Memorandum

January 4, 2019

To:	Zack Sasnow	Ref. No.:	058502
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CC:	Dave Favero, Michael Tomka, John-Eric Pardys		
Subject:	**Ecological Screening Assessment for Isolated Wetlands Recently Formed in IU G**		

1. Introduction

This memorandum presents a streamlined ecological risk assessment (ERA) for several small isolated wetlands that have recently formed at the southern end of Investigation Unit G (IU G) at RACER's Saginaw Nodular Industrial Land (Site) in Saginaw, Michigan. These wetlands developed in the last 6 years, in the footprint of the former Nodular Iron Plant and just south of that footprint (Figure 1). The wetlands appear to have been inadvertently produced by altered drainage and subsequent ponding of perched water that has occurred due to demolition of the Nodular Iron Plant in the early 2000s (including shutting down of dewatering associated with the former Plant) and shutting off sumps that previously pumped water from these general areas to the Secondary Pond in 2012.

As with the recent ecological risk analysis for the Secondary Pond (GHD 2017), this document does not follow the standard United States Environmental Protection (USEPA) ERA process (e.g., USEPA 1997). The intent of this analysis is different from a typical ERA. A typical ERA deals with a natural ecosystem (e.g., an aquatic area, wetland, or terrestrial habitat) that has been contaminated by chemicals. For this typical situation, the goal of an ERA and subsequent remediation is to return an area to its original ecosystem with acceptable risks from historical chemical contaminants. However, the newly formed wetlands are neither natural ecosystems nor are they very good wetland habitats (see discussion below). In addition, RACER's goal is for the area to be redeveloped. In this case, the newly formed wetlands will be filled and or altered. In fact, the wetlands were discovered as part of a potential sale and redevelopment of the area that was ultimately not completed. Thus, the goal of this streamlined ERA is not a return to a natural state but prevention of significant toxic effects until the Site is redeveloped.

The following figures, tables, and attachments were prepared in support of this ecological screening assessment for isolated wetland recently formed in IU G:

Figure 1 – Investigative Unit G – South Wetland Evaluation Biological Zone Samples (0-2 feet [ft])

Figure 2 – Investigative Unit G – South Wetland Evaluation PCB Concentrations - Biological Zone (0-2 ft)

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Table 1 – Screening of Risk to Aquatic Invertebrates

Table 2 – Screening of Risk to Wetland Plants

Table 3 – Exposure to Insectivores

Table 4 – Exposure Concentrations

Table 5 – Summary of Food Chain Model for Tree Swallow

Table 6 – Summary of Food Chain Model for Brown Bat

Attachment A – Wetland Description

1.1 Background

IU G was formerly the location of the Nodular Iron Plant, but in the early 2000s, the plant was demolished. As part of the General Motors Corporation (GMC) bankruptcy, a portion of IU G (southern half), as presented in Figure 1, became the responsibility of RACER. RACER's portion of IU G is approximately 1,300 ft by 1,800 ft, for a total area of approximately 54 acres. Following the demolition of the former Nodular Iron Plant, the remaining concrete floor slab was covered with clean fill (foundry sand) and revegetated (Exponent 2007). Exponent (2007) completed an ERA for the entire Nodular Site, including this portion of IU G. As described therein, in 2007, the vegetation in IU G was in the early stages of old field succession. In the original ERA, the biological habitat of IU G was considered too poor to warrant consideration (Exponent 2007). At that time, the very southern edge of IU G, just south of the Nodular Plant footprint, contained a "a small, isolated, low-lying area that was periodically wet and supported some wetland vegetation (e.g., cattails, *Typha angustifolia*)" (Exponent 2007). However, the ERA stated that this low-lying area was nonetheless poor terrestrial habitat that did not support aquatic habitat. Thus, this area was not considered in the Exponent ERA.

Since the completion of the ERA in 2007, sumps that dewatered the area were turned off in 2012 and as a result surface water drainage has tended to collect in this low lying area and in nearby low lying areas at the southern end of IU G. With the collection of water in the low lying areas, the haul road, which provides access for GM to their landfill to the north, was built-up. Over the last decade or so, this ponded water has produced hydric soils and promoted dominance by wetland vegetation. In 2015, a wetland survey of the area, as required by MDEQ to support a proposed development, determined that several small isolated wetlands had formed (Niswander 2015, Attachment A). The wetland survey delineated five isolated wetlands with areas of 0.23, 0.84, 1.08, 3.93, and 7.23 acres for a total of approximately 13.31 acres of wetland. These wetlands are isolated from each other due to access roads and driveways, which apparently preclude hydrologic connections among them. The wetlands may contain a foot or more of water during wetter seasons but tend to dry up completely during dry seasons.

> According to the wetland scientists (Niswander 2015), the newly formed wetlands are considered to be of "moderate to moderately low quality because of recent disturbance (i.e. the wetlands have developed since the demolition of the pre-existing buildings and infrastructure on the Site) and contain an abundance of invasive vegetation such as Phragmites (*Phragmites australis*), red top

(*Agrostis gigantea*), narrow-leaved cattail (*T. angustifolia*), and purple loosestrife (*Lythrum salicaria*)."

The wetlands are described in greater detail in Attachment A.

As noted above, the 2007 ERA did not consider potential ecological risks in this area because highly disturbed, abandoned industrial uplands have minimal ecological value. However, wetlands, even mediocre and low quality wetlands, are typically accorded more public protection than uplands. Consequently, now that some of IU G has transitioned to wetlands, it appears necessary that potential ecological risks should be considered in these newly formed wetlands.

The following is a streamlined ERA of these newly formed wetland areas. As with the analysis of the secondary ponds, this analysis takes a streamlined approach that does not include the very conservative preliminary steps in the ERA process. The wetlands are not natural and have a low ecological value because they are small and isolated from surface waters. In addition, RACER's goal is for this land to be redeveloped, in which case the wetlands will be filled and/or drained. Thus, the intent of the following analysis is to determine whether acute ecological impacts, if any, are likely.

2. Investigation Summary

2.1 RCRA Facility Investigation

The RFI was conducted by GMC in several phases between 1998 and 2007 in accordance with a June 2, 1995 unilateral order from EPA. The purpose of the RFI was to (i) define the nature and extent of contamination that may be impacting human health and the environment; (ii) focus investigation activities such that the subsequent phases becoming increasingly specific and data quality is sufficient to support the RFI baseline risk assessments; and (iii) collect data sufficient to support Corrective Measures Study. The results of the investigations were submitted to EPA in the Phase 1C RFI in March 2007 and included a human health risk assessment (HHRA) and an ERA (CRA, 2007). Following the bankruptcy, a supplemental RFI report (CRA, 2012) was submitted, which focused on the IUs which were owned by RACER Properties and included sampling results and findings associated with work on-Site since the submittal of the Phase 1C RFI. In addition, the supplemental RFI report included revisions and/or supplements to address EPA comments received in 2007 and 2008 after submittal of the 2007 Phase 1C Report, as appropriate for the Site.

2.2 2015 Additional RFI Investigation

The purpose of the additional investigation of PCBs in soil was to assist in developing and evaluating TSCA compliant remediation alternatives, including defining the limits of a possible PCB notice and restriction area. The purpose of the additional investigation of manganese in soil was to confirm the presence of manganese above MDEQ Part 201 Particulate Inhalation Criteria, and if confirmed, define an area that will require a cover to protect against particulate inhalation exposures and a deed restriction.

The previous exceedance of MDEQ Part 201 Particulate Inhalation Criteria could not be corroborated by additional sampling. All soil samples collected and submitted for analysis of manganese had concentrations below MDEQ Part 201 Particulate Inhalation Criteria. Therefore, no further action related to manganese was recommended for this area, with the exception of proposed overall Site deed restrictions. The overall Site deed restrictions include restricting future use to non-residential purposes, prohibiting the use of groundwater for potable purpose, properly managing contaminated soil, and properly managing potential vapor intrusion.

PCB concentrations in soil have been delineated to 1 milligrams per kilogram (mg/kg) vertically and horizontally. With the extent of PCBs above 1 mg/kg defined, options for closure include placing a deed restriction, placing a cover, or excavate and disposal of PCB impacted soil above 1 mg/kg.

3. Ecological Evaluation of Recently Formed Wetlands

The wetlands are intermittently inundated. Deeper sections may have one or more feet of water during wet seasons, but all are usually without standing water during late summer and droughts. The lack of permanent standing water precludes establishment of fish fauna and of longer-lived aquatic invertebrates. Thus, the primary ecological receptors in these wetlands are wetland plants, shorter-lived aquatic invertebrates, and predators that consume these invertebrate fauna. Exposure media are, therefore, chemicals in soil/sediments and in the aquatic biological tissue for bioaccumulating substances. Assessment endpoints for the ecological evaluation are wetland plants and benthic aquatic organisms, facing direct exposure to chemicals in soils/sediments. The evaluation also considers potential risks to populations of vertebrate predators of the aquatic invertebrates, exposed to chemicals via bioaccumulation pathways. Risks to these ecological receptors via these exposure media will be considered in the ecological evaluation below.

There are also other exposure media and less exposed receptors that will also be tacitly considered. Thus, chemicals desorb and solubilize from the soils/sediments into overlying surface water and then pose direct exposure to aquatic invertebrates living in the water column (e.g., mosquito larvae) or attached to plants (e.g., beetle and dragonfly larvae). However, exposures of water column species to chemicals desorbed from underlying soils/sediments to surface water are typically considerably lower than chemical exposures to benthic invertebrates, living in or on those contaminated soils/sediments. There may also be amphibians breeding in the wetlands. Again, however, amphibians are water column biota, and their exposures to chemicals in soils/sediments are also assumed to be less than those for aquatic benthos. Similarly, herbivorous wildlife may also be exposed to chemicals bioaccumulated by wetland plants. However, the plant bioaccumulation pathway is generally much less efficient than the bioaccumulation pathway from chemicals in soil/sediments to soil/sediment invertebrates. Thus, risks to herbivorous wildlife feeding on wetland plants are assumed to be less than those for predators of benthic invertebrates.

Previous soil sampling of IU G included surface soil samples, usually 0 to 2 feet below ground surface (ft bgs), as well as deeper samples that went 10 or more feet below ground surface. Because exposures to ecological receptors are limited to surface strata of soils/sediments, only data from the very surficial samples are considered.

3.1 Risks to Aquatic Benthos

To screen for risks to aquatic benthos, the surface soil/sediment data were screened against the following ecological screening values (ESVs) that are typically used to assess direct toxicity to benthos. These were the same ESVs used in the recent screening of potential risks in the Secondary Ponds. Non-polar organics were screened against Final Chronic Values (FCVs) produced in USEPA (2003 and 2008). Because several non-polar organics were detected and these pose additive toxicity, the FCVs for individual chemicals were conservatively divided by 10 to produce ESVs that account for potential additive toxicity. When converted to bulk soil/sediments concentrations with equilibrium partitioning, FCVs require knowledge of the organic carbon (OC) concentrations. OC was not assayed in wetland soils/sediments. However, a reasonable value of 2 percent was assumed because wetland soils/sediments tend to have high levels of OC.

Metals, polychlorinated biphenyls (PCBs), and Total polycyclic aromatic hydrocarbons (PAHs) were screened against Probable Effects Concentrations (PEC), which are recommended by the Michigan as indicators of potential toxicity to aquatic benthos[1]. As a third choice of sediment ESVs, Region 4 ESVs were used. Because the intent of this screening is to assess real potential for toxicity, Region 4's less conservative refinement values were used if they were available. If none of these sources had an ESV, then Dutch Maximum Permissible Concentrations (MPC) for sediments were used (Crommentuijn et al. 1997)[2].

Screening of risks was based on the widely used quotient method, in which an ecological screening quotient (SQ) for each chemical is estimated as:

$$SQ = \frac{EEC}{ESV}$$

where EEC is the estimated exposure concentration and ESV is the ecological screening value, which is also a concentration. In the following analyses, the EEC and SQ values are based on both the maximum and mean concentrations of each chemical. In addition to SQ values, screening tables also provide the frequency of exceedance (FOE), the proportion of samples that exceeded the ESVs. Assuming that samples are reasonably dispersed in space, the FOE is an index of the percent of area that could be potentially problematic. For sedentary and non-motile biota, such as plants and benthic invertebrates, the FOE may be a useful indicator of potential risks to the populations. Screening tables also provide summary information about samples, such as number of samples, frequency of detection, maximum and mean concentrations.

The screening results of wetland soils/sediments are presented in Table 1. As shown, there are occasional exceedance of ESVs for a few metals (chromium and manganese), individual PAH compounds, PCBs, and phenol. However, none of these exceedances are considered ecologically significant for several reasons. First, the exceedances are generally limited to a small number and percentage of samples representing a relatively small proportion of the wetland area. Second, the exceedances are generally attributable to the conservativeness of the ESVs rather than actual potential for harm. Thus, chromium III is typically very

[1] For assessing risks additive risks from all PAHs, the PEC for total PAH was used. For this screening, total PAHs concentrations were estimated as the sum of anthracene, benz(a)anthracene, benzo(a)pyrene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. These are the PAH compounds that have single PAHs PECs in the source document for PECs.

[2] The MPCs are estimated as the maximum amount of a metal that could be added to background concentrations without causing toxicity to most species. The derivation of the Netherlands MPCs is transparent, and it is well described in the source document (Crommentuijn et al., 1997). The Netherlands values also specifically incorporate background concentrations. These values are primarily based on direct toxicity, although potential toxicity via bioaccumulation pathways is a minor part of the derivation.

insoluble and not toxic in sediments below about 1000 mg/kg (Berry et al. 2004), far above the PEC value of 110 mg/kg. Similarly, the manganese ESV is a problematic co-occurrence sediment quality benchmark, rather than one based on bioassays. Still the manganese concentrations marginally exceed this conservative value, and manganese was above its ESV in only 22 percent of samples. This frequency of exceedance (FOE) was not considered meaningful because it is only slightly above a widely used threshold, 20 percent, for *de minimis* ecological effects (Suter et al. 1995, 2000; Henning and Shear 1998). In addition, for those samples that exceed the ESV, the negligible magnitude of exceedance of this conservative ESV suggests that risks from manganese can also be dismissed.

PCB concentrations also exceeded the PEC. However, it is well known that PCBs are not very toxic to benthic invertebrates because they lack the Ah receptor, which mediates the extreme toxicity of PCBs. Thus, risks of PCBs to invertebrates are dismissed as unlikely. On the other hand, as is also well known, PCBs are very toxic to vertebrates, which have Ah receptors. Hence, risks to vertebrates from PCBs are addressed below in Section 3.3.

Some individual PAHs exceeded their PAH ESV. However, the ESVs were set equal to the 1/10th the FCV to account for additive effects of other PAHs. Total PAH concentrations did not exceed the PEC for total PAHs, which does account for additive effects of all PAHs. Thus, risks of PAHs to benthic invertebrates can be dismissed with available information.

3.2 Risks to Wetland Plants

Potential toxicity to wetland plants was screened using the plant-specific screening values found in USEPA's EcoSSLs. If no EcoSSL value for phytotoxicity is available, the Dutch MPC was used to screen for phytotoxicity to wetland plants. Potential risk from organic chemicals were not considered in this screening because detected organics are not likely to persist (volatile organic carbons (VOCs), phenol, lighter PAHs) in the root zones of plants, are minimally toxic to plants, such as PCBs and PAHs, or both.

As shown in Table 2, a few metals exceeded ESVs for protection of plants -- chromium, nickel, selenium, manganese, and zinc. Some of these exceedances are due to the conservatism of the benchmarks. The selenium and manganese ESVs are both about half of naturally occurring background concentrations for Michigan. Chromium is generally so sparingly soluble in soils, that it can only be rarely toxic to plants. In addition to the conservativeness of the ESVs, exceedances of most metals are infrequent and the degree of exceedance for these metals is generally only moderate. The plant community in the wetlands is also dense, demonstrating that phytotoxicity is not acute.

In summary, maximum soil/sediment concentrations of some metals are moderately above screening levels for phytotoxic effects. However, the ESVs are very conservative, exceedances are generally limited in magnitude and areal extent, and the area is well vegetated. Thus, current information is sufficient to reasonably dismiss the potential for phytotoxic effects on wetland vegetation.

3.3 Risks to Aerial Insectivores from Chemicals Bioaccumulated by Aquatic Insects

The ESVs used above consider potential risks via direct toxicity to benthos and plants, but not via food chain/bioaccumulation pathways. Thus, it is necessary to consider risks to predators of aquatic invertebrates, which may have bioaccumulated chemicals found in wetland soils/sediments. Potential predators of benthos include birds, such as ducks, and raccoons that feed on the aquatic benthos in the water column and sediments. After emergence, adults of the benthic insects present a complete exposure pathway from chemicals in sediments to bats. and swallows and other insectivorous birds such as redwing blackbirds. If a chemical bioaccumulates readily in food chains, as with PCBs, these chemicals may be passed up from the sediments through the benthos and then to aerial insectivores feeding on adult aquatic insects after emergence. Although many chemicals were found at elevated concentrations in surfaces soils/sediments, only PCBs readily bioaccumulate in food chains. However, risk assessment guidance from EPA Region 4 (EPA Region 4 2015) suggests that high molecular weight PAHs also bioaccumulate readily in aquatic food chains. Therefore, to be conservative, high molecular weight PAHs are also considered in the food chain analyses.

3.3.1 Estimating Exposure to Aerial Insectivores

In this ecological evaluation, bats and swallows, which may feed on aquatic insects emerging from on-Site sediments, represent consumers of aquatic invertebrates. These receptors are smaller than other potential predators (e.g., ducks and raccoons), so they have higher consumption rates and more exposure to bioaccumulated chemicals. To be conservative, the potential food chain exposure to chemicals was initially modeled using worst-case assumptions. That is, these receptors were assumed to eat only contaminated food from the Site for their entire lives. Thus, bats and swallows were assumed to eat only aquatic insects emerging from the newly formed wetlands, not from extensive terrestrial and aquatic areas surrounding the wetlands. Seasonal migrations and very dry periods, when the wetlands are dry, were also not considered. The total exposure for each species was modeled as:

> Total Dose = [food] * consumption rate * absorption efficiency + [soil] * incidental soil/sediment consumption rate * absorption efficiency + [water] * drinking rate * absorption efficiency

All bracketed terms (e.g., [water]) refer to the concentration of the chemical in that medium; other values are self-explanatory. Based on the conservative methodology recommended by the USEPA (1997), relative absorption efficiency[3] was assumed to be 100 percent for all pathways. On the other hand, exposure via water ingestion can be assumed to be insignificant. Although concentrations of chemicals in wetland surface water were not measured, concentrations of the very hydrophobic PAHs and PCBs can be assumed to be at very low levels. Therefore, exposure via drinking water is assumed to be negligible.

Consequently, the equation collapses to:

> Total Dose = [food] * consumption rate + [soil] * incidental soil consumption rate

Species-specific ingestion rates were taken from data supplied in USEPA (1993a) or other sources (e.g., Baron et al., 1999), when available. Body weights and ingestion rates used for the ERA's measurement receptors were based on the adult breeding female and are as presented in Table 3.

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[3] Relative absorption efficiency refers is the absorption efficiency of a compound in a medium, for example soil, compared to that in the original toxicological studies. In general, this refers to the relative absorption of a compound in soil compared to that in food.

The initial, more conservative analyses assume that the bats and swallows only eat insects emerging from the approximately 13.31 acres of newly formed marsh. However, both species have much larger home ranges (Table 3). Consequently, Area Use Factors (AUF) were estimated as 13.31 acres divided by each species home range to estimate the percent of total exposure likely due to the newly formed wetlands. This is still a conservative adjustment because it does not account for seasonal migration for the swallows or those drying periods when the wetlands are dry and not producing adult aquatic insects.

3.3.2 Estimation of COPEC Concentrations in Aquatic Invertebrate Prey

PCB concentrations in aquatic invertebrates were predicted from empirical results of Tracey and Hansen (1995). Tracey and Hansen present empirical biota-to-sediment accumulation factors (BSAF) values normalized to OC in the sediments and lipid in the benthos. Median BSAFs for PCBs were 1.1 on a gram lipid per gram OC basis. OC was not measured in the wetland soils/sediments. However, a relatively low value of 2 percent OC is a reasonable assumption for wetland soils/sediments. Aquatic invertebrates have lipid levels of about 2.0 percent (Oliver and Niimi, 1988). In this case, the lipid and OC concentrations cancel each other, and the final BSAFs for PCBs would be 1.1.

Estimating bioaccumulation of PAHs by aquatic invertebrates is complicated because PAHs are readily metabolized by a variety of taxa (Broman et al. 1990; Thomann and Komlos 1999). In addition, some of the higher molecular weight PAHs are poorly assimilated across the respiratory organs/gills and guts of biota such that total bioaccumulation of the most hydrophobic PAHs is further reduced. Thus, bioaccumulation of PAHs by benthic organisms can be 2 to 3 orders of magnitude less than bioaccumulation of similarly hydrophobic, but hard-to-metabolize chemicals like PCBs and chlorinated pesticides. PAH body burdens of benthic invertebrate were estimated with the BSAF model of Thomann and Komlos (1999). This model successfully predicts empirical data for bioaccumulation of PAHs by crayfish in a small stream (Burkhard and Sheedy 1995), with ongoing inputs of PAHs to both water and sediments. The Thomann/Komlos model predicts BSAFs for PAHs as function of the Kow of the PAH, the lipid concentrations in crayfish, and the OC in sediments. As above, both OC in sediments and lipid levels in benthic invertebrates were assumed to be 2 percent. Using the model’s best fit (Figure 10 of that reference), concentrations of PAH were predicted in crayfish based on Log Kow supplied by EPA (2003).

These chemical-specific BSAF values were then applied to maximum and average sediment concentrations to estimate maximum and mean concentrations of PCBs and PAHs in aquatic insects (Table 4). Coupled with the food chain exposure information provided in Table 3, these estimated insect concentrations yielded exposure estimates for each chemical to the swallows and bats (Tables 5 and 6).

3.3.3 Estimation of COPEC Concentrations in Aquatic Invertebrate Prey

After dietary exposures of bioaccumulating chemicals are estimated, these exposures are compared to a toxicity reference value (TRV). As recommended by USEPA (1997), TRVs used in the SLERA are NOAELs (no observed adverse effects levels). These are doses of a chemical shown to have no ecological effects on an organism. When the estimated exposure is divided by the TRV, it produces an SQ. As before, SQs below 1.0 indicate that that chemical is unlikely to cause impacts. SQ values above 1.0 indicate that the potential for risk cannot be dismissed with the current analysis and data.

Estimated exposures are also compared to LOAELs (lowest observed adverse effects levels). LOAELs are the lowest doses that have been shown to cause ecologically significant toxicity. Exceedance of a LOAELs provides perspective on potential impacts.

TRVs for PCBs for mammals and birds were taken from Region V summary document (Chapman 2003). For PAHs, the NOAEL value (0.61 mg/kg-day) used in deriving the EcoSSLs for PAHs was used for mammals (USEPA 2007). For a number of reasons (see Smith and Pawlisz 2013), this NOAEL is a very conservative value that may not be valid. Smith and Pawlisz (2013) generated an alternative NOAEL of 22.2 mg/kg-day. This value was used as a LOAEL. For birds, a NOAEL of 2 mg/kg-day, from Trust et al. 1994, was used. That same study provided a LOAEL of 20 mg/kg[4]-day.

3.3.4 Results of Food Chain Analyses

The results of the food chain analyses are presented in Tables 5 and 6. No matter the scenario, exposures to PAHs are far below even very conservative TRVs for both swallows and bat. This is not surprising because PAH concentrations were not high and because PAHs do not readily bioaccumulate. On the other hand, estimated PCB exposures were above TRVs under more conservative scenarios: use of maximum concentrations and assumption that the predator only eats insects from the wetlands. Risks fall to nominal levels with more realistic assumptions: use of average concentrations and assumption that these insectivores forage on insects from other sources. Thus, risks to aerial insectivores can be dismissed with available information.

This conclusion is bolstered by a fine-grained view of PCB concentrations (Figure 2). Most, approximately 90 percent, of the PCB samples are centered around a PCB hot spot. These highly localized samples were taken in order to delineate that hot spot. Thus, the average of all PCB samples is dominated by the delineation samples, which are representative of an area about 150 ft in diameter. This <0.5 acre area makes up less than 1/20th of the total wetland acreage. In contrast, the remainder of the samples, which are distributed across the remaining 95 percent of the wetland area, have a total PCB concentration of about 0.1 mg/kg. This latter average is closer to the actual areal average concentration than the average of all samples, 0.58 mg/kg, used in Tables 4, 5 and 6.

4. Summary and Conclusions

IU G is an area of the former Nodular Iron Plant. The plant was demolished in the early 2000s, and a layer of clean fill was reportedly placed over the footprint and surrounding area (Exponent 2007). Potential ecological risks of IU G were not considered in the 2007 ERA (Exponent 2007) because the area was poor, highly

4 For one, the TRV is based on a lifetime cancer bioassay with a strain of mice that is so unusually sensitive to cancer that the results may not be applicable to normal animals. Second, the NOAEL is bounded by LOAEL impacts, which are slight reductions in late life survival. However, slight reductions in late life survival for iteroparous species has no significant ecological effect. Thus, the actual ecological NOAELs for this experiment are doses 5 and 20 times higher than the NOAEL identified by EPA. Third, the causal mechanism for this additional late life mortality was cancer caused by the potent carcinogen, benzo(a)pyrene. Application of these toxicity data to other PAHs must, therefore, consider the relatively much weaker carcinogenic potencies of these other PAH's. Lastly, the NOAEL for this study was a clear outlier, almost 30 times lower than the geomean of other NOAELs for high molecular weight PAHs in other experiments.

disturbed upland habitat. However, over the last decade or so, five small wetlands have developed in the southern edge of IU G as a result of discontinuing dewatering associated with the former Plant in the early 2000s and shutting down sumps that previously helped to dewater the areas in 2012. The newly formed wetlands total an area of about 13.31 acres. Since greater protection is typically accorded to wetland habitats, the potential ecological risks in the wetland areas were considered in an abbreviated risk analysis. The risk assessment used results from previous sampling of the soils of IU G. Only samples from the top 2 ft were considered, as that stratum best represents the biologically active zone of wetlands ecosystems.

The screening considered three receptors: aquatic invertebrates including benthos, wetland plants, and predators of aquatic invertebrates. The latter were represented by bats and swallows, aerial insectivores than feed on adult stages of aquatic insects.

Risks to aquatic invertebrates were screened by comparing chemical concentrations in wetland soils/sediments to ESVs protective of aquatic benthos. Although a few chemicals exceeded these ESVs, the exceedances were generally limited in areal extent and magnitude of exceedance. Thus, risks to benthos were dismissed as unlikely.

Risks to wetland plants were also considered by screening concentrations of metals against very conservative ESVs, mostly derived from EcoSSLs. (Non-metals were not screened because they were found at low concentrations, are not expected to persist in root zones, are not very toxic to plants, or combinations of the previous factors). A few metals exceeded phytotoxic ESVs, however, these exceedances were mostly attributable to the conservativeness of the ESVs rather than real potential for plant toxicity. Supporting this conclusion, the area is well vegetated, demonstrating the lack of acute phytotoxicity.

Lastly, risks to predators of invertebrates from the wetlands were considered for bioaccumulative chemicals (PCBs and high molecular weight PAHs) found at elevated concentrations in wetland soils/sediments. Aerial insectivores, bats and swallows, were chosen as sentinel species for predators of aquatic invertebrates, Concentrations of PCBs and PAHs in aquatic insects were estimated with soil/sediment concentrations and chemical-specific BSAF values. Exposures were first estimated based on the assumption that bats and swallows only forage on aquatic insects emerging from the marsh. These estimated exposures were compared to NOAEL and LOAEL values. PAH exposures were far below levels that could pose toxicity. PCBs were potentially problematic under most conservative assumptions, but these risks could be dismissed for more realistic exposure scenarios – average PCB concentration and realistic area-use factors. In addition, most PCB samples were clustered around a PCB hot-spot; likely areal average concentrations were considerably lower than those used in the exposure assessment, which was based on the average of the highly biased sample set.

In short, the available data indicate that significant ecological risks are unlikely to occur in the newly formed wetlands. These wetlands are unnatural, small, isolated, and of moderate to low habitat value. Moreover, over the long-term, the wetlands may be filled during redevelopment of the Site. Further evaluation of ecological risks is not warranted.

5. References

Baron, L. A., B. E. Sample, and G. W. Suter II, 1999. Ecological risk assessment in a large river-reservoir: 5. Aerial insectivorous wildlife. Environmental Toxicology and Chemistry (18): 621-627.

Burkhard, L.P. and B. R. Sheedy. 1995. Evaluation of screening procedures for bioconcentratable organic chemicals in effluents and sediments. Environmental Toxicology and Chemistry 14:697-711.

Berry, W.J., W.S. Boothman, J.R. Serbst, and P.A. Edwards. 2004. Predicting the toxicity of chromium in sediments. Environ Toxicol Chem 23(12):2981–2992.

Chapman, J. 2003. Memo from James Chapman, EPA Region 5, to Shari Kolak, on-line at www.michigan.gov/documents/deq/deq-rrd-KzooRiv-BERA-102003zAppendixD_312426_7.pdf.

Crommentuijn, T., M.D. Polder, and E.J. van de Plassche, 1997. Maximum permissible concentrations and negligible concentrations for metals, taking into account background. Report #601501.001, National Institute of Public Health and the Environment, Bilthoven, The Netherlands.

CRA. 2007. Phase 1C RFI Report. March, 2007.

CRA. 2012. Supplemental RCRA Facility Investigation (RFI) Report. September 2012.

Exponent. 2007. Ecological Risk Assessment. Appendix B of the RFI.

GHD. 2017. Ecological Screening Assessment for Secondary Pond under Future Use Scenarios. Memo from Daniel Smith of GHD to Nate Nemani of EPA. August 15, 2017.

Henning, M. and N. Shear. 1998. Regulatory perspectives on the significance of ecological changes as reported in ecological risk assessments. Human and ecological risk assessment, 4: 807-814.

Michigan DEQ. 2013. Cleanup Criteria Requirements for Response Activity (Formerly the Part 201 Generic Cleanup Criteria and Screening Levels). http://www.michigan.gov/deq/0,4561,7-135-3311_4109-251790--,00.html.

Niswander 2015. Joint Permit Application: Menard, Inc. – Applicant. Wetland survey conducted by Niswander Environmental, January 4, 2015.

Smith, D.W. and A. Pawlisz. 2013. Fixing the ECO-SSLs one step at a time: high molecular weight (HMW) PAHs. SETAC North America Annual Meeting. Nashville, TN.

Suter, G. W., B. W. Cornaby, C. T. Hadden, R. N. Hull, M. Stack, and F. A. Zafran, 1995. An approach for balancing health and ecological risks at hazardous waste sites. Risk Analysis 15: 221-231.

Suter, G.W., R.A. Efroymson, B.E. Sample, and D.S. Jones. 2000. Ecological Risk Assessment for Contaminated Sites. CRC press, 460 pp.

Thomann, R. V. and J. Komlos. 1999. Model of biota-sediment accumulation factor for polycyclic aromatic hydrocarbons. Environmental Toxicology and Chemistry: Vol. 18, No. 5, pp. 1060-10.

Tracey, G.A. and D.J. Hansen. 1996. Use of biota–sediment accumulation factors to assess imilarity of nonionic organic chemical exposure to benthically coupled organisms of differing trophic mode. Arch Environ Contam Toxicol 30:467–475.

Trust, K. A., A. Fairbrother, and M.J. Hooper, 1994. Eeffects of 7,12-dimethylbenz(a)anthracene on immune function and mixed-function oxygenase activity in the european starling. Environmental Toxicology and Chemistry. 13: 821-830.

USEPA. 1993. Wildlife Exposure Factors Handbook, volumes I and II, U. S. Environmental Protection Agency, USEPA/600/R-93/187a and 187b, December 1993.

USEPA. 1997. Ecological risk assessment guidance for Superfund: process for designing and conduction ecological risk assessments. Interim final. USEPA 540/R/97 OCS. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Edison, NJ.

USEPA. 1998. Proposed Guidelines for Ecological Risk Assessment, USEPA Risk Assessment Forum, Washington D.C. USEPA/630/R 95/002B, August 1998.

USEPA. 2003. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. EPA 600 R 02 013. Office of Research and Development, Washington, DC 20460.

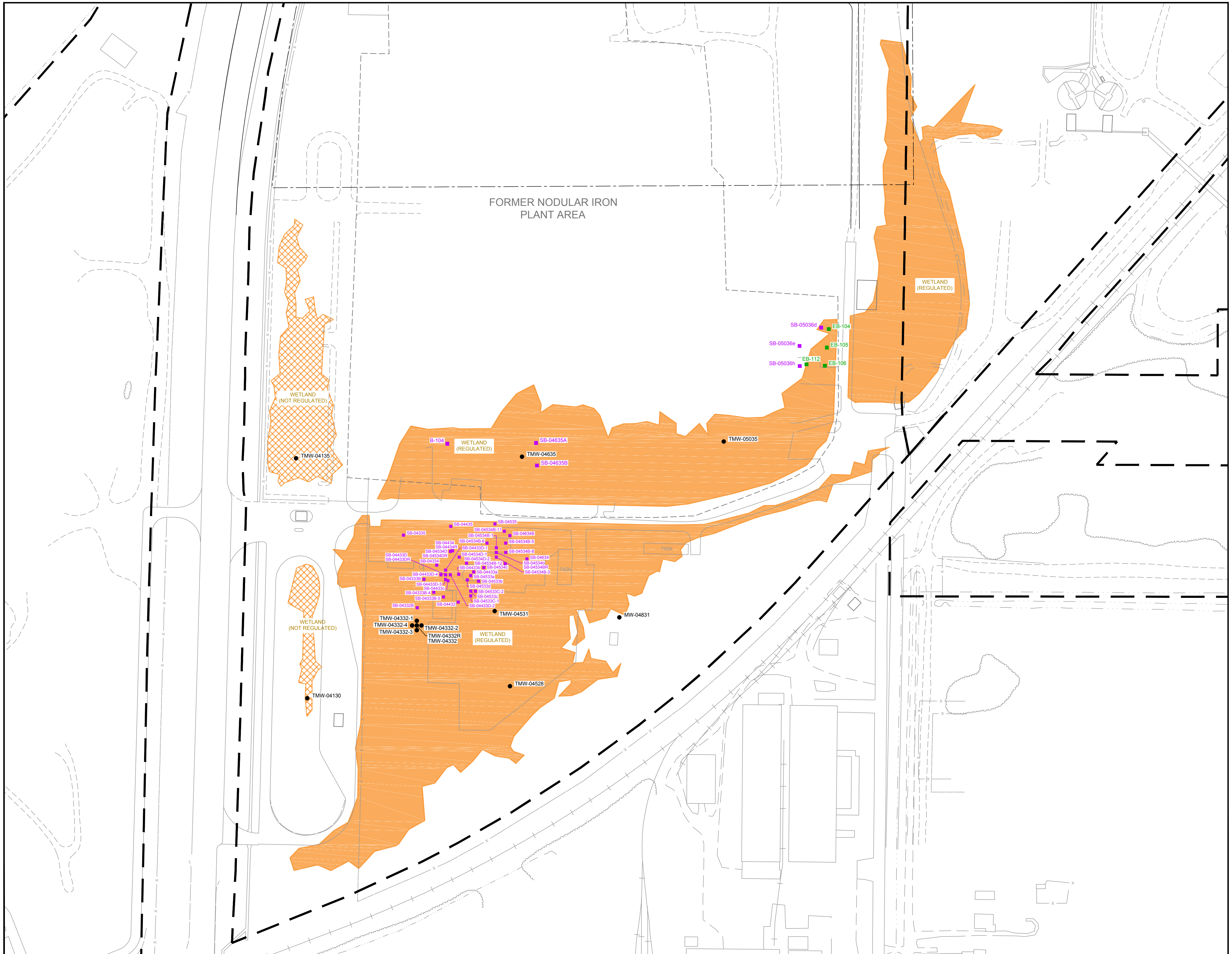
USEPA. 2005. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver and Zinc). EPA/600/R-02/011.

USEPA. 2007. EcoSSL for PAHs. http://rais.ornl.gov/documents/eco-ssl_pah.pdf.

USEPA. 2008. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Compendium of Tier 2 Values for Nonionic Organics. EPA-600-R-02-016. Office of Research and Development. Washington, DC 20460.

USEPA. 2012. Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Procedures for the Determination of the Freely Dissolved Interstitial Water Concentrations of Nonionic Organics. EPA 600/R-02/012. Technical Report, Washington, DC.

USEPA Region 4. 2015. Region 4 Ecological Risk Assessment Supplemental Guidance Interim Draft https://www.epa.gov/Sites/production/files/2015-09/documents/r4_era_guidance_document_draft_final_8-25-2015.pdf.



0 50 100 ft

LEGEND

A — — INVESTIGATIVE UNIT BOUNDARY AND IDENTIFIER

● MONITORING WELL LOCATION

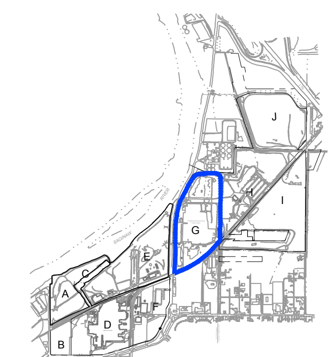
■ SOIL BORING LOCATION

■ SOIL BORING LOCATION - HISTORICAL

NOTES:

1) THIS FIGURE HIGHLIGHTS THE EXCEEDANCES OF ALL SOIL DATA SCREENED AGAINST THE 2013 MDEQ NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS, WITH THE FOLLOWING EXCEPTIONS:

- EXCEEDANCES OF NON-RESIDENTIAL DRINKING WATER PROTECTION CRITERIA ARE NOT HIGHLIGHTED ON THIS FIGURE, AS DRINKING WATER AT THE SITE WILL BE RESTRICTED.
- SOIL DATA WERE NOT SCREENED AGAINST THE GROUNDWATER SURFACE WATER INTERFACE PROTECTION CRITERIA, AS THERE IS GROUNDWATER DATA AVAILABLE FOR THE SITE.



KEY MAP

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

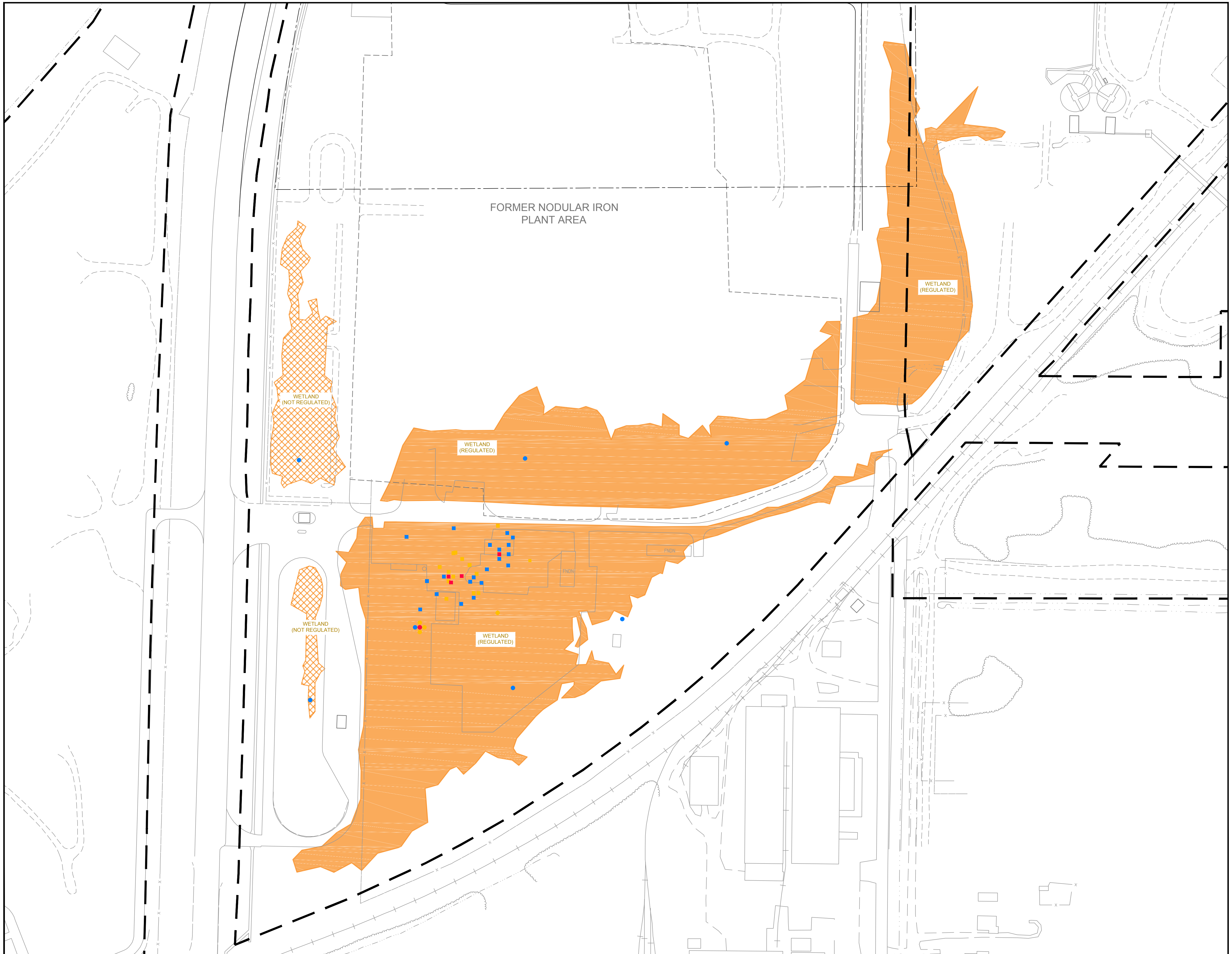
RACER
NODULAR IRON INDUSTRIAL LAND

SAGINAW, MICHIGAN

INVESTIGATIVE UNIT G - SOUTH
WETLAND EVALUATION
BIOLOGICAL ZONE SAMPLES (0-2 FEET)

Source Reference:
MICHIGAN STATE PLANE SOUTH, NAD 83 USING INTERNATIONAL FEET, NGVD 88

Project Manager: MT	Reviewed By: JEP	Date: AUGUST 2018	
Scale: 1" = 100'	Project Nº: 58502-T01	Report Nº: MEMO034	Drawing Nº: figure 1



N

0 50 100 ft

LEGEND

A — — INVESTIGATIVE UNIT BOUNDARY AND IDENTIFIER

MONITORING WELL LOCATION

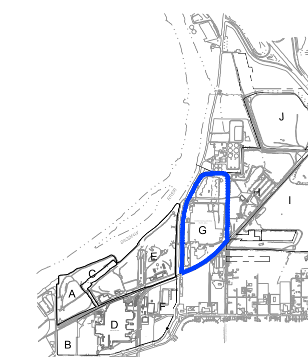
SOIL BORING LOCATION

PCB CONCENTRATIONS

□0.2 □g□g

0.2 - 1.0 □g□g

□1.0 □g□g



KEY MAP

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

RACER
NODULAR IRON INDUSTRIAL LAND

SAGINAW, MICHIGAN

INVESTIGATIVE UNIT G - SOUTH
WETLAND EVALUATION
PCB CONCENTRATIONS - BIOLOGICAL ZONE (0-2 FEET)

GHD

Source Reference:
MICHIGAN STATE PLANE SOUTH, NAD 83 USING INTERNATIONAL FEET, NGVD 88

Project Manager: MT	Reviewed By: JEP	Date: AUGUST 2018	
Scale: 1" = 100'	Project Nº: 58502-T01	Report Nº: MEMO034	Drawing Nº: figure 2

P:□drawing□58000□58502□58502-MEMO□58502-T01(MEMO034)□58502-T01(MEMO034)GN□58502-T01(MEMO034)GN-WA002.DWG Plot Date: JAN 03, 201□

Table 1

Screening of Risk to Aquatick Invertebrates
Ecological Screening Assessment for Newly Formed Wetlands
Nodular Industrial Land
Saginaw, Michigan

Parameters	Units	ESV	Source	# Samples	Frequency of Detection	Max Detection	Mean Detection (ND = 1/2 DL)	Mean Detection (ND = 0)	Max SQ	Mean SQ (ND=1/2 DL)	Mean SQ (ND = 0)	Frequency of Exceedance
Metals												
Aluminum	mg/kg	Not Toxic	-	9	100%	12600.00	4728.89	4728.89	NA	NA	NA	NA
Antimony	mg/kg	25.00	Region 4	9	22%	12.00	2.13	1.37	0.48	0.09	0.05	0%
Arsenic	mg/kg	33.00	PEC	16	100%	11.00	3.00	3.00	0.33	0.09	0.09	0%
Barium	mg/kg	60.00	Region 4	9	100%	80.30	38.63	38.63	1.34	0.64	0.64	11%
Beryllium	mg/kg	1.20	Dutch	9	67%	0.75	0.30	0.18	0.63	0.25	0.15	0%
Cadmium	mg/kg	4.98	PEC	13	54%	0.40	0.23	0.05	0.08	0.05	0.01	0%
Calcium	mg/kg	Nutrient	-	9	100%	92700.00	23133.33	23133.33	NA	NA	NA	NA
Chromium	mg/kg	110.00	PEC	15	100%	309.00	55.67	55.67	**2.81**	0.51	0.51	13%
Cobalt	mg/kg	50.00	Region 4	9	89%	6.10	2.50	2.39	0.12	0.05	0.05	0%
Copper	mg/kg	149.00	PEC	9	100%	98.00	22.71	22.71	0.66	0.15	0.15	0%
Iron	mg/kg	Not Toxic	-	9	100%	98000.00	21401.11	21401.11	NA	NA	NA	NA
Lead	mg/kg	128.00	PEC	13	85%	24.00	9.58	8.69	0.19	0.07	0.07	0%
Magnesium	mg/kg	Nutrient	-	7	100%	37200.00	7011.86	7011.86	NA	NA	NA	NA
Manganese	mg/kg	1100.00	Region 4	9	100%	1230.00	622.22	622.22	1.12	0.57	0.57	**22%**
Mercury	mg/kg	1.10	PEC	9	11%	0.10	0.05	0.01	0.09	0.05	0.01	0%
Nickel	mg/kg	48.30	PEC	9	89%	71.00	20.26	19.70	1.47	0.42	0.41	11%
Potassium	mg/kg	Nutrient	-	7	86%	1610.00	467.79	467.43	NA	NA	NA	NA
Selenium	mg/kg	20.00	Region 4	13	46%	0.79	0.33	0.14	0.04	0.02	0.01	0%
Sodium	mg/kg	Nutrient	-	7	100%	263.00	146.13	146.13	NA	NA	NA	NA
Thallium	mg/kg	2.60	Dutch	9	67%	0.10	0.16	0.02	0.04	0.06	0.01	0%
Vanadium	mg/kg	56.00	Dutch	9	100%	29.00	8.51	8.51	0.52	0.15	0.15	0%
Zinc	mg/kg	459.00	PEC	13	100%	380.00	113.08	113.08	0.83	0.25	0.25	0%
PCBs												
Aroclor-1242 (PCB-1242)	mg/kg	0.67	PEC	62	10%	0.11	0.17	0.01	0.16	0.25	0.01	0%
Aroclor-1248 (PCB-1248)	mg/kg	0.67	PEC	62	2%	0.05	0.16	0.00	0.07	0.24	0.00	0%
Aroclor-1254 (PCB-1254)	mg/kg	0.67	PEC	62	0%	0.00	0.17	0.00	0.00	0.25	0.00	0%
Aroclor-1260 (PCB-1260)	mg/kg	0.67	PEC	62	79%	8.80	0.58	0.56	**13.13**	0.86	0.83	16%
Total PCBs from Aroclors	mg/kg	0.67	PEC	62	79%	8.80	0.56	0.56	**13.13**	0.84	0.84	16%
SVOAs												
1,2,4-Trichlorobenzene	mg/kg	2.20	EPA 2008/10	23	13%	1.90	0.33	0.16	0.86	0.15	0.07	0%
1,2-Dichlorobenzene	mg/kg	1.56	EPA 2008/10	20	10%	0.69	0.22	0.04	0.44	0.14	0.02	0%
1,3-Dichlorobenzene	mg/kg	1.56	EPA 2008/10	20	10%	0.17	0.20	0.02	0.11	0.13	0.01	0%
1,4-Dichlorobenzene	mg/kg	1.56	EPA 2008/10	20	5%	0.05	0.20	0.00	0.03	0.13	0.00	0%
2,4-Dimethylphenol	mg/kg	0.07	Region 4	23	4%	0.03	0.19	0.00	0.37	**2.53**	0.02	0%
2-Methylnaphthalene	mg/kg	0.89	EPA 2003 / 10	23	70%	26.00	2.35	2.29	**29.15**	**2.64**	**2.57**	9%
2-Methylphenol	mg/kg	0.21	Region 4	23	4%	0.04	0.19	0.00	0.17	0.89	0.01	0%
Acenaphthene	mg/kg	0.98	EPA 2003 / 10	23	9%	1.30	0.28	0.10	1.32	0.29	0.11	9%
Anthracene	mg/kg	1.19	EPA 2003 / 10	23	39%	0.15	0.14	0.02	0.13	0.11	0.02	0%
Benzo(a)anthracene	mg/kg	1.68	EPA 2003 / 10	23	43%	0.27	0.15	0.04	0.16	0.09	0.02	0%
Benzo(a)pyrene	mg/kg	1.93	EPA 2003 / 10	23	39%	0.23	0.15	0.03	0.12	0.08	0.02	0%
Benzo(b)fluoranthene	mg/kg	1.96	EPA 2003 / 10	23	39%	0.23	0.15	0.04	0.12	0.08	0.02	0%
Benzo(g,h,i)perylene	mg/kg	2.19	EPA 2003 / 10	23	39%	0.18	0.15	0.03	0.08	0.07	0.01	0%
Benzo(k)fluoranthene	mg/kg	1.96	EPA 2003 / 10	23	30%	0.20	0.16	0.03	0.10	0.08	0.01	0%
bis(2-Chloroethyl)ether	mg/kg	4761.00	Region 4	23	4%	0.03	0.19	0.00	0.00	0.00	0.00	0%
bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	5.29	Region 4	23	26%	0.10	0.16	0.02	0.02	0.03	0.00	0%
Butyl benzylphthalate (BBP)	mg/kg	0.59	Region 4	23	4%	0.07	0.19	0.00	0.13	0.32	0.01	0%
Carbazole	mg/kg	2.20	Region 4	21	10%	0.07	0.19	0.01	0.03	0.09	0.00	0%
Chrysene	mg/kg	1.69	EPA 2008 / 10	23	43%	0.29	0.15	0.04	0.17	0.09	0.02	0%

Table 1

Screening of Risk to Aquatick Invertebrates
Ecological Screening Assessment for Newly Formed Wetlands
Nodular Industrial Land
Saginaw, Michigan

Parameters	Units	ESV	Source	# Samples	Frequency of Detection	Max Detection	Mean Detection (ND = 1/2 DL)	Mean Detection (ND = 0)	Max SQ	Mean SQ (ND=1/2 DL)	Mean SQ (ND = 0)	Frequency of Exceedance
Dibenzofuran	mg/kg	3.40	EPA 2008 / 10	23	57%	0.66	0.15	0.07	0.19	0.05	0.02	0%
Di-n-butylphthalate (DBP)	mg/kg	2000.00	Region 4	23	4%	0.05	0.19	0.00	0.00	0.00	0.00	0%
Fluoranthene	mg/kg	1.41	EPA 2003 / 10	23	61%	0.67	0.16	0.09	0.47	0.11	0.06	0%
Fluorene	mg/kg	1.08	EPA 2003 / 10	23	13%	2.10	0.35	0.18	**1.95**	0.33	0.17	9%
Indeno(1,2,3-cd)pyrene	mg/kg	2.23	EPA 2003 / 10	23	26%	0.16	0.17	0.02	0.07	0.07	0.01	0%
Naphthalene	mg/kg	0.77	EPA 2003 / 10	23	70%	2.40	0.31	0.26	**3.12**	0.41	0.33	9%
Phenanthrene	mg/kg	1.20	EPA 2003 / 10	23	65%	1.80	0.30	0.23	1.50	0.25	0.19	9%
Phenol	mg/kg	0.24	Region 4	23	57%	5.10	0.35	0.26	**21.25**	1.45	1.10	4%
Pyrene	mg/kg	1.39	EPA 2003 / 10	23	39%	0.47	0.18	0.07	0.34	0.13	0.05	0%
Total PAH1	mg/kg	22.80	PEC	23	70%	8.08	0.95	0.95	0.35	0.04	0.04	0%
VOAs												
1,1-Dichloroethane	mg/kg	0.92	EPA 2008 / 10	19	5%	0.02	0.03	0.00	0.02	0.03	0.00	0%
1,2,4-Trimethylbenzene	mg/kg	2.25	EPA 2008 / 10	7	43%	0.08	0.11	0.02	0.03	0.05	0.01	0%
1,2-Dichlorobenzene	mg/kg	1.56	EPA 2008 / 10	3	33%	0.07	0.05	0.02	0.04	0.03	0.01	0%
1,3,5-Trimethylbenzene	mg/kg	2.25	EPA 2008 / 10	7	43%	0.03	0.10	0.01	0.01	0.04	0.00	0%
Benzene	mg/kg	1.32	EPA 2008 / 10	26	8%	0.10	0.04	0.01	0.08	0.03	0.01	0%
cis-1,2-Dichloroethene	mg/kg	0.92	EPA 2008 / 10	19	5%	0.03	0.03	0.00	0.03	0.03	0.00	0%
Ethylbenzene	mg/kg	1.94	EPA 2008 / 10	26	12%	0.06	0.03	0.01	0.03	0.02	0.00	0%
Isopropyl benzene	mg/kg	2.31	EPA 2008 / 10	7	14%	0.02	0.15	0.00	0.01	0.06	0.00	0%
m&p-Xylenes	mg/kg	1.96	EPA 2008 / 10	25	16%	0.27	0.07	0.02	0.14	0.04	0.01	0%
Methylene chloride	mg/kg	0.75	EPA 2008 / 10	19	11%	0.23	0.14	0.01	0.31	0.19	0.02	0%
Naphthalene	mg/kg	0.77	EPA 2003 / 10	2	0%	0.00	0.05	0.00	0.00	0.06	0.00	0%
N-Butylbenzene	mg/kg	2.73	EPA 2008 / 10	7	29%	0.02	0.11	0.00	0.01	0.04	0.00	0%
o-Xylene	mg/kg	0.92	EPA 2008 / 10	25	12%	0.15	0.05	0.01	0.16	0.05	0.01	0%
Toluene	mg/kg	1.14	EPA 2008 / 10	19	26%	0.17	0.05	0.02	0.15	0.04	0.02	0%
Trichloroethene	mg/kg	1.30	EPA 2008 / 10	19	5%	0.05	0.03	0.00	0.04	0.02	0.00	0%
Wet Chemistry												
Ammonia	mg/kg	NA	-	9	11%	0.70	0.94	0.08				
Cyanide (total)	mg/kg	NA	-	2	50%	3.70	2.10	1.85				
Sulfide	mg/kg	NA	-	2	100%	55.40	36.50	36.50				

Notes:

Total PAHs were estimated as the sum of anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene.

Table 2

Screening of Risk to Wetland Plants
Ecological Screening Assessment for Newly Formed Wetlands
Nodular Industrial Land
Saginaw, Michigan

Parameters	Units	ESV	Source	# Samples	Frequency of Detection	Max Detection	Mean Detection (ND = 1/2 DL)	Mean Detection (ND = 0)	Max SQ	Mean SQ (ND=1/2 DL)	Mean SQ (ND = 0)	Frequency of Exceedance
Metals												
Antimony	mg/kg	11.00	EcoSSL Plant	9	0.22	12.00	2.13	1.37	1.09	0.19	0.12	0.11
Cadmium	mg/kg	32.00	EcoSSL Plant	13	0.54	0.40	0.23	0.05	0.01	0.01	0.00	0.00
Chromium	mg/kg	100.00	Dutch MPC	15	1.00	309.00	55.67	55.67	**3.09**	0.56	0.56	0.13
Chromium VI	mg/kg	0.35	EcoSSL Plant	3	0.00	0.00	0.32	0.00	0.00	0.90	0.00	0.00
Copper	mg/kg	70.00	EcoSSL Plant	9	1.00	98.00	22.71	22.71	1.40	0.32	0.32	0.11
Lead	mg/kg	120.00	EcoSSL Plant	13	0.85	24.00	9.58	8.69	0.20	0.08	0.07	0.00
Manganese	mg/kg	220.00	EcoSSL Plant	9	1.00	1230.00	622.22	622.22	**5.59**	**2.83**	**2.83**	**0.67**
Mercury	mg/kg	2.20	Dutch MPC	9	0.11	0.10	0.05	0.01	0.04	0.02	0.00	0.00
Nickel	mg/kg	38.00	EcoSSL Plant	9	0.89	71.00	20.26	19.70	**1.87**	0.53	0.52	**0.22**
Potassium	mg/kg	Nutrient	-	7	0.86	1610.00	467.79	467.43	-	-	-	-
Selenium	mg/kg	0.52	EcoSSL Plant	13	0.46	0.79	0.33	0.14	**1.52**	0.63	0.26	0.08
Sodium	mg/kg	Nutrient	-	7	1.00	263.00	146.13	146.13	-	-	-	-
Thallium	mg/kg	1.00	EcoSSL Plant	9	0.67	0.10	0.16	0.02	0.10	0.16	0.02	0.00
Vanadium	mg/kg	60.00	EcoSSL Plant	9	1.00	29.00	8.51	8.51	0.48	0.14	0.14	0.00
Zinc	mg/kg	160.00	EcoSSL Plant	13	1.00	380.00	113.08	113.08	**2.38**	0.71	0.71	**0.23**

Table 3

Exposure to Insectivores
Ecological Screening Assessment for Newly Formed Wetlands
Nodular Industrial Land
Saginaw, Michigan

Species	Body Weight (kg)	Ecological Guild	Contaminated Prey	Feeding Rate (kg WW / kg BW-day)	Soil Ingestion Rate (kg DW / kg BW-day)	Home Range (acres)
Brown Bat	0.007	Insectivore	Aquatic Insects	0.333	0.000	75
Tree Swallow	0.02	Insectivore	Aquatic Insects	0.755	0.000	80

Notes:

BW refers to body weight
WW refers to wet weight
DW refers to dry weight
Parameters from EPA (1993a) except for bat, which were obtained from Baron et al. (1999).

Table 4

Exposure Concentrations
Ecological Screening Assessment for Newly Formed Wetlands
Nodular Industrial Land
Saginaw, Michigan

COPEC	BSAF	Maximum Concentrations		Average Concentrations	
		Sediment (mg/kg DW)	Aerial Invertebrates (mg/kg WW)	Sediment (mg/kg DW)	Aerial Invertebrates (mg/kg WW)
Total PCBs	1.1	8.80	9.68	0.58	0.64
Benzo(a)anthracene	0.03	0.29	0.01	0.04	0.001
Benzo(a)pyrene	0.03	0.47	0.01	0.07	0.002
Chrysene	0.03	0.23	0.01	0.04	0.001
Pyrene	0.05	0.18	0.01	0.03	0.001
Benzo(b)fluoranthene	0.02	0.20	0.005	0.03	0.001
Benzo(g,h,i)perylene	0.02	0.16	0.003	0.02	0.000
Benzo(k)fluoranthene	0.02	0.20	0.005	0.03	0.001
Indeno(1,2,3-cd)pyrene	0.02	0.16	0.003	0.02	0.000

Notes:

COPEC - Constituent of Potential Ecological Concern
DW - Dry Weight, WW - Wet Weight
BSAF Sources: PCBs from Tracey and Hansen (1995); PAHs from Thomann and Komlos (1999).

Table 5

Ssummary of Food Chain Model for Tree Swallow
Ecological Screening Assessment for Newly Formed Wetlands
Nodular Industrial Land
Saginaw, Michigan

COPEC	IR_{Total} (mg/kg-day)	NOAEL (mg/kg-day)	LOAEL (mg/kg-day)	Unadjusted for Area Use		Adjusted for Area Use[1]	
				HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Mamimum Exposure Concentrations							
Total PCBs	7.31	0.6	1.2	**12.2**	**6.1**	**2.0**	**1.0**
Benzo(a)anthracene	0.01	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(a)pyrene	0.01	2.0	20.0	0.0	0.0	0.0	0.0
Chrysene	0.01	2.0	20.0	0.0	0.0	0.0	0.0
Pyrene	0.01	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(b)fluoranthene	0.004	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(g,h,i)perylene	0.002	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(k)fluoranthene	0.004	2.0	20.0	0.0	0.0	0.0	0.0
Indeno(1,2,3-cd)pyrene	0.002	2.0	20.0	0.0	0.0	0.0	0.0
Average Exposure Concentrations							
Total PCBs	0.49	0.6	1.2	0.8	0.4	0.1	0.1
Benzo(a)anthracene	0.001	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(a)pyrene	0.001	2.0	20.0	0.0	0.0	0.0	0.0
Chrysene	0.001	2.0	20.0	0.0	0.0	0.0	0.0
Pyrene	0.001	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(b)fluoranthene	0.0005	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(g,h,i)perylene	0.0003	2.0	20.0	0.0	0.0	0.0	0.0
Benzo(k)fluoranthene	0.0005	2.0	20.0	0.0	0.0	0.0	0.0
Indeno(1,2,3-cd)pyrene	0.0003	2.0	20.0	0.0	0.0	0.0	0.0

Notes:

Bold identifies a Hazard Quotient greater than unity (1.0)
HQ - Hazard Quotient
IR - Ingestion Rate
NOAEL - No Observed Adverse Effect Level
LOAEL - Lowest Observed Adverse Effect Level
[1] Area Use calculated as 13.3 acres divided by species specific home range.

Table 6

Summary of Food Chain Model for Brown Bat
Ecological Screening Assessment for Newly Formed Wetlands
Nodular Industrial Land
Saginaw, Michigan

COPEC	IR_{Total} (mg/kg-day)	NOAEL (mg/kg-day)	LOAEL (mg/kg-day)	Unadjusted for Area Use		Adjusted for Area Use[1]	
				HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}
Mamimum Exposure Concentrations							
Total PCBs	3.22	0.17	0.20	**19.3**	**16.1**	**3.4**	**2.9**
Benzo(a)anthracene	0.003	0.62	22.20	0.0	0.0	0.0	0.0
Benzo(a)pyrene	0.004	0.62	22.20	0.0	0.0	0.0	0.0
Chrysene	0.003	0.62	22.20	0.0	0.0	0.0	0.0
Pyrene	0.003	0.62	22.20	0.0	0.0	0.0	0.0
Benzo(b)fluoranthene	0.002	0.62	22.20	0.0	0.0	0.0	0.0
Benzo(g,h,i)perylene	0.001	0.62	22.20	0.0	0.0	0.0	0.0
Benzo(k)fluoranthene	0.002	0.62	22.20	0.0	0.0	0.0	0.0
Indeno(1,2,3-cd)pyrene	0.001	0.62	22.20	0.0	0.0	0.0	0.0
Average Exposure Concentrations							
Total PCBs	0.21	0.17	0.20	**1.3**	**1.1**	0.2	0.2
Benzo(a)anthracene	0.0005	0.62	22.2	0.0	0.0	0.0	0.0
Benzo(a)pyrene	0.001	0.62	22.2	0.0	0.0	0.0	0.0
Chrysene	0.0004	0.62	22.2	0.0	0.0	0.0	0.0
Pyrene	0.0005	0.62	22.2	0.0	0.0	0.0	0.0
Benzo(b)fluoranthene	0.0002	0.62	22.2	0.0	0.0	0.0	0.0
Benzo(g,h,i)perylene	0.0001	0.62	22.2	0.0	0.0	0.0	0.0
Benzo(k)fluoranthene	0.0002	0.62	22.2	0.0	0.0	0.0	0.0
Indeno(1,2,3-cd)pyrene	0.0001	0.62	22.2	0.0	0.0	0.0	0.0

Notes:

Bold identifies a Hazard Quotient greater than unity (1.0)
HQ - Harzard Quotient
IR - Ingestion Rate
LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level
[1] Area Use calculated as 13.3 acres divided by species specific home range.

Attachment A
Wetland Description

NISWANDER ENVIRONMENTAL
Finding solutions in a complex world

9436 Maltby Road
Brighton, MI 48116
810.225.0539 office
810.225.0653 fax
www.niswander-env.com

July 22, 2015

Mr. Patrick Schaffer
Menard, Inc. – Properties Division
5101 Menard Drive
Eau Claire, WI 54703

Subject: *Wetland Delineation*
38.86-Acre Racer Trust Property
Buena Vista Township, Saginaw County, MI
NE 1424

Dear Mr. Schaffer:

Niswander Environmental was contracted in July 2015 to complete a wetland delineation on 38.86-acre property (Property) located at 2100 Veterans Memorial Parkway in Section 8 of Buena Vista Township, Saginaw County, Michigan (T12N, R5E). The Property is a former industrial complex that was decommissioned and demolished over 10 years ago. Currently, this disturbed site is a vacant brownfield that is dominated by wetland, old field, meadow, and/or young successional forested habitat. Russian olive and cottonwood dominate much of the land, particularly in the north. The central portions of the site are primarily scrub-shrub wetland. Areas in the south consist of open meadow and old field. Please refer to Photos 1 and 2 in the attached Photographic Log for a representation of the upland portions of the Property.

Niswander Environmental assessed the Property for existing wetlands, watercourses, and floodplains, and delineated the wetland features. During the on-site investigation, **Niswander Environmental identified five (5) wetlands within the Property (Figure 1 – Wetland Location Map)**. The following is a report detailing the results of Niswander Environmental's investigation.

SUPPORTING DOCUMENTATION

Wetlands and Watercourses

Prior to the site investigation, Niswander Environmental completed a thorough review of available State and County GIS data, online resources, wetland maps, historic aerial photos, topographic maps, soil maps, and other materials. Infrared and color aerial photographs (Michigan Geospatial Digital Library – MiGDL, 1998, 2005, and 2012) and 2014 color aerial photographs (GoogleEarth) were obtained and evaluated for any remarkable features. A review of National Wetland Inventory (NWI), Michigan Department of Environmental Quality (MDEQ) Final Wetland Inventory Map, and Saginaw County GIS data was conducted to determine the likely presence, location, size and type of wetlands that may be located on the Property. The United States Fish and Wildlife Service (USFWS) produce the NWI data through aerial photograph interpretation. The MDEQ Final Wetland Inventory Map was created from the NWI, USDA Soils Map, and Land Cover, as mapped by the Michigan Resource Inventory System (MIRIS).

Review of the available wetland maps, including the NWI and MDEQ Final Wetland Inventory Map for Saginaw County, did not identify wetlands or hydric soil on the Property, likely because this Property contained an industrial facility until recently. These maps, however, may not always accurately show the extent or existence of wetland systems in a specific area or correctly identify the wetlands present since they were primarily generated through aerial interpretation. Wetland inventory maps are utilized for preliminary analysis only. Field investigations are always necessary to determine the actual existence and type of wetlands in a given area.

METHODS

Wetlands and Watercourses

Potential wetland areas within the Property were evaluated in the field using the procedures outlined in the US Army Corps of Engineers *1987 Wetland Delineation Manual* ("*87 Manual"*), and the Northeast/NorthCentral Supplement to the "*87 Manual"* as required by the State of Michigan, Department of Environmental Quality, under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, PA451 of 1994, as amended (NREPA). According to these procedures, wetlands are identified by the presence of hydric soils, signs of hydrology indicators, and dominant hydrophytic vegetation.

Hydric soil indicators were assessed in the field through soil pits that were dug in and around potential wetland areas. A soil is considered hydric if it meets requirements as stated in the Natural Resources Conservation Service *Field Indicators of Hydric Soils in the United* States (Version 7.0, 2010), which specifies parameters such as soil matrix color, amount and contrast of redox concentrations or depletions, and depth and thickness for a specific soil type such as loamy, clayey, or sandy soils. Soils were not reviewed in areas with standing or flowing water since these areas are assumed to be hydric.

Signs of hydrology within potential wetland areas were also investigated. Standing water or saturated soils, water marks on trees, drift lines, sediment deposits, and water-stained leaves (among others) are considered primary indicators of hydrology, while secondary signs include drainage patterns, moss trim lines, crayfish burrows, and surface soil cracks. Either one primary or two secondary indicators are necessary in determining the presence of wetland hydrology.

Dominant vegetation for wetland areas are typically determined by estimating the most common species of tree, shrub, and forb layers. The top dominants are visually estimated for each layer or strata, and the indicator status of each dominant species is then determined. An indicator status of obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU) and/or upland (UPL) is typically assigned to each plant species on the U.S. Army Corps of Engineers *National Wetland Plant List* (*http://rsgisias.crrel.usace.army.mil/NWPL/*). An area has hydrophytic (wetland) vegetation when, under normal circumstances, more than 50 percent of the composition of the dominant species from all strata are OBL, FACW, and/or FAC species. An area has non-hydrophytic vegetation when 50 percent or more of the composition of the dominant species from all strata are FACU and/or UPL species. Areas that meet the three criteria of hydric soils, wetland hydrology, and hydrophytic vegetation are considered wetlands. The perimeter of a wetland is typically determined by locating areas where one of these three criteria is no longer present (*i.e.*, where wetland vegetation transitions to upland vegetation or where signs of hydrology are no longer apparent, etc.).

The wetland boundary was flagged and GPS'd in the field, and then digitized into a GIS database (Figure 1 – Wetland Location Map). The actual wetland boundary should be surveyed and incorporated into any development plans to determine the exact size, shape, and location of the wetland.

Under NREPA, wetlands are regulated if they are greater than 5 acres in size or if they are connected to or within 500 feet of an inland lake, pond, river, drain, or stream (*i.e.*, watercourse). A pond is defined in Part 303 Administrative Rules (R 281.921) as a natural or artificial pond that has permanent open water with a surface area that is more than 1 acre, but less than 5 acres. Other watercourses are regulated by the State under Part 301 (Inland Lakes and Streams) if they exhibit defined banks, a bed, and visible evidence of a continued flow or continued occurrence of water. An inland lake or stream does not include the Great Lakes, Lake St. Clair, or a lake or pond that has a surface area of less than 5 acres. It should be noted that the MDEQ has the final authority on the regulatory status of wetlands and watercourses in the State of Michigan.

FINDINGS

On July 15 and 16, 2015 Niswander Environmental conducted a wetland delineation on the Property using the *87 Manual*. Five wetlands (Wetland A - E) were identified and flagged on the Property. The limits of the wetland were flagged in the field with pink flagging labeled A1 – A80, B1 – B145, C1 – C24, D1 – D14, and E1 – E 65. The wetland delineation, once surveyed by a registered surveyor, will provide the exact shape, size, and location of the on-site wetland.

WETLANDS A, B, AND D

Wetlands A, B, and D are similar in terms of habitat type, vegetative composition, soil structure, and hydrologic indicators. They are separated from each other through access roads and driveways, and there does not appear to be a hydrologic connection (Figure 1). Each of these wetlands are classified as emergent/scrub-shrub wetlands, meaning there are portions that are dominated by woody shrubs and small trees, but there are also openings comprised primarily of herbaceous plants. Despite their diversity, these wetlands are considered to be of moderate to moderately low quality because of recent disturbance (i.e., the wetlands have developed since the demolition of the pre-existing buildings and infrastructure on the site) and contain an abundance of invasive vegetation such as Phragmites (*Phragmites australis*), red top (*Agrostis gigantea*), narrow-leaved cattail (*Typha angustifolia*), and purple loosestrife (*Lythrum salicaria*). Other common-to-abundant plants within Wetlands A, B, and D include path rush (*Juncus tenuis*), Torrey's rush (*Juncus torreyi*), sandbar willow (*Salix exigua*), cottonwood (*Populus deltoides*), slender fragrant goldenrod (*Euthamia graminifolia*), and sedge (*Carex* spp.). Wetland A contains a disturbed meadow area in the southern portion of the Property, where wildflowers such as vervain (*Verbena hastata*), late goldenrod (*Solidago gigantea*), swamp milkweed (*Asclepias incarnata*), and swamp aster (*Symphyotrichum puniceum*) along with a variety of sedges and rushes. Please refer to Photos 3 – 7 in the attached Photographic Log.

Hydrologic indicators present at the time of inspection include standing water, saturated soils, aquatic fauna, algal mats, and a positive FAC-Neutral test. Soils within each wetland proved to be similar, consisting of a sandy mucky mineral that is hydric. The upland/wetland interface was determined through topographical differences and the presence/absence of upland species such as common buckthorn (*Rhamnus cathartica*), Virginia creeper (*Parthenocissus cinquefolia*), Russian olive (*Elaeagnus angustifolia*), thistle (*Cirsium arvense*), tall goldenrod (*Solidago altissima*), Queen Anne's lace (*Daucus carota*), spotted knapweed (*Centuarea stoebe*) and various upland grasses. Upland areas generally contained a few wetland species intermixed with an abundance of upland plants, and also lacked primary indicators of hydrology. Please refer to the attached Wetland Determination Data Form for more details pertaining to Wetlands A, B, and D.

Wetland B is likely regulated by the MDEQ due to the fact that it is greater than five acres in size. Wetlands A and D are likely not regulated since they are smaller than five acres and are hydrologically isolated.

WETLAND C

Wetland C is a small, depressional wetland located within a disturbed field along Veterans Memorial Parkway (Figure 1). This emergent wetland is dominated by scouring rush (*Equisetum hymale*), meadow sedge (*Carex granularis*), and taper-tip rush (*Juncus articulatis*). Other species present within this wetland include fowl bluegrass (*Poa palustris*), Torrey's rush, spikerush (*Eleocharis obtusa*), and swamp milkweed (Photo 8; Photographic Log).

Although the interior of the wetland contained standing water, a majority of the wetland was only saturated at the time of inspection. Hydric soils were confirmed when a mucky sand was revealed. Please refer to the attached Wetland Determination Data Form for more details pertaining to Wetland C.

Wetland C is likely not regulated by the MDEQ since it is less than five acres in size and is not hydrologically connected to a regulating body of water.

WETLAND D

Wetland E is a small (~1 ac) wetland located in the northwest portion of the Property, beginning just north of the access drive (Figure 1). Like the other on-site wetlands, this wetland is disturbed but is becoming more naturalized as the years pass. Most of the wetland is classified as scrub-shrub due to the abundance of sapling cottonwood, but other portions are more open and resemble a meadow (Photos 9 and 10; Photographic Log). While no single species truly dominates, the most abundant plants within this wetland include cottonwood, sandbar willow, purple loosestrife, scouring rush, vervain, late goldenrod, slender-fragrant goldenrod, and riverbank grape (*Vitis riparia*).

Wetland E contained a few pockets of standing water, but in general was saturated at or just below the surface. Please refer to the attached Wetland Determination Data Form for more details pertaining to Wetland E.

Wetland E is likely not regulated by the MDEQ since it is less than five acres in size and is hydrologically isolated.

CONCLUSIONS

Niswander Environmental identified fives wetlands (Wetlands A, B, C, D, and E) on the Property. The approximate size and shape of the wetland is represented in Figure 1 (Wetland Location Map). A survey of the wetland delineation should be conducted to accurately determine the wetland boundaries and any potential impacts resulting from future work within this area.

It is Niswander Environmental's professional opinion that Wetland B is regulated by the MDEQ due to the fact that it is greater than 5 acres in size. The remaining four wetlands are less than 5 acres in size, and are hydrologically isolated. However, since the MDEQ has the final regulatory authority, we recommend that a Pre-Application Meeting with the MDEQ be held prior to moving forward with any potential development. A MDEQ Part 303 Permit will be necessary if impacts to regulated wetland are proposed.

We look forward to working with you to make this project a success. If you have any questions or require additional information please call us at your convenience.

Sincerely,

Jeff W. Bridgland
Ecologist
Professional Wetland Scientist #1810

Steven F. Niswander
Principal
Professional Wetland Scientist #1276

Attachments: Figure 1 – Wetland Location Map
Photographic Log
Wetland Determination Data Forms

Photographic Log

Photo 1
The Racer Trust property is a 38.86-acre site that was a former industrial facility that was demolished roughly 10-15 years ago and left fallow.

Photo 2
This disturbed property is dominated by pioneer species such as cottonwood, willow, and Russian olive.

Photographic Log

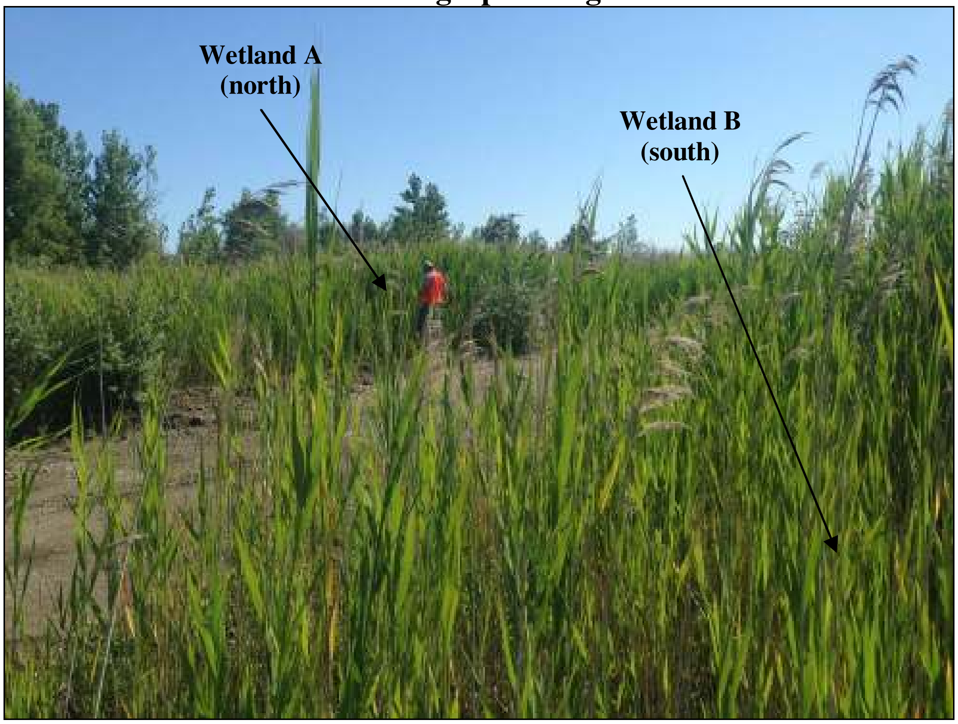


Photo 3

An access driveway splits Wetlands A and B, but there does not appear to be a hydrologic connection between the two. Along the road, these wetlands contain an abundance of invasive Phragmites.

Photo 4

Wetland A, located on the north side of the access drive, is dominated by Phragmites (although other species are present throughout).

Photographic Log

Photo 5
View facing south showing Wetland B, a large (~7^+ acre) scrub-shrub wetland. This wetland is likely regulated by the MDEQ.

Photo 6
The southern portion of Wetland B is comprised primarily of meadow species as opposed to woody species that dominate further north.

Photographic Log

Photo 7

Wetland D, located in the northeast portion of the property, is primarily an emergent wetland dominated by Phragmites, cattail, sedge, and rush.

Photo 8

Wetland C is a small, isolated emergent wetland located along Veterans Memorial Highway.

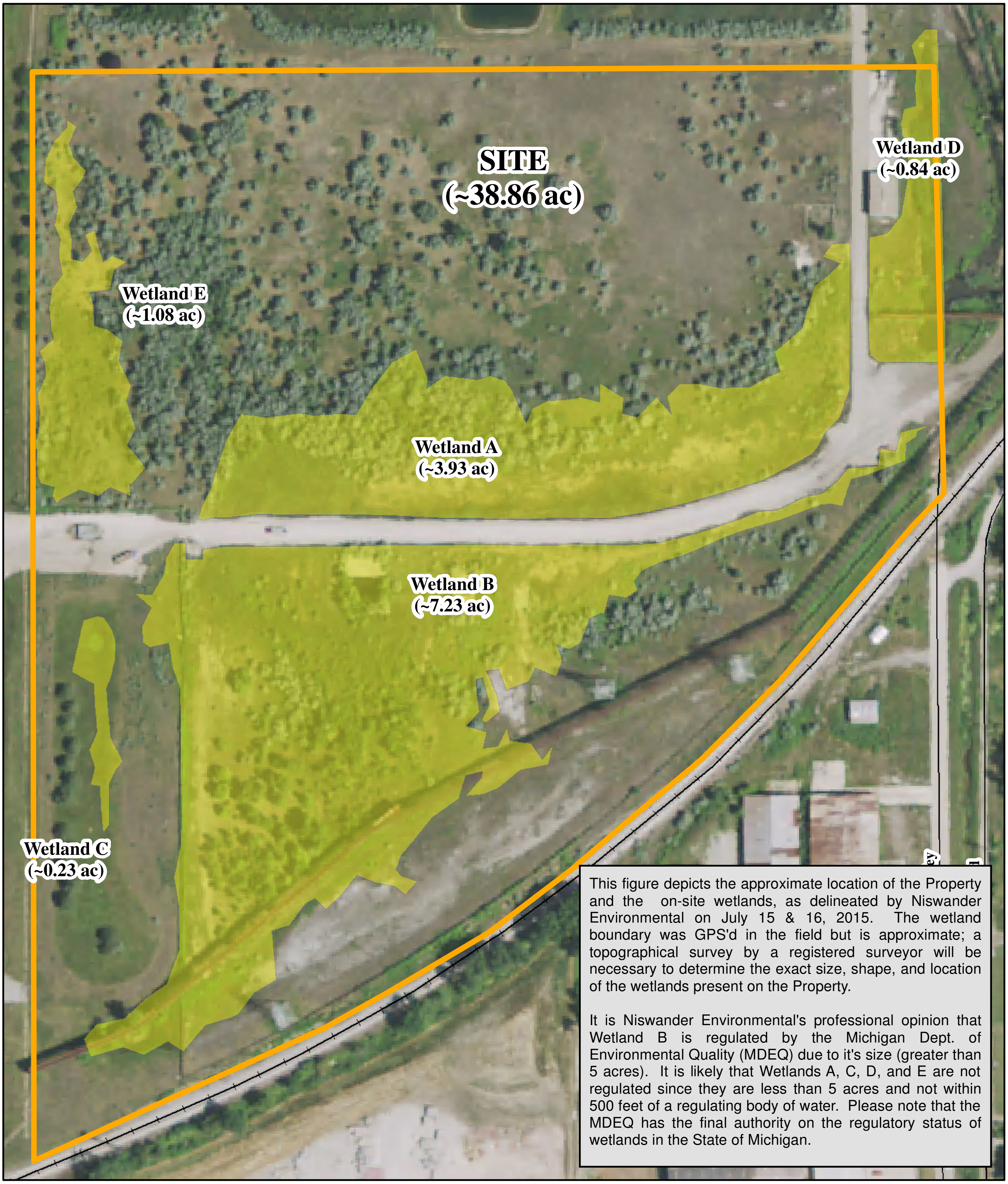
Photographic Log

Photo 9

View facing north showing the scrub-shrub portion of Wetland E. This wetland contains both meadow and scrub-shrub characteristics, and is very diverse.

Photo 10

Pockets of open meadow are common throughout Wetland E. These areas contain an abundance of sedges, rushes and wildflowers such as vervain, goldenrod, milkweed, and aster.



This figure depicts the approximate location of the Property and the on-site wetlands, as delineated by Niswander Environmental on July 15 & 16, 2015. The wetland boundary was GPS'd in the field but is approximate; a topographical survey by a registered surveyor will be necessary to determine the exact size, shape, and location of the wetlands present on the Property.

It is Niswander Environmental's professional opinion that Wetland B is regulated by the Michigan Dept. of Environmental Quality (MDEQ) due to it's size (greater than 5 acres). It is likely that Wetlands A, C, D, and E are not regulated since they are less than 5 acres and not within 500 feet of a regulating body of water. Please note that the MDEQ has the final authority on the regulatory status of wetlands in the State of Michigan.

Figure 1. Wetland Location Map

NE 1424 Racer Trust Industrial Park
Client: Menard, Inc.
38.86-Acre Property at 2100 Veterans Memorial Parkway
Section 8 of Buena VistaTwp., Saginaw Co., MI (T12N, R5E)
Delineation Date: July 15 & 16, 2015
Map Created: July 16, 2015

Feet 0 100 200 400

N W E S

NISWANDER ENVIRONMENTAL
9436 Maltby Road, Brighton, MI 48116
810.225.0539 *office* | 810.225.0653 *fax*

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Menard's Saginaw City/County: Buena Vista Twp., Saginaw Co. Sampling Date: 7/15/2015

Applicant/Owner: Racer Trust State: MI Sampling Point: A, B, D

Investigator(s): J. Bridgland, T. Smith - Niswander Environmental Section, Township, Range: Sec. 8, T12N, R5E

Landform (hillside, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope %: ______

Subregion (LRR or MLRA): ______ Lat: 43 27' 25.00"N Long: 83 54' 32.82"W Datum: GoogleEarth

Soil Map Unit Name: Urban Land (74) NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No x

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ____
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____	If yes, optional Wetland Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
Wetland Data Form for Wetlands A, B, and D. Each of these three wetlands exhibit similar habitat types, vegetative composition, soils, and hydrology. Separated by an access driveway, but no apparent hydrologic connection (no culverts observed). Highly disturbed - former industrial facility that was demolished roughly 10-15 years ago, capped with soil, and left to naturally vegetate. Wetland A = ~3.93 acres (80 flags); Wetland B = ~7.23ac (145 flags); Wetland C = ~ 0.23 ac (24 flags); Wetland D = ~0.84 ac (14 flags); Wetland E = ~ 1.08 ac (65 flags). Wetland B is likely regulated due to size. It is Niswander Environmental's professional opinion that Wetlands A, C, D, and E are hydroligically isolated and smaller than five acres in size and therefore are likely not regulated by the MDEQ.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

X Surface Water (A1)	___ Water-Stained Leaves (B9)
X High Water Table (A2)	X Aquatic Fauna (B13)
X Saturation (A3)	___ Marl Deposits (B15)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)
X Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)
___ Sparsely Vegetated Concave Surface (B8)	

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 3
Water Table Present?	Yes X	No ____	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Wetlands A, B, and D exhibited standing water throughout much of the wetland at the time of the inspection. Much of the remainder of each wetland was saturated at the surface.

VEGETATION – Use scientific names of plants. Sampling Point: A, B, D

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Eastern Cottonwood	10	Yes	FAC
2. Russian-Olive	10	Yes	FACU
3. Black Willow	2	No	OBL
4.			
5.			
6.			
7.			
	22	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. Sandbar Willow	65	Yes	
2. Silky Dogwood	10	No	
3. European Buckthorn	10	No	
4. Russian-Olive	10	No	
5.			
6.			
7.			
	95	=Total Cover	
Herb Stratum (Plot size: 5 ft.)			
1. Common Reed	80	Yes	FACW
2. Purple Loosestrife	50	Yes	OBL
3. Narrow-Leaf Cat-Tail	40	Yes	OBL
4. Torrey's Rush	40	Yes	FACW
5. Late Goldenrod	25	No	FACW
6. *Juncus tenuis*	25	No	FAC
7. *Agrostis gigantea*	20	No	FACW
8. Common Fox Sedge	10	No	OBL
9. Flat-Top Goldentop	10	No	FACW
10. Swamp Milkweed	5	No	OBL
11. water plantain	5	No	OBL
12. Bebb's Sedge	5	No	OBL
	315	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft.)			
1. *Vitis riparia*	10	Yes	FAC
2.			
3.			
4.			
	10	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	117	x 1 =	117
FACW species	175	x 2 =	350
FAC species	45	x 3 =	135
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	347	(A)	642 (B)

Prevalence Index = B/A = 1.85

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Other species present include vervain, swamp aster, chairmakers rush, soft rush, green bulrush, joe-pye weed, boneset, taper-tip rush, and Indian hemp. Northern portions of Wetland A dominated 99% by Phragmites. Southern portions of Wetland B contain disturbed meadow. Upland/Wetland interface determined by presence of upland species such as spotted knapweed, russian olive, tall goldenrod, Virginia creeper, orchard grass, Queen Anne's lace, and/or thistle.

SOIL

Sampling Point A, B, D

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-8	10YR 2/1	95	7.5YR 3/4	5	C	M	Mucky Sand	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- X Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ? Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Menard's Saginaw City/County: Buena Vista Twp., Saginaw Co. Sampling Date: 7/15/2015

Applicant/Owner: Racer Trust State: MI Sampling Point: C

Investigator(s): J. Bridgland, T. Smith - Niswander Environmental Section, Township, Range: Sec. 8, T12N, R5E

Landform (hillside, terrace, etc.): ____ Local relief (concave, convex, none): ____ Slope %: ____

Subregion (LRR or MLRA): ____ Lat: 43 27' 25.00"N Long: 83 54' 32.82"W Datum: GoogleEarth

Soil Map Unit Name: Urban Land (74) NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No x

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
Small, depressional PEM located within overgrown grassy field. Roughly 0.23 acres (24 flags). Likely not regulated due to lack of size and hydrologically isolated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ____ High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 1
Water Table Present?	Yes ____	No ____	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Interior portions of Wetland C contained standing water, but a majority of the wetland was saturated at the surface at the time of inspection

VEGETATION – Use scientific names of plants.

Sampling Point: C

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size: 5 ft.)			
1. *Equisetum hyemale*	50	Yes	FAC
2. *Carex granularis*	50	Yes	FACW
3. *Juncus articulatus*	30	No	OBL
4. *Poa palustris*	15	No	FACW
5. *Juncus torreyi*	5	No	FACW
6. *Eleocharis obtusa*	5	No	OBL
7. *Asclepias incarnata*	1	No	OBL
8. Carex vulpinoidea	1	No	OBL
9. *Scirpus cyperinus*	1	No	OBL
10. *Agrostis gigantea*	1	No	FACW
11. *Solidago gigantea*	1	No	FACW
12.			
	160	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft.)			
1. *Vitis riparia*	5	Yes	FAC
2.			
3.			
4.			
	5	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	38	x 1 =	38	
FACW species	72	x 2 =	144	
FAC species	55	x 3 =	165	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column Totals:	165	(A)	347	(B)

Prevalence Index = B/A = 2.10

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** __

Remarks: (Include photo numbers here or on a separate sheet.)
Dominated by scouring rush, C. granularis (or C. pellita), and taper-tip rush. Upland/Wetland interface determined by subtle slope, presence of upland grasses and thistle.

SOIL

Sampling Point C

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 2/1	95	7.5YR 3/4	5	C	M	Mucky Sand	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
X Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
X Sandy Redox (S5)
___ Stripped Matrix (S6)
? Dark Surface (S7)

___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Menard's Saginaw City/County: Buena Vista Twp., Saginaw Co. Sampling Date: 7/16/2015

Applicant/Owner: Racer Trust State: MI Sampling Point: E

Investigator(s): J. Bridgland - Niswander Environmental Section, Township, Range: Sec. 8, T12N, R5E

Landform (hillside, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope %: ______

Subregion (LRR or MLRA): ______ Lat: 43 27' 25.00"N Long: 83 54' 32.82"W Datum: GoogleEarth

Soil Map Unit Name: Urban Land (74) NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil X, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No x

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**
Hydric Soil Present?	Yes X No ___	**within a Wetland?** **Yes** X **No** ___
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetland Site ID: ______

Remarks: (Explain alternative procedures here or in a separate report.)
PSS wetland with open meadow portions; diverse; hummocky, portions marginally wetland (mesic); Approximately 1.08 ac (65 flags). Likely not regulated due to size and lack of hydrologic connectivity.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	
X High Water Table (A2)	X Aquatic Fauna (B13)	
X Saturation (A3)	___ Marl Deposits (B15)	
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	
___ Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ___	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 4

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Very few pockets of standing water; portions saturated at surface, but mostly below the surface (@ roughly 4")

VEGETATION – Use scientific names of plants.

Sampling Point: E

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides*	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	30	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Populus deltoides*	50	Yes	FAC
2. *Salix interior*	20	Yes	FACW
3. *Russian olive*	10	No	FACU
4. *Cornus amomum*	5	No	FACW
5.			
6.			
7.			
	85	=Total Cover	
Herb Stratum (Plot size: 5 ft.)			
1. *Lythrum salicaria*	35	Yes	OBL
2. *Equisetum hyemale*	25	Yes	FAC
3. *Verbena hastata*	25	Yes	FACW
4. *Solidago gigantea*	20	Yes	FACW
5. *Euthamia graminifolia*	20	Yes	FACW
6. *Agrostis gigantea*	15	No	FACW
7. *Carex vulpinoidea*	15	No	OBL
8. *Apocynum cannabinum*	15	No	FACW
9. *Juncus torreyi*	10	No	FACW
10. *Phragmites australis*	10	No	FACW
11. *Juncus tenuis*	10	No	FAC
12. *Juncus articulatus*	5	No	OBL
	205	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft.)			
1. *Vitis riparia*	20	Yes	FAC
2.			
3.			
4.			
	20	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 9 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	55	x 1 =	55
FACW species	140	x 2 =	280
FAC species	135	x 3 =	405
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	340 (A)		780 (B)

Prevalence Index = B/A = 2.29

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Wetland E is dominated by cottonwood, sandbar willow, purple loosestrife, and grapevine. Abundant and common species include vervain, late goldenrod, scouring rush, slender-fragrant goldenrod, fox seddge, red top, and Indian hemp. Upland/Wetland interface marked by presence of Virginia creeper, russian olive, tall goldenrod, thistle, and poison ivy.

SOIL

Sampling Point E

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 3/2	100					Loamy/Clayey	
1-3	2.5Y 4/3	90	7.5YR 3/4	10	C	M	Sandy	Distinct redox concentrations
3-4	10YR 4/1	100					Sandy	
4-12	10YR 2/1	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
? Stripped Matrix (S6)
? Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No ___

Remarks:

Disturbed ground appears to have been capped with sand. Very hardpack sand at 12" (almost concrete-like). Water filled holed within 30 min to 10", but apparent that it was saturated at about 4".