

April 29, 2011

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Mr. Chris Saari Hydrogeologist Northern Region Remediation and Redevelopment State of Wisconsin Department of Natural Resources Ashland Service Center 2501 Golf Course Road Ashland, Wisconsin 54806



Re:

**Summary of 2009-2010 Site Activities** 

Former DuPont Barksdale Explosives Plant BRRTS No. 02-0400156 and DuPont Barksdale Southern Area (BRRTS 02-04550402)

Dear Mr. Saari:

This letter summarizes the work scope completed during the 2009 and 2010 field seasons at the Former DuPont Barksdale Works (Figure 1) as discussed with you over several conversations and interactions at public and private meetings throughout the past two years. The site characterization efforts conducted during this fieldwork period (i.e., between June 2009 and September 2010) included:

- Broad-scale surficial soil characterization
- Biased soil sampling (surficial and at depth)
- Subsurface characterization via trench excavation
- Waste and select debris removal and disposal

In addition to these investigative efforts, DuPont continued the pilot scale efforts associated with understanding the mechanisms for biodegradation of site-related constituents in soil. The scope of work related to each of these efforts is summarized in the following paragraphs.

## **Broad-Scale Surficial Soil Characterization**

As you are aware, DuPont has been employing micro-incremental (MI) sampling and FIDO screening techniques to characterize the distribution of site-related constituents (i.e., nitraromatic and nitramine organic compounds) on a broad scale in areas where site decommissioning and/or releases during production have resulted in small particles of solid residual product or high dissolved residual concentrations of site-related constituents in soil. The intent of the characterization was to identify areas where residual product was present, if any, and to document areas where site-related organic compounds are not present for consideration for potential future recreational use by the site owner. The current allowable use of each of the areas that comprise the site are shown on Figure 2 (valid through August 2011) These allowable use areas are updated

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by DuPont based on recent investigation results and communicated to the site owner annually.

In 2009, surficial soil characterization efforts using a combination of MI and FIDO techniques were conducted in previously uncharacterized portions of the following areas (see Figure 3):

- Production Lines TNT07-TNT10, (7.1-acres in Use Area PAH);
- Production Lines TNX01- TNX05 (14.6-acres in Use Area PAI);
- Refined Triton Plant (8.3-acres in Use Area PAJ);
- Support buildings and grounds in TNT02-TNT04 (1.8-acres in Use Area PAB);
- Trivelene Lines TRV01-TRV03 (7.8-acres in Use Area PAC);
- Ammonium Nitrate plant building site (1-acre in Use Area PAQ);
- Burning Ground waste site (1.2-acres in Use Area WAA/UAE); and
- Nitramon Plant DNT storage tank site (0.1-acre in PAN).

MI soil samples for FIDO screening in 2009 were collected from approximately 681 locations across the above areas. As a verification of the screening results, split samples were collected and submitted for laboratory confirmation at 10% of the screening locations.

In 2010, MI work extended and added resolution to the map in the following areas where detections were made in 2009.

- Production Lines TNT07-TNT10, (1.1-acres refined in Use Area PAH);
- Production Lines TNX01- TNX05 (5.7-acres added and 1.25-acres refined in Use Area PAI);
- Refined Triton Plant (1.3-acres added and 0.2-acres refined in Use Area PAJ);
- Powder Line (1-acre added in PAM) and
- Support buildings and grounds in TNT02-TNT04 (6.3-acres added in Use Area PAB).

This fieldwork period's testing brings the total surficial FIDO screening effort to 1934 tests covering about 108-acres of the site surface.

In addition to the broad scale surficial soil characterization using the MI and FIDO techniques, more focused surficial soil characterization efforts were undertaken in locations where arsenic and lead were previously identified as the primary constituents of potential interest (COPIs). The focus of these efforts was to refine DuPont's understanding of the distribution of arsenic and lead impacts in support of designating land use areas as acceptable for recreational use by the landowner. X-ray fluorescence (XRF) equipment was utilized to determine the concentration of arsenic and lead in these

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areas and split samples were submitted for laboratory confirmation for 10% of the locations.

In 2009, arsenic and lead mapping was conducted in the following areas (see Figure 4):

- The Burning Ground (1.2-acres in WAA/SAC);
- The Old Burning Ground Road (2.1-acres in UAE);
- The Shell House Siding and Lumber Shed (1.5-acres in PAL and SAE)
- The Boiler Shop (1.8-acres in SAE & UAG)
- The Oil Distributor Building site in the Former office area (0.5-acres in SAE); and
- The Nitramon Loop / Bridge Road intersection (0.6-acres in SAC, UAE, PAN and PAM).

Soil samples for XRF screening were collected from approximately 695 locations across the above areas in 2009.

2010 work focused on refining detections within the 2009 locations as well as initiating the following additional sites

- The OV01 Plant (2.9-acres in PAR)
- The Lead Melt House (2.1-acres in PAK); and
- The Nitre Cake Ditch (0.1-acres in UAK)

This season's testing brings the total XRF screening effort to 2554 tests covering about 13-acres of the site surface.

#### **Biased Sampling**

Biased sampling (see Figure 5) was conducted in 2009 to:

- Characterize surface soil in selected traffic areas;
- Characterize soil at depth in areas where residual solid product had been previously removed;
- Understand the distribution of residual solid product within a former process drainage ditch;
- Evaluate air-borne concentrations of DNT in the vicinity of identified product removal sites;
- Evaluate potential leakage from a former pipeline;
- Continue the surface water and sediment monitoring program; and
- Understand the distribution of site-related constituents in the subsurface where site related compounds have been previously reported at the surface by the analytical laboratory.

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# In 2010 biased sampling was conducted to:

- Characterize soil at depth below the former process drainage ditch (characterized in 2009) following TNT removal;
- Extend sediment sampling to evaluate source contributions; and
- Understand the horizontal distribution of site-related constituents in the subsurface where site related compounds have been previously detected at the depth by the 2009 sampling.

In Use Areas PAT, SAG and PAE, biased soil samples were collected in 2009 from 0 to 2-ft below ground surface (bgs) using a hand auger to characterize the surface of the Acid Loop Road. These samples were collected as 5-point composites every 100 feet along the Acid Loop Rd from the Main Drive 1,800-ft northeast to the east edge of PAT. These samples were analyzed for arsenic and lead.

In each of eight areas where subsurface residual product had been previously removed, a GeoProbe® was used in 2009 to obtain depth-discrete soil samples for analysis by an independent analytical laboratory. Each soil core recovered was lithologically described and field screened using FIDO and Expray techniques across the entire sample interval to the total depth of the boring. Upon completion of the boring, the field screening results were reviewed and one sample was submitted to the analytical laboratory from the interval that had the highest field screening results, and one sample was submitted from the first interval below the former product "layer" that was observed to be non-detect based on field screening results. A single 20 foot boring was placed at each of the following locations:

- Use Area PAC TRV01 Sweating House floor drains
- Use Area PAC TRV01 Nitrating House Catch Box
- Use Area PAC TRV02 Wash House Catch Box
- Use Area PAC TRV02 Sweating House floor drains
- Use Area PAC TRV03 Sweating House floor drains
- Use Area PAD TNT06 Box House Catch Box
- Use Area PAH TNT09 Box House Catch Box
- Use Area PAJ The Refined Triton central Catch Box

At the drainage ditch associated with the Refined Triton Plant (Use Area PAJ), GeoProbe® samples were collected at 3-point cross-sections (boreholes were advanced at the channel center and at 4 feet to either side of the center), every 50-ft, for the first 300 feet of the ditch (beginning at the refined Triton catch box). Borings located within the ditch were advanced to 8 feet bgs, while borings placed outside of the channel were advanced to 4 feet bgs. At each boring location the drainage channel was exposed by hand excavation and the product removed prior to advancing the center borehole. Each soil core recovered was lithologically described and field screened using FIDO and

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Expray techniques across the entire sample interval to the total depth of the boring. Upon completion of the boring, the field screening results were reviewed and one sample was submitted to the analytical laboratory from the interval that had the highest field screening results, and one sample was submitted from the first interval below the former product "layer" that was observed to be non-detect based on field screening results. Following removal of the layer via trenching in 2010 (see "Waste Recovery, Waste Handling, and Disposal" below), samples were collected about every 25 ft from native soils 0 to 3 and 6 to 12 inches below the former waste mass to evaluate residual soil concentrations left following hand removal of visible product.

Air monitoring was conducted in 2009 at three locations where solid DNT had been identified for removal and soils were scheduled for subsequent bio-pilot testing (the former DNT Skid Storage Area in PAL, the Trivelene No. 2 Wash House in PAC and Trivelene No. 3 Sweating House in PAC). Monitoring was conducted at each location by certified industrial hygienists employed by URS. The hygienists collected time-composite samples at the breathing zone and ground surface during weather conditions representative of the anticipated work season. Samples were analyzed for DNT isomers at Bureau Veritas laboratories. No DNT was detected at any of the sampled locations. Since DNT odors were reported during several of the sampling events, it appears that the odor threshold of DNT is below the 0.38 to 1.1-mg/m³ detection limit range of the tests.

In PAM, staff conducted visual and magnetometer mapping of the reported former aboveground DNT pipeline between the rail car off-loading station in PAN and the Dynamite Mix area in western PAM. 2100–ft of former main pipeline and one 145-ft side branch were identified. In most cases, the pipes had been removed but evidence provided by posts, dropped pipe segments and discarded hanger straps served to locate the former line. FIDO screening of the ground surface was conducted within 5- to 10-ft of identified bends or branch points and at 20-ft intervals along the path of the former pipeline. No areas of nitramine residuals were detected by this 2009 screening. Pipe wrap was observed on a few pipe segments and on the ground surface around several hanger posts. Removal of this asbestos containing material is discussed under waste removal below.

At areas where subsurface impacts have been identified but no product was encountered, borings were advanced after surface impact mapping was completed. Samples were collected to 20-ft bgs at the site of the highest impact mapped and to 8-ft bgs at the edges of the impact zone in the cardinal directions. Cores from borings were geologically logged and screened via FIDO and Expray across the full depth. At the center location one sample was submitted from the highest screened depth and one from the first non-detect depth below the impacted zone. At perimeter points a single sample, from a depth representative of the screening range, was submitted. Locations of this work in 2009 were:

- The Ammonium Nitrate Plant in PAQ;
- The DNT Tank in PAN; and

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• The Refined Triton Drainage ponded area in PAJ.

In 2010 similar work was completed at

- The Lydol Melt House in PAM (PAM089-PAM092);
- TNX04 Mono/Binitration House in PAI (PAI108-PAI110)
- A former pipeline in TNX02 (PAI017)
- TNX01 Neutralization House in PAI (PAI103-PAI106)
- TNT08 TNT10 Graining Houses in PAH (PAH100-PAH102) and
- A drainage channel between TNT09 and TNT10 in PAH (PAH103)

At the site of reported mononitrotoluene spills during rail car off loading near the Nitramon Change House in Use Area WAF, 8 Geoprobe® borings were sited along the axes of a 20-ft spaced grid in 2009. Six of these were advanced to a depth of 4-ft bgs. At two locations, a low point near a former drain and a low spot at the east edge of the former rail grade, the borings were advanced to 20-ft bgs. Soil recovered from the borings was lithologically logged then screened using Expray and FIDO techniques. Samples were selected from the interval with the highest screening result or from the bottom of the borehole if nothing was detected by screening. In 2010, fourteen additional borings were added in this area extending the sampling along the rail corridor to the northeast and along a tributary of the Nitramon Drainage to the east.

At two buildings within Use Areas PAP and PAM, NG was previously reported in soil samples by the analytical laboratory. To further characterize the distribution of NG in these areas, soil borings were advanced in 2009 at each building using remotely operated GeoProbe® equipment. Soil obtained from these borings was lithologically logged and screened via Expray across the entire boring depth. One soil sample was submitted from each boring at the interval indicating the highest field screening result. Locations of this work were:

- PAP Nitro Cotton Dry House (15 borings on a 20-ft grid, 13 to 4-ft and 2 to 8-ft bgs);
- PAM Dynamite Mix House #2 (nine 8-ft borings near former operational features)

Surface water samples were collected at 7 locations in 2009. Each of the twelve perimeter locations that had been sampled in prior events were accessed and (if water was present) sampled for nitramine, metallic, volatile and semi-volatile constituents. Sediment traps were also installed but due to the low rainfall between July and October, 10 of the 12 traps did not collect significant sediment and all 12 were therefore left in place to collect material over the winter. Locations where water was present and sampled in 2009 were:

- SWA001 Nolander Road West Drainage;
- SWB001 Nolander Road Central Drainage;

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- SWB001 Nolander Road East Drainage;
- SWE001 Front Gate Drainage;
- SWF001 Central Drainage;
- SWI001 Boyd Creek; and
- SWK001 Missions Springs Creek.

In 2010 additional sediment samples were collected in the following drainages (Figure 6) to refine understanding of residual concentrations:

- SWF049-SWF051 Central Drainage between Substation Drainage and Boyd Creek;
- SWG000 Substation Drainage prior to confluence with Central Drainage;
- SWH000 Nitramon Drainage prior to confluence with Central Drainage; and
- SWI000 Boyd Creek east of Highway 13 prior to confluence with Central Drainage.

Soil borings were advanced at locations where arsenic or lead had previously been detected near the ground surface. These borings were advanced to 20-ft bgs and screened across the full depth using XRF techniques. Samples from the first interval without detections were submitted for laboratory confirmation of the bottom depth of the detected metals. The locations of this work in 2009 were:

- SAE Boiler Shop (SAE004);
- WAC Old Burning Ground Road (WAC013);
- WAG the former demolition waste area or 1970 Berm (WAG001);
- SAA three former magazine sites (SAA009, SAA025, and SSI05-SB009); and
- PAM Box House #3 (PAM006).

Based on 2009 surface mapping additional borings were advanced in 2010 at the following locations

- SAE Boiler Shop (SAE005 SAE008);
- PAL Shell House Rail Siding (PAL023-PAL024)
- UAE Old Burning Ground Road (UAE015 and UAE016);
- WAA Burning Ground (WAA013);
- SAA three former magazine sites (SAA009, SAA025, and SSI05-SB009); and
- PAK Lead Melt House (PAK0).

## Waste Recovery, Waste Handling, and Disposal

Wastes recovered and disposed of during the fieldwork period included asbestos and residual solid nitroaromatic and nitramine organic product (i.e., DNT and TNT). Additionally, selected demolition debris, consisting of residual wood and clay drainage pipe were also collected from the Former Barksdale Works and disposed of by DuPont.

In late spring 2009, DuPont representatives mapped suspected asbestos containing materials (i.e., building materials and pipe wrap residues) at the nitroglycerin (NG) nitration buildings located in Use Area PAO and along a former DNT pipeline from the storage tank in the Nitramon Plant in PAN to the DNT Heater House in Use Area PAM (Figure 7). Suspect ACM was confirmed by licensed URS inspectors; and the confirmed ACM materials were collected by licensed subcontractors then containerized in 55-gal drums. In September 2009, the approximately 25-cubic feet of identified ACM located in PAM was containerized. An additional 18-cubic feet was collected from the PAO locations as well as scattered surface locations observed in PAC and WAF in September 2010. Drums containing the ACM were labeled, inventoried, and then staged at the onsite non-hazardous waste pad until transportation to the offsite disposal facility was available.

DuPont removed residual solid DNT and TNT product in 2009 from several previously identified locations in conjunction with soil characterization via test trenches (Figure 8). Subcontractors mechanically unearthed the buried product then staff mapped the configuration of deposits prior to hand loading solid product residues into transfer containers. The work locations and amounts recovered are listed below:

- Use Area PAB TNT02 Neutralization House (5-lbs TNT)
- Use Area PAB TNT02 Bi/Trinitration House (2-lbs TNT)
- Use Area PAC TRV01 Nitrating House (255-lbs DNT)
- Use Area PAC TRV01 Box House (no DNT found)
- Use Area PAC TRV02 Sweating House (562-lbs DNT)
- Use Area PAC TRV02 Wash House (820-lbs DNT)
- Use Area PAC TRV02 Nitrating House (no DNT found)
- Use Area PAC TRV03 Sweating House (306-lbs DNT)
- Use Area PAD TNT06 Box House (1130-lbs soil containing about 374-lbs TNT)
- Use Area PAH TNT09 Box House Catch Box (64-lbs TNT)
- Use Area PAJ Refined Triton Drainage (1420-lbs soil containing about 470-lbs TNT); and

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> Use Area PAL – DNT Skid Storage Area (35-tons of waste containing about 118lbs of TNT, 596-lbs of DNT and 430-lbs of nitrated xylenes in a soil, water and debris matrix.)

In 2010, DuPont's residual TNT removal actions focused on the Refined Triton Drainage, an area proposed for addition to the Biopilot Study in 2011. To remove potential explosion hazards during future tilling, crews removed near surface solid product identified by 2009 geoprobe and trench work within the Refined Triton Plant's central catch box and ditch system. The materials were located within a 15-inch wide, ditch that had previously been confined by wooden sidewalls. Crews first stripped off 2 to 18" of sloughed topsoil and forest detritus that had accumulated above the former ditch during the 92-year period since operations ceased in this area. These overburden materials were originally slated for test treatment via bioremediation, however WDNR's recent policy change regarding handling of impacted materials during investigatory activities resulted in containerization and off site thermal treatment of approximately 32,000 lbs of this material. The underlying combination of TNT and ditch sediment, totaling about 25,037–lbs and containing an estimated 6,575–lbs of solid TNT, was hand loaded to transfer containers.

The total product removed from the Former Barksdale Works to date (including incidental product entrained in decontamination waste streams) is estimated as follows:

Year	TNT (lbs)	DNT (lbs)	DNX (lbs)	Water (gal)	Debris (tons)	Soil (tons)
2010	7,523	221	6	3,719	3.0	19.0
2009	1,066	2,577	430	1,547	23.3	27.2
2008	489	686	0	1,426	0.2	2.2
2007	547	3	0	2,728	0.2	2.0
2006	463	6	0	3,708	0.4	5.5
2005	455	1	0	2,211	0.0	0.9
2004	305	0	0	2,839	0.0	0.2
To Date	10,484	3,494	436	18,178	27	57

As in the past, all residual product and nitramine contaminated soil was appropriately containerized and shipped off site for subsequent incineration by Veolia ES Technical Solutions in Sauget, IL. Decontamination water was treated by carbon absorption and disposed at the City of Superior Waste Water Treatment Plant.

In addition to residual solid product removal actions, debris consisting of wood and clay drainage pipe was also removed from several areas for off site disposal. The wood removed was primarily associated with construction of drain flumes and catch boxes in site buildings, while the clay drainage pipe was used to convey liquids from buildings (as either floor drain pipe or process sewer). Both of these materials were characterized at

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several work locations and found to contain up to percentage levels of site-related constituents.

Process impacted wood was removed from the following product removal locations (Figure 8) in 2009:

- Use Area PAB TNT02 Neutralization House
- Use Area PAC TRV02 Sweating House
- Use Area PAC TRV02 Wash House
- Use Area PAC TRV03 Sweating House
- Use Area PAD TNT06 Box House Catch Box; and
- Use Area PAH TNT09 Box House Catch Box

Process impacted wood was also recovered from trenches associated with delineation of, and preparations for bio remediation testing at the Refine Triton Plant central catch box system in 2010.

Process impacted tile was removed from the following product removal locations (Figure 8) in 2009:

- Use Area PAC TNT02 Nitrating House
- Use Area PAC TRV02 Sweating House
- Use Area PAC TRV02 Wash House; and
- Use Area PAC TRV03 Sweating House

As with the residual solid product, debris removed was appropriately containerized and shipped off site for subsequent incineration. In total approximately 16,000 pounds of wood, and 24,000 pounds of clay drainage pipe was shipped to Veolia ES Technical Solutions in Sauget, IL. Manifests for *all* waste disposed are maintained in DuPont's files and can be made available for review upon request.

## **Bio-Pilot Activities**

In 2009 eight new bio-pilot test cells were constructed at the following areas:

- C08 Use Area PAC TRV01 Nitrating House;
- C09 Use Area PAC TRV01 Box House;
- C10 Use Area PAC TRV02 Sweating House;
- C11 Use Area PAC TRV02 Nitrating House;
- C12 Use Area PAC TRV02 Wash House;
- C13 Use Area PAC TRV03 Sweating House;
- C14 Use Area PAB TNT02 Bi/Trinitration House; and

• C15 - Use Area PAB - TNT02 Neutralization House.

These sites were added to the existing tilling and sampling program to provide data on degradation of differing mixes of site related compounds. These new cells, as well as the pre-existing seven test cells, were tilled monthly from June through September. The cells were sampled biweekly for soil indicator parameters as well as at season start and end for nitramine compounds. The data collected is being analyzed for temporal trends as part of the ongoing site bio-attenuation study.

In 2010, DuPont installed erosion controls and removed residual product at three proposed bioremediation test sites:

- Proposed C16 Use Area PAJ Refined Triton Ditch System (an area of low concentration TNT impacts in sandy soils);
- Proposed C17 Use Area PAL Upper Dynamite Line Skid Storage Area (an area of high concentration mixed DNX, DNT and TNT impacts);
- Proposed C18 Use Area PAM Lydol Melting House (a low concentration mixed DNT and DNX release site situated in sandy soil); and

As of the end of the 2010 field season bioremediation testing has not been initiated in these areas. DuPont plans to discuss our understanding of the ongoing biopilot program with WDNR prior to entering these sites into the program in 2011.

Should you have any questions or comments, please do not hesitate to call me at (812) 923-1136.

Sincerely,

Bradley S. Nave

**DuPont Project Director** 

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