

Exterior Lighting Assessment and Design Recommendations

conducted for

**Grand Teton National Park**



Photo Credit: Bob Hoyle, NPS from <https://www.nps.gov/grte/learn/news/news-release-14-59.htm> August 18, 2014

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## EXECUTIVE SUMMARY

This report provides a summary and assessment of all existing, exterior, artificial lighting found throughout Grand Teton National Park during the inventory carried out June 15-19, 2022. All inventoried lighting was evaluated for compliance with the International Dark Sky Association's (IDA) 2018 Dark Sky Lighting Guidelines. Exterior lighting is compliant with the IDA guidelines when a fixture is fully-shielded and contains a lamp with a correlated color temperature (CCT) less than or equal to 3000 degrees Kelvin (K) or used under one of several limited exemptions (emergency applications, low lumen lighting for historical preservation, and/or under controlled lighting situations). This effort was conducted to support the park's ongoing efforts to reduce artificial light at night originating from park facilities and to move towards dark sky park certification.

2834 individual fixtures were identified and characterized across the park during the inventory. 34% (959 fixtures) of the exterior artificial lighting within the park was found to be compliant with IDA's Dark Sky Park Lighting Guidelines. IDA requests two-thirds of existing park lighting to be compliant with the guidelines for applicants to pursue an initial Dark Sky Park certification. While lighting improvements required to move from current conditions to two-thirds compliance require retrofits to 940 fixtures, the fact that the park contains so many historic districts and structures makes the initial retrofit effort achievable by simply changing out the existing bulbs in fixtures on historic structures with a low lumen 2700K (or lower) CCT bulb. These 940 lamp replacements can be achieved by changing out the bulbs within fixtures in areas such as the tent village and cabins in Colter Bay and around the lodge rooms in Jackson Lake Lodge. The majority of these fixtures are accessible from the ground or through the use of a step ladder. Using conservative estimates for the bulb costs (\$4 per bulb) and labor associated with swapping a light bulb (30 minutes per bulb at a GS level electrician rate) results in an estimated \$27,000 in total cost.

Once a park becomes recognized as a Dark Sky Park, the park has a period of 5 years to bring exterior lighting from two-thirds compliance to ninety percent compliance. An additional five-year period is allowed in order to bring the exterior lighting from ninety percent compliance to complete compliance with the guidelines. Once the park achieves two-thirds compliance, 935 fixtures will remain that require retrofits for compliance purposes. This report includes eleven recommended actions to address these remaining fixtures at an estimated cost (capital and labor) of approximately \$140,000 or \$14,000 per year over the 10-year period. As the majority of these existing lights will need to be replaced within a 10-year period, the estimated costs should be taken into account by park management moving forward. The total estimated cost for completing the overall effort (initial lamp replacements to get to two-thirds compliance + addressing the remaining non-compliant fixtures) is just under \$170,000.

Grand Teton National Park is a landscape famous for rugged, jagged peaks and abundant wildlife. The park's night sky and nocturnal environment offer a sanctuary of natural night for park wildlife, residents living within the park boundaries, and visitors. Seeking a dark sky certification status for Grand Teton National Park would be a promising step aimed at further conserving and preserving the Park's natural nightscape for future generations.

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Each appendix contains characterization and assessment data for each identified and characterized individual fixture by park location. The presented data is formatted according to IDA Dark Sky Park application guidelines (which can be copied and pasted into a future application) and as map overlays for identifying locations. The provided appendices include:

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## EVALUATION OF EXISTING LIGHTING CONDITIONS

### **Data Sampling Methodology**

All fixtures were visually inspected, characterized, and the resulting data was recorded into an ArcGIS geodatabase in the field using customized forms created within ESRI Field Maps. Characterization data collected for each fixture included:

- Location (Longitude and Latitude)
- Fixture Type
- Lamp Type
- Height of Fixture (in feet)
- Correlated Color Temperature (CCT)
- Shielding
- Application
- Compliance with IDA's 2018 Dark Sky Park Lighting Guidelines

Fixture shielding was conservatively assessed. Only fixtures that were fully-shielded were listed as fully-shielded. Fully-shielded fixtures are fixtures that are either:

- constructed so that all of the light emitted by the fixture is projected below the horizontal plane of the lowest point of the fixture in all directions, or
- installed in locations where the architectural details of the building ensure that emitted light is projected below the horizontal plane of the lowest point of the eave in all directions.

CCT was evaluated for each lamp by:

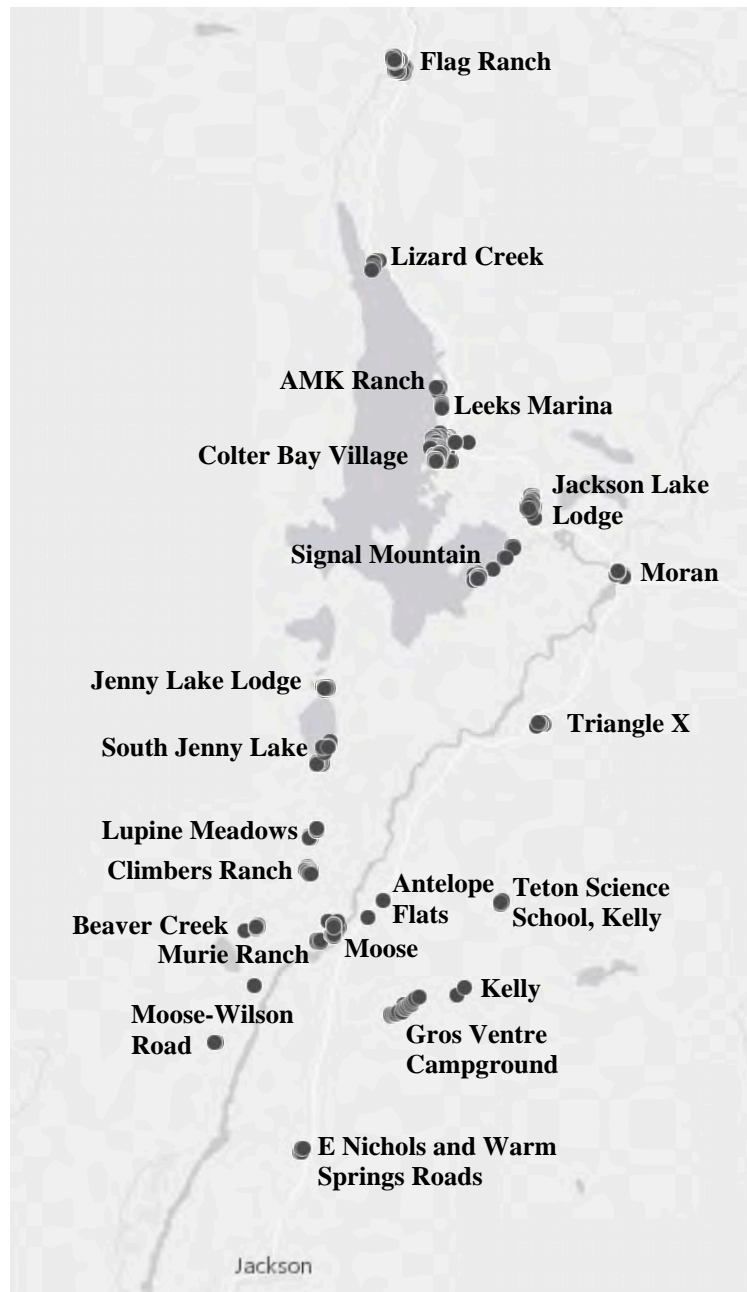
1. accessing the lamp and reading the relevant lamp information printed on the lamp body/panel or identification based upon the lamp itself,
2. taking a direct measurement of CCT using an Ascentek Lighting Passport device, or
3. talking to park staff when fixtures were either not accessible or not on during nighttime visits or were known based upon building specifications.

Fully-shielded fixtures containing lamps with CCT less than or equal to 3000 degrees Kelvin were assessed to be compliant with IDA's 2018 Dark Sky Lighting Guidelines. Additionally, IDA guidelines allow for exceptions for unshielded fixtures when the fixtures are: required by code for emergency purposes; contain lamps with less than 500 lumens used for special purposes, and/or controlled by a motion sensor set to the shortest duration, a timer switch, or computer system so that they cannot be left on all night.

For fixture types that were replicated over an area (sconces on lodging for example), the reported CCT for non-fully shielded fixtures was based upon an assessment of 3-5 lamps within the fixtures. The determined CCT was then applied to that fixture type within the same area wherever it occurred. When repetitive fixtures were fully-shielded, the CCT of each fixture was confirmed. If the CCT was unable to be confirmed in this case, the CCT was assigned as n/a and the fixture was marked non-compliant. In this way, any errors with assessment favored non-compliance. Finally, it is important to note that exterior lighting fixtures were only evaluated within federally managed infrastructure. Private inholdings were not inventoried.

## Summarized Findings

Figure 1 shows a park scale distribution of the 2834 individual fixtures identified and characterized during the inventory. 959 fixtures, accounting for 34% of the exterior artificial lighting within the park, was found to be compliant with IDA's 2018 Dark Sky Park Lighting Guidelines. The breakdown of fixtures (and compliance) by park area is presented in Table 1.



**Figure 1. Generalized locations of fixtures identified within Grand Teton National Park. Dots indicate locations of existing fixtures.**

**Table 1. Exterior Lighting Fixture IDA 2018 Dark Sky Lighting Guidelines Compliance by Park Location**

<b>Location</b>	<b>Total # Fixtures</b>	<b>Total # Dark Sky Compliant Fixtures</b>	<b>% Dark Sky Compliant Fixtures</b>
Flagg Ranch	296	132	45
Lizard Creek Campground	14	1	7
AMK Ranch	14	6	43
Leeks Marina	28	10	36
Colter Bay Village	743	207	28
Jackson Lake Lodge	831	102	12
Moran	47	16	34
Signal Mountain	99	24	24
Jenny Lake Lodge	113	47	42
South Jenny Lake	27	11	41
Lupine Meadows	31	28	90
Climbers Ranch	48	22	46
Beaver Creek	75	41	55
Moose	301	246	82
Murie Ranch	25	17	68
Moose-Wilson Road	40	26	65
E Nichol Springs and Warm Springs Roads	10	7	70
Gros Ventre Campground	45	1	2
Kelly	5	0	0
Teton Science School	17	7	41
Antelope Flats	5	2	40
Triangle X	20	6	30
<b>Grand Teton National Park</b>	<b>2834</b>	<b>959</b>	<b>34</b>

## RECOMMEDATIONS TO ADDRESS NON-COMPLIANT FIXTURES

1875 fixtures located within Grand Teton National Park are currently non-compliant with IDA's 2018 Dark Sky Park Lighting Guidelines. IDA requires two-thirds of existing park lighting to be compliant with the guidelines to achieve initial certification as a Dark Sky Park. Once a park is certified, the park has a period of 5 years to bring exterior lighting from two-thirds compliance to ninety percent compliance. An additional five-year period is allowed in order to bring the exterior lighting from ninety percent compliance to complete compliance with the guidelines.

Recommendations for fixture improvements are provided based upon field observation of each fixture, discussions with staff, and previous experience at other Park Service locations. All recommendations specify design recommendations that meet the IDA 2018 Dark Sky Lighting Guidelines while taking into account historic preservation whenever required.

The recommendations are listed by type below.

<b>Action</b>	<b>Description</b>
Aim Downward	Readjust fixture to aim straight down
Ceiling Cylinder	Replace existing ceiling mounts with fully-shielded ceiling mounts equipped with low lumen 2700K lamps
Flag	Remove fixture illuminating flag poles, raise and lower flag each day
Flood Lamps	Replace existing flood lights with motion sensor flood lights with 3000K or lower CCT lamps
Lamp Replacement	Replace existing lamps in historic areas with low lumen 2700K lamps
Remove	Remove fixture from location
Tin Hats	Replace existing parking lot lamps and hanging lamps in the park with fully-shielded lamp post fixtures containing a 3000K LED lamp
Timer Switch	Equip existing fixtures with 60 minute duration mechanical timer switches
Tube Cover	Equip existing fluorescent tubes with amber cover sleeves
Wall Cylinder	Replace existing sconces with fully-shielded wall cylinders equipped with low lumen 2700K lamps
Wall Pack	Replace existing wall packs with fully-shielded wall packs with 3000K or lower lamps

Table 2 summarizes the number of each recommendation action needed to address non-compliant lighting throughout the park, provides a clickable weblink to a vendor site that carries the type of fully-shielded lighting recommended (along with product specifications), and provides estimates for capital (materials procurement) and labor costs associated with the recommendations as both unit costs and estimated totals.

Provided labor estimates are based upon the time it takes to install/remove the fixture/lamp and assumes a baseline \$50/hour labor rate for a GS level electrician. Mobilization costs and/or external contracting costs are not estimated. Presented labor hours and labor cost estimate are both conservative for the anticipated work.

Provided weblinks are meant to serve as an example of the type of lighting that should be selected for the application, not an endorsement of a one particular vendor over another.

Table 3 provides a summary of recommendations by park area. Tables within *Appendix XXIII – Design Recommendations* provide additional details for individual fixtures impacted by each recommendation by park area along with an associated cost breakdown.

**Table 2. Parkwide Recommendation Summary to Address Non-Compliant Lighting**

Proposed Action	# Actions Across Park	Example (Vendor) Link	Unit Capital Cost (\$)	Total Capital Cost (\$)	Unit Labor (Hours)	Estimated Total Labor (Hours)	Estimated Unit Labor (\$)	Estimated Total Labor (\$)	Total Cost (\$)
Aim Downward	3	-	0	0	0.5	1.5	25	75	75
Ceiling Cylinder	65	<a href="#">website</a>	115	7475	1	65	50	3250	10725
Remove, Take Down Flag Each Day	3	-	0	0	0.5	1.5	25	75	75
Flood Light	39	<a href="#">website</a>	60	2340	1	39	50	1950	4290
Lamp Replacement	1207	<a href="#">website</a>	4	4828	0.5	603.50	25	30175	35003
Remove	36	-	0	0	1	36	50	1800	1800
Tin Hats	28	<a href="#">website</a>	800	22400	2	56	100	2800	25200
Timer Switch	17	<a href="#">website</a>	30	510	0.5	8.5	25	425	935
Tube Cover	15	<a href="#">website</a>	5	75	0.5	7.5	25	375	450
Wall Cylinder	457	<a href="#">website</a>	125	57125	1	457	50	22850	79975
Wall Pack	33	<a href="#">website</a>	262	8646	1	33	50	1650	10296
<b>Total</b>	<b>1903*</b>			<b>103,399</b>		<b>1308.50</b>		<b>65,425</b>	<b>168,824</b>

\* Note: There were 1875 non-compliant fixtures identified within the park. The difference between 1903 and 1875 is due to the portico sconces in Jackson Lake Lodge's covered entrance area having at least two lamps per fixture.

**Table 3. Recommended Actions for Addressing Non-Compliant Lighting Summarized by Park Area.**

Location	Total # Actions	# Aim Downward	# Ceiling Cylinder	# Remove, Take Down Flag	# Flood Light	# Lamp Replacement	# Remove	# Tin Hat	# Timer Switch	# Tube Cover	# Wall Cylinder	# Wall Pack
Flagg Ranch	168	1	-	2	1	-	6	7	-	-	151	-
Lizard Creek Campground	13	-	7	-	-	-	-	-	-	-	6	-
AMK Ranch	8	-	-	-	-	2	2	-	-	-	4	-
Leeks Marina	18	-	1	-	1	-	4	-	-	-	12	-
Colter Bay Village	536	-	-	-	3	389	10	4	8	1	105	16
Jackson Lake Lodge	754	-	-	-	23	685	6	-	5	14	21	-
Moran	31	1	-	1	2	12	1	-	-	-	12	2
Signal Mountain	75	1	16	-	4	5	-	-	3	-	43	3
Jenny Lake Lodge	66	-	-	-	-	54	-	-	-	-	10	2
South Jenny Lake	16	-	5	-	-	2	-	-	-	-	9	-
Lupine Meadows	3	-	-	-	1	1	1	-	-	-	-	-
Climbers Ranch	26	-	1	-	-	15	-	-	-	-	10	-
Beaver Creek	34	-	5	-	-	12	-	-	-	-	17	-
Moose	55	-	1	-	2	9	2	15	1	-	15	10
Murie Ranch	8	-	-	-	-	8	-	-	-	-	-	-
Moose-Wilson Road	14	-	-	-	-	11	3	-	-	-	-	-
E Nichol Springs and Warm Springs Roads	3	-	-	-	-	-	-	1	-	-	2	-
Gros Ventre Campground	44	-	28	-	1	-	-	-	-	-	15	-
Kelly	5	-	-	-	-	2	-	-	-	-	3	-
Teton Science School	10	-	-	-	1	-	1	-	-	-	8	-
Antelope Flats	2	-	-	-	-	-	-	-	-	-	2	-
Triangle X	14	-	1	-	-	-	-	1	-	-	12	-

## **Pathway to two-thirds Compliance**

As mentioned in the executive summary, a total of 940 fixtures present in historic areas can become compliant by simply changing out the existing light bulb with a low lumen 2700K light bulb. The vast majority of these bulbs are present in wall sconces (the most common type being the white jelly jar fixtures) that can be changed from the ground, with a minority requiring a step ladder. Additional fixtures that can be addressed through lamp replacements include historic lamp posts and bollards lighting pathways.

The replacement lamp provided as an example in Table 2's weblink costs under \$2 per bulb, although an estimate of \$4 per bulb is used in this report. Additionally, a labor time estimate of 30 minutes to change out the bulb (at a cost of \$25) is also an over estimate of the labor cost. In reality, each lamp will likely take as little as 5 minutes to change out with volunteers and/or summer interns as no special training is required to unscrew a fixture housing/lens and change out a light bulb.

Table 3 indicates that there are 389 fixtures in Colter Bay (predominantly located on the tent village structures, concessionaire dorms, visitor cabins, campground comfort stations, visitor center, and amphitheater bollards) that could be upgraded into compliance through lamp replacements. Similarly for Jackson Lake Lodge, Table 3 indicates 685 fixtures (predominantly located in and around lodge rooms, NPS residences, and concessionaire dorms) that could also be upgraded into compliance through lamp replacements.

Even taking into account conservative estimates for procurement costs and labor, replacing lamps in 940 fixtures to reach the two-thirds compliance requirement should not exceed an estimated \$27,000.

## **Moving Beyond two-thirds Compliance**

Once a park becomes recognized as a Dark Sky Park, the park has a period of 5 years to bring exterior lighting from two-thirds compliance to ninety percent compliance. An additional five-year period is allowed in order to bring the exterior lighting from ninety percent compliance to complete compliance with the guidelines. Once the park achieves two-thirds compliance, 935 fixtures will remain that require retrofits for compliance purposes. While easy to address fixtures would already have been retrofitted to achieve two-thirds compliance, the recommendations to address the remaining fixtures are also manageable. Around a third of the remaining fixtures could be addressed by:

- aiming fixtures downwards (3 fixtures)
- removing flag pole fixtures and raising/lowering the flag each day (3 fixtures)
- lamp replacements on remaining fixtures on historic areas or structures (247 fixtures)
- removing fixtures that are redundant or in obvious disrepair (36 fixtures)
- installing mechanical timer switches in place of flip switches (17 locations), and
- installing amber sleeve covers over existing fluorescent tube lamps (15 fixtures).

The other remaining fixtures would have to be addressed through changing out the fixture itself. These include replacing remaining non-compliant lighting with:

- Ceiling cylinder fixtures (65 fixtures)
- Motion-sensored flood lights (39 fixtures)
- Tin-hat fixtures (28 fixtures)
- Wall cylinder fixtures (457 fixtures), and
- Wall pack fixtures (33 fixtures).

The recommended fixtures include wall cylinder sconces, wall pack fixtures, and tin-hat fixtures already used throughout the park. The recommended ceiling cylinder fixture is similar in design to the wall cylinder fixture, but is used for ceiling mounted applications. The tin-hat fixtures are recommended to replace existing hanging fixtures and for lamp post applications. All of these fixtures are fully-shielded and should be equipped with the low-lumen lamp used in the lamp replacements. The cost of the lamp has been included in the cost of changing out fixtures within the estimate. The recommended motion-sensored flood light replaces existing flood lights in the park. The recommendation is to use motion-sensored flood lights with incorporated appropriate CCT LEDs. The motion-sensors should be set to the least amount of lighting duration and trigger sensitivity.

For descriptions of each of the above fixture types/recommendations, please see the clickable weblinks provided in Table 2.

Replacing the remaining 935 fixtures is estimated to cost approximately \$140,000, or \$14,000 per year over the 10-year period.

## DISCLAIMER

All data and design recommendations provided within this report and within the associated appendices were provided to the best of my ability. Some of the evaluated lighting assessed during my time on-site were not functioning and characterization was made based upon discussions with available staff and/or my best educated guess.

As previously mentioned, the provided design recommendation given within this report are based upon previous experience and familiarity with lighting standards developed at other Park Service locations throughout the US. While the recommendations include fixture replacement, lamp replacement, and/or fixture removal recommendations, implementation of any recommendations should only be done after review and approval by appropriate Park Service and/or concessionaire staff. This report is also the start of a discussion regarding appropriate levels of lighting and lighting fixtures within the park. Feel free to reach out to me at any time for additional discussions or alternatives to the provided recommendations.

While the fixtures and lamps presented are easily available online, costs may vary from what is listed. I recommend working with a local electrical vendor who may be able to procure the same or similar fixtures at reduced costs. Installation (or removal) of lighting should be completed by qualified personnel and the resulting illumination level along ground surfaces should be verified against GSA, IDA, and/or Park Service specifications.

## APPENDICES

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## Appendix I – Flagg Ranch

This appendix contains individual fixture characterization, assessment, and location data for the 296 identified fixtures located in Flagg Ranch. 45% (132 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AI-1 through AI-5 present the characterization data for each fixture. Figures AI-1 through AI-7 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AI-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Lodge Parking Lot	1-7		Lamp Post LED 18 5000	Yes	Parking	No	No
Visitor Information Station	8		Sconce Fluorescent 8.5 3000	No	Egress	No	No
	9		Flood LED 12 2700	Yes	Area	No	Yes
Ranger Station	10		Flood Halogen 9 2700	No	Egress	Motion Sensor	Yes
Flagg Ranch Lodge	11, 12		Flood HPS 1 1800	No	Flag Pole	No	No
	13-39		Recessed LED 10-19 2700	Yes	Area	No	Yes
	40-43		Recessed LED 10-19 2700	Yes	Area	No	Yes

**Table AI-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Flagg Ranch Lodge	44-46		Flood LED 11 – 15 2700	Yes	Area	No	Yes
Gas Station	47-49		Lamp Post HPS 22 1800	Yes	Area	No	Yes
Maintenance Area	50-58		Sconce LED 7-13.5 2700	Yes	Egress Area	No	Yes
Employee Rec Hall	59, 60		Sconce LED 6.5 2300	Yes	Egress, Area	No	Yes
Employee Apartment Buildings A, B, C	61-115		Sconce LED 6.5 2300	Yes	Egress, Area	No	Yes
Employee Apartment Buildings B, C	116, 117		Sconce LED 16 2300	Yes	Area	No	Yes
Employee Apartment Buildings A	118-121		Sconce LED 6.5, 12 2300	Yes	Stairway	No	Yes

**Table AI-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Employee Apartment Buildings B	122-125		Sconce LED 6.5, 12 2300	Yes	Stairway	No	Yes
Employee Apartment Buildings C	126, 127		Sconce LED 6.5 2300	Yes	Stairway	No	Yes
Employee Apartment Buildings C	128, 129		Sconce LED 6.5 2300	No	Stairway	No	No
Employee Apartment Buildings B	130		Sconce LED 6.5 2300	No	Egress	No	No
Eagle Drive Residences	131-139		Sconce LED, Incandescent 6.5-8 2400-2700, Green	No	Egress	No	No
	140, 141		Sconce LED 6.5 2700	Yes	Egress	No	Yes
Quad and Duplex Residences	142-155		Sconce, Lamp Post LED 6-7 2700	No	Egress, Pathway	No	No

**Table AI-4. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Duplex Residence	156		Sconce LED 6.5 2700	Yes	Egress	No	Yes
	157		Flood LED 7 2700	No	Egress	No	No
Campground Lamp Posts	158-160		Barn Light HPS 16.5 1800	No	Area	No	No
Campground Comfort Stations	161, 165		Flood LED 9 2700	Yes	Area	No	Yes
	162		Wall Pack HPS 11 1800	Yes	Area	No	Yes
	163, 164		Wall Pack HPS 11 1800	No	Egress	No	No
	166, 167		Sconce LED 6.5 2300	Yes	Egress	No	Yes

**Table AI-5. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Campground Office	168		Flood LED 7 3000	No	Egress	Motion	Yes
Cabin Parking Area	169-171		Lamp Post HPS 22 1800	No	Parking	No	No
	172		Lamp Post HPS 22 1800	Yes	Parking	No	Yes
Cabins	175-293		Sconce LED 6.5 2700	No	Egress	No	No
	294		Wall Pack HPS 8 1800	No	Egress	No	No
	295		Flood LED 15.5 2700	Yes	Area	No	Yes
	296		Flood LED 7 2700	No	Area	No	No



**Figure AI-1. Fixture Locations and Compliance Assessment: Lodge Parking Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AI-2. Fixture Locations and Compliance Assessment: Lodge Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AI-3. Fixture Locations and Compliance Assessment: Maintenance Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AI-4. Fixture Locations and Compliance Assessment: Eagle Road Residences.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AI-5. Fixture Locations and Compliance Assessment: Duplex and Quadplex Residences.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AI-6. Fixture Locations and Compliance Assessment: Campground.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.







**Figure AI-7. Fixture Locations and Compliance Assessment: Cabin Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix II – Lizard Creek Campground

This appendix contains individual fixture characterization, assessment, and location data for the 14 identified fixtures located in Lizard Creek Campground. 7% (1 fixture) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Table AII-1 presents the characterization data for each fixture. Figures AII-1 through AII-3 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Residence	1		Sconce LED 8 2700	No	Egress	No	No
Kiosk	2		Flood LED 7 3000	No	Sign	Motion	Yes
Office	3-5		Sconce Fluorescent 6-8 2300	No	Area	No	No
Comfort Stations 1, 2, and 3	6-14		Sconce LED 6.5-7	No	Egress	No	No



**Figure AII-1. Fixture Locations and Compliance Assessment: Entrance Area Residence and Kiosk.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AII-2. Fixture Locations and Compliance Assessment: Office and Comfort Station 1.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AII-3. Fixture Locations and Compliance Assessment: Comfort Stations 2 and 3.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

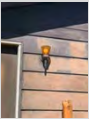

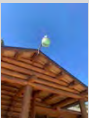

### Appendix III – AMK Ranch

This appendix contains individual fixture characterization, assessment, and location data for the 14 identified fixtures located in AMK Ranch. 43% (6 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AI-1 and AI-2 presents the characterization data for each fixture. Figure AI-1 provides approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AIII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Lawrence House	1-3		Ceiling Mount Incandescent 7.5 2700	Yes	Area	No	Yes
Sunroom Cabin	4		Sconce LED 6 5000	No	Egress	No	No
Director's Cabin	5		Sconce LED 6 2300	Yes	Egress	No	Yes
Johnson Lodge	6		Tin Hat Incandescent 10 2700	Yes	Area	No	Yes
	7		Hanging Light LED 8 2700	Yes	Egress	No	Yes
Wood Shed	8		Barn HPS 14 1800	No	Area	No	No
Boise Cascade Cabin	9		Sconce Incandescent 6 2700	No	Egress	No	No

**Table AIII-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Boise Cascade Cabin	10		Sconce Incandescent 6 2700	No	Egress	No	No
Water Treatment Building	11, 12		Wall Pack LED 11 Unknown	Yes	Egress	No	No*
Berol Lodge	13		Barn Mercury Vapor 12 5000	No	Area	No	No
	14		Hanging Light Unknown 10 Unknown	No	Egress	No	No

\* marked as not compliant, because CCT was not able to be determined. Evaluating CCT may change the assessment.



**Figure AIII-1. Fixture Locations and Compliance Assessment: AMK Ranch.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.





## Appendix IV – Leeks Marina

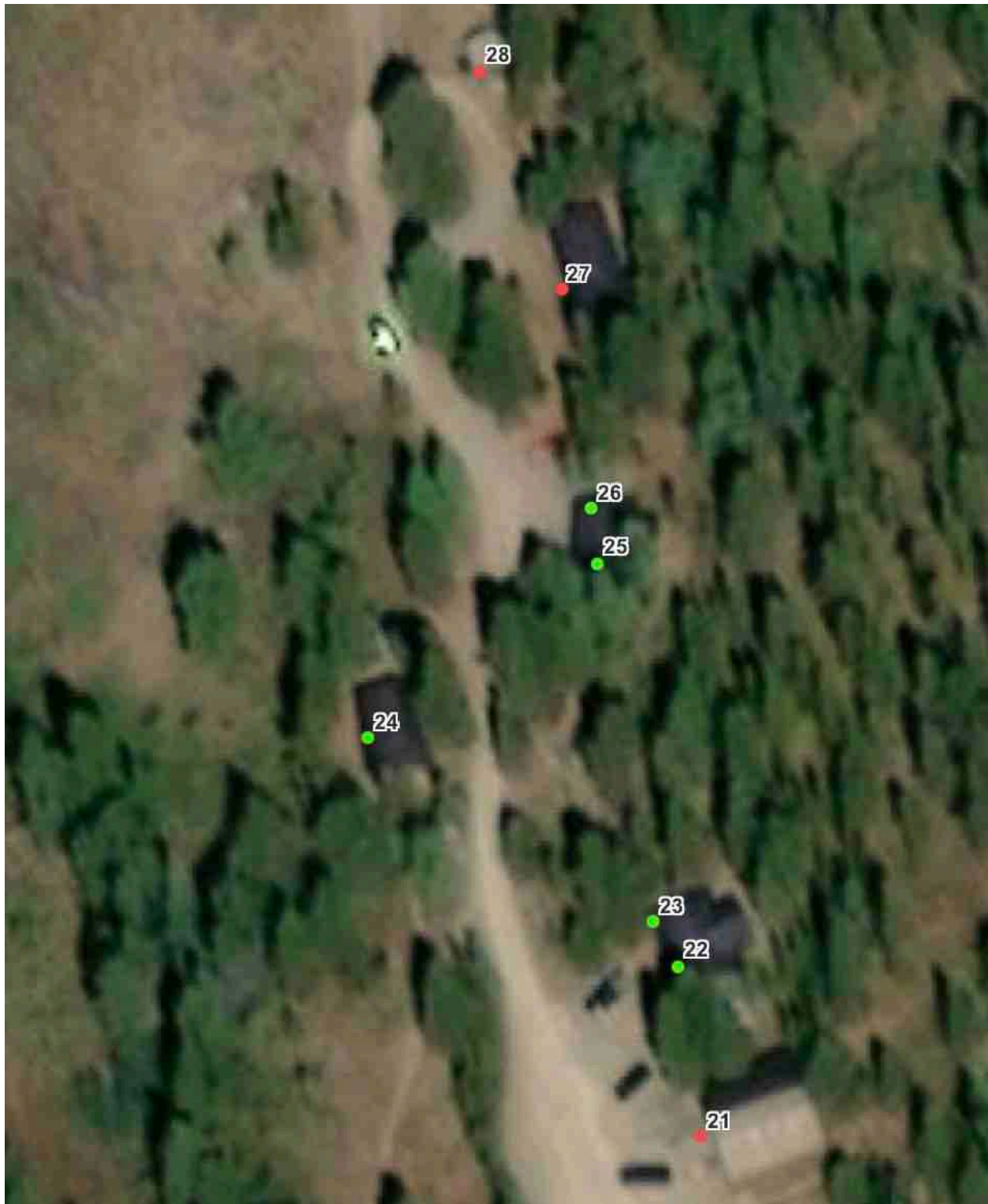
This appendix contains individual fixture characterization, assessment, and location data for the 28 identified fixtures located in Leeks Marina. 36% (10 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AIV-1 through AIV-3 present the characterization data for each fixture. Figures AIV-1 through AIV-3 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AIV-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Parking Area	1-4		Lamp Post LPS 12 1700	No	Parking Lot	No	No
Information Shack	5		Tin Hat HPS 15 1800	Yes	Area	No	Yes
	6		Ceiling Mount LED 8 2700	No	Egress	No	No
Leeks Marina Restaurant	7-15		Sconce LED 8 2700	No	Area	No	No
	16		Flood Fluorescent 8 2700	No	Stairway	No	No
	17-20		Recessed LED 8 2700	Yes	Area	No	Yes
Boat House and Cabin 1	21-23		Sconce LED 13 and 6.5 2700	No	Egress	No	No

**Table AIV-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

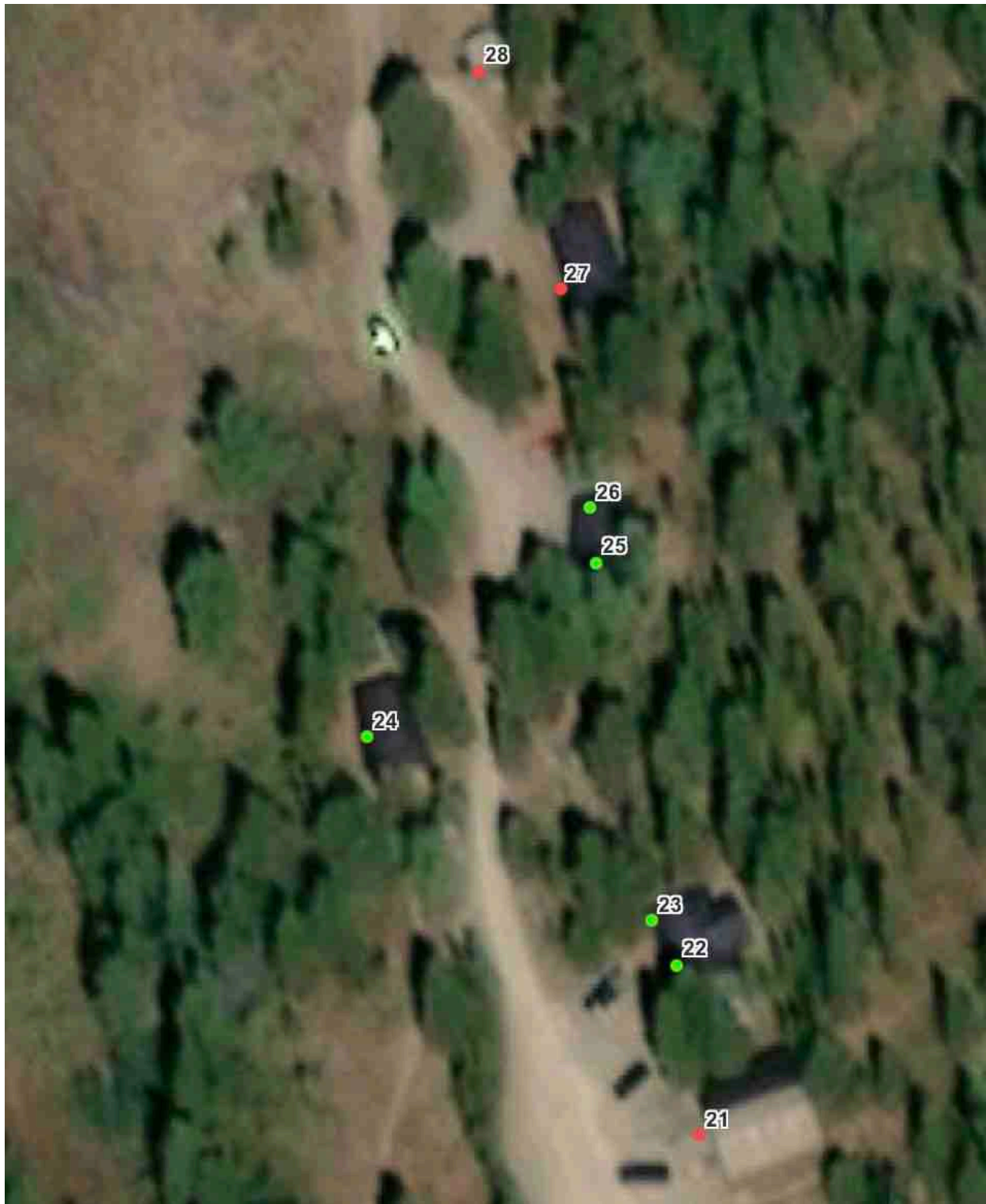
Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Cabin 2	24		Sconce LED 6.5 2700	Yes	Area	No	Yes
Cabin 3	25, 26		Sconce LED 6.5 2700	Yes	Area	No	Yes
Cabin 4	27		Sconce LED 6.5 2700	No	Egress	No	No
Pump House	28		Wall Pack HPS 7.5 1800	No	Area	No	No



**Figure AIV-1. Fixture Locations and Compliance Assessment: Parking Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AIV-2. Fixture Locations and Compliance Assessment: Restaurant Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AIV-3. Fixture Locations and Compliance Assessment: Residential Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix V – Colter Bay Village

This appendix contains individual fixture characterization, assessment, and location data for the 743 identified fixtures located in Colter Bay Village. 28% (207 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AV-1 through AV-20 present the characterization data for each fixture. Figures AV-1 through AV-25 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.


**Table AV-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Gas Station Convenience Store	1		Wall Pack LED 9.5 2300	No	Area	No	No
	2, 3		Wall Pack LED 9.5 2300	No	Area	No	No
	4		Tube Fluorescent 10 Unknown	Yes	Area	No	No
	5		Flood LED 10 3000	Yes	Sign	No	Yes
	6-8		Lamp Post Mercury Vapor 13 5000	Yes	Area	No	No
Jackson Lake Dam Barn 1	9		Wall Pack HPS 16 1800	No	Area	No	No
Colter Bay Ranger Station	10, 11		Wall Pack LED 7, 10 3000	Yes	Egress	No	Yes

**Table AV-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Colter Bay Emergency Services	12		Wall Pack LED 15 5000	Yes	Area	No	No
Buildings & Quarters Shop	13-15		Wall Pack LED 11 5000	Yes	Area	No	No
Covered Sand Storage	16-27		Wall Pack LED 15-16 5000	Yes	Area	No	No
	28		Wall Pack HPS 16 1800	Yes	Area	No	Yes
Gas Pumps	29		Ceiling Mount LED 7 5000	No	Area	No	No
Plumbing and Electrical Shop	30		Sconce LED 7 3000	No	Egress	No	No
Fire Cache	31		Wall Pack HPS 13 1800	No	Area	No	No

**Table AV-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Fire Cache Lamp Post	32		Lamp Post LED 25 5000	Yes	Area	No	No
600 Aspen Loop Residence	33		Flood LED 12 3000	Yes	Area	No	Yes
	34		Sconce Incandescent 6 2700	No	Egress	No	No
602 Aspen Loop Residence	35, 36		Sconce LED 6 2700	Yes	Egress	No	Yes
604-610 Aspen Loop Quad Residence	37-44		Sconce LED 6 2700	No	Egress	No	No
612-618 Aspen Loop Quad Residence	45		Sconce LED 6 2500	No	Egress	No	No
	46-49		Sconce LED 6 2700	Yes	Egress	No	Yes

**Table AV-4. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
612-618 Aspen Loop Quad Residence	50		Sconce Incandescent 6 2700	No	Egress	No	No
	51		Sconce LED 6 2500	No	Egress	No	No
	52		Sconce LED 6 2500	No	Egress	No	No
Shed	53		Flood Halogen 7 2700	No	Area	No	No
Cabin Residence	54		Sconce LED 6.5 2700	Yes	Egress	No	Yes
626 Aspen Loop Residence	55		Ceiling Mount LED 8 2700	Yes	Egress	No	Yes
	56		Sconce LED 7 2500	No	Egress	No	No

**Table AV-5. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
626 Aspen Loop Residence	57, 58		Sconce LED 6 2500	No	Egress	No	No
628 Aspen Loop Residence	59		Ceiling Mount LED 8 5000	Yes	Egress	No	No
	60		Sconce LED 6 5000	Yes	Area	No	No
	61, 62		Sconce Incandescent 7 2700	No	Egress	No	No
630 Aspen Loop Residence	63, 64		Sconce Incandescent 7 2700	No	Egress	No	No
	65		Sconce Incandescent 6 2700	Yes	Egress	No	Yes
	66		Flood LED 8.5 2700	No	Area	No	No

**Table AV-6. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
632 Aspen Loop Residence	67		Sconce LED 7 2700	No	Egress	No	No
	68		Sconce LED 6 2700	Yes	Egress	No	Yes
	69		Sconce LED 6 2700	Yes	Egress	No	Yes
	70		Flood LED 8.5 2700	No	Area	Motion	Yes
634 Aspen Loop Residence	71		Sconce LED 7 Red	No	Egress	No	No
	72		Sconce LED 8.5 2700	No	Egress	No	No
	73, 74		Sconce LED 6 2700	Yes	Egress	No	Yes

**Table AV-7. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
636 Aspen Loop Residence	75		Sconce Fluorescent 5 2700	No	Egress	No	No
	76		Sconce Fluorescent 7 2700	No	Egress	No	No
	77		Sconce Fluorescent 8.5 2700	No	Area	No	No
	78		Sconce Fluorescent 7 2700	Yes	Egress	No	Yes
675 Aspen Loop Residence	79		Ceiling Mount Fluorescent 8 5000	Yes	Egress	No	No
	80-82		Sconce Incandescent 7 2700	No	Egress	No	No
673 Aspen Loop Residence	83		Ceiling Mount Fluorescent 8 5000	Yes	Egress	No	No








**Table AV-8. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
673 Aspen Loop Residence	84-86		Sconce Incandescent 7 2700	No	Egress	No	No
669-671 Aspen Loop Residence	87-89		Sconce LED 7 2700	Yes	Egress	No	Yes
	90		Sconce LED 7 2700	No	Egress	No	No
667 Aspen Loop Residence	91, 92		Sconce LED 7 2700	No	Egress	No	No
	93		Sconce LED 7 2700	No	Egress	No	No
665 Aspen Loop Residence	94, 95		Sconce LED 7 2700	No	Egress	No	No
	96		Sconce LED 7 2700	Yes	Egress	No	Yes

**Table AV-9. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
663 Aspen Loop Residence	97, 98		Sconce LED 7 2700	No	Egress	No	No
	99		Sconce LED 6 2700	No	Egress	No	No
661 Aspen Loop Residence	100		Sconce LED 7 2700	No	Egress	No	No
	101, 102		Sconce LED 7 2700	No	Egress	No	No
	103		Flood LED 6 2700	Yes	Egress	No	Yes
621 Aspen Loop Residence	104		Sconce LED 7 2700	No	Egress	No	No
Cabins Near RV Sites	105 - 107		Flood LED 7 2700	No	Egress	No	No

**Table AV-10. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
640-650 Aspen Loop Sixplex	108 - 112		Sconce LED 7 2700	No	Egress	No	No
	113 - 118		Sconce LED 7 2700	Yes	Egress	No	Yes
624-638 Aspen Loop Sixplex	119 - 123		Sconce LED 7 2700	No	Egress	No	No
	124 - 129		Sconce LED 7 2700	Yes	Egress	No	Yes
616-622 Aspen Loop Fourplex	130-134		Sconce LED 7 2700	No	Egress	No	No
608-614 Aspen Loop Fourplex	135-139		Sconce LED 7 2700	No	Egress	No	No
600-606 Aspen Loop Fourplex	140-144		Sconce LED 7 2700	No	Egress	No	No

**Table AV-11. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Dorm Road Comfort Station Laundry	145, 146		Wall Pack LED 8 2300	Yes	Egress	No	Yes
Dorm Road Comfort Station Laundry	147-149		Sconce LED 7 2700	No	Egress	No	No
Dorm Road Parking Area Lamp Post	150		Barn HPS 18 1800	No	Parking	No	No
Dorm Road Hard Court in Parking Area	151, 152		Flood LED 10 5000	No	Area	Motion	Yes
608 Dorm Road Dorm	153, 154		Recessed LED 18 2700	Yes	Stairway	No	Yes
	155, 156		Flood LED 9 2400	Yes	Egress	No	Yes
606 Dorm Road Dorm	157, 158		Sconce LED 9 2700	No	Egress	No	No

**Table AV-12. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
606 Dorm Road Dorm	159, 160		Sconce Fluorescence 9 3500	No	Egress	No	No
604 Dorm Road Dorm	161-167		Sconce LED 9 2700	No	Egress	No	No
	168, 169		Sconce LED 9 2400	No	Egress	No	No
	170		Sconce Incandescent 9 Green	No	Egress	No	No
600 Dorm Road Dorm	171-174		Sconce LED 9 2700	No	Egress	No	No
	175		Flood LED 20 2700	No	Area	No	No
602 Dorm Road Dorm	176, 177		Sconce LED 9 2400	No	Egress	No	No

**Table AV-13. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
646 Aspen Loop Residence	178-180		Sconce LED 6-9 2700	Yes	Egress	No	Yes
651 Aspen Loop Residence	181		Flood LED 7 2700	Yes	Egress	No	Yes
Dorm Road Comfort Station Laundry	182, 183		Sconce LED 12 3000	No	Area	No	No
Service Station Dorm Road	184, 185		Sconce LED 9 Unknown	No	Area	No	No
	186		Wall Pack HPS 9 1800	No	Area	No	No
Pathway from Dorms	187		Lamp Post Unknown 9 Unknown	No	Pathway	No	No
	188-190		Lamp Post LED 9 Red	No	Pathway	No	No

**Table AV-14. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Pathway from Dorms	191-195		Lamp Post LED 9 2700	No	Pathway	No	No
Tent Village Office and Comfort Station	196, 197		Sconce LED 6 2300	No	Egress	No	No
	198 - 200		Sconce LED 6 2300	No	Egress	No	No
Tent Village Comfort Station	201		Sconce LED 6 2300	No	Egress	No	No
	202, 203		Sconce LED 6 2300	Yes	Egress	No	Yes
Tent Village Sites	204 - 269		Sconce Fluorescent 5 2700	No	Egress	No	No
Cabin Rental Office	270		Sconce LED 6 2700	No	Egress	No	No

**Table AV-15. Exterior Lighting Fixture Compliance with IDA Guidelines**








Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Cabin Rental Office	271, 272		Sconce LED 6 2700	No	Egress	No	No
	273		Sconce LED 6 2700	No	Egress	No	No
	274		Sconce LED 7 2700	No	Egress	No	No
	275		Sconce LED 7 2700	No	Egress	No	No
Building Behind Cabin Office	276		Sconce LED 7 2700	No	Egress	No	No
Cabins	277 - 334 345 - 443		Sconce LED 6 2700	No	Egress	No	No
Parking Lot Dual Color Lamp Posts	444 - 473		Lamp Post LED 28 Red/Soft White*	Yes	Parking	No	Yes

\* Note: I was not able to get a meter read of the white portion of the LED. The white portion was only on in one location that was greatly impacted by indoor lighting from the store. The lighting looked less than 3000K, but should be confirmed. The red portion is compliant.

**Table AV-16. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Campground Group Camping Loop	475-482		Sconce LED 7.5 2700	No	Egress	No	No
Campground Loops H, I, J, K, L, M, N, O	483 - 515		Sconce LED 7.5 2700	No	Egress	No	No
Campground Loop J, Additional Restroom	516		Wall Pack HPS 8 1800	No	Egress	No	No
Campground Shed	517		Flood LED 12 2700	No	Egress	No	No
Campground Loops A, B, C, D, E, F, G, and RV	518-528		Sconce LED 7 2700	Yes	Egress	No	Yes
	529 - 551		Sconce LED 10.5 2700	No	Egress	No	No
Campground Registration Kiosk	552-555		Sconce LED 7 2700	No	Egress	No	No

**Table AV-17. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
RV Campground Office	556		Flood LED 11 2700	Yes	Egress	No	Yes
Grocery & Gift Shop	557-573		Wall Pack LED/Empty Socket 7 – 7.5 2700/na	No	Egress/Area	No	No
	574		Flood LED 6.5 3000	No	Egress	No	No
	575, 576		Ceiling Mount LED 9 2700	Yes	Egress	No	Yes
	577		Tin Hat LED 9.5 2700	Yes	Egress	No	Yes
Launderette & Showers	578		Flood LED 8 3000	No	Egress	No	No
Lift Comfort Station by Beach Access	579, 580		Flood LED 10 3000	No	Area	No	No



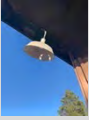


**Table AV-18. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Café Court and Chuckwagon Restaurant	581-605		Tin Hat LED/Fluorescent 7-9 2700, 3000	Yes	Pathway	No	Yes
	606-608		Flood Halogen/LED 9, 11 2700,3000	No	Area	No	No
	609-612		Ceiling Mount LED 9 3000	Yes	Area	No	Yes
Marina Comfort Station	613-615		Wall Pack LED 7, 10 2700	No	Egress	No	No
Bait/Rental Office	616-626		Wall Pack LED/HPS 7-9.5 2700/1800	No	Egress/Area	No	No
	627		Flood LED 7 3000	Yes	Area	No	Yes
Marina Dock Lamp Posts	628-636		Lamp Post LED 4, 8 2700	No	Dock Pathway	No	No

**Table AV-19. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Marina Dock Bollards	637-683		Bollard HPS 3 2400	Yes	Dock Pathway	No	Yes
Visitor Center	684		Sconce LED 4, 9 5000	No	Stairway	No	No
	685-692		Sconce LED 9 5000	Yes	Area	No	No
	693-695		Recessed LED 10 5000	Yes	Egress	No	No
	696		Sconce LED 7 Red	No	Egress	No	No
Amphitheater	697-715		Bollard LED 3 Red	No	Pathway	No	No
	716, 717		Lamp Post LED 15 3000	No	Area	No	No

**Table AV-20. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Amphitheater	718, 719		Flood LED 13 3000	No	Area	No	No
	335-344 535, 556 720-736		Recessed LED 1 Red	Yes	Pathway	No	Yes
Coral Bunkhouse	737-740		Tin Hat LED 10 3000	Yes	Area	No	Yes
	741		Sconce LED 6.5 2700	No	Egress	No	No
608 Dorm Road Dorm	742, 743		Flood LED 7 2700	Yes	Egress	No	Yes



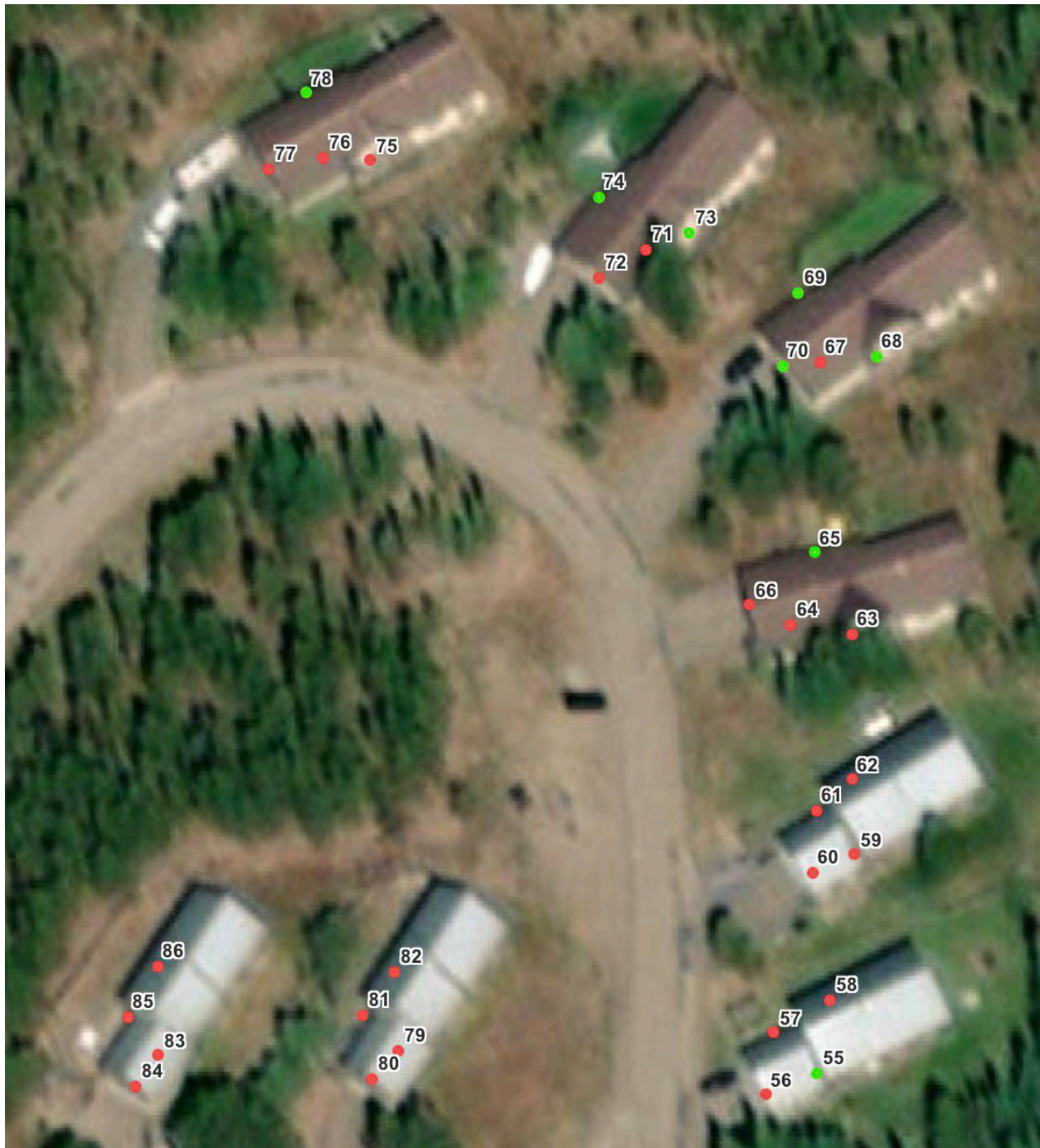
**Figure AV-1. Fixture Locations and Compliance Assessment: Service Station.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



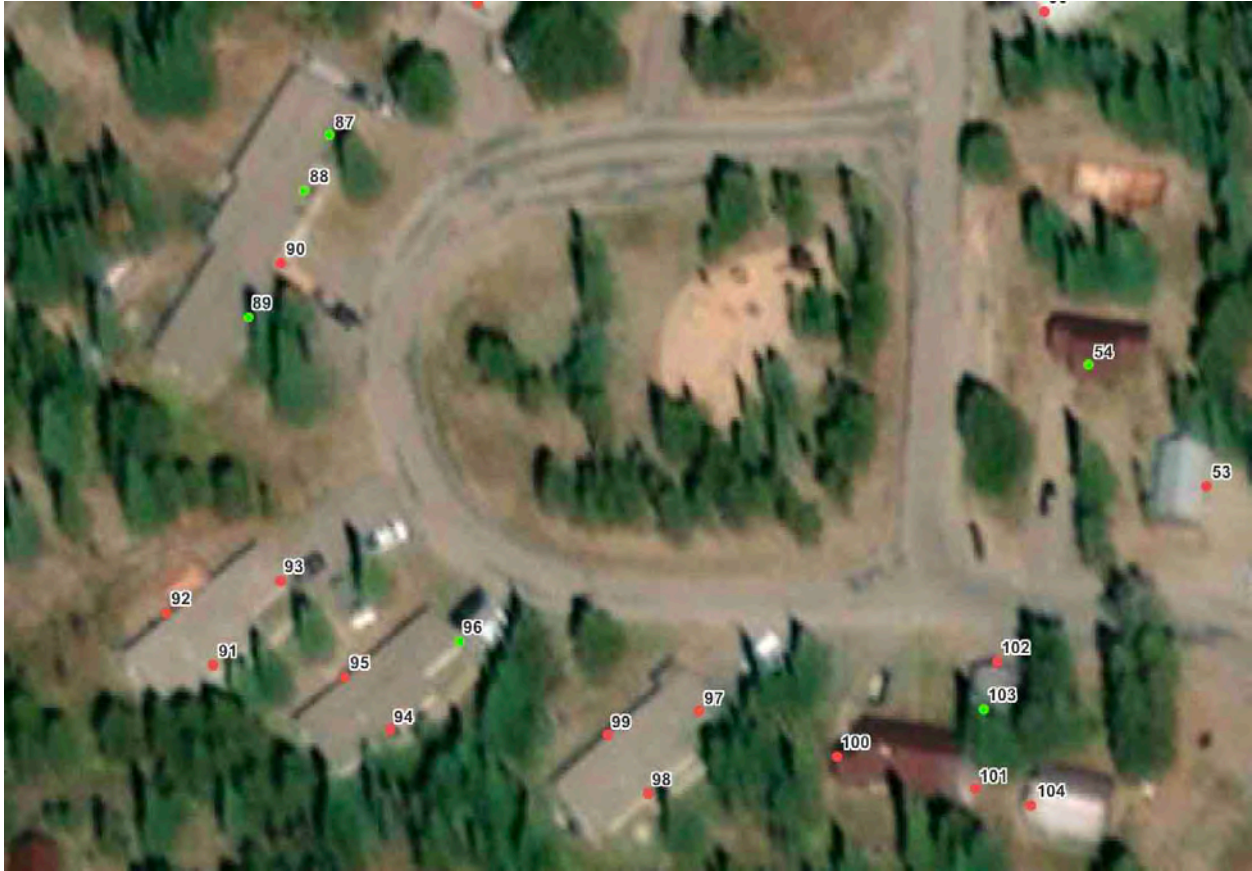
**Figure AV-2. Fixture Locations and Compliance Assessment: Maintenance Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



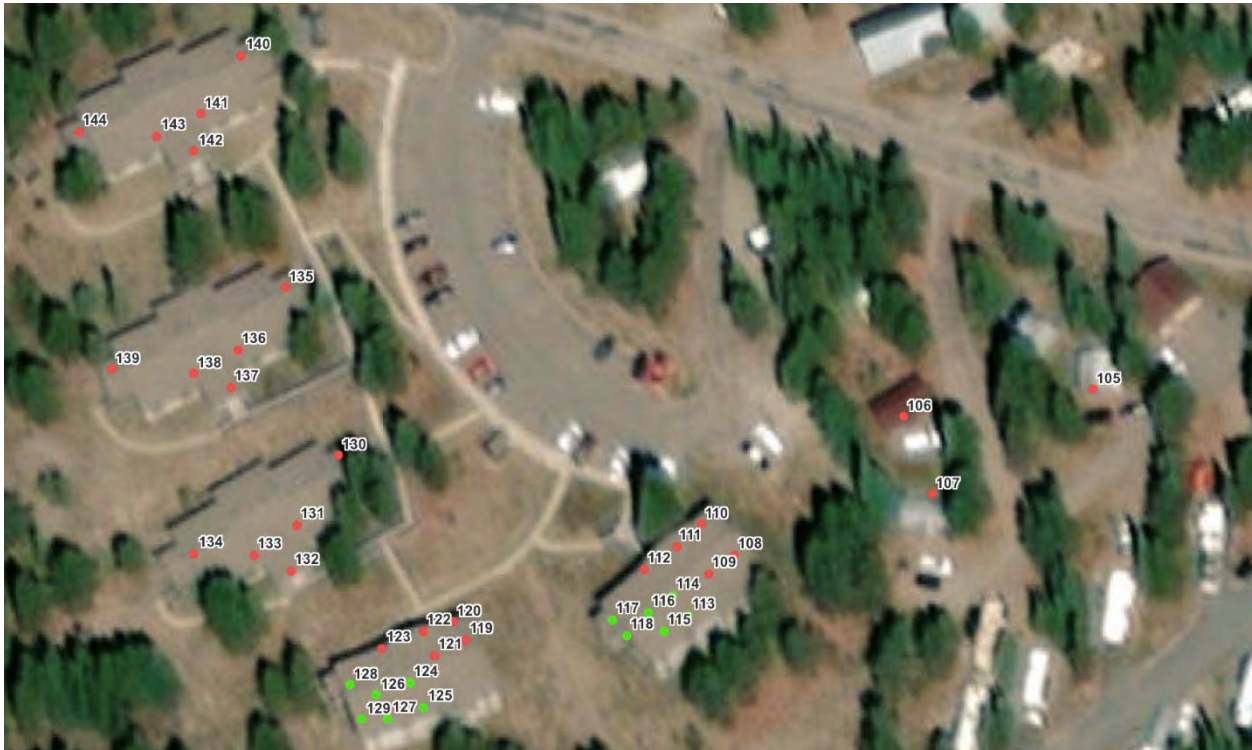
**Figure AV-3. Fixture Locations and Compliance Assessment: 600 – 618 Aspen Loop Residences.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-4. Fixture Locations and Compliance Assessment: 626 – 636, 673, and 675 Aspen Loop Residences.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-5. Fixture Locations and Compliance Assessment: 621 and 663 – 671 Aspen Loop Residences.**  
 Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-6. Fixture Locations and Compliance Assessment: Cabins near Employee RV Sites and 600 – 650 Aspen Loop Residences.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



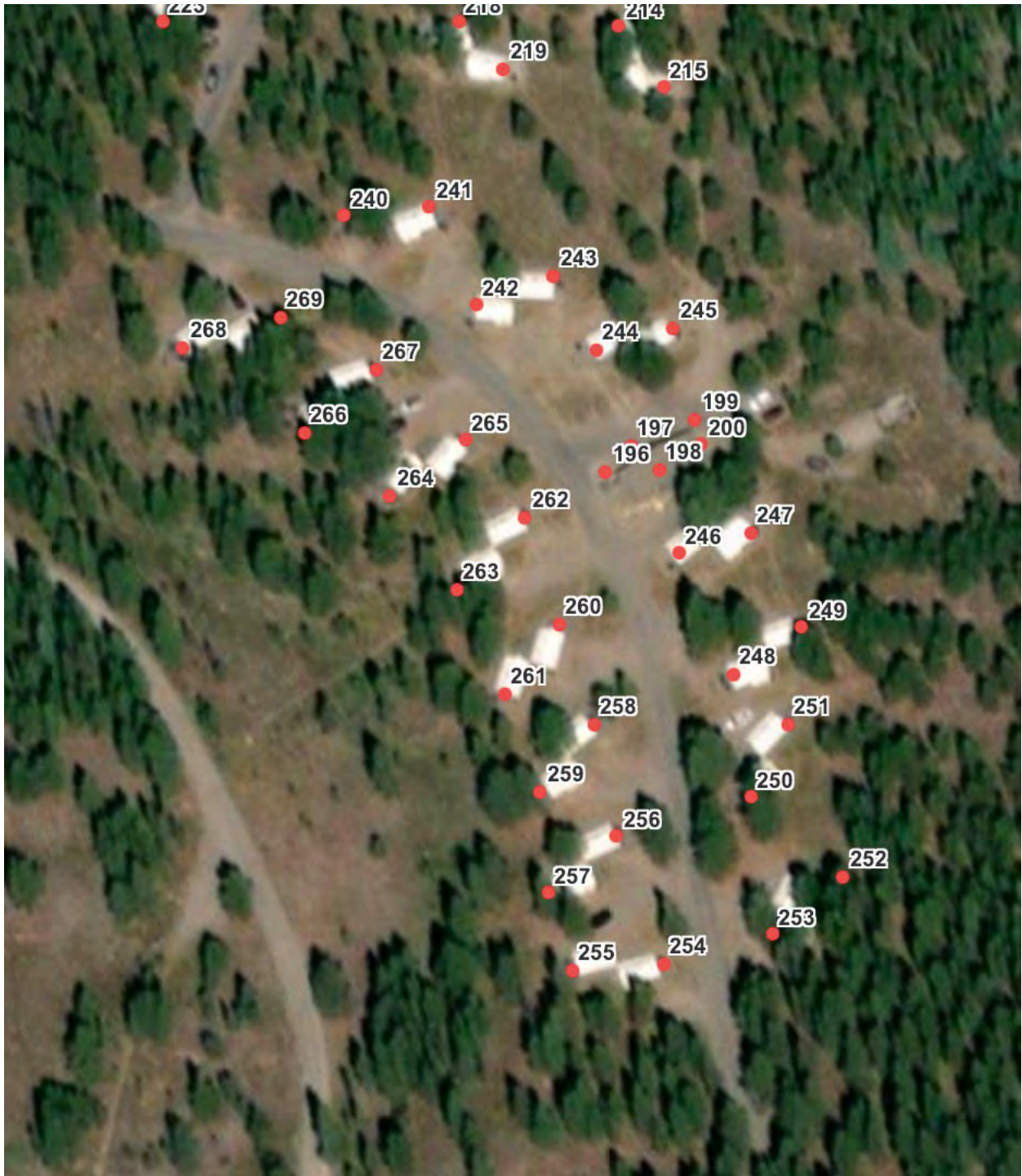
**Figure AV-7. Fixture Locations and Compliance Assessment: Dorm Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables. *\* Please note fixtures 742 and 743 are included within this fixture. The fixture locations were underneath fixtures 155 and 156 and were not discovered until the end of the Colter Bay data quality check. Therefore, they were named as the last two fixtures within this data set.*



**Figure AV-8. Fixture Locations and Compliance Assessment: 646 and 651 Aspen Loop Residences.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-9. Fixture Locations and Compliance Assessment: Old Service Station and Pathway from Dorms.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-10. Fixture Locations and Compliance Assessment: Tent Village Office, Restroom and Lower Sites.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-11. Fixture Locations and Compliance Assessment: Tent Village Upper Sites.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



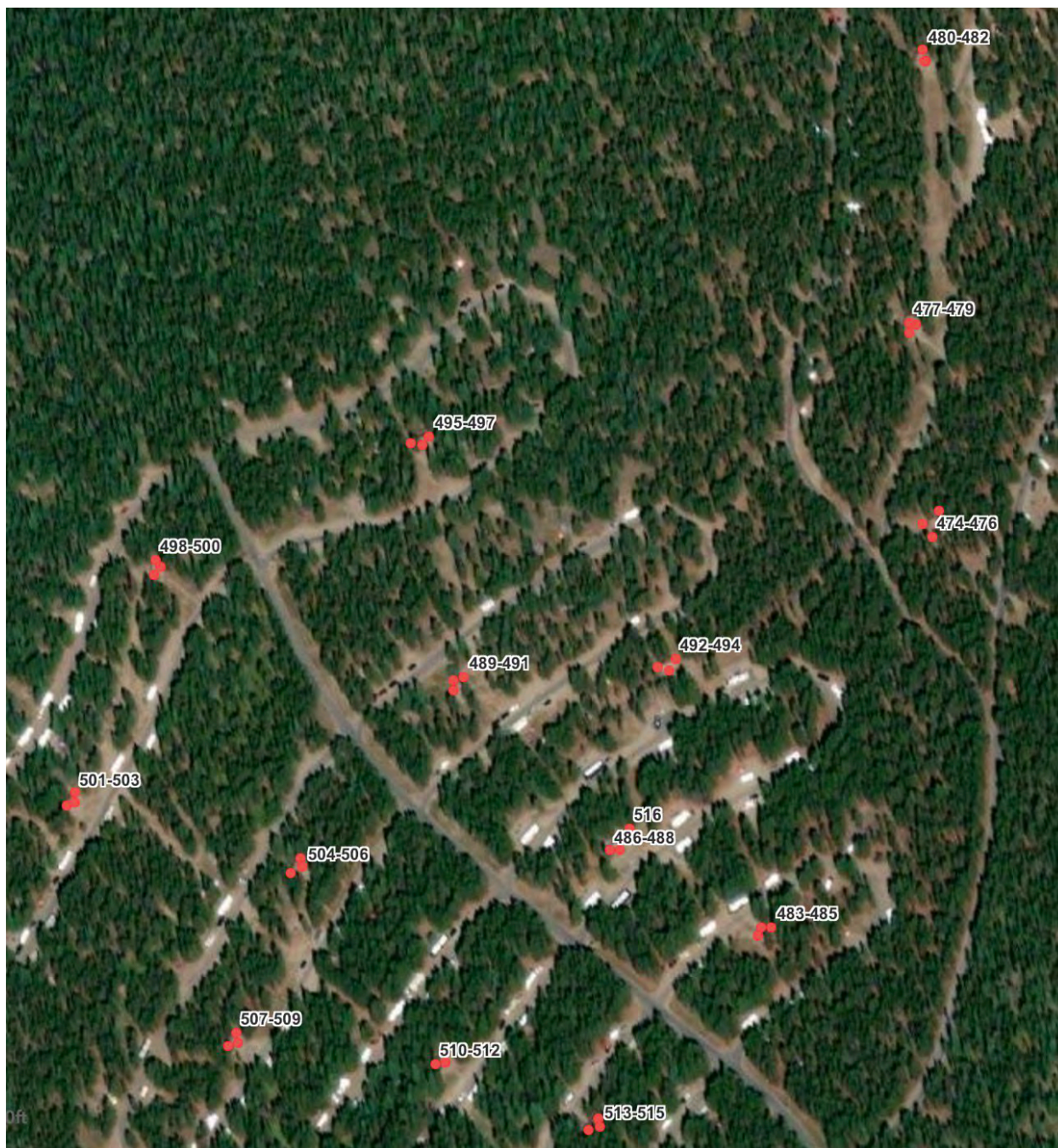
**Figure AV-12. Fixture Locations and Compliance Assessment: Cabin Rental Office.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-13. Fixture Locations and Compliance Assessment: Cabins.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-14. Fixture Locations and Compliance Assessment: Red/White LED Lamp Posts in Parking Lot.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



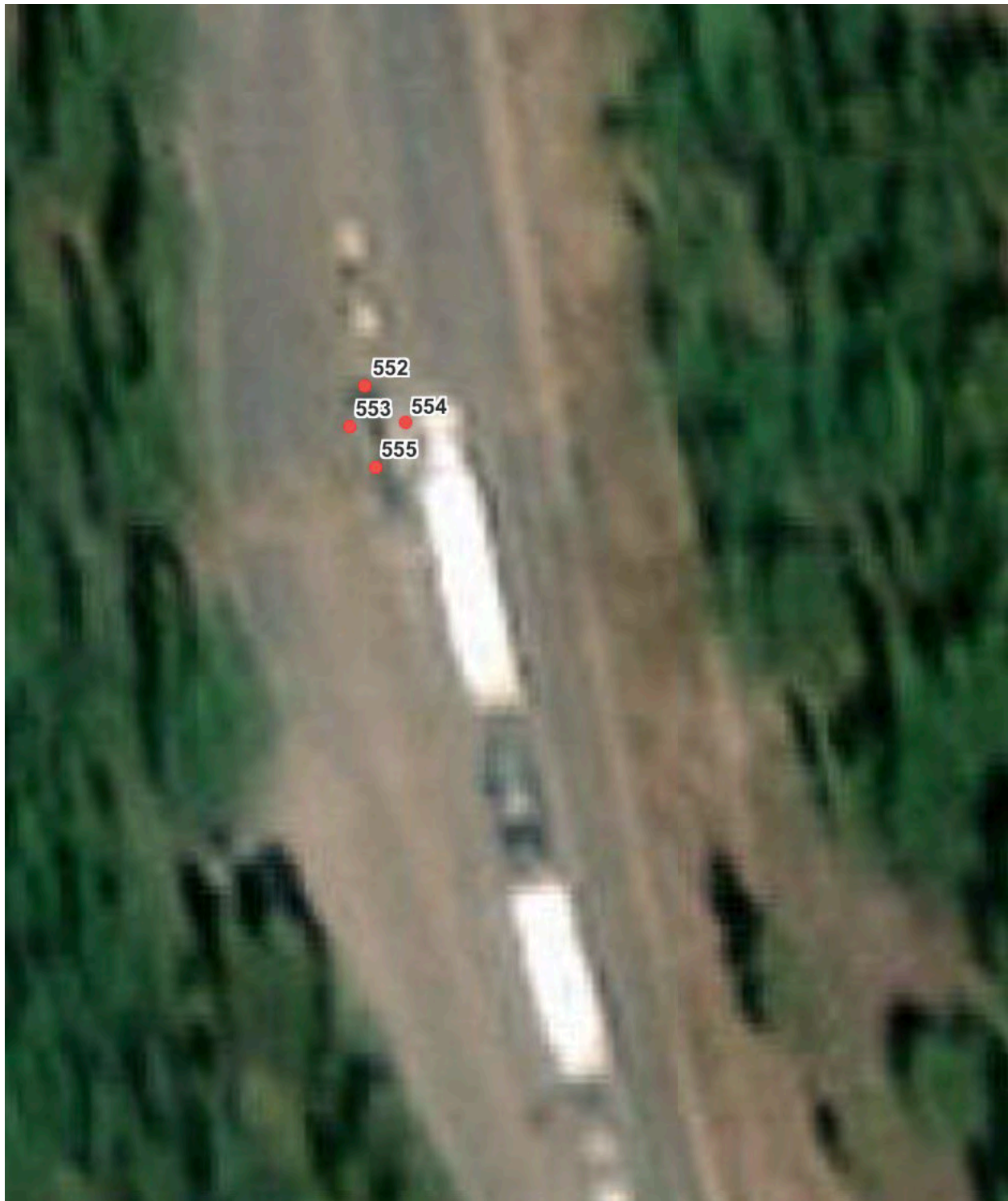
**Figure AV-15. Fixture Locations and Compliance Assessment: Comfort Stations in Campground Group Sites and Loops H, I, J, K, L, M, N, and O.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-16. Fixture Locations and Compliance Assessment: Comfort Stations in Campground Loops A-D.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-17. Fixture Locations and Compliance Assessment: Comfort Stations in Campground Loops E-G and in RV Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-18. Fixture Locations and Compliance Assessment: Campground Registration Kiosk.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-19. Fixture Locations and Compliance Assessment: Grocery and Gift Shop and Laundry/Showers Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-20. Fixture Locations and Compliance Assessment: Lift/Comfort Station by Beach.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-21. Fixture Locations and Compliance Assessment: Café Court and Chuckwagon Restaurant.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-22. Fixture Locations and Compliance Assessment: Marina Comfort Stations, Bait and Rental Office, and Lower Docks.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-23. Fixture Locations and Compliance Assessment: Upper Docks.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-24. Fixture Locations and Compliance Assessment: Visitor Center.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AV-25. Fixture Locations and Compliance Assessment: Amphitheater.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix VI – Jackson Lake Lodge

This appendix contains individual fixture characterization, assessment, and location data for the 831 identified fixtures located in Jackson Lake Lodge. 12% (102 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AVI-1 through AVI-10 present the characterization data for each fixture. Figures AVI-1 through AVI-22 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AVI-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Ranger Station	1		Sconce LED 6 2700	No	Egress	No	No
	2		Flood Incandescent 6 2700	No	Egress	No	No
	3		Tin Hat LED 12 2700	Yes	Egress	No	Yes
Lodge Area Bollards	4-61		Bollard Fluorescent No 2800	No	Pathway	No	No
Lodge Area Lamp Posts*	62-76 81-89 93-104 108- 127		Lamp Post Fluorescent 9.5 2800	No	Area	No	No
Service Station	128, 129		Wall Pack HPS 13 1800	No	Area	No	No
	130, 131		Lamp Post LED 12 5000	Yes	Area	No	No

\* Lamp Posts 82-103 were not on during my visit, while all the others were operational. If these are no longer powered, they would be compliant.

**Table AVI-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Grand Teton Medical Clinic	132, 133		Sconce Fluorescent 6.5 2700	Yes	Egress	No	Yes
Stable (Corral Offices)	134 – 150		Sconce LED 7 2700	No	Area/Egress	No	No
	151 - 153		Flood LED 7 3000	No	Area	No	No
	154, 155		Flood LED 7 3000	Yes	Area	No	Yes
Jackson Lake Lodge	156		Hanging Light LED 10 2700	No	Area	No	No
	157 - 174		Sconce LED 8 2700	No	Area	No	No
	175 - 181		Sconce LED 7.5 2700	No	Area	No	No

**Table AVI-3. Exterior Lighting Fixture Compliance with IDA Guidelines**








Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Jackson Lake Lodge	182 - 193		Wall Pack HPS 7 1800	No	Area/Egress	No	No
	194 – 215		Recessed Fluorescent 3 2700, 3000	Yes	Area/Stairway	No	Yes
Jackson Lake Lodge Loading Dock Area	216		Sconce LED 7.5 2700	No	Area	No	No
	217, 218		Wall Pack LED 6.5, 12 5000	Yes	Area	No	No
	219		Flood Fluorescent 12 3000	No	Area	No	No
	220 – 223		Tin Hat LED 12.5 2700	Yes	Area	No	Yes
Cabin Rooms 900-911	224 - 256		Sconce Incandescent 8 2300	No	Egress	No	No





**Table AVI-4. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Cabin Rooms 560-579	257 - 296		Sconce Incandescent 8 2300	No	Egress	No	No
	297 – 302		Flood LED 20 4500	No	Area	No	No
Cabin Rooms 700-719	303 - 342		Sconce Incandescent 8 2300	No	Egress	No	No
	343 - 348		Flood LED 20 4500	No	Area	No	No
Cabin Rooms 350 - 365	349 - 380		Sconce Incandescent 8 2300	No	Egress	No	No
	381 – 385		Flood LED 20 4500	No	Area	No	No
Cabin Rooms South of Main Parking Area	386 - 533		Sconce Incandescent/Fluorescent 6 2300, 2700	No	Egress	No	No








**Table AVI-5. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Cabin Rooms North. Of Main Parking Area	534 - 667		Sconce Incandescent/Fluorescent 6 2300, 2700	No	Egress	No	No
Pool Area	668, 669		Flood Halogen 12 2700	No	Area	<del>Power</del>	Yes
	670, 671		Sconce Fluorescent 7.5 2800	No	Area	No	No
	672 - 681		Sconce LED 7.5 2300	No	Area	No	No
	682 – 685		Recessed LED 8.5 3000	Yes	Area	No	Yes
Pathway Lodge Cabin Signs	77 - 80 90 - 92 105 – 107 686, 687		Tube Fluorescent 3 3200	Yes	Pathway/Signage	No	No
Managers Residence	688 – 694		Lamp Post LED 5.5 2700	No	Area	< 500 lumens	Yes

**Table AVI-6. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Managers Residence	695, 696		Sconce LED 6 5000	Yes	Area	No	No
	697		Sconce LED 8 3000	Yes	Egress	No	Yes
	698		Sconce Fluorescent 6.5 2700	No	Egress	No	No
Staff Housing #1 - #23	699, 727 739, 740		Flood Halogen 7.5 2700	Yes	Egress	No	Yes
	700 – 703 706 – 709 716 – 720 728-738		Sconce LED, Fluorescent 6-8 2700	No	Egress	No	No
	704		Sconce LED 7 2700	No	Egress	No	No
	705		Sconce LED 7 2700	No	Egress	No	No

**Table AVI-7. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Staff Housing #1 - #23	711 - 714		Sconce Fluorescent 7 2700	No	Egress	No	No
	715		Sconce LED 7 2700	No	Egress	No	No
	721 – 725 793		Sconce Fluorescent 6 2700	No	Egress	No	No
	726		Sconce Incandescent 6 2700	No	Egress	No	No
	741		Sconce Fluorescent 6 2700	No	Egress	No	No
	742		Flood Halogen 7.5 2700	No	Area	No	No
Laundry/ Information	743, 744		Ceiling Mount Fluorescent 8 3500	Yes	Egress	No	No



**Table AVI-8. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Dorms 1 – 8 and 10	745 - 752		Wall Pack HPS 6.5 1800	No	Area	No	No
	753 - 767		Ceiling Mount LED, Fluorescent 8.5 2700, 3000	Yes	Egress	No	Yes
	768, 769		Sconce LED 7 2300	No	Egress	No	No
	770		Sconce LED 7 2700	No	Egress	No	No
	771 - 773		Sconce Unknown 7, 7.5 Unknown	No	Egress	No	No
	774, 775 811		Flood LED 9 5000	No	Area	No	No
	776, 777		Lamp Post LED 25 5000	No	Area	No	No

**Table AVI-9. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Dorms 11 - 13	778		Lamp Post LED 15 5000	No	Egress	No	No
	779		Wall Pack LED 7 5000	No	Egress	Motion	Yes
	780, 781		Sconce LED 8 2700	No	Egress	No	No
	782 - 785		Sconce LED, Fluorescent 6 2700, 3000	No	Egress	No	No
	786 - 789		Flood LED, Fluorescent 8, 11 2700 - 3500	No	Area	No	No
	790		Wall Pack LED 10 2300	No	Area	No	No
	791, 792		Wall Pack HPS 7 1800	No	Egress	No	No

**Table AVI-10. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Dorm 13	794 - 810		Wall Pack LED 7 2300	Yes	No	No	Yes
Dorm 9	812 – 831		Sconce LED 7 3000	Yes	Egress	No	Yes



**Figure AVI-1. Fixture Locations and Compliance Assessment: Ranger Station.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-2. Fixture Locations and Compliance Assessment: Lodge Area Bollards North of Main Parking Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-3. Fixture Locations and Compliance Assessment: Lodge Area Bollards South of Main Parking Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-4. Fixture Locations and Compliance Assessment: Lodge Area Lamp Posts.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-5. Fixture Locations and Compliance Assessment: Service Station and Grand Teton Medical Clinic.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-6. Fixture Locations and Compliance Assessment: Stable (Corral Offices).** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-7. Fixture Locations and Compliance Assessment: Jackson Lake Lodge (Main Lodge Area).** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



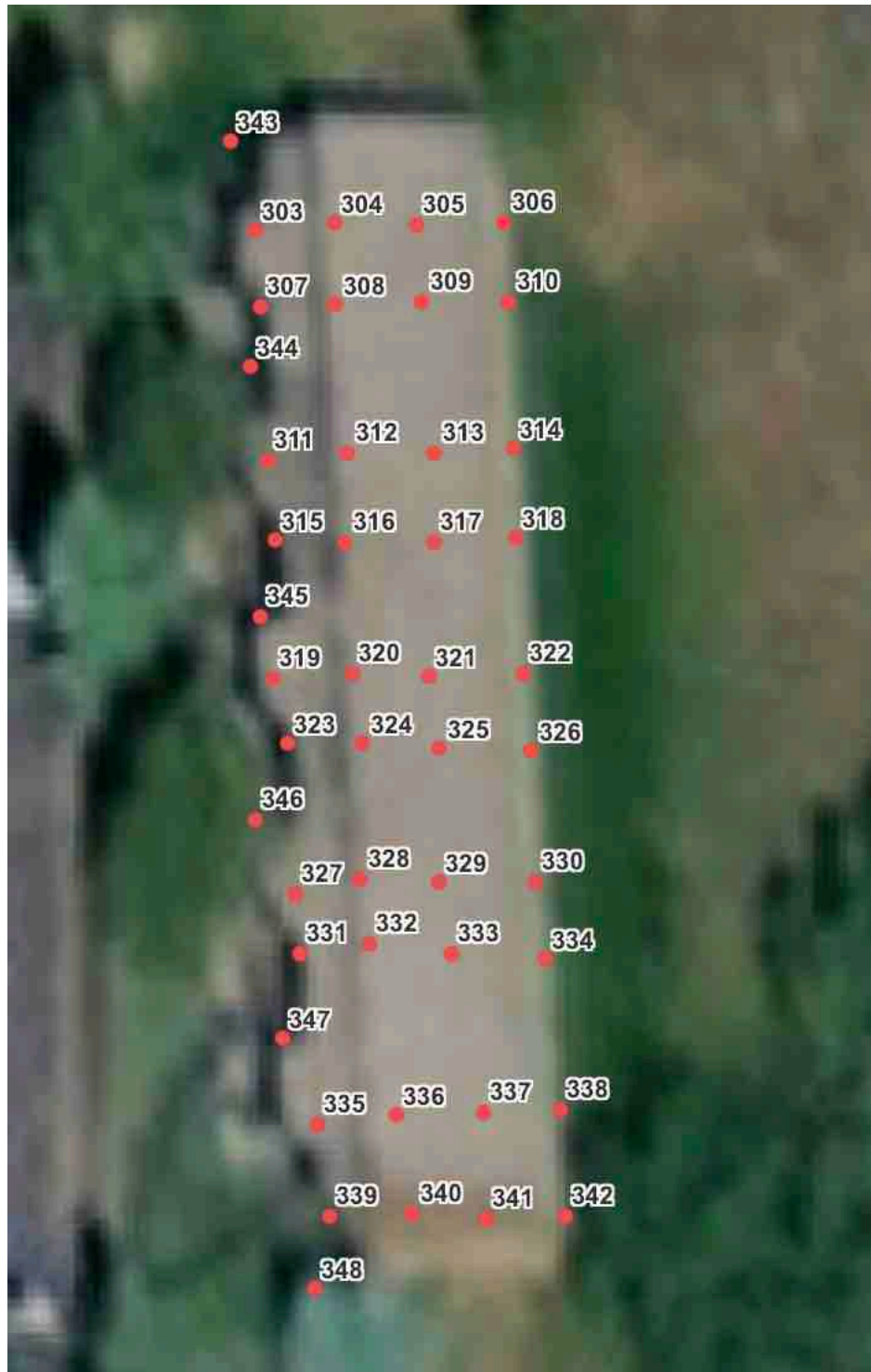
**Figure AVI-8. Fixture Locations and Compliance Assessment: Jackson Lake Lodge (Loading Dock Area).** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-9. Fixture Locations and Compliance Assessment: Cabin Rooms 900 - 911.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-10. Fixture Locations and Compliance Assessment: Cabin Rooms 560 - 579.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-11. Fixture Locations and Compliance Assessment: Cabin Rooms 700 - 719.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-12. Fixture Locations and Compliance Assessment: Cabin Rooms 350 - 380.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-13. Fixture Locations and Compliance Assessment: Cabin Rooms South of Main Parking Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-14. Fixture Locations and Compliance Assessment: Cabin Rooms North of Main Parking Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



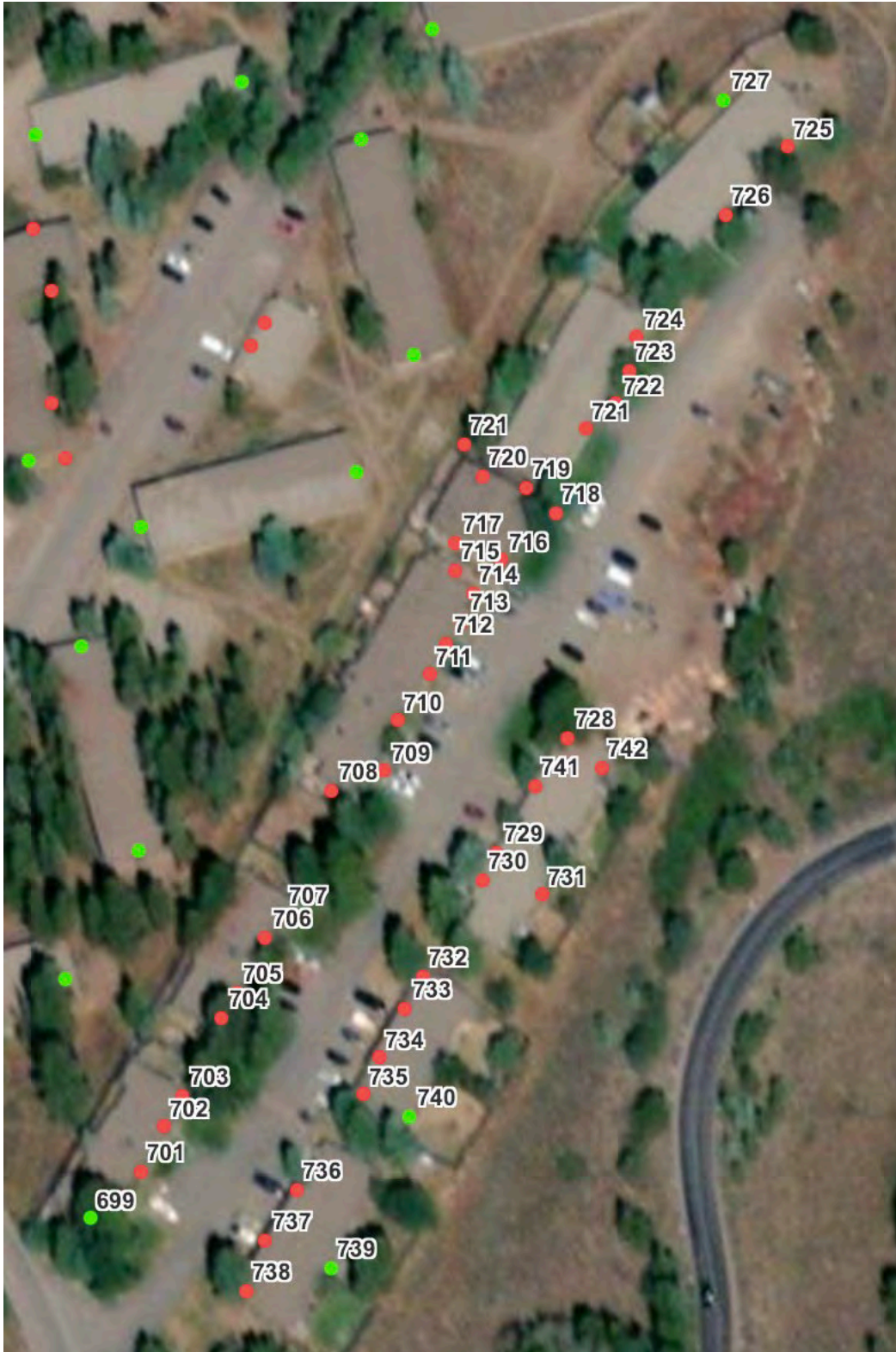
**Figure AVI-15. Fixture Locations and Compliance Assessment: Pool Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-16. Fixture Locations and Compliance Assessment: Pathway Lodge Cabin Signs.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-17. Fixture Locations and Compliance Assessment: Managers Residence.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-18. Fixture Locations and Compliance Assessment: Staff Housing #1 - #23.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-19. Fixture Locations and Compliance Assessment: Laundry/Information Buildings and Dorms 1 – 8 and 10 Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-20. Fixture Locations and Compliance Assessment: Dorms 11 - 13.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVI-21. Fixture Locations and Compliance Assessment: Dorm 13.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.










**Figure AVI-22. Fixture Locations and Compliance Assessment: Dorm 9.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix VII – Moran

This appendix contains individual fixture characterization, assessment, and location data for the 47 identified fixtures located in Colter Bay Village. 34% (16 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AVII-1 through AVII-3 present the characterization data for each fixture. Figures AVII-1 through AVII-3 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AVII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Entrance Station	1		Sconce LED 10 3000	Yes	Egress	No	Yes
	2 – 6		Wall Pack Fluorescent 10 4000	No	Area	No	No
	7-14		Recessed Fluorescent 8 2700*	Yes	Area	No	Yes
Buffalo Fork Ranger Station	15		Flood Incandescent 7 2700	No	Egress	No	No
SLC Office and Residence	16		Tin Hat LED 6.5 3000	No	Egress	No	No
	17		Wall Pack LED 7 5000	No	Area	Motion Sensor	Yes
Garage	18		Wall Pack LED 6.5 3000	Yes	Area	No	Yes







\* My memory and my recorded notes differ from the CCT presented here. I remember seeing whiter lighting under the eve on my way leaving the park. These fixtures should be confirmed.

**Table AVII-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully-Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Moran Volunteer Fire Station	19 – 22		Wall Sconce LED 8, 11.5 5000	Yes	Area/Egress	No	No
Teachers Residence	23		Flood Fluorescent 6 2700	No	Egress	Motion Sensor	Yes
	24		Flood Halogen 6 2700	Yes	Egress	No	Yes
Residence at End of Cul-de-sac	25 - 27		Sconce Fluorescent 6 2700	No	Egress	No	No
	28		Flood LED 9 5000	No	Area	Motion Sensor	Yes
	29		Flood LED 6.5 2700	No	Area	No	No
Duplex Residences	30 – 40		Recessed LED 8 Unknown*	Yes	Egress	No	No

\* These lights were not on during my visit. If the CCT can be determined, these lights may be compliant

**Table AVII-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Residence Adjacent to Post Office	41		Sconce LED 7 2700	Yes	Egress	No	Yes
	42		Sconce LED 7 2700	No	Egress	No	No
	43, 44		Flood LED 7.5 3000	No	Area	No	No
Post Office	45		Sconce Empty Socket 7 n/a	No	Egress	No	No
	46		Recessed LED 7.5 2700	Yes	Egress	No	Yes
	47		Flood LED 7 5000	No	Flag	No	No



**Figure AVII-1. Fixture Locations and Compliance Assessment: Entrance Station.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVII-2. Fixture Locations and Compliance Assessment: Buffalo Fork Ranger Station, SLC Office, and Residence.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.




**Figure AVII-3. Fixture Locations and Compliance Assessment: Residential Area and Post Office.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix VIII – Signal Mountain

This appendix contains individual fixture characterization, assessment, and location data for the 99 identified fixtures located in Signal Mountain (and surrounding area). 24% (24 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AVIII-1 through AVIII-4 present the characterization data for each fixture. Figures AVIII-1 through AVIII-8 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AVIII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Dam (BLM) Residences	1		Flood Halogen 8.6 2700	No	Area	No	No
	2		Sconce Incandescent 6 2700	Yes	Egress	No	Yes
	3		Sconce Incandescent 6 2700	Yes	Egress	No	Yes
	4, 5		Flood LED 9, 11.5 3000	No	Area	Motion Sensor	Yes
	6, 7		Wall Pack HPS 11.5 1800	No	Area	No	No
Brinkerhoff Residence	8		Hanging Light LED 7 2700	No	Egress	No	No
	9, 10		Sconce Incandescent 7 2700	No	Area	No	No





**Table AVIII-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Brinkerhoff Residence	11		Flood LED 7 2700	No	Egress	No	No
Chapel of the Sacred Heart	12		Sconce LED 6.5 2700	No	Area	No	No
	13		Hanging Light LED 7 2700	No	Egress	No	No
Campground Kiosk	14, 15		Flood LED 7 2700	Yes	Sign	No	Yes
Ranger Station	16		Flood LED 8.5 2700	No	Area	No	No
	17		Sconce LED 6 2700	No	Egress	No	No
Pump House	18		Wall Pack HPS 8.5 1800	No	Egress	No	No

**Table AVIII-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Comfort Stations	19 - 33		Sconce LED 7 2700	No	Egress	No	No
Amphitheater	34, 35		Recessed LED 16 2700	No	Area	No	No
Employee Dorms 4-6 and New Building	36 - 50		Sconce LED, Incandescent 5 – 7 2300 – 2700	No	Egress	No	No
	51 - 63		Sconce LED 5 2400, 2700	Yes	Egress	No	Yes
	64		Flood Halogen 8 2700	No	Area	No	No
	65-67		Flood LED 10-16 3000	No	Stairway	Motion Sensor	Yes
Parking Lamp Posts	68, 69		Lamp Post LED 16 3000	Yes	Parking	No	Yes

**Table AVIII-4. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Parking Lamp Posts	70		Lamp Post HPS 16 1800	Yes	Parking	No	Yes
Employee Dorms 1-3	71 - 97		Sconce LED 5 2700	No	Area	No	No
	98		Tin Hat HPS 16 1800	Yes	Area	No	Yes
Little Building in Parking Lot	99		Ceiling Mount LED 7.5 2700	No	Egress	No	No



**Figure AVIII-1. Fixture Locations and Compliance Assessment: BLM Residences and Barn adjacent to Jackson Lake Dam.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVIII-2. Fixture Locations and Compliance Assessment: Brinkerhoff Property.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



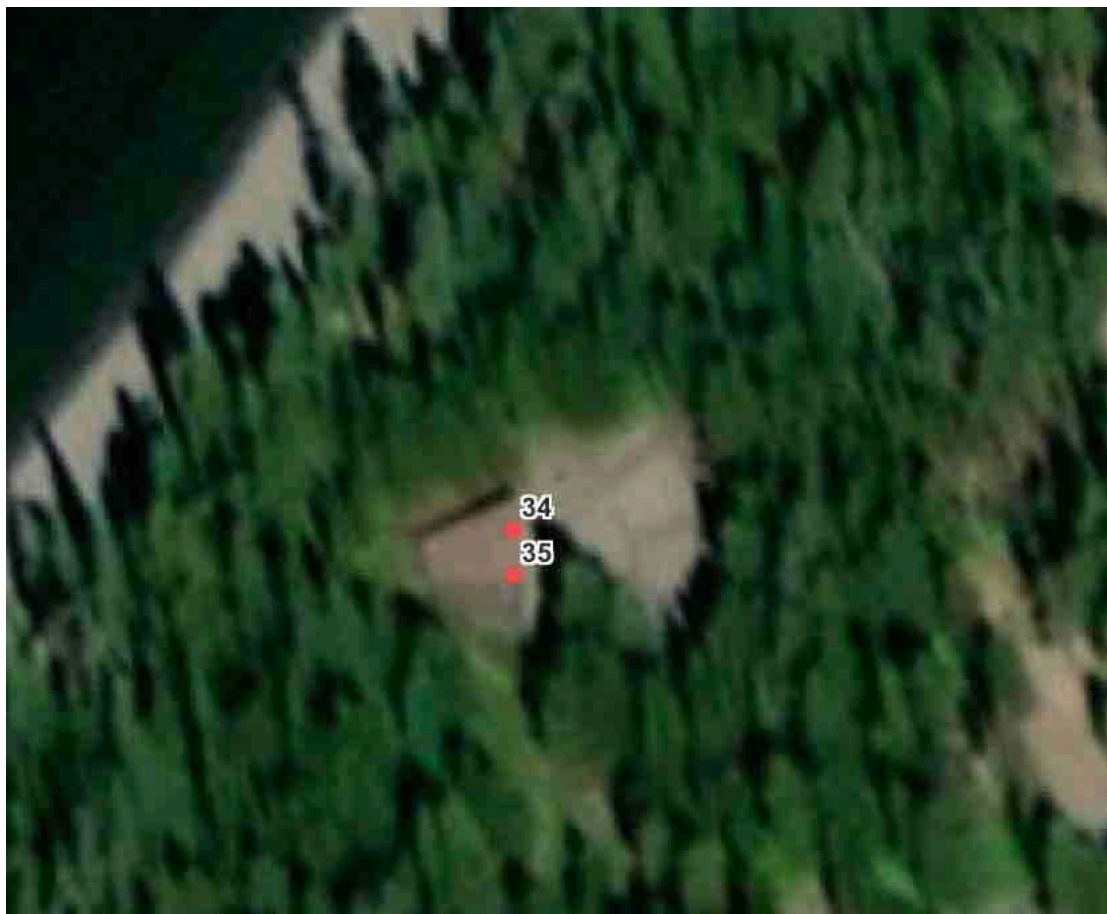
**Figure AVIII-3. Fixture Locations and Compliance Assessment: Chapel of the Sacred Heart.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



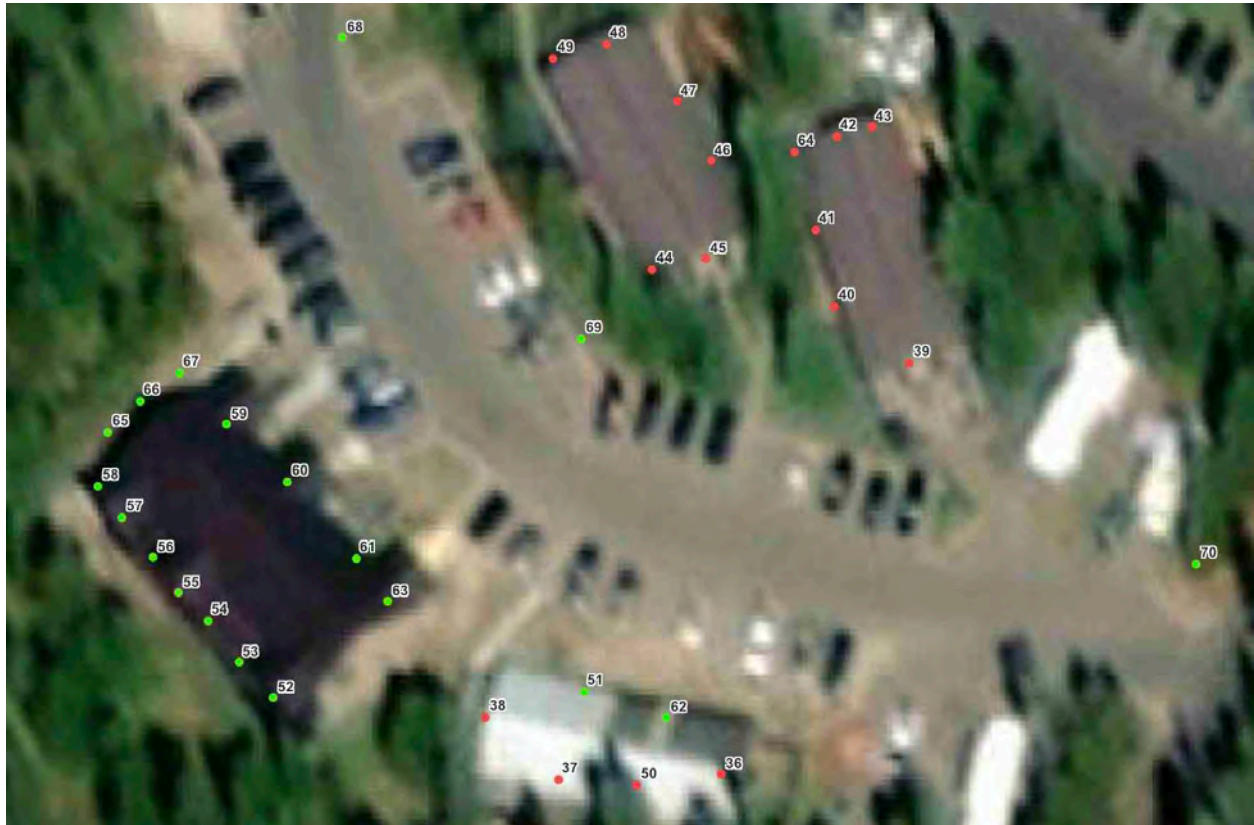
**Figure AVIII-4. Fixture Locations and Compliance Assessment: Ranger Station, Kiosk, and Pump House.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVIII-5. Fixture Locations and Compliance Assessment: Comfort Stations.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVIII-6. Fixture Locations and Compliance Assessment: Amphitheater.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVIII-7. Fixture Locations and Compliance Assessment: Dorms 4-6 and New Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AVIII-8. Fixture Locations and Compliance Assessment: Dorms 1-3.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.






## Appendix IX – Jenny Lake Lodge

This appendix contains individual fixture characterization, assessment, and location data for the 113 identified fixtures located in Jenny Lake Lodge. 42% (47 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AIX-1 through AIX-3 present the characterization data for each fixture. Figures AIX-1 through AIX-5 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.


**Table AIX-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

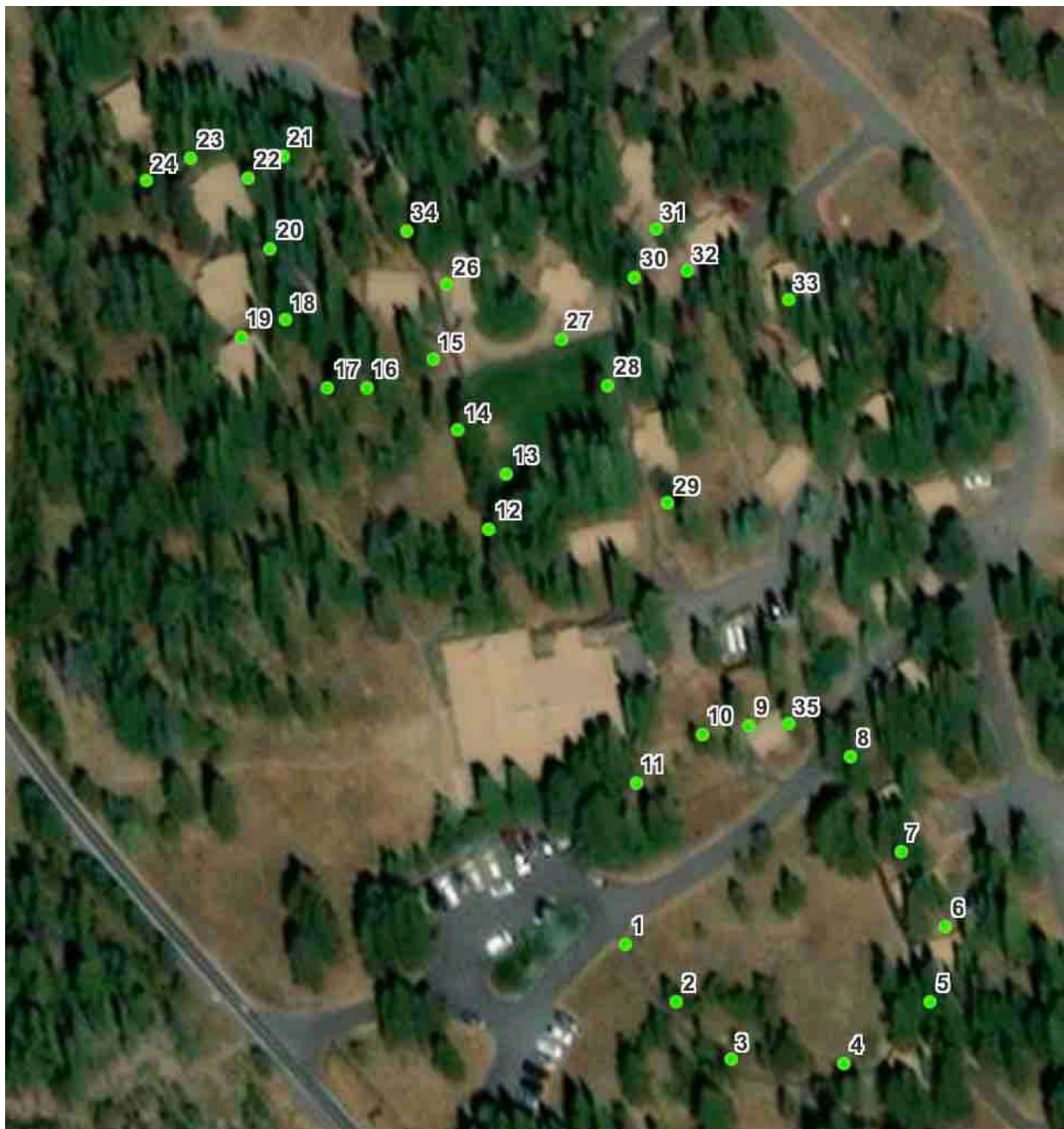
Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Lodge Bollards	1 – 35		Bollard LED 1 2750	No	Pathway	< 500 lumens	Yes
Cabins	36 – 74		Sconce LED 6 2400	No	Egress	No	No
Managers Residence	75, 76		Sconce LED 6 2400	No	Egress	No	No
Lodge	77, 78		Hanging Light Incandescent 10 2000	No	Egress	< 500 lumens	No
	79		Flood Halogen 6.5 2700	No	Egress	No	No
	80		Wall Pack HPS 9 1800	Yes	Egress	No	Yes
	81		Wall Pack HPS 9 1800	No	Egress	No	No

**Table AIX-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Lodge	82	missing	Sconce LED 7.5 2400	No	Egress	No	No
Head House Keeping – Employee Cabin	83 - 85		Wall Pack HPS 8 1800	No	Area	No	No
	86 – 91		Ceiling Mount HPS 8, 13 1800	Yes	Area	No	Yes
	92	missing	Sconce LED 7 2400	Yes	Egress	No	Yes
Employee Cabins	93 – 102 25		Sconce LED 7 2400	No	Egress	No	No
	103 - 108		Sconce LED, Fluorescent 7 2400	No	Egress	No	No
	109 - 111		Sconce LED 6.5 2400	Yes	Egress	No	Yes

**Table AIX-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

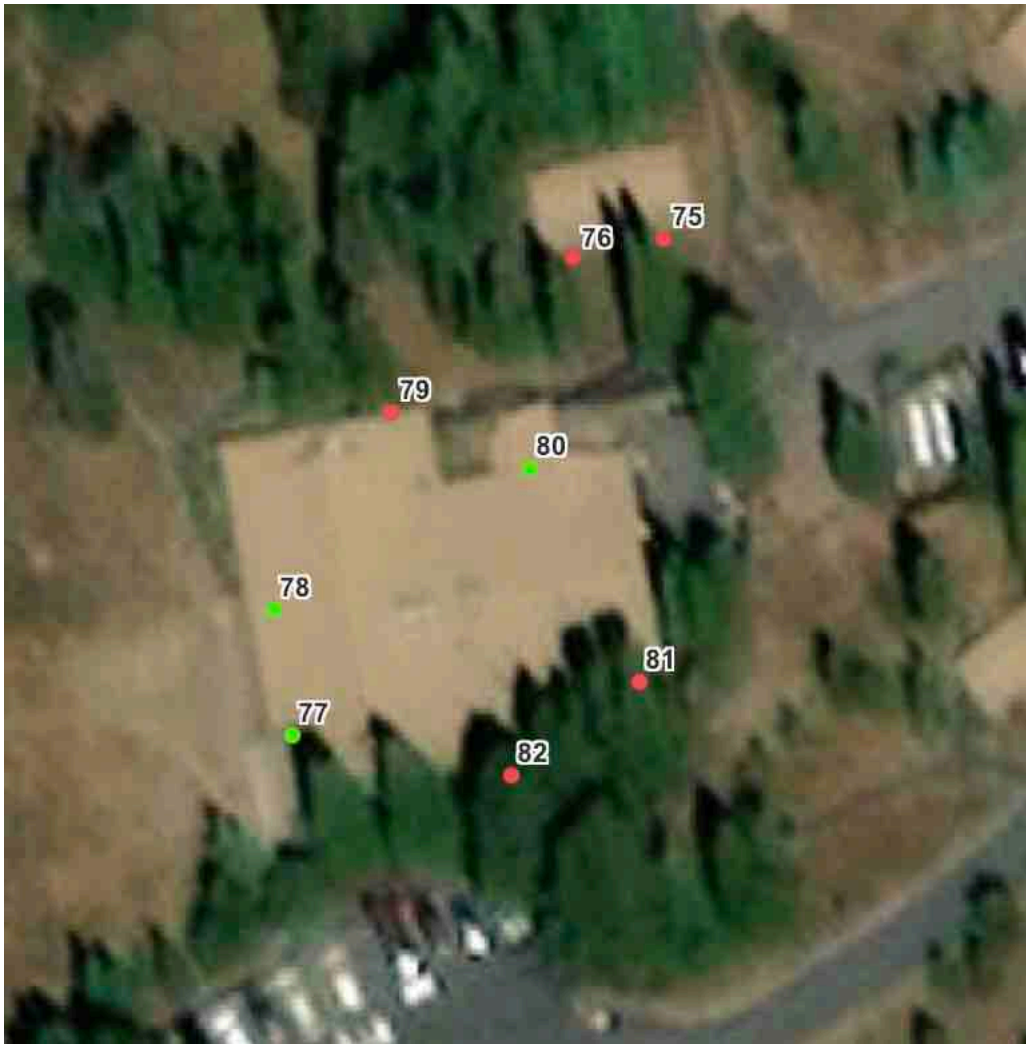
Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Horse Stables House	112, 113		Sconce LED 6 2400	No	Egress	No	No



**Figure AIX-1. Fixture Locations and Compliance Assessment: Lodge Area Bollards.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AIX-2. Fixture Locations and Compliance Assessment: Cabins.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AIX-3. Fixture Locations and Compliance Assessment: Lodge and Manager's Residence.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AIX-4. Fixture Locations and Compliance Assessment: Head House Keeping Residence.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AIX-5. Fixture Locations and Compliance Assessment: Employee Cabins and Horse Stables House.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.







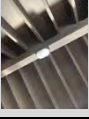
## Appendix X – South Jenny Lake

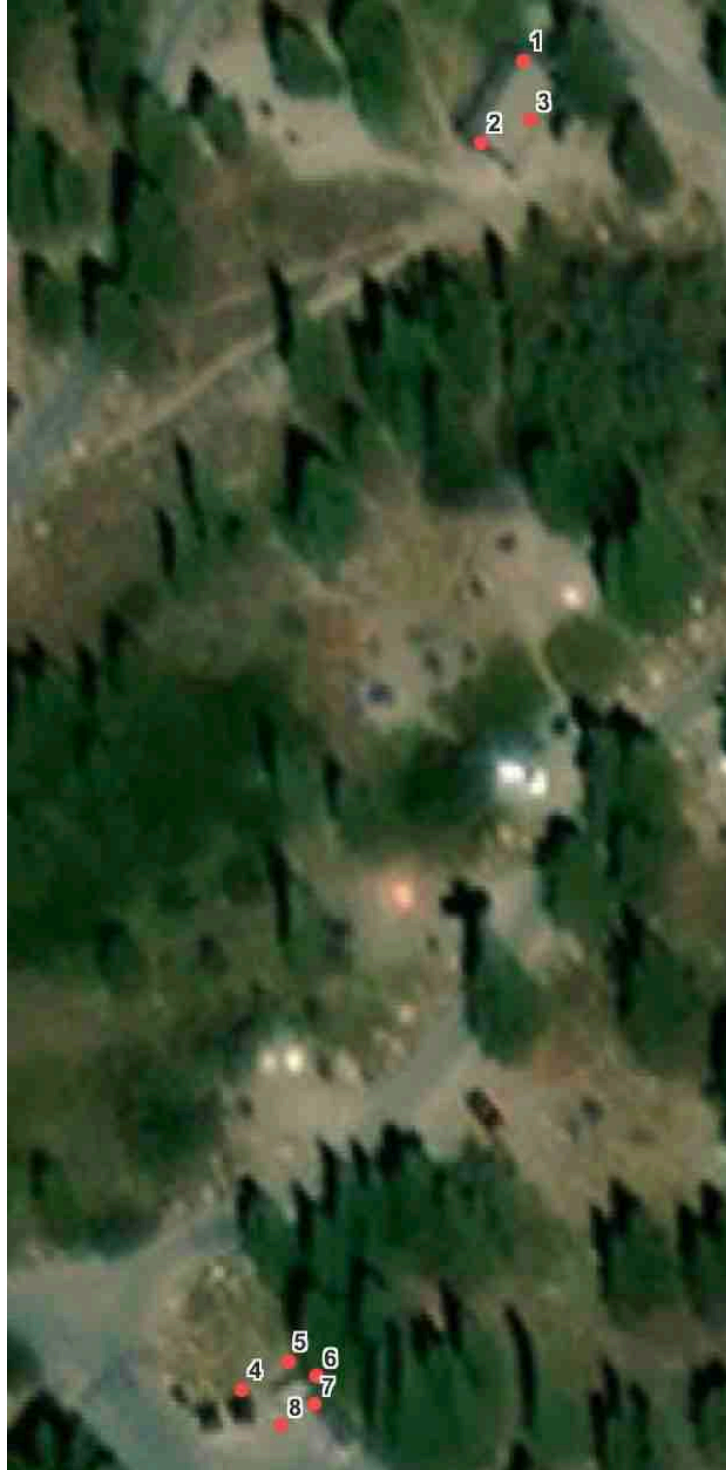
This appendix contains individual fixture characterization, assessment, and location data for the 27 identified fixtures located in South Jenny Lake. 41% (11 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AX-1 and AX-2 present the characterization data for each fixture. Figures AX-1 through AX-3 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AX-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

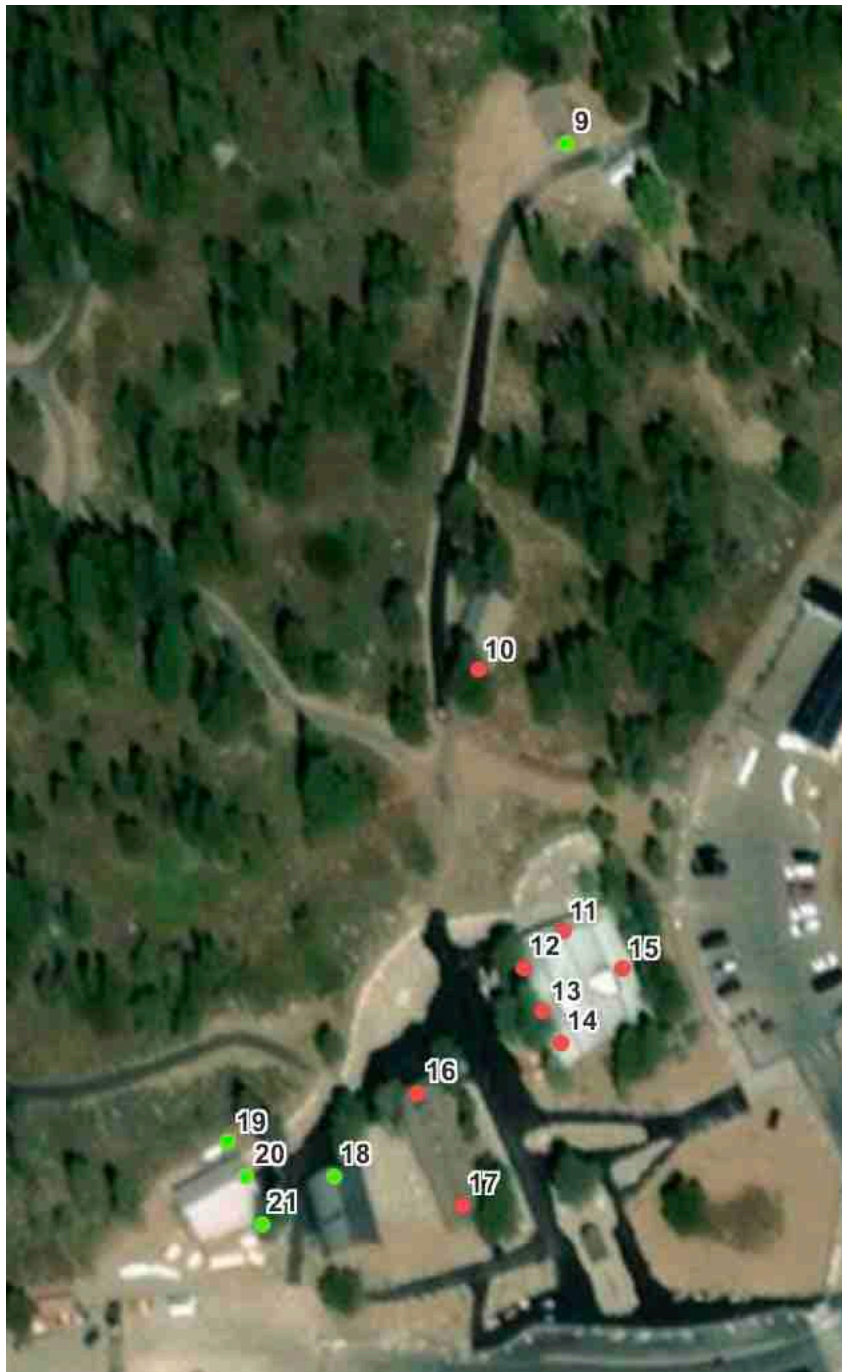
Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Campground Comfort Station	1, 2		Sconce LED 12 2700	No	Area	No	No
	3		Flood Fluorescent 6.5 2700	No	Area	No	No
Campground Office	4 - 7		Sconce Incandescent 7 2300	No	Egress/Area	No	No
Campground Kiosk	8		Ceiling Mount Incandescent 7 2300	No	Sign	No	No
Shower Building	9		Tin Hat LED 8 3000	Yes	Egress	No	Yes
Ranger Station	10		Sconce Unknown 6 Unknown	No	Egress	No	No
Store and Gift Shop	11 – 15		Ceiling Mount LED 11 3200	Yes	Area	No	No

**Table AX-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

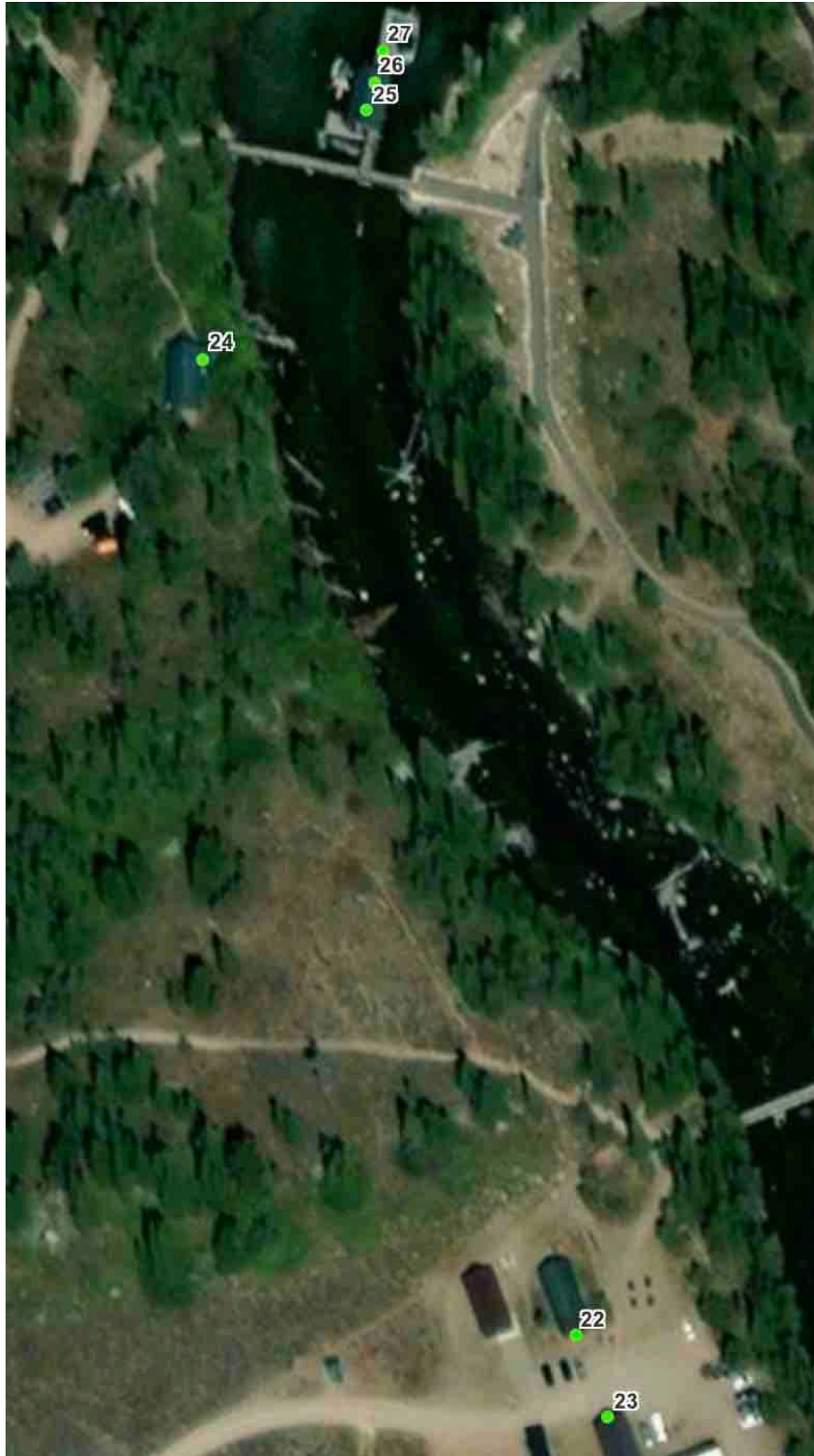
Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Visitor Center	16, 17		Sconce LED 7 3000	No	Egress	No	No
Comfort Stations	18		Recessed LED 8.5 3000	Yes	Egress	Yes	Yes
	19 – 21		Recessed LED 8.5 3000	Yes	Egress	Yes	Yes
CCC Camp Bath House	22		Flood Halogen 6 2700	No	Egress	Motion Sensor	Yes
CCC Camp Mess Hall	23		Tin Hat Incandescent 7 2700	Yes	Egress	No	Yes
Reimer's Cabin	24		Sconce Fluorescent 5.5 2700	Yes	Egress	No	Yes
Boat Dock	25 – 27		Ceiling Mount LED 11 3000	Yes	Area	No	Yes



**Figure AX-1. Fixture Locations and Compliance Assessment: Campground Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AX-2. Fixture Locations and Compliance Assessment: Showers, Ranger Station, Store, Visitor Center, and Comfort Stations.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.









**Figure AX-3. Fixture Locations and Compliance Assessment: CCC Camp, Reimer Residence, and Boat Dock.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XI – Lupine Meadows

This appendix contains individual fixture characterization, assessment, and location data for the 31 identified fixtures located in Lupine Meadows. 90% (28 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXI-1 presents the characterization data for each fixture. Figure AXI-1 provides approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXI-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Cabins	1 - 21		Sconce LED 7 2700	Yes	Egress	No	Yes
	22 – 24		Sconce LED 7 2700	Yes	Egress	No	Yes
	25		Wall Pack HPS 8 1800	No	Egress	No	No
	26		Flood Halogen 4 2700	No	Egress	No	No
Rescue Cache	27		Flood LED 7 3000	No	Area	No	No
	28 - 31		Recessed LED 8.5 2700	Yes	Egress/Area	No	Yes









**Figure AXI-1. Fixture Locations and Compliance Assessment: Lupine Meadows.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.





## Appendix XII – Climbers Ranch

This appendix contains individual fixture characterization, assessment, and location data for the 48 identified fixtures located in Climbers Ranch. 46% (22 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXII-1 through AXII-5 present the characterization data for each fixture. Figures AXII-1 through AXII-3 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.








**Table AXII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Community Building	1, 2		Sconce Incandescent 6.5 2400	Yes	Egress	No	Yes
	3		Sconce Incandescent 6.5 2700	No	Egress	No	No
Dorm	4		Sconce Incandescent 6.5 2700	No	Egress	No	No
Cabins	5 – 8		Sconce LED 6.5 2700	Yes	Egress	No	Yes
	9, 10		Hanging Light LED 5, 6.5 2700	Yes	Egress	No	Yes
	11		Sconce LED 7 2700	Yes	Egress	No	Yes
	12 - 14		Sconce LED 6 2700	Yes	Egress	No	Yes

**Table AXII-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Cabins	15		Ceiling Mount LED 8 2700	Yes	Egress	No	Yes
	16 - 18		Sconce LED 6.5 2700	No	Egress	No	No
	19, 20		Sconce LED 6.5 2700	No	Egress	No	No
	21		Hanging Light LED 8 2700	No	Egress	No	No
	22 - 24		Sconce LED 7 2700	No	Egress	No	No
	48		Sconce Incandescent 6.5 2700	No	Egress	No	No
Managers Residence	25		Ceiling Mount LED 7 2300	No	Egress	No	No


**Table AXII-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

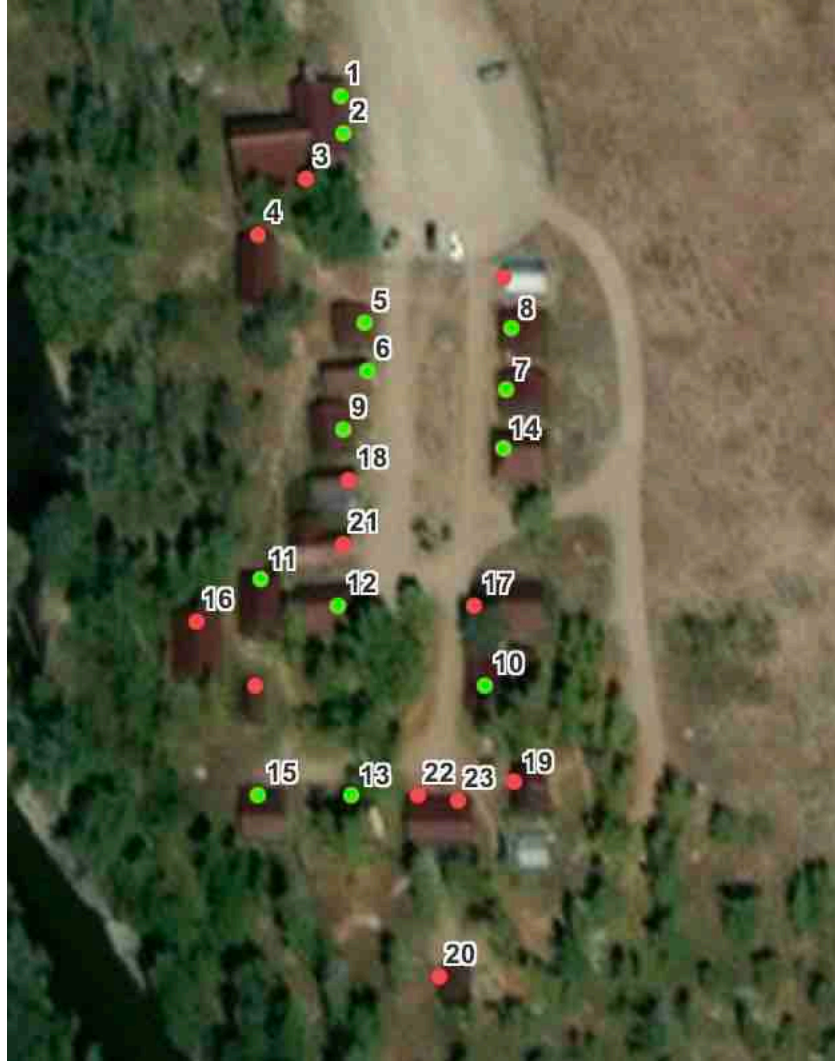
Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Double Diamond Dude Ranch Dining Room	26		Sconce Fluorescent 6.5 2700	No	Egress	No	No
	27		Ceiling Mount LED 9.5 2300	No	Egress	No	No
	28		Sconce LED 6.5 2700	No	Area	No	No
Modern Cook Shelter	29 – 34		Tin Hat Fluorescent 7 2700	Yes	Area	No	Yes
Shower House	35 – 37		Sconce LED 6.5 2700	No	Area	No	No
Cabins	38		Ceiling Mount LED 7 2300	Yes	Egress	No	Yes
	39		Tin Hat Fluorescent 7 2300	Yes	Egress	No	Yes

**Table AXII-4. Exterior Lighting Fixture Compliance with IDA Guidelines**

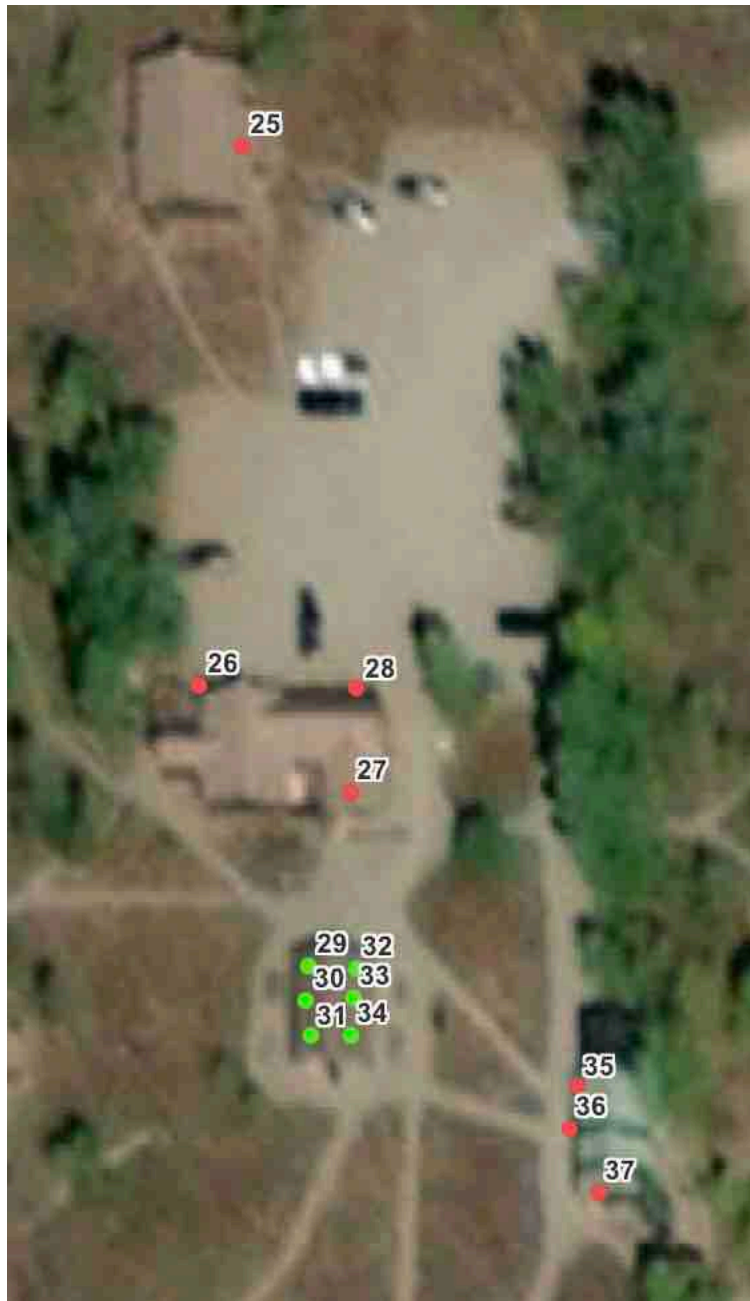
Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Cabins	40		Sconce Fluorescent 6 2700	No	Area	No	No
Dyke Cabin	41		Sconce Fluorescent 6 2700	No	Area	No	No
Mosely Cabin	42		Sconce Fluorescent 9 2700	No	Area	No	No
Fieldhouse Cabin	43		Sconce Fluorescent 6 2700	No	Area	No	No
Hall Cabin	44		Sconce Fluorescent 6 2700	No	Area	No	No
Small Hunter Cabin	45		Sconce Fluorescent 6 2700	No	Area	No	No
Large Hunter Cabin	46		Ceiling Mount LED 7 2400	Yes	Egress	No	Yes

**Table AXII-5. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Duplex Cabin	47		Sconce Fluorescent 6 2700	No	Area	No	No



**Figure AXII-1. Fixture Locations and Compliance Assessment: Climbers Ranch (Area Closest to Inner Park Loop Road).** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXII-2. Fixture Locations and Compliance Assessment: Manager's Residence, Double Diamond Dude Ranch Dining Room, Modern Cook Shelter, Shower House.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXII-3. Fixture Locations and Compliance Assessment: Cabins.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XIII – Beaver Creek

This appendix contains individual fixture characterization, assessment, and location data for the 75 identified fixtures located in TEMPLATE. 55% (41 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXIII-1 through AXIII-4 present the characterization data for each fixture. Figures AXIII-1 and AXIII-2 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXIII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Shed	1, 2		Wall Pack Unknown 8 Unknown	No	Egress	No	No
Carpenter Shop	3		Flood Empty Socket 7 n/a	No	Area	Motion Sensor	Yes
Pine Martin Drive Residences	4 – 19 36 – 38		Sconce LED, Empty Socket 6 – 7 2400, 2700, n/a	Yes	Egress	No	Yes
	20 - 22		Flood LED 6.5, 7 3000	No	Area	Motion Sensor	Yes
	23		Ceiling Mount LED 7 2700	Yes	Egress	No	Yes
	24		Recessed LED 7.5 2700	Yes	Egress	No	Yes
	25 - 33		Sconce Fluorescent 6.5 3000	Yes	Egress/Area	No	Yes





**Table AXIII-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Pine Martin Drive Residences	34, 35		Sconce LED 6 2700	No	Egress	No	No
	39 – 42		Ceiling Mount Incandescent 8.5 2700	Yes	Egress	No	Yes
	43, 44		Sconce Incandescent 6 2700	No	Egress	No	No
	45, 46		Ceiling Mount LED 8.5 2700	No	Egress	No	No
	47, 48		Ceiling Mount LED 8.5 2700	No	Egress	No	No
	49		Ceiling Mount Incandescent 8.5 2400	No	Egress	No	No
	50 - 55		Sconce LED 6 2700	No	Egress	No	No

**Table AXIII-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Pine Martin Drive Residences	56 – 60		Sconce LED 6 2700	No	Egress	No	No
	61		Sconce LED 6 2700	No	Egress	No	No
Beaver Creek Road Residences	62, 63		Sconce LED 7 2700	No	Egress	No	No
	64		Sconce Incandescent 7 2700	No	Egress	No	No
	65, 66		Sconce Incandescent 7 2700	No	Egress	No	No
	67		Sconce Halogen 7 2700	No	Egress	No	No
	68		Sconce LED 7 2700	No	Egress	No	No

**Table AXIII-4. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Beaver Creek Road Residences	69, 70		Sconce LED 7 2700	No	Egress	No	No
	71		Ceiling Mount LED 8 2700	No	Egress	No	No
	72		Sconce LED 7 2700	No	Egress	No	No
	73 - 75		Flood Halogen 7 2700	No	Area	Motion Sensor	Yes



**Figure AXIII-1. Fixture Locations and Compliance Assessment: Pine Martin Drive Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXIII-2. Fixture Locations and Compliance Assessment: Beaver Creek Road Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XIV – Moose

This appendix contains individual fixture characterization, assessment, and location data for the 301 identified fixtures located in Moose. 82% (246 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXIV-1 through AXIV-6 present the characterization data for each fixture. Figures AXIV-1 through AXIV-10 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXIV-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Chapel of the Transfiguration	1		Flood Halogen 7 2700	Yes	Egress	No	Yes
Entrance Station	2		Sconce Fluorescent 6.5 2400	No	Egress	No	No
	3 – 5		Wall Pack LED 8 5000	Yes	Area	No	No
	6 – 9		Recessed LED 8 5000	Yes	Area	No	No
	10		Lamp Post HPS 24 1800	Yes	Area	No	Yes
Mather Circle, Carncross Dr, and Burt Dr Residences	11 – 57		Sconce LED, Incandescent 6.5 2700	Yes	Egress	No	Yes
	58		Sconce LED 6.5 2700	No	Egress	No	No

**Table AXIV-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Mather Circle, Carncross and Burt Dr Residences	59		Sconce Fluorescent 6.5 2700	No	Egress	No	No
	60		Sconce Fluorescent 6.5 2700	No	Egress	No	No
	61		Flood Halogen 7 2700	No	Area	No	No
	62 – 73 272		Ceiling Mount Fluorescent 7.5 2700	Yes	Egress	No	Yes
	74 - 113		Sconce Fluorescent 6, 7.5 3000	Yes	Egress/Area	No	Yes
Noble Way Residences	114 – 123		Sconce LED 6.5 2700	Yes	Egress	No	Yes
	124, 125		Sconce LED 6.5 2700	No	Egress	No	No

**Table AXIV-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Noble Way Residences	126 - 141		Sconce Fluorescent 6, 7.5 3000	Yes	Egress/Area	No	Yes
HQ Road Residences	142 - 159		Sconce LED 6.5, 8 2700	Yes	Egress	No	Yes
	160 - 169		Ceiling Mount LED 7.5 2700	Yes	Egress	No	Yes
Ranger Office	170, 171		Flood Halogen 7 2700	No	Egress	No	No
Shop	172, 173		Sconce LED 9 2700	No	Egress	No	No
	174, 175		Flood LED 9 3000	No	Egress	Motion Sensor	Yes
	176		Flood Halogen 16 2700	No	Area	No	No



**Table AXIV-4. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Shed	177		Sconce LED 9 2700	No	Egress	No	No
Shed	178, 179		Flood Halogen 8 2700	No	Egress	Motion Sensor	Yes
Sand Shed	180		Ceiling Mount Fluorescent 6.5 Unknown	No	Area	No	No
Water Treatment	265 -271		Wall Pack LED 8 – 14 Unknown	Yes	Area/Egress	No	No*
Post Office	188 – 190		Wall Pack HPS 6 – 9 1800	No	Egress	No	No
Grand Teton Association	191 – 195		Flood LED 9, 11 Unknown	No	Egress	Motion Sensor	Yes
Naturalist Storage and Radio Shop	196 – 199		Wall Pack Fluorescent 8, 8.5 3000	Yes	Area/Egress	No	Yes




\* CCT unable to be determined, fixture may be compliant if CCT is in correct range.

**Table AXIV-5. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Naturalist Storage and Radio Shop	200		Wall Pack HPS 9 1800	Yes	Area	No	Yes
	201, 202		Flood LED 11, 14 Unknown	No	Egress	Motion Sensor	Yes
	203 - 206		Flood Halogen 7 2700	No	Egress	Motion Sensor	Yes
Headquarters	207 - 211		Recessed Fluorescent 9, 16 Unknown	Yes	Egress	No	No*
	212 - 220		Wall Pack LED 7 -15 3000	Yes	Egress/Area	Motion Sensor	Yes
	221 - 246		Wall Pack HPS 7 -15 1800	Yes	Egress/Area	Motion Sensor	Yes
Visitor Center Lamp Posts	247 - 261		Lamp Post LED 12 – 24 5000	Yes	Parking, Pathway	No	No

\* CCT unable to be determined, fixture may be compliant if CCT is in correct range.

**Table AXIV-6. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Visitor Center	262 – 264		Sconce LED 6 3000	No	Egress	No	No
Visitor Center Sign Lights	169, 187		Flood LED 10 3000	Yes	Sign	No	Yes
Visitor Center Corridor Lights	273 - 301		Ceiling Mount LED 11 2400	Yes	Area	No	Yes



**Figure AXIV-1. Fixture Locations and Compliance Assessment: Chapel of the Transfiguration.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXIV-2. Fixture Locations and Compliance Assessment: Entrance Station Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



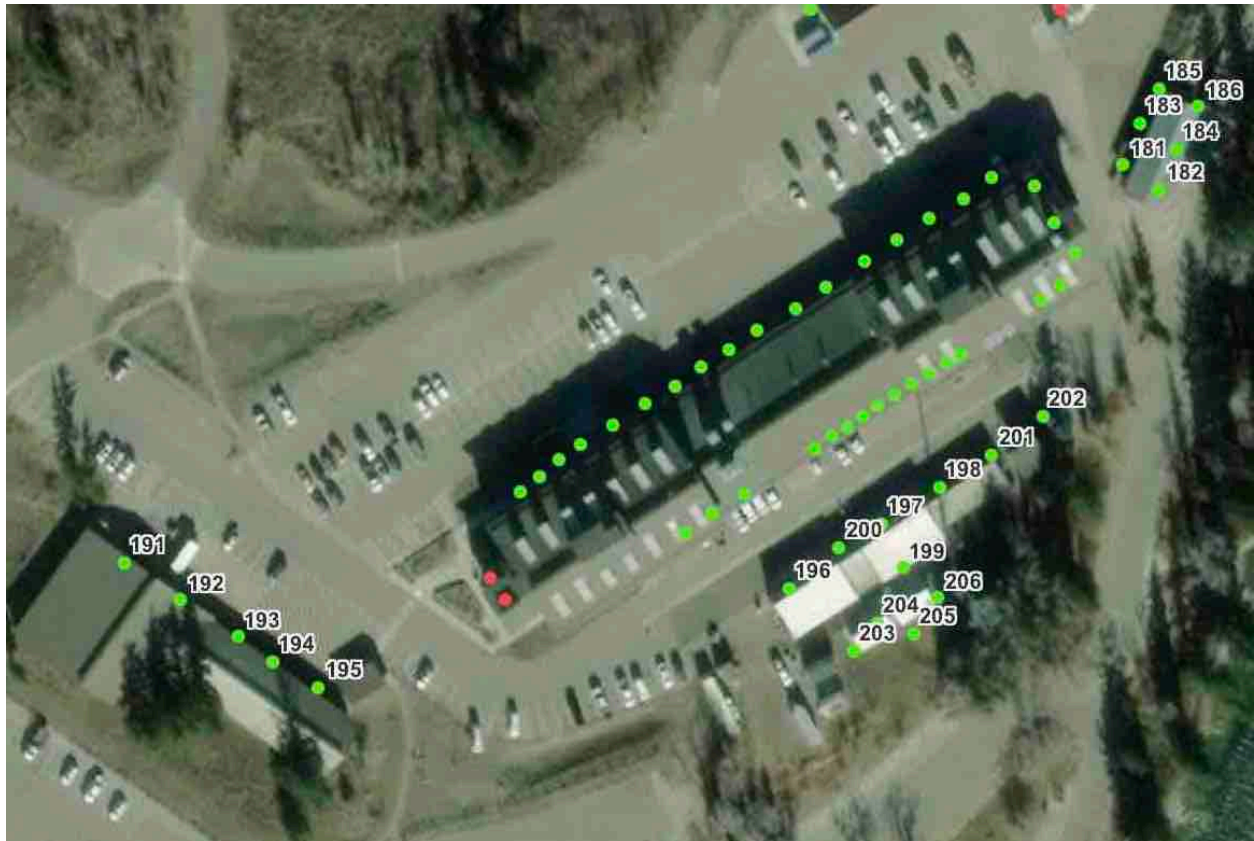
**Figure AXIV-3. Fixture Locations and Compliance Assessment: Mather Circle, Carncross Drive, and Burt Drive.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



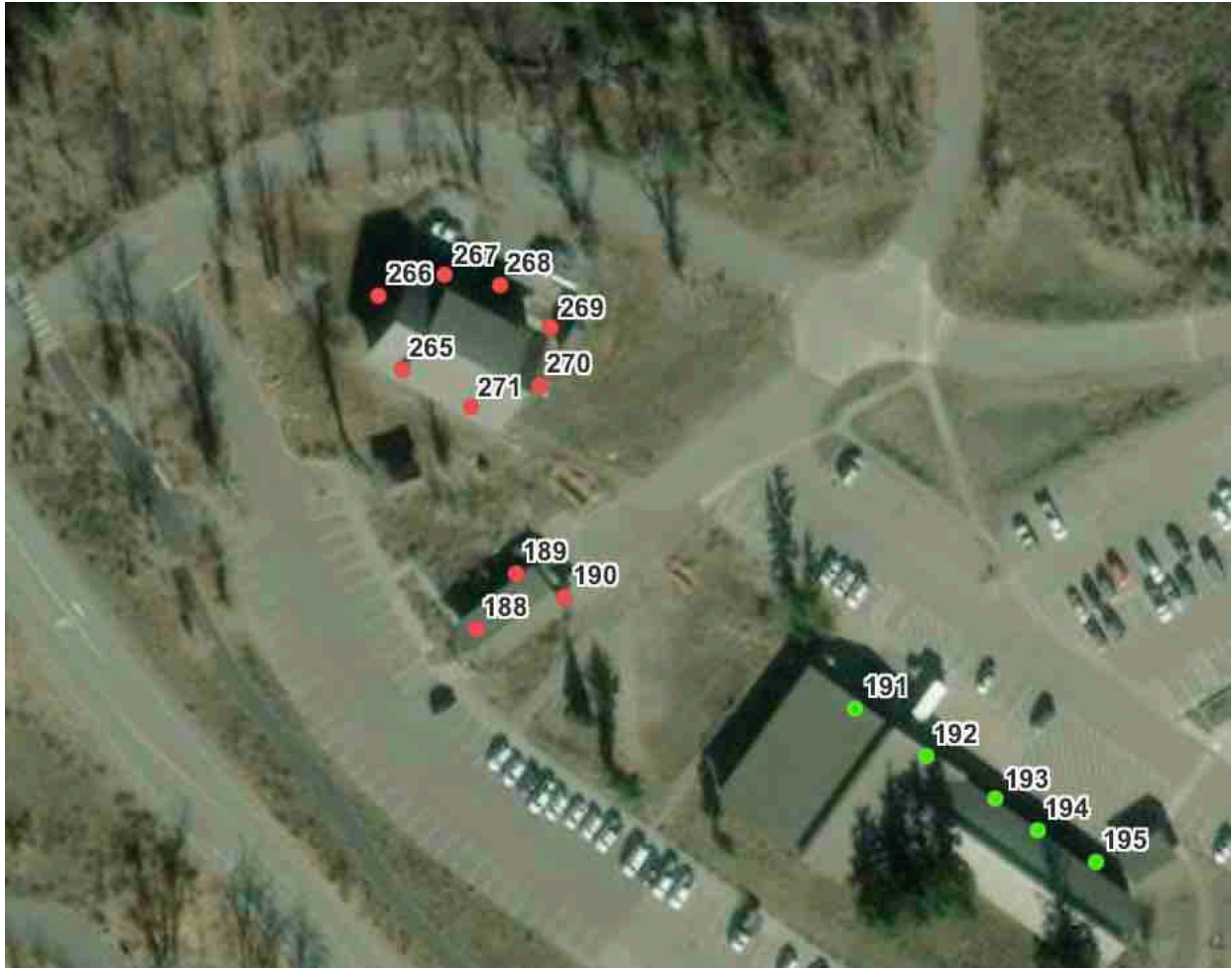
**Figure AXIV-4. Fixture Locations and Compliance Assessment: Noble Way and Headquarters Drive.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXIV-5. Fixture Locations and Compliance Assessment: Hammond Road Maintenance Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



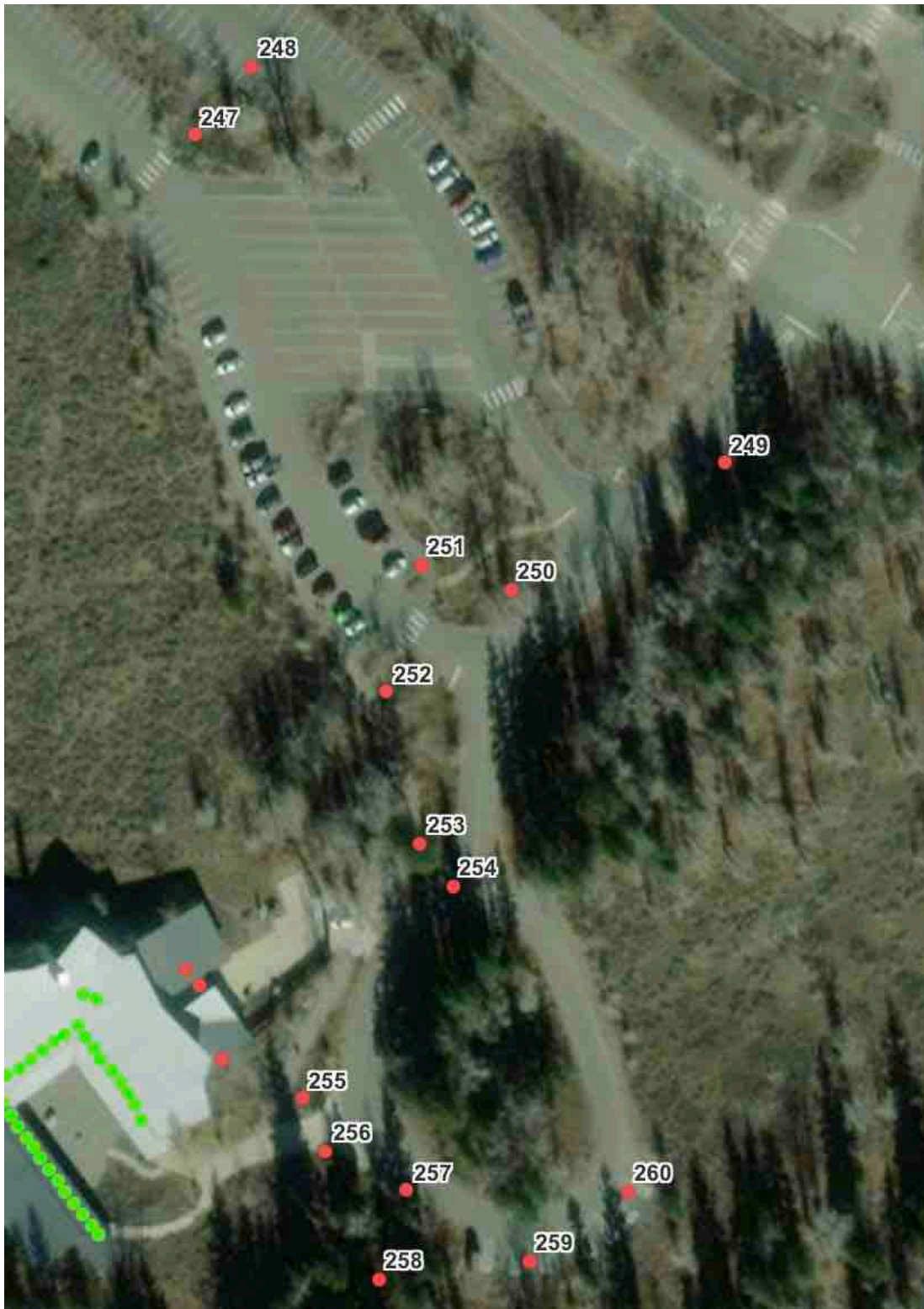
**Figure AXIV-6. Fixture Locations and Compliance Assessment: Buildings Adjacent to the Headquarters Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXIV-7. Fixture Locations and Compliance Assessment: Post Office and Water Treatment Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXIV-8. Fixture Locations and Compliance Assessment: Headquarters Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXIV-9. Fixture Locations and Compliance Assessment: Visitor Center Parking Lot Lamp Posts.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.










**Figure AXIV-10. Fixture Locations and Compliance Assessment: Visitor Center Building.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XV – Murie Ranch

This appendix contains individual fixture characterization, assessment, and location data for the 25 identified fixtures located in Murie Ranch. 68% (17 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXV-1 through AXV-3 present the characterization data for each fixture. Figure AXV-1 provides approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.




**Table AXV-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Duplex Cabin Alatna	1		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Belvedere Cabin	2		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Polaris Cabin	3		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Duplex Cabin Montana	4, 5		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Bath House	6, 7		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Homestead Cabin, STS Lodge	8, 9		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Homestead Cabin and Engine Room	10 - 13		Tin Hat Incandescent 5 2700	No	Egress	No	No

**Table AXV-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Homestead Cabin, STS Lodge	14		Tin Hat Fluorescent 8 5000	No	Egress	No	No
Root Cellar	15		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Frame Cabin	16		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Estes Cabin	17		Tin Hat LED 8 2700	No	Egress	No	No
Garage and Workshop	18		Tin Hat Fluorescent 5 5000	No	Egress	No	No
	19, 20		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes
Cabin	21		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes

**Table AXV-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Chena Cabin	22		Tin Hat LED 5 2700	No	Egress	No	No
Murie Residence	23, 24		Ceiling Mount Incandescent 7.5 2700	Yes	Egress	No	Yes
Olaus Murie Studio	25		Tin Hat Incandescent 5 2700	Yes	Egress	No	Yes









**Figure AXV-1. Fixture Locations and Compliance Assessment: Murie Ranch.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

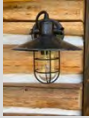

## Appendix XVI – Moose-Wilson Road

This appendix contains individual fixture characterization, assessment, and location data for the 40 identified fixtures located in Moose-Wilson Road. 65% (26 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXVI-1 and AXVI-2 present the characterization data for each fixture. Figures AXVI-1 through AXVI-4 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXVI-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

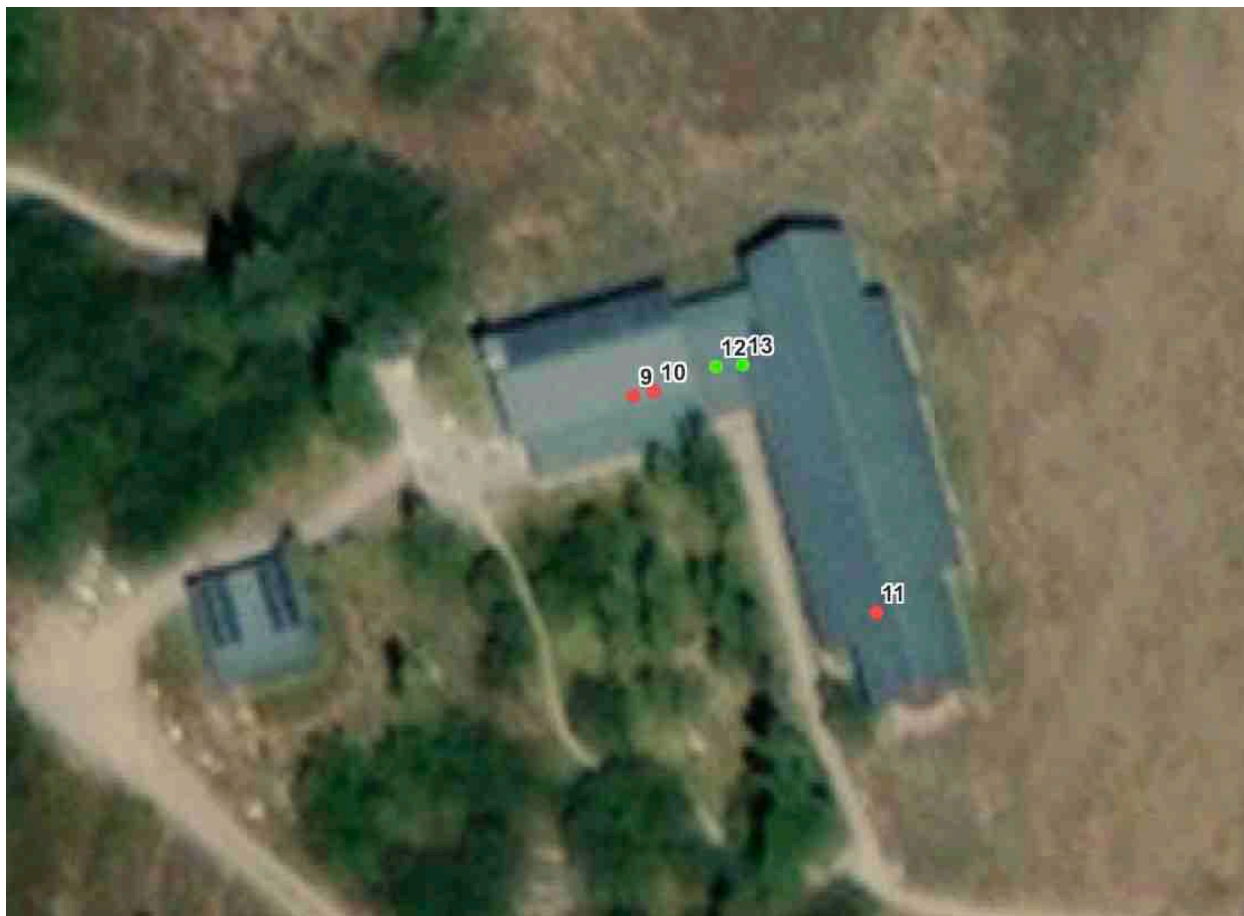
Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Entrance Station	1 – 8		Recessed Fluorescent 9 5000	Yes	Area	No	No
LSR Preserve Visitor Center	9 - 11		Sconce LED 1 5000	Yes	Area	No	No
	12, 13		Sconce LED 6.5 3000	Yes	Egress	No	Yes
White Grass Ranger Station	14	missing	Ceiling Mount Incandescent 8 2700	No	Egress	No	No
White Grass Pump House Cabin 5-12, Girls Cabin	15 – 23		Sconce Incandescent 5 2700	No	Egress	< 500 lumens	Yes
	24 – 30		Ceiling Mount Incandescent 8 2700	Yes	Egress	No	Yes
	31		Tin Hat LED 9 2700	Yes	Egress	No	Yes

**Table AXVI-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
White Grass Main Cabin & Hammond Cabin	32 - 38		Sconce Incandescent 5 2700	No	Egress	< 500 lumens	Yes
	39, 40		Ceiling Mount Incandescent 8 2700	No	Egress	No	No



**Figure AXVI-1. Fixture Locations and Compliance Assessment: Entrance Station.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXVI-2. Fixture Locations and Compliance Assessment: LSR Preserve Visitor Center.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXVI-3. Fixture Locations and Compliance Assessment: White Grass Ranger Station.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXVI-4. Fixture Locations and Compliance Assessment: White Grass Cabin Area.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.


## Appendix XVII – E Nichols and Warm Springs Roads

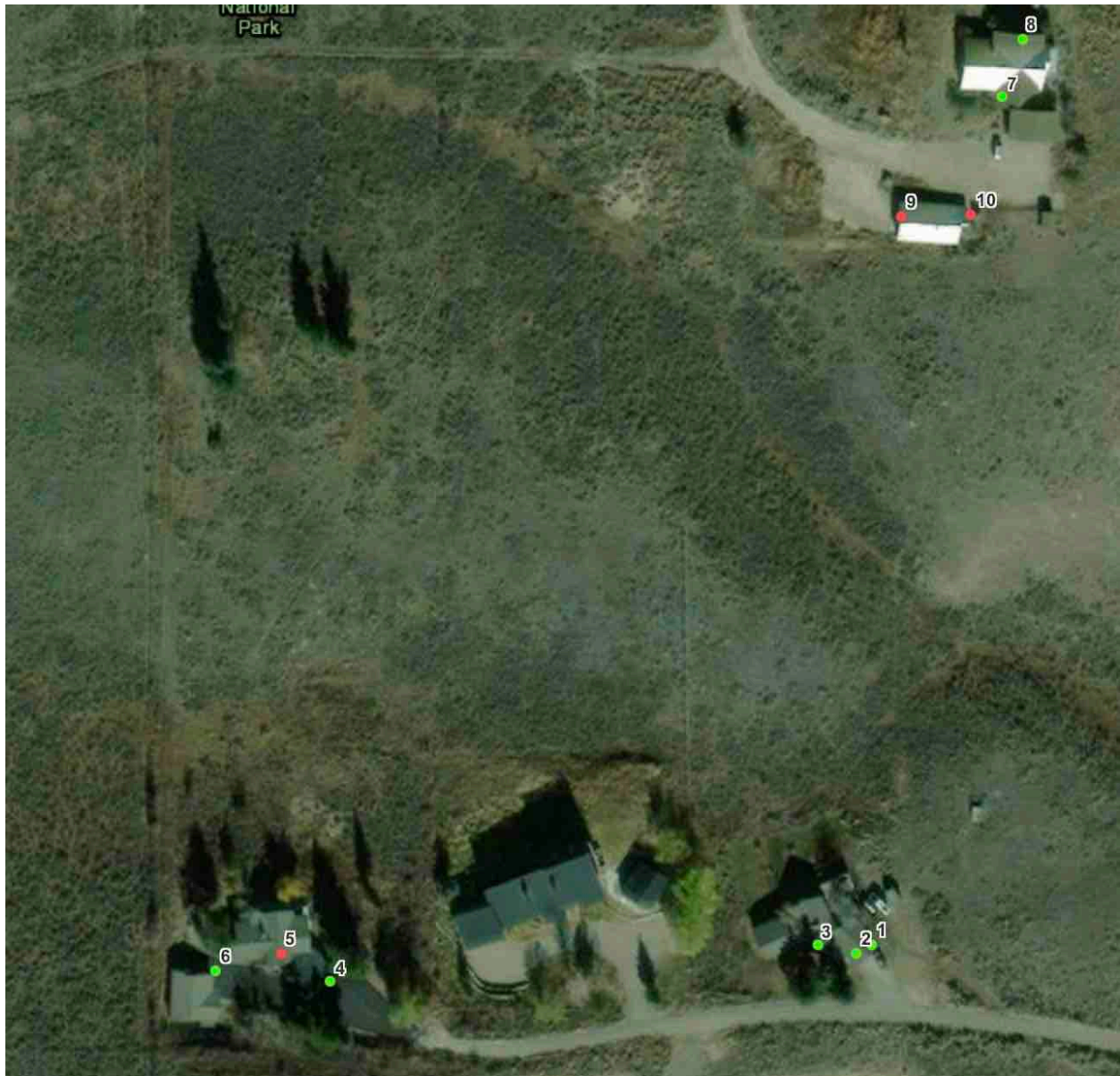
This appendix contains individual fixture characterization, assessment, and location data for the 10 identified fixtures located in E Nichols and Warm Springs Road Residences. 70% (7 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXVII-1 and AXVII-2 present the characterization data for each fixture. Figure AXVII-1 provides approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXVII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully-Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Stewart House	1, 2		Recessed Incandescent 8 2700	Yes	Area	No	Yes
	3		Ceiling Mount Unknown 8 Unknown	No	Egress	Motion Sensor	Yes
Green House	4	Not available	Sconce Unable to assess 7.5 Unable to assess	No	Area	Motion Sensor	Yes
	5	Not available	Hanging Light Unable to assess 8 Unable to assess	No	Egress	No	No
	6		Tin Hat LED 8.5 2700	Yes	Egress	No	Yes
Tanke Residence	7		Hanging Light Fluorescent 7 2700	Yes	Egress	No	Yes
	8		Flood LED 7.5 2700	Yes	Egress	No	Yes

**Table AXVII-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Tanke Guest House	9, 10		Sconce LED 4, 8.5 2700	No	Egress	No	No



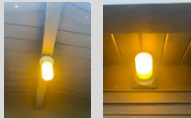



**Figure AXVII-1. Fixture Locations and Compliance Assessment: E Nichols and Warm Spring Road Park Service Properties.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

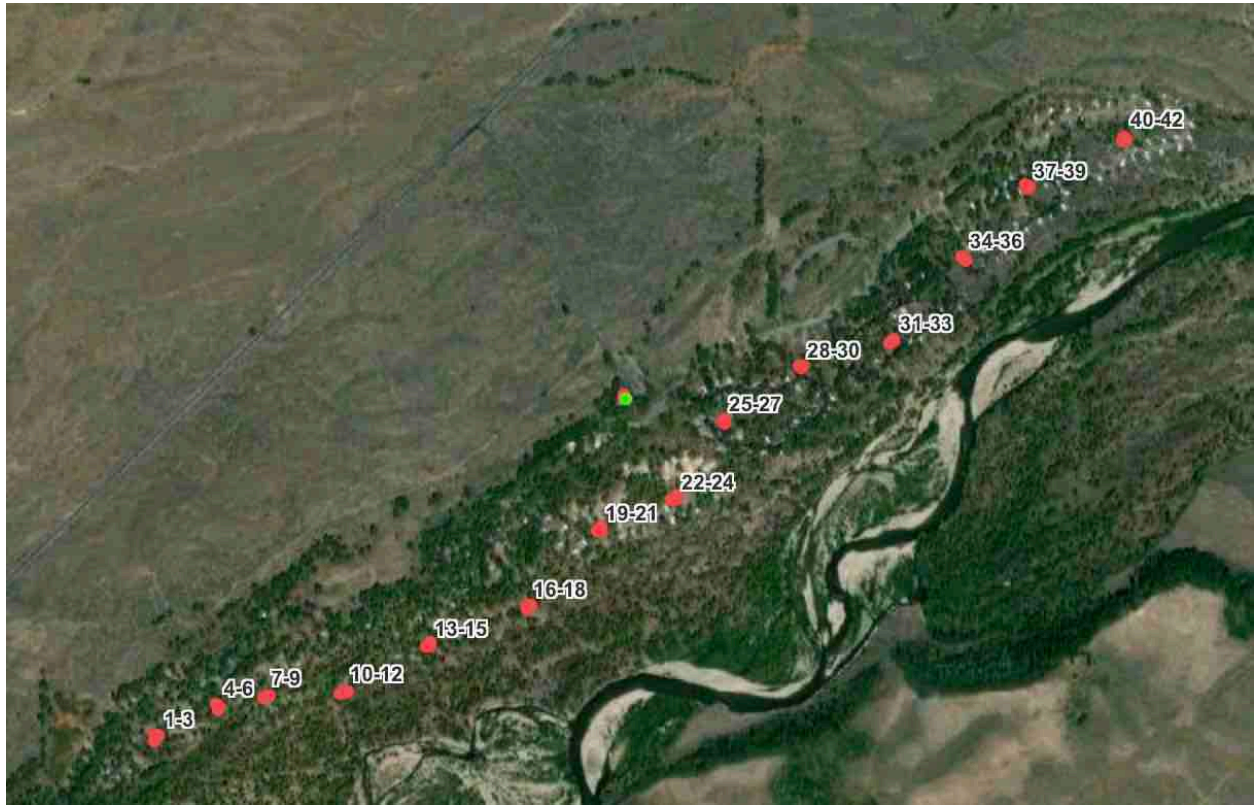
## Appendix XVIII – Gros Ventre

This appendix contains individual fixture characterization, assessment, and location data for the 45 identified fixtures located in Gros Ventre. 2% (1 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Table AXVIII-1 presents the characterization data for each fixture. Figures AXVIII-1 and AXVIII-2 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

\*\* During review of the data, I realized that I missed the amphitheater at Gros Ventre campground. Park staff should stop in to see if there are fixtures that were missed with this omission.

**Table AXVIII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Comfort Stations	1-42		Ceiling Mount/Sconce LED 7.5 2700	No	Egress	No	No
Campground Office	43		Flood Fluorescent 7 2700	No	Area	No	No
	44		Flood Fluorescent 12 2700	No	Area	No	No
Kiosk	45		Flood Fluorescent 7 2700	Yes	Sign	No	Yes



**Figure AXVIII-1. Fixture Locations and Compliance Assessment: Campground Comfort Stations.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.






**Figure AXVIII-2. Fixture Locations and Compliance Assessment: Campground Office.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XIX – Kelly

This appendix contains individual fixture characterization, assessment, and location data for the 5 identified fixtures located in Kelly. 0% (0 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Table AXIX-1 presents the characterization data for each fixture. Figure AXIX-1 provides approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXIX-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Q67 Kelly (HS)	1, 2	Not available	Sconce Incandescent 6.5 2700	No	Egress	No	No
Q1225	3		Sconce LED 6.5 Unknown	No	Egress	No	No
	4		Sconce LED 6.5 Unknown	No	Egress	No	No
	5		Sconce LED 6.5 Unknown	No	Egress	No	No



**Figure AXIX-1. Fixture Locations and Compliance Assessment: Kelly.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XX – Teton Science School

This appendix contains individual fixture characterization, assessment, and location data for the 17 identified fixtures located within the Teton Science School Campus. 41% (7 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXX-1 through AXX-3 present the characterization data for each fixture. Figure AXX-1 provides approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXX-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Buck	1, 2		Flood Halogen 14 2700	No	Egress/Stairway	No	No
	3		Flood Incandescent 10 2700	No	Egress	No	No
	4		Sconce Incandescent 7 2700	No	Egress	No	No
Hunter Lodge Dining Hall	5		Sconce Incandescent 7 2700	No	Egress	No	No
	6		Sconce Incandescent 9 2700	No	Egress	No	No
	7		Sconce Incandescent 7 2700	No	Egress	No	No
	8		Sconce Incandescent 7 2700	No	Egress	No	No

**Table AXX-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Hunter Lodge Dining Hall	9, 10		Recessed Incandescent 9.5 2700	Yes	Area	No	Yes
Ramshorn Lodge and Main Office	11		Ceiling Mount LED 7 2700	Yes	Egress	No	Yes
	12		Sconce Fluorescent 7 2700	Yes	Egress	No	Yes
	13		Flood Halogen 7 2700	No	Area	No	No
Jackson	14		Flood Incandescent 10 2700	No	Area	No	No
Sleeping Indian	15		Sconce LED 5.5 2700	Yes	Egress	No	Yes
Brennan	16		Ceiling Mount Incandescent 7 2700	Yes	Egress	No	Yes

**Table AXX-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	<u>Description</u> Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Denali	17		Recessed LED 7.5 2700	Yes	Egress	No	Yes

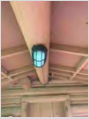






**Figure AXX-1. Fixture Locations and Compliance Assessment: Teton Science School Campus (Federal Buildings Only).** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XXI – Antelope Flats

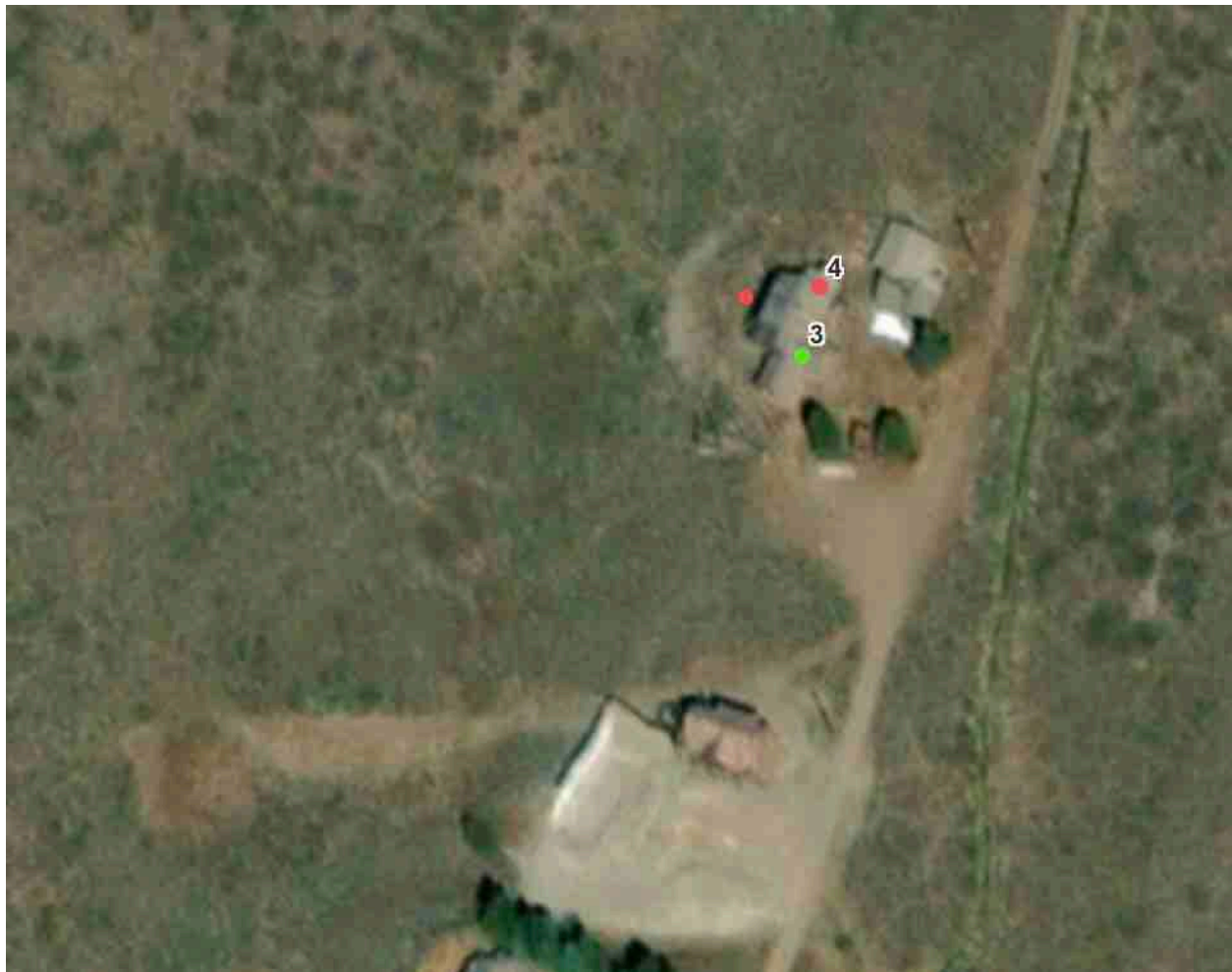
This appendix contains individual fixture characterization, assessment, and location data for the 5 identified fixtures located in TEMPLATE. 40% (2 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Table AXXI-1 presents the characterization data for each fixture. Figures AXXI-1 and AXXI-2 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.

**Table AXXI-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Reimer Residence	1		Ceiling Mount Fluorescent 7.5 2700	Yes	Egress	No	Yes
	2		Ceiling Mount Fluorescent 7.5 2700	Yes	Egress	No	Yes
Rudd House	3		Ceiling Mount LED 8 2700	Yes	Egress	No	Yes
	4		Sconce LED 6.5 2700	No	Egress	No	No
	5		Sconce LED 6.5 2700	No	Egress	No	No



**Figure AXXI-1. Fixture Locations and Compliance Assessment: Reimer House.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.










**Figure AXXI-2. Fixture Locations and Compliance Assessment: Rudd House.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XXII – Triangle X

This appendix contains individual fixture characterization, assessment, and location data for the 20 identified fixtures located in Triangle X. 30% (6 fixtures) of the identified lighting in this area is compliant with the 2018 IDA lighting guidelines. Tables AXXII-1 through AXXII-3 present the characterization data for each fixture. Figures AXXII-1 and AXXII-2 provide approximate locations of each fixture on map overlays. Fixtures that are repetitive are presented together within the table for purposes of clarity and brevity.





**Table AVIII-1. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Berry	1		Ceiling Mount LED 7 5000	Yes	Egress	No	No
Beale	2		Sconce LED 7 5000	No	Egress	No	No
Talbot	3		Sconce LED 7 5000	No	Egress	No	No
4 <sup>th</sup> Cabin	4		Sconce LED 7 5000	No	Egress	No	No
Holmes	5		Sconce LED 5 5000	No	Egress	No	No
1 <sup>st</sup> Cabin	6		Sconce LED 6.5 5000	No	Egress	No	No
Main Lodge	7, 8		Ceiling Mount LED 9 2700	No	Egress	No	No

**Table XXII-2. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Main Lodge	9		Flood Halogen 7 2700	No	Area	No	No
	10		Flood Halogen 7 2700	No	Area	No	No
	11		Ceiling Mount LED 9 5000	No	Egress	No	No
Moran	12, 13		Sconce LED 5 5000	No	Egress	No	No
Gift Shop	14		Sconce LED 6.5 2700	No	Egress	No	No
Cook's Cabin	15		Sconce Fluorescent 6.5 2700	No	Egress	No	No
Bordello	16		Flood Halogen 6.5 2700				

**Table AVIII-3. Exterior Lighting Fixture Compliance with IDA Guidelines**

Location	Fixture ID	Photo	Description Fixture Lamp Height (ft) CCT (K)	Fully- Shielded	Application	Special Purpose	Conformity with IDA Lighting Guidelines
Bordello	17		Sconce Fluorescent 7 2700	No	Egress	No	No
Foreman's House	18		Sconce Incandescent 7 2700	Yes	Egress	No	Yes
	19		Sconce Incandescent 7 2700	No	Egress	No	No
Old Barn	20		Tin Hat Empty Socket 16 n/a	Yes	Area	No	Yes



**Figure AXXII-1. Fixture Locations and Compliance Assessment: Cabins and Lodge.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.



**Figure AXXII-2. Fixture Locations and Compliance Assessment: Employee Housing and Gift Shop.** Dark sky compliant lighting has a green marker and non-compliant lighting has a red marker. Numbers present above the dots indicate the fixture ID number whose characteristics are presented within the tables.

## Appendix XXIII – Design Recommendations

This appendix includes a discussion concerning applicable codes and design characterizations, along with the actions recommended to address existing park managed lighting that is not in compliance with the 2018 IDA Dark Sky Park lighting guidelines. The appendix includes an overall summary of the fixture retrofits recommended to address compliance concerns. The recommendations were made based upon onsite observations, discussions with staff, and previous experience. The presented lighting recommendations include a combination of upgrading existing lighting when appropriate, removing fixtures from power that are clearly not currently functional or serving a purpose, and relamping fixtures to meet historic and/or aesthetic purposes.

Recommendations are made based upon the park area and fixture number. Please refer back to the data and map overlays Appendices I – XXII for additional details and approximate locations.

## Exterior Lighting Codes and Standards

The General Services Administration PBS-P100 Facilities Standards for the Public Building Service (March 2015) provides prescriptive lighting requirements in Chapter 6.3 of the standard. The requirements specify that facilities must provide exterior lighting that meets local zoning laws, provides lighting levels that do not exceed the Illuminating Engineering Society (IES) 10<sup>th</sup> Edition Lighting Handbook, and complies with the IDA/IES Model Lighting Ordinance (MLO).

IDA and IES worked together to develop the MLO which was released in June of 2011. The extent to which lighting is required within the MLO is based upon lighting zone designations. LZ0 (Lighting Zone 0) is the lighting zone recommended for National Park locations by the IDA. The description of LZ0 directly from the ordinance is: *Areas where the natural environment will be seriously and adversely affected by lighting. Impacts include disturbing the biological cycles of flora and fauna and/or detracting from human enjoyment and appreciation of the natural environment. Human activity is subordinate in importance to nature. The vision of human residents and users is adapted to the darkness, and they expect to see little or no lighting. When not needed, lighting should be extinguished.*

For LZ0, the performance method of compliance calls for the base lumens per site to be 0 for all sites. This means that according to IDA/IES's MLO, lighting is not required in LZ0 areas. However, the performance method provides an additional allowance to provide illumination for building entrances or exits. The additional allowance is 400 lumens per door, with a maximum of three allowances per site. To be considered an applicable allowance, the luminaire must be within 20 ft of the door.

The GSA standard also specifies that means of egress must be illuminated according to the National Fire Protection Act (NFPA) 101. NFPA 101, also known as the *Life Safety Code*, provides the minimum criteria for the design of egress facilities. NFPA 101 1.3 specifies that application of the *Life Safety Code* is applicable to new construction and existing buildings and structures. Chapter 7 of the code covers Means of Egress. Chapter 7 Section 8.1.3 states: *The floors and other walking surfaces within an exit and within portions of the exit access and exit discharge designated in 7.8.1.1 shall be illuminated to values of at least 1 footcandle measured at the floor.*

During emergency events, Chapter 7 Section 9.2.1 states: *Emergency illumination shall be provided for a period of 1½ hours in the event of failure of normal lighting. Emergency lighting facilities shall be arranged to provide initial illumination that is at least an average of 1 footcandle and a minimum at any point of 0.1 footcandle measured along the path of egress at floor level. Illumination levels may decline to 0.6 footcandles average and a minimum at any point of 0.06 footcandles at the end of the emergency illumination lighting time duration.*

The GSA standard also specifies that lighting in designated historic locations “may be upgraded with energy efficient light sources and optical enhancements that preserve the historic appearance of the luminaire and space.” Since many of the buildings within the park are designated historic, ensuring that lighting upgrades meet the needs of historic preservation is desired.

## Design Considerations

The IDA/IES MLO, *Life Safety Code*, local adopted building code ordinances, and historic preservation goals all need to be considered when providing design recommendations. Applying these codes to lighting in protected areas remains an on-going point of discussion. Generally, adopting a fully-shielded period relevant fixture that provides a minimum 1 foot-candle ground surface illuminance level in egress areas is a good approach to satisfying applicable codes.

Additional design considerations include:

*Historic Preservation* – Historic structures throughout the park were found to have period and non-period relevant exterior lighting. Within both the IDA/IES MLO LZ0 and within IDA Dark Sky Lighting Guidelines, allowances are given for egress lighting. IDA/IES MLO specifies that egress may be lighted through the use of a 400 lumen or lower lamp with a maximum of three lamps used per site. IDA Dark Sky lighting guidelines allow for use of unshielded fixtures in special applications as long as their lamp initial lumen output is 500 lumens or lower. Therefore, due to the limitations in what can be done to lighting fixtures on historic structures and within historic districts, the simplest approach is often to provide a low lumen lamp with a CCT of less than 3000K.

*Uniformity in Aesthetics and Illumination* – Lighting that is uniform in visual appearance and illumination performance is a preferred design aesthetic.

*Safety* – Lighting itself should not present a hazard.

*Fixture height* – Fixtures should be as low to the ground as feasible.

*Environmental Conditions* – Temperature extremes should be considered when selecting fixtures and lamps. Using commercially supplied fully-shielded fixtures is preferable to creating custom shielding, as commercially designed fixtures (theoretically) consider the potential heat build-up within the fixture.

*Installation and Maintenance* – Installing and maintaining fixtures is usually straight forward. Going with the same fixture for multiple applications is useful, because it cuts down on installation time and routine maintenance. While fixtures that have a built in LED are as easy to install as fixtures requiring a lamp, fixtures requiring a lamp may have a longer overall life. Changing out an individual lamp is easier than changing out a fixture.

*Controls* – Controls add a level of complexity for operation, installation, and maintenance. Most NPS installations go with very simplistic controls, including dusk to dawn photosensors and motion sensors. Zone controls and remotely operated control systems offer some advantages. However, these will only be specified if there is interest.

*Lighting for a Purpose* – Lighting should only be used where and when it is necessary. When lighting is not necessary, lighting should be off. Lighting will be used for egress, aiding in wayfinding, and maintaining historical aesthetics.

## Recommendations for Addressing Existing Non-Compliant Lighting

There are eleven specified recommendations to address non-compliant lighting within the park. The recommendations are listed by type below.

Action	Description
Aim Downward	Readjust fixture to aim straight down
Ceiling Cylinder	Replace existing ceiling mounts with fully-shielded ceiling mounts equipped with low lumen 2700K lamps
Flag	Remove fixture illuminating flag poles, raise and lower flag each day
Flood Lamps	Replace existing flood lights with motion sensor flood lights with 3000K or lower CCT lamps
Lamp Replacement	Replace existing lamps in historic areas with low lumen 2700K lamps
Remove	Remove fixture from location
Tin Hats	Replace existing parking lot lamps and hanging lamps in the park with fully-shielded lamp post fixtures containing a 3000K LED lamp
Timer Switch	Equip existing fixtures with 60 minute duration mechanical timer switches
Tube Cover	Equip existing fluorescent tubes with amber cover sleeves
Wall Cylinder	Replace existing sconces with fully-shielded wall cylinders equipped with low lumen 2700K lamps
Wall Pack	Replace existing wall packs with fully-shielded wall packs with 3000K or lower lamps

Table XXIII.1 provides the number of each action needed to address non-compliant lighting throughout the park, a weblink to a vendor site that carries the type of fully-shielded lighting recommended (along with product specifications), and an estimate for capital (materials procurement) and labor costs. Labor costs were estimated based upon the time it takes to install/remove the fixture/lamp and assumes a baseline \$50/hour for a GS level electrician. Mobilization costs and/or external contracting costs are not estimated. However, the labor hours and labor cost estimate are both conservative for the anticipated work.

The weblink is meant to serve as an example of the type of lighting that should be selected for the application, not an endorsement of a one particular vendor over another. Please follow procurement guidelines when selecting an appropriate vendor. However, be sure that what is ordered is compliant with the 2018 Dark Sky Park Lighting Guidelines.

**Table XXIII.1. Parkwide Recommendation Summary to Address Non-Compliant Lighting**

Proposed Action	# Actions Across Park	Example (Vendor) Link	Unit Capital Cost (\$)	Total Capital Cost (\$)	Unit Labor (Hours)	Estimated Total Labor (Hours)	Estimated Unit Labor (\$)	Estimated Total Labor (\$)	Total Cost (\$)
Aim Downward	3	-	0	0	0.5	1.5	25	75	75
Ceiling Cylinder	65	<a href="#">website</a>	115	7475	1	65	50	3250	10725
Remove, Take Down Flag Each Day	3	-	0	0	0.5	1.5	25	75	75
Flood Light	39	<a href="#">website</a>	60	2340	1	39	50	1950	4290
Lamp Replacement	1207	<a href="#">website</a>	4	4828	0.5	603.50	25	30175	35003
Remove	36	-	0	0	1	36	50	1800	1800
Tin Hats	28	<a href="#">website</a>	800	22400	2	56	100	2800	25200
Timer Switch	17	<a href="#">website</a>	30	510	0.5	8.5	25	425	935
Tube Cover	15	<a href="#">website</a>	5	75	0.5	7.5	25	375	450
Wall Cylinder	457	<a href="#">website</a>	125	57125	1	457	50	22850	79975
Wall Pack	33	<a href="#">website</a>	262	8646	1	33	50	1650	10296
<b>Total</b>	<b>1903*</b>			<b>103,399</b>		<b>1308.50</b>		<b>65,425</b>	<b>168,824</b>

\* Note: There were 1875 non-compliant fixtures identified within the park. The difference between 1903 and 1875 is due to the portico sconces in Jackson Lake Lodge's covered entrance area having at least two lamps per fixture.

## Recommendations by Park Area

Recommendations below are made based upon the park area and fixture number. Please refer back to the data and map overlays in Appendices I – to Appendix XXII for additional details.

**Table XXXIII.2. Recommendations for Flagg Ranch**

Proposed Action	# Fixture Retrofits	Fixture IDs Appendix I – Flagg Ranch Maps	Fixture or Lamp Cost (\$)	Labor (Hours)	Labor Cost (\$)	Total Cost (\$)
Aim Downward	1	174	0	0.5	25	25
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	2	11,12	0	1	50	50
Flood Light	1	157	60	1	50	110
Lamp Replacement	-	-	-	-	-	-
Remove	6	158-160,169-171	0	6	300	300
Tin Hats	7	1-7	5600	14	700	6300
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	151	8, 128-139, 142-155, 163,164,173-294	18875	151	7550	26425
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>168</b>		<b>24535</b>	<b>173.5</b>	<b>8675</b>	<b>33210</b>

**Table XXXIII.3. Recommendations for Lizard Creek Campground**

Proposed Action	# Fixture Retrofits	Fixture IDs Appendix II – Lizard Creek Campground Maps	Fixture or Lamp Cost (\$)	Labor (Hours)	Labor Cost (\$)	Total Cost (\$)
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	7	5, 6, 8, 10-12, 14	805	7	350	1155
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	-	-	-	-	-	-
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	6	1, 3, 4, 7, 9, 13	750	6	300	1050
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>13</b>		<b>1555</b>	<b>13</b>	<b>650</b>	<b>2205</b>

**Table XXXIII.4. Recommendations for AMK Ranch**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix III – AMK Ranch Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	2	4,14	8	1	50	58
Remove	2	8,13	0	2	100	100
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	4	9-12	500	4	200	700
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>8</b>		<b>508</b>	<b>7</b>	<b>350</b>	<b>858</b>

**Table XXXIII.5. Recommendations for Leeks Marina**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix IV – Leeks Marina Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	1	6	115	1	50	165
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	1	16	60	1	50	110
Lamp Replacement	-	-	-	-	-	-
Remove	4	1-4	0	4	200	200
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	12	7-15, 21, 27, 28	1500	12	600	2100
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>18</b>		<b>1675</b>	<b>18</b>	<b>900</b>	<b>2575</b>

**Table XXXIII.6. Recommendations for Colter Bay Village**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix IV– Colter Bay Village Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	0	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	3	66,517	180	3	150	330
Lamp Replacement	389	1-3, 30, 31, 59, 60, 79, 83, 157-174, 176, 177, 184, 185, 187-201, 204- 516, 529-534, 536-555, 569-574, 578-580, 613- 615, 684-715	1556	194.5	9725	11281
Remove	10	9, 150, 175, 186, 557- 568, 606-608	0	10	500	500
Tin Hats	4	6, 7, 8, 32	3200	8	400	3600
Timer Switch	8	29, 105- 107, 716-719	240	4	200	440
Tube Cover	1	4	5	0.5	25	30
Wall Cylinder	105	34, 37-45, 50-52, 56- 58, 61-64, 67, 71, 72, 75-77, 80- 82, 84-86, 90-95, 97-102, 104, 108-112, 119-123, 130- 144, 147-149, 182, 183, 559-567, 616-636, 741	13125	105	5250	18375
Wall Pack	16	12-27	4192	16	800	4992
<b>Total</b>	<b>536</b>		<b>22498</b>	<b>341</b>	<b>17050</b>	<b>39548</b>

**Table XXXIII.7. Recommendations for Jackson Lake Lodge**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix VI – Jackson Lake Lodge Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	23	219, 297-302, 343-348, 381-385, 778, 786-789	1380	23	1150	2530
Lamp Replacement	660	1, 2, 4-76, 81-89, 93- 104, 108-127, 130, 131, 134-150, 175-193, 216, 224-296, 303-342, 349- 354, 355-380, 386-667, 670-681, 695, 696, 698, 700-715, 728-735, 741, 745-752, 768, 769-773, 782-785, 793	2740	342.5	17125	19865
Remove	6	128, 129, 742, 774, 775, 811	0	6	300	300
Tin Hats	-	-	-	-	-	-
Timer Switch	5	151-153, 776, 777	150	2.5	125	275
Tube Cover	14	77-80, 90-92, 105-107, 686, 687, 743, 744	70	7	350	420
Wall Cylinder	21	217, 218, 716-726, 736- 738, 780, 781, 790-, 792	2625	21	1050	3675
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>754</b>		<b>6965</b>	<b>402</b>	<b>20100</b>	<b>27065</b>

**Table XXXIII.8. Recommendations for Moran**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix VII – Moran Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	1	29	0	0.5	25	25
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	1	47	0	0.5	25	25
Flood Light	2	43, 44	120	2	100	220
Lamp Replacement	12	16, 30-40	48	6	300	348
Remove	1	15	0	1	50	50
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	12	2-6, 21, 22, 25-27, 42, 45	1500	12	600	2100
Wall Pack	2	19,20	524	2	100	624
<b>Total</b>	<b>31</b>		<b>2192</b>	<b>24</b>	<b>1200</b>	<b>3392</b>

**Table XXXIII.9. Recommendations for Signal Mountain Area**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix VIII – Signal Mountain Area Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	1	1	0	0.5	25	25
Ceiling Cylinder	16	19-33, 99	1840	16	800	2640
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	4	14-16, 64	240	4	200	440
Lamp Replacement	5	8-10, 12, 13	20	2.5	125	145
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	3	11, 34, 35	90	1.5	75	165
Tube Cover	-	-	-	-	-	-
Wall Cylinder	43	17, 36-50, 71-97	5375	43	2150	7525
Wall Pack	3	6, 7, 18	786	3	150	936
<b>Total</b>	<b>75</b>		<b>8351</b>	<b>70.5</b>	<b>3525</b>	<b>11876</b>

**Table XXXIII.10. Recommendations for Jenny Lake Lodge**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix IX – Jenny Lake Lodge Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	54	36-75, 82, 93-97, 101- 106, 112, 113	216	27	1350	1566
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	10	25, 79, 83-85, 98-100, 107, 108	1250	10	500	1750
Wall Pack	2	76, 81	524	2	100	624
<b>Total</b>	<b>66</b>		<b>1990</b>	<b>39</b>	<b>1950</b>	<b>3940</b>

**Table XXXIII.11. Recommendations for South Jenny Lake**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix X – South Jenny Lake Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	5	11-15	575	5	250	825
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	2	16, 17	8	1	50	58
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	9	1-8, 10	1125	9	450	1575
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>16</b>		<b>1708</b>	<b>15</b>	<b>750</b>	<b>2458</b>

**Table XXXIII.12. Recommendations for Lupine Meadows**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XI – Lupine Meadows Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	1	27	60	1	50	110
Lamp Replacement	1	25	4	0.5	25	29
Remove	1	26	0	1	50	50
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	-	-	-	-	-	-
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>3</b>		<b>64</b>	<b>2.5</b>	<b>125</b>	<b>189</b>

**Table XXXIII.13. Recommendations for Climbers Ranch**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XII – Climbers Ranch Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	1	25	115	1	50	165
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	15	3, 4, 16-24, 26-28, 48	60	7.5	375	435
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	10	35-37, 40-45, 47	1250	10	500	1750
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>26</b>		<b>1425</b>	<b>18.5</b>	<b>925</b>	<b>2350</b>

**Table XXXIII.14. Recommendations for Beaver Creek**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XIII – Beaver Creek Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	5	45-49	575	5	250	825
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	12	43, 62-72	48	6	300	348
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	17	1, 2, 34, 35, 44, 50-61	2125	17	850	2975
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>34</b>		<b>2748</b>	<b>28</b>	<b>1400</b>	<b>4148</b>

**Table XXXIII.15. Recommendations for Moose**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XIV - Moose Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	1	272	115	1	50	165
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	2	61,176	120	2	100	220
Lamp Replacement	9	6-9, 207-211	36	4.5	225	261
Remove	2	171, 172	0	2	100	100
Tin Hats	15	247-261	12000	30	1500	13500
Timer Switch	1	180	30	0.5	25	55
Tube Cover	-	-	-	-	-	-
Wall Cylinder	15	2, 58-60, 124, 125, 170, 173, 177, 188-190, 262- 264	1875	15	750	2625
Wall Pack	10	3- 5, 265-271	2620	10	500	3120
<b>Total</b>	<b>55</b>		<b>16796</b>	<b>65</b>	<b>3250</b>	<b>20046</b>

**Table XXXIII.17. Recommendations for Murie Ranch**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix VX – Murie Ranch Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	8	10-14, 17, 18, 22	32	4	200	232
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	-	-	-	-	-	-
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>8</b>		<b>32</b>	<b>4</b>	<b>200</b>	<b>232</b>

**Table XXXIII.18. Recommendations for Moose-Wilson Road**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XVI – Moose-Wilson Road Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	11	1-8, 14, 39, 40	44	5.5	275	319
Remove	3	9-11	0	3	150	150
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	-	-	-	-	-	-
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>14</b>		<b>44</b>	<b>8.5</b>	<b>425</b>	<b>469</b>

**Table XXXIII.19. Recommendations for E. Nichols Springs and Warm Springs Roads**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XVII – E Nichols and Warm Springs Roads Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	-	-	-	-	-	-
Remove	-	-	-	-	-	-
Tin Hats	1	5	800	2	100	900
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	2	9, 10	250	2	100	350
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>3</b>		<b>1050</b>	<b>4</b>	<b>200</b>	<b>1250</b>

**Table XXXIII.20. Recommendations for Gros Ventre Campground**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XVIII – Gros Ventre Campground Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	28	1, 3, 5-7, 9, 10, 12, 13, 15, 16, 18, 19, 21, 22, 24, 25, 27, 28, 30, 31, 33, 34, 36, 37, 39, 40, 42	3220	28	1400	4620
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	1	44	60	1	50	110
Lamp Replacement	-	-	-	-	-	-
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	15	2, 4, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 43	1875	15	750	2625
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>44</b>		<b>5155</b>	<b>44</b>	<b>2200</b>	<b>7355</b>

**Table XXXIII.21. Recommendations for Kelly**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XIX – Kelly Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	2	1, 2	8	1	50	58
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	3	3-5	375	3	150	525
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>5</b>		<b>383</b>	<b>4</b>	<b>200</b>	<b>583</b>

**Table XXXIII.22. Recommendations for Teton Science School Campus**

Proposed Action	# Fixture Retrofits	Fixture IDs Appendix XX – Teton Science School Campus Maps	Fixture or Lamp Cost (\$)	Labor (Hours)	Labor Cost (\$)	Total Cost (\$)
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	1	14	60	1	50	110
Lamp Replacement	-	-	-	-	-	-
Remove	1	13	0	1	50	50
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	8	1-8	1000	8	400	1400
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>10</b>		<b>1060</b>	<b>10</b>	<b>500</b>	<b>1560</b>

**Table XXXIII.23. Recommendations for Antelope Flats**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XXI – Antelope Flats Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	-	-	-	-	-	-
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	-	-	-	-	-	-
Remove	-	-	-	-	-	-
Tin Hats	-	-	-	-	-	-
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	2	4, 5	250	2	100	350
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>2</b>		<b>250</b>	<b>2</b>	<b>100</b>	<b>350</b>

**Table XXXIII.16. Recommendations for Triangle X**

<b>Proposed Action</b>	<b># Fixture Retrofits</b>	<b>Fixture IDs Appendix XXII – Triangle X Maps</b>	<b>Fixture or Lamp Cost (\$)</b>	<b>Labor (Hours)</b>	<b>Labor Cost (\$)</b>	<b>Total Cost (\$)</b>
Aim Downward	-	-	-	-	-	-
Ceiling Cylinder	1	1	115	1	50	165
Remove, Take Down Flag Each Day	-	-	-	-	-	-
Flood Light	-	-	-	-	-	-
Lamp Replacement	-	-	-	-	-	-
Remove	-	-	-	-	-	-
Tin Hats	1	11	800	2	100	900
Timer Switch	-	-	-	-	-	-
Tube Cover	-	-	-	-	-	-
Wall Cylinder	12	2-6, 9, 10, 12-14, 16, 17	1500	12	600	2100
Wall Pack	-	-	-	-	-	-
<b>Total</b>	<b>14</b>		<b>2415</b>	<b>15</b>	<b>750</b>	<b>3165</b>

## DISCLAIMER

All design recommendations provided within this appendix were provided to the best of my ability and are based upon previous experience and familiarity with lighting standards developed at other Park Service locations throughout the US. The replacement options presented in this report are also meant to inform the reader concerning the type of fixture and lamps that should be used to meet IDA Dark Sky Park guidelines. While the recommendations include fixture replacement, lamp replacement, and/or fixture removal recommendations, implementation of any recommendations should only be done after review and approval by appropriate Park Service and/or concessionaire staff. Installation (or removal) of lighting should be completed by qualified personnel and the resulting illumination level along ground surfaces should be verified against GSA, IDA, and/or Park Service specifications.