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PLANT UPGRADE ANALYSIS OF THE
MOORETON-DWIGHT COOPERATIVE**

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INTRODUCTION

ELEVATOR LOCATIONS

Mooreton and Dwight are located in southeastern North Dakota and are both served by the Burlington Northern Railroad. Mooreton is situated on the northwest junction of Interstate 29 and Highway 13. Dwight is located two miles north of Highway 13 and one-half mile west of Highway 81. Both communities are currently served by both truck and rail.

GRAIN PRODUCTION

Corn and hard red spring wheat (HRS) are the two principal crops grown in Richland County (Table 1). Corn production in 1982 was 11.6 million bushels while the 1978-82 average was 9.9 million bushels. Production of HRS in 1982 was 6.1 million bushels while the 1977-81 average was 5.7 million bushels. Barley, soybeans and oats are other crops that contribute significantly to total crop production in Richland County. Average production from 1977 to 1981 was 2.8 million bushels of barley and 2.2 million bushels of oats. Soybean production during the 1978-82 period averaged 1.9 million bushels.

GRAIN MOVEMENTS

Richland County

Minneapolis/St. Paul (MSP) and Duluth/Superior (D/S) were the two primary markets for hard red spring wheat shipments from Richland County during the 1978-79 to 1982-83 period (Table 2). MSP received an average of 2.7 million bushels (57 percent) of all HRS shipments while D/S received an average of 1.7 million bushels (35 percent) during the five year period.

Corn shipments from the county were primarily to Pacific Northwest (PNW) destinations. PNW destinations received 49 percent of all Richland

TABLE 1. PRODUCTION OF SELECTED CROPS, RICHLAND COUNTY, NORTH DAKOTA.

Crop	1982	1981	Five Year Average (1977-1981)
HRS	6,145,000	7,675,000	5,752,700
Durum	355,000	994,000	466,000
Barley	2,617,000	3,503,000	2,814,500
Oats	1,630,000	1,885,000	2,274,900
Rye	50,200	50,300	81,800
Sunflower (cwt.)	944,700	987,300	1,795,800
Flax	29,800	62,100	83,900
Corn (for grain)	11,663,800	13,745,100	9,945,300 ^a
Dry Beans (cwt.)	107,880	189,552	--
Soybeans	2,032,300	2,266,200	1,969,940 ^a

^a5-year average is 1978-82.

TABLE 2. GRAIN MOVEMENTS FROM RICHLAND COUNTY, 1978-79 TO 1982-83.

Commodity/ Year	D/S	MSP	PNW	Other	Total
	----- bushels -----				
WHEAT					
1978-79	1,977,067 (44%)	2,278,709 (51%)	23,087 (1%)	199,188 (4%)	4,478,051 (100%)
1979-80	1,504,684 (33%)	2,778,383 (61%)	3,370 (\lt 1%)	242,713 (5%)	4,529,150 (100%)
1980-81	2,292,979 (47%)	2,042,773 (42%)	3,320 (\lt 1%)	491,189 (10%)	4,830,261 (100%)
1981-82	1,761,302 (34%)	3,075,360 (60%)	--	328,938 (6%)	5,165,600 (100%)
1982-83	1,006,898 (20%)	3,589,951 (70%)	--	564,401 (10%)	5,161,250 (100%)
5 Yr. Avg.	1,707,986 (35%)	2,753,035 (57%)	5,955 (\lt 1%)	385,286 (8%)	4,852,262 (100%)
BARLEY					
1978-79	256,155 (6%)	966,617 (22%)	9,292 (\lt 1%)	3,104,519 (72%)	4,336,583 (100%)
1979-80	241,261 (4%)	727,932 (13%)	3,861 (\lt 1%)	4,532,604 (82%)	5,505,658 (100%)
1980-81	182,884 (3%)	436,366 (6%)	27,021 (\lt 1%)	6,110,979 (90%)	6,757,250 (100%)
1981-82	144,777 (3%)	491,235 (9%)	10,949 (\lt 1%)	4,986,442 (89%)	5,633,403 (100%)
1982-83	213,665 (4%)	497,462 (9%)	1,891 (\lt 1%)	4,966,866 (87%)	5,679,884 (100%)
5 Yr. Avg.	207,748 (4%)	623,922 (11%)	10,603 (\lt 1%)	4,740,282 (85%)	5,582,555 (100%)

continued

TABLE 2 - continued

Commodity/ Year	D/S	MSP	PNW	Other	Total
	----- bushels -----				
CORN					
1978-79	114,217 (3%)	40,115 (1%)	3,271,826 (83%)	528,894 (13%)	3,955,052 (100%)
1979-80	144,712 (3%)	57,172 (1%)	4,603,500 (91%)	231,370 (5%)	5,036,754 (100%)
1980-81	40,048 (1%)	107,369 (2%)	5,184,886 (88%)	559,534 (9%)	5,891,837 (100%)
1981-82	88,523 (2%)	344,288 (8%)	3,607,570 (79%)	524,410 (11%)	4,564,791 (100%)
1982-83	89,326 (2%)	97,260 (2%)	2,121,779 (49%)	2,061,190 (47%)	4,369,555 (100%)
5 Yr. Avg.	95,365 (2%)	129,241 (3%)	3,757,912 (79%)	781,080 (16%)	4,763,598 (100%)
SUNFLOWER					
1978-79	2,991,719 (77%)	154,364 (4%)	--	759,156 (19%)	3,905,239 (100%)
1979-80	3,047,392 (71%)	337,549 (8%)	--	889,955 (21%)	4,274,896 (100%)
1980-81	2,112,759 (57%)	385,256 (10%)	55,920 (2%)	1,131,266 (31%)	3,685,201 (100%)
1981-82	1,444,921 (53%)	505,227 (19%)	1,020 (\ll 1%)	767,600 (28%)	2,718,768 (100%)
1982-83	981,420 (58%)	110,577 (6%)	12,247 (1%)	597,614 (35%)	1,701,858 (100%)
5 Yr. Avg.	2,116,722 (65%)	298,595 (9%)	13,837 (\ll 1%)	829,118 (25%)	3,258,272 (100%)
OTHER *					
1978-79	456,039 (16%)	1,310,146 (45%)	11,929 (\ll 1%)	1,105,918 (38%)	2,884,032 (100%)
1979-80	408,457 (13%)	1,431,570 (46%)	9,080 (\ll 1%)	1,245,393 (40%)	3,094,500 (100%)
1980-81	335,197 (14%)	883,554 (36%)	10,381 (\ll 1%)	1,240,056 (50%)	2,469,188 (100%)
1981-82	373,634 (11%)	1,503,785 (42%)	26,329 (1%)	1,646,713 (46%)	3,550,461 (100%)
1982-83	181,939 (6%)	1,386,620 (46%)	346,913 (12%)	1,088,471 (36%)	3,003,943 (100%)
5 Yr. Avg.	351,053 (12%)	1,303,135 (43%)	80,926 (3%)	1,265,310 (42%)	3,000,424 (100%)

*Includes soybean movements.

County corn shipments (2.1 million bushels) during 1982-83 and an average of 79 percent (3.8 million bushels) of all corn shipments during the 1978-79 to 1982-83 period.

Dwight and Mooreton

The Dwight and Mooreton elevators shipped a total of 515,625 bushels of HRS during 1982-83 (Table 3). This was more than double the amount shipped during the 1981-82 crop year. The two elevators shipped an average of 399,605 bushels of HRS during the 1978-79 to 1982-83 period. The bulk of HRS shipments have historically been to Duluth/Superior. However, in 1982-83 only 87,958 bushels (17 percent of all HRS shipments) were shipped to Duluth/Superior. Minneapolis received 56 percent (290,538) of all HRS shipments in 1982-83.

Barley shipments from Dwight and Mooreton historically have been to both Minneapolis and Duluth/Superior. Average shipments over the 5-year period were 21,726 bushels to MSP (62 percent share) and 13,381 bushels to D/S (38 percent share).

Corn movements from the two elevators during the 1978-79 to 1982-83 period were primarily to the Pacific Northwest. During the five year period 89 percent of all corn shipments were to PNW destinations. However, in 1982-83 only 37 percent of the total corn movement was shipped west. Total corn shipments from Mooreton and Dwight declined substantially in 1981-82 and 1982-83 compared to the previous three years. Over 500,000 bushels were handled in 1980-81 compared to 166,000 bushels in 1981-82 and 249,000 bushels in 1982-83. The five year average was approximately 350,000 bushels.

¹ This section details major commodity movements. Additional data are contained in Appendix Table I on movements by commodity, destination and mode.

TABLE 3. GRAIN MOVEMENTS FROM DWIGHT AND MOORETON, 1978-79 TO 1982-83.

Commodity/ Year	D/S	MSP	PNW	Other	Total
	bushels				
WHEAT					
1978-79	166,006 (41%)	110,530 (27%)	19,800 (5%)	107,819 (27%)	404,155 (100%)
1979-80	142,223 (40%)	143,797 (40%)	6,226 (2%)	65,994 (18%)	358,240 (100%)
1980-81	292,153 (59%)	96,277 (19%)	--	110,438 (22%)	498,868 (100%)
1981-82	128,327 (58%)	49,770 (23%)	--	43,043 (19%)	221,140 (100%)
1982-83	87,958 (17%)	290,538 (56%)	--	137,129 (27%)	515,625 (100%)
5 Yr. Avg.	163,333 (41%)	138,182 (36%)	5,205 (1%)	92,885 (23%)	399,605 (100%)
BARLEY					
1978-79	44,204 (67%)	21,802 (33%)	--	--	66,006 (100%)
1979-80	6,226 (18%)	29,254 (82%)	--	--	35,480 (100%)
1980-81	5,707 (17%)	29,613 (83%)	--	--	34,320 (100%)
1981-82	--	21,329 (100%)	--	--	21,329 (100%)
1982-83	10,770 (59%)	7,633 (41%)	--	--	18,403 (100%)
5 Yr. Avg.	13,381 (38%)	21,726 (62%)	--	--	35,107 (100%)

continued

TABLE 3. - continued

CORN	D/S	MSP	PNW	Other	Total
1978-79	--	4,000 (1%)	336,609 (99%)	--	340,609 (100%)
1979-80	--	2,950 (1%)	465,146 (99%)	--	468,096 (100%)
1980-81	--	--	514,309 (99%)	3,000 (1%)	517,309 (100%)
1981-82	--	--	143,053 (86%)	23,429 (14%)	166,482 (100%)
1982-83	--	6,660 (3%)	93,071 (37%)	149,679 (60%)	249,410 (100%)
5 Yr. Avg.	--	2,722 (1%)	310,438 (89%)	35,222 (10%)	348,382 (100%)
SUNFLOWER					
1978-79	325,800 (92%)	20,000 (6%)	--	9,536 (2%)	355,336 (100%)
1979-80	203,695 (91%)	1,911 (1%)	--	18,827 (8%)	224,433 (100%)
1980-81	95,764 (90%)	--	--	10,543 (10%)	106,307
1981-82	--	--	--	--	--
1982-83	--	--	--	--	--
OTHER*					
1978-79	8,904 (6%)	60,635 (38%)	--	92,130 (57%)	161,669 (100%)
1979-80	46,696 (24%)	74,047 (38%)	--	74,363 (38%)	195,106 (100%)
1980-81	9,348 (6%)	51,799 (35%)	--	87,537 (59%)	148,684 (100%)
1981-82	15,461 (12%)	13,910 (11%)	3,065 (2%)	98,129 (75%)	130,565 (100%)
1982-83	9,625 (3%)	131,324 (46%)	--	146,123 (51%)	287,072 (100%)
5 Yr. Avg.	18,007 (10%)	66,343 (36%)	613 (1%)	99,656 (54%)	184,619 (100%)

*Includes soybean movements.

Soybean shipments from the Mooreton and Dwight elevators increased substantially in 1982-83 compared to previous years (Table 4). Over 230,000 bushels of soybeans were moved in that year, approximately twice the amount moved in 1979-80. Most of the movement has traditionally been to "other Minnesota" destinations. However, in 1982-83 over 40 percent of total soybean shipments were to Minneapolis/St. Paul. Average soybean volume handled during the 1978-79 to 1982-83 period was 123,092 bushels.

TABLE 4. SOYBEAN SHIPMENTS FROM MOORETON AND DWIGHT, 1978-79 TO 1982-83.

Year	D/S	MSP	OTHER MINNESOTA ----- bushels -----	MISC.	TOTAL
1978-79	5,904 (6%)	917 (1%)	89,722 (93%)	--	96,543 (100%)
1979-80	18,071 (16%)	19,687 (18%)	72,763 (66%)	--	110,521 (100%)
1980-81	--	1,695 (2%)	86,459 (98%)	--	88,154 (100%)
1981-82	--	--	86,675 (97%)	3,065 (3%)	89,740 (100%)
1982-83	9,625 (4%)	93,721 (41%)	67,855 (29%)	59,298 (26%)	230,499 (100%)
Five Year Average	6,720 (5%)	23,204 (19%)	80,695 (66%)	12,473 (10%)	123,092 (100%)

RAIL RATE STRUCTURE

Rail rate structures and the level of the various rates are of extreme importance to enterprises considering investment alternatives. Rate spreads, (the price difference between alternative service levels), to a large extent dictate how much can be invested in a particular elevator. Volume is another key factor to be analyzed.

Basically, a four-tiered rate structure exists for shipping grain from Mooreton and Dwight to eastern market destinations. Rail rates to Minneapolis/St. Paul and Duluth/Superior include single-car, 3-car, 26-car and 52-car service levels (Table 5). Rate spreads among service levels from both Mooreton and Dwight to MSP are: 4 cents between single-car and 3-car, 8 cents between the 3-car and 26-car and 5 cents between the 26-car and 52-car. Rate spreads from both origins to D/S are 4 cents between single-car and 3-car, 10 cents between 3-car and 26-car and 5 cents between 26-car and 52-car.

TABLE 5. RAIL RATES TO MINNEAPOLIS/ST. PAUL AND DULUTH/SUPERIOR FROM MOORETON AND DWIGHT, FOR WHEAT, CORN, BARLEY, SUNFLOWER AND SOYBEANS, MARCH, 1984.

Service Level	Minneapolis/St. Paul		Duluth/Superior	
	Mooreton	Dwight	Mooreton	Dwight
	----- cents/cwt. -----			
Single-car	65	62	71	71
3-car	61	58	67	67
26-car	53	50	57	57
52-car	48	45	52	52

Westbound rail rates for corn from Mooreton and Dwight are contained in Table 6. A 10 cent per cwt. spread exists between the 27-car multiple origin and 27-car single origin rates, while a 21 cent per cwt. spread exists between the 27-car single origin and 54-car rate. One 54-car shipment, relative to two 27-car single origin shipments, would save over \$20,000 (180,000 bushels times 12.6 cents per bushel rate spread). This savings would have to be analyzed relative to the investment required to upgrade to a 54-car loading facility. Obviously, the grain volume that can be handled at each of the rate levels will determine the level of investment which can be justified.

TABLE 6. WESTBOUND RAIL RATES FOR CORN FROM MOORETON AND DWIGHT, MARCH 1984.

Service Level	Rate (cents/cwt.)
27-car multiple origin	176
27-car single origin	166
54-car	145

INVESTMENT ANALYSIS

Any capital investment which is required in order to utilize the lower rate must be capitalized based on the rate spread. A simple example will help to illustrate this relationship. First, assume that an elevator is shipping 300,000 bushels of wheat to D/S at 60 cents per hundredweight (36 cents per bushel) which is the 3-car rail rate. Further assume that the manager wishes to ship via the 26-car rate (a rate savings of 10 cents per cwt. or 6 cents per bushel) and that \$100,000 must be invested in the

facility in order to meet the 26-car loading requirements. Assuming that the investment can be financed at 14 percent, the necessary calculations are:

$$I^* = (V * S) - I(i)$$

where: I^* = Investment criterion
V = Volume
S = Rate spread
I = Investment required to upgrade
i = Interest rate

Decision criterion:

If I^* is positive the rate spread justifies the investment.

If I^* is negative the rate spread does not justify the investment.

Substituting the above mentioned values:

$$\begin{aligned} I^* &= (300,000 \text{ bu.} * \$0.06) - 100,000 (.14) \\ &= \$4,000 \end{aligned}$$

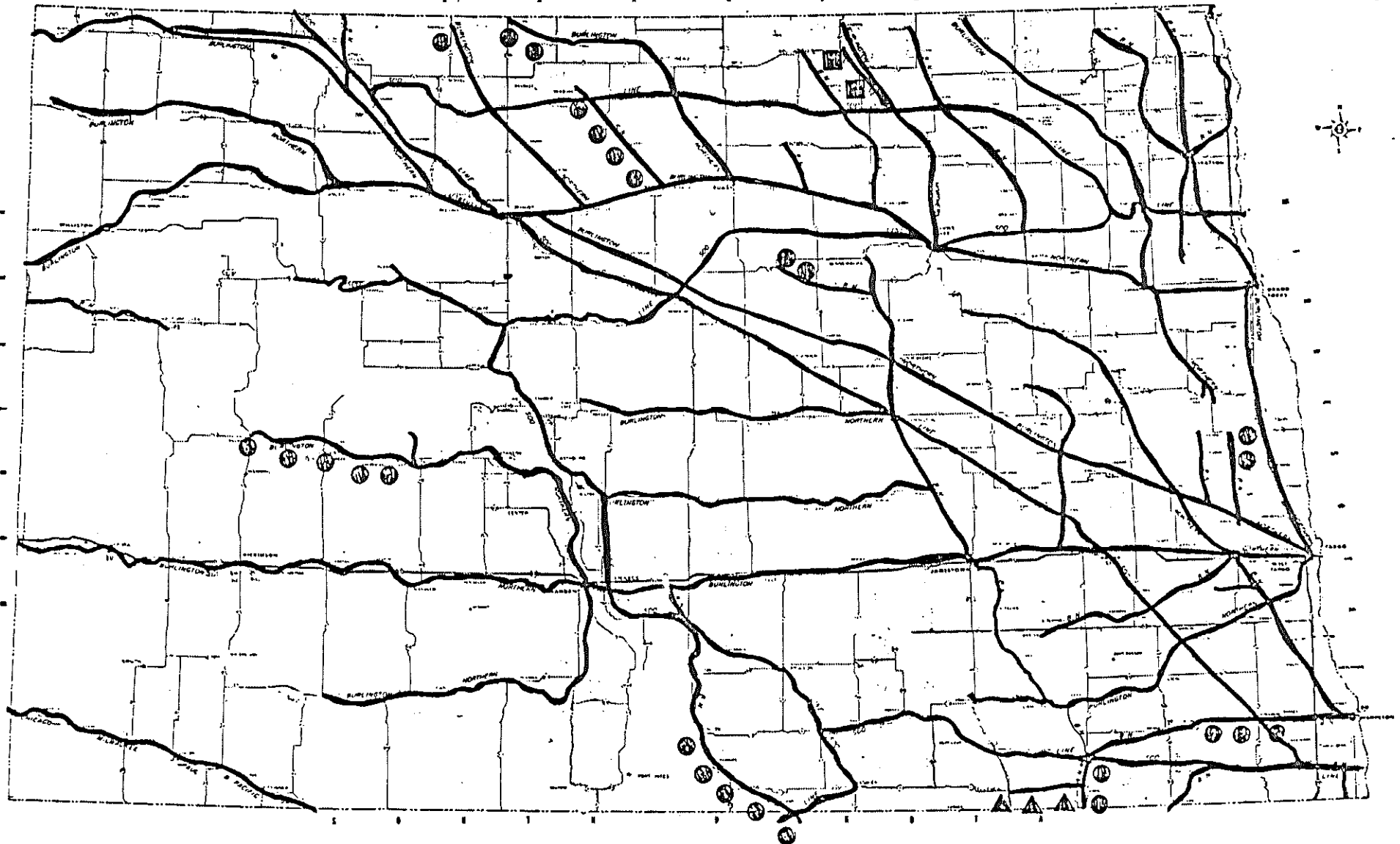
I^* is positive (\$4,000), therefore the rate spread justifies the \$100,000 investment.

This example illustrates the importance between utilizing a lower rate service level and the investment required to access the lower rate. However, it gives only a superficial view since factors such as competition, etc. are not taken into account. This type of analysis is applied to the Mooreton-Dwight cooperative in Appendix II.

RAIL ABANDONMENT

Neither Mooreton nor Dwight are on branch lines that are currently being proposed for abandonment by the railroad providing service. The Boards of Directors of both facilities should be fully aware of Burlington Northern's intentions concerning future service before any investments are made. Figure 1 is a map depicting the abandonment status of North Dakota rail segments.

EXISTING North Dakota State Highway and Rail Network



- ⊙ - Category I
- ⊠ - Category II
- ▲ - Category III

— RAIL LINES

NORTH DAKOTA

SYSTEM DIAGRAM MAP

<u>CATEGORY I LINES</u>	<u>MILES</u>
Hunter to Blanchard (BN)	10.4
Barney to Milnor (BN)	22.1
Valley City to Berea (BN)	4.8
Oakes to SD Border (CNW)	14.2
Linton to SD Border (BN)	36.7
Tuttle to Regan (BN)	26.3
Maddock to Esmond (BN)	12.2
Towner to Newburg (BN)	35.3
Westhope to Antler (BN)	13.0
Mohall to Sherwood (BN)	14.6
Zap to Killdeer (BN)	40.9
TOTAL	230.4

CATEGORY II LINES

Egeland to Armourdale (Soo)	21.7
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CATEGORY III LINES

Ludden to Ellendale (BN)	20.0
TOTAL	20.0

- Category I:
(red) All lines or portions of lines which the carrier anticipates will be the subject of an abandonment or discontinuance application to be filed within the 3-year period following the date upon which the diagram, or any amended program, is filed with the Commission.
- Category II:
(green) All lines or portions of lines potentially subject to abandonment which the carrier has under study and believes may be the subject of a future abandonment application because of either anticipated operating losses or excessive rehabilitation costs, as compared to potential revenues.
- Category III:
(yellow) All lines or portions of lines for which an abandonment or discontinuance application is pending before the Commission on the date upon which the diagram, or any amended diagram, is filed with the Commission.

Grain Volume Estimating Methodology

The "trade area" or region from which a country grain elevator is able to attract grain will vary in size depending on many factors. One of the most important of these factors is the freight rate (rail or truck) which can be utilized by the elevator to ship grain to terminal markets. The freight rate is the major factor in determining the difference between the terminal market price and the country grain elevator "board price" or price paid to farmers. Comparative costs of shipping from farms to competing elevators will also influence where producers haul grains. Other factors which will influence the grain volume available to an elevator are the density of grain production in the area, the physical road network in the region, elevator services available, and overall elevator management skills.

The methodology used herein utilizes comparative freight rates and distances to competing elevators to estimate the trade area of the Mooreton and Dwight grain elevators. It is presumed that a farmer's decision on where to ship his grain is affected by two variables: 1) the elevator "board price" (which is determined by the elevator's applicable freight rate), and 2) the relative distances the producer must haul his grain by farm truck to area elevators. The "net farm price" or the net price per bushel received by a farmer will be equal to the elevator board price less costs of trucking from farm to elevator. The producer's net farm price can therefore be represented in mathematical notation as:

$$P_f = P_e - T (D)$$

where: P_f = net farm price

P_e = elevator board price

T = farm truck cost per unit of distance

D = distance from farm to elevator

At some point between two competing elevators, the net farm price of hauling to the two markets will equal. That is, the producer would be indifferent as to which elevator he would haul to -- his net price per bushel would be the same. This point where the net farm price is equal to both elevators would define the boundary of market areas. Producers on the "elevator A" side of this point would receive a higher price per bushel by shipping to elevator A than elevator B, and vice versa. For example, if the straight line distance between two elevators is 14 miles, some point along this 14 mile segment would exist where the net farm price to producers would be equal hauling to either elevator. Assuming a rail rate of 60 cents per hundredweight (cwt.) at both elevators, and a farm trucking cost of .35 cents per bushel-mile,² that point of equal net return can be identified as follows:

$$P_a - \$.0035/\text{bushel-mile} (X) = P_b \$.0035/\text{bushel mile} (14-X)$$

Using a terminal market price of one dollar (constant) at both elevators and applicable freight rates, the point of equal net return is:

$$.64 - .0035X = .64 - .0462 + .0035X$$

$$X = 7$$

Therefore, producers within seven miles of elevator A would be better off shipping grain to elevator A rather than to elevator B. In this case, the point of equal net return is midway between the two elevators because the applicable freight rates are the same for both

²Griffin, Gene; Wesley Wilson; and Ken Casavant, "Characteristics and Costs of Operation of North Dakota's Farm Trucks," Upper Great Plains Transportation Institute, North Dakota State University, Fargo. Report forthcoming.

elevators. The procedure involved herein computes that point of equal producer returns for all elevators surrounding Mooreton and Dwight. The territory contained within the cellular shaped figure connecting these points would define the drawing territory or trade area of the Mooreton-Dwight cooperative.

Mooreton-Dwight Trade Area Size and Volume

The concentration of grain elevators in Richland county is high compared to most areas in North Dakota. Therefore, those elevators must share the actual grain produced in the county. However, grain production is also relatively high so sufficient volume is available to support the larger number of shippers. The relative amounts of grain handled by each will change depending on which of these stations producers decide to patronize. This decision as to market outlet will be affected by such factors as the distances to various elevators, the level of ancillary services offered by each, and others.

The primary criteria used by producers when deciding where to sell grain is price received. And, as prices among competing elevators change, producers will re-evaluate their net price they would receive by hauling to different markets. Therefore, it is critical to analyze effects of proposed price changes on an elevator's trade area and expected level of patronage.

The size of trade area and volume for the Mooreton and Dwight elevators was estimated collectively. That is, an estimate of the total volume handled is presented rather than estimates for each elevator. Competing elevators which are included in the analysis are presented in Table 7. Also included in Table 7 are rail rates accessible, service levels utilized by each elevator, and elevator board prices which were offered on March 7, 1984 (corn) and on March 9, 1984 (wheat). Estimates of the

Mooreton-Dwight trade area volume are therefore computed using the elevator board prices given in Table 7. It should be noted that the results depends heavily on the relative prices among elevators rather than the absolute levels of prices. If these relative prices change, the results will also change. Much of the following analysis involves changing these price relationships to study effects on the trade area if competing elevators react to various changes in the local competitive situation.

TABLE 7. RAIL RATES AND SERVICE LEVELS UTILIZED,^a AND CORN AND WHEAT PRICES OFFERED BY SELECTED RICHLAND COUNTY ELEVATORS.

Elevator	Service Level		Rail Rate		Board Price	
	Corn	Wheat	Corn	Wheat	Corn ^b	Wheat ^c
Dwight	27mo	3	176	58	3.03	3.75
Mooreton	27mo	3	176	61	3.00	3.73
Breckinridge	27so	3	166	56	3.06	3.73
Galchutt	27so	3	166	61	3.03	3.80
Colfax	27mo	3	176	64	3.06	3.78
Barney	27mo	3	176	64	3.03	3.69
Wyndmere	27mo	3	176	65	3.04	3.78
Hankinson ^d	27mo	3	176	57	3.09	3.77
Fairmount	27so	3	166	52	2.90	3.78
Great Bend	--	--	--	--	3.00	3.74
Lidgerwood	54so	3	145	61	3.05	3.74
Mantador	27mo	3	176	--	3.02	3.75
Abercrombie	--	--	--	--	3.00	3.82

^aAlthough some stations have physical capabilities to utilize multiple car rates, the lower rate is not necessarily attained due to problems accumulating grain, etc.

^bElevator prices for corn were quoted on March 7, 1984.

^cElevator prices for wheat were quoted on March 9, 1984.

^dThe 54 car station in Hankinson is a transshipment/loading station, and does not buy from farmers. The elevator prices quoted here are for the commercial elevator in Hankinson.

Two situations were analyzed regarding the size of the Mooreton-Dwight trade area. First, the size of the trade area was estimated assuming Mooreton is able to utilize 27 car (corn) and 26 car (wheat) service levels for grain shipment. Also, effects of competitors' reactions were analyzed. The size of the trade area was estimated assuming Barney, Galchutt, and Breckinridge are also able to increase their prices to farmers by utilizing multiple car rates. Second, the size of the trade area was estimated assuming Mooreton is able to utilize 54 car (corn) and 26 car (wheat) service levels and their associated rates. Effects of competitors reactions were also analyzed in this case.

Scenario 1

Under Scenario 1, Mooreton and Dwight were presumed to be able to increase their corn price as a result of upgrading to load 25-27 car trains at Mooreton. Board prices at Mooreton and Dwight were assumed to increase by four cents and two cents per bushel, respectively. Dwight's board price was presumed to increase less to account for the fact that grain will either be trucked to Mooreton for subsequent reshipment or loaded as a multiple origin shipment. The underlying assumption is that not all of the rate savings between 27 multiple origin and 27 single origin shipments (10 cents per hundredweight) can be passed on to patrons -- some is required to amortize debt and pay for cost of trucking grain from Dwight to Mooreton. Also, somewhat less than 100 percent of the grain handled will actually be shipped under the lowest rate possible. Total corn volume estimated to be contained within the Mooreton-Dwight trade area was 386,320 bushels (Table 8).

TABLE 8. CORN PRODUCTION CONTAINED IN MOORETON-DWIGHT TRADE AREA, SCENARIO 1.

Township	Township Production as Percent of County	Township Percent Contained in Trade Area	County Production	Trade Area Volume
Antelope	3.57	34	4,763,598	57,820
Ibsen	2.38	68	4,763,598	77,094
Dwight	1.19	82	4,763,598	46,483
Barney	2.97	35	4,763,598	49,601
Mooreton	3.57	73	4,763,598	124,144
Center	1.19	55	4,763,598	31,178
TOTAL				386,320

The trade area size and volume was estimated separately for wheat and other crops due to the different rail rate structures in existence for corn vs. other commodities. Estimated volumes of wheat and miscellaneous commodities contained in the Mooreton-Dwight trade area are presented in Table 9. Volume of other crops is about 50 percent higher than wheat volume. This maybe somewhat unrealistic, and is addressed later in this report.

TABLE 9. VOLUME OF WHEAT AND MISCELLANEOUS COMMODITIES CONTAINED IN MOORETON-DWIGHT TRADE AREA, SCENARIO 1.

Township	Township Production as Percent of County		Township Percent Contained in Trade Area	County Production		Trade Area Volume	
				Wheat	Other	Wheat	Other
				----- bushels -----			
Antelope	3.1	1.37	36	4,852,262	11,841,251	54,151	58,401
Ibsen	3.72	2.74	32	4,852,262	11,841,251	57,761	103,824
Dwight	3.72	3.42	31	4,852,262	11,841,251	55,956	125,724
Barney	3.72	2.05	71	4,852,262	11,841,251	128,158	172,770
Mooreton	3.72	2.05	100	4,852,262	11,841,251	180,504	243,338
Center	3.72	2.74	66	4,852,262	11,841,251	119,133	214,137
Belford	3.1	3.42	3	4,852,262	11,841,251	4,513	12,167
Brandenburg	3.1	2.74	9	4,852,262	11,841,251	13,538	29,201
TOTAL						613,714	959,201

Trade area volume was also estimated after changing some of the conditions to analyze effects of adjustments in the competitive surroundings. Grain volume was estimated assuming three Mooreton-Dwight competitors reacted to the upgrading and also upgraded to competing service levels. Wyndmere, Gulchutt and Breckenridge are assumed to upgrade to also be able to offer similar prices to producers. The effects of the three competitors also being able to increase corn and wheat prices by four cents per bushel is presented in Table 10.

TABLE 10. EFFECTS OF COMPETITIVE PRICE REACTIONS BY THREE MOORETON COMPETITORS, SCENARIO 1.

Commodity	Base Case Volume	Wyndmere (Barney) Increases Price by Four Cents ^a	Barney and Calchutt Increase Corn Price by Four Cents (bushels)	Wyndmere (Barney), Galchutt and Breckenridge Increase Corn and Wheat Price by Four Cents
Corn	386,320	292,617	275,621	243,470
Wheat	613,714	432,307	432,307	405,231
Other	959,562	721,902	721,902	669,179
Total	1,959,596	1,446,826	1,429,830	1,317,880

^aBarney's price increase does not affect wheat volume but does affect corn volume.

It should be noted that corn volume in any of these cases is not as large as either wheat or other crop volume. This is due to existing price differentials among competing elevators and relative changes that may occur among those elevators. Competing elevators' corn prices were high and allowed competitors to capture a larger share of available corn production.

Scenario 2

Under Scenario 2, Mooreton and Dwight were presumed to be able to further increase prices paid to producers as a result of upgrading to 50-54 car loading capabilities. Prices for corn at Mooreton and Dwight were assumed to increase first by an additional five cents then ten cents per bushel. Trade areas were estimated under both of these situations. The actual rate spread between 27 car single origin and 54 car single origin service levels is approximately 12 cents per bushel. However, it is doubtful that this entire rate savings would be reflected

in prices to farmers. At least a portion of it would likely be required to amortize principal and interest on construction financing, and part may be required to pay for transshipments from Dwight to Mooreton. Also, not all corn volume would be able to be shipped under the lowest rate.

Wheat price was not increased as was corn price. Although some rate savings may be realized from an occasional 52 car shipment of wheat, few such shipments have actually been taking place for east-bound movements due to the smaller rate spread between 26 and 52 car service levels.

The estimated corn volume contained within the trade area if both Mooreton and Dwight raised corn prices by nine cents per bushel (5 cents plus the 4 cent increase from Scenario 1) is presented in Table 11. Also the volume estimate if Mooreton and Dwight increased corn price by 14 cents per bushel (10 cents plus the four cent increase from Scenario 1) is presented in Table 11. The total estimated corn volume in the trade area after prices were increased by nine cents was 957,817 bushels. This volume estimate increased to 1,689,999 bushels when board prices were raised by 14 cents.

TABLE 11. CORN PRODUCTION CONTAINED IN THE MOORETON-DWIGHT TRADE AREA, SCENARIO 2.

Township	Proportion of Township Contained in Trade Area		Trade Area Volume	
	9 cent increase	14 cent increase	9 cent increase	14 cent increase
	----- percent -----		----- bushels -----	
Garborg	2	70	3,968	138,883
Nansen	33	92	65,473	182,532
Abercrombie	33	96	28,060	81,629
Homestead	5	70	7,086	99,202
Antelope	100	100	170,060	170,060
Ibsen	100	100	113,374	113,374
Dwight	100	100	56,687	56,687
Dantan	11	71	18,707	120,743
Barney	100	100	141,717	141,717
Mooreton	100	100	170,060	170,060
Center	100	100	56,687	56,687
Liberty Grove	0	38	-0-	43,082
Belford	18	76	30,611	129,246
Brandenburg	34	94	38,547	106,571
Summitt	27	90	<u>22,958</u>	<u>76,527</u>
Total			957,817	1,689,999

Competitors' corn prices were also adjusted in order to analyze effects of reactions by elevators surrounding Mooreton and Dwight. Corn volume for Mooreton-Dwight was first estimated assuming Barney increased their price by 14 cents as a result of 54 car shipments. Corn volume was then estimated assuming board prices at Barney and Mooreton were equalized. Results of this sensitivity analysis are presented in Table 12.

TABLE 12. CORN VOLUME CONTAINED IN MOORETON-DWIGHT TRADE AREA AFTER COMPETITORS' PRICE REACTIONS.

Competitive Situation	Corn Volume (bushels)
Mooreton-Dwight 9 cent increase	957,817
Mooreton-Dwight 14 cent increase	1,686,999
Mooreton-Barney equal prices	920,025
Barney 14 cent increase	679,958

Summary

Corn and HRS wheat are the predominant crops grown in the Mooreton-Dwight area, but a variety of other commodities such as barley, soybeans and oats are also marketed through area grain elevators. Total commodity movements from the Mooreton and Dwight elevators has been erratic for the last five years, with an average of approximately one million bushels shipped from both stations between the 1978-79 and 1982-83 crop years. The rail rate savings which can be attained by shipping corn and other commodities in multi-car or trainload lots has been the primary impetus for consideration of upgrading elevator facilities. The purpose of this study was to describe the Mooreton-Dwight trade area, estimate the approximate size of the trade area, and estimate the volume of grain the two stations could expect to attract if they were capable of utilizing multi-car and trainload rail rates.

The rail rate structures in effect for westbound corn provide more incentive for elevator management to utilize trainload shipments. A rate savings of approximately 17 cents per bushel can be attained by shipping corn in 54 car lots westbound rather than in 27 car multiple origin lots. This large rate spread provides significantly more incentive for trainload shipments than narrower spreads on other commodities shipped to eastern markets.

The size and shape of an elevator's trade area will depend on many factors such as the competing elevators' prices, distances among elevators, and farmers' partonage. The amount of grain available for marketing within this trade area will depend on factors such as density of production and proportion of production actually shipped through country grain elevators.

The approximate size and shape of the Mooreton-Dwight trade area after upgrading to 26 car loading capabilities (wheat) is shown in Figure A-1 (Appendix). Its shape is determined primarily by competition from Barney, Hankinson, Great Bend and Galchutt. The size and shape did change, however, as the relative prices at competing stations were altered to project competitive reactions. The size of the trade area after upgrading to 54 car loading capabilities (corn) becomes larger and is shown in Figure A-2 (Appendix). Table 13 is a summary of estimated grain volume contained in the Mooreton-Dwight trade area under different competitive circumstances.

Volume of crops other than wheat and corn was adjusted downward from previously quoted estimates. Volume increases as a result of trainload shipping capabilities would not likely be as significant for lower-volume or specialty crops because of their shipping characteristics. These commodities are not as conducive to multiple car shipments and therefore do not have associated lower rates. For this reason, the proportion of crops other than corn and wheat was maintained at the level prior to these projected changes. Volume of other crops was estimated to be 32 percent of wheat and corn volume at all throughput levels.

TABLE 13. MOORETON-DWIGHT ESTIMATED TRADE AREA GRAIN VOLUME, SELECTED COMPETITIVE CONDITIONS.

Competitive Situation	Corn	Wheat	Other Crops (bushels)	Total
Scenario 1.				
a. M/D increases C&W prices by 4 cents and 2 cents	386,320	613,714	320,011	1,320,045
b. Wynd/Barney increase C&W prices 4 cents and 2 cents	292,617	432,307	231,976	956,900
c. Barney/Galchutt increase corn price by 4 cents	275,621	432,307	226,537	934,465
d. Wynd/Barney/Galchutt/Breck increase C&W price by 4 cents	243,470	405,231	207,584	856,285
Scenario 2.				
a. M/D increases corn price by 9 cents, wheat by 4 cents and 2 cents	957,817	613,714	502,890	2,074,421
b. M/D increases corn price by 14 cents and wheat by 4 cents and 2 cents	1,689,999	613,714	737,188	3,040,901
c. M/D increase corn 14 cents and wheat 4 cents and 2 cents. Barney equalizes corn price and increases wheat by 4 cents	920,025	432,307	432,746	1,785,078

Actual volume of grain handled depends on the relative prices at Mooreton-Dwight and competing stations, as well as other factors. However, given that Mooreton does upgrade to 54 car loading capabilities and some competitive reaction occurs from surrounding elevators, the trade area volume can be expected to be approximately 1.7 to 2.0 million bushels. This range is consistent with situations "Scenario 2-a." and "Scenario 2-c" in Table 13. This estimate consists of approximately 50 percent corn, 27 percent wheat, and 23 percent other crops.

This estimate of potential grain volume available for the Mooreton-Dwight cooperative will provide a guideline or starting point for managers, board members and patrons to use when considering the potential for their elevator. Other factors which cannot be included in the analysis should be considered by the individual and evaluated as their effect on potential grain volume. Some of these other factors include:

1. Previous years handle
2. Road system
3. Producer patronage and loyalty
4. Ancillary services offered
5. Expected reactions of competing elevators
6. Merchandising skills of each elevator
7. Special rate considerations such as contract rates
8. Subjective views of management.

APPENDIX I

Grain Movement from Mooreton and Dwight

1982-83

1981-82

1980-81

1979-80

GRAIN MOVEMENT FROM MOORETON AND DWIGHT, 1982-83

COM=WHEAT	COM=WHEAT	DEST=DULUTH/SUPERIOR
	TOTBU	87958
	TRUCKBU	0
	RAILBU	87958
COM=WHEAT	COM=WHEAT	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	290538
	TRUCKBU	4150
	RAILBU	286388
COM=WHEAT	COM=WHEAT	DEST=OTHER MINNESOTA
	TOTBU	124829
	TRUCKBU	0
	RAILBU	124829
COM=WHEAT	COM=WHEAT	DEST=SOUTHEASTERN STATES
	TOTBU	3300
	TRUCKBU	0
	RAILBU	3300
COM=WHEAT	COM=WHEAT	DEST=SOUTHWESTERN MIDLAND STATES
	TOTBU	9000
	TRUCKBU	0
	RAILBU	9000
COM=DURUM	COM=DURUM	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	2100
	TRUCKBU	0
	RAILBU	2100
COM=BARLEY	COM=BARLEY	DEST=DULUTH/SUPERIOR
	TOTBU	10770
	TRUCKBU	0
	RAILBU	10770
COM=BARLEY	COM=BARLEY	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	7633
	TRUCKBU	0
	RAILBU	7633
COM=OATS	COM=OATS	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	26420
	TRUCKBU	0
	RAILBU	26420

COM=OATS COM=OATS DEST=SIoux CITY/OMAHA/KANSAS CITY

TOTBU 9470
TRUCKBU 0
RAILBU 9470

COM=OATS COM=OATS DEST=SOUTHWESTERN MIDLAND STATES

TOTBU 9500
TRUCKBU 0
RAILBU 9500

COM=CORN COM=CORN DEST=MINNEAPOLIS/ST PAUL

TOTBU 6660
TRUCKBU 0
RAILBU 6660

COM=CORN COM=CORN DEST=PACIFIC NORTHWEST

TOTBU 93071
TRUCKBU 0
RAILBU 93071

COM=CORN COM=CORN DEST=MISCELLANEOUS

TOTBU 149679
TRUCKBU 107679
RAILBU 42000

COM=SOYBEANS COM=SOYBEANS DEST=DULUTH/SUPERIOR

TOTBU 9625
TRUCKBU 0
RAILBU 9625

COM=SOYBEANS COM=SOYBEANS DEST=MINNEAPOLIS/ST PAUL

TOTBU 93721
TRUCKBU 10539
RAILBU 83182

COM=SOYBEANS COM=SOYBEANS DEST=OTHER MINNESOTA

TOTBU 67855
TRUCKBU 67855
RAILBU 0

COM=SOYBEANS COM=SOYBEANS DEST=MISCELLANEOUS

TOTBU 59298
TRUCKBU 22998
RAILBU 36300

COM=PINTO BEANS COM=PINTO BEANS DEST=MINNEAPOLIS/ST PAUL

TOTBU 9083
TRUCKBU 0
RAILBU 9083

GRAIN MOVEMENT FROM MOORETON AND DWIGHT, 1981-82

COM=WHEAT	COM=WHEAT	DEST=DULUTH/SUPERIOR
	TOTBU	128327
	TRUCKBU	19965
	RAILBU	108362
COM=WHEAT	COM=WHEAT	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	49770
	TRUCKBU	10270
	RAILBU	39500
COM=WHEAT	COM=WHEAT	DEST=OTHER MINNESOTA
	TOTBU	43043
	TRUCKBU	0
	RAILBU	43043
COM=DURUM	COM=DURUM	DEST=DULUTH/SUPERIOR
	TOTBU	15461
	TRUCKBU	0
	RAILBU	15461
COM=DURUM	COM=DURUM	DEST=OTHER MINNESOTA
	TOTBU	2974
	TRUCKBU	0
	RAILBU	2974
COM=BARLEY	COM=BARLEY	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	21329
	TRUCKBU	0
	RAILBU	21329
COM=OATS	COM=OATS	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	13910
	TRUCKBU	0
	RAILBU	13910
COM=CORN	COM=CORN	DEST=OTHER MINNESOTA
	TOTBU	20129
	TRUCKBU	20129
	RAILBU	0
COM=CORN	COM=CORN	DEST=PACIFIC NORTHWEST
	TOTBU	143053
	TRUCKBU	0
	RAILBU	143053

COM=CORN COM=CORN DEST=MISCELLANEOUS

TOTBU	3300
TRUCKBU	0
RAILBU	3300

COM=SOYBEANS COM=SOYBEANS DEST=OTHER MINNESOTA

TOTBU	86675
TRUCKBU	86675
RAILBU	0

COM=SOYBEANS COM=SOYBEANS DEST=PACIFIC NORTHWEST

TOTBU	3065
TRUCKBU	0
RAILBU	3065

COM=PINTO BEANS COM=PINTO BEANS DEST=MISCELLANEOUS

TOTBU	8480
TRUCKBU	8480
RAILBU	0

GRAIN MOVEMENT FROM MOORETON AND DWIGHT, 1980-81

COM=WHEAT COM=WHEAT DEST=DULUTH/SUPERIOR

TOTBU 292153
 TRUCKBU 0
 RAILBU 292153

COM=WHEAT COM=WHEAT DEST=MINNEAPOLIS/ST PAUL

TOTBU 96277
 TRUCKBU 13498
 RAILBU 82779

COM=WHEAT COM=WHEAT DEST=OTHER MINNESOTA

TOTBU 107138
 TRUCKBU 0
 RAILBU 107138

COM=WHEAT COM=WHEAT DEST=SOUTHWESTERN MIDLAND STATES

TOTBU 3300
 TRUCKBU 0
 RAILBU 3300

COM=DURUM COM=DURUM DEST=DULUTH/SUPERIOR

TOTBU 9348
 TRUCKBU 0
 RAILBU 9348

COM=BARLEY COM=BARLEY DEST=DULUTH/SUPERIOR

TOTBU 5707
 TRUCKBU 2172
 RAILBU 3535

COM=BARLEY COM=BARLEY DEST=MINNEAPOLIS/ST PAUL

TOTBU 28613
 TRUCKBU 0
 RAILBU 28613

COM=OATS COM=OATS DEST=MINNEAPOLIS/ST PAUL

TOTBU 50104
 TRUCKBU 0
 RAILBU 50104

COM=OATS COM=OATS DEST=MISCELLANEOUS

TOTBU 1078
 TRUCKBU 1078
 RAILBU 0

COM=CORN COM=CORN DEST=PACIFIC NORTHWEST

TOTBU 514309
TRUCKBU 0
RAILBU 514309

COM=CORN COM=CORN DEST=MISCELLANEOUS

TOTBU 3000
TRUCKBU 0
RAILBU 3000

COM=SOYBEANS COM=SOYBEANS DEST=MINNEAPOLIS/ST PAUL

TOTBU 1695
TRUCKBU 1695
RAILBU 0

COM=SOYBEANS COM=SOYBEANS DEST=OTHER MINNESOTA

TOTBU 86459
TRUCKBU 86459
RAILBU 0

COM=SUNFLOWERS COM=SUNFLOWERS DEST=DULUTH/SUPERIOR

TOTBU 95764
TRUCKBU 0
RAILBU 95764

COM=SUNFLOWERS COM=SUNFLOWERS DEST=OTHER MINNESOTA

TOTBU 10543
TRUCKBU 10543
RAILBU 0

GRAIN MOVEMENT FROM MOORETON AND DWIGHT, 1979-80

COM=WHEAT COM=WHEAT DEST=DULUTH/SUPERIOR

TOTBU 142223
TRUCKBU 61804
RAILBU 80419

COM=WHEAT COM=WHEAT DEST=MINNEAPOLIS/ST PAUL

TOTBU 143797
TRUCKBU 24684
RAILBU 119113

COM=WHEAT COM=WHEAT DEST=OTHER MINNESOTA

TOTBU 56994
TRUCKBU 6553
RAILBU 50441

COM=WHEAT COM=WHEAT DEST=SOUTHWESTERN MIDLAND STATES

TOTBU 9000
TRUCKBU 0
RAILBU 9000

COM=DURUM COM=DURUM DEST=DULUTH/SUPERIOR

TOTBU 23625
TRUCKBU 2367
RAILBU 21258

COM=DURUM COM=DURUM DEST=MINNEAPOLIS/ST PAUL

TOTBU 12000
TRUCKBU 0
RAILBU 12000

COM=DURUM COM=DURUM DEST=OTHER MINNESOTA

TOTBU 1600
TRUCKBU 1600
RAILBU 0

COM=BARLEY COM=BARLEY DEST=DULUTH/SUPERIOR

TOTBU 6226
TRUCKBU 3226
RAILBU 3000

COM=BARLEY COM=BARLEY DEST=MINNEAPOLIS/ST PAUL

TOTBU 29254
TRUCKBU 0
RAILBU 29254

COM=OATS	COM=OATS	DEST=DULUTH/SUPERIOR
	TOTBU	5000
	TRUCKBU	0
	RAILBU	5000
COM=OATS	COM=OATS	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	42360
	TRUCKBU	0
	RAILBU	42360
COM=CORN	COM=CORN	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	2950
	TRUCKBU	0
	RAILBU	2950
COM=CORN	COM=CORN	DEST=PACIFIC NORTHWEST
	TOTBU	465146
	TRUCKBU	0
	RAILBU	465146
COM=CORN	COM=CORN	DEST=MISCELLANEOUS
	TOTBU	17732
	TRUCKBU	14732
	RAILBU	3000
COM=SOYBEANS	COM=SOYBEANS	DEST=DULUTH/SUPERIOR
	TOTBU	18071
	TRUCKBU	12071
	RAILBU	6000
COM=SOYBEANS	COM=SOYBEANS	DEST=MINNEAPOLIS/ST PAUL
	TOTBU	19687
	TRUCKBU	0
	RAILBU	19687
COM=SOYBEANS	COM=SOYBEANS	DEST=OTHER MINNESOTA
	TOTBU	72763
	TRUCKBU	72763
	RAILBU	0
COM=SUNFLOWERS	COM=SUNFLOWERS	DEST=DULUTH/SUPERIOR
	TOTBU	203695
	TRUCKBU	109005
	RAILBU	94690

COM=SUNFLOWERS COM=SUNFLOWERS DEST=MINNEAPOLIS/ST PAUL

TOTBU	1911
TRUCKBU	1911
RAILBU	0

COM=SUNFLOWERS COM=SUNFLOWERS DEST=OTHER MINNESOTA

TOTBU	18827
TRUCKBU	18827
RAILBU	0

APPENDIX II

Investment Analysis Using Trade Area
Grain Volume Estimates

Investment Analysis

$$I^* = [(VOL_1 \times SPR_1) + (VOL_2 \times SPR_2) + \dots + (VOL_n \times SPR_n)] - INV (i)$$

I^* = investment criteria

VOL_1 = expected volume of commodity 1

VOL_2 = expected volume of commodity 2

VOL_n = expected volume of commodity n

SPR_1 = rate savings (spread) on commodity 1

SPR_2 = rate savings (spread) on commodity 2

SPR_n = rate savings (spread) on commodity n

INV = level of investment required

i = interest rate or desired return on investment

Scenario 1

$$\begin{aligned} I^* &= [(386,320 \times .056) + (613,714) \times .048] - 650,000 (.12) \\ &= 21,634 + 29,458 - 78,000 \\ &= - \$26,908 \end{aligned}$$

Assuming only 50% of each commodity can be shipped under the new rates

$$\begin{aligned} I^* &= [(193,160 \times .056) + (306,857 \times .048)] - 650,000 (.12) \\ &= 10,817 + 14,729 - 78,000 \\ &= - \$52,454 \end{aligned}$$

Scenario 2 (using situation "2-a" figures from Table 13)

$$\begin{aligned} I^* &= [(957,817 \times .1736) + (613,714 \times .048)] - 650,000 (.12) \\ &= 166,277 + 29,458 - 78,000 \\ &= \$117,735 \end{aligned}$$

if only 50% of each commodity can be shipped under the new rates,

$$\begin{aligned} I^* &= [(478,908 \times .1736) + (306,857 \times .048)] - 650,000 (.12) \\ &= 83,138 + 14,729 - 78,000 \\ &= \$19,867 \end{aligned}$$

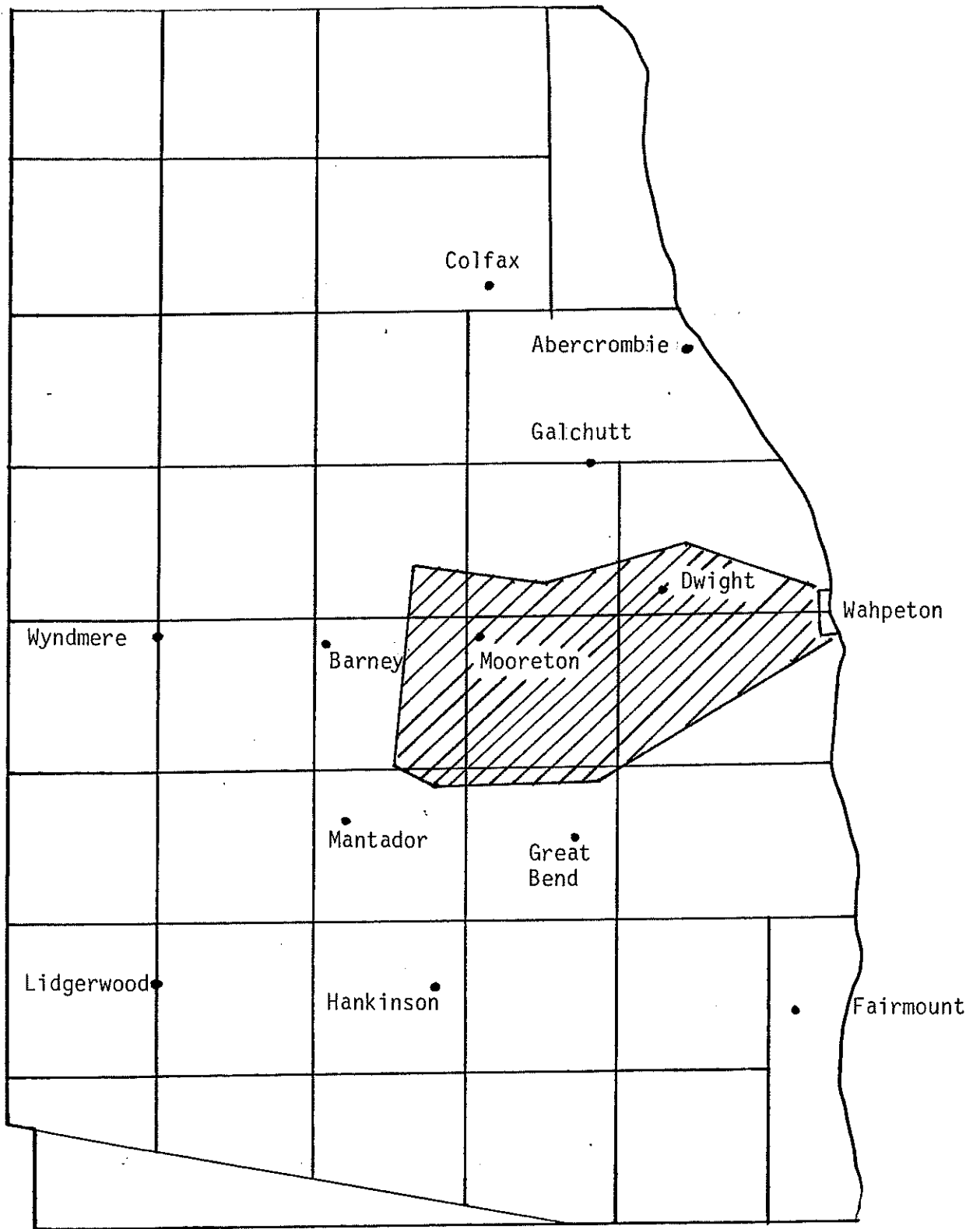


Figure A-1. Approximate Size and Shape of the Mooreton-Dwight Trade Area (wheat).

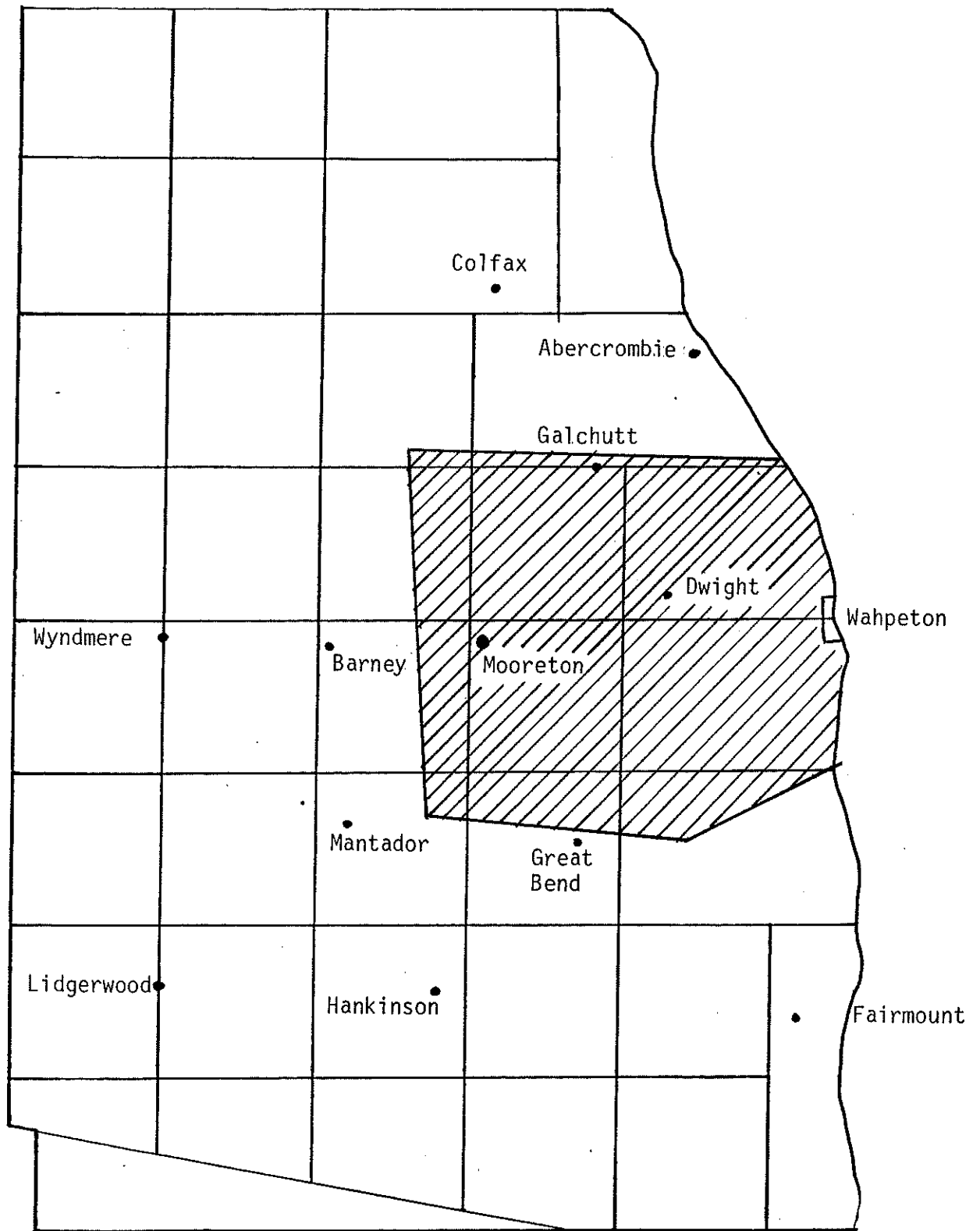


Figure A-2. Approximate Size and Shape of the Mooreton-Dwight Trade Area (corn).