

Chapter 8 – Land Use, Facility, and Administrative Alternatives

INTRODUCTION. The previous chapters presented the evaluation and analysis of airport operational noise abatement procedures. This chapter presents the evaluation, analysis, and alternatives relative to land use measures, as well as administrative and facility measures.

- **Land use measures** represent mechanisms that local land use officials can undertake to improve the compatibility of areas exposed to various noise levels.
- **Administrative measures** are those that JAC can implement and are solely within their discretion. These measures will not result in noise reduction (as can be expected from the implementation of the operational noise abatement procedures), but will enable JAC to monitor the success of the program and to provide enhanced community response to issues of concern.
- **Facility measures** include changes to the direct airport facilities that could reduce noise. These measures generally do not result in noise reductions that would be evident in the Average Day Night Noise Level (DNL).

Many of the typical land use alternatives that are examined in a Part 150 Study are not applicable at JAC, such as sound insulation programs, because there must be homes located within the 65 DNL and greater noise contours in order to be eligible for these types of federal programs. JAC has no non-compatible land uses located within either the existing or future 65 DNL noise contours. Additionally, facility alternatives, such as a runway extension, are limited by the Use Agreement.

The following land use and facility measures were considered in Chapter 6 and dismissed as not being applicable to JAC for the reasons elaborated in that Chapter.

Land Use Alternatives Dismissed:

- Aquisition of property
- Sound insulation
- Acquisition of avigation easements; voluntary sales assistance



Facility Alternatives Dismissed

- Noise Barriers (Shielding, including earth berms and walls)
- Construction of a new runway in a different orientation
- Runway Extensions
- High Speed Taxiways

This chapter focuses on those land use options that can protect non-compatible land uses in the future through local planning, as well as administrative alternatives such as enhancing the noise monitoring program and creating a Fly Quiet Program. Additionally, due to the focus of this Study on operational NextGen alternatives, one facility alternative was examined relative to ground based equipment that could be beneficial to JAC.

The analysis includes several measures that arose as a result of the public outreach process and discussions that have taken place at the SIC and public meetings, as well as those measures that were included in the previous NCP, approved by the FAA. The following table summarizes the land use, administrative, and facility options that are examined in this chapter.

Table 8-1: Land Use, Administration and Facility Alternatives

Options	Responsible Party	Relationship to Previous Part 150 Study
<i>Land Use Alternatives</i>		
Zoning Code Changes/Noise Overlay Zone/Disclosure Statements/Construction Requirements	Local Jurisdiction	Continued Measure
Comprehensive Plan Amendments	Local Jurisdiction	New Measure
<i>Administrative and Facility Alternatives</i>		
Development of Fly Quiet Report Card and Pilot Awareness Program	JAC	New Measure
Continuation of Study Input Committee	JAC	New Measure
Installation of a BI-6 Repeater in Jackson Hole Tower	JAC	New Measure
Noise Monitoring/Flight Tracking	JAC	New in 150 Study
Noise Complaint Response and Investigation	JAC	Continued Measure
Review and Update Part 150 Study	JAC	Continued Measure
GBAS Upgrade	JAC	New Measure

Source: Mead & Hunt, 2016.

8.1 Land Use Alternatives

This analysis focuses on the evaluation of land use measures designed to reduce non-compatible land use. Land use compatibility actions can be placed in two groups:

- **Preventive:** Prohibiting certain land uses from developing within the aircraft noise exposure contours. Preventive actions do not affect existing land uses, but are targeted at preventing future noise sensitive uses and generally have to be implemented by the land use authority, such as the County. Preventive actions include zoning, building codes/subdivision regulation provisions, granting of avigation easements, sound attenuation requirements for new construction, buyer disclosure statements, and comprehensive plan amendments.
- **Remedial or Corrective:** Remedial or corrective actions are directed at correcting existing non-compatible land uses. Remedial actions may include sound insulation of single family structures, multi-family structures, sleeping portions of fire stations, hospitals, assisted living facilities, religious facilities, schools, and libraries; purchase of non-compatible land uses within high noise contours; purchase of avigation easements; and sales assistance programs.

Remedial measures are within the authority of the FAA to fund for existing non-compatible land uses inside the 65 DNL noise contour. Remedial actions were determined to not be applicable at JAC because there are no non-compatible land uses within the 65 DNL or greater noise contours. Preventative measures are within the authority of the local jurisdiction and usually of lesser concern to citizens living near JAC because they apply only to new construction. The alternatives below focus on preventative measures.

8.1.1 Zoning Code Changes/Noise Overlay Zone/Buyer Notification/Construction Requirements

GOAL: To protect the health, safety, and welfare of the public through the prevention of new non-compatible land uses within the vicinity of JAC; to reduce the annoyance of aircraft noise intrusion to prospective residents by providing direct notice of the possibility of such intrusion prior to home purchase; and to provide mandatory construction requirements for new structures within the airport environs.

DESCRIPTION: This measure is continued from the previous Part 150 Study (Measure 7: Reduction of Noise Intrusion to Sensitive Land Uses in the Airport Environs from 2004 Part 150 Study Record of Approval).



Teton County currently has adopted the Jackson Hole Airport Resolution as part of the County Development Regulations. The Resolution contains the Height Hazard zoning ordinance and the Airport Noise Exposure regulations. The noise exposure regulations state that if any part of a subdivision is to be located within two miles of the centerline of the runway, subdivision plats shall be annotated to indicate the immediate proximity to JAC. This Action will notify potential residents within JAC environs of possible noise intrusion. In addition, recommended noise reduction measures for construction are presented in an effort to reduce inside noise levels by 25 dB for properties within the 65 or 70 DNL. It is recommended that these regulations remain part of any future County regulatory scheme.

DISCUSSION: Potential property buyers be notified of the potential for noise. Additionally, noise reduction measures may be included for the construction of any future residential structures within a certain contour. The future base case 65 DNL noise contour is located entirely on JAC property. Therefore, it might be in the County's interest to put these construction requirements in place for a larger contour (such as the 60 DNL) or for the same area defined for the notice requirement in the Code.

SUMMARY: Zoning can be a very effective means of controlling land use development and is the most widely used land use control. This measure has already been implemented by Teton County. It is therefore recommended that the Jackson Hole Airport Resolution be kept in place in any zoning revisions in the future to continue to apply preventative zoning measures and buyer notification. The airport director should file the updated NEMs with the County.

8.1.2 Comprehensive Plan Amendments

GOAL: To prevent the introduction of new non-compatible land uses through the land use planning and development policy process.

DESCRIPTION: Comprehensive plans are prepared by local jurisdictions to 1) identify current conditions in a community, 2) identify community goals and policies, and 3) identify plans for that community to achieve the goals. This measure proposes that the Town and County Planners consider JAC in any future comprehensive plan update to achieve long-term land use compatibility of the jurisdiction's lands.



These plans are particularly important in the area around JAC that may experience noise levels that could affect certain types of residential structures or public buildings, and may be outside the 65 DNL noise contour. It is desirable that each community develop its plans and policies to be compatible with existing and future aircraft noise levels. This approach will help ensure that compatible development occurs in the future, as it is much easier to avoid the creation of land use incompatibilities than it is to remedy incompatibilities in the future.

DISCUSSION: The Town of Jackson and Teton County adopted the Jackson/Teton County Comprehensive Plan in April 2012 to serve as a guide for future development within Jackson and Teton County. The Comprehensive Plan recognizes the importance of JAC as a key gateway to destinations in the area such as the GTNP. The Plan also recognizes that the areas west and south of JAC serve as gateways to these major destinations and should be carefully planned accordingly. The Comprehensive Plan includes a Future Land Use Plan to envision what the community will look like upon full implementation of the themes and goals of the Comprehensive Plan.

Regarding directions for future development, the Comprehensive Plan classifies the subareas west of JAC as primarily Preservation and Conservation-oriented subareas. These subarea types are focused on preserving existing infrastructure with no change to undeveloped open space, scenic resources, or wildlife habitat; and focuses on improved conservation through increasing the amount of such resources, respectively. Based upon these classifications, and due to the prevalence of protected natural lands in the region, future land use changes can be expected to have little impact on land use development and change within the airport vicinity. These recommendations within the plan focus on conservation and are consistent with long-term compatible land uses.

SUMMARY: As stated earlier, a comprehensive plan by itself does not reduce aircraft noise levels nor does it control the use of land, as it is just a policy statement of the intended future use of land. However, comprehensive plans do influence the development or change in use of any particular piece of property. They also serve as a guide for future development. As described above, the Comprehensive Plan focuses on conservation within the area surrounding JAC. This, paired with the Jackson Hole Airport Noise Resolution, provides good preventative land use measures. It is recommended that any future comprehensive plan from Teton County or planning studies from NPS would continue to examine the future land use plans near JAC and take into account the NEMs contained within this Study.



8.2 Administrative and Facility Alternatives

Administrative and facility measures are those that JAC can implement, with or without FAA funding. These measures will generally not result in noise reduction or would result in small changes relative to single events that would not affect the DNL contours. These alternatives enable JAC to monitor the success of the program and to provide enhanced response to community concerns and pilot coordination on issues of concern. They are not dependent upon other measures to be implemented.

8.2.1 Development of Fly Quiet Program and Pilot Awareness Program

GOAL: To reduce the effect of single event noise levels and to increase awareness of noise sensitive uses and noise abatement procedures for pilots operating at JAC.

DESCRIPTION: This measure involves the creation of a Fly Quiet Program for JAC. The Fly Quiet Program's purpose is to encourage individual airlines, fractional jet operators, and individual business jet operators to operate as quietly as possible at JAC. One of the features of the program would be a Report Card that acknowledges those operators that attempt to follow the noise abatement goals of JAC. The program may have different award categories for different categories of operators. For example, the program could include one category for airlines, one for fractional operators like NetJets, and one for individual business jet operators. A goal for the Fly Quiet Program could be for fractional operators to schedule their quietest aircraft into JAC. These newer, quieter aircraft are also typically equipped with more modern cockpit management systems capable of flying precise procedures that can avoid noise sensitive land uses. The program creates a participatory atmosphere of the operators working with JAC, and the community to actively reduce noise by grading an airline's operator's performance, adding the grades to the Report Card, and making the scores available to the public via an airport tablet application, newsletters, publications, and/or public meetings.

The participation of GTNP, pilots, affected communities, as well as users of GTNP would be required to develop and initiate a Fly Quiet Program. The Fly Quiet Program is intended to grow and change as new procedures and new technologies are incorporated into JAC's noise abatement program. For example, a goal of the program could be for airlines to operate Stage 5 aircraft at JAC, which are also typically equipped to fly NextGen procedures. These goals would be voluntary, and scores would be computed and reports would be generated quarterly and yearly.



The Fly Quiet Program offers a dynamic venue for implementing new noise abatement initiatives by praising and publicizing active participation rather than a system that admonishes violations of mostly voluntary procedures. This would build upon the existing voluntary procedures described in Chapter 1.

DISCUSSION: Pilot education is very important with regards to single event levels. A Fly Quiet Program distributed to pilots can help educate them on “good neighbor” procedures, which would reduce the effect of fly-overs on noise sensitive uses. This is particularly applicable as it relates to the noise sensitive areas of GTNP and the specifications of the Use Agreement

Comments received during this Study have indicated that a Fly Quiet Program would be highly valued to examine additional methods to reduce overflights of noise sensitive areas.

SUMMARY: A Fly Quiet Program is focused on education. Experience with these programs across the nation has indicated that education can be an important tool for reducing single event noise near airports (particularly related to general aviation operations) and can be more easily updated than a Part 150 Study.

8.2.2 Continuation of Study Input Committee

GOAL: To assist in implementation of the Part 150 Study Noise Compatibility Program, the Fly Quiet Program, and identify and address noise issues with an ongoing method.

DESCRIPTION: This measure involves the continuation of the SIC established for this Study. It is recommended that noise concerns are addressed through a continuation of a committee meetings.

DISCUSSION: Noise metrics and mitigation is a complex subject and the SIC members and airport staff have invested a significant amount of time in the development of this Study, particularly in the “learning curve” effort and building of relationships. This is particularly important for JAC with the partnership between the airport staff and NPS staff. The continuation of the committee in one format or another could assist on-going implementation efforts once the NCP is approved by the FAA. The balance of interested parties is very important for the successful implementation of the NCP. Current members include stakeholders such citizens, the Elk Refuge, Teton County representatives, pilots, ATCT, among others. These members could continue as part of the committee and additional new members could be added to represent additional interests as needed.



SUMMARY: Continuation of the SIC in some format can ensure that the “body of knowledge” gained during the Study process is not lost and can continue to foster relationships between the stakeholders as the program gets implemented.

8.2.3 Installation of a BI-6 Repeater in Jackson Hole Tower

GOAL: To provide the JAC Tower with enhanced ability to offer additional guidance to aircraft to avoid, as much as possible, and avoid noise sensitive areas of the within the GTNP and surrounding areas.

DESCRIPTION: This measure involves installing a repeater of the existing BI-6 radar feed that is already installed at JAC. The B1-6 radar system is a state-of-the-art monopulse secondary surveillance radar that is able to interrogate transponder equipped aircraft to determine aircraft range, azimuth, assigned code, altitude, Mode-S identification, and emergency status. It would provide controllers at the JAC Tower with a BI-6 repeater scope that gives local controllers the ability to positively identify visual flight rules (VFR) traffic by assigning transponder codes and then providing advisories to local visual flying aircraft. This could potentially allow the controllers the ability to provide accurate traffic advisories to the airlines, corporate jets, and air taxis that are on instrument flight rules (IFR) flight plans and separate from one another (by Salt Lake Center) and from VFR traffic. This would include developing a Memorandum of Understanding (MOU) with all controllers to recommend east turns and paths for all operations to avoid the defined noise sensitive areas.

DISCUSSION: At JAC, the Tower uses long-range radar, which does not provide information for smaller aircraft due to the nature of long-range radar not being as precise as a more local radar feed. Due to this, aircraft operate on a “one-in”, “one-out” basis, meaning aircraft operate in an environment that uses the same separation standards as if there was not radar available for the air traffic controllers. The JAC radar is a beacon interrogator feed (BI-6 feed) that updates every 12 seconds based upon beacon code responses; this allows JAC to see aircraft flight tracks, even smaller aircraft as long as the aircraft beacon receives the radar interrogation. The BI-6 repeater scope will provide this same information in a display scope to the Tower that currently is displayed at Salt Lake Center. The radar will give the air traffic controllers better accuracy when knowing where an aircraft is in relation to GTNP and especially sensitive noise areas. This increased situational awareness will allow controllers to guide aircraft away from the Critical Area Boundary within GTNP as well as areas around JAC which would typically be outside of the 65 DNL but that receive overflights. This could help reduce overflights of the noise sensitive areas of GTNP and surrounding areas.



SUMMARY: Installation of a repeater at JAC will provide greater aircraft location accuracy for the air traffic controllers, allowing them to guide aircraft away from noise-sensitive uses within GTNP and other areas.

8.2.4 Noise Monitoring/Flight Tracking

GOAL: To track single noise events around JAC.

DESCRIPTION: This measure was not specifically outlined in the 2004 Part 150 Study ROA; however, JAC has one of the most extensive noise monitoring systems in the country. This alternative would look at ways to improve on this system and integrate it with a potential Fly Quiet Program.

DISCUSSION: In 2003, JAC installed a noise monitoring system consisting of six permanent noise monitoring sites, as shown in Chapter 1. Prior to installation of the permanent system, JAC completed seasonal monitoring from 1984 to 2003. The permanent monitoring system is state-of-the-art and complies with all specific International Electrotechnical Commission (IEC) standards and measurement standards established by the American National Standards Institute (ANSI) for Type 1 instrumentation.

The data collected by the permanent monitors include the continuous measurement of 1-second average or equivalent (LEQ) noise levels. This type of measurement system allows for a more accurate measurement of lower aircraft noise levels that are typical of the sites in GTNP. Analysis of this data resulted in the SEL noise levels from each individual flyover, the hourly LEQ noise levels, and the daily DNL noise levels for the measurement period.

In fall of 2008, the FAA installed a BI-6 radar system at JAC. With the installation of radar, the noise monitoring system was also upgraded. The BI-6 radar data connection allows for the noise monitoring system to correlate an aircraft noise event to the aircraft causing the event. The upgrade allows the noise monitoring system to more accurately measure the aircraft noise levels at the noise measurement points.

JAC maintains a live feed of all of the IFR aircraft activity in the United States directly from the FAA center data as a secondary information source compiled by ITT Corp. These data are fused from multiple sensors, including en-route data, ADS-B transponders, and the BI-6 radar located at JAC. VFR operations are determined from the FAA's Terminal Area Forecast and OpsNet databases. When possible, VFR data are correlated with the noise event data using custom software.



Each flight is assigned a unique identification track number, so all of the data for any particular flight can be compiled. The flight information includes data such as the ARTS aircraft type, ARTS airline code, departing and arriving airport codes, and flight number. The position information includes the X and Y coordinates as well as the altitude of the aircraft at each point.

Another new data source JAC should consider is the FAA's System Wide Information Management System (SWIM). SWIM is a mechanism to access a wide array of Air Traffic Management (ATM) data, including near-live flight tracks. Accessing SWIM data does not require connectivity to other FAA facilities such as Air Route Traffic Control Centers (ARTCC), TRACONS or BI-6 systems. Instead, authorized data consumers make software requests over the Internet (through a VPN) to get any and all available data in the vicinity of JAC.

The data can contain other information not included in the BI-6 feed, such as detailed flight plans and planned routes. SWIM data that covers the Jackson Hole area is just now starting to come online and be available for use. This should improve JAC's ability to track and report on operations that currently are not available from the current radar feed. For example, transient helicopter and fixed wing tour flights that are now unknown, can be tracked from their departure/arriving airport. The data will also include ADS-B data so that the operator of that aircraft will also be known. While not all aircraft are now ADS-B equipped, the mandate is to have nearly all aircraft equipped by 2020.

SUMMARY: JAC is actively using their noise monitoring system, and it is recommended they continue to do so to report on supplemental metrics and tracking for use by JAC and the GTNP. This measure recommends that the noise monitoring system be upgraded when necessary to continue this important program. Additionally, it is recommended that during the Fly Quiet Program, specific attention is paid to ways to integrate the Fly Quiet Program with the noise monitoring system to accurately track the effectiveness of the Program over time and identify ways to improve the program and the system, particularly with respect to integrating new technology opportunities noted above.



8.2.5 Noise Complaint Response and Investigation

GOAL: To collect and examine aircraft noise comments and increase ability to respond to public and GTNP concerns based on comments received.

DESCRIPTION: This measure is a continuation of an approved measure from the previous Part 150 Study. Under this alternative, JAC would continue its Noise Complaint system approved in 1985 as part of the initial NCP, recording noise complaints received from citizens to monitor the noise abatement plan described in Chapter 1.

As part of this measure, airport staff receives a report from Flight View, showing N-numbers and time of aircraft operations at JAC. The airport staff proactively looks up the addresses and companies that operate during the curfew (with the exception of life-flights). For any aircraft that do not conform to the voluntary curfew (regardless of whether there is a complaint), JAC sends them a notification letter. Although the curfew is voluntary, JAC finds that the letter notifications can help reduce the number of nighttime operations during the curfew.

If there is a complaint filed relative to an event, after finding the cause of the violation, JAC follows up with the person who submitted the complaint. Due to this process of proactively contacting all companies that operate during the curfew, and the other noise mitigation processes in place, JAC receives few noise complaints.

DISCUSSION: Stakeholder comments can be very important for the relationship between JAC, GTNP, and the public. This measure should be continued and could be integrated with the recommended Fly Quiet Program alternative to provide a cohesive approach.

SUMMARY: Tracking noise comments or complaints can help JAC better understand the location and type of operations that are most annoying to the public. Additionally, it could be integrated with a Fly Quiet Program to provide additional links to metrics/reporting.

8.2.6 Review and Update Part 150 Study

GOAL: To update the Part 150 Study when appropriate to ensure the NEMs and NCP are adjusted as conditions change over time.

DESCRIPTION: This measure would involve the update of the NEMs or the Part 150 Study, when needed, or when dictated by the Use Agreement with the Park Service.



DISCUSSION: A Part 150 Study is intended to be a “living document” to be used as a tool to monitor and guide program development, and evaluate aircraft types and operations. The Study should be reviewed and updated, as appropriate. The general guideline is whenever the actual operations are approximately 15% different from the forecast operations, the NEMs should be reviewed. In addition, any time there are significant new non-compatible land uses within the 65 DNL or greater contours, or if there are airport facility changes which may affect the contours, consideration should be given to reviewing the maps. At the end of the five-year study period (after the date of NCP approval), the operations and mix should be re-evaluated to identify the extent to which they have changed to determine if a Part 150 Study Update is warranted.

SUMMARY: This measure will ensure that the NCP is adjusted as conditions in the environs of JAC change over time (such as an increase in number/type of traffic, operational, or technology changes).

8.2.7 Upgrade JAC’s Ground Based Augmentation System (GBAS)

GOAL: Use the most updated ground based technology that supports NextGen procedures.

DESCRIPTION: This measure would involve the upgrade of JAC’s existing Ground Based Augmentation System (GBAS) to support proposed NextGen procedures. JAC previously purchased a GBAS, which is a NextGen landing system, like an ILS, but uses the GPS signal along with local ground based augmentation that allows aircraft to land in instrument weather conditions. It is different than an ILS in that it can be used on both runway ends and can support multiple approach procedures without installing an ILS at each runway end. The current system at JAC is not active, but JAC can request an upgrade at any time from the manufacturer. The upgrade is at no cost; however, there are some one-time construction costs and on-going maintenance that are currently not reimbursable by the FAA. Below is a list of the advantages of GBAS.

- It is a very precise and accurate landing system that is less influenced by poor weather than an ILS. It would enhance the safety for aircraft landing at JAC when using this landing system.
- Aircraft that use this technology are flying a very precise and stabilized approach. The approach can be designed to be optimized so that minimum thrust is required to give the aircraft a continuous descent, and a quieter landing can be attained without the need for power adjustments that often occur with a conventional ILS approach.



- The system would provide for an instrument approach from the south (Runway 01) that would have better minimums than can be achieved today, which means aircraft could land in poor weather conditions. In the future, the minimums may even be improved over the current minimums for aircraft landing from the north (Runway 19). This could increase the ability for aircraft to land from the south, reducing overflights over GTNP (see Alternative 5, which proposes increased use of landings on Runway 01). However, as presented in the noise analysis alternatives section, this could increase noise over residences to the south.
- Currently the only operator at JAC that has GBAS-capable aircraft equipped to use this technology is Delta's 737-700 aircraft. New generation aircraft such as the 737 MAX and A320 NEOs will be equipped to fly this type of landing system. This includes the 737-MAX aircraft ordered by both Delta and United. Thus, having this landing system may encourage airlines to operate these aircraft at JAC, which could be beneficial from a noise perspective because these new generation aircraft are quieter than current aircraft.

DISCUSSION: Currently, the FAA does not reimburse the annual maintenance for GBAS landing systems. The recommendation is to work with airlines that have shown interest in the technology to do a preliminary analysis that would document the performance benefits of a GBAS at JAC. Generally, the benefits would be difficult to precisely determine in terms of the DNL noise contours, but could help increase the use of future NextGen procedures, more stabilized quieter landings, and promote the use of new generation, quieter aircraft at JAC. This recommendation pursues the upgrade to the GBAS if and when FAA provides annual maintenance support.

SUMMARY: This measure would help provide support for NextGen procedures through the upgrading of ground based technology.

