WINTER HAVEN
The Chain of Lakes City

EVALUATION OF AIRFIELD BEACON AND PAPI UNITS

WINTER HAVEN REGIONAL AIRPORT

Winter Haven, Florida

FINAL REPORT

May 2022

AVCON, INC.
5555 E. Michigan Street
Suite 200
Orlando, FL 32822
407.599.1122
407.599.1133
www.avconinc.com
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APPENDICES

1. PROJECT DATA

The project takes place at the Winter Haven Regional Airport (GIF). The scope of work is as follows:

- Conduct a site visit to visually inspect the existing airfield beacon and PAPI Units on Runway 5-23;
- Identify equipment Manufacturer, type/model, condition, age, etc. of the equipment;
- Due to costs associated with an aerial lift and the age of the existing beacon, the beacon evaluation will not include up-close up mechanical inspection, but rather a desktop evaluation of replacement options.
- Identify if existing equipment meets current FAA criteria;
- Recommend rehabilitation/replacement/improvements for subject equipment, as necessary.
- Compare energy usage of existing equipment versus new (LED) equipment;
- Consider LED options for incorporation in proposed equipment;
- Identify if existing concrete pads and base cans can be reused for PAPI Units;
- Evaluate existing airfield beacon location and recommend alternate, improved siting, if necessary. This evaluation does not include FAA coordination for beacon siting;
- Provide rough order of magnitude cost estimate for the recommended rehabilitation/replacement/improvements for subject equipment; and
- Prepare a brief narrative summary of the evaluation findings and recommendations

2. SITE INFORMATION

Winter Haven Regional Airport (GIF) is located within the City of Winter Haven immediately south of U.S. Highway 92. The airport is owned and operated by the City of Winter Haven which provides a full range of services to the general aviation community. The airport property comprises approximately 520 acres. The Airport Reference Point (ARP) is latitude 28-03-46.5 N and 81-45-11.9 W and the airport elevation is 145 feet above mean sea level. The airport property is relatively flat. Winter Haven Regional Airport consists of a 5,006 foot x 100 foot primary paved runway (Runway 5-23), a 4,001 foot x 100 foot paved crosswind runway (Runway 11-29), associated taxiways, hangars, FBO, Airport Administration Building, and a fueling facility. Runway 5-23 is equipped with PAPIs, REILSs, and GPS approaches, allowing for non-precision operations. General aviation constitutes the majority of the airport's annual activity.

3. DESCRIPTION OF WORK

RUNWAY 5-23 PRECISION PATH APPROACH INDICTOR (PAPI):

A PAPI system has several purposes. The primary purpose is to aid a pilot to maintain a safe distance above hazards in the approach to the runway surface and provide a visual aiming point with the PAPI to reduce the probability of undershoots and overshoots during landing.

2 box, L-881, PAPI systems are normally installed on runways that are not provided with electronic guidance, on non-Part 139 airports. The system can be expanded to a 4 box, L-880, system when jet aircraft operations are introduced or expected in future operations.

Existing Conditions:

Each end of Runway 5-23 is equipped with a 2-box, L-881, Style A, voltage driven PAPI system installed on the left side of each runway approach at a distance which corresponds to each runways threshold clearance height (TCH). Criteria for siting and location of PAPI units has changed from when these units had been originally sited and installed. Additional discussion of this topic is provided later in this report under ***Siting and Location of PAPI Units***.

In generic terms, the TCH establishes minimum vertical distance an aircraft should be from the ground elevation of the threshold as the aircraft crosses the threshold. This height is determined by the aircraft type, visual glide angle and obstacles in the approach of the runway. FAA Form 5010 “Airport Master Record” identifies that each PAPI system is set for a 3-degree glide path and that Runway 5 has a TCH of 45 feet and Runway 23 has a TCH of 44 feet.

Each of the existing PAPI systems are voltage driven, type A, systems with a Power Control Unit (PCU) and photocell to control the intensity of the lighting during day and night operations. Each system has 2 Light Housing Assemblies (LHA) with two incandescent lamps in each LHA. The source of power for both systems is in the Airfield Lighting Vault (ALV) from an appropriately sized circuit breaker located in the power distribution panel and a contactor that is interfaced to the airfield lighting control system. The line voltage for each PAPI system is 240 Volts, 60 Hz, single phase power.

ALV power distribution Panel provides power to the two (2) PAPI systems on the airfield. The PAPI power is turned on/off at the ALV by circuit breaker “9” in the power distribution panel. The power can also be disconnected locally at the Runway 23 set of PAPI’s from an external disconnect switch. Runway 5 PAPI system does not have a local power disconnect and power must be disconnected at the Airfield Lighting Vault.

The intensity of the PAPI lighting is controlled by Photosensor mounted to the PCU at each set of PAPI’s. The photosensor controls the light output by providing a control signal to the PCU. During daylight hours the PCU outputs 6.6 amps of power to provide the highest light intensity and during night hours the PCU outputs a lower amperage to

adjust the light intensity to a lower setting that remains clearly visible in the runway approach but does not interfere with the pilot's vision or the local surrounding area.

Runway 5 is equipped with an ADB Airfield Solutions PAPI system manufactured and installed in 2012, **(See Appendix B, Figures 1-5)**. The PAPI system for this runway end is 10 years old. Runway 5 PAPI does not have a power disconnect at the PCU. Power needs to be locked out and tagged out at the ALV when working on this unit. The photosensor, located on the top of the PCU, controlling the intensity of the lighting is damaged and will eventually allow water to enter the PCU, **(See Appendix B, Figures 4&5)**. An immediate repair of the photocell and closure of the opening should be undertaken to prevent damage to the internal electronics of the PCU.

Runway 23 is equipped with a ADB Siemens PAPI system manufactured and installed in 2000, **(See Appendix B, Figures 6-10)**. The PAPI for this runway end are 22 years old. Runway 23 PAPI has a power disconnect at the PAPI location and does not meet FAA criteria requirements as stated in Engineering Brief 79, **(See Appendix B, Figures 8&9)**. EB 79 does not permit the disconnect attached to the PCU to be within the ROFA of the runway. This disconnect must be placed outside the ROFA.

Please note, although both units are ADB, ADB had gone through a series of acquisitions over its history. Hence the unit form 2000 was manufactured during the time that Siemens had acquired ADB, and the 2012 unit was manufactured after Siemens relinquished ownership of ADB back to ADB.

Airport Lighting and NAVAID estimated replacement durations are provided in Table 3-7 "Minimum Useful Life" criteria is defined in FAA Order 5100.38D Change 1, dated February 26,2019, the current version of the Airport Improvement Program Handbook. This table line item "f. Airfield lighting and signage" states the minimum useful life of the equipment as 10 years. "j. NAVAIDS and Weather Reporting Equipment" states the minimum useful life of the equipment as 15 years.

NAVAID Fixed by Function Requirements:

FAA Engineering Brief No. 79 (EB-79), *Determining RSA NAVAID Frangibility and Fixed-By-Function Requirements* provides criteria and guidance for determining whether navigational aids, such as PAPI's, are fixed by function and whether they meet frangibility standards inside the Runway Safety Area (RSA).

EB 79 elaborates on whether the individual components of a NAVAID are fixed-by-function and if these components can remain in the RSA. In general terms junction boxes, Power Control Units (PCU), Power Control Assembly (PCA) and other appurtenances that support fixed-by-function NAVAIDS are NOT considered fixed-by-function and must be removed from the RSA.

In addition to fixed-by-function criteria for the RSA, there is also siting criteria for a component or object being fixed-by-function for the Runway Object Free Area (ROFA), such as disconnect switches and power racks.

EB79 currently mandates the PAPI Power and Control Unit (PCU) be located, at a minimum, outside the Runway Safety Area (RSA) and meet frangibility requirements. Supporting electrical distribution equipment, disconnect switches and power racks, must be located outside the Runway Object Free Area (ROFA). To mitigate any possible discretions, AVCON recommends removing all non-fixed-by-function components outside of the ROFA.

The existing external disconnect switch and the PCU are mounted on frangible mounts, but the component location does not comply with FAA EB 79 fixed-by-function criteria.

FAA AC 150/5345-28G, Precision Approach Path Indicator (PAPI) Systems, 9/29/2011 states that the maximum allowable distance between the outside light housing assembly and the PCU is 100 feet. At GIF the distance from the outside PAPI light housing assembly to the ROFA is approximately 140 feet. The 100-foot requirement limits the ability to move the PCU out of the ROFA. For this reason, current driven FAA Style B PAPIs should be considered. Another reason to consider using a current driven PAPI is the routing of power cables to the PAPI units in the field. The existing voltage-powered circuits are in the same duct bank and manhole system as the 5 kV airfield lighting series circuit cables. Chapter 5 of National Electric Code (NEC) Section 300.3(C) prohibits mixing the 5 kV airfield lighting series circuit unshielded cables with the 1000 volt and less voltage powered PAPI cables in the same raceway or enclosure.

Siting and Location of PAPI units:

The siting and location of PAPI units is defined using two FAA criteria documents. FAA Advisory Circular (AC) 150/5340-30 “Design and Installation Details for Airport Visual Aids“ current version J and FAA Engineering Brief #95 “Additional Siting and Survey Considerations for Precision Approach Path Indicator (PAPI) and other Visual Glide Slope Indicators (VGSI).

FAA AC 150/5340-30 provides the basic criteria for siting of a runway PAPI system so that the PAPI defines an approach with sufficient clearance over obstacles and a minimum threshold crossing height (TCH). To determine the location of the PAPI the following criteria is taken into consideration:

a) Threshold Crossing Height: The TCH is determined by the height group, 1-4, of the aircraft primarily using the runway. The height group is determined by the height of the cockpit to wheel height of the aircraft.

b) Lowest on Course Signal: This is the lowest on course angle of the light signal presented to the pilot to maintain the visual glide slope and remain clear of obstacles in the approach. This angle is not the same as the typical 3-degree visual glide slope angle and is 15 minutes lower than the visual glide slope angle.

c) The slope of the Runway from the threshold to the location of the PAPI Runway Reference Point for touch down. The slope of the runway must be considered to obtain the required TCH.

d) The Obstacle Clearance Surface (OCS) which is an imaginary surface beginning 300 feet in front of the PAPI unit on the runway centerline, extending 4 nm into the approach, and 10 degrees each side of the runway centerline.

This above information is used to perform the required calculations to determine the distance of the PAPI from the runway threshold and provide clearance over obstacles within the OCS.

Engineering Brief (EB) 95, Additional Siting and Survey considerations for Precision Approach Path Indicator (PAPI) and Other Visual Glides Slope Indicators (VGSI) was issued in December 2017 outlining additional requirements when siting PAPI units. This EB provided clarification and guidance to be taken during design phase of new PAPI installations and/or recommissioning of an existing PAPI system.

EB 95 extends the evaluation of the obstacle clearance within the lateral limits of the visible light beam, even if it means going ***outside*** the standard 10-degree to 10-degree obstacle protection area centered on the runway. It also states, if the obstacle outside the standard 10-degree azimuth poses a risk to aircraft maneuvering to land, the azimuth spread of the light beam shall be suitably restricted so that the object remains outside the confines of the light beam. In basic terms, the FAA is concerned with obstacles that will interfere with the PAPI light beam outside of the 10 degree zone and has defined a new Clearance Surface and Survey requirement referred to as: PAPI Light Signal Clearance Surface (LSCS). This is in addition to the previous OCS, **(See Appendix B, Figures 11&12)**

The LSCS originates at the LHAs and proceeds outward at an angle of 1 degree less than the lowest course signal and extends 14 degrees to the left side of the first LHA (closest to runway), the area between, and 14 degrees to the right side of the outermost LHA (farthest from the runway), **(See Appendix B, Figure 11)**. The lowest course signal for 4-box PAPI (L-880) is the aiming angle of the third LHA and for 2-box PAPI (L-881) is the aiming angle of the unit farthest from the runway. The LSCS extends from the point of origin, as shown in **Figure 11** for a two box L-881 PAPI, and to a distance of 8 nautical miles from the runway threshold.

This survey shall be completed to determine obstacles within the LSCS and mitigation efforts shall be undertaken to limit obstacles with the visible light beam of the PAPI. If the obstacle cannot be removed, the most common method of mitigation is to baffle the PAPI light beam, **(See Appendix B, Figure 12).**

PAPI Recommendations:

LED PAPI units are available providing substantially greater lamp life, estimated at 50,000 hours, than the current incandescent bulbs as well as reducing the electrical load at each location. The load for each existing incandescent PAPI system is approximately 1650 VA whereas the equivalent LED system would require 264 VA for each installation. Representing an 84% reduction in electrical load per system. The circuit breakers in the vault would be replaced as well as the conductors from the vault to the PAPI locations. Type B, CCR driven units, would be preferred depending on vault space for a new CCR.

If Type A, voltage driven units, are determined to be the installed a small 30 AMP NEMA 4X disconnect would be installed outside the ROFA to permit disconnecting the power from the PAPI in the field to service the PAPI unit and an alternate conductor pathway would be determined to separate the voltage driven circuit from the 5kv airfield circuits.

AIRPORT ROTATING BEACON

Existing Conditions:

Panel A provides power to beacon that is immediately next to the Airfield Lighting Vault, **(See Appendix B, Figures 13-16).** The source of power for the Airport Beacon is in the Airfield Lighting Vault (ALV) from an appropriately sized circuit breaker located in Panel A and a contactor that is interfaced to the airfield lighting control system. The line voltage for the beacon is 240 Volts, 60 Hz, single phase power.

GIF has two beacon assemblies located next to the Airfield Lighting Vault. The first beacon is mounted on a concrete pole and is an RB4, 4 headed beacon assembly which was manufactured by ADB in the late 1980's. This unit has been discontinued prior to 2000 and is no longer supported by the manufacturer. The unit is estimated to be at least 22 years old and is not functioning, **(See Appendix B, Figure 15).**

The second unit is a DCB-224 Beacon assembly which was manufactured by Carlisle and Finch Company and was originally designed for use in lighthouses throughout the United States in the 1950's. The unit uses two 400-watt metal halide lamps enclosed in an aluminum drum assembly with a set of parabolic reflectors for the light output. This unit is no longer in production and service components can be difficult to obtain. This beacon assembly is mounted atop a steel cage type mast estimated to be 60 feet in height. The mast does not have a climbing system to secure a maintenance person and requires of a motorized lift to perform bulb changes or maintenance of the unit, **(See Appendix B, Figure 16).**

Currently, neither beacon assembly has obstruction lights mounted alongside the units. The obstruction lights would illuminate if the beacon lamps were to fail providing identification to a pilot of the pending obstacle.

Each beacon pole, **(See Appendix B, Figures 13&14),** does have a strike termination device, air terminal, installed, but no visible grounding electrode can be identified for the concrete pole mounted RB-4 unit. The Steel tower for the DCB-224 Beacon is bonded at the base to a grounding electrode with the steel tower providing the connection between the beacon mount and the grounding electrode. A separate bonding conductor is not present between the air terminal and grounding electrode.

Airport rotating beacons typically have an expected life of up to 20 years depending upon the impacts of environmental conditions, as well as the quality and frequency of the maintenance performed over the life of the equipment. The Airport's existing DCB-2224 L-802A high intensity rotating beacon is estimated to be more than 30 years old, has been impacted by the environmental conditions, and is obsolete, beyond its useful life due to unavailability of spare parts. The RB-4 beacon assembly is estimated to be more than 22 years old, is no longer in production and beyond its useful life due to unavailability of spare parts. It is ultimately recommended to produce a project for a complete airport rotating beacon and pole assembly replacement.

Beacon Recommendations:
LED Beacon units are available providing substantially greater lamp life, estimated at 50,000 hours, than the current incandescent bulbs as well as reducing the electrical load by approximately 75% over traditional metal halide lamps. The circuit breaker in the vault would be replaced as well as the conductors from the vault to the beacon location. A small 30 AMP NEMA 4X disconnect would be installed next to the beacon to permit disconnecting the power locally from the beacon. A siting study will be conducted to determine the best location of the beacon assembly and determine if a tipdown pole assembly may be used in lieu of the traditional steel structural pole assembly. A Tell-Tale relay will be installed to the beacon along with proper obstruction lighting. The Tell-Tale relay initiates the illumination of the obstruction light if the beacon lighting should fail. All new grounding and bonding of the beacon and beacon pole will be included in the replacement design.

4. OVERALL RECOMMENDATIONS

NAVAIDs (PAPIs,) – AVCON recommends the replacement for each of the Airport-owned non-federal PAPIs. The PAPI for Runway 23 is beyond its useful life and the PAPI for Runway 5 is approaching its end of useful life. AVCON would recommend installing LED PAPI units, **(See Appendix B, Figure 17),** which will offer lower operating costs and maintenance of the lighting system. In addition to design the following items will be required:

a) A topographical survey to include the runways thresholds and runway centerline for the first 1200 feet from each runway end will be required to verify/site the location of the new PAPI units.

b) In accordance with EB 95, a Light Signal Clearance Surface (LSCS) survey will be required to establish the obstacle clearances within the Light Signal area within the approach and determine requirements to remove the obstacles and/or baffling of the PAPI unit to comply with FAA EB 95.

c) An FAA Flight Check of the new PAPI systems will be required to commission the units for use.

Airport Rotating Beacon – AVCON recommends the Airport's rotating beacon and tower be replaced as described within this report. LED Beacons are available which will reduce the operating costs of GIF and lower the maintenance of the beacon, **(See Appendix B, Figure 18)**. AVCON also recommends the existing steel frame beacon tower be removed and install the new beacon on a tipdown pole assembly, **(See**

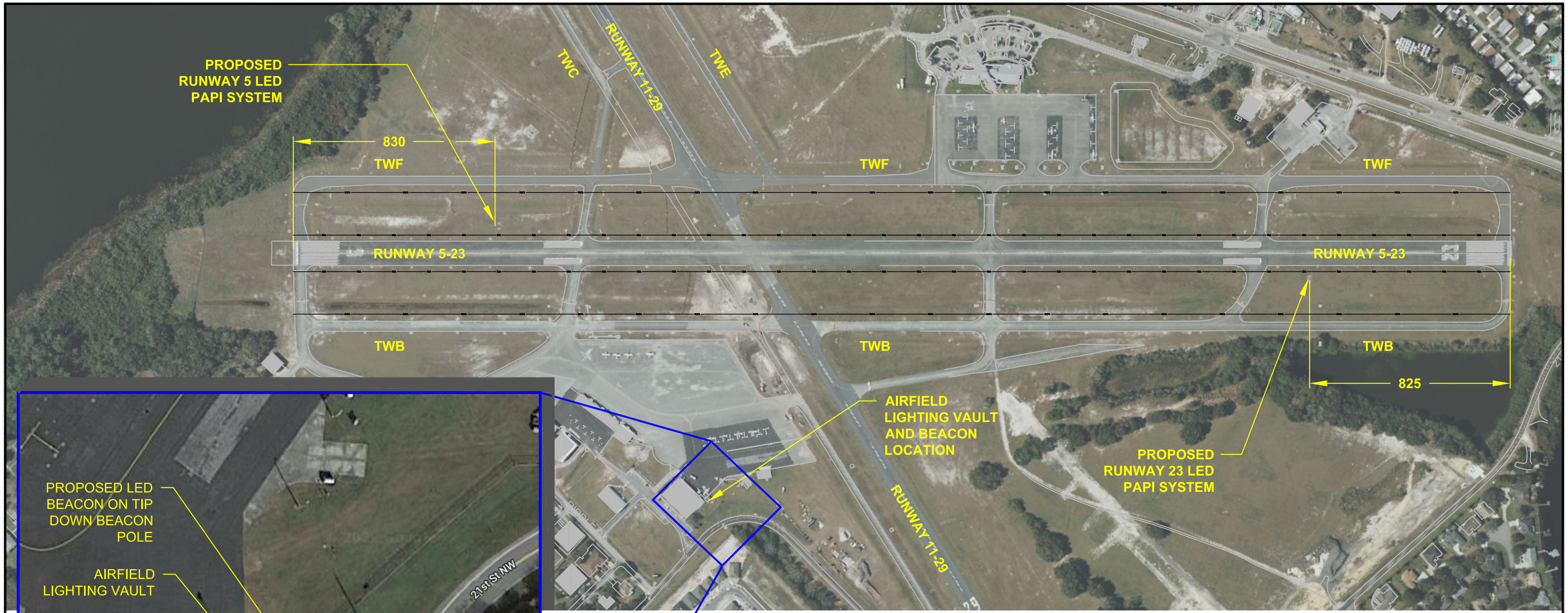
Appendix B, Figure 19). The tipdown pole will remove the need to climb a tower structure, removing the fall hazard for servicing the beacon. The beacon will be sited to a new location close to the ALV and a siting study will be conducted to verify the use of a tipdown pole would be applicable. If the siting reveals that a more traditional structural pole be installed, additional safety equipment, such as a fall protection/climbing system, shall be specified.

The Airport Beacon is more than 20 years of age. Replacement components, and service are increasingly difficult to obtain and maintain a serviceable Airport Beacon. The beacon is beyond the useful life defined in FAA Order 5100.38D Change 1, dated February 26,2019, Table 3-7 “Minimum Useful Life”.

5. ESTIMATE OF DESIGN AND CONSTRUCTION COSTS

See **Appendix C – Engineer’s Opinion of Design and Construction Costs**.

APPENDIX A
PROJECT LAYOUT



AIRPORT BEACON

RUNWAY 5-23 PAPI SYSTEMS

NORTH

0 100 200 400

GRAPHIC SCALE IN FEET

V:\2022\2022.230.02 - GIF PAPI and Beacon Assessment\2022.230.02 - CADD\22.230.02_Exhibit.dwg 5/3/2022 2:23 PM

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AVCON, INC.
ENGINEERS & PLANNERS
5555 EAST MICHIGAN ST., SUITE 200 – ORLANDO, FL. 32822
OFFICE: (407) 599-1122 – FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NO. 5057
WWW.AVCONINC.COM

EVALUATION OF AIRFIELD BEACON AND PAPI UNITS

PROJECT ELEMENTS

EX. 1

APPENDIX B
PROJECT PHOTOS

Runway 5, Existing L-881 2 Box PAPI System

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Runway 23, Existing L-881 2 Box PAPI System

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

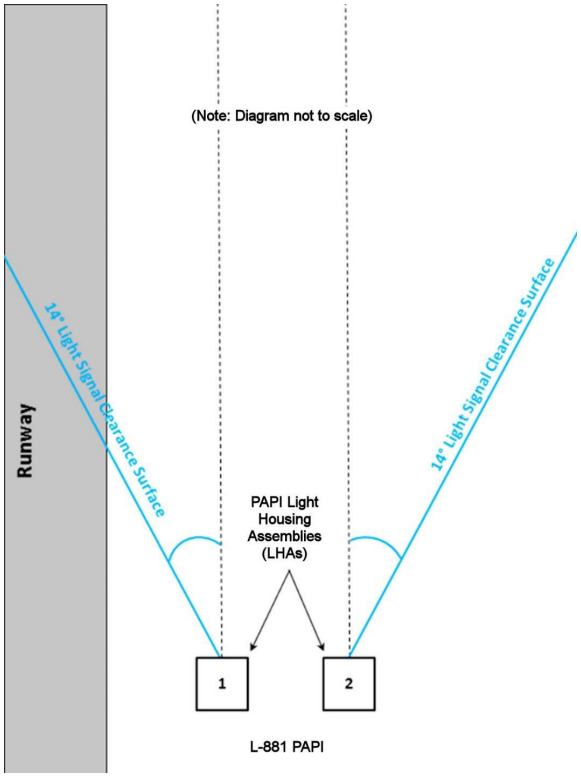

Figure 11

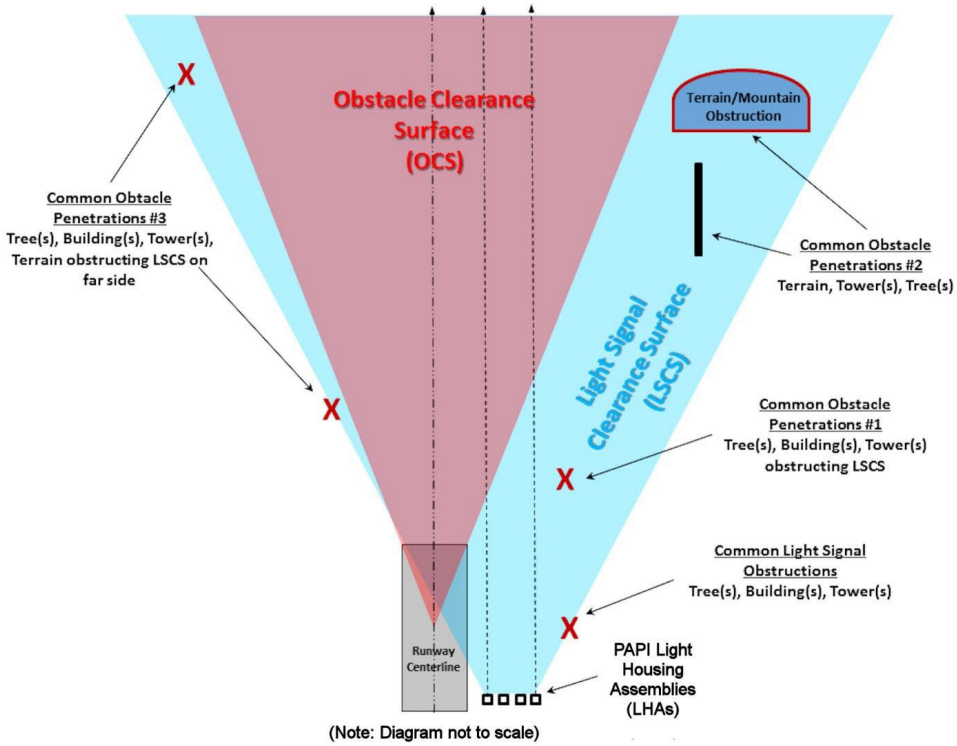

Figure 12
EB 95, Light Signal Clearance Surface (LSCS) Criteria

Existing Beacon

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17, LED PAPI

Figure 18, LED Beacon

Figure 19, Tipdown Beacon Pole

APPENDIX C
ENGINEER'S OPINION OF DESIGN AND CONSTRUCTION COST ESTIMATES

WINTER HAVEN REGIONAL AIRPORT (GIF)

EVALUATION OF AIRFIELD BEACON AND PAPI UNITS

SUMMARY OF RECOMMENDED AIRFIELD FACILITY UPGRADES & OTHER AIRPORT CAPITAL IMPROVEMENTS AND PROJECT COST ESTIMATES (2022-2023)

MAY 2022

SCHEDULE	APPROXIMATE TIMEFRAME	PROJECT DESCRIPTION	PROJECT TYPE	CONSTRUCTION COST	DESIGN FEES	15% CONTINGENCY	TOTAL CONSTRUCTION ESTIMATE
SCHEDULE A	2023	RUNWAY 5-23 NEW PRECISION APPROACH PATH INDICATORS (PAPI)	New Construction	$324,989	$32,499	$48,748	$373,737
SCHEDULE B	2023	NEW AIRPORT ROTATING BEACON WITH TIP DOWN POLE ASSEMBLY	New Construction	$138,397	$16,608	$23,251	$161,648
GRAND TOTALS =				$463,386	$49,107	$71,999	$535,385

1. *Refer to* ***Appendix C*** *for detailed project cost estimates.*

AVCON

EVALUATION OF AIRFIELD BEACON AND PAPI UNITS
ENGINEER'S PRELIMINARY OPINION OF COSTS - MAY 2022
2022.230.02

SCHEDULE A RUNWAY 5-23 NEW PRECISION APPROACH PATH INDICATORS (PAPI)

Item	No.	Description	Unit	Quantity	Unit Price	Extension
1	SP-104	TEMPORARY POWER AND TEMPORARY AIRFIELD LIGHTING/SIGNAGE/NAVIGATIONAL FACILITIES	LS	1	$5,000.00	$ 5,000.00
2	SP-105	ELECTRICAL DEMOLITION	LS	1	$20,000.00	$ 20,000.00
3	L-108	1/C L-824 TYPE C UNSHIELDED #8 AWG 5KV STRANDED COPPER CABLE, INSTALLED IN DUCT OR CONDUIT	LF	15,000	$2.00	$ 30,000.00
4	L-108	1/C #2 AWG SOLID COPPER COUNTERPOISE CABLE, INSTALLED OVER DUCT OR CONDUIT	LF	1,000	$3.00	$ 3,000.00
5	L-108	3/4" DIAMETER BY 10.00' LONG COPPER CLAD STEEL SECTIONAL GROUND ROD	EA	50	$150.00	$ 7,500.00
6	L-109	AIRFIELD ELECTRICAL VAULT MODIFICATIONS	LS	1	$10,000.00	$ 10,000.00
7	L-109	SHORT CIRCUIT/COORDINATION/DEVICE EVALUATION/ARC FLASH ANALYSIS	LS	1	$8,000.00	$ 8,000.00
8	L-109	2.5 KW L-828/L-829 CONSTANT CURRENT REGULATOR - 5 STEP - 240V	EA	1	$25,000.00	$ 25,000.00
9	L-110	1 WAY 2" SCHEDULE 40 PVC DIRECT EARTH BURIED DUCT	LF	1,000	$6.00	$ 6,000.00
10	L-110	1 WAY 2" SCHEDULE 40 PVC CONCRETE DIRECTIONAL BORE DUCT	LF	300	$12.00	$ 3,600.00
11	L-125	L-881(L), 2 BOX, LED PRECISION APPROACH PATH INDICATOR (PAPI) - RUNWAY 5 COMPLETE	EA	1	$ 45,000.00	$ 45,000.00
12	L-125	L-881(L), 2 BOX, LED PRECISION APPROACH PATH INDICATOR (PAPI) - RUNWAY 23 COMPLETE	EA	1	$ 45,000.00	$ 45,000.00
13	L-125	L-881 FAA FLIGHT INSPECTION FOR PAPI SYSTEM COMMISSIONING, BOTH RUNWAYS	AL	1	$ 20,000.00	$ 20,000.00
14	SURV	TOPOGRAPHIC SURVEY AND LSCS Survey - TO BE INCLUDED IN DESIGN FEES	LS	1	$ 45,000.00	$ 45,000.00
15						
16						
17						
18						
19						
20						
					Sub Total	$ 273,100

A	M-001-1	MOBILIZATION @	10%	$ 27,310
B	M-001-2	MAINTENANCE OF TRAFFIC @	4%	$ 10,924
		DETAILED PRICING ALLOWANCE	5%	$ 13,655

ASSUMPTIONS:

1. CONSTRUCTION/PROJECT COSTS ROUNDED TO THE NEAREST $1,000

2. ALL DOLLARS STATED IN CY 2022 COSTS (NO ESCALATION CONSIDERED)

CONSTRUCTION COSTS		**$ 324,989**
DESIGN FEES	**10%**	**$ 32,499**
SUBTOTAL		**$ 357,488**
CONTINGENCY @	**15%**	**$ 48,748**
TOTAL CONSTRUCTION COST		**$ 373,737**

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ENGINEER'S PRELIMINARY OPINION OF COSTS - MAY 2022
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SCHEDULE B		NEW AIRPORT ROTATING BEACON WITH TIP DOWN POLE ASSEMBLY				
Item	**No.**	**Description**	**Unit**	**Quantity**	**Unit Price**	**Extension**
1	L-104-1	TEMPORARY POWER AND TEMPORARY AIRFIELD LIGHTING	LS	1	$ 5,000	$ 5,000
2	L-105-1	ELECTRICAL DEMOLITION, INCLUDING REMOVAL OF OLD BEACON, POLE, FOUNDATION, FENCE AND APPURTENANCES	LS	1	$ 20,000	$ 20,000
3	L-107-1	L-801A(L) ROTATING BEACON, CLASS 1, MEDIUM INTENSITY - LED WITH TEL-TALE RELAY OPTION	EA	1	$ 20,000	$ 20,000
4	L-107-2	AIRPORT BEACON TILT DOWN POLE, PAINTED PER FAA CRITERIA, WITH BOLTING HARDWARE,	EA	1	$ 40,000	$ 40,000
5	L-107-3	BEACON POLE FOUNDATION - COMPLETE	EA	1	$ 10,000	$ 10,000
6	L-108-1	GROUND GRID CONDUCTOR, GROUND RODS, AIR TERMINALS AND DOWN CONDUCTOR AT BEACON SITE	LS	1	$ 8,000.00	$ 8,000
7	L-108-2	#2 COUNTERPOISE CONDUCTOR FROM VAULT TO BEACON	LF	100	$ 3.00	$ 300
8	L-109-1	VAULT MODIFICATIONS, CIRCUIT BREAKER, CONDUCTORS, CONTACTOR INTERFACE TO ALCS	LS	1	$ 10,000.00	$ 10,000
9	L-110-1	CONDUIT AND CONDUCTORS FROM VAULT TO BEACON	LF	100	$ 25.00	$ 2,500
10	L-125-1	L-810(L) OBSTRUCTION LIGHTS - LED	EA	2	$ 250.00	$ 500
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
					Sub Total	$ 116,300

A	M-001-1	MOBILIZATION @	10%	$ 11,630
B	M-001-2	MAINTENANCE OF TRAFFIC @	4%	$ 4,652
		DETAILED PRICING ALLOWANCE	5%	$ 5,815

ASSUMPTIONS:

1. CONSTRUCTION/PROJECT COSTS ROUNDED TO THE NEAREST $1,000

2. ALL DOLLARS STATED IN CY 2022 COSTS (NO ESCALATION CONSIDERED)

CONSTRUCTION COSTS		**$ 138,397**
DESIGN FEES	**12%**	**$ 16,608**
Subtotal		**$ 155,005**
CONTINGENCY @	**15%**	**$ 23,251**
TOTAL CONSTRUCTION COST		**$ 161,648**