Rose & Westra
A Division of GZA

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

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MEMORANDUM

To: Abby Hendershott, MDEQ

From: Mark Westra, Rose & Westra, a Division of GZA GeoEnvironmental, Inc.

Date: January 23, 2019

File No.: 16.0062335.05

Re: Wolverine World Wide, Inc. (Wolverine) – Former Tannery
Interim Groundwater Response – Supplemental Information

Per MDEQ request, R&W/GZA provides the following information about the groundwater capture and treatment system being designed for the former Tannery Site.

Background

The goal is to capture most groundwater discharging to the Rogue River from the Site (south of Rum Creek). To accomplish this, Wolverine contracted to install three groundwater capture wells at the approximate locations shown on Figure C-1. The captured groundwater will be pumped to an on-site (pre-)treatment system which includes:

- Iron removal (aeration and settling)
- Equalization
- Sediment filtration
- UV sanitizer
- Two-stage granular activated carbon (GAC)
- Sediment filtration
- Effluent metering and sampling

The system will also have connections for a full-scale resin adsorption pilot test prior to the GAC. Resin may be used to pre-treat or ultimately replace the GAC depending on pilot test results.

Basis of Design

The tentative basis of design in order of flow is:

Extraction Wells – three extraction wells are proposed at a flow of 2 to 5 gallons per minute (gpm). Because flow adjustments or additional purge wells may be required, the treatment system basis of design is for a continuous flow of 10 gpm and a 20 gpm peak flow.

Aeration Tank – The purpose of the aeration tank is to provide pH adjustment and aeration to oxidize iron to iron hydroxide that can be removed by settling in the subsequent unit process (settling tank). Automatic feed of sodium hydroxide to the tank will be made to a pH set-point of 8.0 to 9.0. At a pH of 8.0 or greater, the oxidation of ferrous iron is complete in 30 seconds. The oxygen required is based on an influent iron concentration of 7.5 mg/l. The oxygen required for iron and extraneous demand assumed, if any, is less than 0.15 lb/hour. Oxygen will be provided by adding air at a rate of 6 to 8 SCFM, which will also

provide mixing for pH adjustment. Air will be introduced using a coarse bubble aerator. The aeration tank will have an operating capacity of 1,200 gallons, providing a detention time of 120 minutes when full. At a low operating level of 50%, the detention time is 60 minutes. The discharge from the aeration tank flows by gravity to the settling tank.

Settling Tank – The settling tank will be designed with a maximum overflow rate of 0.5 gpm/square foot. Settled hydroxide solids will be discharged to a sludge holding tank. The discharge from the settling tank will flow to the equalization tank. From the equalization tank, the primary pump(s) will discharge to the influent sediment filters.

Influent Sediment Filters – The influent sediment filters will be bag filters using a 150-psi housing and equipped with 25-micron polyester felt-filter bags. The filters will remove solids prior to discharge to the GAC adsorption vessels.

Pilot Test Connections - Because the life of the resin is reported to be longer than the GAC, but cannot be tested in the laboratory, we propose to pilot resin using the full forward flow.

GAC Adsorption – The GAC design is based on a flow rate of 10 gpm (see above). The system will be operated at 2 to 5 gpm initially to document performance. The specification for each of the two GAC vessels is summarized as follows:

- Dimensions – 30" diameter, 48" side shell height, 500 lbs of carbon capacity (based on a density of 29.5 lb/cu ft)
- EBCT – 25 minutes at 10 gpm, 12.5 minutes at 20 gpm.
- Inlet and Outlet – 2" FNPT
- Influent Concentration – 10,000 ppt PFOS+PFOA

Effluent Sediment Filters – The effluent sediment filter will be bag filters using a 150-psi housing and equipped with 25-micron polyester felt-filter bags. The filters will remove solids prior to discharge.

Effluent Monitoring and Sampling - To be designed based on discharge location.

Once the discharge location and requirements are finally established, Wolverine intends to proceed with system construction. We expect the capture wells to be installed late January/early February.

Additional Design Considerations

Prior to final design, we currently anticipate the following steps:

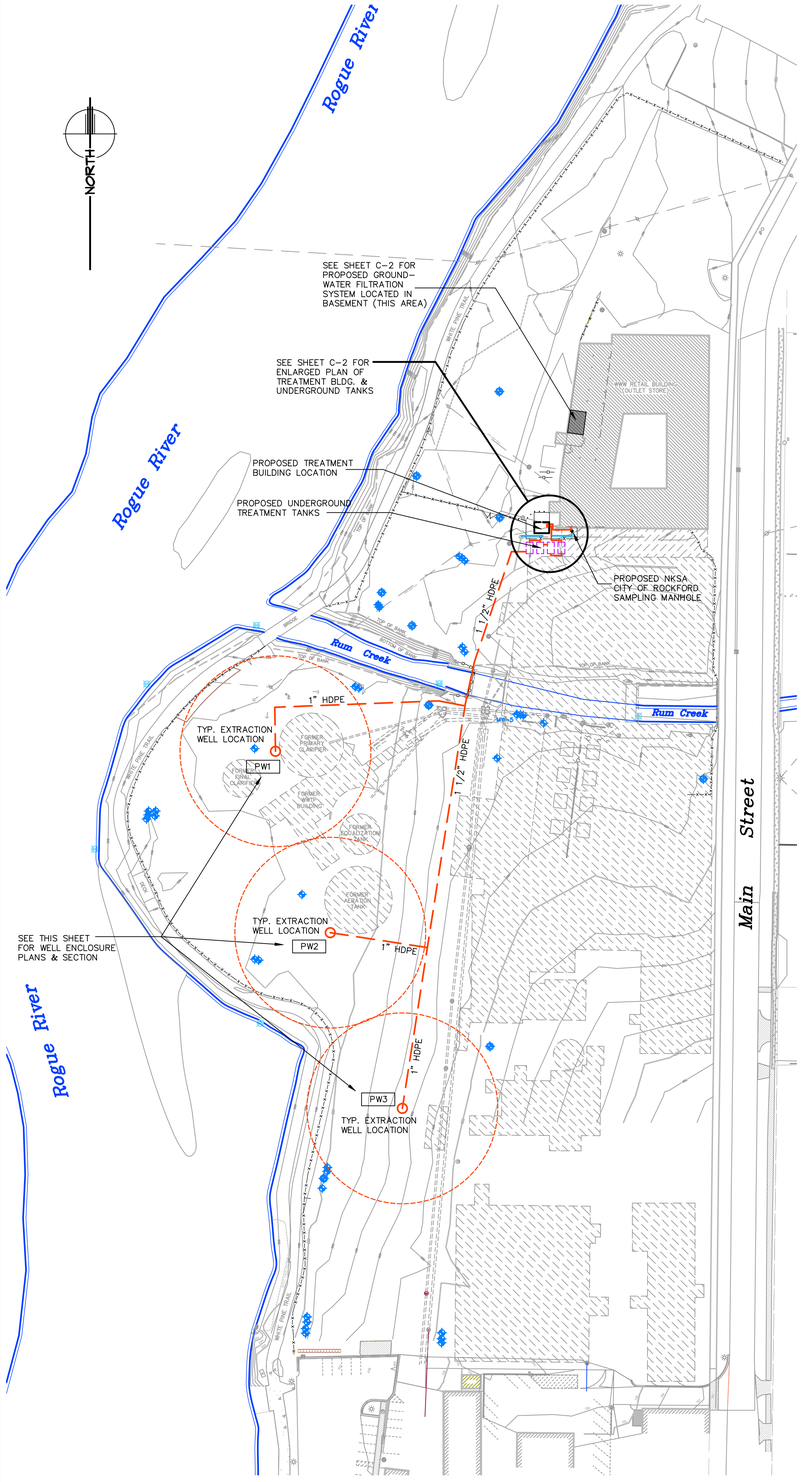
- Confirm discharge method as well as associated effluent and monitoring requirements
- Perform a pump test to refine flow and groundwater capture estimates
- Perform an accelerated carbon test to better estimate the GAC vessel life.

The final decision to implement these tests and any required treatment train modifications will be made as the design progress and receipt of discharge requirements.

maw/rbh

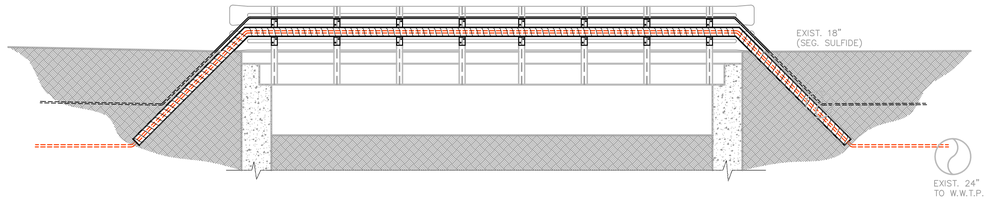
Attachments: Figure C-1 – Site Plan
Figures WT2a and WT2b – Process Flow Diagrams

cc/att: John Byl – Warner Norcross & Judd LLP - jbyl@wnj.com
David Latchana – Wolverine World Wide -David.Latchana@wwwinc.com
Leslie Nelson – R&W/GZA



SITE PLAN W/ PROPOSED GROUNDWATER TREATMENT SYSTEM PIPING and EXTRACTION WELLS

SCALE: 1" = 75'

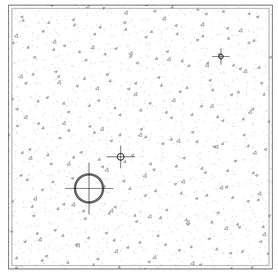


PIPING DETAIL AT BRIDGE

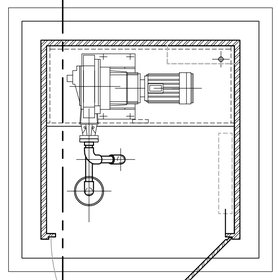
SCALE: 1/4" = 1'

PHOTO AT PIPING DETAIL AT BRIDGE

NO SCALE



ENCLOSURE SLAB PLAN



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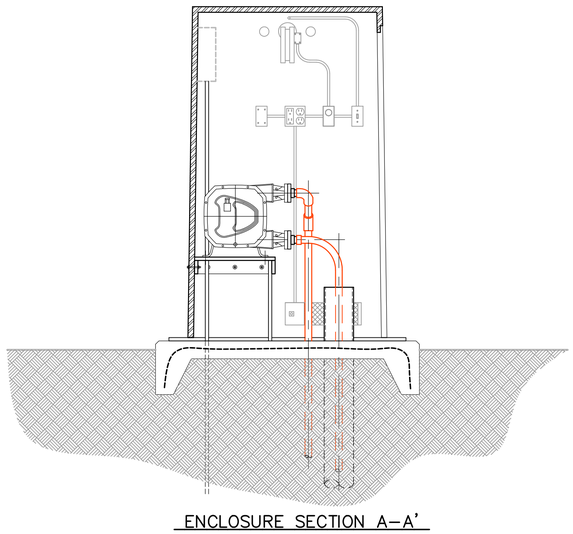

ENCLOSURE SECTION A–A'

WELL ENCLOSURE DETAILS

SCALE: 3/4" = 1'

NORTH

DRAWN BY	DESIGN BY	DATE
KJB	BLR	12/18/15

FILE NO.: 62335_05_base

NO.	REVISIONS	BY	DATE
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WOLVERINE WORLD WIDE/WNJ
FORMER TANNERY SITE, 1213 MAIN ST, ROCKFORD, MI
GROUNDWATER TREATMENT FACILITY

ROSE & WESTRA
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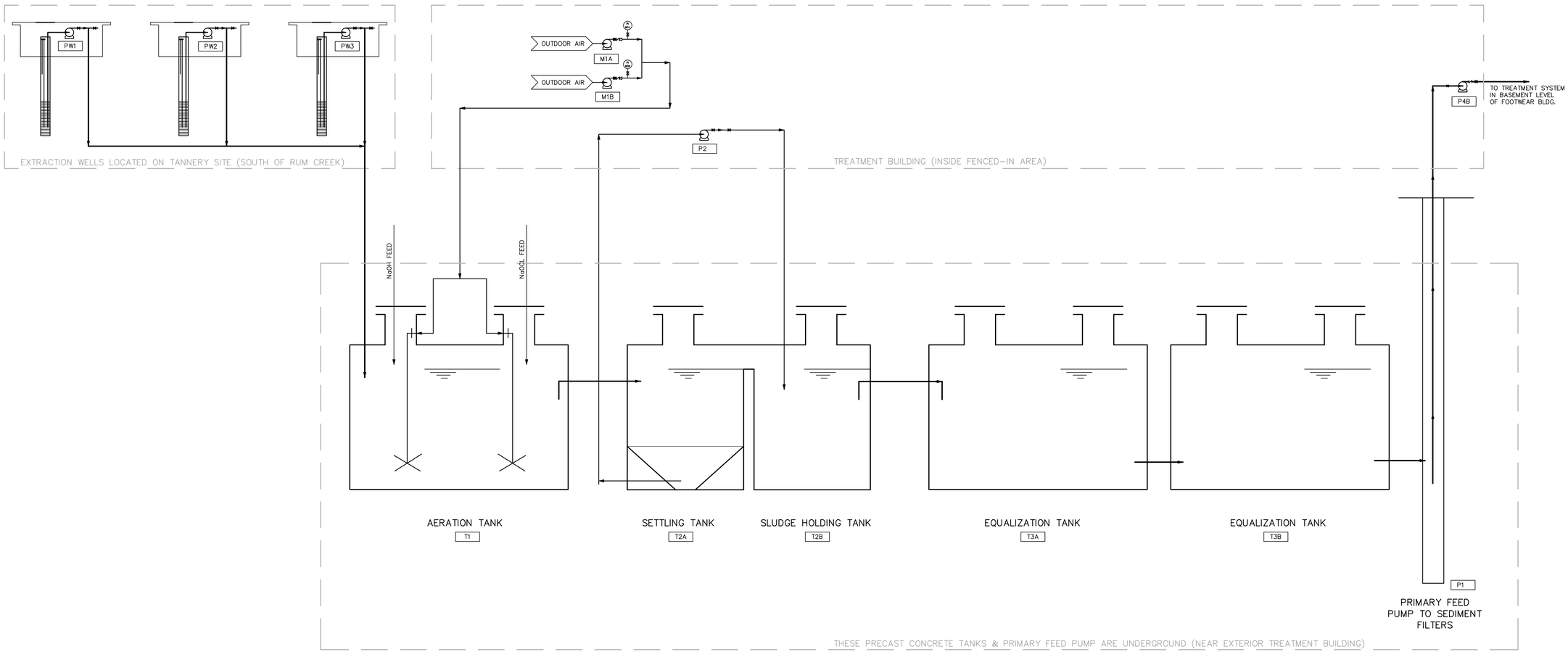
Grand Rapids, Michigan
GEOTECHNICAL– ENVIRONMENTAL– ECOLOGICAL– WATER– CONSTRUCTION MANAGEMENT

PROJECT NO.
16.0062335.05

SHEET NO.
C-1



PROCESS FLOW DIAGRAM

NO SCALE

DRAFT COPY

DRAWN BY KJB | DESIGN BY BLR | DATE 10/11/16

FILE NO.: 62335_05_BASE

NO.	REVISIONS	BY	DATE
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WOLVERINE WORLD WIDE
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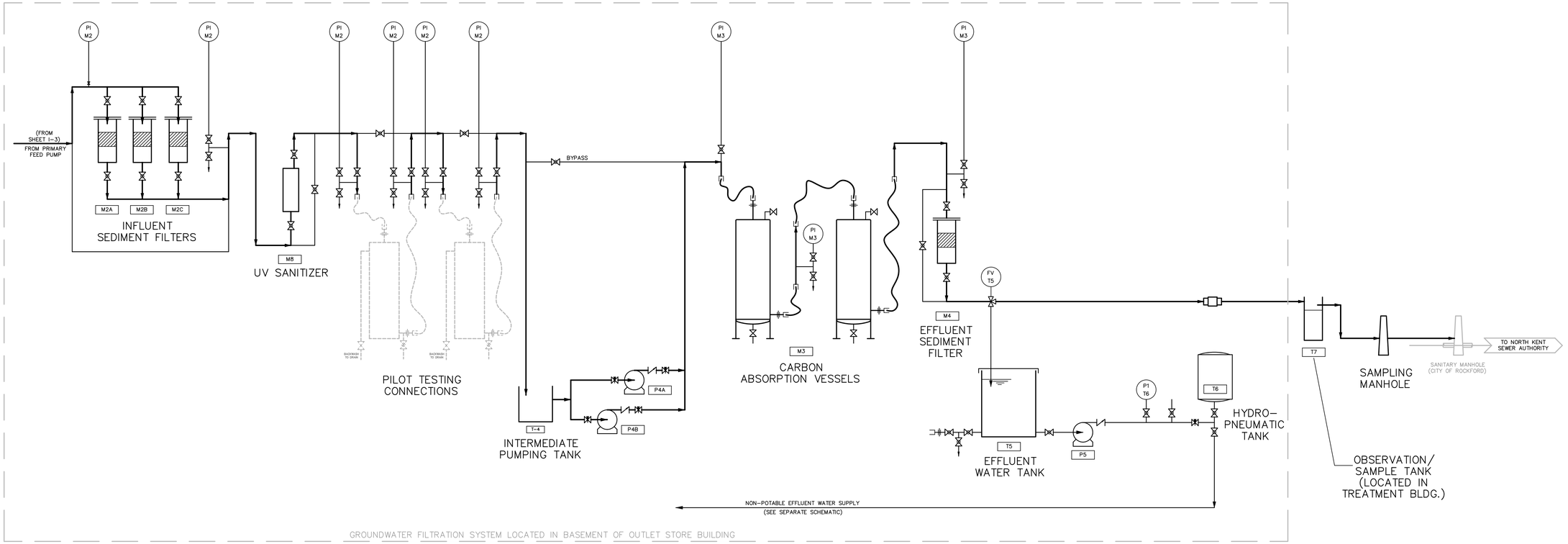
16.0062335.05

SHEET NO.
WT2a



PROCESS FLOW DIAGRAM

NO SCALE

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FILE NO.: 62335_05_NKS4

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WOLVERINE WORLD WIDE
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PROJECT NO.
16.0062335.05

SHEET NO.
WT2b