Opposition to Conditional Use Permit (CUP) cu2016022 for Killeskillen LLC Dairy CAFO

The Brookings County Planning and Zoning board is required to find that the proposed CAFO "**will not adversely affect the public interest**" (Brookings County Zoning Regulation Article 5 Section 5.05 e.). To do so, the board must pay "**particular attention to .... Economic, noise, glare or other effects of the conditional use on adjoining properties and surrounding properties," as well as "General compatibility with adjacent properties and other property in the district.**" (Brookings County Zoning Ordinance Article 5 Section 5.05 f.3. and 5.05 f.8).

We ask the board to deny this conditional use on the grounds that it would adversely affect the public interest, due to conflicts with the ordinance and the following effects on surrounding properties:

1. An Aquifer Protection Zone B stream, containing shallow aquifer materials, flows through the southwest quadrant of the site. Class A, B, and C CAFOs are prohibited in Aquifer Protection Zone B. The close proximity of the CAFO facility to this Zone B aquifer significantly increases the risk of pollution to surface and ground waters, and is **adverse to the public interest**.

2. The stream flowing through this site feeds into Lake Hendricks. A CAFO at this site would substantially increase the potential for water pollution affecting properties not only adjacent to the site, but in the Deer Creek and Lake Hendricks areas. The presence of a CAFO is **incompatible with other property in the area,** and the potential for damage to health, safety and property values **is adverse to the public interest.**

3. The stream running through the site has been designated as a Flood Zone A, and is known and documented as a flood-prone region, exacerbated by steep slopes. The presence of a CAFO in close proximity to this flood zone dramatically increases the potential for flooding, water pollution, property damage, and danger to the public downstream of the site, and is **adverse to the public interest**. The county should reduce flood losses by "(1) **Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, etc." (Article 15:01.4, p 45)**

4. The topography of the site and surrounding area includes steep slopes, substantially increasing the risk of water pollution and flooding. The siting of a CAFO in such terrain is **incompatible with other property in the area and adverse to the public interest**.

5. A well is located less than ¼ mile from the proposed site. Class A CAFOs **cannot be located less than ½ mile from any well.** (**Article 22:00-14**)

6. There is significant potential for damage to the environment and wildlife of the area, via drainage into the Deer Creek basin, the aquifer bordering Oak Lake and Lake Hendricks, and Lake Hendricks, from nitrates, phosphates, and other pollutants. The presence of a CAFO is **incompatible with other property in the area and adverse to the public interest**.

7. The siting of a CAFO in this location poses an increased risk to public safety and to the environment, due to the potential for improper storage, handling, and application of manure.

Supporting evidence is provided in detail below.

1. An Aquifer Protection Zone B stream, containing shallow aquifer materials, flows through the southwest quadrant of the site. Class A, B, and C CAFOs are prohibited in Aquifer Protection Zone B. The close proximity of the CAFO facility to this Zone B aquifer significantly increases the risk of pollution to surface and ground waters, and is adverse to the public interest.

The legal description of the animal feeding operation property is "NE1/4 of Section 10, T112N, R48W," i.e., the site encompasses the entire quarter section (Figure 1).

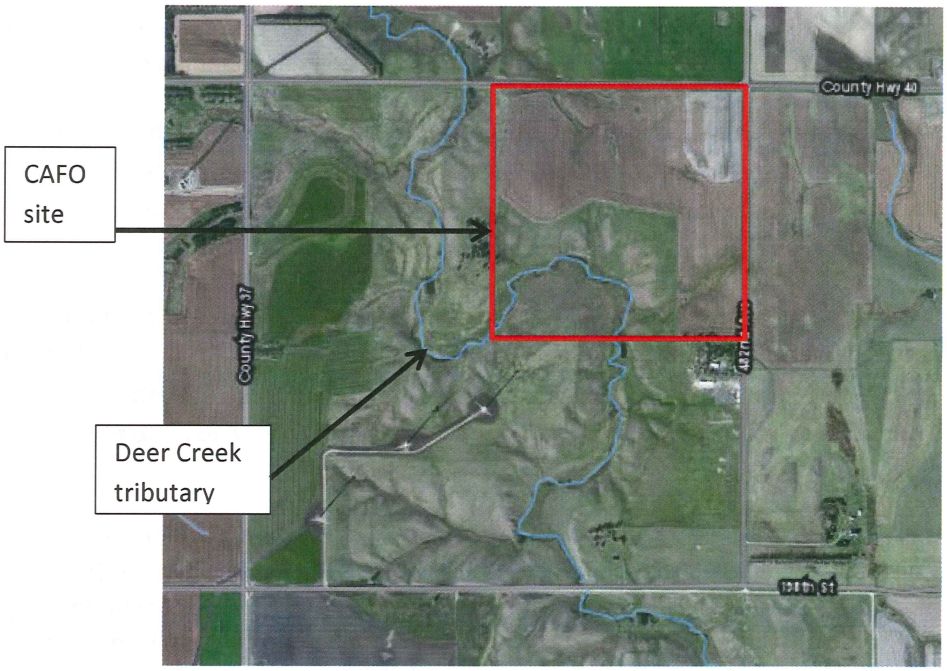
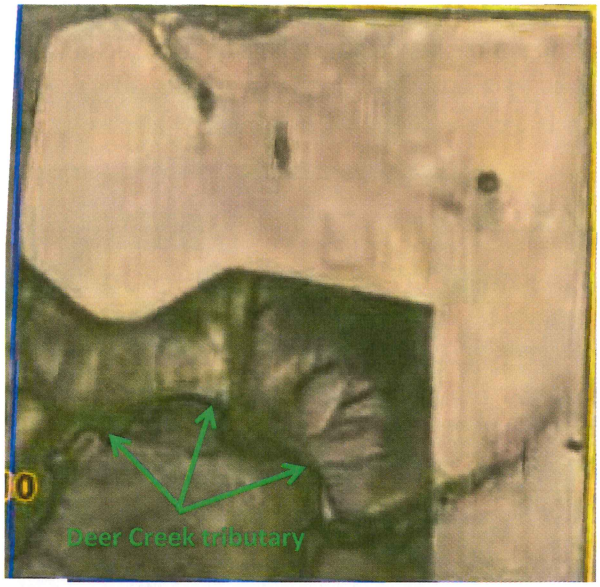



Figure 1. Section 10 of Oak Lake Township, showing the proposed CAFO site (outlined in red). Cultivated area in beige. The stream ( blue) is a tributary of Deer Creek.

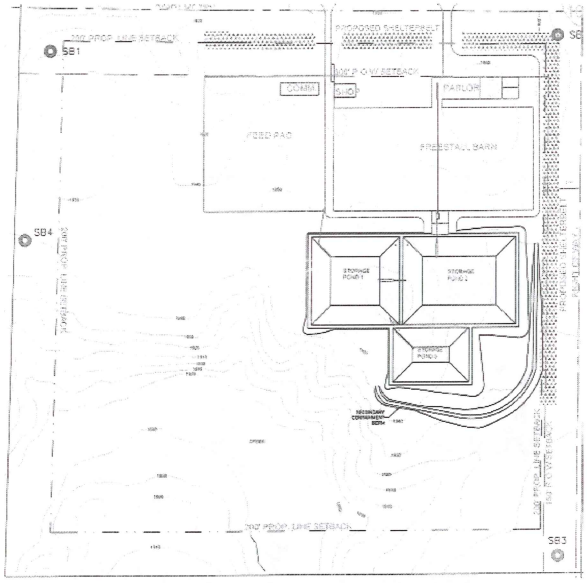
Figure 2A, below, shows the CAFO site. The stream that flows through the southwest quadrant of the site is a Deer Creek tributary. Several smaller tributaries or drainages flow into it along the arc of its passage through the site, due to the strongly sloped terrain surrounding the stream. The currently cultivated area shows as beige and the stream and vegetation are visible in green.

Figure 2B shows the building plans, sized to match 2A. (The dashed line along the west and south marks the 200 ft setback.) Figure 3 shows the building plans overlain on the site. Note that Storage Ponds 1 and 3 extend west of the cultivated area and into the slopes bordering the stream; i.e., the cultivated area does not exactly correspond to the building plan.

Figure 3 shows the building plans overlain on the site. Note that Storage ponds 1 and 3 extend west of the cultivated area.

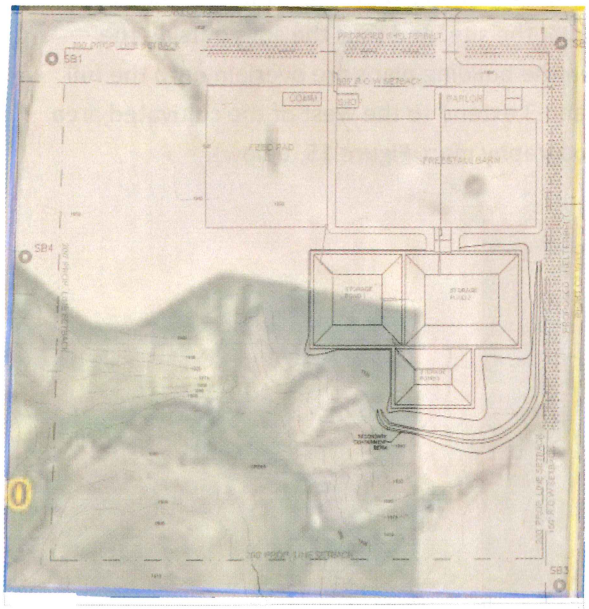



A




B

Figure 2.A. The quarter section including the CAFO site, from the Beacon viewer township sections map. (https://beacon.schneidercorp.com/Application.aspx?AppID=134&LayerID=1601&PageTypeID=1&PageID=914)
B. The CAFO building plans, as submitted by the applicant, at same scale as Figure 2A.



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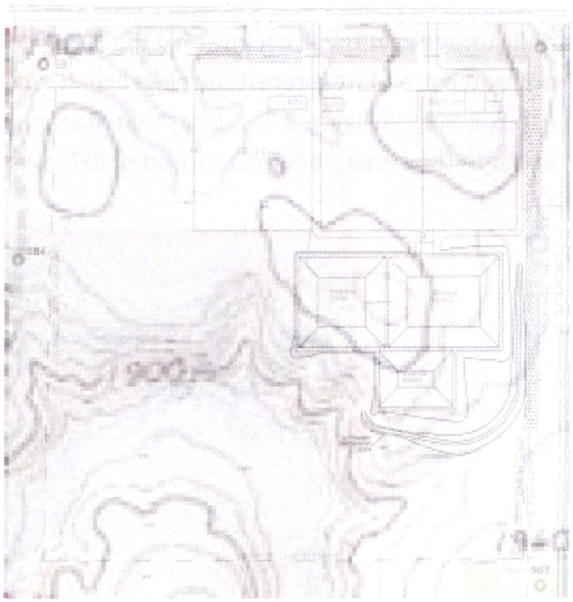

B

Figure 3.A. Building plans overlain on the quarter section/CAFO site, aerial view.
B. Building plans overlain on the quarter section/CAFO site, topographic map.

Figure 4 shows the soil types found on the site. The Soil Map in Figure 4A was provided by the applicant, who used an Area of Interest (blue line) that encompassed only the cultivated area of the site. In Figure 4B, we have drawn the Area of Interest to encompass the entire site, i.e., the whole quarter section. BkE soils are shaded in yellow.

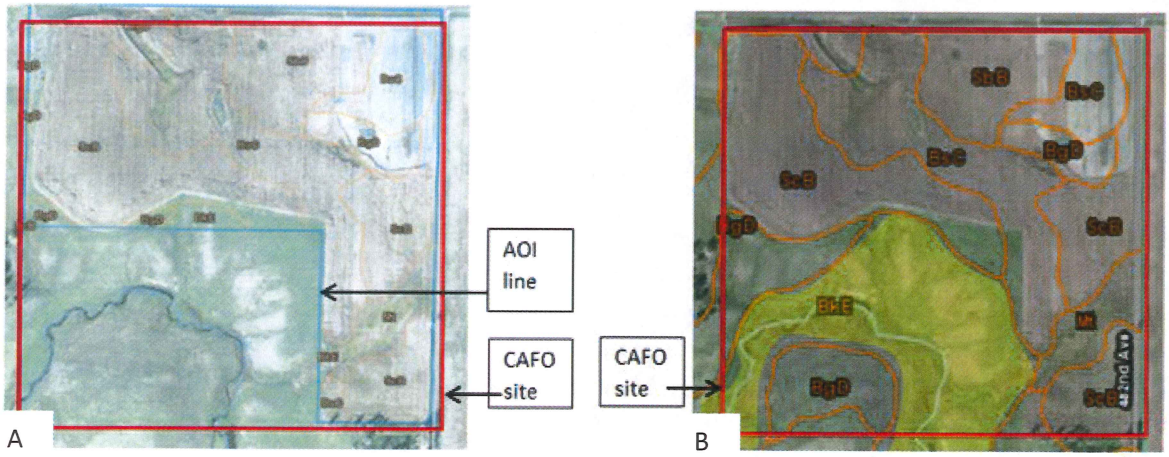


Figure 4. Soil maps of the CAFO site (outlined in red). A. Soil Map from applicant's CUP application, Appendix VI. Area of interest (blue line) is drawn around only the cultivated area, excluding the area where Storage Ponds 1 and 3 overlap to the west. B. Soil map using the full site as the Area of Interest. (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx) BkE soils are shaded in yellow.

The soil map provided by the applicant (Figure 4A) gives the misleading impression that the buildings and storage ponds will occupy only the cultivated portion of the site, and thus the soils outside the cultivated are of no interest or relevance. However, when the building plans are overlain onto the full site Soil Map in Figure 5, it is clear that Storage Ponds 1 and 3 extend to the west of the cultivated area and into the steep slopes comprised of BkE soils. (Cf. Topography map, Figure 15, below).

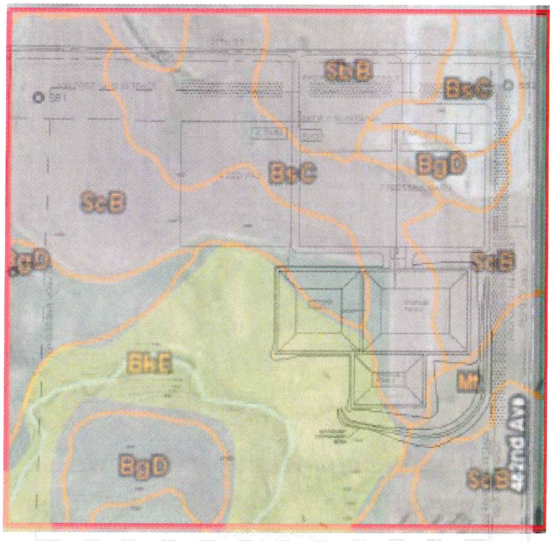

Figure 5. Building plan overlain onto full site soil map.

(The accuracy of our overlay is confirmed by examining the overlay in the applicant's Setback map (CUP application Appendix V), which also shows the storage ponds extending west of the cultivated area.)

The CAFO site also appears to be depicted inaccurately, i.e., not showing the full extent of the area occupied by the storage ponds, on the applicant's Flood Zone Map (Appendix VI), which appears to construe the site as only within the cultivated area of the section.

The soil types shown in Figures 4 and 5 include BgD and BkE soils. BgD is Buse-Barnes loam soil, with slope of 9 to 20%, and typical of moraines. BkE (Figure 4B, yellow shading) is Buse-Lamoure soil, channeled, with slopes ranging from 9 to 40%, and typical of moraines and floodplains (Web Soil Survey Map Unit Description http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx ).

The applicant submitted soil boring results from samples at the northeast, northwest, west, and southeast corners of the site (Figure 6). No soil boring was taken in the southwest area of the site, where Storage ponds 1 and 3 extend into the BkE region (Figure 5).

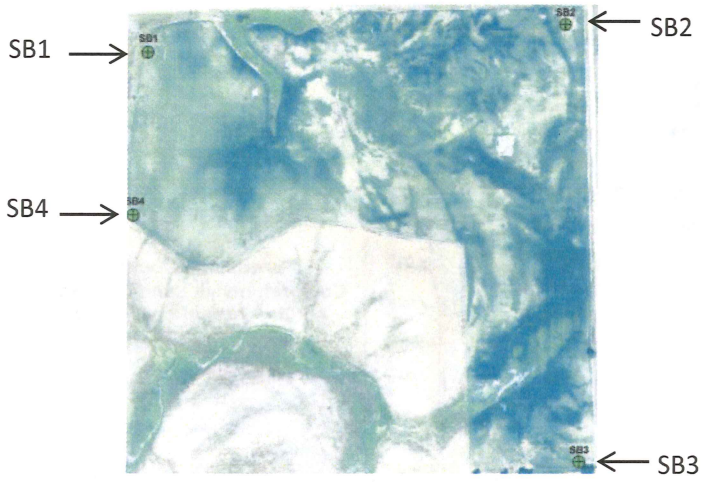


Figure 6. Soil boring (SB) sample locations, from CUP application Appendix VI.

A wet gravel layer was found in soil boring number 3 (SB3) at 11-14 feet. This was suggested (Friedrichsen letter) to be "a small deposit within the till and is not believed to represent an aquifer. Additionally, boring 3 is located well south of the proposed storage ponds." However, we suggest that it may, indeed, represent shallow aquifer materials, which may also be found in the southwest quadrant of the site. Considering the slopes and the presence of BkE soils immediately to the south and west of Storage Ponds 1 and 3, it is strange that a soil boring was not taken from this area. As BkE soils are typical of moraines, it is likely that such a sample may also contain water and gravel, indicating the presence of shallow aquifer materials.

The entire area immediately adjacent to and southwest of Storage Ponds 1 and 3 was ignored both in terms of determining what soil types were present, and taking soil borings. Even if, as the applicant contends, the site comprises only the structures and the ground on which they sit, the storage ponds extend past the applicant's Area of Interest zone and into the slopes and BkE soils to the west and southwest. A soil boring should have been taken in that area.

The stream flowing though the proposed site is known to be a Zone B aquifer protection area (Figure 7). The Brookings County Zoning Ordinance specifies that Class A, Class B, and Class C CAFOs are expressly prohibited in both Zone A and Zone B (**Brookings County Zoning Ordinance Article 16 Section 16.00-5**).

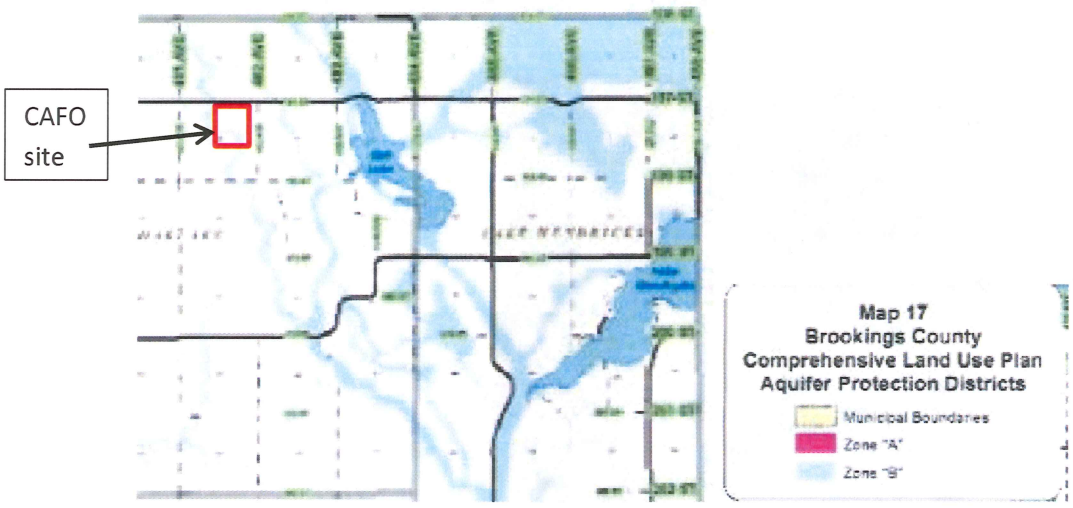


Figure 7. Northeast corner of Map 17 (p 39), Brookings County Comprehensive Land Use Plan Aquifer Protection Zones. The Deer Creek tributary within the site is blue, indicating a Zone B Aquifer Protection district.

The South Dakota Geological Survey map of the First Occurrence of Aquifer Materials in Brookings County ((http://www.sdgs.usd.edu/pubs/pdf/AM-19_20040803.pdf accessed 11/24/16) shows the presence of shallow aquifer materials. We have zoomed in on the northeast corner (Figure 8) of this map. The Deer Creek tributary that flows through the site is clearly designated as a shallow aquifer zone having shallow aquifer materials (sand and gravel) within 50 feet of the surface.

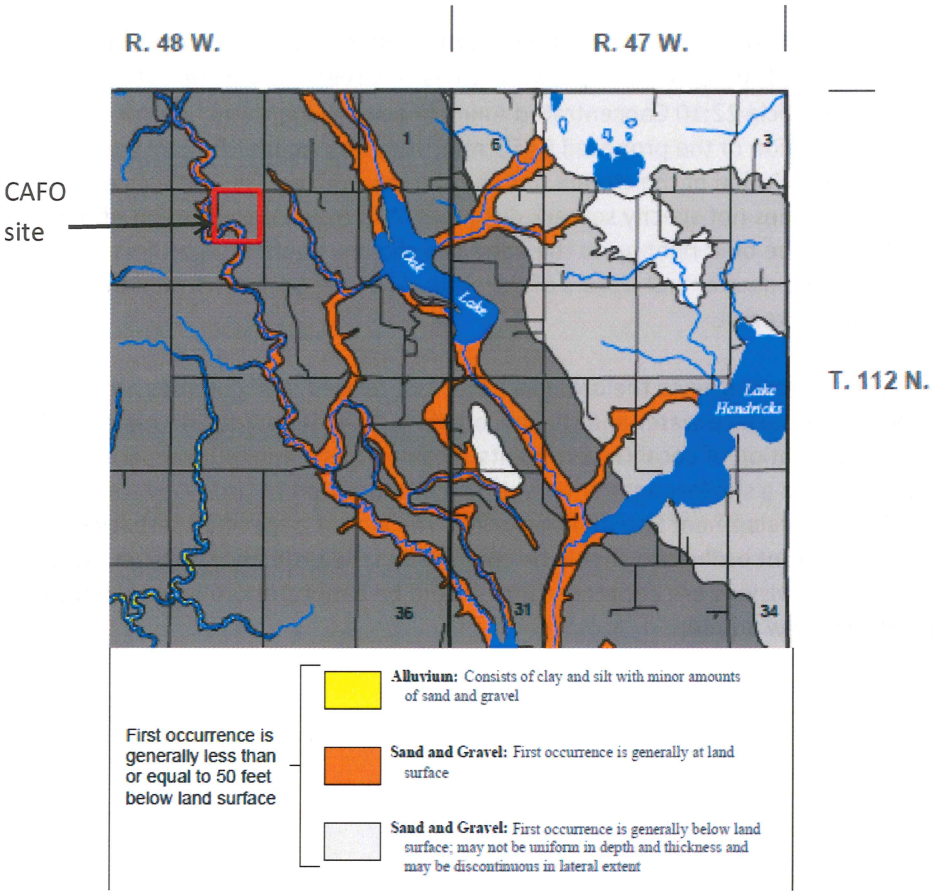


Figure 8. Zoom-in of northeast corner of SD Geological Survey Map of First Occurrence of Aquifer Materials. Streams and lakes are shown in blue, shallow aquifer materials (sand and gravel) within 50 feet of the surface shown in orange. CAFO site outlined in red. (http://www.sdgs.usd.edu/pubs/pdf/AM-19_20040803.pdf accessed 11/24/16).

The size and concentration of many CAFOs and the quantities of waste stored at such sites increase the potential for water pollution. In addition to seepage through the foundation soil, leakage occurs due to cracks, seams, structural faults, spills, etc., even when liners are required. The North Carolina State University Biological & Agricultural Engineering department, an advocate of industrial agriculture, notes that "All lagoons, storage ponds, or holding tanks leak to some extent" (NCSU FAQs About Livestock Production). The potential for significant damage to ground and surface waters, not only to adjacent properties but at considerable distance from the site, underlies the need for prohibitions and setbacks from shallow aquifers, and the importance of evaluating the potential environmental impact of each proposed site.

The Brookings County Zoning Ordinance states: "**In general, no Concentrated Animal Feeding Operation shall be constructed, located, or operated so as to create a significant contribution of pollution.**"(Article 22:10 Concentrated Animal Feeding Operation Control Requirements 1, p 83). The location of the proposed CAFO relative to the Aquifer Protection Zone B constitutes a significant risk of pollution of the stream and the shallow aquifer. The ordinance prohibits CAFOs on shallow aquifers, but does not specify setback distances. A narrow interpretation of the ordinance would allow CAFOs to be built right up to the edge of a shallow aquifer, regardless of the substantial risk of pollution to the aquifer and waters of the state. Allowing such construction would clearly be adverse to the public interest.

CAFO sizes have dramatically increased since the ordinance was last revised, and counties are prudently adopting setback distances from surface water and shallow aquifers. The SD County Site Analysis Plan developed by First District Association of Local Governments recommends a minimum separation distance of ½ mile from a CAFO to a shallow aquifer (First District Association of Local Governments. 2015. Brookings County Rural Development Site Analysis, p 20). The lack of a specified setback distance from shallow aquifers in the current ordinance should be corrected in the ordinance revision, which is currently in progress. Until the revisions are adopted, there should be a moratorium on new CAFOs within less than ¼ mile of a shallow aquifer.

2. The stream flowing through this site feeds into Lake Hendricks. A CAFO at this site would substantially increase the potential for water pollution affecting properties not only adjacent to the site, but along Deer Creek and around Lake Hendricks. The potential for damage to health, safety and property values is adverse to the public interest.

The Deer Creek tributary, which loops through the southwest quadrant of the site, flows into Deer Creek, which flows into the Deer Creek-Lake Hendricks watershed and the flood plain southwest of Lake Hendricks (Figure 9). The terrain from just northwest of the site and extending southeast past the tip of Lake Hendricks is hilly, with steep slopes, and intersected with multiple streams and tributaries. There are fewer cultivated fields in this region due to the steep terrain and the potential for erosion.

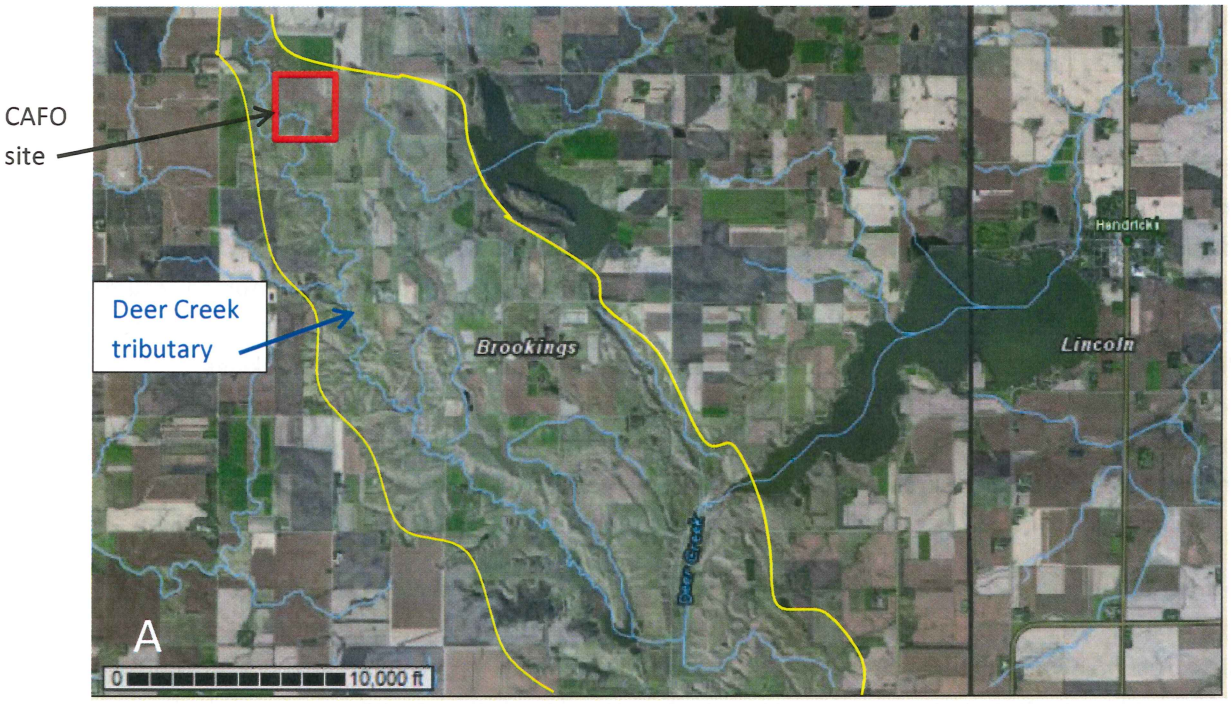


Figure 9. Streams and lakes of the area. Deer Creek and Oak Lake tributaries are shown in blue, draining into Lake Hendricks or Oak Lake. CAFO site outlined in red. Yellow lines approximate the perimeter of hills and steep slopes extending northwest to southeast. (Natural Resource Conservation Service/Web Soil Survey map http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx )

The site is within the Upper Deer Creek and Lake Hendricks watershed (http://www.brookingscountysd.gov/AgendaCenter/ViewFile/Item/1467?fileID=2043). Streams and tributaries on and around the site lead to the aquifer bordered by Oak Lake on the north, Lake Hendricks on the east, and Deer Creek on the south and west (Figure 8 and http://www.brookingscountysd.gov/DocumentCenter/View/73). Lake Hendricks township and the eastern half or more of Oak Lake township are part of the Lac Qui Parle sub-basin (hydrologic coded 0702003) of the Minnesota River basin (http://mrbdc.mnsu.edu/lac-qui-parle-river-major-watershed and

http://www.brookingscountysd.gov/DocumentCenter/View/73), and both townships have been so designated by the SD River Basin Natural Resource District Oversight Advisory Task Force http://sdlegislature.gov/img/Maps/BasinMaps/Red%20Minnesota.png.

Seventy to eighty percent of the ~25,000 acre Lake Hendricks watershed is in South Dakota (http://www.pca.state.mn.us/index.php/water/water-types-and-programs/watersheds/lac-qui-parle-river.html ), with drainage into upper Deer Creek (Brookings Conservation District Report 2002; SDDENR Watershed Protection Program 1999), then into Lake Hendricks.

Pollutants from Deer Creek, including fecal coliform bacteria, have contributed to diminished water quality in Lake Hendricks. Thus, the concerns of citizens not only directly adjacent to the proposed facility but also in the specific watershed and hydrologic sub-basin must be considered. Much of the value of lake area property derives from the usability and quality of the lake. Allowing uses that increase the potential for pollution and environmental degradation will diminish property values.

The city of Hendricks, the Lake Hendricks Improvement Association, SDGFP, and other agencies have recently engaged in extensive and costly efforts to improve and maintain the water quality of Lake Hendricks and to restore the Deer Creek wetlands (Lake Hendricks Restoration Project 2009) through which these waters pass on their way into Lake Hendricks. This remarkable cooperative effort to secure the safety of Lake Hendricks waters and the Deer Creek-Lake Hendricks environment for residents and wildlife in the region was supported by both MN and SD agencies including MNDNR, Brookings Conservation district, EDWDD, NRCS, and national conservation groups Pheasants Forever and Ducks Unlimited, at a cost of over $4,000,000 (C. Nygaard, LHIA Board, pers. comm). The proposed CAFO poses an unacceptable risk to these areas, threatening the work done to improve and protect Deer Creek and Lake Hendricks.

Even if the board agrees with the applicant that the facility includes only the actual buildings and storage ponds, and even if the prohibition against CAFOs in Zone B can be interpreted to mean only the physical placement of structures directly over the Zone B shallow aquifer, nevertheless, the proximity of the CAFO facility, its structures, operations and activities, to a Zone B stream and associated shallow aquifer significantly increases the risk for pollution of Deer Creek and Lake Hendricks, threatening the safety and well-being of citizens and communities downstream of the site. Such an increased risk calls for rejection of this CUP.

3. The stream running through the site has been designated as a Flood Zone A, and is known and documented as a flood-prone region, exacerbated by steep slopes. The presence of a CAFO in close proximity to this flood zone dramatically increases the potential for flooding, water pollution, property damage, and danger to the public downstream of the site, and is adverse to the public interest.

The stream flowing through the southwest quadrant of the site is designated as a floodplain zone, as indicated by the Oak Lake Township map (Figure 10), which also shows outwash deposits; and by Map 16 (p 38) of the Brookings County Comprehensive Plan of 2016 (http://www.brookingscountysd.gov/DocumentCenter/View/1557) and the FEMA map in the applicant's Appendix VI.

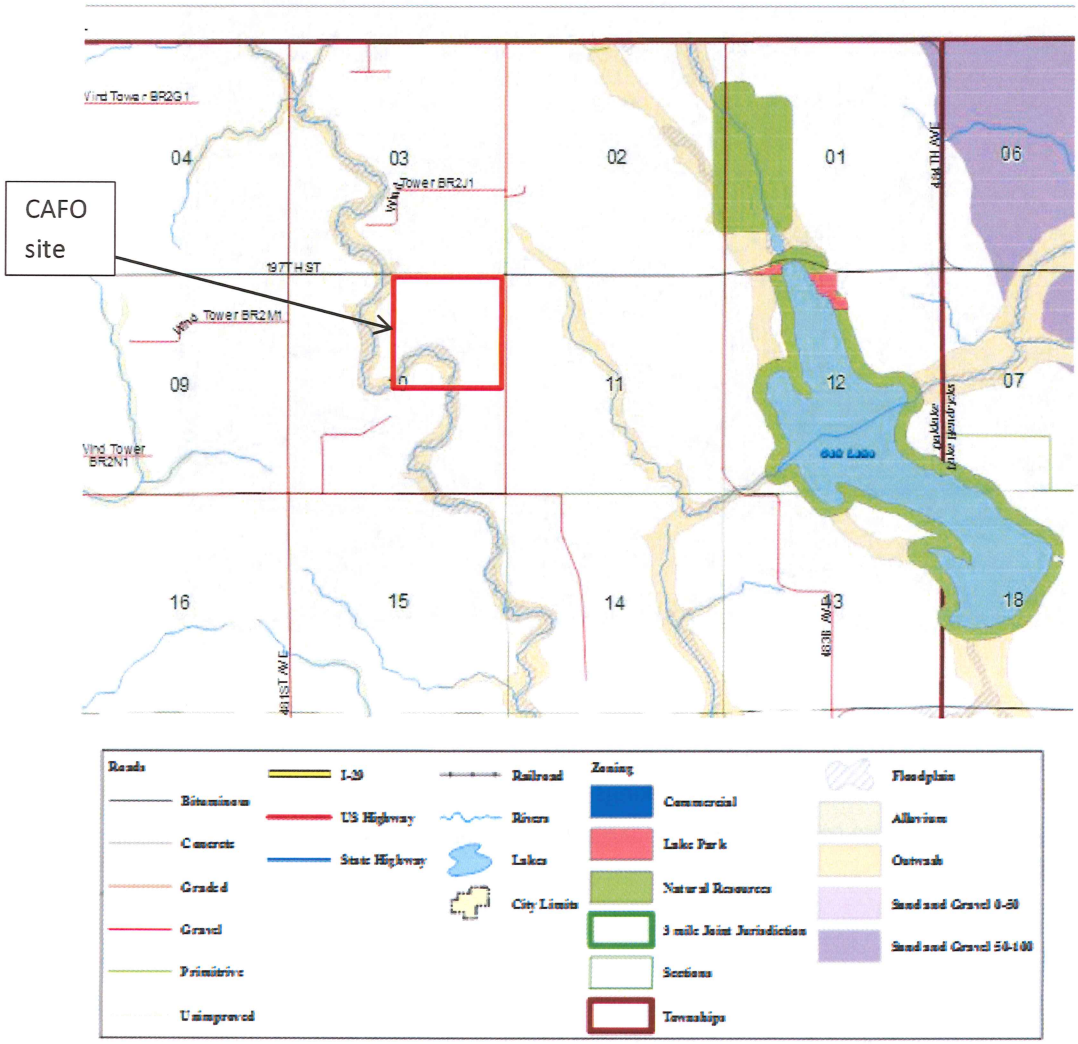


Figure 10. Oak Lake township map from the Brookings County website showing floodplain along the stream flowing through the site. Floodplain is indicated as hashed blue lines over beige outwash material. CAFO site outlined in red. http://www.brookingscountysd.gov/DocumentCenter/View/95

The stream that flows through the proposed site has been responsible for repeated flooding at the south end of the section (198th St) (Figures 12 and 13). This stream and others in the Deer Creek watershed district can convey pollutants and waste material into the Oak Lake-Deer Creek-Lake Hendricks basin, the Deer Creek-Lake Hendricks aquifer, Deer Creek, Lake Hendricks and the Lac qui Parle-Minnesota River basin.


Figure 12. Deer Creek tributary (blue arrow) on proposed site (outlined in yellow). Site of flooding (orange arrow) in 2010. Brookings County, Beacon viewer. https://beacon.schneidercorp.com/Application.aspx?AppID=134&LayerID=1601&PageTypeID=1&PageID=914)

Flood events at levels that may qualify as 25-year events and result in overflow into surrounding surface and ground waters, which flow into Lake Hendricks, have occurred at least three times within the past 13 years: in 2001, 2005, and 2010 (Figure 13). In 2010, the stream leading from the proposed site flooded out the culverts at the south end of the section where the proposed CAFO is sited (Fig 13B).


Figure 13. A. Flooded stream at southern border of Section 10 in 2005. B. Flooding washed out culverts of stream immediately south of section 10 in 2010. C. Pollution on township road from overflow of feedlot ½ mile upstream in 2001. (Photos from N. Patrick, Oak Lake Twp)

Flooding has also occurred in Lake Hendricks due to increased inflow from Deer Creek, and resulted in extensive damage to infrastructure around the lake and in the city (Figure 14).

Figure 14. Flooding at Lake Hendricks in 2010.

The steep elevation differential between the CAFO site (at ~1950 ft) and the Oak Lake-Deer Creek-Lake Hendricks basin (1750-1800 ft) and consequent rapid flow of runoff and stream water prevents the settling out of pollutants and diminishes the capability of vegetation to filter out pollutants before entry into the lake and other surface waters.

The effects of excavation, storage pond filling, etc., during construction should also be considered due to the potential of these activities to increase flooding and contamination both on site and downstream.

In addition, a CAFO, by definition, is a facility "where crops, vegetation, forage growth, are not sustained over any portion of the lot or facility." Vegetation reduces erosion, improves the ability of the ground to

retain water, slows the movement of water, and filters pollutants (Alldred and Baines 2016, Reddy et al 1999, Helmers et al 2008). The removal or degradation of vegetation associated with a CAFO increases the potential for flooding and for the entry of pollutants into waterways. This risk is exacerbated by the topography of this site.

The proximity of the buildings and manure storage ponds to a stream that is designated as a flood plain zone, and the potential for filling, grading, etc., during the construction of this facility to alter the floodplain and natural protective barriers, and the removal or degradation of vegetation resulting in greater risk of erosion and flooding, especially in the presence of the steep slopes of this site, all increase the risk of flooding and pose danger to health, safety, and property. These factors require the rejection of this CUP.

The Zoning Ordinance specifies that the county should act to reduce flood losses by "(1) Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards; … (3) Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters; (4) Controlling filling, grading, dredging, and other development which may increase flood damage;" (**Article 15:01.4, 15:2, p 45)**

The Brookings County Zoning Ordinance is currently undergoing revision. It would be prudent to adopt a 1,000-ft setback from flood zones for industrial operations including CAFOs, as advocated in the Minnesota Pollution Control Agency guidelines https://www.pca.state.mn.us/sites/default/files/wq-f8-30.pdf , and it would be advisable to impose a moratorium on new CUPs in these areas until the revisions have been adopted.

4. The topography of the site and surrounding area includes steep slopes, substantially increasing the risk of water pollution and flooding. The siting of a CAFO in such terrain is incompatible with other property in the area and adverse to the public interest.

This is a region of unusually steep typography (Figure 15), and water flow is fast. The site plan shows the storage ponds at ~1950' elevation. The southwest corners of Storage Ponds 1 and 3 are 300 to 400 ft from stream bed at 1880 ft. The drop off begins immediately adjacent to the southwest corners of these storage ponds, with a drop in elevation of ~70 ft over a horizontal distance of only 300-400 ft, i.e., a 17.5% to 23% slope.

Runoff rapidly moves into the streams of this watershed, which contributes to flooding, and also conveys pollutants, pathogens, bacteria, parasites, antibiotics, hormones, nutrients including nitrates and phosphorus, into Deer Creek and Lake Hendricks.

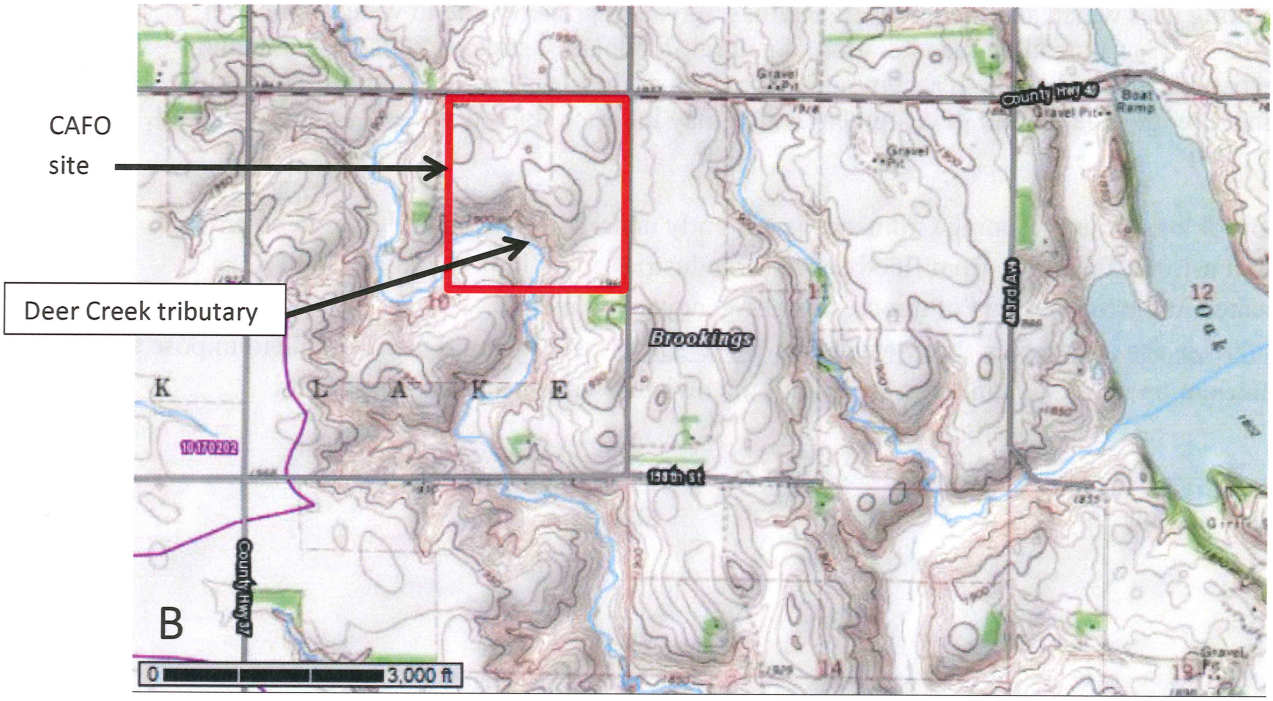


Figure 15. Topography of the site. Proposed CAFO site (outlined in red) and Deer Creek and Oak Lake tributaries (in blue). Note steep slopes (each line=10 ft change in elevation). (Natural Resource Conservation Service map)

One inch of rain on a 160 acre site equals over 4.3 million gallons; and 4 inches, the amount expected in a 25-year event, will be over 16 million gallons. Most of that will flow rapidly from the site into the stream in the southwest quadrant of the site, and into Deer Creek, carrying soil and pollutants. It should also be noted that the occurrence of 25-year events has become more frequent than 25 years in our region.

The topography of the site and the region, the steep slopes, pose an unacceptable increase in the risk of flooding and pollution of the waterways. This site is simply inappropriate for a CAFO, and the CUP should be denied.

The Planning and Zoning Board must consider each CUP application on a site specific basis, taking into consideration the topography of the proposed site. "**Each application for a new or expanded concentrated animal feeding operation (CAFO) will be reviewed by the County Zoning Commission on a site specific basis. The County Zoning Commission reserves the right to increase the minimum required setbacks and separation distance on a site specific review, based on one or more of the following considerations. … B. Due to topography and prevailing wind direction, additional setback and separation distance is appropriate to safeguard air or water quality." (Brookings County Zoning Ordinance Article 22: 16**, p 90)

In the case of this CUP application, the topography is such that the distance from the stream is insufficient to protect against the increased threat of pollution due to the steep slopes, increased water flow and speed, and high erosion potential. The CUP should be denied.

5. A well is located less than ¼ mile from the proposed site (Figure 16). **Class A CAFOs cannot be located less than ½ mile from any well.** (**Article 22:00-14,** p 87)

A private well (Figure 16) is located approximately ¼ mile from the proposed site. Waste materials and other pollutants may rapidly contaminate aquifers through wells. Placement of a CAFO within the minimum safe distance poses an unacceptable risk to public health.

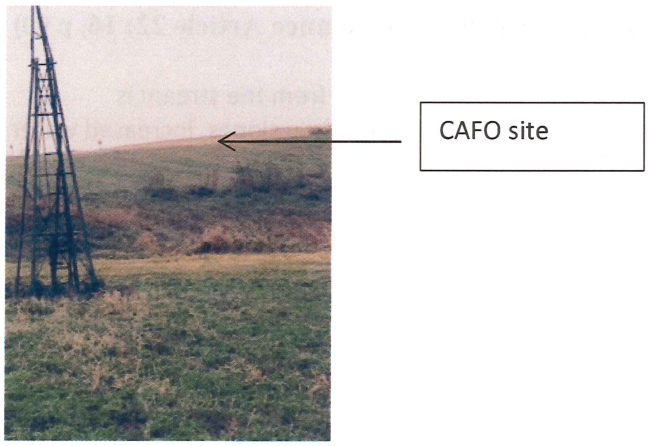


Figure 16. Well ca. ¼ mile from proposed site. Photo taken October 27 2014 by B. Olson.

The minimum setback distance from a well for a Class A CAFO is 2,640 ft, according to the **Brookings County Zoning Ordinance, Article 22:00-14** (p 87 of the pdf).

6. There is significant potential for damage to the environment and wildlife of the area, via drainage into the Deer Creek basin and the aquifer bordering Oak Lake and Lake Hendricks, from nitrates, phosphorus, and other pollutants. The presence of a CAFO is incompatible with other property in the area and adverse to the public interest.

The Brookings County Comprehensive Land Use Plan 2016 states that "**It is the goal of Brookings County to preserve, protect, conserve, and enhance environmental resources including land, water, wetlands, lakes, rivers and streams, wildlife habitats, and recreational areas.**" Placing a CAFO in this location would undermine this goal.

Oak Lake, Deer Creek, Lake Hendricks and the surrounding area lie within the Prairie Coteau, part of the prairie pothole region. This is an important ecosystem, and breeding ground for over half the nation's ducks (Johnson et al 2005). The Oak Lake field Station comprises approximately 570 acres of wetlands, tall grass prairie, pastures, and oak-dominated woods, and the spring-fed prairie pothole lake. The wetlands of Oak Lake and the Oak Lake-Lake Hendricks basin support over 144 species of birds (resident or transient), including ducks breeding in spring and summer and stopping for rest-over during migration. Species found at Oak Lake include the great blue heron, great egret, green heron, belted kingfisher, at least 7 species of raptor including osprey; American white pelican, Great horned owl, bald eagle (endangered), and many sparrows, warblers, etc.

The proposed CAFO site also contains wetlands (Figure 17).

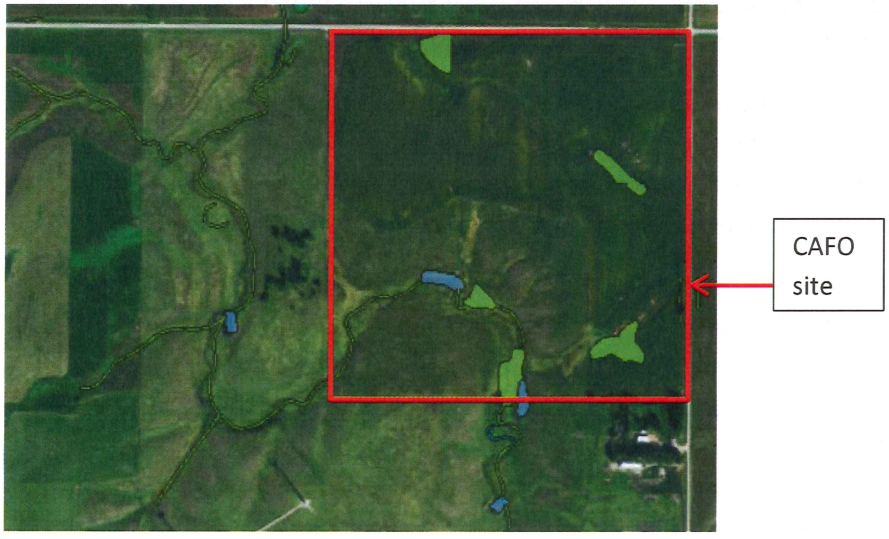


Figure 17. Wetlands (light green) on the CAFO site (outlined in red) and around the stream, from the Fish and Wildlife Service wetlands mapper https://www.fws.gov/wetlands/Data/Mapper.html

The Topeka shiner, a federally listed endangered species, is known to occur in Deer Creek and other streams in the area (SD GFP Topeka Shiner Management Plan; USDA NRCS 2010 http://gfp.sd.gov/Wildlife/management/plans/docs/TopekaShinerManagementPlan-Revised.pdf) (Figure 18). This fish has been collected by a landowner in a stream within ½ mile of the site, and is also likely to occur in other streams in fields on or near the site. The Topeka shiner is an indicator of stream health. In the late 1990s – early 2000s, Topeka shiner prevalence in SD appeared to be due to relatively fewer incursions and contamination of the prairie stream habitat. However, over the past decade, wetlands and prairie streams have substantially declined over its range. Consequently, there is a need to preserve the habitat of this and other species (Wall and Berry 2004). The SD DENR, in response to comments on the draft General Permit 09/02/2015, p 8-9 (comment 25) has said that if a CAFO will be within ¼ of a stream where the shiner is present, they must file an Endangered Species Action Plan; and the NDPES permit will not allow impacts on endangered species.

The Oak Lake Field Station is also home to the rare Northern Red Belly snake (a monitored species in SD, protected in IA) (Cahoe and Troelstrup 2004), at the western limit of its range, and in one of the remaining pockets of habitat for this species.

The Dakota skipper and Poweshiek skipperling are native to the area and were recently listed as endangered species by the US Fish & Wildlife Service http://www.fws.gov/midwest/Endangered/insects/dask/index.html. Critical habitats for both the Dakota skipper and the Poweshiek skipperling have been designated as the area around the intersection of 483rd Ave and 198th St in Brookings County (https://www.fws.gov/midwest/Endangered/insects/dask/fCHmaps/daskchSD.pdf and https://www.fws.gov/midwest/Endangered/insects/posk/fCHmaps/poskchSD.pdf ), i.e., between Oak Lake and the Deer Creek tributary that flows through the proposed CAFO site.

Another endemic species and candidate for listing is the Regal fritillary. Critical nectar sources for this species include violet, milkweed, coneflower and bergamot, which occur at the Oak Lake field station. The endangered American burying beetle, last documented here in the 1940s, is a potential inhabitant of the Oak Lake area (P. Johnson, SDSU, pers comm).

Amphibians, critical to the food chain, are declining in number and range due to habitat loss, pollution, etc., in SD and elsewhere (Naugle et al 2005). The Oak Lake-Lake Hendricks area is home to a number of important frog species (northern leopard frog, tree frogs, etc.). The use of pesticides for fly control can also affect other invertebrates in and around nearby fields and surface waters including Oak Lake, by drift and drainage, with subsequent effects on insectivorous animals including many birds, amphibians, reptiles, and mammals. The potential for environmental damage to this region will be significantly increased by the presence of a CAFO.

Both Lake Hendricks and Oak Lake include public lands and public access and recreational areas. Residents in the area as well as many individuals who live outside Oak Lake Township or Lake Hendricks use these waters for fishing, boating, swimming, wildlife observation, etc. A CAFO is inappropriate in such an area.

7. The siting of a CAFO in this location poses an increased risk to the public safety and to the environment, due to the potential for improper storage, handling, and application of manure.

Vast quantities of manure will be generated by this CAFO. Some will be applied on the remaining cultivated ground at the site (Field 1 of the applicant's NMP Spreadsheet B1, Appendix II). Most will be transported and applied to fields off site. Thus, the effects of the CAFO extend beyond the buildings and storage ponds, beyond the site, and beyond the section. In fact, the impacts of a CAFO extend not only to the land on which manure is applied, but to the streams, rivers, and lakes into which the waste material may flow.

Manure that is applied to fields can enter the water supply and tributaries through runoff or seepage, carrying waste material, nutrients, bacteria, parasites, pathogens, etc. into surface and ground water (Weida 2000), and this is exacerbated by steep slopes and hilly terrain.

The following account is typical of manure applications in the Oak Lake-Lake Hendricks area:

"The application is being done on a field that varies from a 2 to 5% grade, meaning the elevation changes 2 to 5 feet within a 100 foot distance of travel, which is not uncommon in our area, and can easily be higher. Each knife on the applicator creates a trench from one end of the field to the other, every 3 feet, a miniature waterway if you will, 8 to 12 inches deep and probably 3 inches wide. Let's say they are only filling the bottom of the trench with 4 inches of manure. Each trench would contain 1 gallon of manure every 19.4 inches. Every acre will contain 1202 lineal feet of trench. That equates to 750 gallons of manure applied per acre. Simply double this figure for every additional 4 inches of application depth in the trench. A typical 8 inch dragline will flow 400 to 600 gallons per minute. Enter the force of gravity. If too much liquid is injected in the trench, it simply runs downhill through each trench, every 3 feet, creating pools where the ground levels out, which most commonly in a field is a wetland area, tile inlet, drainage ditch, or a road ditch. Granted, some does get retained by the soil, but it can only handle a a certain point of saturation. Now comes the point when the field is finished. Typically, the dragline pipe is fed with up to a 12 inch pipe leading from the lagoon site to the field, running down ditches, through culverts, and across fields. The pipe feeding the applicator is typically 6 inches to reduce weight, being fed from a pumping station located near the field. The pipeline needs to be unhooked from the applicator and most likely from a pumping station located where the pipeline enters the field. The pipeline is not flushed with water and injected before it is unhooked. Manure in the pipeline has to be discharged so it can be rolled up and transported. This discharge ends everywhere from the field to ditches and culverts. The pipeline normally will run several miles. An 8 inch pipe contains 1 gallon every 4.6 inches of pipe, which equates to 13,774 gallons per mile. A 12 inch pipe contains a gallon every 2.04 inches, which equates to 31,059 gallons per mile. I am sure that pressure is reduced in the pipeline before it is opened, but running through hills and valleys, the total volume in the pipeline might be reduced to half, but it still ends up in a pool or runs where it is unhooked and rolled up. One can only imagine the concentration of the manure at that point which is seen in the pictures. From there, with either rainfall or snowmelt, it gets washed downstream into our streams and lakes."

Consequences of excessive manure application and/or field slope are demonstrated in Figure 18.

Figure 18. Photographs of manure overflow following field application taken 10/29/14, 3-4 days after manure application onto fields at the intersection of HWY 30 and HWY 77. Photos by Joe Beech October 30 2014, via C Nygaard email 11/01/14)

The quality of streams and lakes in SD is declining. The SD DENR 2016 Surface Water Quality Report http://denr.sd.gov/documents/16irdraft.pdf found that only about 20% of all lakes and streams now support all beneficial uses. Stream impairments are primarily due to bacteria and suspended solids from erosion; lake impairments to excess nutrients, which enhance algal growth, and siltation. The DENR found that these impairments are primarily due to agricultural nonpoint source pollution.

DENR regulates manure applications because over application or improper transport and storage can lead to pollution of surface and ground water. However, tiling and drainage fall under the purview of counties, and DENR pays little attention to manure application in relation to these. Nor does DENR regulate CAFOs with regard to bacterial pollution. DENR leaves these issues to the counties and townships to regulate (2015 General Permit revisions, response to public comments, p 1). DENR also accepts field application rates that exceed crop needs for phosphorus, basing application rates on crop nitrogen needs. However, the phosphorus content of manure typically exceeds crop requirements, resulting in phosphorus build-up in lakes and streams, with concomitant algal blooms, anoxia, and death of fish and other wildlife (http://denr.sd.gov/documents/16irdraft.pdf ).

Therefore, in considering additional CAFOs, counties must not rely solely on DENR to fully evaluate all potential impacts of a given CAFO on water quality and public safety; nor the cumulative effect of increasing numbers of CAFOs on the water quality and environment of a region.

From October 2009 to November 2016, DENR cited 39 CAFOs for violations of the General water pollution control permit (SD DENR 2016 CAFO Summary of Enforcement Actions). In many cases, there were multiple violations of various regulations. The most frequent types of violations included failure to properly maintain manure containment (including exceeding storage pond capacity) (14 infractions); improper discharges from manure containment or application systems (10 infractions); and improper field applications (including applying to non-approved fields, not conducting soil tests, applying at

improper rates or improper locations) (25 infractions). (Some infractions represent multiple incidents.) Among the facilities cited was Global Dairy (9/30/14), owned by Michael Crinion (http://global-dairy.estelline.sd.amfibi.directory/us/c/13272638-global-dairy), for "Discharging pollutants from a manure application field by not complying with land application best management practices. Land applying manure or process wastewater on a field not in an operation's approved nutrient management plan. Placing a used sand bedding stockpile outside the manure containment system."

The risk of water pollution and the associated hazards to public health and environmental degradation, especially in this particular location, call for a rejection of this CUP.

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