

# Appendices

## **Appendix 3A**

Acreage Grid Map for Aerial Photo Interpretation

## **Appendix 3B**

Products Available from the Air Photo Distribution Office

## **Appendix 3C**

List of Laboratories Offering Soil and Manure Analysis Services

## **Appendix 3D**

How to Use a Slope Gauge

## **Appendix 4A**

Standard Values for Manure Nutrient Content and Estimated Daily Manure Production

## **Appendix 6A**

Crop Nutrient Uptake and Removal Coefficients

## **Appendix 6B**

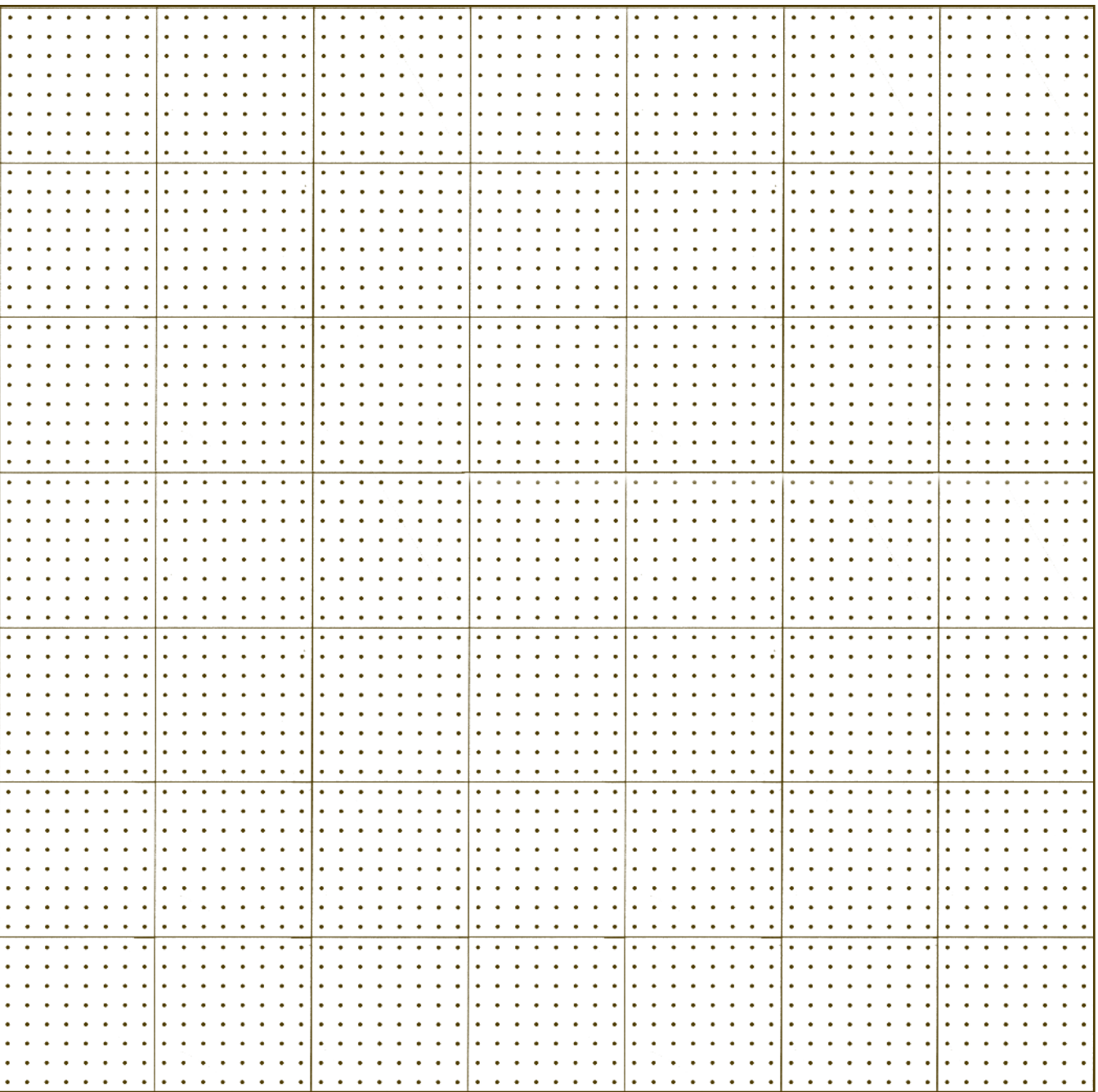
Calculating Expected Nutrient Uptake and Removal

## Appendix 3A

### Acreege Grid for Map and Aerial Photo Interpretation

#### » How to use this grid

1. Photocopy this grid onto a transparency sheet.
2. Place grid over the area to be measured.
3. Use a non-permanent, find tipped overhead pen and trace the area of interest.
4. Count the number of dots within the outlined area (**Note:** when dots fall on the area boundary, count every other dot).
5. Use the tables on the next page to estimate area.



### Common map scales plus approximate metric measurements and estimates of area

Relative Scale	Scale in Centimetre and Metres	Centimetres per Kilometer	Hectares per Map Square (2.5 x 2.5 cm)	Representative Hectares for Each Dot in the Square
1:5,000	1 cm = 50 m	20.000	1.613	0.025
1:10,000	1 cm = 100 m	10.000	6.452	0.101
1:15,000	1 cm = 150 m	6.667	14.517	0.227
1:20,000	1 cm = 200 m	5.000	25.807	0.403
1:30,000	1 cm = 300 m	3.333	58.066	0.907
1:31,680	1 cm = 317 m	3.157	64.752	1.012
1:40,000	1 cm = 400 m	2.500	103.229	1.613
1:60,000	1 cm = 600 m	1.667	232.265	3.629
1:63,360	1 cm = 633.6 m	1.578	259.008	4.047

### Common map scales plus approximate imperial measurements and estimates of area

Relative Scale	Scale in Inches and Feet	Inches per Mile	Acres per Map Square (1 x 1 in.)	Representative Acres for Each Dot in the Square
1:5,000	1 in = 417 ft	12.672	3.986	0.062
1:10,000	1 in = 833 ft	6.336	15.942	0.249
1:15,000	1 in = 1250 ft	4.224	35.870	0.560
1:20,000	1 in = 1667 ft	3.168	63.769	0.996
1:30,000	1 in = 2500 ft	2.112	143.480	2.242
1:31,680	1 in = 2640 ft	2.000	160.000	2.500
1:40,000	1 in = 3333 ft	1.584	255.076	3.986
1:60,000	1 in = 5000 ft	1.056	573.920	8.970
1:63,360	1 in = 5280 ft	1.000	640.000	10.000

## Appendix 3B

Table 3B-1. Listing, Description and Prices (as of October 2006) for Products Available from the Air Photo Distribution Office<sup>1</sup>

Product Name	Description	Price <sup>2</sup>		Notes
		B&W	Colour	
Contact Prints	Contact prints are photographic copies made directly from the film negatives.  The image size is approximately 25 cm (9.5 in.) square. The photographs are printed on matte photographic paper.	\$8.75 (Regular) \$17.50 (Rush)	\$12.00 (Regular) \$24.00 (Rush)	Pre 2004 False colour IR photography is no longer available as contact prints but available in digital and laser copy format.
Diapositives	Diapositives are copies of photographs printed on clear film rather than photographic paper.	\$11.00	\$11.00	Diapositive orders will be processed and ready for pick up at our Edmonton office within 10 business days.
Laser Prints	Laser prints would be appropriate for situations where photographic quality contact prints are not required.  They are created from the existing contact prints within the Reference Library using a 600 dpi laser copier.	\$6.00	\$7.00	Laser prints are typically produced within five business days. Small quantities may be obtained as you wait; larger orders will take longer.
Digital Photography	High-resolution (default 800 ppi) aerial photos are in digital MrSID file format.	\$13.50 (800 ppi) \$16.50 (1200 ppi)	\$13.50 (800 ppi) \$16.50 (1200 ppi)	Digital format (MrSID = GIS image format) orders processed within 3-5 working days delivered free by ftp site or on CD for \$10.00. Higher ppi values and different file types are available upon request.  <b>Note:</b> <i>MrSID file format is directly supported by the major GIS programs. Other free MrSID viewers are also available for download from the Air Photo Office ftp site.</i>
Laser Enlargements	Laser enlargements are derived from the original contact prints and are printed out at 600 lpi.	\$12.00	\$12.00	Laser enlargements (up to ×4) and up to 11×17-in. paper size can be done while you wait, but depends on the order size. The advantage of laser enlargements is that the turnaround time is quick and it is the lowest price enlargement.
Digital Enlargements	High-resolution digital enlargements are created from scanned prints/negatives and printed out at 2400 lpi.	\$20.00	\$20.00	The enlargement factor is limited only by the size of the area to be enlarged up to 11×17-in. paper size. Faster turnaround time than contact enlargements and better quality and higher enlargement factor than laser enlargements.
Photographic Enlargements	Photographic enlargements are available from aerial photographs and are made directly from the film negative.	\$28.00 – \$125.00 (Size-dependent)	\$28.00 – \$125.00 (Size-dependent)	An area of a photograph can be enlarged up to a paper size of 100 x 100 cm with the most common paper size being 25 x 25 cm and 50 x 50 cm. Orders processed within 10 working days.

Source: [http://www.srd.gov.ab.ca/land/g\\_air\\_products.html](http://www.srd.gov.ab.ca/land/g_air_products.html)Prices are those quoted on the Air Photo Distribution Office website **effective June 2006** and are subject to change. To confirm prices for specific products and quantities, please contact Air Photo Distribution Office in Edmonton by phoning the Alberta Government toll free line 310-0000 and requesting (780) 427-3520.

## Appendix 3C

### List of Laboratories Offering Soil and Manure Analysis Services within Canada

**Important note:** This list is current as of July, 2007. Please contact individual companies to get more information regarding cost and the roster of services they provide. Contact information for these companies is provided for your information only and should not be interpreted as an endorsement or as a guarantee of quality service.

» **Bodycote Norwest Labs**  
([www.bodycotetesting.com](http://www.bodycotetesting.com))

#### Edmonton

7217 Roper Road, Edmonton, AB T6B 3J4  
Phone: (780) 438-5522 Fax: (780) 434-8586  
Toll Free in western Canada: 1-800-661-7645  
Email: [Edmonton@bodycote.com](mailto:Edmonton@bodycote.com)

#### Calgary

#9, 2712-37 Avenue N.E., Calgary, AB T1Y 5L3  
Phone: (403) 291-2022 Fax: (403) 291-2021  
Toll Free in western Canada: 1-800-661-1645  
Email: [Calgary@bodycote.com](mailto:Calgary@bodycote.com)

4605 – 12 Street, NE, Calgary, AB T2E 4R3  
Phone: (403) 291-3024 Fax: (403) 250-2819  
Toll Free in western Canada: 1-800-331-8266  
Email: [Calgary@bodycote.com](mailto:Calgary@bodycote.com)

#### Grande Prairie

11301-96 Avenue, Grande Prairie, AB T8V 5M3  
Phone: (780) 532-8709 Fax: (780) 539-061  
Email: [GrandePrairie@bodycote.com](mailto:GrandePrairie@bodycote.com)

» **ALS Laboratories**  
([www.alsglobal.com/Environmental/Labs/Overview.aspx](http://www.alsglobal.com/Environmental/Labs/Overview.aspx))

#### Edmonton

9936 - 67th Avenue, Edmonton, AB T6E 0P5  
Phone: (780) 413-5227 Fax: (780) 437-2311  
Toll-Free: 1-800-668-9878  
Email: [Edmonton@alsenviro.com](mailto:Edmonton@alsenviro.com)

#### Calgary

Bay 7, 1313 - 44th Avenue NE, Calgary, AB T2E 6L5  
Phone: (403) 291-9897 Fax: (403) 291-0298  
Toll Free: 1-800-668-9878  
Email: [Calgary@alsenviro.com](mailto:Calgary@alsenviro.com)

#### Grande Prairie

9505-111 Street Grand Prairie, AB T8V 5W1  
Phone: (780) 539-5196 Fax: (780) 513-2191  
Email: [GrandePrairie@alsenviro.com](mailto:GrandePrairie@alsenviro.com)

#### Fort McMurray

Bay 1, 245 MacDonald Cr, Fort McMurray, AB T9H 4B5  
Phone: (780) 791-1524 Fax: (780) 791-1586  
Toll Free: 1-800-668-9878  
Email: [FortMcMurray@alsenviro.com](mailto:FortMcMurray@alsenviro.com)

#### Saskatoon

819 58 Street East, Saskatoon, SK S7K 6X5  
Phone: (306) 668-8370 Fax: (306) 668-8383  
Toll Free: 1-800- 668-9878  
Email: [Saskatoon@alsenviro.com](mailto:Saskatoon@alsenviro.com)

» **Midwest Laboratories Canada**  
([www.midwestlabscanada.com](http://www.midwestlabscanada.com))  
#8, 4001B-19th Street N.E., Calgary AB T2E 6X8  
Phone: (403) 250-3317 Fax: (403) 250-5249  
Email: [mwl@midwestlabscanada.com](mailto:mwl@midwestlabscanada.com)

» **Lakeside Labs**  
PO Box 800, Brooks AB T1R 1B7  
Phone: (403) 362-3326 Fax: (403) 362-8231  
Email: [leshured@myipplus.net](mailto:leshured@myipplus.net)

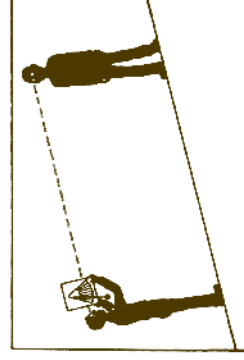
» **Sandberg Labs**  
**Sandberg Labs Ltd.**  
3510 - 6th Avenue N, Lethbridge AB T1H 5C3  
Phone:(403) 328-1133 Fax:(403) 320-1033  
Email: [sandberg@agt.net](mailto:sandberg@agt.net)

» **A&L Canada Laboratories Inc.**  
2136 JetStream Rd., London ON N5V 3P5  
Phone: (519) 457-2575 Fax: (519) 457-2664  
Website: [www.al-labs-can.com](http://www.al-labs-can.com)  
Email: [alcanadalabs@alcanada.com](mailto:alcanadalabs@alcanada.com)

## Appendix 3D

### How to Use a Slope Gauge

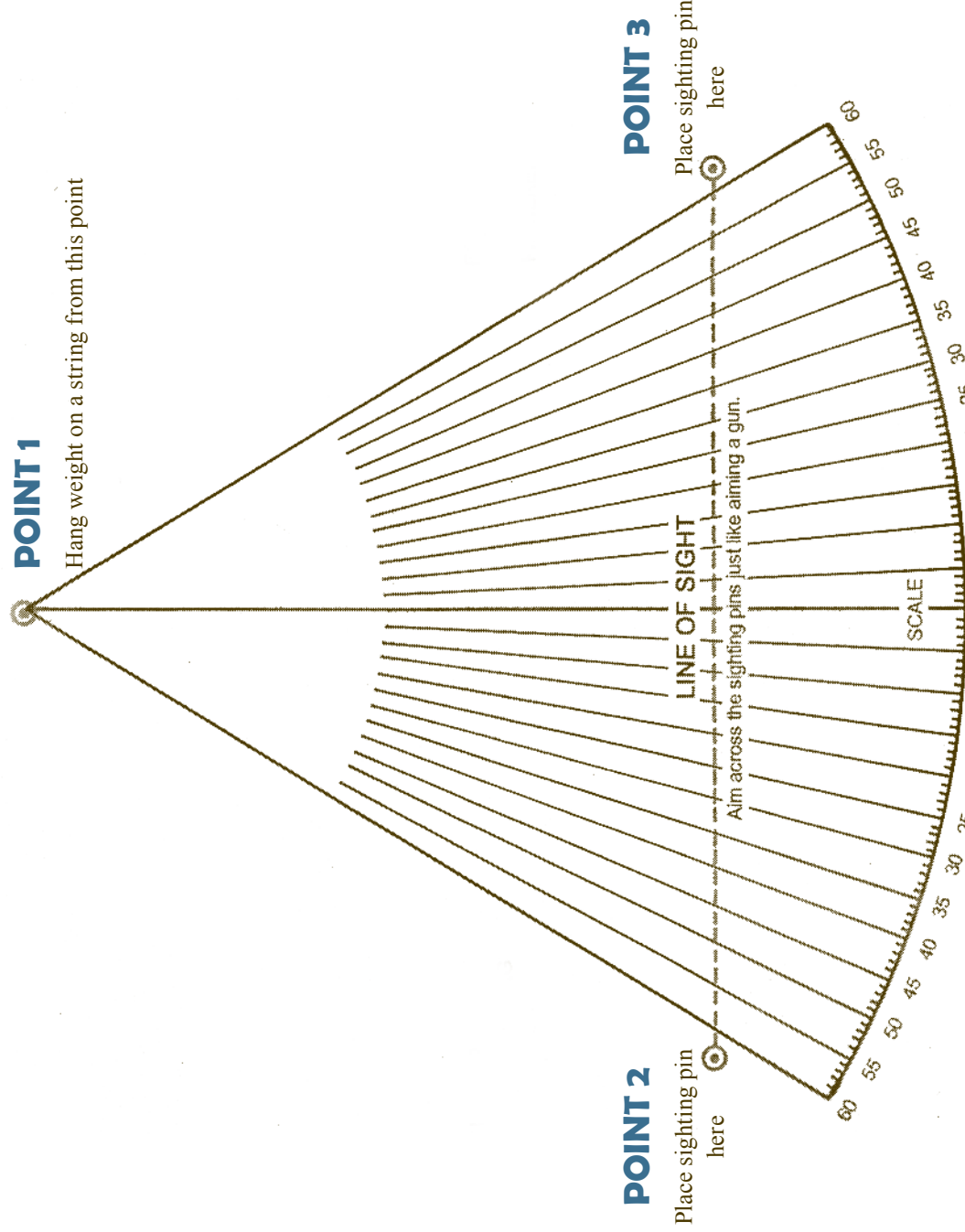
1. Photocopy the bottom portion of this page and mount to a wood surface approximately 8" x 9".
2. Tack nails in each of the three marked points on the sheet to use as sighting pins.
3. Attach a small weight to a 10" string and hang it from the nail on Point 1.
4. Keep the sighting pins in your line of vision and aim at the point on an object or person that is the **same height** from the ground as your eyes. For example, let's assume you're aiming at a person who is taller than you. If that person's chin is the same height from the ground as your eyes, aim for their chin (see illustration). If you're aiming at a stick, tie a ribbon around the point on the stick that is at your eye level then aim at the ribbon.



5. The person or object does not need to be any particular distance away.
6. You can aim the slope gauge either up or down the slope.
7. Hold the slope gauge as steady as possible and make sure the weighted string can swing easily across the scale.
8. After you have finished sighting, hold the string at the point where it comes to rest on the scale.
9. Read the percent of slope directly from the scale and record your measurement. You may want to take several measurements on the same slope to check your accuracy.

### POINT 1

Hang weight on a string from this point



### POINT 2

Place sighting pin here

### POINT 3

Place sighting pin here

Read percent of slope directly on this scale. The point where string rests on scale indicates the percent of slope.

## Appendix 4A

### Standard Values for Manure Nutrient Content and Estimated Daily Manure Production

Table 4A-1. Standard Manure Nutrient Characteristic (as removed) for Common Classes of Livestock Adapted from the *Agricultural Operation Practices Act* (Province of Alberta 2001), Table 5 in Schedule 2 of the Standards and Administration Regulations.

Species/Class	Typical Nutrient Content (% of fresh manure)						
	Moisture <sup>1</sup>	Total N <sup>1</sup>	Avail N	Crop N	Total P <sup>2</sup>	Total K <sup>3,4</sup>	
Beef	Feeders						
	Finishers						
	Feeder calves	50 (30-70)	1.0 (0.65-1.25)	0.26	0.32	0.24	0.67
	Cow/calf pair						
Dairy	Cows/bulls						
	Paved feedlot	65 (50-75)	0.7 (0.45-0.80)	0.27	0.25	0.09	0.38
	Free-stall housing	92 (85-95)	0.40 (0.35-0.60)	0.18	0.17	0.09	0.42
Dairy	Tie-stall housing						
	Loose housed	80 (70-85)	0.50 (0.45-0.65)	0.21	0.19	0.09	0.42
Swine	Replacements						
	Calves						
Swine	Liquid	96 (90-99)	0.35 (0.20-0.55)	0.16	0.16	0.11	0.17
	Solid	50 (40-70)	0.80 (0.60-0.90)	0.32	0.31	0.15	0.23
Poultry	Caged layers, belt removal (solid)	40 (30-60)	3.01 (2.50-3.50)	2.01	1.89	1.54	1.0
	Caged layers, deep pit (solid)	50 (30-60)	2.41 (2.00-3.00)	1.60	1.51	1.23	0.83
	Caged layers (liquid)	90 (85-95)	0.60 (0.50-1.00)	0.40	0.38	0.25	0.20
	Broilers replacement pullets	35 (30-50)	3.41 (3.50-4.00)	1.95	1.84	0.95	1.00
	Broiler breeders	35 (30-50)	3.01 (1.60-2.10)	1.72	1.63	0.95	1.00
	Turkey breeders	35 (30-50)	1.75 (1.50-2.00)	1.00	0.95	0.59	0.63
Sheep	Ewes w/ lambs						
	Ewes/rams	50 (30-65)	1.00 (0.62-1.25)	0.40	0.36	0.20	1.04
	Feeders						
Goats	Lambs	50 (30-65)	0.70 (0.50-1.00)	0.28	0.25	0.20	1.04
	Goats	50 (30-65)	0.63 (0.50-0.75)	0.25	0.23	0.23	1.04
Horses	Feedlot	50 (30-60)	1.50 (1.00-2.00)	0.75	0.71	0.23	1.04
	PMU	75 (50-80)	0.60 (0.50-0.70)	0.30	0.29	0.13	0.5
	Donkeys						
	Mules	50 (30-70)	1.00 (0.80-1.10)	0.50	0.48	0.23	1.04

<sup>1</sup> Figure presented is average content, with observed range in values in brackets.

<sup>2</sup> To convert to P<sub>2</sub>O<sub>5</sub>, multiply number in table by 2.29

<sup>3</sup> To convert to K<sub>2</sub>O, multiply number in table by 1.20

<sup>4</sup> From the 2000 Code of Practice for Responsible Livestock Development and Manure Management (AF 2000).



Table 4A-2. Standard Manure Nutrient Characteristics (as removed) for Common Classes of Livestock Adapted from Tri-Provincial Manure Application and Use Guidelines (2001)

Species/Class	Nutrient <sup>1</sup> (% of fresh manure, except NH <sub>4</sub> – N)				
	Moisture	Total N	NH <sub>4</sub> – N <sup>2</sup>	Total P	Total K
Liquid swine	96.6 (91.0-99.0)	0.31 (0.04-0.68)	1946 (230-5150)	0.10 (0.00-0.51)	0.14 (0.03-0.37)
Liquid dairy	91.1 (80.1-99.0)	0.34 (0.07-0.76)	1463 (21-7168)	0.09 (0.01-0.85)	0.32 (0.02-0.98)
Solid beef	74.6 (61.6-79.9)	0.60 (0.14-2.02)	564 (11-2656)	0.14 (0.03-0.64)	0.59 (0.16-2.54)
Liquid poultry	90.9 (81.3-97.4)	0.80 (0.30-1.42)	5751 (107-10510)	0.28 (0.06-0.51)	0.33 (0.16-0.53)

<sup>1</sup> Figures presented is average content, with observed range in values in brackets

<sup>2</sup> NH<sub>4</sub>-N expressed in parts per million (ppm)

Appendix 4A

Table 4A-3. Standard Daily Manure Production Estimates for Common Classes of Livestock Adapted from the Agricultural Operation Practices Act (Province of Alberta 2004), Tables 5 and 6 in Schedule 2 of the Standards and Administration Regulations.

Species/Class	Solid				Liquid				
	Weight		Volume		Weight		Volume		
	kg	lbs	m <sup>3</sup>	ft <sup>3</sup>	L	gal <sup>l</sup>	m <sup>3</sup>	ft <sup>3</sup>	
Beef	Feeders	3.8	8.4	0.0062	0.21	---	---	---	---
	Finishers - Open lot	6.0	13.1	0.0094	0.32	---	---	---	---
	Finishers - Paved lot	9.0	19.8	0.0126	0.43	---	---	---	---
	Feeder calves < 550lbs	1.5	3.3	0.0023	0.08	---	---	---	---
	Cow/calf pair	8.1	17.8	0.0129	0.44	---	---	---	---
	Cows/bulls	7.5	16.5	0.0117	0.40	---	---	---	---
Dairy (* count lactating cows only)	Free stall: Lactating cow only <sup>2</sup>	---	---	---	---	98.6	21.7	0.099	3.50
	Free stall: Dry cow	---	---	---	---	43.0	9.5	0.042	1.50
	Free stall: Lactating with dry cows only <sup>3</sup>	---	---	---	---	116.8	25.7	0.116	4.11
	Tie stall: Lactating cow only	63.5	139.7	0.0779	2.66	---	---	---	---
	Loose housing: Lactating cow only	66.5	146.3	0.0815	2.78	---	---	---	---
	Dry Cow	31.8	70.0	---	1.30	---	---	---	---
	Replacement heifers	19.5	42.9	0.0240	0.82	---	---	---	---
	Calves	1.3	2.9	0.0021	0.07	---	---	---	---
Swine (* count sows only)	Farrow-to-finish*	39.3	86.4	0.0510	1.74	65.7	14.44	0.065	2.31
	Farrow-to-wean*	12.1	26.6	0.0158	0.54	20.2	4.44	0.020	0.71
	Lactating sow*	9.7	21.3	0.0126	0.43	15.9	3.50	0.016	0.56
	Weaner pig	1.3	2.8	0.0018	0.06	2.3	0.50	0.002	0.08
	Feeder pig	3.7	8.2	0.0050	0.17	7.1	1.56	0.007	0.25
Poultry (/100 birds)	Caged layers, liquid	---	---	---	---	27	6.0	0.027	0.95
	Caged layers, belt manure removal	4.5	9.9	0.0120	0.41	---	---	---	---
	Caged layers, deep pit	5.9	13.0	0.0091	0.31	---	---	---	---
	Broilers	2.7	6.0	0.0088	0.30	---	---	---	---
	Broiler breeders	7.2	15.8	0.0173	0.59	---	---	---	---
	Layer breeders	5.3	11.7	0.0155	0.53	---	---	---	---
	Replacement pullets	2.7	6.0	0.0044	0.30	---	---	---	---
	Turkey hens, light	6.2	13.6	0.0249	0.85	---	---	---	---
	Turkey toms, heavy	9.0	19.8	0.0375	1.28	---	---	---	---
Turkey broilers	5.0	11.0	0.0149	0.51	---	---	---	---	
Horses	PMU, per head	20.8	45.8	0.0270	0.92	---	---	---	---
	Feedlot, per head	6.9	15.2	0.0135	0.46	---	---	---	---
	Donkeys	3.5	7.6	0.0067	0.23	---	---	---	---
	Mules	5.2	11.4	0.0103	0.35	---	---	---	---

Species/Class		Solid				Liquid			
		Weight		Volume		Weight		Volume	
		kg	lbs	m <sup>3</sup>	ft <sup>3</sup>	L	gal <sup>1</sup>	m <sup>3</sup>	ft <sup>3</sup>
Sheep	Ewes w/ lambs	1.8	3.9	0.0038	0.13	---	---	---	---
	Ewes/rams	1.4	3.1	0.0029	0.10	---	---	---	---
	Feeders	0.7	1.5	0.0015	0.05	---	---	---	---
	Lambs	0.4	0.8	0.0006	0.02	---	---	---	---
Goats	Milk/meat (per ewe)	2.7	5.9	0.0054	0.19	---	---	---	---
	Feeders	0.3	0.60	0.0006	0.02	---	---	---	---
	Does/bucks	1.4	3.10	0.0029	0.10	---	---	---	---
Bison	Cows / bulls	3.3	7.3	0.0051	0.18	---	---	---	---

<sup>1</sup> Imperial gallons, equal to 1.2 US gallons

<sup>2</sup> Includes milking parlour wash-water of 30 L per lactating cow

<sup>3</sup> Includes milking parlour wash-water of 30 L per lactating cow (zero milking parlour wash-water for dries)

## APPENDIX 6A

Table 6A-1 Crop Nutrient Uptake and Removal Coefficients Ranges (Metric Units)

Crop	Units		Nitrogen (N)		Phosphate (P <sub>2</sub> O <sub>3</sub> )		Potash (K <sub>2</sub> O)		Sulphur (S)	
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Spring Wheat	kg/kg	Uptake	0.0316	0.0387	0.0121	0.0146	0.0271	0.0333	0.0033	0.0042
		Removal	0.0225	0.0275	0.0087	0.0108	0.0067	0.0079	0.0017	0.0021
Winter Wheat	kg/kg	Uptake	0.0203	0.0247	0.0090	0.0113	0.0213	0.0260	0.0030	0.0037
		Removal	0.0157	0.0190	0.0077	0.0093	0.0050	0.0063	0.0020	0.0027
Barley	kg/kg	Uptake	0.0260	0.0318	0.0104	0.0128	0.0250	0.0305	0.0031	0.0036
		Removal	0.0182	0.0221	0.0078	0.0096	0.0060	0.0073	0.0016	0.0021
Oats	kg/kg	Uptake	0.0300	0.0366	0.0113	0.0141	0.0409	0.0500	0.0038	0.0044
		Removal	0.0172	0.0213	0.0072	0.0088	0.0053	0.0063	0.0013	0.0016
Rye	kg/kg	Uptake	0.0269	0.0328	0.0133	0.0166	0.0380	0.0467	0.0045	0.0055
		Removal	0.0172	0.0208	0.0071	0.0088	0.0058	0.0071	0.0013	0.0016
Corn	kg/kg	Uptake	0.0246	0.0300	0.0102	0.0123	0.0207	0.0252	0.0023	0.0029
		Removal	0.0155	0.0191	0.0070	0.0086	0.0045	0.0054	0.0011	0.0013
Canola	kg/kg	Uptake	0.0571	0.0703	0.0263	0.0326	0.0417	0.0509	0.0097	0.0120
		Removal	0.0349	0.0423	0.0189	0.0229	0.0091	0.0114	0.0057	0.0069
Flax	kg/kg	Uptake	0.0465	0.0571	0.0135	0.0165	0.0293	0.0360	0.0090	0.0113
		Removal	0.0345	0.0420	0.0105	0.0128	0.0098	0.0120	0.0038	0.0045
Sunflower	kg/kg	Uptake	0.0335	0.0410	0.0115	0.0140	0.0165	0.0220	0.0040	0.0045
		Removal	0.0240	0.0295	0.0070	0.0090	0.0055	0.0065	0.0020	0.0025
Peas	kg/kg	Uptake	0.0460	0.0560	0.0127	0.0153	0.0410	0.0500	0.0037	0.0047
		Removal	0.0350	0.0430	0.0103	0.0127	0.0107	0.0130	0.0020	0.0023
Lentils	kg/kg	Uptake	0.0456	0.0561	0.0122	0.0150	0.0383	0.0467	0.0044	0.0056
		Removal	0.0306	0.0372	0.0094	0.0111	0.0161	0.0200	0.0022	0.0028
Fababeans	kg/kg	Uptake	0.0756	0.0924	0.0262	0.0318	0.0674	0.0824	0.0035	0.0044
		Removal	0.0453	0.0553	0.0162	0.0197	0.0138	0.0168	0.0018	0.0024
Sugarbeets	kg/tonne	Uptake	4.3077	5.2599	1.3830	1.7004	7.8672	9.6130	0.6802	0.8162
		Removal	1.7911	2.1992	0.8162	1.0202	2.9020	3.5595	0.2721	0.3174
Potatoes	kg/tonne	Uptake	5.1250	6.2750	1.5000	1.8250	6.7000	8.1750	0.4000	0.5000
		Removal	2.8750	3.5250	0.8250	1.0000	4.8500	5.9500	0.2750	0.3250
Alfalfa DM <sup>1</sup>	kg/tonne	Uptake								
		Removal	26.1000	31.9000	6.2000	7.6000	27.0000	33.0000	2.7000	3.3000
Clover DM <sup>1</sup>	kg/tonne	Uptake								
		Removal	24.1422	29.4933	6.2222	7.5911	22.5244	27.6267	1.2444	1.4933
Grass DM <sup>1</sup>	kg/tonne	Uptake								
		Removal	15.3791	18.8896	4.5134	5.5164	19.5582	23.9045	1.8388	2.3403
Barley Silage DM <sup>1</sup>	kg/tonne	Uptake								
		Removal	14.5600	20.1600	5.1520	6.7200	12.7680	14.7840	1.5680	2.3520
Corn Silage DM <sup>1</sup>	kg/tonne	Uptake								
		Removal	14.0000	17.2000	5.7000	7.0000	18.1000	22.2000	1.2000	1.4000

<sup>1</sup> DM = Dry Matter

Table 6A-2 Crop Nutrient Uptake and Removal Coefficients Ranges (Imperial Units)

Crop	Units		Nitrogen (N)		Phosphate (P <sub>2</sub> O <sub>5</sub> )		Potash (K <sub>2</sub> O)		Sulphur (S)	
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Spring Wheat	lb/bu	Uptake	1.9000	2.3250	0.7250	0.8750	1.6250	2.0000	0.2000	0.2500
		Removal	1.3500	1.6500	0.5250	0.6500	0.4000	0.4750	0.1000	0.1250
Winter Wheat	lb/bu	Uptake	1.2200	1.4800	0.5400	0.6800	1.2800	1.5600	0.1800	0.2200
		Removal	0.9400	1.1400	0.4600	0.5600	0.3000	0.3800	0.1200	0.1600
Barley	lb/bu	Uptake	1.2500	1.5250	0.5000	0.6125	1.2000	1.4625	0.1500	0.1750
		Removal	0.8750	1.0625	0.3750	0.4625	0.2875	0.3500	0.0750	0.1000
Oats	lb/bu	Uptake	0.9600	1.1700	0.3600	0.4500	1.3100	1.6000	0.1200	0.1400
		Removal	0.5500	0.6800	0.2300	0.2800	0.1700	0.2000	0.0400	0.0500
Rye	lb/bu	Uptake	1.5091	1.8364	0.7455	0.9273	2.1273	2.6182	0.2545	0.3091
		Removal	0.9636	1.1636	0.4000	0.4909	0.3273	0.4000	0.0727	0.0909
Corn	lb/bu	Uptake	1.3800	1.6800	0.5700	0.6900	1.1600	1.4100	0.1300	0.1600
		Removal	0.8700	1.0700	0.3900	0.4800	0.2500	0.3000	0.0600	0.0700
Canola	lb/bu	Uptake	2.8571	3.5143	1.3143	1.6286	2.0857	2.5429	0.4857	0.6000
		Removal	1.7429	2.1143	0.9429	1.1429	0.4571	0.5714	0.2857	0.3429
Flax	lb/bu	Uptake	2.5833	3.1667	0.7500	0.9167	1.6250	2.0000	0.5000	0.6250
		Removal	1.9167	2.3333	0.5833	0.7083	0.5417	0.6667	0.2083	0.2500
Sunflower	lb/bu	Uptake	1.3400	1.6400	0.4600	0.5600	0.6600	0.8800	0.1600	0.1800
		Removal	0.9600	1.1800	0.2800	0.3600	0.2200	0.2600	0.0800	0.1000
Peas	lb/bu	Uptake	2.7600	3.3600	0.7600	0.9200	2.4600	3.0000	0.2200	0.2800
		Removal	2.1000	2.5800	0.6200	0.7600	0.6400	0.7800	0.1200	0.1400
Lentils	lb/bu	Uptake	2.7333	3.3667	0.7333	0.9000	2.3000	2.8000	0.2667	0.3333
		Removal	1.8333	2.2333	0.5667	0.6667	0.9667	1.2000	0.1333	0.1667
Fababeans	lb/bu	Uptake	5.1400	6.2800	1.7800	2.1600	4.5800	5.6000	0.2400	0.3000
		Removal	3.0800	3.7600	1.1000	1.3400	0.9400	1.1400	0.1200	0.1600
Sugarbeets	lb/ton	Uptake	8.6364	10.5455	2.7727	3.4091	15.7727	19.2727	1.3636	1.6364
		Removal	3.5909	4.4091	1.6364	2.0455	5.8182	7.1364	0.5455	0.6364
Potatoes	lb/ton	Uptake	10.2500	12.5500	3.0000	3.6500	13.4000	16.3500	0.8000	1.0000
		Removal	5.7500	7.0500	1.6500	2.0000	9.7000	11.9000	0.5500	0.6500
Alfalfa DM <sup>1</sup>	lb/ton	Uptake								
		Removal	52.2000	63.8000	12.4000	15.2000	54.0000	66.0000	5.4000	6.6000
Clover DM <sup>1</sup>	lb/ton	Uptake								
		Removal	48.5000	59.2500	12.5000	15.2500	45.2500	55.5000	2.5000	3.0000
Grass DM <sup>1</sup>	lb/ton	Uptake								
		Removal	30.6667	37.6667	9.0000	11.0000	39.0000	47.6667	3.6667	4.6667
Barley Silage DM <sup>1</sup>	lb/ton	Uptake								
		Removal	28.8889	40.0000	10.2222	13.3333	25.3333	29.3333	3.1111	4.6667
Corn Silage DM <sup>1</sup>	lb/ton	Uptake								
		Removal	28.0000	34.4000	11.4000	14.0000	36.2000	44.4000	2.4000	2.8000

<sup>1</sup> DM = Dry Matter

Derived from Nutrient Uptake and Removal by Field Crops, Western Canada, 2001, Compiled by the Canadian Fertilizer Institute (CFI)

## Appendix 6B

### Calculating Expected Nutrient Uptake and Removal

Tables 6A-1 and 6A-2 (Appendix 6A) provide coefficient ranges to estimate crop nutrient uptake and removal based on expected or measured crop yields.



For a barley yield of 70 bu/ac, the expected range of nutrients taken up by the barley is

**Crop Nitrogen Uptake (lb N/ac) = Yield (bu/ac) X Uptake Coefficient (lb N/bu) (Table 6A-2)**

Using lower coefficient Crop N Uptake = 87.5 lb N /ac = 70 bu/ac x 1.2500 lb N/bu

Using upper coefficient Crop N Uptake = 106.8 lb N/ac = 70 bu/ac X 1.5250 lb N/bu

A 70 bu/ac barley would be expected to take up between 87.5 to 106.8 lb N/ac in the total biomass (grain and straw).

For the barley yield of 70 bu/ac, the expected range of nutrients removed in the grain is

**Crop Nitrogen Removal (lb N/ac) = Yield (bu/ac) X Removal Coefficient (lb N/bu) (Table 6A-2)**

Lower 61.3 lb N/ac = 70 bu/ac X 0.8750 lb N/bu

Upper 74.4 lb N/ac = 70 bu/ac X 1.0625 lb N/bu

A 70 bu/ac barley would be expected to remove between 61.3 to 74.4 lb N/ac in the grain removed from the field.

A barley silage crop with a yield of 6 tons/ac at 50% moisture is equivalent to 3 tons/ac dry matter

$$\begin{aligned} \text{Yield}_{\text{Dry Matter}} &= \text{Yield}_{50\% \text{ Moisture}} / (100/(100-\% \text{ Moisture})) \\ &= 6 \text{ tons/ac} / (100/(100-50)) \\ &= 3 \text{ tons/ac} \end{aligned}$$

For the barley silage yield of 3 tons/ac of dry matter, the expected range of nutrients removed in the grain is

**Nutrient Uptake (lb N/ac) = Yield<sub>Dry Matter</sub> (tons/ac) x Uptake Coefficient (lb N/ton) (Table 6A-2)**

Nitrogen: Lower 86.7 lb N/ac = 3 tons/ac X 28.8889 lb/ton

Upper 120 lb N/ac = 3 tons/ac X 40.0000 lb/ton

A 6 ton/ac barley silage crop at 50% moisture would be expected to take up between 86.7 and 120.0 lb N/ac in the total silage biomass (grain and straw).