

# Antidegradation Applicability Decision Tree, the Application and an Example Project

Presenter:

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All new or expanded regulated discharges are subject to antidegradation review requirements.

- **Alternatives Analysis**: structured evaluation of the reasonableness of less- and non-degrading alternatives.
- **Degradation**: increase in the concentration of the pollutants of concern (POCs).
- **Existing Water Quality (EWQ)**: level of the POC in a water segment on the effective date (August 30, 2008).



## Missouri's Antidegradation Implementation Procedure

For determining whether or not degradation is allowed in waters of the state from new or expanding regulated discharges is generally based on:

- the level of protection (i.e., Tier 1, 2, or 3) assigned to the pollutants of concern (POCs) within the water receiving the discharge,
- the type of receiving water,
- existing water quality (EWQ) of the receiving water,
- the necessity of degradation, and
- the social and economic importance (SEI) of the proposed discharge.

10 CSR 20-7.031(2) Antidegradation. The antidegradation policy shall provide three levels of protection.

- (A) **Tier One.** Public health, existing instream water uses and a level of water quality necessary to protect existing uses shall be maintained and protected.
- (B) **Tier Two.** *Next slide*
- (C) **Tier Three.** There shall be no lowering of water quality in outstanding national resource waters or outstanding state resource waters.
- (D) These three (3) levels of protection shall be implemented according to procedures hereby incorporated by reference and known as the “Missouri Antidegradation Rule and Implementation Procedure, April 20, 2007, Revised May 7, 2008.”

## 10 CSR 20-7.031(2) Antidegradation (Continued).

(B) **Tier Two.** Existing water quality is better than applicable water quality criteria and shall be fully maintained and protected. A proposed new or modified source of pollution may result in limited lowering of water quality provided that:

1. The source does not violate any of the general criteria, or any of the criteria for protection of beneficial uses;
2. The source meets all applicable technological effluent limitations and minimum standards of design; and
3. The lowering of water quality is necessary for the accommodation of important economic and social development.

High Quality

## Tiers of Water Quality

Existing Water Quality

Available Assimilative Capacity

Water Quality Standard

Beneficial Use Impairment

Tier 2—Minimal Degradation  
<10 Percent of Available Assimilative Capacity

Tier 2—Significant Degradation (may be assumed in the minimal degradation area)

Tier 1

Low Quality

# Tier 1

- Degradation has already been documented.
- Additional discharges allowed without a full antidegradation review if :
  - 1) the discharge would not cause or contribute to a violation of the WQS;
  - 2) all other conditions of the state permitting requirements are met (i.e., no-discharge options are explored and technology-based requirements (including ELGs) are met); and
  - 3) the permit is issued reflecting the highest statutory and regulatory requirements.

# Tier 2

- No evidence of existing significant water quality degradation.
- Lowering water quality is allowed if justified by a full antidegradation review (No adverse impact to beneficial uses).

# Tier 3

- Designated ONRWs and OSRWs.
- No lowering of water quality allowed.
- NO new direct discharges allowed.



# Antidegradation Summary Forms

Submit with the full antidegradation report and Water Quality Review Assistance/Antidegradation Review Request form.

- Tier Determination and Effluent Limit Summary
- Attachment A: Tier 2 – Significant Degradation
- Attachment B: Tier 2 – Minimal Degradation
- Attachment C: Temporary Degradation
- Attachment D: Tier 1 Review
- No Degradation Evaluation – Conclusion of Antidegradation Review

These forms are available at <http://www.dnr.mo.gov/forms/index.html> or <http://www.dnr.mo.gov/env/wpp/permits/antideg-implementation.htm>



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## Antidegradation Implementation

Starting Aug. 30, 2008, all permit applications for new or expanded discharges will be required to follow the new *Missouri Antidegradation Rule and Implementation Procedure*. The Antidegradation Review process will be initiated by requests for water quality based effluent limits.

[Antidegradation Rule and Implementation Procedure PDF](#) **Final**

Approved April 20, 2007 and revised on May 7, 2008.

### Antidegradation Review Request Form and Process Diagram

- Water Quality Review Assistance/ Antidegradation Review Request, Form--MO 780-1893 [Adobe PDF](#) / [Fill-in MS Word DOC](#)
- Antidegradation Review Summary - Tier Determination and Effluent Limit Summary, Form--MO 780-2025 [Adobe PDF](#) / [Fill-in MS Word DOC](#)
- Antidegradation Review Summary - Attachment A: Tier 2 - Significant Degradation, Form--MO 780-2021 [Adobe PDF](#) / [Fill-in MS Word DOC](#)
- Antidegradation Review Summary - Attachment B: Tier 2 - Minimal Degradation, Form--MO 780-2022 [Adobe PDF](#) / [Fill-in MS Word DOC](#)
- Antidegradation Review Summary - Attachment C: Temporary Degradation, Form--MO 780-2023 [Adobe PDF](#) / [Fill-in MS Word DOC](#)
- Antidegradation Review Summary - Attachment D: Tier 1 Review, Form--MO 780-2024 [Adobe PDF](#) / [Fill-in MS Word DOC](#)
- No Degradation Evaluation - Conclusion of Antidegradation Review, Form--MO 780-2026 [Adobe PDF](#) / [Fill-in MS Word DOC](#)



The activity shall be considered not to result in significant degradation, if:

- The proposed net increase in the discharge of a POC does not result in an increase in the ambient water quality concentration of the receiving water after mixing, or
- The reduction of the facility assimilative capacity (FAC) for an pollutant is less than 10 percent...

# EWQ or Significant Degradation?

- Dischargers will be required to generate EWQ for all POCs associated with the proposed discharge unless the discharger wishes to assume that significant degradation will result.
- Only credible data will be reviewed in order to determine the EWQ on a pollutant-by-pollutant basis for each POC.

# Determination of Existing Water Quality

- The preferred approach for assessing EWQ is to use previously collected data where available.
- Where adequate data is not available, the second preferred approach is to collect water quality data.
- The third preferred approach for assessing EWQ is to use an appropriate water quality model.
- Sometimes more than one approach may be needed to characterize EWQ for all POCs.

# Water Quality Assessment Procedures

- EWQ must be established at critical flow conditions.
- Submit a Quality Assurance Project Plan (QAPP) or similar document to the department.
- Notify the department early as to the nature of the discharge, receiving water, discharge location, and effluent characteristics.
- The initial consultation may also be used to evaluate the availability of existing data that may be used as a supplement to, or in lieu of, new EWQ data.

# Necessity of Degradation

An applicant proposing **any new or expanded discharge** that would **significantly degrade** water quality is required to prepare an evaluation of **alternatives** to the proposed discharge. The purpose of this evaluation is to **determine** whether or not the proposed discharge is “**necessary**,” that is, no reasonable alternative(s) exist to prevent significant degradation. The applicant should evaluate a range of non-degrading or less-degrading pollution control alternatives.

# Selecting a Reasonable Alternative

## ■ **Practicability**

- Evaluation of the effectiveness, reliability, and potential environmental impacts

## ■ **Economic Efficiency** –

- Alternatives that are deemed practicable must undergo a direct cost comparison (Present Worth Framework recommended).
- As a non-binding rule-of-thumb, alternatives less than 120 percent of the base cost of pollution control measures are economically efficient.

## ■ **Affordability** –

- Optional.
- May be used to determine if the alternative is too expensive.



# Practicability

- 1) Effectiveness and Reliability
- 2) Environmental Factors

# Practicability

## 1) Effectiveness and Reliability

- Certainty of achieving technology-based requirements and water quality criteria to protect existing uses
- Technical feasibility of alternatives (no-discharge within dense urban area)
- System or technology reliability, potential for upsets/accidents
- Nature of pollutants discharged
- Influent flow variability, timing, and duration

# Practicability (continued)

## 2) Environmental Factors

- Sensitivity of stream uses
- Sensitivity of groundwater uses in the area
- Effect on endangered species
- Potential to generate secondary water quality impacts (stormwater, hydrology)
- Other secondary environmental impacts

# Economic Efficiency

- Analysis of costs to optimize the balance between water quality benefits and project costs.
- General cost categories include:
  - Capital costs and annual operating costs (including cost escalation)
  - Other costs (one-time costs, savings, opportunity cost, salvage value)
- Applicants should use a **present worth framework** for reporting cost information.
- The alternative that is most economically efficient is then compared to the base cost of pollution control.
- Applicants should evaluate the economic efficiency of the treatment options for each of the primary POCs.



# Present Worth Calculations

- = Capital Costs (Initial Construction)
- + Annual Operating Costs  
(Examples: Labor, Laboratory, and Electricity)
- + Future Costs (Equipment Replacement)

# Solving for Present Worth (PW) of annual operating costs

$$PW = A * \frac{(1 + i)^n - 1}{i (1 + i)^n}$$

A = Annual operating costs (any other annual expenses)

i = Interest rate as a decimal (If interest rate is 10%, i = 0.10)

n = Number of years (Design life of treatment facility)

# Solving for Present Worth (PW) of future costs

$$PW = \frac{F}{(1 + i)^n}$$

F = Future costs in year n (equipment replacement in year n)

i = Interest rate as a decimal (If interest rate is 10%, i = 0.10)

n = Number of years to the future cost (10 year replacement)



# Economic Efficiency

## (Annualized Costs Methodology)

- Objectives

- Determine general cost categories
- Find annual costs for values
- Calculate annual cost for values if not in annual cost

# General Cost Categories

- Capital Costs
- Replacement Costs
- Operating Costs
- Maintenance Costs
- Salvage Values
  - Only when pertinent

# Annualized Costs Methodology

- Make sure to take all costs into account
- Find annual costs for all categories
  - Most costs are given in terms of annual cost except capital costs
- Calculate the Annualized Cost for the alternative by adding together each of the general cost categories for that alternative
- Compare alternatives based on Annualized Costs to give all alternatives equal weight

# Calculations

- Annualized Capital Costs =

$$AC = PVC \times \frac{r \times (1 + r)^n}{(1 + r)^n - 1}$$



where,

*AC* = annualized cost accrued at the end of each of *n* periods;

*PVC* = present value of costs;

*r* = the discount rate per period; and

*n* = the duration of the policy.

- Other Costs are typically given in annual costs already
  - Operating
  - Maintenance
  - Replacement

# Costs Comparison

- Compare alternatives based on annualized costs
- Time horizon should be consistent for comparisons
- Projects can be economically efficient yet not affordable



# Economic Efficiency Example

- Based off EPA guidance

## Cost of Wastewater Treatment Upgrade

### Capital Improvements

1990 dollars \$2,500,000

1994 dollars \$3,300,000 (using ENR capital cost index of 1.32)

### Annual Operating Costs

1990 dollars \$750,000

1994 dollars \$802,500 (using ENR operating cost index of 1.07)

## Financing for Wastewater Treatment Upgrade

### Source of Financing

General obligation bond

### Repayment Term, Vehicle

20 years, property and sales tax revenues

### Bond Rate

8.45% (optimistic), 11% (realistic)

### Total Annual Cost of Existing Plant

\$2,950,500

# I. Calculating the Municipal Preliminary Screener

## A. Calculate Average Annualized Cost Per Household

### 1. Calculate the Total Annual Cost of the Project

Interest Rate for Financing ( $i$ ) = 0.0845 (expressed as a fraction)

Time Period for Financing ( $n$ ) = 20 years

★ Annualization Factor  $\left( \frac{i}{(i + 1)^n - 1} + i \right) =$  0.1052865 (1)

Total Capital Cost of Project to be Financed = \$ 3,300,000 (2)

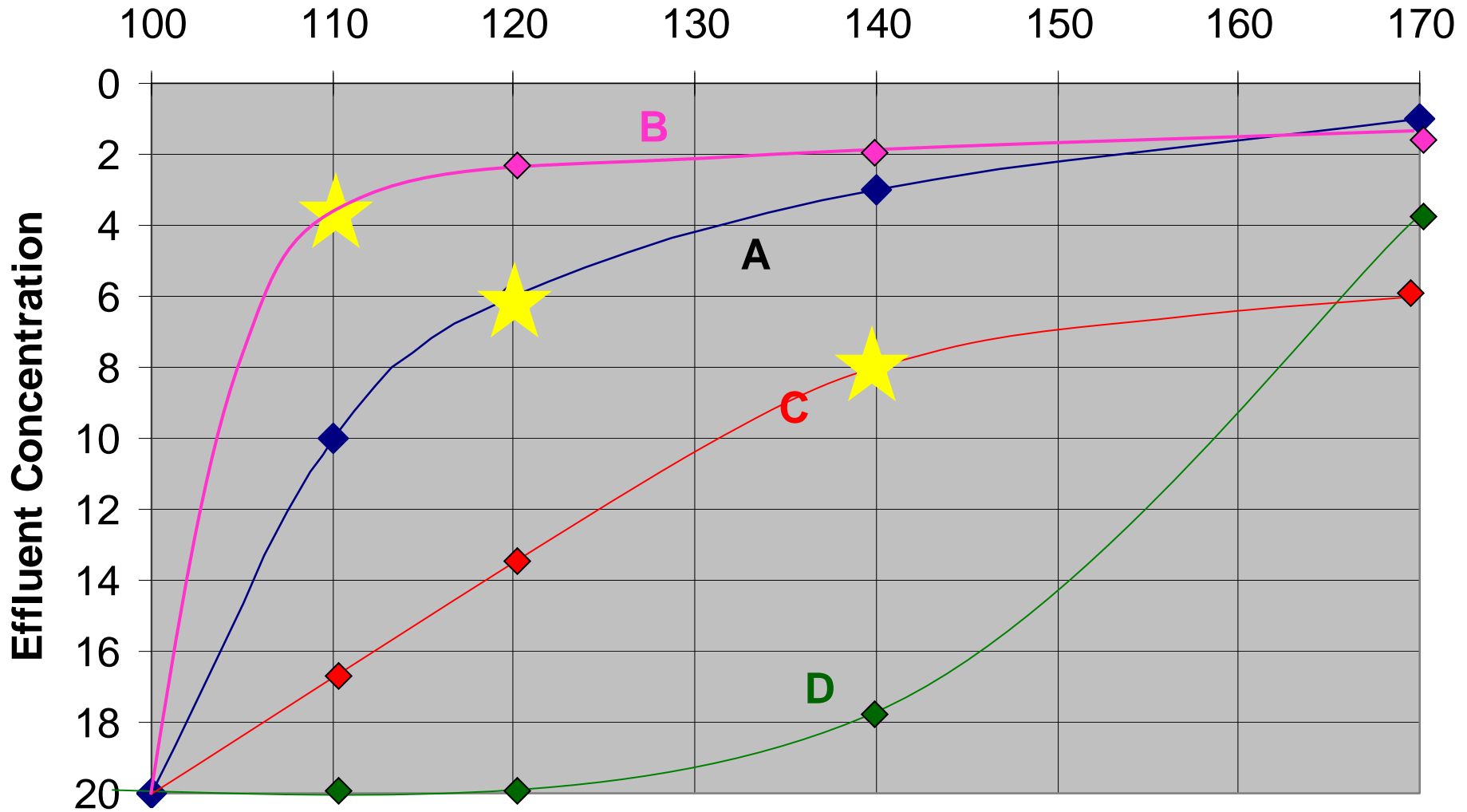
Annual Operating Costs of Project = \$ 802,500 (3)

Annualized Capital Cost [(1) x (2)] = \$ 347,445 (4)

Total Annual Cost of Project [(3) + (4)] = \$ 1,149,945 (5)

# Economic Efficiency (Knee of Curve)

Percent of Base Cost



# Affordability

- Optional - Alternatives identified as most practicable and economically efficient are considered affordable if the applicant does not supply an affordability analysis.
- The U.S. Environmental Protection Agency's water quality standards handbook – “Interim Economic Guidance for Water Quality Standards,” EPA-823-B-95-002 (1995)
- If the most efficient alternative is not affordable, then the affordability of the next most efficient alternative should be evaluated until an alternative is chosen that is practical, economically efficient and affordable.

# Social and Economic Importance (SEI)

## Steps in Determining SEI

- Identify the affected community
  - geographical area in which the waters are located
    - Those living near the site of the proposed project
    - Those expected to directly or indirectly benefit from the project.
- Identify relevant factors that characterize the social and economic conditions of the affected community.
- Describe the important social and economic development associated with the project

# Affected Community

- The populace, who are the ones connected to and ultimately paying for the wastewater treatment facility,
- the County, local school district, and other governmental entities as it may affect their tax base and demand for services,
- and the neighboring and downstream landowners.

# Social and Economic Factors

- Measures of employment or income
- Production
- Housing
- Community tax base
- Necessary public services (e.g., fire department, school, infrastructure)
- Public health, safety or environmental problem
- Additional factors

# Social and Economic Demonstration

- 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 project constitutes important social and economic development if the applicant demonstrates that the project will lead to beneficial changes in the factors presented.



# Questions?

Contact information:

[keith.forck@dnr.mo.gov](mailto:keith.forck@dnr.mo.gov)

573-526-4232



# Break

Return for Example Project

Contact information:

[keith.forck@dnr.mo.gov](mailto:keith.forck@dnr.mo.gov)

573-526-4232

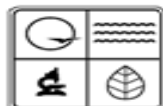
# City of Metropolis (Example Project)

## ■ Existing:

- 0.02 MGD POTW
- Lagoon – 30 mg/L BOD and 60 mg/L TSS limits
- I&I issues

## ■ Proposed:

- 0.05 MGD POTW
- Secondary Treatment +
- I&I storage
- Discharge to Unnamed tributary to South Turkey Creek with second waterbody segment being South Turkey Creek (1.00 miles downstream).



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
 WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH  
**WATER QUALITY REVIEW ASSISTANCE/ANTIDegradation REVIEW REQUEST**  
 PRE-CONSTRUCTION REVIEW FOR PROTECTION OF BENEFICIAL USES AND DEVELOPING EFFLUENT LIMITS

TYPE OF PROJECT <input type="checkbox"/> Grant <input type="checkbox"/> SRF Loan <input type="checkbox"/> All Other Projects	
REQUESTER Your Consulting Engineer	TELEPHONE NUMBER WITH AREA CODE 800-361-4827
PERMITTEE CITY OF METROPOLIS	TELEPHONE NUMBER WITH AREA CODE 573-751-1300
<b>REASON FOR REQUEST</b>	
<input type="checkbox"/> New Facility (See Instruction #9) <input type="checkbox"/> Upgrade (No expansion) (See AIP, Section II.B.1) <input checked="" type="checkbox"/> Expansion	
DESCRIPTION OF PROPOSED ACTIVITY: Expansion of wastewater treatment system from 20,000 <u>gpd</u> to 50,000 <u>gpd</u> .	
<b>FACILITY INFORMATION</b>	
FACILITY NAME METROPOLIS WWTF	MSOP NUMBER (IF APPLICABLE) MO-XXXXXXXX
COUNTY KENT	SIC / NACS CODE 4952
METHOD OF BACTERIA COMPLIANCE	

OUTFALL	NEW DESIGN FLOW** (MGD)	TREATMENT TYPE	EFFLUENT TYPES*
001	0.05	Secondary +	Domestic
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\* Describe predominating character of effluent. Example: Domestic Wastewater, Municipal Wastewater, Industrial Wastewater, Storm water, Mining Leachate, etc.

\*\* If expansion, indicate new design flow.

Checked for rare or endangered species and provided determination with this request. See Instruction #8.

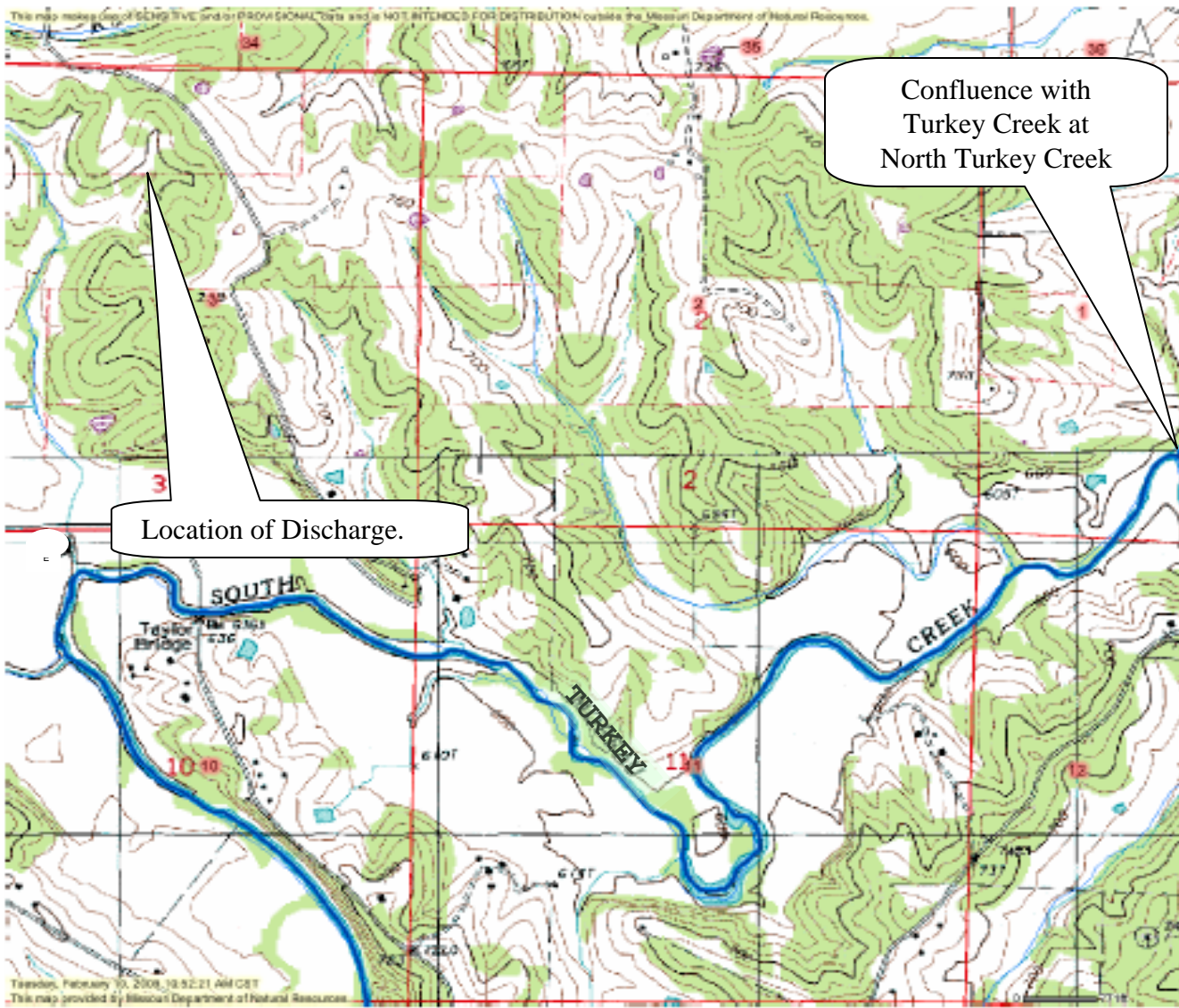
**ANTIDegradation REVIEW SUBMISSION:**

See attached Antidegradation instructions. Applicant supplied a summary within:

- Tier Determination and Effluent Limit Summary
- Attachment A – Significant Degradation
- Attachment B – Minimal Degradation
- Attachment C – Temporary degradation
- Attachment D – Tier 1 Review
- No Degradation Evaluation – Conclusion of Antidegradation Review

# Metropolis

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### Legend

- MPDES Outlets
  - CAPS
  - MUNICIPAL
  - NON-POINT
- MPDES Stormwater
  - MPDES Table E (F)
  - MPDES Table E (D)
  - MPDES Table D
  - Lossing Streams
  - MPDES - Table H
  - MPDES - Table G
- M&D 1-1006
- Public Land Survey System
- County Boundary
- Impaired Waters 2002 - 2006
- Biological Reference Stream Segments

Location of Discharge.

Confluence with Turkey Creek at North Turkey Creek



View Scale 1:21,030

Disclaimer: Although this map has been compiled by the Missouri Department of Natural Resources, no warranty, expressed or implied, is made by the department as to the accuracy of data and related materials. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by the department in the use of these data or related materials.



# MDC

Missouri Department of Conservation

# gis mapping service

## What An Inquiry Will Tell You

There are three levels of response based upon your search.

**Level 1:** A letter of no further action (print this for your records).

**Level 2:** A state species or natural community of conservation concern has been identified in the proposed project area. Contact the Missouri Department of Conservation Policy Coordination Section (contact information given).

**Level 3:** A Federally listed, proposed, or candidate species has been identified in the proposed project area. Contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation Policy Coordination Section (contact information given).

Perform a Search by clicking on a radio button below.

- Search by Township, Range, and Section [Help](#)
- Search by Latitude and Longitude using decimal degrees [Help](#)
- Search by NAD83 UTM Zone 15 [Help](#)
- Search interactively on the map display by drawing a point, line, or polygon. **This search option may not work with browsers other than Microsoft Internet Explorer.** [Help](#)

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# Natural Heritage Review

## On-line LEVEL 1 REPORT

*Print this page and use/attach as documentation that your project has consulted with the Missouri Department of Conservation and the U.S. Fish and Wildlife Service about species of conservation concern.*

*No further consultation about this project is necessary.*

February 19, 2009

### Your login and project information below:

User ID: 908  
First Name: keith  
Last Name: forck  
Email Address: keith.forck@dnr.mo.gov  
Business: department of natural resources  
Project: Wastewater

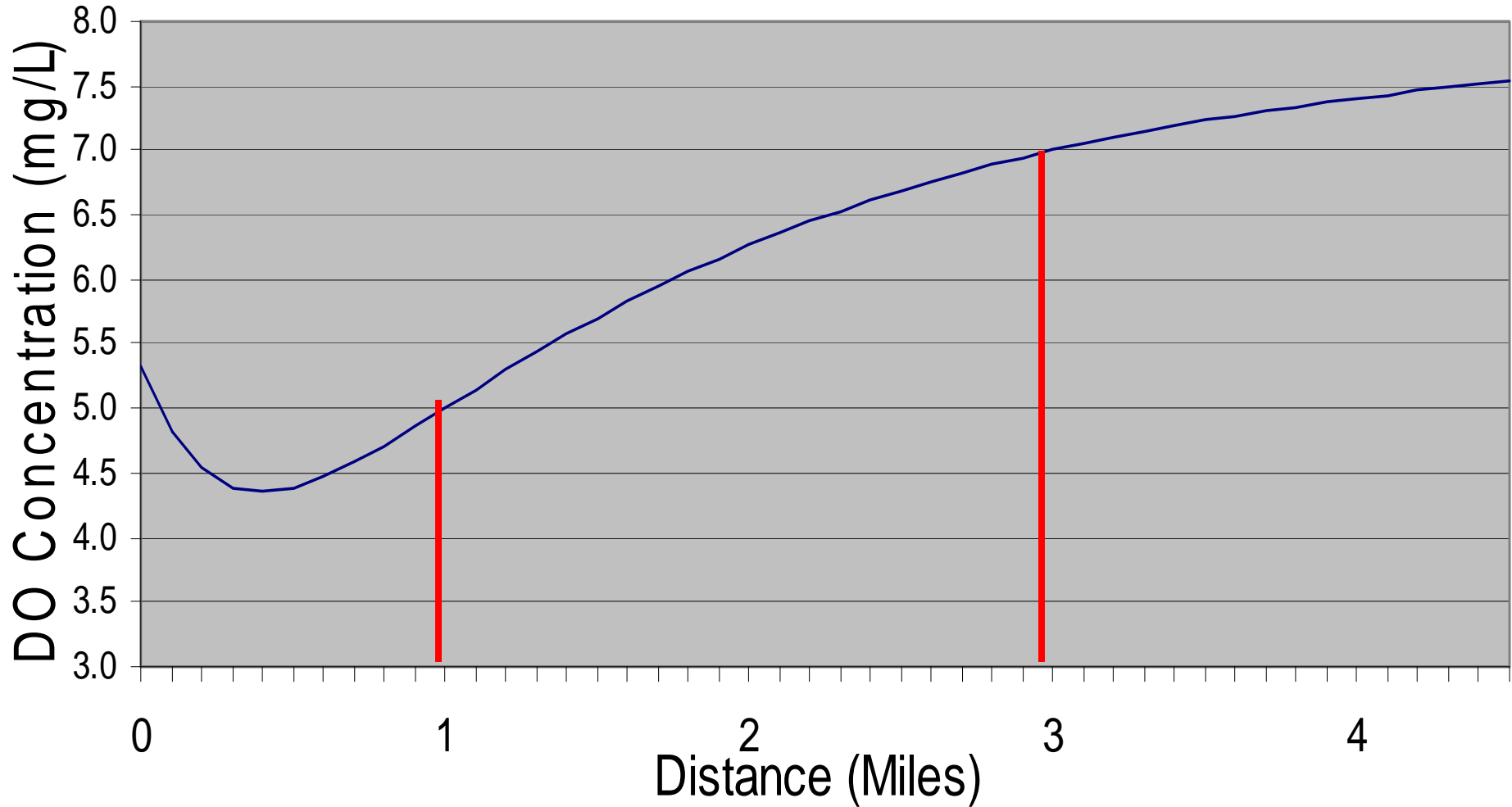
### Your query information below:

User ID	Response Level	Township	Range	Section	Direction	Latitude	Longitude	Point	Line	UTM North	UTM East	Rectangle	TimeStamp
908		38	22	3	W	0	0			0	0		2/19/2009 12:48:31 PM

Wastewater

Wastewater – storm sewer, sanitary sewer, treatment plant, discharge

# Streeter-Phelps DO Model Results



# Total Ammonia Nitrogen

Early Life Stages Present Total Ammonia Nitrogen criteria apply. [10 CSR 20-7.031(4)(B)7.C. & Table B3].

+

Season	Temp (°C)	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: May 1 – October 31, Winter: November 1 – April 30. □

Used a modified Feed Forward Reaction decay formula to allow degradation for ammonia:

$$[\text{NH}_3\text{N}]_t = [\text{NH}_3\text{N}]_{t=0} * e^{-kt}$$

$[\text{NH}_3\text{N}]_t$  = ammonia concentration at confluence with classified segment.

$[\text{NH}_3\text{N}]_{t=0}$  = ammonia concentration at pipe =  $C_e$

$k$  =  $\text{NH}_3$  oxidation per day ( $k_{1,20}$ ) $E_1^{(\text{Temp}-20)}$

$$k_{1,20} = 0.3(\text{day}^{-1})$$

$$E_1 = \text{temperature correction factor} = 1.083$$

Time for effluent to travel to first classified segment (in days) = 0.26 days =  $t$

Summer Temp. = 26°C

Given  $k = (0.3)(1.083)^{(26-20)} = 0.4841$  and  $t = 0.16$  days;  $e^{-kt} = e^{-(0.4841)(0.26)} = 0.88$ .

88 % of the ammonia concentration remains after leaving the facility and reaching the first classified stream segment.

$$C_e = (1.5 \text{ mg/L}) / 0.88 = 1.7 \text{ mg/L}$$

$$LTA_e = 1.7 \text{ mg/L} (0.780) = \mathbf{1.3 \text{ mg/L}}$$

[CV = 0.6, 99<sup>th</sup> Percentile, 30 day average]

$$MDL = 1.3 \text{ mg/L} (3.11) = 4.0 \text{ mg/L}$$

[CV = 0.6, 99<sup>th</sup> Percentile]

$$AML = 1.3 \text{ mg/L} (1.19) = 1.6 \text{ mg/L}$$

[CV = 0.6, 95<sup>th</sup> Percentile, n = 30]



# Non-Degrading Alternatives

- Land Application
- Sub-Surface Irrigation
- Regional Sewer
- Alternative Discharge Location
- Recycling or Reuse



# Less Degrading Alternatives

- Extended Aeration – Base Cost Technology
- Recirculating Sand Filter
- Extended Aeration with Filtration
- Membrane Bioreactor
- Membrane Bioreactor with Reverse Osmosis

# Alternative One

- Practicability
  1. Operator Preference – past experience
  2. Concern about occasional upsets/poor settling
- Economic Efficiency
  1. Base Cost – Present Worth - \$1000
  2. Effluent Concentrations of:
    - 20 mg/L for BOD and TSS
    - 1.5 mg/L for Ammonia (Summer)
    - 2.5 mg/L for Ammonia (Winter)

# Alternative Two

- Practicability

1. Catch Solids
2. Concern about Effluent Ammonia Concentration

- Economic Efficiency

1. Present Worth Cost - \$1100
2. Effluent Concentrations of:
  - 10 mg/L for BOD and TSS
  - 1.6 mg/L for Ammonia (Summer)
  - 2.6 mg/L for Ammonia (Winter)

# Alternative Three

- Practicability

1. Catch Solids that may pass through clarifier
2. Concern about somewhat more maintenance

- Economic Efficiency

1. Present Worth Cost - \$1250
2. Effluent Concentrations of:
  - 10 mg/L for BOD and TSS
  - 1.2 mg/L for Ammonia (Summer)
  - 2.2 mg/L for Ammonia (Winter)

# Alternative Four

- Practicability

1. Produces very clean effluent
2. Concern about O&M – Energy Intensive

- Economic Efficiency

1. Present Worth Cost - \$1600
2. Effluent Concentrations of:
  - 3.0 mg/L for BOD and TSS
  - 0.8 mg/L for Ammonia (Summer)
  - 1.8 mg/L for Ammonia (Winter)

# Alternative Five

- Practicability

1. Almost 100% treatment
2. Concern about \$\$\$\$\$\$

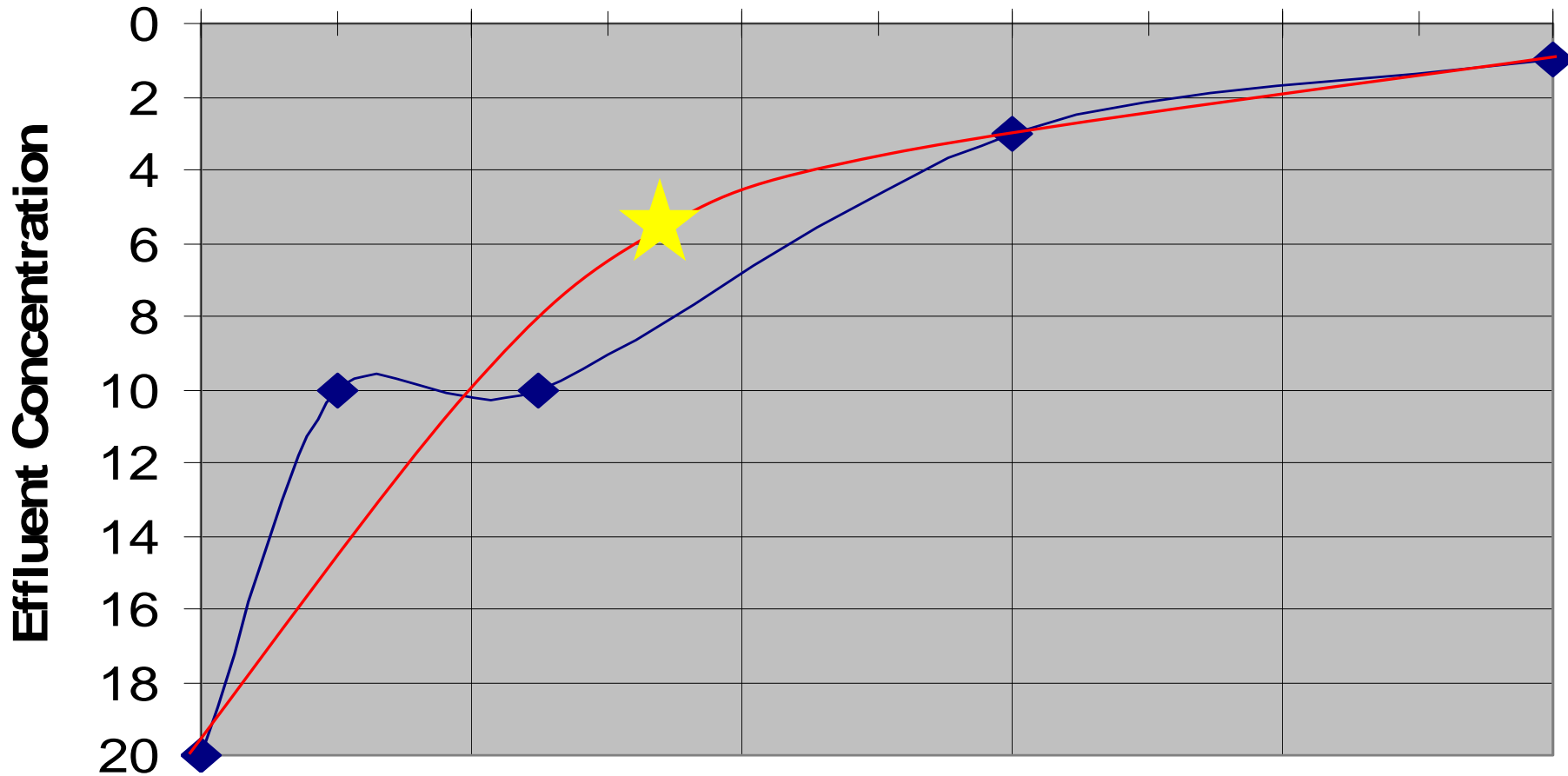
- Economic Efficiency

1. Present Worth Cost - \$2000
2. Effluent Concentrations of:
  - 1.0 mg/L for BOD and TSS
  - 0.6 mg/L for Ammonia (Summer)
  - 1.6 mg/L for Ammonia (Winter)

# Economic Efficiency (Knee of Curve)

Percent Base Cost (Present Worth)

100 120 140 160 180 200

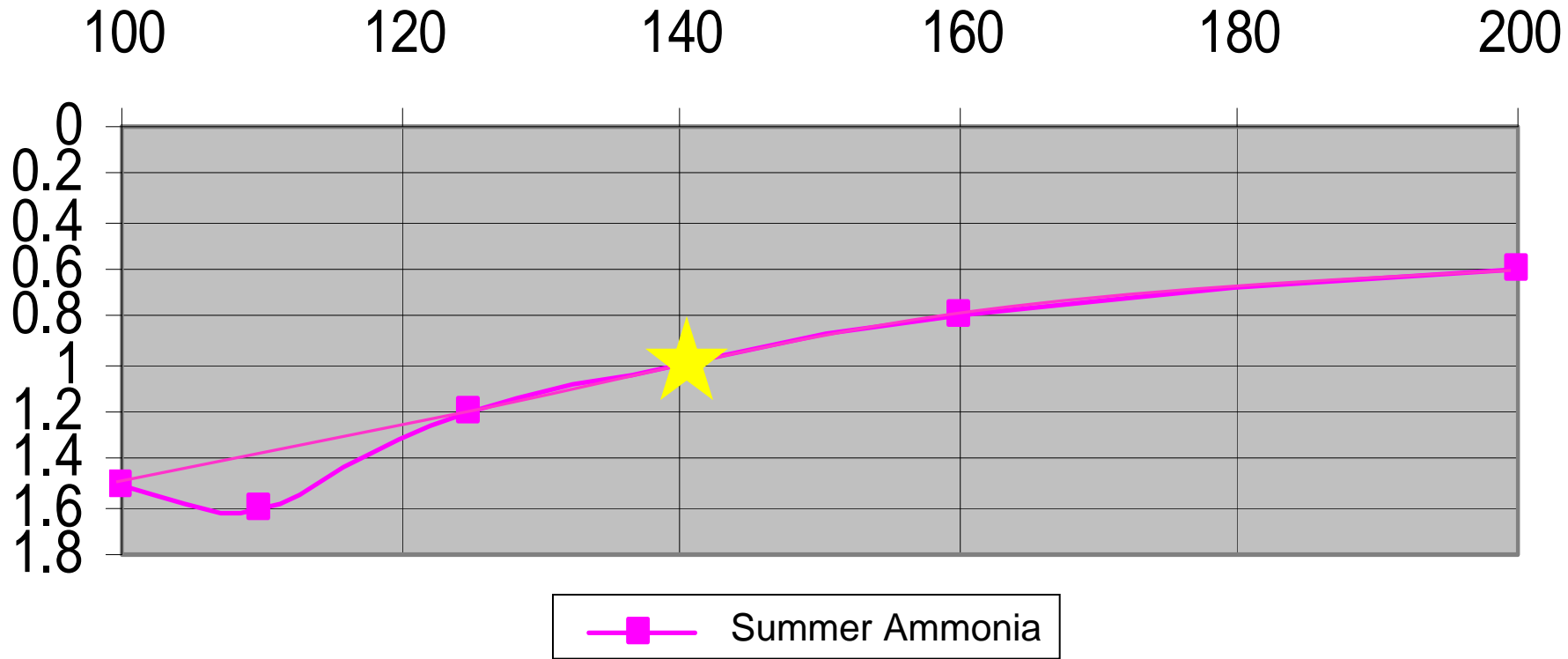


—◆— BOD & TSS

# Economic Efficiency (Knee of Curve)

Percent Base Cost (Present Worth)

Effluent Concentration

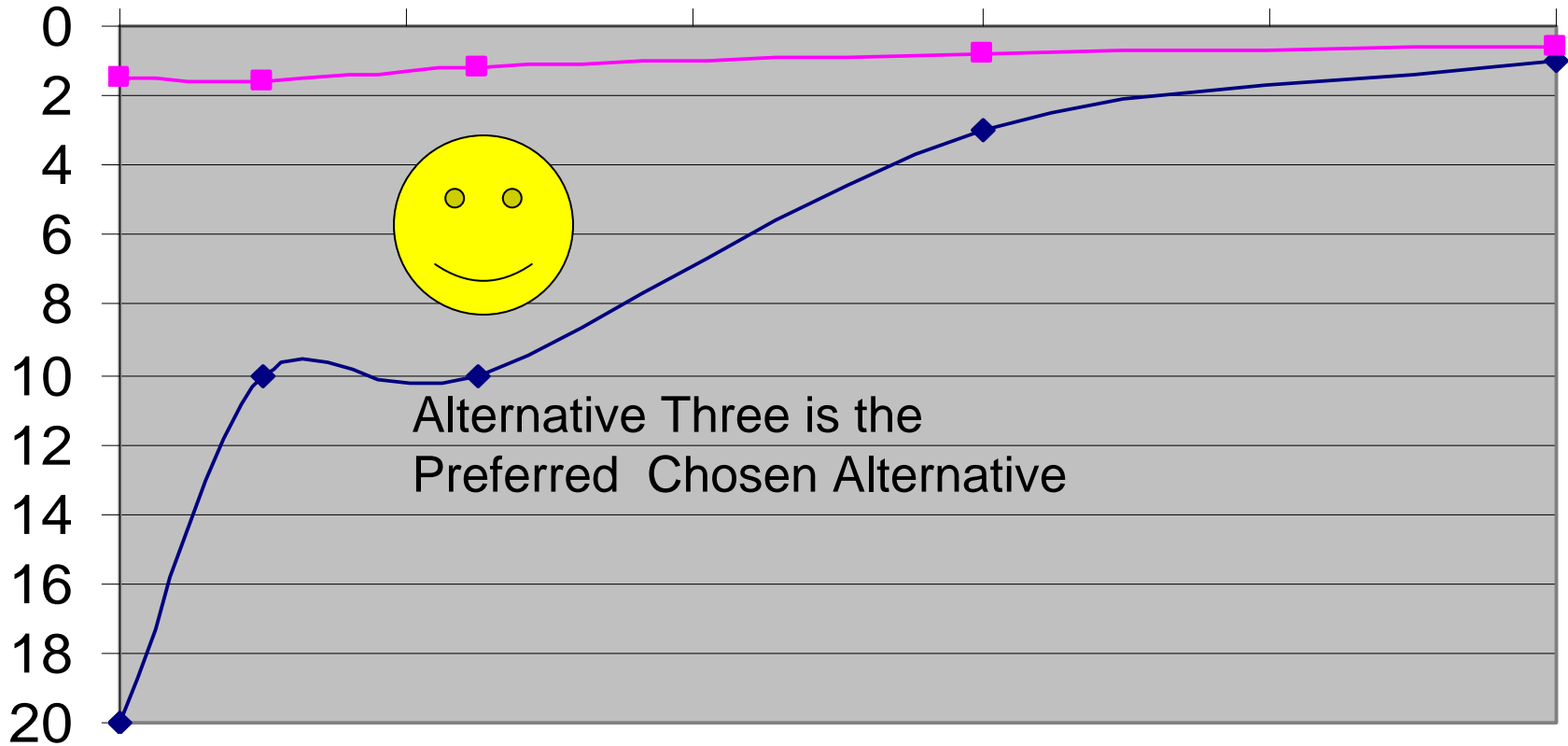


# Economic Efficiency (Knee of Curve)

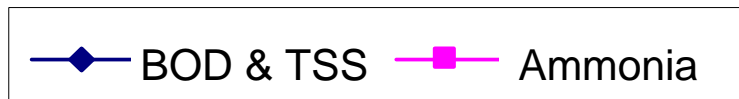
Percent Base Cost (Present Worth)

100 120 140 160 180 200

Effluent Concentration



Alternative Three is the Preferred Chosen Alternative



# Social and Economic Importance (SEI)

The affected community is:

- the citizens of Metropolis as they are the ones ultimately paying for the wastewater treatment facility,
- the County of Kent, and the R-IV school district as it will increase the tax base and demand for services,
- And the downstream landowners along the unnamed tributary and South Turkey Creek.



# Social and Economic Factors

- Housing
- Community tax base
- Necessary public services (e.g., fire department, school, infrastructure)
- Public health, safety or environmental problem

# City of Metropolis SEI

- This facility will provide one of the services necessary (wastewater treatment) to allow the City to continue growing at approximately 4.3% per year for the next 20 years. This bedroom community provides housing for the commuters to the bigger cities to the east and west. The City does not believe this growth will cause the City to lose its' small community neighborhood atmosphere.
- With the City of Metropolis being the third biggest city in Kent County, it provides for important tax base for the county to continue to operate. The county believes services are provided more efficiently to denser population growth areas than to scattered rural housing.
- For the downstream landowners, it will provide for improved water quality in the receiving streams.



# Questions?

Contact information:

[keith.forck@dnr.mo.gov](mailto:keith.forck@dnr.mo.gov)

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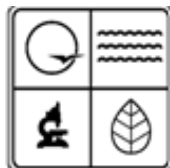


# Lunch

Contact information:

[keith.forck@dnr.mo.gov](mailto:keith.forck@dnr.mo.gov)

573-526-4232



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH  
**ANTIDEGRADATION REVIEW SUMMARY**  
**TIER DETERMINATION AND EFFLUENT LIMIT SUMMARY**

### 1. FACILITY

NAME <b>METROPOLIS WWTF</b>		TELEPHONE NUMBER WITH AREA CODE <b>573-751-1300</b>	
ADDRESS (PHYSICAL) <b>270 PURPHECT DRIVE</b>	CITY <b>METROPOLIS</b>	STATE <b>MO</b>	ZIP CODE <b>654321</b>

### 2. RECEIVING WATER BODY SEGMENT #1

NAME  
**UNNAMED TRIBUTARY TO SOUTH TURKEY CREEK – FROM OUTFALL TO MOUTH**

- 2.1 UPPER END OF SEGMENT (Location of discharge)  
UTM **557043.9 426251** OR Lat , Long
- 2.2 LOWER END OF SEGMENT  
UTM **557101.1 426123** OR Lat , Long

Per the Missouri Antidegradation Rule and 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."

### 3. WATER BODY SEGMENT #2 (IF APPLICABLE)

NAME  
**SOUTH TURKEY CREEK – FROM CONFLUENCE WITH UNNAMED TRIB. TO TURKEY CREEK (NORTH TURKEY CR.)**

- 3.1 UPPER END OF SEGMENT  
UTM **557101.1 426123** OR Lat , Long
- 3.2 LOWER END OF SEGMENT  
UTM **560295.1 426161** OR Lat , Long

### 4. WATER BODY SEGMENT #3 (IF APPLICABLE)

NAME  
**N/A**

## 5. PROJECT INFORMATION

**Is the receiving water body an Outstanding National Resource Water, an Outstanding State Resource Water, or drainage thereto?**

Yes       No

In Tables D and E of 10 CSR 20-7.031, Outstanding National Resource Waters and Outstanding State Resource Water are listed. Per the Antidegradation Implementation Procedure Section 1.B.3., "any degradation of water quality is prohibited in these waters unless the discharge only results in temporary degradation." Therefore, if degradation is significant or minimal, the Antidegradation Review will be denied.

**Will the proposed discharge of all pollutants of concern, or POCs, result in no net increase in the ambient water quality concentration of the receiving water after mixing?**

Yes       No

If yes, submit a summary table showing the levels of each pollutant of concern before and after the proposed discharge in the receiving water and then complete Attachment B for the first downstream classified water body segment.

**Will the discharge result in temporary degradation?**

Yes       No

If yes, complete Attachment C.

**Has the project been determined as non-degrading?**

Yes       No

If yes, complete No Degradation Evaluation – Conclusion of Antidegradation Review form.

Submit with the appropriate Construction Permit Application as no antidegradation review is required.

**If yes to one of the above questions, skip to Section 8 - Wet Weather.**

# Tier Determination and Effluent Limit Summary Page 2

<b>7. POLLUTANTS OF CONCERN AND TIER DETERMINATION(S)</b>		
Pollutants of Concern to be considered include those pollutants reasonably expected to be present in the discharge per the Antidegradation Implementation Procedure Section II.S. The tier protection levels are specified and defined in rule at 10 CSR 20-7.031 (2).		
<b>Water Body Segment One Pollutants of Concern and Tier Determination(s)</b>		
<b>Tier 1</b>	<b>Tier 2 with Minimal Degradation</b>	<b>Tier 2 with Significant Degradation</b>
	BACTERIA (FECAL C.)	BIOCHEMICAL OXYGEN DEMAND <sup>5*</sup>
	BACTERIA (E. COLI)	TOTAL SUSPENDED SOLIDS*
		DISSOLVED OXYGEN*
		AMMONIA*
<b>Note:</b> Add an asterisk to items that you only assume are Tier 2 with significant degradation.		
<b>Water Body Segment Two Pollutants of Concern and Tier Determination(s)</b>		
<b>Tier 1</b>	<b>Tier 2 with Minimal Degradation</b>	<b>Tier 2 with Significant Degradation</b>
	BACTERIA (FECAL C.)	BIOCHEMICAL OXYGEN DEMAND <sup>5*</sup>
	BACTERIA (E. COLI)	TOTAL SUSPENDED SOLIDS*
		DISSOLVED OXYGEN*
		AMMONIA*

- For pollutants of concern that are Tier 2 with significant degradation, complete Attachment A.
- For pollutants of concern that are Tier 2 with minimal degradation, complete Attachment B.
- For pollutants of concern that are Tier 1, complete Attachment D. Additionally, a Tier 2 review must be conducted for each pollutant of concern on the appropriate water body segment.

# Tier Determination and Effluent Limit Summary (Continued)

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## 8. WET WEATHER ANTICIPATIONS

If an applicant anticipates excessive inflow or infiltration and pursues approval from the department to bypass secondary treatment, a feasibility analysis is required. The feasibility analysis must comply with the criteria of all applicable state and federal regulations including 40 CFR 122.41(m)(4). Attach the feasibility analysis to this report.

**What is the Wet Weather Flow Peaking Factor in relation to design flow?** 4:1

### Wet Weather Design Summary:

EXTREME WET WEATHER EVENTS LEAD TO SOME HIGH PEAK FLOW MEASUREMENTS AT THE EXISTING LAGOON.

MO780-2025 (01/09)

## 9. SUMMARY OF THE PROPOSED ANTIDegradation REVIEW EFFLUENT LIMITS

What are the proposed pollutants of concern and their respective effluent limits that the selected treatment option will comply with:

Pollutant of Concern	Units	Wasteload Allocation	Average Monthly Limit	Daily Maximum Limit
BOD5	MG/L	10	10	15
TSS	MG/L	10	10	15
DISSOLVED OXYGEN	MG/L	6.0 Minimum		
AMMONIA (SUMMER)	MG/L	1.2	1.2	1.8
AMMONIA (WINTER)	MG/L	2.2	2.2	3.3
BACTERIA (E. COLI)	#/100ML	126		
BACTERIA (FECAL C.)	#/100ML		400	1000

These proposed limits must not violate water quality standards, be protective of beneficial uses and achieve the highest statutory and regulatory requirements.

Attach the Antidegradation Review report and all supporting documentation.

**CONSULTANT:** I have prepared or reviewed this form and all attached reports and documentation. The conclusion proposed is consistent with the Antidegradation Implementation Procedure and current state and federal regulation.

SIGNATURE

DATE

NAME AND OFFICIAL TITLES

COMPANY NAME

ADDRESS

CITY

STATE

ZIP CODE

TELEPHONE NUMBER WITH AREA CODE

E-MAIL ADDRESS

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

SIGNATURE

DATE

NAME AND OFFICIAL TITLES

ADDRESS

CITY

STATE

ZIP CODE

TELEPHONE NUMBER WITH AREA CODE

E-MAIL ADDRESS

**CONTINUING AUTHORITY:** Continuing Authority is the permanent organization that will be responsible for the operation, maintenance and modernization of the facility. 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](http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-6a.pdf).

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

SIGNATURE

DATE

NAME AND OFFICIAL TITLES

ADDRESS

CITY

STATE

ZIP CODE

TELEPHONE NUMBER WITH AREA CODE

E-MAIL ADDRESS



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
 WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH  
**ANTIDEGRADATION REVIEW SUMMARY**  
**ATTACHMENT A: TIER 2 – SIGNIFICANT DEGRADATION**

**1. FACILITY**

NAME METROPOLIS WWTF		TELEPHONE NUMBER WITH AREA CODE 573-751-1300	
ADDRESS (PHYSICAL) 270 PURPHECT DRIVE	CITY METROPOLIS	STATE MO	ZIP CODE 654321

**2. RECEIVING WATER BODY SEGMENT #1**

NAME  
UNNAMED TRIBUTARY TO SOUTH TURKEY CREEK – FROM OUTFALL TO MOUTH

**3. WATER BODY SEGMENT #2 (IF APPLICABLE)**

NAME  
SOUTH TURKEY CREEK – FROM CONFLUENCE WITH UNNAMED TRIB. TO TURKEY CREEK (NORTH TURKEY CR.)

**4. IDENTIFYING ALTERNATIVES**

Supply a summary of the alternatives considered and the level of treatment attainable with regards to the alternative. "For Discharges likely to cause significant degradation, an analysis of non-degrading and less-degrading alternatives must be provided," as stated in the Antidegradation Implementation Procedure Section II.B.1. Per 10 CSR 20-6.010(4)(D)1., the feasibility of a no-discharge system must be considered. Attach all supportive documentation in the Antidegradation Review report.

**Non-degrading alternatives:** LAND APPLICATION, SUB-SURFACE IRRIGATION, REGIONAL SEWER, ALTERNATIVE DISCHARGE LOCATION, RECYCLING OR REUSE

# ATTACHMENT A: TIER 2 – SIGNIFICANT DEGRADATION

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Alternatives ranging from less-degrading to degrading including Preferred Alternative  
(All must meet water quality standards):

Alternatives	Level of Treatment Attainable for each Pollutant of Concern					
	BOD	TSS	Ammonia as N (Summer)	Ammonia as N (Winter)	Bacteria (E. Coli)	Dissolved Oxygen
	(MG/L)	(MG/L)	(MG/L)	(MG/L)	(#/100ML)	(MG/L)
ALTERNATIVE FIVE	1	1	0.6	1.6	126	6.0
ALTERNATIVE FOUR	3	3	0.8	1.8	126	6.0
ALTERNATIVE THREE	10	10	1.2	2.2	126	6.0
ALTERNATIVE TWO	10	10	1.6	2.6	126	6.0
ALTERNATIVE ONE	20	20	1.5	2.5	126	6.0
██████████	██████████	██████████	██████████	██████████	██████████	██████████
██████████	██████████	██████████	██████████	██████████	██████████	██████████
██████████	██████████	██████████	██████████	██████████	██████████	██████████

**Identifying Alternatives Summary:** THE BASE CASE FOR PROTECTION OF BENEFICIAL USES WAS ALTERNATIVE ONE. THE ALTERNATIVES ABOVE ARE LISTED BY THE BOD EFFLUENT CONCENTRATIONS. THE ATTACHED REPORT DISCUSSES ALL THE ALTERNATIVES FROM THE NON-DEGRADATING THROUGH LESS-DEGRADING TO THE DEGRADING OPTION. IT ALSO DISCUSSES WHY ALL THE NON-DEGRADING ALTERNATIVES WERE DETERMINED NOT PRACTICABLE AND/OR NOT ECONOMICALLY EFFICIENT. LAGOON RETROFIT WAS NOT CONSIDERED FULLY DUE TO THE DESIRE TO USE THE BASIN FOR PEAK FLOW STORAGE WITH NO DISCHARGE INTENDED AND PRELIMINARY COST ESTIMATES.

# ATTACHMENT A: TIER 2 – SIGNIFICANT DEGRADATION

Page 2

## 5. DETERMINATION OF THE REASONABLE ALTERNATIVE

Per the Antidegradation Implementation Procedure Section II.B.2, "a reasonable alternative is one that is practicable, economically efficient and affordable." Provide basis and supporting documentation in the Antidegradation Review report.

### **Practicability Summary:**

"The practicability of an alternative is considered by evaluating the effectiveness, reliability, and potential environmental impacts," according to the Antidegradation Implementation Procedure Section II.B.2.a. Examples of factors to consider, including secondary environmental impacts, are given in the Antidegradation Implementation Procedure Section II.B.2.a.

THE NON-DEGRADING ALTERNATIVES WERE ALL DETERMINED NOT PRACTICABLE FOR VARIOUS REASONS INCLUDING SOILS, LAND VALUES, EASEMENTS, ETC. MORE DETAILS IN THE REPORT.

THE LESS-DEGRADING TO DEGRADING ALTERNATIVES WERE ALL DETERMINED TO BE PRACTICABLE. REPORT INCLUDES THE POSITIVES AND CONCERNS OF EACH ALTERNATIVE AS EACH LESS-DEGRADING TO DEGRADING ALTERNATIVE WAS CONSIDERED ACCEPTABLE.

### **Economic Efficiency Summary:**

Alternatives that are deemed practicable must undergo a direct cost comparison in order to determine economic efficiency. Means to determine economic efficiency are provided in the Antidegradation Implementation Procedure Section II.B.2.b.

ALTERNATIVE ONE IS THE BASE COST TECHNOLOGY. ALTERNATIVE TWO IS COST EFFECTIVE AT 110% OF THE BASE COST TECHNOLOGY. ALTERNATIVE THREE WAS ALSO CONSIDERED COST EFFECTIVE AT 125% OF THE BASE COST TECHNOLOGY. ALTERNATIVE FOUR AND FIVE WERE NOT CONSIDERED COST EFFECTIVE AT 160 AND 200 PERCENT OF THE BASE COST TECHNOLOGY, RESPECTIVELY.

# ATTACHMENT A: TIER 2 – SIGNIFICANT DEGRADATION

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## **Affordability Summary:**

Alternatives identified as most practicable and economically efficient are considered affordable if the applicant does not supply an affordability analysis. An affordability analysis per the Antidegradation Implementation Procedure Section II.B.2.c, "may be used to determine if the alternative is too expensive to reasonably implement."

THIS SECTION IS OPTIONAL. AN AFFORDABILITY ANALYSIS WAS NOT PERFORMED.

## **Preferred Chosen Alternative:**

ALTERNATIVE THREE WITH REAERATION IS THE PREFERRED CHOSEN ALTERNATIVE AS IT IS DETERMINED PRACTICABLE AND ECONOMICALLY EFFICIENT AND IS LESS DEGRADING THAN THE BASE CASE TECHNOLOGY.

## **Reasons for Rejecting the other Evaluated Alternatives:**

ALTERNATIVES FOUR AND FIVE WERE REJECTED BECAUSE THEY WERE NOT ECONOMICALLY EFFICIENT.

ALTERNATIVES ONE AND TWO ARE MORE DEGRADING THAN ALTERNATIVE THREE. SEE ATTACHED REPORT FOR MORE DISCUSSION.

## **Comments/Discussion:**

ALTHOUGH FACILITY HAS SOME CONCERN ABOUT AMMONIA EFFLUENT CONCENTRATIONS, ALL ALTERNATIVES WERE DETERMINED CAPABLE OF PROTECTING EXISTING USES AND MEETING WATER QUALITY STANDARDS.

# ATTACHMENT A: TIER 2 – SIGNIFICANT DEGRADATION

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## 6. SOCIAL AND ECONOMIC IMPORTANCE OF THE PREFERRED ALTERNATIVE

If the preferred alternative will result in significant degradation, then it must be demonstrated that it will allow important economic and social development in accordance to the Antidegradation Implementation Procedure Section II.E. 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.

### 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."

CITIZENS OF METROPOLIS  
COUNTY OF KENT & R-IV SCHOOL DISTRICT  
NEIGHBORS AND DOWNSTREAM LANDOWNERS

### Identify relevant factors that characterize the social and economic conditions of the affected community:

Examples of social and economic factors are provided in the Antidegradation Implementation Procedure Section II.E.1., but specific community examples are encouraged.

HOUSING  
COMMUNITY TAX BASE  
NECESSARY PUBLIC SERVICES (E. G., FIRE DEPARTMENT, SCHOOL, INFRASTRUCTURE)  
PUBLIC HEALTH, SAFETY OR ENVIRONMENTAL PROBLEM

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

Determining benefits for the community and the environment should be site specific and in accordance with the Antidegradation Implementation Procedure Section II.E.1.

PROVIDE FOR GROWTH OF APPROXIMATELY 4.3% PER YEAR FOR THE NEXT 20 YEARS. IMPORTANT TAX BASE FOR THE COUNTY & COUNTY BELIEVES SERVICES ARE PROVIDED MORE EFFICIENTLY TO DENSER POPULATION GROWTH AREAS THAN TO SCATTERED RURAL HOUSING. PROVIDE FOR IMPROVED WATER QUALITY IN THE RECEIVING STREAM.

# ATTACHMENT A: TIER 2 – SIGNIFICANT DEGRADATION

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**PROPOSED PROJECT SUMMARY:**

METROPOLIS IS PROPOSING TO UPGRADE AND EXPAND THE EXISTING WASTEWATER TREATMENT FACILITY. THIS EXPANSION WOULD INCREASE THE DESIGN FLOW FROM 0.02 MGD TO 0.05 MGD. THE PROPOSED FACILITY IS ALTERNATIVE THREE WITH REAERATION.

Attach the Antidegradation Review report and all supporting documentation. This is a technical document, which must be signed, sealed and dated by a registered professional engineer of Missouri.

**CONSULTANT:** I have prepared or reviewed this form and all attached reports and documentation. The conclusion proposed in consistent with the Antidegradation Implementation Procedure and current state and federal regulations.

SIGNATURE

DATE

PRINT NAME

LICENSE #:

TELEPHONE NUMBER WITH AREA CODE

E-MAIL ADDRESS:

**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



# Questions?

Contact information:

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573-526-4232