Nuclear Development
244 Chestnut Street, Salem, NJ 08079

PSEG
Power LLC

ND-2012-0010
February 10, 2012

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. 44, Surface Faulting

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

2) RAI No. 44, SRP Section: 02.05.03 – Surface Faulting, dated December 12, 2011 (eRAI 6164)

3) PSEG Power, LLC Letter No. ND-2012-0003 to USNRC, Response to Request for Additional Information, RAI No. 44, Surface Faulting, dated January 11, 2012

4) PSEG Power, LLC Letter No. ND-2012-0007 to USNRC, Response to Request for Additional Information, RAI No. 44, Surface Faulting, dated January 25, 2012

The purpose of this letter is to respond to the request for additional information (RAI) identified in Reference 2 above. This RAI addresses Surface Faulting, as described in Subsection 2.5.3 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. 44, Question Nos. 02.05.03-7 through 02.05.03-10 and 02.05.03-13. The responses to the remaining RAI No. 44 questions were provided in References 3 and 4.

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Enclosure 2 includes the revisions to SSAR Subsection 2.5.3 resulting from our responses to RAI No. 44, Question Nos. 02.05.03-8 and 02.05.03-10.

Enclosure 3 includes the revision to SSAR Figure 2.5.3-1 resulting from our response to RAI No. 44, Question No. 02.05.03-13.

Enclosure 4 includes the new regulatory commitments established in this submittal.

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 10th day of February, 2012.

Sincerely,

James Mallon
Early Site Permit Manager
Nuclear Development
PSEG Power, LLC

Enclosure 1: Response to NRC Request for Additional Information, RAI No. 44, Questions Nos. 02.05.03-7 through 02.05.03-10 and 02.05.03-13, SRP Section: 02.05.03 – Surface Faulting
Enclosure 2: Proposed Revisions, Part 2 – Site Safety Analysis Report (SSAR), Subsection 2.5.3 - Surface Faulting
Enclosure 3: CD-ROM Containing Revised SSAR Figure 2.5.3-1
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)
USNRC Region I, Regional Administrator (w/enclosures)

PSEG Letter ND-2012-0010, dated February 10, 2012

ENCLOSURE 1

RESPONSE to RAI No. 44

QUESTION Nos.
02.05.03-7
02.05.03-8
02.05.03-9
02.05.03-10
02.05.03-13

Response to RAI No. 44, Question 02.05.03-7:

In Reference 2, the NRC staff asked PSEG for information regarding Surface Faulting, as described in Subsection 2.5.3 of the Site Safety Analysis Report. The specific request for Question 02.05.03-7 was:

> *SSAR Subsection 2.5.3.2.1, "Paleozoic Structures Exposed in the Piedmont," states that the Pleasant Grove-Huntingdon Valley fault crosscuts the Rosemont fault, and that both faults are Paleozoic in age. However, the SSAR does not identify the location where this field observation was made.*
>
> *In order for the staff to fully evaluate the potential for faulting within the PSEG site vicinity, and in compliance with 10 CFR 100.23 and in conformance to NUREG 0800, Section 2.5.3, "Surface Faulting," please clarify the location where the field relationship of crosscutting Paleozoic structures was observed.*

PSEG Response to NRC RAI:

The Rosemont shear zone and the Pleasant Grove-Huntingdon Valley fault are also discussed in SSAR Subsection 2.5.1.1.4.2.2. The interpretation of the Rosemont fault being truncated against the Pleasant Grove-Huntingdon Valley fault is seen in several publications and maps (e.g.; SSAR References 2.5.3-7, 2.5.3-32). The publications reviewed indicate the intersection of these two structures is located north-northwest of Philadelphia, PA at the northeast corner of the West Chester and Avondale massifs (marked by WC and Av on SSAR Figure 2.5.1-8a). This location was not visited as part of the preparation of the ESPA for the PSEG site.

Associated PSEG Site ESP Application Revisions:

None.

Response to RAI No. 44, Question 02.05.03-8:

In Reference 2, the specific request for Question 02.05.03-8 was:

> *SSAR Subsection 2.5.3.2.2, "Faults Buried by Coastal Plain Sediments," states that Benson (1992) used gravity and magnetic anomaly maps, boreholes, and seismic lines to map three Mesozoic basins buried beneath Coastal Plain sediments in the site vicinity. Benson (1992) concluded that the faults associated with these three basins do not cut rocks younger than Cretaceous (145.5-65.5 Ma). However, the SSAR does not provide any detail regarding the degree of resolution of these data sets for detecting fault displacement (i.e, what minimal displacement might be missed in these data), or which data type was relied upon most heavily to determine that post-Cretaceous rocks were not affected by faulting associated with these basins. It is also not clear to the staff whether these data sets were adequate to eliminate the possibility of a Mesozoic basin and associated boundary fault underlying the site area.*
>
> *In order for the staff to adequately evaluate the potential for faulting within the PSEG site vicinity, and in compliance with 10 CFR 100.23 and in conformance to NUREG 0800, Section 2.5.3, "Surface Faulting," please clarify the degree of resolution of the data sets used to determine a lack of evidence for displacement of Quaternary stratigraphic units in the site vicinity, and whether there was adequate data to eliminate a concern about a subsurface Mesozoic basin in the site area.*

PSEG Response to NRC RAI:

The statement in SSAR Subsection 2.5.3.2.2 relating to faulting associated with buried Mesozoic basins being limited to Cretaceous and older strata was based on the results of the seismic reflection data presented in SSAR Reference 2.5.3-23. These data image relatively small offsets in Cretaceous strata (15 meters and less; about 45 ft) and are based on terminations of reflection events in the Cretaceous interval. Because this seismic reflection program was aimed at studying relatively deep structures in the crystalline basement (i.e. "Taconic Suture"), the data acquisition parameters used were targeted at optimizing reflections of deep structures (a relatively low frequency sweep [14 – 56 Hz] and approximately 220 ft shot and receiver station interval). The vertical resolution for noise-free data is typically taken to be one-fourth of the dominant wavelength. For a typical Coastal Plain material with compressive wave velocity of 6000 ft/sec and 50Hz data the vertical resolution would be about 30 ft. (best case assuming noise-free data; high dominant frequency; and correct interval velocity). Therefore, the maximum offsets reported (45 ft) are close to the vertical resolution limit in the Cretaceous section. Also, the relatively large shot and receiver station spacing means that the stretch mute will effectively eliminate the far offset data in the shallow section, resulting in a loss of sampling redundancy (fold) and a significant decrease in the signal to noise ratio. The effect is to cause rapid degradation of the vertical resolution in the shallow section. The data reported in SSAR Reference 2.5.3-23 show

a reflection event at about 0.5 sec. reflection time with a relatively high signal to noise ratio. This event was interpreted by the authors of SSAR Reference 2.5.3-23 to be unaffected by the faulting in the underlying strata (SSAR Reference 2.5.3-23, Figures 3 and 4) and is the basis for the conclusion that the faulting was confined to the underlying strata. The limits on vertical resolution discussed above apply to this conclusion.

The data used to determine a lack of evidence for displacement of Quaternary stratigraphic units in the site vicinity were a review of maps, literature and subsurface boring data, along with examination of aerial photography and ground and aerial reconnaissance. The response to RAI No. 44, Question 02.05.03-2 includes a list of maps and publications reviewed, while the responses to RAI No. 42, Question 02.05.01-4 and Question 02.05.01-5 include requested information on the field and aerial reconnaissance data. The potential resolution available from these types of data is not easily quantified. For subsurface borings, the resolution to detect faulting in the subsurface is dependent on the spacing of borings and regional dip and orientation of geologic strata, along with assumptions on strata variability. For aerial reconnaissance data, the ability to recognize surface warping of the strata or surface faulting depends on vegetation density and ground surface dissection.

The outcrop pattern of the youngest terraces along the Delaware estuary are oriented approximately strike normal to potential faulting that would be associated with a Mesozoic basin (SSAR Figure 2.5.1-12a). Thus, the terraces are in a favorable orientation to intersect such potential faulting. The LIDAR data for the site area give the highest resolution representation of topographic expression of the terrace surfaces and therefore, would provide the highest resolution indication that these surfaces were deformed in relation to any potential faulting. For the PSEG site area, the LIDAR data shown in SSAR Figure 2.5.1-27 indicate that these terrace surfaces are highly dissected and exhibit elevation ranges on the order of 20 to 30 ft. This makes correlations of individual surfaces problematic and places corresponding limitations on resolution using these terrace surfaces to detect deformation.

The resolution available from the potential field data (aeromagnetic and gravity) may be determined based on examination of SSAR Figures 2.5.1-23 and 24b. SSAR Figure 2.5.1-23 illustrates the station spacing for gravity data in the site vicinity. The station spacing in the site area is approximately 5 miles, and the data do delineate a gravity low that is well sampled at this spacing. SSAR Figure 2.5.1-24b illustrates the sampling available for the aeromagnetic surveys available for the site vicinity. The flight lines in the site area are relatively far apart (approximately 5 miles) and oriented east – west. Therefore, any potential Mesozoic basin would be densely sampled in the east – west direction but aliased in the north – south direction. Given the non-unique nature of potential field data, it is recognized that variation in the gravitation and magnetic data may result from geologic conditions other than Mesozoic basins. As discussed in SSAR Subsection 2.5.1.1.6 and the response to RAI No. 42, Question 02.05.01-14, the identification of Mesozoic basins in the subsurface, using potential field data alone is uncertain. Therefore, along with potential field data, additional data must be

considered. In an effort to explore the possibility of the presence of Mesozoic basins extending beneath the site, data relevant to the basement beneath the site was investigated. This investigation aimed to determine the elevation and attitude of the basement surface and the age and lithology of the basement rocks, and to evaluate the likelihood that Triassic rift sediments exist at depth in the area.

As noted in SSAR Subsection 2.5.1.2.4.1, a log of a well drilled at the site indicated that 'residual clay above basement' was penetrated at a depth of 1800 feet. The residual clay was interpreted as saprolite in Wissahickon schist. A review of well logs, cores, and cuttings of basement rocks indicates that saprolite is common at the basement surface in the region. Other wells located within 10 miles of the site encountered crystalline basement at depths varying from 1364 ft to 2295 ft, consistent with the expected southeast dipping basement surface. Calculated projections from the indicated southeastern dip in the basement rock should be encountered at a depth of approximately 1750 ft. below sea level at the PSEG Site, within a likely 10% error of the value obtained from the site well of 1800 ft (SSAR Figure 2.5.1-35).

Based on the depth to basement information presented in SSAR Figure 2.5.1-35 and review of the combined magnetic and gravity studies published in the available literature, there are no known Mesozoic basins identified within the site area. However, considering the non-unique characteristics of the potential field data and resolution available from the terrace surfaces, conclusive determination of the presence or absence of a subsurface Mesozoic basin in the site area is uncertain. The lack of recognized surface deformation in the Quaternary units means that deformation associated with Mesozoic basins in the Quaternary units would have to be of relatively small magnitude in relation to the limits stated in the discussion above.

In conclusion, on review of the available compilations and representations of the buried basins, it is concluded that the Benson map (Reference 2.5.1-15 and Figures 2.5.1-9 and 2.5.1-35) presents the best available regional representations of the Mesozoic basins along the central Atlantic margin. The Benson map indicates that the nearest Mesozoic basin is a postulated extension of the Queen Anne basin, located approximately 15 mi. south of the site. Although data coverage is not ideal, the available data from the site itself and from wells located 8 to 30 mi. distant from the site, do not provide conclusive evidence of the presence of a basin within the site area.

Associated PSEG Site ESP Application Revisions:

During the development of the response to this question, a typographical error was identified in SSAR Subsection 2.5.1.2.4.1. The term 'site vicinity' will be revised to 'site area' as shown in Enclosure 2.

Response to RAI No. 44, Question 02.05.03-9:

In Reference 2, the specific request for Question 02.05.03-9 was:

> *SSAR Subsection 2.5.3.2.2, "Faults Buried by Coastal Plain Sediments," states that Benson (2006) used geophysical well log data to stratigraphically correlate the Cretaceous age Potomac Formation, and determine that Cretaceous stratigraphy does not show any fault disruptions with the exception of one apparent offset of Cretaceous units about 15-20 miles north-northwest of the site. The SSAR states that the base of the overlying Quaternary units was not offset by this fault, but did not address the degree of resolution of this data set for making this conclusion.*
>
> *In order for the staff to adequately evaluate the potential for faulting within the PSEG site vicinity, and in compliance with 10 CFR 100.23 and in conformance to NUREG 0800, Section 2.5.3, "Surface Faulting," please clarify the degree of resolution of the geophysical well log data used to determine that the buried fault located 15-20 miles north-northwest of the site does not offset stratigraphic units of Quaternary age.*

PSEG Response to NRC RAI:

The apparent offset of the Cretaceous Potomac group occurs north-northwest of the PSEG Site and was discovered in a well log study (SSAR Reference 2.5.3-2). The study correlates geophysical logs of approximately 90 borings. Results of palynological analysis on samples from 11 of the borings or surface exposures studied provide further stratigraphic control. The queried fault is also discussed in the response to RAI 44, Question 02.05.03-1. The presence of this queried fault (illustrated on section H-H' of SSAR Reference 2.5.3-2), is based on data from two borings, Cb54-49 to the west of the fault, and Cb55-60 to the east of the fault, both of which were logged continuously with geophysical techniques.

The stratigraphy in boring Cb54-49 is established from resistivity and spontaneous potential logs that were correlated with nearby borings located west of the proposed fault. The nearest boring to Cb54-49 with pollen to confirm the stratigraphy is located 3.5 miles away. The stratigraphy in the eastern boring, Cb55-60, was based on gamma-ray logging of the boring, as well as palynological analysis of a sample from a depth of 50 feet in the boring (SSAR Reference 2.5.3-2). The interpretation of the western boring (Cb54-49), as shown on Section H-H' in SSAR Reference 2.5.3-2, indicates that the upper 70 feet should be Upper Cretaceous strata, whereas the pollen sample in the boring to the east (Cb55-60), is consistent with middle to late Albian or Lower Cretaceous age, implying a potential vertical offset of strata occurs between the two borings (SSAR Reference 2.5.3-2).

The technical details of the geophysical logging techniques used to assess the vertical resolution of the spontaneous potential, resistivity, and gamma ray logs, are not

provided in SSAR Reference 2.5.3-2, although they are described as continuously logged, indicating low sample spacing, and therefore high vertical resolution on the logs. However, the uncertainties of the downhole logging are much smaller than the uncertainties associated with the stratigraphic correlation within a boring and from boring to boring. Qualitatively, better Cretaceous stratigraphic control is available for borings which contain pollen (such as Cb55-60), and the resolution on the stratigraphy in boring without pollen is improved with proximity to pollen-bearing borings. In terms of interpretation of the base of the Quaternary, the borings in question are near Christiana, where the base of the Quaternary was exposed at the surface, providing more confidence in the resolution of the elevation and correlation of the base of the Quaternary in the borings in question.

Associated PSEG Site ESP Application Revisions:

None.

Response to RAI No. 44, Question 02.05.03-10:

In Reference 2, the specific request for Question 02.05.03-10 was:

> *SSAR Subsection 2.5.3.2.2, "Faults Buried by Coastal Plain Sediments," discusses the lineaments and basement faults postulated by Spoljaric (1972, 1973, 1974, 1979), broadly known as the New Castle County faults, two of which extend into the site area as lineaments (based on Landsat data). The SSAR description distinguishes between the postulated basement faults and the lineaments, and states that the basement faults have been demonstrated to be pre-Cretaceous in age, thus posing no surface faulting hazard at the site. However, SSAR Subsection 2.5.3.2.2 does not summarize the data that demonstrate the validity of a pre-Cretaceous age. The SSAR further indicates that the interpretation of a young age for the lineaments is unsupported for the following reasons: (a) Borings have not revealed offsets in near-surface units that cross the projection of the lineaments; (b) earlier studies show that basement faults do not extend into Cretaceous or Tertiary units; (c) trenching of one lineament north of the PSEG site revealed unfaulted Tertiary and Quaternary units; and (d) Spoljaric (1974) noted that surface faulting was not evident along the lineaments. However, the SSAR does not indicate which lineament was trenched to conclude that Quaternary units were not offset along the lineament.*
>
> *In order for the staff to adequately evaluate the potential for faulting within the PSEG site vicinity and at the PSEG site, and in compliance with 10 CFR 100.23 and in conformance to NUREG 0800, Section 2.5.3, "Surface Faulting," please clarify what data were used to demonstrate the validity of a pre-Cretaceous age for the basement faults of Spoljaric. Please also clarify which lineament was trenched and provide additional details of the trench investigation, as this action provides support for concluding that the lineaments do not represent Quaternary faults.*

PSEG Response to NRC RAI:

The Delaware Geological Survey conducted a detailed study in New Castle County to determine if there was any evidence for near-surface deformation related to lineaments or basement faults identified by Spoljaric (SSAR Reference 2.5.3-25) and to assess earthquake hazards in northern Delaware (SSAR Reference 2.5.3-13) (note this is also SSAR Reference 2.5.1-128, and is depicted on SSAR Figure 2.5.1-19). The study included a seismic reflection line (NCRS-1) designed to image the top 1500 feet of the subsurface, three deep borings (350-550 feet in depth to reach basement) that were designed to intersect postulated basement faults, and five shallow (5-8 feet in depth) trenches to examine surficial strata (Figure RAI-44-10-1). The data and conclusions presented in SSAR Reference 2.5.3-13 did not provide any evidence of shallow tectonic deformation or faulting along this transect.

The borings and the trenches were located within a mile of the proposed trace of a nearby northeast-trending Spoljaric lineament, and along strike of several basement

faults identified by Spoljaric to the southwest (SSAR Figure 2.5.1-19; Figure RAI-44-10-1; SSAR Reference 2.5.3-26).

The information from the five trenches, as described in SSAR Reference 2.5.3-13, is summarized below.

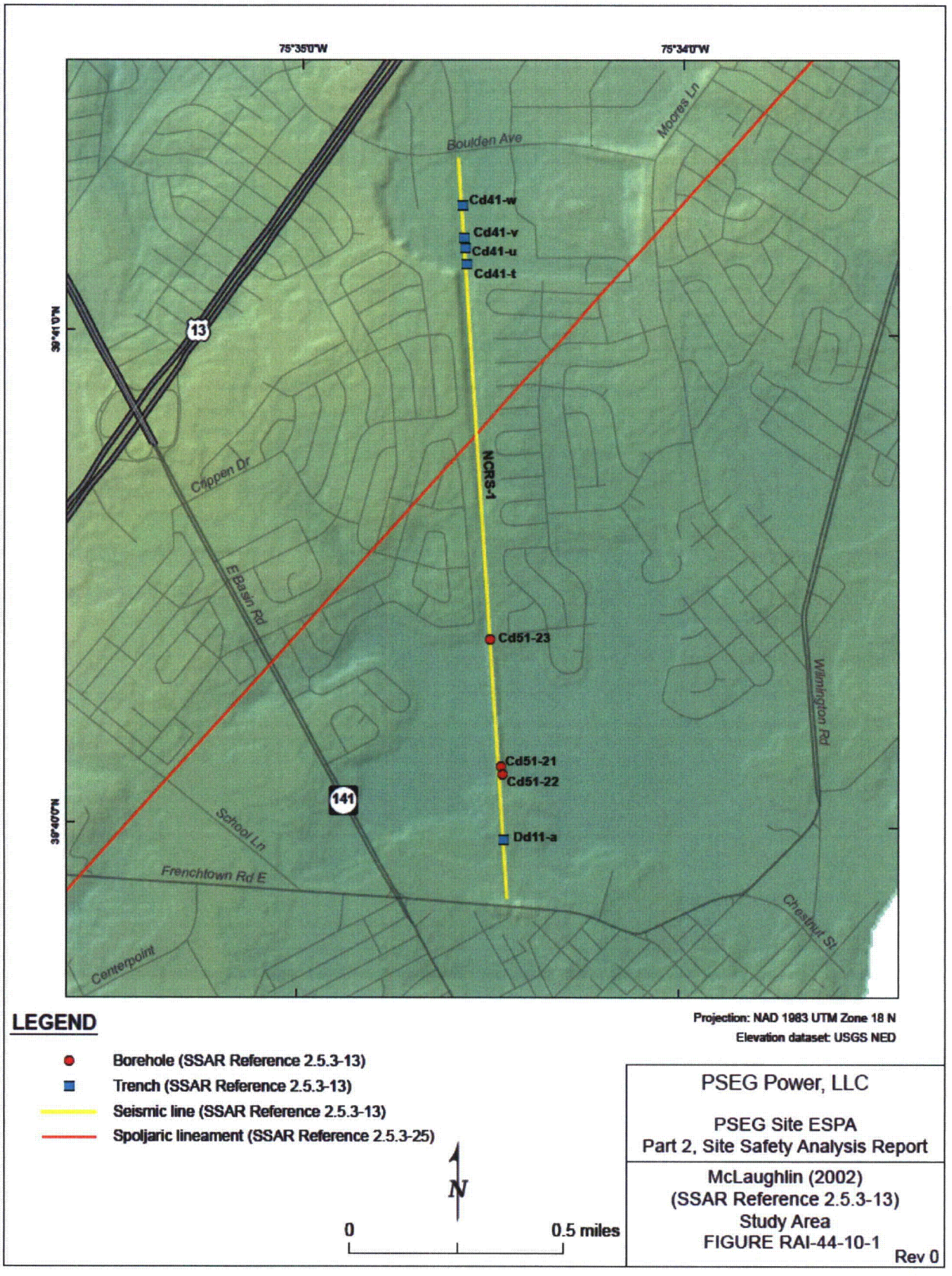
- Trench Cd41-t identified five lithologic units- mostly sands- interpreted as part of the Quaternary Columbia formation. The contacts between the units were horizontal.
- Trench Cd41-u described six lithologic units including upper portions of the Cretaceous Potomac Formation in addition to the Quaternary Columbia Formation. Contacts between the units dip gently (<10 degrees) to the north.
- Trench Cd41-v contained four lithologic units which dip northward, also composed of Potomac Formation overlain by Columbia Formation.
- Trench Cd41-w exposed clays tentatively assigned to the Columbia Formation that were cut by an erosional surface.
- Trench Dd11-a, located to the south of the other trenches, exposed flat-lying clays overlain by sands, interpreted as Potomac formation overlain by the Quaternary Lynch Heights Formation.

These trenches were located to test hypothesized faulting in early interpretations of the seismic reflection data. No evidence of faulting was encountered in any of the five trenches in the Potomac formation or the overlying Quaternary deposits (SSAR Reference 2.5.3-13). These trenches, along with the boring data, and reinterpretations of the seismic data indicate an unfaulted shallow section along the NCRS-1.

The study performed by the Delaware Geological Survey included geophysical, boring, and trenching activities at sites located approximately 12 miles north of the PSEG site. This work focused on evaluating the possibility of young tectonic faulting and determined that the Cretaceous to Quaternary strata examined are unfaulted (SSAR Reference 2.5.3-13).

Associated PSEG Site ESP Application Revisions:

SSAR Subsection 2.5.3.2.2 will be updated as specified in Enclosure 2 of this document.


75°35'0"W
75°34'0"W
39°41'0"N
39°40'0"N
Boulden Ave
Moores Ln
Cd41-w
Cd41-v
Cd41-u
Cd41-t
13
NCRS-1
Clippen Dr
E Basin Rd
Cd51-23
Wilmington Rd
Cd51-21
Cd51-22
141
School Ln
Dd11-a
Frenchtown Rd E
Chestnut St
Centerpoint
LEGEND
Borehole (SSAR Reference 2.5.3-13)
Trench (SSAR Reference 2.5.3-13)
Seismic line (SSAR Reference 2.5.3-13)
Spoljaric lineament (SSAR Reference 2.5.3-25)
Projection: NAD 1983 UTM Zone 18 N
Elevation dataset: USGS NED
N
0
0.5 miles
PSEG Power, LLC
PSEG Site ESPA
Part 2, Site Safety Analysis Report
McLaughlin (2002)
(SSAR Reference 2.5.3-13)
Study Area
FIGURE RAI-44-10-1
Rev 0

Response to RAI No. 44, Question 02.05.03-13:

In Reference 2, the specific request for Question 02.05.03-13 was:

> *SSAR Figure 2.5.3-1 includes a north-northwest yellow line that is not defined in the figure legend and it is not clear what this line represents on the map showing site vicinity geology and seismology. The SSAR Figure 2.5.3-1 map legend identifies only Cretaceous and Quaternary coastal plain units, which is inconsistent with SSAR Figure 2.5.1-12a that shows tertiary units in the eastern portion of the site vicinity.*
>
> *In order for the staff to adequately evaluate the potential for faulting within the PSEG site vicinity and at the PSEG site, and in compliance with 10 CFR 100.23 and in conformance to NUREG 0800, Section 2.5.3, "Surface Faulting," please update the legend in SSAR Figure 2.5.3-1 to be consistent with SSAR Figure 2.5.1-12a and please identify the north-northwest yellow line included in the map. Also, please explain the significance of Quaternary units in contact with Cretaceous units along the fall line west of the site.*

PSEG Response to NRC RAI:

The legend of SSAR Figure 2.5.3-1 should read Cretaceous-Quaternary units. The missing hyphen will be inserted on the revised figure as shown in Enclosure 3. The north-northwest trending yellow line is one of the lineaments identified by Spoljaric (SSAR Reference 2.5.3-25). The line color and style of the line depicting this lineament is also corrected in the updated version of SSAR Figure 2.5.3-1.

Along the fall line west of the site, the Quaternary Columbia formation is frequently in contact with Cretaceous Potomac Formation (SSAR Figure 2.5.1-12). This indicates a period of erosion and/or non-deposition, or an unconformity, which occurred prior to the deposition of the Quaternary units. The site stratigraphy includes several unconformities - at the top of the Potomac Formation, the top of the Vincentown Formation, and the top of the Kirkwood Formation (SSAR Figure 2.5.1-34). The unconformity at the top of the Vincentown Formation is part of a regional Oligocene angular unconformity identified across the New Jersey coastal plain (SSAR Reference 2.5.1-152). SSAR Figure 2.5.1-36 illustrates the effects of this regional unconformity and discussion is provided in SSAR Subsection 2.5.1.1.3.4.3.

Associated PSEG Site ESP Application Revisions:

SSAR Figure 2.5.3-1 will be updated as specified in Enclosure 3 of this document.

PSEG Letter ND-2012-0010, dated February 10, 2012

ENCLOSURE 2

Proposed Revisions
Part 2 – Site Safety Analysis Report (SSAR)

Section 2.5.3 – Surface Faulting

Marked Up Pages

2.5-66
2.5-195

crystalline rocks of probable Paleozoic or Precambrian age (Reference 2.5.1-244). Palynology from a deep well updip at Ft. Mott, NJ, confirms Cretaceous ages for units at a depth of 820 ft. (Reference 2.5.1-217), and a well located downdip in Cumberland County, NJ, has fossils indicating Cretaceous strata at a depth of 2300 ft. before encountering basement at 3616 ft. (Reference 2.5.1-30).

Replace with 'area' per Question 02.05.03-8.

At least two other wells located in the regional gravity low drilled through Cretaceous rocks to encounter crystalline basement (Reference 2.5.1-244). In addition, a seismic line crosses the gravity low east of the PSEG Site (Reference 2.5.1-63). Retrieved depth-to-basement values are consistent with those expected from boring data (Figure 2.5.1-35). Seismic velocities from the refraction transect indicate that the basement velocities are approximately 18,000 feet per second, consistent with crystalline rocks, rather than Triassic rift sediments (Reference 2.5.1-63). An intermediate layer encountered above basement (interpreted as the Cretaceous-Tertiary boundary) has seismic velocities of 4,500 to 8000 feet per second, too low to be correlated with Triassic rift sediments (Reference 2.5.1-42). Certainly, data coverage is not ideal, particularly east of the PSEG Site and west of the seismic refraction line. However, the available data, from the site itself and from wells located 8 to 30 mi. distant from the site, refute the presence of a basin within the site vicinity.

Faults mapped within the site vicinity fall into two categories: Piedmont faults exposed in northernmost DE, and basement faults beneath the Coastal Plain strata. The Piedmont faults in northernmost DE, approximately 15 mi. north of the PSEG Site, cut only Paleozoic units and have a maximum age of latest Paleozoic (Subsection 2.5.1.1.4.2.2). The availability of a variety of subsurface data (borings, geophysical logs, vibroseis data, seismic data) has allowed for the identification of many small offsets in the basement surface at depth beneath the Coastal Plain sediments in DE (see discussion of basement faults of Spoljaric (References 2.5.1-210 and 2.5.1-211) in Subsection 2.5.1.1.4.2.5.5). Borings are the most frequent type of data used, but only provide elevation of a layer at one location, therefore the apparent offsets could actually be the result of smooth variations in the elevation of the basement surface, rather than discrete faults. Nevertheless, the faults identified with such data generally cut metamorphic basement (with presumed Paleozoic age) and, in some cases, Cretaceous sedimentary units. The Tertiary and younger strata within the vicinity of the PSEG Site are undeformed (References 2.5.1-56 and 2.5.1-176).

2.5.1.2.4.2 Site Area and Site

The 5-mi. radius of the PSEG Site contains no tectonic faults, folds, or structures (Figure 2.5.1-28). The structure within the PSEG Site is best characterized by planar Cretaceous and Tertiary strata that dip gently to the southeast (Figure 2.5.1-36). Most recent geologic mapping indicates that no faults have been mapped within 5 mi. of the site (Reference 2.5.1-157). Figure 2.5.1-37 shows the locations of two cross-sections constructed from the ESPA and nearby Hope Creek and Salem borings. These cross-sections (Figures 2.5.1-38 and 2.5.1-39) indicate that Tertiary and older units are flat, planar and undisrupted (Figures 2.5.1-37, 2.5.1-38, and 2.5.1-39). The one exception to this is the top of the Vincentown formation/base of the Kirkwood, which has an erosional, channelized character with many feet of relief (approximately 35 ft.) across the new plant location area (Figure 2.5.1-40). The Hope Creek Final Safety Analysis Report (FSAR) indicates that approximately 25 ft. of relief is present across the smaller area investigated with borings for the Salem and Hope Creek plants, shown as two linear ridges in the top of the Vincentown oriented roughly north-south (References 2.5.1-175 and 2.5.1-176). It is important

As discussed in Subsection 2.5.1.1.4.2.5.5, a geologist working with the Delaware Geological Survey, Nenad Spoljaric, identified numerous lineaments, faults, and probable faults throughout Delaware, known broadly as the New Castle County faults. These features vary from offsets of the crystalline basement surface identified in boreholes to postulated lineaments and faults identified with satellite data or imagery (References 2.5.3-24, 2.5.3-26, 2.5.3-27, and 2.5.3-25). While many of these various features exist within the site vicinity, only two extend within the site area in Delaware. These two features, a "fault" and "possible fault" were drawn from lineaments interpreted in Landsat data (Reference 2.5.3-25).

The basement faulting of the earlier studies (References 2.5.3-24 and 2.5.3-26) is distinct from the lineaments mapped on the surface with satellite data (References 2.5.3-27 and 2.5.3-25). There is little doubt that offsets of the Precambrian to Paleozoic basement rocks exist (References 2.5.3-24 and 2.5.3-26). Evidence indicates that unfaulted Cretaceous and younger units overlie these faults (References 2.5.3-24 and 2.5.3-26). These faults are post-Paleozoic and pre-Cretaceous, therefore it is a reasonable interpretation that these offsets are probably due to faulting during Mesozoic rifting. More importantly, these offsets have been demonstrated to be pre-Cretaceous in age, and thus pose no surface faulting hazard. The existence and geologic relevance of the lineaments mapped by Spoljaric (References 2.5.3-27 and 2.5.3-25), however, are questionable and the interpretation that these lineaments are related to young faulting is not supported. The assessment that these lineaments may be faults primarily stems from the coincidence that part of the lineaments are located near areas where pre-Cretaceous basement faulting has been identified at depth in earlier studies (References 2.5.3-9, 2.5.3-24, and 2.5.3-26). The 'fault' or 'possible fault' assessments for the lineaments (References 2.5.3-27 and 2.5.3-25) are unsupported because:

- Boring investigations have failed to find offsets in near-surface units that cross the projection of these lineaments (References 2.5.3-5 and 2.5.3-2).
- The earlier studies of the basement offsets clearly indicate that the basement faults do not extend upward into the Cretaceous or Tertiary units (References 2.5.3-9, 2.5.3-24, and 2.5.3-25).
- ~~Trenching of one of the lineaments north of the PSEG Site found unfaulted Tertiary and Quaternary units at the surface (Reference 2.5.3-13).~~
- Spoljaric (Reference 2.5.3-27) noted that faulting at the surface was not evident.

In summary, neither lineaments nor the basement faults have been demonstrated to be associated with surficial faulting (Reference 2.5.3-34). In particular, the postulated "fault" and "possible fault" lineaments of Spoljaric (References 2.5.3-27 and 2.5.3-25) in the site area have not been corroborated by other workers (References 2.5.3-20 and 2.5.3-19). Additionally, no evidence from the current aerial imagery investigation or field and aerial reconnaissance supports their existence . These features do not pose a surface faulting hazard for the PSEG Site.

2.5.3.2.3 Hypothesized Features

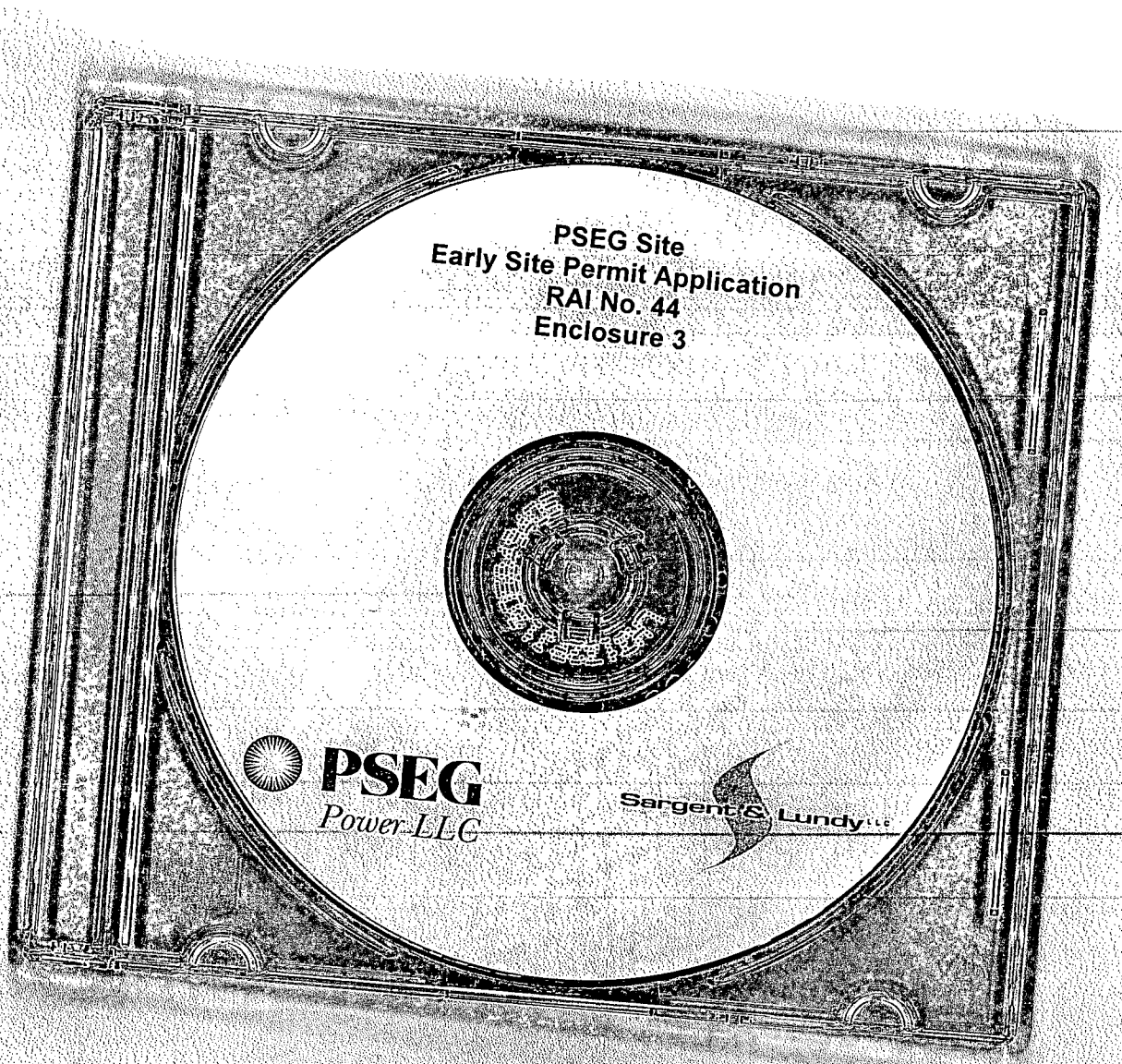
Two additional faults have been hypothes
the River Bend Trend/Stafford fault of Ma
(Reference 2.5.3-16) are located within th
1). These features do not offset or disturb
faulting hazard at the PSEG Site.

Replace with below per Question No. 02.05.03-10:
"Trenching, borings, and a seismic line near one of the lineaments north of the PSEG Site found unfaulted Cretaceous and Quaternary units at the surface (Reference 2.5.3-13)."

PSEG Letter ND-2012-0010, dated February 10, 2012

ENCLOSURE 3

CD-ROM Containing Revised SSAR Figure 2.5.3-1


PSEG Site
Early Site Permit Application
RAI No. 44
Enclosure 3
PSEG
Power LLC
Sargent & Lundy LLC

PSEG Letter ND-2012-0010, dated February 10, 2012

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 Subsection 2.5.3 to incorporate the changes in Enclosure 2 and 3 in response to NRC RAI No. 44, Question Nos. 02.05.03-8, 02.05.03-10 and 02.05.03-13.	This revision will be included in a future update of the PSEG ESP application.	Yes	No