



# APPENDIX D

## AIRPORT TRAFFIC CONTROL TOWER

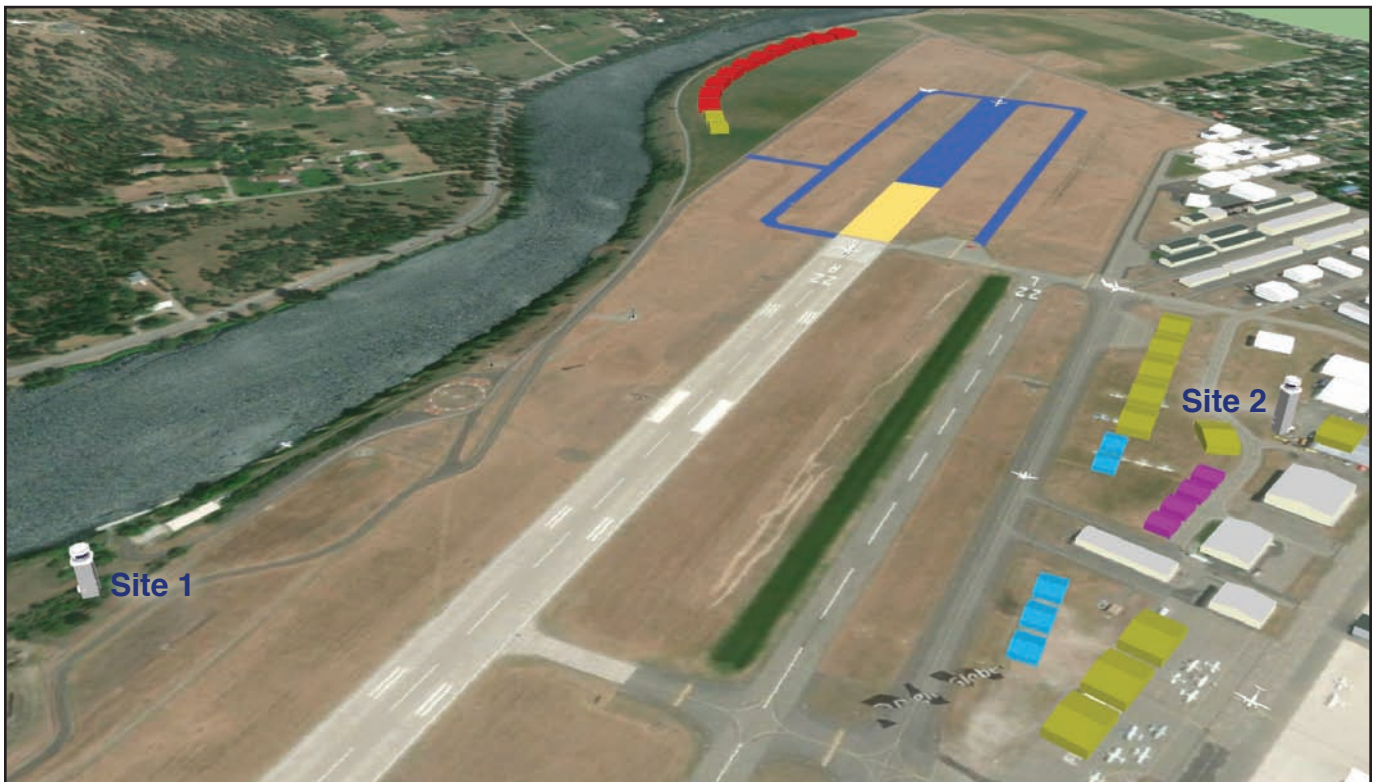
## SITING STUDY

# SITING REPORT

## PROPOSED NEW AIRPORT TRAFFIC CONTROL TOWER at the FELTS FIELD AIRPORT

### SPOKANE, WASHINGTON

Prepared for: Spokane Airport Authority  
For Submittal to: Federal Aviation Administration



## 1192 AIR TRAFFIC CONTROL TOWER (ATCT) FEASIBILITY STUDY (PHASE 1)

FINAL DRAFT – JUNE 1, 2020

# ATCT Siting Report (SFF)

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This Siting Report was prepared by  
***CTBXaviation***

## Felts Field Airport ATCT

# SITE COMPARISON CHART

ITEM	SITE 1	SITE 2
1 ATCT Orientation/Cab Direction	Primarily Southeast	Primarily Northwest
2 Construction Cost Estimate	\$5,700,000	\$6,850,000
3 Latitude/Longitude	47° 41' 4.33"N; 117° 19' 29.87"W	47° 40' 58.44"N; 117° 18' 57.49"W
4 Access to ATCT Site	Utilize Adjacent Gonzaga Rowing Club Access Road	Utilize Airport Gate #1 to Interior Access Road
5 Distance to and Elevation of Key Point	3727 ft. (end Runway 22R Future) 1954 ft. MSL	4022 ft. (end Runway 4L) 1943 ft. MSL
6 Ground Elevation	1929 ft. MSL	1951 ft. MSL
7 Controller (ATCS) Eye Height (5' above cab floor)	77 ft. AGL 2006 ft. MSL	100 ft. AGL 2051 ft. MSL
8 ATCT Height (cab floor +35 feet incl. antennas)	107 ft. AGL 2036 ft. MSL	130 ft. AGL 2081 ft. MSL
9 ATCT Potential Impacts to NAVAIDS	None	None
10 TERPS Impacts	None	Exist. Procedures: None Future Procedures: See App A
11 Part 77 Impacts	Penetrates 7:1 Surface 4L-22R by 71.1'	Penetrates 7:1 Surface 4L-22R by 41.3' 4R-22L by 62.1'
13 Object Discrimination: Detection Recognition Identification	PASS PASS PASS	PASS PASS PASS
14 LOS Angle of Incidence (degrees)	0.80	1.54

*Note: The eye height at Site 2 is the result of the Line-of-Sight required to see over existing and future hangars. It is higher than Site 1 as exemplified by angle of incidence greater than the minimum of 0.80 degrees.*



## SFF AIRFIELD OVERVIEW



# 1. BACKGROUND INFORMATION

## 1.1 PURPOSE OF THIS REPORT

Spokane's Felts Field (SFF) has two hard surface runways, alternate grass and water landing areas, an instrument landing system on one runway, an airport traffic control tower (ATCT), taxiway system, aircraft aprons and many hangars. The airport property also supports a floatplane ramp and docks for a water landing area in the Spokane River which is not under the responsibility of the control tower.

SFF is a very land constrained airport, with a river to the north and limited available space along the runways. The existing landside facilities are on a narrow strip of land in between the runways and the adjacent Rutter Avenue and railroad tracks. The airport has significant demand for additional hangars and businesses with limited options for locations. An area between existing hangars and Taxiway B has been contemplated for building future hangars, however, doing so would block the view of the required airfield movement areas from the existing control tower (*Figure 1-1*).



Figure 1-1: SFF Movement Area

Therefore, the purpose of this report is to identify two (2) viable locations and heights of an ATCT that can virtually satisfy the FAA criteria of a Safety Risk Management Document (SRMD) and will allow hangars to be constructed within the desired area without obstructing the controllers' line-of-sight. This process will generally follow the guidelines set forth in FAA Order 6480.4B, Chapter 8, Alternate Siting Process. However, it will not provide a complete SRMD at this time.

This report will address:

- Impacts to instrument approaches with vertical guidance (Terminal Instrument Procedures – TERPS)
- Impacts to FAR Part 77
- Impacts to communications, navigation, surveillance equipment & rotating beacon
- Visibility Performance
- Operational Requirements
- Rough Order of Magnitude (ROM) construction cost of the ATCT structure and ATC equipment relative to recently constructed projects.

The technical source data for this study includes the Airport Layout Plan (ALP) dated October 16, 2017, ground contour mapping, aerial photography, an interactive 3D computer simulation, the FAA Visibility Tool, current instrument approach plates, site visits, and preliminary tower design data. The proposed eye height, critical lines-of-sight, and site feasibility were examined through the use of these documents and tools.



## **1.2 SUMMARY OF KICKOFF MEETING/ATTENDEES**

A kickoff meeting for the Felts Field Airport ATCT Siting Process took place on January 23, 2020 in the SIA Board Room at Spokane International Airport.

The list of attendees included:

- Mark Kuttrus, *Assistant VP, Aviation Planning, WSP*
- Brian Lally, *President, CTBXaviation*
- Mike Lally, *Siting Analyst, CTBXaviation*
- Larry Krauter, *CEO, Spokane Airports*
- Lisa Corcoran, *Project Manager, Spokane Airports*
- Matt Breen, *Director, Planning & Engineering, Spokane Airports*
- Ryan Sheehan, *Director of Operations & Maintenance, Spokane Airports*
- Adam Phelps, *Operations Manager, Spokane Airports*
- Chris Mansfield, *Senior Project Manager, TO Engineers*
- Hyrum Wadsworth, *ATM-SERCO, FAA-Tower Contracted*

## 2. SITING CRITERIA

### 2.1 THE ATCT SITING PROCESS

The initial evaluation of SFF for the siting of an ATCT took into consideration the entire airfield for the study. That exercise resulted in six (6) initial candidate sites based upon factors having the highest potential for the successful siting and construction of an ATCT (*Figure 3-1*). Through the process of elimination for the most desirable locations, two (2) sites were selected for final consideration.

The following is a summary of considerations used in this siting analysis:

- **Analyze Airport Planning Standards** - Identify building restriction lines, object free zones, runway visibility zone, aircraft parking aprons, buildings, aircraft movement areas, location of utilities, airfield lighting vault extensions, rotating beacon, and off airport development.
- **Terminal Instrument Procedures (TERPS) Analysis** - Evaluate ATCTs at each respective site for possible impacts to the approaches, circling minimums and missed approach segments (Appendix A).

It is not likely that there will be any issues from a TERPs perspective regarding proposed ATCT Sites 1 and 2. RWY 4L is a full ILS, precision approach, but the minimums are high due to trees on the adjacent mountain. Typically the non-precision approaches are more critical because the missed approach point is either at the threshold or even beyond the threshold to accommodate fixed error. The minimums for Felts Field are so high that they are not relevant. The controlling procedure is actually the RNAV (GPS) RWY 4L procedure which has the lowest precision minimums. The obstacle clearance over Sites 1 and 2 are approximately 100 feet clear above the proposed ATCTs.

- **FAR Part 77 Surfaces** - Each proposed site and structure was evaluated relative to its potential penetration of the Airport's Part 77 imaginary surfaces (Appendix A).
- **Impacts to Communications, Navigation and Surveillance** - There is no airport or air surveillance equipment located on or near Felts Field to

be impacted. There is a clear radio line-of-sight to the entire airfield and airspace from the proposed ATCT Sites 1 and 2 with the assumption that antennas will be mounted on the roof of the facility (Appendix A).

The location of Site 1 is the result of the comparison of it (rowing club area) versus Site 5 (ASOS/Segmented Circle area). Impact to the offset localizer (LOC) is the primary issue.

The current LOC is an 8-element array. The 8-element array has a peak in its sideband radiation pattern (which is a source of reflections from objects in the stronger portions of the pattern) at about 8.5 degrees, matching Site 5 fairly close. As a result, the 8-element array will not tolerate a tower at 9 deg off course regarding Site 5. If the 8-element array is upgraded to a 14-element version, the maximum of the sideband energy is moved to about 5 degrees and a reflector at 9 degrees is better tolerated. This upgrade would make Site 5 acceptable (at least at this high level of analysis). However, with either LOC configuration, Site 1 is preferable.

No impacts to the SFF ILS system are anticipated with respect to Site 2.

- **Visibility Performance Analysis** - A minimum vertical LOS and angular intersection of 48-minutes (0.80 degrees) is used to determine controller eye height. The farthest distant points (Key Point) on the airfield as measured from the control cab typically represent a “worst case” situation for the purpose of ATCT siting and viewing perspective. However, when there is a significant difference in the elevations of runway ends with respect to an ATCT ground elevation, the furthest distance may not control the required eye height. The gradient of the surfaces of taxiways and runways along the LOS is also considered in the cab eye height calculation. Two human factor performance metrics, Object Discrimination Analysis and LOS Angle of Incidence, are applied to assess the impact of the proposed ATCT height on the Air Traffic Control Specialist (ATCS) distance perception. The FAA ATCT Visibility Analysis Tool (ATCTVAT) was used to assess the human factors performance metrics. The two (2) shortlisted candidate sites both passed the Visibility Performance Analysis. ATCTVAT results are presented in Appendix C.

**SFF Runway 4L-22R Data Table**

Runway	Existing	20 Year Req't	Ultimate
4L-22R	4499' x 100'	5500' x 100'	6100' x 100'

*Note: For the purposes of this Siting Report, the Future runway length applied to the LOS and Eye Height calculations is the Ultimate Length.*

**Operational Requirements** - The site plot must provide sufficient area to accommodate the building, emergency generator, exterior transformers, personnel parking, and any planned future improvements as prescribed by facility requirements.

According to the SFF ATCS, 100% of jets, multi-engine aircraft, and single engine turboprops land on Runway 4L-22R, as well as 85% of single-engine piston aircraft. The Runway 4 direction is used for 30% of operations and the Runway 22 direction is used for 70% of operations.

Maximum visibility of airborne traffic patterns and airfield movement surfaces must be available to all ATCS's positions. A clear, unobstructed and direct view of all active runways, taxiways and landing areas must be available. The airport traffic pattern and inbound traffic direction are also a visibility consideration.

**Rough Order of Magnitude (ROM) Cost Estimate** - Opinion of Construction Cost (not based on any design at this time) is provided for site comparison purposes and are not recommended for setting construction budgets. It generally represents FY 2020 construction costs related to the ATCT building, Minimum Equipment List (MEL) electronics, and site work within 100 feet of structure. ROM construction-only costs are presented below and on the Site Comparison Chart. Siting, design, and other professional fees may be an additional 25% of the construction costs. FAA will require a Reimbursable Agreement for NAS Telecommunications, FDIO, STARS and NAVAIDs equipment and can range up to \$800k. The AIP Reauthorization Act (FY 19) provides and allows for FAA funding for the planning, design and construction of contract towers. Other special programs and congressional designations, such as ARRA, have paid for these costs.

Construction ROM for each proposed site:

Site 1 (77' AGL eye height) = \$5.7M

Site 2 (100' AGL eye height) = \$6.9M

## 2.2 INTERACTIVE 3D COMPUTER SIMULATION

CTBXaviation provided a 3D Interactive Computer Simulation of the airport and inner approaches that allowed real time analysis of various ATCT height and location scenarios from a controller's eyes to the airfield movement and non-movement areas. Simulation screenshots from the two (2) candidate sites are presented in Appendix B.



## 3. INITIAL SITES CONSIDERED

### 3.1 CANDIDATE SITES AND SITES ELIMINATED

The six (6) potential sites identified in Figure 3-1 were originally considered for the kickoff meeting held in January 2020.

The siting considerations listed in paragraph 2.1 were uniformly factored when evaluating the candidate sites. Candidate Sites are labeled 1, 2, 3, 4, 5 and 6. The observations made of these sites are summarized here.

The Airport Traffic Control Tower siting analysis was carried out to identify new potential ATCT sites at Felts Field Airport (SFF) that are capable of supporting a new control tower.

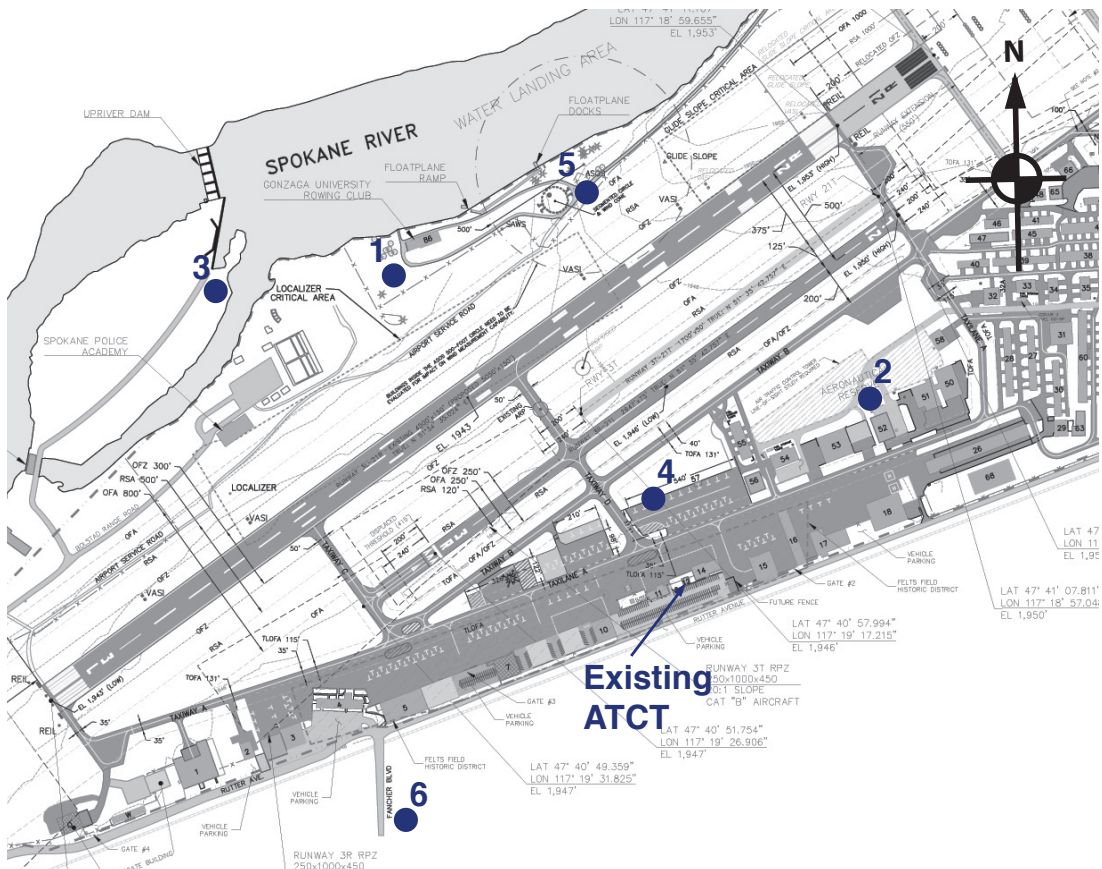


Figure 3-1: Sites originally considered for Siting Report

Six (6) sites were identified for evaluation based on available space, access, unencumbered line-of-sight, clean view of all critical operations areas, access to utilities and infrastructure, compatibility with the latest Airport Layout Plan (ALP), and cost.

**1 - Rowing Club:** Located in an undeveloped treed area on the north side of the airport, Site 1 sits 40 feet west of the adjacent Gonzaga Rowing Club access road. Site 1 is 625 feet from Runway 4L-22R centerline and 240 feet outside the Runway OFA. The eye height is 77 feet AGL. It is 1650 feet from the airfield lighting vault. Ground elevation is 1929 feet MSL. This site has the potential to be considered further.

**2 - Equipment Building:** Located on the south side of the airport inside of the Airport Operational Area (AOA) and 1150 feet northeast of the existing ATCT, this site is located at the north end of the existing Airport Equipment Building. Site 2 is 1100 feet from Runway 4L-22R centerline and 700 feet outside of the Runway OFA. It is 600 feet outside of the 4L-22R runway primary surface and 475 feet outside of the 4R-22L runway primary surface. The minimum eye height is 48 feet AGL, but a proposed eye height of 100 feet AGL is needed in order to have clear LOS over all existing and future hangars. It is 700 feet from the airfield lighting vault. Ground elevation is 1951 feet MSL. This site has the potential to be considered further.

**3 - Island:** Located on the power plant island on the north side of the airport, this site is 425 feet south of the Upriver Dam. Site 3 is 950 feet from Runway 4L-22R centerline. The eye height is 93.5 feet AGL. It is 2425 feet from the airfield lighting vault. Ground elevation is 1925 feet MSL.

**4 - Customs Inspection Trailer:** Located 390 feet northwest of the existing ATCT and adjacent to the Customs Inspection Trailer, Site 4 is 875 feet from Runway 4L-22R centerline and 475 feet outside the Runway OFA. It is 175 feet from the centerline of Taxiway B. The eye height is 52 feet AGL. It is 300 feet from the airfield lighting vault. Ground elevation is 1950 feet MSL.

**5 - ASOS Area:** Located in an undeveloped area on the north side of the airport, Site 5 sits between the ASOS and the Segmented Circle. Site 5 is 450 feet from Runway 4L-22R centerline and 50 feet outside the Runway OFA. The eye height is 42 feet AGL. It is 1300 feet from the airfield lighting vault. Ground elevation is 1950 feet MSL.

**6 - Warehouse Site:** Located on the south side of the airport, Site 6 is located 1725 feet southwest of the existing ATCT. The site is on airport property, however, it is on the south side of Rutter Avenue and the railroad tracks in an overflow parking lot. Site 6 is 1400 feet from Runway 4L-22R centerline and 1000 feet outside the Runway OFA. The minimum eye height is 74 feet AGL, but a proposed eye height of 140 feet AGL is needed in order to have clear LOS over all existing and future hangars. It is 2250 feet from the airfield lighting vault. Ground elevation is 1953 feet MSL.

**Summary of Candidate Sites**

Site No.	Proposed Controller Eye Height (AGL)	Ground Elevation (MSL)	Distance to Keypoint	Key Point / Elevation (MSL)	ATCTVAT Pass/Fail Detection
1	77'	1929'	3737'	22RF / 1954'	P
2	100'	1951'	4022'	4L / 1943'	P
3	93.5'	1925'	4616'	22RF / 1954'	P
4	52'	1950'	3439'	22RF / 1954'	P
5	42'	1950'	2706'	22RF / 1954'	P
6	140'	1953'	5233'	22RF / 1954'	P

*Note: For the purposes of this Siting Report, the Future runway length applied to the LOS and Eye Height calculations is the Ultimate Length.*

### **3.2 SITES ELIMINATED**

Sites 3, 4, 5 and 6 were eliminated from further study for the following reasons:

Site 3 was eliminated because the island on the north side of the airport is not a feasible location logistically. It is not on airport property. It would be in the path of seaplanes approaching and taking off on the Spokane River. Main traffic pattern to Runway 4L-22R is “behind” the controllers which is not desirable. Problem with seeing aircraft approaching from the north, over Beacon Hill.

Site 4 was eliminated due to having unacceptable risks involving line-of-sight obstructions from the existing control tower to Taxiway B, Runway 4R-22L and Runway 4L-22R during construction. Mitigations, such as a temporary tower or a supplemental camera, were not considered feasible.

Site 5 was eliminated due to it being too close to the localizer (LOC) critical area. The current LOC is an 8 element array, which won’t be able to tolerate well with a tower at 9 degrees off course. Site 1 is a more preferable site for the current LOC antenna system if a tower on the north side of the airport is to be considered. Also, the ASOS would have to be relocated to satisfy its NOAA setback requirements for wind.

Site 6 was eliminated due to the same visibility problems (i.e., ability to see over existing and future hangars) as the existing ATCT. This site was mainly used for demonstration purposes to see how tall a tower would need to be with a similar vantage point as the existing ATCT. An eye height of 140 feet (ASL) would be needed to have clear LOS over the hangar that obstructs Taxiway B.



## 4. PREFERRED SITES

The remaining sites for further consideration, Sites 1 and 2 were fully evaluated. Refer to Figure 3-1 on Page 16 for their airfield locations.

### 4.1 SITE 1

#### 4.1.1 Description

Site 1 is located on the north side of the airport in an undeveloped treed area (Figure 4-1). The site sits 40 feet west of the adjacent Gonzaga Rowing Club access road and 1000 feet southwest of the ASOS. The setback to Runway 4L-22R exceeds the minimum required 400 foot Object Free Area as noted on the ALP for SFF. This site is set 625 feet offset to the Runway 4L-22R (primary/precision instrument runway) centerline. Site 1 is 1650 feet from the airfield lighting vault.



Figure 4-1: Site 1 Location

The existing ground is flat at an elevation of 1929 feet MSL. The site is at the bottom of a hill that is approximately 20 below the airfield elevation. The ATCT cab was evaluated at an eye level of 2006 feet MSL (77 feet AGL). The overall height estimated to the tops of the antennas and lightning rods is estimated for airspace determinations (35' above cab floor) at 2036 feet MSL (107 feet AGL).

The distance to the furthest point on the airfield is 3727 feet to the future end of Runway 22R (1600 ft. extension). The ATCS will mostly have southeasterly views of the airfield. Lines of sight to all runways, taxiways and terminal area apron will be unobstructed from this site and height. Currently, ATCS's do not have a good visual on arriving aircraft until they fly over Beacon Hill from the north (*Figure 4-2*). ATCS's usually have a visual of aircraft once they are about 3 miles away. Site 1 is 1950 feet closer to Beacon Hill than the existing ATCT, which will make it more difficult for controllers to see aircraft over the hill. Also, downwind traffic will be behind the ATCS's operating positions, which is not ideal since they will have to turn around and possibly move toward the rear of the control cab to locate that traffic.

Site 1 has no impact on existing helicopter patterns, which mostly occur across the airfield along Taxiway B. There is a helicopter landing and take-off area 2400 feet southeast of Site 1. Site 1 has the potential to share infrastructure and access with the adjacent Gonzaga Rowing Club and will have clear LOS to all existing and future movement areas.

#### **4.1.2 Site Reference Data**

(Lat. 47° 41' 4.33"N; Long. 117° 19' 29.87"W; Eye 77' AGL)

#### **4.1.3 Siting Criteria**

##### 4.1.3.1 Criteria 1 – Visual Performance

The LOS Angle of Incidence was measured from the proposed eye height of 77 feet AGL (2006 feet MSL) relative to the ground elevation (1929 feet MSL) at Site 1, which is also the minimum eye height for this location and elevation. The LOS to the furthest movement area of the airport from Site 1 is to the future end of Runway 22R and will be visible from this height. The distance to Runway End 22R FUTURE is 3727 feet from Site 1. A proposed eye height of 77 feet AGL satisfies the FAA Angle of Incidence criteria and, as evidenced by the computer simulation, is high enough to see over any existing and future obstacles.

The 77 feet AGL eye height also provides room for functional spaces in the building below the cab. This height was entered into the FAA Visibility Tool which received a Passing result (see Appendix C).

The FAA uses the average distance from the cab floor to the ATCS eye as 5 feet. When the 5 feet is subtracted from the eye height at Site 1, a cab floor height of 72 feet AGL (2001 feet MSL) is the result.

**Object Discrimination Analysis** is the metric that determines how well an object the size of a Dodge Caravan or a Cessna 152 can be identified from the proposed site and height. Site 1 at the 2006 foot MSL eye height produced Passing results (see Appendix C).

#### 4.1.3.2 Criteria 2 – TERPS

An evaluation of the United States Standard for Terminal Instrument Procedures (TERPS) should be conducted at a later date by the FAA Western Service Area Flight Procedures Office (FPO). The preliminary advance analysis conducted for this report (Appendix A) found that there is no adverse impact to any of the instrument approach procedures.

#### 4.1.3.3 Criteria 3 – Part 77

The ATCT at Site 1 will be approximately 625 feet from the centerline of precision instrument Runway 4L-22R and will penetrate the existing 7:1 surface of this runway by 71.1 feet (Appendix A). An ATCT is considered fundamental airport development and is typically lighted with red FAA L-810 obstruction lighting in accordance with FAA Advisory Circular (AC) 70/7460-1K to allow such a penetration (see Appendix A).

#### 4.1.3.4 Criteria 10 – Security

The FAA has developed a minimum level of physical security requirements for sponsor owned FCT facilities as detailed in FAA Order 1600.69C effective August 13, 2018. The Order references the specific implementation guidance for the minimum level of physical security as prescribed in the Facility Security Management Program (FSMP). Site 1 will comply with fencing, lighting, main door and cab door access control with cab monitored camera and intercom, key pads or card swipe entry devices at doors and warning signage. FCT's are categorized as Facility Security Level (FSL) 1A, which may use a six (6) foot high security fence unless the ATCT is within the Aircraft Operation Area (AOA) or inside a secure active military base or part of the terminal building, in which case no fence is required.

## **4.1.4 Other Factors**

### 4.1.4.1 Panoramic Screen Shots of Computer Simulation

Digital still image files were taken during the computer siting simulation. They depict a sequential panoramic, 360 degree view from inside the control cab at Site 1 at the 2006 foot MSL (77 foot AGL) eye height. It should be noted that the existing and future development areas are depicted in the simulation. The panoramic computer screen shots are presented in Appendix B.

### 4.1.4.2 Rotating Beacon and Weather Sensor

A new Airport Rotating Beacon will be located on top of the new tower cab. The difference in location is not expected to adversely affect off-airport land uses.

Automated Surface Observation System (ASOS) location criteria maintains that the sensors should be clear of all structures over 20 feet tall within 500 feet. Located on SFF, in the vicinity of the ILS Glide Slope Antenna and 1000 feet northeast of Site 1, the ASOS is owned and maintained by the National Weather Service. There will be no weather sensor impacts from an ATCT at Site 1.

### 4.1.4.3 Communications and NAVAIDS

ATC or NAVAIDS signals can be affected by the construction of tall structures on airports. Signals can sometimes be affected by significant undulations in the airfield terrain. A NASWATCH determination should be conducted by FAA for each ATCT site proposed.

The Localizer and Glide Slope Antenna are considered a safe distance from Site 1. Preliminary findings regarding NAVAIDS are documented in Appendix A.

4.1.4.4 Airfield Lighting and NAVAIDS Monitoring: There are no FAA control/monitoring cables or airfield lighting cables located in the vicinity of Site 1. The existing FAA glide slope antenna and localizer locations are monitored remotely by the FAA. If FAA decides to provide a monitor in the new ATCT, then they will decide if it will be hard wired by telephone lines or by radio. Site 1 is 1650 feet from the airfield lighting vault which is within the capabilities of remote control via UHF modem from the ATCT to the vault.



#### 4.1.5 Summary for Site 1

Site 1 was evaluated at an ATCS eye height of 2006 feet MSL (77 feet AGL). The site is at the bottom of a hill that is approximately 20 below the airfield elevation. This site is considered to be suitable with no obstructed views to all existing and future runways, taxiways, future north side aircraft apron and existing terminal area apron, including the helipad located 2400 feet southeast of Site 1.

Site 1 is located in an undeveloped treed area on the north side of the airport and sits 40 feet west of the adjacent Gonzaga Rowing Club access road. It is 2460 feet northwest of the terminal building and it is set 625 feet offset to the Runway 4L-22R centerline. The OFA of Runway 4L-22R is 400 feet from the runway centerline. Since Site 1 is outside the AOA in a relatively public area, a six (6) foot high chain link fence with a motorized gate and access control is required around the site building and parking lot to satisfy some FAA security requirements.

This site has clear views of the airfield with the furthest point being 3727 feet to the future end of Runway 22R. Views of the airfield will be mostly to the southeast. Currently, ATCS's do not have a good visual on arriving aircraft until they fly over Beacon Hill from the north (*Figure 4-2*). ATCS's usually have a visual of aircraft once they are about 3 miles away. Site 1 is 1950 feet closer to Beacon Hill than the existing ATCT, which will make it more difficult for controllers to see aircraft over the hill. Also, downwind traffic will be behind the ATCS's operating positions, which is not ideal since they will have to turn around and possibly move toward the rear of the control cab to locate that traffic.

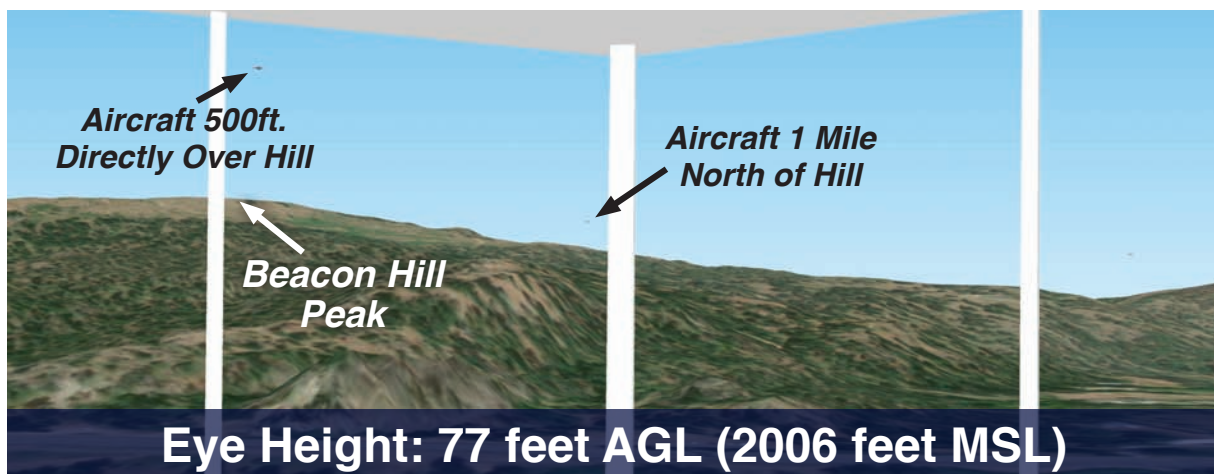


Figure 4-2: Site 1 LOS over Beacon Hill

## 4.2 SITE 2

### 4.2.1 Description

Site 2 is located on the south side of the airport inside of the Airport Operational Area (AOA) and 1150 feet northeast of the existing ATCT, this site is located at the north end of the existing Airport Equipment Building (Figure 4-3). The setback to Runway 4L-22R exceeds the minimum required 400 foot Object Free Area as noted on the ALP for SFF. Site 2 is 1100 feet from Runway 4L-22R centerline and 700 feet outside of the Runway OFA. It is 600 feet outside of the 4L-22R runway primary surface and 475 feet outside of the 4R-22L runway primary surface. Site 2 is 700 feet from the airfield lighting vault.

The existing ground is flat at an elevation of 1951 feet MSL. The ATCT cab was evaluated at an eye level of 2051 feet MSL (100 feet AGL). The overall height estimated to the tops of the antennas and lightning rods is estimated for airspace determinations (35' above cab floor) at 2081 feet MSL (130 feet AGL).



Figure 4-3: Site 2 Location

The distance to the furthest point on the airfield is 4022 feet to the approach end of Runway 4L. The ATCS will mostly have northwesterly views of the airfield. Lines of sight to all runways, taxiways and terminal area apron will be unobstructed from this site and height. Currently, ATCS's do not have a good visual on arriving aircraft until they fly over Beacon Hill from the north. ATC's usually have visual of aircraft once they are about 3 miles away. Like the existing ATCT, Site 2 is on the south side of the airport, so controllers will use the same situational awareness that is currently in practice. Downwind will be in front of controllers positions, which is desirable in order for them to see the aircraft traffic pattern of the main runway (4L-22R).

Site 2 has no impact on existing helicopter patterns, which mostly occur along Taxiway B. There is a helicopter landing and take-off area 340 feet south of Site 2. Site 2 will have clear LOS to all existing and future movement areas.

#### **4.2.2 Site Reference Data**

(Lat. 47° 40' 58.44"N; Long. 117° 18' 57.49"W; Eye 100' AGL)

#### **4.2.3 Siting Criteria**

##### 4.2.3.1 Criteria 1 – Visual Performance

The minimum ATCTVAT eye height for Site 2 is 48 feet AGL (1999 feet MSL). At this height existing and future hangars obstruct the LOS of Taxiway B and portions of Runway 4R-22L (*Figure 4-4*).

In order to alleviate the hangar obstructions to the line-of-sight for Site 2, the Angle of Incidence was measured from the proposed eye height of 100 feet AGL (2051 feet MSL) relative to the ground elevation (1951 feet MSL). The LOS to the furthest movement area of the airport from Site 2 is to the end of Runway 4L and will be visible from this height (*Figure 4-5*). The distance to Runway End 4L is 4022 feet from Site 2. A proposed eye height of 100 feet AGL satisfies the FAA Angle of Incidence criteria and, as evidenced by the computer simulation, is high enough to see over any existing and future obstacles.

The 100 feet AGL eye height also provides room for functional spaces in the building below the cab. This height was entered into the FAA Visibility Tool which received a Passing result (see Appendix C).



**NOTE: White/Gray structures are existing & Colored structures are proposed hangars**

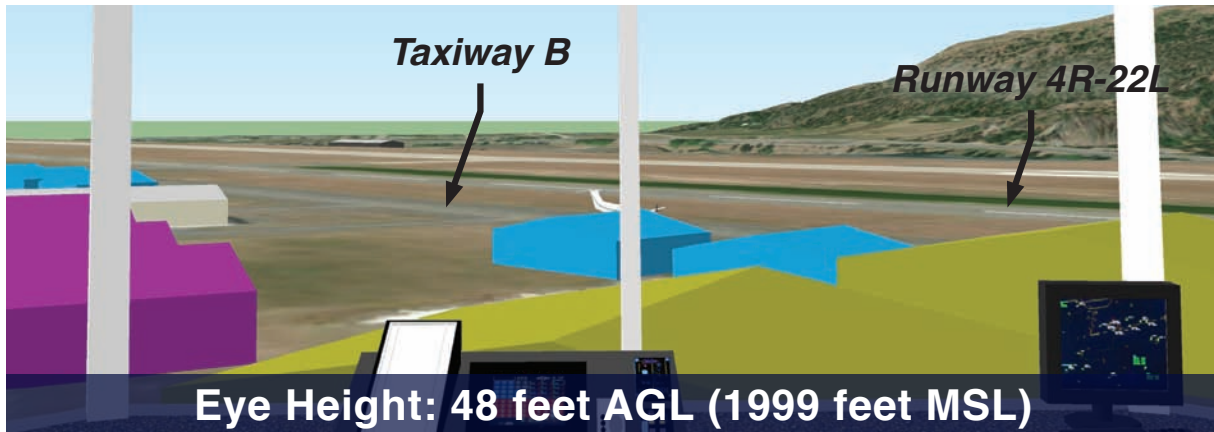


Figure 4-4A: Site 2 LOS Obstruction (Appendix B)

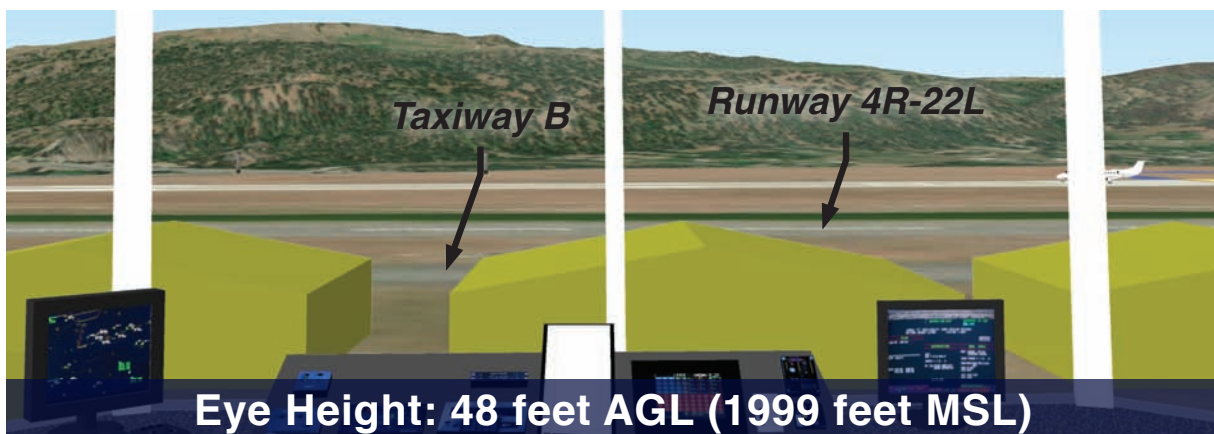


Figure 4-4B: Site 2 LOS Obstruction (Appendix B)

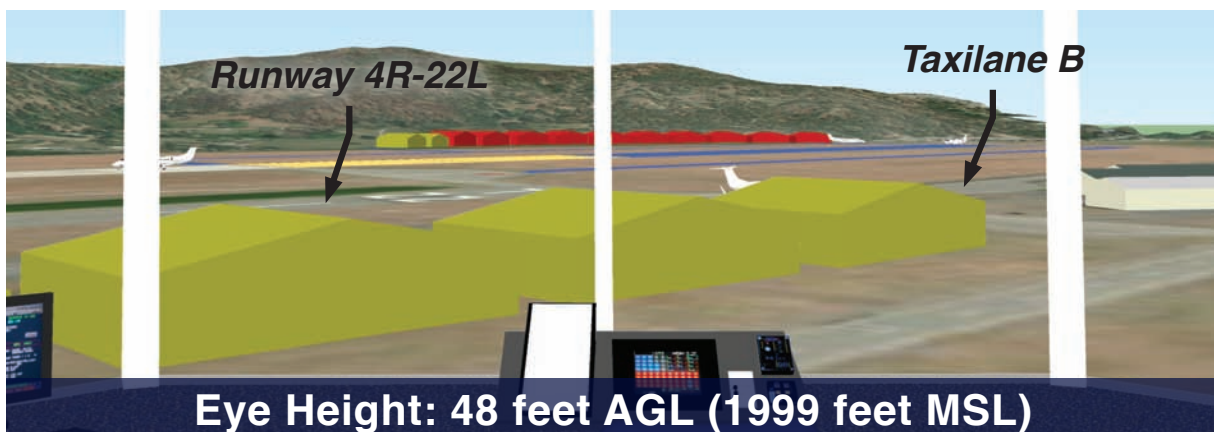


Figure 4-4C: Site 2 LOS Obstruction (Appendix B)

**NOTE: White/Gray structures are existing & Colored structures are proposed hangars**

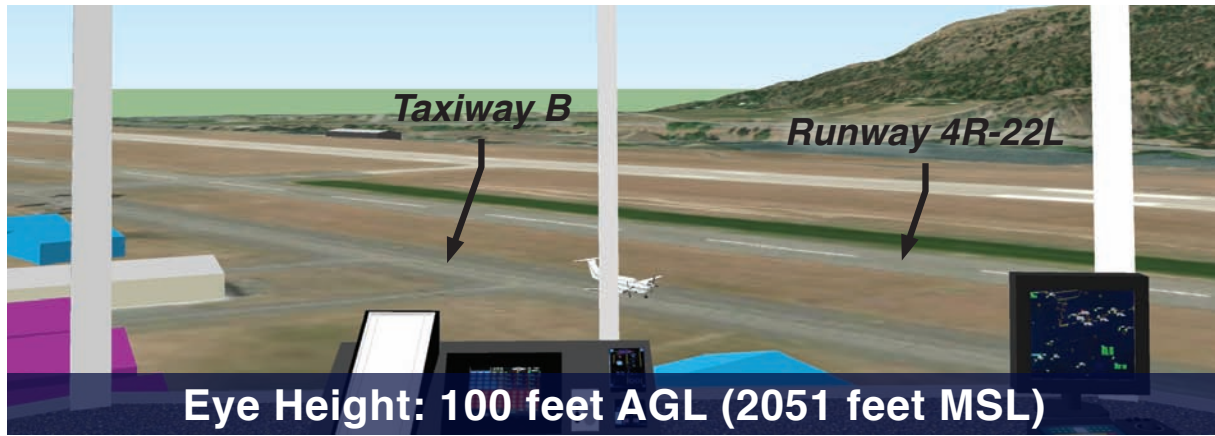


Figure 4-5A: Site 2 Clear LOS (Appendix B)

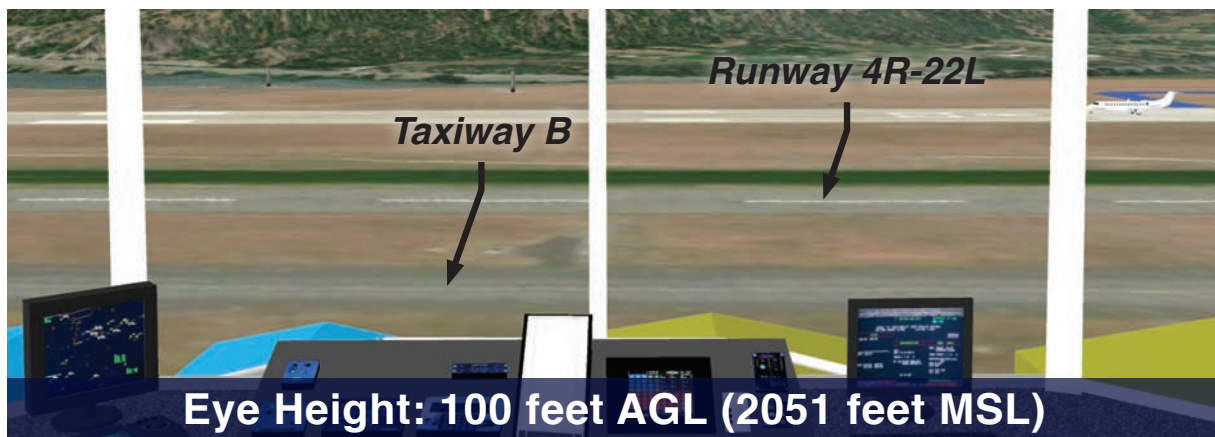


Figure 4-5B: Site 2 Clear LOS (Appendix B)

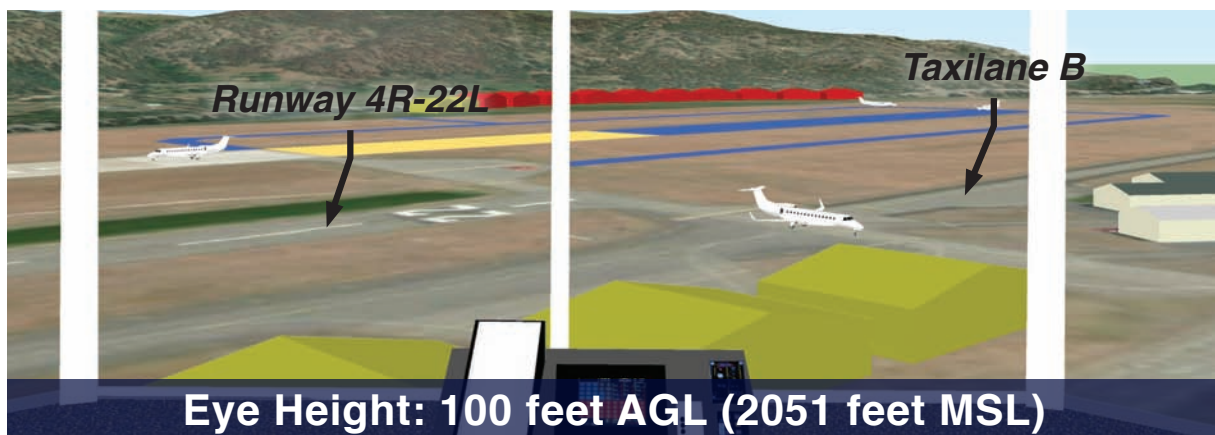


Figure 4-5C: Site 2 Clear LOS (Appendix B)



The FAA uses the average distance from the cab floor to the ATCS eye as 5 feet. When the 5 feet is subtracted from the eye height at Site 2, a cab floor height of 95 feet AGL (2046 feet MSL) is the result.

**Object Discrimination Analysis** is the metric that determines how well an object the size of a Dodge Caravan or a Cessna 152 can be identified from the proposed site and height. Site 2 at the 2051 foot MSL eye height produced Passing results (see Appendix C).

#### 4.2.3.2 Criteria 2 – TERPS

An evaluation of the United States Standard for Terminal Instrument Procedures (TERPS) will be confirmed by the FAA Western Service Area Flight Procedures Office (FPO). The preliminary advance analysis conducted for this report (Appendix A) found that there is no adverse impact to any of the existing approach procedures. However, consideration of a future straight-in ILS approach to Runway 22R could be slightly impacted by an ATCT at Site 2. More details are presented in Appendix A.

#### 4.2.3.3 Criteria 3 – Part 77

The ATCT at Site 2 will be approximately 1100 feet from the centerline of precision instrument Runway 4L-22R and will penetrate the existing 7:1 surface of this runway by 41.3 feet. The site will also be 600 feet from the centerline of visual approach Runway 4R-22L and will penetrate the existing 7:1 surface of this runway by 62.1 feet (Appendix A). An ATCT is considered fundamental airport development and is typically lighted with red FAA L-810 obstruction lighting in accordance with FAA Advisory Circular (AC) 70/7460-1K to allow such a penetration (see Appendix A).

#### 4.2.3.4 Criteria 10 – Security

The FAA has developed a minimum level of physical security requirements for sponsor owned FCT facilities as detailed in FAA Order 1600.69C effective August 13, 2018. The Order references the specific implementation guidance for the minimum level of physical security as prescribed in the Facility Security Management Program (FSMP). Site 2 will comply with fencing, lighting, main door and cab door access control with cab monitored camera and intercom, key pads or card swipe entry devices at doors and warning signage. FCT's are categorized as Facility Security Level (FSL) 1A, which may use a six (6) foot high security fence unless the ATCT is within the Aircraft Operation Area (AOA) or inside a secure active military base or part of the terminal building, in which case no fence is required.

## **4.2.4 Other Factors**

### 4.2.4.1 Panoramic Screen Shots of Computer Simulation

Digital still image files were taken during the computer siting simulation. They depict a sequential panoramic, 360 degree view from inside the control cab at Site 2 at the 1999 foot MSL (48 foot AGL) minimum eye height and at the 2051 foot MSL (100 foot AGL) proposed eye height. It should be noted that the existing and future development areas are depicted in the simulation. The panoramic computer screen shots are presented in Appendix B.

### 4.2.4.2 Rotating Beacon and Weather Sensor

A new Airport Rotating Beacon will be located on top of the new tower cab. The difference in location is not expected to adversely affect off-airport land uses.

Automated Surface Observation System (ASOS) location criteria maintains that the sensors should be clear of all structures over 20 feet tall within 500 feet. Located on SFF, in the vicinity of the ILS Glide Slope Antenna, the ASOS is owned and maintained by the National Weather Service. There will be no weather sensor impacts from an ATCT at Site 2.

### 4.2.4.3 Communications and NAVAIDS

ATC or NAVAIDS signals can be affected by the construction of tall structures on airports. Signals can sometimes be affected by significant undulations in the airfield terrain. A NASWATCH determination should be conducted by FAA for each ATCT site proposed.

The Localizer and Glide Slope Antenna are considered a safe distance from Site 2. Preliminary findings regarding NAVAIDS are documented in Appendix A.

4.2.4.4 Airfield Lighting and NAVAIDS Monitoring: There are no FAA control/monitoring cables or airfield lighting cables located in the vicinity of Site 2. The existing FAA glide slope antenna and localizer locations are monitored remotely by the FAA. If FAA decides to provide a monitor in the new ATCT, then they will decide if it will be hard wired by telephone lines or by radio. Site 2 is 700 feet from the airfield lighting vault which is within the capabilities of remote control via UHF modem from the ATCT to the vault.

#### **4.2.5 Summary for Site 2**

Site 2 was evaluated at an ATCS eye height of 2051 feet MSL (100 feet AGL). This site is considered to be suitable with no obstructed views to all existing and future runways, taxiways, future north side aircraft apron and existing terminal area apron, including the helipad located 340 feet south of Site 2. Site 2 allows for the proper scan of the runway with concurrent helicopter operations.

Site 2 is located on the south side of the airport, 1150 feet northeast of the existing ATCT and inside of the Airport Operational Area (AOA). Therefore, Site 2 will not require any perimeter fencing or gate. This site is located at the north end of the existing Airport Equipment Building. Site 2 is 1100 feet from Runway 4L-22R centerline and 475 feet outside of the Runway OFA. It is 600 feet outside of the 4L-22R runway primary surface and 475 feet outside of the 4R-22L runway primary surface.

At the proposed eye height of 100 feet AGL, this site has clear views of the airfield (*Figure 4-5*) with the furthest point being 4022 feet to the end of Runway 4L. Views of the airfield will be mostly to the northwest. Currently, Beacon Hill creates some LOS concerns because controllers lose sight of aircraft coming from the north over the hill. ATC's usually have visual of aircraft once they are about 3 miles away. Like the existing ATCT, Site 2 is on the south side of the airport, so controllers will use the same situational awareness that is currently in practice. Downwind to the main runway (4L-22R) will be in front of controllers positions, which is desirable in order for them to see aircraft traffic patterns and the airfield without distractions.

## Felts Field Airport ATCT

# SITE COMPARISON CHART

ITEM	SITE 1	SITE 2
1 ATCT Orientation/Cab Direction	Primarily Southeast	Primarily Northwest
2 Construction Cost Estimate	\$5,700,000	\$6,850,000
3 Latitude/Longitude	47° 41' 4.33"N; 117° 19' 29.87"W	47° 40' 58.44"N; 117° 18' 57.49"W
4 Access to ATCT Site	Utilize Adjacent Gonzaga Rowing Club Access Road	Utilize Airport Gate #1 to Interior Access Road
5 Distance to and Elevation of Key Point	3727 ft. (end Runway 22R Future) 1954 ft. MSL	4022 ft. (end Runway 4L) 1943 ft. MSL
6 Ground Elevation	1929 ft. MSL	1951 ft. MSL
7 Controller (ATCS) Eye Height (5' above cab floor)	77 ft. AGL 2006 ft. MSL	100 ft. AGL 2051 ft. MSL
8 ATCT Height (cab floor +35 feet incl. antennas)	107 ft. AGL 2036 ft. MSL	130 ft. AGL 2081 ft. MSL
9 ATCT Potential Impacts to NAVAIDS	None	None
10 TERPS Impacts	None	Exist. Procedures: None Future Procedures: See App A
11 Part 77 Impacts	Penetrates 7:1 Surface 4L-22R by 71.1'	Penetrates 7:1 Surface 4L-22R by 41.3' 4R-22L by 62.1'
13 Object Discrimination: Detection Recognition Identification	PASS PASS PASS	PASS PASS PASS
14 LOS Angle of Incidence (degrees)	0.80	1.54

*Note: The eye height at Site 2 is the result of the Line-of-Sight required to see over existing and future hangars. It is higher than Site 1 as exemplified by angle of incidence greater than the minimum of 0.80 degrees.*