Nuclear Development
244 Chestnut Street, Salem, NJ 08079

PSEG
Power LLC

ND-2011-0045
June 23, 2011

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

Subject: **PSEG Early Site Permit Application**
Docket No. 52-043
Response to Request for Additional Information, RAI No. 25, Hydrologic Description

References:
1) PSEG Power, LLC letter to USNRC, Application for Early Site Permit for the PSEG Site, dated May 25, 2010

2) RAI No. 25, SRP Section: 02.04.01 - Hydrologic Description, dated April 29, 2011 (eRAI 5710)

The purpose of this letter is to respond to the request for additional information (RAI) identified in Reference 2 above. This RAI addresses the Hydrologic Description, as described in Section 2.4.1 of the Site Safety Analysis Report (SSAR), as submitted in Part 2 of the PSEG Site Early Site Permit Application, Revision 0.

Enclosure 1 provides our response for RAI No. 25, Question Nos. 02.04.01-1 and 02.04.01-2. Our response to RAI No. 25, Question No. 02.04.01-2 will result in a revision to the SSAR. Enclosure 2 includes the proposed revision to the SSAR. Enclosure 3 is a set of three DVD-ROMs which include the digital files for Surface Water. Enclosure 4 includes the new regulatory commitment established in this submittal.

To facilitate the NRC staff use of the files, a User's Guide is being prepared. The User's Guide will include user instructions for each subsection of SSAR Section 2.4 that utilized HEC programs. The user instructions will include specific steps for the selection and application of files for running the various models implemented during the development of SSAR Section 2.4. The user instructions will be provided under separate cover no later than July 7, 2011.

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NRO

If any additional information is needed, please contact David Robillard, PSEG Nuclear Development Licensing Engineer, at (856) 339-7914.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 23rd day of June, 2011.

Sincerely,

David P. Lewis
Director, Nuclear Development
PSEG Power, LLC

Enclosure 1: Response to NRC Request for Additional Information, RAI No. 25, Question Nos. 02.04.01-1 and 02.04.04-2, SRP Section: 02.04.01 - Hydrologic Description
Enclosure 2: Proposed Revisions Part 2 – Site Safety Analysis Report (SSAR) Section 2.4, Hydrologic Engineering
Enclosure 3: DVD-ROMs Containing Digital Files for Surface Water (Set of 3 Discs)
Enclosure 4: Summary of Regulatory Commitments

cc: USNRC Project Manager, Division of New Reactor Licensing, PSEG Site (w/enclosures)
USNRC, Environmental Project Manager, Division of Site and Environmental Reviews (w/enclosures 1, 2 and 4)
USNRC Region I, Regional Administrator (w/enclosures 1, 2 and 4)

PSEG Letter ND-2011-0045, dated June 23, 2011

ENCLOSURE 1

RESPONSE to RAI No. 25

QUESTIONS 02.04.01-1 and 02.04.01-2

Response to RAI No. 25, Question 02.04.01-1:

In Reference 2, the NRC staff asked PSEG for information regarding Hydrologic Description, as described in Subsection 2.4.1 of the Site Safety Analysis Report. The specific request for Question 02.04.01-1 was:

> *NUREG-0800, Standard Review Plan (SRP), Chapter 2, Section 2.4.1, 'Hydrologic Description,' establishes guidance that the NRC staff use to evaluate whether an application meets the NRC's regulation in 10 CFR 100.20(c) and 10 CFR 52.79.*
>
> *Staff has reviewed the PSEG SSAR Section 2.4.1. Much of the discussion in this section as well as throughout the other sub-sections of Chapter 2.4 is based on the results of HEC-HMS and HEC-RAS modeling. In order to verify the results of the modeling, staff requests that the applicant provide all HEC-HMS and HEC-RAS input and output files, including DSS files, DEM files, and any GIS files used to provide rational for the input parameters used.*

PSEG Response to NRC RAI:

The digital files requested by the NRC are provided in the DVD-ROMs included in Enclosure 3. The DVD-ROMs contain the DEM, DSS, GIS, HEC-HMS, and HEC-RAS files used for the hydrologic and hydraulic modeling in SSAR Section 2.4.

To facilitate the NRC staff use of these files, a User's Guide is being prepared which will include user instructions for each subsection of SSAR Section 2.4 that utilized HEC programs. The user instructions will include specific steps for the selection and application of files for running the various models implemented during the development of SSAR Section 2.4. This will assist the NRC in assembling the files and reproducing the results reported in SSAR Section 2.4. The User's Guide will be provided, under separate cover, no later than July 7, 2011.

Associated PSEG Site ESP Application Revisions:

None.

Response to RAI No. 25, Question 02.04.01-2:

In Reference 2, the specific request for Question 02.04.01-2 was:

> *NUREG-0800, Standard Review Plan (SRP), Chapter 2, Section 2.4.1, 'Hydrologic Description,' establishes guidance that the NRC staff use to evaluate whether an application meets the NRC's regulations.*
>
> *Staff has reviewed the PSEG SSAR and identified that throughout Chapter 2.4 sections, data are provided in text and tables using multiple datum and temporal information. Some tables show datum conversions without discussion of how the conversion was performed. The staff cannot be confident of confirmatory analyses without knowing what data were used and what conversions were performed.*
>
> *Staff requests that the applicant provide corrected elevation, datum, datum conversion procedures, time period information, and gaging station identification for all surface water records discussed in the SSAR.*

PSEG Response to NRC RAI:

Surface Water Elevations Datum Conversions:
In developing SSAR Section 2.4, numerous water surface elevation values were converted between different datums, and the converted values are reported in the SSAR text and tables. In response to this RAI, water surface elevations that appear in SSAR Section 2.4 (SSAR pages 2.4-1 through 2.4-133) were reviewed to summarize the requested information. SSAR Subsection 2.4.12 references well elevations surveyed in NAVD and SSAR Subsection 2.4.13 did not have any reference to surface water elevations, and therefore are not included in this RAI response.

All reported water surface elevations are provided in Table RAI 25-1, along with examples of conversion, to demonstrate that the reported water surface elevations in SSAR Section 2.4 are consistent with source information. Datum conversions throughout Section 2.4 were performed using the Army Corp of Engineers' CORPSCON software. The software is widely used throughout the United States as an acceptable method for performing datum conversions. This software is available for download at http://crunch.tec.army.mil/software/corpscon/corpscon.html. CORPSCON performs vertical conversions to and from the National Geodetic Vertical Datum of 1929 (NGVD 29) and the North American Vertical Datum of 1988 (NAVD). Vertical conversions are based on the National Geodetic Survey program VERTCON and can be performed for the continental United States only (Ref. RAI-25-1). CORPSCON Version 6.0 was used in these datum conversions.

The below examples are provided to detail the conversions that were performed, and can be used in conjunction with Table RAI 25-1.

Example 1:

Items (4) through (11) of Table RAI 25-1.

Validation of *Table 2.4.1-3 NOAA Tidal Gage Data for the Delaware Bay and Delaware River*

NOAA Gage ID	Location	RM[a]	Coordinates		Established	Mean Range (ft.)[b]	Diurnal Range (ft.)[b]
8557380	Lewes, DE	0	38° 46.9' N	75° 7.2' W	1/14/1919	4.08	4.65
8551910	Reedy Point, DE	59	39° 33.5' N	75° 34.4' W	7/30/1956	5.34	5.84
8545530	Philadelphia, PA	100	39° 57.2' N	75° 8.3' W	7/1/1900	6.24	6.82
8548989	Newbold, PA	126	40° 8.2' N	74° 45.1' W	10/27/2001	7.86	8.44

a) River miles measured from the mouth of the Delaware River as reported by DRBC. SSAR References 2.4.1-7, 2.4.1-8, 2.4.1-9, and 2.4.1-10

b) Epoch 1983-2001

The NOAA Tides and Currents website (SSAR References 2.4.1-7, 2.4.1-8, 2.4.1-9, and 2.4.1-10) lists these Mean Ranges and Diurnal Ranges as the tidal ranges at this gage. These elevations are not relative to any datum, but rather are:

1) The difference in height between mean low water and mean high water at each specific gage station.
2) The difference in height between mean low low water and mean high high water at each specific gage station.

Therefore, no datum conversion is required.

Example 2:

Item (12) through Item (24) of Table RAI 25-1

Validation of *Table 2.4.1-4 Tidal Values at NOAA Reedy Point, DE Tidal Gage (Gage Number 8551910) (ft. NAVD)*

Identifier	Level (ft. Relative to Station Datum)	Conversion to Ft. NAVD	Level	Description
MHHW	7.19	MHHW-NAVD (7.19-4.32)	2.9 (ft NAVD)	Mean Higher-High Water
MHW	6.87	MHW – NAVD (6.87-4.32)	2.6 (ft NAVD)	Mean High Water
DTL	4.27	DTL – NAVD (4.27-4.32)	-0.05 (ft NAVD)	Mean Diurnal Tide Level
MTL	4.20	MTL – NAVD (4.20-4.32)	-0.1 (ft NAVD)	Mean Tide Level
msl	4.27	Msl – NAVD (4.27-4.32)	-0.05 (ft NAVD)	Mean Sea Level
MLW	1.53	MLW – NAVD (1.53 – 4.32)	-2.8 (ft NAVD)	Mean Low Water
MLLW	1.35	MLLW – NAVD (1.35 – 4.32)	-3.0 (ft NAVD)	Mean Lower-Low Water
GT	5.84	GT	5.8 (ft)	Great Diurnal Range
MN	5.34	MN	5.3 (ft)	Mean Range of Tide
10% EHT[(a)]	N/A	N/A	4.6 (ft NAVD)	10% Exceedance High Tide
90% ELT[(a)]	N/A	N/A	-5.2 (ft NAVD)	90% Exceedance Low Tide
Maximum	10.23	Maximum – NAVD (10.23-4.32)	5.91(ft NAVD)	Highest Water Level
Minimum	-2.66	Minimum – NAVD (-2.66-4.32)	-6.98(ft NAVD)	Lowest Water Level
NAVD	4.32	N/A	N/A	NAVD

a) Values calculated from monthly MHHW and MLLW values from 1987-2008 (Epoch 1983-2001) SSAR Reference 2.4.1-10

Therefore, the NOAA Station Datum (Epoch 1983-2001) was used to convert the station datum elevation into NAVD, and the NAVD value was reported in the text.

Example 3:

Item (82) and (83) Validation from Table RAI 25-1

The 10 percent exceedance high tide was obtained from NOAA tide gages for Lewes and Reedy Point in datum NAVD. Therefore, no conversion is required.

Table RAI 25-1 depicts a list of water surface elevation references reported in the SSAR. All references to water surface elevations were included in this table, and the appropriate conversion was validated. The elevation as reported in the text is listed, along with the location where that elevation was reported and the method of conversion used for each instance.

Table RAI 25-1 (Sheet 1 of 11)

Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
1	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-2
2	-15.9	NAVD	NC	-15.9	NAVD	NEW PLANT LOCATION	NC	2.4-2
3	5.34	N/A	NC	5.34	ft	REEDY POINT, DE NOAA TIDAL GAGE 8551910	N/A	2.4-4
4	4.08	N/A	NC	4.08	ft	LEWES, DE NOAA TIDAL GAGE 8557380	N/A	2.4-15
5	4.65	N/A	NC	4.65	ft	LEWES, DE NOAA TIDAL GAGE 8557380	N/A	2.4-15
6	5.34	N/A	NC	5.34	ft	REEDY POINT, DE NOAA TIDAL GAGE 8551910	N/A	2.4-15
7	5.84	N/A	NC	5.84	ft	REEDY POINT, DE NOAA TIDAL GAGE 8551910	N/A	2.4-15
8	6.24	N/A	NC	6.24	ft	PHILADELPHIA, PA NOAA TIDAL GAGE 8545530	N/A	2.4-15
9	6.82	N/A	NC	6.82	ft	PHILADELPHIA, PA NOAA TIDAL GAGE 8545530	N/A	2.4-15
10	7.86	N/A	NC	7.86	ft	NEWBOLD, PA NOAA TIDAL GAGE 8548989	N/A	2.4-15
11	8.44	N/A	NC	8.44	ft	NEWBOLD, PA NOAA TIDAL GAGE 8548989	N/A	2.4-15
12	7.19	Station	4.32	2.9	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
13	6.87	Station	4.32	2.6	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
14	4.27	Station	4.32	-0.05	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
15	4.20	Station	4.32	-0.1	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
16	4.27	Station	4.32	-0.05	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
17	1.53	Station	4.32	-2.8	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16

Table RAI 25-1 (Sheet 2 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
18	1.35	Station	4.32	-3.0	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
19	5.84	N/A	NC	5.8	ft	REEDY POINT, DE NOAA TIDAL GAGE 8551910	N/A	2.4-16
20	5.34	N/A	NC	5.3	ft	REEDY POINT, DE NOAA TIDAL GAGE 8551910	N/A	2.4-16
21	4.6	NAVD	NC	4.6	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-16
22	-5.2	NAVD	NC	-5.2	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-16
23	10.23	Station	4.32	5.91	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
24	-2.66	Station	4.32	-6.98	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-16
25	734.88	NGVD	0.548	734.33	NAVD	41° 45' 24" N 75° 03' 28" W	NC	2.4-17
26	600.22	NGVD	0.535	599.69	NAVD	41° 30' 32" N 75° 03' 28" W	NC	2.4-17
27	415.35	NGVD	0.574	414.78	NAVD	41° 22' 14" N 74° 41' 52" W	NC	2.4-17
28	369.93	NGVD	0.600	369.33	NAVD	41° 18' 33" N 74° 47' 43" W	NC	2.4-17
29	293.64	NGVD	0.568	293.07	NAVD	41° 00' 48" N 75° 05' 10" W	NC	2.4-17
30	226.43	NGVD	0.680	225.75	NAVD	40° 49' 35" N 75° 04' 57" W	NC	2.4-17
31	125.12	NGVD	0.800	124.32	NAVD	40° 35' 41" N75° 11' 23" W	NC	2.4-17
32	79.0	NGVD	0.890	48.11	NAVD	40° 21' 53" N 74° 56' 56" W	NC	2.4-17
33	0.0	NGVD	1.05	-1.05	NAVD	40° 13' 18" N 74° 46' 41" W	NC	2.4-17
34	5.74	NGVD	1.10	4.64	NAVD	39° 58' 04" N 75° 11' 20" W	NC	2.4-17
35	68.23	NGVD	1.06	67.17	NAVD	39° 46' 9.9" N 75° 34' 23.8" W	NC	2.4-17
36	1280	NGVD	0.512	1279	NAVD	42° 04' 38" N 74° 58' 04" W	CORPSCON	2.4-19
37	1150	NGVD	0.466	1150	NAVD	42° 03' 46" N 75° 22' 29" W	CORPSCON	2.4-19
38	1440	NGVD	0.568	1439	NAVD	41° 49' 27" N 74° 38' 20" W	CORPSCON	2.4-19
39	1053	NGVD	0.623	1052	NAVD	41° 36' 44" N 75° 15' 55" W	CORPSCON	2.4-19
40	1205	NGVD	0.630	1204	NAVD	41° 35' 18" N 75° 19' 39" W	CORPSCON	2.4-19
41	1176	NGVD	0.630	1189	NAVD	41° 27' 35" N 75° 11' 10" W	CORPSCON	2.4-19
42	1450	NGVD	0.623	1449	NAVD	41° 06' 45" N 75° 43' 15" W	CORPSCON	2.4-19

Table RAI 25-1 (Sheet 3 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
43	820	NGVD	0.646	819	NAVD	40° 53' 50" N 75° 33' 50" W	CORPSCON	2.4-19
44	1000.6	NGVD	0.627	1000	NAVD	40° 55' 45" N 75° 33' 45" W	CORPSCON	2.4-19
45	651	NGVD	0.659	650	NAVD	40° 50' 56" N 75° 38' 19" W	CORPSCON	2.4-19
46	1182	NGVD	0.636	1181	NAVD	40° 51' 25" N 75° 59' 30" W	CORPSCON	2.4-19
47	923.57	NGVD	0.682	923	NAVD	40° 55' 03" N 74° 39' 51" W	CORPSCON	2.4-19
48	929	NGVD	0.722	928	NAVD	40° 43' 38" N 75° 06' 10" W	CORPSCON	2.4-19
49	307	NGVD	0.735	306	NAVD	40° 22' 45" N 76° 01' 59" W	CORPSCON	2.4-19
50	395	NGVD	0.860	394	NAVD	40° 28' 13" N 75° 11' 10" W	CORPSCON	2.4-19
51	286	NGVD	0.915	285	NAVD	40° 20' 30" N 75° 28' 45" W	CORPSCON	2.4-20
52	587.5	NGVD	0.863	587	NAVD	40° 01' 40" N 75° 51' 03" W	CORPSCON	2.4-20
53	359.5	NGVD	0.925	359	NAVD	40° 03' 24" N 75° 43' 06" W	CORPSCON	2.4-20
54	266	NAVD	NC	266	NAVD	SPRINGTON DAM (GEIST RESERVOIR)	NC	2.4-20
55	339	NAVD	NC	339	NAVD	HOOPES RESERVOIR	NC	2.4-20
56	188	NAVD	NC	188	NAVD	NEWARK RESERVOIR	NC	2.4-20
57	5 to 8	N/A	NC	5 to 8	ft	RM 60	N/A	2.4-23
58	7.6	N/A	NC	7.6	MLW	RM 59	N/A	2.4-23
59	9.4	N/A	NC	9.4	ft	RM 92	N/A	2.4-23
60	24.43	NGVD	1.05	>23	NAVD	40° 13' 18" N 74° 46' 41" W	CORPSCON	2.4-23
61	4.0	NAVD	NC	4.0	NAVD	NEW PLANT LOCATION	NC	2.4-24
62	30.6	NGVD	1.05	29.6	NAVD	40° 13' 18" N 74° 46' 41" W	CORPSCON	2.4-24
63	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-25
64	Multiple	NGVD	1.05	Multiple	NAVD	40° 13' 18" N 74° 46' 41" W	CORPSCON	2.4-30
65	-0.40	NAVD	NC	-0.40	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
66	-0.39	NAVD	NC	-0.39	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
67	-0.20	NAVD	NC	-0.20	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
68	0.07	NAVD	NC	0.07	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31

Table RAI 25-1 (Sheet 4 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
69	0.19	NAVD	NC	0.19	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
70	0.17	NAVD	NC	0.17	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
71	0.16	NAVD	NC	0.16	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
72	0.24	NAVD	NC	0.24	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
73	0.32	NAVD	NC	0.32	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
74	0.14	NAVD	NC	0.14	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
75	-0.12	NAVD	NC	-0.12	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
76	-0.33	NAVD	NC	-0.33	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-31
77	21.0	NAVD	NC	21.0	NAVD	NEW PLANT LOCATION	NC	2.4-32
78	9.4	NAVD	NC	9.4	NAVD	NEW PLANT LOCATION	NC	2.4-32
79	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-32
80	5.7	NAVD	NC	5.7	NAVD	NEW PLANT LOCATION	NC	2.4-32
81	8.1	NAVD	NC	8.1	NAVD	NEW PLANT LOCATION	NC	2.4-32
82	4.2	NAVD	NC	4.2	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-41
83	4.6	NAVD	NC	4.6	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-41
84	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-41
85	6.6	NAVD	NC	6.6	NAVD	NEW PLANT LOCATION	NC	2.4-41
86	21.0	NAVD	NC	21.0	NAVD	NEW PLANT LOCATION	NC	2.4-41
87	6.6	NAVD	NC	6.6	NAVD	NEW PLANT LOCATION	NC	2.4-41
88	11.3	NAVD	NC	11.3	NAVD	NEW PLANT LOCATION	NC	2.4-41
89	3.1	NAVD	NC	3.1	NAVD	NEW PLANT LOCATION	NC	2.4-41
90	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-41

Table RAI 25-1 (Sheet 5 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
91	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-42
92	7.3	NAVD	NC	7.3	NAVD	NEW PLANT LOCATION	NC	2.4-42
93	8.3	NAVD	NC	8.3	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-42
94	6.62	NGVD	0.919	5.7	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	CORPSCON[e]	2.4-42
95	16.1	NAVD	NC	16.1	NAVD	NEW PLANT LOCATION	NC	2.4-42
96	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-42
97	21.0	NAVD	NC	21.0	NAVD	NEW PLANT LOCATION	NC	2.4-42
98	21.0	NAVD	NC	21.0	NAVD	NEW PLANT LOCATION	NC	2.4-43
99	54.6	NAVD	NC	54.6	NAVD	40° 13' 18" N 74° 46' 41" W	NC	2.4-48
100	23.8	NAVD	NC	23.8	NAVD	40° 13' 18" N 74° 46' 41" W	NC	2.4-48
101	52.3	NAVD	NC	52.3	NAVD	40° 13' 18" N 74° 46' 41" W	NC	2.4-48
102	2.3	NAVD	NC	2.3	NAVD	NEW PLANT LOCATION	NC	2.4-48
103	2.6	NAVD	NC	2.6	NAVD	NEW PLANT LOCATION	NC	2.4-48
104	1.4	NAVD	NC	1.4	NAVD	NEW PLANT LOCATION	NC	2.4-48
105	0.0	NAVD	NC	0.0	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-48
106	0.0	NAVD	NC	0.0	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-48
107	0.0	NAVD	NC	0.0	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-48
108	6.6	NAVD	NC	6.6	NAVD	NEW PLANT LOCATION	NC	2.4-50
109	21.0	NAVD	NC	21.0	NAVD	NEW PLANT LOCATION	NC	2.4-50
110	7.3	NAVD	NC	7.3	NAVD	NEW PLANT LOCATION	NC	2.4-51
111	16.1	NAVD	NC	16.1	NAVD	NEW PLANT LOCATION	NC	2.4-51
112	6.56	NAVD	NC	6.56	NAVD	NEW PLANT LOCATION	NC	2.4-56
113	6.59	NAVD	NC	6.59	NAVD	NEW PLANT LOCATION	NC	2.4-56
114	4.2	NAVD	NC	4.2	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-56
115	4.6	NAVD	NC	4.6	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-56

Table RAI 25-1 (Sheet 6 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
116	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-56
117	6.5	NAVD	NC	6.5	NAVD	NEW PLANT LOCATION	NC	2.4-56
118	6.8	NAVD	NC	6.8	NAVD	NEW PLANT LOCATION	NC	2.4-57
119	9.4	NAVD	NC	9.4	NAVD	NEW PLANT LOCATION	NC	2.4-57
120	6.8	NAVD	NC	6.8	NAVD	NEW PLANT LOCATION	NC	2.4-57
121	9.4	NAVD	NC	9.4	NAVD	NEW PLANT LOCATION	NC	2.4-57
122	9.4	NAVD	NC	9.4	NAVD	NEW PLANT LOCATION	NC	2.4-59
123	9.4	NAVD	NC	9.4	NAVD	NEW PLANT LOCATION	NC	2.4-59
124	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-59
125	1280	NGVD	0.512	1279	NAVD	42° 04' 38" N 74° 58' 04" W	CORPSCON	2.4-62
126	1150	NGVD	0.466	1150	NAVD	42° 03' 46" N 75° 22' 29" W	CORPSCON	2.4-62
127	1190	NGVD	0.630	1189	NAVD	41° 27' 35" N 75° 11' 10" W	CORPSCON	2.4-62
128	1440	NGVD	0.568	1439	NAVD	41° 49' 27" N 74° 38' 20" W	CORPSCON	2.4-62
129	1450	NGVD	0.623	1449	NAVD	41° 06' 45" N 75° 43' 15" W	CORPSCON	2.4-62
130	651	NGVD	0.659	650	NAVD	40° 50' 56" N 75° 38' 19" W	CORPSCON	2.4-62
131	307	NGVD	0.735	306	NAVD	40° 22' 45" N 76° 01' 59" W	CORPSCON	2.4-62
132	395	NGVD	0.860	394	NAVD	40° 28' 13" N 75° 11' 10" W	CORPSCON	2.4-62
133	359.5	NGVD	0.925	359	NAVD	40° 03' 24" N 75° 43' 06" W	CORPSCON	2.4-62
134	266	NAVD	NC	266	NAVD	SPRINGTON DAM (GEIST RESERVOIR)	NC	2.4-62
135	339	NAVD	NC	339	NAVD	HOOPES RESERVOIR	NC	2.4-62
136	1280	NGVD	0.512	1279	NAVD	42° 04' 38" N 74° 58' 04" W	CORPSCON	2.4-63
137	1150	NGVD	0.466	1150	NAVD	42° 03' 46" N 75° 22' 29" W	CORPSCON	2.4-63
138	1190	NGVD	0.630	1189	NAVD	41° 27' 35" N 75° 11' 10" W	CORPSCON	2.4-63
139	1440	NGVD	0.568	1439	NAVD	41° 49' 27" N 74° 38' 20" W	CORPSCON	2.4-63
140	1450	NGVD	0.623	1449	NAVD	41° 06' 45" N 75° 43' 15" W	CORPSCON	2.4-63
141	651	NGVD	0.659	650	NAVD	40° 50' 56" N 75° 38' 19" W	CORPSCON	2.4-63
142	307	NGVD	0.735	394	NAVD	40° 28' 13" N 75° 11' 10" W	CORPSCON	2.4-63
143	395	NGVD	0.860	306	NAVD	40° 22' 45" N 76° 01' 59" W	CORPSCON	2.4-63
144	359.5	NGVD	0.925	359	NAVD	40° 03' 24" N 75° 43' 06" W	CORPSCON	2.4-63
145	266	NAVD	NC	266	NAVD	SPRINGTON DAM (GEIST RESERVOIR)	NC	2.4-63

Table RAI 25-1 (Sheet 7 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
146	339	NAVD	NC	339	NAVD	HOOPES RESERVOIR	NC	2.4-63
147	1100	NAVD	NC	1100	NAVD	42° 04' 38" N 74° 58' 04" W	NC	2.4-63
148	990	NAVD	NC	990	NAVD	42° 03' 46" N 75° 22' 29" W	NC	2.4-63
149	1120	NAVD	NC	1120	NAVD	41° 27' 35" N 75° 11' 10" W	NC	2.4-63
150	1275	NAVD	NC	1275	NAVD	41° 49' 27" N 74° 38' 20" W	NC	2.4-63
151	1265	NAVD	NC	1265	NAVD	41° 06' 45" N 75° 43' 15" W	NC	2.4-63
152	510	NAVD	NC	510	NAVD	40° 50' 56" N 75° 38' 19" W	NC	2.4-63
153	385	NAVD	NC	385	NAVD	40° 28' 13" N 75° 11' 10" W	NC	2.4-63
154	235	NAVD	NC	235	NAVD	40° 22' 45" N 76° 01' 59" W	NC	2.4-63
155	300	NAVD	NC	300	NAVD	40° 03' 24" N 75° 43' 06" W	NC	2.4-63
156	195	NAVD	NC	195	NAVD	SPRINGTON DAM (GEIST RESERVOIR)	NC	2.4-63
157	240	NAVD	NC	240	NAVD	HOOPES RESERVOIR	NC	2.4-63
158	0.8	NAVD	NC	0.8	NAVD	NEW PLANT LOCATION	NC	2.4-64
159	0.6	NAVD	NC	0.6	NAVD	NEW PLANT LOCATION	NC	2.4-64
160	0.6	NAVD	NC	0.6	NAVD	NEW PLANT LOCATION	NC	2.4-64
161	0.5	NAVD	NC	0.5	NAVD	NEW PLANT LOCATION	NC	2.4-64
162	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-66
163	2.0	N/A	NC	2.0	ft	NEW PLANT LOCATION	N/A	2.4-66
164	0.3	N/A	NC	0.3	ft	NEW PLANT LOCATION	N/A	2.4-66
165	2.6	N/A	NC	2.6	ft	NEW PLANT LOCATION	N/A	2.4-66
166	9.4	NAVD	NC	9.4	NAVD	NEW PLANT LOCATION	NC	2.4-66
167	4.2	NAVD	NC	4.2	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-74
168	4.6	NAVD	NC	4.6	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-74
169	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-74
170	23.4	MLW	2.47	20.9	NAVD	MOUTH OF DELAWARE BAY	NOAA Station Datums (1983-2001)	2.4-75
171	17.6	NAVD	NC	17.6	NAVD	MOUTH OF DELAWARE BAY	NC	2.4-75
172	19.8	NAVD	NC	19.8	NAVD	MOUTH OF DELAWARE BAY	NC	2.4-75

Table RAI 25-1 (Sheet 8 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
173[f]	23.99	MLW	2.30	21.7	NAVD	MOUTH OF DELAWARE BAY	NOAA Station Datums (1983-2001)	2.4-75
174	26.9	NAVD	NC	26.9	NAVD	NEW PLANT LOCATION	NC	2.4-76
175	22.8	NAVD	NC	22.8	NAVD	NEW PLANT LOCATION	NC	2.4-77
176	25.3	NAVD	NC	25.3	NAVD	NEW PLANT LOCATION	NC	2.4-77
177	26.9	NAVD	NC	26.9	NAVD	NEW PLANT LOCATION	NC	2.4-77
178	26.7	NAVD	NC	26.7	NAVD	NEW PLANT LOCATION	NC	2.4-77
179	26.7	NAVD	NC	26.7	NAVD	NEW PLANT LOCATION	NC	2.4-78
180	34.6	NAVD	NC	34.6	NAVD	NEW PLANT LOCATION	NC	2.4-78
181	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-78
182	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-78
183	26.9	NAVD	NC	26.9	NAVD	NEW PLANT LOCATION	NC	2.4-78
184	33.8	NAVD	NC	33.8	NAVD	NEW PLANT LOCATION	NC	2.4-78
185	26.7	NAVD	NC	26.7	NAVD	NEW PLANT LOCATION	NC	2.4-78
186	34.6	NAVD	NC	34.6	NAVD	NEW PLANT LOCATION	NC	2.4-78
187	26.9	NAVD	NC	26.9	NAVD	NEW PLANT LOCATION	NC	2.4-84
188	26.7	NAVD	NC	26.7	NAVD	NEW PLANT LOCATION	NC	2.4-84
189	33.8	NAVD	NC	33.8	NAVD	NEW PLANT LOCATION	NC	2.4-84
190	34.6	NAVD	NC	34.6	NAVD	NEW PLANT LOCATION	NC	2.4-84
191	35.2	NAVD	NC	35.2	NAVD	NEW PLANT LOCATION	NC	2.4-84
192	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-84
193	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-89
194[g]	1.301	Station (msl, m)	1.316 m	-0.049 ft	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-90
195	5.65	NAVD	NC	5.65	NAVD	NEW PLANT LOCATION	NC	2.4-91
196	-6.16	NAVD	NC	-6.16	NAVD	NEW PLANT LOCATION	NC	2.4-91
197	4.76	NAVD	NC	4.76	NAVD	NEW PLANT LOCATION	NC	2.4-92
198	-5.3	NAVD	NC	-5.3	NAVD	NEW PLANT LOCATION	NC	2.4-92
199	5.22	NAVD	NC	5.22	NAVD	NEW PLANT LOCATION	NC	2.4-92
200	-5.56	NAVD	NC	-5.56	NAVD	NEW PLANT LOCATION	NC	2.4-92
201	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-92
202	5.08	NAVD	NC	5.08	NAVD	NEW PLANT LOCATION	NC	2.4-92

Table RAI 25-1 (Sheet 9 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
203	5.65	NAVD	NC	5.65	NAVD	NEW PLANT LOCATION	NC	2.4-92
204	-6.16	NAVD	NC	-6.16	NAVD	NEW PLANT LOCATION	NC	2.4-92
205	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-92
206	5.5	NAVD	NC	5.5	NAVD	NEW PLANT LOCATION	NC	2.4-101
207	5.65	NAVD	NC	5.65	NAVD	NEW PLANT LOCATION	NC	2.4-101
208	4.76	NAVD	NC	4.76	NAVD	NEW PLANT LOCATION	NC	2.4-101
209	5.22	NAVD	NC	5.22	NAVD	NEW PLANT LOCATION	NC	2.4-101
210	-5.62	NAVD	NC	-5.62	NAVD	NEW PLANT LOCATION	NC	2.4-101
211	-6.16	NAVD	NC	-6.16	NAVD	NEW PLANT LOCATION	NC	2.4-101
212	-5.3	NAVD	NC	-5.3	NAVD	NEW PLANT LOCATION	NC	2.4-101
213	-5.56	NAVD	NC	-5.56	NAVD	NEW PLANT LOCATION	NC	2.4-101
214	8.72	gage	-67.17	75.9	NAVD	39° 46' 9.9" N 75° 34' 23.8" W, USGS Gage 01481500	CORPSCON	2.4-103
215	15.2	gage	-67.17	82.4	NAVD	39° 46' 9.9" N 75° 34' 23.8" W, USGS Gage 01481500	CORPSCON	2.4-103
216	0.6	MLW	-2.55	3.2	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-103
217	30.6	NGVD	7.77	22.8	Gage	40° 13' 18" N 74° 46' 41" W, USGS gage 01463500	N/A	2.4-103
218	30.6	NGVD	1.05	29.6	NAVD	40° 13' 18" N 74° 46' 41" W	CORPSCON	2.4-103
219	22.2	NGVD	1.05	21.2	NAVD	40° 13' 18" N 74° 46' 41" W	CORPSCON	2.4-104
220	3.2	NAVD	NC	3.2	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-104
221	30.6	NGVD	1.05	29.6	NAVD	40° 13' 18" N 74° 46' 41" W	CORPSCON	2.4-104
222	4.2	NAVD	NC	4.2	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-105
223	4.6	NAVD	NC	4.6	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-105
224	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-105
225	5.2	NAVD	NC	5.2	NAVD	NEW PLANT LOCATION	NC	2.4-105
226	29.8	NAVD	NC	29.8	NAVD	40° 13' 18" N 74° 46' 41" W	NC	2.4-105
227	4.5	NAVD	NC	4.5	NAVD	NEW PLANT LOCATION	NC	2.4-106

Table RAI 25-1 (Sheet 10 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
228	8.1	NAVD	NC	8.1	NAVD	NEW PLANT LOCATION	NC	2.4-106
229	1.35	Station	4.32	-3.0	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-106
230	-2.66	Station	4.32	-7.0	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-106
231	-8.6	NGVD	NC	-8.6	MSL	REEDY POINT, DE NOAA TIDAL GAGE 8551910	N/A	2.4-106
232	-8.6	NGVD	0.886	-9.5	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	CORPSCON[e]	2.4-106
233	8.1	NAVD	NC	8.1	NAVD	NEW PLANT LOCATION	NC	2.4-107
234	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-107
235	5.2	NAVD	NC	5.2	NAVD	NEW PLANT LOCATION	NC	2.4-114
236	8.1	NAVD	NC	8.1	NAVD	NEW PLANT LOCATION	NC	2.4-114
237	35.9	NAVD	NC	35.9	NAVD	NEW PLANT LOCATION	NC	2.4-120
238	36.9	NAVD	NC	36.9	NAVD	NEW PLANT LOCATION	NC	2.4-120
239	-2.48	Station	4.32	-6.8	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-121
240	-8.6	MSL	NC	-8.6	MSL	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-121
241	-8.6	NGVD	0.886	-9.5	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	CORPSCON[e]	2.4-121
242	1.53	Station	4.32	-2.8	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-121
243	-5.15	NAVD	NC	-5.15	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NC	2.4-121
244	-5.1	NAVD	NC	-5.1	NAVD	NEW PLANT LOCATION	NC	2.4-121
245	-4.6	NAVD	NC	-4.6	NAVD	LEWES, DE NOAA TIDAL GAGE 8557380	NC	2.4-121
246	-5.1	NAVD	NC	-5.1	NAVD	NEW PLANT LOCATION	NC	2.4-123
247	-5.0	NAVD	NC	-5.0	NAVD	NEW PLANT LOCATION	NC	2.4-123
248	-5.0	NAVD	NC	-5.0	NAVD	NEW PLANT LOCATION	NC	2.4-127
249	-15.9	NAVD	NC	-15.9	NAVD	NEW PLANT LOCATION	NC	2.4-127

Table RAI 25-1 (Sheet 11 of 11)
Water Surface Elevation Conversions

Item	Source Elevation[a]	Source Datum	CF[b]	Reported Elevation[c]	Datum	Location	Method of Conversion (with time period where applicable)[d]	SSAR Page Location
250	-6.2	NAVD	NC	-6.2	NAVD	NEW PLANT LOCATION	NC	2.4-127
251	-5.0	NAVD	NC	-5.0	NAVD	NEW PLANT LOCATION	NC	2.4-127
252	-6.5	NAVD	NC	-6.5	NAVD	NEW PLANT LOCATION	NC	2.4-128
253	-15.9	NAVD	NC	-15.9	NAVD	NEW PLANT LOCATION	NC	2.4-128
254	1.35	Station	4.32	-3.0	NAVD	REEDY POINT, DE NOAA TIDAL GAGE 8551910	NOAA Station Datums (1983-2001)	2.4-128
255	-15.9	NAVD	NC	-15.9	NAVD	NEW PLANT LOCATION	NC	2.4-129
256	-6.5	NAVD	NC	-6.5	NAVD	NEW PLANT LOCATION	NC	2.4-129
257	-5.0	NAVD	NC	-5.0	NAVD	NEW PLANT LOCATION	NC	2.4-133
258	-6.2	NAVD	NC	-6.2	NAVD	NEW PLANT LOCATION	NC	2.4-133
259	-6.5	NAVD	NC	-6.5	NAVD	NEW PLANT LOCATION	NC	2.4-133
260	-15.9	NAVD	NC	-15.9	NAVD	NEW PLANT LOCATION	NC	2.4-133

a Water Surface Elevation from the original source, i.e., calculation or SSAR Reference.

b CF = Conversion Factor (ft)

c Reported Elevation = Source Elevation minus CF. Reported Elevation has been rounded to the nearest tenth of a foot, with the following exceptions: (a) additional digits are presented (e.g., hundredths of a foot) if rounding to the nearest tenth would not provide sufficient information, or (b) the Source Elevation was reported to less significant digits, i.e., if the source elevation was provided to nearest foot.

d NOAA Station Datums indicates both the procedure and data presented for each NOAA tide gaging station at NOAA Tides Online (accessed from SSAR References 2.4.1-7, 2.4.1-8, 2.4.1-9, and 2.4.1-10). Time period is the Epoch. NC: No Conversion. N/A: Not Applicable - Reported result is the difference between two water levels and therefore not referenced to a datum.

e Latitude and longitude from NOAA Station Information (Reference 2.4.1-10)

f Source elevations, CFs, and Reported Elevations for Item 173 represent averages of values calculated at Atlantic City, NJ, Ocean City, MD.

g Source elevations and CFs for Item 194 were acquired from the source in meters and subsequently converted to ft.

References:

RAI-25-1 U.S. Army Corps of Engineers. CORPSCON Coordinate Conversion Software. Website, http://www.erdc.usace.army.mil/pls/erdcpub/!www_fact_sheet.PRODUCT_PAGE? ps_product_numb=64474&tmp_Main_Topic=&page=All, accessed June 3, 2011.

2.4.1-7 National Oceanic and Atmospheric Administration, "Lewes, DE Tidal Data," Website, http://tidesandcurrents.noaa.gov/station_info.shtml?stn=8557380%20Lewes,%20 DE, accessed August 3, 2009.

2.4.1-8 National Oceanic and Atmospheric Administration, "Newbold, PA Tidal Data," Website, http://tidesandcurrents.noaa.gov/station_info.shtml?stn=8548989%20Newbold,% 20PA, accessed August 3, 2009.

2.4.1-9 National Oceanic and Atmospheric Administration, "Philadelphia, PA Tidal Data," Website, http://tidesandcurrents.noaa.gov/station_info.shtml?stn=8545530%20 Philadelphia,%20PA, accessed August 3, 2009.

2.4.1-10 National Oceanic and Atmospheric Administration, 1996 – 2008, "Reedy Point Tidal Data," Website, http://tidesandcurrents.noaa.gov/station_info.shtml?stn=8551910%20 Reedy% 20Point,%20DE, accessed February 2, 2009.

Associated PSEG Site ESP Application Revisions:

During development of the response to RAI 25, discrepancies were identified in the water surface elevations and datum conversions provided in Section 2.4 of the SSAR. Table RAI 25-1 includes the corrected values. Enclosure 2 provides the changes to SSAR Section 2.4 to correct these values. The items that require revision were not used in any subsequent calculations, and do not affect the design basis water levels.

PSEG Letter ND-2011-0045, dated June 23, 2011

ENCLOSURE 2

Proposed Revisions
Part 2 – Site Safety Analysis Report

Section 2.4 – Hydrologic Engineering

Marked Up Pages
2.4-16
2.4-17
2.4-31
2.4-75
2.4-106
2.4-108
2.4-121
2.4-130

Table 2.4.1-4
Tidal Values at NOAA Reedy Point, DE Tidal Gage (Gage Number 8551910)
(ft. NAVD)

Identifier	Level	Description
MHHW	2.9	Mean Higher-High Water
MHW	2.6	Mean High Water
DTL	-0.05	Mean Diurnal Tide Level
MTL	-0.1	Mean Tide Level
msl	-0.05	Mean Sea Level
MLW	-2.8	Mean Low Water
MLLW	-3.0	Mean Lower-Low Water
GT	5.8	Great Diurnal Range
MN	5.3	Mean Range of Tide
10% EHT[a]	4.6	10% Exceedance High Tide
90% ELT[a]	-5.2	90% Exceedance Low Tide
Maximum	5.91	Highest Water Level
Minimum	-6.98	Lowest Water Level

b

a) Values calculated from monthly MHHW and MLLW values from 1987-2008 Reference 2.4.1-10

b) N/A. Reported results are the difference between two elevations; therefore, not referred to a datum.

Table 2.4.1-5
USGS Gage Data for the Delaware River and Tributaries

4.64

USGS Gage ID	Location	RM[a]	Coordinates		Elevation, ft.[b]	Area drained, sq. mi.	Average daily flow series			Annual peak flow series		
							Start	End	No. of records	Start	End	No. of records
1427510	Delaware River near Callicoon, NY	302.70	41° 45' 24" N	75° 03' 28" W	734.33	1820	06/27/1975	09/30/2008	12,150	01/27/1976	03/09/2008	33
1428500	Delaware River above Lackawaxen River near Barryville, NY	279.16	41°30' 32" N	74° 59' 10" W	599.69	2020	10/01/1940	09/30/2008	24,837	12/30/1940	03/09/2008	68
1434000	Delaware River between Port Jervis, NY and Matamoras, PA	254.80	41° 22' 14" N	74° 41' 52" W	414.78	3070	10/01/1904	09/30/2008	37,986	10/10/1903	03/09/2008	105
1438500	Delaware River between Montague, NJ and Milford, PA	246.44	41° 18' 33" N	74° 47' 43" W	369.33	3480	10/01/1939	11/30/2008	25,264	10/10/1903	04/16/2007	73
1440200	Delaware River near Delaware Water Gap, PA	215.90	41° 00' 48" N	75° 05' 10" W	293.07	3850	06/02/1964	01/31/1996	11,566	08/19/1955	04/17/2007	39
1446500	Delaware River near Belvidere, NJ	197.67	40° 49' 35" N	75° 04' 57" W	225.75	4535	10/01/1922	12/31/2008	31,504	10/10/1903	04/17/2007	86
1457500	Delaware River near Riegelsville, NJ	174.87	40° 35' 41" N	75° 11' 23" W	124.32	6328	07/01/1906	09/30/1971	23,833	01/08/1841	04/17/2007	103
1462000	Delaware River near Lambertville, NJ	148.64	40° 21' 53" N	74° 56' 56" W	48.11	6680	10/01/1897	09/30/1906	3286	10/06/1786	04/17/2007	48
1463500	Delaware River near Trenton, NJ	134.32	40° 13' 18" N	74° 46' 41" W	-1.05	6780	10/01/1912	01/31/2009	35,187	12/16/1897	04/17/2007	110
1474500	Schuylkill River at Philadelphia, PA	~92	39° 58' 04" N	75° 11' 20" W	~~-4.92~~	1893	10/01/1931	09/30/2008	28,125	10/04/~~1870~~	02/13/2008	79
1481500	Brandywine Creek at Wilmington, DE	~71	39° 46' 09.9" N	75° 34' 23.8" W	~~67.41~~	314	10/01/1946	09/30/2008	22,646	04/30/1947	02/14/2008	62

a) River miles measured from the mouth of the Delaware River as reported by USGS
b) NAVD
There are other USGS gage stations on the Delaware River that are not used in the analysis because they either lack flow data, have old flow data, or too short a record.

References 2.4.1-35, 2.4.1-36, 2.4.1-37, 2.4.1-38, 2.4.1-39, 2.4.1-40, 2.4.1-41, 2.4.1-42, 2.4.1-43, 2.4.1-44, and 2.4.1-45

1869

67.17

Table 2.4.2-3
Reedy Point MSL[a] Elevation Monthly Variation, 1987 – 2008

Month	msl (ft.)
January	-0.38
February	-0.37
March	-0.22
April	0.06
May	0.20
June	0.19
July	0.17
August	0.24
September	0.32
October	0.14
November	-0.12
December	-0.33

a) msl = mean sea level

Reference 2.4.2-10

-0.40
-0.39
-0.20
0.07
0.19
0.17
0.16

ft., NAVD

2.4.5.2.2.2 Storm Surge at the Open Coast

Calculations presented by Bodine are verified by reproducing a sample problem provided by Bodine (Reference 2.4.5-2). The model reproduced Bodine's results for maximum surge to four significant figures.

Inputting the PMH identified in Subsection 2.4.5.1 into the Bodine calculations, a maximum surge elevation of 20.9 ft. NAVD is calculated at the mouth of Delaware Bay. This value includes a fluctuating tide at the mouth of the bay that generates the 10 percent exceedance high tide at the new plant coincident with the peak storm surge (Figure 2.4.5-6).

As a point of comparison, other methodologies available from NOAA and NRC to determine storm surge at the open coast are NOAA's SLOSH program and RG 1.59 Appendix C. SLOSH results are accessed using the SLOSH Display Program v. 1.61g (Reference 2.4.5-22) and adjusted to account for the 10 percent exceedance high tide and NAVD datum. NOAA uses SLOSH to determine hurricane surge levels for a large number of potential hurricanes and provides access to the results via the SLOSH Display Program. The storms presented in the Display Program include a Category 4 storm on the Saffir-Simpson scale, but the Delaware Basin v3 SLOSH dataset does not include a storm with the same parameters as the PMH determined for the PSEG Site. Using the SLOSH Display Program, the highest surge elevation at the mouth of Delaware Bay is 17.6 ft. NAVD. Accounting for the 10 percent exceedance high tide indicates a Category 4 storm elevation of 19.8 ft. NAVD.

21.7 ft.

RG 1.59 is applicable to determine PMH surge levels on open coast sites on the Atlantic Ocean and Gulf of Mexico. Therefore, it is appropriate to use this methodology for estimating storm surge up to the mouth of Delaware Bay, but it is not appropriate to use it beyond the area where a hurricane makes initial landfall. As such, it is not an acceptable method for estimating surge at the new plant. RG 1.59, Appendix C, results for the mouth of Delaware Bay are based on interpolating results from Atlantic City, NJ, and Ocean City, MD, and then adjusting to NAVD. Including the 10 percent exceedance high tide, RG 1.59 estimates a maximum storm surge of ~~22.0 ft.~~, NAVD at the mouth of the Delaware Bay.

While the three methods do not compare the exact same hurricane parameters, the three models produce similar storm surge estimates at the mouth of Delaware Bay for Category 4 hurricanes. The Delaware Basin v3 SLOSH dataset does not include a storm with the same parameters as the PMH determined for the PSEG Site. Therefore, SLOSH is not used to determine the peak surge at the mouth of the Bay. RG 1.59 cannot be used to determine surge at the new plant location, and cannot be used as a substitute for the Bodine method because it does not provide a stage hydrograph for the simulated hurricane to input into HEC-RAS. Further, RG 1.59 does not simulate the PMH as defined by NWS 23 (References 2.4.5-32 and 2.4.5-18). The Bodine method produces a more conservative result than SLOSH, and can specifically simulate the response to the PMH. Therefore, the Bodine model is selected as the basis for determining the PMH surge. The stage hydrograph, including the peak surge at the mouth of the bay calculated using the Bodine method, is input to the HEC-RAS model which propagates the storm surge through Delaware Bay.

The resulting WSEL at the PSEG Site, due to the 10 percent exceedance high tide (4.5 ft. NAVD), plus the spring base flows (0.7 ft.), plus the rise in the Delaware River resulting from the upstream ice jam breach at Trenton (0.1 ft.), plus the coincident wave runup from a 2-year wind speed applied in the critical direction (2.8 ft.) is 8.1 ft. NAVD. Table 2.4.7-3 presents the water surface levels determined from the model.

2.4.7.2.2 Low Water Levels

There are no ice jams recorded in the CRREL database for the Delaware River downstream of the PSEG Site. In addition, the Delaware River width and cross-section increase significantly immediately to the south of the new plant. Therefore, backwater flooding from downstream ice jams has not been considered (Reference 2.4.7-15). However, numerous ice jams located on the Delaware River upstream of the PSEG Site have been recorded, as discussed in Subsection 2.4.7.1. Therefore, the potential for low water elevations in the Delaware River due to upstream river blockage from an ice jam is evaluated. A detailed analysis of winter low water elevations at the new plant due to winter low flows and ice jams is presented in Subsection 2.4.11.

-9.5 ft.

The mean lower low water elevation at the Reedy Point NOAA tidal gage station (gage 8551910) is -3.0 ft. NAVD. Based on historic information of the Reedy Point gage, the minimum water level recorded since inception of the gage (in 1956) is -7.0 ft. NAVD. This occurred on April 7, 1982 (Reference 2.4.7-6). A USGS paper identifies a low water event which occurred on December 31, 1962 due to north-northwesterly winds blowing downstream. The paper identified a low water reading at Reedy Point of -8.6 ft. msl (-9.4 ft. NAVD) (Reference 2.4.7-11). Tidal flow at the PSEG Site, which ranges from 400,000 cubic feet per second (cfs) to 472,000 cfs (References 2.4.1-16 and 2.4.1-23), dominates the freshwater flow of the Delaware River. The tidal flow is much greater than the flow required by the intake structure, making the effects of an ice jam upstream and the resulting reduced Delaware River freshwater flow not a critical factor in the design of the new plant intake.

The invert elevations of the new plant intake structure will be set at an elevation to maintain operations during low water conditions. Intakes will be designed to assure that adequate water is available in the event of low water conditions. Design features to address floating and frazil ice will be included. Low water effects are further discussed in Subsection 2.4.11.

2.4.7.3 Ice Sheet Formation

No safety-related water reservoirs are located on the PSEG Site. Therefore there is no potential for surface ice to reduce the volume of liquid water available in a reservoir for safety-related cooling. Depending on the technology chosen, any basins for the new plant will be designed to withstand internal and external ice effects, and the intake structure on the Delaware River will have protective measures to mitigate potential effects from surface ice.

2.4.7.4 Potential Ice-Induced Forces and Blockages

Frazil ice, fine needle-like structures or thin, flat circular plates of ice, can form on intake structures, thereby causing blockages of the intakes and reducing access to available water (Reference 2.4.7-16). Frazil ice begins to form when the water becomes supercooled (below its

2.4.7-3 MASER Consulting, PA ALTA/ACSM Land Title Survey for PSEG Nuclear LLC of Block 26, Lots 4, 4.01, 5 and 5.01, Job Number 05001694D, Index Number HASU023453, dated June 13, 2008.

2.4.7-4 National Oceanic and Atmospheric Administration, National Ice Center, Website, http://www.natice.noaa.gov/index.htm, accessed July 13, 2009.

2.4.7-5 National Oceanic and Atmospheric Administration, "NOS Estuarine Bathymetry: Delaware Bay DE/NJ (M090)," Website, http://egisws01.nos.noaa.gov/servlet/BuildPage?template=bathy.txt&parm1=M090&B1=Submit, accessed February 2, 2009.

2.4.7-6 National Oceanic and Atmospheric Administration, "Tides and Currents, Reedy Point, DE (Gage 8551910) Datums," Website, http://tidesandcurrents.noaa.gov/data_menu.shtml?stn=8551910%20Reedy%20Point,%20DE&type=Datums, accessed July 10, 2009.

2.4.7-7 National Oceanic and Atmospheric Administration, "Tides and Currents, Reedy Point, DE (Gage 8551910), Historic Tide Data," Website, http://tidesandcurrents.noaa.gov/data_menu.shtml?bdate=19960101&edate=19960331&wl_sensor_hist=W3&relative=&datum=6&unit=1&shift=g&stn=8551910+Reedy+Point%2C+DE&type=Historic+Tide+Data&format=View+Plot, accessed July 11, 2009.

2.4.7-8 National Snow and Ice Data Center, Website, http://nsidc.org/data/docs/noaa/g02176_aari_charts/, accessed August 5, 2009.

2.4.7-9 National Weather Service, "Forecast Office, Records & Normals for Wilmington, DE," Website, http://www.erh.noaa.gov/phi/climate/recsAndNormals/xml/KILG_recsAndNorms.xml, accessed July 13, 2009.

2.4.7-10 Public Service Enterprise Group (PSEG), "Applicant's Environmental Report-Operating License Renewal Stage Salem Generating Station Unit 1 and 2," Docket No. 50-272 and 50-311, Revision 2a, p. 2-3, 3-3 – 3-5, 3-7, 3-8, 2008a.

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2.4.7-11 U.S. Department of the Interior, Report # 1586-E, "Record Low Tide of December 21, 1962 on the Delaware River" 1966, prepared by A.C. Lendo.

2.4.7-12 Public Service Enterprise Group, "Salem Generating Station NJPDES Permit Renewal Application," p. 52 – 53, 1999.

2.4.7-13 U.S. Army Corps of Engineers, "Coastal Engineering Manual," Engineer Manual 1110-2-1100, U.S. Army Corps of Engineers, Washington, D.C. (in 6 volumes), 2002.

2.4.7-14 U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Cold Regions Technical Digest No 91-1, "Frazil Ice Blockage of Intake Trash Racks," Stephen F. Daly, p. 2, March 1991.

2.4.11 LOW WATER CONSIDERATIONS

This subsection investigates natural events that reduce or limit the available safety-related cooling water supply to ensure that an adequate water supply exists to shut down the plant under conditions requiring safety-related cooling. Specifically, the potential for low water conditions to occur in the Delaware Estuary is investigated.

The new plant is located on the northwest corner of the PSEG Site, on the east bank of the Delaware River, in the southwest portion of Salem County, NJ. The site is located 52 RM upstream of the mouth of Delaware Bay. The intake structure located on the east bank of the Delaware River provides a nonsafety-related and, depending on the type of reactor technology selected, safety-related source of water for the new plant. The effect of low water conditions on the new plant requirements are further discussed in Subsection 2.4.11.5.

Under normal flow and weather conditions, water levels at the new plant location are primarily determined by tides. The Delaware River is subject to tidal influence from the mouth of the Delaware River to the head of tide at RM 134 in Trenton (Reference 2.4.11-13). Therefore, the influence of the tide must be addressed for all other potential natural events that result in low water conditions.

Water levels in the Delaware River at the new plant location are influenced by tides; flooding conditions within the Delaware River Basin, and storms, including hurricanes, that affect Delaware Bay. Historical low water conditions and the effect of tides are summarized in Subsection 2.4.11.1. The combined effects of low tides and drought conditions in the Delaware River Basin are addressed in Subsection 2.4.11.2. The effect of negative storm surge, seiches, tsunamis, and ice effects are addressed in Subsection 2.4.11.3.

2.4.11.1 Historical Low Water Conditions and the Effect of Tides

The tide of the Delaware Estuary is semidiurnal in character. There are two high waters and two low waters in a tidal day, with comparatively little diurnal inequality. The Reedy Point, DE station at RM 59 is the tidal gage station nearest the PSEG Site, as shown on Figure 2.4.11-1.

A 22-year record (1987 to 2008) of water levels at the Reedy Point gage shows an extreme low water elevation of -6.8 ft. NAVD, which occurred during November 1989. The extreme low water in the 22-year record is attributed to a negative surge associated with strong northwest winds that occurred on November 21, 1989. Winds at Dover, DE, near Delaware Bay, were consistently from the northwest, ranging from 21 to 37 mph and averaging 28 mph for approximately 18 hours on that day (Reference 2.4.11-6). The wind event was associated with passage of a cold front (Reference 2.4.11-20). A USGS paper identifies a low water event which occurred on December 31, 1962 due to north-northwesterly winds blowing downstream. The paper identified a low water reading at Reedy Point of -8.6 ft. msl (-9.4 ft. NAVD) (Reference 2.4.11-11).

-9.5 ft.

Mean low water at Reedy Point is -2.8 ft. NAVD, and the 90 percent exceedance low tide is -5.15 ft. NAVD. The 90 percent exceedance low tide at the new plant is determined to be -5.1 ft. NAVD by interpolation between the 90 percent exceedance low tides at Reedy Point and Lewes, DE at RM 0 (-4.6 ft. NAVD).

2.4.11-5 Einarsson, E. and A. B. Lowe, "Seiches and Set-Up on Lake Winnipeg," American Society of Limnology and Oceanography, Limnology and Oceanography Vol. 13 No. 2, p. 257 – 271, April 1968.

2.4.11-6 National Climatic Data Center, "TD3505 Format Digitized Hourly Surface Weather Observations for Wilmington Delaware (1942-2009), Dover Delaware (1942-2009), and Millville New Jersey (NJ) (1972-2009)," purchased from NCDC, Asheville North Carolina, downloaded from NCDC file transfer protocol website, ftp://ftp.ncdc.noaa.gov/pub/data/, accessed February 19, 2009

2.4.11-7 National Oceanic and Atmospheric Administration, Coastal Services Center, Historical Storm Tracks, Website, http://csc-s-maps-q.csc.noaa.gov/hurricanes/download.jsp, accessed August 12, 2009.

2.4.11-8 National Oceanic and Atmospheric Administration, "Meteorological Criteria for Standard Project Hurricane and Probable Maximum Hurricane Windfields, Gulf and East Coasts of the United States," NOAA Technical Report NWS 23, 1979.

2.4.11-9 National Oceanic and Atmospheric Administration, "NOS Estuarine Bathymetry: Delaware Bay DE/NJ (M090)," Website, http://egisws01.nos.noaa.gov/servlet/BuildPage?template=bathy.txt&parm1=M090&B1=Submit, accessed February 2, 2009.

2.4.11-10 National Oceanic and Atmospheric Administration, Tides and Currents, Website, http://tidesandcurrents.noaa.gov/station_retrieve.shtml?type=Historic%20Tide%20Data&state=Delaware&id1=855, accessed July 10, 2009.

2.4.11-11 U.S. Department of the Interior, Report # 1586-E, "Record Low Tide of December 21, 1962 on the Delaware River" 1966, prepared by A.C. Lendo.

2.4.11-12 U.S. Army Corp of Engineers, Cold Regions Research and Engineering Laboratory, Technical Note 04-3, "Method to Estimate River Ice Thickness Based on Meteorological Data," June 2004.

2.4.11-13 U.S. Army Corp of Engineers, "Delaware River Main Channel Deepening Project Design Memorandum," Philadelphia District, Philadelphia, Pennsylvania, p. 1, 55 – 59, 1996.

2.4.11-14 U.S. Army Corp of Engineers, "Delaware River Philadelphia to the Sea Examination," Bathymetric Survey Data, Philadelphia, Pennsylvania, 2007 – 2009.

2.4.11-15 U.S. Army Corps of Engineers, "HEC-RAS 4.0 Software," website, http://www.hec.usace.army.mil/software/hec-ras/hecras-download.html, accessed February 23, 2009.

2.4.11-16 U.S. Environmental Protection Agency, "Case Study Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule," EPA-821-R-02-002, p. 19, February 2002.

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PSEG Letter ND-2011-0045, dated June 23, 2011

ENCLOSURE 3

DVD-ROMs Containing Digital Files for Surface Water
(Set of 3 Discs)


PSEG Site
Early Site Permit Application
RAI No. 25 (eRAI 5710)
Response Enclosure 3
Disk 1 of 3
PSEG
Power LLC
MACTEC


PSEG Site
Early Site Permit Application
RAI No. 25 (eRAI 5710)
Response Enclosure 3
Disk 2R1 of 3
PSEG
Power LLC
MACTEC


PSEG Site
Early Site Permit Application
RAI No. 25 (eRAI 5710)
Response Enclosure 3
Disk 3R1 of 3
MACTEC
PSEG
Power LLC

PSEG Letter ND-2011-0045, dated June 23, 2011

ENCLOSURE 4

Summary of Regulatory Commitments

ENCLOSURE 4

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.)

COMMITMENT	COMMITTED DATE	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	Programmatic (Yes/No)
PSEG will revise SSAR Section 2.4 to incorporate the changes in Enclosure 2 in response to NRC RAI No. 25, Question 02.04.01-2.	This revision will be included in the next update of the PSEG Site ESP application SSAR.	Yes	No
PSEG will provide the User Instructions for the DVDs provided in Enclosure 3.	July 7, 2011	Yes	No