Broadband Installation/ROW Plan

Yellowstone National Park

Employee Housing & Xanterra Properties

Updated March 3, 2020

Trade Secret Confidential – FOIA Exempt

Experience

ACCESSPARKS

Solution highlights

12+ YEARS

Team experience as end-to-end wireless ISP to remote federal property. Now focused exclusively on public lands and surrounding communities

Authorized Concessioner

25+ Mbps
Broadband speeds

1 million+
Global hotspots

WISPA
Wireless Internet Service Providers Association

Military/government portfolio snapshot

National Park Service | U.S. Marine Corps | Dept. of Homeland Security | FBI | U.S. Air Force | U.S. Army

Experience bringing Broadband to hundreds of remote federal facilities, worldwide

Proposed Right-of-Way Areas of Coverage

Yellowstone Employee Housing & Xanterra Lodging

Overview of Backha

West

Mt. W

Old Fa

Grant

Canyo

Fishin

Mam

l buildings

Mt. Washburn Verizon Tower; AccessParks Repeater Equipment

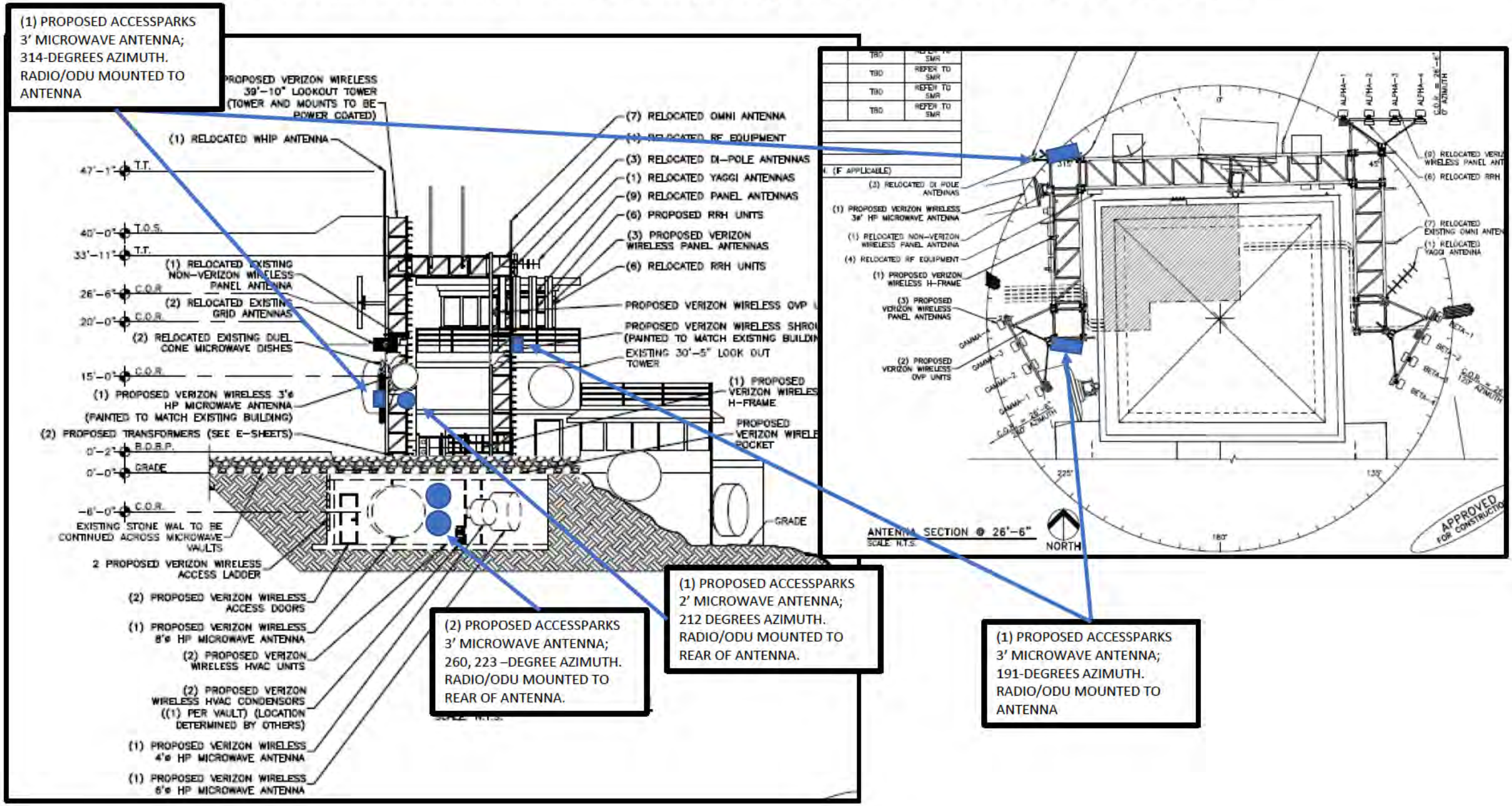
Mount Washburn – Wireless Telecommunications Hub for Yellowstone NP
Tower Coordinates: 44.798N, -110.434W

AccessParks Antenna Plan

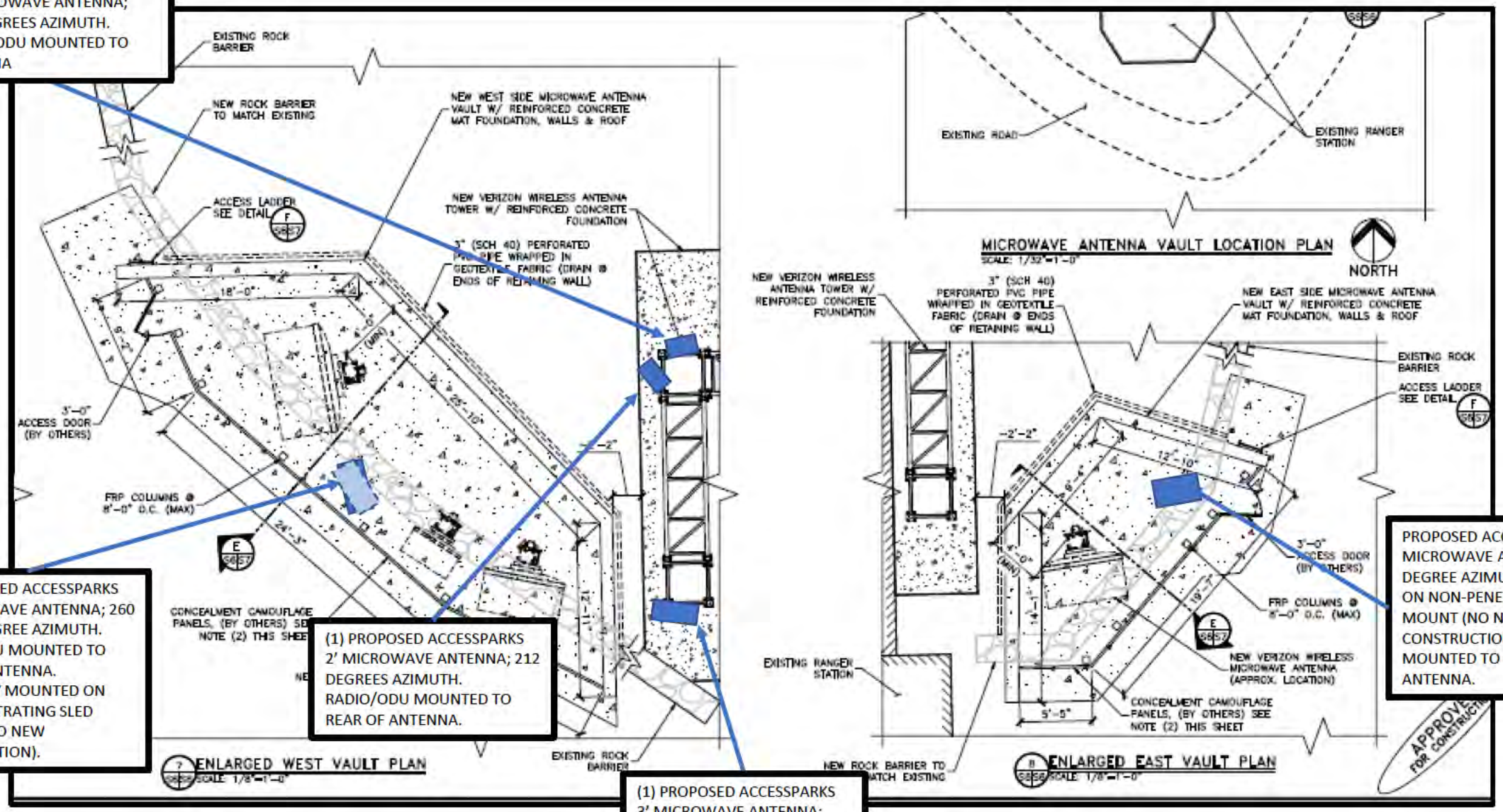
Existing Mt. Washburn Verizon Tower# 27660

1. To West Yellowstone
    - (1) 3-ft antenna, [redacted]-deg azimuth
    - Located in West Vault
2. To Old Faithful
    - (1) 3-ft antenna, [redacted]z, 223-deg azimuth
    - Located in West Vault
3. To Canyon Village
    - (1) 2-ft antenna, [redacted]. 212-deg azimuth
    - Located on lattice, 11-ft AGL, beneath existing 3-ft antenna
4. To Grant Village
    - (1) 3-ft antenna, [redacted]GHz, 191-deg azimuth
    - Located on lattice structure, 17-ft CL
5. To Fishing Bridge
    - (1) 3-ft antenna, [redacted] GHz, 162-deg azimuth
    - Located in East Vault
6. To Gardiner
    - (1) 3-ft antenna, [redacted]GHz, 314-deg azimuth
    - Located on lattice structure, 13-ft CL

Verizon Tower, West View; Proposed AccessParks Antennae



(1) PROPOSED ACCESSPARKS 3' MICROWAVE ANTENNA; 314-DEGREES AZIMUTH. RADIO/ODU MOUNTED TO ANTENNA



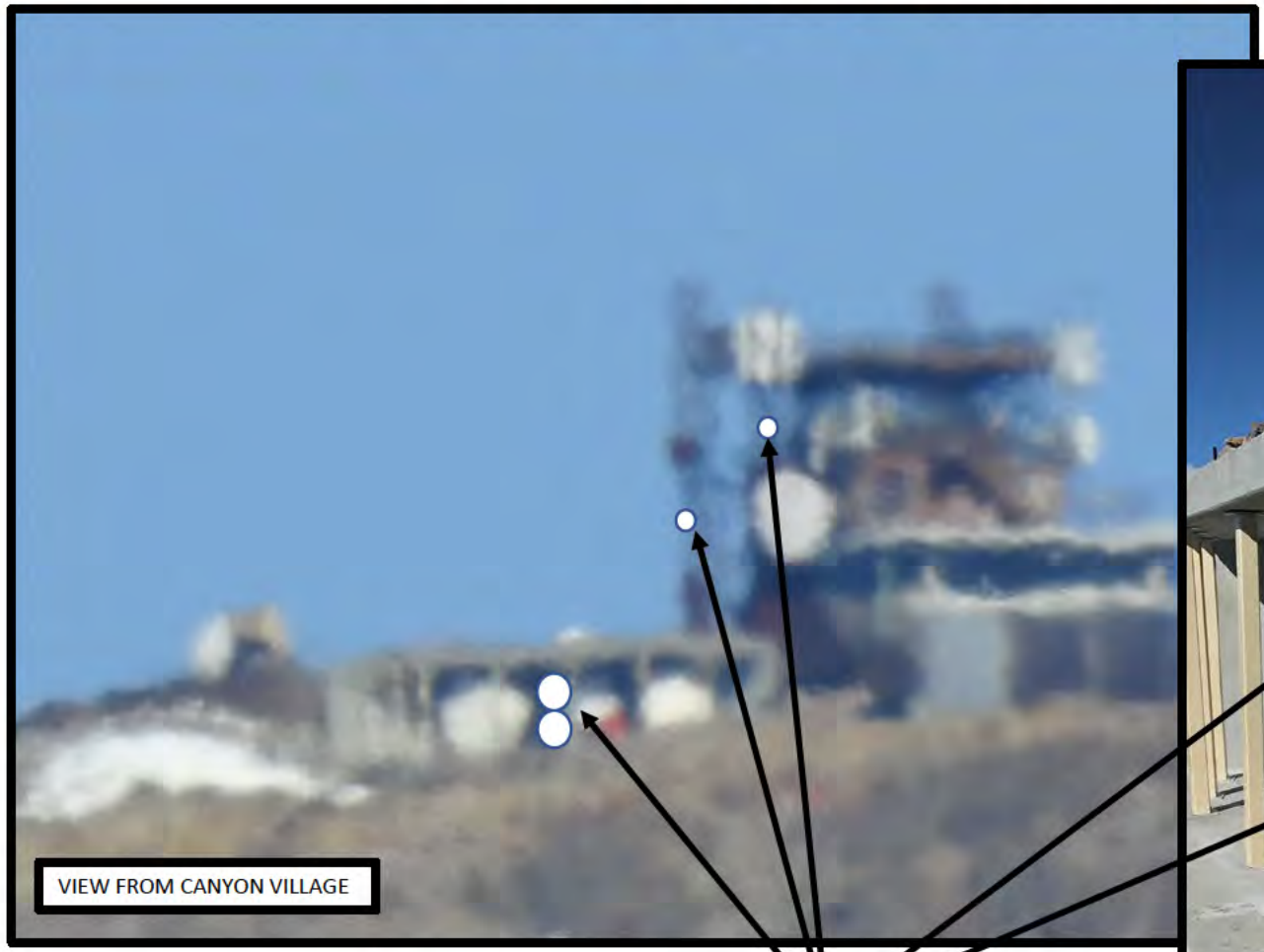
(2) PROPOSED ACCESSPARKS 3' MICROWAVE ANTENNA; 260 & 223 –DEGREE AZIMUTH. RADIO/ODU MOUNTED TO REAR OF ANTENNA. VERTICALLY MOUNTED ON NON-PENETRATING SLED MOUNT (NO NEW CONSTRUCTION).

(1) PROPOSED ACCESSPARKS 2' MICROWAVE ANTENNA; 212 DEGREES AZIMUTH. RADIO/ODU MOUNTED TO REAR OF ANTENNA.

(1) PROPOSED ACCESSPARKS 3' MICROWAVE ANTENNA; 191-DEGREE AZIMUTH. RADIO/ODU MOUNTED INSIDE SHELTER.

PROPOSED ACCESSPARKS 3' MICROWAVE ANTENNA; 162-DEGREE AZIMUTH. MOUNTED ON NON-PENETRATING SLED MOUNT (NO NEW CONSTRUCTION). RADIO/ODU MOUNTED TO REAR OF ANTENNA.

Verizon Tower, West View; Proposed AccessParks Antennae

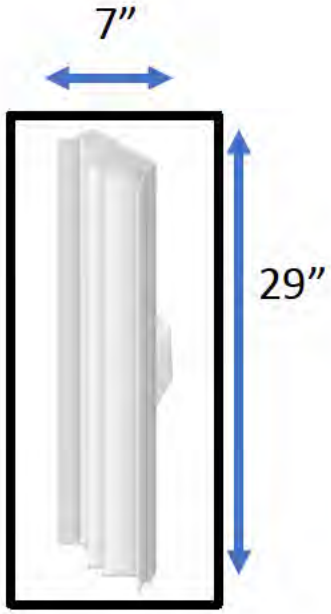


WEST SIDE: PROPOSED FOUR (4) ACCESSPARKS MICROWAVE ANTENNAE.

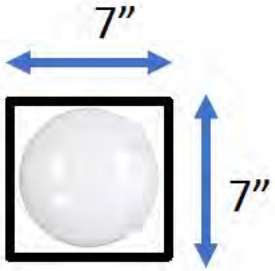
NOTE: TWO (2) EXTERIOR-MOUNTED ANTENNAE TO BE PAINTED TO MATCH BACKGROUND

AccessParks
Typical Local Wireless Network Architecture

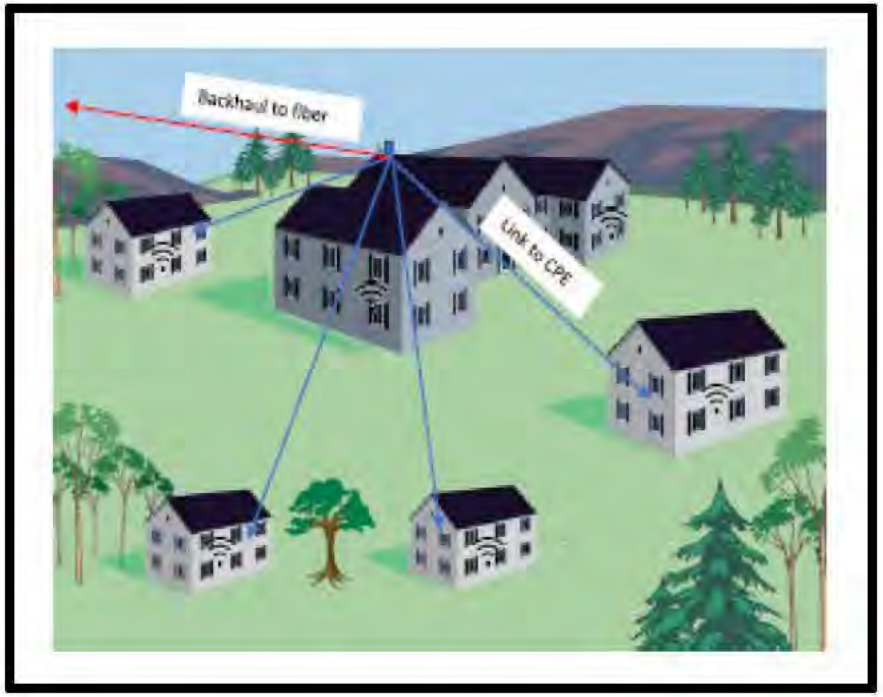
Point-to-Multipoint; Area Distribution

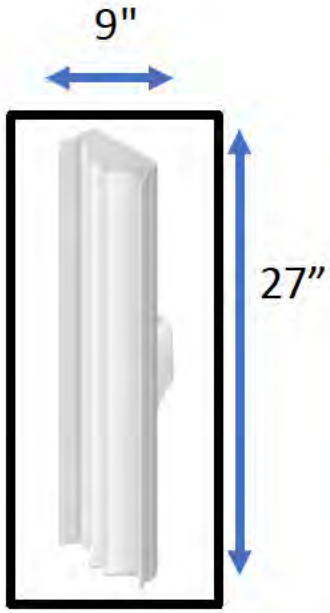


[redacted]GHz PMP Access Point; provides connectivity for 100 CPE



[redacted]GHz Customer Premises Equipment (CPE); one per building





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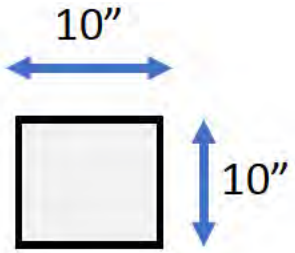
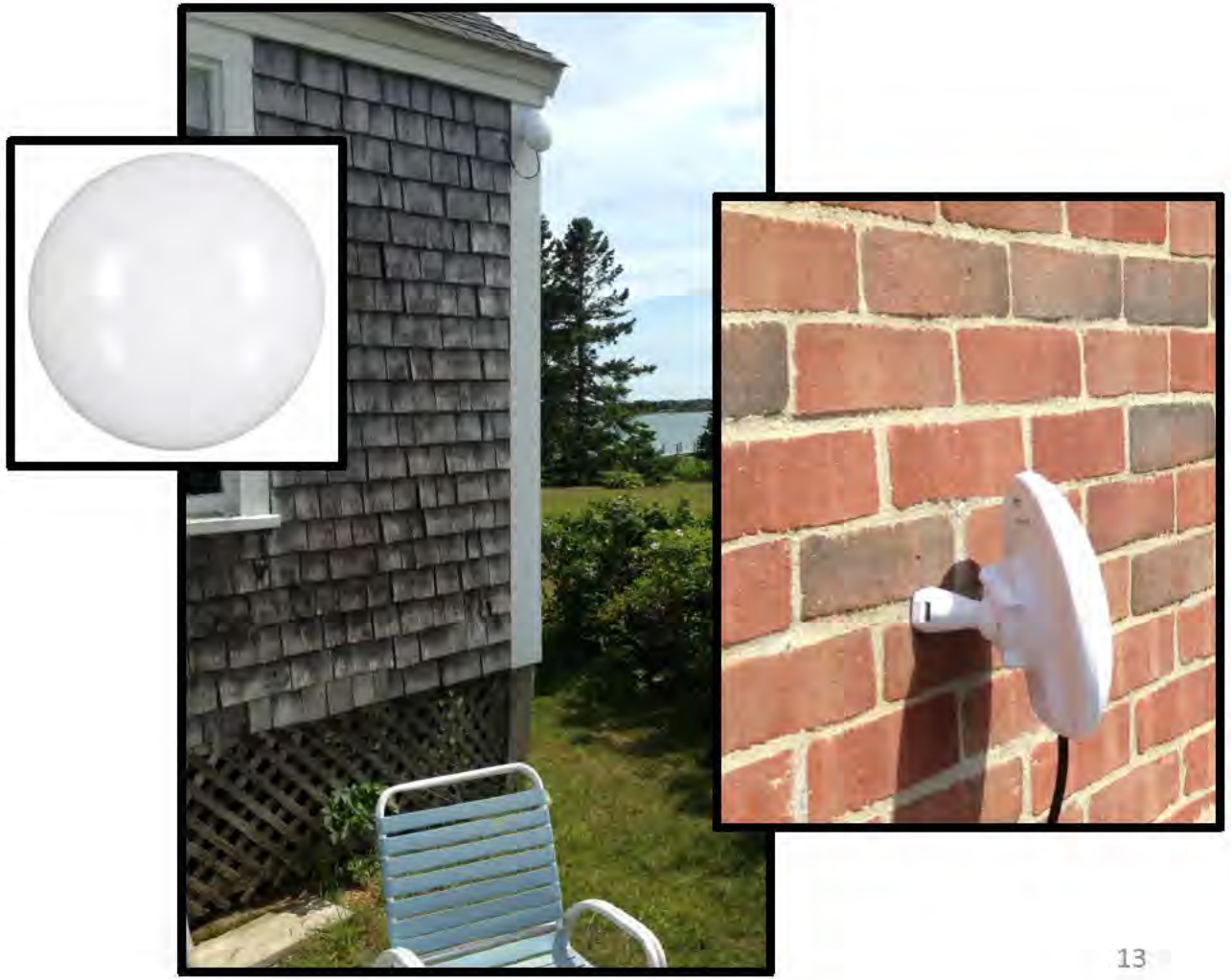


[redacted]GHz Customer Premises Equipment (CPE); one per building

[redacted] GHz Licensed Point-to-Multipoint; Area Distribution

Customer Premises Equipment (CPE)

- 7” diameter
- One per building
- Mounted using one screw
- Painted to match wall
- Capacity of up to 500 Mbps
- [redacted] GHz; FCC Part 15 Compliant
- Powered through Ethernet cable from Wi-Fi router inside building (one cable for data and power). No new electrical service required.
- Ethernet cable to interior using existing wall penetrations



AccessParks Broadband; Lodge Coverage

Gigabit fiber-optic to Internet

[redacted]

Wi-Fi radios; mounted in interior or exterior hallways, near guest rooms. Data + power over one Ethernet cable

Cabling Notes:

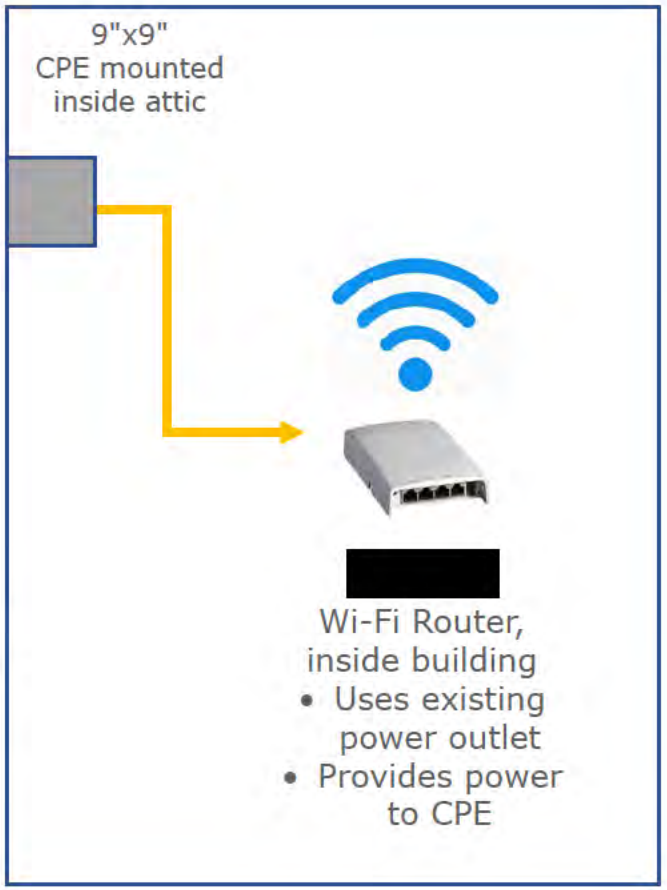
- (1x) cable to each radio, both exterior backhaul and interior Wi-Fi. All interior and exterior cabling will be concealed in existing spaces where possible, or in ½" painted raceway where approved by NPS.
- Penetrations to interior will use existing telephone and electrical penetrations where possible, or through new sealed penetrations with NPS approval.
- Complete walk-through to be done with NPS facilities/compliance staff prior to installation.

AccessParks Broadband

Historic Cabin Coverage (no external CPE)

Gigabit fiber-optic to Internet

[redacted]



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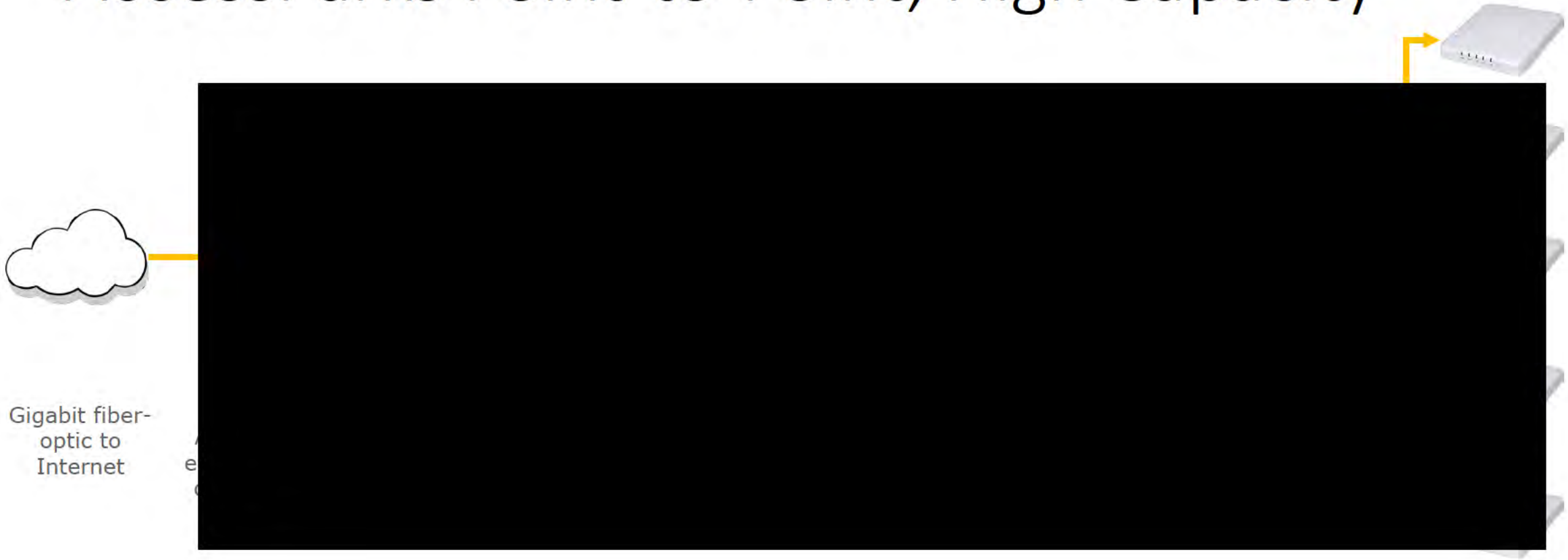
AccessParks Point-to-Point; High Capacity



GHz radio
1-ft diameter
Painted to match background

Wi-Fi radios; mounted in interior or exterior hallways, near guest rooms. Data + power over one Ethernet cable

[redacted] GHz Point-to-Multipoint (PMP)

[redacted]

- CPE is 7"x5"x3"
- Interference-free, due to .9-degree beamwidth
- [redacted] Mbps (1 Gbps throughput per CPE
- [redacted]-ft range, Line of Sight, LOS
- Used for high-density buildings/lodges

Wi-Fi Access Points (APs)

In-Building Wi-Fi Access

[redacted]

- Ceiling mounted, Power over Ethernet (PoE)
- 6.6”(L) x 6.49”(W) x 1.6”(H)
- 802.11n/ac, 2x2 MIMO beamforming antenna

[redacted]

- Wallplate mounted in lodge room Power over Ethernet (PoE)
- 3.54”(L) x 6.73”(W) x 1.14”(H)
- 802.11n/ac, 2x2 MIMO beamforming antenna

Figure 1. Example of BeamFlex+ pattern

Figure 2. R510 2.4GHz Azimuth Antenna Patterns

Figure 3. R510 5GHz Azimuth Antenna Patterns

Figure 4. R510 2.4GHz Elevation Antenna Patterns

Figure 5. R510 5GHz Elevation Antenna Patterns

Public Safety – Indoor Localization

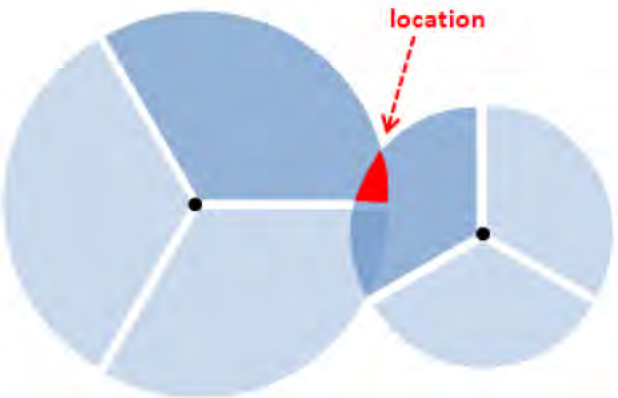
Problem:

Consumer telecom within national parks is limited to cellular, and usually only Verizon (2% of global devices). Cellular phones within parks only transmit home address to 911. Calls to 911 within the park must be triangulated from cell towers, and have **3/4 –mile accuracy, in two dimensions**. This adds precious minutes to EMS response time.

Solution:

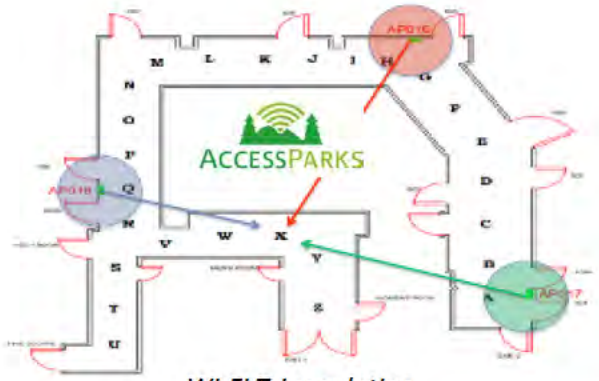
Wi-Fi Positioning System (WiPS) from AccessParks. Next-Generation E911 (NGE911)-compliant, with every Wi-Fi radio as a registered location in national database. Instant geolocation of cellular 911 caller, to within **15 feet and identifying the floor of the caller (z-axis)**. GIS information is automatically sent to the Public Safety Access Point (PSAP) for 100% coverage of visitors.

AccessParks Wi-Fi is Passpoint-enabled for carrier-neutral data and phone offloading to AT&T, Sprint, Verizon, T-Mobile, etc.



Cell phone detected within a certain distance of two cell towers with directional antennae.

Cell phone detected within a certain distance of a single tower.

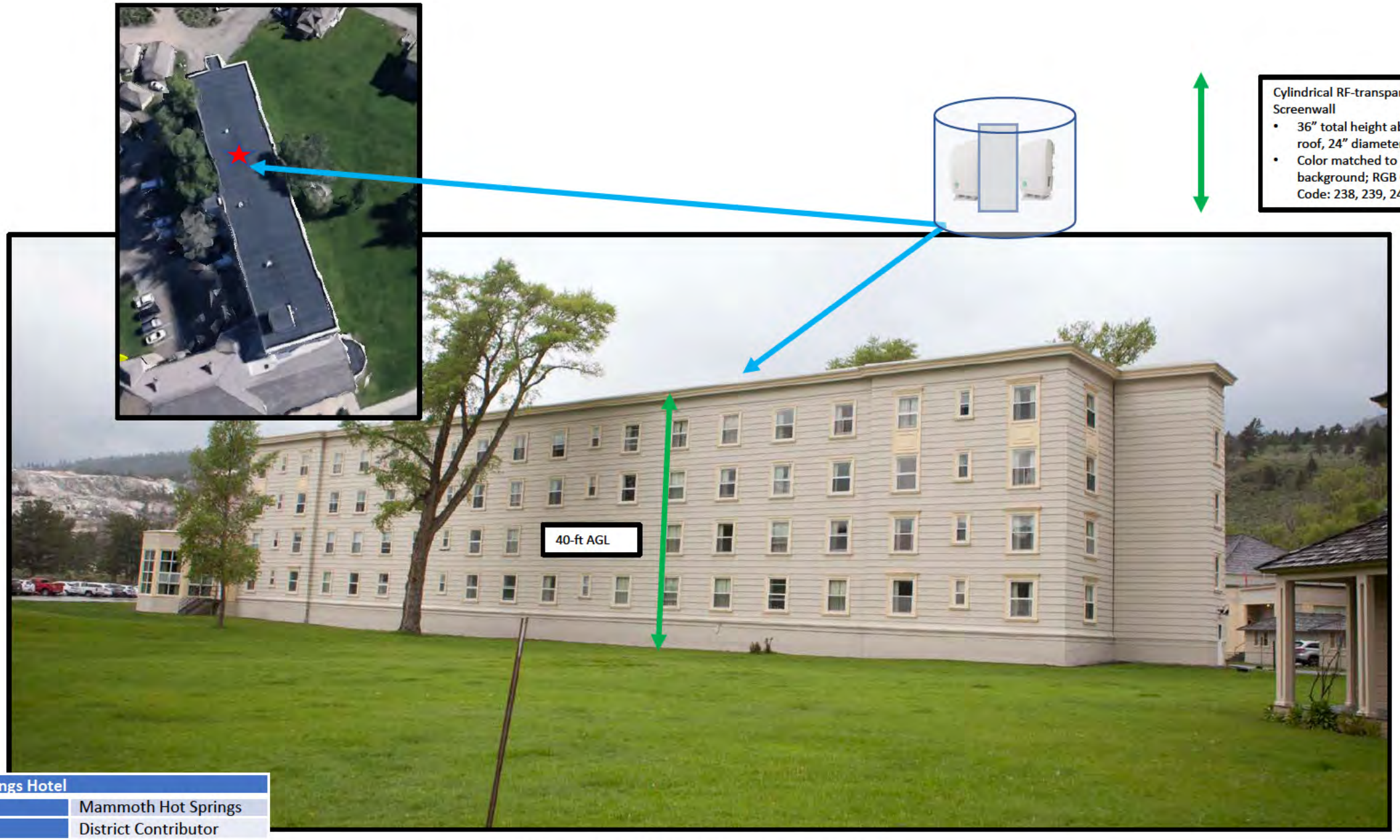


Wi-Fi Triangulation

AccessParks
Proposed Network Architecture;
Yellowstone National Park

Mammoth Hot Springs – Existing Wireless Coverage (known)

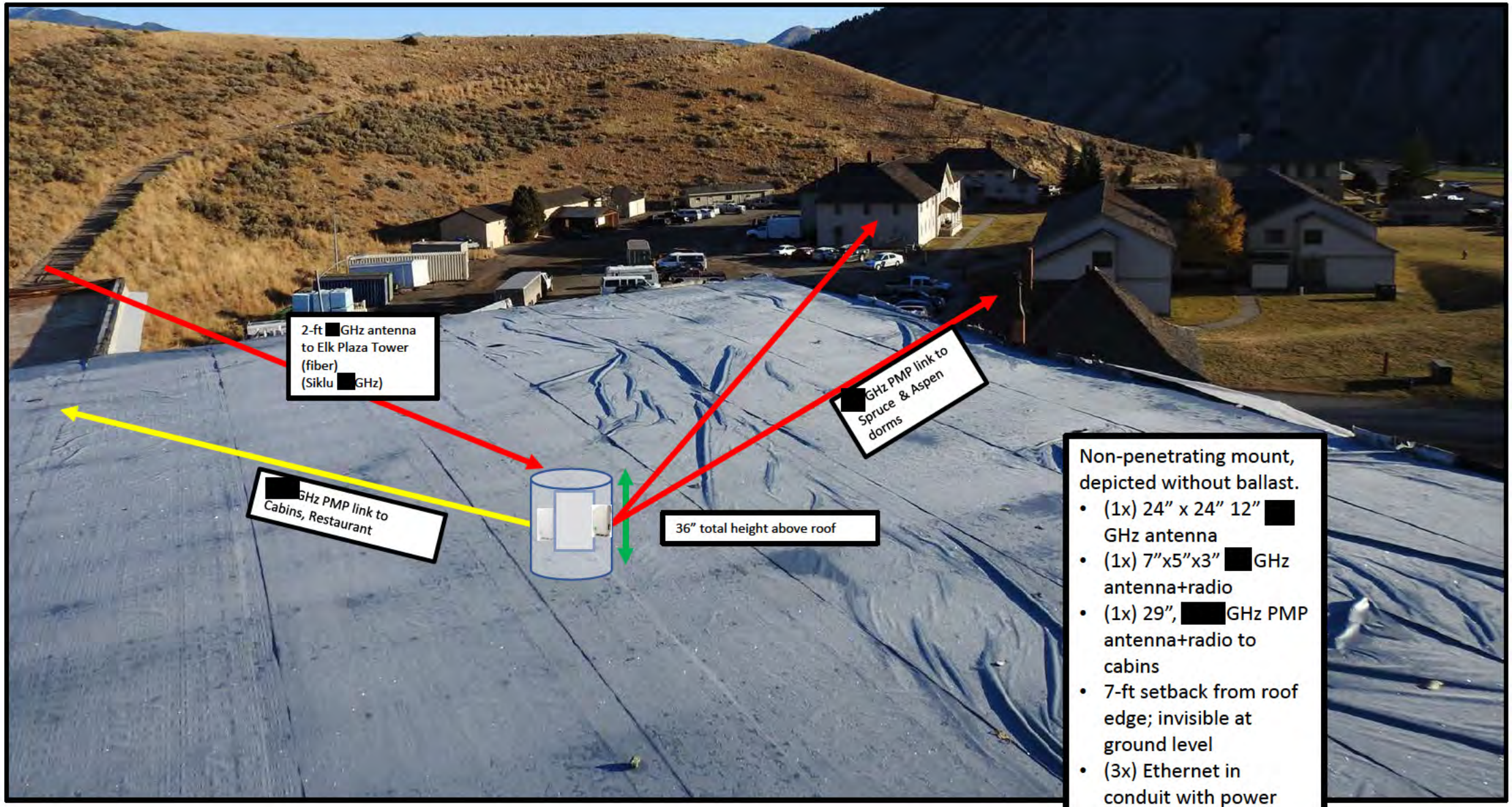
Mammoth Hot Springs – Proposed Wireless Coverage



Mammoth Hot Springs Hotel	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

Mammoth Hot Springs Hotel

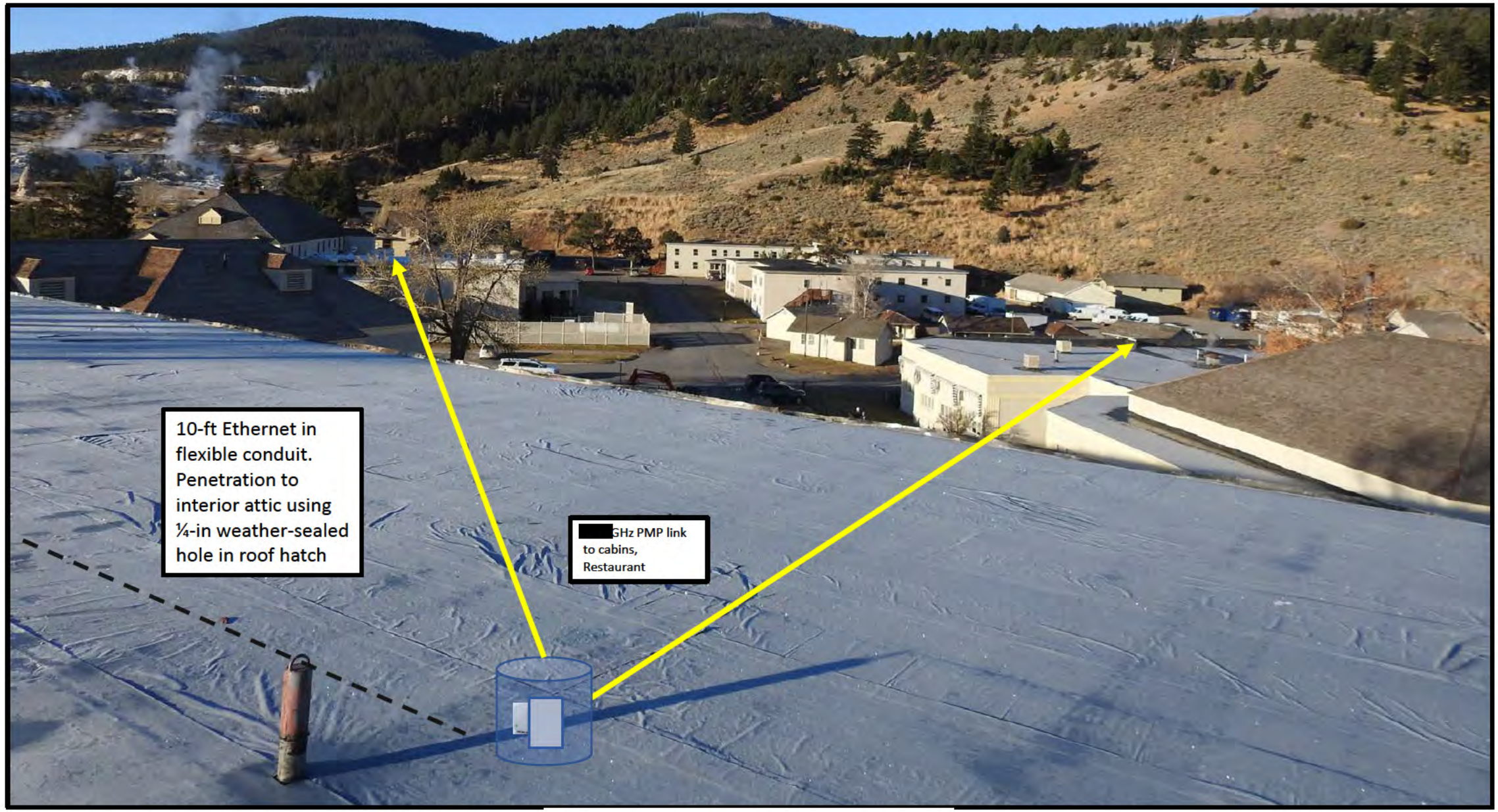
Coordinates: Coord: 44.9768N, -110.7014W



Non-penetrating mount, depicted without ballast.

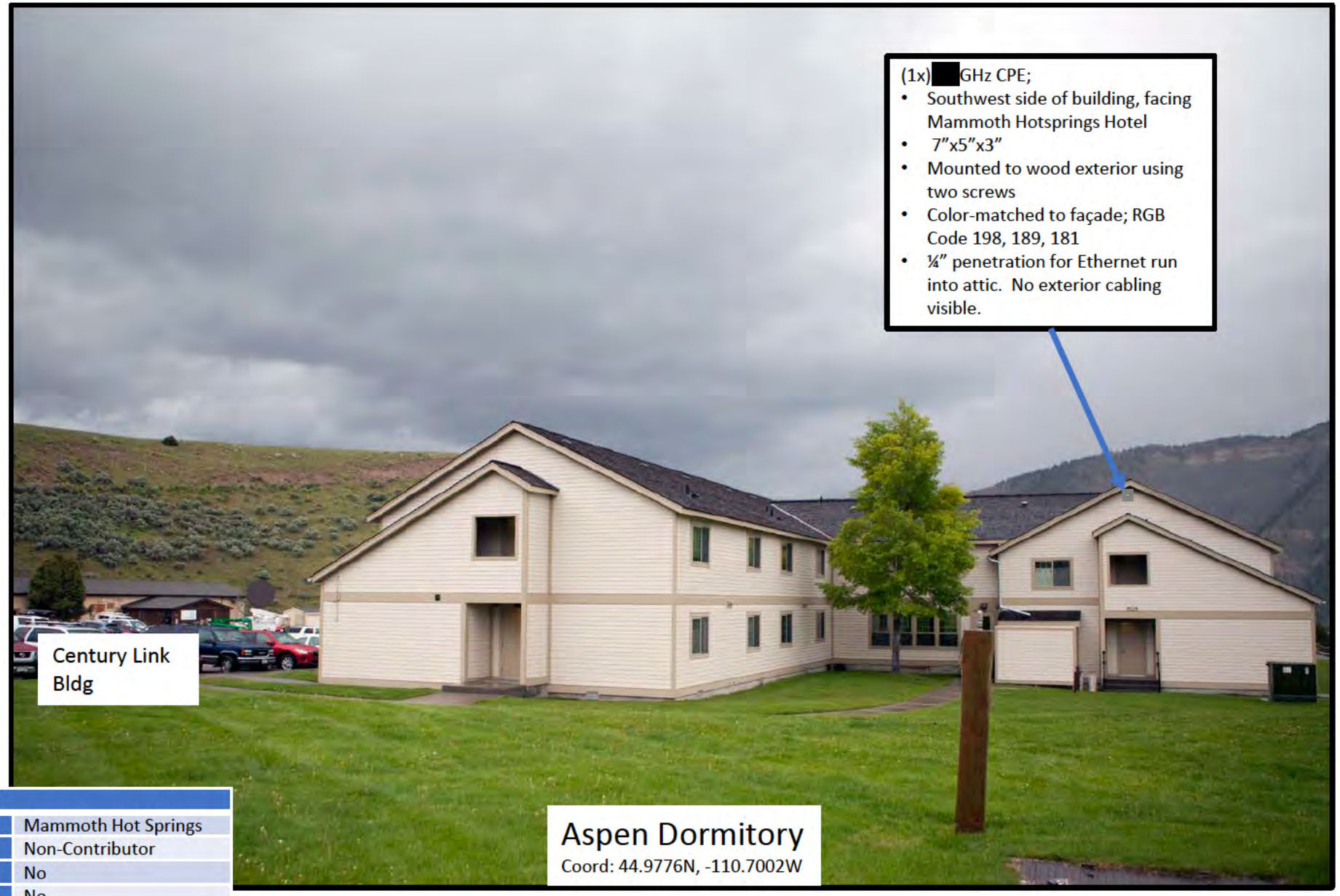
- (1x) 24" x 24" 12" [redacted] GHz antenna
- (1x) 7"x5"x3" [redacted] GHz antenna+radio
- (1x) 29", [redacted] GHz PMP antenna+radio to cabins
- 7-ft setback from roof edge; invisible at ground level
- (3x) Ethernet in conduit with power from interior switch

Mammoth Hot Springs Hotel

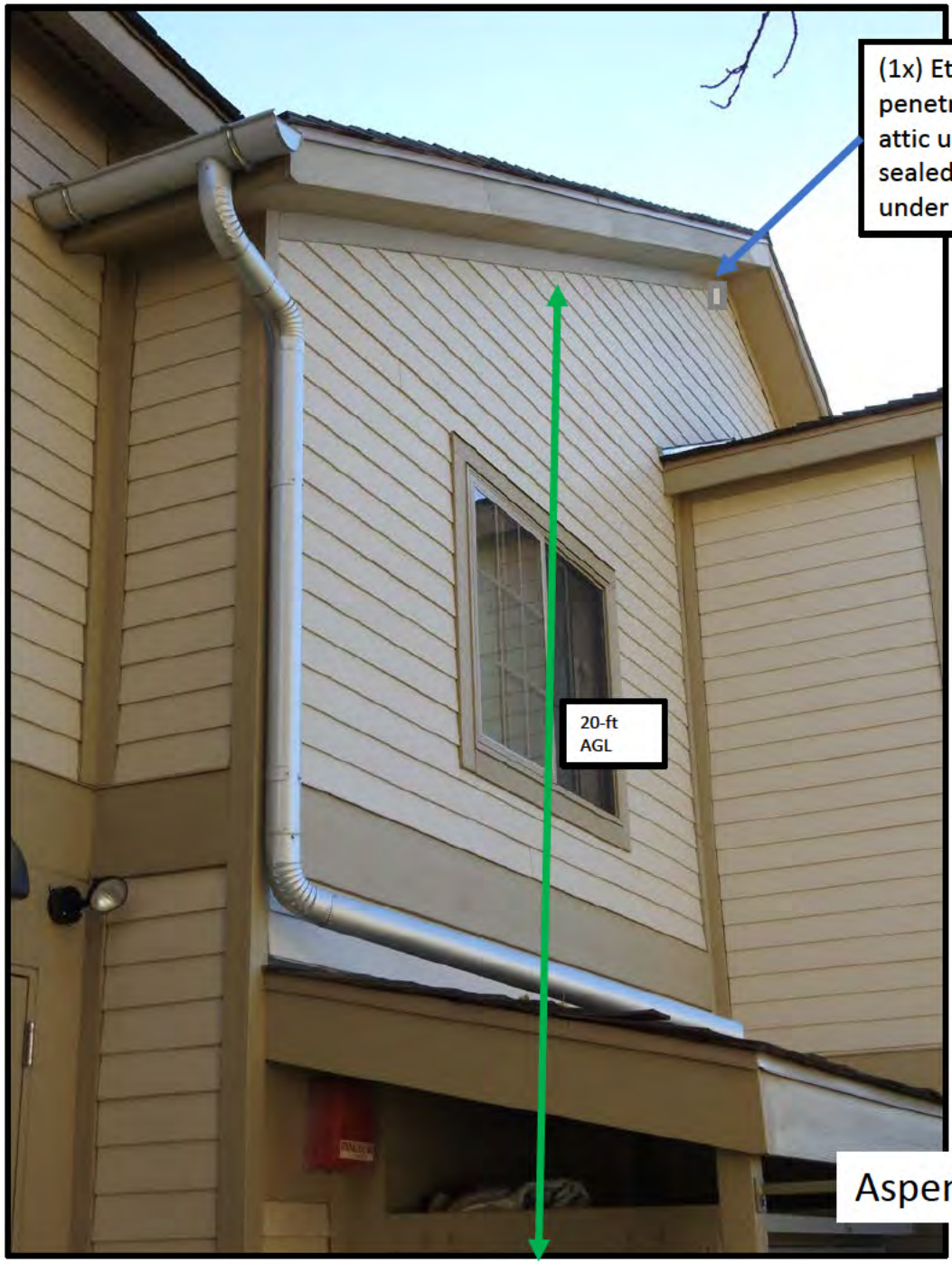


Mammoth Hot Springs Hotel

Mammoth Hot Springs Hotel



Aspen Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	Non-Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

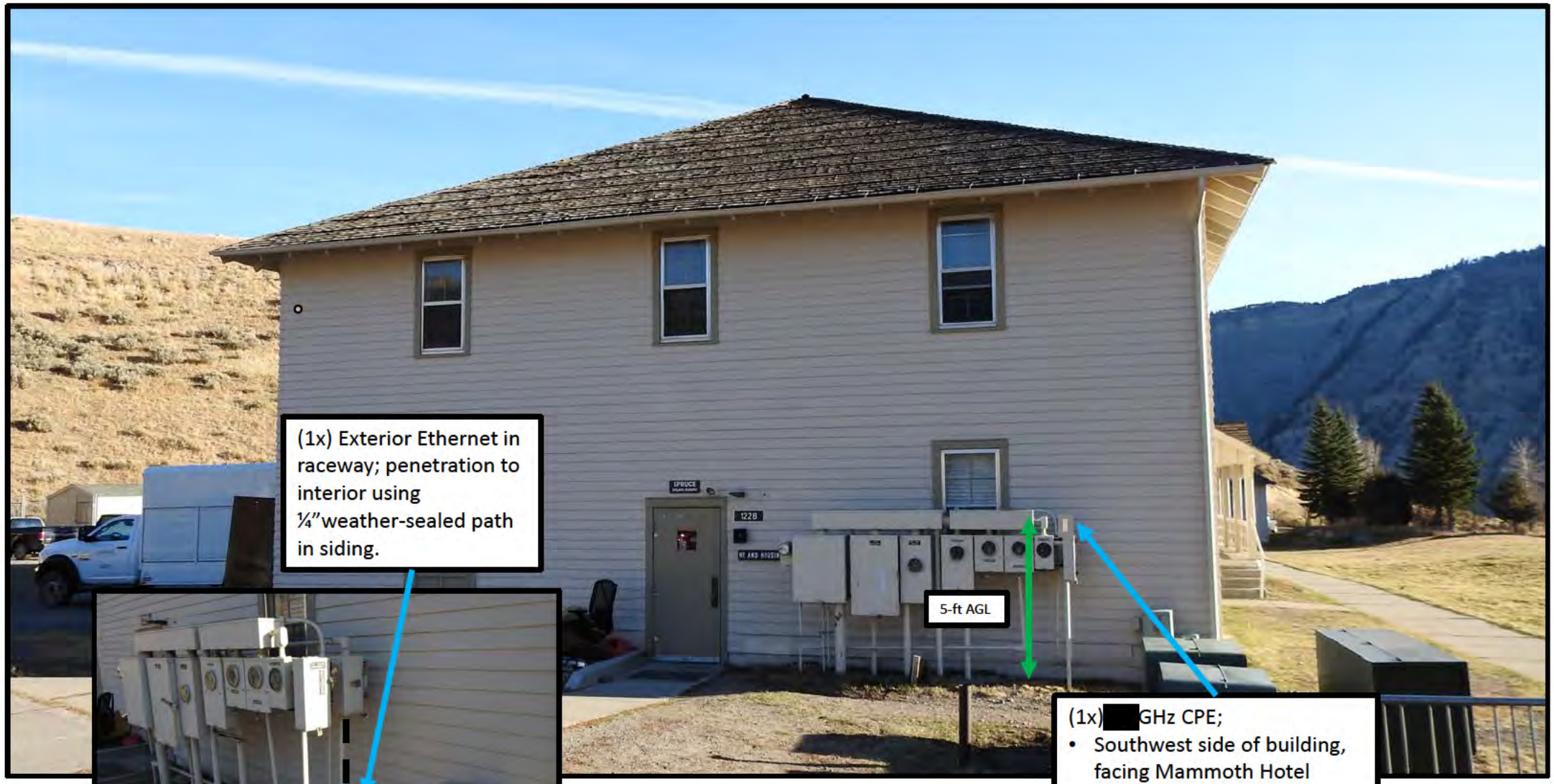


(1x) Ethernet to interior; penetration to interior attic using ¼-in weather-sealed hole in siding, under eave.

Wi-Fi Access Points

- Mounted to metal T-bars
- PoE Ethernet cabling run inside dropped ceiling to switch in closet.

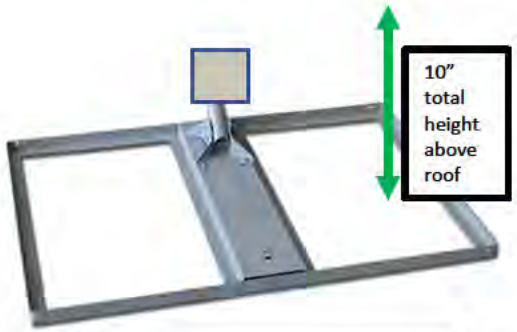
Aspen Dormitory



Spruce Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

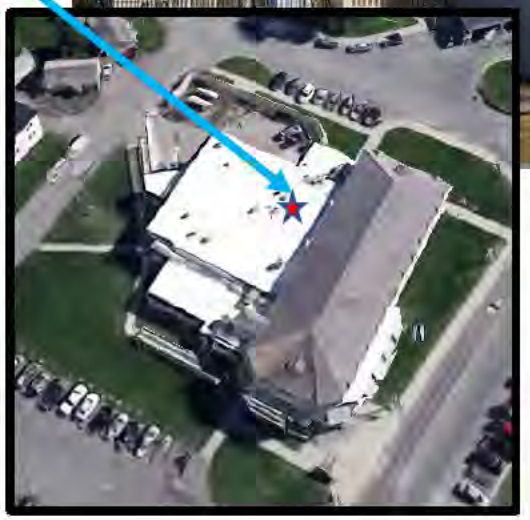
Spruce Dormitory

Coords: 44.9780N, -110.7001W



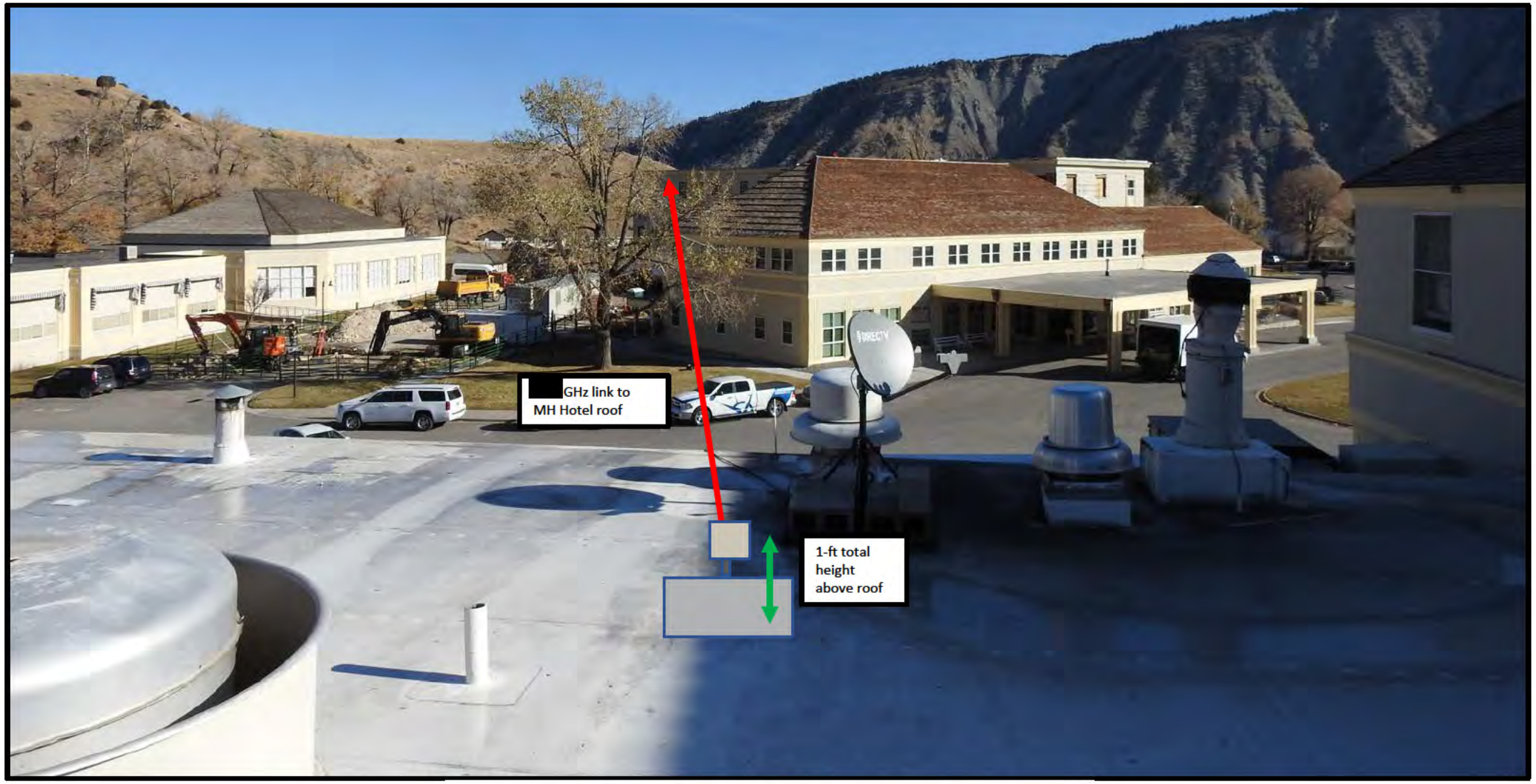
Non-penetrating mount, depicted without ballast.

- (1x) 9"x9"x3" [redacted] GHz radio
- Setback 10-ft from roof edge; invisible to ground level
- All equipment painted to match background
- Ethernet with power from interior switch



Restaurant Building

Restaurant	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	No



Restaurant Building

Rooftop with existing wireless equipment

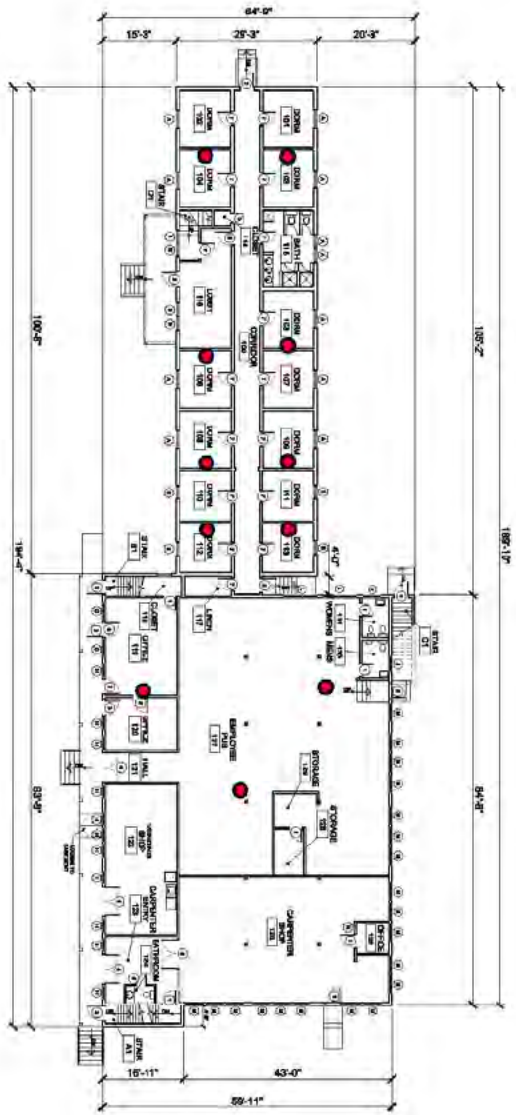
Restaurant Building

Lodgepole Dormitory
(existing fiber-optic backhaul)

Lodgepole Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

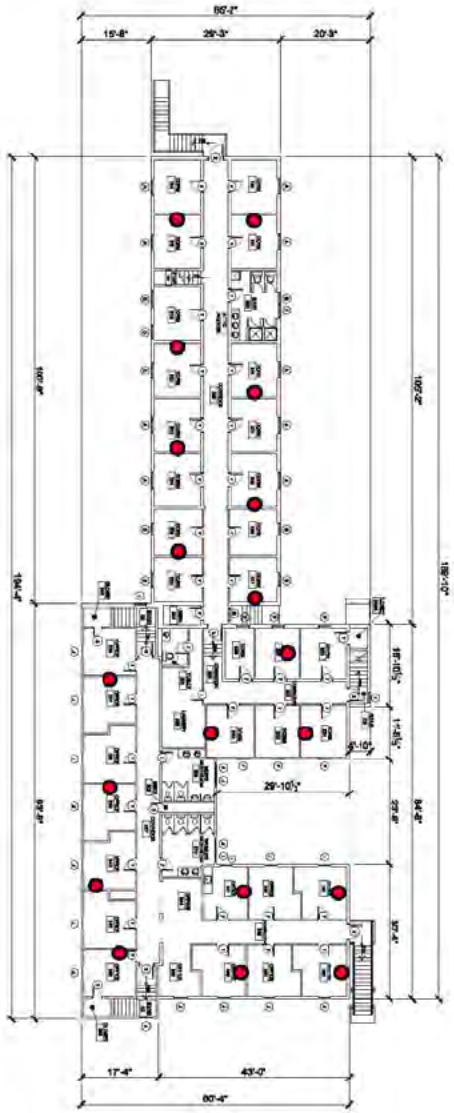
Lodgepole Dormitory APs – Floor 1

Total Access Points:
11



Lodgepole Dormitory APs – Floor 2

Total Access Points:
19



Wi-Fi AP Placement

- One AP per two rooms, located in rooms, ceiling mounted
- Ethernet cabling in 2" raceway in hallways

Lodgepole Dormitory

- Ethernet (x1) in 2" raceway, run in corner on both sides of hallway.
- All equipment painted to match background

AP Placement:

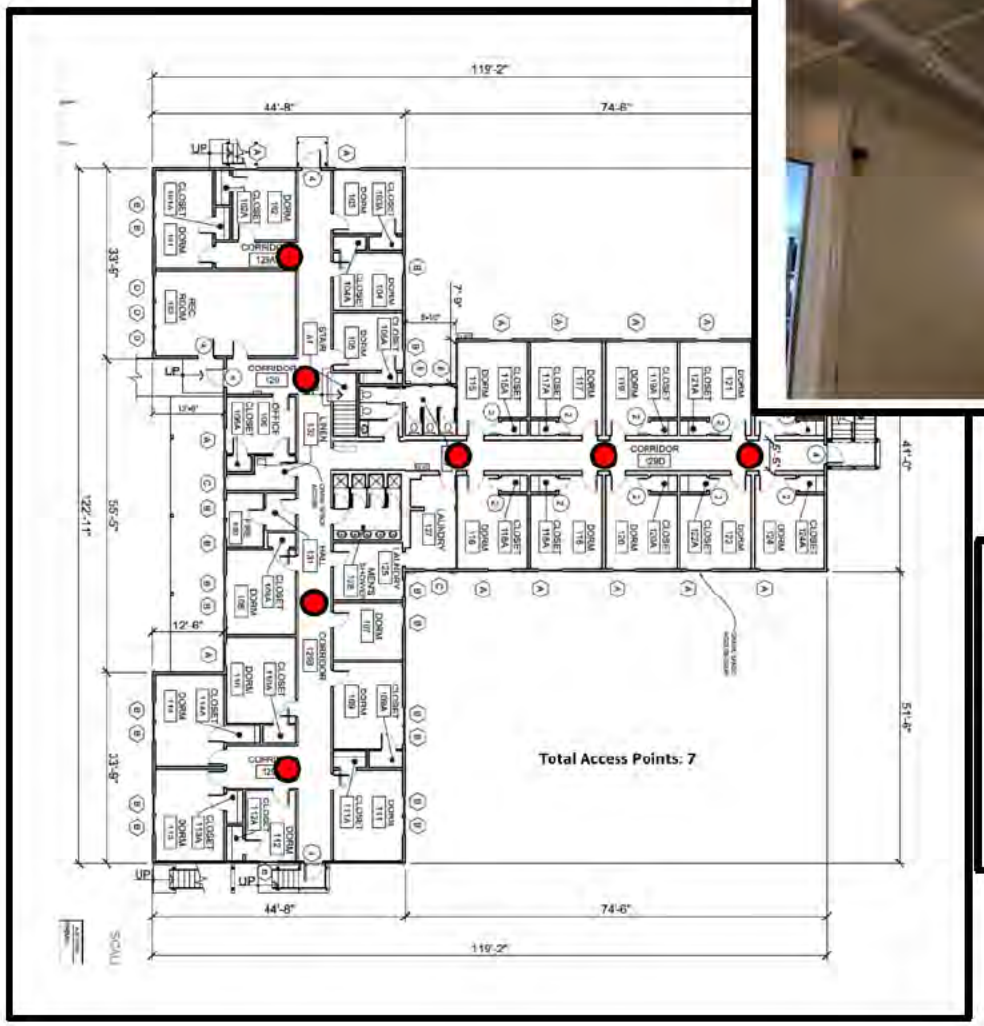
- ¼" wall penetration to ceiling AP location Inside rooms
- Ceiling mounted in room, next to wall; no visible raceway
- 2 rooms per AP

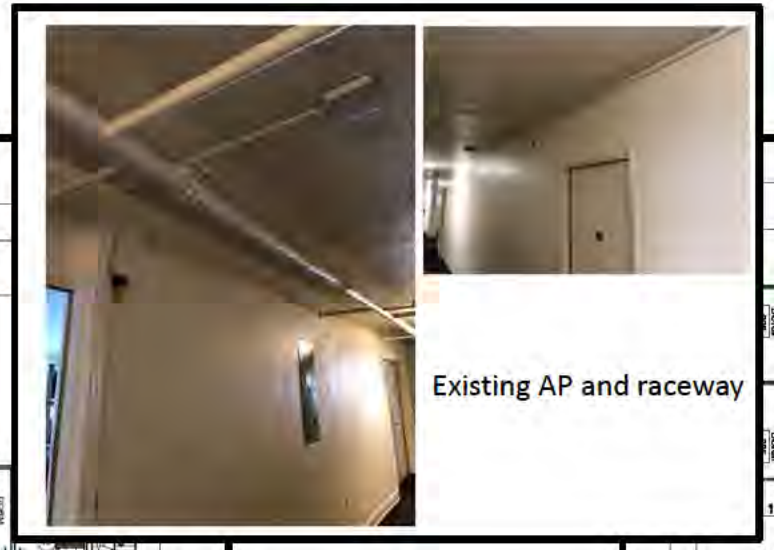
Lodgepole Dormitory

Juniper Dormitory

(existing fiber-optic backhaul)

Juniper Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

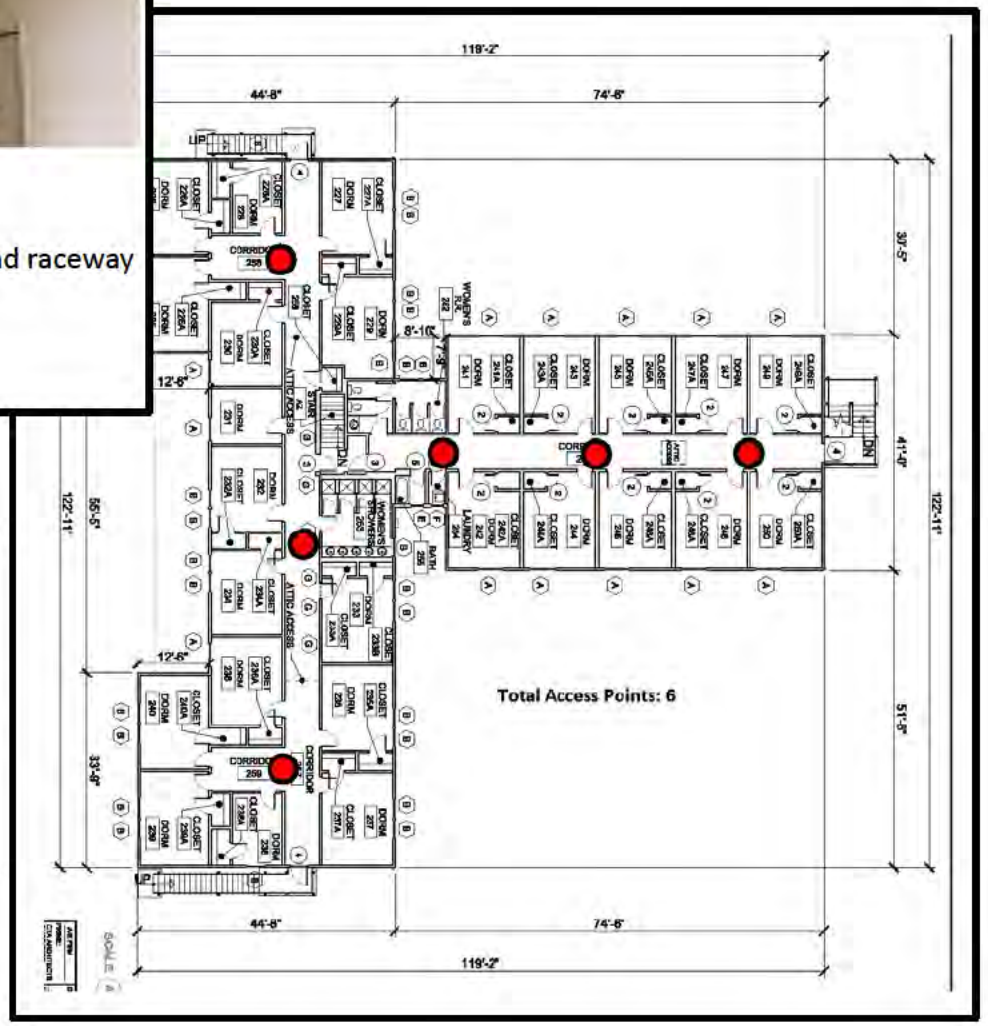




Existing AP and raceway

AP Placement:

- In hallways
- Ceiling mounted
- 4 rooms per AP
- Existing 1" Ethernet in raceway to be extended, color matched



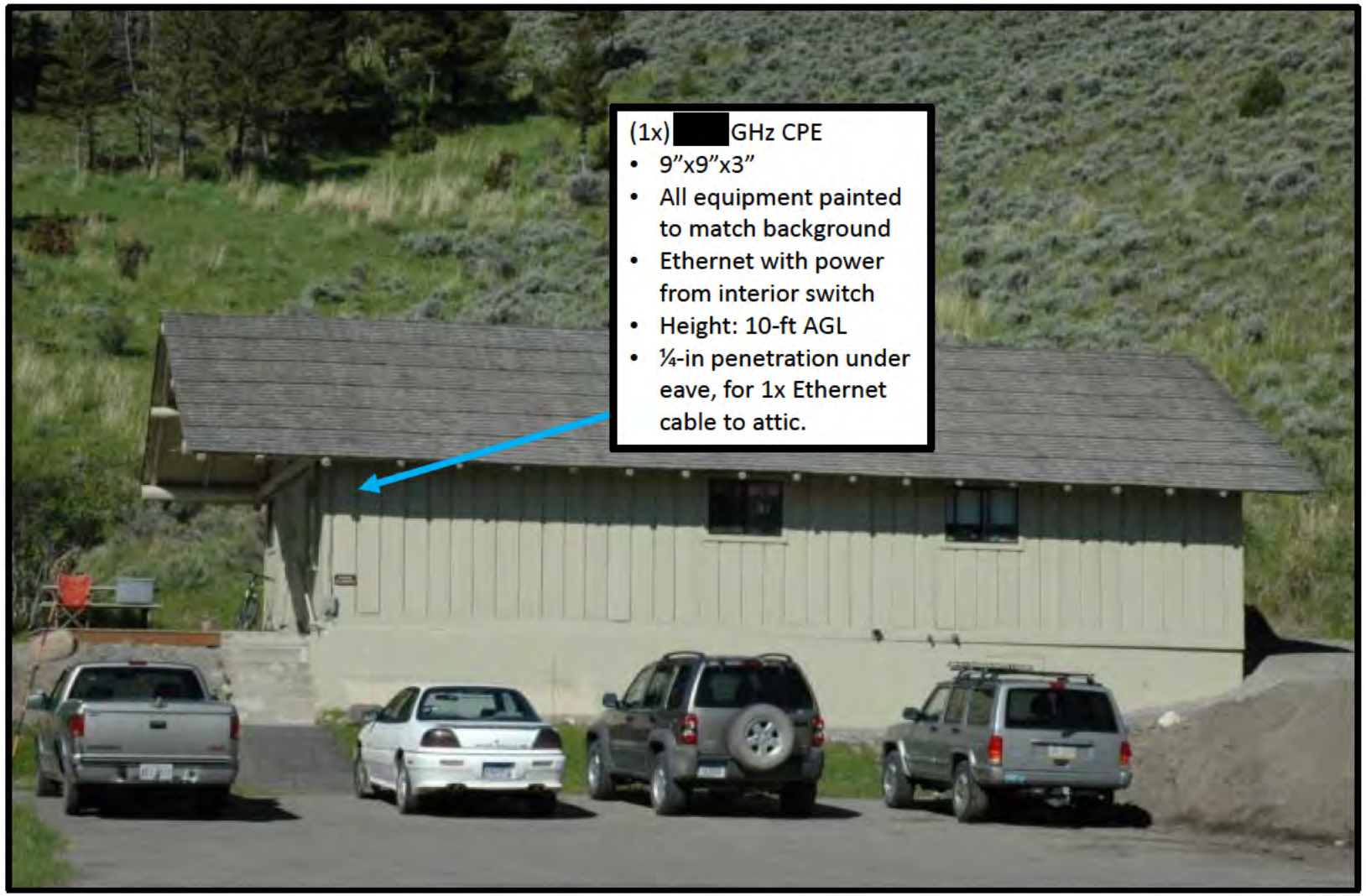
Juniper Dormitory

Mammoth Hot Springs Guest Cabins	
Area	Mammoth Hot Springs
NRHP Eligibility	District Contributors
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

Mammoth Hot Springs Guest Cabins (x97)

Coordinates: 44.977N, -110.703W

Mammoth Hot Springs Hotel; Cabins (typical)
(x97)



YPSS Dormitory	
Area	Mammoth Hot Springs
NRHP Eligibility	Non-Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

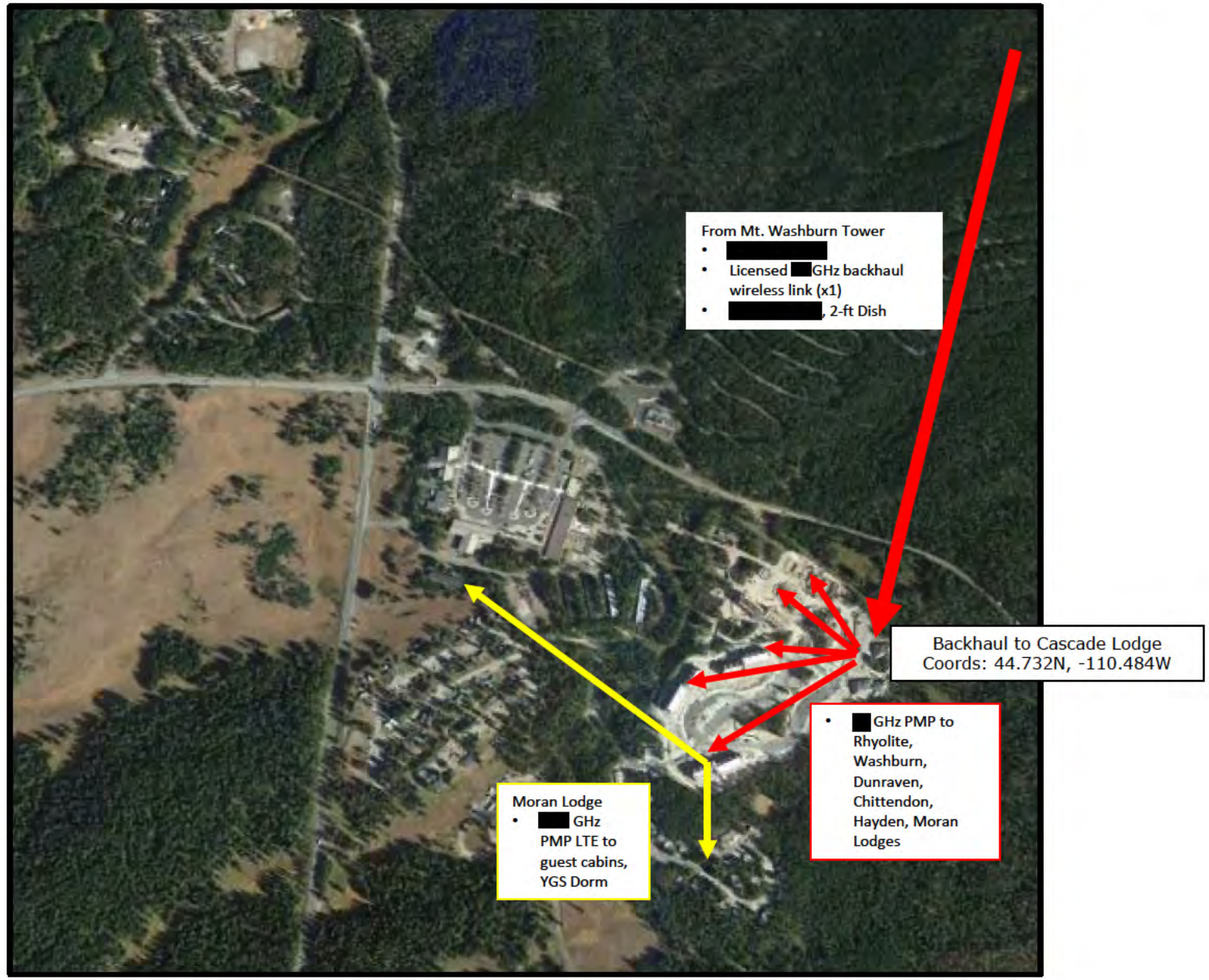
Hamilton Dormitory/YPSS

Coordinates: 44.977N, -110.704W

Canyon Village

Canyon Village Area Existing Wireless Coverage (known)

Canyon Village Area; Proposed Wireless Coverage



Canyon Village Area – Proposed Building Coverage

Canyon Village Lodge
YGS Dormitory
Bighorn Dormitory
Wapiti Dormitory
Grizzly Dormitory
Rhyolite Lodge
Washburn Lodge
Bison Dormitory
Cascade Lodge
Dunraven Lodge
Chittendon Lodge
Hayden Lodge
Moran Lodge
Canyon Village Lodge Cabins

Canyon Lodge	
Area	Canyon Village
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

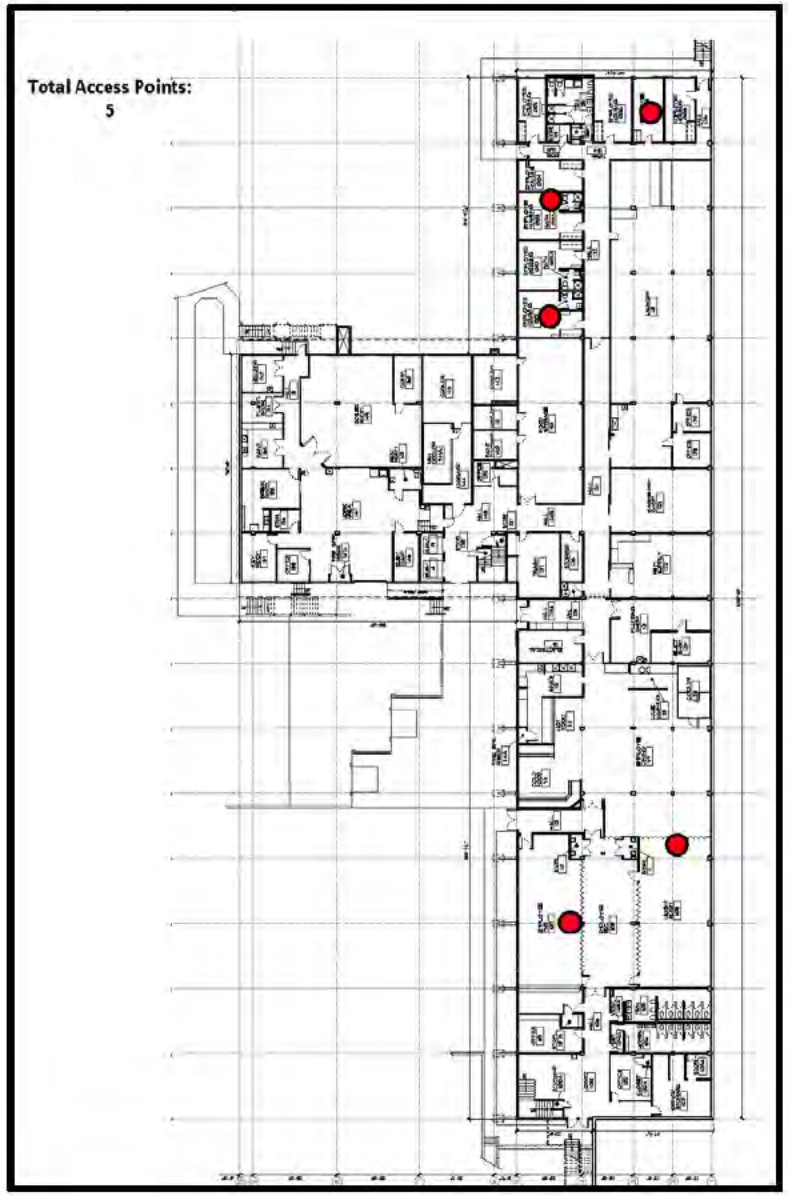
Canyon Lodge

Existing fiber backhaul to building

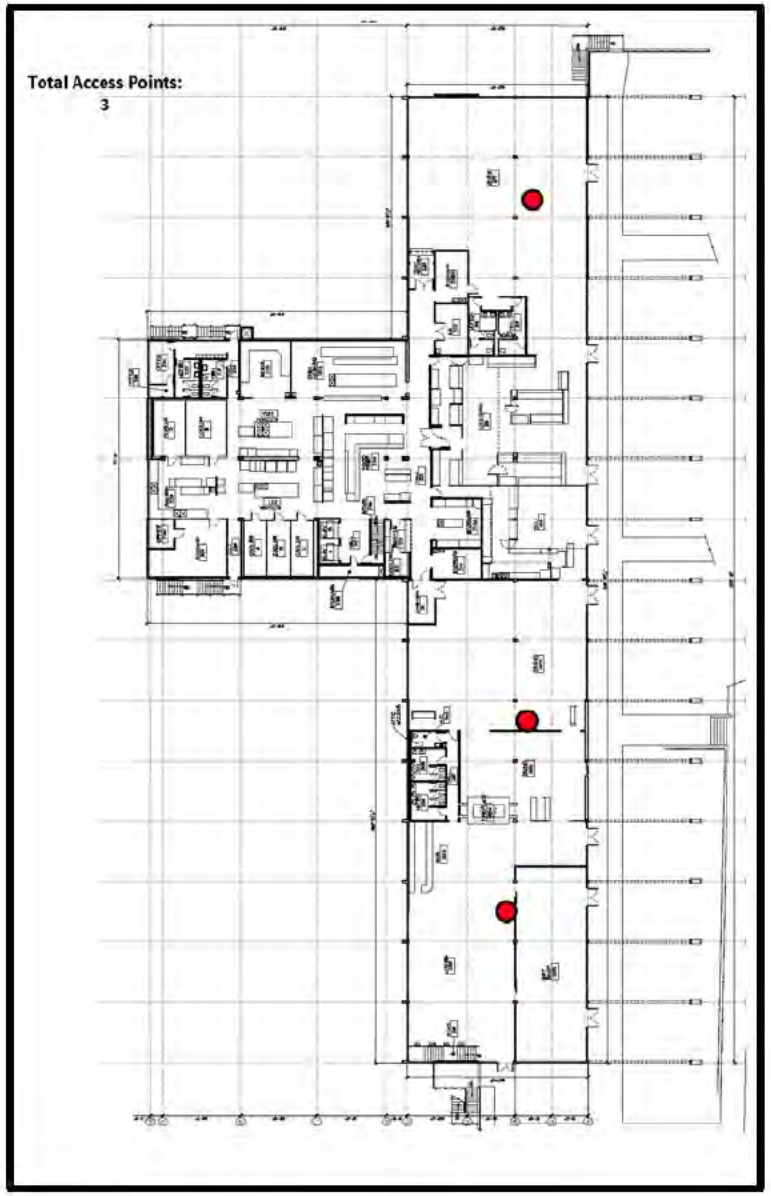
Wi-Fi radios in hallways

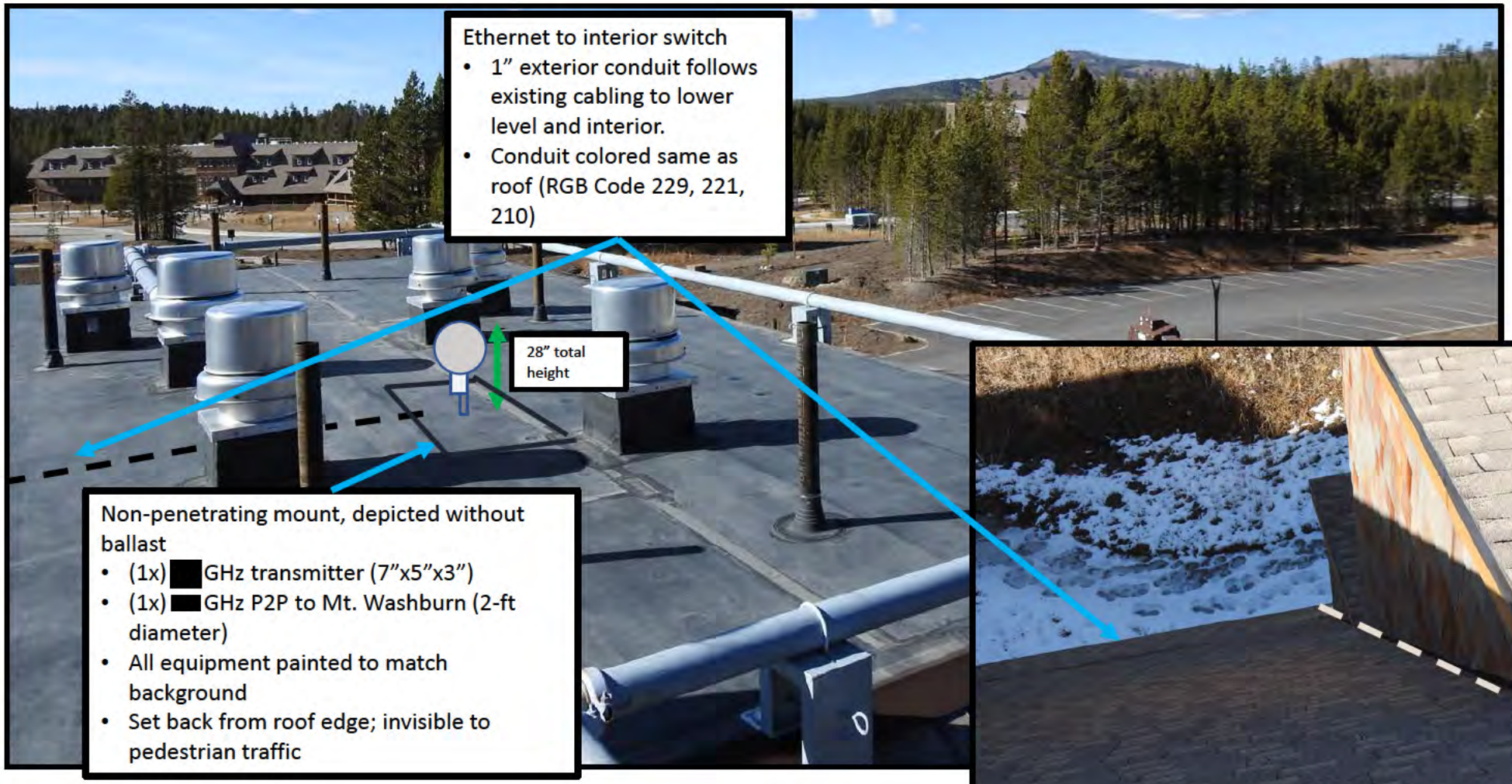
- 6”x6”x2” Wi-Fi AP
- All radios painted to match background
- Ethernet with power from interior switch in crawlspace above
- Cabling secured in crawlspace; no exposed cabling/raceway
- ¼-in penetration in ceiling for Ethernet cable to attic.

Canyon Lodge APs – Floor 1



Canyon Lodge APs – Floor 2



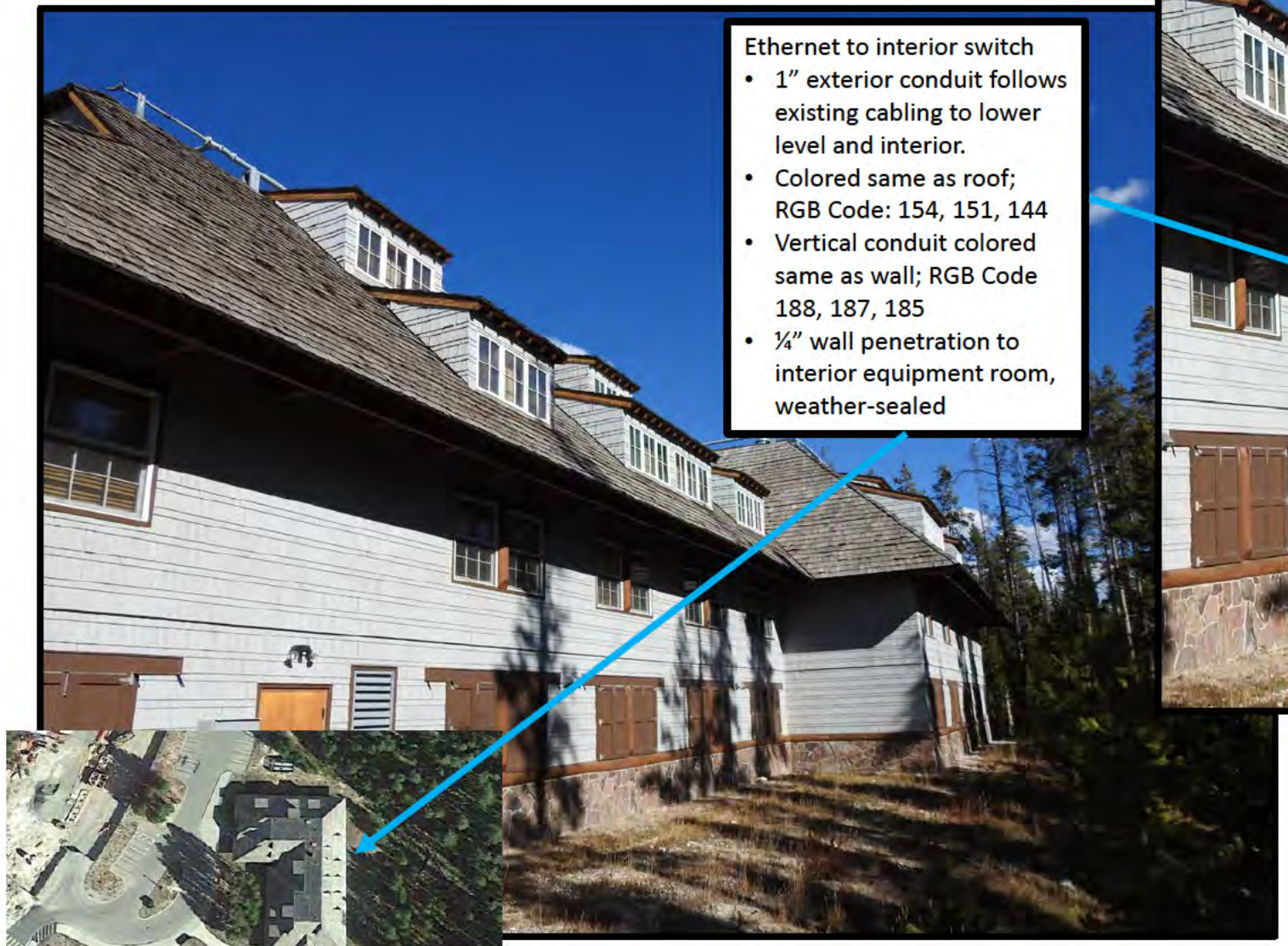


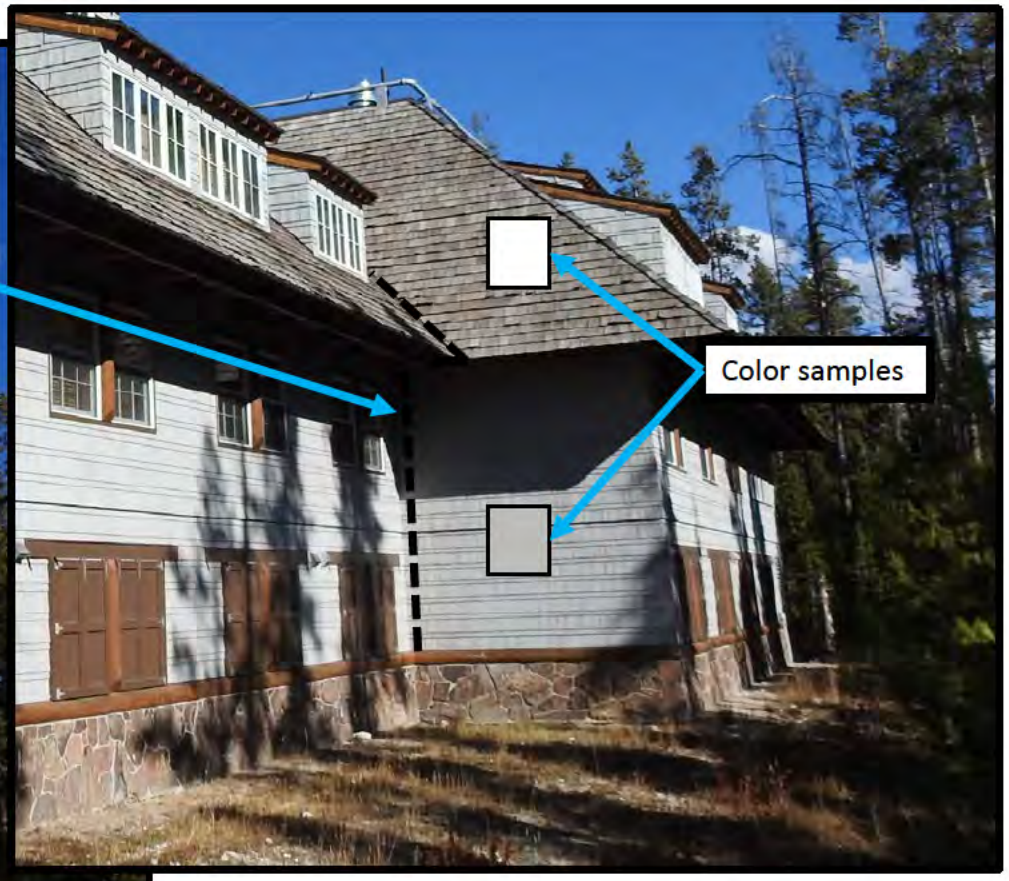
Cascade Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No

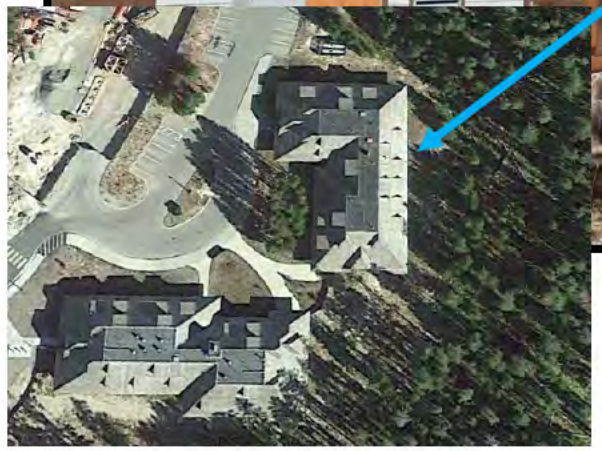
Cascade Lodge

Wireless backhaul to Canyon Village from Mt. Washburn

Coords: 44.742, -110.484

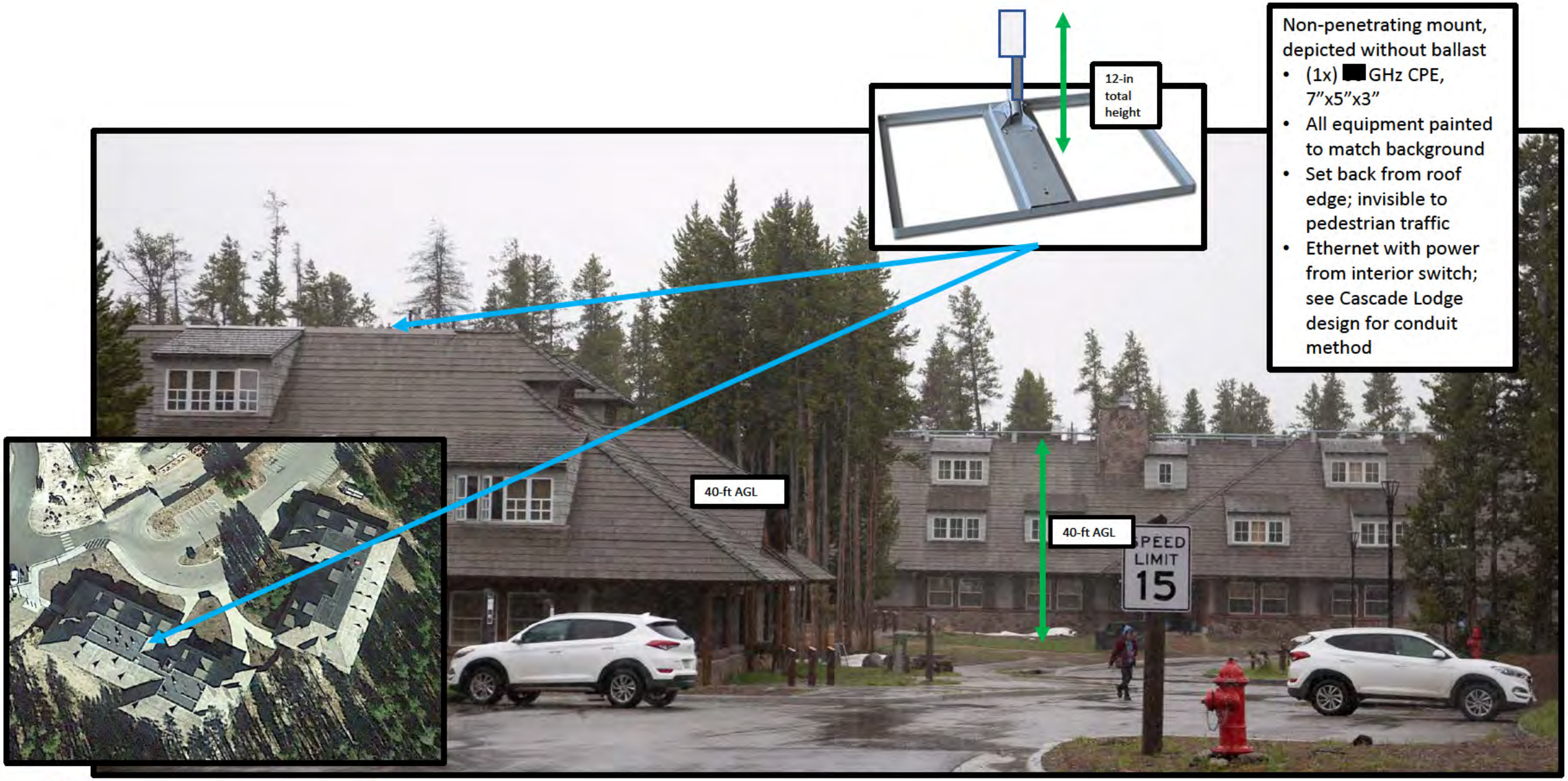






Cascade Lodge

(typical of rear-facing sides of Dunraven, Moran, Hayden, Chittendon, Washburn, Rhyolite Lodges)



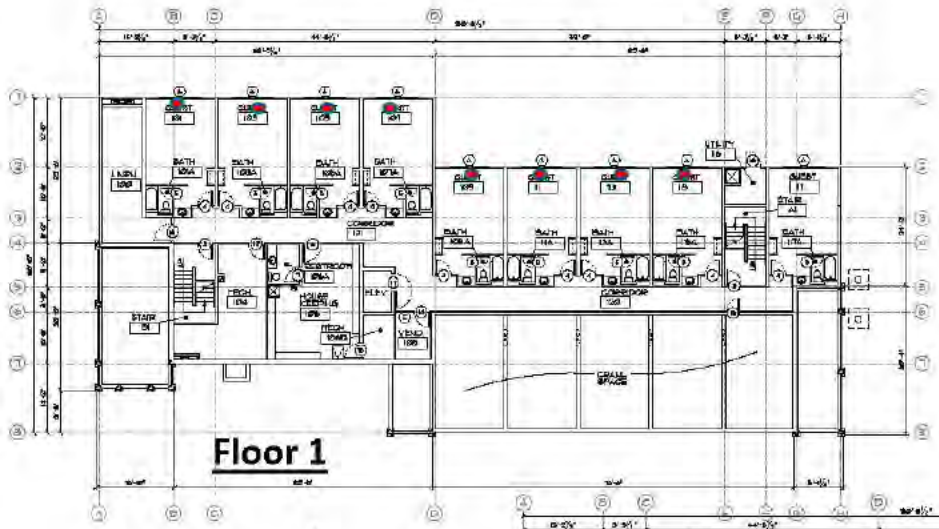
Non-penetrating mount, depicted without ballast

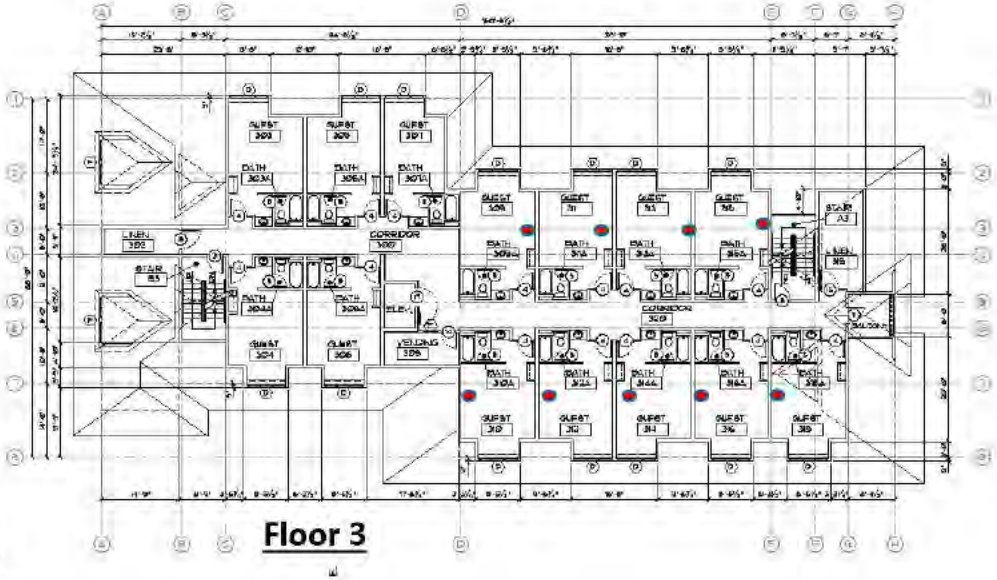
- (1x) [redacted] GHz CPE, 7”x5”x3”
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method

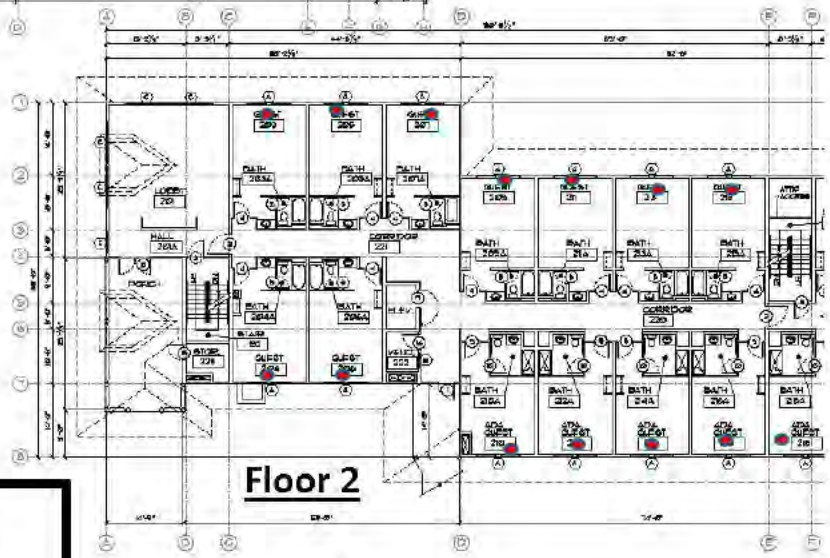
Dunraven Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

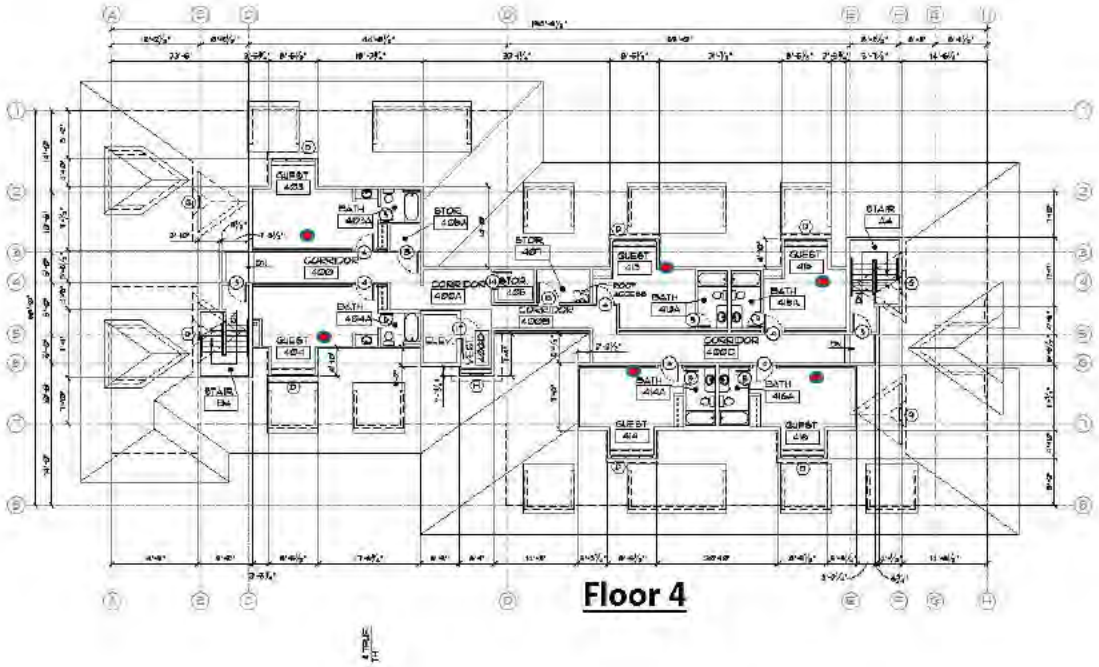
Dunraven Lodge

Coords: 44.742N, -110.484W





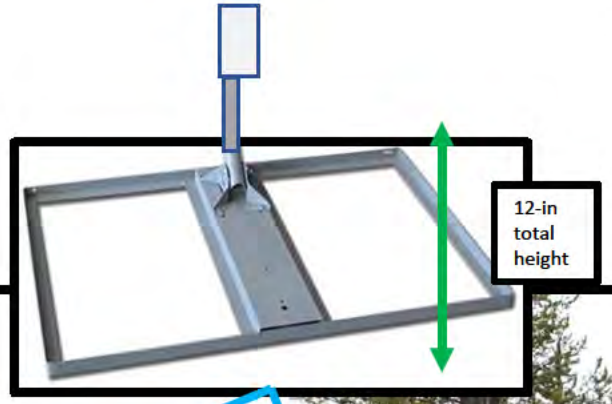




Wi-Fi AP Placement

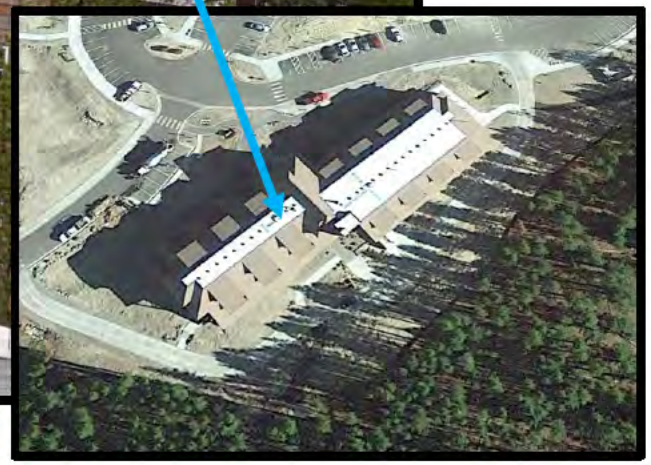
- One AP per room, wallplate-mounted
- Existing data cabling to wall outlets
- 45 total APs

Dunraven Lodge



Non-penetrating mount, depicted without ballast

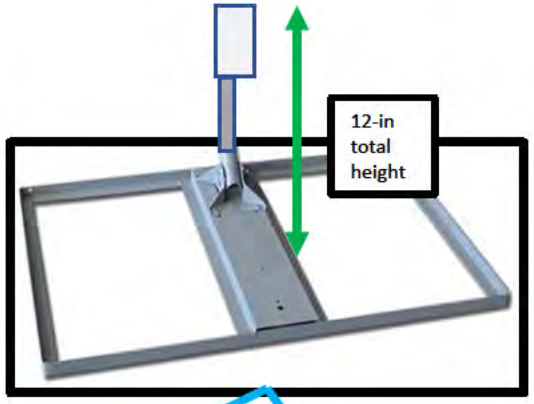
- (1x) [redacted] GHz CPE
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method



Moran Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

Moran Lodge

Coords: 44.730N, -110.487W



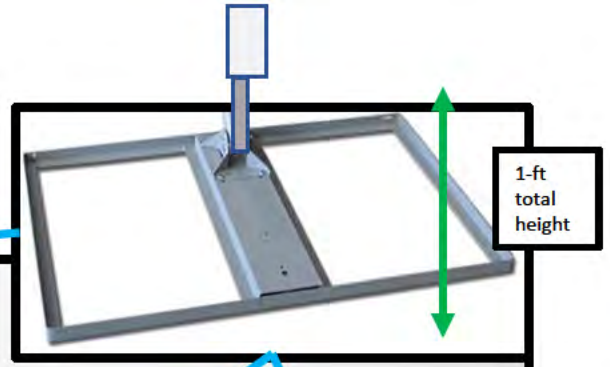
Non-penetrating mount, depicted without ballast

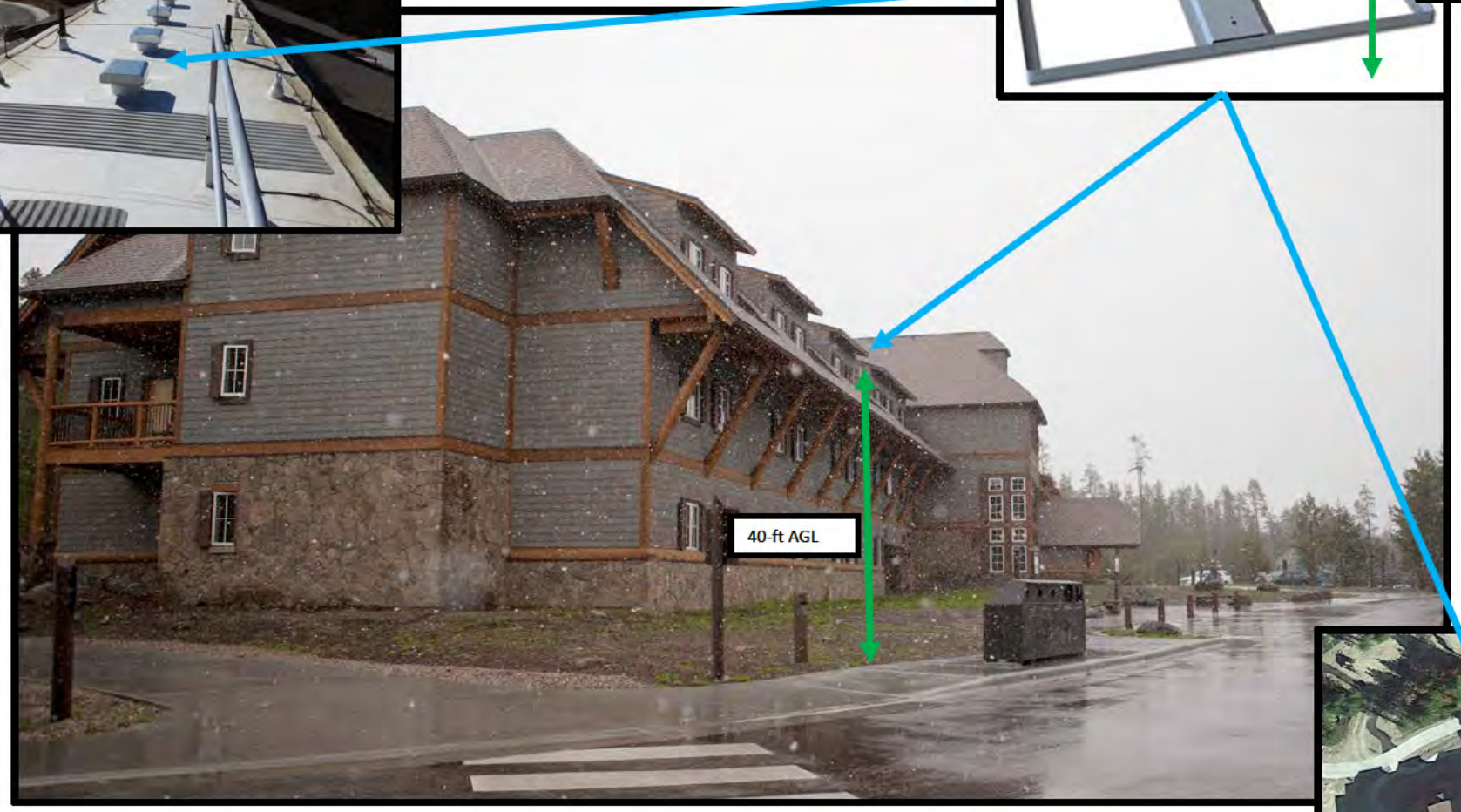
- (1x) [redacted] GHz CPE, 7”x5”x3”
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method

Hayden Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

Hayden Lodge

Coords: 44.732N, -110.488W





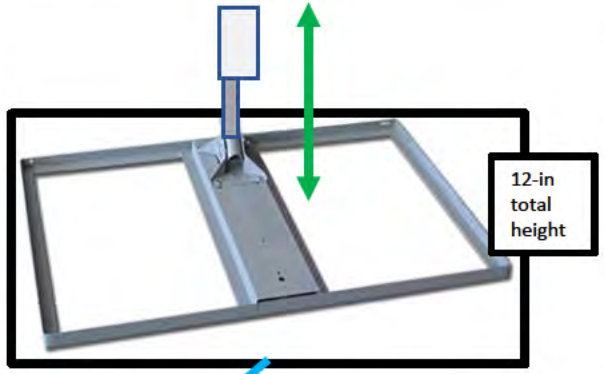
Non-penetrating mount, depicted without ballast

- (1x) [redacted]GHz CPE
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method

Chittendon Lodge

Coords: 44.732N, -110.487W

Chittendon Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes



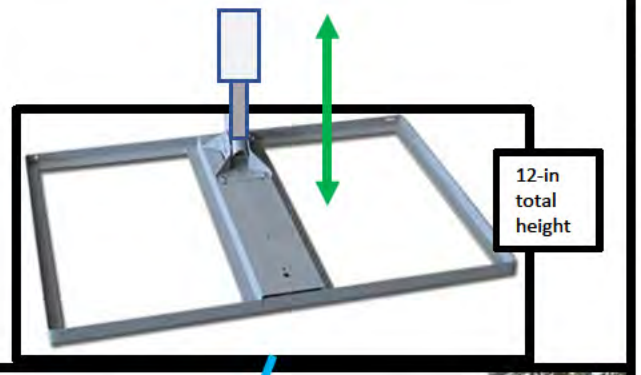
Non-penetrating mount, depicted without ballast

- (1x) [redacted]GHz CPE, 7”x5”x3”
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method

Washburn Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

Washburn Lodge

Coords: 44.732N, -110.486W



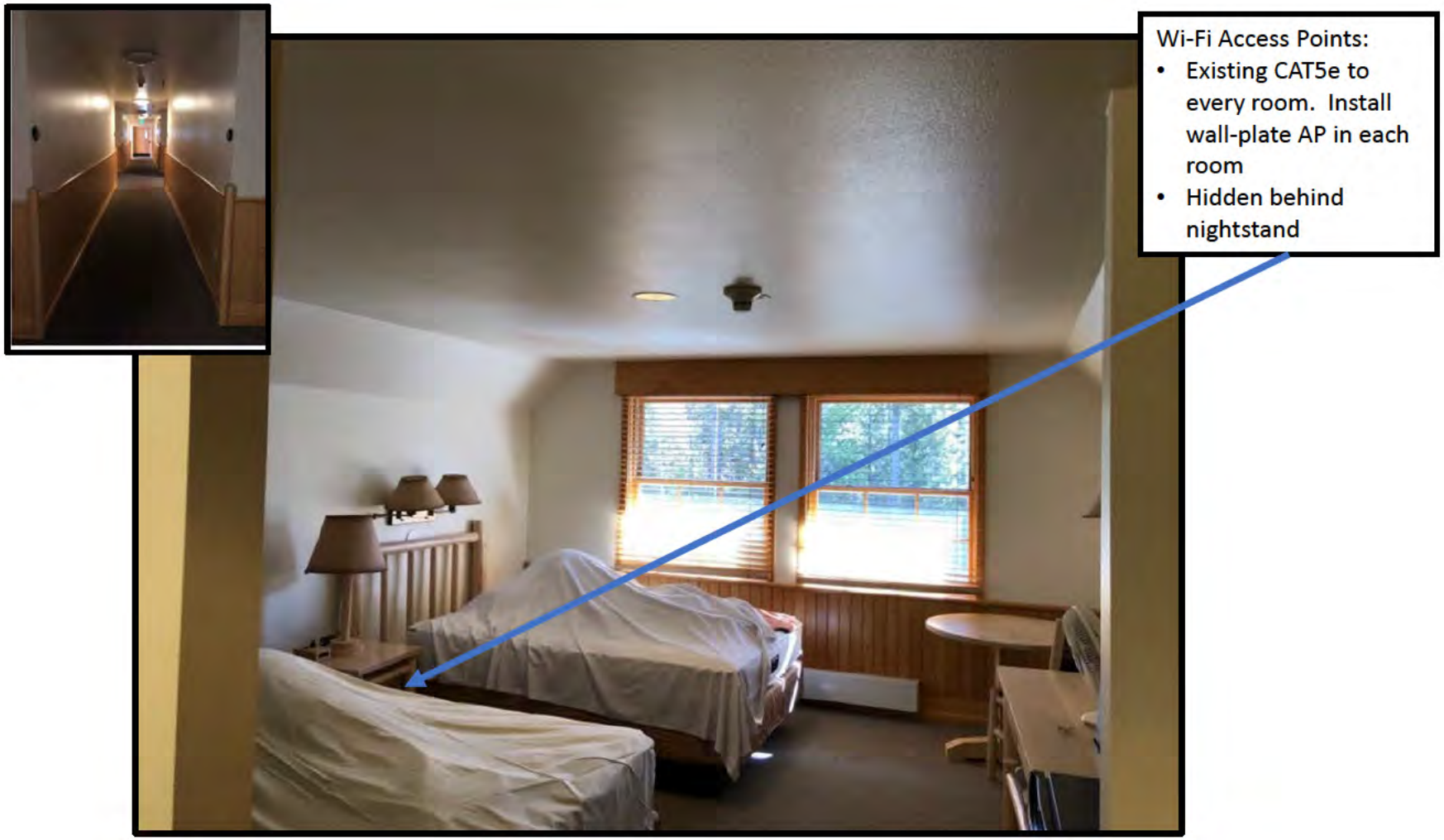
Non-penetrating mount, depicted without ballast

- (1x) [redacted] GHz CPE
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch; see Cascade Lodge design for conduit method

Rhyolite Lodge	
Area	Canyon Village
NRHP Eligibility	Age Ineligible
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

Rhyolite Lodge

Coords: 44.733N, -110.485W



Dunraven, Moran, Hayden, Chittendon, Washburn, Rhyolite Lodges

Bighorn Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

Bighorn Dormitory

Existing fiber backhaul

Coords: 44.733N, -110.488W

Wapiti Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

Wapiti Dormitory

Existing fiber backhaul
Coords: 44.733N, -110.489W

Grizzly Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

Grizzly Dormitory

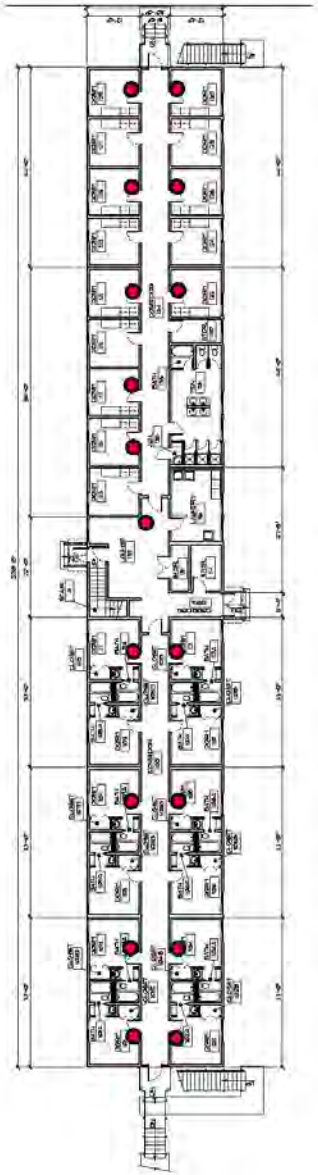
Existing fiber backhaul
Coords: 44.733N, -110.489W

Bison Dormitory

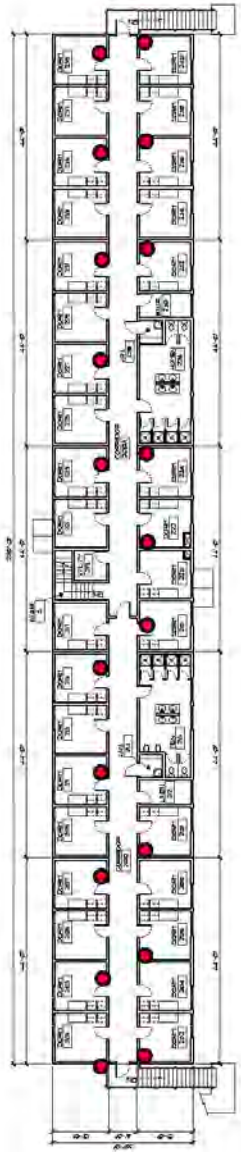
Existing fiber backhaul
Coords: 44.733, -110.490

Bison Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

Total Access Points: 17



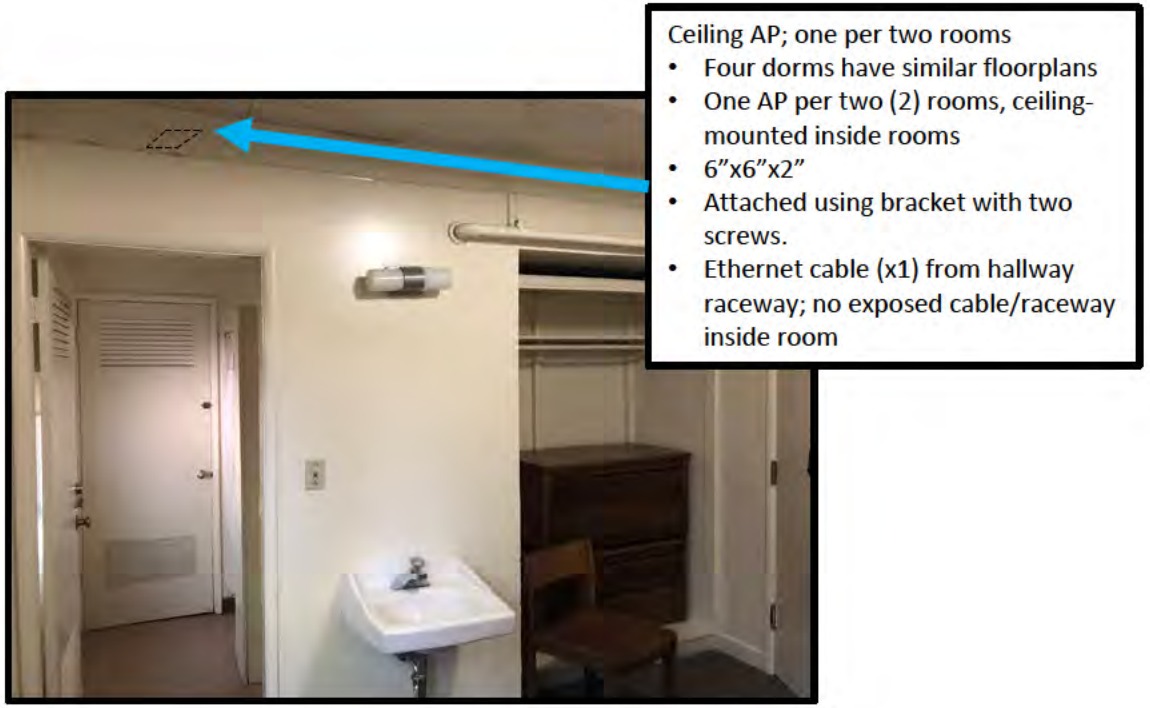
Total Access Points: 19

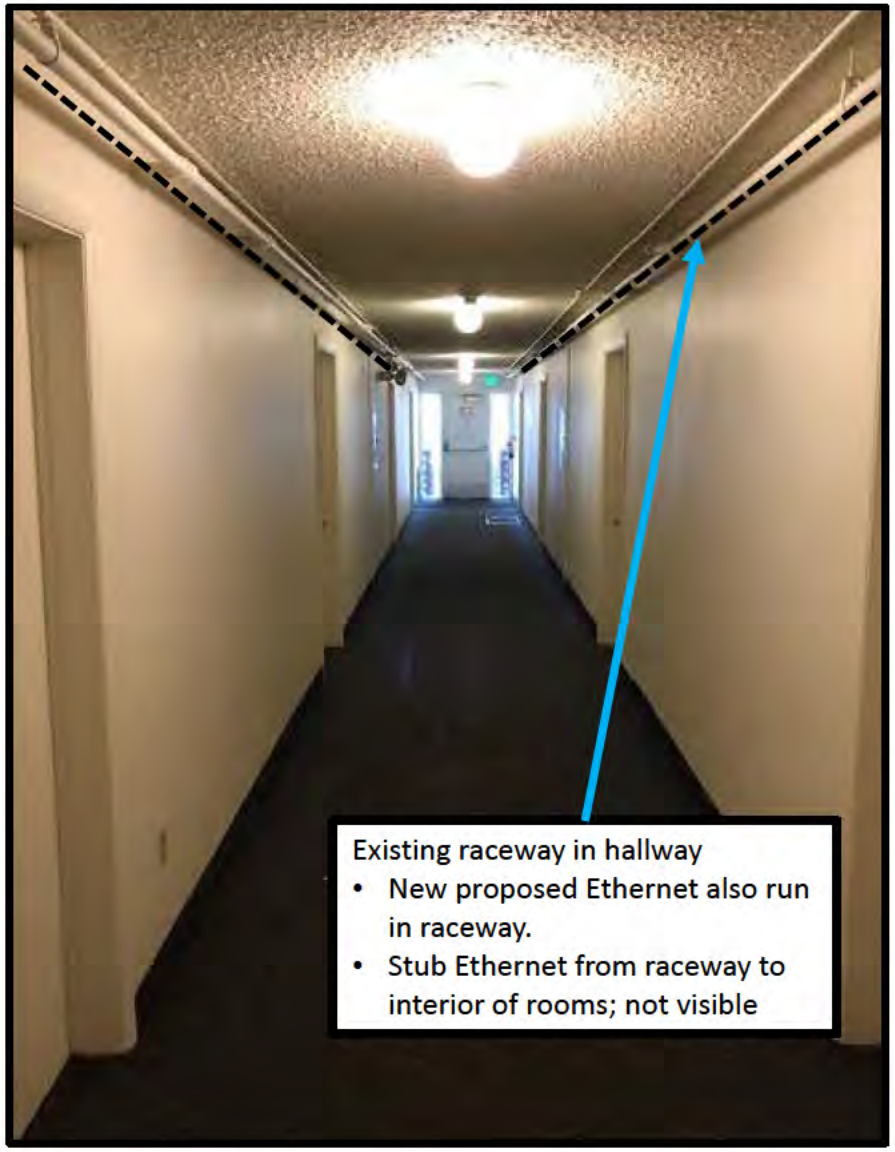


Wi-Fi AP Placement

- Four dorms have similar floorplans
- One AP per two (2) rooms, ceiling-mounted inside rooms
- 36 total APs per dorm; 144 total

Bighorn, Bison, Grizzly, Wapiti Dormitories





Bighorn, Bison, Grizzly, Wapiti Dormitories
(Typical)

- (1x) [redacted] GHz CPE
- Attached using two (2) screws in wooden facade
- All equipment painted to match background; RGB Color 83, 51, 38
- Ethernet with power from interior switch
- ¼-in penetration under eave, for 1x Ethernet cable to attic; no visible cable/conduit

YGS Dormitory	
Area	Canyon Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

YGS Dormitory

Coords: 44.733N, -110.492W

Canyon Village Guest Cabins	
Area	Canyon Village
NRHP Eligibility	Non-Contributors
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

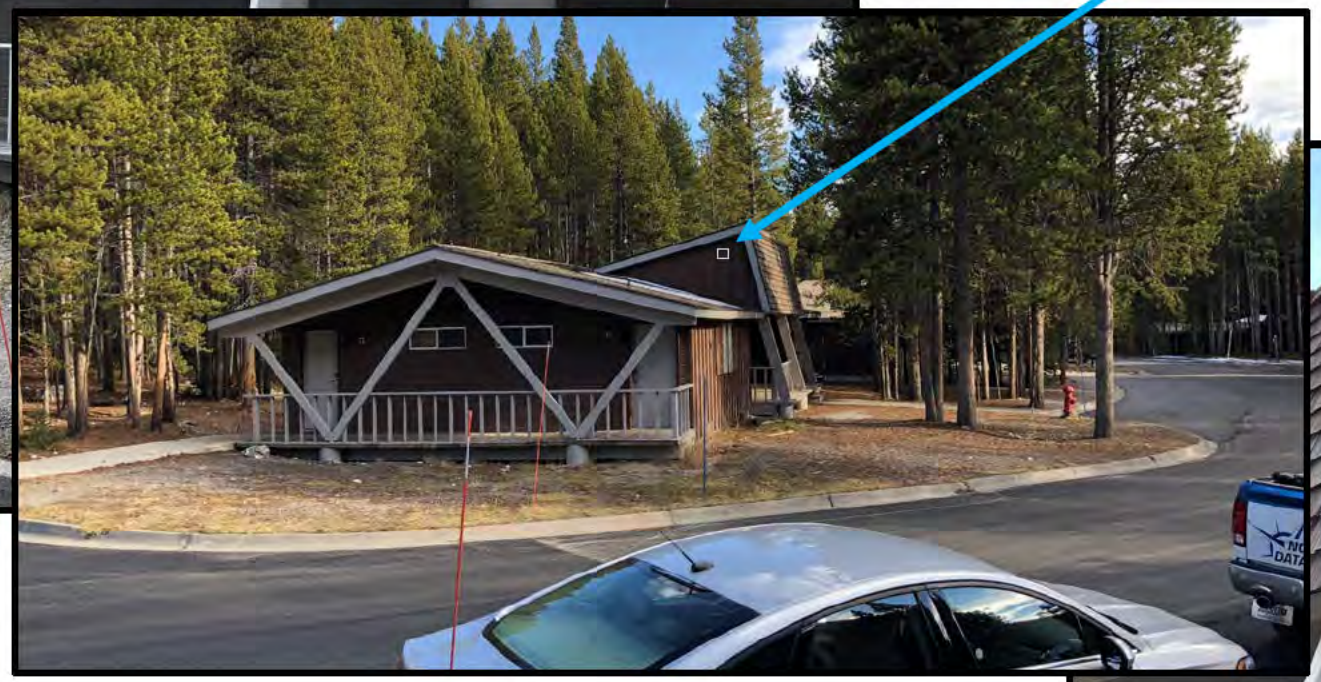
Canyon Village; Guest Cabins

(x26 Buildings)

Coordinates: 44.729N, -110.488W

(1x)[redacted] GHz CPE

- 9"x9"x3”
- All equipment painted to match background; RGB Code 141, 148, 156 or 36, 30, 32
- Ethernet with power from interior switch
- Height: 10-ft AGL
- ¼-in penetration under eave, for 1x Ethernet cable to attic.



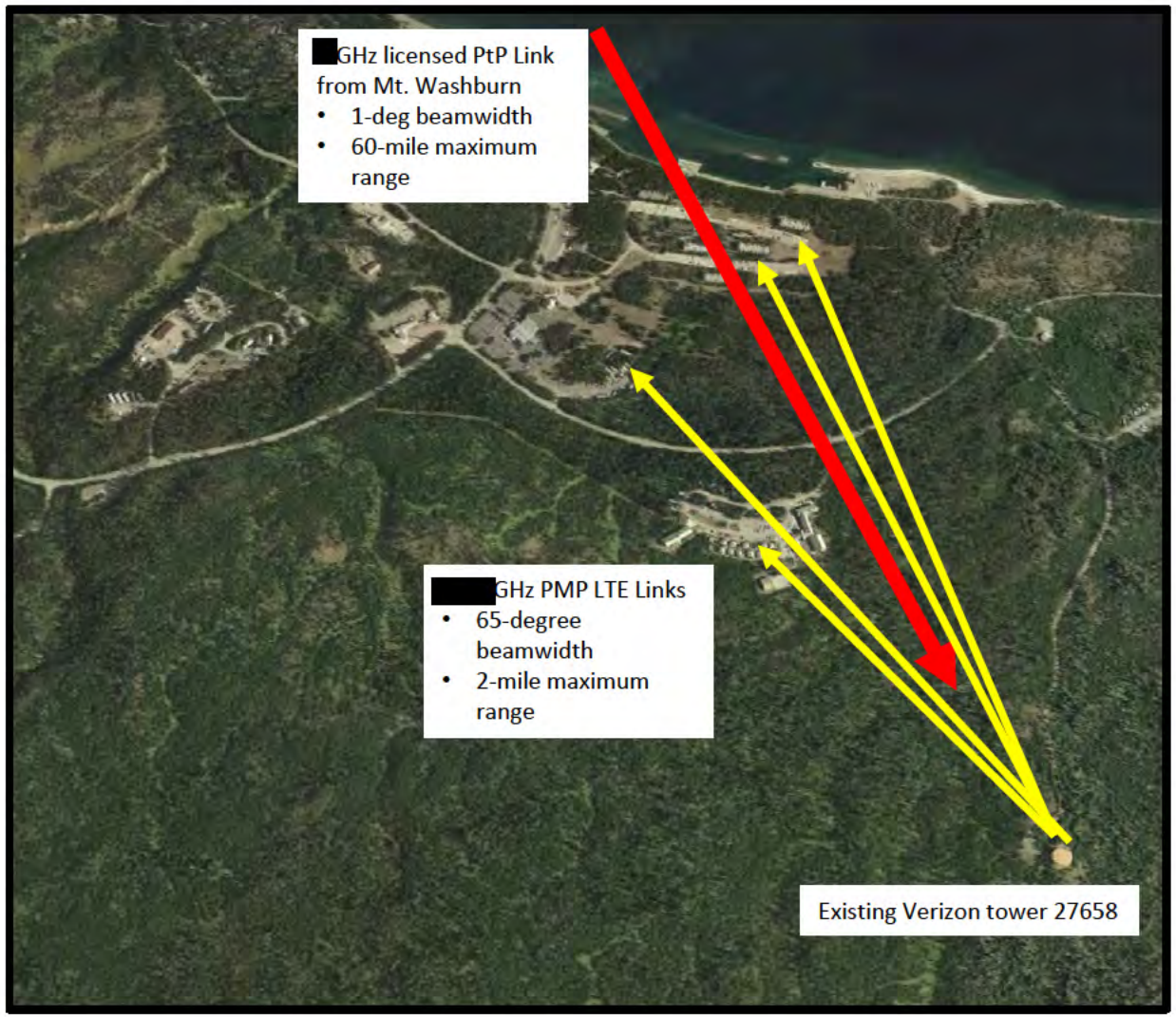
Canyon Village; Guest Cabins
(typical)

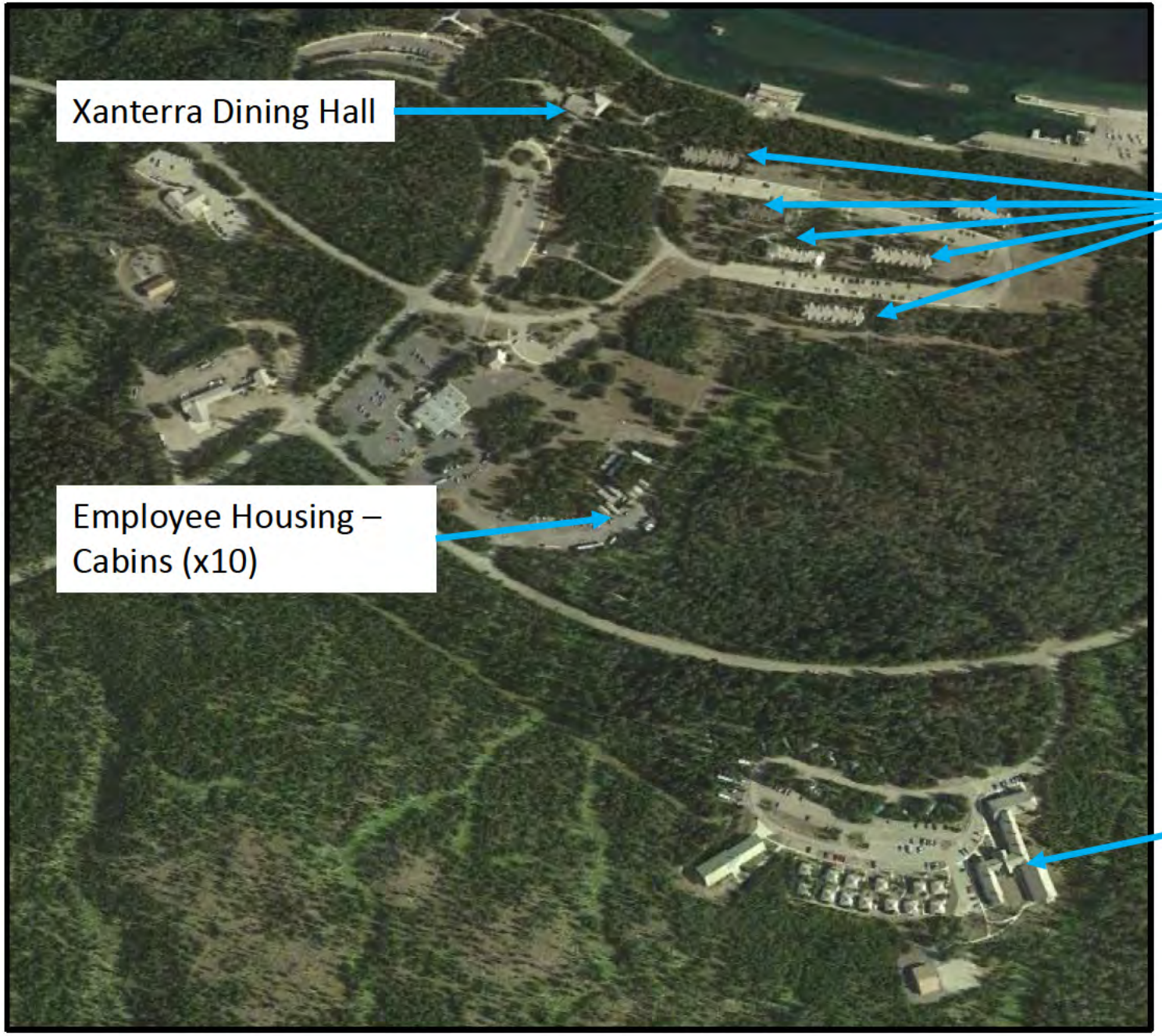
Canyon Village; Guest Cabins
(typical interior)

Grant Village Area

Grant Village Area Existing Wireless (known)

Grant Village Area Proposed Wireless



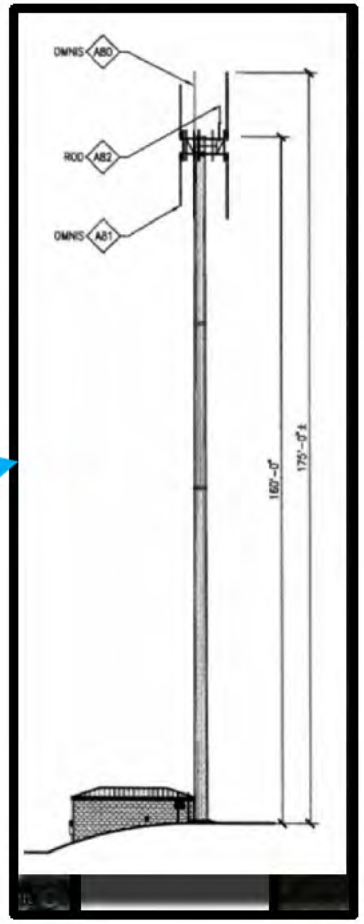


Xanterra Lodges (x6)

- Antelope
- Bear
- Coyote
- Fox
- Elk
- Deer

Employee Housing – Grayling Dormitory

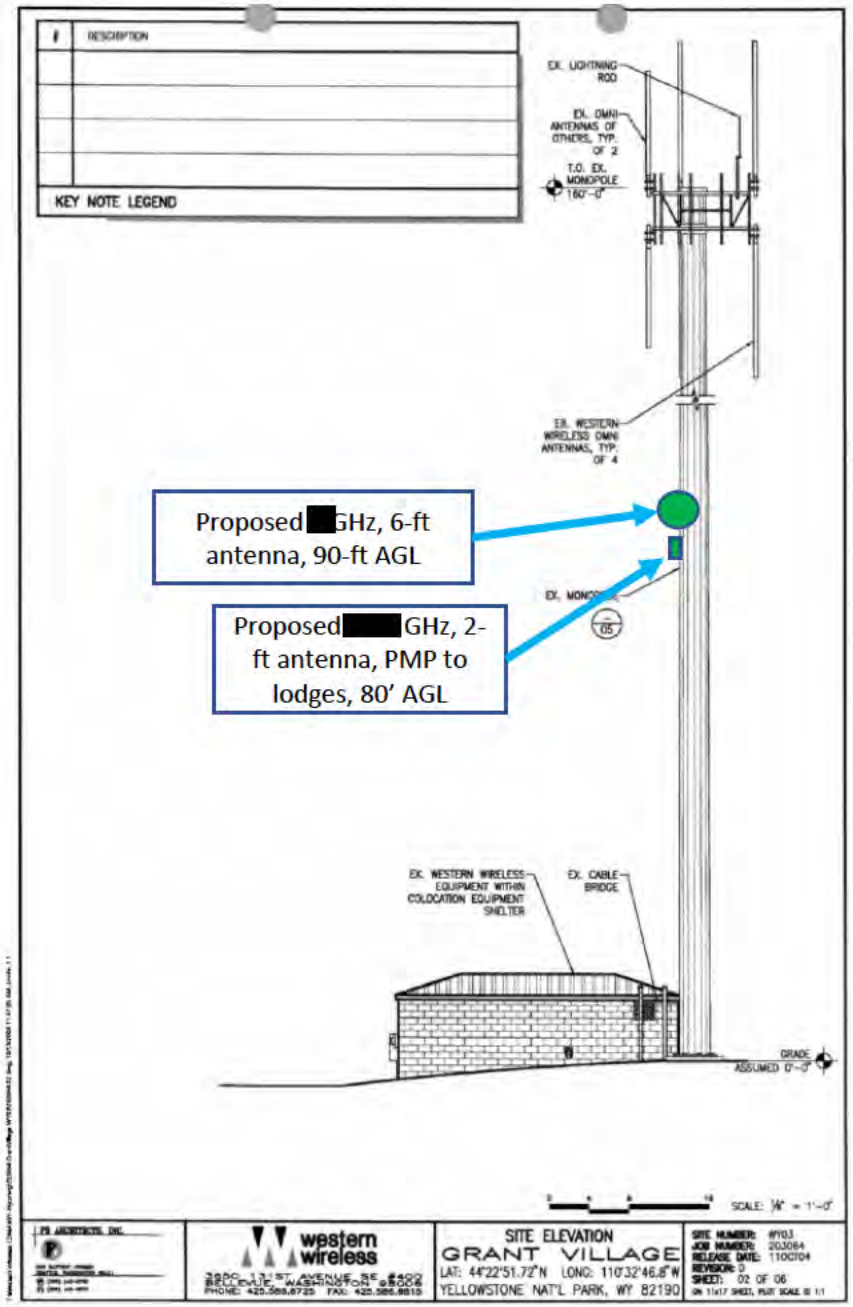
Grant Village Area – Existing Verizon Tower #27658



Grant Village Tower

Proposed colocation on existing Verizon tower #27658

Coordinates: 44.380N, -110.547W



(1x) [redacted] GHz CPE per building

- 9"x9"x3"
- All equipment painted to match background
- Ethernet with power from interior switch in attic
- ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

Antelope Lodge

Coords: 44.392N, -110.553W

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

(1x) [redacted] GHz CPE per building
- 9"x9"x3"
- All equipment painted to match background
- Ethernet with power from interior switch in attic
- ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Fox Lodge

Coords: 44.391N, -110.550W

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Elk Lodge

Coords: 44.391N, -110.551W

Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Bear Lodge

Coords: 44.391N, -110.552W

(1x) [redacted] GHz CPE per building

- 9"x9"x3”
- All equipment painted to match background
- Ethernet with power from interior switch in attic
- ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

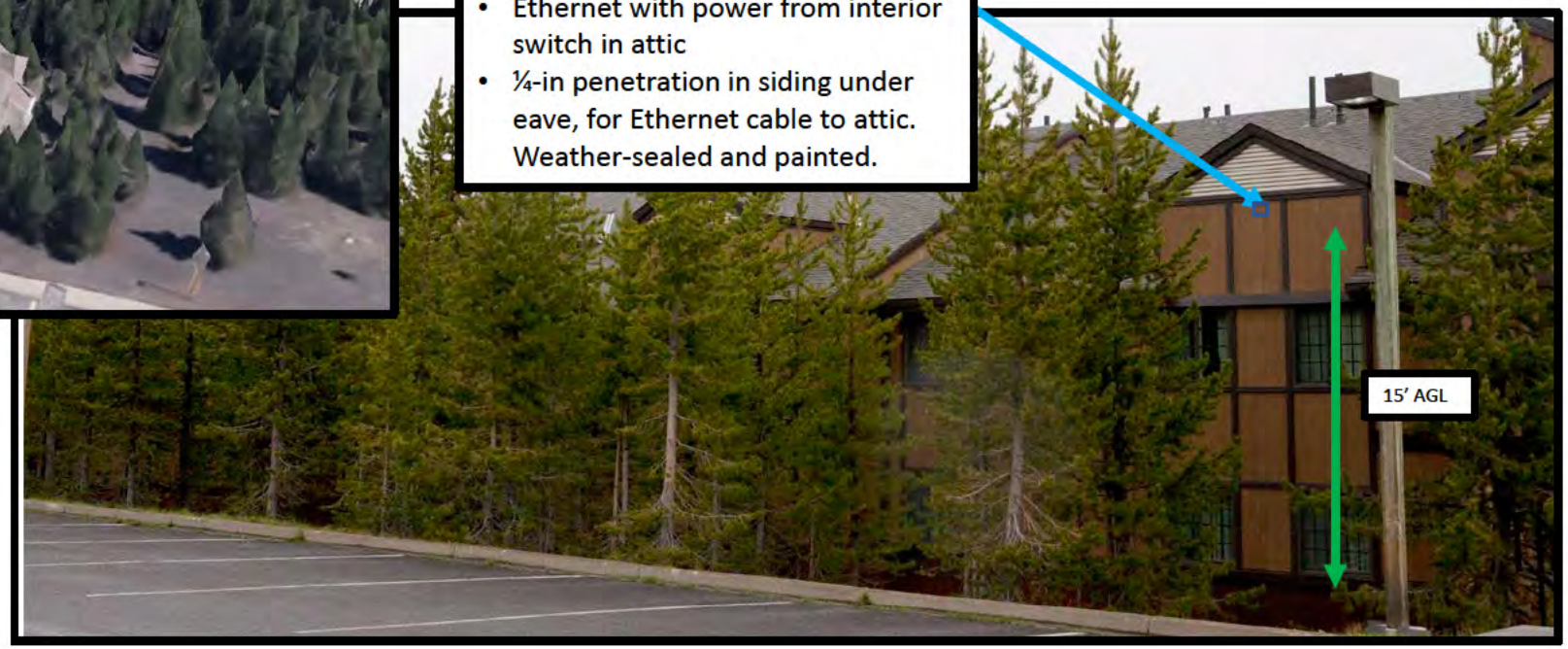
Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Coyote Lodge

Coords: 44.391N, -110.552W

(1x) [redacted] GHz CPE per building

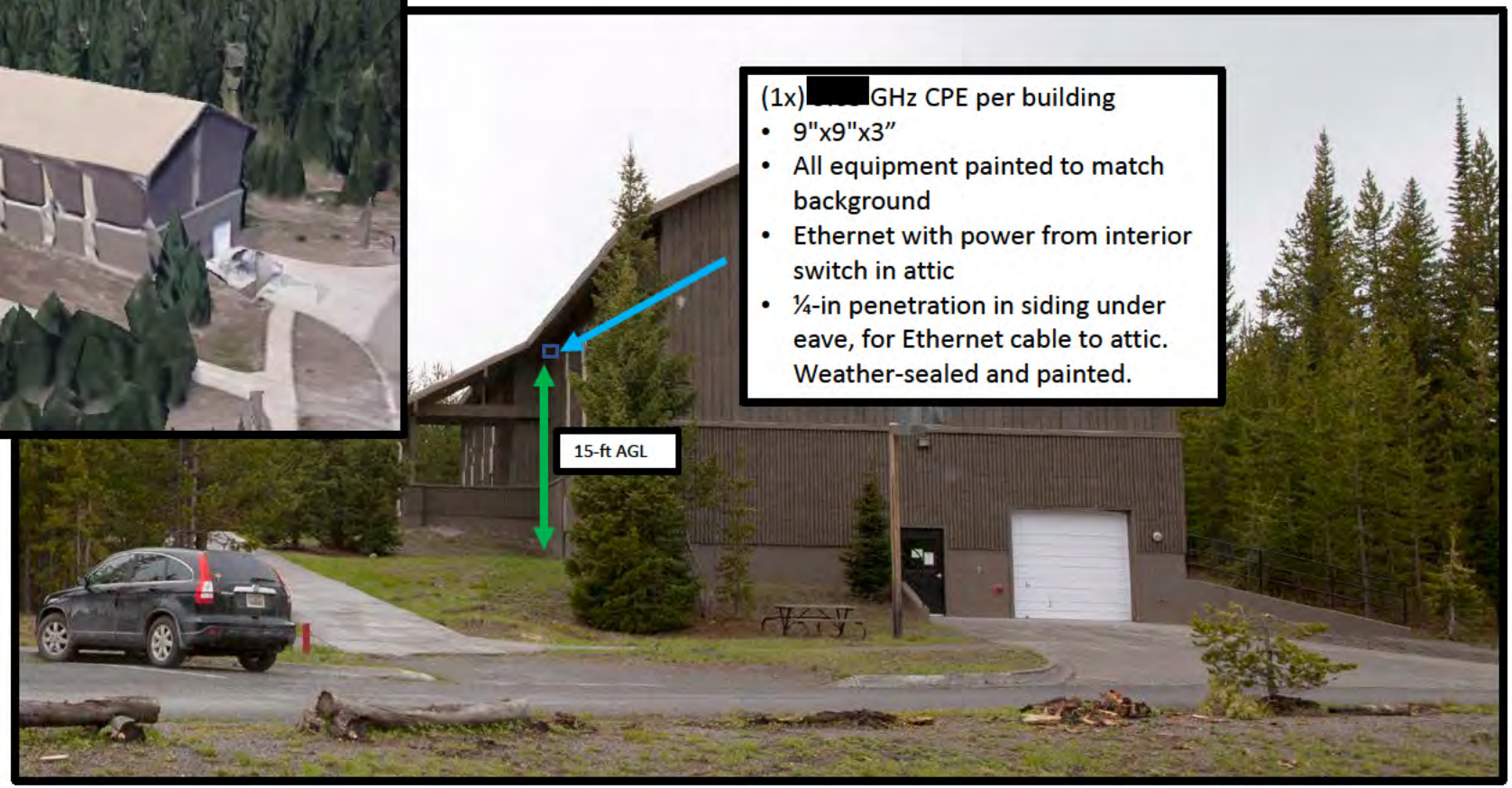
- 9"x9"x3”
- All equipment painted to match background
- Ethernet with power from interior switch in attic
- ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.



Deer Lodge

Coords: 44.390N, -110.552W

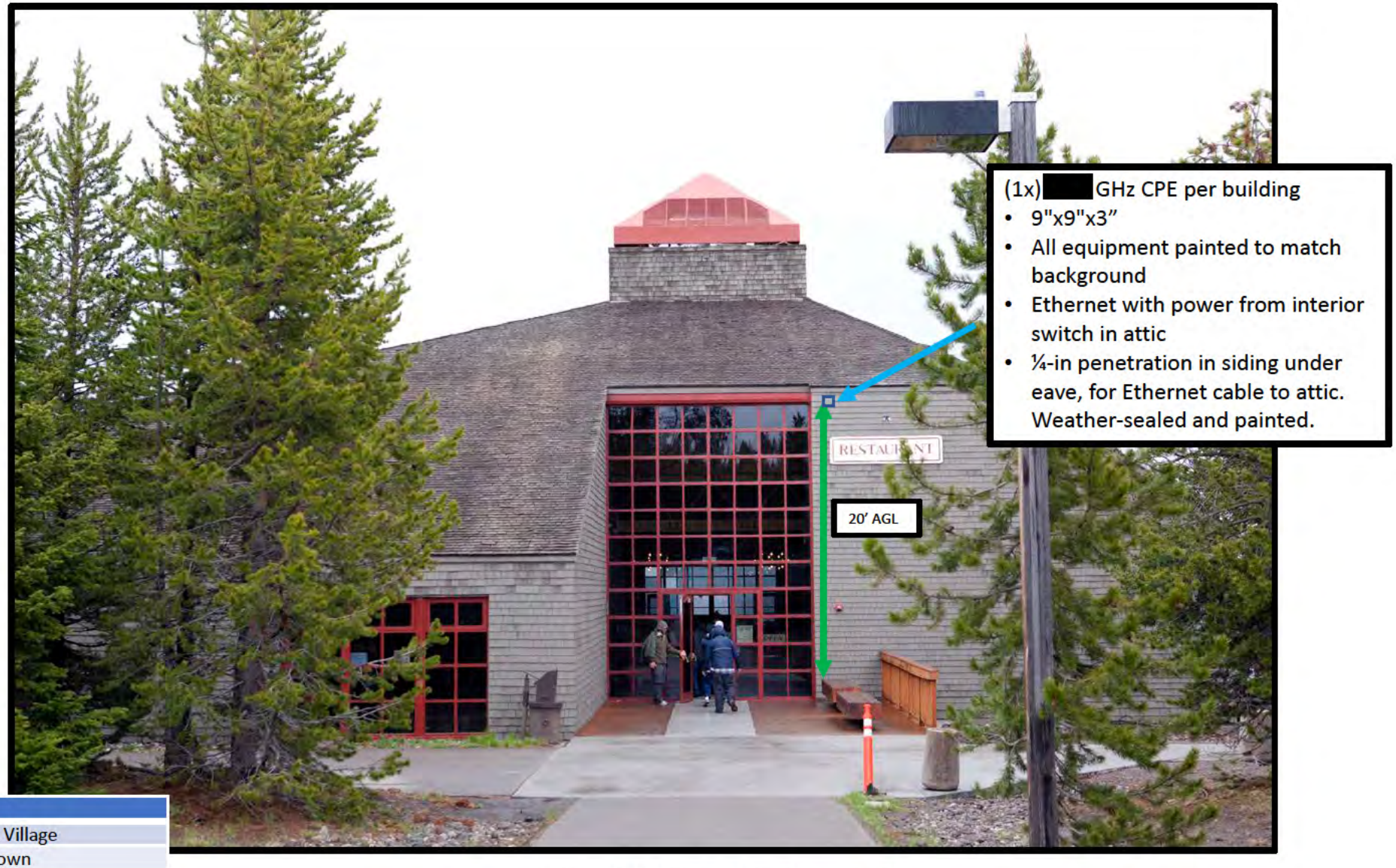
Grant Village Lodges	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes



YGS Dormitory	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

YGS Dormitory

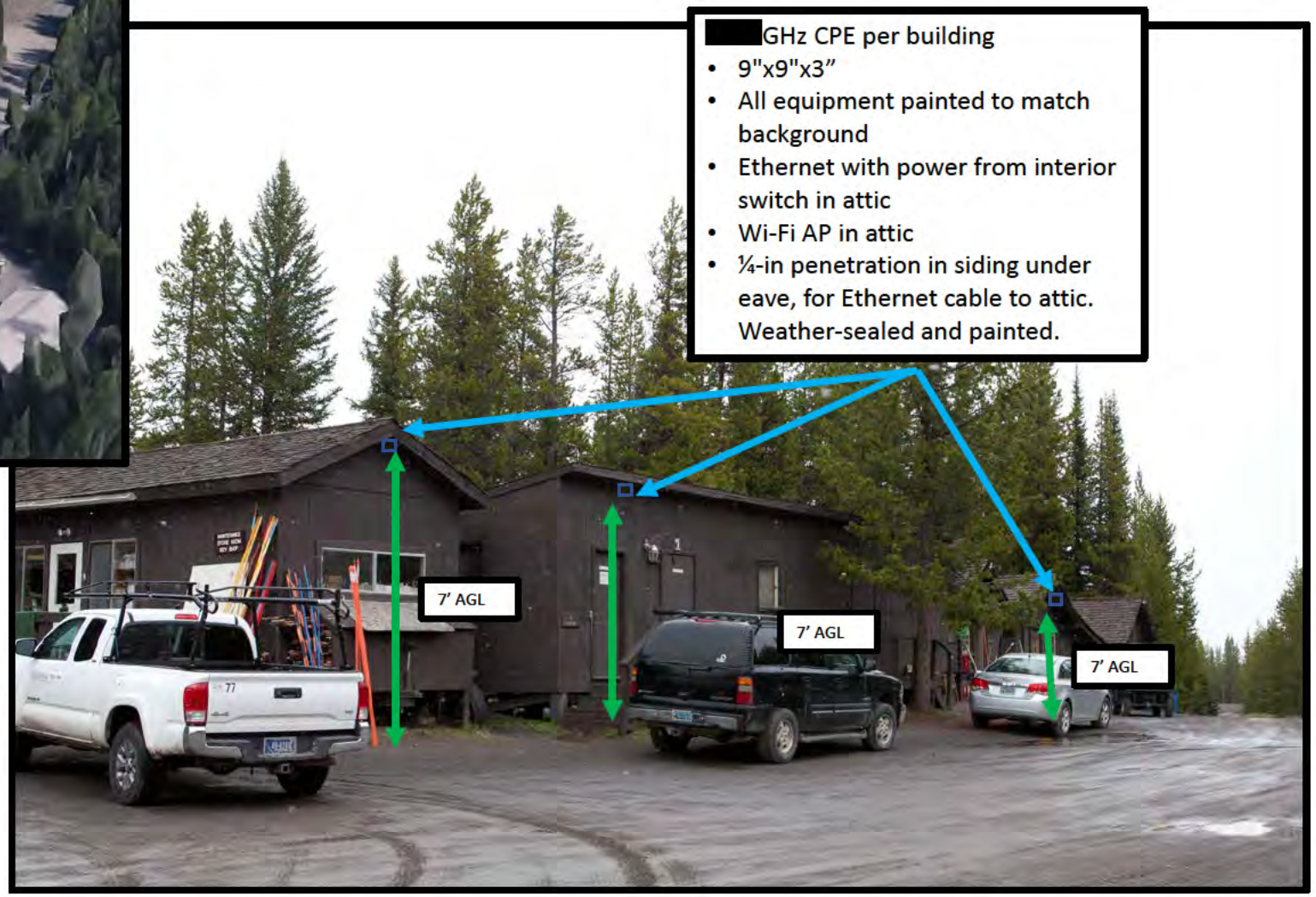
Coords: 44.385N, -110.553W



Grant Village Restaurant	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Grant Village Restaurant

Coords: 44.392N, -110.555W



Grant Village Employee Housing	
Area	Grant Village
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Grant Village Employee Housing
(typical)
Coords: 44.388N, -110.554W

[redacted]GHz CPE per building

- 9”x9”x3”
- All equipment painted to match background
- Ethernet with power from interior switch in attic
- ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

Grayling Dormitory

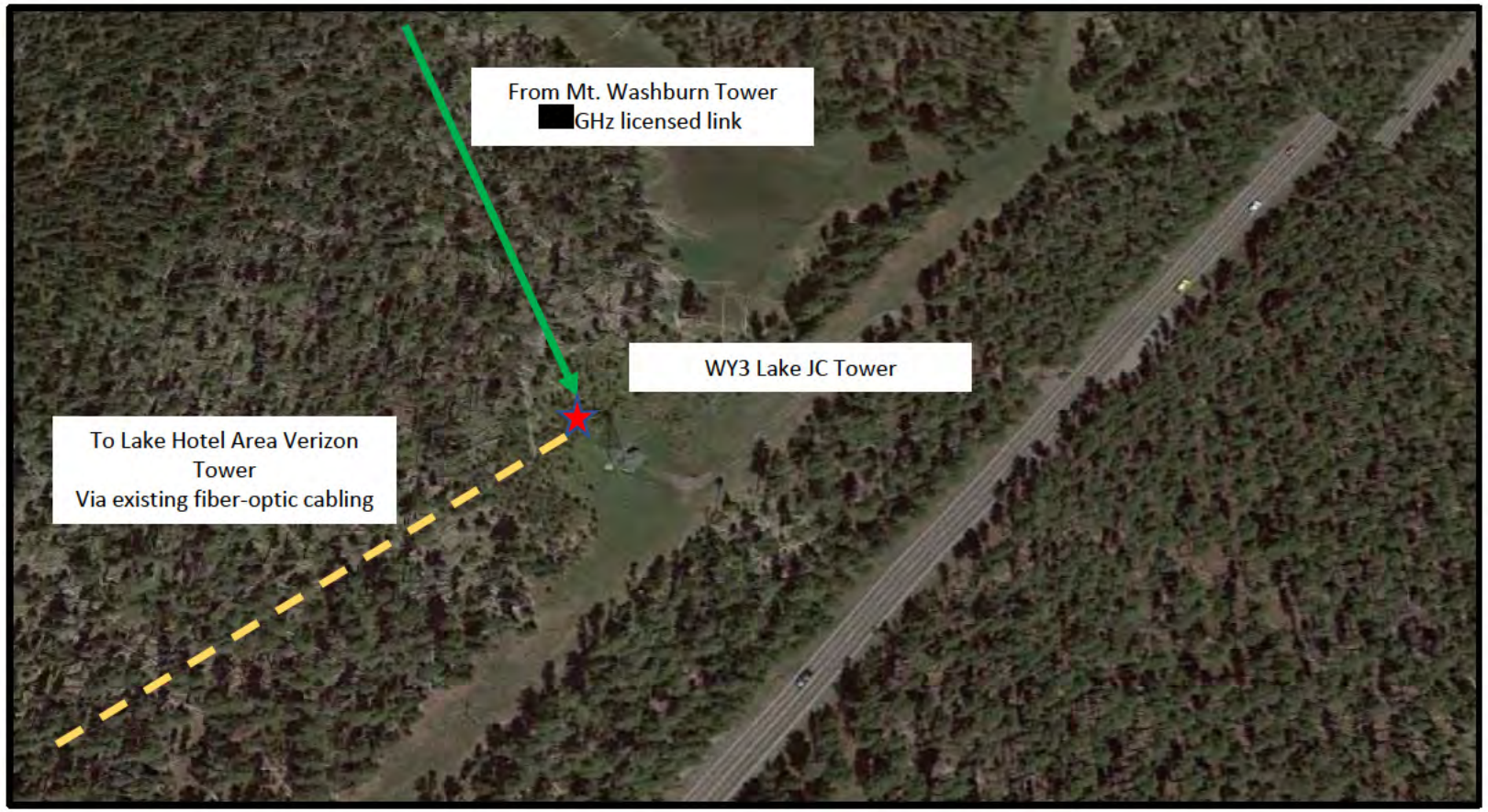
Coords: 44.385N, -110.550W

Grayling Dormitory	
Area	Grant Village
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Fishing Bridge / Lake Area

Fishing Bridge

Century Link Tower (WY3 Lake JC; US-WY-8047)

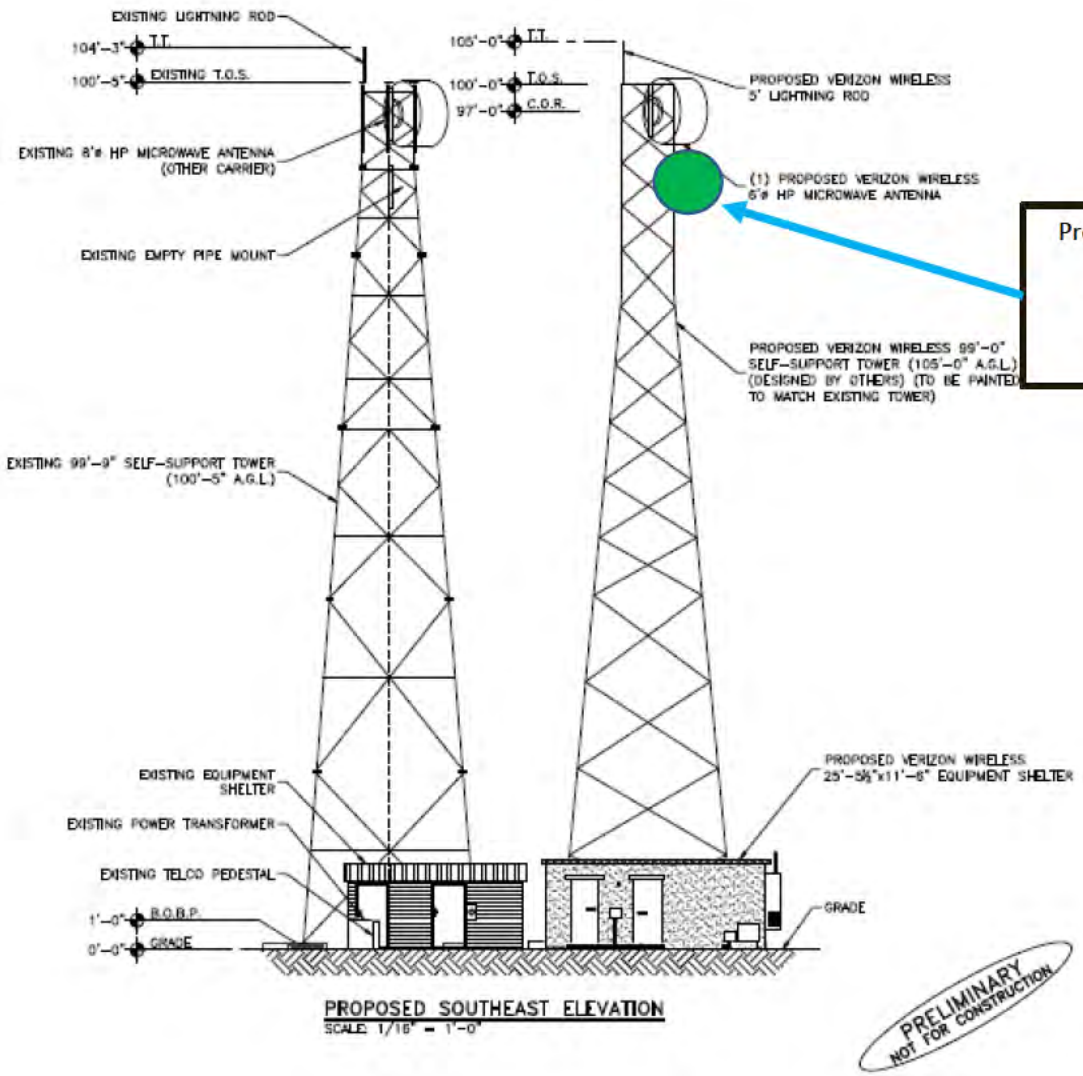


Proposed Wireless Coverage

Coords: 44.574N, -110.384W

Fishing Bridge

Century Link "WY3 Qwest Lake JC" Tower
(Constructed)



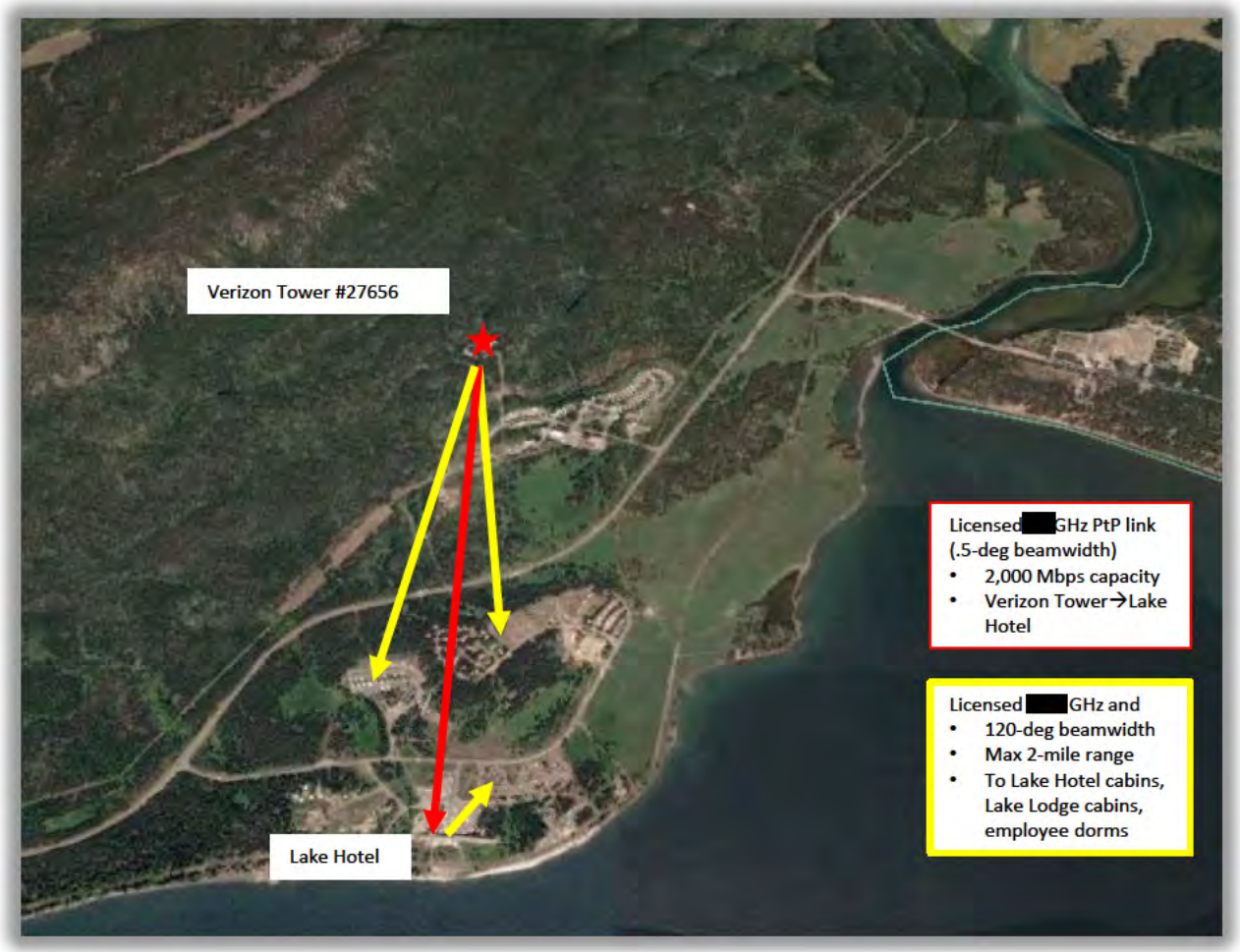
PROPOSED SOUTHEAST ELEVATION
SCALE: 1/16" = 1'-0"

Proposed antenna from Mt. Washburn Tower
6-ft [redacted]GHz antenna
90-ft AGL centerline
351-deg azimuth

Lake Area

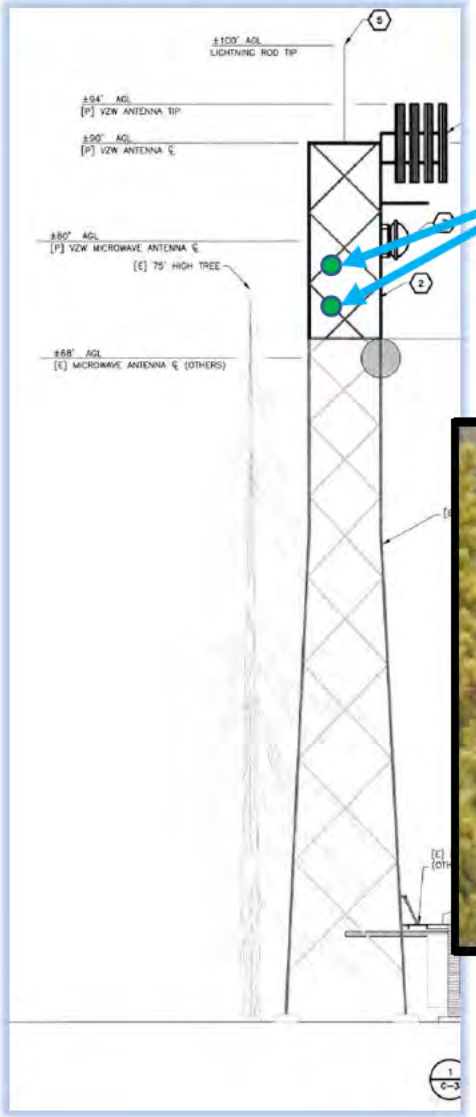
Existing wireless coverage (known)

Lake Area - Proposed Wireless Coverage



Lake Area Tower

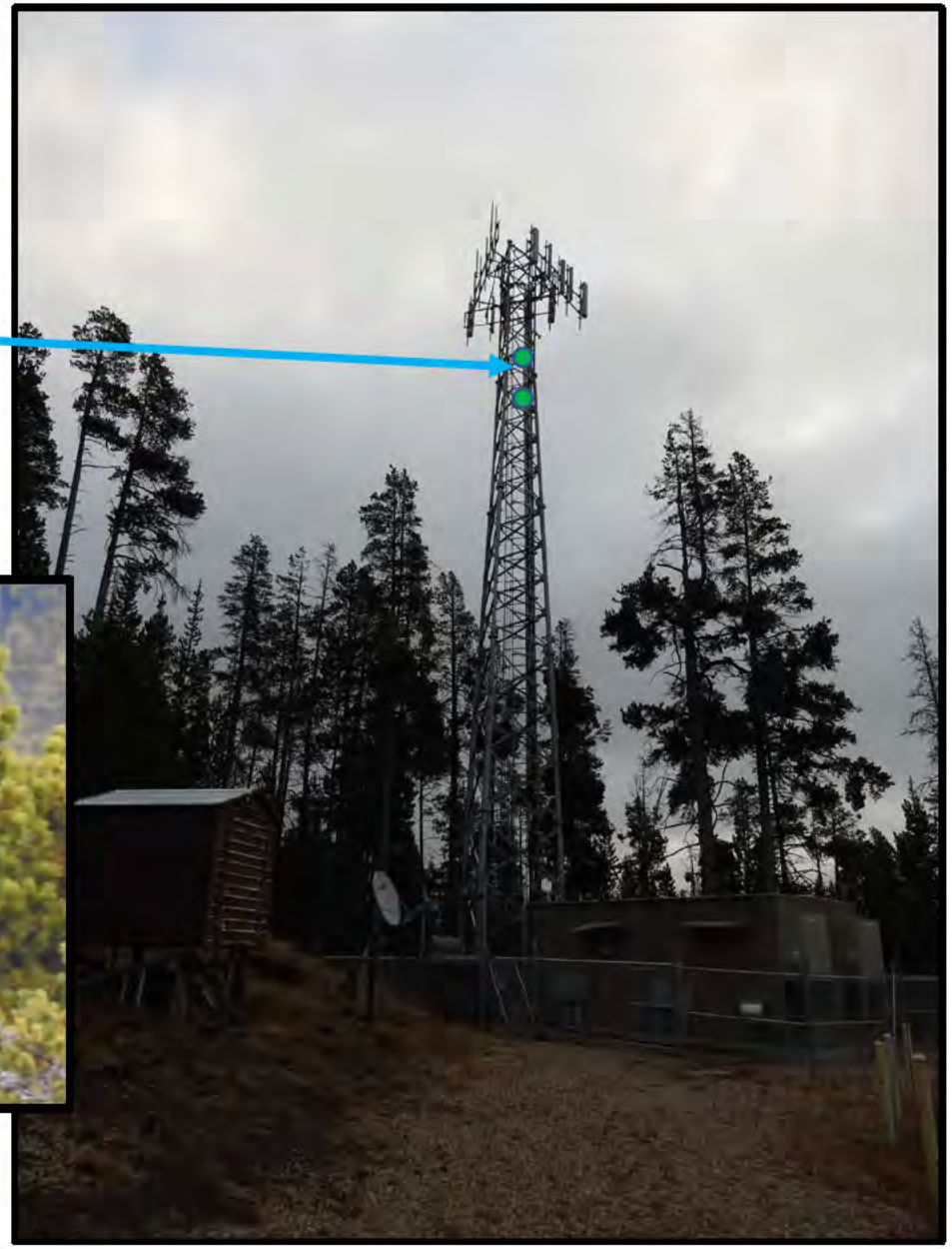
Verizon Tower #27656 (WY3 Fishing Bridge)



Proposed antenna

- 2-ft [redacted] GHz antenna, 168-deg azimuth, 75-ft AGL centerline
- 2-ft, [redacted] GHz antenna, 180-deg azimuth, 70-ft centerline
- Fiber backhaul through existing conduit to "WY3 Lake JC" tower

View from Yellowstone Lake Hotel roof



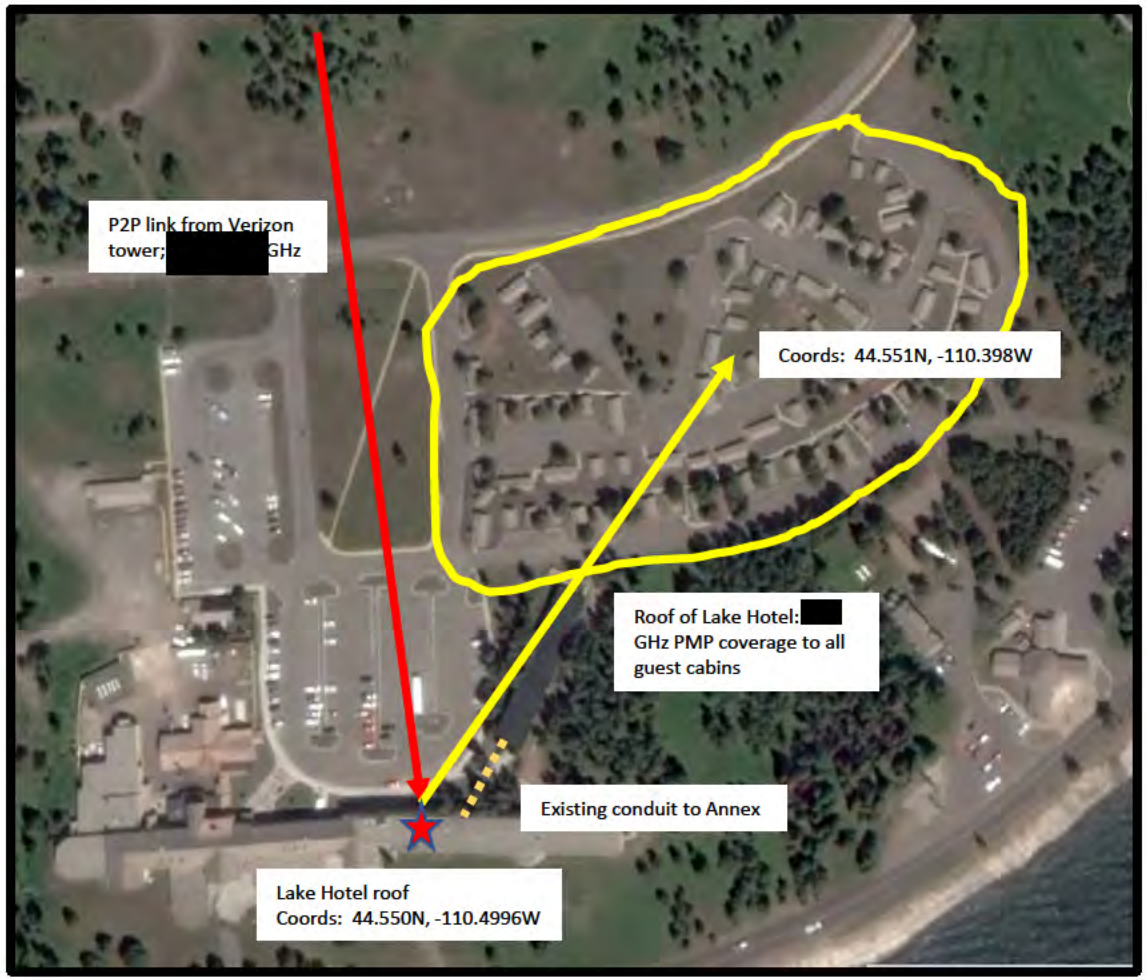
Lake Hotel

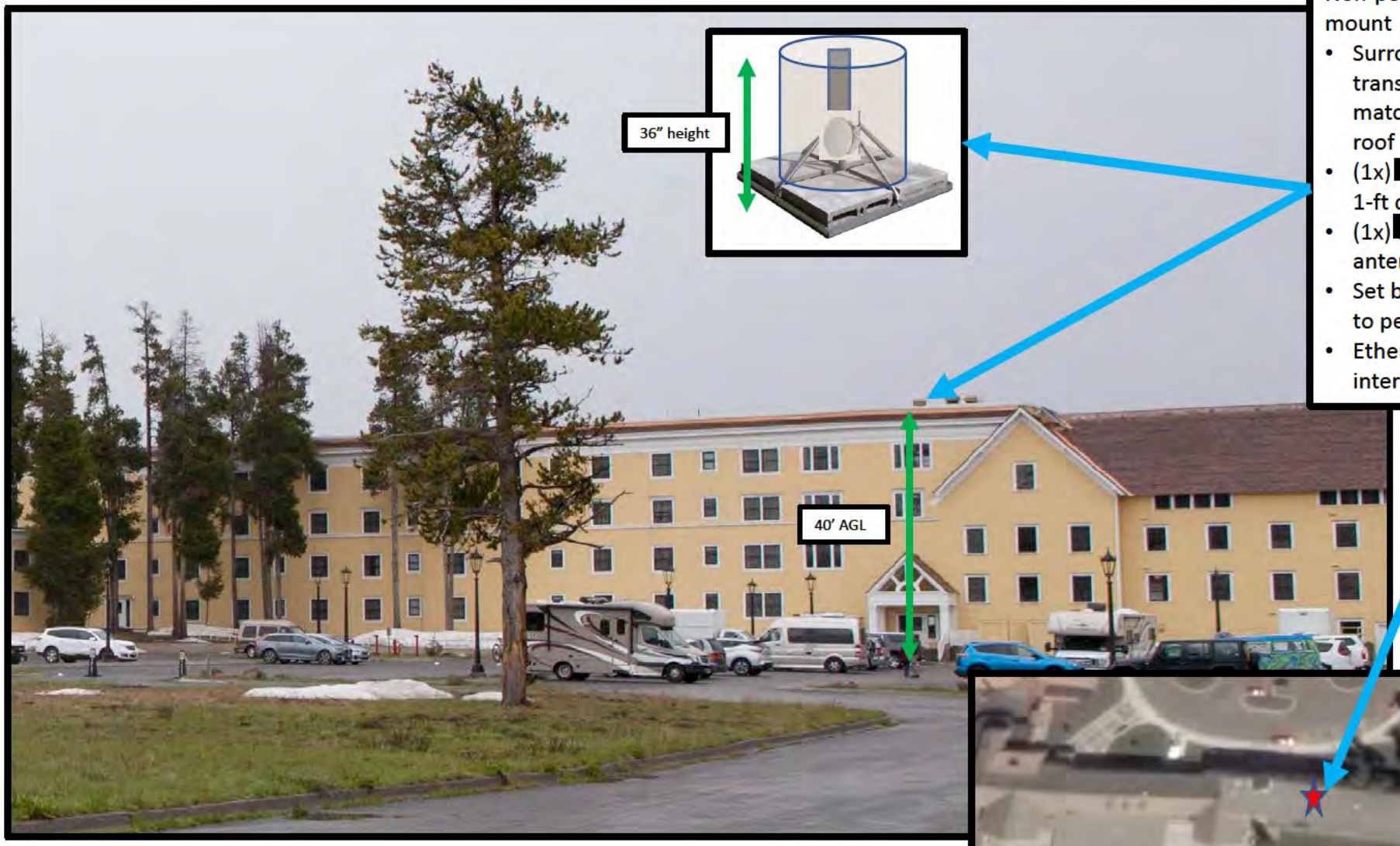
Lake Hotel Area

Existing wireless coverage (known)

Yellowstone Lake Hotel Area

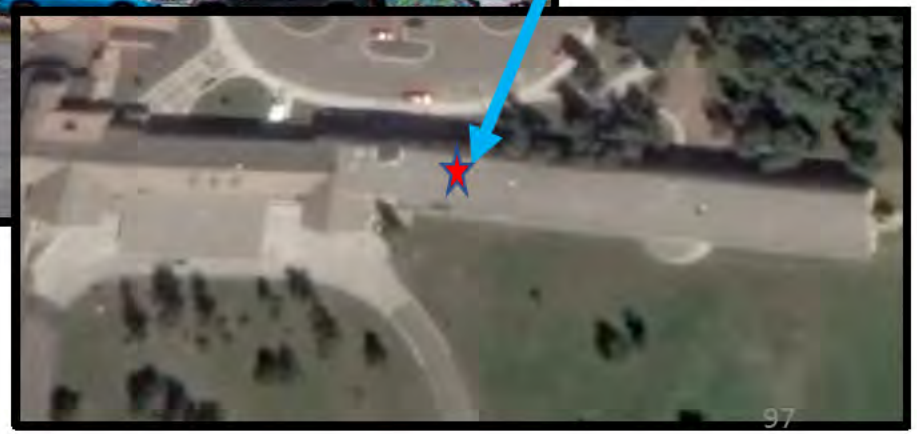
Proposed wireless coverage





Non-penetrating, self-ballasted mount

- Surrounded by RF-transparent screen, color matched to existing vents on roof
- (1x) [redacted] GHz station antenna, 1-ft diameter
- (1x) [redacted] GHz Licensed PMP antenna
- Set back from edge; invisible to pedestrian traffic
- Ethernet with power from interior switch

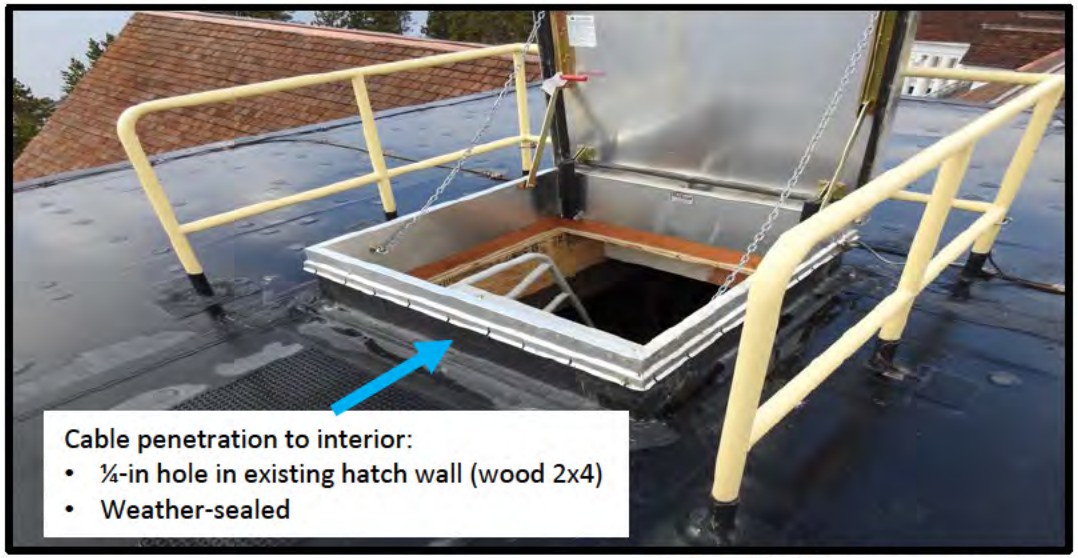


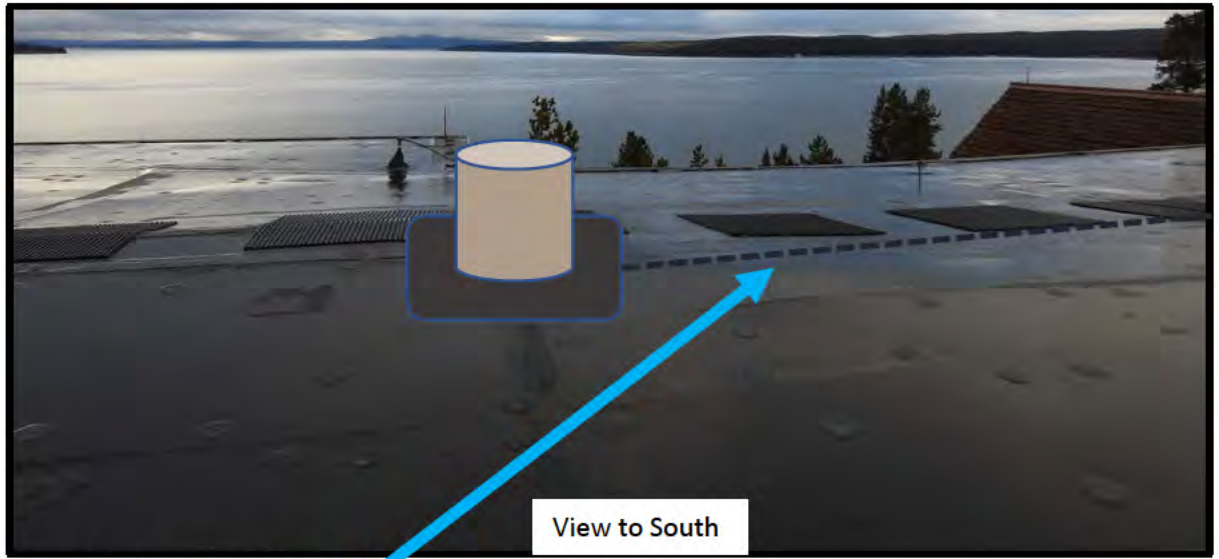
Lake Yellowstone Hotel	
Area	Lake Hotel
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

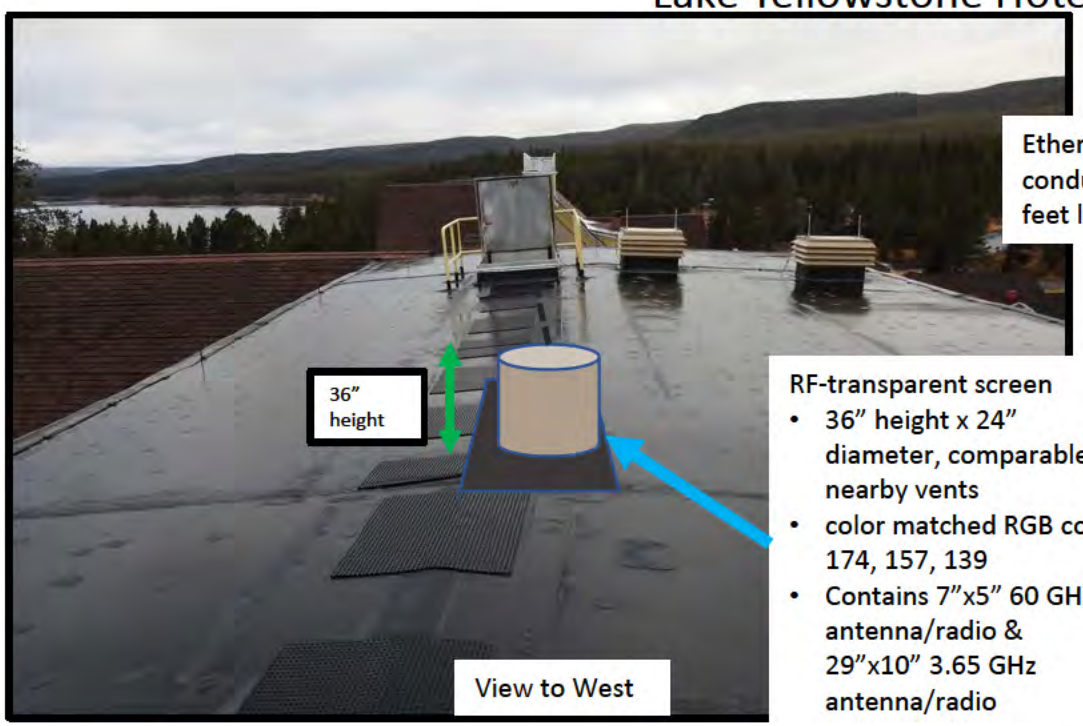
Lake Yellowstone Hotel

(Wi-Fi proposed only for Annex)

Lake Yellowstone Hotel; Roof Mount Viewshed

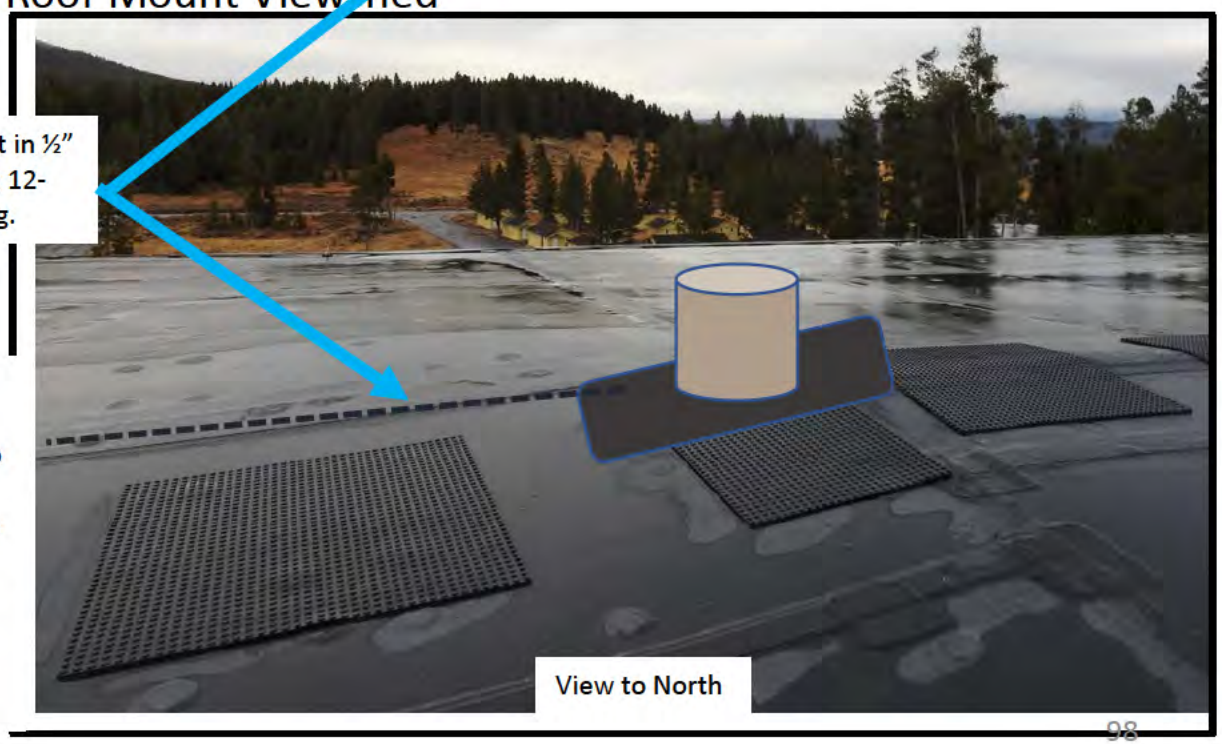






Ethernet in ½" conduit; 12-feet long.

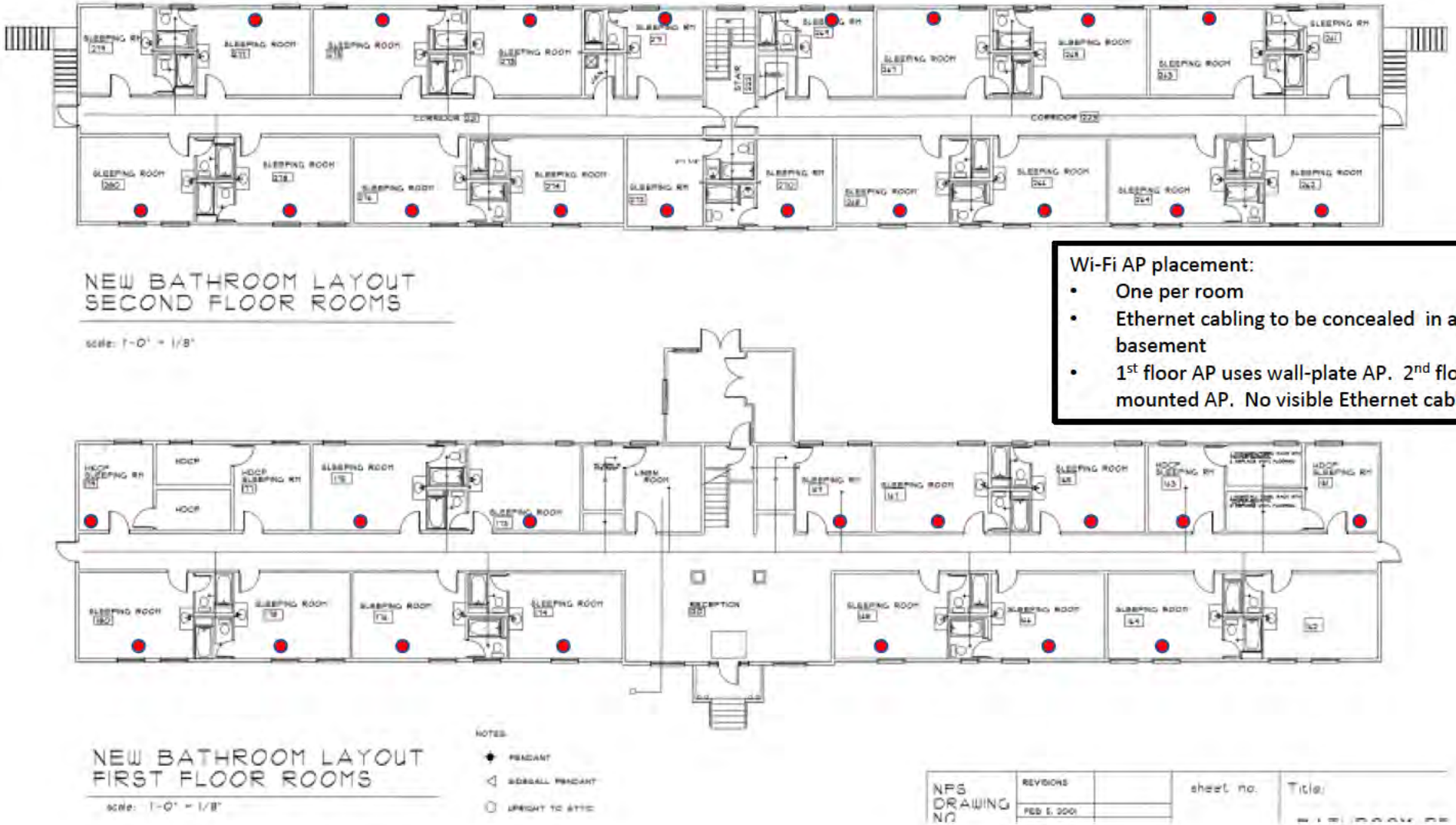
RF-transparent screen
- 36" height x 24" diameter, comparable to nearby vents
- color matched RGB code 174, 157, 139
- Contains 7"x5" 60 GHz antenna/radio & 29"x10" 3.65 GHz antenna/radio



Lake Yellowstone Hotel - Annex	
Area	Lake Hotel
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No

Lake Yellowstone Hotel – Sandpiper Lodge ("Annex")

Coordinates: 44.550N, 110.399W



Wi-Fi AP placement:

- One per room
- Ethernet cabling to be concealed in attic and basement
- 1st floor AP uses wall-plate AP. 2nd floor is ceiling mounted AP. No visible Ethernet cabling/raceway

Lake Yellowstone Hotel – Sandpiper Lodge ("Annex")

CPE

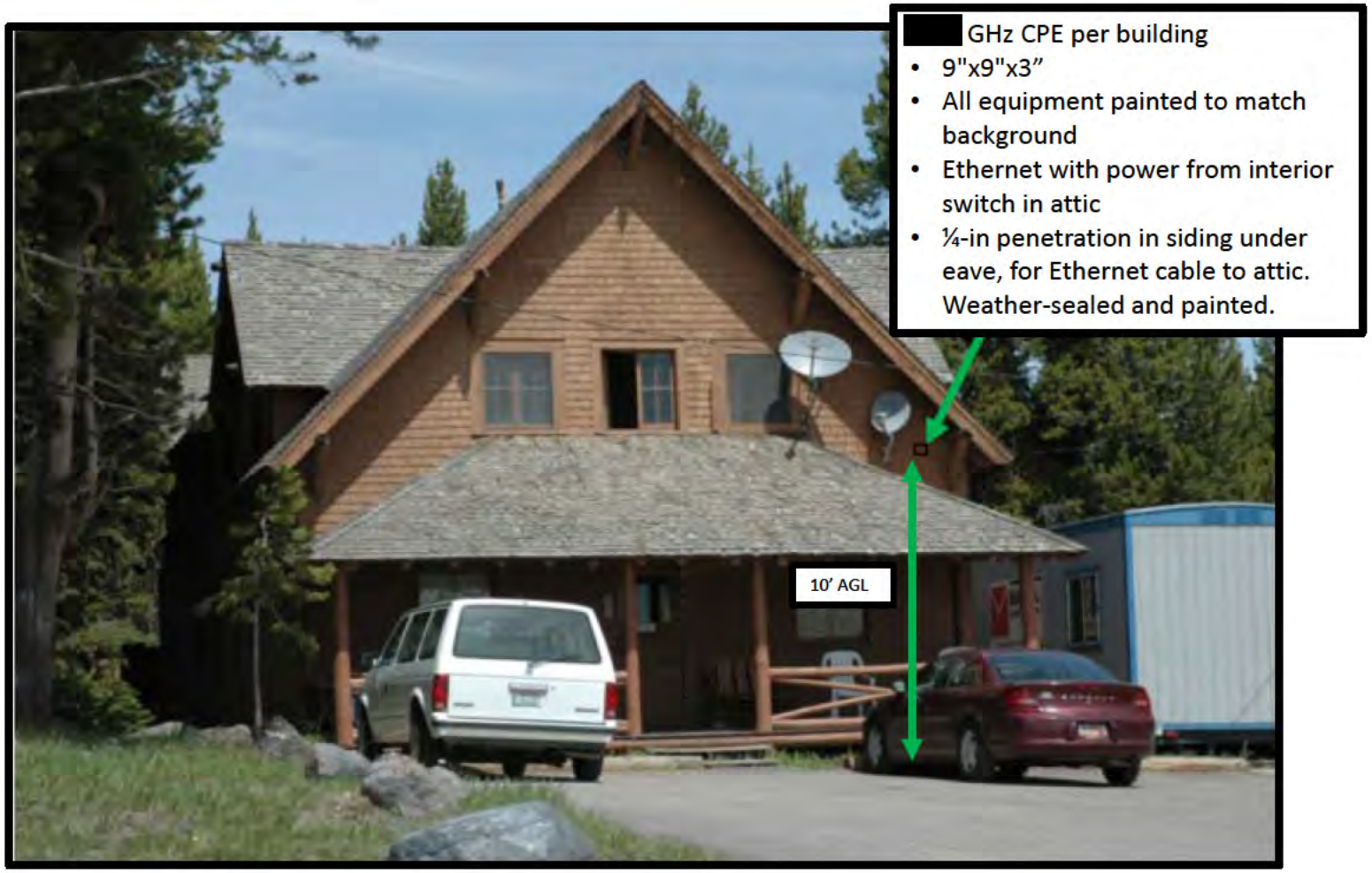
- All [redacted] GHz CPEs and Wi-Fi APs mounted in interior of cabin attic (invisible to guests)

Lake Hotel Guest Cabins	
Area	Lake Hotel
NRHP Eligibility	District Contributors
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No

Lake Hotel Guest Cabins (x78)

(typical)

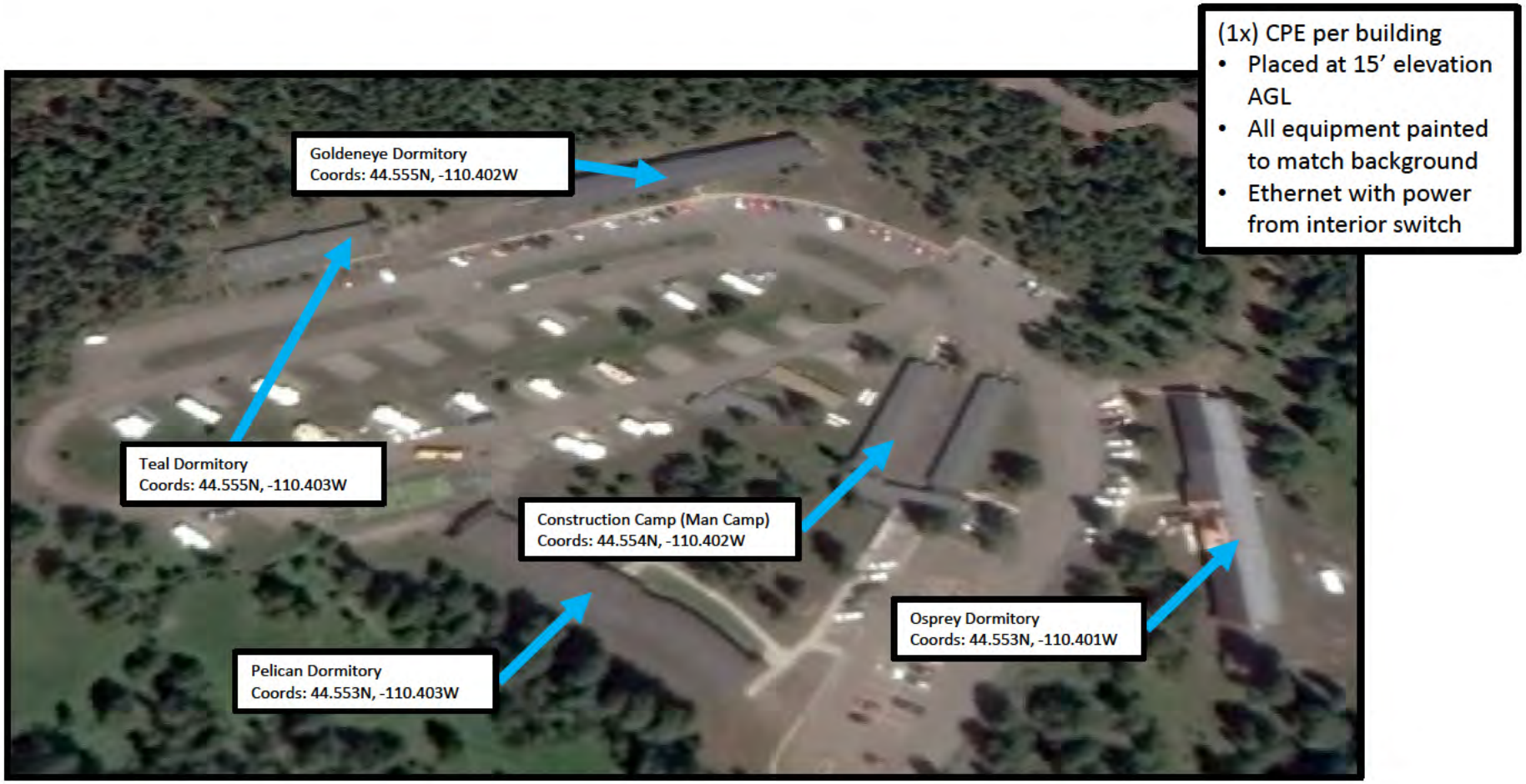
Coordinates: 44.551N, -110.398W



YGS Dormitory

Coords: 44.550N, -110.397W

YGS Dormitory	
Area	Lake Hotel
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes



Lake Lodge Area Dormitories

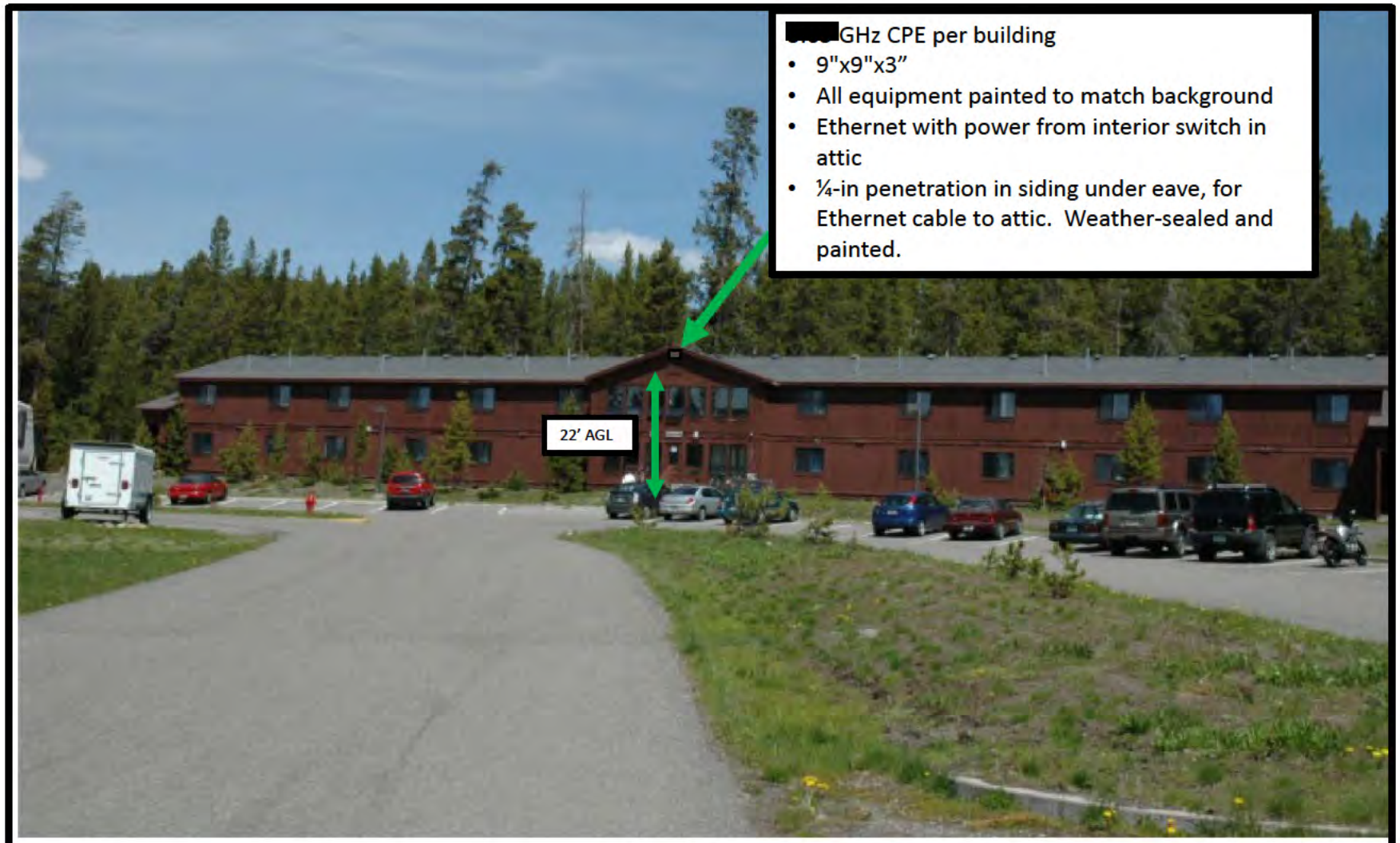
Non-penetrating mount, depicted without ballast

- (1x) [redacted] GHz CPE
- All equipment painted to match background
- Set back from roof edge; invisible to pedestrian traffic
- Ethernet with power from interior switch
- ¼-in wall penetration for Ethernet cable, sealed and painted.

Mallard Dormitory

Coords: 44.555N, -110.397W

Mallard Dormitory	
Area	Lake Hotel
NRHP Eligibility	Unknown
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes



Goldeneye Dormitory

Goldeneye Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

[redacted] GHz CPE per building

- 9"x9"x3"
- All equipment painted to match background
- Ethernet with power from interior switch in attic
- ¼-in penetration in siding under eave, for Ethernet cable to attic. Weather-sealed and painted.

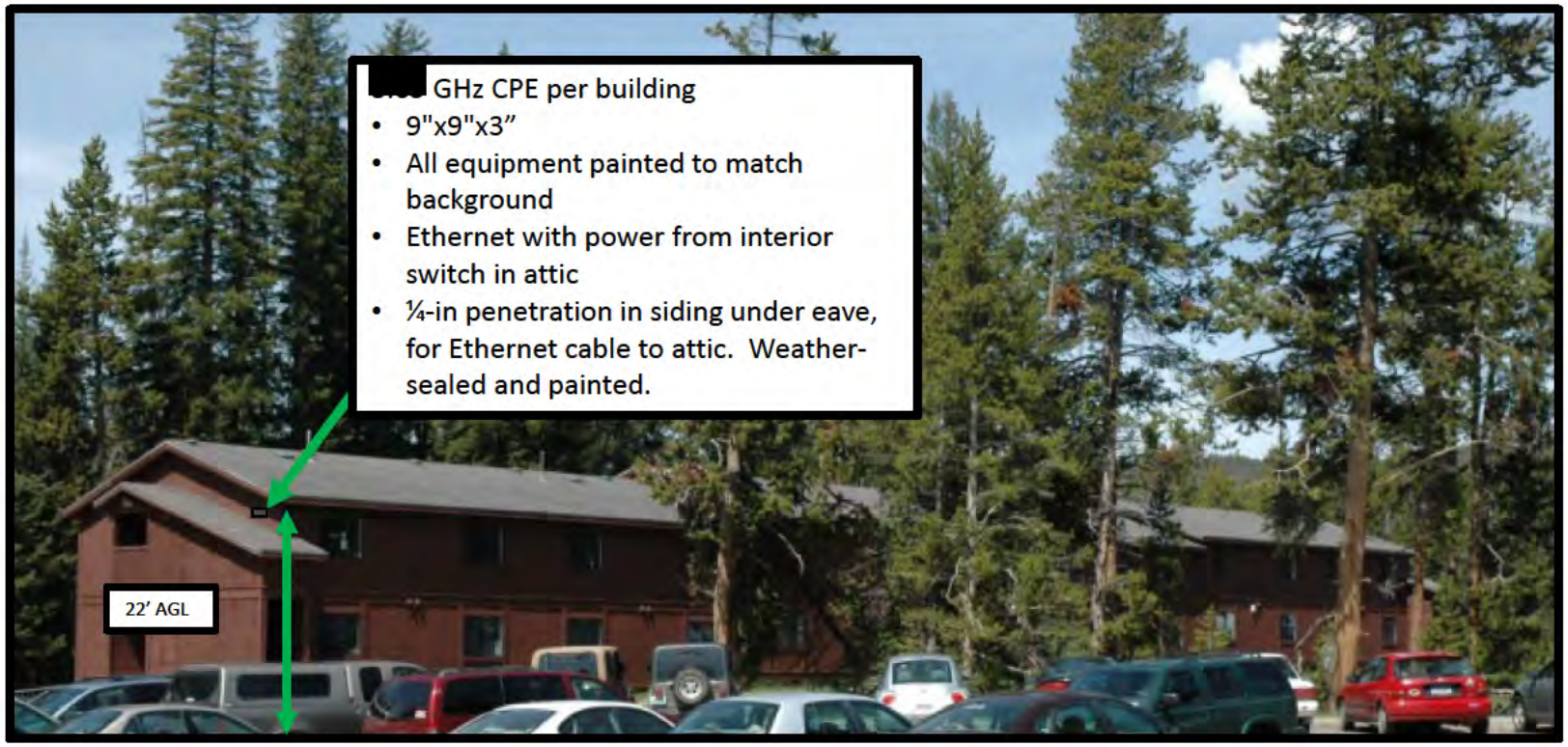
Teal Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Teal Dormitory

Coords: 44.555N, -110.403W

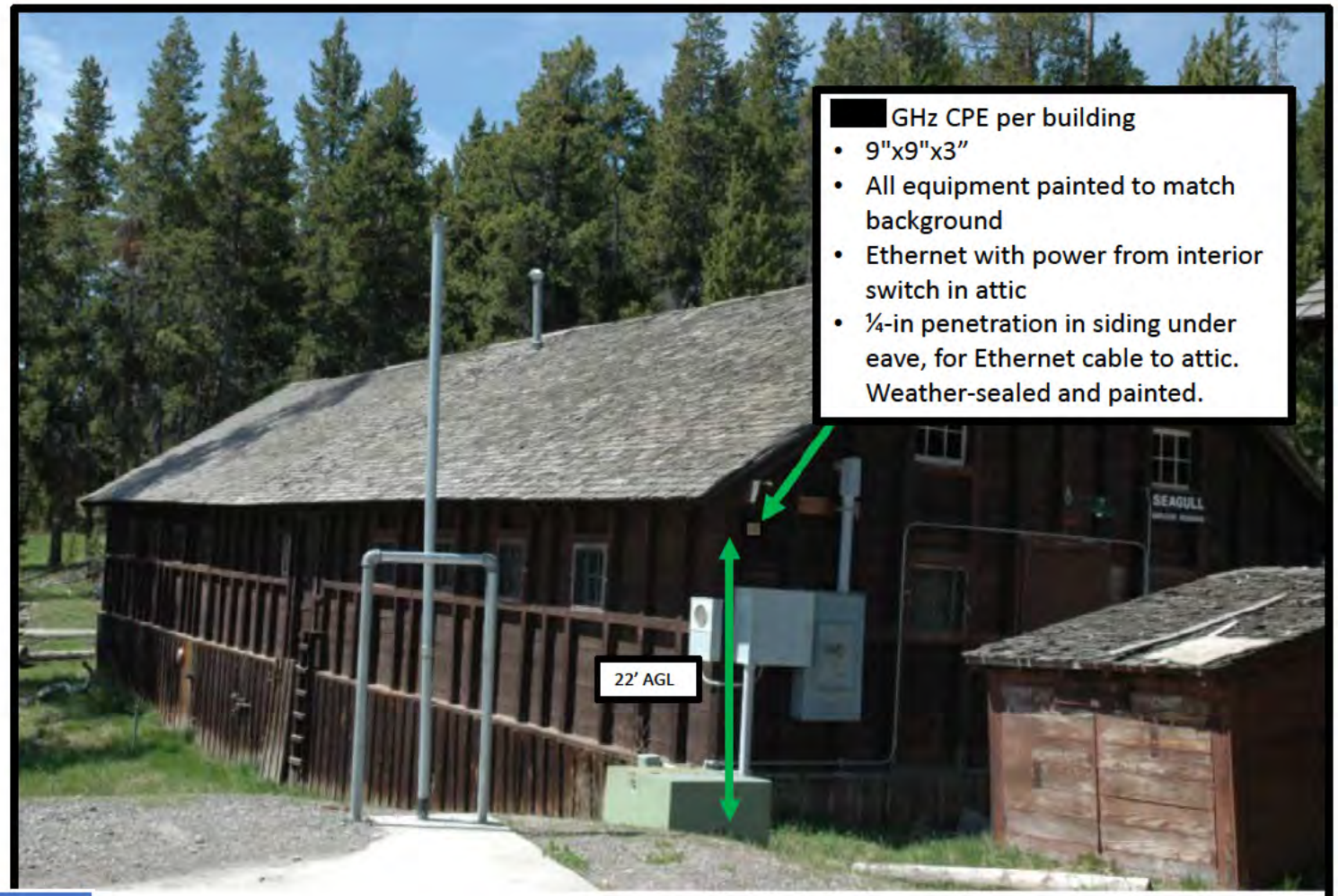
Osprey Dormitory

Osprey Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes



Pelican Dormitory

Pelican Dormitory	
Area	Lake Hotel
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes



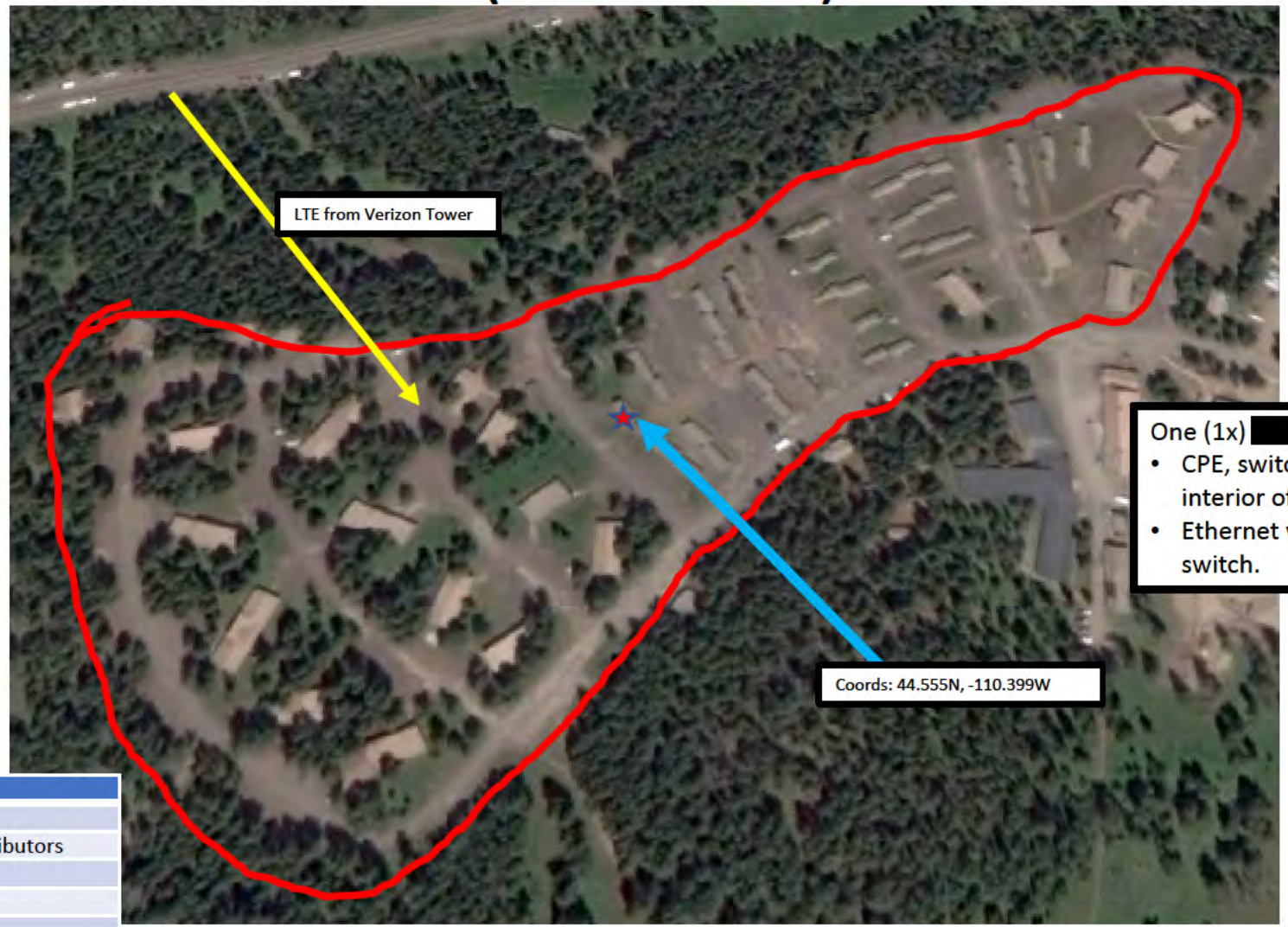
Seagull Dormitory

Seagull Dormitory	
Area	Lake Hotel
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Construction Dormitory ("Man Camp")	
Area	Lake Hotel
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Construction Camp ("Man Camp") Dormitory

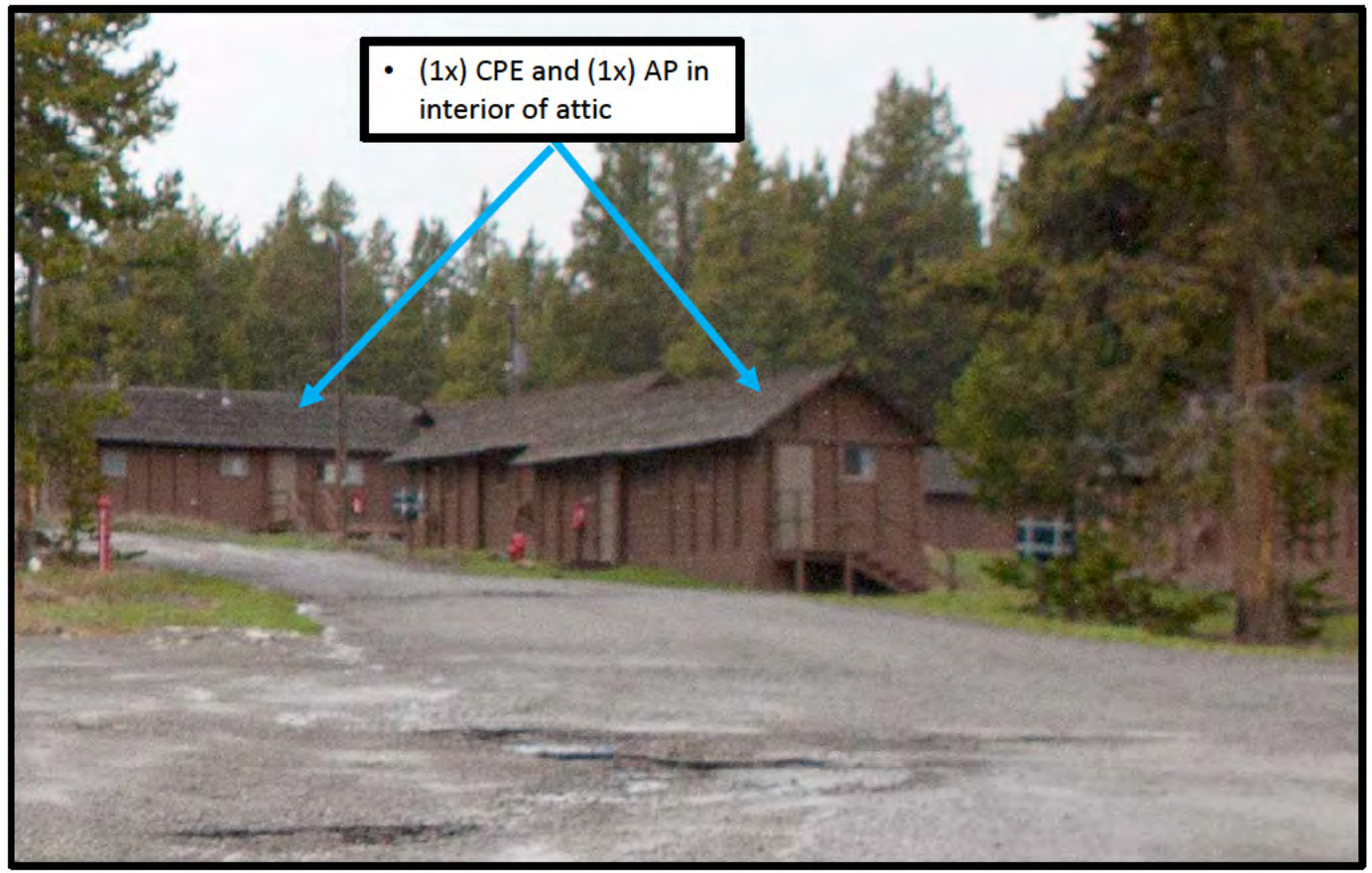
Proposed Coverage; Lake Lodge Guest Cabins (x64 Units)



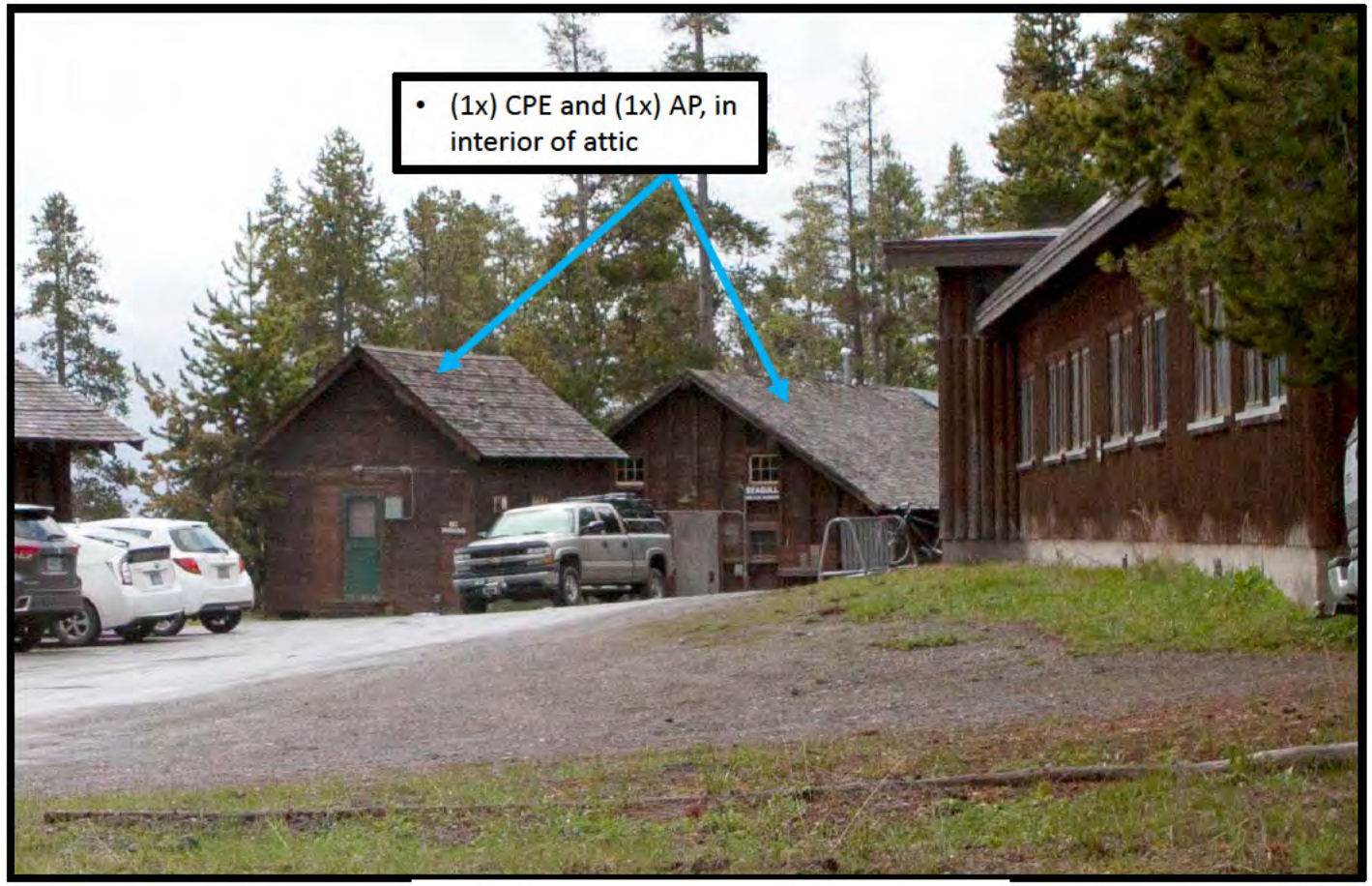
One (1x) [redacted] GHz CPE per cabin

- CPE, switch and Wi-Fi AP located in interior of attic.
- Ethernet with power from interior switch.

Lake Lodge Guest Cabins	
Area	Lake Hotel
NRHP Eligibility	District Contributors
Roof Setback?	No
Interior Installation Only?	Yes
New Penetrations?	No



Lake Lodge Guest Cabins
(typical)

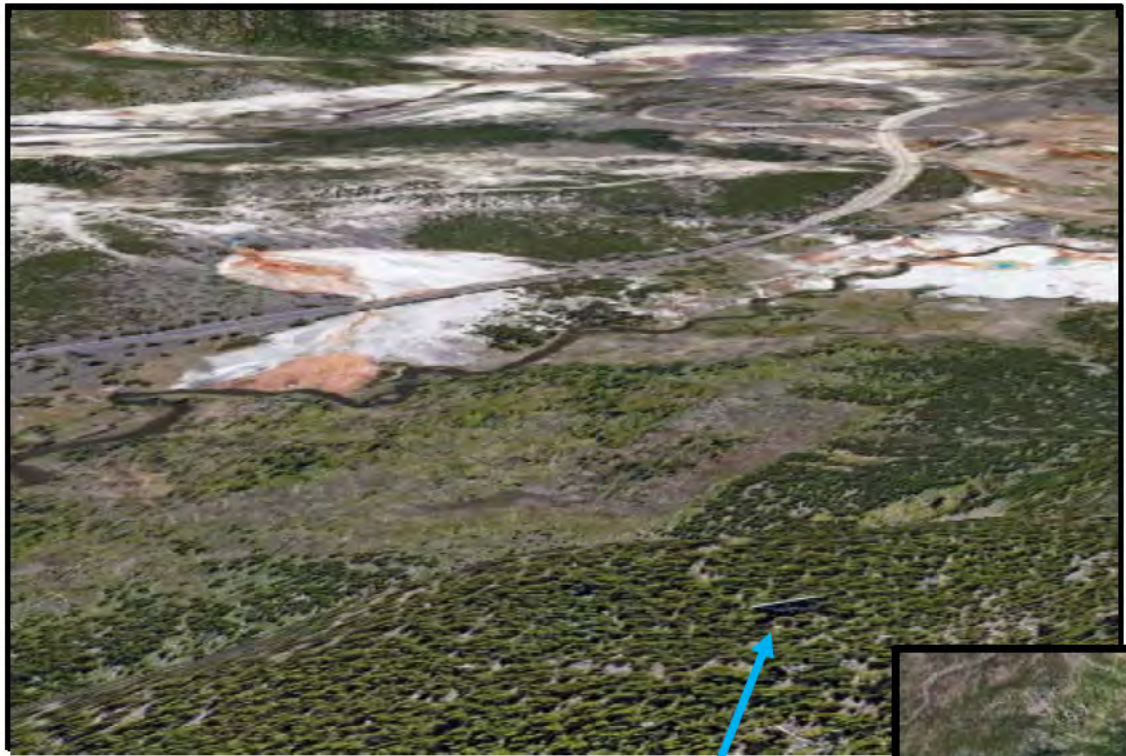


Lake Lodge Guest Cabins
(typical)

Old Faithful

Old Faithful Area

Existing wireless coverage (known)

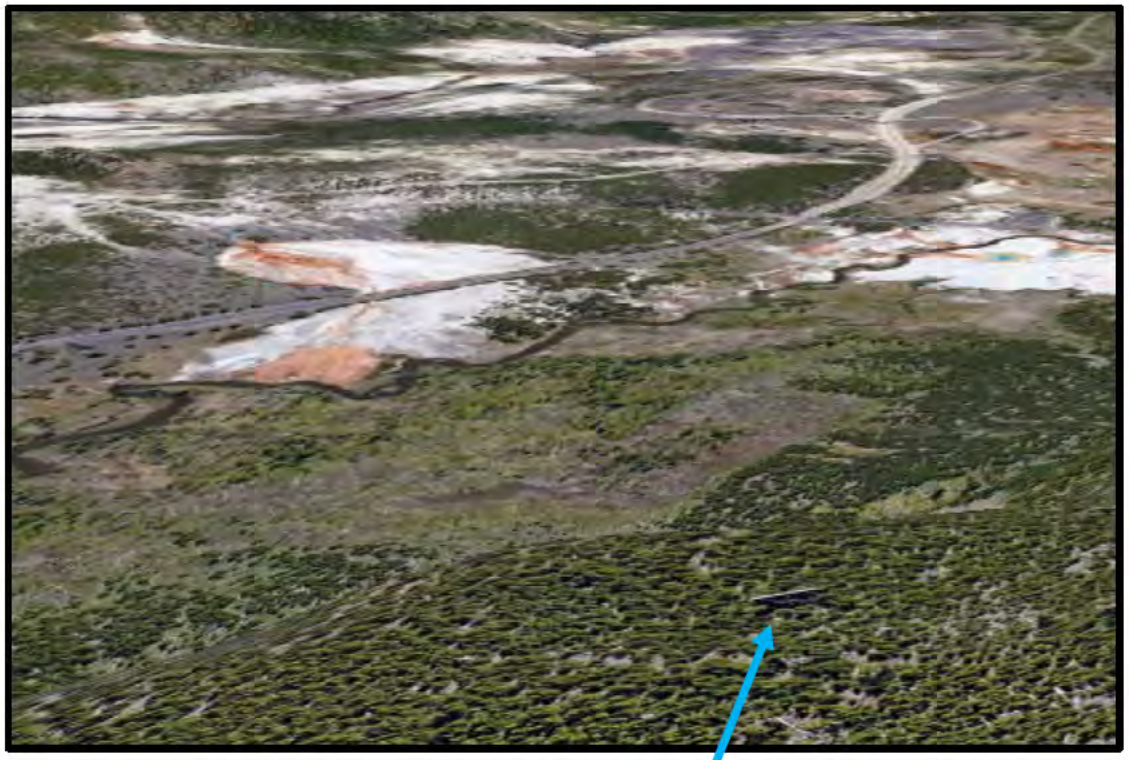


Existing tower (Century Link)
Coords: 44.457N, -110.831W

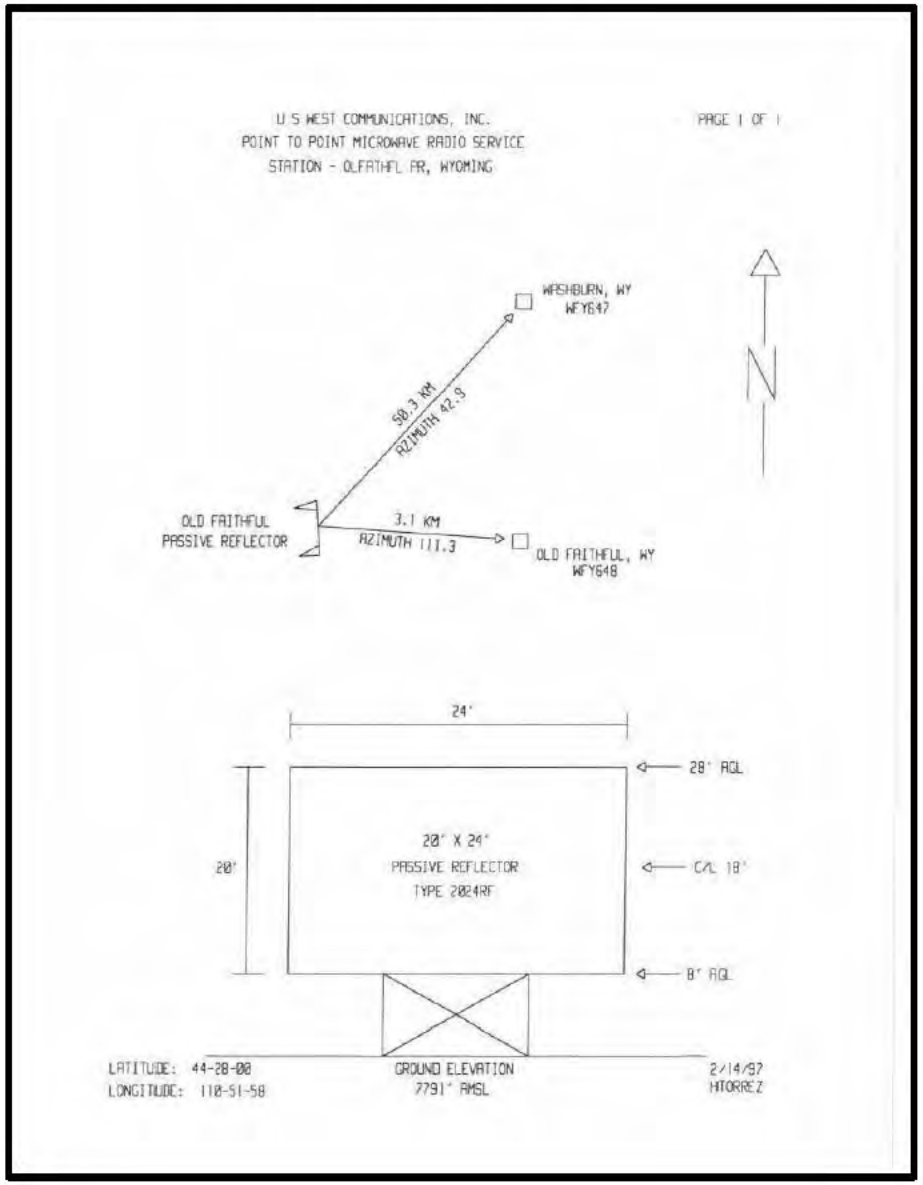
Existing passive reflector
(Century Link)
Coords: 44.467N, -110.867W

Old Faithful Area

Existing Century Link Passive Reflector

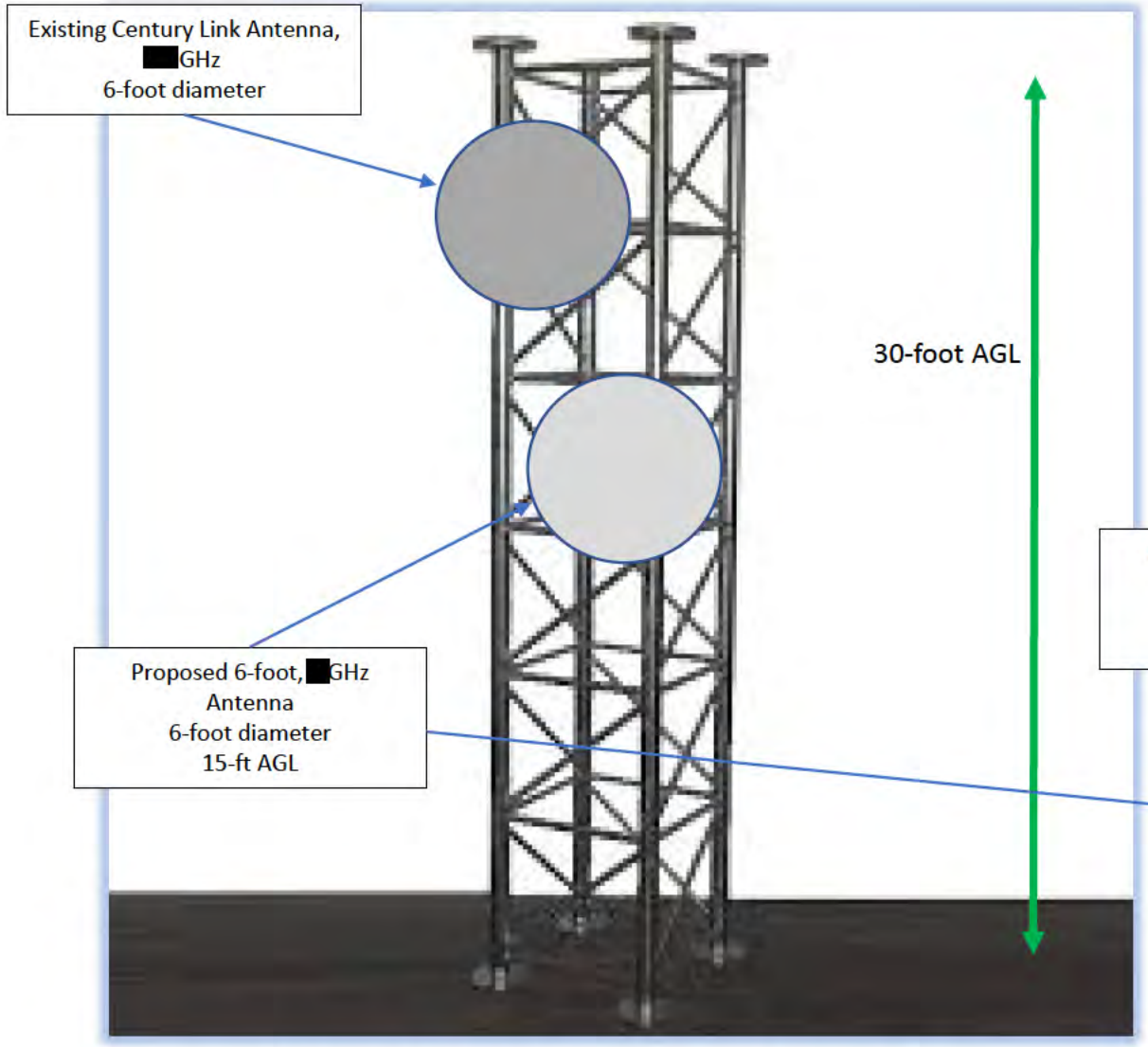


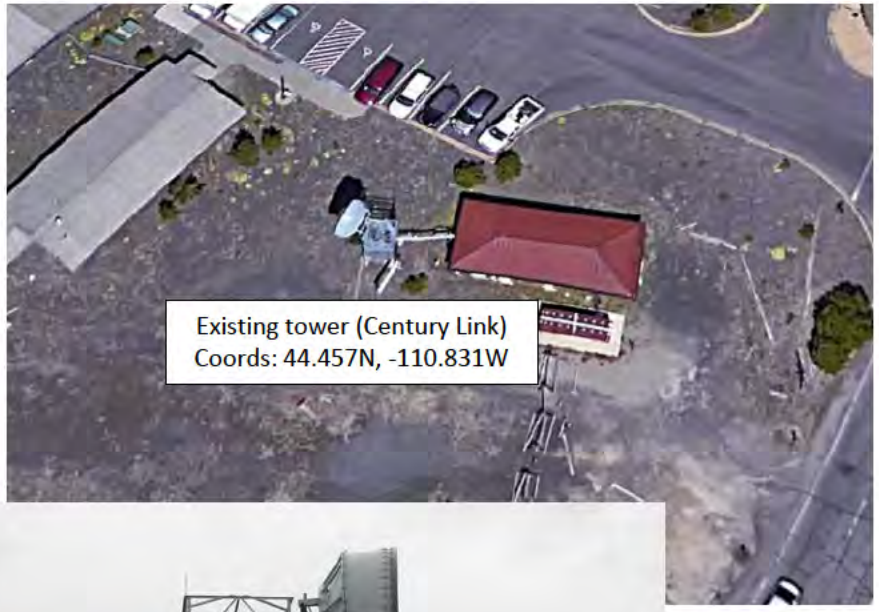
Existing passive reflector
(Century Link)
Coords: 44.467N, -110.867W



Old Faithful Area

Century Link Tower - Detail





Century Link has no site plan or elevation drawings. Full architectural survey and engineering to be completed prior to installation.

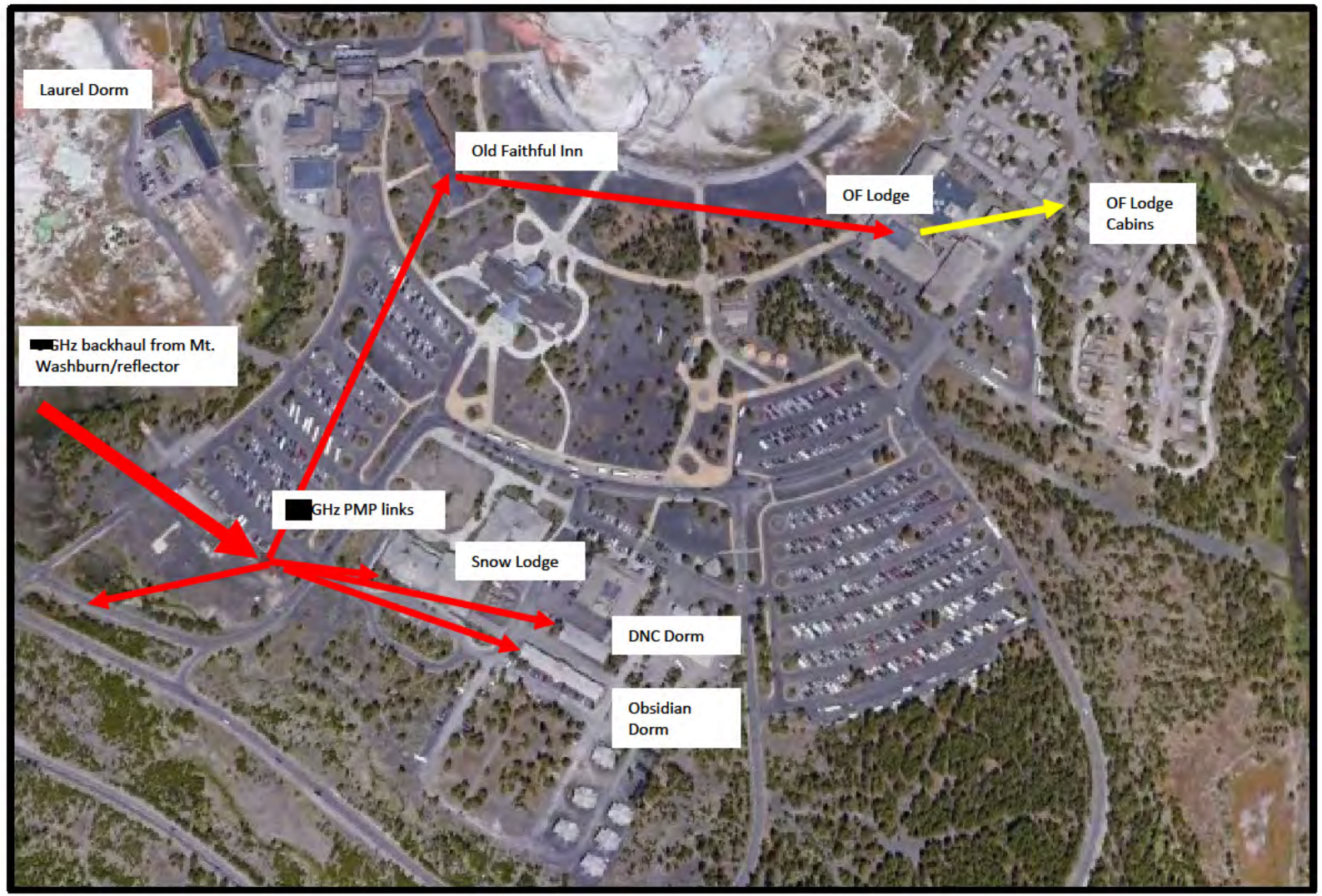
Old Faithful Area

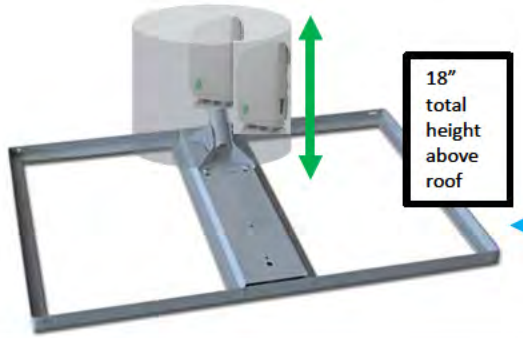
Proposed wireless coverage

[redacted]

Old Faithful Area
Existing wireless coverage (known)

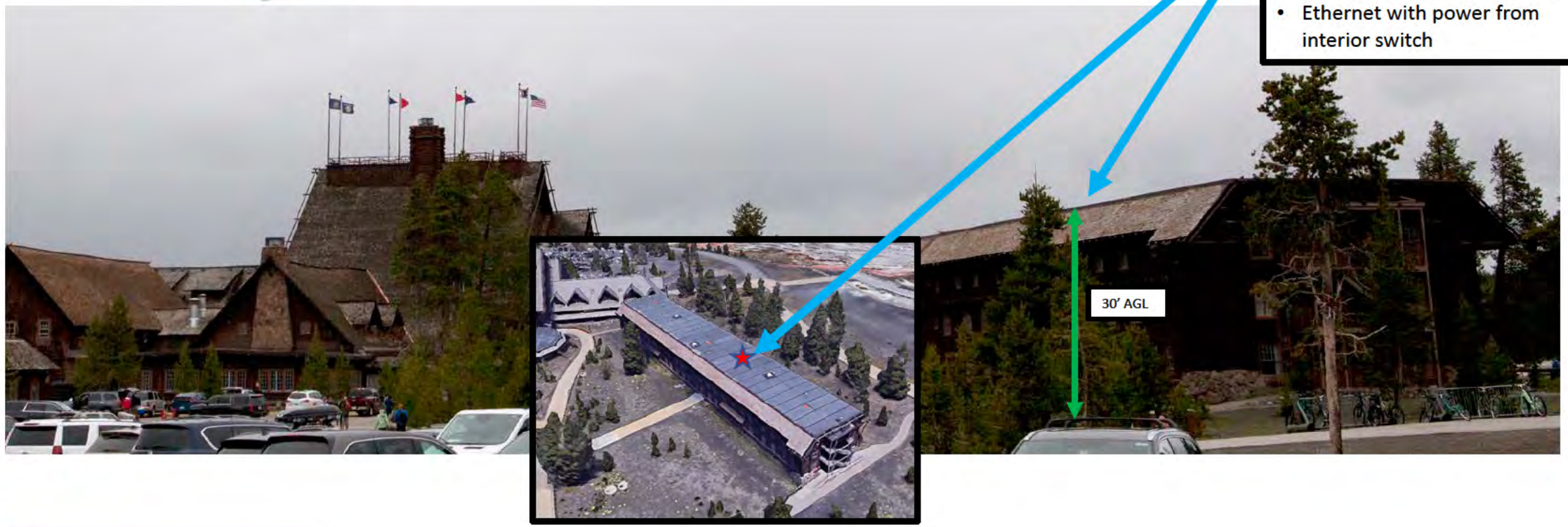
Old Faithful Area
Proposed wireless coverage





RF-transparent screen wall

- 18” height, 24” diameter
- Contains (2x) [redacted] GHz radios, 7”x5”x3”
- All equipment color-matched to background
- 10-ft setback from edge; invisible to pedestrian traffic
- Ethernet with power from interior switch

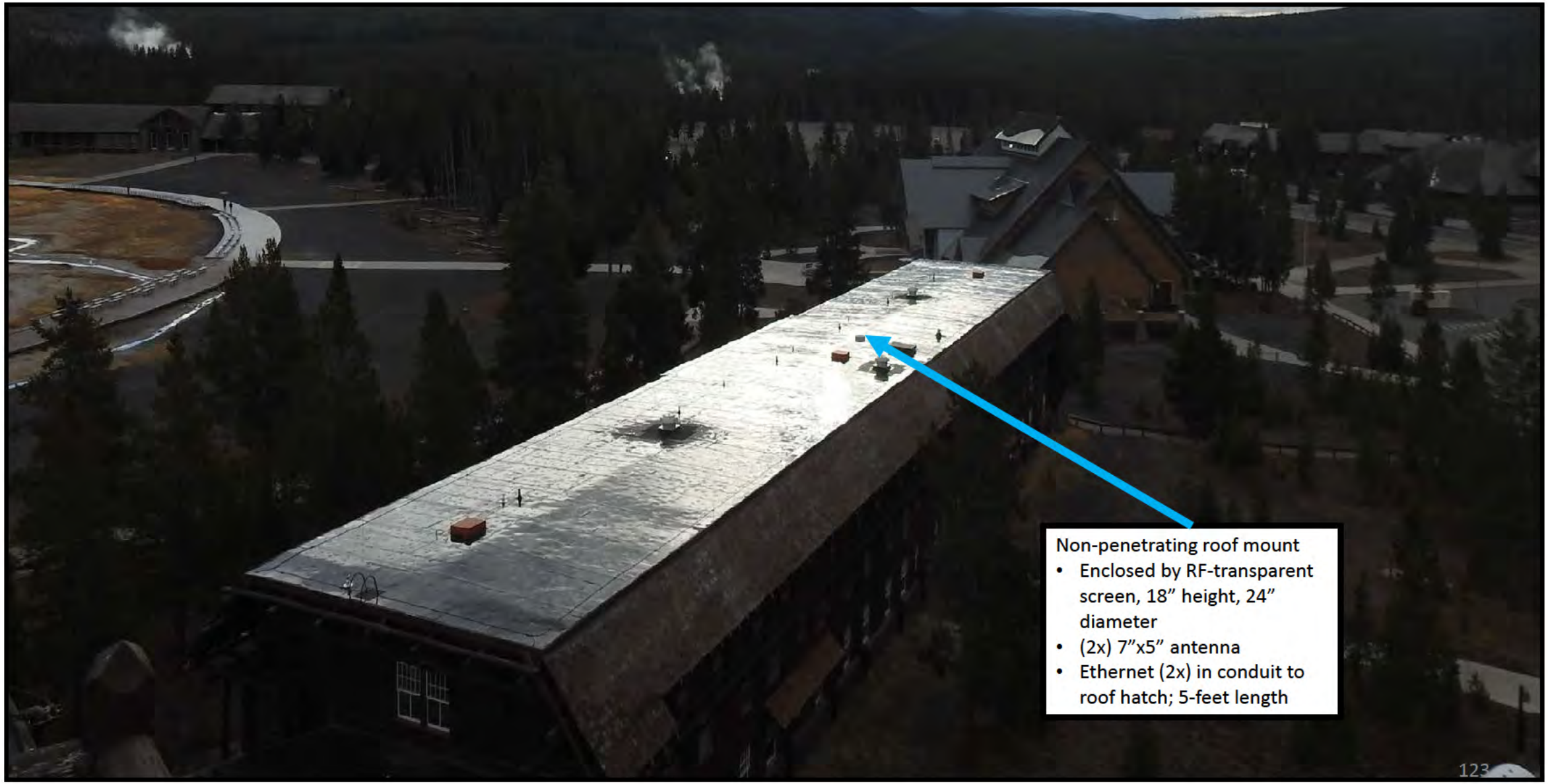


Old Faithful Inn	
Area	Old Faithful
NRHP Eligibility	National Historic Landmark
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	Yes

Old Faithful Inn

Coords: 44.459N, -110.830W

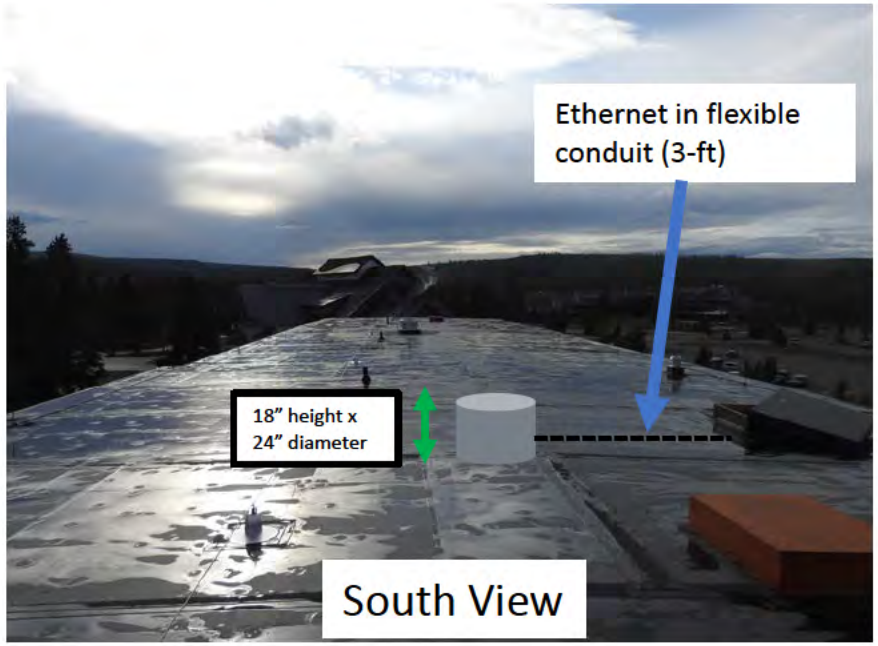
Old Faithful Inn – Roof Antenna

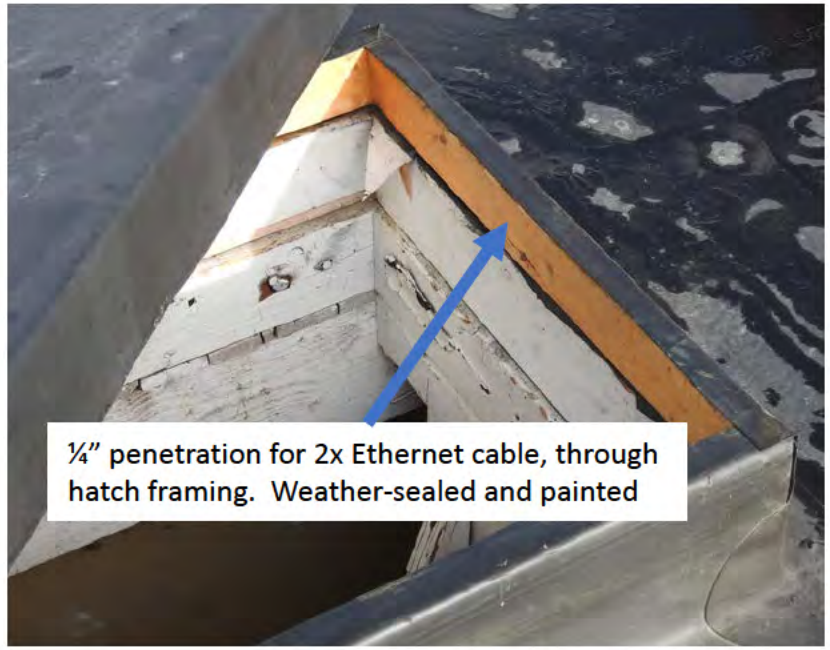


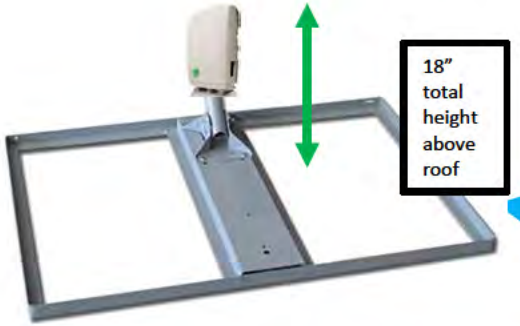
West View

North View

East View


Ethernet in flexible conduit (3-ft)
18" height x 24" diameter
South View


¼" penetration for 2x Ethernet cable, through hatch framing. Weather-sealed and painted



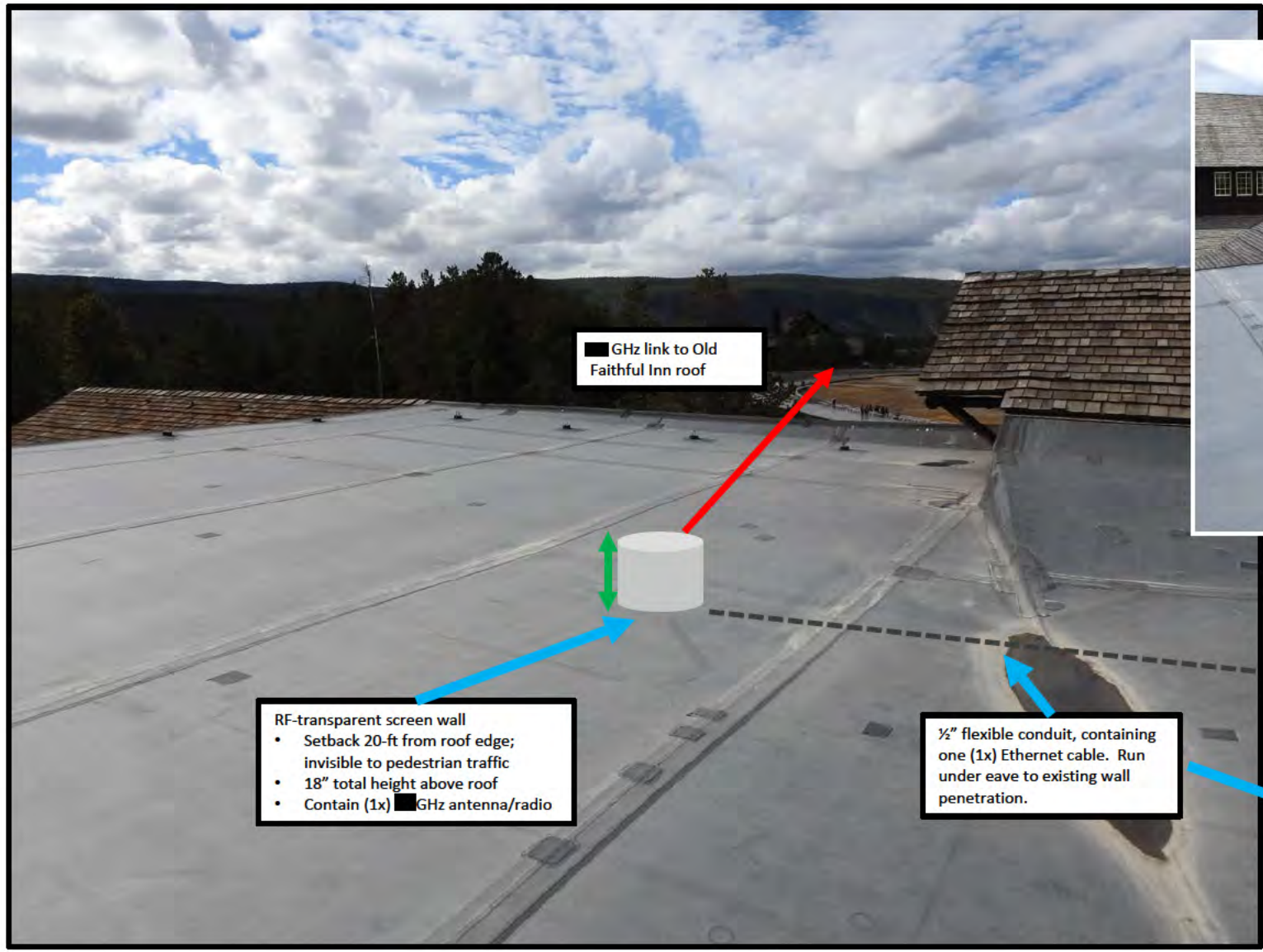
Non-penetrating, self-ballasted mount

- (1x) [redacted] GHz CPE; 7”x5”x3”
- All equipment painted to match background
- Set back from edge; invisible to pedestrian traffic
- Ethernet with power from interior switch, using existing penetrations

Old Faithful Lodge	
Area	Old Faithful
NRHP Eligibility	District Contributor
Roof Setback?	Yes
Interior Installation Only?	No
New Penetrations?	No

Old Faithful Lodge

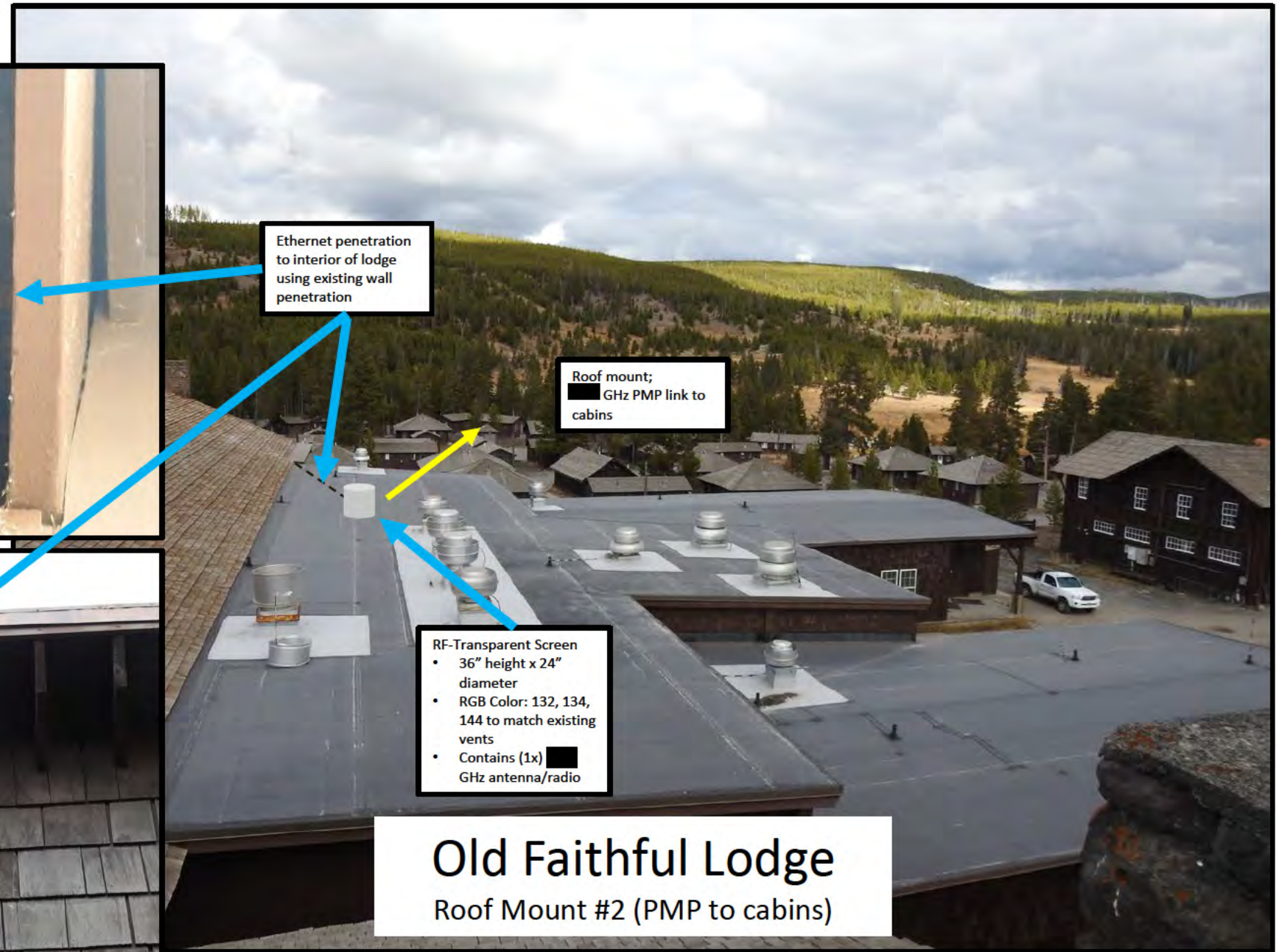
Coords: 44.459N, -110.826W



View to South parking lot

Old Faithful Lodge

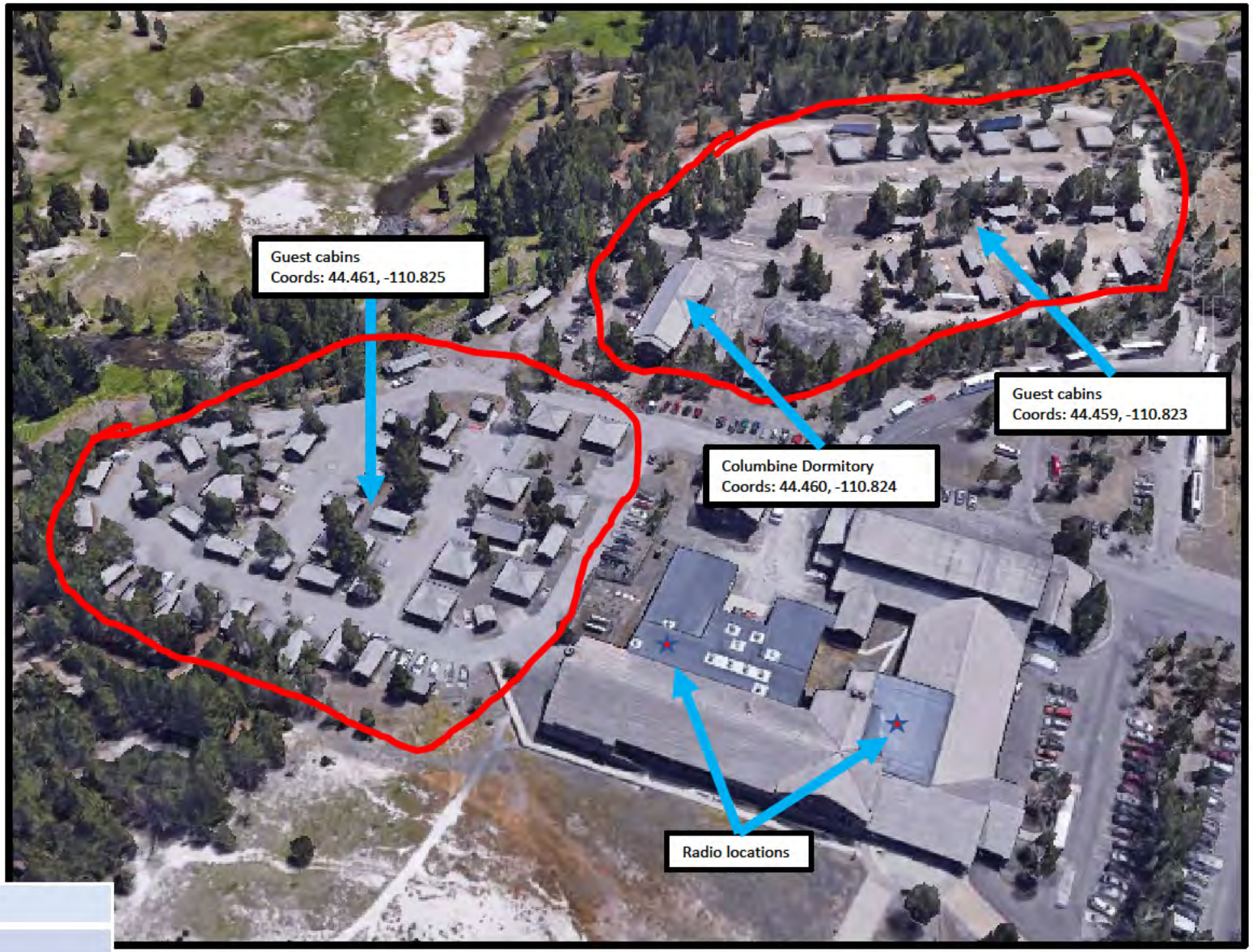
Roof Mount #1 (backhaul)



Old Faithful Lodge

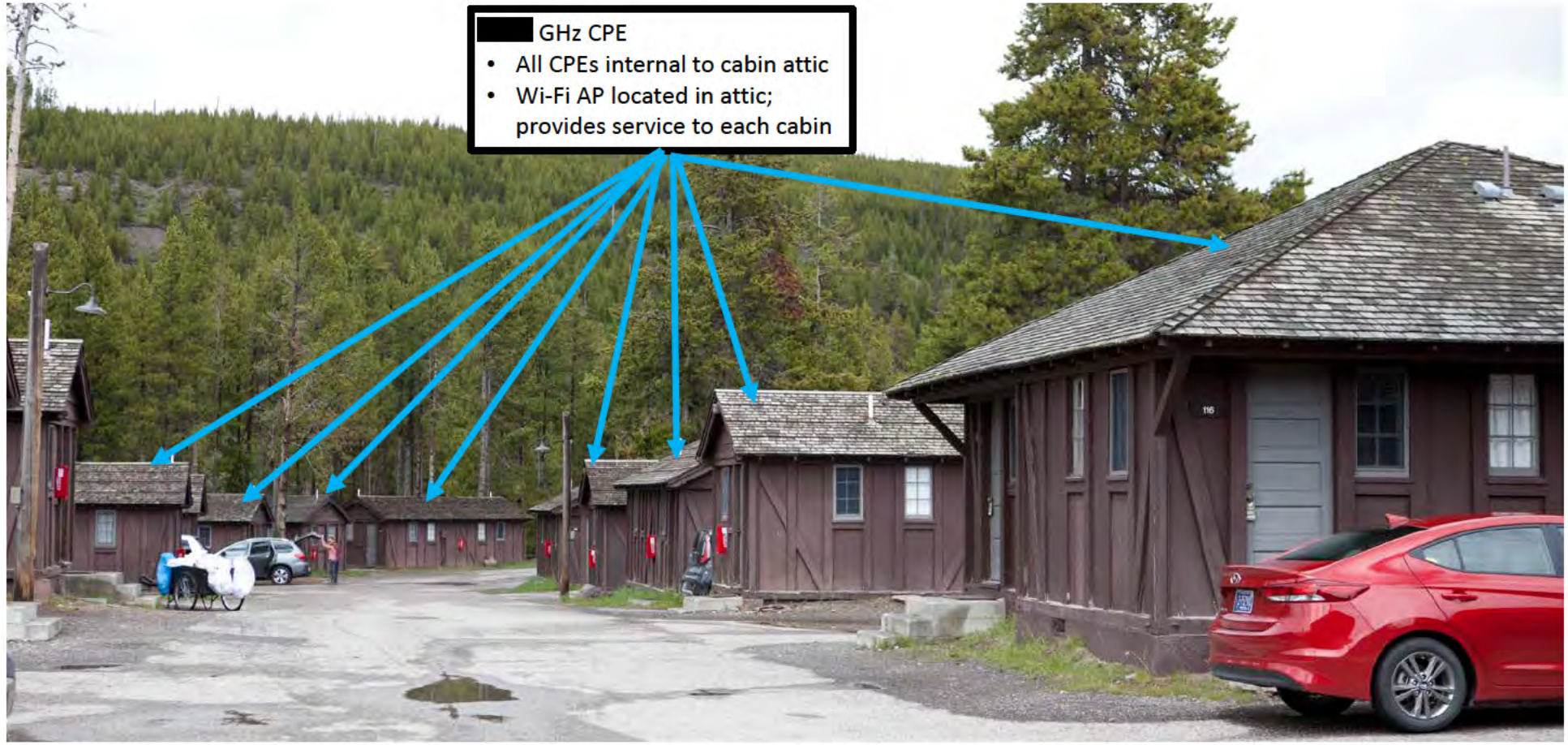
Roof Mount #2 (PMP to cabins)

Views from OF Lodge Cabins



Year Built	Varies
Status	Contributor
ACHP Program Comment Cat.	VII.C.1

Old Faithful Lodge – 161 Guest Cabins



Old Faithful Lodge – Guest Cabins
(161 units - typical)
Coords: 44.460, -110.825

[redacted] GHz CPE

- Equipment painted to match background
- Ethernet with power from interior switch
- ¼" wall penetration under eave, for cabling to attic. Weather-proofed and painted

West-facing façade, toward OF Lodge transmitter

Columbine Dormitory	
Area	Old Faithful
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Columbine Dormitory

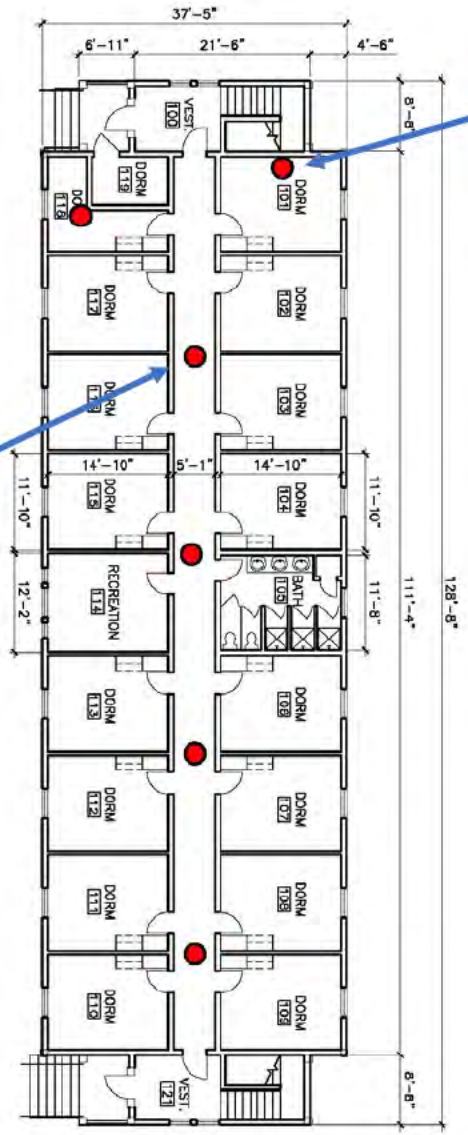
Coords: 44.883N, -110.459W

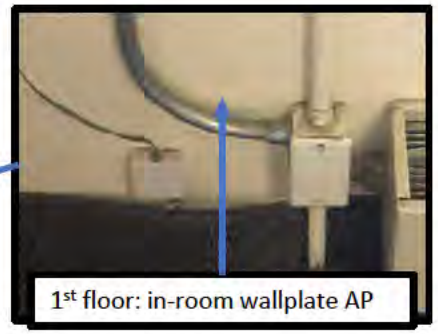
First Floor: 6
Second Floor 6

Total 12 Access Points

1st floor: extend existing raceway in hallway

1st Floor



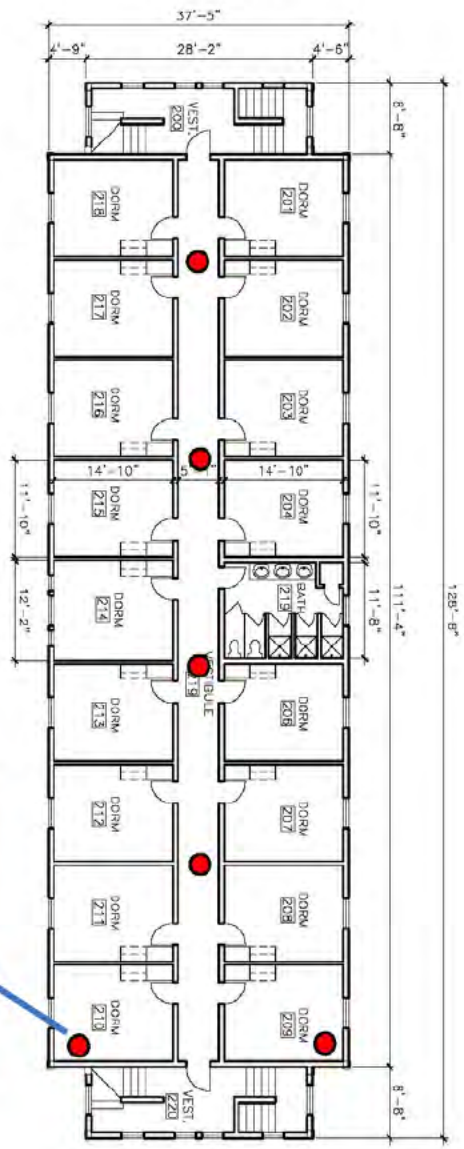


1st floor: in-room wallplate AP

Wi-Fi AP Placement

- Hallway raceway only on 1st floor
- 2nd floor access/cabling from attic; no exposed raceway/cabling

2nd Floor



Columbine Dormitory

(1x) [redacted] GHz CPE at rear of building

Snow Lodge	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Snow Lodge

Coord: 44.457N, -110.829W

[redacted] GHz CPE

- 7"x5"x3"
- Equipment painted to match background
- Ethernet with power from interior switch
- ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.

Laurel Dormitory

Coords: 44.459N, -110.833W

[redacted]GHz CPE

- 7"x5"x3"
- All equipment painted to match background
- Ethernet with power from interior switch
- ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.

Laurel Dormitory	
Area	Old Faithful
NRHP Eligibility	District Contributor
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

[redacted] GHz CPE

- 7”x5”x3”
- Painted to match façade; RGB code 113, 76, 58
- All equipment painted to match background
- Ethernet with power from interior switch
- 18-ft AGL height
- ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.

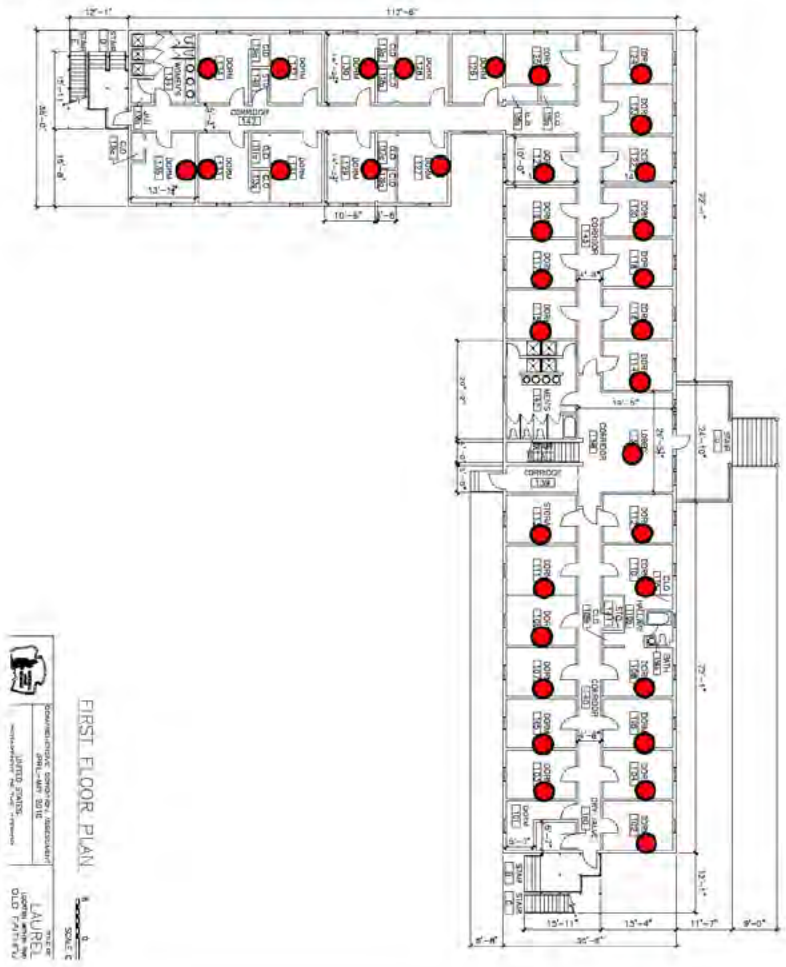
Laurel Dormitory

Coords: 44.459N, -110.833W

First Floor: 35

Second Floor 38

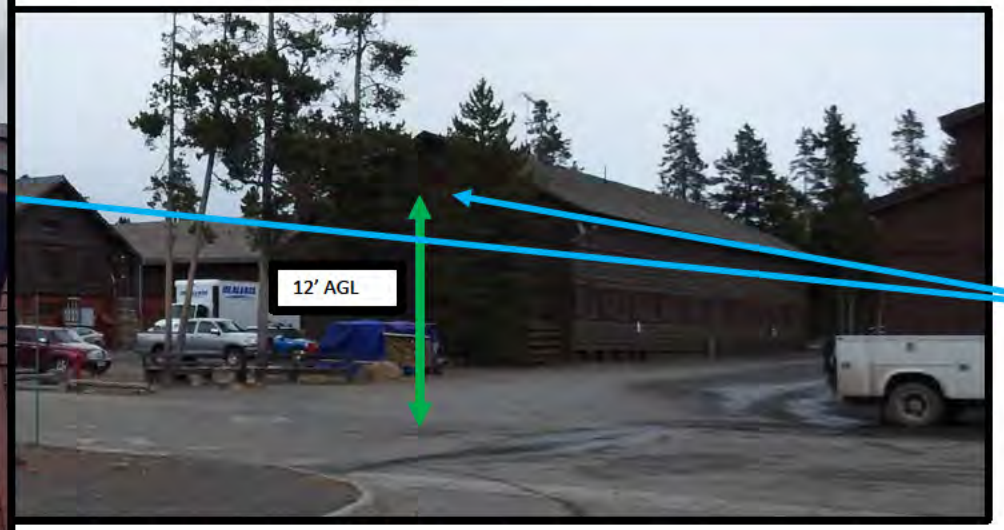
Total 73 Access Points



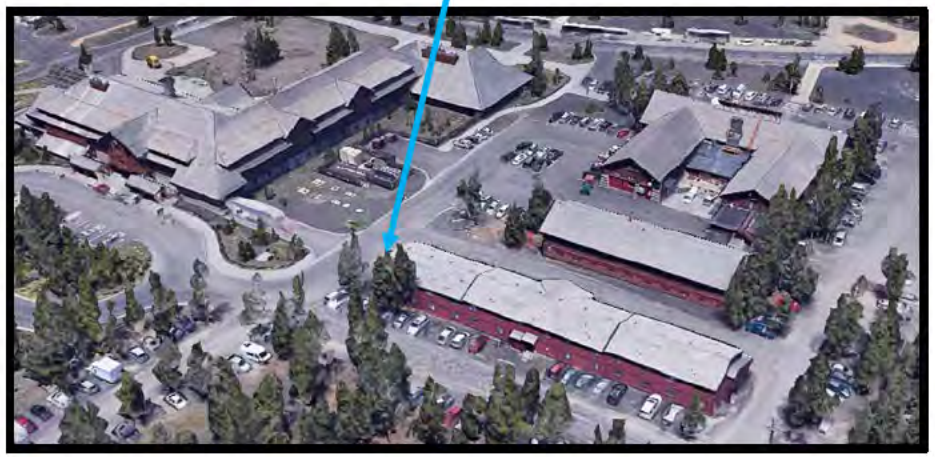
Wi-Fi AP Placement

- One AP per room; wallplate mounted
- Access from attic and basement allow for AP placement
- All cable runs hidden inside attic or basement

Laurel Dormitory



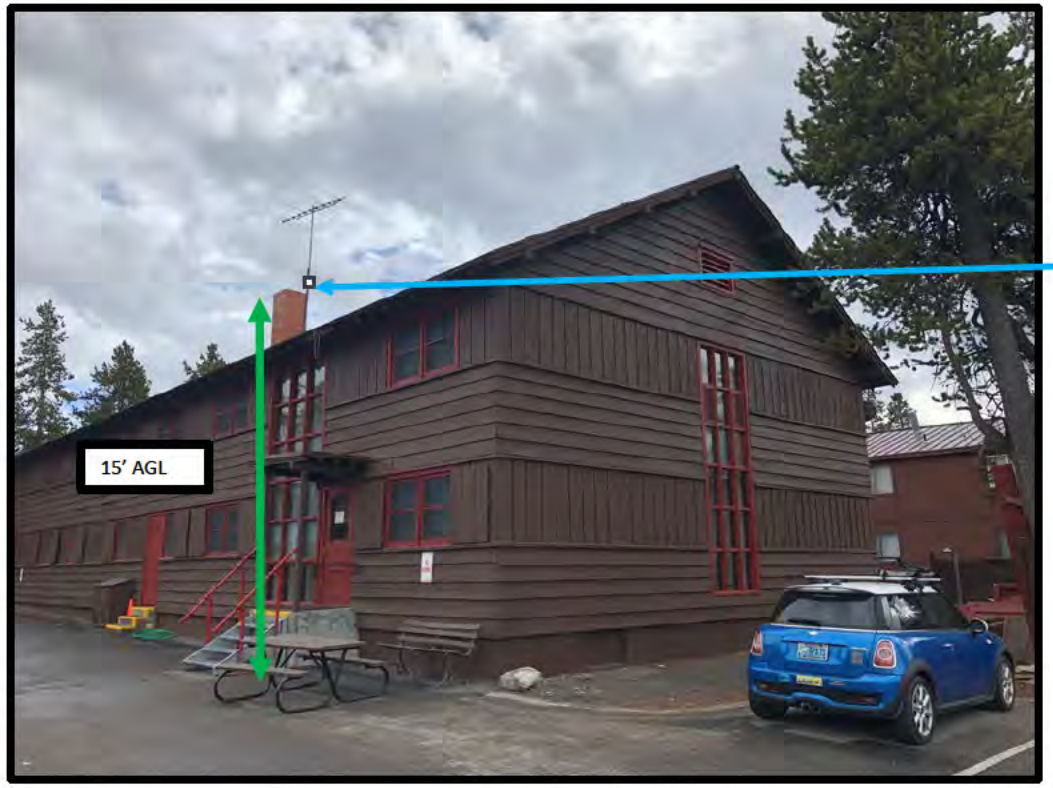
[redacted]GHz CPE
- 7"x5"x3"
- All equipment painted to match background
- Ethernet with power from interior switch
- ¼-in penetration in siding under eave, for Ethernet cable to interior. Weather-sealed and painted.



Obsidian Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Obsidian Dormitory

Coords: 44.456N, -110.828W



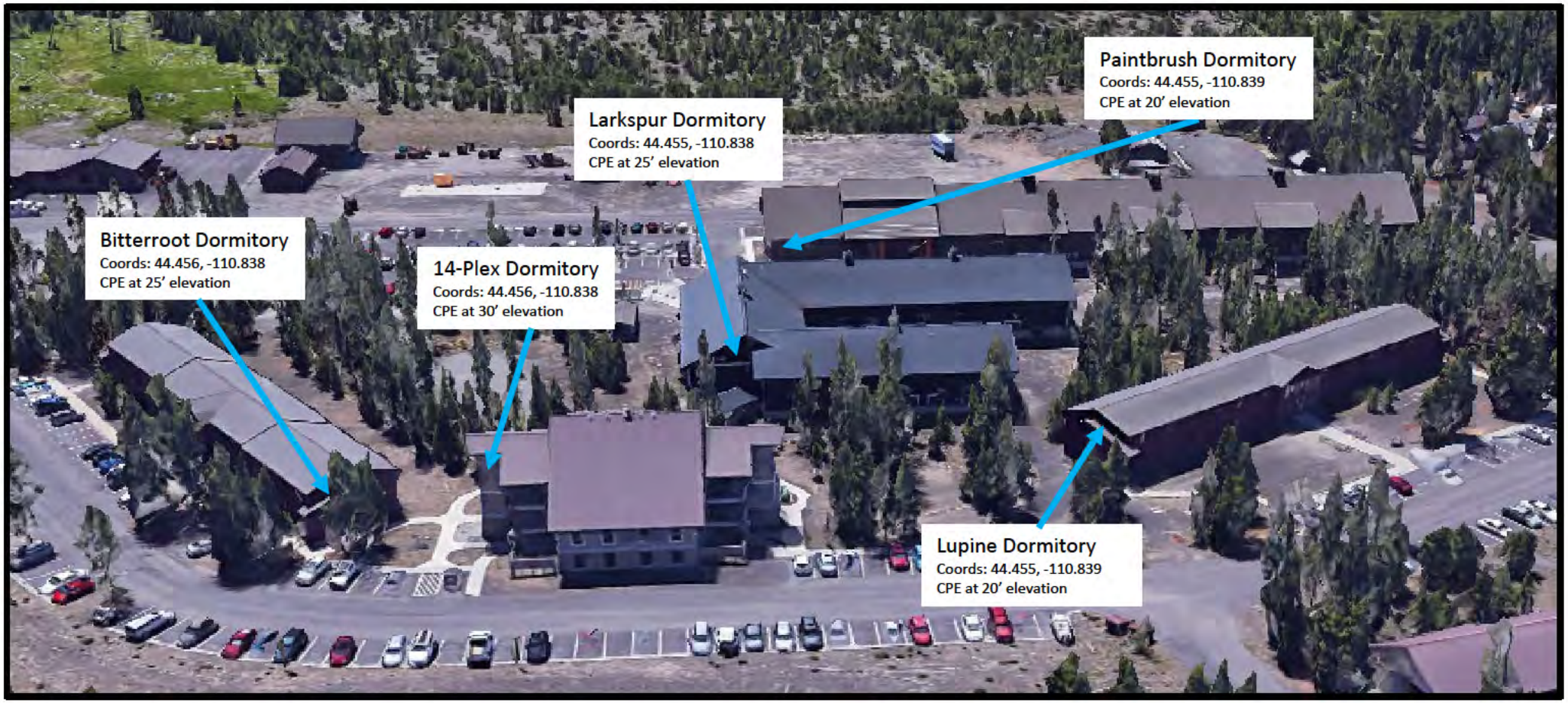
[redacted]GHz CPE

- 7"x5"x3"
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using existing building penetration for TV antenna

Delaware North Dormitory

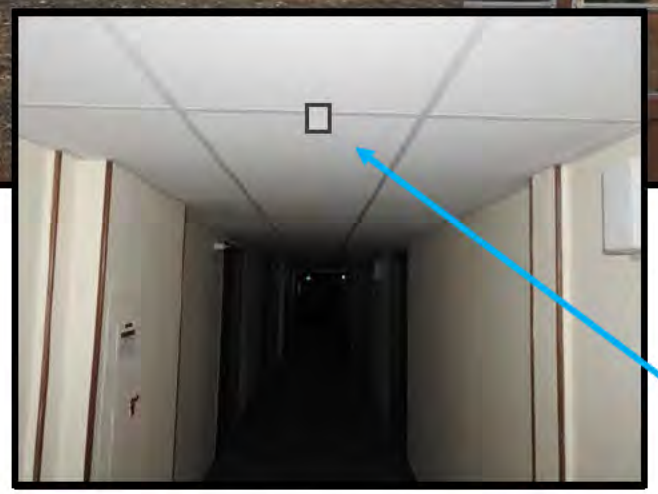
Coords: 44.456N, -110.828W

OF-Delaware North (YGS) Dormitory	
Area	Old Faithful
NRHP Eligibility	Unknown
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No



Old Faithful Utility Area - Dormitories

[redacted] GHz CPE
- 9"x9"x3" 3.65 GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using existing building penetration for TV antenna
- CPE at 20' elevation



Wi-Fi AP Placement:
- Attached to dropped ceiling T-bar.
- Cabling run above dropped ceiling

Lupine Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	No

Lupine Dormitory

Coords: 44.455N, -110.839W

[redacted] GHz CPE

- 9"x9"x3" 3.65 GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using ¼" wall penetration under eave, to interior attic
- CPE at 30' elevation

14-Plex Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

14-Plex Dormitory

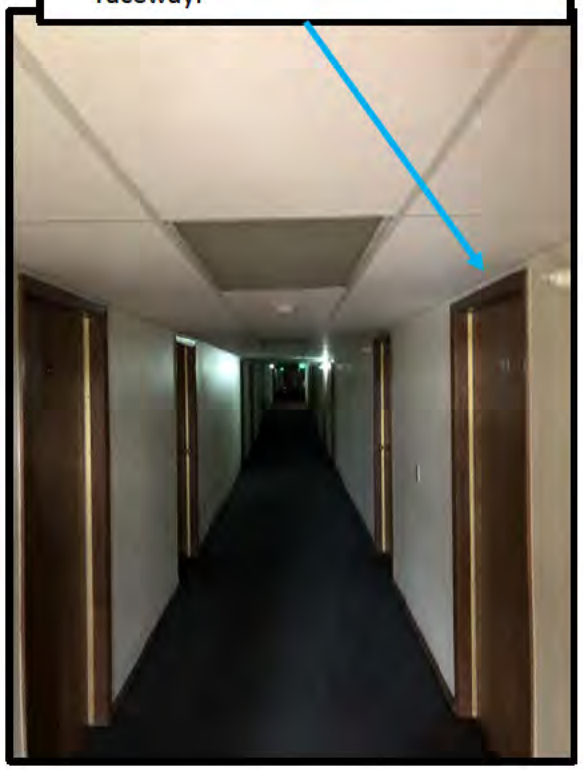
Coords: 44.456N, -110.838W

[redacted] GHz CPE

- 9"x9"x3" [redacted] GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using ¼" wall penetration under eave, to interior attic
- CPE at 20-ft AGL

Wi-Fi AP Placement

- One AP per room; ceiling mounted
- Ethernet run to rooms from within dropped ceiling. No exposed raceway.



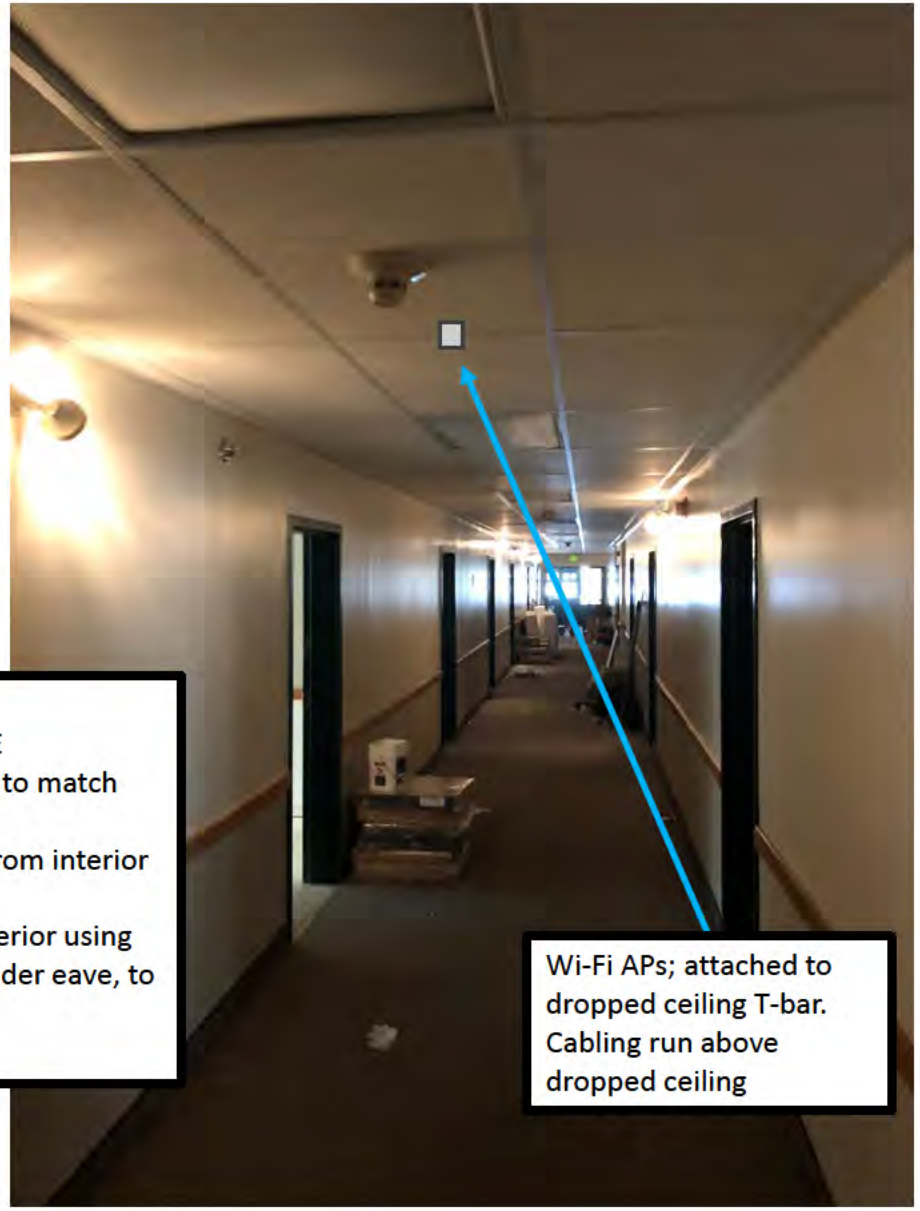
Bitterroot Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Bitterroot Dormitory

Coords: 44.456N, -110.838W

[redacted] GHz CPE

- 9"x9"x3" 3.65 GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using ¼" wall penetration under eave, to interior attic
- CPE at 25-ft AGL



Wi-Fi APs; attached to dropped ceiling T-bar. Cabling run above dropped ceiling

Larkspur Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Larkspur Dormitory

Coords: 44.455N, -110.838W

[redacted]GHz CPE

- 9"x9"x3" 3.65 GHz CPE
- All equipment painted to match background
- Ethernet with power from interior switch
- Ethernet cabling to interior using ¼" wall penetration under eave, to interior attic
- CPE at 20-ft AGL

Wi-Fi APs; attached using same method as existing APs; cabling run in ceiling soffit

Paintbrush Dormitory	
Area	Old Faithful
NRHP Eligibility	Age Ineligible
Roof Setback?	No
Interior Installation Only?	No
New Penetrations?	Yes

Paintbrush Dormitory

Coords: 44.455N, -110.839W

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