UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

JAN -3 2008

Teresa Marks
Director
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

RE: Site-specific Water Quality Standards Revisions Associated with Great Lakes Chemical Corporation in Union County, Arkansas

Dear Ms. Marks:

Thank you for your recent letter, dated August 17, 2007, requesting review and approval of several site-specific water quality standards revisions to Regulation No. 2, *Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas* for six streams in the gulf coastal ecoregion of Arkansas: unnamed tributary 002 (UT002), unnamed tributary 004 (UT004), Bayou de Loutre from the mouth of UT004 to the mouth of Loutre Creek, unnamed tributary 003 (UT003), the unnamed tributary to Little Cornie Bayou (UTLCB-2), and Little Cornie Bayou. These streams are also the receiving waterbodies for discharges from Great Lakes Chemical Corporation in Union County, Arkansas.

Your letter included a request for U.S. Environmental Protection Agency (EPA) approval of the removal of the domestic water supply designated uses for five of the six waterbodies identified above, along with site-specific criteria for chloride, sulfate, and total dissolved solids (TDS), for all six waterbodies identified above. EPA approved the removal of the domestic water supply designated uses for four of the five waterbodies for which such use removal was requested on November 9, 2007. This letter responds to your request for EPA approval of the removal of the domestic water supply designated use for the remaining waterbody (Bayou de Loutre from the mouth of UT004 to the mouth of Loutre Creek), as well as site-specific criteria for chloride, sulfate, and TDS, for the six waterbodies as described in Table 1 below.

Table 1. Site-specific water quality criteria revisions for chloride, sulfate, and TDS, for six waterbodies submitted by ADEQ to EPA for review and approval.

Stream Segment Name	Chloride (mg/L)		Sulfate (mg/L)		TDS (mg/L)	
	Previous	Revised	Previous	Revised	Previous	Revised
UT002[1]	14	65	31	35	123	141
UT004[2]	14	239	--	--	123	324

[1] Unnamed tributary into which Great Lakes Chemical Corporation outfall 002 discharges (UT002) to the confluence with Bayou de Loutre
[2] Unnamed tributary into which Great Lakes Chemical Corporation outfall 004 discharges (UT004) to the confluence with Bayou de Loutre

Stream Segment Name	Chloride (mg/L)		Sulfate (mg/L)		TDS (mg/L)	
	Previous	Revised	Previous	Revised	Previous	Revised
Bayou de Loutre[3]	250	278	--	--	--	--
UT003[4]	14	538	31	35	123	519
UTLCB-2[5]	14	305	--	--	123	325
Little Cornie Bayou[6]	200	215	20	25	--	--

The Arkansas Pollution Control and Ecology Commission adopted the site-specific chloride, sulfate, and TDS criteria for the six waterbodies identified in Table 1 above, as well as the removal of the domestic water supply designated use from Bayou de Loutre, as amendments to the Arkansas surface water quality standards via a third party rulemaking in Minute Order 07-18 on June 22, 2007. In accordance with the *Code of Federal Regulations* (CFR) at 40 CFR §131.20, the Arkansas Department of Environmental Quality (ADEQ) then submitted the water quality standards revisions and supporting documentation to EPA for review and approval. The submittal package was received by EPA on September 17, 2007, and included a statement dated August 17, 2007, from Ellen Carpenter, chief counsel for ADEQ, certifying that the amendments were duly adopted pursuant to State law.

We have completed our review of your request to approve the removal of the domestic water supply designated use from Bayou de Loutre (from the mouth of UT004 to the mouth of Loutre Creek) and site-specific criteria for chloride, sulfate, and TDS for the six waterbodies as identified in Table 1 above. However, for the reasons described below, EPA is unable to take action on these site-specific water quality standards revisions.

In regards to the request to approve the removal of the domestic water supply designated use for Bayou de Loutre, Arkansas' water quality standards submission appears to be missing the necessary supporting documentation to demonstrate that the domestic water supply designated use is not an existing use. Because a clear demonstration in the supporting documentation to show that the domestic water supply designated use in Bayou de Loutre is not an existing use is lacking, this submission does not meet the minimum requirements of a water quality standards submission as described in 40 CFR §131.6. Therefore, EPA is unable to take action on the request to approve this designated use removal. A description of the specific documentation that was found to be missing in the supporting documentation during EPA's review is provided in the enclosure to this letter.

In regards to the request to approve the site-specific minerals criteria, Arkansas' water quality standards submission does not provide adequate supporting documentation to demonstrate that the revised site-specific criteria are appropriately protective. Because a clear demonstration of protection in the supporting documentation is lacking, this submission does not meet the minimum requirements of a water quality standards submission as described in 40 CFR

[3] Bayou de Loutre – from the mouth of UT004 to the mouth of Loutre Creek
[4] Unnamed tributary into which Great Lakes Chemical Corporation outfall 003 discharges (UT003) to the confluence with the unnamed tributary of Little Cornie Bayou (UTLCB-2)
[5] Unnamed tributary of Little Cornie Bayou (UTLCB-2) – from the mouth of UT003 downstream to its confluence with Little Cornie Bayou
[6] Little Cornie Bayou – from the mouth of UTLCB-2 to the Arkansas/Louisiana state line

§131.6. Therefore, EPA is unable to take action on these site-specific criteria revisions. Specific issues of concern regarding the adequacy of the supporting documentation for this submission are identified in the enclosure to this letter. We encourage ADEQ to work with the third party, Great Lakes Chemical Corporation, in responding to the issues identified in the enclosure to this letter so that EPA may have the necessary supporting documentation to take action on the adopted revisions.

I would also like to acknowledge the efforts of the Pollution Control and Ecology Commission, and particularly ADEQ, in the development of these revised standards. We look forward to continue working with you on this water quality standards revision and encourage early and up-front coordination on any future proposed water quality standards revisions to facilitate EPA's review of State-adopted water quality standards revisions submitted for approval. If you have any questions or concerns, please contact me at (214) 665-7101, or have your staff contact Melinda McCoy at (214) 665-8059.

Sincerely yours,

Miguel I. Flores
Director
Water Quality Protection Division

Enclosure

cc: Steve Drown, Chief, Water Division, Arkansas Department of Environmental Quality

Issues of Concern - Supporting Documentation for Site-specific Water Quality Standards Revisions Associated with Great Lakes Chemical Corporation in Union County, Arkansas

A third party, Great Lakes Chemical Corporation, contracted with GBM^c & Associates in order to complete a use attainability analysis (UAA)[1] for six streams in the gulf coastal ecoregion of Arkansas: unnamed tributary 002 (UT002), unnamed tributary 004 (UT004), Bayou de Loutre from the mouth of UT004 to the mouth of Loutre Creek, unnamed tributary 003 (UT003), the unnamed tributary to Little Cornie Bayou (UTLCB-2), and Little Cornie Bayou. These streams are also the receiving waterbodies for discharges from Great Lakes Chemical Corporation in Union County, Arkansas. The UAA study served as the supporting documentation for the site-specific water quality standards revisions associated with these six waterbodies, which included removal of the domestic water supply use for five of the six waterbodies and site-specific criteria for chloride, sulfate and total dissolved solids (TDS).

By letter dated August 17, 2007, the Arkansas Department of Environmental Quality (ADEQ) submitted the water quality standards revisions, along with supporting documentation (the UAA report), to EPA for review and approval. EPA approved the removal of the domestic water supply designated uses for four of the five waterbodies for which such use removal was requested on November 9, 2007. The information provided below describes specific issues of concern regarding the adequacy of the supporting documentation to demonstrate that the domestic water supply designated use is not an existing use for Bayou de Loutre (from the mouth of UT004 to the mouth of Loutre Creek) and that the site-specific minerals criteria are appropriately protective, as referenced in the letter accompanying this enclosure.

DOMESTIC WATER SUPPLY USE REMOVAL

Missing Letter from the Arkansas Department of Health (ADH)

Appendix B – "Agency Documentation" of the UAA report includes three letters as described in the bullets below.

- Letter from the Arkansas Natural Resources Commission (ANRC) to Mr. Vince Blubaugh, dated November 8, 2005, in reference to "Loutre Creek."
- Letter from ADH to Mr. Vince Blubaugh, dated December 6, 2005, in reference to the "unnamed tributaries of Little Cornie Bayou and Bayou de Loutre" and responding to a letter from Mr. Blubaugh dated October 27, 2005.
- Letter from Mr. Vince Blubaugh to ADH, dated May 31, 2006, in reference to "the upper reach of Bayou de Loutre down to its confluence with Gum Creek near El Dorado, Arkansas."

[1] GBM^c & Associates. 2006. *Section 2.306 Site Specific Water Quality Study for Cl, SO_4, and TDS.* Prepared for Great Lakes Chemical Corporation, El Dorado, Arkansas.

As noted in the third bullet above, one of the letters included in Appendix B of the UAA report shows that a request was sent to ADH to determine whether or not Bayou de Loutre (from its upper reach down to its confluence with Gum Creek) was approved, or was being considered for use, as a domestic water source. However, Appendix B of the UAA report does not include a letter from ADH responding to this May 31, 2006, request from Mr. Blubaugh. While the unnamed tributaries to Bayou de Loutre are addressed in the ADH letter dated December 6, 2005, the main stem of Bayou de Loutre does not appear to be addressed in Appendix B of the UAA report.

In order to provide a clear demonstration in the supporting documentation to show that the domestic water supply designated use in Bayou de Loutre is not an existing use, please provide a copy of ADH's letter in response to Mr. Blubaugh's May 31, 2006, request regarding Bayou de Loutre.

SITE-SPECIFIC MINERALS CRITERIA

Toxicity Testing

As it pertains to toxicity testing and analyses, supporting documentation to demonstrate that the site-specific minerals criteria for UT002, UT004, Bayou de Loutre (from the mouth of UT004 to the mouth of Loutre Creek), UT003, UTLCB-2, and Little Cornie Bayou are appropriately protective of aquatic life is generally lacking.

UT002 and UT004
Although Section 3.6.2 – "Toxicity Testing" of the UAA report provides the results of two acute toxicity tests conducted for both outfalls 002 and 004, it is not clear what minerals concentrations (chloride, sulfate, and TDS) were associated with each of these tests and whether or not the minerals concentrations during the toxicity testing were representative of the adopted site-specific minerals criteria under review for UT002 and UT004. Discussion of the potential chronic effects of the site-specific criteria for UT002 and UT004 to aquatic life in these two tributaries is also lacking in Section 3.6.2 of the UAA report.

UT003
Although Section 3.6.2 – "Toxicity Testing" of the UAA report provides estimated TDS concentrations associated with acute biomonitoring tests conducted on outfall 003 effluent from February 2000 to March 2003, chloride and sulfate concentrations associated with each of these tests are not provided. For chronic biomonitoring tests conducted using outfall 003 effluent after 2003, it is not clear whether TDS or conductivity measurements are provided, since Figure 4 in the UAA report shows TDS concentrations, but the corresponding table in Appendix D identifies the same values as conductivity measurements. Further, it is not clear what chloride and sulfate concentrations were associated with each of the outfall 003 chronic biomonitoring tests and whether or not the concentrations during toxicity testing were representative of the adopted site-specific chloride and sulfate criteria under review for UT003.

Additionally, although a discussion is provided on pages 12-13 of the UAA report to support the statement that minerals concentrations in the outfall 003 effluent were not likely responsible for

the negative results demonstrated in the acute biomonitoring conducted prior to 2003, a similar discussion is missing from the UAA report to describe the potential causes for the *Ceriodaphnia dubia* reproduction test failures that occurred in chronic biomonitoring tests conducted after 2003 as indicated in the table in Appendix D of the UAA report.

Bayou de Loutre , UTLCB-2, and Little Cornie Bayou

The supporting documentation in the UAA report does not include a general evaluation or review of the site-specific criteria for Bayou de Loutre, UTLCB-2, and Little Cornie Bayou in light of the available scientific literature concerning the toxicity effects of chloride, sulfate, and TDS to aquatic organisms. Supporting documentation from the literature or other appropriate supporting documentation is important for providing a clear demonstration that the site-specific criteria for Bayou de Loutre, UTLCB-2, and Little Cornie Bayou are appropriately protective of the aquatic life uses (Gulf Coastal seasonal or perennial fishery) in these waterbodies. This is particularly important for Bayou de Loutre and Little Cornie Bayou given the fact that biological community analyses for these waterbodies are not included in the UAA report. Such information may also be useful to supplement the toxicity testing information provided for outfalls 002, 003, and 004, especially if the minerals concentrations present during the toxicity testing referenced above are not available or were not representative of the adopted site-specific minerals criteria under review for UT002, UT003, and UT004.

Supporting Documentation for Benthic Macroinvertebrate Community Analyses and Conclusions

Two issues of concern (described below) were noted regarding the adequacy of the supporting documentation as it related to the analyses and conclusions presented in Section 4.4 – "Benthic Macroinvertebrate Community" of the UAA report. Given these issues of concern, a complete review of and general agreement with the bethic macroinvertebrate results and conclusions presented in Section 4.4.3 – "Results and Discussion" were not possible.

First, it was noted that for all sites (UT002, UT004, UT003, UTLCB-1, and UTLCB-2) the reported abundance values for several different taxa in Table 4.6 were not consistent with the results presented in the macroinvertebrate community "Rapid Bioassessment Field Sheets" within Appendix E of the UAA report. Please clarify whether the "Rapid Bioassessment Field Sheets" in Appendix E sheets are associated with the identification of macroinvertebrates in the field or identification in the laboratory. Also, please explain why the individual taxa abundance results in the sheets in Appendix E do not always match the corresponding individual taxa abundance results in Table 4.6 of the UAA report. Because the various metric and diversity scores upon which the benthic macroinvertebrate community analyses and conclusions are based are dependent upon a clear knowledge concerning the composition of the benthic community collected from each site, clarification (and correction, if necessary) is requested concerning the differences noted between the sheets in Appendix E and Table 4.6 of the UAA report. Also, please provide a copy of the quality assurance/quality control results for the benthic macroinvertebrate data collected.

Second, utilizing only the benthic macroinvertebrate data presented in Table 4.6 (not the data presented in the macroinvertebrate community field sheets in Appendix E), it was noted that the

Shannon-Weiner diversity index scores for all sites appear to have been miscalculated in Table 4.6. Utilizing the following equation, EPA calculated the Shannon-Weiner diversity index scores shown in Table 1 below:

$$H' = - [\Sigma(p_i)(\ln p_i)]$$

where,

- "H'" represents the symbol for the amount of diversity in an ecosystem. H' will be the greatest if the species are all equally abundant.
- "p_i" represents the proportion, or relative abundance, of each individual species to the total (measured from 0 to 1).
- "ln p_i" represents the natural logarithm of pi

Table 1. Comparison of Shannon-Weiner diversity index scores for benthic macroinvertebrates for each site as calculated in the UAA report and by EPA in reviewing the UAA report.

	UT002	UT004	UT003	UTLCB-1	UTLCB-2
UAA Report	2.82	3.14	3.06	3.07	3.68
EPA	2.32	2.46	2.46	2.30	2.65

As demonstrated in Table 2 below, the differences between the Shannon-Weiner diversity index scores calculated in the UAA report and EPA's score calculations also result in changes with regard to site index rankings. Because the Shannon-Weiner diversity index scores play a large role in the UAA report for site-comparisons and drawing conclusions about the condition of the macroinvertebrate community at each site, clarification (and correction, if necessary) is requested concerning what appears to be miscalculations of the Shannon-Weiner diversity index scores presented for all sites in the UAA report.[2] (Also, please note that if the individual taxa abundance results presented in Table 4.6 are revised based upon the first issue of concern noted above (consistency between Appendix E and Table 4.6), this would, in turn, also affect the final Shannon-Weiner diversity index scores.)

Table 2. Comparison of Shannon-Weiner diversity index rankings for benthic macroinvertebrates by site (highest index value to lowest) as determined in the UAA report and by EPA in reviewing the UAA report.

Index Rankings by Site – Highest (far left) to Lowest (far right)					
UAA Report	UTLCB-2	UT004	UTLCB-1	UT003	UT002
EPA	UTLCB-2	UT003	UT004	UT002	UTLCB-1

Further, if the Shannon-Weiner diversity index scores were miscalculated in the UAA report, review (and revision, if necessary) of the previous conclusions drawn in Section 4.4 of the UAA report and in other sections of the report based upon the miscalculated scores/site index rankings is requested. This is especially important since benthic macroinvertebrate communities are

[2] EPA also noted apparent miscalculations in the Shannon-Weiner diversity index scores for the fish assemblages for each site (except UT004) in the UAA report. However, use of either the diversity index scores in the UAA report or EPA's recalculations of the diversity index scores resulted in the same site index rankings.

generally considered to be more sensitive to the effects of elevated minerals concentrations than fish communities.

Given the two concerns described above about the supporting documentation for the benthic macroinvertebrate community analyses and conclusions, review (and correction, if necessary) of the information in Table 4.5 is also requested.

Mass Balance Calculation Utilized in the Derivation of Site-Specific Minerals Criteria for Bayou de Loutre

EPA noted two issues of concern with regard to the mass balance calculation utilized in the derivation of the site-specific chloride criterion for Bayou de Loutre (BDL).

First, it was noticed that the "effluent flow" value (Qe) identified in Table 5.3 of the UAA report was 0.88 cubic feet per second (cfs). However, this "effluent flow" value does not take into account the 4 cfs background flow contribution from both UT002 and UT004. Taking this into account, EPA believes that Qe in Table 5.3 of the UAA report should have been 8.88 cfs, rather than 0.88 cfs. Further, the "effluent concentration" (Ce) identified in Table 5.3 of the UAA report was 1519 mg/L. However, this "effluent concentration" is representative only of the flows/concentrations from outfalls 004 and 002, not the estimated concentrations of chloride in UT004 and UT002 just before combining with Bayou de Loutre (in other words, the Ce of 1519 mg/L does not incorporate dilution from background flows in UT004 and UT002). Table 3 below shows EPA's mass balance calculation using corrected values for Qe and Ce, along with the resulting anticipated concentrations for TDS, chloride, and sulfate for Bayou de Loutre upstream of its confluence with Loutre Creek.[3] As can be seen from the re-calculation in Table 3, it appears that all of the current minerals criteria in Bayou de Loutre can be met.

Table 3. EPA's mass balance calculation using corrected values for Qe and Ce from Table 5.3 of the UAA report.

Station	Flow Description	Flow (cfs)	Flow (mgd)	Concentration (mg/L)			Load (lbs/day)		
				TDS	Chloride	Sulfate	TDS	Chloride	Sulfate
BDL	Upstream - background	4.000	2.585	67	5	13	1445	108	280
UT004	Downstream	4.641	2.999	324	239	20	8105	5978	500
UT002	Downstream	4.238	2.739	141	63	34	3221	1439	777
BDL	**Downstream**	**12.879**	**8.324**	**184**	**108**	**22**	**12770**	**7525**	**1557**

Second, it was noticed that flow and minerals contributions (chloride and sulfate) from Great Lakes Chemical Corporation outfall 001 were not included in the mass balance calculation for Bayou de Loutre. Since it appears that outfall 001 enters Bayou de Loutre between its confluences with UT002 and Loutre Creek, contributions from oufall 001 should be included in the mass balance calculation to derive site-specific criteria for Bayou de Loutre. Please clarify and provide specific rationale for why outfall 001 was excluded from the mass balance calculation for Bayou de Loutre.

[3] Please note that in its re-calculations, EPA utilized the same method for incorporating background flow from upstream tributaries as was utilized in the El Dorado Chemical Company UAA mass balance calculations.

Given the above two concerns (regarding the input values for the mass balance calculation for Bayou de Loutre and the exclusion of contributions from outfall 001), review (and revision, if necessary) of the mass balance calculation for Bayou de Loutre is requested.