State of New Jersey

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
Site Remediation & Waste Management Program
Bureau of Case Management
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CATHERINE R. MCCABE
Commissioner

The Chemours Company
Attn: David E. Epps, Project Manager
2000 Cannonball Road
Pompton Lakes, NJ 07442

November 27, 2018

Re: The Chemours Company (Chemours)
Pompton Lakes, Passaic County, New Jersey

Dear Mr. Epps:

I am writing to notify you that the New Jersey Department of Environmental Protection (DEP) has reached a decision on the Chemours application for a New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Ground Water Permit-by-Rule that was submitted as part of its remediation efforts for the off-site shallow ground water contamination associated with the former DuPont Pompton Lakes Works site. DEP has decided to deny the Permit-by-Rule application.

Chemours submitted the Permit-by-Rule application to DEP's Site Remediation & Waste Management Program in 2016 to obtain authorization to change the location where the treated water from the on-site ground water treatment system is discharged. The treated ground water is currently discharged to infiltration beds located at the southern border of the Chemours site. The Permit-by-Rule application requested authorization to change the discharge location to a 1,400 foot underground horizontal well that Chemours proposed to construct along the southern side of the railroad tracks that run parallel to Barbara Drive.

Chemours requested this NJPDES permit modification to perform a pilot study to determine whether injecting the treated ground water into the horizontal well (known as "hydraulic surcharging") could help reduce the levels of contaminants in the shallow aquifer. However, the routine ground water sampling results that Chemours provides to DEP, including the most recent March and May of 2018 results for the off-site ground water plume, showed the levels of the contaminants in the shallow aquifer have continued to decrease. After carefully considering the information in the Permit-by-Rule application and the ground water sampling results, DEP determined that hydraulic surcharging is not warranted at this time. Additional groundwater monitoring is required to be conducted to continue to evaluate the conditions in the offsite plume.

Although DEP has decided not to approve Chemours' Discharge to Ground Water Permit-by-Rule application, in accordance with NJPDES regulations, it has completed a Response to Comments document that addresses the technically relevant comments and questions that were

received during the public comment period for the application, including those received during the public hearing on September 26, 2017. A copy of this document is enclosed.

If you have any questions, please contact Anthony Cinque of the Bureau of Case Management at 609-633-1416.

Sincerely,

Wayne Howitz, Assistant Director
Remediation Oversight Element
Division of Remediation Management

Enclosure: Response to Comments

c: Mayor Michael Serra, Mayor of Pompton Lakes
Mary Ann Orapello, Health Officer
David VanEck, NJDEP/BGWPA
Heather Swartz, NJDEP/OCR
Perry Katz, EPA
Pat Seppi, EPA

Response to Comments Document for Chemours' Permit-By-Rule Proposal

Regulatory Basis: NJPDES Rules N.J.A.C. 7:14A

7:14A-15.6 DRAFT PERMITS

7:14A-15.6 (e) After the close of the public comment period, the Department shall issue a final permit decision pursuant to N.J.A.C. 7:14A-15.15 including a response to comments document pursuant to N.J.A.C. 7:14A-15.16.

7:14A-15.16 RESPONSE TO COMMENTS
(a) The Department shall specifically respond to comments concerning draft permits from persons, including comments from affected states, by issuing a response to comments document at the time that a final permit decision is issued. The document shall:
1. State what action the Department has taken on the final permit or permit decision;
2. Specify which provisions, if any, of the draft permit have been changed in the final permit, and the reasons for the change. The Department shall make only those changes which do not destroy the value of the original fact sheet or statement of basis; and
3. Briefly describe and respond to all significant and relevant comments on the draft permit raised during the public comment period, or during any public hearing.

Summary of Public Comments and Agency Responses

The following are the Department's responses to public comments received on Chemours' application for a NJPDES-Discharge to Ground Water Permit-By-Rule. Chemours' proposal was detailed in the document entitled *Implementation Work Plan-Hydraulic Surcharging Pilot Study*, dated May 2016.

The Department has decided to **deny** Chemours' request for a Permit-By-Rule for the hydraulic surcharging pilot test, due in part to technical concerns with the proposal. Additionally, evaluation of the recent shallow groundwater data from off-site monitoring wells has shown contaminant levels have been decreasing naturally.

In general, many of the questions and concerns in the public comments were related to uncertainty in the levels to which groundwater will rise near the proposed reinjection well. Many concerns centered on sufficiency of the proposed monitoring system, confidence in the projections derived from groundwater flow modeling, and the sufficiency of site characterization to support the pilot study design.

Many comments received did not directly address the proposed hydraulic surcharge.

Comment: Commenters expressed concern that the Water Level Control Monitoring Network is inadequate. [Issue raised by Ms. Patterson, Ms. Paez, Mr. O'Malley, Ms. Riggiola, PLREI.]

- Response: The current pilot study proposes to reinject the same amount of water as is currently infiltrated using the localized infiltration beds. This should spread water infiltration over a larger area reducing the maximum observed water table rise. However, the placement of the well along the railroad track will result in some elevation of the water table in the neighborhood adjacent to the horizontal well. The groundwater flow model used for design of the system projects a relatively small increase (*e.g.*, 1-2 ft) due to the reinjection well. The model was also used to project the increase in water table elevation in a situation where the average hydraulic conductivity of the shallow zone has been underestimated by an order of magnitude which is a very unlikely situation. This type of analysis provides a degree of confidence that water levels should not rise enough to impact basements under normal conditions. The piezometer/well spacing of approximately 200-400 ft along the horizonal well should provide sufficient coverage to allow detailed evaluation and control of the increase in groundwater elevation during the study. Enhancements to monitoring frequency and design could increase confidence in the program. The Department has discussed this issue with Chemours, and Chemours has expressed a willingness to include additional piezometers in their monitoring network, subject to access limitations. However, further discussions on this issue are not necessary due to the denial of the Permit-By-Rule.

Comment: Many commenters expressed concern that the proposed discharge could cause flooding of basements, and there was no availability of flood insurance.
[Issue raised by Mr. Jaconetta, Ms. Rubino, Mr. LaSala, Ms. Paez, Ms. Mancini, Ms. Martens, Reverend Allen, Mr. Keogh, Mayor Serra, Ms. Riggiola, Ms. Howard, Ms. Patterson, Mr. Tittel, PLREI, Mr. & Ms. Swain, Mr. & Ms. Powers, Mr. Garbe, Mr. & Ms. Lombardo, Ms. Proffit, Mr. Keough, Ms. Schnaidt, Ms. Vasconi, Ms. Dinelli, Miss Cogura, and many others.]

- Response: The Department understands that residents near the proposed horizontal injection well have a legitimate concern that rising water levels may flood their basements, and their request that flood insurance be provided to compensate them in the event that groundwater enters their homes as a result of the proposed injections. Unfortunately, the Department does not have legal authority to demand that Chemours provide such flood insurance. While the Department is confident that with proper monitoring and safeguards, the risk of flooding is minimal, there would always be some risk.

Comment: Commenters expressed skepticism about the use of hydraulic surcharging in general.
[Issue raised by Mr. Cogura, Miss Cogura, Mr. O'Malley, Ms. Riggiola, Ms. Martens, Mr. Tittel, Mr. & Ms. Swain, Mr. & Ms. Powers, Ms. Tacinelli, Mr. M. Smith. Mr. & Ms. Lombardo, Ms. Fern.]

- Response: DuPont/Chemours has been pumping contaminated water from the site since 1998 at about 120 to 140 gallons per minute, and sending the water through an air stripper to remove the volatile organic compounds. Effluent samples are consistently free of volatile organic compounds. This water is returned to the ground via 6 pairs of infiltration basins at the southern boundary of the site.

Hydraulic surcharging is more generically known as in-situ flushing with water. Many such designs use treated groundwater as the flushing solution as in this case. The technology is old and was one of the first enhancements to pump-and-treat systems. The concept is discussed in many documents focused on the design and implementation of pump-and-treat technologies (e.g., Ground Water Issue: Design Guidelines for Conventional Pump-and-Treat Systems, EPA/540/S-97/504, 1997). Since the technology is generally used for remediation at contaminated sites in programs such as RCRA and Superfund, site-specific performance details are often contained in site files and not widely published in the common literature.

A brief search of the USEPA Contaminated Site Clean-Up Information data base (https://clu-in.org) revealed short profiles of 24 sites where in-situ flushing with water has been used. This list is a small subset of the list of sites where the technology has been applied. One of the largest pump-and-treat systems with treated water reinjection is at the U.S. Air Force Plant 44 Superfund Site in Tucson, AZ, which operates at approximately 5000 gpm. Information concerning the Plant 44 system is maintained on the Arizona Department of Environmental Quality website. The use of horizontal wells for infiltration is less common than systems using vertical wells, infiltration beds/galleries/basins, and similar structures due, in part, to costs and the fact that many such systems were installed before shallow horizontal well drilling technology was sufficiently developed and available. However, the basic concepts and the effects on groundwater elevations and flow are similar regardless of the technology used for reinjection.

Flushing with clean water is already ongoing under the original remedy and has resulted in significant decreases in contaminant concentrations in the shallow zone. The proposed horizontal well is only an enhancement of the current technology designed to result in more rapid decreases in contaminant concentrations, particularly in the western portion of the plume where flushing rates were relatively low. This represents no significant change in the basic concepts of the original remedy.

Comment: Commented expressed concern about the adequacy of the groundwater modeling. [Issue raised by Ms. Patterson, Ms. Riggiola.]

- Response: Based on information provided in previous documents (e.g., Appendix A of *Shallow Groundwater Remedial Action Selection Report* (2011)), the groundwater flow model used to simulate the effects of injection using the horizontal well appears to have been constructed in conformance with generally accepted practices. It has been calibrated to observed conditions using groundwater elevations measured at various times in both onsite and offsite wells in the shallow, intermediate, and deep zones of the aquifer. The site characterization data used to support model development were derived from several sources including boring logs, hydraulic tests performed in individual wells, and pumping tests incorporating multiple wells. In general, it appears that the model should provide a reasonable representation of site conditions useful in the design of the horizontal well and projections of its effects on groundwater elevations relative to current conditions. However, it is noted that models such as this one are simplifications of more complex subsurface systems and subject to uncertainty. Therefore, any monitoring data obtained during the pilot study should be used to validate model predictions and improve model calibration, especially near the injection well, if needed.

- **Response: Due to the amount of technical comments submitted by Mr. Intintola, the Department is providing responses to his comments separately.**

MR. INTINTOLA: I am Joseph Intintola, I-n-t-i-n-t-o-l-a. I am a technical investigator for the CAG and I'm also a technical investigator for a private company. I've worked and consulted with Foster Wheeler which you know is a global engineering firm. I've also assisted and worked with them on the EAF contaminated (inaudible) Superfund site in New Jersey back in 1995. This document that you printed up, you have drawings on it -- can everybody see -- I actually have the technical blueprints from O'Brien & Gere. I won't tell you how I obtained them, but they were legally obtained and they are classified, so I will not refer to the particulars. All these drawings in this paper I have all the writing that's supposed to be on the drawings. On document File 3914.47723-06, Drawing G2, clearly states that the horizontal well is not a pilot study. It clearly states in the drawing, decommission and demolish present static fields to connect to the horizontal well.

- Response: Mr. Intintola was possibly referring to an earlier June 2013 version of the proposal, which has since been superseded.

If you are doing a pilot study, which is a temporary project, you would leave the fields intact and operational and attach the horizontal well to it, shut those fields off and operate the well. When you are done with your study, you would shut the well off and turn the fields back on.

- Response: The Department had similar concerns upon review of the June 2013 proposal. In the May 2016 *Implementation Work Plan*, Chemours was planning on maintaining the infiltration basins as a backup during the pilot test, and if the pilot test proved unsuccessful.

The drawings, the engineering and mechanical information that was obtained also, and I, also, was consulting with an environmental engineer, clearly states that it is a current discharge, it is not a pilot study, it will be the new discharge for the public treatment. In 2011, spring, DuPont did a test pilot. The present pump-and-treat system is putting out 123 gallons a minute divided by two which is 61 and a half gallons per (inaudible) fields, which there are six of them, and six discharge fields another 61 and a half gallons. They increased the pump-and-treat system from 123 to 140 gallons a minute, within two hours in basements on Barbara Drive flooded two feet of water. This was put in Bergen Record and obtained from NJDEP records by the engineer that I work with.

- Response: The Department is not aware of reports that basements of homes were flooded along Barbara Drive in Spring of 2011 *as a result of operation of the GWET system*. The GWET system extracted an average monthly flow rate of 111 gpm for March, April, and May 2011 compared to a rate of 128 gpm for the previous months (December, January, and February). Water was discharged to all 12 infiltration beds (6 pairs) of which only 6 beds (3 pairs) are along Barbara Drive. The beds along Barbara Drive received approximately 60% of the total flow from March 1st through May 2011 (which was lower than the previous months). The groundwater table in the vicinity of the infiltration beds is estimated at 10 to 20 feet bgs.

The first design of the horizontal well, which was done in 2012 by O'Brien & Gere, the well was supposed to be put in Barbara Drive. It was supposed to be 1,200 feet long at the depth of 14 feet. After they did all the drawings, which I also have the complete copy of, the information from the engineering

firm, O'Brien & Gere, stated to DuPont that if this well was installed on Barbara Drive and operated, the basements would flood. All the houses, or most of the houses on Barbara Drive have sump pump systems. The houses on Walnut Street that back to the railroad tracks also have sump pump systems. Back in 1992 to 1996 when DuPont Village had a heavy metal contamination cleanup, all the back yards of the homes on Walnut Street along the tracks were dug up six and-a-half to eight feet deep. The contractor that worked for DuPont, instead of bringing in clean fill, brought in clay. Clay does not perc water. So this was not anticipated in their engineering plans for perc rate. The soil samples that were used in 2013 from zoning, they came from Barbara Drive. The basements were never actually measured. The horizontal well says that it would raise the water table four feet. You are going to be pumping 129 gallons a minute into the well, plus another 61 and a half into the (inaudible) fields, that's a total of 190 gallons a minute. In a designing system, there are no diverter valve or dump valves used in case there is a failure. There is another issue with the pump-and-treat system is manganese, a chemical which is clogging, Mr. Epps did not tell you, but starting in 2010 the pump-and-treat system crashed a total of four times to this date and they clogged with manganese, and they brought in a hazmat truck with hazmat workers fully suited with respirators with no permits to clean out the sediment. This is an issue with the horizontal well. Thank you.

- Response: Chemours' 2012 proposal was superseded by the May 2016 *Implementation Work Plan*.
  Although it appears that Chemours has adequately evaluated the risk of basements flooding, some details that could have addressed these concerns were not provided in the work plan. For example, house-by-house projections of the depth to groundwater below existing basements and sumps for houses along Barbara Drive and the closest houses south of the railroad tracks using the currently proposed horizontal well alignment(s) could have been presented. Instead, the work plan presented the evaluation in more general terms and did not present detailed predictions of mounding using the possible well alignment south of the tracks. At a minimum, Chemours should ensure they have fully evaluated the risk on a house-by-house basis for the closest houses both north and south of the railroad tracks, incorporating as few assumptions as possible.
  Chemours had agreed to maintain the infiltration basins in case of malfunction of the horizontal well.
  The Department acknowledges that the pilot study plan did not describe system maintenance. Wells used for reinjection of treated water require periodic maintenance to improve efficiency which will likely decay with time due to some form of fouling. This is a problem common to practically all such systems. Generally, reinjection wells require periodic mechanical redevelopment and, possibly, other treatment to remove materials that clog the screen. However, the specific frequency of redevelopment and the most effective methods cannot be accurately specified prior to the pilot study. Data obtained during the study (e.g., flow rates, pressures, and aquifer response) are needed to specify redevelopment frequency. Investigation of the causes of any observed declines in well efficiency should be used to specify appropriate redevelopment methods and any necessary changes in system operation.

In the design it says that you're going to do a 12-inch boring, a total of 2,000 feet long with an inlet of 177 to surface and an outlet of 177 to surface. In this paper write-up, it says the well depth would be 20,

25 feet, that's a gross mistake because that's measured at track height. The train track is actually seven feet higher than road grade and house grade, so, technically, the well would be 14 feet -- 13 feet underneath the surface. The average water table is 5 and a half feet to 11 feet, the average basement is 8 feet deep. People who have SSD systems already installed on Durham, Perrin, Schuyler, they've already been having issues with groundwater coming in from the negative pressure of the SSD systems, so that's an issue not even counting pressurized water. If you have a 12-inch bore, you are going to use a 6-inch number 10 stainless steel casing. That casing -- that well casing has -- every 2-inches it has a 2-inch slot, and the slot opening is twelve-thousandths, that's about the size of your hair. Inside the 6-inch casing is HDEP pipe with T-fittings and restrictor nozzle that's so designed that the well has equal pressure from either end anywhere in the center. Out in the Midwest, the longest pressurized well were three, four hundred foot wells parallel to each other. That was in a groundwater plume pressurized system, except there were no homes, the plume was in an open field where the factory was. The longest single depth well is held by record by the drill rig company that was used in the Superfund site in Boonton, and that was 1,000 feet long, 100-foot depth, except that was a water inlet well for irrigating a farm, it was not a pressurized well. With this 2,000-foot well, there are no service ports if there is a well failure. I mentioned earlier you have manganese issues with the groundwater that's a fine grit and that accumulates. With openings of only twelve-thousandths, it won't be a long time before those ports start to clog. When they start to clog, you are going to have pressure difference. With the calculated formulation and the engineering drawings, at 129 gallons a minute, the well pressure will be, approximately, 75 PSI according to the engineer. But there is a mistake in the calculations, the actual pressure would be 125 PSI. This 6-inch casing is not centered in 12-inch bore, it is sitting on the bottom. They are not using raised legs to put the 6-inch casing centered in the 12-inch bore, so with the openings around the 6-inch well -- the casing, you have an action called jet knifing, that's when you take pressurized water that is going to press against the bore opening. What that's going to cause is, for everyone in this room to understand, take your garden hose, put it on a straight nozzle, and point it towards the dirt, and leave it there for a minute, and what happens, the dirt starts to open up and you start making a hole. Within, the engineer I worked with calculated, less than a year the 12-inch bore is going to be a lot bigger, the bottom is going to start to jet knife, and you might go into other issues, and this well is also going to be five feet from the edge of the right-of-way. In the drawings -- in the specifications it says that you have fifty feet of water mounding by the well, there's homes at the end of Perrin, Schuyler, Grant that are less than 50 feet and would be in the mounding area, which would mean, basically, those basins will flood as soon as the well is fired up. The last thing is for the residents in this room, the drill rig that they are going to use is a Model 50. To give you a mental picture, that is the size of an M1 Abrams tank, that's the size of the drill rig, that has a diesel engine that's going to be running at 2300 RPMs, eight hours a day running the drill. I don't know -- DuPont said nothing about the sound noise on the homes that are on Barbara Drive. Thank you.

- Response: Based on an estimated total screen length of approximately 1,400 feet, the flow rate per foot of screen will range between 0.09 to 0.20 gallons per minute per foot. The infiltration pressure in the well would be gravity drainage or just above the natural groundwater pressure around the well. Data related to the performance of the hydraulic surcharging pilot study would be collected during operation. If the horizontal well were not to perform up to expectations, Chemours could at any time abandon the pilot test and resume discharge of treated water to the infiltration basins.

The horizontal well is not a pilot study, the engineer drawings that I have that are actually marked classified O'Brien & Gere property clearly states it's a permanent discharge of the pump-and-treat system, it's not a pilot study.

- Response: The O'Brien & Gere proposal from June 2012 was a pilot study. The subject May 2016 Implementation Work Plan was also a pilot study. The desired goal would be to have a successful pilot, modify the permit(s), and continue operation.

The engineer that I work with, his name is Rich Chapin he is an environmental engineer, very well-known to the U.S. Government, he clearly stated that this is not a pilot study, that DuPont would have to file a whole new permit because its modified to the present permit. They have a pump-and-treat permit volume of 280 gallons a minute, but that's in present state, they are now taking a static discharge field and making it a pressurized field, that is a total different design. They are boosting up the PSIs of the system, the water volume. And also, for the record, blue fields 1-C and 1-D that are on Barbara Drive are no longer functioning. How I know that, is that there were tests done on Walnut Street and there is a new groundwater plume in the DuPont Village, the highest sub-slab reading from the NJDEP in 2008, they tested seven homes, the average was 2,300 parts per billion, 2,400, 26, the highest was 3,200. One home tested on Walnut Street, 8,100 sub-slab, almost three times what Barbara Drive is. Indoor level, 75,000 parts per billion PCE, 1,600 parts per billion TCE. The EPA initially told me Perry Katz, initially wrote a letter to the homeowner claiming that there must be a mistake, but it's not, because several other homes were tested in DuPont Village and came up hot. So putting this horizontal well in on the south side of the track, the well doesn't have a mind, it is going to send water in both directions, north and south, regardless, it's not a directional well. By you forcing water towards the north side of the track, you are going to take that contaminated pool of VOCs in the Village and push it towards Wanaque Avenue and Cannonball. So -- and there's documented evidence, and the EPA already has it on file. Ira Perry is just in denial.

- Response: The NJDEP's Site Remediation and Waste Management Program (SR&WMP) is processing all applications for discharges to groundwater as "Permits-By-Rule". Since DGW permits are no longer prepared by the SR&WMP, a PBR is the appropriate administrative vehicle and can be issued for greater than 180 days. Any PBR proposed for greater than 180 days is required to be Public Noticed. Any interested party is welcome to request a public hearing for such proposals. A public hearing for the Chemours' proposal was held on 26 September 2017.

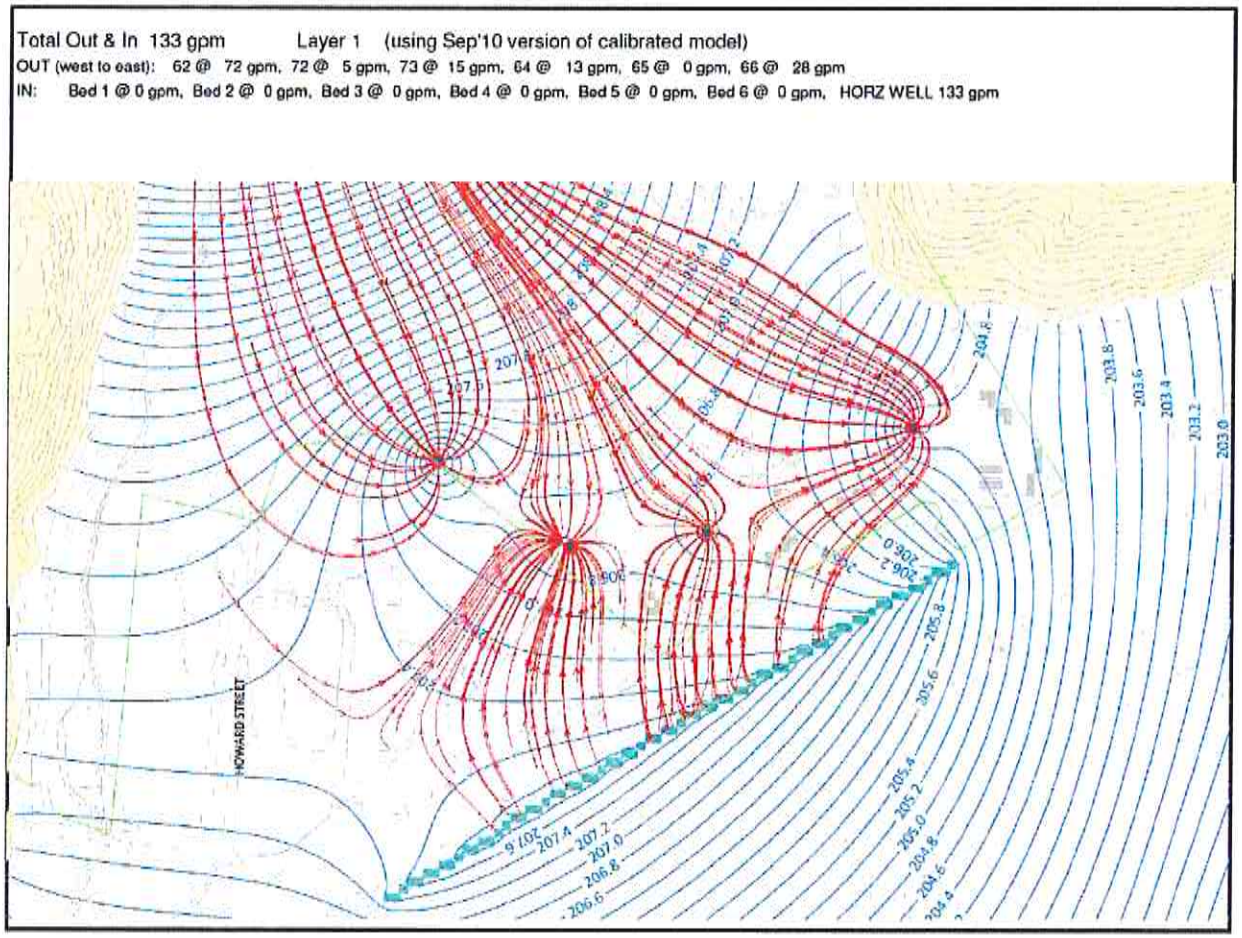
  While the system may be capable of treating 280 gpm (maximum design), the system never operated at the maximum flow or design permitted, and has operated at about an average of 120 to 140 gpm for the past 6 years. Chemours would propose that the system have a safe operation level (i.e., discharge rate) based on measured groundwater elevations established during the pilot study.

  Projected impacts on groundwater flow in the deep aquifer zone due to operation of the reinjection well were not described in the implementation work plan. As the reinjection well would be screened in the shallow zone and hydraulic conductivity appears to decrease with increasing depth, the effects in the deep zone may not be significant. However, there will likely be some degree of influence. The groundwater flow model could be used to

examine the potential effects of the reinjection well in the intermediate and deep zones. It's recommended that this exercise be performed to provide further insight.

By extending the horizontal well to the end of Grant Avenue, Chemours would attempt to direct the discharged water into the shallow aquifer to flush the western portion of their plume south towards Pompton Lake, and north towards the on-site extraction wells. With greater distance from the injection well, groundwater would begin to conform to the regional flow direction and would not be not expected to create a mound large enough to overcome that flow. The figure below illustrates the modeled groundwater contours and expected flow lines.

Figure 3 - Recovery Well 65 Pumping 0 Gallons Per Minute



- **Response: Due to the amount of technical comments submitted by Mr. Foote, the Department is providing responses to his comments separately.**

MR. FOOTE: My name is Bruce Foote, I'm a resident of Pompton Lakes. I'm not in the plume area but I'm concerned. A couple of key questions that I developed from the readings online. There were -- liquid conductivity of soil can be quite variable, nonhomogeneous and only sporadically sampled and tested. You might want to have more sites tested, because I understand soil is sometimes in some areas clay has been pretty processed and so forth.

- Response: Based on information provided in previous documents (e.g., Appendix A of Shallow Groundwater Remedial Action Selection Report (2011)), the groundwater flow model used to simulate the effects of injection using the horizontal well appears to have been constructed in conformance with generally accepted practices. It has been calibrated to observed conditions using groundwater elevations measured at various times in both onsite and offsite wells in the shallow, intermediate, and deep zones of the aquifer. The site characterization data used to support model development were derived from several sources including boring logs, hydraulic tests performed in individual wells, and pumping tests incorporating multiple wells. In general, it appears that the model should provide a reasonable representation of site conditions useful in the design of the horizontal well and projections of its effects on groundwater elevations relative to current conditions. However, it is noted that models such as this one are simplifications of more complex subsurface systems and subject to uncertainty. Therefore, monitoring data obtained during the pilot study should be used to validate model predictions and improve model calibration, especially near the injection well, if needed.
  The groundwater flow model used for design of the system projects a relatively small increase (*e.g.*, 1-2 ft) due to the reinjection well. The model was also used to project the increase in water table elevation in a situation where the average hydraulic conductivity of the shallow zone has been underestimated by an order of magnitude which is a very unlikely situation. This type of analysis provides a degree of confidence that water levels should not rise enough to impact basements under normal conditions.

I understand that there are only four Piezometers -- the monitoring stations on the north side of the right of way, there are only four, and those are only going to be measured twice per week during the startup and during the flow rate ramp-up. I think maybe -- you folks know what the response time of the aquifer is, however, the consequence of missing and having water rise in the basements or getting along and reduce the VOC capability is of serious concern, so maybe we want to measure more often in the beginning and at more locations. A thought I had, maybe automated basement monitoring in each residential building similar to those in the inhouse water usage metering used by the MUA, where an authorized vehicle can drive past and read them. The local Optimum WiFi, it's throughout that whole area so you have a basement monitor that sits on the floor ready to detect water coming in, just as an assurance of that, it can't be that expensive in quantities, and it is hooked up to the local WiFi. Heavy rain has an impact on the aquifer elevations and also the VOC efficiency based on elevations, that water coming up, I am told, challenges the VOC readings.

- Response: In general, it appears Chemours' proposal may meet a minimum standard of sufficiency for monitoring. The piezometer/well spacing of approximately 200-400 ft along the horizonal well should provide sufficient coverage to allow detailed evaluation and control of the increase in groundwater elevation during the study. However, confidence in the monitoring system could be increased by providing greater specificity in the description of the program, and some degree of enhancement (e.g. installation of additional piezometers and increased monitoring frequency). The plan could be revised to state which piezometers would be instrumented with pressure transducers and the frequency at which the transducers would measure water levels. Given the level of community concern, it may be appropriate to instrument all the new piezometers and well 25 with transducers. An hourly measurement frequency would not be uncommon for a study of this nature. Monitoring using the transducers should be started prior to start up and commissioning of the horizontal well. The initial frequency of manual water level monitoring could be increased to daily until water levels have stabilized to increase confidence in the program. In a similar fashion, it would not be unreasonable to increase the frequency of water level measurement and data evaluation during periods where the water elevation is above a given level. Creation of a table listing the piezometers and wells that will be monitored manually and with pressure transducers would be helpful in conveying the monitoring program.

Second point, I recommend not destroying the leaching fields until long after approving the hydraulic surcharge operations, through start-up, flow ramp-up until limited by either permit or flow rate. I am suggesting that as a fall-back position in case the well misbehaves, you should be able to divert back to the leaching field and keep that flow going so it stays clean, and you have that reverse flow back towards DuPont continuing to operate as opposed to losing any going forward.

- Response: After discussion with the Department, Chemours has agreed that the existing infiltration beds would be maintained until the pilot study is complete, data are reviewed, and final proposals are approved. If groundwater elevations in one or more of these piezometers adjacent to the horizontal well equal or exceed 214.5 feet (NAVD 1988), as measured during the groundwater level monitoring program, then the horizontal well discharge rate would be reduced until the groundwater elevations decline below 213 feet. A reduction in flow to the aquifer adjacent to the horizontal well will be achieved by redistributing the flow between the horizontal well and the onsite infiltration beds.

Past requirements to purge the leaching fields of buildup of magnesium crystals from the pumping stations may also develop clogs or clots or residual solids building up in the surcharge well. This filtration of the flow is expected to prevent solids or sedimentation buildup, or will there be a necessity for a disassembly or maintenance accommodations to be built into the well in anticipation of the well failing and having to be cleaned out before it can restart and then divert that flow back to the leaching fields meanwhile and then re-bring it in. I didn't see anything in the data about anticipating being able to pull that high-pressure line out of the system, coil it up, clean it, purge it out, and slide it back in. Is there an anticipated method to clean the 2-inch by .012-inch slots along the well in the event of unexpected

surcharge. It's like putting a plug -- pig in there, and running it down and causing flow through those slots to clean it out so that it's ready to reset the vibration line.

- Response: The Department acknowledges that the pilot study plan did not describe system maintenance. Wells used for reinjection of treated water require periodic maintenance to improve efficiency which will likely decay with time due to some form of fouling. This is a problem common to practically all such systems. Generally, reinjection wells require periodic mechanical redevelopment and, possibly, other treatment to remove materials that clog the screen. However, the specific frequency of redevelopment and the most effective methods cannot be accurately specified prior to the pilot study. Data obtained during the study (*e.g.*, flow rates, pressures, and aquifer response) are needed to specify redevelopment frequency. Investigation of the causes of any observed declines in well efficiency should be used to specify appropriate redevelopment methods and any necessary changes in system operation.

Those are a couple of the questions I had about monitoring often enough to give these people the assurances that you're are not going to challenge their basements, so they can sleep at night as opposed to running down every 10 minutes and checking their basements to see if there is water coming in. Because if that water starts coming in, guarantee it pollutes their entire basement and all their belongings and everything else.

- Response: Although it appears that Chemours has adequately evaluated the risk, some details that could have addressed these concerns were not provided in the work plan. For example, house-by-house projections of the depth to groundwater below existing basements and sumps for houses along Barbara Drive and the closest houses south of the railroad tracks using the currently proposed horizontal well alignment(s) could have been presented. Instead, the work plan presented the evaluation in more general terms and did not present detailed predictions of mounding using the possible well alignment south of the tracks. At a minimum, Chemours should ensure they have fully evaluated the risk on a house-by-house basis for the closest houses both north and south of the railroad tracks, incorporating as few assumptions as possible.

- **Response: Due to the amount of comments within Mr. Chapin's memo, the Department is providing responses to his memo separately. Mr. Chapin's memo of 11/15/2013 addresses an older (June 2013) version of the Implementation Work Plan. On September 9, 2013, NJDEP and USEPA provided comments on the 2013 IWP to DuPont, and DuPont responded on October 14, 2013. In 2015, DuPont transferred the PLW Site to The Chemours Company FC, LLC (Chemours). A revised proposal was sent by Chemours in May 2016, also entitled "Implementation Work Plan - Hydraulic Surcharging Pilot Study", which presented the proposed approach for the subject Permit-By-Rule. As a result, many of the issues raised in Mr. Chapin's 11/15/2013 memo were addressed in the May 2016 version.**

R.W. Chapin, M.S., P.E., *President*
Board Certified Environmental Engineer

Memo

To: Lisa. Riggiola
Citizens for A Clean Pompton Lakes [CCPL]
From: R.W. Chapin, M.S., P.E., BCEE
CCPL Technical Advisor
RE: Comments on Proposed Hydraulic Surcharging
DuPont Pompton Lakes
Date: 11/15/13 [revised]

In accordance with your request documents relating to DuPont's proposed plan to install and operate horizontal well has been reviewed. This memo provides review comments.

DuPont's "Hydraulic Surcharging" [HSurge] proposal has a history the commenced several years ago. Attachment A is a synopsis of the documents specifically relating to the HSurge. It provides descriptions that were excerpted from each document that provide DuPont's descriptions, purposes and objectives.

The following format is used for these comments: Information from the documents is presented/summarized at the margin. Comments on that information are provided as indented bullet items.

This review focused on the latest HSurge document; specifically, *"Implementation Work Plan - Hydraulic Surcharging Pilot Study, DuPont Pompton Lakes Works Pompton Lakes, New Jersey, PI #007411*, dated June 28, 2013 [IWP] and prepared by O'Brien & Gere. However, the IWP does not include all essential information, but references to the previously submitted *"Basis of Design: Horizontal Well/Hydraulic Surcharging IRM/Pilot Study, DuPont Pompton Lakes Works Site Pompton Lakes, New Jersey, PI# 007411*" dated June 29, 2012 [BOD], which was also prepared by O'Brien & Gere. Consequently, the BOD was also reviewed. Comments apply to either or both of these documents.

At the outset, it is very important to recognize the fact that this approach is intended to dilute the volatile organic [VOC] contaminants in the shallow groundwater plume and flush those contaminants downstream in the shallow groundwater system at an increased rate [compared to the current conditions] and discharge to the Lake. While it is intended to change concentrations of the VOCs, it will do nothing to change the mass of contaminants in the plume;

it is neither removing nor destroying the VOCs that form the off-site plume, which has had, and is having, significant impacts on a major residential neighborhood.

- Response: As evidenced by groundwater monitoring results over time, VOC concentrations in groundwater downgradient of the Site and in the vicinity of the infiltration beds where treated groundwater is discharged have decreased by one or more orders of magnitude since the groundwater extraction and treatment (GWET) system began operation in 1998. The water discharged to the infiltration beds is groundwater that has been withdrawn and treated to remove Site-related VOCs. The treated water flowing from the infiltration beds is creating a zone of cleaner water downgradient of the beds.

  The purpose of conducting the hydraulic surcharging pilot study is to collect data on the efficacy of optimizing groundwater flow rates within the shallow aquifer in the western portion of the plume near the Site boundary. This would be accomplished through the design and installation of a water delivery system (i.e., horizontal well) in an attempt to replicate the downward trend of groundwater concentrations observed in the area downgradient of the soccer field infiltration beds associated with the GWET system.

- As previously noted numerous times, the fundamental issue is the vapor intrusion problem created by the plume, including the significant financial impacts that are occurring. Eliminating the plume, e.g., destroying the VOC using in-situ bioremediation is the answer. Long term dilution may subject the plume residents to the plume for longer than necessary.

- Response: The hydraulic surcharging pilot study is being implemented to evaluate whether increased hydraulic surcharging will further reduce VOC concentrations in the shallow aquifer, specifically in the western portion of the offsite plume area. The conceptual model for this project is that by reducing the concentration of VOCs in the shallow aquifer, the groundwater source of vapor intrusion will diminish.

  Although it is possible that bioremediation may ultimately be attempted, performance is by no means guaranteed. Technologies such as in-situ bioremediation are commonly used in source remedial applications. However, the success and rate of effectiveness are dependent on the physical and chemical conditions within the area of treatment. This type of technology is difficult to implement at the scale of this plume and potentially has negative aspects, as do all subsurface technologies. DuPont conducted a 6-month pilot study for treating the off-site plume using enhanced in situ bioremediation (EISB) during 2013. However, technical consultants and industry vendors have stated that the effectiveness of these types of technologies is limited given the lower concentrations of constituents and hydrogeologic conditions present in the shallow aquifer. The off-site plume covers an area of about 132 acres. With each injection well having an effective injection radius of 15-20 feet, a bioremediation program could require over 3000 injection wells, mostly on private property.

- As presented in the IWP, this "pilot" has no defined period; this is unacceptable, as it implies the "pilot" will simply become the solution by never ending.

➢ Response: Data related to the hydraulic surcharging pilot study would be collected for a minimum of one year to evaluate the efficacy of optimizing groundwater flow rates within the shallow aquifer. Additional operation would be evaluated using this initial data. A technical memorandum would be prepared using the data collected to provide recommendations for further operation of the program. The desired goal would be to have a successful pilot, modify the permit(s), and continue operation.

- Standard engineering protocols define a specific time frame for pilot tests as wells as the specific basis that will be used to evaluate the pilot test and judge its success or failure. The IWP lacks both of these fundamentals and must be revised to include them.

➢ Response: The primary performance metric for the hydraulic surcharging pilot study is change of the hydraulic gradient in the shallow aquifer in the area of the horizontal well, which will be used to calculate the increase in pore surcharging rates. This metric can be effectively evaluated in a reasonable timeframe by documenting changes in groundwater elevations.

The HSurge discharge requires a Discharge to Groundwater Permit [DGW] from the New Jersey Department of Environmental Protection [NJDEP]. The IWP states an application for a DGW Permit-by-Rule [PBR] was submitted to the NJDEP on June 15, 2013. Per the NJDEP's regulations, a PBR has a maximum period of 180 days; if the discharge to groundwater will last for a longer period, a full application for a full DGW is required.

- Submission of a DGW-PBR application implies the pilot will have a maximum 180 day period, i.e., the discharge must cease after 180 days. Again, there is no specific definition by the IWP of the length of the pilot and this is unacceptable. A clear, precise definition of the pilot period and evaluation criteria must be included in the IWP.

➢ Response: If Chemours had limited the pilot test to less than 180 days, there would have been no requirement to issue a Public Notice. Chemours proposed to run the pilot study for a minimum of one year to collect sufficient data to evaluate the efficacy of optimizing groundwater flow rates within the shallow aquifer.

- Section 3.4.2 [page 8] of the IWP lists "... necessary permits will be obtained. This includes...PBR greater than 180 days [previously submitted to NJDEP..." This indicates an intent to run this "pilot" for an extended, undefined period of time. Again, a clear, precise schedule for this pilot must be provided. This is unacceptable.

➢ Response: The purpose of a pilot study is to collect and evaluate data important to remedial decision-making. Chemours had proposed to operate this pilot study for a period of one year. If additional time was needed to assist in the evaluation, then the pilot study could be extended in accordance with applicable regulatory requirements.

- A PBR is issued by the NJDEP without a public hearing, where a full DGW requires a public hearing, among other specific needs. The correct terminology must be used to describe the actual permit being applied for. Revisions to the IWP are required.

➢ Response: NJDEP is processing all applications for discharges to groundwater as "Permits-By-Rule". Since DGW permits are no longer prepared by the NJDEP, a PBR is the appropriate administrative vehicle and can be issued for greater than 180 days. Any PBR proposed for greater than 180 days is required to be Public Noticed. Any interested party is welcome to request a public hearing for such proposals. A public hearing for the Chemours' proposal was held on 26 September 2017.

If the proposed discharge of treated groundwater to the horizontal well were to go beyond the pilot study phase, Chemours would follow those requirements listed in the regulations to obtain the necessary PBR modification(s).

As stated in the BOD, "The purpose of conducting the pilot study is to collect data on the efficacy of optimizing groundwater flow rates within the shallow aquifer in the western portion of the plume."

- Section 3.6 of the IWP the monitoring program, which will presumably be used to evaluate the "efficacy" of the HSurge. Water levels in existing wells plus new piezometers and the horizontal well will be monitored on a "routine" basis, and "Groundwater samples are collected on a semi-annual basis..."
- A DGW-PBR application requires a specific monitoring program, e.g., water levels once per week for first month, followed by every other week for the remaining 5 months and groundwater samples will be collected monthly from these wells and analyzed for VOC. The IWP is completely lacking in detail on the monitoring program. Why wasn't the monitoring program submitted to the NJDEP included in the IWP? What is the specific DGW-PBR monitoring proposed to the NJDEP?

➢ Response: A more detailed monitoring program was included in the revised PBR proposal (May 2016) and included the following:

  - Groundwater elevation monitoring during start-up and commissioning will be performed at a minimum of twice per week. This twice weekly monitoring will continue for a minimum of three months.
  - After three months, the groundwater elevation monitoring will occur monthly.
  - Transducers will also be placed in select piezometers as well as the horizontal well to collect groundwater elevation data on a continual basis. Data will be downloaded from the transducers on a weekly basis to assess conditions.

The Department recognizes that confidence in the performance of the hydraulic surcharge well could be improved by adding more monitoring points (piezometers), and conducting more frequent groundwater elevation monitoring. The Department has discussed this issue with Chemours, and Chemours has expressed a willingness to include additional piezometers in their monitoring network, subject to access limitations. However, further discussions on this issue are not necessary due to the denial of the Permit-By-Rule.

- If the pilot period is 180 days, as implied by the IWP, the IWP will sample the groundwater once [semi-annual monitoring], providing one data point for the evaluation of the "efficacy". How is one data point representative and definitive of the increased pore volume and flushing? It isn't.

➢ Response: The pilot study was scheduled to last a minimum of one year.

Data collected from piezometers would be used along with the groundwater model developed for the Site to evaluate what effect the horizontal well is having on pore surcharging rates.

The long-term groundwater monitoring program would provide additional data to evaluate the effect on groundwater quality, which is considered to be a lagging indicator of the horizontal well effect as compared to the water level data.

- The specific procedure and data required to conduct those procedures must be detailed in the IWP; revisions to the IWP are required.

➢ Response: It is uncertain as to what procedures are being referred to in this comment. However, any procedures would follow current regulatory guidelines (NJDEP and USEPA), and be subject to the work plan approved by NJDEP and USEPA. A more detailed proposed monitoring program was included in the revised PBR proposal (May 2016).

The HSurge will change groundwater elevations. The impact of this change on the homes proximate to the Horizontal Well is a KEY question. The BOD conducted computer modeling of the HSurge on the groundwater elevations and compared that to the lowest levels of basements along Barbara Drive.

- How was the elevation of the basements determined? Were they actually surveyed or estimated? What depth of basement was used/assumed for each home?

➢ Response: Since a majority of the homes are accessed on a routine basis for operation of vapor mitigation systems, basement elevations were estimated based on observations and measurements collected during those visits and work.

The model used an estimated depth below grade of 6 feet since all basements daylight with some windows above ground. The base map of the area around the railroad tracks and north are a 2-foot interval with spot elevations in NAVD29.

Most of the public comments dealt with the potential risk of basement flooding. Although it appears that Chemours has adequately evaluated the risk, some details that could have addressed these comments were not provided in the work plan. For example, house-by-house projections of the depth to groundwater below existing basements and sumps for houses along Barbara Drive and the closest houses south of the railroad tracks using the currently proposed horizontal well alignment(s) could have been presented. Instead, the work plan presented the evaluation in more general terms and did not present detailed predictions of mounding using the possible well alignment south of the tracks. At a minimum, Chemours should ensure they have fully evaluated the risk on a house-by-house basis for the closest houses both north and south of the railroad tracks, incorporating as few assumptions as possible.

According to the BOD, "The effect of the discharge of treated groundwater on water levels within the aquifer was evaluated as part of the NJDEP-approved GRAWP. The maximum discharge rate of the GWET was based on groundwater modeling, pump tests, and routine measurements of groundwater elevations in the area of discharge. Based on these data, it has been shown that discharge of treated groundwater to the aquifer has not caused water levels to rise to a point at which groundwater would enter the basements of structures located in the pilot study area (i.e., along Barbara Drive).

- In the spring of 2011 the flow to the infiltration beds located proximate to the eastern end of Barbara Drive was increased from 125 to 140 gpm, This resulted in the flooding of the basements of homes located on Barbara Drive across from those fields. Consequently, the above statement should be revised as it fails to recognize this the historic flooding of basements caused by the existing discharge to groundwater.

➢ Response: The current pilot study proposes to reinject the same amount of water as is currently infiltrated using the localized infiltration beds. This would spread water infiltration over a larger area reducing the maximum observed water table rise. However, the placement of the well along the railroad track would result in some elevation of the water table in the neighborhood adjacent to the horizontal well. The groundwater flow model used for design of the system projects a relatively small increase (e.g., 1-2 ft) due to the reinjection well. The model was also used to project the increase in water table elevation in a situation where the average hydraulic conductivity of the shallow zone has been underestimated by an order of magnitude which is a very unlikely situation. This type of analysis provides a degree of confidence that water levels should not rise enough to impact basements under normal conditions. The piezometer/well spacing of approximately 200-400 ft along the horizonal well should provide sufficient coverage to allow detailed evaluation and control of the increase in groundwater elevation during the study. The Department acknowledges that enhancements to monitoring frequency and design could increase confidence in the program.

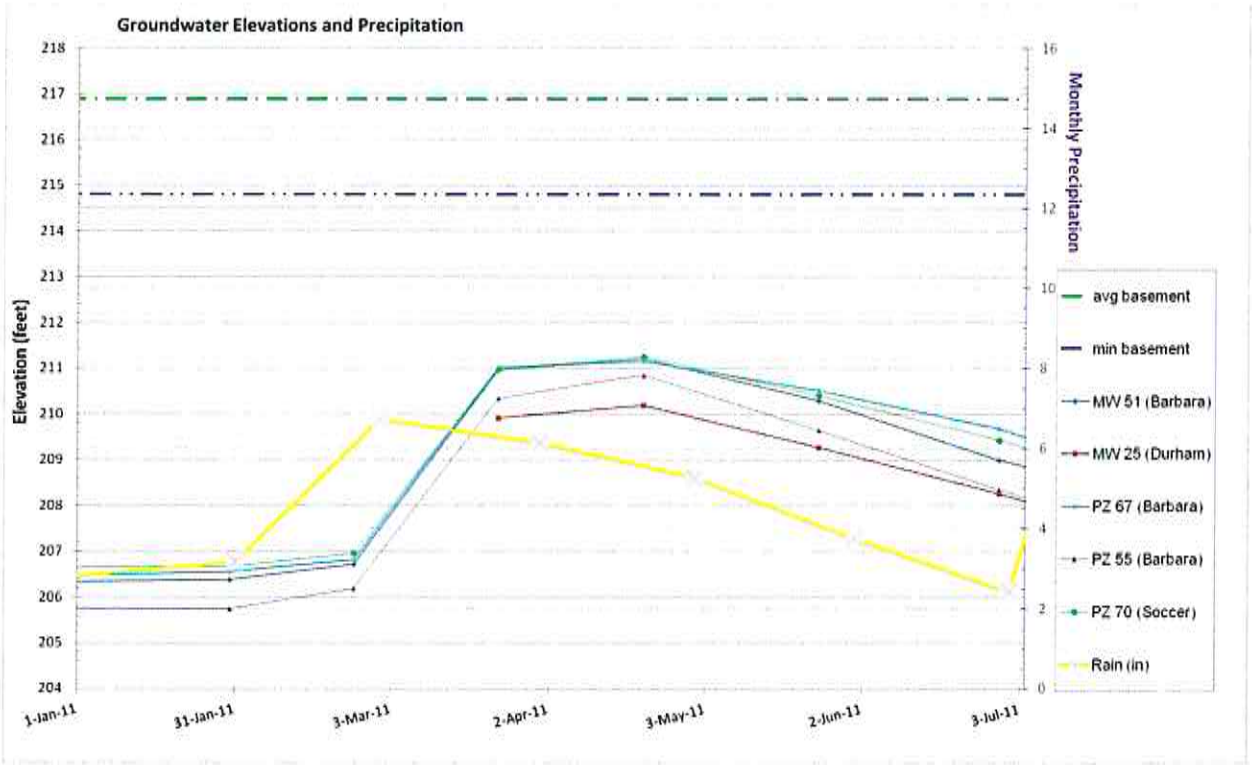
The Department is not aware of reports that basements of homes were flooded along Barbara Drive in Spring of 2011 *as a result of operation of the GWET system*. The GWET system extracted an average monthly flow rate of 111 gpm for March, April, and May 2011 compared to a rate of

128 gpm for the previous months (December, January, and February). Water was discharged to all 12 infiltration beds (6 pairs) of which only 6 beds (3 pairs) are along Barbara Drive. The beds along Barbara Drive received approximately 60% of the total flow from March 1st through May 2011 (which was lower than the previous months).

As shown on the graph below, water table elevations were lower in the months prior to the Spring 2011 reference (while discharge was higher) as compared to the Spring 2011 elevations (while discharge was lower).

As can be seen on the graph below, water table elevation changes appear to mirror times of higher precipitation (there is always a lag as it takes time for surface water to infiltrate to the water table) and the peak can be directly attributable to the almost two-fold increase in precipitation from January to March (6.7" in March, 6.14" in April, and 5.26" in May).

Groundwater elevation measurements collected during this time frame from wells immediately adjacent to the infiltration beds do not show an increase in the water table elevation above the bottom of the basements in this area.



A schematic cross section perpendicular to the horizontal well shows potential water table elevations with the horizontal well operating and all the treated water being infiltrated into the well (Figure 5). This figure shows that even using the maximum groundwater elevation observed, the additional infiltration by the horizontal well will not cause groundwater to

intersect the residential basements upgradient along Barbara Drive or downgradient at the residences close to the proposed horizontal well.

- Figure B is Figure 5 referenced above was excerpted from the IWP. This has been annotated with elevations of homes along Barbara Drive. Figure B shows multiple homes that are at risk of flooding along Barbara Drive and contradicts the statements in the IWP text. An explanation of these contradictions and revisions to the IWP are required.

➢ Response: See response on Figure B below.

The BOD summarizes results of the modeling as follows: "1] Groundwater mounding dissipates within 40 to 50 feet laterally from the proposed horizontal well(s). 2] For most hydraulic conditions, the water table will remain below the elevation of adjacent residential basements (including the water table elevations immediately adjacent to the proposed horizontal well(s), where the highest mounding is estimated to occur). 3] Under periods of high water table conditions, the water table elevation is anticipated to be below adjacent basement elevations, but above adjacent utilities. 4] If the hydraulic conductivity of the shallow groundwater zone is lower than currently estimated, and an above average high water table exists due to higher than normal precipitation and recharge, water table mounding elevations in the middle of Barbara Drive could exceed the elevations of adjacent residential basements, but the mounding "envelope" would not be expected to intercept the basements."

- Figure B summarizes modeling conducted for the IWP. The results, based on the IWP's Figure 5 are the same as presented in the BOD; the horizontal well is shown capable of elevating the water table above the basement elevation of homes along Barbara Drive. An explanation of this contradiction between text and figure and revision of the IWP text is required

➢ Response: The figure being referenced shows multiple water table elevations based on various operating scenarios using different physical characteristics of the aquifer.

- The upper line represents the water table predicted elevation assuming a steady state discharge rate of 129.5 gpm, the lower hydraulic conductivity range for the aquifer [~6.5-7 ft/d], and a scenario in which 5 feet is added to simulate a higher water table level if that were to occur.

- The next lower line represents the proposed steady state discharge rate of 129.5 gpm and the lower hydraulic conductivity range for the aquifer [~6.5-7 ft/d] with no simulated increase in water table elevation.

- The next line represents groundwater elevations using the proposed steady state discharge rate of 129.5 gpm and hydraulic conductivity measured during other investigations in the shallow aquifer [~65-70 ft/d] with no simulated increase in water table elevation.

As shown on the figure, the groundwater elevation mound peaks above the horizontal well, but slopes quickly away from the source of infiltration (the well).

The figure also shows the edges of houses much closer to the horizontal well than what actually occurs. A revised figure is provided as part of a later comment response.

A groundwater elevation monitoring program would be conducted to collect data along the well to verify modeling predictions and modify the pilot as appropriate to ensure protection of people and the environment.

The Barbara Drive modeling uses a flow of approximately 130 gpm [gallons per minute] as the "typical" flow of the on-site treatment system. The IWP states the maximum flow to the horizontal well will not exceed that system's maximum allowable flow under the NJPDES permit of 280 gpm.

- What is the mounding that will occur at the maximum treatment system flow? Why wasn't modelling of that flow provided? Assuming all other input parameters remained the same, doubling the flow will increase the resultant mounding. A pilot study must evaluate the maximum flow conditions; if it does not, how does it evaluate the "efficacy" of this process? The IWP must be revised to include maximum flow conditions.

➢ Response: While the system may be capable of treating 280 gpm (maximum design), the system never operated at the maximum flow or design permitted, and has operated at about an average of 120 to 140 gpm for the past 6 years. Chemours would propose that the system have a safe operation level (i.e., discharge rate) based on measured groundwater elevations established during the pilot study.

The purpose of a pilot study is to gather technical data to evaluate operational effectiveness as well as additional design information. For this pilot study, Chemours would initially operate the system at a flow rate of less than the modeled maximum. During the study, flow rates may be increased or decreased depending on the actual data collected from the water level monitoring points installed along the horizontal well.

If elevations were observed to be increasing such that basements may be in danger of being impacted, then water can be diverted from the horizontal well into the existing infiltration beds away from the homes along the well transect.

- What is the design flow specification for the horizontal well?

➢ Response: The pilot study design objective would be to distribute treated groundwater at an initial rate of less than the modeled maximum. Varying flow rates could be evaluated to collect additional information related to the optimum rate which the study can safely be conducted.

Based on an estimated total screen length of approximately 1,400 feet, the flow rate per foot of screen will range between 0.09 to 0.20 gallons per minute per foot. The infiltration pressure in the well would be gravity drainage or just above the natural groundwater pressure around the well.

The IWP assessment looked at the impacts of the horizontal well homes along Barbara Drive, which is the same conditions looked at in the June 2012 BOD. BUT, the IWP has moved the horizontal well approximately 180 ft south, into the railroad right-of-way.

- As presented in the IWP, the assessment of groundwater elevations is deficient. The closest homes to the proposed horizontal well are located at the northern end of Perrin Ave, Jefferson Ave, Schuyler Ave, Grant Ave and along Durham St. NONE of these locations have been assessed by modeling; WHY? Figure A locates these homes. This is a fatal flaw in the IWP as currently written. The IWP requires revision to evaluate the impacts of a horizontal well located in the railroad right-of-way upon the homes downgradient to the south. No further action on implementation of this pilot can occur until this evaluation is completed and reviewed.

➢ Response: An assessment was completed and there are two figures (Figures 3 and 4) showing the mounding and one cross-section (Figure 5). These figures were included in the work plan submittal.

- Modeling of the impacts the railroad right-of-way horizontal well MUST include an assessment of the maximum flow.

➢ Response: The purpose of a pilot study is to gather technical data to evaluate operational effectiveness as well as additional design information. For this pilot study, Chemours would initially operate the system at a flow rate of less than the modeled maximum. During the study, flow rates may be increased or decreased depending on the actual data collected from the water level monitoring points installed along the horizontal well.

- As proposed, the horizontal well is proposed to be located on the north side of the railroad tracks; however, it may be located on the southern side. A southern location places the horizontal well within 50 feet of neighboring homes. BOTH right-of-way locations MUST be evaluated.

➢ Response: Both right-of-way locations were fully evaluated in consultation with the railroad.

As previously discussed, the highest mounding effect occurs only directly above the horizontal well. Additionally, piezometers located between the homes and the well would be used to evaluate the elevation of the water table to ensure it would not rise above the bottom of those basements.

The IWP discusses clearing of all vegetation along the railroad right-of-way for construction of the horizontal well, and proposes no restoration.

- Such clearing will remove existing vegetative screening of the railroad. Why is this necessary for construction that will occur 20 feet below the grounds surface? Vegetation clearing must be minimized.

➢ Response: Vegetation would be cleared only to the extent that access is required to safely perform work. A survey of the railroad right-of-way would be performed to fully understand the limits of work.

The horizontal well will access the subsurface at the soccer field abutting the end of Barbara Drive. This operation will require a large laydown area and generate significant truck traffic. The drill rig will generate a significant level of noise.

- All access for this the construction must be thru the DuPont property.

➢ Response: Access for drilling the horizontal well would be from/on the Chemours property.

- Short term, construction related impacts must be prevented mitigated to the maximum extent possible.

➢ Response: A project safety analysis in the form of a health & safety plan would be required and would be conducted to identify potential safety issues associated with the implementation of the pilot study with the goal of eliminating safety issues where possible and developing mitigation plans for the remaining potential safety issues to ensure the protection of people and the environment.

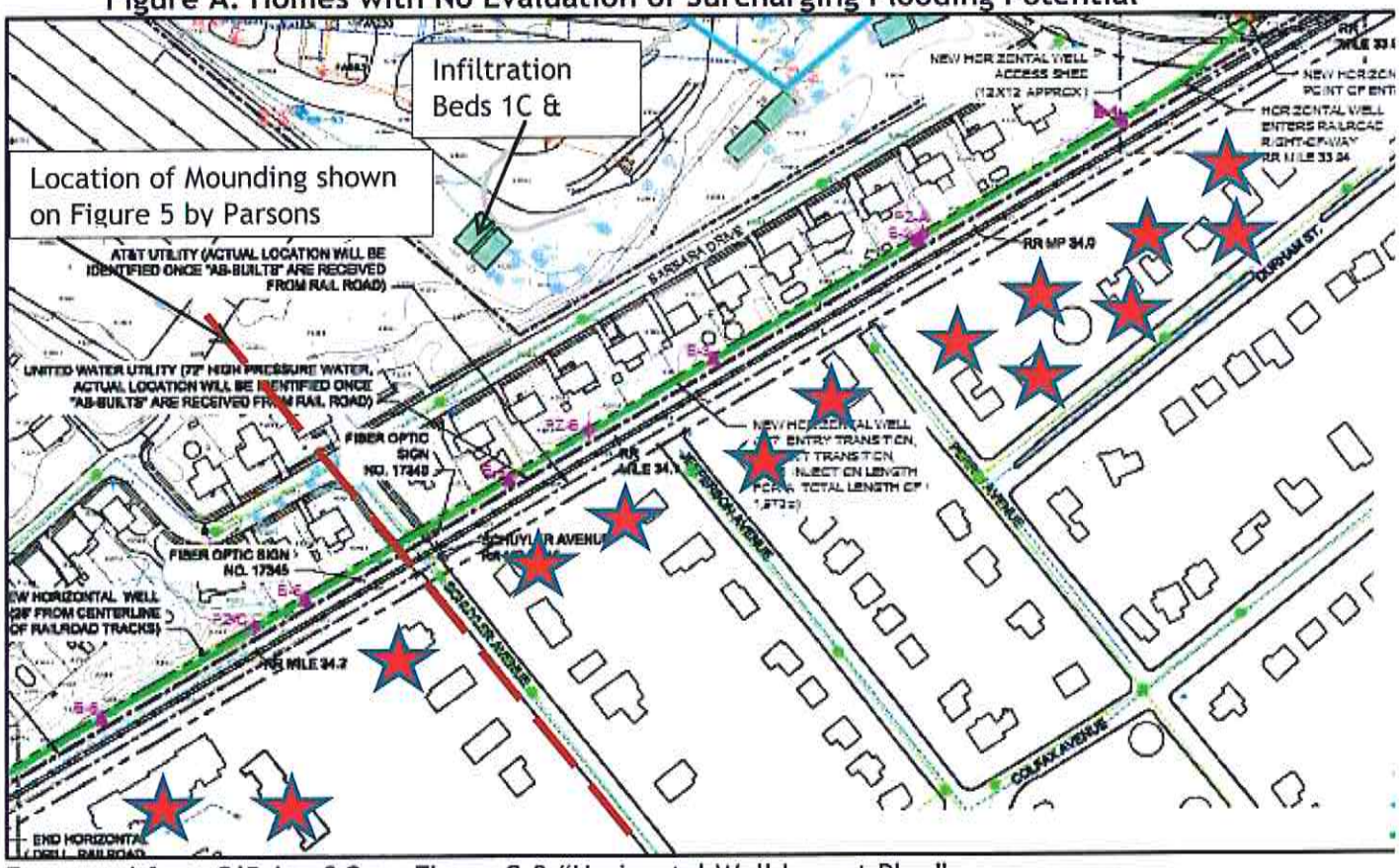
There are a number of homes along Barbara Drive and Walnut Street that are believed to have existing sumps; the presence of existing sumps indicates potential basement flooding under existing conditions, without the horizontal well.

➢ Response: The presence of sumps is not necessarily an indication of potential basement flooding *from the water table*. Water level data collected since the inception of the GWET system have not shown groundwater elevations above basement bottoms.

1. An inventory of homes with existing sumps must be conducted and that data included in the revised IWP.

➢ Response: It is unclear as to what this information would provide as it relates to the overall pilot study. The key information would be basement depths relative to water table elevation.

Figure A: Homes with No Evaluation of Surcharging Flooding Potential



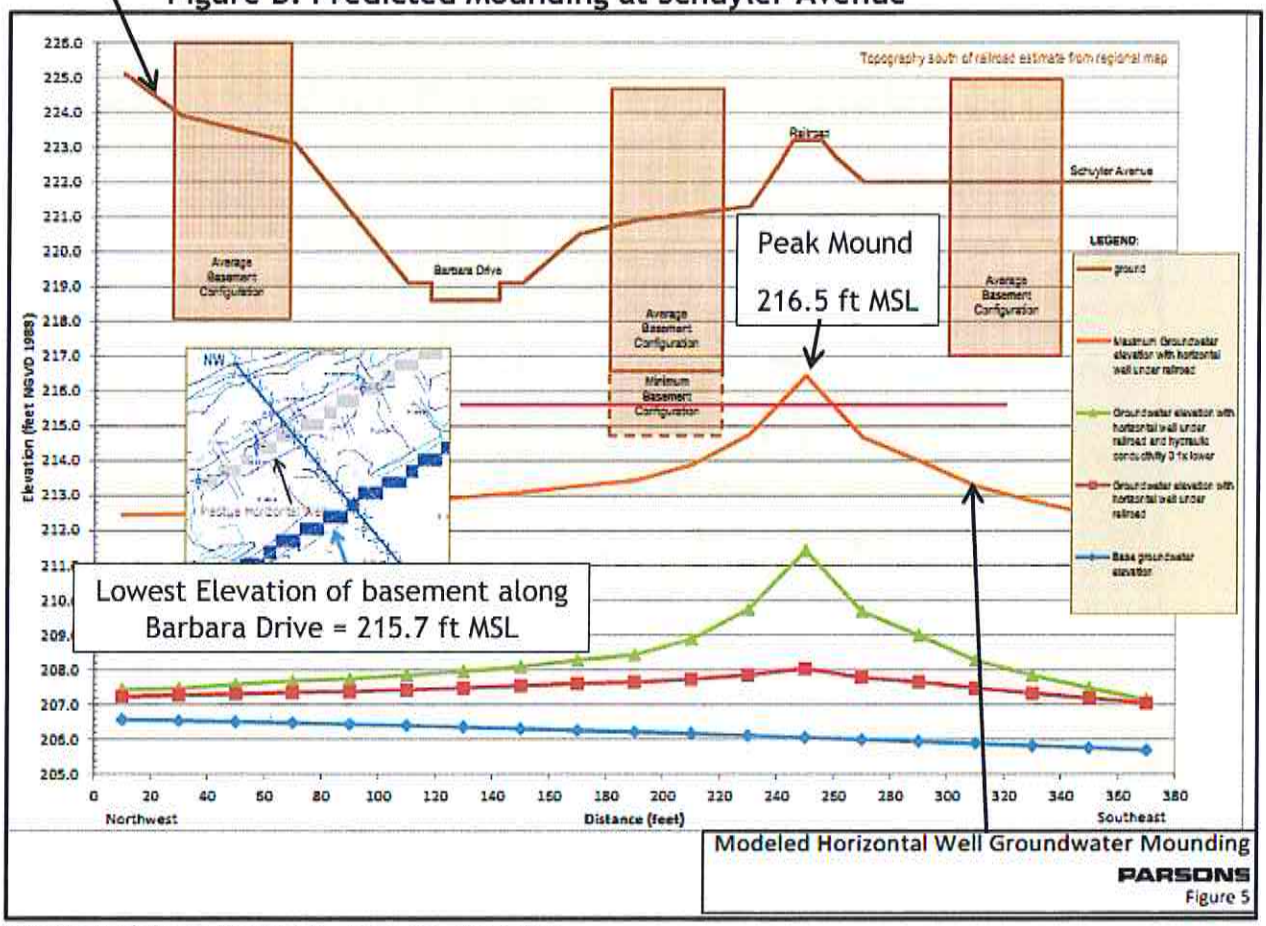
Excerpted from O'Brien &Gere Figure G-2 "Horizontal Well Layout Plan"

= Homes with No Evaluation

- Response: These homes were included in the evaluation.

Ground surface elevation. This is variable.

Figure B: Predicted Mounding at Schuyler Avenue



Excerpted from Figure 5, *June 28, 2013 IWP*

➢ Response: The 'Lowest Elevation of basement along Barbara Drive', as shown on the figure, is 214.7 feet. The actual groundwater mound is not flat, but slopes away from the horizontal well as the orange-brown and green lines on the cross-section show.

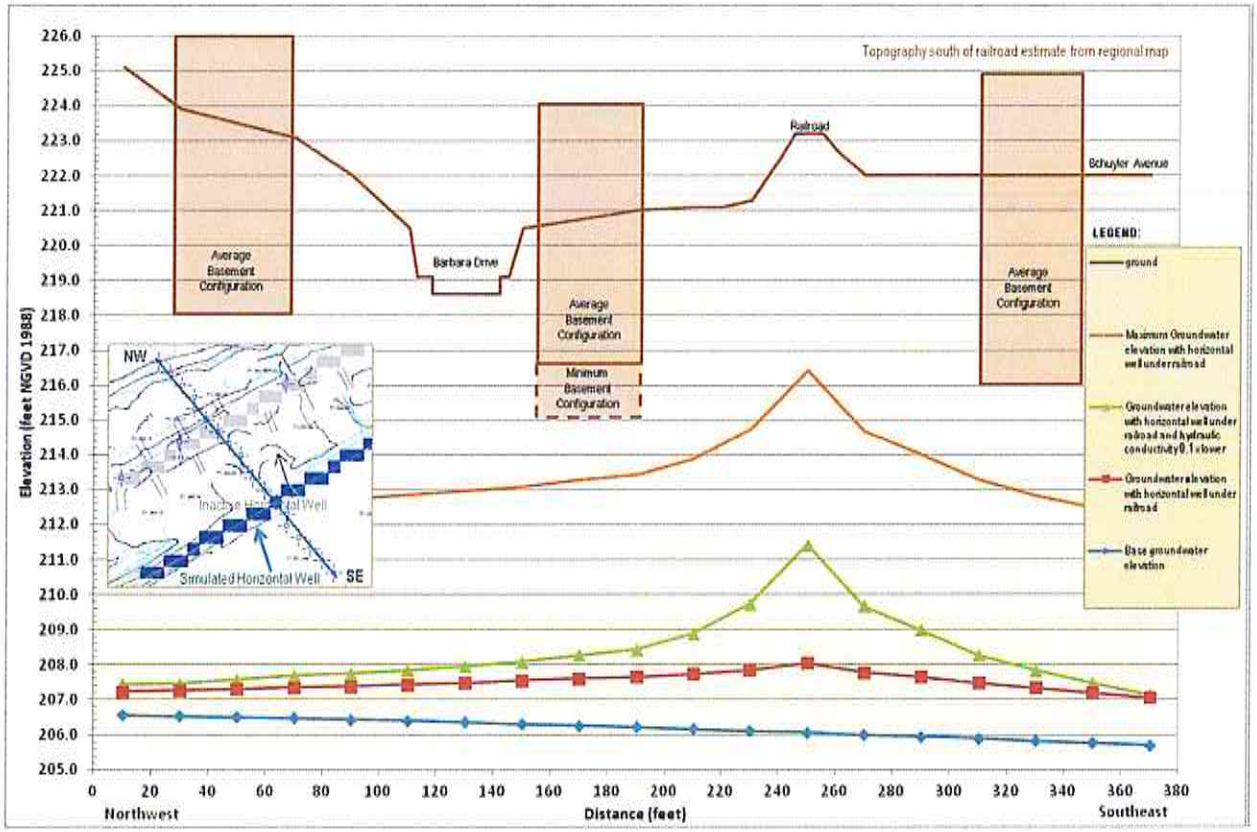
Based on their modeling, the At Risk Barbara Drive homes and their basement elevations are

12 [216.2 ft MSL]; #18 [215.7 ft MSL]; #22 [216.4 ft MSL]

#34 [216.2 ft MSL]; #64 [216.3 ft MSL]; #88 [216.0 ft MSL]

Key" house# [elevation]

➢ Response: The homes referenced in the box above are approximately 70 feet away from the northern edge of the railroad, only #22 is closer at 60 feet. If the well is located along the southern portion of the rail, it would add approximately 15 feet of distance away from the well for all houses. Given this information, along with the extensive water level data collected and modeling completed, the Department is confident that there would be little risk for basement flooding. A revised figure illustrating these field conditions is shown below.



- Figure shows modeled mounds with 130 gpm flow to horizontal well and varying subsurface hydraulic conditions. Peak mound predicted to occur "...If the hydraulic conductivity of the shallow groundwater zone is lower than currently estimated, and an above average high water table exists due to higher than normal precipitation and recharge..." Those specific conditions not specified.

➢ Response: The upper line in the figure illustrates the predicted mounding using a proposed discharge rate of approximately 130 gpm and lower hydraulic conductivity range for the shallow aquifer. It also includes a 5-foot rise in the water table to represent a high water table condition.

The maximum mound is under the railroad tracks and not the houses. Predicted groundwater elevations are approximately 2 feet lower under the houses as indicated by the modeled discharge rate even assuming a 90% lower hydraulic conductivity (e.g., if currently 70 feet/day then lower estimate was 7 feet/day) then currently estimated and an abnormally high water table. This distance increases using proposed discharges and measured hydraulic conductivities and water table elevations.