



# INTERIM REMEDIAL MEASURE PILOT STUDY NEAR WELL 128

presented by  
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## Remediation Goal for Shallow Off-Site Ground Water:

- To find a remedial technology or technologies that can be successfully implemented to clean-up the shallow ground water contamination that has migrated off the DuPont site to the Ground Water Quality Standards





## Steps Necessary to Implement the Pilot Study

- **Stratigraphic study** – completed and report submitted 10/27/10
- **Ground Water Flow Study** – proposed in 11/9/10 IRM Workplan
- **Pilot Study Operation Plan** – to be submitted in August, 2011 – This plan will have the detailed description of the pilot study implementation.





# Stratigraphic Study

- Depth of each aquifer zone
- Detailed stratigraphy
- Approximate concentrations of volatile organic compounds (VOCs) with depth





Aquifer

Depth

Stratigraphy

VOC con.

Aquifer	Depth	Stratigraphy	VOC con.
Shallow Aquifer Zone	7-38 feet below ground surface (bgs.)	Course – medium grained sand, some gravel	VOCs < 50 ppb
Intermed. Aquifer Zone	38-78 feet bgs.	Fine-medium grained sand	VOCs 100 - > 1000 ppb
Deep Aquifer Zone	> 78 feet bgs.	Fine sand, silt	VOCs <2 ppb





## Based on the Contaminant Distribution:

- The pilot study will be in the 40 foot thick intermediate zone.
- Being conservative by conducting the pilot test in the intermediate aquifer zone. No vapors will be generated from the pilot study, since there is about 30 feet of water above the zone where the pilot study will be conducted.





## Purpose of Ground Water Flow Study

- The Ground Water Flow Study is a proposal for ground water flow testing in the area of well 128I.
- This study **is not** a detailed description of the implementation of the pilot study.





# Ground water Flow Study

- Determine the hydraulic conductivity, which is the ability of an aquifer to transmit water, in the vicinity of the injection wells.
  - This is important because the ground water will flow more easily in the zones of higher hydraulic conductivity.
  - By identifying these zones, DuPont will be able to determine the rate and amount of amendments to add to the different zones so that the pilot test proceeds efficiently.







# Ground Water Flow Study

- Determine at what pumping rate the ground water can be withdrawn from the aquifer in the upper and lower screened intervals
  - This will be used to ensure delivery of the amendments to the entire aquifer thickness





# Ground Water Flow Study

- A tracer test will be performed to determine the flow path the water will take from the injection wells to the extraction wells.
  - Based on these results, the location of monitoring wells and the soil gas probe will be determined so that the progress of the remediation can be monitored





# Ground Water Flow Study

- Based on the results of the above tests, a ground water model will be developed. This model will be used to simulate the pilot study and determine the optimum operational parameters including the injection rates, extraction rates, and timing of amendment additions.





# Results of the Ground Water Flow Study and Analysis

- Determine the optimum locations for the monitoring wells and the soil gas probe to monitor the progress of the chemical reaction during the pilot test.
- Determine the operational parameters for the pilot test including:
  - Injection rates, extraction rates, timing of injection and extraction periods, concentration of the amendments to be added to the system





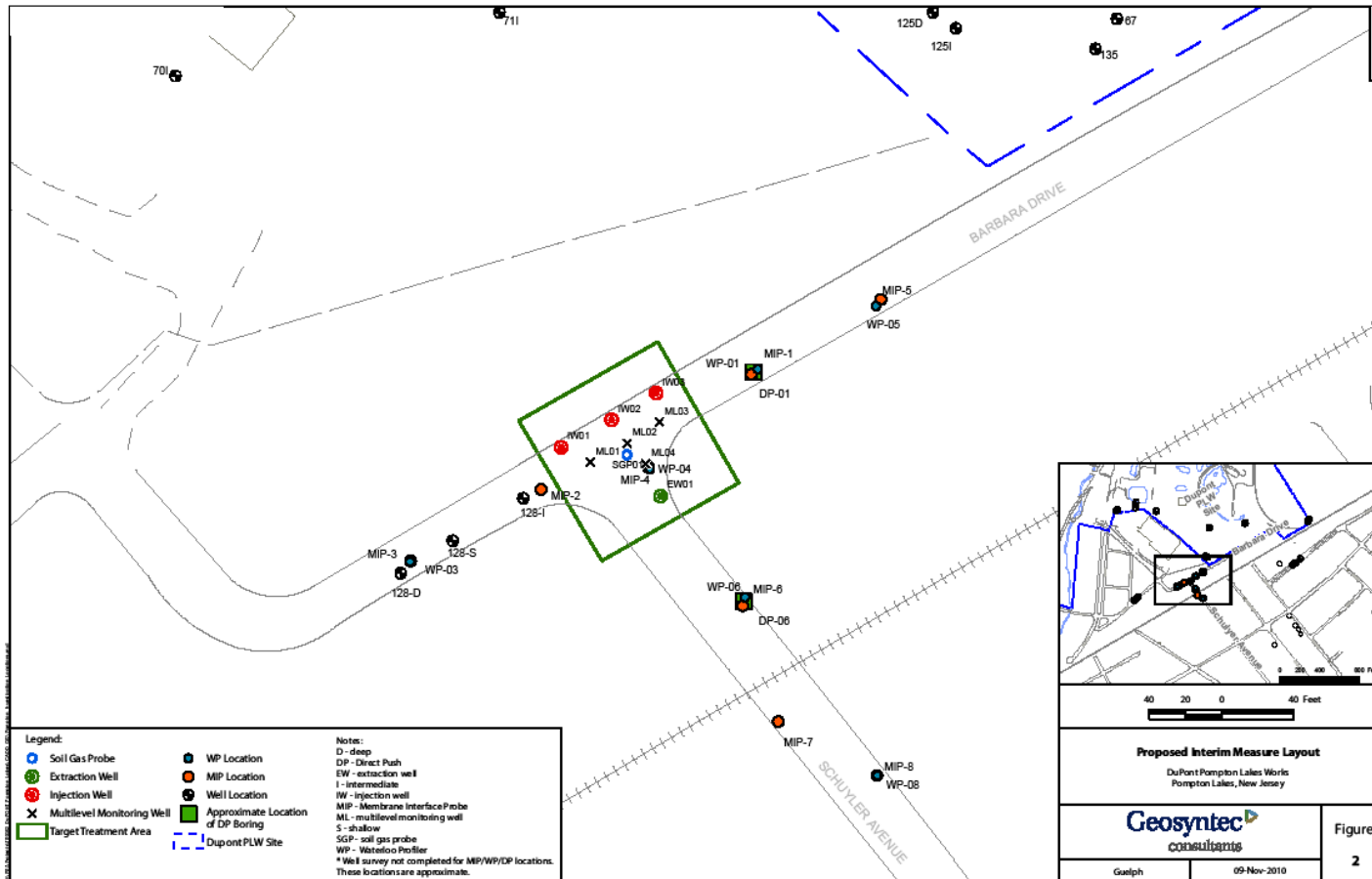
## Target Treatment Area (TTA)

- The TTA is a recirculation cell which will be built at the intersection of Barbara and Schuyler Avenues.
- The cell will have:
  - 3 injection wells with 2 screened intervals
  - 1 extraction well with 2 screened intervals
  - 4 monitoring wells with 7 screened intervals
  - 1 soil gas probe





# Target Treatment Cell





# Permits

- Permit to work in street – local
- Well installation permit – state
- Re-injection permit – state





# Schedule

- Ground Water Flow Study will take about 6 months to complete from agency approval







## Goal of the Pilot Study

- To show through implementation of the pilot study, that Enhanced Anaerobic Bioremediation is capable of reducing the contaminant concentrations in ground water to the Ground Water Quality Standards





# Chemical Reaction

- Tetrachloroethene → Trichloroethene > Cis- 1,2 Dichloroethene → Vinyl Chloride → ethene → ethane
- Naturally occurring bacteria control the reaction. An electron donor is added to feed the bacteria.





# Enhanced Anaerobic Bioremediation Amendments

- Electron Donor
  - Lactate – fast acting
  - Emulsified Vegetable Oil – slow acting
- Bacteria
  - KB-1, which is a consortium of naturally occurring bacteria. This will insure that the reaction goes to completion.





## Conceptual Pilot Study

- The timing and rate of amendment addition will be based on the results of the stratigraphic characterization done in 2010, the ground water flow study and ground water modeling to be performed.





# Conceptual Pilot Study

- Possible scenario
  - During the first week of the month, the electron donor will be injected each morning, then there will be re-circulation of water the rest of the day.
  - During the second week of the month, the KB-1 bacteria will be injected each morning, then there will be re-circulation the rest of the day.





## Conceptual Pilot Study

- The purpose of the re-circulation is to inject enough water into the system, so that the amendments flow away from the injection wells and into the circulation system, so that more amendments can be added.
- DuPont's proposal is to operate the pilot test for 6 months.





## Path Forward

- Completion of the Ground Water Flow Study will result in a detailed operation plan for the pilot study. Expected submittal date - August, 2011.
- To show that enhanced anaerobic bioremediation is effective in remediating the off-site plume.
- Evaluate the potential to expand the system to other areas of the off-site plume.



