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DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
DIVISION OF AIR AND WASTE MANAGEMENT
SITE INVESTIGATION & RESTORATION BRANCH

MEMORANDUM

TO: Robert Haynes, Senior Hearing Officer

THRU: James D. Werner, Director DAWM
Kathy Stiller, PM II SIRB
Qazi Salahuddin, PM I SIRB

FROM: Wilmer Reyes, Environmental Engineer IV SIRB

DATE: 01/14/09

SUBJECT: Technical Response to Public Comments on the Hay Road "Iron Rich" Sludge Drying Site (DE 0024)

The following technical response was prepared to assist in the Hearing Officer's Report to address public comments on SIRB's Proposed Plan of Remedial Action for the Hay Road Iron Rich Sludge Drying Site. The response also addresses comments raised by the Independent Study performed by Schnabel Engineering, Inc. as a result of the 2005 House Concurrent Resolution #22. These responses are based on all the study and investigations performed for the site including the December 2008 Supplemental Remedial Action/Risk Assessment (RI/RA) investigation performed as recommended by the December 2006 Independent Study. Based upon our review, SIRB does not recommend any substantive change to the 2004 proposed plan. Accordingly, we recommend that the proposed plan be approved as the Final Plan of Remedial Action with relatively minor refinements. To address the minor changes resulting from our review, SIRB/DAWM recommends that the Secretary consider the following changes to be made in the Final Plan of Remedial Action:

- Development of a broader area-wide groundwater monitoring program will include further evaluation of the hydrogeology and chemistry of the underlying dredge material and groundwater to determine the potential impact to the surrounding environment including Shellpot Creek. The potential impacts may include ecological impacts to natural resources. No public health risks appear to exist. This groundwater evaluation effort should include not only the DuPont Site, but a larger scope of study involving a variety of sites under which a similar dredge material exists.
- The site-related contaminants present in the Shellpot Creek along with the contaminants from other sources will be addressed through the Shellpot

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Creek initiative, Delaware Estuary Program and DNREC's Natural
Resource Damage Assessment.

The following public comments and responses have been summarized by general topics and not by individual comments so as to avoid repeating essentially identical issues and comments.

Comment 1: *Dioxins, furans and PCB compounds are present in Iron Rich Material (IRM) pile and the underlying Dredge Material (DM) at high concentrations and present a significant risk to human health and the environment. The site has been referred to as the "dioxin pile" by some members of the public and the news media because of this concern, particularly over whether there were any toxic dioxins.*

Response 1: The term "dioxin" typically refer to particular compound (2,3,7,8-tetrachlorodibenzo-p-dioxin, or "TCDD"), which is known to be a persistent and potent toxic chemical. Repeatedly detailed testing of the *Iron Rich* material in and around the DuPont site have indicated that there is no trace of any "dioxin" (TCDD) present at limits of detection at parts per trillion detection limits. Part of the factual confusion may have arisen as a result of the categorization by EPA, which established category of chemicals for testing referred to as "dioxins, furans and PCBs."

Dioxins and furans are a group of dozens of chemical compounds with widely varying toxicities and persistence characteristics. The most toxic of these compounds is 2,3,7,8-tetrachlorodibenzo-p-dioxin ("TCDD"). The test results showed that TCDD and the other DNREC regulated dioxin compound 1,2,3,7,8,9-HxCDD were not detected in the *IRM*. In samples of the dredge material, however, these compounds were detected at concentrations at least ten times lower than DNREC's risk based standard and therefore pose no potential health risk. Sediments along the Shellpot Creek also showed low concentrations of these compounds and the ecological risk is recommended to be further evaluated. However, these contaminants showed different dominant components from the contaminants detected in *Iron Rich* material and indicates that they appear to have come from other potential sources. Other studies of toxics in the Delaware River indicate a pattern of dioxin concentrations from a variety of upstream, watershed and global sources that have accumulated in river sediments.

Other dioxin-like compounds are present at concentrations that are too low to pose any potential health or ecological risk, based on risk assessment using evaluation methods to compare the toxicity of these widely varying compounds. For example, one "dioxin-like" compound (octa-chlorinated dibenzo-p-dioxin "OCDD") is approximately 3,000 times less toxic than TCDD-dioxin. Hence, the toxicity of the dioxin and dioxin-like compounds of much lesser toxicity than 2,3,7,8 TCDD is reported as Toxicity Equivalent Quotient (TEQ) of 1/3,000 of TCDD because it is that much less toxic than if the mixture were pure TCDD. The TEQ approach has been adopted by EPA and scientists internationally as the most appropriate way to estimate the potential health risks of mixture of various families of compounds, like dioxins. Total TEQ results for the *IRM*

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pile and dredge material were calculated below the EPA standard level. TEQ for *IRM* was calculated at 1.87 parts per billion (ppb) and for the DM at 0.06 ppb. The EPA regulatory standard is 5 to 20 ppb for commercial/industrial use. In sum, after extensive testing using internationally-recognized scientific methods, with detection limits at parts per trillion concentrations, the additional testing and analysis during the past four years has confirmed that there is no evidence of any TCDD dioxin in the *IRM* pile. Moreover, the other less toxic forms ("congeners") of dioxin are present at such low concentrations as to pose no potentially elevated risk to human health.

PCB compounds were detected in the *IRM* and DM at concentrations below the DNREC standard of 1 part per million (ppm) except for one *IRM* split sample with 1.1 ppm and one DM sample with 1.22 ppm. The dominant PCB congener present in *IRM* is PCB 209 (decachlorobiphenyl). PCBs are included as one of the contaminants of concern because PCBs, particularly PCB 209, are observed in surrounding environmental samples.

Comment 2: *Schnabel Engineering in the Independent Study commented that Hexachlorobenzene could potentially be present as a free product in the IRM and therefore, was a concern for this compound to migrate from the pile.*

Response 2: Hexachlorobenzene is not present as free product in the *IRM* as confirmed by the Supplemental Investigation (SI), which Schnabel reviewed and agreed with the conclusion. Hexachlorobenzene is, however, present at a low concentration of 19 ppm in *IRM* as detected during additional sampling. The DNREC's Uniform Risk-based Standard for protection of human health for hexachlorobenzene is 4.0 ppm. In addition hexachlorobenzene was not detected in the dredge material. This indicates that vertical migration from Iron Rich material to dredge material has not occurred. Hexachlorobenzene was included as a contaminant of concern for the *IRM*.

Comment 3: *Radiation is believed to be present at the site at high concentrations and may impact human health and the environment. Additional information about radionuclides potentially present in the natural decay series of uranium and thorium in the pile was requested.*

Response 3: Response to radiation issues was provided by DuPont in a letter to Mr. Haynes, the DNREC hearing Officer, dated April 5, 2005. DuPont's response was reviewed by Schnabel during Independent Study and Schnabel stated that DuPont's response adequately addressed the concern. DNREC agrees with this conclusion.

Comment 4: *Contaminants present in the IRM and dredge material are impacting groundwater at the site and the impacted groundwater in turn discharges to the Shellpot Creek and Delaware River causing surface water and sediment contamination.*

Response 4: Organic compounds were not detected in groundwater at the site except for low concentrations of octachlorodibenzofuran (OCDF) and PCB in the unfiltered groundwater sample at a concentration 100 times lower than the regulatory standard. In

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addition, when the sample was filtered these organic compounds were not detected and it was concluded that organic compounds are not present in groundwater. The only inorganic compounds present in groundwater above DNREC standard are iron, manganese, arsenic and vanadium. These inorganic compounds are present in the *IRM* and *DM* but are also present regionally in the groundwater. The proposed groundwater monitoring program will further evaluate these contaminants.

The potential of groundwater contamination from any future leaching of contaminants from *IRM* and *DM* was evaluated using with leachability test for the inorganic and organic compounds in *IRM* and *DM*. Based on leachability test results, conservative modeling and mass loading calculations, as well as the chemical composition of the *IRM* pile indicated that the contribution of the organic and inorganic contaminants present in the *IRM* pile to the underlying dredge material is minimal to none. Leachability test performed in a *DM* sample indicated that some metals in the *DM* have the potential to leach from the *DM* to the groundwater. Mass loading calculations was performed for the contaminants already present in groundwater to determine its impact to the surface water. Iron concentrations present in the groundwater exceeded the surface water quality standards in Shellpot Creek under low flow conditions. However, iron is also present regionally in the groundwater and a monitoring program will be developed to address these concerns. Based on the monitoring results, additional measures may be taken, if needed.

Comment 5: Contaminants from the site is impacting the surrounding surface water, sediment and fish in the Shellpot Creek and Delaware River.

Response 5: Site-related contaminants are presents in the surface water, sediment and fish in Shellpot Creek. Some of these contaminants are detected above Delaware Surface Water Quality Criteria. Contribution from the *IRM* pile to this contamination is believed to be mostly historical, through wind dispersion and drying operation of the iron rich material at the site, before application of temporary coating to the Iron Rich pile and surface runoff. The data, however, showed that contamination in Shellpot Creek is a mixture of site related and non-site related contaminants, but the presence of non-Iron Rich material related contaminants is more significant.

Because of the historical contribution of the *IRM* to the contamination in Shellpot Creek and the contribution from other potential sources, DNREC is proposing to address this issue though the Shellpot Creek Initiative (in coordination with the Delaware Estuary Program and as part of a Natural Resources Damage Assessment (NRDA)).

Comment 6: The Focused Feasibility Study (FFS) evaluated two remedial options for the site: capping of the IRM pile and off-site removal of IRM. Capping of the IRM proposed as the remedy in the Proposed Plan of Remedial Action will not effectively protect the human health and the environment.

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Response 6: The supplemental investigation provided data that supported and did not contradict the previous conclusion that engineering capping of the *Iron Rich* pile would meet the HSCA requirements for a protective remedy of the contaminants detected in the *IRM* pile. The remedial design of the cap and associated engineering controls will ensure the stability of the pile and address the runoff and storm water controls. Consequently, DNREC has concluded that the proposed capping remedy of the *IRM* pile will be adequate to protect human health and the environment from any contaminants in the pile. Because of some broader questions regarding the potential impacts of the dredge material on the environment, the Department is proposing further investigation regarding environmental impacts from the dredge material (i.e., iron, manganese and other compounds) as discussed above.

Comment 7: The risk assessment is inadequate because (1) it failed to include every compound detected and only assess the potential risks from compounds detected above DNREC's screening values; (2) the risk assessment failed to assess the human health impacts of the potential exposure of people living or working downwind of the site; and (3) the risk assessment failed to consider adequately the ecological risks.

Response 7: These risk assessment issues were, in fact, considered as part of the initial site review, and were evaluated further as part of the Independent Study.

The well-accepted scientific methodology under HSCA (DNREC 1999 Remediation Standards Guidance under the Delaware Hazardous Substance Cleanup Act) is to perform risk assessments initially based on an evaluation of the risks of a subset of the complete range of compounds detected, and to consider instead only those compounds detected at concentrations above a "screening level." These screening levels are set at concentrations ten times lower than risk-based cleanup standard. Hence, using this very conservative (i.e., protective) method, if the observed concentrations of these screening compounds are below these screening levels, then, logically, there is no need to evaluate the potential risk of additional compounds observed at far lower concentrations with lower toxicity values.

The risk assessment did, in fact, evaluate the potential risks to both human health for any potentially exposed population. Again, the methodology used was a well-accepted and conservative process that considered first, the most exposed individuals at the highest concentrations possible. Using this conservative methodology, the Department determined that a cap remedy was warranted to protect human health for any potential exposure, including individuals who might be in contact with the material while working on the pile (i.e., temporary on-site workers). A more detailed risk assessment, however, indicated that the site posed a substantially lower risk to human health than this initial conservative assessment estimated. Nonetheless, the Department recommends installation and maintenance of a protective cap as part of the remedy as a conservative protective measure.

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Accordingly, if there is no significant risk to workers at this close proximity, assuming they would be exposed solely to the highest concentrations of the combination of the most toxic compounds found at the site, then we can reasonably conclude that the remedy would also be protected for protective human health at locations further from the site. This is a commonly used logical process we believe provides a high degree of conservatism and protectiveness at this site. In fact, the risk assessment concluded that there was no significant direct human health risk from direct exposure to the *Iron Rich* material, but that a cap was warranted as discussed above.

The evaluation of the potential ecological risks from the site will require additional consideration of the area-wide contributions within the Shellpot Creek water shed, which is exactly what the department has initiated. The potential ecological risks appear to be part of the overall contributions from a variety of sources, including the dredge material and inputs from other sites. The potential ecological impacts from the IRM pile will be addressed adequately by installation and maintaining a protective cap over the pile. To address the potential ecological impacts from the underlying DM, the Department is recommending an area-wide assessment of the dredge material around the Shellpot Creek, as well as within the overall Delaware River assessment and the Natural Resources Damages Assessment.

Comment 8: The long operational life of the geo-membrane and the lack of bottom liner was questioned.

Response 8: This concern was addressed by DuPont in their response document DuPont Comments to Schnabel Engineering Report dated March 2007. Based on the document, which was reviewed by Schnabel, the operation life originally stated is correct. A bottom liner is not needed since the vertical migration of contaminant from IRM is minimal to none. In addition the vertical hydraulic conductivity of the underlying dredge material is low.

Comment 9: Schnabel commented that there was a topographic low in the berm surrounding the site and this low point could potentially be vulnerable to flooding.

Response 9: Based on the information provided in the DuPont response document "DuPont Comments to Schnabel Engineering Report dated March 2007", topographic low of the berm corresponds to an elevation of approximately 9.0 feet MSL NAVD88 at the base of the rip-rap at outfall D002 (south east corner of the site). DNREC determined that this localized topographic low increases in elevation to a 16 feet MSL and is not a flooding concern.

DNREC has reviewed the topographic maps provided by DuPont and the FEMA flooding maps. Based on this review, flooding for the 100 and 500 year are believed to have no direct impact on the Iron Rich pile.

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Comment 10: Capping of the IRM pile will impact groundwater hydrology by changing flow patterns which in turn will influence contaminant movement.

Response 10: Based on current condition, main groundwater flow of the upper water-bearing zone is towards the Shellpot Creek while flow in the lower aquifer unit is towards the Delaware River. Further evaluation of the dredge material and the water bearing zone will be part of the proposed monitoring program for the site. The monitoring program will require assessment of the hydrologic unit for the site in conjunction with the adjacent landfill area (the 3 cells). Additional remedial measures may be taken based on the results of the monitoring program.

Comment 11: The number of samples presented in the 2005 PPRA was considered to be insufficient for DNREC to make conclusions about the contaminants of concern and proposing a remedial action for the site.

Response 11: A sampling work plan was developed to address sampling requirements. The work plan was also reviewed by Schnabel. Additional multimedia samples were collected as part of the Supplemental Investigation (SI) based on the work plan. Samples were collected from underneath the footprint of the pile, so they are representative of current environmental conditions.

In addition to samples collected as a part of the SI, DNREC has used available data from other sampling events from other programs in order to complement data results. Specifically, results from the monitoring program for the landfill cells have been used in the assessment.

Overall, DNREC believes that sufficient samples has been collected at the site and provide a complete survey and informed understanding of site conditions. Additional samples are planned to be collected as part of the proposed monitoring program for the site. More samples may be collected as part of the Shellpot Creek and NRDA initiatives.

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