AGREEMENT FOR PROFESSIONAL SERVICES

THIS AGREEMENT FOR PROFESSIONAL SERVICES ("**Agreement**") is made and entered into as of the date stated on the City's signature page below (the "**Effective Date**") by and between the **CITY AND COUNTY OF DENVER**, a municipal corporation of the State of Colorado (the "**City**"), acting on behalf of its **Department of Aviation**, and **PASSUR AEROSPACE, INC.,** a Colorado corporation in good standing ("**Contractor**") (collectively the "**Parties**").

W I T N E S S E T H:

WHEREAS, the City owns, operates, and maintains Denver International Airport through its Department of Aviation ("**DEN**"); and

WHEREAS, DEN desires to acquire replacement noise monitoring system ("**NOMS**") to help DEN comply with noise and operations monitoring conditions set forth in the April 21, 1988 "Intergovernmental Agreement on a New Airport" with Adams County (the "**1988 IGA**"); and

WHEREAS, DEN has undertaken a competitive process to solicit and receive proposals for such services; and

WHEREAS, Contractor's proposal was selected for award of **Monitoring System (NOMS) Replacement** (the "**Project**"); and

WHEREAS, Contractor is qualified, willing, and able to perform the services, as set forth in this Agreement in a timely, efficient, and economical manner; and

NOW, THEREFORE, for and in consideration of the premises and other good and valuable consideration, the Parties agree as follows:

1. LINE OF AUTHORITY:

The Chief Executive Officer of the Department of Aviation or their designee or successor in function (the "**CEO**"), authorizes and directs all work performed under this Agreement. Until otherwise notified in writing by the CEO, the CEO has delegated the authority granted herein to the Senior Vice President of Sustainability (the "**SVP**"), who will designate a **Project Manager** to coordinate professional services under this Agreement. Reports, memoranda, correspondence, and other submittals required of Contractor hereunder shall be processed in accordance with the Project Manager's directions.

2. SCOPE OF WORK AND CONSULTANT RESPONSIBILITIES:

A. Scope of Services. Contractor shall provide professional services and deliverables for the City as designated by the CEO, from time to time and as described in the attached ***Exhibit A*** ("**Scope of Work**"), in accordance with the schedules and budgets set by the Project Manager

(the "**Work**"). Without requiring amendment to this Agreement, the City may, through an authorization or similar form issued by the CEO and signed by Contractor, make minor changes, additions, or deletions to the Scope of Work if such do not change the Maximum Contract Amount stated below.

B. Standard of Performance. Contractor shall faithfully perform the work required under this Agreement in accordance with the standard of care, skill, efficiency, knowledge, training, and judgment provided by highly competent professionals who perform work of a similar nature to the work described in this Agreement. Contractor hereby represents and warrants to City it will perform its services skillfully, carefully, diligently, and in a professional manner. Contractor agrees and understands that its services will be measured against other professionals providing similar services.

C. Time is of the Essence. Contractor acknowledges that time is of the essence in its performance of all work and obligations under this Agreement. Contractor shall perform all work under this Agreement in a timely and diligent manner. **D. Subcontractors.**

i. In order to retain, hire, and/or contract with an outside subcontractor that is not identified in this Agreement for work under this Agreement, Contractor must obtain the prior written consent of the CEO. Contractor shall request the CEO's approval in writing and shall include a description of the nature and extent of the services to be provided; the name, address and professional experience of the proposed subcontractor; and any other information requested by the City.

ii. The CEO shall have the right to reject any proposed outside subcontractor deemed by the CEO to be unqualified or unsuitable for any reason to perform the proposed services. The CEO shall have the right to limit the number of outside subcontractors and/or to limit the percentage of work to be performed by them.

iii. Any final agreement or contract with an approved subcontractor must contain a valid and binding provision whereby the subcontractor waives any and all rights to make any claim of payment against the City or to file or claim any lien or encumbrance against any City property arising out of the performance or non-performance of this Agreement and/or the subcontract.

iv. Contractor is subject to Denver Revised Municipal Code ("**D.R.M.C.**") § 20-112, wherein Contractor shall pay its subcontractors in a timely fashion. A payment is timely if it is mailed to the subcontractor no later than seven (7) days after receipt of any payment from the City. Any late payments are subject to a late payment penalty as provided in the Denver Prompt Payment Ordinance (D.R.M.C. §§ 20-107 through 20-118).

v. This Section, or any other provision of this Agreement, shall not create any contractual relationship between the City and any subcontractor. The City's approval of a subcontractor shall not create in that subcontractor a right to any subcontract. The City's

approval of a subcontractor does not relieve Contractor of its responsibilities under this Agreement, including the work to be performed by the subcontractor.

D. Personnel Assignments.

i. Contractor or its subcontractor(s) shall assign all key personnel identified in this Agreement to perform work under this Agreement ("**Key Personnel**"). Key Personnel shall perform work under this Agreement, unless otherwise approved in writing by the SVP or their authorized representative. In the event that replacement of Key Personnel is necessary, the City in its sole discretion shall approve or reject the replacement, if any, or shall determine that no replacement is necessary.

ii. It is the intent of the Parties that all Key Personnel perform their specialty for all such services required by this Agreement. Contractor and its subcontractor(s) shall retain Key Personnel for the entire Term of this Agreement to the extent practicable and to the extent that such services maximize the quality of work performed.

iii. If, during the Term of this Agreement, the Project Manager determines that the performance of any Key Personnel or other personnel, whether of Contractor or its subcontractor(s), is not acceptable or that any such personnel is no longer needed for performance of any work under this Agreement, the Project Manager shall notify Contractor and may give Contractor notice of the period of time which the Project Manager considers reasonable to correct such performance or remove the personnel, as applicable.

iv. If Contractor fails to correct such performance, then the City may revoke its approval of the Key Personnel or other personnel in question and notify Contractor that such Key Personnel or other personnel will not be retained on this Project. Within ten (10) days of receiving this notice, Contractor shall use its best efforts to obtain adequate substitute personnel who must be approved in writing by the Project Manager. Contractor's failure to obtain the Project Manager's approval shall be grounds for Termination for Cause in accordance with this Agreement.

E. Information Technology Requirements. ***Exhibit D*** regarding Information Technology Provisions, attached to and hereby incorporated into this Agreement as if fully set forth here, is an essential part of the Agreement between the City and Contractor. Unless the context clearly requires a distinction between the Agreement and Exhibit D, all references to "Agreement" shall include Exhibit D. Contractor shall comply with all requirements of Exhibit D.

3. OWNERSHIP AND DELIVERABLES:

Upon payment to Contractor, all records, data, deliverables, and any other work product prepared by Contractor or any custom development work performed by Contractor for the purpose of performing this Agreement on or before the day of the payment, whether a periodic or final payment, shall become the sole property of the City. Upon request by the City, or based on any schedule agreed to by Contractor and the City, Contractor shall provide the City with copies of the

data/files that have been uploaded to any database maintained by or on behalf of Contractor or otherwise saved or maintained by Contractor as part of the services provided to the City under this Agreement. All such data/files shall be provided to the City electronically in a format agreed to by the Parties. Contractor also agrees to allow the City to review any of the procedures Contractor uses in performing any work or other obligations under this Agreement, and to make available for inspection any and all notes, documents, materials, and devices used in the preparation for or performance of any of the scope of work, for up to three (3) years after termination of this Agreement. Upon written request from the City, Contractor shall deliver any information requested pursuant to this Section within ten (10) business days in the event a schedule or otherwise agreed-upon timeframe does not exist.

4. TERM AND TERMINATION:

A. Term. The Term of this Agreement shall commence on the Effective Date and shall expire three (3) years from the Effective Date, unless terminated in accordance with the terms stated herein (the "**Expiration Date**"). The Term of this Agreement may be extended for up to two (2) one-year extensions, on the same terms and conditions, by written notice from the CEO to Contractor. However, no extension of the Term shall increase the Maximum Contract Amount stated below.

B. If the Term expires prior to Contractor completing the work under this Agreement, subject to the prior written approval of the CEO, this Agreement shall remain in full force and effect until the completion of any services commenced prior to the Expiration Date. Contractor has no right to compensation for services performed after the Expiration Date without such express approval from the CEO.

C. Suspension and Termination.

i. Suspension. The City may suspend performance of this Agreement at any time with or without cause. Upon receipt of notice from the CEO, Contractor shall, as directed in the notice, stop work and submit an invoice for any work performed but not yet billed. Any milestones or other deadlines contained in this Agreement shall be extended by the period of suspension unless otherwise agreed to by the City and Contractor. The Expiration Date shall not be extended as a result of a suspension.

ii. Termination for Convenience. The City may terminate this Agreement at any time without cause upon written notice to Contractor.

iii. Termination for Cause. In the event Contractor fails to perform any provision of this Agreement, the City may either:

a. Terminate this Agreement for cause with ten (10) days prior written notice to Contractor; or

b. Provide Contractor with written notice of the breach and allow Contractor an Opportunity to Cure.

iv. Opportunity to Cure. Upon receiving the City's notice of breach pursuant to Section 4(C)(iii)(b), Contractor shall have five (5) days to commence remedying its defective performance. If Contractor diligently cures its defective performance to the City's satisfaction within a reasonable time as determined by the City, then this Agreement shall not terminate and shall remain in full force and effect. If Contractor fails to cure the breach to the City's satisfaction, then the City may terminate this Agreement pursuant to Section 4(C)(iii)(a).

v. Compensation for Services Performed Prior to Suspension or Termination Notice. If this Agreement is suspended or terminated, the City shall pay Contractor the reasonable cost of only those services performed to the satisfaction of the CEO prior to the notice of suspension or termination. Contractor shall submit a final invoice for these costs within thirty (30) days of the date of the notice. Contractor has no right to compensation for services performed after the notice unless directed to perform those services by the City as part of the suspension or termination process or as provided in Section 4(C)(vi) below.

vi. Reimbursement for Cost of Orderly Termination. In the event of Termination for Convenience of this Agreement pursuant to Section 4(C)(ii), Contractor may request reimbursement from the City of the reasonable costs of orderly termination associated with the Termination for Convenience as part of its submittal of costs pursuant to Section 4(C)(v). In no event shall the total sums paid by the City pursuant to this Agreement, including Sections 4(C)(v) and (C)(vi), exceed the Maximum Contract Amount.

vii. No Claims. Upon termination of this Agreement, Contractor shall have no claim of any kind against the City by reason of such termination or by reason of any act incidental thereto. Contractor shall not be entitled to loss of anticipated profits or any other consequential damages as a result of termination.

D. Remedies. In the event Contractor breaches this Agreement, Contractor shall be liable to the City for all costs of correcting the work without additional compensation, including but not limited to additional costs incurred by the City, its tenants, or its other contractors arising out of Contractor's defective work. These remedies are in addition to, and do not limit, the remedies available to the City in law or in equity. These remedies do not amend or limit the requirements of Section 8 and Section 9 otherwise provided for in this Agreement.

5. COMPENSATION AND PAYMENT:

A. Maximum Contract Amount. Notwithstanding any other provision of this Agreement, the City shall not be liable under any theory for payment for services rendered and expenses incurred by Contractor under the terms of this Agreement for any amount in excess of the sum of **One Million Five Hundred Forty-One Thousand One Hundred Twenty-Two**

Dollars and No Cents ($1,541,122.00) ("**Maximum Contract Amount**"). Contractor shall perform the services and be paid for those services as provided for in this Agreement up to the Maximum Contract Amount.

B. Limited Obligation of City. The obligations of the City under this Agreement shall extend only to monies appropriated and encumbered for the purposes of this Agreement. Contractor acknowledges and understands the City does not by this Agreement irrevocably pledge present cash reserves for payments in future fiscal years, and this Agreement is not intended to create a multiple-fiscal year direct or indirect debt or financial obligation of the City. The City is not under any obligation to make any future encumbrances or appropriations for this Agreement nor is the City under any obligation to amend this Agreement to increase the Maximum Contract Amount above.

C. Payment Source. For payments required under this Agreement, the City shall make payments to Contractor solely from funds of the Airport System Fund and from no other fund or source. The City has no obligation to make payments from any other source.

D. Basis for Contractor's Fee. Contractor's fee is based on the time required by its professionals to complete the services under this Agreement. Individual hourly rates are set forth in ***Exhibit A*** ("**Rates**").

E. Payment Schedule. Subject to the Maximum Contract Amount, for payments required under this Agreement, the City shall pay Contractor's fees and expenses in accordance with this Agreement. Unless otherwise agreed to in writing, Contractor shall invoice the City on a regular basis in arrears and the City shall pay each invoice in accordance with Denver's Prompt Payment Ordinance, D.R.M.C. § 20-107, *et seq*., subject to the Maximum Contract Amount.

F. Invoices. On or before the fifteenth (15^{th}) day of each month, Contractor shall submit to the City a monthly progress invoice containing reimbursable costs and receipts from the previous month for professional services rendered under this Agreement to be audited and approved by the City ("**Invoice**"). Each Invoice shall provide the basis for payments to Contractor under this Agreement. In submitting an Invoice, Contractor shall comply with all requirements of this Agreement and:

i. Include an executive summary and status report(s) that describe the progress of the services and summarize the work performed during the period covered by the Invoice;

ii. Include a statement of recorded hours for any work billed at an hourly rate;

iii. Include the relevant purchase order ("**PO**") number related to theInvoice;

iv. Ensure that amounts shown on the Invoices comply with and clearly reference the relevant services, indicate the hourly rate and multiplier where applicable, and identify the allowable reimbursable expenses;

v. For only those reimbursable costs incurred in the previous month, submit itemized business expense logs and, where billing is based upon receipts, include copies of receipts for all allowable reimbursable expenses;

vi. Include the signature of an authorized officer of Contractor, along with such officer's certification they have examined the Invoice and found it to be correct; and

vii. Submit each Invoice via email to ContractAdminInvoices@flydenver.com.

viii. Late Fees. Contractor understands and agrees interest and late fees shall be payable by the City only to the extent authorized and provided for in the City's Prompt Payment Ordinance.

G. Travel Expenses. Travel and any other expenses are not reimbursable unless such expenses are related to and in furtherance of the purposes of Contractor's engagement, are in accordance with this Agreement, and Contractor receives prior written approval of the SVP or their authorized representative.

H. Timesheets. Contractor shall maintain any timesheets kept or created in relation to the services performed under this Agreement. The City may examine such timesheets and any other related documents upon the City's request.

I. Disputed Invoices. The City reserves the right to reject and not pay any Invoice or part thereof, including any final Invoice resulting from a Termination of this Agreement, where the SVP or their authorized representative determines the amount invoiced exceeds the amount owed based upon the work satisfactorily performed. The City shall pay any undisputed items contained in an Invoice. Disputes concerning payments under this provision shall be resolved in accordance with procedures set forth in Section 9.

J. Carry Over. If Contractor's total fees for any of the services provided under this Agreement are less than the amount budgeted for, the amount remaining in the budget may be used for additional and related services rendered by Contractor if the CEO determines such fees are reasonable and appropriate and provides written approval of the expenditure.

K. Prevailing Wage. To the extent required by law, Contractor shall comply with, and agrees to be bound by, all requirements, conditions and City determinations regarding the Payment of Prevailing Wages Ordinance, D.R.M.C. §§ 20-76 through 20-79, including, but not limited to, the requirement that every covered worker working on a City owned or leased building or on City-

owned land shall be paid no less than the prevailing wages and fringe benefits in effect on the Effective Date of this Agreement.

iv. Prevailing wage and fringe rates will adjust on the yearly anniversary of the actual date of bid or proposal issuance, if applicable, or the date of the written encumbrance if no bid/proposal issuance date is applicable.

v. Contractor shall provide the Auditor with a list of all subcontractors providing any services under the Agreement.

vi. Contractor shall provide the Auditor with electronically-certified payroll records for all covered workers employed under this Agreement.

vii. Contractor shall prominently post at the work site the current prevailing wage and fringe benefit rates. The posting must inform workers that any complaints regarding the payment of prevailing wages or fringe benefits may be submitted to the Denver Auditor by calling (720) 913-5000 or emailing: auditor@denvergov.org.

viii. If Contractor fails to pay workers as required by the Prevailing Wage Ordinance, Contractor will not be paid until documentation of payment satisfactory to the Auditor has been provided. The City may, by written notice, suspend or terminate work if Contractor fails to pay required wages and fringe benefits.

L. Compliance with Denver Wage Laws. To the extent applicable to the Contractor's provision of Services hereunder, the Contractor shall comply with, and agrees to be bound by, all rules, regulations, requirements, conditions, and City determinations regarding the City's Minimum Wage and Civil Wage Theft Ordinances, Sections 58-1 through 58-26 D.R.M.C., including, but not limited to, the requirement that every covered worker shall be paid all earned wages under applicable state, federal, and city law in accordance with the foregoing D.R.M.C. Sections. By executing this Agreement, the Contractor expressly acknowledges that the Contractor is aware of the requirements of the City's Minimum Wage and Civil Wage Theft Ordinances and that any failure by the Contractor, or any other individual or entity acting subject to this Agreement, to strictly comply with the foregoing D.R.M.C. Sections shall result in the penalties and other remedies authorized therein.

M. City Prompt Pay.

i. The City will make monthly progress payments to Contractor for all services performed under this Agreement based upon Contractor's monthly invoices or shall make payments as otherwise provided in this Agreement. The City's Prompt Payment Ordinance, D.R.M.C. §§ 20-107 to 20-118 applies to invoicing and payment under this Agreement.

ii. Final Payment to Contractor shall not be made until after the Project is accepted, and all certificates of completion, record drawings, reproducible copies, and other

deliverables are delivered to the City, and the Agreement is otherwise fully performed by Contractor. The City may, at the discretion of the SVP withhold reasonable amounts from billing and the entirety of the final payment until all such requirements are performed to the satisfaction of the SVP.

6. INSURANCE REQUIREMENTS:

A. Contractor shall obtain and keep in force all of the minimum insurance coverage forms and amounts set forth in ***Exhibit C*** ("**Insurance Requirements**") during the entire Term of this Agreement, including any extensions of the Agreement or other extended period stipulations stated in ***Exhibit C***. All certificates of insurance must be received and accepted by the City before any airport access or work commences.

B. Contractor shall ensure and document that all subcontractors performing services or providing goods hereunder procure and maintain insurance coverage that is appropriate to the primary business risks for their respective scopes of performance. At minimum, such insurance must conform to all applicable requirements of DEN Rules and Regulations Part 230 and all other applicable laws and regulations.

C. The City in no way warrants or represents the minimum limits contained herein are sufficient to protect Contractor from liabilities arising out of the performance of the terms and conditions of this Agreement by Contractor, its agents, representatives, employees, or subcontractors. Contractor shall assess its own risks and maintain higher limits and/or broader coverage as it deems appropriate and/or prudent. Contractor is not relieved of any liability or other obligations assumed or undertaken pursuant to this Agreement by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types.

D. In no event shall the City be liable for any of the following: (i) business interruption or other consequential damages sustained by Contractor; (ii) damage, theft, or destruction of Contractor's inventory, or property of any kind; or (iii) damage, theft, or destruction of an automobile, whether or not insured.

E. The Parties understand and agree that the City, its elected and appointed officials, employees, agents and volunteers are relying on, and do not waive or intend to waive by any provisions of this Agreement, the monetary limitations and any other rights, immunities and protections provided by the Colorado Governmental Immunity Act, C.R.S. §§ 24-10-101 to 120, or otherwise available to the City, its elected and appointed officials, employees, agents and volunteers.

7. DEFENSE AND INDEMNIFICATION:

A. Contractor hereby agrees to defend, indemnify, reimburse and hold harmless the City, its appointed and elected officials, agents and employees for, from and against all liabilities, claims, judgments, suits or demands for damages to persons or property arising out of, resulting from, or relating to the work performed under this Agreement ("**Claims**"), unless such

Claims have been specifically determined by the trier of fact to be the sole negligence or willful misconduct of the City. This indemnity shall be interpreted in the broadest possible manner to indemnify the City for any acts or omissions of Contractor or its subcontractors either passive or active, irrespective of fault, including the City's concurrent negligence whether active or passive, except for the sole negligence or willful misconduct of the City.

B. Contractor's duty to defend and indemnify the City shall arise at the time written notice of the Claim is first provided to the City regardless of whether Claimant has filed suit on the Claim. Contractor's duty to defend and indemnify the City shall arise even if the City is the only party sued by claimant and/or claimant alleges that the City's negligence or willful misconduct was the sole cause of claimant's damages.

C. Contractor will defend any and all Claims which may be brought or threatened against the City and will pay on behalf of the City any expenses incurred by reason of such Claims including, but not limited to, court costs and attorney fees incurred in defending and investigating such Claims or seeking to enforce this indemnity obligation, including but not limited to time expended by the City Attorney Staff, whose costs shall be computed at the rate of two hundred dollars and no cents ($200.00) per hour of City Attorney time. Such payments on behalf of the City shall be in addition to any other legal remedies available to the City and shall not be considered the City's exclusive remedy.

D. Insurance coverage requirements specified in this Agreement shall in no way lessen or limit the liability of Contractor under the terms of this indemnification obligation. Contractor shall obtain, at its own expense, any additional insurance that it deems necessary for the City's protection.

E. This defense and indemnification obligation shall survive the expiration or termination of this Agreement.

8. DISPUTES:

All disputes arising under or related to this Agreement shall be resolved by administrative hearing under the procedures described in D.R.M.C. § 5-17 and all related rules and procedures. The determination resulting from said administrative hearing shall be final, subject only to the right of either party to appeal the determination under Colorado Rule of Civil Procedure 106.

9. GENERAL TERMS AND CONDITIONS:

A. Status of Contractor. Parties agree that the status of Contractor shall be an independent contractor retained on a contractual basis to perform professional or technical services for limited periods of time as described in § 9.1.1(E)(x) of the Charter of the City and County of Denver (the "**City Charter**"). It is not intended, nor shall it be construed, that Contractor or its personnel are employees or officers of the City under D.R.M.C. Chapter 18 for any purpose whatsoever.

B. Assignment. Contractor shall not assign, pledge or transfer its duties, obligations, and rights under this Agreement, in whole or in part, without first obtaining the written consent of the CEO. Any attempt by Contractor to assign or transfer its rights hereunder without such prior written consent shall, at the option of the CEO, automatically terminate this Agreement and all rights of Contractor hereunder.

C. Americans with Disabilities Act ("**ADA**")**.** Contractor shall provide the services specified in this Agreement in a manner that complies with the ADA (42 USC § 12101, *et. seq*) and other federal, state, and local accessibility requirements. Contractor shall not discriminate against disabled persons in the provision of services, benefits or activities provided under this Agreement and further agrees that any violation of this prohibition on the part of Contractor, its employees, agents or assigns may constitute a material breach of this Agreement. If requested by City, Contractor shall engage a qualified disability consultant to review Contractor's work for compliance with the ADA (and any subsequent amendments to the statute) and all other related federal, state, and local disability requirements, and Contractor shall remedy any noncompliance found by the qualified disability consultant as soon as practicable.

D. Compliance with all Laws and Regulations. Contractor and its subcontractor(s) shall perform all work under this Agreement in compliance with all existing and future applicable laws, rules, regulations, and codes of the United States, and the State of Colorado and with the City Charter, ordinances, Executive Orders, and rules and regulations of the City. **E. Compliance with Patent, Trademark and Copyright Laws.**

i. Contractor agrees that all work performed under this Agreement shall comply with all applicable patent, trademark and copyright laws, rules, regulations and codes of the United States, as they may be amended from time to time. Contractor will not utilize any protected patent, trademark or copyright in performance of its work unless it has obtained proper permission, all releases, and other necessary documents. If Contractor prepares any documents which specify any material, equipment, process or procedure which is protected, Contractor shall disclose such patents, trademarks and copyrights in such documents.

ii. Pursuant to Section 8, Contractor shall indemnify and defend the City from any and all claims, damages, suits, costs, expenses, liabilities, actions or proceedings resulting from, or arising out of, directly or indirectly, the performance of work under this Agreement which infringes upon any patent, trademark or copyright protected by law.

E. Notices.

i. Notices of Termination. Notices concerning termination of this Agreement, shall be made as follows:

by Contractor to:

Chief Executive Officer
Denver International Airport
Airport Office Building
8500 Peña Boulevard, 9th Floor
Denver, Colorado 80249-6340

And by the City to:

Passur Aerospace LLC
3452 Lake Lynda Drive, Suite 190
Orlando, Florida 32817

a. Delivery of Formal Notices. Formal notices of the termination of this Agreement shall be delivered personally during normal business hours to the appropriate office above or by prepaid U.S. certified mail, return receipt requested; express mail (FedEx, UPS, or similar service) or package shipping or courier service; or by electronic delivery directed to the person identified above and copied to the Project Manager through the electronic or software system used at the City's direction for any other official communications and document transmittals. Mailed notices shall be deemed effective upon deposit with the U.S. Postal Service and electronically transmitted notices by pressing "send" or the equivalent on the email or other transmittal method sufficient to irretrievably transmit the document. Either party may from time to time designate substitute addresses or persons where and to whom such notices are to be mailed, delivered or emailed, but such substitutions shall not be effective until actual receipt of written or electronic notification thereof through the method contained in Subsection (E)(ii).

b. Other Correspondence. Other notices and day-to-day correspondence between the Parties may be done via email directed to the Project Manager or through the electronic or software system used for work-related communications and transmittals at the City's direction.

F. Rights and Remedies Not Waived. In no event shall any payment by the City hereunder constitute or be construed to be a waiver by the City of any breach of covenant or default which may then exist on the part of Contractor. The City making any such payment when any breach or default exists shall not impair or prejudice any right or remedy available to the City with

respect to such breach or default. The City's assent, expressed or implied, to any breach of any one or more covenants, provisions or conditions of this Agreement shall not be deemed or taken to be a waiver of any other breach.

G. No Third-Party Beneficiaries. The Parties agree that enforcement of the terms and conditions of this Agreement and all rights of action relating to such enforcement shall be strictly reserved to the City and Contractor, and nothing contained in this Agreement shall give or allow any such claim or right of action by any third party. It is the express intention of the Parties that any person or entity other than the City or Contractor receiving services or benefits under this Agreement shall be deemed an incidental beneficiary and shall not have any interest or rights under this Agreement.

H. Governing Law. This Agreement is made under and shall be governed by the laws of the State of Colorado. Each and every term, provision and condition herein is subject to the provisions of Colorado law, the City Charter, and the ordinances and regulations enacted pursuant thereto, as may be amended from time to time.

I. Bond Ordinances. This Agreement is in all respects subject and subordinate to any and all the City bond ordinances applicable to the Airport System and to any other bond ordinances which amend, supplement, or replace such bond ordinances.

J. Venue. Venue for any action arising hereunder shall be in the City and County of Denver, Colorado.

K. Cooperation with Other Contractors.

i. The City may award other contracts for additional work, and Contractor shall fully cooperate with such other contractors. The City, in its sole discretion, may direct Contractor to coordinate its work under this Agreement with one or more such contractors.

ii. Contractor shall have no claim against the City for additional payment due to delays or other conditions created by the operation of other contractors. The City will decide the respective rights of the various contractors in order to secure the completion of the work.

L. Inurement. The rights and obligations of the Parties herein set forth shall inure to the benefit of and be binding upon the Parties hereto and their respective successors and assigns permitted under this Agreement.

M. Force Majeure. The Parties shall not be liable for any failure to perform any of its obligations hereunder due to or caused by, in whole or in part, fire, strikes, lockouts, unusual delay by common carriers, unavoidable casualties, war, riots, acts of terrorism, acts of civil or military authority, acts of God, judicial action, or any other causes beyond the control of the Parties. The

Parties shall have the duty to take reasonable actions to mitigate or prevent further delays or losses resulting from such causes.

N. Coordination and Liaison. Contractor agrees that during the term of this Agreement it shall fully coordinate all services that it has been directed to proceed upon and shall make every reasonable effort to fully coordinate all such services as directed by the SVP or their authorized representative, along with any City agency, or any person or firm under contract with the City doing work which affects Contractor's work.

O. No Authority to Bind City to Contracts. Contractor has no authority to bind the City on any contractual matters. Final approval of all contractual matters which obligate the City must be by the City as required by the City Charter and ordinances.

P. Information Furnished by the City. The City will furnish to Contractor information concerning matters that may be necessary or useful in connection with the work to be performed by Contractor under this Agreement. The Parties shall make good faith efforts to ensure the accuracy of information provided to the other Party; however, Contractor understands and acknowledges that the information provided by the City to Contractor may contain unintended inaccuracies. Contractor shall be responsible for the verification of the information provided to Contractor.

Q. Severability. In case any one or more of the provisions contained in the Agreement shall for any reason be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provision hereof, and this Agreement shall be construed as if such invalid, illegal or unenforceable provision had never been contained herein.

R. Taxes and Costs. Contractor shall promptly pay, when due, all taxes, bills, debts and obligations it incurs performing work under this Agreement and shall allow no lien, mortgage, judgment or execution to be filed against land, facilities or improvements owned by the City.

S. Environmental Requirements. Contractor, in conducting its activities under this Agreement, shall comply with all existing and future applicable local, state and federal environmental rules, regulations, statutes, laws and orders (collectively "**Environmental Requirements**"), including but not limited to Environmental Requirements regarding the storage, use and disposal of Hazardous or Special Materials and Wastes, Clean Water Act legislation, Centralized Waste Treatment Regulations, and DEN Rules and Regulations.

i. For purposes of this Agreement the terms "Hazardous Materials" shall refer to those materials, including without limitation asbestos and asbestos-containing materials, polychlorinated biphenyls (PCBs), per – and polyfluoroalkyl substances (PFAS), oil or any other petroleum products, natural gas, source material, pesticide, and any hazardous waste, toxic substance or related material, including any substance defined or treated as a "hazardous substance," "hazardous waste" or "toxic substance" (or comparable term) in the Comprehensive Environmental Response, Compensation and Liability Act (42 U.S.C. Sec. 9601 *et seq*. (1990)), the Toxic Substances Control Act (15 U.S.C. Sec. 2601 *et seq*.

(1990)), and any rules and regulations promulgated pursuant to such statutes or any other applicable federal or state statute.

ii. Contractor shall acquire all necessary federal, state and local environmental permits and comply with all applicable federal, state and local environmental permit requirements.

iii. Contractor agrees to ensure that its activities under this Agreement are conducted in a manner that minimizes environmental impact through appropriate preventive measures. Contractor agrees to evaluate methods to reduce the generation and disposal of waste materials.

iv. In the case of a release, spill or leak as a result of Contractor's activities under this Agreement, Contractor shall immediately control and remediate the contaminated media to applicable federal, state and local standards. Contractor shall reimburse the City for any penalties and all costs and expenses, including without limitation attorney's fees, incurred by the City as a result of the release or disposal by Contractor of any pollutant or hazardous material.

T. Non-Exclusive Rights. This Agreement does not create an exclusive right for Contractor to provide the services described herein at DEN. The City may, at any time, award other agreements to other contractors or consultants for the same or similar services to those described herein. In the event of a dispute between Contractor and any other party at DEN, including DEN itself, as to the privileges of the parties under their respective agreements, CEO shall determine the privileges of each party and Contractor agrees to be bound by CEO's decision.

10. RECORD RETENTION AND OTHER STANDARD CITY PROVISIONS:

A. Diversity and Inclusiveness. The City encourages the use of qualified small businesses doing business within the metropolitan area that are owned and controlled by economically or socially disadvantaged individuals. Contractor is encouraged, with respect to the goods or services to be provided under this Agreement, to use a process that includes small businesses when considering and selecting any subcontractors or suppliers.

B. No Discrimination in Employment. In connection with the performance of work under the Agreement, the Contractor may not refuse to hire, discharge, promote, demote, or discriminate in matters of compensation against any person otherwise qualified, solely because of race, color, religion, national origin, ethnicity, citizenship, immigration status, gender, age, sexual orientation, gender identity, gender expression, marital status, source of income, military status, protective hairstyle, or disability. The Contractor shall insert the foregoing provision in all subcontracts.

C. Advertising and Public Disclosures. Contractor shall not include any reference to this Agreement or to work performed hereunder in any of its advertising or public relations materials without first obtaining the written approval of the CEO or their authorized representative.

Any oral presentation or written materials related to DEN shall include only presentation materials, work product, and technical data which have been accepted by the City, and designs and renderings, if any, which have been accepted by the City. Contractor shall notify the CEO in advance of the date and time of any such presentations. Nothing herein, however, shall preclude Contractor's transmittal of any information to officials of the City, including without limitation, the Mayor, the CEO, any member or members of Denver City Council, and the Auditor.

D. Colorado Open Records Act.

i. Contractor acknowledges that the City is subject to the provisions of the Colorado Open Records Act ("**CORA**"), C.R.S. §§ 24-72-201 *et seq*., and Contractor agrees that it will fully cooperate with the City in the event of a request or lawsuit arising under such act for the disclosure of any materials or information which Contractor asserts is confidential or otherwise exempt from disclosure. Any other provision of this Agreement notwithstanding, all materials, records, and information provided by Contractor to the City shall be considered confidential by the City only to the extent provided in CORA, and Contractor agrees that any disclosure of information by the City consistent with the provisions of CORA shall result in no liability of the City.

ii. In the event of a request to the City for disclosure of such information, time and circumstances permitting, the City will make a good faith effort to advise Contractor of such request in order to give Contractor the opportunity to object to the disclosure of any material Contractor may consider confidential, proprietary, or otherwise exempt from disclosure. In the event Contractor objects to disclosure, the City, in its sole and absolute discretion, may file an application to the Denver District Court for a determination of whether disclosure is required or exempted. In the event a lawsuit to compel disclosure is filed, the City may tender all such material to the court for judicial determination of the issue of disclosure. In both situations, Contractor agrees it will either waive any claim of privilege or confidentiality or intervene in such legal process to protect materials Contractor does not wish disclosed. Contractor agrees to defend, indemnify, and hold harmless the City, its officers, agents, and employees from any claim, damages, expense, loss, or costs arising out of Contractor's objection to disclosure, including prompt reimbursement to the City of all reasonable attorney's fees, costs, and damages the City may incur directly or may be ordered to pay by such court, including but not limited to time expended by the City Attorney Staff, whose costs shall be computed at the rate of two hundred dollars and no cents ($200.00) per hour of City Attorney time.

E. Examination of Records and Audits.

i. Any authorized agent of the City, including the City Auditor or his or her representative, has the right to access and the right to examine, copy and retain copies, at City's election in paper or electronic form, any pertinent books, documents, papers and records related to Contractor's performance pursuant to this Agreement, provision of any goods or services to the City, and any other transactions related to this Agreement.

Contractor shall cooperate with City representatives and City representatives shall be granted access to the foregoing documents and information during reasonable business hours and until the latter of three (3) years after the final payment under the Agreement or expiration of the applicable statute of limitations. When conducting an audit of this Agreement, the City Auditor shall be subject to government auditing standards issued by the United States Government Accountability Office by the Comptroller General of the United States, including with respect to disclosure of information acquired during the course of an audit. No examination of records and audit pursuant to this paragraph shall require Parties to make disclosures in violation of state or federal privacy laws. Parties shall at all times comply with D.R.M.C. 20-276.

ii. Additionally, Contractor agrees until the expiration of three (3) years after the final payment under the Agreement, any duly authorized representative of the City, including the CEO, shall have the right to examine any pertinent books, documents, papers and records of Contractor related to Contractor's performance of this Agreement, including communications or correspondence related to Contractor's performance, without regard to whether the work was paid for in whole or in part with federal funds or was otherwise related to a federal grant program.

iii. In the event the City receives federal funds to be used toward the services performed under this Agreement, the Federal Aviation Administration ("**FAA**"), the Comptroller General of the United States and any other duly authorized representatives shall have access to any books, documents, papers and records of Contractor which are directly pertinent to a specific grant program for the purpose of making audit, examination, excerpts and transcriptions. Contractor further agrees that such records will contain information concerning the hours and specific services performed along with the applicable federal project number.

F. Use, Possession or Sale of Alcohol or Drugs. Contractor shall cooperate and comply with the provisions of Denver Executive Order 94 and Attachment A thereto concerning the use, possession or sale of alcohol or drugs. Violation of these provisions or refusal to cooperate with implementation of the policy can result in the City barring Contractor from City facilities or participating in City operations.

G. City Smoking Policy. Contractor and its officers, agents and employees shall cooperate and comply with the provisions of Denver Executive Order No. 99 and the Colorado Indoor Clean Air Act, prohibiting smoking in all City buildings and facilities. **H. Conflict of Interest.**

i. Contractor and its subsidiaries, affiliates, subcontractors, principals, or employees shall not engage in any transaction, work, activity or conduct which would result in a conflict of interest. A conflict of interest occurs when, for example, because of the relationship between two individuals, organizations or one organization (including its subsidiaries or related organizations) performing or proposing for multiple scopes of work for the City, there is or could be in the future a lack of impartiality, impaired objectivity, an

unfair advantage over one or more firms competing for the work, or a financial or other interest in other scopes of work.

ii. Contractor represents that, in its Response or Proposal, as applicable, it disclosed any and all current or potential conflicts of interest of which it is aware, including transactions, work, activities, or conduct that might affect the judgment, actions, or work of Contractor or which might give Contractor an unfair advantage in this or a future procurement. If the Parties identified a conflict of interest and agreed to a plan to mitigate such conflict, Contractor agrees it will comply with that mitigation plan.

iii. The City, in its sole discretion, shall determine the existence of a conflict of interest and may terminate this Agreement if such a conflict exists, after it has given Contractor written notice which describes such conflict. If, during the course of the Agreement, the City determines that a potential conflict of interest exists or may exist, Contractor shall have thirty (30) days after the notice is received in which to eliminate or cure the conflict of interest in a manner which is acceptable to the City.

iv. Contractor has a continuing duty to disclose, in writing, any actual or potential conflicts of interest including work Contractor is performing or anticipates performing for other entities on the same or interrelated project or tasks. Contractor must disclose, in writing, any corporate transactions involving other companies that Contractor knows or should know also are performing or anticipate performing work at DEN on the same or interrelated projects or tasks. In the event that Contractor fails to disclose in writing actual or potential conflicts, the CEO in their sole discretion, may terminate the Agreement for cause or for its convenience.

11. SENSITIVE SECURITY INFORMATION:

Contractor acknowledges that, in the course of performing its work under this Agreement, Contractor may be given access to Sensitive Security Information ("**SSI**"), as material is described in the Code of Federal Regulations, 49 C.F.R. Part 1520. Contractor specifically agrees to comply with all requirements of the applicable federal regulations, including but not limited to, 49 C.F.R. Parts 15 and 1520. Contractor understands any questions it may have regarding its obligations with respect to SSI must be referred to DEN's Security Office.

12. DEN SECURITY:

A. Contractor, its officers, authorized officials, employees, agents, subcontractors, and those under its control, shall comply with safety, operational, or security measures required of Contractor or the City by the FAA or TSA. If Contractor, its officers, authorized officials, employees, agents, subcontractors or those under its control, fail or refuse to comply with said measures and such non-compliance results in a monetary penalty being assessed against the City, then, in addition to any other remedies available to the City, Contractor shall fully reimburse the City any fines or penalties levied against the City, and any attorney fees or related costs paid by the City as a result of any such violation. Contractor must pay this amount within fifteen (15) days

from the date of the invoice or written notice. Any fines and fees assessed by the FAA or TSA against the City due to the actions of Contractor and/or its agents will be deducted directly from the invoice for that billing period.

B. Contractor is responsible for compliance with Airport Security regulations and 49 C.F.R. Parts 1542 (Airport Security) and 14 C.F.R. Parts 139 (Airport Certification and Operations). Any and all violations pertaining to Parts 1542 and 139 resulting in a fine will be passed on to and borne by Contractor. The fee/fine will be deducted from the invoice at time of billing.

13. FEDERAL RIGHTS:

This Agreement is subject and subordinate to the terms, reservations, restrictions and conditions of any existing or future agreements between the City and the United States, the execution of which has been or may be required as a condition precedent to the transfer of federal rights or property to the City for airport purposes and the expenditure of federal funds for the extension, expansion or development of the Airport System. As applicable, Contractor shall comply with the Standard Federal Assurances identified in the Appendix.

14. CONTRACT DOCUMENTS; ORDER OF PRECEDENCE:

A. Attachments. This Agreement consists of Section 1 through 16 which precede the signature page, and the following attachments which are incorporated herein and made a part hereof by reference:

Appendix: Standard Federal Assurances
Exhibit A: Scope of Work
Exhibit B: [*Omitted. Rates are included in Exhibit A*]
Exhibit C: Insurance Requirements
Exhibit D: IT Requirements

B. Order of Precedence. In the event of an irreconcilable conflict between a provision of Section 1 through 16 and any of the listed attachments or between provisions of any attachments, such that it is impossible to give effect to both, the order of precedence to determine which document shall control to resolve such conflict, is as follows, in descending order:

Appendix
Section 1 through Section 16 hereof
Exhibit D
Exhibit A
Exhibit C

15. CITY EXECUTION OF AGREEMENT:

A. City Execution. This Agreement is expressly subject to, and shall become effective upon, the execution of all signatories of the City and, if required, the approval of Denver City Council. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same.

B. Electronic Signatures and Electronic Records. The Agreement, and any other documents requiring a signature hereunder, may be signed electronically by the City and/or Contractor in the manner specified by the City. The Parties agree not to deny the legal effect or enforceability of the Agreement solely because it is in electronic form or because an electronic record was used in its formation. The Parties agree not to object to the admissibility of the Agreement in the form of an electronic record, or a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

[SIGNATURE PAGES FOLLOW]

Contract Control Number: PLANE-202473902-[[This Amendment Number]]
Contractor Name: PASSUR AEROSPACE INC

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of:

SEAL

CITY AND COUNTY OF DENVER:

ATTEST:

By: _____

_____

APPROVED AS TO FORM:

Attorney for the City and County of Denver

By: _____

REGISTERED AND COUNTERSIGNED:

By: _____

By: _____

Contract Control Number: PLANE-202473902-[[This Amendment Number]]
Contractor Name: PASSUR AEROSPACE INC

By: Signed by: Curt Vogel A22F218C077B481... _____

Name: Curt Vogel _____
(please print)

Title: Vice President Finance and Admin _____
(please print)

ATTEST: [if required]

By: _____

Name: _____
(please print)

Title: _____
(please print)

Appendix 1

Standard Federal Assurances and Nondiscrimination Non-Federal Contract Provision

A5 CIVIL RIGHTS - GENERAL

A5.3.1 Clause that is used for Contracts

GENERAL CIVIL RIGHTS PROVISIONS

The Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

A6 CIVIL RIGHTS – TITLE VI ASSURANCE

A6.3.1 Title VI Solicitation Notice

Title VI Solicitation Notice:

The (**Name of Sponsor**)**,** in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that any contract entered into pursuant to this advertisement, [select disadvantaged business enterprises or airport concession disadvantaged business enterprises] will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

A6.4 CONTRACT CLAUSES

A6.4.1 Title VI Clauses for Compliance with Nondiscrimination Requirements

Compliance with Nondiscrimination Requirements:

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:

1. **Compliance with Regulations:** The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

3. **Solicitations for Subcontracts, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.
4. **Information and Reports:** The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
    a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or
    b. Cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions:** The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

A6.4.2 Title VI Clauses for Deeds Transferring United States Property

CLAUSES FOR DEEDS TRANSFERRING UNITED STATES PROPERTY

The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of the Airport Improvement Program grant assurances.

NOW, THEREFORE, the Federal Aviation Administration as authorized by law and upon the condition that the (***Title of Sponsor***) will accept title to the lands and maintain the project

constructed thereon in accordance with (***Name of Appropriate Legislative Authority***), for the (**Airport Improvement Program or other program for which land is transferred**), and the policies and procedures prescribed by the Federal Aviation Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 USC § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the (***Title of Sponsor***) all the right, title and interest of the U.S. Department of Transportation/Federal Aviation Administration in and to said lands described in (***Exhibit A attached hereto or other exhibit describing the transferred property***) and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto (***Title of Sponsor***) and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the (***Title of Sponsor),*** its successors and assigns.

The (***Title of Sponsor***), in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the (Title of Sponsor) will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended[, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the Federal Aviation Administration and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

A6.4.3 Title VI Clauses for Transfer of Real Property Acquired or Improved Under the Activity, Facility, or Program

CLAUSES FOR TRANSFER OF REAL PROPERTY ACQUIRED OR IMPROVED UNDER THE AIRPORT IMPROVEMENT PROGRAM

The following clauses will be included in (deeds, licenses, leases, permits, or similar instruments) entered into by the (***Title of Sponsor***) pursuant to the provisions of the Airport Improvement Program grant assurances.

A. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:

    1. In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a Federal Aviation Administration activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Nondiscrimination Acts and Regulations listed in the Pertinent List of Nondiscrimination Authorities (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.

B. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, (***Title of Sponsor***) will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued.*

C. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the (***Title of Sponsor***) will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the (***Title of Sponsor***) and its assigns.*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

A6.4.4 Title VI Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program

CLAUSES FOR CONSTRUCTION/USE/ACCESS TO REAL PROPERTY ACQUIRED UNDER THE ACTIVITY, FACILITY OR PROGRAM

The following clauses will be included in deeds, licenses, permits, or similar instruments/agreements entered into by (***Title of Sponsor***) pursuant to the provisions of the Airport Improvement Program grant assurances.

A. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or

national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the List of discrimination Acts And Authorities.

B. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above nondiscrimination covenants, (***Title of Sponsor***) will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued.*

C. With respect to deeds, in the event of breach of any of the above nondiscrimination covenants, (***Title of Sponsor***) will there upon revert to and vest in and become the absolute property of (***Title of Sponsor***) and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

A6.4.5 Title VI List of Pertinent Nondiscrimination Acts and Authorities

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d et seq., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 et seq.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended (42 USC § 6101 et seq.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of

the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 USC §§ 12131 – 12189) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC 1681 et seq).

A17 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

A17.3 SOLICITATION CLAUSE

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.

The [***Contractor*** **|** ***Consultant***] has full responsibility to monitor compliance to the referenced statute or regulation. The [***Contractor*** **|** ***Consultant***] must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

A20 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

A20.3 CONTRACT CLAUSE

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of

the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

PASSUR® KNOW NOW™

EXHIBIT A

Denver International Airport (DEN) Noise Office

Noise and Operations Monitoring System (NOMS) Replacement Statement of Work

ATTACHMENT 1 – TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

1. NOMS PROPOSAL OVERVIEW

PASSUR Aerospace (PASSUR or Contractor), partnered with Larson Davis (LD), jointly (PASSUR team) is pleased to offer a comprehensive, integrated and turn-key solution to Denver International Airport (DEN)/City of Denver Department of Aviation (DOA) for the DEN Noise Office Noise and Operations Monitoring System (NOMS) Replacement.

Table 1 provides a summary of the solutions and capabilities the PASSUR Team will bring to the DEN NOMS project.

Table 1: PASSUR Team Capabilities

Solution/Service/Capability	Benefit to the DEN
The PASSUR NOMS will be powered by the ARiVA Global Data Feed which leverages a unique sensor constellation that includes a diverse collection of redundant surveillance sensor equipment. The collection (or array) of sensors and surveillance sources are continually managed and updated to meet the ever-changing needs of DEN. It currently amalgamates over 50 independent data sources, including NAS-Wide en-route, terminal radar data and ATC quality ADS-B sensors (exclusively), surveillance data from ASDE-X and ASSC systems, with local DEN specific ADS-B sensors, MLAT, ship radar and AIS sensors, airfield camera systems and schedule data.	Trust is eroded in the community when the airport does not have the commercial, military, GA or helicopter flight track in question. Therefore, having multiple surveillance sensors and geo-referencing is critical to ensure flight track reporting accuracy to the community. Complete tracks also ensure the DEN can rely on accurately correlated tracks, noise, and complaints. Utilizing multi-sensor surveillance data versus one radar sensor provided by the SWIM Terminal Data Distribution System (STDDS) ensures the community that DEN is tracking aircraft using all available FAA surveillance sources. This solution offers automated failover, resiliency and redundancy beyond other solutions.
	ARiVA Data has more military and GA flights with registrations numbers than a local FAA National Offload Program (NOP) or STDDS feed. In addition, ARiVA Data includes more military aircraft tracks than SWIM, thus this will significantly reduce the occurrence of "Ghost Airplanes".
	PASSUR's use of a large collection of sensors means the flight tracks will be updated more frequently and have higher positional accuracy. In most cases, tracks will remain in-tact (unbroken) allowing DEN to better analyze flight patterns, touch and goes, missed approaches, and also accurately identify the origin/destination airport.
The PASSUR Team will provide DEN and Community with easy to use, integrated, automated and mobile device compatible complaint management and flight tracking tools with Symphony PublicVue to facilitate improved and more efficient interaction with DEN's community	PASSUR will automate some of the manual complaint ingest and management processes freeing up noise office personnel to focus more on community relations and developing reports and performing noise complaint investigations/analysis to ensure DEN responds to the community in a timely manner.
NMT Field Support and Services to be provided by trained local, on call personnel.	When applicable, PASSUR will be subcontracting with Denver Area local subcontractors along with our local Technical Staff in support of the installation and maintenance of DEN's NMTs. PASSUR will train local subcontractors on NMT installation and support to ensure timely response to troubleshoot and fix any NMT performance issues to meet the uptime and availability requirements of the NOMS. PASSUR has 3 technicians within the Denver area, and an additional 2 within 4 hours of DEN.
Symphony EnvironmentalVue uniquely combines several key capabilities (True 2D/3D GIS, Contours and VNMs) to enable DEN to effectively and quickly investigate complaints and communicate with their community and internal stakeholders.	The integrated EnvironmentalVue 2D/3D displays allow DEN to more completely identify flight patterns but also easily develop easily understandable graphics and reports. As EnvironmentalVue is the only true GIS based NOMS system on the market, the high-quality flight tracks are much more accurately depicted in the correct location than other competing systems that only project the locations onto a flat cartesian space.
	If selected, optional Integrated Virtual Noise Monitors (VNMs) will allow the NOMS to see the community effects of just the aircraft noise, uncontaminated by the urban background levels or ambient noise. VNMs will also enable DEN to determine aircraft noise impacts where there are no physical NMTs located.

Solution/Service/Capability	Benefit to the DEN
Experienced Project Management	The proposed project manager will provide real-time oversight and support during the project. Additionally, Mr. Rossano has had the privilege of working with DEN and their noise office for the last 7 ½ years to deliver quality solutions.
Supported by Highly Experienced PASSUR Support and Technical Team	PASSUR's has been deploying and supporting flight tracking and noise monitoring solutions since 1974. It's highly experienced staff will train local PASSUR technicians and subcontractor(s), when applicable, on NMT installation and support, supporting local technicians and contractors on-site for NMT installations and remotely for ongoing maintenance and troubleshooting.
Patented Integration of D-ATIS and Airfield Conditions into a NOMS Solution.	PASSUR has unique patented technology for D-ATIS integration into a NOMS system that will provide DEN with improved automation in the generation of their complaints through the detection of the runways in use.
Major Components of the DEN NOMS are already deployed	The PASSUR NOMS solution is largely complete. This has the added benefit to DEN in time and cost savings in the following areas: 1. Faster deployment 2. Faster and easier testing 3. No data migration required 4. Reduced necessary time for staff to get up to speed on solution use 5. Little to no transition risk
Enhanced Touch and Go Algorithms	This PASSUR proprietary solution further increases the performance of the standard touch and go algorithms used in standard NOMS systems. This algorithm has intelligent heuristics that detect operations using known patterns.
Integrated Video Creation with Visual Playback in EnvironmentalVue	DEN can easily capture and share videos showing aircraft, noise, complaints, weather, and lightning with a few simple clicks.

The PASSUR team delivers DEN the best value and lowest risk solution. The PASSUR team is committed to being a continued trusted partner to DEN to meet its current and future NOMS needs.

1.1 DEVELOPMENTAL ELEMENTS

DEN will receive 200 hours annually of custom DEN software development hours for feature enhancements that can be used towards mutually agreed upon features listed in Table 2 below. Features outlined as being part of PASSUR's proposed solution in these technical specifications, which are not currently accessible by DEN but are available within other clients' NOMS solutions, can also be made available in DEN's NOMS, if mutually agreed upon, using the 200 gratis development hours per contract year. Those items are not included in Table 2 below. Please see Table 2 below for a list of PASSUR Developmental Elements.

Table 2: Developmental Elements

Description	PASSUR Response	Type
Public web-based flight track replay capabilities with base maps, simultaneous noise-level replay (time-history plots desired), **simultaneous audio replay**, etc.	PASSUR's PublicVue solution does not currently support simulations with audio replay through to the public - though this is possible. This capability increases the network bandwidth requirement at the sensors, servers, and customer site. PASSUR can discuss and define the requirements for inclusion of audio replay with DEN and whether it will be done for additional cost or through use of the gratis development hours.	Narrative
Display and plot airspeed, climb rate, and acceleration profiles of selected aircraft flight tracks.	At DEN's option, this feature's development can be accelerated as part of this contract for additional cost or through use of the gratis development hours.	Requirement
Select, analyze, and display flight operations data according to penetrations of user-defined areas on the ground (e.g., cylinders or regular polygons) or irregular areas on the ground (e.g., municipal jurisdiction boundaries), ideally with options for defining floors and ceilings.	At DEN's option, this feature's development can be accelerated as part of this contract for additional cost or through use of the gratis development hours.	Requirement
The system should allow complaint responses to be sent via email, if requested by the complainant.	This capability is part of PASSUR's product roadmap.	Requirement
The systems should allow the DOA to enable an automated email response to any complaint entered into the system, acknowledging the receipt of the complaint.	Automated email responses acknowledging the receipt of the complaint is available for complaints through PublicVue, but not currently through manually entered complaints into the EnvironmentalVue system. This capability is part of PASSUR's product roadmap.	Requirement
The web site must be structured to support both "public" and "internal" access. Public access must not require login or personal information from the user but should allow returning users, who choose to have their information stored, to login securely. Public users who chose to login should be able to access their personal information, such as their personal complaint history and display preferences.	PublicVue classically has not stored cookies on the public's computers. PASSUR is willing to discuss the options with DEN and if strongly desired this can be included as part of the PublicVue solution.	Requirement
Event Discrimination and Source Identification • Noise events correlated with multiple DEN-related events • Noise events correlated with aircraft noise events from multiple airports • Easy Keyboard selection and adjustment of discrimination parameters for individual noise monitors	The system does not currently provide these capabilities. If strongly desired, PASSUR can further discuss this with DEN.	Requirement
The software should limit the number of unsuccessful login attempts before a user is locked out of accessing the software. Administrators should be able to reset passwords for users in the event of an account being locked out. Add a password reset function.	The system does not currently limit the number of unsuccessful login attempts. PASSUR can work with DEN however to implement this capability.	Requirement

1.2 RELATIONSHIP OF TECHNICAL RESPONSE TO PASSUR'S SCOPE OF SERVICES

These Technical Specifications have been incorporated into the scope of work by reference.

1.3 SUPPLEMENTAL INFORMATION

The quality of the surveillance data drives the efficiency of both a NOMS and Operations solution on many levels. Users need to be able to trust that they have the best representation of where aircraft are both in real-time and in use with historic analysis. PASSUR's ARiVA Global Feed is the most comprehensive source of flight tracking data available in the industry, and powers all of our proposed solutions for DEN.

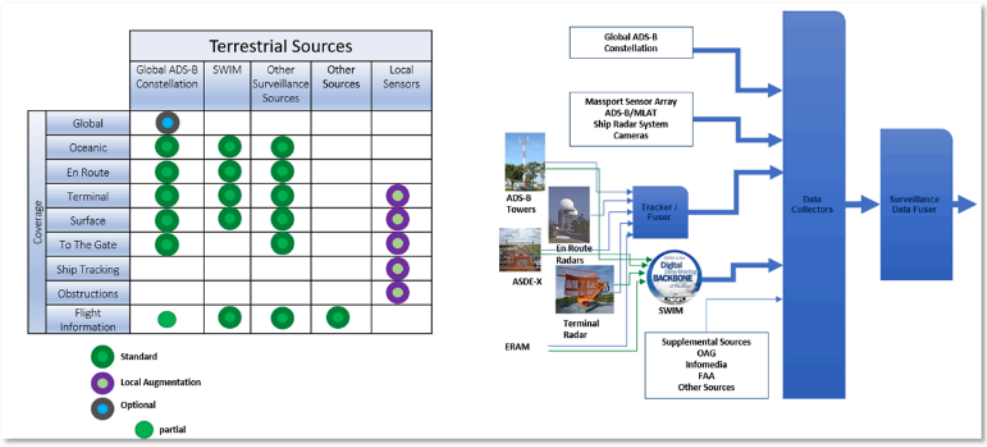


Figure 1: Components of PASSUR's ARiVA Global Data Used in DEN NOMS

1.4 ALTERNATIVES AND OPTIONS

The PASSUR Team is confident in our ability to meet the NOMS System requirements. In addition to the base solutions, PASSUR is offering DEN the following optional NOMS solutions:

Portable NMT Base Solution: Meets requirements of equipment listed in 10.5.1 but with standard portable NMT case.

Option 1: Basic Portable NMT – NMS044-SLA100-U with 831C-SR (sound recording), and 831C-OB3 (real-time 1/1 & 1/3 octave filters). This has been priced in the pricing sheet.

Option 2: Portable NMT Base Solution equipment but with custom NMT cases to fit all equipment. This has been estimated in the pricing sheet but according to the manufacturer must be priced at the time of order.

NMT Maintenance Base Solution: Our base solution offering includes using available spare parts that DEN has in their possession or is able to help PASSUR obtain at commercially reasonable and agreed upon pricing, PASSUR will maintain the NMTs, swapping out malfunctioning parts with spare parts and returning malfunctioning parts to B&K for repair. Turnaround times and repair or replacement availability are subject to B&K's turnaround times and repair or replacement availability. If at any time the NMTs become unrepairable, as deemed so by B&K, PASSUR will work with DEN on a NMT replacement plan. Pricing options have been provided in the proposal Price Sheet.

- Option 1: DEN Noise Office Staff Continues to Maintain the NMTs Themselves
  Advantages: DEN Noise Office staff has a wealth of knowledge and experience in maintaining the NMTs themselves, as well as contacts and an efficient, established process for assessment and repair/replacement. See the cost savings for removing NMT support from the contract outlined in the Pricing sheet.
  Disadvantages: This would require a little more of the staff's time to maintain the NMTs.

- Option 2: Since B&K 3639-C spare parts are not readily available for purchase, DEN may choose to purchase a small quantity of new Larson Davis (LD) 831C NMTs to replace some of B&K NMT sites and use the old monitors for spare parts.

Advantages: This would limit NMT site downtime as it would provide local, readily available spare parts to use for replacements while faulty parts are repaired by B&K.
Disadvantages: DEN would have the up-front cost of purchasing a LD831C NMTs to use for the replacements.

1.5 ASSUMPTIONS REGARDING DEN RESPONSIBILITIES

DEN's Responsibilities for this effort include:

- DEN shall pay for recurring electric and communications for NMTs.
- With proper prior notice, as required in these technical specifications, DEN shall permit PASSUR and its personnel, subject to security regulations and work schedules, access to equipment for installation and maintenance purposes.
- DEN's responsibilities related to maintenance and repair shall be limited to notifying PASSUR of any NMT issues and making an initial on-site visit to the NMT for remedial inspection (including verifying that power and communications are in proper working order) and reset as directed by PASSUR at NMT sites when there is an NMT issue.
- DEN's responsibilities related to SW and HW implementation shall include providing remote network access such that remote SW maintenance can be performed as required and remote data feeds can be accessed for operational display.

PASSUR's Responsibilities for this effort include:

- Providing wireless communication services sufficient to support remote real-time noise data and audio collection as well as remote control for configuration and status monitoring of the NMT hardware
- Providing local and remote NMT troubleshooting/maintenance services as required.
  - Local services
    - Provide rapid response in the event of NMT failures (Power, Communications, Noise monitor, Natural Disaster, etc.)
    - Noise monitor firmware upgrades as required
    - Annual calibration services.
  - Remote services
    - NMT communications firmware upgrades
    - Noise monitor configuration/optimization changes
    - NMT monitoring and testing.
- Providing and maintaining the proposed NOMS Software throughout the terms identified in the contract
- Providing 24/7 NOMS Hardware and Software helpdesk services to log, track, respond to, correct, and report on any anomalies related to the provided NOMS solution

The PASSUR EnvironmentalVue software is a current, secure, reliable and user friendly, existing COTS software that will operate on any internet enabled Windows based PC that is running the most current version of Java (preferably 64-bit) and meets the following minimum requirements as shown in Table 3 and Table 4 below.

Table 3: Minimum Configuration

Minimum Configuration	
Operating System	Windows 7 32 bit or later OS
Hardware	• X86, 2.4 GHz dual-core microprocessor • 3.5 GB of available system memory • 512 MB on card graphics memory • Mouse or similar pointing device

Minimum Configuration	
	• 1024x768 monitor display
Browser	Internet Explorer version 8 or higher

Table 4: Minimum Suggested Configuration

Minimum Suggested Configuration	
Operating System	Windows 7 64 bit or later OS Java 1.8 -64bit
Hardware	• X86, 2.4 GHz quad-core microprocessor • 4 GB of available system memory • 1 GB on card graphics memory • Mouse or similar pointing device • Dual 1920X1280 monitor displays

2. OVERALL SYSTEM OPERATION AND PERFORMANCE

EnvironmentalVue is a remotely hosted, web-based application. The application can be easily launched from Microsoft Internet Explorer, Google Chrome and Mozilla Firefox Browsers in both 32 and 64 bit. EnvironmentalVue is powered by Java and requires only minimal file installations on the client machine to run. PASSUR's data center is hosted at Cyxtera, a world class provider of data services. Cyxtera follows strict standards for maintenance and access control to prevent unauthorized access or unexpected failures.

The proposed PASSUR solution will host the automatic acquisition of all required data including flight operations, noise measurements, weather information, complaint records, and any other required data. Professional hosting includes all database management activities such as backups and archives. PASSUR will provide all hardware and software necessary for central operations of the proposed NOMS.

2.1 NOMS OPERATORS

PASSUR's NOMS solution EnvironmentalVue will run on any Windows based computer that utilizes Windows 7 or higher operating system (OS). EnvironmentalVue is a web-based software solution and is compatible with Internet Explorer, Google Chrome and Mozilla Firefox web browsers.

PASSUR will provide sufficient software licenses for all software to be installed and used simultaneously by up to ten (10) authorized DEN users. Furthermore, PASSUR warrants that it has the right to grant these licenses. PASSUR will also provide fully paid third-party software licenses in the name of DEN, under the terms established by the software license providers in the original packaging with original and complete documentation. All control over software upgrades allowed by third party providers will be forwarded to DEN.

Furthermore, PASSUR will assign at least two (2) DEN EnvironmentalVue users administrative privileges with full read and write access and the ability to change permissions and add users. PASSUR will also allow these administrators the ability to set up EnvironmentalVue Portal credentials to allow DEN staff outside of the noise office access to the reporting functions of the NOMS software. PASSUR will assign three (3) primary NOMS operators with full read and write access.

PASSUR will also provide two (2) complementary licenses of Symphony OpsVue for real-time display and situational awareness, one for use at the DEN Noise Office.

2.2 OPERATOR INTERVENTION

EnvironmentalVue requires little to no operator intervention to support normal daily operations. The hosted solution is continually monitored by PASSUR staff. The PASSUR support staff monitors the health of the system, key performance indicators, and download status. Should an issue arise, PASSUR staff will manage the mitigation and resolution to conclusion, advising DEN as appropriate based on an agreed upon plan of communications. Historically, over 98% of the issues are solved within less than four (4) hours with only an advisory notice to DEN. Over the years, PASSUR has

come to know and understand the normal operations of DEN and often will take proactive action to avoid issues all together.

2.3 ACCOMMODATION OF POWER, TELEPHONE, AND NETWORK SERVICE INTERRUPTION

Each NMT stores data locally in the event of a communications issue. Once communications are reestablished, missing data can be downloaded and processed. Each site has backup batteries to avoid a power interruption. In the event shore power is lost for an extended period of time, once Shore power is restored the NMT will switch back from Battery power to Shore power automatically, the NMT will begin communicating once again with our backend processing system, and any available missing data will be downloaded and made available through our EnvironmentalVue application for playback and analysis.

If there is a network interruption, the noise monitor will log data to internal memory. That data will be automatically downloaded when the network is restored, and it can also be manually downloaded and transferred to the NOMS.

Every morning PASSUR technicians review data downloads from all NMTs. If a power or data issue is observed PASSUR will create a ticket on the issue and track it to resolution. In the event of a network/communications failure the NMT will store noise data until PASSUR is able to re-establish communications. Once communications are re-established PASSUR will download and process the missing noise data into the database. DEN will be notified via email once the missing data is processed.

In the event that the interruption is a hardware issue, PASSUR will coordinate with DEN NOMS staff and when applicable, dispatch a local technician for repair of the NMT.

2.4 CLOCK ACCURACY

The noise monitor includes software Network Time Protocol (NTP) that automatically synchronizes the internal clock to highly accurate network time sources. When using cellular network connections, NTP will typically keep the clock synchronized to absolute time +/- 300 ms. PASSUR uses NTP on all hosted servers. The noise sites each have a GPS unit that sets the time for each NMT. Data will be adjusted to local Eastern Time. Additionally, during each nightly noise monitor download PASSUR checks and updates time if needed.

2.5 AUTOMATIC SYSTEM FAILURE ALERTS

With the delivery of PASSUR's NOMS solution, PASSUR, in accordance with an agreed upon communication plan, will alert DEN staff of system failures including:

- Interruption of the operation of the server
- Failure to acquire time-perishable data, i.e., any failure that will result in the interruption of real time data collection, with no means of later recovery
- Failure of an NMT to satisfactorily complete a self-calibration
- Failure of the system to automatically transfer accumulated data from any external data acquisition device, including, but not limited to, transfer of accumulated noise, operational, weather, or complaint data
- Electrical power failure, telephone failure, or network failure
- Intrusion by unauthorized personnel on the NOMS
- Interruption of the operation of any NMT, with identification of the NMT
- Every other system failure that would lead or has led to the loss of time-perishable data

PASSUR's NOMS alerts users of system failures via email and other methods, in a timely manner in accordance with our network administration policies. Additionally, all system logs containing failure notices are maintained in the PASSUR NOMS database for as long as the relevant noise, operations, complaint, and other primary system data are maintained.

The PASSUR NOMS does not issue interim failure messages without any change to failure status and minimizes the reporting of information that does not contain useful and actionable updates for the user(s). All records pertaining to system failures will be maintained as long as the relevant noise, operations, complaint, and other primary system data are maintained.

2.6 DATA INTEGRITY AND AUDITING

To strengthen the integrity of the underlying data, PASSUR's NOMS system does not permit the editing of raw measured noise data, weather data or track points. Rather the raw data is imported into the DEN database, which can be edited. For auditing purposes, PASSUR's NOMS retains records of all manual changes to the values stored in the database including but not limited to changes to:

- Original automatic identification of noise events
- Flight and operations identification data
- Original automatic identification of the runway used by an operation
- Original automatic identification of the type of operation type
- Original automatic correlations of noise events, complaints, flight tracks, other operations data, and weather data

The PASSUR NOMS maintains records of manual changes made to the identification of noise events, the operations identification data, the runway used by an operation and the type of operation. In addition, the PASSUR NOMS maintains a record of the automatic correlations of noise events, complaints, flight tracks, other operations data, and weather data.

Where PASSUR's NOMS system permits manual changes to values or correlations, PASSUR provides a simple means of restoring the original data or correlation values to the database. Furthermore, PASSUR NOMS provides for the automatic recalculation of noise exposure values to account for any manual changes or restoration of original values.

2.7 GROWTH POTENTIAL

The PASSUR EnvironmentalVue solution is scalable such that NMTs, either fixed or portable, operators, and workstations can be added as required. Given the architecture, any configured computer can be used by a user with an active account. Expansion of PASSUR NOMS software users or hardware shall not require any changes in the basic system software or basic system design and configuration.

2.8 USE OF INDUSTRY STANDARD HARDWARE AND SOFTWARE

The PASSUR solution relies extensively on commercial "off the shelf" (COTS) components and services and has been shown to work well with Airport networks and infrastructure. COTS components include computer and backup hardware, 3rd party software, operating systems, commutations hardware, and ancillary equipment. Of particular note are the COTS noise monitors provided by Larson Davis, which PASSUR has proposed should any existing DEN NMTs need to be replaced or should DEN desire to add additional NMTs in the future. Larson Davis is known for their unique total customer satisfaction guarantee on all of their equipment. If required, PASSUR can work with DEN staff to provide details of the components used at our data center.

2.9 DIMENSIONAL UNITS AND TERMINOLOGY

2.9.1 USE OF U.S. STANDARD TERMINOLOGY

The PASSUR proposed NOMS solution uses standard American English for all data input, output, and documentation. All noise monitor documentation is in English.

2.9.2 DISTANCE UNITS

The PASSUR proposed NOMS uses units of measurement most commonly used in the aviation industry like altitudes in feet and speeds in knots. Users have the ability to select statute miles, nautical miles, or feet for distance measurements for both on-screen and reporting purposes.

2.9.3 DATE FORMAT

The PASSUR proposed NOMS allows dates to be formatted as yyyy-mm-dd or dd-mm-yyyy.

2.9.4 TIME UNITS

PASSUR's EnvironmentalVue allows the user to select the appropriate time format required, allowing users to switch between either 24-hour or civilian formats.

3. FLIGHT OPERATIONS MONITORING

PASSUR's NOMS system provides the most cost-effective aircraft operations identification and monitoring system currently on the market. The system is driven by the extremely accurate ARiVA Global data feed, which provides the most precise and complete flight track data available. Unlike SWIM data which relies on a single sensor to derive an estimated position of the aircraft, PASSUR's ARiVA Global data feed uses a fusion of multiple sensors to determine an aircraft's exact position and georeferences the location of aircraft movements in the NAS. While SWIM's data feed is capped at an altitude of 18,000 ft. PASSUR's ARiVA data feed provides coverage up to 50,000 ft. MSL. Additionally, more general aviation and military aircraft are tracked with ARiVA data than data from the FAA's NOP. This is largely due to both the differences in filtering rules but also because of the multi-sensor data fusion. The ARiVA data feed requires no track smoothing or geo-referencing unlike the SWIM data feed which must be constantly monitored for changes.

The combined PASSUR software and hardware components will provide DEN with a state-of-the-art NOMS solution for DEN Airport.

3.1 MINIMUM REQUIRED FLIGHT OPERATIONS MONITORING CAPABILITIES

The proposed PASSUR NOMS is the existing system used by DEN, with a few enhancements. This system is powered by the PASSUR ARiVA data.

The PASSUR EnvironmentalVue solution provides industry leading runway assignment accuracy at DEN. At DEN, this is possible largely due to the ARiVA data fusion and selection of the most accurate track points from available surveillance sources. This often allows PASSUR to track aircraft to the surface at DEN with great precision. The fused data from radars and transponder-based trackers allows very low attitude coverage to support these assignments.

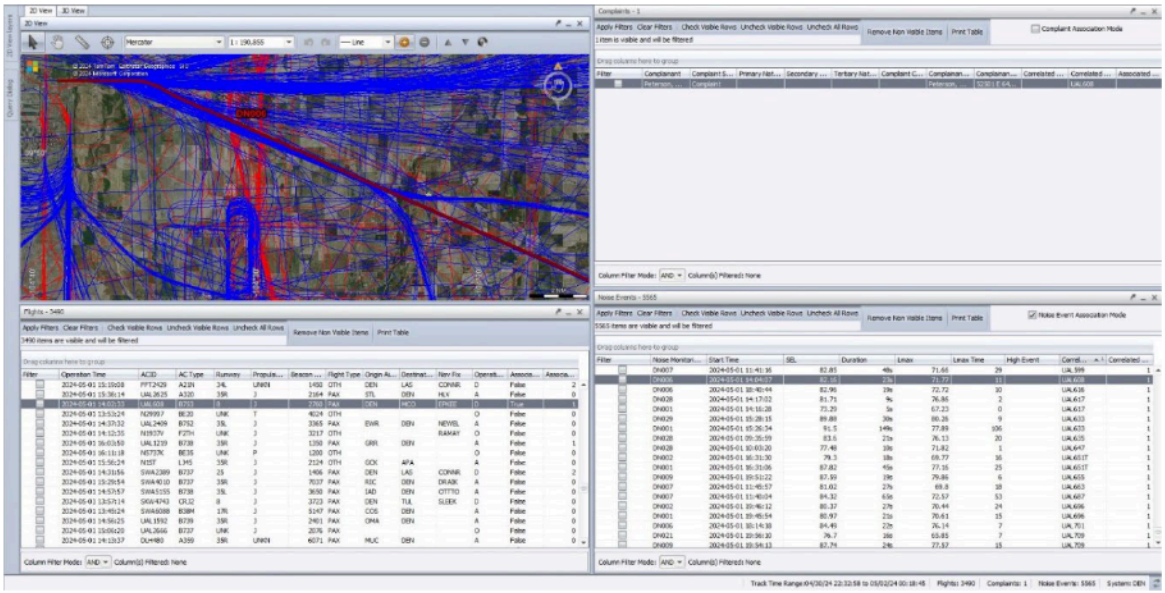


Figure 2: EnvironmentalVue report sampling that includes correlated complaint data, operations, and noise events.

EnvironmentalVue identifies at a minimum the time of the operation, type of operation, the airport of origin and destination, the runway of arrival/departure, operator category, aircraft type category, aircraft registration and or airline flight number, aircraft type, beacon code and origin and destination airport. In total, there are 32 user selectable fields in the Flight operations table that can be displayed, sorted and filtered.

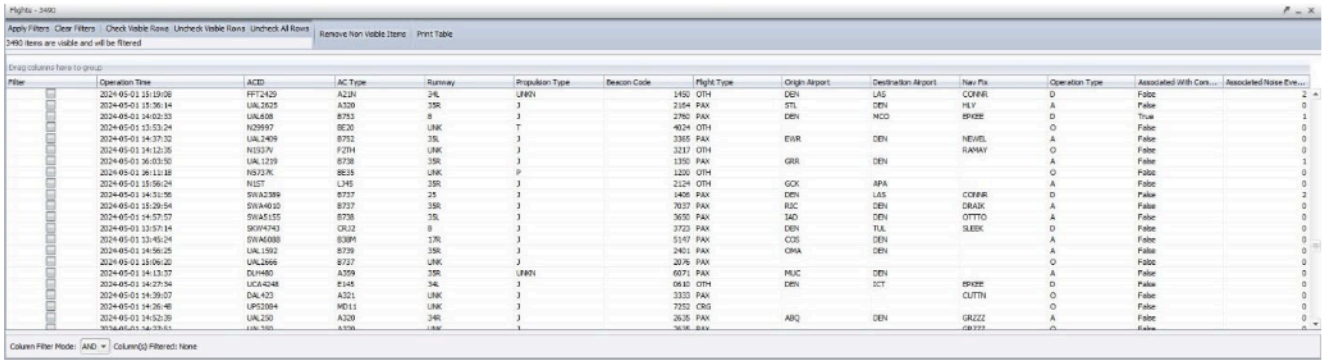


Figure 3: Flight Identification Report

PASSUR NOMS plots ground projections of aircraft flight tracks.

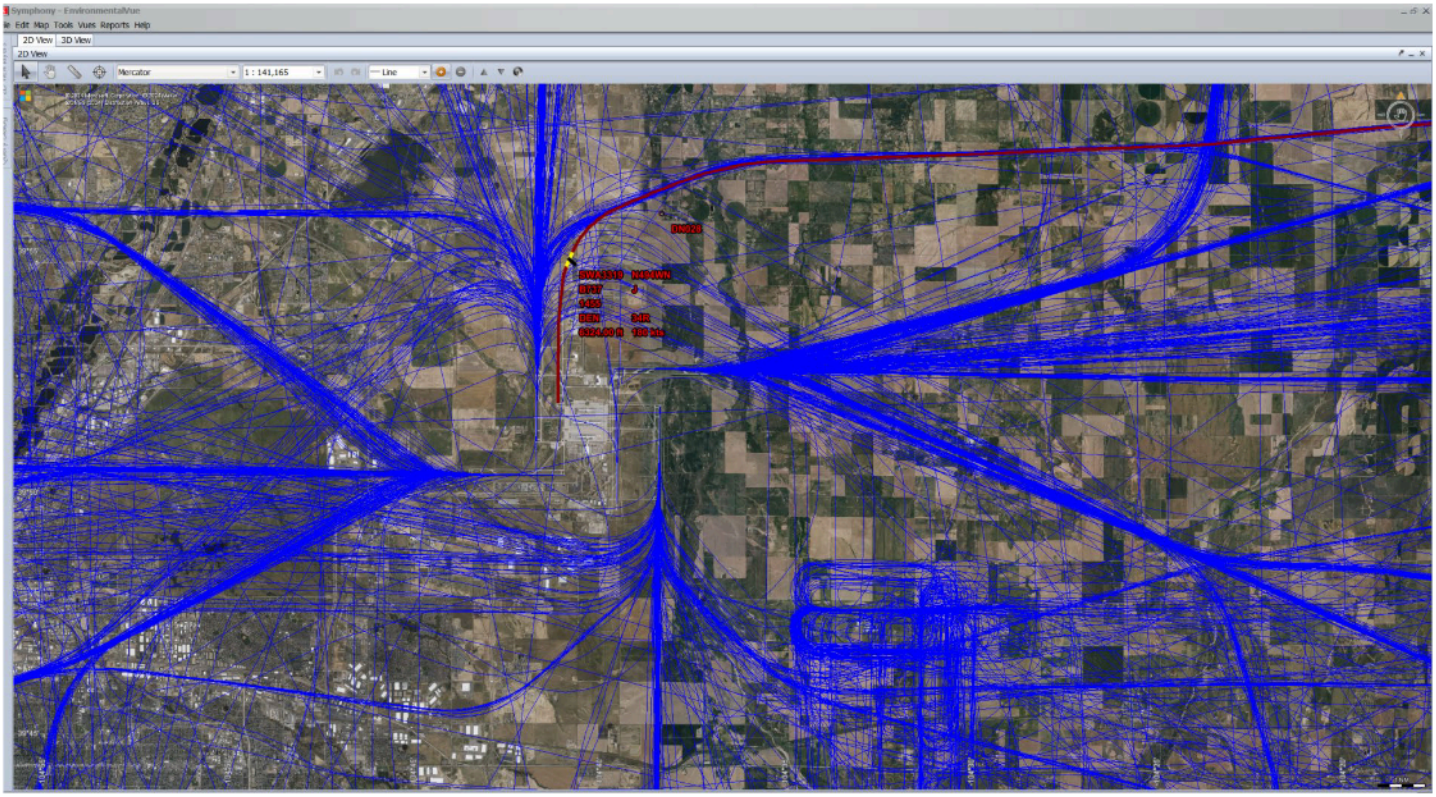


Figure 4: EnvironmentalVue displays ground projection of DEN departures

PASSUR NOMS plots altitude profiles of flight tracks (altitude vs. distance from brake release for takeoffs, and distance from the landing threshold for arrivals).

With the PASSUR NOMS the User may select, sort, and report based on penetration or non-penetration of user defined gates or corridors.

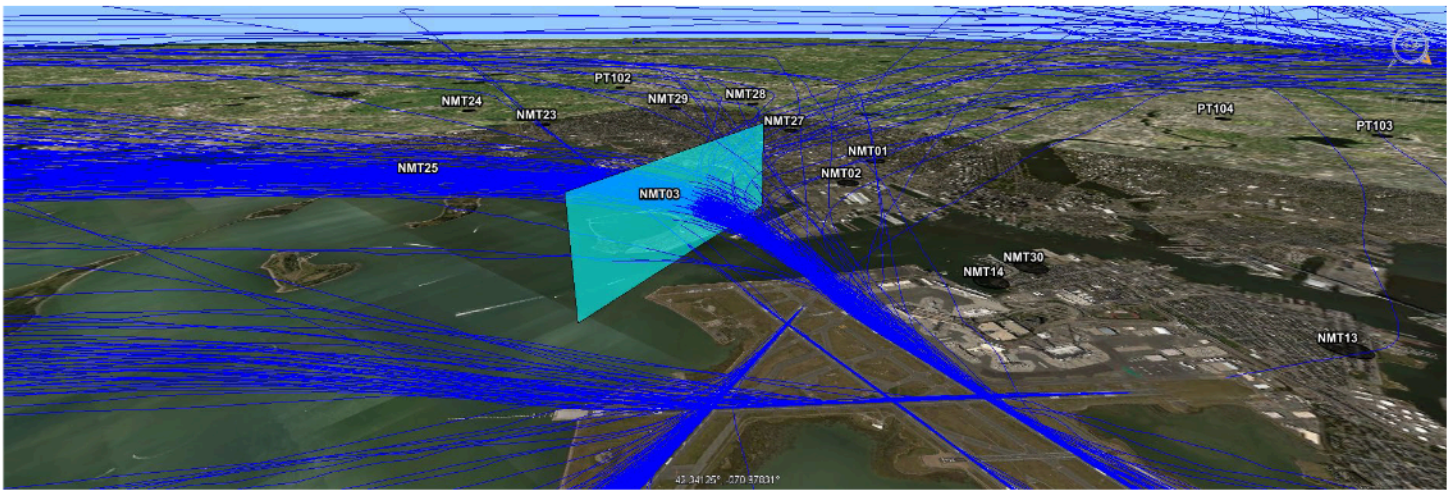
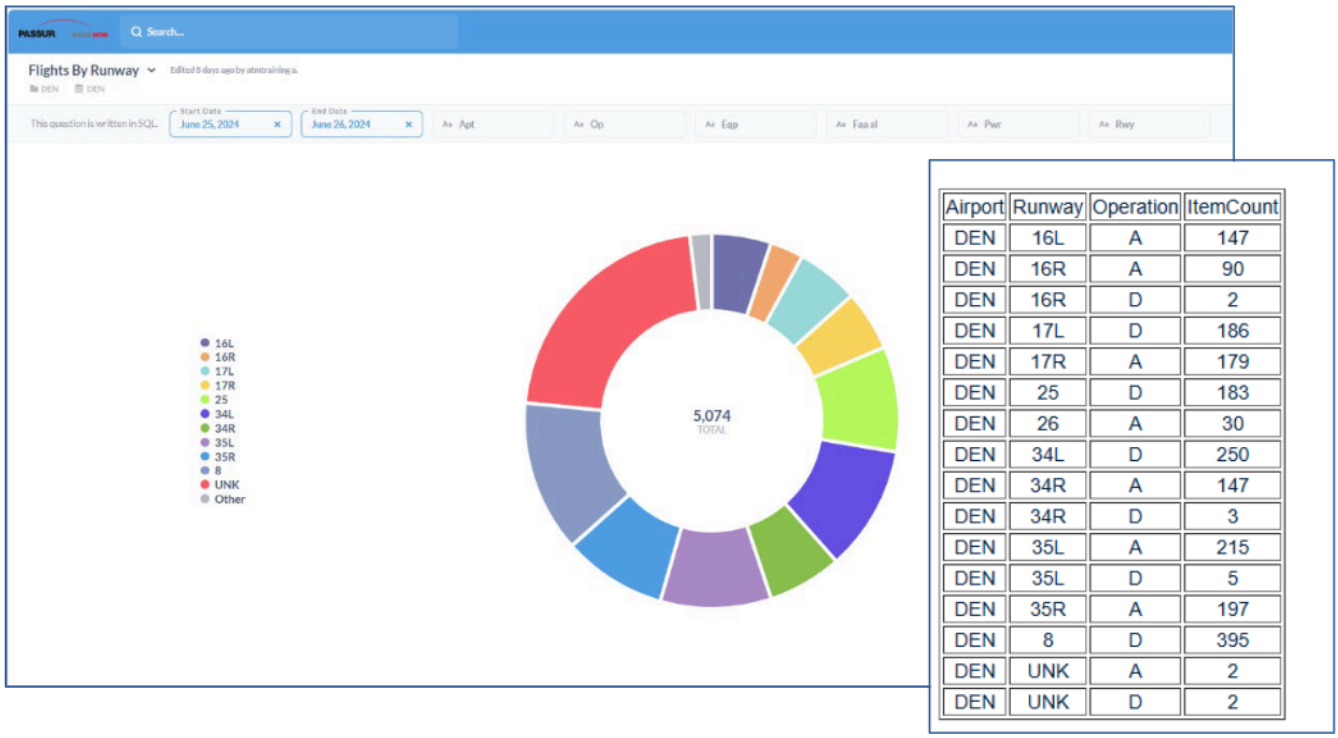


Figure 5: EnvironmentalVue Displays Departure Tracks Penetrating a Gate

PASSUR NOMS automatically assigns and stores runway usage for every DEN flight track in the database with 98% accuracy or better.



Airport	Runway	Operation	ItemCount
DEN	16L	A	147
DEN	16R	A	90
DEN	16R	D	2
DEN	17L	D	186
DEN	17R	A	179
DEN	25	D	183
DEN	26	A	30
DEN	34L	D	250
DEN	34R	A	147
DEN	34R	D	3
DEN	35L	A	215
DEN	35L	D	5
DEN	35R	A	197
DEN	8	D	395
DEN	UNK	A	2
DEN	UNK	D	2

Figure 6: Runway Utilization Chart and Graphical Reporting

The PASSUR suite of reporting tools including ReportVue and EnvironmentalVue Portal will provide DEN with the industry's most advanced NOMS reporting platform and will ensure DEN's continued leadership position in the airport noise abatement industry.

The recently enhanced EnvironmentalVue Portal (EVP) serves as an easy-to-use component of the EnvironmentalVue Suite that allows for nearly endless creation of business graphic visualization. Working from the same EnvironmentalVue database, users may customize attractive dashboards to make consuming information as simple as looking at a picture.

Flight and operations data, complaint information, noise event and summary metrics, as well as weather data are all available in EVP for simple table and chart creation. Users may choose from a library of prefabricated charts and graphs or create their own for dashboard display.

Individual graphics and charts or entire dashboards may be exported from EVP in industry standard formats for use in other applications and documents. Furthermore, EVP users may share dashboards with other airport EnvironmentalVue users thus creating an even larger community library of graphics and dashboards for even simpler implementation of this powerful data display tool.

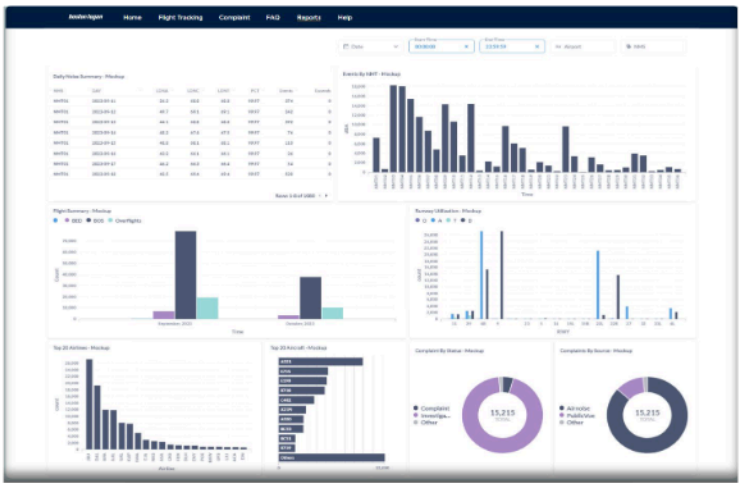


Figure 7: EVP complaint data visualization examples

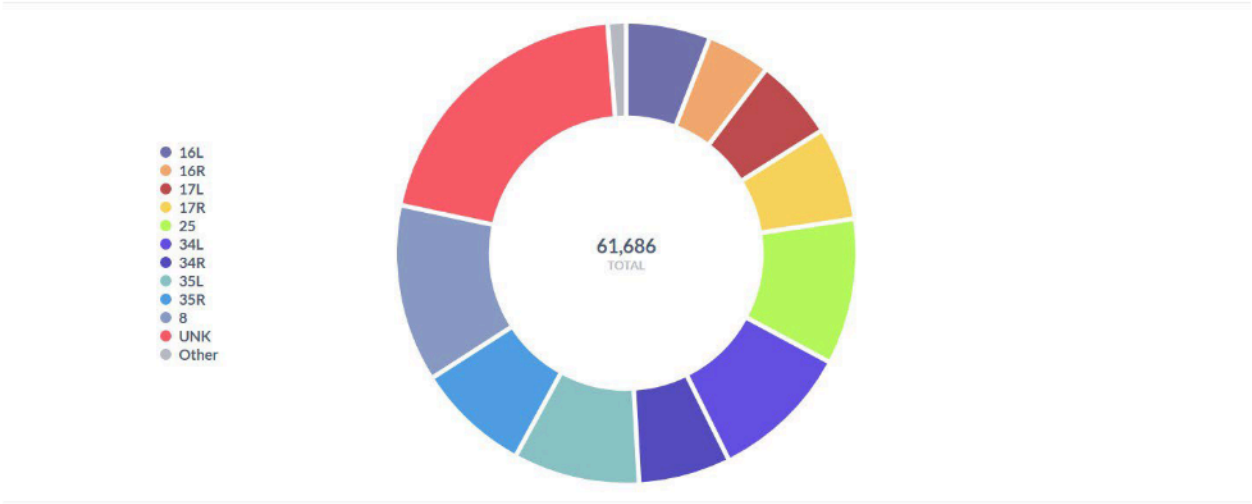


Figure 8: EVP flight summary example

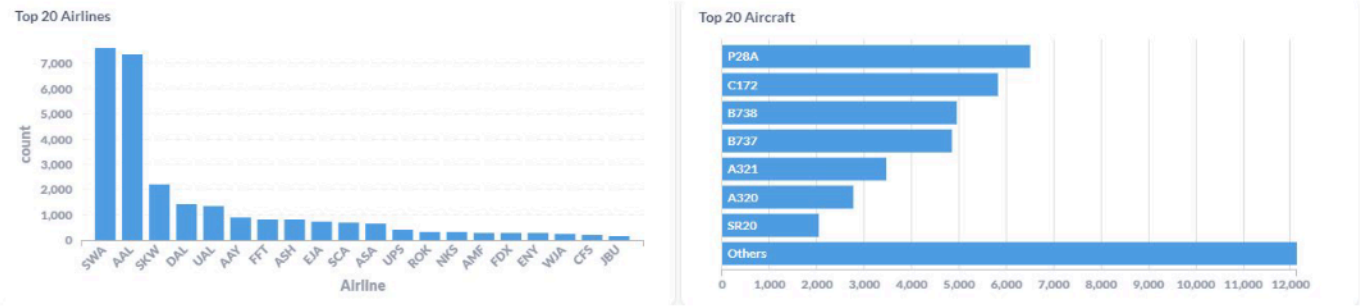


Figure 9: EVP Airline and Aircraft data visualizations

Figure 10: EVP runway utilization report example

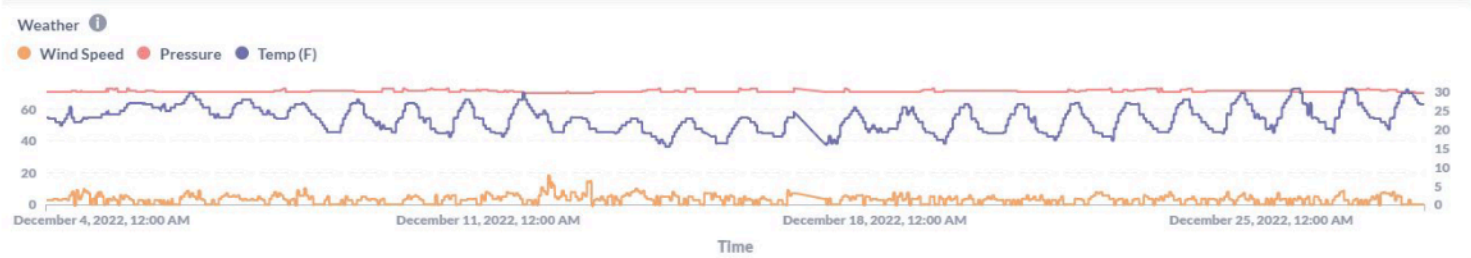


Figure 11: EVP weather data visualization

EnvironmentalVue allows users to query flight track data, complaints, noise events and weather information for any time period (Note that Historical weather can only be replayed for up to the previous 45 days). The flight track replay then allows user to playback the flight track and noise data queried to see all aircraft in the airspace at a given time and their movements within the coverage boundary limits (see Figure 11). The speed of the replay can be adjusted from 1x to 120x by clicking on either the forward or rewind buttons in the Playback Control window. Hitting the Play/Pause button returns the playback speed to the default value of 1x (real time). The time of the replay can also be manually adjusted by sliding the replay marker left or right to the desired time.

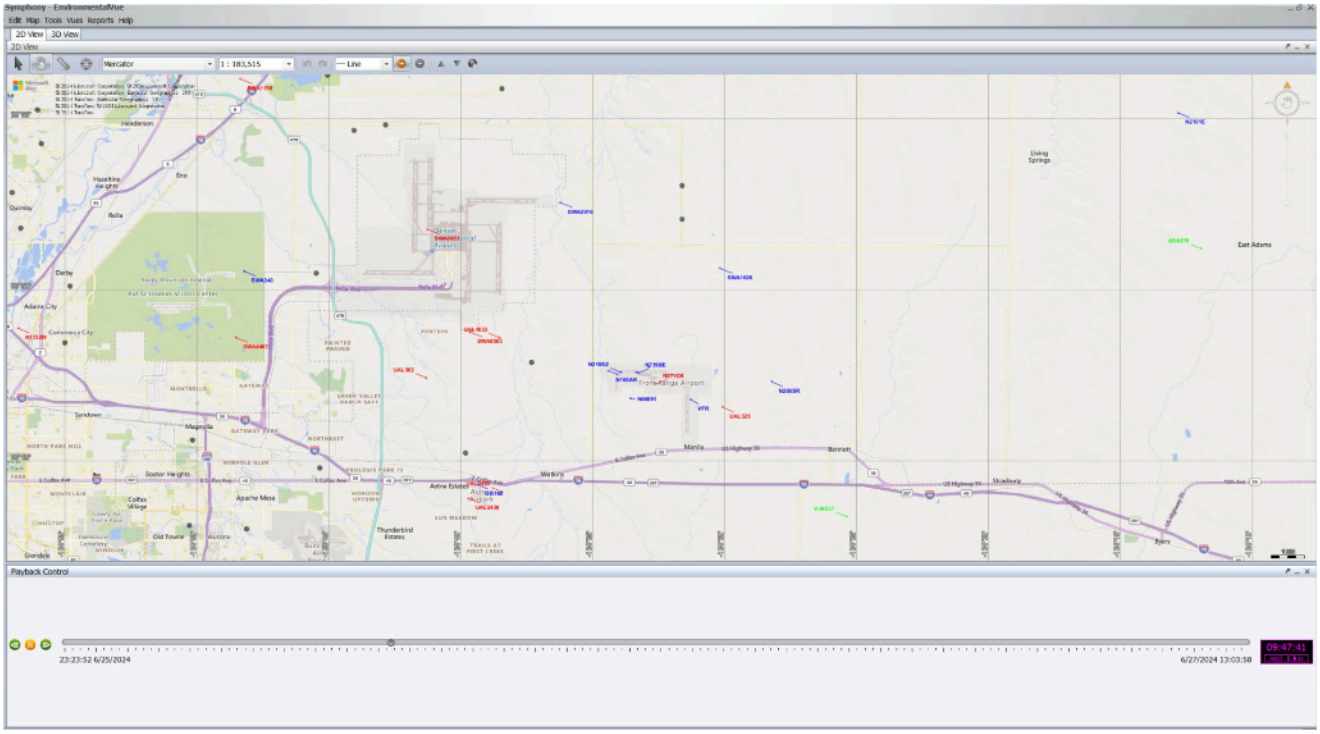


Figure 12: Flight Track Replay

PASSUR's NOMS provides the capability to replay airport activity in an animated fashion from an ATC-like perspective. The user may specify time periods and speed at which the replay will be conducted. DVR-like controls allow the user to easily play, pause, stop, reverse, or skip to a specific time during the selected playback period. The user may also choose to display real-time noise levels as collected from the NMTs on the base map at the NMT locations (assuming noise data exists for the playback time period selected).

Users can elect to include one or all of the following weather layers in their replay:

- Composite weather radar (available for 45 days into the past)
- Lighting strikes (available for 3 days into the past)
- Infrared cloud cover (available for 24 hours)

EnvironmentalVue also has a video capture capability. This allows users to capture a video file from within the tool; no longer requiring a 3rd party solution. This capability also will capture the computer audio, allowing users to see and hear what transpired through a shareable or web possible video. EnvironmentalVue has the capability to display and replay three-dimensional track plots.

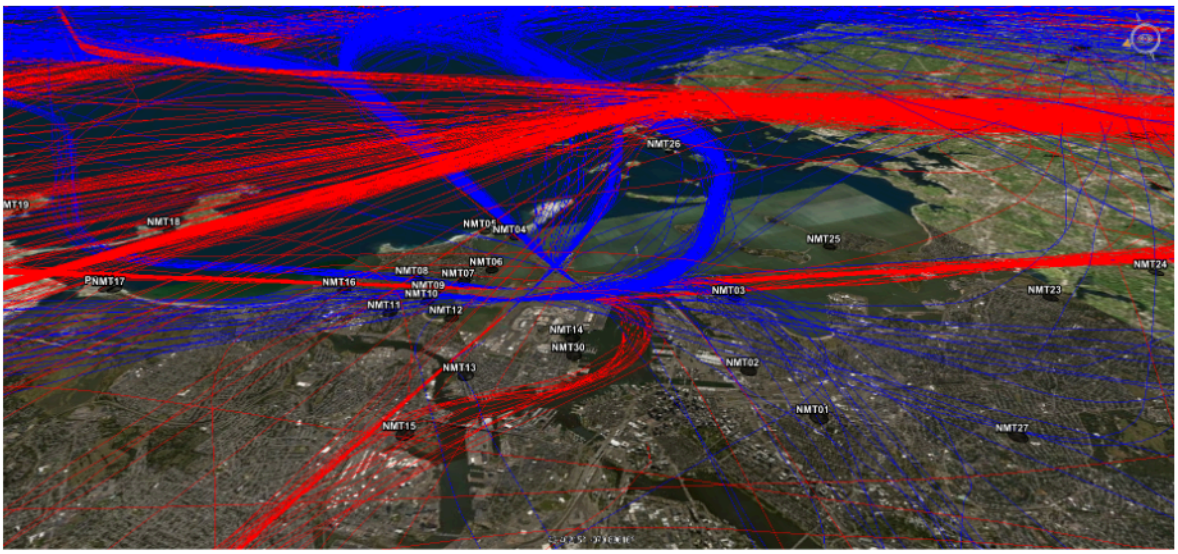


Figure 13: EnvironmentalVue 3D Flight Tracks

EnvironmentalVue enables you to generate track density plots. Track density plots take a set of flight data to create a map that uses colors to indicate where the most flights passed through inside the data set. This allows you to quickly see where there is a high-density flyover area.

EnvironmentalVue displays operations (arrivals, departures, overflights, run-ups touch and go) in user defined colors. (see Figure 13)

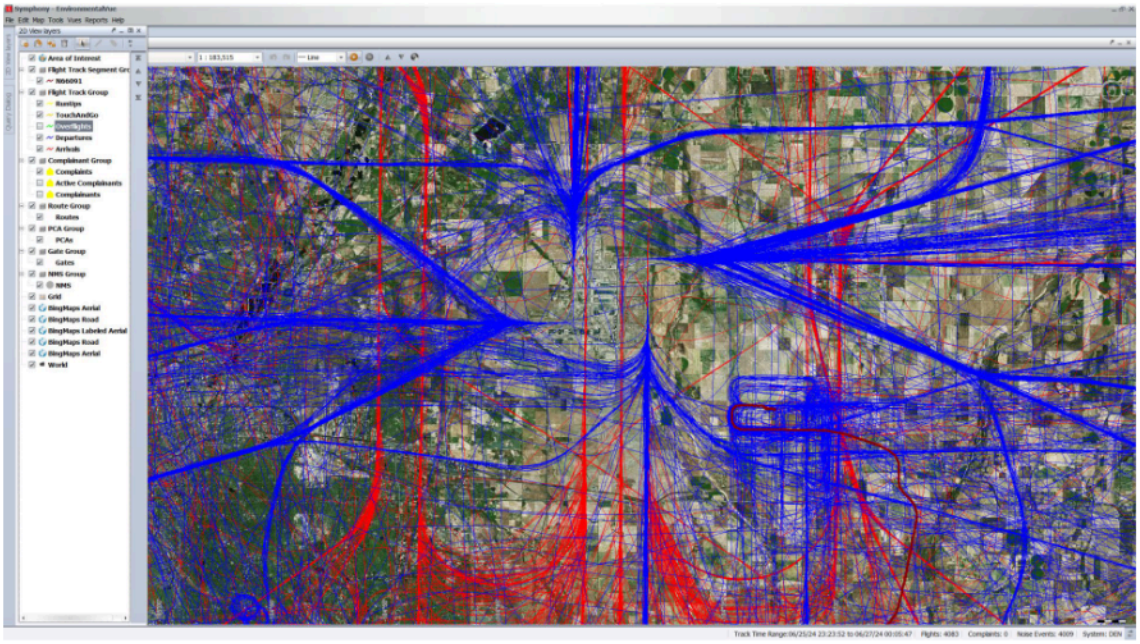


Figure 14: EnvironmentalVue displays operations in User defined colors

EnvironmentalVue is an advanced geospatial information system (GIS) platform with integrated 2D/3D mapping capabilities (compatible with Esri's ArcGIS software) and fused Air Traffic Control (ATC) quality surveillance data.

The quality of the operational capture and classifications NOMS system is driven by the quality and accuracy of the captured flight tracks and also on the ability to process the flight track data and correlated meta data.

PASSUR ARiVA data provides the most complete aircraft surveillance in the requested areas of interest due to the inclusion of multiple radars and array of sensors to capture aircraft transponder emissions.

This data allows for the capture of the most complete flight tracks, which are then processed by PASSUR's proprietary algorithms to verify and in some cases designate the flight as an arrival, departure, overflight, Touch-and-Go, and by extension missed approach.

PASSUR has a proprietary algorithm for detecting ground run-up operations using only surface surveillance. This can reliably be used at airports like DEN where surface surveillance is available, and run-ups are done at known locations.

PASSUR also provides a means to manually enter and update operations into the system. However, through its use of the ARiVA data feed, PASSUR significantly minimizes or eliminates the need for manual updates.

3.2 EXISTING AND POTENTIAL FLIGHT OPERATIONS MONITORING ARRANGEMENTS

PASSUR will continue to provide our PASSUR ARiVA Global Data Feed (previously called NextGen Data) for use in the DEN NOMS.

3.3 FLIGHT OPERATIONS DATA ACQUISITION APPROACH

The ARiVA Symphony Suite is powered by the Symphony Terrestrial Plus feed from PASSUR. It provides DEN with diverse surveillance data and infrastructure that enables the organization not just to track aircraft to the runway and to the gate at DEN, but accurately track overflights over noise-sensitive national parks and track the movement of surface airside vehicles. PASSUR accomplishes this by leveraging a unique sensor constellation that includes a diverse collection of redundant surveillance sensor equipment. The collection (or array) of sensors and surveillance sources are continually managed and updated to meet the ever-changing needs of DEN. It currently amalgamates over 50 independent data sources, including those from local sensors and sources. The data is fused to deliver a single unified data feed that outperforms any single source in coverage, accuracy, and reliability. The system has over the years taken advantage of newer and different types of surveillance technologies and hardware with the goal of supporting customers' needs. This includes:

- Continually improving track quality and aircraft and operational meta data
- Increasing the surveillance volume covered. PASSUR data also provides DEN the unique ability to track international commercial, military, charter, and cargo arrivals from the point of origination.
- Increasing overlapping coverage and redundancy within a covered surveillance volume to increase reliability and performance.
- Delivering best value capabilities through a high-performance surveillance and SaaS application infrastructure at a low cost.

The PASSUR sensor network for DEN is unique in that it leverages a diverse set of tracking sources that includes NAS-Wide en-route, terminal radar data and ATC quality ADS-B sensors (exclusively), surveillance data from ASDE-X and ASSC systems, with local DEN specific ADS-B sensors

PASSUR has also recently expanded its tracking capabilities by incorporating global crowd-sourced ADS-B constellations and satellite-based ADS-B tracking (Satellite-based ADS-B tracking is optional). This world-class system will enable DEN to meet the needs of its operational, environmental, and planning stakeholders by providing real-time situational awareness and post-operations analysis by using a single, robust, secure, and consistent data feed.

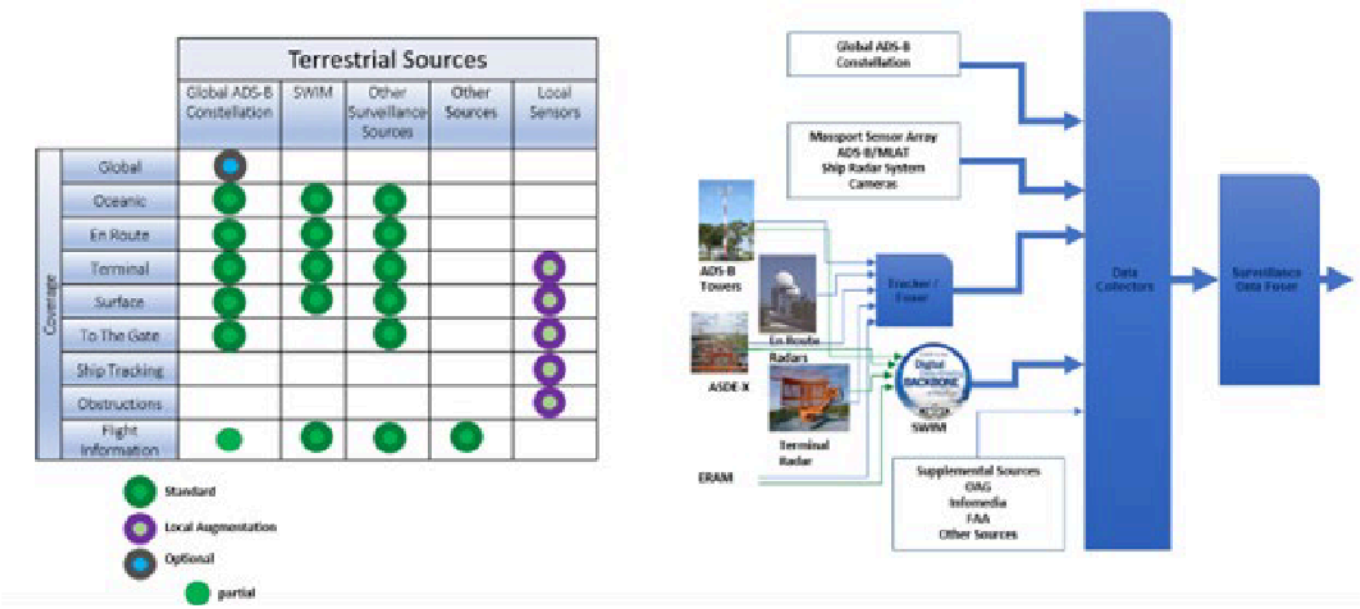


Figure 15: ARiVA Global Data Feed Components

Several of our competitors rely on the FAA's System Wide Information Management (SWIM) or National Offload Project (NOP) data, to run their applications. While SWIM's data feed is capped at an altitude of 12,000 feet, the ARiVA Global Data Feed provides coverage up to 50,000 feet. Additionally, more general aviation and military aircraft are tracked with AGF data than data from the FAA's SWIM or NOP data. This is largely due to AGF's large number of data sources and its multi-sensor data fusion. An ATS provider who relies on single sensor SWIM or NOP data could potentially be missing flight tracks and would not be able to backfill the surveillance data if it is corrupted or lost in any way (the FAA does not backfill SWIM data).

Furthermore, unlike our some of our competitors, the PASSUR data requires little to no smoothing of flight track data due to the higher volume of target points. This reduces or eliminates the errors inherently introduced by smoothing algorithms that negatively affect reported times by seconds and positional accuracy by hundreds of feet or more. While this can clearly impact real-time situations, this also has a significant impact on historic analysis and accuracy of proper correlation of flight track data in a busy and complex airspace.

Table 5 below highlights the benefits of ARiVA Global Data compared to SWIM/NOP Data.

ARiVA Global Data Benefits Compared to FAA SWIM/NOP	Benefit
More surveillance sources	• Increased data availability • Increased coverage • Higher update rates • Higher accuracy with built-in redundancy
Fused FAA Radar and ADS-B data sources	• One, high availability, data feed • Seamless track coverage; no broken tracks • Easier to use • More tail numbers
No altitude or NM range filters	• You can define the coverage you need • No 18,000 ft limit
Multi-sensor tracking	• Better low altitude coverage • Better tracking of smaller GA aircraft • Tracking of Non-ADS-B equipped aircraft

3.4 COMPLIANCE WITH FAA REGULATIONS AND DEN AGREEMENTS

The PASSUR ARiVA flight tracking, and operations data is ATC quality. It is the most accurate and cost-effective flight tracking and operations data commercially available in the U.S.

EnvironmentalVue plots ground projections of aircraft flight tracks, displays aircraft flight tracks (with their readily determined altitudes, beacon codes, ground speed, aircraft types, and operator category) on workstations. It also correlates aircraft flight tracks with noise events and complaints based on time and position. Additionally, the PASSUR NOMS plots flight track altitude profiles against the distance the flights have flown. It also allows the user to easily prepare runway utilization reports and graphics.

3.5 FLIGHT OPERATIONS MONITORING COVERAGE

PASSUR shall continue to meet and exceed the performance requirements for flight operations monitoring coverage at DEN. Should the need arise in the future, PASSUR has the ability to extend the coverage of our ARiVA Data feed to meet DEN's evolving needs.

3.6 FLIGHT OPERATIONS MONITORING ACCURACY

The PASSUR NOMS system is the only existing system that meets the current performance metrics. DEN's current system has industry leading performance for airports similar to DEN and the expectation is that the performance over time will only improve. PASSUR commits to continually work to cost effectively develop upon the existing system to improve the runway accuracy.

PASSUR proposes to continue validating coordinates of the flight operations data using ADS-B tracks of opportunity. As the location and nominal position error of the aircraft for ADS-B equipped aircraft tracks is well defined, this can be used to quickly and effectively verify the positions of the aircraft relative to any predetermined point in space or on the ground. This method is also not subject to identification or other human errors. A similar method is used by the FAA to validate their surveillance systems.

3.7 FLIGHT IDENTIFICATION DATA

The ARiVA Global flight tracking data included in the PASSUR NOMS solution identifies flight tracks in at least the following ways:

- Type of operation for DEN operations. Each track is labeled as an arrival, departure, overflight, or touch-and-go. PASSUR also identifies ground run-up operations.
- DEN runway used. Each operation determined to have used DEN airports will have the specific runway it used as a part of its identification in the database.
- Major operator category including but not limited to passenger, cargo, and military. The PASSUR NOMS will populate the operations table of the database for all IFR flights, identifying the operator category as either passenger, cargo, military or unknown for all operations where the data is available.
- Major aircraft type categories or propulsion. The PASSUR NOMS will populate the operations table of the database with a value identifying jets, turboprops, piston engines, and helicopters regardless of their engine design.
- Aircraft registration number or airline and flight number for commercial overflights. The PASSUR NOMS will populate the operations table of the database for all IFR flights, identifying the tail number and or airline and flight number for all operations where the data is available.
- Aircraft type. The proposed database will identify the type of aircraft as well as the series number where possible (i.e. B737 is a Boeing 737 700 series)
- Beacon code. The PASSUR NOMS will populate the operations table of the database, identifying the beacon code for all aircraft operations where the data is available.
- Origin airport for DEN arrivals and destination airport for DEN departures were provided in the flight plan data.

For "IFR operations" EnvironmentalVue identifies at a minimum the time of the operation, type of operation, the airport of origin and destination, the runway of arrival/departure at DEN, operator category, aircraft type category, aircraft registration and or airline flight number, aircraft type, beacon code and origin and destination airport. In total, there are 32 user selectable fields in the Flight Table that can be displayed, sorted and filtered.

The PASSUR NOMS allows for selecting, sorting, and reporting historic counts or listings of aircraft operations using any fields in the database including but not limited to the following when the data is available:

- Aircraft Type
- Type of operation (departure, arrival or overflight)
- Date/time of operation
- Aircraft owner information
- Aircraft operator information
- Runway used
- Origin and destination airports
- Aircraft operator or airline
- Flight number
- Aircraft registration number (including lifeguard prefix on tail number indicating a medical related flight)
- Specific airframe and engine information
- Penetration or non-penetration of definable gates
- Penetration or non-penetration of definable corridors
- Maximum and minimum PCA limits
- Maximum and minimum altitude limits
- Beacon code

Additionally, the user can combine, or group records based on values in the same field of data such as combining similar aircraft types such as Gulfstream IV and V or records that may otherwise be related for reporting purposes. The PASSUR NOMS also allows the operator to present tabular and graphic reports of the operations (or other data) sorted by these or any other categories. The system is also able to provide aircraft speed and altitude data throughout the entire flight track per requirements.

3.8 THIRD-PARTY OPERATOR, AIRCRAFT, AND FLIGHT DATA

PASSUR integrates data from various sources like OAG, Informa-Aviation Week, the FAA, various global ANSPs, and others and incorporates this into a comprehensive collection of reference data that is incorporated into PASSUR products. A reference table, for example, indexed by aircraft registration number, is updated daily. This is used to pull salient information for the NOMS system on a regular basis. Similarly, Airframe and Aircraft Operator data in updated periodically within the NOMS system. Updates are done to a subset of available fields that are commonly available through NOMS systems. PASSUR can work with DOA to get additional available information if desired.

Additionally, while these refences are currently licensed for delivery thought PASSUR applications, PASSUR is willing to work with the DOA and its suppliers on terms to following reference tables updated daily:

- Schedule Data References
- Enhanced Registration Lookup
- Airframe Reference
- Aircraft Operator Reference

4. NOISE MONITORING

PASSUR acknowledges the ongoing noise monitoring maintenance and support responsibilities for the existing twenty-six (26) NMTs deployed at DEN and one (1) portable noise monitoring kit.

4.1 AUDIO MONITORING, RECORDING, PLAYBACK, AND DISPLAY

Table 6: PASSUR Audio Monitoring, Recording, Playback, and Display

Requested Capability	Included / Not Included	PASSUR Response
Real-time audio monitoring by system operators in the DEN Noise Offices from an operator-selected NMT installation.	Included with LD831 upgrade	The PASSUR solution does not currently include real-time audio monitoring capability of the existing 3639-C NMTs. This feature is available if the DOA chooses to update the noise monitors over time to Larson Davis 831 units. PASSUR is willing to make adaptation to its existing software if desired, to interface to the legacy 3639-Cs to provide this feature, and will work with DOA to scope and potentially price this effort if desired.
Audio recordings and sound level time histories of all noise events above the noise monitor threshold, with playback capabilities, from all NMT installations. Playback shall include an easy-to-use time-search method. The recordings and time histories shall be available for immediate recall by the NOMS operator for a period of one month. Older data shall be archived for retrieval.	Audio functions Included LD831 Upgrade	PASSUR's EnvironmentalVue software has the ability to continually monitor sound level time histories for noise events above a specified threshold. The solution provides a convenient way to play back these levels, queued to a specific time, showing flight tracks, sound levels, correlated noise events, correlated complaints, and weather. The ability to replay noise even audio files is available with replacement NMTs. Optionally, if desired, PASSUR can work with DOA to scope and potentially price this effort to include audio capture and replay for the existing NMTs.
Simultaneous viewing of flight tracks on a real-time or replay basis, along with the associated real-time or replayed audio signal and sound level, from a single operator-selected NMT installation.	Audio functions Included LD831 Upgrade	PASSUR's EnvironmentalVue supports the ability to view real-time and near real-time flight tracks and sound levels within its EnvironmentalVue and PublicVue applications. This capability to include audio can be optionally scoped and potentially priced and added if elected by the DOA.
Presentation of real-time or replayed A-weighted sound level in numeric	Included	PASSUR's Environmental currently supports this capability within EnvironmentalVue and PublicVue for the existing 3639-Cs and also the

Requested Capability	Included / Not Included	PASSUR Response
and/or graphic form(s) simultaneous with track viewing and playback.		proposed replacement LD831 units.
The audio replay should present the unweighted signal. Sound level displays should present the A-weighted level, although optional choices of display of the unweighted level, C-weighted level, or other levels might be of interest.	Audio functions Included LD831 Upgrade	PASSUR's EnvironmentalVue supports the capture of A or C weighted sound level data.

4.2 VIRTUAL NOISE MONITORING OPTION

See CONTOURS WITH VIRTUAL NOISE MONITORS (VNMS) in the main body of the Statement of Work for a detailed response on this optional solution.

5. COMPLAINT ENTRY, ANALYSIS, AND RESPONSE

The PASSUR proposed solution currently supports DEN with their public portal (PublicVue) website. PASSUR will continue to provide the public website for DEN.

5.1 SYSTEM-WIDE COMPLAINT REQUIREMENTS

Proposed features not currently available to DEN can be made available through the use of annual gratis development hours as outlined in Section 1.1 Developmental Elements.

5.1 NOMS Software	PASSUR Comments
Manual entry of complaints into the NOMS database by any one of the primary system operators on their dual-use DEN/NOMS computers, either on a real-time basis or on a post-processing basis from data entered manually on paper forms.	The PASSUR Proposed Solution meets or exceeds this requirement.
Automated entry of complaints from complainants used the third-party "button" application	The PASSUR Proposed Solution meets or exceeds this requirement.
Incorporation of data entry techniques that minimize repetitive data entry. For example, the system should automatically help identify complainants who have called previously, by offering dropdown boxes that offer relevant selections. This automatic data entry processing must key off of at least the following fields of the complainant identification data: last name, address, and phone number.	The PASSUR Proposed Solution meets or exceeds this requirement.
DEN is interested in automated data entry review processes that check for potential duplicate complaint entries due to minor variations in names, addresses, or spelling errors; i.e. processes that prevent the system from identifying a complainant twice because one entry uses "Street" while a second uses "St." or another abbreviation, or because one entry includes "Mr. John Smith" while another uses "John Smith".	The PASSUR Proposed Solution meets or exceeds this requirement.
Automatic assignment of a discrete complainant identification number, with a new number assigned to each complainant, and the previously assigned number automatically entered for repeat callers. The complainant identification number must be shown on all reports.	The PASSUR Proposed Solution meets or exceeds this requirement.

5.1 NOMS Software	PASSUR Comments
Automatic entry of the runway configuration in use and current meteorological information, if the data are available in the system, with the option for operator override of the automatically entered information.	PASSUR can enable this feature for DEN.
Incorporation of pull-down lists of standard entries, such as runway configuration, type of operation, runway used, etc.	The PASSUR Proposed Solution meets or exceeds this requirement.
Web-based entry of complaint-related information by individual complainants.	The PASSUR Proposed Solution meets or exceeds this requirement.
Automatic correlation of complaints with operations, noise, meteorological, and other related data, based on proximity in time and space, and other criteria that PASSUR can support (and that the proposal should describe).	The PASSUR Proposed Solution meets or exceeds this requirement.
The system must include separate fields for entry of date and time of call and date and time of complaint-causing activity.	The PASSUR Proposed Solution meets or exceeds this requirement.
Automatic preparation of complaint response letters from user-selected, pre-prepared forms, with capability for custom editing.	PASSUR shall coordinate with DEN NOMS staff to develop the response letters
Preparation of complaint histories based on complainant name and/or complainant address.	The PASSUR Proposed Solution meets or exceeds this requirement.
Flexible analysis of noise complaint records and preparation of summary reports.	The PASSUR Proposed Solution meets or exceeds this requirement.
Automatic identification of complainants' addresses on an electronic base map, for display with related flight tracks, noise monitor locations, and other correlated information.	The PASSUR Proposed Solution meets or exceeds this requirement.
Identification of the locations of streets, specific addresses (street name and number), and features on the base map by typing in the name of the street, the address, or the feature name, or by selecting a street from an on-screen, pull-down list of streets shown on the base map.	The PASSUR Proposed Solution meets or exceeds this requirement.

5.1 NOMS Software	PASSUR Comments
Identification of street name and address range by positioning a cursor on the base map at the location of interest.	The PASSUR Proposed Solution meets or exceeds this requirement.
All complaint forms, reports, and automatically generated response letters must be compatible with, or written in, Microsoft Office applications, and permit editing using full Word features.	The PASSUR Proposed Solution meets or exceeds this requirement.
The system must provide spelling check and grammar checks, on operator demand.	The PASSUR Proposed Solution meets or exceeds this requirement.
There must be no limit to the length of the text entries into complaint forms and records.	The PASSUR Proposed Solution meets or exceeds this requirement.
System operators must be able to save copies of complaint reports and forms, in electronic formats compatible with Microsoft Office applications.	The PASSUR Proposed Solution meets or exceeds this requirement.
System operators must be able to print multiple copies of complaint reports and forms at any point in the processing progression.	The PASSUR Proposed Solution meets or exceeds this requirement
System operators must be able to attach electronic files in the form of common image formats (jpgs, pngs, etc.) and Microsoft Office compatible documents to complaint entries.	The PASSUR Proposed Solution meets or exceeds this requirement.
Individual complaint responses must permit inclusion of a figure depicting aircraft operation(s) and noise monitor location(s) and single event reading(s) that the system automatically correlates with the complaint or that the Operators manually correlate with the complaint.	The PASSUR Proposed Solution meets or exceeds this requirement.
System operators must be able to copy flight identification data from flight track figures into complaint form text entries.	The PASSUR Proposed Solution meets or exceeds this requirement.
Capability for defining internal and external versions of complaint forms, with Operator identification of fields of data to be included in each version.	The PASSUR Proposed Solution meets or exceeds this requirement.
Distribution within DEN of individual complaint records and summary reports over the DEN network.	The PASSUR Proposed Solution meets or exceeds this requirement.

5.1 NOMS Software	PASSUR Comments
The system should allow complaint responses to be sent via email, if requested by the complainant.	This is in the PASSUR product roadmap.
The systems should allow DEN to enable an automated email response to any complaint entered into the system, acknowledging the receipt of the complaint.	Automated email responses acknowledging the receipt of the complaint is available for complaints through PublicVue, but not currently through manually entered complaints into the EnvironmentalVue system. This capability is part of PASSUR's product roadmap..

5.2 DEN NOISE OFFICE COMPLAINT REQUIREMENTS

5.2 NOMS Software	PASSUR Comments
(1) Complainants register complaints via telephone, website, email message, or letter. DEN Noise Office staff answer the telephone complaint line from 8 a.m. to 5 p.m., Monday through Friday, during normal business days. Telephone complaints are recorded. The complaint line telephone number is (303) 342-2380.	The PASSUR Proposed Solution supports this process/procedure.
(2) The DEN Noise Office personnel transcribe the complaint-related data into the NOMS database.	The PASSUR Proposed Solution supports this process/procedure.
(3) Noise complaints in "Edit Mode" are further divided into one of two subcategories: "General Complaint" (i.e., a complaint that refers to general noisiness and does not identify a specific operation or operations) or "Research Complaint" (i.e., a complaint about specific activity that requires further investigation by Noise Office staff).	The PASSUR Proposed Solution supports this process/procedure.
(4) The Noise Office staff use NOMS to investigate Edit Mode "Research Complaints" to determine the circumstances that might have caused unusual activity or noisiness, and staff enter the information identified in the "The DOA Report of Investigation" section. At this point in time the complaint status changes from Edit Mode to "Answered Mode." The status of General Complaints changes to Answered Mode as soon as they are entered into NOMS.	The PASSUR Proposed Solution supports this process/procedure.
(5) Complaints in Answered Mode are printed for internal review. At this point in time, the complaint status changes from Answered Mode to "Printed Mode." The internal reviewer(s) check for accuracy of entries, spelling, grammar, reasonableness, and completeness of the investigation and mark desired changes or need for further research on the form.	The PASSUR Proposed Solution supports this process/procedure.
(6) The Printed Mode complaints that require editing or research are returned to Edit Mode status for further investigation. Steps 5 and 6 are repeated until all issues are resolved. At that point in time, copies of the printed complaints are distributed internally within the DOA a copy is sent to the FAA Air Traffic Control Tower (ATCT) Manager (if requested by the caller), and a copy is mailed to the caller (if requested). This is the first point in time that copies of the complaints are distributed outside of the Noise Office.	The PASSUR Proposed Solution supports this process/procedure.

5.2 NOMS Software	PASSUR Comments
(7) The DEN Noise Office also produces the graphical and tabular reports shown in Appendix B for internal and external distribution.	The PASSUR Proposed Solution supports this process/procedure.
The NOMS must support these existing complaint processing procedures and report production, automate them to extent feasible, and incorporate enhancements as necessary to meet the full system-wide requirements identified in Section 5.1. The replacement NOMS must automatically enter the weather data obtained from the Weather Company data described in Section 7.1, and automatically enter the runways in use from the D-ATIS data discussed in Section 7.2.	The PASSUR Proposed Solution meets or exceeds this requirement.
The NOMS must have the ability to automatically generate a response for Airport staff to review and finalize and then send upon Airport approval via email to complainants. These email responses should have the ability to include attachments to the email, such as maps. Verification that the email was sent must be retained within the complaint management system.	The PASSUR Proposed Solution meets or exceeds this requirement.

5.3 COMPLAINANT DATABASE INTEGRATION

The PASSUR EnvironmentalVue Suite has various tools for cleaning up, consolidating, detecting and archiving duplicate or inactive complainants within the existing System. Since PASSUR's solution does not require migration, if desired, PASSUR will work with DEN to archive complainants that have been inactive an agreed upon period within the first month of the start of the new agreement.

For example, PASSUR can archive complainants who have not issued a new complaint in 10 years or more. PASSUR can also analyze the complainant database for complainants with incomplete or missing data, which also may need to be archived.

6. PUBLIC WEBSITE

DEN currently has Symphony PublicVue deployed. It can be accessed by going to DEN's Noise and Airspace page here, https://www.flydenver.com/business-and-community/noise-and-airspace/ , and clicking on the link to "Track Flights Online with PublicVue."

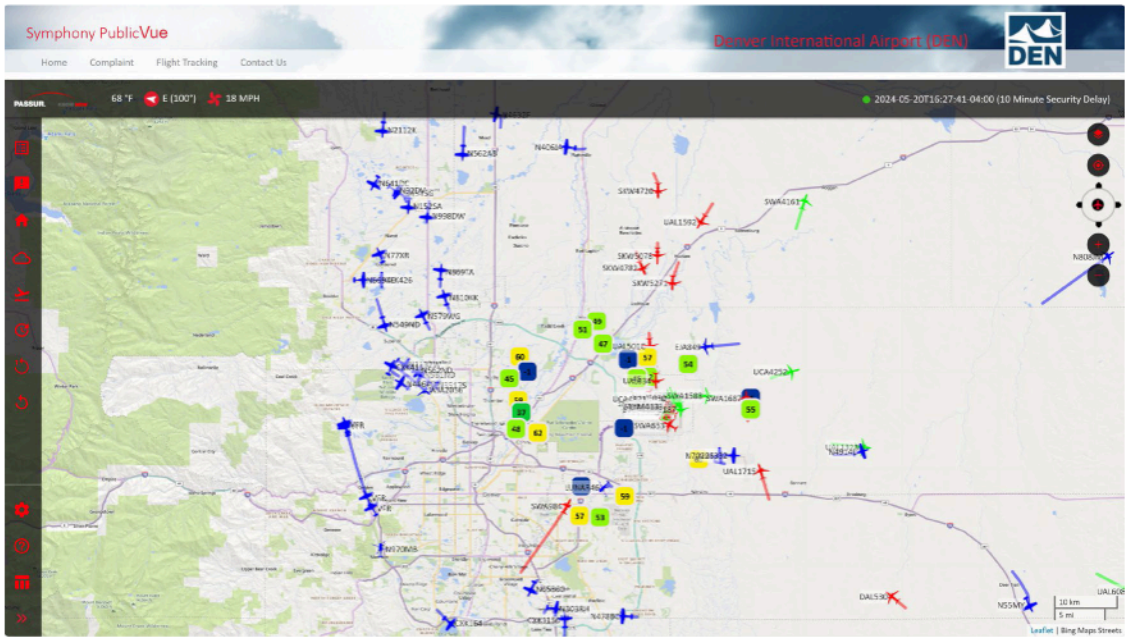
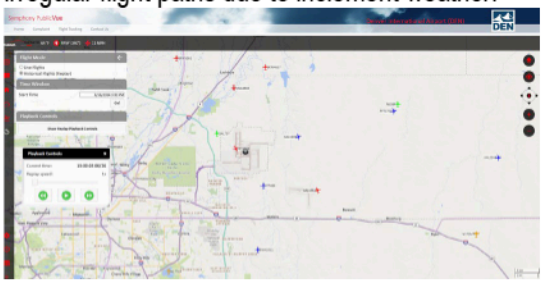
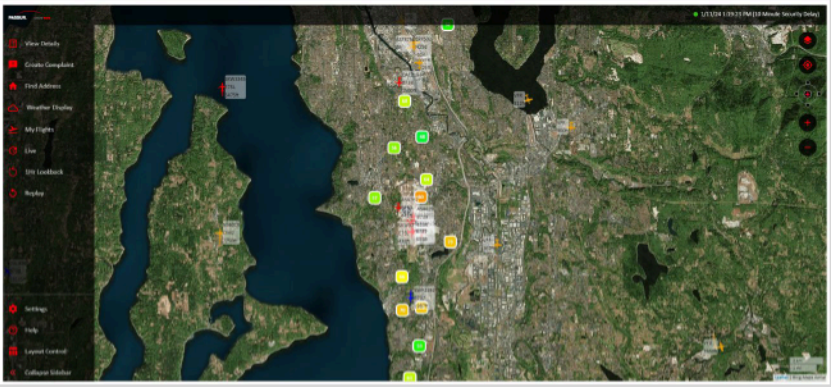


Figure 16: Denver International Airport (DEN)

Public Web Site	PASSUR Comments
Separate noise website for DEN	The PASSUR Solution currently supports a separate noise website for DEN, which was tailored to the airport's needs. It is powered by the ARiVA data and can save complaints directly into the database. The website works well on workstations, mobile and tablet devices.
Displaying flight operations and identification data, on a near-live basis, e.g., with a 10-minute delay; over user-selectable map layers and aerial photos. The graphical interface should have the ability to zoom, pan, and re-center the view window.	PASSUR's proposed, and existing solution, provides public access to 10min delayed data for DEN. The solution includes street and aerial map options and allows the airport to select the default option. Additional maps are also provided, as well as the flexibility to support DEN provided custom maps. The map control has standard zoom and pan controls on the map, but also includes mouse and keyboard controls making it easy to use.
Displaying flight operations and aircraft identification data for user-selected historical periods on a replay basis, with user-adjustable replay speeds and map display areas. Graphical interface should have the ability to zoom, pan, and re-center the view window.	PASSUR's PublicVue solution allows users to replay historical flight tracks (and noise event when configured) data and graphical weather for a date and time they select. The display includes a user-friendly DVR like tool allowing the users to play back information in forward and reverse at various use selectable speeds and directions. Additionally, the replay shows weather information on the map such as precipitation, lightning and infrared cloud cover. This additional information is highly useful in helping the community see many causes for irregular flight paths due to inclement weather. 
Displaying noise measurement data on a near-live bases and for user-selected historical periods, with user-selectable time periods, measurement sites, and noise metrics. This data should be printable directly or through the use of a printer friendly view.	PASSUR's proposed solution supports the integration and display of noise data in multiple ways. PublicVue will be configured to allow users to see 10-minute delayed noise data from the NMT units. The data will be synchronized with the flight track data. This can also be done in replay mode. Self-Service noise reports and others are also available through PublicVue. The data can be conveniently generated and printed from the browser. Additionally, if DEN desires, PASSUR can create an instance of MobileVue for airport use only that has live flight tracks and noise. The following is an example of the integrated flight track and noise data for Sea-Tac airport.

Public Web Site	PASSUR Comments
	
Noise event audio playback from a user-selected noise monitor or monitors.	The PASSUR solution does not currently include real-time or audio playback monitoring capability of the existing 3639-C NMTs. This feature is available if the DOA chooses to update the noise monitors over time to Larson Davis 831 units. PASSUR is willing to make adaptation to its existing software if desired, to interface to the to the legacy 3639-Cs, and can will work with DOA to scope and price this effort if desired.
Display and printing (pdf compatible) of pre-defined and user-created reports	PASSUR's PublicVue and the proposed Commununity Portal will allow the DOA to define which reports they would like to make available for either display or printable to the Public.
User entry of complaint data for submission to DEN. Complaint entry process should be as thorough as possible and allow users who have logged in to access their historic complaint data, current complaint status, and responses from DEN. Acknowledgement of a submitted complaint and the DEN responses should optionally be emailed if user has entered an email address.	The PASSUR NOMS solution allows community members to submit complaints through the public portal to enter new complaints. Additionally, the public complaint system is connected to the EnvironmentalVue NOMS database allowing registered users the ability to view the status and responses of the complaints they have entered. The complaints created are entered directly into the EnvironmentalVue database eliminating the need for manual re-entry of the information. The complainant has access to all complaints entered by them into the system regardless of if they submitted them through the web, phone, automated complaint line or other means. Acknowledgement of submitted complaint and the DEN responses can be emailed if user has entered an email address.
DEN responsibilities related to initial establishment of the Internet capabilities, including creation of initial content.	A partnership between DEN and PASSUR is required to provide a seamless and positive experience for the community through the public portals. Though there will be collaboration on both sides, DEN will be responsible for determining messaging content on the DEN website. PASSUR will suggest language for application, data, or product specific items as it has in the past. PASSUR will be responsible for hosting and supporting the PublicVue website but will review any DEN specific language and branding with DEN as needed.

Public Web Site	PASSUR Comments
DEN responsibilities related to ongoing maintenance, operation, and support of the Internet capabilities, including updating and entering content	Similar to the above response, there will be collaboration on both sides, but DEN will be responsible for maintaining its website and PASSUR will be responsible for the Public Portal.
User-related requirements, including minimum computer specifications and communications capabilities, compatible browsers, etc.	PublicVue works with most modern Windows, OS X, iOS, and Android devices. It can be run using Edge, Internet Explorer, Safari, Firefox, and Chrome as available on the respective platform. For the best user experience, the most current browser version is recommended, though older versions may work, some features and display options may not be available. The recommended desktop browser is either the current version of Edge or Chrome. Though the system will work on smaller screens, larger displays are desirable for the best viewing results. Due to the nature of the application, a reliable internet connection is required for the consistent display of animated data.
Limitations on data access, such as number of permissible operators at one time, time delays for display of flight operations and identification data, etc.	The PublicVue solution can handle many times the historic load seen at DEN. PASSUR monitors server utilization and can add capacity if required. Data for the public site may be delayed 10 minutes in keeping with FAA security suggestions. Though the flight tracks can remain, the FAA requires that identification data for sensitive flight operations be removed from the data feed. Live data is available, however, through PASSUR's MobileVue application (for airport staff use only). A license to Symphony MobileVue will be provided complimentary upon request.

6.1.1 COMMUNITY NOISE PORTAL – NEW OPTIONAL FEATURE INCLUDED FOR DEN

The Community Portal is a customizable toolset designed for DEN constituents to explore, understand, and communicate with the airport, information related to aircraft operations and their impact on them. The tool includes extensive analytical capabilities and provides users with information for their education and to submit community complaints. Complaints may be submitted through the PublicVue website which may be accessed through the Community Portal.

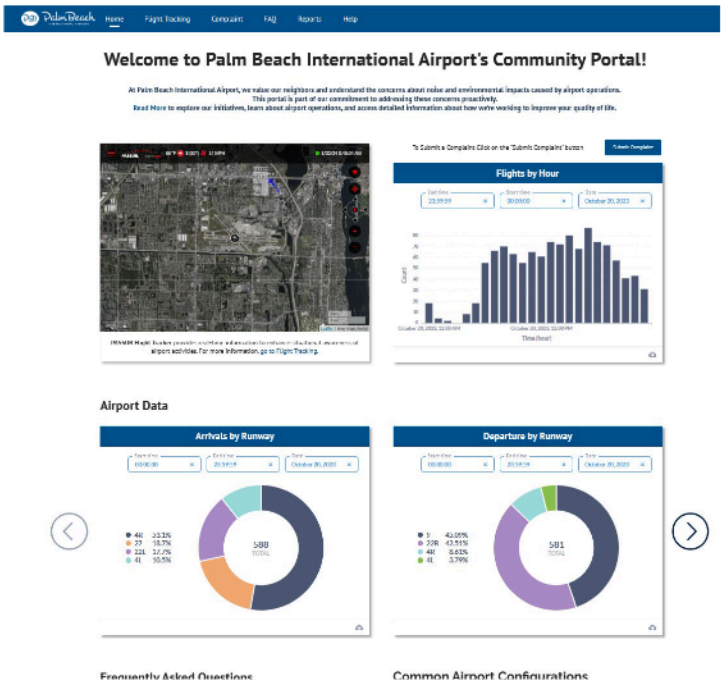


Figure 17: PASSUR Community Portal Example

Community Portal contains access to the Symphony PublicVue website for real-time (or airport-imposed delay) flight tracks, historical playback, online complaint filing, and more. With the Community Portal, DEN can quickly and easily review data related to community comments using its extensive analysis tools and advanced reporting.

Out of the box, the Community Portal will include a customizable dashboard with an array of interactive tools and capabilities via gadgets. Gadgets include aircraft mapping tools, weather information, Digital ATIS, informational charts, airport news, FAQs, complaint entry, and more. It also includes the ability to add other useful links from your airport, the FAA, and other sources you wish to provide to the greater DEN community. Its modern UI can be tailored to DEN's specific needs and the airport has the ability to choose which gadgets to display in their dashboards, along with how they are organized.

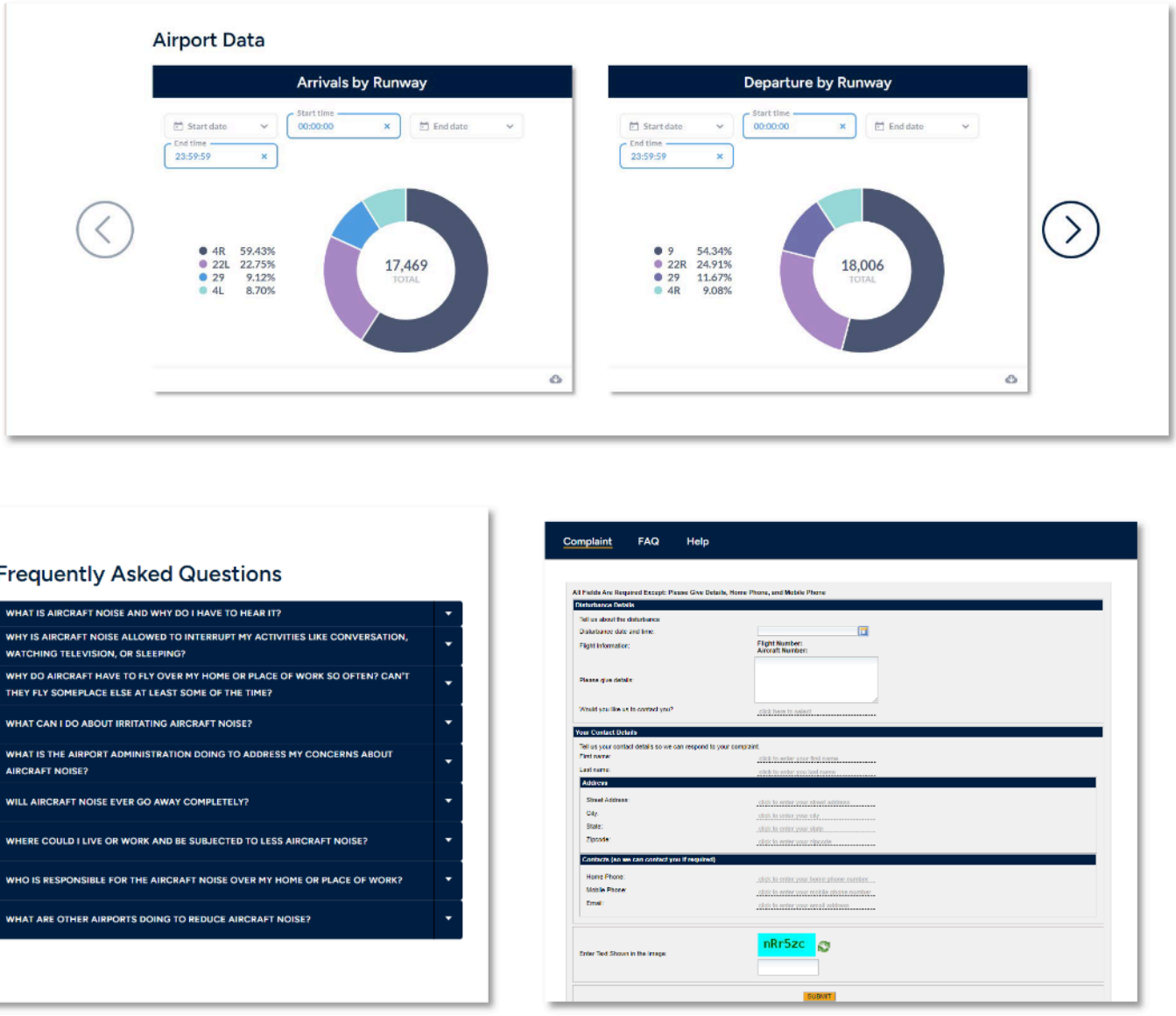


Figure 18: PASSUR Community Portal – Data examples DEN can choose to display

7. METEOROLOGICAL AND AIRFIELD OPERATING CONDITIONS MONITORING

EnvironmentalVue leverages patented technology for automatically providing combined data from noise, flight tracks, complaints, and airport operations data. Proposed features not currently available to DEN can be made available through the use of annual gratis development hours as outlined in Section 1.1 Developmental Elements.

7.1 DEN METEOROLOGICAL MONITORING

The proposed PASSUR solution will provide DEN METAR weather data which coincides with weather information communicated to pilots and airline dispatchers. It is both accurate and cost effective. METAR is comprised of hourly observations that include the following fields when reported:

- Date
- Time
- Wind speed and direction (average)
- Wind gust (maximum speed)
- Visibility (miles)
- Temperature
- Dew Point
- Sky conditions
- Ceiling

7.2 DEN AIRFIELD OPERATING CONDITIONS MONITORING

While previously not a requirement for Denver, the PASSUR EnvironmentalVue solution can collect, process, correlate and display D-ATIS messages for DEN. PASSUR can integrate this functionality if desired by DEN. Data will be collected and provided as available from the source feed with multiple messages sometimes being available in an hour. This capability can be used to also process the runways in use for correlation with flights, complaints and noise events. An example report from Boston Logan (BOS) is demonstrated in Figure 19.

datis_times	datis_type	datis_message	flight_time	flight_id	flight_operation	flight_runway	flight_airline
2007-09-10 17:17:36	ATIS	BOS ARR INFO K 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD SHORT OF RWY 4L. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. DEP ATIS FRQ 135.0. ...ADVS you have INFO K.. . BOS DEP INFO V 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD AT THE B HOLD POINT. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. ARR ATIS FRQ 127.875. ...ADVS you have INFO V.. .	2007-09-10 17:33:28	UAL543	D	9	UAL
2007-09-10 17:17:36	ATIS	BOS ARR INFO K 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD SHORT OF RWY 4L. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. DEP ATIS FRQ 135.0. ...ADVS you have INFO K.. . BOS DEP INFO V 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD AT THE B HOLD POINT. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. ARR ATIS FRQ 127.875. ...ADVS you have INFO V.. .	2007-09-10 17:58:38	CHQ6256	A	4R	CHQ
2007-09-10 17:17:36	ATIS	BOS ARR INFO K 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD SHORT OF RWY 4L. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. DEP ATIS FRQ 135.0. ...ADVS you have INFO K.. . BOS DEP INFO V 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD AT THE B HOLD POINT. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. ARR ATIS FRQ 127.875. ...ADVS you have INFO V.. .	2007-09-10 17:23:16	JBU1012	A	4R	JBU
2007-09-10 17:17:36	ATIS	BOS ARR INFO K 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD SHORT OF RWY 4L. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. DEP ATIS FRQ 135.0. ...ADVS you have INFO K.. . BOS DEP INFO V 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD AT THE B HOLD POINT. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. ARR ATIS FRQ 127.875. ...ADVS you have INFO V.. .	2007-09-10 17:06:50	TRS280	A	4R	TRS
2007-09-10 17:17:36	ATIS	BOS ARR INFO K 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD SHORT OF RWY 4L. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. DEP ATIS FRQ 135.0. ...ADVS you have INFO K.. . BOS DEP INFO V 2100Z Special. 09008KT 1 3/4SM BR FEW004 OVC013 17/16 A3000 THREE ZERO ZERO ZERO. ILS 4R, DEP 9. READBACK ALL HOLD SHORT INSTRUCTIONS. TAXIING ACFT EXPCT TO HOLD AT THE B HOLD POINT. MOD BIRD ACTVTY IN ALL AREAS. TWY E CLSD BTWN M AND 22R. ARR ATIS FRQ 127.875. ...ADVS you have INFO V.. .	2007-09-10 17:59:15	TRS157	D	9	TRS

Figure 19: BOS D-ATIS Correlated with Flights

8. COMPUTER AND NETWORK SPECIFICATIONS

8 Computer and Network Specifications	PASSUR Comments
DEN expects to obtain a hosted web-based NOMS, which will minimize the need for computer and network specifications.	The proposed solution is hosted at PASSUR facilities and is web based.
DOA maintains a network of computers in its offices at DEN. DOA staff members have desktop computers on this network for word processing, spreadsheet use, e-mail and other normal business functions.	PASSUR will continue to work with DEN staff to make maximum use of the existing computer equipment that is sufficient to support the provided software.
The existing DEN network is an Ethernet local-area network (LAN) utilizing TCP/IP protocols. The NOMS must operate on this existing network without adversely affecting the performance of the LAN. The NOMS must also be made secure from attack by hackers and viruses. The proposal must describe the vendor's proposed method for securing the computers and the data. The proposal must clearly describe the proposed network arrangements, software compatibility, and file transfer capabilities. The proposal must also define the roles that PASSUR assumes DEN will have in the installation and ongoing support/administration processes.	The proposed solution is completely hosted at PASSUR facilities making the need for local area network resources minimal beyond that of providing internet access to all of the workstations DEN desires to use for NOMS purposes.
DEN requires that the NOMS installation permit all operators, including the NOMS operators identified in Section 2.1, to utilize their desktop computers and include other device types, such as IOS (iPhone and iPad) and Android platforms, to access and operate the NOMS, so that they have only one computer on their desks.	PASSUR will provide hosted NOMS software that will run on existing DEN workstations allowing for only one computer on users' desks. PASSUR's PublicVue portal runs on desktop computers, IOS and Android platforms.
DEN uses the Microsoft Office Suite. (e.g. Word, Excel, Access, Outlook, and PowerPoint). The NOMS must provide DEN staff with the capability to transfer data and report and graphics output from the NOMS onto any computer operating on the DEN network, in formats that are compatible with the Microsoft Office Suite of applications, AutoCAD (latest version), AutoCAD Map, and ESRI GIS Enterprise solution. PASSUR-required desktop software, drivers, etc. must also be compatible with the Microsoft Office Suite. PASSUR should address how device or operating system upgrades will be handled.	PASSUR's proposed solution maximizes the use of industry standard data formats for output and export including but not limited to Microsoft suite and ESRI. If selected, PASSUR will notify DEN of any relevant third-party software upgrades.

9. NOMS SOFTWARE

9 NOMS Software	PASSUR Comments
The NOMS shall use a remotely hosted, web-based application service delivery approach. The NOMS shall be accessible to any DEN-authorized user from various client devices through a thin client interface over the internet via an industry-standard Web browser (or browsers), with local software installation limited to browser plug-ins. DEN requires that all capabilities of software products be available to staff.	The PASSUR proposed solution is remotely hosted and web based. The software will be accessible by authorized DEN users from any internet connected computer utilizing industry standard browser software with plugins.

9 NOMS Software	PASSUR Comments
The proposal must identify the source of all software, i.e., third party sources, software developed by PASSUR prior to DEN procurement, and software that the Contractor would develop specifically for this NOMS.	PASSUR will specify the source of third-party software and notify DEN of which (minimal) software is developed specifically for this solution.
The software must utilize a user-friendly GUI.	EnvironmentalVue utilizes a user-friendly GUI developed using well established GUI industry standards.
The Contractor must provide sufficient software licenses for all software to be installed and used simultaneously by at least ten DEN staff, as required in these specifications. The proposal must clearly state that the PASSUR has a right to grant such licenses.	PASSUR will provide sufficient software licenses for all software to be installed and used by at least 10 users simultaneously. PASSUR has the exclusive right to grant EnvironmentalVue software licenses.
The Contractor must provide fully paid third-party software licenses in DEN's name, under the terms established by the software license providers. The Contractor must provide DEN with copies of all licenses and registration forms for all third-party software, with the original packing boxes, media, and documentation. The Contractor must ensure that DEN obtains direct notification of opportunities for third-party software upgrades.	PASSUR will provide DEN with all third-party software licenses as required.
Arithmetic to logarithmic and logarithmic to arithmetic conversions, and other computations must not introduce errors of greater than ± 0.1 decibel.	The proposed software meets the required computational precision specification.
As discussed in Section 2.5, the software must include failure detection and warning features for conditions requiring operator attention, including, but not limited to, failure of the system to transfer accumulated data from any external data acquisition device, and every other system failure that would lead to the loss of time-perishable data.	The proposed NOMS software includes failure detection and warning features as required. Users and PASSUR technical support staff are actively notified of irregular or problematic operation.
The NOMS must verify the validity of data transmitted from all remote data acquisition devices to the Contractor's server(s), either by parity checks, "checksums", or other means.	All data transfer software includes error checking to assure accuracy.
Downloading and uploading data to and from external devices must not limit any user's ability to perform any other tasks on the system while downloading/uploading is in progress. Data transfer must not interfere with NOMS data collection.	As a hosted solution, data downloads and other transfers will not interrupt software user operation.
The software must provide security against unauthorized database access or system operation. The software must allow read-only access to the database without giving access to the NOMS interface. The security system must allow DEN to prohibit Contractor access to the NOMS. The proposal must describe the security approach and features. The software should limit the number of unsuccessful login attempts before a user is locked out of accessing the software.	PASSUR secures its servers, software, databases, and other NOMS infrastructure from unauthorized access utilizing state-of-the-art security protocols and tools. *The system does not currently limit the number of unsuccessful login attempts. PASSUR can work with DEN however to implement this capability.
DEN requires that NOMS software include on-line help, with step-by-step instructions for performing most routine tasks. The proposal must describe the help capabilities the Contractor will provide.	Online help, as specified, is a standard deliverable for the proposed NOMS solution.

9 NOMS Software	PASSUR Comments
As discussed in Section 8.2, the NOMS must permit DEN operators to independently transfer data from the system across the existing DEN network to import in a compatible format into AutoCAD, AutoCAD Map, and/or ESRI GIS Enterprise solution and the Microsoft Office suite of applications, including Word, Excel, Access, and PowerPoint. PASSUR must assume that DEN will install this suite of applications onto any existing or new computers integrated into the NOMS.	The proposed NOMS software allows for users to readily transfer and export data in numerous file formats including the required industry standard GIS and MS formats.
The NOMS must allow the user to use a full range of logical operators in linking data from any and all sources, and searching, filtering, sorting, correlating, and otherwise conducting analyses and preparing reports and graphics. The logical operator set must allow at least the choice of "and", "or" "greater than", "less than", "equal to or less than", "equal to or greater than", and "not equal to".	EnvironmentalVue allows for all of the required logical operators for standard and ad hoc reporting and data queries.
The NOMS should allow the system operators to perform mathematical and statistical operations on data sets drawn from all data types collected by the system, including, but not limited to:	
• Calculation of arithmetic averages of data sets	EnvironmentalVue provides the means for arithmetic averages of data sets.
• Performance of all arithmetic operations (addition, subtraction, multiplication, division)	EnvironmentalVue provides the means for addition, subtraction, multiplication, and division.
• Calculation of logarithmic averages (e.g., energy averages of decibel quantities)	EnvironmentalVue provides the means for the calculation of energy averages of decibel quantities.
• Calculation of arithmetic means, medians and modes	EnvironmentalVue provides for the calculation of means, medians, and modes.
• Calculation of standard deviations	EnvironmentalVue provides the means for calculation of standard deviations.
• Last-squares "best-fit" trend analyses and plots	EnvironmentalVue provides the means for best-fit trend analysis and plots.
The proposal should clearly identify which of these capabilities will be provided and the manner in which they will be accessible to operators.	PASSUR will clearly identify the methods used to achieve these mathematical processes including built-in reporting tools and through the use of MS Excel templates.
The NOMS software must automatically acquire and import into the database all data acquired from data sources with the exception of manually initiated data transfers such as the uploading of portable noise monitors and manual complaint data entry. The NOMS must complete all automatic data acquisition, transfer, central processing, and correlation within four hours of the end of the day on which the data are acquired from the external data acquisition devices.	The proposed NOMS software automatically acquires and imports all required data with the exception of the manually initiated portable noise data, some complaint data, and other similar datasets. It does so within 4 hours of the end of the day on which the data was acquired.

9 NOMS Software	PASSUR Comments
DEN prefers that the NOMS software provide for keyboard entry of corrected data entries. The software should re-compute any calculated values in the database that the editing process affects. If the NOMS permits such data correction, the NOMS must provide a clear and convenient means for determining which data entries have been edited, and for returning the edited data to their original values. The overriding requirement is for the NOMS to maintain a complete record of the original, empirically collected data.	EnvironmentalVue allows the user to correct manually system data and then recalculate metrics and other data impacted by the user edits while maintaining an audit trail of the edits with the means to undo the user edits.
The proposal must include a description of the file editing capabilities and approach for determining original, empirical values.	All original values are maintained in the EnvironmentalVue database.
DEN desires that the NOMS permit system operators to manually enter data from outside sources into a minimum of ten additional fields in the central NOMS database, in a manner that links the entered data to flight operations, noise events, or complaints.	EnvironmentalVue includes at least 10 additional fields available to the user for manual entry that are fully integrated into the database with flight operations, noise events, and complaints.
The proposal must include a description of the manual data entry capabilities and the types of data that can be stored.	EnvironmentalVue allows for 4 additional fields in the operations table, 4 additional fields in the noise events table, and 4 additional fields in the complaints table for the user to enter data of their choosing.
The NOMS must include digitized base mapping for use in on-screen display and hard-copy printing/plotting of any geographically related NOMS data, including, but not limited to noise measurement locations, flight tracks, and complaints. The base map must provide coverage for all points within a 50 nautical mile radius of DEN.	EnvironmentalVue includes extensive base mapping for on-screen display and printing of geographically related NOMS data including flight tracks, noise measurements, complaint locations, and other data within a 50-nautical mile radius of DEN. This has the ability to be expanded if desired by DOA
The NOMS must use the same base map and layers for all geographic-related functions, e.g., flight track analyses, complaint analyses, noise monitoring locations, etc. The PASSUR must calibrate the map data annually to assure that positional information is accurate. If unacceptable drift is detected, PASSUR must adjust all mapping and aerial photos to reflect the adjustment (see Section 9.16.4)	The proposed NOMS uses the same base maps and layers for all geographical functions. All data including flight tracks and complaint locations are accurately georeferenced so that locations are as precise as technology will allow.
The mapping system shall use the Colorado State Plane coordinate system (NAD 83), in meters.	EnvironmentalVue allows the users to select which coordinate system is used including NAD83 (in meters if desired).
The base mapping must be in layers and allow NOMS operators to select which combination of layers are shown on the screen at any given time. Users must have the capability to select different colors or line symbols for individual layers on the screen and in hard copy plots. At a minimum, the Contractor must provide the following layers:	EnvironmentalVue allows the user full control over the visibility, stack order, and other properties of all available map layers for on screen display and hard copy printouts.
• Center lines of major streets	Provided in EnvironmentalVue
• Street names for major streets	Provided in EnvironmentalVue
• Center lines of all other streets	Provided in EnvironmentalVue

9 NOMS Software	PASSUR Comments
• Street names for all other streets	Provided in EnvironmentalVue
• Outlines of major water bodies and rivers	Provided in EnvironmentalVue
• Water body and river labels	Provided in EnvironmentalVue
• Political divisions (county and municipal boundaries)	Provided in EnvironmentalVue
• Political jurisdiction boundary labels	Provided in EnvironmentalVue
• DEN runway layouts	Provided in EnvironmentalVue
• DEN runway end labels	Provided in EnvironmentalVue
• Runway layouts for all other airports within the mapped area	Provided in EnvironmentalVue
• Runway end labels for all other airports within the mapped area	Provided in EnvironmentalVue
• Seamless digital color orthos in TIFF-World format (aerial photography available from MASSGIS)	Provided in EnvironmentalVue
• United States Geographical Survey (USGS) topographic contours	Provided in EnvironmentalVue
• Edge of pavement mapping for major streets	Provided in EnvironmentalVue
• Edge of pavement mapping for minor streets	Provided in EnvironmentalVue
The NOMS must allow system operators to define any area to be displayed or printed that is a subset of the entire base map, e.g., zoom in, zoom out, pan, etc.	EnvironmentalVue allows the user to manipulate the map for display and printing through zooming in, zooming out, and panning to desired location.
The NOMS must require no longer than five seconds to refresh the full area and detail of any map area selected for display.	EnvironmentalVue meets the five second refresh requirement.
The NOMS must permit operators to create scaled drawings for use in reports, presentations, and other purposes. All plots and computer display of mapping data must include a graphic distance scale and north arrow. Operators must have the capability to add figure titles, a map legend, DOA logo(s), text boxes, and other annotation.	PASSUR's proposed solution allows the user to create scaled drawings as well as displays graphic scale and north arrow. Users may create map annotations including figure titles, map legend, DEN logos, text boxes, etc.
The NOMS must permit system operators to export drawings into Microsoft Word documents and into Microsoft PowerPoint presentations.	EnvironmentalVue allows users to export all graphic and tabular output to formats readily imported into MS suite software applications.
It is desirable that the NOMS allow DEN convenient means for creating new map layers, including raster, vector, and text data.	EnvironmentalVue data is readily exported into map layer formats that me be used elsewhere including raster, vector, and text data.
The NOMS must permit operators to import and export map layers in ESRI GIS Enterprise solution compatible format(s).	EnvironmentalVue permits operators to export map layers in ESRI format.
PASSUR must provide updated base maps at the start of each annual software support period.	PASSUR will provide updated base maps continually throughout the software support period.

9 NOMS Software	PASSUR Comments
As part of initial system acceptance and after completing each update of the base maps, the Contractor must demonstrate the accuracy of the map layers by comparing the coordinates of known fixed locations, determined using the Global Positioning Satellite (GPS) receiver specified in Section 10.5.6, and entered into the base map. At a minimum, the Contractor must confirm the locations of each permanent noise monitor in the DEN environ, and up to 25 additional locations identified by DEN.	PASSUR will comply with the acceptance test requirements for determining map accuracy.
As discussed in Section, 3.6, PASSUR also must ensure that flight operations data are properly aligned with the base mapping in all three dimensions. The Contractor must demonstrate this process as part of initial system acceptance and at least once annually during warranty renewal periods.	PASSUR will demonstrate the accuracy of the display of flight tracking data as required for system acceptance.
The proposal must describe the mapping features that PASSUR will provide with the NOMS.	EnvironmentalVue will be delivered with aerial photo imagery of the entire Earth, vector roadmap data for the entire United States, IFR charts (low and high levels), VFR sectional maps, as well as import any georeferenced mapping data desired and sourced by DEN.
The proposal must identify capabilities and limitations that the proposed system will have related to importing and exporting drawings in ESRI GIS Enterprise solution compatible format(s).	EnvironmentalVue readily accepts, with point and click actions by the user, ESRI compatible map layer files.
The proposal must identify the proposed mapping data source, its currency, and coverage, and should identify options available to DEN for selecting specific data for inclusion in the map layer choices available to system operators.	PASSUR currently provides aerial and vector road map data sourced from Bing. Other DEN sourced Georeferenced mapping data will be provided seamlessly to the user.
The proposal must identify which map layers the Contractor will update during each warranty renewal period. The Contractor must update these files annually.	PASSUR will update all mapping data files delivered with EnvironmentalVue annually.
The software must support the production of standard and custom reports and graphics with a state-of-the-art look and feel. The software must allow operators to preview and modify the format of all standard or custom reports and graphics on the computer screen prior to printing. The on-screen preview must be consistent with the printed version in terms of line and text spacing, margins, column alignment, etc. DEN prefers that report production be performed to the maximum feasible extent using a Microsoft Office application, or that reports can be exported to Microsoft Office application, for editing and production. All reports and graphics should allow the seamless traversing of midnight. For instance, the time interval from 22:00 to 07:00, or any other user-defined period that traverses midnight, must appear as a single continuous time period for the reports and graphics produced by the system.	EnvironmentalVue reporting tool, ReportVue, along with EnvironmentalVue Portal (EVP) will allow the user to specify from a variety of templates for state-of-the-art business graphic capabilities. Database querying for periods traversing midnight is handled as required in these specifications. Any report output may be readily exported into formats compatible with the MS Office Suite of software.

9 NOMS Software	PASSUR Comments
The proposal must include examples of standard reports and graphics that PASSUR's NOMS will produce. The proposal must indicate whether these capabilities exist in the current version of the NOMS software, or if their implementation will require additional software development. DEN recognizes that the sample reports may reflect formatting prepared for other installations; PASSUR is not required to reformat the reports for the proposal effort. However, the Contractor will be required to reformat the reports to properly reflect the DEN implementation, as part of the DEN NOMS installation.	PASSUR has included examples of standard graphics and reports output in this response. Also refer to Appendix B.
Appendix B presents samples of existing standard reports for DEN that PASSUR must provide.	PASSUR will provide all standard reports included in Appendix B.
The proposal must include a budget for DEN to identify up to 15 additional reports and graphics which the Contractor will prepare prior to the end of the first year of system operation.	PASSUR will include delivery of up to 15 additional reports specified by DEN prior to the end of the first year of system operation.
It is highly desirable for the NOMS to have the maximum possible capability to present results in graphic form. The NOMS must permit operators to select different forms of graphic presentation, including at least line graphs, bar charts, stacked bar charts, pie charts, and x-y plots. The graphics must be available in black-and-white and color versions, at user discretion. The graphics must be exportable to electronic formats suitable for use in reports, presentations, and web pages.	PASSUR will address this desirable capability with the Excel template function.
The NOMS must provide the means to initiate, suppress, and schedule (on a single time and repetitive basis) the automatic printing of all reports and graphics.	EnvironmentalVue features a user friendly fully functional report scheduling capability.
The proposal must define the standard and custom reports and graphics preparation capabilities that the proposed NOMS installation will include, and specifically identify any limitations on their definition, elements, formatting, production, distribution, or other matters.	PASSUR has provided a full description of the reporting capabilities and limitations in this proposal.
PASSUR must supply software and hardware to automatically acquire data from the permanent noise monitors, to support user-initiated downloading of noise data from portable noise monitors, and to perform noise-related data processing functions defined in these specifications.	EnvironmentalVue and its peripheral components automatically or manually download noise data and perform the associated noise related data processing.
The NOMS must have the capacity for simultaneous installation and operation of up to 100 permanent noise monitors. No software modifications, except for output format changes, must be required to add permanent noise monitors. The system's database must provide for unlimited numbers of total measurement sites, to include permanent and portable monitoring sites at which DEN might conduct repeat measurements at intervals. The system must accommodate such interrupted repeat measurements.	EnvironmentalVue has no limit to the number of permanent noise monitors that can operate simultaneously nor to the number of noise monitors that can be incorporated into the proposed system. Interrupted measurements do not impact the collection or accuracy of the data.

9 NOMS Software	PASSUR Comments
The DOA requires at least annual external calibrations (more frequent if manufacturer recommends) for all noise monitors at all of the NMT sites. The software must include the automatic self-calibration function described in Section 10.4.5. The NOMS software must not include calibration signals in any noise calculations. The NOMS must compile and maintain data entries for every calibration, with the following data entries preferred, but not required:	The proposed noise monitors perform automatic self-calibrations as required by these specifications. The calibration data is maintained in the database and does not impact the collection of desired measurements.
• Noise monitor number	Calibration records include noise monitor number.
• Data and time	Calibration records include date and time of the calibration.
• Identification of the calibration as manually or automatically initiated	Calibration records include whether or not the calibration was manually or automatically initiated.
• Noise level immediately before calibration	Calibration records include the noise level immediately before calibration.
• Noise level immediately after calibration	Calibration records include the noise level immediately following the calibration
• Calibration level	Calibration records include the calibration level used during the calibration process.
• Offset from previous calibration level	Calibration records include the means to readily determine the difference between them and any previous calibration level.
• Offset from ideal calibration level	Calibration records include the means to readily determine the ideal calibration level by displaying the calibration level.
• Identification of calibration as acceptable or unacceptable	The calibration records include a pass/fail flag indicating whether or not the calibration was acceptable.
The proposal must identify the calibration-related data to be retained.	This proposal identifies the fields of data maintained in the calibration table of the database.
The NOMS must appropriately calculate daily noise levels on days affected by changes to and from Daylight Savings Time and on any days affected by loss of data due to system malfunction.	PASSUR proposed solution appropriately calculates daily noise levels on days affected by changes to and from Daylight Savings Time.
DEN prefers that operators have the option of selecting the number of significant digits printed and displayed for noise measurement results, with choices including the nearest decibel and the nearest tenth of a decibel.	EnvironmentalVue allows the user to select the number of significant digits printed and displayed noise levels.
The software must identify and automatically generate database entries on all noise events and classify noise events by source. The proposal must provide a description of the approach that the NOMS will take to identifying noise sources.	EnvironmentalVue automatically correlates noise event data to flight tracking data and maintains those correlations for display and reporting purposes. This allows the user to easily determine the source of noise events as being specific aircraft or non-aircraft related.

9 NOMS Software	PASSUR Comments
The software must allow the system user to establish sound level thresholds and minimum durations above the threshold for each individual noise monitor that noise signals must exceed in order to be identified as a noise event by the system. The proposal must identify the types of thresholds and the range of allowable values for each.	PASSUR will provide user access to all specified noise event detection parameters.
At a minimum, the NOMS must incorporate a hardware/software system for discriminating between noise events that are caused by:	EnvironmentalVue event correlation process allows for identification of:
• DEN-related aircraft events	DEN related aircraft events
• Other aircraft events	Other aircraft events
• Non-aircraft noise sources (community noise events)	Non-aircraft related noise sources
• Noise events correlated with operations from other airports	Noise events associated with aircraft from other airports
• Noise events correlated with multiple DEN-related events	
• Noise events correlated with aircraft noise events from multiple airports	
• Non-aircraft events	Non-aircraft related noise events
• Wind-related events (based on user identification)	Wind-related noise events
• Events related to equipment malfunction or other artificial causes (based on user identification)	Events related to equipment malfunction
The system must provide for easy keyboard selection and adjustment of discrimination parameters for individual noise monitors.	
The NOMS must allow system operators to establish maximum noise level (Lmax) and maximum Sound Exposure Level (SEL) thresholds for each monitoring location that, when exceeded by an aircraft noise event, identify the event as a high-range noise event.	EnvironmentalVue allows users to establish high range noise events parameters for each noise monitor as required.
DEN is interested in increasing the accuracy of the automatic identification of aircraft noise events, including measurement of aircraft-related noise events with relatively short durations and low maximum levels, and improved discrimination of aircraft-related noise events from other sources. The DOA is interested in ideas PASSUR may have for improving the accuracy of differentiating aircraft generated noise from noise generated by other noise sources at the NMT.	PASSUR can provide optional floating event detection threshold at DEN's request. This approach will allow for the detection of noise events in low and high ambient noise periods when fixed threshold methods would fail to detect events.
• For each noise event measured at each permanent or portable noise monitor, the NOMS should provide for the compilation and storage of the following (minimum) data:	EnvironmentalVue will allow for the storage of the following:
• Date	Date of the noise event
• Noise monitor location	Location of the noise monitor
• Maximum sound level (Lmax)	Lmax
• Sound Exposure Level (SEL)	SEL
• Time of Lmax	Lmax time and date
• Start time of event (time when noise event sound level first exceeds the threshold)	Time the noise event started (when it first exceeds detection threshold.

9 NOMS Software	PASSUR Comments
• End time of event (time when sound level falls below threshold)	The means to determine the end of the event.
• Duration of event	Duration of the noise event in seconds.
• Noise event source	The source of the noise event through the correlation process.
• Correlated operations and flight identification data	Correlated operations and flight identification data.
• Correlated complaint data	Correlated complaint data
The proposal must identify the specific information that PASSUR's NOMS will collect and store for each noise event. Data that PASSUR's NOMS will provide in addition to the items listed above is desirable and should be identified in the proposal.	
It is desirable that the NOMS include the capability to produce plots of the sound level versus time for any individual single event. The plots must include labeled axes for the sound level and the elapsed time, and labels showing the event thresholds (sound level and minimum duration), the start time of the event, the end time of the event, the date, and the site number. The proposal must identify the plotting capabilities that the installed system will include.	EnvironmentalVue provides easy means of creating a noise event graphic plot.
For each hour period, the NOMS must provide for the compilation, computation, and storage of the following (minimum) data from the database for each noise monitoring location at which the NOMS collects data during a given hour:	EnvironmentalVue provides for the compilation, computation, and storage of the following minimum data from its database for each noise monitoring location:
• Individual equivalent sound level (Leq) values for each noise event source category	Leq from individual noise sources
• Total Leq from all sources	Total hourly Leq from all noise sources
• Six user adjustable percentile levels (Ln), initially set at 1, 5, 10, 50, 90, and 99%	Hourly Leq from 6 user specified Ln values.
• Percent of time the noise monitor operational during the hour	Percent of time the noise monitor was functioning during each hour.
• Number of noise events monitored at the noise monitor during the hour, by source category	Number of noise events monitored at the noise monitor location by hour and source.
The proposal must identify the specific information that PASSUR's NOMS will collect and store for each hour. Data in addition to the items listed above are desirable.	
For each 24-hour period, the NOMS must provide for the compilation, computation, and storage of the 24-hour equivalents of the values included in the hourly data compilation. The NOMS must also provide individual and total Day-Night Average Sound Level (DNL or Ldn) values for each noise event source category.	EnvironmentalVue will compile, computer and store
For each calendar month, the NOMS must provide for the compilation, computation, and storage of the monthly equivalents of the values identified for the daily data compilation in Section 9.18.9.	EnvironmentalVue provides the user the ability to calculate all DNL and Leq metrics for any period of time selected.

9 NOMS Software	PASSUR Comments
For each calendar year, the NOMS must provide for the compilation, computation, and storage of the annual equivalents of the values identified for the daily data compilation in Section 9.18.9.	EnvironmentalVue provides the user the ability to calculate all DNL and Leq metrics for any period of time selected.
The software must allow for selection, sorting, analysis, and reporting of noise event data using any of the fields in the database, including, but not limited to:	EnvironmentalVue allows for selection, sorting, analysis, and reporting on the following fields in the database:
• Upper and lower limits for the Lmax during the event	The upper and lower limits of the Lmax during the event
• Upper and lower limits for the SEL of the event	Not applicable. SEL is a metric that applies to the entire event.
• Date and time limits	Date and time limits
• Source category	Source category
• Correlated aircraft operations and flight identification data	Correlated aircraft operations identification data
• Correlated complaint data	Correlated complaint data
• Airfield operating conditions data	Airfields operating conditions data (weather)
The proposal must define the noise monitoring software capabilities that the NOMS will include.	PASSUR is providing a full description of the noise monitoring software capabilities within EnvironmentalVue in this technical response
The NOMS must include software that provides flight operations, flight identification, and airfield operations monitoring, analysis, display, and reporting capabilities identified in Section 3, and capabilities, as further defined below:	EnvironmentalVue provides flight operations, flight identification, and airfield operations monitoring with analysis, display, and reporting capabilities.
The NOMS must permit the user to annotate any display of stored flight operations data with associated flight identification data, including on-screen or hard-copy plots, and on-screen replay. The flight identification data must include at least the following data, to the extent available: aircraft type, aircraft identification (airline and flight number, registration number, or other operator identification), altitude, and speed. The system should allow the user to select the information to be included in the data block for each flight, to include any combination of the data block items.	EnvironmentalVue allows the user to annotate flight tracks for display or printing with any data fields associated with the operations records including but not limited to aircraft type, aircraft identification, altitude, speed, and beacon code.
The NOMS must provide the capability to "replay" airport activity for user-selected time periods, as though viewing a radar screen, at user-selectable speeds (including slower than, equal to, or faster than real-time speed). The NOMS should also provide the capability to display sound level data, for any number of monitors for which noise data are available for the replay time period.	EnvironmentalVue provides and easy to use animated replay function that allows the user to replay air traffic activity for any period of time selected with graphic representation of noise events and applicable complaint data.
The on-screen and hard-copy plotting software should include a smoothing algorithm for aircraft altitude profile and two- and three-dimensional track display.	PASSUR provides air traffic control quality flight tracking data that requires no further synthesis for 'smoothing'. If DEN finds smoothing to be necessary, PASSUR will develop and implement an additional process to the data.

9 NOMS Software	PASSUR Comments
The replacement NOMS shall incorporate all gates and corridors currently in use with the existing NOMS. The NOMS must permit operators to define airspace analysis gates and corridors by "clicking on" the base map. The user must also be able to identify maximum and minimum altitudes for each gate, and for each end of a corridor, through keyboard entry. The system must allow operators to define, name, store, recall, and delete gates and corridors. The software must automatically identify gate penetrations by flight tracks, and adherence or lack of adherence with corridors, and allow operators to use these conditions as criteria for selection, sorting, analysis, and display of flight operations and correlated data. The proposal must identify the NOMS gate and corridor related capabilities.	EnvironmentalVue provides a point and click gate and corridor creation feature that allows the user to create, store, analyze, and report on gate and corridor performance of any flight track in the database.
The NOMS must compute the point of closest approach (PCA) from flight tracks to user-defined ground points, complaint locations, and monitor sites. The software must allow operators to enter the coordinates of PCA analysis locations, and to enter them using the cursor keys, or by "clicking on" the base map. The software must allow the user to add or delete analysis locations from a file of defined PCA locations. The PCA calculations must provide the following information:	EnvironmentalVue provides a point and click point of closest approach (PCA) feature that allows the user to create an origin at any location in order to calculate the following:
• Slant distance (line-of-sight) from aircraft to PCA analysis location	Slant distance from the aircraft to the PCA origin
• Ground distance from PCA analysis location to ground projection of aircraft at PCA	Ground distance from PCA to location of ground projection of the aircraft at its PCA.
• Aircraft altitude at PCA	Aircraft altitude at its PCA
• Time of PCA	Time of PCA
• Elevation angle above the horizontal plane of the line-of-sight from the observer to the PCA	Elevation angle above the horizontal plane of the line of site from the airport's center to the PCA
• Aircraft ground track heading	Aircraft's ground track heading
The NOMS must permit operators to use PCA data as a basis for selection and sorting of flight operations and correlated data.	EnvironmentalVue allows users to utilize PCA data for sorting and selecting flight operations data.
DEN desires that the NOMS provide operators with the capability to compute and display PCA corrected for ground elevation.	EnvironmentalVue allows the user to display altitude in either MSL or AGL units at any time.
The proposal must identify the PCA-related capabilities that the installed system will include.	PASSUR is providing a full description of PCA related capabilities included in the proposed solution.
The NOMS must automatically determine runway utilization for all DEN operations by matching flight tracks to the runway geometry. The tabulation must identify the runway end used and the type of operation, and information on airfield operating conditions during the time of the operation.	EnvironmentalVue automatically determines utilization for all DEN operations by runway end and type of operation while maintaining airfield conditions records.

9 NOMS Software	PASSUR Comments
The NOMS must store the runway use data and permit operators to access the data in a form that allows specialized analysis. The system must allow for sorts, tabulations, comparisons, and graphs of data for user-specified time periods, type of operation, specific runway end used, aircraft type, airline/aircraft operator, and airfield operating conditions.	The runway utilization data created by EnvironmentalVue is available to users for sorting, tabulating, comparing, and graphing from all data fields in the flight table of the database.
The NOMS must allow operators to develop, screen preview, and print runway use reports, in tabular form, for hourly, daily, weekly, monthly, annual, and user-defined time periods. The NOMS should allow for development of tables and graphics that compare user-identified time periods.	EnvironmentalVue allows users to develop, preview, and print runway use reports in tabular form for any user defined time period or time grouping such as daily, weekly, etc.
The NOMS must permit the tables to break the data down by at least the following categories:	The proposed solution will allow for the breakdown of data in the following ways:
• Type of operation: at a minimum arrival, departure, and overflight, and including touch-and-go and missed approach (The proposal must clearly define limitations of the proposed NOMS in identifying any of these categories of operations, including touch-and-go and missed approach.)	Operation type including Arrival, Departure, Overflight, Touch and Go, and Runup.
• Runway used	Runway (where applicable)
• Major operator category (e.g., air carrier, commuter, general aviation, and military)	Operator category
• Major aircraft type categories (e.g., air carrier jets, corporate jets, turboprops, single and multi- piston, and helicopter)	Aircraft category
• Aircraft registration number	Registration number
• Aircraft type	Aircraft type
• Aircraft owner, operator, or airline	Aircraft owner, operator, or airline
• Part 36 certification stage (if identifiable)	Part 36 certification (if identifiable)
• Airline identification and flight number, for commercial operations	Flight number
• Beacon code	Beacon code
• Origin airport	Origin airport
• Destination airport	Destination airport
• Intermediate fixes and other available flight plan data	Navigational fixes
• Specific airframe and engine information	Airframe and engine information
• Time of day (using DNL or operator-defined periods)	Time of day applicable to DNL calculations
• Airfield operating conditions, including the following items:	Airfield operating conditions including
– Time	Time
– Wind speed and direction	Wind speed and direction
– Wind shear alerts	Wind shear alerts when available
– Runways in use	Runways in use
– Visibility	Visibility
– Ceiling	Ceiling when provided
– Precipitation and Snow	Precipitation
– Temperature	Air temperature
– Dew Point	Dew Point when provided

9 NOMS Software	PASSUR Comments
– Altimeter	Altimeter setting
– Instrument Approach	Instrument approach when provided
– Notices to Airmen (taxiway/runway closures, etc.)	NOTAMS
The NOMS must automatically produce pre-defined runway use reports and graphics for any user-defined time period.	EnvironmentalVue can automatically produce predefined runway use reports and graphics for any user-defined time period.
The proposal must provide detailed descriptions of runway use analysis, reporting, and plotting capabilities that the NOMS will provide.	PASSUR is providing a full description of the runway use analysis, reporting, and plotting capabilities provided in EnvironmentalVue
The software must allow for selecting, sorting, analyzing, and reporting aircraft operations data and correlated noise, complaint, and airfield operating conditions data using any of the fields in the database, including at least:	EnvironmentalVue will allow for the selecting, sorting, analyzing, and reporting of aircraft operations data and correlated noise and complaint data using any fields in the database including but not limited to:
• Aircraft type (e.g., B737, Lear 35)	Aircraft Type
• Part 36 certification stage (if identifiable)	Part 36 certification stage if identifiable
• Type of operation (departure, arrival or overflight)	Type of operation
• Runway used	Runway used
• Aircraft owner, operator, or airline	Aircraft owner, operator, or airline
• Aircraft registration number	Registration number
• Airline identification and flight number, for commercial operations	Aircraft identification (flight number where appropriate)
• Beacon code	Beacon code
• Penetration or non-penetration of NOMS operator-definable gates	Gate penetration performance
• Adherence or non-adherence to NOMS operator-definable corridors	Corridor compliance performance
• Maximum and minimum point of closest approach (PCA) limits	PCA calculations
• Maximum and minimum altitude limits	All altitude values
• Correlated noise data	Correlated noise data
• Correlated complaint information	Correlated complaint data
• Data on airfield operating conditions at the time of the operation (D-ATIS)	D-ATIS
• Other categories of data on individual operations available in the NOMS database.	All other data fields in the NOMS database
The proposal must describe the operations selecting and sorting capabilities.	PASSUR is providing a full description of the sorting and selecting capabilities available for querying and reporting in EnvironmentalVue
The NOMS software must allow for flight track and aircraft identification data to be exported that includes all items listed in 10.19.1. This must also include international flight tracks. The file format must be approved by the Airport for use and be able to be uploaded to an SFTP site for use by DEN.	EnvironmentalVue allows for any data fields within the application to be exported and downloaded, including international flight tracks.

9 NOMS Software	PASSUR Comments
The NOMS must include software and hardware that permit the NOMS to support the complaint functions specified in Section 5 for all means of accepting, processing and responding to aircraft noise complaints.	EnvironmentalVue includes all software and hardware necessary for complaint functions outlined in Section 5.

10. NMT REPLACEMENT

PASSUR is recommending replacing the aging 3639-C NMTs through attrition (when unrepairable), or if desired by Denver over a designated period of time with the Larson Davis Mondel 831C. PASSUR has installed and maintained over 60 Larson Davis (LD) NMTS.

10.1 MEASUREMENT PERFORMANCE REQUIREMENTS

The LD831C noise monitor fully complies with the requirements of ANSI S1.4-1983 and the newer version ANSI S1.4-2014 as well as IEC 61672-1.

The range over which the output is proportional to the analog of the noise level (call Dynamic range in the RFP) is commonly called measurement range. The measurement range for the noise monitor is typically 24 dB to 140 dB A-weighted.

The A-weighted noise floor level is typically 16 dB.

The A-weighted electrical response to sine waves in the frequency range of 22.4 Hz to 11,200 Hz is linear within 0.7 dB at the following frequencies:

- 31.5 Hz – linear from 23 to 100 dB
- 1000 Hz – linear from 23 to 140 dB
- 4000 Hz – linear from 23 to 141 dB
- 8000 Hz – linear from 23 to 138 dB
- 12500 Hz – linear from 23 to 135 dB

Note: the variation in the top end of linearity is due to the effects of the A-weighting filter.

10.2 ENVIRONMENTAL REQUIREMENTS

The LD831C NMT is designed for long term, continuous use in outdoor environments. As much as is feasibly possible, all components are industrial grade and designed for use over a wide temperature range.

All replacement NMTs comply with this requirement. Test data for each of the noise monitors can be provided that demonstrates compliance at 31.5 Hz, 1000 Hz, 8000 Hz and over a relative humidity range of 40% to 93% (the limits of the test facility).

The provided noise monitor complies with this requirement with sensitivity less than +/- 0.5 dB as defined in ANSI S1.4 and IEC 61672-1. Test data for each of the noise monitors can be provided that demonstrates compliance from -40 °C to 70 °C (-40 °F to 158 °F).

The provided noise monitor will operate continuously when exposed to these noise levels.

The microphone and preamplifier are protected from precipitation by a special hydrophobic fabric that repels water and transmits sound. Cables are routed inside the pole. For new site locations, the electronics are to be enclosed in a NEMA4X rated enclosure. For existing sites where upgrades to the hardware will be performed, PASSUR will reuse the existing enclosures and retrofit the new Larson Davis 831C hardware wherever possible as long as the structural and environmental integrity of the enclosure is not compromised or unrepairable, and as long as the new noise monitoring equipment will fit into the existing enclosure. Should the existing enclosure be deemed as unusable, PASSUR will notify DEN and make recommendations. In the event DEN decides to replace the enclosure, PASSUR will replace it with a new NEMA4X rated enclosure, priced in the pricing sheet.

10.2.1 WIND-INDUCED NOISE

When making outdoor noise measurements, sensitive microphones and noise measuring equipment can be exposed to all types of weather including rain, dew, wind and heat. PASSUR protects equipment and data from the negative effects of exposure to weather by using an Environmental Protection System. PASSUR has backup windscreens if any are missing or damaged.

The supplied outdoor microphone protection, EPS2116, has a windscreen and rain protection. At 20 mph the typical wind induced noise is 51.4 dB A-weighted. The entire NMT will withstand wind velocities of 120 mph without damage.

10.3 ACOUSTIC SIGNAL PROCESSING

PASSUR's proposed NOMS solution processes the acoustical signals obtained at both fixed and portable NMT sites. This has the advantage of minimizing the chance of data corruption during transmission. It also provides for system-wide redundancy as each location maintains its own capability to process the acoustical signal. Proper maintenance and calibration of the sites will ensure reliable and accurate signal processing throughout the design life of the NMT equipment.

10.3.1 NOISE THRESHOLD EXCEEDANCES

PASSUR NOMS can be configured to notify DEN when thresholds have been exceeded through an automated report. The user can set times of applicability for thresholds allowing for variability of levels within a day. It is expected that these thresholds and methods of delivery will be highly site dependent. PASSUR can work with DEN to set up a matrix of thresholds, delivery mechanisms, and alert frequency for each site.

10.4 PERMANENT NOISE MONITOR INSTALLATIONS AND PERFORMANCE

PASSUR will provide warranty, as well as support and maintenance (if selected) of all new LD831Cs.

10.4.1 INSTALLATION SUBCONTRACTOR(S)

Should the need arise to replace DEN's current NMTs, PASSUR will retain a locally licensed subcontract firm(s), with all required licenses, to establish new or modified site infrastructure required at each permanent NMT site and perform all local installation which requires such licenses. PASSUR will also leverage its experienced field services staff and local technicians, as well as local qualified and experienced subcontractors, as applicable, as part of the Noise Monitor Deployment team.

10.4.2 THE DOA AND PASSUR RESPONSIBILITIES

PASSUR plans to utilize the local subcontractors having the necessary licenses and understanding of local permitting processes to apply for licenses/approvals/permits and perform all of the utility work required at each new NMT Site.

PASSUR will work with DEN in securing utilities and communications services (and associated static IP addresses) at each new NMT site. Once the NMT sites are installed, any newly established NMT associated utility and communications services will be transitioned over to DEN for regular monthly payment processing.

10.4.3 UTILITY ACCESS

PASSUR will work with DEN in securing utilities and communications services at any new NMT site. PASSUR will obtain all permits and approvals for ongoing operation of the installations in the name of DEN, as appropriate.

10.4.4 DATA TRANSFER

The proposed EnvironmentalVue solution includes the Larson Davis 831C plus the RV50 Sierra wireless modem. The wireless modem enables the EnvironmentalVue hosted servers to be, cost effectively, in continual and reliable contact with the noise monitors to not just stream data but also monitor their health. Daily downloads are from the noise monitors are also performed to ensure complete data collection. Similar to the noise data, the EnvironmentalVue hosted servers are continually collecting and monitoring flight track data from the ARiVA data feed. In both cases, the data feeds have automated alerts to notify the Symphony support team of failures if they occur.

PASSUR's EnvironmentalVue solution, in the event of failure, will automatically alert the Symphony support team. The system will automatically try to re-connect to the noise monitors. If a reconnection is not possible within a specified period of time, the support team will remotely troubleshoot and reestablish the connection. The Larson Davis LD831C

units are configured to store 180 days of data locally without data loss. If needed due to a prolonged communication outage, support will coordinate with DEN staff to visit the site to perform a manual download. This can be done through a USB connection to the unit using a laptop and the Larson Davis download software. This way, files can be collected, and then emailed or accessed through FTP to the Symphony Support team for uploading to the system. Once data connectivity is restored, all un-downloaded data will be automatically collected by EnvironmentalVue to eliminate gaps or overlaps in the data.

Data can be manually transferred to a PC using a USB cable and the Larson Davis G4 Utility software. The G4 Utility software can be freely downloaded from the Larson Davis website and installed on as many computers as needed.

Daily data downloading can be done both continually and periodically. The total time spent during the day to download the NMT data can vary depending on the configuration of the NMT, but typically averages to about 5 minutes per noise monitor.

10.4.5 SELF-CALIBRATION

The existing Larson Davis 831C noise monitor has a built-in self-calibration test that can be run on a schedule as required.

10.4.6 EXTERNAL CALIBRATION

The Larson Davis 831C noise monitor utilizes the CAL200 acoustic calibrator. External Noise Monitor Calibrations will be performed once during new unit installation, once at the end of the test evaluation period and every year after that throughout the maintenance period of the contract. The CAL200 is a IEC 60942 Class 1 Handheld, 9 VDC battery operated, Sound Level Calibrator designed for ½" microphones operating at 1000 Hz and can operate at temperatures ranging from -10°C to +50°C. However, we strongly recommend acoustic calibrations not be performed at extreme temperatures and in accordance with industry and manufacturer standards. In order to get an accurate calibration, it is important the microphone and calibrator both are stabilized at a common ambient temperature which can take hours, especially at cold temperatures, because the calibrator is normally stored at room temperature.

PASSUR will follow the recommended calibration procedures as defined by Larson Davis in the NMS045/NMS044 Sound Advisor manuals for the LD 831C fixed and portable noise monitors. This methodology is outlined in the following steps:

- Step1: The pole should be in the tip down position.
- Step2: Remove Windscreen and Bird Spike from the microphone
- Step3: Place the acoustic calibrator over the microphone
- Step4: Navigate the Noise Monitor software menus and select the calibrator being utilized
- Step5: Activate/Turn on the Calibrator
- Step6: Select option to begin to perform calibration on the Noise Monitor
- Step7: Read results and save results if within tolerance, if not try repositioning calibrator on the microphone and run again. If still not within tolerance, troubleshoot and correct as required
- Step8: Close Calibration SW menu on Noise Monitor and return to Home menu
- Step9: Turn off and Remove Calibrator from microphone
- Step10: Replace Windscreen and Bird spike
- Step11: Return tilt pole to original tilt up position and lock in place
- Step12: Close NMT enclosure and lock as appropriate

10.4.7 SOUND LEVEL DISPLAY

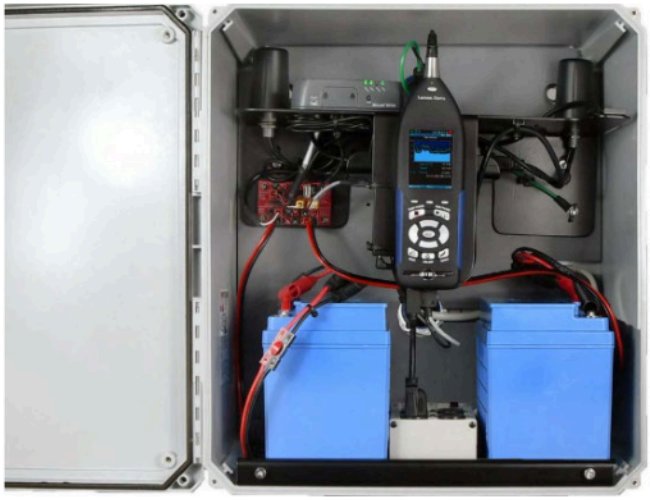
The existing LD831C NMT has a display that is visible not only remotely but also while inside the enclosure (see Figure 20). The fixed NMT has a color TFT LCD display that faces forward when the door of the enclosure is opened, and it can be read by a person standing on the ground in sunlight. The noise monitor also provides functionality to show the noise monitor display in a web browser on a mobile device such as a smart phone.

Figure 20: LD Sound Level Display

10.4.8 ELECTRONICS ENCLOSURES

It is PASSUR's approach to reuse the existing NMT enclosures wherever possible. If new or replacement NMTs are needed, PASSUR will perform a site survey prior to ordering any hardware to determine the physical and environmental integrity, as well as enclosure's space to fit new equipment for reutilizing the existing enclosures at each site in effort provide DEN the most cost-effective hardware replacement solution. The site survey report will be provided to DEN indicating the condition of each site enclosure and our recommendations.

PASSUR provided enclosures will be hinged with key locks and keyed alike. PASSUR will provide a minimum of two keys for each permanent monitor enclosure. PASSUR NMT installations will continue the existing capability of automatically identifying and reporting when monitor enclosures are open.



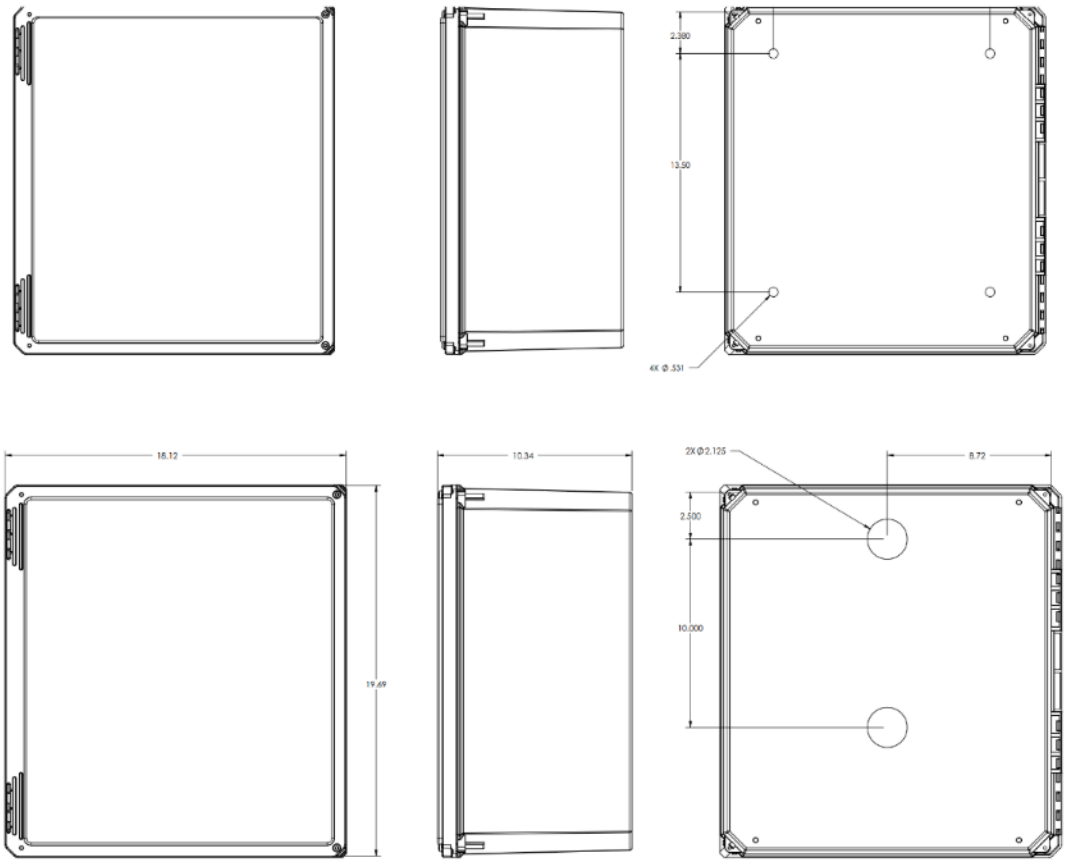


Figure 21: NMT Electronic Enclosure Dimensions

10.4.9 MICROPHONE MOUNTING POLES

PASSUR is proposing to utilize the existing NMT enclosure and microphone-mounting poles for each fixed NMT. The NMT will consist of conduit and enclosures to protect wiring from external disturbances including people, animals, and environmental conditions. The measurement microphones will be installed to be free from any obstructions that could affect measurement accuracy. If PASSUR should find that there is a need to replace specific or all existing poles, PASSUR will provide the reasoning and additional costs required.

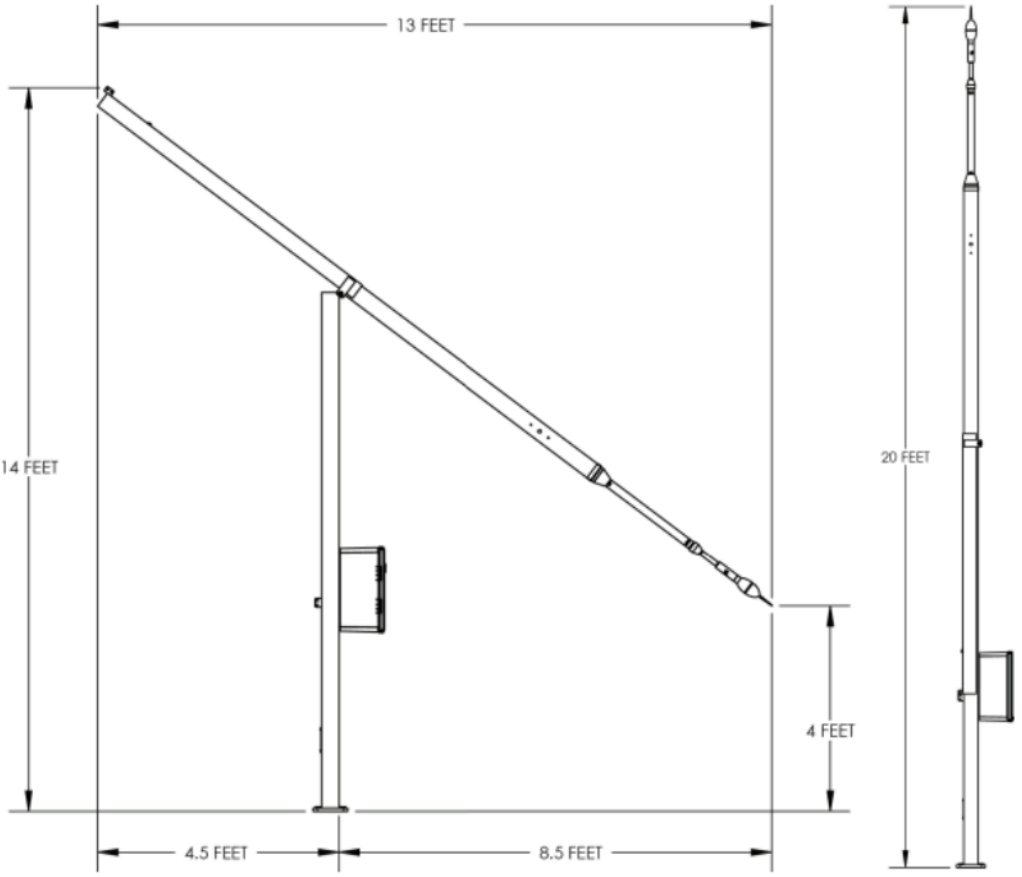


Figure 22: Mounting Pole Dimensions

10.4.10 VIBRATION ISOLATION

The fixed NMT installation is designed so that vibration and/or sound do not produce rattling or unwanted noise and will comply with this requirement. The component most susceptible to vibration is the microphone since vertical movement can appear as sound. The microphone is mounted to minimize vertical motion.

10.4.11 LIGHTNING, MAGNETIC, ELECTROSTATIC

The LD 831C NMT has been tested for the effects of operation near 60 Hz power lines and no effect can be detected. For safety reasons, it is recommended to be further than 2 feet from overhead power lines. Components that are sensitive to electrostatic and RF interference are shielded and fully comply with the Europe requirements in CE for RF and ESD immunity. The test report is available upon request.

10.4.12 WIND-INDUCED NOISE AND ENDURANCE

The LD831C NMT is designed to withstand wind velocities of 120 mph without damage.

10.4.13 DESIGN LIFE

The Larson Davis 831C NMT design life is over 10 years being a class 1 noise monitor. The model LD831C permanent noise monitoring system is designed for long term monitoring around airports, industrial facilities, motorsport complexes, wind farms, mining operations, and within the general community.

10.4.14 PROPOSAL REQUIREMENTS

PASSUR has a long and successful track record implementing and supporting the LD831C NMTs in conjunction with Larson Davis. PASSUR has included specific pricing for any future NMT replacements or additions in the Pricing Proposal document.

10.5 PORTABLE NOISE MONITORING FIELD KITS

The PASSUR proposed EnvironmentalVue application interfaces seamlessly with fixed and portable noise monitoring devices. Both proposed NMT equipment types (fixed and portable) are integrated into the EnvironmentalVue system architecture. Fixed and portable devices will provide all required noise measurement data and metrics.

10.5.1 PORTABLE NOISE MONITORING FIELD KIT COMPONENTS

Proposed PASSUR-provided portable monitoring field kit will include the following components:

- Automatic operation noise monitoring hardware capable of continuous, independent, outdoor operation, AC or battery power, with a method for manually initiated data transfer to the NOMS.
- Microphone and any required preamplifier with windscreen to reasonably minimize wind-induced noise and bird deterrent features.
- Two monitor-to-microphone cables, minimum of 50 feet in length.
- A cellular modem for downloading to the NOMS.
- External microphone calibrator.
- Lockable, weatherproof security case or cases with interior space to hold the monitor, extra batteries, and any other system components to be left in the field, and all other field kit components for transport.
- Tripod appropriate for securely mounting the microphone to at least a height of 1.5-meters, suitable for continuous outdoor operation.
- Power cable for AC operation where available, minimum of 50 feet in length.
- Two rechargeable battery packs, each allowing a minimum of eight days of unattended operation, and battery charger(s) sufficient to recharge one battery pack within 24 hours.
- Chains and locks that provide a means for securing the equipment.
- Handheld weather station for observing weather conditions during site visits.
- Integrated GPS within the sound level meter or a stand-alone GPS unit.
- Camera for site photographs.
- Other components required by PASSUR's portable monitoring field kit design.

10.5.2 DATA TRANSFER MECHANISM

Noise data can be recovered from the Portable NMTs either through the use of USB thumb drive or automatically downloaded remotely as with the fixed NMT sites via wireless modem if the option is purchased.

10.5.3 EXTERNAL CALIBRATOR

DEN will utilize the CAL200 acoustic calibrator. External Noise Monitor Calibrations will be performed once every year throughout the maintenance period of the contract. The CAL200 is a IEC 60942 Class 1 Handheld, 9 VDC battery operated, Sound Level Calibrator designed for ½" microphones operating at 1000 Hz and can operate at temperatures ranging from -10°C to +50°C.

10.5.4 PORTABLE MONITOR CASES

The case for new DEN noise monitors will be a standard Pelican iM2720 with the following specifications:

DIMENSIONS

- Interior (L x W x D) 22.00 x 17.00" x 10.00 (55.9 x 43.2 x 25.4 cm)
- Exterior (L x W x D) 24.60 x 19.70" x 11.70 (62.5 x 50 x 29.7 cm)
- Lid Depth 2.00" (5.1 cm)
- Bottom Depth 8.00" (20.3 cm)
- Total Depth 10" (25.4 cm)
- Interior Volume 2.16 ft³ (0.061 m³)

Figure 23: NMS044 Larson Davis Portable Noise Monitor System

The portable will be packaged to weigh less than 40 lbs. If DEN requires a custom-built case to fit all equipment inside (extra batteries, tripod, extra cables, etc.), Larson Davis said they would have to provide a quote at the time of purchase due to the custom nature of the request.

10.5.5 INDEPENDENT OPERATION

The portable noise monitor will be capable of sustained independent operation without user intervention and without any connection to power or communication lines for eight days. The time required for replenishment after eight days of operation will be less than one hour. This includes the time it takes to replace any consumables, including batteries. System calibration and transfer of accumulated data is also included in the 1-hour replenishment budget.

10.5.6 GLOBAL POSITIONING SYSTEM RECEIVER

Each new noise monitor will include an integrated GPS and will automatically communicate its location with the data. The built-in GPS is also used as a time source to keep the noise monitor clock accurate.

10.5.7 PROPOSAL REQUIREMENTS

Although there are no plans to add additional Portable NMTs at this time, PASSUR has a long and successful track record implementing and supporting the LD831C NMTs in conjunction with Larson Davis. PASSUR has included specific pricing for any future Portable NMT replacements or additions in the Pricing Proposal document.

11. ACCEPTANCE TESTING

Both the EnvironmentalVue and PublicVue solutions have already been deployed and are in productive use by DEN. PASSUR will optimize an approach to be minimally intrusive to the day-to-day operations during any upgrades or rollouts of new components of these software solutions for DEN. PASSUR will meet with the DEN staff to walkthrough the statement of work in detail to create a traceability matrix. This will be used to define a rigorous validation approach of each new deliverable component. At DEN's discretion, the testing can be stream-lined by deciding not to retest components, previously deployed and unaffected by the implementation. Time saved can be used to provide supplemental and advanced training and consulting to DEN staff on use and advanced use of the products.

11.1 ACCEPTANCE TEST PLAN

Within 60 days of receiving the notice to proceed from the DOA, PASSUR will submit an acceptance testing plan that meets or exceeds the requirements outlined in 11.2 through 11.9. The DOA will review the test plans for adequacy prior to initiation of the on-site performance demonstration.

11.2 IN-PLANT TESTING OF REMOTE DATA ACQUISITION EQUIPMENT (UNOBSERVED)

PASSUR will provide documentation to the DOA that demonstrates that all noise measurement equipment to be used in outdoor locations meets the acoustic and environmental requirements of these specifications. The DOA will pass or reject tested components based on their compliance with these specifications and may require substitution and testing of alternative components.

11.3 INITIAL ON-SITE PERFORMANCE DEMONSTRATION

At the completion of on-site system installation, PASSUR will demonstrate to the DOA representatives that the NOMS meets all requirements of these specifications, including test runs of all hardware and software, and collection and processing of all data types for at least two weeks.

11.4 ACOUSTICAL CALIBRATION

PASSUR will perform an acoustical calibration of each permanent and portable noise monitor. At the option of the DOA, the DOA representatives may observe the calibration. A report on the calibrations detailing initial, 30-day, and any interim calibration values will be provided as part of the final acceptance test report.

11.5 PORTABLE NOISE MONITOR DOWNLOAD

Software and hardware to download the data from new portable noise monitors in the field must be demonstrated to the DOA's representatives. This data must then be uploaded into the NOMS for the purpose of demonstrating the graphical displays and reports that relate to noise data. PASSUR will mitigate any defects found prior to acceptance. For this, PASSUR will also ensure that the Noise Office Staff is trained and is comfortable executing the required steps for this process.

11.6 OPERATIONAL TEST

After the DOA determines that PASSUR has successfully concluded the tests required in Section 11.2 through 11.5, the 30-Day Operational Test will commence. The NOMS must be considered to have met the requirements of the operational test if it is fully operational for at least 30 consecutive days. If the NOMS does not pass this test, PASSUR will repair or replace NOMS elements and initiate additional tests until the system is fully operational for 30 consecutive days. PASSUR will mitigate any defects found prior to acceptance.

11.6.1 ADDITIONAL ACCEPTANCE TESTING

The DOA reserves the right to extend the Operational Test phase to include larger sample sizes and extended testing, until PASSUR has demonstrated to the DOA's satisfaction that the system is fully installed and meets minimum specified performance requirements, with the exception of minor "punch list" items of the nature discussed in 11.6.2.

11.6.2 COMPLETION PUNCH LIST

When the DOA, at is sole discretion, determines that remaining deliverables and completion requirements are minor in nature and will not prevent the NOMS from acquiring and reporting accurate data and that the NOMS is performing satisfactorily to permit the DOA to use it on a daily basis in place of the existing NOMS, the DOA will provide notice to PASSUR that the Operational Test is complete and provide a completion punch list of minor omissions and defects required to achieve full compliance with the project specification and achieve final acceptance of the NOMS. Examples of potential punch list items may include minor cosmetic changes and preferences, system fine-tuning, report tuning, and the resolution of minor functional anomalies.

11.7 OPERATIONAL CERTIFICATE

At the successful completion of the Operational Test, including the side-by-side test, and when the DOA commences using the NOMS operationally, the DOA shall issue PASSUR with an "Operational Certificate." The issuing of the operational certificate shall start the NOMS warrantee period.

The operational certificate shall state that the NOMS is operationally and substantially in compliance with these Technical Specifications. The operational certificate shall detail the punch list of items requiring completion to achieve final acceptance of the NOMS.

Final acceptance of the NOMS shall not occur until the punch list items have been closed and the other conditions for final acceptance defined in Section 11.9 have been met.

11.8 REMOVAL OF EXISTING NOMS COMPONENTS

Prior to or at the completion of the Operational Test, PASSUR will identify all existing NOMS components that the NOMS requires to meet performance specifications.

PASSUR will provide a plan and schedule for the removal of the remaining existing NOMS components. Following DOA review and approval of the plan, PASSUR will be responsible for removing the unnecessary existing NOMS components and providing them to DOA for disposal. PASSUR will be responsible for ensuring the removal of the existing NOMS hardware and software will not result in the loss of NOMS data and/or functionality.

The continued maintenance and support of the retained existing NOMS components will become PASSUR's responsibility upon notice of the NOMS final acceptance through the initial warranty period and any warranty extensions.

11.9 FINAL ACCEPTANCE

To obtain final acceptance, PASSUR must undertake the following steps:

- Meet with the DOA's Project Manager to confirm that PASSUR has satisfactorily addressed all acceptance punch list items identified throughout the acceptance testing.
- Prepare and submit a final acceptance test report to the DOA that summarizes the acceptance test process, including start and end dates for all test elements, a summary of system deficiencies identified in each phase, the corrective actions taken, the results of the corrective actions, and the results of the acoustic calibrations. The acceptance test report must include validation of the accuracy of the flight operations coordinates.
- Demonstrate to the DOA's satisfaction that the NOMS meets specified requirements.
- Complete removal of the unnecessary existing NOMS Components.

The DOA shall provide PASSUR with written notice when NOMS meets full requirements for final acceptance. PASSUR will provide the DOA a final inter-connectivity device map within 30 days of written acceptance. The device map shall be updated upon changes to the system over the duration of the contract.

12. DATA OWNERSHIP

PASSUR acknowledges DEN's full ownership of all data collected or integrated into the proposed NOMS. In addition, PASSUR acknowledges the data ownership requirements for the proposed solution. No party will use, transfer, copy, modify, or remove any collected and stored data without written permission from DEN.

PASSUR will provide copies of licenses and documentation for all third-party data sources that the NOMS uses in the name of DEN, under the terms established by the licensed providers.

PASSUR will not use, display, or distribute noise, complaints and/or flight track data that have been collected or processed by or stored in the NOMS without the expressed written permission of DEN as stated in the RFP.

13. WARRANTY AND MAINTENANCE

PASSUR will provide the following NOMS warranty elements detailed below.

13.1 SYSTEM WARRANTY

- The PASSUR offer includes a complimentary two (2) year manufacturer's hardware warranty on any new Larson Davis NMTs. PASSUR will provide all hands-on maintenance and service of the noise monitoring terminals through our locally based technicians. All technicians will be trained in NMT troubleshooting and support.
- PASSUR will provide all parts and labor necessary to keep the PASSUR maintained equipment in operating condition. Replacement parts will be new or reconditioned parts that meet the original functional requirements and, upon installation, become the property of the licensee. Replaced parts removed from the maintained equipment will be the property of PASSUR. Consumable items, such as bird spikes, wind- screens, etc. that are part of maintained NMTs will be replaced as needed.
- PASSUR will provide all updated versions of the NOMS software to DEN at no additional cost throughout the life of the contract.
- PASSUR provides 24/7 remote customer support by phone at 866-437-7247.
- PASSUR uses a web-based, Symphony Trouble Tracking System (STTS) to monitor/track customer problems. This system will be used to measure issue status, resolution and response timeliness.

13.2 SYSTEM MAINTENANCE AND REPAIR

See Section 1.8 MAINTENANCE PLAN in main body of Statement of Work for additional details.

PARTS AVAILABILITY – PARTS REPLACEMENT (TRACKING)

See Section 1.8.4 PARTS AVAILABILITY in the main Statement of Work body for additional details.

CALIBRATIONS & SCHEDULED PREVENTIVE MAINTENANCE

NMT Calibrations will be performed initially during new site installations, again at the end of the evaluation period, and annually on the anniversary of the last day of the evaluation period. Additional calibrations may be required throughout the warranty period of the NMTs if failures occur such that calibrations are required before the system can be brought online (e.g. in the event of microphone or noise monitor failures).

13.3 REMEDY CHOICES AVAILABLE TO DEN

During the original or renewal warranty and maintenance period, should PASSUR's available technical support team not completely repair or return to good working order any system failure, PASSUR will:

- Provide onsite technical support at no additional cost to DEN
- Replace the malfunctioning Hardware and/or software with new or identical items at no additional cost to DEN
- Obtain the necessary repair/replacement parts by the most expeditious means necessary at no additional cost to DEN

13.4 MALFUNCTION REPORT

PASSUR will provide the DEN NOMS program manager with a written and signed Malfunction / Maintenance report within 5 days of completion of every documented maintenance action relating to the Noise Monitoring Hardware. Each report will include:

- The date and time of arrival
- Time spent for repair
- Type and number of item(s) repaired
- Description of the malfunction
- The corrective actions taken
- The name of the Contractor's maintenance representative.

13.5 DEN RESPONSIBILITIES

1. With proper notice, DEN will permit PASSUR and its personnel, subject to security regulations and work schedules, access to equipment for maintenance purposes.
2. DEN will permit PASSUR sponsored modifications, agreed to by DEN, within a reasonable time after being notified by PASSUR. Such modifications must not interfere with normal day-to-day operations of DEN and must never be made without prior DEN knowledge and consent.
3. DEN's responsibilities related to maintenance and repair will be limited to notifying PASSUR, and to limited attempts at troubleshooting (not to exceed two hours), following telephone directions provided by PASSUR.

13.6 WARRANTY RENEWAL OPTIONS

PASSUR warrants the proposed Noise Operations Monitoring System software for the entire 5-year duration of the contract (3-year base term with 2 subsequent option years) and therefore requires no renewal fees from DEN for any aspect of the system. New Larson Davis NMT Hardware will be warranted based on when it was installed (each comes with a 2-Year warranty from installation and acceptance by Denver). After the 2-Year hardware warranties expire, repairs will be covered under the annual NMT maintenance and support plan. Extended Larson Davis NMT warranties can be quoted upon request if the annual NMT maintenance and support plan option is not selected.

14. MANUALS AND DOCUMENTATION

PASSUR will provide DEN with system manuals and required documentation. The manuals and documentation will be provided in electronic format, as well as hard copy format, bound in loose-leaf binders, suitable for standard office reproduction.

14.1 SYSTEM OPERATION MANUALS

PASSUR will provide DEN with digital copies of the complete system setup, operating and trouble-shooting manuals. The manuals will be indexed and provide step-by-step instructions for all system operations.

14.2 PREVENTATIVE MAINTENANCE REQUIREMENTS MANUAL

PASSUR will supply a manual that describes preventative maintenance, including the following information:

- Preventative Maintenance Requirements
- Schedule of Tasks to be Performed
- Parts to be Replaced or Refurbished, etc.
- List of all Equipment (and any special tools to maintain and calibrate the NOMS)

14.3 ADDITIONAL DOCUMENTATION

PASSUR will also supply the following DEN required documentation:

- Documentation for PASSUR-provided software, including a description of overall database structure, individual file components, and data formats
- Third-party software manufacturers' operating manuals
- Third-party hardware manufacturers' operating and service instructions
- Complete parts inventory
- Estimate of a one-year supply of all system consumables
- Documentation of initial NOMS software parameter values and the processes for establishing and revising them
- Maintenance and use of the portable noise monitoring kits

15. TRAINING

PASSUR will conduct detailed customized training for a minimum of eight (8) DEN staff in the care and operation of the proposed NOMS solution. PASSUR will also provide advanced system training for a minimum of three (3) DOA system operators to perform DOA-related maintenance duties, external calibrations of the permanent noise monitors, and use of the portable noise monitors. Initial training will take place after the system is fully and successfully operational and will be on site with recurrent training (refresher, new user, and new feature) offered via webinar as needed. As an extension of the DEN staff, PASSUR can offer advanced training as needed. In addition, PASSUR also makes regular visits to users of Symphony technology throughout the year when more training can be provided in accordance with the DEN

staff's wishes. The appropriate and required user documentation manuals will be provided and updated as necessary throughout the life of the contract.

PASSUR will provide a complete overview of the NOMS and all data acquisition, processing, correlation, and reporting functions. Additionally, PASSUR will further familiarize system operators with all aspects of the capabilities of the delivered technology, adding to the DEN staff's already significant knowledge of the current NOMS in place. Included in the training will be exporting data from the NOMS database for the creation of noise contours.

The initial NOMS training is usually performed on-site for two to three days, and the agenda is tailored to meet clients' needs. Training can also be provided via the web. Users will be trained in all aspects of their unique systems. Initial software training is anticipated to be conducted by Sam Carter, and hardware training is anticipated to be conducted by Patrick O'Callaghan and/or Ken Perez. An example of an initial NOMS training plan is below.

Day 1: Navigating the User Interface

Training will begin with an introduction to all of the features, windows, and capabilities of the Symphony EnvironmentalVue application. Trainees will learn what the software can do as well as the basics of accessing it and most of its commonly used features.

I. Logging in, Menu bar, Map, and Tables
   a. Proper URL and login credentials
   b. Available tools and windows
   c. Accessing and arranging maps
   d. Accessing Smart Tables of flight, noise event, and complaint data
   e. Saving and accessing workspace Vue
   f. Multiple vue files
   g. Setting default vue

II. Detailed map manipulation
   a. Viewing map layers
   b. Changing map layer properties
   c. Copying map layers

III. Querying data
   a. Select date/time of flight, noise, and complaint data for viewing
   b. Filter data query criteria
   c. Customize flight track data appearance

Day 2: Detailed Data Analysis

Training will continue with more sophisticated operation of the Symphony EnvironmentalVue software. Trainees will learn how to view data in greater detail as well as how to use EnvironmentalVue for complex analysis.

IV. Using SmartTables
   a. Sorting data
   b. Changing the column display order
   c. Grouping data
   d. Highlighting rows
   e. Filtering data
      i. In the SmartTable
      ii. On the map

V. Noise and complaint data
   a. Understanding noise event data
   b. Entering complainant and complaint data
   c. Associating flights with noise events and/or complaints

VI. Gates and PCAs
   a. Understanding and creating gates
   b. Understanding and creating PCAs (points of closest approach)
   c. Performing gate and PCA analysis
   d. Reviewing gate and PCA analysis results
VII. Advanced track analysis
   a. Animated flight track playback
   b. Average track
   c. Track Density Plot
VIII. Working with charts
   a. Altitude Profile Chart
   b. Noise Event Chart
   c. Noise Playback Chart
   d. Gate Penetration Chart

Day 3: Practical Exercises

IX. Flight Track Analysis
   a. Using actual gates
   b. Monitoring track procedures
   c. Practical PCAs
X. Complaint Handling
   a. Data Entry
   b. Complaint investigation/response
XI. Noise Data Analysis
   a. Noise Event Data
   b. Summary Noise Data
XII. PublicVue
   a. DEN Staff training
   b. Public Webinar (if deemed necessary by DEN)
XIII. Community Noise Portal
   a. Setup for DEN

This training outline assumes that trainees will have three full days to devote to the training process. The schedule can be modified to accommodate other duties that trainees may have. However, that would require a longer period of time on site. PASSUR's approach to the training process maintains enough structure to convey the required skills to successfully utilize Symphony EnvironmentalVue while allowing enough flexibility to accommodate special interest in certain features on the part of trainees.

After the completion of initial on-site training, PASSUR training staff offers extensive recurrent training via web hosted sessions that are offered to all Symphony EnvironmentalVue users or can be arranged on an individual basis to reinforce understanding of a particular feature.

Denver International Airport (DEN) Noise Office

Noise and Operations Monitoring System (NOMS) Replacement Statement of Work

1. PROPOSED WORK PLAN AND APPROACH

1.1 BASE SERVICES SOLUTION OVERVIEW

Software/Service	License/Unit Quantity	Description
Symphony EnvironmentalVue	10	Noise & Operations Monitoring System
Symphony PublicVue	Unlimited	Public Flight Tracking Portal
Symphony Community Portal	Unlimited	Community Portal for Airport Shared Noise, Complaint, & Operations Related Information
Symphony Contours with VNMs		Automated Generation of Noise Contours
Noise Monitoring Terminal (NMT) Support	26 NMTs	Support of DEN's Permanent B&K3639-C NMTs (Subject to B&K's Parts & Services Availability) Until They Are Replaced with LD831-C NMTs in the 2025 Contract Year
NMT Upgrade/Replacement	26 NMTs	Replacement of DEN's Permanent BK3639-C NMTs with Permanent LD831-C NMTs

1.2 PROJECT MANAGEMENT

PASSUR is committed to providing the most professional and outstanding project management, project delivery, account management, customer support, and product development services to deliver a state-of-the-art solution to DEN. Mr. Chris Rossano, Symphony's Chief Software Engineer, will serve as the Project Manager (PM), coordinating and managing the implementation schedule and tasks with the PASSUR Management and Support Teams. Project Management consists of all tasks associated with the coordination and communication of all scheduled activities and dependencies. PASSUR coordinates project activities seamlessly within the team to meet project deliverables. This includes the oversight of deliverable documentation, software, testing and training activities, as well as administrative functions such as contracts, finance, and customer relationship management. Project management activities are collaborative efforts between DEN and PASSUR, as well as PASSUR and its subcontractors to ensure the project stays on schedule, all requirements are met, and that there is limited impact to continuity of operations.

1.3 IMPLEMENTATION

As the incumbent NOMS provider, the following PASSUR software solutions are already deployed and in use by DEN:

- Symphony EnvironmentalVue
  - Includes ReportVue & EnvironmentalVue Portal features
- Symphony PublicVue

Table 1 below provides a list of the anticipated milestones and key deliverables.

Table 1: Milestones & Key Deliverables

Milestone/Key Deliverable	
EnvironmentalVue Feature Enhancements Using 200 Annual Gratis Software Development Hours	Testing
Contours with VNMs	User Manuals
Community Noise Portal	Training
NMT Upgrade in 2025	NOMS Acceptance

1.4 MANUALS & DOCUMENTATION

PASSUR will provide system manuals and documentation. All manuals and documentation will be provided in electronic format, as well as hard copy format (if desired), bound in loose-leaf binders, suitable for standard office production.

1.4.1 SYSTEM OPERATING MANUALS

PASSUR will provide digital copies of complete system setup, operating, and troubleshooting manuals. The manuals will provide instructions in a "cookbook" fashion, with step-by-step instructions for all system operations, and with keystroke-by-keystroke instructions for all system software functions including coverage of all of PASSUR's proprietary software, input of all required data and preparation of all required output. The manuals will include a hyperlinked index.

1.4.2 PREVENTATIVE MAINTENANCE REQUIREMENTS MANUAL

PASSUR will provide a manual that describes preventive maintenance requirements in detail, including a schedule of tasks to be performed, parts to be replaced or refurbished, etc. This manual will include a list of all equipment, and any special tools required to maintain and calibrate the NOMS.

1.4.3 ADDITIONAL DOCUMENTATION

PASSUR will provide the following documentation:

- Documentation for proposing firm-provided software, including a description of overall database structure, individual file components, and data formats
- Third-party software manufacturers' operating manuals
- Third-party hardware manufacturers' operating and service instructions
- Complete parts inventory
- Estimate of a one-year supply of all system consumables
- Documentation of initial NOMS software parameter values and the processes for establishing and revising them
- Maintenance and use of the portable noise monitoring kits

1.5 TRAINING

PASSUR will conduct detailed customized training for a minimum of eight (8) DEN staff in the care and operation of the proposed NOMS solution. PASSUR will also provide advanced system training for a minimum of three (3) DOA system operators to perform DOA-related maintenance duties, and external calibrations of the permanent noise monitors. If portable NMTs are purchased in the future, PASSUR will provide training on the use of the portable noise monitors at the time of delivery. The advanced training will permit these staff to perform system administration duties. Initial software training is anticipated to be conducted by Sam Carter and Chris Rossano, and hardware training is anticipated to be conducted by Patrick O'Callaghan and/or Ken Perez. Initial training will take place after the system is fully and successfully operational in a classroom type setting and will be on site if desired by DEN with recurrent training offered via webinar as needed. PASSUR also makes regular visits to users of Symphony technology throughout the year when more training can be provided in accordance with the DEN staff's wishes. The appropriate and required user documentation manuals will be provided.

PASSUR will provide a complete overview of the NOMS and all data acquisition, processing, correlation, and reporting functions. Additionally, PASSUR will further familiarize system operators with all aspects of the capabilities of the delivered technology, adding to the DEN staff's already significant knowledge of the current NOMS in place. The initial NOMS training is usually performed on-site for two to three days, and the agenda is tailored to meet clients' needs. Training can also be provided via the web. Users will be trained in all aspects of their unique systems. An example of an initial NOMS training plan can be found in Section 15. TRAINING of Attachment 1 – Technical Specifications.

This training outline assumes that trainees will have three full days to devote to the training process. The schedule can be modified to accommodate other duties that trainees may have and prioritize training on the most desired topics from the training outline above. Follow-up web-based training sessions will be provided as needed. PASSUR's approach to the training process maintains enough structure to convey the required skills to successfully utilize Symphony all software while allowing enough flexibility to accommodate special interest in certain features on the part of trainees.

After the completion of initial on-site training, PASSUR training staff offers extensive recurrent training via web hosted sessions that are offered to all Symphony EnvironmentalVue users or can be arranged on an individual basis to reinforce understanding of a particular feature, provide new users training, and/or train on new NOMS features.

1.6 TESTING PLAN

System Acceptance testing will be a supervised test with the DEN NOMS PM. PASSUR has established several "best practices" with respect to NOMS project testing, failures and acceptance. The PASSUR PM will provide a thorough plan for the DEN to review and accept in advance of acceptance testing. PASSUR will leverage previously proven test plans that have been implemented and executed in the past and will work with the DEN NOMS project manager to execute an acceptance test plan that is mutually agreeable to both parties to limit cost and to maintain schedule requirements.

1.7 PROBLEM REPORTING

PASSUR automates event notifications and makes every effort to be notified of any software or hardware related issues before the client is aware of any potential problem. If an issue arises and the client wishes to report it, PASSUR provides 24/7 support via phone, email, and PASSUR's web-based, Symphony Trouble Tracking System (STTS) which is used to monitor customer issues. This system will be used to measure issue status, resolution and response timeliness. The system is available at https://secure.symphonycdm.com/support/ and requires airport name, user and password for authentication. The STTS allows DEN staff to monitor the progress of the trouble ticket as it is addressed, escalated if necessary, and closed. PASSUR also provides a user hot-line support number at (866) 437-7247. Calls to this hot line are entered into the STTS for monitoring and reporting. The support team can also be reached via the SymphonySupport@PASSUR.com email address. PASSUR will respond either by e-mail, telephone, or through the web-based STTS within 5 business hours to any entries into the STTS by the customer.

1.8 MAINTENANCE PLAN

NMT maintenance and support is subject to parts and repair availability and service/delivery timelines of the NMT manufacturer, B&K. See the sections below, as well as Attachment 1 – Technical Specifications for additional information.

1.8.1 HARDWARE MAINTENANCE

PASSUR will provide all hands-on maintenance and service of the noise monitoring terminals through our locally based technicians. PASSUR has three (3) Denver area-based technicians, and another two (2) within 4 hours of DEN. PASSUR also commits to using a local disadvantaged business enterprise (i.e. SBE, MWBE, etc.) for NMT support. All technicians and any subcontractors will be trained to maintain the BK3639-C NMTs, as well as the LD831C NMTs if current NMTs are replaced, and will be supported remotely by PASSUR's expert technical support staff.

PASSUR will provide all parts, equipment, and labor necessary to keep the PASSUR maintained equipment in operating condition, subject to parts and repair availability of the NMT manufacturer, B&K. Replacement parts will be new or reconditioned parts that meet the original functional requirements and, upon installation, become the property of Licensee. Replaced parts removed from the maintained equipment will be the property of PASSUR. Consumable items, such as bird spikes, wind- screens, etc. that are part of maintained NMTs will be replaced as needed. Onsite preventive maintenance including annual calibrations, troubleshooting, and repair will be performed by PASSUR's local technicians or subcontractors. Using available spare parts, the technician will troubleshoot the NMT. Faulty parts will be mailed in to the manufacturer to be repaired or replaced. Once the part is repaired or replaced, it will be reinstalled at the NMT site, or returned to the spare parts inventory at DEN.

PASSUR will respond to a major NOMS failure so as to commence appropriate action to correct the failure within twenty 24 hours from either: (1) the time that the NOMS provides the proposing firm with an automatic system failure alert, or (2) from the time that the DOA contacts the proposing firm personnel or leaves a message at the designated proposing firm telephone number, whichever is earliest. Subject to availability of spare parts from the manufacturer, PASSUR will correct major failures within 72 hours of notification. Major system failures are defined as failure of any system component(s) that will result in the permanent loss of data from any noise monitor, or from the flight operations and identification monitoring system. All other failures will be considered minor failures. PASSUR will respond to a minor NOMS failure so as to commence remedial action within 72 hours from the time the DOA contacts proposing firm personnel or leaves a message at the designated proposing firm telephone number. The proposing firm must correct minor failures within two business

weeks of notification. PASSUR will notify the DOA of any conditions that have developed or that might develop that might affect the proper operation of the NOMS, as defined in these specifications.

During the original or renewal warranty periods, under the proposing firm's maintenance obligations, the proposing firm will be responsible for any costs for the maintenance and warranty items listed in Section 13.2 SYSTEM MAINTENANCE AND REPAIR of Attachment 1 – Technical Specifications.

1.8.2 SCHEDULED PREVENTATIVE MAINTENANCE

PASSUR has an inspection checklist/preventative maintenance report that is completed after a site visit or calibration visit. PASSUR will do a mechanical inspection of the site which includes the following checks:

Table 2 – Site Mechanical Inspection Checks	
Condition of Fence	Windshield Foam
NMT Cabinet Condition	Bird Spike
Moisture Inside NMT	Lightning Rod
NMT Insect Infestation	Earth Connection
NMT Desiccant	Mast & Mast Mounting
Conduit Condition	Other Unique Site-Specific Items as Applicable

PASSUR checks a site status report of each NMT daily for any issues with the site. If any issues are found a trouble ticket will be created to track the issue resolution. The DEN staff is notified daily of NMT status, as well as provided with calibration reports after each annual calibration. PASSUR will perform all scheduled preventative maintenance on the NOMS between the hours of 8 a.m. and 6 p.m. (local time), Mondays through Fridays only, on days on which the DEN conducts normal business. PASSUR shall contact DEN at least five business days in advance to schedule preventative maintenance.

1.8.3 NOMS MAINTENANCE AND REPAIR

With PASSUR' local field tech presence, we can repair most noise monitoring issues within 48 hours, subject to spare parts availability. If there is an issue with a remote monitoring site, PASSUR will request DEN staff to verify that electric power and communications at the remote site are in good working order. Once DEN staff confirm utilities are in good working order, if the issue has not been resolved, PASSUR will dispatch a local technician. Using locally stored available spare parts, the technician will attend on-site to perform hardware maintenance/part switch out to correct a malfunction on the equipment at the site. Replaced parts will be mailed in to Bruel & Kjaer (B&K) for repair or replacement, and the repaired or replaced part will be reinstalled at the NMT site or returned to the local spare parts inventory for DEN. PASSUR will also work with B&K or Larson Davis on required firmware upgrades, and PASSUR will calibrate NMTs annually.

1.8.4 PARTS AVAILABILITY

PASSUR reached out to B&K to obtain pricing for spare parts and repair services for DEN's 3639-C NMTs and was informed that B&K stopped selling the 3639-C-100 in 2018 so according to their policy to maintain repair services for 5 years from last order date, it is not on their list of repairable products. However, they checked the similarity to the 3639-A-100 cabinet that they phased out in 2022 (and maintain repair services for until 2027), and they indicated the two cabinets seem to be identical except for the Outdoor microphone that is used (4184-A vs. 4952). They do have spare parts for the 3639-A-100 so they believe there is a good chance that they can repair a 3639-C-100 cabinet and provide the newer model microphone, but they would have to do a formal assessment on a case-by-case basis.

Therefore, since PASSUR is unable to buy spare parts from B&K and repair services will be assessed on a case-by-case basis, using any available spare parts that DEN has in their possession or is able to help PASSUR obtain at commercially reasonable pricing, PASSUR will maintain the NMTs, swapping out malfunctioning parts with spare parts and returning malfunctioning parts to B&K for repair. Turnaround times and repair or replacement availability are subject to B&K's turnaround times and repair or replacement availability.

All available spare parts will be stored at DEN (subject to their approval) to facilitate rapid response from our local technicians. If at any time the NMTs become unrepairable, as deemed so by B&K, PASSUR will work with DEN on a

NMT replacement plan. Two alternative approaches to NMT Maintenance have been provided in Section 1.4 of Attachment 1 – Technical Specifications.

1.8.5 GENERAL ITEMS EXCLUDED FROM MAINTENANCE

The following items are not included in PASSUR maintenance and support services:

- Repair or replacement of equipment under maintenance damaged by vandalism, accident, fire, riot, civil disturbance, or acts of war.
- Repair or replacement of equipment damaged by acts of God, including, but not limited to, lightning strikes, flood, unusually severe weather or other acts of nature.
- Repair or replacement of equipment under maintenance damaged by modifications or adjustments made by DEN personnel and not authorized by PASSUR.
- Electric and communication services.
- Equipment maintained by PASSUR for which repair parts or services are currently unavailable or become unavailable during this Agreement term, which can no longer be adequately and reasonably maintained, and equipment that reaches End of Life during the term of this Agreement.
- Damage to Maintained Equipment caused by leaking or corroded batteries.
- Paint or surface finished of any item of Maintained Equipment.
- Changes in third party data formats.
- Tree trimming, overgrown foliage, or other similar site maintenance work.
- Extermination Services.
- Remote site poles.

1.9 SOFTWARE SUPPORT

With the delivery of PASSUR' NOMS solution, PASSUR, in accordance with the agreed upon communication plan, will alert DEN staff of system failures including:

- Interruption of the operation of the server
- Failure to acquire time-perishable data, i.e., any failure that will result in the interruption of real time data collection, with no means of later recovery
- Failure of an NMT to satisfactorily complete a self-calibration
- Failure of the system to automatically transfer accumulated data from any external data acquisition device, including, but not limited to, transfer of accumulated noise, meteorological, or flight operations data
- Electrical power failure or telephone failure
- Intrusion by unauthorized personnel on the NOMS
- Interruption of the operation of any NMT, with identification of the NMT
- Every other system failure that would lead or has led to the loss of time-perishable data

PASSUR NOMS alerts users of system failures via email and other methods, in a timely manner in accordance with our network administration policies. Additionally, all system logs containing failure notices are maintained in the PASSUR NOMS database for as long as the relevant noise, operations, complaint, and other primary system data are maintained. PASSUR NOMS does not issue interim failure messages without any change to failure status and minimizes the reporting of information that does not contain useful and actionable updates for the user(s). All records pertaining to system failures will be maintained as long as the relevant noise, operations, complaint, and other primary system data are maintained.

1.9.1 RECOMMENDED SYSTEM REQUIREMENTS

Recommended system requirements are outlined in and continually updated in the Symphony Workstation Setup Guide, which will be provided to DEN.

1.10 SOLUTION DESCRIPTIONS

1.10.1 SYMPHONY ENVIRONMENTALVUE

Symphony EnvironmentalVue allows DEN to visually display in 2D and 3D real-time and historical ARiVA surveillance data, graphical weather data, view measured aircraft noise emissions, manage community complaints, and improve community relations by presenting information to the public. This is accomplished through published graphical and tabular reports. EnvironmentalVue also helps DEN improve environmental compliance and displays precise flight tracks.

ENVIRONMENTALVUE KEY FEATURES

Key features of EnvironmentalVue include the following:

- Powerful underlying GIS engine permitting users to confidently create the most accurate, robust maps and exhibits.
- Intuitive graphical user interface with robust reporting capabilities
- Access to real-time and historic flight track data
- Provides reporting of flight data such as type of operation, date/time of operation, runway, operator information, flight number, tail number, beacon code, origin or destination airport, and aircraft type
- 3D display is the NOMS industry's most dynamic and realistic, including highly accurate aircraft depictions and aircraft liveries (if available with flight plan data)
- Provides aircraft speed and altitude data throughout the whole flight track.
- 3D view of gates, corridors, and points-of-closest approach (PCA) result in powerful graphical exhibits for either industry experts or laypersons
- Variety of compatible platforms including Microsoft Edge, Google Chrome, and Mozilla Firefox
- User configurable Vues/workspaces consisting of tables, maps, & charting data displays. Customized Vues may be saved for ease of future access.
- A variety of map configurations (Road, Aerial, Aerial Labeled, etc.) as well as the ability to easily load your own or customized Georeferenced Maps
- Users may add layers like contours, gates and zones to analyze flight tracks. Flight track data can be exported to other formats like AutoCAD, GIS, JPEG, etc.
- Easily create gates, domes, and cylinders around specific points of interest on the map
- Smart Tables are directly connected to map displays and may be configured to report via a tabular output or map display (32 data fields may be filtered)
- Flight track data can be exported to other formats like AutoCAD, GIS, JPEG, etc.
- Historical replay, reporting and storage of flight data.
- Real-time and Historical Graphical Weather – 5 KM Radar Composite, Lightning, and Infrared Satellite
- Fully Integrated, Easy-to-Use, Video Capture Tools
- The ReportVue Module represents one of the industry's most powerful report-generation systems including custom reports, standard reports and standard outputs to PDF, Word, Excel and CSV files, and dynamic and interactive previews of the reports
- Customized sorting on the reported data along with ability to display data in easy-to-read graphical format
- The ReportVue module has built-in pivot table capabilities for enhanced analytical output
- EnvironmentalVue Portal provides users with a dashboard type interface that can be customized to display charts and graphs of complaint, noise, and flight operations data that is of most interest to DEN.
- Track and manage noise complaints.

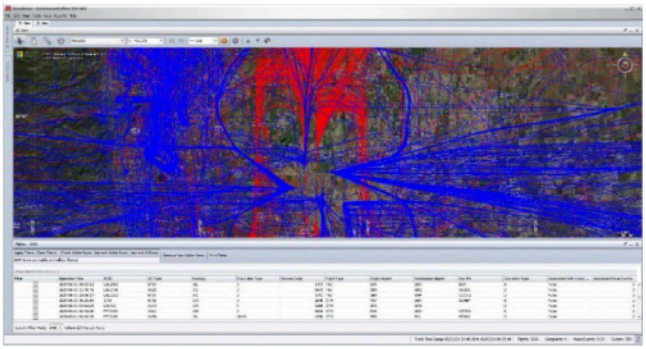


Figure 1: EnvironmentalVue tracks with Flight Table

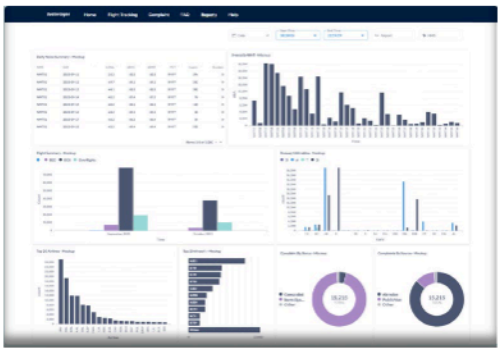


Figure 2: EnvironmentalVue Portal Dashboard Example

ENVIRONMENTALVUE PORTAL DASHBOARD

PASSUR will provide its next generation EnvironmentalVue Portal Dashboard to supply the essential reporting and dashboard visualization needs for DEN personnel. The EnvironmentalVue Dashboard (Dashboard) is an easy-to-use, lightweight, analysis tool that is part of the EnvironmentalVue Suite. It provides the user with nearly endless creation of business graphic visualizations. Working from the same EnvironmentalVue database, users may customize attractive dashboards to make consuming information as simple as looking at a picture. PASSUR will work with DEN to tailor the dashboards.

The tool itself can be used for flight operations data, complaint information, noise event and summary metrics, and weather data. Users may choose from a library of prefabricated charts and graphs or create their own for dashboard display. Individual graphics and charts or entire dashboards may be exported from the Dashboard in industry standard formats for use in other applications and documents. Furthermore, Dashboard users may share their information with other airport users thus creating an even larger community library of graphics and dashboards for even simpler implementation of this powerful data display tool.

SYMPHONY ENVIRONMENTALVUE REPORTVUE - AIRCRAFT OPERATIONS SELECTION, SORTING, AND REPORTING CAPABILITIES

Symphony EnvironmentalVue includes a powerful reporting tool, ReportVue. EnvironmentalVue users have the flexibility to create standard or ad hoc custom reports that can be shared with other airport stakeholders and the public through published reports or web-based community information portals. PASSUR provides an extensive library of standard reports built from decades of experience in the NOMS business. The standard reports in EnvironmentalVue are configured with the output automatically formatted. The user only needs to specify the date and time range which the report output will represent. Additionally, the user may use any of the fields within the report to filter which records will end up in the report output.

ReportVue allows users to select, sort, filter, group, compile and compute results using the entire database with its table and fields all in a point-and-click fashion. Users can query for and create custom reports of any data field(s) in the database including data on flight operations, weather, noise and complaint data. These reports can be displayed in table format or exported to PDF or an Excel file for further analysis. The user can also combine, or group records based on values in the same field of data such as combining similar aircraft types (i.e. Gulfstream IV and V) or records that may otherwise be related for reporting purposes. ReportVue also allows the operator to present tabular and graphic reports of the operations (or other data) sorted by these or any other categories. Users can use this capability to create an endless library of infinitely useful reports.

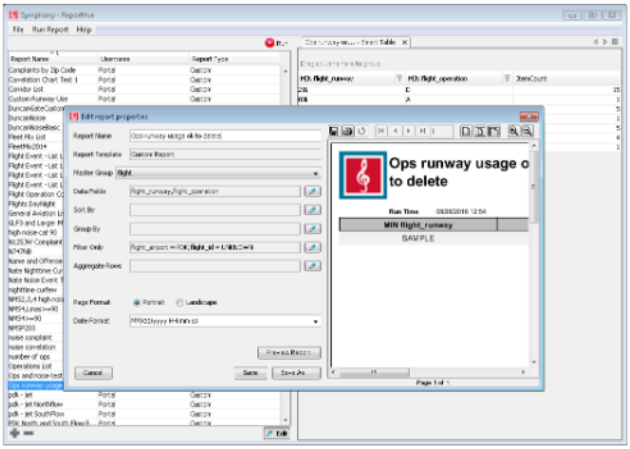


Figure 3: EnvironmentalVue ReportVue Custom Reports

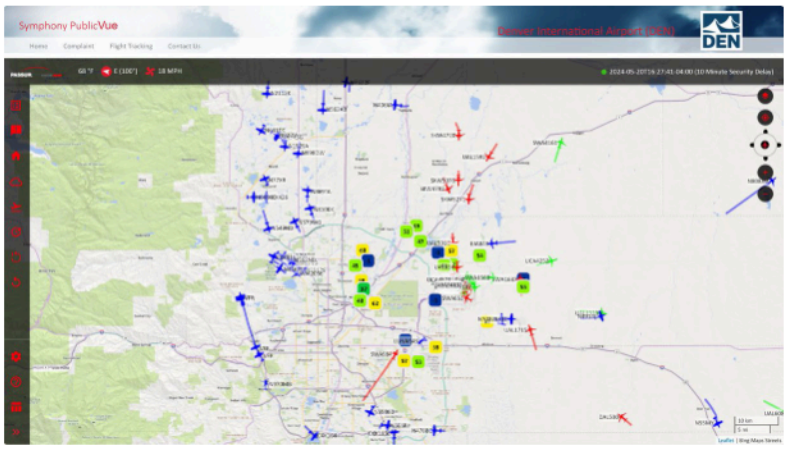


Figure 4: DEN Symphony PublicVue

1.10.2 SYMPHONY PUBLICVUE

PublicVue is a web enabled centrally hosted solution that delivers an advanced modern Public Flight Tracking System. The PublicVue solution with its high-quality flight tracking capabilities provides the public with accurate, complete, reliable, and robust visualizations of aircraft traffic. The tool includes extensive analytical capabilities and provides users with information for their education and to submit community complaints. PublicVue utilizes PASSUR ARiVA flight tracking and surveillance data, providing the most comprehensive view of flight activity around the airport.

Symphony PublicVue is currently utilized by over a dozen medium and large hub airports across North America. It is a web-enabled centrally hosted solution that delivers an advanced state-of-the- art Interactive Public Website for use by the community. The PublicVue solution, with its high-quality flight tracking capabilities, provides vivid visualizations and extensive analytical capabilities to the public. As the most publicly visible element of an airport's NOMS, citizens can access PublicVue via the Internet and locate their homes on the base map by inputting their address. This allows the user to then observe historical and real-time (or near-real time) flight operations near their residence. Symphony PublicVue also allows the user to directly input noise complaints via the Internet, which are accessible by DEN users through EnvironmentalVue.

PUBLICVUE KEY FEATURES

Key PublicVue features include:

- High definition, configurable displays that run on most web browsers
- Historic replay for flight tracking options
- Information available in real-time or with a customer defined security delay (if desired)
- Address Lookup and Locate Me (for smartphones & tablets) tools enable public to define location and show the relative position of the aircraft to that location
- Data accuracy, transparency, and consistency in what the public sees through PublicVue and what the Noise office analyzes in EnvironmentalVue
- Intuitive, user customizable displays, including 7 different map overlays and real-time weather overlays
- Tabular data supports filtering within the data table for public users who are interested in analyzing particular operations
- User configurable flight data tags, pop-up labels, icon sizing and colorization
- Flight following with optional display of the full flight path and slant angle/point of closest approach feature shows homeowners the exact route and profile of a flight in the vicinity of their location
- Ability to display real-time (or near real-time) noise data at DEN's Noise Monitoring Sites, as well as noise event levels in historical replay
- Real-time and historical graphical weather, lightning
- Customizable Home/Landing Page – Airport can choose a custom image, message, and logo to be included on a Home/Landing Page.

- Ability to post announcement messages to the community. The Airport can post messages to the community with relevant information (i.e., events affecting flight operations such as runway closures, changes in typical flight patterns due to weather, etc.).
- Customizable Contact Us Tab Airport may include contact information for public inquiry such as an address, phone number, e-mail address, and noise abatement URL
- Customizable complaint page where PHL can either provide instructions on how to submit a noise complaint, or if desired, provide the ability for users to submit community complaints via our online PublicVue Complaint Web Form which are integrated into the Symphony EnvironmentalVue database
- Fully integrated complaint creation auto-populates flight information
- Integration with EnvironmentalVue enables the public to submit complaints via PublicVue that will directly populate into the NOMS database

1.10.3 SYMPHONY COMMUNITY PORTAL – NEW FEATURE INCLUDED FOR DEN

The Community Portal is a customizable toolset designed for DEN constituents to explore, understand, and communicate with the airport, information related to aircraft operations and their impact on them. The tool includes extensive analytical capabilities and provides users with information for their education and to submit community complaints. Complaints may be submitted through the PublicVue website which may be accessed through the Community Portal.

Community Portal contains access to the Symphony PublicVue website for real-time (or airport-imposed delay) flight tracks, historical playback, online complaint filing, and more. Out of the box, the Community Portal will include a customizable dashboard with an array of interactive tools and capabilities via gadgets. Gadgets include aircraft mapping tools, weather information, Digital ATIS, informational charts, airport news, FAQs, complaint entry, and more. It also includes the ability to add other useful links from your airport, the FAA, and other sources you wish to provide to the greater DEN community. Its modern UI can be tailored to DEN's specific needs and the airport has the ability to choose which gadgets to display in their dashboards, along with how they are organized.

1.10.4 CONTOURS WITH VIRTUAL NOISE MONITORS (VNMS)

The PASSUR Contours and VNMS module currently utilizes the Integrated Noise Model (INM) and PASSUR is in the process of transitioning to the Aviation Environmental Design Tool (AEDT). This phased transition is anticipated to occur in the coming months. While VNMs can be used anywhere within the volume for which flight tracks are available, VNMs are especially useful in areas where there is a high ambient or a low aircraft noise level since INM only calculates the aircraft noise, resulting in aircraft-only noise metrics unaffected by ambient corruption.

VNMs can also be located anywhere they are needed and compute using available historical data. VNMs are enabled within Symphony Contours and currently use the INM calculated noise to produce the following standard daily NMT metrics:

- Leq (A-weighted equivalent sound level)
- Lmax (A-weighted maximum sound level)
- EPNL (Effective perceived noise level)
- SEL (Sound energy level)
- DNL (Day-Night average sound Level)
- CNEL (Community noise equivalent level)
- TALA65 (A-weighted noise level time above 65)

Although Contours with VNMs does not currently include single-event noise metrics, it is in PASSUR's current product roadmap to include them in a future update. VNMs would enable DEN to easily monitor different noise affected areas without the expense or challenges of physical or temporary noise monitors. Like AEDT, the long used and well proven INM determines noise exposure from aircraft utilizing aircraft operational details contained in the EnvironmentalVue database. While employing some additional advanced features, AEDT results are not only comparable to those of the INM but, they are equally subject to the margin of error introduced by the casual user in most airport administrative use cases. The preference of AEDT over INM can overlook this equivalence in favor of the appearance of greater accuracy. Use of both modeling tools has, does, and always will require the expertise of modeling professionals in their implementation for government approval and funding of noise abatement and mitigation projects. Given this, PASSUR respectfully proposes

a well-established contouring tool that, while still based on the INM, provides the consistent reliable contouring results and relative value that AEDT produces (without AEDT emissions modeling capabilities) for the expected use by DEN.

Please note that performing an "official" Part 150 Study is not the purpose of the automated Contours and VNM product. It is always recommended that noise modeling consultants/ professionals be consulted to develop and explain modeling results when needed for official Part 150 use.

1.10.5 LD831C NMTS FOR REPLACEMENT OF DEN'S CURRENT B&K 3639-C NMTS & ADDITIONAL NEW NMT SITES

PASSUR, partnered with respected acoustic industry leader Larson Davis, offers DEN the most technologically advanced NMT on the market. The Model 831C represents the latest cutting-edge technology in the NOMS industry and is 100% made in the U.S. PASSUR, unlike certain competitors, offers noise monitors like the Model 831C which utilizes an open architecture and standard data formats allowing it to interface with any NOMS software. The new, state of the art, Larson Davis SoundAdvisor Model 831C noise monitor is designed to be networked and open to any software vendor. Larson Davis offers a SDK (Software Development Kit) to support open integration. This open architecture provides DEN with the flexibility to meet their evolving needs should they decide to switch to another NOMS software vendor in the future.

The proposed system is very modular, which makes the service easy to manage and maintain. As technologies become obsolete, the Model 831C NMT can be easily replaced. The Model 831C supports remote administration and internet-based data communication via wireless cellular technology which minimizes maintenance and service costs. Larson Davis noise monitors include auto calibration and system health reporting features, and a supporting software utility that complements EnvironmentalVue software integration.

In addition, Larson Davis backs all its noise monitoring equipment with a two (2) year manufacturer's hardware warranty and a 100% customer satisfaction guarantee. The total customer satisfaction policy is backed by its executive management, and the noise monitoring equipment is ISO 9001:2008 certified.

Should the need arise to add additional NMTs in the future, PASSUR will retain a locally licensed subcontract firm(s), with all required licenses, to establish new site infrastructure required at each new permanent NMT site and perform all local installation which requires such licenses.

2. KEY PERSONNEL

The PASSUR Project Team will perform and deliver to the Scope of Work/Technical Requirements effectively and conveniently through coordinated efforts with PASSUR's subcontractors and DEN. Leading the PASSUR team will be industry veteran, NOMS Subject Matter Expert (SME), and PASSUR's Symphony Director of Engineering, Mr. Chris Rossano. He will serve as the dedicated Project Manager for the DEN NOMS project. Mr. Rossano has over 30 years of experience in the aviation industry which includes the implementation and support of the existing NOMS software solution currently deployed at DEN. He will continue to contribute his experience and unique knowledge of DEN's overall requirements to successfully deliver the NOMS solution on schedule and meet service level requirements.

Mr. Rossano will have immediate access to PASSUR senior level management to ensure all necessary staff and corporate assets are available for a successful on-time deployment of the NOMS solution. Figure 5 demonstrates the team organizational chart and the roles of key personnel for this project.

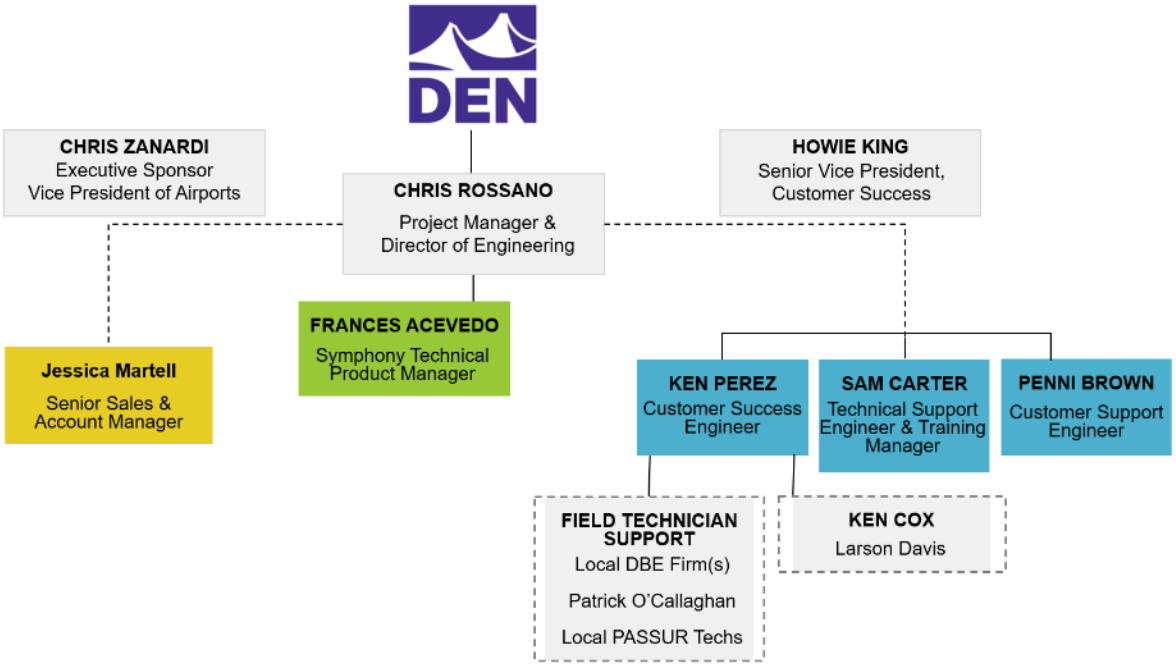


Figure 5: PASSUR Organizational Chart with Roles of the Key Personnel

Table 3: PASSUR DEN Project Management Team and Support Staff Roles and Responsibilities

KEY PERSONNEL	RESPONSIBILITIES
Chris Zanardi Vice President of Airports	Responsible for the day-to-day management of the PASSUR Airport Group's commercial operations and financial performance. Works with the broader PASSUR organization to ensure that the Symphony team has the required resources to meet project and ongoing service deliverables.
Chris Rossano Project Manager, Symphony Director of Engineering/SME	As Project Manager, Mr. Rossano will provide oversight of the DEN project and work with the Senior Vice President of Customer Success to ensure that PASSUR meets all contractual deliverables. As the DEN Project Manager, Mr. Rossano will provide any required implementation schedules and conduct regular project status meetings.
Howie King Senior Vice President of Customer Success	Responsible for leading the Customer Success/Support team from project inception through the life of the NOMS contract. This includes, but is not limited to pre-service engineering, customer expectation management, service delivery and implementation, customer value proposition realization and customer retention.
Jessica Martell Senior Sales & Account Manager	Responsible for the day-to-day management of the DEN account after implementation. This includes serving as the main point-of-contact for DEN on all contractual, product roadmap, training, and service delivery matters.
Samuel Carter Technical Support Engineer & Training Manager	Mr. Carter will provide Training as required by the DEN Staff on proposed PASSUR applications. He is also responsible for overseeing and coordinating the development of the NOMS training program and materials, as well as leading its implementation.
Penni Brown Customer Support Manager	Responsible for Tier 1-3 customer support including application support, database support, IT support, and hardware support.
Frances Acevedo Symphony Technical Product Manager	Works with Symphony Team and customers to investigate, identify, and fix product issues, as well as gather customer feedback to understand customer software use cases and user evolving needs. Responsible for using this information to support the development of product roadmaps to enhance Symphony Solutions. Works with the Director of Engineering and Software Development Team to plan and execute software releases.
Ken Cox Larson Davis NMT Product Manager	Responsible for overseeing the successful purchase and delivery of any additional Noise Monitoring Terminal Equipment to PASSUR, as well as ensuring 100% DEN customer satisfaction with the LD NMTs.

Ken Perez Customer Success Engineer	Responsible for Tier 1-3 customer support including application support, database support, IT support, and hardware support.
Patrick O'Callaghan PASSUR Hardware Field Tech	Provides surveillance infrastructure and NMT deployment and maintenance services and training. Anticipated Trainer of DEN local field technicians on NMT support.

3. EXPECTED LEVEL OF ASSISTANCE REQUIRED FROM CLIENT

DEN's Responsibilities for this effort include:

- DEN shall pay for recurring electric and communications for NMTs.
- With proper prior notice, as required in these technical specifications, DEN shall permit PASSUR and its personnel, subject to security regulations and work schedules, access to equipment for installation and maintenance purposes.
- DEN's responsibilities related to maintenance and repair shall be limited to notifying PASSUR of any NMT issues and making an initial on-site visit to the NMT for remedial inspection (including verifying that power and communications are in proper working order) and reset as directed by PASSUR at NMT sites when there is an NMT issue.
- DEN's responsibilities related to SW and HW implementation shall include providing remote network access such that remote SW maintenance can be performed as required and remote data feeds can be accessed for operational display.
- Provide DEN's preferences for customizable default display features when deploying new NOMS features

4. ALTERNATIVE B&K NMT SUPPORT OPTION

DEN Noise Office Staff may choose to maintain the B&K NMTs themselves until they are replaced with Larson Davis 831-C NMTs.

5. DETAILED TECHNICAL SPECIFICATIONS

Additional detailed technical specifications of the NOMS is found in Attachment 1 – Technical Specifications, attached hereto and incorporated by reference.

Passur Aerospace Cost Breakdown

		Year 1	Year 2	Year 3	Year 4	Year 5
Base Solution	Subscription/Licenses EnviroVue	$ 150,000.00	$ 150,000.00	$ 150,000.00	$ 154,500.00	$ 154,500.00
	PublicVue	$ 15,000.00	$ 15,000.00	$ 15,000.00	$ 15,450.00	$ 15,450.00
	TOTALS	$ 165,000.00	$ 165,000.00	$ 165,000.00	$ 169,950.00	$ 169,950.00
	OPTIONAL					
	Plane Noise Complaint Box	$ 39,818.00	$ 24,818.00	$ 24,818.00	$ 25,562.00	$ 25,562.00
	Contours with VNM	$ -	$ -	$ -		
	Community Noise Portal	$ -	$ -	$ -		
	NMT Support and Maintenance	$ 37,800.00	$ 37,800.00	$ 37,800.00	$ 38,934.00	$ 38,934.00
	NEW NMTs Larsen Davis 831C	$ 531,802.00				
	Larson Davis 831C Support & Maintenance	$ 27,000.00	$ 27,000.00	$ 27,000.00	$ 27,810.00	$ 27,810.00

YEARLY COST BREAKDOWN

	2025 Year 1	2026 Year 2	2027 Year 3	2028 Year 4	2029 Year 5	
	$ 165,000.00	$ 165,000.00	$ 165,000.00	$ 169,950.00	$ 169,950.00	Base with EnviroVue and PublicVue
	$ 531,802.00					CIP FUNDS New NMT Larson Davis 831C Replacement 1 time cost*
	$ 37,800.00					OLD NMT Support & Maint
	$ 27,000.00	$ 27,000.00	$ 27,000.00	$ 27,810.00	$ 27,810.00	NEW NMT Support & Maint
TOTALS	**$ 761,602.00**	**$ 192,000.00**	**$ 192,000.00**	**$ 197,760.00**	**$ 197,760.00**	

$ 1,145,602.00 GRAND TOTAL 3 YEAR

$ 1,541,122.00 GRAND TOTAL 5 YEAR

*** PLEASE NOTE: Payment for the NMT replacement project will be as follows. 80% of total amount payable upon approval of CIP Funding, and Purchase Order (PO). The remaining 20% of the amount will be payable upon completion of said replacement and testing of the new NMTs.**

EXHIBIT C

CITY AND COUNTY OF DENVER
INSURANCE REQUIREMENTS FOR DEPARTMENT OF AVIATION
GOODS AND SERVICES AGREEMENT

A. Certificate Holder and Submission Instructions

Contractor must provide a Certificate of Insurance as follows:

Certificate Holder: CITY AND COUNTY OF DENVER
Denver International Airport
8500 Peña Boulevard
Denver CO 80249
Attn/Submit to: contractadmininvoices@flydenver.com

- ACORD Form (or equivalent) certificate is required.
- Contractor must be evidenced as a Named Insured party.
- Electronic submission only, hard copy documents will not be accepted.
- Reference on the certificate must include the City-assigned Contract Number, if applicable.

The City may at any time modify submission requirements, including the use of third-party software and/or services, which may include an additional fee to the Contractor.

B. Defined Terms

1. "Agreement" as used in this exhibit refers to the contractual agreement to which this exhibit is attached, irrespective of any other title or name it may otherwise have.
2. "Contractor" as used in this exhibit refers to the party contracting with the City and County of Denver pursuant to the attached Agreement.

C. Coverages and Limits

1. Commercial General Liability
   Contractor shall maintain insurance coverage including bodily injury, property damage, personal injury, advertising injury, independent contractors, and products and completed operations in minimum limits of $1,000,000 each occurrence, $2,000,000 products and completed operations aggregate; if policy contains a general aggregate, a minimum limit of $2,000,000 annual per location aggregate must be maintained.

   a. Coverage shall include Contractual Liability covering liability assumed under this Agreement (including defense costs assumed under contract) within the scope of coverages provided.
   b. Coverage shall include Mobile Equipment Liability, if used to perform services under this Agreement.
   c. If a "per location" policy aggregate is required, "location" shall mean the entire airport premises.

2. Business Automobile Liability
   Contractor shall maintain a minimum limit of $1,000,000 combined single limit each occurrence for bodily injury and property damage for all owned, leased, hired and/or non-owned vehicles used in performing services under this Agreement.

   a. If operating vehicles unescorted airside at DEN, a $10,000,000 combined single limit each occurrence for bodily injury and property damage is required.
   b. If Contractor does not have blanket coverage on all owned and operated vehicles and will require unescorted airside driving privileges, then a schedule of insured vehicles (including year, make, model and VIN number) must be submitted with the Certificate of Insurance.
   c. If transporting waste, hazardous material, or regulated substances, Contractor shall carry a Broadened

Pollution Endorsement and an MCS 90 endorsement on its policy.

d. If Contractor does not own any fleet vehicles and Contractor's owners, officers, directors, and/or employees use their personal vehicles to perform services under this Agreement, Contractor shall ensure that Personal Automobile Liability including a Business Use Endorsement is maintained by the vehicle owner, and if appropriate, Non-Owned Auto Liability by the Contractor. This provision does not apply to persons solely commuting to and from the airport.
e. If Contractor will be completing all services to DEN under this Agreement remotely and not be driving to locations under direction of the City to perform services this requirement is waived.

3. Workers' Compensation and Employer's Liability Insurance
Contractor shall maintain the coverage as required by statute for each work location and shall maintain Employer's Liability insurance with limits no less than $100,000 per occurrence for each bodily injury claim, $100,000 per occurrence for each bodily injury caused by disease claim, and $500,000 aggregate for all bodily injuries caused by disease claims.

    a. Colorado Workers' Compensation Act allows for certain, limited exemptions from Worker's Compensation insurance coverage requirements. It is the sole responsibility of the Contractor to determine their eligibility for providing this coverage, executing all required documentation with the State of Colorado, and obtaining all necessary approvals. Verification document(s) evidencing exemption status must be submitted with the Certificate of Insurance.

4. Property Insurance
Contractor is solely responsible for any loss or damage to its real or business personal property located on DEN premises including, but not limited to, materials, tools, equipment, vehicles, furnishings, structures and personal property of its employees and subcontractors unless caused by the sole, gross negligence of the City. If Contractor carries property insurance on its property located on DEN premises, a waiver of subrogation as outlined in Section F will be required from its insurer.

5. Professional Liability (Errors and Omissions) Insurance
Contractor shall maintain a minimum limit of $1,000,000 each claim and annual policy aggregate, providing coverage for all applicable professional services outlined in this Agreement.

6. Cyber Insurance
Contractor shall maintain a minimum limit of $1,000,000 per occurrence and $1,000,000 annual policy aggregate covering claims involving privacy violations, information theft, damage to or destruction of electronic information, intentional and/or unintentional release of private information, alteration of electronic information, extortion, and network security.

7. Technology Errors and Omissions
Contractor shall maintain a minimum limit of $1,000,000 per occurrence and $1,000,000 annual policy aggregate including cyber liability, network security, privacy liability and product failure coverage.

    a. Coverage shall include, but not be limited to, liability arising from theft, dissemination and/or use of personal, private, confidential, information subject to a non-disclosure agreement, including information stored or transmitted, privacy or cyber laws, damage to or destruction of information, intentional and/or unintentional release of private information, alteration of information, extortion and network security, introduction of a computer virus into, or otherwise causing damage to, a customer's or third person's computer, computer system, network or similar computer related property and the data, software, and programs thereon, advertising injury, personal injury (including invasion of privacy) and intellectual property offenses related to internet.

8. Unmanned Aerial Vehicle (UAV) Liability:
If Contractor desires to use drones in any aspect of its work or presence on DEN premises, the following requirements must be met prior to commencing any drone operations:

a. Express written permission must be granted by DEN.
b. Express written permission must be granted by the Federal Aviation Administration (FAA).
c. Drone equipment must be properly registered with the FAA.
d. Drone operator(s) must be properly licensed by the FAA.
e. Contractor must maintain UAV Liability including flight coverage, personal and advertising injury liability, and hired/non-owned UAV liability for its commercial drone operations with a limit no less than $1,000,000 combined single limit each occurrence for bodily injury and property damage.

9. Excess/Umbrella Liability
Combination of primary and excess coverage may be used to achieve minimum required coverage limits. Excess/Umbrella policy(ies) must follow form of the primary policies with which they are related to provide the minimum limits and be verified as such on any submitted Certificate of Insurance.

D. Reference to Project and/or Contract
The City Project Name, Title of Agreement and/or Contract Number and description shall be noted on the Certificate of Insurance, if applicable.

E. Additional Insured
For all coverages required under this Agreement (excluding Workers' Compensation, Employer's Liability and Professional Liability, if required), Contractor's insurer(s) shall include the City and County of Denver, its elected and appointed officials, successors, agents, employees, and volunteers as Additional Insureds by policy endorsement.

F. Waiver of Subrogation
For all coverages required under this Agreement (excluding Professional Liability, if required), Contractor's insurer(s) shall waive subrogation rights against the City and County of Denver, its elected and appointed officials, successors, agents, employees, and volunteers by policy endorsement.

If Contractor will be completing all services to the City under this Agreement remotely and not be traveling to locations under direction of the City to perform services, this requirement is waived specific to Workers' Compensation coverage.

G. Notice of Material Change, Cancellation or Nonrenewal
Each certificate and related policy shall contain a valid provision requiring notification to the Certificate Holder in the event any of the required policies be canceled or non-renewed or reduction in required coverage before the expiration date thereof.

1. Such notice shall reference the DEN assigned contract number related to this Agreement.
2. Such notice shall be sent thirty (30) calendar days prior to such cancellation or non-renewal or reduction in required coverage unless due to non-payment of premiums for which notice shall be sent ten (10) calendar days prior.
3. If such written notice is unavailable from the insurer or afforded as outlined above, Contractor shall provide written notice of cancellation, non-renewal and any reduction in required coverage to the Certificate Holder within three (3) business days of receiving such notice by its insurer(s) and include documentation of the formal notice received from its insurer(s) as verification. Contractor shall replace cancelled or nonrenewed policies with no lapse in coverage and provide an updated Certificate of Insurance to DEN.
4. In the event any general aggregate or other aggregate limits are reduced below the required minimum per occurrence limits, Contractor will procure, at its own expense, coverage at the requirement minimum per occurrence limits. If Contractor cannot replenish coverage within ten (10) calendar days, it must notify the City immediately.

H. Cooperation
Contractor agrees to fully cooperate in connection with any investigation or inquiry and accept any formally tendered claim related to this Agreement, whether received from the City or its representative. Contractor's failure

to fully cooperate may, as determined in the City's sole discretion, provide cause for default under the Agreement. The City understands acceptance of a tendered claim does not constitute acceptance of liability.

I. Additional Provisions

1. Deductibles or any type of retention are the sole responsibility of the Contractor.
2. Defense costs shall be in addition to the limits of liability. If this provision is unavailable that limitation must be evidenced on the Certificate of Insurance.
3. Coverage required may not contain an exclusion related to operations on airport premises.
4. A severability of interests or separation of insureds provision (no insured vs. insured exclusion) is included under all policies where Additional Insured status is required.
5. A provision that coverage is primary and non-contributory with other coverage or self-insurance maintained by the City under all policies where Additional Insured status is required.
6. If the Contractor procures or maintains insurance policies with coverages or limits beyond those stated herein, such greater policies will apply to their full effect and not be reduced or limited by the minimum requirements stated herein.
7. All policies shall be written on an occurrence form. If an occurrence form is unavailable or not industry norm for a given policy type, claims-made coverage will be accepted by the City provided the retroactive date is on or before the Agreement Effective Date or the first date when any goods or services were provided to the City, whichever is earlier, and continuous coverage will be maintained or an extended reporting period placed for three years (eight years for construction-related agreements) beginning at the time work under this Agreement is completed or the Agreement is terminated, whichever is later.
8. Certificates of Insurance must specify the issuing companies, policy numbers and policy periods for each required form of coverage. The certificates for each insurance policy are to be signed by an authorized representative and must be submitted to the City at the time Contractor signed this Agreement.
9. The insurance shall be underwritten by an insurer licensed or authorized to do business in the State of Colorado and rated by A.M. Best Company as A- VIII or better.
10. Certificate of Insurance and Related Endorsements: The City's acceptance of a certificate of insurance or other proof of insurance that does not comply with all insurance requirements shall not act as a waiver of Contractor's breach of this Agreement or of any of the City's rights or remedies under this Agreement. All coverage requirements shall be enforced unless waived or otherwise modified in writing by DEN Risk Management. Contractor is solely responsible for ensuring all formal policy endorsements are issued by their insurers to support the requirements.
11. The City shall have the right to verify, at any time, all coverage, information, or representations, and the insured and its insurance representatives shall promptly and fully cooperate in any such audit the City may elect to undertake including provision of copies of insurance policies upon request. In the case of such audit, the City may be subject to a non-disclosure agreement and/or redactions of policy information unrelated to verification of required coverage.
12. No material changes, modifications, or interlineations to required insurance coverage shall be allowed without the review and written approval of DEN Risk Management.
13. Contractor shall be responsible for ensuring the City is provided updated Certificate(s) of Insurance prior to each policy renewal.
14. Contractor's failure to maintain required insurance shall be the basis for immediate suspension and cause for termination of this Agreement, at the City's sole discretion and without penalty to the City.

J. Part 230 and the DEN Airport Rules and Regulations

If the minimum insurance requirements set forth herein differ from the equivalent types of insurance requirements in Part 230 of the DEN Airport Rules and Regulations, the greater and broader insurance requirements shall supersede those lesser requirements, unless expressly excepted in writing by DEN Risk Management. Part 230 applies to Contractor and its subcontractors of any tier.

K. Applicability of ROCIP Requirements

The City and County of Denver and Denver International Airport (hereinafter referred to collectively as "DEN") has arranged for certain construction activities at DEN to be insured under an Owner Controlled Insurance Program (OCIP) or a Rolling Owner Controlled Insurance Program (ROCIP) (hereinafter collectively referred to as "ROCIP"). A ROCIP is a single insurance program that insures DEN, the Contractor and subcontractors of

any tier, and other designated parties (Enrolled Parties), for work performed at the Project Site. **Work contemplated under this Agreement by Contractor is NOT included under a ROCIP program. Contractor must provide its own insurance as specified in this Agreement. If Contractor is assigned work to be conducted within a ROCIP Project Site it must comply with the provisions of the DEN ROCIP Safety Manual, which is part of the Contract Documents and which is linked below to the most recent manual.**

DEN ROCIP Safety Manual

DEN is additionally providing links to the DEN ROCIP Insurance Manual and the DEN ROCIP Claims Guide solely for Contractor's information.

DEN ROCIP Insurance Manual
DEN ROCIP Claims Guide

Notice of Change to ROCIP: DEN reserves the right to assign work per task order to a specific ROCIP program, if more than one is active, as well as terminate or modify a DEN ROCIP or any portion thereof. Further, dependent on factors including, but not limited to, the official timing and duration of the ROCIP project for which services are provided or related to under this Agreement, DEN may need to transition from one ROCIP program to another and introduce corresponding requirements for contractors. DEN will provide Contractor notice of changes regarding a ROCIP program as applicable to Contractor's work or responsibilities under the ROCIP Safety Manual.

EXHIBIT D, CONTRACT NO. 202473902-00

INFORMATION TECHNOLOGY PROVISIONS

This Exhibit regarding **Information Technology Provisions** (the "Exhibit") is an essential part of the Agreement between the City and Consultant to which this Exhibit is attached. Unless the context clearly requires a distinction between the Agreement and this Exhibit, all references to "Agreement" shall include this Exhibit.

1. **SERVICE LEVEL AGREEMENTS; FUNCTIONALITY MATRIX**: To the extent the Consultant provides service level commitments in connection with its provision of any Work (as defined in the Agreement Section 2), the Consultant shall be fully responsible for the delivery and maintenance of the Work, in whole and/or in part, in accordance with the terms of a service level agreement to be mutually agreed to by the Parties. The Consultant agrees that the Work shall also conform to the functionality matrix to be mutually agreed to by the Parties.

2. **GENERAL TECHNOLOGY SPECIFICATIONS**

   2.1. Vendor Supported Releases: The Consultant shall maintain the currency of all third-party software used in the development and execution or use of the Work with third-party vendor approved and supported releases, including, but not limited to, all code libraries, frameworks, components, and other products (*e.g.,* Java JRE, code signing certificates, .NET, jQuery plugins, *etc.*), whether commercial, free, open-source, or closed-source.

   2.2. Identity Management: The City's Identity and Access Management ("**IdM**") system is an integrated infrastructure solution that enables many of the City's services and online resources to operate more efficiently, effectively, and securely. All new and proposed applications must utilize the authentication and authorization functions and components of IdM. Strong authentication is required for privileged accounts or accounts with access to sensitive information. This technical requirement applies to all solutions regardless of where the application is hosted.

   2.3. Additional Products or Services: The Parties acknowledge that the Consultant will continue to enhance and/or modify its existing products or services. To use those enhanced products or services, the City shall be entitled to order those offerings at any time throughout the duration of the Agreement provided the pricing is set out in the Agreement. Once agreed upon by the Parties, additional products or services shall be subject to the same terms and conditions as contained herein and any order placed by the City shall not create any additional binding conditions on the City and shall not act as an amendment of the terms and conditions of the Agreement. If additional products or services are requested by the City, the Parties shall follow the agreed upon order process and if no process is

outlined, then the CIO, or other designated Agency personnel, shall be authorized to sign any necessary forms to acquire the products/services on behalf of the City. Additional licenses shall be prorated and co-termed with current licensing contained in the Agreement.

2.4. **Reoccurring Security Audits**: Prior to the Effective Date of the Agreement, the Consultant, will at its expense conduct or have conducted the following, and thereafter, the Consultant will at its expense conduct or have conducted the following at least once per year, and immediately after any actual or reasonably suspected Security Breach: (i) a SSAE 16/SOC 2 or other mutually agreed upon audit of the Consultant's security policies, procedures and controls; (ii) a quarterly external and internal vulnerability scan of the Consultant's systems and facilities, to include public facing websites, that are used in any way to deliver Services under the Agreement. The report must include the vulnerability, age, and remediation plan for all issues identified as critical or high; and (iii) a formal penetration test performed by qualified personnel of the Consultant's systems and facilities that are used in any way to deliver Work under the Agreement. The Consultant will provide the City the reports or other documentation resulting from the above audits, certifications, scans, and tests within seven (7) business days of the Consultant's receipt of such results. The report must include the vulnerability, age, and remediation plan for all issues identified as critical or high or medium. Based on the results and recommendations of the above audits, the Consultant will, within thirty (30) calendar days of receipt of such results, promptly modify its security measures to meet its obligations under the Agreement and provide the City with written evidence of remediation. In addition, the Consultant shall comply with the City's annual risk assessment and the results thereof. The City may require, at the Consultant's expense, that the Consultant perform additional audits and tests, the results of which will be provided to the City within seven (7) business days of Consultant's receipt of such results. The Consultant will provide the City the results of the above audits. If additional funds are required to perform the tests required by the City that are not accounted for in the Agreement, the Parties agree to amend the Agreement as necessary. The Consultant shall also protect data against deterioration or degradation of quality and authenticity by, at minimum, having a third party perform annual data integrity audits

2.5. **Transition of Services**: Upon expiration or earlier termination of the Agreement or any Work provided hereunder, the Consultant shall accomplish a complete transition of the Services from the Consultant to the City or any replacement provider designated solely by the City without any interruption of or adverse impact on the Services or any other services provided by third parties under the Agreement. The Consultant shall cooperate fully with the City or such replacement provider and promptly take all steps required to assist in effecting a complete transition of the Services designated by the City. All Services

related to such transition shall be performed at no additional to the City. The Consultant shall extend the Agreement monthly if additional time is required beyond the termination of the Agreement, if necessary, to effectuate the transition and the City shall pay a proration of the subscription fee.

2.6. Disaster Recovery and Continuity

2.6.1. The Consultant shall maintain a continuous and uninterrupted business continuity and disaster recovery program with respect to the Work provided under the Agreement. The program shall be designed, in the event of a significant business disruption affecting the Consultant, to provide the necessary and sufficient capabilities, processes, and procedures to enable the Consultant to resume and continue to perform its duties and obligations under the Agreement without undue delay or disruption. In the event of equipment failures, the Consultant shall, at no additional expense to the City, take reasonable steps to minimize service interruptions, including using any back-up facilities where appropriate. Upon request, the Consultant shall provide the City with a copy of its disaster recovery plan and procedures.

2.6.2. Prior to the Effective Date of the Agreement, the Consultant shall, at its own expense, conduct or have conducted the following, and thereafter, the Consultant will, at its own expense, conduct or have conducted the following at least once per year:

2.6.2.1. A test of the operability, sufficiency, and completeness of business continuity and disaster recovery program's capabilities, processes, and procedures that are necessary to resume and continue to perform its duties and obligations under the Agreement.

2.6.2.2. Based upon the results and subsequent recommendations of the testing above, the Consultant will, within thirty (30) calendar days of receipt of such results and recommendations, promptly modify its capabilities, processes, and procedures to meet its obligations under the Agreement and provide City with written evidence of remediation.

2.6.2.3. Upon request, the Consultant shall provide the City with report summaries or other documentation resulting from above testing of any business continuity and disaster recovery procedures regarding the Services provided under the Agreement.

2.6.2.4. The Consultant represents that it is capable, willing, and able to provide the necessary and sufficient business continuity and disaster recovery capabilities

and functions that are appropriate for it to provide services under the Agreement.

3. DELIVERY AND ACCEPTANCE

3.1. Acceptance & Rejection: Software, technology services, or other deliverables created and/or delivered pursuant to the Agreement (collectively, "Deliverables") will be considered accepted ("Acceptance") only when the City provides the Consultant affirmative written notice of acceptance that such Deliverable has been accepted by the City. Such communication shall be provided within a reasonable time from the delivery of the Deliverable and shall not be unreasonably delayed or withheld. Acceptance by the City shall be final, except in cases of Consultant's failure to conduct proper quality assurance, latent defects that could not reasonably have been detected upon delivery, or the Consultant's gross negligence or willful misconduct. The City may reject a Deliverable if it materially deviates from its specifications and requirements listed in the Agreement or its attachments by written notice setting forth the nature of such deviation. In the event of such rejection, the Consultant shall correct the deviation, at its sole expense, and redeliver the Deliverable within fifteen (15) days. After redelivery, the Parties shall again follow the acceptance procedures set forth herein. If any Deliverable does not perform to the City's satisfaction, the City reserves the right to repudiate acceptance. If the City ultimately rejects a Deliverable, or repudiates acceptance of it, the Consultant will refund to the City all fees paid, if any, by the City with respect to any rejected Deliverable. Acceptance shall not relieve the Consultant from its responsibility under any representation or warranty contained in the Agreement, and payment of an invoice prior to Acceptance does not grant a waiver of any representation or warranty made by the Consultant.

3.2. Quality Assurance: The Consultant shall provide and maintain a quality assurance system acceptable to the City for Deliverables under the Agreement and shall provide to the City only such Deliverables that have been inspected and found to conform to the specifications identified in the Agreement and any applicable solicitation, bid, offer, or proposal from which the Agreement results. The Consultant's delivery of any Deliverables to the City shall constitute certification that any Deliverables have been determined to conform to the applicable specifications, and the Consultant shall make records of such quality assurance available to the City upon request.

3.3. License to Deliverables: Effective upon Acceptance of each Deliverable, the Consultant grants the City a nonexclusive, royalty-free license to reproduce, modify, display, and use such Deliverable, and all intellectual property rights necessary to use the Deliverable as authorized, as necessary for the City's internal business purposes, provided the City

complies with any license restrictions set forth in the Agreement and any attachments thereto. The City will not reverse engineer or reverse compile any part of a Deliverable unless agreed by the Parties in writing.

3.4. **Incorporation of Deliverables**: Upon Acceptance, each Deliverable will thereafter be subject to the Agreement's terms, including without limitation license, warranty, and indemnity terms.

4. WARRANTIES AND REPRESENTATIONS

4.1. Notwithstanding the acceptance of any Work or Deliverable, or the payment of any invoice for such Work or Deliverable, the Consultant warrants that any Work or Deliverable provided by the Consultant under the Agreement shall be free from material defects and shall function as intended and in material accordance with the applicable specifications. The Consultant warrants that any Work or Deliverable, and any media used to distribute it, shall be, at the time of delivery, free from any harmful or malicious code, including without limitation viruses, malware, spyware, ransomware, or other similar function or technological means designed to disrupt, interfere with, or damage the normal operation of the Work or Deliverable and the use of City resources and systems. The Consultant's warranties under this Section shall apply to any defects or material nonconformities discovered within 180 days following delivery of any Work or Deliverable.

4.2. Upon notice of any defect or material nonconformity, the Consultant shall submit to the City in writing within ten business days of the notice one or more recommendations for corrective action with sufficient documentation for the City to ascertain the feasibility, risks, and impacts of each recommendation. The City's remedy for such defect or material non-conformity shall be:

4.2.1. The Consultant shall re-perform, repair, or replace such Work or Deliverable in accordance with any recommendation chosen by the City. The Consultant shall deliver, at no additional cost to the City, all documentation required under the Agreement as applicable to the corrected Work or Deliverable; or

4.2.2. The Consultant shall refund to the City all amounts paid for such Work or Deliverable, as well as pay to the City any additional amounts reasonably necessary for the City to procure alternative goods or services of substantially equivalent capability, function, and performance.

4.3. Any Work or Deliverable delivered to the City as a remedy under this Section shall be subject to the same quality assurance, acceptance, and warranty requirements as the

original Work or Deliverable. The duration of the warranty for any replacement or corrected Work or Deliverable shall run from the date of the corrected or replacement Work or Deliverable.

4.4. **Customization Services**: The Consultant warrants that it will perform all customization services, if any, in a professional and workmanlike manner. In case of breach of the warranty of the preceding sentence, the Consultant, at its own expense, shall promptly re-perform the customization services in question or provide a full refund for all nonconforming customization services.

4.5. **Third-Party Warranties and Indemnities**: The Consultant will assign to the City all third-party warranties and indemnities that the Consultant receives in connection with any Work or Deliverables provided to the City. To the extent that the Consultant is not permitted to assign any warranties or indemnities through to the City, the Consultant agrees to specifically identify and enforce those warranties and indemnities on behalf of the City to the extent the Consultant is permitted to do so under the terms of the applicable third-party agreements.

4.6. **Intellectual Property Rights in the Software**: The Consultant warrants that it is the owner of all Deliverables, and of each and every component thereof, or the recipient of a valid license thereto, and that it has and will maintain the full power and authority to grant the intellectual property rights to the Deliverables in the Agreement without the further consent of any third party and without conditions or requirements not set forth in the Agreement. In the event of a breach of the warranty in this Section, the Consultant, at its own expense, shall promptly take the following actions: (i) secure for the City the right to continue using the Deliverable as intended; (ii) replace or modify the Deliverable to make it non-infringing, provided such modification or replacement will not materially degrade any functionality as stated in the Agreement; or (iii) refund 100% of the fee paid for the Deliverable for every month remaining in the Term, in which case the Consultant may terminate any or all of the City's licenses to the infringing Deliverable granted in the Agreement and require return or destruction of copies thereof. The Consultant also warrants that there are no pending or threatened lawsuits, claims, disputes, or actions: (i) alleging that any of the Work or Deliverables infringes, violates, or misappropriates any third-party rights; or (ii) adversely affecting any Deliverables or Services, or the Consultant's ability to perform its obligations hereunder.

4.7. **Disabling Code**: The Work and any Deliverables will contain no malicious or disabling code that is intended to damage, destroy, or destructively alter software, hardware, systems, or data. The Consultant represents, warrants and agrees that the City will not receive from the Consultant any virus, worm, trap door, back door, timer, clock, counter

or other limiting routine, instruction or design, or other malicious, illicit or similar unrequested code, including surveillance software or routines which may, or is designed to, permit access by any person, or on its own, to erase, or otherwise harm or modify any City system, resources, or data (a "Disabling Code"). In the event a Disabling Code is identified, the Consultant shall take all steps necessary, at no additional cost to the City, to: (i) restore and/or reconstruct all data lost by the City as a result of a Disabling Code; (ii) furnish to City a corrected version of the Work or Deliverables without the presence of a Disabling Code; and, (iii) as needed, re-implement the Work or Deliverable at no additional cost to the City. This warranty shall remain in full force and effect during the Term.

5. ACCESSIBILITY AND WEBSITE COMPLIANCE

5.1. Compliance: The Consultant shall comply with, and the Work and Work Product provided under the Agreement shall be in compliance with, all applicable provisions of §§ 24-85-101, *et seq*., C.R.S., and the *Accessibility Standards for Individuals with a Disability*, as established pursuant to Section § 24-85-103 (2.5), C.R.S (collectively, the "Guidelines"). The Consultant shall also comply with Level AA of the most current version of the Web Content Accessibility Guidelines (WCAG), incorporated in the State of Colorado technology standards.

5.2. Testing: The City may require the Consultant's compliance to be determined by a third party selected by the City to attest that the Consultant's has performed all obligations under the Agreement in compliance with §§ 24-85-101, *et seq*., C.R.S., and the Accessibility Standards for Individuals with a Disability as established pursuant to Section § 24-85-103 (2.5), C.R.S.

5.3. Validation and Remediation: The Consultant agrees to promptly respond to and resolve any instance of noncompliance regarding accessibility in a timely manner and shall remedy any noncompliant Work Product, Service, or Deliverable at no additional cost to the City. If the City reasonably determines accessibility issues exist, the Consultant shall provide a "roadmap" for remedying those deficiencies on a reasonable timeline to be approved by the City. Resolution of reported accessibility issue(s) that may arise shall be addressed as high priority, and failure to make satisfactory progress towards compliance with the Guidelines, as agreed to in the roadmap, shall constitute a breach of contract and be grounds for termination or non-renewal of the Agreement.

6. DATA MANAGEMENT, SECURITY, AND PROTECTION

6.1. **Compliance with Data Protection Laws and Policies**: The Consultant shall comply with all applicable federal, state, local laws, rules, regulations, directives, and policies relating to data protection, use, collection, disclosures, processing, and privacy as they apply to the Consultant under the Agreement, including, without limitation, applicable industry standards or guidelines based on the data's classification relevant to the Consultant's performance hereunder and, when applicable, the most recent iterations of § 24-73-101, *et seq*.; C.R.S., IRS Publication 1075; the Health Information Portability and Accountability Act ("HIPAA"); the U.S. Department of Justice, Federal Bureau of Investigation, Criminal Justice Information Services ("CJIS") Security Policy for all Criminal Justice Information; the Colorado Consumer Protection Act, the Payment Card Industry Data Security Standard ("PCI-DSS"), and the Minimum Acceptable Risk Standards for Exchanges (collectively, "Data Protection Laws"). If the Consultant becomes aware that it cannot reasonably comply with the terms or conditions contained herein due to a conflicting law or policy, the Consultant shall promptly notify the City. The Consultant shall comply with all rules, policies, procedures, and standards issued by the City's Technology Services Security Section. The most recent copy is available upon request.

6.2. **Safeguarding Protected and Sensitive Information**: "Protected Information" means data, regardless of form, that has been designated as sensitive, private, proprietary, protected, or confidential by law, policy, or the City. Protected Information includes, but is not limited to, employment records, protected health information, student and education records, criminal justice information, personal financial records, research data, trade secrets, classified government information, other regulated data, and personally identifiable information as defined by §§ 24-73-101(4)(b) and 6-1-716(1)(g)(I)(A), C.R.S., as amended. Protected Information shall not include public records that by law must be made available to the public under CORA. To the extent there is any uncertainty as to whether data constitutes Protected Information, the data in question shall be treated as Protected Information until a determination is made by the City or an appropriate legal authority. Unless the City provides security protection for the information it discloses to the Consultant, the Consultant shall implement and maintain reasonable security procedures and practices that are both appropriate to the nature of the Protected Information disclosed and that are reasonably designed to help safeguard Protected Information from unauthorized access, use, modification, disclosure, or destruction. Disclosure of Protected Information does not include disclosure to a third party under circumstances where the City retains primary responsibility for implementing and maintaining reasonable security procedures and practices appropriate to the nature of the Protected Information, and the City implements and maintains technical controls reasonably designed to safeguard Protected Information from unauthorized access, modification, disclosure, or destruction or effectively eliminate the third party's ability to

access Protected Information, notwithstanding the third party's physical possession of Protected Information. If the Consultant has been contracted to maintain, store, or process personal information on the City's behalf, the Consultant is a "Third-Party Service Provider" as defined by § 24-73-103(1)(i), C.R.S.

6.3. **Data Access and Integrity**: The Consultant shall implement and maintain all appropriate administrative, physical, technical, and procedural safeguards necessary and appropriate to ensure compliance with the Data Protection Laws applicable to the Consultant's performance hereunder to ensure the security and confidentiality of data. The Consultant shall protect against threats or hazards to the security or integrity of data; protect against unauthorized disclosure, access to, or use of data; restrict access to data as necessary; and ensure the proper and legal use of data. The Consultant shall not engage in "data mining" except as specifically and expressly required by law or authorized in writing by the City. Unless otherwise required by law, the City has exclusive ownership of all City Data under the Agreement, and the Consultant shall have no right, title, or interest in City Data obtained in connection with the services provided herein. The Consultant has a limited, nonexclusive license to access and use data as provided in the Agreement solely for the purpose of performing its obligations hereunder. The City retains the right to access and retrieve City Data stored on the Consultant's infrastructure at any time during the Term. All City Data created and/or processed by the Work, if any, is and shall remain the property of the City and shall in no way become attached to the Work, nor shall the Consultant have any rights in or to the City Data without the express written permission of the City. This Agreement does not give a Party any rights, implied or otherwise, to the other's data, content, or intellectual property, except as expressly stated in the Agreement. The City retains the right to use the Work to access and retrieve data stored on the Consultant's infrastructure at any time during the Term. Upon written request, the Consultant shall provide the City its policies and procedures to maintain the confidentiality of City Data and Protected Information.

6.4. **Response to Legal Orders for City Data**: If the Consultant is required by a court of competent jurisdiction or administrative body to disclose City Data, the Consultant shall first notify the City and, prior to any disclosure, cooperate with the City's reasonable requests in connection with the City's right to intervene, quash, or modify the legal order, demand, or request, and upon request, provide the City with a copy of its response. If the City receives a subpoena, legal order, or other legal demand seeking data maintained by the Consultant, the City will promptly provide a copy to the Consultant. Upon notice and if required by law, the Consultant shall promptly provide the City with copies of its data required for the City to meet its necessary disclosure obligations.

6.5. Data Retention, Transfer, Litigation Holds, and Destruction: Using appropriate and reliable storage media, the Consultant shall regularly backup data used in connection with the Agreement and retain such backup copies consistent with the City's data and record retention policies. All City Data shall be encrypted in transmission, including by web interface, and in storage by an agreed upon National Institute of Standards and Technology ("NIST") approved strong encryption method and standard. The Consultant shall not transfer or maintain data under the Agreement outside of the United States without the City's express written permission. Upon termination of the Agreement, the Consultant shall securely delete or securely transfer all data, including Protected Information, to the City in an industry standard format as directed by the City; however, this requirement shall not apply to the extent the Consultant is required by law to retain data, including Protected Information. Upon the City's request, the Consultant shall confirm, by providing a certificate, the data disposed of, the date disposed of, and the method of disposal. With respect to any data in the Consultant's exclusive custody, the City may request, at not additional cost to the City, that the Consultant preserve such data outside of record retention policies. The City will promptly coordinate with the Consultant regarding the preservation and disposition of any data and records relevant to any current or anticipated litigation, and the Consultant shall continue to preserve the records until further notice by the City. Unless otherwise required by law or regulation, when paper or electronic documents are no longer needed, the Consultant shall destroy or arrange for the destruction of such documents within its custody or control that contain Protected Information by shredding, erasing, or otherwise modifying the Protected Information in the paper or electronic documents to make it unreadable or indecipherable. The Consultant and its third-party services providers must develop and maintain a written policy for the destruction of such records.

6.6. Software and Computing Systems: At its reasonable discretion, the City may prohibit the Consultant from the use of certain software programs, databases, and computing systems with known vulnerabilities to collect, use, process, store, or generate data and information received under the Agreement. The Consultant shall fully comply with all requirements and conditions, if any, associated with the use of software programs, databases, and computing systems as reasonably directed by the City. The Consultant shall not use funds paid by the City for the acquisition, operation, or maintenance of software in violation of any copyright laws or licensing restrictions. The Consultant shall maintain commercially reasonable network security that, at a minimum, includes network firewalls, intrusion detection/prevention, and enhancements or updates consistent with evolving industry standards The Consultant shall use industry-standard and up-to-date security tools, technologies and procedures including, but not limited to, anti-virus and anti-malware protections. The Consultant shall ensure that any underlying or integrated

software employed under the Agreement is updated on a regular basis and does not pose a security threat.

6.7. **Background Checks**: The Consultant shall ensure that, prior to being granted access to Protected Information, the Consultant's agents, employees, Subconsultants, volunteers, or assigns who perform work under the Agreement have all undergone and passed all necessary criminal background screenings, have successfully completed annual instruction of a nature sufficient to enable them to effectively comply with all data protection provisions of the Agreement and Data Protection Laws, and possess all qualifications appropriate to the nature of the employees' duties and the sensitivity of the data. If the Consultant will have access to federal tax information ("FTI") under the Agreement, the Consultant shall comply with the background check and other provisions of Section 6103(b) of the Internal Revenue Code, the requirements of IRS Publication 1075, and the Privacy Act of 1974, 5 U.S.C. § 552a, *et. seq*., related to federal tax information.

6.8. **Subconsultants and Employees**: If the Consultant engages a Subconsultant under the Agreement, the Consultant shall impose data protection terms that provide at least the same level of data protection as in the Agreement and to the extent appropriate to the nature of the Work provided. The Consultant shall monitor the compliance with such obligations and remain responsible for its Subconsultant's compliance with the obligations of the Agreement and for any of its Subconsultant's acts or omissions that cause the Consultant to breach any of its obligations under the Agreement. Unless the Consultant provides its own security protection for the information it discloses to a third party, the Consultant shall require the third party to implement and maintain reasonable security procedures and practices that are appropriate to the nature of the Protected Information disclosed and that are reasonably designed to protect it from unauthorized access, use, modification, disclosure, or destruction. Any term or condition within the Agreement relating to the protection and confidentially of any disclosed data shall apply equally to both the Consultant and any of its Subconsultants, agents, assigns, employees, or volunteers. Upon request, the Consultant shall provide the City copies of its record retention, data privacy, and information security policies. The Consultant shall ensure all Subconsultants sign, or have signed, agreements containing nondisclosure provisions at least as protective as those in the Agreement, and that the nondisclosure provisions are in force so long as the Subconsultant has access to any data disclosed under the Agreement. Upon request, the Consultant shall provide copies of those signed nondisclosure agreements to the City.

6.9. **Security Audit Access**: The Consultant shall permit the City reasonable access and shall provide the City with information reasonably required to assess the Consultant's

compliance with its security and confidentiality obligations under the Agreement. Such access and information shall include an annual SSAE 16/SOC 2 audit, or an alternative audit recommended by the City, and the Consultant shall comply with the City's annual risk assessment and the results thereof. To the extent the Consultant controls or maintains information systems used in connection with the Agreement, the Consultant shall provide the City with the results of all security assessment activities when conducted on such information systems, including any code-level vulnerability scans, application-level risk assessments, and other security assessment activities as required by the Agreement or reasonably requested by the City. The Consultant will remediate any vulnerabilities to comply with its obligations hereunder.

6.10. Unauthorized Data Disclosure

6.10.1. **Security Breach**: If the Consultant becomes aware of a suspected or unauthorized acquisition or disclosure of unencrypted data, in any form, that compromises the security, access, confidentiality, or integrity of City Data, Protected Information, or other data maintained or provided by the City ("Security Breach"), the Consultant shall notify the City in the most expedient time and without unreasonable delay but no less than forty-eight (48) hours. A Security Breach shall also include, without limitation, (i) attempts to gain unauthorized access to a City system or City Data regardless of where such information is located; (ii) unwanted disruption or denial of service; (iii) the unauthorized use of a City system for the processing or storage of data; or (iv) changes to the City's system hardware, firmware, or software characteristics without the City's knowledge, instruction, or consent. Any oral notice of a Security Breach provided by the Consultant shall be immediately followed by a written notice to the City. The Consultant shall maintain documented policies and procedures for Security Breaches including reporting, notification, and mitigation.

6.10.2. **Cooperation**: The Consultant shall fully cooperate with the City regarding recovery, lawful notices, investigations, remediation, and the necessity to involve law enforcement, as determined by the City and as required by law. The Consultant shall preserve and provide all information relevant to the Security Breach to the City; provided, however, the Consultant shall not be obligated to disclose confidential business information or trade secrets. Unless the Consultant can establish that neither it nor any of its agents, employees, assigns, or Subconsultants are the cause or source of the Security Breach, the Consultant shall indemnify, defend, and hold harmless the City for all claims, including reasonable attorneys' fees, costs, and expenses incidental thereto, which may be suffered by, accrued

against, charged to, or recoverable from the City in connection with a Security Breach and any required lawful notices.

6.10.3. **Reporting**: The Consultant shall provide a written report to the City that identifies: (i) the nature of the unauthorized use or disclosure; (ii) the data used or disclosed; (iii) the parties responsible for the Security Breach (if known); (iv) what the Consultant has done or shall do to mitigate the effect of the Security Breach; and (v) what corrective action the Consultant has taken or shall take to prevent future Security Breaches. Except as expressly required by law, the Consultant will not disclose or otherwise provide notice of the incident directly to any person, regulatory agencies, or other entities, without prior written permission from the City.

6.10.4. **Costs**: Notwithstanding any other provision of the Agreement, and in addition to any other remedies available to the City under law or equity, the Consultant will promptly reimburse the City in full for all costs incurred by the City in any investigation, remediation or litigation resulting from any Security Breach, including but not limited to providing notification to third parties whose data was compromised and to regulatory bodies, law-enforcement agencies, or other entities as required by law or contract; establishing and monitoring call center(s), and credit monitoring and/or identity restoration services to assist each person impacted by a Security Breach in such a fashion that, in the City's sole discretion, could lead to identity theft; and the payment of legal fees and expenses, audit costs, fines and penalties, and other fees imposed by regulatory agencies, courts of law, or contracting partners as a result of the Security Breach.

6.10.5. **Remediation**: After a Security Breach, the Consultant shall take steps to reduce the risk of incurring a similar type of Security Breach in the future as directed by the City, which may include, but is not limited to, developing and implementing a remediation plan that is approved by the City at no additional cost to the City. The City may adjust or direct modifications to this plan, and the Consultant shall make all reasonable modifications as directed by the City. The City may, in its sole discretion and at the Consultant's sole expense, require the Consultant to engage the services of an independent, qualified, City-approved third party to conduct a security audit. The Consultant shall provide the City with the results of such audit and evidence of the Consultant's planned remediation in response to any negative findings. Implementation of corrective actions to remedy the Security Breach and restore the City's access to the Work shall occur within five (5) calendar days of the date the Consultant becomes aware of any Security Breach.

6.11. **Request for Additional Protections and Survival**: In addition to the terms contained herein, the City may reasonably request that the Consultant protect the confidentiality of certain Protected Information or other data in specific ways to ensure compliance with Data Protection Laws and any changes thereto. Unless a request for additional protections is mandated by a change in law, the Consultant may reasonably decline the City's request to provide additional protections. If such a request requires the Consultant to take steps beyond those contained herein, the Consultant shall notify the City with the anticipated cost of compliance, and the City may thereafter, in its sole discretion, direct the Consultant to comply with the request at the City's expense; provided, however, that any increase in costs that would increase the Maximum Contract Amount must first be memorialized in a written amendment complying with City procedures. Obligations contained in the Agreement relating to the protection and confidentially of any disclosed data shall survive termination of the Agreement, and the Consultant shall continue to safeguard all data for so long as the data remains confidential or protected and in the Consultant's possession or control.