Missouri Clean Water Commission
Department of Natural Resources
Nightingale Creek Conference Room, 1st floor
1101 Riverside Dr.
Jefferson City, MO 65102

April 5, 2017

Alternatives Analysis for Domestic Wastewater Facilities with Design Flows Less than 10,000 Gallons per Day

Issue: Based on a comprehensive review of previous Antidegradation projects, staff has developed a voluntary Antidegradation approach for small domestic wastewater systems with design flows of less than 10,000 gallons per day. This approach would allow applicants to forego the additional engineering services needed to conduct an analysis of treatment alternatives for their specific Antidegradation submittal and instead utilize the alternatives analysis that has been prepared by staff. The applicants would still be required to demonstrate that a non-discharging option is not feasible, and they would have to make the case in their application that their proposed discharge is socially and economically important. The proposed limits resulting from this alternatives analysis are protective of water quality and meet the intent and requirements of the Antidegradation Implementation Procedure (AIP).

This approach would not be available for situations in which applicants wished to discharge into waters that are impaired (Tier 1) or into Outstanding State or National Resource waters (Tier 3), nor would it be available to any industrial or other non-domestic wastewater. The one exception would be that the Program envisions allowing the use of this approach for projects which will discharge to waters that are impaired for bacteria because the alternatives analysis concludes that disinfection would be required for all applicants utilizing this approach.

This alternatives analysis was placed on public notice on March 3, 2017, and the comment period is scheduled to close on April 21, 2017. Staff would welcome comments regarding the proposed alternatives analysis.

Background: When someone constructs a new wastewater discharge or expands their existing discharge, both federal and state regulations require that the applicant undergo an Antidegradation review. This review includes a structured analysis of treatment technologies. If, through this process, a less-degrading treatment alternative can be identified that is practicable and economically efficient, then the regulations ask the applicant to build the system which would result in a better quality effluent and in turn better protect the State's waters.

The engineering costs to prepare the Antidegradation review can run between $3,000 to $10,000 and applicants must hire an engineer, who works with them to conduct this analysis and prepare the formal applications, and they must also wait for department staff to review

their submittals. There has been an appreciable demand for these small domestic wastewater treatment systems over the last five years, and the Water Protection Program's engineering staff has reviewed the analysis of alternatives for dozens of these smaller projects.

In an effort to reduce the regulatory burden for small systems in terms of both cost and time, the Water Protection Program's Engineering Section conducted a comprehensive review of approximately 45 previous domestic projects involving facilities with small design flows. Through this analysis, staff has concluded that there are several technologies available for small systems that produce high quality effluent in a manner that is not cost prohibitive.

This approach will not require a regulatory change and will not require a rule amendment. It will provide a completely optional path for some of our applicants which will fulfill the requirements of the AIP and Water Quality Standards Rule 10 CSR 20-7.031. If an individual owner wishes to conduct their own alternatives analysis, they are free to do so and can proceed using the traditional Antidegradation review approach. Based on data from 2008 through early 2016, an estimated 25 percent of our domestic wastewater Antidegradation review applicants may meet the applicability requirements to use the *Department's Alternatives Analysis* if they so choose.

In concert with this approach, staff has developed a form applicants can use to consider non-discharging options for their project. The form was also placed on public notice, and it serves to guide applicants through all of the questions and decisions necessary to demonstrate that a non-discharging system is not feasible for their particular project. In addition, an application form has been developed that can be used to help communicate to the department the reasons why their particular project is socially and economically important.

In choosing to use the *Department's Alternatives Analysis*, the applicant will be electing to build a treatment plant that provides a high level of treatment that meets the expected future ammonia limits based on the U.S. Environmental Protection Agency's guidance, *Final Aquatic Life Ambient Water Quality Criteria for Ammonia – Fresh Water 2013* and will potentially reduce the need to upgrade in the near future. This innovative approach will provide more uniformity for small systems and a clear benefit to water quality. We are not aware of any other states that have implemented a similar approach.

Recommended Action: Information only.

Suggested Motion Language: None

List of Attachments:

- *Department's Alternatives Analysis for Domestic Wastewater Facilities with Design Flows Less than 10,000 Gallons per Day*
- Attachment E: Tier 2 – Significant Degradation using Department's Alternatives Analysis for Domestic Wastewater Facilities with Design Flow Less than 10,000 Gallons per Day
- No Discharge Evaluation

Missouri Department of Natural Resources
Water Protection Program
Water Pollution Control Branch
Engineering Section

Water Quality and Antidegradation Review

Department's Alternatives Analysis for Domestic Wastewater Facilities with Design Flow Less Than 10,000 Gallons per Day

For Protection of Water Quality
and Determination of Effluent Limits

February, 2017

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1. WATER QUALITY INFORMATION

In accordance with Missouri's Water Quality Standard [10 CSR 20-7.031(3)] and federal antidegradation policy at Title 40 Code of Federal Regulation (CFR) Section 131.12 (a), the Missouri Department of Natural Resources (MDNR) developed a statewide antidegradation policy and corresponding procedures to implement the policy. A proposed discharge to a water body will be required to undergo a level of Antidegradation Review which documents that the use of a water body's available assimilative capacity is justified. Effective August 30, 2008, and revised July13, 2016, a facility is required to use *Missouri's Antidegradation Implementation Procedure (AIP)* for new and expanded wastewater discharges.

2. APPLICABILITY

This Water Quality and Antidegradation Review is for facilities which produce primarily domestic wastewater and discharge less than 10,000 gallons per day. It is not applicable to facilities where the receiving waterbody, or downstream waterbodies, have a Total Maximum Daily Load (TMDL) or are 303(d) or 305(b) listed for the pollutants of concerns addressed in this alternatives analysis, with an exception for waterbodies that are listed for *E. coli* since disinfection will be required. Facilities that are currently under enforcement will need to coordinate with the Water Protection Program's compliance and enforcement section to determine applicability for the Department's Alternatives Analysis. No mixing will be included in this review for receiving waterbodies. If the applicant would like to have effluent limitation derivation include mixing considerations, a site specific alternatives analysis will need to be completed.

3. TIER DETERMINATION

Below is a list of pollutants of concern reasonably expected to be in the discharge for a domestic wastewater treatment facility. Pollutants of concern are defined as those pollutants "proposed for discharge that affects beneficial use(s) in waters of the state. POCs include pollutants that create conditions unfavorable to beneficial uses in the water body receiving the discharge or proposed to receive the discharge" (AIP, Page 7). No existing water quality data is required because all POCs were considered to be Tier 2 and significantly degrading in the absence of existing water quality. Assumed uses for the receiving waterbody are General Criteria, Protection of Warm Water Aquatic Life (AQL), Human Health Protection (HHP), Irrigation (IRR), and Livestock & Wildlife Protection (LWP). If any Tier 1 Pollutants of Concern not addressed in this alternatives analysis will be discharged, the applicant must submit *Attachment D: Tier 1 Review* (http://dnr.mo.gov/forms/780-2024-f.pdf) for those pollutants.

Table 1. Pollutants of Concern and Tier Determination

POLLUTANTS OF CONCERN	TIER*	DEGRADATION	COMMENT****
Biochemical Oxygen Demand (BOD_5)/DO	2	Significant	
Total Suspended Solids (TSS)	**	Significant	
Ammonia	2	Significant	
pH	***	Significant	Permit limits applied
Escherichia coli (*E. coli*)	2	Significant	

* Tier assumed.
** Tier determination not possible: No in-stream standard for this parameter.
*** The standard for this parameter is a range.
**** Permit limits for other parameters including Oil & Grease, Total Residual Chlorine, Nitrates, and Total Phosphorus will be applied based on water quality standards and criteria as applicable.

Total Residual Chlorine (TRC) effluent limits of 0.017 mg/L daily maximum, 0.008 mg/L monthly average are recommended if chlorine is used as a disinfectant. Standard compliance language for TRC, including the minimum level (ML), may be included in the operating permit.

4. DEMONSTRATION OF NECESSITY AND SOCIAL AND ECONOMIC IMPORTANCE

Missouri's Antidegradation Implementation Procedures (AIP) specify that if the proposed activity results in significant degradation then a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance are required. The applicant must submit *Attachment E: Tier 2 – Significant Degradation Using Department's Alternatives Analysis for Domestic Wastewater Facilities with Design Flow Less Than 10,000 Gallons per Day* form. This analysis will serve as the applicant's alternatives analysis to fulfill the requirements of the AIP.

A Geohydrologic Evaluation must be submitted with the Antidegradation Review Request.

A Missouri Department of Conservation Natural Heritage Review Report must be obtained by the applicant. The applicant should review the Natural Heritage Review and contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination if necessary.

4.1. NO DISCHARGE EVALUATION

According to 10 CSR 20-6.010(4)(D), reports for the purpose of constructing a wastewater treatment facility shall consider the feasibility of constructing and operating a no discharge facility. Per the Antidegradation Implementation Procedure Section II.B.1, for discharges likely to cause significant degradation, applicants must provide an analysis of non-degrading alternatives. No-discharge alternatives may include surface land application, subsurface land application, and connection to a regional treatment facility.

The applicant must submit a *No Discharge Evaluation* form to demonstrate that a no-discharge facility is not feasible for this site. If the information provided on the form is not sufficient to demonstrate that a no-discharge facility is not feasible, a more detailed evaluation of no discharge options will be required before the Department can complete its determination.

4.2. DEMONSTRATION OF NECESSITY

The department has used available data to complete an alternatives analysis of previously evaluated treatment technologies and expected performance. Data from forty-five Water Quality and Antidegradation Reviews (WQARs) completed between March 2011 and March 2016 was evaluated and results are presented in Figure 1, Figure 2, and Table 2 below.

The data include five facilities designed to provide a high level of treatment to meet the expected future ammonia as N effluent limits based on the 2013 EPA Ammonia criteria for the protection of mussels and gill-breathing snails (See Notice to Permittee in DERIVATION AND DISCUSSION OF LIMITS section). The data available to date indicates that the cost of facilities of this size range designed to meet 2013 EPA ammonia criteria is not substantively higher than other facilities designed to meet the current ammonia criteria.

The data include fourteen facilities designed to meet BOD and TSS effluent limits of 10 mg/L monthly average and 15 mg/L daily maximum or weekly average. The data available to date indicates that the cost of facilities designed to meet BOD and TSS effluent limits of 10 mg/L monthly average and 15 mg/L daily maximum or weekly average is not substantively higher than other facilities of this size range designed to meet less stringent BOD and TSS effluent limits.

Facilities which were designed to meet limits based on the 2013 EPA ammonia criteria included a membrane bioreactor, extended aeration package plant, recirculating sand filter with moving bed biofilm reactor, sequencing batch reactor, and an integrated fixed film activated sludge system.

Membrane bioreactor (MBR) systems combine a suspended growth biological reactor with solids removal via filtration across a membrane. The membranes can be designed for and operated in small spaces and

with high removal efficiency of contaminants such as nitrogen, phosphorus, bacteria, biochemical oxygen demand, and total suspended solids. Membrane filtration allows a higher biomass concentration to be maintained in the treatment tank, thereby allowing smaller bioreactors to be used for a smaller footprint. MBR systems provide operational flexibility with respect to flow rates, as well as the ability to readily add or subtract units as needed, but that flexibility has limits. Membranes typically require that the water surface be maintained above a minimum elevation so that the membranes remain wet during operation. Throughput limitations are dictated by the physical properties of the membrane, and the result is that peak design flows generally should be no more than 1.5 to 2 times the average design flow. If peak flows exceed that limit, additional membranes may be needed to process the peak flow, or equalization may need to be included in the design. MBR systems typically have higher capital and operating costs than conventional systems.

The extended aeration process is a modification of the activated sludge process which provides biological treatment for the removal of biodegradable organic wastes under aerobic conditions. Wastewater in the aeration tank is mixed and oxygen is provided to the microorganisms. The mixed liquor then flows to a clarifier or settling chamber where most microorganisms settle to the bottom of the clarifier and a portion are pumped back to the beginning of the plant. The clarified wastewater flows over a weir and into a collection channel before being disinfected and discharged. Extended aeration is often used in smaller prefabricated package-type plants where lower operating efficiency is offset by mechanical simplicity and minimized design costs. In comparison to traditional activated sludge, longer mixing time with aged sludge and light loading (low F:M) offers a stable biological ecosystem better adapted for effectively treating waste load fluctuations from variable occupancy situations. Although the process is stable and easier to operate, extended aeration systems may discharge higher effluent suspended solids than found under conventional loadings.

Moving Bed Bioreactor (MBBR) systems may be a single aerated reactor, or several in series, with a buoyant free-moving plastic biofilm carrier media. MBBR systems can be designed to be capable of meeting more stringent total nitrogen limits. They produce a significantly reduced solids loading to the liquid-solids separation unit, the biofilm improves process stability, they offer flexibility to meet specific treatment objectives, and they are well suited for retrofit into existing treatment systems. MBBR systems require a smaller tank volume than a conventional activated sludge system and therefore have a smaller footprint. Adequate mixing must be provided to ensure that free floating media remains uniformly distributed and screens must be provided to retain the media within the reactors.

Integrated fixed film activated sludge (IFAS) systems add fixed or free floating media to an activated sludge basin. The process gets its name from combining a conventional activated sludge process with a fixed film system. This treatment system is similar to an MBBR; however MBBR systems do not recycle sludge. IFAS systems are often installed as a retrofit solution to conventional activated sludge systems. They require a smaller tank volume than a conventional activated sludge system and therefore have a smaller footprint. The biofilm combines aerobic, anaerobic, and anoxic zones promoting better nitrification compared to conventional activated sludge systems and the biofilm improves process stability. Adequate mixing must be provided to ensure that free floating media remains uniformly distributed and to slough biomass from the media. Higher dissolved oxygen concentrations may be required as compared to conventional activated sludge. Screens must be provided to retain the media within the reactors.

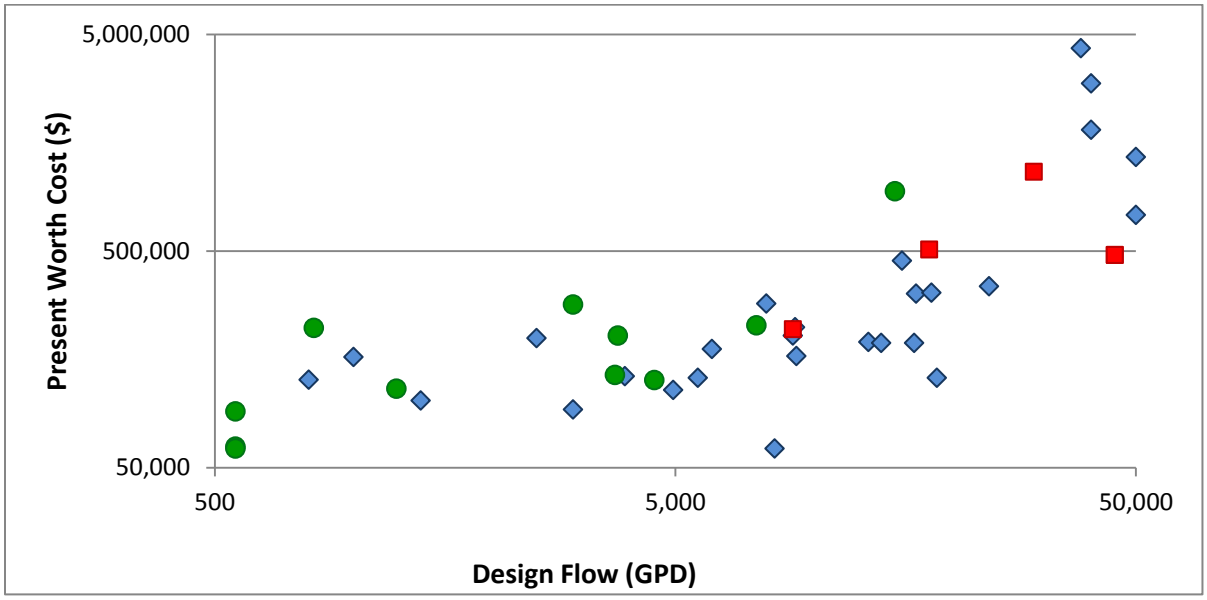
In addition to the treatment technologies listed above, all of which had previous WQARs that established advanced ammonia limits, there are other technology alternatives that can meet the advanced ammonia limits including recirculating sand filter, recirculating textile filter, conventional activated sludge, oxidation ditch, and lagoon retrofits. To obtain this level of performance, all technologies must be properly designed to accommodate nitrification and de-nitrification and they must be properly and actively operated.

Recirculating sand filters (RSF) remove contaminants in wastewater through physical, chemical, and, most importantly, biological processes. The three common components are a pretreatment unit (generally a septic tank), a recirculation tank, and a sand filter. In the recirculation tank, raw effluent from the septic tank and the sand filter filtrate are mixed and pumped back to the sand filter bed. RSFs are effective in applications with high levels of BOD and can provide a good effluent quality with 85 - 95% removal of BOD and TSS. They can be designed to provide nitrification, but this requires increased surface area. Treatment is affected by extremely cold weather. Treatment capacity can be expanded through modular design. RSFs require routine maintenance, although the complexity of maintenance is generally minimal.

Recirculating textile filters systems are configured similar to an RSF except the filter media is an engineered fabric textile. They can be configured to provide nitrification, but this may require additional treatment units. They have a small operating footprint, are more aesthetically pleasing than some other treatment options, produce minimal noise, have the ability to handle variable flows, and have simple maintenance.

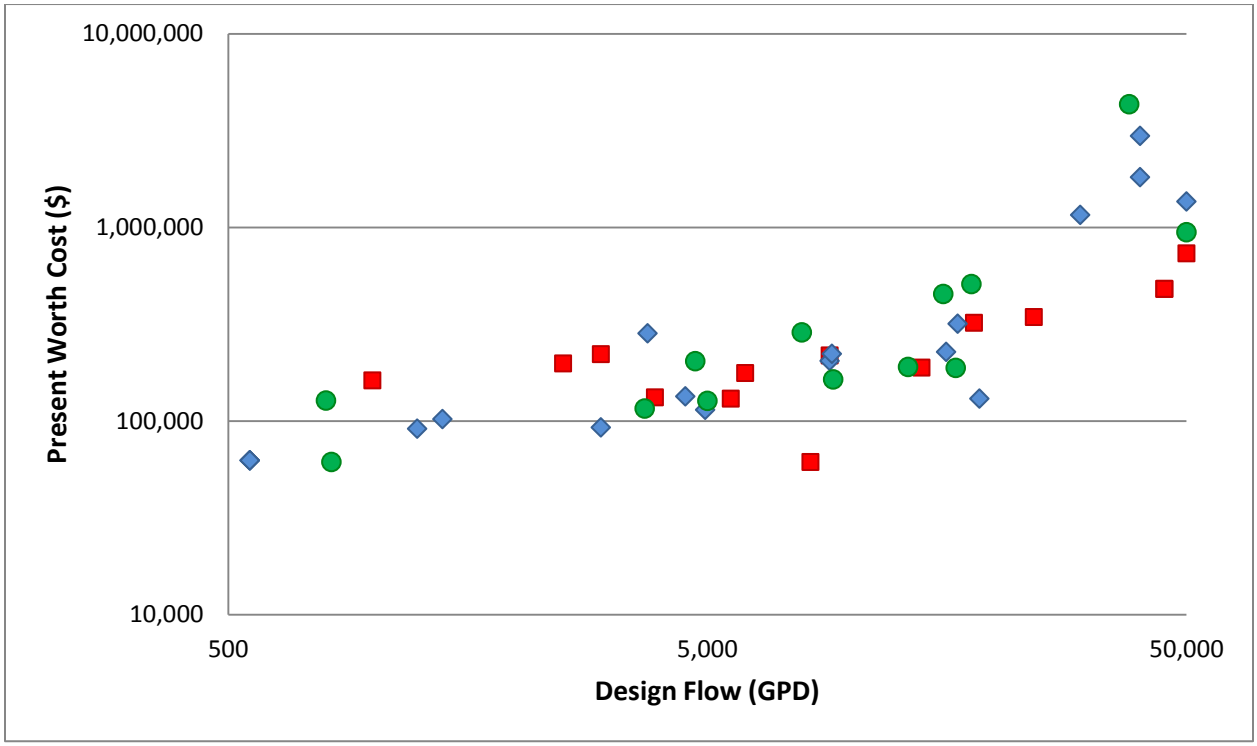
The above treatment system descriptions were adapted from EPA technology fact sheets and *Design of Municipal Wastewater Treatment Plants: WEF Manual of Practice No. 8 ASCE Manuals and Reports on Engineering Practice No. 76; Fifth Edition*, as well as other readily available sources and previous Water Quality and Antidegradation Reviews.

FIGURE 1. DESIGN FLOW VS. PRESENT WORTH COST VS. AMMONIA LIMITS



LEGEND		Summer Ammonia (mg/L)		Winter Ammonia (mg/L)	
		Daily Max	Monthly Avg.	Daily Max	Monthly Avg.
2013 EPA Criteria	■	≤1.7	≤0.6	≤5.6	≤2.1
Existing Aquatic Life Criteria (no mixing)	◆	approx. 3.7	approx. 1.4	approx. 7.5	approx. 2.9
Less Stringent (mixing)	●	>3.7	>1.4	>7.5	>2.9

FIGURE 2. DESIGN FLOW VS. PRESENT WORTH COST VS. BOD & TSS LIMITS



LEGEND	BOD (mg/L)		TSS (mg/L)	
	Daily Max	Monthly Avg.	Daily Max	Monthly Avg.
■	15	10	15	10
◆	15	10	>15	>10
●	>15	>10	>15	>10

TABLE 2. DESIGN FLOW VS. PRESENT WORTH COST

DATE	Design Flow (MGD)	Technology	BOD (mg/L)		TSS (mg/L)		Summer Ammonia (mg/L)		Winter Ammonia (mg/L)		Present Worth Cost ($)	$ PW/gpd
			Daily Max or Weekly Average	Monthly Average	Daily Max or Weekly Average	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Monthly Average		
5/2/2012	0.000555	Recirculating Fabric Filter	15	10	20	15	12.1	4.6	12.1	4.6	62,506	113
4/2/2013	0.000555	Recirculating Fabric Filter	15	10	20	15	12.1	4.6	12.1	4.6	62,506	113
10/1/2014	0.000555	Extended Aeration Package Plant	15	10	22.5	15	7.8	3	7.8	3	62,506	113
4/4/2012	0.000800	Recirculating Fabric Filter	30	15	30	15	4	1.5	7.7	2.9	127,427	159
12/1/2013	0.000821	Membrane Bioreactor	30	20	30	20	12.1	4.6	12.1	4.6	61,240	75
9/2/2012	0.001000	Recirculating Fabric Filter	15	10	15	10	3.7	1.4	7.5	2.9	162,007	162
7/6/2011	0.001240	Recirculating Fabric Filter	15	10	22	15	6	3	6	3	91,000	73
1/1/2015	0.001400	Recirculating Fabric Filter	15	10	23	15	3.7	1.4	7.6	2.9	102,174	73
5/5/2011	0.002500	Extended Aeration	15	10	15	10	3.7	1.4	7.5	2.9	198,000	79
9/1/2011	0.003000	Recirculating Fabric Filter	15	10	15	10	12.1	4.6	12.1	4.6	220,915	74
3/1/2012	0.003000	Extended Aeration Package Plant	15	10	20	15	3.7	1.4	7.5	2.9	92,604	31
2/22/2016	0.003700	Recirculating Rock Filter	30	20	30	20	7.3	2.8	7.3	2.8	115,688	31
7/4/2011	0.003750	Recirculating Fabric Filter	15	10	20	15	12.1	4.6	12.1	4.6	283,000	75
4/1/2014	0.003885	Recirculating Sand Filter	15	10	15	10	3.7	1.4	7.5	2.9	132,185	34
12/1/2012	0.004500	Recirculating Sand Filter	15	10	23	15	12.1	4.6	12.1	4.6	133,676	30
6/3/2013	0.004718	Recirculating Sand Filter	30	20	30	20	12.1	4.6	12.1	4.6	203,060	43
11/2/2011	0.004950	Recirculating Sand Filter	15	10	20	15	3.5	1.4	7.5	2.9	114,058	23
6/4/2011	0.005000	Moving Bed Biofilm Reactor	45	30	45	30	5.7	2.2	8.2	3.2	127,000	25
9/6/2012	0.005600	Extended Aeration with Filtration and Aerated Holding Tanks	15	10	15	10	3.7	1.4	7.5	2.9	130,000	23
6/1/2011	0.006000	Recirculating Sand Filter	15	10	15	10	3.7	1.4	7.5	2.9	176,239	29
3/1/2011	0.007875	Modular Fixed Film Activated Sludge with Constructed Wetlands	30	20	30	20	3.7	1.4	7.5	2.9	285,780	36
4/3/2012	0.008210	Membrane Bioreactor	15	10	15	10	2.6	1	2.6	1	61,240	7
8/5/2014	0.009000	Recirculating Sand Filter	15	10	20	15	3.1	1.2	7.5	2.9	203,698	23
1/1/2014	0.009000	Membrane Bioreactor	15	10	15	10	1.6	0.6	5.5	2.1	217,739	24
4/6/2012	0.009100	Membrane Bioreactor	15	10	20	15	3.7	1.4	7.5	2.9	222,160	24
3/7/2012	0.009158	Recirculating Gravel filter	30	20	30	20	3.7	1.5	6.5	2.5	163,681	18
6/1/2014	0.013125	Recirculating Sand Filter	45	30	45	30	3	1.1	6	2.3	189,985	14
8/4/2012	0.014000	Extended Aeration	15	10	15	10	3.7	1.4	7.5	2.8	188,208	13
7/1/2014	0.015540	Recirculating Sand Filter	23	15	23	15	3.9	1.5	7.8	3	450,986	29
7/5/2011	0.015750	Recirculating Sand Filter	15	10	20	15	7.8	2.5	7.8	2.5	226,969	14
2/27/2015	0.016500	Extended Aeration Package Plant	45	30	45	30	3.7	1.4	7.5	2.9	187,957	11
7/1/2012	0.016650	Extended Aeration	15	10	20	15	3.7	1.4	7.5	2.9	317,750	19
9/3/2014	0.017800	Extended Aeration Package Plant	45	30	45	30	1.4	0.6	2.9	2.1	507,618	29
5/11/2015	0.018000	Recirculating Sand Filter, Polishing Reactor, Chemical Phosphorus Removal	15	10	15	10	3.7	1.4	6.5	2.1	320,318	18
7/3/2013	0.018500	Recirculating Fabric Filter with Chemical & Filter Phosphorus Removal	15	10	20	15	3.7	1.4	7.5	2.9	130,000	7

2/27/2015	0.024000	Recirculating Gravel Filter	**15**	**10**	**15**	**10**	**3.7**	**1.4**	**6.5**	**2.1**	343,816	14
9/1/2014	0.030000	Recirculating Sand Filter, Moving Bed Biofilm Reactor, Chemical Phosphorus removal	**15**	**10**	**20**	**15**	**1.7**	**0.6**	**5.6**	**2.1**	1,157,390	39
6/2/2012	0.038000	Aerated Lagoon with Recirculating Sand Filter	**45**	**30**	**45**	**30**	**3.7**	**1.4**	**7.5**	**2.9**	4,309,665	113
2/3/2013	0.040000	Moving Bed Biofilm Reactor (can be operated as IFAS)	**15**	**10**	**20**	**15**	**3.7**	**1.4**	**7.5**	**2.9**	2,963,181	74
8/20/2015	0.040000	Recirculating Sand Filter, Moving Bed Biofilm Reactor	**15**	**10**	**20**	**15**	**3.7**	**1**	**5.6**	**2.1**	1,812,000	45
6/4/2013	0.045000	Moving Bed Biofilm Reactor	**15**	**10**	**15**	**10**	**1.7**	**0.6**	**5.6**	**2.1**	479,344	11
3/9/2016	0.045000	Moving Bed Biofilm Reactor	**15**	**10**	**15**	**10**	**1.7**	**0.6**	**5.6**	**2.1**	479,344	11
6/4/2012	0.050000	New Technology Package Plant	**30**	**20**	**30**	**20**	**7.5**	**2.9**	**7.5**	**2.9**	942,050	19
7/3/2011	0.050000	Extended Aeration Package Plant	**15**	**10**	**20**	**15**	**3.7**	**1.4**	**7.5**	**2.9**	1,357,506	27
8/3/2014	0.050000	Recirculating Sand Filter	**15**	**10**	**15**	**10**	**3.7**	**1.4**	**7.5**	**2.9**	733,723	15

Additionally, the table of wastewater treatment technologies in the *Ammonia Criteria: New EPA Recommended Criteria* factsheet located at http://dnr.mo.gov/pubs/pub2481.htm includes several technologies which have demonstrated capability in meeting ammonia effluent limits of less than 0.7 mg/L when designed appropriately.

As a result of this alternatives analysis, the department has determined that for a facility which discharges less than 10,000 gallons per day, depending on site specific conditions, there are technologies available which may be economically efficient and practicable that are capable of meeting the effluent limitations in Table 3. If the facility owners do not believe that there is a treatment technology that is both economically efficient and practicable for their facility to meet the limits in Table 3, a site specific alternatives analysis may be required.

4.3. DESIGN FLOW DETERMINATION

As part of the department's alternatives analysis, facilities up to 50,000 gallons per day were evaluated. A design flow maximum of 10,000 gallons per day was chosen for applicability of this alternatives analysis for a variety of reasons. As facilities increase in size, site specific factors may require a more site specific alternatives analysis. For example, larger facilities are more likely to have wet weather flows that must be addressed and are more likely to need Whole Effluent Toxicity testing or nutrient monitoring. Larger facilities are also more likely to discharge a larger variety of pollutants of concern which may not be addressed in this review. Larger facilities also benefit from an economy of scale; smaller facilities tend to have a higher cost per gallon of wastewater treated, which is distributed over fewer paying customers. Finally, as we are working with a limited amount of data, limiting the design flow applicability for the department's alternatives analysis ensures a factor of safety in our review.

4.4. REGIONALIZATION ALTERATIVE

Within Section II B 1. of the AIP, discussion of the potential for discharge to a regional wastewater collection system is mentioned. The applicant must provide justification for not pursuing regionalization on the *No Discharge Evaluation* form. If the information provided on the form is not sufficient to demonstrate that a regionalization alternative is not feasible, a more detailed evaluation will be required before the Department can complete its determination.

4.5. LOSING STREAM ALTERATIVE DISCHARGE LOCATION

Under 10 CSR 20-7.015(4)(A), *discharges to losing stream shall be permitted only after other alternatives including land application, discharge to gaining stream and connection to a regional facility have been evaluated and determined to be unacceptable for environmental and/or economic reasons*.

Information provided by the applicant on the *No Discharge Evaluation* form must include evaluation and justification for why the owner is not pursuing land application, or connection to a regional facility.

4.6. SOCIAL AND ECONOMIC IMPORTANCE EVALUATION

Missouri's antidegradation implementation procedures specify that if the proposed activity results in significant degradation then a determination of social and economic importance is required.

Information provided by the applicant in the *Attachment E: Tier 2 – Significant Degradation Using Department's Alternatives Analysis for Domestic Wastewater Facilities with Design Flow Less Than 10,000 Gallons per Day* form must include a detailed social and economic importance evaluation. If the information provided on the form is not sufficient to demonstrate important social and economic importance, then a more detailed evaluation will be required before the Department can complete its determination.

5. GENERAL ASSUMPTIONS OF THE WATER QUALITY AND ANTIDEGRADATION REVIEW

1. A Water Quality and Antidegradation Review (WQAR) assumes that [10 CSR 20-6.010(3) Continuing Authorities and 10 CSR 20-6.010(4) (D), consideration for no discharge] has been or will be addressed in a Missouri State Operating Permit or Construction Permit Application.
2. A WQAR does not indicate approval or disapproval of alternative analysis as per [10 CSR 20-7.015(4) Losing Streams], and/or any section of the effluent regulations.
3. Changes to Federal and State Regulations made after the drafting of this WQAR may alter Water Quality Based Effluent Limits (WQBEL).
4. Effluent limitations derived from Federal or Missouri State Regulations (FSR) may be WQBEL or Effluent Limit Guidelines (ELG).
5. WQBEL supersede ELG only when they are more stringent. Mass limits derived from technology based limits are still appropriate.
6. A WQAR does not allow discharges to waters of the state, and shall not be construed as a National Pollution Discharge Elimination System or Missouri State Operating Permit to discharge or a permit to construct, modify, or upgrade.
7. Limitations and other requirements in a WQAR may change as Water Quality Standards, Methodology, and Implementation procedures change.
8. Nothing in this WQAR removes any obligations to comply with county or other local ordinances or restrictions.
9. If the proposed treatment technology is not covered in 10 CSR 20-8 Design Guides, the treatment process may be considered a new technology. As a new technology, the permittee will need to work with the review engineer to ensure equipment is sized properly. The operating permit may contain additional requirements to evaluate the effectiveness of the technology once the facility is in operation. This Antidegradation Review is based on the information provided by the facility and is not a comprehensive review of the proposed treatment technology. If the review engineer determines the proposed technology will not consistently meet proposed effluent limits, the permittee will be required to revise their Antidegradation Report.

6. PERMIT LIMITS AND MONITORING INFORMATION

TABLE 3. EFFLUENT LIMITS – ALL OUTFALLS

PARAMETER		UNITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	BASIS FOR LIMIT (NOTE 1)	MONITORING FREQUENCY
FLOW		MGD	*		*	FSR	ONCE/MONTH
BIOCHEMICAL OXYGEN DEMAND$_5$ **		MG/L		15	10	PEL	ONCE/MONTH
TOTAL SUSPENDED SOLIDS **		MG/L		15	10	PEL	ONCE/MONTH
PH		SU	6.5– 9.0		6.5 – 9.0	FSR	ONCE/MONTH
AMMONIA AS N (APR 1 – SEPT 30)		MG/L	1.7		0.6	PEL	ONCE/MONTH
AMMONIA AS N (OCT 1 – MAR 31)		MG/L	5.6		2.1	PEL	ONCE/MONTH
ESCHERICHIA COLIFORM (*E. COLI*)	WBC(A) (NOTE 2)	#/100ML	630***		126	FSR	ONCE/MONTH
	WBC(B) (NOTE 2)	#/100ML	1030***		206	FSR	ONCE/MONTH
	LOSING STREAM (NOTE 3)	#/100ML	126***		*	FSR	ONCE/MONTH

* Monitoring requirements only.

** Publicly owned treatment works will be required to meet a removal efficiency of 85% or more for BOD_5 and TSS. Influent BOD_5 and TSS data should be reported to ensure removal efficiency requirements are met.

*** Publicly owned treatment works will receive a weekly average *E. coli* limit and private facilities will receive a daily maximum *E. coli* limit.

NOTE 1 – PREFERRED ALTERNATIVE EFFLUENT LIMIT – PEL; OR FEDERAL/STATE REGULATION – FSR. ALSO, PLEASE SEE THE **GENERAL ASSUMPTIONS OF THE WQAR #4 & #5.**

NOTE 2 - Effluent limitations and monitoring requirements for *E. coli* for WBC(A) and WBC(B)are applicable only during the recreational season from April 1 through October 31. The Monthly Average Limit for *E. coli* is expressed as a geometric mean.

NOTE 3 – Effluent limits and monitoring requirements for *E. coli* are applicable year round for designated losing streams. No more than 10% of samples over the course of a calendar year shall exceed the 126 #/100 mL daily maximum.

Permit limits for other applicable parameters, including Oil & Grease, Total Residual Chlorine, Nitrates, and Total Phosphorus, will be included in the operating permit based on water quality standards and criteria as applicable.

7. RECEIVING WATER MONITORING REQUIREMENTS

No receiving water monitoring requirements recommended at this time.

8. DERIVATION AND DISCUSSION OF LIMITS

Wasteload allocations and limits were calculated using two methods:

1) Water quality-based – Using water quality criteria or water quality model results and the dilution equation below:

$$C = \frac{(C_s \times Q_s) + (C_e \times Q_e)}{(Q_e + Q_s)}$$ (EPA/505/2-90-001, Section 4.5.5)

Where C = downstream concentration
C_s = upstream concentration
Q_s = upstream flow
C_e = effluent concentration
Q_e = effluent flow

Chronic wasteload allocations were determined using applicable chronic water quality criteria (CCC: criteria continuous concentration). Acute wasteload allocations were determined using applicable water quality criteria (CMC: criteria maximum concentration).

Water quality-based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's "Technical Support Document For Water Quality-based Toxics Control" (EPA/505/2-90-001).

Note: Under 40 CFR 133.105, permitting authorities shall require more stringent limitations than equivalent to secondary treatment limitations for 1) existing facilities if the permitting authority determines that the 30-day average and 7-day average BOD_5 and TSS effluent values that could be achievable through proper operation and maintenance of the treatment works, and 2) new facilities if the permitting authority determines that the 30-day average and 7-day average BOD_5 and TSS effluent values that could be achievable through proper operation and maintenance of the treatment works, considering the design capability of the treatment process.

8.1. LIMIT DERIVATION

- **Flow**. In accordance with [40 CFR Part 122.44(i)(1)(ii)] the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification.

- **Biochemical Oxygen Demand (BOD_5).** BOD_5 limits of 10 mg/L monthly average and 15 mg/L average weekly were determined by the department to be achievable and protective of beneficial uses and existing water quality.

  As per the *DO Modeling & BOD Effluent Limit Development Administrative Guidance for the Purpose of Conducting Water Quality Assistance Reviews*, facilities less than 100,000 gallons per day, and proposing BOD treatment less than or equal to an average monthly of 10 mg/L and average weekly of 15 mg/L as demonstrated by performance specifications from a manufacturer or effluent sampling of an existing facility with the same treatment facility are exempt from the DO modeling requirement. See http://dnr.mo.gov/env/wpp/permits/docs/DO_Modeling_Administrative_Guidance_Dec_09.pdf.

  Influent monitoring may be required for this facility in its Missouri State Operating Permit.

- **Total Suspended Solids (TSS).** TSS limits of 10 mg/L monthly average and 15 mg/L average weekly were determined by the department to be achievable based and protective of beneficial uses and existing water quality. According to EPA, because TSS and BOD are closely correlated, we apply the same limits for TSS as BOD.

  Influent monitoring may be required for this facility in its Missouri State Operating Permit.

- **pH**. – 6.5-9.0 SU. Technology based effluent limitations of 6.0-9.0 SU [10 CSR 20-7.015] are not protective of the Water Quality Standard, which states that water contaminants shall not cause pH to be outside the range of 6.5-9.0 SU. No mixing zone is allowed in this general water quality and antidegradation review, therefore the water quality standard must be met at the outfall.

- **Total Ammonia Nitrogen**. The department has determined that the alternatives analysis-based technology limits of 0.6 mg/L monthly average and 1.7 mg/L daily maximum in summer, and 2.1 mg/L monthly average and 5.6 mg/L daily maximum in winter are achievable by some treatment technologies.

Because these limits are more protective than the water quality-based limits calculated below for a stream with no mixing, the technology-based limits were used.

In choosing to use the department's alternatives analysis, the facility is electing to build a treatment plant that provides a high level of treatment that meets the expected future limits based on the 2013 EPA Ammonia criteria and will potentially reduce the need to upgrade in the near future (See Notice to Permittee below). If the facility owners do not believe that there is a treatment technology that is both economically efficient and practicable for their facility to meet these limits, a site specific alternatives analysis may be required.

Water Quality-Based Effluent Limits (WQBEL):
Early Life Stages Present Total Ammonia Nitrogen criteria apply
[10 CSR 20-7.031(5)(B)7.C. & Table B3]. Background total ammonia nitrogen = 0.01 mg/L

Season	Temp (^oC)	pH (SU)	Total Ammonia Nitrogen CCC (mg N/L)	Total Ammonia Nitrogen CMC (mg N/L)
Summer	26	7.8	1.5	12.1
Winter	6	7.8	3.1	12.1

Summer: April 1 – September 30, Winter: October 1 – March 31.

Summer

$C_e = (((Q_e+Q_s)*C) - (Q_s*C_s))/Q_e$

Chronic WLA: $C_e = ((Q_e + 0.0)1.5 – (0.0 * 0.01))/Q_e = 1.5$ mg/L

Acute WLA: $C_e = ((Q_e + 0.0)12.1 – (0.0 * 0.01))/Q_e = 12.1$ mg/L

LTA_c = 1.5 mg/L (0.780) = **1.2 mg/L** [CV = 0.6, 99th Percentile, 30 day avg.]
LTA_a = 12.1 mg/L (0.321) = 3.88 mg/L [CV = 0.6, 99th Percentile]

MDL = 1.2 mg/L (3.11) = 3.7 mg/L [CV = 0.6, 99th Percentile]
AML = 1.2 mg/L (1.19) = 1.4 mg/L [CV = 0.6, 95th Percentile, n = 30]

Winter

Chronic WLA: $C_e = ((Q_e + 0.0)3.1 – (0.0 * 0.01))/Q_e = 3.1$ mg/L

Acute WLA: $C_e = ((Q_e + 0.0)12.1 – (0.0025 * 0.01))/Q_e = 12.1$ mg/L

LTA_c = 3.1 mg/L (0.780) = **2.4 mg/L** [CV = 0.6, 99th Percentile, 30 day avg.]
LTA_a = 12.1 mg/L (0.321) = 3.9 mg/L [CV = 0.6, 99th Percentile]

MDL = 2.4 mg/L (3.11) = 7.5 mg/L [CV = 0.6, 99th Percentile]
AML = 2.4 mg/L (1.19) = 2.9 mg/L [CV = 0.6, 95th Percentile, n = 30]

	Maximum Daily Limit (mg/l)		Average Monthly Limit (mg/l)	
	Summer	Winter	Summer	Winter
WQBEL	3.7	7.5	1.4	2.9
Alternatives Analysis Limits	1.7	5.6	0.6	2.1

Notice to Permittee:

On August 22, 2013, the U.S. Environmental Protection Agency (EPA) published a notice in the Federal Register announcing the final national recommended ambient water quality criteria for protection of aquatic life from the effects of ammonia in freshwater. The EPA's guidance, *Final Aquatic Life Ambient Water Quality Criteria for Ammonia – Fresh Water 2013*, is not a rule, nor automatically part of a state's water quality standards. States must adopt new ammonia criteria consistent with EPA's published ammonia criteria into their water quality standards that protect the designated uses of the water bodies.

The Water Protection Program (WPP) is providing this notice to inform permittees that EPA's published ammonia criteria for aquatic life protection is lower than the current Missouri criteria. The Department of Natural Resources has initiated stakeholder discussions on how to best incorporate these new criteria into the State's rules. A date for when this rule change will occur has not been determined. The ammonia effluent limits proposed in this WQAR are expected to meet the new EPA criteria where mussels of the family Unionidae are present or expected to be present for a facility in a location that discharges to a receiving stream with no mixing. More information about the new ammonia criteria for aquatic life protection may be found at: http://dnr.mo.gov/pubs/pub2481.htm.

- ***Escherichia coli (E. coli)***. Limits will be applied based on the receiving stream designated use.

  Whole Body Contact (A): Monthly average of 126 per 100 mL as a geometric mean and Daily Maximum or Weekly Average as a geometric mean of 630 per 100 mL during the recreational season (April 1 – October 31), to protect Whole Body Contact Recreation (A) designated use of the receiving water body, as per 10 CSR 20-7.031(5)(C) and 10 CSR 20-7.015 (9)(B)1. An effluent limit for both monthly average and daily maximum or weekly average is required by 40 CFR 122.45(d). Publicly owned treatment works will receive weekly average limits, while non-publicly owned treatment works will receive daily maximum limits.

  Whole Body Contact (B): Monthly average of 206 per 100 mL as a geometric mean and Daily Maximum or Weekly Average as a geometric mean of 1030 per 100 mL during the recreational season (April 1 – October 31), to protect Whole Body Contact Recreation (B) designated use of the receiving water body, as per 10 CSR 20-7.031(5)(C) and 10 CSR 20-7.015 (9)(B)1. An effluent limit for both monthly average and daily maximum or weekly average is required by 40 CFR 122.45(d). Publicly owned treatment works will receive weekly average limits, while non-publicly owned treatment works will receive daily maximum limits.

  Losing Stream: Discharges to losing streams shall not exceed 126 per 100 mL as a Daily Maximum at any time, as per 10 CSR 20-7.031(5)(C). Monitoring only for a monthly average. No more than 10% of samples over the course of the calendar year shall exceed 126 #/100 mL daily maximum as per 10 CSR 20-7.015(9)(B)1.G.

  Per the effluent regulations, the *E. coli* sampling/monitoring frequency for facilities less than 100,000 gallons per day shall be set to match the monitoring frequency of wastewater and sludge sampling program for the receiving water category in 7.015(1)(B)3. during the recreational season (April 1 – October 31), with compliance to be determined by calculating the geometric mean of all samples collected during the reporting period (samples collected during the calendar week for the weekly average, and samples collected during the calendar month for the monthly average). Please see GENERAL ASSUMPTIONS OF THE WQAR #7

- **Total Residual Chlorine (TRC)**. These limits will apply to facilities which chlorinate. Warm-water Protection of Aquatic Life CCC = 10 μg/L, CMC = 19 μg/L [10 CSR 20-7.031, Table A]. Background TRC = 0.0 μg/L.

  $C_e = (((Q_e+Q_s)*C) - (Q_s*C_s))/Q_e$

  Chronic WLA: $C_e = ((Q_e + 0.0)10 – (0.0 * 0.0))/ Q_e = 10$ μg/L

  Acute WLA: $C_e = ((Q_e + 0.0)19 – (0.0 * 0.0))/ Q_e = 19$ μg/L

  LTA_c = 10 μg/L (0.527) = **5.3 μg/L** [CV = 0.6, 99th Percentile]
  LTA_a = 19 μg/L (0.321) = 6.1 μg/L [CV = 0.6, 99th Percentile]

  MDL = **5.3 μg/L** (3.11) = 16.5 μg/L [CV = 0.6, 99th Percentile]
  AML = **5.3 μg/L** (1.55) = 8.2 μg/L [CV = 0.6, 95th Percentile, n = 4]

  Total Residual Chlorine effluent limits of 0.017 mg/L daily maximum, 0.008 mg/L monthly average are recommended if chlorine is used as a disinfectant. Standard compliance language for TRC, including the minimum level (ML), should be included in the permit.

- **Oil & Grease**. These limits will apply to publicly owned treatment works and may apply to other facilities as appropriate. Conventional pollutant, [10 CSR 20-7.031, Table A]. Effluent limitation for protection of aquatic life; 10 mg/L monthly average, 15 mg/L daily maximum.

- **Total Phosphorus.** Discharges to Table Rock Lake and Lake Taneycomo watersheds shall meet 0.5 mg/L per 10 CSR 20-7.015(3). Discharges to the White River Basin and outside of the area designated above for phosphorus limitations shall have monitoring only for phosphorus at a frequency the same as BOD and TSS as per 10 CSR 20-7.015(3)(E).

Permit limits for any other applicable parameters may be included in the operating permit based on water quality standards and criteria as applicable.

9. ANTIDEGRADATION REVIEW PRELIMINARY DETERMINATION

The proposed new or expanded facility discharge is assumed to result in significant degradation of the receiving waterbody. The department has used available data to complete a review of available treatment technologies and expected performance. As a result of this review, the department has determined that, depending on site specific conditions, there may be technologies available which are economically efficient and practicable for a facility that are capable of meeting the effluent limits in Table 3. If the facility owners do not believe that there is a treatment technology that is both economically efficient and practicable for their facility to meet the limits in Table 3, a site specific WQAR may be requested.

Any treatment option designed to meet these effluent limits may be considered a reasonable alternative in moving forward with the appropriate facility plan, construction permit application, or other future submittals.

If the proposed treatment system is not covered in 10 CSR 20-8 Design Guides and is considered a new treatment technology, your construction permit application must address approvability of the technology in accordance with the *New Technology Definitions and Requirements* factsheet available at http://dnr.mo.gov/pubs/pub2453.htm. If you have any questions regarding the new technology factsheet, please contact Cindy LePage of the Water Protection Program. The permittee will need to work with the review engineer to ensure equipment is sized properly and that the technology will consistently achieve the proposed effluent limits. The operating permit may contain additional requirements to evaluate the effectiveness of the technology once the facility is in operation.

Per the requirements of the AIP, the effluent limits in this review were developed to be protective of beneficial uses and to attain the highest statutory and regulatory requirements. MDNR has determined that the submitted review is sufficient and meets the requirements of the AIP. No further analysis is needed for this discharge.

WATER PROTECTION PROGRAM

[Signature]

Refaat H. Mefrakis, P.E.
Engineering Section Chief

WATER PROTECTION PROGRAM

[Signature]

John Rustige, P.E.
Wastewater Engineering Unit Chief

WATER PROTECTION PROGRAM

[Signature]

Cailie Carlile, P.E.
Engineering Section

Appendix A: Map of Discharge Location

(*A USGS topographic map can be obtained on the web at http://www.dnr.mo.gov/internetmapviewer/.*)

Appendix B: Natural Heritage Review

(*Applicant must check for rare and endangered aquatic species that may be affected by the discharge by using the following web link: http://mdcgis.mdc.mo.gov/heritage/. The results of the survey must indicate whether there are known endangered species on the site.)*

Appendix C: Antidegradation Review Summary Attachments

The attachments that follow contain summary information provided by the applicant.

MDNR staff determined that the following changes must be made to the information contained within these attachments:

1) Water Quality Review Assistance/Antidegradation Review Request form:
    a. No changes needed.

2) Attachment E: Tier 2 – Significant Degradation Using Department's Alternatives Analysis for Domestic Wastewater Facilities with Design Flow Less Than 10,000 Gallons Per Day form:
    a. No changes needed.

3) No Discharge Evaluation Form:
    a. No changes needed.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH

ANTIDEGRADATION REVIEW SUBMITTAL
ATTACHMENT E: TIER 2 – SIGNIFICANT DEGRADATION USING DEPARTMENT'S ALTERNATIVES ANALYSIS FOR DOMESTIC WASTEWATER FACILITIES WITH DESIGN FLOW LESS THAN 10,000 GALLONS PER DAY

1. APPLICABILITY

If you answer "Yes" to any of the below questions, a site specific Alternatives Analysis may be required.

The Department's Alternatives Analysis is *not* applicable to facilities which have a Total Maximum Daily Load (TMDL) or are 303(d) or 305(b) listed for the pollutants of concerns addressed in this alternatives analysis, with an exception for *E. coli* since disinfection will be required.

Facilities that are currently under enforcement will need to coordinate with the Water Protection Program's compliance and enforcement section to determine applicability for the Department's Alternatives Analysis.

1.1 Does the receiving waterbody or downstream waterbody have a Total Maximum Daily Load (TMDL)? ☐ Yes ☐ No
(This can be checked at: http://dnr.mo.gov/env/wpp/tmdl/)

1.2 Is the receiving waterbody or downstream waterbody 303(d) or 305(b) listed as impaired or potentially impaired? (This can be checked at: http://dnr.mo.gov/env/wpp/waterquality/303d/303d.htm) ☐ Yes ☐ No

1.3 Is the facility currently under enforcement with the department or the Environmental Protection Agency? ☐ Yes ☐ No

1.4 Is the design flow 10,000 gallons per day or more? ☐ Yes ☐ No

1.5 Is a non-discharging system a viable option ☐ Yes ☐ No

The following forms must also be submitted with this form:

☐ No Discharge Evaluation Form (http://dnr.mo.gov/env/wpp/permits/antideg-implementation.htm)

☐ Water Quality Review Assistance/Antidegradation Review Request Form (http://dnr.mo.gov/forms/780-1893-f.pdf)

2. FACILITY

NAME		TELEPHONE NUMBER WITH AREA CODE	
ADDRESS (PHYSICAL)	CITY	STATE	ZIP CODE

3. OWNER

NAME AND OFFICIAL TITLES			
ADDRESS	CITY	STATE	ZIP CODE
TELEPHONE NUMBER WITH AREA CODE	E-MAIL ADDRESS		

4. CONTINUING AUTHORITY
The regulatory requirement regarding continuing authority is found in 10 CSR 20-6.010(3) available at www.sos.mo.gov/adrules/csr/current/10csr/10c20-6a.pdf.

NAME AND OFFICIAL TITLES			
ADDRESS	CITY	STATE	ZIP CODE
TELEPHONE NUMBER WITH AREA CODE	E-MAIL ADDRESS		

5. RECEIVING WATER BODY SEGMENT #1

NAME

5.1 UPPER END OF SEGMENT (Location of discharge)
UTM _____ OR Lat _____, Long _____

5.2 LOWER END OF SEGMENT
UTM _____ OR Lat _____, Long _____

Per the Missouri Antidegradation Implementation Procedure, or AIP, the definition of a segment, "a segment is a section of water that is bound, at a minimum, by significant existing sources and confluences with other significant water bodies."

6. WATER BODY SEGMENT #2

NAME

6.1 UPPER END OF SEGMENT
UTM _____ OR Lat _____, Long _____

6.2 LOWER END OF SEGMENT
UTM _____ OR Lat _____, Long _____

7. SOCIAL AND ECONOMIC IMPORTANCE OF THE PREFERRED ALTERNATIVE

This section must be completed with adequate and thorough descriptions of the Social and Economic Importance associated with the proposed project in accordance with the Antidegradation Implementation Procedure Section II.E. for discharge to be allowed.

Social and Economic Importance is defined as the social and economic benefits to the community that will occur from any activity involving a new or expanding discharge.

7.1 Identify the affected community:

(The affected community is defined in 10 CSR 20-7.031(2)(B) as the community "in the geographical area in which the waters are located.: Per the Antidegradation Implementation Procedure Section II.E.1, "the affected community should include those living near the site of the proposed project as well as those in the community that are expected to directly or indirectly benefit from the project.")

7.2 Identify the important social and economic development associated with the project:

Will the proposed discharging activity:

Create or expand employment?	☐ Yes	☐ No	☐ Don't know	☐N/A
Increase median family income?	☐ Yes	☐ No	☐ Don't know	☐N/A
Reduce the number of households below the poverty line?	☐ Yes	☐ No	☐ Don't know	☐N/A
Increase the community tax base?	☐ Yes	☐ No	☐ Don't know	☐N/A
Increase needed housing supply?	☐ Yes	☐ No	☐ Don't know	☐N/A
Provide necessary public services (e.g., school, infrastructure, fire department, etc.)?	☐ Yes	☐ No	☐ Don't know	☐N/A
Correct a public health, safety, or environmental problem?	☐ Yes	☐ No	☐ Don't know	☐N/A

Other:

7.3 Describe the important social and economic development associated with the project:

(The applicant must describe the expected changes in the factors identified in question 7.2 above that are associated with the project and provide information on any additional items demonstrating important social and economic development. The applicant should first describe the existing condition of the affected community. This base condition should then be compared to the predicted change (benefit) in social and economic condition after the discharge is allowed. The social and economic measures identified above do not constitute a comprehensive list. Each situation and community is different and will require an analysis of unique social and economic factors in accordance with the Antidegradation Implementation Procedure Section II.E.1.)

7.4 Is any other written correspondence or documentation included with this application to provide further evidence of social and economic importance:

☐ No.

☐ Yes:

- ☐ Letter(s) from the mayor or community in support of the proposed project
- ☐ Re-zoning approval
- ☐ Other:

8. NO DISCHARGE ALTERNATIVES EVALUATION

According to 10 CSR 20-6.010(4)(D), reports for the purpose of constructing a wastewater treatment facility shall consider the feasibility of constructing and operating a no discharge facility. Per the Antidegradation Implementation Procedure Section II.B.1, for discharges likely to cause significant degradation, applicants must provide an analysis of non-degrading alternatives. No-discharge alternatives may include surface land application, subsurface land application, and connection to a regional treatment facility.

You must submit the *No-Discharge Evaluation Form* available at http://dnr.mo.gov/env/wpp/permits/antideg-implementation.htm to demonstrate that a non-discharging alternative is not feasible. If sufficient information is not provided on the *No-Discharge Evaluation Form* to demonstrate that a non-discharging facility is not feasible, a more detailed evaluation of no discharge options must be submitted.

8. IDENTIFY PREFERRED TREATMENT ALTERNATIVE

Describe your preferred treatment alternative which has been recommended or approved by a registered professional engineer licensed to practice in Missouri. The preferred treatment alternative must be capable of meeting the effluent limits in the table under item 9. of this form.

Applicants choosing to use a new wastewater technology that is considered an "unproven technology" in Missouri must comply with the requirements set forth in the *New Technology Definitions and Requirements Factsheet* that can be found

ENGINEERING CONSULTANT NAME	COMPANY NAME

9. SUMMARY OF THE POLLUTANTS OF CONCERN AND EFFLUENT LIMITS

Pollutants of Concern to be considered include those pollutants reasonably expected to be present in the discharge per the Antidegradation Implementation Procedure Section II.A. and assumed or demonstrated to cause significant degradation.
The tier protection levels are specified and defined in rule at 10 CSR 20-7.031 (2).
All POCs in this alternatives analysis were considered to be Tier 2 and significantly degrading in the absence of existing water quality.

As a result of this Alternatives Analysis review, the department has determined that, depending on site specific conditions, there are treatment technologies available which may be economically efficient and practicable that are capable of meeting the effluent limitations below. If the facility owners do not believe that there is a treatment technology that is economically efficient, affordable, or practicable for their facility to meet these limits, a site specific alternatives analysis will be required.

The chosen alternative must be capable of meeting the following effluent limitations:

Pollutant of Concern*		Units	Daily Maximum	Weekly Average	Monthly Average
BOD_5		mg/L		15	10
TSS		mg/L		15	10
Ammonia as N Summer		mg/L	1.7		0.6
Ammonia as N Winter		mg/L	5.6		2.1
pH		SU	6.5– 9.0		6.5 – 9.0
Escherichia coli (*E. coli*)	WBC(A)	#/100 ML	630***		126
	WBC(B)	#/100 ML	1030***		206
	Losing Stream**	#/100 ML	126***		*

* Permit limits for other parameters, including Oil & Grease, Total Residual Chlorine, Nitrates, and Total Phosphorus, will be included in the operating permit based on applicable water quality standards and criteria as applicable.

Total Residual Chlorine (TRC) effluent limits of 0.017 mg/L daily maximum, 0.008 mg/L monthly average are recommended if chlorine is used as a disinfectant. Standard compliance language for TRC, including the minimum level (ML), may be included in the operating permit.

** For any facility which will discharge to a waterbody designated as a losing stream or within two (2) miles flow distance upstream of a losing stream.

*** Publicly owned treatment works will receive a weekly average limit and private facilities will receive a daily maximum limit.

If any Tier 1 Pollutants of Concern not addressed in this alternatives analysis will be discharged, the applicant must submit *Attachment D: Tier 1 Review* (http://dnr.mo.gov/forms/780-2024-f.pdf) for those pollutants.

OWNER: I have read and reviewed the prepared documents and agree with this submittal.

SIGNATURE	DATE

CONTINUING AUTHORITY: I have read and reviewed the prepared documents and agree with this submittal.

SIGNATURE	DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH

NO DISCHARGE EVALUATION

NO DISCHARGE EVALUATION

According to 10 CSR 20-6.010(4)(D), reports for the purpose of constructing a wastewater treatment facility shall consider the feasibility of constructing and operating a no discharge facility. Per the Antidegradation Implementation Procedure Section II.B.1, for discharges likely to cause significant degradation, applicants must provide an analysis of non-degrading alternatives. No-discharge alternatives may include surface land application, subsurface land application, and connection to a regional treatment facility.

Please refer to the *No-Discharge Evaluation Memo and Matrix* available at http://dnr.mo.gov/env/wpp/permits/docs/20160217-no-discharge-memo.pdf for examples of information and documentation to provide to justify common reasons for not pursuing no-discharge land application. If sufficient information is not provided on this form to demonstrate that a no-discharge facility is not feasible, a more detailed evaluation of no discharge options may have to be submitted.

Additional pages may be attached if more room is needed.

1. FACILITY:

NAME	COUNTY

2. EVALUATION OF NO-DISCHARGE LAND APPLICATION

Check all applicable reasons why no-discharge land application was not pursued:

☐ **2.1 Land Availability and Cost:**

A. How many acres are required for land application of the effluent?

B. What is the cost to purchase any necessary additional land within 1.5 miles of the facility?

C. Were costs evaluated for transporting and land applying at a location farther from the site? ☐ Yes ☐ No

D. What is the capital cost estimate for piping and pumps to transport effluent to a suitable land application site?

E. Did you evaluate entering a long term lease with a farmer or other land owner: ☐ Yes ☐ No

How many land owners were contacted and what restrictions were presented?

Could controls be built into the contract, such as requiring the owner to use a certain percentage of the water annually?

F. Were increased application rates evaluated in order to use less land?? ☐ Yes ☐ No

G. Was using multiple application sites evaluated to optimize application rate per site? ☐ Yes ☐ No

H. Can the facility do seasonal discharge or seasonal application? ☐ Yes ☐ No

I. Was land applying to public use areas, such as golf courses or parks, evaluated? ☐ Yes ☐ No

J. Were long term costs evaluated and compared for upgrading to a mechanical plant with future Water Quality Standards changes (i.e. mussel ammonia, bacteria, TP, TN) vs. cost for a land application system? ☐ Yes ☐ No

☐ **2.2 Easements**

A. Were land owners contacted for rights to an easement? ☐ Yes ☐ No

B. What is the cost of easement acquisition?

☐ **2.3 Zoning or Suitability of Site in Proximity to Neighboring Sites or Waterbodies:**

A.	Can buffer distances be increased to reduce neighbor complaints?	☐ Yes	☐ No
B.	Was drip or subsurface irrigation evaluated as opposed to surface application?	☐ Yes	☐ No
C.	Does the county ordinance specifically restrict land application, surface and subsurface?	☐ Yes	☐ No
D.	Can a vegetated buffer be installed to reduce necessary buffer distances?	☐ Yes	☐ No
E.	Can higher application rates requiring less land be used?	☐ Yes	☐ No
F.	Are there other steps or considerations that can be made (see 2.1)?	☐ Yes	☐ No
G.	What is the distance to a neighboring county without zoning restrictions?		

☐ **2.4 Unsuitability of Geology or Soils**

A.	Is a Geohydrologic Evaluation, County Soils Survey Map, or other resource showing suitability and application rates included with this application?	☐ Yes	☐ No
B.	Is it cost-effective to bring in additional soils?	☐ Yes	☐ No
C.	Can the application rate be decreased to a suitable rate?	☐ Yes	☐ No
D.	Were subsurface application alternatives (e.g. low pressure pipe, drip) considered?	☐ Yes	☐ No
E.	If collapse potential is a concern, was using a liner or alternative site (see 2.1) evaluated?	☐ Yes	☐ No

2.5 Summarize why no discharge land application was not a practicable or economically efficient alternative

3. EVALUATION OF REGIONALIZATION

3.1 Regionalization Feasibility:

A. What is the distance to connect to the closest municipality's line or other facility's line?

B. Is there any planning or zoning in the area regarding development and services?

C. What is the estimated capital cost for piping and pumps to regionalize?

D. Does a regional facility have the capacity to treat the additional effluent from this project, and if not, what would it cost to upgrade the regional facility?

3.2 Summarize why regionalization was not a practicable or economically efficient alternative

4. DOCUMENTATION

4.1 Is any other written correspondence or documentation included with this application to provide further justification for not pursuing a no-discharge option or regionalization?

☐ No.

☐ Yes:

- ☐ Correspondence with land owners regarding land for sale or lease or easement rights.
- ☐ Letters from the community or a consulting engineer regarding availability, proximity, and location of suitable land and the reasonable cost of such the land.
- ☐ Documentation of recent land sales or appraisals.
- ☐ Calculations for sizing a land application system.
- ☐ Detailed cost estimates for a land application system or regionalization including lift stations, piping, easements, liners, and/or connection costs.
- ☐ Geohydrologic evaluation or other soils report.
- ☐ Copy of a county/city ordinance.
- ☐ Council meeting minutes.
- ☐ A letter from an existing higher preference continuing authority waiving preferential status where service is not available in accordance with 10 CSR 20-6.0 10 (3) or if capacity is not available.
- ☐ A letter from the existing higher preference continuing authority stating that the regional facility has no interest in taking flow from the new or expanded facility.
- ☐ A letter from the regional municipality stating that the project area is outside city limits and annexation would be required.
- ☐ Verification of funding from State Revolving Fund, which does not fund projects outside city limits.
- ☐ Other:

OWNER: I have read and reviewed the prepared documents and agree with this submittal.

NAME AND OFFICIAL TITLES	
SIGNATURE	DATE

CONTINUING AUTHORITY: I have read and reviewed the prepared documents and agree with this submittal.
The regulatory requirement regarding continuing authority is found in 10 CSR 20-6.010(3) available at www.sos.mo.gov/adrules/csr/current/10csr/10c20-6a.pdf.

NAME AND OFFICIAL TITLES	
SIGNATURE	DATE