MPCA Environmental Review for Animal Feedlots

GUIDANCE

This guidance provides supplemental information for feedlot proposers about preparing an Environmental Assessment Worksheet (EAW) using the **Alternative EAW Form for Animal Feedlots**. In addition to informing the public and decision makers, the information disclosed in the EAW is an information gathering process that informs permitting actions. An EAW's purpose is to provide information regarding a project regarding the potential for significant environmental effects. This process will determine if additional environmental analysis is needed through and Environmental Impact Statement. The EAW may also indicate how the project can be modified to lessen its environmental impacts. Such modifications may be imposed as permit conditions.

The Environmental Quality Board (EQB) also publishes *EAW Guidance* for the EAW process and preparation of an EAW in general. Information in the EQB Guidance may also be useful to feedlot proposers when gathering project specific information necessary for preparing the alternative animal feedlot EAW form.

General guidance. The project proposer is required to supply all reasonably accessible data or information to adequately address questions within the EAW form, or as requested by the Responsible Governmental Unit (RGU). The finalized EAW (the version reviewed by the public) is required by law to be prepared by the Minnesota Pollution Control Agency (MPCA). The MPCA is the RGU for Animal Feedlots that meet unit threshold for mandatory EAWs identified in MN Rule 4410.4300, Subp. 29, unless the county will issue the feedlot permit, in which case the county is the RGU. However, the county is not the RGU prior to January 1, 2001.

Pre-application Meeting. MPCA recommends an application meeting with MPCA Environmental Review Unit and relevant permit programs. This meeting will help to clarify the proposed project scope, desired construction timeframes, applicable MPCA EAW and permit requirements, and respective processes necessary to complete both in a timely manner.

Item-specific guidance

1. Enter the same name used on application for feedlot permits. The name listed on the EAW should indicate the animal species. If there could be confusion with another similarly named feedlot, a geographic reference should be added (township name and, if needed, section number). An example of a complete name is: *Joe Jones Swine Facility – Norway Township.*

2. The Feedlot Proposer is the entity that has applied for or would receive the approval for the project and not a consultant, attorney, or other entity or person representing the proposer.

2a. The person listed as the contact should be familiar with the technical nature of the project and the data provided on the EAW form. The contact may be an engineer or other consultant if so desired by the proposer.

3. The RGU for Animal Feedlots is the MPCA -Environmental Review Unit or the Local Government Unit (LGU). The MPCA will complete this section and the Tempo AI # upon receipt.

4. Reason for **EAW Preparation**. Complete reason for the EAW preparation, and if an EAW is required or discretionary for the proposed project. This determination can be reviewed in the recommended pre-application meeting with the RGU. Indicate which Subpart the project is relevant in MN Rule 4410.4300, Subpart 29 A. or Subpart 29 B, based on Animal Units and if the feedlot is located in a designated Sensitive Area.

Tables 1 and 2 show the **mandatory EAW and exemption categories** effective July 1, 2003 for construction of new animal feedlots (Table 1) and expansion of existing feedlots (Table 2). The boxes below provide definitions of terms used in the tables and the conditions established by the legislature that a feedlot must meet to be eligible for the new exemption.

Table 1. New Animal Feedlot Construction

	Non-Sensitive Areas		**Sensitive Areas**	
Number of Animal Units	*Exempt?*	*EAW Mandatory?*	*Exempt?*	*EAW Mandatory?*
1000 or more	No	Yes	No	Yes
500-999	Yes, if exemption conditions met.	No	No	Yes
300-499	Yes, if exemption conditions met.	No	No	No
50-299	Yes	No	No	No
Less than 50	Yes	No	Yes	No

Table 2. Expansion of Existing Feedlot

		Non-Sensitive Areas		**Sensitive Areas**	
Number of Animal Units added	*Total number of Animal Units after construction*	*Exempt?*	*EAW Mandatory?*	*Exempt?*	*EAW Mandatory?*
1000 or more	1000 or more	No	Yes	No	Yes
500-999	Less than 1000*	Yes, if exemption conditions met.	No	No	Yes
100-499	Less than 1000*	Yes, if exemption conditions met.	No	No	No
50-99	Not applicable	Yes	No	No	No
Less than 50	Less than 50	Yes	No	Yes	No

*If the total cumulative capacity of the animal feedlot is 1000 animal units or more, than the feedlot is not exempt.

Such animal feedlots are exempt if:

1. The application for the animal feedlot includes a written commitment by the proposer to design, construct and operate the facility in full compliance with Minnesota Pollution Control Agency (MPCA) feedlot rules; and

2. The county board holds a public meeting for citizen input at least ten business days before the MPCA or county issues a feedlot permit unless another public meeting for citizen input has been held with regard to the feedlot to be permitted.

The MPCA has revised the feedlot permit application form to incorporate additional language satisfying condition #1.

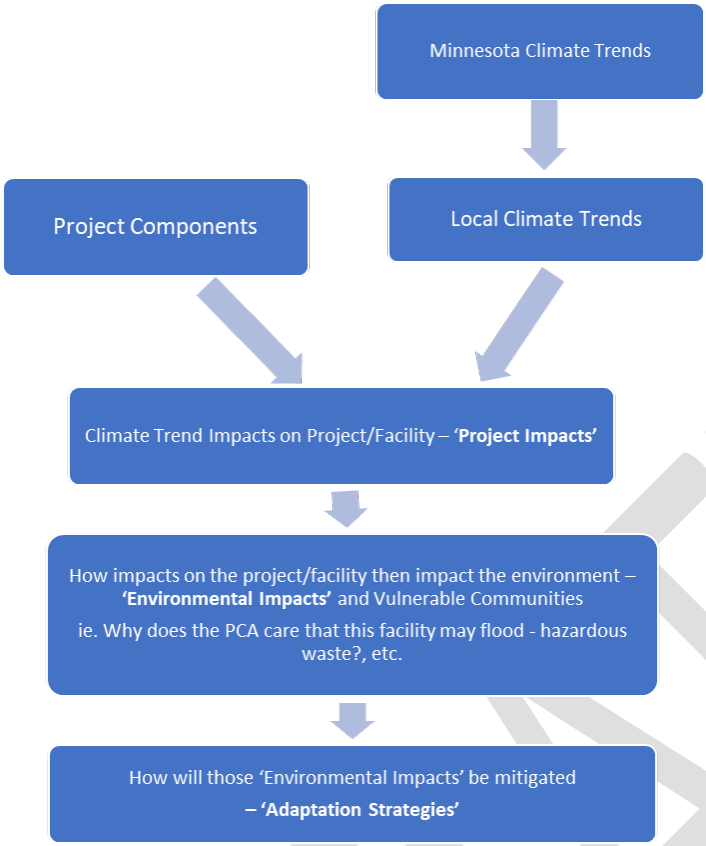
For suggestions about holding a public meeting for citizen input consult "New Exemptions for Environmental Review of Feedlots From 2003 Legislative Session" (available at the EQB website under Feedlot Environmental Review at: www.eqb.state.mn.us/review.html)

5. Project Location. Include the location of the feedlot and the manure application fields. Provide the required and maps showing all significant project features, environmental conditions, and jurisdictions.

6. Project Description. If this project is an expansion of an existing feedlot, or if there may be future expansions, it may result in a "phased action." Minnesota Rule requires all parts of phased action be reviewed, which could impact what is covered in the EAW. Phased actions are discussed in *Guide to Minnesota Environmental Review Rules (May 2010)*. Questions about phased actions can be referred to the RGU.

7. Climate Adaptation and Resilience. It is beneficial for the proposer to clearly make the connection(s) between local climate trends and project components so reviewers can evaluate impacts to the proposed project, the surrounding area and how the impacts will be considered in the design, construction, operation, and maintenance of the project over its projected lifetime. Utilize Section 3 in the standard EAW Guidelines for Climate Adaptation and Resilience for additional clarification and examples.

Figure 1. Climate Adaptation and Resilience Review Process



7a. Climate Trends

Minnesota's climate already is changing rapidly and will continue to do so for the foreseeable future. Temperatures are increasing -- especially in winter -- and larger, more frequent extreme precipitation events are occurring. Substantial warming during winter and at night, increased precipitation, and heavier downpours already have affected our natural resources, and how we interact with and use them. The decades ahead will bring even warmer winters and nights, and even larger rainfalls, along with the likelihood of increased summer heat and the potential for longer dry spells (MN DNR - Climate Trends).

The following climate trends and projects are identified in this section and are expected to continue into the future:

Climate Trends (data-driven):

- Average annual temperature increasing
- Average annual precipitation increasing
- Winter minimums increasing
- Nighttime temperatures increasing
- Extreme events increasing

Projected climate change (model-driven):

- Increasing risk of heat waves
- Increasing risk of drought

These trends are identified in the tables below. If additional climate trends are included, assess any impacts

through each Resource Category and Project Component. For additional information, see the *EQB EAW Guidance: Developing a carbon footprint and incorporating climate adaptation and resilience.*

Table 3. Climate Trends and Projection Guide

State of Minnesota **Climate Trends (data driven) &** **Projected Climate Change (model driven)**	**Climate Trend Tools for County / Local Trends**
Increasing Temperature 1. Average annual temperature increasing	Minnesota Climate Trends • Choose Geographic Unit • Data Option Selections: **Average Temperature** Time Scale: 12 months Month Ending: December Data Start Year: 1980 Data End year: Current year • Compare Years and Show Trend starting in 1980 – Current Year • Plot Data
Increasing Precipitation 2. Average annual precipitation increasing	Minnesota Climate Trends • Choose Geographic Unit • Data Option Selections: **Precipitation** Time Scale: 12 months Month Ending: December Data Start Year: 1980 Data End year: Current year • Compare Years and Show Trend starting in 1980 – Current Year • Plot Data
Increasing Temperature 3. Winter minimums increasing	Minnesota Climate Trends • Choose Geographic Unit • Data Option Selections: **Minimum Temperature** Time Scale: 4 months Month Ending: March Data Start Year: 1980 • Compare Years and Show Trend starting in 1980 – Current Year • Plot Data
Increasing Temperature 4. Nighttime temperatures increasing	Minnesota Climate Trends • Choose Geographic Unit • Data Option Selections: **Minimum Temperature** Time Scale: 4 months Month Ending: March Data Start Year: 1980 • Compare Years and Show Trend starting in 1980 – Current Year • Plot Data
Increasing Precipitation 5. Extreme events increasing	Minnesota Climate Trends • Choose Geographic Unit • Data Option Selections: **Precipitation** Time Scale: 4 months

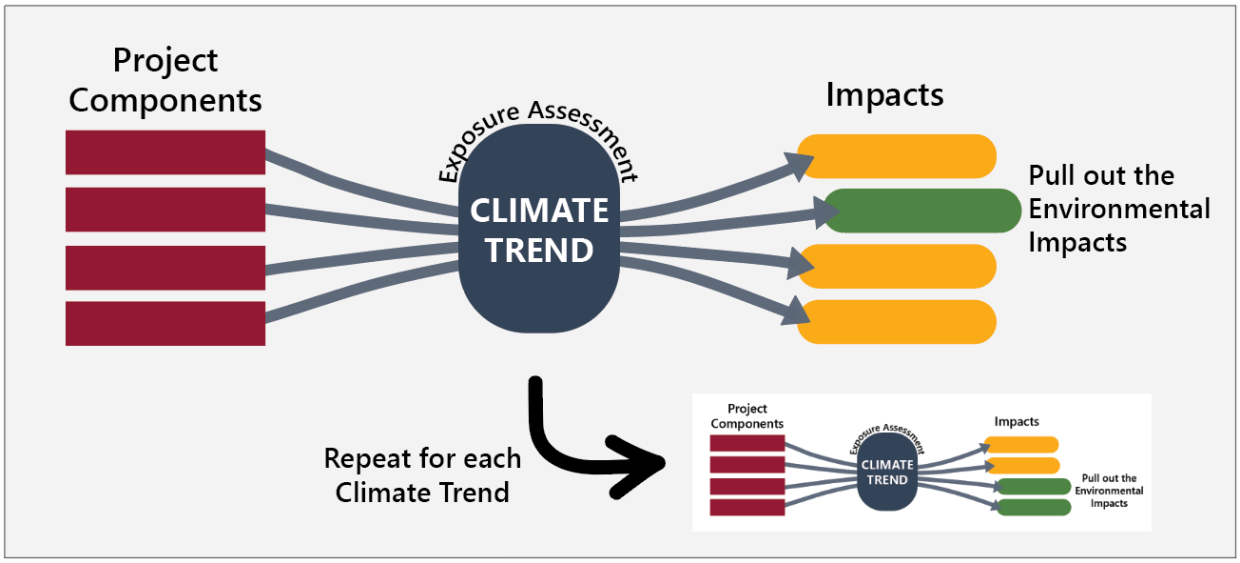
	Month Ending: March Data Start Year: 1980 • Compare Years and Show Trend starting in 1980 – Current Year • Plot Data
Project Climate change: • Increasing risk of heat waves	Minnesota Climate Explorer • Choose Geographic Unit • Click on Projected Future • Select Climate Variable **Maximum Temperature** Time Scale: 3 months Month Ending: August • Plot Data
Projected climate change: • Increasing risk of drought	Minnesota Climate Explorer • Choose Geographic Unit • Click on Projected Future • Select Climate Variable **Precipitation** Time Scale: 3 months Month Ending: August • Plot Data

Table 4. Resources used to determine Climate Trends:

	Climate Trend Tools
	From EQB guidance
Current Trends	Minnesota Climate Trends
Projected Changes	Minnesota Climate Explorer
Climate Hazard Projections	Climate Mapping for Resilience and Adaptation (CMRA) Assessment
	Climate Resilience Evaluation and Awareness Tool (CREAT) Climate Change Scenarios Projection Map
	Risk Factor
Additional Information Sources	National Climate Assessment (NCA4 Volume II or more recent), especially Chapter 21: Midwest; Chapter 28: Reducing Risk; Maps in Chapters 6 & 7.
	Intergovernmental Panel on Climate Change Assessment Report (IPCC 6 or more recent) and Interactive Atlas
	National Oceanic and Atmospheric Administration (NOAA) Climate.gov
	Additional Resources used by Project Proposer

7b. Project Interaction with Climate Trends. Review of the interactions between the project components with the climate trends follows the Exposure Assessment process as illustrated in Figure 2. Each individual project component is compared against the identified climate trend to evaluate the potential impacts and determine which may impact the environment.

Figure 2. Exposure Assessment



To understand how this project and the above outlined Climate Trends could impact the environment, it is important to understand what components of the project are being affected. Identify relevant project components under the **Feedlot Project Information** in the Table 5 below. Project Components include all the new (or removed) elements of this project that could be affected by the climate trends, including elements of the site design and the processes/activities happening at the site.

For each Resource Category in Table 5 (**Project Design, Land Use, Contamination/HazMat/Wastes):** Describe how the project's proposed activities and how the project's design will interact with the described climate trends and projections, described in 7a. Describe proposed adaptations to address the climate change risks and vulnerabilities identified.

Resource Categories

Project Design - How climate change is anticipated to affect the design of the project, such as changes to land cover, construction materials, site design, etc.

Land Use – The compatibility of activities with land use, planning and zoning, as it relates primarily to the development and the projected climate changes for the project location.

Contamination / Hazardous Materials / Wastes – Describe any operational concerns due to warmer, wetter weather with more extreme rainfall events and localized flooding such as increased leaching, erosion, and sedimentation.

Utilize the table below to list proposed activities and describe how each of these activities will interact with each climate trend and projection listed in 7a.
Examples are in italics, below.

Table 5. Interaction between Components of Proposed Activities and Identified Climate Trends and Projections

Resource Category	**Climate Trends & Climate Projections**	**Project Information** (Components of Proposed Activities)	**Potential Environmental Impacts** Address ***Anticipated Climate Change Hazards*****:** storm intensity, flooding, extreme heat, drought, and wildfire	**Adaptation Strategies** (with applicable timeframe - construction, near-term, long-term)
Project Design	**Increasing Temperature** • **Average Temperature Increasing**	*Example: Increased impervious surfaces.*	*Environmental Impact not foreseen with interaction between impervious surfaces and average temperature increasing.*	*N/A*
		Increased constructed surfaces, such as dark roofing and asphalt.	*Increased heat absorption during the day that is radiated at night, which increases heat island effect and amplifies warming temperatures of climate change.*	*Use of light-colored building materials and surfaces to reduce heat absorption. Regular maintenance and updates to infrastructures, as needed, for life of project.*
		Increased quantity of concrete and building construction materials, and infrastructure.	*Infrastructure more vulnerable to damage and deterioration from elevated temperatures.*	*Use of construction materials that are resilient to increasing temperatures for the life of the project.*
		(List others, as appropriate)		

Resource Category	Climate Trends & Climate Projections	Project Information (Components of Proposed Activities)	Potential Environmental Impacts Address ***Anticipated Climate Change Hazards***: storm intensity, flooding, extreme heat, drought, and wildfire	Adaptation Strategies (with applicable timeframe - construction, near-term, long-term)
	Increasing Temperature • **Winter Minimum Temperature Increasing**	*Increased impervious surfaces.*	*Increased seasonal melting periods, creating risk of localized flooding in immediate and generalized area of the project, in addition to other stormwater effects, especially when vegetative buffers are absent.* *Reduced site vegetation during winter thaw and increased stormflow velocity over frozen ground, increasing soil erosion and stream sedimentation.*	*Utilize best management practices and management solutions to contain stormwater and mitigate the impacts of rural development on stream ecosystems.* *Vegetate with a plant mix more tolerant of long-term changes in precipitation or temperature.*
		Increased constructed surfaces, such as dark roofing and asphalt.	*Increased heat absorption during the day that is radiated at night, which increases heat island effect and amplifies warming temperatures of climate change.*	*Use of light-colored building materials and surfaces to reduce heat absorption. Regular maintenance and updates to infrastructures, as needed, for life of project.*
		Increased quantity of concrete and building construction materials, and infrastructure.	*Infrastructure more vulnerable to damage from elevated temperatures over more days during the year.*	*Use of construction materials that are resilient to increasing temperatures for the life of the project.*
		(List others as appropriate)		
	Increasing Temperature • **Nighttime Temp Increasing**	***Repeat Project Components for each Climate Trend ↓***		

Resource Category	**Climate Trends & Climate Projections**	**Project Information** (Components of Proposed Activities)	**Potential Environmental Impacts** Address ***Anticipated Climate Change Hazards*:** storm intensity, flooding, extreme heat, drought, and wildfire	**Adaptation Strategies** (with applicable timeframe - construction, near-term, long-term)
	Increasing Precipitation • **Average Annual Precipitation Increasing**			
	Increasing Precipitation • **Extreme Precipitation Events Increasing**			
	• **Increasing risk of heatwaves**			
	• **Increasing risk of drought**			

Resource Category	Climate Trends	Project Information (Proposed Activities)	Potential Environmental Impacts Address *Anticipated Climate Change Hazards:* storm intensity, flooding, extreme heat, drought, and wildfire	Adaptation Strategies (with applicable timeframe - construction, near-term, long-term)
Land Use	**Increasing Temperature** • **Average Temperature Increasing**	*Increased groundwater use.*	*Environmental Impact not foreseen with interaction between increased groundwater use and average temperature increasing.*	N/A
		Increased manure storage volume.	*Increased risk of catastrophic spills, affecting water quality, wildlife, and wildlife habitat.*	*Follow manure hauling and application best management practices outlined in Manure Management Plan.* *Regular inspections of manure storage facilities and hauling equipment.* *Advise employees of emergency procedures in event of spill.*
		Removal of site vegetation.	*Increased risk of erosion, sedimentation, and pollution into nearby waterways and streams. This is amplified by increased precipitation and increased intensity of storms.*	*Utilize intermittent reclamation practices during construction to reduce erosion and establish permanent vegetation as soon as construction is complete.* *Follow SWPP practices during construction.* *Vegetate with a plant mix more tolerant of long-term changes in precipitation or temperature.*
		(List others as appropriate)		
	Increasing Temperature • **Winter Minimum Temperature Increasing**	*Repeat Project Components for each Climate Trend ↓*		

Resource Category	**Climate Trends**	**Project Information** (Proposed Activities)	**Potential Environmental Impacts** Address *Anticipated Climate Change Hazards:* storm intensity, flooding, extreme heat, drought, and wildfire	**Adaptation Strategies** (with applicable timeframe - construction, near-term, long-term)
	Increasing Temperature • **Nighttime Temp Increasing**			
	Increasing Precipitation • **Average Annual Precipitation Increasing**			
	Increasing Precipitation • **Extreme Precipitation Events Increasing**			

Resource Category	**Climate Trends**	**Project Information** (Proposed Activities)	**Potential Environmental Impacts** Address *Anticipated Climate Change Hazards:* storm intensity, flooding, extreme heat, drought, and wildfire	**Adaptation Strategies** (with applicable timeframe - construction, near-term, long-term)
	• **Increasing risk of heat waves**			
	• **Increasing intensity of drought**			
Contamination/ Hazardous Materials/Wastes	**Increasing Temperature** • **Winter Minimum Temperature Increasing**			

Resource Category	Climate Trends	Project Information (Proposed Activities)	Potential Environmental Impacts Address *Anticipated Climate Change Hazards:* storm intensity, flooding, extreme heat, drought, and wildfire	Adaptation Strategies (with applicable timeframe - construction, near-term, long-term)
	Increasing Temperature • **Nighttime Temp Increasing**			
	Increasing Precipitation • **Average Annual Precipitation Increasing**			
	Increasing Precipitation • **Extreme Precipitation Events Increasing**			

Resource Category	**Climate Trends**	**Project Information** (Proposed Activities)	**Potential Environmental Impacts** Address *Anticipated Climate Change Hazards:* storm intensity, flooding, extreme heat, drought, and wildfire	**Adaptation Strategies** (with applicable timeframe - construction, near-term, long-term)
	• **Increasing risk of heat waves**			
	• **Increasing intensity of drought**			
Water Resources	*Address in Item 12*	*Address in Item 12*	*Address in Item 12*	*Address in Item 12*
Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (rare features)	*Address in Item 14*	*Address in Item 14*	*Address in Item 14*	*Address in Item 14*

8. Cover Types. See standard EAW Climate Guidance to identify acreage of Cover Types as it relates to Green Infrastructure.

9. Permits and Approvals required. Note that *final decisions are prohibited until all appropriate environmental review has been completed*. See Minnesota Rules, Chapter 4410.3100.

10. Land uses. Local planning and zoning officials and tribal governments should be consulted about the consistency of the project with any applicable local ordinances. It may be prudent to obtain a letter from the local unit documenting project consistency with local ordinances, and to attach a copy to the EAW submission.

For projects on or near Indian Reservations/tribal lands/Indian Country, ensure the proposed project is consistent with tribal law therefore best practice is to contact relevant tribal officials and obtain a letter documenting the project's consistency with tribal law

11. Geology, soils and topography / land forms. Distinguishes geological characteristics of the project site versus manure application site(s).

12. Water Resources. Describe surface water and groundwater features on or near the project site and manure application areas in the table and on attached maps. Indicate whether any **geologic site hazards to ground water or sensitive areas to surface waters** are present at the feedlot, manure storage area, or manure application sites. If yes, describe the features, show them on a map, and discuss proposed design and mitigation measures to avoid or minimize potential impacts. If known, address any cumulative impacts of the proposed project or expansion to these water resources.

Water appropriation. If the project uses more than 10,000 gallons per day or 1 million gallons per year, a permit application is required by DNR to appropriate water. (Minn Stat. 2023.103G.287) . A DNR Preliminary Well Construction Assessment is Required prior to the construction of a new water supply well, and a permit application and a valid water appropriation permit is required prior to appropriation of groundwater. Please describe the water source, depth of wells or surface water features, and total volume of water needed for animal use, cooling, and cleaning. Describe proposed measures to ensure maximum efficiency of water use and conservation.

> **Other surface waters.** In addition to the standard EAW requirements, describe permanent controls to manage or treat runoff. Identify water resources affected and give the DNR Public Waters Inventory number (PWI) if the water resources affected are on the PWI. Describe proposed mitigation measures to avoid or minimize impacts.
>
> **Manure management.** Give a brief description of how manure will be collected, stored, transferred (if applicable) and applied at this facility. Include a description of any manure processing activities such as liquid solid separation and anaerobic digestion. Attach copy of Manure Management Plan (MMP). If an anaerobic digester will process manure, list any other feedstocks used in the digester.
>
> **Indian Reservations**. For projects on or near Indian Reservations, a tribal permit application may be required for water appropriation. Contact relevant tribal officials for more information if your project is on or near an Indian Reservation.

13. Contamination/Hazardous Materials/Waste – Insert information here as it pertains to feedlot operations.

14. **Fish, wildlife, plant communities, and sensitive ecological resources (rare features)**

The DNR Division of Ecological and Water Resources maintains the Natural Heritage Information System (NHIS), a collection of databases that provides the most comprehensive information on Minnesota's rare natural features (e.g., MBS Sites of Biodiversity Significance, DNR Native Plant Communities). The NHIS public layers are available to view via the Minnesota Conservation Explorer (MCE) or to download from the Minnesota Geospatial Commons. To identify potential impacts to rare features, request a Natural Heritage Review via the Minnesota Conservation Explorer. MCE will automatically assess potential impacts to Minnesota's rare features and provide a Natural Heritage Review letter or a notice that further review by DNR staff is needed before a Natural Heritage Review letter can be issued. The Natural Heritage Review letter informs project proposers of any potential impacts to rare features and includes actions to follow state law and recommended measures to avoid or minimize disturbance to ecologically significant areas or state-listed species. The Natural Heritage Review letter should be attached to the EAW and the project proposer should address all issues mentioned in the letter when answering Question 14 of the EAW.

To identify potential impacts to federally listed species, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online Information for Planning and Consultation (IPaC) tool. Use the information provided when answering Question 14 of the EAW.

15. Cultural Resources.

Cultural Resources needs definitions of "traditional cultural properties," "close proximity," and "tribal connections" all need definitions or consistent terms should be used throughout the EAW worksheet.

Guidance should also be provided here to contact not only the SHPO but also the THPO (Tribal Historic Preservation Officer).

16. Visual. Proponents need to inquire with local and tribal ordinances and zoning in their area regarding visual effects.

17. Air. An Air Emissions Risk Analysis (AERA may be required per Air Assessment Practice Guidance. The study and its results must be summarized in the EAW to provide information about the potential for significant air or odor impacts.

To address potential cumulative air impacts, the modeling must include appropriate background concentrations for hydrogen sulfide. Guidance on obtaining an appropriate background hydrogen sulfide concentration can be found in *Guidelines on Air Quality Models,* 40 CFR Ch. I (7–1–99 Edition), Appendix W to Part 51 (section 9.2). This document can be found at http://www.epa.gov/scram001/guidance/guide/appw_99.pdfl Appendix 4 is a letter from the Commissioner of the PCA providing further information about the current requirements for air quality cumulative impacts analysis.

It is recommended that a modeling protocol be developed by the proposer and reviewed by the MPCA in a pre-application meeting before the modeling study is undertaken. Modeling requirements: H2S, ammonia, odor. Be sure AERA is included.

18. GHG Emissions/Carbon Footprint – work on this section. Refer to EQB Guide.

19. Noise needs a discussion of how a project proponent determines the effect of noise in the vicinity of the project and define what is considered vicinity as it relates to noise. Reference state, local, tribal, and potentially federal noise standards. Quality of life definition. For example - the cumulative impact of the proposed project on noise in the area,

environmental justice concerns (Minn. Stat. 116.065).

20. Transportation Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 *available at: http://www.dot.state.mn.us/accessmanagement/resources.html)* or a similar local guidance.

Appendix 1. Agency Contacts and Other Resources

The following agencies may review an EAW or provide information on how to appropriately respond to questions on the EAW form.

State agencies

Environmental Quality Board 651-757-2873

Department of Agriculture 651-296-1488

Department of Health 651-215-0807

Department of Natural Resources 651-296-4796
(or the regional office indicated on the DNR map below)

Department of Transportation 651-779-5094

Metropolitan Council 651-602-1000
Data Center 651-602-1140
Environment Resource Planning and Management 651-602-1145
Environmental Services 651-602-1005

Minnesota Geological Survey 612-627-4780

Minnesota Historical Society 651-296-5462

Minnesota Planning 651-296-3985
Datanet 651-296-6866

Pollution Control Agency
Environmental review coordinator 651-296-7398

Tribal Nations

(Insert relevant contacts and departments (Natural Resources, Env Review, Etc)

Federal agencies

Army Corps of Engineers 651-290-5200

Fish and Wildlife Service 612-713-5300

Natural Resources Conservation Service (check local phone directory blue pages)

Other resources

Minnesota Department of Transportation County highway maps: These maps show all roads, national and state parks, forests, wildlife management areas and refuges.

MnDOT Map Sales 651-296-2216
http://www.dot.state.mn.us/maps.shtml

U.S. Geological Survey maps: These 7.5-minute maps are available for the entire state from local map dealers and government agencies.

Minnesota Geological Survey 612-627-4780
http://www.geo.umn.edu/mgs

U.S. Geological Survey 800-ASK-USGS
http://mapping.usgs.gov

Insert Online Mapping Resources for:

Aerial Photos, Soils, Water Resources, Air, Cultural, Tribal, etc.

Insert Glossary of Terms, or incorporate into document:

Animal units: EQB's rules use animal units as defined in the MPCA chapter 7020 rules.

Sensitive areas are shorelands; delineated flood plains (along Red River only includes 1,000 feet from bank); federal, state or local wild and scenic river districts; within 1,000 feet of a karst feature (sinkhole, cave, disappearing spring, resurgent spring, karst window, dry valley or blind valley); and vulnerable parts of delineated drinking water supply management areas.

Appendix 2: Glossary of Karst Terms

The following definitions are extracted from *A Glossary of Minnesota Karst Terminology,*
Jeffrey A. Green, MnDNR, and Calvin A. Alexander, Jr., University of Minnesota, May 1999.

Blind valley: A valley that terminates abruptly at a point where its stream sinks, or once sank, underground. As sinks develop higher up the blind valley, the original valley termination may be dry under most flow conditions.

Cave: A natural underground room or series of rooms and passages large enough to be entered by a man; generally formed by solution of limestone.

Dry valley: Valley that lacks a permanent surface stream. Dry valleys are common on carbonate rocks with good primary permeability, such as the chalk, and occur on other permeable rocks such as sandstone. Dry valleys on cavernous limestone were formed when streams flowed on the surface, either before secondary permeability and cave systems developed, or when caves were blocked by ground ice in periglacial climates. The valleys became dry when underground drains formed or were re-opened, capturing first part and then all of the surface drainage.

Karst: (noun): A landscape created on soluble rock with efficient underground drainage. Karst is characterized by caves, dolines, a lack of surface drainage and other climatically controlled features, and is mainly, but not exclusively, formed on limestone. The name derives from the German form of Kras – the Classical Karst straddling the border between Slovenia and Italy. In this original, temperate, karst the dominant landforms are dolines, but contrasting landscapes are the pinnacle, cone, and tower karsts of the tropics, and the fluviokarst and glaciokarst of colder climates. The uncapitalized term “kras” originally denoted bare, stony ground in the Slovene language. (adjective) Features, characteristics or functions produced by the solution of soluble geologic materials.

Karst window: Depression revealing a part of a subterranean river flowing across its floor, or an unroofed part of a cave.

Resurgence: Point at which an underground stream reaches the surface and becomes a surface stream. In European literature, the term is reserved for the reemergence of a stream that has earlier sunk upstream.

Sinkhole: General terms for closed depression. They may be basin, funnel, or cylindrical shaped.

Spring: Any natural discharge of water from rock or soil onto the surface of the land or into a body of surface water.

Appendix 3: Acceptable Feedlot Air Quality Mitigation Practices (Update this section)

This document is intended as guidance to assist producers and regulators in their review of various feedlot air quality control measures and practices. This information is compiled based on a review of scientific literature, demonstration projects and ongoing research efforts by the University of Minnesota Biosystems and Agricultural Engineering Department.

Production unit (livestock building and manure storage) odor control options			
System:	***Description:***	***Advantages:***	***Disadvantages:***
Oil Sprinkling	Vegetable oil is sprinkled daily at low levels in the animal pens.	Helps in the reduction of airborne dust and odors.	Creates an oily environment and greasy residue on the floor and pen partitions if too much oil is sprinkled.
Biofilters	Odorous gases are passed through a bed of compost and wood chips; bacteria and fungal activity help oxidize organic volatile compounds.	Reduces odor and hydrogen sulfide emissions effectively.	May need special fans because of pressure drop.
Biological and chemical wet scrubbers	Odorous gases are passed through a column packed with different media types; water (and/or chemical) is sprayed over the top of the column to help optimize biological and chemical reactions.	Reduces odors, H2S, and NH3 emissions effectively	Capital and operational costs; disposal of collected pollutants.
Washing Wall	A wetted pad is installed in a stud wall about 5 feet upwind of ventilation fans and downwind of hog in a tunnel ventilated building.	Dust reduction of 50% and 33% reduction of ammonia at medium ventilation rates.	For tunnel ventilated buildings only. No documentation on odor reduction.
Solid Composting	Biological process in which aerobic bacteria concert organic material into a soil-like manure called compost; it's the same process that decays leaves and other organic debris in nature.		

Natural Crust	Dairy and sometimes swine storage basins can form a natural crust. This crust will reduce odor emissions.	Effectively controls odors.	Techniques to produce and maintain a natural crust are elusive, but developing.
Straw Cover	Wheat, barley or other straw is floated on the manure surface.	Effectively controls odor.	Must be applied annually and maintained throughout the year. A geotextile cover or related material can be used to support the straw and keep solids from entering the basin.
Plastic Cover	Non-porous cover floated on the liquid surface. Cover traps gases before they escape. Gases must be drawn off and treated.	Nearly eliminates odor emissions.	Gases must be withdrawn from under the cover and treated. No good technologies developed for this process.
Anaerobic Digestion	Biological process where organic carbon is converted to methane by anaerobic bacteria under controlled conditions of temperature and pH.	Reduces odor and organic matter; produces biogas which can be converted to heat or electricity; retains nutrients; easier handling of liquid.	Capital costs and requires skilled management.
Aerobic Treatment	Biological process whereby organic matter is oxidized by aerobic bacteria; mechanical aeration is required in order to supply oxygen to the bacterial population.	Reduces odor, organic matter and nutrients (if desired).	Capital and operating costs; separation step (liquid/solid) may be necessary for most slurries.