Exelon Generation.

10 CFR 50.54(f)

RS-16-051
RA-16-017

April 15, 2016

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Oyster Creek Nuclear Generating Station
Renewed Facility Operating License No. DPR-16
NRC Docket No. 50-219

Subject: Supplemental Response to NRC Audit Review Request for Additional Information Regarding Fukushima Lessons Learned - Flood Hazard Reevaluation Report

References:

1. Exelon Generation Company, LLC Letter to USNRC, Flood Hazard Reevaluation Report Pursuant to 10 CFR 50.54(f) Regarding the Fukushima Near-Term Task Force Recommendation 2.1: Flooding, dated March 12, 2015 (RS-15-063)
2. NRC Letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012
3. NRC Email from T. Govan to D. Distel, Oyster Creek FLO-2D Follow-up Questions, dated December 11, 2015

In Reference 1, Exelon Generation Company, LLC (EGC) provided the Flooding Hazard Reevaluation Report (FHRR) for the Oyster Creek Nuclear Generating Station in response to the March 12, 2012 Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 2, (Reference 2). The NRC conducted an audit/webinar review of the Oyster Creek Nuclear Generating Station FHRR on August 18, 2015. In support of the FHRR audit, the NRC provided audit information needs items. The information provided by EGC to address the audit information needs items was subsequently reviewed by the NRC during the audit. An additional Oyster Creek FHRR audit review call was conducted on January 14, 2016 to discuss the EGC responses to the NRC clarification questions provided in Reference 3. EGC's responses to the NRC clarification questions resulted in a revision to the Local Intense Precipitation (LIP) Report (Enclosure 1) and updated LIP model input and output electronic files (Enclosure 2).

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EGC's responses to the NRC clarification questions resulted in identification of a need for an additional layer of sandbags at Door 9 to improve margin. Sandbags at Door 9 were initially identified as an Interim Action in Enclosure 4 of Reference 1.

EGC's responses to the NRC clarification questions also resulted in the addition of a door previously excluded from the results summary tables in the LIP Report. Door 14 was added to Tables 4 and 5, and Figure 4 of the LIP Report (Enclosure 1), and has a threshold elevation of 23.50 ft MSL and a peak reevaluated LIP elevation of 24.38 ft MSL. Similar to Door 9, sandbags will be staged at the entrance of Door 14 as a temporary LIP barrier. The additional protection measures at Door 14 have been added as a regulatory commitment in Enclosure 3.

The results of the updated evaluation have been reviewed and the temporary LIP barriers will adequately protect the plant from the slightly increased water level at Reactor Building Door 9 and Door 14.

A list of regulatory commitments contained in this letter is provided in Enclosure 3.

If you have any questions regarding this report, please contact Ron Gaston at (630) 657-3359.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 15th day of April 2016.

Respectfully submitted,

James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosures:
1. Oyster Creek Nuclear Generating Station – Local Intense Precipitation Evaluation Report, Revision 8
2. DVD labeled: Oyster Creek Nuclear Generating Station, Calculation LIP-OYS-001, Rev. 7, Local Intense Precipitation FLO-2D Model, RCN:LIP-310.7, Input and Output Files, April 5, 2016

   Document Components:

   LIP-OYS-001 Rev.7

   02_FLO-2D Model
3. Summary of Regulatory Commitments

cc: NRC Regional Administrator - Region I
NRC Project Manager, NRR – Oyster Creek Nuclear Generating Station
NRC Senior Resident Inspector – Oyster Creek Nuclear Generating Station
Ms. Tekia Govan, NRR/JLD/PPSD/HMB, NRC
Manager, Bureau of Nuclear Engineering – New Jersey Department of Environmental Protection (w/o Enclosure 2)
Mayor of Lacey Township, Forked River, NJ (w/o Enclosure 2)

Enclosure 1

Oyster Creek Nuclear Generating Station

Local Intense Precipitation Evaluation Report

Revision 8

(16 pages)

LOCAL INTENSE PRECIPITATION EVALUATION REPORT, Rev. 8

for the

OYSTER CREEK NUCLEAR GENERATING STATION
Route 9 South, PO Box 388, Forked River, NJ 08731

Exelon

Exelon Generation Company, LLC (Exelon)
P.O. Box 805387
Chicago, Illinois 60680-5387

Prepared by:
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Revision 8 Submittal Date: March 25, 2016

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Corporate Acceptance:	Joseph V. Bellini	Exelon		4/5/16

Contents

Figures

Tables

1. LIST OF ACRONYMS

ASME	American Society of Mechanical Engineers
CLB	Current Licensing Basis
DEM	Digital Elevation Model
ft	Foot / Linear Foot
HMR 51	Hydrometeorological Report 51
HMR 52	Hydrometeorological Report 52
HSG	Hydrologic Soil Group
IPEEE	Individual Plan Examination of External Events
lb	Pound Force
LIP	Local Intense Precipitation
MSL	Mean Sea Level Datum
NAVD 88	North American Vertical Datum of 1988
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
OCNGS	Oyster Creek Nuclear Generating Station
PMP	Probable Maximum Precipitation
PMF	Probable Maximum Flood
RAI	Request for Additional Information
IR	Issue Report
UFSAR	Updated Final Safety Analysis
USDA	United States Department of Agriculture

2. PURPOSE

a. Background

AMEC Environment & Infrastructure, Inc. (AMEC) on behalf of Exelon Corporation (Exelon) performed an evaluation of site runoff generated from a Local Intense Precipitation (LIP) event to supplement the on-going flooding studies at Oyster Creek Nuclear Generating Station (OCNGS). AMEC performed this work under a Quality Assurance (QA) Program that conforms to the requirements of ASME NQA-1 and 10.CFR.50 Appendix B. The LIP evaluation was performed in accordance with the Nuclear Regulatory Commission's (NRC's) "Design-Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America", dated November 2011 (NUREG/CR-7046) (Reference 9).

NUREG/CR-7046 (Reference 9) identifies the LIP under causative mechanisms for design-basis floods and states that these mechanisms or causes be investigated to estimate the design-basis flood for nuclear power plant sites. Local flooding is associated with inundation caused by localized, short-duration, intense rainfall events. The focus of this study was to evaluate the adequacy of the site's grading, drainage, and runoff-carrying capacity. It was assumed for this analysis that all active and passive drainage system components (e.g., pumps, gravity storm drain systems, small culverts, inlets, etc.) are non-functional during the local intense rainfall event, per Case 3 in NUREG/CR-7046 (Reference 9). As such, only overland flow and open channel systems were modeled and considered in the local flooding analysis.

Per NUREG/CR-7046 (Reference 9), the LIP event is defined as a 1-hour/1-square mile Probable Maximum Precipitation (PMP). The PMP is the greatest depth of precipitation, for a given duration, that is theoretically possible for a particular area and geographic location (Reference 9). The PMP is not derived from historic rainfall records, although historic atmospheric conditions and patterns are considered. The 1-hour PMP event was developed using Hydrometeorological Report 52 (HMR 52) (Reference 7).

b. Site Description

OCNGS is located on the coastal pine barrens of New Jersey, in Lacey and Ocean Townships, Ocean County (Figure 1). The plant site is located to the west of Route 9, and is bounded by Oyster Creek in the north, south, and east (Figure 1). The site is approximately 35 miles north of Atlantic City, New Jersey, and 45 miles east of Philadelphia, Pennsylvania (Reference 4).

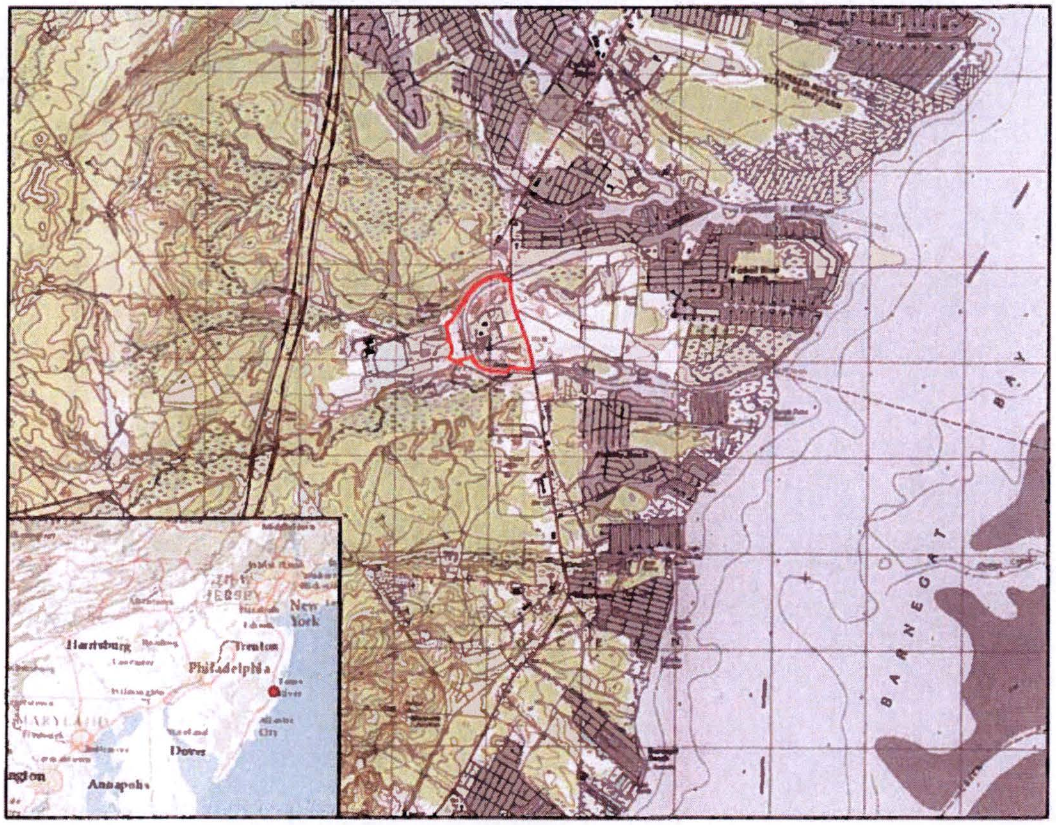

Figure 1: Oyster Creek Nuclear Generating Station Location

c. Vertical Datum

Elevations provided in this report are presented in the North American Vertical Datum of 1988 (NAVD 88) and the Mean Sea Level Datum (MSL) to relate calculated results to the Current Licensing Basis (CLB) documents. The topographic, photogrammetric, and survey data used for the calculations are in the NAVD 88 datum.

A conversion was required to compare elevations reported in the MSL and NAVD 88 datums. According to the NOAA Center for Operational Oceanographic Products and Services website (Reference 8), the datum shift from MSL to NAVD 88 for the OCNGS latitude and longitude (39.8222, -74.203) requires an adjustment based on the closest benchmark location. The closest benchmark location is the Inside Barnegat Inlet Station, 8533615 (Reference 8). Equation 1 shows the datum conversion to convert the MSL elevation to the NAVD 88 datum.

Equation 1

$$\textbf{Elevation in ft NAVD 88} = \textbf{Elevation in ft MSL} - \mathbf{0.02\ ft}$$

d. Summary of Current Licensing Basis Flood Hazards

The OCNGS grade elevation is 22.98 ft NAVD 88 (23.00 feet MSL), and the water intake structure invert is at elevation 5.98 ft NAVD 88 (6.00 feet MSL). According to the site's Updated Final Safety Analysis Report (UFSAR), the current Probable Maximum Flood (PMF) in the Oyster Creek watershed would generate a peak water surface elevation at the site of approximately 5.28 ft NAVD 88 (5.30 feet MSL) (Reference 4).

The site topography generally slopes from Route 9 to the west toward OCNGS with a station grade elevation of 22.98 ft NAVD 88 (23.00 feet MSL). The floor elevations of the Reactor and Turbine Buildings are 6 inches above grade at elevation 23.48 ft NAVD 88 (23.50 feet MSL). Two entrances to the emergency Diesel Generator Building are at elevation 22.98 ft NAVD 88 (23.00 feet MSL). A 6-inch high asphalt dike is provided at these entrances to provide protection against external flooding of the emergency Diesel Generator Building up to an elevation of 23.48 feet NAVD 88 (23.50 feet MSL). The plant site grading generally slopes away from the high point in the center of the island toward the intake to the north and west, the discharge canal to the south and west, and Route 9 to the east (Reference 4). Per AMEC's field observations during a site visit on April 27, 2012, the switchyard, located on the west bank of the intake and discharge canals across from the station, is generally flat with an estimated grade of 1%. The eastern half of the switchyard slopes toward the northeast toward a 2-ft high earthen berm along the eastern and northern fence line. The western half of the switchyard drains toward the west to a drainage ditch, just outside of the fence line.

Per Oyster Creek Station's UFSAR, Section 2.4.2.3 (Reference 4), an LIP investigation was previously performed. The UFSAR indicates that runoff resulting from LIP partly drains off the site through the existing storm water sewers and partly drains away as overland flow towards the outer periphery of the plant site. Due to the time lag between the runoff and rainfall, some local site ponding is predicted to occur; however, this predicted ponding does not result in flooding of the site. Based on the information provided in the UFSAR (Reference 4) the flood elevation for the LIP was established at 23.48 ft NAVD 88 (23.50 ft MSL). The USFAR does not provide details on the methodology and assumptions used in evaluating the LIP flood elevation.

Additional information regarding the licensing basis LIP flooding evaluation is discussed in the August 2000 AmerGen reply letter to Request for Additional Information (RAI) on Individual Plan Examination of External

Events (IPEEE) at OCNGS (Reference 2). According to the 2000 AmerGen reply letter, the initial site drainage analysis prior to the IPEEE was performed in 1982 (Reference 2). This analysis was performed for a 6-hour point PMP of 27 inches (Reference 2). The analysis considered the site topography and the existing storm sewer drainage system consisting mostly of 8-inch diameter sewers leading into a 10-inch diameter sewer to a 30-inch diameter outfall into the discharge canal north of the Emergency Diesel Generator Building (Reference 2). The 2000 AmerGen reply letter indicates the methodology and assumptions for performing the hydrologic analysis and calculation of flood depths were not provided (Reference 2). This prior analysis concluded that the local site flooding would occur 5 inches above grade elevation of 23.00 feet MSL (Reference 10).

The 2000 AmerGen reply letter (Reference 2) indicates that a drainage analysis using the updated PMP criteria was performed under the IPEEE for OCNGS. As part of the evaluation, a site walkdown was performed to confirm the site configuration per the design drawings. Changes in site configuration that were identified during this site walkdown included new catch basins and pipes, as well as change in drainage patterns due to the construction of an Administration Building. The site drainage analysis was performed using criteria from Hydrometeorological Report 51 and 52 (HMR 51 and HMR 52) for a 1-hour PMP of 18 inches and 24-hour PMP of 35 inches (Reference 2). The storm sewer system and changes in site configuration were incorporated in the analysis; however, the methodology and assumptions for performing the hydrologic analysis and calculation of flood depths were not discussed in detail (Reference 2). The results of the analysis showed that a water surface elevation of 23.60 feet MSL could occur in areas adjacent to the north, east, and south sides of the Reactor Building (Reference 2). However, the analysis did not indicate whether this calculated water surface elevation was the result of the 1-hour or 24-hour PMP. The analysis concluded that water intrusion in other buildings would not lead to severe accidents, since the Turbine Building or Diesel Generator Building would not be affected by the flooding (Reference 2). The analysis also concluded that the only potential water entry would be the Reactor Building; however, the entrances are kept closed during normal operation (Reference 2). The 2000 AmerGen reply letter (Reference 2) indicates that the interior of the Reactor Building is maintained at a negative pressure of 0.25 inches of water (Reference 2). The analysis states that the force exerted on the airlock doors by approximately one inch of water along the base is negligible compared to the pressure of 0.25 inches of water over the entire door surface, and therefore the airlock doors would remain in place minimizing water intrusion into the building (Reference 2).

3. METHODOLOGY

a. Modeling Approach

This evaluation used a two-dimensional (2D) hydrodynamic model, FLO-2D, to evaluate the flow characteristics of the runoff caused by an LIP event. The FLO-2D model was created with boundaries along the centerline of Route 9 to the east, OCNGS to the north and south, and the access road just west of the switchyard fence line. The switchyard was included in the study area to evaluate the potential effects of the LIP on the safety-related systems, structures, and components (SSCs) in this area. Figure 2 shows the exterior boundary of the FLO-2D model.

The FLO-2D model consists of 66,664 10-ft by 10-ft grids elements. The 10-ft by 10-ft grid size was chosen to provide an adequate level of detail to reflect the hydrodynamic effects at the site, while requiring a reasonable amount of computational resources. Based on Table 1.1 of the FLO-2D Data Input manual, the optimal number of grid elements is 150,000 (Reference 5). If the grid size were reduced to 5 ft by 5 ft, the model would have approximately 267,000 grid elements, which is greater than the optimal number of grid elements. The FLO-2D model required the following inputs to evaluate the LIP (Reference 5):

- Topography to characterize grading, slopes, drainage divides, and low areas of the site;
- Manning's roughness coefficients (n-values) to characterize the land cover of the site and its effects on flow depths and velocities; and
- 1-hour PMP event to characterize the Local Intense Precipitation event (volume, distribution, and duration).

The model was run with the above inputs to evaluate the adequacy of the site grading and runoff carrying capacity during the local intense precipitation event. The model provides information on the following parameters:

- Flood elevations;
- Flood depths;
- Velocity vectors (magnitude and direction);
- Resultant static loads; and
- Resultant impact loads.

It was assumed that all active and passive drainage system components (e.g., pumps, gravity storm drain systems, small culverts, inlets, etc.) are non-functional or clogged during the LIP event, per Case 3 in NUREG/CR-7046 (Reference 9). NUREG/CR-7046 discusses that it is extremely rare that the passive site drainage network would remain completely unblocked during the LIP event. Assuming blocked conditions was considered reasonable during a LIP event because the expectation is that: 1) a significant volume of debris/sediment would be transported, delivered, and accumulated at drainage structures and 2) conveyance capacity of the drainage system is very limited, even if completely open, relative to the peak flow rates during a LIP event. Furthermore, the NRC would require the utility to provide substantial justification for crediting partial or full conveyance from drainage structures (Reference 9).

The LIP evaluation was conducted independently of external high-water events, and was assumed to have occurred non-coincidental to a river flood. Therefore, backwater or tailwater was not considered. Per recommendations provided by NUREG/CR-7046, runoff losses were ignored during the LIP event to maximize the runoff from the event. The site is predominantly impervious and, therefore, accounting for losses would have very minimal impact on the results. The soil types in previous surfaces are classified by the USDA-NRCS as being within Hydrologic Soil Group (HSG) A, which is characterized as having saturated infiltration rates ranging from 0.6 inches per hour to 20.00 inches per hour (Reference 11). However, given that the majority of the site is impervious, the saturation infiltration rates can be assumed to be toward the low end of this range and negligible compared to the rainfall intensity for an LIP event. If included, the NRC would require the utility to provide justification for crediting losses (Reference 9). Only overland flow and open channel systems were modeled and considered in the LIP flooding analysis.

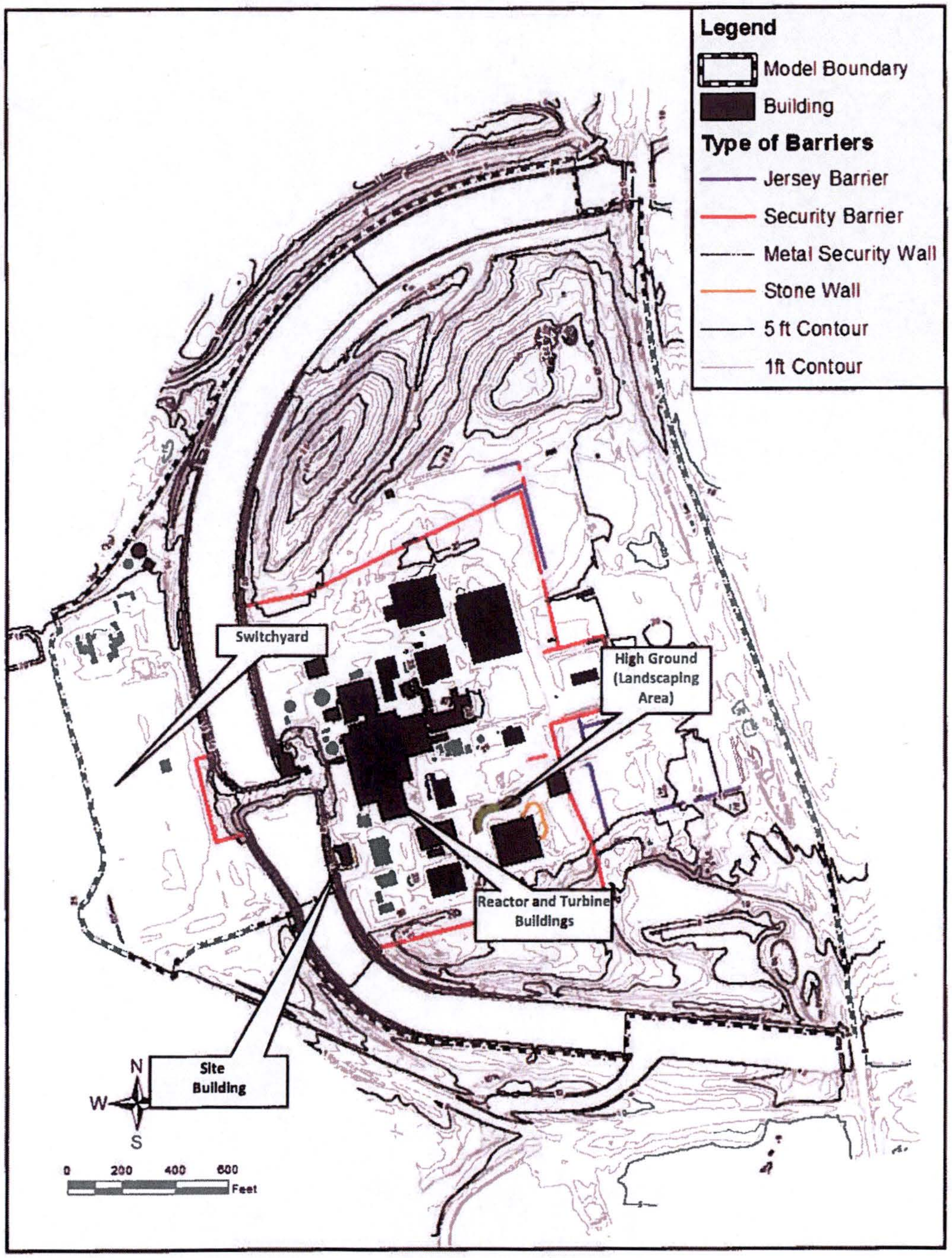

Figure 2: FLO-2D Model Boundary

b. Topography

The FLO-2D model was constructed from a digital elevation model (DEM) produced from available photogrammetric survey data, supplemented with a field survey completed to characterize grading, slopes, drainage divides, and low areas of the site.

A digital CAD file of the photogrammetric survey data collected in 2004 was provided by Exelon (Reference 3). The survey data provided 1-foot contours of the site. AMEC accepted the survey data through a commercial grade dedication process under AMEC's Quality Assurance Program.

AMEC considered the photogrammetric survey sufficient as a baseline for the LIP evaluation. Supplemental field surveys of the site were completed to incorporate site features that were not identified by the photogrammetric survey. The features included depressions/low points and jersey and security barriers. The field survey was performed in July of 2012 by a Professional Land Surveyor licensed in the State of New Jersey (Reference 12).

The supplemental field survey data was incorporated into the photogrammetric survey using AutoCAD Civil3D software to produce the DEM. The DEM was clipped to match the FLO-2D model limits shown in Figure 2 above.

c. Land Cover

The FLO-2D model uses Manning's Roughness Coefficients (n-values) to characterize the site's surface roughness and calculate effects on flow depths and velocities. Land cover for the site was evaluated using interpretation of orthoimagery that was verified in the field by AMEC during subsequent visits to the site. N-values were assigned to each land cover type and based on ranges described on page 22 of the FLO-2D Reference Manual (Reference 6). The assigned n-values are provided in Table 1 below.

Table 1: Assigned Manning's Roughness Coefficients (n-Values)

Land Cover Surfaces of Oyster Creek Station[1]	Recommended Range of n-values[2]	Assigned n-value	% Coverage
Bermuda and dense grass, dense vegetation	0.17 - 0.48	0.32	39%
Shrubs and forest litter, pasture	0.30 - 0.40	0.40	26%
Asphalt, Concrete, or Buildings	0.02 - 0.05	0.035	14%
Gravel[3]	-	0.05	9%
Water surface[4]	-	0.02	12%

[1]Land cover surface per orthoimagery and field verification.
[2]Recommended ranges of Manning's n-values per page 22 of the FLO-2D Reference Manual provided in Appendix A.
[3]Gravel surfaces were assigned a n-value from the upper range for Asphalt/Concrete to reflect the roughness of the material.
[4]Water surfaces assigned a n-values from the lower range for Asphalt/Concrete to reflect minimal roughness.

As noted in Table 1, the n-values assigned to gravel and water land cover surfaces are values from the recommended range for asphalt/concrete to reflect their surface roughness. Gravel was assigned the high end of the range to account for typical irregularities in the gravel surface. The Manning's n-value for water was assigned the low end of the range to account for internal friction. Shrubs and forest litter were assigned a Manning's n-value towards the upper end of the recommended range to account for the observed dense brush surface. The rest of the land cover surface categories were assigned the middle of their respective recommended ranges.

A sensitivity analysis was performed on the n-values to evaluate the effect this parameter has on the maximum water surface elevation. As part of the analysis, the upper and lower ranges of the Manning's n-values presented in Table 1 were run through the FLO-2D model. The results indicated that the differences in water surface elevations between the upper and lower range values of the Manning's n-values presented in Table 1 are within ± 0.08 ft. This also suggests that the LIP peak flood levels for much of the site are controlled by floodwaters ponding or backing-up at constrictions (e.g., catch basins and small culverts), reducing the effect of surface friction on flow depths.

d. Probable Maximum Precipitation

The 1-hour PMP event distribution was developed using HMR 52. Per NUREG/CR-7046 (Reference 9), the LIP event is defined as a 1-hour/1-square-mile PMP event. The total PMP depth per square mile for the 1-hr event was extrapolated from the PMP depth contour map provided in Figure 24 of HMR 52 (Reference 7). The distribution of the 1-hr PMP was developed for the 5-, 15-, and 30-minute time intervals, with the 60-minute interval being the 1-hr PMP depth. The depth for each time interval was calculated using the ratios obtained from Figures 36, 37, and 38 of HMR 52 (Reference 7). The 1-hr PMP distribution is provided in Table 2 and Figure 3 below. The 1-hour PMP event was run through the FLO-2D model to calculate the subsequent site flooding.

Table 2: 1-hour/1-sq-mi PMP Distribution for Oyster Creek Station

Time (minutes)	Percent Total PMP (%)	Cumulative Depth (inches)	Reference
0	0%	0.00	-
5	33.46%	6.05	HMR 52, Page 94, Figure 36
15	52.58%	9.50	HMR 52, Page 95, Figure 37
30	75.46%	13.64	HMR 52, Page 96, Figure 38
60	100%	18.07	HMR 52, Page 79, Figure 24

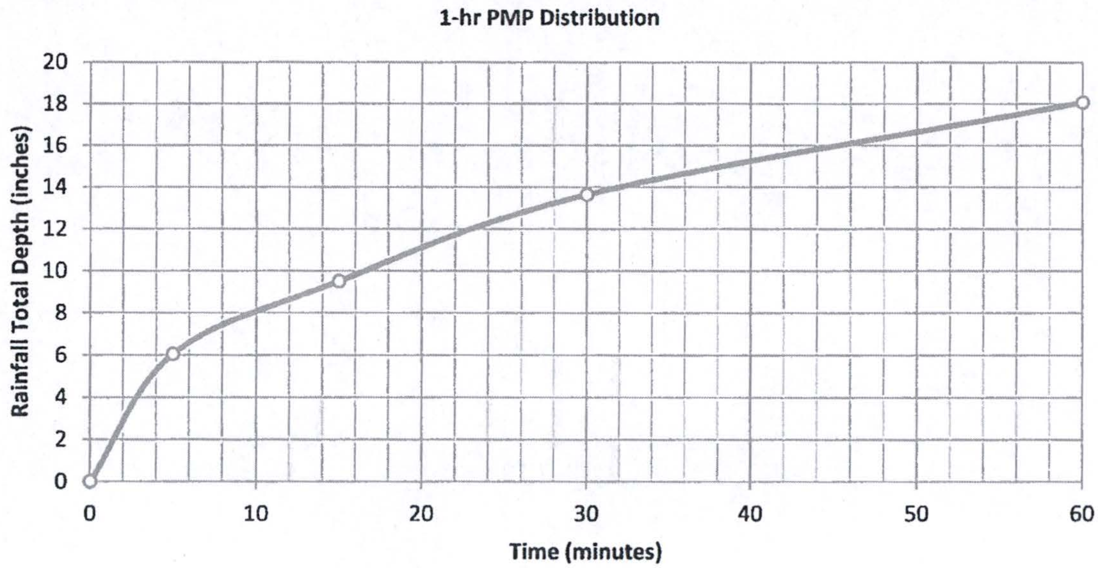

Figure 3: 1-hour/1-sq-mi PMP Distribution for Oyster Creek Station

4. RESULTS

The LIP flooding evaluation, as per the Case 3 assumptions of NUREG/CR-7046, Section 3.2 (Reference 9) produced results that include flooding depths, water surface elevations, velocities, resultant static loads, and resultant impact loads that could be expected for an LIP event at the site. The maximum resultant impact load and maximum resultant static load are expressed as pounds force per unit width. Multiplying these loads by the horizontal width of the structure within the grid element will provide the magnitude of the resultant force. Detailed calculations, results, and figures are presented in AMEC Calculation Package LIP-OYS-001 (Reference 1). The calculated maximum results of the LIP evaluation are presented in Table 3.

The FLO-2D model shows peak LIP flood elevations around the plant ranging between 23.04 and 24.39 feet NAVD 88 (23.06 and 24.41 feet MSL) for the Reactor Building and between 21.49 and 23.21 feet NAVD 88 (21.51 and 23.23 feet MSL) for the Turbine Building. This is 4.09 feet lower to 0.91 feet higher than the design-basis peak LIP flood elevation of 23.48 feet NAVD 88 (23.50 feet MSL). In comparing available information from the design-basis evaluation (References 2 and 4), the difference appears to be attributable to assumptions and methods used in developing the design-basis flood levels. The design-basis flood evaluation appears to have included the effects of the storm sewer system being operational during the event. Based on the FLO-2D model output, features such as grated catch basins, and other constrictions/obstructions, control much of the flooding during an LIP event. The design basis evaluation appears to have assumed that the storm sewer conveyance was uninhibited.

Results provided in this report are direct outputs from the FLO-2D model. The FLO-2D model reports results to the hundredth of a foot. However, based on the sensitivity analysis of Manning's n values, an accuracy of +/- 0.1 foot should be taken into consideration when evaluating the reported results.

Table 3: LIP Predicted Flooding Results at the Oyster Creek Station

Building Name	Max. Water Surface Elevation		Max. Flooding Depth	Max. Velocity	Max. Resultant Impact Load	Max. Resultant Static Load
	ft (NAVD 88)	ft (MSL)	ft	ft/sec.	lb/ft	lb/ft
Diesel Generator Building	19.39 - 23.64	19.41 - 23.66	0.1 - 1.6	0.39 - 1.76	0.41 - 10.5	0.34 - 79.62
Storage Building	22.52 - 23.03	22.54 - 23.05	0.11 - 0.71	0.2 - 1.07	0.48 - 6.42	0.35 - 15.86
XFMR (Transformers)	21.47 - 22.57	21.49 - 22.59	0.22 - 0.58	0.34 - 1.9	1.01 - 5.18	1.47 - 10.49
Pre-Treatment Building	22.2 - 22.68	22.22 - 22.7	0.2 - 0.68	0.45 - 1.64	0.7 - 7	1.26 - 14.56
Old Machine Shop	22.68 - 23.26	22.7 - 23.28	0.16 - 1.12	0.39 - 1.17	1.6 - 59.95	0.77 - 39.12
Security Building	22.89 - 23.11	22.91 - 23.13	0.11 - 2.04	0.24 - 1.24	0.55 - 9.61	0.38 - 71.51
Office Building	22.98 - 23.14	23 - 23.16	0.27 - 1.14	0.37 - 1.34	1.58 - 94.03	2.23 - 40.88
Reactor Building	23.04 - 24.39	23.06 - 24.41	1.04 - 2.36	0.27 - 2.35	1.53 - 91.59	5.98 - 74.3
Mac Facility	24.38 - 24.43	24.4 - 24.45	1.38 - 1.43	0.46 - 1.47	10.23 - 92.82	59.43 - 63.82
Respirator Facility	23.21 - 23.23	23.23 - 23.25	1.21 - 1.23	0.66 - 1.19	10.85 - 99.95	45.57 - 47.11
Storage Tank T-12-4	22.79 - 23.53	22.81 - 23.55	0.12 - 1.53	0.41 - 0.99	0.61 - 11.96	0.42 - 72.62
T.B.Dirty Oil Tank	22.14 - 23.23	22.16 - 23.25	0.12 - 0.51	0.27 - 1.1	0.56 - 1.98	0.43 - 8.01
Cond Storage Tank	22.14 - 22.93	22.16 - 22.95	0.14 - 1.93	0.5 - 2.77	0.19 - 22.1	0.64 - 31.54
Chlorination Facility	14.68 - 22.86	14.7 - 22.88	0.11 - 0.86	0.34 - 3.71	0.46 - 12.74	0.36 - 22.96
Turbine Building	21.49 - 23.21	21.51 - 23.23	0.12 - 2.61	0.32 - 3.43	0.69 - 94.76	0.41 - 91.1

The maximum predicted LIP flooding results at critical entrances to the site buildings (shown in Figure 4) are provided in Table 4.

Table 4: LIP Predicted Flooding Results at the Main Doors of the Site Buildings

Door No.	Reference Grid Element No.	Max. Water Surface Elevation		Max. Flooding Depth	Max. Velocity	Max. Resultant Impact Load	Max. Resultant Static Load
		ft (NAVD 88)	ft (MSL)	ft	ft/sec.	lb/ft	lb/ft
Door 1	24458	22.70	22.72	0.70	0.91	8.68	15.28
Door 2	26887	22.75	22.77	0.75	0.85	6.92	17.63
Door 3	23275	22.70	22.72	0.70	0.85	8.44	15.11
Door 4	26895	23.16	23.18	0.20	0.57	2.58	1.30
Door 5	22982	22.70	22.72	0.70	0.52	0.88	15.12
Door 6	27829	23.02	23.04	1.02	0.50	7.26	32.73
Door 7	30020	23.07	23.09	1.07	0.62	1.57	35.81
Door 8	31919	23.20	23.22	1.20	0.59	5.93	45.16
Door 9	26009	24.35	24.37	1.35	0.84	91.59	57.09
Door 10	20654	22.62	22.64	0.62	1.29	4.67	11.82
Door 11	20647	22.82	22.84	0.82	0.64	4.47	20.75
Door 12	19802	23.57	23.59	0.57	1.22	3.66	10.31
Door 13	18978	23.63	23.65	0.63	0.43	2.90	12.48
Door 14	28471	24.36	24.38	2.36	0.27	24.52	74.30

The predicted LIP flooding depths and duration above the station grade elevation at the critical entrances to the site buildings are provided in Table 5.

Table 5: LIP Predicted Flooding Depths above the Station Grade/ Door Sill at the Main Doors of the Site Buildings

Door No.	Reference Grid Element No. (ref. 1)	Max. Water Surface Elevation		Station Grade/ Door Sill Elevation	Max. Flooding Depth Above the Station Grade/Door Sill Elevation	Flooding Duration Above the Station Grade/Door Sill Elevation
		ft (NAVD 88)	ft (MSL)	ft (MSL)	ft	hrs
Door 1[1]	24458	22.70	22.72	23.50	-0.78	0.00
Door 2[1]	26887	22.75	22.77	23.50	-0.73	0.00
Door 3[1]	23275	22.70	22.72	23.50	-0.78	0.00
Door 4[1]	26895	23.16	23.18	23.50	-0.32	0.00
Door 5[1]	22982	22.70	22.72	23.50	-0.78	0.00
Door 6[1]	27829	23.02	23.04	23.50	-0.46	0.00
Door 7[1]	30020	23.07	23.09	23.50	-0.41	0.00
Door 8[1]	31919	23.20	23.22	23.50	-0.28	0.00
Door 9[1]	26009	24.35	24.37	23.50	0.87	1.52
Door 10[2]	20654	22.62	22.64	23.62	-0.98	0.00
Door 11[2]	20647	22.82	22.84	23.61	-0.77	0.00
Door 12[2]	19802	23.57	23.59	23.60	-0.01	0.00
Door 13[2]	18978	23.63	23.65	23.69	-0.04	0.00
Door 14[1]	28471	24.36	24.38	23.50	0.88	1.41

[1] Plant grade elevation of 23.5 ft MSL per UFSAR Section 2.4 (Reference 4) converted to 23.48 ft NAVD 88.

[2] Door sill elevations estimated per drawing DRC 06-121-203, Rev 0 (Reference 13).

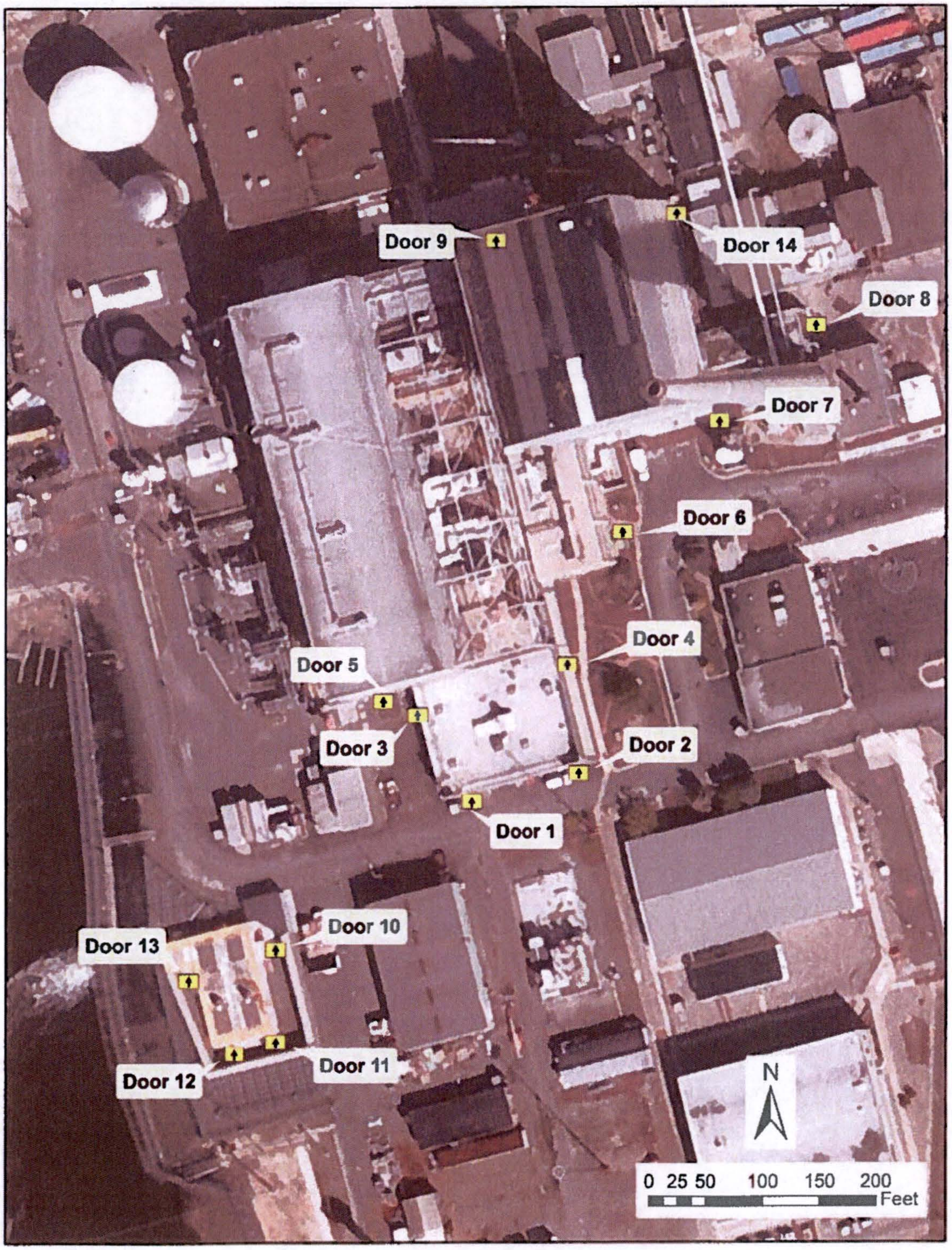

Figure 4: Locations of Doors

5. CONCLUSIONS

Per the UFSAR, the OCNGS grade elevation is 22.98 ft NAVD 88 (23.00 feet MSL) (Reference 4). The floor elevations of the Reactor and Turbine Buildings are 6 inches above grade at elevation 23.48 ft NAVD 88 (23.50 feet MSL) (Reference 4). According to the UFSAR (Reference 4), the previous LIP investigation concluded that the LIP water surface elevations would not exceed the finished floor elevation of the plant.

The results show that the predicted maximum LIP flooding water surface elevations at the main doors of the site buildings range between 22.62 and 24.36 feet NAVD 88 (22.64 and 24.38 feet MSL), which is 0.86 ft lower to 0.88 ft higher than the station grade elevation. The results in Table 5 show that the approximate water surface elevation at Door 9 could remain above the plant grade for approximately 1.52 hours, and at Door 14 for approximately 1.41 hours. However, the approximate water surface elevations at the other doors evaluated in this study appear to be below the plant grade or the door sill elevation.

Based on the results of AMEC's LIP flooding evaluation (Reference 1), the need for incorporation of additional flood protection measures should be further evaluated for Door 9 and Door 14, since it appears the LIP flooding elevation exceeds the current protection level per the CLB documents at these locations. The LIP flooding event is a short-duration storm, however necessary warning time is provided to the site through established procedures.

6. REFERENCES

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Enclosure 2

Oyster Creek Nuclear Generating Station

DVD labeled: Oyster Creek Nuclear Generating Station, Calculation LIP-OYS-001, Rev. 7 Local Intense Precipitation FLO-2D Model, RCN:LIP-310.7, Input and Output Files, April 5, 2016

Enclosure 3

Oyster Creek Nuclear Generating Station

Summary of Regulatory Commitments

The following table identifies commitments made in this document. (Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

Item Number	Interim Actions Taken or Planned to Take as Included in the Reevaluation Report (Commitment)	Implementation Date (Committed Date or Outage)	Commitment Type One-Time Action (Yes/No)	Commitment Type Programmatic (Yes/No)
1.	Sand bags for installation at Door DR-814-39 will be pre-staged outside the Drywell processing center (South Entrance) near the Service Water Rad monitoring shed. Sandbagging Door DR-814-39 will provide protection for the RB Northeast Airlock entrance (Door 14 in Enclosure 1). There is minimal preparation and installation time required.	August 15, 2016	No	Yes