# 5.16 LIGHT EMISSIONS

Airports have high-intensity lights to illuminate runways, taxiways, and gate areas, and to supply visual approach navigational aids, which are critical to the safe operation of an airport.

This section presents the analysis of the impact of airport-related light emissions upon the residential areas surrounding Port Columbus International Airport (CMH or Airport) resulting from the project alternatives under consideration in this Environmental Impact Statement (EIS).[1]

## 5.16.1 REGULATORY SETTING

Only in unusual circumstances (e.g., when high-intensity strobe lights would shine directly into people's homes) would the impact of light emissions be considered sufficient to warrant special study and a more detailed examination of alternatives in an EIS. Light emissions are assessed to the "extent to which any lighting associated with an action will create an annoyance among people in the vicinity or interfere with their normal activities". Airport facilities at CMH are illuminated by various types of lighting emanating from any of the following sources:

- Airfield lighting on runways, runway thresholds, taxiways, and ramps (runway lighting);
- Visual approach aids;
- Obstruction lights;
- Terminal and facilities lighting; and
- Roadway and parking lot lighting.

Generally, lights located at the runway thresholds and in the approach area pose the greatest concern for potential impact. Therefore, the following light systems were evaluated:

- Approach lighting system;
- Visual glideslope indicators;
- Runway end lights;
- In-runway lighting;
- Runway edge lights; and
- Taxiway edge lights.

[1] The light emissions analysis considered only airfield lighting, which would not include light emissions from restaurants, commercial office buildings, etc.

The following information is provided in the assessment for each lighting system:

- Location of existing and future runway threshold lights, and approach light systems;
- Descriptions of each airfield lighting system as to its purpose, intensity, color, flashing sequence, and beam angle; and
- Assessment of the extent of annoyance caused by the CMH airfield lighting systems.

## 5.16.2 EXISTING CONDITIONS: 2006

This section describes conditions at the Airport as they existed during the preparation of this environmental document. The following paragraphs discuss the existing lighting systems in use at CMH. A summary of the existing lighting systems is presented in **Table 5.16-1**.

### Approach Lighting Systems (ALS)

Approach lighting systems (ALS) provide the basic means to transition from instrument flight to visual flight for landing. It is a configuration of steady-burning sequenced flashing signal lights that appear to the pilot as a ball of light traveling toward the runway at high speed (twice a second). Operational requirements dictate the type and configuration of the approach light system for a particular runway.

All four runway ends include a Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). This system uses medium-intensity lights to guide a pilot to the runway centerline as a flight progresses through the transition from instrument flight to visual flight during landing. The MALSR lighting system provides early runway lineup and lead-in guidance, runway end identification, and to a degree, roll guidance. The lights are helpful during some periods of restricted visibility. The MALSR system is beneficial where extraneous lighting prevents the pilot from lining up with the runway centerline or where the surrounding terrain is devoid of lighting and does not provide the cues necessary for proper aircraft attitude control.[2] A diagram of a typical MALSR lighting system is shown in **Exhibit 5.16-*1, MALSR Lighting System.***

[2] Spence, C.F. (Ed). 2006. AIM/FAR Aeronautical Information Manual/Federal Aviation Regulations. McGraw Hill: New York.

**Table 5.16-1**
**EXISTING AIRFIELD LIGHTING SYSTEMS**
**Port Columbus International Airport**

| LIGHTING SYSTEM | Runway End | | | |
|---|---|---|---|---|
| | 10R | 28L | 10L | 28R |
| Approach Lighting System | MALSR | MALSR | MALSR | MALSR |
| Visual Glideslope Indicators | PAPI | none | PAPI | PAPI |
| Runway End Identifier Lights | none | none | none | none |
| In-Runway Lighting | none | none | none | none |
| Runway Edge Lights | HIRL | HIRL | HIRL | HIRL |

Notes: MALSR - Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights
PAPI - Precision Approach Path Indicator
HIRL - High Intensity Runway Lights
Source: AirNav website, accessed on August 16, 2007. http://www.airnav.com/airport/KCMH.

The runway threshold lights start 200 feet from the landing threshold and extend at 200-foot intervals into the approach area at a distance of 2,400 to 3,000 feet for precision instrument runways and 1,400 to 1,500 feet for non-precision instrument runways. There are generally seven light bars with five steady-burning lights for each bar. At the light bar 1,000 feet from the runway threshold, there are two additional bars (one on each side of the centerline bar) each with five steady-burning lights.[3]

Runway threshold lights consist of a line of green lights located perpendicular to the extended runway centerline not more than two feet or less than 100 feet from the designated threshold of the runway.

The lights of the MALSR lighting system are medium-intensity lights with intensity control provided. The lights are white and steady-burning, with green lights closest to the runway threshold. The MALSR lighting system does not use flashing lights. The lights are mounted on poles and aimed with their beam axis parallel to the runway centerline and intercepting an assumed 3-degree slope at a horizontal distance of 1,600 feet in advance of the light.

A MALSR lighting system is installed on Runway ends 10L, 10R, 28L, and 28R at CMH. The MALSR starts at the landing threshold and extends into the approach area a distance of 2,000 to 2,300 feet, depending on the runway end. **Table 5.16-2** shows the nearest homes to each of the MALSR light bars.

[3] FAA AC 150/5340-30B, *Design and Installation Details for Airport Visual Aids*, August 1, 2006.

**Table 5.16-2**
**DISTANCES FROM MALSR LIGHTS TO NEAREST HOMES BY RUNWAY END – EXISTING CONDITIONS**
**Port Columbus International Airport**

| Runway | Distance to Nearest Home (in feet) |
|---|---|
| **10R** | 1,400 |
| **28L** | 2,600 |
| **10L** | 1,300 |
| **28R** | 2,500 |

Source: Landrum & Brown, 2007.

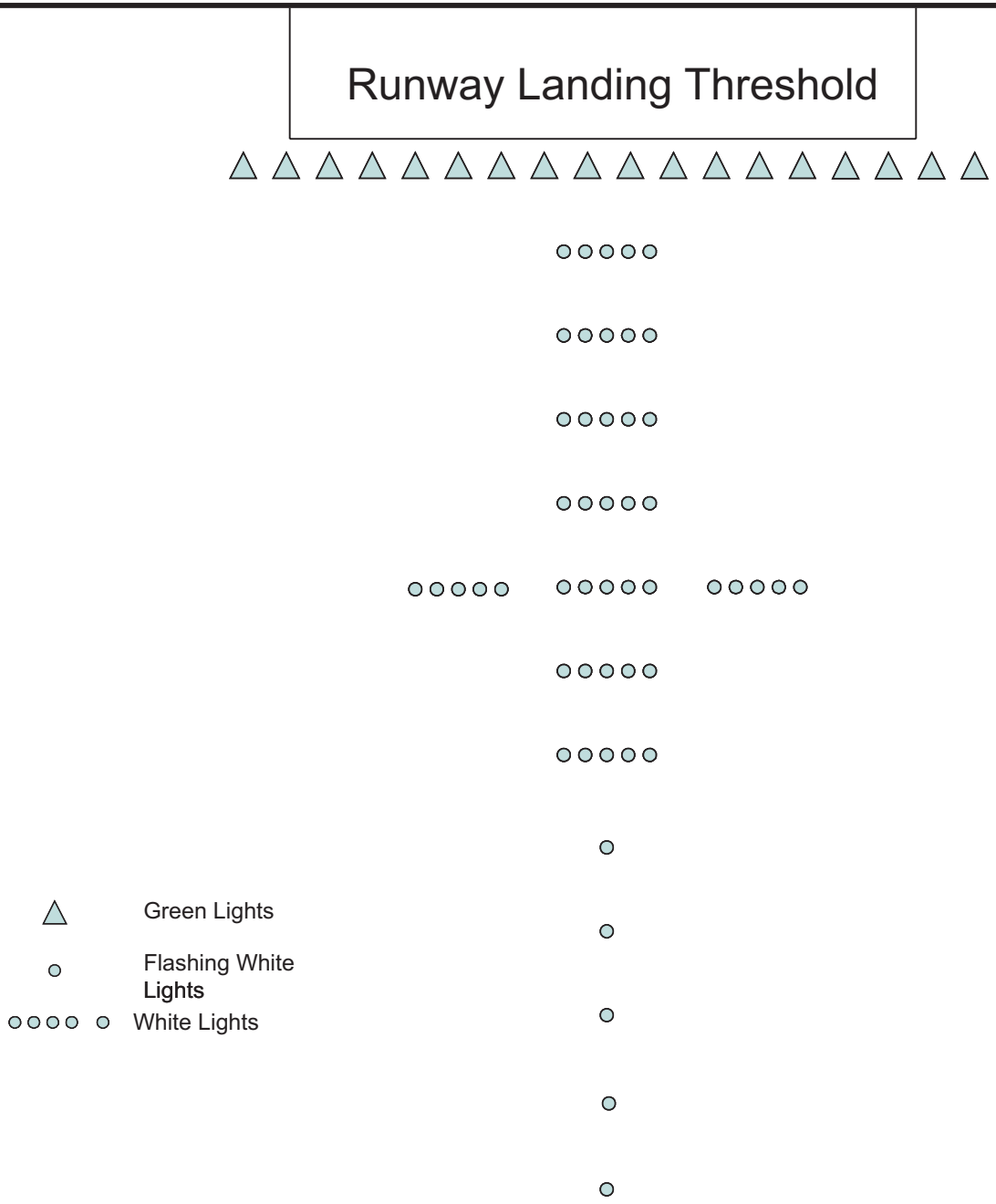
***Visual Glideslope Indicator:*** The Visual Glideslope Indicator is a system of lights arranged to provide visual descent guidance information during the approach to a runway.[4] One such system, a Precision Approach Path Indicator (PAPI), provides a specific light pattern when the aircraft is on the desired descent path to the touchdown point. A diagram of a PAPI lighting system is shown in **Exhibit 5.16-2, *PAPI Lighting System***.

The PAPI system includes four identical light units normally placed 50 feet from the left side of the runway providing visual approach slope information. The PAPI is a single horizontal bar with four sharp transition lamps installed on the left side of the runway. The system is located perpendicular to the runway centerline, at a distance from the threshold that provides the proper threshold crossing height and obstacle clearance.

Each lamp projects a split beam of light. The upper segment is white, and the lower segment is red. The transition from white to red, or vice versa, occurs within a vertical angle of five minutes of arc at the beam center and results in a well-defined corridor of light consisting of white (top) and red (bottom) beams. These systems have an effective visual range of about five miles during the day and up to 20 miles at night.

The PAPI lights are high-intensity lights that are red and white and are not sequenced flashing lights. The lights are installed on poles and the light beam is positioned to project 20 feet above the most critical obstruction in the area. At CMH, PAPI lights are installed at the ends of Runways 10L, 10R, and 28R. There is no PAPI at Runway End 28L.

[4] FAA AC 150/5345-52, *Generic Visual Glideslope Indicators (GVGI),* 9/5/2007.


Runway Landing Threshold
Green Lights
Flashing White Lights
White Lights

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# PAPI

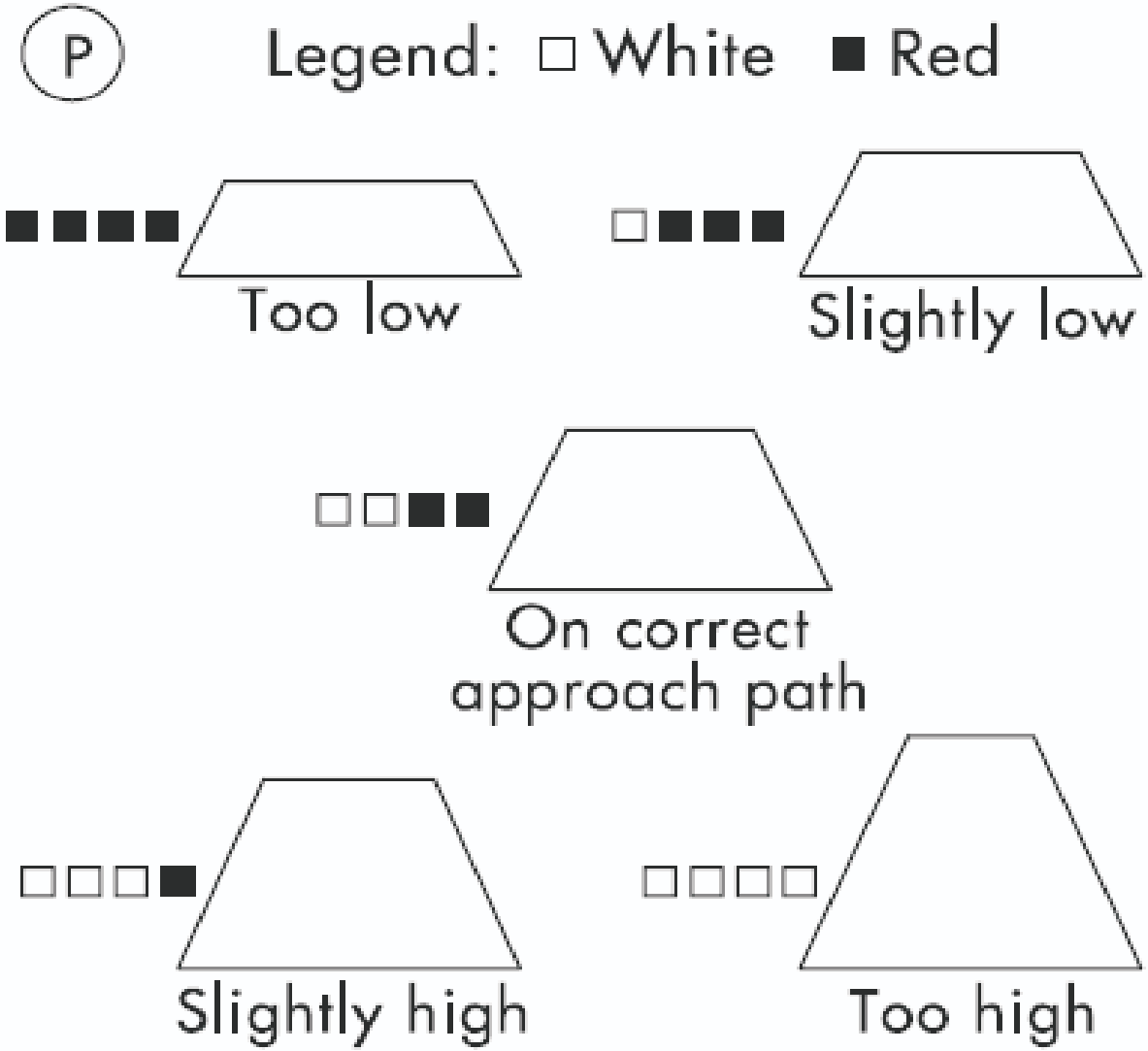
P
Legend: □ White ■ Red
Too low
Slightly low
On correct approach path
Slightly high
Too high

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**Table 5.16-3** shows the nearest home to each of the PAPI lighting systems. The lights are projected at such a steep upward angle that the light beam is above all surrounding buildings. Residences beyond each of these runway ends would not be impacted by the light emissions from the PAPI lighting systems at CMH.

**Exhibits 5.16-3 through 5.16-6** show the lighting equipment installed at each of the four runway ends at CMH.

**Table 5.16-3**
**DISTANCES FROM PAPI TO NEAREST HOMES BY RUNWAY END – EXISTING CONDITIONS**
**Port Columbus International Airport**

| Runway | Distance to Nearest Home (in feet) |
|---|---|
| **10R** | 2,800 |
| **28L** | n/a |
| **10L** | 2,300 |
| **28R** | 2,300 |

Source: Landrum & Brown, 2007.

### Runway Edge Light Systems

HIRL are used to outline the edges of a runway during periods of darkness and low visibility weather conditions. They are used on runways having precision Instrument Flight Rules (IFR) approach procedures and for runways utilizing Runway Visual Range (RVR). The lights are located approximately 200 feet apart with a maximum height of 24 inches above the pavement elevation.

The light emitted from HIRLs is white, except that yellow light is substituted for white light on the last 2,000 feet of an instrument runway, or one-half the runway length, whichever is less. The yellow lights indicate the caution zone for landing. The lights in the caution zone emit yellow light in the direction facing the instrument approach threshold and white light in the opposite direction.

The lights marking the ends of the runway emit red light toward the runway to indicate the end of the runway to a departing aircraft and emit green outward from the runway end to indicate the threshold to landing aircraft.[5] HIRLs do not use sequenced flashing lights. The yellow and green lights are directed facing the instrument approach threshold. The white and red lights are directed toward the runway.

[5] FAA AC 150/5340-30B, *Design and Installation Details for Airport Visual Aids*, August 1, 2006.

### Other Airport Lighting

A rotating beacon identifies the location of the Airport at night and is identified by projecting a green and white beam of light 180 degrees apart.

Obstructions in the vicinity of the Airport are also marked or lighted to warn pilots of their presence. These obstructions may be identified by a steady-red, flashing-red, or white strobe light. These obstructions are identified for pilots on approach and sectional Visual Flight Rules (VFR) charts and on the official Airport Obstruction Chart, published by the National Oceanic and Atmospheric Administration (NOAA).

Other lighting exists along the taxiways and ramps for low visibility purposes and to assist aircraft movement on the airfield, such as hold position lights, stop bar lights, and runway and taxiway signage. Each of these additional light systems is located within the Airport complex and represent no impact upon neighboring communities.

## 5.16.3 FUTURE CONDITIONS: 2012

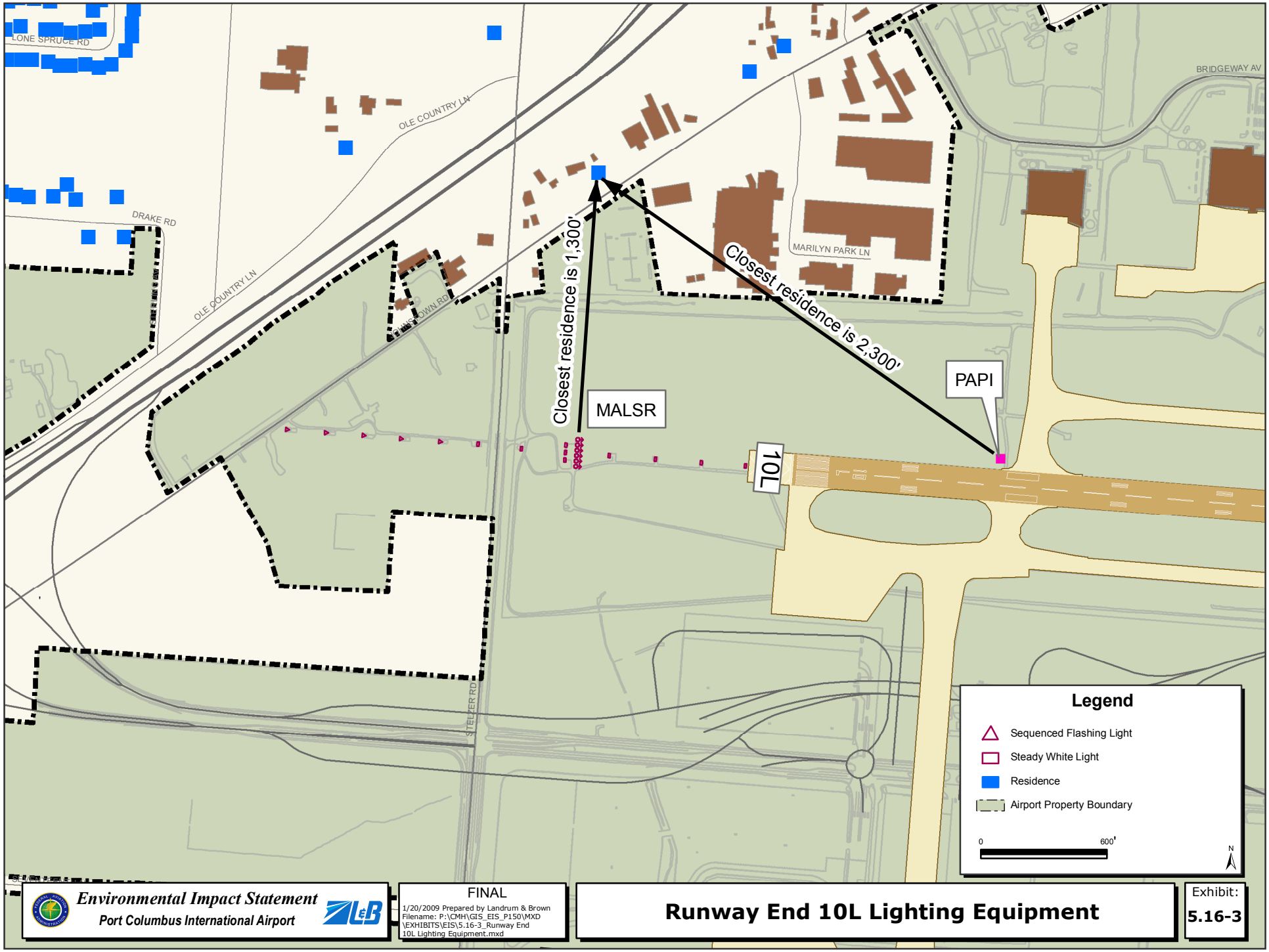
The following section describes the conditions that would result from the lighting required by each of the proposed runway alternatives during the first full year in which the proposed relocated runway is anticipated to be operational. While the same types of lighting systems described for the existing conditions are expected to be used for each of the proposed runway alternatives, the location of lighting equipment in relation to homes will change due to the proposed relocation of Runway 10R/28L.

**Alternative A:**
**No Action**

Under this Alternative, Runway 10R/28L would remain in its current location and therefore no changes to the existing lighting equipment or locations would occur.

**Alternative C2a:**
**Relocate Runway 10R/28L 800 Feet to the South – Noise Abatement Scenario A**

Alternative C2a includes the relocation of Runway 10R/28L 800 feet to the south. The relocated runway would include MALSR and PAPI lighting on both ends. These lights would move 800 feet south of the current location. In addition, the relocated runway would include a CAT-II approach to Runway 10R, which would increase the number of light stands in the MALSR system from 8 to 15. The MALSR lights would not extend farther west than they currently do today; however, the lights would be spaced closer together. **Exhibit 5.16-7, *Runway 10X (Alternative C2) MALSR and PAPI Locations,*** and **Exhibit 5.16-8, *Runway 28X (Alternative C2) MALSR Location,*** show the location of the proposed lighting equipment for Alternative C2a. **Table 5.16-4** and **Table 5.16-5** show the distances from the MALSR and PAPI equipment to the nearest homes under this alternative.

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*Port Columbus International Airport*

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Filename: P:\CMH\GIS_EIS_P150\MXD\EXHIBITS\EIS\5.16-3_Runway End 10L Lighting Equipment.mxd

**Runway End 10L Lighting Equipment**

Exhibit:
**5.16-3**

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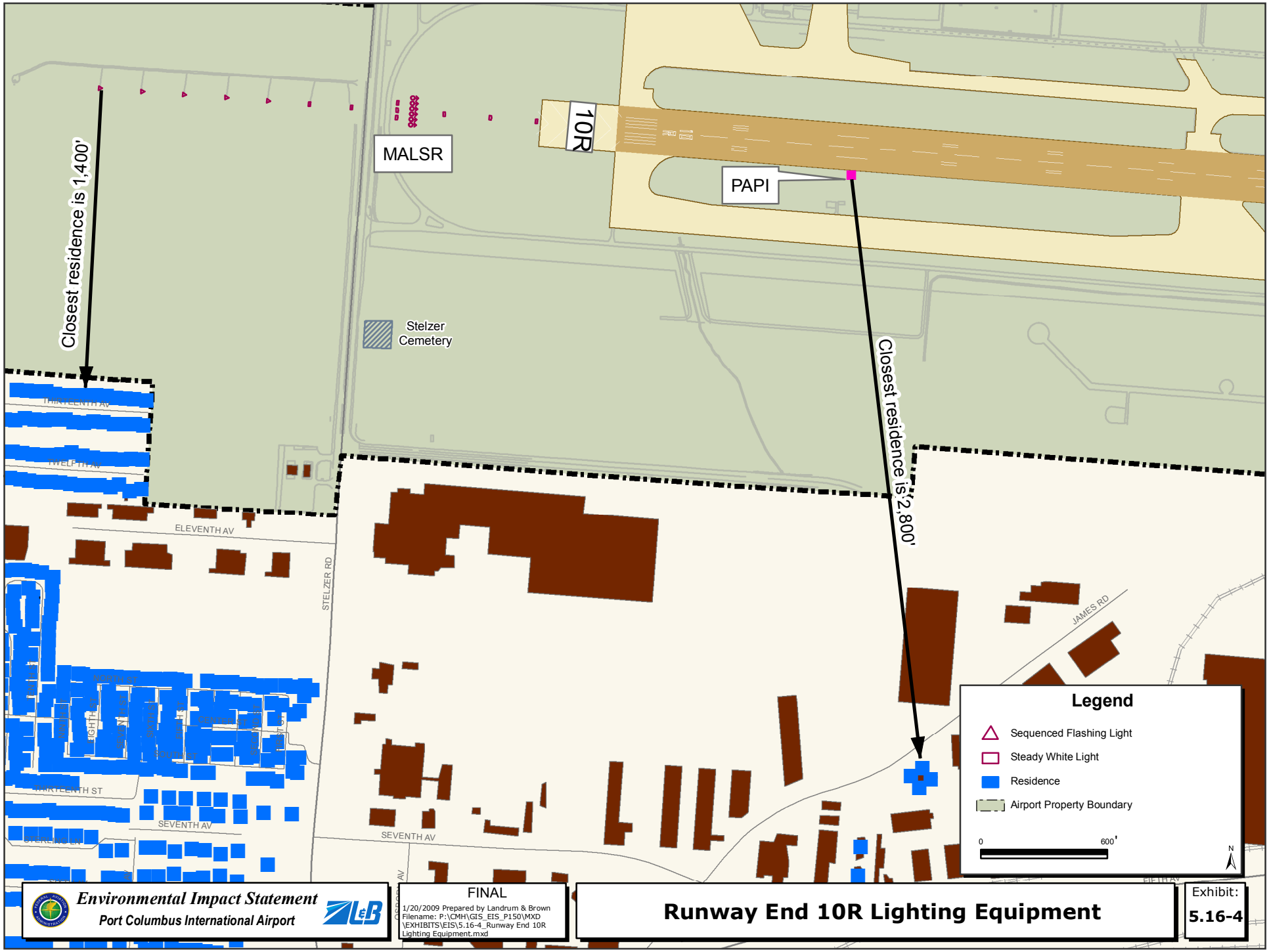
MALSR
10R
PAPI
Closest residence is 1,400'
Closest residence is 2,800'
Stelzer Cemetery
THIRTEENTH AV
TWELFTH AV
ELEVENTH AV
STELZER RD
THIRTEENTH ST
SEVENTH AV
JAMES RD
Legend
Sequenced Flashing Light
Steady White Light
Residence
Airport Property Boundary
0
600'
N
Environmental Impact Statement
Port Columbus International Airport
FINAL
1/20/2009 Prepared by Landrum & Brown
Filename: P:\CMH\GIS_EIS_P150\MXD
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Lighting Equipment.mxd
Runway End 10R Lighting Equipment
Exhibit:
5.16-4

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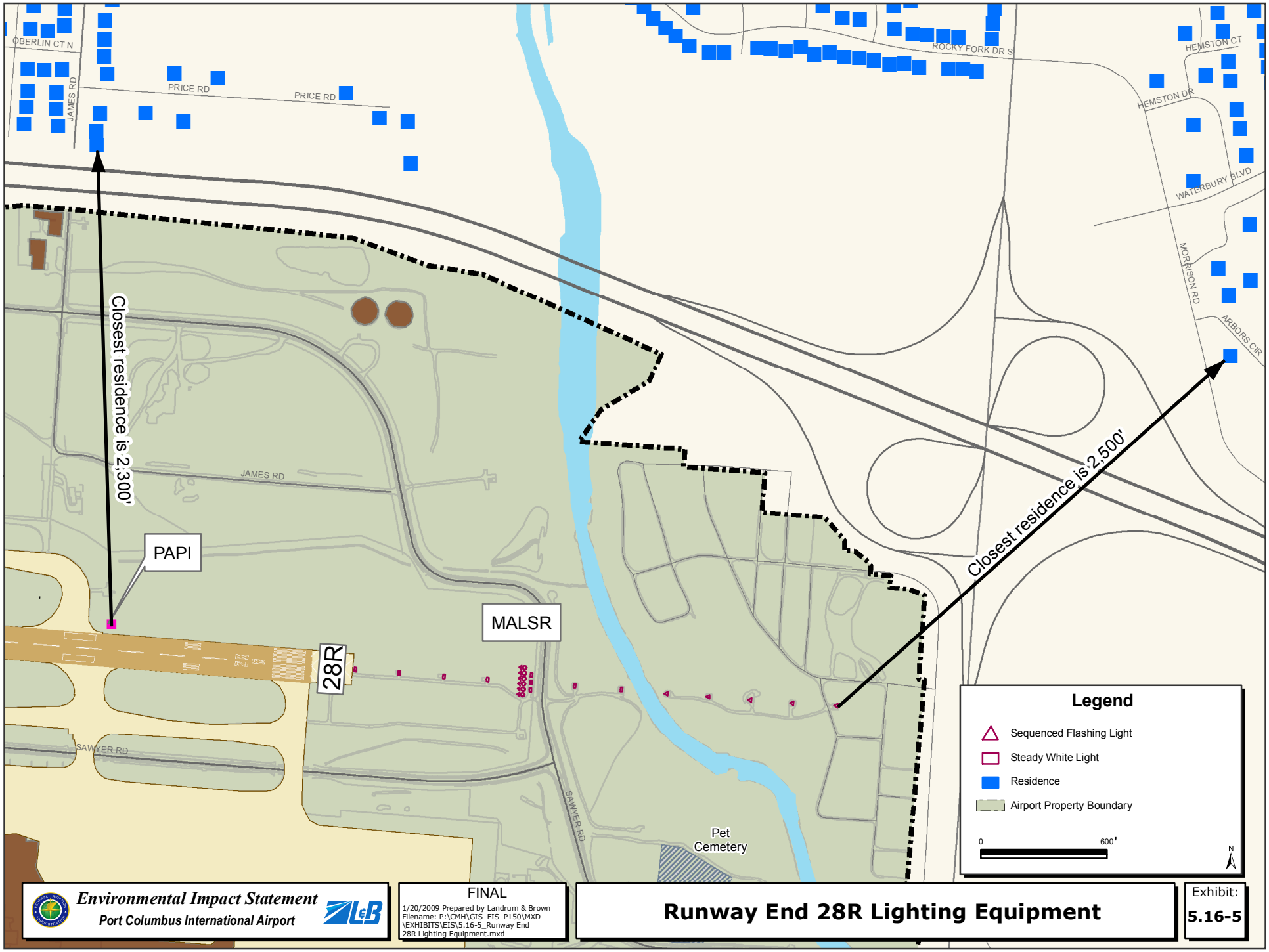
OBERLIN CT N
JAMES RD
PRICE RD
PRICE RD
ROCKY FORK DR S
HEMSTON CT
HEMSTON DR
WATERBURY BLVD
MORRISON RD
ARBORS CIR
Closest residence is 2,300'
JAMES RD
PAPI
MALSR
28R
Closest residence is 2,500'
SAWYER RD
SAWYER RD
Pet Cemetery
Legend
Sequenced Flashing Light
Steady White Light
Residence
Airport Property Boundary
0
600'
N
Environmental Impact Statement
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1/20/2009 Prepared by Landrum & Brown
Filename: P:\CMH\GIS_EIS_P150\MXD
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28R Lighting Equipment.mxd
Runway End 28R Lighting Equipment
Exhibit:
5.16-5

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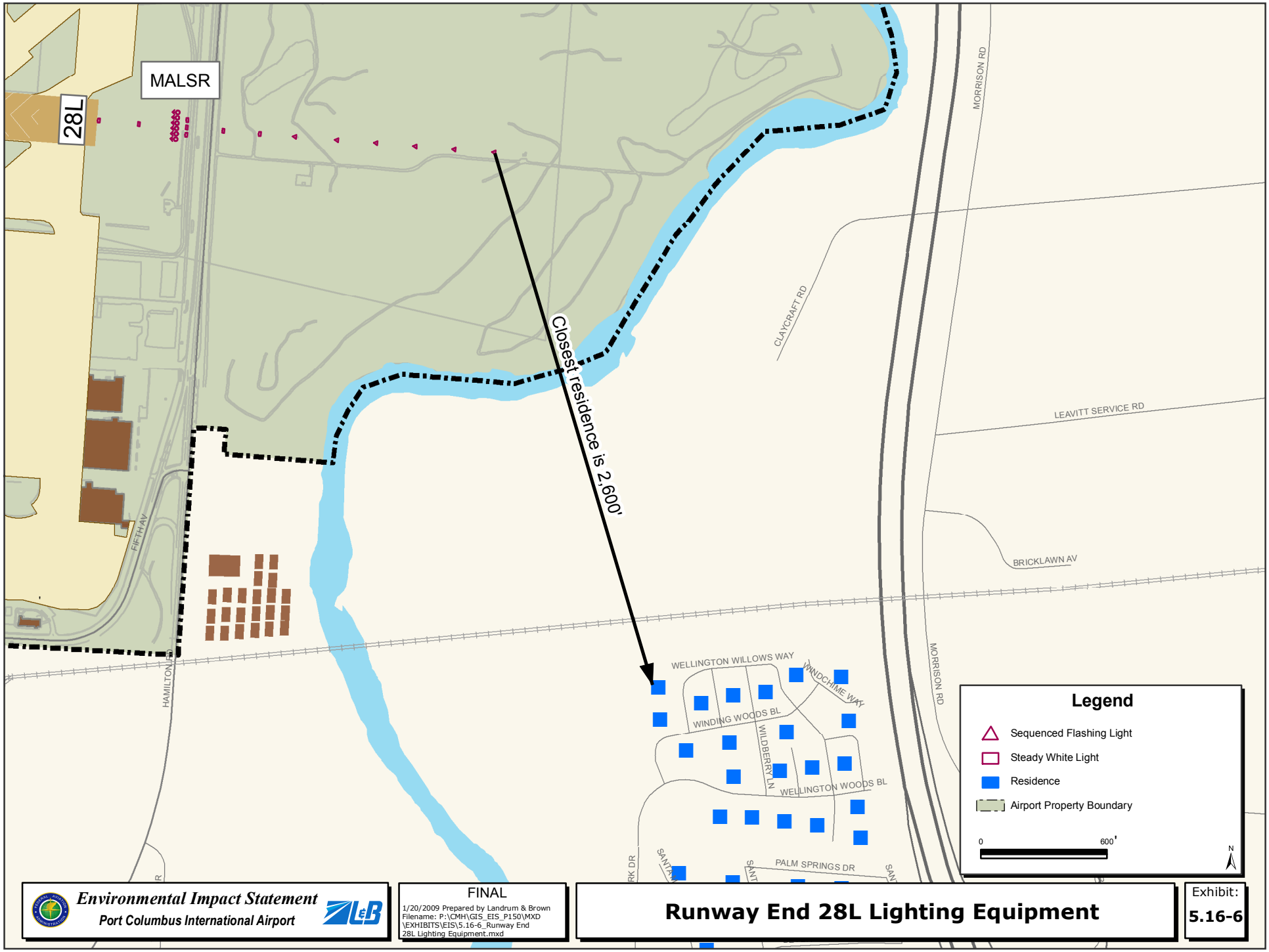
MALSR
28L
Closest residence is 2,600'
MORRISON RD
CLAYCRAFT RD
LEAVITT SERVICE RD
BRICKLAWN AV
FIFTH AV
HAMILTON RD
WELLINGTON WILLOWS WAY
WINDCHIME WAY
WINDING WOODS BL
WILDBERRY LN
WELLINGTON WOODS BL
PALM SPRINGS DR
Legend
Sequenced Flashing Light
Steady White Light
Residence
Airport Property Boundary
0
600'
N
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Filename: P:\CMH\GIS_EIS_P150\MXD
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28L Lighting Equipment.mxd
Runway End 28L Lighting Equipment
Exhibit:
5.16-6

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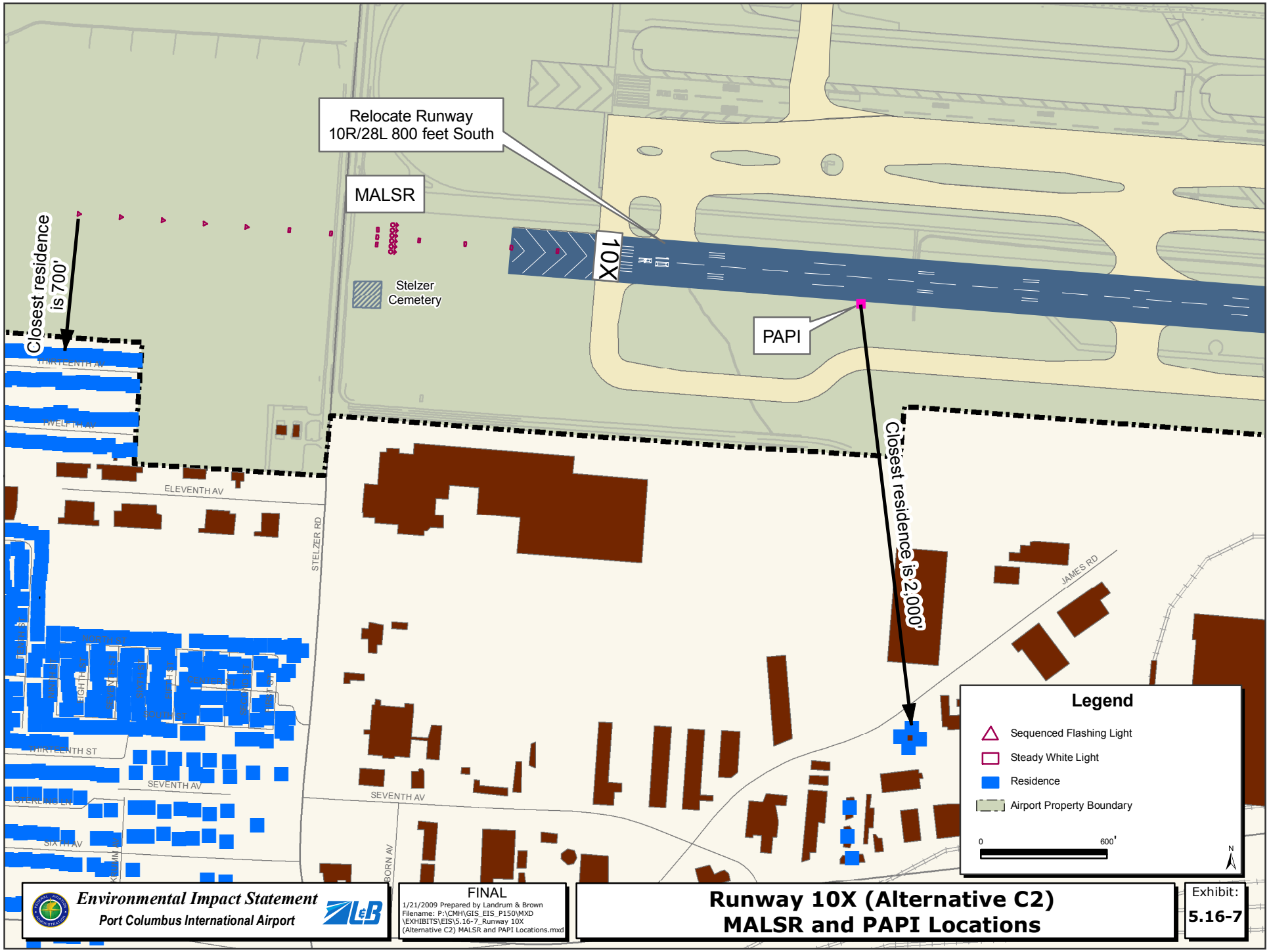
Relocate Runway
10R/28L 800 feet South
MALSR
10X
Stelzer
Cemetery
PAPI
Closest residence
is 700'
Closest residence is 2,000'
ELEVENTH AV
STELZER RD
JAMES RD
THIRTEENTH ST
SEVENTH AV
SIXTH AV
Legend
Sequenced Flashing Light
Steady White Light
Residence
Airport Property Boundary
0
600'
N
Environmental Impact Statement
Port Columbus International Airport
FINAL
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(Alternative C2) MALSR and PAPI Locations.mxd
Runway 10X (Alternative C2)
MALSR and PAPI Locations
Exhibit:
5.16-7

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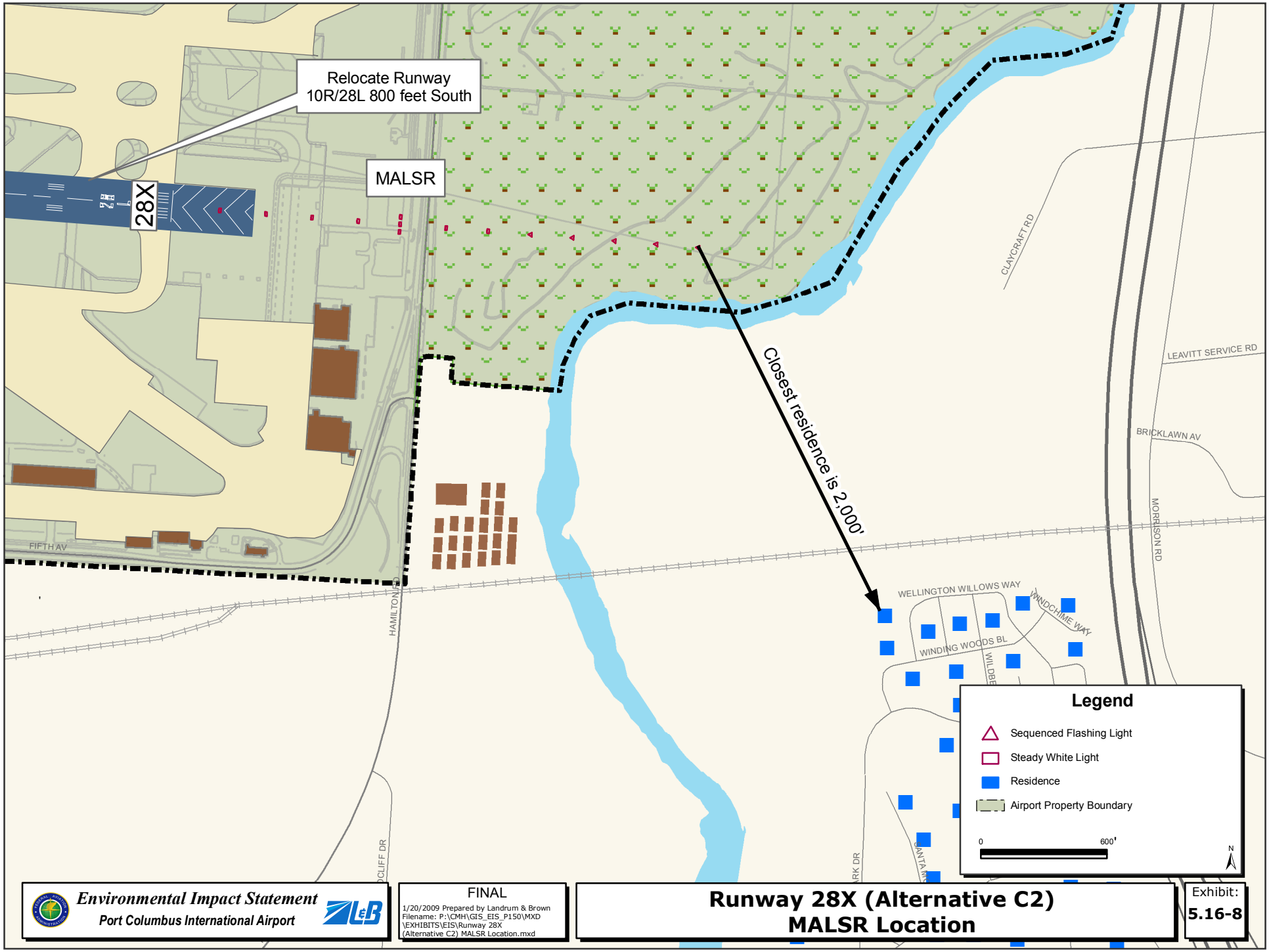
Relocate Runway
10R/28L 800 feet South
MALSR
28X
Closest residence is 2,000'
CLAYCRAFT RD
LEAVITT SERVICE RD
BRICKLAWN AV
MORRISON RD
FIFTH AV
HAMILTON RD
WELLINGTON WILLOWS WAY
WINDCHIME WAY
WINDING WOODS BL
Legend
Sequenced Flashing Light
Steady White Light
Residence
Airport Property Boundary
0
600'
N
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Filename: P:\CMH\GIS_EIS_P150\MXD
\EXHIBITS\EIS\Runway 28X
(Alternative C2) MALSR Location.mxd
Runway 28X (Alternative C2)
MALSR Location
Exhibit:
5.16-8

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**Table 5.16-4**
**DISTANCES FROM MALSR LIGHTS TO NEAREST HOMES BY RUNWAY END – 2012 ALTERNATIVE C2A CONDITIONS**
**Port Columbus International Airport**

| Runway | Distance to Nearest Home (in feet) |
|---|---|
| **10X** | 700* |
| **28X** | 2,000 |
| **10L** | 1,300 |
| **28R** | 2,500 |

* Note: This assumes the removal of the 35 homes located on East 13th Avenue, east of Sterling Avenue for the purposes of clearing the Runway Protection Zone. See Section 5.2, *Land Use,* for more information on acquisition.

Source: Landrum & Brown, 2007.

**Table 5.16-5**
**DISTANCES FROM PAPI LIGHTS TO NEAREST HOMES BY RUNWAY END – 2012 ALTERNATIVE C2A CONDITIONS**
**Port Columbus International Airport**

| Runway | Distance to Nearest Home (in feet) |
|---|---|
| **10X** | 2,000 |
| **28X** | n/a |
| **10L** | 2,300 |
| **28R** | 2,300 |

Source: Landrum & Brown, 2007.

### Alternative C2b: Relocate Runway 10R/28L 800 Feet to the South – Noise Abatement Scenario B

Alternative C2b includes the same relocation of Runway 10R/28L 800 feet to the south as Alternative C2a, along with operational changes proposed in the 2007 Part 150 Noise Compatibility Study Update (2007 Part 150 Study). The proposed operational changes would not change the number, type, or location of lights on the airfield. Therefore, the location of runway approach lighting and visual slope indicators will remain the same as discussed for Alternative C2a and shown on Exhibits 5.16-7 and 5.16-8 and in Tables 5.16-4 and 5.16-5.

## Alternative C3a: Relocate Runway 10R/28L 702 Feet to the South – Noise Abatement Scenario A

Alternative C3a includes the relocation of Runway 10R/28L 702 feet to the south. The relocated runway would include MALSR and PAPI lighting on both ends. These lights would move 702 feet south of the current location. In addition, the relocated runway would include a CAT-II approach to Runway 10R, which would increase the number of light stands in the MALSR system from 8 to 15. The MALSR lights would not extend farther west than they currently do today; however, the lights would be spaced closer together. **Exhibit 5.16-9, *Runway 10X (Alternative C3) MALSR and PAPI Locations,*** and **Exhibit 5.16-10, *Runway 28X (Alternative C3) MALSR Location,*** show the location of the proposed lighting equipment for Alternative C3a. **Table 5.16-6** and **Table 5.16-7** show the distances from the MALSR and PAPI equipment to the nearest homes under this alternative.

**Table 5.16-6**
**DISTANCES FROM MALSR LIGHTS TO NEAREST HOMES BY RUNWAY END – 2012 ALTERNATIVE C3A CONDITIONS**
**Port Columbus International Airport**

| Runway | Distance to Nearest Home (in feet) |
|---|---|
| **10X** | 700* |
| **28X** | 2,100 |
| **10L** | 1,300 |
| **28R** | 2,500 |

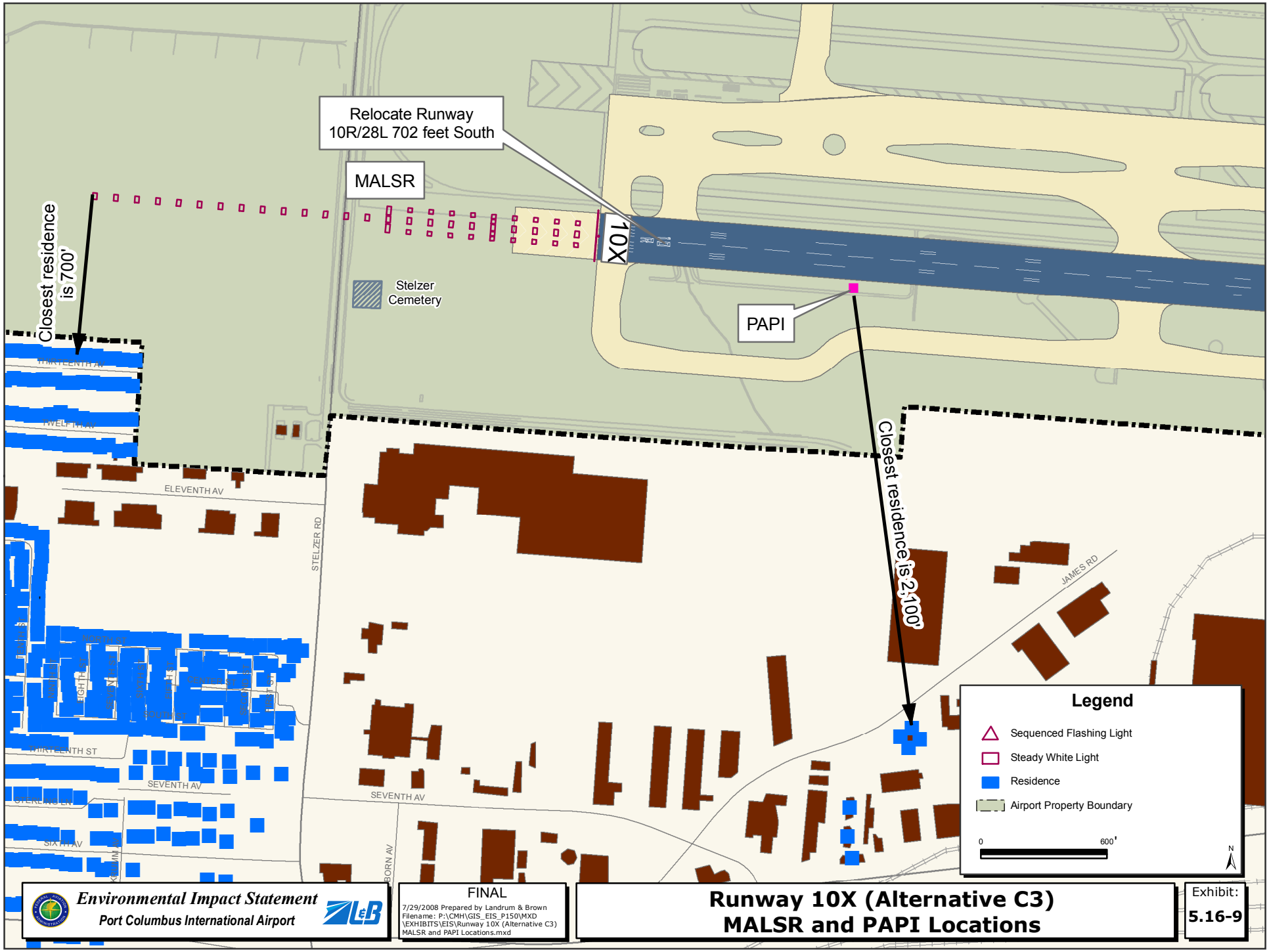
* Note: This assumes the removal of the 35 homes located on East 13th Avenue, east of Sterling Avenue for the purposes of clearing the Runway Protection Zone. See Section 5.2, *Land Use,* for more information on acquisition.

Source: Landrum & Brown, 2007.

**Table 5.16-7**
**DISTANCES FROM PAPI LIGHTS TO NEAREST HOMES BY RUNWAY END – 2012 ALTERNATIVE C3A CONDITIONS**
**Port Columbus International Airport**

| Runway | Distance to Nearest Home (in feet) |
|---|---|
| **10X** | 2,100 |
| **28X** | n/a |
| **10L** | 2,300 |
| **28R** | 2,300 |

Source: Landrum & Brown, 2007.


Relocate Runway
10R/28L 702 feet South
MALSR
10X
PAPI
Closest residence
is 700'
Stelzer
Cemetery
Closest residence is 2,100'
ELEVENTH AV
STELZER RD
JAMES RD
THIRTEENTH ST
SEVENTH AV
SIXTH AV
Legend
Sequenced Flashing Light
Steady White Light
Residence
Airport Property Boundary
0
600'
N
Environmental Impact Statement
Port Columbus International Airport
FINAL
7/29/2008 Prepared by Landrum & Brown
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MALSR and PAPI Locations.mxd
Runway 10X (Alternative C3)
MALSR and PAPI Locations
Exhibit:
5.16-9

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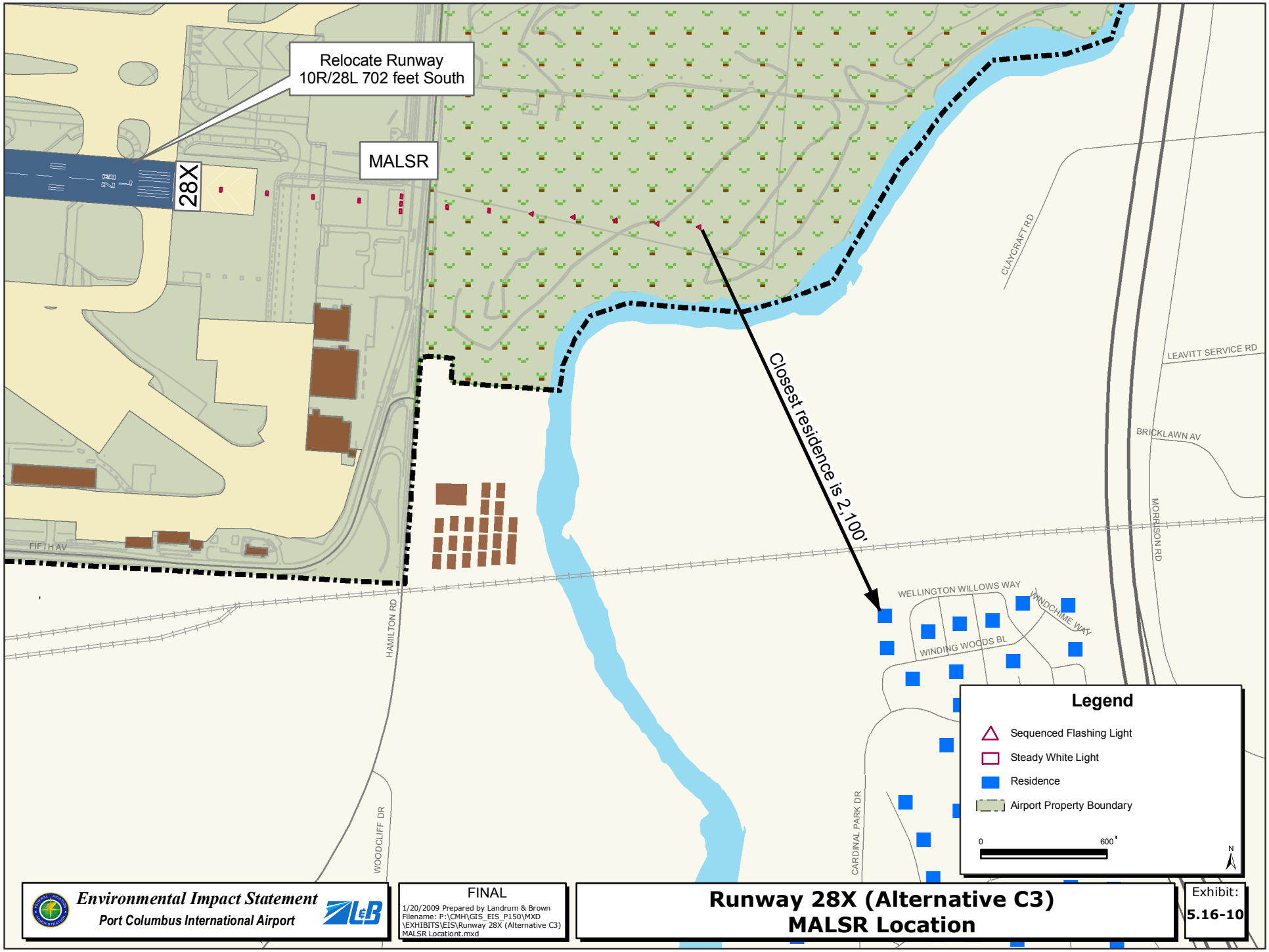
Relocate Runway
10R/28L 702 feet South
MALSR
28X
Closest residence is 2,100'
CLAYCRAFT RD
LEAVITT SERVICE RD
BRICKLAWN AV
MORRISON RD
FIFTH AV
HAMILTON RD
WOODCLIFF DR
WELLINGTON WILLOWS WAY
WINDCHIME WAY
WINDING WOODS BL
CARDINAL PARK DR
Legend
Sequenced Flashing Light
Steady White Light
Residence
Airport Property Boundary
0
600'
N
Environmental Impact Statement
Port Columbus International Airport
FINAL
1/20/2009 Prepared by Landrum & Brown
Filename: P:\CMH\GIS_EIS_P150\MXD
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MALSR Locationt.mxd
Runway 28X (Alternative C3)
MALSR Location
Exhibit:
5.16-10

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### Alternative C3b: 2012 Relocate Runway 10R/28L 702 Feet to the South – Noise Abatement Scenario B (Sponsor's Proposed Project)

Alternative C3b includes the same relocation of Runway 10R/28L 702 feet to the south as Alternative C3a, along with operational changes proposed in the 2007 Part 150 Study. The proposed operational changes would not change the number, type, or location of lights on the airfield. Therefore, the location of runway approach lighting and visual slope indicators will remain the same as discussed for Alternative C3a and shown on Exhibit 5.16-9 and Exhibit 5.16-10 and in Table 5.16-6 and Table 5.16-7.

## 5.16.4 FUTURE CONDITIONS: 2018

Alternatives C2a, C2b, C3a, and C3b assume that by 2018, Phase 1 of the proposed passenger terminal will be constructed and in operation. However, any new lighting associated with the proposed passenger terminal would be located in the middle of Airport property and therefore would not affect any residences. No additional changes to the airfield lighting are anticipated to occur between 2012 and 2018. Therefore, the conditions and potential impacts described for the 2012 Alternatives would remain the same for each of the 2018 Alternatives.

## 5.16.5 VISUAL IMPACTS

According to FAA Order 1050.1E, "Visual or aesthetic impacts are inherently more difficult to define because of the subjectivity involved". Analysis of visual impacts refers to "…the extent that the development contrasts with the existing environment…"[6] Because the location of the proposed development would occur entirely on Airport property, surrounded by existing commercial and industrial development, no adverse visual or aesthetic impacts are anticipated.

[6] FAA Order 1050.1E: *Environmental Impacts: Policies and Procedures,* Appendix A, paragraph 12.2b. .

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