

# ATTACHMENT CSC-26



## VISIBILITY ANALYSIS

### PROPOSED SOLAR PHOTOVOLTAIC FACILITY SEASIDE LANDFILL BRIDGEPORT, CONNECTICUT



Prepared for:

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## Introduction

The United Illuminating Company (“UI”) is proposing to develop a 2.2 megawatt (“MW”) alternating current (“AC”) solar photovoltaic facility and a 2.8 MW fuel cell facility at 350 Waldemere Avenue in Bridgeport, Connecticut (“Project”). UI has submitted to the Connecticut Siting Council (“Council”) a Petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the Project. The Council’s interrogatories 26, 27 and 28 (issued August 4, 2014) under Petition 1104, specifically requested of UI:

*Q 26. In regards to Section 6.4 of the Petition, please submit the visual analysis report that includes all 11 photo locations in the viewshed index. For each photo location, include a description as to whether the solar field is visible and, if so, indicate the percentage of the solar field that would be visible. Describe how the simulations were prepared.<sup>1</sup>*

*Q.27 Describe the distance to and visibility from the following:*

*27a Seabright Avenue beach*

*27b Fayerweather Yacht Club on Brewster Street*

*27c Eames Boulevard*

*27d Arthur Street*

*27e Ferris Street*

*27f Yacht Street*

*27g Soccer field area of Seaside Park*

*27h Barnum Drive*

*27i Barnum Boulevard*

*Q.28 Were photosimulations prepared of the fuel cell units from area receptors? If so, please provide. If not, why not.*

On behalf of UI and in response to the Council’s questions, All-Points Technology Corporation, P.C. (“APT”) completed this evaluation of the visibility associated with the Project.

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<sup>1</sup> Note that the viewshed index referenced in the council’s interrogatory includes a total of 13 photo locations, all of which are addressed in this report.

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## **Project Description and Setting**

The Project includes the proposed installation of approximately 8,500 ballasted 300-watt photovoltaic panels, one Fuel Cell Energy DFC3000 power plant and associated ground equipment. The entire facility would be enclosed within eight-foot tall, chain-link perimeter security fencing. The Project would be located on approximately 22 acres encompassing a large portion of a former landfill operated by the City of Bridgeport. The landfill property is located on a peninsula adjacent to Barnum Boulevard and Seaside Park. The landfill is surrounded by Cedar Creek to the north, a material storage yard operated by the City to the east, Long Island Sound to south, and Black Rock Harbor to the west. The Site is accessible from Cedar Creek Drive to the east.

Land use within the immediate vicinity of the landfill is primarily industrial in nature, with a mix of urban commercial and residential development occurring to the north and west across Cedar Creek, Burr Creek and Black Rock Harbor. Seaside Park and the University of Bridgeport campus lie to the east.

## **Methodology**

In response to Council interrogatory 26, we offer this discussion regarding the two-step methodology employed to prepare the simulations presented in this report.

### **Preliminary Computer Modelling**

To conduct this assessment, three-dimensional computer models were developed for the solar farm, the landfill property and the Project area (approximately 0.75 mile radius surrounding the landfill). Information used in the models included 3D files created by the photo-voltaic panel manufacturer, LiDAR<sup>2</sup>-based digital elevation data and customized land use data layers developed specifically for the Project. The LiDAR-based Digital Elevation Model represents topographic information for the state of Connecticut that was derived through the spatial interpolation of airborne LiDAR-based data collected in the year 2000 and has a horizontal resolution of ten (10) feet.

### **Photographic Documentation and Simulations**

On January 30, 2014, APT personnel staged four-foot weather balloons at three locations on the landfill property and recorded their locations (using global positioning system (“GPS”) equipment technology) and heights. Weather conditions were favorable for the in-field activities with winds averaging less than 3 miles per hour. The balloons were secured at heights of approximately 30 feet above existing grade. The primary purpose of floating the balloons was to allow APT the opportunity to have known, fixed points and heights to use as visual references for proper positioning of photographs and for incorporation into the computer models.

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<sup>2</sup> LiDAR is an acronym for Light Detection and Ranging. It is a technology that utilized lasers to determine the distance to an object or surface. LiDAR is similar to radar, but incorporates laser pulses rather than sound waves. It measures the time delay between transmission and reflection of the laser pulse.

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Prior to initiation of this assessment, UI worked closely with the City of Bridgeport to establish locations from which photographs might be taken to evaluate views of the Project. Once the balloons were secured, APT obtained photographs from these vantage points to document existing views of the Project area within the confines of the landfill. In addition to obtaining photographs from the pre-selected locations, APT conducted a field reconnaissance of the Project area by driving along local roads and other publicly accessible locations to document and inventory where the balloons could be seen above/through the tree canopy, buildings/homes and other infrastructure.

The geographic coordinates of the camera's position at each photo location were logged via GPS. Photographs were taken with a Canon EOS 6D digital camera body and Canon EF 24 to 105 millimeter ("mm") zoom lens, with the lens set to 50 mm for all but four of the views presented herein. Photo point locations 1, 4, 5 and 6 were taken using a 24 mm focal length in order to provide a greater depth of field for presentation in this report. Focal lengths ranging from 24 mm to 50 mm approximate views similar to that achieved by the human eye. However, two key aspects of an image can be directly affected by the specific focal length that is selected: field of view and relation of sizes between objects in the frame. A 24 mm focal length provides a wider field of view, representative of the extent the human eyes may see (including some peripheral vision), but the relation of sizes between objects at the edges of the photos can become minimally skewed. A 50 mm focal length has a narrower field of view than the human eye but the relation of sizes between objects is represented similar to what the human eye might perceive.

*"The lens that most closely approximates the view of the unaided human eye is known as the normal focal-length lens. For the 35 mm camera format, which gives a 24x36 mm image, the normal focal length is about 50 mm."*<sup>3</sup>

When taking photographs for these analyses, APT prefers a focal length of 50 mm; however there are times when wider views (requiring the use of the 24 mm lens setting, in this case) can better reflect "real world" viewing conditions by providing greater context to the scene. Regardless of the lens setting, the scale of the subject in the photograph and corresponding simulation remains proportional to its surroundings.

Photographic simulations were generated to portray scaled renderings of the solar facility from the 13 representative locations where it would be visible. One simulation has also been provided of the proposed fuel cell installation. Using field data, site plan information and 3D modeling software, the spatially referenced models of the Project area, solar farm and fuel cell were generated and merged. The geographic coordinates obtained in the field for the photograph locations were incorporated into the model to produce virtual camera positions within the spatial 3D model. Photo simulations were then created using a combination of renderings generated in the 3D model and photo-rendering software programs. For presentation purposes in this report, all of the photographs were produced in an approximate 7-inch by 10.5-inch format<sup>4</sup>.

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<sup>3</sup> Warren, Bruce. Photography, West Publishing Company, Eagan, MN, c. 1993, (page 70).

<sup>4</sup> When viewing in this format size, we believe it is important to provide the largest representational image while maintaining an accurate relation of sizes between objects within the frame of the photograph and depicting the subject (the Project) in a way similar to what an observer might see, to the greatest extent possible.

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In further response to interrogatory 26, the following table summarizes characteristics of the photographs and simulations presented in the attachment to this report including a description of each location, the focal lens setting used, the view orientation, the distance from where the photo was taken relative to the proposed Project site and the approximate percentage of the solar farm visible from that view.

View	Location	Focal Length	Orientation	Dist. To Project	% Visible
1	West Beach Bath House	24 mm	Northwest	±0.08 Mile	30%
2	South End of Barnum Avenue	50 mm	Northeast	±0.32 Mile	60%
3	Seaside Park	50 mm	Southwest	±0.56 Mile	20%
4	Bostwick Avenue	24 mm	Southeast	±0.16 Mile	75%
5	Captain's Cove Seaport	24 mm	Southeast	±0.18 Mile	75%
6	Bloodroot Restaurant	24 mm	Southeast	±0.38 Mile	75%
7	Fayerweather Yacht Club	50 mm	East	±0.15 Mile	80%
8	Black Rock Yacht Club	50 mm	Northeast	±0.63 Mile	45%
9	Grovers Avenue	50 mm	Northeast	±0.79 Mile	45%
10	I-95	50 mm	Southeast	±0.85 Mile	80%
11	Barnum Dyke	50 mm	Southwest	±0.29 Mile	25%
12	Barnum Dyke	50 mm	Southwest	±0.26 Mile	20%
13	Sound View Drive	50 mm	West	±0.53 Mile	10%
14	Barnum Dyke & Waldemere Ave*	50 mm	West	±0.10 Mile	N/A

\*Photo 14 depicts fuel cell installation (photo taken August 14, 2014)

A photolog map depicting the locations of photographs 1 through 13 in Section 6.4 of the Petition (as referenced in the Council's interrogatory presented herein), photo-documentation of existing conditions (at the time of the field reconnaissance) and photo-simulations of the Project are presented in the attachment to this report. Note photograph 14 represents the proposed fuel cell installation, in response to interrogatory 28.

The 13 locations identified in Section 6.4 of the Petition were selected by the City of Bridgeport to gain an understanding of the views that might be achieved of the Project. It is important to consider that the specific locations from where the photographs were taken generally represent a "worst case" scenario from that area. They were chosen in the field to present unobstructed view lines (wherever possible), are static in nature and do not necessarily fairly characterize the prevailing views from all locations within a given area. The simulations provide a representation of the Project under similar settings as those encountered during the balloon float and reconnaissance. Views of the Project can change substantially throughout the seasons as well as the time of day, and are dependent on weather and other atmospheric conditions including but not necessarily limited to haze, fog, and clouds; the location, angle and intensity of the sun; light conditions, and the specific viewer location.

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## Visibility Analysis Results

Based on the results of the balloon float, field reconnaissance and modelling efforts, APT determined that views of the Project would be limited to those areas where portions of the landfill are currently visible. The low profile of the Project's infrastructure does not significantly increase the areal extent of the existing viewshed. In addition, the location of the proposed fuel cell limits direct views to the immediate area of the Barnum Dyke and Waldemere Avenue intersection (see photo 14).

Within Seaside Park, which the landfill abuts, portions of the Project would be visible intermittently from along the western end of Barnum Boulevard (photos 1 and 2) for a stretch of approximately 1,500 feet. No substantive views of the Project would be achieved beyond the immediate vicinity of the landfill property from locations to the east (photos 3, 11, 12 and 13).

Views would be restricted to those areas along the northern shoreline of Cedar Creek and Burr Creek, where the landfill is visible across the open water (photos 4 through 9) at distances ranging from 0.10 mile to over 0.75 mile away.

The majority of the landfill is currently visible from portions of I-95 (photo 10). Future views would be consistent with City of Bridgeport Mayor Bill Finch's opinion of the Project as helping to signal a "change in [Bridgeport's] image from a declining industrial city to a smart, green community with vision and innovation" by serving as "a model for the reuse of an environmental impaired property..." that is an "eyesore," and "having millions of people a year traveling along I-95 and passing the facility on their way to Seaside Park will generate not only a new appreciation for Bridgeport, but significant economic opportunity as well."<sup>5</sup>

We offer the responses (descriptions of distance to and visibility from nine locations listed in interrogatory 27) in the following table.

Question	Location	Photo	Orientation	Dist. To Project	Visibility
27a	Seabright Avenue beach	No photo	Northeast	±0.30 Mile	Year-round
27b	Fayerweather Yacht Club on Brewster Street	Photo 7	Northeast	±0.18 Mile	Year-round
27c	Eames Boulevard*	Photo 9	Northeast	±0.79 Mile	Year-round
27d	Arthur Street	No Photo**	Southeast	±0.36 Mile	Year-round
27e	Ferris Street	Photo 6	Southeast	±0.38 Mile	Year-round
27f	Yacht Street	No photo	Southeast	±0.39 Mile	Mixed***
27g	Soccer field area of Seaside Park	Photo 3	Southwest	±0.56 Mile	Year-round
27h	Barnum Drive	Photo 12****	Southwest	±0.26 Mile	Year-round
27i	Barnum Boulevard	Photos 1 & 2	NE & NW	±0.08-0.32 Mile	Year-round

\*Eames Boulevard is also labeled as Grovers Avenue

\*\*Photo 6 (Ferris Street) is one street over from this location

\*\*\*Yacht Street extends along the north short of Cedar and Burr Creeks and has a mix of seasonal and year-round views.

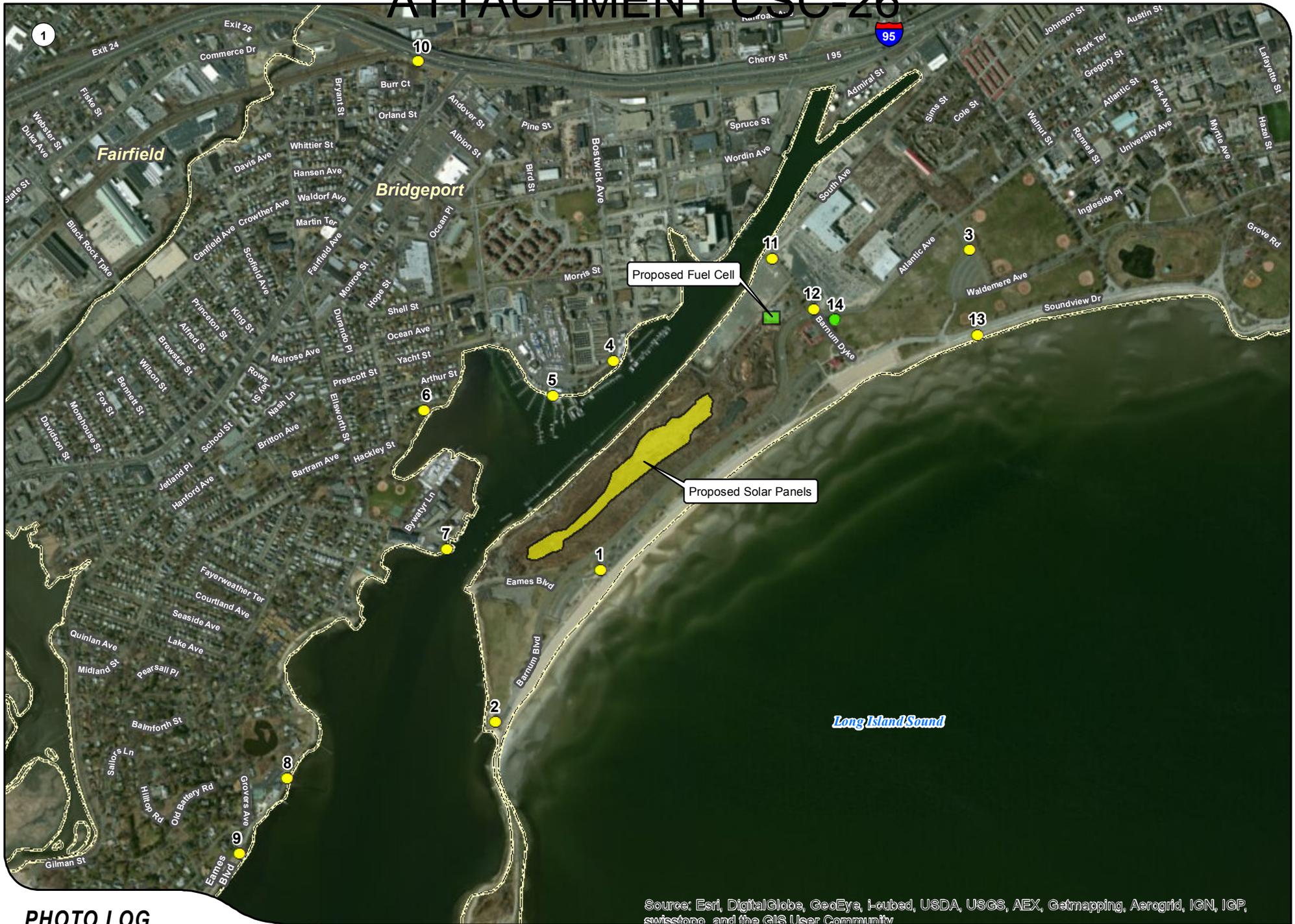
\*\*\*\* Photo 12 depicts the view from the entrance to Barnum Drive (which becomes Barnum Boulevard).

<sup>5</sup> Correspondence, Mayor Bill Finch, Docket No. 12-01-05 (April 4, 2012 testimony), Public Utilities Regulatory Authority.

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## ATTACHMENTS

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## PHOTO LOG

Legend

- Proposed Solar Panels
- Proposed Solar Panels Photo Location
- Municipal Boundary
- Proposed Fuel Cell
- Proposed Fuel Cell Photo Location

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstone, and the GIS User Community



500 250 0 500  
Feet

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## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
1	WEST BEACH BATH HOUSE (24mm Focal Length)	NORTHWEST	+/- 0.08 MILE

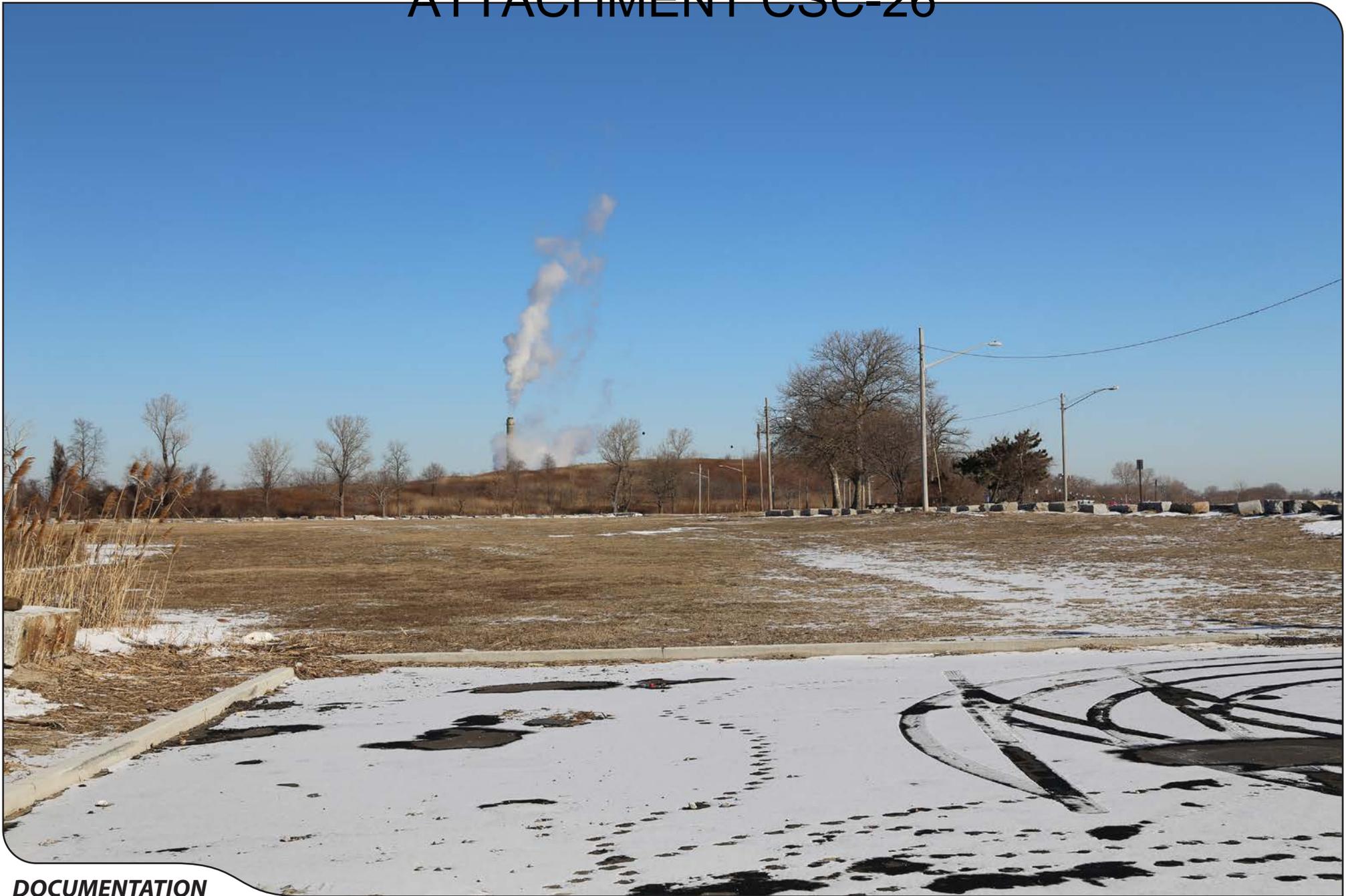
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## SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
1	WEST BEACH BATH HOUSE (24mm Focal Length)	NORTHWEST	+/- 0.08 MILE

# ATTACHMENT CSC-26



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
2	PARKING LOT AT SOUTHERN END OF BARNUM BOULEVARD (50mm Focal Length)	NORTHEAST	+/- 0.32 MILE

# ATTACHMENT CSC-26



## **SIMULATION**

PHOTO

2

LOCATION

**PARKING LOT AT SOUTHERN END OF BARNUM BOULEVARD (50mm Focal Length)**

ORIENTATION

**NORTHEAST**

DISTANCE TO SITE

**+/- 0.32 MILE**

# ATTACHMENT CSC-26



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
3	SEASIDE PARK (50mm Focal Length)	SOUTHWEST	+/- 0.56 MILE

# ATTACHMENT CSC-26



## **SIMULATION**

PHOTO

**3**

LOCATION

**SEASIDE PARK (50mm Focal Length)**

ORIENTATION

**SOUTHWEST**

DISTANCE TO SITE

**+/- 0.56 MILE**

# ATTACHMENT CSC-26



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
4	BOSTWICK AVENUE (24mm Focal Length)	SOUTHEAST	+/- 0.16 MILE

# ATTACHMENT CSC-26



## ***SIMULATION***

PHOTO

4

LOCATION

**BOSTWICK AVENUE (24mm Focal Length)**

ORIENTATION

**SOUTHEAST**

DISTANCE TO SITE

**+/- 0.16 MILE**



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
5	CAPTAIN'S COVE SEAPORT – UPPER DECK (24mm Focal Length)	SOUTHEAST	+/- 0.18 MILE

# ATTACHMENT CSC-26



## **SIMULATION**

PHOTO

5

LOCATION

**CAPTAIN'S COVE SEAPORT – UPPER DECK (24mm Focal Length)**

ORIENTATION

**SOUTHEAST**

DISTANCE TO SITE

**+/- 0.18 MILE**

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## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
6	BLOODROOT RESTAURANT PARKING LOT - FERRIS STREET (24mm Focal Length)	SOUTHEAST	+/- 0.38 MILE

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## **SIMULATION**

PHOTO

6

LOCATION

**BLOODROOT RESTAURANT PARKING LOT - FERRIS STREET (24mm Focal Length)**

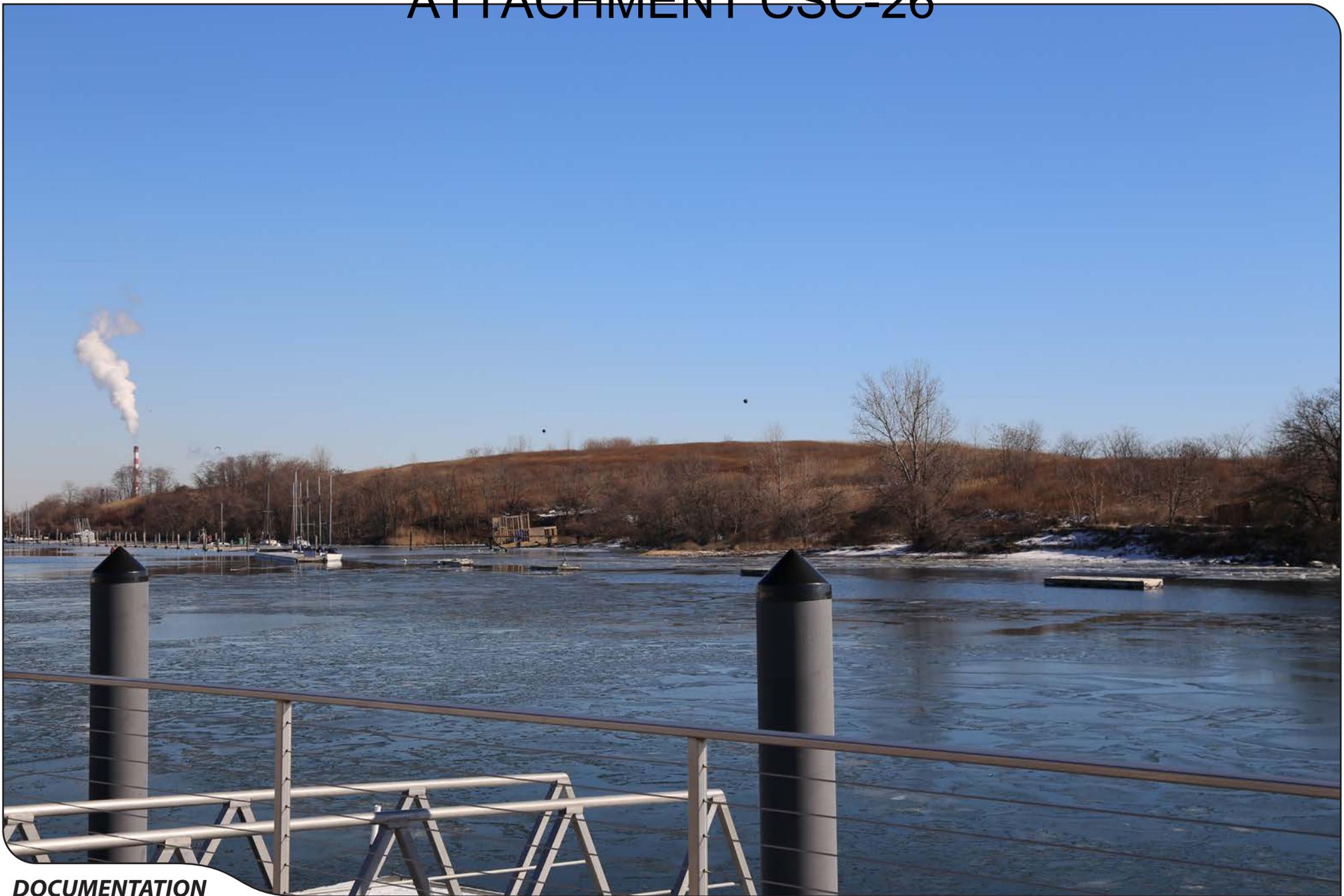
ORIENTATION

**SOUTHEAST**

DISTANCE TO SITE

**+/- 0.38 MILE**

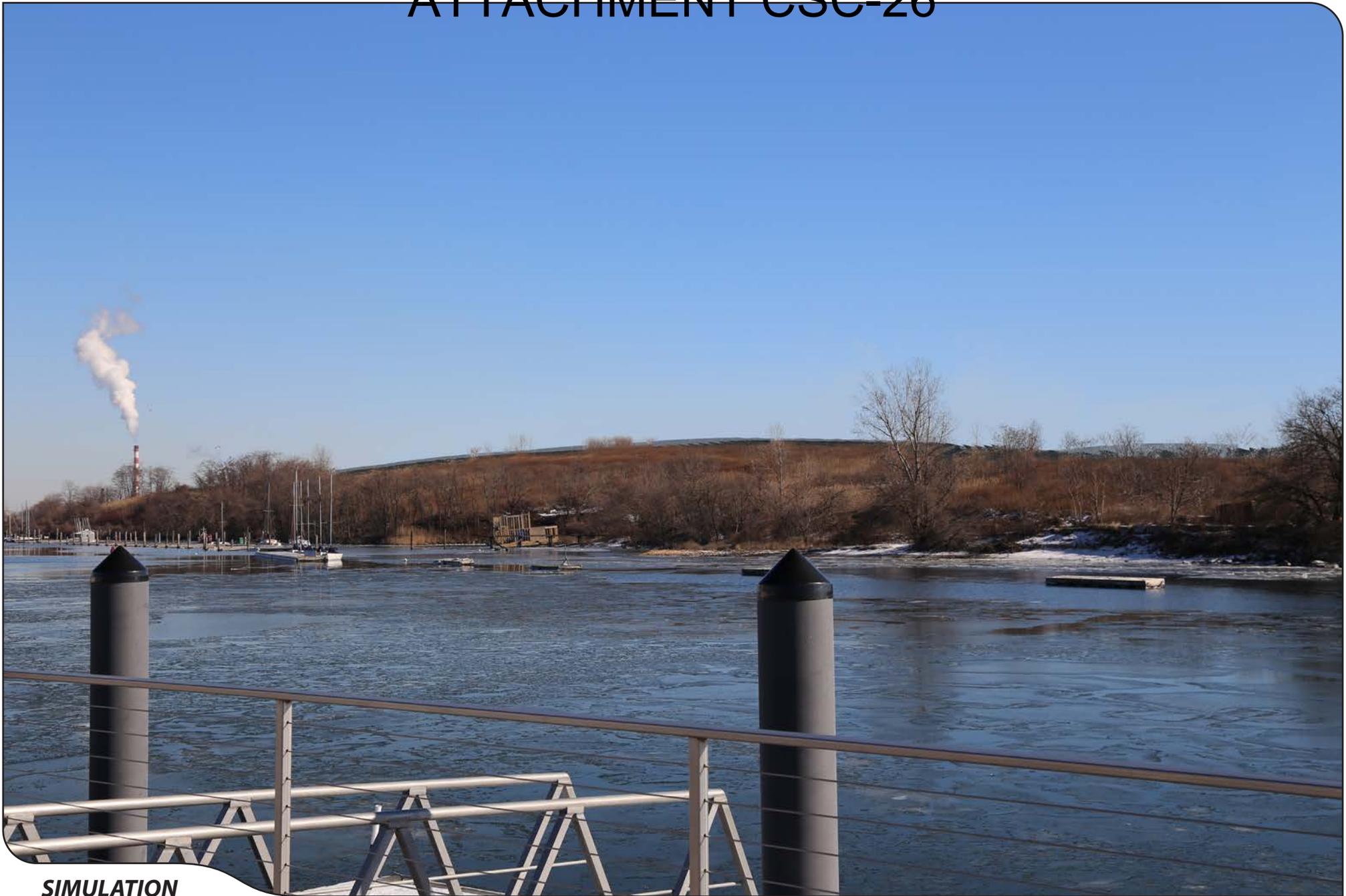
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## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
7	FAYERWEATHER YACHT CLUB (50mm Focal Length)	EAST	+/- 0.15 MILE

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## **SIMULATION**

PHOTO

7

LOCATION

**FAYERWEATHER YACHT CLUB (50mm Focal Length)**

ORIENTATION

**EAST**

DISTANCE TO SITE

**+/- 0.15 MILE**

# ATTACHMENT CSC-26



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
8	BLACK ROCK YACHT CLUB (50mm Focal Length)	NORTHEAST	+/- 0.63 MILE

# ATTACHMENT CSC-26



## ***SIMULATION***

PHOTO

**8**

LOCATION

**BLACK ROCK YACHT CLUB (50mm Focal Length)**

ORIENTATION

**NORTHEAST**

DISTANCE TO SITE

**+/- 0.63 MILE**

# ATTACHMENT CSC-26



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
9	GROVERS AVENUE (50mm Focal Length)	NORTHEAST	+/- 0.79 MILE

# ATTACHMENT CSC-26



## **SIMULATION**

PHOTO

9

LOCATION

**GROVERS AVENUE (50mm Focal Length)**

ORIENTATION

**NORTHEAST**

DISTANCE TO SITE

**+/- 0.79 MILE**

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## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
10	I-95 (50mm Focal Length)	SOUTHEAST	+/- 0.85 MILE

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## **SIMULATION**

PHOTO

**10**

LOCATION

**I-95 (50mm Focal Length)**

ORIENTATION

**SOUTHEAST**

DISTANCE TO SITE

**+/- 0.85 MILE**

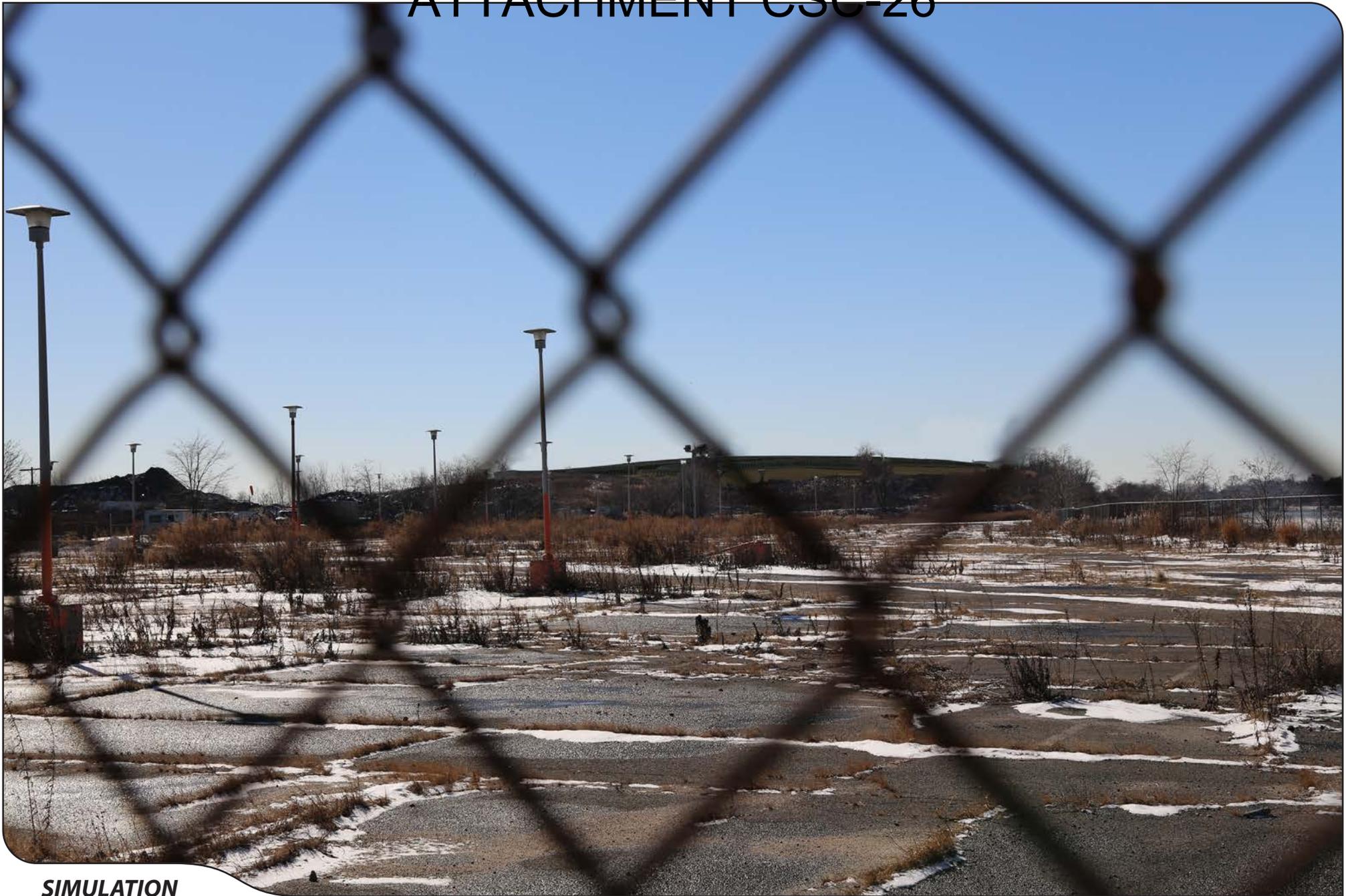
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## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
11	BARNUM DYKE (50mm Focal Length)	SOUTHWEST	+/- 0.29 MILE

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## **SIMULATION**

PHOTO

11

LOCATION

**BARNUM DYKE (50mm Focal Length)**

ORIENTATION

**SOUTHWEST**

DISTANCE TO SITE

**+/- 0.29 MILE**

# ATTACHMENT CSC-26



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
12	BARNUM DYKE (50mm Focal Length)	SOUTHWEST	+/- 0.26 MILE

# ATTACHMENT CSC-26



## SIMULATION

PHOTO

12

LOCATION

BARNUM DYKE (50mm Focal Length)

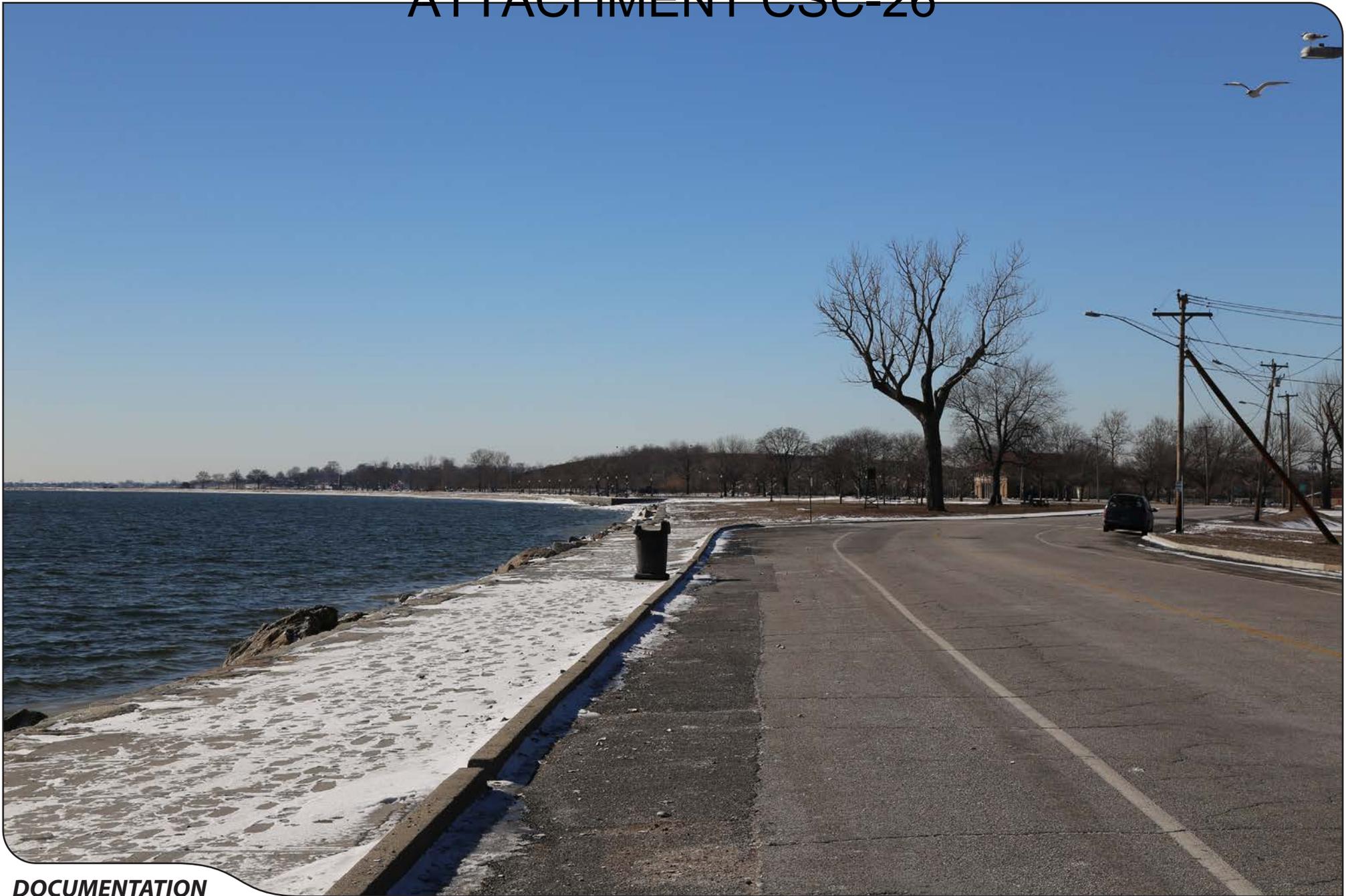
ORIENTATION

SOUTHWEST

DISTANCE TO SITE

+/- 0.26 MILE

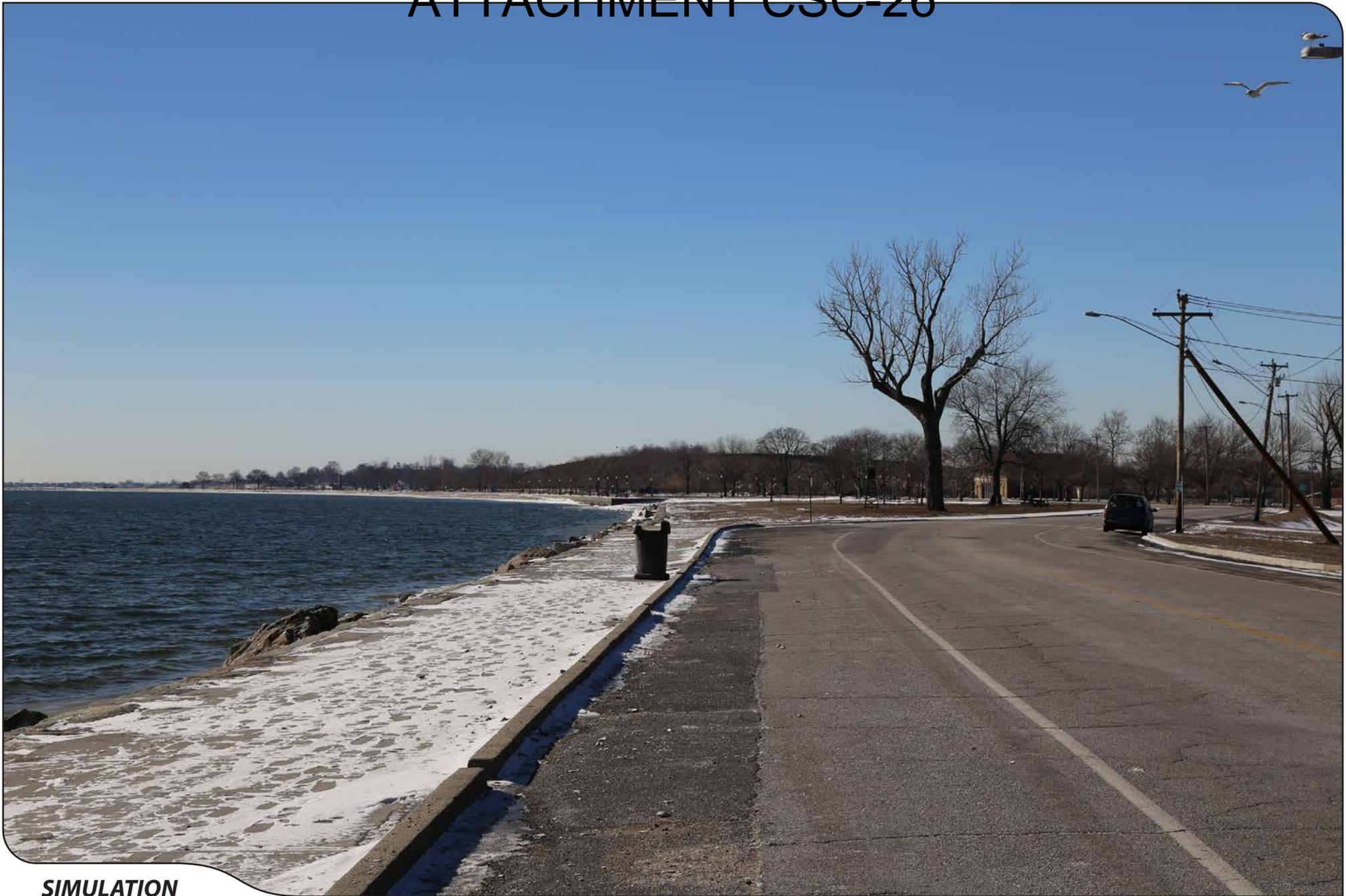
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## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
13	SOUNDVIEW DRIVE (50mm Focal Length)	WEST	+/- 0.53 MILE

# ATTACHMENT CSC-26



## ***SIMULATION***

PHOTO

**13**

LOCATION

**SOUNDVIEW DRIVE (50mm Focal Length)**

ORIENTATION

**WEST**

DISTANCE TO SITE

**+/- 0.53 MILE**

# ATTACHMENT CSC-26



## DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE
14	INETERSECTION OF BARNUM DYKE AND WALDEMERE AVENUE (50mm Focal Length)	WEST	+/- 0.10 MILE

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## ***SIMULATION***

PHOTO

14

LOCATION

**INETERSECTION OF BARNUM DYKE AND WALDEMERE AVENUE (50mm Focal Length)**

ORIENTATION

**WEST**

DISTANCE TO SITE

**+/- 0.10 MILE**

# ATTACHMENT CSC-26



## **SIMULATION**

PHOTO

14

LOCATION

**INETERSECTION OF BARNUM DYKE AND WALDEMERE AVENUE (50mm Focal Length)**

ORIENTATION

**WEST**

DISTANCE TO SITE

**+/- 0.10 MILE**