projections of the following:

- Annual enplanements by planning horizon
- Annual enplanements for air carrier and commuter flights for domestic and international segments by planning horizon

- Enplanements by origin/destination versus connecting passengers
- Average seats per departure and load factor projections by international, domestic, air carrier and commuter
- Total annual commercial passenger operations (air carrier and commuter by domestic and international segment)
- Aircraft fleet mix for air carrier and commuter operations for domestic and international segments by planning horizon

The projection of aircraft fleet mix will initially focus on seating ranges of aircraft likely to serve SEA and then will be further refined to identify specific aircraft types based on existing airline fleets and the announced orders for new aircraft by carriers both serving SEA and those that may be considered likely candidates to serve the area in the future. Fleet mix will be developed for the base year and the five- and ten-year horizons. Specific aircraft types will be identified in the forecast process for use in the development of the noise exposure contours in this Part 150 Study.

Deliverables: As part of the Aviation Forecast working paper, and of the Draft and Final Part 150 Reports, L&B will provide baseline projections by five- and ten-year planning horizons of passenger enplanements and passenger aircraft operations, fleet mix, and assumed load factors along with a summary of the supporting methodology.

Subtask 4.4: Prepare Non-Commercial Passenger Forecast

Description: Projections of future air cargo, General Aviation, and military activity will be prepared. Each of these is discussed below:

Air Cargo: Projections of future air cargo volumes will be generated using historical cargo growth trends to develop both regression- and/or market share-based analyses. Input from cargo operators at SEA received during the inventory process along with input from SEA staff responsible for cargo activities will also be considered. Using input data from the cargo carriers at SEA, adjustments will be made to the trend line projections to reflect potential market shifts, emerging opportunities and/or the anticipated impact of increased security requirements on the freight market in SEA. Other activities to be completed under this task will include the development of a current and projected volume and mix of dedicated freight and mail carried by dedicated freighters.

The air cargo forecast will be prepared for a base year, five-, and ten-year planning horizons. Where data allows, the cargo forecast will include projections of the following:

- Annual enplaned volumes of dedicated air freight and mail
- Total operations by dedicated air freight aircraft
- Air cargo fleet mix over the planning time frame

General Aviation: A revised general aviation activity forecast will be prepared for SEA taking into consideration forecasts from other sources, such as the FAA's Terminal Area Forecast and other studies. Consideration will be given to such recently emerging trends as large-scale fractional ownership of general aviation business jets and increased utilization of general aviation as an alternative to commercial passenger service. Historical activity data will be reviewed and organized to identify historical based aircraft levels, activity peaking characteristics, and the split of local and itinerant aircraft operations. Projections developed for the general aviation category of activity at SEA will include:

- Projected annual operations by local and itinerant activity
- General Aviation Fleet Mix
- Based Aircraft Fleet Mix

Military: A military aviation activity forecast will be prepared for SEA taking into consideration the FAA's Terminal Area Forecast. Because SEA has no based military operations, and relatively few transient military operations annually, this task will not require an extensive level of detail. Historical activity data will be reviewed and organized to identify historical based aircraft levels and aircraft types.

From these combined activities a projection of the total operational levels by type and time frame for SEA will be derived and used as a basis for the military activity forecast. Projections developed for the military category of activity at SEA will include:

- Projected annual operations
- Military Fleet Mix

Deliverables: As part of the Aviation Forecast working paper, and of the Draft and Final Part 150 Reports, L&B will provide baseline projections by five- and ten-year planning horizons of future air cargo, general aviation, and military operational activity anticipated to occur at SEA by aircraft type.

Subtask 4.5: Future Average Annual Day Hourly Distributions

Description: Part 150 analysis requires the classification of noise-modeled operations by daytime (7 am – 10 pm) and nighttime (10 pm – 7 am). In order to project daytime and nighttime operational proportions, an hourly distribution of traffic levels for the average annual day will be prepared for each of the commercial passenger, air cargo, general aviation, and military segments of the forecast. Additionally, the hourly distributions may be referenced if there is potential for any proposed noise-abatement alternatives to cause a shift of operations from daytime to nighttime or vice-versa.

Deliverables: As part of the Aviation Forecast working paper, and of the Draft and Final Part 150 Reports, L&B will provide hourly distributions based on an average annual day for the base year, five-, and ten-year horizons.

Subtask 4.6: Prepare Aviation Forecast Documentation

Description: Because the aviation forecasts for a Part 150 Study require FAA approval, an Aviation Forecast working paper will be prepared for FAA review upon completion of the forecasting effort. The working paper will ultimately form the basis of the Aviation Forecast Chapter in the Part 150 Report.

Prior to developing the Aviation Forecast working paper, the preliminary tabular results of the forecast process will be provided to the FAA Northwest Mountain region for their review. This submittal will be in an electronic PDF format.

The draft working paper will discuss the issues, methodology, and information used as a basis for developing the baseline aviation activity forecast. Also addressed in the working paper will be the projection of future activity levels for each category of activity at SEA. The Draft Aviation Forecast Working Paper will be provided in electronic PDF format for distribution to members of the technical committee, agency reviewers and representatives of Airport management and staff. Upon completion of this review the revised working paper will be posted as a PDF file on a project website.

FAA approval of the forecast will be obtained prior to the subsequent analytical tasks being undertaken.

After the review of the contents of the Draft Aviation Forecast Working Paper by POS and representatives of the FAA Northwest Mountain Region, L&B will respond in writing to specific agency comments and make required changes to the text, analyses and projections to respond to concerns and comments noted by reviewers. It is anticipated that any clarification of comments from the FAA will be addressed via conference call. A revised Aviation Forecast document will be prepared and distributed using the project website and electronic media.

Deliverables: L&B will provide draft and final Aviation Forecast documentation acceptable to the Airport and the FAA for use in subsequent elements of the Part 150 process.

Subtask 4.7: Airport and Consultant Coordination Meetings

Description: During the development of the Aviation Activity Forecast, coordination with stakeholders is anticipated beyond those meetings associated with the presentation of findings to the Technical Advisory Committees and the general public. One internal coordination meeting between L&B and POS, and FAA is anticipated and will consist of the following:

- A meeting for purposes of affirming assumptions, data refinement, and methodology review will be required as part of this task.

Deliverables: L&B will provide meeting notes for review by POS that addresses key discussion points, issues, directions and actions items.

TASK 5: NOISE MEASUREMENTS

Description: The POS has placed 25 permanent noise monitors around SEA for the purpose of gathering noise measurements from aircraft operating at the Airport. The measured events from these sites (collected in Subtask 3.6) will be collected and analyzed for completeness.

This task also includes supplementing the data from those 25 sites with short-term noise-measurements for two locations west of the new runway at SEA which are not currently covered by POS's existing network of permanent noise monitors. The purpose of these supplemental measurements is to document sound propagation effects that occur to the west of the new runway where there is a depression in the topography. Complex effects on sound propagation caused by this unique topography may not be completely captured by the Integrated Noise Model (INM). Thus, noise model output for that area may require some additional explanation and/or qualification. Results from the noise measurements in this task will serve as a supplement to the calculated noise contours from the INM, not as feedback for adjusting INM input or output. For example, there is some question about what operation on the airport is creating increased noise levels in this area (reverse thrust, engine runups, aircraft taxiing). The information gathered through these measurements will be used to identify the source of the noise and to develop potential remedies for the increased noise levels.

The two supplemental measurement site locations will be determined so as to capture effects to the homes that are below runway grade where there may be shielding effects, and to homes that are at runway grade across the depressed area that do not benefit from the excess attenuation that occurs when sound propagates near the ground. The measurements will be conducted over the course of one or two consecutive weeks based on consultation between L&B and POS.

If it is determined through public scoping sessions that additional temporary noise monitoring is warranted beyond the two supplemental sites, then Supplemental Task S2 will be utilized to complete that effort.

Deliverables: L&B will provide a detailed summary of the propagation of sound west of the new runway and will assess the ability of the Integrated Noise Model to account for the unique topography in an appendix to the Draft and Final Part 150 Reports.

TASK 6: CURRENT NOISE CONTOUR EVALUATION

A Noise Exposure Map (NEM) will be developed to represent the existing conditions at the airport in the year of submission of the NEM to FAA, likely year 2011. The NEM will be developed through use of the most recently released version of the Integrated Noise Model (INM) at the commencement of the study. Input to the INM will be based primarily on data acquired for SEA for CY 2009. However, because of a known anomaly in runway use for 2009 due to Runway 16L/34R being closed for a significant portion of the year, runway use for existing noise exposure will be forecasted for the year of submission, and then verified and/or adjusted if necessary at a later date prior to submission.

Subtask 6.1: Preparation of INM Input

Description: This task will process operational data for use in the Integrated Noise Model (INM). In order to thoroughly assess and prepare noise exposure contours, eight categories of data must be assessed for input into INM: Meteorological Conditions; Runway Layout; Annual Operations; Aircraft Fleet Mix; Runway End Utilization and Day/Night use; and Flight Track Location and Utilization, Flight Profiles, and Engine Run-Ups. Each of these categories of information is described below

- Meteorological Conditions – Average temperature, pressure, and humidity for the airport will be determined from a long-term sample of data from the closest weather station to SEA in the National Climatic Data Center database.
- Runway Layout – Runway end and threshold locations will be determined from the latest Airport Layout Plan (ALP) data sheet.
- Annual Operations – Annual operations will be determined based on the analysis performed for Existing Facilities and Operations in Subtask 3.2 and the Aviation Demand Forecast of Task 4.
- Aircraft Fleet Mix – Aircraft fleet mix will be determined based on the analysis performed for Existing Facilities and Operations in Subtask 3.2 and the Aviation Demand Forecast of Task 4.
- Runway End Utilization and Day/Night Use – Runway end utilization and day/night use will be determined based on the analysis performed for Existing Facilities and Operations in Subtask 3.2. Because of the temporary closure of Runway 16L/34R during a significant portion of year 2009, runway use will be forecasted for the year of submission of the Existing Conditions NEM, and then validated and/or modified at a later date when more data is available.
- Flight Track Location and Utilization – Flight track location and utilization will be based on the analysis of Existing Radar Data performed in Subtask 3.5. INM model flight tracks will be constructed to correspond to represent the central two-dimensionally projected ground-path and dispersion for all individual routes which have been parsed in the collected radar data. Operations will be distributed to these model flight tracks based on the distribution of operations to the routes identified in the radar data.
- Flight Profiles – Flight profiles which determine the thrust, altitude, and speed of aircraft along flight tracks will be modeled as INM standard profiles. Determinations of stage number for each operation will be based on trip distance or on estimations of takeoff weights if that information is available. If custom profiles are required, they will be developed under Supplemental Task S1.
- Engine Run-Ups – Engine Run-Ups modeled based on the analysis performed for Existing Engine Run-Ups in Subtask 3.7 and potentially information collected for the Hush House Evaluation in Task 10.

Deliverables: A summary of the technical aspects of development of the INM model will be included in an appendix to the Draft and Final Part 150 Report.

Subtask 6.2: Comparison of Model to Noise Measurements

Description: In order to lend confidence to the INM modeling and potentially to refine INM input, this task will compare noise monitoring data to the developed noise model for existing conditions at SEA. The type of data compared will be Sound Exposure Levels (SEL) for single aircraft events of selected aircraft type(s). The selection of aircraft type(s) for comparison will be made based on the aircraft which contributes most to overall noise exposure around SEA. Noise will be compared for both approach and departure operations at locations determined by SEA's existing network of permanent monitors. The noise monitoring data will be collected in Subtask 3.6 from the existing permanent monitors at SEA. Noise model data will be determined by means of an INM detail grid run for SEL.

The establishment of criteria to determine whether the INM modeling requires refinement based on the comparison to measurements will be made in collaboration between L&B, POS, and FAA based on multiple factors which will be more clearly defined during the course of the Part 150 process. If the INM model input requires refinement consisting of any non-standard INM modeling procedures, that process will be performed under Supplemental Task S1 and will require collaboration and approval from the FAA.

Deliverables: A summary of the comparison of INM model output to noise measurements will be provided in an appendix to the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 6.3: Contour Evaluation and Mapping

Description: Contours of DNL 65, 70, and 75 will be prepared for the Existing Year conditions to satisfy requirements of Part 150. The contours will be displayed on a map of sufficient quality and scale to be clear and readable. The base map will clearly depict the airport boundaries and environs including land use.

Deliverables: The Noise Exposure Map for Existing Year Conditions will be depicted in the Draft and Final Part 150 Reports and will be presented at public and committee meetings as well as provided electronically to POS.

Subtask 6.4: Supplemental Metric Evaluation

Description: If deemed appropriate in consultation between L&B and POS, L&B will evaluate 55 and 60 DNL, as well as up to two (2) additional noise metrics to supplement the Day-Night Sound Level (DNL) analysis required for Part 150 studies. The supplemental noise metrics may include any A-weighted noise metrics that are described for possible use in *FAA Order 1050.1E* or *The Desk Reference for Airport Actions* that accompanies *FAA Order 5050.4B* and the FAA memorandum "AEE and Airports Coordination Policy for Non-Standard Modeling Procedures and Methodology," July 2009. These metrics may be presented as contours or grid points depending on the metrics selected and the purpose of the analysis. For example, information on noise levels at schools would be shown as grid point data for each school. For aircraft single event noise, contours are the usual presentation method.

The supplemental noise metric analysis will report the levels of these metrics for information purposes only and may include some general discussion of potential secondary effects (e.g. sleep disturbance, classroom learning, and low-frequency impacts). However, this discussion must not draw any specific conclusions about impacts or suggest that the findings are significant in any way if there are no approved FAA criteria and standards. Conversely, the discussion must include effective language about existing scientific uncertainties and the lack of FAA assessment methodology, impact criteria, and policy guidance in the area examined by supplemental metrics. Because funding for noise mitigation programs within a Part 150 Study is limited to those areas within the 65 DNL or higher, the analysis in this task will be focused on answering questions the public has regarding noise and overflight impacts. Supplemental noise metrics produced in this study are not intended in any way to make FAA funding available for mitigation beyond the 65 DNL. In addition, assessing noise levels beyond 65 DNL is useful for discussing land use planning policies with local jurisdictions.

Deliverables: A summary of the analysis of supplemental noise metrics will be provided in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 6.5: Verification of Model Validity for Year of Submittal

Description: Because the primary data used to develop the Existing Conditions NEM will be from a year prior to the year of submittal to FAA, the data must be verified as reasonably representing conditions in the year of submittal. Of specific importance will be operating levels and runway use. L&B will obtain operating levels and runway use for the most recent months prior to the date of submittal and will compare that data to that which was modeled for the Existing NEM. If the comparison shows a reasonable agreement, no further work will be required. If comparison shows an unacceptable discrepancy, L&B will refine the model input as necessary to adjust for changes which occurred between 2009 and the year of submittal, rerun the INM model, and produce a revised version of the Existing NEM.

Deliverables: A summary of the analysis which validates the modeling for the year of submittal will be included in the Draft and Final Part 150 Report and will be included with the submission of the Existing NEM to the FAA.

TASK 7: FUTURE BASELINE NOISE EXPOSURE

Future Baseline Noise Exposure contours will be developed to represent noise levels projected five years into the future, assuming changes only in operation levels and fleet mix at SEA. The noise exposure will be developed primarily based on input acquired from the Aviation Demand Forecasts of Task 4 and the Existing Noise Exposure of Task 6.

Subtask 7.1: Development of INM Model Input

Description: Input to the INM for the Future Baseline Noise Exposure will be developed primarily based on the input for the Existing NEM with the exceptions of annual operations and aircraft fleet mix. Annual operations and fleet mix will be used directly from the forecasts prepared in Task 4. All of the following parameters will be assumed constant between existing and 5-year future conditions: Meteorological Conditions; Runway Layout; Runway End Utilization and Day/Night use; and Flight Track Location and Utilization, Flight Profiles, and Engine Run-Up parameters.

Deliverables: A summary of the technical aspects of development of the INM model will be included in an appendix to the Draft and Final Part 150 Report.

Subtask 7.2: Contour Evaluation and Mapping

Description: Contours of DNL 65, 70, and 75 will be prepared for the 5-Year Future Baseline conditions to satisfy requirements of Part 150. The contours will be displayed on a map of sufficient quality and scale to be clear and readable. The base map will clearly depict the airport boundaries and environs including land use.

Deliverables: The contour map for Future Baseline Noise Exposure will be depicted in the Draft and Final Part 150 Reports and will be presented at public and committee meetings as well as provided electronically to POS.

Subtask 7.3: Supplemental Metric Evaluation

Description: If deemed appropriate in consultation between L&B and POS, L&B will evaluate 55 and 60 DNL, as well as up to two (2) additional noise metrics to supplement the Day-Night Sound Level (DNL) analysis required for Part 150 studies. The supplemental noise metrics may include any A-weighted noise metrics that are described for possible use in *FAA Order 1050.1E* or *The Desk Reference for Airport Actions* that accompanies *FAA Order 5050.4B* and the FAA memorandum "AEE and Airports Coordination Policy for Non-Standard Modeling Procedures and Methodology," July 2009. These metrics may be presented as contours or grid points depending on the metrics selected and the purpose of the analysis. For example, information on noise levels at schools would be shown as grid point data for each school. For aircraft single event noise, contours are the usual presentation method.

The supplemental noise metric analysis will report the levels of these metrics for information purposes only and may include some general discussion of potential secondary effects (e.g. sleep disturbance, classroom learning, and low-frequency impacts). However, this discussion must not draw any specific conclusions about impacts or suggest that the findings are significant in any way if there are no approved FAA criteria and standards. Conversely, the discussion must include effective language about existing scientific uncertainties and the lack of FAA assessment methodology, impact criteria, and policy guidance in the area examined by supplemental metrics. Because funding for noise mitigation programs within a Part 150 Study is limited to those areas within the 65 DNL or higher, the analysis in this task will be focused on answering questions the public has regarding noise and overflight impacts. Supplemental noise metrics produced in this study are not intended in any way to make FAA funding available for mitigation beyond the 65 DNL. In addition, assessing noise levels beyond 65 DNL is useful for discussing land use planning policies with local jurisdictions.

Deliverables: A summary of the analysis of supplemental noise metrics will be provided in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

TASK 8: NOISE IMPACT EVALUATION

Description: Population and housing unit impacts will be calculated for the significant ranges of the DNL contours of both the Existing NEM and the Future Baseline map. L&B's in-house models will be utilized to determine population levels within each noise contour band. The resulting impact totals, by noise level, will establish the basis against which alternative airport operating configurations may be compared for noise abatement effectiveness. Impacted homes that have received sound insulation treatment in the past or are currently eligible for sound insulation under previous programs will be identified.

Impacts to noise-sensitive public facilities, such as churches, schools, hospitals, libraries, and nursing homes will be identified. These facilities will be identified by name, depicted on the land use base map, and listed in tabular format by DNL noise contour band.

Deliverables: This subtask will result in the following items which will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings:

- Calculated numbers of population and housing units located within the significant ranges of the DNL contours of current conditions noise exposure summarized by jurisdiction and delineated based on participation in past and current mitigation programs
- Numbers of noise-sensitive land uses impacted by aircraft noise, by noise level, and by type of land use, and summarized by jurisdiction
- A GIS map depicting noise-impacted land uses

TASK 9: NOISE ABATEMENT EVALUATION

Subtask 9.1: Evaluation of Current Procedures

Description: The current noise abatement procedures identified in Subtask 3.4 will be discussed and an implementation status will be given. The procedures will be evaluated for effectiveness and those procedures that continue to be warranted will be identified. These determinations will be developed on the basis of extensive consultations with POS staff, advisory committee members, the FAA, and the general public through focus group meetings and public information workshops described in Task 2.

Deliverables: The currently implemented noise abatement procedures which are recommended for continuation will be identified in the Draft and Final Part 150 Reports.

Subtask 9.2: Identification of Additional Noise Abatement Alternatives

Description: L&B will identify alternatives that may help to benefit the noise environment around SEA. An alternative is defined as an operating procedure, or group of interdependent operating procedures, that is to be evaluated. Aside from internal development, L&B will solicit ideas for noise abatement from POS staff, advisory committee members, the FAA, and the general public through focus group meetings and public information workshops described in Task 2.

One alternative which will certainly be considered is the construction and use of a hush house, also known as a ground run-up enclosure (GRE), to contain noise from engine run-ups at SEA. Because this alternative has already been highlighted by POS as a particularly important issue, the development of the hush house alternative will be considered as a separate task, Task 10 in this Scope of Work.

Alternatives will not be considered which would only serve to shift impactful noise levels from one populated area to another. Emphasis will be placed on evaluation of noise abatement procedures relating to the new runway at SEA. Alternatives that were evaluated in past SEA Part 150 studies will not be evaluated again, unless conditions have demonstrably changed and revisiting the issues may provide value to the study. For each of the previous measures, a brief statement regarding why it was not implemented and whether or not the conditions have changed will be included in the study. Types of potential noise abatement procedures for consideration to be included in alternatives may include but would not necessarily be limited to the following:

- Flight location (e.g., departure flight corridors)
- Flight Times (e.g., preferential runway by time of day)
- Flight Management (e.g., reduced thrust, modification of intercept altitudes, on-board instrumentation)
- Runway use program (e.g., how often runway ends are used)
- Ground activity restrictions (e.g., run-up locations/time)
- Facility development (e.g., noise berms, run-up enclosures / hush house)

- Flight restrictions (e.g., mandatory curfews / restrictions - would require Part 161 Study)
- Departure Profiles

Deliverables: L&B will develop a table of specified noise abatement alternatives for detailed evaluation and noise modeling which will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 9.3: Modeling and Evaluation of Alternative Procedures

Description: In this subtask, the alternatives identified in Subtask 9.2 and Task 10 will be evaluated in terms of feasibility and safety. Those alternatives deemed both feasible and safe will be noise-modeled in a 5-year future condition. The results of the noise-modeling will be compared to the Future Baseline Noise Exposure. Comparison criteria will include the number of residences, residents, and noise-sensitive non-residential uses impacted at exposure levels of DNL 75 dB, 70 dB, 65 dB and beyond where appropriate; differences in exposure to supplemental noise metrics, effects on margins of flight safety and operational efficiency; cost of implementation; effects on air service and interstate commerce; and the ability to be implemented effectively.

L&B will provide analysis for up to 10 sets of contours for noise abatement alternatives. This will include quantitative and qualitative measures of comparison of the assessed alternatives to aid in selection of a preferred alternative.

Deliverables: L&B will develop an evaluation matrix which will graphically depict each alternative and its evaluation. This will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 9.4: Abatement Alternatives / Screening

Description: The noise exposure contours and the evaluation of alternatives produced in the above subtasks will be presented to the advisory committee for review and comment. Based on that review, and in consultation with POS staff, a selection will be made of optimal alternative or combination of alternatives. The optimal procedures will be modeled using INM in Subtask 9.5.

Deliverables: L&B will develop a summary of the reasoning for the selection of the optimal procedures will be included in the Draft and Final Part 150 Reports.

Subtask 9.5: Modeling and Evaluation of Optimal Alternatives

Description: A tentative optimal noise abatement scenario will be developed in Subtask 9.4. This scenario will consist of a combination of operational, procedural, and facilities alternatives, as found feasible under earlier tasks. This effort will focus on the formulation of the optimum achievable modifications. More than one refined scenario may be prepared at this point if there remain major alternatives which are mutually exclusive and which continue to hold promise for implementation. This optimal scenario will provide the basis for development of land use alternatives in Task 12.

Deliverables: L&B will develop a list of refined noise abatement scenarios to serve as the basis for land use alternatives in Task 5. This list will be sent to POS for concurrence.

TASK 10: HUSH HOUSE EVALUATION

POS has specifically directed L&B to analyze the need, cost, and feasibility of locating a hush house, also known as a Ground Run-Up Enclosure (GRE), at SEA within the five year planning horizon of the study. Ultimately, this task will result in consideration of at least one noise abatement measure specific to a GRE which will be included among those analyzed in Subtask 9.3. L&B will use past evaluations, current conditions, and future 5-year conditions to make a final recommendation on the feasibility of the facility. Evaluation criteria will include noise effects, cost of implementation, site availability, and the ability to be implemented effectively.

Subtask 10.1: Research/Evaluate Previous Studies and Reports

Description: L&B will research and evaluate any previously performed studies relative to ground run-up noise and/or the construction of a GRE at SEA. At a minimum, this will include review of the GRE analysis performed in the previous Part 150 study at SEA. Available documentation may also be reviewed from sample US airports of similar size which have undertaken projects to construct GREs.

Deliverables: A summary of the significant and pertinent findings from each reviewed document will be provided in the Draft and Final Part 150 Reports.

Subtask 10.2: Determine SEA Run-Up Characteristics

Description: Beginning with the run-up data collected as part of the Inventory of Existing Conditions in Subtask 3.7, L&B will gather and compile the various characteristics of Run-Up operations at SEA. L&B will also reference the evaluation of previous studies conducted in Subtask 10.1, and may also perform additional consultation with airport users, FAA, and SEA staff. The types of data which will be sought will include:

- Types of current and forecast aircraft that conduct maintenance run-ups at SEA
- The average daily number of run-up operations by run-up type (i.e., C-checks, trim test) per aircraft type during both the daytime and nighttime hours
- Typical power level and duration at each power for each of the types of run-ups per aircraft type
- Locations on the airport where run-ups are conducted
- Aircraft orientations that may be used at each run-up location
- The percentage of time each location and orientation is used by each aircraft type during both the daytime and nighttime hours

Deliverables: A summary of the characteristics of run-up operations at SEA will be included in the Draft and Final Part 150 Reports.

Subtask 10.3: Development of Preliminary GRE Alternatives

Description: This subtask of the study involves developing a number of options for construction of a GRE to reduce the noise impacts from engine run-ups. Important variables in the construction of a GRE include but are not limited to: location, size, general design concept, noise reduction capability, and orientation. Viable concepts from past studies will be included as preliminary alternatives as well as concepts developed through coordination with members of the Technical Advisory Committee and POS.

Deliverables: The GRE alternatives for consideration will be summarized and included in the Draft and Final Part 150 Reports, and will be presented at Technical Advisory Committee meetings.

Subtask 10.4: Selection of GRE Alternative(s) for Noise Abatement Measure(s)

Description: The preliminary GRE alternatives identified in Subtask 10.3 will be generally assessed and rated under the following criteria:

- Ability to reduce run-up noise at SEA
- Usability in various meteorological conditions
- Compatibility with airfield operations
- Anticipated costs of construction, maintenance, and use

Through consultation between L&B and POS, one or more GRE alternatives will be selected for further analysis and inclusion as a potential noise abatement measure. The remainder of the evaluation for the selected GRE alternative(s), including the ultimate analysis of need, cost, and feasibility will be conducted under the tasks in this Scope related to Noise-Abatement alternatives.

Deliverables: A summary of the rationale for choosing the selected GRE alternative(s) will be included in the Draft and Final Part 150 Reports, and will be presented at Technical Advisory Committee meetings.

TASK 11: NOISE MONITORING AND FLIGHT TRACKING SYSTEM EVALUATION

Description: This task will include a review of the existing noise monitoring and flight tracking system and an evaluation of its current performance relative to a survey of the airports needs, new technology, improved reliability as well as determination of a need for additional noise monitors. The primary focus of this task will be a determination of the need to upgrade or replace the existing noise monitoring terminals, as well as to replace or upgrade the system software. An evaluation of the need for adding noise monitoring terminals will be made.

The evaluation will include a review of technology advances available in newer systems in terms of automation, data reporting, reliability, and cost effectiveness.

Deliverables: L&B will include an analysis of the current noise monitoring and flight tracking system, along with any recommendations for upgrades or replacement in the noise mitigation alternatives section of the Draft and Final Part 150 reports.

TASK 12: LAND USE EVALUATION

Subtask 12.1: Evaluation of Current Program

Description: This Subtask provides for a review of the POS current land use mitigation programs to evaluate the sufficiency of current mitigation. Current measures that are no longer considered to be effective, acceptable, or implementable will be identified in consultation with POS staff, advisory committee members, and the general public.

Deliverables: Identified areas requiring more, less, or different land use mitigation than presently planned will be developed as an exhibit to help facilitate discussion between L&B and POS, and at committee and public meetings.

Subtask 12.2: Evaluation of Alternatives

Description: Alternative land use mitigation techniques will be reviewed for their potential application in specific neighborhoods that are within the 65 DNL noise contour. These alternatives will be evaluated on a case-by-case basis with respect to such factors as need, cost, effectiveness, impact on adjacent neighborhoods, public acceptability, and the ability to be implemented effectively. Members of the public and representatives of local governments will be provided an opportunity to participate in this review through public workshops.

Deliverables: A table summarizing the identification/evaluation of land use mitigation alternatives will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 12.3: Land Use Alternatives / Alternative Screening

Description: Land use alternatives evaluated in Subtask 12.2 will be screened to a list of tentatively favored measures at a meeting with the advisory committee. The rationale for eliminating land use alternatives from further consideration will be provided. General parameters will be established for the use of the remaining alternatives, such as noise problems to be addressed by the alternatives, locations for use of the alternatives, and the probable effectiveness of the alternatives.

Deliverables: An evaluated list of land use mitigation alternatives for consideration in developing the final Noise Compatibility Plan (NCP) in Task 13 will be provided to POS for concurrence.

TASK 13: NOISE COMPATIBILITY PLAN

Subtask 13.1: Selection of Noise Abatement Measures

Description: Upon review of the tentative optimum noise abatement procedures developed in Subtask 9.5 by the public and the advisory committee, the comprehensive list of procedures necessary to develop the Noise Compatibility Plan (NCP) will be developed. This step will include the organization of the measures into final scenarios for immediate, near-term, and long-term implementation, as appropriate.

Deliverables: L&B will develop a table of clearly identified program elements for noise abatement by time frame/operating configuration. These will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 13.2: Selection of Recommended Land Use Measures

Description: Upon review of the tentatively favored land use measures developed in Subtask 12.3 by the public and advisory committee, the comprehensive list of measures necessary to develop the NCP will be developed. The recommendations will identify strategies to control the development of new incompatible land uses within undeveloped areas.

Deliverables: L&B will develop a table of clearly identified program elements for land use by time frame/operating configuration. These will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 13.3: Selection of Implementation Measures

Description: Implementation measures typically consist of actions taken to facilitate the execution of the program's recommendations, to operate the program on a daily basis, and to periodically review and update the program. These measures will be identified in the final stages of the planning effort, based on the types of noise abatement and land use mitigation measures that are selected. Identification of these measures will be made in consultation with POS staff and advisory committee members.

Deliverables: L&B will develop a table of clearly identified program elements for implementation measures by time frame/operating configuration. These will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 13.4: Prepare Future Noise Compatibility Program Noise Exposure Contours

Description: Noise exposure contours of 65, 70, and 75 DNL levels will be prepared for a mitigated 5-year condition to satisfy requirements of Part 150 and for a mitigated 10-year condition to understand potential impacts over an extended timeline. All recommended noise abatement measures and facility

development anticipated for this time frame will be included in the noise contour. Assumptions will be based on the best information at the time and verified with the POS.

Deliverables: L&B will develop an exhibit of noise exposure patterns for 5-year and 10-year Future NCP. This will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings.

Subtask 13.5: Evaluation of Impacts

Description: Based upon the recommended noise abatement procedures and land use measures, the impacts of the selected noise abatement program will be determined. Residual existing and future off-airport population and land use impacts will be identified and documented. These impacts are those that will remain in spite of all planned efforts to abate noise.

Deliverables: This subtask will result in the following items which will be included in the Draft and Final Part 150 Reports and will be presented at public and committee meetings:

- Calculated numbers of population and housing units located within the significant ranges of the DNL 65 dB and above contours summarized by jurisdiction and delineated based on participation in past and current mitigation programs
- Numbers of noise-sensitive land uses impacted by aircraft, by level and by type of use and summarized by jurisdiction
- A GIS map depicting noise-impacted land uses

Subtask 13.6: Implementation Actions/Schedule/Costs/Financing

Description: Well-developed strategies will be designed that provide step-by-step implementation of those noise abatement and land use management measures recommended by this Part 150 Study. These recommendations will include management policies and strategies, as well as agreements or publicity documents. Each action will be identified in terms of the responsible agency, the nature of that responsibility, and actions that must be taken to initiate implementation. Each must be closely coordinated with the FAA, SEA users, and local planning agencies to ensure full understanding of the intent of the measure throughout its implementation. A schedule for implementing each action, including both beginning and ending years, will be defined in consultation with POS staff.

Total year-by-year costs associated with each potential action will be compiled. Potential sources of funding will be identified for each potential action. Of particular interest is grant funding from the FAA. Using public records and input from the FAA Northwest Mountain Region office, available grant funds and annual schedule will be estimated. Local matching funds and the costs of ineligible projects will be compiled. Based on the estimated funding, a financing-based schedule for implementation of each potential action will be developed.

Deliverables: L&B will develop a list of recommended implementation actions, a proposed schedule for implementation, and a summary of projected costs for the NCP to be included in the Draft and Final Part 150 Reports and to be presented at public and committee meetings.

TASK 14: REPORTS

Subtask 14.1: Preliminary Draft Part 150 Report

Description: A Preliminary Draft Part 150 Report will be provided to POS and the FAA for their review and comments prior to release of the Draft Report. L&B will collect comments from POS and FAA and make appropriate changes in consultation with POS.

Deliverables: L&B will produce up to ten (10) hard copies of a Preliminary Draft for FAA and POS. If requested, a PDF version of the Preliminary Draft will also be produced and delivered to POS and FAA.

Subtask 14.2: Draft Part 150 Report

Description: After obtaining and incorporating comments from POS and FAA, the Draft Part 150 Report will be released. This will include a draft NEM/NCP checklist. For public hearing review, draft reports will be provided for placement in public repositories. Distribution of the draft report will be made by POS. Electronic PDF versions of the Draft document for use on the website will be prepared.

Deliverables: L&B will produce up to thirty-five (35) hard copies and up to one-hundred (100) CDs of the Draft Part 150 Reports for FAA, POS, and placement in public repositories. A PDF version of the Draft will be developed and delivered to POS for website publication.

Subtask 14.3: Preliminary Final Part 150 Report

Description: On completion of the Public Hearings, L&B will make any necessary revisions to text and graphics and a Preliminary Final Part 150 Report will be prepared and provided to POS and the FAA for their review. Included will be descriptions of all public involvement and coordination with the appropriate public and private organizations as required under Part 150. L&B will collect comments from POS and FAA and make appropriate changes in consultation with POS.

Deliverables: L&B will produce up to ten (10) hard copies of the Preliminary Final Part 150 Report or FAA and POS review. If requested, a PDF version of the Preliminary Draft will also be produced and delivered to POS and FAA.

Subtask 14.4: Final Part 150 Report

Description: After obtaining and incorporating comments from POS and FAA, the Final Part 150 Report will be released. Distribution of the Final Report will be made by POS. Electronic PDF versions of the Final Report for use on the website will be prepared.

Deliverables: L&B will produce up to fifty (50) hard copies and up to one-hundred (100) CDs of the Final Document for combined use of the POS and the FAA. A PDF version of the Final Report will be developed and delivered to POS for website publication.

Subtask 14.5: Executive Summary

Description: Upon issuance of the Record of Approval (ROA), L&B will prepare an Executive Summary documenting the entire Part 150 Update process, findings, and recommendations. The Executive Summary will be prepared after the ROA to take into account any comments or conditions that the FAA may place on the recommended measures during the review process. The Executive Summary will be bound separately from the Final Part 150 Document and will be made available to POS. An electronic PDF version of the Executive Summary will be prepared for publication to the website by POS.

Deliverables: L&B will prepare up to fifty (50) hard copies of an Executive Summary for the POS and an electronic PDF version of the Executive Summary.

Subtask 14.6: Electronic Delivery of Study Files

Description: Upon issuance of the Record of Approval (ROA), L&B will deliver to the POS a complete set of all data files created for the study. This will include the following items:

- All PowerPoint presentations in .ppt format
- All graphic materials for workshops in .jpg format
- All Draft and Final document files in Word and .pdf format
- All INM study files in native INM format and ArcView shape files
- Copy of web site HTML hosted by L&B

Deliverables: L&B will provide electronic versions of all study files on CD/DVD along with an inventory of the files for ease of use.

TASK 15: ENVIRONMENTAL PROCESSING

Description: This task involves the preparation of any State Environmental Protection Act (SEPA) documentation required for POS adoption of the Part 150 Noise Compatibility Program. For purposes of providing a cost for these elements, it is assumed that documentation on the level of a Categorical Exclusion or checklist will be sufficient and that most if not all of the information needed to complete the documentation will be taken from the Part 150 Study or other environmental documents prepared by the POS.

In addition, for each recommended NCP measure, L&B will analyze whether further Federal environmental review in accordance with the National Environmental Policy Act (NEPA) will be required for implementation. Measures which involve Federal actions require a NEPA review prior to implementation. Any such measures will be identified and categorized based on the anticipated level of NEPA analysis required.

Any information developed in the Part 150 Study that will be useful for the NEPA analysis of the measures will be presented in a way that can be transferred directly to a separate NEPA document.

Deliverables: L&B will prepare the necessary SEPA documentation needed for the POS to adopt the Final Part 150 Noise Compatibility Program. In addition, L&B will provide information to assist in any NEPA reviews that may be necessary.

TASK 16: PROJECT MANAGEMENT

Description: This task involves the routine coordination and management of the Part 150 Study. L&B will submit monthly written reports on the progress of work with concurrent copies to the FAA. The monthly reports shall describe the status of each aspect of the work, any problems encountered, the amount of work accomplished, and a comparison of actual accomplishments to the goals established for the period. In the event that established goals have not been met, the monthly report shall describe the reasons for slippage. The monthly report shall also describe recommendations for modifications to the Scope of Work, changes in methodology or schedules for completion, decisions or conclusions that would alter the course of the study, and dates of upcoming meetings.

Monthly coordination meetings (total of 24) will be held for the purpose of briefing POS staff on the progress of the study, listening and responding to staff concerns, discussing the budget, and collecting any needed data or information. Most of these one hour meetings will be held via telephone conference, but six (6) will be held in person in conjunction with other on-site meetings. L&B will provide meeting agendas and meeting summaries of all coordination meetings.

L&B will hold quarterly consultant team meetings (total of 8) to coordinate work products and internal strategy for the project. These one hour meetings will allow the team to discuss data needs, project status, deliverables, and any outstanding issues on a regular basis. Most of these meetings will be held via teleconference, but two (2) will be held in person in conjunction with other on-site meetings.

Deliverables: L&B will provide meeting agendas, handouts, and monthly study update reports, as well as hold monthly and quarterly coordination meetings.

SUPPLEMENTAL TASKS

The following tasks will be included in the Final Scope of Work and Budget, but will be authorized individually by POS. If not authorized by POS in writing, work will not proceed and the POS will not be billed for these items.

TASK S1: NON-STANDARD INM MODELING PROCEDURES

Description: The FAA Airport Planning and Environmental Division (APP-400) and the Office of Environment and Energy Noise Division (AEE-100) have recently released guidance for Part 150 studies regarding the use procedures including non-standard data inputs to the FAA Integrated Noise Model (INM), certain uses of supplemental noise metrics, and alternative noise methodologies (“AEE and Airports Coordination Policy for Non-Standard Modeling Procedures and Methodology,” July 2009). The most likely need for non-standard procedures would be the model the use of Continuous Descent Approach (CDA) profiles in the INM. Currently the INM cannot model CDA operations. CDA effects benefits are usually, but not always, on areas outside the 65 DNL contour because CDA benefits typically occur at distances greater than 7 nm from the landing threshold. But when describing noise levels to these more remote communities, a description of the benefit of CDA operations may be useful in this Part 150 as such communities have a history of being active in noise issues at the airport. If, through consultation between L&B and POS, any non-standard procedures are required to accurately model noise for any of the Existing NEM, Future NEM, or Future NCP, L&B will seek and attain the approval of the necessary FAA bodies which is required to employ such procedures.

Because this process may involve a potentially costly effort to create a proposal for the FAA which would detail and support the use of the non-standard methodologies, the process is included as a supplemental task to this project.

Deliverables: L&B with the written support of POS will obtain FAA approval documentation for the use of any non-standard modeling procedures which would be included in the Draft and Final Part 150 Reports.

TASK S2: SUPPLEMENTAL NOISE MEASUREMENTS

Task S2.1: Program Design

Upon notice by the POS, L&B will design a noise measurement program at SEA to address the most important issues of the technical modeling, as well as any public relations issues. The program will focus on single-event noise levels for direct correlation with specific aircraft flight data in the INM.

Task S2.2: Identification of Noise Measurement Sites

Locations for noise measurement sites will be selected based on the desire by the public and approved by the POS. Up to ten (10) sites will be selected for supplemental noise measurement. When selecting sites, consideration will be given for safety of the operator and equipment, proximity to one of the 25 permanent noise monitors, and suitability for collecting aircraft noise.

Task S2.3: Air/Ground Noise Monitoring

Single-event noise levels will be measured for the conditions most suggested or likely to return valuable information. The measurement period will extend over one work week. Measurements will be conducted with four (4) portable noise monitors for specific times over this period.

Operators of the equipment will record relevant information observed during the measurement periods for inclusion in a report and use in correlation with collected data on known aircraft activity and comparison to information from the INM. To the extent practical, all measurements will be conducted in the vicinity of impacted areas. In each case, the ambient levels without aircraft activity will also be noted.

The focus of the measurement program will be the collection of SEL data for later correlation with specific flight operations on tracks at varying slant range distances as determined from data processing. The information from the noise measurement program will also be used to compare to the INM model information for validation. The time that each location will be measured will depend on the scheduling of traffic and the actual activity to which the site is exposed at the time of measurement. Single-event noise measurements will be collected at up to ten (10) sites in the area for correlation with radar and comparison of INM data.

Task S2.4: Radar Data Collection and Evaluation

In order to correlate flight activities with measured noise events and to obtain accurate flight track and performance profile data, radar data will be collected for periods of time during which noise is measured. POS radar data will provide appropriate information on time, velocities, flight tracks, altitude profiles, and aircraft types. Data will be requested and processed to prepare a correlation with the noise levels recorded during the measurement period.

Task S2.5: Summary Report

Upon completion of the noise measurements and analysis of the findings, a summary report will be prepared. The report will contain information on the methodology, equipment, conditions at the time, and summarize the results for each site. Metrics, SEL, Lmax, LEQ, and Time-Above will be calculated from the noise measurement data and presented in the report.