MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

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Waste and Hazardous Materials Division

FROM: Erik Sunday, Surface Water Assessment Section, Water Bureau

DATE: December 11, 2009

SUBJECT: General Motors Corp-Saginaw Metal Casting Operations (GM-SMCO)
Groundwater venting discharge

The Surface Water Assessment Section has evaluated Water Quality-Based Effluent Limits (WQBELs) for the GM-SMCO groundwater venting discharge. The existing GM-SMCO facility is continuously venting groundwater to the Saginaw River from four groundwater-surface water interfaces (GSIs) as described in the November 12, 2009, Mixing Zone Determination Request (MZDR) forwarded to SWAS by Waste and Hazardous Materials Division (WHMD):

Ammonia Part 1 – 1.73 cubic feet per second (cfs) (1.12 million gallons per day (MGD))
Ammonia Part 2 – 0.81 cfs (0.52 MGD)
pH-High – 0.76 cfs (0.49 MGD)
pH-Low – 2.05 cfs (1.33 MGD)

The above venting flow rates are maximum flows. The vents are located in Sections 7, 17, and 18 of T12N, R5E of Saginaw County. The pH-High groundwater venting flows to the Saginaw River through the Ammonia Part 1 venting area. Therefore, these two vents have been treated as a single vent with a maximum flow rate of 2.49 cfs (1.73 cfs + 0.76 cfs) in developing WQBELs. The combined Ammonia Part 1 and pH-High vent discharges to the Saginaw River downstream of the Carrolton Bar, while the Ammonia Part 2 and pH-Low vents discharge to a channel of the Saginaw River southeast of the Carrolton Bar.

The monthly exceedance flows (in cfs) for the Saginaw River below the Carrolton Bar at the point of discharge of the combined Ammonia Part 1 and pH-High vents are as follows:

	JAN.	FEB.	MAR.	APR.	MAY	JUNE
50%	2200	2510	6950	6830	3640	1880
95%	750	800	1560	2220	1180	740

	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
50%	1150	980	1000	1250	2010	2380
95%	550	500	510	600	750	780

The monthly exceedance flows (in cfs) for the channel of the Saginaw River southeast of the Carrolton Bar at the point of discharge of the Ammonia Part 2 and pH-Low vents are as follows:

	JAN.	FEB.	MAR.	APR.	MAY	JUNE
50%	1630	1860	5140	5050	2700	1390
95%	560	590	1160	1640	870	550

	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
50%	850	730	740	930	1490	1760
95%	410	370	380	440	560	580

The Saginaw River is protected for warmwater fish, other indigenous aquatic life and wildlife, agriculture, navigation, industrial water supply, public water supply at the point of intake, partial body contact recreation, total body contact recreation from May 1 to October 31, and fish consumption.

Ammonia concentrations and pH are the primary concerns for this facility's venting groundwater. Average values of groundwater pH in the four venting areas were computed from data contained in the MZDR:

Ammonia Part 1 – 7.06 S.U.
Ammonia Part 2 – 6.86
pH-High – 11.19
pH-Low – 5.48

SWAS recommends a pH range of 6.5 to 9.0 S.U. for all venting groundwater discharges to the Saginaw River year-round. Table 1 contains total ammonia recommendations based on meeting the 0.420 mg/l warmwater un-ionized ammonia acute toxicity criterion in the combined Ammonia Part 1 and pH-High venting. No ammonia recommendations for any other GM-SMCO groundwater venting should be necessary to protect against acute or chronic un-ionized ammonia toxicity based on data provided in the MZDR. Pollutants affecting dissolved oxygen in the receiving water are not expected to be present at problematic levels in the venting discharges.

The fraction of total ammonia existing as un-ionized ammonia is calculated, in part, from the pH of the venting groundwater. For the combined Ammonia Part 1 and pH-High venting, the upper value of the WQBEL pH range, 9.0 S.U., was used in the calculation of WQBELs based on un-ionized ammonia toxicity. The recommendations in Table 1 apply for groundwater pH's of 9.0 S.U. or lower. If the groundwater venting is permitted to discharge at a pH greater than 9.0 S.U., WQBELs for the combined Ammonia Part 1 and pH-High venting will need to be recalculated. For evaluation of the pH-Low and Ammonia Part 2 ventings, a pH of 7.1 S.U. was used based on the calculated average pH for the Ammonia Part 1 venting.

The attached effluent limit recommendations are based on water quality standards. We have not addressed treatment practicality or cost effectiveness. Our recommendations do not imply that other considerations should not be taken into account when deciding on permit limits.

Table 1. GM-SMCO pH and ammonia toxicity-based WQBEL recommendations
Combined Ammonia Part 1 and pH-High groundwater venting
WQBELs assume a pH of 9.0 S.U. or less in venting groundwater

Parameter	Months	Conc. (mg/l)	Load (lb/d)	Basis	Rationale
NH3-N	Year round	3.1	42	Daily Max.	Acute warmwater toxicity

Design Flow = 2.49 cfs (1.61 MGD)

cc: Jon Bloemker, Saginaw Bay District Supervisor, SWAS, WB
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