Weston & Sampson

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August 30, 2018

Ms. Amy Brady
Norfolk Zoning Board of Appeals
Norfolk Town Hall
1 Liberty Lane
Norfolk, MA 02056

Re: Review of Remediation Activities at 17 Lawrence Street, Norfolk, MA (RTN 2-3000173)

Dear Ms. Brady:

Weston & Sampson was retained by the Town of Norfolk (the Town) to review previous assessment, environmental Massachusetts Contingency Plan (310 CMR 40.0000) response actions and limited environmental review of the proposed redevelopment of the Buckley & Mann Site located at 17 Lawrence Street in Norfolk, Massachusetts (the Site). The Massachusetts Department of Environmental Protection (MassDEP) has assigned Release Tracking Number (RTN) 2-3000173 to the release at the aforementioned property, which occupies a portion of the Abbyville Commons Residential Project, a proposed redevelopment as a 196-unit residential complex.

Weston & Sampson is pleased to provide the Town with this summary letter detailing our review of the above areas related to the Site. In performing the evaluation, we have reviewed available documents provided by the Town from Mabbett & Associates Inc., including the Project Status Summary dated April 26, 2018 and relevant attachments, as well as information readily available online from MassDEP.

SITE DESCRIPTION AND SUMMARY OF PREVIOUS RESPONSE ACTIONS

Based on prior reports, the Site is an undeveloped, approximately 143-acre parcel of land located at 17 Lawrence Street in Norfolk. Historically, an approximately 20-acre portion of the Site was occupied by Buckley & Mann, a textile manufacturer that operated at the Site from the early 1900s to 1994. Site uses under the Buckley & Mann textile operations resulted in the release of oil and hazardous materials (OHM) to site soils, shallow groundwater, and sediment associated with former treatment lagoons for effluent from the textile operations.

Previous assessments performed between 1986 and 2000 identified contaminants of concern at the Site which included chromium, lead and polycyclic aromatic hydrocarbons (PAHs) in soil and trace PAHs in shallow groundwater. Remedial activities performed in 1998 and 1999 included:

- Excavation and off-site disposal of approximately 315 cubic yards of soil containing lead and chromium;
- Removal and off-site disposal of drummed wastes associated with former operations;
- Removal and off-site disposal of approximately four cubic yards of potential asbestos containing material; and
- Consolidation of an additional 4,550 cubic yards of contaminated soil into an on-site consolidation cell, which was subsequently covered with a geotextile fabric and three feet of clean soil.

Following the completion of the above activities, CDM Smith (CDM) submitted a Class A-3 Response Action Outcome (RAO) Statement and Notice of Activity and Use Limitation (AUL) to MassDEP on August 1, 2001.

In September 2017, MassDEP performed an audit of the RAO and AUL in place on the Site. The audit identified two deficiencies with the RAO and AUL:

1. Soil conditions within the AUL area (representing the consolidated and capped soil area) indicated that concentrations of OHM exceeded Method 1 S-1 Standards (established to be protective of unrestricted

site use). The AUL did not explicitly prohibit residential use, and as such, soil in this area continues to exceed the relevant unrestricted use standards, representing a violation of 310 CMR 40.1074(2)(i).

2. A characterization of risk of harm to the environment was not conducted as part of the CDM RAO. According to the MassDEP Notice of Audit Findings and Notice of Noncompliance, this risk shall be characterized using a two-stage approach. In Stage I, the objective is to identify whether conditions at the Site have the potential to impact current environmental receptors, based on a review of analytical data indicating the presence of OHM in surface water or sediment on the Site including wetlands, the presence of OHM at the site within two feet of the ground surface, and the potential for this contamination to result in exposure to wildlife.

MassDEP further commented on the Method 1 risk characterization written in support of the 2001 RAO, which did not include a detailed assessment of potential risk to environmental receptors (wetland and terrestrial habitats) on the Site. According to the MassDEP audit and information contained in the RAO, sediment samples collected from the on-site lagoon and trench indicated elevated levels of TPH, chromium, lead, and zinc. As of the submittal date of the RAO, sediment screening criteria were based on the Lowest Effects Level, published by the Ontario Ministry Environment. Concentrations of chromium, lead, and zinc exceeded the threshold lowest effects level, suggesting that additional work would be necessary to establish the impact or lack thereof to the on-site environment. The absence of a Stage I Environmental Screening was reported as a violation of 310 CMR 40.0995.

Ultimately, MassDEP required that the AUL on the Site be terminated, a new AUL registered with the Norfolk County Registry of Deeds to address the deficiencies in the initial AUL, and a revised Permanent Solution Statement be prepared for the Site that corrects the violations noted above.

Subsequent to the NOAF / NON, Mabbett & Associates, Inc. terminated the AUL in place on the Site and retracted the RAO on May 14, 2018. At this time, Mabbett additionally filed a Tier Classification Extension to extend deadlines for addressing the MassDEP concerns past the initial 180-day deadline as specified in the NOAF/NON. According to the Tier Classification submittal, Mabbett estimated that assessment activities, additional remediation, and regulatory closure through filing of a Permanent Solution for the Site would be completed within one year of the Tier Classification submittal (May 2019).

Post RAO Assessments

To support redevelopment activities of the Site, additional assessments were performed by the development team, including sampling of Site soils, sediment, groundwater and surface water since 2013. Information regarding these assessments is summarized below, and sampling locations from these assessments are presented in Figures 4 through 9, attached as an appendix to this report. Initial considerations for the sample results from each investigation is provided in the relevant sections, followed by a detailed description of recommendations for additional assessment.

2013 Test Pitting Investigation:

Following demolition of the on-site buildings in 2011, thirty-eight (38) test pits were excavated through the remaining concrete slabs of these structures to characterize soils below the buildings. Test pits were reportedly excavated to six feet below grade and eight (8) laboratory analytical samples were collected based on the visible appearance of potential contamination and analyzed for Volatile Petroleum Hydrocarbons (VPH), Extractable Petroleum Hydrocarbons (EPH), and RCRA 8 Metals. Results from the nine soil samples provided in Table 7 of the Mabbett Report indicate that one exceedance of Method 1 S-1 Standards was reported for lead in sample P3 TP1 (221 mg/kg v. 200 mg/kg).

Concentrations of EPH fractions and various PAHs were detected throughout the test pit samples at concentrations below relevant Method 1 S-1 standards. Concentrations of Naphthalene and Xylene were detected in two test pits below Method 1 standards, with all other assessed VPH compounds below method detection limits. Arsenic and barium were detected in all five of the evaluated soil samples at concentrations below Method 1

standards, while cadmium, chromium, lead, and mercury were detected in a subset of the samples below Method 1 Standards.

June 2014 Groundwater Sampling

Six of the on-site wells in the vicinity of Area #10 - Consolidation Area were sampled in June 2014 to assess for potential leaching of contaminants from Site soils to underlying groundwater. Samples were analyzed for VOCs, EPH/PAHs, and metals.

Two detections of arsenic were noted above the relevant Method 1 GW-1 standards, from MW-3 and MW-6 (0.031 mg/L and 0.0174 mg/L versus Method 1 GW-1 cleanup standards of 0.01 mg/L). Barium, chromium, and mercury were additionally detected above method reporting limits but below relevant Method 1 Standards. No VOCs or EPH fractions or target analytes were detected above method reporting limits except for acetone in one sample, which was detected below relevant Method 1 Standards. As acetone is a common laboratory contaminant, this compound is not currently considered a contaminant of concern with respect to the Site.

Weston & Sampson notes that several analytes, including cadmium and various VOCs had elevated method detection limits above the relevant Method 1 Standards. Reanalysis or sampling of these sample locations should be considered as warranted based on subsequent supplemental data to eliminate the possibility that these compounds are present above Method 1 Standards.

2014 Test Pitting Investigation

During a 2014 assessment, twenty-three additional test pits were excavated on the site to further assess soil in the former building areas. Soil samples were field screened for the presence of Total Organic Vapors (TOV) using a photoionization detector (PID), with no “significant PID field screening detections” noted in the report. Select samples were submitted for analysis of MCP 14 metals based on discoloration, debris, or proximity to known process areas, and one sample was submitted for EPH analysis.

Of the nine submitted samples, various detections of metals including barium cadmium, chromium, lead, mercury, nickel, vanadium and zinc were noted, with no samples exceeding relevant Method 1 cleanup Standards. Several PAH compounds, as well as EPH (C19-C36 aliphatic fraction) were reported in sample TP-10 below relevant Method 1 Standards.

Based on these analytical results, PAH detections were likely associated with coal ash observed within this test pit location. Weston & Sampson notes that similarly to the 2013 Test Pitting investigation, a limited number of samples were submitted from a large area and number of test pits (nine samples out of twenty-three test pit locations). As such, additional assessment is recommended within these areas to improve the frequency of sampling and aerial coverage.

2014 Surface Water Sampling

In October 2014, surface water samples were sampled from Bush Pond and City Mills Pond to evaluate the potential effects of stormwater runoff from the Site to these areas. One sample was collected from each waterbody and analyzed for RCRA 8 Metals. A second set of samples was collected from upstream and downstream locations of the Site in November 2014 to further assess the extent to which surface water impacts could be attributed to the Site. Two samples were collected from Eagle Brook (upstream of the Site), and one sample was collected from the Mill River (downstream of the Site). Results from these analyses reportedly indicated that arsenic exceeded Ambient Water Quality Criteria, as well as one exceedance of Ambient Water Quality Criteria for lead in Bush Pond. Additional surface water and sediment sampling is recommended in all water bodies of the site to assess for site-related impacts and ecological risk.

2015 Groundwater Sampling

In April 2015, an additional round of groundwater samples was collected from the six on-site wells assessed in 2014 in Area #10, for MCP 14 Metals. Two samples were additionally analyzed for VOCs.

Three additional wells outside of the initial 2014 study area were sampled in June 2015 to evaluate migration of contamination from the Site to nearby receptors. Town Well WS-3, as well as two on-site monitoring wells (MW-3DX and MW-9DX) located southwest of Lagoon #3 and northeast of the Carbonizer Lagoon, respectively, were analyzed for MCP 14 Metals, only.

Arsenic was detected in seven of the nine wells at concentrations above Method 1 GW-1 standards, including wells WS-3 and MW-3DX. Except for low level detections of barium and zinc below relevant Method 1 Standards, no additional metals were detected in the analyzed samples. Trichloroethylene (TCE) was the only detection of VOCs from monitoring well MW-3. No previous detections of TCE had been reported at the site, and the source of this detection is unknown. As TCE was detected at 3.02 ug/L vs. a Method 1 GW-1 standard of 5 ug/L, Weston & Sampson recommends additional VOC delineation in this area to assess whether this detection was anomalous, or whether further assessment is needed both spatially and at deeper depths in the aquifer.

At the time of the initial 2015 groundwater sampling event, it was presumed that arsenic present in site groundwater may be a result of natural conditions, rather than historical industrial operations. To further assess this possibility, a third round of groundwater samples were collected in September 2014 from five on-site monitoring wells for analysis of both total and dissolved arsenic to assess whether suspended solids within the wells were contributing to the elevated arsenic concentrations detected. Dissolved arsenic was not detected in any of the assessed soil samples above method detection limits, while total arsenic was detected in several of the analyzed samples. The report stated that the lack of detections within the filtered (dissolved) samples indicated that arsenic was primarily associated with soil particles, rather than dissolved from overburden soils or other site conditions. Weston & Sampson recommends sampling of groundwater wells upgradient of the Site to determine if arsenic in groundwater is a regional occurrence.

2015 Phase I Environmental Site Assessment (ESA) and 2017 ESA update

A Phase I ESA was completed in December 2015 to assess the presence of any Recognized Environmental Conditions (RECs) on the site pursuant to ASM standard E1527-13. The Phase I identified the presence of the on-site consolidation area as a REC and noted that this area was being managed under the MCP, with an AUL in place restricting site use. No evidence of historical use, storage, release, or disposal of OHM was reportedly identified beyond the limits of the former Buckley Mann Facility. A subsequent update to the Phase I was completed in 2017 stating that no significant changes in site conditions had occurred.

2018 Soil Investigation

In March 2018, supplemental soil samples were collected from the Carbonizer Trench, Carbonizer Lagoon, and Tail Race portions of the site. This sampling was conducted to evaluate residual contaminations in these three waste treatment areas in support of an environmental risk characterization for the Site. Four soil samples were collected from the banks of the Carbonizer Trench, eight from the Carbonizer Lagoon, and four samples from the Tail Race, with all samples collected from a depth of 0 – 1 feet below ground surface (BGS). All sixteen samples were analyzed for MCP 14 Metals, with five select soil samples additionally analyzed for EPH and PAH target analytes.

Within the Carbonizer Lagoon area, each of the collected soil samples contained lead above Method 1 S-1 Cleanup Standards, while two samples contained various additional metals above relevant Method 1 Cleanup Standards, including antimony, cadmium, trivalent chromium, and zinc.

Two samples from the portion of the Carbonizer Trench closest to the lagoon, concentrations of lead and 2-methylnaphthalene exceeded Method 1 S-1 Cleanup Standards. The two samples in the upstream portion of the trench reportedly did not exceed Method 1 Cleanup Standards.

Additionally, none of the samples collected from the tail race reportedly contained metals or EPH / PAHs above Method 1 Standards.

Considering the continued exceedance of Method 1 standards in the Carbonizer Trench and Lagoon, Mabbett proposed additional soil sampling in these areas to delineate the vertical and horizontal extent of lead contamination in support of the anticipated Environmental Risk Characterization, and to verify the conclusions of the human health risk assessment reportedly performed to support the 2001 RAO. Also, these soil samples were collected from embankment soil only and not sediment from below existing water surfaces. Additional sediment sampling is recommended from these areas for evaluation of potential risk to human health and the environment.

Discussion of Current MCP Status and Compliance

Currently, the Site is administratively in compliance with MassDEP and the provisions of the MCP. Following receipt of the NOAF / NON, Buckley Mann terminated the AUL and retracted the RAO, and subsequently filed a Notification of Delay in Compliance with Response Action Deadlines Form, as well as submitting a Tier Classification Extension for the Site. The Tier Classification Extension gives an additional two years to complete response actions on the Site and file a Permanent Solution, and the owner can apply for additional extensions as needed following MassDEP notification and subsequent approval. Note that a Tier Classification Extension does not absolve the responsible party from additional timeline requirements, fees, etc. under the MCP for additional regulatory submittals.

Mabbett has indicated that they anticipate response actions to be completed within one year of the filing of the May 14, 2018 Tier Classification Extension, including achievement of a condition of no significant risk and filing of a Permanent Solution for the Site. In addition, the Site is now a Public Plan (PIP) site following the petition of more than 10 local concerned citizens on May 23, 2018.

Discussion of Risk to Human Health Posed by Current Contaminant Concentrations

Risk assessment activities conducted in support of the former CDM Class A-3 RAO for the Site were relatively minimal and did not adequately address current requirements of MCP Subpart I: Risk Characterization (310 CMR 40.0900). As surface water and sediment impacts have been reported for the Site, a Method 1 Risk Assessment (as conducted under the CDM RAO) is insufficient under the MCP to fully evaluate the risks on the Site, and a more detailed, site-specific Method 3 Risk assessment is required.

Prior to completion of the risk assessment, additional investigation into the nature and extent of contamination on the Site is required, fulfilling the objectives of a Phase II Comprehensive Site Assessment. Prior to this assessment a Conceptual Site Model should be developed, which lists contaminants of concern, describes how this contamination has entered and been transported in the environment, and identifies exposure pathways that would affect receptors (human populations, wildlife populations, etc.). This CSM should address fate and transport considerations of the on-site media, as well as inform delineation of nature and extent of encountered contamination to identify data gaps and areas that need additional sampling to support risk assessment activities.

General Considerations and Sampling Recommendations

Comprehensive figures have not been provided showing all sampling locations, depths, dates collected, and tested contaminants from the various assessment rounds. Overall better figures are needed that clearly identify where samples have been collected and further assess data gaps without bold topographic lines and wetland boundaries clouding site features and sample locations. Geologic cross sections should also be developed which demonstrate the vertical extent of impacts and the geologic strata that impacts are within. Additionally, although groundwater flow has been determined to be roughly to the north and west, a complete study of the well network to refine groundwater flow information may be useful for detailing contaminant transport considerations.

Weston & Sampson additionally notes that data used in support of the CDM RAO utilized out-of-date testing methodology, including use of total petroleum hydrocarbon (TPH) test to assess petroleum impacts, which has

been superseded by MassDEP VPH/EPH testing methodologies. Further consideration of past data, in light of testing methodology and current site conditions may be warranted. Future testing would require EPH/VPH and mandated Quality Assurance / Quality Control as defined by MCP 310 CMR 40.0017 – Compendium of Analytical Methods (CAM).

Chromium testing across the former Textile Mill area has indicated concentrations in excess of 650 parts per million, which exceed threshold values of 200 ppm requiring an Imminent Hazard evaluation. Furthermore, chromium speciation should be completed across this area to evaluate whether chromium is primarily in the form of Chromium (III) or Chromium (VI).

Furthermore, as previous Site operations included the use of dye paste, additional testing for such compounds as sulfates, pH, chlorides, copper, and VOCs should be considered in relevant portions of the Site.

Area-Specific Sampling Comments and Recommendations

Based upon current MCP standards and guidance, as well as our review of information provided by Mabbett on remedial actions conducted to date, additional sampling to determine the nature and extent of contamination on the Site is recommended. Overall, samples collected during the CDM assessment were inadequate to fully delineate the extent of contamination both horizontally and vertically throughout the Site, with sample depths often unreported in CDM documentation. Additionally, surficial soil sampling has been conducted at many locations throughout the Site indicating concentrations above relevant standards, but no additional sampling at greater depths has been performed to determine the full thickness of the contaminated soils and sediments. See Figures 4-9 for recommended sampling locations. To assess potential risks to the Site to human health, the following actions should be considered:

1. Additional sampling in the Carbonizer Lagoon

The Carbonizer Lagoon area has historically shown concentrations of lead in excess of Method 1 Criteria throughout samples collected from this area. Additional metals have also been detected in surficial soils from this location above Method 1 Standards, including chromium and zinc. Supplemental sampling to determine the horizontal extent of this contamination is recommended, as a clear horizontal boundary has not yet been established. Furthermore, numerous surficial samples of the top 0 – 1 feet have been collected, but from our review of the available Mabbett and CDM documents, deeper samples have not been collected. Additional soil samples should be collected for, at a minimum, metals analysis at depth. In addition, samples should be collected for additional parameters to evaluate ecological risk including samples of surface water and sediment (If present).

2. Additional Sampling in the Carbonizer Trench

Similar to the Carbonizer Lagoon, additional sampling of, at a minimum, the downstream portion of the Carbonizer Trench for metals should be conducted to define both the horizontal and vertical extent of contamination in this area. In addition, samples should be collected for additional parameters to evaluate ecological risk including samples of surface water and sediment (If present).

3. Supplemental Sampling from Dredge Spoil Lagoon Areas

Areas 3, 4, 5, 6, 7, and 8, as identified by CDM as debris, process waste, and lagoon dredging stockpile areas, were historically excavated and consolidated within the capped Area 10 northeast of the former on-site structures. These areas reportedly represented dredge spoils from the on-site lagoons and other fill materials from various areas of the Site, which contained elevated concentrations of, at a minimum, PAHs and chromium. To date, no documentation of confirmatory sampling exists demonstrating that No Significant Risk to human health or the environment exists. As such, further sampling along the reported horizontal boundaries of these areas is recommended, as well as sampling within the areas to assess whether sufficient depths of excavation occurred. Additionally, supplemental assessment of petroleum constituents including EPH and PAHs, and copper should

be considered within this area to delineate nature and extent and assess these COCs, which are associated with dye house process wastes.

4. Additional Sampling in Lagoon #1, Lagoon #2 and Lagoon #3

Similar to the areas described above, the former Lagoon #1 and Lagoon #2 areas have exhibited elevated PAH, chromium, and 1,1-biphenyl concentrations. Additional sampling to delineate these areas both horizontally and vertically should be conducted, including analysis of copper, and EPH / PAHs due to the nature of these locations as repositories for dye house process wastes. Samples should also be collected to evaluate ecological risk including samples of surface water and sediment (If present). As a comprehensive measure, similar sampling should also be conducted in Lagoon #3.

5. Additional sampling within the area of former on-site structures

Following building demolition, a total of sixty-one test pits were excavated within the general vicinity of, or through, the former building slabs. A limited number of analytical samples were collected from these test pits, which represent a large spatial area and may be associated with former process areas. Further assessment of these areas may be warranted, including additional laboratory sampling in the vicinity of P3 TP1, which showed evidence of lead above relevant Method 1 Standards. Additional assessment of previously untested portions of the Site should be considered on a holistic basis to obtain better site coverage following generation of a site-wide figure and assessment of data gaps.

6. AUL Area

Sampling should be conducted outside the perimeter of the AUL Area to improve spatial coverage around the consolidation area for metals and EPH with target PAH analysis. EPH/PAH testing is recommended since dredged material from lagoons has previously contained these constituents along with metals such as lead.

Discussion of Risk to the Environment Posed by Current Contaminant Concentrations

To fully address the risk to environmental receptors posed by Site contamination, a Method 3 Environmental Risk Characterization would be required, as per 310 CMR 40.0995. In the April 2018 status report for the Site, Mabbett has indicated that a Stage I Environmental Risk Screening should be performed following additional sampling of the Carbonizer Trench and Carbonizer Lagoon, with the intention of determining whether Significant Risk of Harm to the environment can be ruled out based on the residual contaminant levels. In reviewing previous data for the Site, it is considered likely that one or more contaminants of concern for the Site will exceed relevant threshold values as published in the MassDEP Technical Update – Revised Sediment Screening Values. If data exceeds these values, a quantitative Stage II Risk Characterization can be performed, which will determine the actual risks to ecological receptors and the environment. Such evaluations are typically conducted by a qualified ecological risk assessor. Following the development of a conceptual site model to represent the links between contaminants, their fate and transport in the environment, and potential environmental receptors, additional sampling activities, lab testing, locations, and biological studies are performed to characterize the degree of risk. Ultimately, a finding of a condition of "No Significant Risk" to the environment is necessary to complete a permanent solution for the Site. If significant risk continues to exist, additional remedial actions are necessary until such a condition is achieved.

Based on historic sediment data from the Site, and review of Site photographs taken by interested parties, it is possible that not only does a condition of no significant risk fail to currently exist for the Site, but additionally that an *Imminent Hazard* may be present as per 310 CMR 40,0955 (3), which states:

The following conditions shall constitute an Imminent Hazard to the environment:
(a) evidence of stressed biota attributable to the release at the disposal site, including, without limitation, fish kills or abiotic conditions;

MassDEP prepared a PowerPoint presentation entitled Ecological Risk Assessment where examples of stressed biota/ Readily Apparent Harm may indicate an Imminent Hazard. An example of Readily Apparent Harm is iron flocculant as illustrated by the following slide in the presentation.

If an Imminent Hazard to the environment is found, notification to MassDEP must occur within 2-hours per 310 CMR 40.0311(7) and filing of an Immediate Response Action (IRA) Plan indicating measures to be taken to eliminate that hazard would be required. Further evaluation of the potential for an Imminent Hazard condition related to the condition of on-site surface water bodies is therefore recommended.

Recommendations for Supplemental Investigations and Delineation Activities pertaining to the Environment

To support a Stage II Environmental Screening, additional sampling of Site sediment, surface water and / or soils will likely be required. Considering concerns raised by the Conservation Commission pertaining to potential impacts to Bush Pond, and in consideration of potential outlet structures to this surface water body from the Buckley and Mann Site, sampling of surface waters and sediment within the pond is recommended to support the human and ecological risk assessments. Additional sampling of all Site surface water bodies, and associated sediments is also recommended to further assess environmental risks in support of the Stage II Environmental Screening.

Evaluation of Current Site Conditions to a Potential On-Site Municipal Well

To evaluate whether historic and/or present hazardous materials/waste on the Site present impacts to a potential municipal well on the Site, Weston & Sampson reviewed the Mabbett April 2018 Project Status Summary, which included a GHC Hydrogeologic Evaluation Report dated December 15, 2017, as well as a CAQ Engineering Associates, Inc., Abbyville Commons Development WWTP – Narrative dated March 8, 2018.

Weston & Sampson has the following comments pertaining primarily to the GHC Report and not necessarily MCP issues:

The numerical groundwater model used was a tool to evaluate groundwater mound height as a result of the proposed groundwater discharge. Weston & Sampson notes the following on the GWC model:

- Overall, the model was limited in scope and simplified with respect to aquifer geometry, variability in aquifer parameters, and boundary conditions.
- The model was not calibrated to observed piezometric level conditions. The model was not verified to an observed aquifer stress.
- The model did not provide a site-wide understanding of groundwater flow (vertically and horizontally).

- The model was sufficient to simulate and predict the resultant mound height at the area of discharge and directly downgradient to the Mill River as a result of the proposed groundwater discharge.
- The model was not capable of simulating impacts to area sensitive receptors, including:
    - Private bedrock water supply wells
    - The Town of Norfolk's proposed public water supply test well area.
    - The Town of Franklin's public water supply wells
    - The AUL

Insufficient subsurface data collection was collected to understand whether there is a hydraulic connection between the proposed discharge area and the private bedrock water supply wells. Analytical approaches were used to evaluate the potential impact to existing and proposed public water supplies.

The hydraulic impact from the proposed groundwater discharge on the AUL area is a 29% increase in the hydraulic gradient. This in turn will increase the average linear velocity of groundwater flow in this area by the same percentage. The contaminants of concern however are bound to soils and not expected to migrate significantly.

Based on this assessment, subsurface data collection gaps and a simplified modeling approach have limited the extent to which an evaluation of potential impacts to nearby sensitive receptors can be made. That being said, uncertainty in the evaluation has been compensated by the project proponent by:

- Increasing number of monitoring wells included in the groundwater monitoring plan to evaluate potential impacts to nearby private drinking water supply wells, and
- Increasing the level of wastewater treatment proposed to meet the DEP requirements for a groundwater discharge located within a two-year time of travel to public drinking water supply wells.
- Provide curbside public water supply shutoffs for Lawrence Street homes.
- Conduct pre/post construction monitoring of monitoring wells located between the WWTF and both the private wells and the Town Test Well Site, as well as private wells themselves for those abutters who are interested.

Adopting the supplementary measures detailed above will provide an additional level of conservatism in both the discharge water quality and subsequent monitoring that minimize the threat of a potential impact as a result of this development.

From an environmental risk and MCP perspective, Weston & Sampson additionally notes that overall, total arsenic appears to be the primary contaminant identified to date in Site groundwater. Through the various assessments performed by Mabbett, these high arsenic concentrations have been potentially attributed to soil particles remaining within the collected water samples, rather than dissolved arsenic within the groundwater. Further assessment of treatment for, at a minimum, the dissolved arsenic concentrations should be considered during design of treatment systems for any wells installed near the Buckley Mann Site. Additional monitoring well installations between the Buckley Mann Site and the production well location should also be considered to further supplement the existing on-site data.

Conclusions

Based on our review of the available information, we have identified data gaps that we recommend to address. Aspects of the Site that we believe require additional investigation include:

- Further soil sampling and assessment of several areas of the Site to delineate contaminants of concern within these areas in support of a Site risk characterization to human health, including:
    - The Carbonizer Lagoon and Trench,
    - The Dredge Spoil Areas from the former on-site lagoons,
    - Lagoon #1 and Lagoon #2,
    - The general area of the former on-site structures,
    - The perimeter of the AUL area

- Additional sampling of on-site surface water, soils, and embankments, as required to support an ecological risk assessment for the Site,
- Evaluation of additional contaminants of concern in select areas related to site operations, including petroleum constituents (EPH and PAHs), copper, as well as VOCs,
- Preparation of a Method III Risk Assessment to synthesize the above information and determine whether a condition of No Significant Risk has been achieved for the Site, or whether additional remedial actions will be required to comply with the provisions of the MCP,
- Adopt supplementary measures pertaining to the on-site WWTP and proposed production well, as detailed above, to minimize the threat of potential impact as a result of this development.

Further discussion of commentary from relevant interested parties can be provided following the completion of relevant Zoning Board of Appeals and other Town meetings, as well as based on community input provided for the Site through the Public Involvement Plan, as needed. We are pleased to have been of service to the Town of Norfolk. If you have any questions regarding this letter, please do not hesitate to contact the undersigned at (978) 573-4040.

Sincerely,

WESTON & SAMPSON ENGINEERS, INC.

Frank Ricciardi, P.E., LSP
Vice President

FIGURES

- Adopt supplementary measures pertaining to the on-site WWTP and proposed production well, as detailed above, to minimize the threat of potential impact as a result of this development.

Further discussion of commentary from relevant interested parties can be provided following the completion of relevant Zoning Board of Appeals and other Town meetings, as well as based on community input provided for the Site through the Public Involvement Plan, as needed. We are pleased to have been of service to the Town of Framingham. If you have any questions regarding this letter, please do not hesitate to contact the undersigned at (978) 573-4040.

Sincerely,

WESTON & SAMPSON ENGINEERS, INC.

Frank Ricciardi, P.E., LSP
Vice President

FIGURES

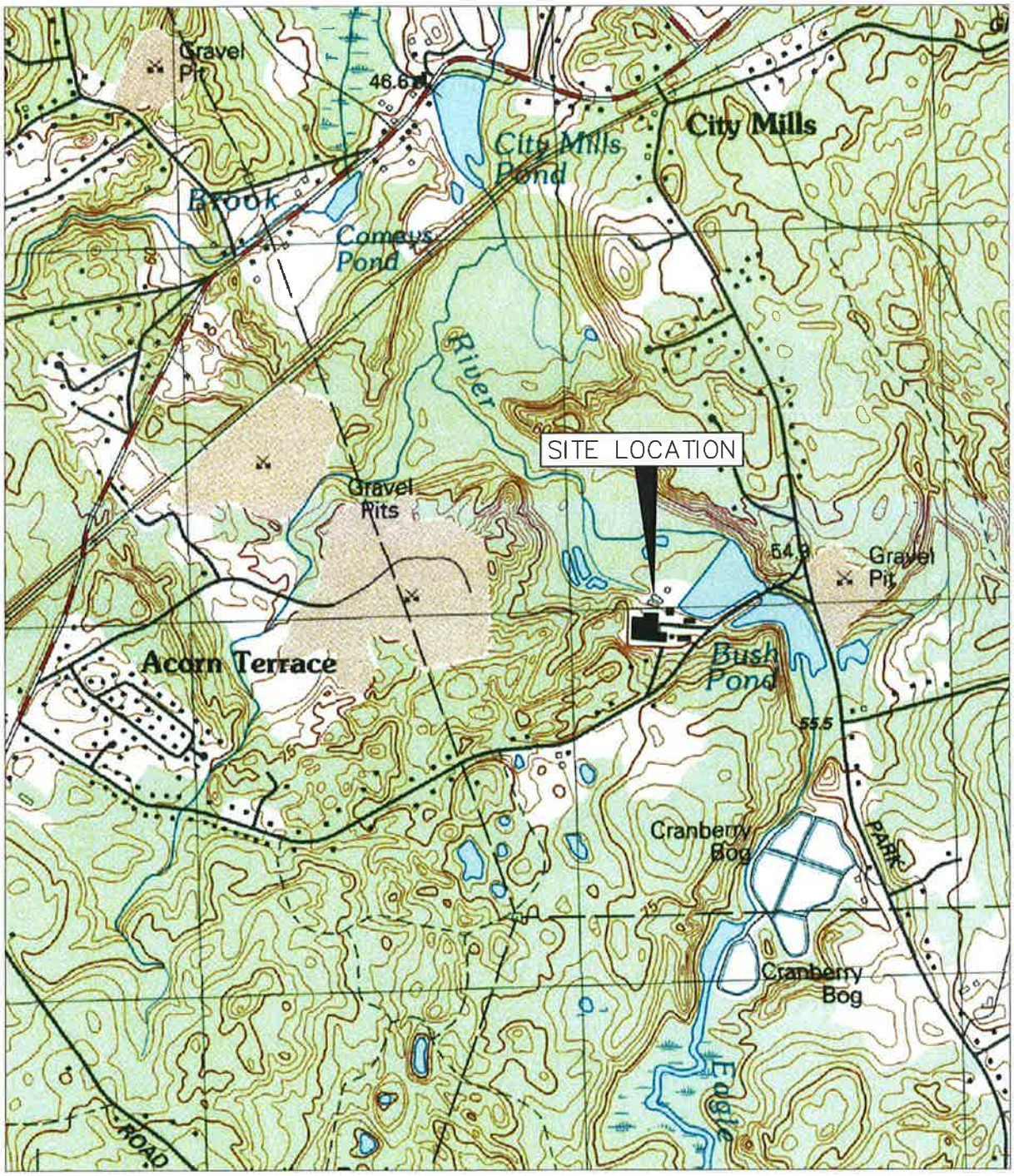


FIGURE 1
BUCKLEY & MANN PROPERTY
NORFOLK MASSACHUSETTS

SITE LOCUS

SCALE: 1"=1000'

0 1000 2000

C:\Users\omesn\Desktop\Norfolk CAD\Norfolk.dwg

FIGURE 2
BUCKLEY & MANN PROPERTY
NORFOLK MASSACHUSETTS

AERIAL IMAGE

SCALE: 1"=200'

0 200 400

C:\Users\amesn\Desktop\Norfolk CAD\Norfolk.dwg

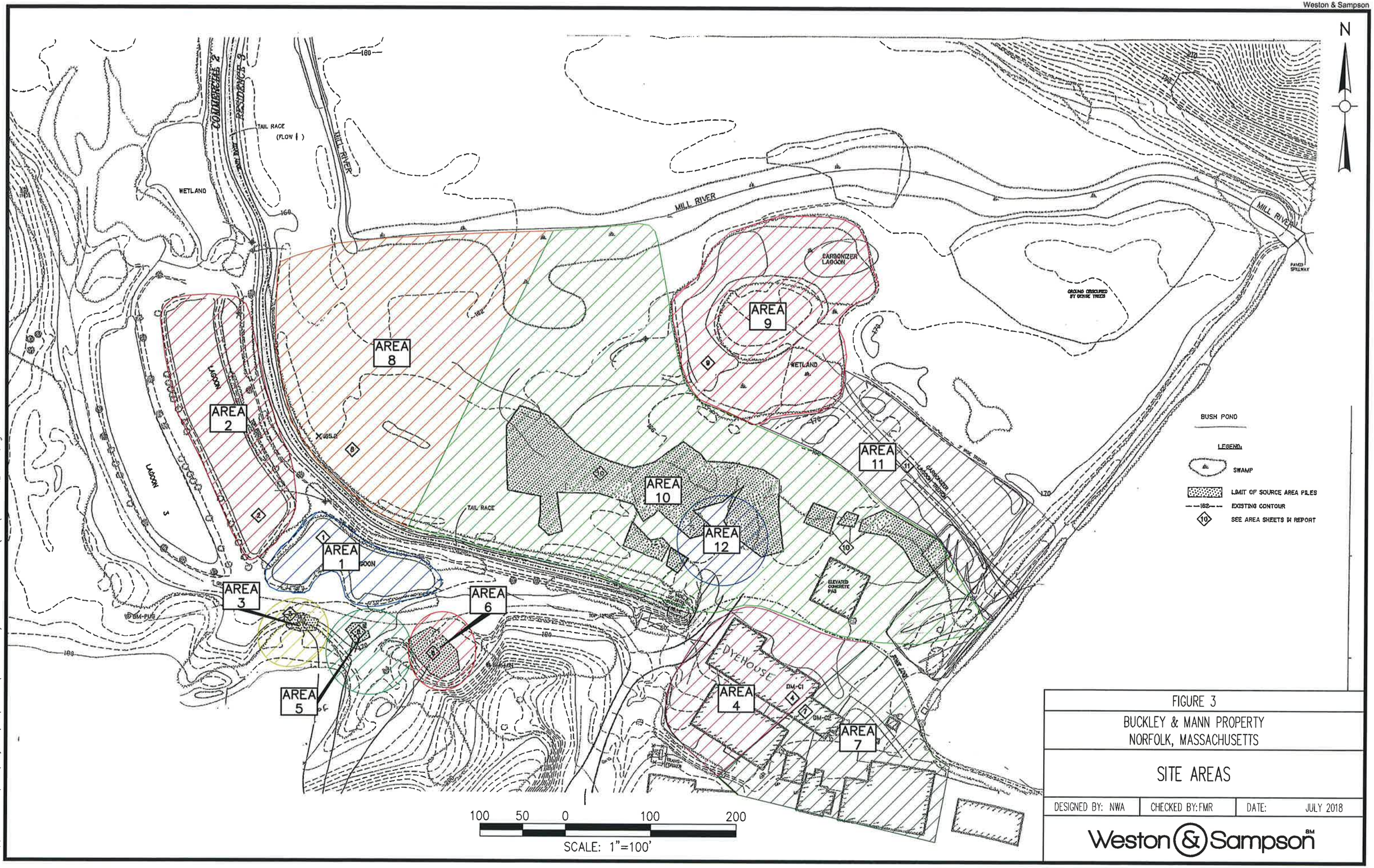


FIGURE 3

BUCKLEY & MANN PROPERTY
NORFOLK, MASSACHUSETTS

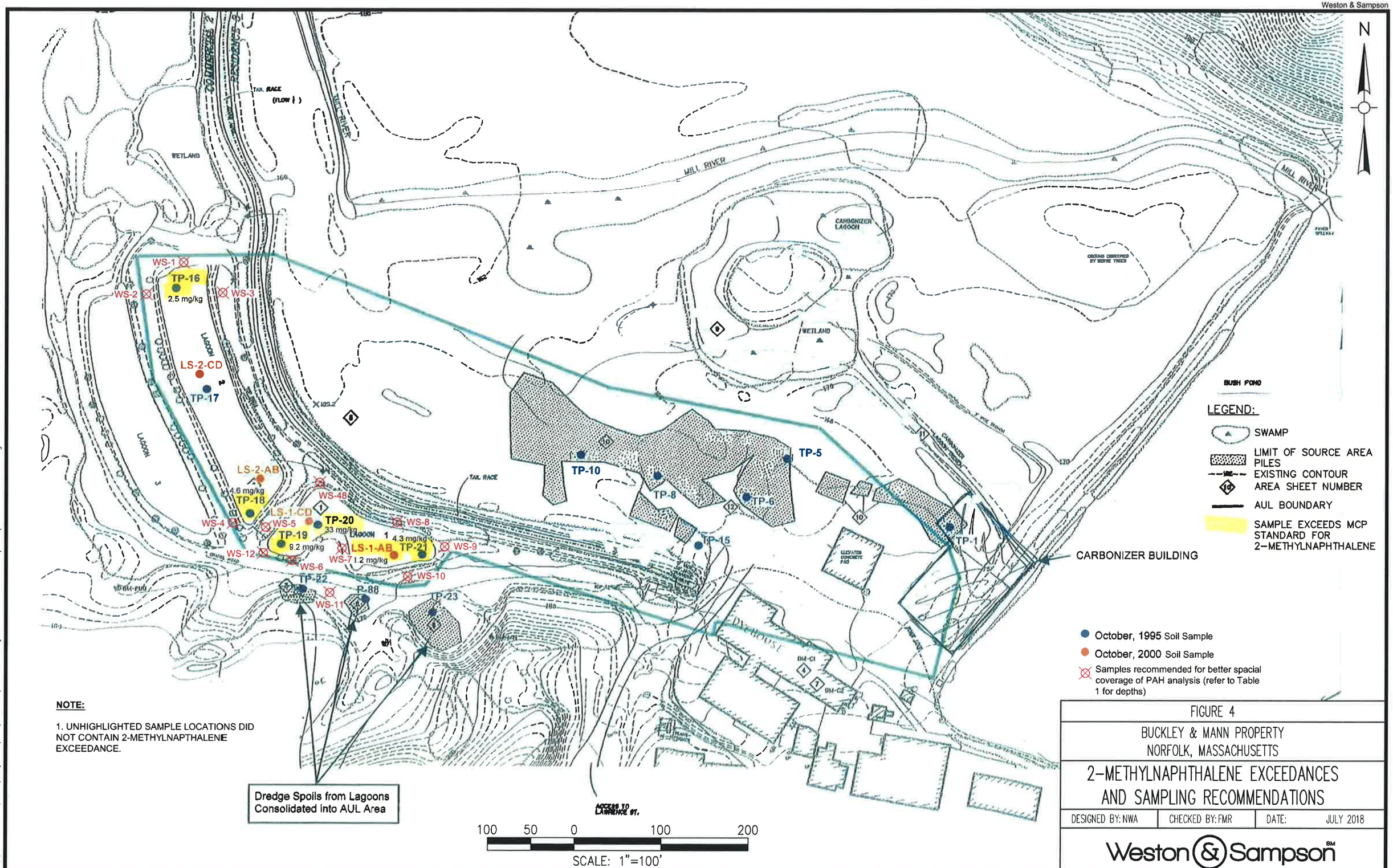
SITE AREAS

DESIGNED BY: NWA	CHECKED BY: FMR	DATE: JULY 2018

Weston & Sampson

\\wse03.local\WSE\Projects\MA\Norfolk\Norfolk Abbyville Commons MCP\CAD\Norfolk REV AH.dwg

Weston & Sampson



NOTE:

1. UNHIGHLIGHTED SAMPLE LOCATIONS DID NOT CONTAIN 2-METHYLNAPHTHALENE EXCEEDANCE.

FIGURE 4

BUCKLEY & MANN PROPERTY
NORFOLK, MASSACHUSETTS

2-METHYLNAPHTHALENE EXCEEDANCES AND SAMPLING RECOMMENDATIONS

DESIGNED BY: NWA	CHECKED BY: FMR	DATE: JULY 2018

Weston & Sampson

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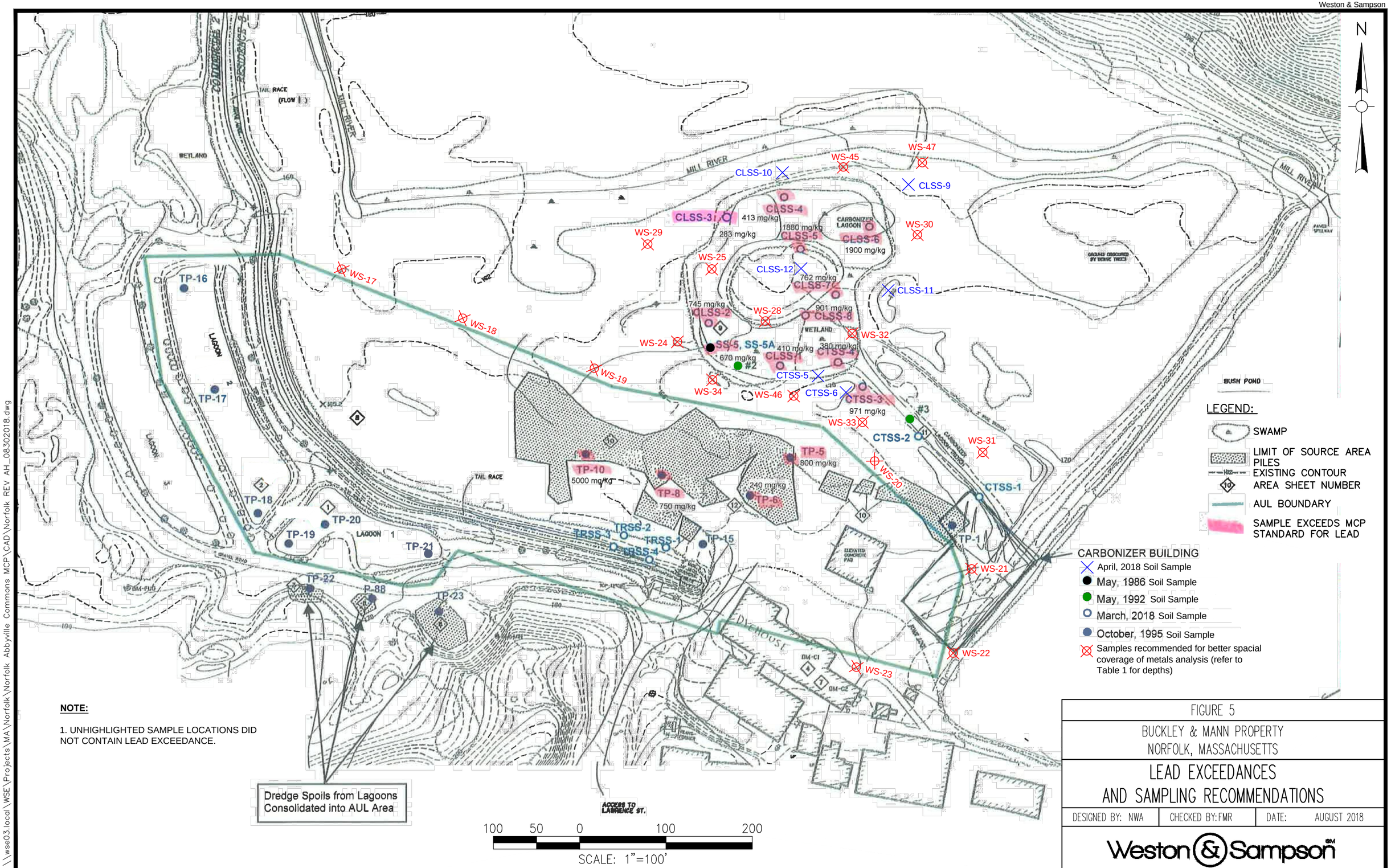

NOTE:

1. UNHIGHLIGHTED SAMPLE LOCATIONS DID NOT CONTAIN LEAD EXCEEDANCE.

FIGURE 5

BUCKLEY & MANN PROPERTY
NORFOLK, MASSACHUSETTS

LEAD EXCEEDANCES
AND SAMPLING RECOMMENDATIONS

DESIGNED BY: NWA	CHECKED BY: FMR	DATE: AUGUST 2018

Weston & Sampson

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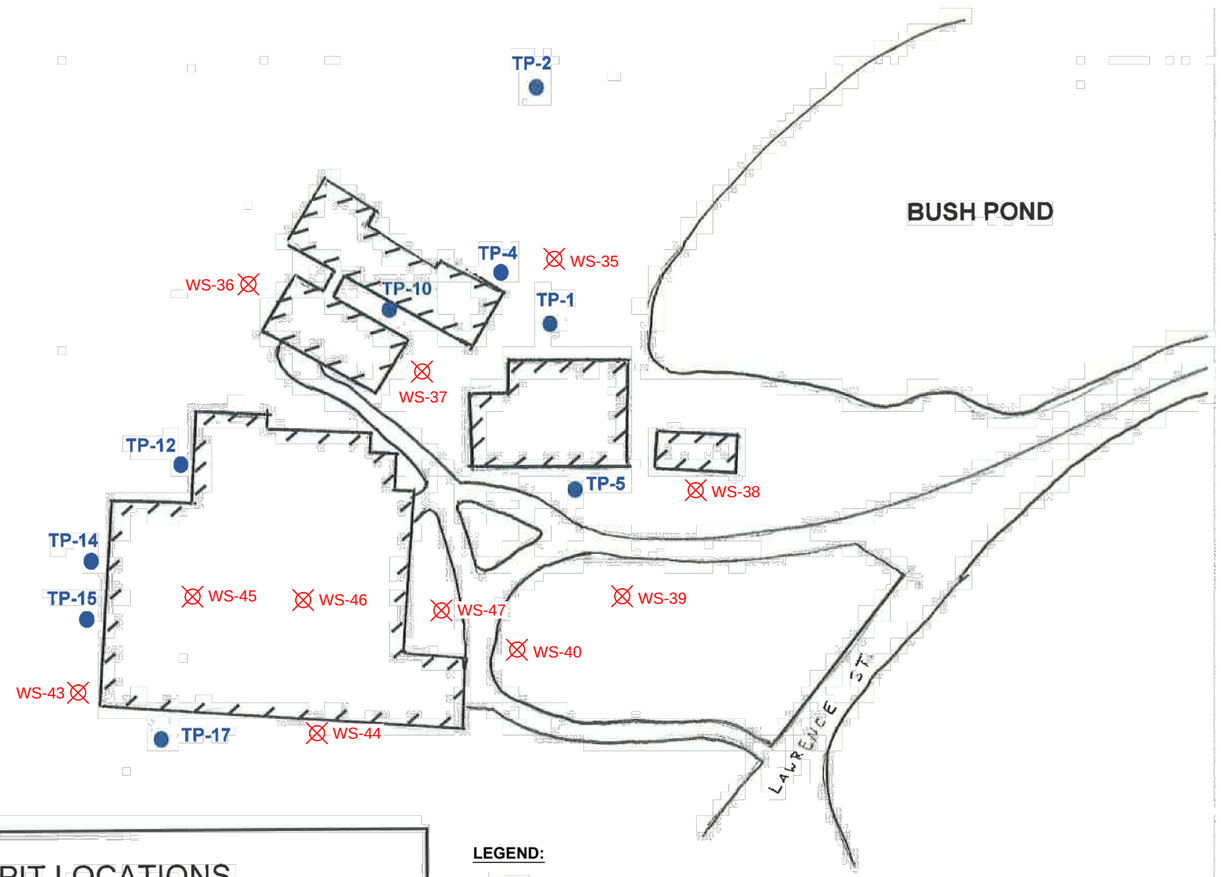

N

2014 TEST PIT LOCATIONS
17 LAWRENCE STREET, NORFOLK, MA

LEGEND:

TP-1 2014 TEST PIT

Samples recommended for better spacial coverage of metals analysis (refer to Table 1 for depths)

100 50 0 100 200

SCALE: 1"=100'

FIGURE 7

BUCKLEY & MANN PROPERTY
NORFOLK, MASSACHUSETTS

2014 TEST PIT LOCATIONS
AND SAMPLING RECOMMENDATIONS

DESIGNED BY: NWA	CHECKED BY: FMR	DATE: AUGUST 2018

Weston & Sampson

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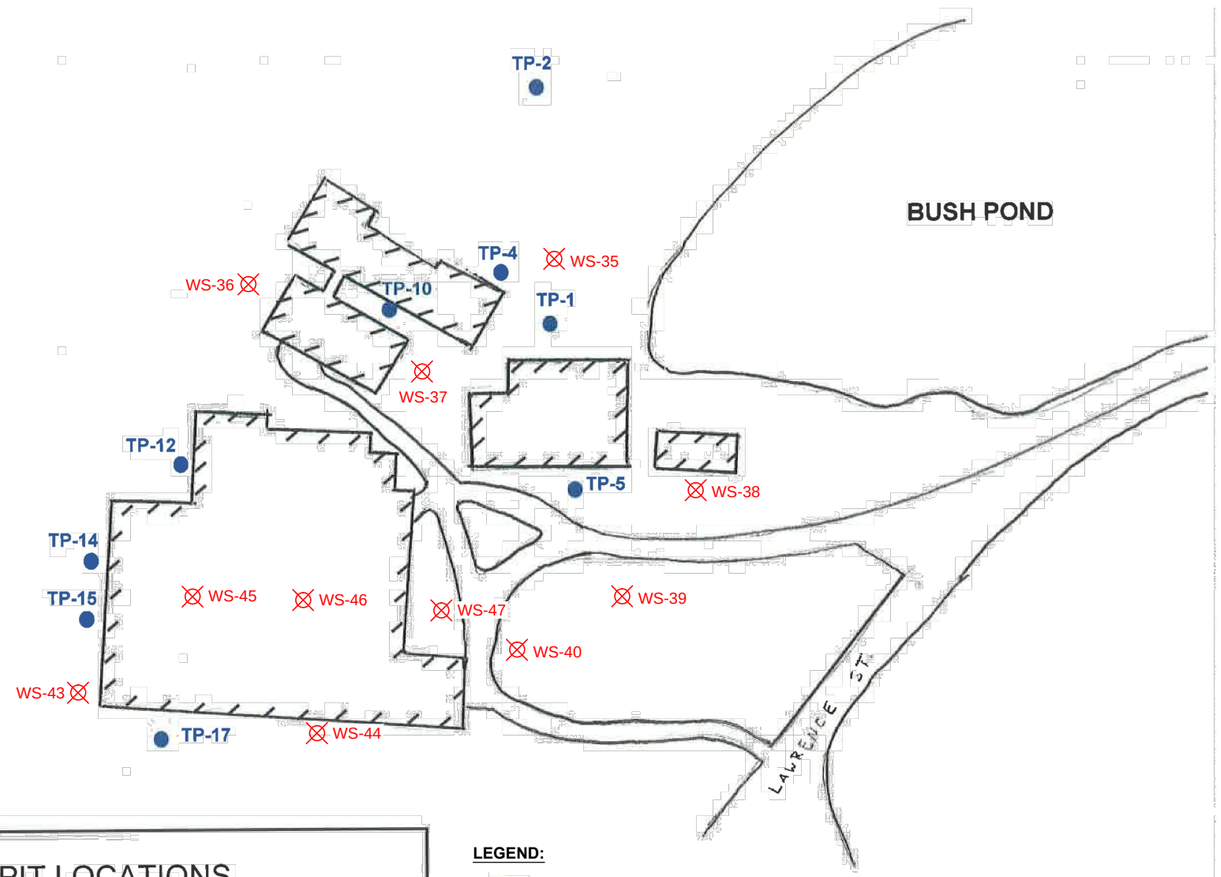

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17 LAWRENCE STREET, NORFOLK, MA

LEGEND:

TP-1 2014 TEST PIT

Samples recommended for better spacial coverage of metals analysis (refer to Table 1 for depths)

100 50 0 100 200

SCALE: 1"=100'

FIGURE 7

BUCKLEY & MANN PROPERTY
NORFOLK, MASSACHUSETTS

2014 TEST PIT LOCATIONS
AND SAMPLING RECOMMENDATIONS

DESIGNED BY: NWA	CHECKED BY: FMR	DATE: AUGUST 2018

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N

MW-03A

MW-03 31 ug/L (2014) 20 ug/L (2015)

WSSW-1

EW-02

WSSW-3 /L (2015)

MW-05
360 ug/L (2015)

WSSW-2

WSSW-18

WSSW-5

WSSW-4

WSSW-19

WSSW-6

GW-1-AB
16 ug/L (2000)

WSSW-7

WSSW-8

WSSW-9

39 ug/L (2014

MW-06
17.4 ug/L (2014)
320 ug/L (2015)

WSSW-15

WSSW-16

WSSW-17

WSSW-10

WSSW-11

WSSW-12

WSSW-13

WSSW-14

MILL RIVER

WETLAND

TAIL RACE (FLOW ↓)

LAGOON

CARBONIZER LAGOON

BUSH POND

CARBONIZER BUILDING

DYE HOUSE

ACCESS TO LAWRENCE ST.

Dredge Spoils from Lagoons consolidated into AUL Area

GROUNDWATER RECOMMENDATION:

Current round of groundwater sampling from existing wells for dissolved metals and VOCs

LEGEND:

- SWAMP
- LIMIT OF SOURCE AREA PILES
- EXISTING CONTOUR
- AREA SHEET NUMBER
- AUL BOUNDARY
- SAMPLE EXCEEDS 10 µg/L OF ARSENIC
- SAMPLE EXCEEDS 10 µg/L OF LEAD
- Monitoring Well
- SURFACE WATER
- SAMPLE EXCEEDS 10 µg/L OF 2-METHYLNAPTHALENE
- RECOMMENDED SURFACE WATER/SEDIMENT SAMPLE LOCATION

100 50 0 100 200

SCALE: 1"=100'

FIGURE 8

BUCKLEY & MANN PROPERTY
NORFOLK, MASSACHUSETTS

GROUNDWATER EXCEEDANCES AND RECOMMENDED SURFACE WATER SAMPLING

DESIGNED BY: NWA	CHECKED BY: FMR	DATE: JULY 2018

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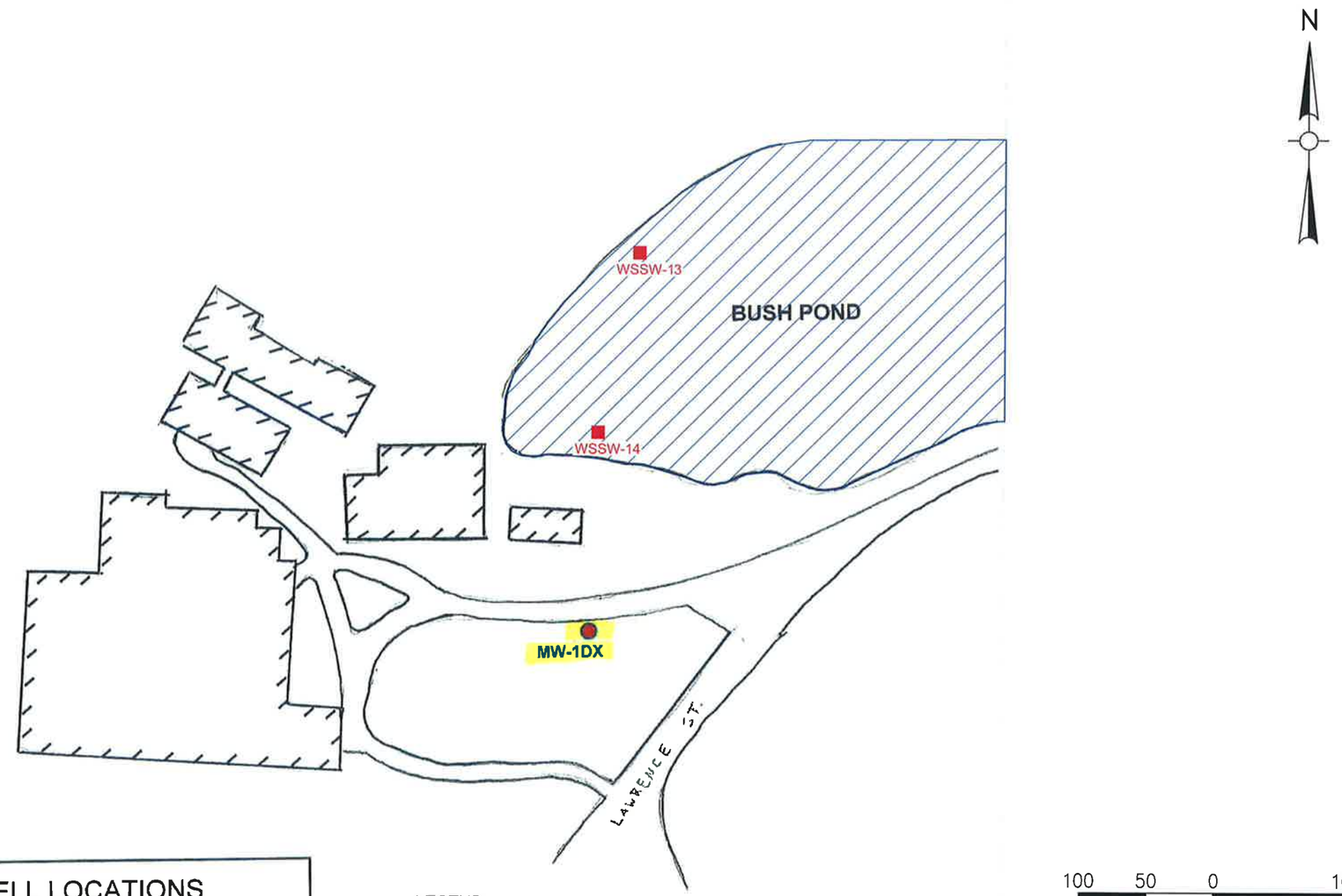

GROUNDWATER RECOMMENDATION:

Current round of groundwater sampling from existing wells for dissolved metals and VOCs

MONITORING WELL LOCATIONS
17 LAWRENCE STREET, NORFOLK, MA

LEGEND:

SAMPLE EXCEEDS 10 µg/L OF ARSENIC

SURFACE WATER

RECOMMENDED SURFACE WATER/SEDIMENT SAMPLE LOCATION

100 50 0 100 200

SCALE: 1"=100'

FIGURE 9

BUCKLEY & MANN PROPERTY
NORFOLK, MASSACHUSETTS

GROUNDWATER EXCEEDANCES AND RECOMMENDED SURFACE WATER SAMPLING

DESIGNED BY: NWA	CHECKED BY: FMR	DATE: JULY 2018

Weston & Sampson

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TABLES

TABLE 1
Recommended Samples

Site Area #	Sample ID	MCP 14 Metals	VOCs	PAHs	EPHs
Lagoon 1	WS-6 (0-1')	1		1	
Lagoon 1	WS-6 (1-3')	1		1	
Lagoon 1	WS-7 (0-1')	1		1	
Lagoon 1	WS-7 (1-3')	1		1	
Lagoon 1	WS-8 (0-1')			1	
Lagoon 1	WS-8 (1-3')			1	
Lagoon 1	WS-9 (0-1')			1	
Lagoon 1	WS-9 (1-3')			1	
Lagoon 1	WS-12 (0-1')	1		1	
Lagoon 1	WS-12 (1-3')	1		1	
Lagoon 1	WS-41 (0-1')	1			1
Lagoon 1	WS-41 (1-3')	1			1
Lagoon 1	WS-48 (0-1')	1		1	
Lagoon 1	WS-48 (1-3')	1		1	
Lagoon 2	WS-1 (0-1')			1	
Lagoon 2	WS-1 (1-3')			1	
Lagoon 2	WS-2 (0-1')			1	
Lagoon 2	WS-2 (1-3')			1	
Lagoon 2	WS-3 (0-1')			1	
Lagoon 2	WS-3 (1-3')			1	
Lagoon 2	WS-4 (0-1')			1	
Lagoon 2	WS-4 (1-3')			1	
Lagoon 2	WS-5 (0-1')	1		1	
Lagoon 2	WS-5 (1-3')	1		1	
Lagoon 2	WS-16 (0-1')	1			
Lagoon 2	WS-16 (1-3')	1			
Former Buildings	WS-35 (0-1')	1	1		1
Former Buildings	WS-35 (1-3')	1	1		1
Former Buildings	WS-36 (0-1')	1	1		1
Former Buildings	WS-36 (1-3')	1	1		1
Former Buildings	WS-37 (0-1')	1	1		1
Former Buildings	WS-37 (1-3')	1	1		1
Former Buildings	WS-38 (0-1')	1	1		1
Former Buildings	WS-38 (1-3')	1	1		1
Former Buildings	WS-39 (0-1')	1	1		1
Former Buildings	WS-39 (1-3')	1	1		1
Former Buildings	WS-40 (0-1')	1	1		1
Former Buildings	WS-40 (1-3')	1	1		1
Former Buildings	WS-43 (0-1')	1	1		1
Former Buildings	WS-43 (1-3')	1	1		1
Former Buildings	WS-44 (0-1')	1	1		1
Former Buildings	WS-44 (1-3')	1	1		1
Source Area Pile 3	WS-13 (0-1')	1			
Source Area Pile 3	WS-13 (1-3')	1			
Source Area Pile 5	WS-11 (0-1')	1		1	
Source Area Pile 5	WS-11 (1-3')	1		1	
Source Area Pile 5	WS-14 (0-1')	1			
Source Area Pile 5	WS-14 (1-3')	1			
Source Area Pile 6	WS-10 (0-1')	1		1	
Source Area Pile 6	WS-10 (1-3')	1		1	
Source Area Pile 6	WS-15 (0-1')	1			
Source Area Pile 6	WS-15 (1-3')	1			
Source Area Pile 6	WS-42 (0-1')	1			1
Source Area Pile 6	WS-42 (1-3')	1			1
Carbonizer Lagoon	WS-24 (0-1')	1			
Carbonizer Lagoon	WS-24 (1-3')	1			
Carbonizer Lagoon	WS-25 (1-3')	1			
Carbonizer Lagoon	WS-28 (1-3')	1			
Carbonizer Lagoon	WS-29 (0-1')	1			
Carbonizer Lagoon	WS-29 (1-3')	1			
Carbonizer Lagoon	WS-30 (0-1')	1			
Carbonizer Lagoon	WS-30 (1-3')	1			
Carbonizer Lagoon	WS-32 (1-3')	1			
Carbonizer Lagoon	WS-34 (0-1')	1	1		1
Carbonizer Lagoon	WS-34 (1-3')	1	1		1
Carbonizer Lagoon	WS-45 (0-1')	1			
Carbonizer Lagoon	WS-45 (1-3')	1			
Carbonizer Lagoon	WS-46 (0-1')	1	1		
Carbonizer Lagoon	WS-46 (1-3')	1	1		
Mill River	WS-47 (0-1')	1			
Mill River	WS-47 (1-3')	1			
AUL Area	WS-17 (0-1')	1			
AUL Area	WS-17 (1-3')	1			
AUL Area	WS-18 (0-1')	1			
AUL Area	WS-18 (1-3')	1			
AUL Area	WS-19 (0-1')	1			
AUL Area	WS-19 (1-3')	1			
AUL Area	WS-20 (0-1')	1			
AUL Area	WS-20 (1-3')	1			
AUL Area	WS-21 (0-1')	1			
AUL Area	WS-21 (1-3')	1			
AUL Area	WS-22 (0-1')	1			
AUL Area	WS-22 (1-3')	1			
AUL Area	WS-23 (0-1')	1			
AUL Area	WS-23 (1-3')	1			
Carbonizer Trench	WS-31 (0-1')	1			
Carbonizer Trench	WS-31 (1-3')	1			
Carbonizer Trench	WS-33 (0-1')	1			
Carbonizer Trench	WS-33 (1-3')	1			
Total:		**77**	**20**	**26**	**22**

TABLE 2

Recommended Surface Water and Groundwater Samples*

Site Area	Sample ID	Dissolved Metals	Fe	VOCs	EPHs
Lagoon 1	WSSW-6	1	1	1	1
Lagoon 2	WSSW-3	1	1	1	1
Lagoon 2	WSSW-5	1	1	1	1
Lagoon 3	WSSW-2	1	1	1	1
Lagoon 3	WSSW-4	1	1	1	1
Carbonizer Lagoon	WSSW-15	1	1	1	1
Carbonizer Lagoon	WSSW-16	1	1	1	1
Carbonizer Lagoon	WSSW-17	1	1	1	1
Tail Race	WSSW-1	1	1	1	1
Tail Race	WSSW-7	1	1	1	1
Tail Race	WSSW-18	1	1	1	1
Tail Race	WSSW-19	1	1	1	1
Mill River	WSSW-8	1	1	1	1
Mill River	WSSW-9	1	1	1	1
Mill River	WSSW-10	1	1	1	1
Bush Pond	WSSW-13	1	1	1	1
Bush Pond	WSSW-14	1	1	1	1
Carbonizer Trench	WSSW-11	1	1	1	1
Carbonizer Trench	WSSW-12	1	1	1	1
Total:		**19**	**19**	**19**	**19**

* All viable groundwater monitoring wells on Site should be sampled for dissolved metals and VOCs at a minimum.