EPA Comments on revised Phase III Remedial Action Plan – RTN 4-601 Former Aerovox Facility, Prepared for AVX Corporation, Fountain Inn, SC, June 2017

General Comments:

Interface with the Harbor Remediation:

a. AVX has made the most limited use possible of the contaminant data collected by EPA and provided to them in November 2016 from the adjacent riverbank and river sediments of the Acushnet River. This data indicates that there has been and continues to be a significant potential for migration of contaminated groundwater and DNAPL from the Aerovox Site to the New Bedford Harbor Superfund Site. The data provided by EPA should be utilized throughout the report in analysis and discussion of potential past and future fate and transport of both CVOCs and PCBs in groundwater and DNAPL.

b. There is only minor consideration of the ongoing remediation of Harbor sediments by EPA, particularly the well-communicated fact that a significant amount of sediment directly adjacent to the Aerovox Site has been scheduled for removal. One of the rare exceptions to this are indications in the Phase III report which cite the potential for concentrations of COCs to enter the Aerovox Site from the New Bedford Harbor Superfund Site.

c. AVX appears to have failed to address MassDEP's comment No. 9 for OU3B (pages 17-18 of MassDEP's February, 2017 determination) which requires that "Such considerations must be included in any Phase III evaluation in meet [sic] the performance standards of a Phase III RAP. 310 CMR 40.0858(3)(b) specifically states that the comparative difficulty in implementing each alternative in terms of facility operations and other current or potential remedial actions must be addressed." For example, in its description of its preferred alternative OU3-9, AVX leaves out details about how to prevent erosion of contaminated material at either Site; how, after removal of the existing sheet pile wall, it intends to restore the shoreline area to resiliency in light of EPA's planned removal of the shoreline material east of the property boundary at the Aerovox Site, or how it will prevent recontamination at the Titleist site until EPA dredges the subtidal and intertidal areas at the Titleist shoreline.

d. The preferred alternative eventually implemented by AVX, especially on the shoreline, must accommodate both the interim cap to be installed by EPA at the adjacent New Bedford Harbor Superfund Site in the near term, as well as the selected remedy of dredging for the New Bedford Harbor Superfund Site once the source and management of migration has been satisfactorily addressed. The geotechnical stability of any type of vertical barrier or treatment wall to be constructed by AVX must be compatible with EPA's interim sediment cap as well as the shoreline dredging to be completed by EPA at a later time. It will be important to include structural elements that will ensure that any type of vertical barrier or treatment wall maintains its integrity during implementation of the

Harbor remedy. Similarly, there is little discussion about why the existing sheet pile wall must be removed. Is the effectiveness and technical feasibility of the preferred alternative for OU3-9 dependent upon removal of the existing sheet pile wall? Will AVX achieve source control and management of migration if the wall is left in place? EPA anticipates installing its interim cap in 2018 and EPA believes that AVX should reconsider its alternative evaluation under section 310 CMR 40.0858(3)(b) of the MCP.

e. Also under Section 40.0853, a Phase III evaluation shall result in a preferred alternative that is reasonably likely to achieve No Significant Risk and that is a Permanent Solution or a Temporary Solution until a Permanent Solution can be reached. Each of these terms are defined in the MCP to mean no substance of concern shall present a significant risk of damage or harm to health, safety, public welfare or the environment during any foreseeable period of time, or in the case of a Temporary Solution, until a Permanent solution is achieved. This would encompass protecting the surrounding environment, that is, the adjacent Acushnet River, from releases and migration of contaminants from the Aerovox Site. The section below from MassDEP's 2010 ACO with AVX explains the purpose of the sheetpile wall:

> (k) Under the 1982 Order with USEPA and the Consent Agreement with DEQE, Aerovox installed a hydraulic asphalt concrete cap over a portion of the Property soils, and a steel sheet pile cutoff wall to serve as a vertical barrier between PCB-contaminated soils and groundwater, and tidal flow into and out of the Acushnet River.

AVX's preferred alternative must ensure that contamination does not migrate from the Aerovox Site into the Harbor. AVX needs to take into account the existing sheetpile wall's function as a barrier to contaminant migration. Also the sheetpile wall may serve to limit PCB contamination from the Harbor to go back to the Aerovox Site ("vertical barrier between PCB-contaminated soils and groundwater, and tidal flow into and out of the Acushnet River). If the sheetpile wall is removed and EPA has not completed the dredging of PCB-contaminated sediment next to the wall, then AVX must address migration of contamination from the Aerovox Site to the Harbor and recontamination of the Aerovox Site by the Harbor.

f. Modelling of the fate and transport of COCs carried in groundwater and DNAPL into the New Bedford Harbor Superfund Site appears to overestimate the permeability of the shallow bedrock aquifer to transport COCs away from the Site and to underestimate its impact on COC pore water concentrations in the immediate area of the Acushnet River. A more realistic modelling effort supported by the existing data should be undertaken by AVX.

g. Additionally, although a significant amount of material within 25 feet laterally of the sheet pile wall is now proposed for removal and on-site consolidation, nearly all material at and below the peat layer is not. Nearly all of this area could be considered within a confirmed or potential DNAPL zone, i.e., even a relatively

narrow band is expected to contain a significant amount of contamination that would eventually be released to the Harbor if not removed or fully contained. While excavation of soils as described in Alternative OU3-9 will remove the major contaminated soils along the boundary, the results of the soil characterization of MW-15D show that considerable quantities of PCBs could be found under the peat layer and in the deeper portions of the outwash and glacial till. Leaving this material in place could jeopardize the Harbor by mass transport of DNAPL gravimetrically or by erosion into the Harbor.

h. Finally, the Phase III report states that the remedial goals of OU3 only relate to risks at the Aerovox Site after the New Bedford Harbor remediation is complete. This is at odds with the direction indicated in MassDEP's February 7, 2017 written determination. Comment 3 on OU3B clearly states that AVX's obligation to control the source at the Aerovox site should not be "contingent upon" source removal in the Acushnet River or as part of the EPA New Bedford Harbor Superfund cleanup." No dredging of sediment by EPA in the New Bedford Harbor Superfund Site can take place until the fully functional source control and management of migration remedies have been fully implemented by AVX.

Monitoring Plan: A limited amount of contaminated soil and DNAPL has been targeted for removal by the OU3-9 preferred alternative. Therefore, a monitoring and corrective action plan to monitor and to address potential releases to the New Bedford Harbor Superfund Site during remedy construction and address remedy effectiveness in perpetuity are critical elements moving forward.

The June 30, 2017 Phase III Report states of OU3-9:

> "This alternative would also include long term groundwater monitoring (estimated at twenty years) for CVOCs and PCBs to verify that impacted groundwater does not flow off-property to adjacent properties or the river. The monitoring network is assumed to consist of approximately twelve monitoring wells. It is anticipated that the first year of monitoring would be conducted on a quarterly basis to confirm the effectiveness of the barrier, the last two years on a quarterly basis to provide the data needed for the Permanent Solution Statement, and that during intervening years the samples would be collected semi-annually."

There is no mention in the Phase III Report of a contingency remedy to be implemented if the monitoring demonstrated 'flow' off-property or to the river (aka " New Bedford Harbor Superfund Site"). Given the lack of a demonstrated track record of this technology at this type of site, MassDEP should consider if one be should be required.

It is unclear what measures AVX will employ to avoid creating a sheen during excavations at the Aerovox and Titleist parcels, what contingent measures will be taken in the event of a release, and whether estimated costs include these measures. EPA notified AVX and MassDEP during the IRA when sheens occurred (and were not contained) and that EPA considered this to be a release to the Harbor.

Compliance with TSCA: In its letters to AVX dated May 1, 2017, and October 25, 2016, copies of which were provided to MassDEP, EPA has notified AVX that in order to maintain compliance with TSCA, all 21E submissions must be provided to our TSCA program coordinator, Kim Tisa, for review and comment. After reviewing the initial Phase III submission (August 2016), Kim provided AVX with comments. Through phone conversation with AVX's LSP, both parties agreed that the revised Phase III would include revisions to address Kim's comments. By separate letter, Kim is providing separate comments on behalf of the TSCA program on AVX's revised submission, a copy of which will be provided to MassDEP.

Evaluation of Alternatives: AVX's evaluation of the weighting criteria is problematic, leading to a preferred alternative that is less protective than others identified and relies on unproven technology, with implementability and constructability issues.

a. Page 4-4, Section 4.1.2.1 indicates that groundwater modelling led to the conclusion that pumping at the required rates in shallow bedrock to create hydraulic capture would draw contamination down from the overburden soils into bedrock fractures, complicating subsequent removal. As indicated in specific comments below, the modelling of the bedrock aquifer with unrealistically high permeability compared to overburden deposits at the Site should be reconsidered and corrected. AVX used the conclusion of the modelling to screen out all hydraulic containment remedies; the resulting screening out of the hydraulic barrier technology likewise should be corrected.

b. Discussions of the effectiveness of the proposed remedial alternatives for overburden groundwater were subjective and did not appear to fully consider the possible effects of each alternative on the Harbor cleanup efforts. In fact, it is not clear that the preferred remedial alternative (OU3-9) will be fully effective with respect to preventing contaminant migration to the River based on limited column testing demonstrating mixed results performed and described in the Phase III Report. No instance where a similar technology has been used in a similar environment with similar COCs and DNAPL present has been presented. No further testing on pilot or bench scale should be considered without a clear rationale for selection of a technology so unproven elsewhere, and in light of the enormous gap between the effectiveness, implementability, and constructability of hydraulic containment compared to an unproven PRB in this set of conditions. Hydraulic containment has been used for a wide variety of sites and contaminants and does not have the level of uncertainty for effectiveness and constructability that a PRB would entail. Alternatives employing hydraulic containment and an impermeable barrier would be much more likely to achieve a permanent solution and should be fairly evaluated in light of those facts.

c. For OU3, AVX appears to have determined that *any* alternatives containing in-situ treatment of hot spot overburden soils will achieve a Permanent

Solution, yet AVX has screened out other alternatives with proven track records at other sites. For instance, hydraulic containment is capable of significantly reducing off-site migration of COCs without an in-situ treatment component but was nonetheless screened out. Additionally, AVX gives a great deal of weight to the in-situ treatment for soils despite all of the problems identified during the studies summarized in section 4.4 and Appendix H of the submission. For instance, the studies concluded that the effect of reagents tested for potential use for in-situ treatment of soils were unclear for PCBs and did not have a clear effect on groundwater concentrations in the lab tests.

Impacted Shallow Uncapped Soils, OU1: AVX is shifting the burden for a portion of the Titleist cleanup to EPA. With regard to PCB exceedances identified by EPA sampling, AVX has drawn the OU1 site boundary based on its own definition of migrating contamination, using only overland flow from the Aerovox Site. It specifically excludes from its OU1 remediation any contamination beyond the asphalt parking lot marked by site geography where the land rises and forms a sort of natural berm beyond which the overland flow from Aerovox cannot migrate onto the Titleist property. For the remaining contamination identified by EPA sampling, AVX claims it comes from the River and is beyond AVX's scope to address under 21E (i.e., it is EPA's responsibility to address). EPA does not agree with this position (at least for contamination above the high tide line) since AVX has been identified as the primary party responsible for the Harbor contamination. The OU1 remedy should address contamination on the Titleist property above the high tide line.

DNAPL: DNAPL Summary (Section 2.4.7 and Appendix D): In response to comments on the 2016 Phase III, a detailed DNAPL evaluation of the Site was completed for the revision. Figures 2 and 3 of Appendix D show "probable" DNAPL zones extending along approximately 40% of the Aerovox shoreline, immediately adjacent to the Harbor, for the shallow and deep overburden zones of the aquifer, with the following statements provided in the supporting text (bolding of text has been added for emphasis):

> "Therefore, the DNAPL mobility evaluation is congruent with the investigative findings and supportive of a **middle-** to late-stage DNAPL plume condition" (Appendix D, page 21)

> "Current site conditions indicate that contiguous DNAPL bodies of sufficient lateral extent to migrate under these gradient influences are not likely present at the Site and the major if the DNAPL present today is in the form of residual DNAPL." [assumed text is meant to be "…major form of DNAPL…"] (Appendix D, page 21)

> "Rather, the DNAPL is considered to be stable, but may have micro-scale mobility, defined by the MCP as NAPL with a footprint that is not expanding, but which is visibly present in the subsurface in sufficient quantities **to migrate or**

potentially migrate as a separate phase over a short distance and visibly impact an excavation, boring or monitoring well." (section 2.4.7, page 2-23)

a. DNAPL guidance documents define the "middle" stage condition as still having some pooled DNAPL in the subsurface. Even if DNAPL at the Site is considered residual at this time, the presence of even a small amount of pooled DNAPL along the boundary of the Site presents a significant risk of recontamination of Harbor sediments at the Harbor Superfund Site. Just as DNAPL was able the migrate the "short distance" into monitoring well MW-15D and into the shoreline excavations performed in 2016, some release into the Harbor is expected as sediments adjacent to the Aerovox Site are excavated. In addition, this mobility has the potential to cause the selected OU-3 remedy (PRB wall) to fail as it is inappropriate in treating DNAPL. EPA's TCL for the New Bedford Harbor Superfund Site is 10 mg/kg for the sediments of the upper Harbor. Therefore, release of even a small amount of DNAPL from the Aerovox Site has the potential to re-contaminate substantial areas of the Harbor.

b. In its summary of DNAPL on page 2-23 (Section 2.4.7) AVX has characterized DNAPL as stable and that it may have micro-scale mobility. EPA does not agree with these characterizations for the reasons set out in these comments. For sites with DNAPL with reportable amounts (as at Aerovox), to reach a Permanent Solution, the MCP at 310 CMR 1003(7) requires that non-stable DNAPL is not present under current site conditions and for the foreseeable future and that all DNAPL with micro-scale mobility is removed to the extent feasible based on consideration of CSM principles. EPA continues to believe DNAPL is an uncontrolled source and will be able to continue to travel gravimetrically to the New Bedford Harbor Site (Acushnet River). Pursuant to 310 CMR 40.1003(7) and considering EPA's planned remedial actions in the Harbor adjacent to the DNAPL source areas, AVX may not therefore be able to achieve a Permanent Solution.

c. In addition, as mentioned above, the revised Phase III still does not take into account EPA's data collection efforts in the adjacent Harbor sediments, as demonstrated in the cross sections of both VOC and PCB contamination provided to AVX and MassDEP in November 2016. Taken together with the sheen generated on the water surface during the implementation of the IRA, there is ample evidence that the NAPL present at the Aerovox Site may not be stable and is continuing to migrate towards the New Bedford Harbor Superfund Site.

<u>Selection of Permeable Reactive Barrier Wall as an Element of the Remedy for Aerovox Property Overburden Groundwater, OU3B:</u> EPA continues to have significant concerns about the effectiveness and constructability of the PRB with the COCs present at the Site in this setting. The PRB may not meet the technological feasibility criteria for a comprehensive remedial alternative because "the reliability of the identified alternative has not been sufficiently proven at other sites or through pilot tests and a substantial uncertainty exists as to whether it will effectively reduce risk." 310 CMR 40.0860(6)(b). More specifically,

a. AVX does not include a reliable contingent remedy in the event the 8-month pilot test fails or yields less than successful results. Without a reliable, proven contingent remedy, additional delays will occur until such a contingency remedy is approved by MassDEP and implemented. In the meantime, Aerovox Site contaminants will continue to pose a risk to human health and the environment, will continue to migrate offsite into the Harbor Site, and will cause further delay in achieving a complete remedy for the Harbor Site. AVX is again shifting the burden of cleaning up the Aerovox contamination to EPA through this delay as Site contaminants continue to migrate offsite and into the Harbor. In the event that MassDEP is willing to consider allowing the selection of the PRB as a component of the remedy, it should consider requiring AVX to include a reliable, proven contingent remedy and set concrete triggers for when that contingent remedy must be implemented based on monitoring performed.

b. The alternatives that include the PRB (including the preferred alternative OU3-9) were scored with a moderate to high likelihood of achieving background groundwater concentrations (Permanent Solution) despite all of the constructability and permanence issues EPA has identified in our past comments, and despite the results of AVX's own column testing which indicated only partial removal of the COCs. AVX's own report indicates that more study is needed to prove the effectiveness of this potential alternative. Alternatives relying on hydraulic containment obviously have a proven track record in this kind of a situation and should be scored appropriately in comparison to the PRB alternatives. The statement by AVX that groundwater treatment alternatives have a "marginally higher possibility of reaching background conditions" in section 5.3.1 is a misleading understatement. Groundwater treatment alternatives have a long track record at other sites and do not face the same implementability and constructability concerns as the potential PRB.

c. Alternative OU3- 9 was afforded "good" scores for effectiveness and reliability and "very good" for implementability despite issues previously identified with regard to partial ability of the PRB to contain COCs in Site groundwater, the potential for constructability issues associated with installing the PRB, and unknowns in regeneration costs and frequency. Instead, it appears the driving force in the analysis was cost, as Alternative 9 is the lowest of the 11 alternatives in terms of net present worth. Alternative 9 is also rated "very good" for risk, in terms of controlling erosion; however, it includes removing the existing sheet pile wall and does not offer any other structural support to prevent erosion or to support the existing rip rap on the eastern side of the wall. Any rating applied to OU3-9 in terms of reliability and effectiveness would be conjecture since it is unknown if will remove COCs to background levels based on column testing and lack of track record at other sites with similar conditions.

d. EPA provided substantial comments on the use of a PRB as a remedial component in our comment letter of September 28, 2016 on the initial version of the Phase III report (August 2016), and many of those comments are still applicable to the revised preferred remedy OU3-9. Several of the most significant comments are represented below and discussed further in the specific comment section.

"Considering existing guidance and literature on PRBs, EPA has not found any information to support that a PRB will be effective at treating PCBs. PRBs can be effective at treatment of dissolved-phase CVOC groundwater plumes and are typically constructed at the downgradient edge of a dissolved-phase plume. At this Site, AVX is proposing to construct a PRB through a DNAPL source area and highly-contaminated CVOC and PCBs co-mingled groundwater plume with the river immediately to the east in a system with brackish water where groundwater flow reverses twice-daily as a result of the tides. These significant complexities are not adequately accounted for in the effectiveness, reliability or implementability factors in the evaluation of the OU3B-4 alternative. Additional specific concerns with a PRB wall are as follows:

a. The PRB is proposed to be constructed almost as a "funnel-and-gate" system with impermeable vertical barriers preventing flow around the PRB. However, industry experience has shown that funnel-and-gate systems do not reliably direct groundwater flow through the PRB (i.e., "gate"). Therefore, effective installation of the PRB would likely require a longer PRB than assumed in the Phase II.
b. In recent years, zero-valent ion (ZVI) barriers have been shown to not last as long as previously thought (typically assumed to last for at least 30 years). It should not be assumed that a ZVI barrier will work and persist without significant testing to ensure that the groundwater geochemical conditions will not result in passivation or clogging of the ZVI and degradation of the efficacy of the iron. The Phase III recognizes that replacement of the PRB may be required over the lifetime of the remedy. It does appear that the cost estimate includes one recharge of the PRB; AVX by that period of time will no longer presumably be involved in the project due to their participation agreement with the City of New Bedford leaving it responsible for the potential failures and complexities of the installed PRB.
c. The evaluation of the effectiveness of the PRB with respect to preventing migration of dissolved PCBs did not appear to consider the possibility that migration may be facilitated by dissolved organic material, potentially including the organic material proposed for inclusion in the PRB design.
d. It appears that the PRB was conceptualized to be constructed using material with a hydraulic conductivity similar to or greater than that of the aquifer materials. In practice, this can be difficult to accomplish. If the hydraulic conductivity of the PRB is significantly less than the aquifer, groundwater elevations upgradient of the PRB will increase and likely result in additional contaminant migration from the overburden, through

the bedrock, and into the harbor. Alternatively, if the hydraulic conductivity is higher, this could increase communication between the aquifer and the Acushnet River.

e. One-pass trenching can be an effective method of PRB installation, however it is unclear whether this method would be able to match the contours of the top of the bedrock and ensure a good "seal" along the top of the rock. The deep overburden will tend to be the zone that conducts the highest concentrations of DNAPL COCs. The remedy should include provisions to prevent a gap in the barrier at the bottom.

f. How will performance be measured and monitored? What provisions will there be for further actions if the PRB is not performing as designed and there is breakthrough to the east into the harbor? "

Note: Although the subsequent June 30, 2017 AVX Phase III submittal proposes removal of some of the highest impacted DNAPL zone in the northeast corner of the Site to bedrock, there are still potential DNAPL zones being left in place throughout in material adjacent to the 25-foot wide zone and within the underlying highly contaminated peat layer.

e. It appears that yet more bench and pilot testing of technologies without proven track records are proposed in the June 30, 2017 Phase III document. Delays beyond the 8 months predicted for performing such studies can be expected. This time period may be counterproductive due to the fact that actual proven and reliable alternatives such as hydraulic containment are not being designed for eventual implementation until a later time. Again, these studies will in fact delay the completion of the final cleanup of the adjacent areas of the New Bedford Harbor Superfund Site.

Given these concerns and those identified in the specific comments, the ultimate performance of the PRB should be considered by AVX to be uncertain and afforded less weight in the alternatives evaluation.

Bedrock Transport Pathway: In its February 7, 2017 written determination, MassDEP found deficiencies with the August 2016 Phase III report preferred alternative for OU4, which included the same or similar components as the preferred alternative in the June 30, 2017 version. EPA has the following general concerns with the preferred alternative for OU4; specific concerns are presented in the next section:

a. The preferred alternative for OU4 (ISCO treatment of bedrock groundwater and DNAPL) is dependent on adequate contaminant treatment in bedrock, since there is no component that prevents groundwater flow from bedrock to the Acushnet River. Based on review of bedrock hydrology adjacent to the Acushnet River, it appears that a significant portion of the contaminated bedrock aquifer is in good hydraulic communication with the River. With respect to control of contaminant migration from the Aerovox Site to the Acushnet River, it would appear that a low permeability vertical barrier extending some depth into the bedrock and combined with groundwater extraction for hydraulic gradient control, would be significantly more effective for controlling bedrock groundwater. In

addition, such an approach also has a long-term record of effectiveness at sites elsewhere.

b. Is there any site which has utilized the proposed preferred alternative for OU4? With regard to PCBs presumed treatment by oxidants, is there any relevant studies in the literature which would lead AVX to believe that it will be an effective treatment for PCBs at any other sites? AVX has proposed investing months of additional time for these pilot studies which will only lead to additional delay in implementation of the remedy at the Aerovox site.

c. The Section 5.4. Comparative Analysis for OU-4 is fatally flawed due to the screening out of all active bedrock groundwater alternatives on the basis of the questionable assignment of high conductivities to the shallow bedrock aquifer in modelling presented with the Phase III report. In light of these facts, MassDEP could consider requesting that AVX recomplete the comparative analysis with the active remediation component included, which has a long track record at other sites.

Proposed Consolidation Area(s): AVX's preferred alternatives for OU1 and OU3 include consolidation of highly contaminated PCB waste material onto the Aerovox Site. Very little detail is provided regarding how this material will be consolidated. EPA has the following concerns:

a. Without a lined consolidation area, will onsite consolidation of excavated DNAPL material act as a continuing source to groundwater? Even with proposed engineered barrier, would subsurface tidal action or groundwater flow cause further migration of contamination from the consolidation area? Would it also impact groundwater concentrations of VOCs such that it may impact Precix vapor issues or does the proposed northern vertical wall prevent such migration through overburden and bedrock?

b. The consolidation cell is proposed to be outside the 100-foot waterfront buffer but it is unclear if it is located outside the 500-foot flood zone. FEMA has regulations at 44 CFR Part 9 to address construction in a 500-year flood zone; AVX should be required to identify if this cell is within the 500-year flood zone and how it will be constructed to withstand such flooding. Will the excavation and consolidation of DNAPL material without a liner under an engineered barrier cause the existing groundwater concentrations of TCE and PCB to increase? In order words, will the PRB treatment be sufficient to address such increased concentrations should they occur?

c. At a minimum, DNAPL impacted soils from the 25-foot wide excavation zone should be considered for segregation and disposed of offsite rather than consolidated onsite given the extremely high concentrations and any potential that it may increase migration of contaminants offsite to the River and/or that the PRB may not be sufficient to address such concentrations. Such an approach would

also pose less long-term risk to leave such high levels onsite and offsite would reduce the residual risk after remediation.

d. MassDEP may consider including in the preferred alternative for OU3 an AUL that requires an evaluation for vapor intrusion for any new structure built on the Aerovox Site. The estimated cost for such evaluations should also be included.

In addition, for OU2, MassDEP may consider including in the AUL a requirement that new building construction, renovation, or expansion of existing building footprints must be evaluated for potential vapor intrusion risks. Costs for this evaluation could also be included. OU2 could also include a contingent plan, along with estimated costs, in the event AVX's long-term monitoring detects an indoor air risk in the future.

Detailed Comments on the Phase III Remedial Action Plan—RTN 4-601, Former Aerovox Facility, New Bedford, MA dated June 2017

1. Alternative OU3-9 calls for excavation of northeast corner soils to bedrock to address the deep contaminated soils above the till as represented by MW-15D. Does this excavation include the highly contaminated soils in MIP-53 and MIP-54 that are currently north of the present sheet pile wall? It is not clear from Figure 4.3.3-9 if this is an excavation to bottom of peat or top of bedrock.

2. The last paragraph of Section 2.4.1 states that the sheet pile wall will not be included as part of the final Aerovox remedial alternative. The third paragraph on page 2-6 states that the sheet pile wall will be removed but AVX fails to explain why it is necessary to remove the existing sheet pile wall. Based on the production of sheen during the intermediate removal actions, what precautions will be placed on mitigating transport of contaminants into the Harbor during and after the removal of this barrier? (See also EPA's general comment No. 1 above.)

3. The existing sheet pile wall forms the eastern boundary of the Site under AVX's administrative settlement with EPA for the Aerovox Site. AVX fails to describe how it will monitor offsite migration of contaminants without a physical border between the Harbor Site and the Aerovox Site. MassDEP may want to consider requiring AVX to provide a detailed plan showing how it will demonstrate compliance with source control and management of migration at the Site boundary.

4. The hydraulic conductivity reported in the Phase II CSA for bedrock is comparable to a well graded sand (34.9 ft/day, page 2-11). This affects the modeling of each of the alternatives since the bedrock regime in reality is not as open as modeled. This would in turn, limit the flux of contaminants from the bedrock through the sediments into the Harbor. This could in turn lead to an underestimate of the pore water concentrations in the sediment in the output of the modelling performed by AVX. The assumption that the bedrock layer is this porous is probably not realistic in regard to discharge of contaminants to the Harbor. AVX should re-estimate the hydraulic conductivity of the upper bedrock layer in a manner consistent with the data collected in conjunction with the Site investigation and with general practice for similar situations, as well as recalibrate and run the groundwater model.

5. The text states that "Groundwater modeling indicates that pumping at the required rates to create hydraulic capture would draw contamination down from the overburden soils into bedrock fractures complicating subsequent removal." (Section 4.1.2.1, pg 4-4). It is difficult to envision pumping rates that pull contaminants from the upper layers and subsequently push contaminants into the bedrock fractures. If the bedrock is as open as modeled, this should not be a problem. Hydraulic conductivities consistent with site investigation and general practice should be used in the model for the upper bedrock layer. As the unrealistic permeability in bedrock has been used to screen out hydraulic containment for bedrock, this technology which is proven, reliable, and implementable should be added back to the screening analysis and carried through.

6. Statements are made on page 2-12 that the expected concentrations of PCBs and TCE are below Mass GW-3 levels in pore water beneath the river. Given the very high hydraulic conductivity assigned to the bedrock aquifer in this area, is this an accurate representation of what is actually expected, and how does it compare to the actual sediment concentration data provided to AVX depicting conditions within the river sediments.

7. Based on the estimates in the last paragraph of Section 2.4.5.1 (page 2-15), approximately 53 percent of the PCB mass will be addressed in Alternative OU3-9 by removal of all soils 0-25 ft from the shoreline and from the surface to the top of the peat layer. However, these soils will be staged on site and therefore will not be removed but managed. Therefore, all of the remaining mass of PCBs from the Aerovox site will remain on site, but just pose a less immediate threat to the Harbor. Under the feasibility evaluations in 310 CMR 40.0860, MassDEP should not consider excavating and consolidating material above UCLs to be a Permanent Solution in that this material poses a significant risk and that offsite disposal locations are available for disposal of this material.

8. Mass flux: Section 2.4.4: Mass flux of TCE for both the bedrock and the overburden is calculated for the plume width where TCE exceed the GW-3 standard of 5,000 ug/L (as stated in both sections 2.4.4.1 and 2.4.4.2). The GW-3 standard is an exposure-based criterion that is not appropriate for use in calculating the overall mass flux since mass flux itself is not an exposure-based construct, but rather a straightforward estimate of the amount of COC entering the harbor. Mass flux estimation helps determine whether eventually the mass entering the harbor will lead to unacceptable water or sediment concentrations within the harbor. For example, 1,000 gallons per day of water with TCE concentrations of 4,900 ug/L were entering the harbor would be vastly more concerning than 10 gallons per day of water with TCE concentrations of 5,100 ug/L, despite the fact that the water in the latter scenario exceed the GW-3 standard. It would more appropriate to select a MUCH lower concentration contour of TCE for use in estimating mass flux. The only reason to select a contour at all for a flux estimation (rather than extending the width to the non-detect boundary) is the argument that a large area discharging at a low concentration (e.g., 5 ug/L) will not significantly change the overall calculated mass flux. However, by setting the plume width to 5,000 ug/L contour, mass flux through bedrock or overburden where concentrations are still in the thousands of ug/L is ignored, though this mass may be significant. For example, the concentration of TCE in bedrock shown on Appendix B Figure 1 is 4,400 ug/L. This location is well outside the bounds of the mass flux estimation, resulting in a significant underestimation of mass flux. Selecting the 100 ug/L contour to bound the plume width is considered a conservative, reasonable assumption.

9. ZVI PRB: ZVI lab testing was performed using groundwater from MW-15D, a well that has historically had high concentrations of PCBs and CVOCs as well as observed DNAPL. From a contaminant standpoint, it was logical to use this location for testing. An EPA comment on the 2016 Phase III recommended doing the kind of bench-scale testing that B&C contracted SiREM to perform. However, one of the concerns that was expressed in that comment was to evaluate the effect of the Site groundwater to determine whether the water from the Site would result in passivation or clogging of the ZVI and degradation of the efficacy of the iron. Given the depth of well MW-15D, it does not appear to be representative of the shallow groundwater influenced by tidal estuary waters the PRB would be in contact with. Specific conductivity for MW-15D was between 3 and 4 mS/cm in samples collected in 2014 and 2015, sulfate concentrations were approximately 170 mg/L, and chloride concentrations were approximately 1,100 mg/L. Shallower samples closer to the Harbor bottom tended to have higher specific conductivity, ranging to greater than 30 mS/cm during the same 2014-15 sampling events, with these elevated values assumed due to the influence of more saline estuary waters (values for sea water are: conductivity ~5,000 mS/cm; sulfate concentration ~2,500 to 3,000 mg/L; and chloride concentration ~19,000 mg/L). Did SiREM consider the impact of high total dissolved solids from the sea water-groundwater mixture that would be expected to flow through the PRB during the hydraulic gradient reversal that has been documented to occur at the higher stages of the tidal cycle? Other PRBs installed in high total dissolve solids environments have experienced heightened solids precipitation within the barrier, causing porosity loss due to plugging and armoring. These processes adversely affect the PRB effectiveness and longevity. This issue should be addressed when considering PRB alternatives.

10. In Section 5.3, assessments of effectiveness, reliability, and long term costs appear to be inaccurate for the ZVI PRB component of the OU3-9 alternative relative to saline environment in which the PRB will be installed. No consideration is apparent for PRB performance and long term maintenance cost due to the loss of permeability that is likely to occur as a result of ZVI corrosion or clogging. For the proposed installation along the eastern edge of the Site property, loss of porosity of the PRB will occur on both the upgradient and downgradient sides of the barrier wall due to the tidally-influenced change in flow directions. Tidal water exchange is likely to accelerate loss of PRB porosity and transmissivity and require active long-term maintenance to maintain or recover the ability of the PRB to treat the contaminant plume. Thus, the assignment of ratings for the OU3-9 alternative needs to account for this performance uncertainty.

11. Page 4-46 states: "Site inorganics geochemical composition does not contain strong oxidizers (e.g. nitrate) or high concentrations of potential ZVI passivating constituents such as silica or TOC, although longer term evaluation of potential secondary byproduct from iron reduction may be warranted to evaluate for potential iron hydroxide passivation of ZVI."

In light of issues discussed above, consideration of elimination of this technology from screening should be seriously considered.

12. For the 2016 Phase III, EPA provided comments about the assumptions of efficacy of installing a PRB along the bedrock surface using one-pass trenching. This is not likely to be effective for a bedrock with significant topography as exists at this Site, and therefore, there is likely to be a section of the overburden above the bedrock without ZVI or carbon, leading to the creation of a preferential pathway for migration of COCs into the river. Hydraulic containment alternatives in combination with a physical barrier and groundwater treatment should be scored appropriately higher (by a very large margin) due to the fact it will not face this implementibility issue.

13. A PRB is a key element of the preferred alternative. However, in addition to the issues discussed above, as described in the EPA comments on the 2016 draft Phase III, a PRB is designed to treat dissolved phase contamination and will not treat DNAPL that may move through it. As noted in the general comment above regarding DNAPL, the revised Phase III indicates that a shoreline PRB would be installed above and near potential DNAPL zones and that the DNAPL at the Site has the potential for short-distance migration. MassDEP may want to consider that DNAPL present in soil that is sufficiently mobile to drain into wells may also be sufficiently mobile to migrate short distances into and through a permeable barrier. Again, AVX has provided no examples where a PRB has been utilized in a similar situation. The presence of DNAPL within or beyond a PRB will prevent the PRB from eliminating contaminant migration from within the Aerovox Site to the environment and it cannot therefore achieve a Permanent Solution. The presence of high concentrations of VOCs co-solvent in DNAPL with PCBs further complicates the situation by mobilizing PCBs into the environment.

14. Appendix G, Groundwater Flow Model. On page 747 of the Phase III submission (Appendix G, Page 2-1), the following statement is made:

"The barrier wall does, however, reduce the estimated groundwater flux through the contained overburden by approximately 50 percent. This is due to the more circuitous route groundwater from the overburden units must take to discharge to the river, as well as the reduced gradients and tidal fluctuations caused by the barrier wall."

More detail needs to be provided relative to the modeled boundary conditions employed to represent Remedial Scenario 1. Based on the description in Appendix G, Section 2.1, this model scenario should represent zero water input from the surface, nearly zero water input laterally via Model Layers 1 and 2 (overburden), and primary water input through the Model Layer 3 (bedrock) within the lateral boundary of the modeled hydraulic barrier in overburden. As stated in the description of the model output for this scenario, the bedrock layer controls one-half (50%) of the volumetric water exchange between the enclosed portion of the model domain and the Acushnet River. This value for bedrock water exchange with the Acushnet River appears unreasonably high given the

summary of site characterization data depicting the measured distribution of fractures in bedrock, as shown in Appendix B, Figure 1. Please also provide a graphical presentation of the modeled particle tracks through bedrock to the Acushnet River for the elevation domain represented in Figure 1 of Appendix B.

This is a critical issue for the remedy selection process, since the modeled degree of water exchange between bedrock underlying the Site property and the portion of the Acushnet River abutting the property dominates the rating scores for the various remedial technologies. Thus, the accuracy of this modeled site characteristic needs to be understood with a high level of confidence and estimated in accordance with the site specific data and general practice. It will be highly dependent on the accuracy of the Phase II CSA description of the estimated spatial distribution of fractured bedrock.

15. Page 39, Section 2.5.2:

"A peat layer of varying thickness is present across much of the eastern portions of the Site. The sheet pile wall that defines the eastern edge of the Property was keyed into this peat layer to impede the migration of contaminants within shallow groundwater and from shallow soils into the river. However, contaminants in deep overburden groundwater and at the overburden bedrock interface migrate with tidal flow both toward and away from the river."

As demonstrated by prior data collection efforts by AVX, there is direct evidence from soil borings (MIP45, MIP46, MIP47) immediately west of the existing sheet pile wall that demonstrate the peat layer is not a continuous subsurface feature. While the prior intent may have been to key the sheet pile wall into the subsurface peat layer, more recent site characterization data demonstrate that this design objective was not and could not be achieved in the northeast portion of the site property. The Phase III report should not be based on the faulty assumption that the sheet pile wall is fully keyed into a subsurface peat layer, or that the peat layer is continuous.

16. Page 2-12: The first bullet acknowledges that net upward vertical gradient is likely greater beneath the River (regional discharge zone), and continues to state that this will result in a 'lower estimated concentration in the outwash deposits and pore water of the river sediments". What is the basis of this statement? How is this statement consistent with the data collected by EPA and provided to AVX prior to the production of this report regarding COCs that have migrated into the New Bedford Harbor Superfund Site?

17. Page 4-13: The statement that the primary source of contamination to the Acushnet River from the Aerovox Site is primarily due to on site trenches and direct dumping from the shoreline isn't necessarily supported by data from beneath the Acushnet River provided by EPA which AVX does not appear to have considered in its submission. AVX contends that "the river currently

contains DNAPL and significant levels of soil and sediment contamination which are themselves a continuing source", and states that these are continuing sources back to the Aerovox Site, but this conclusion is contradicted by the data provided by EPA which strongly imply a subsurface pathway from the Aerovox Site itself, rather than the surface discharge scenario promoted by AVX.

18. Page 4-13 also indicates that achieving mitigation of contaminant migration from the Site to the River will be complicated by the reverse flow from the River into the Site until EPA also completes source removal (including DNAPL found in Harbor sediment) in the River as part of the New Bedford Harbor Superfund Site remediation. As EPA has noted many times now, AVX continues to incorrectly rely on the Harbor cleanup to avoid its 21E obligations to fully achieve source control and management of migration.

19. All alternatives that include Permeable Reactive Barriers (PRBs) include only one regeneration of the media for cost estimating purposes, and long-term costs beyond that will likely be the responsibility by the City of New Bedford. According to the description of OU3-9 in section 4.2.3.9, "The PRB would function indefinitely…" What are the costs of this indefinite function? It is unclear how this leads to a Permanent Solution and not a Site in Remedy Operating Status.

20. Section 4.3.1.1: Estimated Flux from both the bedrock and surficial aquifer should be re-examined in light of general comment on weaknesses in modelling approach and conclusions drawn from that analysis outlined here. The predicted pore water modelling results need to be revised.

21. Section 4.3.1.2: The conclusion drawn in this section that the "proof of concept" tests for the PRB proves that up to 100% removal could be achieved is misleading. The actual range of results in the treatability column testing should be described here. There is no documented use of a PRB known to EPA in a situation analogous to this, and its effectiveness in the long-term due to constructability and operations concerns is in serious doubt.

22. Section 4.3.1.2: The statement made is the "groundwater flow model indicates that both alternatives [both active groundwater remediation and PRB alternatives] achieve complete capture of overburden groundwater within the containment area". The prospects for the PRB to achieve this are doubtful over the short and long run for reasons already stated throughout our comments; does the model in fact show that there is no net flux of contaminants of concern outside of the Aerovox Site as is implied by this statement with the PRB in place?

23. Section 4.3.2: Indicates that alternatives representing OU3-1 to OU3-9 range up to removal of 36% of the total Aerovox property PCB mass. How does this figure comport with the conclusion that alternative OU3-9 achieves a reduction in oil

and hazardous materials in the environment as close to background as is feasible, the standard for a Permanent Solution?

24. Section 4.4.2.2: The results of some of the batch testing reported appear to show a reduction in the concentration of TCE and in the groundwater samples tested. Did the analytical chemistry in this testing indicate what byproduct compounds were being produced by the reaction presumably causing this measured reduction? Will the theorized reduction in TCE and SVOCs in general change the potential for co-solvent transport of PCBs in groundwater off of the Aerovox Site whether is meets the GW-3 standard or not?

25. With regard to column study results presented, do the results consider the tidal nature of the location of the proposed PRB, and the highly concentrated material which the Aerovox Site has already released to the seaward side of this location? Will the reactive barrier testing accurately reflect the actual concentrations to be encountered at the PRB?

    Additionally, do the column tests indicate the likely length of time until the reactive barrier would need to be replaced? Costing tables project just one regeneration after 10 years; what is this estimate based upon and how realistic is it?

26. Section 2.4.2 states that: "The depth of DNAPL impacted soil was confirmed to be the top of the peat layer in the MIP-23 area and within the thickness of the peat layer in the UV-17/BGP-20 area." What analytical data was this determination based upon?