



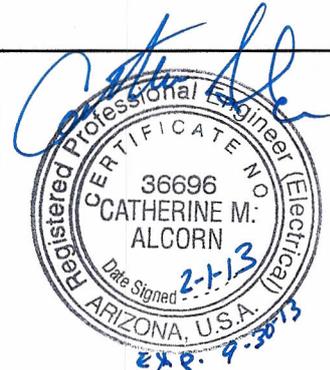
# Pinal County Airpark

## Electrical Infrastructure Study

February 1, 2013



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## **Section 1: EXECUTIVE SUMMARY**

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CR Engineers Inc. has conducted an overall evaluation of the electrical system of the Pinal Airpark and has prepared this report to highlight their findings. The report goes through the system following the two transmission lines through the airpark facility by facility, documenting and developing a base plan of the system and sighting the overall condition of each facility. We evaluated the system based upon the age of the equipment, the condition of the installation, and its compliance with current standards and National Electric Code (NEC) minimum safety standards. Even though the equipment or system may still be operational, CR Engineers Inc. may still recommend its replacement based upon the expected life of the equipment or the condition the equipment is in. The priority always is to evaluate how safe the system is, for not only the public but those who have to work on, in or around those systems. Health and life safety issues take priority over functionality in all cases and will be evaluated as such.

As part of the overall assessment and functionality report, CR Engineers will make recommendations based upon the need at each facility. The on-site Engineers acknowledge that the facilities, equipment and buildings are old, and that all of the upgrades will not be accomplished at one time. To help those who will be doing the planning, we have created a priority of the most urgent items based upon the most critical life health safety issues that need to be corrected first.

The Pinal Airpark has been functioning since 1942, and as such has served the region admirably. This report is to identify issues so that Pinal County can develop a plan to refurbish the complex, and extend its operational life for an additional 30 years or more.

## **Section 2: OVERALL PRIORITY SUMMARY**

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Even though there are many issues that need attention, the first priority is the medium Voltage (MV) pole mounted transformers that are set on the ground in unsecure or dangerous enclosures. These locations are as follows:

1. At the motel building complex between Buildings T-23 and T-24, the MV pole mounted transformer yard for Buildings T-24 thru T-21, is set on the ground inside the tin enclosure and is exposed to the public. These transformers should be replaced with pad-mount transformers with all the wiring contained in conduit and approved enclosures. Proper containment of the area needs to be achieved to protect the public to the requirements of the NEC.
2. At the motel building complex between Buildings T-33 and T-32, the MV pole mounted transformers set on the ground inside the block enclosure need to be changed to pad mount transformers with all the wiring contained in conduit and approved enclosures. Proper containment of the area needs to be achieved to protect the public to the requirements of the NEC.
3. The pole mount transformers that feed building T- 66 that is enclosed in a tin enclosure. The transformers should be replaced with pad mount transformers with all the wiring contained in conduit and approved enclosures. Proper containment of the area needs to be achieved to protect the public to the requirements of the NEC.
4. At the south east corner of Building T-543 the overhead MV power line drop that runs around the base of the building exposes personnel to electrical shock hazard and must be addressed. The installation needs to be brought up to NEC requirements.
5. The pole mount transformers set on the ground inside a plywood enclosure at the rear of building T-86, should be replaced with pad mount transformers with all wiring being contained in conduit and approved enclosures. Proper containment of the area must be achieved to protect the public to the requirements of the NEC.
6. The 3 pole mount transformers set on the ground inside the Fire Station electrical room needs to be changed to pad-mount transformers and should be moved to the exterior of the building per the requirements of the NEC.
7. The Airfield lighting system needs to be totally replaced starting with the 4150 Volt transformer and old knob and tube wiring inside the airfield electrical vault to the 5kV cable exposed on the infield of the airfield.

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Below lists immediate corrections that need to be done at nearly every building since there are significant NEC violations. Most of these violations are serious enough that, under most circumstances, they would constitute a major violation and yet they are not the most serious problems in this system.

1. There are indoor panels being used on the exterior of the motel buildings with open spaces, missing circuit breakers, open and exposed live buss, and numerous other NEC violations. Because these buildings are used to house the public they should receive the most immediate attention.
2. The individual buildings all have NEC violations associated with the electrical installation. Most of these violations could mainly be attributed to the age of the system and of the building. The minimum standards for health and safety still should apply and these buildings need to be individually assessed. Corrections need to be made to protect the safety of each individual that enters them.
3. Because Pinal County is responsible for the medium voltage transmission lines and overall system once it leaves the Trico Sub-Station, Pinal County should have qualified individuals certified to work and maintain medium Voltage systems. These individuals should be the only personnel with ability to access the medium voltage system and equipment.
4. A long term plan needs to be written to systematically go through the entire power distribution system from the Trico Sub-Station to each facility to bring the system up to minimum NEC, OSHA, and FAA standards. This would insure the long term health, life safety, and reliability of the electrical system. The plan also should include recommendations to maintain the system for years to come.

### **Section 3: EXECUTIVE COST SUMMARY**

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1. Due to the health and life safety issues at the seven priority areas of the Pinal County Airpark, these sites will require immediate attention as soon as any available funding is allocated. These sites will require approximately \$660,000.00. This will correct the major liability factor associated with the medium Voltage electrical system. These are immediate issues and should be the first priority for any funding available. See Section 9.01.
2. The airfield lighting, airfield electrical vault, and guidance signage should be the next issue to be addressed. See Section 9.01. The airfield expenditures would break down as follows:
  - a. Airfield Manhole and Cable – includes necessary cabling, conduit, and manhole systems to supply the airfield electrical vault and tower along with the airfield lights and guidance signage, approximately \$150,000.00.

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- b. Airfield Electrical Vault – Replacement of the constant current regulators, airfield lighting controls, and all associated electrical equipment with updated, modern FAA certified equipment, approximately \$120,000.00 in estimated construction costs.
  - c. Airfield Lighting – Replacement of all wiring, conduits, and lighting for the airfield, approximately \$434,000.00 in estimated construction costs.
  - d. Airfield Guidance Signage – Replacement of the airfield signage to bring it into compliance with the FAA standards, approximately \$171,000.00 in estimated construction costs.
3. See Section 9.02 for a total site estimates per area’s described including design service, refurbish costs and maintenance.

## Section 4: SUBSTATION OVERVIEW

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Trico Sub-Station

The inspection started at the Trico Sub-Station located on the south side of the main road after entering the security gate. The Trico transmission lines come in from the utility TGEL&P (TRICO). At the substation there are two (2) main lines that come into the Airpark on a 4160 Volt Overhead (OH) Line which is located closest to the road and a 25 kV Overhead Line. These two lines are metered by the Utility at the substation.

From the substation, both transmission lines run northwest for approximately three (3) poles to Darr Boulevard. The 4160 Volt line runs on the east side of Darr Boulevard and the 25 kV line runs on the west side of Darr Boulevard heading north, parallel with the roadway.

## Section 5: 4160 VOLT DISTRIBUTION SYSTEM

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The inspection and report will follow the 4160 Volt distribution system completely. The 25 KV distribution system will be addressed similarly in Section 6.

### 5.01 - PUMP AREA

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#### Site Evaluation:

The 4160 Volt OH line runs north along Darr Boulevard for two (2) poles where the first split goes east for two (2) poles then north to the water pumping building and the water storage tank. At this location there are 3 – 50 KVA transformers: #079, #080, and #081. There is also 1 – 3 KVA transformer, #078, mounted on a pole. These feed the pump building which houses a 400 Amp, 3-Phase service disconnect. There are three (3) large pump motors with 73 Full Load Amps, 220-440 Volts, 3-phase. There is a large air compressor at 40 Amps, 240 Volts, as well as miscellaneous lights, receptacles, and several disconnects of various sizes mounted but not labeled.

The water pump site has several NEC violations and repairs that need to be addressed. These include covers missing from the conduit bodies (LBs), missing knock outs, etc.

#### Deficiencies:

The three (3) transformers that are mounted are functioning, however the wood frame that supports them is aging and weathered. There are open LB-type electrical fittings that do not have covers. There are electrical knockouts that expose the internal live wiring to moisture and intrusion. There are service receptacles that are not GFCI protected and exposed to the weather without the proper covers. Overall, the system is old and most of the equipment would not meet current NEC requirements.

#### Recommendations:

A qualified electrician should go through the site and address the immediate health and life safety issues, starting with the obvious open and exposed wiring, installing knock out covers and GFCI receptacles as needed. This will, at least, limit the liability of the site until a complete review and design can be done to bring the entire site up to current NEC requirements.



Water Tank and Pump Area



Pump House SES

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Pole mounted Transformer



Pumps

### 5.02 - AIR QUALITY PUMP SITE

#### Site Evaluation:

There is an overhead line that extends from the pump building south and east with poles set at approximately 200 feet apart. This line extends south and east to a remote pump house and Air Quality station. The transformer #078- 3 KVA sends 480 Volt, 3-phase to a safety switch (200 Amp, 480 Volt 3-phase, 4 wire) which feeds the majority of the equipment at the site.

#### Deficiencies:

The equipment that is mounted on the exterior of the pump building is old and showing severe weather deterioration. No major health and life safety issues were observed at this site. The wall where the equipment is mounted is deteriorating and as such compromises the mounting of equipment to it.

#### Recommendations:

The system is operating and is generally in fair condition. The equipment should be evaluated and a design done to insure that the system is updated and complies with the NEC, Arc Fault hazards, grounding and overcurrent protection required.



Remote Pump Building



Electrical Panel



Safety Switch



Safety Switch



Air Quality Building



Air Quality Tower

### 5.03 - POLES

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#### Site Evaluation:

From the split on Darr Boulevard, the 4160 Volt OH line extends north at the third and fourth poles and both poles are cracking and severely splitting. They should be assessed for replacement as soon as possible.

#### Deficiencies:

The overall overhead system is in adequate, though aging condition. There are several poles that are cracking or splitting and will need to be replaced. There are also several poles that also need to be replaced due to leaning and weathering.

#### Recommendations:

The immediate need to replace poles is not a priority at this time, however a contingency of funds should be set aside for the replacement of poles in the future.



Split and Cracked Poles

### 5.04 - QUONSET P STREET

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#### Site Evaluation:

At P Street the 4160 Volt OH line splits to the west towards the airfield south of P Street and at the first pole to the west from Darr Boulevard. There is a line that drops down the

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pole from a 50KVA pole mounted transformer to the Quonset type building further to the south from P Street. On the building is a 200 Amp, 240 Volt, 1-phase disconnect mounted on the north east corner of the building. In the immediate area there is a 20 Amp air compressor but no electrical panel is mounted on the exterior of the building.

Further west on P Street, the plans show another drop before you reach the main road but the drop in this location could not be located.

### Deficiencies:

No major issues were identified at this location and no immediate deficiencies were noted.

### Recommendations:

No corrections required at this time.



Pole Mounted Transformer



Safety Switch



Quonset Shop Electrical

## 5.05 - THREE (3) TRANSFORMERS NOT IN USE

### Site Evaluation:

On Darr Boulevard, from P Street the 4160 Volt OH line extends north past O Street to just south of N Street where it turns east on the south side of N Street. Approximately 50 feet east from Darr Boulevard, there are three (3) transformers mounted on a cross member but are not connected or not in use at this time. These are identified as transformers #082, #083, and #084. Their sizes were not labeled or obvious from the ground.

### Deficiencies:

The three transformers are not in use at this time and no immediate deficiencies were noted.

### Recommendations:

No corrections are required at this time.

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3 Pole Mounted Transformer not in Use

### 5.06 - TELECOM PANELS

#### Site Evaluation:

At the next pole, east of the three (3) transformers noted above, there is a 3 KVA transformer, #076, that feeds a 240 Volt, 30 Amp disconnect mounted on the pole. This looks to feed several communications/telecommunications panels.

#### Deficiencies:

The safety switch is weathered and showing deterioration at this time. No NEC violations were observed.

#### Recommendations:

No immediate changes need to be made at this time; however, due to the age of the equipment and constant exposure to the weather, funds should be set aside for future upgrade as the equipment continues to age.



3KVA Transformer



Safety Switch



Telecom Equipment

## CHOLLA AND 6<sup>TH</sup> (N) STREET TEE

The 4160 Volt OH line extends further east past Cholla Boulevard where it splits with one feed going north on the east side of Cholla Boulevard and one feed going to the east side of 6<sup>th</sup> Street.

### 5.07 - BIRDS NEST

#### Site Evaluation:

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This section will first follow the 4160 Volt OH main line towards 6<sup>th</sup> Street. Later in the report it will return to the feed down Cholla Boulevard. The main line continues east along the south side of N Street to a point where it crosses 6<sup>th</sup> Street. At this point the as-built plans show a tee with one line running to the south and one running to the north. In actuality, the line only turns to the north. There are no visible lines going back to the south. At this location, Pole #27 has a large bird nest built on the transmission wires that could cause a problem.

### Deficiencies:

The isolated pole has no immediate issues that need to be addressed.

Pole #27 has a large nest built in the cross framing members of the pole which has not caused an issue to this point. The debris that has collected in the nest is a hazard not only to the bird but compromises the electrical system if it catches fire due to an arc fault.

### Recommendations:

The bird nest needs to be removed by qualified personnel due to the proximity to live 4160 Volt lines.



Bird Nest in Cross Tree

## 5.08 - ISOLATED UNUSED POLE AND TRANSFORMER

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### Site Evaluation:

At a point half the way between 5<sup>th</sup> and 6<sup>th</sup> Street on N Street, south of the main transmission lines, there is a pole set some 50 feet south of the transmission lines with a single transformer, #077, mounted on the pole. Neither the pole nor the transformer is connected to the main lines. There are several concrete slabs in this location so it may have been a drop for these buildings at one time. There are also several additional drops indicated on the as-built plans in this general area that do not exist today.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

The pole and transformer are not in use at this time. The transformer could however be removed from the pole and evaluated as a spare replacement transformer if needed. If the transformer is left on the pole exposed to the weather it will continue to deteriorate over time.



Pole with unused Transformer

### 5.09 - SHOOTING RANGE

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#### **Site Evaluation:**

The 4160 Volt OH line goes north through the desert to a point directly east of building T-53 approximately 500 feet or so where it then turns back west towards the restaurant building. At the first pole west of the turn there is a feed to the north going underground to the shooting range where there is a pole mount transformer, set on the ground inside a small wooden enclosure, just outside the fenced shooting range area. The transformer is a 37.5 KV Transformer, #064, and it feeds a 120/240 Volt, 1-phase panel in the shooting range.

#### **Deficiencies:**

The enclosure that houses the pole mounted transformer, which is set on the ground, is made of plywood and is deteriorating and weathering. There is not enough clearance to properly service the transformer. The pole mounted transformer should not be used in this location.

#### **Recommendations:**

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The transformer and the enclosure should be removed. A new pad-mount transformer should be installed in this location where all of the wiring can be placed in an approved enclosure to remove the liability of the possibility of accidental contact with deadly medium Voltage wiring. This installation is in violation of the NEC and with accepted practices and standards. It also poses health and life safety issues and needs to be corrected immediately.



OH to UG at Pole



Shooting Range Panel



Transformer Enclosure



Pole mount Transformer set on ground

### 5.10 - LAUNDRY RUN NORTH END

#### Site Evaluation:

From the second pole to the west on the 4160 Volt OH Line there is an overhead line that runs north to the laundry building. On the north east side of this location, there are three (3) transformers mounted on the pole: #061, #062, and #063. Two are 37.5 kV transformers but the other is slightly larger than the other two but is not labeled. They feed a 400 Amp, 3-phase disconnect with meter #75-790-494, 4 Wire, 240 Volt.

#### Deficiencies:

The installation does not have any major deficiencies as far as equipment or workmanship. The problem is that the laundry building has two electrical services feeding the building, which is a violation of the NEC. In the event of a fire, there is a problem when a building has two different electrical sources as to how and if the power has completely been turned off. There is also the problem of personnel who have to work on any portion of the building due to the requirement for complete building power shut down being necessary for a safe working environment.

#### Recommendations:

The NEC prohibits a building from having two separate power supply sources. The laundry facility has two overhead power drops, one from the north and one from the south. Since the north end is larger and has more capacity, the south end power source should be disconnected and the south end power source re-fed from the north. This will require a qualified engineer to design and verify that all loads can be picked up by the north end service. This is a safety issue. With two power supply sources, if personnel are working on the facility and they turn the power off from only one source, the facility will still be energized and personnel could get seriously injured.

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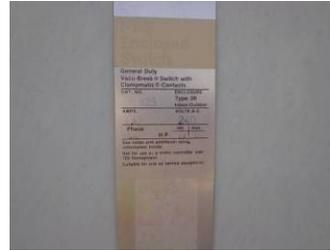
3 Transformers on Pole



Laundry Meter



Laundry North End Electric



Laundry North End Capacity

### 5.11 - LAUNDRY RUN SOUTH END

#### Site Evaluation:

There is an additional overhead drop that extends from the Motel area to the south end of the laundry building. It is a 200 Amp, 240 Volt, 3-phase disconnect mounted on the building exterior. This is a NEC violation to have one building being fed from two separate sources.

#### Deficiencies:

Refer to Laundry North End.

#### Recommendations:

Remove and tie into the Laundry North end system to comply with the NEC.

### 5.13 - RESTAURANT YARD

#### Site Evaluation:

The 4160 Volt OH lines continues west to a small substation fenced in lot just east of the restaurant building where there are three (3) transformers: 2 – 37.5 KVA and 1 - 100KVA (#067, #066, and #065). These transformers feed the restaurant building, pool, and possibly parts of the motel. The lines run underground from the substation yard to the buildings and most of the panels are not mounted on the exterior of the buildings so the direct location and direction of the feeds are hard to determine because they are not visible from the exterior.

#### Deficiencies:

Over all, the site does not have any major NEC violations. Due to the age of the installation, the pole mount transformers are set on a wooden platform up off the ground, but are functioning properly. The entire installation is showing signs of aging and

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deterioration due to exposure to the elements. The disconnect is completely rusted and the wood deck is showing signs of fatigue.

The Restaurant building itself was not evaluated except for the service panel on the exterior of the building. The panel is an interior panel in type but mounted on the exterior of the building. This is in violation of the NEC. The panel is overloaded and shows signs of decay. Several other disconnects and conduits are visible from the exterior of the building and all show their age and need attention to comply with the NEC.

### Recommendations:

The equipment is old and not appropriate under current NEC standards and as such an independent evaluation of the building and its interior and exterior electrical system should be considered. Once any upgrade is done to any portion of the system the entire system will have to be upgraded. Due to the age of the buildings the cost of an electrical rewire with all new equipment might not be economically feasible.

No immediate work needs to be done, however due to the age and condition of the installation in the near future the system is going to need an upgrade. Funding will need to be set aside for this in the long term plan for this facility.



Restaurant Yard



Mast & Cut Off



3 Transformers



3 Transformers



Safety Switch -weathered



Restaurant Panel

### 5.13 - 500 KVA PAD MOUNT TRANSFORMER AND SES

#### Site Evaluation:

From the restaurant substation the 4160 Volt line runs underground to the west and north of the group of buildings to a location just north of building T-42 where there is a 500 KVA, 3-phase pad mount transformer (#060). The 500 KVA transformer feeds a GE free-standing 2000 Amp Service Entrance Section (SES). The SES is labeled 1200 supply Amps, 1200 Amp neutral, 208Y/120 Volts, 3-phase, 4 Wire, 60 Hz with 50KAIC

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arc fault bracing. The main circuit breaker is a 1200 Amp circuit breaker. The SES has three sections: one is the main circuit breaker, the second has 6-200 Amp, 240 Volts circuit breakers in it, and the third section also has 6-200 Amp, 240 Volts circuit breakers in it. The 12 circuit breakers supply power to buildings T-37 through T-46 and most likely also buildings T-91 and T-90 and T-92 as well.



Motel 500KVA Transformer and SES



Main Breaker



500KVA Transformer



1 Section T-37 – T-42 Breakers

### 5.14 - MOTEL BUILDINGS T-37 THROUGH T-46

#### Site Evaluation:

The 200 Amp circuit breakers supply power to separate 200 Amp, 1-phase safety switches on the north side of each of the buildings T-37 through T-46 and T-90 through T-92. This is the end of the 4160 Volt line from the east side feed. The report will now go back to the Cholla Boulevard and N Street.

#### Deficiencies:

At the north end of each building there is a 200 Amp safety switch installed to feed each building and serves as the disconnect for the building. The safety switches are generally in good condition, though on some of the buildings they are old and showing some weathering. No major violations were noted. The interior wiring or electrical status was not inspected during the course of this study.

#### Recommendations:

There is no work that is required immediately, however, the buildings are old and some funds should be set aside if the buildings are to remain in service. Judging only from the age and condition of the complex, extensive electrical upgrades will need to be done to rewire the buildings and upgrade the electrical equipment to meet current NEC standards.



Safety Switch



Safety Switch Size

## CHOLLA AND 6<sup>TH</sup> (N) STREET FEED NORTH

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### 5.15 - T-36 THROUGH T-27 TRANSFORMER YARD

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#### Site Evaluation:

The report will now go back to the tee / split at Cholla Boulevard and N Street where the 4160 Volt line goes north overhead towards the motel housing area. The run has seven (7) poles. At the sixth pole north, the line drops underground and runs on a path north and east to a location between buildings T-33 and T-32. At this location the line goes into a small fenced in block enclosure where two (2) pole mount transformers #063 – 37.5 KVA and #064 – 37.5 KVA are set on the ground to feed buildings T-36 through T-44.

Even though the system is operational and has been for some period of time, this use of pole-mount transformers set on the ground is not a safe practice. When the inspector opened up the enclosure there were towels, tennis shoes, and underwear draped on the transformers and wiring in this enclosure. The lock for the enclosure was not secured and the 4160 Volt lines were easily accessible to anyone. These transformers should be removed and pad-mount transformers installed where they are inaccessible to the public. To date there have not been any accidents but it is only a matter of time before there will be one with this type of unsafe installation.

#### Deficiencies:

Pole mounted transformers are being used in place of pad-mounted transformers. They have been placed in a block enclosure in attempts to protect the public from them but the door and gate were not locked. The inspector found towels, tennis shoes, and underwear draped on the wires and equipment at this location. The Voltage is 4160 Volts with energized wires exposed. This installation and use of pole mount transformers set on the ground is in direct conflict with the NEC. Because this is a motel and public facility, the potential for a catastrophic event is magnified.

#### Recommendations:

The pole mounted transformers must be replaced with pad-mount transformers. All wiring must be enclosed in an approved enclosure to prevent accidental contact. All wiring must be placed in conduit as required in the NEC. This will help to reduce the liability of Pinal County at this facility.



Motel Transformer Enclosure - inside



Outside



4160 Volt wires & connections

### 5.16 - T – 36 THROUGH T-27 BUILDING PANELS

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#### Site Evaluation:

Each building has its own electrical panel. Most of the panels are 100 Amp indoor panels mounted on the exterior of the building and are not metered, however, there are a couple of meter sockets. Many of the panels have NEC violations, safety issues, and are in disrepair. Most of the issues can be attributed to the age of the equipment. The open spaces with exposed wiring and exposed live buss work and wires need immediate attention.

#### Deficiencies:

The buildings all have their own panel on the north-east side of each building. Most of the panels are interior panels mounted on the exterior of the building. Most of the panels have been overloaded and the use of multiple split circuit breakers has been used. Some of the panels do not have a main circuit breaker. Many of the panels are missing circuit breakers and the spaces have been left open exposing the live buss to the environment and accidental contact to the live wiring.

The inspector did not go through the interior of the buildings, but from the exterior there are numerous NEC violations including open exposed wiring, receptacles on the exterior of the building that are not GFCI or weatherproof, and conduits not supported, interior panels used on the exterior, and many more. Some of the buildings appear not to be in use.

#### Recommendations:

Each building needs to be individually evaluated. The buildings that are going to remain in use should have a qualified electrician go through and eliminate the obvious NEC infractions. This will help to mitigate the liability to Pinal County and protect the public. If the buildings are going to remain in operation for an extended period of time they will need to be rewired and new equipment should be installed that complies with the NEC.

## Pinal County Airpark Electrical Infrastructure Study



Motel Electrical



Meter and Panel



Meter and Panel



Panel



Panel



Indoor Panel mounted  
on exterior



Panel with open spaces

### 5.17 - BUILDING T-26 THROUGH T-21 TRANSFORMER YARD

#### Site Evaluation:

From pole #7 the main 4160 Volt line moves west underground to a location between buildings T-23 and building T-22 where there is a tin enclosure with three (3) pole mount transformers set on the ground. This installation is a major safety issue. Not only is it located in the motel area where it could be accessed by the public, but because of the nature of the materials used and the proximity of the transformer to the vegetation there now is an increased potential for arc fault occurrence. The transformers are #070 – 50 KVA, #071 – 50 KVA, and #072 – 75 KVA. These three transformers feed buildings T-26 through T-21.

#### Deficiencies:

This installation is a disaster waiting to happen. The pole mounted transformers have been set on the ground with wiring exposed, but unlike the previous installation, there appears to be no concrete slab. This has allowed the grass, weeds, and bushes to grow up in and around the live transformers making access and maintenance almost impossible. The installation is also enclosed with a tin metal enclosure that is not big enough to allow the proper amount of access or working clearances. Anyone attempting to service or even inspect this installation puts their lives in danger. This is a major health and life safety violation and must be corrected immediately.

#### Recommendations:

The power must be turned off to this site and the pole mounted transformers removed. Proper pad-mount transformers must be installed in their place with all wiring placed in approved enclosures and conduits. The inspector cannot stress enough the danger with this installation with the vegetation overgrowth and no clear line of sight to the live wiring and connections. The vegetation conducts moisture and in a rain storm arcing can

## Pinal County Airpark Electrical Infrastructure Study

occur due to the overgrown vegetation. Anyone who attempts to cut the vegetation is taking their life in their hands. Should one be in contact with the tin enclosure and live wiring, they will be killed with the 4160 Volts of live current. This must be corrected immediately.



Transformer with tin enclosure



Vegetation up in wire connections

### 5.18 - BUILDING T-26 THROUGH T-21 BUILDING ELECTRICAL SYSTEM

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#### Site Evaluation:

The electrical services and equipment are similar in nature to the previous buildings electrical equipment. They are also similar in size. Most of the equipment is outdated, requires NEC repairs, and is showing age and wear. The panels are similar in size and installation to the previous panels discussed on buildings T-36 through T-27.

#### Deficiencies:

These buildings are very consistent with the previous buildings already cited. The electrical system and equipment are used and there are NEC violations. Some of the buildings appear to be in use but others do not. Those that are in use have NEC violations that need to be addressed.

#### Recommendations:

The buildings that are to remain in use should be evaluated individually and brought up to the minimum NEC practices and standards by qualified personnel.



Panel with exposed Buss

### 5.19 - T-87 AND GRUMMAN TRANSFORMER YARD

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#### Site Evaluation:

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The 4160 Volts line then runs further west to a location between buildings T-87 and the Grumman Building where there is a block enclosure with three (3) pole type transformers mounted on the ground: #073 – 100 KVA, #074 – 50 KVA, and #075 – 50 KVA. There is a 400 Amp heavy-duty safety switch mounted on the north wall of the enclosure on the exterior. It is a 240 VAC, 125 HP wall-mounted heavy-duty safety switch. This installation is better than the previous site however it does not meet the NEC requirements.

### Deficiencies:

Pole mounted transformers have been set on the ground and are used in place of pad-mount transformers. These transformers have been placed in a block enclosure with a lockable door. The installation is better than the others; however the working clearances as prescribed in the NEC cannot be achieved in this installation particularly when you consider that this is a 4160 Volt installation. The connections are exposed and the space is too confined to safely work on the equipment.

### Recommendations:

Although this installation is better than some of the others, it still poses a risk to anyone asked to service or maintain this equipment. The pole mounted transformers should be removed and replaced with pad-mount transformers with the appropriate working clearances. All wiring and connections should be enclosed in an approved enclosure and conduit and all requirements for medium Voltage should be followed.



Transformer enclosure

## 5.20 - T-87 50 KV TRANSFORMER with METER

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### Site Evaluation:

Further to the north between the two buildings there is a pad-mounted transformer that appeared to be rated at 50 KVA with a meter socket mounted directly on the transformer. The meter # is 55-274-047 120/240 Volt, 1-phase. This appears to feed the two buildings east and west of the transformer location.

### Deficiencies:

No deficiencies were noted.

### Recommendations:

No corrections are required at this time.



Pad mount Transformer with Meter



Pad Mount Transformer with Meter

## CENTURY BOULEVARD (MAIN ROAD) AND P STREET

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The report will now go back to the 4160 Volt overhead line at the point where it crosses Century Boulevard (main road) and P Street.

### 5.21 - T-82 VAULT

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#### **Site Evaluation:**

The 4160 Volt line runs east from the pad-mount transformer at the corner of Darr Boulevard and G Street underground to a cinder block vault between buildings T-55 and T-52. The as-built plans name this vault T-82. Inside the vault is a 75 KVA transformer #059 that feeds three (3) safety switches. The first safety switch is a 200 Amp, 240 Volt, 1-phase that feeds buildings T-55 and T-54. The second safety switch is a 200 Amp, 240 Volt, 1-phase that feeds buildings T-47, T-48, and T-49. The third safety switch is a 200 Amp, 240 Volt, 1-phase that feeds buildings T-50, T-51, and T-52. From the T-82 vault, it runs in direct burial back to the east with two (2) circuits to feed the 100 Amp, 120/240 Volt, 1-phase panels mounted on the buildings T-46 through T-52.

There are several additional buildings and panels that are in this area that are being fed from underground feeds. It is almost impossible to determine the routing and which transformer feeds what without accurate as-built plans or extensive testing.

#### **Deficiencies:**

The 75KVA pole mounted transformer is set on the ground inside a semi-block building. There is very little access and virtually no working clearances at this installation. Due to the medium Voltage, this is a health and life safety violation.

The low Voltage wiring (600 Volts and below) is not installed per NEC minimum standards. The wire gutter, above the safety switches, has no cover and there is not enough clear working space in front of the equipment.

#### **Recommendations:**

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The pole mounted transformer should be removed and a pad-mounted transformer installed with all the wiring and connections enclosed in an approved enclosure and conduit. Proper working clearances must be observed, and access to live wires, connections, and equipment needs to be brought up to minimum NEC requirements.



Vault T-82 Transformer -  
No working Clearance



Transformer Enclosure



Safety Switch



Open expose Gutter

### 5.22 - T-46 THROUGH T-55 BUILDING ELECTRICAL SYSTEM

#### Site Evaluation:

From the T-82 vault and from each 200 Amp, 240 Volt, 1-phase safety switch, the wiring runs underground to the individual buildings T-55 through T-46. The buildings each have a disconnect and service outlet on the north east corner.

#### Deficiencies:

The equipment is old but still in working order. There are minor NEC infractions on several of the buildings such as open knock outs, service receptacles with no covers, and no GFCI protection.

#### Recommendations:

A qualified electrician should go through and correct obvious NEC infractions. The building wiring has not been evaluated or inspected during the course of this project, so no recommendations will be made regarding the status of the buildings themselves. Judging from the age and condition of the previous buildings and systems inspected, these also are old and in need of upgrades.



Building Safety Switch with open knock out

### 5.23 - BASKETBALL COURT TRANSFORMER

#### Site Evaluation:

At the intersection of Darr Boulevard and 6<sup>th</sup> Street there is a pad-mount transformer, #057, on the south west side opposite the basketball court. From the transformer #057 the as-built plans show it feeding 3-100 KVA transformers by the fire station building complex: transformers #085, #086, and #087.

The overhead 4160 Volt line goes through a 3 KVA transformer where it then tees across 6<sup>th</sup> Street towards the basketball court. The overhead line comes down the light pole for the basketball courts to a small disconnect where there is a service outlet and a photo cell.

The as-built plans show an underground feed from this location to the Fire Station, but none could be located during this inspection. On-site personnel did not think that it was ever installed. It is noted in this report that the as-built plans show a line here, but without a wire detector none could be identified.

#### Deficiencies:

No deficiencies were noted for these two drops.

#### Recommendations:

No repairs are required at this time. Considerations need to be made as to the age of the equipment and possible future upgrades may be needed.



Pad-mount Transformer



Building Electrical Service



Electrical Panel

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Pole Mount Transformer



Basketball Pole



Basketball Equipment

### 5.24 - FIRE STATION & HUMAN RESOURCE BUILDING ELECTRICAL SYSTEM

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#### Site Evaluation:

Directly north of the Fire Station on the south side of 6<sup>th</sup> Street a 4160 Volt line drops down the pole and goes underground from the pole to the west side of the Fire Station. There it enters the Fire Station electrical room with a 4160 Volt live line through an open cut out switch to 3 – 1000 KVA pole mounted transformers #085, #086 and #087. The 4160 Volt wiring is all exposed and unprotected or enclosed inside the electrical room. The cut-off switch is mounted on the north wall in very close proximity to one of the Fire Station's 200 Amp safety switches. On the other side of the door is an additional 200 Amp safety switch and on the south wall is two (2) more 200 Amp safety switches. Two of the safety switches are for the Fire Station Building and two are for the Human Resources Buildings.

#### Deficiencies:

When CRE's Inspector entered the Fire Station electrical room and was taking pictures, the static electricity in the room made the hair on his arms and head stand up. The floor was covered with dust and there was evidence on several pieces of equipment of ARC

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marks. This is one of the most dangerous installations at Pinal County Airpark. The 100 KVA, 4160 Volt pole mount transformers set on the ground that are enclosed in the electrical room of the Fire Station are a hazard. The installation has exposed wiring, the improper use of a pole mounted transformer in an electrical room, and it does not have the proper amount of working clearance for the medium voltage equipment that it houses. The room is electrically charged and the amount of dust makes this area very dangerous.

### Recommendations:

The 4160 Volt line needs to be intercepted before entering the electrical room, and pad-mount transformers should be installed outside of the building, following NEC guidelines protecting all wiring, conductors, and connections. From the pad-mount transformers the lower voltage (480 or 240 Volt) lines could be run into the electrical room where they could be protected and installed per the NEC. This would reduce the risk to both the building and the fire fighting personnel and would also reduce the liability that Pinal County has under the current installation.



Fire Station Transformer



Fire Station 4160 Volt cut off switch



Building Safety Switch 1 of 4

## 5.25 - BUILDING T-86 NORTH

### Site Evaluation:

From the tee north along the flight line to building T-86 behind the building is an enclosure constructed of plywood with three (3) transformers #053, #054, and #055. They are 37.5 KVA transformers that feed building T-86. The feed is overhead. Building T-86 is some type of cabinet/wood working shop with many saws, planers, sanders, shapers and power tools. The electrical service is inside the building and not visible from the exterior.



Transformer enclosure yard



Exterior of Transformer Yard

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Overhead Mast to Building



Floodlights

### 5.26 - BUILDING T-62 AND FLOOD LIGHT

#### Site Evaluation:

From Building T-86 the overhead line runs north to Building T-62 where there is one pole with transformer #052 rated at 10 KVA that feeds a flood light (per the as-built plans) due to the security fencing the inspector could not field verify. See last picture above.

Further north there is building T-62 with pole mounted 37.5 KVA transformers #051 and #050. One feeds the building and the other feeds a flood light pole with a 125 Amp main and a 20 Amp photo cell. The metal pole has five (5) flood light heads. At the building, the inspector could not gain access so the service type and size could not be verified.



T-86 Transformers

### 5.27 - METER SOCKET AND TWO DISCONNECTS NORTH OF TOWER

#### Site Evaluation:

Back to the 4160 Volt OH line just north of the H Street and east of the flight line there is a pole where the power drops down to a meter socket with meter #64-808-293, 200 Amp, 3-phase, with two disconnects (100 Amp, 3-phase, 240 Volts).



Meter



Two weathered Transformers

### 5.28 - TOWER TRANSFORMER YARD

#### Site Evaluation:

The 4160 Volt OH line crosses over H Street to a location just east of the Tower where it feeds a transformer bank of four (4) transformers in a fenced yard: #042, #043, #044, and #045. Three of the transformers are 37.5 KV transformers and one is a 50 kV transformer. These power the Tower and airfield Electrical vault.



Tower Yard



Transformer Yard



Junction Box for Tower



Tower



Weathered Junction Box



Airfield Electrical Vault Entrance

### 5.29 - AIRFIELD ELECTRICAL VAULT

#### Site Evaluation:

From the 4160 Volt overhead line south of the Tower, the as-built line runs west to building T-60 which is the airfield electrical vault. The 4160 Volt line is connected to a 35 kW constant current regulator (CCR) that supplies a constant 6.6 Amp feed to the airfield lighting. The other two transformers, #047 and #046, are in the vault but are not physically connected to the transformers. The Airfield lighting will be covered later in this report under Section 8.

From the Tower transformer yard, there is a line that feeds the electrical panels in the airfield electrical vault controlling the service receptacles and lighting.

#### Deficiencies:

The airfield electrical vault does not have any obvious NEC violations. The panel and equipment are old, 1942 vintage equipment and as such is outdated and do not have the current overcurrent or arc fault protection required by the NEC. The system is currently

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grandfathered and is operational, however if the system is altered in any way it will have to be upgraded to meet current standards and NEC requirements.

### Recommendations:

See Section 8.

### Note:

At this location the 4160 Volt line runs underground from the pole south of the Tower yard behind the Doole Hangar building past Lot B to a pole located east of building 61.

### 5.30 - SOUTH OF BUILDING T-85 EAST OF BUILDING 61

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#### Site Evaluation:

The 4160 Volt line runs underground from the last pole south and east of the Tower behind the Doole Hangar along the west side of Cactus Boulevard to a pole located south and east of building T-85. From this pole, it goes back overhead and runs south along the flight line. At this pole there are three (3) pole mounted transformers: #038 - 3 KVA, #039 - 5 KVA, and #040 - 3 KVA respectively. These three transformers provided power to Building T-85 as shown on the as-built plans. They are currently not in use and building T-85 is now on the 25 kV line described later in this report.

#### Deficiencies:

There are no deficiencies at this location.

#### Recommendations:

No corrections are required at this time.



Pole mount Transformer



OH to UG Feed



Correct use of Switch Cabinet

### 5.31 - TRANSFORMER NUMBER 37

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#### Site Evaluation:

From this pole, the 4160 Volt line runs overhead south parallel to the flight line to a pole with a single transformer: #037 – 25 kV. The transformer is not connected at this time. This transformer is used to feed a flood light pole on the flight line but is not in use at this time.

#### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections are required at this time.



Transformer not in use

### 5.32 - EVERGREEN BUILDING AND YARD

#### Site Evaluation:

The 4160 Volt line then runs further south and drops underground behind the Evergreen building. In the yard it drops down to a switch cabinet and then underground to a 50 KVA transformer (#35). The transformer feeds a 200 Amp, 240 Volt disconnect on the building then through a meter socket (#64-346-552, 200 Amp, 240 Volt, 3-Wire). There is a panel mounted beside the meter socket and disconnect that was locked at the time of the inspection so specific information about the panel could not be obtained.

#### Deficiencies:

There are no deficiencies at this location.

#### Recommendations:

No corrections are required at this time.



50KVA Transformer



Evergreen Electrical Service



Safety Switch



Evergreen Meter

### 5.33 - FLOOD LIGHT AND FUEL BUILDING

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#### Site Evaluation:

The 4160 Volt line then runs south and east through the Evergreen Yard and parking area to a pole where transformer #035 feeds back west to a bank of flood lights on a metal pole on the flight line. The pole has eight (8) flood head fixtures and one obstruction light mounted on the metal pole. The panel is a 60 Amp, 240 Volt, 1-phase panel that powers the light pole.

The fuel building is being fed from the 4160 Volt line from the 60 Amp, 240 Volt, panel that feeds the light pole. Directly east of the fuel building is a safety switch that has been gutted and is no longer NEC compliant. The inside of the safety switch is being used as a junction box and #12 AWG romex wiring is being run outside of the safety switch to a light for the storage yard. The 4160 Volt line runs further south where there is a single transformer, #034, which is not in use at this time.

#### Deficiencies:

The safety switch and wiring are in violation of the NEC. The #12 AWG romex wiring is not approved to be run exposed and is in violation of the NEC. The yard light is in violation of the NEC because it does not have any overcurrent protection.

#### Recommendations:

The safety switch enclosure should be removed and an approved NEMA 3R panel should be installed per the NEC. The #12 AWG romex wire should be removed and run in conduit continuously to the light fixture protecting the wire per the NEC. The load on the lighting needs to be determined and the proper overcurrent protection device installed in the panel to protect the system per the NEC.



Floodlights



Light Safety Switch



Gutted Safety Switch



Transformer not in use

### 5.34 - BUILDING T-74

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**Site Evaluation:**

This site has the 4160 Volt line dropped down to a pad-mount 500 KVA transformer that feeds the building T-74 distribution system.

**Deficiencies:**

There are no deficiencies at this location.

**Recommendations:**

No corrections are required at this time.

### 5.38 - T-63 BUILDING AND YARD

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**Site Evaluation:**

The 4160 Volt line continues to a point between buildings T-63 and T-64 on the west side. Nearest to T-63 there are three (3) pad-mount transformers: #033 – 750 KVA, #032 – 300 KVA, and #031 – 300 KVA. The feeds to and from the pad-mount transformers are underground so what they power has not been determined on this study.

**Deficiencies:**

The center transformer has been enclosed in a steel enclosure and the status of this transformer is not known. It needs to be opened and evaluated. The inspector could hear the transformer buzzing very loud and suspects that there could be a pole mounted transformer mounted on the ground at this location but was not able to verify the status or identify the NEC compliance at this location. The homemade enclosure leads the inspector to believe that there are some issues here.

**Recommendations:**

The homemade enclosure needs to be opened and evaluated and corrections made as needed to bring into compliance with the NEC.



750KVA Transformer



300KVA Transformer



300KVA Transformer

### 5.36 - T-64 BUILDING AND YARD

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**Site Evaluation:**

The 4160 Volt line runs east from behind T-64 east past the parking lot and yard to a location just north of the facilities Paint building #79. It turns to the south to 1<sup>st</sup> street.

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There is one pole mounted transformer (#001 – 3 KVA) which powers the paint facility building panel.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections required at this time.

## 5.37 - PAINT FACILITY T-79

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### Site Evaluation:

The panel on the paint facility building does not have a dead front and the wiring is in bad shape as well as many of the exposed conduits are missing cover plates and straps. These are NEC violations and need to be addressed.

### Deficiencies:

There are numerous NEC non-compliance issues at this site. The panel does not have a dead front and the live wires and buss are accessible from the front of the panel. Most of the LB fittings have missing cover plates and the wiring is exposed to the outside environment. There are exposed wires running on the exterior of the building feeding service receptacles that are in violation of the NEC. The exposed wire is being supported by zip ties to the existing conduit work. The service receptacle is not a weatherproof enclosure and is not GFCI protected.

### Recommendations:

The service panel needs to be replaced with a disconnecting means or main circuit breaker allowing the system to be shut off if necessary. The covers need to be installed on all fittings. All exposed wiring needs to be installed following approved NEC practices and must be supported per the NEC minimum standards. In addition, a qualified electrician and engineer should evaluate the interior of the structure to make sure that the facility is safe per the NEC minimum standards.



Open LB



Open LB

## Pinal County Airpark Electrical Infrastructure Study



Exposed wire no GFCI



Paint Facility Panel

### 5.38 - BUILDING T-8

#### Site Evaluation:

The 4160 Volt line runs south from building 79 to the south side of 1<sup>st</sup> or (P) Street where it goes east and west. The east run goes back to the east side of Darr Boulevard where it makes the split. West it runs to a point in front of building T- 8 where there are three (3) transformers mounted on the pole to the west of the building. The building T-8 has a small 200 Amp, 240 Volt panel in the main office that is fed from transformer #007- 10 KVA, #008 – 10 KVA, and #009 – 25 KVA.

#### Deficiencies:

The panel is old and showing wear and age but no NEC violations were found at this location.

#### Recommendations:

No corrections are required at this time.



Pole Transformers



Building 8 Panel

### 5.39 - BUILDING T-98

#### Site Evaluation:

At this pole there is also a split that goes across the parking lot to building T-98 where it feeds a series of panels and disconnects for the building, the lighting, the fuel dispensing, and some additional loads that were not directly labeled.

#### Deficiencies:

This location is a maintenance shop and also serves as the fuel pump shut-off disconnect. The electrical room serves as the tool crib storage room which is locked inside a cage.

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There is inadequate working clearance per the NEC. The fuel shut-off safety switch is not readily accessible in case of emergency. There is a homemade switchboard that has a number of single gang switch boxes ganged together on the north wall that was not opened or evaluated. There are numerous violations and issues at this location.

### Recommendations:

The electrical room needs to have a qualified electrical engineer evaluate the system thoroughly. Access and working clearance needs to be established with an emergency shut-off point for the fuel pumps clearly marked and labeled. The correction of this electrical room is very complicated and complex due to the space and age of the system bringing it into compliance will be very difficult and expensive since it needs to be totally reconfigured and designed.



Building T-98 Safety Switch



T-98 Panel and homemade Switch Cabinet

### 5.40 - BUILDING T-77

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#### Site Evaluation:

From building T-98, the 4160 Volt line runs further west across the driveway to building T-77 where there is a small panel.

#### Deficiencies:

The panel does not have a main shut off or overcurrent protection visible. The panel is also fully loaded with split breakers and might be undersized. This panel should be evaluated as to the electrical loads that are on the panel and if it is adequately sized.

#### Recommendations:

The panel should be evaluated by a qualified engineer to determine all the loads on the panel are within the manufactures specifications and guidelines and comply with the NEC.



T- 77 Panel

### 5.41 - BUILDING T-543

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#### **Site Evaluation:**

From Building T-77 the 4160 Volt line runs across to building T-543 where it splits and feeds to the west a flood light pole on the flight line. Then it continues north to a pole located on the south west corner of building T-64 where there is a fenced in area with seven (7) transformers in it. Six of the transformers are pole mount type transformers set on the ground: #028 – 100 KVA, #029 – 100 KVA, and #030 – 100 KVA. Set behind these transformers are three (3) additional transformers: #027 – 100 KVA, and #026 – 100 KVA, and #025 – 100 KVA. Nearest the building is a 75 KVA modern pad- mount step down transformer that feeds building 64. The western most transformers are not currently being used. However, the back three transformers are in use as well at the 75 KVA step down transformer. The three back transformers are being fed from an underground feed from the east side of building T-543. This has a potential fire and health safety violation. On the south east corner of the building, the overhead line drops down the outside of the building through a mast head and conduits. At ground level the conduit turns to the east to the corner of the building slab. At this point it makes a 90° bend then the wiring is exposed for a foot or two before it takes another 90° bend into a broken end of a 3” PVC underground conduit. The 4160 Volt cable is lying on the ground damaged and exposed to the weather. This is particularly dangerous in that someone could accidentally step on the energized cable and be killed.

This is an extremely dangerous situation with multiple NEC violations and must be addressed immediately.

#### **Deficiencies:**

The 4160 Volt line that runs down the mast head on building 543 then feeds the transformers in the T-64 yard is a major health and life safety violation and should be addressed immediately. Where the conduit makes a 90° bend at the south-east corner of building T-543 the conduit is broken and the 4160 Volt cables are bare on the ground directly in front of the concrete step to the entrance to the building. This must be addressed immediately and is a major liability to Pinal County.

There are other NEC issues that also need to be addressed. At building T-543, there is a junction box on the roof that does not have a cover plate. There are service receptacles that are not weatherproof or GFCI protected. There are also improper supports on the conduit systems. The building is marked with hazardous chemical storage markers on the building and even though an interior inspection was not conducted, the interior of the buildings electrical system should be reviewed for compliance to electrical devices in a hazardous location.

#### **Recommendations:**

The 4160 Volt conduit must be repaired and replaced immediately before someone is seriously injured or killed. The entire building must be evaluated and brought up to current safety standards per the NEC to insure the safe operation and use of the facility.

## Pinal County Airpark Electrical Infrastructure Study

The seriousness of this cannot be stated more clearly as this is an accident and tragedy waiting to happen.



4160 Volt waiting to Kill!



T-64 Transformer Yard



Floodlights



T-64 Transformer Yard



T-64 Transformer Yard

### 5.42 - BUILDING T-66

#### Site Evaluation:

From the pole north and west of building #8, the 4160 Volt line runs due south to a pole located towards the rear of building #8. At this pole there are transformers: #022 – 10 KVA, #023 – 37.5 KVA, and #024 – 37.5 KVA. These three transformers are set on the ground in a metal enclosed barricade and power building 98 shop and building T-66. These transformers pose a safety hazard due to the undergrowth and vegetation as well as the proximity to traffic and human interaction. The building 98 shop has a line going into the building however, the loads could not be obtained. The building T-66 is powered from a 200 Amp panel near the office area of the building.

#### Deficiencies:

The transformer enclosure in the parking lot is a major NEC violation and needs immediate attention. The pole mounted transformers are set on the ground and the vegetation has grown up into the wiring and connections. The enclosure is tin siding and the working clearance is inadequate, making it very unsafe for anyone to enter the enclosure without exposing themselves to extreme danger and potential shock hazards. The vegetation could easily conduct the 4160 Volt arc to the tin enclosure and just touching the enclosure could cause an accidental arc fault.

The building is fed with a 200 Amp panel which looks to be potentially overloaded. As with most of the facilities, the electrical system is extremely outdated and even though it is grandfathered, there are NEC violations due to the age and condition of the equipment.

## Pinal County Airpark Electrical Infrastructure Study

### Recommendations:

The transformer enclosure must be removed and the pole mounted transformers replaced with pad-mount transformers that will comply with the NEC. The conductors and connections must be enclosed in an approved enclosure and the system protected to prevent injury or accidental death.

The building should be evaluated and an updated system installed to manage the loads placed upon it.



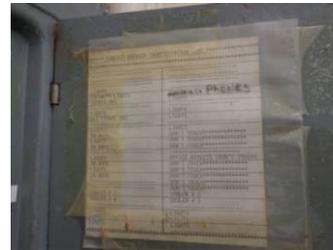
Transformer Yard with tin enclosure and overgrown



Transformer Yard



Panel at T-66



Panel Schedule

### 5.43 - FUEL FARM TRANSFORMERS

#### Site Evaluation:

The next pole to the south has a group of three (3) transformers: #012 – 7.5 KVA, #011 – 7.5 KVA, and #010 – 7.5 KVA. This line feeds the fuel farm and associated equipment. From the transformer to the fuel farm is a 120/240 Volt secondary line.

Further to the south are three (3) more poles with three (3) transformers on each pole. They are behind the security fencing and their loads appear to be the fuel farm. They are transformers #015 – 167 KVA, #014 – 167 KVA, #013 – 167 KVA, and transformers #018 – 50 KVA, #017 – 50 KVA, and #016 – 50 KVA. And at the last pole to the south transformers are: #021 – 37.5 KVA, #020 – 37.5 KVA and #019 – 37.5 KVA. This last set of transformers are shown on the as-built plans as feeding a secondary line to the fuel farm at 120/240 Volt, 1-phase.

#### Deficiencies:

The pole transformers are in compliance with the NEC. The fuel farm facilities are being fed with secondary 120/240 Volt power. The fuel farm was not evaluated but the facility

## Pinal County Airpark Electrical Infrastructure Study

from the exterior appears to be more modern and up to date with current NEC requirements.

### Recommendations:

No immediate changes need to be made at this time. Plans should be in place to have the fuel farm evaluated more in depth to insure that it remains in compliance with the NEC. Due to the nature of the facility, it should remain high on the priority list to keep all maintenance and equipment in compliance through ongoing safety inspections.



Fuel Farm Transformers



Three pole mount Transformers

## Section 6: 25 KVA LINE

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The 25 KV transmission line starts out at the Trico Substation running to a location south and west of Darr Boulevard and Century Boulevard where it turns and runs on the west side of Darr Boulevard parallel with Darr Boulevard to J or 5<sup>th</sup> Street. There it turns to the west parallel with J Street on the south side of the roadway to a pad-mount transformer (#041 – 750 KVA) mounted on the southwest corner of the Doole Hangar building and the flight line. It feeds the Doole Hangar, Buildings 59, 11, 12, 7, 85, and 6, as well as buildings 10, and 13 north and east of the Doole Hangar. It also feeds a pedestal for the park area on the North West corner of Darr Boulevard and 4<sup>th</sup> Street (K).



Transmission Lines

### 6.01 - PARK TRANSFORMER AND PEDESTAL

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#### Site Evaluation:

The only other transformer on the 25 KV line, other than the 750 KVA pad-mount transformer on the flight line, is the 37.5 KVA pole mount transformer at the northwest corner of Darr Boulevard and 4<sup>th</sup> Street. The transformer feeds a small landscape type

## Pinal County Airpark Electrical Infrastructure Study

pedestal panel with a 200 Amp main circuit breaker mini power center with 4-20 Amp branch circuits in it.



Pole mount Transformer



Park Pedestal



Park Pedestal Breakers

### 6.02 - 750 KVA TRANSFORMER

#### Site Evaluation:

The 25 KV line feeds the 750 KVA pad mount transformer on the southwest corner of the Doole Hanger building. It powers the communications panels located directly north of the transformer as well as the buildings to the south as previously stated.

#### Deficiencies:

There are no deficiencies at this location.

#### Recommendations:

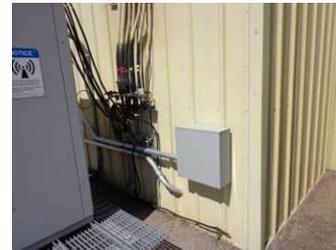
No corrections required at this time.



750KVA Transformer



Com Electrical Panel



Com Wiring

### 6.03 - BUILDING T-59

#### Site Evaluation:

## Pinal County Airpark Electrical Infrastructure Study

Building T-59 is located on the south side of the large hanger building on the flight line. The service for this building could not be found. Access to the building was limited and it appeared that the electrical panel is inside. Further investigations will be required.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections are required at this time.

## 6.04 - BUILDING T-7

### Site Evaluation:

To the south and east of building T-59 is a yellow metal building with a Cutler Hammer switch board rated at 480Y/277 Volt, 3-phase, 4 Wire, 600 Amp neutral, 65KAIC. Next to the switch board cabinet there is a step down transformer that feeds several panels. First is an Eaton 400 Amp, 277/480 Volt, 3-phase, panel with a 200 Amp, 3-pole main circuit breaker. It is labeled Panel LA. Panel LA feeds mainly the air conditioning loads for the building.

The next panel is a 400 Amp Eaton panel rated at 208Y/120 Volt, 3-phase, 35KAIC. This panel is labeled LB, and has a 200 Amp main circuit breaker with a 65kAIC rating. The panel is worn but indicates that a load on this panel is primarily the lighting and interior electrical circuits for the building.

The next panel is panel HB rated at 100 Amp, 480Y/277 Volts with a 277 Volt neutral. It does not have a main circuit breaker and the panel is not labeled.

The final panel is a 120/208Y Volt, 3-phase, 225 Amp panel with no main circuit breaker and no panel schedule.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections are required at this time. Panel should be properly completed for each panel.

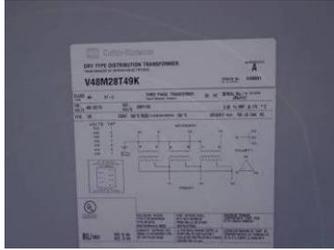


T-7 Equipment SES



SES

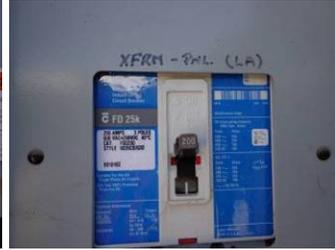
## Pinal County Airpark Electrical Infrastructure Study



T- 7 Transformer



Name Plate



Panel LA



Eaton Panel Schedule



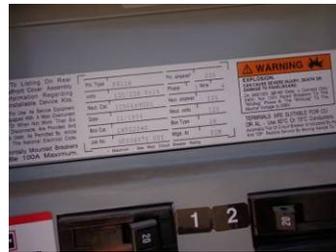
Panel LB Main



Panel LB



Eaton Panel Schedule



Name Plate HB 100Amp



120/208 Y Name Plate

### 6.05 - BUILDING T-11

#### Site Evaluation:

To the south of building T-59 and south west of the yellow metal building are two (2) double-wide portable buildings set on the flight line. They are fed through a step down transformer rated at 75 KVA, 240/480 Volts to 120/240 Volt. The step down transformer feeds a Siemens 400 Amp, 120/240 Volt P1 Ty panel with a 400 Amp main circuit breaker. The panel is labeled that it feeds trailers #1, #2, and #3 with 100 Amp circuit breakers.

#### Deficiencies:

There are no deficiencies at this location.

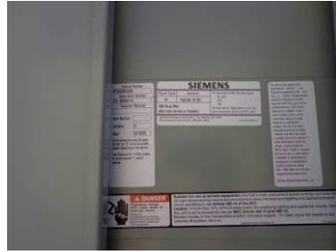
#### Recommendations:

No corrections are required at this time.

## Pinal County Airpark Electrical Infrastructure Study



T-12 Transformer



T-11 Panel



T-11 Main



T-11 Panel Schedule

### 6.06 - BUILDING T-12

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#### Site Evaluation:

The second double-wide portable building further south also has a dry type step down transformer (240/480 Volt to 120/240 Volt) that feeds a Siemens 400 Amp panel with a 400 Amp main circuit breaker. The panel is labeled with a 100 Amp circuit breaker that feeds north, a 100 Amp circuit breaker that feeds middle, a 100 Amp circuit breaker that feeds south, and a 100 Amp circuit breaker that feeds building T-85.

#### Deficiencies:

There are no deficiencies at this location.

#### Recommendations:

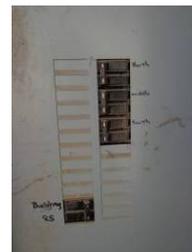
No corrections are required at this time.



T-12 Transformer



T-12 Main



T-12 Panel

### 6.07 - BUILDING T-6

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## Pinal County Airpark Electrical Infrastructure Study

### Site Evaluation:

Building T-85 has a Federal-Pacific 25 KVA step down transformer (240/480 Volt to 120/ 240 Volt, 1-phase) which feeds a main disconnect on building T-6 rated at 100 Amp, 240 VAC, 250 VDC.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections are required at this time.



T-6 Transformer



T-6 Safety Switch

## 6.08 - BUILDING T-85

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This building is being fed from the panel on building T-12.

## 6.09 – DISCLAIMER

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As aforementioned, there is confusion as to what system these buildings are on. On-site personnel have the best knowledge of the electrical system at Pinal County Airpark. We are reporting these buildings on the 25 KV line per their information.

## 6.10 - DOOLE HANGER SES

---

### Site Evaluation:

At the north east corner of Doole Hangar, there is some confusion in regards to how and from where the Doole Hangar service entrance section (SES) is being fed. The as-builts are not real clear but seem to show it being fed from the underground 4160 Volt line. However, on site personnel are sure that power comes from the switch cabinet near Century and H Street from the 25kV line. From CR Engineers Inc. inspection, it appears that the portable Building #10 and the double-wide portable #13 as well as the Doole Hangar SES are being fed from the switch cabinet at Century and H Street however, it is being fed from the 25 kV National Guard transmission line.

## Pinal County Airpark Electrical Infrastructure Study

Without more extensive research and testing, we do not know for positive which of the lines feeds these buildings. We do know that the 150 kV pad-mount transformer #54897, on the north east corner of the hangar building, is feeding the SES for the Doole Hangar. To the west of the transformer and mounted on the building is the SES for the Building. The SES is a Square D Catalog # 344FR, 400 Amp series E2 Nema 3R, 208Y/120 Volt, 3-phase, 4 wire. The circuit breakers are QMB364W, 200A, 3-Pole; the meter number is LHK-00285, 120/480 Volt, 4 wire Y or 4 wire D.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections are required at this time.



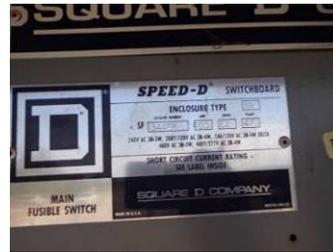
Doole Hangar Switch Cabinet



Doole Hangar Meter



Doole Hangar SES



Breakers

## 6.11 - BUILDING T-10 PORTABLES

### Site Evaluation:

The 25 KV line also feeds underground to a transformer located further north and east of the big hangar. This transformer feeds a large set of portables and is a large pad-mounted transformer which is not labeled, but it appears to be a 300 KV transformer. This transformer feeds an SES Switch cabinet located just south of the transformer. The SES is a Square D 600 Amp 208Y/120 Volt, 3-phase service with a 400 Amp main circuit breaker. At the side of the switch gear there is a meter socket with meter number LHK-00584, 120 to 480 Volt, 3-phase.

### Deficiencies:

## Pinal County Airpark Electrical Infrastructure Study

The doors on the SES are off the hinges and the enclosure is held shut with a lag screw through the door.

### Recommendations:

New hinges should be installed so that easy access can be accomplished in the case of an emergency.



500KVA Transformer



Portables T-10 Meter



Portables SES



Portable SES



Portables Breakers

## 6.12 - DOUBLE-WIDE PORTABLE BUILDINGS T-13

### Site Evaluation:

The double-wide portable buildings are located directly to the north of the 500 KVA transformer. They are fed underground to two panels, one on each portable building south end. The panels are Cutler Hammer 125 Amp, 120/240 Volt, 1-phase 3 wire with 125 Amp main circuit breakers.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections are required at this time.



Portable Panel

## Section 7: THE NATIONAL GUARD 25 KV LINE

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From the substation there is a 25 kV overhead transmission line that runs south from the Trico lines further south from the substation. This line runs north and west, south of the roadway until it reaches Century Boulevard where it turns to the north and runs parallel to Century Boulevard on the west side of the roadway to a location on the south west corner of Century Boulevard and 4<sup>th</sup> Street. At this location the line drops down to underground for the balance of the way to the National Guard Facility. Along Century Boulevard, between G and H streets, there is a switch cabinet, #WTS17. Also along Century Boulevard between E and F streets, there is an additional switch cabinet, #WTS38. And northwest of E Street there is an additional switch cabinet, #WTS03.

The inspector did not gain access to the National Guard Facility and it is not in the scope of this study to pursue any further information on this line.

### Deficiencies:

There are no deficiencies at this location.

### Recommendations:

No corrections are required at this time.



Switch Cabinet



Switch Cabinet



Switch Cabinet

## Section 8: AIRFIELD ELECTRICAL SYSTEM



The airfield lighting and signage at the Pinal County Airpark was evaluated to determine the status of the airfield electrical system, to identify the deficiencies in the system, and to make recommendations on how to correct the deficiencies to insure the reliable safe operation of the airfield electrical system in the future.

The system was originally installed in 1942 as a military airfield. The system, though still operational, has reached and surpassed its expected life. Even though there has been ongoing maintenance, the basic system is still 70 years old. The airfield electrical vault is very antiquated and still has the old style knob and tube wiring mounted around the ceiling. The constant current regulator (CCR) is newer yet it still dates back to the 1960s. The controls are a combination of new circuitry and old enclosure and contacts. The airfield cable is installed from the airfield electrical vault to the airfield manhole out on the airfield. From the manhole, the cable runs for some distance inside conduits then changes to direct burial the balance of the way to the airfield signs and edge lights. In the infield and along the shoulders of the runway, the direct buried cable is exposed to the elements and subject to damage.

The edge lights are functioning, however, there are several broken fixtures and the wiring is inadequate. The signs are Size 1 signs and subject to the FAA Advisory Circular (AC) requirements for Size 1 signs. All of the airfield signage has issues that need to be addressed in order to comply with the FAA AC requirements.

The vault needs to be rewired to remove the knob and tube wiring and to remove the electrical shock hazards present with the current installation. Modern constant current regulators (CCRs) and controls need to be installed to bring the vault up to FAA AC standards.

## Pinal County Airpark Electrical Infrastructure Study

The airfield direct buried cables need to be removed and replaced in a manner that will insure that the lights and signage will operate in a safe, reliable fashion.

The signage needs to be relocated to meet the FAA AC requirements.

### 8.01 – AIRFIELD ELECTRICAL VAULT

---

#### Site Evaluation:

The power for the airfield lighting system enters the airfield electrical vault on the east side of the Airfield from the 4160 Volt distribution system which is located west of the Tower through a pole mounted transformer set on the ground inside the vault room. This system is an old Westinghouse constant current regulator/transformer. The system runs at a constant 6.6 Amps and one constant current regulator supplies all the power through one circuit for all lighting on the airfield.

The existing wiring in the vault is the old knob and tube wiring from 1942 and has had very few upgrades since then. Upon entering the vault, there is a hand activated pull type dead man switch that cuts the power to the constant current regulator. However, the 4160 Volt power is still energized along the knob and tube wiring around the ceiling. Any work or maintenance needing to be done on the system exposes the technicians to live wiring.

#### Deficiencies:

The exposed 4160 Volt lines running though the 1942 vintage knob and tube wiring is a shock hazard and is not in compliance with the NEC. The controls are not listed or in compliance with FAA AC or NEC.

#### Recommendations:

The system needs to be replaced with new reliable equipment that complies with the FAA AC and the NEC.



Constant Current  
Regulator



Name Plate



Knob and Tube Wiring

## Pinal County Airpark Electrical Infrastructure Study



Dead Man Cut Off



1942 Capacitor



1942 Regulator Switch

### 8.02 - AIRFIELD MANHOLE AND CABLES

#### Site Evaluation:

After the constant current regulator there is a control cabinet that has some modern circuitry retro fit into the old control cabinet from the 1940's. The 5kV airfield cable goes out of the vault through conduits to a manhole along the taxiway. As mentioned above, the entire airfield electrical system is all on one circuit, however, the old wiring and cables have not been removed so in the manhole it is very difficult to determine what cables are energized and what is abandoned. The cable is then run out of the vault in conduit to the manhole and at some point after goes into direct burial the balance of the run. More extensive testing will have to be done to the lights and signs to determine where the conduit system stops and the direct buried cable starts.

#### Deficiencies:

The direct buried cables are exposed in the infield and runway edge. This poses a shock hazard to anyone who has to do maintenance on the infield or runway. Because this is a medium voltage (5kV), it is very dangerous if the cabling were to be cut or shorted. The ramp up voltages can get very high and therefore very hazardous.

#### Recommendations:

The direct buried cables need to be replaced and put into conduit. This will eliminate the shock hazard and will insure a safe reliable system for years to come. Typically 5kV, L-824 airfield cable should be replaced in its entirety every 10-15 years due to insulation degradation and age.

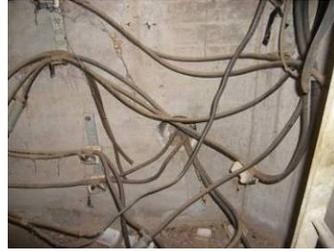


4" Duct Bank and 1942 Controls



Manhole Wiring

## Pinal County Airpark Electrical Infrastructure Study



Manhole Wiring



Manhole Wiring

### 8.03 – AIRFIELD LIGHTING

#### Site Evaluation:

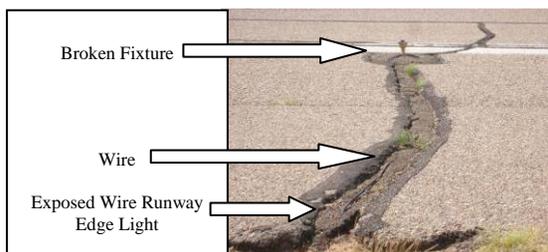
The runway edge lighting is set one to two feet from the runway. The edge lights are powered using direct buried cable laid directly into the existing cracks in the asphalt. Over time the originally buried cable has become exposed in many places. It is also exposed in the cracks of the asphalt. This is particularly dangerous because where the cable is exposed in the infield, maintenance personnel use mowers to keep the weeds down. If they hit one of these cables, they could be exposed to 5 kiloVolts of electricity. This is an accident waiting to happen.

#### Deficiencies:

Several fixtures are damaged and or inoperable. The wiring and connections are damaged and exposed. The installation is old and antiquated and does not comply with current FAA AC or NEC requirements.

#### Recommendations:

The edge lights should be replaced and relocated in accordance with the FAA AC and the NEC requirements.



Exposed Cable 5000 Volt

### 8.04 – AIRFIELD GUIDANCE SIGNAGE

#### Site Evaluation:

The airfield guidance signage is Size 1 signage. The runway exit signs are 40 feet from the edge of runway but the FAA AC circular calls for them to be from 10 to 20 feet from runway edge. The taxiway mandatory hold bar signage is 35 feet from edge of taxiway. They should be 10 to 20 feet from the taxiway edge line per the FAA AC. The runway

## Pinal County Airpark Electrical Infrastructure Study

distance remaining signs are 97 feet from edge of runway. They should be 50 to 75 feet from the runway edge. Most of the signs show signs of wear and age. Some show physical damage and most need some form of maintenance.

The unlighted signage seems to be in compliance although some of the distances from edge line need to be verified.

In short, the airfield electrical system at the Pinal County Airpark is outdated and needs to be replaced and although it is generally still operating. Once any portion of the system is upgraded, the NEC would a full upgrade of the entire system in order to stay compliant. The safety issues alone demand that the vault be upgraded to protect airport personnel who must maintain this system. The wiring should be meggered to determine the status of the cable insulation. However, because of the exposed direct buried cable posing a safety and health hazard, testing is a mute point since it needs to be replaced. The guidance signs, though electrically sound at this point, are out of specification with the FAA AC. Therefore the signage needs to be corrected to comply.

### Deficiencies:

The signs need to be moved to the correct locations to meet the FAA AC requirements. Many of the signs need maintenance and repairs.

### Recommendations:

The signs and bases need to be moved to the correct locations to satisfy the FAA. The correct guidance signage is critical to ground traffic safety.



Runway Edge Light



Size 1 Sign



Broken Sign



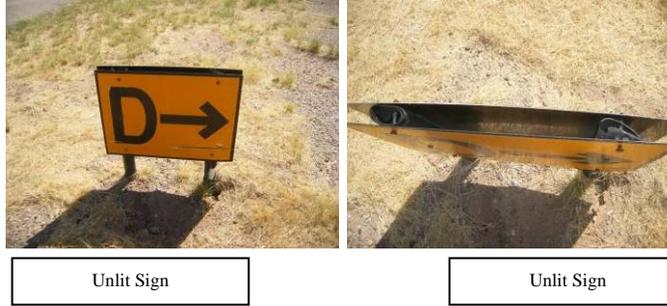
Unlit Sign



Distance Remaining Signs



## Pinal County Airpark Electrical Infrastructure Study



Unlit Sign

Unlit Sign

## Section 9: ENGINEERS ESTIMATED COST SUMMARY

### 9.01 - Priority List Cost Estimate

Priority Cost Estimate		
1.	Building T-24 through T-21 Transformer Yard	\$120,000.00
2.	Motel Transformer yard T-33 and T-32	\$80,000.00
3.	T-66 Transformer yard	\$120,000.00
4.	Building T-543 exposed 4160 Volt cable	\$30,000.00
5.	T-86 Transformer yard	\$120,000.00
6.	Fire Station Electrical Room Transformers	\$150,000.00
7.	Shooting Range Transformer yard	\$40,000.00
8.	Airfield Vault, Lighting and Signage	\$1,000,000.00
<b>Total Cost Estimate</b>		<b>\$1,660,00.00</b>

### 9.02 - Upgrade, Refurbishment and Maintenance Cost Estimate (Includes Costs Listed Above)

5.01 Pump Area	
Design Services	\$2,000.00
Refurbish Costs	\$35,000.00
Maintenance	\$2,500.00
<b>Total</b>	<b>\$39,500.00</b>

5.02 Air Quality Pump Site	
Design Services	\$1,000.00
Refurbish Costs	\$5,000.00
Maintenance	\$500.00
<b>Total</b>	<b>\$6,500.00</b>

## Pinal County Airpark Electrical Infrastructure Study

<b>5.03 Poles</b>	
Design Services	\$0.00
Refurbish Costs	\$45,000.00
Maintenance	\$3,000.00
<b>Total</b>	<b>\$48,000.00</b>

<b>5.04 Quonset P Street</b>	
Design Services	\$0.00
Refurbish Costs	\$0.00
Maintenance	\$200.00
<b>Total</b>	<b>\$200.00</b>

<b>5.06 Telecom Panels</b>	
Design Services	\$0.00
Refurbish Costs	\$0.00
Maintenance	\$800.00
<b>Total</b>	<b>\$800.00</b>

<b>5.07 Birds Nest</b>	
Design Services	\$0.00
Refurbish Costs	\$500.00
Maintenance	\$0.00
<b>Total</b>	<b>\$500.00</b>

<b>5.08 Isolated Unused Pole and Transformer</b>	
Design Services	\$0.00
Refurbish Costs	\$0.00
Maintenance	\$1,000.00
<b>Total</b>	<b>\$1,000.00</b>

<b>5.09 Shooting Range</b>	
Design Services	\$4,000.00
Refurbish Costs	\$50,000.00
Maintenance	\$500.00
<b>Total</b>	<b>\$54,500.00</b>

<b>5.10 and 5.11 Laundry Building</b>	
Design Services	\$4,000.00
Refurbish Costs	\$12,000.00
Maintenance	\$1,000.00
<b>Total</b>	<b>\$17,000.00</b>

<b>5.12 Restaurant Yard and Building</b>	
Design Services	\$14,000.00
Refurbish Costs	\$150,000.00
Maintenance	\$1,500.00

## Pinal County Airpark Electrical Infrastructure Study

<b>Total</b>	<b>\$165,500.00</b>
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<b>5.14 Motel Buildings T-37 thru T-46</b>	
Design Services	\$12,000.00
Refurbish Costs	125,000.00
Maintenance	3,000.00
<b>Total</b>	<b>\$140,000.00</b>

<b>5.15 and 5.16 Buildings T-36 thru T-27</b>	
Design Services	\$3,000.00
Refurbish Costs	\$45,000.00
Maintenance	\$3,000.00
<b>Total</b>	<b>\$51,000.00</b>

<b>5.17 and 5.18 Buildings T-26 thru T-21</b>	
Design Services	\$8,000.00
Refurbish Costs	\$156,000.00
Maintenance	\$3,000.00
<b>Total</b>	<b>\$167,000.00</b>

<b>5.19 T-87 and Grumman Building</b>	
Design Services	\$2,000.00
Refurbish Costs	\$10,000.00
Maintenance	\$1,000.00
<b>Total</b>	<b>\$13,000.00</b>

<b>5.21 T-82 Vault and Yard</b>	
Design Services	\$4,000.00
Refurbish Costs	46,000.00
Maintenance	1,500.00
<b>Total</b>	<b>\$51,500.00</b>

<b>5.22 Buildings T-46 thru T-55</b>	
Design Services	\$3,000.00
Refurbish Costs	\$31,500.00
Maintenance	\$3,000.00
<b>Total</b>	<b>\$37,500.00</b>

<b>5.24 Fire Station and Human Resources Building</b>	
Design Services	\$15,000.00
Refurbish Costs	186,000.00
Maintenance	3,000.00
<b>Total</b>	<b>\$204,000.00</b>

## Pinal County Airpark Electrical Infrastructure Study

<b>5.25 Building T-86 North</b>	
Design Services	\$500.00
Refurbish Costs	1,000.00
Maintenance	200.00
<b>Total</b>	<b>\$1,700.00</b>

<b>5.33 Flood Light and Fuel Building</b>	
Design Services	\$3,000.00
Refurbish Costs	\$15,000.00
Maintenance	\$3,000.00
<b>Total</b>	<b>\$21,000.00</b>

<b>5.35 T-63 Building and Yard</b>	
Design Services	\$6,000.00
Refurbish Costs	\$120,000.00
Maintenance	\$3,000.00
<b>Total</b>	<b>\$129,000.00</b>

<b>5.37 T-79 Paint Facility Building</b>	
Design Services	\$3,000.00
Refurbish Costs	\$12,000.00
Maintenance	\$1,000.00
<b>Total</b>	<b>\$16,000.00</b>

<b>5.39 T-98 Building and Fuel Pumps</b>	
Design Services	\$3,000.00
Refurbish Costs	\$25,000.00
Maintenance	\$3,000.00
<b>Total</b>	<b>\$31,000.00</b>

<b>5.40 Building T-77</b>	
Design Services	\$3,000.00
Refurbish Costs	\$12,000.00
Maintenance	\$2,000.00
<b>Total</b>	<b>\$17,000.00</b>

<b>5.41 Building T-534</b>	
Design Services	\$3,000.00
Refurbish Costs	\$42,000.00
Maintenance	\$2,000.00
<b>Total</b>	<b>\$47,000.00</b>

<b>5.40 Building T-66</b>	
Design Services	\$15,000.00

## Pinal County Airpark Electrical Infrastructure Study

Refurbish Costs	\$132,000.00
Maintenance	\$2,000.00
<b>Total</b>	<b>\$149,000.00</b>

<b>6.11 Building #10 Portables</b>	
Design Services	\$.00
Refurbish Costs	.00
Maintenance	500.00
<b>Total</b>	<b>\$500.00</b>

<b>6.12 Building Double Wide Portable Buildings T-13</b>	
Design Services	\$0.00
Refurbish Costs	\$0.00
Maintenance	\$500.00
<b>Total</b>	<b>\$500.00</b>

<b>8.01 Airfield Vault</b>	
Design Services	\$12,000.00
Refurbish Costs	\$110,000.00
Maintenance	\$10,000.00
<b>Total</b>	<b>\$132,000.00</b>

<b>8.02 Airfield Manhole and Cables</b>	
Design Services	\$10,000.00
Refurbish Costs	\$120,000.00
Maintenance	\$20,000.00
<b>Total</b>	<b>\$150,000.00</b>

<b>8.03 Airfield Lighting</b>	
Design Services	\$15,000.00
Refurbish Costs	\$399,000.00
Maintenance	\$20,000.00
<b>Total</b>	<b>\$434,000.00</b>

<b>8.04 Airfield Guidance Signage</b>	
Design Services	\$10,000.00
Refurbish Costs	\$151,000.00
Maintenance	\$10,000.00
<b>Total</b>	<b>\$171,000.00</b>

**9.03 - Total Cost Summary**



**TOTAL COST SUMMARY**

Design Services	\$ 155,500.00
Refurbishment Costs	\$2,036,000.00
Maintenance Costs	\$ 105,700.00
<b><u>TOTAL COST SUMMARY</u></b>	<b>\$2,297,200.00</b>

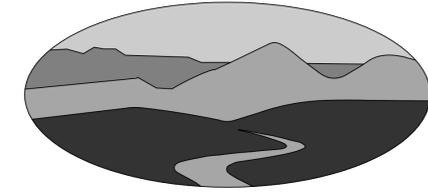


**Section 10: ABBREVIATIONS USED IN REPORT**

<b>AC</b>	ADVISORY CIRCULAR
<b>CCR</b>	CONSTANT CURRENT REGULATOR
<b>FAA</b>	FEDERAL AVIATION ADMINISTRATION
<b>GFCI</b>	GROUND FAULT CIRCUIT INTERRUPTER
<b>HP</b>	HORSEPOWER
<b>Hz</b>	HERTZ
<b>KAIC</b>	KILO AMPS INTERRUPTING CURRENT
<b>kV</b>	KILOVOLT
<b>KW</b>	KILOWATT
<b>MV</b>	MEDIUM VOLTAGE
<b>NEC</b>	NATIONAL ELECTRIC CODE
<b>NEMA</b>	NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION
<b>OH</b>	OVERHEAD LINE
<b>OSHA</b>	OCCUPATIONAL SAFETY AND HAZARD ADMINISTRATION
<b>SES</b>	SERVICE ENTRANCE SECTION
<b>VAC</b>	VOLT ALTERNATING CURRENT
<b>VDC</b>	VOLTAGE DIRECT CURRENT

# Appendix

# ELECTRICAL STUDY FOR PINAL AIR PARK



PINAL ♦ COUNTY  
*wide open opportunity*

**ELECTRICAL LEGEND:**  
(UNLESS OTHERWISE NOTED ON PLANS)

- EXISTING OVERHEAD 4160V TRANSMISSION LINE
- - - EXISTING UNDERGROUND 4160V TRANSMISSION LINE
- EXISTING OVERHEAD 25KV TRANSMISSION LINE
- - - EXISTING UNDERGROUND 25KV TRANSMISSION LINE
- · - · - EXISTING UNDERGROUND 25KV LINE (NATIONAL GUARD)
- EXISTING OVERHEAD 25KV LINE (NATIONAL GUARD)
- - - LINETYPE INDICATES EXISTING SECONDARY
  
- △ EXISTING POLE MOUNTED TRANSFORMER
- EXISTING POWER POLE
- EXISTING PAD MOUNTED TRANSFORMER
- UB EXISTING UNDERGROUND JUNCTION BOX
- EXISTING SES
- EXISTING SWITCH CABINET
- EXISTING PANEL

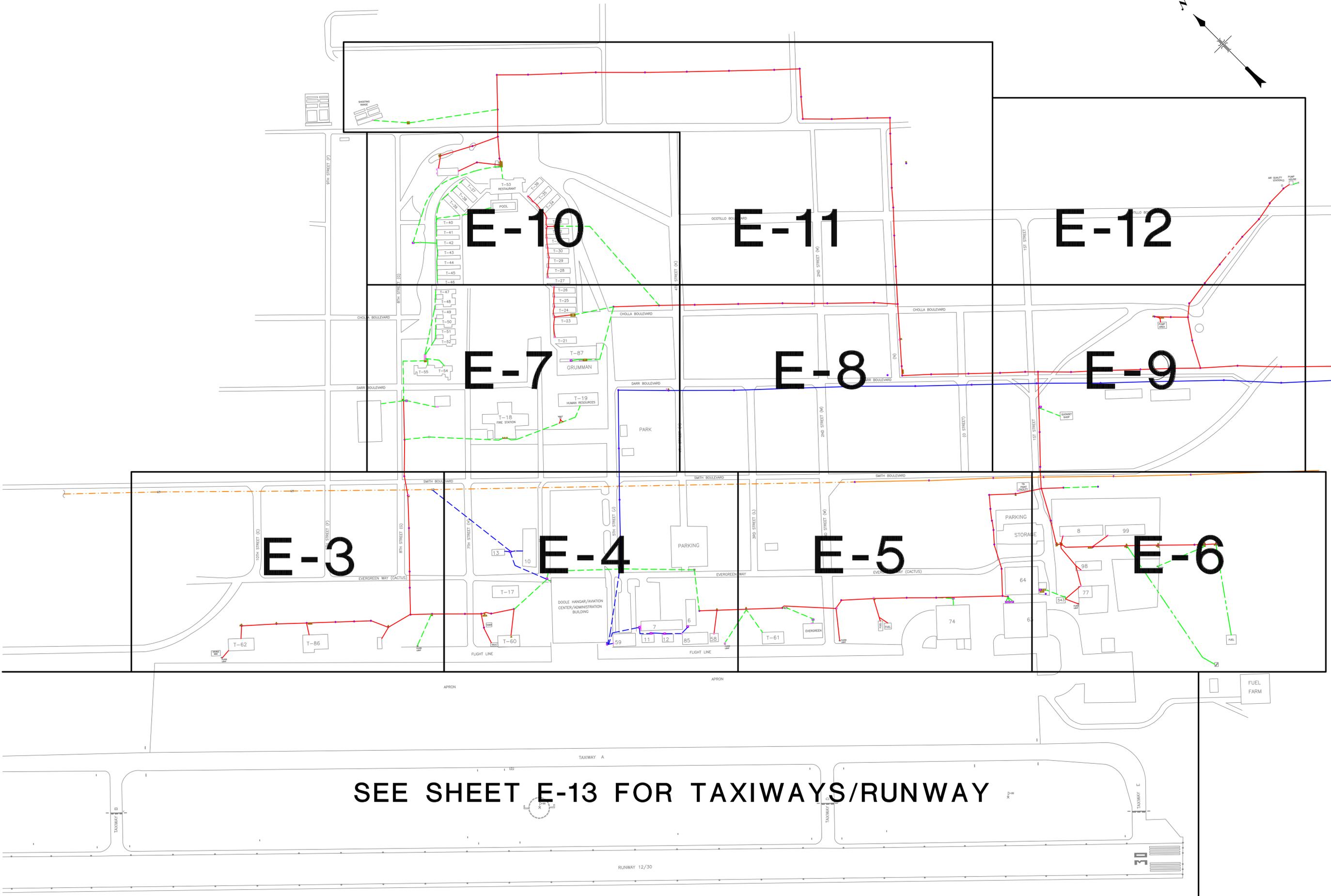
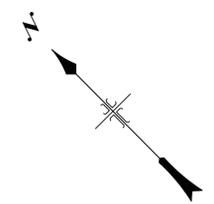
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CONSTRUCTION  
OR RECORDING

DESIGNED RD DRAWN JBW  
CHECKED CA DATE 2/13  
PROJECT NO. 12023

PINAL AIR PARK  
ELECTRICAL STUDY  
ELECTRICAL LEGEND

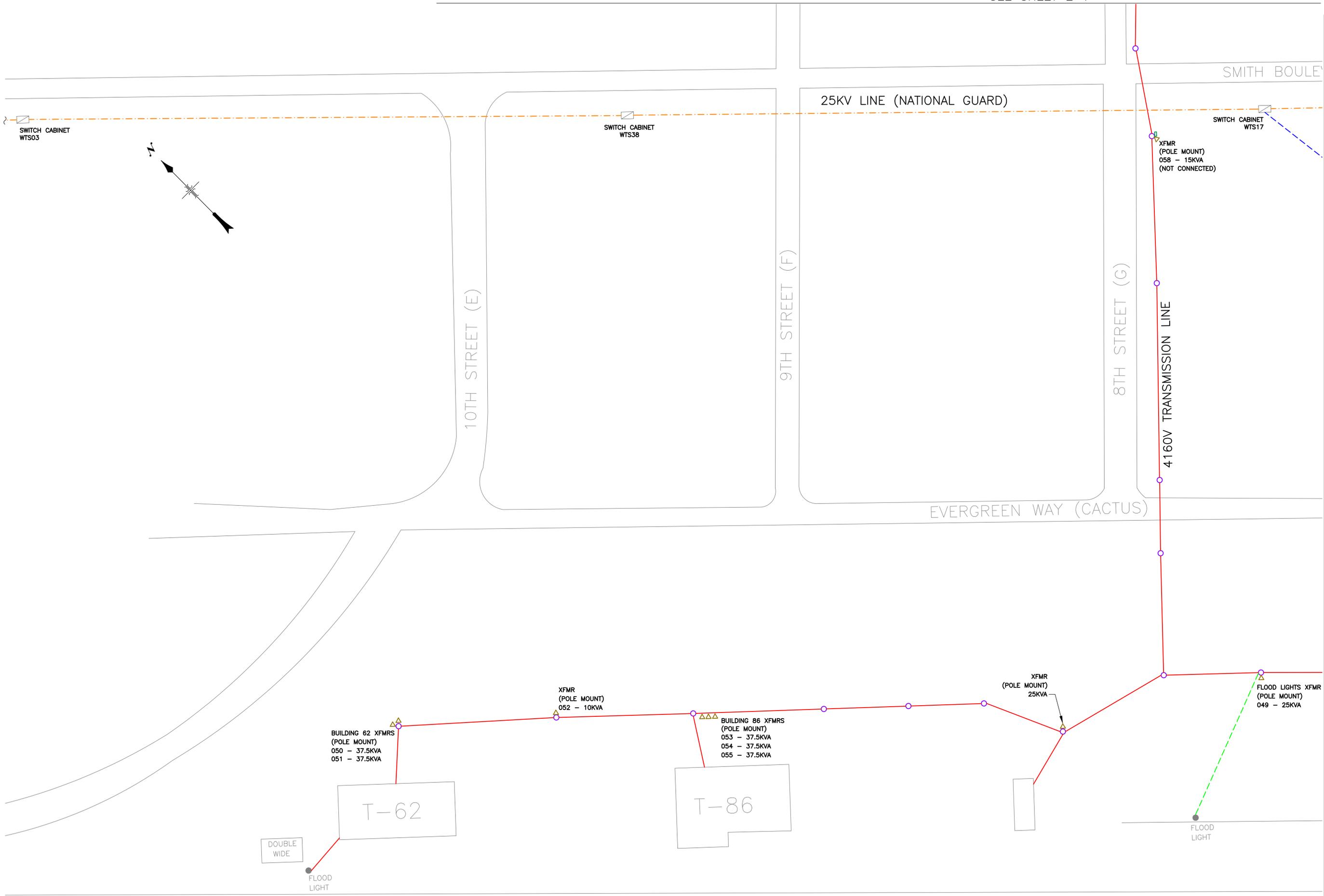


SEE SHEET E-13 FOR TAXIWAYS/RUNWAY

NOT TO SCALE

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CHECKED <u>CA</u>	DATE <u>2.13</u>
PROJECT NO. <u>12023</u>	
PINAL AIR PARK ELECTRICAL STUDY OVERALL ELECTRICAL SITE PLAN	
<b>E-2</b>	

SEE SHEET E-7



SEE SHEET E-4

DESIGNED	RD	DRAWN	JBW
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		PROJECT NO. 12023	

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**CR** engineers

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**PINAL AIR PARK**  
ELECTRICAL STUDY  
PARTIAL ELECTRICAL SITE PLAN

**E-3**

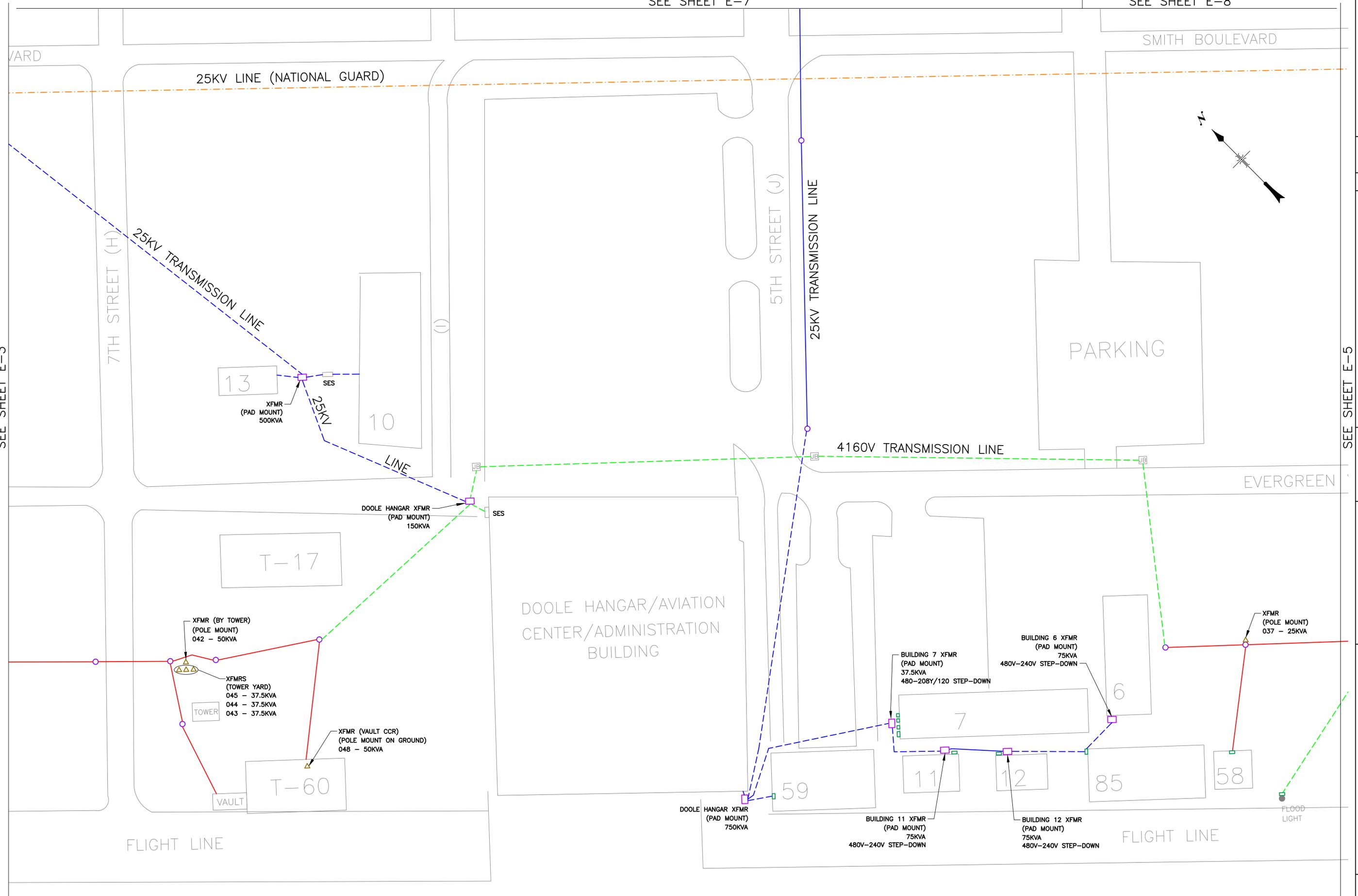
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SEE SHEET E-7

SEE SHEET E-8

SEE SHEET E-3

SEE SHEET E-5



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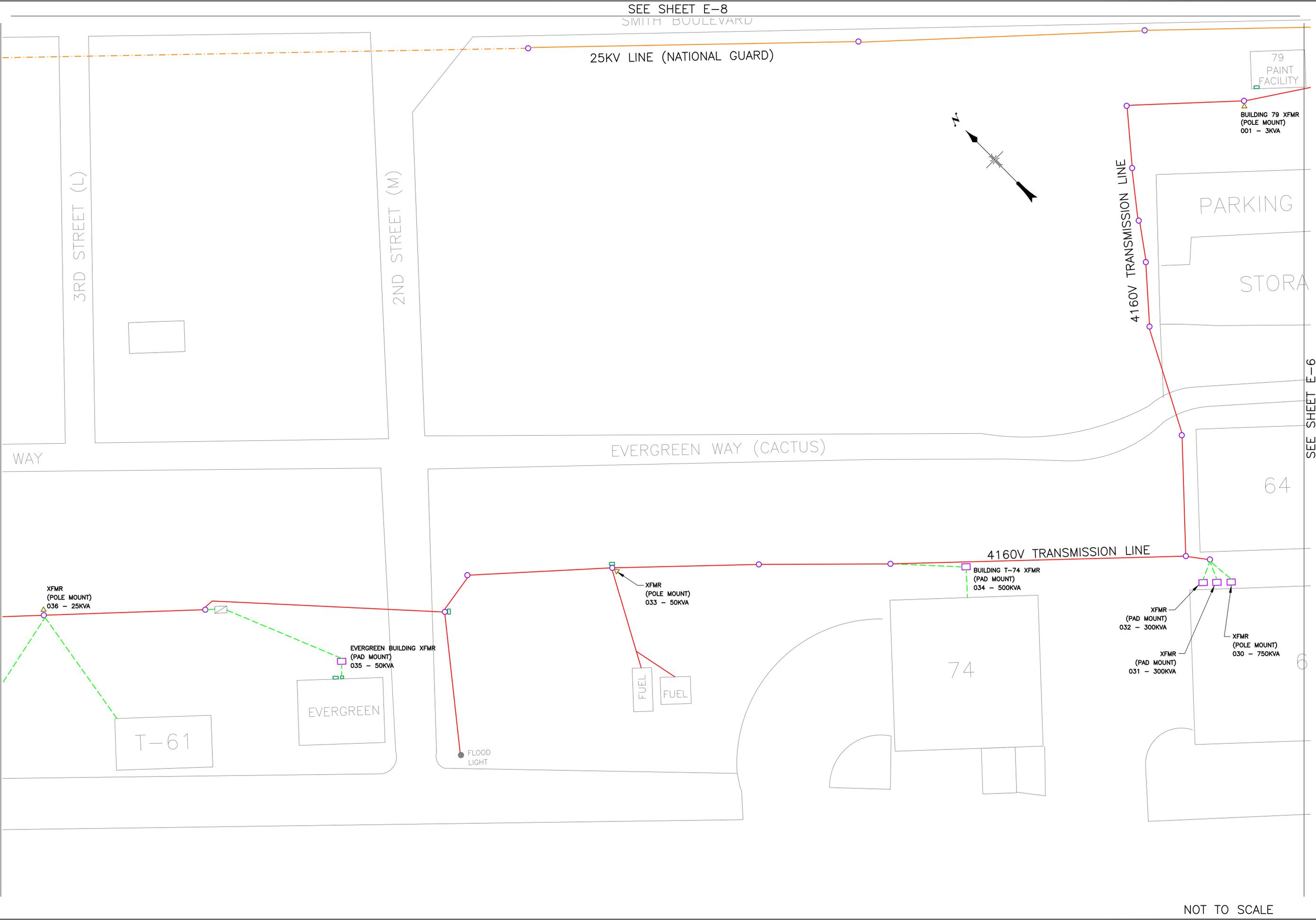
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 DRAWN BY JBW  
 CHECKED BY CA  
 DATE 2.13.23  
 PROJECT NO. 12023

**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
**PARTIAL ELECTRICAL SITE PLAN**

**E-4**

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SEE SHEET E-4



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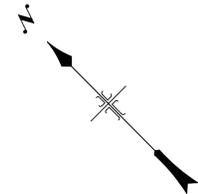
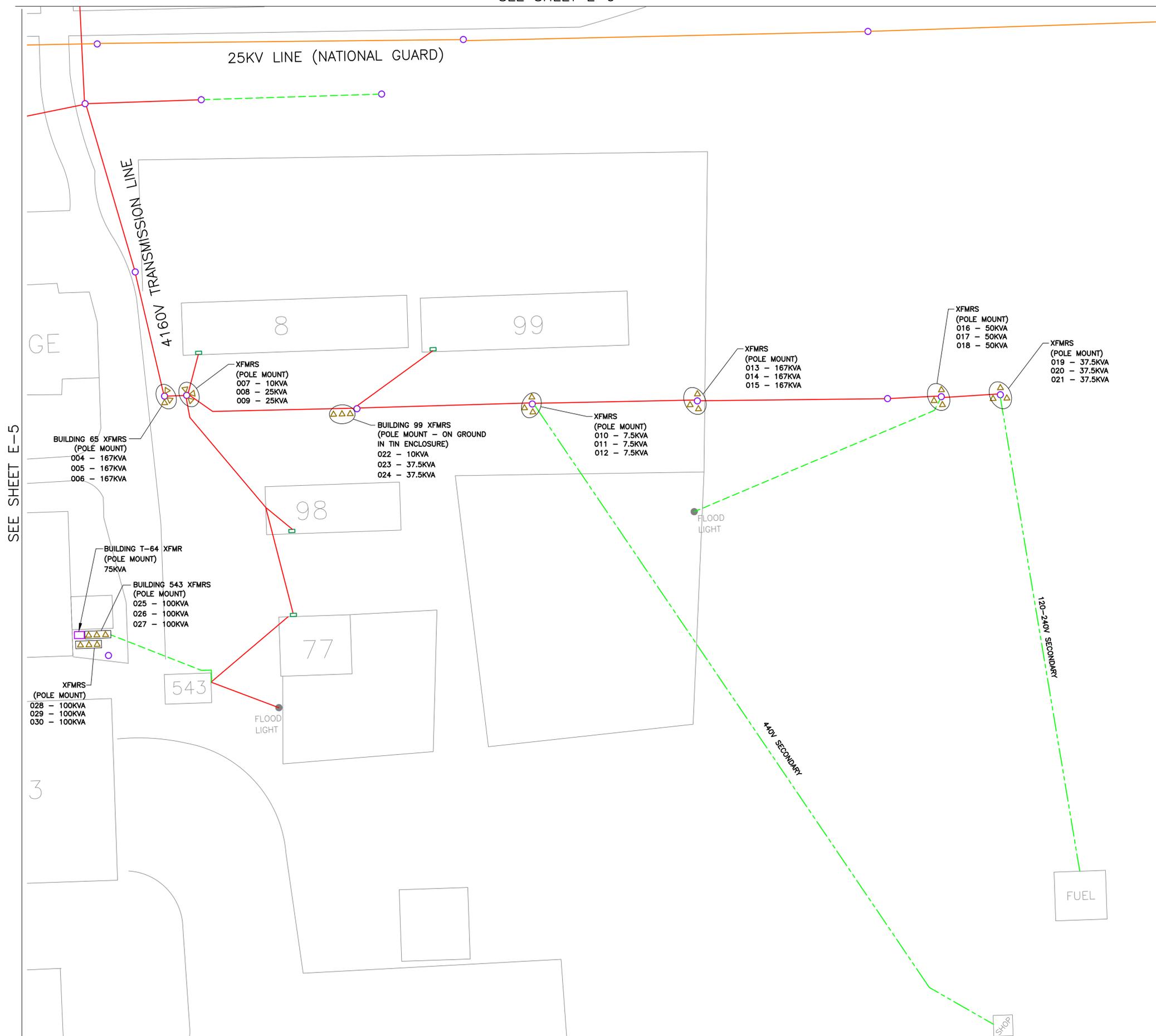
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PINAL AIR PARK  
ELECTRICAL STUDY  
PARTIAL ELECTRICAL SITE PLAN

**E-5**

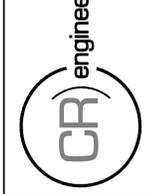
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SEE SHEET E-9



SEE SHEET E-5


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PROJECT NO.			12023

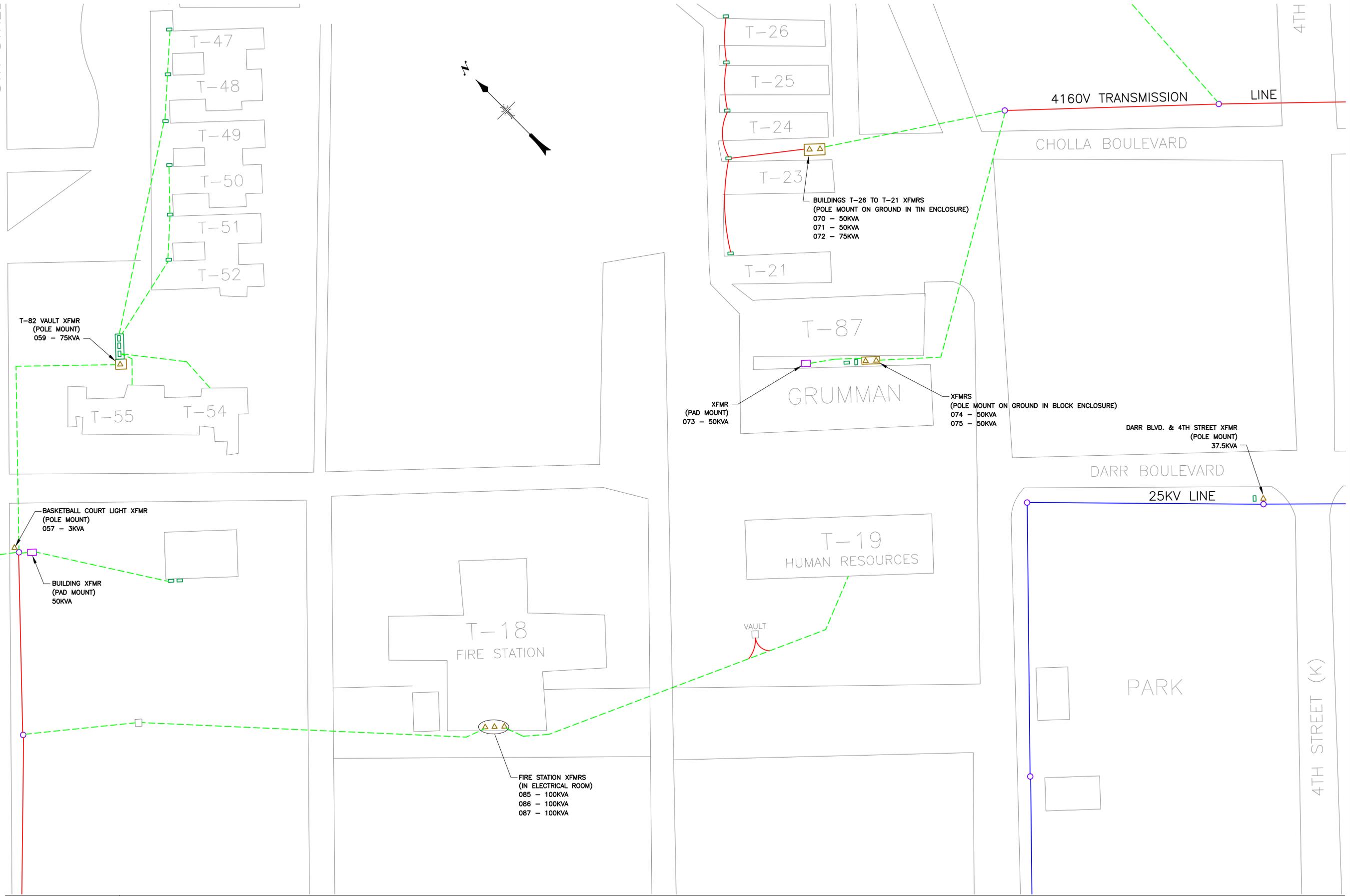
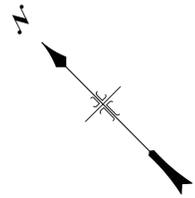
**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
 PARTIAL ELECTRICAL SITE PLAN

**E-6**

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SEE SHEET E-10

0111 J11ALL



SEE SHEET E-3

SEE SHEET E-4

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SEE SHEET E-8

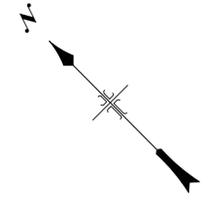
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PROJECT NO. 12023			
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<b>E-7</b>			

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SEE SHEET E-11



4160V TRANSMISSION LINE

CHOLLA BOULEVARD

XFMR  
(POLE MOUNT)  
076 - 3KVA

XFMRs  
(POLE MOUNT)  
082 - 37.5KVA  
083 - 37.5KVA  
084 - 37.5KVA

4160V TRANSMISSION LINE

DARR BOULEVARD

25KV LINE

2ND STREET (M)

(O STREET)

SMITH BOULEVARD

SMITH BOULEVARD

SEE SHEET E-5

NOT TO SCALE

SEE SHEET E-7

SEE SHEET E-9

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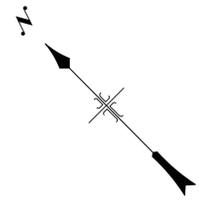
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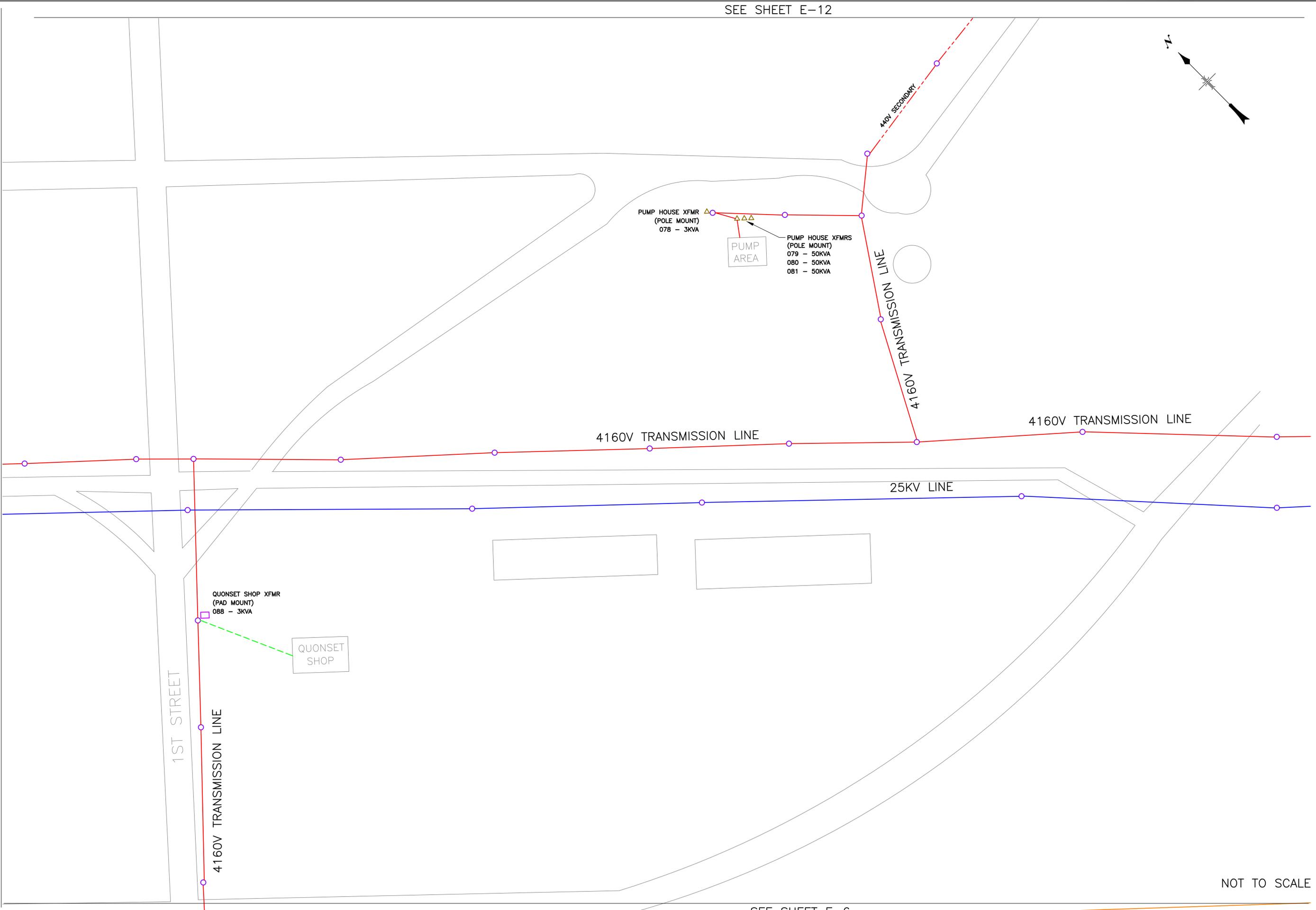
**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
**PARTIAL ELECTRICAL SITE PLAN**

**E-8**

SEE SHEET E-12



SEE SHEET E-8



1ST STREET

4160V TRANSMISSION LINE

QUONSET SHOP XFMR  
(PAD MOUNT)  
088 - 3KVA

QUONSET  
SHOP

4160V TRANSMISSION LINE

25KV LINE

4160V TRANSMISSION LINE

4160V TRANSMISSION LINE

440V SECONDARY

PUMP HOUSE XFMR  
(POLE MOUNT)  
078 - 3KVA

PUMP HOUSE XFMR  
(POLE MOUNT)  
079 - 50KVA  
080 - 50KVA  
081 - 50KVA

PUMP  
AREA

NOT TO SCALE

SEE SHEET E-6


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**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
 PARTIAL ELECTRICAL SITE PLAN

**E-9**

SEE SHEET E-11

LAUNDRY NE XFMR  
(POLE MOUNT)  
061 - 100KVA  
062 - 100KVA  
063 - 100KVA

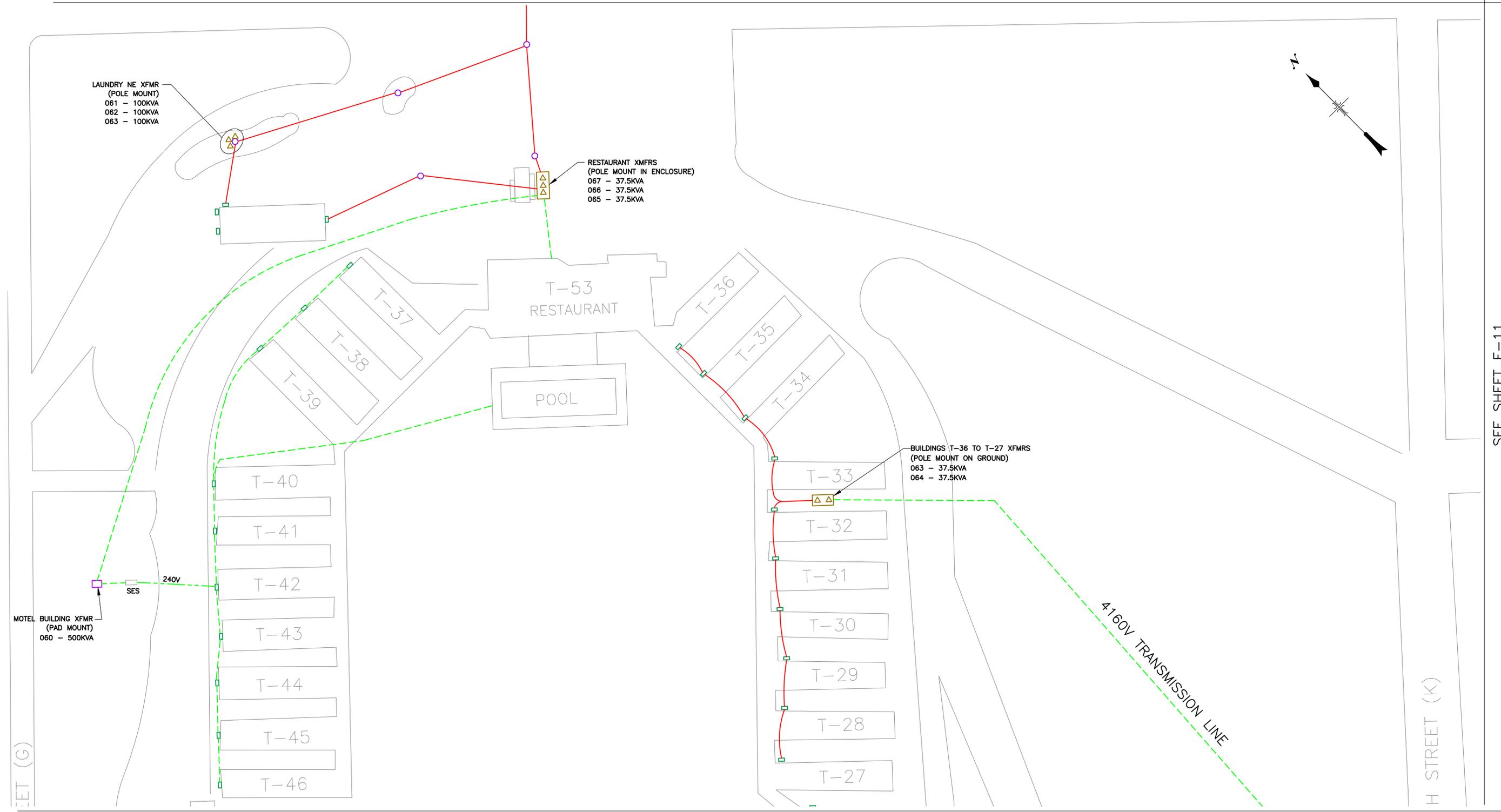
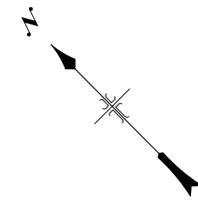
RESTAURANT XMFRS  
(POLE MOUNT IN ENCLOSURE)  
067 - 37.5KVA  
066 - 37.5KVA  
065 - 37.5KVA

BUILDINGS T-36 TO T-27 XMFRS  
(POLE MOUNT ON GROUND)  
063 - 37.5KVA  
064 - 37.5KVA

MOTEL BUILDING XFMR  
(PAD MOUNT)  
060 - 500KVA

240V

4160V TRANSMISSION LINE



SEE SHEET E-7

SEE SHEET E-11

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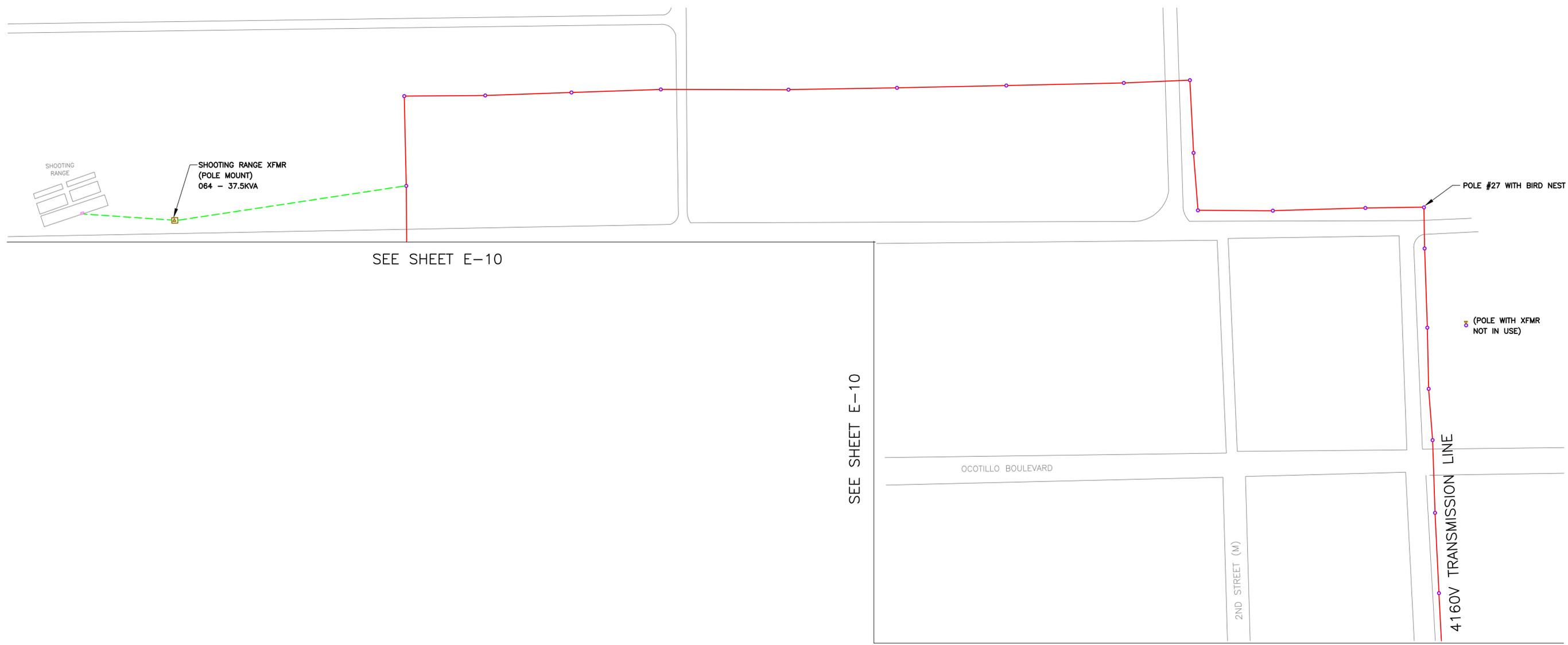
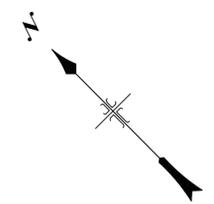
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**PINAL AIR PARK**  
ELECTRICAL STUDY  
PARTIAL ELECTRICAL SITE PLAN

**E-10**

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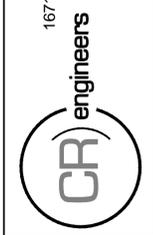
SEE SHEET E-10

SEE SHEET E-10

SEE SHEET E-8

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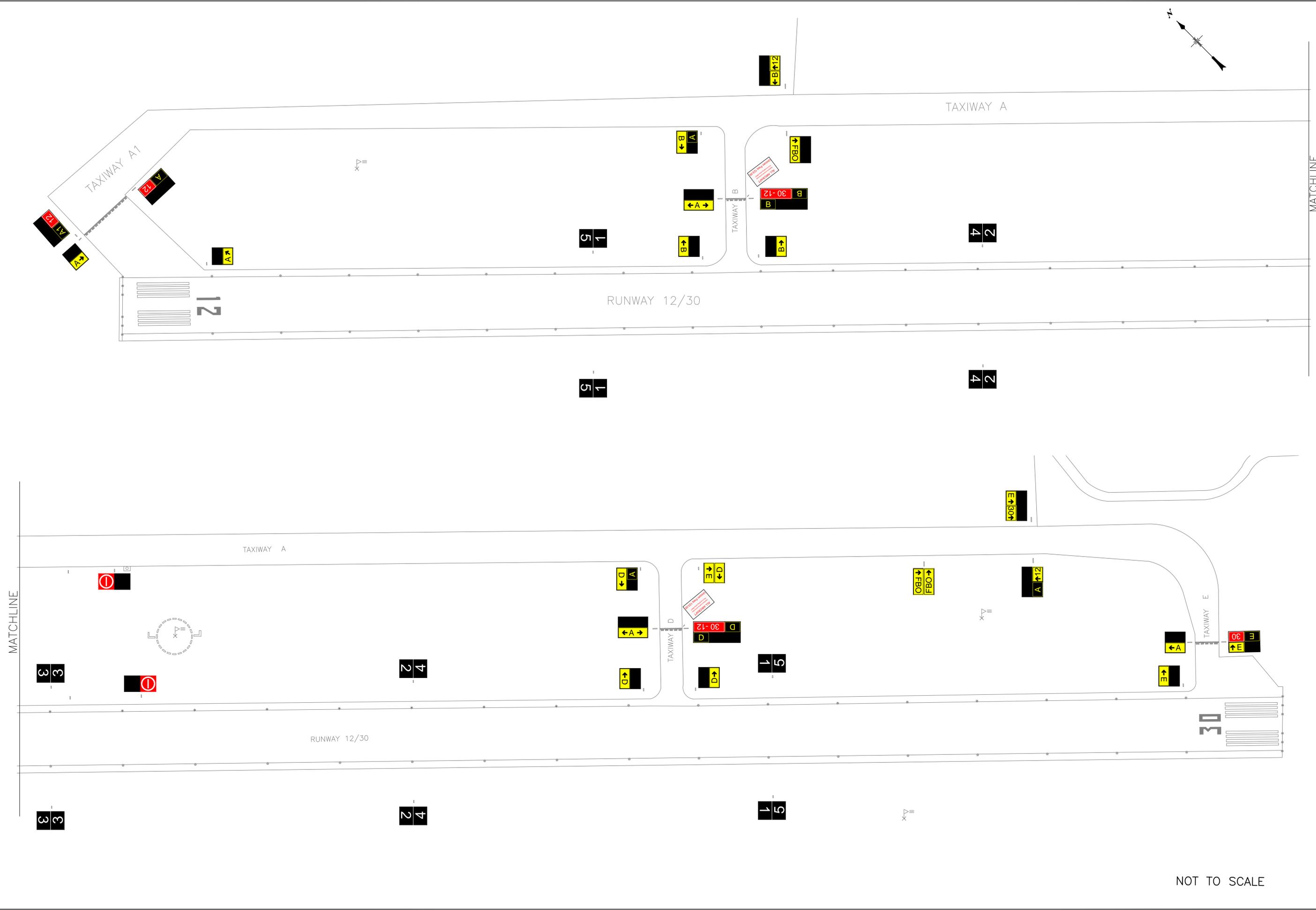
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**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
 PARTIAL ELECTRICAL SITE PLAN

**E-11**





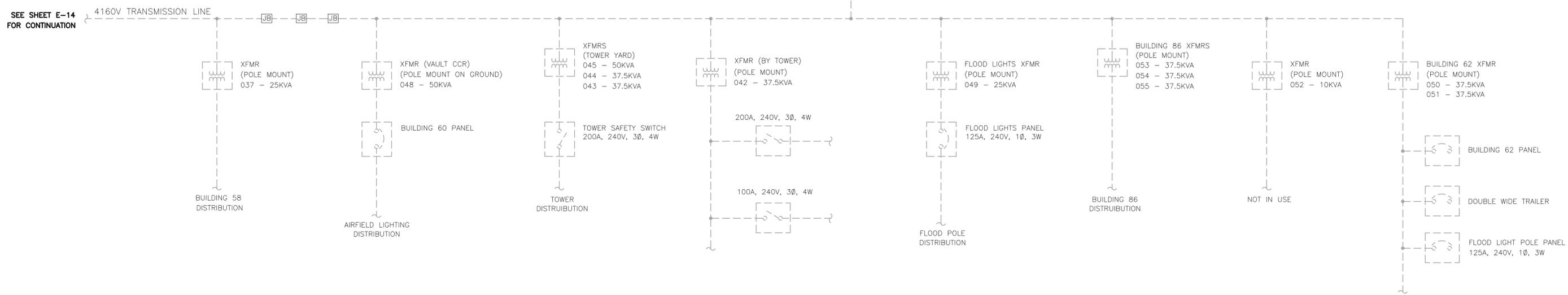
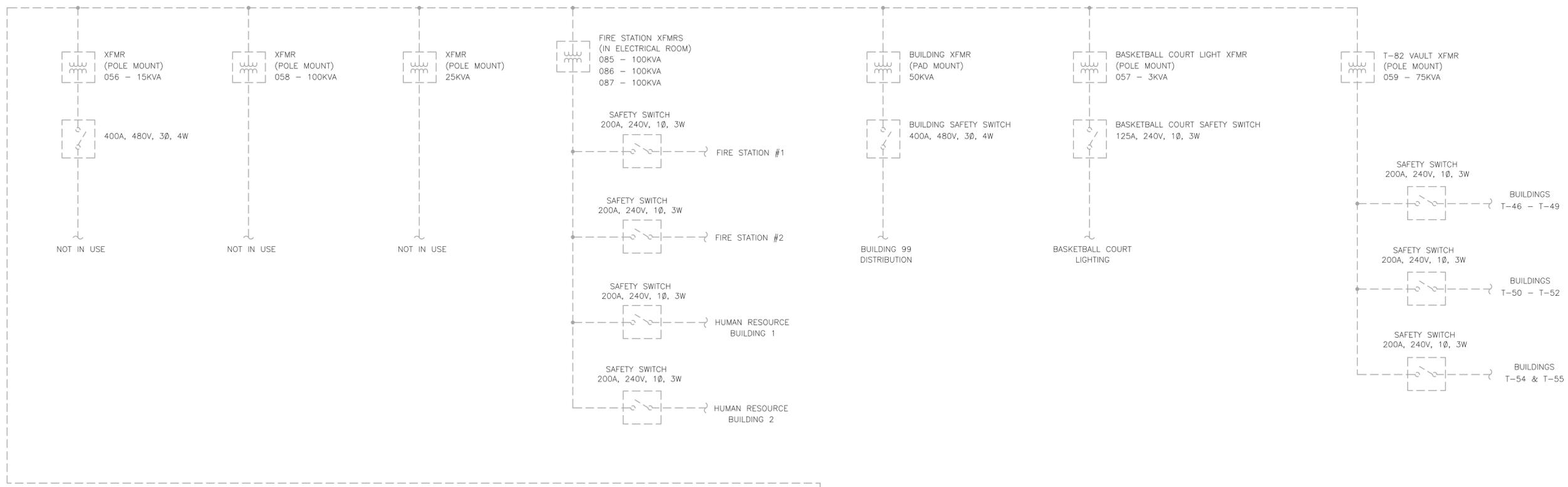
MATCHLINE

MATCHLINE

NOT TO SCALE

	
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PROJECT NO. 12023	
<p><b>PINAL AIR PARK          ELECTRICAL STUDY          PARTIAL ELECTRICAL SITE PLAN</b></p>	
<p><b>E-13</b></p>	





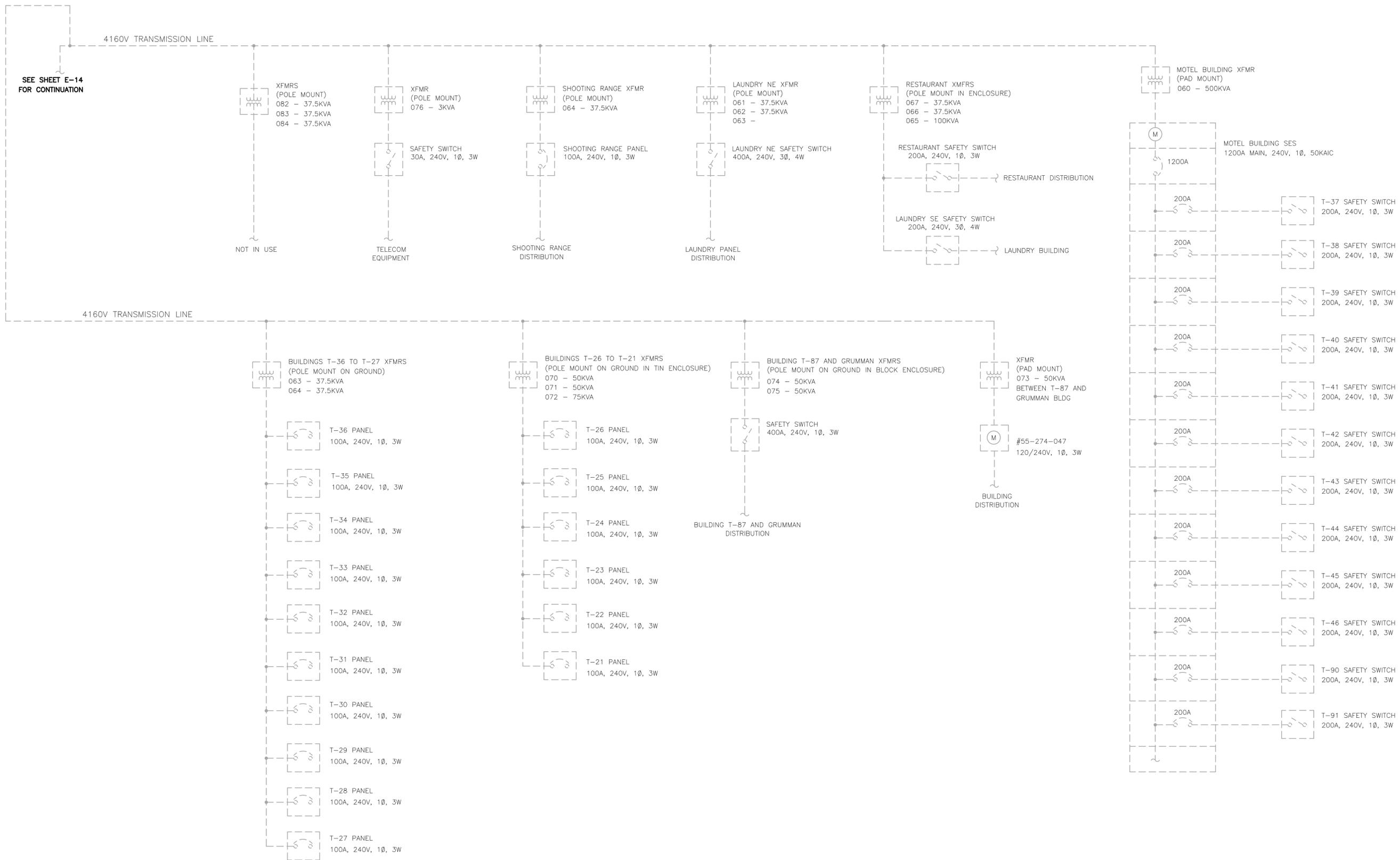

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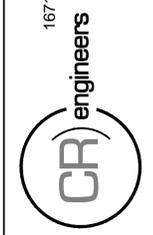
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**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
 EXISTING SINGLE LINE DIAGRAM  
 4160V TRANSMISSION LINE



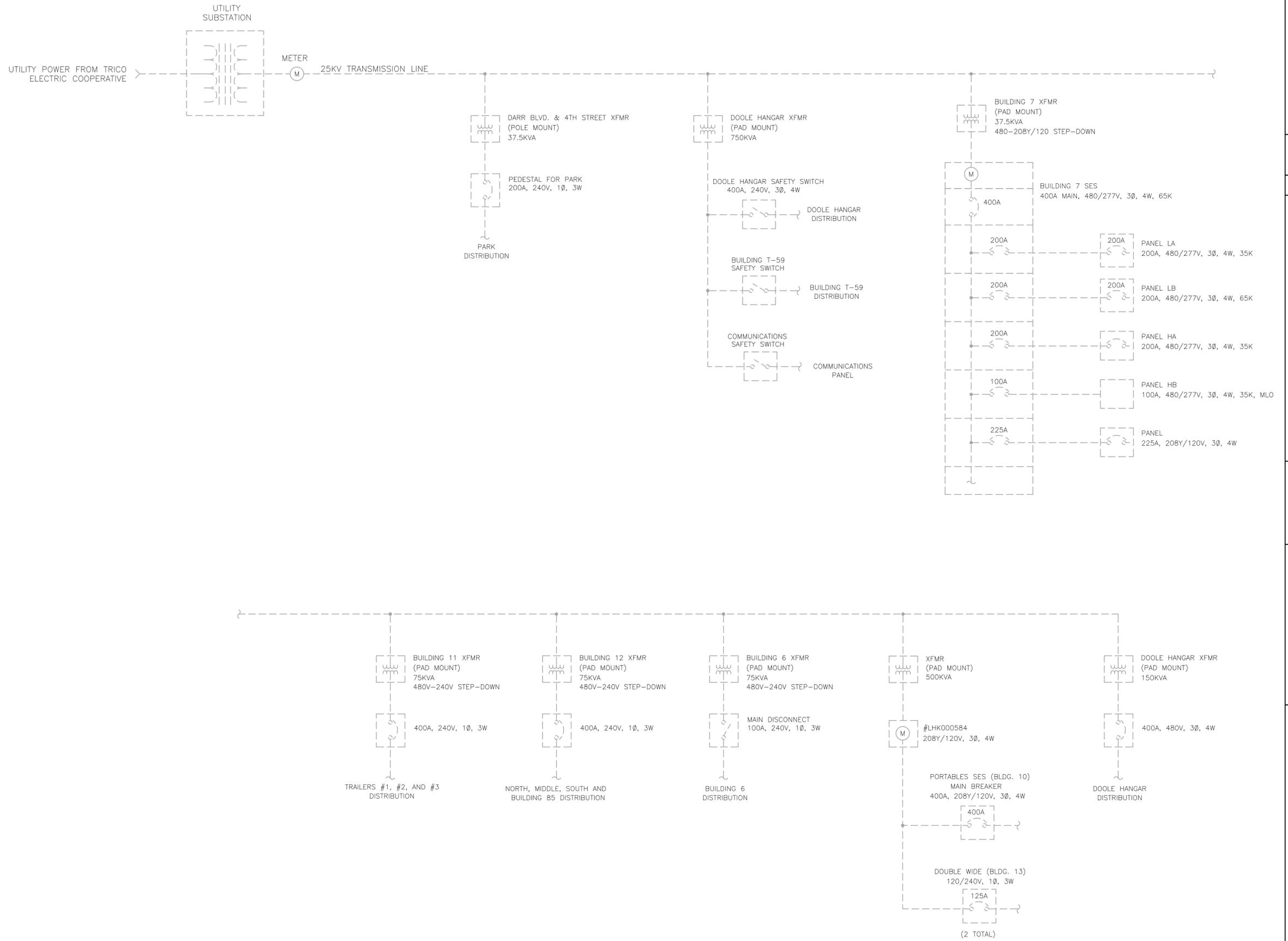
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**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
**EXISTING SINGLE LINE DIAGRAM**  
**4160V TRANSMISSION LINE**



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**PINAL AIR PARK**  
**ELECTRICAL STUDY**  
 EXISTING SINGLE LINE DIAGRAM  
 25KV TRANSMISSION LINE