FRIENDS OF THE MISSISSIPPI RIVER

Working to protect the Mississippi River and its watershed in the Twin Cities area.

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Amy Hadiaris
Pollution Control Agency
520 Lafayette Road North
St Paul, MN 55155

RE: Comments on Ford Area C Comprehensive Site History & Investigation Report II

Dear Ms Hadiaris:

Friends of the Mississippi River (FMR) is a local non-profit community-based organization that works to protect and enhance the natural and cultural assets of the Mississippi River and its watershed in the Twin Cities. We have 2,300 active members, and more than 6,500 annual volunteers who care deeply about the river's unique resources.

FMR has engaged Paul Wotzka of Land and Water Consulting to prepare the attached comments. We appreciate the opportunity to provide input at this juncture and look forward to continuing to work with the MPCA, Ford and other stakeholders on this important matter.

Sincerely,

Whitney L. Clark
Executive Director

Comments on ***Area C – Comprehensive Site History and Investigation Report II,*** **May 2017**

Introduction

The purpose of these comments is to review the adequacy of the Investigation Report, highlight salient issues found therein, and make recommendations for improvements in monitoring, analysis, and remediation of Area C for the benefit of human and aquatic health.

Overall, there is significant understated water quality contamination at the site and a significant risk of future contamination to groundwater and the Mississippi River that is not adequately addressed in the Report. Specifically, the Investigation Report: 1) ignores the risk of intact barrels contained within the pile of industrial waste 2) inappropriately applies surface water standards to groundwater contamination identified at the site 3) poorly evaluates the complexities of ground and surface water interaction and the close connection to water quality contamination at the site 4) uses water quality analytical methods with reporting and method detection limits significantly higher than applicable standards thereby minimizing potential contamination 5) inadequately investigates contamination due to very limited sampling both in terms of frequency of samples and number of parameters analyzed for, in the Mississippi River near Area C conducted for commonly detected compounds emanating from the waste pile.

Waste Pile

From the Investigation Report and the 3D visualization model provide by Arcadis, the dimensions of the industrial waste pile within Area C and its location on the floodplain of the Mississippi can be determined. Utilizing this tool and results from sampling soil contaminates, the overall mass of contamination of the pile could be estimated. In addition, Figure 9b for Trench 2 and Figure 9c for Trench 3, identify intact barrels from investigation of Area C conducted in 2015. Based on these observations and other investigations within the Report, the number of intact barrels locked within the pile of industrial waste could also be estimated. The determinations of the total mass of contamination and the number of intact barrels contained within the pile would provide a "ball park" number in order to estimate total contamination still contained within the pile and an estimate of the risk of future contamination from the pile.

Also, from the 3D visualization model, it can be determined that the bottom part of the industrial waste pile, which contains the highest concentrations of pollutants, will be inundated during a 10-year flood from the Mississippi River (elevation 707 ft) and that the 50 and 100-year flood elevations will inundate almost the entire waste pile. From mapping conducted on the 4 miles of tunnels underneath the TCAP site, the physical dimensions, slopes and elevations of the tunnels could be added to the 3D model in order to analyze groundwater flow and direction into the pile from tunnel 1A and interaction with surface water. The tunnels will act as preferential flow paths for groundwater analogous to agricultural drain tile. Water flowing in tunnels is conduit flow and can be measured by typical surface water measurements - velocity in ft/sec and volumes in cfs – to calculate loading of pollutants and thereby better understand the flux of contaminants within the St. Peter Aquifer (see pictures and tunnel map below).

Thallium as an example Water Quality Parameter that is an Understated Risk in the Investigation Report

Thallium Concentrations in Groundwater

Thallium is used as an example of a water quality parameter that is observed at much higher levels than HRL standard in groundwater (15 times greater). Lower levels of thallium are not detected because the MDL (relative zero for laboratory water quality analyses) for thallium is 3 times greater than the applicable HRL standard (1.7 to 2.1 vs. 0.6). This blind spot in the water quality analyses for thallium leads to an incomplete picture of its behavior in groundwater underneath area C. It should also be noted, that background levels in the St. Peter aquifer in the Twin Cities area are approximately 0.014 ug/L, which is over 700 times less than the observed concentrations in St. Peter wells in Area C, based on a 1999 MPCA baseline study of aquifers in the metropolitan area (https://www.pca.state.mn.us/sites/default/files/metro-rpt.pdf).

Thallium has been called the "poisoner's poison" since it is colorless, odorless, and tasteless. It can be absorbed through the skin as well as ingested and inhaled. Thallium's chemical properties are compiled in the following fact sheet: http://www.health.utah.gov/enviroepi/appletree/Lehi/thallium.pdf. A review of research that has been conducted on thallium in aquatic ecosystems can be found here: http://espace.inrs.ca/830/1/R001272.pdf. For these comments to the Area C Investigative Report, it is important to emphasize that thallium is extremely toxic, and has multiple routes of exposure that can impact human and aquatic health including adsorption through the skin and a bioconcentration factor in fresh water fish and plants of 100,000.

The Health Risk Limit (HRL) for thallium is 0.6 [ug/L]. HRLs are promulgated by the Minnesota Department of Health for groundwater contaminants by estimating the long-term exposure level that is unlikely to result in deleterious effects to humans. HRLs strictly incorporate factors related to human health (Minn. R., Pts. 4717.7100 to 4717.7800). Uncertainty and other exposure pathways, such as showering, cooking, and inhalation of water vapor, are addressed through the use of safety factors. HRLs are the appropriate standards to be applied to all groundwater concentrations of Thallium found in Area C.

Observed concentration of thallium, using EPA Method 6010, ranged from 2.4 to 10 ug/L in a multitude of wells at different times within Area C. In addition, thallium has been detected at least once in St Peter Aquifer wells AMW 30 and 31 north of

Area C and one well in the Platteville formation. These observed concentrations are 10 to nearly 20 times higher than the HRL of 0.6 [ug/L]. Non-detections of thallium need to be viewed with the understanding that the MDL for thallium analyses is between 1.7- 2.1 [ug/L], which is 3 times greater than standard. The sporadic nature of thallium detections can easily be explained by the high MDL or relative zero of the laboratory method used in relation to the HRL. This blind spot in observable concentrations should not be used to understate the potential risk of thallium concentration to human and aquatic health.

A similar analysis should be conducted on other commonly detected water quality contaminants found at area C including PAHs. A table like the one below should indicate RLs, MDLs, range of detected concentrations, frequency of detection, and any blind spots in contaminant levels due to analytical water quality methods used. Analysis of observed water quality concentrations versus standards cannot accurately be completed when there is a large blind spot between applicable standards and observed concentrations due to high RLs/MDLs.

Thallium in Water – concentrations in (ug/L)

	Concentration	Comment
Matrix - Lab Method Used	Water	EPA Method 6010
Lab Reporting Limit (RL)	10	Ideally RL is 2-10X MDL; observed concentrations between RL and MDL are flagged with a "J" suffix
Lab Method Detection Limit (MDL)	1.7 to 2.1	Must be < RL
Observed Concentration Range	2.1 to 10	St. Peter aquifer/river parcel overburden flagged with a "J" suffix because observed concentrations > MDL but < RL
Applicable Standard: Groundwater (HRL)	0.6	When a standard < MDL, then samples with concentrations between the MDL and the standard are not known
Other Laboratory Methods for the same Matrix will have different RLs and MDLs	1.0	MDH has a RL for thallium of 1.0 for EPA Methods 6020 and 200.8 (drinking and non-potable water). Presumably, a MDL would be 2 -10 times lower and therefore below the HRL groundwater or 2B surface water standards

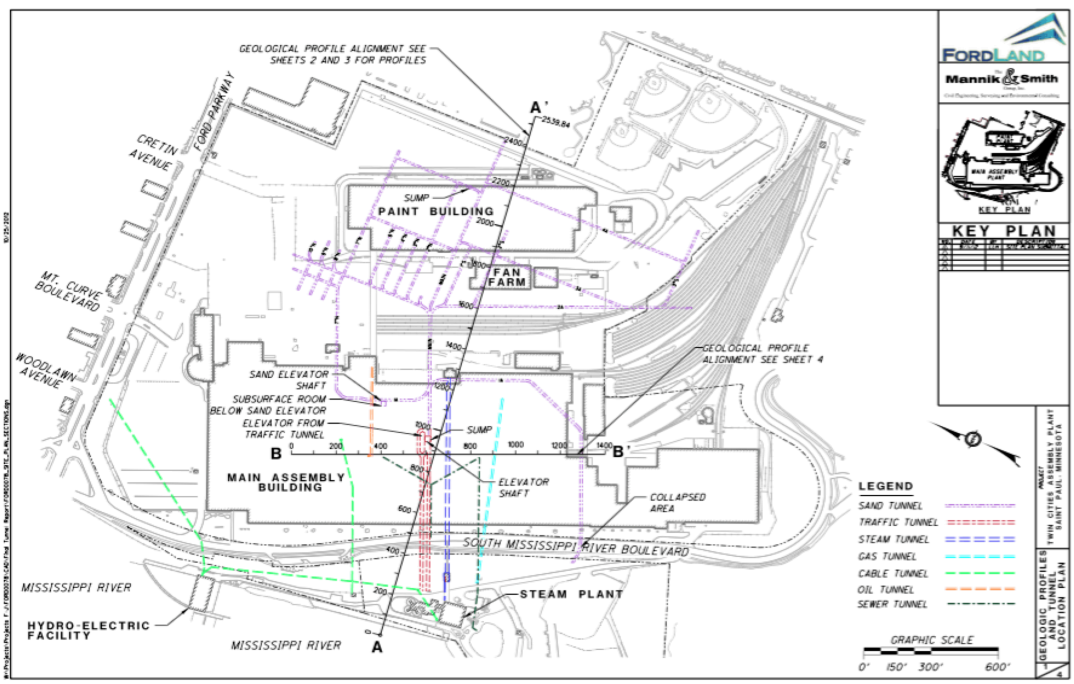
Thallium concentrations in surface water

Page 8-16 of the Investigation Report states the following conclusion with respect to metals detected in Mississippi River sampling: *Surface Water. Metal detections in the surface water samples have been isolated and at concentrations below their respective WQSs.* A review of surface water sampling results in the Investigation Report indicates, however, that thallium was not analyzed in any of the samples taken. Therefore, it is not known if there are detectable concentrations of thallium in the Mississippi River with respect to the 2B surface water standard for thallium of 0.56 [ug/L].

Finally, what is missing from the analysis of thallium concentrations at Area C is whether or not they are from Ford's manufacturing processes including the mining and manufacturing of glass that was conducted at the site from 1915-1958. Ford should share data with the MPCA on thallium usage and waste products from its automobile and glass manufacturing operation.

Groundwater and Surface Water Interaction within Area C

The entire Ford TCAP site is underlain by a network of 4 miles of silica sand mining tunnels, and other tunnels and shafts for traffic, steam, oil, gas, cable and sewer:



These tunnels serve as preferential flow paths when groundwater elevations reach the tunnel floors:

Other images of TCAP Tunnels filled with water can be found at:
https://www.substreet.org/wp-content/uploads/2016/09/Mine-Cart-Power-Supports-CSUSBTREET.org_.jpg
Most important for Area C is the outlet of tunnel 1A, which directly enters into the industrial waste pile. Silica sand tunnel 1A functions as conduit for St. Peter groundwater into the pile whenever groundwater elevations exceed the tunnel floor. Because there is a network of interconnected tunnels, without a detailed survey of dimensions, elevations and slopes of the tunnels, it is impossible to state the actual impact of conduit and diffuse groundwater flow into the pile. However, this unique feature underneath Area C needs to be evaluated in order to understand the potential inundation of the industrial waste pile from groundwater through this preferential flow path.

Water also flows through the pile due to the influence of the Mississippi River. When flooding occurs, tailwater elevation from Lock and Dam will rise and inundate the pile. Arcadis's 3D visualization model indicates that during typical tailwater elevations (689 feet), the Mississippi River would touch the lowest part of the pile. At the 10-year flood elevation (707 feet), the bottom portion of the pile will be inundated which contains the highest concentrations of pollutants. Mississippi tailwater elevations will control the water level under and within the pile when it is greater than the groundwater elevation of the St. Peter and has the potential to alter or reverse groundwater flow direction back into the St. Peter aquifer. A dramatic change in direction of groundwater flow has been documented in the Investigation Report (see pages 357-358, 451-53). This groundwater and surface interaction needs to be understood in greater detail in order to better assess the risk of contamination from pollutants leaching from the industrial waste pile into the

Mississippi River and St. Peter Aquifer. Historic tailwater elevation for Lock and Dam 1 are available at:
http://www.mvp-wc.usace.army.mil/data/LockDam_01.Data.html

In sum, water quality sampling throughout the 30-year history has been sporadic at best and not correlated to the hydrologic and hydrogeological complexities of the site and therefore leaves a incomplete picture of the risk to aquatic and human health due to existing and future contamination from the waste pile.

Recommendations

- Conduct a Health Consultation Study of the site for thallium, PAHs, and other commonly detected compounds with the Minnesota Department of Health (MDH) and other experts on hydrology, hydrogeology, and toxicology
- Determine the total mass of contamination contained in the industrial waste pile and estimate the number of intact drums and barrels of contaminants
- Add the map of tunnels underneath the TCAP site to the Arcadis 3D visualization model to better understand the hydrologic and hydrogeological complexities of Area C
- Contract with an analytical lab that provides lower MDLs and RLs of commonly detected contaminants in order to understand their behavior within the complexities of the hydrology and hydrogeology of the site
- Construct a table of commonly detected pollutants found in Area C listing MDLs, RLs, observed concentration ranges, frequency of detections, and applicable groundwater and surface water standards
- Use appropriate MDH promulgated HRL groundwater standards to evaluate pollutant concentrations found in groundwater
- Use Soil Leaching Values versus Soil Reference Values to evaluate the risks for contaminated soil to contaminate groundwater
- Use continuous data monitoring technology to gain a better understanding of: 1) the influence of the tailwater elevations to groundwater water levels at the site and 2) the influence of tunnel-conduit and diffuse groundwater flow into the pile
- Conduct additional water quality sampling of groundwater and surface water at the site with the new understanding developed from the continuous water quantity monitoring
- Conduct sampling of the Mississippi for commonly detected contaminants emanating from the industrial waste at times when the concentrations would be expected to be the highest e.g. base flow or 7Q10 flows if they occur
- Conduct sampling of fish tissue and aquatic vegetation for metals and other pollutants that may bioconcentrate or bioaccumulate in different part of the ecosystem
- Ford should share data with the MPCA on its historic usage of commonly detected pollutants at the site, in particular pollutants like thallium, which

may have been used during the manufacturing of glass at the site from 1915 to 1958.

- Acknowledge the very complex hydrology, hydrogeology, and water quality behavior at the site
- Graph historical tailwater elevation from Lock and Dam 1 and compare them to the location of the industrial waste pile and the groundwater elevations of the St. Peter Aquifer
- Graph parameters contained in the field notes at the end of the Investigation Report for dissolved oxygen, pH, and temperature of groundwater in order to better understand the chemical reactions occurring within the pile of industrial waste
- Acknowledge the inherent vulnerabilities of contamination at the site due to the location of the industrial waste pile in the floodplain of the Mississippi River and tunnel-conduit flow of St. Peter groundwater into the pile
- Acknowledge the large unknown risks that are posed by intact barrels and drums of industrial waste at the site that may not yet be leaking
- The top priority of the feasibility study for remediation of Area C should be the removal of the pile of industrial waste. Complete removal of the pile and contaminated groundwater would eliminate future monitoring and investigatory costs
- Absent complete removal of the pile of industrial waste and contaminated groundwater, remedial action alternatives for soils include:
  - Removal
  - Consolidation
  - Disposal in industrial waste/hazardous waste landfill
  - Soil treatment
    - Incineration (on-site or off-site)
    - Bioremediation of some compounds
- Absent complete removal of the pile of industrial waste and contaminated groundwater, remedial action alternatives for groundwater:
  - Monitoring
  - Deed restriction
  - Physical containment
  - Hydraulic containment/collection
    - Extraction wells
    - Extraction wells with reinjection
  - Treatment
    - Biological
    - Activated carbon
    - Air stripping
    - Aeration
    - Oxidation
    - Ion exchange
    - Reverse osmosis
    - Solar evaporation

- Discharge to POTW
  - Ultraviolet oxidation
  - Biological/activated carbon
- Treatment by groundwater disposal
  - Reinjection/recharge of treated water
  - Discharge to surface water of treated water
  - Discharge to POTW of some contaminated water
  - Discharge to RCRA facility of some contaminated water.

Conclusion

The nearly 40-year history of investigation and monitoring of the industrial waste pile under Area C has one common theme - the adage "dilution is the solution to pollution." Extensive efforts have been made to determine the dimensions and content of the pile while no effort has been directed to actual cleanup. The implied hope from the Investigation Report is that the pollution emanating from the pile will cause minimal adverse effects on human or aquatic health and that the Mississippi River and the St. Peter Aquifer, which are the recipients of this pollution, will dilute the pollutants from 80 years of manufacturing to such low levels that it will be deemed harmless by regulators. We strongly disagree with this approach and through the comments above we have endeavored to show the flaws of this approach in the Investigation Report.

We believe risks to human health and the environment have not been properly evaluated and we are concerned that the report improperly understates the seriousness of pollution problems within Area C. First, the floodplain of the Mississippi River is a very poor place for uncontained industrial waste to reside.

Additionally, the floodplain location with a large tunnel outlet from a series of mined tunnels from a major aquifer draining directly into the pile, significantly complicates efforts to understand potential risks to human and environmental health and leads us to conclude that the waste should be removed. Obviously, the 90,000 cubic yards of construction debris that was deliberately placed on top of the industrial waste poses significant challenges to removing the waste but we don't believe this excuses the responsibility to permanently clean up the site.

While, in our comments above, we have suggested numerous additional steps that should be taken to properly investigate potential risks posed by the industrial waste located within Area C, we would submit that rather than expending more resources on efforts to characterize the risk, Ford should now begin investigating the methods and costs associated with removing the waste and fully remediating the site.

Ford and the MPCA must acknowledge that continuous inundation of the pile by the 10-year or greater floods along with direct conduit flow into the pile from the tunnel outlet due to rising groundwater elevations, will, over time, wash all of the contaminants into the Mississippi River and St. Peter Aquifer. We believe this is irresponsible and unacceptable.

Ford should develop a remediation plan to remove the waste pile and treat contaminated groundwater water and restore this part of the Mississippi River Gorge.

Ford has a long history as a good corporate citizen in our community. Leaving a pile of industrial toxic waste, leaching contaminants into the Mississippi River and groundwater within a National Park would be a stain on the company's legacy that should be avoided by fully remediating Area C.