

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Arm-lwr- 11/04 January 2006



Wisconsin Department of Agriculture, Trade and Consumer Protection
 2811 Agriculture Drive, PO Box 8911, Madison WI 53708-8911
 Phone: (608) 224-4622 or (608) 224-4500

Worksheet 2 – Odor Management

Instructions: This worksheet addresses odor from *livestock structures*. You are NOT required to complete this worksheet if any of the following apply (check box if applicable):

- I am requesting approval for a *new livestock facility* with fewer than 500 *animal units*.
- I am requesting approval for an *expanded livestock facility* with fewer than 1,000 *animal units*.
- All *livestock structures* will be at least 2500 ft. from the nearest affected neighbor.

If you checked any of the above boxes, just sign below and submit this page with your application. If you did NOT check any of the above boxes, you must complete this worksheet to calculate the odor score (Box 4) for your proposed *livestock facility*. To meet the odor management standard, you must have a total odor score of 500 or more.

If *livestock structures* are located in *clusters* that are separated by more than 750 feet, you may elect to complete a separate worksheet for each *cluster*. If you choose that option, each *cluster* must meet the odor management standard.

A complete worksheet must include Tables A and B. You may use a convenient automated spreadsheet in place of Tables A and B if you prefer (submit spreadsheet output instead of tables, results will be identical). However, you must still sign and submit this signature page. The spreadsheet is available at the *DATCP* website, <http://www.datcp.state.wi.us>.

TO COMPLETE THIS WORKSHEET, FOLLOW THESE STEPS:

Step 1: Complete Table A to determine the Predicted Odor from your *livestock structures*. Enter the Predicted Odor in Box 3 below (NOT Box 1).

Step 2: Complete Table B to determine your Separation Score. Enter your Separation Score in Box 1 below. (NOT Box 2).

Step 3: Enter your management credits in Box 2 (maximum 100 points). All applicants may enter 80 points for completing required incident response and employee training plans (described on page A-3). Applicants completing an optional odor management plan (described on page A-3), may add an additional 20 points. Applicants determine plan contents, as long as the plan addresses the required topics.

Step 4: Add Box 1 and Box 2. Subtract Box 3 and enter the total in Box 4. This is your Odor Score.

<div style="border: 1px solid black; width: 100px; height: 25px; margin: 0 auto;"></div>	+	<div style="border: 1px solid black; width: 100px; height: 25px; margin: 0 auto;"></div>	-	<div style="border: 1px solid black; width: 100px; height: 25px; margin: 0 auto;"></div>	=	<div style="border: 1px solid black; width: 100px; height: 25px; margin: 0 auto;"></div>
Box 1 Separation Score (from Step 2)		Box 2 Management Score (from Step 3)		Box 3 Predicted Odor (from Step 1)		Box 4 Odor Score

A local government must approve a *livestock facility* with an odor score of 500 or more (Box 4). You may add odor control practices to increase your odor score to 500 or more. A local government may approve, but is not required to approve, a *livestock facility* with an odor score less than 500 but not less than 470.

Signature of Applicant or Authorized Representative

Date

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Worksheet 2 (continued)
TABLE A: Predicted Odor from Livestock Structures
Instructions: Complete Table A. You must measure all structures to the same affected neighbor. If the nearest neighbor is not the same for all livestock structures, you will need to complete the table once for each close neighbor. Compare the "H" Total of the table for each neighbor. The neighbor that has the lowest weighted distance is considered your nearest affected neighbor, and you should use that table to complete the odor worksheet. Enter the Column F total on page A-6 in Box 3. Enter the Column G result on page A-8 in Box 3. Add lines or use additional sheet, if needed, to list all structures.

1. Animal Housing Areas – List each

Column A Manure Management Type Enter your housing buildings and the related 4-letter code from Chart 2. You may exclude up to 1000 calf hutches and 4 structures less than the sq. footage listed in Chart 2.	Column B Odor Generation Number From Chart 2	Column C Housing Area (ft ²) Use occupied animal area only. Exclude feed alleys, holding areas and milking parlors. Express in 10,000's. (Ex: 15,523 ft ² = 1.55)	Column D Odor Control Practice Codes List all that apply to each housing area, from Chart 3	Column E Multiplier for Odor Control Practice List all that apply to each from Chart 3. Enter "1" if none.	Column F Predicted Odor Multiply columns B, C, and E	Column G Distance to Nearest Affected Neighbor (ft) Measure from corner of the bldg to corner of the neighbor's bldg. Measure all to the same neighbor.	Column H Weighted Distance (ft.) Multiply columns F & G
1A.							
1B.							
1C.							
1D.							
1E.							

2. Waste Storage Facilities – List each

Column A Waste Storage Type Enter 4-letter type code from Chart 2	Column B Odor Generation Number From Chart 2	Column C Exposed Surface Area Measure surface area (ft ²) when pit is filled to capacity, excluding freeboard. Enter in 10,000's. (Ex: 75,575 = 7.56)	Column D Odor Control Practice Codes List all that apply to each facility from Chart 3	Column E Multiplier for Odor Control Practice List all that apply to each from Chart 3. Enter "1" if none.	Column F Predicted Odor Multiply columns B, C, and E	Column G Distance to Nearest Affected Neighbor (ft) Measure from top inside edge to neighbor's bldg corner. Measure to the same neighbor.	Column H Weighted Distance (ft.) Multiply columns F & G
2A.							
2B.							
2C.							
2D.							

3. Animal Lots – List each

Column A Animal Lot Type Enter 4-letter type code from Chart 2	Column B Odor Generation Number From Chart 2	Column C Animal Lot Area (ft ²) Enter in 10,000's (Ex: 7438 = .74)	Column D Odor Control Practice Codes List all that apply to each facility from Chart 3	Column E Multiplier for Odor Control Practice List all that apply to each from Chart 3. Enter "1" if none.	Column F Predicted Odor Multiply columns B, C, and E	Column G Distance to Nearest Affected Neighbor (ft) Measure from corner to corner. Measure all structures to the same neighbor.	Column H Weighted Distance (ft.) Multiply columns F & G
3A.							
3B.							
3C.							
					F Total	G = (H Total) ÷ (F Total)	H Total

Enter on page A-6, Box 3
 Enter on page A-8, Table B, Step 1

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Worksheet 2 (continued)

Table B: Separation Score

INSTRUCTIONS		RESULTS
Step 1: Enter, at right, the result from Table A, Column G (page A-7).		Distance (ft.) to Nearest Affected Neighbor: _____
Step 2: Select multiplier based on the compass direction looking from the <i>livestock facility</i> to the nearest <i>affected neighbor</i> . Enter at right.		Multiplier: _____
Compass Direction	Multiplier	
North	1.0	
Northeast	1.0	
East	1.1	
Southeast	1.2	
South	1.2	
Southwest	1.2	
West	1.3	
Northwest	1.1	
Step 3: Calculate wind-adjusted separation distance (Distance to nearest <i>affected neighbor</i> x multiplier). Enter at right.		Wind-Adjusted Separation Distance (ft.) _____
Step 4: Determine <i>affected neighbor</i> density and enter at right: <i>Low density</i> = No more than 5 residences and no <i>high-use buildings</i> within 1300 ft of each structure. <i>High density</i> = 6 or more residences or at least one <i>high-use building</i> within 1300 ft of each structure.		Low or High Density? _____
Step 5: Use results above and Chart 1 to find your Separation Score. Enter at right and on Page A-6 in Box 1 .		Separation Score

Chart 1: Separation Score

Wind-Adjusted Separation Distance (ft.)	Low Density	High Density
0-99	505	503
100-149	506	504
150-199	511	507
200-249	516	510
250-299	521	514
300-349	527	518
350-399	534	523
400-449	541	528
450-499	548	533
500-599	560	542
600-699	577	555
700-799	595	569
800-899	615	585
900-999	636	601
1000-1099	658	619
1100-1199	681	637
1200-1299	705	657
1300-1399	730	
1400-1499	756	
1500-1599	783	
1600-1699	810	
1700-1799	839	
1800-1899	868	
1900-1999	899	
2000-2099	930	
2100-2199	962	
2200-2299	994	
2300-2399	1027	
2400-2499	1061	
2500-2749	1123	
2750-2999	1214	
3000-3249	1309	

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Worksheet 2 (continued)

Chart 2: Odor Generation Numbers

<i>Animal Housing Area Type</i>	<i>Housing/ Management Type Code</i>	<i>Manure Management Method</i>	<i>Odor Generation Number</i>	<i>Exempt Buildings Maximum Size (ft²) (May exclude up to 4)</i>
Dairy Stanchion	DSDC	Daily to weekly cleaning	2	7500
Dairy Free Stall and Beef & Dairy Heifers (Forage Ration)	DBSS	Slatted floor (includes floor and pit below)	6	2500
	DBSC	Scrape	4	3500
	DBAF	Alley flush to storage	10	1500
	DBBP	Bedded pack	2	7500
Beef Finishing (High Energy Ration)	BFSF	Slatted floor (includes floor and pit below)	12	1000
	BFSC	Scrape	8	2000
	BFBP	Bedded pack	4	3500
Pork Gestation/ Farrow/Nursery	PGSF	Slatted floor (includes floor and pit below)	46	N/A
	PGPP	Pull plug to storage	22	N/A
Pork Finishing	PFSF	Slatted floor (includes floor and pit below)	34	N/A
	PFPP	Pull plug to storage	20	N/A
	PFSS	Scrape systems to storage	11	1500
	PFDB	Deep bedded	4	3500
Poultry	PBLT	Broiler (litter)	1	15000
	PDLQ	Ducks (liquid)	20	N/A
	PLAY	Layers	20	N/A
	PTDL	Turkey and Ducks (litter)	2	7500

<i>Type Codes</i>	<i>Waste Storage Facility Types</i> <i>Note: Storage under slatted floor is addressed under animal housing.</i>	<i>Odor Generation Number</i>
WSSS	Solid (stack)	2
WSLT	Long term (6 months or longer as determined in Column E of worksheet 3)	13
WSST	Short term (less than 6 months as determined in Column E of worksheet 3)	28

<i>Animal Lot Codes</i>	<i>Animal Lot Types</i>		<i>Odor Generation Number</i>
ALPV	Paved		4
UPDB	Unpaved	Dairy/Beef/Sheep/Goats	6
UPSW		Swine/Poultry	11

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Worksheet 2 (continued)

Chart 3: Odor Control Practices

Category	Practice Code	Practice Name (Practices must meet specifications on pages A-11 to A-13)	Multiplier*
Animal Housing Area			
A	A1	Diet manipulation	0.8
B (Choose only 1)	B1	Bio-filter	0.1
	B2	Vegetable oil sprinkling (for swine only)	0.4
	B3	Fresh water flush	0.4
	B4	Treated water flush	0.7
	B5	Air Dam (for swine only)	0.9
C	C1	Windbreak (includes man-made berms)	0.9
D	D1	Frequent cleaning of animal housing area	0.9
Waste Storage Facilities			
E (Choose only 1)	E1	Anaerobic digestion	0.2
	E2	Chemical or biological additives	0.8
	E3	Compost	0.2
	E4	Solids Separation and Reduction	0.6
	E5	Water Treatment	0.1
F (Choose only 1)	F1	Aeration	0.3
	F2	Bio-cover	0.4
	F3	Geotextile cover	0.5
	F4	Impermeable cover	0.1
	F5	Natural crust	0.3
	F6	Bottom fill	0.9
G	G1	Windbreak (includes man-made berms)	0.9
Animal Lots			
H (Choose only 1)	H1	Frequent cleaning of <i>animal lot</i>	0.4
	H2	Drag <i>animal lot</i>	0.5
I	I1	<i>Animal lot</i> moisture control	0.8
J	J1	Windbreak (includes man-made berms)	0.9

*Smaller multiplier = more odor controlled (e.g. a multiplier of 0.4 represents a 60% control).

Innovative Odor Control Practices (all odor sources):

You may take credit for odor control practices not listed in Chart 3 if *DATCP* pre-approves a multiplier for each of those practices. Follow the procedure in *ATCP 51.14(5)(c)* to obtain *DATCP* approval. If you obtain *DATCP* approval, you may include the approved practice and multiplier in odor worksheet calculations in the same manner as for odor control practices listed in Chart 3 (attach *DATCP* approval to your application).

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Worksheet 2 (continued)

Odor Control Practice Specifications

Odor control practices identified in Chart 3 must meet the following specifications:

Animal Housing

Diet manipulation (A1) – Limit protein in animal diet by one of the following means:

- Match nutrient supply with animal requirements.
- Formulate low-protein amino acid supplemented diets.
- Add phytase enzyme ingredients.
- Process ingredients in ways that limit protein content of processed feed.
- Use phase feeding.
- Use split sex feeding.
- Minimize feed wastage.

Bio-filter (B1) – Vent air from *animal housing areas* through a bio-filter consisting of compost and wood chips, mixed at a rate of 30:70 to 50:50 (ratio by weight of compost to wood chips). The mixture must be at least 40% moisture by weight. The bio-filter must be 10" to 18" thick, and must have an area of at least 50 to 85 sq. ft. per 1000 cu. ft. per minute (cfm) of airflow.

Vegetable oil sprinkling (B2) – Sprinkle vegetable oil on floors in *animal housing areas* (swine) each day. Apply oil at start-up rate of approximately 40 milliliters per square meter per day (mL/m²-day) in the first 1–2 days of each production cycle. During the remainder of each production cycle, apply oil at maintenance rate of 5 mL/m²-day. Avoid oil applications to pens near fans, to areas near heaters, and to areas surrounding feeders.

Fresh water flush (B3) – Use fresh water to flush manure from floors of *animal housing areas* into collection or *waste storage structures*. Flush at least 3 times a day, and more often if necessary, to prevent manure from drying and sticking to floors. Flush must be adequate to remove manure solids effectively.

Treated water flush (B4) – Use treated manure effluent to flush manure from floors of *animal housing areas* into collection or *waste storage structures*. Flush at least 3 times a day, and more often if necessary, to prevent manure from drying and sticking to floors. Flush with waste storage effluent treated by one of the following means:

- *Solids Separation and Reduction (see E4 below).*
- *Aeration (see F1 below).*
- *Anaerobic digestion (see E1 below).*

Air Dam (B5) – Erect and maintain a wall (typically a 10-foot x 10-foot pipe frame and tarpaulin) placed at the end of a swine-finishing building, immediately downwind of the exhaust to deflect air and odor plume. Replace material used for the barriers (tarpaulins on a frame of solid wood, for example) as needed, which may be from a few years to decades, depending on the material.

Windbreak (C1) – Maintain a solid or porous windbreak, 10 to 50 feet from the odor source, which reduces forward momentum of airflow and vertically disperses the odor plume. The length of a windbreak shall be at least half of the perimeter of the animal housing. A windbreak may be constructed of vegetation or other materials. Vegetation windbreaks must contain at least 3 rows of trees and shrubs, of both fast and slow-growing species, that are well suited for the site. Windbreaks must be designed and constructed according to *NRCS Technical Guide Standard 380* (June, 2002).

Frequent cleaning of animal housing area (D1) – Scrape and remove manure from *animal housing areas* at least 3 times a day.

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Worksheet 2 (continued)

Waste Storage Facilities

Anaerobic digestion (E1) – Subject manure to managed biological decomposition within a sealed oxygen-free container (“digester”). Anaerobic digestion must meet design and operational standards necessary to achieve adequate odor control, including requirements for solids concentration, flow rates, retention time, and minimum temperatures. Systems must meet the following:

- *Plug flow digester.* Treats manure with a total solids concentration of 8 to 14%. Must be kept in the digester for at least 20 days at a temperature of 95° to 104° F. (35° to 40° C). The digester’s ratio of flow path width to fluid depth must be between 3.5:1 and 5:1.
- *Complete mix digester.* Treats manure with a total solids concentration of 2.5 to 10%. Must be kept in the digester for at least 17 days at a temperature of 95° to 104° F. (35° to 40° C.). The digester must have appropriate mixing devices to ensure complete mixing.
- *Fixed film digester.* Treats manure with a total solids concentration of not more than 5%. Must be kept in the digester for 1 to 6 days at a temperature of 59° to 99° F (15° to 39° C). Microbial support material must have at least 3-inch openings.
- *Other systems.* Use proprietary design and performance specifications that are commonly accepted and provide adequate odor mitigation.

Chemical or biological additives (E2) – Apply, to stored manure, chemical or biological additives that are scientifically proven to be effective in reducing odor from that manure when applied under applicable conditions and in applicable amounts.

Compost (E3) – Aerobically treat solid or semi-solid manure to create compost. Compost must have a carbon: nitrogen ratio of 25:1 to 40:1, and must consist of at least 40 to 60% moisture by weight. Composted material must be held at a temperature of more than 130° F. (54° C.) for more than 5 days.

Solids Separation and Reduction (E4) – Reduce the solid content of stored manure to an average of less than 2% solids through separation, multi-tiered pits or other means.

Water Treatment (E5) – Install and use a physical, chemical or biological process that removes the majority of contaminants from the waste stream, resulting in a liquid effluent meeting surface water discharge standards. The remaining solid fraction or sludge must be accounted for based on its form, and the management it is subject to.

Aeration (F1) – Use aeration equipment to maintain aerobic activity in stored manure. Aeration must maintain an average of 2 milligrams of dissolved oxygen per liter of manure stored in the upper foot of manure stored in the aerated structure between April and October.

Bio-cover (F2) – Cover the surface of waste storage structure with an 8” to 12” thick blanket of dry wheat, barley or good quality straw. The blanket must cover nearly all of the waste surface between the months of April and October. Add to the blanket as necessary (typically every 6 weeks to 4 months) to maintain the required cover.

Geotextile cover (F3) – Cover the surface of waste storage structure with a geotextile membrane that is at least 2.4 mm thick. The membrane must cover nearly all of waste surface between the months of April and October.

Impermeable cover (F4) – Cover the surface of waste storage structure with an impermeable barrier that prevents gas from escaping. Gas must be drawn off, and either treated or burned.

Natural crust (F5) – Maintain a natural crust of dry manure on the surface of stored manure. The natural crust must cover a substantial amount of the surface area of the stored manure, for most of the time between the months of April and October.

Bottom fill (F6) – Add manure to a liquid *manure storage structure* from the bottom so as to limit disturbance to the surface of the stored manure.

Windbreak (G1) – Maintain a solid or porous windbreak, 10 to 50 feet from the odor source, which reduces forward momentum of airflow and vertically disperses the odor plume. The length of a windbreak shall be at least half of the perimeter of the *waste storage facility*. A windbreak may be constructed of vegetation or other materials. Vegetation windbreaks must contain at least 3 rows of trees and shrubs, of both fast and slow-growing species, that are well suited for the site. Windbreaks must be designed and constructed according to *NRCS Technical Guide Standard 380* (June, 2002).

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

Worksheet 2 (continued)

Animal Lots

Frequent cleaning of animal lot (H1) – Scrape and remove manure from *animal lot* surfaces at least once every 3 days. You may leave an undisturbed, compacted manure layer (1 to 2 inches thick) on the surface of unpaved *animal lots* to provide good surface sealing.

Drag animal lot (H2) – Drag manure in *animal lots* with harrow or disk at least once every 7 days during the months of April through October, to aerate and dry the manure.

Animal lot moisture control (I1) – Prevent runoff water from flowing onto *animal lots* from roofs and other surfaces. Use diversions or roof runoff systems identified in s. *ATCP 50.70 or 50.85*. *Animal lots* must have a grade of at least one percent to promote drainage and drying.

Windbreak (J1) – Maintain a solid or porous windbreak, 10 to 50 feet from the odor source, which reduces forward momentum of airflow and vertically disperses the odor plume. The length of a windbreak shall be at least half of the perimeter of the *animal lot*. A windbreak may be constructed of vegetation or other materials. Vegetation windbreaks must contain at least 3 rows of trees and shrubs, of both fast- and slow-growing species, that are well suited for the site. Windbreaks must be designed and constructed according to *NRCS Technical Guide Standard 380* (June, 2002).