



October 3, 2014

District Engineer
U.S. Army Corps of Engineers
Philadelphia District, Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3390

**Re: Formal Comments by Delaware Riverkeeper Network on Section 404
Public Notice: CENAP-OR-R-2009-0157, PSEG Nuclear, LLC**

To Whom It May Concern:

Public Service Electric and Gas Company Nuclear, LLC (PSEG) is seeking a permit pursuant to Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act of 1899 for construction of a new nuclear power plant/reactor site on Artificial Island in Lower Alloways Creek Township, Salem County, NJ adjacent to two existing nuclear plants, the Hope Creek and Salem Generating Stations. (We are naming it "Salem 4.") According to the U.S. Army Corps of Engineers' (USACE) Public Notice, dated September 4, 2014, the project would include/require:

- "Approximately 134 acres of tidal and non-tidal wetlands would be permanently impacted/filled for the construction of the power block area, the cooling tower area, the switchyard, and the heavy haul road."
- "[A]pproximately 28 acres of tidal and non-tidal wetlands would be temporarily impacted/filled with the installation of the concrete batch plant, the construction parking area, and the laydown areas."
- Dewatering activities, onsite settling basin and outfall structure.
- Construction of a "600 linear foot long by 300 linear foot wide concrete intake structure [that] would involve excavation, grading, and filling activities that would permanently impact approximately 1.5 acres of tidal wetlands" and included a forebay area that would extend into the River.
- An unknown level of new dredging will be required to accommodate the proposed new intake structure and the barge unloading and mooring facility.

The Delaware Riverkeeper Network is particularly concerned about this project and has provided the following comments and enclosed attachments to be considered by the USACE when deciding upon this permit application.

DELAWARE RIVERKEEPER NETWORK
925 Canal Street, Suite 3701
Bristol, PA 19007
Office: (215) 369-1188
fax: (215) 369-1181
drm@delawareriverkeeper.org
www.delawareriverkeeper.org

Comment 1: A Hearing is needed on this highly controversial and dangerous proposal.

The Delaware Riverkeeper Network would like to request a public hearing be scheduled and held regarding this application and proposal. Construction of a fourth nuclear plant on Artificial Island, in an area predicted to be consistently under or surrounded by water in just a few decades to come, and in a place where hundreds of acres of wetlands are to be further damaged by PSEG, is an obvious danger and threat to the region and highly controversial and so therefore deserves a public airing and hearing before the USACE renders a decision. A hearing should be scheduled in New Jersey, with a second hearing scheduled in Delaware where residents too will be impacted but for whom a New Jersey hearing location would be difficult.

Comment 2: Issuance of a 404 Permit is Premature since the Permit Application is Incomplete

The Public Notice (CENAP-OP-R-2009-0157) and the intent of the USACE to take comment and issue this 404 permit is premature, since the applicant is not legally authorized to sign this application and thus this application is not complete. USACE Regulation, 33 CFR Part 325.1(d)(10) states that an application will only be determined to be complete when sufficient information is received to issue a public notice. One of those critical requirements to issue a public notice is having sufficient information (subsection (d)(8)) such that the “applicant possesses or will possess the requisite property interest to undertake the activity.” At the time of this application PSEG was not able to demonstrate this requirement. This requirement is also stated even more definitively at USACE Regulation, 33 CFR Part 320.4(g)(6), such that “The applicant’s signature on an application is an affirmation that the applicant possesses or will possess the requisite property interest to undertake the activity proposed in the application.”

PSEG cannot demonstrate this prerequisite requirement for permit application completeness, since it does not own or currently have legal authority to undertake the proposed activities listed in the draft permit. Based upon a different Public Notice (CENAP-PL-E-14-01, dated July 15, 2014), USACE has confirmed that PSEG is not at this time the owner of the property proposed for this 404 permit. USACE is the present owner of this property. While that Public Notice proposes some form of land swap by the USACE to PSEG, there is no level of certainty that this will occur, especially since even if the USACE agrees to a trade, there could be additional legal obstacles or actions to challenge it or invalidate it. Since this trade has not happened, any Public Notice for this 404 permit cannot be legally issued. 33 CFR Part 325.1(d) provides for 10 criteria that should be examined and/or included in USACE applications, including the applicant’s signature affirming a requisite property interest to undertake the activity. If this permit is issued today, PSEG could not comply with the permit conditions, thus confirming why this Public Notice is defective. PSEG does not have that legal authority as of the date of the application for this Permit so this Public Notice and application is therefore non-conforming to USACE’s own permit processing regulations, is fundamentally flawed and it should therefore be withdrawn. Even if the USACE has inappropriately and illegally made a final decision on the land swap that they have shared with the applicant and not the public, the Delaware Riverkeeper Network has clearly outlined for the record in response to the Public Notice for CENAP-PL-E-14-01 how the USACE has failed to fulfill all of its legal obligations prior to rendering a decision on the land swap, and therefore the USACE is legally unable to support a final determination upon which this current public notice could rely.

Federal agencies are not allowed under any law to issue permits based upon speculative information, since the ultimate decision and any judicial review of such will likely show that it was arbitrary and capricious. Since the USACE has done exactly that, any permit issued that failed based upon an incomplete application, such as this one, will likely be invalidated if challenged in Court. While Courts will not often substitute their judgment for agency decisions based upon conformity with agency substantive expertise, they will readily strike down decisions of agencies that do not follow their own procedural requirements. The proposal to issue this permit at this time is just such an example of procedural error by USACE, readily subject to challenge.

The USACE should therefore withdraw this public notice since PSEG has no legal standing to seek this permit since it does not own the land or have other legal power over the land upon which these regulated activities are proposed to occur.

Comment 3: Issuance of a 404 Permit is Premature Since the Ultimate Use of this Land has Not been Determined

The large area of over 148 acres proposed to be filled in this 404 permit is entirely wetlands, as defined. USACE states that “Most wetlands constitute a productive and valuable public resource, the unnecessary alteration or destruction of which should be discouraged as contrary to the public interest.” 33 CFR 320.4(b)(1.) (Emphasis added) Since the ultimate ownership of this land is currently in question and if PSEG does not get approval to build its power plant, then USACE will have contradicted its own regulations by issuing this permit and allowing for the unnecessary destruction of these irreplaceable wetlands.

USACE should therefore act to withdraw the current Public Notice and the permit application as being premature and not act until such time as PSEG actually obtains a tangible and identifiable ownership interest (deed) in the property and PSEG also gets the other critical federal approvals to actually site and build its proposed nuclear power plant. The USACE’s own Public Interest Review regulations and guidance require that a balancing process take place to be sure that “the benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments.” 33 CFR 320.4(a.) In this situation any balancing process must weigh the fact that two major hurdles have not been met by the applicant (ownership and permission to site and build a power plant) so that entertaining even an application is inconsistent with proper administrative procedures and a waste of agency resources. No permit application should be accepted as “complete” until these two prerequisites have been fulfilled by PSEG.

Comment 4: Since this Project is Undertaken and/or Funded by USACE, Executive Order 11990 must be Invoked

The proposed actions to swap lands currently owned by USACE mean by definition that in some form or another USACE is now involved in a project that is or may be partially or in some capacity undertaken or funded by USACE.¹ In accordance with 33 CFR 320.4(b)(1) the USACE must now provide for a heightened level of scrutiny as to the ultimate outcome of whether it

¹ No dollar amounts have been provided for land values associated with the land swap in the Public Notice, so it is possible that without independent financial and environmental auditing that the USACE could also be funding in some form the property to be acquired by PSEG

should even consider the issuance of a 404 permit at this time. Section 320.4 (b)(1) states in part, “For projects to be undertaken or partially or entirely funded by a federal, state or local agency, additional requirements on wetlands considerations are stated in Executive Order 11990, dated 24 May 1977.” (“EO 11990”) USACE has not identified or discussed EO 11990 in this permit or Public Notice and it must do so in order to fairly evaluate this application and comply with its own regulations.

The Delaware Riverkeeper Network maintains that while the USACE owns this property (right now) and may be involved in a land deal with a private entity that transfers ownership, this is a project that is undertaken or partially or entirely funded by USACE, and therefore, Executive Order 11990 review is mandated. Once this review has been initiated, the outcome of this permit and its conditions will likely change, since EO 11990 requires federal agencies to have a heightened level of review and scrutiny over the filling of wetlands. EO 11990 review has not been performed by USACE, but it should have been so as to adequately evaluate the appropriateness of the PSEG proposal.

In addition, since the USACE presently owns this property, there are additional regulatory requirements that must be imposed upon any decision to issue a permit to fill under section 404 of the Clean Water Act. 33 CFR §325.1(d)(8) states that “the signature of the applicant or the agent will be an affirmation that the applicant possesses or will possess the requisite property interest to undertake the activity proposed in the application, **except where the lands are under the control of the Corps of Engineers, in which cases the district engineer will coordinate the transfer of the real estate and the permit action.**” (Emphasis added)

Since this land is owned by USACE and it is also proposing a 404 permit, given that two different branches of USACE are handling the land swap and the 404 permit, we query as to how the USACE is actually coordinating both actions when it appears that two different offices are processing their permit separately. USACE needs to demonstrate that this coordination is occurring, since any 404 permit decision should not be made until any land swap has been approved.

Comment 5: The “Field of Dreams Approach” is not a Legally Supportable Proper Agency Action

“If you build it they will come” was a line from the movie “Field of Dreams”. In that mythical story a person built a baseball field in a corn field and magically players from the past as spirits showed up to start playing ball. This Public Notice by USACE is also a proverbial field of dreams, except that federal agencies have never been given authority to speculate on the future and act on it now. The fact is that right now it is purely speculation that a nuclear power plant will be built on this site and the USACE action to issue a 404 permit is based entirely upon this speculation. The Delaware Riverkeeper Network can find no statutory authority, regulation or USACE guidance that establishes a legal basis for such anticipatory beliefs to form the basis for the issuance of a real 404 permit to fill wetlands. USACE is wasting valuable federal resources and contravening its own procedures by processing a permit application that clearly is not ripe for review.

The matter of any decision to site a nuclear power plant on this property is presently the subject of a Draft Environmental Impact Statement being prepared and reviewed by the Federal Nuclear Regulatory Commission. A Final Environmental Impact Statement is expected to be completed in the spring of 2015. Regardless of this timeframe, no final decision has been made at this time whether in fact the NRC will even recommend that this location is the best. Therefore, unless the USACE is operating under some new “field of dreams” regulatory approach, it must stand down and wait before it issues a public notice and issues a permit since to do anything else would be acting upon pure speculation.

In addition, the USACE should be careful not to violate constitutional due process requirements, and associated notice and opportunity to be heard if it issues this Public Notice, accepts comments, closes the comment period thirty days later and then waits 6 months or a year until the NRC issues its determination before it then approves a 404 permit. Times change, circumstances change, and facts change with time, and so the USACE will have to act to re-notice and reopen a new comment period if it intends to wait on this permit until the NRC acts. To do otherwise would violate constitutional due process and most certainly lead to a viable permit challenge.

Given the anticipatory nature of this public notice, and the high level of legal irregularities demonstrated by the USACE with this permit decision-making as well as the land swap, one is left guessing as to what level of objectivity USACE has in the present process and its less than arms-length relationship to PSEG in this matter.

Comment 6: The USACE has failed to comply with NEPA in proposing consideration of this project.

Prior to taking action on this permit application the Army Corps must fulfill its obligations pursuant to the National Environmental Policy Act (NEPA). It is wholly inappropriate and a violation of law for the USACE to be seeking public comment on this permit application prior to completing its NEPA obligations. We have not seen a Final Environmental Assessment, a Finding of No Significant Impact, or a Final Environmental Impact Statement (EIS) for this proposed new nuclear plant dubbed Salem 4. There is currently a draft EIS issued by the NRC for which the public review and comment period is ongoing, and we understand the USACE is a cooperating agency of the review team for this draft EIS. If the USACE seeks to rely upon that EIS document for informing decisions regarding this current application, it must allow the EIS process to be completed prior to the USACE considering or deciding upon this permit application. The flawed NEPA documents issued previously by the USACE regarding CENAP-PL-E-14-01, Environmental Assessment of the Proposed Land Exchange of Properties at Artificial Island, Salem County, NJ for Properties in Oldmans Township, Salem County and Logan Township, Gloucester County, NJ; Development of Confined Disposal Facility does not fulfill the current NEPA obligation as it focused on the land swap and the resulting confined disposal facility, not the proposed construction of Salem 4.

The USACE must rescind this public notice until such time as it has fulfilled its NEPA obligation.

Comment 7: The proposal results in unacceptable permanent and temporary impacts to wetlands.

As noted previously, at a minimum this project will impact:

- “Approximately 134 acres of tidal and non-tidal wetlands would be permanently impacted/filled for the construction of the power block area, the cooling tower area, the switchyard, and the heavy haul road.”
- “[A]pproximately 28 acres of tidal and non-tidal wetlands would be temporarily impacted/filled with the installation of the concrete batch plant, the construction parking area, and the laydown areas.”
- Construction of a “600 linear foot long by 300 linear foot wide concrete intake structure [that] would involve excavation, grading, and filling activities that would permanently impact approximately 1.5 acres of tidal wetlands.”

The public notice asserts that all temporarily impacted wetlands will be restored to their pre-construction use or condition. It also asserts there will be mitigation for the loss of approximately 148 acres of wetlands and waters of the U.S. The proposed compensation plan would be to transform existing tidal marshes through the removal and conversion of the dominant vegetation. This proposed mitigation is based on the false assumption that one type of vegetation (*Phragmites australis*) is of lower ecological value than another (*Spartina alterniflora*).²

Although the United States is making important progress in the conservation of wetland resources, the U.S. Fish and Wildlife Service (FWS) continues to report that wetland losses are greater than wetland gains. Marine and estuarine intertidal wetlands declined by close to 85,000 acres between 2004 and 2009.³ Wetlands continue to face pressures from development, from the effects of sea level rise, and from the cumulative effect of other environmental pollutants and stressors. For example, approximately 24,000 acres of wetlands were permitted to be filled by the USACE from 1993 to 2000.⁴

One objective of the Clean Water Act is to prevent adverse impacts to wetlands and restore and maintain the integrity of our waters a goal of “no net loss” of wetlands. As such, compensatory mitigation should only be used to offset unavoidable impacts after avoidance and minimization of impacts has been evaluated. There has been no discussion of how PSEG is avoiding and minimizing impacts to wetlands. simply a blanket assertion that elevation of a roadway/causeway will eliminate the need for wetlands and water fill but no discussion beyond that. There is no discussion with regards to the large footprint of the proposed plant and associated infrastructure.

Generally, the only way to adequately protect aquatic resources is to avoid impacting them in the first place. Wetlands receive legal protection because they have been shown to be a significant

² Kiviat, E. (2013). Ecosystem services of *Phragmites* in North America with emphasis on habitat functions. *AoB Plants*, 5, plt008.; Kettenring, K. M., de Blois, S., & Hauber, D. P. (2012). Moving from a regional to a continental perspective of *Phragmites australis* invasion in North America. *AoB plants*, 2012, pls040.

³ Dahl, T.E. 2011. Status and trends of wetlands in the conterminous United States 2004 to 2009. U.S. Department of the Interior; Fish and Wildlife Service, Washington, D.C. 108 pp.

⁴ National Research Council. *Compensating for Wetland Losses Under the Clean Water Act*. Washington, DC: The National Academies Press, 2001.

ecological resource that provides a variety of functions that are of value to humans, wildlife and the economy. For example, wetland declines are believed by experts to be responsible in part for the “significant decline in blue fish populations” in New Jersey. Blue fish and striped bass are recreationally important and depend on wetlands that provide habitat for their small prey fish.⁵ Constructing upon such a large acreage of wetlands in the Delaware estuary will contribute to this decline.

The USACE public notice does not even mention the avoidance/minimization analysis, an important and critical part of the decision-making process. Avoidance/ minimization should be explicit and carried out in a way that compensatory mitigation is only used as a last case resort. The determination of whether there are unavoidable impacts should not be arbitrary. Avoidance is always the best alternative, and restored wetlands cannot replace natural wetland functions. Avoidance and minimization has received less attention, and this lack of priority on these initial steps have resulted in the ineffective wetland conservation and the preservation of aquatic ecosystem functions by allowing too often, irreparable harm and permanent destruction of wetlands.

Furthermore, the compensatory mitigation as described will not restore natural or historical wetland function (restoration) nor result in a gain in wetland function (enhancement) - two of the appropriate forms of compensatory mitigation.⁶

The Estuary Enhancement Program (EEP) that was so often referenced in the NRC public hearings on October 1, 2014, and which is most certainly to serve as the model for any wetlands mitigation options proposed by PSEG, is not a net positive contribution to the Delaware estuary wetland system, has not restored any natural or historical functions and characteristics, and has not improved wetland functions. While scientists studying the previous PSEG restoration projects have published peer-review journal articles on the management approach, final results assessing if the objectives to restore vegetative diversity and functioning wetlands were achieved have yet to be published.⁷ From its inception the EEP was based on the false premises that *Phragmites australis* is of lesser ecological value to the anticipated *Spartina* and that any alteration or change in vegetation would be sustainable in the near term and the long term. Furthermore, the EEP has been largely dependent upon the use of the broad spectrum herbicide glyphosate that is dangerous to the environment and to people.

The characterization that the majority of the wetland areas proposed to be permanently impacted/filled are dominated by *Phragmites australis* as code for asserting the wetlands are compromised is a red herring. Asserting as a justification for this project that the *Phragmites* dominated wetlands are degraded and their ruination is somehow less impactful or harmful to the ecology or communities of the region is not supported by PSEG’s own science or by reality.⁸ And the unsubstantiated assumption that converting a *Phragmites* dominated wetland to a

⁵ Confronting Climate Change in the U.S. Northeast, Science, Impacts and Solutions, July 2007, a report of the Northeast Climate Impacts Assessment.

⁶ U.S. Environmental Protection Agency. Wetlands Compensatory Mitigation Factsheet. EPA-843-F-08-002.

⁷ Hazelton, E. L., Mozdzer, T. J., Burdick, D. M., Kettenring, K. M., & Whigham, D. F. (2014). *Phragmites australis* management in the United States: 40 years of methods and outcomes. *AoB plants*, 6, plu001.

⁸ Kiviat, *supra note 2*

Spartina alterniflora wetland will enhance the ecological value of the proposed mitigation site is also faulty.

Phragmites dominated wetlands support numerous native organisms, provide important ecosystems services, and support biodiversity and habitat functions that are linked to distinctive characteristics of the plant.⁹ Studies have shown that fish assemblages can be similar in *Phragmites* and *Spartina alterniflora* wetlands or even present in greater densities.¹⁰ Data collected by PSEG in and around Artificial Island in the Delaware River ecosystem demonstrates that *Phragmites* dominated wetlands provides both food and habitat valuable to the Delaware Bay system. According to an evaluation of the restored wetlands from the previous Salem NJPDES permit.¹¹

“It has not been demonstrated that the restoration of the *Phragmites* dominated sites is increasing fish utilization of those areas. Monitoring at Alloway Creek includes several sites dominated by *Phragmites*, *Spartina* or under treatment for *Phragmites* removal. The 2000 monitoring showed that within Alloway Creek large marsh creeks, fish abundance was similar at all three sites. In 2002, the *Phragmites* site had the highest abundance of fish, while the treated and *Spartina* sites had lower abundances. While 2002 data showed larger abundance in the treated Alloway site, it also demonstrated that the untreated *Phragmites* site had the highest species richness. Reproduction of mummichog and Atlantic silverside was seen in the *Phragmites* dominated sites both prior to and following the treatment of *Phragmites* and growth patterns were seen to be similar for mummichog and Atlantic silverside both pre and post treatment as well. Studies also indicate that mummichog are able to use *Phragmites* as a food source in *Phragmites* dominated sites. These results indicate that *Phragmites* eradication has not been proven to increase utilization of the site and increased fish production.”

The EEP model for compensatory mitigation is also not sustainable because the change in vegetation that is proposed can only persistent through continual maintenance – the Delaware Bay area is home to large swaths of *Phragmites* and so there is a perpetual source for the species which will repopulate any area of appropriate habitat condition that is not concertedly managed to prevent this. For example, PSEG eliminated 1,200 acres in the Mill Creek area from the program because of an inability to convert *Phragmites* to *Spartina* after 5 years of herbicide application. PSEG has applied tens of thousands of pounds of herbicides, as well as engaging in discing and mowing all of which adversely impacts the habitat and introduces a dangerous chemical into our environment. The fact that these wetlands will not be sustainable in the absence of an ongoing obligation by PSEG to continue these damaging activities is indefensible for achieving the goal of wetlands protection or mitigation. Scientific research has documented that land-use patterns on adjacent sites influence the success of restoration plans, and for

⁹ Kiviat, *supra* note 2

¹⁰ Fell, P. E., Warren, R. S., Curtis, A. E., & Steiner, E. M. (2006). Short-term effects on macroinvertebrates and fishes of herbiciding and mowing *Phragmites australis*-dominated tidal marsh. *Northeastern Naturalist*, 13(2), 191-212. ; Warren, R. S., Fell, P. E., Grimsby, J. L., Buck, E. L., Rilling, G. C., & Fertik, R. A. (2001). Rates, patterns, and impacts of *Phragmites australis* expansion and effects of experimental *Phragmites* control on vegetation, macroinvertebrates, and fish within tidelands of the lower Connecticut River. *Estuaries*, 24(1), 90-107.

¹¹ Delaware Riverkeeper Network. 2003. Evaluation of special conditions contained in salem nuclear generating station NJPDES permit to restore wetlands, install fish ladders, and increase biological abundance within the Delaware Estuary. Prepared by Carpenter Environmental Associates, Inc. Dec 3, 2003.

Phragmites management to be successful, plans should be developed at the watershed-scale (vs. a site level scale) so to address the source of invasion and should focus on restoring native plant communities rather than simply eradicating *Phragmites* stands.¹² The methods used by PSEG in the past do little to reduce the dominance of *Phragmites* in the long term. For example, mowing can actually stimulate shoot production resulting in an increased density of *Phragmites* shoots.¹³ Moreover, one-time applications of herbicide are never effective, and therefore, herbicides must be used in a multi-year application resulting in a long-term commitment and ongoing environmental damage.¹⁴

For all of these reasons, the proposed permit will result in unacceptable permanent and temporary impacts to wetlands that will not be properly mitigated. The proposed compensation plan does not take into account avoidance/ minimization, does not result in restored or enhanced wetlands, and will result in additional environmental degradation through herbicide application. The USACE should not allow the proposed project to degrade wetland resources as planned, and to the extent that mitigation is performed, the mitigation plan should provide methods that have a potential to succeed, be sustainable, and not use the application of damaging herbicides.

Comment 8: Glyphosate use is detrimental to the environment, the aquatic ecosystem, and human health

There has been ongoing use by PSEG of glyphosate since 2004 although we have been unable to dedicate the resources necessary to continue to count the volumes used. The USACE and NRC should engage in that assessment as the ongoing application of glyphosate into our sensitive ecological systems is a high priority concern that should not be perpetuated by either the USACE or the NRC in their consideration, review and approvals of the Salem 4 proposal. The ecosystem services provided by *Phragmites* and the wetland mitigation sites should be weighed against the environmental damages caused by the removal of *Phragmites* through the use of herbicides and glyphosate.

Glyphosate is a broad spectrum, non-selective herbicide. Roundup (as a trade name) and other herbicide formulations that include glyphosate as their active ingredient also contain surfactants that are designed to help deliver the glyphosate into the plant cells for action. In the case of some formulations, the volume of “other ingredients” including the surfactant can outweigh the volume of glyphosate in a named herbicide product. So when considering the toxicity of glyphosate-based herbicides, one must also know and consider the impacts of the surfactants and other ingredients contained therein. Much of the research into the effects of Roundup and others in this herbicidal family seems to demonstrate that at least some of the toxic impacts to the environment are caused by the surfactant used.

At last assessment:

¹² Hazelton, E. L., Mozdzer, T. J., Burdick, D. M., Kettenring, K. M., & Whigham, D. F. (2014). *Phragmites australis* management in the United States: 40 years of methods and outcomes. *AoB plants*, 6, plu001.

¹³ Derr, J. F. (2008). Common reed (*Phragmites australis*) response to mowing and herbicide application. *Invasive Plant Science and Management*, 1(1), 12-16.; Warren, R. S., Fell, P. E., Grimsby, J. L., Buck, E. L., Rilling, G. C., & Fertik, R. A. (2001). Rates, patterns, and impacts of *Phragmites australis* expansion and effects of experimental *Phragmites* control on vegetation, macroinvertebrates, and fish within tidelands of the lower Connecticut River. *Estuaries*, 24(1), 90-107.

¹⁴ Kettenring, K. M., & Adams, C. R. (2011). Lessons learned from invasive plant control experiments: a systematic review and meta-analysis. *Journal of Applied Ecology*, 48(4), 970-979.

- In 1996, PSEG applied glyphosate to 2,364 acres.
- In 1999, PSEG applied glyphosate to 330 acres.
- In 2000, PSE&G applied glyphosate to approximately 850 acres, using 600 gallons of glyphosate (3,240 pounds active ingredient)
- PSEG has applied glyphosate on 419 acres in Lower Alloways Creek and the Cohansey River site, using 1271 pounds of glyphosate.
- In 2002, PSEG applied glyphosate on 402 acres, using 1233 pounds of glyphosate.
- In 2003, PSEG applied glyphosate on 400 acres, using 1233 pounds of glyphosate.
- Between 1996 and 2004, PSEG applied cumulatively 22,000 pounds of glyphosate on approximately 2500 acres of wetlands in the Delaware Bay region.

Effects of Glyphosate and Surfactants on the Environment

The effect of pesticides on water health is dependent on numerous factors that vary with each type of pesticide, such as its active ingredient, contaminants that exist as impurities in the active ingredient, additives that are mixed with the active ingredient (like wetting agents, diluents or solvents, extenders, adhesives, buffers, preservatives or emulsifiers), and the product that is formed after the active ingredients are degraded by chemical, microbial or photochemical processes once the chemical enters our environment.¹⁵ Glyphosate is usually assumed to be quickly and tightly adsorbed to soil particles and as a result not to have adverse effects beyond its target. But glyphosate is known to enter aquatic systems, e.g. by accidental direct application, by drift of the herbicide spray, or as the result of surface runoff. Research on the effects of glyphosate in the aquatic environment has not received the same level of study or attention as its effects on land. But there is research that shows that “[o]nce in the aquatic environment, glyphosate may become toxic to living organisms, including plants, animals and microorganisms.”¹⁶

Study has shown that the introduction of glyphosate can cause a major change in water chemistry, namely a significant increase in total phosphorous concentrations.¹⁷ It has also been found that Roundup “was roughly four times more toxic” to some aquatic macrophytes (aquatic plants) than glyphosate alone¹⁸ -- again raising the issue of the toxicity of the surfactant alone and in conjunction with the glyphosate herbicide. Study has also shown that Roundup could actually stimulate nuisance algae, resulting in cyanobacteria blooms in freshwaters which could have an adverse affect on water quality, as well as human and animal health.¹⁹

Effects of Glyphosate and Surfactants in Aquatic Ecosystems

It has been generally believed that glyphosate, which is designed to kill plants, has only minor effects on animals that may be exposed. In the case of amphibians, testing on effects has been

¹⁵ Ongley, Edwin D. “Control of Water Pollution from Agriculture: Chapter 4 Pesticides as Water Pollutants”. Food and Agriculture Organization Irrigation and Drainage. Natural Resources Management and Environment Department. 1996.

¹⁶ Perez et. al. “Effects of the Herbicide Roundup on Freshwater Microbial Communities: a Mesocosm Study.” Ecological Applications, 17(8), 2007, pp 2310-2322.

¹⁷ Perez et. al. “Effects of the Herbicide Roundup on Freshwater Microbial Communities: a Mesocosm Study.” Ecological Applications, 17(8), 2007, pp 2310-2322.

¹⁸ Perez et. al. “Effects of the Herbicide Roundup on Freshwater Microbial Communities: a Mesocosm Study.” Ecological Applications, 17(8), 2007, pp 2310-2322.

¹⁹ Perez et. al. “Effects of the Herbicide Roundup on Freshwater Microbial Communities: a Mesocosm Study.” Ecological Applications, 17(8), 2007, pp 2310-2322.

relatively light. Testing that has occurred has been largely focused on the larval stage (i.e. tadpoles); but a large portion of amphibian life is spent in the terrestrial stage.

In one study²⁰ it was found:

- ✓ “Roundup caused a large reduction in the survival of all three species of tadpoles” (i.e. toads, leopard frogs, tree frogs).
- ✓ Across all soil types “Roundup reduced tree frog tadpole survival from 75% to 2%, toad tadpole survival from 97% to 0%, and leopard frog tadpole survival from 98% to 4%. Across all species, only 2% of all tadpoles survived the Roundup application after three weeks.” (The soil types issue is important because some have claimed that by absorbing glyphosate and subjecting it to microbial breakdown, soils remove the herbicide from the aquatic environment and so prevent it from having lethal effects on aquatic life.)
- ✓ “In the terrestrial experiments, all three species suffered substantial mortality when exposed to Roundup. After 24 hours, the application of Roundup reduced juvenile wood frog survival from 96% to 32% [], juvenile tree frog survival from 100% to 18% [], and juvenile toad survival from 100% to 14%[]. Across all species, only 21% of all juvenile amphibians survived the Roundup application after one day.”
- ✓ “The most striking result from the experiments was that a chemical designed to kill plants killed 98% of all tadpoles within three weeks and 79% of all juveniles within one day.”
- ✓ “The cause of the high Roundup-associated mortality appears to result from direct toxicity (possibly due to damaged epithelial cells in the gills []) rather than any indirect effect...”
- ✓ Rapid death also occurred in terrestrial experiments. “After only 24 hours, 79% of all juvenile frogs and toads died.”

Studies considering the effects of Roundup on amphibian larvae suggest that the deaths caused may primarily be caused by the surfactant POEA.²¹ There is other research that backs up the findings regarding the toxicity of Roundup in the environment and the contribution of the surfactant to this harmful effect.²² Whether the lethal effects of the herbicide Roundup is primarily due to the glyphosate or the surfactant, it is clear that the herbicide called Roundup, with the combination of ingredients it possesses “can cause high rates of mortality in several species of North American Amphibians.”²³ The population impacts of losing 96 to 100% of tadpoles combined with 68 to 86% of juvenile frogs and toads on land could be substantial.²⁴

²⁰ Relyea, Rick A. “The Lethal Impact of Roundup on Aquatic and Terrestrial Amphibians.” *Ecological Applications*, 15(4) pages 1118-1124, 2005.

²¹ Relyea, Rick A. “The Lethal Impact of Roundup on Aquatic and Terrestrial Amphibians.” *Ecological Applications*, 15(4), 2005, pp 1118-1124.

²² See discussion and research found in Relyea, Rick A. “Pesticides and Amphibians: The Importance of Community Context”, *Ecological Applications*, 15(4), 2005, pp. 1125-1134.

²³ Relyea, Rick A. “The Lethal Impact of Roundup on Aquatic and Terrestrial Amphibians.” *Ecological Applications*, 15(4), 2005, pp 1118-1124.

²⁴ Relyea, Rick A. “The Lethal Impact of Roundup on Aquatic and Terrestrial Amphibians.” *Ecological Applications*, 15(4), 2005, pp 1118-1124.

When pesticides in the environment are compounded by other stressors on aquatic or animal life, such as predation or competition, the effects of the pesticides can become even more lethal.²⁵

A study conducted by the University of Pittsburgh's Department of Biological Sciences, tested the negative effects of four well-known pesticides on the biodiversity of aquatic communities containing algae and 25 species of animals. The pesticides tested consisted of two insecticides, Sevin and malathion and two herbicides, Roundup and 2,4-D. The study found that species richness was reduced by 15% with Sevin, 30% with malathion, and 22% with Roundup. The insecticides, Sevin and malathion specifically reduced zooplankton diversity by eliminating cladocerans, which are small crustaceans commonly called water fleas, as well as reducing the diversity and biomass of predatory insects. The two herbicides, Roundup and 2,4-D had no effects on zooplankton, insect predators, or snails. However, although 2,4-D had no effect on tadpoles, Roundup completely eradicated two species of tadpoles and nearly exterminated a third species, resulting in a 70% decrease in the species richness of tadpoles overall.²⁶

Human Health Effects of Herbicides Containing Glyphosate and POEA

There continues to be emerging research that demonstrates that glyphosate, POEA and the herbicides like Roundup containing them are not safe for humans as is often asserted. At the very least there is science which calls into question the impacts of herbicides like Roundup and support implementation of the precautionary principle whereby these herbicides are not allowed for use until they are conclusively proven safe. As with studies in the environment, studies of human effects indicate that it is the glyphosate with the surfactant that has the more toxic effects.

For example:

- A 2009 study on liver cells found that formulations of Roundup had endocrine disrupting affects at dilutions 800 times lower than the level authorized in some food or feed. "This confirms and enhances the potential toxic action of G[lyphosate]-based herbicides that we observed in human placental and embryonic cell lines, and on fresh umbilical cord cells" The study authors wrote: "...G[lyphosate]-based herbicides present DNA damages and CMR [carcinogen, mutagen and reprotoxic] effects on human cells and *in vivo*. The direct g[lyphosate] action is most probably amplified by vesicles formed by adjuvants or detergent-like substances that allow cell penetration, stability, and probably change its bioavailability and thus metabolism."²⁷ (Informational note: adjuvant=surfactant; *in vivo* means in the living organism as opposed to *in vitro* which means in the laboratory).
- In 2005, researchers found that Roundup could be considered a potential endocrine disruptor. And that "at higher doses still below the classical agricultural dilutions, its toxicity on placental cells could induce some reproduction problems." The research found that Roundup reduced placental cell viability with concentrations 10 times lower than that of the agricultural use and that it did so to a higher degree than glyphosate. The

²⁵ Relyea, Rick A. "The Lethal Impact of Roundup on Aquatic and Terrestrial Amphibians." *Ecological Applications*, 15(4), 2005, pp 1118-1124.

²⁶ Relyea, Rick. "The Impact of Insecticides and Herbicides on the Biodiversity and Productivity of Aquatic Communities." *Ecological Applications*, 15(2), 2005, pp. 618-627; Another study of significance: Paganelli, A. et. al., "Glyphosate-Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling", *Chem. Res. Toxicol.*, submitted May 20, 2010.

²⁷ Gasnier, C. et al "Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines". *Toxicology* 262, 2009 pp 184-191.

researchers further concluded that the dilution of glyphosate in a Roundup formulation may multiply its endocrine effect.²⁸ This study also found that the addition of surfactants “greatly facilitated” the penetration of glyphosate through animal cell membranes, as it does for plant cell membranes.

- A 2009 published study looked at the effects of different Roundup formulas on human cells including from the placenta, embryonic kidney and neonate. The results found that “the four R[oundup] herbicides and G[lyphosate] cause cellular death for all types of human cells, with comparable toxicity for each one but at different concentrations.” According to the study, the surfactant POEA, of those considered, was the most potent and “[t]hus, POEA could be considered as the active ingredient on human cell death...” And that while POEA, glyphosate or the major metabolite of glyphosate known as AMPA (aminomethylphosphonic acid), may have a “small toxic effect on embryonic cells alone at low levels, the combination of two of them at the same final concentration is significantly deleterious.” And it found that the surfactants did not appear to be necessary to “render G[lyphosate] as a death inducer” at the levels studied. In conclusion “... the proprietary mixtures available on the market could cause cell damage and even death around residual levels to be expected....”²⁹
- The Institute of Science in Society reported on a test that “Monsanto’s glyphosate-based herbicide Roundup Bioforce as well as glyphosate alone reduced testosterone levels in testicular cells at very low concentrations; and at the higher concentrations – still 10 times below agricultural use – the cells died in 24-48 hours.”³⁰
- Glyphosate has also been shown to be damaging and toxic to mouse bone marrow.³¹

The USACE should take into account the methods that PSEG will use to compensate for permanent wetland losses as a result of the proposed project. Scientific research has shown that the herbicide glyphosate is dangerous to the environment and to people, and therefore, should not be used for compensatory mitigation because it will cause greater harm and USACE should consider prohibiting its use as part of its permitting programs.

Comment 9: The dredging and construction of a new barge mooring facility will cause immediate and ongoing damage to the Delaware River.

The proposed project will include the construction of a new barge unloading and mooring facility resulting in new dredging of the river, permanent impact to tidal waters, and on-going impacts from Vessel-related discharges.

Dredging can resuspend and reintroduce toxics into the Delaware River system. According to experts, the dredging of the Delaware River bottom can introduce heavy metals, pesticides, and other toxins into the River, reintroducing them into the environment and food chain, and putting

²⁸ Richard, S. et. al, “Differential Effects of Glyphosate and Roundup on Human Placental Cells and Aromatase.” Environmental Health Perspectives, Vol.

²⁹ Nora Benachour & Gilles-Eric Seralini, “Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells,” Chem. Res. Toxicol. 2009, 22, 97-105.

³⁰ “Glyphosate Kills Rat Testis Cells, ISIS Report 27/02/12, www.i-sis.org.uk/glyphosate_kills_rat_testis_cells.php

³¹ Prasad, S. et al. “Clastogenic Effects of Glyphosate in bone Marrow Cells of Swiss Albino Mice”, Journal of Toxicology, vol 2009, Article ID 308985, 2009.

at risk drinking water aquifers important to communities in New Jersey and Delaware. According to the National Marine Fisheries Service (NMFS), additional water quality concerns include turbidity through the resuspension of sediments from both dredging and port operations which can degrade water quality, lower dissolved oxygen levels, and potentially releasing chemical contaminants that are bound to the fine-grained estuarine/marine sediments.

Among the negative effects that have not been adequately considered or addressed by USACE is the impact of vessel related discharges as a result of a new mooring facility and increased vessel/ barge activity. Vessel-related operational discharges represent one of the largest anthropogenic inputs of pollutants into estuary environments and pose a long-term and substantial threat to coastal ecosystems. Vessel discharges result in negative environmental impacts by releasing both traditional pollutants (i.e., oil, nutrients, toxics, sewage) and by contributing to the spread of aquatic invasive species (ANS). Furthermore, alterations to sedimentation and wave patterns caused by vessels entering and exiting the mooring area could also increase turbidity. Suspended sediments can mask pheromones used by migratory fishes and can smother immobile benthic organisms.

Appropriate controls and best management practices should be required for all dredging authorizations as part of any permit that may ultimately be issued.

Comment 10: Salem 4 is proposed for a region that will be consistently under or surrounded by water raising the potential for a catastrophic nuclear event and inhibiting the ability of emergency services to reach the facility at times when it will most likely be needed.

The impacts of sea level rise are consistently predicted to be greater within the Delaware Bay and Estuary than elsewhere in the Mid-Atlantic, thus raising the concerns for placement of a new nuclear plant on wetlands at the waters edge.

The EPA, in a report to Congress, has stated: “Published estimates of sea level rise due to global warming generally range from 0.5 to 2.0 meters (1.5 to 7 feet) by 2100.”³² But “[t]he MidAtlantic States are anticipated to experience sea-level rise greater than the global average.”³³ And the former Executive Director of the Delaware River Basin Commission (DRBC), referencing science on the matter, said at a February 2010 public discussion on global climate change that the figure for our region will more appropriately range from 2.3 feet (.72 m) to 5.5 ft (1.67 m).³⁴ Additionally, “Along much of the Northeast shoreline – from New Jersey to Cape Cod – there is evidence that relative sea level is rising faster than the global average because the land is gradually subsiding.”³⁵ The Delaware Estuary Program, in a report focused on sea level rise for the Delaware Estuary, talks about an anticipated rise of .5 to 1.5 meters “or more” and

³² "The Potential Effects of Global Climate Change on the US", Report to Congress from the US Environmental Protection Agency, December 1989

³³ "Climate Change and the Delaware Estuary - Three Case Studies in Vulnerability Assessment and Adaptation Planning," published by the Partnership for the Delaware Estuary, June 2010

³⁴ Carol Collier, Executive Director Delaware River Basin Commission, Global Climate Change Talk, Heinz Refuge, February 2010

³⁵ Confronting Climate Change in the U.S. Northeast, Science, Impacts and Solutions, July 2007, a report of the Northeast Climate Impacts Assessment.

goes on to say that, for the Delaware Estuary, its “best estimate for RSLR [relative sea level rise] by the end of the century is .8 to 1.7 m.” (.8 m = 2.62 ft; 1.7 m = 5.58 ft).³⁶

Inundation maps for future decades consistently show that with sea level rise the proposed location of Salem 4 will be inundated and/or surrounded by water; with, at best, the nuclear plant (because of fill) being located on an island surrounded by water thus impeding emergency response that is a foreseeable need in the wake of future storm events. A 2008 study³⁷ by the University of Pennsylvania Department of City and Regional Planning mapped lands predicted to be inundated in 2050 and 2100 with sea level rise. The maps show Artificial Island becoming a true Island by 2050 surrounded by water with only the current location of Salem 1 & 2 and Hope Creek above ground, likely due to associated fill. The same would most certainly become true with construction of Salem 4, placing this fourth nuclear plant out of reach from emergency response personnel during foreseeable high hazard periods when emergency response capabilities would be an obvious potential need. According to the University of Penn study and ongoing research by others, storm surges will make matters even worse in the Estuary and watershed with storms becoming more intense, having higher wind speeds as well as heavier precipitation; Nor’easters becoming more frequent; an increasing probability of severe hurricanes in the mid-Atlantic region; and the combination of storm surge and sea level rise moving the zone of impact further inland.

An April 2014 study³⁸ released by Climate Central also talks about sea level rise and its impacts on New Jersey, including Salem County which is among the areas in the State the report predicts will experience high impacts from flooding due to sea level rise. According to the Surging Seas Risk Finder website³⁹ analysis associated with the Climate Central report, there is a greater than 50% chance of at least one flood of 6 feet in the New Jersey area by the year 2050 and a 99% risk of at least one flood exceeding 9 feet by the year 2100 – we are talking decades until these floods are likely to happen. At these levels, and even far lower, this analysis too shows water cutting off the existing and proposed power plant areas, increasing the likelihood of hazard. At 7 feet, one of the nuclear plants on Artificial Island is below 7 feet and therefore directly at risk from flooding, with both plants being below 9 feet and so at direct risk when the waters reach those levels, according to the Surging Seas Risk Finder website.

Due to the effects of climate change, including sea level rise, the frequency of what is now considered a 100 year flood event will increase substantially, including in New Jersey’s coastal areas. In fact, whether you are considering low or high emission scenarios, the frequency of today’s 100-year flood event is expected to occur, on average, every four years in Atlantic City.⁴⁰ And so the hazard of having Salem 4 constructed in this reach of the Delaware Estuary is

³⁶ "Climate Change and the Delaware Estuary - Three Case Studies in Vulnerability Assessment and Adaptation Planning", published by the Partnership for the Delaware Estuary, June 2010

³⁷ UPenn Department of City and Regional Planning. 2008. Climate Change: Impacts and Responses in the Delaware River Basin

³⁸ Climate Central. 2014. “New Jersey and the Surging Sea, A Vulnerability Assessment with Projections for Sea Level Rise and Coastal Flood Risk”

³⁹ found at: <http://sealevel.climatecentral.org/ssrf/new-jersey>

⁴⁰ Confronting Climate Change in the U.S. Northeast, Science, Impacts and Solutions, July 2007, a report of the Northeast Climate Impacts Assessment.

increasing due to the effects of climate change and sea level rise. These new and future scenarios need to become part of the consideration in decision-making included for Salem 4.

Furthermore, to the extent that the *Phragmites* dominated wetlands to be impacted are considered by PSEG to be substandard, the USACE and PSEG are ignoring the likely reality that as sea level rises and the salt line in the Delaware estuary migrates upriver from sea level and channel deepening, these very same *Phragmites* dominated wetlands are likely to be inundated and overwhelmed in the future, with nature thereby supporting and securing the transformation of these wetlands from *Phragmites* dominated to being dominated by other plant species. That was the concept used by PSEG in other projects, they removed salt hay dikes in order to re-inundate wetlands areas for the purpose of supporting and securing the inundation of *Phragmites* so other species would instead move in to the wetlands area. To the extent that will occur naturally in a few short decades to come on the wetlands at issue, these *Phragmites* dominated wetlands will themselves be transformed into wetlands dominated by other species that PSEG and the Army Corps would characterize as preferable. Building upon these wetlands denies the estuary and the region the benefits of that natural transformation. This outcome is so likely, the overwhelming majority of these wetland areas will be impacted by rising waters, that one of the biggest concerns expressed in the documents included in this comment is the inability of wetlands to be able to adapt fast enough and keep pace with sea level rise even at a basic level, and that instead they will be overwhelmed and disappear.

No 404 permit should be issued since Nuclear Power Plants should not be built in areas that may flood.

Comment 11: The proposed activity will not stimulate the economy nor create additional jobs.

When it comes to jobs, the biggest economic and job creating engine of our region is a healthy Delaware River and all of the ecological systems it supports including wetlands, wildlife and aquatic life. The heavy foot print Salem 4 will have on the Delaware Estuary, the additional wetlands loss it will result in at the waters' edge, the additional pollution inputs into the River, and the other ecological impacts of the Delaware River, cannot be supported by an argument of jobs. Jobs and the local economy are best served by protecting the ecological health of our Delaware River.

The Delaware Riverkeeper Network requests that no 404 permit be issued for this application since doing so will not be the best use of the river's resources.

Comment 12: Alternative energy options have not been given adequate consideration.

Sustainable energy options have not been given due consideration by the USACE. Solar, geothermal, appropriate water sources and new and emerging sustainable energy options, including increased efficiency and conservation, are not being given an appropriate level of consideration. Renewable energy sources based on current and near future technologies are capable of producing the baseload power targeted by PSEG.

The importance of our state's aquatic resources cannot be understated. The Delaware River is in great need of restoration activity. It is very important that permit decision-making is done such

that proposed projects help improve water quality, and we do not believe the PSEG proposal does that. We urge you to not approve this permit and to require PSEG to draft a proposal that will ensure a “no net loss” of aquatic resources.

Thank you again for consideration of our comments and please don't hesitate to contact us should you seek further information.

Sincerely,



Maya K. van Rossum
the Delaware Riverkeeper



Christine M. Arnott, Ph.D.
Research Assistant



David P. Brook
Senior Attorney