National Park Service
U.S. Department of the Interior
Bryce Canyon National Park
Bryce, Utah

Cellular Telecommunications Tower with Power and Fiber Optic Connection

Environmental Assessment

October 2019

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PURPOSE AND NEED

Purpose and Need for Action

Bryce Canyon National Park (BRCA) is considering the issuance of separate right-of-way permits to Verizon Wireless, South Central Utah Telephone Association (SCUTA) and Garkane Energy Cooperative (Garkane) for the installation of a cellular telecommunications tower, fiber optic utility, and electric utility rights-of-way, respectively. The NPS is required to consider the wireless telecommunication application in accordance with the Telecommunications Act of 1996 (47 USC 332 note), which authorizes, but does not mandate, a presumption that such requests be granted.

Given the requirements of the Telecommunications Act, and related NPS management policies, the NPS needs to undertake the following in determining whether to grant the right-of-way permits:

- Understand, characterize, and analyze the environmental impacts of a proposed cellular tower, and the availability of practicable alternatives, to fully inform a decision as to whether to grant right-of-way permits;
- Give consideration consistent with NPS Management Policies as to whether or not the proposal would cause unavoidable conflict with the park's mission, or is inconsistent with the purposes and values for which the park was established, in which case the permits would be denied;
- Evaluate the potential positive and negative effects on the park's natural and cultural resources, and the visitor's experience and safety; and
- Give consideration to existing nearby cellular telecommunication facilities, and existing and future park cellular needs, including co-location.

Background

In July 2015, Verizon Wireless submitted an application to install a cellular telecommunications tower in BRCA near the water tanks and existing NPS radio towers in the area known as "Science Hill". According to Verizon Wireless, the facility would provide improved cellular service to park visitors and staff, particularly in the developed areas of the park where the greatest density of visitors and staff are typically present (Figure 1). The proposed tower would require fiber optic data and electrical power connections.

The NPS held several meetings with Verizon Wireless and conducted outreach with the public, Garfield County, partners and affiliated Tribes to identify potential alternative site locations that would minimize impacts to the park. This also included sites that are relatively secluded, inaccessible to or rarely visited by the public, and are close to existing infrastructure in disturbed areas with nearby power sources. See the Alternatives section for those alternatives that are evaluated in this EA, and those that were considered and dismissed.

Existing Verizon Wireless towers or antennas in the vicinity of BRCA include sites on Wilson Peak (northwest), near Ruby's Inn (known by Verizon Wireless as "Henderson Point") (north), and in the town of Tropic (east). The Tropic site went on-line in the fall of 2017. These sites provide limited cellular service within the park. The Wilson Peak and Henderson Point sites provide coverage primarily above the canyon rim on the plateau, while the Tropic site provides coverage primarily below the rim within the amphitheater.

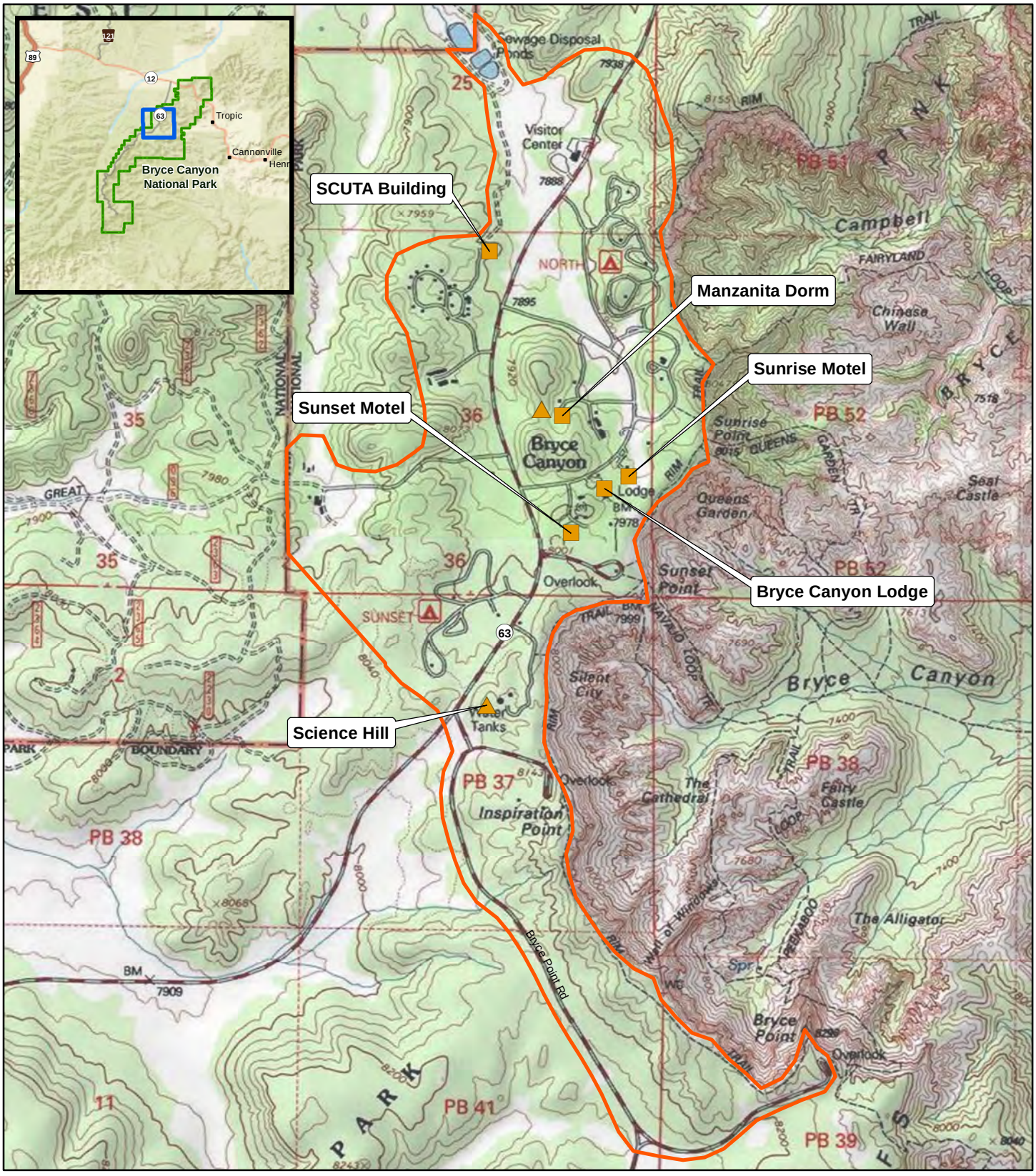

FIGURE 1

BRCA Developed Area

and Potential Cell Tower Locations

Bryce Canyon National Park

Cellular Telecommunications Tower with Power and Fiber Optic Connection

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Impact Topics Retained for Further Analysis

The following topics are carried forward for further analysis in this EA:

- Historic Properties and Cultural Landscapes
- Vegetation
- Visitor Use and Experience
- Visual and Scenic Resources
- Recommended Wilderness

Impact Topics Dismissed from Further Analysis

The following topics are dismissed from further analysis in this EA for the reasons provided.

Air Quality

BRCA is designated as a Class I air quality area under the Clean Air Act; meaning this area receives the highest level of protection with only a small amount of additional air pollution allowed. Air pollutants (i.e. ozone, nitrogen, sulfur, and mercury) directly impact the park by reducing visibility, contaminating vegetation, soils, and surface waters, as well as disrupting lifecycle and behavior patterns of certain wildlife species (NPS 2016).

Implementation of either action alternative would result in a minor increase in exhaust emissions from construction equipment and vehicles (about 8 total at any time) during the 90-day construction phase, as well as from the diesel back-up generator during operation. The generator would typically undergo a test run for about one hour per week in addition to operating during power outages. There would also be minor dust emissions from construction activities like soil grading and trenching during the 90-day construction period. These emissions are small relative to the other sources within the park and would make an inconsequential contribution to the park's overall emissions profile. Under Alternative B at Science Hill, these emissions would likely have small, short-term impacts on air quality data recorded by IMPROVE aerosol monitors and National Atmospheric Deposition Program (NADP) and National Oceanic and Atmospheric Administration (NOAA) precipitation deposition monitoring equipment located less than 100 feet northwest of the tower site.

Archaeological Resources

Comprehensive archaeological surveys have been completed for all 35,835 acres of BRCA. The surveys were conducted in two parts; the first survey included nearly 11,000 acres on the Paunsaugunt Plateau (Wenker 2004), and the second included the remaining area (about 25,000 acres) within the geologic amphitheaters under the rim (Dominguez et al. 2014). Together these studies provide a comprehensive and detailed view of the archeological resources within all of BRCA and no archaeological sites were identified within either of the action alternative project areas (Wenker 2004). Should any inadvertent discoveries occur during project construction, steps outlined in the NPS National Programmatic Agreement would be followed and cultural resources protected. The listed Mitigation Measures would further protect historic properties in all areas of disturbance; therefore, Archeological Resources was dismissed as an impact topic.

Environmental Justice

Panguitch and other communities surrounding the park contain both minority and low-income populations; however, there are no minority or low-income populations that would be disproportionately affected by the proposed actions. In addition, the implementation of any of the proposed alternatives would not result in any identifiable adverse human health effects; therefore,

there would be no direct or indirect adverse effects on any minority or low-income population or community.

Ethnographic Resources and Indian Sacred Sites

The NPS defines ethnographic resources as "a site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it." (Director's Order-28). Ethnographic resources may also be Traditional Cultural Properties, which are eligible for inclusion in the National Register (NPS 2006). Indian sacred sites are those places having established religious meaning and as locales of private cultural ceremonial activities (NPS 2006b). NPS understands that Native Americans traditionally used the area for hunting and gathering activities and acknowledges the current importance of the area as part of the traditional homeland for several tribes.

American Indian tribes contacted regarding the proposal are listed in the Consultation and Coordination section of the document. The tribal contacts were sent an informational letter on October 6, 2017 describing the proposed project with a request to receive their comments with subsequent follow-up. Responses were received from the Hopi Tribe and the Southern Ute Indian Tribe. The Hopi Tribe stated that no known Traditional Cultural Properties are present in the project areas, and they defer consultation on this project to the SHPO and other interested parties. The Southern Ute Indian Tribe inquired about the identification of wickiups/brush-shelters, possible skyscape / landscape features, and culturally modified trees near the project sites. The Tribe was notified that no evidence of structures, including temporary structures such as wickiups, have been identified within one mile of the project sites (Wenker 2004, Dominguez et al. 2014) and their response stated that they had no further questions. Additionally, the BRCA Superintendent presented a briefing on the EA to the Kaibab Band of Paiute Indians and the Paiute Indian Tribe of Utah (5 bands: Shivwits, Cedar, Kanosh, Indian Peaks, and Koosharem). No other scoping comments were received from associated Native American tribes as of the date of this EA. Each tribe will be notified of the availability of this EA and will be asked for their review and comment.

If new information about ethnographic resources, tribal concerns, or other subsequent issues are identified, the NPS will reconsider this determination.

Human Health and Safety

Safety and health of the public, employees, contractors, volunteers and other park visitors are core National Park Service values (NPS 2006b). The procedures applicable to the permitting of wireless communications facilities in NPS units are found in Reference Manual (RM) 53 (RM-53, 2009), which includes direction to consider the safety of the visiting public as a factor when reviewing applications.

Peak visitation at BRCA occurs from March through November and represents the time period when most emergency calls are placed and search and rescue (SAR) operations are needed. On average, there are typically 20 to 25 emergency calls from the developed area of BRCA daily during peak season. In 2017 there were 86 SAR operations conducted within the park. While some SAR calls may originate from the developed area, actual SAR operations are conducted outside the developed area below the canyon rim, with most originating from the popular trails starting at Sunrise or Sunset Points.

Visitors may request assistance for various reasons using cellular phones, landline phones at park buildings, or through direct contact with park staff. Visitors in the developed area rarely experience any difficulty calling for assistance using existing resources; if cellular service is unavailable, a landline phone

or park staff person is usually accessible. Communication among park operations, emergency responders, dispatchers, and park headquarters during emergency situations is primarily by use of the park's two-way radio system; cellular service does not play an important role in emergency response services in the park. Visitors currently may experience difficulty calling for help from locations below the canyon rim, but the proposed project would not improve cellular service to this area and would, therefore, have little to no effect on human health and safety.

Migratory Birds

The proposed communication tower may result in direct or indirect bird mortality through collisions with the tower or direct mortality during vegetation removal or tower maintenance activities. The U.S. Fish and Wildlife Service (USFWS) has issued recommended best practices for communication tower design, siting, construction, operation, maintenance and decommissioning to reduce impacts on migratory birds (USFWS 2018a). The proposed project would adhere to the following USFWS recommended best practices. There would be no lights on the tower as no Federal Aviation Administration (FAA) obstruction lighting would be required. Other measures taken include consideration of co-location (see Alternatives Considered and Dismissed), minimizing habitat loss by siting in disturbed areas, use of a free-standing (no guy wires) tower design less than 199 feet tall, and use of a minimum number and intensity of down-shielded task lights within the equipment compound that would only be illuminated when technicians working on the equipment cabinets or generator are present. The measures related to lighting as well as additional best practices related to vegetation are included in the Mitigation Measures. By following the USFWS recommendations the adverse effects on migratory birds would be extremely unlikely or not measurable; therefore, Migratory Birds was dismissed as an impact topic.

Night Sky

In accordance with 2006 NPS Management Policies, the NPS strives to preserve natural ambient lightscapes, which are natural resources and values that exist in the absence of human-caused light (NPS 2006b). The absence of in-park light pollution, the good air quality, and the remoteness of BRCA make for exceptional stargazing. Bryce Canyon has become a leader in night sky protection and appreciation.

There would be no lights on the tower as no FAA obstruction lighting would be required. Lighting may be installed within the fenced compound for technicians working on the equipment cabinets or generator. These lights would be down-shielded and only illuminated when technicians are present. Lighting associated with the project would follow BRCA's Lighting Management Plan (BRCA 2019) in addition to the identified Mitigation Measures. As a result, there would be no new permanent light source introduced to the park and temporary task lighting within the compound would not be frequently illuminated and would employ mitigation measures to ensure lighting used at night would minimize impacts to the night sky resources. Therefore, this impact topic was eliminated from further evaluation.

Soundscape

Preservation of the natural soundscapes in BRCA is a key part of the park's mission. Natural soundscapes exist in the absence of human-caused sound. During the roughly 90-day construction period noise from construction activities and vehicles would be expected near the project site. Noise would be variable and intermittent throughout the construction period. The vehicles and activities may be expected to include trenching or boring for utilities (about 2 weeks), drilling for foundations (1-2 days), pouring concrete (1 day), tower erection using a crane (1 day), and a mini-excavator for grading and moving materials around within the project site (8 to 12 weeks). The back-up generator for the

cellular equipment would periodically make minimal noise. The generator would be equipped with a sound-dampening enclosure resulting in an average generated sound level of 68 dBA during operation at a distance of 23 feet as measured on an open paved surface. This is roughly equivalent to a residential air conditioning unit at a distance of 20 feet, or normal conversation at a distance of 3 feet. The generator would typically undergo a test run for about one hour per week in addition to operating during power outages. Overall, sound resulting from all of the above sources at either of the considered tower locations would be expected to be minimal and infrequent; therefore, this topic is eliminated from further evaluation.

Public comments identified concerns related to the sounds of cell phone use, including phones ringing, people talking and people playing loud music or videos. This issue is considered most appropriately addressed under the impact topic Visitor Use and Experience.

Special Status Species

An official federal species list (consultation code 06E23000-2017-SLI-0342) was obtained from the U.S. Fish and Wildlife (USFWS) Information for Planning and Consultation (IPaC) website (https://ecos.fws.gov/ipac/) on June 11, 2019. The list identified five threatened and endangered species that may occur within the alternative project areas: Utah prairie dog (*Cynomys parvidens*), California condor (*Gymnogyps californianus*), Mexican spotted owl (*Strix occidentalis lucida*), Jones cycladenia (*Cycladenia humilis var. jonesii*), and Ute ladies' tresses (*Spiranthes diluvialis*). The Alternative B (Science Hill) project area consists primarily of built-up areas and roadways with areas of bare ground and shrubby vegetation near the potential tower location, and the Alternative C (Manzanita Dorm) project area consists primarily of Ponderosa pine woodland (see the Vegetation impact topic for additional details). Neither of the project areas provide suitable habitat for any of the listed species indicated above, which includes meadows and forest edges for Utah prairie dogs, rocky forested areas near cliffs for California condors, old-growth or mature forests in canyons for Mexican spotted owls, sparse desert scrub on steep slopes for Jones cycladenia, and riparian areas for Ute ladies' tresses.

Additionally, the closest Utah prairie dog colony is more than 1,000 feet away from the Science Hill project area and more than 700 feet from the Manzanita Dorm project area according to annual Utah prairie dog population surveys and colony mapping conducted by NPS wildlife biologists. At these distances, the project would not disturb Utah prairie dogs and there would be no effect on this species (USFWS 2018b). Sightings of California condor in BRCA are rare, occurring only once every few years, and usually near cliff areas. The project areas are removed from the cliffs and no condors have been sighted near the project areas; therefore, the project would not be expected to impact this species. Surveys for Mexican spotted owls in BRCA were conducted by NPS in 1993-1995 and 2008-2009 with no recorded sighting of this species in the park. Furthermore, the NPS Inventory and Monitoring Network conducts annual surveys for landbirds and have never recorded a Mexican spotted owl in BRCA (NPS 2018). Plant surveys of the project areas completed by NPS vegetation biologists in 2017 and 2018 did not identify Jones cycladenia or Ute ladies' tresses.

An official state sensitive species list (by county) was also obtained from the Utah Division of Wildlife Resources website (http://dwrcdc.nr.utah.gov/ucdc/ViewReports/sslist.htm) dated November 1, 2017. None of the 32 listed wildlife species for Garfield County are known to inhabit the project areas based on surveys previously completed by NPS wildlife biologists. State listed species transient to the project area may avoid it during the approximately 90-day construction period, but the habitat at the project locations is common and affected individuals could relocate to similar habitat nearby. Therefore, the proposed project would be expected to have little to no effect on state listed wildlife species.

Although Utah has discontinued recognizing state sensitive plant species, the BRCA Vascular Plant Checklist (Fertig & Topp 2009) was also reviewed. Most of the species on this list are not present within the project areas and would not be affected by the project. However, three species are known to be present in the project areas based on surveys previously completed by NPS vegetation biologists: *Draba subalpina* (breaks draba), *Lomatium minimum* (least lomatium), and *Townsendia montana var. minima* (Bryce Canyon townsendia). These species are not dismissed and are analyzed under the Vegetation impact topic.

ALTERNATIVES

Three alternatives, including two action alternatives and the no-action alternative, are carried forward for evaluation in this EA. Several design options and alternate locations were also considered and dismissed (see the Alternatives Considered and Dismissed section).

Under any of the alternatives, the NPS may still receive and must respond to future applications to install wireless telecommunications facilities within the park; if so, the NPS would address these under a separate environmental analysis document. The NPS encourages new infrastructure to be designed to accept co-location by other entities whenever possible (NPS 2006b). For example, constructing an 80-foot tower under Alternative B or Alternative C would provide additional capacity for future right-of-way permit requests that would not be available if a 40-foot or 60-foot tower were constructed under these alternatives.

Alternatives Carried Forward

Alternative A – No Action

Under the No Action alternative,a Verizon Wireless telecommunications tower and the associated SCUTA fiber optic and Garkane electrical utilities would not be constructed and no related special use or right-of-way permits would be issued. Existing cellular service from installations outside the park would remain the same, as opportunities for additional coverage from outside the park are limited due to topography. Two-way radios and satellite coverage would continue to be available to those with appropriate devices.

Alternative B – New Tower at Science Hill

Under Alternative B, permits would be issued for the construction (special use permit) and operation and maintenance (right-of-way permit), of a new cellular telecommunications tower with fiber optic and electrical utilities near the water tanks and existing NPS tower in the area known as “Science Hill” (Figure 1). The proposed cellular service would include voice and data capabilities using long-term evolution (LTE) technology. The tower would have antennas pointed to the north, south and west (three antenna sectors in total). Antennas would be directed away from the recommended wilderness and backcountry areas in the main geologic amphitheater areas as these areas are already partially covered by the tower in Tropic; additionally, a tower on the plateau would not provide effective coverage in this direction due to the topography.

SCUTA is in the process of upgrading the park’s existing copper utility lines to fiber optic cable. The fiber optic cable would need to be extended to the tower site. Garkane buried electrical utilities are present in many areas of the park and an electrical utility right-of-way also would need to be routed from the nearest available power source to the tower site.

Construction of the project would take approximately 90 days to complete with installation of utilities and tower construction occurring concurrently. Construction activities may be expected to include trenching or boring for utilities (about 2 weeks), drilling for foundations (1-2 days), pouring concrete (1 day), tower erection using a crane (1 day), and operation of a mini-excavator for grading and moving materials around within the project site (8 to 12 weeks) After construction, Verizon Wireless employees would conduct normal maintenance of the tower equipment on a regular schedule (usually monthly) and occasionally respond to emergency or alarm calls to the site (estimated to be about six times per year).

Site Design

The tower would be located within an approximately 22-foot by 52-foot (1,144 square-foot) fenced compound that would also include equipment cabinets with a canopy and an external diesel backup generator on an approximately 13-foot by 14-foot concrete pad (Figure 4). The generator would be equipped with a sound-dampening enclosure resulting in an average generated sound level of 68 dBA during operation at a distance of 23 feet as measured on an open paved surface. Additionally, an approximately 12-foot by 60-foot gravel access route would be installed on the north side of the fenced compound. The top 6 inches of the access route would be scarified and compacted, removing any soft soil that will not compact and replace it with road base as needed, then install 6 inches of gravel compacting to 95% as it blends into native soil. The extent of disturbance during construction of the tower compound would include an additional approximately 20 feet around the fenced compound and 5 feet on the north side of the access route for heavy equipment and a crane to access the site totaling approximately 4,700 square-feet (Figure 3). A construction staging area with temporary fencing similar in size to the tower compound would be located near the project area on an existing gravel or paved surface. Gravel and any other fill material used in the construction would be obtained from a commercial source. Revegetation and recontouring of disturbed areas would take place following construction, as needed, in accordance with BRCA and NPS policy (see Mitigation Measures).

Approximately 2,000 feet of new buried fiber optic utility line would be installed along the center of the existing Science Hill gravel access drive between the tower site and the upgraded fiber optic utility near the access drive entrance off Highway 63 within a 10-foot wide right-of-way (Figure 2). The new right-of-way and buried fiber optic line would be located within previously disturbed areas. Power is currently available from Garkane Energy on Science Hill, and an approximately 60-foot buried electrical utility line would be installed within a 10-foot right-of-way from an existing transformer to the tower site (Figure 3). Fiber optic and electrical utilities would be installed in an approximately 3-foot wide trench or would be bored within the rights-of-way. The buried utility lines would be installed approximately 3 to 5 feet below the ground surface in compliance with the Utah Administrative Code.

Verizon Wireless' application requested approval for a 60-foot or 80-foot stealth "monopine" tower, which is designed to look like a pine tree and blend into the surroundings. These heights were requested because Verizon Wireless indicated that a 60-foot tower would meet their coverage needs, but an 80-foot tower would provide the space needed to accommodate an additional carrier that may wish to co-locate on the tower in the future. Based on internal and public scoping, the range of tower designs and heights considered for Alternative B includes both monopine and self-support design (Figure 4), and tower heights of 40, 60, and 80 feet. A self-support tower may be painted to compliment the surrounding scenery if necessary.

Signal Coverage and Strength

On April 17, 2018, Verizon Wireless conducted a signal drive test in BRCA to measure the cellular coverage and signal strength that would be expected from a tower on Science Hill. A Verizon Wireless Radio Frequency Engineer used the drive test data to generate models of the predicted signal propagation from a tower on Science Hill with heights of 40, 60, and 80 feet. Verizon Wireless provided maps to NPS displaying these data, which Verizon Wireless considers to be confidential and proprietary and so are not disclosed in this EA. While the model is based on the site-specific signal test data, it is still only an approximation of the anticipated service coverage. If the tower were built, the actual service coverage may vary from the model. The expected increase in cellular service from a tower with any of the considered heights at Science Hill would be similar, with some increase in the extent of service quality for each increase in height (i.e., an 80-foot tower would provide marginally better service than a 60-foot tower, which would provide marginally better service than 40-foot tower). At all considered

heights, portions of the developed area of the park with poor or no service would be expected to remain. Table 1 shows the approximate extent of the anticipated signal strengths for select locations within the park.

Table 1: Extent of relative expected cellular signal strength by tower height for locations within BRCA under Alternative B.

	Approximate Percent of Area with Relative Signal Strength*			
Location (area)	**Current**	**40 feet**	**60 feet**	**80 feet**
Bryce Canyon Lodge (3.9 acres)	Weak 100%	Moderate 80% Weak 20%	Moderate 90% Weak 10%	Moderate 90% Weak 10%
Lodge Loop Road (6.8 acres)	Weak 75% Moderate 24% None 1%	Moderate 85% Weak 15%	Moderate 90% Weak 10%	Moderate 89% Weak 10% Strong 1%
NPS Historic Housing (7.3 acres)	Weak 100%	Weak 60% Moderate 40%	Weak 55% Moderate 45%	Moderate 60% Weak 40%
NPS Housing (17.0 acres)	Weak 65% Moderate 35%	Moderate 85% Weak 15%	Moderate 85% Weak 15%	Moderate 90% Weak 10%
NPS Maintenance Yard (4.2 acres)	Weak 98% Moderate 2%	Weak 85% Moderate 15%	Weak 85% Moderate 15%	Weak 80% Moderate 20%
Paria View Overlook (0.1 acre)	Weak 75% None 25%	Weak 75% None 25%	Weak 75% None 25%	Weak 100%
Sunset Campground (31.3 acres)	Weak 95% Moderate 5%	Moderate 95% Weak 5%	Moderate 97% Weak 3%	Moderate 96% Strong 2% Weak 2%
Sunset Motel (0.9 acre)	Weak 100%	Moderate 100%	Moderate 100%	Moderate 100%
Sunset View Overlook (0.7 acre)	Weak 60% Moderate 40%	Moderate 55% Weak 45%	Moderate 65% Weak 35%	Moderate 85% Weak 15%
Swamp Canyon Overlook (0.5 acre)	None 75% Weak 25%	None 75% Weak 25%	None 75% Weak 25%	None 75% Weak 25%
Visitor Center (4.9 acres)	Moderate 100%	Moderate 100%	Moderate 100%	Moderate 100%

* The signal strength categories and areal extent (percent area) are based on the signal propagation models and do not necessarily represent the actual conditions that would result if the tower were built but provide a basis for comparison.
Signal strength categories defined by Verizon Wireless based on the modeled reference signal received power (RSRP) values: Weak – outdoor coverage, slow data speeds; Moderate – outdoor and in-vehicle coverage, faster data speeds; Strong – outdoor, in-vehicle, and in-building coverage, fast data speeds.

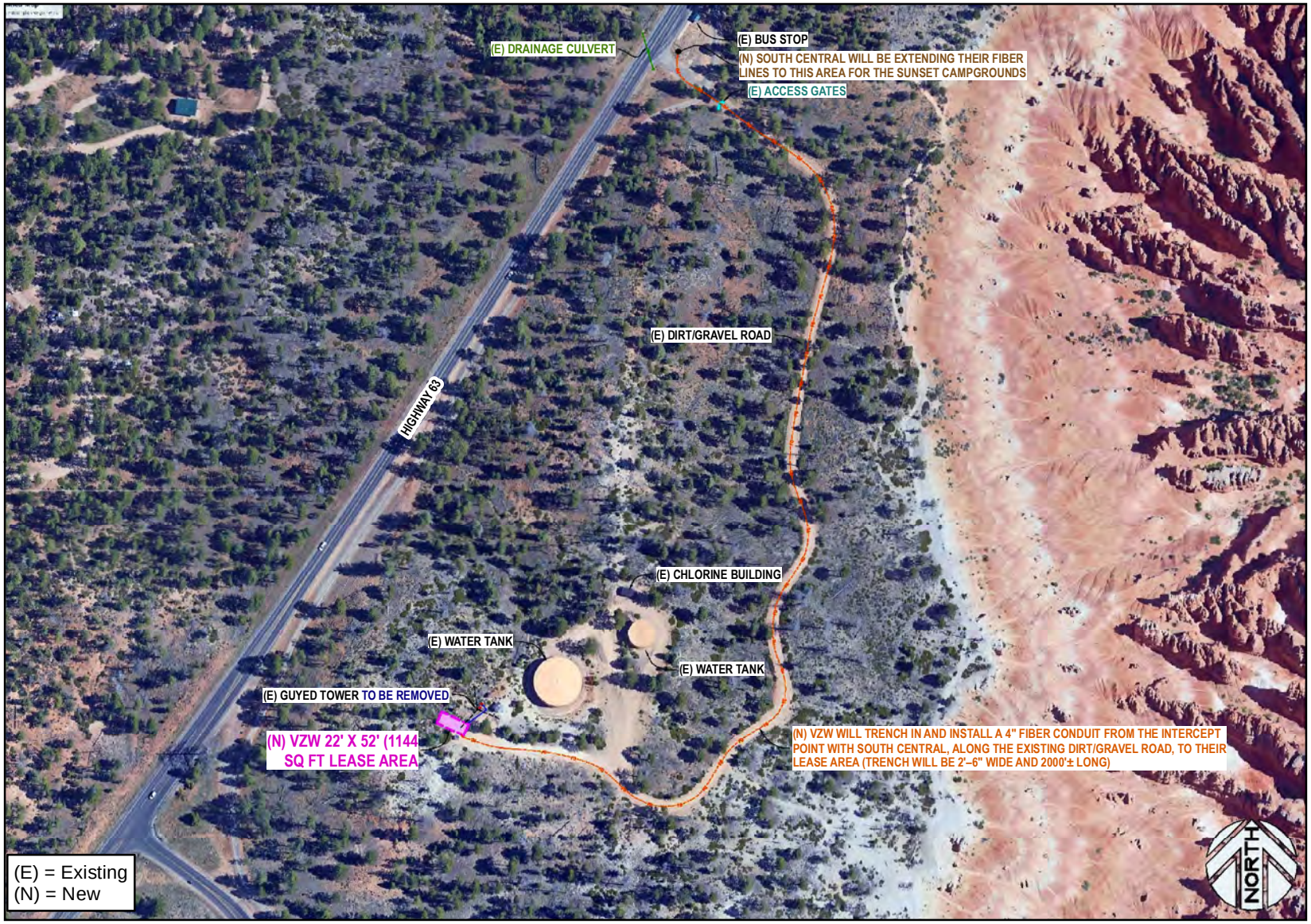

FIGURE 2

Science Hill Fiber Optic Route

Bryce Canyon National Park
Cellular Telecommunications Tower with Power and Fiber Optic Connection

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October 2019

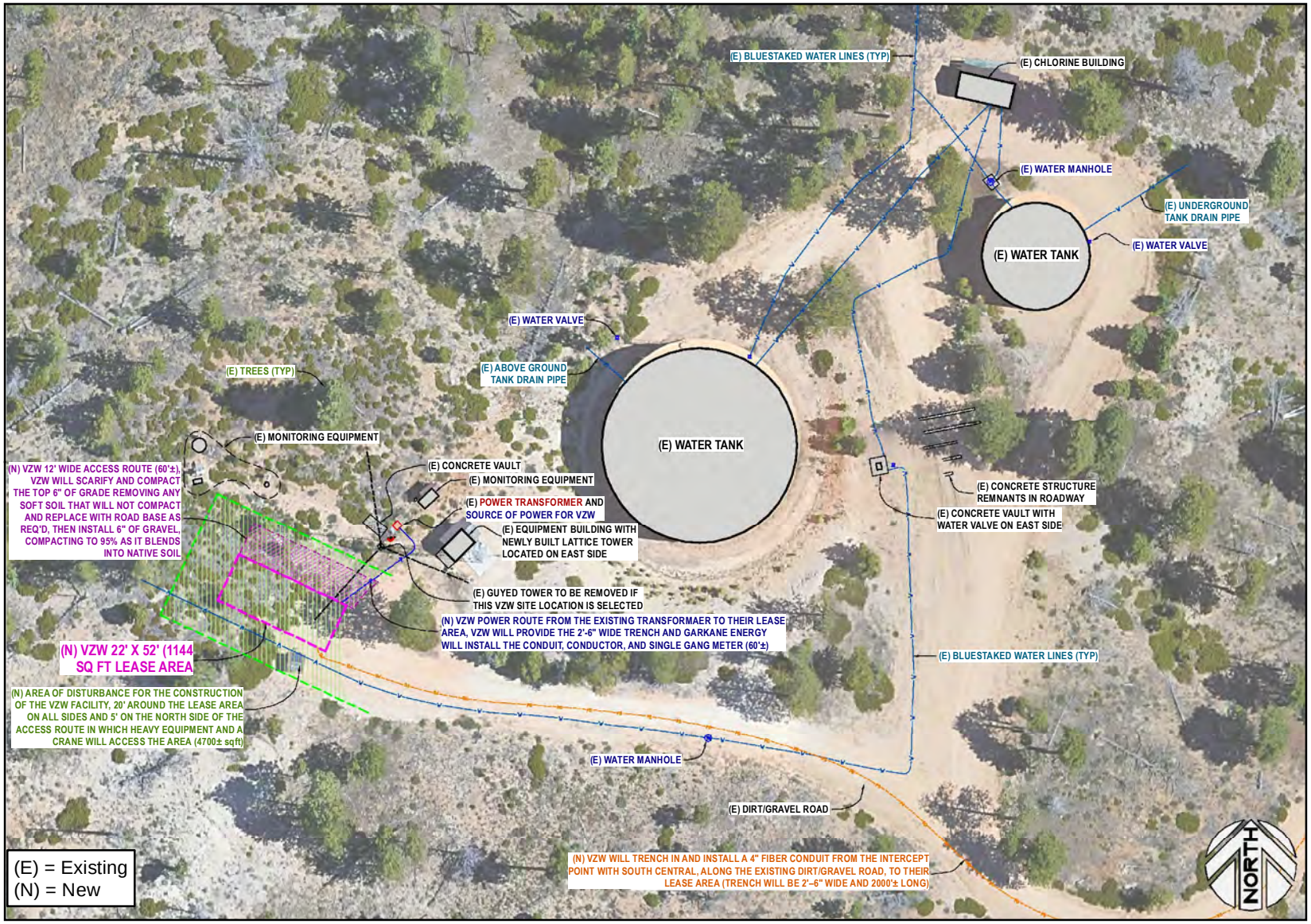

FIGURE 3

Science Hill Site Plan

Bryce Canyon National Park

Cellular Telecommunications Tower with Power and Fiber Optic Connection

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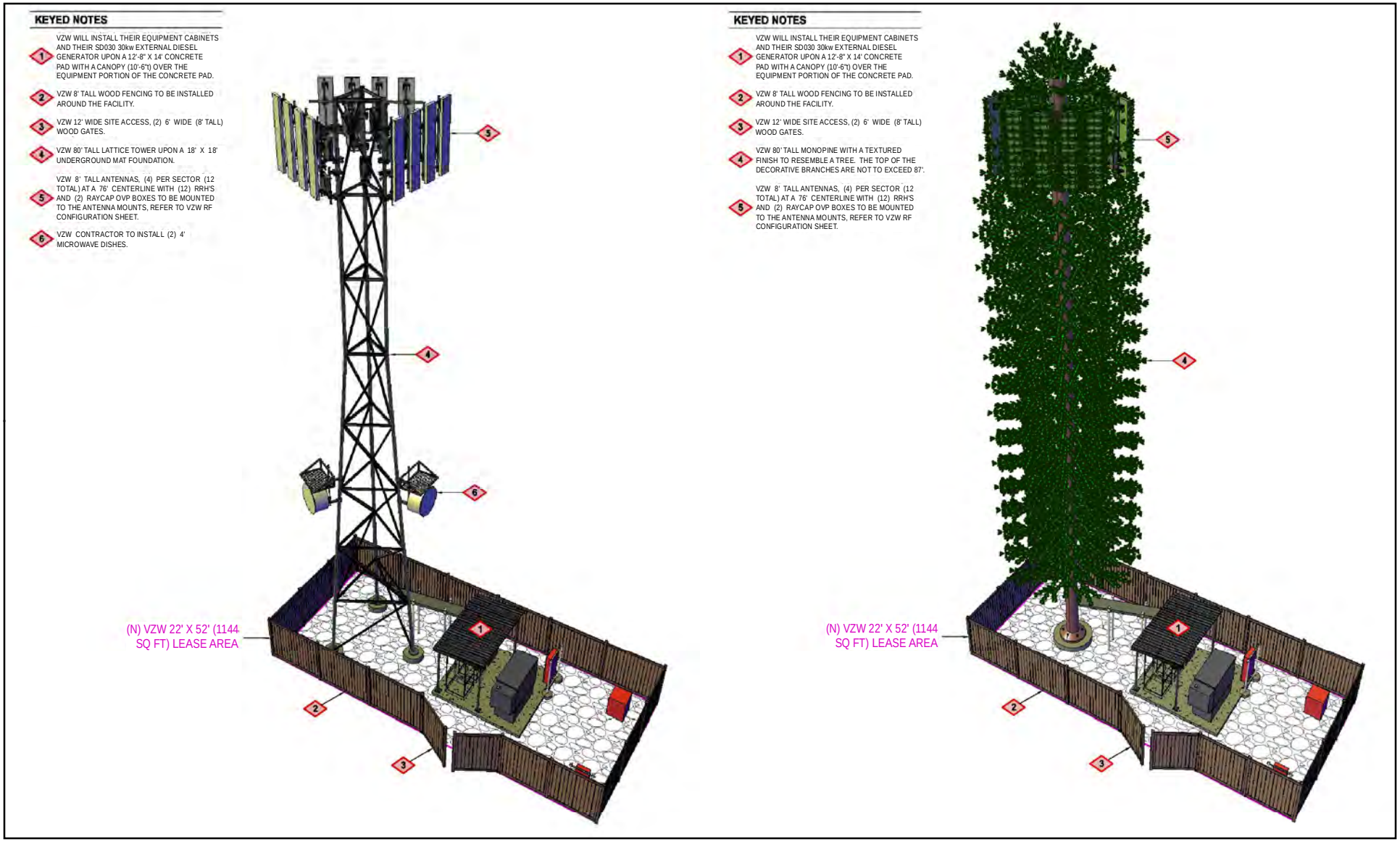

FIGURE 4

Self-Support and Monopine Tower Designs

Bryce Canyon National Park
Cellular Telecommunications Tower with Power and Fiber Optic Connection

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October 2019

Alternative C – New Tower Near Manzanita Dorm

Under Alternative C, permits would be issued for the construction (special use permit) and operation and maintenance (right-of-way permit), of a new cellular telecommunications tower with fiber optic and electrical utilities near the Manzanita Lodge Dormitory ("Manzanita Dorm") (Figure 1). The proposed cellular service would include voice and data capabilities using LTE technology. The tower would have antennas pointed to the north, south and west (three antenna sectors in total). Antennas would be directed away from the recommended wilderness and backcountry areas in the amphitheater as these areas are already partially covered by the tower in Tropic; additionally, a tower on the plateau would not provide effective coverage in this direction due to the topography.

SCUTA is in the process of upgrading the park's existing copper utility lines to fiber optic cable. The fiber optic cable would need to be extended to the tower site. Garkane buried electrical utilities are present in many areas of the park and an electrical utility right-of-way also would need to be routed from the nearest available power source to the tower site.

Construction of the project would take approximately 90 days to complete with installation of utilities and tower construction occurring concurrently. Construction activities may be expected to include trenching or boring for utilities (about 2 weeks), drilling for foundations (1-2 days), pouring concrete (1 day), tower erection using a crane (1 day), and operation of a mini-excavator for grading and moving materials around within the project site (8 to 12 weeks). After construction, Verizon Wireless employees would conduct normal maintenance of the tower equipment on a regular schedule (usually monthly) and occasionally respond to emergency or alarm calls to the site (estimated to be about six times per year).

Site Design

The tower would be located within an approximately 22-foot by 52-foot fenced compound that would also include equipment cabinets with a canopy and an external diesel backup generator on an approximately 13-foot by 14-foot concrete pad (Figure 4). The generator would be equipped with a sound-dampening enclosure resulting in an average generated sound level of 68 dBA during operation at a distance of 23 feet as measured on an open paved surface. The Manzanita Dorm tower site is very close to an existing SCUTA copper telephone line that will be upgraded to fiber optic, so approximately 50 feet of new buried fiber optic utility line would be installed within a 10-foot right-of-way extending from the upgraded service to the tower site. An approximately 450-foot access and electrical utility route would extend from the parking lot and existing transformer near Manzanita Dorm to the tower site, which would include a new buried electrical line within a 10-foot right-of-way and a new roughly 12-foot wide gravel access drive. The access road would be constructed by scarifying and compacting the top 6 inches of grade, removing any soft soils that will not compact and replacing with road base and required, then installing 6 inches of gravel and compacting to 95% as it blends into native soil. The extent of disturbance during construction would include an additional approximately 20 feet around the fenced compound and an additional 10 feet on either side of the access and utility route for heavy equipment and a crane to access the site (Figure 5). A construction staging area with temporary fencing similar in size to the tower compound would be located near the project area on an existing gravel or paved surface. Gravel and any other fill material used in the construction would be obtained from a commercial source. Revegetation and recontouring of disturbed areas would take place following construction, as needed, in accordance with BRCA and NPS policy (see Mitigation Measures).

The new rights-of-ways for buried fiber optic and electrical lines and access drive would be located within previously disturbed areas. Fiber optic and electrical utilities would be installed in an approximately 3-foot wide trench or would be bored within the rights-of-way. The buried utility lines

would be installed approximately 3 to 5 feet below the ground surface in compliance with the Utah Administrative Code.

This location was identified because it is closer to the desired coverage area. Based on internal and public scoping, the range of tower designs and heights considered for Alternative C includes both monopine and self-support tower designs (Figure 4), and tower heights of 40, 60, and 80 feet. A self-support tower may be painted to compliment the surrounding scenery, if necessary.

Signal Coverage and Strength

Due to schedule and access limitations, a signal drive test was not conducted for the Manzanita Dorm location. However, Verizon Wireless used the results of the signal drive test from the Science Hill location (see Alternative B) to generate models of the predicted signal propagation from a tower near Manzanita Dorm with heights of 40, 60, and 80 feet. Verizon Wireless provided maps to NPS displaying these data, which Verizon Wireless considers to be confidential and proprietary and so are not disclosed in this EA. Although based on the signal test data for Alternative B, the model is an approximation of the anticipated service coverage and the actual service coverage experienced if the tower were built may vary from the model. The expected increase in cellular service for each increase in height from a tower at Manzanita Dorm would be expected to be greater than at Science Hill (Alternative B) (i.e., an 80-foot tower would provide moderately better service than a 60-foot tower, which would provide moderately better service than a 40-foot tower). Table 2 shows the approximate extent of the anticipated signal strengths for select locations within the park.

Table 2: Extent of relative expected cellular signal strength by tower height for locations within BRCA under Alternative C.

	Approximate Percent of Area with Relative Signal Strength*			
Location (area)	**Current**	**40 feet**	**60 feet**	**80 feet**
Bryce Canyon Lodge (3.9 acres)	Weak 100%	Weak 95% Moderate 5%	Weak 50% Moderate 50%	Moderate 100%
Lodge Loop Road (6.8 acres)	Weak 75% Moderate 24% None 1%	Weak 50% Moderate 50%	Moderate 55% Weak 45%	Moderate 70% Weak 25% Strong 5%
NPS Historic Housing (7.3 acres)	Weak 100%	Moderate 55% Weak 45%	Moderate 65% Weak 35%	Moderate 85% Weak 14% Strong 1%
NPS Housing (17.0 acres)	Weak 65% Moderate 35%	Moderate 95% Weak 5%	Moderate 98% Weak 2%	Moderate 100%
NPS Maintenance Yard (4.2 acres)	Weak 98% Moderate 2%	Moderate 80% Strong 20%	Strong 80% Moderate 20%	Strong 95% Moderate 5%
Paria View Overlook (0.1 acre)	Weak 75% None 25%	Weak 75% None 25%	Weak 75% None 25%	Weak 75% None 25%
Sunset Campground (31.3 acres)	Weak 95% Moderate 5%	Moderate 90% Weak 10%	Moderate 95% Weak 5%	Moderate 90% Strong 5% Weak 5%
Sunset Motel (0.9 acre)	Weak 100%	Moderate 99% Weak 1%	Moderate 100%	Moderate 100%
Sunset View Overlook (0.7 acre)	Weak 60% Moderate 40%	Weak 60% Moderate 40%	Weak 55% Moderate 45%	Moderate 75% Weak 25%
Swamp Canyon Overlook (0.5 acre)	None 75% Weak 25%	None 75% Weak 25%	None 75% Weak 25%	None 75% Weak 25%
Visitor Center (4.9 acres)	Moderate 100%	Moderate 100%	Moderate 100%	Strong 80% Moderate 20%

* The signal strength categories and areal extent (percent area) are based on the signal propagation models and do not necessarily represent the actual conditions that would result if the tower were built but provide a basis for comparison.
Signal strength categories defined by Verizon Wireless based on the modeled reference signal received power (RSRP) values: Weak – outdoor coverage, slow data speeds; Moderate – outdoor and in-vehicle coverage, faster data speeds; Strong – outdoor, in-vehicle, and in-building coverage, fast data speeds.

FIGURE 5

Manzanita Dorm Site Plan

Bryce Canyon National Park
Cellular Telecommunications Tower with Power and Fiber Optic Connection

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NPS Preferred Alternative

The NPS preferred alternative is Alternative B with a tower height of 60 feet and self-support tower design.

Alternatives Considered and Dismissed

As described in Table 3, the following suggestions and alternative locations for the project were considered but dismissed from further consideration. These include suggestions from internal and external scoping.

Table 3: Suggestions and alternative locations dismissed from further consideration.

Suggestions/Alternative Locations Dismissed	Reason for Dismissal
Issue right-of-way permits for the construction of a new cellular telecommunications tower near SCUTA's building at the former terminus of their fiber optic service in the northern part of the park (Figure 1).	Verizon Wireless would need a tall (100-foot or greater) tower at this location to achieve the desired coverage because of the relatively low elevation at the site. Such a tower would be very visible to visitors immediately upon entering the park south of the Visitor Center, resulting in too great an impact to visitor experience and visual resources.
Issue right-of-way permits to replace and collocate antennas on the existing NPS radio tower on Science Hill (Figure 1).	A tower 100-120 feet tall would be required to accommodate the existing NPS and other user's antennas in addition to Verizon Wireless in order to mitigate interference with NPS radio equipment. In addition, the tower would also be wide at the base or require many guys wires for stability. This would result in a large visual impact; therefore, this alternative was deemed to be duplicative with other less environmentally damaging alternatives.
Issue right-of-way permits to collocate antennas in the attic of the modern Sunrise Motel and/or Sunset Motel building(s) (Figure 1).	This alternative was determined to be technically infeasible because the antennas could not be placed at a high enough elevation due to the relatively low ground elevation at these locations and the short building heights (approximately 30 feet).
Issue right-of-way permits for the construction of a network of "small cell" antenna nodes.	Verizon Wireless would need to install 15-20 small cell nodes to achieve the desired increase in cellular service, each of which would require its own power and fiber optic lines. This would result in too great an environmental impact.
Add a new Verizon Wireless tower or add antennas on existing towers outside the park boundary to increase coverage in BRCA.	Currently Verizon Wireless has cellular towers at Ruby's Inn (Henderson Point), Wilson Peak, and in the town of Tropic. Due to limitations of topography, placing cell towers elsewhere outside the park would not improve service in the developed area the park. While some have suggested placing towers at Canaan Peak, the Verizon Wireless antenna installation sites providing the existing limited cellular service in BRCA are much closer than Canaan Peak; a new tower at this location would not increase service within the park because it is too far away. Likewise, another tower on the hill south of Tropic would be duplicative with the existing site and would not increase service in the developed area of the park. Adding antennas to the existing tower sites would not improve cellular coverage or service within the park either because the existing antennas already provide the greatest possible coverage and service from those locations.

Suggestions/Alternative Locations Dismissed	Reason for Dismissal
Issue right-of-way permits for the construction of a new 100-foot tower near Manzanita Dorm or Science Hill.	After review and analysis of predicted signal propagation and potential visual effects, a 100-foot tower would not provide a significantly greater increase in cellular service to the target area than an 80-foot tower and would have a greater visual impact, therefore, it was dismissed.

Mitigation Measures

The following mitigation measures would minimize the degree and/or extent of adverse impacts of the action alternatives and would be implemented during project construction and operation.

Air Quality

- Equipment would not be allowed to idle longer than 2 minutes when not in use.
- All motor vehicles and equipment would have mufflers conforming to original manufacturers' specification that are in good working order and are in constant operation to prevent excessive or unusual fumes or smoke.
- Fugitive dust generated by construction would be controlled by spraying water on the construction site, if needed.

Archeological Resources

- All contractors and subcontractors would be informed of the procedures should previously unknown cultural resources be uncovered during construction activities, as well as the penalties for illegally collecting artifacts or intentionally damaging paleontological materials, archeological sites, or historic properties.
- During construction, specifically activities involving earthwork or digging, qualified park staff would monitor work zones to confirm the presence or absence of significant archeological resources. In the event of discovery of unanticipated cultural resources work would halt, and the park would contact the NPS archaeologist to determine next steps needed to protect the resources.
- In the unlikely event that human remains are discovered during construction, all work on the project would stop. As required by law, the coroner would be notified first. All provisions outlined in the Native American Graves Protection and Repatriation Act (1990) would be followed.
- Equipment and materials staging areas would avoid known archeological resources.

Bats and Migratory Birds

- To minimize negative impacts to nesting birds, vegetation removal would not occur during nesting season for any birds protected under the Migratory Bird Treaty Act, generally from April 1 through July 31.
- To minimize negative impacts to maternity roosting bats, tree and snag removal would not occur from April 15 through August 31, unless otherwise approved by the park's wildlife biologist.
- Pre-construction/pre-vegetation removal bird surveys for nests and bat surveys for maternity roosts may be required. No construction activities would be conducted in identified nesting areas or bat maternity roosting areas until the young have fledged.

Historic Properties

- Construction activities occurring close to historic properties would be monitored by qualified park staff to ensure construction activities remain within the approved footprint.
- New construction elements would complement the design, materials, and physical appearance of existing features within cultural landscapes and historic districts. Color and finish treatments may be necessary to ensure that new materials blend with the existing features.
- The extent of tree removal and native vegetation disturbance in and near cultural landscapes and historic districts would be minimized to the extent practicable.
- All work would be performed in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties and Guidelines for the Treatment of Cultural Landscapes, and the BRCA Old NPS Housing and Bryce Canyon Lodge Cultural Landscape Report.

Human Health and Safety

- The contractor would provide a safety plan to the park prior to commencement of work. The safety plan would demonstrate compliance with OSHA and other applicable safety laws, and would identify contractor points of contact.
- The contractor would provide a traffic management plan for review and approval by the park prior to the commencement of work activities. The plan would address vehicle and pedestrian traffic within the construction zone including: the location of warning signs, type of signs, placement of flaggers, placement of cones/fencing, barricades, duration of anticipated delays, use of pilot cars, etc. All signs would meet NPS standards.
- All project zones would be kept trash-free at all times and construction generated debris would be removed from the park to an approved landfill at intervals to prevent a large build-up of waste material.

Night Sky

- New lighting would be compliant with BRCA's Lighting Management Plan to reduce impacts to the night sky and wildlife. This would include, but is not limited to, low-level lighting, minimized glare, downward focused light fixtures, and energy efficient light sources.
- Hours of outdoor construction would be limited to hours between sunrise and sunset, so no lighting would be needed.
- Security lighting installed in the equipment compound would be limited to the minimum effective number of lights to allow Verizon Wireless technicians to work on tower equipment after dark. Lighting would also be down-shielded and would only be illuminated when technicians are present.

Soundscapes

- Hours of operation of motorized equipment during construction would be limited to 9:00a.m. to 5:00p.m. to protect dawn, dusk, and nighttime quiet.
- Equipment would not be allowed to idle longer than 2 minutes when not in use.
- All motor vehicles and equipment would have mufflers conforming to original manufacturers' specification that are in good working order and are in constant operation to prevent excessive or unusual noise.

Special Status Species and Wildlife

- Park staff would inform project personnel about special status species and what actions should be taken if a special status species is encountered to protect the species.
- Construction site and staging areas would be monitored by park natural resource staff throughout the duration of the project in case any special status species unexpectedly appear in the project area. Should any appear and if park staff become concerned about potential impacts on the species from construction or other project related activities, work would stop and not resume until necessary protective steps are taken to avoid any impacts to the special status species.
- If trenches will be open for more than one work day, ramps would be installed every 20 to 50 feet to allow for the escape of animals that may fall in, and/or the trench would be covered to prevent animals from falling in and becoming trapped.

Vegetation and Soils

- Construction zones would be identified (e.g. flagging, construction tape, etc.) to confine activity to the minimum work area required. No work would be conducted beyond the marked designated construction area to reduce disturbance to native plants and reduce the potential for the introduction or spread of invasive non-native plant species.
- Construction equipment would be cleaned before entering the park to minimize the transport of exotic seeds to the site. All equipment entering the park would be inspected and may be required to be pressure washed to remove foreign soil, vegetation, and other materials that may contain non-native seeds or vegetation. Any equipment that leaves the park would need to be re-inspected by park staff prior to re-entering.
- Any non-native species occurring in project and staging areas would be treated before and after construction, as well as in the long-term, using species-specific targeted herbicides approved in the park's Vegetation Management Plan, as deemed necessary by the park's vegetation program manager.
- Nonnative species encroachment and distribution would be monitored for 2–3 years after construction and action would be taken to prevent the spread of nonnative species if they are identified.
- Vegetation program staff at the park would attempt to salvage plants prior to construction that would otherwise be lost. Salvaged plants may be used to revegetate disturbed areas after construction or transplanted to other areas of the park.
- Revegetation and recontouring of disturbed areas would take place following construction, as deemed necessary by the park's vegetation program manager, and would be designed to minimize impacts on native vegetation and deter the possible spread of invasive species. Revegetation efforts would strive to reconstruct the natural spacing, abundance and diversity of native plant species found in similar vegetated landscapes of the park.
- All revegetation efforts would use site-adapted native species and / or site-adapted native seed, and park policies regarding revegetation and site restoration would be incorporated. These efforts would consider, among other things, use of native species, plant salvage potential, and non-native vegetation management. Policies related to revegetation would be referenced from the BRCA Vegetation Management Plan (2010d) and NPS Management Policies (2006b).
- Revegetation efforts would be initiated as soon as possible following construction to minimize the competition of native species with non-native species.
- A pre-construction survey for rare plants would be conducted in any areas suspected of containing populations of these species. Areas found to contain rare plants would be marked (e.g. flagging,

construction tape, etc.) and avoided. If avoidance is not possible salvage via transplant would be conducted if feasible.
- Any fill, rock, or additional topsoil needed would be obtained from a park-approved weed-free source.
- Equipment and construction materials staging areas would be restricted to previously disturbed sites.
- Stockpiled soils and stone material would be covered in accordance with federal, state, or local erosion and sediment control regulations. Silt fencing would be installed, if required.
- Because disturbed soils are susceptible to erosion until revegetation takes place, standard erosion control measures such as straw wattles and / or sand bags would be used to minimize any potential soil erosion during and after construction.
- Topsoil would be removed and stockpiled separately from deeper excavations and used to assist native plant revegetation in disturbance areas.

Visitor Use and Experience

- Signs, alerts, press releases, and notifications would be issued to inform visitors prior to and throughout the duration of construction.
- Construction zones would be identified (i.e. flagging, construction tape, fencing, etc.) to prevent visitors from entering construction zones unknowingly.
- Equipment and material staging and storage would be confined to park assigned areas that would include existing disturbed areas along park roadways and within parking areas. Staging areas would be sited away from visitor use areas to the greatest extent possible and would not impede vehicle traffic of visitors, contractors, or park staff.
- To the extent practical, work would be scheduled to avoid construction activity and construction related delays during peak visitation times. No holiday or night time construction work would be allowed. Weekend construction work would not be allowed unless authorized by the park.

Recommended Wilderness

- No permanent improvements would be made in recommended wilderness.
- Tower antennas would be directed away from recommended wilderness as much as possible to minimize the extent of new cellular signals entering recommended wilderness.
- Contractors would be required to maintain construction equipment properly to minimize any noise that may reach recommended wilderness areas.

General Construction Measures

- Any park infrastructure impacted during construction, including but not limited to paved and unpaved roadways, walkways, and turf, shall be restored to pre-construction conditions upon completion of the project as documented in photographs taken of pre- and post-construction conditions.
- The location of all potential utility lines would be field located and marked prior to work to avoid disturbance conflict.
- All equipment used for the project would be maintained in a clean and well-functioning state to avoid or minimize contamination from automotive fluids. All equipment would be checked daily for leaks, and if a leak is found, the equipment would be removed from the site until it is repaired.
- A pre-construction meeting would be held to review all NPS regulations that pertain to the work area and project, and a final inspection meeting would be conducted to review the project before final closeout.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment (existing setting or baseline conditions) and analyzes the potential environmental consequences (direct, indirect, and cumulative impacts or effects) that would occur as a result of implementing the alternatives.

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). In order to determine the cumulative impacts, it was necessary to examine past, present, and reasonably foreseeable future actions at BRCA. The actions listed below were identified for the purpose of conducting the cumulative impacts analysis. Not all actions apply to every impact topic.

- Planned SCUTA fiber optic utility upgrade including replacement of all active copper telephone lines with fiber optic lines.
- Planned enhancement of the public wi-fi internet currently available in the visitor center and introduction of new public wi-fi service availability at additional locations in the developed area.
- Existing cellular service in BRCA from the Wilson Peak, Henderson Point, and Topic towers located outside of the park.
- Existing above-ground development (structures, roads, trails, etc.) in the developed area including two water tanks and two radio towers on Science Hill.
- Previous construction of the Manzanita, Ponderosa, and Whispering Pines dormitories in the Old NPS Housing cultural landscape.
- Previous release of the Bryce Canyon Shuttle Tracker application (app) by Ride Systems for connected wireless devices.

Historic Properties

Affected Environment

Historic properties are defined as any site, district, building, structure, or object eligible for or listed on the National Register of Historic Places (NRHP), which is the nation's inventory of historic places and the national repository of documentation on property types and their significance.

Cultural Landscape Reports (NPS 2006a) and Cultural Landscape Inventories -CLIs (NPS 2010b, NPS 2010c) were completed for the Bryce Canyon Lodge Historic District and the Old NPS Housing Historic District. These CLIs resulted in recommendations to expand the historic district boundaries for both listed districts; thus making the entirety of the expanded areas, including the cultural landscapes, eligible for listing on the NRHP. These recommendations received concurrence from the park superintendent and the State Historic Preservation Officer (SHPO) making the cultural landscapes components of each historic district. In addition, Historic Structure Reports were completed for the Old Housing Historic District (NPS 2015) and the Utah Parks Company Service Station (NPS 2005). A detailed summary of the below listed historic properties is provided in Appendix A. Figure 6 displays the locations of the historic properties in relation to the proposed tower locations.

Eight historic properties were identified that could potentially be affected by the considered alternatives:

- Bryce Canyon Lodge Historic District including the Bryce Canyon Lodge and Deluxe Cabins National Historic Landmark
- Old NPS Housing Historic District
- Bryce Canyon National Park Scenic Trails Historic District
- Bryce Inn (now General Store)
- Loop C Comfort Station – North Campground
- Loop D Comfort Station – North Campground
- Old Administration Building (now High Plateaus Institute)
- Utah Parks Company Service Station

Historic properties are evaluated for significance and integrity through using the following NRHP criteria:

- Criteria A: Associated with events that have made a significant contribution to the broad patterns of history.
- Criteria B: Associated with the lives of significant persons.
- Criteria C: Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
- Criteria D: Potential to yield information important to prehistory or history (NPS 1997).

In addition to meeting one or more of the NRHP criteria, a property must have integrity, or the ability to convey its significance through its physical features. There are seven aspects of integrity defined by the NPS:

- Location: The place where a historic property was constructed, or where a historic event occurred.
- Design: The combinations of elements that create the form, plan, space, structure, and style of a property.
- Setting: The physical environment of a historic property.
- Materials: The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- Workmanship: The physical evidence of the crafts of a particular culture or people during any given period in prehistory or history.
- Feeling: The property's expression of the aesthetic or historic sense of a particular period of time.
- Association: The direct link between an important historic event or person and a historic property.

Historic properties either retain integrity (that is, convey their significance) or they do not. To retain historic integrity a property will always possess several, and usually most, of the aspects. Some aspects of integrity are more important to a particular property's significance. A direct or indirect adverse effect occurs when alterations to a property's contributing features are diminished.

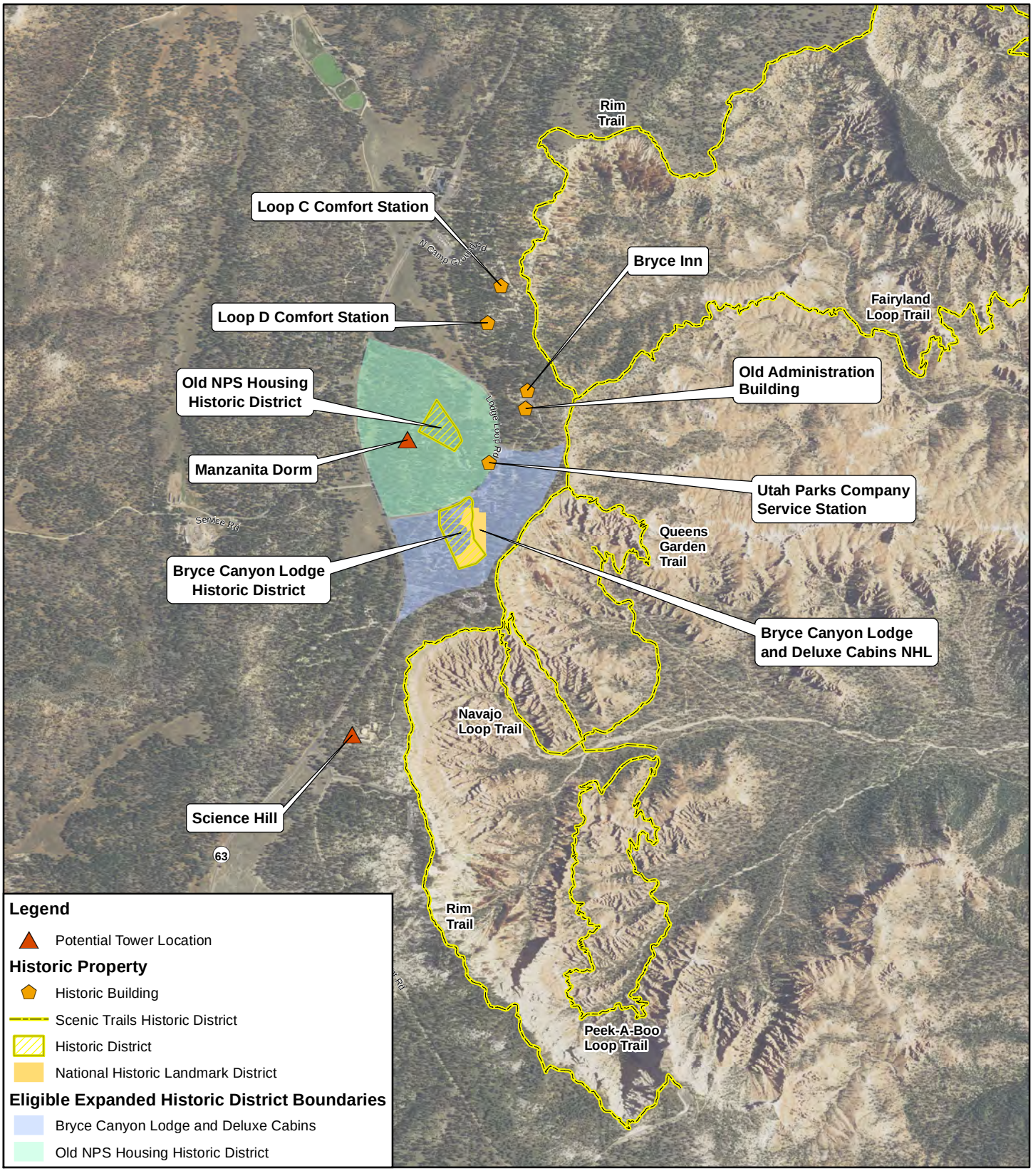

FIGURE 6

Historic Properties

Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection

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Impacts of Alternative A — No Action

No action would be taken, and there would be no new direct/indirect impacts to any historic properties.

Cumulative Impacts

The impacts on historic properties would not change under Alternative A; therefore, there would be no cumulative impacts.

Impacts of Alternative B — New Tower at Science Hill

Direct Impacts

There are no historic properties that would be directly impacted by the proposed tower and utility routes under Alternative B.

Indirect Impacts

Except for the Bryce Canyon National Park Scenic Trails Historic District, the historic properties listed in Appendix A are all more than 1,800 feet (0.34 mile) north of the tower site. The proposed tower would either not be visible at all from these properties or would be heavily screened and would not figure prominently in views of the properties, or from the properties, due to the intervening distance, topography, and vegetative screening regardless of the tower type (self-support or monopine) or height (40, 60, or 80 feet) (Appendix B). Therefore, the proposed tower would have little to no impact on the integrity of these historic properties and would not affect their eligibility for inclusion in the NRHP.

However, the proposed tower would be visible from sections of the Rim Trail and Queen's Garden Trail components of the Bryce Canyon Scenic Trails Historic District at any of the considered heights (40, 60, or 80 feet) (Appendix B). The Rim Trail is about 835 feet east of the tower site at the closest point. The setting of this property is among the most important aspects of its integrity as it was originally designed to provide views of the canyons and amphitheaters below the rim of the Paunsaugunt Plateau and, to a lesser extent, screened views into the developed area on the plateau. The addition of the proposed tower to the viewshed of the Bryce Canyon Scenic Trails Historic District would introduce a modern, man-made element to the natural setting. Regardless of the height or style selected, the proposed tower would not figure prominently in the viewshed of the historic district as it would not be expected to penetrate the skyline or exceed the visually adjacent tree height and would be at least partially screened by tree cover in all views. Therefore, the impact on the integrity of setting would not be substantially diminished and the Bryce Canyon Scenic Trails Historic District would remain listed on the NRHP.

Cumulative Impacts

The previous construction of a 70-foot guyed radio tower, an approximately 50-foot self-support radio tower, and two approximately 25-foot tall water tanks, the larger of which is approximately 85 feet wide and the smaller is about 50 feet wide, on Science Hill has negatively impacted the setting of the Bryce Canyon Scenic Trails Historic District. The viewsheds of the existing radio towers are very similar to the viewsheds for the proposed tower under Alternative B (Figure 10), but the water tanks are only visible from the Rim Trail immediately east of their location and from the vicinity of Inspiration Point. The existing radio towers and water tanks do not figure prominently in the viewshed of the historic district and the impact on the integrity of setting does not diminish the property's ability to convey its significance. Collectively, these past actions have had, and would continue to have, adverse impacts on historic properties, specifically the Bryce Canyon Scenic Trails Historic District, but the historic district retains sufficient integrity to convey its significance. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on the

Bryce Canyon Scenic Trails Historic District historic property would continue to be adverse. The incremental impacts of Alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Impacts of Alternative C — New Tower at Manzanita Dorm

The area of potential impact for Alternative C is located within the Old NPS Housing Historic District as expanded per the CLI. The other remaining identified historic properties as identified in Appendix A are generally located ¼ to ½ mile away from the tower site. The direct and indirect impacts, respectively, are discussed below.

Direct Impacts

Contributing buildings to the Old NPS Housing Historic District include: five small cabins, the "wood vendor," a large single-family residence, and the ranger dormitory. The ranger residence was destroyed by fire, but the remaining stone wall is a contributing element to the historic landscape. The proposed location of the tower would be screened from view from these buildings by a hill and vegetation and would not figure prominently on the landscape regardless of tower style or height. Potential impacts on these buildings as staff housing are described below under land use.

In addition, the 2010 Old NPS Housing Historic District CLI (NPS 2010c) provides a listing of landscape features that contribute to the significance and integrity of the historic district. Described below are the impacts on these landscape features.

Historic Trace Road

The proposed access and utility routes extending from the Manzanita Dorm parking lot to the proposed tower site follow the historic trace road, which is a remnant of an asphalt road that once provided access to maintenance areas and additional housing to the northwest prior to the re-routing of the Rim Road (Highway 63) in 1958. The historic trace road is in poor condition as most of the asphalt paving material has been removed and the land minimally revegetated with bunch grasses (NPS 2010c). Under Alternative C, about 450 feet of the historic road would be rebuilt as a 12-foot wide gravel road. The historic trace road primarily retains integrity of location, which would not be impacted under Alternative C as the new road would follow the historic road alignment. The new road would also be comparable in scale to the historic road as it would not require any widening of the sparsely vegetated path that indicates the former location of the road. The historic trace road would retain sufficient integrity to convey its significance.

Land Use

Land use in the area consists primarily of residential facilities for permanent and seasonal staff for both NPS and concessioners. Alternative C would introduce a commercial utility structure to the landscape that would be incompatible with the historic use of the area for staff housing and would, therefore, negatively impact the integrity aspects of design, feeling, and association for the cultural landscape. Despite this change and loss of integrity, the area would otherwise continue to be used for residential housing and would retain sufficient integrity to convey its significance.

Natural Systems and Features, and Topography

The topography of the area is significant and helps to define an intimate, enclosed character. The most prominent features of this area are the two low knolls that separate the residential area from the Rim Road to the west. The proposed tower location under Alternative C would be

located near the base of the larger, northwest knoll. The proposed tower site is a relatively flat area adjacent to the historic trace road that winds around the knoll, but some grading would be required during construction of the tower to further level the area. Grading activities would be limited to an area of at most approximately 0.16 acre (7,000 square-feet), which represents less than 1% of the approximately 17-acre knoll. The grading would not substantially change the topographic feature and would not affect its ability to convey its significance as a barrier between the housing area for park staff and public areas used by visitors.

Vegetation

The vegetation within the Old NPS Housing area is predominantly ponderosa pine forest and high-plateau sagebrush meadows. In conjunction with the topography, the existing forest vegetation on the slopes of the knolls contributes to the intimate atmosphere of the area. The forest helps to shield views to and from the buildings from outside the district, as well as between widely-spaced structures within the district. A higher density of forest is found in this area than similar areas nearby, likely owing to a combination of factors including a lack of historic development except for the existing structures, historic fire suppression, and supplemental plantings.

Construction of the proposed tower and access road would require removing some low herbaceous and shrub vegetation, as well as about six ponderosa pine trees from the vicinity of the tower. A permanent loss of roughly 7,000 square-feet (0.16 acre) of vegetation would result from the installation of the fenced tower compound and access road. Trampling during construction would also damage an area of up to 9,400 square-feet (0.22 acre) but following construction this area would be revegetated by seeding and/or planting it with native grasses and forbs as needed. Additionally, construction of the project would open a new pathway for invasive species to establish and spread, but mitigation measures incorporate the overall treatment guidelines for *Natural Systems* provided in the Cultural Landscape Report (NPS 2006a, pg. V-5) and include pre-construction requirements for vehicles, monitoring, and erosion control measures to minimize the potential spread of non-native plants.

There would be a combined permanent and temporary loss of about 0.38 acre of vegetation and potential introduction of invasive species. The remaining native vegetation cover would continue to act as a shield for views to, from, and between buildings in the district and would retain sufficient integrity to convey its significance.

Indirect Impacts

Excluding the Old NPS Housing Historic District, the remaining historic properties are located between ¼ and ½ mile of the tower site (Appendix A and Figure 6). Due to the intervening topography and vegetative screening, the proposed tower would either not be visible at all from these properties or would be heavily screened and would not figure prominently in views of the properties, or from the properties, regardless of the tower type (self-support or monopine) or height (40, 60, or 80 feet) (Appendix B). Therefore, the proposed tower would have little to no impact on the integrity of these historic properties and would not affect their eligibility for continued inclusion in the NRHP.

In summary, given the direct and indirect impacts described above, Alternative C would result in changes that adversely impact the historic trace road, land use, northwest knoll topographic feature, and vegetation characteristics of the Old NPS Housing District. However, whether considered together or individually the impacts to these characteristics of the historic district would not substantially diminish the integrity of location, setting, design, materials, workmanship, feeling or association.

Therefore, the Old NPS Housing Historic District would retain sufficient integrity to convey its significance as a residential housing area for park staff. The described impacts to the historic district would be expected regardless of the tower style (self-support or monopine) or height (40, 60, or 80 feet).

Cumulative Impacts

Past, present, and reasonably foreseeable future actions that have adversely impacted the Old NPS Housing Historic District include the previous construction of the Manzanita, Ponderosa, and Whispering Pines dorms, and the planned upgrade and extension of the SCUTA copper telephone lines to fiber optic.

The Manzanita dormitory is somewhat consistent with the historic style of the Old NPS Housing Historic District with the exception of its scale and some design elements, while the Ponderosa and Whispering Pines dormitories are largely not consistent with the historic context in their design, scale, materials, and location. The considerable lack of historic context exhibited by these structures, in particular the Ponderosa and Whispering Pines dorms, diminishes the Historic District's integrity of feeling and association.

The existing SCUTA copper telephone lines in the Old NPS Housing Historic District are being upgraded to fiber optic. The ground and vegetation disturbing activities would have temporary, negative impacts on the integrity of the cultural landscape component within the historic district. The ground disturbing activities associated with Alternative C would largely overlap spatially and temporally with areas disturbed for installation of fiber optic lines.

Collectively, these past actions have had, and would continue to have, adverse impacts on the Old NPS Housing Historic District. Alternative C would adversely impact the historic trace road, land use, northwest knoll topographic feature, and vegetation characteristics of the historic district, but the district would retain sufficient integrity to convey its significance. When the effects of Alternative C are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on the Old NPS Housing Historic District would continue to be adverse. The incremental impacts of Alternative C would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Vegetation

Affected Environment

The vegetation of BRCA reflects the changes in elevation and topography, as well as the geology, soils, and water availability within the park. The Vegetation Classification and Mapping Project Report mapped and characterized the vegetation communities found in BRCA (Tendick et al. 2011). The Alternative B (Science Hill) tower site is located at the convergence of the following vegetation communities: Bristlecone Pine Woodland; Ponderosa Pine – (Douglas Fir) / Manzanita Woodland Complex; and Ponderosa Pine / Mixed Herbaceous Woodland Complex. A small area of Roadside Restored Herbaceous Complex vegetation community is also present along the utility route near Highway 63. However, most of the Science Hill project site is within non-vegetated land classifications for built-up land and roadways. The Alternative C (Manzanita Dorm) project site is located along a ridge in a transitional area between the Ponderosa Pine / Mixed Mountain Shrub Woodland Complex vegetation community and the Ponderosa Pine – (Douglas Fir) / Manzanita Woodland Complex vegetation community. A portion of the access and utility route for the Manzanita Dorm site is also within non-vegetated land classifications for built-up land and roadways

Non-native plants exist throughout the park but are concentrated along the road corridors and areas heavily impacted by park operations, visitor use, and livestock facilities. Common invasive species include whitetop (*Cardaria draba*), yellow salsify (*Tragopogon dubius*), yellow sweet-clover (*Melilotus officinalis*), black medic (*Medicago lupulina*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*) and several species of knapweed and thistle. Additional information about the vegetation communities in the park—and the park's management of those communities—can be found in BRCA's Vegetation Management Plan and Environmental Assessment (NPS 2010d). Vegetation communities found near the project sites are shown in Figure 7.

A plant survey was conducted by park staff of the Science Hill project area in June 2017. The tower site is in a location primarily mapped as Bristlecone Pine Woodland (Figure 7) but the characteristics of this community were not observed. Vegetation at the site consisted primarily of shrub species such as manzanita (*Arctostaphylos patula*), antelope bitterbrush (*Purshia tridentata*) and mountain lilac (*Ceanothus martinii*), and common forb and grass species such as King's flax (*Linum kingii*), primrose, Fendler's sandwort (*Arenaria fendleri*), stemless four-nerve daisy (*Tetraneuris acaulis*), evening primrose (*Oenothera spp.*), matted penstemon (*Penstemon caespitosus*), and Indian rice grass (*Achnatherum hymenoides*), which is more characteristic of the Ponderosa Pine – (Douglas Fir) / Manzanita Woodland Complex. Total vegetation cover at the site was roughly 25% to 30%. Populations of *Lomatium minimum* (little desert parsley), a species of conservation concern, were observed growing along the margin of approximately 200 feet of the existing access road at the site. The closest population to the tower site was about 75 feet to the east.

Plant surveys were conducted of the Manzanita Dorm project area in September 2016 and June 2017. Ponderosa pine was the dominant canopy species found at the site with few limber pine (*Pinus flexus*) and Rocky Mountain Juniper also present; however, the canopy is absent along the access and utility routes where an old road was previously located. Greenleaf manzanita was the dominant understory shrub species observed, with common occurrences of antelope bitterbrush and mountain lilac, and to a lesser degree, snowberry (*Symphoricarpos oreophilus*) and horsebrush (*Tetradymia canacens*). On the north- and east-facing slopes of the site native bunch grasses and exotic sod-forming grasses had a large presence in the understory. In contrast, the understory found on the south- and west-facing slopes was sparser between shrubs, with an apparent higher diversity of forb species. Individuals of *Townsendia minima* (Wyoming Townsend daisy) and *Draba subalpina* (subalpine draba) were observed in the project area. *T. minima* is listed on the Utah Native Plant Society's "Watch List" for potential conservation (Alexander 2016), and *D. subalpina* is identified as 'vulnerable' by NatureServe (2018).

Impacts of Alternative A — No Action

No action would be taken and there would be no new direct/indirect impact to vegetation communities in the park related to the denial of the right-of-way permit applications.

Cumulative Impacts

The impacts on vegetation would not change under Alternative A; therefore, there would be no cumulative impacts.

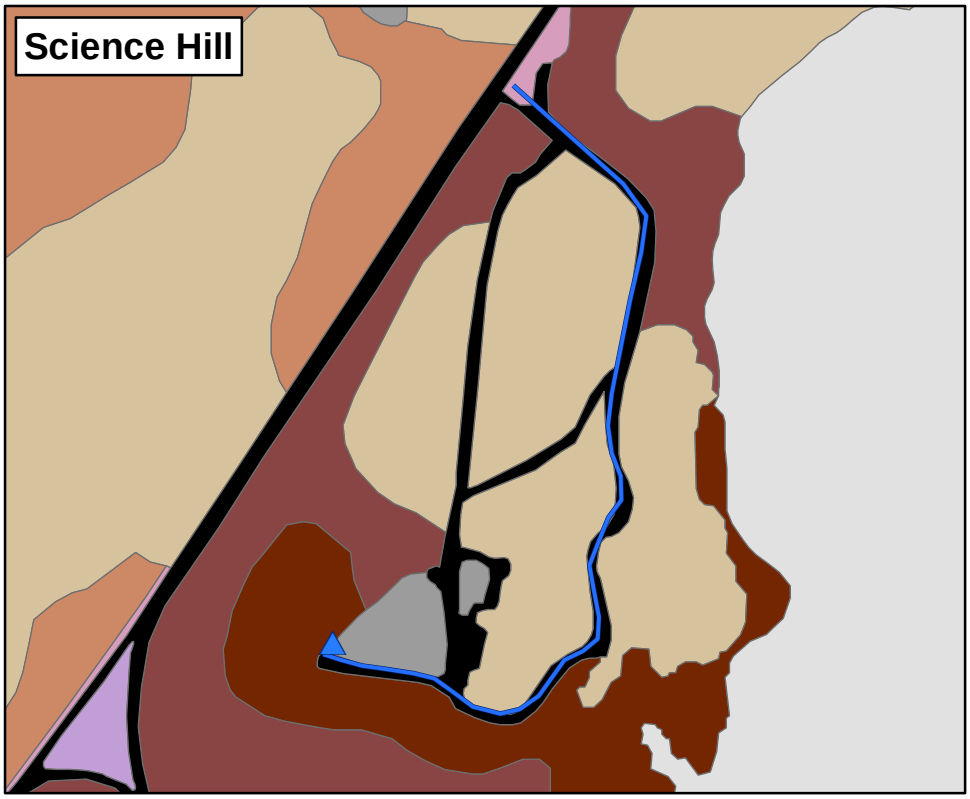
Legend

Potential Tower Location

Access/Utility Route

Vegetation Communities and Landcover Types

- Bristlecone Pine Woodland
- Ponderosa Pine / Mixed Herbaceous Woodland Complex
- Ponderosa Pine / Mixed Mountain Shrub Woodland Complex
- Ponderosa Pine – (Douglas Fir) / Manzanita Woodland Complex
- Black Sagebrush Shrubland Complex
- Viscid Rabbitbrush Shrubland Complex
- Perennial Disturbed Grassland Complex
- Dry Meadow Mixed Herbaceous Vegetation Mosaic
- Roadside Restored Herbaceous Complex
- Sedge and Rush Wet Meadow Herbaceous Vegetation Mosaic
- Claron Formation
- Mixed Urban or Built-up Land
- Roadways



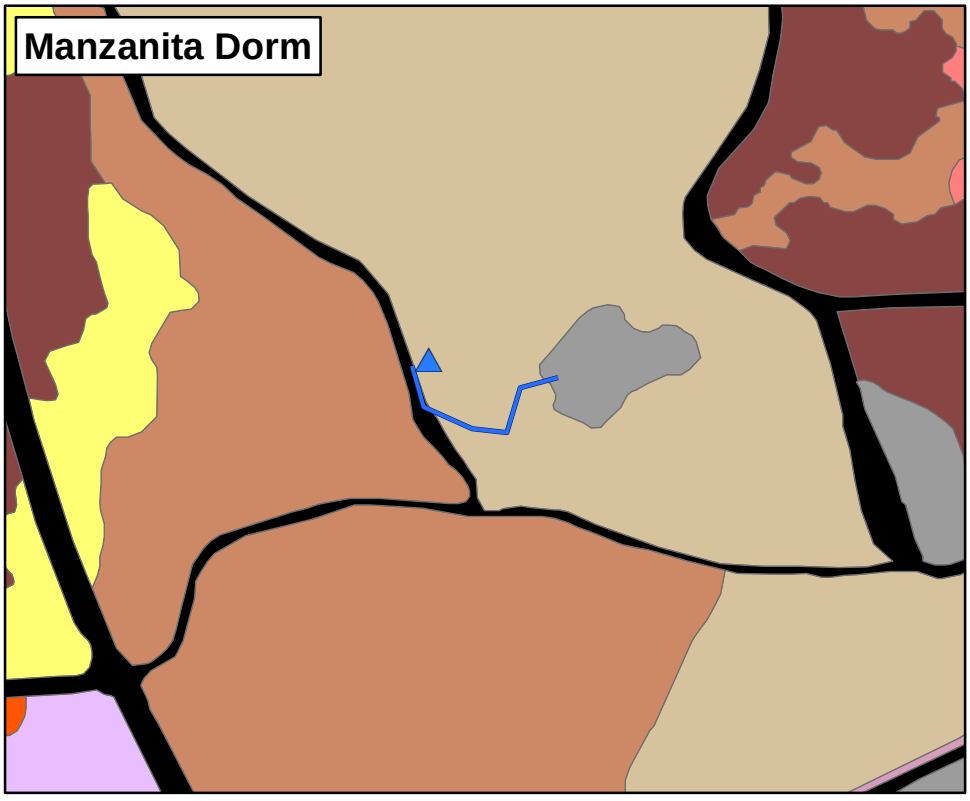


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FIGURE 7

Vegetation Communities in Potential Project Areas

Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection

United States Department of the Interior / National Park Service

October 2019

Impacts of Alternative B — New Tower at Science Hill

The majority of the 0.6-acre project area, which includes the fenced tower area, power and fiber optic utilities, and construction work areas, lies within the existing gravel access road. About 0.1 acre of the project area is vegetated in the vicinity of the tower compound and electrical utility route. A permanent loss of roughly 900 square-feet of vegetation and exposed soil would result from the installation of the fenced tower compound. Trampling during construction would also damage an area of up to 3,300 square-feet (0.08 acre) but following construction this area would be revegetated by seeding and/or planting it with native grasses and forbs as needed (see Mitigation Measures). Impacted species are relatively common to BRCA, and the site location avoids sensitive bristlecone pine habitat. Minimal tree removal may also be required possibly including one large (16 inch diameter at breast height [dbh]) ponderosa pine and / or less than 5 smaller (up to 4 inches dbh) ponderosa pine or juniper trees (BRCA 2017).

The fiber optic utility line would be installed in the previously disturbed road corridor and would not impact any vegetation, including the sensitive species *L. minimum*. The *L. minimum* populations along the road would either be transplanted or populations would be marked off for avoidance to ensure construction personnel would not impact them (see Mitigation Measures).

Vegetation and soils disturbance resulting from construction of the project would open a new pathway for invasive species establishment. Listed Mitigation Measures including pre-construction requirements for vehicles and monitoring, would minimize the introduction and spread of nonnative plants.

Cumulative Impacts

Approximately 3 acres of vegetation was removed from Science Hill for construction of the water tanks, radio towers, and associated access roads. These actions have had, and would continue to have, adverse impacts on vegetation. As described above, Alternative B would result in an additional permanent loss of roughly 900 square-feet of vegetation and exposed soils, and an additional 3,300 square-feet (0.08 acre) of vegetation and bare soil would be disturbed during construction but would be revegetated as needed following completion of construction. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on vegetation would continue to be adverse. The incremental impacts of Alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Impacts of Alternative C — New Tower at Manzanita Dorm

The majority of the 0.4-acre project area, which includes the fenced tower area, power and fiber optic utilities, access road, and construction work areas, lies within an old road scar. The pavement was removed from the road and the area is now sparsely vegetated with few shrubs, forbs and grasses. Only the tower compound would be located beyond the old road scar in relatively undisturbed vegetation. A permanent loss of roughly 7,000 square-feet (0.16 acre) of vegetation and exposed soil would result from the installation of the fenced tower compound and access road. Permanent vegetation loss would include about six mature ponderosa pine trees (Figure 5). Trampling during construction would also damage an area of up to 9,400 square-feet (0.22 acre) but following construction this area would be revegetated by seeding and/or planting it with native grasses and forbs as needed (see Mitigation Measures). A variety of individual grasses, forbs, shrubs, and trees would be lost or damaged under Alternative C, but these species are common in the park so the impact to the larger vegetation community would be minimal.

A total of two individuals of *T. minima* were identified throughout the entire surveyed area. Large populations of *T. minima* occur in nearby locations in the park so impacts to individuals in the project area would have a minimal effect on the species local population. *D. subalpina* was also found sparingly in the project area. This species is endemic to the region but is fairly common so impacts to individuals in the project area would have a minimal effect on the species. The listed Mitigation Measures include practices to reduce impacts to rare plant species.

Several exotic species were observed in the project area during the 2016 and 2017 surveys and vegetation and soils disturbance resulting from construction of the project would open a new pathway for invasive species to establish and spread, as well as promote erosion. Listed Mitigation Measures, including pre-construction requirements for vehicles, monitoring, and erosion control measures, would minimize the potential spread of non-native plants and soil erosion.

Cumulative Impacts

Approximately 0.5 acre of vegetation was removed for construction of the Manzanita dormitory and associated parking lot. These actions have had, and would continue to have, adverse impacts on vegetation. The planned upgrade of the existing SCUTA copper telephone lines to fiber optic will also impact vegetation in the vicinity of the Alternative C project area. Ground disturbing activities associated with replacing the buried utility lines would temporarily (expected to be up to 3 years) impact vegetation until it is able to recover naturally or through establishment of supplemental plantings or seeding. These actions have had, and would continue to have, adverse impacts on vegetation. Part of the existing copper line that will be upgraded lies within the old road where the access and utility routes are proposed to be located under Alternative C. The ground disturbing activities associated with Alternative C would largely overlap spatially and temporally with areas disturbed for installation of fiber optic lines. When the effects of Alternative C are combined with other past and present impacts, the total cumulative impact on vegetation would continue to be adverse. The incremental impacts of Alternative C would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Visitor Use and Experience

Affected Environment

The impact topic “Visitor Use and Experience” focuses on the majority of park visitors who visit sites within the developed area, who drive through, who stay in park lodging or campgrounds, and/or who day hike near the rim of the Bryce Amphitheater. Visitors outside of these areas would not be affected by the action alternatives, and so were not considered in the analysis.

BRCA is a high-profile national park with visitors from all over the world. Visitation at the park steadily increased from 1,012,563 in 2007 to 1,745,804 in 2015 and jumped to 2,679,478 in 2018 (Figure 8) (NPS 2019). The peak visitation period for the park is March through November. Visitors primarily come to the park for the scenic vistas, but many also watch wildlife, take photos, hike, camp, and stargaze while in the park. The locations visited by the majority of visitors include the four scenic overlook points in the Bryce Amphitheater (Sunset Point, Sunrise Point, Bryce Point and Inspiration Point) as well as the visitor center, and about half of visitors visit the Bryce Canyon Lodge (NPS 2010a).

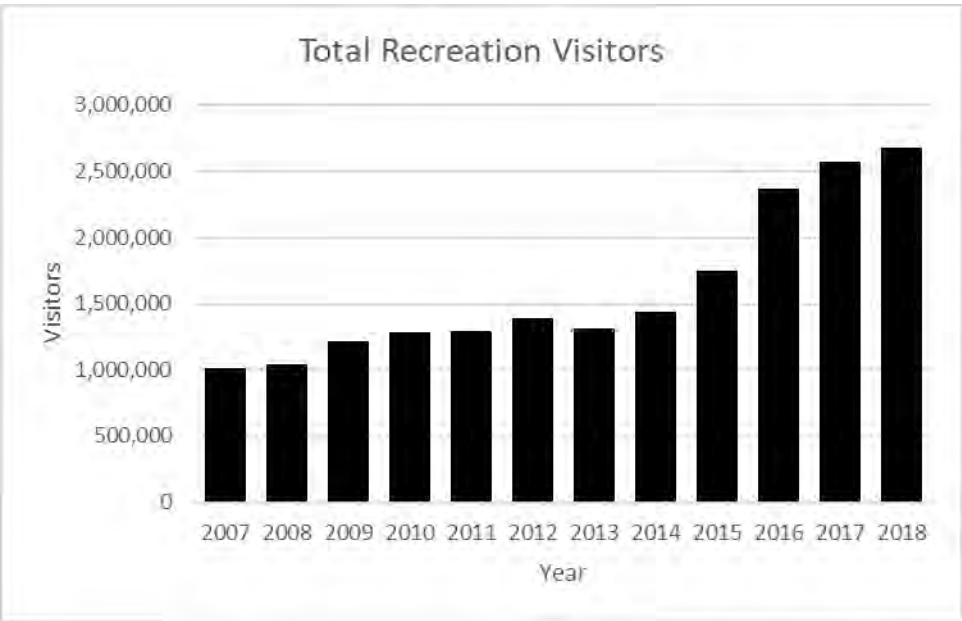


Figure 8. Annual visitation trends at BRCA (NPS 2019)

Visitors increasingly use phones as cameras to take photographs locally for viewing and sharing on social media instantly or when they return home. Visitors who travel with electronic devices may use them for photography, music (with and without earphones), information (such as guidebooks), and as route-finding tools within the park. These uses may occur with or without access to wireless (cellular or wi-fi) network services.

The park increasingly utilizes social media to communicate with the public about park conditions, and visitors increasingly rely on use of social media to monitor weather, road, and trail conditions within the park. Currently, park visitors must obtain information from locations primarily outside the park where wi-fi and cellular signals are available, or in person at the park visitor center using wi-fi available at that location or directly from park staff or bulletin board postings. The BRCA website is one of the most common sources of information for visitors prior to visiting the park and is also used by some visitors during their visit (NPS 2010a).

Existing Verizon Wireless towers or antennas in the vicinity of BRCA include sites on Wilson Peak (northwest), near Ruby's Inn (known by Verizon Wireless as "Henderson Point") (north), and in the town of Tropic (east). The Tropic site went on-line in the fall of 2017. These sites provide limited cellular service within the park. The Wilson Peak and Henderson Point sites provide coverage primarily above the canyon rim on the plateau, while the Tropic site provides coverage primarily below the rim within the amphitheater. Cellular coverage is generally better in BRCA than in many other national parks; however, gaps in coverage and limited network capacity in many areas with coverage can result in unreliable service (e.g., missed or dropped calls, failed text messages, and/or slow data speeds).

Impacts of Alternative A — No Action

There would be no change in visitor experience under the no action alternative and there would be no new direct/indirect impacts on visitor use and experience.

Cumulative Impacts

The impacts on visitor use and experience would not change under Alternative A; therefore, there would be no cumulative effects.

Impacts of Alternative B — New Tower at Science Hill

Under Alternative B the proposed tower would improve cellular service by closing some coverage gaps and increasing network capacity in the developed area. This would result in fewer dropped calls and faster data speeds at some locations during periods of high visitation. Cellular service impacts would not be affected by tower style (self-support or monopine) but would be influenced by tower location and height.

Under Alternative B, regardless of tower height, visitors would generally get coverage outdoors and in their vehicles and experience moderately fast data speeds in the vicinity of the Lodge, Lodge Loop Road, Sunset Campground, Sunset Motel, Sunset View Overlook, and the Visitor Center (Table 1). At none of these locations do visitors have a good chance of coverage indoors.

As a result of the increased cellular service availability in these areas, visitors may increase their use of cellular devices for route finding, information (via electronic educational and interpretive media), and communication within their travel group, with emergency services and with park information services (interpreters, rangers).

There would likely be more encounters with people talking on their cell phones, or broadcasting music or other noise. For those visitors who feel cellular service detracts from their park experience, increased cellular service could adversely impact their visit if, for example, they are distracted by people talking or listening to music on their phones and by cell phone ringtones. However, though their experience would be diminished because of these impacts, it is unlikely that these visitors would be displaced from the park.

For visitors who feel cellular service enhances their park experience, including increased comfort due to connectivity with others, impacts would be beneficial. In addition, some visitors would have access to park information on their cellular devices and may pursue activities in areas of the park they otherwise would not visit, resulting in beneficial impacts.

Under Alternative B benefits would only be realized by Verizon Wireless subscribers, which currently account for just over one third (about 35%) of U.S. wireless subscribers (Dano 2018), but negative impacts may be experienced by any visitor.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions that have impacted visitor use and experience include the existing limited cellular service from towers outside the park boundaries, the potential enhancement to the public wi-fi internet currently available at the Visitor Center and introduction of new public wi-fi internet availability at select locations in the developed area serviced by the proposed upgraded SCUTA fiber optic utility network, and the release of the Bryce Canyon Shuttle Tracker application (app) by Ride Systems for connected wireless devices.

The existing limited Verizon Wireless cellular service within the developed area primarily originates from the Wilson Peak and Henderson Point antenna sites located northwest and north of the park, respectively, as well as some service provided by the Tropic site located to the east of the park. The proposed upgraded fiber optic utility network would allow for faster wi-fi internet at the Visitor Center and for new wi-fi internet availability at concessioner assigned facilities that currently have copper lines. The Shuttle Tracker app allows visitors to track the park shuttle in real time, view stop locations, estimate arrival times, see how full shuttles are, and receive important announcements and updates. This app benefits visitors by allowing them to more easily navigate the park using the shuttle service and allows the shuttle operators to more easily track capacity and ensure enough shuttles are operating to meet demand and reduce the likelihood of visitors waiting curbside for extended periods of time.

Collectively, the current cellular service in the developed area, the Shuttle Tracker app, and the proposed enhanced and expanded wi-fi internet availability in the park have both adverse and beneficial impacts on visitor use and experience as described above, depending on the perception of the visitor regarding technology and cell phone use within the park.

When the effects of Alternative B are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on visitor use and experience would continue to be both adverse and beneficial. The incremental impacts of Alternative B would contribute to, but would not substantially change, the impacts that are already occurring.

Impacts of Alternative C — New Tower at Manzanita Dorm

Under Alternative C the proposed tower would improve cellular service by closing some coverage gaps and increasing network capacity in the developed area. This would result in fewer dropped calls and faster data speeds at some locations during periods of high visitation. Cellular service impacts would not be affected by tower style (self-support or monopine) but would be influenced by tower location and height.

Under Alternative C, coverage would be about the same as under Alternative B regardless of tower height for the Sunset Campground, Sunset Motel, and Sunset View Overlook. However, coverage in the vicinity of the Lodge and Lodge Loop Road depends on tower height. In these areas, the 40-foot and 60-foot towers would provide less outdoor/in-vehicle coverage than under Alternative B and only the 80-foot tower would have about the same coverage. Alternative C would, however, provide the possibility for indoor coverage at the Visitor Center with an 80-foot tower, which would not be expected under Alternative B. See Table 1 and Table 2 for a summary of expected relative signal strengths under Alternative B and Alternative C

As a result of the increased cellular service availability in these areas, visitors may increase their use of cellular devices for route finding, information (via electronic educational and interpretive media), and communication within their travel group, with emergency services and with park information services (interpreters, rangers).

There would likely be more encounters with people talking on their cell phones, or broadcasting music or other noise. For those visitors who feel cellular service detracts from their park experience, increased cellular service could adversely impact their visit if, for example, they are distracted by people talking or listening to music on their phones and by cell phone ringtones. However, though their experience

would be diminished because of these impacts, it is unlikely that these visitors would be displaced from the park.

For visitors who feel cellular service enhances their park experience, including increased comfort due to connectivity with others, impacts would be beneficial. In addition, some visitors would have access to park information on their cellular devices and may pursue activities in areas of the park they otherwise would not visit, resulting in beneficial impacts.

Under Alternative C benefits would only be realized by Verizon Wireless subscribers, which currently account for just over one third (about 35%) of U.S. wireless subscribers (Dano 2018), but negative impacts may be experienced by any visitor.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions that have impacted visitor use and experience include the existing limited cellular service from towers outside the park boundaries, the potential enhancement to the public wi-fi internet currently available at the Visitor Center and introduction of new public wi-fi internet availability at select locations in the developed area serviced by the proposed upgraded SCUTA fiber optic utility network, and the release of the Bryce Canyon Shuttle Tracker application (app) by Ride Systems for connected wireless devices.

The existing limited Verizon Wireless cellular service within the developed area primarily originates from the Wilson Peak and Henderson Point antenna sites located northwest and north of the park, respectively, as well as some service provided by the Tropic site located to the east of the park. The proposed upgraded fiber optic utility network would allow for faster wi-fi internet at the Visitor Center and for new wi-fi internet availability at concessioner assigned facilities that currently have copper lines. The Shuttle Tracker app allows visitors to track the park shuttle in real time, view stop locations, estimate arrival times, see how full shuttles are, and receive important announcements and updates. This app benefits visitors by allowing them to more easily navigate the park using the shuttle service and allows the shuttle operators to more easily track capacity and ensure enough shuttles are operating to meet demand and reduce the likelihood of visitors waiting curbside for extended periods of time.

Collectively, the current cellular service in the developed area, the Shuttle Tracker app, and the proposed enhanced and expanded wi-fi internet availability in the park have both adverse and beneficial impacts on visitor use and experience as described above, depending on the perception of the visitor regarding technology and cell phone use within the park.

When the effects of Alternative C are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on visitor use and experience would continue to be both adverse and beneficial. The incremental impacts of Alternative C would contribute to, but would not substantially change, the impacts that are already occurring.

Visual and Scenic Resources

Affected Environment

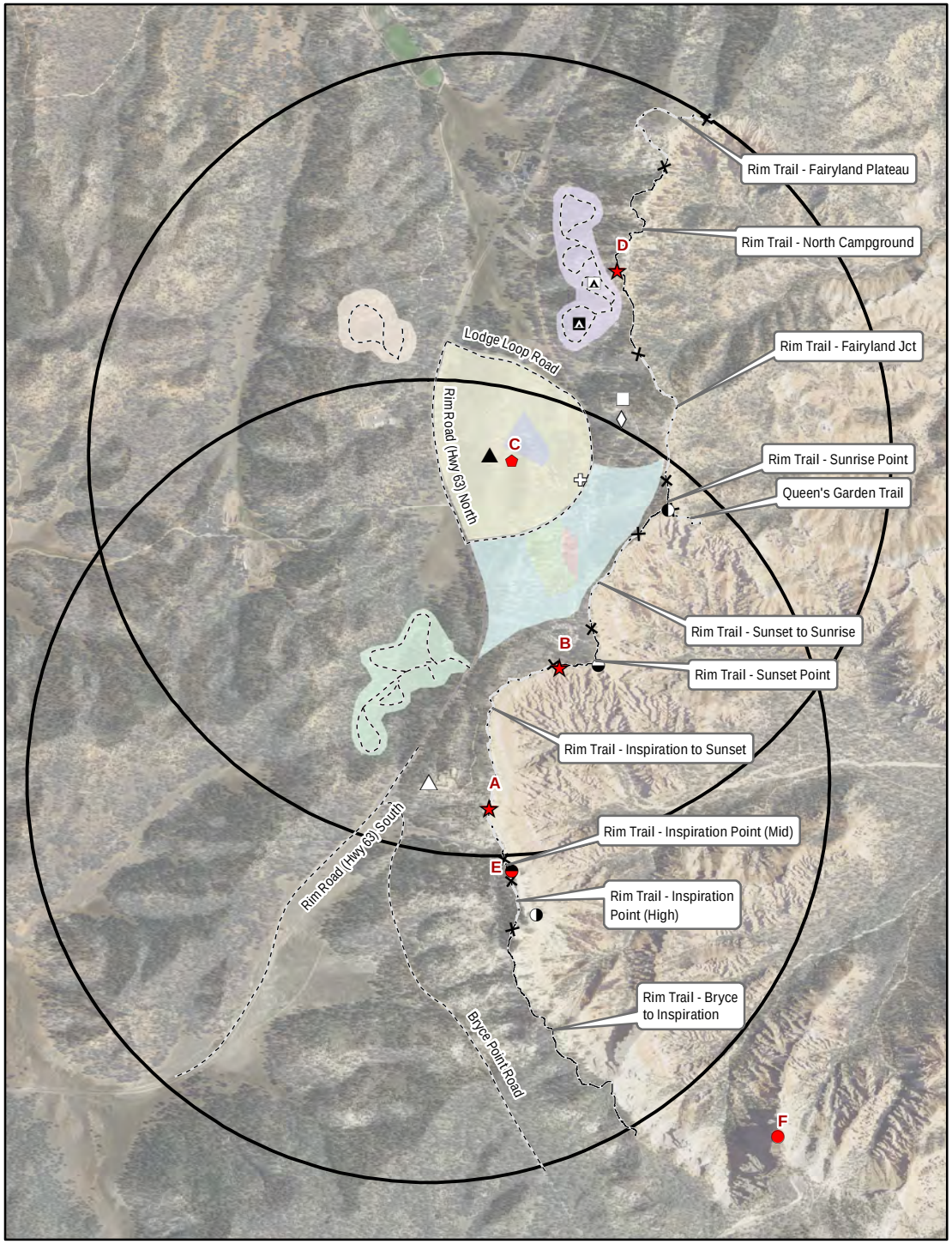
Views are considered an important part of the visitor experience at national parks and features on the visible landscape influence the enjoyment, appreciation, and understanding of a park. BRCA was established to preserve the unique and scenic geologic features found throughout the park, and accordingly the primary visual attractions within the park are its scenic vistas of the erosional features

carved in the Claron Formation below the canyon rim including hoodoos, fins, windows, fluted cliffs, bridges, arches, and grottoes. Additionally, from the high panoramic viewpoints throughout the park visitors can often see over a hundred miles beyond the park boundary including views of cliffs, canyons, and forested landscapes (Baril et al. 2018). NPS policy (2006b) also mandates that development within parks does not compete with or dominate park features and all facilities be harmonious with and integrated into the park landscape and environs to minimize environmental impact, including the installation of in-park utilities such that they are as unobtrusive as possible.

The developed area includes a grouping of visitor facilities (e.g., lodging, dining, camping, parking, etc.) as well as administrative facilities (e.g., staff housing, material storage, scientific and communication equipment, commercial horse areas, etc.). The concentration of these varied uses within the natural setting of the larger park creates a sort of village atmosphere, although uses are often separated from each other to prevent a dense or urban feeling. The developed area is characterized by gently rolling topography interspersed with low knolls. The natural landscape is primarily coniferous forest with some areas of open meadow (NPS 2006a).

The elevation of the developed area is around 8,000 feet above mean sea level (AMSL) and the elevation on the plateau rises about 1,000 feet AMSL from the north end of the park to the south end. The elevation at the proposed tower location under Alternative B (Science Hill) is approximately 8,129 feet AMSL, and the elevation at the proposed tower location under Alternative C (Manzanita Dorm) is approximately 7,984 feet AMSL. Existing vertical elements in the vicinity of the Alternative B project area (Science Hill) include an approximately 70-foot guyed radio tower, an approximately 50-foot self-support radio tower, and two approximately 25-foot tall water tanks, the larger of which is approximately 85 feet wide and the smaller is about 50 feet wide. There are no existing vertical elements in the immediate vicinity of the Alternative C (Manzanita Dorm) site other than the surrounding pine forest.

A Visual Impact Assessment (Appendix B), was completed to determine the potential visual effects of the alternatives on visual and scenic resources in the park. Visual impacts were assessed by considering the visual experience of visitors (with the unaided eye), from 33 key observation points (KOPs) within one mile (study area) of the proposed tower location for each alternative (Figure 9). The existing views from each of the 33 KOPs are described in Table 4.



Potential Tower Location

- Science Hill
- Manzanita Dorm
- 1-Mile Radius Study Area

Key Observation Point (KOP) and Photo Simulation Viewpoint

- Bryce Inn KOP
- Old Administration Building KOP
- Loop C Comfort Station KOP
- Loop D Comfort Station KOP
- Utah Parks Company Service Station KOP
- Manzanita Dorm KOP and Photo Simulation Viewpoint
- Bryce Point Scenic Overlook Photo Simulation Viewpoint
- Inspiration Point Scenic Overlook (High) KOP
- Inspiration Point Scenic Overlook (Mid) KOP and Photo Simulation Viewpoint
- Sunrise Point Scenic Overlook KOP
- Sunset Point Scenic Overlook KOP
- Photo Simulation Viewpoint
- Road KOP
- Trail Segment KOP
- Trail Segment KOP
- Bryce Canyon Lodge Cultural Landscape KOP
- Bryce Canyon Lodge Historic District KOP
- Bryce Canyon Lodge and Deluxe Cabins NHL District KOP
- Mission 66 Housing KOP
- North Campground KOP
- Old NPS Housing Cultural Landscape KOP
- Old NPS Housing Historic District KOP
- Sunset Campground KOP

0 Mile 0.5

FIGURE 9
Key Observation Points (KOPs) and Study Areas
Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection
United States Department of the Interior
National Park Service
October 2019

Table 4: Existing views from scenic resource KOPs.

Scenic Resource KOP	Existing Views
Historic Properties	
Bryce Canyon Lodge and Deluxe Cabins NHL **Bryce Canyon Lodge Historic District** **Old NPS Housing Historic District** **Bryce Inn** **Old Administration Building** **Loop C Comfort Station** **Loop D Comfort Station** **Utah Parks Company Service Station**	Views from these KOPs generally include historic and modern buildings, roads, parking areas, trails, Ponderosa pine forests, and meadows. Views from the individual historic properties and those within and outside of the historic districts and landscapes are screened by vegetation and topography, which largely prevents viewers from seeing beyond their immediate vicinity. No views of the amphitheaters are afforded from these locations.
Bryce Canyon National Park Scenic Trails Historic District Portions of the Rim Trail (divided into 10 segments) and Queen's Garden Trail (1 segment) only were identified as KOPs, the remaining trails in the historic district do no fall within the viewshed of the proposed alternatives. Rim Trail segments include: Fairlyland Plateau, North Campground, Fairyland Jct, Sunrise Point, Sunset to Sunrise, Sunset Point, Inspiration to Sunset, Inspiration Point (Mid), Inspiration Point (High), Bryce to Inspiration.	The trails primarily provide visual access to the canyons and amphitheaters below (east of) the rim of the Paunsaugunt Plateau, but also afford views into the developed area on the plateau to the west. The two existing radio towers on Science Hill are visible from the Inspiration Point (High), Inspiration Point (Mid), Inspiration to Sunset, and Sunrise Point Rim Trail KOPs as well as the Queen's Garden Trail KOP. The two existing water tanks on Science Hill are visible from the Inspiration Point (High), Inspiration Point (Mid), and Inspiration to Sunset Rim Trail KOPs.
Scenic Overlooks	
Sunrise Point **Sunset Point** **Inspiration Point (Mid)** **Inspiration Point (High)**	Located along the Rim Trail, the scenic overlooks primarily provide views of Bryce Canyon National Park's iconic geology, but also afford views of the developed area on the plateau above the canyon. The two existing radio towers on Science Hill are visible from the Inspiration Point (High), Inspiration Point (Mid), and Sunrise Point KOPs. The two existing water tanks on Science Hill are visible from the Inspiration Point (High) and Inspiration Point (Mid) KOPs.
Park Roads	
Rim Road (Hwy 63) North **Rim Road (Hwy 63) South** **Lodge Loop Road** **Bryce Point Road**	Views from the roads mostly include the adjacent vegetation consisting primarily of ponderosa pine forest with some openings into sagebrush meadow. No views of the amphitheaters are afforded from these roadways. The Lodge Loop Road also affords views of historic and newer park buildings.
Visitor Campgrounds	
North Campground **Sunset Campground**	Views from these KOPs primarily include Ponderosa pine forest as well as historic and newer comfort station buildings, roads, trails, and campsites. Views within the campgrounds as well as views out of the campground areas are limited by the Ponderosa pine forest and the gently rolling topography present at these locations.

Scenic Resource KOP	Existing Views
NPS Staff and Concessioner Housing	
Manzanita Dorm	A non-contributing element of the Old NPS Housing Cultural Landscape, views from this KOP primarily include Ponderosa pine forest as well as one historic building (Ranger Dorm [HS-4]). The topography and forest cover at this location limit views within the area.
Mission 66 Housing	Views from this KOP generally include residential park buildings, roads, parking areas, and Ponderosa pine forest. The rolling topography and forest cover present at this location limits views in to, or out of, the area.

Impacts of Alternative A — No Action

Under Alternative A, no new structures would be constructed so there would be no changes to the visual and scenic resources in the developed area. No new impacts to visual and scenic resources would occur.

Cumulative Impacts

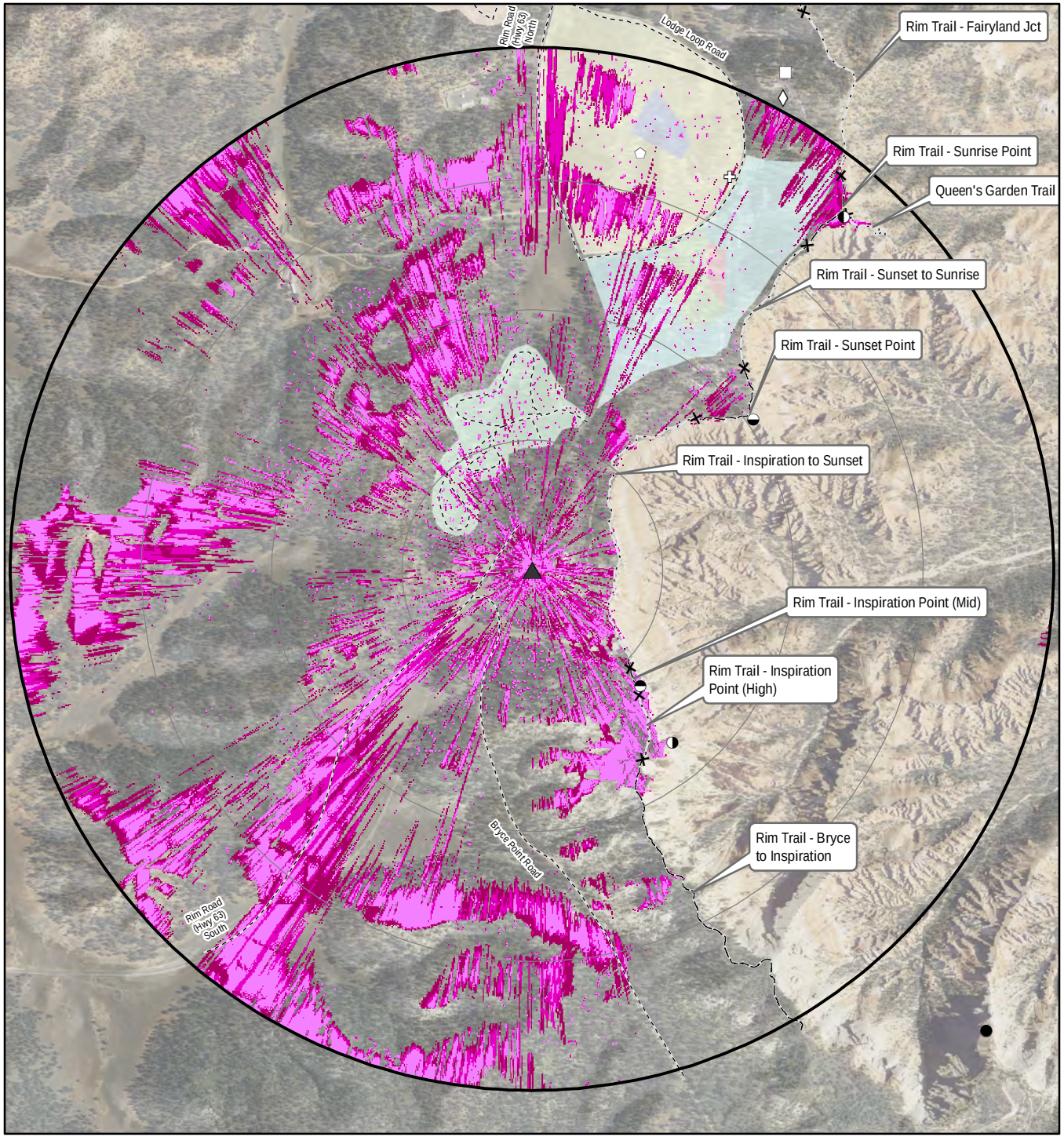
The impacts on visual and scenic resources would not change under Alternative A; therefore, there would be no cumulative impacts.

Impacts of Alternative B — New Tower at Science Hill

All or part of the 24 KOPs listed in Table 5 below are within the 1-mile study area for Alternative B. The KOPs and modeled viewsheds for the 40-foot, 60-foot and 80-foot tower heights under Alternative B are shown on Figure 10. Photo simulations of self-support and monopine style towers seen from Sunset Point, Inspiration Point, Bryce Point, and two locations on the Rim Trail are included in Appendix B. Impacts to visual and scenic resources for the range of tower designs considered under Alternative B are discussed below.

Table 5: KOPs in the study area for Alternative B.

Historic Properties	Scenic Overlooks
Bryce Canyon Lodge and Deluxe Cabins NHL	Sunrise Point
Bryce Canyon Lodge Historic District	Sunset Point
Old NPS Housing Historic District	Inspiration Point (Mid)
Utah Parks Company Service Station	Inspiration Point (High)
Bryce Canyon National Park Scenic Trails Historic District	**Park Roads**
Rim Trail - Sunrise Point	Rim Road (Hwy 63) North
Rim Trail - Sunset to Sunrise	Rim Road (Hwy 63) South
Rim Trail - Sunset Point	Lodge Loop Road
Rim Trail - Inspiration to Sunset	Bryce Point Road
Rim Trail - Inspiration Point (Mid)	**Visitor Campgrounds**
Rim Trail - Inspiration Point (High)	Sunset Campground
Rim Trail - Bryce to Inspiration	**NPS Staff and Concessioner Housing**
Queen's Garden Trail	Manzanita Dorm



Potential Tower Location
1-Mile Radius Study Area
0.25-Mile Distance Intervals

Viewshed

40-foot Tower
60-foot Tower
80-foot Tower

Key Observation Point (KOP)

Bryce Inn
Old Administration Building
Utah Parks Company Service Station
Manzanita Dorm
Bryce Point Scenic Overlook
Inspiration Point Scenic Overlook (High)
Inspiration Point Scenic Overlook (Mid)
Sunrise Point Scenic Overlook
Sunset Point Scenic Overlook
Road
Trail Segment
Trail Segment
Bryce Canyon Lodge Cultural Landscape
Bryce Canyon Lodge Historic District
Bryce Canyon Lodge and Deluxe Cabins NHL District
Mission 66 Housing
North Campground
Old NPS Housing Cultural Landscape
Old NPS Housing Historic District
Sunset Campground

0 Mile 0.5

Figure 10
Science Hill Viewshed

Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection
United States Department of the Interior
National Park Service
October 2019

From 12 of the 24 KOPs, a tower at any height (80, 60, or 40 feet) on Science Hill would either not be visible at all or would not be seen by the casual observer because of heavy screening from intervening vegetation and topography. The few visitors who could see it would likely be those who were aware of it in advance and actively looking for it. See Photo Simulation F in Appendix B for an example of the greatest expected visibility of the tower from these locations.

80-Foot Tower

From the following 12 remaining KOPs, an 80-foot tower on Science Hill would be more obvious:

- Inspiration Point (Mid and High), Sunset Point, and Sunrise Point scenic overlooks;
- Portions of the Inspiration Point (Mid and High), Inspiration to Sunset, Sunset Point, and Sunrise Point segments of the historic Rim Trail with an approximate combined total length of just under 1 mile;
- About 500 feet of the historic Queen's Garden Trail descending from Sunrise Point;
- About 1 mile of the Rim Road (Highway 63) South; and
- About 0.2 mile of Bryce Point Road.

Views of the lower portion of the tower from these 12 KOPs would be at least partially obscured by topography and/or vegetation; however, the top-most portion of the tower would extend above the adjacent trees and/or penetrate the skyline and would, therefore, be visible to many visitors at these KOPs. The degree of visibility would depend on the proximity of the KOP to the tower. From more distant locations, including the Sunset and Sunrise Point segments of the Rim Trail and scenic overlooks, and the Queen's Garden Trail, the tower would not compete with major landscape elements because it would lack sufficient contrast and/or would occupy a small part of the field of view. See Photo Simulation B in Appendix B for an example of the visibility of the tower from these locations.

From closer locations, including the Inspiration Point (Mid and High) segments of the Rim Trail and scenic overlooks, Inspiration to Sunset segment of the Rim Trail, Rim Road (Highway 63) South, and Bryce Point Road, the tower's man-made appearance would clearly contrast with the natural setting, but would not strongly attract attention because it would still occupy a small part of the field of view. The tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater from the scenic overlook and historic trails KOPs. From these KOPs, some visitors who are focused on the scenic views below the rim may not notice the tower at all, so it would have very low potential to impact their experience of the scenic resources. For other visitors who do notice the tower, it would likely draw minimal, if any, focus away from the scenic canyon features. From the park road KOPs, the tower would be visible to northbound travelers only for a few minutes at most. See Photo Simulations A and E in Appendix B for examples of the visibility of the tower from these locations.

The self-support and monopine tower designs would both be an unnatural visual intrusion on the landscape. A self-support tower painted to compliment the surrounding scenery would have similar color contrast as a monopine. A monopine style tower would have less texture contrast with the surrounding scenery than a self-support design as the visual texture would be more similar to the surrounding forest. In the more distant views, a slightly taller "tree" penetrating the skyline would likely be less noticeable to many visitors, and therefore have a smaller visual impact, than a self-support tower (Giggenbach 2008, Mohammed 2006). See Photo Simulation B in Appendix B for an example of the relative visibility of these two tower designs from a distance. Closer views of a monopine tower that allow for greater detail to be observed, however, may draw as much or more attention than a self-support tower would from viewers that recognize the tower as a man-made structure and not a tree

(Stromberg 2015). See Photo Simulations A and C in Appendix B for examples of the relative visibility of these two tower designs from closer viewpoints.

In general, the impact to the visual experience of the scenic resources in the park for those viewers that notice the tower would depend on the perceptions of each individual but would generally be expected to be slightly negative or neutral.

60-Foot Tower

Compared to the 80-foot tower, a 60-foot tower would be much less visible in views that include BRCA's iconic geologic scenery as seen from the Inspiration Point (Mid and High) and Sunrise Point scenic overlooks; the Inspiration to Sunset, Inspiration Point (Mid and High), Sunset Point, and Sunrise Point segments of the Rim Trail totaling about 0.6 mile; and about 300 feet of the historic Queen's Garden Trail descending from Sunrise Point. It would no longer be visible from the Sunset Point scenic overlook. Similarly, there would also be a slight reduction (about 150 feet each) in the length of the Rim Road (Hwy 63) South and Bryce Point Road from which the tower would be expected to be visible. The tower would generally appear to be a similar height as nearby trees without protruding above the horizon and more of the structure would be obscured by topography and vegetation in views that include geologic scenery as well as along roads.

Impacts to the quality of the scenic canyon landscape and views from the affected roads would be similar but reduced from those described above for an 80-foot tower. There would be an estimated 15% reduction in the length of linear KOPs with views of a 60-foot tower compared to an 80-foot tower, and less of the structure of a 60-foot tower would generally be visible further reducing impacts to the scenic quality. At this height, a monopine style tower may be somewhat more effective in helping the facility to blend in with the ponderosa pine forest and reduce the potential visibility of the tower compared to the self-support style tower when viewed at a distance as it would be more similar in height to the surrounding trees. However, closer views of a monopine tower that allow for greater detail to be observed may still draw as much or more attention than a self-support tower would from viewers that recognize the tower as a man-made structure and not a tree. See Photo Simulations A and C in Appendix B for examples of the relative visibility of these two tower designs from closer viewpoints.

Given the reduced visibility of a 60-foot tower, it is likely that more viewers would fail to notice the tower in the landscape resulting in very low potential to impact to their experience of the scenic resources compared to an 80-foot tower. The magnitude of the negative impact on the experience of viewers who do notice the tower, whether a self-support or monopine style, may also be reduced, but would still depend on the perceptions of each individual.

40-Foot Tower

A 40-foot tower would have very low visibility in views that include BRCA's iconic geologic scenery as seen from the Inspiration Point (Mid and High) and Sunrise Point scenic overlooks; the Inspiration to Sunset, Inspiration Point (Mid and High), Sunset Point, and Sunrise Point segments of the Rim Trail (combined total of about 0.3 mile); and about 100 feet of the historic Queen's Garden Trail descending from Sunrise Point. There would be a reduction of about 375 feet in the length of the Rim Road (Hwy 63) South from which the tower would be expected to be visible compared to a 60-foot tower (approximately 525 foot reduction from an 80-foot tower), and a reduction of about 250 feet would be expected along Bryce Point Road compared to a 60-foot tower (400 foot reduction from an 80-foot tower). The tower would generally appear to be a similar height as nearby trees without protruding

above the horizon and in many locations most of the structure would be obscured by topography and vegetation in views that include the geologic scenery as well as along park roads.

A 40-foot tower would likely have very low potential to impact scenic resources as it would not be noticeable to the majority of visitors from most locations in the park even at close distances. The greatest expected visibility would be on a small section of Bryce Point Road within about 1,000 feet of the tower site from which the tower may still penetrate the skyline. As most of a 40-foot tower would be expected to be screened from view by vegetation and topography in views from most locations in the park, the tower style (self-support or monopine) would not be expected to have much influence on the visibility of the tower.

Based on the generally very low anticipated visibility of a 40-foot tower, it is likely that few visitors would notice it where it is visible and there would be very low potential for their experience of the scenic resources to be impacted. The magnitude of the negative impact on the experience of viewers who do notice the tower may be reduced to a minimal level, but would still depend on the perceptions of each individual.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions impacting the visual and scenic resources include two existing radio towers and two water tanks. The two existing radio towers are visible from the Inspiration Point (Mid and High) and Sunrise Point scenic overlooks; the Inspiration to Sunset, Inspiration Point (Mid and High), Sunset Point, and Sunrise Point segments of the Rim Trail; and part of the historic Queen's Garden Trail as it descends from Sunrise Point. Both towers have form, line, color, and texture visual contrasts that are associated with the steel gray lattice tower structure and antennas. The existing towers have a narrow profile and are equipped with omni-type antennas that also have a narrow profile giving the structures very small visual mass, especially when viewed from a distance. The water tanks are only visible from the Inspiration Point (Mid and High) segment of the Rim Trail and scenic overlook, and the Rim Trail immediately east of their location but have a relatively large visual mass. The tanks are painted an orange color in an attempt to blend in with the canyon stone, but still contrast with the color of the trees and additionally have form, line, and texture visual contrasts associated with their shape and smooth appearance.

Collectively, these actions have had, and would continue to have adverse impacts on visual and scenic resources. A tower constructed under Alternative B would generally be visible from many of the same important viewpoints along the canyon rim that currently have views of the existing water tanks and NPS radio towers on Science Hill. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on visual and scenic resources would continue to be adverse regardless of tower height or type selected. The incremental impacts of Alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Impacts of Alternative C — New Tower at Manzanita Dorm

All or part of the 28 KOPs listed in Table 6 below are within the 1-mile study area for Alternative C. The KOPs and modeled viewsheds for the 40-foot, 60-foot and 80-foot tower heights under Alternative C are shown on Figure 11. Photo simulations of self-support and monopine style towers seen from Manzanita Dorm, the Rim Trail near the North Campground, Inspiration Point and Bryce Point are included in

Appendix B. Impacts to visual and scenic resources for the range of tower designs considered under Alternative C are discussed below.

Table 6: KOPs in the study area for Alternative C.

Historic Properties and Cultural Landscapes	Scenic Overlooks
Bryce Canyon Lodge and Deluxe Cabins	Sunrise Point
Bryce Canyon Lodge Historic District	Sunset Point
Bryce Canyon Lodge and Deluxe Cabins Landscape	**Park Roads**
Old NPS Housing Historic District	Rim Road (Hwy 63) North
Old NPS Housing Historic District Landscape	Rim Road (Hwy 63) South
Bryce Inn	Lodge Loop Road
Old Administration Building	Bryce Point Road
Loop C Comfort Station	**Visitor Campgrounds**
Loop D Comfort Station	North Campground
Utah Parks Company Service Station	Sunset Campground
Bryce Canyon National Park Scenic Trails Historic District	**NPS Staff and Concessioner Housing**
Rim Trail - Fairyland Plateau	Manzanita Dorm
Rim Trail - North Campground	Mission 66 Housing
Rim Trail - Fairyland Jct	
Rim Trail - Sunrise Point	
Rim Trail - Sunset to Sunrise	
Rim Trail - Sunset Point	
Rim Trail - Inspiration to Sunset	
Queen's Garden Trail	

From 25 of the 28 KOPs, a tower at any height (80, 60, or 40 feet) at Manzanita Dorm would either not be visible at all or would not be seen by the casual observer because of heavy screening from intervening vegetation and topography. The few visitors who could see it would likely be those who were aware of it in advance and actively looking for it. See Photo Simulations E and F in Appendix B for examples of the greatest expected visibility of the tower from these locations.

<u>80-Foot Tower</u>

From the following 3 remaining KOPs, an 80-foot tower at Manzanita Dorm would be more obvious:

- Portions of the North Campground segment of the historic Rim Trail with an approximate total length of approximately 875 feet;
- Portions of the Old NPS Housing Historic District Landscape; and
- Manzanita Dorm.

Views of the lower portion of the tower from the North Campground segment of the Rim Trail would be at least partially obscured by topography and/or vegetation; however, the top-most portion of the tower would extend above the adjacent trees and/or penetrate the skyline and would, therefore, be visible to many visitors at this KOP. The tower would not compete with major landscape elements because it would lack sufficient contrast and/or would occupy a small part of the field of view due to the distance between the KOP and tower. See Photo Simulation D in Appendix B for an example of the visibility of the tower from this location.

Due to the rolling topography and dense tree cover most views of the tower in the Old NPS Housing Historic District Landscape would be heavily screened and the tower would not likely penetrate the skyline. However, when viewed from locations in close proximity to the tower with relatively sparse

tree cover, like the old road scar or the area in front of the Manzanita Dorm, the top-most portion of the tower would extend above the adjacent trees and/or penetrate the skyline. From these close viewing distances, the tower's man-made appearance would strongly contrast with the natural setting and could draw and hold the attention of viewers interfering noticeably with views of nearby landscape elements. The Old NPS Housing Historic District Landscape is not a public use area, so viewers would generally be limited to area residents, primarily those residing in Manzanita Dorm, and commercial and private users of the horse trail south of the tower site. See Photo Simulation C in Appendix B for an example of the visibility of the tower from these locations.

The self-support and monopine tower designs would both be an unnatural visual intrusion on the landscape. A self-support tower painted to compliment the surrounding scenery would have similar color contrast as a monopine. A monopine style tower would have less texture contrast with the surrounding scenery than a self-support design as the visual texture would be more similar to the surrounding forest. In the more distant views, a slightly taller "tree" penetrating the skyline would likely be less noticeable to many visitors, and therefore have a smaller visual impact, than a self-support tower (Giggenbach 2008, Mohammed 2006). See Photo Simulation D in Appendix B for an example of the relative visibility of these two tower designs from a distance. Closer views of a monopine tower that allow for greater detail to be observed, however, may draw as much or more attention than a self-support tower would from viewers that recognize the tower as a man-made structure and not a tree (Stromberg 2015). See Photo Simulations A and C in Appendix B for examples of the relative visibility of these two tower designs from closer viewpoints.

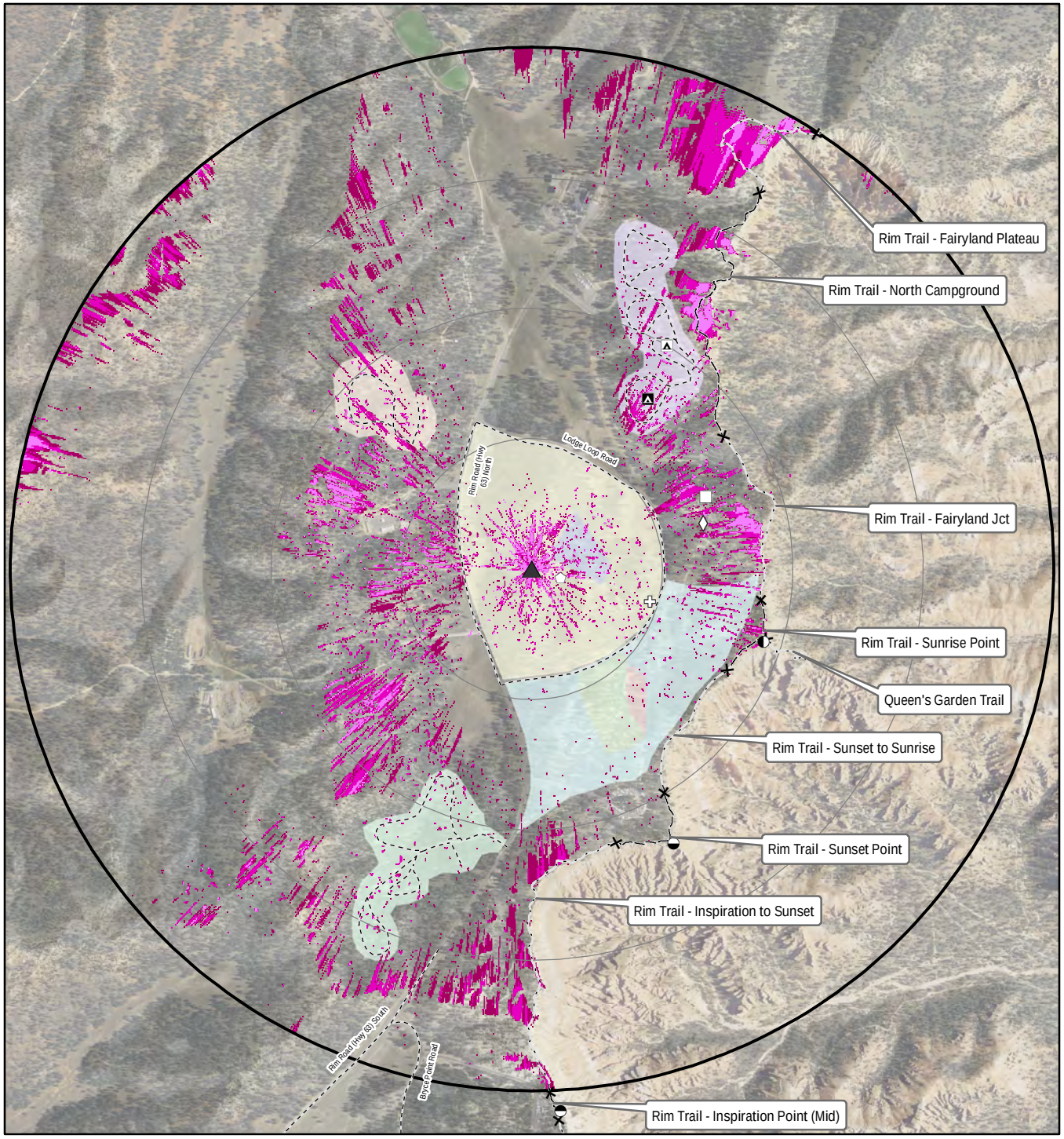
In general, the impact to the visual experience of the scenic resources in the park for those viewers that notice the tower would depend on the perceptions of each individual but would generally be expected to be slightly negative or neutral.

60-Foot and 40-Foot Towers

A 60-foot or 40-foot tower would not be seen by the casual observer from the North Campground segment of the Rim Trail because of heavy screening from intervening vegetation and topography. The few visitors who could see it would likely be those who were aware of it in advance and actively looking for it.

The visibility of a 60-foot or 40-foot tower from the Old NPS Housing Historic District Landscape and Manzanita Dorm would be similar to the 80-foot tower described above, except the shorter towers would not extend above the adjacent trees or penetrate the skyline. Additionally, more of the tower structure would generally be screened by intervening vegetation and topography.

Given the reduced visibility of a 60-foot or 40-foot tower, it is likely that more viewers would fail to notice the tower in the landscape resulting in lower potential to impact their experience of the scenic resources compared to an 80-foot tower. The magnitude of the negative impact on the experience of viewers who do notice the tower, whether a self-support or monopine style, may also be reduced, but would still depend on the perceptions of each individual.



Potential Tower Location
1-Mile Radius Study Area
0.25-Mile Distance Intervals

Viewshed

40-foot Tower
60-foot Tower
80-foot Tower

Key Observation Point (KOP)

Bryce Inn
Old Administration Building
Loop C Comfort Station
Loop D Comfort Station
Utah Parks Company Service Station
Manzanita Dorm
Inspiration Point Scenic Overlook (Mid)
Sunrise Point Scenic Overlook
Sunset Point Scenic Overlook
Road
Trail Segment
Trail Segment
Bryce Canyon Lodge Cultural Landscape
Bryce Canyon Lodge Historic District
Bryce Canyon Lodge and Deluxe Cabins NHL District
Mission 66 Housing
North Campground
Old NPS Housing Cultural Landscape
Old NPS Housing Historic District
Sunset Campground

0 Mile 0.5

Figure 11
Manzanita Dorm Viewshed

Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection
United States Department of the Interior
National Park Service
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Cumulative Impacts

Past and present actions impacting the visual and scenic resources include the construction of historic and newer buildings, roads, and trails in the developed area. Specifically, views from the Manzanita Dorm KOP include one historic building, a parking lot and associated infrastructure; however, views from this KOP primarily include ponderosa pine forest. Similarly, views from the Old NPS Housing Historic District include historic and modern buildings, roads, trails, parking areas, and associated infrastructure. However, views are largely screened by vegetation and topography, which largely prevents viewers from seeing beyond their immediate vicinity. The impacts to the Manzanita Dorm and the Old NPS Housing Historic District would depend on the perceptions of each individual, but the modern elements would generally be expected to be slightly negative or neutral while the historic element would be expected to be neutral to beneficial.

Collectively, these actions have adverse and beneficial impacts on visual and scenic resources in the park. As described above, Alternative C would add to the number of man-made installations in the park that alter the viewshed in the developed area. The total cumulative impact of Alternative C combined with the other past and present impacts on visual and scenic resources would continue to be adverse and beneficial. The incremental impacts of Alternative C would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Recommended Wilderness

Affected Environment

There is no designated wilderness within or near BRCA; however, 22,325 acres (62%) of the park have been recommended as wilderness, which is to be managed in a manner that would retain its wilderness character. Wilderness character is the combination of biophysical, experiential, and symbolic ideals that distinguishes wilderness from other lands. The five qualities of wilderness character are:

1. Untrammeled by humans, where humans are visitors and do not remain;
2. Undeveloped and retaining primeval character and influence without permanent improvements or human habitation;
3. Natural and generally appearing to have been affected primarily by the forces of nature with the imprint of human' work substantially unnoticeable;
4. Offers outstanding opportunities for solitude or primitive and unconfined recreation; and
5. Other features of scientific, educational, scenic, or historical value (NPS 2006b).

The recommended wilderness area is primarily located below the canyon rim and neither of the considered project locations is in recommended wilderness (Figure 12). Cellular service is currently available in the majority of recommended wilderness areas in the northern part of BRCA. In general, it is spotty and weak allowing for occasional voice and text service, but good coverage strong enough to allow for data streaming is present in some areas near Highway 12 in the northern part of the park, as well as areas west of the town of Tropic. Noise from cellular devices currently affects the outstanding opportunity for solitude, and the natural quality of wilderness (e.g., wildlife disturbance). Because primitive recreation requires self-reliance and skills in wilderness travel, opportunities for such experiences may be considered degraded by the presence of technologies that make wilderness travel easier (Landres, et al. 2015). Electronic devices including smartphones with cameras are present and common in recommended wilderness areas in BRCA.

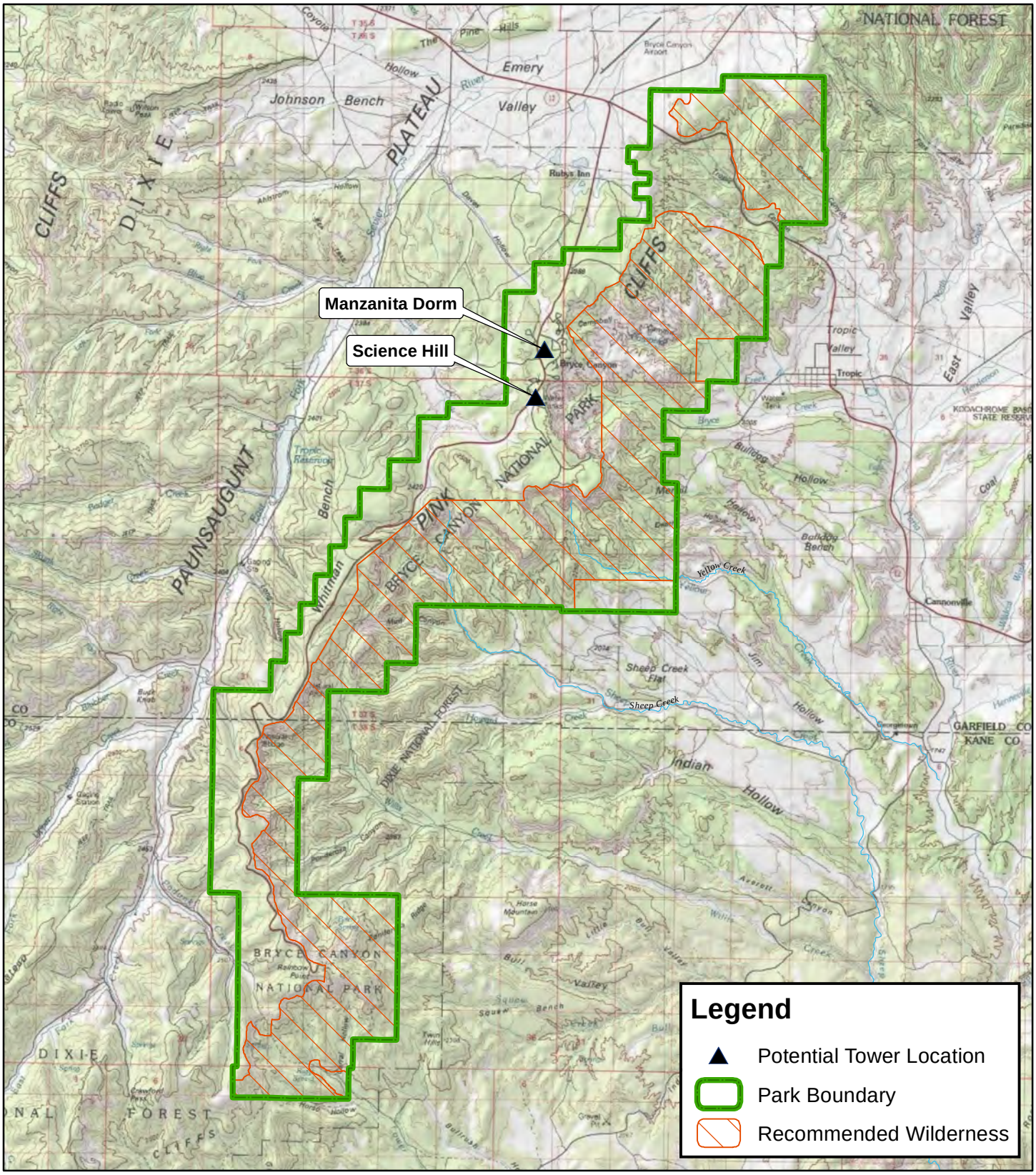

FIGURE 12

BRCA Recommended Wilderness

Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection

United States Department of the Interior / National Park Service

October 2019

Impacts of Alternative A — No Action

Under Alternative A there would be no change to existing recommended wilderness conditions in BRCA. No new direct/indirect impacts to wilderness character would occur.

Cumulative Impacts

The impacts on recommended wilderness would not change under Alternative A; therefore, there would be no cumulative impacts.

Impacts of Alternative B — New Tower at Science Hill

Under Alternative B, potential impacts of cellular service and use of electronic devices to wilderness character include negative impacts to visitor's experience of solitude and opportunities for primitive and unconfined recreation. The degree of impact is subjective, depending on individual visitor preference.

A new tower at Science Hill would have antennas pointed to the north, south and west. No antennas would point east toward the nearest recommended wilderness area. Under Alternative B, there may be some new moderate strength signal coverage on the plateau between Yellow Creek and Sheep Creek, and along the southwestern edge of Boat Mesa. At these locations, visitors would have the ability to use cellular devices to make calls or use data service that they could not under the existing conditions. There are no established trails within these areas that would be affected by Alternative B. The geographic scale of the affected area as well as the magnitude of the increase in cellular signal strength would be very small compared to the areal extent and magnitude of cellular signals already present in the recommended wilderness areas of BRCA.

For the same reasons described above, noise from cellular use is not expected to change and would not impact the natural quality of wilderness.

Cumulative Impacts

Past actions that have impacted recommended wilderness include construction of the Wilson Peak, Henderson Point, and Tropic cellular towers. These towers provide very limited cellular service to much of the northern portion of recommended wilderness in BRCA, which may adversely affect the perception of solitude and the natural quality of recommended wilderness for visitors. These actions have had, and would continue to have, adverse cumulative impacts on recommended wilderness. Alternative B would introduce another source of cellular signals propagating into recommended wilderness areas of the park, but the area affected as well as the magnitude of the increase in cellular signal strength would be very small. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on recommended wilderness would continue to be adverse. The incremental impacts of Alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Impacts of Alternative C — New Tower at Manzanita Dorm

The potential impacts to wilderness character under Alternative C are the same as Alternative B except under this alternative there may be some new moderate strength signal coverage on the southwest edge of the plateau between Yellow Creek and Sheep Creek, and along the ridge east of Bryce Point. At these locations, visitors would have the ability to use cellular devices to make calls or use data service that they could not under the existing conditions. There are no established trails within these areas that would be affected by Alternative C. The geographic scale of the affected area as well as the magnitude of the increase in cellular signal strength would be very small compared to the areal extent and magnitude of cellular signals already present in the recommended wilderness areas of BRCA.

Cumulative Impacts

Past actions that have impacted recommended wilderness include construction of the Wilson Peak, Henderson Point, and Tropic cellular towers. These towers provide very limited cellular service to much of the northern portion of recommended wilderness in BRCA, which may adversely affect the perception of solitude and the natural quality of recommended wilderness for visitors. These actions have had, and would continue to have, adverse cumulative impacts on recommended wilderness. Alternative C would introduce another source of cellular signals propagating into recommended wilderness areas of the park, but the area affected as well as the magnitude of the increase in cellular signal strength would be very small. When the effects of Alternative C are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on recommended wilderness would continue to be adverse. The incremental impacts of Alternative C would contribute slightly to, but would not substantially change, the impacts that are already occurring.

CONSULTATION AND COORDINATION

List of Agencies and Tribes Contacted

Name	Title, Agency
Brian Bremner	County Engineer, Garfield County
Chris Hansen	Preservation Planner/Deputy SHPO, Utah State Historic Preservation Office
Charles F. Wood	Chairman, Chemehuevi Indian Tribe
Virgil W. Johnson	Chairman, Confederated Tribes of the Goshute
Herman G. Honanie	Chairman, The Hopi Tribe
Roland Maldonado	Chairman, Kaibab Band of Paiute Indians
Benny Tso	Chairperson, Las Vegas Tribe of Paiute Indians
Darren Deboda	Chairman, Moapa Band of Paiutes
Russell Begay	President, Navajo Nation
Darren Parry	Chairman, Northwestern Band of Shoshone Nation
Tamra Borchardt-Mayo	Chairwoman, Paiute Indian Tribe of Utah
Lora Tom	Chairwoman, Paiute Indian Tribe of Utah: Cedar Band of Paiutes
Corrina Bow	Chairwoman, Paiute Indian Tribe of Utah: Kanosh Band of Paiutes
LaTosha Mayo	Chairwoman, Paiute Indian Tribe of Utah: Koosharem Band of Paiutes
Jeanine Borchardt	Chairwoman, Paiute Indian Tribe of Utah: Indian Peaks Band of Paiutes
Patrick Charles	Band Chairperson, Paiute Indian Tribe of Utah: Shivwits Band of Paiutes
Carlene Yellowhair	President, San Juan Southern Paiute Tribe
Candace Bear	Chairwoman, Skull Valley Band of Goshute
Clement Frost	Chairman, The Southern Ute Indian Tribe
Luke Duncan	Chairman, Ute Indian Tribe of the Uintah and Ouray
Harold Cuthair	Chairman, Ute Mountain Ute Tribe
Elayne Cantsee	Committee Rep., White Mesa Ute Community
Val R. Panteah Sr.	Governor, Zuni Tribe of the Zuni Reservation

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APPENDIX A: SUMMARY OF HISTORIC PROPERTIES

Resource	Bryce Canyon Lodge and Deluxe Cabins National Historic Landmark Bryce Canyon Lodge Historic District
Type of Property	National Historic Landmark Historic District
Eligibility for Listing on NRHP	NHL Listed 1987 (Harrison 1985) Historic District NRHP Listed 1987, Boundary Increase 1995 (Harrison 1985, Caywood 1994a) Historic District Expansion NRHP Eligible per 2010 NPS CLI (NPS 2010b)
Significance	The Bryce Canyon Lodge and Deluxe Cabins National Historic Landmark (NHL) and Bryce Canyon Lodge Historic District are listed or eligible for listing in the NRHP under Criterion A for their association with the development of the park's recreational facilities, and under Criterion C as an example of rustic building design. The property is associated with the development of concessionaire facilities and partnerships between the NPS and Union Pacific Railroad's Utah Parks Company. It also reflects the work of master architect Gilbert Stanley Underwood, and of Chief NPS landscape engineer (landscape architect) Daniel Ray Hull who collaborated with Underwood in an integrated design approach of the architecture and landscape architecture for the Lodge and cabins. The period of significance is from 1924 through 1944.
Contributing Features and Characteristics	The Bryce Canyon Lodge Historic District encompasses the Bryce Canyon Lodge and Deluxe Cabins NHL as well as a number of important landscape features and a few unlisted buildings and structures. The Historic District includes 26 buildings, 16 of which are designated as a National Historic Landmark. These include the Bryce Canyon Lodge, ten Deluxe Duplex Cabins and five Deluxe Quadruplex Cabins. The remaining buildings in the district include the Recreation Hall, Men's Dormitory, Pump House, Linen House, and six Standard Cabins. Non-contributing buildings in the landscape include the Sunrise and Sunset Motel units. The Lodge historically formed the nucleus of a complex that consisted of more than 60 individual cabins and assorted service buildings; however, most of the smaller, standard cabins have been removed. The remaining buildings generally possess integrity of materials, workmanship and design (exterior surfaces), location, feeling, and association. The historical setting has been compromised somewhat by the elimination of the majority of the standard cabins and rerouting of the road to the Lodge. The landscape vegetation is typical of the Ponderosa Pine forest, but human activity has impacted the density of the tree cover, the balance with understory vegetation, and the introduction of species that would not naturally occur. The central natural feature of the area is the low-timbered knoll in the center of the loop created by the Lodge Loop Road and the Lodge Access Road, which creates a visual division between the major buildings and activity zones that have been located around it. Views outside the area, including views of the canyon rim, are screened by vegetation and topography giving the area a relaxed sense of quiet even during peak season. The Bryce Canyon Lodge landscape is one of the prominent public-use zones within the Park and has a variety of land uses. Most focus upon short-term residential accommodation, but also include support facilities for catering, maintenance, employee housing and administration as well as recreation and interpretive uses. However, changes in circulation patterns (both vehicular and pedestrian), spatial organization, built features and activities have dramatically changed the way visitors experience the Lodge area and have diminished the impact of the Lodge itself. Additionally, the development of the Visitor Center and additional lodging opportunities outside the Park has transformed the Historic Lodge area from the central visitor facility at the Park to a minor element and an experience for a more limited number of visitors. The historic landscape as a whole retains the integrity aspects of location, design, setting, materials, and workmanship.
Approximate Distance to Proposed Science Hill Tower Site	3,600 feet / 0.68 mile from Bryce Canyon Lodge 1,800 feet / 0.34 mile from south edge of cultural landscape area
Approximate Distance to Proposed Manzanita Dorm Tower Site	1,470 feet / 0.27 mile from Bryce Canyon Lodge 1,075 feet / 0.21 mile from northwest edge of cultural landscape area

Resource	Old NPS Housing Historic District
Type of Property	Historic District
Eligibility for Listing on NRHP	Historic District NRHP Listed 1995 (Caywood 1994b) Historic District Expansion NRHP Eligible per 2010 NPS CLI (NPS 2010c)
Significance	The Old NPS Housing Historic District is listed or eligible for listing in the NRHP under Criterion A for their association with the development of NPS administrative infrastructure in the park, and under Criterion C as representative examples of the "simplified" rustic design. The period of significance extends from 1932 to 1944.
Contributing Features and Characteristics	The Old NPS Housing Historic District encompasses 9 buildings as well as significant contextual landscape features, a few unlisted buildings, and the individually NRHP-listed Utah Parks Company Service Station building. Contributing buildings to the district include 5 small cabins, the "wood vendor", a larger single-family residence, and the Ranger Dormitory. The Ranger Residence was destroyed by fire, but the remaining stone wall is a contributing element to the historic district. The Garage is a non-contributing element to the district due to its age. The Utah Parks Company Service Station is also a non-contributing element of the historic district due to its date of construction, purpose, and architectural style and is therefore treated as a separate, free-standing unit. Additional non-contributing buildings in the district include and the Manzanita Lodge, Ponderosa, and Whispering Pines concessioner dormitories. The Historic District represents the first housing development within the park specifically designed to house NPS employees. The area continues to be used for housing Park employees, but now includes concessioner employees as well as NPS staff. This site was intentionally located away from visitor service facilities and the existing forest vegetation was utilized to shield views to and from the buildings to avoid visually interfering with the Park experience of visitors and offering employees privacy from the public. The topography and forest vegetation of the area also helped to create an enclosed forested village atmosphere and were as much a part of the Rustic style as were the buildings. The most prominent topographic features in the area are the two low knolls that separate the residential area from the Rim Road to the West. Characteristic vegetation includes the Ponderosa pine forest and sagebrush meadows. Due to fire suppression and supplemental plantings, the vegetation throughout the area is likely denser than it was during the period of significance. During the period of significance, access to the housing area was only available from one point off the Rim Road by a road currently known as the East Access Road. Historically, this road continued past the residential area around the western and southern edges of the highest knoll to the NPS maintenance area and additional dormitories to the north. When the Rim Road was realigned in 1958 the maintenance area was moved and the portion of the road between the Ranger's Dormitory and the former maintenance area was removed, though traces of it remain. Pieces of asphalt can be seen lying along the route and the land has been minimally revegetated with bunch grasses. This historic trace road along with the East Access Road, part of the North Access Road, and parts of the spur roads to the concessioner dormitories are contributing elements to the historic landscape. Natural features present during the period of significance, such as topography, soils, and vegetation communities persist today with few alterations. Realignment of the Rim Road resulted in slight alteration of vegetation and spatial organization of the landscape and some small-scale changes in topography and vegetation have occurred as the result of building and utility construction projects; however, broader patterns remain. The construction of the Ponderosa and Whispering Pines dormitories, and to a lesser extent the Manzanita Lodge dormitory, have dramatically altered the character of the area. The dormitories are not in keeping with the scale and character of the Simplified Rustic style and related landscape aesthetic presented by the original housing structures and the overall setting created by the harmony between built structures and natural features. The position of the Ponderosa and Whispering Pines dormitories do not reflect the historic spatial organization of the area and, unlike the historic structures, are visible from visitor vantage points. The related alterations to roads and parking lots have changed the character and the feeling of the landscape to reflect more of a contemporary feel with large expanses of pavement, and vehicular and pedestrian traffic flow has been altered resulting in degradation of the quiet village atmosphere and reducing the overall historic integrity of the area. Despite these incompatible characteristics, the historic landscape retains integrity, especially the aspects of location, design, setting, materials and workmanship.

Resource (cont.)	Old NPS Housing Historic District and Landscape
Approximate Distance to Proposed Science Hill Tower Site	4,420 feet / 0.84 mile from south edge of historic district 3,170 feet / 0.60 mile from south edge of cultural landscape area
Approximate Distance to Proposed Manzanita Dorm Tower Site	200 feet from southwestern edge of historic district Within the cultural landscape area

Resource	Bryce Canyon National Park Scenic Trails Historic District
Type of Property	Historic District
Eligibility for Listing on NRHP	NRHP Listed 1995 (Caywood 1994c)
Significance	The Bryce Canyon National Park Scenic Trails Historic District is listed in the NRHP under Criterion A for its association with the development of NPS administrative facilities, and under Criterion C as an example of a designed landscape. The period of significance extends from the date of the construction of the first trail from the plateau into the canyon in 1917 to the end of the historical period as defined in the National Register in 1944. Changes in integrity include the replacement of the original stone and concrete stairway and guard wall with a paved ramp and pipe railing on the Navajo Loop Trail; application of asphalt in high-traffic areas of the Rim Trail; and new tread and alignment modifications (due to erosion, rock fall, etc.) to portions of all trails.
Contributing Features and Characteristics	The Bryce Canyon National Park Scenic Trails Historic District includes the following five structures (trails): Navajo Loop Trail, Queen's Garden Trail, Peekaboo Loop Trail, Fairyland Loop Trail, and Rim Trail, as well as the area 10 feet on either side of the trails. Although the trails have individual names, they are all connected and form a contiguous network. The Rim Trail parallels the edge of the Paunsaugunt Plateau between Fairyland Point and Bryce Point and was constructed between 1931 and 1935. The four remaining trails originate on the Rim Trail and descend into the canyons. The Queen's Garden Trail located between Sunrise and Sunset point, the Navajo Loop Trail accessed from Sunset Point, and the Peekaboo Loop Trail accessed from Bryce Point were all completed in 1929. Portions of the Navajo Loop Trail were constructed prior to the establishment of the park around 1917. Portions of the Fairyland Loop Trail were also constructed before the establishment of the park prior to 1931 and the loop trail was completed between 1934 and 1935. With the exception of the Peekaboo Loop Trail and upper portions of the Queen's Garden Trail which also accommodated horse travelers, all of the trails were designated as foot trails. The placement of these trails in the natural landscape was designed to provide physical and visual access to the canyons and amphitheaters below the rim of the Paunsaugunt Plateau. The first trails included those that make up the current Navajo Loop Trial in the vicinity of Bryce Canyon Lodge and were popular with park tourists during the historical period because they offered the best opportunity to view "hoodoos" up close. A contextual inventory of a portion of the Rim Trail between Sunrise Point and Inspiration Point was included in the Cultural Landscape Report for the Old NPS Housing and Bryce Canyon Lodge Historic Districts (NPS 2006a) in order to understand the human activities in the developed area of the park as a whole. The Cultural Landscape Report identifies two types of views along the Rim Trail: distant views of the canyons and amphitheaters to the east, and screened views into the developed area on the plateau to the west. Inspiration Point is the highest viewpoint along the Rim Trail and provides the greatest opportunity for views to the west beyond the developed area.
Approximate Distance to Proposed Science Hill Tower Site	835 feet / 0.16 mile west from the Rim Trail at the nearest point
Approximate Distance to Proposed Manzanita Dorm Tower Site	2,240 feet / 0.43 mile northwest from the Rim Trail at the nearest point 2,460 feet / 0.46 mile west-northwest from the Queen's Garden Trail at the nearest point

Resource	Bryce Inn
Type of Property	Historic Building
Eligibility for Listing on NRHP	NRHP Listed 1995 (Caywood 1994d)
Significance	The Bryce Inn is listed in the NRHP under Criterion C for its value as an example of Gilbert Stanley Underwood's rustic architectural design. The Bryce Inn is associated with the development of recreational and administrative infrastructure within the park, specifically with concessioner development, and resources associated with the Utah Parks Company. It also represents the last major improvement designed by Gilbert Stanley Underwood for the Utah Parks Company.
Contributing Features and Characteristics	Bryce Inn, also known as the General Store, Head House, or HS-118, was designed by Gilbert Stanley Underwood. It was constructed in 1932 with modifications in 1937 and 1973. The building possesses integrity of materials workmanship, design, and location. The building originally served as a central feature of the Camp Center or the "housekeeping" cabin area group of buildings. Today, it is the remaining concessioner building within the housekeeping area. The removal of all other concessioner buildings from the area has compromised the associative integrity of the Bryce Inn. A contextual inventory of the Bryce Canyon General Store area was included in the Cultural Landscape Report for the Old NPS Housing and Bryce Canyon Lodge Historic Districts (NPS 2006a) in order to understand the human activities in the developed area of the park as a whole. The general store area receives a great deal of visitor traffic due to its location near the north campground and Sunrise point; however, the local topography and forested slopes help to shield views between these areas of activity thereby enabling the area to retain a unique sense of place.
Approximate Distance to Proposed Science Hill Tower Site	5,650 feet / 1.07 mile
Approximate Distance to Proposed Manzanita Dorm Tower Site	1,905 feet / 0.35 mile

Resource	Loop C Comfort Station (North Campground) Loop D Comfort Station (North Campground)
Type of Property	Historic Building
Eligibility for Listing on NRHP	NRHP Listed 1995 (Caywood 1994e, Caywood 1994f)
Significance	The Loop C Comfort Station and the Loop D Comfort Station are listed in the NRHP under Criterion A for their association with the development of NPS administrative infrastructure in the park, and under Criterion C for their representation of NPS rustic architecture. The North Campground was the first formal campground developed and administered by the NPS during the historical period at Bryce Canyon National Park. Loop D was constructed first in 1935 with Loop C added by 1938.
Contributing Features and Characteristics	The North Campground consists of four loops lettered A, B, C, and D, each of which contains a centrally located comfort station surrounded by a number of campsites. The campground is in an area with gently rolling topography and stands of pine with sparse understory vegetation. The Loop C Comfort Station, also known as HS-36, is a one-story log building constructed about 1938. The Loop D Comfort Station, also known as HS-37, is a one-story log building constructed about 1935. Excepting a few modifications, both buildings possesses integrity of materials, workmanship, design, location, and setting. A contextual inventory of the North Campground area was included in the Cultural Landscape Report for the Old NPS Housing and Bryce Canyon Lodge Historic Districts (NPS 2006a) in order to understand the human activities in the developed area of the park as a whole. The majority of the campsites are within the Ponderosa pine forest, but foot traffic and other human activity has reduced the understory significantly. The campground area is characterized by gently rolling topography, which together with the forest cover limits views within the area as well as views out of the campground area.
Approximate Distance to Proposed Science Hill Tower Site	6,945 feet / 1.32 mile from the Loop C Comfort Station 6,365 feet / 1.21 mile from the Loop D Comfort Station
Approximate Distance to Proposed Manzanita Dorm Tower Site	2,640 feet / 0.50 mile from the Loop C Comfort Station 2,085 feet / 0.40 mile from the Loop D Comfort Station

Resource	Old Administration Building
Type of Property	Historic Building
Eligibility for Listing on NRHP	NRHP Listed 1995 (Caywood 1994g)
Significance	The Old Administration Building is listed in the NRHP under Criterion A for its association with the development of NPS administrative facilities in the park, and under Criterion C for its value as an example of NPS rustic architecture. The Old Administration Building represents the first NPS facility constructed in the park to house the administrative activities of NPS personnel.
Contributing Features and Characteristics	The Old Administration Building, also known as the Nature Center, Museum, or HS-31, was constructed in two phases around 1932 and 1934. The building faces east onto a park access road and scattered pine trees and shrubbery are located in front of the buildings. The knoll behind (west) of the building is more densely timbered with ponderosa pine. A contextual inventory of the Bryce Canyon General Store area that includes the Old Administration Building was included in the Cultural Landscape Report for the Old NPS Housing and Bryce Canyon Lodge Historic Districts (NPS 2006a) in order to understand the human activities in the developed area of the park as a whole. The general store area receives a great deal of visitor traffic due to its location near the north campground and Sunrise point; however, the local topography and forested slopes help to shield views between these areas of activity thereby enabling the area to retain a unique sense of place.
Approximate Distance to Proposed Science Hill Tower Site	5,425 feet / 1.03 mile
Approximate Distance to Proposed Manzanita Dorm Tower Site	1,795 feet / 0.34 mile

Resource	Utah Parks Company Service Station
Type of Property	Historic Building
Eligibility for Listing on NRHP	NRHP Listed 1995 (Caywood 1994h)
Significance	The Utah Parks Company Service Station was initially included as a contributing element in the determination of eligibility for the Bryce Canyon Lodge Historic District. However, the subsequent removal of a large number of cabins from the district resulted in a discontinuous distribution of historic resources between the remaining structures in the district and the service station. Therefore, the service station was individually listed in the NRHP under Criterion A for its association with the development of recreational and administrative infrastructure in the park, specifically with concessioner development, and may be considered eligible under Criterion C as an example of the trend toward modern architectural styles in the late 1940s and 1950s. The building was also listed with Criteria Consideration G because it was evaluated prior to its attaining 50 years of age but was considered critical to a complete understanding of the concessioner services available within Bryce Canyon National Park. This building represents the last major improvement constructed by the Utah Parks Company in Bryce Canyon National Park, with the goal of upgrading facilities and extending the range of services to tourists.
Contributing Features and Characteristics	The Utah Parks Company Service Station, also known as HS-117, was designed by Spence, Ambrose, Talley and Lee Architects Associated of San Francisco, California. Harmon Brothers Construction Company, of Salt Lake City, Utah, built the structure around 1947. Rather than the rustic designs used elsewhere, this building reflects modern architectural styles of the 1940s known as “roadside architecture”. Gasoline and automotive services were discontinued in 1988. The service station is currently used as a comfort station for park visitors but remains largely vacant in anticipation of the identification of an appropriate future use. The Utah Parks Company Service Station historic property is also included in the Old NPS Housing Historic District Landscape area but is treated as a separate element due to its date of construction and use.
Approximate Distance to Proposed Science Hill Tower Site	4,445 feet / 0.85 mile
Approximate Distance to Proposed Manzanita Dorm Tower Site	1,240 feet / 0.24 mile

APPENDIX B: VISUAL IMPACT ANALYSIS

VISUAL IMPACT ASSESSMENT

Cellular Telecommunications Tower with Power and Fiber Optic Connection Environmental Assessment
Bryce Canyon National Park

Introduction
The visual impact assessment for this project generally follows the guidance issued by the National Park Service for evaluating renewable energy project visual impact assessments (Sullivan and Meyer 2014) as cellular telecommunications towers share many of the same potential visual impact characteristics as wind turbines or transmission towers. Included in this document are a discussion of the viewshed analysis, identification of key observation points (KOPs), photo simulation preparation, and determination of visual impacts.

Viewshed Analysis Methods and Results
Visual impacts were assessed by considering the visual experience of visitors from locations within one mile of the proposed tower location for each alternative with the unaided eye (study area). While the tower would be visible from some locations greater than one mile away, it would not protrude significantly above the horizon and its appearance to the unaided eye when viewed with a forested backdrop would be so faint that it would either not be perceived at all or would have little to no potential to affect the scenic quality.

The viewshed analysis was completed primarily using the viewshed tool in Google Earth Pro (Google LLC 2018). The "3D Buildings" layer of Google Earth Pro includes approximations of the topology of buildings and trees within Bryce Canyon National Park. By conducting the viewshed analysis in Google Earth Pro using the 3D Buildings layer we believe that a more realistic approximation of the tower viewsheds was created that incorporates the visual screening provided by the forest in the park, whereas a viewshed assessment using ground topography (digital elevation model [DEM]) alone would greatly overestimate the visibility of the tower. The 3D Buildings layer does have limitations affecting the accuracy of the analysis, however. There may be errors or omissions in the locations of trees and other structures, the dimensions of the trees and structures are generalized, and trees are treated a solid objects even though in reality it is often possible to see distant objects between the branches.

To generate the viewsheds for the range of alternatives considered in the EA, placemarks were added for each of the potential tower locations – Science Hill and Manzanita Dorm. Viewsheds were then calculated and displayed for each location with an altitude above ground level of 25 meters (80 feet), 19 meters (60 feet), and 13 meters (40 feet) assigned to each placemark. Each of the resulting viewshed images within the 1-mile study area were then saved and processed using ArcGIS software by Esri Inc. (2017) to generate georeferenced polygons of the viewshed areas for analysis and display in figures. The resulting viewsheds for Alternative B (Science Hill) and Alternative C (Manzanita Dorm) are presented in Image 1 and Image 2, respectively.

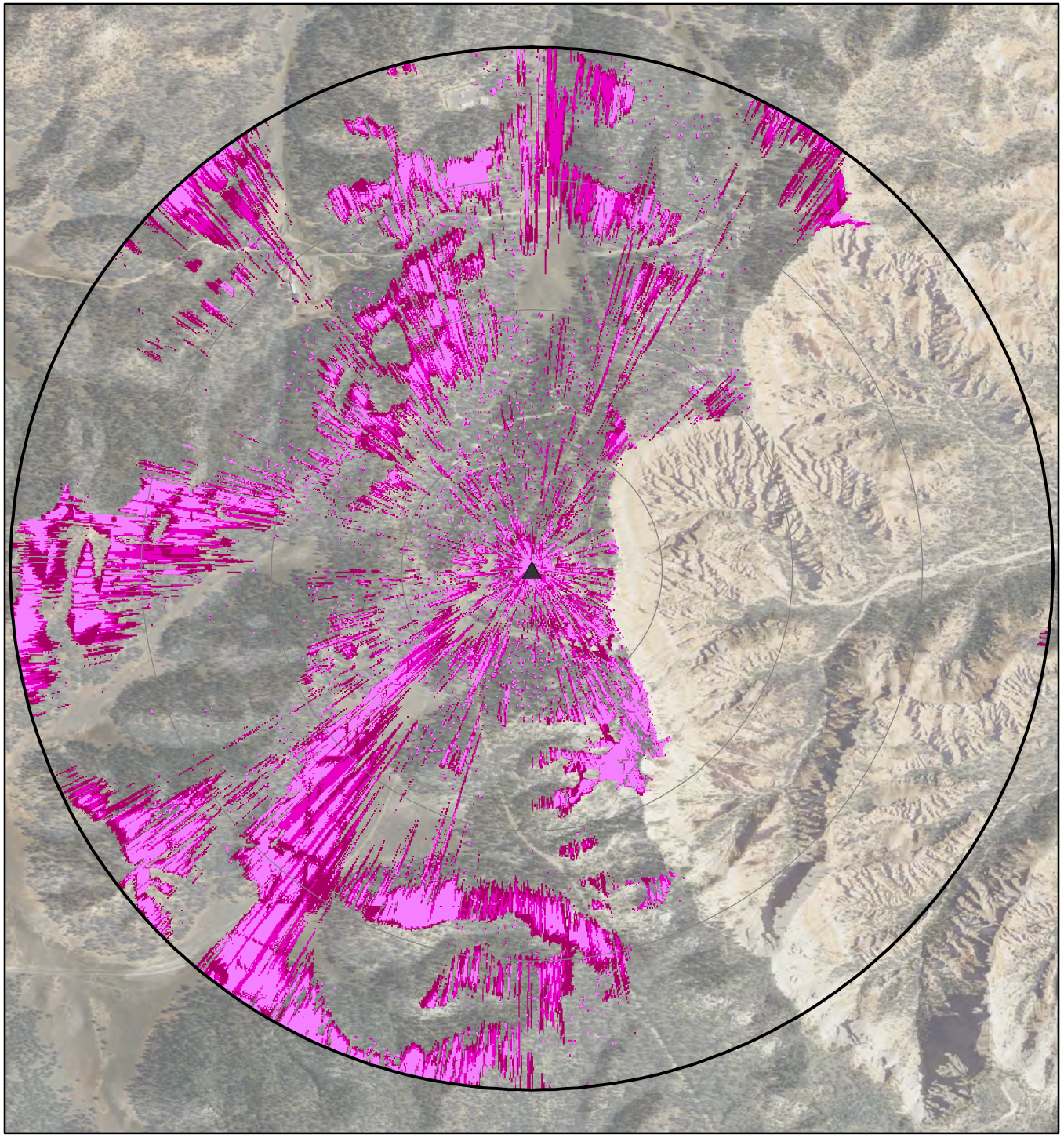

IMAGE 1

Science Hill Viewshed

Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection
United States Department of the Interior
National Park Service
April 2019

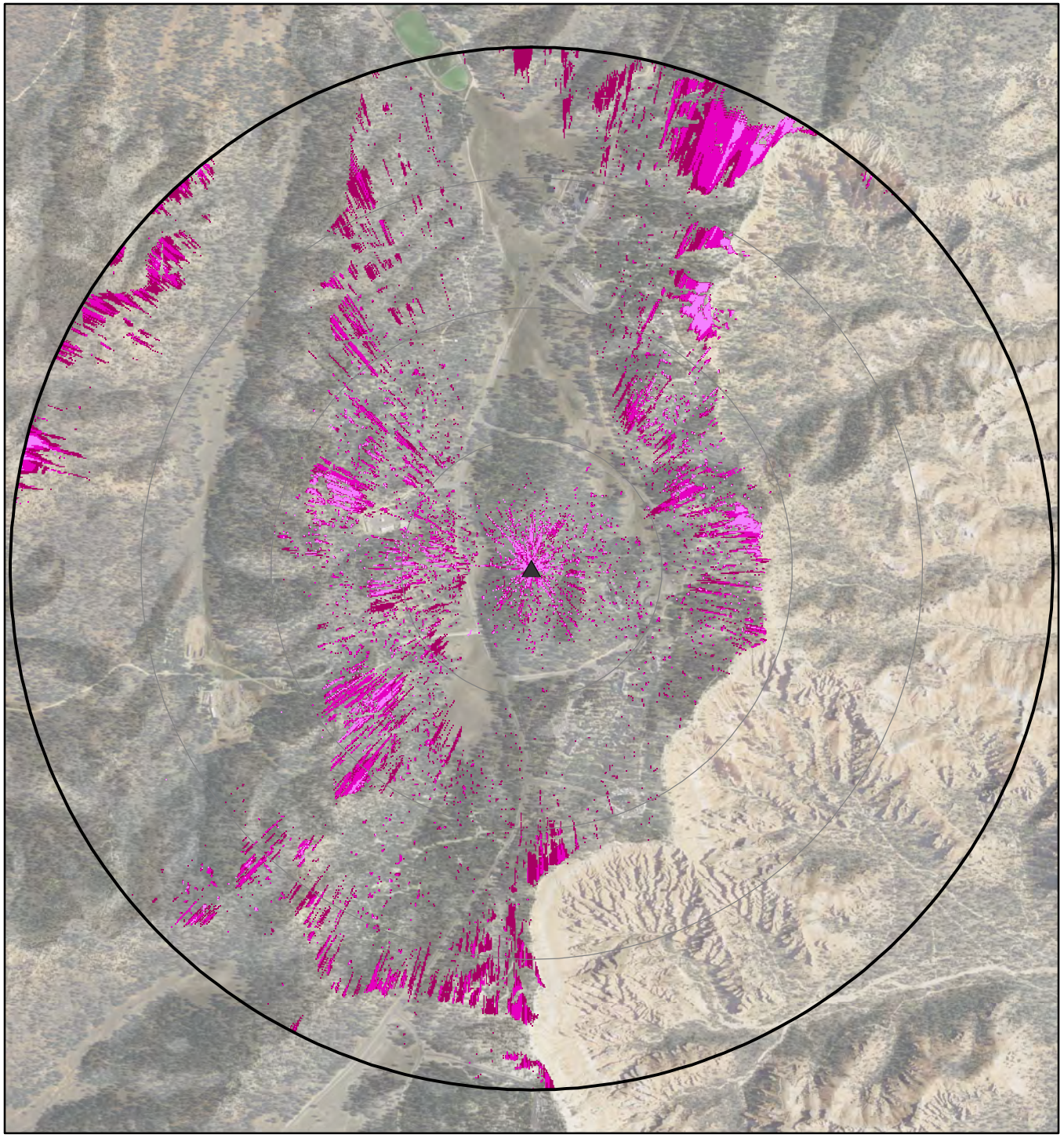

IMAGE 2

Manzanita Dorm Viewshed

Bryce Canyon National Park
Cellular Telecommunications Tower
with Power and Fiber Optic Connection
United States Department of the Interior
National Park Service
April 2019

The resulting viewshed represents the area from which the top of the tower would be visible. It includes areas where lower parts of the tower would be screened by intervening topography or vegetation, but does not include areas from which lower portions of the tower may be visible if the top is not. Additionally, the Google Earth Pro viewshed tool projects the viewshed onto the 3D Buildings layer, not just the underlying ground topography, so some of the viewshed is on the tops of trees and does not necessarily represent locations where the tower would be visible from the ground.

Field verification of the viewshed analysis was completed for the three considered tower heights for Alternative B (Science Hill) during the signal drive test on April 17, 2018. A boom lift was positioned in the approximate location of the proposed tower and the lift basket equipped with an antenna was raised to 40, 60, and 80 feet above the ground. Then park staff and Verizon Wireless contractors observed the boom lift from over 40 locations at key observation points (KOPs) around the park and noted its visibility for each height. Photographs were also taken when the lift was visible. Observations were made at locations where the tower should have been visible according to the viewshed analysis, as well as locations where the viewshed analysis indicated the tower would not be visible. The Google Earth Pro viewshed was found to generally be accurate in its estimation of the visibility of the proposed tower (Image 3). Areas in the calculated viewshed that did not actually have views of the tower occurred in some areas where trees were apparently missing and/or had incorrect dimensions in the 3D Buildings layer, and screened views of the tower through vegetation occurred in some areas outside the calculated viewshed area.

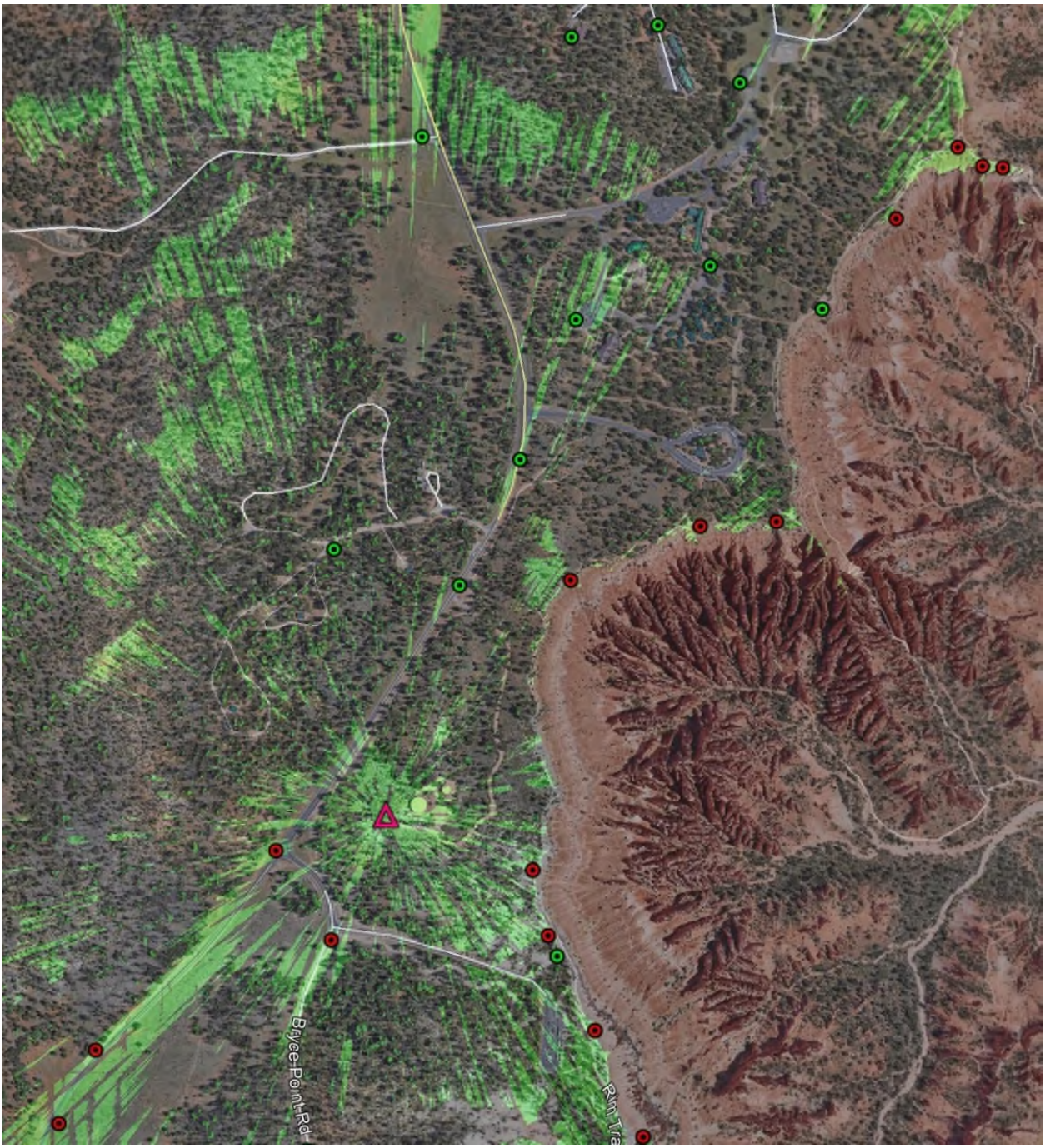

Image 3: View of Science Hill tower (pink triangle) 80-foot viewshed (green shaded areas) compared to field-verified observations during signal drive test (red dots = tower is visible, green dots = tower is not visible).

Key Observation Points (KOPs)

As one of the most visited areas in Bryce Canyon National Park and the area where the greatest density of visitors and staff are typically present, there are numerous key observation points (KOPs) present in the developed area of Bryce Canyon National Park and within the study areas. These include eleven historic properties and cultural landscapes, three scenic overlooks, two visitor campgrounds, two employee and concessioner housing locations, three

public roads, and the visitor center. Selected KOPs include areas where park visitors and employees are frequently present and where a change in the viewshed could affect those viewers. Linear KOPs were then further refined using the results of the viewshed analysis to focus on areas where views of the tower would be expected to be the most prominent. The locations of identified KOPs are shown in Image 4, and a detailed description of each is included in Table 1.

The existing features in the viewsheds of the identified KOPs include man-made structures like historic and modern buildings, roads, and trails, and natural components like forests, meadows, and geologic formations. Central to the establishment of Bryce Canyon National Park were the unique and scenic erosional geological features (hoodoos, etc.) found in the amphitheaters of the park. Therefore, views that include these geologic features are more significant than other views within the park and warrant greater protection. Identified KOPs with views of the iconic geological scenery generally include those at scenic overlook points and along the Rim Trail and Queen's Garden Trail.

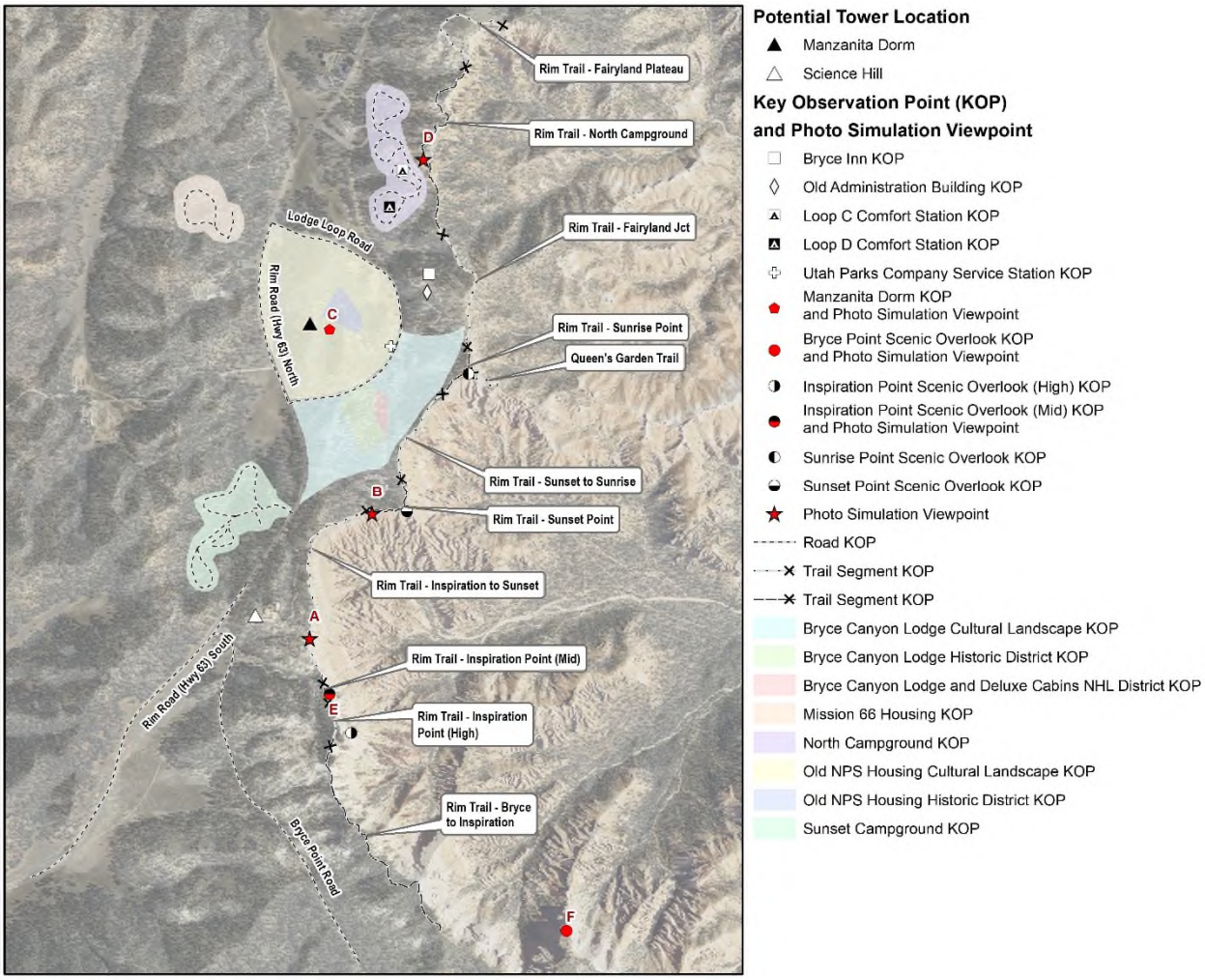

Image 4: Locations of KOPs and photo simulation viewpoints identified in the study areas.

Table 1: Scenic Resource KOPs.

<table>
<tr><th>Scenic Resource KOP</th><th>Description</th></tr>
<tr><td colspan="2">Historic Properties and Cultural Landscapes</td></tr>
<tr><td>Bryce Canyon Lodge and Deluxe Cabins

Bryce Canyon Lodge Historic District

Bryce Canyon Lodge and Deluxe Cabins Landscape</td><td>The Bryce Canyon Lodge Historic District includes 26 buildings, 16 of which are designated as the Bryce Canyon Lodge and Deluxe Cabins National Historic Landmark. The Bryce Canyon Lodge and Deluxe Cabins cultural landscape encompasses the Historic District and National Historic Landmark as well as the surrounding landscape. The Bryce Canyon Lodge landscape is one of the prominent public-use zones within the Park and has a variety of uses primarily focused upon short-term residential accommodation, but also include support facilities for catering, maintenance, employee housing and administration as well as recreation and interpretive uses. Views outside the area are screened by vegetation and topography giving the area a relaxed sense of quiet even during peak season.

The Bryce Canyon Lodge and Deluxe Cabins Cultural Landscape is about 65 acres in size and includes the roughly 5.7-acre Bryce Canyon Lodge and Deluxe Cabins National Historic Landmark and the 9.1-acre Bryce Canyon Lodge Historic District (there is about 3.3 acres of overlap between the National Historic Landmark and the Historic District). Elevations within the National Historic Landmark and Historic District range from approximately 7,951 to 8,006 feet AMSL, and elevations within the cultural landscape range from approximately 7,920 to 8,028 feet AMSL.</td></tr>
<tr><td>Old NPS Housing Historic District and Landscape</td><td>The Old NPS Housing Historic District Landscape encompasses 9 buildings in the Historic District as well as the surrounding landscape. The area is used for housing NPS staff and concessioner employees. The surrounding hills and ponderosa pine forest limit views within the area.

The cultural landscape is about 91 acres in size and includes the roughly 5.1-acre historic district. Elevations within the Historic District range from approximately 7,923 to 7,969 feet AMSL, and elevations within the cultural landscape range from approximately 7,894 to 8,029 feet AMSL.</td></tr>
<tr><td>Bryce Canyon National Park Scenic Trails Historic District</td><td>The historic district includes five trails: Navajo Loop Trail, Queen’s Garden Trail, Peekaboo Loop Trail, Fairyland Loop Trail, and Rim Trail. The trails primarily provide physical and visual access to the canyons and amphitheaters below (east of) the rim of the Paunsaugunt Plateau, but also afford views into the developed area on the plateau to the west.

Portions of the Rim Trail and Queen’s Garden trail only were identified as KOPs, as the remaining trails do not fall within the viewshed of the proposed alternatives. Approximately 3.6 miles of the Rim Trail was divided into ten contiguous segments, or KOPs:

<table>
<tr><th></th><th></th><th colspan="2">Elevation (feet AMSL)</th></tr>
<tr><th>Rim Trail Segment</th><th>Segment Length</th><th>Min</th><th>Max</th></tr>
<tr><td>Fairlyland Plateau</td><td>0.37 mile / 1,940 feet</td><td>8,013</td><td>8,155</td></tr>
<tr><td>North Campground</td><td>0.61 mile / 3,229 feet</td><td>7,950</td><td>8,074</td></tr>
<tr><td>Fairyland Jct</td><td>0.37 mile / 1,950 feet</td><td>7,948</td><td>8,020</td></tr>
<tr><td>Sunrise Point</td><td>0.17 mile / 901 feet</td><td>7,961</td><td>7,998</td></tr>
<tr><td>Sunset to Sunrise</td><td>0.29 mile / 1,507 feet</td><td>7,959</td><td>7,979</td></tr>
<tr><td>Sunset Point</td><td>0.20 mile / 1,070 feet</td><td>7,969</td><td>8,008</td></tr>
<tr><td>Inspiration to Sunset</td><td>0.63 mile / 3,339 feet</td><td>8,007</td><td>8,158</td></tr>
<tr><td>Inspiration Point (Mid)</td><td>0.06 mile / 309 feet</td><td>8,165</td><td>8,199</td></tr>
</table>
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</table>

Scenic Resource KOP	Description
Bryce Canyon National Park Scenic Trails Historic District (Cont.)	Inspiration Point (High) 0.13 mile / 698 feet 8,210 8,288 Bryce to Inspiration 0.75 mile / 3,949 feet 8,264 8,378 One segment of the Queen's Garden Trail was identified as a KOP extending 0.14 mile (765 feet) southeast below the canyon rim from the intersection with the Rim Trail at Sunrise Point. Elevations along this segment of trail range from approximately 7,891 to 7,998 feet AMSL.
Bryce Inn **Old Administration Building**	The Bryce Inn / Old Administration Building area receives a great deal of visitor traffic due to its location near the north campground and Sunrise point; however, the local topography and forested slopes help to shield views between these areas of activity thereby enabling the area to retain a unique sense of place. The Bryce Inn is located at an elevation of approximately 7,953 feet AMSL and the Old Administration Building is at an elevation of approximately 7,951 feet AMSL.
Loop C Comfort Station **Loop D Comfort Station**	Located within the North Campground. The area is characterized by gently rolling topography, which together with the forest cover limits views within the area as well as views out of the campground area. The Loop C Comfort Station is located at an elevation of approximately 7,947 feet AMSL and the Loop D Comfort Station is at an elevation of approximately 7,978 feet AMSL.
Utah Parks Company Service Station	Located at the east edge of the Old NPS Housing Cultural Landscape on the Lodge Loop Road. The service station is currently used as a comfort station for park visitors but remains largely vacant in anticipation of the identification of an appropriate future use. The service station is located at an elevation of approximately 7,929 feet AMSL.
Scenic Overlooks	
Sunrise Point **Sunset Point** **Inspiration Point (Mid and High)**	Located along the Rim Trail, the scenic overlooks provide views of Bryce Canyon National Park's iconic geology and are among the most visited locations in the park. The Sunrise Point overlook at an elevation of approximately 8,017 feet AMSL, the Sunset Point overlook is at an elevation of approximately 8,000 feet AMSL, the Inspiration Point (Mid) overlook is at an elevation of approximately 8,207 feet AMSL, and the Inspiration Point (High) overlook is at an elevation of approximately 8,323 feet AMSL.
Park Roads	
Rim Road (Hwy 63)	The Rim Road is the principal vehicular roadway within the park generally following the eastern rim of the Paunsaugunt Plateau; however, no views of the amphitheaters are afforded from the roadway in the developed area. The roadway generally follows the rolling topography of the plateau and views mostly include the adjacent vegetation consisting primarily of ponderosa pine forest with some openings into sagebrush meadow. Two segments of the Rim Road were identified as KOPs. The "North" segment is 0.52 mile (2,761 feet) long and extends between both ends of the Lodge Loop Road along the western edge of the Old NPS Housing Cultural Landscape. Elevations along this segment of the Rim Road range from approximately 7,904 to 7,956 feet AMSL. The "South" segment begins about 800 feet north of the intersection with Bryce Point Road and extends 1.04 miles (5,514 feet) to the south through the East Creek meadow. Elevations along this segment of the Rim Road range from approximately 7,946 to 8,081 feet AMSL.

Scenic Resource KOP	Description
Lodge Loop Road	The Lodge Loop Road branches off from the Rim Road and provides the primary access to the developed area of the park and to the scenic overlooks of the Bryce Amphitheater, though no views of the amphitheater are afforded from the roadway itself. Views along the roadway include the adjacent vegetation consisting primarily of ponderosa pine forest with some openings into sagebrush meadow as well as historic and newer park buildings. The road is about 0.94 mile (4,996 feet) long and elevations range from approximately 7,895 to 7,983 feet AMSL.
Bryce Point Road	The Bryce Point Road branches off the Rim Road and provides access to the Inspiration Point, Bryce Point, and Paria View scenic overlooks; however, no views of the amphitheaters are afforded from the roadway itself. Views along the roadway include the adjacent vegetation consisting primarily of ponderosa pine forest with some openings into sagebrush meadow. The segment of the Bryce Point Road identified as a KOP extends 1.08 miles (5,697 feet) southeast from the intersection with the Rim Road and elevations range from approximately 8,066 to 8,185 feet AMSL.
Visitor Campgrounds	
North Campground	The campground contains more than 100 vehicular campsites organized in four loops, each of which contains a centrally located comfort station. The majority of the campsites are within the Ponderosa pine forest, which together with the gently rolling topography limits views within the area as well as views out of the campground area. The campground area is approximately 29 acres and includes about 1.2 miles of roads. Elevations within the north campground range from approximately 7,913 to 7,978 feet AMSL,
Sunset Campground	The campground contains 101 vehicular campsites organized in three loops, as well as a group campsite, universal access campsites and Park volunteer RV spaces. The campground is only in operation from mid-April to mid-October. The campsites are within the Ponderosa pine forest, which together with the gently rolling topography generally limits views within the area as well as views out of the campground area. The campground area is approximately 31 acres and includes about 1.3 miles of roads. Elevations within the sunset campground range from approximately 7,985 to 8,070 feet AMSL,
NPS Staff and Concessioner Housing	
Manzanita Dorm	A non-contributing element of the Old NPS Housing Cultural Landscape. Provides year-round housing for concessioner staff. Sited on the slope of one of two low knolls that feature prominently in the topography of the area. This topography together with the forest cover limits views within the area. Manzanita Dorm is located at an elevation of approximately 7,954 feet AMSL.
Mission 66 Housing	NPS employee housing including apartments and single-family residences on about 0.5 mile of roads within an approximately 17-acre area. The structures are located in the level area between hills in the gently rolling topographic setting and the vegetation is dominated by ponderosa pine forest. The topography together with the forest cover limits views in to, or out of, the area. Elevations within the Mission 66 housing area range from approximately 7,922 to 7,981 feet AMSL,

Photo Simulations

Photo simulations of the proposed range of tower alternatives were developed by Verizon Wireless to assist in evaluating the potential visual impact of the project. The views that include the park's iconic hoodoo terrain geologic scenery were considered to be the most sensitive, and therefore the visual analysis photo locations selected focused on those with the greatest potential to impact visitors' appreciation of these scenic views. Six locations were selected based on the viewshed analysis including five along the Rim Trail (near the North Campground, Sunset Point, between Sunset and Inspiration Points, Inspiration Point, and Bryce Point), and one at Manzanita Dorm. The Bryce Point location was selected as an example of a location where the tower is visible from more than one mile away but appears so faint as to not significantly impact the scenic view. Photo simulation viewpoints are listed in Table 2 and shown in Image 4 above.

Table 2: Photo Simulation Viewpoints.

		Tower Site Simulated	
ID	**KOP**	**Science Hill**	**Manzanita Dorm**
A	Rim Trail – Inspiration to Sunset	Yes	No
B	Rim Trail – Sunset Point	Yes	No
C	Manzanita Dorm	No	Yes
D	Rim Trail – North Campground	Yes	Yes
E	Inspiration Point Scenic Overlook (Mid)	Yes	Yes
F	Bryce Point Scenic Overlook	Yes	Yes

Photographs from 4 viewpoints (A, B, C, and D) were taken on April 7, 2019. On this date, the roads and trails to Inspiration Point and Bryce Point (viewpoints E and F) were closed due to unstable ground conditions from the spring thaw. However, Verizon Wireless had previously created photo simulations from these locations in 2017 early in the EA review process. As these photo simulations were done in an earlier phase of the assessment, they show 100-foot self-support and monopole towers, which is taller than the towers currently being considered.

The photo simulations were created by incorporating images of self-support and monopine tower designs into each of the viewpoint photos using photo editing software to produce approximate visualizations of what the tower and the surrounding area may reasonably look like after the tower is constructed. The tower height and scale were estimated based on the known height of surrounding objects and vegetation, distance from the photo location, and viewshed analysis including photos taken during the signal drive test. The tower appearance was conservatively estimated to be as accurate as possible but erred toward making the appearance larger in cases with any uncertainty. Completed photo simulations are attached at the end of this document.

Photo simulations are only approximations of what the project would look like, however, and cannot completely convey what it would look like for "real" since photo simulations really simulate a photograph of the proposed project, not the actual visual experience that a viewer would have in that landscape. Some important limitations of simulations include:

- Loss of dynamic visual experience—The human visual experience changes constantly as the viewer moves and the visual environment changes. Simulations based on photos cannot capture the dynamic visual experience.
- Limitations to contrast range—A camera cannot capture the same range of visual contrast as the human eye, and simulations based on photography often under-represent visual contrasts of projects.

- Limits to the field of view—Photographs have a limited and predetermined field of view and cannot capture the full field of human view unless panoramic images are used.
- Limited viewpoints—Simulations developed for views from KOPs only depict the views from those locations and omit many other potential views of the project.
- Viewing distance requirements—Simulation must be viewed at a specific viewing distance to see the project at the same size as it would be seen in the real landscape.

Visual Impact Assessment Methodology

Visual impacts are defined as changes to the scenic attributes of the landscape brought about by the introduction of visual contrasts (i.e., a change to what is seen by the viewer) AND the associated changes in the human visual experience of the landscape. Because visual impacts are tied to the experience of the viewer, they can be positive or negative depending on the perception of each individual.

Visual contrasts are typically described in terms of four design characteristics:

Form—the mass or shape of an object or objects that appears unified;
Line—the path, real or imagined, that the eye follows when perceiving abrupt differences in form, color, or texture;
Color—the property of reflecting light of a particular intensity and wavelength (or mixture of wavelengths) to which the eye is sensitive; and
Texture—the visual manifestations of light and shadow created by the variations in the surface of an object or landscape.

Sullivan and Meyer (2014) note that the visibility of an object in a landscape setting and its apparent visual characteristics for any given view are the result of a complex interplay among the observer, the observed object, and various factors that affect visual perception, referred to as visibility factors. Visibility factors are primary determinants of the visual contrasts associated with a project. There are eight major types of visibility factors that affect perception of large objects in the landscape:

- Viewshed limiting factors—variables associated with accurate viewshed analysis.
- Viewer characteristics—visual acuity, viewer engagement and experience, and viewer motion.
- Lighting factors—the angle, intensity, and distribution of sunlight on the project.
- Atmospheric conditions—the presence of humidity and particulate matter which may affect visibility by diminishing contrast and subduing colors.
- Distance—the distance between the viewer and the viewed object, which affects the apparent size and degree of contrast between an object and its surroundings.
- Viewing geometry—the spatial relationship of the viewer to the project, that is, looking up or down at a project and the horizontal direction of the view.
- Backdrop—the visual background against which facility elements are seen, for example, towers viewed against the surrounding ground terrain and forest are generally less visible than those viewed against the sky.
- Object visual characteristics—the inherent visual characteristics of the project, such as the structure size; the scale relative to other objects in view; and the form, line, surface colors, and textures of the project components.

The visual contrasts vary considerably between the two considered tower designs - self-support and monopine. The only visual contrasts shared in common with both tower designs include the scale contrasts of the height of the tower, and form, line and color contrasts of the fenced equipment compound at the base of the tower.

A self-support tower structure would have moderate to strong form, line, color, and texture visual contrasts associated with the steel gray lattice tower structure and antennas compared to the surrounding landscape. These contrasts would generally become less apparent when viewed from greater distances. The lattice structure gives the tower a relatively small visual mass and permits views of the background landscape through the tower that allows it to blend into the background somewhat. The relatively high contrast of this type of tower would generally make it more visible and have a greater visual impact; however, the ubiquity of cellular towers in the world today may result in some viewers taking little to no notice of the tower as they are now a common and expected part of the built landscape.

Camouflaged or “stealth” cellular towers are designed to look like something else, such as a pine tree in the case of the monopine design, to better blend into their surroundings (Slaman 2014). When done effectively, the camouflaged towers can be much less visually apparent and therefore have a much smaller visual impact than traditional tower design (ACHP n.d., Mohammed 2006). However, when “stealth” towers don’t actually blend in with their surroundings they may draw more attention and be more visually obtrusive than a traditional tower (Rodriguez 2014, Stromberg 2015). Often this is due to significant differences in height and/or appearance, or lack of similarity to the surroundings causing them to stand out. Visual contrasts associated with the monopine design may include color and texture contrasts from the tower “branches”, and form contrasts from the shape of the “crown” and visually bulky antennas at the top of the tower.

The tower visibility for each KOP was determined by using the ground-level view feature in Google Earth Pro and a polygon with the same height as the placemark used to generate the viewshed of the proposed tower to determine the visibility of the tower. For linear features, the tool was used to “walk” along the path to view the proposed tower from all locations within the KOP. For area features, observations were made from multiple locations within the KOP with the objective of identifying the “worst case” views using information from the viewshed analysis and on-site observations. Tower visibility for the Alternative B (Science Hill) location was also supplemented by observations and photographs from the signal drive test. This method was largely limited to assessing changes in visibility due to tower height, but not type.

The photo simulations were further used to verify the visibility determinations from Google Earth Pro by comparing the photographic simulations of the project (“after” photos) to the unaltered photos showing existing conditions (“before” photos). The photo simulations were also used to assess differences in visibility between the self-support and monopine tower designs.

Visual Impact Assessment Results

The visual impact for each KOP was generally determined based on judgments about the effects of the predicted visual contrasts on the visual qualities and character of the landscape and the perceptions of viewers likely to see the project. These visual impact determinations are detailed in Table 3 for each of the alternatives considered in the EA. The discussion of visibility and impacts in Table 3 includes approximate distances along linear KOPs from which the tower may be visible based on the analysis completed. These values do not necessarily represent the actual impact area that would result but provide a basis for comparison.

In summary, none of the considered alternatives would likely have much impact on the visual and scenic resources in Bryce Canyon National Park. A tower constructed at Science Hill would likely be more visible and have greater potential for visual impacts in general, as well as specifically to the important views of Bryce Canyon National Park's iconic geological scenery within the canyon amphitheaters, compared to a tower constructed at Manzanita Dorm. An 80-foot tower constructed at the Science Hill location would be more likely to penetrate the skyline in views from KOPs, thereby increasing it's visibility and potential for visual impact, compared to a 60-foot or 40-foot tower, which would both rarely if ever be expected to penetrate the skyline. An 80-foot tower constructed at Manzanita Dorm may also penetrate the skyline slightly from a few KOP locations, but a tower of any considered height at this location would generally be expected to have very low visibility in the study area with the exception of views from the Manzanita Dorm building and some surrounding nearby forest areas. Use of a high-quality monopine style tower of any of the considered heights at either alternative location could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility and visual impact of the tower compared to a self-support tower design, particularly in views where the tower penetrates the skyline but does not appear much larger than the visually adjacent apparent tree heights. Near views of a monopine tower that allow for greater detail to be observed may draw as much or more attention from viewers that recognize the tower as a man-made structure and not a tree compared to a self-support style tower.

Table 3: KOP Visual Impacts by Tower Site Alternative.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Rim Trail – Bryce to Inspiration	The Rim Trail between Bryce Point and Inspiration Point is a linear KOP approximately 3,949 feet long in the study area. It is located approximately 2,185 feet southeast of the proposed tower site at the nearest point and extends out to 1 mile from the tower site at the edge of the study area. An 80-foot tower at this location may be visible to individuals traveling north on the trail along a nearly contiguous, approximately 425-foot long stretch of trail at the north end of the KOP, which is about 11% of the total length. The length of trail from which the tower may be visible would be reduced slightly to approximately 390 feet (10% of the total length) for a 60-foot tower, and 335 feet (9% of the total length) for a 40-foot tower. The proposed tower would not likely be visible to individuals traveling south along the trail. At any of the considered heights, the proposed tower would not penetrate the skyline, would not exceed the visually adjacent apparent tree height, and in many cases would be heavily screened by intervening tree cover. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the distance from the tower site, intervening tree cover, and views against the forest backdrop, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have very low potential to impact their experience of the scenic resources. For visitors who do notice the tower, it would likely draw minimal, if any, focus away from the scenic canyon features as it would occupy only a very small part of the field of view.	NA – KOP located greater than 1 mile from the proposed tower site.
Rim Trail – Inspiration Point (High) Inspiration Point (High) Scenic Overlook	The Rim Trail near the “high” Inspiration Point scenic overlook is a linear KOP approximately 698 feet long in the study area. It is located approximately 1,610 feet southeast of the proposed tower site at the nearest point and approximately 2,185 feet southeast of the proposed tower site at the farthest point. The developed scenic overlook point is located approximately 2,245 feet southeast of the proposed tower site at the end of a short trail that forks off from the Rim Trail near the south end of the linear KOP. The proposed tower, regardless of height or type, may be visible to individuals traveling north along most of the length of the trail as well as canyon views to the north from the scenic overlook point. The proposed tower would not be visible to individuals traveling south along the trail or in views of the canyon to the east or south from the scenic overlook point. An 80-foot tower at this location may be visible along nearly the entire length of the trail (672 feet or 96% of the total length) as well as from the scenic overlook point. The tower may exceed the visually adjacent apparent tree height in most views and may penetrate the skyline slightly in some views near the north end of the linear KOP but not from the scenic overlook point. The tower would be screened by intervening tree cover in many locations. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest reducing the potential visibility of the tower compared to a self-support tower design, particularly in views where the tower penetrates the skyline. A slightly taller “tree” penetrating the skyline would likely be less noticeable to many visitors, and therefore have a smaller visual impact, than a self-support tower. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view. A 60-foot or 40-foot tower at this location would have less potential visibility compared to an 80-foot tower. A tower of either height may be visible along approximately 525 feet of the linear KOP (75% of the total length) as well as the scenic overlook point. The tower may exceed the visually adjacent apparent tree height in some, but not most, views along the Rim Trail but would likely not exceed the visually adjacent apparent tree height from the scenic overlook point. It would not penetrate the skyline in any views and would be screened by intervening trees in many locations. At either of these heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential	NA – KOPs located greater than 1 mile from the proposed tower site.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Rim Trail – Inspiration Point (High) Inspiration Point (High) Scenic Overlook (Cont.)	visibility of the tower compared to a self-support tower design. The man-made appearance of a self-support tower that may contrast more strongly with the natural setting could be more visible to some viewers, and therefore have a greater visual impact, compared to a monopine. More viewers may notice a 60-foot or 40-foot self-support tower than a 60-foot or 40-foot monopine, but based on the generally low anticipated visibility of the tower, it is likely that the number of visitors who do notice the tower would be low and it would likely draw minimal, if any, focus away from the scenic canyon features as it would occupy only a very small part of the field of view.	(see previous page)
Rim Trail – Inspiration Point (Mid) Inspiration Point (Mid) Scenic Overlook	The Rim Trail near the "mid" Inspiration Point scenic overlook is a linear KOP approximately 309 feet long in the study area. It is located approximately 1,340 feet southeast of the proposed tower site at the nearest point and approximately 1,610 feet southeast of the proposed tower site at the farthest point. The developed scenic overlook point is located approximately 1,600 feet southeast of the proposed tower site adjacent to the Rim Trail near the south end of the linear KOP. The proposed tower, regardless of height or type, may be visible to individuals traveling north along most of the length of the trail as well as in canyon views to the north from the scenic overlook point. The proposed tower would not be visible to individuals traveling south along the trail or in views of the canyon to the east or south from the scenic overlook point. An 80-foot tower at this location may be visible along most of the length of the trail (272 feet or 88% of the total length) as well as from the scenic overlook point. The tower may exceed the visually adjacent apparent tree height and may penetrate the skyline slightly in views from this location along the trail and from the scenic overlook point. The tower would be partially screened by intervening tree cover in some locations. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design (Photo Simulation E). A slightly taller "tree" penetrating the skyline would likely be less noticeable to many visitors, and therefore have a smaller visual impact, than a self-support tower. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view. A 60-foot or 40-foot tower at this location would have less potential visibility compared to an 80-foot tower. A 60-foot tower may be visible along approximately 245 feet of the linear KOP (80% of the total length) and a 40-foot tower may be visible along approximately 225 feet of the linear KOP (73% of the total length). Towers of either of these heights would also be visible from the scenic overlook point. A 60-foot tower may exceed the visually adjacent apparent tree height, but a 40-foot tower would likely appear similar in size to the visually adjacent apparent tree height. A tower of either of these heights would not penetrate the skyline and would be screened by intervening trees in many locations. At either of these heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. The man-made appearance of a self-support tower that may contrast more strongly with the natural setting could be more visible to some viewers, and therefore have a greater visual impact, compared to a monopine. More viewers may notice a 60-foot or 40-foot self-support tower than a 60-foot or 40-foot monopine, but based on the generally low anticipated visibility of the tower, it is likely that the number of visitors who do notice the tower would be low and it would likely draw minimal, if any, focus away from the scenic canyon features as it would occupy only a very small part of the field of view.	NA – KOPs located greater than 1 mile from the proposed tower site.
Rim Trail – Inspiration to Sunset	The Rim Trail between Inspiration Point and Sunset Point is a linear KOP approximately 3,339 feet long in the study area. It is located approximately 835 feet east of the proposed tower site at the nearest point. The southern end of the KOP is located approximately 1,340 feet to the southeast of the proposed tower site, and the northern end of the KOP is located approximately 2,300 feet to the northeast. This is the closest KOP to the proposed	The Rim Trail between Inspiration Point and Sunset Point is a linear KOP approximately 3,339 feet long in the study area. It is located approximately 2,930 feet south of the proposed tower site at the nearest point and extends out to 1 mile south of the tower site at the edge of the study area. The proposed tower may be visible to individuals traveling north along the trail but would not be visible to individuals traveling south along the trail. An 80-foot tower at this

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Rim Trail – Inspiration to Sunset (Cont.)	tower site, and like most of the Rim Trail, this segment affords views of the iconic geologic scenery in the canyon. However, to see the tower from the closest viewpoints in the KOP where it may be most visible, the viewer would be turned away from the canyon looking toward the plateau, so the proposed tower would have much lower potential to impact important views of the geological scenery from locations with the greatest visibility. An 80-foot tower at this location may be visible primarily to individuals traveling north on the trail in the southern portion of the KOP with less potential for visibility for individuals traveling south in the northern portion of the KOP. The proposed tower may be visible from scattered, discontinuous areas along approximately 1,445-feet of the trail, which is about 43% of the total length. The tower may exceed the visually adjacent apparent tree height and / or may penetrate the skyline slightly in views from this location. The tower would likely be at least partially screened by intervening tree cover and / or topography in most locations. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design (Photo Simulation A). However, portions of this KOP are in relatively close proximity to the proposed tower site, and near views of a monopine tower that allow for greater detail to be observed may draw attention from viewers that recognize the tower as a man-made structure and not a tree. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view. A 60-foot tower at this location would have less potential visibility compared to an 80-foot tower, and a 40-foot tower would have the least potential visibility. A 60-foot tower may be visible along approximately 1,275 feet of the linear KOP (38% of the total length) and a 40-foot tower may only be visible along approximately 515 feet of the linear KOP (15% of the total length). A 60-foot tower may penetrate the skyline but would likely not exceed the visually adjacent apparent tree height and would be at least partially screened by intervening topography and / or trees in many locations. A 40-foot tower would not likely penetrate the skyline nor exceed the visually adjacent apparent tree height and would likely be heavily screened by intervening topography and / or trees. At either of these heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, like an 80-foot tower, near views of a 60-foot or 40-foot monopine tower that allow for greater detail to be observed would likely still have weak to moderate form, color, and/or texture visual contrast and may draw attention from viewers that recognize the tower as a man-made structure and not a tree. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view.	location may be visible from scattered and discontinuous areas totaling approximately 1,060 feet in the KOP, which is about 32% of the total length. The length of trail from which the tower may be visible would be reduced to approximately 320 feet (10% of the total length) for a 60-foot tower. A 40-foot tower would likely not be visible at all from within this KOP. An 80-foot or 60-foot tower would not likely exceed the visually adjacent apparent tree height or penetrate the skyline, and in many cases would be heavily screened by intervening tree cover. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights at this location, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have very low potential to impact their experience of the scenic resources. For visitors who do notice the tower, it would likely draw minimal, if any, focus away from the scenic canyon features as it would occupy only a very small part of the field of view.
Rim Trail – Sunset Point Sunset Point Scenic Overlook	The Rim Trail near the Sunset Point scenic overlook is a linear KOP approximately 1,070 feet long in the study area. It is located approximately 2,300 feet northeast of the proposed tower site at the nearest point and approximately 3,000 feet northeast of the proposed tower site at the farthest point. The developed scenic overlook point is located approximately 2,715 feet northeast of the proposed tower site at the end of a short trail that forks off from the Rim Trail near the middle of the linear KOP. The proposed tower may be visible to individuals traveling south / west along the trail as well as in canyon views to the south from the scenic overlook point. The proposed tower would not be visible to individuals traveling north / east along the trail or in views of the canyon to the east or north from the scenic overlook point. An 80-foot tower at this location may be visible from scattered, discontinuous areas along an approximately 670-foot long stretch of trail at the southwest end of the KOP, which is about 63% of the total length, as well as the developed scenic overlook point. The tower may slightly penetrate the skyline but would likely not exceed the visually adjacent apparent tree height and would be at least partially screened by intervening topography and / or trees in most views.	The Rim Trail near the Sunset Point scenic overlook is a linear KOP approximately 1,070 feet long in the study area. It is located approximately 2,575 feet southeast of the proposed tower site at the nearest point and approximately 3,070 feet southeast of the proposed tower site at the farthest point. The developed scenic overlook point is located approximately 3,130 feet southeast of the proposed tower site at the end of a short trail that forks off from the Rim Trail near the middle of the linear KOP. A tower at this location would not be expected to be visible from anywhere in these KOPs regardless of height or type and would, therefore, have little to no potential to impact the scenic quality.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Rim Trail – Sunset Point Sunset Point Scenic Overlook (Cont.)	A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest reducing the potential visibility of the tower compared to a self-support tower design (Photo Simulation B). A slightly taller "tree" penetrating the skyline would likely be less noticeable to many visitors, and therefore have a smaller visual impact, than a self-support tower. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view. A 60-foot tower at this location would have much less potential visibility compared to an 80-foot tower and a 40-foot tower would not be expected to be visible at all. A 60-foot tower may be visible along only approximately 65 feet of the linear KOP (6% of the total length) but not the scenic overlook point. The tower would not likely exceed the visually adjacent apparent tree height nor penetrate the skyline and would be heavily screened by intervening trees. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a 60-foot or 40-foot tower, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view.	(see previous page)
Rim Trail – Sunset to Sunrise	The Rim Trail between Sunset Point and Sunrise Point is a linear KOP approximately 1,507 feet long in the study area. It is located approximately 3,000 feet northeast of the proposed tower site at the nearest point and approximately 4,370 feet northeast of the proposed tower site at the farthest point. A tower at this location would not be expected to be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality.	The Rim Trail between Sunset Point and Sunrise Point is a linear KOP approximately 1,507 feet long in the study area. It is located approximately 2,140 feet southeast of the proposed tower site at the nearest point and approximately 2,575 feet southeast of the proposed tower site at the farthest point. A tower at this location would not be expected to be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality.
Rim Trail – Sunrise Point Sunrise Point Scenic Overlook	The Rim Trail near the Sunrise Point scenic overlook is a linear KOP approximately 901 feet long in the study area. It is located approximately 4,370 feet northeast of the proposed tower site at the nearest point and approximately 5,125 feet northeast of the proposed tower site at the farthest point. The developed scenic overlook point is located approximately 4,765 feet northeast of the proposed tower site at the end of a short trail that forks off from the Rim Trail near the middle of the linear KOP. The proposed tower may be visible to individuals traveling south along the trail as well as in canyon views to the south from the scenic overlook point. The proposed tower would not be visible to individuals traveling north along the trail or in views of the canyon to the east or north from the scenic overlook point. An 80-foot tower at this location may be visible along most of the length of the trail (752 feet or 83% of the total length) as well as the scenic overlook point. The tower may exceed the visually adjacent apparent tree height and may penetrate the skyline slightly in views from this location along the trail and from the scenic overlook point. Views of the tower would be partially screened by intervening topography and / or tree cover. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design. However, due to the distance from the tower site a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine even when viewed against the sky. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view. A 60-foot tower at this location would have less potential visibility compared to an 80-foot tower, and a 40-foot tower would have the least potential visibility. A 60-foot tower may be visible along approximately 655 feet of the linear KOP (73% of the total length) and a 40-foot tower may only be visible along approximately 145 feet of the linear KOP (16% of the total	The Rim Trail near the Sunrise Point scenic overlook is a linear KOP approximately 901 feet long in the study area. It is located approximately 2,240 feet east of the proposed tower site at the nearest point and approximately 2,440 feet east of the proposed tower site at the farthest point. The developed scenic overlook point is located approximately 2,460 feet east of the proposed tower site at the end of a short trail that forks off from the Rim Trail near the middle of the linear KOP. Like most of the Rim Trail, this segment affords views of the iconic geologic scenery in the canyon. However, to see the tower from this KOP the viewer would likely be mostly or entirely turned away from the canyon looking toward the plateau, so the proposed tower would have much lower potential to impact important views of the geological scenery from locations in this KOP. An 80-foot tower at this location may be visible from scattered and discontinuous areas totaling approximately 110 feet in the KOP, which is about 12% of the total length. The length of trail from which the tower may be visible would be reduced to approximately 95 feet (11% of the total length) for a 60-foot tower and approximately 25 feet (3% of the total length) for a 40-foot tower. At any height the tower would not likely exceed the visually adjacent apparent tree height or penetrate the skyline, and would likely be heavily screened by intervening topography and / or tree cover in views from the Rim Trail and scenic overlook. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights at this location, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have very low potential to impact their experience of the scenic resources. For visitors who do notice the tower, it would likely draw minimal, if any, focus away from the scenic canyon features as it would occupy only a very small part of the field of view.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Rim Trail – Sunrise Point Sunrise Point Scenic Overlook (Cont.)	length). Towers with either of these heights would also likely be visible from the scenic overlook point. A tower with either of these heights would not likely penetrate the skyline nor exceed the visually adjacent apparent tree height and would be moderately to heavily screened by intervening topography and / or trees. At either of these heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a 60-foot or 40-foot tower, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view.	(see previous page)
Rim Trail – Fairyland Jct	NA – KOP located greater than 1 mile from the proposed tower site.	The Rim Trail near the southern junction with the Fairyland Loop Trail (“Fairyland Jct”) is a linear KOP approximately 1,950 feet long in the study area. It is located approximately 2,355 feet east of the proposed tower site at the nearest point and approximately 2,555 feet east of the proposed tower site at the farthest point. Like most of the Rim Trail, this segment affords views of the iconic geologic scenery in the canyon. But to see the tower from this KOP the viewer would likely be mostly or entirely turned away from the canyon looking toward the plateau, so the proposed tower would have much lower potential to impact important views of the geological scenery from location in this KOP. An 80-foot tower at this location may be visible from scattered and discontinuous areas primarily in the southern portion of the KOP totaling approximately 65 feet, which is about 3% of the total length. The length of trail from which the tower may be visible would be reduced to approximately 40 feet (2% of the total length) for a 60-foot tower. A 40-foot tower would likely not be visible at all from within this KOP. An 80-foot or 60-foot tower would not likely exceed the visually adjacent apparent tree height or penetrate the skyline, and would likely be heavily screened by intervening topography and / or tree cover. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights at this location, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have very low potential to impact their experience of the scenic resources. For visitors who do notice the tower, it would likely draw minimal, if any, focus away from the scenic canyon features as it would occupy only a very small part of the field of view.
Rim Trail – North Campground	NA – KOP located greater than 1 mile from the proposed tower site.	The Rim Trail near the North Campground is a linear KOP approximately 3,229 feet long in the study area. It is located approximately 2,370 feet northeast of the proposed tower site at the nearest point and approximately 4,515 feet north east of the proposed tower site at the farthest point. The proposed tower may be visible to individuals traveling south along the trail and would not likely be visible to individuals traveling north. Due to the rolling topography in this KOP, the tower would likely be visible only from two areas in the central and northern potions of the KOP between about ½ mile and ¾ mile northeast of the proposed tower site. An 80-foot tower at this location may be visible from a total of approximately 875 feet of trail in the KOP, which is about 27% of the total length. The tower may exceed the visually adjacent apparent tree height or may penetrate the skyline slightly in some views in the southern portion of the KOP. The lower portions of the tower would be screened by intervening tree cover. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest reducing the potential visibility of the tower compared to a self-support tower design, particularly in views where the tower penetrates the skyline (Photo Simulation D). A slightly taller “tree” penetrating the skyline would likely be less noticeable to many visitors, and therefore have a smaller visual impact, than a self-support tower. Where visible, the tower would generally be seen in the extreme periphery of views of the geologic scenery of the

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Rim Trail – North Campground (Cont.)	(see previous page)	amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view. A 60-foot tower at this location would have less potential visibility compared to an 80-foot tower, and a 40-foot tower would have the least potential visibility. A 60-foot tower may be visible along approximately 785 feet of the linear KOP (24% of the total length) and a 40-foot tower may be visible along approximately 485 feet of the linear KOP (15% of the total length). A tower with either of these heights would not likely penetrate the skyline nor exceed the visually adjacent apparent tree height and the lower portions of the tower would be screened by intervening tree cover. At either of these heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a 60-foot or 40-foot tower, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Where visible, the tower would generally be seen in the extreme periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view.
Rim Trail – Fairyland Plateau	NA – KOP located greater than 1 mile from the proposed tower site.	The Rim Trail at the northern edge of the study area climbs a plateau in the northern part of Bryce Canyon National Park as it proceeds toward the Fairyland Point scenic overlook (“Fairyland Plateau”). This linear KOP is approximately 1,940 feet long in the study area. It is located approximately 4,515 feet northeast of the proposed tower site at the nearest point and extends out to 1 mile northeast of the tower site at the edge of the study area. The proposed tower may be visible primarily to individuals traveling south along the trail and would not likely be visible to individuals traveling north. An 80-foot tower at this location may be visible from scattered and discontinuous areas primarily in the southern portion of the KOP totaling approximately 1,385 feet, which is about 71% of the total length. The length of trail from which the tower may be visible would be reduced to approximately 1,040 feet (54% of the total length) for a 60-foot tower and approximately 390 feet (20% of the total length) for a 40-foot tower. At any of the considered heights the tower would not likely exceed the visually adjacent apparent tree height or penetrate the skyline, and would likely be heavily screened by intervening topography and / or tree cover in many views. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights at this location, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have very low potential to impact their experience of the scenic resources. For visitors who do notice the tower, it would likely draw minimal, if any, focus away from the scenic canyon features as it would occupy only a very small part of the field of view.
Queen’s Garden Trail	The Queen’s Garden Trail is a linear KOP approximately 765 feet long in the study area. It is located near the Sunrise Point scenic overlook approximately 4,765 feet northeast of the proposed tower site at the nearest point and approximately 4,925 feet northeast of the proposed tower site at the farthest point. The proposed tower may be visible in canyon views to the south from the trail but would not likely be visible in views along the trail for eastbound or westbound travelers, and would not be visible in canyon views to the north of the trail. An 80-foot tower at this location may be visible from scattered, discontinuous areas along an approximately 510-foot long stretch of trail in the KOP, which is about 67% of the total length. The tower may exceed the visually adjacent apparent tree height or may penetrate the skyline slightly in views from this location, but views of the tower would be partially screened by intervening topography and / or tree cover. A high-quality monopine	The Queen’s Garden Trail is a linear KOP approximately 765 feet long in the study area. It is located near the Sunrise Point scenic overlook approximately 2,460 feet east of the proposed tower site at the nearest point and approximately 2,915 feet east of the proposed tower site at the farthest point. A tower at this location would not be expected to be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Queen's Garden Trail (Cont.)	tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design. However, due to the distance from the tower site a self-support style tower may not have much greater visual impact at this KOP than a monopine even when viewed against the sky. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view. A 60-foot or 40-foot tower at this location would have less potential visibility compared to an 80-foot tower. A 60-foot tower may be visible along approximately 320 feet of the linear KOP (42% of the total length) and a 40-foot tower may only be visible along approximately 100 feet of the linear KOP (13% of the total length). A tower with either of these heights would not penetrate the skyline and would be heavily screened by intervening topography and / or trees. At either of these heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a 60-foot or 40-foot tower, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Where visible, the tower would generally be seen in the periphery of views of the geologic scenery of the amphitheater. Regardless of the design, the tower would draw minimal, if any, focus away from the scenic canyon features for viewers who notice it as it would occupy only a very small part of the field of view.	(see previous page)
Rim Road (Hwy 63) South	The "South" section of the Rim Road (Hwy 63) is a linear KOP approximately 5,514 feet long in the study area. It is located approximately 370 feet southwest of the proposed tower site at the nearest point and approximately 5,115 feet southwest of the proposed tower site at the farthest point. The proposed tower may be visible primarily to individuals traveling north along the road and would not generally be visible to individuals traveling south except at the northern end of the KOP. An 80-foot tower at this location may be visible along most of the length of the road in the KOP (approximately 5,015 feet or 91% of the total length). The tower may exceed the visually adjacent apparent tree height and may penetrate the skyline slightly in views from this location. The lower portions of the tower would likely be partially screened by intervening tree cover. Despite the greater distance, the tower may remain fairly visible at the south end of the KOP due to the lack of tree cover in the East Creek meadow. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design. A slightly taller "tree" penetrating the skyline would likely be less noticeable to many visitors, and therefore have a smaller visual impact, than a self-support tower, particularly when viewed at greater distances. However, portions of this KOP are in relatively close proximity to the proposed tower site, and near views of a monopine tower that allow for greater detail to be observed would likely still have form, color, and/or texture visual contrast that may draw attention from viewers who recognize the tower as a man-made structure and not a tree. While a monopine style tower may have less overall potential visibility compared to a self-support, the visual impact to the KOP from either type of tower would be small as the tower would likely be visible to northbound travelers on the road for only a few minutes at most and would occupy only a very small part of the field of view. A 60-foot tower at this location would have less potential visibility compared to an 80-foot tower, and a 40-foot tower would have the least potential visibility. A 60-foot tower may be visible along approximately 4,875 feet of the linear KOP (88% of the total length) and a 40-foot tower may be visible along approximately 4,495 feet of the linear KOP (82% of the total length). A 60-foot tower may exceed the visually adjacent apparent tree height or may penetrate the skyline slightly in views from this location, while a 40-foot tower would not likely exceed the visually adjacent apparent tree height nor penetrate the skyline. Views of a tower with either of these heights would be partially screened by intervening tree cover and / or topography. A	The "South" section of the Rim Road (Hwy 63) is a linear KOP approximately 1,401 feet long in the study area. It is located approximately 3,965 feet south of the proposed tower site at the nearest point and extends out to 1 mile south of the tower site at the edge of the study area. The proposed tower may be visible primarily to individuals traveling north along the road and would not generally be visible to individuals traveling south. An 80-foot tower at this location may be visible from scattered and discontinuous areas primarily in the northern portion of the KOP totaling approximately 300 feet, which is about 21% of the total length. A 60-foot or 40-foot tower would likely not be visible at all from within this KOP. An 80-foot tower would not likely exceed the visually adjacent apparent tree height or penetrate the skyline, and would likely be heavily screened by intervening topography and / or tree cover. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights at this location, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have a very low potential to impact views within the KOP.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Rim Road (Hwy 63) South (Cont.)	high-quality monopine tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design. However, due to the low expected visibility of a 40-foot tower, a self-support style tower of this height would not be expected to have much greater visual impact at this KOP than a monopine. Regardless of the design, the visual impact to the KOP from a 60-foot or 40-foot tower would be small as it would likely be visible to northbound travelers on the road for only a few minutes at most, would not very strongly contrast with the surrounding natural scene, and would occupy only a very small part of the field of view.	(see previous page)
Rim Road (Hwy 63) North	The “North” section of the Rim Road (Hwy 63) is a linear KOP approximately 2,244 feet long in the study area. It is located approximately 3,165 feet northwest of the proposed tower site at the nearest point and extends out to 1 mile northwest of the tower site at the edge of the study area. The proposed tower may be visible to individuals traveling south along the road but would not generally be visible to individuals traveling to the north. An 80-foot tower at this location may be visible from scattered, discontinuous areas along an approximately 810-foot long stretch of road in the KOP, which is about 36% of the total length. The length of road from which the tower may be visible would be reduced to approximately 600 feet (27% of the total length) for a 60-foot tower, and only approximately 140 feet (9% of the total length) for a 40-foot tower. At any of the considered heights, the proposed tower would not penetrate the skyline and would be heavily screened by intervening topography and / or tree cover. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have a very low potential to impact views within the KOP.	The “North” section of the Rim Road (Hwy 63) is a linear KOP approximately 2,761 feet long in the study area. It is located approximately 670 feet west of the proposed tower site at the nearest point. The southern end of the KOP is located approximately 1,155 feet to the south of the proposed tower site, and the northern end of the KOP is located approximately 1,625 feet to the northwest. An 80-foot tower at this location may be visible from scattered and discontinuous areas totaling approximately 720 feet in the KOP, which is about 26% of the total length. The length of road from which the tower may be visible would be reduced to approximately 295 feet (11% of the total length) for a 60-foot tower. A 40-foot tower would likely not be visible at all from within this KOP. An 80-foot or 60-foot tower would not likely exceed the visually adjacent apparent tree height or penetrate the skyline, and would likely be heavily screened by intervening topography and / or tree cover. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights at this location, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have a very low potential to impact views within the KOP.
Bryce Point Road	Bryce Point Road is a linear KOP approximately 5,697 feet long in the study area. It is located approximately 520 feet southwest of the proposed tower site at the nearest point and extends out to 1 mile south of the tower site at the edge of the study area. The proposed tower may be visible primarily to individuals traveling north along the road and would not generally be visible to individuals traveling south except at the northern end of the KOP. Due to the curvature of the road and rolling topography, the tower would likely be visible only from the northern end of the KOP within ¼ mile of the proposed tower site, and from a ridge about ¾ mile south of the proposed tower site. An 80-foot tower at this location may be visible from a total of approximately 1,385 feet of road in the KOP, which is about 24% of the total length. The tower may greatly exceed the visually adjacent apparent tree height and may penetrate the skyline in views from northern portion of the KOP, though the lower portions of the tower would likely be at least partially screened by intervening tree cover. In the southern portion of the KOP, the tower would not likely penetrate the skyline or exceed the visually adjacent apparent tree height, and in many cases would likely be heavily screened by intervening topography and / or tree cover. Although the tower may appear much taller than the visually adjacent apparent trees in a few areas at the north end of the KOP, a high-quality monopine tower may still help the facility to blend in with the ponderosa pine forest slightly reducing the overall potential visibility of the tower within the KOP compared to a self-support tower design. Near views of a monopine tower that allow for greater detail to be observed may further draw attention from viewers who recognize the tower as a man-made structure and not a tree. While a monopine style tower may have less overall potential visibility compared to a self-support, the visual impact to the KOP from either type of tower would be small as the tower would likely be visible to travelers on the road for only a brief amount of time and would generally occupy a small part of the field of view.	Bryce Point Road is a linear KOP approximately 780 feet long in the study area. It is located approximately 4,770 feet south of the proposed tower site at the nearest point and extends out to 1 mile south of the tower site at the edge of the study area. A tower at this location would not be expected to be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Bryce Point Road (Cont.)	A 60-foot tower at this location would have less potential visibility compared to an 80-foot tower, and a 40-foot tower would have the least potential visibility. A 60-foot tower may be visible along approximately 1,240 feet of the linear KOP (22% of the total length) and a 40-foot tower may be visible along approximately 990 feet of the linear KOP (17% of the total length). A 60-foot tower may exceed the visually adjacent apparent tree height and / or may penetrate the skyline slightly in views from northern portion of the KOP, while a 40-foot tower may penetrate the skyline slightly but would not exceed the visually adjacent apparent tree height. Views of a tower with either of these heights from the northern portion of the KOP would be partially screened by intervening tree cover and / or topography. In the southern portion of the KOP, the tower would not likely penetrate the skyline or exceed the visually adjacent apparent tree height, and in most cases would likely be heavily screened by intervening topography and / or tree cover. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design. However, portions of this KOP are in relatively close proximity to the proposed tower site, and near views of a monopine tower that allow for greater detail to be observed would likely still have form, color, and/or texture visual contrast that may draw attention from viewers who recognize the tower as a man-made structure and not a tree. While a monopine style tower may have less overall potential visibility compared to a self-support design, the visual impact to the KOP from either type of tower would be small as the tower would likely be visible to travelers on the road for only a brief amount of time and would generally occupy only a small part of the field of view.	(see previous page)
Lodge Loop Road	The Lodge Loop Road is a linear KOP approximately 2,928 feet long in the study area. It is located approximately 3,165 feet north of the proposed tower site at the nearest point and extends out to 1 mile north of the tower site at the edge of the study area. A tower at this location would not be expected to be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality.	The Lodge Loop Road is a linear KOP approximately 4,996 feet long in the study area. It is located approximately 1,075 feet south of the proposed tower site at the nearest point. The northern portion of the KOP is located approximately 1,315 feet to the north of the proposed tower site, and the eastern edge of the KOP is located approximately 1,335 feet to the east. An 80-foot tower at this location may be visible from a small portion of the KOP northeast of the proposed tower location totaling approximately 70 feet, which is about 1% of the total length. A 60-foot or 40-foot tower would likely not be visible at all from within this KOP. An 80-foot tower would not likely exceed the visually adjacent apparent tree height or penetrate the skyline, and would likely be heavily screened by intervening topography and / or tree cover. At any of the considered heights, a high-quality monopine tower could help the facility to blend in with the ponderosa pine forest further reducing the potential visibility of the tower compared to a self-support tower design. However, due to the very low expected visibility of a tower with any of the considered heights at this location, a self-support style tower would not be expected to have much greater visual impact at this KOP than a monopine. Based on the generally very low anticipated visibility of the tower regardless of height or type, it is likely that very few visitors would notice it where it is visible and so would have a very low potential to impact views within the KOP.
Bryce Canyon Lodge Historic District Bryce Canyon Lodge and Deluxe Cabins NHL Bryce Canyon Lodge Cultural Landscape	The Bryce Canyon Lodge Cultural Landscape is an approximately 65-acre area KOP within the study area. It is located approximately 1,800 feet north of the proposed tower site at the nearest point and extends out to 1 mile northeast of the tower site at the edge of the study area. Included within the cultural landscape KOP are the Bryce Canyon Lodge Historic District KOP and the Bryce Canyon Lodge and Deluxe Cabins NHL KOP, which together total an approximately 11.5-acre area. The Historic District and NHL are located approximately 2,930 feet northeast of the proposed tower site at the nearest point and approximately 3,910 feet northeast of the proposed tower site at the farthest point. A tower at this location would not likely be visible from anywhere in these KOPs regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations within these KOPs, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.	The Bryce Canyon Lodge Cultural Landscape is an approximately 65-acre area KOP within the study area. It is located approximately 1,075 feet south of the proposed tower site at the nearest point and approximately 2,620 feet southeast of the proposed tower site at the farthest point. Included within the cultural landscape KOP are the Bryce Canyon Lodge Historic District KOP and the Bryce Canyon Lodge and Deluxe Cabins NHL KOP, which together total an approximately 11.5-acre area. The Historic District and NHL are located approximately 1,160 feet southeast of the proposed tower site at the nearest point and approximately 2,040 feet southeast of the proposed tower site at the farthest point. A tower at this location would not likely be visible from anywhere in these KOPs regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations within these KOPs, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Old NPS Housing Historic District Old NPS Housing Cultural Landscape Utah Parks Company Service Station Manzanita Dorm	The Old NPS Housing Cultural Landscape is an approximately 77.5-acre area KOP within the study area. It is located approximately 3,170 feet north of the proposed tower site at the nearest point and extends out to 1 mile north of the tower site at the edge of the study area. The Old NPS Housing Historic District is an approximately 5.1-acre area KOP included within the cultural landscape KOP located approximately 4,420 feet north of the proposed tower site at the nearest point and approximately 5,045 feet north of the proposed tower site at the farthest point. Also included within the cultural landscape KOP are the Utah Parks Company Service Station building and Manzanita Dorm building KOPs located approximately 4,455 feet north of the proposed tower site and 4,370 feet north of the proposed tower site, respectively. A tower at this location would not likely be visible from anywhere in these KOPs regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations within these KOPs, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.	The Old NPS Housing Cultural Landscape is an approximately 91-acre area KOP within the study area. The proposed tower site is located within the cultural landscape. The Old NPS Housing Historic District is an approximately 5.1-acre area KOP included within the cultural landscape KOP located approximately 200 feet northeast of the proposed tower site at the nearest point and approximately 790 feet east of the proposed tower site at the farthest point. Also included within the cultural landscape KOP are the Utah Parks Company Service Station building and Manzanita Dorm building KOPs located approximately 1,240 feet southeast of the proposed tower site and 310 feet east of the proposed tower site, respectively. A tower with any of the considered heights at this location may be visible from largely scattered and isolated areas within the cultural landscape KOP. Due to the rolling topography and dense tree cover most views of the tower from within the cultural landscape KOP would be heavily screened and the tower would not likely penetrate the skyline. A 60-foot or 40-foot tower would not likely exceed the visually adjacent apparent tree height nor penetrate the skyline in views from within the KOP; however, an 80-foot tower would likely exceed the visually adjacent apparent tree height, would likely penetrate the skyline slightly, and may be only partially screened by intervening topography and / or tree cover only when viewed from closer locations with relatively sparse tree cover, like the old road scar or Manzanita Dorm (Photo Simulation C). A tower of any height would not likely be visible from within the historic district KOP or from the Utah Parks Company Service Station KOP except possibly from scattered and isolated locations where views of the tower would be heavily screened by intervening topography and / or tree cover. A high-quality monopine tower could help the facility to blend in with the ponderosa pine forest somewhat reducing the potential visibility of the tower compared to a self-support tower design. Near views of a monopine tower that allow for greater detail to be observed would likely have form, color, and/or texture visual contrast that may draw attention from viewers who recognize the tower as a man-made structure and not a tree. Most of the cultural landscape KOP is not a public use area, so viewers would generally be limited to area residents, primarily those residing in Manzanita Dorm. The impact to the visual experience of the historic and natural landscape for these residents would depend on the perceptions of each individual but would generally be expected to be negative or neutral.
Bryce Inn Old Administration Building	NA – KOPs located greater than 1 mile from the proposed tower site.	Bryce Inn is located approximately 1,905 feet northeast of the proposed tower site, and the Old Administration Building is located approximately 1,795 feet northeast of the proposed tower site. A tower at this location would not likely be visible from anywhere at these KOPs regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations at these KOPs, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.
North Campground Loop C Comfort Station Loop D Comfort Station	NA – KOPs located greater than 1 mile from the proposed tower site.	The North Campground is an approximately 29-acre area KOP within the study area. It is located approximately 1,715 feet northeast of the proposed tower site at the nearest point and approximately 3,700 feet northeast of the proposed tower site at the farthest point. Included within the North Campground KOP are the Loop C and Loop D Comfort Station KOPs located approximately 2,640 feet and 2,085 feet northeast of the proposed tower site, respectively. A tower at this location would not likely be visible from anywhere in these KOPs regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations within these KOPs, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.
Sunset Campground	The Sunset Campground is an approximately 31.3-acre area KOP within the study area. It is located approximately 740 feet northwest of the proposed tower site at the nearest point and approximately 2,290 feet north of the proposed tower site at the farthest point. A tower at this location would not likely be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations within this KOP, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.	The Sunset Campground is an approximately 31.3-acre area KOP within the study area. It is located approximately 2,200 feet south of the proposed tower site at the nearest point and approximately 4,280 feet south of the proposed tower site at the farthest point. A tower at this location would not likely be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations within this KOP, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.

KOP	Visual Impact Description Alternative B – Science Hill	Visual Impact Description Alternative C – Manzanita Dorm
Mission 66 Housing	NA – KOP located greater than 1 mile from the proposed tower site.	Mission 66 Housing is an approximately 17-acre area KOP within the study area. It is located approximately 1,635 feet northwest of the proposed tower site at the nearest point and approximately 2,840 feet northwest of the proposed tower site at the farthest point. A tower at this location would not likely be visible from anywhere in this KOP regardless of height or type and would, therefore, have little to no potential to impact the scenic quality. If the tower was visible from any locations within this KOP, they would likely be scattered and isolated, and views of the tower would likely be heavily screened by intervening topography and / or tree cover.

References

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PHOTO SIMULATIONS

Simulation A

UT6 BRYCE CANYON

Rim Trail (Science Hill)

View of Science Hill Tower

80’ Self Support Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8922
Date: April 7, 2019
Time: 10:09 AM
GPS Coordinates: lat 37.6174°, long -112.1709°
Viewpoint Elevation: 8,011’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Self Support Lattice
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

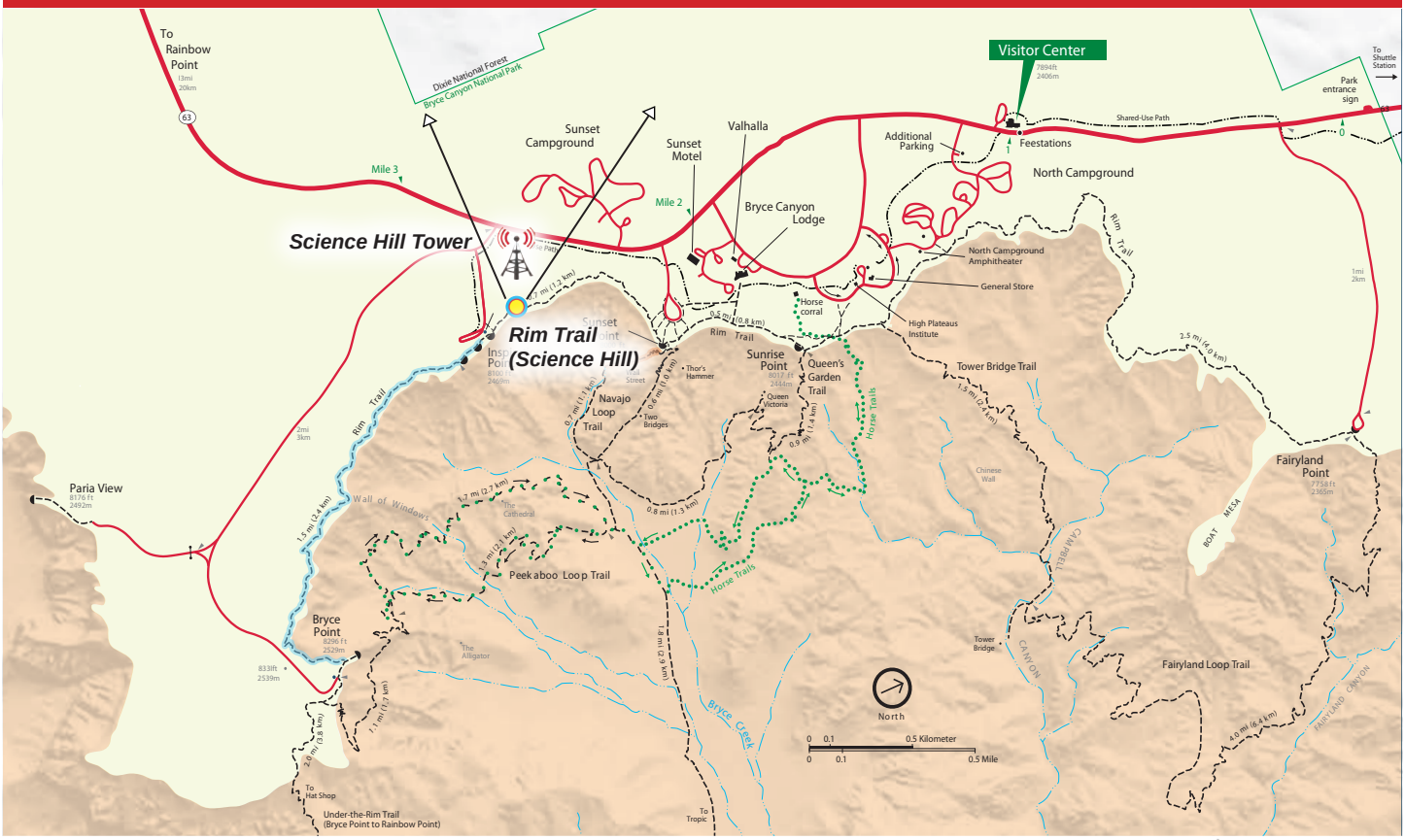
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on an in field man-lift test. The height of the man-lift was set to 80’ at the tower location. A test photo was then taken at the key observation point that included the man-lift. Another photo was taken without the man lift and a scaled tower was inserted into the subject photo based on the man-lift height of the test photo.

CONTEXT MAP



Technology Associates

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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 80' SELF SUPPORT TELECOMMUNICATION TOWER

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 80' SELF SUPPORT TELECOMMUNICATION TOWER

Simulation A

UT6 BRYCE CANYON

Rim Trail (Science Hill)

View of Science Hill Tower

80’ Monopine Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8922
Date: April 7, 2019
Time: 10:09 AM
GPS Coordinates: lat 37.6174°, long -112.1709°
Viewpoint Elevation: 8,011’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Monopine
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

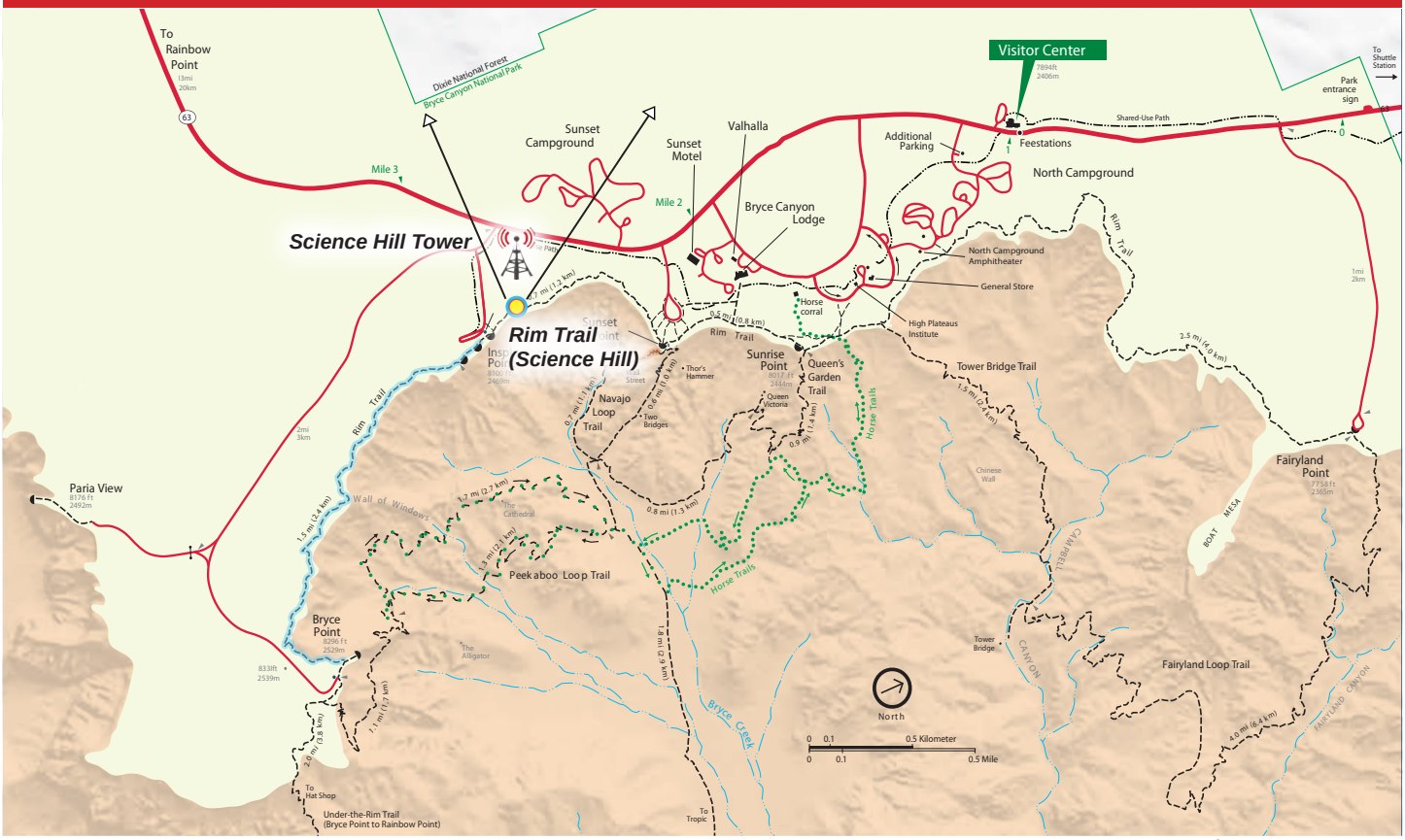
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on an in field man-lift test. The height of the man-lift was set to 80’ at the tower location. A test photo was then taken at the key observation point that included the man-lift. Another photo was taken without the man lift and a scaled tower was inserted into the subject photo based on the man-lift height of the test photo.

CONTEXT MAP



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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 80' MONOPINE TELECOMMUNICATION TOWER

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 80' MONOPINE TELECOMMUNICATION TOWER

Simulation A

UT6 BRYCE CANYON

Rim Trail (Science Hill)

View of Science Hill Tower

60’ Self Support Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8922
Date: April 7, 2019
Time: 10:09 AM
GPS Coordinates: lat 37.6174°, long -112.1709°
Viewpoint Elevation: 8,011’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Self Support Lattice
Height: 60’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

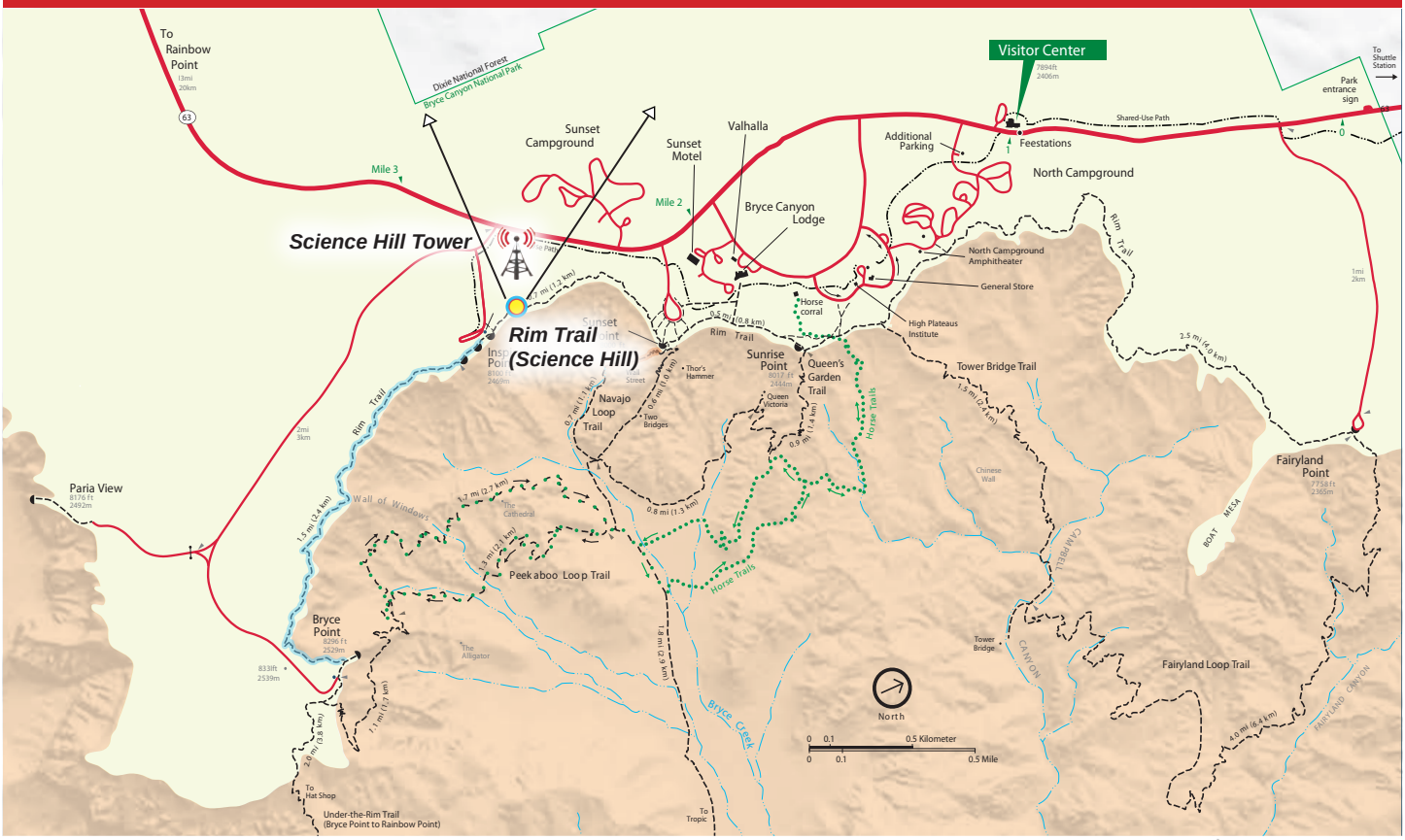
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on an in field man-lift test. The height of the man-lift was set to 80’ at the tower location. A test photo was then taken at the key observation point that included the man-lift. Another photo was taken without the man lift and a scaled tower was inserted into the subject photo based on the man-lift height of the test photo.

CONTEXT MAP



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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 60' SELF SUPPORT TELECOMMUNICATION TOWER

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 60' SELF SUPPORT TELECOMMUNICATION TOWER

Simulation A

UT6 BRYCE CANYON

Rim Trail (Science Hill)

View of Science Hill Tower

60’ Monopine Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8922
Date: April 7, 2019
Time: 10:09 AM
GPS Coordinates: lat 37.6174°, long -112.1709°
Viewpoint Elevation: 8,011’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Monopine
Height: 60’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

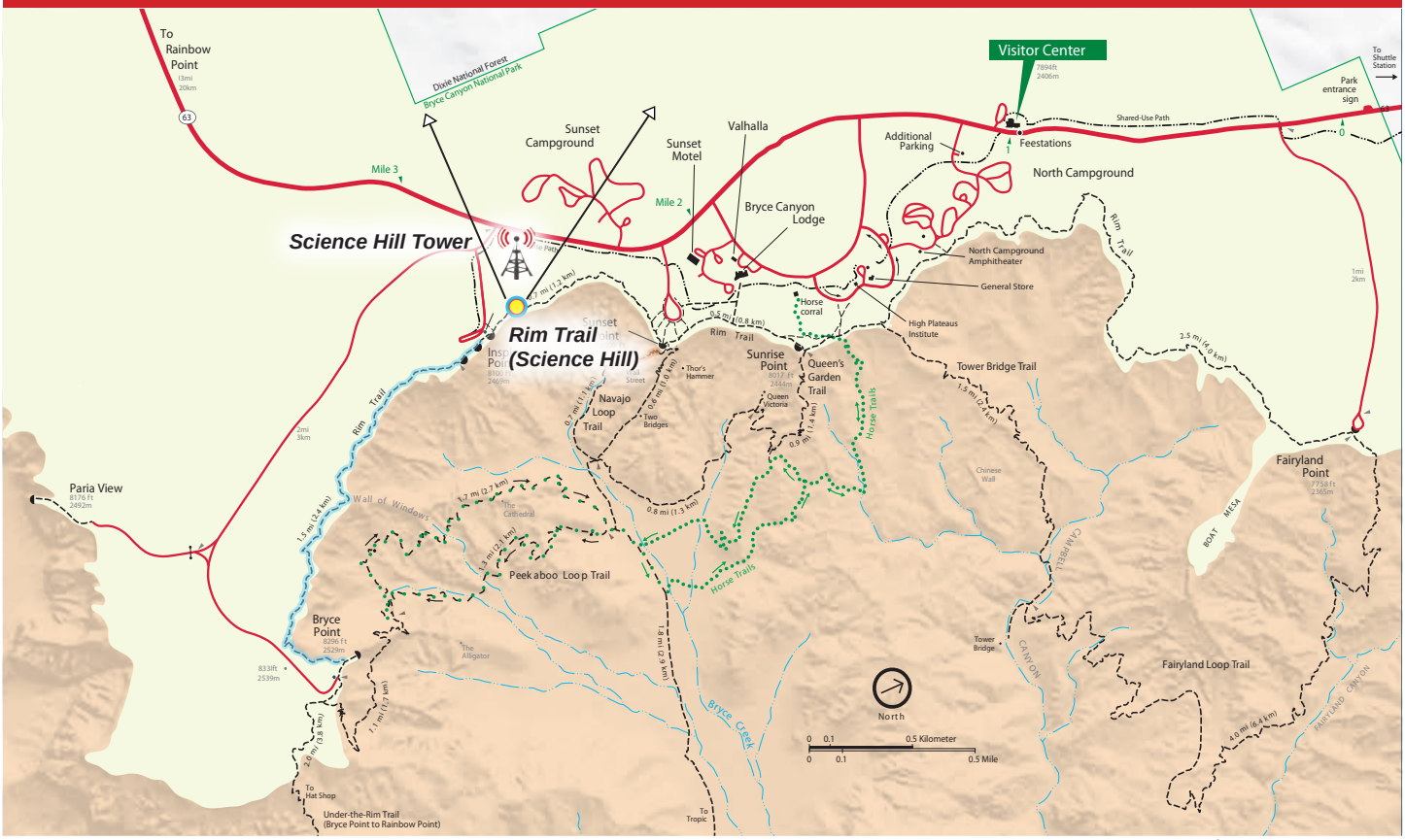
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on an in field man-lift test. The height of the man-lift was set to 80’ at the tower location. A test photo was then taken at the key observation point that included the man-lift. Another photo was taken without the man lift and a scaled tower was inserted into the subject photo based on the man-lift height of the test photo.

CONTEXT MAP



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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 60' MONOPINE TELECOMMUNICATION TOWER

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (SCIENCE HILL) SIMULATION, EARLY MORNING, 800 FT., 60' MONOPINE TELECOMMUNICATION TOWER

Simulation B

UT6 BRYCE CANYON

Sunset Point

View of Science Hill Tower

80’ Self Support Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8907
Date: April 7, 2019
Time: 9:52 AM
GPS Coordinates: lat 37.6225°, long -112.1678°
Viewpoint Elevation: 8,011’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Side Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Self Support Lattice
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

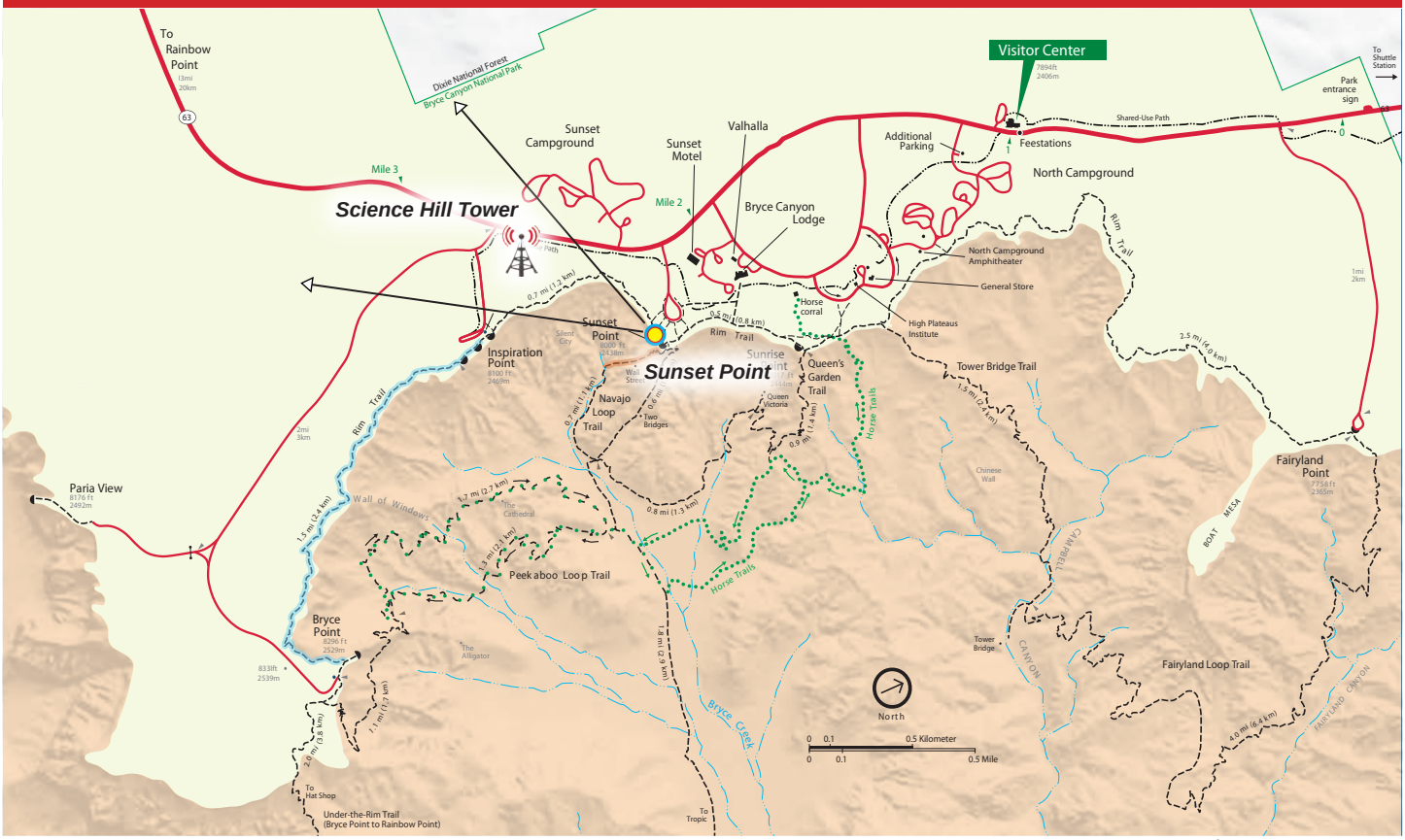
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on surrounding vegetation and a viewshed simulation through Google Earth.

CONTEXT MAP



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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

SUNSET POINT SIMULATION, EARLY MORNING, 0.4 MILES, EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

SUN SET POINT SIMULATION, EARLY MORNING, 0.4 MILES, 80' SELF SUPPORT TELECOMMUNICATION TOWER

SCIENCE HILL AREA - ENLARGED 20x

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

SUNSET POINT SIMULATION, EARLY MORNING, 0.4 MILES, 80' SELF SUPPORT TELECOMMUNICATION TOWER

Simulation B

UT6 BRYCE CANYON

Sunset Point

View of Science Hill Tower

80’ Monopine Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8907
Date: April 7, 2019
Time: 9:52 AM
GPS Coordinates: lat 37.6225°, long -112.1678°
Viewpoint Elevation: 8,011’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Side Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Monopine
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

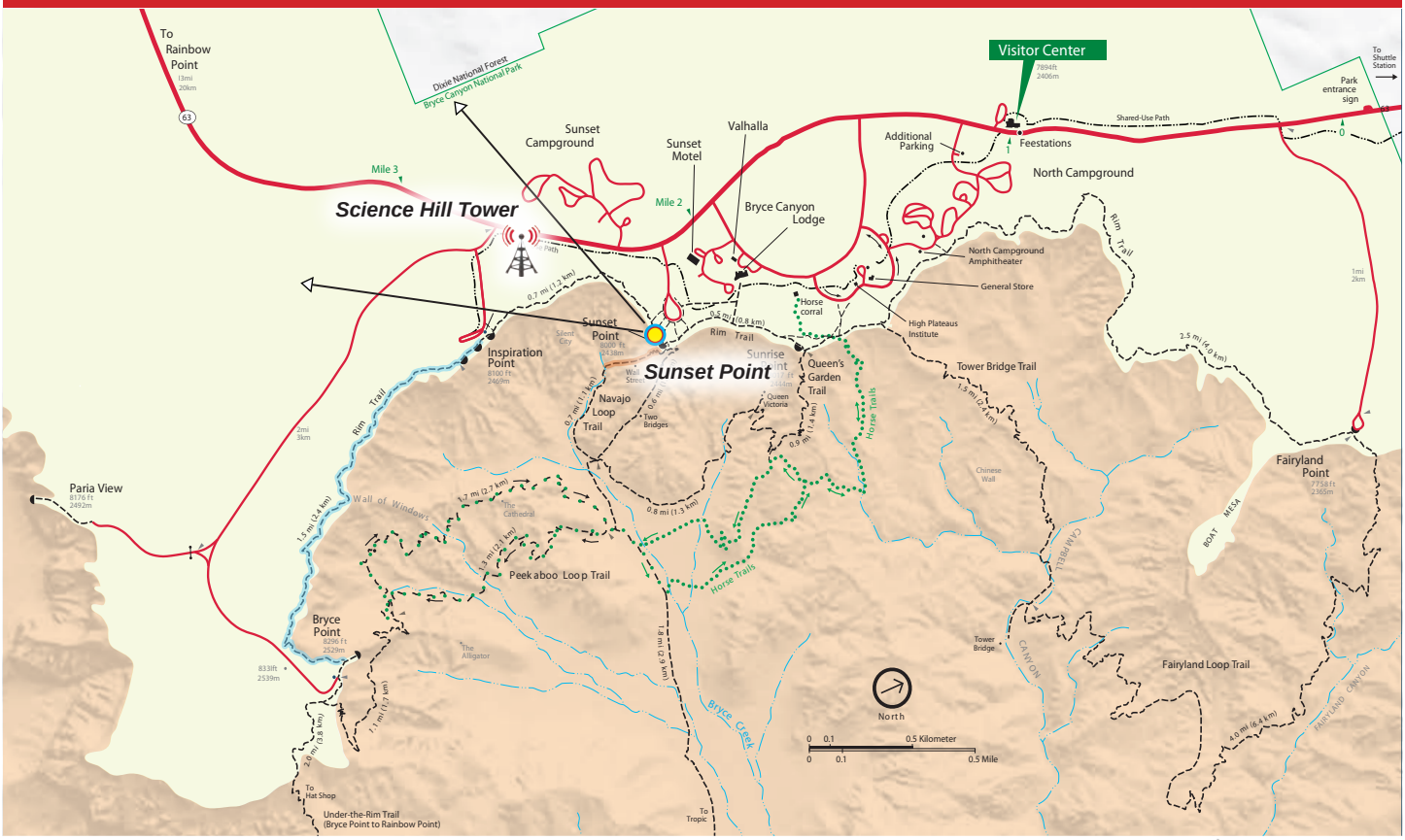
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on surrounding vegetation and a viewshed simulation through Google Earth.

CONTEXT MAP



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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

SUNSET POINT SIMULATION, EARLY MORNING, 0.4 MILES, EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

SUN SET POINT SIMULATION, EARLY MORNING, 0.4 MILES, 80' MONOPINE TELECOMMUNICATION TOWER

SCIENCE HILL AREA - ENLARGED 20x

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

SUNSET POINT SIMULATION, EARLY MORNING, 0.4 MILES, 80' MONOPINE TELECOMMUNICATION TOWER

Simulation C

UT6 BRYCE CANYON

Staff Dormitory

View of Manzanita Dorm Tower

80’ Self Support Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8905
Date: April 7, 2019
Time: 9:42 AM
GPS Coordinates: lat 37.6300°, long -112.1702°
Viewpoint Elevation: 7,965’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Self Support Lattice
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

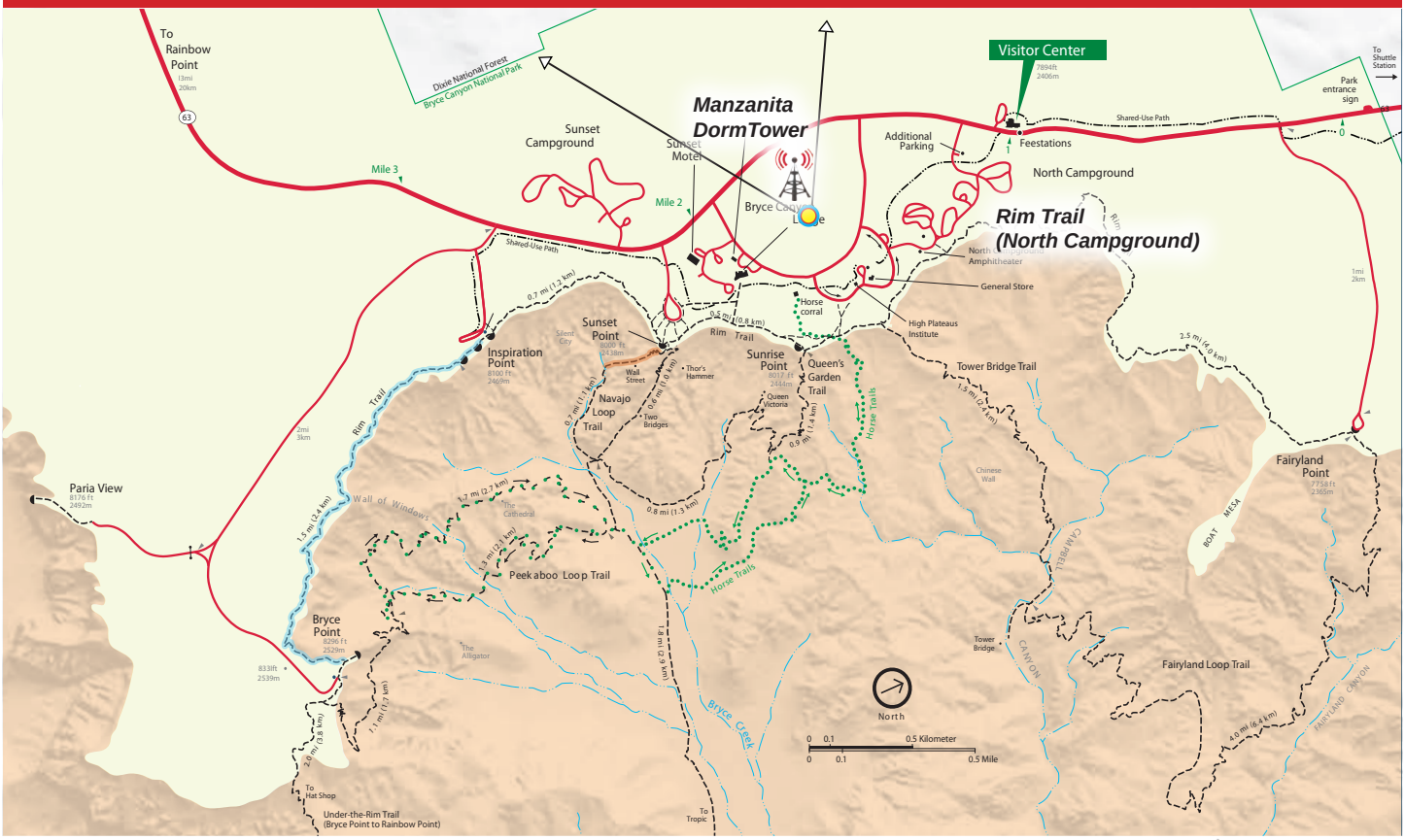
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on height of surrounding objects and vegetation. Scale was then determined based on distance from key observation point.

CONTEXT MAP



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VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

ENMPLOYEE DORMITORY SIMULATION, EARLY MORNING, 300 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

EMPLOYEE DORMATORY SIMULATION, EARLY MORNING, 300 FT., 80' SELF SUPPORT TELECOMMUNICATION TOWER

Simulation C

UT6 BRYCE CANYON

Staff Dormitory

View of Manzanita Dorm Tower

80’ Monopine Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8905
Date: April 7, 2019
Time: 9:42 AM
GPS Coordinates: lat 37.6300°, long -112.1702°
Viewpoint Elevation: 7,965’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Monopine
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

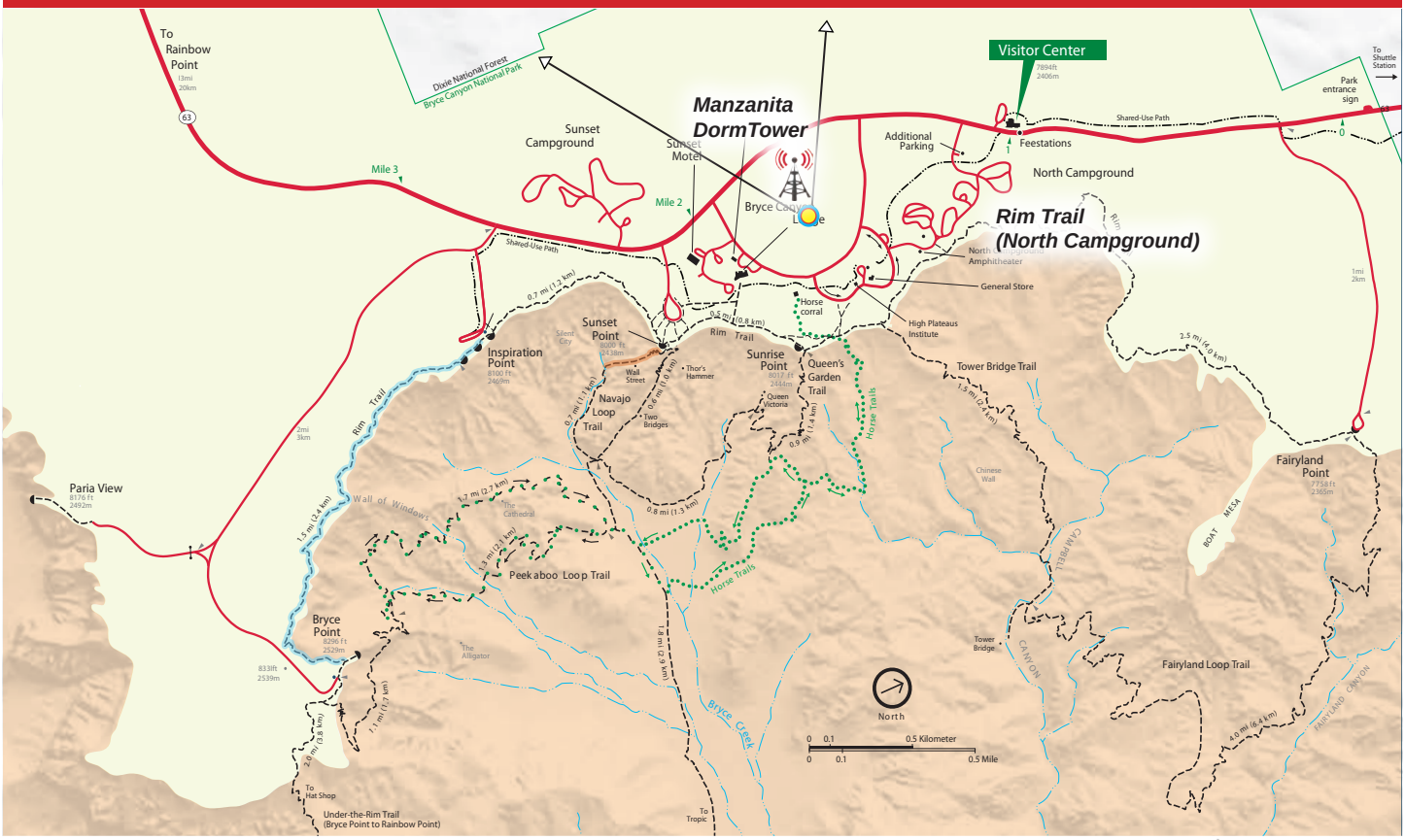
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on height of surrounding objects and vegetation. Scale was then determined based on distance from key observation point.

CONTEXT MAP



Technology Associates

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

ENMPLOYEE DORMITORY SIMULATION, EARLY MORNING, 300 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

EMPLOYEE DORMATORY SIMULATION, EARLY MORNING, 300 FT., 80' MONOPINE TELECOMMUNICATION TOWER

Simulation C

UT6 BRYCE CANYON

Staff Dormitory

View of Manzanita Dorm Tower

60’ Self Support Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8905
Date: April 7, 2019
Time: 9:42 AM
GPS Coordinates: lat 37.6300°, long -112.1702°
Viewpoint Elevation: 7,965’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Self Support Lattice
Height: 60’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

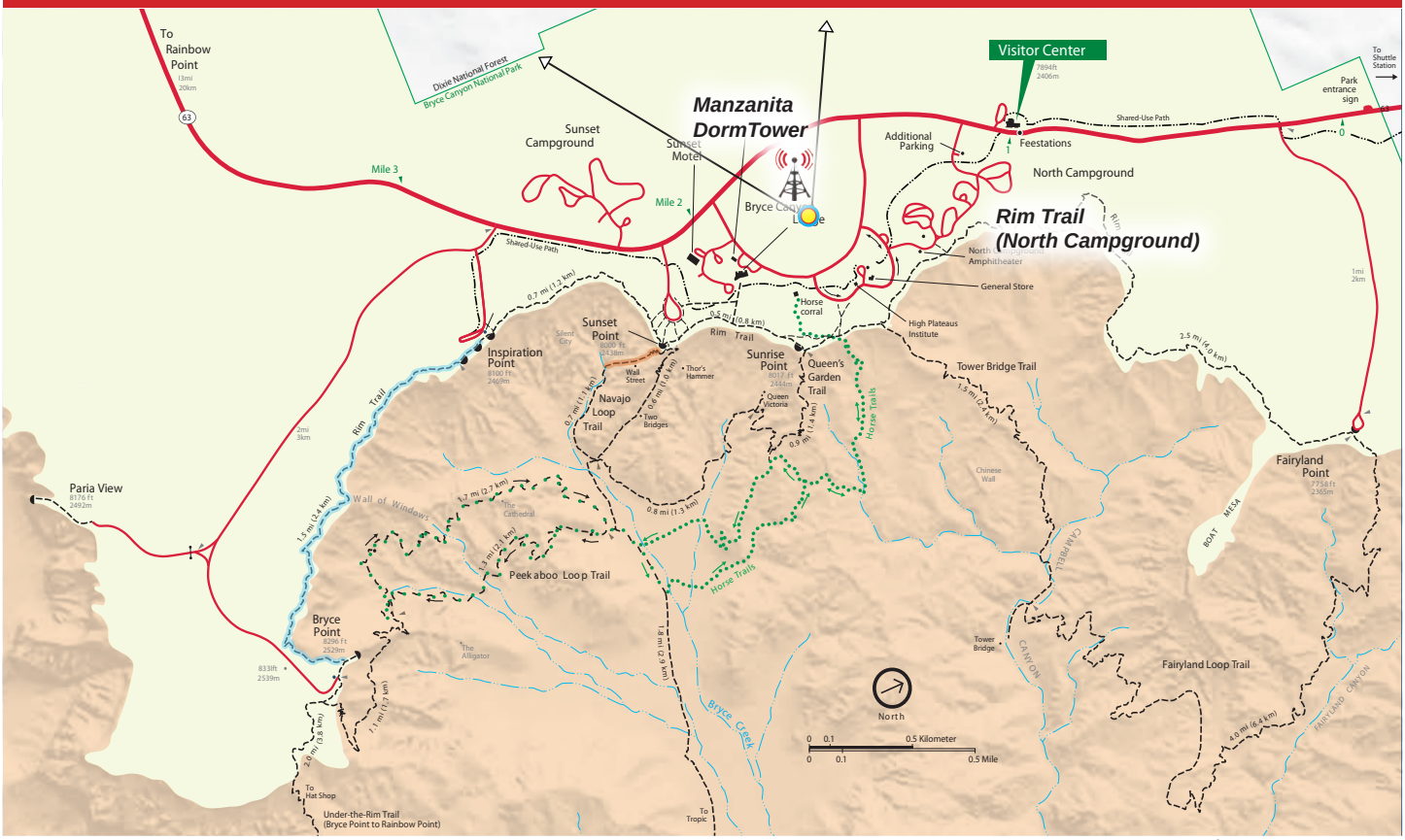
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on height of surrounding objects and vegetation. Scale was then determined based on distance from key observation point.

CONTEXT MAP



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VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

ENMPLOYEE DORMITORY SIMULATION, EARLY MORNING, 300 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

EMPLOYEE DORMATORY SIMULATION, EARLY MORNING, 300 FT., 60' SELF SUPPORT TELECOMMUNICATION TOWER

Simulation C

UT6 BRYCE CANYON

Staff Dormitory

View of Manzanita Dorm Tower

60’ Monopine Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8905
Date: April 7, 2019
Time: 9:42 AM
GPS Coordinates: lat 37.6300°, long -112.1702°
Viewpoint Elevation: 7,965’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Front Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Monopine
Height: 60’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

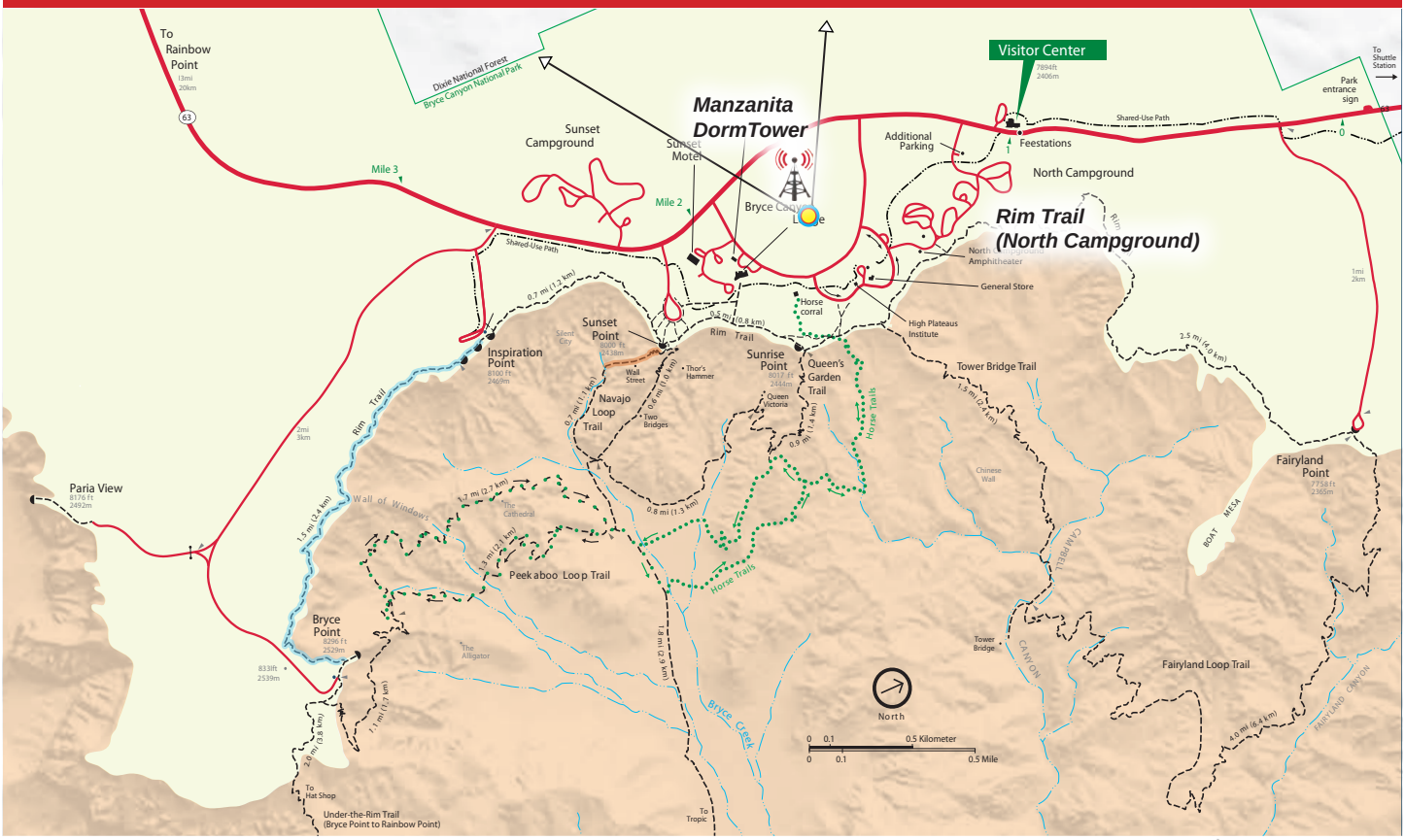
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on height of surrounding objects and vegetation. Scale was then determined based on distance from key observation point.

CONTEXT MAP



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VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

ENMPLOYEE DORMITORY SIMULATION, EARLY MORNING, 300 FT., EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

EMPLOYEE DORMATORY SIMULATION, EARLY MORNING, 300 FT., 60' MONOPINE TELECOMMUNICATION TOWER

Simulation D

UT6 BRYCE CANYON

Rim Trail (North Campground)

View of Manzanita Dorm Tower

80’ Self Support Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8901
Date: April 7, 2019
Time: 9:30 AM
GPS Coordinates: lat 37.6369°, long -112.1654°
Viewpoint Elevation: 8,021’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Side Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Self Support Lattice
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

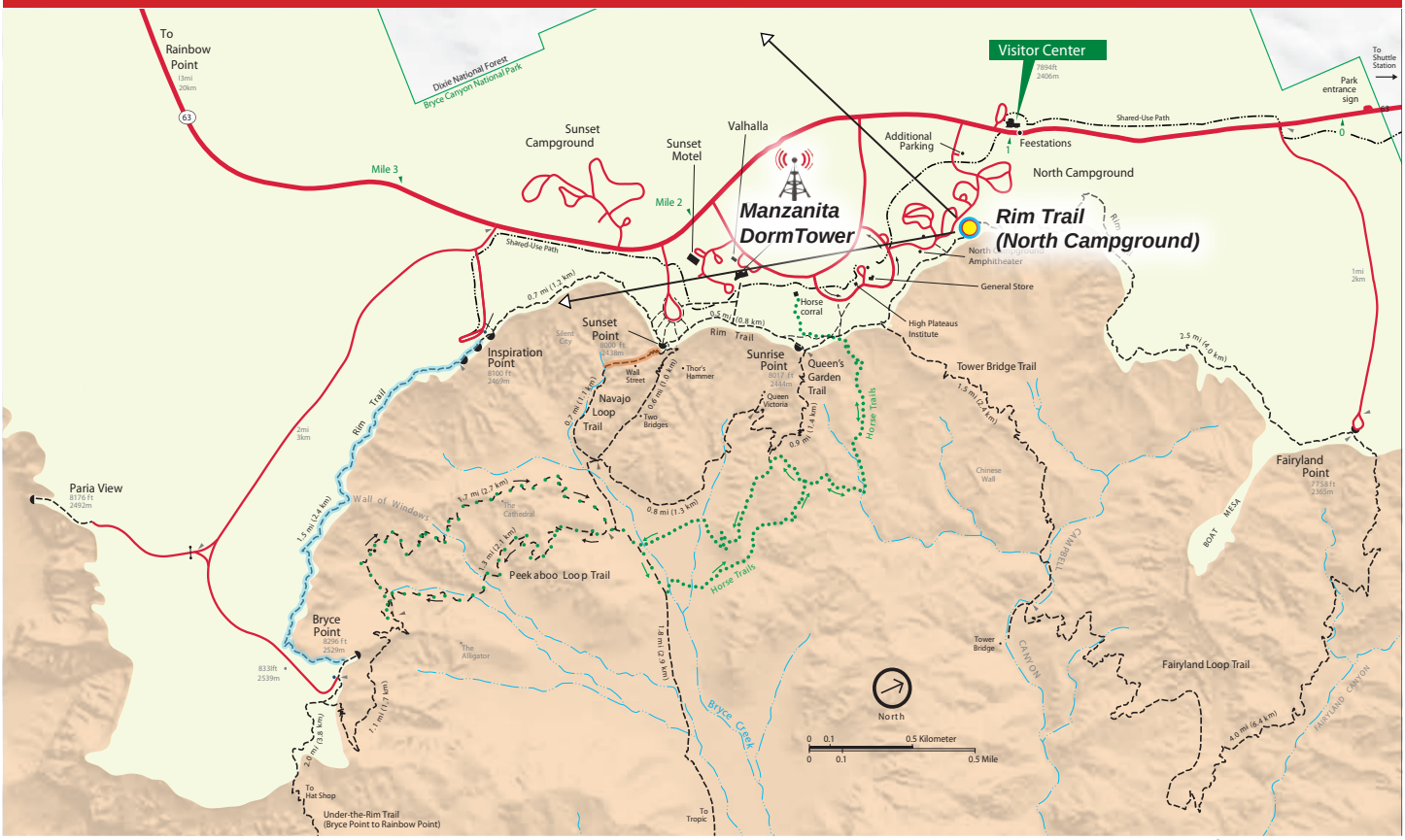
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on a google earth model. An 80’ object was placed at the tower location. A rendering was created to simulate the tower height and location in a 3D model based from the key observation point. This 3D model was then used to create the tower height and location in the subject photo from the key observation point.

CONTEXT MAP



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VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, .57 MILES, EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, .57 MILES, 80' SELF SUPPORT TELECOMMUNICATION TOWER

MANZANITA DORM AREA - ENLARGED 20x

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, .57 MILES, 80' SELF SUPPORT TELECOMMUNICATION TOWER

Simulation D

UT6 BRYCE CANYON

Rim Trail (North Campground)

View of Manzanita Dorm Tower

80’ Monopine Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8901
Date: April 7, 2019
Time: 9:30 AM
GPS Coordinates: lat 37.6369°, long -112.1654°
Viewpoint Elevation: 8,021’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Side Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Monopine
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

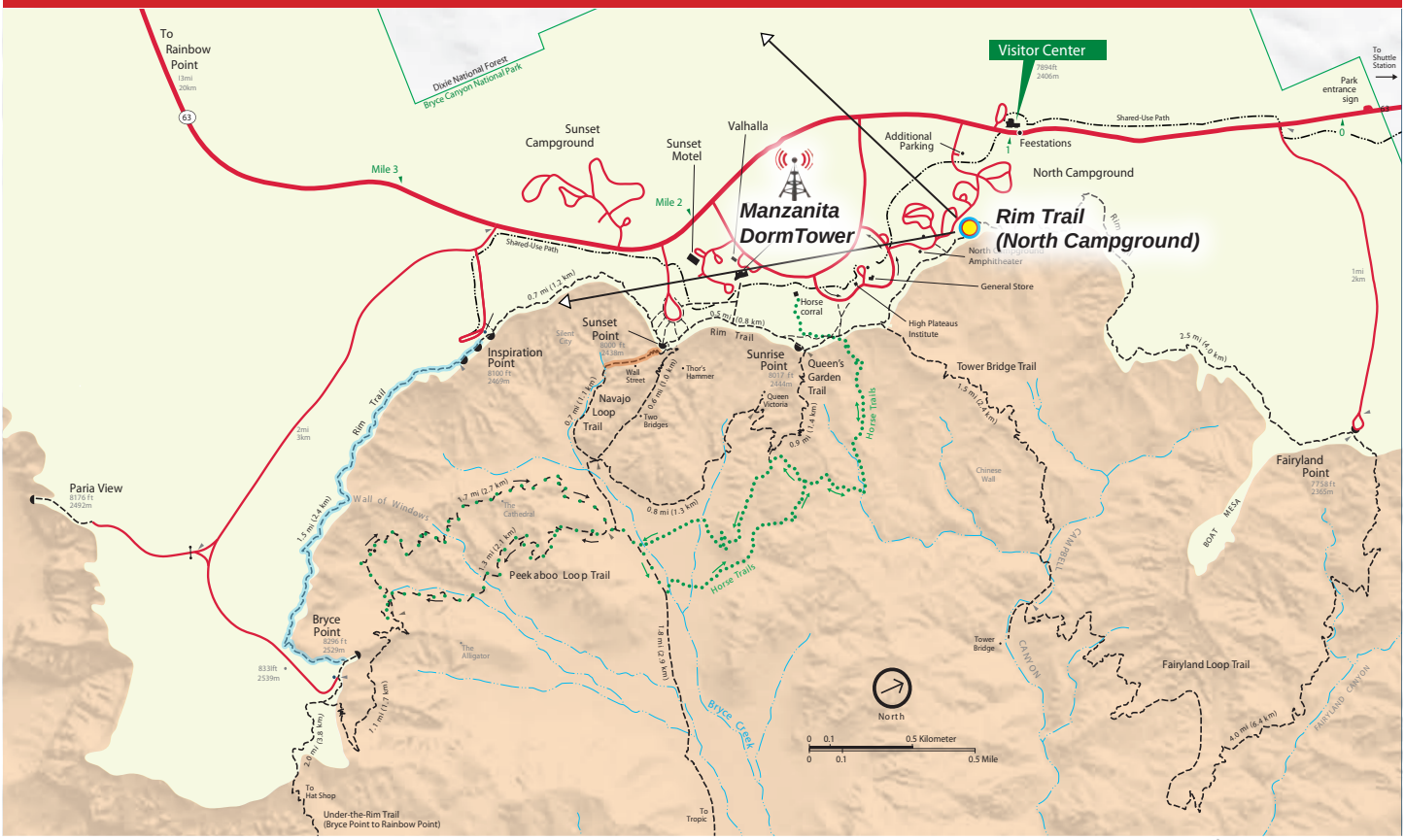
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on a google earth model. An 80’ object was placed at the tower location. A rendering was created to simulate the tower height and location in a 3D model based from the key observation point. This 3D model was then used to create the tower height and location in the subject photo from the key observation point.

CONTEXT MAP



Technology Associates

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VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, .57 MILES, EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, .57 MILES, 80' MONOPINE TELECOMMUNICATION TOWER

MANZANITA DORM AREA - ENLARGED 20x

verizon

VISUALIZATION STUDY FOR MANZANITA DORM TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, .57 MILES, 80' MONOPINE TELECOMMUNICATION TOWER

Simulation D

UT6 BRYCE CANYON

Rim Trail (North Campground)

View of Science Hill Tower

80’ Self Support Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8896
Date: April 7, 2019
Time: 9:30 AM
GPS Coordinates: lat 37.6369°, long -112.1654°
Viewpoint Elevation: 8,021’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Side Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Self Support Lattice
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

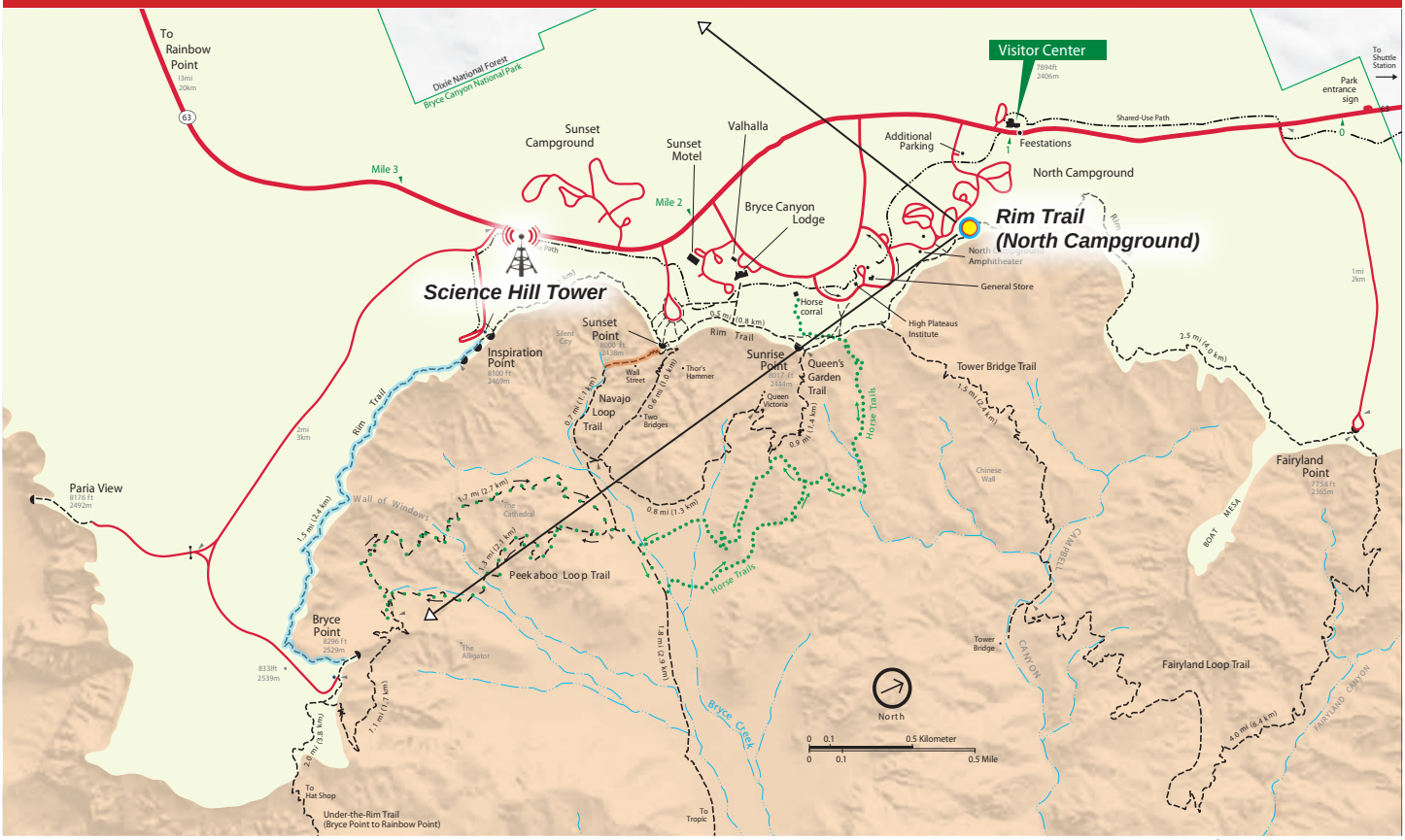
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on an in field man-lift test. The height of the man-lift was set to 80’ at the tower location. A test photo was then taken at the key observation point that included the man-lift. Another photo was taken without the man lift and a scaled tower was inserted into the subject photo based on the man-lift height of the test photo.

CONTEXT MAP



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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, 1.3 MILES, EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, 1.3 MILES, 80' SELF SUPPORT TELECOMMUNICATION TOWER

SCIENCE HILL AREA - ENLARGED 20x

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, 1.3 MILES, 80' SELF SUPPORT TELECOMMUNICATION TOWER

Simulation D

UT6 BRYCE CANYON

Rim Trail (North Campground)

View of Science Hill Tower

80’ Monopine Wireless Telecommunication Tower

GENERAL INFORMATION

Base Photograph
Photo Name: DSC_8896
Date: April 7, 2019
Time: 9:30 AM
GPS Coordinates: lat 37.6369°, long -112.1654°
Viewpoint Elevation: 8,021’ AMSL

Sun and Weather
Sun Angle/Azimuth: 104°
Sun Elevation: 28°
Lighting Angle: Side Lit
Weather Conditions: Sunny
Visibility: 18 mi

Tower Information
Manufacturer: Sabre Industries Towers and Poles
Type: Monopine
Height: 80’

Camera
Camera Make/Model: Nikon D5000
Sensor Dimensions: 23.6 mm X 15.8 mm
Lens Make/Model: Nikkor DX AF-P DX
Lens Focal Length in 35mm Film: 27 mm
Camera Height: 1.5 m (5’)

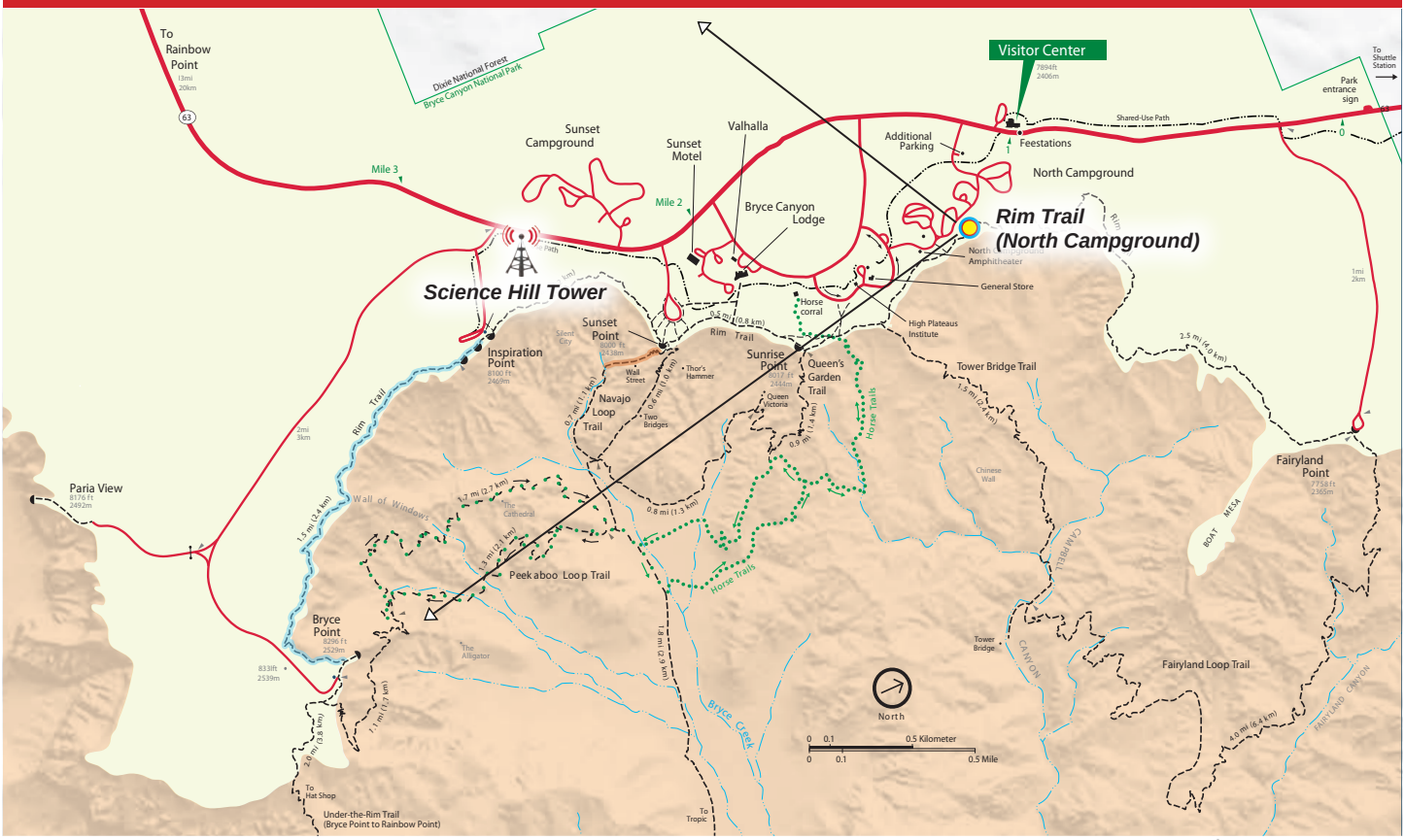
VIEWING INSTRUCTIONS

The simulation is properly printed on an 11” X 17” sheet at actual size. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the property perspective when viewed at a distance of approximately twice the image height.

NOTES

The tower scale was determined based on an in field man-lift test. The height of the man-lift was set to 80’ at the tower location. A test photo was then taken at the key observation point that included the man-lift. Another photo was taken without the man lift and a scaled tower was inserted into the subject photo based on the man-lift height of the test photo.

CONTEXT MAP



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VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, 1.3 MILES, EXISTING CONDITIONS

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, 1.3 MILES, 80' MONOPINE TELECOMMUNICATION TOWER

SCIENCE HILL AREA - ENLARGED 20x

verizon

VISUALIZATION STUDY FOR SCIENCE HILL TOWER - BRYCE CANYON NATIONAL PARK

RIM TRAIL (NORTH CAMPGROUND) SIMULATION, EARLY MORNING, 1.3 MILES, 80' MONOPINE TELECOMMUNICATION TOWER

UT6 BRYCE CANYON

VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - SELF SUPPORT

NORTH

View From Inspiration Point

EXISTING SITE

AERIAL LOCATION

PHOTO SIMULATION E - 100’ SELF SUPPORT TOWER

Drawn By: **Daniel Thurgood**
Salt Lake City Office
Drawn For: **National Park Service**
Bryce Canyon

Salt Lake Office
5710 S Green Street
Murray, UT 84123
801-463-1020

Corporate
3115 Melrose Drive
Carlsbad, CA 92010
760-765-5275

UT6 BRYCE CANYON

VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - SELF SUPPORT

EXISTING SITE

AERIAL LOCATION

PHOTO SIMULATION E - 100’ SELF SUPPORT TOWER

NORTH

View From Inspiration Point

Technology Associates

Drawn By: **Daniel Thurgood**
Salt Lake City Office

Drawn For: **National Park Service**
Bryce Canyon

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760-765-5275

UT6 BRYCE CANYON

VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - MONOPINE

NORTH

View From Inspiration Point

EXISTING SITE

AERIAL LOCATION

PHOTO SIMULATION E - 100’ MONOPINE TOWER

Technology Associates

Drawn By: **Daniel Thurgood**
Salt Lake City Office
Drawn For: **National Park Service**
Bryce Canyon

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verizon

UT6 BRYCE CANYON

VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - MONOPINE

NORTH

View From Inspiration Point

EXISTING SITE

AERIAL LOCATION

PHOTO SIMULATION E - 100’ MONOPINE TOWER

Technology Associates

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Drawn For: **National Park Service**
Bryce Canyon

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760-765-5275

UT6 BRYCE CANYON

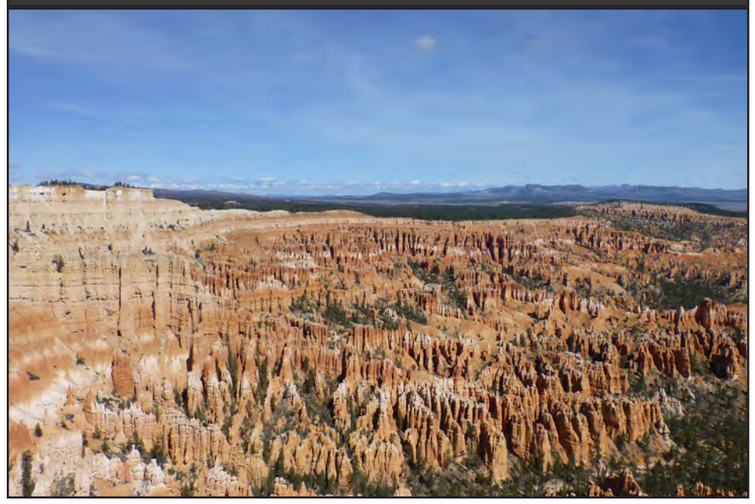
VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - SELF SUPPORT TOWER

NW

View From Bryce Point

EXISTING SITE



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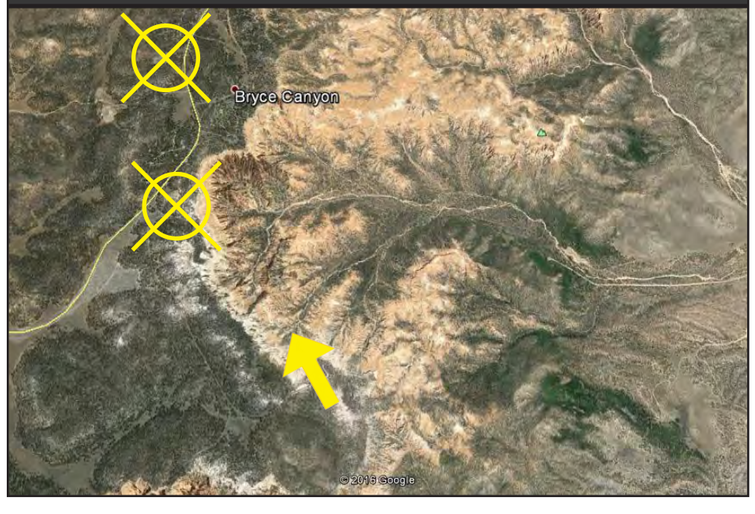
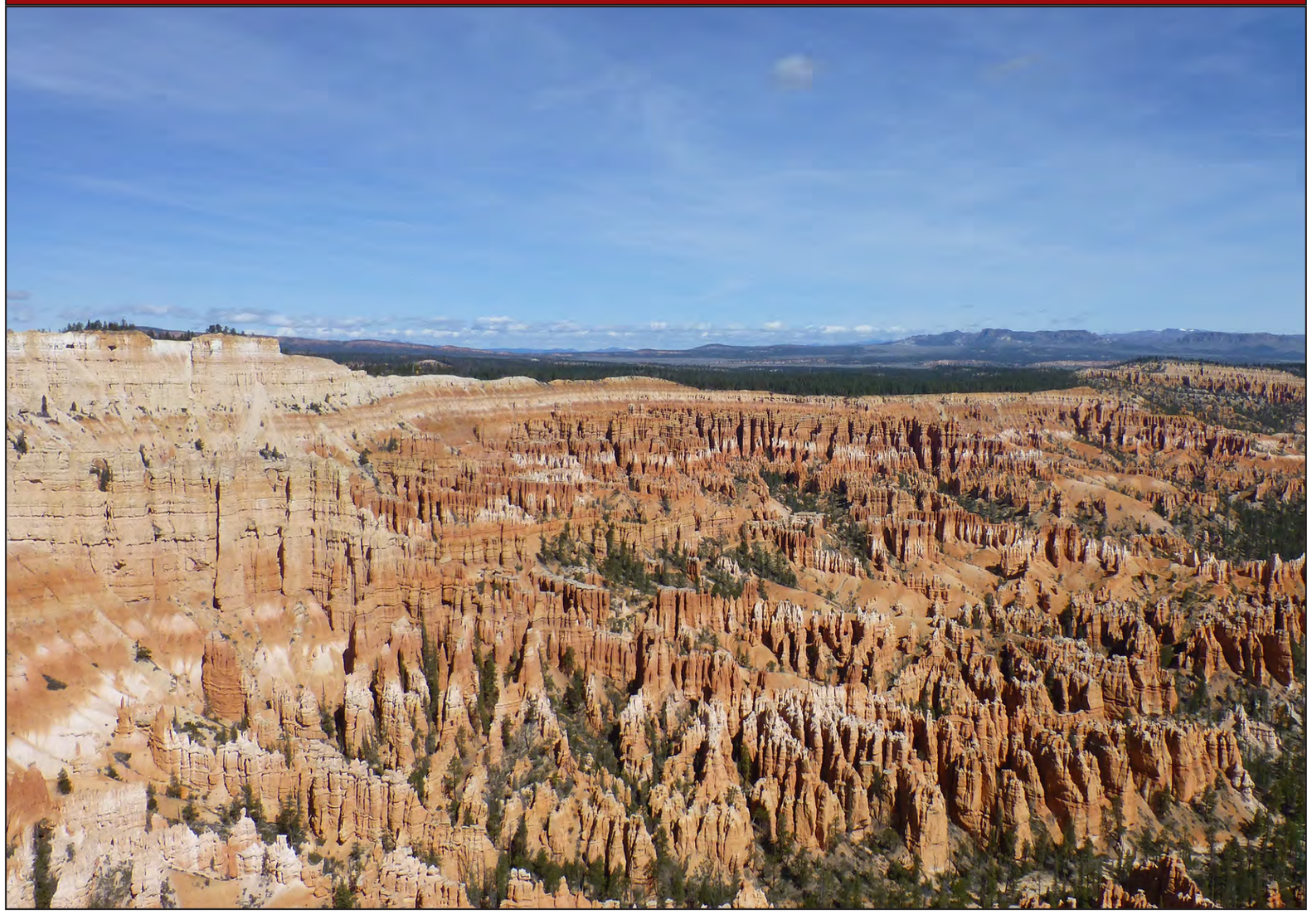


PHOTO SIMULATION F - 100’ SELF SUPPORT TOWER



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UT6 BRYCE CANYON

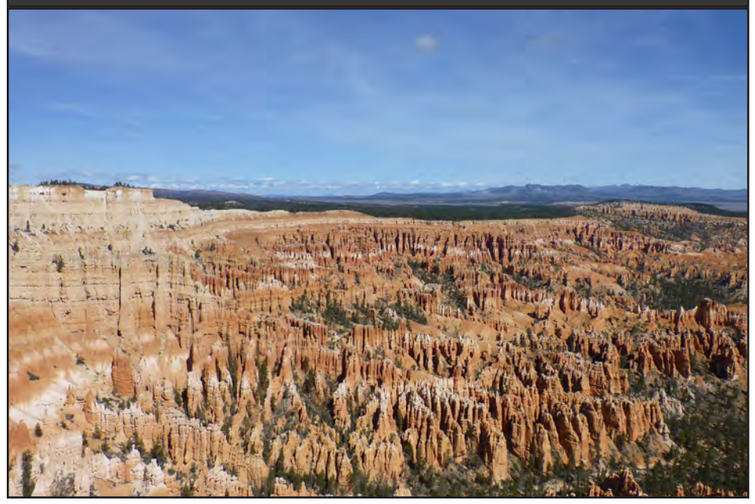
VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - SELF SUPPORT TOWER

NW

View From Bryce Point

EXISTING SITE



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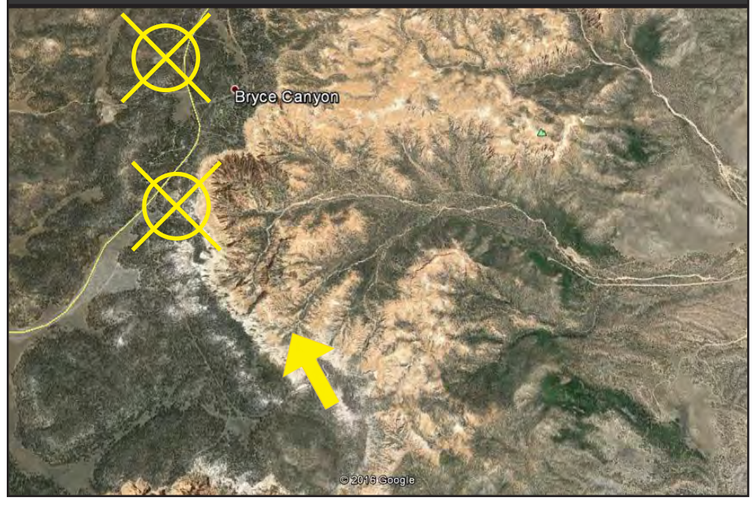

PHOTO SIMULATION F - 100’ SELF SUPPORT TOWER

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Salt Lake City Office

Drawn For: **National Park Service**
Bryce Canyon

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UT6 BRYCE CANYON

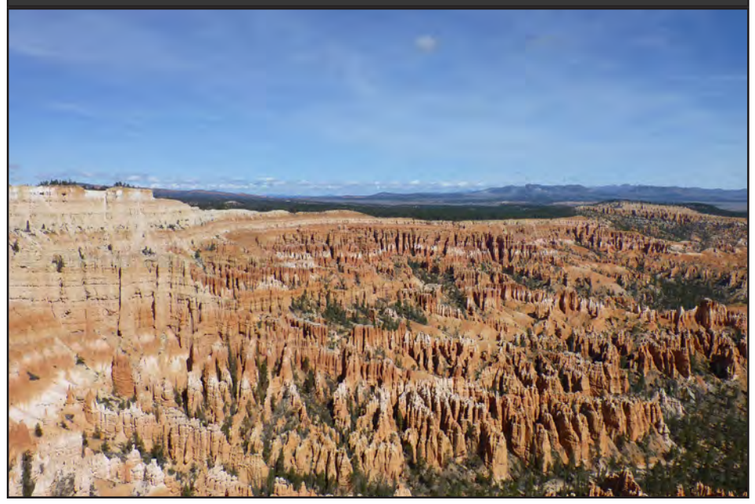
VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - MONOPINE

NW

View From Bryce Point

EXISTING SITE



AERIAL LOCATION

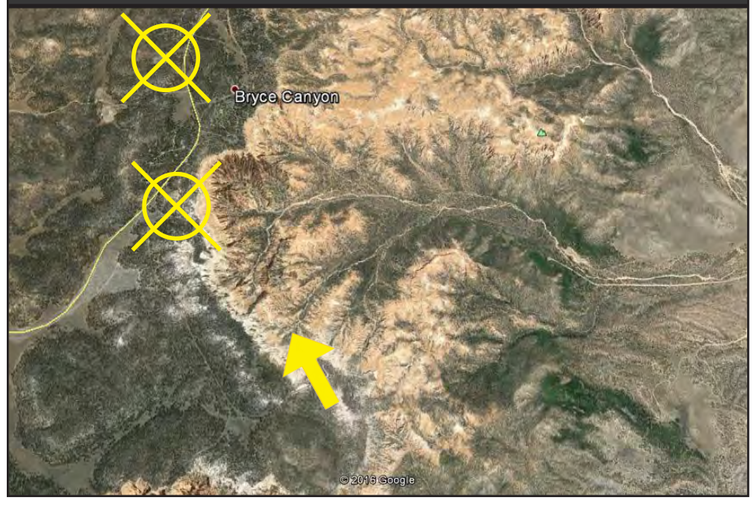
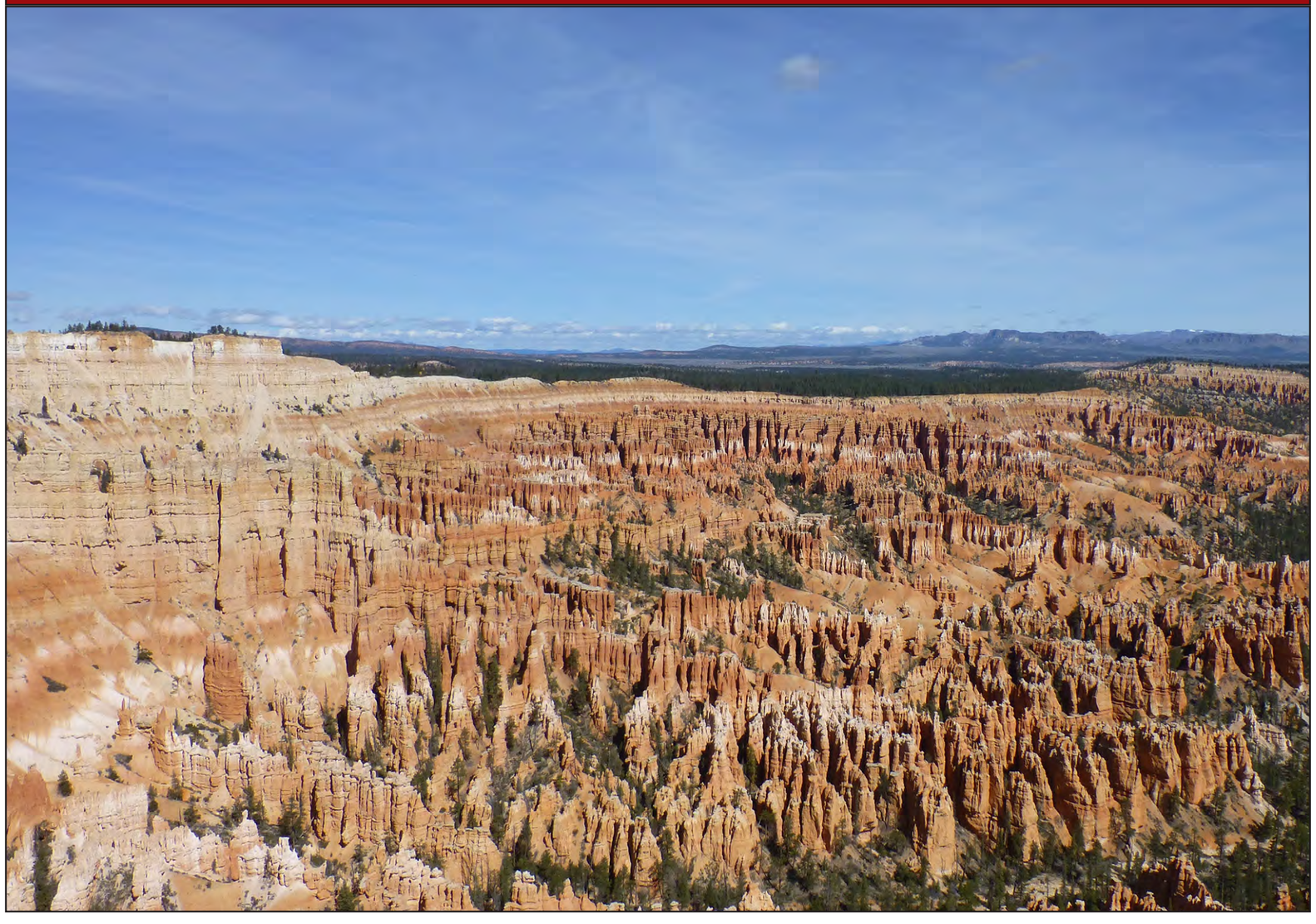


PHOTO SIMULATION F - 100’ MONOPINE TOWER



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Salt Lake City Office
Drawn For: **National Park Service**
Bryce Canyon

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UT6 BRYCE CANYON

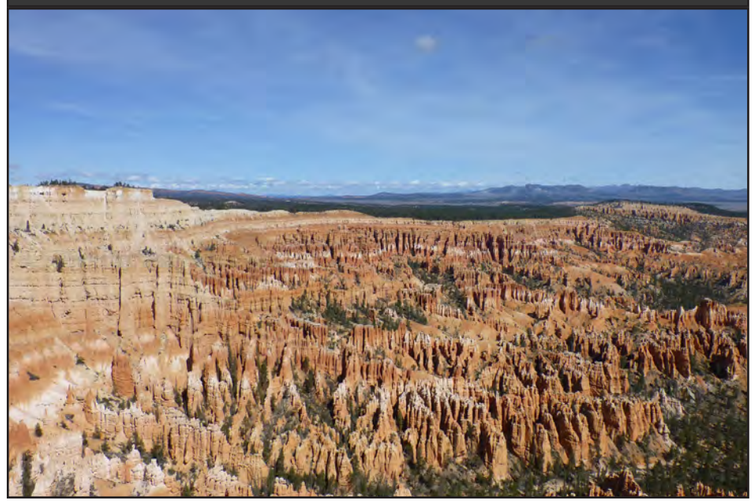
VERIZON WIRELESS TELECOMMUNICATION FACILITY

MACRO SITE - MONOPINE

NW

View From Bryce Point

EXISTING SITE



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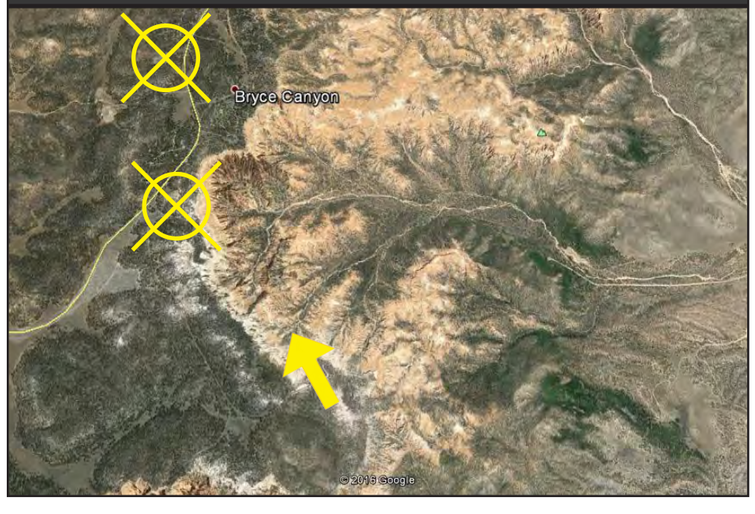

PHOTO SIMULATION F - 100’ MONOPINE TOWER

Technology Associates

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Salt Lake City Office

Drawn For: **National Park Service**
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