HARDIN COUNTY
Board of Supervisors

Wednesday, June 3, 2020

NOTICE: County buildings are closed to the public due to COVID-19 concerns and restrictions on public gatherings of no more than 10 people, as set forth by Governor Reynolds in her State of Public Health Emergency Disaster Proclamation. To access and participate in the meetings remotely, please call 641-939-8109 for meeting information.

1. 11:00 A.M. Call To Order
   Courthouse Large Conference Room
2. Attendance
3. Approval Of Agenda
4. Public Hearing: Animal Feeding Operation Construction Permit - Tri-B Site Section 8, Section 8, Alden Township

   Documents:

   TRI-B SITE CONSTRUCTION PERMIT APPLICATION.PDF
   TRI-B SITE COUNTY VERIFICATION.PDF
   TRI-B SITE MANURE MANAGEMENT PLAN.PDF
   TRI B SITE MATRIX DOCUMENTS.PDF
5. Verify Proof Of Publication
6. Review Project
7. Written Comments
8. Public Comments
9. Close Hearing
10. Adjournment

Please staple check here

Iowa Department of Natural Resources

Construction Permit Application Form

Confinement Feeding Operations

INSTRUCTIONS:

Prior to constructing, installing, modifying or expanding a confinement feeding operation structure[1], answer questions 1-8 on Item 3, Section A (page 2), to determine if a construction permit is required. To calculate the animal unit capacity (AUC) of the operation, complete Table 1 (page 4). If a construction permit is required, complete the rest of the form, have the applicant(s) sign it on pages 5 and 6. Mail to the DNR (see address on page 5) this application form, documents and fees requested in Checklist No. 1 or 2 (pages 10-15). See item 5 (page 5), to determine which checklist to use.

If a construction permit is not needed, some pre-construction requirements may still apply prior to the construction of a formed manure storage structure[2]. See page 5 for additional DNR contact information.

THIS APPLICATION IS FOR:

1. ☒ A new confinement feeding operation
2. ☐ An existing confinement feeding operation *(answer all of the following questions):*
   a) Facility ID No. (5 digit number): _____
   b) Date when the operation was first constructed: _____
   c) Date when the last construction, expansion or modification was completed: _____

(Not needed if the confinement operation has previously received a construction permit from DNR.)

d) Is this also an ownership change? ☐ Yes ☐ No If yes box is checked additional fees apply. See page 8

ITEM 1 – LOCATION AND CONTACT INFORMATION ***(See page 17 for instructions and an example)*:**

A) Name of operation: Tri-B Site Section 8

Location:

NE	NE	8	89N 21W	Alden	Hardin
(¼ ¼)	(¼)	(Section)	(Tier & Range)	(Name of Township)	(County)

B) Applicant information:

Name: Tri-B Farms LLC Title: Owner

Address: 710 100th St, Dows, IA 50071

Telephone: 641-858-6416 Fax: N/A Email: N/A

C) Person to contact with questions about this application (if different than applicant):

Name: Seth Wengert Title: Consultant

Address: 1531 Davidson Ave Clemons, IA 50051

Telephone: 641-750-1655 Fax: 800-674-3045 Email: seth@4agvice.com

☒ Enclose aerial photo or engineering drawing showing the proposed location of the confinement feeding operation structure[1] and all applicable separation distances, as requested in Attachment 1 (pages 11-12 or 14-15). See example of aerial photo on pages 18 to 19, at the end of this form.

☐ I manage or have a 10% or more ownership interest in another confinement feeding operation located within 2,500 feet of the proposed site. Please contact the DNR AFO Program staff at (712) 262-4177 to verify site adjacency requirements.

[1] Confinement feeding operation structure = animal feeding operation structure (confinement building, manure storage structure or egg washwater storage structure) that is part of a confinement feeding operation. Manure storage structures include formed and unformed manure storage structures.
[2] Formed manure storage structure = covered or uncovered concrete or steel tanks, and concrete pits below the building.

ITEM 2 – SITING INFORMATION:

A) **Karst Determination:** Go to DNR AFO Siting Atlas at http://programs.iowadnr.gov/maps/afo/. Search for your site by either scrolling into your location or entering an address or legal description in the bottom search bar. Left click on the location of your proposed structure. Make sure the karst layer box is checked on the map layers. If you cannot access the map, or if you have questions about this issue, contact the AFO Engineer at (712) 262-4177. Check one of the following:

- ☒ The site is not in karst or potential karst. Print and enclose the map with the name and location of the site clearly marked.
- ☐ The site is in karst. The upgraded concrete standards of 567 IAC 65.15(14)"c" must be used. Refer to "Applicant's submittal checklist" on page 10 for karst documentation.
- ☐ The site is within 1,000 feet of a known sinkhole, Secondary Containment Barrier is required in accordance with 567 IAC 65.15(17).

B) **Alluvial Soils Determination:** Go to the AFO Siting Atlas as described above. Make sure the alluvial layer box is checked on the map legend. If you cannot access the map, or if you have questions about this issue, contact DNR Flood Plain at (866) 849-0321. Check one of the following:

- ☒ The site is not in alluvial soils. Print and enclose the map with the name and location of the site clearly marked.
- ☐ The site is in alluvial soils. You will need to submit a request for a flood plain determination from DNR Flood Plain (866) 849-0321. After receiving determination submit one of the following:
- ☐ Not in 100-year floodplain or does not require a flood plain permit. Include correspondence from the DNR Flood Plain Section.
- ☐ Requires flood plain permit. Include flood plain permit.
- ☐ Documentation has been submitted to determine site is not in alluvial soils. Refer to "Applicant's Submittal Checklist" on page 10 for alluvial soils documentation.

ITEM 3 – OPERATION INFORMATION:

A) A construction permit is required prior to any of the following:

1. ☐ Constructing or modifying any unformed manure storage structure[3], constructing or modifying a confinement building that uses an unformed manure storage structure[3], or increasing animal units in a confinement building that uses an unformed manure storage structure.
2. ☒ Constructing, installing or modifying a confinement building or a formed manure storage structure[2] at a confinement feeding operation if, after construction, installation or expansion, the AUC of the operation is 1,000 animal units (AU) or more. This also applies to confinement feeding operations that store manure exclusively in a dry form.
3. ☐ Initiating a change that would result in an increase in the volume of manure or a modification in the manner in which manure is stored in any unformed manure storage structure[3], even if no construction or physical alteration is necessary. Increases in the volume of manure due to an increase in animal capacity, animal weight capacity or AUC up to the limits specified in a previously issued construction permit do not require a new construction permit.
4. ☐ Initiating a change, even if no construction or physical alteration is necessary, that would result in an increase in the volume of manure or a modification in the manner in which manure is stored in a formed manure storage structure[2] if, after the change, the AUC of the operation is 1,000 AU or more. Increases in the volume of manure due to an increase in animal capacity, animal weight capacity or AUC up to the limits specified in a previously issued construction permit do not require a new construction permit.
5. ☐ Constructing or modifying any egg washwater storage structure or a confinement building at a confinement feeding operation that includes an egg washwater storage structure.
6. ☐ Initiating a change that would result in an increase in the volume of egg washwater or a modification in the manner in which egg washwater is stored, even if no construction or physical alteration is necessary. Increases in the volume of egg washwater due to an increase in animal capacity, animal weight capacity or AUC up to the limits specified in a previously issued construction permit do not require a new construction permit.
7. ☐ Repopulating a confinement feeding operation if it was closed for 24 months or more and if any of the following apply:
   1. ☐ The confinement feeding operation uses an unformed manure storage structure[3] or egg washwater storage structure;
   2. ☐ The confinement feeding operation includes only confinement buildings and formed manure storage structures[2] and has an AUC of 1,000 AU or more.
8. ☐ Installing a permanent manure transfer piping system, unless the department determines that a construction permit is not required.

[3] Unformed manure storage structure = covered or uncovered anaerobic lagoon, earthen manure storage basin, aerobic earthen structure.

B) In your own words, describe in detail, the proposed construction, expansion, installation, modification or repair being proposed in this project.(Must be completed) Attach additional pages if necessary:

The scope of the project will entail construction of a two(2) new swine finishing barns on the site. Each barn will be a 101'-10" x 193' x 8'depth deep pit facility. The facilities will house a total maximum of 5,000 market hogs combined between the two barns. Fans will be placed on top of manure pump out covers. No water lines will enter the pit.

C) Master Matrix *(must check one)*. If any of boxes 1 to 3 are checked, the operation is required to be evaluated with the master matrix if the county, where the confinement feeding operation structure[1] is or would be located, has adopted a 'Construction Evaluation Resolution' (CER). Select the one that best describes your confinement feeding operation:

1. ☒ A new confinement feeding operation proposed in a county that has adopted a CER.
2. ☐ An existing operation constructed on or after April 1, 2002, in a county that has adopted a CER.
3. ☐ An existing operation constructed prior to April 1, 2002, with a current or proposed AUC of 1,667 AU or more, in a county that has adopted a CER.
4. ☐ None of the above. Therefore, the master matrix evaluation is not required.

D) Qualified Operation *(must check one)*. If any of boxes 1 to 4 are checked, the operation is also a 'qualified operation'. A qualified operation is required to use a manure storage structure that employs bacterial action which is maintained by the utilization of air or oxygen, and which shall include aeration equipment. However, this requirement does not apply if box 5 is checked. Select the one that best describes your confinement feeding operation:

1. ☐ A swine farrowing and gestating operation with an AUC of 2,500 AU or more. If the replacement breeding swine are raised and used at the operation, the animal units for those replacement animals do not count in the operations total AUC for the purpose of determining a qualified operation.
2. ☐ A swine farrow-to-finish operation with an AUC of 5,400 AU or more.
3. ☐ A cattle confinement feeding operation (including dairies) with an AUC of 8,500 AU or more.
4. ☐ Other confinement feeding operations with an AUC of 5,333 AU or more.
5. ☒ This is not a qualified operation because:
   a. ☒ It is below the limits shown on boxes 1 to 4.
   b. ☐ It includes a confinement feeding operation structure[1] constructed prior to May 31, 1995.
   c. ☐ It handles manure exclusively in a dry form (poultry).

ITEM 4 – ANIMAL UNIT CAPACITY (AUC) and, if applicable, ANIMAL WEIGHT CAPACITY (AWC):

A) Calculating AUC – Required for all operations

For each animal species, multiply the maximum number of animals that you would ever confine at one time by the appropriate factor, then add all AU together on Table 1 (page 4). Use the maximum market weight for the appropriate animal species to select the AU factor.

You must complete all applicable columns in Table 1. Use column a) to calculate the existing AUC, before permit for existing operations only. Use column b) to calculate the 'Total proposed AUC' (after a permit is issued) including new operations. The number obtained in column b) is the AUC of the operation and must be used to determine permit requirements. Use column c) to calculate the 'New AU' to be added to an existing operation. To calculate the indemnity fee (see page 7), also use column c), however, if the "Existing AUC" (column a) is 500 AU or less, enter the "Total proposed AUC" (column b) in the "New AU" (column c).

In calculating the AUC of a confinement feeding operation, you must include the AUC of all confinement buildings which are part of the confinement feeding operation, unless a confinement building has been abandoned. A confinement feeding operation structure[1] is abandoned if the confinement feeding operation structure[1] has been razed, removed from the site of a confinement feeding operation, filled in with earth, or converted to uses other than a confinement feeding operation structure[1] so that it cannot be used as a confinement feeding operation structure[1] without significant reconstruction. Therefore, in Table 1, enter the animal unit capacity of all the confinement buildings, including those that are from an "adjacent" operation located within 2,500 feet. For more information, contact the AFO Program at (712) 262-4177.

Table 1. Animal Unit Capacity (AUC): **(No. HEAD) x (FACTOR) = AUC**

Animal Species	a) Existing AUC (Before permit)			b) Total Proposed AUC (After permit)		
	(No. Head)	x (Factor)	= AUC	(No. Head)	x (Factor)	= AUC
Slaughter or feeder cattle		1.0			1.0	
Immature dairy cattle		1.0			1.0	
Mature dairy cattle		1.4			1.4	
Gestating sows		0.4			0.4	
Farrowing sows & litter		0.4			0.4	
Boars		0.4			0.4	
Gilts		0.4			0.4	
Finished (Market) hogs	0	0.4	0	5000	0.4	2000
Nursery pigs 15 lbs to 55 lbs		0.1			0.1	
Sheep and lambs		0.1			0.1	
Goats		0.1			0.1	
Horses		2.0			2.0	
Turkeys 7 lbs or more		0.018			0.018	
Turkeys less than 7 lbs		0.0085			0.0085	
Broiler/Layer chickens 3 lbs or more		0.01			0.01	
Broiler/Layer chickens less than 3 lbs		0.0025			0.0025	
Ducks		0.04			0.04	
Fish 25 grams or more		0.001			0.001	
Fish less than 25 grams		0.00006			0.00006	
TOTALS:	a) Existing AUC:			b) Total proposed AUC:		2000

Note: If the "Existing AUC" (column a) is 500 AU or less, enter the "Total proposed AUC" (column b) in the "New AU" (column c)

c) New AU = b) - a): 2000

(This is the AUC of the operation)

B) Calculating AWC - Only for operations first constructed prior to March 1, 2003

The AWC is needed for an operation that was first constructed prior to March 1, 2003, to determine some of the minimum separation distance requirements for construction or expansion.

The AWC is the product of multiplying the maximum number of animals that you would ever confine at any one time by their average weight (lbs) during the production cycle. Then add the AWC if more than one animal species is present (examples on how to determine the AWC are provided in 567 IAC 65.1(455B).)

If the operation was first constructed prior to March 1, 2003, you must complete all applicable columns in Table 2:

Table 2. Animal Weight Capacity (AWC): **(No. head) * (Avg. weight, lbs) = AWC, lbs**

Animal Species	a) Existing AWC (Before Permit)			b) Proposed AWC (After permit)		
	(No. head) x	avg weight	= AWC	(No. head) x	avg weight	= AWC
Slaughter or feeder cattle						
Immature dairy cattle						
Mature dairy cattle						
Gestating sows						
Farrowing sows & litter						
Boars						
Gilts						
Finished (Market) hogs						
Nursery pigs 15 lbs to 55 lbs						
Sheep and lambs						
Goats						
Horses						
Turkeys 7lbs or more						
Turkeys less than 7 lbs						
Broiler/Layer chickens 3 lbs or more						
Broiler/Layer chickens less than 3 lbs						
Ducks						
Fish 25 grams or more						
Fish less than 25 grams						
TOTALS:	a) Existing AWC:			b) Total proposed AWC:		

c) New AWC = b) - a):

(This is the AWC of the operation)

ITEM 5 – SUBMITTAL REQUIREMENTS Checklists No. 1 or 2 (pages 10-15) describe the submittal requirements, which are based on the type of confinement feeding operation structure[1] and AUC proposed. To determine which checklist to use, choose the option that best describes your confinement feeding operation:

A) ☒ **Formed manure storage structures[2]**: The proposed confinement feeding operation structure[1] will be or will use a formed manure storage structure[2]. Check one of the following boxes:

1. ☐ A swine farrowing and gestating operation with an AUC of 1,250 AU or more. Use Submittal Checklist No. 2 (page 13).
2. ☐ A swine farrow-to-finish operation with an AUC of 2,750 AU or more. Use Submittal Checklist No. 2 (page 13).
3. ☐ A cattle confinement feeding operation (including dairies) with an AUC of 4,000 AU or more. Use Submittal Checklist No. 2 (page 13).
4. ☐ Other confinement feeding operations with an AUC of 3,000 AU or more. Use Submittal Checklist No. 2 (page 13).
5. ☒ None of the above. Use Submittal Checklist No. 1 (page 10).

If any of boxes 1 to 4 are checked, the operation meets the threshold requirements for an engineer[4] and a Professional Engineer (PE), licensed in Iowa, is required. For these cases, use Submittal Checklist No. 2 (page 13).

If you checked box 5, your operation is below threshold requirements for an engineer[4] and a Professional Engineer (PE) is not required. Use Submittal Checklist No. 1 (page 10).

B) ☐ **Unformed manure storage structure[3]**: The proposed confinement feeding operation structure[1], will be or will use an unformed manure storage structure[3] or an egg washwater storage structure. A Professional Engineer (PE) licensed in Iowa must design and sign the engineering documents for any size of operation. Use Submittal Checklist No. 2 (page 13) and Addendum "A" (page 16).

ITEM 6- UTILIZING RURAL WATER SYSTEM FOR WATER SUPPLY

☐ The proposed facility will utilize rural water and the providing rural water system has been notified and is aware of the proposed increase in water use.

ITEM 7 – SIGNATURE:

I hereby certify that the information contained in this application is complete and accurate.

Signature of Applicant(s): Brent M. Zipp Date: 3/20/2020

MAILING INSTRUCTIONS:

To expedite the application process, follow the submittal requirements explained in Checklist No. 1 or 2 (pages 10 to 16), whichever applies. Page 1 of this form should be the first page of the package. Mail all documents and fees to:

Iowa DNR
AFO Program
1900 N Grand Ave
Gateway North, Ste E17
Spencer, IA 51301

(Note: Incomplete applications will be returned to the sender.)

Questions

Questions about construction permit requirements or regarding this form should be directed to an engineer of the animal feeding operations (AFO) Program at (712) 262-4177. To contact the appropriate DNR Field Office, go to http://www.iowadnr.gov/fieldoffice.

[4] Threshold requirements for an engineer apply to the construction of a formed manure storage structure[2]. Operations that meet or exceed the threshold requirements for an engineer are required to submit engineering documents signed by a professional engineer licensed in the state of Iowa. Please refer to Checklist No. 2 (pages 13-15).

ITEM 8

Interested Parties Form
Confinement Feeding Operation

Interest means ownership of a confinement feeding operation as a sole proprietor or a 10 percent or more ownership interest held by a person in a confinement feeding operation as a joint tenant, tenant in common, shareholder, partner, member, beneficiary or other equity interest holder. Ownership interest is an interest when it is held either directly or indirectly through a spouse or dependent child, or both.

INSTRUCTIONS:

Please list all persons (including corporations, partnerships, etc.) who have an interest in any part of the confinement feeding operation covered by this permit application.

Full Name	Address	City/State	Zip
Tri-B LLC	710 100th St,	Dows, IA	50071
Ryan Tripp	710 100th St,	Dows, IA	50071
Brent Tripp	402 9th Ave,	Eldora, IA	50627
Mathew Tripp	16817 Blue Jacket st	overland Park, KS	66221

For each name above, please list below all other confinement feeding operations in Iowa in which that person has an interest. Check box "**None**", below, if there are no other confinement feeding operations in Iowa in which the above listed person(s) has or have an interest.

Operation Name	Location (¼ ¼, ¼, Section, Tier, Range, Township, County)	City
☐ **None** [There are no other confinements in Iowa in which the above listed person(s) has or have an interest].		
Tri-B Farms Site 1	NE 1/4 of the SW 1/4 of Section30, T091N, R21W, Hamilton Twp, Franklin Co.	Dows
Tri-B Farms Site 2	NE 1/4 of the NW 1/4 of Section30, T091N, R21W Hamilton Twp, Franklin Co.	Dows
Tri B Site #3	SE 1/4 of the SE 1/4 of Section30, T091N, R21W Hamilton Twp, Franklin Co.	Dows

I hereby certify that the information provided on this form is complete and accurate.

Signature of Applicant(s): Brent M. Tripp Date: 3/20/2020

ITEM 9

Manure Storage Indemnity Fee Form for Construction Permits

CASHIER'S USE ONLY
0474-542-474A-0431
Facility ID #
County

Credit fees to: Tri-B LLC

Name of operation: Tri-B Site Section 8

INSTRUCTIONS:

1) Use the 'Total Proposed AUC' from column b), Table 1 (page 4), to select the appropriate fee line in the table below. The 'Total Proposed AUC' is the AUC of the operation.
2) Select the animal specie and row number (see examples). Enter the 'New AU' from column c), Table 1 (page 4). The 'New AU' is the number of AU to be added to an existing operation or being proposed with a new operation. **Note**: If the "Existing AUC" (column a) is 500 AU or less, enter the "Total proposed AUC" (column b) in "New AU" (column c).
3) Multiply the 'New AU' by the appropriate 'Fee per AU'. The resulting number is the indemnity fee due.

- **Example 1**: An existing swine operation is expanding from an 'Existing AUC' of 1,000 AU to a 'Total Proposed AUC' of 1,800 AU, and has previously paid an indemnity fee for the existing 1,000 AU. Calculate the indemnity fee as follows: The 'Total Proposed AUC' is between 1,000 AU and 3,000 AU; the animal specie is other than poultry; enter 800 AU in the 'New AU' column, row 4, and multiply it by $ 0.15:

  (800 AU) x ($ 0.15 per AU) = $ 120.00

- **Example 2**: An existing poultry operation is expanding from an 'Existing AUC' of 250 AU to a 'Total Proposed AUC' of 2,000 AU and has not paid the indemnity fee for animals housed in the existing buildings. Calculate the indemnity fee as follows: The 'Total Proposed AUC' is between 1,000 AU and 3,000 AU; the animal specie is poultry and the indemnity fee has not previously been paid, enter 2,000 AU in the 'New AU' column on row 3, and multiply it by $0.06:

  (2,000 AU) x ($ 0.06 per AU) = $ 120.00

- **Example 3**: If you are proposing a new swine confinement feeding operation with a 'Total Proposed AUC' of 3,500 AU, enter 3,500 AU in the 'New AU' column, row 6 and multiply it by $ 0.20:

  (3,500 AU) x ($ 0.20 per AU) = $ 700.00

- **Example 4**: If you are applying for a construction permit but you are not increasing the AUC of the operation, and has previously paid the applicable indemnity for the animals housed in the existing buildings, there is no indemnity fee due ($ 0.00). If no indemnity fee is due, do not submit this page.

Indemnity Fee Table:

Total Proposed AUC (After Permit (from column B, Table 1)	Row	Animal species	New AU (from column C Table 1)	x	Fee per AU	Indemnity Fee
Less than 1,000 AU	1	Poultry		x	$ 0.04 =	
	2	Other		x	$ 0.10 =	
1,000 AU or more to less than 3,000 AU	3	Poultry		x	$ 0.06 =	
	4	Other	2000	x	$ 0.15 =	300
3,000 AU or more	5	Poultry		x	$ 0.08 =	
	6	Other		x	$ 0.20 =	

ITEM 9 (Cont.)

Filing Fees Form for Construction Permits

CASHIER'S USE ONLY
0473-542-473A-0431
0474-542-474A-0431
Facility ID #
County

Credit fees to: Tri-B LLC

Name of operation: Tri-B Site Section 8

INSTRUCTIONS:

1. If the operation is applying for a construction permit enclose a payment for the following:
   ☒ Construction application fee $250.00.
   (Note: This fee is non-refundable)

2. A manure management plan must be submitted with a filing fee.
   ☒ Manure management plan filing fee $250.00
   (Note: This fee is non-refundable)

3. If this is a change in ownership then indemnity fees must also be paid on the current (existing) total AUC at the appropriate rate on page 7.
   ☐ Indemnity fee due to ownership change $ _____

4. Total filing fees: Add the fees paid in items 1, 2 and 3 (above): $ 500

SUMMARY:

- Manure Storage Indemnity Fee (see previous page) to be deposited in the Manure Storage Indemnity Fee Fund (474)	$	300
- Total filing fees (see item 4 on this page) to be deposited in the Animal Agriculture Compliance Fund (473)	$	500
TOTAL DUE:	$	800

Make check payable to: Iowa Department of Natural Resources or Iowa DNR; and send it along with the construction application documents (See Submittal Checklist No. 1 or 2, pages 10-15.) Note: Do not send this fee to the county.

Construction Design Statement (CDS)

Instructions:

1. This form is for new or expanding confinement feeding operations with an AUC[1] of more than 500 AU, not required to have a professional engineer (PE)[2], that are proposing to construct a formed manure storage structure[3].
2. Complete and submit Sections 1, 2 and 3 (pages 1 to 6).
3. Complete and submit Section 4 (page 6) only if you are applying for a construction permit and are constructing three or more confinement feeding operation structures[4].
4. Mail only pages 1 to 6, as instructed on page 6 and 7. Do not mail the remainder of this form.
5. If the site-specific design is sealed by a PE[2], do not use this CDS instead use DNR Form 542-8122.

Section 1 - Information about the proposed formed manure storage structure[3](s)

A) Information about the operation:

Name of operation: Tri-B Section 8 Facility ID No.: _____

Location:

NE	NE	8	89N - 21W	Alden	Hardin
(¼ ¼)	(¼)	(Section)	(Tier & Range)	(Name of Township)	(County)

B) Description of the proposed formed manure storage structure[3]. Include dimensions (length, width, or diameter, depth). Indicate if it is aboveground or belowground; covered or uncovered, made of concrete or steel, address location of pit fans, if applicable, and address water line entry into buildings. If necessary attach more pages:

Two(2) barns with the individual dimensions of 193'-0" x 101'-10" wide x 8'-0" deep below ground concrete pit, covered by slats and building. All pit fans are located on pumpouts and waterline will enter into attached office, then travel along the ceiling into hog barn.

C) Utilizing Rural Water System and Domestic Sewage Disposal

- ☐ The proposed facility will utilize rural water and the providing rural water system has been notified and is aware of the proposed increase in water use.
- ☒ I understand that no domestic wastewater (toilets, showers, or sinks) or laundry facilities can be discharged to the manure storage structure.

D) Aerial photos: Aerial photos must be submitted that clearly show the location of all existing and proposed confinement feeding operation structures and show at least a one-mile radius around the structures. The photos must either show roads on the north and south or east and west sides of a section (so that a mile distance is apparent), or include a distance scale.

The photo(s) must show that the proposed structures comply with all statutory minimum required separation distances to the objects listed below:

- Residences (not owned by the permit applicant), churches, businesses, schools, public use areas
- Water wells (depends on type)
- Major water sources, wellhead or cistern of an agricultural drainage well or known sinkholes
- Water sources (other than major water sources) and surface intakes of an agricultural drainage well
- Designated wetlands
- Road right-of-way

The separation distance to each of the above objects must be noted with a straight line between the proposed structure(s) and the object. If any of the above objects is not located within one mile from the proposed structures, note the fact on the photo(s) or use additional pages. (Example: "No agricultural drainage wells within one mile.")

All separation distances that are not clearly in excess of the required minimum separation distance must be measured according to 567 IAC 65.11(9) using standard survey methods. Go to the DNR Fact Sheet Page on our website and select DNR fact sheet "Distance Requirements for Construction" to find the required separation distances. Or, go directly to the Minimum Separation Distances for Construction or Expansion of Confinement Feeding Operation Structures Form. An example aerial photo can be found on pages 18 to 19 of the AFO Construction Permit Application (DNR Form 542-1428), or at the previously listed link.

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[1] To determine the AUC see the 'Manure Storage Indemnity Fee' (Form 542-4021) or the 'Construction Permit Application' (Form 542-1428), or visit http://www.iowadnr.gov

[2] PE is a professional engineer licensed in the state of Iowa or a NRCS-Engineer working for the USDA-Natural Resources Conservation Service (NRCS).

[3] Formed manure storage structure means a covered or uncovered concrete or steel tank, including concrete pits below the floor.

[4] Confinement feeding operation structure = A confinement building, a formed or unformed manure storage structure, or an egg washwater storage structure.

Note: If a master matrix is required, the photos must also show that the additional separation distances required for any points claimed in matrix criteria one through ten will be met for the objects listed above. Note the additional separation distance by drawing a straight line between the proposed structures and the matrix item.

E) Karst Determination: Go to DNR AFO Siting Atlas at http://programs.iowadnr.gov/maps/afo/. Search for your site by either scrolling into your location or entering an address or legal description in the bottom search bar. Left click on the location of your proposed structure. Make sure the karst layer box is checked on the map layers. If you cannot access the map, or if you have questions about this issue, contact the AFO Engineer at 712-262-4177. Check one of the following:

- [x] The site is not in karst or potential karst. Print and enclose the map with the name and location of the site clearly marked.
- [ ] The Siting Atlas has indicated that the site is in karst. The upgraded concrete standards of 567 IAC 65.15(14)"c" must be used. Complete and sign Section 3.H (page 5).

F) Alluvial Soils Determination: Go to the AFO Siting Atlas as described above. Make sure the alluvial box is checked on the map layers. If you cannot access the map, or if you have questions about this issue, contact DNR Flood Plain at 866-849-0321. Check one of the following:

- [x] The site is not in alluvial soils. Print and enclose the map with the name and location of the site clearly marked.
- [ ] If the site is in alluvial soils contact DNR Flood Plain at 866-849-0321. You will be required to submit a petition for a declaratory order if less than 1000 AU or request a flood plain determination if 1000 AU or greater. After receiving Flood Plain determination, submit one of the following:
- [ ] Include correspondence from the DNR showing the site is not in 100-year flood plain or does not require a Flood Plain permit.
- [ ] Include copy of the Flood Plain permit if a Flood Plain permit is required.

NOTE: You may not be in a flood plain per DNR, however in a County Flood Hazard Area and need a county permit.

Section 2 - Manure management plan:

[x] An original manure management plan (MMP) is enclosed with this form, even if a MMP was previously filed.

Tri-B LLC	Brent M. Zipp	3/20/2020
Owner's Name (print)	Owner's Signature	Date

Section 3 - Construction design standards: The person responsible for constructing the formed manure storage structure(s)[3] must complete Section 3.

A) Liquid and semi-liquid manure: The proposed formed manure storage structure[3] will be (check one):

- A.1 [x] A non-circular concrete tank, belowground, with walls laterally braced or below the building concrete pit designed according to 567 IAC Chapter 65, Appendix D.
- A.2 [ ] A non-circular concrete tank, belowground, walls designed according to MidWest Plan Service (MWPS), publication MWPS-36. Include design calculations.
- A.3 [ ] A circular concrete tank, walls designed according to MidWest Plan Service (MWPS), publication MWPS TR-9. Include design calculations.
- A.4 [ ] Will be made of steel, constructed aboveground according to the manufacturer's recommendations.

B) Dry manure: The proposed formed manure storage structure[3] will be (check one):

- B.1 [ ] An aboveground concrete tank, with walls designed according to MWPS-36. Include design calculations.
- B.2 [ ] Will be made of steel, constructed aboveground according to the manufacturer's recommendations.
- B.3 [ ] Will be a belowground or partially belowground concrete tank, with walls laterally braced designed according to 567 IAC Chapter 65, Appendix D or MWPS-36. Include design calculations.

C) Details of the proposed design: Submit an additional completed copy of this page 3 for each formed manure storage structure[3] that have different dimensions. Complete all of the following information:

Number of buildings: 2 Building name: Barn 1 & barn 2

Dimensions of proposed formed manure storage structure[3]

	Length	Width	Height or depth	Wall thickness	Diameter (circular tanks only)
Feet	193	101	8	0	
Inches		10		8	

To determine the appropriate vertical steel in walls, first check one of the following boxes (must check one):

a. ☐ To use Tables D-1 and D-2 (on pages 7-8), backfilling of walls shall be performed with gravel, sand, silt, and clay mixtures (less than 50 percent fines), with coarse sand with silt or clay (less than 50 percent fines), or cleaner granular material (see page 9 for the unified soils classification). You will need to submit a copy of a USDA soil survey map with the proposed location of the formed manure storage structures[3] clearly marked showing the unified soil classification; or a statement signed by a qualified organization or NRCS staff.

b. ☒ Use Tables D-3 and D-4 (on pages 8-9) if backfilling of walls will be performed with soils that are unknown or with low plasticity silts and clays with some sand or gravel (50 percent or more fines); or fine sands with silt or clay (less than 50 percent fines); or low to medium plasticity silts and clays with little sand or gravel (50 percent or more fines); or high plasticity silts and clays (see page 9 for unified soils classification). You must use Tables D-3 and D-4 if you do not submit the soils information requested in box "a", above.

Maximum spacing of steel, in inches

Description of reinforcing steel in walls	Proposed vertical steel in walls [see boxes "a" and "b", above]				Proposed horizontal steel in walls (use Table D-5)
	Walls where vehicles are **not** allowed within 5 feet (use Table D-1)[a]	All walls with pumpout ports and walls where vehicles are allowed within 5 feet (use Table D-2)[a]	Walls where vehicles are **not** allowed within 5 feet (use Table D-3)[b]	All walls with pumpout ports and walls where vehicles are allowed within 5 feet (use Table D-4)[b]	
Grade 40, No. 4					
Grade 40, No. 5					
Grade 60, No. 4			9	9	12
Grade 60, No. 5					

D) Aboveground tanks or partially aboveground tanks: Liquid and semi-liquid manure (check the following box):

☐ If the proposed tank is to be constructed **aboveground or partially aboveground** and will have an external outlet or inlet below the liquid level, the tank will also be constructed according to the 567 IAC 65.15(20).

E) Steel Tanks: Certification that the tank will be constructed according to the tank manufacturer's specifications:

Name of tank manufacturer company: _____

Address: _____

Telephone: _____ Fax: _____

F) Additional construction design standards:

To determine the additional requirements set forth in 567 IAC 65.15(14) that would apply to the proposed formed manure storage structure[3], check any of the following 3 boxes based on the information entered on Sections 3.A or 3.B (page 2):

☒ If you checked boxes A.1, A.2, A.3 or B.3 (on page 2) **all** of the following 15 additional requirements apply. Complete the numbered items 1 to 15 (below).

☐ If you checked box B.1 (on page 2), only the requirements of numbered items 1, 3, 4, 5, 6, 8 and 12 apply and need to check those boxes (below).

☐ If you checked boxes A.4 or B.2 (on page 2) and the steel tank will have a concrete floor, only the requirements of numbered items 1, 2, 3, 4, 5, 8, 9, 12, apply and need to check those boxes (below).

Additional Requirements that will be followed during construction of the formed manure storage structure(s)[3]:

1. Site preparation (check the following box):
   - [x] The finished subgrade of a formed manure storage structure shall be graded and compacted to provide a uniform and level base and shall be free of vegetation, manure and debris. For the purpose of this subrule, "uniform" means a finished subgrade with similar soils.

2. Groundwater separation requirements (check one of the following boxes):
   - [x] When the groundwater table, as determined in 65.15(7)"c," is above the bottom of the formed structure, a drain tile shall be installed along the footings to artificially lower the groundwater table pursuant to 65.15(7)"b"(2). The drain tile shall be placed within 3 feet of the footings as indicated in Appendix D, Figure D-1, at the end of this chapter and shall be covered with a minimum of 2 inches of gravel, granular material, fabric or a combination of these materials to prevent plugging the drain tile. A device to allow monitoring of the water in the drainage tile lines installed to lower the groundwater table and a device to allow shutoff of the drainage tile lines shall be installed if the drainage tile lines do not have a surface outlet accessible on the property where the formed manure storage structure is located. **Perimeter tiles must be tied into existing tile, day light, or have an operating sump pump installed in tile riser. Perimeter tiles CANNOT dead end at riser or monitoring port.**
   - [ ] In lieu of the drain tile, a certification signed by a PE[2], a groundwater professional certified pursuant to 567 Chapter 134, or a qualified staff from NRCS, is being submitted indicating that the groundwater elevation, according to 65.15(7)"c", is below the bottom of the formed structure.

3. Minimum as-placed concrete compressive strength (check the following box):
   - [x] All concrete shall have the following minimum as-placed compressive strengths and shall meet American Society for Testing and Materials (ASTM) standard ASTM C 94: 4,000 pounds per square inch (psi) for walls, floors, beams, columns and pumpouts and 3,000 psi for the footings. The average concrete strength by testing shall not be below design strength. No single test result shall be more than 500 psi less than the minimum compressive strength.

4. Cement and aggregates specifications (check the following box):
   - [x] Cementitious materials shall consist of Portland cement conforming to ASTM C 150. Aggregates shall conform to ASTM C 33. Blended cements in conformance with ASTM C 595 are allowed only for concrete placed between March 15 and October 15. Portland-pozzolan cement or Portland blast furnace slag blended cements shall contain at least 75 percent, by mass, of Portland cement.

5. Concrete consolidation and vibration requirements (check the following box):
   - [x] All concrete placed for walls shall be consolidated or vibrated, by manual or mechanical means, or a combination, in a manner which meets ACI 309.

6. Minimum rebar specifications: (check the following box):
   - [x] All rebar used shall be a minimum of grade 40 steel. All rebar, with the exception of rebar dowels connecting the walls to the floor or footings, shall be secured and tied in place prior to the placing of concrete.

7. Wall reinforcement placement specifications (check the following box):
   - [x] All wall reinforcement shall be placed so as to have a rebar cover of 2 inches from the inside face of the wall for a belowground manure storage structure. Vertical wall reinforcement should be placed closest to the inside face. Rebar placement shall not exceed tolerances specified in ACI 318.

8. Minimum floor specifications. Complete part a) and b):
   a) Floor thickness requirements (check the following box):
      - [x] The floor slab shall be a minimum of 5 inches thick. Nondestructive methods to verify the floor slab thickness may be required by the department. The results shall indicate that at least 95 percent of the floor slab area meets the minimum required thickness. In no case shall the floor slab thickness be less than 4½ inches.

   b) The floor slab reinforcement shall be located in the middle of the thickness of the floor slab (check one of the following boxes):
      - [x] Formed manure storage structures with a depth of 4 feet or more shall have primary reinforcement consisting of a minimum of #4 rebar placed a maximum of 18 inches on center in each direction placed in a single mat.
      - [ ] Formed manure storage structure with a depth less than 4 feet shall have shrinkage reinforcement consisting of a minimum of 6 × 6-W1.4 × W1.4 welded wire fabric.

9. Minimum footing specifications (check the following box):
   - [x] The footing or the area where the floor comes in contact with the walls and columns shall have a thickness equal to the wall thickness, but in no case be less than 8 inches, and the width shall be at least twice the thickness of the footing. All exterior walls shall have footings below the frostline. Tolerances shall not exceed -½ inch of the minimum footing dimensions.

10. Requirement to connect walls to footings (check one of the following boxes):
   - [ ] The vertical steel of all walls shall be extended into the footing, and be bent at 90°, OR
   - [x] A separate dowel shall be installed as a #4 rebar that is bent at 90° with at least 20 inches of rebar in the wall and extended into the footing within 3 inches of the bottom of the footing and extended at least 3 inches horizontally, as indicated in Appendix D, Figure D-1 (page 10). Dowel spacing (bend or extended) shall be the same as the spacing for the vertical rebar.
   - [ ] As an alternative to the 90°bend, the dowel may be extended at least 12 inches into the footing, with a minimum concrete cover of 3 inches at the bottom, as indicated in Appendix D, Figure D-1 (page 10). Dowel spacing (bend or extended) shall be the same as the spacing for the vertical rebar.
   - [ ] In lieu of dowels, mechanical means or alternate methods may be used as anchorage of interior walls to footings. Please submit structural calculations and details of this proposal.

11. Concrete forms specifications (check the following box):
   - [x] All walls shall be formed with rigid forming systems and shall not be earth-formed. Form ties shall be non-removable.

12. Curing of concrete requirements (check the following box):
   - [x] All concrete shall be cured for at least seven days after placing, in a manner which meets ACI 308, by maintaining adequate moisture or preventing evaporation. Proper curing shall be done by ponding, spraying or fogging water; or by using a curing compound that meets ASTM C 309; or by using wet burlap, plastic sheets or similar materials.

13. Construction joints and waterstops specifications (check the following box):
   - [x] All construction joints in exterior walls shall be constructed to prevent discontinuity of steel and have properly spliced rebar placed through the joint. Waterstops shall be installed in all areas where fresh concrete will meet hardened concrete as indicated in Appendix D, Figures D-1 and D-2, at the end of this chapter. The waterstops shall be made of plastic, rolled bentonite or similar materials approved by the department.

14. Backfilling of walls specifications (check the following box):
   - [x] Backfilling of the walls shall not start until the floor slats or permanent bracing have been installed. Backfilling shall be performed with material free of vegetation, large rocks or debris.

15. Additional design requirements (check the following box, if applicable):
   - [ ] A formed manure storage structure with a depth greater than 12 feet shall be designed by a PE or an NRCS engineer.

G) Construction Certification: The person responsible for constructing the formed manure storage structure[3] must sign this page. Any change(s) to the specifications of the formed manure storage structure must be first approved by DNR:

"I hereby certify that I have read and understand the minimum design and construction standards of Iowa Code chapter 459, Subchapter III, and the 567 Iowa Administrative Code (IAC) 65.15(14) "Minimum concrete standards" or 567 IAC 65 (if other than concrete)." The proposed formed manure storage structure(s)[3] at the operation:

Name of operation: Tri-B Section 8 County: Hardin

Owner's name: Tri-B llc

will be constructed in accordance with these minimum requirements. Included with this certification are:

- [ ] Page 1-3, for each formed manure storage structure[3] that have different dimensions
- [ ] Pages 4 to 6 (applicable sections)
- [ ] Other documents (specify):

Brent M. Tripp	Brent M. Tripp	3/20/2020
(Print name)	(Signature)	(Date)
Tri B Farms	710 100th St, Dows, IA 50071	641-858-6416
(Company)	(Address)	(Phone No.)

(See page 7 for mailing instructions)

H) **Upgraded Concrete Standards Certification:** If the site is in karst according to Section 1.D (page 2) the person responsible for constructing the formed manure storage structure must also complete this section:
567 IAC 65.15(14)"c". Karst terrain - upgraded standards. If the site of the proposed formed manure storage structure is located in an area that exhibits karst terrain or an area that drains into a known sinkhole, the minimum concrete standards set forth in 65.15(14)"a" or "b" shall apply. In addition, the following requirements apply to all formed manure storage structures that store nondry or dry manure (check all of the following boxes):

☐ (1) A minimum 5-foot vertical separation distance between the bottom of a formed manure storage structure and limestone, dolomite, or other soluble rock is required if the formed manure storage structure is not designed by a PE or an NRCS engineer. (The 5-foot separation must be a continuous profile of low permeability soil directly beneath the bottom of the formed manure storage structure.

☐ (2) If the vertical separation distance between the bottom of the proposed formed manure storage structure and limestone, dolomite, or other soluble rock is less than 5 feet, the structure shall be designed and sealed by a PE or an NRCS engineer who certifies the structural integrity of the structure. A 2-foot-thick layer of compacted clay soil shall be constructed underneath the floor of the formed manure storage structure. However, it is recommended that any formed manure storage structure be constructed aboveground if the vertical separation distance between the bottom of the structure and the limestone, dolomite, or other soluble rock is less than 5 feet.

☐ (3) In addition, in an area that exhibits karst terrain or an area that drains into a known sinkhole, a PE, an NRCS engineer or a qualified organization shall submit a soil exploration study based on the results from soil borings or test pits to determine the vertical separation between the bottom of the formed structure and limestone, dolomite, or other soluble rock. A minimum of two soil borings, equally spaced within each formed structure, or two test pits outside of each formed structure, are required. After soil exploration is completed, each soil boring and pit shall be properly plugged with concrete grout, bentonite, or similar materials.

☐ (4) Backfilling shall not start until the floor slats have been placed or permanent bracing has been installed, and shall be performed with material free of vegetation, large rocks, or debris.

"I have read and understand the upgraded concrete standards of IAC 65.15(14)"c", and certify that the proposed formed manure storage structure(s)[3] at the above operation will be constructed according to these standards":

(Print name)	(Signature)	(Date)
(Company)	(Address)	(Phone No.)

Section 4 - Drainage Tile Certification: Required only if applying for a construction permit and constructing three or more confinement feeding operations structures[4]. This section must be completed and signed by the person responsible for excavating the confinement feeding operation structure[4]:

567 IAC 65.15(1) - Drainage tile removal for new construction of a manure storage structure. Prior to constructing a manure storage structure, other than storage of manure in an exclusively dry form, the site for the animal feeding operation structure shall be investigated for drainage tile lines as provided in this subrule. All applicable records of known drainage tiles shall be examined for the existence of drainage tile lines.

c. The applicant for a construction permit for a formed manure storage structure shall investigate for tile lines during excavation for the structure. Drainage tile lines discovered upgrade from the structure shall be rerouted around the formed manure storage structure to continue the flow of drainage. All other drainage tile lines discovered shall be rerouted, capped, plugged with concrete, Portland cement concrete grout or similar materials or reconnected to upgrade tile lines. Drainage tile lines installed at the time of construction to lower a groundwater table may remain where located. A device to allow monitoring of the water in the drainage tile lines and a device to allow shutoff of the drainage tile lines shall be installed if the drainage tile lines do not have a surface outlet accessible on the property where the formed manure storage structure is located.

"I certify that I have read and understand the requirements of 567 IAC 65.15(1)"c" and that to the best of my knowledge, information and belief, the proposed confinement feeding operation structures[4] at:

Name of operation: Tri-B Section 8 County: Hardin

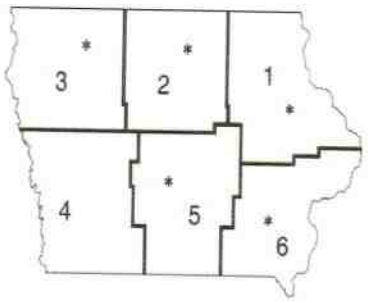
Owner's name: Tri-B llc

will not impede the drainage of established drainage tile lines which cross their property lines and if construction disturbs drainage tile lines, I will take the necessary measures to reestablish drainage and, upon completion of construction, file a statement that those measures were taken to reestablish drainage."

(Print name)	(Signature)	(Date)
(Company)	(Address)	(Phone No.)

Mailing Instructions: Mail only pages 1 to 6 of this CDS according to the following:

1. Operations not needing a construction permit (AUC[1] between 501 and 999 AU and constructing a formed manure storage structure[3]) but required to submit a manure management plan (MMP), at least **30 days** prior to beginning construction must file this CDS, the required karst and alluvial soils documentation requested in Section 1,C and 1,D (page 1) along with the required MMP documents and fees with the nearest DNR Field Office:



Field Office 1
909 W Main St Ste 4
Manchester, IA 52057
(563) 927-2640

Field Office 2
2300 15th St SW
Mason City, IA 50401
(641) 424-4073

Field Office 3
1900 N Grand Ave
Spencer, IA 51301
(712) 262-4177

Field Office 4
1401 Sunnyside Ln
Atlantic, IA 50022
(712) 243-1934

Field Office 5
502 E 9th St
Des Moines IA 50319
(515) 725-0268

Field Office 6
1023 W Madison
Washington, IA 52353
(319) 653-2135

2. If a construction permit is required (AUC[1] = 1,000 AU or more and constructing a formed manure storage structure[3]), mail this CDS, the required construction application documents and fees, at least 90 days prior to beginning construction, to allow for all actions required by Iowa law, to the AFO-Program (DNR Field Office 3, 1900 N Grand, Gateway North Ste E17, Spencer IA 51301). You must follow the instructions in the construction application form (DNR Form 542-1428).

If you have any questions regarding the concrete standards requirements and CDS, contact an engineer of the AFO- Program at 712-262-4177, the nearest DNR Field Office, or visit http://www.iowadnr.gov/afo.

567—Iowa Administrative Code (IAC) Chapter 65, APPENDIX D

DESIGN SPECIFICATIONS—FORMED MANURE STORAGE STRUCTURES

The following design specifications apply to a formed manure storage structure that is constructed belowground, is laterally braced and is not designed using MWPS-36 or by a PE or an NRCS engineer:

(1) The walls of a rectangular formed structure with a depth up to 12 feet shall be designed in accordance with the tables provided in this appendix.

(2) Consideration shall be given to internal and external loads including, but not limited to, lateral earth pressures, hydrostatic pressures, wind loads, and floor or cover, building and equipment loads.

(3) Each wall shall be braced laterally at the top of the wall.

(4) The walls shall be constructed above the groundwater table, or a drain tile shall be installed to artificially lower the groundwater table.

(5) Each wall that includes a pumpout port shall be constructed under the design consideration that vehicles will be operating within 5 feet of the wall as provided in Tables D-2 and D-4.

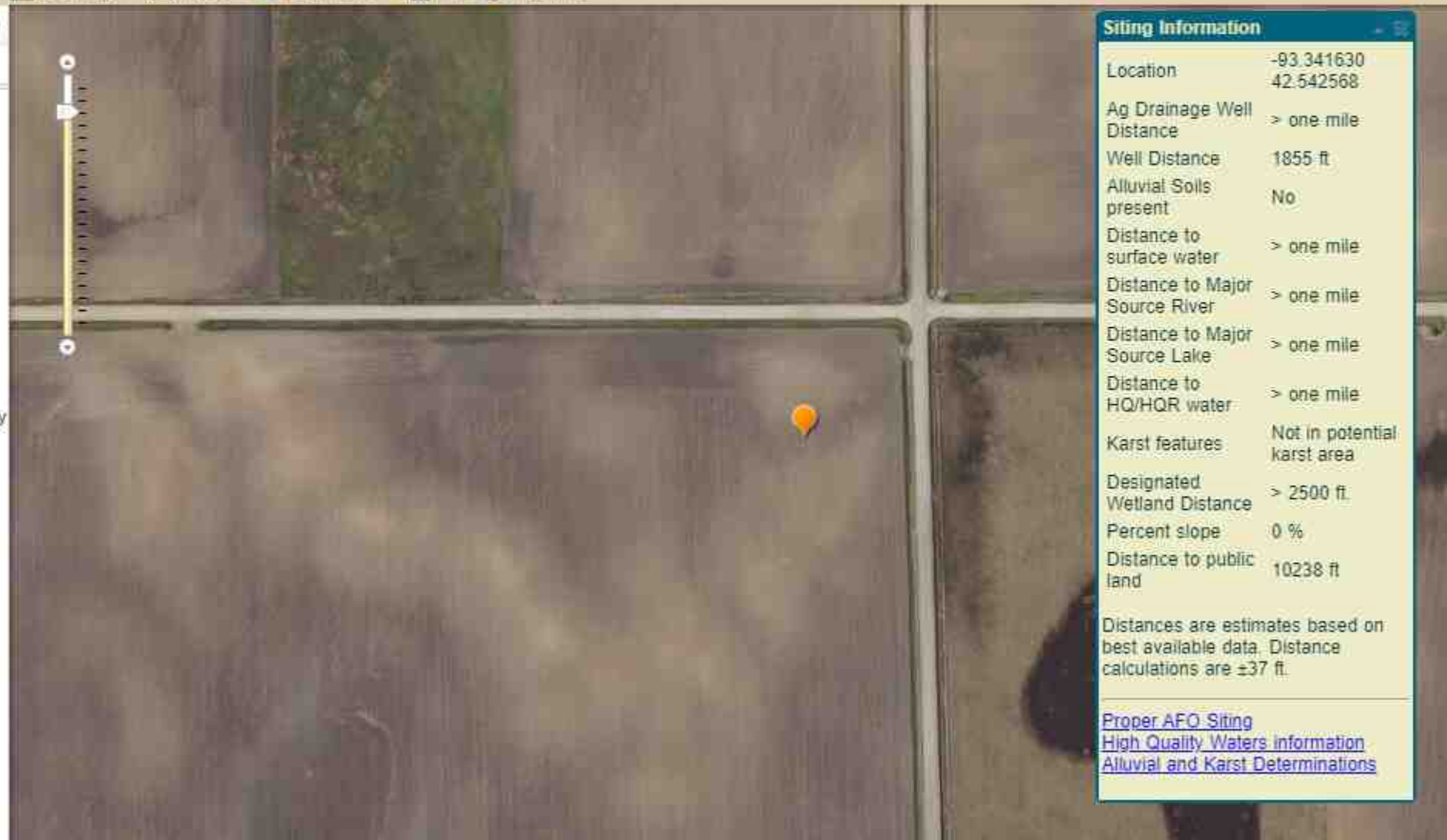
(6) Minimum wall thickness and minimum vertical steel reinforcement shall be in accordance with one of the following:

(a) Table D-1, if **all** of the following conditions are met:

1. There will be **NO VEHICLES** operating within 5 feet of the wall.
2. Backfilling is performed with **gravel, sand, silt, and clay mixtures (less than 50 percent fines), with coarse sand with silt or clay (less than 50 percent fines), or cleaner granular material** (see NRCS Conservation Practice Standard, "Waste Storage Facility," Code 313, Table 2, for description and unified classification or ASTM D 2488 and D 653).

Map layers | Legend

- AFO Siting Data
  - Sinkholes
  - Ag Drainage Well
  - Wells
  - Animal Feeding Operation
  - Public Drainage Infrastructure
  - Drainage Districts
  - High Qty Wtr Resource (Rivers)
  - High Qty Wtr Resource (Waterbody
  - Major Water Source (Rivers)
  - Major Water Source (Lake)
  - Surface Water
  - Public Land
  - Public Land Survey (PLSS)
  - Sinkhole or Potential Karst
    - Sinkhole w/ 1000 ft radius
    - Karst and Potential Karst
  - Alluvial Soils
- AFO Model/Support Data



Siting Information

Location	-93.341630 42.542568
Ag Drainage Well Distance	> one mile
Well Distance	1855 ft
Alluvial Soils present	No
Distance to surface water	> one mile
Distance to Major Source River	> one mile
Distance to Major Source Lake	> one mile
Distance to HQ/HQR water	> one mile
Karst features	Not in potential karst area
Designated Wetland Distance	> 2500 ft
Percent slope	0 %
Distance to public land	10238 ft

Distances are estimates based on best available data. Distance calculations are ±37 ft.

Proper AFO Siting
High Quality Waters information
Alluvial and Karst Determinations

Close Up & Karst/Alluvial Map

Tri-B Section 8

NE 1/4 of the NE 1/4 Sec 8,
T89N R21W, Alden Twp., Hardin Co

Legend

Distance
- Proposed Well
- R.O.W.
- Proposed Barns
- county

Alluvial
- Alluvial Soils

Karst
- 1
- 2

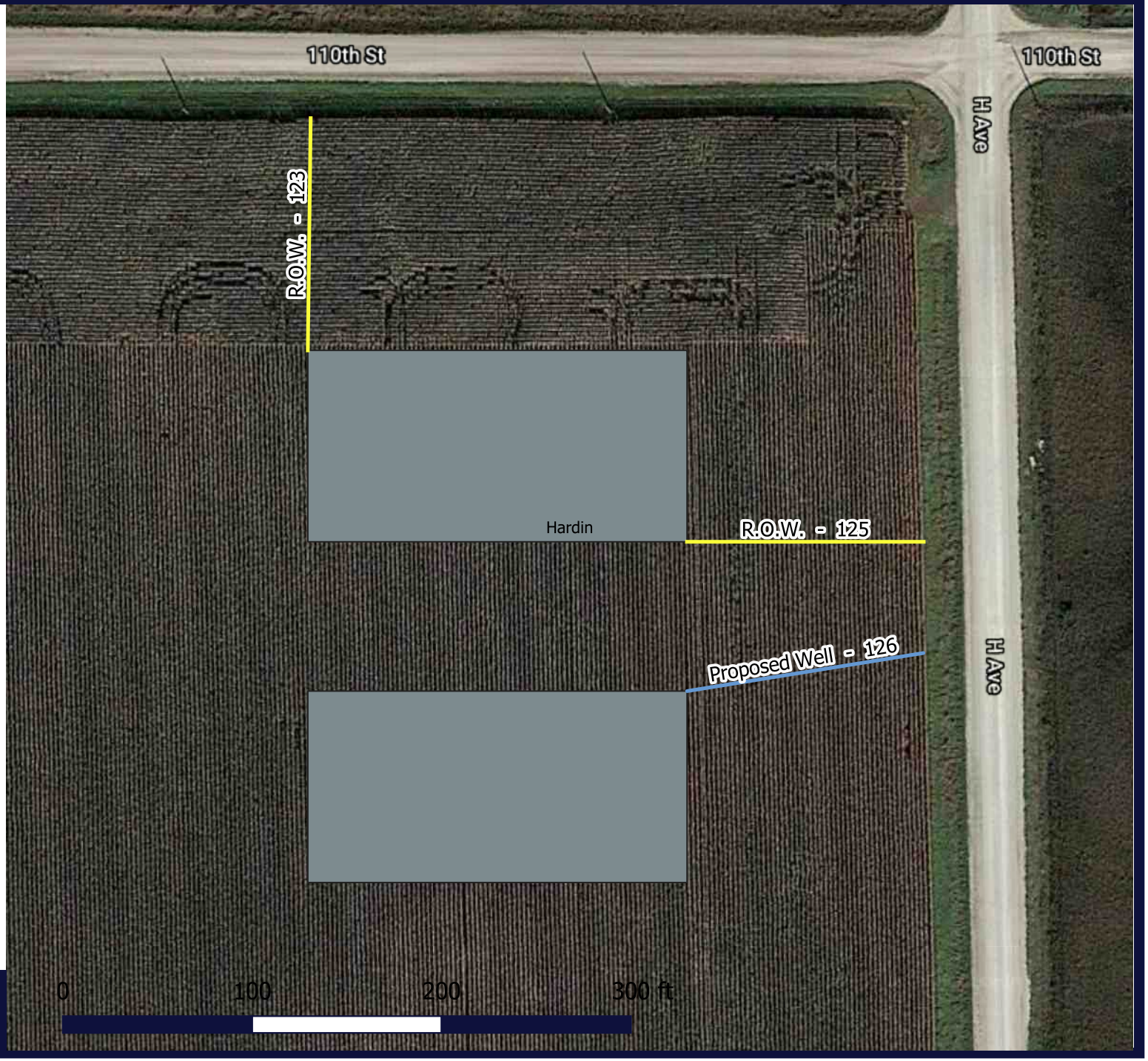
The site is located 123 ft from the nearest R.O.W.

The site is located 4511 ft from the nearest water Source

The nearest well be drilled Approximately 126ft from the site

The Site is not located in Karst Topography.

The Site is not located in Alluvial Soils.



AgVICE
800-674-3045
info@4agvice.com

1 Mile Map

Tri-B Section 8

NE 1/4 of the NE 1/4 Sec 8,
T89N R21W, Alden Twp., Hardin Co

Legend

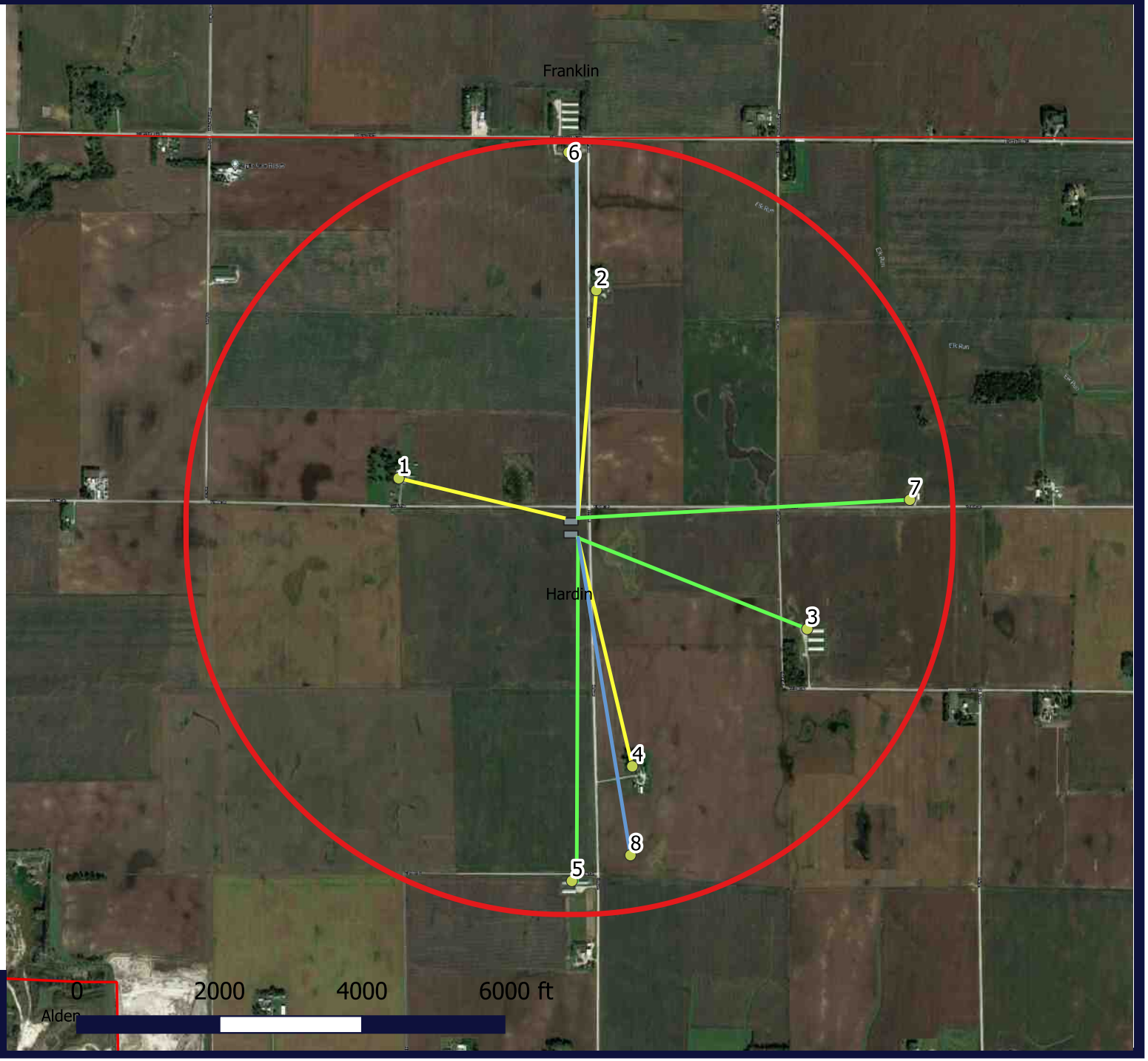
- points

Distance

- CAFO
- Grain Bins
- Residence
- Nearest Water
- 1 Mile Buffer
- Proposed Barns
- incorporated_cities_2010
- county

id	Length(ft)	Type
1	2383	Residence
2	3205	Residence
3	3460	CAFO
4	3294	Residence
5	4818	CAFO
6	5056	Grain Bins
7	4664	CAFO
10	125	R.O.W.
8	4511	Nearest Water
12	123	R.O.W.

There are no:
-Wells within 100 feet
-Water sources within 500 feet
-Major water sources within1,000 feet
-Residences within 1,875 feet
-Incorporated Areas or
-Public Use areas within 2,500 feet
-Designated Wetlands within 2,500 feet



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800-674-3045
info@4agvice.com

ITEM 10

COUNTY VERIFICATION RECEIPT
OF DNR CONSTRUCTION PERMIT APPLICATION

This form provides proof that the County Board of Supervisors has been provided with a complete copy of the construction permit application documents (everything except the fees) for the confinement feeding operation or a complete MMP has been provided to the County because manure will be applied in that county:

Applicant: Tri-B LLC Telephone: 641-858-6416

Name of operation: Tri-B Site Section 8

Location:	NE	NE	8	89N - 21W	Alden	Hardin
	(¼ ¼)	(¼)	(Section)	(Tier & Range)	(Name of Township)	(County)

Documents being submitted to the county:

- ☒ Construction permit application form: submit items 1 to 9 (see Submittal Checklist No. 1 or 2)
- ☒ Attachment 1 - Aerial photos: Must clearly show the location of the proposed confinement feeding operation structure[1] and that all the separation distances are met, including those claimed for points in the master matrix (if applicable).
- ☒ Attachment 2 - Statement of design certification, submit any of the following (see Checklist No. 1 or 2):
  - ☒ Construction Design Statement form
  - ☐ Professional Engineer (PE) Design Certification form
  - ☐ Engineering report, construction plans and technical specifications
  - ☐ In addition, if proposing an unformed manure storage structure[3] or an egg washwater storage structure submit documentation required in Addemdum "A" of this construction application form.
- ☒ Attachment 3 - Manure management plan (MMP).
- ☒ Attachment 4 - Master Matrix (if required). You must include supporting documents (see Checklist No. 1 or 2)

THIS SECTION IS RESERVED FOR THE COUNTY

As soon as DNR receives a construction permit application, the DNR will fax your County Auditor a "Courtesy reminder letter" explaining what actions your County Board of Supervisors must complete and the deadlines.

Public Notice is required for **all** construction permit applications, including those applications not required to be evaluated with the master matrix and applications in counties not participating in the Master matrix.

Counties participating in the master matrix: the county's master matrix evaluation and county's recommendation is required for the following cases:

- A new confinement feeding operation that is applying for a construction permit
- An existing confinement feeding operation that was first constructed on or after April 1, 2002 that is applying for a construction permit.
- An existing confinement feeding operation that was first constructed prior to April 1, 2002 that is applying for a construction permit with an animal unit capacity (AUC) is 1,667 animal units (AU) or more.

I have read and acknowledge the county's duty with this construction permit application, as specified in 567 IAC 65.10 and Iowa Code 459.304. On behalf of the Board of Supervisors for:

COUNTY: _____

NAME: _____

TITLE: _____
(Member of the County Board of Supervisors or its designated official/employee)

Date: _____ , 20 _____ .

If you do not receive the courtesy reminder letter within a reasonable time, or if you have any questions, please contact the animal feeding operations (AFO) Program at (712) 262-4177 or visit www.IowaDNR.gov

Manure Management Plan Form
Animal Feeding Operation Information

Instructions: Complete this form for your animal feeding operation. Footnotes are provided on page 4.

The information within this form, and the attachments, describes my animal feeding operation, my manure storage and handling system, and my planned manure management system. I (we) will manage the manure, and the nutrients it contains, as described within this manure management plan (MMP) and any revisions of the plan, individual field information, and field summary sheet, and in accordance with current rules and regulations. Deviations permitted by Iowa law will be documented and maintained in my records.

Signed: Brent M Tripp (Signature) Brent M. Tripp (Print name) **Date:** 3/20/2020

Name of operation: Tri-B Site Section 8 **Facility ID No.** 0

Location of the operation: 110th St (911 address)

Alden (Town) IA (State) 50006 (Zip)

NE (1/4 1/4) 1/4 of the NE (1/4) 1/4 of Sec 8 (Section) T 89N (Tier & Range) R 21W Alden (Township Name) Hardin (County)

Owner and contacts of the animal feeding operation:

Owner Tri-B Farms LLC Phone 641-858-6416

Address 710 100th St Dows IA 50071

E-mail address (optional) Cell phone (optional)

Contact person (if different than owner) AgVice LLC Phone 800-674-3045

Address PO Box 262, Gladbrook, IA 50635

E-mail address (optional) info@4agvice.com Cell phone (optional)

Contract company (if applicable) Phone

Address

This manure management plan is for: (check one)

___ existing operation, not expanding ___ existing operation, expanding ___ existing operation, new owner X new operation

Construction and Expansion Dates: 2020 date of initial construction and all expansions

Table 1. Information about livestock production and manure management system

1	2	3	4	5	6	7	8
Animal type/ Production phase [a]	Max # of animals confined	Manure Storage Structure [b]	N [c]	P_2O_5 [c]	gal/space/dy [d]	Days/yr Facility occupied	Annual Manure Produced [e]
Wean/finish (dry feed)	5000	Deep Pit	49	40	0.90	365	1642500
						Total Gallons	1642500

Estimated annual animal production[f]: 10000 animals/year

Source of Manure Nutrient Content Data (standard tables, manure analysis, other)[g]: Historical Manure Analysis

Manure Management Plan Form

Determining Maximum Allowable Manure Application Rates

Instructions: Complete a worksheet for each unique combination of the following factors (crop rotation, optimum crop yield, manure nutrient concentration, remaining crop N need, method of application) that occurs at this operation. Endnotes are given on pages 4-6.

Management Identification (Mgt ID)[g]: CC = Corn-Corn Rotation
(Identify this application scenario by letter, refer to endnote g)

Method used to determine optimum yield[h]: USDA Iowa Ag Statistics **Timing of Application:** Fall/Spring

Method of Application[i]: Injected **Application Loss Factor[i]:** 0.98

If spray irrigation is used, identify method[j]:

Table 2. Manure Nutrient Concentration

Manure Nutrient Content (lbs/1000gal or lbs/ton)					
Manure Storage Structure(s)[k]	Deep Pit				
Total N	49	P_2O_5		40	
% TN available 1st year[l]	0.9	% 2nd year	0	% 3rd year	
Available N 1st year[m]	43.22	2nd year[n]	0	3rd year[o]	

Table 3. Crop Usage Rates[p]

(lbs/bu or lbs/ton)	N	P_2O_5
Corn	1.2	0.32
Soybean	3.8	0.72
Alfalfa	50	13

* Use blank space above to add crop not listed.

Table 4. Calculations for rate based on nitrogen (always required).

1	Applying Manure For (crop to be grown)[q]		Corn	Corn	Corn	Corn
2	Optimum Crop Yield[h]	bu or ton/acre	216	216	216	216
3	P_2O_5 removed with crop by harvest[r]	lb/acre	69.12	69.12	69.12	69.12
4	Crop N utilization[s]	lb/acre	259	259	259	259
5a	Legume N credit[t]	lb/acre	0	0	0	0
5b	Commercial N planned[u]	lb/acre	0	0	0	0
5c	Manure N carryover credit[v]	lb/acre	0	0	0	0
6	Remaining crop N need[w]	lb/acre	259	259	259	259
7	Manure rate to supply remaining N[x]	gal/acre or ton/acre	5993	5993	5993	5993
8	P_2O_5 applied with N-based rate[y]	lb/acre	240	240	240	240

Table 5. Calculations for rate based on phosphorus (required if P-based rates are planned)

9	Commercial P_2O_5 planned[z]	lb/acre				
10	Manure rate to supply P removal[aa]	gal/acre or ton/acre	1728	1728	1728	1728
11	Manure rate for P based plan[bb]	gal/acre or ton/acre				
12	Manure N applied with P-based plan[cc]	lb/acre				

Table 6. Application rates that will be carried over to page 3.

13	Planned Manure Application Rate[dd]	gal/acre or ton/acre	5993	5993	5993	5993

When applicable, manure application rates must be based on the P index value as follows:
(0-2) N-based manure management.
(>2-5) N-based manure management but P application rate cannot exceed two times the P removal rate of the crop schedule.
(>5-10) Until December 31, 2008, P-based manure management while adopting practices to reduce P index to 5 or below.
(>10) No manure application until practices are adopted to reduce P index to 5 or below.

Manure Management Plan Form

Year by Year Manure Management Plan Summary

Instructions: Complete this form for each of the next four growing seasons, to demonstrate sufficient land base to apply manure over multiple crop years. If this page is identical for multiple years (e.g. every other year), submit only once for the identical years, and indicate which years the form represents. Footnotes are given on page 6.

Crop year(s): _____

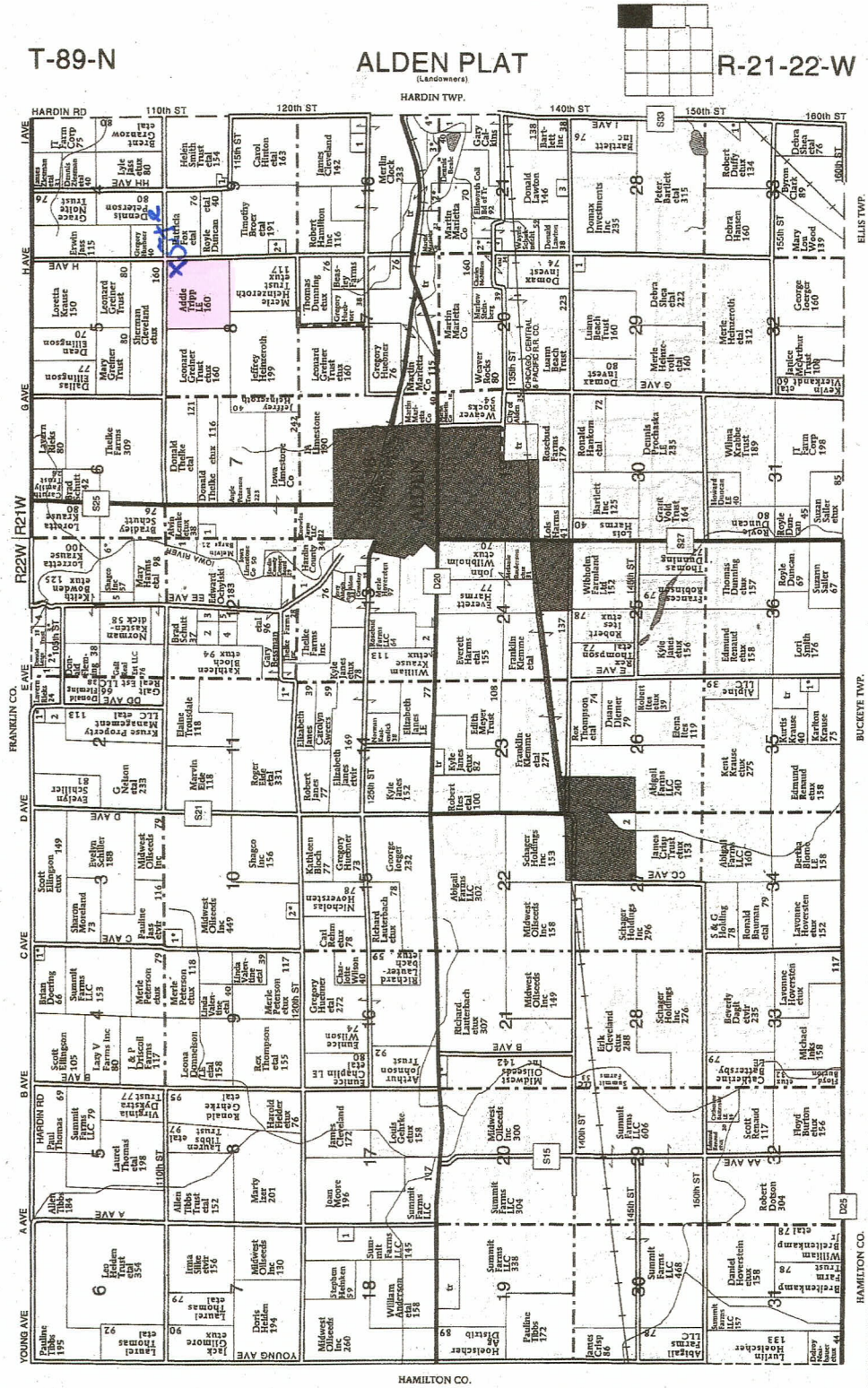
1	2	3	4	5	6	7	8	9	10	11
Field Designation [ee]	Field Location Sec___ T___ R___ ___1/4 of the___ 1/4 Townsip Name_____, County Name _____	Mgt Id [ff]	Planned Crop	Acres receiving manure[gg]	Own, rent, agreement (include length of agreement) [hh]	P index value [ii]	HEL (Y/N)[jj]	Planned Application gal/acre	Planned Application gal/field [kk]	Correct Soil Test for P[ll] (Yes or No)
80225_Addie's South	All of the NE 1/4 of Sec 8, T89N R21W, Alden Twp, Hardin Co.	CC	Corn	148.69	Rent	0.39	No	5993	891099	Yes
80226_Larson South	All of the NE 1/4 of Sec 23, T90N R22W, Oakland Twp, Franklin Co.	CC	Corn	145.93	Rent	0.51	No	5993	874558	Yes
80227_Ron Larson Home	All of the NE 1/4 less the SE of the NE of Sec 11, T90N R22W, Oakland Twp, Franklin Co.	CC	Corn	108.48	Rent	0.36	No	5993	650121	Yes
								0	0	
								0	0	
	Total acres available for manure application			403.1	**Total gallons that could be applied**				2415778	

T-89-N

ALDEN PLAT

(Landowners)

R-21-22-W



ALDEN TOWNSHIP

SECTION 1
1. Rieke, Lavern 10
2. Bessman, Gary 13
3. Blair, Danny 18
4. Hardin County 8
5. Marton Pork Production Inc 8
6. Schutt, Bradley 15

SECTION 2
1. Lancaster, Jon 5
2. Kruse Property Management LLC 11

SECTION 4W
1. Dennis, Joedy 6

SECTION 7E
1. Bangs, Melvin 10

SECTION 9E
1. Barbite, Steven 6
2. Heinzeroth Trust, Merle 6

SECTION 10
1. Janes, Kyle 8
2. Janes, Kyle 8

SECTION 11
1. Janes, Kyle 14

SECTION 12
1. Lemke, Alvin 11
2. Schutt, Bradley 15
3. Danger, Thomas 6
4. Ochylski, Edward 12
5. Hansen, David 7

SECTION 13
1. Hardin County Conservation Board 26

2. Christensen Farms Midwest LLC 20

SECTION 16E
1. Klein, Stephen 6
2. Alewel, Marc 7
3. Kruse, Stan 10
4. Meyer, Richard 7

SECTION 18W
1. Roland, James 14

SECTION 21E
1. Meyer, Richard 16
2. McMillan, Charles 15

3. Domax Investments Inc 7

SECTION 21W
1. Schutt, Sally 10

SECTION 27
1. Midwest Oilseeds Inc 10
2. Abigail Farms LLC 11

SECTION 29E
1. Heinzeroth, Merle 5

SECTION 33E
1. Riley, Gary 15

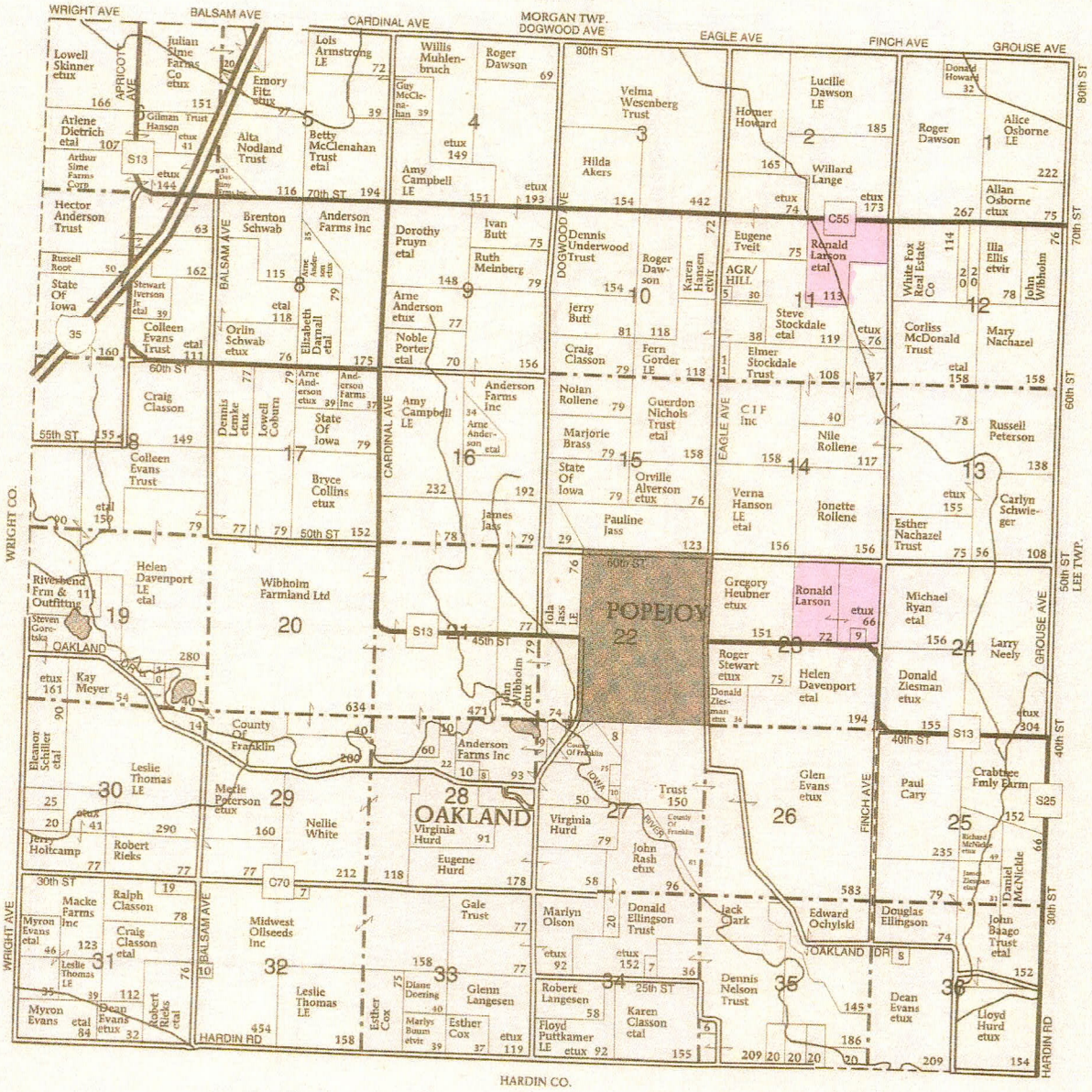
SECTION 35
1. Sparks, Joseph 7

T-90-N

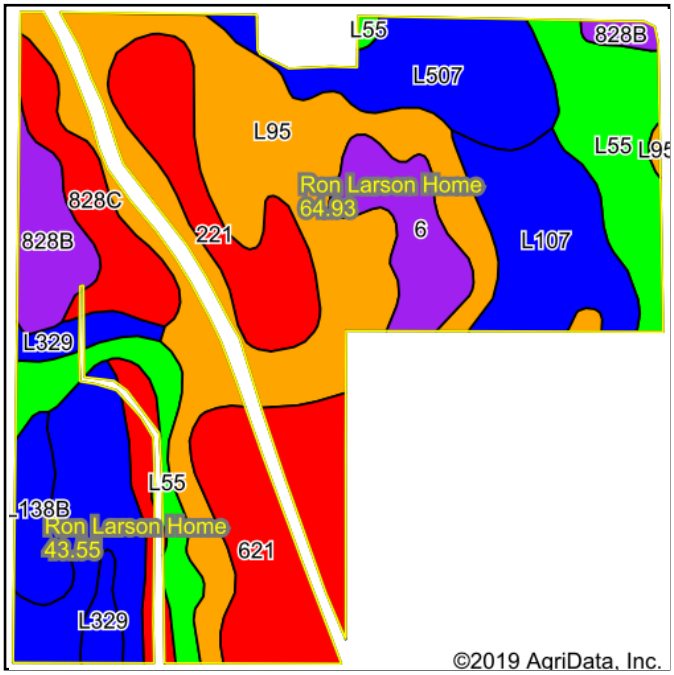
OAKLAND PLAT

(Landowners)

R-22-W



Ron Larson Home - Soils Map



State: **Iowa**
County: **Franklin**
Location: **11-90N-22W**
Township: **Oakland**
Acres: **108.48**
Date: **3/12/2020**

Maps Provided By:
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AgVICE

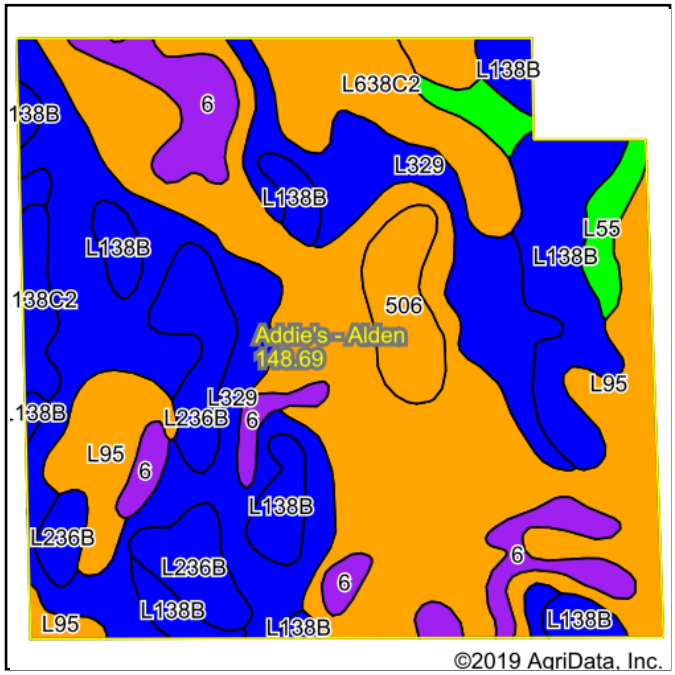
Area Symbol: IA069, Soil Area Version: 26

Code	Soil Description	Acres	Percent of field	CSR2 Legend	Non-Irr Class *c	CSR2**	CSR	*n NCCPI Overall	*n NCCPI Corn	*n NCCPI Small Grains	*n NCCPI Soybeans
L95	Harps clay loam, Bemis moraine, 0 to 2 percent slopes	28.39	26.2%		IIw	75		76	67	17	76
L55	Nicollet loam, 1 to 3 percent slopes	12.41	11.4%		Ie	91		83	78	50	83
621	Houghton muck, 0 to 1 percent slopes	11.33	10.4%		IIIw	19	25	90	86	14	90
L107	Webster clay loam, Bemis moraine, 0 to 2 percent slopes	8.78	8.1%		IIw	88		80	77	19	80
L507	Canisteo clay loam, Bemis moraine, 0 to 2 percent slopes	8.76	8.1%		IIw	87		79	69	17	79
221	Klossner muck, 0 to 1 percent slopes	8.14	7.5%		IIIw	32	44	88	83	14	88
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	8.03	7.4%		IIIe	83		60	57	43	60
828C	Zenor sandy loam, 5 to 14 percent slopes	5.20	4.8%		IIIe	28	30	46	46	45	32
6	Okoboji silty clay loam, 0 to 1 percent slopes	5.04	4.6%		IIIw	59	57	80	80	13	77
828B	Zenor sandy loam, 2 to 5 percent slopes	4.72	4.4%		IIIe	51	46	48	48	46	34
L138B	Clarion loam, Bemis moraine, 2 to 6 percent slopes	2.93	2.7%		IIe	88		79	79	61	79
L329	Webster-Nicollet complex, Bemis moraine, 0 to 3 percent slopes	2.59	2.4%		IIw	89		81	77	32	81
L62D2	Storden loam, Bemis moraine, 10 to 16 percent slopes, moderately eroded	2.16	2.0%		IVe	41		60	54	35	60
					Weighted Average	**66.3**	***-**	***n 76**	***n 70.7**	***n 26.6**	***n 74.5**

**IA has updated the CSR values for each county to CSR2.
*- CSR weighted average cannot be calculated on the current soils data, use prior data version for csr values.
*n: The aggregation method is "Weighted Average using major components"
*c: Using Capabilities Class Dominant Condition Aggregation Method
Soils data provided by USDA and NRCS.

Soils data provided by USDA and NRCS.

Addie's - Alden - Soils Map



State: **Iowa**
County: **Hardin**
Location: **8-89N-21W**
Township: **Alden**
Acres: **148.69**
Date: **3/12/2020**

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AgVICE

Area Symbol: IA083, Soil Area Version: 26

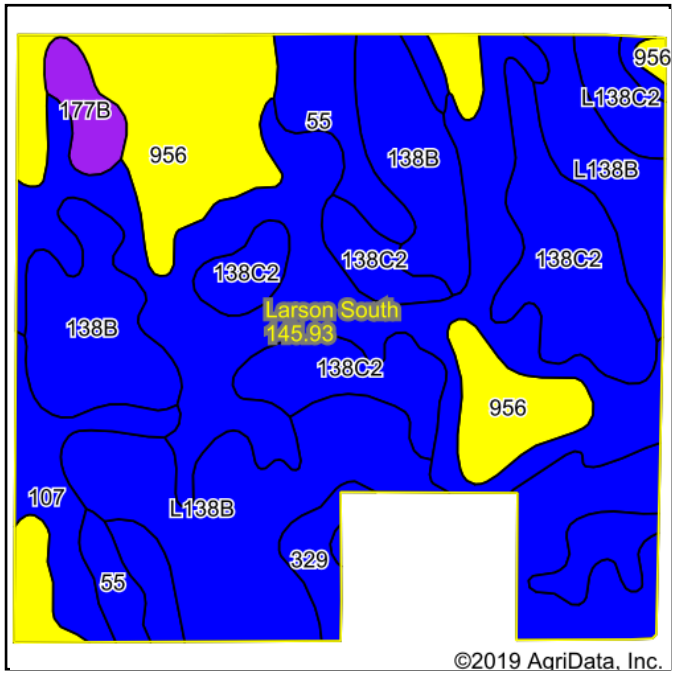
Code	Soil Description	Acres	Percent of field	CSR2 Legend	Non-Irr Class *c	CSR2**	CSR	*n NCCPI Overall	*n NCCPI Corn	*n NCCPI Small Grains	*n NCCPI Soybeans
L95	Harps clay loam, Bemis moraine, 0 to 2 percent slopes	53.67	36.1%		IIw	75		76	67	17	76
L329	Webster-Nicollet complex, Bemis moraine, 0 to 3 percent slopes	37.20	25.0%		IIw	89		81	77	32	81
L138B	Clarion loam, Bemis moraine, 2 to 6 percent slopes	18.67	12.6%		IIe	88		79	79	61	79
6	Okoboji silty clay loam, 0 to 1 percent slopes	10.99	7.4%		IIIw	59	59	80	80	13	77
L236B	Lester loam, Bemis moraine, 2 to 6 percent slopes	9.00	6.1%		IIe	85		89	89	60	77
L638C2	Clarion-Storden complex, Bemis moraine, 6 to 10 percent slopes, moderately eroded	8.50	5.7%		IIIe	75		61	57	39	61
506	Wacousta silt loam, 0 to 1 percent slopes	4.62	3.1%		IIIw	74	78	94	77	7	94
L55	Nicollet loam, 1 to 3 percent slopes	3.81	2.6%		Ie	91		83	78	50	83
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	2.23	1.5%		IIIe	83		60	57	43	60
					Weighted Average	**80.1**	***-**	***n 78.4**	***n 73.2**	***n 30.8**	***n 77.4**

**IA has updated the CSR values for each county to CSR2.
*- CSR weighted average cannot be calculated on the current soils data, use prior data version for csr values.
*n: The aggregation method is "Weighted Average using major components"
*c: Using Capabilities Class Dominant Condition Aggregation Method

Soils data provided by USDA and NRCS.

Soils data provided by USDA and NRCS.

Larson South - Soils Map



State: **Iowa**
County: **Franklin**
Location: **23-90N-22W**
Township: **Oakland**
Acres: **145.93**
Date: **3/12/2020**

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AgVICE

Area Symbol: IA069, Soil Area Version: 26

Code	Soil Description	Acres	Percent of field	CSR2 Legend	Non-Irr Class *c	CSR2**	CSR	*n NCCPI Overall	*n NCCPI Corn	*n NCCPI Small Grains	*n NCCPI Soybeans
L329	Webster-Nicollet complex, Bemis moraine, 0 to 3 percent slopes	34.71	23.8%		IIw	89		81	77	32	81
L138B	Clarion loam, Bemis moraine, 2 to 6 percent slopes	31.30	21.4%		IIe	88		79	79	61	79
956	Harps-Okoboji complex, 0 to 2 percent slopes	22.12	15.2%		IIw	69	59	78	73	12	77
138C2	Clarion loam, 6 to 10 percent slopes, moderately eroded	21.84	15.0%		IIIe	83	65	65	61	44	65
138B	Clarion loam, 2 to 6 percent slopes	15.57	10.7%		IIe	89	82	83	81	54	83
55	Nicollet clay loam, 1 to 3 percent slopes	7.29	5.0%		Iw	89	89	82	82	41	78
107	Webster clay loam, 0 to 2 percent slopes	5.77	4.0%		IIw	86	84	80	78	14	80
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	2.58	1.8%		IIIe	83		60	57	43	60
177B	Saude loam, 2 to 5 percent slopes	2.55	1.7%		IIs	55	58	75	75	55	58
329	Webster-Nicollet complex, 0 to 3 percent slopes	2.20	1.5%		IIw	87	86	81	80	25	79
				Weighted Average		**84**	***-**	***n 77.5**	***n 74.8**	***n 39.6**	***n 76.8**

**IA has updated the CSR values for each county to CSR2.
*- CSR weighted average cannot be calculated on the current soils data, use prior data version for csr values.
*n: The aggregation method is "Weighted Average using major components"
*c: Using Capabilities Class Dominant Condition Aggregation Method

Soils data provided by USDA and NRCS.

Soils data provided by USDA and NRCS.

Management System	N	P_2O_5	K_2O	Management System	N	P_2O_5	K_2O
	Lbs./1,000 gallon				Lbs./ton		
Liquid, Pit				**Solid Manure (Bedded)**			
Swine				**Swine-confined**			
Nursery, 25 lb.	35	20	20	Nursery, 25 lb.	14	9	11
Grow-finish, 150 lb. (wet /dry)	58	40	45	Grow-finish, 150 lb.	14	9	11
Grow-finish, 150 lb. (dry feed)	50	42	30	Gestation, 400 lb.	14	9	11
Grow-finish, 150 lb. (earthen)	32	22	20	Sow and litter, 450 lb.	14	9	11
Gestation, 400 lb.	25	25	25	Farrow-nursery	14	9	11
Sow and litter[1], 450 lb.	25	20	15	Farrow finish	14	9	11
Farrow-nursery[2]	27	23	22				
Farrow-finish[3]	44	32	24				
Dairy-confined				**Dairy-confined**			
Cows, 1,200 lb. or more	25	12	11	Cows, 1,200 lb. or more	12	6	12
Heifers, 900 lb.	25	12	11	Heifers, 900 lb.	12	6	12
Calves, 500 lb.	25	12	11	Calves, 500 lb.	12	6	12
Veal calves, 250 lb.	25	12	11	Veal calves, 250 lb.	12	6	12
Dairy herd[4]	25	12	11	Dairy herd[4]	12	6	12
Beef-confined				**Beef-confined**			
Mature cows, 1,000 lb.	40	25	35	Mature cows, 1,000 lb.	12	6	12
Finishing, 900 lb.	40	25	35	Finishing, 900 lb.	12	6	12
Feeder calves, 500 lb.	40	25	35	Feeder calves, 500 lb.	12	6	12
Lagoon[5]				**Poultry**			
(all animals)	4	3	4	Layer, caged, 4 lb.[6]	35	80	50
				Broiler, litter, 2 lb.	65	65	45
				Turkey, litter, 10 lb.	40	40	25
Open Lot Runoff							
Earthen lots (liquids)				**Open lot (solids, scraped)**			
Beef, 400 sq ft/hd	3	1	6	Beef, 400 sq ft/hd	22	16	14
Dairy, 1,000 sq ft/hd	3	1	6	Dairy, 1,000 sq ft/hd	11	6	11
Swine, 50 sq ft/hd	3	1	6	Swine, 50 sq ft/hd	15	14	9
Concrete lots (liquids)							
Beef, 400 sq ft/hd	6	2	7				
Dairy, 1,000 sq ft/hd	6	2	7				
Swine, 50 sq ft/hd	15	5	10				

[1]Sow and litter figures are per farrowing crate

[2]Farrow-nursery figures are per sow in the breeding herd and include one farrowing sow, five gestation sows, and nine nursery pig spaces.

[3] Farrow-finish figures are per sow in the breeding herd and include one farrowing sow, five gestation sows, nine nursery pigs, and 36 finishing pig spaces.

[4] Per productive cow in the herd; includes lactating cow, 330 days; dry cow, 35 days; heifer, 222 days; and calf, 165 days.

[5] Weights assumed: beef, 1,000 pounds; dairy, 1,200 pounds; swine, 150 pounds.

[6] Wet basis at 41 percent moisture.

Iowa Phosphorus Index

v. 1/22/2007

Credits: Iowa State University
USDA National Soil Tilth Laboratory
USDA Natural Resource Conservation Service

Field Number	Erosion							+	Runoff					+	Tile / Subsurface Recharge			=	Overall
	Gross Erosion	x	Sediment Trap Factor	x	SDR	x	Buffer Factor	x	Enrichment Factor	x	STP Factor	= Erosion PI		RCN Factor	x (STP Factor	+ P App Factor	) = Runoff PI		Flow Factor	x STP Factor	= Tile/Sub PI		P Index
Addie's - Alden --	0.97		1.00		0.05		1.00		1.10		0.85	0.05		1.08	0.23	0.02	0.27		1.00	0.07	0.07		0.39
Ron Larson South --	3.22		1.00		0.06		1.00		1.10		0.83	0.19		1.08	0.21	0.02	0.24		1.00	0.07	0.07		0.51
Ron Larson Home --	0.18		1.00		0.30		1.00		1.10		0.79	0.05		1.39	0.16	0.02	0.24		1.00	0.07	0.07		0.36

RUSLE2 Profile Erosion Calculation Record

Info: Larson South

File: Plan: Profile (Temp. scenario[1]) of TRI-B(Franklin)*

Inputs:
Location: USA\Iowa\Franklin County
Soil: Hardin County, Iowa\138C2 Clarion loam, 5 to 9 percent slopes, moderately eroded\Clarion loam moderately eroded 95%
Slope length (horiz): 98 ft
Avg. slope steepness: 8.0 %

Management	*Vegetation*	*Yield units*	*# yield units, #/ac*
managements\CMZ 04\c.Other Local Mgt Records\a-(C/C)=conv	vegetations\Corn, grain	bushels	213.00
managements\CMZ 04\c.Other Local Mgt Records\a-(C/C)=conv	vegetations\Corn, grain	bushels	213.00

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: 100 percent drained
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 3.2 t/ac/yr
Detachment on slope: 3.2 t/ac/yr
Soil loss for cons. plan: 3.2 t/ac/yr
Sediment delivery: 3.2 t/ac/yr

Crit. slope length: 98 ft
Surf. cover after planting: -- %
Avg. ann. total biomass removal: 0 lb/ac

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
11/9/0	Manure injector, liquid high disturb.30 inch		89
11/10/0	Subsoiler		87
5/9/1	Cultivator, field 6-12 in sweeps		73
5/10/1	Planter, double disk opnr	Corn, grain	74
5/11/1	Sprayer, post emergence		85
6/15/1	Sprayer, post emergence		86
10/15/1	Harvest, killing crop 50pct standing stubble		92

11/9/1	Manure injector, liquid high disturb.30 inch		90
11/10/1	Subsoiler		89
5/9/2	Cultivator, field 6-12 in sweeps		75
5/10/2	Planter, double disk opnr	Corn, grain	76
5/11/2	Sprayer, post emergence		86
6/15/3	Sprayer, post emergence		52
10/17/3	Harvest, killing crop 50pct standing stubble		90

RUSLE2 Profile Erosion Calculation Record

Info: Addie's - Alden

File: Plan: Profile (Temp. scenario[1]) of TRI-B(Hardin)

Inputs:
Location: USA\Iowa\Hardin County
Soil: Hardin County, Iowa\138B Clarion loam, 2 to 5 percent slopes\Clarion loam 100%
Slope length (horiz): 98 ft
Avg. slope steepness: 3.0 %

Management	*Vegetation*	*Yield units*	*# yield units, #/ac*
managements\CMZ 04\c.Other Local Mgt Records\a-(C/C)=conv	vegetations\Corn, grain	bushels	222.00
managements\CMZ 04\c.Other Local Mgt Records\a-(C/C)=conv	vegetations\Corn, grain	bushels	222.00

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: 100 percent drained
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 0.97 t/ac/yr
Detachment on slope: 0.97 t/ac/yr
Soil loss for cons. plan: 0.97 t/ac/yr
Sediment delivery: 0.97 t/ac/yr

Crit. slope length: 98 ft
Surf. cover after planting: -- %
Avg. ann. total biomass removal: 0 lb/ac

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
11/9/0	Manure injector, liquid high disturb.30 inch		89
11/10/0	Subsoiler		88
5/9/1	Cultivator, field 6-12 in sweeps		74
5/10/1	Planter, double disk opnr	Corn, grain	74
5/11/1	Sprayer, post emergence		86
6/15/1	Sprayer, post emergence		86
10/15/1	Harvest, killing crop 50pct standing stubble		93
11/9/1	Manure injector, liquid high disturb.30 inch		91
11/10/1	Subsoiler		90
5/9/2	Cultivator, field 6-12 in sweeps		76
5/10/2	Planter, double disk opnr	Corn, grain	76
5/11/2	Sprayer, post emergence		87
6/15/3	Sprayer, post emergence		51
10/17/3	Harvest, killing crop 50pct standing stubble		90

RUSLE2 Profile Erosion Calculation Record

Info: Larson Home

File: Plan: Profile (Temp. scenario[1]) of TRI-B(Franklin)

Inputs:
Location: USA\Iowa\Franklin County
Soil: Hardin County, Iowa\95 Harps loam, 1 to 3 percent slopes\Harps loam 95%
Slope length (horiz): 98 ft
Avg. slope steepness: 1.0 %

Management	*Vegetation*	*Yield units*	*# yield units, #/ac*
managements\CMZ 04\c.Other Local Mgt Records\a-(C/C)=conv	vegetations\Corn, grain	bushels	226.00
managements\CMZ 04\c.Other Local Mgt Records\a-(C/C)=conv	vegetations\Corn, grain	bushels	226.00

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: 100 percent drained
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 0.18 t/ac/yr
Detachment on slope: 0.18 t/ac/yr
Soil loss for cons. plan: 0.18 t/ac/yr
Sediment delivery: 0.18 t/ac/yr

Crit. slope length: 98 ft
Surf. cover after planting: -- %
Avg. ann. total biomass removal: 0 lb/ac

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
11/9/0	Manure injector, liquid high disturb.30 inch		90
11/10/0	Subsoiler		89
5/9/1	Cultivator, field 6-12 in sweeps		75
5/10/1	Planter, double disk opnr	Corn, grain	76
5/11/1	Sprayer, post emergence		86
6/15/1	Sprayer, post emergence		86
10/15/1	Harvest, killing crop 50pct standing stubble		93

11/9/1	Manure injector, liquid high disturb.30 inch		92
11/10/1	Subsoiler		90
5/9/2	Cultivator, field 6-12 in sweeps		77
5/10/2	Planter, double disk opnr	Corn, grain	78
5/11/2	Sprayer, post emergence		87
6/15/3	Sprayer, post emergence		52
10/17/3	Harvest, killing crop 50pct standing stubble		91

Using Manure Nutrients for Crop Production

Nutrients in Animal Manure

Manure can supply nutrients required by crops and replenish nutrients removed from soil by crop harvest. Since manure contains multiple nutrients, applications should consider not only what is needed for the crop to be grown but also how the ratio of nutrients in manure could affect soil test levels. This ensures adequate nutrient supply and reduces potential for over- or under-application and subsequent buildup or depletion in the soil. Good manure nutrient management should consider short-term and long-term impacts on crop nutrient supply and soil resources.

Manure has characteristics that make nutrient management different and sometimes more complicated than fertilizer. These include a mix of organic and inorganic nutrient forms; variation in nutrient concentration and forms; variation in dry matter and resultant handling as a liquid or solid; and relatively low nutrient concentration requiring large application volumes. Since manure nutrient composition can vary significantly, sampling and laboratory analysis are always needed, while with fertilizer nutrient concentrations are provided at a guaranteed analysis.

The manure nutrient concentration varies considerably between animal species; dietary options; animal genetics; animal performance; production management and facility type; and collection, bedding, storage, handling, and agitation for land application. Use of average or "book" nutrient values can be helpful for designing a new facility and creating manure management plans but is not very helpful in determining specific manure nutrient supply or application rates due to wide variation in nutrient concentrations between production facilities. For example, a recent sampling across swine finishing facilities found a range in total N from 32 to 79 lb N/1,000 gal, P from 17 to 54 lb P_2O_5/1,000 gal, and K from 23 to 48 lb K_2O/1,000 gal. A similar or larger range can be found with other manure types. Nutrient analyses often vary greatly as storage facilities are emptied or manure is stockpiled, and also among multiple samples collected from loads during land application. Therefore, collecting multiple manure samples and maintaining a history of analysis results will improve use of manure nutrients.

For determining manure application rates and equating to crop fertilization requirements, it is most helpful if manure analyses give N, P_2O_5, and K_2O based on an as-received or wet basis in lb per ton or lb per 1,000 gal units. It is beyond the scope of this publication to give detailed manure sampling and laboratory analysis

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recommendations. Those can be found in the extension materials listed on page 7. If manure analyses are provided from the laboratory in other units, they must be converted to these units. See the ISU Extension manure sampling publication for appropriate conversion factors. If manure average nutrient values or methods to estimate manure nutrient concentrations based on excretion are of interest or needed for planning purposes, those can be found in the Midwest Plan Service bulletins listed on page 7.

Manure Nutrient Availability for Crops

Nutrient management guidelines use the words "manure nutrient availability" when suggesting manure applications to supply nutrients needed by crops. However, the meaning of "availability" for manure nutrients often is not clear or its use not consistent. Available is defined as present or ready for immediate use, or present in such chemical or physical form as to be usable (as by a plant). The main reasoning for using the term "available" in describing manure nutrients is that some portions are in forms that cannot be used by plants immediately upon application to soil and have to be converted to a form that plants can take up. The term "available" is not typically applied to fertilizers because most include chemical forms that plants can take up or are quickly converted upon application to soil. According to this definition, most inorganic fertilizers contain basically 100 percent crop-available nutrients. For example, anhydrous ammonia dissolves in water and rapidly changes to ammonium, urea hydrolyzes to ammonium within a few days, and ammonium is further transformed to nitrate by soil microorganisms. Monoammonium phosphate (MAP) and diammonium phosphate (DAP) are highly soluble in water and dissolve to ammonium and orthophosphate. Potassium chloride (KCl, potash), dissolves in water to potassium (K^+) and chloride (Cl^-) ions. Both orthophosphate and K ions are taken up by plants. Because all K contained in manure is in the K^+ ionic form, manure K is readily crop available in all manure sources.

For manure N and P, there is usually a mix of organic and inorganic materials that varies among manure sources, production systems, bedding, storage, and handling. This variety in forms of N and P in manure contributes to greater uncertainty in manure nutrient management compared with fertilizers. The ratio of inorganic (mainly ammonium) and organic N varies considerably with the manure source. This was shown, for example, by on-farm research that included manure sampling and analysis from swine and poultry operations. The fraction of total N as ammonium N was almost 100 percent for swine manure from the liquid portion of anaerobic lagoons, 65 to 100 percent (average 84 percent) for liquid swine manure from under-building pits or storage tanks, and 10 to 40 percent (average 20 percent) for solid poultry manure. The large ammonium-N concentration and organic-N fraction that is easily mineralized after application to soil explain why N in liquid swine manure is considered "highly" crop available and almost comparable to fertilizer N. Other manures have lower ammonium-N concentrations and greater (and tougher to degrade)

organic materials due to bedding and feed materials. Considerable P in swine manure is orthophosphate and calcium phosphate compounds (derived both from feed and mineral supplements added to rations) that are soluble or dissolve quickly once applied to soil. The rest is organic P, which varies greatly in complexity and reaction in soil. Testing manure for ammonium-N or water-soluble N can be a way of estimating immediately available N. Unfortunately, a similarly useful test does not exist for P. Therefore, the availability estimate for manure N and P can be, and often is, less than 100 percent of total N and P.

Manure Nutrient Supply

There is a clear difference between crop availability of nutrients in fertilizer or manure and season-long supply of nutrients. Significant amounts of plant usable forms of nutrients in both fertilizer and manure might be lost and became unavailable to crops after application. For example, N can be lost through processes such as leaching, volatilization, or denitrification while P can be lost through erosion and surface runoff. Also, these nutrients can be converted for short or long periods of time into forms not usable by plants through processes such as immobilization to organic materials for N and retention by soil mineral constituents for P. Nutrient loss issues are not as pertinent for P and K as for N in Iowa soils as long as there is little soil erosion and surface runoff.

The immediate or long-term fate of plant usable nutrients in soil can be similar for manure and fertilizer. However, variation in manure nutrient concentration, application rate, and application distribution affect nutrient supply and contribute to increased uncertainty with manure management. Application rate and distribution uncertainties affect all applied nutrient sources but are more difficult to manage with manure than with fertilizer. With careful manure sampling, pre-application nutrient analysis, study of nutrient analysis history, and calibration of application equipment, reasonable manure nutrient application rates can be achieved. Due to material characteristics, and sampling and analysis variability, field distribution and application rate variability often is greater for dry manure sources.

These supply issues can be important for N, P, and K, although typically are of greater concern with N. There are several reasons, including manure usually is applied for corn production where N supply is critical, many Iowa soils have optimum or higher P and K test levels where need for and response to P and K is much less than with N, and crop deficiency symptoms and yield loss resulting from nutrient supply problems are more obvious for N.

Manure nutrient loss, application rate, and distribution uncertainties usually are not included in crop nutrient availability estimates. Instead, they are handled by suggested management practices. Not all published guidelines are consistent in this regard and, therefore, suggested crop nutrient availabilities do vary between states and regions. In this publication, use of "availability" refers to manure nutrients potentially available for plant uptake (with no losses) by the first crop after application or beyond, and percent nutrient availability values provided correlate to those for commonly used fertilizers. The guidelines in this publication assume supply issues are handled in the best way possible as is done with fertilizers. It is important to understand that for successful manure nutrient management, in many instances supply issues are as, or more, critical than estimates of nutrient availability.

Improving crop nutrient supply with manure can be achieved by understanding the issues related to manure nutrient analysis, application rate, application distribution, and the benefits and risks related to management practices such as application timing and placement that influence potential losses. Additionally, use of available tools to determine initial soil nutrient levels and adjust application rates can help provide for adequate season-long nutrient supply when either manure or fertilizer is used. These tools include commonly used pre-plant soil testing for P and K, estimates of N application rate need based on response trial data (such as the *Corn Nitrogen Rate Calculator*), and tools to help determine need for

additional N after planting corn such as the late-spring soil nitrate test and in-season crop sensing for N stress.

Manure Nutrient Application Recommendations

To determine manure application rates, the following information is required: needed crop nutrient fertilization rate for N, P, K, or other deficient nutrients; manure type; nutrient analysis; nutrient crop availability; and method of application. Nutrient recommendations for crops are provided in other Iowa State University Extension publications and are not repeated here (see list on page 7). Once the needed nutrient application rate is determined, the manure rate to supply crop available nutrients is calculated based on the specific manure source being used.

An additional consideration is what portion of the needed fertilization will be supplied from manure—to meet the full crop nutrient requirement, or a partial requirement from manure and the remaining from fertilizer. This is an important consideration because manure contains multiple nutrients and a manure rate to supply the most deficient nutrient can over-supply other nutrients. Also, manure application to meet the least deficient or most environmentally restrictive nutrient application can result in under-supply of other nutrients.

In these cases, use of fertilizers in addition to manure application is necessary to appropriately meet all nutrient application requirements.

Manure Nutrient Availability Values

Many of the manure N, P, and K crop availability estimates listed in Table 1 are derived from research trials conducted in Iowa. However, when local research is lacking, applicable information was taken from research conducted in other states. For manure sources not listed in the table, values based on manure with similar characteristics can provide a reasonable estimate. The ranges in nutrient availability are provided to account for variation in the proportion of organic and inorganic N and P forms, bedding type and amount, manure sampling and analysis variation, and application importance at different P and K soil test levels. See the footnote in Table 1 for further information on variability in manure nutrient availability.

First-Year Availability Estimates

Table 1. First-year nutrient availability for different animal manure sources.

Manure Source	Nitrogen[1]	Phosphorus[2]	Potassium[2]
	- - - - - - - - - - - - - Percent of Total Nutrient Applied - - - - - - - - - - - - -		
Beef cattle (solid or liquid)	30–50	80–100	90–100
Dairy (solid or liquid)	30–50	80–100	90–100
Liquid swine (anaerobic pit)	90–100	90–100	90–100
Liquid swine (anaerobic lagoon)	90–100[3]	90–100[3]	90–100
Poultry (all species)	50–60	90–100	90–100

[1]The estimates for N availability do not account for potential volatile N losses during and after land application. Correction factors for volatile loss are given in Table 2. The ranges are provided to account for variation in the proportion of ammonium N (and for poultry manure also uric acid), bedding type and amount, and both sampling and analysis.

[2]The ranges in P and K availability are provided to account for variation in sampling and analysis, and for needed P and K supply with different soil test levels. A small portion of manure P may not be available immediately after application, but all P is potentially available over time. Use lower P and K availability values for soils testing in the Very Low and Low soil test interpretation categories, where large yield loss could occur if insufficient P or K is applied and a reasonable buildup is desirable. Use 100% when manure is applied to maintain soil-test P and K in the Optimum soil test category, when the probability of a yield response is small.

[3]Values apply for the liquid portion of swine manure in lagoons; the N and P availability will be less and difficult to estimate with settled solids.

Second- and Third-Year Availability Estimates

While manure N may become crop available over multiple years for some sources, there should not be an expectation that all of the manure N will eventually become crop available. This happens because some of the N is in difficult to degrade organic forms (recalcitrant) and will become part of the soil organic matter. For some manure sources, such as with bedded systems, not all of the manure N should be accounted for in manure plans over multiple years and the first-, second-, or third-year availability may not add up to 100 percent.

Animal manure that has considerable organic material can have some residual-N availability in the second or third year after application. The second-year N availability estimate for beef cattle and dairy manure is 10 percent, and 5 percent for the third year. Other manures that have similar organic N and bedding could have similar second- and third-year N availability. Manure sources that have low organic N will not have second-year crop available N. These include liquid systems like swine manure stored in under-building pits and above-ground tanks, and anaerobic lagoons. Poultry manure, since it has considerable organic material, has some but low second-year (0–10 percent) availability and no third-year N availability.

The P and K contained in animal manure are estimated at 100 percent crop available over a long term. Residual effects of P and K not used in the year of application will be reflected in soil tests and crop use, just like fertilizer P and K applied for one year or for multiple years.

Adjusting for Manure Nitrogen Volatilization

The estimates for manure N availability in Table 1 do not consider potential volatile N losses during or after application. Losses are from various volatile N compounds in manure, such as ammonia, and ammonia that is produced when urea, uric acid, or other compounds convert to ammonium. These are similar losses that can occur from some N fertilizers such as anhydrous ammonia, urea, and urea-ammonium nitrate (UAN) solutions. If manure is left on the soil surface, losses may occur until N is moved into the soil with rainfall or incorporated with tillage. Many factors affect the rate and amount of volatile loss, such as temperature, humidity, rainfall, soil moisture, soil pH, surface residue cover, and days to incorporation. Volatile losses at or after application often are difficult to predict accurately. However, losses can be significant, and, therefore, it is important to make an adjustment for volatile N losses from applied manure and for manure management planning purposes. Values given in Table 2 provide guidance on potential volatile losses. The correction factors in Table 2 do not account for N losses during storage and handling (time from excretion to sampling for analysis) and assume a reasonable time period from sampling to land application so that the manure analysis represents the manure being applied. To estimate manure N remaining in soil after application, multiply the applied manure N rate by the appropriate correction factor.

Table 2. Correction factors to account for N volatilization losses during and after land application of animal manure.[1]

Application Method	Incorporation	Volatilization Correction Factor[2]
Direct injection	—	0.98–1.00
Broadcast (liquid/solid)	Immediate incorporation	0.95–0.99
Broadcast (liquid)	No incorporation	0.75–0.90
Broadcast (solid)	No incorporation	0.70–0.85
Irrigation	No incorporation	0.60–0.75

[1]Adapted from Midwest Plan Service MWPS-18, Third Edition. Nitrogen losses during and within four days of application.

[2]Multiply the manure total N rate applied times the volatilization correction factor to determine the portion of total manure N remaining.

Considerations for Time of Application

The time of application influences nutrient availability and potential manure and nutrient loss from soil. Fall applications allow more time for organic N and P portions of manure to mineralize so they are available for plant uptake the next crop season. This is more important for N in manures with high organic matter content, such as bedded systems. Iowa research has shown that fall versus springtime P and K application usually is not an agronomic issue for fertilizers or manure. The increased time for organic N mineralization with fall application also allows for nitrification of ammonium and therefore more potential nitrate loss through leaching or denitrification with excessively wet spring conditions. This is a more important issue for manure with large ammonium-N concentration, such as liquid swine manure. Coarse-textured soils, with high permeability, are the most likely to have leaching losses. Fine- and moderately fine-textured soils, prone to excess wetness, are most likely to have denitrification losses. Manure applied in the spring has less time for organic N and P mineralization before crop uptake. Delayed mineralization can be an important issue for manure with high organic matter content, especially in cold springs. With manure that contains a large portion of N as ammonium, spring application allows for better timing of nitrification to nitrate and subsequent crop use, and less chance of N loss.

As a general rule, do not apply manure in the fall unless the soil temperature is 50° F and cooling at the four-inch soil depth. This will slow the mineralization and nitrification processes and is an especially important consideration for manure containing a large portion of N as ammonium.

Broadcasting manure onto frozen, snow-covered, water-saturated soils increases the potential for nutrient losses with rainfall or snowmelt runoff to surface water systems. If manure must be applied in these conditions, it should be applied on relatively flat land, slopes less than 5 percent, and well away from streams and waterways (see Iowa Department of Natural Resources rules on setback distances).

Example Calculation of Manure Application Rates

Note: *The N, P, and K fertilization requirements in these examples are determined from appropriate extension publications and Web-based tools listed at the right.*

Example 1

- Manure source: liquid swine manure, finishing under-building pit.
- Manure analysis: 40 lb N/1,000 gal, 25 lb P_2O_5/1,000 gal, 35 lb K_2O/1,000 gal.
- Intended crop: corn in a corn-soybean rotation.
- Soil tests: 19 ppm Bray P-1 (Optimum), 165 ppm Ammonium Acetate K (Optimum).
- Crop yield and P and K removal for determining nutrient rates needed to maintain the Optimum soil test category: 200 bu/acre corn yield; 75 lb P_2O_5/acre and 60 lb K_2O removal.
- Manure rate: based on corn N fertilization requirement at 125 lb N/acre.
- Manure application: injected late fall.
- Manure nutrient availability: 100 percent for N, P, and K.
- Manure N volatilization correction factor: 0.98.
- Manure rate: 125 lb N/acre ÷ (40 lb N/1,000 gal × 0.98) = 3,200 gal/acre.
- Manure available P and K nutrients applied: 3,200 gal/acre × (25 lb P_2O_5/1,000 gal × 1.00) = 80 lb P_2O_5/acre; and 3,200 gal/acre × (35 lb K_2O/1,000 gal × 1.00) = 112 lb K_2O/acre.
- Phosphorus and K applied with the manure are adequate for P (slightly more than expected corn removal) and will supply more than needed K. The extra P and K can be used by the next crop and should be accounted for. However, additional P and K will need to be applied for the following soybean crop.

Example 2

- Manure source: solid layer manure.
- Manure analysis: 72 lb N/ton, 69 lb P_2O_5/ton, 54 lb K_2O/ton.
- Intended crop: corn-soybean rotation.
- Soil tests: 18 ppm Bray P-1 (Optimum), 120 ppm Ammonium Acetate K (Low).
- Manure rate: based on P requirement for the crop rotation at 120 lb P_2O_5/acre.
- Manure application: late fall, incorporated after four days.
- Manure nutrient availability: 55 percent for N, 100 percent for P and K.
- Manure N volatilization correction factor: 0.80.
- Manure rate: 120 lb P_2O_5/acre ÷ (69 lb P_2O_5/ton × 1.00) = 1.7 ton/acre.
- Manure available N and K nutrients applied: 1.7 ton/acre × (72 lb N/ton × 0.60 × 0.80) = 60 lb N/acre; and 1.7 ton/acre × (54 lb K_2O/ton × 1.00) = 92 lb K_2O/acre.
- Corn N fertilization need and K needed for the corn and soybean crops with a Low soil test category: 130 lb N/acre and 172 lb K_2O/acre.
- Crop available N and K applied with manure is not adequate for N, need additional 70 lb fertilizer N/acre (130 lb N/acre – 60 lb N/acre); and applied K is not adequate for the corn and soybean crops, need additional 80 lb K_2O/acre (172 – 92 lb K_2O/acre) from fertilizer.

Additional Resources

CROP 3073 *Nitrogen use in Iowa Crop Production*

PM 1688 *A General Guide for Crop Nutrient and Limestone Recommendations in Iowa*

PM 287 *Take a Good Sample to Help Make Good Decisions*

PM 2015 *Concepts and Rationale for Regional Nitrogen Rate Guidelines for Corn*

PM 1714 *Nitrogen Fertilizer Recommendations for Corn in Iowa*

PM 2026 *Sensing Nitrogen Stress in Corn*

PM 1584 *Cornstalk Testing to Evaluate Nitrogen Management*

PM 1588 *How to Sample Manure for Nutrient Analysis*

A3769 *Recommended Methods of Manure Analysis* (University of Wisconsin)

MWPS-18-S1 *Manure Characteristics: Section 1* (Midwest Plan Service)

MWPS-18 *Livestock Waste Facilities Handbook, Third Edition* (Midwest Plan Service)

Corn Nitrogen Rate Calculator, **http://cnrc.agron.iastate.edu/**

Summary

- Carefully manage the nutrients in animal manure as you would manage fertilizer.
- Have representative manure samples analyzed to determine nutrient concentration. At a minimum, samples should be analyzed for moisture (dry matter) and total N, P, and K. For additional information on N composition, samples can be analyzed for ammonium. Maintain a manure analysis history for production facilities.
- Set the manure application rate according to crop fertilization requirements and for the crop availability of manure N, P, and K.
- Adjust manure rates for estimated N volatilization.
- For manure application rates, consider the crop N, P, and K fertilization requirements and field P-Index ratings, but do not exceed the crop N fertilization need.
- Consider the nutrient needs of crop rotations rather than just individual crops, which is especially important for P and K management.
- Allocate manure to fields based on soil tests and crops to be grown.
- Fall applications of manure should not be made until the soil temperature is 50° F and cooling, especially for manure sources that have a large portion of N as ammonium.
- Do not apply manure to snow-covered, frozen, or water-saturated sloping ground to reduce risk of nutrient loss and water quality impairment.

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Expert Reviewed This publication was peer-reviewed by three independent reviewers using a double-blind process.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914 in cooperation with the U.S. Department of Agriculture. Cathann A. Kress, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.

Management System	N	P_2O_5	K_2O	Management System	N	P_2O_5	K_2O
	Lbs./1,000 gallon				Lbs./ton		
Liquid, Pit				**Solid Manure (Bedded)**			
Swine				**Swine-confined**			
Nursery, 25 lb.	35	20	20	Nursery, 25 lb.	14	9	11
Grow-finish, 150 lb. (wet /dry)	58	40	45	Grow-finish, 150 lb.	14	9	11
Grow-finish, 150 lb. (dry feed)	50	42	30	Gestation, 400 lb.	14	9	11
Grow-finish, 150 lb. (earthen)	32	22	20	Sow and litter, 450 lb.	14	9	11
Gestation, 400 lb.	25	25	25	Farrow-nursery	14	9	11
Sow and litter[1], 450 lb.	25	20	15	Farrow finish	14	9	11
Farrow-nursery[2]	27	23	22				
Farrow-finish[3]	44	32	24				
Dairy-confined				**Dairy-confined**			
Cows, 1,200 lb. or more	25	12	11	Cows, 1,200 lb. or more	12	6	12
Heifers, 900 lb.	25	12	11	Heifers, 900 lb.	12	6	12
Calves, 500 lb.	25	12	11	Calves, 500 lb.	12	6	12
Veal calves, 250 lb.	25	12	11	Veal calves, 250 lb.	12	6	12
Dairy herd[4]	25	12	11	Dairy herd[4]	12	6	12
Beef-confined				**Beef-confined**			
Mature cows, 1,000 lb.	40	25	35	Mature cows, 1,000 lb.	12	6	12
Finishing, 900 lb.	40	25	35	Finishing, 900 lb.	12	6	12
Feeder calves, 500 lb.	40	25	35	Feeder calves, 500 lb.	12	6	12
Lagoon[5]				**Poultry**			
(all animals)	4	3	4	Layer, caged, 4 lb.[6]	35	80	50
				Broiler, litter, 2 lb.	65	65	45
				Turkey, litter, 10 lb.	40	40	25
Open Lot Runoff							
Earthen lots (liquids)				**Open lot (solids, scraped)**			
Beef, 400 sq ft/hd	3	1	6	Beef, 400 sq ft/hd	22	16	14
Dairy, 1,000 sq ft/hd	3	1	6	Dairy, 1,000 sq ft/hd	11	6	11
Swine, 50 sq ft/hd	3	1	6	Swine, 50 sq ft/hd	15	14	9
Concrete lots (liquids)							
Beef, 400 sq ft/hd	6	2	7				
Dairy, 1,000 sq ft/hd	6	2	7				
Swine, 50 sq ft/hd	15	5	10				

[1]Sow and litter figures are per farrowing crate

[2]Farrow-nursery figures are per sow in the breeding herd and include one farrowing sow, five gestation sows, and nine nursery pig spaces.

[3] Farrow-finish figures are per sow in the breeding herd and include one farrowing sow, five gestation sows, nine nursery pigs, and 36 finishing pig spaces.

[4] Per productive cow in the herd; includes lactating cow, 330 days; dry cow, 35 days; heifer, 222 days; and calf, 165 days.

[5] Weights assumed: beef, 1,000 pounds; dairy, 1,200 pounds; swine, 150 pounds.

[6] Wet basis at 41 percent moisture.

APPENDIX C MASTER MATRIX

Proposed Site Characteristics

The following scoring criteria apply to the site of the proposed confinement feeding operation. Mark one score under each criterion selected by the applicant. The proposed site must obtain a minimum overall score of 440 and a score of 53.38 in the "air" subcategory, a score of 67.75 in the "water" subcategory and a score of 101.13 in the "community impacts" subcategory.

1. Additional separation distance, above minimum requirements, from proposed confinement structure to the closest:

- Residence not owned by the owner of the confinement feeding operation,
- Hospital,
- Nursing home, or
- Licensed or registered child care facility.

	Score	Air	Water	Community
250 feet to 500 feet	25	16.25		8.75
501 feet to 750 feet	45	29.25		17.50
751 feet to 1,000 feet	65	42.25		22.75
1,001 feet to 1,250 feet	85	55.25		29.75
1,251 feet or more	100	65.00		35.00

(A) Refer to the construction permit application package to determine the animal unit capacity (or animal weight capacity if an expansion) of the proposed confinement feeding operation. Then refer to Table 6 of 567--Chapter 65 to determine minimum required separation distances.
(B) The department will award points only for the single building, of the four listed above, closest to the proposed confinement feeding operation.
(C) "Licensed child care center" – a facility licensed by the department of human services providing child care or preschool services for seven or more children, except when the facility is registered as a child care home.
(D) "Registered child development homes" - child care providers certify that they comply with rules adopted by the department of human services. This process is voluntary for providers caring for five or fewer children and mandatory for providers caring for six or more children.
(E) A full listing of licensed and registered child care facilities is available at county offices of the department of human services.

2. Additional separation distance, above minimum requirements, from proposed confinement structure to the closest public use area.

	Score	Air	Water	Community
250 feet to 500 feet	5	2.00		3.00
501 feet to 750 feet	10	4.00		6.00
751 feet to 1,000 feet	15	6.00		9.00
1,001 feet to 1,250 feet	20	8.00		12.00
1,251 feet to 1,500	25	10.00		15.00
1,501 feet or more	30	12.00		18.00

(A) Refer to the construction permit application package to determine the animal unit capacity (or animal weight capacity if an expansion) of the proposed confinement feeding operation. Then refer to Table 6 of 567--Chapter 65 to determine minimum required separation distances.
(B) "Public use area" - a portion of land owned by the United States, the state, or a political subdivision with facilities which attract the public to congregate and remain in the area for significant periods of time. Facilities include, but are not limited to, picnic grounds, campgrounds, cemeteries, lodges, shelter houses, playground equipment, lakes as listed in Table 2 of 567--Chapter 65, and swimming beaches. It does not include a highway, road right-of-way, parking areas, recreational trails or other areas where the public passes through, but does not congregate or remain in the area for significant periods of time.

3. Additional separation distance, above minimum requirements, from proposed confinement structure to the closest:

- Educational institution,
- Religious institution, or

- Commercial enterprise.

	Score	Air	Water	Community
250 feet to 500 feet	5	2.00		3.00
501 feet to 750 feet	10	4.00		6.00
751 feet to 1,000 feet	15	6.00		9.00
1,001 feet to 1,250 feet	20	8.00		12.00
1,251 feet to 1,500	25	10.00		15.00
1,501 feet or more	30	12.00		18.00

(A) Refer to the construction permit application package to determine the animal unit capacity (or animal weight capacity if an expansion) of the proposed confinement feeding operation. Then refer to Table 6 of 567--Chapter 65 to determine minimum required separation distances.
(B) The department will award points only for the single building, of the three listed above, closest to the proposed confinement feeding operation.
(C) "Educational institution" - a building in which an organized course of study or training is offered to students enrolled in kindergarten through grade 12 and served by local school districts, accredited or approved nonpublic schools, area educational agencies, community colleges, institutions of higher education under the control of the state board of regents, and accredited independent colleges and universities.
(D) "Religious institution" - a building in which an active congregation is devoted to worship.
(E) "Commercial enterprise" - a building which is used as a part of a business that manufactures goods, delivers services, or sells goods or services, which is customarily and regularly used by the general public during the entire calendar year and which is connected to electric, water, and sewer systems. A commercial enterprise does not include a farm operation.

4. Additional separation distance, above minimum requirement of 500 feet, from proposed confinement structure to the closest water source.

	Score	Air	Water	Community
250 feet to 500 feet	5		5.00	
501 feet to 750 feet	10		10.00	
751 feet to 1,000 feet	15		15.00	
1,001 feet to 1,250 feet	20		20.00	
1,251 feet to 1,500	25		25.00	
1,501 feet or more	30		30.00	

"Water source" - a lake, river, reservoir, creek, stream, ditch, or other body of water or channel having definite banks and a bed with water flow, except lakes or ponds without an outlet to which only one landowner is riparian.

5. Separation distance of 300 feet or more from the proposed confinement structure to the nearest thoroughfare.

	Score	Air	Water	Community
300 feet or more	30	9.00		21.00

(A) "Thoroughfare" - a road, street, bridge, or highway open to the public and constructed or maintained by the state or a political subdivision.
(B) The 300-foot distance includes the 100-foot minimum setback plus additional 200 feet.

6. Additional separation distance, above minimum requirements, from proposed confinement structure to the closest critical public area.

	Score	Air	Water	Community
500 feet or more	10	4.00		6.00

(A) All critical public areas as defined in 567--65.1(455B), are public use areas, and therefore subject to public use area minimum separation distances.
(B) Refer to the construction permit application package to determine the animal unit capacity (or animal weight capacity if an expansion) of the proposed confinement feeding operation. Then refer to Table 6 of 567--Chapter 65 to determine minimum required separation distances.

7. Proposed confinement structure is at least two times the minimum required separation distance from all private and public water wells.

	Score	Air	Water	Community
Two times the minimum separation distance	30		24.00	6.00

Refer to Table 6 of 567--Chapter 65 for minimum required separation distances to wells.

8. Additional separation distance, above the minimum requirement of 1,000 feet, from proposed confinement structure to the closest:

- Agricultural drainage well,
- Known sinkhole, or
- Major water source.

	Score	Air	Water	Community
250 feet to 500 feet	5	0.50	2.50	2.00
501 feet to 750 feet	10	1.00	5.00	4.00
751 feet to 1,000 feet	15	1.50	7.50	6.00
1,001 feet to 1,250 feet	20	2.00	10.00	8.00
1,251 feet to 1,500 feet	25	2.50	12.50	10.00
1,501 feet to 1,750 feet	30	3.00	15.00	12.00
1,751 feet to 2,000 feet	35	3.50	17.50	14.00
2,001 feet to 2,250 feet	40	4.00	20.00	16.00
2,251 feet to 2,500 feet	45	4.50	22.50	18.00
2,501 feet or more	50	5.00	25.00	20.00

(A) The department will award points only for the single item, of the three listed above, that is closest to the proposed confinement feeding operation.
(B) "Agricultural drainage wells" - include surface intakes, cisterns and wellheads of agricultural drainage wells.
(C) "Major water source" - a lake, reservoir, river or stream located within the territorial limits of the state, or any marginal river area adjacent to the state which can support a floating vessel capable of carrying one or more persons during a total of a six-month period in one out of ten years, excluding periods of flooding. Major water sources in the state are listed in Tables 1 and 2 in 567--Chapter 65.

9. Distance between the proposed confinement structure and the nearest confinement facility that has a submitted department manure management plan.

	Score	Air	Water	Community
Three-quarter of a mile or more (3,960 feet)	25	7.50	7.50	10.00

Confinement facilities include swine, poultry, and dairy and beef cattle.

10. Separation distance from proposed confinement structure to closest:

- High quality (HQ) waters,
- High quality resource (HQR) waters, or
- Protected water areas (PWA)

is at least two times the minimum required separation distance

	Score	Air	Water	Community
Two times the minimum separation distance	30		22.50	7.50

(A) The department will award points only for the single item, of the three listed above, closest to the proposed confinement feeding operation.
(B) HQ waters are identified in 567--Chapter 61.
(C) HQR waters are identified in 567--Chapter 61.
(D) A listing of PWAs is available at:
http://www.iowadnr.gov/Recreation/CanoeingKayaking/StreamCare/ProtectedWaterAreas.aspx

11. Air quality modeling results demonstrating an annoyance level less than 2 percent of the time for residences within two times the minimum separation distance.

	Score	Air	Water	Community
University of Minnesota OFFSET model results demonstrating an annoyance level less than 2 percent of the time	10	6.00		4.00e

(A) OFFSET can be found at http://www.extension.umn.edu/distribution/livestocksystems/DI7680.html. For more information, contact Dr. Larry Jacobson, University of Minnesota, (612) 625-8288, jacob007@tc.umn.edu.

(B) A residence that has a signed waiver for the minimum separation distance cannot be included in the model.
(C) Only the OFFSET model is acceptable until the department recognizes other air quality models.

12. Liquid manure storage structure is covered.

	Score	Air	Water	Community
Covered liquid manure storage	30	27.00		3.00

(A) "Covered" - organic or inorganic material, placed upon an animal feeding operation structure used to store manure, which significantly reduces the exchange of gases between the stored manure and the outside air. Organic materials include, but are not limited to, a layer of chopped straw, other crop residue, or a naturally occurring crust on the surface of the stored manure. Inorganic materials include, but are not limited to, wood, steel, aluminum, rubber, plastic, or Styrofoam. The materials shall shield at least 90 percent of the surface area of the stored manure from the outside air. Cover shall include an organic or inorganic material which current scientific research shows reduces detectable odor by at least 75 percent. A formed manure storage structure directly beneath a floor where animals are housed in a confinement feeding operation is deemed to be covered.
(B) The design, operation and maintenance plan for the manure cover must be in the construction permit application and made a condition in the approved construction permit.

13. Construction permit application contains design, construction, operation and maintenance plan for emergency containment area at manure storage structure pump-out area.

	Score	Air	Water	Community
Emergency containment	20		18.00	2.00

(A) The emergency containment area must be able to contain at least 5 percent of the total volume capacity of the manure storage structure.
(B) The emergency containment area must be constructed on soils that are fine-grained and have low permeability.
(C) If manure is spilled into the emergency containment area, the spill must be reported to the department within six hours of onset or discovery.
(D) The design, construction, operation and maintenance plan for the emergency containment area must be in the construction permit application and made a condition in the approved construction permit.

14. Installation of a filter(s) designed to reduce odors from confinement building(s) exhaust fan(s).

	Score	Air	Water	Community
Installation of filter(s)	10	8.00		2.00

The design, operation and maintenance plan for the filter(s) must be in the construction permit application and made a condition in the approved construction permit.

15. Utilization of landscaping around confinement structure.

	Score	Air	Water	Community
Two times the minimum separation distance	20	10.00		10.00

The design, operation and maintenance plan for the landscaping must be in the construction permit application and made a condition in the approved construction permit. The design should contain at least three rows of trees and shrubs, of both fast and slow-growing species that are well suited for the site.

16. Enhancement, above minimum requirements, of structures used in stockpiling and composting activities, such as an impermeable pad and a roof or cover.

	Score	Air	Water	Community
Stockpile and compost facility enhancements	30	9.00	18.00	3.00

(A) The design, operation and maintenance plan for the stockpile or compost structure enhancements must be in the construction permit application and made a condition in the approved construction permit.
(B) The stockpile or compost structures must be located on land adjacent or contiguous to the confinement building.

17. Proposed manure storage structure is formed

	Score	Air	Water	Community
Formed manure storage structure	30		27.00	3.00

(A) "Formed manure storage structure" -a covered or uncovered impoundment used to store manure from an animal feeding operation, which has walls and a floor constructed of concrete, concrete block, wood, steel, or similar materials. Similar materials may include, but are not limited to, plastic, rubber, fiberglass, or other synthetic materials. Materials used in a formed manure storage structure shall have the structural integrity to withstand

expected internal and external load pressures.
(B) The design, operation and maintenance plan for the formed manure storage structure must be in the construction permit application and made a condition in the approved construction permit.

18. Manure storage structure is aerated to meet departmental standards as an aerobic structure, if aeration is not already required by the department.

	Score	Air	Water	Community
Aerated manure storage structure(s)	10	8.00		2.00

(A) Aerobic structure - an animal feeding operation structure other than an egg wash water storage structure which relies on aerobic bacterial action which is maintained by the utilization of air or oxygen and which includes aeration equipment to digest organic matter. Aeration equipment shall be used and shall be capable of providing oxygen at a rate sufficient to maintain an average of 2 milligrams per liter dissolved oxygen concentration in the upper 30 percent of the depth of manure in the structure at all times.
(B) The design, operation and maintenance plan for the aeration equipment must be in the construction permit application and made a condition in the approved construction permit.

19. Proposed confinement site has a suitable truck turnaround area so that semitrailers do not have to back into the facility from the road

	Score	Air	Water	Community
Truck turnaround	20			20.00

(A) The design, operation and maintenance plan for the truck turn around area must be in the construction permit application and made a condition in the approved construction permit.
(B) The turnaround area should be at least 120 feet in diameter and be adequately surfaced for traffic in inclement weather.

20. Construction permit applicant's animal feeding operation environmental and worker protection violation history for the last five years at all facilities in which the applicant has an interest.

	Score	Air	Water	Community
No history of Administrative Orders in last five years	30			30.00

(A) "Interest" - means ownership of a confinement feeding operation as a sole proprietor or a 10 percent or more ownership interest held by a person in a confinement feeding operation as a joint tenant, tenant in common, shareholder, partner, member, beneficiary or other equity interest holder. Ownership interest is an interest when it is held either directly, indirectly through a spouse or dependent child, or both.
(B) An environmental violation is a final Administrative Order (AO) from the department of natural resources or final court ruling against the construction permit applicant for environmental violations related to an animal feeding operation. A Notice of Violation (NOV) does not constitute a violation.

21. Construction permit applicant waives the right to claim a Pollution Control Tax Exemption for the life of the proposed confinement feeding operation structure.

	Score	Air	Water	Community
Permanent waiver of Pollution Control Tax Exemption	5			5.00

(A) Waiver of Pollution Control Tax Exemption is limited to the proposed structure(s) in the construction permit application.
(B) The department and county assessor will maintain a record of this waiver, and it must be in the construction permit application and made a condition in the approved construction permit.

22. Construction permit applicant can lawfully claim a Homestead Tax Exemption on the site where the proposed confinement structure is to be constructed
- OR -
the construction permit applicant is the closest resident to the proposed confinement structure.

	Score	Air	Water	Community
Site qualifies for Homestead Tax Exemption or permit applicant is closest resident to proposed structure	25			25.00

Proof of Homestead Tax Exemption is required as part of the construction permit application.
(A) Applicant includes persons who have ownership interests."Interest" - means ownership of a confinement feeding operation as a sole proprietor or a 10 percent or more ownership interest held by a person in a confinement feeding operation as a joint tenant, tenant in common, shareholder, partner, member, beneficiary or other equity interest holder. Ownership interest is an interest when it is held either directly, indirectly through a spouse or

dependent child, or both.

23. Construction permit applicant can lawfully claim a Family Farm Tax Credit for agricultural land where the proposed confinement feeding operation is to be located pursuant to Iowa Code chapter 425A.

	Score	Air	Water	Community
Family Farm Tax Credit qualification	25			25.00

(A) Applicant includes persons who have ownership interests. "Interest" - means ownership of a confinement feeding operation as a sole proprietor or a 10 percent or more ownership interest held by a person in a confinement feeding operation as a joint tenant, tenant in common, shareholder, partner, member, beneficiary or other equity interest holder. Ownership interest is an interest when it is held either directly, indirectly through a spouse or dependent child, or both.

24. Facility size.

	Score	Air	Water	Community
1 to 2,000 animal unit capacity	20			20.00
2,001 to 3,000 animal unit capacity	10			10.00
3,001 animal unit capacity or more	0			0.00

(A) Refer to the construction permit application package to determine the animal unit capacity of the proposed confinement structure at the completion of construction.
(B) If the proposed structure is part of an expansion, animal unit capacity (or animal weight capacity) must include all animals confined in adjacent confinement structures.
(C) Two or more animal feeding operations under common ownership or management are deemed to be a single animal feeding operation if they are adjacent or utilize a common area or system for manure disposal. In addition, for purposes of determining whether two or more confinement feeding operations are adjacent, all of the following must apply:
(a) At least one confinement feeding operation structure must be constructed on and after May 21, 1998.
(b) A confinement feeding operation structure which is part of one confinement feeding operation is separated by less than a minimum required distance from a confinement feeding operation structure which is part of the other confinement feeding operation. The minimum required distance shall be as follows:
(1) 1,250 feet for confinement feeding operations having a combined animal unit capacity of less than 1,000 animal units.
(2) 2,500 feet for confinement feeding operations having a combined animal unit capacity of 1,000 animal units or more.

25. Construction permit application includes livestock feeding and watering systems that significantly reduce manure volume.

	Score	Air	Water	Community
Wet/dry feeders or other feeding and watering systems that significantly reduce manure volume	25		12.50	12.50

The design, operation and maintenance plan for the feeding system must be in the construction permit application and made a condition in the approved construction permit.

Proposed Site Operation and Manure Management Practices

The following scoring criteria apply to the operation and manure management characteristics of the proposed confinement feeding operation. Mark <u>one</u> score under each criterion that best reflects the characteristics of the submitted manure management plan.

26. Liquid or dry manure (choose only one subsection from subsections "a" - "e" and mark one

		Score	Air	Water	Community
a.	Bulk dry manure is sold under Iowa Code Chapter 200A and surface-applied	15		15.00	
	Bulk dry manure is sold under Iowa Code Chapter 200A and incorporated on the same date it is land-applied	30	12.00	12.00	6.00

b.	Dry manure is composted and land-applied under the requirements of a department manure management plan	10	4.00	4.00	2.00
	Dry manure is composted and sold so that no manure is applied under the requirements of a department manure	30	12.00	12.00	6.00

	management plan				

c.	Methane digester is used to generate energy from manure and remaining manure is surface-applied under the requirements of an approved department manure management plan	10	3.00	3.00	4.00
	After methane digestion is complete, manure is injected or incorporated on the same date it is land-applied under the requirements of an approved department manure management plan	30	12.00	12.00	6.00

d.	Dry manure is completely burned to generate energy and no remaining manure is applied under the requirement of a manure management plan	30	9.00	9.00	12.00
	Some dry manure is burned to generate energy, but remaining manure is land-applied and incorporated on the same date it is land applied	30	12.00	12.00	6.00

e.	Injection or incorporation of manure on the same date it is land-applied	30	12.00	12.00	6.00

(A) Choose only ONE line from subsection "a", "b," "c," "d," or "e" above and mark only one score in that subsection.
(B) The injection or incorporation of manure must be in the construction permit application and made a condition in the approved construction permit.
(C) If an emergency arises and injection or incorporation is not feasible, prior to land application of manure the applicant must receive a written approval for an emergency waiver from a department field office to surface-apply manure.
(D) Requirements pertaining to the sale of bulk dry manure under pursuant to Iowa Code chapter 200A must be incorporated into the construction permit application and made a condition of the approved construction permit.
(E) The design, operation and maintenance plan for utilization of manure as an energy source must be in the construction permit application and made a condition in the approved construction permit.
(F) The design, operation and maintenance plan for composting facilities must be in the construction permit application and made a condition in the approved construction permit.

27. Land application of manure is based on a two-year crop rotation phosphorus uptake level.

	Score	Air	Water	Community
Two-year phosphorus crop uptake application rate	10		10.00	

(A) Land application of manure cannot exceed phosphorus crop usage levels for a two-year crop rotation cycle.
(B) The phosphorus uptake application rates must be in the construction permit application and made a condition in the approved construction permit.

28. Land application of manure to farmland that has USDA Natural Resources Conservation Service (NRCS) approved buffer strips contiguous to all water sources traversing or adjacent to the fields listed in the manure management plan.

	Score	Air	Water	Community
Manure application on farmland with buffer strips	10		8.00	2.00

(A) The department may request NRCS maintenance agreements to ensure proper design, installation and maintenance of filter strips. If a filter strip is present but not designed by NRCS, it must meet NRCS standard specifications.
(B) The application field does not need to be owned by the confinement facility owner to receive points.
(C) On current and future manure management plans, the requirement for buffer strips on all land application areas must be in the construction permit application and made a condition in the approved construction permit.

29. Land application of manure does not occur on highly erodible land (HEL), as classified by the USDA NRCS.

	Score	Air	Water	Community
No manure application on HEL farmland	10		10.00	

Manure application on non-HEL farmland must be in the construction permit application and made a condition in the approved construction permit.

30. Additional separation distance, above minimum requirements (0 or 750 feet, see below), for the land application of manure to the closest:

- Residence not owned by the owner of the confinement feeding operation,
- Hospital,
- Nursing home, or
- Licensed or registered child care facility.

	Score	Air	Water	Community
Additional separation distance of 200 feet	5	3.25		1.75
Additional separation distance of 500 feet	10	6.50		3.50

(A) The department will award points only for the single building, of the four listed above, closest to the proposed confinement feeding operation.
(B) Minimum separation distance for land application of manure injected or incorporated on the same date as application: 0 feet.
(C) Minimum separation distance for land application of manure broadcast on soil surface: 750 feet.
(D) The additional separation distances must be in the construction permit application and made a condition in the approved construction permit.
(E) "Licensed child care center" – a facility licensed by the department of human services providing child care or preschool services for seven or more children, except when the facility is registered as a child care home.
(F) "Registered child development homes" - child care providers certify that they comply with rules adopted by the department of human services. This process is voluntary for providers caring for five or fewer children and mandatory for providers caring for six or more children.
(G) A full listing of licensed and registered child care facilities is available at county offices of the Department of Human Services

31. Additional separation distance, above minimum requirements (0 or 750 feet, see below), for land application of manure to closest public use area.

	Score	Air	Water	Community
Additional separation distance of 200 feet	5	2.00		3.00

(A) “Public use area” - a portion of land owned by the United States, the state, or a political subdivision with facilities which attract the public to congregate and remain in the area for significant periods of time. Facilities include, but are not limited to, picnic grounds, campgrounds, cemeteries, lodges, shelter houses, playground equipment, lakes as listed in Table 2 in 567--Chapter 65, and swimming beaches. It does not include a highway, road right-of-way, parking areas, recreational trails or other areas where the public passes through, but does not congregate or remain in the area for significant periods of time.
(B) Minimum separation distance for land application of manure injected or incorporated on the same date as application: 0 feet.
(C) Minimum separation distance for land application of manure broadcast on soil surface: 750 feet.
(D) The additional separation distances must be in the construction permit application and made a condition in the approved construction permit.

32. Additional separation distance, above minimum requirements (0 or 750 feet, see below), for the land application of manure to the closest:

- Educational institution,
- Religious institution, or
- Commercial enterprise.

	Score	Air	Water	Community
Additional separation distance of 200 feet	5	2.00		3.00

(A) Minimum separation distance for land application of manure broadcast on soil surface: 750 feet.
(B) Minimum separation distance for land application of manure injected or incorporated on same date as application: 0 feet.
(C) The additional separation distances must be in the construction permit application and made a condition in the approved construction permit.
(D) "Educational institution" - a building in which an organized course of study or training is offered to students enrolled in kindergarten through grade 12 and served by local school districts, accredited or approved nonpublic schools, area educational agencies, community colleges, institutions of higher education under the control of the state board of regents, and accredited independent colleges and universities.
(E) "Religious institution" - a building in which an active congregation is devoted to worship.
(F) "Commercial enterprise" - a building which is used as a part of a business that manufactures goods, delivers

services, or sells goods or services, which is customarily and regularly used by the general public during the entire calendar year and which is connected to electric, water, and sewer systems. A commercial enterprise does not include a farm operation.

33. Additional separation distance of 50 feet, above minimum requirements (0 or 200 feet, see below), for the land application of manure to the closest private drinking water well or public drinking water well - OR
well is properly closed under supervision of county health officials.

	Score	Air	Water	Community
Additional separation distance of 50 feet or well is properly closed	10		8.00	2.00

(A) Minimum separation distance for land application of manure injected or incorporated on the same date as application or 50-foot vegetation buffer exists around well and manure is not applied to the buffer: 0 feet.
(B) Minimum separation distance for land application of manure broadcast on soil surface: 200 feet.
(C) If applicant chooses to close the well; the well closure must be incorporated into the construction permit application and made a condition in the approved construction permit.

34. Additional separation distance, above minimum requirements, for the land application of manure to the closest:

- Agricultural drainage well,
- Known sinkhole,
- Major water source, or
- Water source

	Score	Air	Water	Community
Additional separation distance of 200 feet	5	0.50	2.50	2.00
Additional separation distance of 400 feet	10	1.00	5.00	4.00

(A) "Agricultural drainage wells" - include surface intakes, cisterns and wellheads of agricultural drainage wells.
(B) "Major water source" - a lake, reservoir, river or stream located within the territorial limits of the state, or any marginal river area adjacent to the state, which can support a floating vessel capable of carrying one or more persons during a total of a six-month period in one out of ten years, excluding periods of flooding. Major water sources in the state are listed in Tables 1 and 2 in 567--Chapter 65.
(C) "Water source" - a lake, river, reservoir, creek, stream, ditch, or other body of water or channel having definite banks and a bed with water flow, except lakes or ponds without an outlet to which only one landowner is riparian.
(D) The additional separation distances must be in the construction permit application and made a condition in the approved construction permit.

35. Additional separation distance above minimum requirements, for the land application of manure, to the closest:

- High quality (HQ) water,
- High quality resource (HQR) water, or
- Protected water area (PWA).

	Score	Air	Water	Community
Additional separation distance of 200 feet	5		3.75	1.25
Additional separation distance of 400 feet	10		7.50	2.50

(A) HQ waters are identified in 567--Chapter 61.
(B) HQR waters are identified in 567--Chapter 61.
(C) A listing of PWAs is available at:
http://www.iowadnr.gov/Recreation/CanoeingKayaking/StreamCare/ProtectedWaterAreas.aspx.

36. Demonstrated community support.

	Score	Air	Water	Community
Written approval of 100% of the property owners within a one mile radius	20			20.00

37. Worker safety and protection plan is submitted with the construction permit application.

	Score	Air	Water	Community
Submission of worker safety and protection plan	10			10.00

(A) The worker safety and protection plan must be in the construction permit application and made a condition in the approved construction permit.
(B) The worker safety and protection plan and subsequent records must be kept on site with the manure management plan records.

38. Applicant signs a waiver of confidentiality allowing public to view confidential manure management plan land application records

	Score	Air	Water	Community
Manure management plan confidentiality waiver	5			5.00

The waiver of confidentiality must be in the construction permit application and made a condition in the approved construction permit. The applicant may limit public inspection to reasonable times and places.

39. Added economic value based on quality job development (number of full time equivalent (FTE) positions), and salary equal to or above Iowa department of workforce development median (45-2093)
-OR-
the proposed structure increases commercial property tax base in the county.

	Score	Air	Water	Community
Economic value to local community	10			10.00

The Iowa Department of Workforce Development regional profiles are available at http://www.iowaworkforce.org/centers/regionalsites.htm. Select the appropriate region and then select "Regional Profile."

40. Construction permit application contains an emergency action plan.

	Score	Air	Water	Community
Emergency action plan	5		2.50	2.50

(A) Iowa State University Extension publication PM 1859 lists the components of an emergency action plan. The emergency action plan submitted should parallel the components listed in the publication.
(B) The posting and implementation of an emergency action plan must be in the construction permit application and made a condition in the approved construction permit.
(C) The emergency action plan and subsequent records must be kept on site with the manure management plan records.

41. Construction permit application contains a closure plan.

	Score	Air	Water	Community
Closure Plan	5		2.50	2.50

(A) The closure plan must be in the construction permit application and made a condition in the approved construction permit.
(B) The closure plan must be kept on site with the manure management plan records.

42. Adoption and implementation of an environmental management system (EMS) recognized by the department.

	Score	Air	Water	Community
EMS	15	4.50	4.50	6.00

(A) The EMS must be in the construction permit application and made a condition in the approved construction permit.
(B) The EMS must be recognized by the department as an acceptable EMS for use with confinement operations.

43. Adoption and implementation of NRCS approved Comprehensive Nutrient Management Plan (CNMP).

	Score	Air	Water	Community
CNMP	10	3.00	3.00	4.00

The implementation and continuation of a CNMP must be in the construction permit application and made a condition in the approved construction permit.

44. Groundwater monitoring wells installed near manure storage structure), and applicant agrees to provide data to the department.

	Score	Air	Water	Community
Groundwater monitoring	15		10.50	4.50

(A) Monitoring well location, sampling and data submission must meet department requirements.
(B) The design, operation and maintenance plan for the groundwater monitoring wells, and data transfer to the

department, must be in the construction permit application and made a condition in the approved construction permit.

	Total Score	Air	Water	Community
	880	213.50	271.00	404.50
Score to pass	440	53.38	67.75	101.13

Tri-B Section 8 Site

Master Matrix Score

& Support Documents

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Master Matrix Scoring Summary

Tri-B Section 8 Master Matrix Score

Item	Total	A	W	C	Notes
1	45	29.25	0	17.5	The closest residence to the proposed facility is approximately 2383 feet. This is an additional 508 feet above the required 1875 feet to unincorporated areas (residences, hospitals, nursing homes, or licensed/registered child care facilities, etc.) Refer to site map.
2	30	12	0	18	The closest public use area to the proposed facility is approximately 9955ft feet (Alden River Access). This is an additional 7455 feet above the required minimum of 2500 feet to public use areas (picnic grounds, campgrounds, cemeteries, lodges, shelter houses, playground equipment, lakes, swimming beaches, etc.) Refer to site map.
3	30	12	0	18	The closest educational institution, religious institution or commercial enterprise is approximately 8827 from the facility (Alden City Limits). This is an additional 6952 feet above the required minimum separation distance of 1875 feet to the closest educational institution, religious institution, or commercial enterprise. Refer to site map.
4	30	0	30	0	The closest water source is approximately 4511 feet from the facility. This is an additional 3999 feet above the minimum separation distance of 500 feet to the closest water source. Refer to site map.
6	10	4	0	6	The closest critical public area is approximately 9955ft from the facility (name of area). This is an additional 7455 feet above the required minimum of 2500 feet to critical public areas. Refer to site map.
8	50	5	25	20	The closest major water source (Iowa River) is approximately 9400 feet away from the facility. This is an additional 8500 feet above the minimum requirement of 1,000 feet from the closest agricultural drainage well, known sinkhole, or major water source.

10	30	0	22.5	7.5	The closest high quality (HQ) water, high quality resource (HQR) water, or protected water area (PWR) in Hardin County is the Iowa River, which is approximately 9400 feet away from the facility. This is an additional 8400 feet above the minimum requirement of 1,000 feet from the closest high quality (HQ) water, high quality resource (HQR) water, or protected water area (PWR).
12	30	27	0	3	The site will consist of 2 (two) swine finishing buildings housing a maximum of 5000 finishing animals, 2000 animal units. Each building will have an 8' deep formed concrete pit and covered by slats. See attached design, operation, and maintenance for the covered liquid manure storage.
16	30	9	18	3	Tri-B Section 8 Farm has elected to build a composting facility on the site of the facility. The structure will be greatly enhanced over what is required by Iowa law. This entitles the farm to claim 30 points on the master matrix item #16 for constructing an enhanced compost structure. See attached design, operation, and maintenance statement for the compost facility along with building design and setback information.
17	30	0	27		The site will utilize an 8' deep formed concrete pit. See attached design, operation, and maintenance for the formed liquid manure storage.
19	20	0	0	20	Tri-B Section 8 Farm has elected to build a driveway and truck turn around on the site of the facility. This will prevent semi trucks from having to back into the site from the road and enhance driver safety around the site. This entitles the farm to claim 20 points on the master matrix for constructing a truck turnaround. See attached design, operation, and maintenance statement for the truck turn around.
20	30	0	0	30	Tri-B LLC or it's owners have had no history of administrative orders in the last 5 years. This makes Tri-B Section 8 eligible for points on Matrix item #20.
24	20	0	0	20	The facility will hold a total capacity of 5000 head, or 2000 animal units. Refer to Construction Permit Application, page 3.

25	25	0	12.5	12.5	Tri-B Section 8 Farm has elected install and use a watering system that will significantly reduce the volume of manure that is produced on the site. Attached data shows this style of watering system reduces water usage and manure production by 25%. . This entitles the farm to claim 25 points on the master matrix item 25. See attached design, operation, and maintenance statement for the reduced volume feeding/watering system.
26	30	12	12	6	26e. In support of points taken for item 26e, Tri-B Section 8 will inject manure on the same date of application to utilize the maximum nutrient value of the manure. This will also dramatically reduce the chances of nutrient loss due to field runoff conditions created by rain events. This will be beneficial to any neighbors as the odor will not stay in the area as long as is created when manure is surface applied. See Manure Management Plan. Also see attached ISU Extension Document: "Tillage, Manure Management and Water Quality".
31	5	2	0	3	The closest public use area is Popejoy Conservation Park. This is located more than 200 feet above the minimum required separation distance from where manure application will occur. See attached map for Matrix Item #31 & #32, and DNR document: "Separation Distances for Land Application of Manure".
32	5	2	0	3	The closest educational institution, religious institution, or commercial enterprise is located in Popejoy. This is located more than 200 feet above the minimum required separation distance from where manure application will occur. See attached map for Matrix Item #31 & #32, and DNR document: "Separation Distances for Land Application of Manure".
35	10	0	7.5	2.5	The closest high quality (HQ) water, high quality resource (HQR) water, or protected water area (PWR) in Hardin County is the Iowa River. This river is located more than 400 feet above the minimum required separation distance from any land where manure application will occur.
37	10	0	0	10	In support for points taken for item 37, Tri-B Section 8 has completed a Worker Safety and Protection Plan to accompany the Emergency Action Plan. See Attached Worker Safety and Protection plan (Exhibit A)

40	5	0	2.5	2.5	The attached Emergency Action Plan/Emergency Response Plan (ERP) will be posted and maintained on site along with the manure management plan records, and will be implemented in case of emergency. Any changes needed to the ERP will be made immediately and re-posted on site, to ensure the document is always up-to-date. See Attached Emergency Response Plan (Exhibit B) and ISU extension contact list
41	5	0	2.5	2.5	In the event that this site will need to close the deep pit, the site closure plan and NRCS Code 360 - Closure Of Waste Impoundments will be followed. All buildings will be washed completely and flushed into the below building pits. The pits will be completely pumped out and applied to the soils at an appropriate application rate and method, determined by a manure sample and DNR-management guidelines. The remaining facility buildings and cement structures will be destroyed and disposed of according to approved methods, regulations, and permits required by the appropriate county, state and federal departments, agencies, and personnel required at that time. See attached Closure Plan(Exhibit C) and NRCS Code 360.
Score	**480.00**	**114.25**	**159.50**	**205.00**	
Score to Pass	**440.00**	**53.38**	**37.75**	**101.13**	

Master Matrix Item #1: Distance to non-owned residence

The closest residence to the proposed facility is approximately 2383 feet. This is an additional 508 feet above the required 1875 feet to unincorporated areas (residences, hospitals, nursing homes, or licensed/registered child care facilities, etc.) Refer to site map on page 3. This entitles the farm to claim 45 points on the master matrix item 1.

Master Matrix Item #2: Distance to Public Use Area

The closest public use area to the proposed facility is approximately 9955ft feet (Alden River Access). This is an additional 7455 feet above the required minimum of 2500 feet to public use areas (picnic grounds, campgrounds, cemeteries, lodges, shelter houses, playground equipment, lakes, swimming beaches, etc.) Refer to site map on page 3. This entitles the farm

to claim 30 points on the master matrix item 2.

Master Matrix Item #3: Distance to Educational, religious, or Commercial

The closest educational institution, religious institution or commercial enterprise is approximately 8827 from the facility (Alden City Limits). This is an additional 6952 feet above the required minimum separation distance of 1875 feet to the closest educational institution, religious institution, or commercial enterprise. Refer to site map on page 3. This entitles the farm to claim 30 points on the master matrix item 3.

Master Matrix Item #4: Distance to Closest Water Source

The closest water source is approximately 4511 feet from the facility. This is an additional 3999 feet above the minimum separation distance of 500 feet to the closest water source. Refer to site map on page 3. This entitles the farm to claim 30 points on the master matrix item 4.

Master Matrix Item #5: Distance to nearest thoroughfare

No Points Taken

Master Matrix Item #6: Distance to closest critical public area

The closest critical public area is approximately 9955ft from the facility (name of area). This is an additional 7455 feet above the required minimum of 2500 feet to critical public areas. Refer to site map on page 3. This entitles the farm to claim 10 points on the master matrix item 6.

Master Matrix Item #7: Distance to public and private wells

No Points taken

Master Matrix Item #8: Distance to Major Water, sinkhole or drainage well

The closest major water source (Iowa River) is approximately 9400 feet away from the facility. This is an additional 8500 feet above the minimum requirement of 1,000 feet from the closest agricultural drainage well, known sinkhole, or major water source. This entitles the farm to claim 50 points on the master matrix item 8.

Master Matrix Item #9: Distance to nearest confinement facility w/ MMP

No Points Taken

Master Matrix Item #10: Distance to High Quality Waters

The closest high quality (HQ) water, high quality resource (HQR) water, or protected water area (PWR) in Hardin County is the Iowa River, which is approximately 9400 feet away from the facility. This is an additional 8400 feet above the minimum requirement of 1,000 feet from the closest high quality (HQ) water, high quality resource (HQR) water, or protected water area (PWR). This entitles the farm to claim 30 points on the master matrix item 10.

Figure 1: Site Setback Map

Master Matrix Item #11: Air quality modeling

No Points Taken

Master Matrix Item #12: Covered Manure storage

The farm is claiming 30 points because it will be constructed with and utilize a covered concrete manure storage structure that is below the floor of the building where the animals are housed. Each formed manure structure will be covered by concrete slats, wood frame and steel covered roof and building sides. The DNR definition of "Covered" is, "A formed manure storage structure directly beneath a floor where animals are housed in a confinement feeding operation is deemed to be covered." Based on this definition, the farm qualifies for 30 points on Master Matrix Item # 12.

A. Design:

The site will consist of 2 swine finishing buildings housing a maximum of 5000 finishing animals, 2000 animal units. The building will have an 8' deep formed concrete pit beneath it and covered by slats. One hundred percent of the manure storage will be covered by the building roof, walls and floor. The construction design specification will meet the IDNR requirements as verified in the IDNR Construction Design Statement form, which is attached. According to Iowa Department of Natural Resources rules, this will qualify this structure as "covered" storage. (Refer to Construction Permit Application.)

B. Operation:

The building's roof, walls, and floor will be operated to maintain 100% coverage of the manure storage structure. No manure will be stored outside of the deep pit located below building. Weekly inspections of the building structure will be conducted by the site owner to ensure water is not infiltrating the storage pit, and that the structural integrity of the building structure covering said deep pit is not compromised in any areas.

C. Maintenance:

Each building's roof, walls and floor will be maintained for 100% coverage of the manure storage. Maintenance of the cover will be minimal, as it is built of steel, and is the main component of the confinement building. However, a maintenance routine shall include a weekly walk around inspections of the outside of the building structure, looking for any evidence of compromised integrity. The person conducting the maintenance inspections shall have appropriate experience and training to adequately access the condition of the structure. If any leaks or other issues relating to structure integrity are found, they will be immediately repaired with appropriate materials to achieve as-built condition.

Master Matrix Item #13: Emergency containment

No Points Taken

Master Matrix Item #14: Installation of filter(s)

No Points Taken

Master Matrix Item 15: Utilization of Landscaping

No Points Taken

Master Matrix Item 16: Stockpile or Compost Facility

Tri-B Section 8 Farm has elected to build a composting facility on the site of the barns. The structure will be greatly enhanced over what is required by Iowa law. It will include concrete compost pad, and also a roof over the facility to manage moisture. Additionally, the composting facility will have sidewalls to contain all potential run-off or leachate. This entitles the farm to claim 30 points on the master matrix item #16 for constructing an enhanced compost structure.

A. Design:

The facility will consist of a concrete floor and four concrete bays that are covered by a steel roof. The design of the composting facility does not allow the release of leachate or runoff from facility into water or surfaces. The design will help prevent problems with flies, rodents, other vermin and wildlife.

The facility will be designed per the ISU extension recommendations found in ISU Publication PM1917, which is attached. Based on the site capacity of 5000 head of wean to market finishing pigs and an annual animal output of 10,000 head, the facility will have a minimum total primary volume of 1700 cu ft. The minimum secondary capacity will be 1700 cu ft as well. Thus the total combined minimum volume will need to be at least 3,400 cubic feet.

The facility will have four(4) bays with each measuring a usable floor area of 10ft x 20ft. Assuming a depth of compost of 5ft, each bay will hold 1,000 cubic feet of compost material. The total combined capacity of all the bays and the facility as a whole will be 4000 cubic feet which is substantially greater than the required 3,400 cubic feet that is needed to properly compost all mortalities from the site.

The composting facility is located outside of wetlands and 100 year floodplain areas. It will be located at least 50ft from the property line, 100ft from private wells, 200ft from public wells, 500ft from neighboring residences, and 100ft from flowing or intermittent streams, lakes or ponds. Please see the attached facility design documents and setback map.

B. Operation:

The facility will be used for composting and stockpiling. Tri-B Section 8 will follow Iowa State University recommendations on the operation of the facility (see attached). A 12” bed of composting material will be placed on the floor before any carcasses are added. Livestock mortalities will be moved to the compost facility within 24 hours of death. Each Carcass will be covered with another 12” of composting material. Following the initial heating cycle, the carcasses and composting material will be moved from the primary bin to the secondary bin. This mechanical action will create a stirring affect which introduces oxygen into the pile, redistributes moisture and further breaks down the material. Per composting best practices, the pile will be turned as necessary to ensure effective composting, and so that there is no odor during the composting process. This will ensure that entire carcasses, including bones, will be completely converted into a valuable crop fertilizer that will then be spread on crop fields.

C. Maintenance:

No spreading of the compost shall occur until all soft tissue is fully decomposed. Finished compost will typically be spread fall and spring as weather permits according to crop nutrient requirement and MMP regulations. Application of finished compost will be done in such a manor to prevent runoff from the field into waters of the state. Under no circumstance will the finished compost be stored longer than 18 months Timely maintenance of the facility will take place to maximize degradation of the carcasses. The structure will be maintained in as built condition.

Figure 2: Compost Setback Map

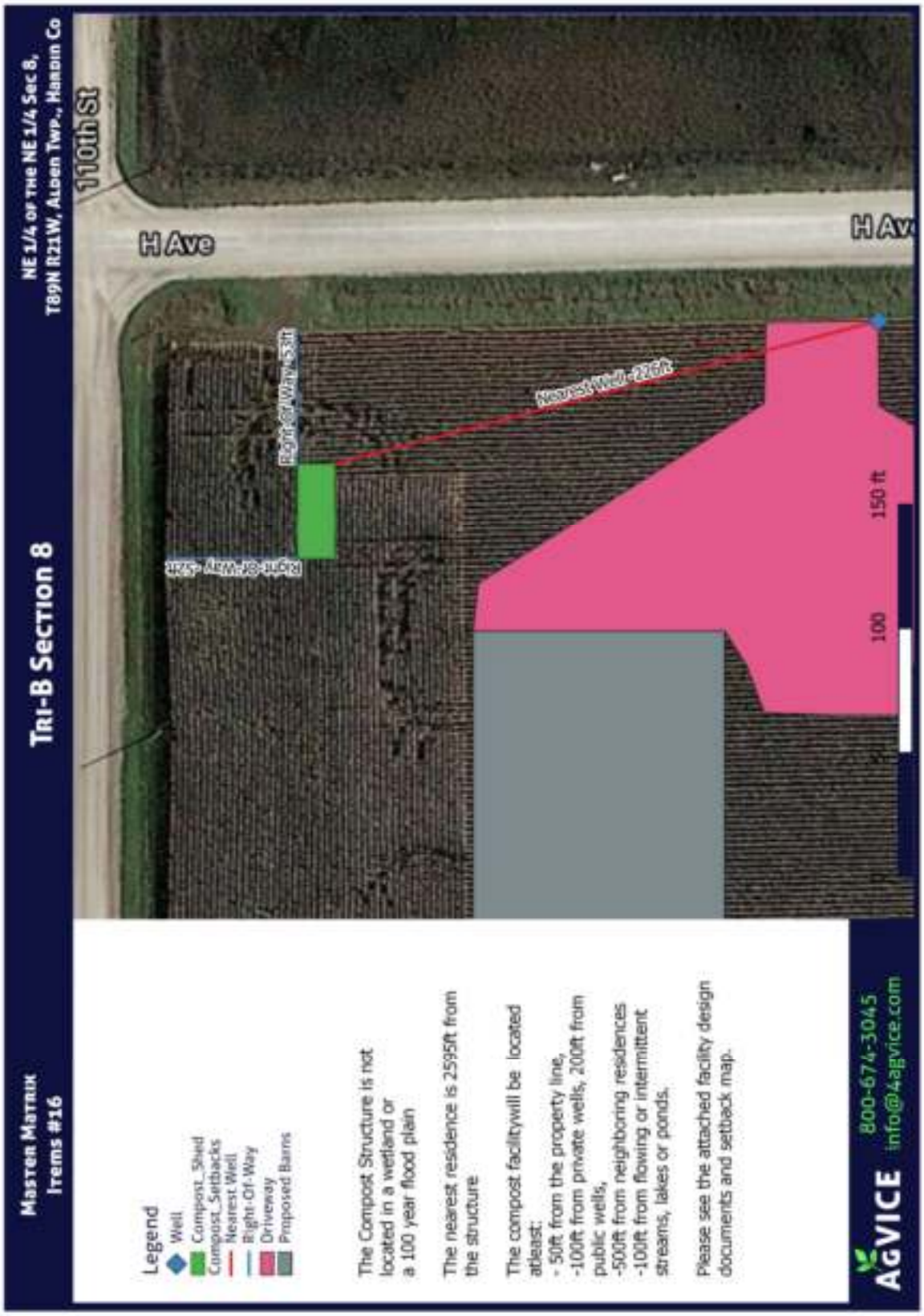


Figure 3: Compost Structure Floorplan

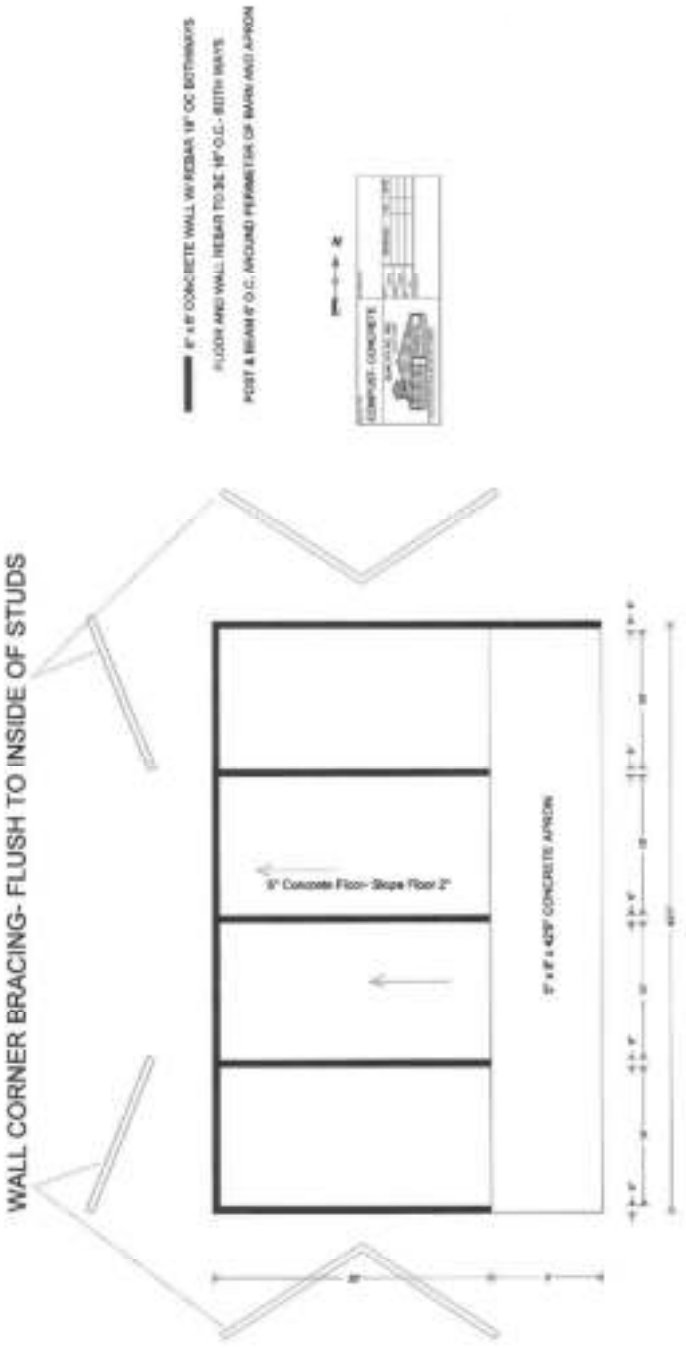
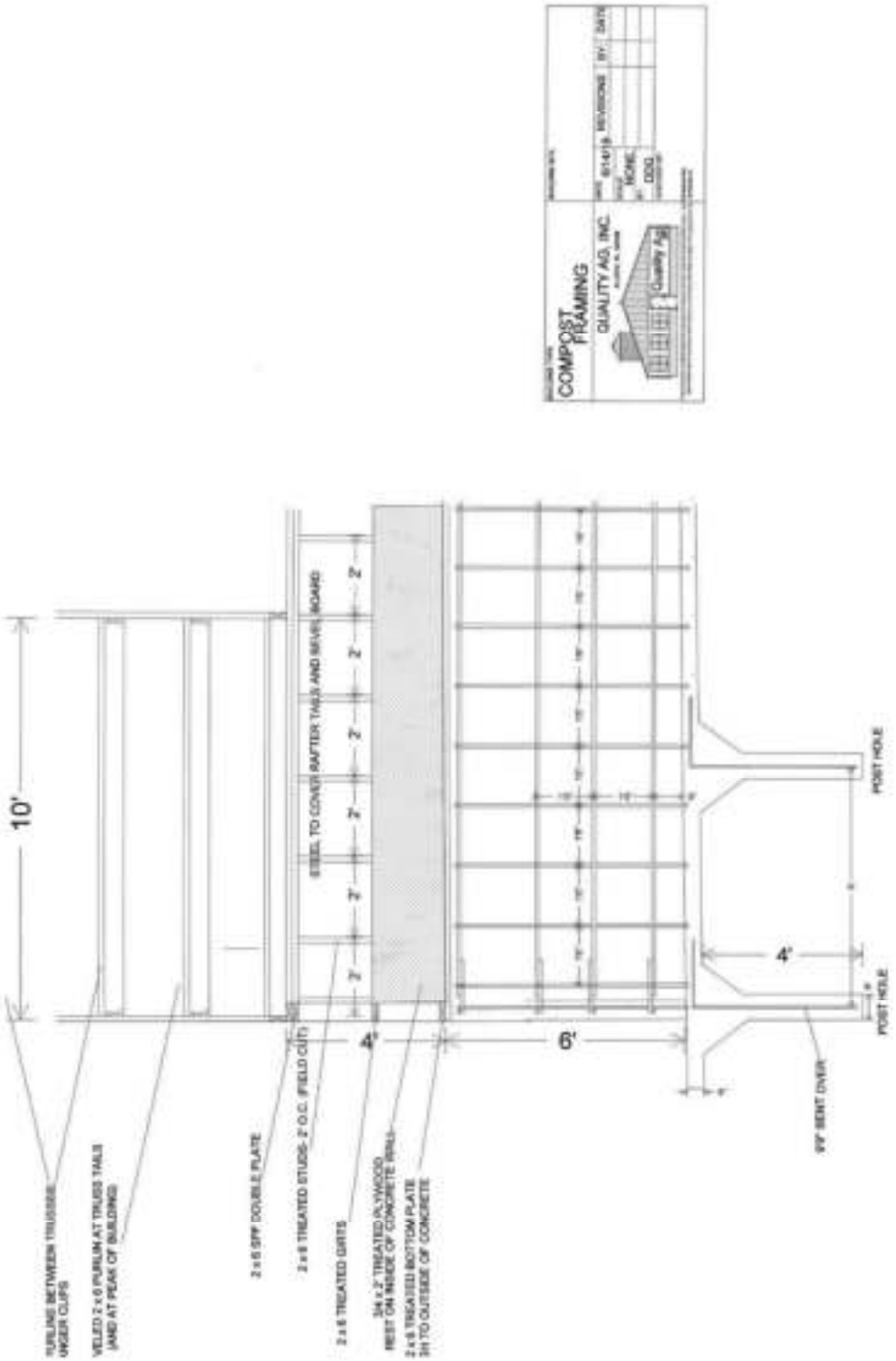


Figure 4: Compost Structure Roof and Walls



Master Matrix Item #17: Formed Storage

The farm is claiming 30 points because it will be constructed with and utilize a formed concrete manure storage structure that is below the floor of the building where the animals are housed. The DNR defines a formed storage structure as, “a covered or uncovered impoundment used to store manure from an animal feeding operation, which has walls and a floor constructed of concrete, concrete block, wood, steel, or similar materials. Similar materials may include, but are not limited to, plastic, rubber, fiberglass, or other synthetic materials. Materials used in a formed manure storage structure shall have the structural integrity to withstand.” Based on this definition, the farm qualifies for 30 points on Master Matrix Item # 17.

A. Design:

The site will utilize an 8' deep formed concrete pit. Refer to Construction Design Statement for specification of concrete and reinforcement materials to be used in this structure. The reinforced cast in place structure meets the requirements of chapter 65 for manure storage for swine housing and the support of roof walls and slats. During construction a floor and footings will be poured, then walls will be poured over the approved footing. The walls will be tied to the footing and floor using rebar in the manor as specified in the construction design statement. A water stop will be installed between the wall and the footing to prevent infiltration/exfiltration. No backfilling will occur until all slats are set and grouted in place. Prior to being put into service, it will be inspected to insure that it was no defects and processes maximum designed strength. As certified in the construction design statement, a perimeter monitoring tile will be installed around the base of the manure storage structure underground.

B. Operation:

The manure storage facility will be operated as a below building concrete pit. It is static with no moving parts. It will be operated in such a manor to preserve the as built strength and integrity of the structure. Heavy equipment will maintain a safe distance to avoid any stress on the structures. The concrete walls of the manure storage pit are designed for heavy equipment to be operated no less than 5 feet from the walls. The pump-out ports prevent heavy equipment from being operated closer than 5 feet from the pit walls. The pump-out ports are constructed of reinforced concrete so that heavy equipment can be operated within 5 feet of the pump-out ports.

Weekly inspections of the storage structure shall be conducted to assure the soundness of the structure. They will include the following:

1- Weekly concrete pit inspections for cracks and other defects to assure the soundness of the structure. The inspections will consist of walking around the outside of the entire structure visually observing for cracks and other defects. If a crack or other defect is observed from the outside, an inspection will be made from the inside of the structure to the extent possible without entering the pit.

2- Weekly observations of the level of the manure in the pit will be conducted to prevent overflow and maintain air flow. In addition, any drop in pit levels could be an indication of a leak or other structural problem and will be investigated immediately. All repairs will be performed using the maintenance procedures in the next section.

C. Maintenance:

Due to the concrete design and specification for the structure, maintenance is

expected to be minimal for this structure. However, a maintenance routine shall include a weekly walk around inspection of the exterior of the below building pits, looking for any evidence of compromised integrity, cracks or any evidence of outside water entering the pit. The person conducting the maintenance inspections shall have appropriate experience and knowledge to adequately access the condition of the manure storage structure. If any evidence of cracks is found, grout or another form of sealing agent will be immediately used to appropriately seal the cracks to achieve as-built condition of the manure storage structure.

In addition, the integrity of each pit shall be evaluated by observing the perimeter footing tile discharge for signs of contamination such as bad smell, discoloration, excessive liquid in the tile lines during dry times, and dead foliage. If contamination is observed the DNR will be notified, and an immediate investigation will be conducted by the site owner and any necessary structural experts to locate the source of the problem and the problem will immediately be corrected. The investigation will include closing the tile shutoff valve and taking water samples for visual and laboratory analysis.

Also, proper functioning of the perimeter tile system will be checked during the weekly inspections. Proper operation of the perimeter tile will be evaluated by observations of the rate of flow from the tile through the monitoring port or the discharge point. If the flow is not consistent with soil moisture levels, an investigation for possible collapse or blockage will be conducted immediately. Any collapsing and plugging of the drain tile must be fixed and immediate measures will be taken if any leaks are detected from the pits.

If contamination in the tile line is observed or if the tile appears to be blocked, the problem will be located as noted above and proper remedial actions will be taken to stop the leak, such as sealing any crack as detailed above or repairing any larger leak with concrete, or any other appropriate remedial actions as directed by consulting structural experts. Any and all repairs made to the manure storage structure and perimeter tile system will be done in a manner such that when completed they will achieve as-built condition.

Master Matrix Item #18: Aerated manure storage structure

No Points Taken

Master Matrix Item #19: Truck Turnaround

Tri-B Section 8 Farm has elected to build a driveway and truck turn around on the site of the facility. This will prevent semi trucks from having to back into the site from the road and enhance driver safety around the site. This entitles the farm to claim 20 points on the master matrix for constructing a truck turnaround.

A. Design:

The site will have a driveway large enough so that trucks will not have to back into the site from the road. It will have a diameter greater than 120ft. Semi-trucks will be able to pull into the site and make a complete turn without the need to back onto the road. The driveway will be adequately surfaced for traffic in inclement weather. The driveway base

will be constructed with a 2-3 inch diameter base rock. Layers of road stone will then be added on top of the larger base rock to make a surface similar to county roads.

B. Operation:

The driveway will be operated to provide for safe entrance and exit to the property for delivery vehicles and not to obstruct the public thoroughfare. Snow will be promptly removed from the driveway in the winter. Salt or sand may also be added in the winter to improve traction if icy conditions develop.

C. Maintenance:

The driveway will be maintained to a level that will support regular truck traffic. Road rock gravel will be used as a road surface that will be monitored for the purposes of leveling, filling potholes, and adequate snow removal. It will be periodically regraded and additional gravel added as needed to maintain as built condition.

Master Matrix Item #20: No history of Administrative Orders

Tri-B LLC or it's owners have had no history of administrative orders in the last 5 years. This entitles Tri-B Section 8 to 30 points on Matrix item #20.

Master Matrix Item #21: waiver of Pollution Control Tax Exemption

No Points Taken

Master Matrix Item #22: Homestead Tax Exemption or Closest Resident

No Points Taken

Master Matrix Item #23: Family Farm Tax Credit

No Points Taken

Master Matrix Item #24: Facility size

The facility will hold a total capacity of 5000 head, or 2000 animal units. Refer to Construction Permit Application, page 3. This entitles the farm to claim 20 points on the master matrix item 24.

Master Matrix Item 25: Feeding & Watering Systems that reduce manure volume

Tri-B Section 8 Farm has elected install and use a watering system that will significantly reduce the volume of manure that is produced on the site. Attached data shows this style of watering system reduces water usage and manure production by 25%. Real world use in facilities have shown an even greater reduction in manure production can be achieved. This entitles the farm to claim 25 points on the master matrix item 25.

A. Design:

The buildings on the site will utilize a cup style watering device. These waterers utilize pressure regulators to reduce waste and manure volume in the storage structure. Industry wide accepted data shows significant water savings compared to a gate mounted watering nipple. Refer to the attached scientific articles illustrating the water savings and benefits of utilizing cup style waterers.

B. Operation:

Watering cups will be adjusted to reduce waste and promote water and feed efficiency for the facility. The water savings result in reducing the gallons of nutrients in the pit that later have to be hauled out onto farm fields.

C. Maintenance:

The cup waterers will be inspected on a daily basis and adjusted as needed. Water flow and usage will be monitored and logged on a regular basis to control waste and excess manure volume due to waste. The water and feed systems will be maintained in as built condition.

Master Matrix Item 26e: Injection of manure

In support of points taken for item 26e, Tri-B Section 8 will inject manure on the same date of application to utilize the maximum nutrient value of the manure. This will also dramatically reduce the chances of nutrient loss due to field runoff conditions created by rain events. This will also be beneficial to any neighbors as the odor will not stay in the area as long as is created when manure is surface applied. The manure will be injected by a certified commercial manure applicator. The normal and preferred equipment used for application consists of a vertical tillage style injection system. Today Tony Hand provides manure application services to Tri-B. See Manure Management Plan for additional information in the injection of manure. Also see attached ISU Extension Document: "Tillage, Manure Management and Water Quality". This entitles the farm to claim 30 points on the master matrix item 26e.

Master Matrix Item #27: Two-year phosphorus crop uptake

No Points Taken

Master Matrix Item #28: Application on farmland with buffer strips

No Points Taken

Master Matrix Item #29: No manure application on HEL farmland

No Points Taken

Master Matrix Item #30: Application of manure to closest residence

No Points Taken

Master Matrix Item #31: Application of manure to closest public use area

The closest public use area is Popejoy Conservation Park. This is located more than 200 feet above the minimum required separation distance from where manure application will occur. See attached maps located in Exhibit D showing 200ft setback for each field currently in the MMP. Also see attached DNR document: "Separation Distances for Land Application of Manure". This entitles the farm to claim 5 points on the master matrix item 31.

Master Matrix Item #32: Manure application to closest school, church or business

The closest educational institution, religious institution, or commercial enterprise is located in Popejoy. This is located more than 200 feet above the minimum required separation distance from where manure application will occur. See attached maps located in Exhibit D showing 200ft setback for each field currently in the MMP. Also see DNR document: "Separation

Distances for Land Application of Manure". This entitles the farm to claim 5 points on the master matrix item 32.

Master Matrix Item #33: Manure Application Setback distance from wells

No Points Taken

Master Matrix Item #34: Application of manure to closest water source

No Points Taken

Master Matrix Item #35: Manure Application Setback distance from HQ Water

The closest high quality (HQ) water, high quality resource (HQR) water, or protected water area (PWR) in Hardin County is the Iowa River. This river is located more than 400 feet above the minimum required separation distance from any land where manure application will occur. See attached maps located in Exhibit D showing 400ft setback for each field currently in the MMP. Also see attached DNR list of high quality (HQ) water, high quality resource (HQR) water, or protected water area (PWR). This entitles the farm to claim 10 points on the master matrix item 35.

Master Matrix Item #36: Demonstrated community support

No Points Taken

Master Matrix Item #37: Worker Safety & Protection Plan

In support for points taken for item 37, Tri-B Section 8 has completed a Worker Safety and Protection Plan to accompany the Emergency Action Plan. See attached Work Safety Plan located in Exhibit A at the end of this document. The worker safety plan will be kept on site at all times. This entitles the farm to claim 10 points on the master matrix item 37.

Master Matrix Item #38: MMP confidentiality waiver

No Points Taken

Master Matrix Item #39: Economic value

No Points Taken

Master Matrix Item #40: Emergency Response Plan

An Emergency action plan in compliance with Iowa State Extension publication PM 1859 was submitted with the construction permit application and was made a condition in the construction permit. The attached Emergency Response Plan, Emergency Action Plan and subsequent records will be posted and kept on site with manure management plan records. The plans will be implemented in case of emergency. Any changes needed to the ERP will be made immediately and re-posted on site, to ensure the document is always up to date. See Attached Emergency Response Plan located in Exhibit B at the end of this document. Also attached are driving directions and site contacts. This entitles the farm to claim 5 points on the master matrix item 40.

Master Matrix Item #41Closure Plan;

In the event that this site will need to close the deep pit, the NRCS Code 360 – “Closure Of Waste Impoundments”, which is attached, will be followed. The site specific closure plan is

attached in Exhibit C at the end of this document. The site closure plan will be kept on site with all other MMP documents at all times. This entitles the farm to claim 5 points on the master matrix item 41.

Master Matrix Item #42; EMS

No Points Taken

Master Matrix Item #43: CNMP

No Points Taken

Master Matrix Item #44: Groundwater monitoring

No Points Taken

Exhibit A *(Item #37: Worker Safety & Protection Plan)*

Tri-B Section 8 Site SAFETY

To Be kept on site with all other MMP documents at all times

Emergency Preparedness- Hospital and emergency medical care contact information and the site's 9-1-1 address will be displayed in the Tri-B Section 8 site office. All injuries, regardless of how minor, will be reported to the Tri-B Section 8 owners. Employees need to be aware of the site's:

- Method for communicating an emergency (i.e. verbal, by radio, by cell phone)
- Severe weather shelter
- Evacuation point, and
- Procedure for accounting for all employees after an emergency evacuation.

In the event of a fire, report the fire immediately. Employees may attempt to extinguish the fire only if they are comfortable doing so, have the appropriate training, and the fire is manageable – if the fire is too big, Get Out!

Personal Protective Equipment (PPE) - All necessary PPE will be on site and available for workers.

Equipment and Machinery- Proper machine guarding will always be in place, and equipment maintenance guidelines will be followed in accordance with the manufacturer's recommendation.

Minors will always be under the supervision of an authorized adult

Tri-B Section 8 Recommendations for Accident Prevention

To all Tri-B Section 8 site workers: Make accident prevention a management as well as a personal goal. Develop an awareness of potential hazards on the farm and make every possible effort to eliminate them. Make a conscious effort to prepare for emergency situations including fires, vehicle accidents, electrical shocks from equipment and wires, and adverse health effects from chemical exposures. Be aware that the entire facility is built on top of a manure storage area and plan for the potential danger of the manure and gases.

- Ensure exit routes and exits are free of obstructions
- Reduce your risk of injury and illness with preventive measures. Read and follow instructions in equipment operator's manuals. Follow instructions on product labels for safe use, handling, and storage.
- Always use proper lifting techniques. Never attempt to lift or push an object that is too heavy; use an alternate means of lifting or seek assistance

- Observe and follow all posted warnings and rules
- Conduct routine inspections of the equipment to determine problems and potential failures that may contribute to or cause an accident.
- Conduct meetings with fellow workers and family members to assess safety hazards, discuss potential accident situations, and outline emergency procedures.
- Be especially alert to hazards that may affect children.
- Minimize hazards by careful selection of products we buy, by providing good maintenance of tools, buildings, and equipment, and establishing good housekeeping procedures.
- Make sure guards for farm equipment are put back on after maintenance to protect workers from moving machinery parts.
- Review material safety data sheets (MSDSs) and labels that come with chemical products.
- Chemicals that may be poisonous or not intended for consumption should be kept in well-labeled containers

Communicate information concerning hazards to all workers. Prevent pesticide poisonings and dermatitis caused by chemicals by ensuring that protective measures recommended in the MSDSs or labels are taken.

- Take the necessary precautions to prevent entrapment and suffocation caused by unstable surfaces of feed storage bins.
- Be aware that methane gas, carbon dioxide, ammonia and hydrogen sulfide can be present in unventilated grain bins and manure pits in quantities sufficient to cause asphyxiation or explosion.
- Lockout/tagout (de-energize) equipment before performing repairs or maintenance operations.
- Safety precautions should be taken for hot work activities (i.e. move hot work activity to a designated shop or outside of the building, adequate ventilation, use of welding blankets).
- Properly store sharps/needles to prevent inadvertent injuries or punctures.

Benefits

A safer, healthy workplace improves production and morale and prevents human suffering.

Summary

Tri-B Section 8 wants to raise the level of awareness concerning the need for improved site safety. All site workers should be active in the prevention of potentially dangerous equipment and situations. Please let Tri-B Section 8 know of any potentially dangerous equipment or situations and be assertive to follow through to make sure that remedies are made.

Exhibit B *(Item #40: Emergency Response Plan)*

Tri-B Section 8 Site Emergency Response Plan

To Be kept on site with all other MMP documents at all times

Emergency Action Plans

Emergency action plans provide detailed information on what to do if you have an accident or emergency at your livestock facility, such as a manure spill. While Emergency Action Plans are not required, it is a good idea to keep a copy of the plan with your manure management plan or records, production records, or somewhere that is easily located by you, family members, or employees. A well-designed and implemented emergency action plan can reduce the severity of emergencies, the risk to humans and animals, the economic losses, and the potential of environmental pollution.

This fact sheet is designed to address emergency action plans in the event of a manure leak or spill. In addition to developing an emergency action plan to address manure management, you might consider developing additional plans to address mass animal mortalities; weather-related emergencies; or electrical, plumbing, or other mechanical failures.

An emergency action plan should contain four items:

1) a plan of action to prevent the release of manure or prevent environmental contamination

2) a detailed map of the site and application fields

3) a list of contact names and numbers included with the plan and posted near the phone

4) a clean-up plan

This fact sheet is not designed to be a "fill-in-the-blank" form. It is designed to give you the basic information needed to prepare an emergency action plan. The plan you design will be specific to your livestock facility and your management practices. You may want to work with your local emergency management coordinator when developing your emergency action plan. The coordinator can help you identify resources and file any necessary notifications needed in the response of an accident or spill.

PLAN OF ACTION

A plan of action should be developed for each livestock facility. Review the plan of action every six months and make sure all personnel involved with the livestock facility are familiar with the plan. Items to consider for a plan of action include:

- Assess the situation, know what factors are at risk (human health, animal welfare, the environment, livestock structures)
- Reduce risk through implementation of planned steps
  - Prevent spills or discharges by maintaining equipment and following plans
  - Eliminate the source of manure if spill or discharge occur
  - Contain the spill
- Contact appropriate authorities to report emergencies or accidents
- Assess damages

In the event of a manure spill or leak, every effort possible should be made to prevent movement of manure off-site. If necessary, contact neighbors or nearby contractors with earth-moving equipment available to assist with containment. If tile intakes are present, have devices on hand to prevent manure from entering the tile lines. Contact neighbors with manure handling equipment to land apply the manure. Prevent manure from entering bodies of water or other environmentally sensitive areas, such as sinkholes and ag drainage wells. For assistance, contact your local sheriff's department or other emergency response personnel in your county. **State law requires that you report manure spills or leaks to the Iowa Department of Natural Resources as soon as possible, but not later than 6 hours from onset or discovery of the problem (see *Contact Names and Numbers*).**

IOWA STATE UNIVERSITY
University Extension

ERP Site Contact List

IOWA STATE UNIVERSITY
University Extension

Contact Names and Numbers

A list of contact names and numbers should be filed with the emergency action plan and a copy posted by the phone for emergencies.

Site Name

Tri-B Section 8

Owner/Operator

Name: Tri-B LLC

Phone: 641-858-6416

Site Address (including e911 address)

H Ave

Alden, IA 50006

Specific Directions to the Site

From Casey's in Alden:

Head East on Co Rd D20 & drive 2.1 miles

Turn Left onto H ave and drive 1.8 miles

HUMAN INJURY

Explain that self-contained breathing apparatus may be required if someone has been overcome by gases.

Rescue Unit/Ambulance

Phone: 911

Doctor or Physician

Name: McFarland Clinic

Phone: 641-648-2586

Hospital or Medical Clinic

Name: Hansen Family Hospital

Phone: 641-648-7000

Fire Department

Phone: 911

County Sheriff

Name: Hardin County Sheriff

Phone: 641-939-8189

County Health Official

Name: Hardin Co Envro Health dept

Phone: 641-849-7372

Poison Control Center

Phone: 800-222-1222

Others

Name:

Phone:

Name:

Phone:

Post by the telephone for reference.

IOWA STATE UNIVERSITY
University Extension

Contact Names and Numbers

Manure Leaks or Spills

IOWA DEPARTMENT OF NATURAL RESOURCES FIELD OFFICE

State law requires that you report manure spills or leaks to the Iowa Department of Natural Resources as soon as possible, but not later than 6 hours from onset or discovery of the problem (see *Contact Names and Numbers*).

Work Days 8 a.m. - 4:30 p.m.
Phone: 641-424-4073

Weekends, Holidays, and After Business Hours
Phone: (515) 281-8694

FIELD OFFICE LOCATIONS
ENVIRONMENTAL PROTECTION DIVISION

FIELD OFFICE	LOCATION	PHONE NUMBER
1	309 W. Main, Suite 4 • Manchester, IA 52057	319-927-2640
2	2300 15th St. SW • Mason City, IA 50401	641-424-4073
3	1900 North Grand Ave. • Spencer, IA 51301	712-262-4177
4	1401 Sunnyside Lane • Atlantic, IA 50022	712-243-1934
5	401 SW 7th St., Suite I • Des Moines, IA 50309	515-725-0268
6	1004 West Madison • Washington, IA 52353	319-653-2135

COUNTY SHERIFF

Name: Hardin County Sheriff
Phone: 641-939-8189

CONTRACTOR

Earth Moving
Name: McDowell & Sons
Phone: 641-648-5071

Pumping Equipment
Name: Tony Hand
Phone: 641-751-8850

Hauling Equipment
Name: Tony Hand
Phone: 641-751-8850

Equipment Owners
Name: Ryan Tripp
Phone: 641-425-6389

County Engineer
Name: Hardin Co Engineer's Office
Phone: 641-858-5058

Others
Name:
Phone:

Post by the telephone for reference.

IOWA STATE UNIVERSITY
University Extension

Contact Names and Numbers

PARTIAL SYSTEM FAILURE

Equipment suppliers and technicians:

Electricity
Name: Brent Tripp
Phone: 641-858-6416

Plumbing
Name: Brent Tripp
Phone: 641-858-6416

Ventilation
Name: Brent Tripp
Phone: 641-858-6416

Heating
Name: Brent Tripp
Phone: 641-858-6416

Feed
Name: Christensen Farms
Phone: (507) 794-5310

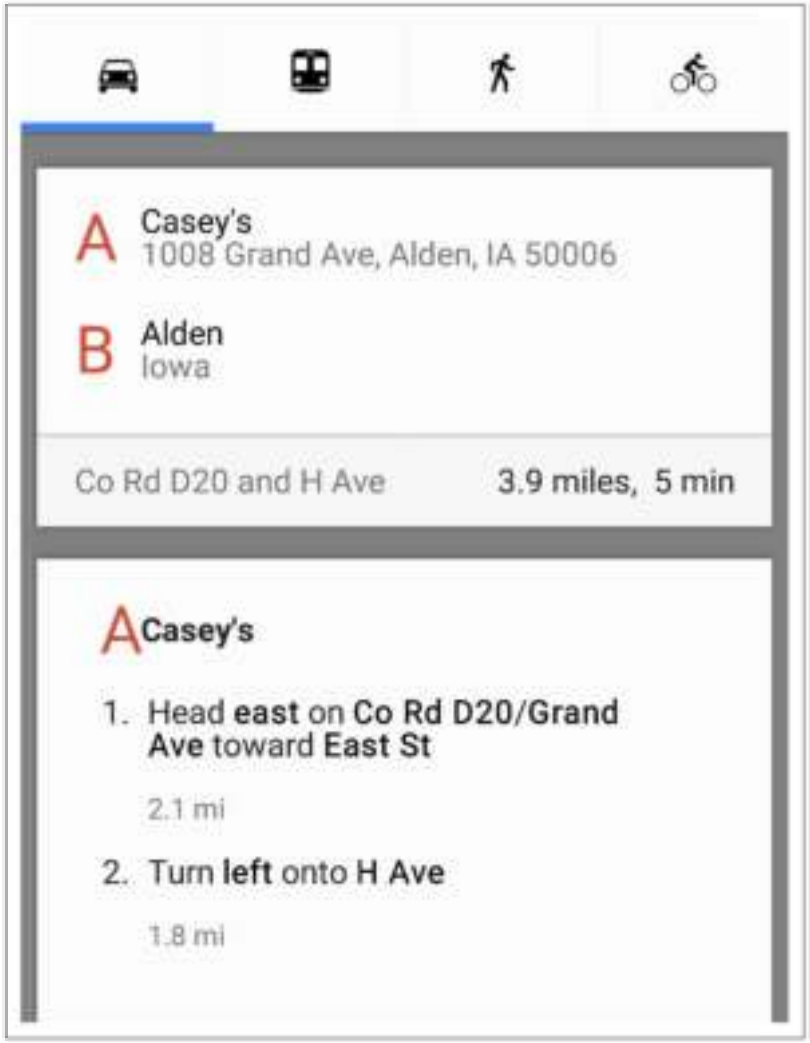
Veterinarian
Name: Christensen Farms
Phone: (507) 794-5310

Mortality Disposal
Name: Darling International
Phone: 800-800-4841

Insurance Carrier
Name: HCSB Insurance Service
Phone: 641-939-3404
Policy: New Policy

Other

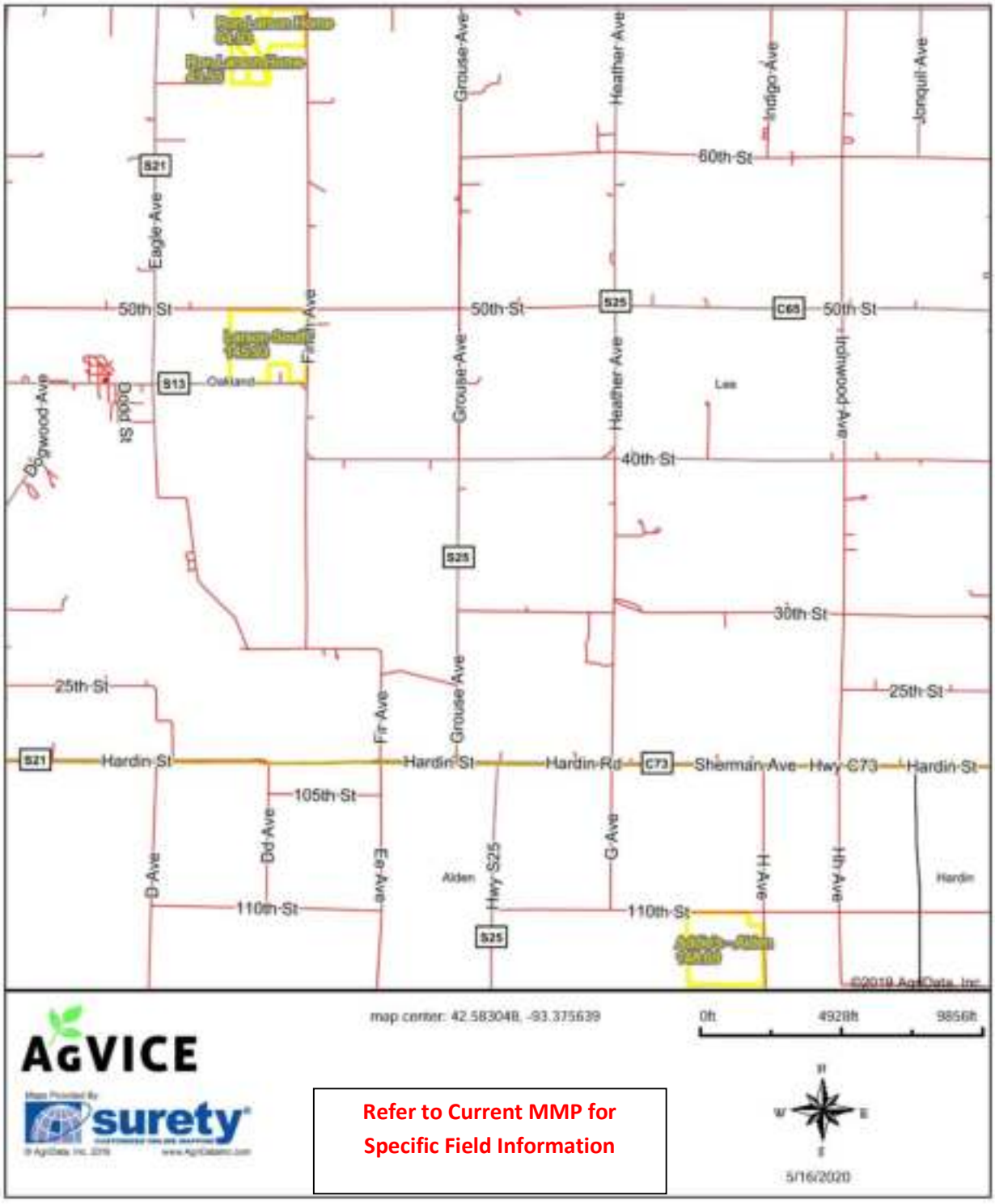
Post by the telephone for reference.


A Casey's
1008 Grand Ave, Alden, IA 50006
B Alden
Iowa
Co Rd D20 and H Ave
3.9 miles, 5 min
A Casey's
1. Head east on Co Rd D20/Grand Ave toward East St
2.1 mi
2. Turn left onto H Ave
1.8 mi

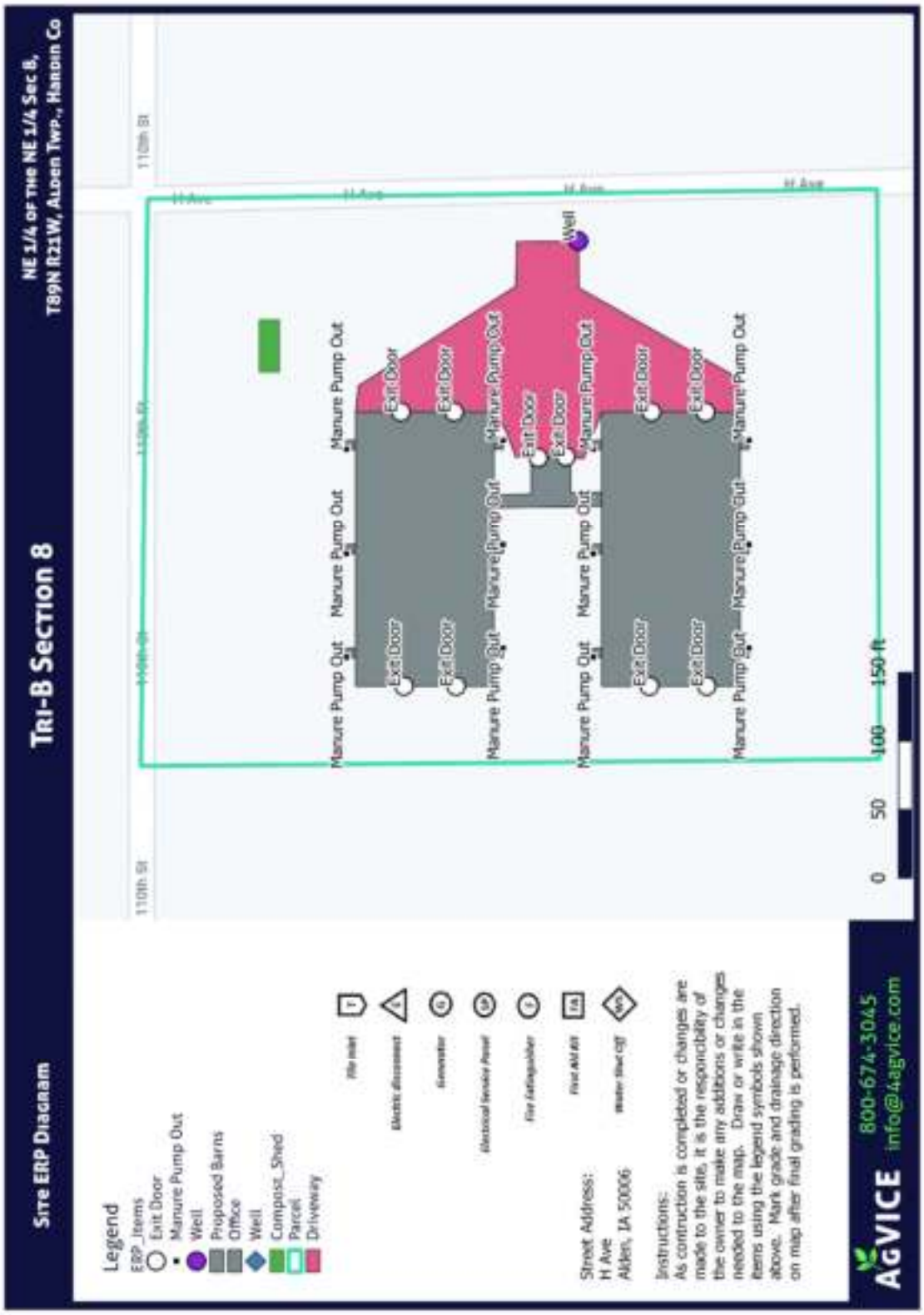

B Alden

ERP Field Location Map

OverView Map



ERP Site Diagram



Emergency Action Plan

MEDICAL EMERGENCY

1. STOP all other activities to address the emergency.

2. CHECK scene and the nature and extent of the medical emergency. Ensure that the scene and/or area is safe to enter. Determine how much help is needed.

3. CALL 9-1-1 or the local emergency number for an ambulance immediately if the victim needs emergency medical treatment (loss of consciousness, severe bleeding, airway/breathing difficulty, eye injury, broken bones, spinal injury, chest pains, etc).

A. For life-threatening injuries or illnesses (chest pains, eye injury, severe bleeding, head/neck wound, airway/ breathing difficulty, loss of consciousness, broken bones, etc.), Call 9-1-1 immediately. If you are unsure whether the situation is a life-threatening emergency, call 9-1-1 immediately.

- When reporting the emergency provide the following information:
    1. Type of emergency
    2. 9-1-1 address of facility (have readily available)
    3. Location of the victim
    4. Condition of the victim
    5. Any dangerous conditions
    6. Name of caller
- Do not move the individual unless authorized by medical personnel, or if the accident scene is becoming unsafe for the responders and accident victim.

B. For nonlife-threatening injuries or illness, the employee will notify the supervisor immediately. If there is any uncertainty if the situation is a life-threatening emergency, call 9-1-1 immediately.

I. Employee will seek immediate medical attention as deemed appropriate.

Ii. If the individual does not request an ambulance, then assist the individual with transportation to the proper medical treatment facility.

Iii. Discuss appropriate biosecurity measures during emergencies with the supervisor.

4. CARE for the victim until help arrives.

5. For any chemical product information, refer to the Material Safety Data Sheets (MSDS) binder

FIRE PROCEDURES

1. STOP all other activities to address the emergency.

2. CALL the fire protection district immediately.

3. EVACUATE the building upon seeing smoke/fire or hearing the fire alarm (other types of evacuation are covered elsewhere in this document):

a. Verbally warn employees in the immediate area, (such as, yelling “FIRE!”)

b. All employees are required to evacuate the building, unless otherwise assigned or authorized to remain by the emergency agency in charge.

c. CLOSE THE DOORS AS YOU LEAVE.

d. Use Stairways. When out, move away from building to a prearranged assembly area for a head count. You should be as far out from the building as it is high. Leave walks and drives open for fire and emergency responders.

e. If necessary for a safe, orderly evacuation, activate fire extinguishers or firehose. At the discretion of the individual, use extinguisher if trained and assigned to do so.

4. ASSESS the nature and extent of the fire.

5. NOTIFY Barn owner of the fire as soon as possible.

6. POWER disruptions can affect the water, feed, ventilation, emergency power, and manure transfer systems. Make sure all systems are operational for any surviving animals, especially the ventilation system.

7. EMERCENCY ANIMAL RELOCATION: Establish emergency transportation contacts in advance and make transport arrangements for surviving animals.

SEVERE WEATHER

1. SEEK SHELTER in an area of the building protected by concrete, that has no glass windows (exterior or interior) such as a hallway or bathroom area. Exit the shelter area ONLY after the danger has fully passed.

2. NOTIFY persons on-site to evacuate the building verbally, by radio or by cell phone and take head count by the supervisor-in-charge

3. ASSESS damage and implement necessary Emergency Action Plan procedures.

i. Thunderstorm Warning, it is not necessary to take any additional steps other than to ensure that you are prepared if the conditions deteriorate.

ii. Tornado Warning, take shelter in an area of the building protected by concrete, such as a hallway or bathroom area.

- If you are unable to seek shelter in one of the designated areas, move away from windows. Stay away from auditoriums, areas having a wide, free span roof, or the upper levels of a building. Take cover under heavy furniture.
- If you are outdoors and unable to access an indoor shelter, lie flat in the nearest depression, such as a ditch or ravine. If there is time, move away from the path of the tornado at a right angle.

POWER FAILURE

1. STOP all other activities to address the emergency.

2. MAKE SURE generator starts and is working properly. If generator fails:

a. NOTIFY persons on-site to evacuate the building verbally, by radio or by cell phone.

b. Move away from building to the site evacuation point for a head count by the supervisor-in-charge.

c. DO NOT RE-ENTER the confinement areas until ventilation is re-established due to possible asphyxiation hazard.

3. MONITOR generator and fuel level periodically to ensure proper operation.

4. DROP emergency curtains ONLY in the event that electrical power cannot be restored within 15 minutes (varies with size of animals and ambient temperature).

5. NOTIFY Pig owner of the outage as soon as possible.

STRUCTURAL DAMAGE

1. EVACUATE the building upon seeing or hearing of significant structural damage (i.e. roof collapse from snow load, severe weather damage, or explosion).

2. NOTIFY persons on-site to evacuate the building verbally, by radio, or by cell phone.

3. Move away from building to the site evacuation point for a head count by the supervisor-in-charge.

4. TURN OFF electricity and gas to the site, until deemed safe to turn on.

5. NOTIFY Owner of the structure damage as soon as possible.

GAS LEAK

1. EVACUATE the building upon seeing or smelling the gas leak.

2. NOTIFY persons on-site to evacuate the building verbally, by radio, or by cell phone.

3. Move away from building to the site evacuation point for a head count by the supervisor-in-charge.

4. TURN OFF gas to the site, until deemed safe to turn on.

5. CALL the gas company regarding the leak.

6. NOTIFY Owner of the leak as soon as possible.

MANURE DISCHARGE

1. STOP all non-emergency activities to address the situation.

2. CHECK the scene to make sure it is safe.

    i. Assess the extent of the emergency.

    ii. Determine how much help is needed.

    iii. Initiate Emergency Response Plan as necessary

3. CALL for help as needed.

    i. If serious human injuries have occurred, immediately call 9-1-1 or the local emergency number for an ambulance before caring for the victim.

ii. If manure has been spilled on the road, contact police for traffic control.

iii. Call site owner and then the manure applicator and/or excavation contractor depending on quantity released

4. CARE for any injured people.

5. CONTAIN the spill and prevent downstream movement to waters of the state. Depending on the situation, this may or may not be possible.

6. ASSESS the extent of the spill and note any obvious damages.

i. Did the waste reach any surface waters?

ii. Approximately how much was released and for what duration?

iii. Any damage noted, such as employee injury, fish kills, or property damage?

iv. Did the spill leave the property?

v. Does the spill have the potential to reach surface waters?

vi. Could a future rain event cause the spill to reach surface waters?

vii. Are potable water wells in danger (either on or off the property)?

7. REPORT the spill to the appropriate regulatory agencies including Iowa Department of Natural Resources

8. IMPLEMENT procedures as advised by the appropriate agency.

9. CLEAN all livestock manure from the affected area.

i. Vacuum-pump the manure to an approved manure storage or land apply the manure according to the nutrient management plan.

ii. Flush residual materials from the area with pressurized fresh water.

iii. Capture and land apply rinse water.

iv. Excavate and land apply manure-saturated soil.

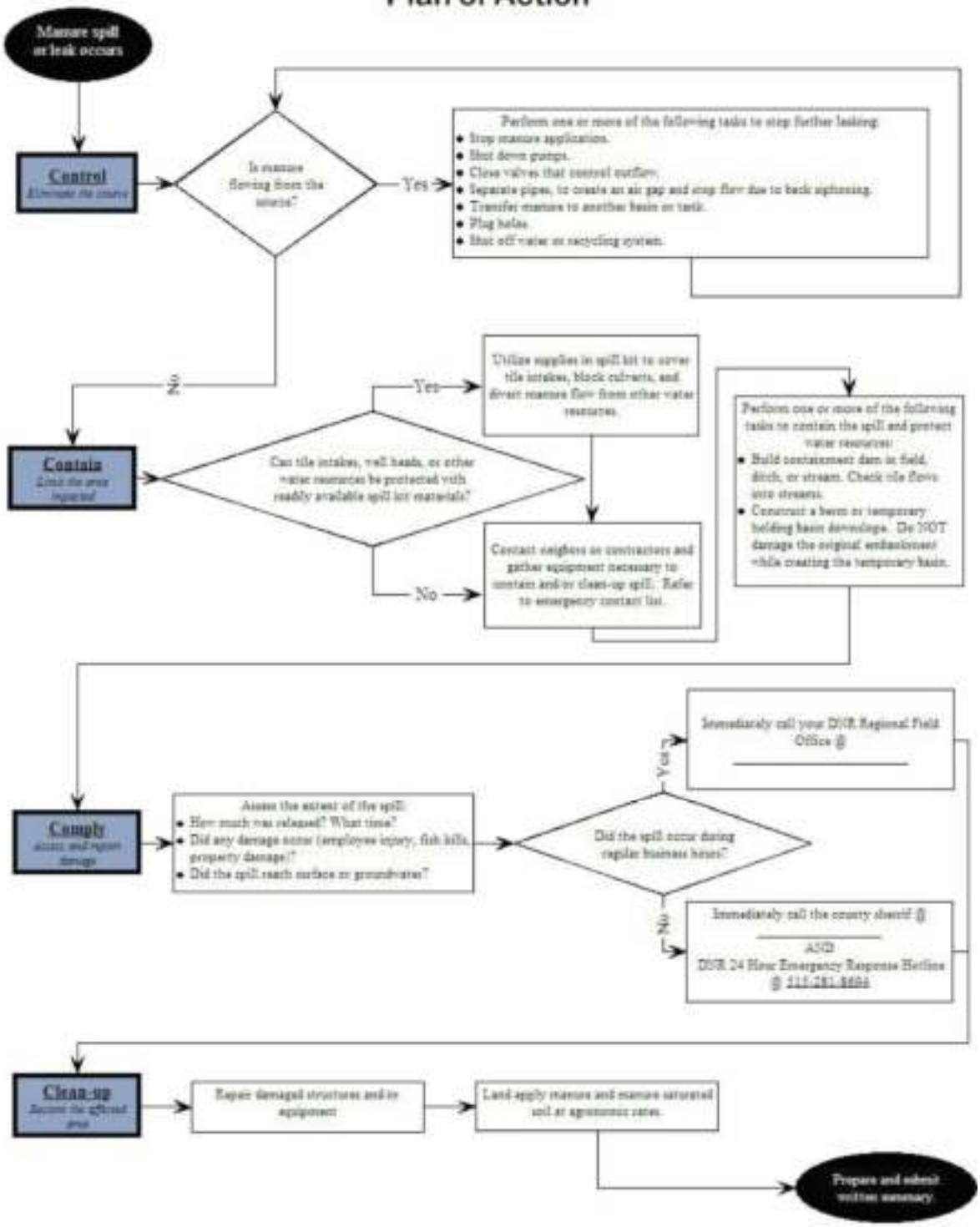
v. Remove the temporary containment, and flush the affected area with large volumes of fresh water until clean.

vi. REPAIR the equipment that caused the discharge before further use.

vii. RESTORE the grade and vegetation of the affected area.

viii. DOCUMENT all cleanup and repair activities with a written log and photographs.

Emergency Manure Spill Response Plan of Action



9

Exhibit C *(Item #41 Closure Plan)*

Tri-B Section 8 Site Closure Plan

To Be kept on site with all other MMP documents at all times!

Closure Plan as of 5/15/2020

This plan has been developed and written in accordance with NRCS conservation practice standard "Closure of Waste Impoundments." This closure plan is based on NRCS code #360. This plan also meets the standards and requirements that are set forth by the Iowa Department of Natural resources. The closure shall comply with all federal, state of Iowa, tribal and local, laws, rules and regulations at the time of the closure. Tri-B LLC will notify the Iowa DNR Field Office of their intent to the close the structures on the farm, which consist of two(2) 8ft deep manure pits below ground, subsequent to six(6) months of the structures being emptied of last livestock. Applicant will follow any closure rules that may be established at the time that are more stringent than what are found in this closure plan. Tri-B LLC and the Iowa DNR will establish a timeline for completion of this closure plan.

1. The manure will be well agitated to try and remove as much of the manure as possible. The effluent, solids, and any sludge will have an analysis for nitrogen, and phosphorus performed on it. This analysis will be used in determining the amount of material that will be applied on a per acre basis according to the manure management plan
2. The non-concrete construction materials should be removed and disposed of according to current Iowa department of Natural Resources rules and guidelines.
3. Slats will be removed from the structure for pit cleaning. The slats can be broken up and added back after the pit is clean and walls have been knocked in.
4. All solid left in concrete containment shall be removed and field applied according to agronomic rates.
5. The concrete structure will be cleaned, and then the applicant will contact the DNR for visual inspection if the DNR so advices. If the DNR determines containment is clean enough to not create environmental impact, applicant can proceed to the next step
6. The floor of the manure containment shall be broken up so as to not impound water. Containment walls will be broken up and pulled into the manure pit area. Demolished building materials may also be placed on top of the concrete if not disposed of in another way.
7. Materials will be covered with soil to a settled depth of one(1) foot, and the back fill be sufficiently mounded such that runoff will be diverted from the site after backfill settles
8. Measures shall be taken during demolish to minimize site erosion and pollution of downstream water resources. This may include items such as silt fence, hay bale barriers, temporary vegetation, and mulching.

Exhibit D *(Item #31 & #32 Field Maps w/ Setbacks)*

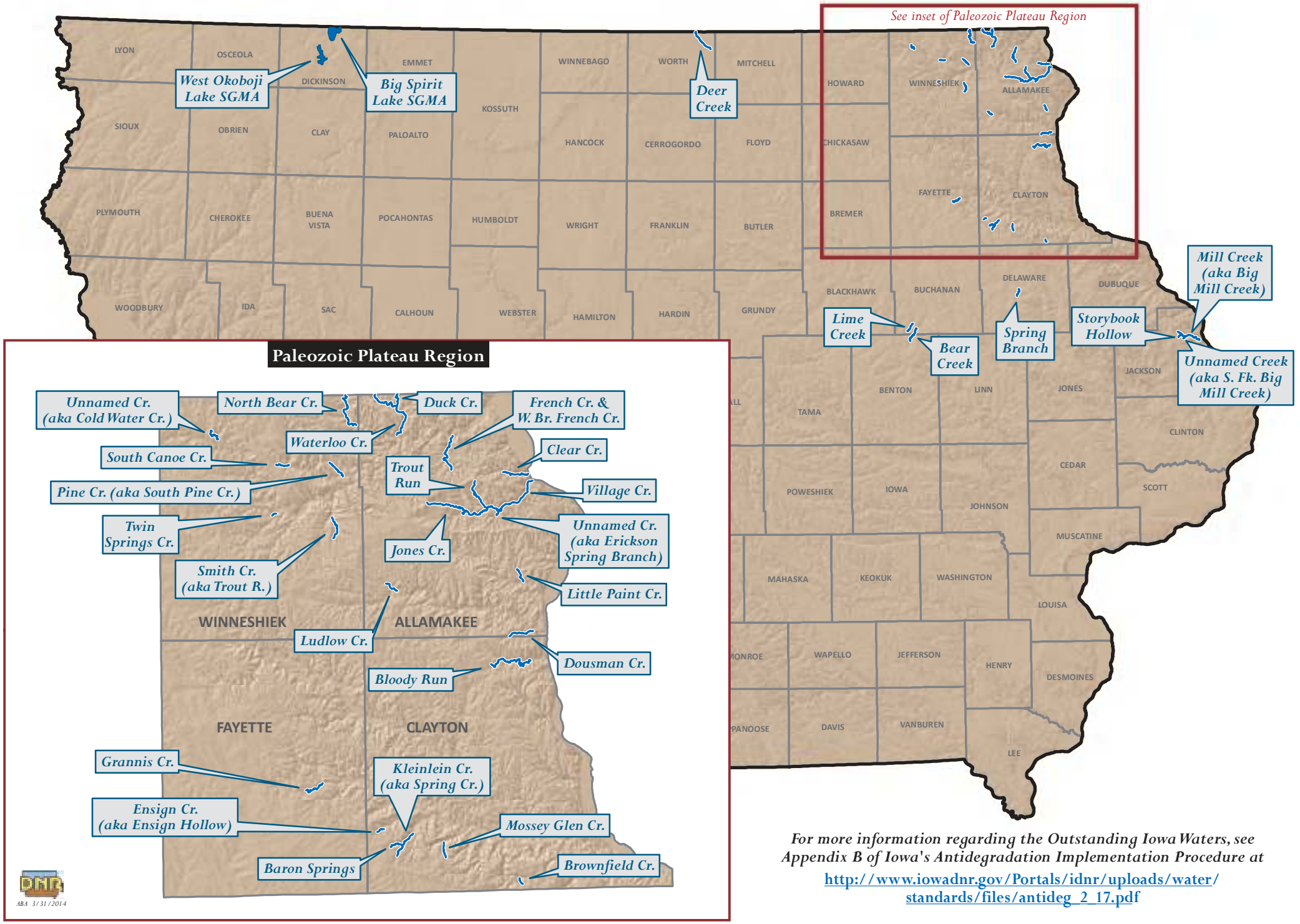

Tri-B Section 8 Application Fields
Larson South
Legend
400ft Application Buffer
200ft Application Buffer
Tripp_Fields
0 250 500 ft
AgVice
800-674-3045
info@4agvice.com


Tri-B Section 8 Application Fields
Ron Larson Home
Ron Larson Home
AgVICE
800-674-3045
info@4agvice.com
0 250 500 ft
Legend
400ft Application Buffer
200ft Application Buffer
Tripp_Fields

Exhibit E *(Attachments)*

1. Iowa State University PM 1917 *Composting Swine Mortalities in Iowa*
2. Study by Mike Brumm *Impact of feeders and drink devices on manure Production*
3. Manitoba Ag *Can Feeder and Drinker Design Affect Water Usage Rates*
4. Iowa State University PMR 1003 *Using Manure Nutrients for Crop Production*
5. DNR 113 *Separation Distances for Land Application of Manure*
6. NRCS Code 360 *Waste Facility Closure*
7. DNR 117 *High Quality Water Resources*

Outstanding Iowa Waters



For more information regarding the Outstanding Iowa Waters, see Appendix B of Iowa's Antidegradation Implementation Procedure at
http://www.iowadnr.gov/Portals/idnr/uploads/water/standards/files/antideg_2_17.pdf

High Quality Water Resources

A list for manure applicators and producers who need a construction permit

Passed by the 2002 General Assembly, Senate File 2293 set new requirements for the location and expansion of confinement feeding operations and for the land application of manure.

One of these changes added high quality water resources to the protected areas from certain manure application practices and as Items 10 and 35 on the master matrix, a system used to rate potential locations for confinement feeding operations needing a construction permit.

As defined by SF 2293, high quality water resources include high quality (HQ) waters and high quality resource (HQR) waters which are both listed in Iowa's Water Quality Standards in Chapter 61.3(5) "e" of the Iowa Administrative Code. Waters that were listed as HQ or HQR waters have above average characteristics and have not been channelized or significantly altered. High quality water resources also include protected water areas (PWA) listed below and on the DNR website under state parks, other division programs.

Definitions of the three water types

High quality water (HQ): Waters with exceptionally better quality than the levels specified in the Water Quality Standards and with exceptional recreational and ecological importance. Special protection is warranted to maintain the unusual, unique or outstanding physical, chemical, or biological characteristics which these waters possess.

High quality resource water (HQR): Waters of substantial recreational or ecological significance which possess unusual, outstanding or unique physical, chemical, or biological characteristics which enhance the beneficial uses and warrant special protection.

Protected water areas (PWA): This program started in 1978 to maintain, preserve and protect outstanding natural and scenic qualities of select waters and their adjacent land areas. Sections of five rivers have been designated (see below), but other possible protected waters exist, including lakes and marshes. The long-term goal of the program is to have one PWA in each of the seven landform regions in Iowa.

How to use the list

Look for high quality water resources by county or in the PWA list below.

A meandering stream, Catfish Creek is a typical high quality resource water (HQR). The creek is located in Swiss Valley County Park in Dubuque County.

Photo by Jamie Mootz.

For More Information

Manure applicators should see the DNR factsheet "Separation Distances for Land Application of Manure," available on the DNR website and at DNR field offices. **Producers** who need to use the master matrix can find more information, including an interactive matrix, under animal feeding operations on the DNR website at www.iowadnr.com/.

Protected Water Areas (PWA)

Upper Iowa River: Kendallville (Winneshiek Co.) to Hwy 76 in Allamakee Co. (64.2 miles)

Little Sioux River: Spencer (Clay Co.) to the Linn Grove Dam in Buena Vista Co. (34.5 miles)

Middle Raccoon River: Panora (Guthrie Co.) to the Redfield Dam in Dallas Co. (14.6 miles)

Wapsipinicon River: Hwy 93 (Bremer Co.) to conjunction with the Mississippi River, Clinton/Scott Co. line (177 miles)

Boone River: Webster City (confluence of Brewers Cr.) to confluence with the Des Moines River (25 miles)

DNR 117: 3-2003

High Quality Water Resources by County

HQ = High Quality Water **HQR** = High Quality Resource Water **PWA** = Protected Water Areas on p.1

Allamakee

HQR

Yellow River - Mouth to Allamakee-Winneshiek Co. line
Dousman Creek - Mouth to Allamakee-Clayton Co. line
Suttle Creek - Mouth to Allamakee-Clayton Co. line
Unnamed Creek (aka Bear Creek) - Mouth (S13, T96N, R5W) to N. line of S12, T96N, R5W, Allamakee Co.
Norfolk Creek - Mouth to confluence with Teeple Cr. (S24, T97N, R6W, Allamakee Co.)
Teeple Creek - Mouth to W. Line of S11, T97N, R6W, Allamakee Co.
Cota Creek - Mouth to W. line of S10, T97N, R3W, Allamakee Co.
Trout Run - Mouth through one mile reach
Unnamed Creek (Erickson Spring) - Mouth (S 23, T98N R4W) to W. line of S23, T98N, R4W, Allamakee Co.
Irish Hollow Creek - Mouth to N. line of S17, T100N, R4W, Allamakee Co.
Clear Creek - Mouth to N. line of S15, T100N, R5W, Allamakee Co.
Upper Iowa River - Lane's Bridge (Allamakee Co.) to Allamakee-Winneshiek Co. line

HQ

Paint Creek - Little Paint Creek to Rd Crossing, S18, T97N, R4W, Allamakee Co.
Little Paint Creek - Mouth to N. line of S30, T97N, R3W, Allamakee Co.
Hickory Creek - Mouth to S. line of S28, T96N, R5W, Allamakee Co.
Wexford Creek - Mouth to W. line of S25, T98N, R3W, Allamakee Co.
Village Creek - Mouth to W. line of S19, T98N, R4W, Allamakee Co.
Clear Creek - Mouth to W. line of S25, T99N, R4W, Allamakee Co.
French Creek - Mouth to E. line of S23, T99N, R5W, Allamakee Co.
Silver Creek - Mouth to S. line of S31, T99N, R5W, Allamakee Co.
Waterloo Creek - Mouth to Iowa-Minnesota state line
Patterson Creek - Mouth to E. Line S3, T98N, R6W, Allamakee Co.

Appanoose

HQR

Chariton River - Hwy 2 to Appanoose - Lucas Co. line

Black Hawk

HQR

Cedar River - Confluence with Beaver Creek to Blackhawk-Bremer Co. line
W Fk Cedar River - Mouth to Blackhawk-Butler Co. line
Shell Rock River - Mouth to Blackhawk-Bremer Co. line
Wapsipinicon River - Buchanan-Blackhawk Co. Line to Blackhawk-Bremer Co. line

Boone

HQR

Des Moines River - Fraiser Dam to Boone - Webster Co. line

Bremer

HQR

Cedar River - Bremer-Blackhawk Co. line to Bremer-Chickasaw Co. line
Shell Rock River - Bremer-Blackhawk Co. Line to Bremer-Butler Co. line
Wapsipinicon River - Bremer-Blackhawk Co. line to Snyder's Access (S34, T93N, R12W, Bremer Co.)

Buchanan

HQR

Wapsipninicon River - Linn-Buchanan Co. line to Buchanan-Blackhawk Co. line

Buena Vista

HQR

Little Sioux River - entire length in Buena Vista Co.

Butler

HQR

W Fk Cedar River - Butler-Blackhawk Co. line to confluence with Maynes Creek
Shell Rock River - Butler-Bremer Co. line to S. corporate limits, Shell Rock (S12, T91N, R15W, Butler Co.)

Carroll

HQR

North Raccoon River - Carroll-Greene Co. line to Hwy 286 (S17,T85N, R33W, Carroll Co.)

Cerro Gordo

HQR

Clear Lake

Cherokee

HQR

Little Sioux River - Hwy 3 in Cherokee (S26, T92N, R40W, Cherokee Co.) to Buena Vista - Cherokee Co. line

Chickasaw

HQR

Cedar River - Bremer-Chickasaw Co. line to S29, T94N, R14W, Chickasaw Co.

Clay

HQR

Little Sioux River - Buena Vista-Clay Co. line to east corporate limit Spencer (S17, T96N, R36W, Clay Co.)
Elk Lake

Clayton

HQR

Point Hollow Creek - Mouth to Clayton-Dubuque Co. line
Bloody Run Creek (aka Grimes Hollow) - Mouth to Clayton-Delaware Co. line
Pecks Creek - Mouth to S. line S15, T91N, R3W, Clayton Co.
South Cedar Creek - N. line S7, T92N, R3W to N. line S30, T93N, R3W, Clayton Co.
Steeles Branch - Mouth to Clayton-Delaware Co. line
Brownfield Creek - Mouth to spring source (S31, T91N, R3W, Clayton Co.)
Volga River - Mouth to Clayton-Fayette Co. line
Bear Creek - S. Line S18, T91N, R4W to W. line S23, T91N, R5W, Clayton Co.
Mossey Glen Creek - Mouth to S. line S10, T91N, R5W, Clayton Co.
Cox Creek (aka Anderson Hollow) - Kleinlein Cr. To S. Line S12, T91N, R6W, Clayton Co.
Kleinlein Creek (aka Spring Creek) - Mouth to spring source (S10, T91N, R6W, Clayton Co.)
Hewett Creek - Mouth to S. line of S29, T92N, R6W, Clayton Co.
Dry Mill Creek - Mouth to W. line of S9, T93N, R4W, Clayton Co.
Miners Creek - Hwy 52 (Clayton Co.) to W. line of S1, T92N, R3W, Clayton Co.
Unnamed Creek (aka W. Fk. Sny Magill Cr.) - Mouth to W. line of S7, T94N, R3W, Clayton Co.
Bloody Run - Mouth to W. line of S22 T95N, R4W, Clayton Co.
Maquoketa River - Delaware-Clayton Co. line to Clayton-Fayette Co. line
Pine Creek - Mouth to confluence with Brownfield Creek (Clayton Co.)

HQ

Turkey River - Confluence with Volga River to Clayton-Fayette County line
Little Turkey River - Clayton-Delaware Co. line to S. line S11,T90N, R3W, Delaware Co.
Ram Hollow - Mouth to Clayton-Delaware Co. line
Baron Spring - Mouth to spring source (S4, T91N, R6W, Clayton Co.)
Ensign Creek (aka Ensign Hollow) - Mouth to spring source (S29, T92N, R6W, Clayton Co.)
Mink Creek - Mouth to Clayton-Fayette Co. line
Buck Creek - Mouth to W. line of S9, T93N, R3W, Clayton Co.
Sny Magill Creek - Mouth to W. line of S6, T94N, R3W, Clayton Co.
North Cedar Creek - Mouth to W. line of S24, T94N, R4W, Clayton Co.

Cedar

HQR

Cedar River - Muscatine-Cedar Co. line to Cedar-Johnson Co. line
Wapsipinicon River - Cedar-Clinton Co. line to Cedar-Jones Co. line

Clinton

HQR

Wapsinpinicon River - Mouth to Clinton-Cedar Co. line

Dallas

HQR

Raccoon River - Polk-Dallas Co. line to confluence of N. & S. Raccoon River
Middle Raccoon River - Redfield Dam to Dallas-Guthrie Co. line
North Raccoon River - Mouth to Dallas-Greene County line

Dickinson

HQR

Grover's Marsh

HQ

Big Spirit Lake
East Okoboji Lake
Lower Gar Lake
Minnewashta Lake
Upper Gar Lake
West Okoboji Lake

Delaware

HQR

Bloody Run Creek (aka Grimes Hollow) - Clayton-Delaware Co. line to source S3, T90N, R3W, Delaware Co.
Steeles Brook - Clayton-Delaware Co. line to W. line S5, T90N, R4W, Delaware Co.
Twin Springs Creek - Mouth to spring source in S12, T90N, R4W, Delaware Co.

HQR

S Br Fountain Spring Creek - Mouth to W. line of SW1/4, S16, T90N, R4W, Delaware Co.
Schechtman Branch - Mouth to S. line S14, T90N, R4W, Delaware Co.
Maquoketa River - Delaware-Jones Co. line to confluence with Plum Creek

HQ

Maquoketa River - Mouth of S. Fk. Maquoketa River to Clayton-Delaware Co. line
Spring Branch - Mouth to spring source in S35, T89N, R5W, Delaware Co.
Fenchel Creek - Mouth to Richmond Springs (center S4, T90N, R6W, Delaware Co.)
Little Turkey River - Clayton-Delaware Co. line to S.Line S11,T90N, R3W, Delaware Co.
Ram Hollow - Clayton-Delware Co. line to source S10, T90N, R3W, Delaware Co.
Fountain Spring Creek - Mouth to W. line of NW1/4, S16, T90N, R4W, Delaware Co.

Dubuque

HQR

Catfish Creek - S. line S9, T88N, R2E to W. line S30, T88N, R2E, Dubuque Co.
Little Maquoketa River - Hogans Branch to N. line of S5, T88N, R1W, Dubuque Co.
Bloody Run - Mouth to W. line S21, T90W, R2E, Dubuque Co.
Cloie Branch - Mouth to W. line S5, T89W, R2E, Dubuque Co.
Hogans Branch - Mouth to W. line S9, T88N, R1W, Dubuque Co.
Point Hollow Creek - Clayton-Dubuque Co. line to source (S8, T90N,R2W, Dubuque Co.)

HQ

Mid. Fk Little Maquoketa River - W. line S31, T90N, R1E to N. line S33, T90N, R1W, Dubuque Co.

Emmet

HQR

Burr Oak Lake
Tuttle Lake

Fayette

Volga River - Clayton-Fayette Co. line to E. corporate limit Fayette (NE1/4, S28, T93N, R8W, Fayette Co.)
Brush Creek - Bear Creek to E. line of S17, T92N, R7W, Fayette Co.
Bell Creek - Mouth to W. line S8, T94N, R7W, Fayette Co.
Bass Creek - Mouth to W. line S3, T95N, R9W, Fayette Co.

HQ

Otter Creek - Mouth to confluence Grovers Cr. (S22, T94N, R8W, Fayette Co.)

HQ

Maquoketa River - Fayette-Clayton Co. line to Hwy. 3
Turkey River - Clayton-Fayette Co. line to Fayette-Winnishek Co. line
Mink Creek - Clayton-Fayette Co. line to W. line S15, T93N, R7W, Fayette Co.
Bear Creek - Mouth to W. line S6, T92N, R7W, Fayette Co.
Grannis Creek - Mouth to W. line S36, T93N, R8W, Fayette Co.
Unnamed Creek (aka Glovers Cr.) - Mouth to W. line S15, T94N, R8W, Fayette Co.

Greene

HQR

North Raccoon River - Entire length in Co.

Guthrie

HQR

Middle Raccoon River - Dallas-Guthrie Co. line to Lake Panaroma Dam
Lake Panaroma

Hamilton

HQR

Boone River - Webster-Hamilton Co. line to confluence with Brewers Creek
South Skunk River - Story-Hamilton Co. line to Drainage Ditch 71 (S11,T86N, R24W)

Hardin

HQR

Iowa River - Marshall-Hardin Co. line to E. corporate limits, Iowa Falls (S20, T89N, R20W)

Harrison

HQR

DeSoto Bend

Henry

HQR

Skunk River - Henry Co. Rd. (S3, T71N, R7W) to Henry-Jefferson Co. line

Humboldt

HQR

E. Fork Des Moines River - Mouth to Humboldt - Kossuth Co. line

Howard

HQR

Chialk Creek - Mouth to N. line of S36, T99N, R11W, Howard Co.
Upper Iowa River - Winnishiek-Howard Co. line to NE1/4, S12, T100N, R13W (Howard Co.)
Staff Creek - Mouth to W. line S 27, T100N, R14W
Beaver Creek - Mouth to S. line S29, T100N, R13W, Howard Co.

HQ

Turkey River - Howard-Winneshiek Co. line to Vernon Springs (S34, T99N,R11W)
Bohemian Creek - Winnishiek-Howard Co. line to W. line S2, T97N, R11W, Howard Co.
Nichols Creek (aka Bigalk Cr.) - Winneshiek-Howard Co. line to W. line S23, T100N, R11W, Howard Co.

Jackson

HQR

N Fork Maquoketa River - Mouth to Jackson-Jones Co. line
Cedar Creek - Mouth to E. line of S29, T85N, R3E, Jackson Co.
Unnamed Creek - Mouth (S7, T86N, R2E) to W. line S11, T86N, R 1E, Jackson Co.
Ozark Spring Run - Mouth to spring source in center of S32, T86N, R1E, Jackson Co.
Pleasant Creek - W. line S11, T85N, R4E, to W. line S15, T85N, R4E, Jackson Co.
Maquoketa River - Deep Creek to Jones-Jackson Co. line

HQ

Brush Creek - N. line S23, T85N, R3E to N line S1, T85N, R3E, Jackson Co.
Mill Creek (aka Big Mill Creek) - Confluence with Little Mill Cr. to confluence with unnamed Cr. (S1, T86N,R3E, Jackson Co.)
Little Mill Creek - Mouth to W. line of S29, T86N, R4E, Jackson Co.
S. Fk. Big Mill Creek - Mouth to W. line of S17, T86N, R4E, Jackson Co.
Storybook Hollow - Mouth to S. line S12, T86N, R3E, Jackson Co.
Unnamed Creek - Mouth (S1, T86N, R3W) to W. line of S1, T86N, R3E, Jackson Co.
Dalton Lake

Jefferson

HQR

Skunk River - Entire length in Jefferson Co.

Jones

HQR

Maquoketa River - Jones-Jackson Co. line to Delaware-Jones Co. line
N Fork Maquoketa River - Jackson-Jones Co. line to confluence with White Water Creek
Wasipinicon River - Cedar-Jones Co. line to Jones-Linn Co. line

Johnson

HQR

Iowa River - Louisa-Johnson Co. line to northern-most point of Johnson-Washington Co. line
Cedar River - Cedar-Johnson Co. line to Johnson-Linn Co. line

Keokuk

HQR

Skunk River - Keokuk-Washington Co. line to confluence N. & S. Skunk R.
South Skunk River - Mouth to Hwy 21 (S34, T75N, R13W, Keokuk Co.)
North Skunk River - Mouth to Keokuk-Mahaska Co. line

Kossuth

HQR

E. Fork Des Moines River - Kossuth-Humboldt Co. line to Co. Rd. B63 (S23, T94N, R29W, Kossuth Co.)
Union Slough

Linn

HQR

Cedar River - Johnson-Linn Co. line to Hwy 30
Wapsipinicon River - Entire length in county

Louisa

HQR

Iowa River - Mouth to S. corporate limits Wapello (S35, T74N, R3W, Louisa Co.)
Iowa River - Confluence with Cedar River to Louisa-Johnson Co. line
Cedar River - Mouth to Louisa-Mucatine Co. line

Lucas

HQR

Chariton River - Appanoose-Lucas Co. line to Highway 14

Mahaska

HQR

North Skunk River - Entire length in county

Marshall

HQR

Iowa River - Hwy 149 to confluence with Asher Creek (excluding waters in Meskwaki Settlement of the Sac Fox Tribe of the Mississippi)

Mitchell

HQR

Burr Oak Creek - Co. Rd. T46 to N. line of S5, T98N, R16W, Mitchell Co.
Beaver Creek - Mouth to Mitchell Co. Rd A31 (N line S19, T99N, R15W, Mitchell Co.)
Rock Creek - Confluence with Goose Cr. to Hwy. 9 (N line S26, T98N, R18W, Mitchell Co.)

HQ

Wapsipinicon River - Town of McIntire to N line S20, T100N, R15W, Mitchell Co.
Spring Creek - Mouth to N. line of S8, T97N, R16W, Mitchell Co.
Turtle Creek - Mouth to E. line of S7, T99N, R17W, Mitchell Co.

Muscatine

HQR

Cedar River - Entire length in county

Palo Alto

HQR

Virgin Lake

Scott

HQR

Wapsinpinicon River - entire length in Scott Co.

Story

HQR

South Skunk River - Ames Waterworks Dam to Story-Hamilton Co. line

Warren

HQR

North River - Co. Rd. R63 (S16, T77N, R24W) to Badger Cr. (S33, T77N, R25W, Warren Co.)

Washington

HQR

Skunk River - Entire length in Washinton Co.
Iowa River - Entire length in Washinton Co.
English River - Mouth to confluence (N. line S2, T77N,R6W, Washington Co.) with Ramsey Cr.

Webster

HQR

Des Moines River - Boone-Webster Co. line to W. line S15, T88N, R28W, Webster Co.
Boone River - Mouth to Webster-Hamilton Co, line

Winneshiek

HQR

Yellow River - Allamakee-Winneshiek Co. line to N. Fork Yellow R. (S13, T96N, R7W, Winneshiek Co.)
Upper Iowa River - Entire length in Co.
Middle Bear Creek - Mouth to N. line S16, T100N, R7W, Winneshiek Co.
Paint Creek (aka Pine Cr.) - Mouth (Allamakee Co.) to unnamed creek (SE¼, S11, T99N, R7W, Winneshiek Co.)
Unnamed Creek - Mouth (SE¼, Sec ll, T99N, R7W) to N. line S12, T99N, R7W, Winneshiek Co.
Pine Creek - Mouth to N. line S21, T99N, R7W, Winneshiek Co.
North Canoe Creek - Mouth to N. line S2, T99N, R8W, Winneshiek Co.
Trout Creek (aka Trout River) - Mouth to confluence with Smith Cr.
Trout Creek (aka Trout Run) - Mouth to confluence with unnamed stream (S27, T98N, R8W, Winneshiek Co.)

HQR

Ten Mile Creek - Mouth to confluence with Walnut Cr. (S18, T98N, R9W, Winneshiek Co.)
Unnamed Stream (aka Casey Spring) - Mouth to W. line S26, T99N, R9W, Winneshiek Co.
Dry Run Creek - Mouth to W. line S36, T98N, R9W, Winneshiek Co.
Martha Creek - Mouth to W. line S13, T99N, R10W, Winneshiek Co.
E Pine Creek - Mouth to Iowa-Minnesota State line
Pine Creek - Mouth to Iowa-Minnesota State line
Silver Creek - Mouth to N. line S26, T100N, R9W, Winneshiek Co.

HQ

Bohemian Creek - Mouth to Howard-Winneshiek Co. line
Bear Creek - N. Bear Creek to spring source S29, T100N, R7W, Winnshiek Co.
North Bear Creek - Mouth to Iowa-Minnesota State line
Canoe Creek (aka W. Canoe Cr.) - Winneshiek Co. Rd W38 to W. line of S8, T99N, R8W, Winneshiek Co.
Coon Creek - Mouth to road crossing S13, T98N, R7W, Winneshiek Co.
Smith Creek (aka Trout River) - Mouth to S. line S33, T98N, R7W, Winneshiek Co.
Twin Springs Creek - Mouth to springs in S20, T98N, R8W, Winneshiek Co.
Unnamed Stream (aka Trout Run) - mouth to S. line S27, T98N, R8W, Winneshiek Co.
Nichols Creek (aka Bigalk Cr.) - Mouth to Winneshiek-Howard Co. line
Unnamed Creek (aka Cold Water Cr.) - Mouth to N. line S31, T100N, R9W, Winneshiek Co.
Turkey River - Fayette-Winneshiek County line to Winneshiek-Howard Co. line

Worth

HQR

Silver Lake
Silver Lake Marsh

Wright

HQR

Elm Lake

This list was developed to assist manure applicators and applicants for a confinement feeding operation construction permit. It was current in March 2003.

If you need more information, please contact the closest DNR field office.

Composting Swine Mortalities in Iowa

Composting Gains Popularity

With more than 25 million hogs produced annually in Iowa, cost effective mortality disposal alternatives that minimize risks to herd health and the environment are essential. Following the lead of the poultry industry, where composting has been used successfully for more than a decade, swine producers are finding that composting is a flexible and reasonably priced disposal method that can be used year round. Results of a statewide survey of Iowa swine producers conducted by Iowa State University and the Iowa Pork Producers Association during March of 2001 show that about 12 percent of producers now rely exclusively on composting to dispose of their mortalities. An additional 6 percent of producers say they rely on composting as a backup disposal method when timely rendering service is not available.

Swine producers say they are attracted to composting for a variety of reasons. Composting allows them to manage mortalities promptly, as they occur. With properly designed composting facilities, there is no need to call for rendering service or to worry about options if the rendering truck can't make it that day. Composting also eliminates the need to wait for the ground to dry up or thaw out so that burial can be accomplished.

Composting facilities and equipment

Covered bins versus open windrows?
Composting in moderately sized roofed bins is the recommended method for Iowa's highly variable climate. Use of covered bins simplifies management of the composting operation and maximizes the potential for success regardless of weather conditions. Covered bin systems reduce the potential for seasonal odor problems caused by overly wet compost. Bins also minimize space requirements, improve heat retention during cold weather, and help to avoid problems with scavenging insects and animals. Bin systems need not be complicated or costly. Old corn cribs, open front livestock buildings, and other types of unused farm structures can often be converted for composting at a relatively low cost.

Though sometimes used for emergencies, composting in open piles or windrows is not recommended for day-to-day mortality management. Open systems are vulnerable to saturation during wet weather, which can lead to odor production and release of contaminated leachate. While these problems can be reduced to some extent by using extra cover material and turning the piles more frequently to break up wet spots, the material, labor, and management resources required to successfully operate open systems during adverse weather conditions will be higher than for bin composting systems.

Figure 1. Composting rapidly decomposes swine mortalities, producing a soil-like product that can be spread on cropland. (Photo by Tom Glanville, Iowa State University.)

Equipment
Most of the equipment used in swine mortality composting is commonly found on livestock farms. Machinery needs include a skid loader, or tractor with front-end loader, to load and unload composting bins or windrow; and a solid manure spreader to spread finished compost on cropland. A stainless steel composting thermometer with a three- or four-foot long stem is needed to check internal pile temperatures.

Cover material
The material used to cover the carcasses is an important part of the composting system. The ideal cover material retains heat, absorbs excess moisture, and provides a barrier that helps discourage insects and scavengers. Cover materials also must provide much of the carbon, which is essential to the microbes that decompose animal carcasses. Due to its excellent ability to retain heat and absorb excess moisture, sawdust is generally acknowledged as the best cover material. Unfortunately, sawdust and recycled wood products are in high demand for many other uses, making them increasingly hard to obtain and raising their prices substantially in recent years.

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Alternative cover materials that are much easier to obtain include chopped cornstalks or straw. Since these tend to be less absorptive and have poorer insulating properties than sawdust, their use requires more care during cold or wet weather. Poultry litter, a mixture of sawdust and poultry manure produced during turkey and broiler production, has been used successfully for carcass composting in the poultry industry. Not only does litter have the desirable characteristics of sawdust, the bacteria and nitrogen added by the manure make this mixture more biologically active than sawdust alone. Bedding from swine hoop buildings also can be used as cover material. Since the quality of used bedding from hoop buildings varies considerably, care should be taken to avoid materials that are saturated with liquid or that contain high proportions of manure because these conditions can lead to slow decay and/or excessive odor production.

Figure 2. This low-cost bin composting system was constructed with used materials and is located inside a converted farm building. (photo by Kris Kohl, Iowa State University)

Disposal area

Swine composting operations require cropland or pasture land for final disposal of the finished compost. The finished compost will contain some recognizable bones, particularly if large breeding animals or finishing hogs are composted, so locating the disposal area away from non-farm residences is recommended. If the composting operation is functioning properly, however, bones will be free of all soft tissues, and they will be dry, brittle, and of little or no attraction to scavenging animals or insects.

Producers frequently ask about the fertilizer value of their compost. Unfortunately, the nitrogen value of the compost is difficult to predict because it can vary considerably depending on the type and amount of cover material used. Sampling and testing the compost for nutrient content is the only reliable way to determine its fertilizer value.

Composting procedures

Mortality composting is begun by placing a 12-inch layer of cover material in the bottom of the bin. Decaying carcasses release excess moisture, so a thick absorptive base layer plays an important role in preventing release of excess liquid.

Carcasses placed in the composting bins should not touch each other and should be at least 9 to 12 inches from bin walls. Too many carcasses in one spot leads to localized wet spots and poor decay. Carcasses that are too close to the cool exterior side walls of the bin will decay slowly and are less likely to be exposed to the high temperatures necessary to kill disease-causing microorganisms. After a layer of carcasses has been placed in the bin, add 6 to 9 inches of cover material. Complete coverage is essential to avoid problems with insects, rodents, and scavengers. Daily layering of new carcasses and cover material continues until the bin is filled to a depth of about 5 feet. In some instances, it may help to segregate large and small carcasses in separate bins. This allows smaller carcasses to move through the treatment process quickly, minimizing the amount of bin space tied up in lengthy treatment cycles. To ensure continuous coverage throughout the composting cycle, it may be necessary to add cover material from time to time as material within the bins settles. This is particularly true when large carcasses are composted.

In a properly operating facility, new material added to bins reaches temperatures of 120 to150°F within 24 to 48 hours. Internal temperatures can be monitored with a long-stemmed (36- to 48-inch) composting thermometer. For an accurate picture of internal conditions, probe the bin at several locations. It is normal to find hot and cool spots within the same bin, so a single temperature measurement can be misleading. If a bin fails to heat up, too much or too little moisture is the most common cause. It may be necessary to unload the bin and mix in compost from an active (hot) bin to remedy the problem.

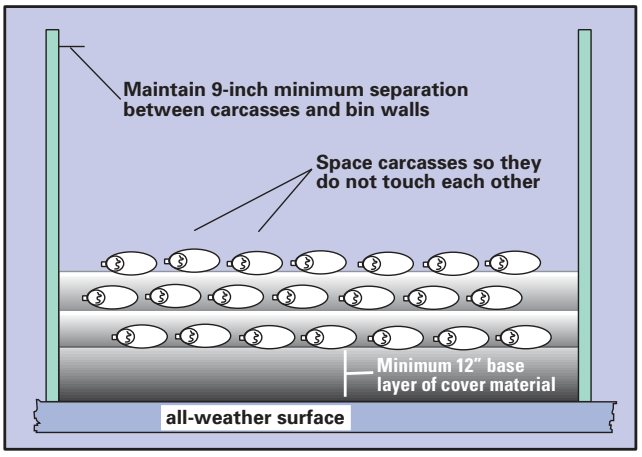

Figure 3. Animal carcasses should not touch each other, and should not be placed in the cool zone near composting bin walls.

After a bin is completely filled, it must undergo a primary heating cycle of 60 to 90 days. The length of the primary heating cycle will vary with the size of carcasses placed in the bin. For farrowing house and nursery losses, an initial heating cycle of as little as 30 days may be adequate. If the bin is filled with larger market-weight animals or breeding stock, primary heating cycles as long as 6 months may be necessary.

Following the primary heating cycle, the partially omposted carcasses are removed from the primary bin and placed in a secondary bin. The mechanical action of moving the compost breaks up the pile, redistributes excess moisture, and introduces a new oxygen supply. Once this takes place, a secondary heating cycle occurs, accompanied by further decomposition. By the end of a 60- to 90-day secondary heating cycle, even large carcasses of breeding stock are normally reduced to a few large bones that are free of soft tissues which cause odors or attract insects and predators.

Figure 4. Checking internal temperatures with a composting thermometer is a quick way to determine if moisture and other conditions are suitable for rapid decay and pathogen reduction. (Photo by Tom Glanville, Iowa State University.)

Sizing and layout

Bin-type composting systems located under a roof are recommended for best year-round performance, optimal processing, and minimal problems with runoff and scavengers. Total bin volume for a swine mortality composting operation is based on average daily weight of animals to be composted. Typically, about 20 cubic feet of primary bin volume is recommended for each pound of average daily loss, with an equal amount of secondary bin space.

Use Table 1 to estimate the amount of primary bin volume for your particular operation. Write in the annual number of pre-wean and nursery pig litters produced by your operation in the first two rows of column B. The annual number of pigs produced by your finishing operation, and the average breeding stock population, are entered in the bottom two rows of column C. Multiply the values in columns B and C by the composter volume factor in column D, and enter the result in column E. The sum of all the values in column E (entered in Total box) is the estimated total amount of primary composting volume needed for your operation. You will need an equal volume of secondary bin space.

Table 1. Simplified method for estimating primary bin volume

(A) Phase of operation	(B) Litters per year	(C)* Number of animals	(D)** Volume factor	(E) Primary bin volume (cubic feet)
Pre-wean pigs	*675 litters*		X 0.41	= *277*
Nursery pigs	*675 litters*		X 0.26	= *176*
Finishing pigs		*5,800 pigs*	X 0.17	= *986*
Breeding stock		*300 sows*	X 0.57	= *171*
			Total	= *1610*

* For finishing pigs, use annual number marketed. For breeding stock, use average year-round population.
** Volume factors based on 20 cubic feet of primary bin capacity per pound of average daily loss. Weight of mortalities is calculated assuming average mortality rates as follows: pre-ween mortality, 25 pigs/litter @ 3 lbs./pig, nursery mortality, 2 percent (assume 95 pigs/litter) @ 25 lb./pig, finishing mortality, 2 percent @ 150 lb./pig, and breeding stock mortality, 3 percent annually @ 350 lbs./animal.

Example values shown in italics in columns B and C of Table 1 are for a 300-sow farrow-to-finish operation producing 675 litters per year, and marketing 5,800 finished pigs per year.

Approximate dimensions for each bin can be estimated following these steps:

Step 1: Estimate minimum bin width. Side-to-side dimensions of at least twice the loader bucket width are recommended to provide sufficient maneuvering room. For a skid loader with a 4 ft. wide bucket, for example, bin widths of at least 8 ft. are suggested.

Step 2: Select front-to-back bin dimension. One to two times the minimum bin width is suggested. For the 8 ft. wide bins in this example, a front-to-back dimension of 12 ft. is used.

Step 3: Calculate individual bin volume: Multiply bin width (from step 1) by the front-to-back dimension (from step 2) to obtain bin floor area. Then multiply the floor area by the anticipated working depth to obtain the bin volume. Working depths of 5 ft. or less are recommended (bin walls should be about 1 ft. higher than the working depth). In this example the bin floor area is 8 ft. X 12 ft. = 96 square ft. Using a 5 ft. working depth, the individual bin volume is: 96 sq. ft. X 5 ft. = 480 cubic feet.

Step 4: Estimate number of primary bins: To determine the number of primary bins needed, divide the estimated Total Primary Bin Volume (sum of values in column E of Table 1) by the Individual Bin Volume (step 3). If a fractional value is obtained, round UP to next whole number. For this example, dividing the total primary bin volume of 1610 cubic feet by the individual bin volume of 480 cubic feet yields a value of 3.35. Rounding this value UP, 4 primary bins are recommended.

Figure 5. This simple four-bin swine mortality composting unity includes space for dry storage of cover material behind the bins. (Photo by Palmer Holden, Iowa State University.)

Step 5: Estimate number of secondary bins: The number of secondary bins should equal the number of primary bins. In this case, 4 secondary bins are recommended.

Step 6: Additional bins for cover material: If space to stockpile dry cover material is NOT available in adjacent buildings, construction of 2 or more additional bins for this purpose is recommended.

Step 7: Select bin layout: Bin layout is usually dictated by the geometry of the available space. Linear and tandem layouts, like the floor plans shown in Figure 6, are most common. If bins will be located outdoors where they are not shielded from wind, the tandem layout is recommended to help retain heat during cold weather.

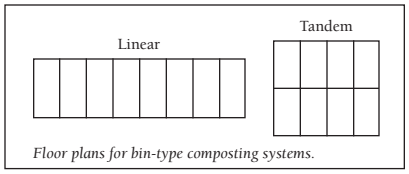

Figure 6. Typical floor plans for bin-type composting systems.

Frequently Asked Questions

Q. My composting operation is very odorous, the decay is slow, and internal pile temperatures are low even during summer months. What can I do to improve this?

A. Excessive odor production accompanied by low internal temperatures is typical of compost that is too wet. Excess water is normal in the *immediate* vicinity of the swine carcasses, but each carcass should be surrounded by sufficient amounts of cover material to absorb the liquid and prevent any from seeping out of the base or sides of the pile. Material in the outer envelope of the compost pile (a few inches beneath the outer surface) should feel slightly damp, but if squeezing a handful of the envelope material causes water to drip out, it is too wet. Excess moisture is usually caused by failure to protect the composting operation or cover material stockpiles from excess precipitation, or by using too little absorptive cover material over and around the animal carcasses.

Q. My compost fails to heat up, even during warm weather. Excess moisture does NOT seem to be the problem. What else could cause this?

A. Likely causes are use of cover material that is extremely dry, or too little nitrogen in the cover material. Animal carcasses release considerable

moisture into the cover material immediately surrounding them, but dry or extremely porous cover materials can draw moisture away from the carcasses or encourage excessive moisture evaporation. If so, the zone around the carcasses may become too dry for rapid bacterial decay and heat production. If this happens, do not add water directly to the top of the compost bin. This can saturate the pile, causing seepage, anaerobic conditions, and excessive odor. To increase the water content in a controlled way, add water to stockpiled cover material, and then mix the moistened cover material into the compost pile. If moisture content appears adequate, insufficient nitrogen in the cover material is a likely cause of low internal temperatures. To boost the nitrogen content, mix a small amount of manure into the cover material. Avoid adding large amounts of manure at one time as this can lead to odorous releases of ammonia.

Q. I have trouble getting my compost bins to heat up during cold weather. What can I do to improve heat production and retention?

A. If your composting operation works well in warm weather, but not during the winter, try increasing the size of your cover material stockpile or of your composting bins. Most cover materials produce small amounts of heat while stockpiled. Larger stockpiles help to retain this heat, providing warmer material with which to cover the carcasses that are added to the composting bin. It's also important to use composting bins that are large enough to retain heat during cold weather. Small bins contain insufficient amounts of biodegradable material to produce and retain heat during cold, windy weather. It's also important to **not** let carcasses freeze before putting them into the compost bin. Frozen carcasses require tremendous amounts of heat for thawing before decomposition can begin.

Q. How can I tell if a material will make a good cover material for carcass composting?

A. Stockpile some of the potential cover material and use your composting thermometer to monitor internal temperatures. Good cover materials have sufficient moisture, porosity, and nutrient content to promote self-heating. Avoid cover materials that show little potential for self-heating.

Q. Can I reuse finished compost as cover material to compost subsequent mortalities?

A. Yes, if the moisture content of the finished compost is acceptable (neither too wet nor too dry), limited reuse is possible. Continuous reuse may ultimately lead to a nutrient imbalance that reduces biological activity.

Q. My swine composting operation is working great and I would like to make some extra money by composting pigs from neighboring farms. Are there any limits on the size of on-farm composting operations or other regulations that I need to know about?

A. Composting dead animals that do **not** originate on the same farm where the composting facility is located requires a permit from the Iowa Department of Natural Resources (IDNR). Contact IDNR for further information about permits and operating requirements for commercial composting facilities.

Iowa's animal mortality composting regulations

Administrative rules of the IDNR state that on-farm composting of dead animals generated on the same farm as the composting facility is exempt from having a permit if the following operating requirements are met:

- Dead animals are incorporated into the composting process within 24 hours of death and covered with sufficient animal manure, animal bedding, crop residues, or clean wood waste (free of coatings and preservatives) necessary as bulking agents and to prevent access by domestic or wild animals.

- Composting is done in a manner that prevents formation and release of runoff and leachate and controls odors, flies, rodents, and other vermin.

- Dead animals are not removed from composting until all flesh, internal organs, and other soft tissue are fully decomposed.

- Storage of finished compost shall be limited to 18 months and shall be applied to cropland or pasture land at rates consistent with the nitrogen use levels necessary to obtain optimum crop yields and shall be applied in a manner as to prevent runoff to surface waters of the state.

- Application of compost to other lands shall require prior approval by IDNR.

- Composting must be done on an all-weather surface of compacted soil, compacted granular aggregates, asphalt, concrete or similar relatively impermeable material that will permit accessibility during periods of inclement weather and prevent contamination of surface and groundwater.

- If composting is done in a permanent structure, composter construction shall utilize weather and rot-resistant materials capable of supporting composting operations without damage. (Although not mandatory, a roof over the composting facility is recommended to prevent excess moisture accumulation that can lead to production of undesirable odors and leachate.)

- Composting must be done outside of wetlands or the 100-year flood plain and at least 100 feet from private wells, 200 feet from public wells, 50 feet from property lines, 500 feet from inhabited residences, and 100 feet from flowing or intermittent streams, lakes, or ponds.

More information

For additional information visit Iowa State University's award winning swine mortality composting web site on the Internet at: www.abe.iastate.edu/pigsgone/

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Special thanks to Jay Harmon, Ph.D., Department of Agricultural & Biosystems Engineering, Iowa State University, and Ubbo Agena, Iowa Department of Natural Resources, for their technical review of this publication.

This publication was made possible, in part, through a research and demonstration grant from the Leopold Center for Sustainable Agriculture, Iowa State University, and by support from Iowa State University Extension.

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Impact of feeders and drinker devices on pig performance, water use, and manure volume

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Summary

Objective: To determine the impact of feeder and drinker designs on pig performance, water use, and manure volume.

Methods: Experiment One compared a wet/dry feeder to a dry feeder with wall-mounted nipple drinker. Experiment Two compared a swinging nipple drinker to a gate-mounted nipple, and Experiment Three compared a bowl drinker to the swinging drinker of Experiment Two. In all experiments, pigs were housed in pens of 20–24 pigs per pen in partially slatted, mechanically ventilated facilities.

Results: In Experiment One, water disappearance (L per pig per day) was 4.49 for the wet/dry feeder versus 6.06 for the dry feeder plus nipple drinker. In Experiment Two, water disappearance was 4.90 L per pig per day for the swinging drinker versus 5.50 for the gate-mounted drinker. In Experiment Three, water disappearance was 3.78 for the bowl versus 5.01 for the swinging drinker. Summer manure production in Experiment One was 4.96 L per pig per day for the wet-dry feeder versus 7.02 for the nipple drinker. Winter manure production was 3.96 L per pig per day for the swinging drinker versus 4.59 for the nipple drinker in Experiment Two.

Implications: These results document the wide range in water use and manure volume associated with feeder and drinker devices installed in swine facilities. They also suggest lower amounts of total water use and manure volume than those currently cited in the literature or used by regulatory officials.

Keywords: swine, water intake, feeder, manure

Received: August 9, 1999
Accepted: December 21, 1999

The importance of water availability to growing-finishing pigs is often cited in publications dealing with swine nutrition.[1–4] Some have recommended maximum stocking densities and minimum delivery rates (L per minute) for nipple drinking devices.[2] Some have estimated total manure production, including wasted drinking water, based on the use of nipple drinkers and include water wastage from these drinkers.[5] Other studies fail to mention the impact of water delivery devices on total manure volume.[6–8]

The objective of this study was to conduct a series of experiments to examine the impact of alternative water delivery devices on pig performance, water use, and manure production.

Materials and methods

Housing

In each of three experiments, pigs were housed in two similar, mechanically ventilated, partially slatted finishing facilities at the University of Nebraska's Northeast Research and Extension Center near Concord, Nebraska. Each facility had six 3.7-m × 4.6-m (12.1 ft × 15.1 ft) pens with 50% of the pen area slatted. There were 24 pigs per pen in Experiments One and Two (0.70 m^2 [7.5 ft^2] per pig) and 20 pigs per pen in Experiment Three (0.84 m^2 [9.0 ft^2] per pig). Pen size was not adjusted in the event of pig death or removal for poor performance.

In Experiments One and Three, summer cooling was provided to all pens of pigs within a facility by means of a thermostatically controlled drip system with intermittent dripping initiated at 27°C (80.6°F). Water used for cooling was not metered, but the same system serviced all pens within a building with one control and a similar setup in each pen.

Manure system

The manure system in each facility was a shallow pit (depth = 1.2 m [3.9 ft]) drained periodically into a lagoon (i.e., a pull-plug system). The pens on the north or south side of a center aisle had a common pit and pull-plug system. Feeder and drinker treatments were assigned to either the north or south side of the aisle so manure production could be estimated from manure depth in the common pit for each feeder or waterer type.

Water disappearance (animal intake and waste) was measured for each feeder or drinker type in each facility by water meters installed in the water delivery line corresponding to the manure pit location. Manure production was estimated by recording the manure depth in each pit prior to removal of the pull-plug.

Carcass measures

Carcass lean estimates were collected on individually identified pigs by employees of SiouxPreme Packing Co.; Sioux Center, Iowa using total body electrical conductivity (TOBEC). Data were reported by the slaughter house as carcass percentage lean containing 5% fat. Lean gain containing 5% fat was calculated using the procedures suggested by the National Pork Producers Council (NPPC).[9]

Experiment One

Both a winter and summer trial using crossbred (Duroc × [Yorkshire-Landrace × Duroc]) feeder pigs were conducted. Pigs were allocated at arrival on the basis of sex and arrival weight outcome groups in a

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This article is available online at http://www.aasp.org/shap.html.

Brumm MC, Dahlquist JM, Heemstra JM. Impact of feeders and drinker devices on pig performance, water use, and manure volume. *Swine Health Prod.* 2000;8(2):51–57.

balanced design to pens equipped with one of the following two experimental treatments:

- a Crystal Springs® wet/dry feeding system (GroMaster, Inc.; Omaha, Nebraska). The Crystal Springs® feeder provided two feeding spaces for 24 pigs and a single nipple drinker in the feed trough. No other drinking water source was provided. Water pressure to the feeders was adjusted to 69 kPa (10 psi); or
- a traditional system of dry feeders and nipple drinkers: two three-hole stainless steel feeders (Marting Manufacturing Co.; Britt, Iowa). The feeders were separated by 1 m (3.3 feet) so pig access to all six feeder holes was not restricted. There were two nipple drinkers provided on the wall opposite the feeders over the slatted portion of the pens (Figure 1). The nipple drinkers were 0.8 m (32 inches) apart and 0.5 m (20 inches) above the slats. Water pressure to these drinkers was 240 kPa (35 psi).

Corn-soybean meal-based diets in meal form containing 3% added fat were formulated to provide

- 0.9% lysine from 18.6–40.9 kg (41–90 lb) bodyweight (BW),
- 0.8% lysine from 40.9–77.3 kg (90–170 lb) BW, and
- 0.7% lysine from 77.3 kg (170 lb) to slaughter.

Diets were switched on the week individual pens of pigs achieved the target weights. All diets contained 44 mg per kg tylosin.

Experiment Two

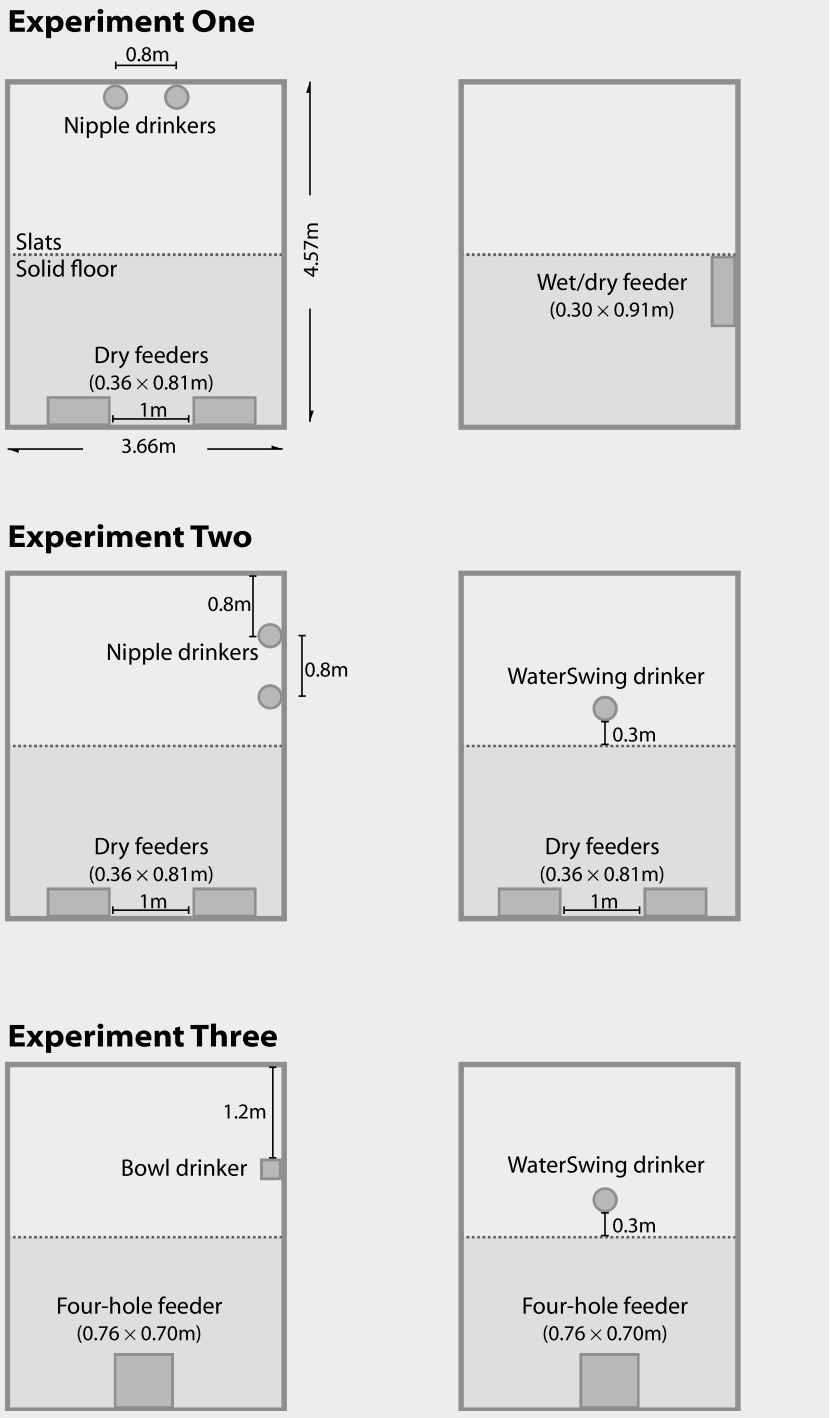
At arrival, crossbred (Line 326 × C15) pigs (PIC, Inc.; Franklin, Kentucky) were sorted by sex, with barrows in one facility and gilts in the other in this winter trial. Within sex (facility), pigs were randomly assigned on the basis of weight blocks in a balanced design to pens equipped with one of the following experimental treatments:

- the Trojan WaterSwing® (Ritchie Industries, Inc.; Conrad, Iowa). The WaterSwing® drinker consisted of opposing nipple drinkers attached to a delivery pipe, which was suspended from a chain anchored to the ceiling in the middle of the pen of pigs; or
- conventionally installed Trojan nipple drinkers. The conventional nipple drinkers were installed on the slotted portion of the pen partition over the slatted floor portion of the pen (Figure 1). The two conventional nipple drinkers were spaced 0.8 m (32 inches) apart to limit pig dominance activities.

Both drinker types were adjusted for height every 2–3 weeks to provide 5–10 cm (2–4 inches) of clearance between the shoulder of the pigs (while standing) and the bottom of the drinker. Water pressure to both drinker types was 200 kPa (30 psi).

Corn-soybean meal-based diets in meal form were formulated for each sex according to the University of Nebraska[2] recommendations for pigs of high lean-gain potential. All diets contained 44 mg per kg tylosin.

Figure 1: Feeder and drinker locations for Experiments One, Two, and Three



Experiment Three

In a summer trial, crossbred feeder pigs (PIC Line 326 × C15) were allocated at arrival on the basis of sex and arrival weight in a balanced design to mixed-sex pens equipped with one of the following experimental treatments:

- the Drik-O-Mat® bowl drinker (Farmweld, Inc.; Teutopolis, Illinois). A single bowl was fastened to the pen partition over the slatted floor portion of the pen 0.8 m (32 inches) from the rear wall of the pen with the bottom lip of the bowl 25 cm (10 inches) from the floor (Figure 1); or
- the WaterSwing® used in Experiment Two. The WaterSwing® was adjusted as in Experiment Two.

Water pressure to both drinker types was 240 kPa (35 psi).

A four-space feeder (Farmweld Wean-Finish, Farmweld Inc.; Teutopolis, Illinois) was provided with two spaces on each side of the feed hopper. The feeder was located perpendicular to the center aisle in the center of the pen partition along the aisle (Figure 1).

Corn–soybean meal-based diets in meal form containing 5% added fat were formulated to have the same lysine:calorie ratio as the gilt diets in Experiment Two. Diets contained 110 mg per kg tylosin except for days 20–38, when they contained 44 mg per kg tylosin.

Statistical analysis

The pen of pigs was the experimental unit for all pig performance criteria except death loss and pig removal. For water disappearance and manure volume, the side of the facility (north versus south) was the experimental unit. Results were analyzed by period. Average weights of all pigs at the beginning and ending of each period (day on test) were subtotaled. All statistical analysis was conducted using GLM procedures as outlined by SAS (SAS; Cary, North Carolina).

Water:feed (W:F) ratios were analyzed as a time series using the ProcMix procedures of SAS. In Experiment One, the model included trial (season), drinker type, weight block, facility, and all two-way and three-way interactions. In Experiments Two and Three, the model included drinker type, weight block, facility, and the two-way interaction.

Death loss and data on pigs removed for poor performance (i.e., pigs with two consecutive weigh periods with < 0.2 kg per day average daily gain [ADG]) were analyzed by χ^2 analysis.

Results

Experiment One

Feeder type did not interact significantly ($P > .1$) with trial (season) or initial weight on pig performance (Table 1).

Pigs using the two-hole wet/dry feeder grew faster ($P < .05$) and had a higher daily feed intake ($P < .001$) than pigs using the traditional dry feeder and nipple drinker. Because feed disappearance for pigs using the wet/dry feeder increased more than daily gain, their feed conversion was worse ($P < .005$).

Feeder type had no effect ($P > .1$) on carcass lean, rate of lean gain, or pig health as measured by the percentage of pigs that died or that were removed for poor performance.

Total water use was reduced by 26% for the wet/dry feeders compared to the dry feeders with nipple drinkers ($P < .05$). Trial (season) had no effect on water use.

In the winter trial, total manure volume was excessive for one of the wet/dry feeder treatments in one of the two facilities because feed was found to be lodged against the nipple drinker in the feed trough for a 2-day weekend, which discharged a large volume of water into the manure collection pit. While corrections were immediately made for water disappearance, no such

Table 1: Effect of feeder type on performance, Experiment One

	Feeder type			
Item	Wet/dry	Dry	SEM	*P* values
Number of pens	12	12		
Pig weight, kg				
Initial	18.6	18.5	<.01	
Final	108.0	107.4	.4	Not Significant (NS) ($P > .1$)
CV *	9.5	10.4	.5	NS
ADG, kg	.780	.760	.006	.036
ADFI, kg	2.379	2.250	.019	<.001
Gain:feed	.328	.338	.002	.002
Carcass lean †	46.7%	47.0%	.2%	NS
Lean gain, kg/d †,‡	.273	.272	.002	NS
Pigs dead or removed	1.7%	1.4%		NS
Water, L x pig^{-1} x day^{-1} §	4.49	6.06	.36	.037
Water:feed, kg:kg §	1.78	2.79	.08	.003
Manure production, L x pig^{-1} x day^{-1} ¶ Summer	4.96	7.02	.20	.087

* CV=Coefficient of variation of within pen weight when first pig removed for slaughter
† Containing 5% fat
‡ Equation of NPPC (1991)
§ Represents four observations per feeder type
¶ Represents two observations per feeder type

Table 2: Manure production

	Experiment One (summer)		Experiment Two	
	Dry	Wet/dry	Swing	Nipple
Per pig per day				
Volume	7.02 L (1.85 gal)	4.96 L (1.31 gal)	3.96 L (1.05 gal)	4.59 L (1.21 gal)
Mass*	7.0 kg (15.4 lb)	4.9 kg (10.8 lb)	3.9 kg (8.6 lb)	4.5 kg (9.9 lb)
Per 1000 kg bodyweight				
Mass	109 kg (240 lb)	76 kg (167 lb)	61 kg (134 lb)	70 kg (154 lb)

* 990 kg per m^3 (61.8 lb per cu. foot); ASAE[8]

corrections were made to the manure volume. Thus, manure production was statistically analyzed only for the summer trial (Table 2). Use of the wet/dry feeder resulted in a 29.3% reduction (P <.1) in daily manure volume compared to the dry feeders and nipple drinkers.

Experiment Two

Within 2 days of initiating this experiment, all pigs were coughing severely and a consulting veterinarian diagnosed pneumonia caused by *Mycoplasma hyopneumoniae*. An intensive water medication program was initiated. Although death loss was minimal (Table 3), the within-pen variation in performance increased, as did the number of pigs removed from the experiment due to poor performance.

Overall, drinker type had no effect (P >.10) on daily gain, feed intake, feed conversion efficiency, carcass lean, or lean growth (Table 3). Drinker type had no effect on the uniformity of gain as measured by coefficient of variation of within-pen weights when the first pigs were removed for slaughter on day 103 of the experiment.

Total water use was reduced by 11.1% for the swinging drinker compared to the conventional drinker (P <.05). Manure volume is reported through day 103 of the experiment (Table 2). From study days 103–117 a leak in the water line where it entered one of the facilities through the manure storage pit for one treatment went undetected. Water disappearance for the period remained valid since the leak was prior to the water meters for each drinker type. For the first 103 days of the experiment, manure volume was reduced 13.7% (P <.05) for the swinging drinker versus the conventional drinker.

Experiment Three

Although drinker type had no effect on uniformity of weight within a pen or ADG, pigs on the bowl drinkers ate less feed (P <.01), resulting in a trend to improvement in feed conversion efficiency (P <.1; Table 4). Pigs on the bowl drinkers used 25% less water (P =.057) than pigs on the swing drinker. Manure production is not reported due to apparent errors in pit depth measurements. The effect of drinker type on carcass data is not reported due to the packer's failure to provide information on one delivery of pigs.

Water:Feed Ratio

Water:feed ratios (W:F) were calculated as kg of water per kg of feed disappearance for all experiments (Figure 2) using a water density of 1 kg per L. In Experiment One,

Table 3: Effect of drinker type on performance, Experiment Two

Item	Drinker type: Swing	Drinker type: Nipple	SEM	*P* values
Number of pens	6	6		
Pig weight, kg				
Initial	18.2	18.3	<.1	
Final	110.0	109.9	.5	Not significant (NS) (P>.1)
CV *	9.7	10.0	.4	NS
ADG, kg	.754	.748	.008	NS
ADFI, kg	2.302	2.307	.028	NS
Gain:feed	.324	.327	.003	NS
Carcass lean,†	52.3%	52.2%	.5%	NS
Lean gain, kg/d †,‡	.313	.313	.004	NS
Pigs dead or removed	3.3%	2.1%		NS
Water, L x pig^{-1} x day^{-1} §	4.90	5.50	.04	.058
Water:feed, kg:kg §	2.34	2.64	<.01	.003
Manure production, L x pig^{-1} x day^{-1} §¶	3.96	4.59	.41	.018

* CV=Coefficient of variation of within pen weight when first pig removed for slaughter
† containing 5% fat
‡ equation of NPPC (1991)
§ represents two observations per feeder type
¶ through d 103 of experiment

pigs on the wet/dry feeders had a lower W:F than pigs on the dry feeder system for every time period reported. The first two time periods (19–34 kg) had higher (P <.01) W:F than the last three on both drinker types. For the overall experiment, pigs on wet/dry feeders used 1 kg of water less per kg of feed than did pigs on the conventional system (P <.005; Table 1).

In Experiment Two, W:F was always significantly different (P <.001) between drinkers for every time period reported (Figure 2). Overall, pigs on the swing drinker used 0.3 kg less water per kg of feed than pigs on the nipple drinker (P <.005; Table 3).

In Experiment Three, there was an interaction (P <.01) between drinker type and observation period. Water:feed ratios remained relatively constant for the bowl drinker, but fluctuated for the swing drinker (Figure 2).

The overall W:F ratio was lowest for the wet/dry feeder (1.78; Experiment One) and similar to the bowl drinker (1.89; Experiment Three). The swing drinker had similar overall ratios in Experiment Two (2.34) and Experiment Three (2.41).

Discussion

Feed wastage, assessed by visual observation, was not considered a problem in any feeder type in any of the experimental pens. During the winter trial (Experiment One), coarse-ground feed was delivered once from the commercial feed mill, making adjustment of the wet/dry feeders difficult; once the feed milling problem was corrected, no further feeder management difficulties were observed.

Patterson[10] reported that use of a wet/dry feeder improved ADG but had no effect on average daily feed intake (ADFI), gain:feed, or carcass characteristics. In a subsequent experiment, he reported that feeder type had no effect on pig performance.[11] Walker[12] also observed that a wet/dry feeder had no effect on feed conversion, but did report that use of this type of feeder improved ADFI and ADG and increased P2 backfat. Young and Lawrence[13] concluded that pigs can adapt to the physical and social constraints imposed by a feeding system by altering aspects of their feeding behavior. This supports the lack of major performance differences we observed between feeder types in Experiment One, suggesting that the appropriate range of

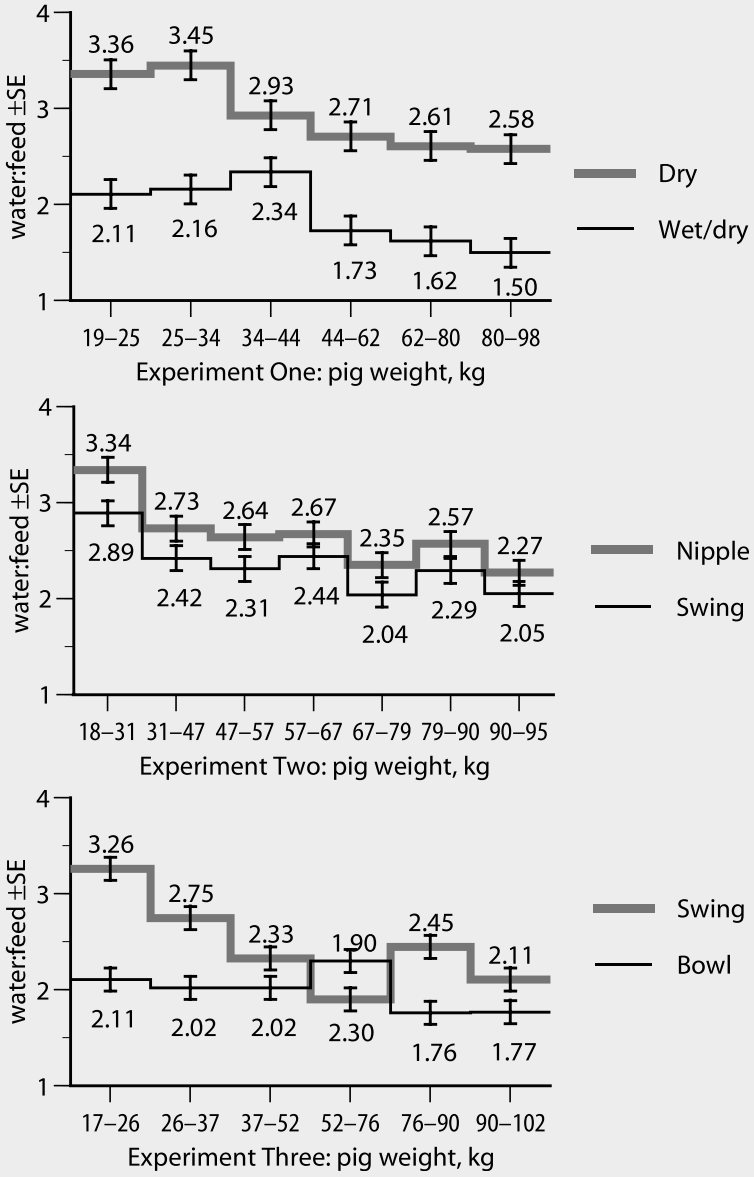
Table 4: Effect of drinker type on performance, Experiment Three

Item	Drinker type		SEM	*P* values
	Swing	Bowl		
Number of pens	6	6		
Pig weight, kg				
Initial	17.5	17.4	.1	
Final	115.1	113.9	.5	Not significant (NS) (P>.1)
CV *	8.8	8.8	.4	NS
ADG, kg	.831	.820	.005	NS
ADFI, kg	2.118	2.043	.014	.006
Gain:feed	.392	.401	.003	.090
Pigs dead or removed	0.8%	2.5%		NS
Water, L x pig^{-1} x day^{-1} †	5.01	3.78	.08	.057
Water:feed, kg:kg †	2.41	1.89	<.01	.005

* coefficients of variation of within pen weight when first removed for slaughter

† represents two observations per feeder type

Figure 2: Impact of drinker device on water usage for Experiments One, Two, and Three



feeder designs and stocking densities in swine facilities may be wider than the recommended four to five pigs per feeder space.[7]

In observations consistent with ours in Experiment One, Maton and Daelemans[14] concluded that all wet feeders included in their experiments reduced water spillage so that water consumption was only 70%–80% of that observed from conventional feeders and nipple drinkers. In addition, slurry (manure) volume was reduced by 20%–30% in their study.

Miyawaki, et al.,[15] reported that growing-finishing pigs with access to a wet/dry feeder similar to that used in Experiment One had a faster eating speed than pigs given access to conventional dry feeders with separate drinkers, resulting in reduced eating time per pig. As the number of pigs per space increased from five to 15, both total and average eating time decreased. For the wet/dry feeder investigated, they concluded that a reasonable number of finishing pigs per feeding space is eight to ten.[16] The stocking density in Experiment One was 12 pigs per feeder space.

Our observation in Experiment One that season did not interact with feeder type is in contrast to the results of Miyawaki, et al.,[17] who reported that water disappearance in a summer experiment was greater using a conventional system, (16 L per pig per day) than that using a feeder similar to the wet/dry feeder we used in Experiment One (7.5 L per pig per day). However, they observed no effect of feeder type on water disappearance in a winter experiment (5.9 versus 6.2 L per pig per day).

Estimates of total water use by growing-finishing pigs are limited and varied.[1,4,7] For pigs between 20–90 kg (44–198 lb) BW, the NRC[4] recommends a minimum requirement of approximately 2 kg (1.9 gal) of water for each kg (2.2 lb) of feed (water:feed ratio). In Experiments One and Three, mean W:F did not reach these recommended values and declined for all delivery devices investigated in all experiments as pigs grew (Figure 2). The NRC[4] estimate makes no mention of a possible interaction between BW and W:F. Our results are also inconsistent with the observations of Crumby,[18] who noted that the voluntary W:F for growing pigs that were allowed ad libitum access to feed was about 2.5:1. Mount, et al.,[19] reported W:F of 2.1:1 for 37-kg (81-lb) pigs, 5.0:1 for 50-kg (110-lb) pigs, and 2.2:1 for 73-kg (161-lb) pigs fed ad libitum, contradicting our observations that W:F decreases as pigs grow.

Brumm, et al.,[5] reported manure production values for growing-finishing pigs offered ad libitum feed from 14–91 kg (31–200 lb) BW and nipple drinkers similar to those used in Experiments One and Two to average 5.7 kg (12.5 lb) per pig per day. The ASAE[8] cites an average value of 84 kg ± 24 kg (185 lb ± 53 lb) manure (feces and urine only) production per 1000 kg (2200 lb) liveweight per day. The Nebraska DEQ[20] uses an estimate of 62 kg per 1000 kg (136 lb per 2200 lb) liveweight plus 20% for spillage and washwater or 74 kg per 1000 kg (163 lb per 2200 lb) liveweight.

One possible explanation for the differences in manure production noted between our results and other reports is a difference in feed conversion efficiency. In the studies included in the data by Brumm, et al.,[5] mean gain:feed in 14–91 kg pigs (31–200 lb) were .302[21] and .289.[22] These are lower than the .333 average we observed in Experiment One, the .325 average in Experiment Two, and the .397 average in Experiment Three. In these experiments, the improved feed conversions occurred even though final weights were 10–15 kg (22–33 lb) heavier. These results suggest that feed conversion has improved due to improvements in genetics, nutrition, and equipment design, and that manure production has decreased, and that the estimates used by regulators[20] and designers[8] of manure storage facilities have not been modified to properly account for this evolution.

Currently, the Midwest Plan Service (MWPS)[7]estimates total daily water needs at 11.4 L (3 gal) per growing pig and 15.1 L (4 gal) per finishing pig. When combined with their manure production estimates, this is a water:manure ratio (water volume ÷ manure volume) of 2.9 for the growing pig and 2.2 for the finishing pig. In Experiment Two, the ratio was < 50% of these MWPS[7] estimates. In these experiments, overall water use and manure volume does not include washwater, which can partially account for why the recorded values are lower than those used to design the manure storage facilities. However, washwater almost always enters the manure storage device at a ratio of 1:1. Thus, it seems that current estimates of daily manure volume in the literature are too high, even when additional water needs for facility cleaning are included in the estimate.

Implications

- Water use and manure volume ranges widely depending upon feeder and drinker type.
- Decisions regarding drinker device selection have a major impact on water use and manure production.
- Differences in pig performance that could be attributed to feeder and drinker type were minimal.
- We observed lower amounts of total water use and manure production than reported elsewhere in the literature or suggested by regulatory officials.

Acknowledgements

Published as Journal series no. 12448, Agric. Res. Div., University of Nebraska. Acknowledgement is made to Dennis Forsberg for routine animal care. This research was supported in part by grants from: Gro Master, Inc., Omaha, Nebraska; Ritchie Industries, Inc., Conrad, Iowa; and Farmweld, Inc., Teutopolis, Illinois.

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Manitoba Agriculture, Food and Rural Initiatives

Can Feeder and Drinker Design Affect Water Usage Rates?

Brian Cotton, Swine Specialist, Brandon, MB

One of the concerns with swine production is the amount of water used and the amount of manure produced on the farm.

To address this concern, researchers Brumm, Dahlquist and Heemstra of the University of Nebraska set up trials to determine the impact of feeder and drinker designs on pig performance, water use and manure volume. They compared a wet / dry feeder to a dry feeder with wall-mounted nipple drinker, a swinging nipple drinker to a gate-mounted drinker and a bowl drinker to a swinging drinker. The water was metered and manure volume was measured in the pits.

In the trial comparing the wet / dry feeder to the dry feeder with the nipple drinker, total water use was 26% less for the wet / dry feeder, and manure volume was reduced by 29.3%.

With the swinging drinker water was reduced 11.1% and manure volume was reduced 13.7% compared to the conventional drinker.

In experiment three, pigs on bowl drinkers used 25% less water than pigs on the swing drinker.

The results from these trials suggest that feed conversion has improved due to improvements in genetics, nutrition and equipment design and that manure production has decreased.

Conclusions

- Water use and manure volume ranges widely depending upon feeder and drinker type.
- Decisions regarding drinker device selection have a major impact on water use and manure production.
- Differences in pig performance that could be attributed to feeder and drinker type were minimal.

Summarized from "Swine Health & Production, Vol. 8, # 2.

Master Matrix Item #26e

Using Manure Nutrients for Crop Production

Nutrients in Animal Manure

Manure can supply nutrients required by crops and replenish nutrients removed from soil by crop harvest. Since manure contains multiple nutrients, applications should consider not only what is needed for the crop to be grown but also how the ratio of nutrients in manure could affect soil test levels. This ensures adequate nutrient supply and reduces potential for over- or under-application and subsequent buildup or depletion in the soil. Good manure nutrient management should consider short-term and long-term impacts on crop nutrient supply and soil resources.

Manure has characteristics that make nutrient management different and sometimes more complicated than fertilizer. These include a mix of organic and inorganic nutrient forms; variation in nutrient concentration and forms; variation in dry matter and resultant handling as a liquid or solid; and relatively low nutrient concentration requiring large application volumes. Since manure nutrient composition can vary significantly, sampling and laboratory analysis are always needed, while with fertilizer nutrient concentrations are provided at a guaranteed analysis.

The manure nutrient concentration varies considerably between animal species; dietary options; animal genetics; animal performance; production management and facility type; and collection, bedding, storage, handling, and agitation for land application. Use of average or "book" nutrient values can be helpful for designing a new facility and creating manure management plans but is not very helpful in determining specific manure nutrient supply or application rates due to wide variation in nutrient concentrations between production facilities. For example, a recent sampling across swine finishing facilities found a range in total N from 32 to 79 lb N/1,000 gal, P from 17 to 54 lb P_2O_5/1,000 gal, and K from 23 to 48 lb K_2O/1,000 gal. A similar or larger range can be found with other manure types. Nutrient analyses often vary greatly as storage facilities are emptied or manure is stockpiled, and also among multiple samples collected from loads during land application. Therefore, collecting multiple manure samples and maintaining a history of analysis results will improve use of manure nutrients.

For determining manure application rates and equating to crop fertilization requirements, it is most helpful if manure analyses give N, P_2O_5, and K_2O based on an as-received or wet basis in lb per ton or lb per 1,000 gal units. It is beyond the scope of this publication to give detailed manure sampling and laboratory analysis

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recommendations. Those can be found in the extension materials listed on page 7. If manure analyses are provided from the laboratory in other units, they must be converted to these units. See the ISU Extension manure sampling publication for appropriate conversion factors. If manure average nutrient values or methods to estimate manure nutrient concentrations based on excretion are of interest or needed for planning purposes, those can be found in the Midwest Plan Service bulletins listed on page 7.

Manure Nutrient Availability for Crops

Nutrient management guidelines use the words "manure nutrient availability" when suggesting manure applications to supply nutrients needed by crops. However, the meaning of "availability" for manure nutrients often is not clear or its use not consistent. Available is defined as present or ready for immediate use, or present in such chemical or physical form as to be usable (as by a plant). The main reasoning for using the term "available" in describing manure nutrients is that some portions are in forms that cannot be used by plants immediately upon application to soil and have to be converted to a form that plants can take up. The term "available" is not typically applied to fertilizers because most include chemical forms that plants can take up or are quickly converted upon application to soil. According to this definition, most inorganic fertilizers contain basically 100 percent crop-available nutrients. For example, anhydrous ammonia dissolves in water and rapidly changes to ammonium, urea hydrolyzes to ammonium within a few days, and ammonium is further transformed to nitrate by soil microorganisms. Monoammonium phosphate (MAP) and diammonium phosphate (DAP) are highly soluble in water and dissolve to ammonium and orthophosphate. Potassium chloride (KCl, potash), dissolves in water to potassium (K^+) and chloride (Cl^-) ions. Both orthophosphate and K ions are taken up by plants. Because all K contained in manure is in the K^+ ionic form, manure K is readily crop available in all manure sources.

For manure N and P, there is usually a mix of organic and inorganic materials that varies among manure sources, production systems, bedding, storage, and handling. This variety in forms of N and P in manure contributes to greater uncertainty in manure nutrient management compared with fertilizers. The ratio of inorganic (mainly ammonium) and organic N varies considerably with the manure source. This was shown, for example, by on-farm research that included manure sampling and analysis from swine and poultry operations. The fraction of total N as ammonium N was almost 100 percent for swine manure from the liquid portion of anaerobic lagoons, 65 to 100 percent (average 84 percent) for liquid swine manure from under-building pits or storage tanks, and 10 to 40 percent (average 20 percent) for solid poultry manure. The large ammonium-N concentration and organic-N fraction that is easily mineralized after applica-

tion to soil explain why N in liquid swine manure is considered "highly" crop available and almost comparable to fertilizer N. Other manures have lower ammonium-N concentrations and greater (and tougher to degrade) organic materials due to bedding and feed materials. Considerable P in swine manure is orthophosphate and calcium phosphate compounds (derived both from feed and mineral supplements added to rations) that are soluble or dissolve quickly once applied to soil. The rest is organic P, which varies greatly in complexity and reaction in soil. Testing manure for ammonium-N or water-soluble N can be a way of estimating immediately available N. Unfortunately, a similarly useful test does not exist for P. Therefore, the availability estimate for manure N and P can be, and often is, less than 100 percent of total N and P.

Manure Nutrient Supply

There is a clear difference between crop availability of nutrients in fertilizer or manure and season-long supply of nutrients. Significant amounts of plant usable forms of nutrients in both fertilizer and manure might be lost and became unavailable to crops after application. For example, N can be lost through processes such as leaching, volatilization, or denitrification while P can be lost through erosion and surface runoff. Also, these nutrients can be converted for short or long periods of time into forms not usable by plants through processes such as immobilization to organic materials for N and retention by soil mineral constituents for P. Nutrient loss issues are not as pertinent for P and K as for N in Iowa soils as long as there is little soil erosion and surface runoff.

The immediate or long-term fate of plant usable nutrients in soil can be similar for manure and fertilizer. However, variation in manure nutrient concentration, application rate, and application distribution affect nutrient supply and contribute to increased uncertainty with manure management. Application rate and distribution uncertainties affect all applied nutrient sources but are more difficult to manage with manure than with fertilizer. With careful manure sampling, pre-application nutrient analysis, study of nutrient analysis history, and calibration of application equipment, reasonable manure nutrient application rates can be achieved. Due to material characteristics, and sampling and analysis variability, field distribution and application rate variability often is greater for dry manure sources.

These supply issues can be important for N, P, and K, although typically are of greater concern with N. There are several reasons, including manure usually is applied for corn production where N supply is critical, many Iowa soils have optimum or higher P and K test levels where need for and response to P and K is much less than with N, and crop deficiency symptoms and yield loss resulting from nutrient supply problems are more obvious for N.

Manure nutrient loss, application rate, and distribution uncertainties usually are not included in crop nutrient availability estimates. Instead, they are handled by suggested management practices. Not all published guidelines are consistent in this regard and, therefore, suggested crop nutrient availabilities do vary between states and regions. In this publication, use of "availability" refers to manure nutrients potentially available for plant uptake (with no losses) by the first crop after application or beyond, and percent nutrient availability values provided correlate to those for commonly used fertilizers. The guidelines in this publication assume supply issues are handled in the best way possible as is done with fertilizers. It is important to understand that for successful manure nutrient management, in many instances supply issues are as, or more, critical than estimates of nutrient availability.

Improving crop nutrient supply with manure can be achieved by understanding the issues related to manure nutrient analysis, application rate, application distribution, and the benefits and risks related to management practices such as application timing and placement that influence potential losses. Additionally, use of available tools to determine initial soil nutrient levels and adjust application rates can help provide for adequate season-long nutrient supply when either manure or fertilizer is used. These tools include commonly used pre-plant soil testing for P and K, estimates of N application rate need based on response trial data (such as

the *Corn Nitrogen Rate Calculator*), and tools to help determine need for additional N after planting corn such as the late-spring soil nitrate test and in-season crop sensing for N stress.

Manure Nutrient Application Recommendations

To determine manure application rates, the following information is required: needed crop nutrient fertilization rate for N, P, K, or other deficient nutrients; manure type; nutrient analysis; nutrient crop availability; and method of application. Nutrient recommendations for crops are provided in other Iowa State University Extension publications and are not repeated here (see list on page 7).

Once the needed nutrient application rate is determined, the manure rate to supply crop available nutrients is calculated based on the specific manure source being used.

An additional consideration is what portion of the needed fertilization will be supplied from manure—to meet the full crop nutrient requirement, or a partial requirement from manure and the remaining from fertilizer. This is an important consideration because manure contains multiple nutrients and a manure rate to supply the most deficient nutrient can over-supply other nutrients. Also, manure application to meet the least deficient or most environmentally restrictive nutrient application can result in under-supply of other nutrients.

In these cases, use of fertilizers in addition to manure application is necessary to appropriately meet all nutrient application requirements.

Manure Nutrient Availability Values

Many of the manure N, P, and K crop availability estimates listed in Table 1 are derived from research trials conducted in Iowa. However, when local research is lacking, applicable information was taken from research conducted in other states. For manure sources not listed in the table, values based on manure with similar characteristics can provide a reasonable estimate.

First-Year Availability Estimates

Table 1. First-year nutrient availability for different animal manure sources.

Manure Source	Nitrogen[1]	Phosphorus[2]	Potassium[2]
	- - - - - - - - - - - - - Percent of Total Nutrient Applied - - - - - - - - - - - - -		
Beef cattle (solid or liquid)	30–40	60–100	90–100
Dairy (solid or liquid)	30–40	60–100	90–100
Liquid swine (anaerobic pit)	90–100	90–100	90–100
Liquid swine (anaerobic lagoon)	90–100[3]	90–100[3]	90–100
Poultry (all species)	50–60	90–100	90–100

[1]The estimates for N availability do not account for potential volatile N losses during and after land application. Correction factors for volatile loss are given in Table 2. The ranges are provided to account for variation in the proportion of ammonium N (and for poultry manure also uric acid), bedding type and amount, and both sampling and analysis.

[2]The ranges in P and K availability are provided to account for variation in sampling and analysis, and for needed P and K supply with different soil test levels. A small portion of manure P may not be available immediately after application, but all P is potentially available over time. Use lower P and K availability values for soils testing in the Very Low and Low soil test interpretation categories, where large yield loss could occur if insufficient P or K is applied and a reasonable buildup is desirable. Use 100% when manure is applied to maintain soil-test P and K in the Optimum soil test category, when the probability of a yield response is small.

[3]Values apply for the liquid portion of swine manure in lagoons; the N and P availability will be less and difficult to estimate with settled solids.

Second- and Third-Year Availability Estimates

While manure N may become crop available over multiple years for some sources, there should not be an expectation that all of the manure N will eventually become crop available. This happens because some of the N is in difficult to degrade organic forms (recalcitrant) and will become part of the soil organic matter. For some manure sources, such as with bedded systems, not all of the manure N should be accounted for in manure plans over multiple years and the first-, second-, or third-year availability may not add up to 100 percent.

Animal manure that has considerable organic material can have some residual-N availability in the second or third year after application. The second-year N availability estimate for beef cattle and dairy manure is 10 percent, and 5 percent for the third year. Other manures that have similar organic N and bedding could have similar second- and third-year N availability. Manure sources that have low organic N will not have second-year crop available N. These include liquid systems like swine manure stored in under-building pits and above-ground tanks, and anaerobic lagoons. Poultry manure, since it has considerable organic material, has some but low second-year (0–10 percent) availability and no third-year N availability.

The P and K contained in animal manure are estimated at 100 percent crop available over a long term. Residual effects of P and K not used in the year of application will be reflected in soil tests and crop use, just like fertilizer P and K applied for one year or for multiple years.

Adjusting for Manure Nitrogen Volatilization

The estimates for manure N availability in Table 1 do not consider potential volatile N losses during or after application. Losses are from various volatile N compounds in manure, such as ammonia, and ammonia that is produced when urea, uric acid, or other compounds convert to ammonium. These are similar losses that can occur from some N fertilizers such as anhydrous ammonia, urea, and urea-ammonium nitrate (UAN) solutions. If manure is left on the soil surface, losses may occur until N is moved into the soil with rainfall or incorporated with tillage. Many factors affect the rate and amount of volatile loss, such as temperature, humidity, rainfall, soil moisture, soil pH, surface residue cover, and days to incorporation. Volatile losses at or after application often are difficult to predict accurately. However, losses can be significant, and, therefore, it is important to make an adjustment for volatile N losses from applied manure and for manure management planning purposes. Values given in Table 2 provide guidance on potential volatile losses. The correction factors in Table 2 do not account for N losses during storage and handling (time from excretion to sampling for analysis) and assume a reasonable time period from sampling to land application so that the manure analysis represents the manure being applied. To estimate manure N remaining in soil after application, multiply the applied manure N rate by the appropriate correction factor.

Table 2. Correction factors to account for N volatilization losses during and after land application of animal manure.[1]

Application Method	Incorporation	Volatilization Correction Factor[2]
Direct injection	—	0.98–1.00
Broadcast (liquid/solid)	Immediate incorporation	0.95–0.99
Broadcast (liquid)	No incorporation	0.75–0.90
Broadcast (solid)	No incorporation	0.70–0.85
Irrigation	No incorporation	0.60–0.75

[1]Adapted from Midwest Plan Service MWPS-18, Third Edition. Nitrogen losses during and within four days of application.

[2]Multiply the manure total N rate applied times the volatilization correction factor to determine the portion of total manure N remaining.

Considerations for Time of Application

The time of application influences nutrient availability and potential manure and nutrient loss from soil. Fall applications allow more time for organic N and P portions of manure to mineralize so they are available for plant uptake the next crop season. This is more important for N in manures with high organic matter content, such as bedded systems. Iowa research has shown that fall versus springtime P and K application usually is not an agronomic issue for fertilizers or manure. The increased time for organic N mineralization with fall application also allows for nitrification of ammonium and therefore more potential nitrate loss through leaching or denitrification with excessively wet spring conditions. This is a more important issue for manure with large ammonium-N concentration, such as liquid swine manure. Coarse-textured soils, with high permeability, are the most likely to have leaching losses. Fine- and moderately fine-textured soils, prone to excess wetness, are most likely to have denitrification losses. Manure applied in the spring has less time for organic N and P mineralization before crop uptake. Delayed mineralization can be an important issue for manure with high organic matter content, especially in cold springs. With manure that contains a large portion of N as ammonium, spring application allows for better timing of nitrification to nitrate and subsequent crop use, and less chance of N loss.

As a general rule, do not apply manure in the fall unless the soil temperature is 50° F and cooling at the four-inch soil depth. This will slow the mineralization and nitrification processes and is an especially important consideration for manure containing a large portion of N as ammonium.

Broadcasting manure onto frozen, snow-covered, water-saturated soils increases the potential for nutrient losses with rainfall or snowmelt runoff to surface water systems. If manure must be applied in these conditions, it should be applied on relatively flat land, slopes less than 5 percent, and well away from streams and waterways (see Iowa Department of Natural Resources rules on setback distances).

Example Calculation of Manure Application Rates

Note: *The N, P, and K fertilization requirements in these examples are determined from appropriate extension publications and Web-based tools listed at the right.*

Example 1

- Manure source: liquid swine manure, finishing under-building pit.
- Manure analysis: 40 lb N/1,000 gal, 25 lb P_2O_5/1,000 gal, 35 lb K_2O/1,000 gal.
- Intended crop: corn in a corn-soybean rotation.
- Soil tests: 19 ppm Bray P-1 (Optimum), 165 ppm Ammonium Acetate K (Optimum).
- Crop yield and P and K removal for determining nutrient rates needed to maintain the Optimum soil test category: 200 bu/acre corn yield; 75 lb P_2O_5/acre and 60 lb K_2O removal.
- Manure rate: based on corn N fertilization requirement at 125 lb N/acre.
- Manure application: injected late fall.
- Manure nutrient availability: 100 percent for N, P, and K.
- Manure N volatilization correction factor: 0.98.
- Manure rate: 125 lb N/acre ÷ (40 lb N/1,000 gal × 0.98) = 3,200 gal/acre.
- Manure available P and K nutrients applied: 3,200 gal/acre × (25 lb P_2O_5/1,000 gal × 1.00) = 80 lb P_2O_5/acre; and 3,200 gal/acre × (35 lb K_2O/1,000 gal × 1.00) = 112 lb K_2O/acre.
- Phosphorus and K applied with the manure are adequate for P (slightly more than expected corn removal) and will supply more than needed K. The extra P and K can be used by the next crop and should be accounted for. However, additional P and K will need to be applied for the following soybean crop.

Example 2

- Manure source: solid layer manure.
- Manure analysis: 72 lb N/ton, 69 lb P_2O_5/ton, 54 lb K_2O/ton.
- Intended crop: corn-soybean rotation.
- Soil tests: 18 ppm Bray P-1 (Optimum), 120 ppm Ammonium Acetate K (Low).
- Manure rate: based on P requirement for the crop rotation at 120 lb P_2O_5/acre.
- Manure application: late fall, incorporated after four days.
- Manure nutrient availability: 55 percent for N, 100 percent for P and K.
- Manure N volatilization correction factor: 0.80.
- Manure rate: 120 lb P_2O_5/acre ÷ (69 lb P_2O_5/ton × 1.00) = 1.7 ton/acre.
- Manure available N and K nutrients applied: 1.7 ton/acre × (72 lb N/ton × 0.60 × 0.80) = 60 lb N/acre; and 1.7 ton/acre × (54 lb K_2O/ton × 1.00) = 92 lb K_2O/acre.
- Corn N fertilization need and K needed for the corn and soybean crops with a Low soil test category: 130 lb N/acre and 172 lb K_2O/acre.
- Crop available N and K applied with manure is not adequate for N, need additional 70 lb fertilizer N/acre (130 lb N/acre – 60 lb N/acre); and applied K is not adequate for the corn and soybean crops, need additional 80 lb K_2O/acre (172 – 92 lb K_2O/acre) from fertilizer.

Additional Resources

PM 1688 *A General Guide for Crop Nutrient and Limestone Recommendations in Iowa*

PM 287 *Take a Good Sample to Help Make Good Decisions*

PM 2015 *Concepts and Rationale for Regional Nitrogen Rate Guidelines for Corn*

PM 1714 *Nitrogen Fertilizer Recommendations for Corn in Iowa*

PM 2026 *Sensing Nitrogen Stress in Corn*

PM 1584 *Cornstalk Testing to Evaluate Nitrogen Management*

PM 1588 *How to Sample Manure for Nutrient Analysis*

A3769 *Recommended Methods of Manure Analysis* (University of Wisconsin)

MWPS-18-S1 *Manure Characteristics: Section 1* (Midwest Plan Service)

MWPS-18 *Livestock Waste Facilities Handbook, Third Edition* (Midwest Plan Service)

Corn Nitrogen Rate Calculator, **http://extension.agron.iastate.edu/soilfertility/nrate.aspx**

Summary

- Carefully manage the nutrients in animal manure as you would manage fertilizer.
- Have representative manure samples analyzed to determine nutrient concentration. At a minimum, samples should be analyzed for moisture (dry matter) and total N, P, and K. For additional information on N composition, samples can be analyzed for ammonium. Maintain a manure analysis history for production facilities.
- Set the manure application rate according to crop fertilization requirements and for the crop availability of manure N, P, and K.
- Adjust manure rates for estimated N volatilization.
- For manure application rates, consider the crop N, P, and K fertilization requirements and field P-Index ratings, but do not exceed the crop N fertilization need.
- Consider the nutrient needs of crop rotations rather than just individual crops, which is especially important for P and K management.
- Allocate manure to fields based on soil tests and crops to be grown.
- Fall applications of manure should not be made until the soil temperature is 50° F and cooling, especially for manure sources that have a large portion of N as ammonium.
- Do not apply manure to snow-covered, frozen, or water-saturated sloping ground to reduce risk of nutrient loss and water quality impairment.

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Expert Reviewed This publication was peer-reviewed by three independent reviewers using a double-blind process.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Jack M. Payne, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.

Aerial Map

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3/23/2020

Separation Distances for Land Application of Manure from Open Feedlots & Confinement Feeding Operations, including SAFOs

Revised October 2008
Effective 3/1/03

Iowa law requires that all manure from an animal feeding operation must be land applied in a manner that will not cause surface or groundwater pollution. Chapter 65 of the Iowa Administrative Code (IAC) contains rules that govern land application of manure, including the separation distances summarized in Tables 1, 2 and 3 below. The separation distances are required by law and must be maintained between the protected area and the application area. Separation distances vary based on manure type, manure source and application method. Manure applicators need to be certified unless the manure originates from a small animal feeding operation or an open feedlot. All commercial applicators must be certified.

Please note that manure includes animal excreta or other commonly associated wastes of animals including, but not limited to, bedding, compost, litter, feed losses, raw materials or other materials comingled with manure or set aside for disposal. Manure does not include wastewater resulting from the washing and in-shell packaging of eggs.

CAUTION: This document is only a summary of administrative rules contained in 567 IAC chapter 65; it is a guidance document and should not be used as replacement for the administrative rules. While every effort has been made to assure the accuracy of this information, the administrative rules will prevail in the event of a conflict between this document and the administrative rules.

Table 1: For Confinements - Required separation distances (in feet) to ***buildings or public use areas*** by type of manure and method of manure application

Buildings or Public Use Areas	***Dry Manure***		***Liquid Manure***		
	Surface Application		***Direct Injection***	***Surface Application***	
	Incorporated within 24 hours	Incorporated after 24 hrs. or not incorporated		Incorporated within 24 hrs.	Incorporated after 24 hrs. or not incorporated
• residence • business • church • school • public use area	0	0	0	0	750 ft. [1]

1. a) This separation distance applies only to liquid manure from confinement feeding operations. It does not apply to manure from open feed lots or dry manure. The required 750-foot separation distance also does not apply if any of the following exist:
   1) manure is injected or incorporated within 24 hours,
   2) a written waiver is issued by owner of the building or public use area benefiting from the required separation distance,
   3) manure comes from a small animal feeding operation (SAFO), or
   4) manure is applied by low pressure spray irrigation equipment (a 250-foot separation distance applies—see Table 3).

   b) Measure the separation distance from the applied manure to the closest point of buildings; and to the facilities where people congregate (for public use areas).

Table 2: For All Animal Feeding Operations - Required separation distances to ***designated areas*** by type of manure and method of manure application

Designated Areas	***Dry Manure***		***Liquid Manure***		
	Surface Application		***Direct Injection***	***Surface Application***	
	Incorporated on same date	Not incorporated		Incorporated on same date	Not incorporated
• sinkhole • abandoned well • cistern • drinking water well • designated wetland • water source	0	200 ft.[2] (50 ft. with buffer[3])	0	0	200 ft.[2] (50 ft. with buffer[3])
• high quality water resource	0	800 ft.[2, 4] (50 ft. with buffer[3])	0	0	800 ft.[2, 4] (50 ft. with buffer[3])
• unplugged ag drainage well • ag drainage well surface inlet	0	200 ft.[5]	0	0	200 ft. - no application if irrigated[5]

2. The separation distance applies to both open feedlots and confinement feeding operations, regardless of size. The 200-foot or 800-foot separation distance does not apply if either of the following exist:
   a) if manure is injected or incorporated on the same date as the manure was land applied, it can be applied up to the edge of the designated area, or
   b) if a 50-foot buffer is established around a designated area, manure can be applied up to the edge of the buffer.
3. Do not apply manure in the vegetative buffer.
4. Check with the DNR to see if you are adjacent to a high quality water resource, because an 800-foot separation distance will apply.
5. Manure shall not be applied within 200 feet of an unplugged ag drainage well or unplugged ag drainage well surface inlet, unless injected or incorporated on the same date. No application allowed if irrigated - see Table 3.

Table 3: Confinements - Additional separation distances for land application of ***irrigated liquid manure***

Protected Areas	***Irrigated Liquid Manure*** [1]	
	Low Pressure (≤ 25 psi)	High Pressure (> 25 psi)
Property Boundary Line	100 ft. [2]	100 ft. [2]
Buildings or Public Use Areas • residence • business • church • school • public use area	250 ft. [3]	750 ft. [4]
Designated Areas For separation distances from environmentally sensitive "designated areas" such as sinkholes, abandoned wells, high quality water resource, etc.	See Table 2	See Table 2
• unplugged ag drainage well • ag drainage well surface inlet • agricultural drainage well area (watershed)	No Irrigation Allowed [5]	No Irrigation Allowed [5]

1. These separation distances apply to liquid manure from a confinement feeding operation. They do not apply to manure from open feedlots or dry manure.
2. a) Maintain at least 100 feet between the wetted perimeter (per manufacturer's specifications) and the property boundary line where irrigation is being used, and the actual wetted perimeter shall not exceed the property boundary line.
   b) If property includes a road right-of-way (ROW), a railroad ROW or an access easement, use the boundary of the ROW or easement as the property boundary line.
3. a) This separation distance applies to liquid manure applied by low pressure spray irrigation equipment as defined below.
   b) Measure the separation distance from the actual wetted perimeter of the manure to the closest point of buildings; and to the facilities where people congregate (for public use areas).
4. a) The required 750-foot separation distance does not apply if any of the following exist:
   1) manure is incorporated within 24 hours,
   2) a written waiver is issued by the owner of the building or public use area benefiting from the required separation distance,
   3) manure comes from a small animal feeding operation (SAFO), or
   4) manure is applied from no more than 9 feet high, with drop nozzles by low pressure spray irrigation (a 250-foot separation distance applies).
   b) Measure the separation distance from the actual wetted perimeter of the manure to the closest point of buildings; and to the facilities where people congregate (for public use areas).
5. No manure can be applied by spray irrigation equipment within an ag drainage well area. An ag drainage well area includes all land where surface or subsurface water drain to the well directly or through a drainage system connected to the well.

Recommended separation distance for land application of manure

Recommended, but not required: avoid application within 200 feet of (and draining into) a surface intake for a tile line.

Definitions

Buffer: consists of an area of permanent vegetation cover, including filter strips and riparian forest buffers, which exists for 50 feet surrounding the designated area other than an unplugged ag drainage well or surface intake to an unplugged ag drainage well. Do not apply manure in the vegetative buffer.

Designated area: includes a known sinkhole, or a cistern, abandoned well, unplugged agricultural drainage well, agricultural drainage well surface inlet, drinking water well, designated wetland, or water source. Designated areas do not include terrace tile inlets.

Designated wetland: means land owned by the U.S. Government or DNR and designated as a protected wetland by the Department of Interior or the DNR. It does not include land where an ag drainage well has been plugged causing a temporary wetland or land within a drainage or levee district.

High Quality Water Resource: means a high quality water or high quality resource water according to Chapter 61 of the Iowa Administrative Code or a protected water area system as defined in Iowa Protected Water Areas General Plan. (See list of high quality water resources by county.)

Low pressure spray irrigation equipment: discharges at a maximum pressure of 25 pounds per square inch (psi) and downward from a maximum height of nine feet.

Public use area: government-owned land (local, state or federal) with facilities that attract people for significant amounts of time (i.e., picnic grounds, campgrounds, shelters, lakes, etc.). Public use areas do not include highways, road right-of-ways, parking areas, recreational trails or similar areas that people pass through but do not congregate in. Note: cemeteries are included in public use areas, but may be privately owned or managed.

Small Animal Feeding Operation (SAFO): an animal feeding operation that has an animal unit capacity of 500 or fewer animal units. Applies only to confinement feeding operations.

Water source: a lake, river, reservoir, creek, stream, ditch, or other body of water or channel having definite banks and a bed with water flow, except lakes or ponds without outlet to which only one landowner is riparian.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

WASTE FACILITY CLOSURE

(No.)

CODE 360

DEFINITION

The decommissioning of facilities, and/or the rehabilitation of contaminated soil, in an environmentally safe manner, where agricultural waste has been handled, treated, and/or stored and is no longer used for the intended purpose.

PURPOSE

- Protect the quality of surface water and groundwater resources.
- Mitigate air emissions.
- Eliminate a safety hazard for humans and livestock.
- Safeguard the public health.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to agricultural waste facilities or livestock production sites that are no longer needed as a part of a waste management system and are to be permanently closed or converted for another use. These facilities include liquid/dry waste storage facilities, confined animal housing, feedlots, livestock yards, or composting facilities. This practice applies to open lot operations that are closed and converted to confinement based operations (buildings).

This practice applies where impoundments that are to be converted to fresh water storage meet current NRCS standards.

Where structures that include agricultural waste storage, such as confined animal housing, are to be decommissioned, this practice will apply to the removal of the waste and rehabilitation of soil within the facility.

This practice applies to remediation of soil contaminated by agricultural wastes that have been stored on-site.

It does not apply to sites contaminated by materials that require the issuance of a hazardous waste permit, such as fuel or pesticides.

CRITERIA

General Criteria Applicable to All Purposes

The closure shall comply with all Federal, State, and local laws, rules, and regulations including national pollutant discharge elimination system (NPDES) requirements.

Existing waste transfer components that convey to waste facilities or provide drainage from the facility area shall be removed and replaced with compacted earth material or otherwise rendered unable to convey waste.

Remove manure, agricultural waste, and contaminated soil to the maximum extent practicable. All manure and agricultural waste that could negatively impact water and/or air quality or pose a safety hazard shall be removed as deemed practicable. All liquid, slurry, sludge, and solid waste, and soil removed from the facility shall be utilized in accordance with Nutrient Management, (590) and/or Waste Utilization, (633).

Precautions (fencing and warning signs) shall be used where necessary to ensure that the facility is not used for purposes incompatible with the facility modification.

Erosion and Pollution Control. All disturbed areas shall be re-vegetated or treated with other suitable measures used to control erosion and restore the aesthetic value of the site. Sites, not suitable for re-vegetation through normal cropping practices, shall be vegetated in accordance with Critical Area Planting, (342).

Liquid and Slurry Waste Removal. Liquid and slurry wastes shall be agitated and pumped to the maximum extent practicable. Water shall be added as necessary to facilitate the agitation and pumping. The wastewater shall be utilized in accordance with Nutrient Management, (590) and/or Waste Utilization, (633).

Sludge Removal. During sludge removal operations, the integrity of the liner, if one is present, shall be maintained. Sludge shall be removed to the maximum extent practicable and utilized in accordance with Nutrient Management, (590) and/or Waste Utilization, (633).

Impoundment Closure. Three options are associated with the decommissioning of liquid waste impoundments. One of the following will be used.

1. Embankment Impoundments (those with a depth of water at the design water level of three feet or more above natural ground) may be breached so that they no longer impound water. The embankment material can then be graded into the impoundment area, and the area vegetated for another use. Or the embankment may remain if the impoundment area surface has been sufficiently cleaned so that runoff leaving the site would not be considered as contaminated by the wastes.
2. Excavated Impoundments may be backfilled so that these areas may be reclaimed for other uses.
3. Impoundments may be converted to fresh water storage.

Embankment Impoundments. Waste and sludge shall be removed from the impoundment before the embankment is breached. Concrete and flexible membrane liners shall be removed or rendered unable to impound water and properly disposed of. The slopes and bottom of the breach shall be stable for the soil material involved, however the side slopes shall be no steeper than three horizontal to one vertical (3:1).

Excavated Impoundments. Concrete and flexible membrane liners shall be removed or rendered unable to impound water and properly disposed of. The backfill height shall exceed the height to the design finished grade by a minimum of 5 percent to allow for settlement. The top one foot of the backfill shall be constructed of the most impervious soil material readily available and mounded to shed rainfall runoff. Incorporate available topsoil where feasible to aid establishment of vegetation.

Conversion to Fresh Water Storage. The converted impoundment shall meet the requirements as set forth in the appropriate NRCS practice standard for the intended purpose. Where the original impoundment was not constructed to meet NRCS standards, the investigation for structural integrity shall be in accordance with National Engineering Manual (NEM) 501.23. When it is not practical to remove the sludge from a waste impoundment that is being converted to fresh water storage, the impoundment shall not be used for fish production, swimming, or livestock watering until the water quality is adequate for these purposes.

Fabricated Liquid Waste Facilities. If fabricated structures are to be demolished, disassembled or otherwise altered, it shall be done to such an extent that no water can be impounded. Disassembled materials such as pieces of metal shall be temporarily stored in such a manner that they do not pose a hazard to animals or humans until their final disposition.

Demolished materials shall recycled, if possible, or be buried on-site or moved off-site to locations designated by state or local officials. If buried on-site, the materials are to be covered with soil to a settled depth of at least one foot. The backfill height shall exceed the height to the design finished grade by a minimum of 5 percent to allow for settlement, and the backfill be sufficiently mounded such that runoff will be diverted from the site after the backfill settles.

Dry Waste Storage or Treatment Facilities. The soil at dry waste facilities such as confined

animal housing, feedlots, livestock yards, or composting facilities with earthen floors must be evaluated.

The evaluation shall include laboratory analyses of the soil profile for any nutrients for which specific information is needed to determine the required depth of rehabilitation. Soil samples shall be taken at multiple locations and depths within the facility. One sample per depth interval per acre of the area being decommissioned with a minimum of 3 samples per depth interval shall be taken. Samples taken for each specified sampling depth interval may be consolidated into a single set (e.g., 3 samples taken at the 0 to 6 inch depth interval may be consolidated into a single sample for testing). The samples shall be collected, prepared and tested in accordance with Nutrient Management, (590).

The results of the soil analysis will be used to prepare a plan to recover the site for its intended use. The following site appropriate options shall be utilized, if needed:

- Adjust pH to restore desired crop growing conditions
- Plant salt tolerant plants to restore the site to desired crop conditions. The harvested vegetation quality should be monitored for N, P, and K removal.
- Select plants and erosion control practices to minimize phosphorus transport from the site and facilitate remediation of excessively high phosphorus levels.

Although in-situ processes are the preferred method for adjusting the soil conditions, removal of a portion of the soil may be necessary. The removed soil shall be land applied in accordance with Nutrient Management, (590) and/or Waste Utilization, (633). Excavated areas shall be graded and or backfilled to shed rainfall and prevent ponding of runoff. Where feasible, available topsoil should be used to aid the establishment of permanent vegetation, a cover crop, or other planting in accordance with Critical Area Planting (342).

CONSIDERATIONS

Conduct pre-closure soil and water (surface and subsurface) testing to establish base line data surrounding the site at the time of closure. Establishing baseline data can be used in the future to address soil and water issues.

Where the surface is covered by a dense mat of floating vegetation, pumping effort to empty waste impoundments may be reduced by first applying herbicide to the vegetation and then burning the residue. Appropriate permits must be obtained before burning. When burning is conducted, take necessary actions to ensure that smoke is managed to minimize impacts to downwind populations.

Alternative methods of sludge removal may be required where the impoundments contain large amounts of bedding, oyster shells, soil, or other debris.

Minimize the impact of odors associated with land applying dry wastes and with agitation, emptying, and land applying wastewater and sludge from a waste impoundment by conducting these operations at a time when the humidity is low, when winds are calm, and when wind direction is away from populated areas. Adding chemical and biological additives to the waste prior to agitation and emptying can reduce odors. Odor impacts from land application can also be mitigated by using an incorporation application method.

Minimize agitation of the wastes to only the amount needed for pumping to reduce the potential for release of air emissions.

Soil to fill excavated areas should not come from important farmlands (prime, statewide, local, and/or unique).

Waste facility closure may improve utilization and aesthetics of the farmstead.

Breached embankments may detract from the overall aesthetics of the operation. Embankments should be removed and the site returned to its original grade.

Disassembled fabricated structures may be suitable for assembly at another site. Care should be taken during closure to minimize damage to the pieces of the facility, particularly coatings that prevent corrosion of metal pieces.

Measures should be taken during contractor's activities to minimize site erosion and pollution

of downstream water resources. This may include such items as silt fences, hay bale barriers, temporary vegetation, and mulching.

To minimize potential impacts to livestock, such as nitrate poisoning, initiate a testing and monitoring program of nutrient levels in crop products, particularly livestock feeds, harvested from sites of closed animal confinement facilities.

PLANS AND SPECIFICATIONS

Plans and specifications for the decommissioning of abandoned waste facilities and the rehabilitation of contaminated soil shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum, include the following:

1. A plan view showing the location and extent of the practice.
2. Pertinent elevations of the closed facility and excavation limits.
3. Number, capacity, and quality of facility(ies) and estimate of soil volume to be moved.
4. Location of known utilities.
5. Requirements for salvage and disposal of structural materials.
6. Vegetative requirements.
7. Nutrient Management/Utilization Plan for animal wastes and soil.
8. Odor management or mitigation requirement.
9. Safety plan requirements. Note: Per Occupational Safety and Health Administration (OSHA) confined space entry protocol, personnel shall not enter confined space of an enclosed waste facility without breathing apparatus or taking other appropriate measures.

The following Construction Specifications is intended as a guide to selecting the appropriate specifications for specific project. The list includes most but may not contain all of the specifications that are needed for a specific project:

IA-1 Site Preparation
IA-3 Structural Removal
IA-5 Pollution Control
IA-6 Seeding and Mulching for Protective Cover
IA-11 Removal of Water
IA-21 Excavation
IA-23 Earthfill
IA-24 Drainfill
IA-26 Salvaging and Spreading Topsoil
IA-27 Diversions
IA-92 Fences

OPERATION AND MAINTENANCE

The proper decommissioning and rehabilitation of a waste facility should require little or no operation and maintenance. However, if it is converted to another use, such as a fresh water facility, operation and maintenance shall be in accordance with the needs as set forth in the appropriate NRCS conservation practice standard for the intended purpose.

REFERENCES

Rice, J.M., D.F. Caldwell, and F.J. Humenik. Ed. 2006. Closure of Earthen Manure Structures in Animal Agriculture and the Environment: National Center for Manure and Animal Waste Management White Papers, pp. 263-282. ASABE. Pub. Number 913C0306.