TECHNICAL BRIEFING – DRAFT FINAL LETTER REPORT
300 MARSH AREA – MARCH 2014

The document reviewed was a letter report describing a site inspection level investigation performed at the 300 Marsh Area.

Site Background

The 300 Marsh Area is a densely vegetated wetland comprising 4.6 acres; that area is part of a larger 21-acre deciduous wooded wetland located east of Green Pond Brook (GPB). A bridge at the southern edge of the Former DRMO Yard leads to the site. The site was identified from air photos. Originally the GPB had an oxbow, a prominent bend resembling a half circle that encompassed the Marsh Area (seen on 1931 air photo); the oxbox was eventually "cut off" and a straight channel formed that bypassed the Marsh Area (seen on 1941 air photo). It was reported that munitions and explosives of concern (MEC) were found in the banks of GPB near or adjacent to the Former DRMO Yard. The site was the subject of investigation because it was believed that there was the potential for activities conducted in GPB and at the Former DRMO Yard to have affected the 300 Marsh Area.

A remedial action has been completed at the Former DRMO Yard resulting in most of the yard area being paved. There are three buildings at the Former DRMO Yard – their use is unknown. Prior to development of the yard site, the area was a lowlying marsh. In 1926 after the catastrophic explosion triggered by lightning at one of the Navy's munitions depots, the area was suspected to have been filled with explosion debris. From the 1920s to the 1940s part of the yard area was used as a burning ground for smokeless powder and TNT. From 1955 to 1988 the Former DRMO Yard was used for storage, for disposal, salvage, and sale of excess materials, transformers, vehicles, scrap metal, batteries and office equipment.

Previous Investigation

The Former DRMO Yard and GPB have been the subject of numerous investigations – as part of both Installation Restoration Program (IRP) and Military Munitions Response Program (MMRP) efforts. The contaminants of concern (COCs) for the Former DRMO Yard include the following: metals (eight metals), polyaromatic hydrocarbons ([PAHs] eight compounds), polychlorinated biphenyls ([PCBs] three

compounds), explosives (1 compound), and dioxins (1 compound). Of the sampling related to the Former DRMO Yard three soil samples were from the eastern bank of GPB adjacent to the 300 Marsh Area – two samples were collected from test pits in 1993 and one surface soil sample was collected in 2003.

The 1993 samples were part of a non-time critical removal action. Samples were either grab samples or composites. The test pit sample from Test Pit O was only analyzed for metals and explosives. This sample was described as "…a surface grab sample collected from a disturbed area along the bank of Green Pond Brook"; several metals exceeding Levels of Concern (LOC) and nitrocellulose (compound does not have an LOC) were detected. The other sample, from Test Pit N, was analyzed for volatile organic compounds (VOCs), semi-VOCs, explosives, metals, PCBs, and total petroleum hydrocarbons (TPH). There were either no detections or no detections above LOCs for VOCs, SVOCs, PCBs, and TPH. One explosive, nitrocellulose, and two metals (copper and zinc) were detected at concentrations above LOCs.

The 2003 sample was a surface soil sample from a disturbed area along the eastern bank of GPB within the 300 Marsh Area; it was analyzed for metals. Numerous metals were detected in exceedance of LOCs.

GPB was the subject of extensive investigation as part of the IRP. The brook was broken into four regions for the purpose of investigation; Region 2 contains the 300 Marsh Area. The COCs for Region 2 includes PAHs, PCBs, explosives, and copper. Only copper was identified in the area near the Former DRMO Yard; other COCs were found in a sample from a swale leading to GPB.

The Green Pond Munitions Response Site (MRS) is one of the MMRP sites at Picatinny Arsenal. During the 2012 MMRP Remedial Investigation (RI) at the Former DRMO Yard geophysical investigation was conducted on the banks along the stream. Four hundred anomalies were detected. Intrusive investigation of the anomalies revealed munitions debris (MD) at four locations in GPB adjacent to the 300 Marsh Area.

Two soil samples – one each from the northernmost and southernmost MD locations – were collected for analysis of metals, PCBs, SVOCs, and explosives. Antimony, arsenic, barium, beryllium, copper, lead, and zinc were detected at concentrations above LOCs. Of those exceedances; antimony, copper, lead, and zinc are associated with munitions known to have been used and/or that have been found at the base.

LOCs for the compounds where there was an exceedance are as follows:

- Antimony – 14 milligrams per kilogram (mg/kg)
- Arsenic – 20 mg/kg
- Barium – 700 mg/kg
- Beryllium – 2 mg/kg
- Copper – 600 mg/kg
- Lead – 400 mg/kg
- Zinc – 1,500 mg/kg
- Benzo(b)fluoranthene – 900 ug/kg

Site Investigation Tasks

The SI was completed in 2012 and 2013 in conjunction with the site-wide MMRP RI. Objectives of the SI were as follows:

- Determine presence of geophysical anomalies along the banks of GPB. If present, intrusively investigate the anomalies to determine their nature.
- Determine whether analytes were present in soil at concentrations exceeding IRP LOCs.

As part of the investigation geophysical investigation and soil sampling were performed.

Geophysical Investigation

Four locations containing MD were found in/along GPB during the MMRP RI. As part of the SI, which is the subject of this briefing, a “mag and dig operation” was completed along a 50-foot wide area adjacent to the banks of GPB within the 300 Marsh Area. Only non-munitions related metallic debris was found and no subsurface anomalies were detected.

Soil Sampling

Soil samples were collected in May 2012, July 2012, and October 2013. Samples were collected at approximately 200-foot gridded intervals. Thirteen soil samples were initially collected at a depth of 0 to 6 inches below ground surface (bgs) for analysis of metals, PCBs, SVOCs, and explosives. Arsenic was detected at concentrations above the corresponding LOC in many of the original 13 sampling locations. Also found in excess of the LOCs were lead (1 exceedance) and PAHs (2 exceedances for benzo(b)fluoranthene). Additional samples were then collected from around the exceedances for vertical and horizontal delineation of arsenic.

Only arsenic, lead, and benzo(b)fluoranthene were found above the LOCs. PCBs and explosives were either not detected or were found at concentrations below their LOCs.

Validation of the analytical data found no major deficiencies. None of the data was rejected.

Data Evaluation

Arsenic was the only analyte in the 300 Marsh Area to have been detected both above the LOC and over a "relatively widespread area." Samples at shallow depth (0 to 6 inches bgs) had the higher concentrations. The shallow occurrence of higher concentrations is interpreted as the arsenic not having high mobility within the soil column and as showing "a high degree of partitioning to the soil phase, with aqueous concentrations remaining low as water travels down through the soil." Based on the limited mobility and the concentration in the shallow soil there are "no potential exposure pathways to human and/or ecological receptors." The potential factors controlling the high capacity of arsenic in surface soil are as follows: high organic matter content, presence of sulfide minerals, and association of arsenic with iron.

A comparison of the arsenic LOC to the NJDEP Ecological Screening Criteria show that some criteria are below or close to the LOC (20 mg/kg) whereas others are above the LOC (avian receptor – 43 mg/kg; mammalian receptor – 46 mg/kg).

Arsenic Source Evaluation

Results from the 300 Marsh Area were compared to those from the Former DRMO Yard to determine whether the arsenic is from the same source. Metal-to-arsenic concentration ratios were calculated for metals identified as COCs (cadmium, copper, lead, and zinc) for both the 300 Marsh Area and the Former DRMO Yard. Ratios differ substantially between the two areas calling into question a common source for the contaminant. The difference between ratios is suggestive of different processes controlling arsenic deposition.

Three potential pathways by which arsenic could have been transported to the 300 Marsh Area from the Former DRMO Yard were identified as follows: 1) water transport, 2) wind transport, or 3) burning activities causing volatilization of arsenic, followed by wet or dry deposition. These processes do not seem probable as it is unlikely that they could result in arsenic concentrations similar to those at the Former DRMO Yard and with substantially differing metal-to-arsenic ratios to those at the Former DRMO Yard. Therefore "it appears extremely unlikely that the arsenic in the 300 Marsh Area is related to the DRMO Yard."

The source of arsenic is unknown. It is speculated that the levels observed are the result of enrichment of naturally occurring arsenic that occurs in the organic matter layer. As such no further investigation is recommended.

Results of three historical soil samples from the east bank of GPB in the area of the Former DRMO Yard were also considered as part of the investigation; however, two of the sample locations could not be accurately determined. These samples contained antimony, arsenic, cadmium, copper, lead, mercury, and zinc at concentrations above LOCs. Two soil samples, referred to earlier, were collected as part of the MMRP RI and were from the proximity of MD that was detected. The results of the two samples and the historic sample indicate that metal concentrations may be associated with MD. Based on the detections along the Eastern Bank additional biased soil sampling is recommended.

Comments

Additional sampling will take place for the 300 Marsh Area as part of another investigative effort. It is not specified whether that sampling will occur under the MMRP or the IRP.