November 17, 2017

Mr. Kuruvilla Powathil
Acting Director, Consultant Management Bureau
NYS Dept. of Transportation
POD # 33
50 Wolf Road
Albany, NY 12232

Attention: Mr. Tony Palumbo

**Re: PIN HMFR.00.301**
**New York Air National Guard Base, Stewart international Airport**
**Newburgh, Orange County, New York**
**Recreation Pond Pre-Design Investigation**

Dear Mr. Palumbo:

The following letter report summarizes the procedures and results of the pre-design investigation (PDI) activities conducted July through September 2017 at Recreation Pond by HDR Engineering, Inc. (HDR) on behalf of New York State. Sampling was conducted in accordance with HDR's approved scope of work dated July 5, 2017.

## Background

Previous investigations of the source(s) of poly- and perfluorinated alkyl substances (PFASs) encountered in Lake Washington, a drinking water supply reservoir for the City of Newburgh, revealed the presence of high concentrations of PFASs in Recreation Pond. Recreation Pond, a retention pond located immediately south of the New York Air National Guard Base (ANG) (see Figure 1 – Site Location), receives runoff from the site property via three permitted outfalls (Outfalls 2, 3, and A). Outfall 2 collects surface water from the western portion of the ANG base, which consists of the Kilo and Juliet Ramps, a maintenance hanger, and fuel storage (two aboveground storage tanks in the northeast corner of the site). Outfall 3 collects water from the eastern portion of the ANG base, which includes the remainder of the ANG facilities and parking areas. Outfall A, also referred to as Outfall 14, is a curtain drain located along the western boundary of the ANG base with Stewart International Airport (SWF). A fourth outfall that collects drainage from the watershed located on the north side of Route 17K also drains to Recreation Pond; this outfall was included in the PDI program to estimate the contribution from the upstream watershed and evaluate if diversion is warranted. Note the 17K Outfall is not permitted, sampled or monitored so there is no other letter or

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number designation associated with it. Recreation Pond discharges to Silver Stream (via a weir, also known as Outfall 10), which eventually leads to Lake Washington. Recreation Pond and the above-described drainage areas and outfalls are shown on Figure 2 – Site Layout.

Due to the high concentrations of PFASs encountered in Recreation Pond during an initial site investigation by NYSDEC and the relationship of the Pond to Lake Washington, the NYSDEC recommended a treatment system be designed for the Pond. HDR was tasked with conducting a PDI that would aid in the development of the treatment system design and included a bathymetric survey, the collection of flow monitoring data, the collection of sediment and surface water quality data, and a rapid small scale column test (RSSCT).

**Field Investigative Procedures and Results**

**Bathymetric Survey**

On July 19, 2017 HDR's subcontractor Aqua Survey, Inc. (ASI) completed a bathymetric survey of Recreation Pond with oversight by an HDR Geologist. ASI mobilized a small jon boat, a two person crew, an ODOM dual-frequency fathometer, notebook computer, Hypack for survey control, ship track recording with data acquisition, and an RTK-GPS navigational system to perform the survey. ASI occupied a known benchmark close to the site for quality assurance/quality control (QA/QC) of the differential global positional system (DGPS). ASI used 50-foot lane spacing when performing the survey and ran additional cross lanes as a cross check of the data collected. In addition, soft sediments were probed using a calibrated rod to cross check the sounding data and verify sediment thickness results.

The plot points and contours of the survey area are provided on geo-referenced maps (Figures 3A through 3C). Figure 3A provides elevation data for the top of soft sediments, Figure 3B provides elevation data for the bottom of soft sediments, and Figure 3C provides the sediment thickness. Note that the measurements provided are in whole numbers (feet) with the corresponding subscript representing tenths of feet. For example in Figure 3C, "$2_4$" would equate to a sediment thickness at this plot point of 2.4 feet. As provided in Figure 3C, sediment thickness ranges from 0.1 to 3.8 feet at the surveyed locations.

**Flow Monitoring Data Collection and Processing**

On July 20, 2017, HDR installed flow meters for purposes of collecting and evaluating flow data into Recreation Pond. HDR set-up Son-Tek™ meters at each Outfall (2, 3, A and 17K). For the 17K Outfall, flow meters were installed both at the access point

adjacent to the Pond (17KDown) and at the upstream culvert located adjacent to Route 17K (17KUp). Note that the ANG had a flow meter set up at the discharge point of Recreation Pond (i.e., the weir/Outfall 10) and data collected from this meter was to be provided by ANG for purposes of this evaluation.

The meters installed by HDR were mounted with hardware to the culverts and collected data for flow, total volume, level and velocity over a two-month time period. Outfalls 2, 3, and A daylight at the top of the hill located adjacent to Recreation Pond (at the relative elevation of the ANG base). Surface water then flows down the respective chute at each location, passes by baffles (in place for energy dispersion) located at the bottom of the chute and then flows through a short culvert underneath the access road that surrounds Recreation Pond before entering the Pond. The flow meters at these locations were installed at the top of the hill where the water would exit prior to flowing down the chute. The meters were mounted at the invert approximately five to ten ft back into the culvert in order to prevent any potential interference in flow as the water exited the culvert and entered the chute. The 17K culvert does not have a chute. The culvert pipe traverses the ANG base and daylights at the Pond; a storm water grate, located on the north side of the access road, was used to access the 17KDown location and install the flow meter. At the 17KUp location stormwater from the north side of Route 17K flows through a pipe underneath Route 17K, enters a box culvert and then flows into a swale before entering the 48" culvert pipe that traverses underneath the ANG base. Additional flow from a culvert pipe on the south side of Route 17K, which runs parallel to the south side of Route 17K, also enters the swale and flows through the 48" culvert pipe toward Recreation Pond.

HDR returned to check on the meters and download data on August 14, 2017. At this time, the five flow meters were in good condition and the data appeared to be logging normally with no noted issues. On August 25, 2017, the ANG informed HDR that after a check of their meter, installed at Outfall 10, it was determined that the meter had been compromised and only data through August 2, 2017 could be saved. On September 1, 2017, HDR returned to the site to install a temporary replacement meter at Outfall 10 in order to obtain additional discharge data for the last approximately two weeks of the two-month monitoring event. HDR returned to the site on September 12, 2017 to dismantle the meters from the culverts and weir. HDR technicians extracted the data from the meters and together with the available Outfall 10 flow data provided by ANG, reduced and plotted the data. Rain data was provided by SWF staff from their automated weather observing system (AWOS); this data is presented alongside the flow monitoring data in the attached plots. The raw data from the flow monitoring event is included in folders by outfall/flow meter on the attached DVD (Attachment A). In addition the DVD contains an excel database file that includes summary tables of the combined raw flow data, the rain data, and the plots presented as part of this letter

report.

With the exception of the gap in Outfall 10 data described above, the data collected during the flow monitoring event was of good quality with no notable issues in the way the meters operated and collected the data. The following items were noted upon initial evaluation of the data:

- 17KUp to 17KDown correlation - As described above the configuration of the 17K culvert pipe is different than the other outfalls. It was evident from the data that the 17KDown location was experiencing backflow from the Pond, particularly during rain events, but was also apparent during low flow conditions as well. Generally the flow from the 17KUp and 17KDown locations correlated well with the flow from 17KUp being slightly higher, which is likely due to the reduction observed at 17KDown due to backflow but could also indicate some loss in volume through small cracks or breaks in the 48" pipe as it traverses under the ANG base. For this reason, the flow data collected from the 17KUp location was used to asses flow into Recreation Pond for this outfall as a more conservative estimate on the contribution from north of Route 17K.

- Outfall 10/weir data – as described above discharge data was only available from the start of the monitoring event on July 20, 2017 through August 2, 2017 and from September 1, 2017 through September 12, 2017; approximately two weeks at the start and end of the monitoring event, respectively. During the first two weeks only one small rain event was recorded and during the second two weeks of data two rain events were recorded. A general discussion of the results for these events is provided below. With the limited data available for Outfall 10, the results discussion largely focuses on inputs to the Pond.

The following describes the contribution of the outfalls to Recreation Pond for the ten rain events that occurred during the two-month monitoring event. Table 1 provides the total volume and percent contribution by rain event at each outfall, presented as greatest to least volume in cubic feet (cf). Outfall 2 fairly consistently is the largest contributor of water to Recreation Pond and in general, especially for larger rain events, accounts for approximately half of the overall contribution with the 17K Outfall making up approximately one quarter of the volume and Outfalls 3 and A combined the remaining one quarter. Volumetric contributions are also shown graphically on Figures 4 and 5. Figure 4 provides median volumetric contributions for all events (Chart a), the top three rain events (Chart b), and the top three flow events (Chart c), respectively. Figure 5 is a stacked bar graph showing percent contribution from each outfall for each of the ten rain events. Similar relative contributions can be seen here as described above; however, for some of the smaller rain events the volume contributed by the 17K Outfall is more on the order of approximately 40% of the total and is comparable to that

contributed by Outfall 2, with Outfalls 3 and A combined making up the remaining approximately 20% of total volume to the Pond.

The top three rain events are also depicted graphically on Figure 6 in terms of flow and plot each of the outfalls and precipitation versus time. In general a response is noted at the outfalls within one hour and a half of the start of a rain event, and peak flow is observed within approximately one hour of peak rain. Flow appears to drop off gradually along with the gradual decrease in precipitation. The highest flow rates are observed from Outfall 2, followed by Outfall 3 with relatively half the flow rate observed at Outfall 2, and finally Outfall A and Outfall 17K appear to have relatively comparable flow rates to one and another that are again relatively half the flow rate observed at Outfall 3.

As described above, the data set for discharge data from Outfall 10 is missing data from the majority of the rain events that occurred throughout the two-month monitoring event. Figure 7 depicts the September rain events and shows Outfall 10 in relation to the other outfalls that input to the Pond. A response can be seen at Outfall 10 within one half hour of an increase in flow at the input outfalls and similarly this increase in flow continues approximately one half hour after flow returns to baseline conditions at the input outfalls.

**Sediment Sampling**

Prior to mobilization, the results of the bathymetric survey were reviewed by the State and it was determined that eight sediment samples were sufficient for purposes of evaluating historical deposition in the Pond and providing sufficient preliminary data for design purposes. Sediment samples were collected from eight of the plot points surveyed during the bathymetric survey where sufficient sediment could be obtained (see Figure 8). In accordance with the scope of work samples were collected from:

- In front of where Outfall 2 and Outfall A enter the Pond, SED-POND-3;
- In front of where Outfall 3 and the 17K Outfall enter the pond, SED-POND-4;
- Prior to the discharge point (Outfall 10), SED-POND-8; and
- Within the center of the Pond. As recommended by the New York State Department of Environmental Conservation (NYSDEC) samples were collected from two of three locations where more than three feet of sediment was present and the remainder from where one to three feet of sediment was present (SED-POND-1, -2, -5, -6, and -7).

As part of the sediment sample collection activities on September 7, 2017, HDR

subcontractor ASI mobilized a small jon boat, petite ponar dredge sampler, DGPS, and a two person crew. The dredge sampler was deployed from the jon boat to collect sediment samples at the locations described above, which were located using DGPS.

Sediment sample from each location was contained in high density polyethylene (HDPE) buckets with lids and transferred to HDR on shore for processing. The HDR Geologist characterized the material visually and collected eight samples for laboratory analysis of target compound list (TCL) volatile organic compounds (VOCs), semivolatile organics compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs), target analyte list (TAL) metals plus mercury, and the PFAS six analyte list. As described in the scope of work, although not part of this investigation, additional analytes may be required for full disposal characterization purposes, such as toxicity characteristic leaching procedure (TCLP), corrosivity, reactivity, etc., and will ultimately be dictated by disposal facility requirements.

Analysis of the sediment samples was provided by Test America. Results are summarized in detail on Table 2; totals for each analyte group are also displayed on Figure 8. NYSDEC Freshwater Sediment Values for Class A Sediments were used for comparison purposes. The laboratory analytical data package is included as Attachment B.

In general the sediment was very dark brown to black in color. No notable odors or sheen were observed for any of the samples.

Although there are no guidance values for PFASs in sediment, the United States Environmental Protection Agency (EPA) Region 2 values for PFASs in soil are discussed here for comparison purposes. The soil screening level developed by EPA Region 2 is 1,000,000 nanograms per kilogram (ng/kg) for the sum of PFOA and PFOS. This value was developed by EPA Region 2 for a site in upstate New York (EPA, July 2016) for comparison of soil sampling results for the Project. All of the sediment samples are well below the EPA Region 2 soil screening level of 1,000,000 ng/kg for the sum of PFOA and PFOS.

Of the TAL metals, concentrations of arsenic, cadmium, copper, lead, nickel, silver, and zinc exceeded the respective NYSDEC Sediment Value in the majority of sediment samples. Of the organics analyzed, TCL VOCs results were all non-detect with the exception of acetone, 2-butanone, carbon disulfide, and methylene chloride all of which could potentially be a result of laboratory contamination. Detections of polycyclic aromatic hydrocarbons (PAHs) and select pesticides in the sediment samples are to be expected considering the nature of the runoff into the Pond and historic land use. The reporting limits for TCL SVOCs, pesticides, PCBs were raised, and in some instances

were elevated above available Sediment Values, due to dilution or matrix interferences to enable the quantification of target analytes. The results obtained are largely non-detect or below the respective Sediment Values, where available.

One matrix spike/matrix spike duplicate (MS/MSD) sample was collected from SED-POND-1 and an equipment blank was collected on the petite ponar dredge sampler. Several analytes failed the recovery criteria low and the relative percent difference (RPD) for the MS/MSD. The laboratory noted matrix interference and reporting limits were raised accordingly. Given the results obtained for pesticides, PCBs, and metals this does impact the usability of the data for its intended purpose. Concentrations of five of the six PFASs were detected in the sediment equipment blank sample, which could mean a potential bias high in the field sample results.

**Surface Water Sampling**

HDR collected surface water samples on September 7, 2017 from all four of the outfalls that feed the Pond, including both 17KUp and 17KDown for the 17KOutfall input, as well as sampling from two locations within the Pond itself and at the discharge point (Outfall 10) (see Figure 9). Surface water samples from Outfalls 2, 3, and A were collected at the base of the chute, prior to entering the respective pipes that lead under the access road to Recreation Pond. Samples were collected using a stainless steel dip bucket. As the 17K Outfall does not have a chute, surface water was sampled at the manhole cover located adjacent to the Pond and at the upstream culvert located adjacent to Route 17K. Samples were collected using a peristaltic pump and HDPE tubing. As sampling was conducted concurrently with the sediment sample collection, HDR utilized the subcontractor's jon boat to collect surface water samples from within the Pond. Samples were collected from approximately six inches below the surface (SW-POND-1S and -2S) and from approximately six inches above the sediment (SW-POND-1D and -2D) using a peristaltic pump and lowering the HDPE tubing to the appropriate depth. Surface water samples were collected for the same parameters described above for sediment. In addition, diesel range organics and gasoline range organics (DRO/GRO) and glycols were also analyzed in surface water. This suite of analysis as well as analyzing for total organic carbon (TOC) was completed to provide information necessary to assess carbon demand for the future treatment system design.

Analysis of the surface water samples was provided by Test America. Results are summarized in detail on Table 3; totals for each analyte group are also displayed on Figure 9. NYSDEC Surface Water Standards and the EPA Health Advisory Limits were used for comparison purposes. The laboratory analytical data package is included as Attachment B.

Detectable concentrations of all six of the PFASs analyzed were detected in all samples. Results are compared to the EPA Health Advisory Limit of 70 ng/l, which applies to PFOS and PFOA individually as well as the sum. The results from all of the surface water samples with the exception of 17KUp and 17KDown exceeded the advisory limit. The samples collected from Outfalls 2 and 3 contained elevated concentrations above the advisory limit for both PFOS and PFOA; the respective sums were 1190 ng/l and 1191.8 ng/l. Of the remaining samples that exceeded the advisory limit, only PFOS concentrations were greater than 70 ng/l. Concentrations of PFOS in these samples ranged from 259 to 450 ng/l.

Of the remaining parameters analyzed, very low level, estimated concentrations of DRO were detected in the majority of the samples. GRO, pesticides and PCBs were non-detect in all samples. VOCs were also all non-detect with the exception of acetone, a common laboratory contaminant. The reporting limits for TCL SVOCs and select other organics were raised, and in some instances were elevated above available Surface Water Standards, due to dilution or matrix interferences to enable the quantification of target analytes. The results obtained are largely non-detect or below the respective Surface Water Standards, where available, with the exception of benzo(a)pyrene in one sample. Concentrations of metals detected were all below available Surface Water Standards with the exception of iron and manganese. TOC was detected at concentrations less than 5 mg/l in all samples; however, the majority were qualified "B" as TOC was also detected in the blank, the concentrations in the samples are likely biased high. Based on these results, any potential competition for carbon from other classes of contaminants (besides PFASs) relative to the proposed design would likely be minimal.

Of note, the concentrations obtained for the samples within the Pond were generally comparable to one another as well as between the shallow and deep intervals sampled with the deeper sample results being slightly higher than the shallow sample results at both locations. In addition, the concentrations obtained in the surface water sample collected from 17KDown were higher and in most cases concentrations were double those detected in the 17KUp sample. This could mean potential infiltration from surface water and/or groundwater within the ANG as the pipe traverses underneath the Base. Overall the concentrations detected from the 17K culvert pipe were much lower than the samples collected from the other inputs with PFASs below the EPA advisory limit as noted above.

One MS/MSD sample was collected from SW-POND-1S and an equipment blank was collected on a stainless steel dip bucket. In addition a trip blank and field blank sample were collected as well as a duplicate sample from Outfall A. One or more analytes failed the recovery criteria low and the relative percent difference (RPD) for the MS/MSD.

There were no detections in the equipment blank, trip blank or field blank. Of the data pairs that could be evaluated from the duplicate, PFNA (48.7%) and PFOS (47.9%) as well as seven of the ten pairs of metals results revealed relatively large RPDs. This could be due in part to improper filling of the sample jars to ensure a truly duplicate sample. The higher concentrations were observed in the parent sample, which were used for purposes of the results discussion.

**Carbon Pilot Study**

In addition to the above surface water quality data, HDR collected sufficient sample from the Pond for a bench scale study by Engineering Performance Solutions (EPS), an independent performance based laboratory. The study evaluated the effectiveness of granular activated carbon (GAC) considering the site-specific concentrations of PFASs and other contaminants present in the Pond. Bituminous coal-based re-agglomerated GAC has proven to have better performance than other GAC remediating PFASs and was recommended for the study. HDR collected the necessary sample volume concurrently with the above surface water sampling activities. EPS performed a RSSCT that simulates full scale performance and provides information on carbon type, breakthrough data, and usage rates that are critical to the system design. The report is included as Attachment C. Note that the information contained within the report is not definitive. Changes in water quality or activated carbon quality could influence the results presented in the report, i.e., seasonal changes in water quality could impact removal efficiencies.

if you have any questions or need additional information, please do not hesitate to contact me.

Sincerely,

Melissa E. LaMacchia, MS, PG
Associate | Senior Project Manager

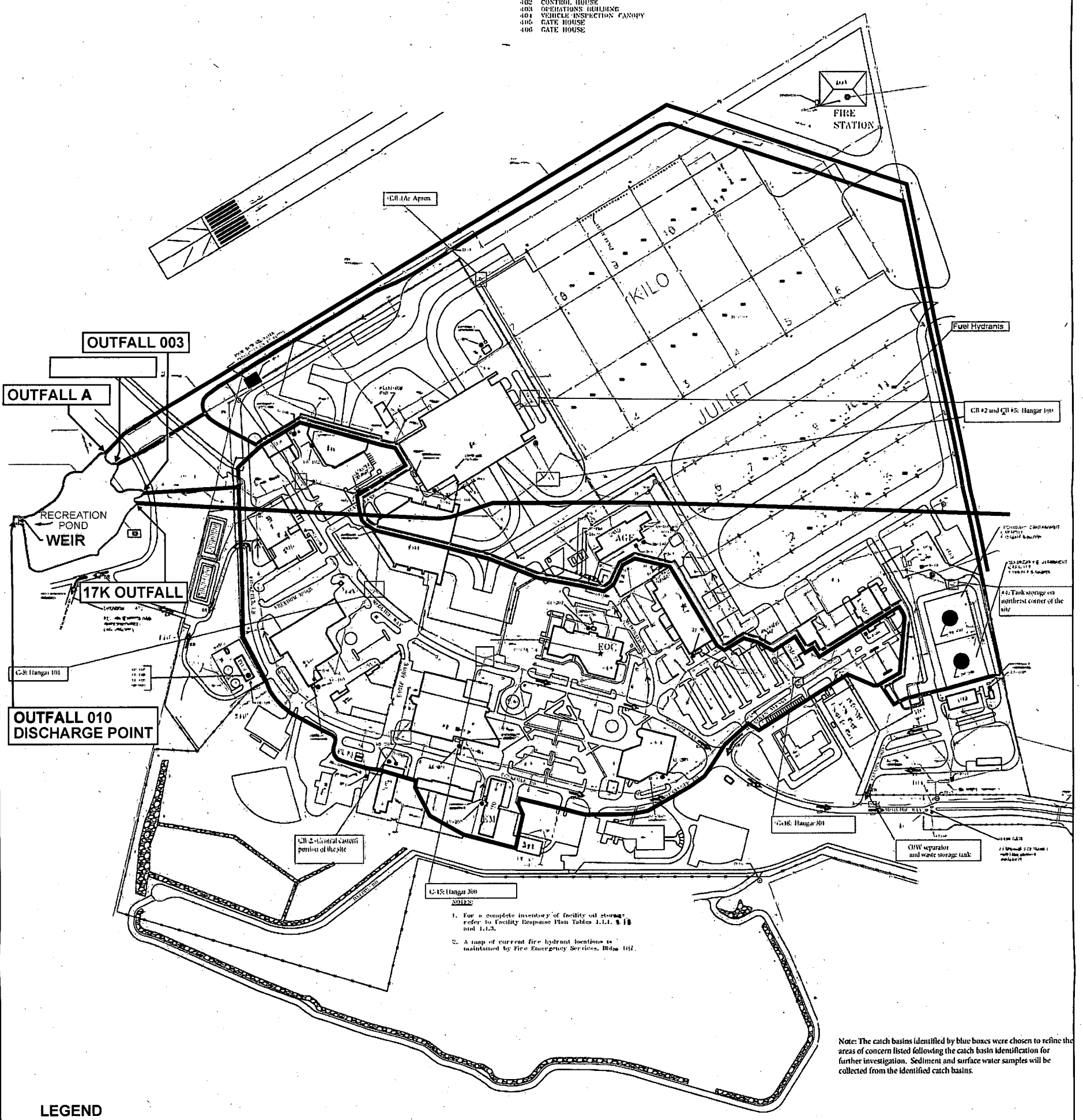
cc: J. Bass, NYSDOT

Attachments

## FACILITIES

100 COMPOSITE MAINTENANCE/HANGAR
101 CORROSION CONTROL/FUEL CELL
102 FUEL CELL NOSE DOCK
104 FIRE STATION
105 LES/AP
106 SFS/PSOH
107 COMPOSITE MAINTENANCE FACILITY
1107 HAZARDOUS MATERIAL STORAGE
108 UTILITY CENTER
109 HIGH VOLTAGE SWITCHGEAR
110 WATER SUPPLY BOOSTER PUMP STATION
111 DIVERSION CHAMBER WITH OIL/FUEL SEPERATORS
200 SUPPORT EQUIPMENT MAINTENANCE SHOP
201 GUARD HOUSE
202 COMPOSITE SQUADRON OPS./TELECOM.
203 COMPOSITE OPERATIONAL TRAINING
204 ANG/USMCR BASE SUPPLY
205 HAZARDOUS STORAGE (USMCR)
206 HAZARDOUS STORAGE (ANG)
207 BASE ENGINEERING
208 AUTOMOTIVE VEHICLE MAINTENANCE SHOP
209 AUTO PARKING SHED
211 BASE CIVIL ENGINEERING COVERED STORAGE
300 COMPOSITE AIRCRAFT MAINT./50 OPS. (USMCR)
301 FUEL CELL HANGAR (USMCR)
302 INTERMEDIATE MAINTENANCE ACTIVITY (USMCR)
303 AVIONICS PAD (USMCR)
401 PUMP HOUSE
402 CONTROL HOUSE
403 OPERATIONS BUILDING
404 VEHICLE INSPECTION CANOPY
405 GATE HOUSE
406 GATE HOUSE

- EVACUATION ROUTE
- SPILL FLOW DIRECTION
- RIP RAP-LIZED DITCH
- ABOVEGROUND STORAGE TANKS
- UNDERGROUND STORAGE TANKS
- OIL/WATER SEPARATOR
- MONITORING WELL
- INDUSTRIAL WASTE LINE
- STORM SEWER SYSTEM
  - STORM SEWER
  - CATCHBASIN
  - SUMP DRAIN
  - REINFORCED CONCRETE PIPE
  - DRAIN PIT
  - CATCHBASIN #21
  - SUMP PIT
  - STORM WATER CONC. PIPE
  - CMP/ METAL PIPE
  - CAST IRON
  - STORM WATER
  - DRAIN INLET




Note: The catch basins identified by blue boxes were chosen to refine the areas of concern listed following the catch basin identification for further investigation. Sediment and surface water samples will be collected from the identified catch basins.

**LEGEND**

- OUTFALL A
- OUTFALL 002
- OUTFALL 003
- 17K OUTFALL
- RECREATION POND

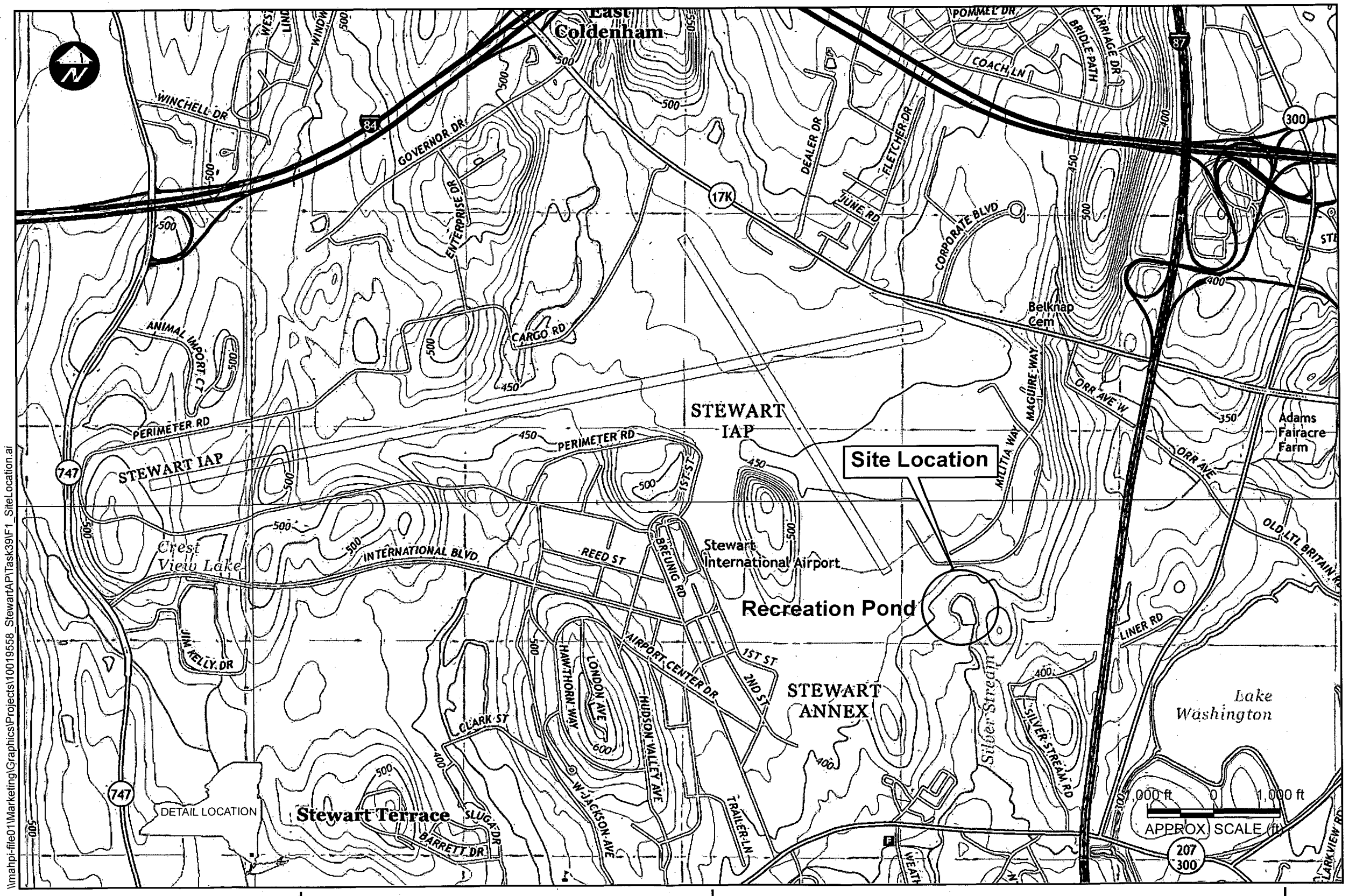
0 400 ft
SCALE (ft)

\\mahpi-file01\Marketing\Graphics\Projects\10019558_StewartAPITask39\F2_SiteLayout.ai

HDR Engineering, Inc.
1 International Blvd.
Mahwah, NJ 07495

**Site Layout**
Recreation Pond Pre-Design Investigation
Stewart International Airport - Air National Guard Base
Newburgh, NY

Figure 2

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HDR Engineering, Inc.
1 International Blvd.
Mahwah, NJ 07495

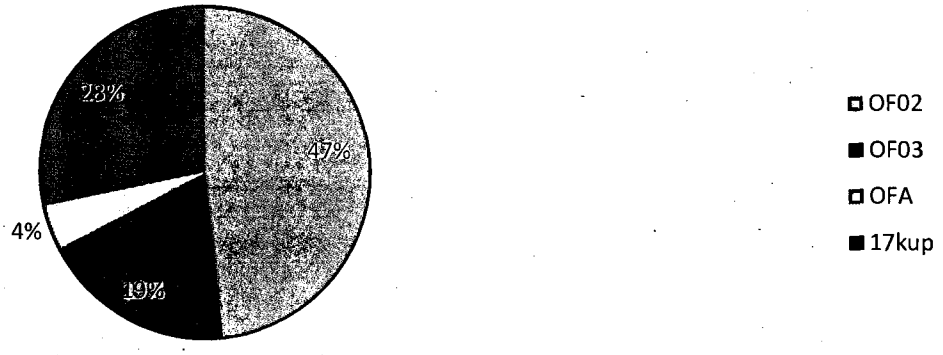
Map source: USGS 7.5-min. Quadrangle Series: Cornwall-on-Hudson, NY, 2013; Maybrook, NY, 2013; Newburgh, NY, 2013; Walden, NY, 2013.

**Site Location**

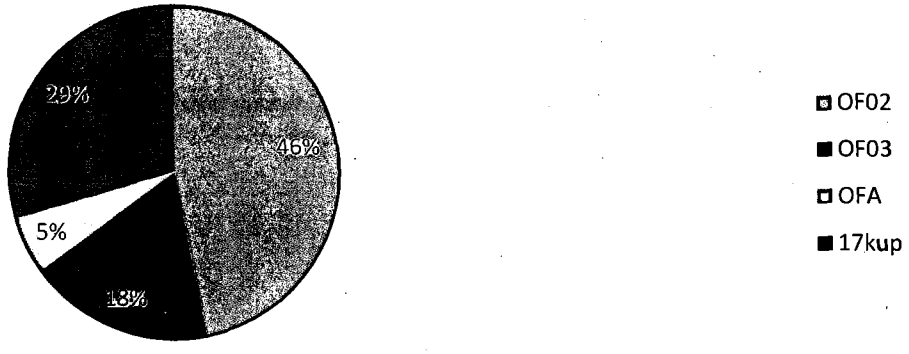
**Recreation Pond Pre-Design Investigation**
**Stewart International Airport - Air National Guard Base**
**Newburgh, NY**

Figure 1

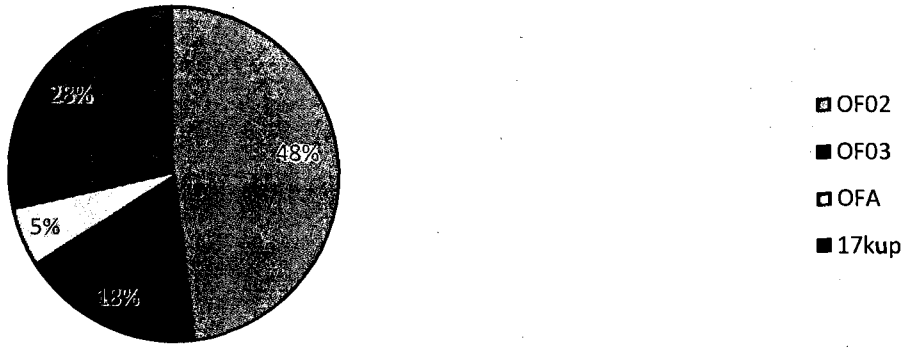
## a) Median Volumetric Contribution All Events




## b) Median Volumetric Contribution Top 3 Rain Events




## c) Median Volumetric Contribution Top 3 Flow Events




| | | | | | |
|---|---|---|---|---|---|
| HDR | *Recreation Pond 2017 Flow Monitoring* | **Median Volume Contribution by Outfall for a) All Events; b) Top 3 Rain Events; and c) Top 3 Flow Events** | DATE: | 10/10/17 | **FIGURE** |
| | | | CREATED BY: | JV | 4 |
| | | | REVIEWED BY: | | |
| | | | JOB NO: | | |

**LEGEND**

- ● Pond Sediment Sample Locations
- ■ Outfall Surface Water Sample Locations

0 Miles 0.01

Notes:
1. PFASs are reported in ng/kg.
2. Pesticides, PCBs, SVOCs, VOCs are reported in ug/kg.
3. Metals are reported in mg/kg.
4. Freshwater sediment guidance values for Total PCBs is 100 ug/kg.

Outfall-003

Outfall-17K-Down

Outfall-002

Outfall-A

Outfall-10

Pond-1

Pond-2

Pond-3

Pond-4

Pond-5

Pond-6

Pond-7

Pond-8

SED-POND-4
PFOS 223000
PFOA 3710
PFHxS 13600
PFHpA 1840
PFBS 830
PFNA 2640

SED-POND-3
PFOS 25700
PFOA 1320
PFHxS 1930
PFHpA 330
PFBS —
PFNA 300

SED-POND-5
PFOS 69300
PFOA 2070
PFHxS 5960
PFHpA 1050
PFBS 670
PFNA —

SED-POND-1
PFOS 71600
PFOA 2510
PFHpA 920
PFNA 780
PFBS 480
PFHxS 4590
ng/kg

SED-POND-2
PFOS 79200
PFOA 2280
PFHxS 5250
PFHpA 770
PFBS 640
PFNA 710

SED-POND-6
PFOS 67300
PFOA 2380
PFHxS 4700
PFHpA 900
PFBS —
PFNA 730

SED-POND-7
PFOS 102000
PFOA 2590
PFHxS 5810
PFHpA 1040
PFBS 780
PFNA 890

SED-POND-8
PFOS 14100
PFOA 570
PFHxS 1110
PFHpA 220
PFBS —
PFNA 160

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**FIGURE 8 - SEDIMENT ANALYTICAL RESULTS**

**NEW YORK AIR NATIONAL GUARD, STEWART INTERNATIONAL AIRPORT - NEWBURGH, NY**

**LEGEND**

- Pond Sediment Sample Locations
- Outfall Surface Water Sample Locations

0 Miles 0.01

Notes:
1. PFASs are reported in ng/kg.
2. Pesticides, PCBs, SVOCs, VOCs are reported in ug/kg.
3. Metals are reported in mg/kg.
4. Freshwater sediment guidance values for Total PCBs is 100 ug/kg.

Outfall-003

Outfall-17K-Down

| Location ID | SED-POND-4 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 223,000 |
| PFOA | 3,710 |
| Total PFASs | 245,620 |
| Total Metals | 118,128 |
| Total Pesticides | 56 |
| Total PCBs | ND |
| Total SVOCs | 137,510 |
| Total VOCs | 120 |

Outfall-002

Outfall-A

| Location ID | SED-POND-3 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 25,700 |
| PFOA | 1,320 |
| Total PFASs | 29,580 |
| Total Metals | 110,180 |
| Total Pesticides | 24 |
| Total PCBs | ND |
| Total SVOCs | 156,270 |
| Total VOCs | 218 |

| Location ID | SED-POND-5 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 69,300 |
| PFOA | 2,070 |
| Total PFASs | 79.05 |
| Total Metals | 116,703 |
| Total Pesticides | 42 |
| Total PCBs | ND |
| Total SVOCs | 83,110 |
| Total VOCs | 213 |

Pond-4

Pond-3

Pond-1

Pond-5

| Location ID | SED-POND-1 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 71,600 |
| PFOA | 2,510 |
| Total PFASs | 80,880 |
| Total Metals | 144,694 |
| Total Pesticides | 48 |
| Total PCBs | ND |
| Total SVOCs | 173,020 |
| Total VOCs | 343 |

| Location ID | SED-POND-2 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 79,200 |
| PFOA | 2,280 |
| Total PFASs | 88,850 |
| Total Metals | 135,727 |
| Total Pesticides | 329 |
| Total PCBs | ND |
| Total SVOCs | 204,220 |
| Total VOCs | 507 |

Pond-6

| Location ID | SED-POND-6 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 67,300 |
| PFOA | 2,380 |
| Total PFASs | 76,010 |
| Total Metals | 142,777 |
| Total Pesticides | 19 |
| Total PCBs | ND |
| Total SVOCs | 180,320 |
| Total VOCs | 183 |

Pond-2

Pond-7

| Location ID | SED-POND-7 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 102,000 |
| PFOA | 2,590 |
| Total PFASs | 113,110 |
| Total Metals | 131,944 |
| Total Pesticides | 39 |
| Total PCBs | ND |
| Total SVOCs | 255,480 |
| Total VOCs | 379 |

Pond-8

| Location ID | SED-POND-8 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 14,100 |
| PFOA | 570 |
| Total PFASs | 16,160 |
| Total Metals | 66,249 |
| Total Pesticides | 25 |
| Total PCBs | ND |
| Total SVOCs | 132,430 |
| Total VOCs | 199 |

Outfall-10

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

HDR

# FIGURE 8 - SEDIMENT ANALYTICAL RESULTS

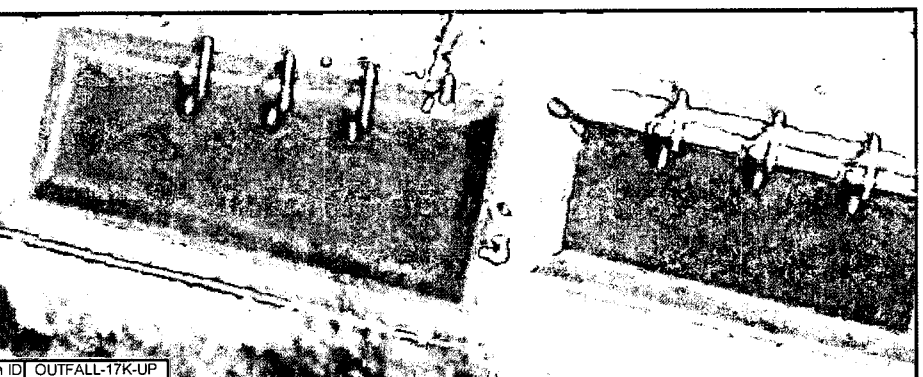
## NEW YORK AIR NATIONAL GUARD, STEWART INTERNATIONAL AIRPORT - NEWBURGH, NY

**LEGEND**

- Pond Sediment Sample Locations
- Outfall Surface Water Sample Locations

0 Miles 0.01

Notes:
1. PFASs are reported in ng/l.
2. DRO/GRO are reported in mg/l.
3. Metals, Pesticides, PCBs, SVOCs, VOCs are reported in ug/l.
4. Locations that exceed the EPA Health Advisory for the sum of PFOS and PFOA (70 ng/l) are highlighted in yellow.



| Location ID | OUTFALL-17K-UP |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 3.7 |
| PFOA | 4.1 |
| Total PFASs | 16 |
| DRO | 0.15 J |
| GRO | 0.025 U |
| DRO/GRO | 0.15 J/0.025 U |
| TOC | 4.5 |
| Total Metals | 84,633 |
| Total Pesticides | ND |
| Total PCBs | ND |
| Total SVOCs | ND |
| Total VOCs | 3.4 |

Outfall-003

| Location ID | OUTFALL-003 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 1,120 |
| PFOA | 71.8 |
| Total PFASs | 1,582 |
| DRO | 0.084 J |
| GRO | 0.025 U |
| DRO/GRO | 0.084 J/0.025 U |
| TOC | 3.3 |
| Total Metals | 189,327 |
| Total Pesticides | ND |
| Total PCBs | ND |
| Total SVOCs | 0.87 |
| Total VOCs | 3.4 |

| Location ID | OUTFALL-002 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 1,060 |
| PFOA | 130 |
| Total PFASs | 1,511 |
| DRO | 0.1 J |
| GRO | 0.025 U |
| DRO/GRO | 0.1 J/0.025 U |
| TOC | 1.8 |
| Total Metals | 63,825 |
| Total Pesticides | ND |
| Total PCBs | ND |
| Total SVOCs | ND |
| Total VOCs | 11 |

Outfall-002

Outfall-A

| Location ID | OUTFALL-A | OUTFALL-A (DUP) |
|---|---|---|
| Date Sampled | 9/7/2017 | 9/7/2017 |
| PFOS | 450 | 276 |
| PFOA | 56.6 | 49.0 |
| Total PFASs | 868 | 681 |
| DRO | 0.084 J | 0.11 J |
| GRO | 0.025 U | 0.025 U |
| DRO/GRO | 0.084 J/0.025 U | 0.11 J/0.025 U |
| TOC | 3.7 | 3.5 |
| Total Metals | 226,101 | 156,698 |
| Total Pesticides | ND | ND |
| Total PCBs | ND | ND |
| Total SVOCs | 1.12 | ND |
| Total VOCs | 3 | 3.1 |

Outfall-17K-Down

| Location ID | OUTFALL-17K-DOWN |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 16.5 |
| PFOA | 8.2 |
| Total PFASs | 43 |
| DRO | 0.12 J |
| GRO | 0.025 U |
| DRO/GRO | 0.12 J/0.025 U |
| TOC | 4.1 |
| Total Metals | 97,333 |
| Total Pesticides | ND |
| Total PCBs | ND |
| Total SVOCs | 0.99 |
| Total VOCs | 7.8 |

Pond-4

Pond-3

| Location ID | SW-POND-1-S | SW-POND-1-D |
|---|---|---|
| Date Sampled | 9/7/2017 | 9/7/2017 |
| PFOS | 262 | 278 |
| PFOA | 37.9 | 40.2 |
| Total PFASs | 444 | 468 |
| DRO | 0.4 U | 0.096 J |
| GRO | 0.025 U | 0.025 U |
| DRO/GRO | 0.4 U/0.025 U | 0.096 J/0.025 U |
| TOC | 3.4 | 3.4 |
| Total Metals | 62,253 | 66,592 |
| Total Pesticides | ND | ND |
| Total PCBs | ND | ND |
| Total SVOCs | 1.2 | 1 |
| Total VOCs | 5.8 | 4.5 |

Pond 5

Pond-6

| Location ID | SW-POND-2-S | SW-POND-2-D |
|---|---|---|
| Date Sampled | 9/7/2017 | 9/7/2017 |
| PFOS | 259 | 313 |
| PFOA | 38.0 | 41.0 |
| Total PFASs | 439 | 514 |
| DRO | 0.089 J | 0.092 J |
| GRO | 0.025 U | 0.025 U |
| DRO/GRO | 0.089 J/0.025 U | 0.092 J/0.025 U |
| TOC | 3.2 | 3.3 |
| Total Metals | 68,982 | 67,695 |
| Total Pesticides | ND | ND |
| Total PCBs | ND | ND |
| Total SVOCs | 1.3 | 1.3 |
| Total VOCs | 4.8 | 4.7 |

Pond-7

Pond-8

Outfall-10

| Location ID | OUTFALL-10 |
|---|---|
| Date Sampled | 9/7/2017 |
| PFOS | 277 |
| PFOA | 41.7 |
| Total PFASs | 481 |
| DRO | 0.11 J |
| GRO | 0.025 U |
| DRO/GRO | 0.11 J/0.025 U |
| TOC | 3.2 |
| Total Metals | 64,984 |
| Total Pesticides | ND |
| Total PCBs | ND |
| Total SVOCs | 1.1 |
| Total VOCs | 5.6 |

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

# FIGURE 9 - SURFACE WATER ANALYTICAL RESULTS

## NEW YORK AIR NATIONAL GUARD, STEWART INTERNATIONAL AIRPORT - NEWBURGH, NY

## Servis, Alexandra M (DEC)

**Subject:** Stewart ANGB Chronology
**Location:** Conference Call

**Start:** Fri 10/27/2017 10:00 AM
**End:** Fri 10/27/2017 11:00 AM

**Recurrence:** (none)

**Meeting Status:** Accepted

**Organizer:** LaMacchia, Melissa

**Categories:** Meeting



Hi All
Call-in information for Friday:
(866) 583-7984
Conference code: 6971496
Thanks,

**Melissa E. LaMacchia,** MS, PG
D 201.335.9391 **M** 845.548.6960

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**From:** Bass, Jonathan (DOT) [mailto:Jonathan.Bass@dot.ny.gov]
**Sent:** Tuesday, October 24, 2017 3:19 PM
**To:** Heitzman, George (DEC)
**Cc:** Servis, Alexandra M (DEC); Omorogbe, Amen (DEC); LaMacchia, Melissa; Ifkovits, John; Saucier, Sarah K (DEC)
**Subject:** RE: Stewart ANGB Chronology

George,
I spoke with Lexy this afternoon. We would like to try and schedule this call for Friday (10/27) at say 10:00am. If you or others cannot participate, you could pass your questions and/or comments through Lexy/Sarah and then Melissa and/or John could address verbally on the call with written follow up, if necessary. Let me know if this works for you.
Melissa, can you or John set up a call in number for this and reply back with the information?
Thanks
Jonathan

**From:** Heitzman, George (DEC)
**Sent:** Wednesday, October 18, 2017 2:37 PM
**To:** Bass, Jonathan (DOT) <Jonathan.Bass@dot.ny.gov>
**Cc:** Servis, Alexandra M (DEC) <Alexandra.Servis@dec.ny.gov>; Omorogbe, Amen (DEC) <amen.omorogbe@dec.ny.gov>
**Subject:** RE: Stewart ANGB Chronology

Sure. Lexy is at a conference this week, and I want to give her and Amen time to digest the findings. We certainly can meet and provide feedback within 2 weeks. Let's pencil in a call late next week.

**George Heitzman**
Director, Remedial Bureau C

Division of Environmental Remediation
**New York State Department of Environmental Conservation**
Albany, NY 12233-7014
P: (518) 402-9662 | george.heitzman@dec.ny.gov
www.dec.ny.gov | | |
**From:** Bass, Jonathan (DOT)
**Sent:** Wednesday, October 18, 2017 2:35 PM
**To:** Heitzman, George (DEC) <george.heitzman@dec.ny.gov>
**Subject:** RE: Stewart ANGB Chronology
Ok. Also, if it would be helpful we can set up a conference call with HDR to discuss. Let me know.
**From:** Heitzman, George (DEC)
**Sent:** Wednesday, October 18, 2017 2:14 PM
**To:** Bass, Jonathan (DOT) <Jonathan.Bass@dot.ny.gov>
**Subject:** RE: Stewart ANGB Chronology
Thanks Jonathan.
I'm just going through the HDR report – there are some really interesting findings.
**George Heitzman**
Director, Remedial Bureau C
Division of Environmental Remediation
**New York State Department of Environmental Conservation**
Albany, NY 12233-7014
P: (518) 402-9662 | george.heitzman@dec.ny.gov
www.dec.ny.gov | | |
**From:** Bass, Jonathan (DOT)
**Sent:** Wednesday, October 18, 2017 2:11 PM
**To:** Heitzman, George (DEC) <george.heitzman@dec.ny.gov>
**Cc:** Ryan, Michael (DEC) <michael.ryan@dec.ny.gov>; Cruden, Michael (DEC) <michael.cruden@dec.ny.gov>; Kuehner, Wendy S (HEALTH) <wendy.kuehner@health.ny.gov>; Gilday, William M (HEALTH) <william.gilday@health.ny.gov>
**Subject:** RE: Stewart ANGB Chronology
George,
I have added some additional items in red font at the end for your consideration.
Jonathan
**From:** Heitzman, George (DEC)
**Sent:** Wednesday, October 18, 2017 1:26 PM
**To:** Cruden, Michael (DEC) <michael.cruden@dec.ny.gov>; Bass, Jonathan (DOT) <Jonathan.Bass@dot.ny.gov>; Kuehner, Wendy S (HEALTH) <wendy.kuehner@health.ny.gov>; Gilday, William M (HEALTH) <william.gilday@health.ny.gov>
**Cc:** Ryan, Michael (DEC) <michael.ryan@dec.ny.gov>
**Subject:** Stewart ANGB Chronology
The Attorney General's Office has asked DEC to develop a chronology of NY State response actions concerning the Newburgh/Stewart water contamination crisis. I've roughed out some of the milestones and need a few dates inserted or verified. Since the focus of the AG is likely to be cost recovery under Superfund, I've listed the milestones primarily related to contractual authorizations and the milestones that typically trigger the statute of limitations.
If you have any other suggestions for milestones, feel free to add on.
Thanks,
George

Engineering
Performance Solutions

# CARBON EVALUATION STUDY FOR PFOA AND PFOS REMOVAL

**As commisioned by:**
**HDR**
**8404 Indian Hills Drive**
**Omaha, NE 68114**

**Prepared by:**
**Engineering Performance Solutions, LLC**
**3161 St. Johns Bluff Rd. S. Suite 3**
**Jacksonville, FL 32246**
**904-645-7775**

**Report #: 210.01.1117**

**Date: 11/07/2017**

## TABLE OF CONTENTS

## SCOPE

Per our agreement with John J Ifkovits, Senior Hydrogeologist for HDR, Engineering Performance Solutions, LLC (EPS) has agreed to perform a rapid small-scale column test (RSSCT) to evaluate the breakthrough performance of perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) using Calgon Carbon's bituminous coal-based re-agglomerated Filtrasorb 400 12 x 40 carbon (F400). The RSSCT was designed to simulate a full-scale empty-bed contact time (EBCT) of 5 minutes.

## METHOD

A source water labeled Rec Pond Water was collected from Stewart Airport and shipped (on ice) overnight to the EPS facilities in Jacksonville, FL. The water was stored at 4 °C until the testing commenced.

A key feature of RSSCTs is that the GAC grains utilized in the mini-column are considerably smaller than full-scale grains. As determined by Crittenden et al. (1991), mini-columns containing finely ground GAC can accurately simulate full-scale GAC breakthrough profiles in a fraction of the time required for full-scale adsorption systems. The mini-column employed herein contained 200 x 230 mesh (mean particle size = 0.070 mm) GAC grains. Using a proportional diffusivity scaling equation, a small-scale EBCT of 0.41 minutes was needed to simulate the desired full-scale EBCT of 5 minutes for the 12 x 40 carbon.

Proportional diffusivity scaling equation = $\frac{EBCT_{SC}}{EBCT_{LC}} = \frac{R_{SC}}{R_{LC}} = tsc / tLc$

Table 1 below contains the column parameters used for the test.

**Table 1**

| Column Details | Depth (cm) | Diameter (cm) | Flow (ml/min) |
|---|---|---|---|
| F400 @ 5 min. | 3.0 | 0.5 | 1.42 |

As the mini-column was processing water, effluent samples were collected on a regular basis and then analyzed for PFOA and PFOS concentrations. Average influent concentration for the water was 0.049 ug/L for PFOA and 0.370 ug/L for PFOS. All samples below the minimum detection limit (MDL) were graphed at the reporting limit.

## RESULTS

The RSSCTs were run to simulate 288 days of full scale use or approximately 83,000 bed volumes (BVs).

The breakthrough curve resultants for PFOA and PFOS are shown below in Figure 1 and Table 1.

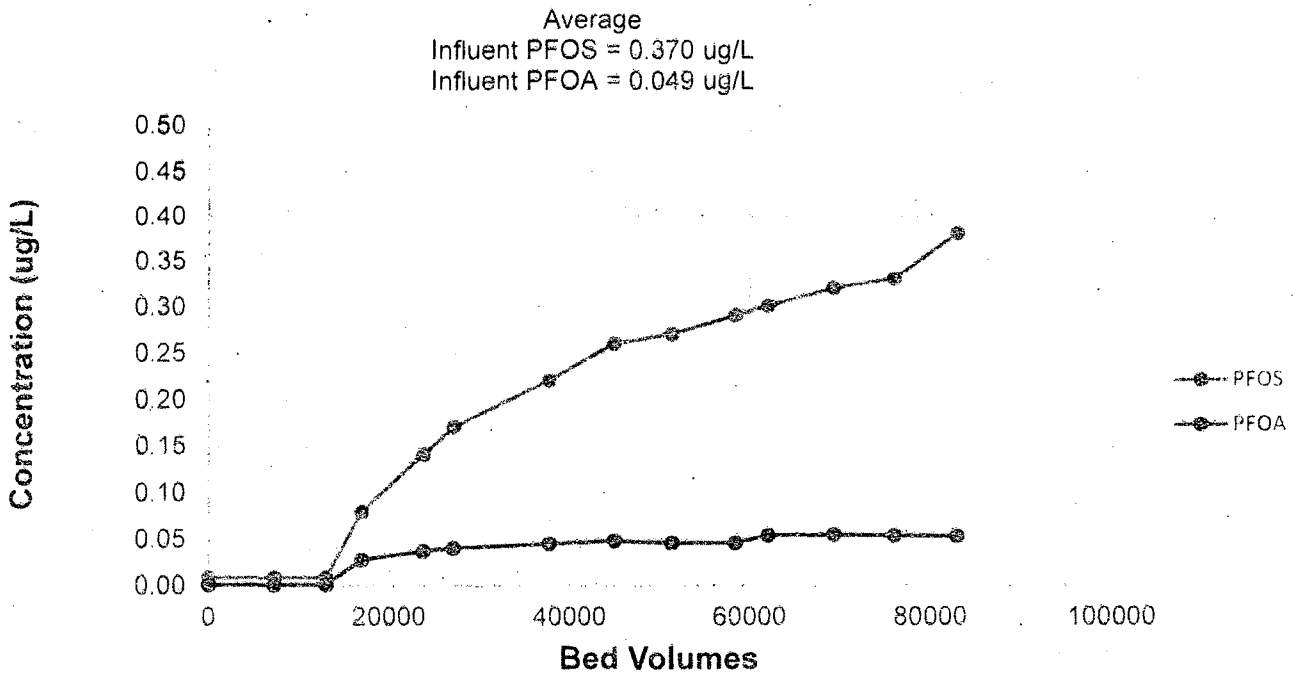


**Figure 1.** PFOA and PFOS breakthrough profile (simulated full-scale EBCT = 5 min, 1 day = 288 bed volumes).

As shown in Figure 1 both compounds started to show breakthrough at around 17,000 bed volumes or at around 60 days of run time. As seen in past studies GAC is quite effective in removing PFOS. Even though it is at a much higher concentration it does not reach saturation until the end of the column test at around 80,000 bed volumes or around 278 days . PFOA is show to be less efficient in removal by GAC and thus reached saturation at 45,000 bed volumes or approximately 156 days of run time.

Table 1 below shows the analytical results used in the graph above.

**Table 1. F400**

| BVs | PFOA (ug/L) | PFOS (ug/L) | BVs | PFOA (ug/L) | PFOS (ug/L) |
|---|---|---|---|---|---|
| 0 | <0.001 | <0.009 | 51322 | 0.045 | 0.270 |
| 7249 | <0.001 | <0.009 | 58426 | 0.045 | 0.290 |
| 13048 | <0.001 | <0.009 | 62050 | 0.053 | 0.300 |
| 16962 | 0.027 | 0.079 | 69299 | 0.054 | 0.320 |
| 23776 | 0.036 | 0.140 | 75968 | 0.053 | 0.330 |
| 27111 | 0.040 | 0.170 | 82927 | 0.052 | 0.380 |
| 37694 | 0.044 | 0.220 | | | |
| 44943 | 0.047 | 0.260 | | | |

< less than MDL

NOTE: Please be advised that the information contained within this report is not definitive. Changes in water quality or activated carbon quality could influence the results presented above. In other words, seasonal changes in water quality could impact removal efficiencies. Additionally, the trends and performance depicted here are specific to this facility only and should not be considered representative of any other.

## REFERENCES

Crittenden JC, Reddy PJ, Arora H, Trynoski J, Hand DW, Perram DL, Summers RS. Predicting GAC performance with rapid small scale column tests. J AWWA 1991; 83:1:77-87.