

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION



MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92<sup>nd</sup> Congress) as amended,

Permit No. MO-0055409

Owner: City of Farber  
Address: P.O. Box 37, Farber, MO 63345

Continuing Authority: Same as above  
Address: Same as above

Facility Name: Farber Wastewater Treatment Facility  
Facility Address: 0.3 miles east of County Road 544 and Highway AA intersection, Farber, MO 63345

Legal Description: See Page 2  
UTM Coordinates: See Page 2

Receiving Stream: See Page 2  
First Classified Stream and ID: See Page 2  
USGS Basin & Sub-watershed No.: See Page 2

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

See Page 2

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051.6 of the Law.

April 1, 2014  
Effective Date

Sara Parker Pauley, Director, Department of Natural Resources

December 31, 2018  
Expiration Date

John Madras, Director, Water Protection Program

**FACILITY DESCRIPTION** (continued)

POTW – SIC #4952

The use or operation of this facility shall be by or under the supervision of a Certified “D” Operator.

Two-cell storage lagoon / wastewater irrigation / sludge is retained in lagoon.

Design population equivalent is 800.

Design flow is 82,000 gallons per day (1-in-10 year design including net rainfall minus evaporation).

Average design flow is 70,000 gallons per day (dry weather flows).

Actual flow is 60,000 gallons per day.

Design sludge production is 7.8 dry tons per year.

**Receiving Stream Watershed:** a gaining stream setting

**Facility Type:**

No-discharge Storage and Irrigation System for annual flows into gaining stream

**Design Basis:**

Design dry weather flows:

**Average Annual**

70,000 gpd

Design with 1-in-10 year flows:

82,000 gpd

Design PE: 800

**Permitted Feature #001 - Storage Cell #1:**

Freeboard for basin: 1 foot

Storage volume (minimum to maximum water levels) 3,909,000 gallons

Legal Description:

SE ¼, SW ¼, NW ¼, Sec. 22, T52N, R6W, Audrain County

UTM Coordinates:

X=623581, Y=4348025

Receiving Stream:

Unnamed tributary to Hickory Creek (U)

First Classified Stream and ID:

Hickory Creek (C) (186)

USGS Basin & Sub-watershed No.:

(07110008-0102)

**Permitted Feature #002 - Storage Cell #2:**

Freeboard for basin: 1 foot

Storage volume (minimum to maximum water levels) 12,900,000 gallons

Legal Description:

NE ¼, NE ¼, SW ¼, Sec. 22, T52N, R6W, Audrain County

UTM Coordinates:

X=623918, Y=4347720

Receiving Stream:

Unnamed tributary to Hickory Creek (U)

First Classified Stream and ID:

Hickory Creek (C) (186)

USGS Basin & Sub-watershed No.:

(07110008-0102)

**Storage Capacity (in Days):**

Design for dry weather flows:

240 days

Design with 1-in 10 year flows:

205 days

**FACILITY DESCRIPTION** (continued)

**Permitted Feature #003 – Center Pivot Land Application Field (120 acre field)**

Legal Description: SW ¼, Sec. 22, T52N, R6W, Audrain County  
UTM Coordinates: X=623587, Y=4347486  
Receiving Stream: Unnamed tributary to Hickory Creek (U)  
First Classified Stream and ID: Hickory Creek (C) (186)  
USGS Basin & Sub-watershed No.: (07110008-0102)

**Permitted Feature #004– Center Pivot Land Application Field (100 acre field)**

Legal Description: NW ¼, Sec. 27, T52N, R6W, Audrain County  
UTM Coordinates: X=623600, Y=4346658  
Receiving Stream: Unnamed tributary to Hickory Creek (U)  
First Classified Stream and ID: Hickory Creek (C) (186)  
USGS Basin & Sub-watershed No.: (07110008-0102)

**Land Application:**

Irrigation Volume/year: 26,263,940 gallons at design loading (including 1-in-10 year flows)  
Irrigation areas: 120 acres at design loading (220 acres total available)  
Application rates: 0.5 inch/hour; 1.0 inch/day; 3.0 inches/week; 24 inches/year  
Field slopes: less than 5 percent  
Equipment type: Center Pivot  
Vegetation: Row Crop  
Application rate is based on: hydraulic loading rate

PERMITTED FEATURES #001 & #002	TABLE A-1. IRRIGATION SYSTEM LIMITATIONS AND MONITORING REQUIREMENTS				PAGE NUMBER 4 of 8	
					PERMIT NUMBER MO-0055409	
The permittee is authorized to conduct land application of wastewater as specified in the application for this permit. The final limitations shall become effective on <b>April 1, 2014</b> , and remain in effect until expiration of the permit. The land application of wastewater shall be controlled, limited and monitored by the permittee as specified below:						
EFFLUENT PARAMETER(S)	UNITS	FINAL LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Storage Basin Operational Monitoring (Notes 1 & 2, Page 5)						
Storage Basin Freeboard (Note 3, Page 5)	feet	*			once/month	measured
Precipitation (Note 6, Page 5)	inches	*			daily	total
MONITORING REPORTS SHALL BE SUBMITTED <u>ANNUALLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2015</u> .						

PERMITTED FEATURE #002	TABLE A-2. IRRIGATION SYSTEM LIMITATIONS AND MONITORING REQUIREMENTS					
	The permittee is authorized to conduct land application of wastewater as specified in the application for this permit. The final limitations shall become effective on <b>April 1, 2014</b> , and remain in effect until expiration of the permit. The land application of wastewater shall be controlled, limited and monitored by the permittee as specified below:					
EFFLUENT PARAMETER(S)	UNITS	FINAL LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Irrigated Wastewater (Notes 2 & 4, Page 5)						
Total Kjeldahl Nitrogen as N (Note 5, Page 5)	mg/L	*			once/year	grab
Nitrate Nitrogen as N (Note 5)	mg/L	*			once/year	grab
MONITORING REPORTS SHALL BE SUBMITTED <u>ANNUALLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2015</u> .						

PERMITTED FEATURES #003 & #004	TABLE A-3. IRRIGATION SYSTEM LIMITATIONS AND MONITORING REQUIREMENTS					
	The permittee is authorized to conduct land application of wastewater as specified in the application for this permit. The final limitations shall become effective on <b>April 1, 2014</b> , and remain in effect until expiration of the permit. The land application of wastewater shall be controlled, limited and monitored by the permittee as specified below:					
EFFLUENT PARAMETER(S)	UNITS	FINAL LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Land Application Operational Monitoring (Note 2)						
Irrigation Period	hours	*			daily	total
Volume Irrigated	gallons	*			daily	total
Application Area	acres	*			daily	total
Application Rate	inches	*			daily	total
MONITORING REPORTS SHALL BE SUBMITTED <u>ANNUALLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2015</u> .						

\* Monitoring requirement only.

Note 1 - **No-discharge facility requirements.** Wastewater shall be stored and land applied during suitable conditions so that there is no discharge from the storage basin(s) or irrigation site. An emergency discharge may occur when excess wastewater has accumulated above feasible irrigation rates due to precipitation exceeding the 1-in-10-year, 365-day rainfall or the 25-year, 24-hour storm event.

Note 2 - Records shall be maintained and summarized into an annual operating report, which shall be submitted by January 28th of each year for the previous calendar year period using report forms approved by the Department. The summarized annual report is in addition to the reporting requirements listed in Table A. The summarized annual report shall include the following:

- a. Record of maintenance and repairs performed during the year, average number of times per month the facility is checked to see if it is operating properly, and description of any unusual operating conditions encountered during the year;
- b. The number of days the storage basin(s) has discharged during the year, the discharge flow, the reasons discharge occurred and effluent analysis performed; and
- c. A summary of the irrigation operations including freeboard at the start and end of the irrigation season, the number of days of irrigation for each month, the total gallons irrigated, the total acres used, crops grown, crop yields per acre, the application rate in inches/acre per day and for the year, the monthly and annual precipitation received at the facility, a summary of testing results for wastewater and soils, and calculations for nitrogen applied and crop removal of nitrogen.

Note 3 - Storage Basin freeboard shall be reported as Storage Basin water level in feet below the overflow level. See Special Conditions for Wastewater Irrigation System requirements.

Note 4 - Wastewater that is irrigated shall be sampled at the irrigation pump or wet well. If irrigation did not occurred during the report period, report as “No Irrigation”.

Note 5 - Monitor once during the months of March through November. Wastewater irrigation rates shall not exceed a nitrogen application rate of 150 pounds total nitrogen per acre per year, and the applied wastewater shall not exceed ten (10) mg/l of nitrate nitrogen as N.

Note 6 – Precipitation for Permitted Features #001 and #002 is only required to be reported for Permitted Feature #001 as precipitation for Permitted Feature #002 will be considered the same as for Permitted Feature #001.

**TABLE B.  
INFLUENT MONITORING REQUIREMENTS**

The facility is required to meet a removal efficiency of 65% or more as a monthly average. The monitoring requirements shall become effective on **April 1, 2014**, and remain in effect until expiration of the permit. To determine removal efficiencies, the influent wastewater shall be monitored by the permittee as specified below:

SAMPLING LOCATION AND PARAMETER(S)	UNITS	MONITORING REQUIREMENTS	
		MEASUREMENT FREQUENCY	SAMPLE TYPE
Biochemical Oxygen Demand <sub>5</sub>	mg/L	once/year***	grab
Total Suspended Solids	mg/L	once/year***	grab

MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE JANUARY 28, 2015.

\*\*\* Sample the influent for the parameters listed in Table B only if an emergency discharge occurs during the sampling year (October 1st – September 30<sup>th</sup> of each year). If no discharge occurs during the sampling year, report no-discharge.

**C. STANDARD CONDITIONS**

In addition to specified conditions stated herein, this permit is subject to the attached Parts I, II, & III standard conditions dated November 1, 2013, May 1, 2013, and August 15, 1994, and hereby incorporated as though fully set forth herein.

D. SPECIAL CONDITIONS

1. Emergency Discharge. An emergency discharge from wastewater storage structures may only occur if rainfall exceeds the 1 in 10 year (Data taken from the Missouri Climate Atlas) or the 24 hour, 25 year (Data taken from NRCS Urban Hydrology for Small Watersheds) rainfall events. **Discharge for any other reason shall constitute a permit violation and shall be reported in accordance with Standard Conditions, Part 1, Section B.2.b.** Monitoring shall take place once in the **first six (6) hours** of discovery of the discharge and then **once per week** following the initial sampling period until the discharge ceases. The facility shall submit test results, along with the number of days the storage basin(s) has discharged during the month, to the Northeast Regional Office by the 28<sup>th</sup> day of the month after the discharge ceases. Permittee shall monitor for the following constituents:

Constituent	Units
Flow	MGD
Biochemical Oxygen Demand <sub>5</sub>	mg/L
Total Suspended Solids	mg/l
Ammonia as N	mg/L
pH – Units	SU
Oil & Grease	mg/L

2. This permit may be reopened and modified, or alternatively revoked and reissued, to:
- (a) Comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
    - (1) contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
    - (2) controls any pollutant not limited in the permit.
  - (b) Incorporate new or modified effluent limitations or other conditions, if the result of a waste load allocation study, toxicity test or other information indicates changes are necessary to assure compliance with Missouri's Water Quality Standards.
  - (c) Incorporate new or modified effluent limitations or other conditions if, as the result of a watershed analysis, a Total Maximum Daily Load (TMDL) limitation is developed for the receiving waters which are currently included in Missouri's list of waters of the state not fully achieving the state's water quality standards, also called the 303(d) list.
  - (d) Incorporate the requirement to develop a pretreatment program pursuant to 40 CFR 403.8(a) when the Director of the Water Protection Program determines that a pretreatment program is necessary due to any new introduction of pollutants into the Publically Owned Treatment Works or any substantial change in the volume or character of pollutants being introduced.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Clean Water Act then applicable.

3. All permitted features s must be clearly marked in the field. The permitted features and land application fields shall also be marked on the aerial or topographic site map included with the Operation and Maintenance manual.
4. Permittee will cease discharge by connection to a facility with an area-wide management plan per 10 CSR 20-6.010(3)(B) within 90 days of notice of its availability.
5. Water Quality Standards
- (a) To the extent required by law, discharges to waters of the state shall not cause a violation of water quality standards rule under 10 CSR 20-7.031, including both specific and general criteria.
  - (b) General Criteria. The following general water quality criteria shall be applicable to all waters of the state at all times including mixing zones. No water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:
    - (1) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
    - (2) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;
    - (3) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
    - (4) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life;
    - (5) There shall be no significant human health hazard from incidental contact with the water;
    - (6) There shall be no acute toxicity to livestock or wildlife watering;
    - (7) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community;
    - (8) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247.

D. SPECIAL CONDITIONS (continued)

6. Changes in Discharges of Toxic Substances

The permittee shall notify the Director as soon as it knows or has reason to believe:

- (a) That any activity has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:"
    - (1) One hundred micrograms per liter (100 µg/L);
    - (2) Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,5 dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
    - (3) Five (5) times the maximum concentration value reported for the pollutant in the permit application;
    - (4) The level established by the Director in accordance with 40 CFR 122.44(f).
  - (b) That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant, which was not reported in the permit application.
7. Report as no-discharge when a discharge does not occur during the report period.
  8. It is a violation of the Missouri Clean Water Law to fail to pay fees associated with this permit (644.055 RSMo).
  9. The permittee shall comply with any applicable requirements listed in 10 CSR 20-9, unless the facility has received written notification that the Department has approved a modification to the requirements. The monitoring frequencies contained in this permit shall not be construed by the permittee as a modification of the monitoring frequencies listed in 10 CSR 20-9. If a modification of the monitoring frequencies listed in 10 CSR 20-9 is needed, the permittee shall submit a written request to the department for review and, if deemed necessary, approval.
  10. The permittee shall submit a report annually in January to the Northeast Regional Office with the Discharge and Monitoring reports which address measures taken to locate and eliminate sources of infiltration and inflow into the collection system serving the facility for the previous year.
  11. Bypasses are not authorized at this facility and are subject to 40 CFR 122.41(m). If a bypass occurs, the permittee shall report in accordance to 40 CFR 122.41(m)(3)(i), and with Standard Condition Part I, Section B, subsection 2.b. Bypasses are to be reported to the Northeast Regional Office.
  12. The facility must be sufficiently secured to restrict entry by children, livestock and unauthorized persons as well as to protect the facility from vandalism.
  13. A least one gate must be provided to access the wastewater treatment facility and provide for maintenance and mowing. The gate shall remain locked except when opened by the permittee to perform operational monitoring, sampling, maintenance, mowing, or for inspections by the Department.
  14. At least one (1) warning sign shall be placed on each side of the facility enclosure in such positions as to be clearly visible from all directions of approach. There shall also be one (1) sign placed for every five hundred feet (500') (150 m) of the perimeter fence. A sign shall also be placed on each gate. Minimum wording shall be SEWAGE TREATMENT FACILITY—KEEP OUT. Signs shall be made of durable materials with characters at least two inches (2") high and shall be securely fastened to the fence, equipment or other suitable locations.
  15. The permittee shall develop, maintain and implement an Operation and Maintenance (O&M) Manual that includes all necessary items to ensure the operation and integrity of the waste handling and land application systems, including key operating procedures, an aerial or topographic site map with the permitted features, land application fields, and irrigation buffer zones marked, and a brief summary of the operation of the facility. The O & M manual shall be made available to the operator. The O&M Manual shall be reviewed and updated at least every five years.
  16. An all-weather access road shall be provided to the treatment facility.
  17. The berms of the storage basin(s) shall be mowed and kept free of any deep-rooted vegetation, animal dens, or other potential sources of damage to the berms.

D. SPECIAL CONDITIONS (continued)

18. The facility shall ensure that adequate provisions are provided to prevent surface water intrusion into the storage basin(s) and to divert stormwater runoff around the storage basin(s) and protect embankments from erosion.
19. Wastewater Irrigation System.
  - (a) Discharge Reporting. Any unauthorized discharge from the storage basin(s) or irrigation system shall be reported to the department as soon as possible but always within 24 hours. Discharge is allowed only as described in the Facility Description and Effluent Limitations sections of this permit.
  - (b) Storage Basin Operating Levels - No-discharge Systems. The minimum and maximum operating water levels for the storage basin(s) shall be clearly marked. Each storage basin shall be operated so that the maximum water elevation does not exceed two feet below the Emergency Spillway except due to exceedances of the 1-in-10 year, 365-day or 25-year, 24-hour storm events according to National Weather Service data. Wastewater shall be land applied whenever feasible based on soil and weather conditions and permit requirements. Storage basin(s) shall be lowered to the minimum operating level prior to each winter by November 30.
  - (c) Emergency Spillway. Lagoons and earthen storage basins should have an emergency spillway to protect the structural integrity of earthen structures during operation at near full water levels and in the event of overflow conditions. The spillway shall be at least one foot below top of berm.
  - (d) General Irrigation Requirements. The wastewater irrigation system shall be operated so as to provide uniform distribution of irrigated wastewater over the entire irrigation site. A complete ground cover of vegetation shall be maintained on the irrigation site unless the system is approved for row crop irrigation. **Wastewater shall be land applied only during daylight hours.** The wastewater irrigation system shall be capable of irrigating the annual design flow during an application period of less than 100 days or 800 hours per year.
  - (e) Saturated/Frozen Conditions. There shall be no irrigation during ground frost, frozen, snow covered, or saturated soil conditions, or when precipitation is imminent or occurring.
  - (f) Buffer Zones. There shall be no irrigation within 300 feet of any down gradient pond, lake, sinkhole, losing stream or water supply withdrawal; 100 feet of gaining streams or tributaries; 150 feet of dwelling or public use areas; or 50 feet of the property line.
  - (g) Public Access Restrictions. Public access shall not be allowed to public use area irrigation sites when application is occurring.
  - (h) Irrigated Wastewater Disinfection. Wastewater shall be disinfected prior to land application (not storage) to public use areas.
  - (j) Nitrogen Loading Rates. Wastewater irrigation rates shall not exceed a nitrogen application rate of 150 pounds total nitrogen per acre per year, and the applied wastewater shall not exceed ten (10) mg/l of nitrate nitrogen as N. If the applied wastewater exceeds ten (10) mg/l of nitrate nitrogen as N, then the facility shall submit a revised permit application to request use of the Plant Available Nitrogen (PAN) method based on crop nitrogen requirements for harvested crops, along with calculations to show the amount of plant-available nitrogen provided and the amount of nitrogen that will be utilized by the vegetation to be grown.
  - (k) Equipment Checks during Irrigation. The irrigation system and application site shall be visually inspected at least **twice/day** during wastewater irrigation to check for equipment malfunctions and runoff from the irrigation site.
20. Land Application Sites. To add additional land application sites or convert any of the land to public use areas, a construction permit and permit modification may be required. The facility shall contact the Department for a written determination. Additionally, the O&M Manual shall be updated to include the additional land application site(s) and a copy of the updated sections of the O&M Manual shall be submitted to the Northeast Regional Office in accordance with Special Condition #15.

**MISSOURI DEPARTMENT OF NATURAL RESOURCES  
FACT SHEET  
FOR THE PURPOSE OF RENEWAL  
OF  
MO-0055409  
FARBER WASTEWATER TREATMENT FACILITY**

The Federal Water Pollution Control Act ("Clean Water Act" Section 402 Public Law 92-500 as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of storm water from certain point sources. All such discharges are unlawful without a permit (Section 301 of the "Clean Water Act"). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Director of the Missouri Department of Natural Resources (Department) under an approved program, operating in accordance with federal and state laws (Federal "Clean Water Act" and "Missouri Clean Water Law" Section 644 as amended). MSOPs are issued for a period of five (5) years unless otherwise specified.

As per [40 CFR Part 124.8(a)] and [10 CSR 20-6.020(1)2.] a Factsheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the Missouri State Operating Permit (operating permit) listed below.

A Factsheet is not an enforceable part of an operating permit.

This Factsheet is for a Major , Minor , Variance ; and/or permit with widespread public interest .

**Part I – Facility Information**

Facility Type: POTW - SIC #4952

Facility Description:

Two-cell storage lagoon / wastewater irrigation / sludge is retained in lagoon / two land application fields / two center pivots

Have any changes occurred at this facility or in the receiving water body that effects effluent limit derivation?

- No.

Application Date: 02/05/2013

Expiration Date: 11/20/2013

**PERMITTED FEATURE(S) TABLE:**

PERMITTED FEATURE	DESIGN FLOW (CFS)	TREATMENT LEVEL	EFFLUENT TYPE
#001	0.11	Land Application	Domestic

Facility Performance History:

The facility was last inspected on October 25, 2012. The inspection showed the following unsatisfactory features; failure to submit a complete Annual Operations Report, failure to develop and implement a program for repair and maintenance of the collection system, failure to maintain the inner berm slopes of the lagoon, failure to keep a minimum of two feet of water in the lagoon, and failed to submit semi-annual inflow and infiltration reports. The facility submitted a response letter, and the facility was returned to compliance.

**Part II – Operator Certification Requirements**

Applicable ; This facility is required to have a certified operator.

As per [10 CSR 20-6.010(8) Terms and Conditions of a Permit], permittees shall operate and maintain facilities to comply with the Missouri Clean Water Law and applicable permit conditions and regulations. Operators or supervisors of operations at regulated wastewater treatment facilities shall be certified in accordance with [10 CSR 20-9.020(2)] and any other applicable state law or regulation. As per [10 CSR 20-9.020(2)(A)], requirements for operation by certified personnel shall apply to all wastewater treatment systems, if applicable, as listed below:

Check boxes below that are applicable to the facility;

- Owned or operated by or for:
  - Municipalities
  - Public Sewer District:
  - County
  - Public Water Supply Districts:
  - Private sewer company regulated by the Public Service Commission:
  - State or Federal agencies:

Each of the above entities are only applicable if they have a Population Equivalent greater than two hundred (200) and/or fifty (50) or more service connections.

This facility currently requires an operator with a D Certification Level. Please see **Appendix - Classification Worksheet**. Modifications made to the wastewater treatment facility may cause the classification to be modified.

Operator’s Name: Martin S. Allen  
 Certification Number: 1812  
 Certification Level: A

The listing of the operator above only signifies that staff drafting this operating permit have reviewed appropriate Department records and determined that the name listed on the operating permit application has the correct and applicable Certification Level.

**Part III– Operational Monitoring**

As per [10 CSR 20-9.010(4)], the facility is required to conduct operational monitoring.

**Part IV – Receiving Stream Information**

10 CSR 20-7.031 Missouri Water Quality Standards, the Department defines the Clean Water Commission water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and/or 1<sup>st</sup> classified receiving stream’s beneficial water uses to be maintained are located in the Receiving Stream Table located below in accordance with [10 CSR 20-7.031(3)].

**RECEIVING STREAM(S) TABLE:**

WATER-BODY NAME	CLASS	WBID	DESIGNATED USES*	12-DIGIT HUC	DISTANCE TO CLASSIFIED SEGMENT (MI)
Unnamed tributary to Hickory Creek	U	NA	General Criteria	07110008-0102	~ 4.6
Hickory Creek	C	186	LWW, AQL, WBC-B		

\* - Irrigation (IRR), Livestock & Wildlife Watering (LWW), Protection of Warm Water Aquatic Life and Human Health-Fish Consumption (AQL), Cool Water Fishery(CLF), Cold Water Fishery (CDF), Whole Body Contact Recreation (WBC), Secondary Contact Recreation (SCR), Drinking Water Supply (DWS), Industrial (IND), Groundwater (GRW).

\*\* - Ecological Drainage Unit

**RECEIVING STREAM(S) LOW-FLOW VALUES:**

RECEIVING STREAM (U, C, P)	LOW-FLOW VALUES (CFS)		
	1Q10	7Q10	30Q10
Unnamed tributary to Hickory Creek (U)	-	-	-

\* - Irrigation (IRR), Livestock & Wildlife Watering (LWW), Protection of Warm Water Aquatic Life and Human Health-Fish Consumption (AQL), Cool Water Fishery (CLF), Cold Water Fishery (CDF), Whole Body Contact Recreation (WBC), Secondary Contact Recreation (SCR), Drinking Water Supply (DWS), Industrial (IND), Groundwater (GRW).

\*\* - Ecological Drainage Unit

**RECEIVING STREAM MONITORING REQUIREMENTS:**

No receiving water monitoring requirements recommended at this time.

Receiving Water Body's Water Quality

No stream surveys have been conducted for this facility.

**Part V – Rationale and Derivation of Effluent Limitations & Permit Conditions**

**ALTERNATIVE EVALUATIONS FOR NEW FACILITIES:**

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

Not Applicable ; The facility does not discharge to a Losing Stream as defined by [10 CSR 20-2.010(36)] & [10 CSR 20-7.031(1)(N)], or is an existing facility.

**ANTI-BACKSLIDING:**

A provision in the Federal Regulations [CWA §303(d)(4); CWA §402(c); 40 CFR Part 122.44(I)] that requires a reissued permit to be as stringent as the previous permit with some exceptions.

- All limits in this operating permit are at least as protective as those previously established; therefore, backsliding does not apply.

**ANTIDegradation:**

In accordance with Missouri's Water Quality Standard [10 CSR 20-7.031(2)], the Department is to document by means of Antidegradation Review that the use of a water body's available assimilative capacity is justified. Degradation is justified by documenting the socio-economic importance of a discharging activity after determining the necessity of the discharge.

- No degradation proposed and no further review necessary. Facility did not apply for authorization to increase pollutant loading or to add additional pollutants to their discharge.

**AREA-WIDE WASTE TREATMENT MANAGEMENT & CONTINUING AUTHORITY:**

As per [10 CSR 20-6.010(3)(B)], ... An applicant may utilize a lower preference continuing authority by submitting, as part of the application, a statement waiving preferential status from each existing higher preference authority, providing the waiver does not conflict with any area-wide management plan approved under section 208 of the Federal Clean Water Act or any other regional sewage service and treatment plan approved for higher preference authority by the Department.

**BIOSOLIDS & SEWAGE SLUDGE:**

Biosolids are solid materials resulting from domestic wastewater treatment that meet federal and state criteria for beneficial uses (i.e. fertilizer). Sewage sludge is solids, semi-solids, or liquid residue generated during the treatment of domestic sewage in a treatment works; including but not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in a treatment works. Additional information regarding biosolids and sludge is located at the following web address:

<http://dnr.mo.gov/env/wpp/pub/index.html>, items WQ422 through WQ449.

- Permittee is not authorized to land apply biosolids. Sludge/biosolids are removed by contract hauler, incinerated, stored in the lagoon, etc. The permittee must submit a sludge management plan for approval that details removal and disposal plans when sludge is to be removed from lagoons.

**COMPLIANCE AND ENFORCEMENT:**

Enforcement is the action taken by the Water Protection Program (WPP) to bring an entity into compliance with the Missouri Clean Water Law, its implementing regulations, and/or any terms and conditions of an operating permit. The primary purpose of the enforcement activity in the WPP is to resolve violations and return the entity to compliance.

Not Applicable ; The permittee/facility is not currently under Water Protection Program enforcement action.

**PRETREATMENT PROGRAM:**

The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a Publicly Owned Treatment Works [40 CFR Part 403.3(q)].

Not Applicable ; The permittee, at this time, is not required to have a Pretreatment Program or does not have an approved pretreatment program.

**REASONABLE POTENTIAL ANALYSIS (RPA):**

Federal regulation [40 CFR Part 122.44(d)(1)(i)] requires effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause or contribute to an in-stream excursion above narrative or numeric water quality standard.

Not Applicable ; A RPA was not conducted for this facility.

**REMOVAL EFFICIENCY:**

Removal efficiency is a method by which the Federal Regulations define Secondary Treatment and Equivalent to Secondary Treatment, which applies to Biochemical Oxygen Demand 5-day (BOD<sub>5</sub>) and Total Suspended Solids (TSS) for Publicly Owned Treatment Works (POTWs)/municipals.

Applicable ; Equivalent to Secondary Treatment is 65% removal [40 CFR Part 133.105(a)(3) & (b)(3)]. Facility only has to determine removal efficiency if an emergency discharge occurs.

**SANITARY SEWER OVERFLOWS (SSO) AND INFLOW AND INFILTRATION (I&I):**

Sanitary Sewer Overflows (SSOs) are defined as untreated sewage releases and are considered bypassing under state regulation [10 CSR 20-2.010(11)] and should not be confused with the federal definition of bypass. SSOs result from a variety of causes including blockages, line breaks, and sewer defects that can either allow wastewater to backup within the collection system during dry weather conditions or allow excess stormwater and groundwater to enter and overload the collection system during wet weather conditions. SSOs can also result from lapses in sewer system operation and maintenance, inadequate sewer design and construction, power failures, and vandalism. SSOs include overflows out of manholes, cleanouts, broken pipes, and other into waters of the state and onto city streets, sidewalks, and other terrestrial locations.

Inflow and Infiltration (I&I) is defined as unwanted intrusion of stormwater or groundwater into a collection system. This can occur from points of direct connection such as sump pumps, roof drain downspouts, foundation drains, and storm drain cross-connections or through cracks, holes, joint failures, faulty line connections, damaged manholes, and other openings in the collection system itself. I&I results from a variety of causes including line breaks, improperly sealed connections, cracks caused by soil erosion/settling, penetration of vegetative roots, and other sewer defects. In addition, excess stormwater and groundwater entering the collection system from line breaks and sewer defects have the potential to negatively impact the treatment facility.

Missouri RSMo §644.026.1 mandates that the Department require proper maintenance and operation of treatment facilities and sewer systems and proper disposal of residual waste from all such facilities.

Applicable ; In accordance with Missouri RSMo §644.026.1(15) and 40 CFR Part 122.41(e), the permittee is required to develop and/or implement a program for maintenance and repair of the collection system and shall be required in this operating permit by either means of a Special Condition or Schedule of Compliance. In addition, the Department considers the development of this program as an implementation of this condition. Additionally, 40 CFR Part 403.3(o) defines a POTW to include any device and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial wastes of liquid nature. It also includes sewers, pipes, and other conveyances only if they convey wastewater to a POTW Treatment Plant.

At this time, the Department recommends the US EPA's Guide for Evaluating Capacity, Management, Operation and Maintenance (CMOM) Programs At Sanitary Sewer Collection Systems (Document # EPA 305-B-05-002). The CMOM identifies some of the criteria used by the EPA to evaluate a collection system's management, operation, and maintenance and was intended for use by the EPA, state, regulated community, and/or third party entities. The CMOM is applicable to small, medium, and large systems; both public and privately owned; and both regional and satellite collection systems. The CMOM does not substitute for the Clean Water Act, the Missouri Clean Water Law, and both federal and state regulations, as it is not a regulation.

**SCHEDULE OF COMPLIANCE (SOC):**

Per 644.051.4 RSMo, a permit may be issued with a Schedule of Compliance (SOC) to provide time for a facility to come into compliance with new state or federal effluent regulations, water quality standards, or other requirements. Such a schedule is not allowed if the facility is already in compliance with the new requirement, or if prohibited by other statute or regulation. A SOC includes an enforceable sequence of interim requirements (actions, operations, or milestone events) leading to compliance with the Missouri Clean Water Law, its implementing regulations, and/or the terms and conditions of an operating permit. *See also* Section 502(17) of the Clean Water Act, and 40 CFR §122.2. For new effluent limitations, the permit includes interim monitoring for the specific parameter to demonstrate the facility is not already in compliance with the new requirement. Per 40 CFR § 122.47(a)(1) and 10 CSR 20-7.031(10), compliance must occur as soon as possible. If the permit provides a schedule for meeting new water quality based effluent limits, a SOC must include an enforceable, final effluent limitation in the permit even if the SOC extends beyond the life of the permit.

Not Applicable ; This permit does not contain a SOC.

**STORM WATER POLLUTION PREVENTION PLAN (SWPPP):**

In accordance with 40 CFR 122.44(k) *Best Management Practices (BMPs)* to control or abate the discharge of pollutants when: (1) Authorized under section 304(e) of the Clean Water Act (CWA) for the control of toxic pollutants and hazardous substances from ancillary industrial activities; (2) Authorized under section 402(p) of the CWA for the control of storm water discharges; (3) Numeric effluent limitations are infeasible; or (4) the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA.

Not Applicable ; At this time, the permittee is not required to develop and implement a SWPPP.

**VARIANCE:**

As per the Missouri Clean Water Law § 644.061.4, variances shall be granted for such period of time and under such terms and conditions as shall be specified by the commission in its order. The variance may be extended by affirmative action of the commission. In no event shall the variance be granted for a period of time greater than is reasonably necessary for complying with the Missouri Clean Water Law §§644.006 to 644.141 or any standard, rule or regulation promulgated pursuant to Missouri Clean Water Law §§644.006 to 644.141.

Not Applicable ; This operating permit is not drafted under premises of a petition for variance.

**WASTELOAD ALLOCATIONS (WLA) FOR LIMITS:**

As per [10 CSR 20-2.010(78)], the amount of pollutant each discharger is allowed by the Department to release into a given stream after the Department has determined total amount of pollutant that may be discharged into that stream without endangering its water quality.

Not Applicable ; Wasteload allocations were not calculated.

**WLA MODELING:**

There are two general types of effluent limitations, technology-based effluent limits (TBELs) and water quality based effluent limits (WQBELs). If TBELs do not provide adequate protection for the receiving waters, then WQBEL must be used.

Not Applicable ; A WLA study was either not submitted or determined not applicable by Department staff.

**WATER QUALITY STANDARDS:**

Per [10 CSR 20-7.031(3)], General Criteria shall be applicable to all waters of the state at all times including mixing zones. Additionally, [40 CFR 122.44(d)(1)] directs the Department to establish in each NPDES permit to include conditions to achieve water quality established under Section 303 of the Clean Water Act, including State narrative criteria for water quality.

**WHOLE EFFLUENT TOXICITY (WET) TEST:**

A WET test is a quantifiable method of determining if a discharge from a facility may be causing toxicity to aquatic life by itself, in combination with or through synergistic responses when mixed with receiving stream water.

Not Applicable ; At this time, the permittee is not required to conduct WET test for this facility.

**40 CFR 122.41(M) - BYPASSES:**

The federal Clean Water Act (CWA), Section 402 prohibits wastewater dischargers from “bypassing” untreated or partially treated sewage (wastewater) beyond the headworks. A bypass is defined as an intentional diversion of waste streams from any portion of a treatment facility, [40 CFR 122.41(m)(1)(i)]. Additionally, Missouri regulation 10 CSR 20-2.010(11) defines a bypass as the diversion of wastewater from any portion of wastewater treatment facility or sewer system to waters of the state. Only under exceptional and specified limitations do the federal regulations allow for a facility to bypass some or all of the flow from its treatment process. Bypasses are prohibited by the CWA unless a permittee can meet all of the criteria listed in 40 CFR 122.41(m)(4)(i)(A), (B), & (C). Any bypasses from this facility are subject to the reporting required in 40 CFR 122.41(l)(6) and per Missouri’s Standard Conditions I, Section B, part 2.b. Additionally, Anticipated Bypasses include bypasses from peak flow basins or similar devices designed for peak wet weather flows.

Not Applicable ; This facility does not anticipate bypassing.

**303(d) LIST & TOTAL MAXIMUM DAILY LOAD (TMDL):**

Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses of water as whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

Not Applicable ; This facility does not discharge to a 303(d) listed stream.

**Part VI – Permit Limits Determination**

**APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:**

As per Missouri’s Effluent Regulations [10 CSR 20-7.015], the waters of the state are divided into the below listed seven (7) categories. Each category lists effluent limitations for specific parameters, which are presented in each permitted feature’s Effluent Limitation Table and further discussed in the Derivation & Discussion of Limits section.

- Missouri or Mississippi River [10 CSR 20-7.015(2)]:
- Lake or Reservoir [10 CSR 20-7.015(3)]:
- Losing [10 CSR 20-7.015(4)]:
- Metropolitan No-Discharge [10 CSR 20-7.015(5)]:
- Special Stream [10 CSR 20-7.015(6)]:
- Subsurface Water [10 CSR 20-7.015(7)]:
- All Other Waters [10 CSR 20-7.015(8)]:

**Permitted Features #001 & #002 – Emergency Discharge**

There are no effluent limits associated with Permitted Features #001 & #002 for the no-discharge facility. However, the following is required for an emergency discharge.

**EMERGENCY DISCHARGE TABLE:**

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MODIFIED	PREVIOUS PERMIT LIMITATIONS
Flow	MGD	9	*			NO	*
Biochemical Oxygen Demand <sub>5</sub>	mg/L	9	*			YES	65/45
Total Suspended Solids	mg/L	9	*			YES	110/70
Ammonia as N	mg/L	9	*			NO	*
pH	SU	9	*			YES	≥ 6.0
Oil & Grease	mg/L	9	*			YES	15/10
Monitoring Frequency	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.						

\* - Monitoring requirement only

**Basis for Limitations Codes:**

- |  |                                    |
|--|------------------------------------|
| 1. State or Federal Regulation/Law       | 7. Antidegradation Policy          |
| 2. Water Quality Standard (includes RPA) | 8. Water Quality Model             |
| 3. Water Quality Based Effluent Limits   | 9. Best Professional Judgment      |
| 4. Lagoon Policy                         | 10. TMDL or Permit in lieu of TMDL |
| 5. Ammonia Policy                        | 11. WET test Policy                |
| 6. Dissolved Oxygen Policy               |                                    |

• **Minimum Sampling and Reporting Frequency Requirements.**

PARAMETER	SAMPLING FREQUENCY	REPORTING FREQUENCY
Flow	once/week while discharging	Test results are due on the 28 <sup>th</sup> day of the month after the cessation of the discharge
Biochemical Oxygen Demand <sub>5</sub>	once/week while discharging	
Total Suspended Solids	once/week while discharging	
Ammonia as N	once/week while discharging	
pH	once/week while discharging	
Oil & Grease	once/week while discharging	

**PERMITTED FEATURES #001 & #002 – STORAGE BASINS**

Irrigation limitations derived and established in the below Irrigation Limitations Table are based on current operations of the facility. Future permit action due to facility modification may contain new operating permit terms and conditions that supersede the terms and conditions, including effluent limitations, of this operating permit.

**IRRIGATION LIMITATIONS TABLE:**

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MODIFIED	PREVIOUS PERMIT LIMITATIONS
Freeboard	feet	1	*			No	*
Precipitation	inches	1	*			No	*
Total Kjeldahl Nitrogen (#002 only)	mg/L	1	*			No	*
Nitrate Nitrogen as N (#002 only)	mg/L	1	*			No	*
Monitoring Frequency	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.						

\* - Monitoring requirement only.

**Basis for Limitations Codes:**

- |  |                                    |
|--|------------------------------------|
| 1. State or Federal Regulation/Law       | 7. Antidegradation Policy          |
| 2. Water Quality Standard (includes RPA) | 8. Water Quality Model             |
| 3. Water Quality Based Effluent Limits   | 9. Best Professional Judgment      |
| 4. Lagoon Policy                         | 10. TMDL or Permit in lieu of TMDL |
| 5. Ammonia Policy                        | 11. WET Test Policy                |
| 6. Antidegradation Review                |                                    |

**PERMITTED FEATURES #001 & #002 – DERIVATION AND DISCUSSION OF LIMITS:**

- **Freeboard.** Monitoring requirement only.
- **Precipitation.** Monitoring requirement only.
- **Total Kjeldahl Nitrogen.** Monitoring requirement only. Monitoring for Total Kjeldahl Nitrogen as N is included to determine nutrient loading rates on the land application fields. [10 CSR 20-8.020(15)(F)7.]
- **Nitrate Nitrogen as N.** Monitoring requirement only. Monitoring for Nitrate Nitrogen as N is included to determine nutrient loading rates on the land application fields. [10 CSR 20-8.020(15)(F)7.]

**Minimum Sampling and Reporting Frequency Requirements.**

PARAMETER	SAMPLING FREQUENCY	REPORTING FREQUENCY
Freeboard	once/month	once/year
Precipitation	once/day	once/year
Total Kjeldahl Nitrogen	once/year	once/year
Nitrate Nitrogen as N	once/year	once/year

**PERMITTED FEATURES #003 & #004 – IRRIGATION FIELDS**

PARAMETER	UNIT	BASIS FOR LIMITS	DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MODIFIED	PREVIOUS PERMIT LIMITATIONS
Irrigation Period	hours	1	*			No	*
Volume Irrigated	gallons	1	*			No	*
Application Area	acres	1	*			No	*
Application Rate	inches	1	*			No	*
Monitoring Frequency	Please see Minimum Sampling and Reporting Frequency Requirements in the Derivation and Discussion Section below.						

\* - Monitoring requirement only.

\*\* - Parameter not previously established in previous state operating permit.

\*\*\* - # of colonies/100mL; the Monthly Average for Fecal Coliform is a geometric mean.

**Basis for Limitations Codes:**

- |  |                                    |
|--|------------------------------------|
| 1. State or Federal Regulation/Law       | 7. Antidegradation Policy          |
| 2. Water Quality Standard (includes RPA) | 8. Water Quality Model             |
| 3. Water Quality Based Effluent Limits   | 9. Best Professional Judgment      |
| 4. Lagoon Policy                         | 10. TMDL or Permit in lieu of TMDL |
| 5. Ammonia Policy                        | 11. WET Test Policy                |
| 6. Antidegradation Review                |                                    |

- **Irrigation Period.** Monitoring requirement only. Monitoring for the Irrigation Period is included to determine if proper application is occurring on the land application fields.
- **Volume Irrigated.** Monitoring requirement only. Monitoring for the Volume Irrigated is included to determine if proper application is occurring on the land application fields.
- **Application Area.** Monitoring requirement only. Monitoring for the Application Area is included to determine if proper application is occurring on the land application fields.
- **Application Rate.** Monitoring requirement only. Monitoring for the Application Rate is included to determine if proper application is occurring on the land application fields.

**Minimum Sampling and Reporting Frequency Requirements.**

PARAMETER	SAMPLING FREQUENCY	REPORTING FREQUENCY
Irrigation Period	once/day	once/year
Volume Irrigated	once/day	once/year
Application Area	once/day	once/year
Application Rate	once/day	once/year

**Sampling Frequency Justification:**

The sampling frequency was retained from the previous permit.

**Sampling Type Justification**

Due to the sampling being from irrigation, grab sample is more appropriate.

## **Part VII – Finding of Affordability**

Pursuant to Section 644.145, RSMo., the Department is required to determine whether a permit or decision is affordable and makes a finding of affordability for certain permitting and enforcement decisions. This requirement applies to discharges from combined or separate sanitary sewer systems or publically-owned treatment works.

Not Applicable; The Department is not required to determine findings of affordability because the permit contains no new conditions or requirements that convey a new cost to the facility.

## **Part VIII – Administrative Requirements**

On the basis of preliminary staff review and the application of applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the operating permit. The proposed determinations are tentative pending public comment.

### **PERMIT SYNCHRONIZATION:**

The Department of Natural Resources is currently undergoing a synchronization process for operating permits. Permits are normally issued on a five-year term, but to achieve synchronization many permits will need to be issued for less than the full five years allowed by regulation. The intent is that all permits within a watershed will move through the Watershed Based Management (WBM) cycle together will all expire in the same fiscal year. This will allow further streamlining by placing multiple permits within a smaller geographic area on public notice simultaneously, thereby reducing repeated administrative efforts. This will also allow the department to explore a watershed based permitting effort at some point in the future. Renewal applications must continue to be submitted within 180 days of expiration, however, in instances where effluent data from the previous renewal is less than 4 years old, that data may be re-submitted to meet the requirements of the renewal application. If the permit provides a schedule of compliance for meeting new water quality based effluent limits beyond the expiration date of the permit, the time remaining in the schedule of compliance will be allotted in the renewed permit.

### **PUBLIC NOTICE:**

The Department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest in and water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and permittee must be notified of the denial in writing.

The Department must issue public notice of a pending operating permit or of a new or reissued statewide general permit. The public comment period is the length of time not less than 30 days following the date of the public notice which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed operating permit, then please refer to the Public Notice page located at the front of this draft operating permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- The Public Notice period for this operating permit was from January 10, 2014 to February 10, 2014. No responses received.

**DATE OF FACT SHEET:** DECEMBER 3, 2013

### **COMPLETED BY:**

**BRANT FARRIS, ENVIRONMENTAL SPECIALIST III**  
**MISSOURI DEPARTMENT OF NATURAL RESOURCES**  
**WATER PROTECTION PROGRAM**  
**OPERATING PERMITS SECTION - DOMESTIC WASTEWATER UNIT**  
**(660) 385-8061**  
**brant.farris@dnr.mo.gov**

**Appendices**

**APPENDIX - CLASSIFICATION WORKSHEET:**

ITEM	POINTS POSSIBLE	POINTS ASSIGNED
Maximum Population Equivalent (P.E.) served (Max 10 pts.)	1 pt./10,000 PE or major fraction thereof.	
Maximum: 10 pt Design Flow (avg. day) or peak month; use greater (Max 10 pts.)	1 pt. / MGD or major fraction thereof.	
<b>EFFLUENT DISCHARGE RECEIVING WATER SENSITIVITY:</b>		
Missouri or Mississippi River	0	
All other stream discharges except to losing streams and stream reaches supporting whole body contact	1	1
Discharge to lake or reservoir outside of designated whole body contact recreational area	2	
Discharge to losing stream, or stream, lake or reservoir area supporting whole body contact recreation	3	
<b>PRELIMINARY TREATMENT - Headworks</b>		
Screening and/or comminution	3	
Grit removal	3	
Plant pumping of main flow (lift station at the headworks)	3	
<b>PRIMARY TREATMENT</b>		
Primary clarifiers	5	
Combined sedimentation/digestion	5	
Chemical addition (except chlorine, enzymes)	4	
<b>REQUIRED LABORATORY CONTROL – performed by plant personnel (highest level only)</b>		
Push – button or visual methods for simple test such as pH, Settleable solids	3	
Additional procedures such as DO, COD, BOD, titrations, solids, volatile content	5	5
More advanced determinations such as BOD seeding procedures, fecal coliform, nutrients, total oils, phenols, etc.	7	
Highly sophisticated instrumentation, such as atomic absorption and gas chromatograph	10	
<b>ALTERNATIVE FATE OF EFFLUENT</b>		
Direct reuse or recycle of effluent	6	
Land Disposal – low rate	3	3
High rate	5	
Overland flow	4	
Total from page <b>ONE (1)</b>	----	9

**APPENDIX - CLASSIFICATION WORKSHEET (CONTINUED):**

ITEM	POINTS POSSIBLE	POINTS ASSIGNED
<b>VARIATION IN RAW WASTE (highest level only) (DMR exceedances and Design Flow exceedances)</b>		
Variation do not exceed those normally or typically expected	0	
Recurring deviations or excessive variations of 100 to 200 % in strength and/or flow	2	
Recurring deviations or excessive variations of more than 200 % in strength and/or flow	4	
Raw wastes subject to toxic waste discharge	6	
<b>SECONDARY TREATMENT</b>		
Trickling filter and other fixed film media with secondary clarifiers	10	
Activated sludge with secondary clarifiers (including extended aeration and oxidation ditches)	15	
Stabilization ponds without aeration	5	5
Aerated lagoon	8	
Advanced Waste Treatment Polishing Pond	2	
Chemical/physical – without secondary	15	
Chemical/physical – following secondary	10	
Biological or chemical/biological	12	
Carbon regeneration	4	
<b>DISINFECTION</b>		
Chlorination or comparable	5	
Dechlorination	2	
On-site generation of disinfectant (except UV light)	5	
UV light	4	
<b>SOLIDS HANDLING - SLUDGE</b>		
Solids Handling Thickening	5	
Anaerobic digestion	10	
Aerobic digestion	6	
Evaporative sludge drying	2	
Mechanical dewatering	8	
Solids reduction (incineration, wet oxidation)	12	
Land application	6	
Total from page <b>TWO (2)</b>	----	5
Total from page <b>ONE (1)</b>	---	9
Grand Total	---	14

- A: 71 points and greater
- B: 51 points – 70 points
- C: 26 points – 50 points
- D: 0 points – 25 points



STANDARD CONDITIONS FOR NPDES PERMITS  
ISSUED BY  
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION  
REVISED  
NOVEMBER 1, 2013

These Standard Conditions incorporate permit conditions as required by 40 CFR 122.41 or other applicable state statutes or regulations. These minimum conditions apply unless superseded by requirements specified in the permit.

## Part I – General Conditions

### Section A – Sampling, Monitoring, and Recording

1. **Sampling Requirements.**
  - a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
  - b. All samples shall be taken at the outfall(s) or Missouri Department of Natural Resources (Department) approved sampling location(s), and unless specified, before the effluent joins or is diluted by any other body of water or substance.
2. **Monitoring Requirements.**
  - a. Records of monitoring information shall include:
    - i. The date, exact place, and time of sampling or measurements;
    - ii. The individual(s) who performed the sampling or measurements;
    - iii. The date(s) analyses were performed;
    - iv. The individual(s) who performed the analyses;
    - v. The analytical techniques or methods used; and
    - vi. The results of such analyses.
  - b. If the permittee monitors any pollutant more frequently than required by the permit at the location specified in the permit using test procedures approved under 40 CFR Part 136, or another method required for an industry-specific waste stream under 40 CFR subchapters N or O, the results of such monitoring shall be included in the calculation and reported to the Department with the discharge monitoring report data (DMR) submitted to the Department pursuant to Section B, paragraph 7.
3. **Sample and Monitoring Calculations.** Calculations for all sample and monitoring results which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in the permit.
4. **Test Procedures.** The analytical and sampling methods used shall conform to the reference methods listed in 10 CSR 20-7.015 unless alternates are approved by the Department. The facility shall use sufficiently sensitive analytical methods for detecting, identifying, and measuring the concentrations of pollutants. The facility shall ensure that the selected methods are able to quantify the presence of pollutants in a given discharge at concentrations that are low enough to determine compliance with Water Quality Standards in 10 CSR 20-7.031 or effluent limitations unless provisions in the permit allow for other alternatives. A method is “sufficiently sensitive” when; 1) the method minimum level is at or below the level of the applicable water quality criterion for the pollutant or, 2) the method minimum level is above the applicable water quality criterion, but the amount of pollutant in a facility’s discharge is high enough that the method detects and quantifies the level of pollutant in the discharge, or 3) the method has the lowest minimum level of the analytical methods approved under 10 CSR 20-7.015. These methods are also required for parameters that are listed as monitoring only, as the data collected may be used to determine if limitations need to be established. A permittee is responsible for working with their contractors to ensure that the analysis performed is sufficiently sensitive.
5. **Record Retention.** Except for records of monitoring information required by the permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five (5) years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

6. **Illegal Activities.**
  - a. The Federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under the permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than two (2) years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than four (4) years, or both.
  - b. The Missouri Clean Water Law provides that any person or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than six (6) months, or by both. Second and successive convictions for violation under this paragraph by any person shall be punished by a fine of not more than \$50,000 per day of violation, or by imprisonment for not more than two (2) years, or both.

### Section B – Reporting Requirements

1. **Planned Changes.**
  - a. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility when:
    - i. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or
    - ii. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1);
    - iii. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan;
    - iv. Any facility expansions, production increases, or process modifications which will result in a new or substantially different discharge or sludge characteristics must be reported to the Department 60 days before the facility or process modification begins. Notification may be accomplished by application for a new permit. If the discharge does not violate effluent limitations specified in the permit, the facility is to submit a notice to the Department of the changed discharge at least 30 days before such changes. The Department may require a construction permit and/or permit modification as a result of the proposed changes at the facility.
2. **Twenty-Four Hour Reporting.**
  - a. The permittee shall report any noncompliance which may endanger health or the environment. Relevant information shall be provided orally or via the current electronic method approved by the Department, within 24 hours from the time the permittee becomes aware of the circumstances, and shall be reported to the appropriate Regional Office during normal business hours or the Environmental Emergency Response hotline at 573-634-2436 outside of normal business hours. A written submission shall also be provided within five (5) business days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.



STANDARD CONDITIONS FOR NPDES PERMITS  
ISSUED BY  
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION  
REVISED  
NOVEMBER 1, 2013

- b. The following shall be included as information which must be reported within 24 hours under this paragraph.
    - i. Any unanticipated bypass which exceeds any effluent limitation in the permit.
    - ii. Any upset which exceeds any effluent limitation in the permit.
    - iii. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Department in the permit required to be reported within 24 hours.
  - c. The Department may waive the written report on a case-by-case basis for reports under paragraph 2. b. of this section if the oral report has been received within 24 hours.
3. **Sanitary Sewer Overflow Reporting.** The following requirements solely reflect reporting obligations, and reporting does not necessarily reflect noncompliance, which may depend on the circumstances of the incident reported.
- a. **Twenty-Four Hour (24-Hour) Reporting.** The permittee or owner shall report any incident in which wastewater escapes the collection system such that it reaches waters of the state or it may pose an imminent or substantial endangerment to the health or welfare of persons. Relevant information shall be provided orally or via the current electronic method approved by the Department within 24 hours from the time the permittee becomes aware of the incident. A written submission shall also be provided within five (5) business days of the time the permittee or owner becomes aware of the incident. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours. The five (5) day reports may be provided via the current electronic method approved by the Department.
  - b. **Incidents Reported via Discharge Monitoring Reports (DMRs).** The permittee or owner shall report any event in which wastewater escapes the collection system, which does not enter waters of the state and is not expected to pose an imminent or substantial endangerment to the health or welfare of persons, which occur typically during wet weather events. Relevant information shall be provided with the permittee's or owner's DMRs.
4. **Anticipated Noncompliance.** The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The notice shall be submitted to the Department 60 days prior to such changes or activity.
5. **Compliance Schedules.** Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date. The report shall provide an explanation for the instance of noncompliance and a proposed schedule or anticipated date, for achieving compliance with the compliance schedule requirement.
6. **Other Noncompliance.** The permittee shall report all instances of noncompliance not reported under paragraphs 2, 3, 4, and 7 of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph 2. a. of this section.
7. **Other Information.** Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.
8. **Discharge Monitoring Reports.**
- a. Monitoring results shall be reported at the intervals specified in the permit.
  - b. Monitoring results must be reported to the Department via the current method approved by the Department, unless the permittee has been granted a waiver from using the method. If the permittee has been granted a waiver, the permittee must use forms provided by the Department.
  - c. Monitoring results shall be reported to the Department no later than the 28<sup>th</sup> day of the month following the end of the reporting period.

Section C – Bypass/Upset Requirements

1. **Definitions.**
  - a. *Bypass:* the intentional diversion of waste streams from any portion of a treatment facility.
  - b. *Severe Property Damage:* substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
  - c. *Upset:* an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
2. **Bypass Requirements.**
  - a. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2. b. and 2. c. of this section.
  - b. Notice.
    - i. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.
    - ii. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Section B – Reporting Requirements, paragraph 5 (24-hour notice).
  - c. Prohibition of bypass.
    - i. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless:
      1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
      2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
      3. The permittee submitted notices as required under paragraph 2. b. of this section.
    - ii. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three (3) conditions listed above in paragraph 2. c. i. of this section.
3. **Upset Requirements.**
  - a. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph 3. b. of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
  - b. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
    - i. An upset occurred and that the permittee can identify the cause(s) of the upset;
    - ii. The permitted facility was at the time being properly operated; and
    - iii. The permittee submitted notice of the upset as required in Section B – Reporting Requirements, paragraph 2. b. ii. (24-hour notice).
    - iv. The permittee complied with any remedial measures required under Section D – Administrative Requirements, paragraph 4.
  - c. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.



STANDARD CONDITIONS FOR NPDES PERMITS  
ISSUED BY  
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION  
REVISED  
NOVEMBER 1, 2013

Section D – Administrative Requirements

1. **Duty to Comply.** The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Missouri Clean Water Law and Federal Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.
  - a. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Federal Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.
  - b. The Federal Clean Water Act provides that any person who violates section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under section 402, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed \$25,000 per day for each violation. The Federal Clean Water Act provides that any person who negligently violates sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, or any requirement imposed in a pretreatment program approved under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of \$2,500 to \$25,000 per day of violation, or imprisonment of not more than one (1) year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than \$50,000 per day of violation, or by imprisonment of not more than two (2) years, or both. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of \$5,000 to \$50,000 per day of violation, or imprisonment for not more than three (3) years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than \$100,000 per day of violation, or imprisonment of not more than six (6) years, or both. Any person who knowingly violates section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than \$250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than \$500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the CWA, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than \$1,000,000 and can be fined up to \$2,000,000 for second or subsequent convictions.
  - c. Any person may be assessed an administrative penalty by the EPA Director for violating section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act. Administrative penalties for Class I violations are not to exceed \$10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed \$25,000. Penalties for Class II violations are not to exceed \$10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed \$125,000.
  - d. It is unlawful for any person to cause or permit any discharge of water contaminants from any water contaminant or point source located in Missouri in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law, or any standard, rule or regulation promulgated by the commission. In the event the commission or the director determines that any provision of sections 644.006 to 644.141 of the Missouri Clean Water Law or standard, rules, limitations or regulations promulgated pursuant thereto, or permits issued by, or any final abatement order, other order, or determination made by the commission or the director, or any filing requirement pursuant to sections 644.006 to 644.141 of the Missouri Clean Water Law or any other provision which this state is required to enforce pursuant to any federal water pollution control act, is being, was, or is in imminent danger of being violated, the commission or director may cause to have instituted a civil action in any court of competent jurisdiction for the injunctive relief to prevent any such violation or further violation or for the assessment of a penalty not to exceed \$10,000 per day for each day, or part thereof, the violation occurred and continues to occur, or both, as the court deems proper. Any person who willfully or negligently commits any violation in this paragraph shall, upon conviction, be punished by a fine of not less than \$2,500 nor more than \$25,000 per day of violation, or by imprisonment for not more than one year, or both. Second and successive convictions for violation of the same provision of this paragraph by any person shall be punished by a fine of not more than \$50,000 per day of violation, or by imprisonment for not more than two (2) years, or both.
2. **Duty to Reapply.**
  - a. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.
  - b. A permittee with a currently effective site-specific permit shall submit an application for renewal at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Department. (The Department shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)
  - c. A permittees with currently effective general permit shall submit an application for renewal at least 30 days before the existing permit expires, unless the permittee has been notified by the Department that an earlier application must be made. The Department may grant permission for a later submission date. (The Department shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)
3. **Need to Halt or Reduce Activity Not a Defense.** It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
4. **Duty to Mitigate.** The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
5. **Proper Operation and Maintenance.** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.
6. **Permit Actions.**
  - a. Subject to compliance with statutory requirements of the Law and Regulations and applicable Court Order, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:
    - i. Violations of any terms or conditions of this permit or the law;
    - ii. Having obtained this permit by misrepresentation or failure to disclose fully any relevant facts;
    - iii. A change in any circumstances or conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
    - iv. Any reason set forth in the Law or Regulations.
  - b. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.



STANDARD CONDITIONS FOR NPDES PERMITS  
ISSUED BY  
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION  
REVISED  
NOVEMBER 1, 2013

7. **Permit Transfer.**
  - a. Subject to 10 CSR 20-6.010, an operating permit may be transferred upon submission to the Department of an application to transfer signed by the existing owner and the new owner, unless prohibited by the terms of the permit. Until such time the permit is officially transferred, the original permittee remains responsible for complying with the terms and conditions of the existing permit.
  - b. The Department may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Missouri Clean Water Law or the Federal Clean Water Act.
  - c. The Department, within 30 days of receipt of the application, shall notify the new permittee of its intent to revoke or reissue or transfer the permit.
8. **Toxic Pollutants.** The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Federal Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the Federal Clean Water Act within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.
9. **Property Rights.** This permit does not convey any property rights of any sort, or any exclusive privilege.
10. **Duty to Provide Information.** The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.
11. **Inspection and Entry.** The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), upon presentation of credentials and other documents as may be required by law, to:
  - a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;
  - b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
  - c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
  - d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Federal Clean Water Act or Missouri Clean Water Law, any substances or parameters at any location.
12. **Closure of Treatment Facilities.**
  - a. Persons who cease operation or plan to cease operation of waste, wastewater, and sludge handling and treatment facilities shall close the facilities in accordance with a closure plan approved by the Department.
  - b. Operating Permits under 10 CSR 20-6.010 or under 10 CSR 20-6.015 are required until all waste, wastewater, and sludges have been disposed of in accordance with the closure plan approved by the Department and any disturbed areas have been properly stabilized. Disturbed areas will be considered stabilized when perennial vegetation, pavement, or structures using permanent materials cover all areas that have been disturbed. Vegetative cover, if used, shall be at least 70% plant density over 100% of the disturbed area.
13. **Signatory Requirement.**
  - a. All permit applications, reports required by the permit, or information requested by the Department shall be signed and certified. (See 40 CFR 122.22 and 10 CSR 20-6.010)
  - b. The Federal Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six (6) months per violation, or by both.
14. **Severability.** The provisions of the permit are severable, and if any provision of the permit, or the application of any provision of the permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of the permit, shall not be affected thereby.



STANDARD CONDITIONS FOR NPDES PERMITS  
ISSUED BY  
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION  
REVISED  
MAY 1, 2013

PART II - SPECIAL CONDITIONS – PUBLICLY OWNED TREATMENT WORKS  
SECTION A – INDUSTRIAL USERS

**1. Definitions**

Definitions as set forth in the Missouri Clean Water Laws and approved by the Missouri Clean Water Commission shall apply to terms used herein.

Significant Industrial User (SIU). Except as provided in the *General Pretreatment Regulation* 10 CSR 20-6.100, the term Significant Industrial User means:

1. All Industrial Users subject to Categorical Pretreatment Standards; and
2. Any other Industrial User that: discharges an average of 25,000 gallons per day or more of process wastewater to the Publicly-Owned Treatment Works (POTW) (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority on the basis that the Industrial User has a reasonable potential for adversely affecting the POTW's or for violating any Pretreatment Standard or requirement.

Clean Water Act (CWA) is the the federal Clean Water Act of 1972, 33 U.S.C. § 1251 et seq. (2002).

**2. Identification of Industrial Discharges**

Pursuant to 40 CFR 122.44(j)(1), all POTWs shall identify, in terms of character and volume of pollutants, any Significant Industrial Users discharging to the POTW subject to Pretreatment Standards under section 307(b) of the CWA and 40 CFR 403.

**3. Application Information**

Applications for renewal or modification of this permit must contain the information about industrial discharges to the POTW pursuant to 40 CFR 122.21(j)(6)

**4. Notice to the Department**

Pursuant to 40 CFR 122.42(b), all POTWs must provide adequate notice of the following:

1. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging these pollutants; and
2. Any substantial change into the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
3. For purposes of this paragraph, adequate notice shall include information on:
  - i. the quality and quantity of effluent introduced into the POTW, and
  - ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

For POTWs without an approved pretreatment program, the notice of industrial discharges which was not included in the permit application shall be made as soon as practicable. For POTWs with an approved pretreatment program, notice is to be included in the annual pretreatment report required in the special conditions of this permit. Notice may be sent to:

Missouri Department of Natural Resources  
Water Protection Program  
Attn: Pretreatment Coordinator  
P.O. Box 176  
Jefferson City, MO 65102

**STANDARD CONDITIONS FOR NPDES PERMITS**  
**ISSUED BY**  
**THE MISSOURI DEPARTMENT OF NATURAL RESOURCES**  
**MISSOURI CLEAN WATER COMMISSION**  
**AUGUST 15, 1994**

**PART III – SLUDGE & BIOSOLIDS FROM DOMESTIC WASTEWATER TREATMENT FACILITIES**

**SECTION A – GENERAL REQUIREMENTS**

1. This permit pertains to sludge requirements under the Missouri Clean Water Law and regulation and incorporates applicable federal sludge disposal requirements under 40 CFR 503. The Environmental Protection Agency (EPA) has principal authority for permitting and enforcement of the federal sludge regulations under 40 CFS 503 until such time as Missouri is delegated the new EPA sludge program. EPA has reviewed and accepted these standard sludge conditions. EPA may choose to issue a separate sludge addendum to this permit or a separate federal sludge permit at their discretion to further address federal requirements.
2. These PART III Standard Conditions apply only to sludge and biosolids generated at domestic wastewater treatment facilities, including public owned treatment works (POTW) and privately owned facilities.
3. Sludge and Biosolids Use and Disposal Practices.
  - a. Permittee is authorized to operate the sludge and biosolids treatment, storage, use, and disposal facilities listed in the facility description of this permit.
  - b. Permittee shall not exceed the design sludge volume listed in the facility description and shall not use sludge disposal methods that are not listed in the facility description, without prior approval of the permitting authority.
  - c. Permittee is authorized to operate the storage, treatment or generating sites listed in the Facility Description section of this permit.
  - d. A separate operating permit is required for each operating location where sludge or biosolids are generated, stored, treated, or disposed, unless specifically exempted in this permit or in 10 CSR 20, Chapter 6 regulations. For land application, see section H, subsection 3 of these standard conditions.
4. Sludge Received From Other Facilities
  - a. Permittees may accept domestic wastewater sludge from other facilities including septic tank pumpings from residential sources as long as the design sludge volume is not exceeded and the treatment facility performance is not impaired.
  - b. The permittee shall obtain a signed statement from the sludge generator or hauler that certifies the type and source of the sludge.
  - c. Sludge received from out-of-state generators shall receive prior approval of the permitting authority and shall be listed in the facility description or special conditions section of the permit.
5. These permit requirements do not supersede nor remove liability for compliance with county and other local ordinances.
6. These permit requirements do not supersede nor remove liability for compliance with other environmental regulations such as odor emissions under the Missouri Air Pollution Control Law and regulations.
7. This permit may (after due process) be modified, or alternatively revoked and reissued, to comply with any applicable sludge disposal standard or limitation issued or approved under Section 405(d) of the Clean Water Act or under Chapter 644 RsMo.
8. In addition to the STANDARD CONDITIONS, the department may include sludge limitations in the special conditions portion or other sections of this permit.
9. Alternate Limits in Site Specific Permit.

Where deemed appropriate, the department may require an individual site specific permit in order to authorize alternate limitations:

  - a. An individual permit must be obtained for each operating location, including application sites.
  - b. To request a site specific permit, an individual permit application, permit fees, and supporting documents shall be submitted for each operating location. This shall include a detailed sludge/biosolids management plan or engineering report.
10. Exceptions to these Standard Conditions may be authorized on a case-by-case basis by the department, as follows:
  - a. The department will prepare a permit modification and follow permit public notice provisions as applicable under 10 CSR 20-6.020, 40 CFR 124.10, and 40 CFR 501.15(a)(2)(ix)(E). This includes notification of the owners of property located adjacent to each land application site, where appropriate.
  - b. Exceptions cannot be granted where prohibited by the federal sludge regulations under 40 CFR 503.
11. Compliance Period  
Compliance shall be achieved as expeditiously as possible but no later than the compliance dates under 40 CFR 503.2.

## **SECTION B – DEFINITIONS**

1. Biosolids means an organic fertilizer or soil amendment produced by the treatment of domestic wastewater sludge. Untreated sludge or sludge that does not conform to the pollutants and pathogen treatment requirements in this permit is not considered biosolids.
2. Biosolids land application facility is a facility where biosolids are spread onto the land at agronomic rates for production of food or fiber. The facility includes any structures necessary to store the biosolids until soil, weather, and crop conditions are favorable for land application.
3. Class A biosolids means a material that has met the Class A pathogen reduction requirements or equivalent treatment by a Process to Further Reduce Pathogens (PFRP) in accordance with 40 CFR 503.
4. Class B biosolids means a material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PFRP) in accordance with 40 CFR 503.
5. Domestic wastewater means wastewater originating from the sanitary conveniences of residences, commercial buildings, factories and institutions; or co-mingled sanitary and industrial wastewater processed by a public owned treatment works (POTW) or privately owned facility.
6. Mechanical treatment plants are wastewater treatment facilities that use mechanical devices to treat wastewater, including septic tanks, extended aeration, activated sludge, contact stabilization, trickling filters, rotating biological discs, and other similar facilities. It does not include unaerated wastewater treatment lagoons and constructed wetlands for wastewater treatment.
7. Operating location as defined in 10 CSR 20-2.010 is all contiguous lands owned, operated or controlled by one (1) person or by two (2) or more persons jointly or as tenants in common.
8. Plant Available Nitrogen (PAN) is the nitrogen that will be available to plants during the next growing season after biosolids application.
9. Sinkhole is a depression in the land surface into which surface water flows to join an underground drainage system.
10. Site Specific Permit is a permit that has alternate limits developed to address specific site conditions for each land application site or storage site.
11. Sludge is the solid, semisolid, or liquid residue removed during the treatment of wastewater. Sludge includes septage removed from septic tanks.
12. Sludge lagoon is an earthen basin that receives sludge that has been removed from a wastewater treatment facility. It does not include a wastewater treatment lagoon or sludge treatment units that are not a part of a mechanical wastewater treatment facility.
13. Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamp, marshes, bogs, and similar areas. Wetlands do not include constructed wetlands used for wastewater treatment.

## **SECTION C – MECHANICAL WASTEWATER TREATMENT FACILITIES**

1. Sludge shall be routinely removed from the wastewater treatment facilities and handled according to the permit facility description and sludge conditions in this permit.
2. The permittee shall operate the facility so that there is no sludge loss into the discharged effluent in excess of permit limits, no sludge bypassing, and no discharge of sludge to waters of the state.
3. Mechanical treatment plants shall have separate sludge storage compartments in accordance with 10 CSR 20, Chapter 8. Failure to remove sludge from these storage compartments on the required design schedule is a violation of this permit.

## **SECTION D – SLUDGE DISPOSED AT OTHER TREATMENT FACILITY OR CONTRACT HAULER**

1. This section applies to permittees that haul sludge to another treatment facility for disposal or use contract haulers to remove and dispose of sludge.
2. Permittees that use contract haulers are responsible for compliance with all the terms of this permit including final disposal, unless the hauler has a separate permit for sludge or biosolids disposal issued by the department; or the hauler transports the sludge to another permitted treatment facility.
3. The permittee shall require documentation from the contractor of the disposal methods used and permits obtained by the contractor.
4. Testing of sludge, other than total solids content, is not required if sludge is hauled to a municipal wastewater treatment facility or other permitted wastewater treatment facility.

## **SECTION E – WASTEWATER TREATMENT LAGOONS AND STORMWATER RETENTION BASINS**

1. Sludge that is retained within a wastewater treatment lagoon is subject to sludge disposal requirements when the sludge is removed from the lagoon or when the lagoon ceases to receive and treat wastewater.
2. If sludge is removed during the year, an annual sludge report must be submitted.
3. Storm water retention basins or other earthen basins, which have been used as sludge storage for a mechanical treatment system is considered a sludge lagoon and must comply with Section G of this permit.

## **SECTION F – INCINERATION OF SLUDGE**

1. Sludge incineration facilities shall comply with the requirements of 40 CFR 503 Subpart E; air pollution control regulations under 10 CSR 10; and solid waste management regulations under 10 CSR 80.
2. Permittee may be authorized under the facility description of this permit to store incineration ash in lagoons or ash ponds. This permit does not authorize the disposal of incineration ash. Incineration ash shall be disposed in accordance with 10 CSR 80; or if the ash is determined to be hazardous waste, shall be disposed in accordance with 10 CSR 25.
3. In addition to normal sludge monitoring, incineration facilities shall report the following as part of the annual report, quantity of sludge incinerated, quantity of ash generated, quantity of ash stored; and ash use or disposal method, quantity, and location. Permittee shall also provide the name of the disposal facility and the applicable permit number.
4. Additional limitations, monitoring, and reporting requirements may be addressed in the Special Conditions sections of this permit.

## **SECTION G – SURFACE DISPOSAL SITES AND SLUDGE LAGOONS**

1. Surface disposal sites shall comply with the requirements in 40 CFR 503 Subpart C, and solid waste disposal regulations under 10 CSR 80.
2. Additional limitations, monitoring, and reporting requirements may be addressed in the Special Conditions section of this permit.
3. Effective February 19, 1995, a sludge lagoon that has been in use for more than two years without removal of accumulated sludge, or that has not been properly closed shall comply with one of the following options:
  - a. Permittee shall obtain a site specific permit to address surface disposal requirements under 40 CFR 503, ground water quality regulations under 10 CSR 20, Chapter 7 and 8, and solid waste management regulations under 10 CSR 80;
  - b. Permittee shall clean out the sludge lagoon to remove any sludge over two years old and shall continue to remove accumulated sludge at least every two years or an alternate schedule approved under 40 CFR 503.20(b). In order to avoid damage to the lagoon seal during cleaning, the permittee may leave a layer of sludge on the bottom of the lagoon, upon prior approval of the department; or
  - c. Permittee shall close the lagoon in accordance with Section 1.

## **SECTION H – LAND APPLICATION**

1. The permittee shall not land apply sludge or biosolids unless land application is authorized in the Facility Description or special conditions section of the permit.
2. This permit replaces and terminates all previous sludge management plan approvals by the department for land application of sludge or biosolids.
3. Land application sites within a 20 mile radius of the wastewater treatment facility are authorized under this permit when biosolids are applied for beneficial use in accordance with these standard conditions unless a site specific permit is required under Section A, Subsection 9.
4. Biosolids shall not be applied unless authorized in this permit or exempted under 10 CSR 20, Chapter 6.
  - a. This permit does not authorize the land application of sludge except when sludge meets the definition of biosolids.
  - b. This permit authorizes “Class A or B” biosolids derived from domestic wastewater sludges to be land applied onto grass land, crop land, timber land or other similar agricultural or silviculture lands at rates suitable for beneficial use as organic fertilizer and soil conditioner.
5. Public Contact Sites.

Permittees who wish to apply Class A biosolids to public contact sites must obtain approval from the department. Applications for approval shall be in the form of an engineering report and shall address priority pollutants and dioxin concentrations. Authorization for land applications must be provided in the special conditions section of this permit or in a separate site-specific permit. 4

6. Agricultural and Silvicultural Sites.

In addition to specified conditions herein, this permit is subject to the attached Water Quality Guides numbers WQ 422 through 426 published by the University of Missouri, and hereby incorporated as though fully set forth herein. The guide topics are as follows:

- WQ 422 Land Application of Septage
- WQ 423 Monitoring Requirements for Biosolids Land Application
- WQ 424 Biosolids Standards for Pathogens and Vectors
- WQ 425 Biosolids Standards for Metals and Other Trace Substances
- WQ 426 Best Management Practices for Biosolids Land Applications

## **SECTION I – CLOSURE REQUIREMENTS**

1. This section applies to all wastewater treatment facilities (mechanical and lagoons) and sludge or biosolids storage and treatment facilities and incineration ash ponds. It does not apply to land application sites.
2. Permittees who plan to cease operation must obtain department approval of a closure plan which addresses proper removal and disposal of all residues, including sludge, biosolids, and ash. Permittee must maintain this permit until the facility is properly closed per 10 CSR 20-6.010 and 10 CSR 20-6.015.
3. Residuals that are left in place during closure of a lagoon or earthen structure shall not exceed the agricultural loading rates as follows:
  - a. Residuals shall meet the monitoring and land application limits for agricultural rates as referenced in Section H of these standard conditions.
  - b. If a wastewater treatment lagoon has been in operation for 15 years or more, the sludge in the lagoon qualifies for Class B with respect to pathogens (see WQ 424, Table 3), and testing for fecal coliform is not required. For other lagoons, testing for fecal coliform is required to show compliance with Class B limitations. See WQ 423 and 424.
  - c. The allowable nitrogen loading that may be left in the lagoon shall be based on the plant available nitrogen (PAN) loading. See WQ 426 for calculation procedures. For a grass cover crop, the allowable PAN is 300 pounds/acre.
4. When closing a wastewater treatment lagoon with a design treatment capacity equal or less than 150 persons, the residuals are considered “septage” under the similar treatment works” definition. See WQ 422. Under the septage category, residuals may be left in place as follows:
  - a. Testing for metals or fecal coliform is not required.
  - b. If the wastewater treatment lagoon has been in use for less than 15 years, mix lime with the sludge at the rate of 50 pounds of hydrated lime per 1000 gallons (134 cubic feet) of sludge.
  - c. The amount of sludge that may be left in the lagoon shall be based on the plant available nitrogen (PAN) loading. 100 dry tons/acre of sludge may be left in the basin without testing for nitrogen. If more than 100 dry tons/acre will be left in the lagoon, test for nitrogen and determine the PAN in accordance with WQ 426. Allowable PAN loading is 300 pounds/acre.
5. Residuals left within the lagoon shall be mixed with soil on at least a 1 to 1 ratio, the lagoon berms shall be demolished, and the site shall be graded and vegetated so as to avoid ponding of storm water and provide adequate surface water drainage without creating erosion.
6. Lagoon closure activities shall obtain a storm water permit for land disturbance activities that equal or exceed five acres in accordance with 10 CSR 20-6.200.
7. If sludge exceeds agricultural loading rates under Section H or I, a landfill permit or solid waste disposal permit shall be obtained to authorize on-site sludge disposal under the Missouri Solid Waste Management Law and regulations per 10 CSR 80, and the permittee must comply with the surface disposal requirements under 40 CFR 503, Subpart C.

## **SECTION J – MONITORING FREQUENCY**

1. At a minimum, sludge or biosolids shall be tested for volume and percent total solids on a frequency that will accurately represent sludge quantities produced and disposed.
2. Testing for land application is listed under Section H, Subsection 6 of these standard conditions (see WQ 423). Once per year is the minimum test frequency. Additional testing shall be performed for each 100 dry tons of sludge generated or stored during the year.
3. Additional testing may be required in the special conditions or other sections of the permit. Permittees receiving industrial wastewater may be required to conduct additional testing upon request from the department.
4. Monitoring requirements shall be performed in accordance with, “POTW Sludge Sampling and Analysis Guidance Document”, United States Environmental Protection Agency, August 1989, and subsequent revisions.

## SECTION K – RECORD KEEPING AND REPORTING REQUIREMENTS

1. The permittee shall maintain records on file at the facility for at least five years for the items listed in these Standard Conditions and any additional items in the Special Conditions section of this permit. This shall include dates when the sludge facility is checked for proper operation, records of maintenance and repairs and other relevant information.
2. Reporting Period
  - a. By January 28<sup>th</sup> of each year, an annual report shall be submitted for the previous calendar year period for all mechanical wastewater treatment facilities, sludge lagoons, and sludge or biosolids disposal facilities.
  - b. Permittees with wastewater treatment lagoons shall submit the above annual report only when sludge or biosolids are removed from the lagoon during the report period or when the lagoon is closed.
3. Report Forms. The annual report shall be submitted on report forms provided by the department or equivalent forms approved by the department.
4. Report shall be submitted as follows:  
Major facilities (those serving 10,000 persons or 1 million gallons per day) shall report to both the department and EPA. Other facilities need to report only to the department. Reports shall be submitted to the addresses listed as follows:

DNR regional office listed in your permit  
(See cover letter of permit)

EPA Region VII  
Water Compliance Branch (WACM)  
Sludge Coordinator  
901 N 5<sup>th</sup> Street  
Kansas City, KS 66101

5. Annual Report Contents. The annual report shall include the following:
  - a. Sludge/biosolids testing performed. Include a copy or summary of all test results, even if not required by this permit.
  - b. Sludge or Biosolids quantity shall be reported as dry tons for quantity generated by the wastewater treatment facility, the quantity stored on site at end of year, and the quantity used or disposed.
  - c. Gallons and % solids data used to calculate the dry ton amounts.
  - d. Description of any unusual operating conditions.
  - e. Final disposal method, dates, and location, and person responsible for hauling and disposal.
    - (1) This must include the name, address and permit number for the hauler and the sludge facility. If hauled to a municipal wastewater treatment facility, sanitary landfill, or other approved treatment facility, give the name and permit number of that facility.
    - (2) Include a description of the type of hauling equipment used and the capacity in tons, gallons, or cubic feet.
  - f. Contract Hauler Activities.  
If contract hauler, provide a copy of a signed contract or billing receipts from the contractor. Permittee shall require the contractor to supply information required under this permit for which the contractor is responsible. The permittee shall submit a signed statement from the contractor that he has complied with the standards contained in this permit, unless the contract hauler has a separate sludge disposal or biosolids use permit.
  - g. Land Application Sites.
    - (1) Report the location of each application site, the annual and cumulative dry tons/acre for each site, and the landowners name and address. The location for each spreading site shall be given as legal description for nearest ¼, ¼, Section, Township, Range, and County, or as latitude and longitude.
    - (2) If biosolids application exceeds 2 dry tons/acre/year, report biosolids nitrogen results. Plant Available Nitrogen (PAN) in pounds/acre, crop nitrogen requirement, available nitrogen in the soil prior to biosolids application, and PAN calculations for each site.
    - (3) If the “Low Metals” criteria is exceeded, report the annual and cumulative pollutant loading rates in pounds per acre for each applicable pollutant, and report the percent of cumulative loading which has been reached at each site.
    - (4) Report the method used for compliance with pathogen and vector attraction requirements.
    - (5) Report soil test results for pH, CEC, and phosphorus. If none was tested during the year, report the last date when tested and results.



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
 WATER PROTECTION PROGRAM, WATER POLLUTION BRANCH  
**FORM B – APPLICATION FOR CONSTRUCTION OR OPERATING PERMIT FOR FACILITIES WHICH RECEIVE PRIMARILY DOMESTIC WASTE (≤100,000 gallons per day) UNDER MISSOURI CLEAN WATER LAW**

AP14511

FOR AGENCY USE ONLY	
CHECK NUMBER	
DATE RECEIVED	FEE SUBMITTED
2/5/13	ESB

**NOTE ► PLEASE READ THE ACCOMPANYING INSTRUCTIONS BEFORE COMPLETING THIS FORM**

1. This application is for:

- An operating permit and antidegradation review public notice.
- A construction permit following an appropriate operating permit and antidegradation review public notice.
- A construction permit and a concurrent operating permit and antidegradation review public notice.
- A construction permit (submitted before Aug. 30, 2008 or antidegradation review is not required).
- An operating permit for a new or unpermitted facility. Construction Permit # \_\_\_\_\_
- An operating permit renewal: Permit #MO- 0055409 Expiration Date 11/20/2013
- An operating permit modification: Permit #MO- \_\_\_\_\_ Reason: \_\_\_\_\_

1.1 Is this a Federal/State Funded Project?  YES  NO Funding Agency/Project #: \_\_\_\_\_  
 1.2 Is the appropriate fee included with the application (See instructions for appropriate fee)?  YES  NO

**2. FACILITY (Outfall 001 of 001 )**

NAME Farber Wastewater Treatment Facility		TELEPHONE WITH AREA CODE (573) 249-3652	
ADDRESS (PHYSICAL) 1/2 Mile E of Rte. AA and CR 544 Intersection	CITY Farber	STATE MO	ZIP CODE 63345

2.1 LEGAL DESCRIPTION: NE ¼, SW ¼, ¼, Sec. 22 , T 52n , R 6W AUDR County

2.2 UTM Coordinates Easting (X): \_\_\_\_\_ Northing (Y): \_\_\_\_\_  
 For Universal Transverse Mercator (UTM), Zone 15 North referenced to North American Datum 1983 (NAD83)

2.3 Name of receiving stream: Unnamed tributary to Hickory Creek

**3. OWNER**

NAME City of Farber		E-MAIL ADDRESS farbermo@hotmail.com		TELEPHONE WITH AREA CODE (573) 249-3652	
ADDRESS 214 East Highway 54 P.O. Box 37	CITY Farber	STATE MO	ZIP CODE 63345		

3.1 Request review of draft permit prior to Public Notice?  YES  NO

**4. CONTINUING AUTHORITY: Permanent organization which will serve as the continuing authority for the operation, maintenance and modernization of the facility.**

NAME City of Farber		TELEPHONE WITH AREA CODE (573) 249-3652			
ADDRESS 214 East Highway 54	CITY Farber	STATE MO	ZIP CODE 63345		

**5. OPERATOR**

NAME Scott Allen	CERTIFICATE NUMBER 1812	TELEPHONE WITH AREA CODE (573) 473-6302
---------------------	----------------------------	--

**6. FACILITY CONTACT**

NAME Scott Allen	TITLE Chief Operator Water and WW Systems	TELEPHONE WITH AREA CODE (573) 473-6302
---------------------	--	--

**7.0 ADDITIONAL FACILITY INFORMATION**

7.1 Description of facilities (Attach additional sheet if required). Attach a 1" = 2,000' scale U.S. Geological Survey topographic map showing location of all outfalls and downstream landowners. (See Item 9.)

7.2 Facility SIC code: 4952 ; Discharge SIC code: 4952 ; Facility NAICS code: \_\_\_\_\_ ; Discharge NAICS code: \_\_\_\_\_.

7.3 Number of people presently connected or population equivalent (P.E.) 400 Design P.E. 800  
 Number of units presently connected: Homes 170 Trailers \_\_\_\_\_ Apartments 16 Other \_\_\_\_\_  
 Design flow for this outfall: 82000 Total design flow for the facility: 82000 Actual flow for this outfall: 60000  
 Commercial Establishment: Daily number of employees working 0 Daily number of customers/guests 0

7.4 Length of pipe in the sewer collection system? 2 m feet/miles (Please denote which unit is appropriate.)

7.5 Does any bypassing occur in the collection system or at the treatment facility?  Yes  No (If yes, attach explanation.)

7.6 Does significant infiltration occur in the collection system?  Yes  No (If yes, attach explanation and proposed repair.)

7.7 Is industrial waste discharged to the facility identified in Item 2?  Yes  No (If yes, see instructions.)

7.8 Will the discharge be continuous through the year?  Yes  No  
 a. Discharge will occur during the following months: No Discharge Land Application System  
 b. How many days of the week will the discharge occur? None

7.9 Is wastewater land applied?  Yes  No (If yes, attach Form I.)

7.10 Will chlorine be added to the effluent?  Yes  No  
 a. If chlorine is added, what is the resulting residual? NA µg/l (micrograms per liter)

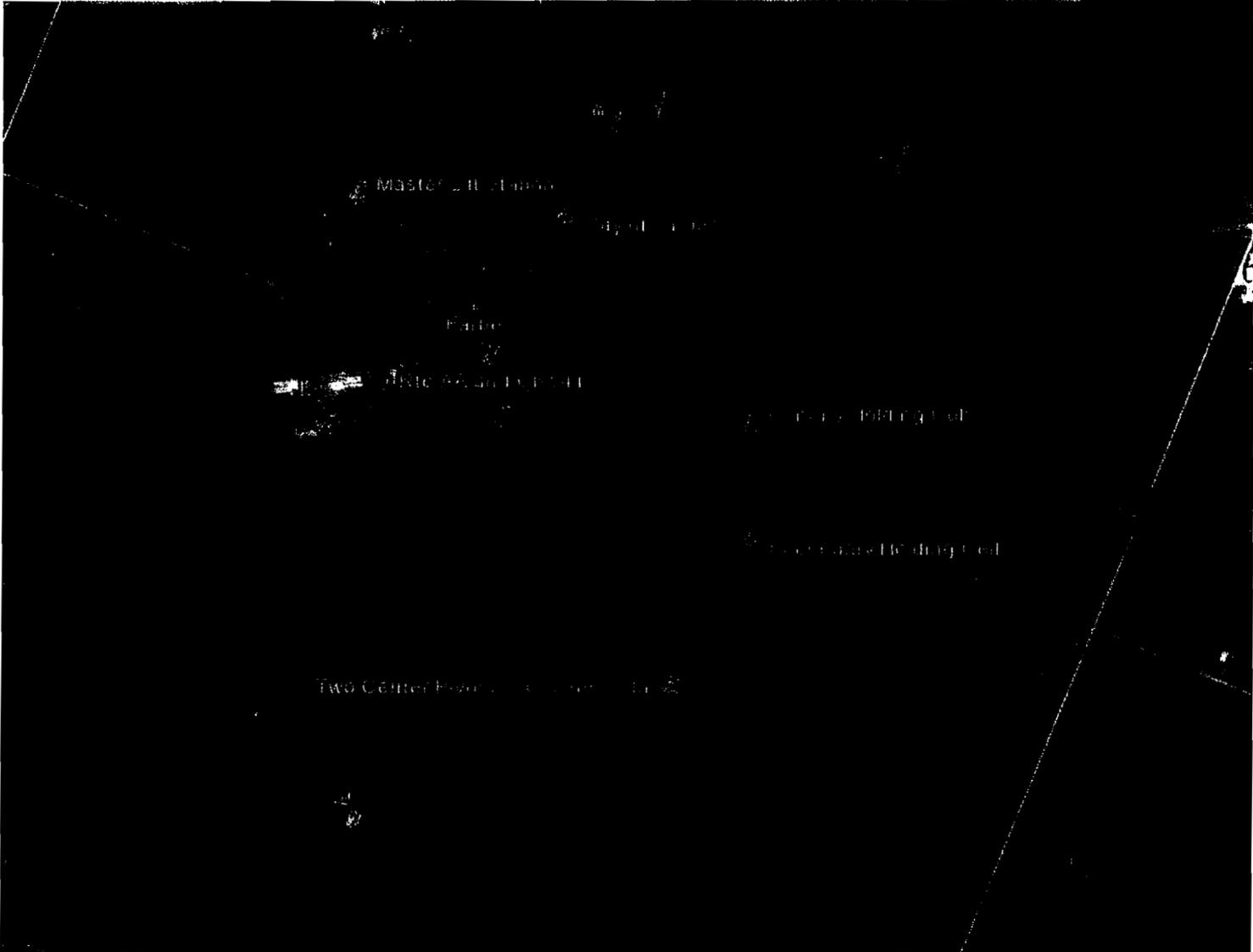
7.11 Does this facility discharge to a losing stream or sinkhole?  Yes  No

7.12 Attach a flow chart showing all influents, treatment facilities and outfalls.

7.13 Has a waste load allocation study been completed for this facility?  Yes  No

7.14 List all permit violations, including effluent limit exceedances in the last five years. Attach a separate sheet if necessary. If none, write none. Failure to submit annual report Failure to submit maintenance program.





**INSTRUCTIONS FOR COMPLETING FORM B  
APPLICATION FOR CONSTRUCTION OR OPERATING PERMITS FOR  
FACILITIES WHICH RECEIVE BASICALLY DOMESTIC WASTE  
(Facilities over 100,000 gallons per day of domestic waste must use FORM B2)**

**(Facilities that receive wastes other than domestic must fill out FORM A and other forms as appropriate)**

1. Check which parameter is applicable. **Do not check more than one item.** Construction and operating permit refer to permits issued by the Department of Natural Resources, Water Protection Program, Water Pollution Branch. Effective Sept. 1, 2008, a facility will be required to use *MISSOURI'S ANTIDegradation Rule And Implementation Procedure*. For more information, this document is available on the Web at [www.dnr.mo.gov/env/wpp/docs/aip-cwc-app-050708.pdf](http://www.dnr.mo.gov/env/wpp/docs/aip-cwc-app-050708.pdf). This procedure will be applicable to new and expanded wastewater facilities and requires the proposed discharge to a water body to undergo a level of Antidegradation Review which documents that the use of a water body's available assimilative capacity is justified.

1.1 Self-explanatory.

- 1.2 An operating permit and antidegradation review public notice requires a Water Quality/Antidegradation Review Sheet to be submitted with the application (No fee required).

**CONSTRUCTION PERMIT FEES** (Please include fee with application.)

\$750 for a sewage treatment facility with a design flow of less than 500,000 gallons per day, or gpd.

\$2,200 for sewage treatment facility with a design flow of 500,000 gpd or more.

**DOMESTIC OPERATING PERMIT FEES** (Annual operating permit fees are based on flow and are due each year on the anniversary date of the permit.)

Annual fee/Design flow	Annual fee/Design flow	Annual Fee/Design flow
\$100.....<5,000 gpd	\$375.....10,000-10,999 gpd	\$650.....16,000-16,999 gpd
\$150.....5,000-5,999 gpd	\$400.....11,000-11,999 gpd	\$800.....17,000-19,999 gpd
\$175.....6,000-6,999 gpd	\$450.....12,000-12,999 gpd	\$1,000.....20,000-22,999 gpd
\$200.....7,000-7,999 gpd	\$500.....13,000-13,999 gpd	\$2,000.....23,000-24,999 gpd
\$225.....8,000-8,999 gpd	\$550.....14,000-14,999 gpd	\$2,500.....25,000-29,999 gpd
\$250.....9,000-9,999 gpd	\$600.....15,000-15,999 gpd	\$3,000.....30,000 gpd -1 mgd

New domestic wastewater treatment facilities must submit the annual fee with the original application.

**If the application is for a site-specific permit re-issuance, send no fees.** You will be invoiced separately by the department on the anniversary date of the original permit. Permit fees must be current for the department to reissue the operating permit. Late fees of 2 percent per month are charged and added to outstanding annual fees.

**PUBLIC SEWER SYSTEM OPERATING PERMIT FEES** (City, Public Sewer District, Public Water District, or other publicly owned treatment works). Annual fee is based on number of service connections. The table of fees is in 10 CSR 20-6.011 and is 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). New Public Sewer System facilities should not submit any fee as the department will invoice the permittee.

**OPERATING PERMIT MODIFICATIONS**, including transfers, are subject to the following fees:

- a. Municipals - \$200 each
- b. All others - 25 percent of annual fee

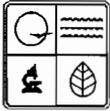
Note: Facility name or address changes where owner, operator and continuing authority remain the same are not considered transfers. Incomplete permit applications or related engineering documents will be returned by the department if they are not completed in the time frame established by the department in a comment letter to the owner. Permit fees for returned applications shall be forfeited. Permit fees for applications being processed by the department that are withdrawn by the applicant shall be forfeited.

2. If the facility has multiple outfalls, designate the outfall number and total number and use a separate form for each outfall. Name of Facility - The name by which is this facility locally known. Example: Southwest Sewage Treatment Plant, Country Club Mobile Home Park, etc. Give the street address or location of the facility. If the facility lacks a street name or route number, give the names of the closest intersection, highway, country road, etc.
- 2.1 Point of discharge should be given in terms of the legal description of the waste treatment plant. Sufficient information should be submitted that it may be located by department staff.
- 2.2 Global Positioning System, or GPS, is a satellite-based navigation system. The department prefers that a GPS receiver is used at the outfall pipe and the displayed coordinates submitted. If access to a GPS receiver is not available, use a mapping system to approximate the coordinates; the department's mapping system is available at [www.dnr.mo.gov/internetmapviewer/](http://www.dnr.mo.gov/internetmapviewer/).
- 2.3 Receiving stream(s) - Include the name of the stream or streams to which the discharge is directed and any subsequent tributary until a continuous flowing stream is reached.
3. Owner - Include the legal name and address of the owner.
- 3.1 Prior to submitting a permit to public notice, the Department of Natural Resources shall provide the permit applicant 10 days to review the draft permit for nonsubstantive drafting errors. In the interest of expediting permit issuance, permit applicants may waive the opportunity to review draft permits prior to public notice. Check yes to review the draft permit prior to public notice. Check no to waive the process and expedite the permit.
4. Continuing Authority - Include the permanent organization that will serve as the continuing authority for the operation, maintenance and modernization of the facility. The regulatory requirement regarding continuing authority is 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) or contact the appropriate Department of Natural Resources Regional Office.
5. Operator - Provide the name, certificate number and telephone number of the operator of the facility.
6. Provide the name, title and work telephone number of a person who is thoroughly familiar with the operation of the facility and with the facts reported in this application and who can be contacted by the department, if necessary.

**INSTRUCTIONS FOR COMPLETING FORM B  
APPLICATION FOR CONSTRUCTION OR OPERATING PERMITS FOR  
FACILITIES WHICH RECEIVE BASICALLY DOMESTIC WASTE  
(CONTINUED)**

- 7.1 Provide a brief description of the wastewater treatment facilities. Attach a 1"=2,000' scale U.S. Geological Survey topographic map showing location of all outfalls. This type of map is available on the Web at [www.dnr.mo.gov/internetmapviewer/](http://www.dnr.mo.gov/internetmapviewer/) or from the Department of Natural Resources' Division of Geology and Land Survey in Rolla, Missouri at 573-368-2125.
- 7.2 For Standard Industrial Codes, visit [www.osha.gov/pls/imis/sicsearch.html](http://www.osha.gov/pls/imis/sicsearch.html) and for the North American Industry Classification System at [www.census.gov/naics](http://www.census.gov/naics) or contact the appropriate Department of Natural Resources Regional Office. For example, a family style restaurant has a Facility SIC code of 5812 and a Facility NAICS code of 722210.
- 7.3 Indicate the total number of people presently served by the wastewater treatment facility. If this is a commercial establishment, indicate the number of employees and the number of guests or patrons served by the wastewater treatment facility on a daily basis.
- 7.4 Self-explanatory.
- 7.5 Include overflows of combined sewers and lift stations or bypassing of the wastewater treatment facility. Provide a detailed description of the circumstances that sewage bypassing occurs and the frequency of occurrence.
- 7.6 Self-explanatory.
- 7.7 Attach a list of industrial discharges into the system. For each industry, provide the name of facility, address, flow, type of industry/SIC code/ NAICS code and a list of the pollutants discharged by that industry into the collection system.
- 7.8 - 7.14 Self-explanatory.
- 8.1 A copy of 10 CSR 25 is available on the Web at [www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp#10-25](http://www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp#10-25) or at the Department of Natural Resources Regional Offices.
- 8.2 - 8.8 Self-explanatory.
- 8.9 Refer to University of Missouri Extension Environmental Quality publications about biosolids - numbers WQ420-426. Available on the Web at [extension.missouri.edu/explore/envqual/](http://extension.missouri.edu/explore/envqual/). In addition, the federal sludge regulations are available through the U.S. Government Printing Office at [www.gpoaccess.gov/cfr/index.html](http://www.gpoaccess.gov/cfr/index.html).
9. Provide the name and address of the first downstream landowner, different from that of the permitted facility, through whose property the discharge will flow. For discharges that leave the permitted facility and flow under a road or highway, or along the right-of-way, the downstream property owner is the landowner that the discharge flows to after leaving the right-of-way.
10. - 10.3 Self-explanatory.
- Signature - All applications must be signed as follows and the signatures must be **original**:
- a. For a corporation, by an officer having responsibility for the overall operation of the regulated facility or activity or for environmental matters.
  - b. For a partnership or sole proprietorship, by a general partner or the proprietor.
  - c. For a municipal, state, federal or other public facility, by either a principal executive officer or by an individual having overall responsibility for environmental matters at the facility.

This completed form, along with the applicable permit fees, should be submitted to the appropriate Regional Office. Submittal of an incomplete application may result in the application being returned. Map of regional offices with addresses and phone numbers can be viewed on the web at [www.dnr.mo.gov/regions/ro-map.pdf](http://www.dnr.mo.gov/regions/ro-map.pdf). If there are any questions concerning this form, please contact the appropriate Regional Office or the Department of Natural Resources, Water Protection Program, Water Pollution Branch, NPDES Permits and Engineering Section at 573-751-6825.



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
 WATER PROTECTION PROGRAM, WATER POLLUTION BRANCH  
 (SEE MAP FOR APPROPRIATE REGIONAL OFFICE)  
**FORM I – PERMIT APPLICATION FOR CONSTRUCTION AND  
 OPERATION OF WASTEWATER IRRIGATION SYSTEMS**

**FOR AGENCY USE ONLY**

PERMIT NUMBER

MO -

DATE RECEIVED

**INSTRUCTIONS: The following forms must be submitted with Form I: FORM B for domestic wastewater. Submit FORMS E and G for land disturbance permit if construction areas total one acre or more.**

**1.00 FACILITY INFORMATION**

1.10 Facility Name

City of Farber Wastewater Treatment Facility

1.20 Application for:  Construction Permit (attach Engineering report, Plans and Specifications per 10 CSR 20-8)  
 Operating Permit (if no construction permit, attach engineering documents)

Date Irrigation System Began Operation: \_\_\_\_\_

Operating Permit Renewal

1.30 Type of wastewater to be irrigated:  Domestic  Municipal  State/National Park  Seasonal business  
 Municipal with Pretreatment Program or Significant Industrial Users  Other (explain) \_\_\_\_\_

SIC Codes (list all that apply, in order of importance) 4952

1.40 Months when the business or enterprise will operate or generate wastewater:

12 months per year  Part of year (list Months): \_\_\_\_\_

1.50 This system is designed for:

No-discharge  Partial irrigation when feasible and discharge rest of time.

Irrigation during recreation season (April – October) and discharge during November – March.

Other (explain) Primary Cell 3.9 MG, Holding Cell 12.9 MG, Land application with emergency wet weather discharge

1.60 List the Facility outfalls which will be applicable to the irrigation system from outfalls listed on Form B.

Outfall Nos. 001 \_ \_ \_ \_ \_

**2.00 STORAGE BASINS**

2.10 Number of storage basins: 2 Type of basin:  Steel  Concrete  Fiberglass  Earthen  
 Earthen with membrane liner

2.20 Storage basin dimensions at inside top of berm (feet): Report freeboard as feet from top of berm to emergency spillway or overflow pipe.

(Complete Attachment A: Profile Sketch)

Basin #1: Length 580 Width 150 Depth 6 Freeboard 2 Berm Width 8 % Slope 3

Basin #2: Length 650 Width 145 Depth 18 Freeboard 2 Berm Width 8 % Slope 3

2.30 Storage Basin operating levels (report as feet below emergency overflow level)

Basin #1: Maximum water level 2 ft. Minimum operating water level 4 ft.

Basin #2: Maximum water level 2 ft. Minimum operating water level 16 ft.

2.40 Depth of sludge in lagoons and storage basins 2 ft.

Total sludge stored 7.8 dry tons \_\_\_\_\_ cu. ft.

**3.00 LAND APPLICATION SYSTEM**

3.10 Number of irrigation sites 1 Total Acres 220 Maximum % field slopes 5

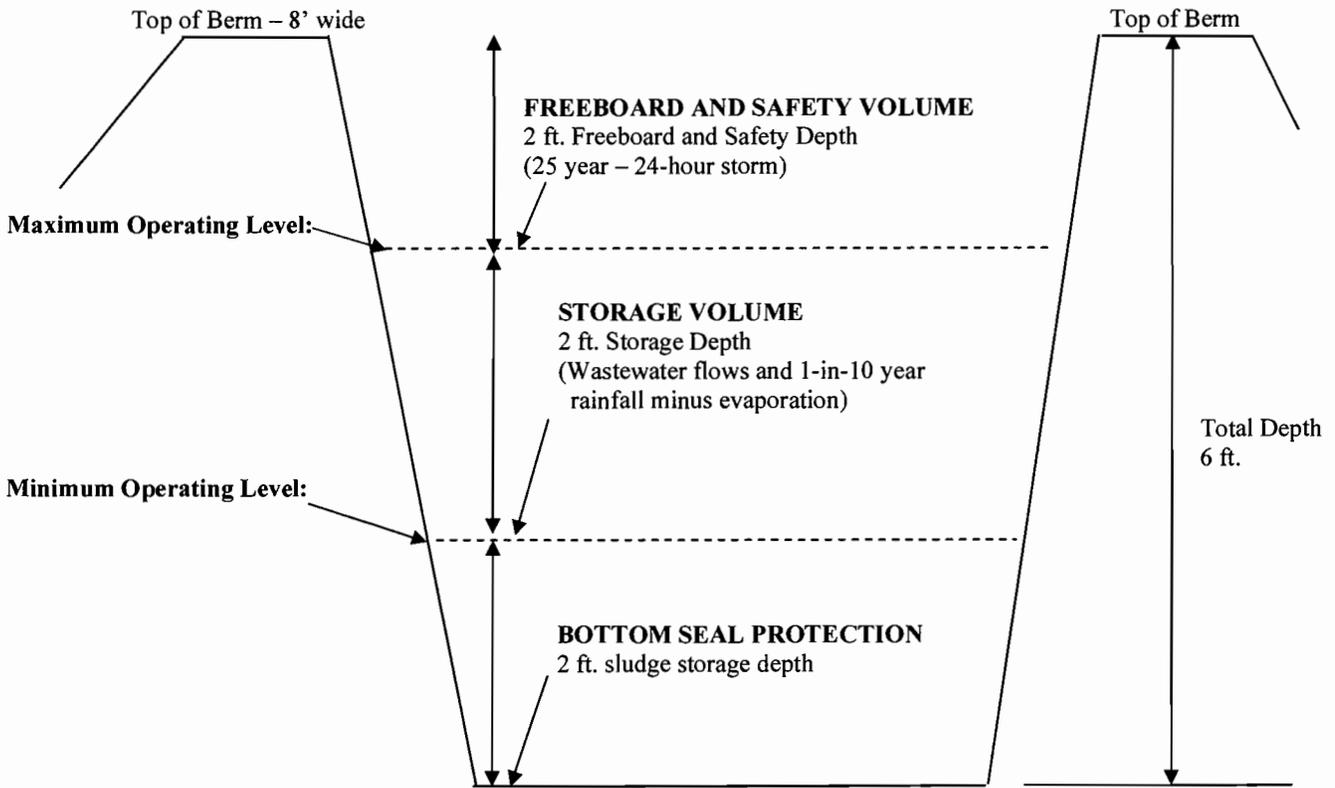
Location: NE  $\frac{1}{4}$ , SW  $\frac{1}{4}$ , \_\_\_\_\_  $\frac{1}{4}$ , 22 Sec. 52N T 6W R AUD County 220 Acres

Location: \_\_\_\_\_  $\frac{1}{4}$ , \_\_\_\_\_  $\frac{1}{4}$ , \_\_\_\_\_  $\frac{1}{4}$ , \_\_\_\_\_ Sec. \_\_\_\_\_ T \_\_\_\_\_ R \_\_\_\_\_ County \_\_\_\_\_ Acres

3.11	Type of vegetation: <input type="checkbox"/> Grass hay <input type="checkbox"/> Pasture <input type="checkbox"/> Timber <input checked="" type="checkbox"/> Row crops <input type="checkbox"/> Other (describe) _____
3.20	Wastewater flow (dry weather) gallons/day: Average annual: <u>60,000</u> Seasonal <u>70,000</u> Off-season _____ Months of seasonal flow: <u>2</u> Human Population Equivalent: <u>800</u>
3.21	Land Application rate per acre (design flow including 1 in 10 year storm water flows): Design: <u>24</u> inches/year <u>0.5</u> inches/hour <u>1.0</u> inches/day <u>3.0</u> inches/week Actual: _____ inches/year   _____ inches/hour   _____ inches/day   _____ inches/week Total Irrigation per year (gallons): _____ Design   _____ Actual <i>See Attached Annual</i> Actual months used for Irrigation (check): <input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input checked="" type="checkbox"/> May <input checked="" type="checkbox"/> Jun <input checked="" type="checkbox"/> Jul <input checked="" type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input type="checkbox"/> Nov <input type="checkbox"/> Dec
3.22	Land Application Rate is based on: <input type="checkbox"/> Nutrient Management Plan (N&P) <input type="checkbox"/> Hydraulic Loading <input checked="" type="checkbox"/> Other (describe) <u>Crop needs</u>
3.30	Equipment type: <input type="checkbox"/> Sprinklers <input type="checkbox"/> Gated pipe <input checked="" type="checkbox"/> Center pivot <input type="checkbox"/> Traveling gun <input type="checkbox"/> Other (describe) _____ Equipment Flow Capacity: _____ Gallons per hour   _____ Total hours of operation per year
3.40	Public Access Restrictions for irrigation sites: <input checked="" type="checkbox"/> Site is Fenced <input type="checkbox"/> Wastewater disinfection prior to irrigation <input type="checkbox"/> Other (describe): _____
3.50	Separation distance (in feet) from the outside edge of the wetted irrigation area to down gradient features: <u>NA</u> Permanent flowing stream <u>NA</u> Losing Stream <u>150</u> Intermittent (wet weather) stream <u>NA</u> Lake or pond <u>150</u> Property boundary <u>NA</u> Dwellings <u>NA</u> Water supply well   _____ Other (describe) _____
3.60	SOILS INFORMATION:   Use information from the County Soil Survey, NRCS, or professional soil scientist. Soil Series Name _____   Depth of bedrock _____ Feet   Depth of water table _____ Feet Soil Infiltration rate in inches/hour (in/hr) for most restrictive layer within the following soil depth ranges: _____ In/hr for 0-12 in soil depth   _____ In/hr for 12-24 inch soil depth   _____ In/hr for 24-60 inch soil depth
3.70	Include a recent Geologic Report by the Department's Geological Survey and Resource Assessment Division with your construction permit.
3.80	Attach a current copy of the Operation and Maintenance (O&M) Plan for the irrigation system.   Date of O&M Plan: <u>NA</u>
3.81	Attach a site map showing topography, storage basins, irrigation sites, property boundary, streams, wells, roads, dwellings and other pertinent features.
3.82	Attach a facility sketch showing treatment units, storage basins, pipelines, irrigation equipment, application sites and other features.
<b>4.00 CERTIFICATION</b>	
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining this information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine or imprisonment.	
CONSULTING ENGINEER – Name, Official Title and Engineering Firm   (TYPE OR PRINT)	TELEPHONE NUMBER (area code and number)
SIGNATURE	DATE SIGNED
OWNER OR AUTHORIZED REPRESENTATIVE – Name and Official Title   (TYPE OR PRINT) <u>Scott Allen   Chief Operator</u>	TELEPHONE NUMBER (area code and number) <u>573-672-3237</u>
SIGNATURE <u>Scott Allen</u>	DATE SIGNED <u>2-4-2013</u>

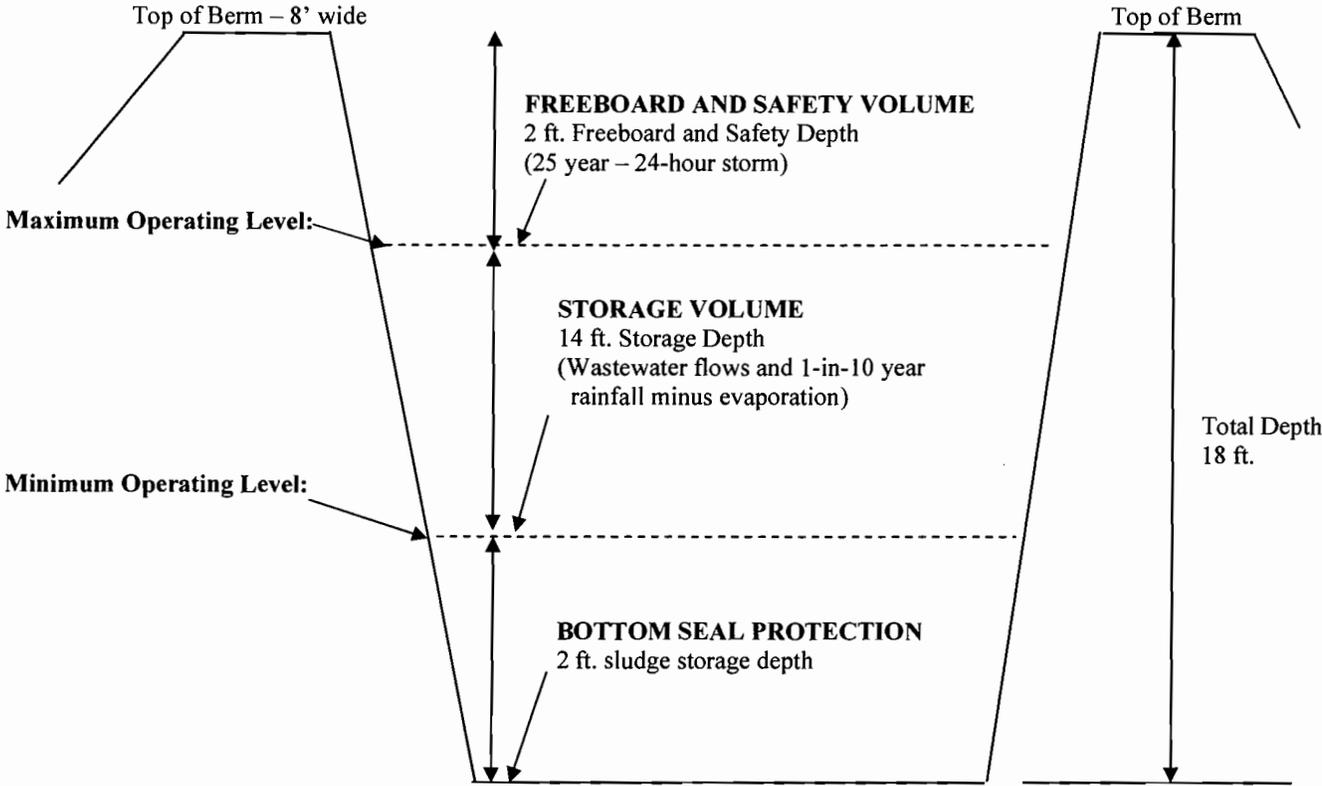
LAGOON PROFILE

Cell #1



LAGOON PROFILE

Cell #2





***CITY OF FARBER  
214 E HWY 54  
FARBER, MO 63345***

Missouri Department of Natural Resources  
Permit Review Section

February 4, 2013

RE: City of Farber NPDES Permit Renewal  
MO-0055408

Please find enclosed the renewal application for the City of Farber, Missouri State Operating Permit MO-0055409, which expires November 20, 2013.

The original 1986 EPA funded project was EPA#C291086-02. The project consisted of construction of a 12.9 MG holding cell and a 120 acre center pivot irrigation system. A second center pivot irrigator was installed several years later which covered a 100 acre tract connected to the same quarter section of ground.

The project is located in Audrain County. The irrigated ground is considered a part of the Mexico-Putnam Soil Classification, more specifically Mexico silt/loam with 1-3% slope.

Attached for your review are the following items:

- Current Missouri State Operating Permit
- Missouri DNR Form B Application for Renewal
- Missouri DNR Form I Permit Application for Wastewater Irrigation Systems
- Map showing facility locations
- Lagoon profile map
- Annual Land Application Reports 2009-2012
- Irrigation calculations based upon 220 acres of total cropland and flow calculations of 40,000 GPD, 60,000 GPD, and 80,000 GPD
- Fourth quarter 2012 actual flow records
- Soil information obtained from the latest Audrain County NRCS survey (Note: I have provided only that information which pertained to the soil type in question)

If you have any questions or comments, please contact me at the following numbers.

Scott Allen  
Work Phone – 573-672-3237  
Cell Phone – 573-473-6302  
e-mail: [scott.allen@unitedwater.com](mailto:scott.allen@unitedwater.com)

**CITY OF FARBBER  
ANNUAL OPERATING REPORT**

**IRRIGATION SYSTEM**

**YEAR: 2009**

**1. Maintenance and repairs performed:**

Serviced pump and gearboxes. Checked all tires on pivot. Cleaned nozzles on each section.

**2. Average number of times per month the facility is checked:**

8

**3. Unusual operating conditions:**

Very wet year with little need for additional water

**4. Number of days lagoon has discharged:**

Full discharge April 4th - April 11th (8 days total)

**5. Discharge flow:**

576,000 gallon (72,000 gpd for 8 days)

**6. Reason for discharge:**

Wet weather prior to irrigation season

**7. Irrigation operations:**

Lagoon Freeboard (feet from overflow at end of month)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12	7	4	0	6	4	8	6	12	2	8	6

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
						2	5	5	5	5	
											17

Number of days of irrigation for each month:

Total gallons irrigated: 19,413,000 gallons (at 600 gpm)

Total acres used: 220 acres in two pivots

Crops grown: Corn and soybeans

Crop yields per acre:

168 bu/acre corn average 47 bu/acre soybeans average

Application rate in inches/acre per day and for the year:

Total 3.25 inches on 220 acres. No crop during November application.

Total precipitation: Inches

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
						0.75	0.75	0.75		1.00		3.25
0.1	2.6	4	7.1	4.3	4.1	7.3	3.5	3.7	11.7	1.9	2.7	53.00

**CITY OF FARBER  
ANNUAL OPERATING REPORT**

**IRRIGATION SYSTEM      YEAR: 2010**

**1. Maintenance and repairs performed:**  
 Serviced pump and gearboxes. Checked all tires on pivot. Cleaned nozzles on each section. Replaced motor on section three of original north pivot

**2. Average number of times per month the facility is checked:**  
 8

**3. Unusual operating conditions:**  
 Very wet year with little need for additional water. Pumping to avoid discharge.

**4. Number of days lagoon has discharged:**  
 No discharge for the year.

**5. Discharge flow:**  
 0

**6. Reason for discharge:**

**7. Irrigation operations:**  
 Lagoon Freeboard (feet from overflow at end of month)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
5	4	2	2	2.5	3	5	8	12	10	8	9	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
			3	3	2	2	2	2	8		2	22

**Number of days of irrigation for each month:**

**Total gallons irrigated:** 19,008,000 gallons (at 600 gpm)

**Total acres used:** 220 acres in two pivots

**Crops grown:** Corn and soybeans

**Crop yields per acre:**

**177 bu/acre corn average    49 bu/acre soybeans average**

**Application rate in inches/acre per day and for the year:**

Total 3.5 inches applied to 220 acres

**Total precipitation: Inches**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
			0.25	0.5	0.5	0.5	0.5	0.5	0.5	0.75		3.5
2.4	1.9	3.1	8.2	4.7	4.4	7.9	5.4	7.6	0.5	1.9	2.3	50.30

**CITY OF FARBER  
ANNUAL OPERATING REPORT**

**IRRIGATION SYSTEM      YEAR: 2011**

**1. Maintenance and repairs performed:**

Serviced pump and gearboxes. Checked all tires on pivot. Cleaned nozzles on each section. Replaced motor on section three of original north pivot

**2. Average number of times per month the facility is checked:**

8

**3. Unusual operating conditions:**

Wet spring.

**4. Number of days lagoon has discharged:**

No discharge for the year.

**5. Discharge flow:**

0

**6. Reason for discharge:**

**7. Irrigation operations:**

Lagoon Freeboard (feet from overflow at end of month)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
8	2.5	1.5	2	2.5	6	9	14	15	14	12	10	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
		1			3	6	6		3			19

**Number of days of irrigation for each month:**

**Total gallons irrigated:** 16,800,000 gallons (at 600 gpm)

**Total acres used:** 220 acres in two pivots

**Crops grown:** Corn and soybeans

**Crop yields per acre:**

**184 bu/acre corn average    51 bu/acre soybeans average**

**Application rate in inches/acre per day and for the year:**

Total 3 inches applied to all acres

**Total precipitation: Inches (23 inch snow in Feb)**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
		0.5			0.5	0.5	0.75		0.75			3
0.1	2.3	2.7	4.5	5.2	5	3.4	3.4	2.6	1.1	4.6	3.4	38.30

**CITY OF FARBER  
ANNUAL OPERATING REPORT**

**IRRIGATION SYSTEM      YEAR: 2012**

**1. Maintenance and repairs performed:**  
 Serviced pump and gearboxes. Checked all tires on pivot. Cleaned nozzles on each section.

**2. Average number of times per month the facility is checked:**  
 8

**3. Unusual operating conditions:**  
 Good rain in April followed by drought conditions

**4. Number of days lagoon has discharged:**  
 No discharge for the year.

**5. Discharge flow:**  
 0

**6. Reason for discharge:**

**7. Irrigation operations:**  
 Lagoon Freeboard (feet from overflow at end of month)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
8	7	6	5	5	6	11	16	16	18	18	17	

Secondary holding cell dry in October

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
					4	2	2					8

**Number of days of irrigation for each month:**

**Total gallons irrigated:** 11,500,000 gallons (at 600 gpm)

**Total acres used:** 220 acres in two pivots

**Crops grown:** Corn and soybeans

**Crop yields per acre:**

54 bu/acre corn average    31 bu/acre soybeans average

Application rate in inches/acre per day and for the year:  
 did not have enough water to irrigate all 220 acres

**Total precipitation: Inches**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
					1	1	0.75					2.75
0.3	2.4	4.4	6.5	1.4	1.1	1.4	0.2	2.2	3	0.9	0.8	24.60

**CITY OF FARBER - WASTEWATER LAND APPLICATION SYSTEM CALCULATIONS**

1 Acre Foot Equals 43,560 Cubic Feet X 7.48 Gallons/cubic foot Equals 325,829 Gallons/ cu acre foot Equals 27,152 Gallons/acre inch

**40,000 GPD EXAMPLE**

Pivots operate at 600 GPM

Primary	Cell 1	Equals	3,909,000 Gallons	Approximately	651,500 Gal/foot
Storage	Cell 2	Equals	12,900,000 Gallons	Approximately	716,667 Gal/foot
Daily Flow		Equals	<b>40,000</b> Gallons/Day		
	Total Gallons		27,500,000 Gallons	Divided by	27,152 Gallons/acre inch
					Equals 1013 Acre Inches
Total Acres to be irrigated			<b>220</b>	<b>Total Available Irrigation Inches per Acre</b>	<b>4.60 Inches</b>

**NOTE: Change the numbers for flow and total acres highlighted in yellow to get the total available inches of irrigation per acre.**

## CITY OF FARBER - WASTEWATER LAND APPLICATION SYSTEM CALCULATIONS

**60,000 GPD EXAMPLE**

 1 Acre Foot Equals 43,560 Cubic Feet X 7.48 Gallons/cubic foot Equals 325,829 Gallons/ cu acre foot Equals 27.152 Gallons/acre inch

Pivots operate at 600 GPM

Primary	Cell 1	Equals	3,909,000 Gallons	Approximately	651,500 Gal/foot	
Storage	Cell 2	Equals	12,900,000 Gallons	Approximately	716,667 Gal/foot	
Daily Flow		Equals	60,000	Gallons/Day		
Total Gallons			34,800,000 Gallons	Divided by	27.152	Gallons/acre inch Equals 1282 Acre Inches
Total Acres to be Irrigated			220	Total Available Irrigation Inches per Acre 5.83 Inches		

**NOTE:** *Change the numbers for flow and total acres highlighted in yellow to get the total available inches of irrigation per acre.*



# CITY OF FARBER - LIFT STATION RECORDS

## LIFT STATION AND FLOW RECORD

OCTOBER - 2012

# 1 LS PUMP		# 2 LS PUMP			TOTAL FLOWS		
DAY	HOUR METER	HOURS	HOUR METER	HOURS	LIFT STATION FLOW - GAL	GRAVITY FLOW - GAL	TOTAL FLOW - GAL
Last	16687.0		15681.5				
1	16687.3	0.3	15681.8	0.3	10,800	7,560	18,360
2	16687.7	0.4	15682.0	0.2	10,800	7,560	18,360
3	16688.0	0.3	15682.2	0.2	9,000	6,300	15,300
4	16688.2	0.2	15682.5	0.3	9,000	6,300	15,300
5	16688.7	0.5	15682.7	0.2	12,600	8,820	21,420
6	16689.0	0.3	15683.0	0.3	10,800	7,560	18,360
7	16689.4	0.4	15683.3	0.3	12,600	8,820	21,420
8	16689.8	0.4	15683.6	0.3	12,600	8,820	21,420
9	16690.1	0.3	15683.9	0.3	10,800	7,560	18,360
10	16690.4	0.3	15684.3	0.4	12,600	8,820	21,420
11	16690.7	0.3	15684.7	0.4	12,600	8,820	21,420
12	16690.8	0.1	15684.9	0.2	5,400	3,780	9,180
13	16691.4	0.6	15685.6	0.7	23,400	16,380	39,780
14	16691.8	0.4	15686.0	0.4	14,400	10,080	24,480
15	16692.2	0.4	15686.2	0.2	10,800	7,560	18,360
16	16692.5	0.3	15686.5	0.3	10,800	7,560	18,360
17	16692.9	0.4	15686.9	0.4	14,400	10,080	24,480
18	16693.2	0.3	15687.3	0.4	12,600	8,820	21,420
19	16693.5	0.3	15687.8	0.5	14,400	10,080	24,480
20	16693.8	0.3	15688.0	0.2	9,000	6,300	15,300
21	16694.1	0.3	15688.4	0.4	12,600	8,820	21,420
22	16694.5	0.4	15688.6	0.2	10,800	7,560	18,360
23	16694.9	0.4	15689.0	0.4	14,400	10,080	24,480
24	16695.2	0.3	15689.2	0.2	9,000	6,300	15,300
25	16695.4	0.2	15689.6	0.4	10,800	7,560	18,360
26	16695.9	0.5	15690.0	0.4	16,200	11,340	27,540
27	16696.0	0.1	15690.2	0.2	5,400	3,780	9,180
28	16696.3	0.3	15690.5	0.3	10,800	7,560	18,360
29	16696.6	0.3	15690.9	0.4	12,600	8,820	21,420
30	16696.8	0.2	15691.1	0.2	7,200	5,040	12,240
31	16697.1	0.3	15691.6	0.5	14,400	10,080	24,480
<b>Total</b>		10.1		10.1	363,600	254,520	618,120

## CITY OF FARBER - LIFT STATION RECORDS

LIFT STATION AND FLOW RECORD

NOVEMBER - 2012

# 1 LS PUMP		# 2 LS PUMP			TOTAL FLOWS		
DAY	HOUR METER	HOURS	HOUR METER	HOURS	LIFT STATION FLOW - GAL	GRAVITY FLOW - GAL	TOTAL FLOW - GAL
Last	16697.1		15691.6				
1	16697.5	0.4	15691.9	0.3	12,600	8,820	21,420
2	16697.8	0.3	15692.2	0.3	10,800	7,560	18,360
3	16698.1	0.3	15692.6	0.4	12,600	8,820	21,420
4	16698.5	0.4	15692.9	0.3	12,600	8,820	21,420
5	16698.8	0.3	15693.2	0.3	10,800	7,560	18,360
6	16699.1	0.3	15693.5	0.3	10,800	7,560	18,360
7	16699.4	0.3	15693.7	0.2	9,000	6,300	15,300
8	16699.7	0.3	15693.8	0.1	7,200	5,040	12,240
9	16700.0	0.3	15694.1	0.3	10,800	7,560	18,360
10	16700.2	0.2	15694.4	0.3	9,000	6,300	15,300
11	16700.6	0.4	15694.9	0.5	16,200	11,340	27,540
12	16701.1	0.5	15695.1	0.2	12,600	8,820	21,420
13	16701.5	0.4	15695.3	0.2	10,800	7,560	18,360
14	16701.7	0.2	15695.8	0.5	12,600	8,820	21,420
15	16702.0	0.3	15696.0	0.2	9,000	6,300	15,300
16	16702.4	0.4	15696.2	0.2	10,800	7,560	18,360
17	16702.8	0.4	15696.7	0.5	16,200	11,340	27,540
18	16703.2	0.4	15697.0	0.3	12,600	8,820	21,420
19	16703.5	0.3	15697.3	0.3	10,800	7,560	18,360
20	16703.7	0.2	15697.5	0.2	7,200	5,040	12,240
21	16703.9	0.2	15697.7	0.2	7,200	5,040	12,240
22	16704.1	0.2	15698.0	0.3	9,000	6,300	15,300
23	16704.4	0.3	15698.4	0.4	12,600	8,820	21,420
24	16704.8	0.4	15698.8	0.4	14,400	10,080	24,480
25	16705.0	0.2	15699.1	0.3	9,000	6,300	15,300
26	16705.2	0.2	15699.1	0.0	3,600	2,520	6,120
27	16705.5	0.3	15699.3	0.2	9,000	6,300	15,300
28	16705.7	0.2	15699.7	0.4	10,800	7,560	18,360
29	16705.9	0.2	15700.0	0.3	9,000	6,300	15,300
30	16706.1	0.2	15700.4	0.4	10,800	7,560	18,360
Total		9.0		8.8	320,400	224,280	544,680

## CITY OF FARBER - LIFT STATION RECORDS

LIFT STATION AND FLOW RECORD

DECEMBER - 2012

# 1 LS PUMP		# 2 LS PUMP			TOTAL FLOWS		
DAY	HOUR METER	HOURS	HOUR METER	HOURS	LIFT STATION FLOW - GAL	GRAVITY FLOW - GAL	TOTAL FLOW - GAL
Last	16706.1		15700.4				
1	16706.3	0.2	15700.6	0.2	7,200	5,040	12,240
2	16706.6	0.3	15701.0	0.4	12,600	8,820	21,420
3	16707.0	0.4	15701.4	0.4	14,400	10,080	24,480
4	16707.5	0.5	15701.9	0.5	18,000	12,600	30,600
5	16708.1	0.6	15702.4	0.5	19,800	13,860	33,660
6	16708.4	0.3	15702.7	0.3	10,800	7,560	18,360
7	16708.8	0.4	15703.0	0.3	12,600	8,820	21,420
8	16709.2	0.4	15703.2	0.2	10,800	7,560	18,360
9	16709.5	0.3	15703.7	0.5	14,400	10,080	24,480
10	16709.7	0.2	15703.9	0.2	7,200	5,040	12,240
11	16710.1	0.4	15704.1	0.2	10,800	7,560	18,360
12	16710.5	0.4	15704.5	0.4	14,400	10,080	24,480
13	16710.6	0.1	15704.8	0.3	7,200	5,040	12,240
14	16710.9	0.3	15705.1	0.3	10,800	7,560	18,360
15	16711.3	0.4	15705.4	0.3	12,600	8,820	21,420
16	16711.6	0.3	15705.7	0.3	10,800	7,560	18,360
17	16711.8	0.2	15705.9	0.2	7,200	5,040	12,240
18	16712.3	0.5	15706.3	0.4	16,200	11,340	27,540
19	16713.0	0.7	15707.0	0.7	25,200	17,640	42,840
20	16713.5	0.5	15707.7	0.7	21,600	15,120	36,720
21	16714.0	0.5	15708.2	0.5	18,000	12,600	30,600
22	16714.2	0.2	15708.6	0.4	10,800	7,560	18,360
23	16714.9	0.7	15709.1	0.5	21,600	15,120	36,720
24	16715.2	0.3	15709.5	0.4	12,600	8,820	21,420
25	16715.6	0.4	15709.8	0.3	12,600	8,820	21,420
26	16715.8	0.2	15709.9	0.1	5,400	3,780	9,180
27	16716.0	0.2	15710.1	0.2	7,200	5,040	12,240
28	16716.3	0.3	15710.4	0.3	10,800	7,560	18,360
29	16716.6	0.3	15710.7	0.3	10,800	7,560	18,360
30	16716.9	0.3	15711.0	0.3	10,800	7,560	18,360
31	16717.2	0.3	15711.3	0.3	10,800	7,560	18,360
<b>Total</b>		<b>11.1</b>		<b>10.9</b>	<b>396,000</b>	<b>277,200</b>	<b>673,200</b>

# Soil Survey of Audrain County, Missouri

By Fred J. Young, Natural Resources Conservation Service, and Alice W. Geller,  
Missouri Department of Natural Resources

Fieldwork by Frederick E. Horn, Ron Taylor, Bobby Ward, and Fred J. Young,  
Natural Resources Conservation Service, and George H. Davis, Alice W. Geller, and  
Wyn Kelly, Missouri Department of Natural Resources

United States Department of Agriculture, Natural Resources Conservation Service,  
in cooperation with  
the Missouri Agricultural Experiment Station

AUDRAIN COUNTY is in east-central Missouri, north of the Missouri River (fig. 1). It has an area of 446,285 acres, or about 697 square miles.

Audrain County is bordered on the north by Monroe and Ralls Counties, on the east by Pike County, on the south by Montgomery and Callaway Counties, and on the west by Boone and Randolph Counties. The town of Mexico is the county seat. It is located near the center of the county. In 1980, the population of Mexico was 12,276. The town of Vandalia, in the northeastern part of the county, had a population of just over 3,000. Other smaller towns in the county include Laddonia, Farber, and Martinsburg. In 1982, the population of Audrain County was 25,779.

Audrain County is entirely within the Central Claypan Areas major land resource area (20). It is primarily an agricultural county.

This survey updates the soil survey of Audrain County published in 1911 (5). It provides additional interpretive information and larger maps, which show the soils in greater detail.

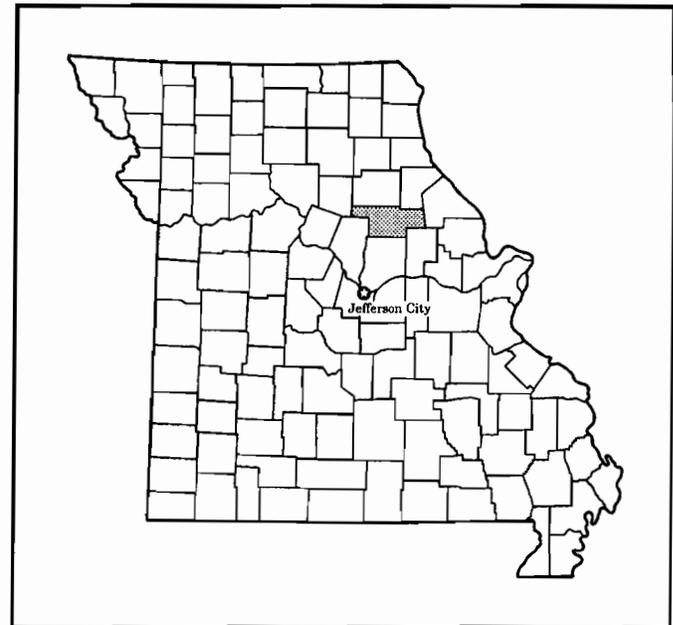


Figure 1.—Location of Audrain County in Missouri.

## General Nature of the County

This section gives general information about the county. It describes climate; physiography, relief, and drainage; and history and development.

### Climate

The consistent pattern of climate in Audrain County is one of cold winters and long, hot summers. Heavy

rains occur mainly in spring and early in summer, when moist air from the Gulf of Mexico interacts with drier continental air. The annual rainfall is normally adequate for corn, soybeans, and all grain crops.

Tornadoes and severe thunderstorms occur occasionally in the county but are local and of short

duration. Hailstorms occur at times during the warmer part of the year but in an irregular pattern and in only small areas.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Mexico, Missouri, in the period 1951 to 1987. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 29 degrees F and the average daily minimum temperature is 19 degrees. The lowest temperature on record, which occurred at Mexico on January 11, 1982, is -20 degrees. In summer, the average temperature is 75 degrees and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on July 15, 1954, is 116 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 40 inches. Of this, about 25 inches, or 65 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 5.18 inches at Mexico on September 16, 1965. Thunderstorms occur on about 53 days each year.

The average seasonal snowfall is about 23 inches. The greatest snow depth at any one time during the period of record was 18 inches. On the average, 16 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 12 miles per hour, in spring.

### Physiography, Relief, and Drainage

About 88 percent of Audrain County is on a glacial till plain. The level to gently sloping surface of this till plain is at an elevation of about 760 feet near Vandalia to about 900 feet near the Boone County border. Slopes are generally long and smooth. This relatively

undissected portion of the till plain is covered with a layer of loess.

The till plain is dissected primarily by the Salt River and its tributaries. The Salt River flows north in Audrain County and drains most of the central and western areas. The Cuivre River system drains much of the eastern portion of the county, and the Loutre River drains a relatively small area in the south. A portion of the Grand Divide between the Missouri and Mississippi River systems is in Audrain County. It is the part of the undissected till plain between the Salt and Cuivre River systems, which drain to the Mississippi River, and the Loutre River system, which drains into the Missouri River.

The glacial till is more dissected adjacent to these drainages. Local relief is greater in these areas of moderately sloping to steep glacial till soils. Geologic erosion has removed most of the overlying loess in these areas, and in a few places the underlying shale or cherty limestone is exposed. A few limestone bluffs are adjacent to the northernmost reaches of the Salt River and major tributaries, where dissection of the glacial till plain has been most effective.

Alluvial landforms consist of flood plains and stream terraces that are directly adjacent to most of the rivers, streams, and major creeks. The elevation ranges from about 650 feet on the terraces of the Salt River along the Monroe County border in the north, to nearly 850 feet along the Boone County line near Centralia. As many as three distinct surfaces are within these areas, separated by generally indistinct scarps or short slopes that are usually less than a foot to as much as 15 feet high. Most areas are nearly level, although many areas of the highest terrace are dissected and gently sloping.

### History and Development

Audrain County was home to the Osage and Missouri Indians prior to Anglo settlement. These people primarily hunted in the area and camped along the major streams (4).

Robert Littleby was the first settler. He homesteaded along a creek, which is named after him, in north-central Audrain County. Early settlers selected the wooded draws in the county as homesites. These draws provided wood for fuel, timber for building material, and habitat for game. During the early 1800's, at least 75 percent of the county was tall grass prairie, which appeared foreign and barren to people accustomed to the forests of Kentucky and Tennessee (15).

Audrain County was organized in 1836 and named for Colonel James H. Audrain, a Missouri statesman. Settlement continued slowly, and by 1865, only 6,500 people had settled in the county. About one-tenth of the

land was cultivated (15). Over the next 50 years, immigration and cultivation greatly increased. In 1910, about 97 percent of the county was farmed and 48 percent of the land was cultivated and planted to corn, wheat, rye, oats, or sorghum. Cattle were the major livestock raised. Horses, mules, sheep, and hogs also were raised.

Crop production has continued as the primary land use. The only decrease in cropland occurred during World War II when several thousand acres was converted to pasture. Since then the amount of land area planted to crops has increased to its current level of approximately 89 percent of the county. Soybeans were first grown around 1945 and are now the most widely planted crop in the county. Winter wheat, corn, and grain sorghum also are major crops (23).

The amount of pasture and hayland acreage was highest in 1950, when it included 36 percent of the county. Currently, about 11 percent of the county is pasture or hayland. Cattle and hogs are the primary livestock raised, and many farmers raise sheep (23).

The acreage of woodland ranged from a high of 25.0 percent before settlement to the current level of 6.4 percent. The acreage of woodland has remained essentially constant since 1929. Slightly over one-half of the woodland is used as pasture (23).

Concurrent with the development of farming in Audrain County was the mining of fireclay and the production of refractory brick. The clay was deposited in sinkholes over a large area in and around the county during the Pennsylvanian period (8). These sinkholes were subsequently covered by rock strata and glacial till. Several active and abandoned mines are in scattered areas throughout the county. The first firebrick plant began operation in 1883 near Vandalia. The industry grew, and plants operated in Mexico, Vandalia, and Farber by 1943. Today, plants are in Mexico and Vandalia. Although production is diminishing in intensity, Audrain County remains a world leader in refractory brick production.

To a lesser extent coal and limestone also have been mined in Audrain County. Currently, there is no active mining of these resources. Several abandoned mines are in the north-central portion of the county. The amount of reclamation in these mined areas is slight or none.

The first soil survey of Audrain County was conducted and published in 1911 (5). The authors noted that "erosion is doing considerable damage to some of the rougher areas along larger streams" and in some areas the surface layer was entirely washed away. The Audrain County Soil and Water Conservation District was formed in 1967 to assist farmers in reducing the hazard of erosion.

## How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists

classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Some of the boundaries on the soil maps of Audrain County do not match those on the soil map of adjacent counties, and some of the soil names and descriptions do not fully agree. The differences are a result of improvements in the classification of soils, particularly modifications or refinements in soil series concepts. Also, there may be differences in the intensity of mapping or in the extent of the soils within the survey area.

## Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

# General Soil Map Units

---

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

## 1. Mexico-Putnam Association

*Nearly level and very gently sloping, loamy over clayey, somewhat poorly drained and poorly drained soils; on uplands*

This association is on a broad, loess-covered glacial till plain that has not been dissected by drainageways. The highest elevation in the county is in this association. Slopes range from 0 to 3 percent. They are very long and smooth. Few natural drainageways are in this association, although grassed waterways have been established in some areas.

This association makes up about 41 percent of the county. It is about 65 percent Mexico soils, 31 percent Putnam soils, and 4 percent soils of minor extent (fig. 2).

The Mexico soils are very gently sloping and somewhat poorly drained. They are on broad, convex interfluvial divides. Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. In sequence downward, the subsoil is mixed dark grayish brown and red silty clay loam and grayish brown silt loam; mottled dark grayish brown, red, and yellowish brown silty clay; grayish brown, mottled silty

clay; and multicolored silty clay loam. The substratum is light brownish gray, mottled clay loam.

The Putnam soils are nearly level and poorly drained. They are on the broad divides that are in the highest landscape positions. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 8 inches thick. The subsoil is dark gray, mottled silty clay in the upper part and grayish brown and gray, mottled silty clay loam in the lower part.

Of minor extent in this association are the Leonard and Lenzburg soils. Leonard soils have more sand in the lower part of the subsoil than the major soils and are on gently sloping side slopes. Lenzburg soils consist of material that has been excavated during surface mining activities. They are very gently sloping to very steep.

Nearly all of this association is used for cultivated crops, mainly corn and soybeans. Winter wheat, grain sorghum, and some alfalfa also are grown. A small acreage is pastured.

This association is suited to cultivated crops and to most grasses and legumes. The main management concern in areas of the Mexico soils is the hazard of erosion. Wetness is a limitation in areas of the Putnam soils.

The wetness, a shrink-swell potential, and restricted permeability are limitations affecting building site development and septic tank absorption fields.

Very little cover is available for wildlife in this association. Some habitat is provided along brushy fence rows and the edge of fields. Wildlife habitat can be improved by maintaining the quality and increasing the extent of permanent vegetative cover in uncultivated areas.

## 2. Mexico-Leonard-Armstrong Association

*Very gently sloping to moderately sloping, loamy over clayey, poorly drained to moderately well drained soils; on uplands*

This association is on the part of the glacial till plain that has been weakly dissected by drainageways. The

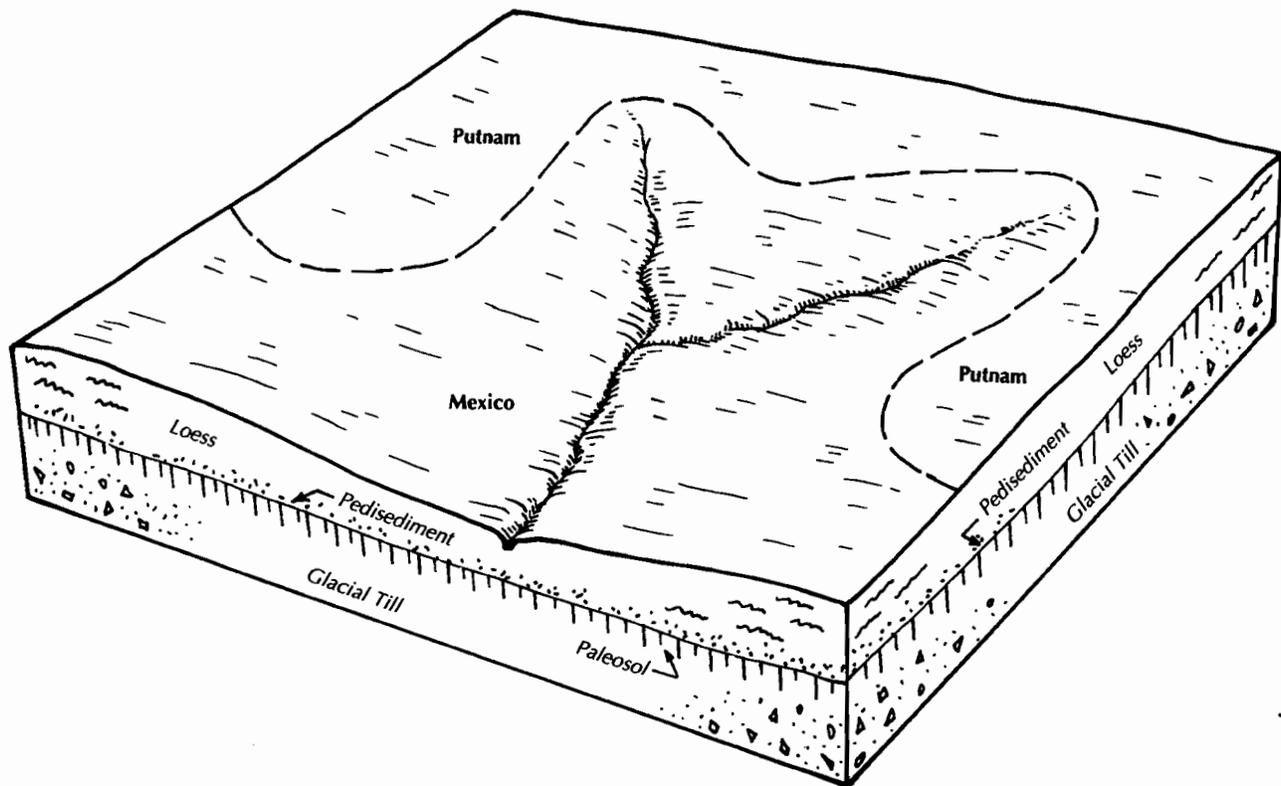


Figure 2.—Typical pattern of soils and parent material in the Mexico-Putnam association.

landscape consists mainly of narrow, convex, elongated interfluvies and long side slopes. Drainageways are small and narrow. Slopes range from 1 to 9 percent. Many grassed waterways have been established on concave slopes. Much of the original surface layer of the soils in this association has been removed by erosion.

This association makes up about 42 percent of the county. It is about 32 percent Mexico soils, 32 percent Leonard soils, 30 percent Armstrong and similar soils, and 6 percent soils of minor extent (fig. 3).

The Mexico soils are very gently sloping and somewhat poorly drained. They are on interfluvies. Typically, the surface layer is very dark grayish brown, friable silty clay loam about 5 inches thick. The upper part of the subsoil is dark gray and dark grayish brown, mottled silty clay. The next part is grayish brown, mottled silty clay loam. The lower part is grayish brown, mottled clay loam.

The Leonard soils are gently sloping and poorly drained. They are on upland side slopes and at the head of drainageways. Typically, the surface layer is very dark grayish brown, firm silty clay loam about 6 inches thick. The upper part of the subsoil is dark gray,

mottled silty clay. The next part is dark grayish brown and gray, mottled silty clay loam. The lower part is gray and grayish brown, mottled clay loam.

The Armstrong soils are moderately sloping and moderately well drained. They are on upland side slopes. Typically, the surface layer is very dark grayish brown, very friable loam about 4 inches thick. In sequence downward, the subsoil is dark brown clay loam; dark brown, mottled clay loam; yellowish brown and dark brown, mottled clay; and grayish brown, yellowish brown, and light brownish gray, mottled clay loam.

Of minor extent in this association are the Twomile, Belknap, and Lenzburg soils. Twomile soils have a thick subsurface layer of silt loam and are in nearly level high flood plains. Belknap soils are silt loam throughout and are on narrow flood plains. Lenzburg soils are clay loam throughout. They consist of material that has been excavated during surface mining activities.

The very gently sloping and gently sloping areas of this association are used mainly for cultivated crops, and the moderately sloping areas are used mainly for pasture. Corn and soybeans are the main crops. Grain sorghum, winter wheat, and alfalfa also are grown.

Many areas have a permanent grass cover. Trees and brush grow in narrow areas along drainageways and on some moderately sloping side slopes.

This association is suited to cultivated crops, grasses, and legumes. The hazard of erosion is the main management concern.

Wetness, a high shrink-swell potential, and restricted permeability are limitations affecting building site development and septic tank absorption fields.

The areas of trees and brush provide important wildlife habitat in this association. Additional habitat is provided along brushy fence rows and the edge of fields and in pastures of warm-season grasses that have not been overgrazed. Wildlife habitat can be improved by maintaining the quality and increasing the extent of permanent vegetative cover in uncultivated areas.

**3. Keswick-Marion Association**

*Very gently sloping to strongly sloping, loamy over clayey, moderately well drained and somewhat poorly drained soils; on uplands*

This association is on the part of the glacial till plain that has been strongly dissected by drainageways. The

landscape consists mainly of short side slopes and narrow, convex, elongated interfluves. Slopes range from 1 to 14 percent. The drainageways are small and narrow, and many are deeply incised.

This association makes up about 8 percent of the county. It is about 75 percent Keswick and similar soils, 11 percent Marion soils, and 14 percent soils of minor extent (fig. 4).

The Keswick soils are moderately sloping and strongly sloping and are moderately well drained. They are on side slopes. Typically, the surface layer is dark brown, friable silt loam about 2 inches thick. The subsurface layer is dark brown, mottled silt loam about 5 inches thick. The subsoil is mottled clay loam. It is dark yellowish brown, yellowish brown, and strong brown in the upper part and grayish brown in the lower part.

The Marion soils are very gently sloping and gently sloping and are somewhat poorly drained. They are on narrow ridgetops. Typically, the surface layer is dark grayish brown, very friable silt loam about 2 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 7 inches thick. The upper part of the subsoil is brown, mottled silty clay, and the lower

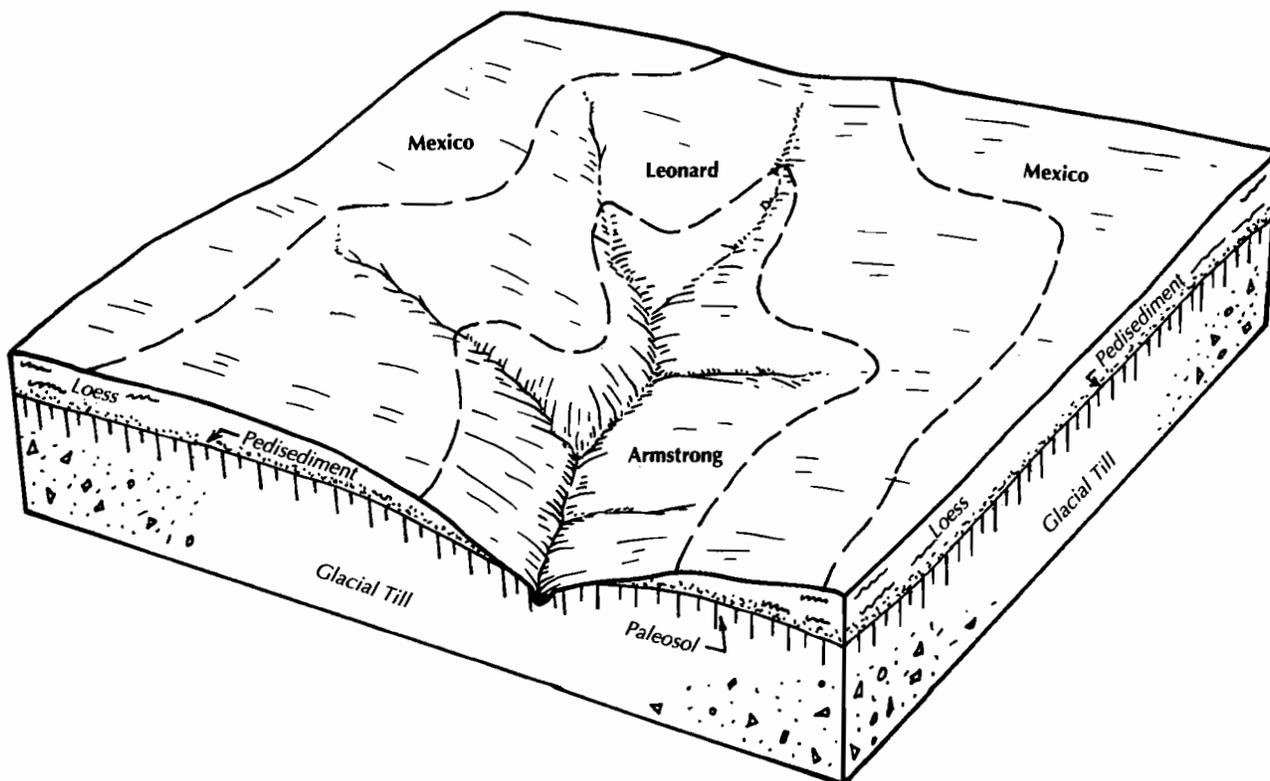


Figure 3.—Typical pattern of soils and parent material in the Mexico-Leonard-Armstrong association.

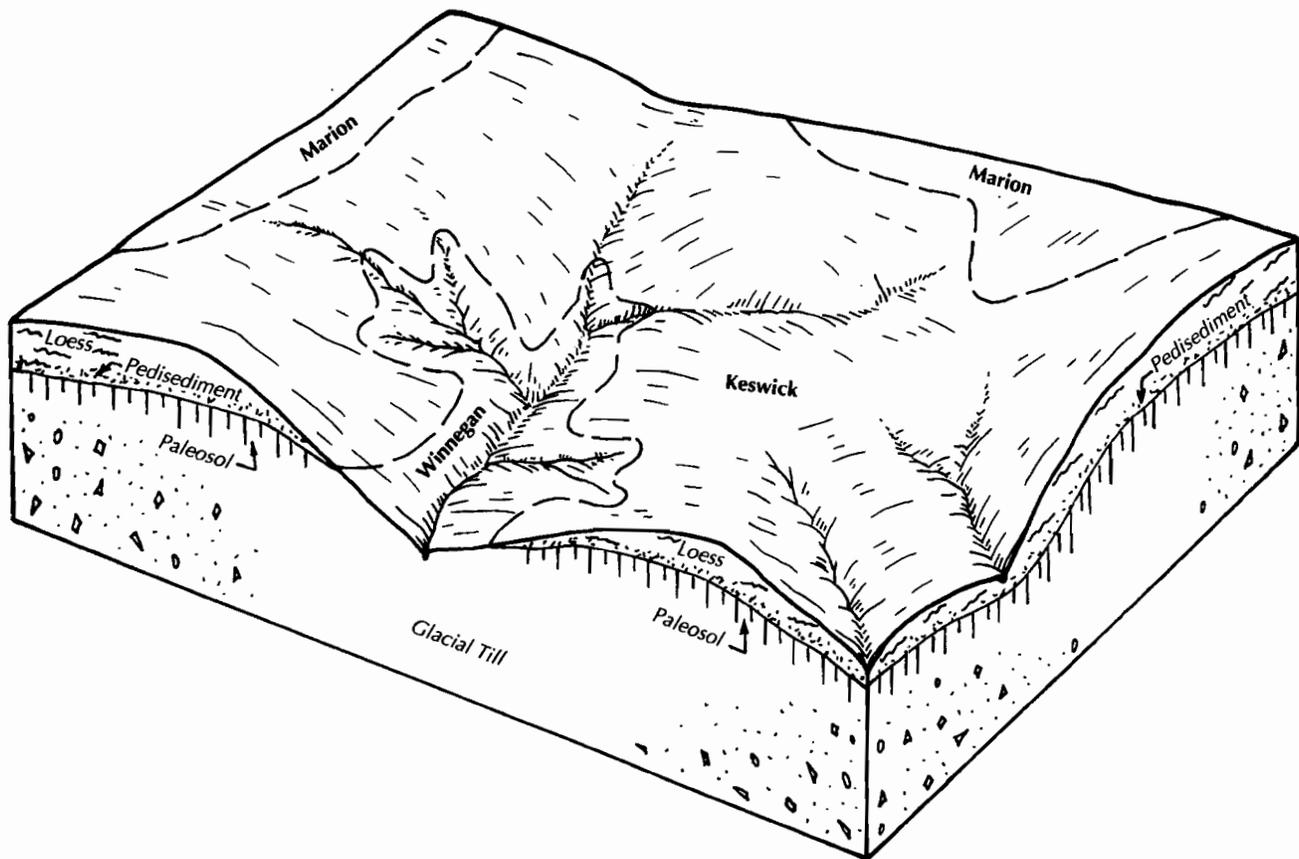


Figure 4.—Typical pattern of soils and parent material in the Keswick-Marion association.

part is light brownish gray, mottled silty clay loam.

Of minor extent in this association are the Winnegan, Goss, Twomile, Belknap, and Lenzburg soils. Winnegan soils do not have mottles in the upper part of the subsoil. Goss soils are cobbly or very cobbly throughout. Winnegan and Goss soils are on steep side slopes below the Keswick soils. Twomile soils are poorly drained. Belknap soils are silt loam throughout. Twomile and Belknap soils are on nearly level flood plains. Lenzburg soils are clay loam throughout. They consist of material that has been excavated during surface mining activities.

Most areas of the Marion soils and the moderately sloping areas of the Keswick soils are used as pasture. Other areas of the Keswick soils, particularly the strongly sloping areas, are used as woodland. A few gently sloping or moderately sloping areas are used for cultivated crops. Timber is harvested in some forested areas, but commercial logging is minimal.

Most areas of this association are suited to cultivated crops, grasses, and legumes. The hazard of erosion is the main management concern. It is very severe in strongly sloping areas.

Wetness, a shrink-swell potential, and restricted permeability are limitations affecting building site development and septic tank absorption fields. The slope is an additional limitation in the steeper areas.

The forested areas in this association include valuable timber species, such as white oak, and can be managed for timber production. The seedling mortality rate and the hazard of windthrow are the main management concerns in these areas.

This association provides most of the forest cover necessary for wildlife in the county. Additional habitat is provided along brushy fence rows and the edge of fields and in pastures of warm-season grasses that have not been overgrazed.

#### 4. Belknap-Twomile-Gifford Association

*Nearly level and gently sloping, loamy and loamy over clayey, somewhat poorly drained and poorly drained soils; on flood plains and stream terraces*

This association is on the flood plains and high stream terraces of major drainageways. Individual areas of this association are narrow and elongated and

include a perennial stream. Flooding occurs frequently in areas of the Belknap soils and occasionally in areas of the Twomile soils.

This association makes up about 9 percent of the county. It is about 38 percent Belknap soils, 34 percent Twomile soils, 14 percent Gifford soils, and 14 percent soils of minor extent, mostly Chariton soils (fig. 5).

The Belknap soils are nearly level and somewhat poorly drained. They are on low flood plains. Typically, the surface layer is dark grayish brown, friable silt loam about 11 inches thick. The substratum is mottled silt loam. It is dark grayish brown and grayish brown in the upper part and light brownish gray and gray in the lower part.

The Twomile soils are nearly level and poorly drained. They are on high flood plains. Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is mottled silt loam. It is grayish brown in the upper part and light brownish gray in the lower part. The subsoil is mottled silty clay loam. It is grayish brown and dark grayish brown in the upper part and dark grayish brown in the lower part.

The Gifford soils are gently sloping and poorly drained. They are on the high stream terraces. Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The upper part of the subsoil is dark grayish brown, mottled silty clay loam. The next part is dark grayish brown and grayish brown, mottled silty clay. The lower part is grayish brown and dark gray, mottled silty clay loam and dark gray, mottled silt loam.

Of minor extent in this association are the Jemerson and Chariton soils. Jemerson soils are on the high flood plains and are well drained. Chariton soils are on the high terraces and are nearly level.

Most areas of the Twomile and Gifford soils are used for cultivated crops, mainly corn and soybeans. Winter wheat and grain sorghum also are grown. Some areas are used for pasture. Most areas of the Belknap soils are used as woodland. Some areas are used for cultivated crops or as pasture.

The soils in this association are suited to cultivated crops and to the grasses and legumes that can tolerate the wetness. The main management concerns are the wetness and the flooding.

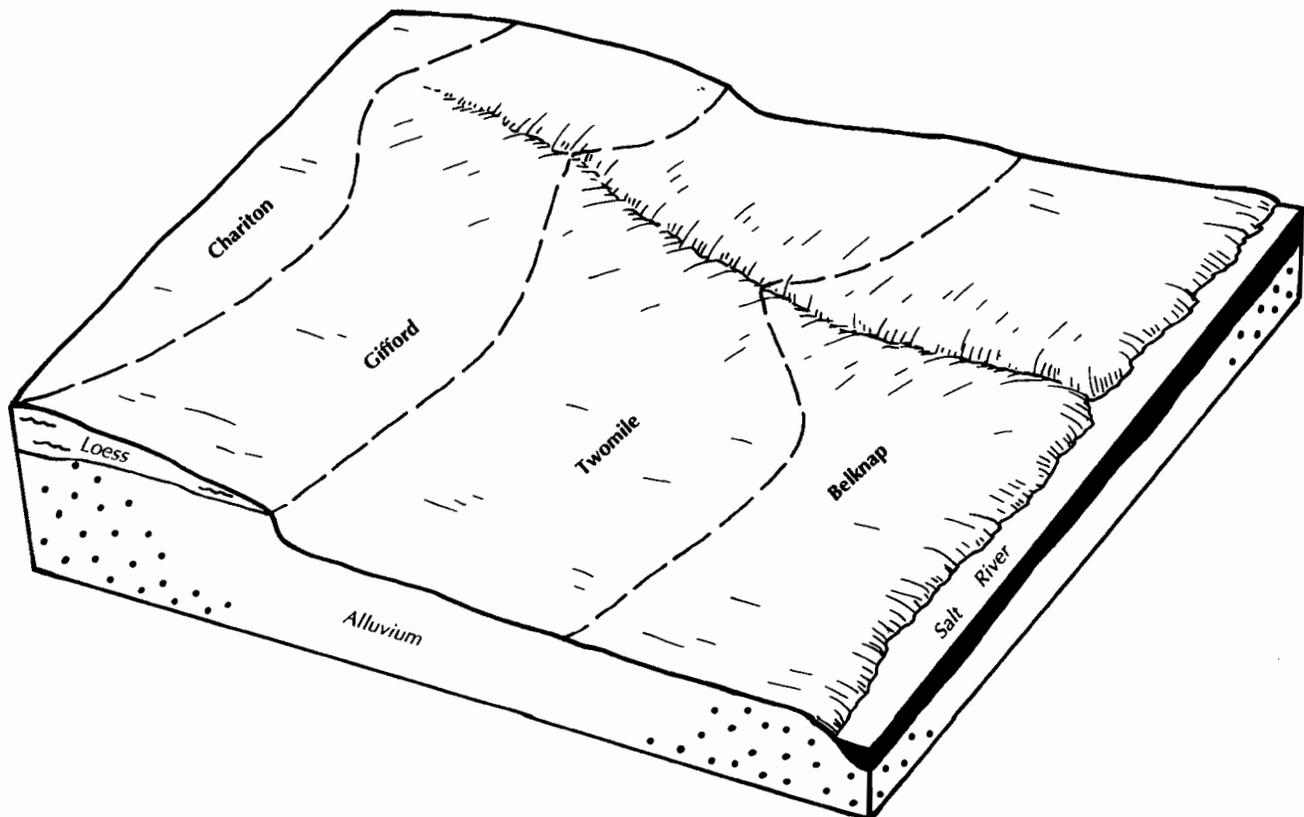


Figure 5.—Typical pattern of soils and parent material in the Belknap-Twomile-Gifford association.

Sewage generally can be piped to a nearby area where soils are better suited to an onsite waste disposal system.

The high shrink-swell potential, low strength, the slope, frost action, and the wetness are the main limitations affecting local roads and streets. Strengthening the subgrade by adding crushed rock or other suitable material or mixing the base material with additives, such as hydrated lime, minimizes the damage caused by shrinking and swelling and by low strength. Cutting and filling generally is necessary to reduce the slope to an acceptable grade for roads and streets. A gravel moisture barrier in the subgrade minimizes the damage caused by frost action. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts minimize the damage caused by wetness.

The land capability classification is Vle.

**27B—Mexico silt loam, 1 to 3 percent slopes.** This very deep, very gently sloping, somewhat poorly drained soil is on broad upland interfluvies and divides. It formed in loess and in the underlying pediments. Individual areas are irregular in shape and range from 5 to 1,500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

*Surface layer:*

0 to 7 inches, very dark grayish brown, friable silt loam

*Subsoil:*

7 to 11 inches, dark grayish brown and red silty clay loam and grayish brown silt loam

11 to 17 inches, mottled dark grayish brown, red, and yellowish brown silty clay

17 to 36 inches, grayish brown, mottled silty clay

36 to 48 inches, mottled grayish brown, dark yellowish brown, and yellowish brown silty clay loam

*Substratum:*

48 to 60 inches, light brownish gray, mottled clay loam

In places, the soil is eroded and the surface layer is silty clay loam.

Included with this soil in mapping are areas of Putnam and Leonard soils. Putnam soils are poorly drained and are in nearly level areas. Leonard soils also are poorly drained. They are on the lower side slopes. Included soils make up less than 5 percent of this unit.

Important soil properties—

*Permeability:* Very slow

*Surface runoff:* Slow

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Shrink-swell potential:* High

*Depth to a seasonal high water table:* 1.0 to 2.5 feet (perched)

In most areas this soil is used for cultivated crops. In a few areas it is used for hay and pasture (fig. 6).

This soil is suited to corn, soybeans, grain sorghum, and winter wheat. The hazard of erosion is moderate. The wetness delays fieldwork in some years, but yields generally are only slightly affected. The hazard of erosion can be reduced by farming on the contour, applying a conservation tillage system that leaves a protective cover of crop residue on the surface, terracing, and stripcropping. Grassed waterways serve as outlets for runoff from terraces.

This soil is suited to most of the commonly grown grasses and legumes, such as alfalfa, birdsfoot trefoil, red clover, tall fescue, and switchgrass. The wetness may affect the selection of plants. Generally, the species that can tolerate the wetness grow best. Equipment should not be operated when the soil is saturated. Erosion is a management concern when establishing new seedings. It can be minimized by preparing the seedbed on the contour and by timing tillage so that a good ground cover is quickly established.

The main limitations on sites for dwellings are the wetness and the shrink-swell potential. Installing tile drains around footings and foundations minimizes the damage caused by excessive wetness. A suitable outlet for the drainage tile is needed. Adequately reinforcing the footings and foundations with concrete and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling.

This soil is unsuitable as a site for conventional septic tank absorption fields. It is limited by the very slow permeability and the wetness. The absorption fields can function adequately if they are properly constructed in a mound of moderately rapidly permeable fill material so that they are raised a sufficient distance above the perched seasonal high water table. Holding tanks are an effective alternative to septic tank absorption fields. Properly constructed lagoons function adequately if the site is leveled.

The high shrink-swell potential and low strength are the main limitations affecting local roads and streets. The wetness and frost action also are limitations. Strengthening the subgrade by adding crushed rock or



Figure 6.—An area of Mexico silt loam, 1 to 3 percent slopes, used for row crops and hay.

other suitable material or mixing the base material with additives, such as hydrated lime, minimizes the damage caused by shrinking and swelling and by low strength. A gravel moisture barrier in the subgrade minimizes the damage caused by frost action. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts minimize the damage caused by wetness.

The land capability classification is IIe.

**27B2—Mexico silty clay loam, 1 to 3 percent slopes, eroded.** This very deep, very gently sloping, somewhat poorly drained soil generally is on broad upland interfluvial divides. It formed in loess and in the underlying pediments. Much of the original dark surface soil has been removed by erosion in most areas. Individual areas are irregular in shape and range from 5 to 1,000 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

*Surface layer:*

0 to 5 inches, very dark grayish brown, friable silty clay loam

*Subsoil:*

5 to 10 inches, dark gray, mottled silty clay

10 to 16 inches, dark grayish brown, mottled silty clay

16 to 47 inches, grayish brown, mottled silty clay loam

47 to 60 inches, dark grayish brown, mottled clay loam

In places, the soil is not eroded and the surface layer is silt loam. In a few areas the slope is 4 percent.

Included with this soil in mapping are areas of

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
10C2	Armstrong loam, 4 to 9 percent slopes, eroded-----	50,275	11.3
10C3	Armstrong clay loam, 5 to 9 percent slopes, severely eroded-----	1,205	0.3
18F	Goss cobbly silt loam, 14 to 30 percent slopes-----	1,390	0.3
19B	Marion silt loam, 1 to 5 percent slopes-----	4,235	0.9
22C2	Keswick silt loam, 5 to 9 percent slopes, eroded-----	26,250	5.9
22D2	Keswick loam, 9 to 14 percent slopes, eroded-----	3,345	0.8
23B2	Leonard silty clay loam, 2 to 4 percent slopes, eroded-----	65,800	14.7
24F	Winnegan silt loam, 14 to 30 percent slopes-----	1,950	0.4
27B	Mexico silt loam, 1 to 3 percent slopes-----	111,580	25.0
27B2	Mexico silty clay loam, 1 to 3 percent slopes, eroded-----	68,680	15.4
28	Twomile silt loam-----	17,860	4.0
33	Belknap silt loam-----	18,595	4.2
34	Putnam silt loam-----	57,045	12.8
45B	Gifford silt loam, 1 to 4 percent slopes-----	5,450	1.2
47	Chariton silt loam-----	4,780	1.1
56B	Jemerson silt loam, 1 to 3 percent slopes-----	304	0.1
74C2	Winnegan clay loam, bedrock substratum, 5 to 9 percent slopes, eroded-----	655	0.1
74D2	Winnegan loam, bedrock substratum, 9 to 14 percent slopes, eroded-----	2,055	0.5
90B	Lenzburg silty clay loam, 1 to 5 percent slopes-----	490	0.1
90F	Lenzburg clay loam, 5 to 50 percent slopes-----	1,320	0.3
100	Udorthents, nearly level to strongly sloping-----	90	*
	Water areas less than 40 acres in size-----	2,765	0.6
	Water areas more than 40 acres in size-----	166	*
	Total-----	446,285	100.0

\* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
19B	Marion silt loam, 1 to 5 percent slopes
23B2	Leonard silty clay loam, 2 to 4 percent slopes, eroded (where drained)
27B	Mexico silt loam, 1 to 3 percent slopes (where drained)
27B2	Mexico silty clay loam, 1 to 3 percent slopes, eroded (where drained)
28	Twomile silt loam (where drained)
33	Belknap silt loam (where protected from flooding or not frequently flooded during the growing season)
34	Putnam silt loam (where drained)
45B	Gifford silt loam, 1 to 4 percent slopes (where drained)
47	Chariton silt loam (where drained)
56B	Jemerson silt loam, 1 to 3 percent slopes

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Grain sorghum	Winter wheat	Orchard- grass-red clover hay	Alfalfa hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	Tons	AUM*
10C2----- Armstrong	IIIe	77	27	75	43	2.6	3.4	4.3
10C3----- Armstrong	IVe	72	25	70	40	2.4	3.2	4.0
18F----- Goss	VIIe	---	---	---	---	---	---	3.0
19B----- Marion	IIIe	80	28	77	44	2.7	3.6	4.4
22C2----- Keswick	IIIe	77	27	75	43	2.6	3.4	4.3
22D2----- Keswick	IVe	67	23	65	37	2.2	3.0	3.7
23B2----- Leonard	IIIe	75	26	71	42	2.5	---	4.2
24F----- Winnegan	VIe	---	---	---	---	---	---	---
27B----- Mexico	IIe	90	30	87	50	3.0	4.0	5.0
27B2----- Mexico	IIIe	85	28	82	47	2.8	3.5	4.7
28----- Twomile	IIIw	75	26	72	42	2.5	---	4.2
33----- Belknap	IIIw	85	29	82	47	2.8	---	3.8
34----- Putnam	IIw	90	31	87	50	3.0	---	5.0
45B----- Gifford	IIe	80	28	77	44	2.7	---	4.4
47----- Chariton	IIw	90	31	87	50	3.0	---	5.0
56B----- Jemerson	IIe	100	34	96	55	3.3	4.2	5.6
74C2----- Winnegan	IIIe	70	24	67	39	2.3	3.4	3.9
74D2----- Winnegan	IVe	65	22	62	35	2.1	2.9	3.6
90B----- Lenzburg	IIe	75	26	72	42	2.5	3.3	4.2

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "poor," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10C2----- Armstrong	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
10C3----- Armstrong	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
18F----- Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, small stones, slope.
19B----- Marion	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
22C2, 22D2----- Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
23B2----- Leonard	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
24F----- Winnegan	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
27B, 27B2----- Mexico	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
28----- Twomile	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
33----- Belknap	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
34----- Putnam	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
45B----- Gifford	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
10C2----- Armstrong	Moderate: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
10C3----- Armstrong	Moderate: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
18F----- Goss	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
19B----- Marion	Moderate: slope.	Moderate: wetness.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
22C2----- Keswick	Moderate: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
22D2----- Keswick	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
23B2----- Leonard	Moderate: slope.	Severe: wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily.
24F----- Winnegan	Severe: slope.	Moderate: wetness.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, wetness.	Slope, percs slowly.
27B, 27B2----- Mexico	Slight-----	Moderate: hard to pack, wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
28----- Twomile	Moderate: seepage.	Moderate: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
33----- Belknap	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
34----- Putnam	Slight-----	Severe: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
45B----- Gifford	Slight-----	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
47----- Chariton	Moderate: seepage.	Severe: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO			4	10	40	200		
			In				Pct	Pct				
24F----- Winnegan	0-7	Silt loam	CL-ML, CL	A-4, A-6	0	0	95-100	95-100	80-90	60-80	20-30	5-15
	7-39	Clay loam, clay.	CL	A-7	0	0	95-100	95-100	85-95	65-85	40-50	20-30
	39-60	Clay loam, loam.	CL	A-6	0	0	95-100	95-100	85-95	60-80	25-40	10-20
27B----- Mexico	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	9-13	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-100	45-60	25-35
	13-29	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-75	30-45
	29-52	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-100	45-60	25-35
	52-60	Silty clay loam, clay loam, silty clay.	CL, CH	A-7	0	0	100	95-100	90-100	70-100	40-65	15-40
27B2----- Mexico	0-5	Silty clay loam.	CL, CH, ML, MH	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	5-16	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-100	45-60	25-35
	16-47	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	95-100	60-75	30-45
	47-60	Silty clay loam, clay loam, silty clay.	CL, CH	A-7	0	0	100	95-100	90-100	70-100	40-65	15-40
28----- Twomile	0-9	Silt loam	CL-ML, CL	A-4	0	0	100	100	95-100	90-100	20-30	4-9
	9-23	Silt loam, silt.	CL-ML, CL	A-4	0	0	100	100	95-100	90-100	20-30	4-9
	23-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-45	15-25
33----- Belknap	0-11	Silt loam	ML, CL, CL-ML	A-4	0	0	100	95-100	90-100	80-100	20-30	2-8
	11-60	Silt loam	ML, CL-ML, CL	A-4, A-6	0	0	100	95-100	90-100	80-100	20-35	NP-12
34----- Putnam	0-8	Silt loam	CL, ML	A-6, A-4	0	0	100	100	90-100	85-100	30-40	5-15
	8-16	Silt loam	CL, ML	A-4, A-6	0	0	100	100	90-100	85-100	30-40	5-15
	16-30	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	90-100	60-70	35-45
	30-46	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	95-100	90-100	50-65	25-40
	46-60	Silty clay loam.	CL	A-7	0	0	100	100	95-100	90-100	40-50	20-30

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
10C2----- Armstrong	0-4	22-27	1.45-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Moderate	0.32	3	6	2-3
	4-46	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High	0.32			
	46-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.8	Moderate	0.32			
10C3----- Armstrong	0-3	35-42	1.45-1.50	0.2-0.6	0.18-0.20	5.6-7.3	Moderate	0.37	2	4	1-2
	3-42	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High	0.32			
	42-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.8	Moderate	0.32			
18F----- Goss	0-5	10-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.5	Low	0.24	2	8	1-2
	5-20	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low	0.10			
	20-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate	0.10			
19B----- Marion	0-9	12-27	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3	6	1-2
	9-29	48-60	1.30-1.65	<0.06	0.11-0.13	3.6-5.5	High	0.32			
	29-49	30-40	1.30-1.55	0.06-0.2	0.15-0.17	3.6-6.0	Moderate	0.43			
	49-60	24-35	1.35-1.45	0.2-0.6	0.15-0.18	5.1-6.5	Moderate	0.43			
22C2----- Keswick	0-7	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate	0.37	3	6	1-2
	7-51	35-60	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High	0.37			
	51-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.8	Moderate	0.37			
22D2----- Keswick	0-5	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate	0.37	3	6	1-2
	5-16	35-60	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High	0.37			
	16-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.8	Moderate	0.37			
23B2----- Leonard	0-6	27-35	1.20-1.40	0.2-0.6	0.22-0.24	6.1-7.3	Moderate	0.37	3	7	1-2
	6-19	35-45	1.30-1.45	0.06-0.2	0.11-0.13	4.5-6.5	High	0.37			
	19-25	35-50	1.20-1.35	0.06-0.2	0.10-0.12	4.5-6.5	High	0.37			
	25-60	32-50	1.25-1.40	0.06-0.2	0.11-0.14	5.1-7.8	High	0.37			
24F----- Winnegan	0-7	18-27	1.20-1.40	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.32	3	6	5-1
	7-39	35-45	1.35-1.55	0.06-0.2	0.09-0.15	4.5-6.5	High	0.32			
	39-60	20-35	1.40-1.60	0.2-0.6	0.09-0.15	7.4-8.4	Moderate	0.32			
27B----- Mexico	0-9	15-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.43	3	6	2-4
	9-13	35-50	1.25-1.45	0.2-0.6	0.12-0.16	4.5-6.0	High	0.32			
	13-29	50-60	1.25-1.45	<0.06	0.08-0.12	4.5-6.0	High	0.32			
	29-52	35-50	1.25-1.45	0.2-0.6	0.12-0.16	5.1-7.3	High	0.32			
	52-60	27-50	1.25-1.45	<0.6	0.12-0.18	5.1-7.3	High	0.32			
27B2----- Mexico	0-5	27-35	1.30-1.50	0.2-0.6	0.16-0.20	5.1-7.3	Moderate	0.43	2	7	1-2
	5-16	35-50	1.25-1.45	0.2-0.6	0.12-0.16	4.5-6.0	High	0.32			
	16-47	50-60	1.25-1.45	<0.06	0.08-0.12	4.5-6.0	High	0.32			
	47-60	27-50	1.25-1.45	<0.6	0.12-0.18	5.1-7.3	High	0.32			
28----- Twomile	0-9	10-18	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	5	5	1-2
	9-23	10-18	1.35-1.45	0.6-2.0	0.22-0.24	4.5-6.0	Low	0.43			
	23-60	25-35	1.30-1.40	0.06-0.2	0.08-0.10	3.6-6.5	Moderate	0.43			
33----- Belknap	0-11	8-18	1.35-1.55	0.6-2.0	0.21-0.25	4.5-7.3	Low	0.37	5	5	1-2
	11-60	12-18	1.40-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low	0.37			
34----- Putnam	0-8	12-27	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3	6	2-3
	8-16	12-27	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.5	Low	0.43			
	16-30	48-60	1.20-1.40	<0.06	0.09-0.11	3.6-5.5	High	0.28			
	30-46	35-48	1.25-1.45	0.06-0.2	0.12-0.16	3.6-5.5	High	0.37			
	46-60	27-35	1.30-1.50	0.06-0.2	0.14-0.18	5.1-6.5	Moderate	0.43			

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
10C2, 10C3 Armstrong	C	None	---	---	1.0-3.0	Perched	Nov-Apr	>60	---	High	High	Moderate.
18F Goss	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
19B Marion	D	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High	High.
22C2, 22D2 Keswick	C	None	---	---	1.0-3.0	Perched	Nov-Apr	>60	---	High	High	Moderate.
23B2 Leonard	D	None	---	---	0.5-2.0	Perched	Nov-May	>60	---	High	High	Moderate.
24F Winnegan	C	None	---	---	2.0-3.5	Perched	Nov-Apr	>60	---	Moderate	High	High.
27B, 27B2 Mexico	D	None	---	---	1.0-2.5	Perched	Nov-May	>60	---	Moderate	High	Moderate.
28 Twomile	C/D	Occasional	Very brief to brief.	Nov-May	1.0-2.0	Perched	Nov-May	>60	---	High	High	High.
33 Belknap	C	Frequent	Brief to long.	Nov-May	1.0-3.0	Apparent	Nov-May	>60	---	High	High	High.
34 Putnam	D	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	Moderate	High	High.
45B Gifford	D	None	---	---	0.5-2.0	Perched	Nov-May	>60	---	Moderate	High	Moderate.
47 Chariton	C	Rare	---	---	0-1.5	Perched	Nov-May	>60	---	High	High	Moderate.
56B Jemerson	B	Rare	---	---	3.5-5.0	Apparent	Nov-Apr	>60	---	High	Moderate	Moderate.
74C2, 74D2 Winnegan	C	None	---	---	2.0-3.5	Perched	Nov-Apr	40-60	Soft	Moderate	High	High.
90B, 90F Lenzburg	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.