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Canada. Dept. of Consumer and
Corporate Affairs.

A study of the weights and
measures activity in the Prairies
Region 1964-1973

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A STUDY
OF
THE WEIGHTS AND MEASURES ACTIVITY
IN
THE PRAIRIE REGION
1964-1973

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J. Lahey
September 20, 1974

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1. HAS PRODUCTIVITY IN THE WEIGHTS AND MEASURES ACTIVITY

DECLINED OVER THE LAST DECADE?

A. WHAT IS THE PROBLEM?

Over the last decade the number of devices inspected by the Weights and Measures staff has declined dramatically, while the number of inspectors has held constant or even increased. This fact was particularly troublesome to Departmental administrators because it meant that the Service's statutory responsibility to inspect every device in the country annually could not be met without substantial infusions of new resources. But Treasury Board could hardly be expected to authorize new resources to accomplish what had formerly been possible with the existing manpower. The new Weights and Measures Act of 1971, therefore, was designed in part to legitimize what was by then virtually common practice. But instituting a two-year cycle for device inspections did not abolish the problem of declining productivity. The question remains: Where will the downward trend level out?

In order to predict at what point productivity will achieve a stable equilibrium it is necessary to discover the causes of the decline. Although various explanations such as a change in the nature of devices inspected, morale problems and the advent of collective bargaining have been advanced to account for this phenomenon, no one has been able to show persuasively the extent to which these or other explanations were the decisive factors in any lessening of productivity among the Weights and Measures staff. The purpose of this paper, therefore, is to subject the

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available statistical evidence, as well as the oral testimony of Weights and Measures staff, to a detailed analysis in order to propose a clear and consistent explanation for whatever decline in productivity may have occurred in the Activity within the Prairie Region during the last ten years.

It is not self-evident, however, that productivity has declined in the Weights and Measures Activity. The total number of devices inspected per man year is only a very crude indicator of the Activity's work, since it pays no attention to changes in the devices inspected, to the varying length of time required to inspect different kinds of devices, or to evolving work patterns. The first question of this study then must be: Has there in fact been any decline in the productivity of the Weights and Measures Activity?

B. A BETTER MEASURE: WEIGHTED WORK

The statistics on the number of devices of each class inspected in each year between 1964 and 1973 (See Table 1), show that not all classes of devices exhibited a similar rate of decline; indeed, for some classes inspections actually increased. Because of this fact, and because the length of time required for inspection varies significantly from one class of devices to another, any measure of work accomplished by the Weights and Measures staff must take account of these differences in inspection time. For example, in assessing the fact that the total device inspections in the Prairie region declined by nearly 42% in ten years from 123345 devices in 1964 to 71708 devices in 1973, it is important to know that the class which

TABLE 1: DEVICES INSPECTED BY CLASS IN THE PRAIRIE REGION
1964 - 1973

CLASS	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as a % of 1964
01	27207	25539	24689	22988	24147	19851	14030	12857	12595	13006	47.8%
10	23778	23597	22042	20808	20606	16814	14231	13455	12472	12073	50.8%
12	704	771	741	770	759	714	725	781	721	762	108.2%
14	992	992	963	1002	893	936	926	903	852	1010	101.8%
15	5286	5262	5216	5058	4771	4983	4763	4862	4483	4286	81.1%
16	1432	1535	1553	1462	1485	1532	1619	1665	1523	1741	121.6%
17	5128	5105	5019	4840	4610	4754	4538	4599	4254	4059	79.2%
18	78	93	97	108	117	124	122	120	110	110	141.0%
20	4499	4407	3905	3731	3732	2881	2260	2016	1753	1698	37.8%
24	15753	15632	14818	14513	15046	13214	12055	10960	10933	10702	67.9%
26	36	46	39	59	57	54	54	54	52	68	188.9%
29	4410	4571	4618	4422	4215	4253	3952	4106	3714	3733	84.6%
30	954	858	773	218	847	951	731	930	462	717	75.2%
34	29	33	68	22	78	90	220	244	369	502	1731.0%
40	2283	1864	1393	1216	1096	852	403	544	309	272	11.9%
48	679	632	531	603	576	470	323	391	258	290	42.7%
49	467	515	687	588	520	541	431	523	93	61	13.1%
51	525	407	459	435	448	355	289	328	316	305	58.1%
52	19404	19190	17613	17447	18093	15463	13702	12787	13350	11448	59.0%
54	3958	3977	3644	3554	3637	3355	2534	1902	2128	1849	46.7%
56	5654	5934	5500	5677	5859	5167	3701	2850	2984	2983	52.8%
TOTAL	123345	121037	114370	109502	111592	97354	81621	76879	73731	71708	58.1%

is easiest to inspect (01 - weights) declined by 52% in those years, while one of the most difficult classes (16 - truck scales outside grain elevators) increased by 22% in the same period.

In order to produce a more accurate basic indicator of work accomplished, a system of weights based on average inspection times was devised. Each weight unit corresponds to five minutes of average inspection time. (See Annex A for a description of the rationale behind the weighting system). The weights assigned to each class are the following (Table 2):

TABLE 2: Weight Units Assigned by Device Class

CLASS	WEIGHT UNITS	CLASS	WEIGHT UNITS
01	1	29	3
10	4	30	1
12	7	34	4
14	12	40	5
15	9	48	54
16	18	49	5
17	16	51	14
18	30	52	4
20	3	54	9
24	4	56	9
26	21		

The number of devices in each class (Table 1) was then multiplied by the weight assigned to that class, and these products were totalled to allow comparison of one year with another. Using these "weighted work units" as a measure, the work accomplished by the Weights and Measures staff in the Prairie region declined by only 37% during the decade, from

558618 units in 1964 to 349372 units in 1973 (Table 3). The pattern of total inspections both by devices and by weighted work is illustrated in Figure 1.

TABLE 3: Weighted Work Units of Weights and Measures
Inspection in the Prairie Region by Year 1964 - 1973

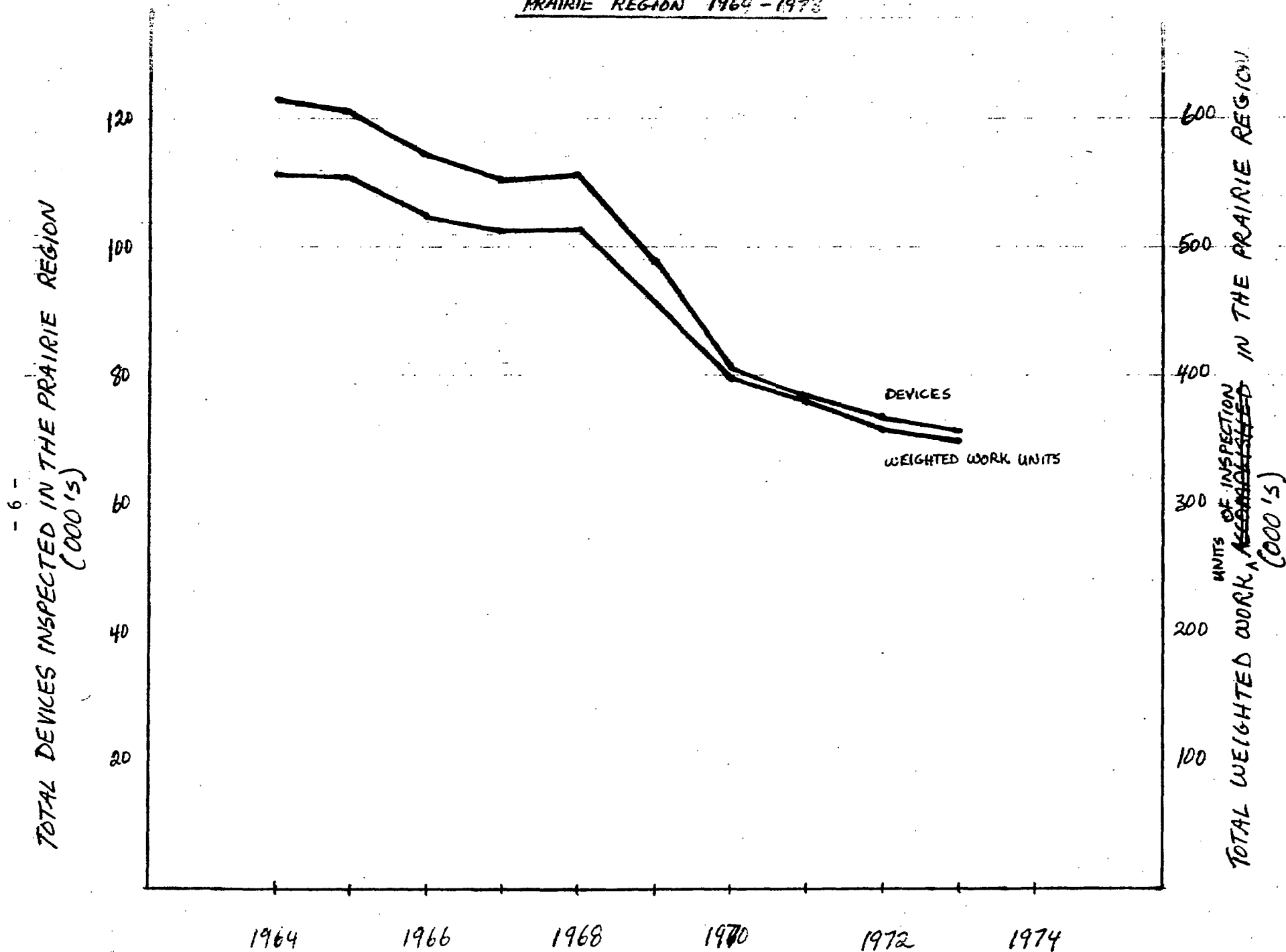
YEAR	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
TOTAL WEIGHTED WORK UNITS	558618	553736	521635	512089	512694	459632	395520	379907	356982	349372

The fact that the weighted work units of inspection declined less rapidly than the number of devices inspected indicates that the proportion of difficult devices within the inspection program has increased relative to that of those more easily inspected. Nevertheless, the amount of work accomplished has clearly declined according to either measure. What about productivity?

C: MEASURING PRODUCTIVITY

Productivity is a measure of the rate of production. Generally productivity in the Weights and Measures Activity has been discussed in terms of the number of devices inspected per man year allotted to inspection (including the District Inspector, the Assistant District Inspector and all inspectors, but not the clerical or stenographic staff). Because we consider the weighted work units a better measure of work accomplished, we shall concentrate initially on the weighted work units per man year allotted

FIGURE 1 - EVOLUTION OF DEVICES INSPECTED AND WEIGHTED WORK UNITS OF INSPECTION IN THE PRAIRIE REGION 1964-1973



to inspection. Analysis of the District Inspector's Statement of Revenue (SW-51) over the last seven years shows that the number of man years allotted to inspection by the Weights and Measures Activity is the following (Table 4):

TABLE 4: Man Years of inspection in weights and measures in the Prairie region 1967 - 1973

YEAR	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
INSPECTION MAN YEARS	NOT AVAILABLE	NOT AVAILABLE	NOT AVAILABLE	38.3	38	36.8	34.7	34.5	34	34.5

(NOTE 1: Totals are not available for 1964-1966 because of incomplete figures in the Winnipeg and Edmonton Districts).

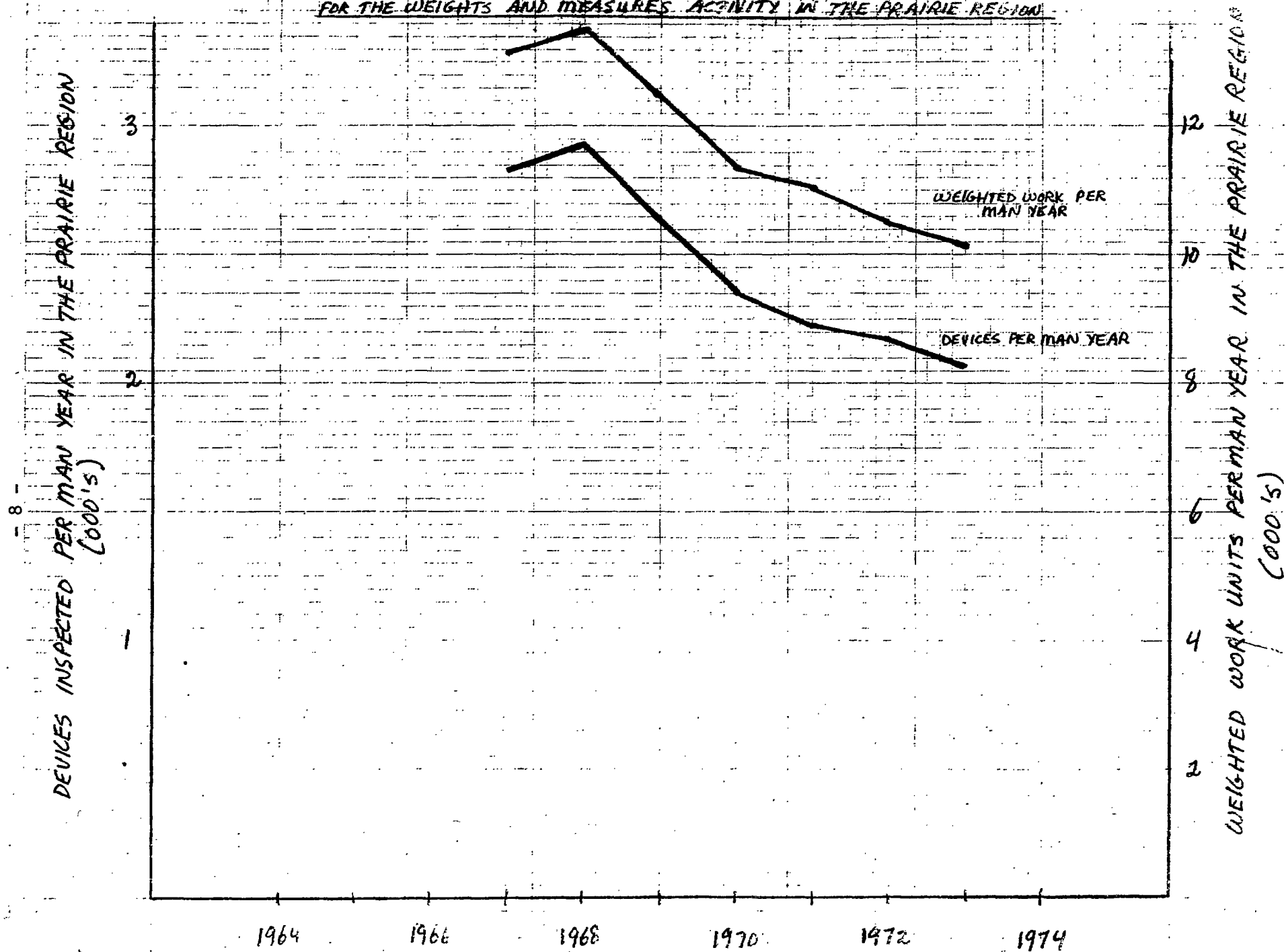
(NOTE 2: Totals exclude 3 man years in Winnipeg and one in Calgary allotted to factory prepack work from 1965 to 1969).

By dividing these man year figures into the devices inspected and the weighted work units, we obtained two initial indicators of productivity in the Weights and Measures Activity. The results are presented in Table 5 and illustrated in Figure 2.

TABLE 5: Productivity in devices per man year and weighted work units per man year in Prairie Weights and Measures Activity, 1967 - 1973

YEAR	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
DEVICES PER MAN YEAR	NOT AVAILABLE	n.a.	n.a.	2877	2938	2645	2352	2228	2169	2078
WEIGHTED WORK UNITS PER MAN YEAR	n.a.	n.a.	n.a.	13370	13492	12490	11398	11012	10499	10127

FIGURE 2 - PRODUCTIVITY IN DEVICES PER MAN YEAR AND WEIGHTED WORK UNITS PER MAN YEAR
FOR THE WEIGHTS AND MEASURES ACTIVITY IN THE PRAIRIE REGION



Naturally enough, considering that the divisors (man years allotted to inspection) are the same, the decline in weighted work units per man year from 1967 to 1973 is less at 24% than that of devices per man year in the same period at 28%.

But further analysis indicates that the above calculations may not fairly reflect the evolution of productivity in the Weights and Measures Activity. Figures on the distribution of time among inspections, clerical work and leave recorded in the District Inspector's monthly Statement of Revenue (SE-51) reveal important changes in the pattern of time utilization in the Activity (Table 6).

**TABLE 6: Time Utilization in Weights and Measures for
Prairie Region 1966 - 1973**

YEAR	TOTAL			TIME UTILIZATION			
	MAN	INSPECTION		CLERICAL		LEAVE	
	DAYS	MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL
1966	9260.5	6694.5	72%	1646.5	18%	919.5	10%
1967	9740.5	6873	71%	1742	18%	1125	11%
1968	9683	7127.5	74%	1636.5	17%	919	9%
1969	9289.5	6601	71%	1816.5	20%	872	9%
1970	8544.5	5856	69%	1811	21%	877.5	10%
1971	8621	5709.5	66%	1911	22%	1000.5	12%
1972	8451	5685	67%	1843	22%	923	11%
1973	8533	5825.5	68%	1751	21%	956.5	11%

NOTE: An inspection day is one on which a certificate is written. A clerical day is one on which no certificate is written. Days allotted to short weight inspection are deleted from these figures. After 1969, such days are negligible (1 or 2% of the total).

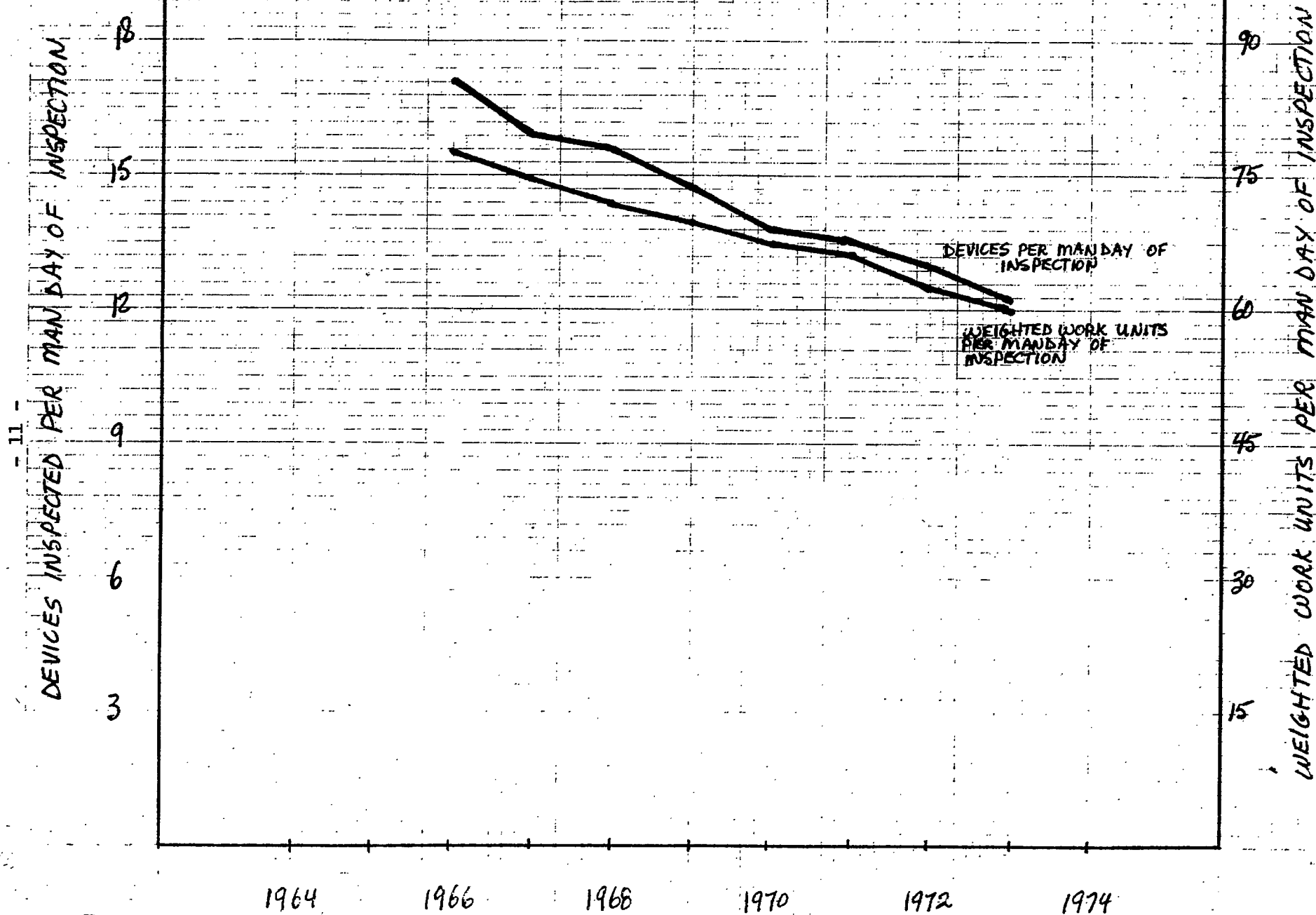
Before 1969, however, their inclusion would distort the percentages since 3 men in Winnipeg and one man in Calgary were permanently assigned to Factory Pack short weight work. These men's inspection, clerical and leave days are included. The four man years, however, are not included in the Regional man year totals in Table 4, since most of their time was spent on short-weight. In general it could be said that their work was included to the extent it was typical Weights and Measures work, and excluded when it pertained to their specialty, Factory Pack inspections.

Certainly the increase in clerical time documented in Table 6 contributed to a decline in productivity by diminishing the time available for inspections as a proportion of the total man days available to the Weights and Measures Activity. But the issue of the ratio of clerical to inspection time is distinct from the question of how the productivity of time actually spent on inspections has changed. In order to deal with the latter problem, we turn to two other measures of productivity: devices inspected and weighted work accomplished per reported man day of inspection (Table 7 and Figure 3).

TABLE 7: Productivity in devices per man day of inspection and weighted work units per man day of inspection

YEAR	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
DEVICES PER MAN DAY OF INSPECTION	n.a.	n.a.	17.1	16.0	15.7	14.7	13.9	13.5	13.0	12.3
WEIGHTED WORK UNITS PER MAN DAY OF INSPECTION	n.a.	n.a.	77.9	74.5	71.9	69.6	67.5	66.5	62.8	60.0

FIGURE 3: PRODUCTIVITY IN DEVICES PER MAN DAY OF INSPECTION AND WEIGHTED WORK UNITS PER MANDAY OF INSPECTION FOR THE WEIGHTS AND MEASURE ACTIVITY IN THE PRAIRIE REGION



In the seven years between 1967 and 1973, therefore, the number of devices inspected per man day of inspection slipped by 23% from 16.0 in 1967 to 12.3 in 1973, while weighted work accomplished per man day of inspection declined by 19% from 74.5 in 1967 to 60.0 in 1973. (1966 was not used as the base year in order to facilitate comparison with the productivity figures based on man years contained in Table 5 and Figure 2).

II. WHERE HAS THE DECLINE OCCURRED?

A. SOME QUESTIONS

Our analysis has so far shown that there has been a decline in the productivity of the Weights and Measures Activity in the Prairie Region of approximately 19% between 1967 and 1973. But has production fallen off to the same extent throughout the Weights and Measures Activity, or has one facet slipped while others have flourished? Have the declines in production and productivity happened at a steady rate, or can we pinpoint the moments when they occurred? Have these declines affected all districts equally, or have some fallen off more than others? If, by answering these questions, we can isolate when and where declines occurred, it should help us to discover their causes.

B. WHICH SUB-ACTIVITIES HAVE DECLINED?

Weights and Measures work is organized into various separate sub-activities which are determined largely by the equipment required for that sub-activity. For example, when an inspector goes out in a heavy duty weight truck to inspect grain elevator truck scales he also inspects hopper scales and dockage scales because they are part of the operation of a grain elevator; but he does not inspect gasoline meters or verify store scales. Eight such sub-activities are carried out separately:

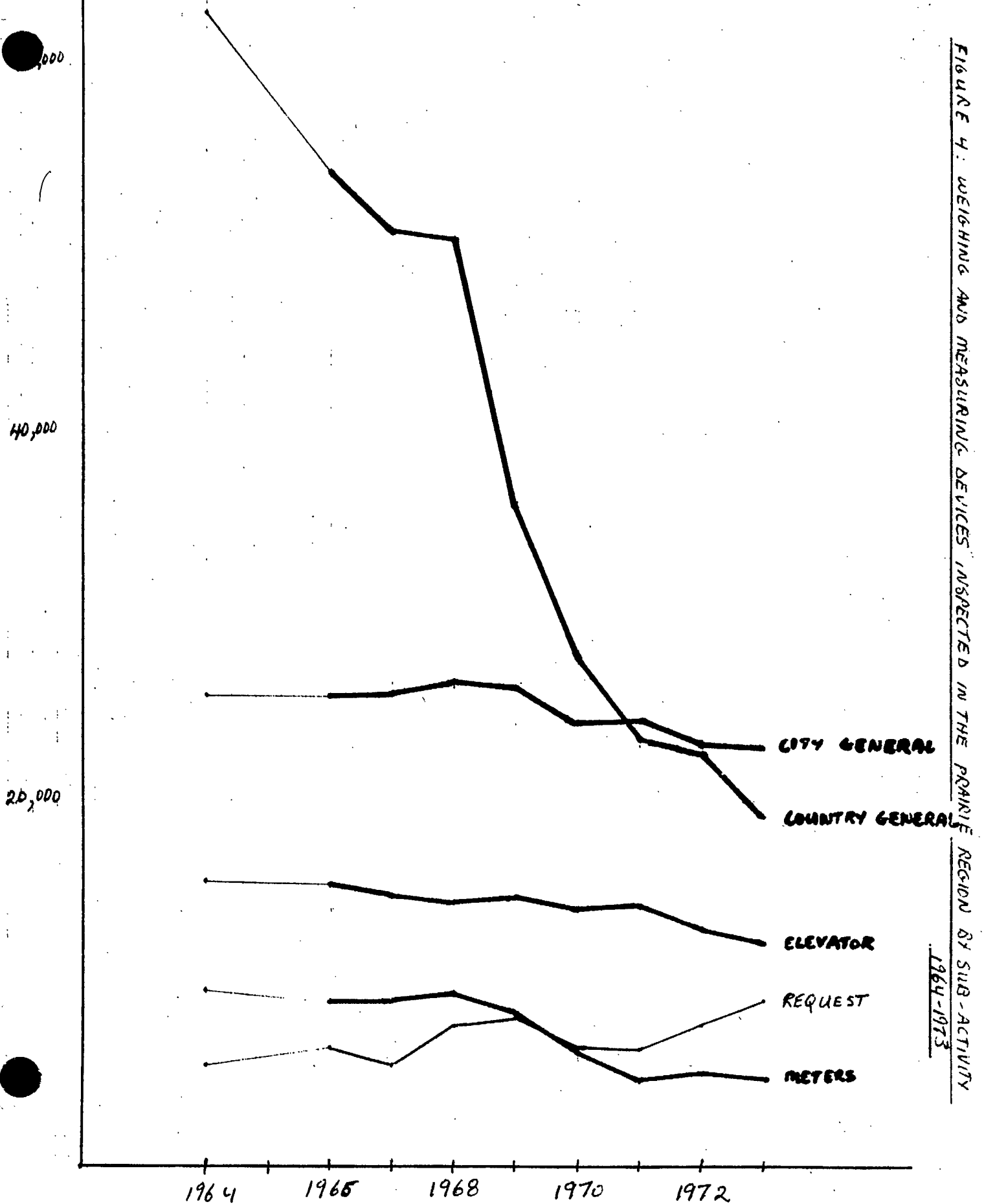
1. Elevator work
2. Other heavy-duty work
3. City general work
4. Country general work
5. Bulk meter work
6. Calibration work
7. Propane meter work
8. Request work

Each of these sub-activities groups certain classes or parts of certain classes of devices. The fact that the number of devices inspected in each year changed at a different rate from one class to another (Table 1) raises the possibility that production in each of these sub-activities may have changed at different rates as well. (Annex B gives the definitions used for each sub-activity). We have been able to test this hypothesis by applying the definitions in Annex B to the inspection statistics for each district, then multiplying these figures by the appropriate weights, and finally calculating the number of weighted work units of inspection accomplished in each sub-activity throughout the period. The results are contained in Table 8 and 9, and illustrated in Figures 4 and 5.

TABLE 8: Weighing and measuring devices inspected in the
Prairie Region by Sub-activity 1964 - 1973

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	15814		15498	14875	14 288	14757	14094	14316	13137	12500	79.0%
2. Other Heavy Work	2126		2243	2257	2265	2228	2343	2349	2205	2561	120.5%
3. City General	25695		25571	25761	26397	26102	24031	24422	22941	22858	89.0%
4. Country General	62787		53913	50953	50312	36060	27602	23348	22612	19034	30.3%
5. Bulk Meter	9612		9144	9231	9496	8522	6235	4752	5112	4832	50.3%
6. Calibration	1134		924	981	886	899	676	869	310	312	27.5%
7. Propane Meter	561		459	437	448	355	289	328	313	286	51.0%
8. Request	5536		6633	5618	7688	8269	6358	6628	7774	9318	168.3%
TOTAL	123271		114385	110113	111780	97192	81628	77011	74358	71701	58.2%

PRAIRIE SUMMARY - DEVICES BY GROUP



PRAIRIE SUMMARY - WEIGHTED WORK VALUES BY GROUP
(in '000's)

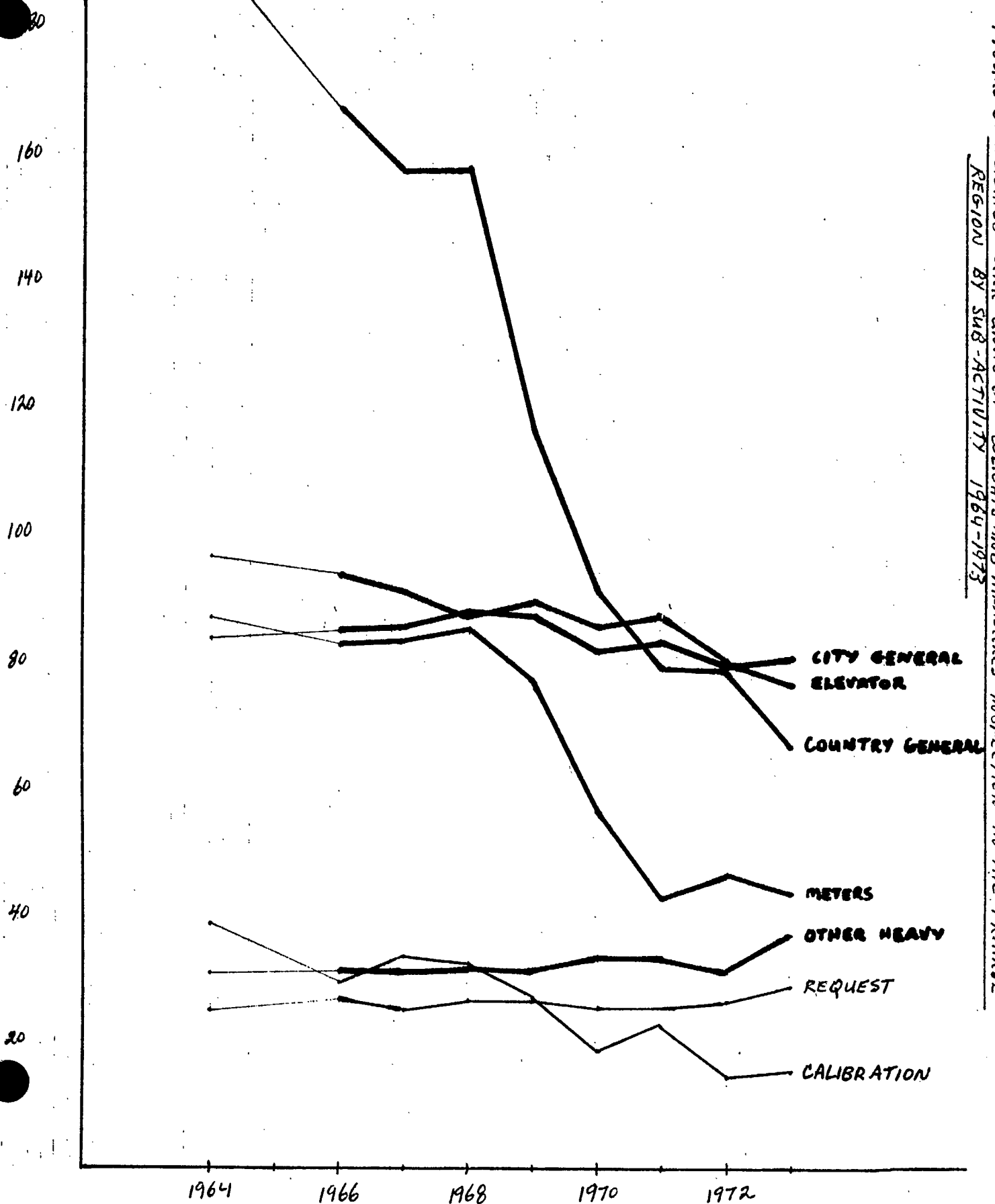


FIGURE 5: WEIGHTED WORK UNITS OF WEIGHTS AND MEASURES INSPECTION IN THE PRAIRIE REGION BY SUB-ACTIVITY 1964-1973

TABLE 9: Weighted work units of Weights and Measures inspection in the Prairie Region by Sub-activity 1964 - 1973

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 64
1. Elevator	96094		93939	90985	86620	89784	85761	87259	80108	76221	79.3%
2. Other Heavy Work	30851		31133	31046	31893	31181	33213	33207	31177	36503	118.3%
3. City General	83509		84561	85542	87699	86815	81513	83089	79901	80044	95.9%
4. Country General	191269		166903	157168	157858	116222	90944	78480	78039	66371	34.7%
5. Bulk Meter	86508		82296	83079	85464	76698	56115	42768	46008	43488	50.3%
6. Calibration	38031		29853	33969	32046	26667	18501	22548	14088	15726	41.4%
7. Propane Meter	7854		6426	6090	6272	4970	4046	4592	4382	4004	51.0%
8. Request	25100		26664	24990	26421	26091	25645	25889	26421	28654	114.2%
TOTAL	559270		521775	512869	514273	458431	395738	378080	360094	351011	62.8%

On the basis of the statistics on weighted work accomplished by sub-activity it is possible to divide the sub-activities into two groups according to the degree to which 1964 production levels were maintained through the decade to 1973. In one group of sub-activities including other heavy duty work, city general work and request work production remained virtually constant or even increased. Because most of the decline in elevator group inspections is a result of a drop in the number of licensed elevators in the Prairies, it is reasonable to include it in this first group of sub-activities. (A comparison of Canadian Grain Commission figures on licensed elevators with our statistics on inspections reveals that in 1964 the Weights and Measures staff inspected 5128 of 5153 licensed elevators,

or 99% of the total, while in 1973, 4059 of 4331 were inspected, or 94% of the total). For the second group of sub-activities, including country general work, bulk meter work, calibration work and propane meter work, production fell by 1973 to half or less of the 1964 rate. Moreover, of the decade's total decline of 208259 units in weighted work accomplished, country general work accounted for 60% of the decline and bulk meter work for another 21%. In short, the slump in production by the Weights and Measures staff is heavily concentrated in two sub-activities: Country general work and Bulk meter work. This fact is well illustrated in Figure 5.

C. WHEN DID PRODUCTION AND PRODUCTIVITY DECLINE?

1. PRODUCTION

From the graph of the evolution of Weights and Measures production in the Prairie Region (Figure 1) it is clear that while production fell in every year of the decade except 1968, the greatest decline occurred in the two years 1969 and 1970. This observation is confirmed by Table 10:

TABLE 10: Evolution in Prairie Weights and Measures Production
1964 - 1973

YEAR	NUMBER OF DEVICES INSPECTED	% CHANGE FROM PREVIOUS YEAR	NUMBER OF WEIGHTED WORK UNITS OF INSPECTION	% CHANGE FROM PREVIOUS YEAR
1964	123381		558618	
1965	121067	- 1.9%	553736	- .9%
1966	114350	- 5.6%	521635	- 5.8%
1967	110175	- 3.7%	512089	- 1.8%
1968	111633	+ 1.3%	512694	+ .1%
1969	97353	-12.8%	459632	-10.4%
1970	81621	-16.2%	395520	-13.9%
1971	76866	- 5.8%	379907	- 3.9%
1972	73733	- 4.1%	356982	- 6.0%
1973	71708	- 2.7%	349372	- 2.1%

The graphs of production by sub-activity (Figures 4 and 5) also corroborate this pattern. The two sub-activities which together account for 81% of the decline in weighted work, country general work and bulk meter work, show a persistent decline in every year but 1968 and 1972 (and 1967 in the case of bulk meters), with by far the greatest decreases occurring in 1969, 1970 and 1971). Indeed the fall in weighted work accomplished in the two years 1969 and 1970 is 117174 units, or 56% of the total difference between the 1964 level of production and that of 1973.

2. PRODUCTIVITY

The graph of productivity as measured by devices or weighted work units per man year allotted to inspection (Figure 2) indicates an increase in 1968 followed by a relatively steep decline in 1969 and 1970 and a smoother but still continuous decline in subsequent years. This pattern is detailed in Table 11:

TABLE 11: Evolution of changes in productivity as measured per man year allotted to inspection 1967 - 1973

YEAR	DEVICES PER MAN YEAR	% CHANGE FROM PREVIOUS YEAR	WEIGHTED WORK UNITS PER MAN YEAR	% CHANGE FROM PREVIOUS YEAR
1967	2840		13198	
1968	2938	+ 3.5%	13492	+2.2%
1969	2645	-10.0%	12490	-7.4%
1970	2352	-11.1%	11398	-8.7%
1971	2228	- 5.3%	11012	-3.4%
1972	2169	- 2.7%	10499	-4.7%
1973	2078	- 4.2%	10127	-3.6%

The graph of productivity as measured by devices or weighted work units per man day actually used on inspections is quite different. First, measured in this way, productivity fell in each year. Second, particularly in weighted work units per man day, the declines were fairly regular, ranging between 2% and 6% per year. Third, according to the weighted work units per man day, to the extent that changes in productivity differed from one year to another, the greatest rates of decline were experienced both before and after the period between 1969 and 1971 when total production fell most drastically. (Refer to Table 12):

TABLE 12: Evolution of changes in productivity as measured per man day of inspection 1966 - 1973

YEAR	DEVICES PER MAN DAY OF INSPECTION	% CHANGE FROM PREVIOUS YEAR	WEIGHTED WORK UNITS PER MAN DAY OF INSPECTION	% CHANGE FROM PREVIOUS YEAR
1966	17.08		77.9	
1967	16.03	- 6.2%	74.5	- 4.4%
1968	15.66	- 2.3%	71.9	- 3.5%
1969	14.74	- 5.9%	69.6	- 3.2%
1970	13.93	- 5.5%	67.5	- 3.0%
1971	13.46	- 3.4%	66.5	- 1.5%
1972	12.96	- 3.7%	62.8	- 5.6%
1973	12.30	- 5.1%	60.0	- 4.5%

D. SUMMARY OF DATA ON REGIONAL PRODUCTION AND PRODUCTIVITY

We have seen that Weights and Measures production in the Prairie Region as measured by weighted work units of inspection accomplished declined by 37% between 1964 and 1973. Productivity as measured by weighted work

units per man year allotted to inspection declined by 24% between 1967 and 1973, the only period for which full statistics are available. Primarily because of changes in time utilization, this figure is not an accurate measure of the productivity of time actually expended on inspection.

Turning to regional productivity as measured by weighted work units per reported man day of inspection we find a decline of 19% between 1967 and 1973.

By analyzing the sub-activities into which the Weights and Measures program is organized, we discover that 81% of the total regional decline in production is in two of eight sub-activities, country general work and bulk meter work. Both total production and production by sub-activity showed their greatest declines by far in 1969 and 1970. While productivity as measured by weighted work units per man year allotted to inspection experienced its greatest decreases in those same two years, changes in regional productivity as measured by weighted work per man day of inspection reported was fairly even throughout the period.

E. TO WHAT EXTENT DID THE DECLINES DIFFER
FROM ONE DISTRICT TO ANOTHER?

1. PRODUCTION

The statistics on device inspections and weighted work units of inspection accomplished in each district show that although each district had a substantial decline, both the pattern and the extent of decrease varied

from one district to another. (Refer to Tables 13 and 14 and Figures 6 and 7 for presentation of annual totals for each district. Refer to Annex C for detailed figures and graphs of device inspection by class in each district.)

YEAR	D I S T R I C T S					PRAIRIE REGION TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964	17449	29428	19955	22221	34328	123381
1965	18048	28837	19445	21891	32846	121067
1966	14785	26729	18665	20003	34168	114350
1967	17524	22669	18422	20136	31424	110175
1968	16607	23302	18006	19867	33851	111633
1969	14164	17126	16699	16850	32514	97353
1970	14388	15688	11491	16605	23449	81621
1971	10771	16130	10138	14248	25579	76866
1972	13252	19662	6231	12227	22361	73733
1973	9402	21124	8350	10073	22759	71708
% Decline 1964-1973	46%	28%	58%	55%	34%	42%

TABLE 13: Device Inspections by District 1964-1973

YEAR	D I S T R I C T S					PRAIRIE REGION TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964	88329	138194	94917	100639	136539	558618
1965	90496	139002	92128	100688	131422	553736
1966	80048	132783	86264	91592	130948	521635
1967	89111	116748	88827	92025	125378	512089
1968	86111	117186	84551	93475	131371	512694
1969	73980	100956	82824	78758	123114	459632
1970	79031	77436	60572	77291	101190	395520
1971	59147	87573	62052	68875	102260	379907
1972	64938	96064	38969	64157	92854	356982
1973	59976	100961	43936	52571	91928	349372
% Decrease 1964-1973	32%	27%	54%	48%	33%	37%

TABLE 14: Weighted Work Accomplished by District 1964-1973

FIGURE 6: DEVICES INSPECTED BY DISTRICT IN THE PRAIRIE REGION 1964-1973

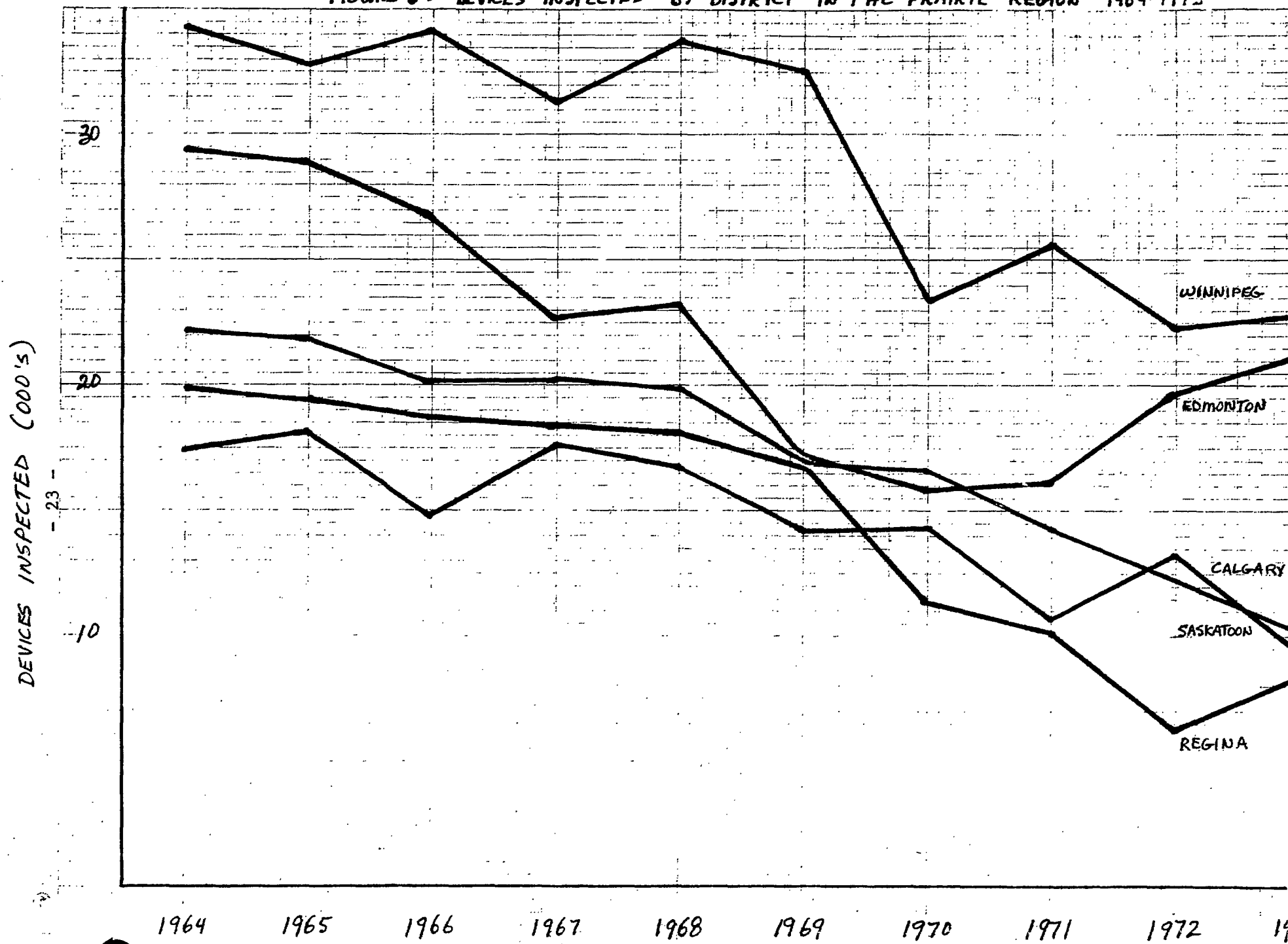
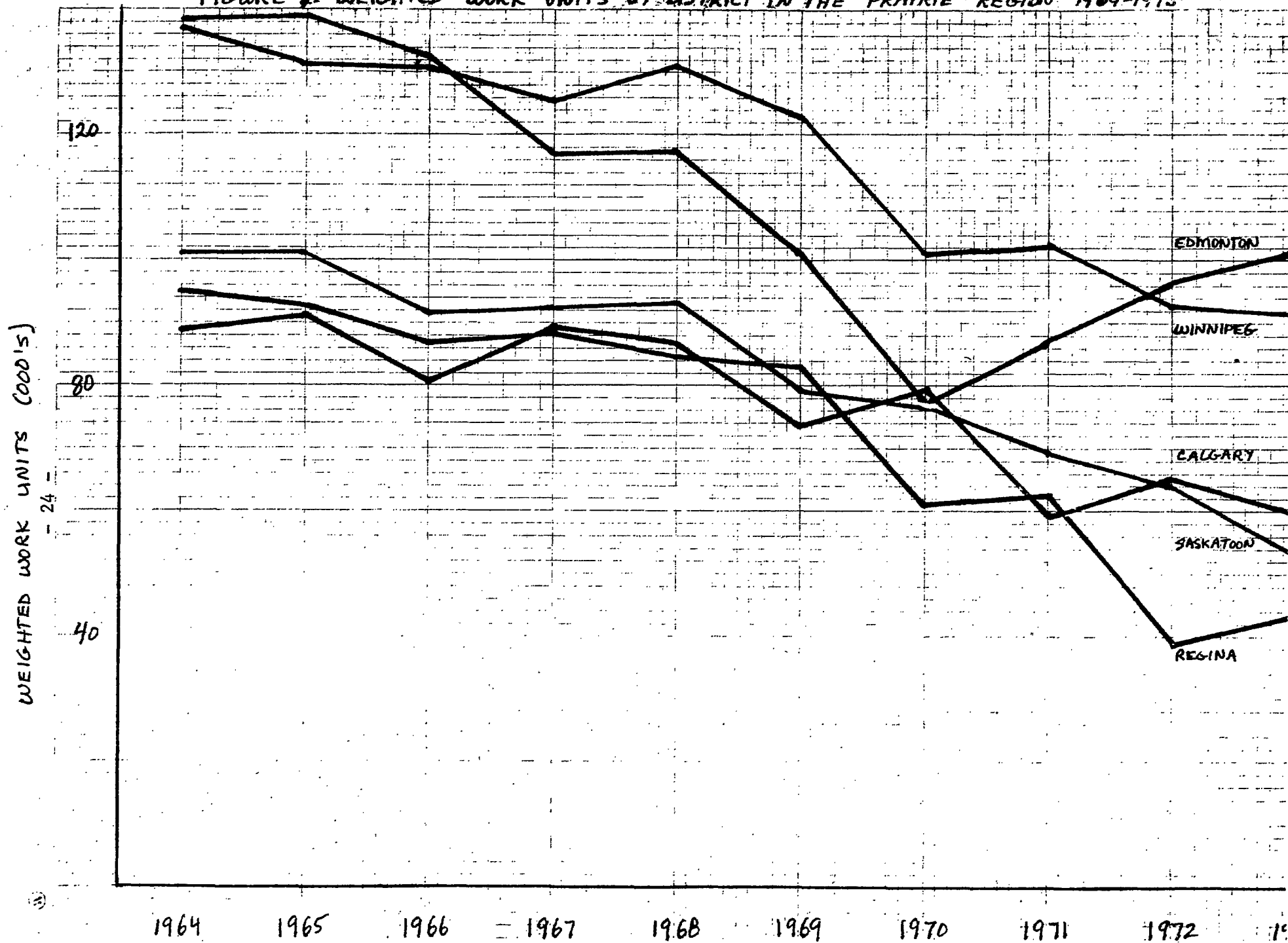


FIGURE 7: WEIGHTED WORK UNITS BY DISTRICT IN THE PRAIRIE REGION 1964-1973



Although for each district the shape of the graph of devices inspected and of the graph of weighted work units of inspection is similar, only in Winnipeg and Edmonton is the magnitude of the district's decline in production virtually identical according to both measures. For Saskatoon, Regina and Calgary, the difference is substantial. Because we consider the weighted work units to be a better measure of production for reasons already discussed, we shall concentrate on these figures in making observations and drawing conclusions about district performance. It will be seen on the basis of these figures that the districts fall into two basic groups. In the first group comprising Edmonton, Calgary and Winnipeg districts, production fell by 27%, 32% and 33% respectively, or roughly one-third. In the second group comprising Regina and Saskatoon districts, production dropped by 54% and 48%, or roughly one-half.

More detailed study of the production curves shows that except for Edmonton, all the districts maintained fairly stable production levels with only moderate declines until 1969. In that year all districts except Regina commenced a sharp decrease in production which continued in 1970; by that time, Calgary replaced Regina as the one district out of step. After 1970, however, every district has displayed a different pattern of changes in production: Edmonton began a rapid and sustained increase; Winnipeg evened out and then slipped again; Calgary fell sharply and then rose and fell modestly; Saskatoon slid steadily; and Regina evened out, slipped badly and then slipped again. Particularly after 1968, then, the most striking feature of this data is the extent to which each district's experience has been unique.

2. PRODUCTIVITY

The man years allotted to inspection in each district between 1964 and 1973 were the following (Table 15):

YEAR	D I S T R I C T S					PRAIRIE REGIONAL TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964	6		5.7	6		
1965	6	9	6	5.8		
1966	6.5	9	6	6		
1967	7.5	9	6	6	9.8	38.3
1968	8	8.5	6	6	9.5	38
1969	7	8	6	6	9.8	36.8
1970	7	7.7	5	6	9	34.7
1971	6.7	8	5.3	5.5	9	34.5
1972	6.7	8.5	4.4	5.8	8.6	34
1973	6.5	9	5	6	8	34.5

TABLE 15: Man Years Allotted to Inspection by District 1964-1973

Note: Factory pre-pack man years allotted to Winnipeg and Calgary districts between 1965 and 1969 are not included.

By dividing these man year figures into the production figures contained in Tables 13 and 14, we were able to derive the following productivity data (Tables 16 and 17 and Figures 8 and 9):

YEAR	D I S T R I C T S					PRAIRIE REGIONAL TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964	2908		3501	3704		
1965	3008	3204	3241	3774		
1966	2275	2970	3111	3334		
1967	2337	2519	3070	3356	3207	2877
1968	2076	2741	3001	3311	3563	2938
1969	2023	2141	2783	2808	3318	2645
1970	2055	2037	2298	2768	2605	2352
1971	1608	2016	1913	2591	2842	2228
1972	1978	2313	1416	2108	2600	2169
1973	1446	2347	1670	1679	2845	2078
% Decline 1967-1973	38%	7%	46%	50%	11%	28%

TABLE 16: Productivity Measured by Devices Per Man Year

FIGURE 8 : PRODUCTIVITY MEASURED BY DEVICES PER MAN YEAR BY DISTRICT 1964-1973

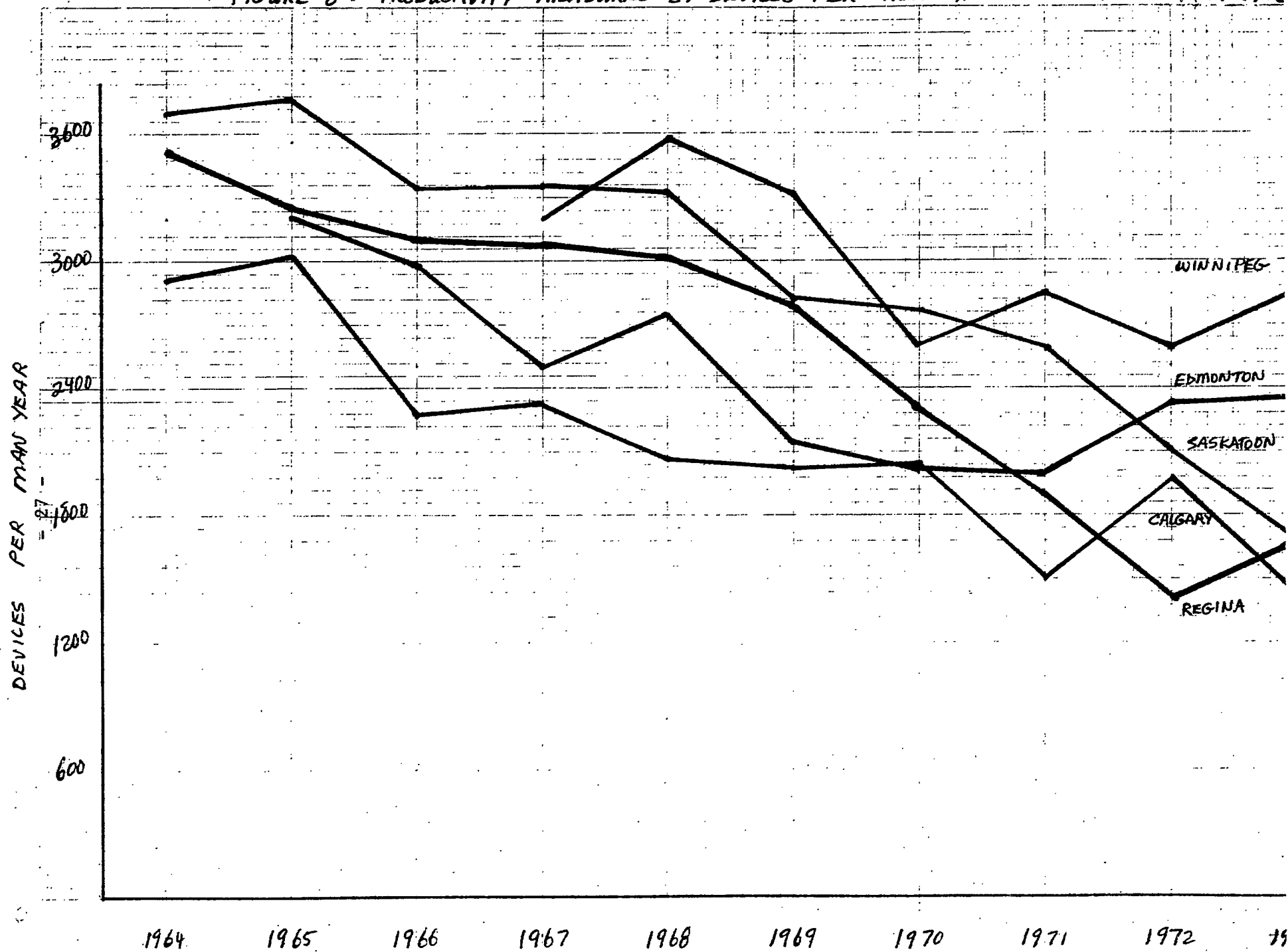
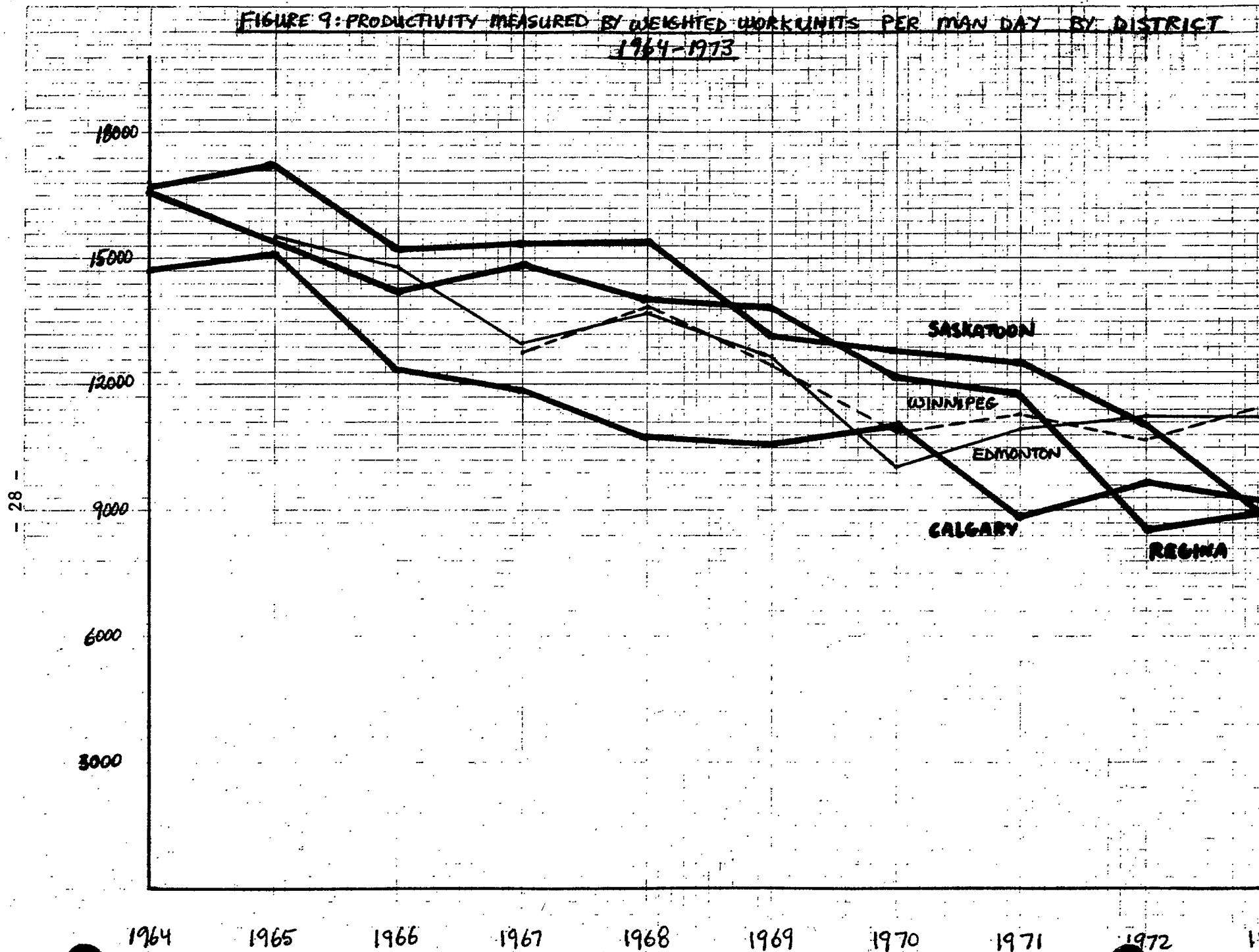


FIGURE 9: PRODUCTIVITY MEASURED BY WEIGHTED WORKUNITS PER MAN DAY BY DISTRICT
1964-1973



YEAR	D I S T R I C T S					PRAIRIE REGIONAL TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964	14722		16652	16773		
1965	15083	15445	15355	17360		
1966	12315	14754	14377	15265		
1967	11881	12972	14805	15338	12794	13370
1968	10764	13787	14092	15579	13829	13492
1969	10569	12620	13804	13126	12563	12490
1970	11290	10057	12114	12882	11243	11398
1971	8828	10947	11708	12523	11362	11012
1972	9692	11302	8857	11062	10797	10499
1973	9227	11218	8787	8762	11491	10127
% Decline 1967-1973	22%	14%	41%	43%	10%	24%

TABLE 17: Productivity Measured by Weighted Work Units Per Man Year

Because of the absence of complete man year figures before 1967, we can only use the period from 1967 to 1973 as a common basis for comparing productivity declines between districts. It must be borne in mind, however, that each of the districts for which complete figures are possible show declines in the years between 1964 and 1966 as well. But even within the more restricted period, the variation in the decline in productivity between the five districts is remarkable, ranging from a 10% decline in weighted work per man year in Winnipeg district to 43% in Saskatoon district.

In analyzing district performance over the last decade, we must also consider whether changes in time utilization or unusual periods of sick leave or training may have made these indicators of productivity per man year inaccurate measures of the efficiency of time actually spent on inspections.

Table 18 summarizes the data on time utilization in each district:

TABLE 18: Time Utilization by District 1964-1973

(a) Calgary District

YEAR	TOTAL MAN DAYS	INSPECTION MAN DAYS	% OF TOTAL MAN DAYS	CLERICAL MAN DAYS	% OF TOTAL MAN DAYS	LEAVE MAN DAYS	% OF TOTAL MAN DAYS
1964	1467	1050	72%	285.5	19%	131.5	9%
1965	1487.5	1093.5	74%	272	18%	122	8%
1966	1607	1150	72%	303	19%	154	9%
1967	1966.5	1397.5	71%	341	17%	228	12%
1968	2050	1418.5	69%	393.5	19%	238	12%
1969	1800.5	1280.5	71%	325	18%	195	11%
1970	1732	1244	72%	310.5	18%	177.5	10%
1971	1670	1117	67%	423.5	25%	129.5	8%
1972	1651	1140	69%	342	21%	169	10%
1973	1596	1082.5	68%	382	24%	131.5	8%

(b) Edmonton District

YEAR	TOTAL MAN DAYS	INSPECTION MAN DAYS	% OF TOTAL MAN DAYS	CLERICAL MAN DAYS	% OF TOTAL MAN DAYS	LEAVE MAN DAYS	% OF TOTAL MAN DAYS
1964							
1965	2290.5	1785	78%	309.5	13%	196	9%
1966	2288	1759	77%	281	12%	248	11%
1967	2337	1716	73%	275	12%	346	15%
1968	2123	1670	78%	293	14%	160	8%
1969	1972	1416	72%	355	18%	201	10%
1970	1938.5	1186	61%	435.5	22%	317	17%
1971	2039	1321	65%	388.5	19%	329.5	16%
1972	2149.5	1463.5	68%	413	19%	273	13%
1973	2260.5	1613.5	71%	434	19%	213	10%

(c) Regina District

YEAR	TOTAL MAN DAYS	INSPECTION MAN DAYS	% OF TOTAL MAN DAYS	CLERICAL MAN DAYS	% OF TOTAL MAN DAYS	LEAVE MAN DAYS	% OF TOTAL MAN DAYS
1964	1365	968.5	71%	314	23%	82.5	6%
1965	1483	975	66%	361.5	24%	146.5	10%
1966	1438	954	66%	299	21%	185	13%
1967	1447.5	1016	70%	351	24%	80.5	6%
1968	1464.5	1104	75%	222.5	15%	138	10%
1969	1503	1071.5	71%	304.5	20%	127	9%
1970	1194	881.5	74%	236.5	20%	76	6%
1971	1255	836	67%	221	18%	198	15%
1972	1085.5	719.5	66%	227.5	21%	138.5	13%
1973	1218	898.5	74%	209	17%	110.5	9%

(d) Saskatoon District

YEAR	TOTAL MAN DAYS	INSPECTION MAN DAYS	% OF TOTAL MAN DAYS	CLERICAL MAN DAYS	% OF TOTAL MAN DAYS	LEAVE MAN DAYS	% OF TOTAL MAN DAYS
1964	1525	966	63%	403	26%	156	11%
1965	1505	965	64%	407	27%	133	9%
1966	1457	979	67%	362	25%	116	8%
1967	1483	953	64%	384	26%	146	10%
1968	1469	1007	69%	336.5	23%	125.5	8%
1969	1481	940	63%	414.5	28%	126.5	9%
1970	1500	905	60%	471	31%	124	9%
1971	1412	805	57%	451.5	32%	155.5	11%
1972	1425	870	61%	418	29%	137	10%
1973	1456	736	51%	435	30%	285	19%

(e) Winnipeg District

YEAR	TOTAL MAN DAYS	INSPECTION MAN DAYS	% OF TOTAL MAN DAYS	CLERICAL MAN DAYS	% OF TOTAL MAN DAYS	LEAVE MAN DAYS	% OF TOTAL MAN DAYS
1964							
1965							
1966	2522.5	1852.5	73%	401.5	16%	268.5	11%
1967	2506.5	1790.5	71%	391	16%	325	13%
1968	2577	1928	75%	391	15%	258	10%
1969	2677.5	1893	71%	417.5	16%	367	13%
1970	2179.5	1639	75%	357.5	16%	183	9%
1971	2245.5	1630.5	73%	426.5	19%	188.5	8%
1972	2140	1492	70%	442.5	21%	205.5	9%
1973	2003	1495	75%	291.5	15%	216.5	10%

Note: All short weight work days are excluded from these figures. However, inspection, clerical and leave days recorded by the men assigned to Factory pre-pack work between 1965 and 1969 are included. See note to Table 6.

Again no two districts have had the same experience. Despite fluctuations, Calgary shows a definite downward trend in the percentage of time expended on inspections. Edmonton dipped sharply to 1970 and then recovered much of what was lost. There is no obvious trend to Regina's data. The most notable fact about Saskatoon is not that the percentage of its time spent on inspection has slipped, but rather the low levels maintained throughout. Winnipeg has been fairly steady within a 5% range. These figures confirm the need to investigate productivity as measured per man day of investigation.

By dividing the inspection man days in Table 18 into the production figures in Tables 13 and 14, we derived the following data on devices inspected per man day of inspection in each district (Table 19) and weighted

work accomplished per man day of inspection (Table 20). These figures are illustrated by a graph for each district (Figures 10 - 14):

YEAR	D I S T R I C T S					PRAIRIE REGIONAL TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964	16.6		20.6	23.0		
1965	16.5	16.2	19.9	22.7		
1966	12.9	15.2	19.6	20.4	18.4	17.1
1967	12.5	13.2	18.1	21.1	17.6	16.0
1968	11.7	14.0	16.3	19.7	17.6	15.7
1969	11.1	12.1	15.6	17.9	17.2	14.7
1970	11.6	13.2	13.0	18.3	14.3	13.9
1971	9.6	12.2	12.1	17.7	15.7	13.5
1972	11.6	13.4	8.7	14.1	15.0	13.0
1973	8.7	13.1	9.3	13.7	15.2	12.3
% Decline 1967-1972	30%	1%	49%	35%	13%	23%

TABLE 19: Productivity Measured by Devices Per Man Day of Inspection

YEAR	D I S T R I C T S					PRAIRIE REGIONAL TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964	84.1		98.0	104.2		
1965	82.8	77.9	94.5	104.3		
1966	69.6	75.5	90.4	93.6	70.7	77.9
1967	63.8	68.0	87.4	96.6	70.0	74.5
1968	60.7	70.2	76.6	92.8	68.1	71.9
1969	57.8	71.3	77.3	83.8	65.0	69.6
1970	63.5	65.3	68.7	85.4	61.7	67.5
1971	53.0	66.3	74.2	85.6	62.7	66.5
1972	57.0	65.6	54.2	73.7	62.2	62.8
1973	55.4	62.6	48.9	71.4	61.5	60.0
% Decline 1967-1973	13%	8%	44%	26%	12%	19%

TABLE 20: Productivity Measured by Weighted Work Units
Per Man Day of Inspection

FIGURE 10: PRODUCTIVITY PER MAN DAY OF INSPECTION IN THE CALGARY DISTRICT 1964-1973

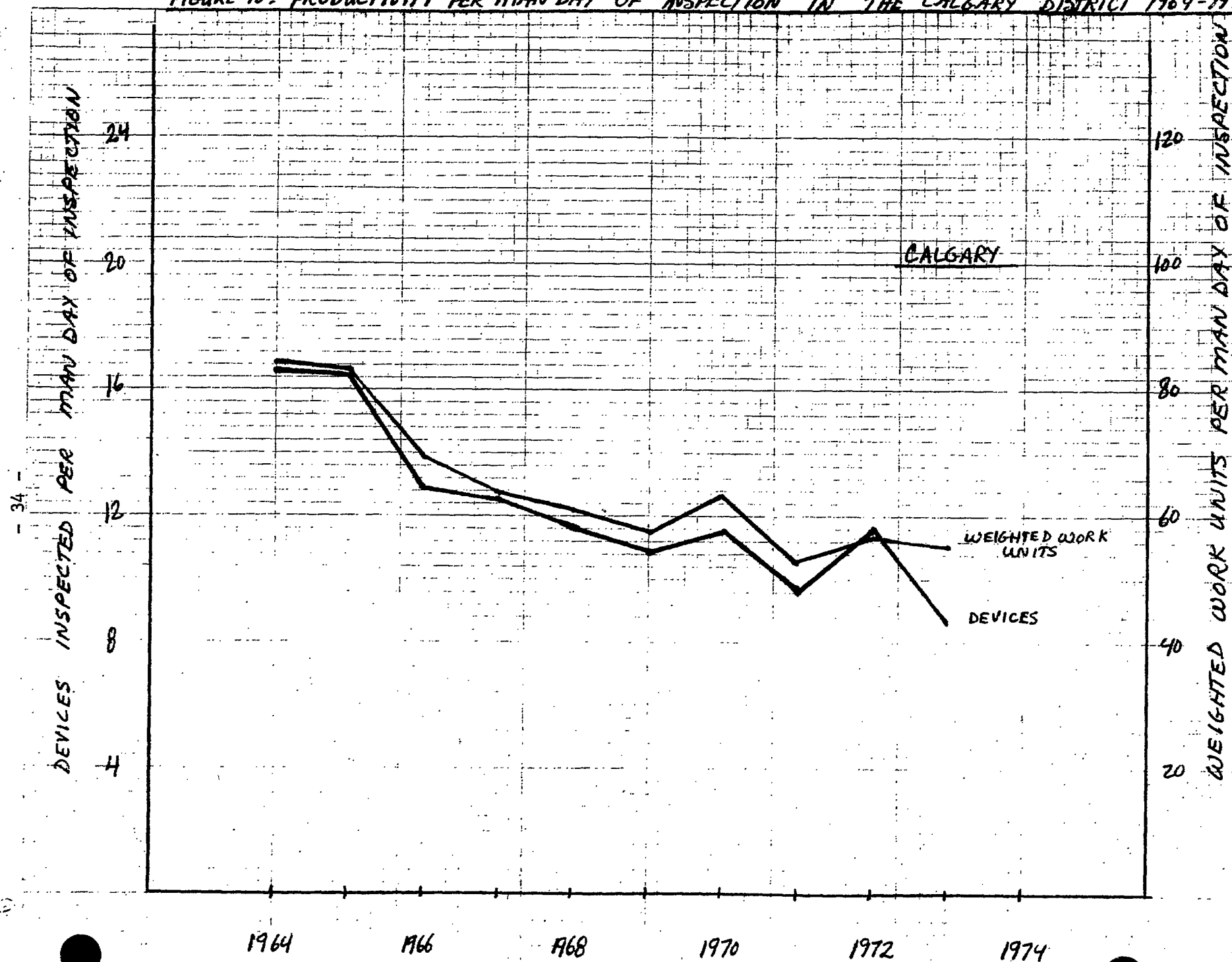


FIGURE 11: PRODUCTIVITY PER MAN DAY OF INSPECTION IN THE EDMONTON DISTRICT 1965-1973

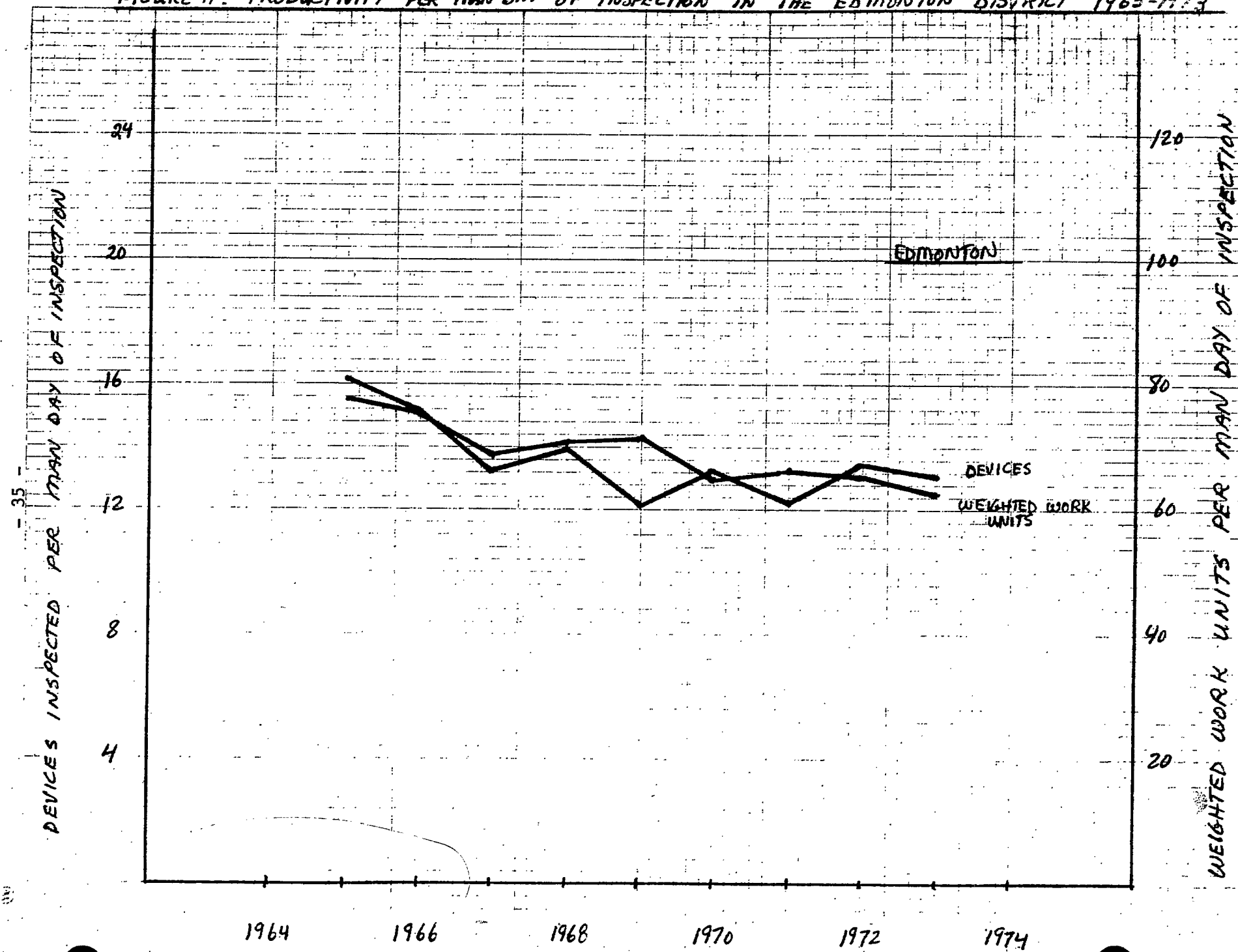


FIGURE 12: PRODUCTIVITY PER MAN DAY OF INSPECTION IN THE REGINA DISTRICT 1964-1973

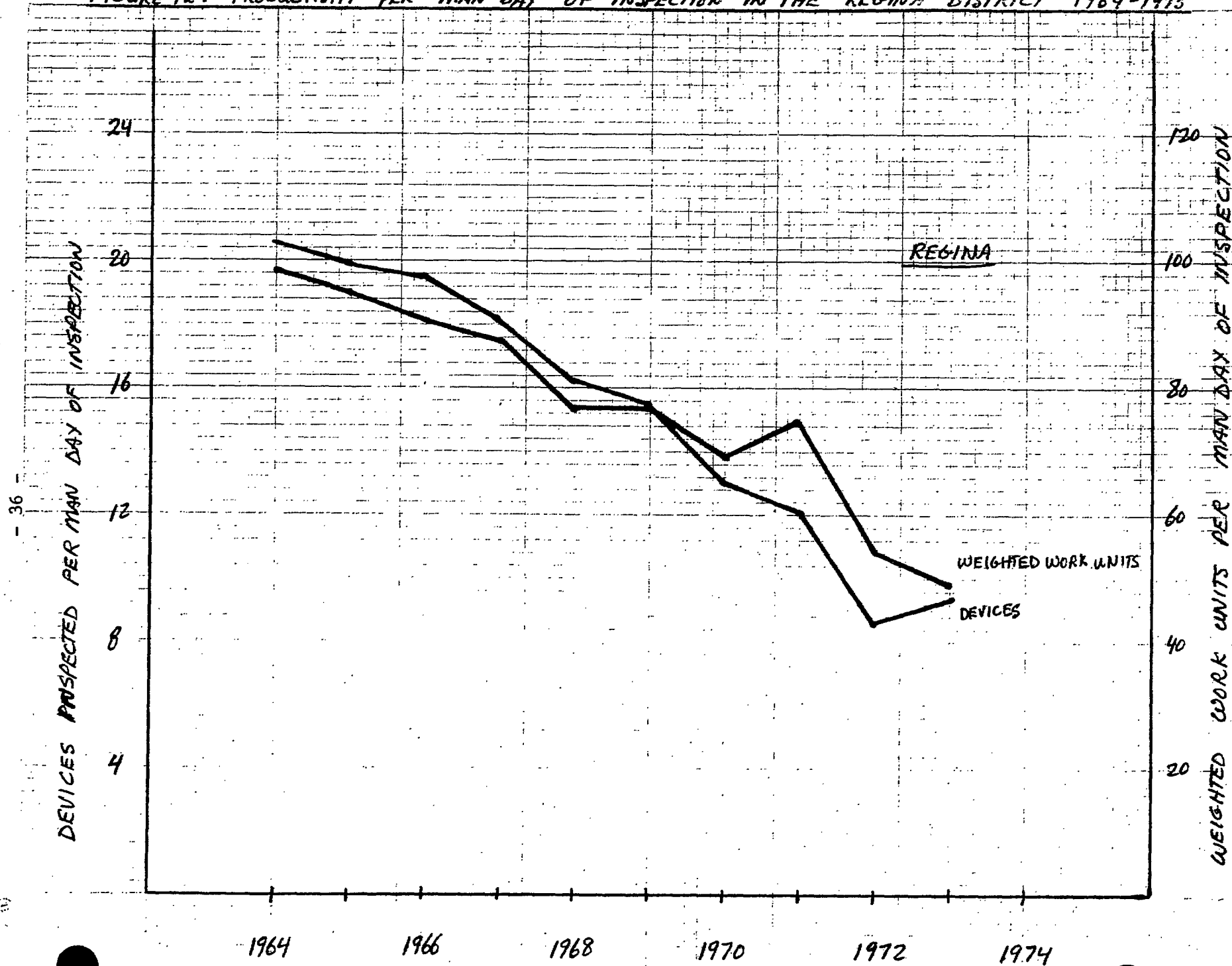


FIGURE 13: PRODUCTIVITY PER MAN DAY OF INSPECTION IN THE SASKATOON DISTRICT 1964-1972

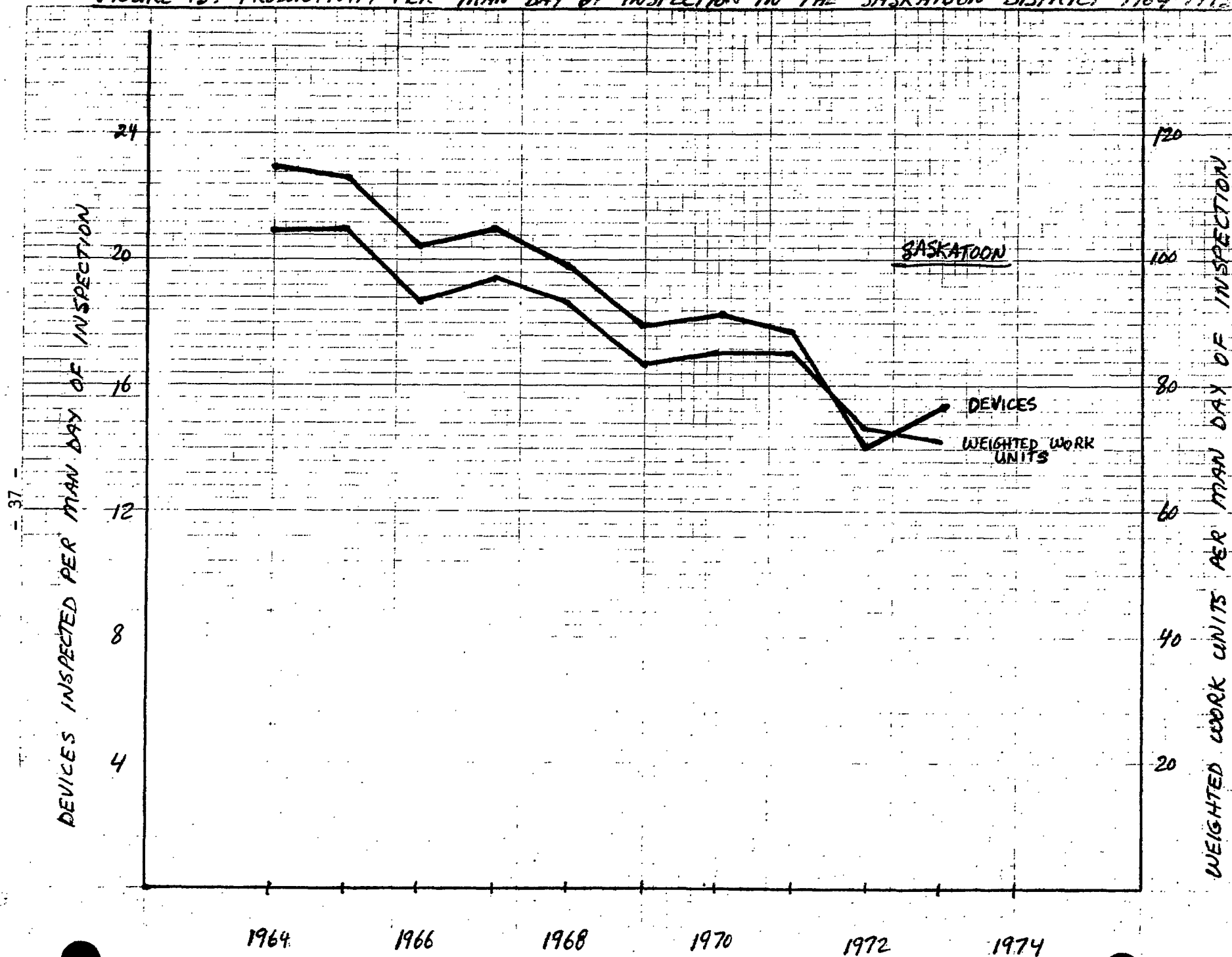
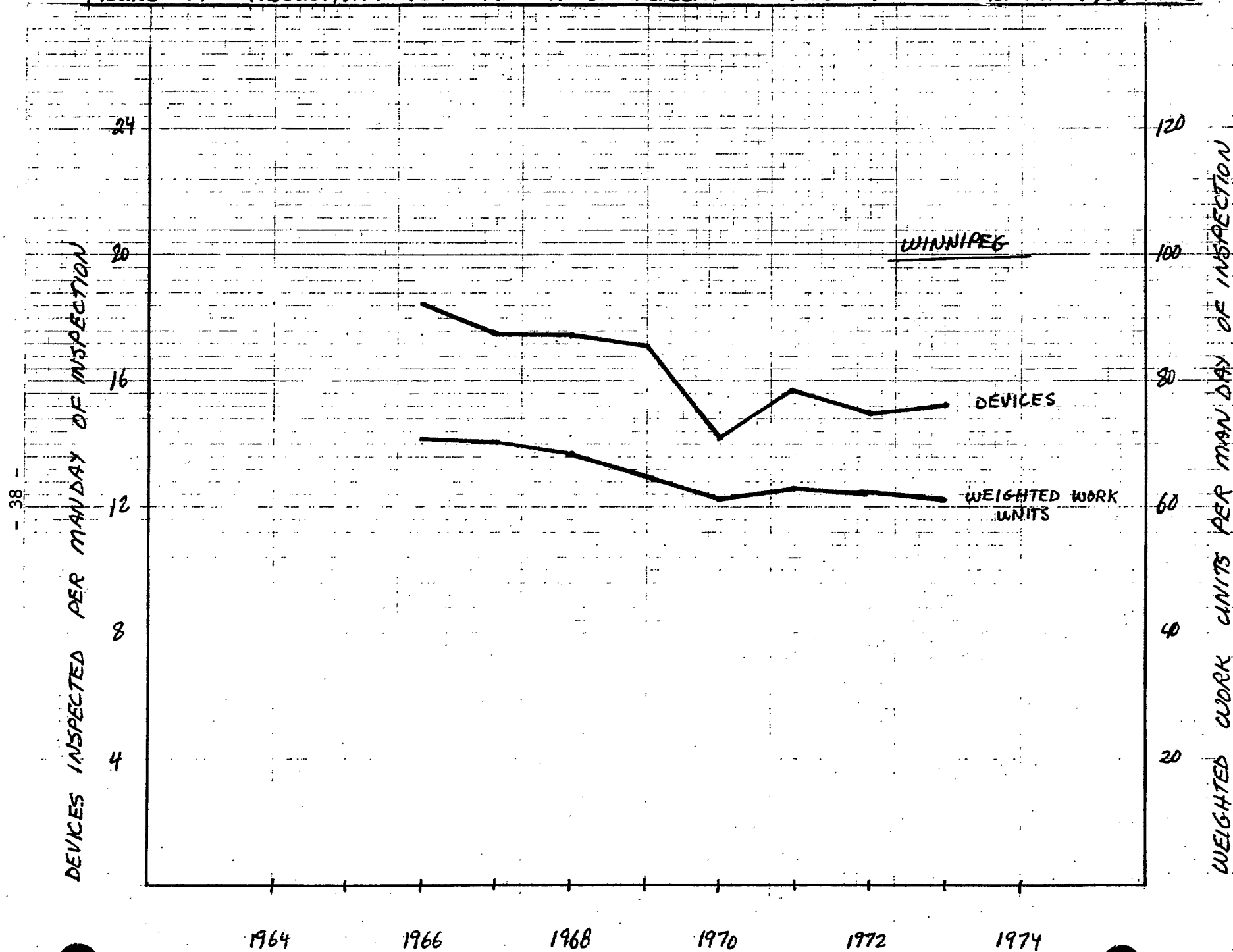


FIGURE 14: PRODUCTIVITY PER MAN DAY OF INSPECTION IN THE WINNIPEG DISTRICT 1966-1973



From the above information, it is evident that whereas declines in productivity between 1967 and 1973 as measured by weighted work units per man year ranged from 10% in Winnipeg to 43% in Saskatoon, differences between districts in declines measured by weighted work units per man day were slightly greater, ranging from 8% in Edmonton to 44% in Regina. It is also important to recognize that in every district for which statistics are available, substantial declines in productivity were sustained in the years between 1964 and 1967 as well. For example, Calgary district's 10-year decline was 34%, compared with its decrease between 1967 and 1973 of only 13%. The most remarkable feature of these statistics is the large variation in the absolute levels of productivity in each district. Saskatoon, for instance, despite experiencing the second largest decline in productivity between 1967 and 1973 (26%), nevertheless retained by far the highest level of productivity in weighted work per man day of inspection.

Since it is clear that the evolution of the figures of both production and productivity differ greatly among the five districts, we are led to wonder whether the decreases by sub-activity and the timing of decreases vary by district as well.

3. DISTRICT PRODUCTION BY SUB-ACTIVITY

By applying to the inspection statistics for each district (See Annex C) the definitions of the eight sub-activities (See Annex B) we were able to derive figures on production by sub-activity in each district. (See Tables 21 to 30 and Figures 15 to 24). A glance at these figures shows important dissimilarities from one district to another. In some districts city general work increased over the period; in others it slipped. In some districts country general work and meter work declined very steadily; in others they rose and fell from one year to the next.

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	2242		2207	2115	1904	2063	2054	2014	1517	1480	66.0%
2. Other Heavy Work	511		520	487	493	478	584	491	359	602	117.8%
3. City General	4063		4282	4379	4405	4232	4271	4113	4469	4493	110.6%
4. Country General	8310		5159	8041	7424	5492	5061	2355	5533	854	10.3%
5. Meter	1486		1106	1422	1250	776	1333	434	509	964	64.9%
6. Calibration	133		113	96	104	78	74	64	53	111	83.5%
7. Propane	36		404	386	417	323	261	287	286	258	716.7%
8. Request	667		1026	595	610	722	750	1011	835	607	91.0%
TOTAL	17448		14817	17521	16607	14164	14388	10769	13561	9369	53.7%

**TABLE 21: Weighing and Measuring Devices Inspected in the Calgary District
by Sub-Activity 1964-1973**

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	13794		13589	13037	11732	12762	12660	12421	9348	9118	66.1%
2. Other Heavy Work	7379		7608	7006	7104	6991	8426	7175	4982	8464	114.7%
3. City General	14897		15801	15960	16331	15648	16151	15526	17261	17295	116.1%
4. Country General	26845		16604	25468	24533	18502	17788	8386	19430	3383	12.6%
5. Meter	13374		9954	12798	11250	6984	11997	3906	4581	8676	64.9%
6. Calibration	7182		6102	5184	5616	4212	3996	3456	2862	5994	83.5%
7. Propane	504		5656	5404	5838	4522	3654	4018	4004	3612	716.7%
8. Request	4594		4807	4028	3704	4395	4359	4269	3719	3436	74.8%
TOTAL	88569		80121	88885	86108	74016	79031	59157	66187	59978	67.7%

**TABLE 22: Weighted Work Units of Weights and Measures Inspection
in the Calgary District by Sub-Activity 1964-1973**

IN THE CALGARY DISTRICT
FIGURE 15: DEVICES INSPECTED, BY SUB-ACTIVITY 1964-1973

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CALGARY SUMMARY - DEVICES BY GROUP

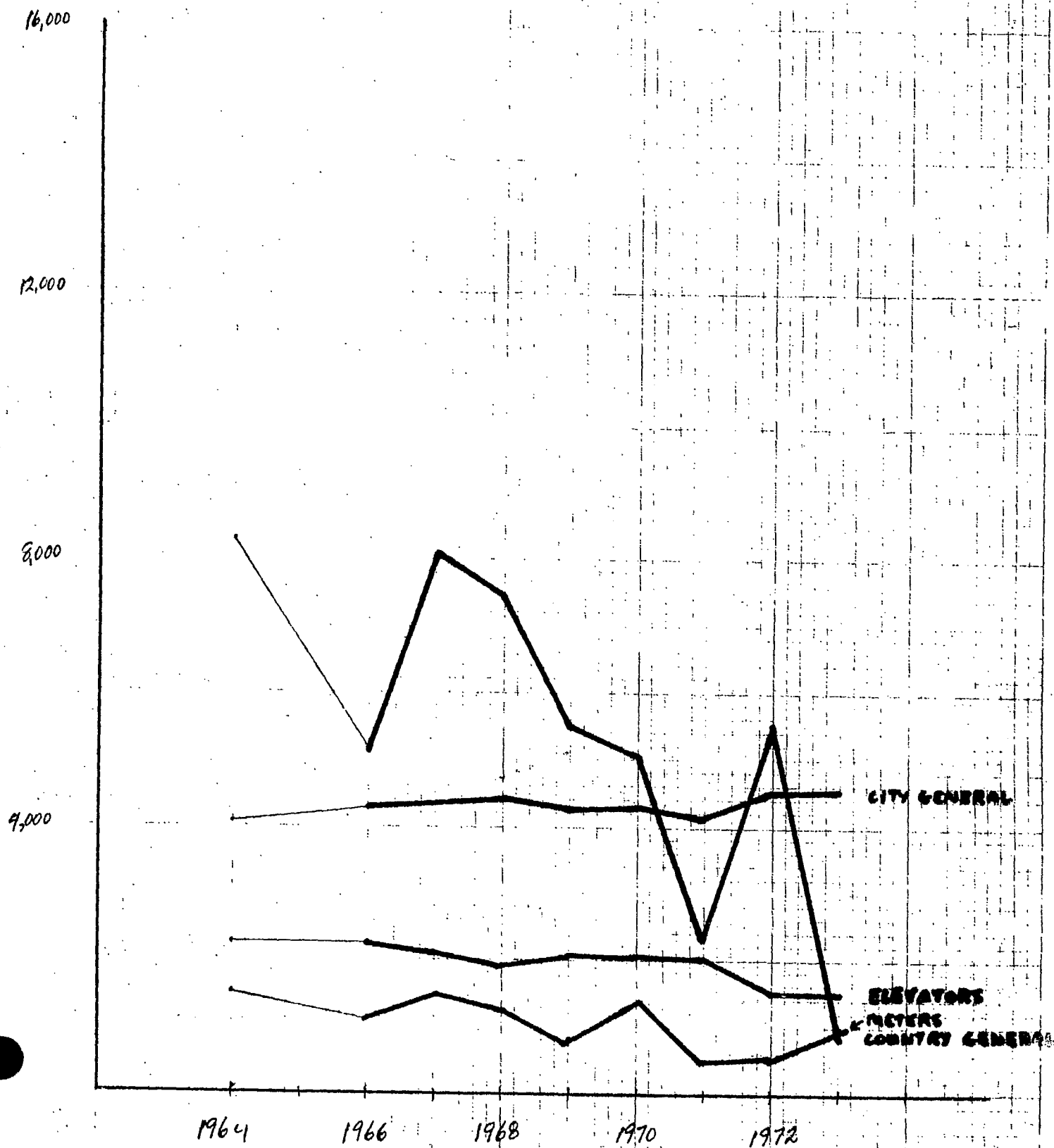
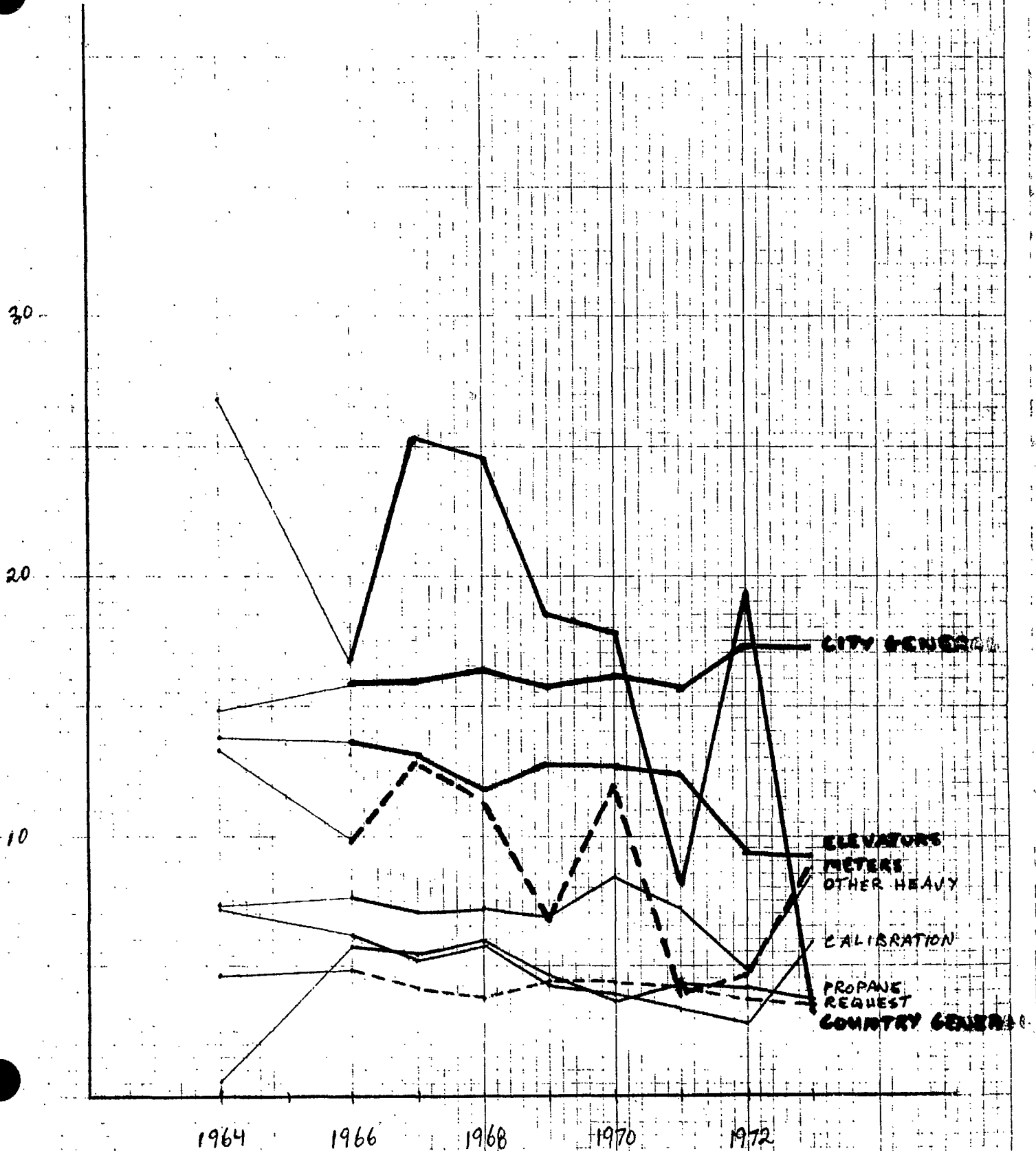


FIGURE 16: WEIGHTED WORK UNITS OF INSPECTION IN THE CALGARY DISTRICT BY SUB-ACTIVITY 1964-1973



	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	2829	2814	2776	2690	2038	2645	2031	2508	2434	2311	81.7%
2. Other Heavy Work	559	687	662	735	662	642	629	761	753	816	146.0%
3. City General	5837	5961	5885	5885	5996	5816	5348	6118	5776	5637	96.6%
4. Country General	15527	15185	13621	9112	10723	4045	5455	4124	8149	8750	56.4%
5. Meter	2503	2623	2539	2291	2405	2705	637	1319	1082	1377	55.0%
6. Calibration	264	254	248	203	245	181	117	124	87	78	29.5%
7. Propane	123	113									
8. Request	1652	1155	1018	1653	1314	1008	1471	1294	1381	2155	130.4%
TOTAL	29294	28792	26749	22569	23383	17042	15688	16248	19662	21124	72.1%

TABLE 23: Weighing and Measuring Devices Inspected in the Edmonton District
by Sub-Activity 1964-1973

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	17152	17048	16843	16928	12356	16083	12332	15274	14778	14000	81.6%
2. Other Heavy Work	8606	8906	8680	9744	9174	8470	8713	10542	10511	11335	131.7%
3. City General	19998	20366	20493	20575	20999	20493	18963	21864	20928	20246	101.2%
4. Country General	48271	48215	44158	30933	35112	15014	18589	15760	28919	31711	65.7%
5. Meter	22527	23607	22851	20619	21645	24345	5733	11871	9738	12393	55.0%
6. Calibration	13797	12900	13392	10962	13230	9774	6318	6696	4698	4212	30.5%
7. Propane	1722	1582									
8. Request	5771	6490	6410	7048	5933	5265	6768	6173	6480	7074	122.6%
TOTAL	137844	139114	132827	116809	118449	99444	77416	88180	96052	100971	73.3%

TABLE 24: Weighted Work Units of Weights and Measures Inspection
in the Edmonton District by Sub-Activity 1964-1973

FIGURE 17: WEIGHING AND MEASURING DEVICES INSPECTED BY SUB-ACTIVITY
IN THE EDMONTON DISTRICT 1964-1973

EDMONTON SUMMARY - DEVICES BY GROUP

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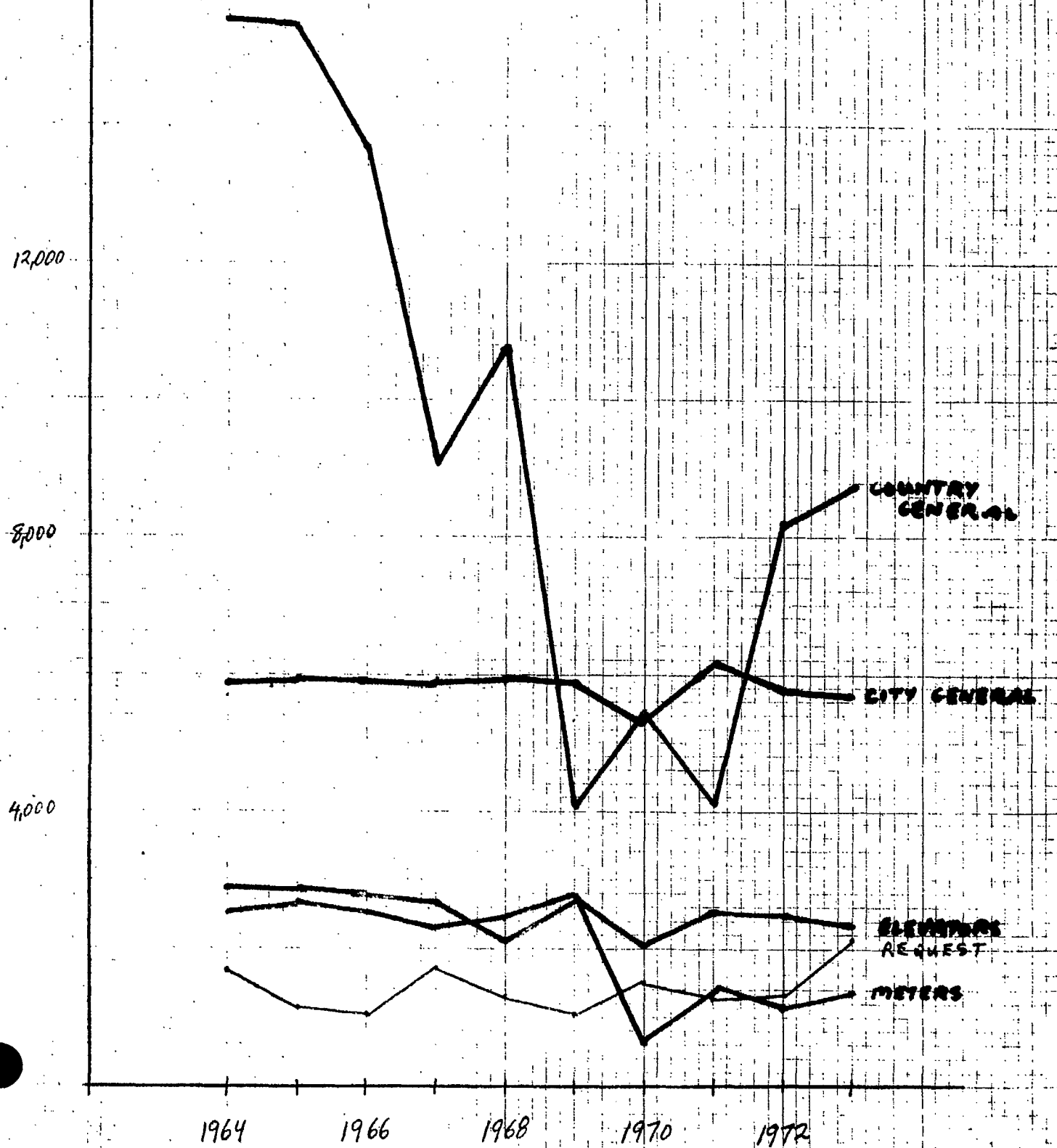


FIGURE 18: WEIGHTED WORK UNITS OF INTERACTION IN THE
EDMONTON DISTRICT BY SUB-ACTIVITY 1964-1973
EDMONTON - 45 -

EDMONTON SUMMARY - WEIGHTED WORK VALUES BY GROUP

(IN '000S)

40

30

20

10

1964

1966

1968

1970

1972

COUNTRY
GENERAL

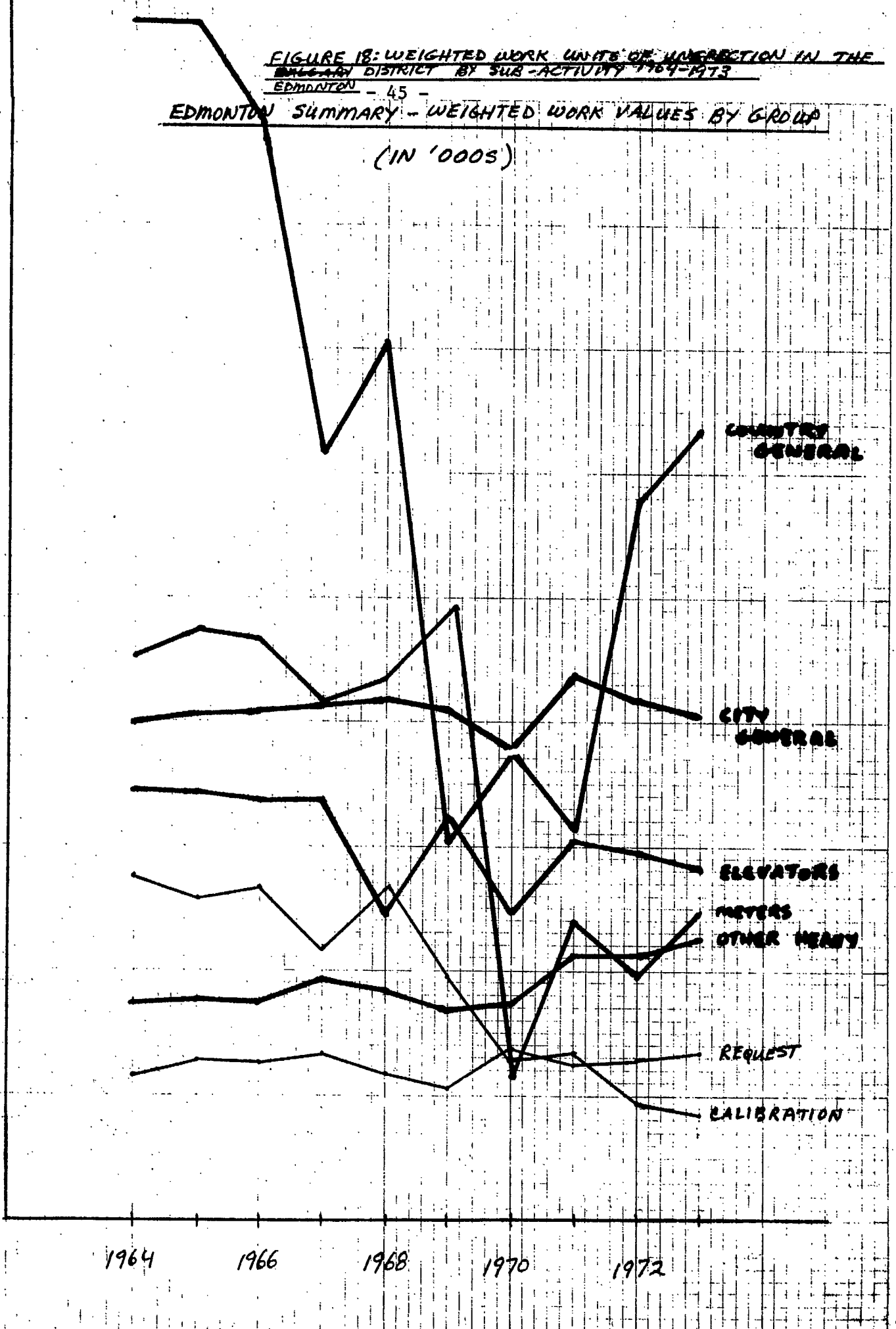
CITY
GENERAL

ELEVATORS

MEYERS
OTHER HEAVY

REQUEST

CALIBRATION



	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	3840	3804	3733	3747	3699	3605	3617	3571	3380	3229	84.1%
2. Other Heavy Duty	229	240	227	221	227	242	226	216	207	243	106.1%
3. City General	2134	2113	2135	2142	2182	2238	1409	1413	541	1955	91.6%
4. Country General	11017	10434	9777	9424	8423	7053	3560	2709	327	294	2.7%
5. Meter	1644	1728	1665	1717	1817	1759	1215	756	487	540	32.8%
6. Calibration	455	408	286	387	315	503	367	562	111	72	15.8%
7. Propane	95	78	4	4	5	5	6	5	5	4	4.2%
8. Request	525	628	839	780	1366	1194	1091	912	1188	2019	384.6%
TOTAL	19945	19433	18666	18422	18034	16599	11491	10144	6236	8356	41.9%

**TABLE 25: Weighing and Measuring Devices Inspected in the Regina District
by Sub-Activity 1964-1973**

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	23310	23053	22674	22751	22276	21913	22008	21779	20732	19806	85.0%
2. Other Heavy Duty	3364	3513	3332	3163	3326	3574	3330	3152	3111	3534	105.1%
3. City General	6920	6987	7047	7118	7286	7482	5040	4793	2067	6672	96.4%
4. Country General	32327	30888	29496	27745	25686	22086	11182	8776	1138	901	2.8%
5. Meter	14796	15552	14985	15453	16353	15831	10935	6804	4383	4860	32.8%
6. Calibration	9525	7344	4785	8862	5127	8190	4314	9846	4158	3888	40.8%
7. Propane	1330	1092	56	56	70	70	84	70	70	56	4.2%
8. Request	3311	3705	4031	3755	4501	3656	3671	3322	3352	4229	127.7%
TOTAL	94937	92134	86406	88903	84625	82802	60564	58790	38981	43946	46.3%

**TABLE 26: Weighted Work Units of Weights and Measures Inspection
in the Regina District by Sub-Activity 1964-1973**

FIGURE 19: DEVICES INSPECTED IN REGINA DISTRICT BY
SUB-ACTIVITY 1964-1973

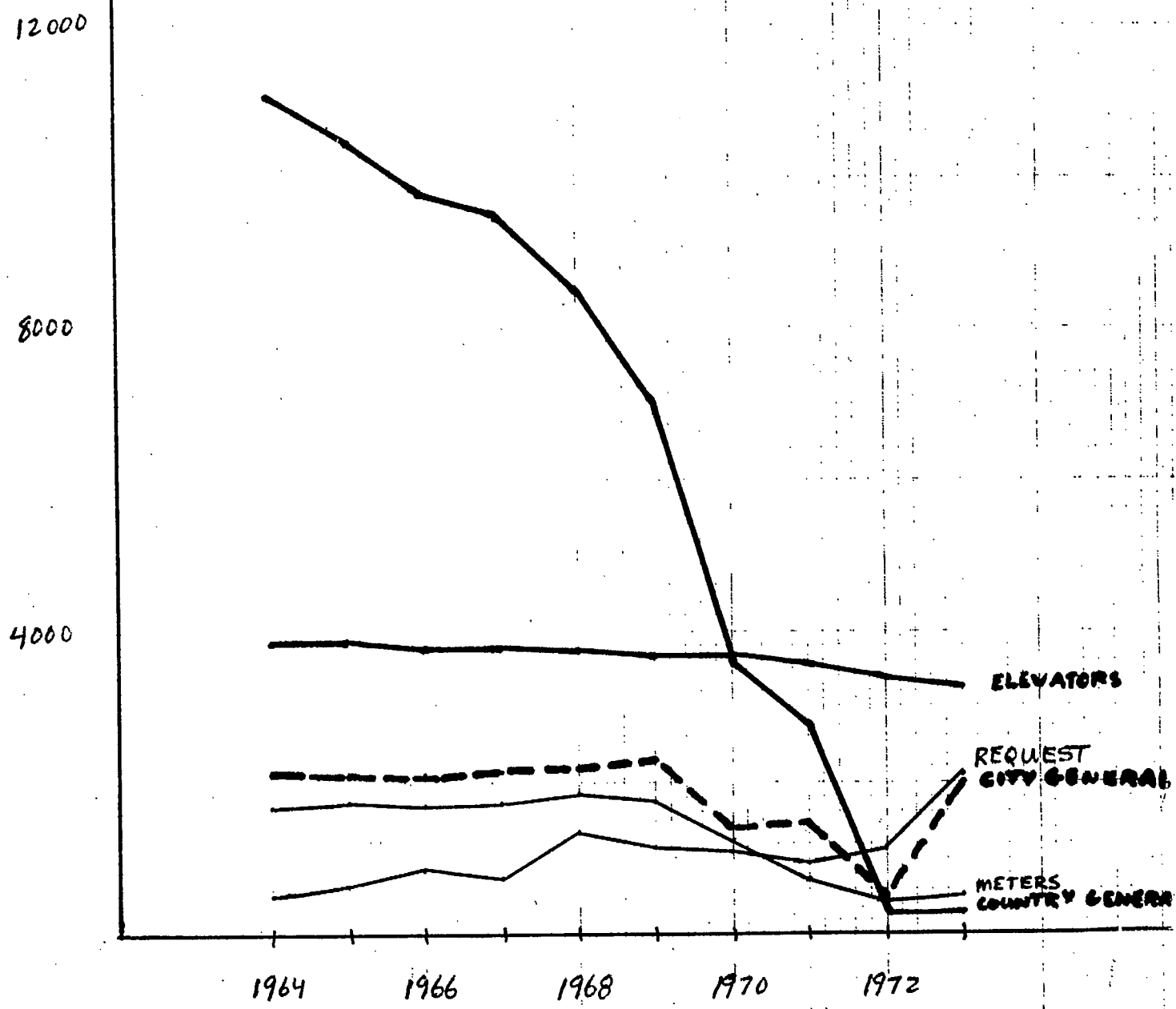
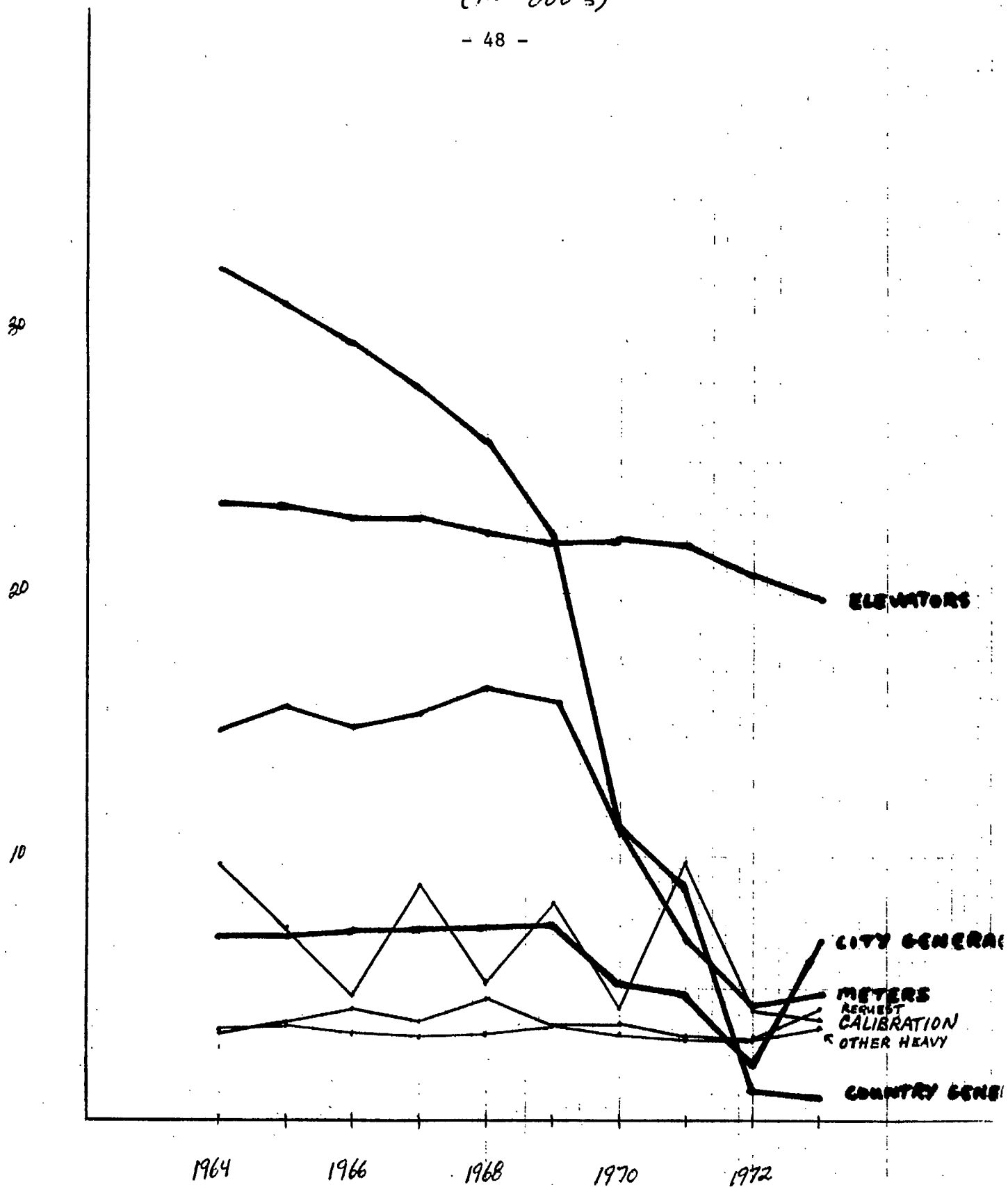


FIGURE 20: WEIGHTED WORK UNITS OF INSPECTION IN THE REGINA DISTRICT
BY SUB-ACTIVITY 1964-1973

REGINA SUMMARY-WEIGHTED WORK VALUES BY GROUP

(IN 000's)

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	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	4885	4835	4834	4743	4721	4559	4555	4408	4119	3873	79.3%
2. Other Heavy Duty	264	266	251	248	261	230	250	258	246	263	99.6%
3. City General	1894	1916	1929	1968	2085	2089	2060	2071	2030	1484	78.4%
4. Country General	12829	12448	10854	11191	10447	8621	8343	6380	4100	3328	25.9%
5. Meter	1823	1847	1664	1587	1804	1037	940	735	1273	560	30.7%
6. Calibration	56	103	81	53	66	43	47	37	24	31	55.4%
7. Propane	155	128									
8. Request	286	324	363	347	503	271	413	364	436	536	187.4%
TOTAL	22192	21867	19976	20137	19887	16850	16608	14253	12228	10075	45.4%

**TABLE 27: Weighing and Measuring Devices Inspected in the Saskatoon District
by Sub-Activity 1964-1973**

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	29621	29306	29210	28763	28639	27668	27731	26839	25076	23583	79.6%
2. Other Heavy Duty	3873	3841	3645	3516	3745	3296	3605	3778	3562	3902	100.7%
3. City General	6001	6132	6146	6361	6861	6964	7036	7260	6859	5597	93.3%
4. Country General	38242	37519	33196	34236	32217	26755	26789	20914	13464	11124	29.0%
5. Meter	16407	16623	14976	14283	16236	9333	8460	6615	11457	5040	30.7%
6. Calibration	1953	2754	1926	2352	2493	1710	1110	927	786	858	43.9%
7. Propane	2170	1792									
8. Request	2410	2713	2365	2564	3250	3032	2552	2578	2980	3532	146.6%
TOTAL	100677	100387	91464	92075	93441	78758	77283	68911	64184	53636	53.3%

**TABLE 28: Weighted Work Units of Weights and Measures Inspection
in the Saskatoon District by Sub-Activity 1964-1973**

FIGURE 21: DEVICES INSPECTED IN THE SASKATOON DISTRICT BY SUB-ACTIVITY
1964-1973

SASKATOON SUMMARY - DEVICES BY GROUP

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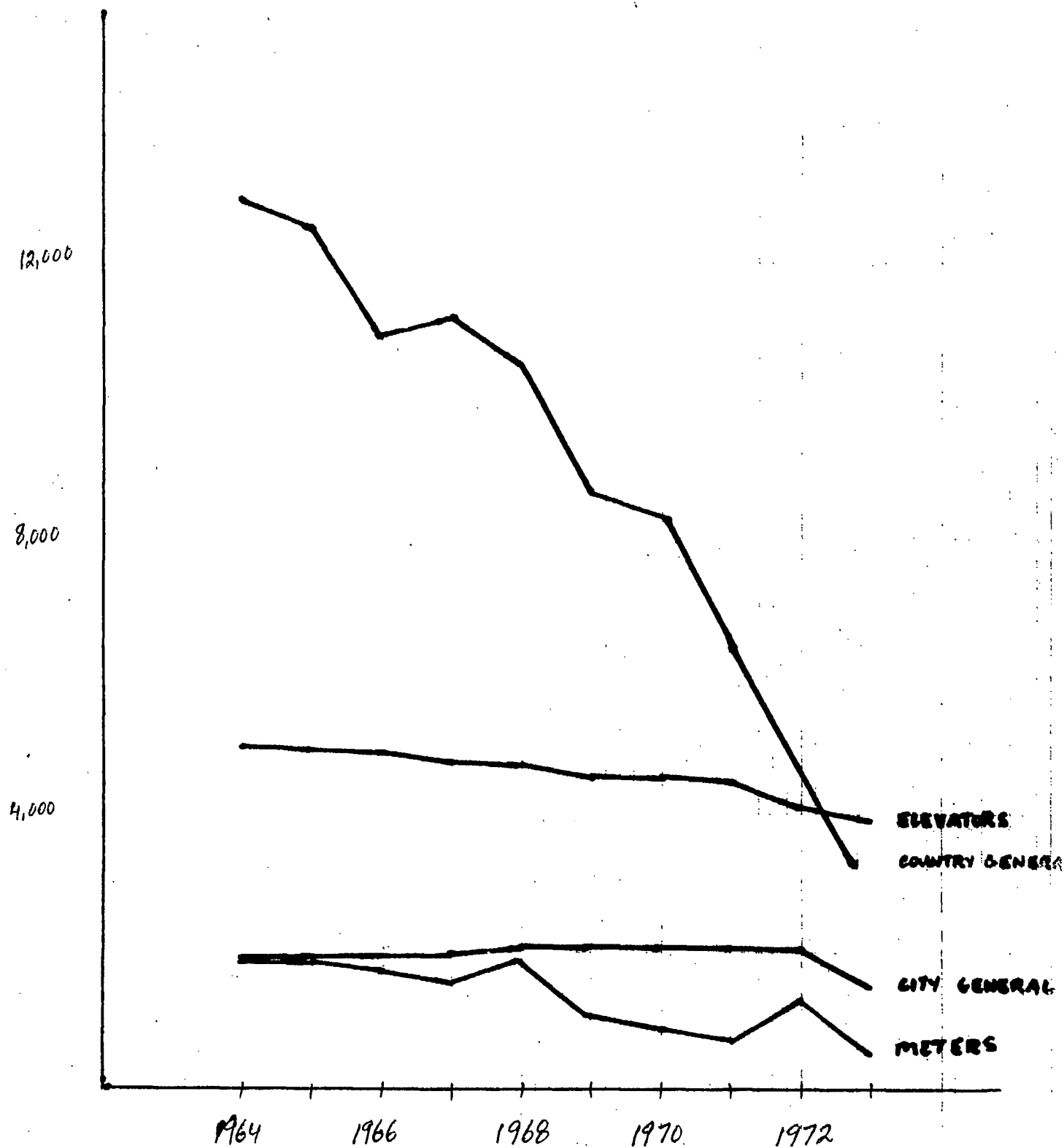
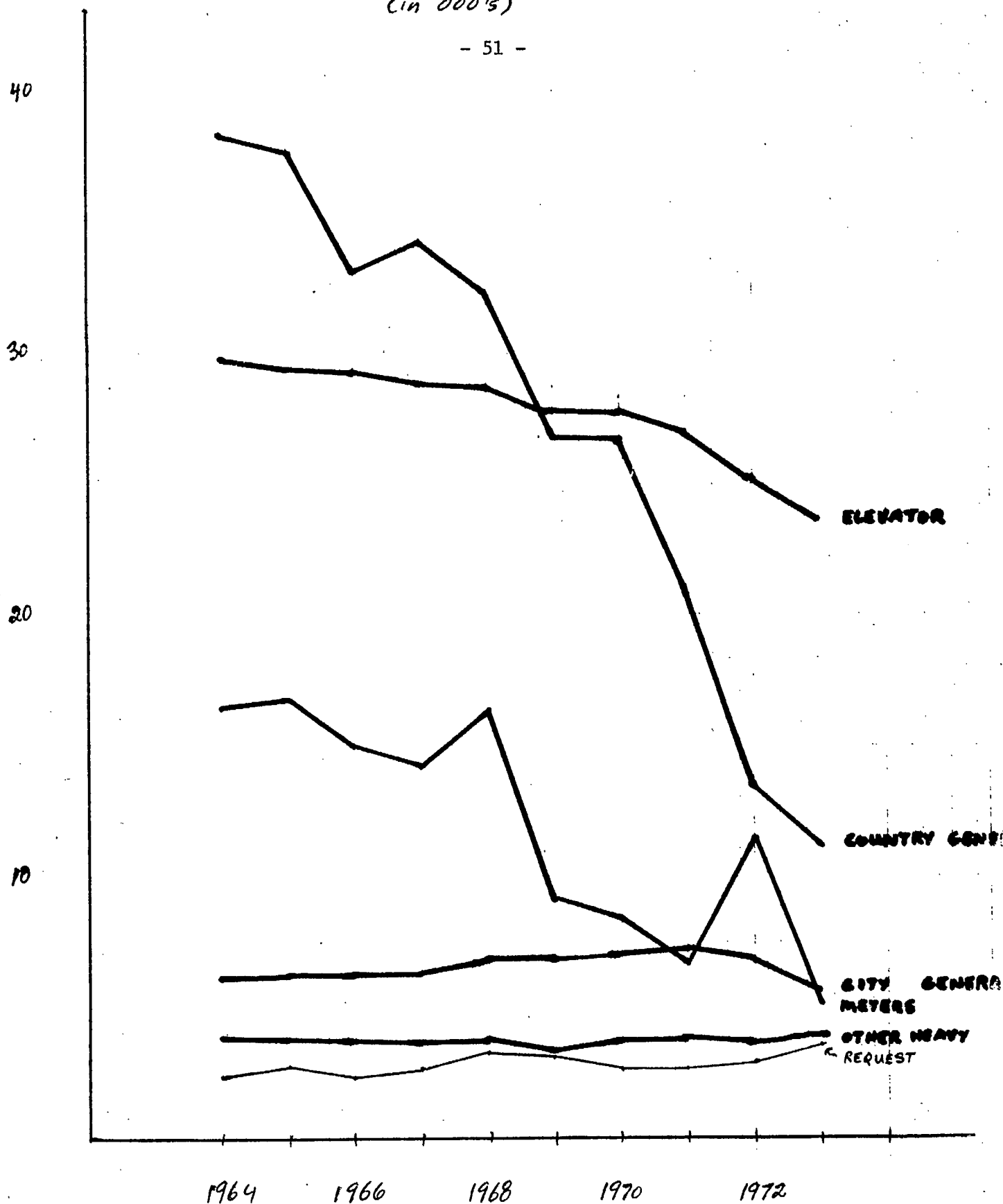


FIGURE 22: WEIGHTED WORK UNITS OF INSPECTION IN THE SASKATOON DISTRICT BY SUB-ACTIVITY 1964-1973

SASKATOON SUMMARY - WEIGHTED WORK VALUES BY GROUP
(in 000's)

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	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	2018	2002	1948	1580	1926	1885	1837	1815	1687	1607	79.6%
2. Other Heavy Work	563	551	583	566	622	636	654	623	640	637	113.1%
3. City General	11767	11325	11340	11387	11729	11727	10943	10707	10125	9289	78.9%
4. Country General	15104	14340	14502	13185	13295	10849	5183	7780	4503	5808	38.5%
5. Meter	2156	2155	2170	2214	2220	2245	2110	1508	1761	1391	64.5%
6. Calibration	226	236	196	242	156	94	71	82	35	20	8.8%
7. Propane	152	61	51	45	26	27	22	36	22	24	15.8%
8. Request	2406	2163	3387	2243	3895	5074	2633	3047	3934	4001	166.3%
TOTAL	34392	32833	34177	31462	33869	32537	23453	25598	22671	22777	66.2%

**TABLE 29: Weighing and Measuring Devices Inspected in the Winnipeg District
by Sub-Activity 1964-1973**

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
1. Elevator	12217	12111	11623	9506	11617	11358	11030	10946	10174	9714	79.5%
2. Other Heavy Work	7629	7548	7868	7617	8544	8850	9139	8560	9011	9268	121.5%
3. City General	35693	34672	35074	35528	36222	36228	34323	33664	32786	30234	84.7%
4. Country General	45584	43157	43449	38786	40310	33865	16596	24644	15088	19252	42.2%
5. Meter	19404	19395	19530	19926	19980	20205	18990	13572	15849	12519	64.5%
6. Calibration	5574	5502	3648	6336	5580	2781	2763	1623	1584	774	13.9%
7. Propane	2128	854	714	630	364	378	308	504	308	336	15.8%
8. Request	9014	8173	9051	7595	9033	9743	8295	9547	9890	10383	115.2%
TOTAL	137243	131412	130957	125924	131650	123408	101444	103060	94690	92480	67.4%

**TABLE 30: Weighted Work Units of Weights and Measures Inspection
in the Winnipeg District by Sub-Activity 1964-1973**

FIGURE 23: DEVICES INSPECTED IN THE WINNIPEG DISTRICT BY SUB-ACTIVITY
1964-1973

WINNIPEG SUMMARY - DEVICES BY GROUP

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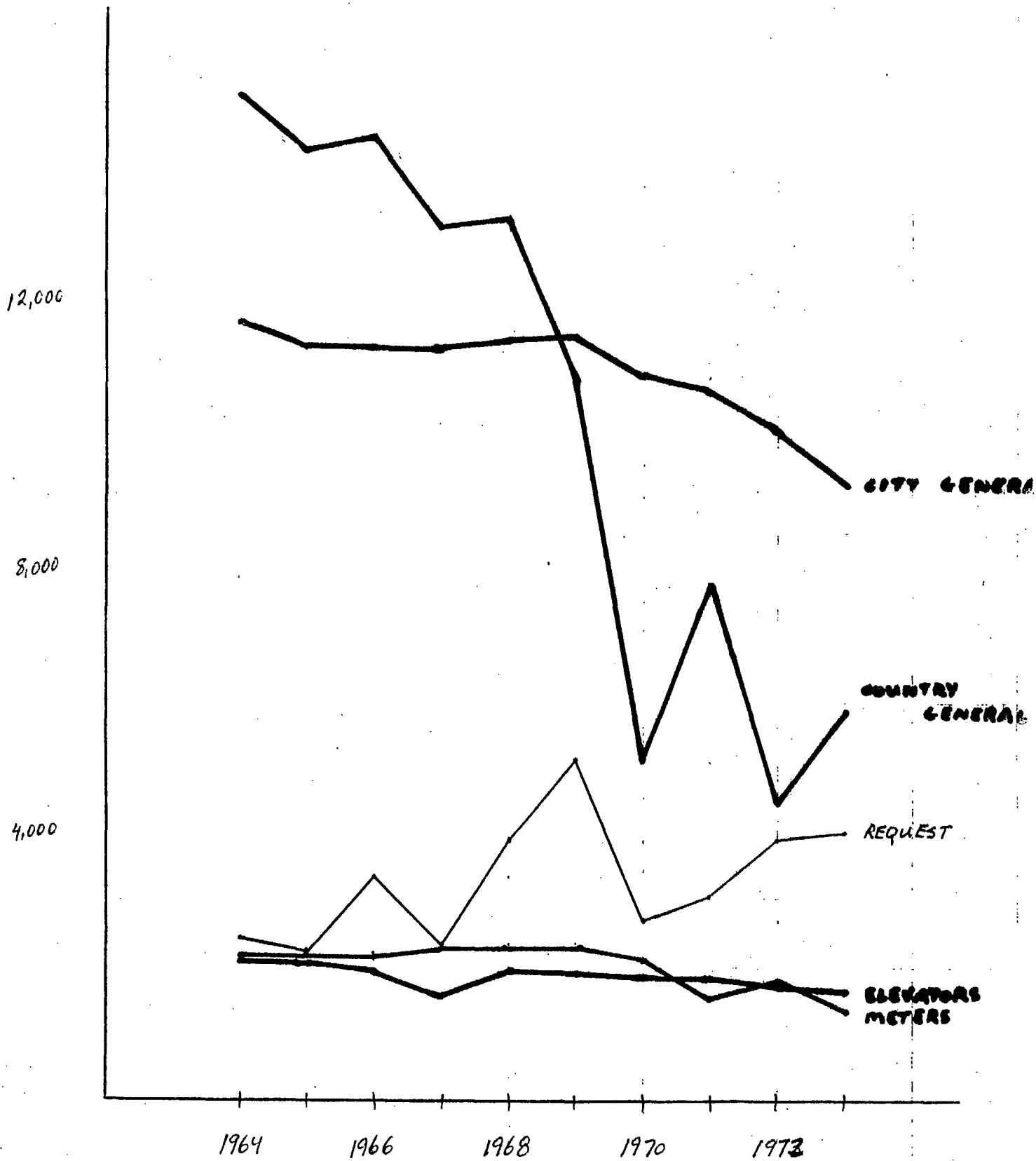
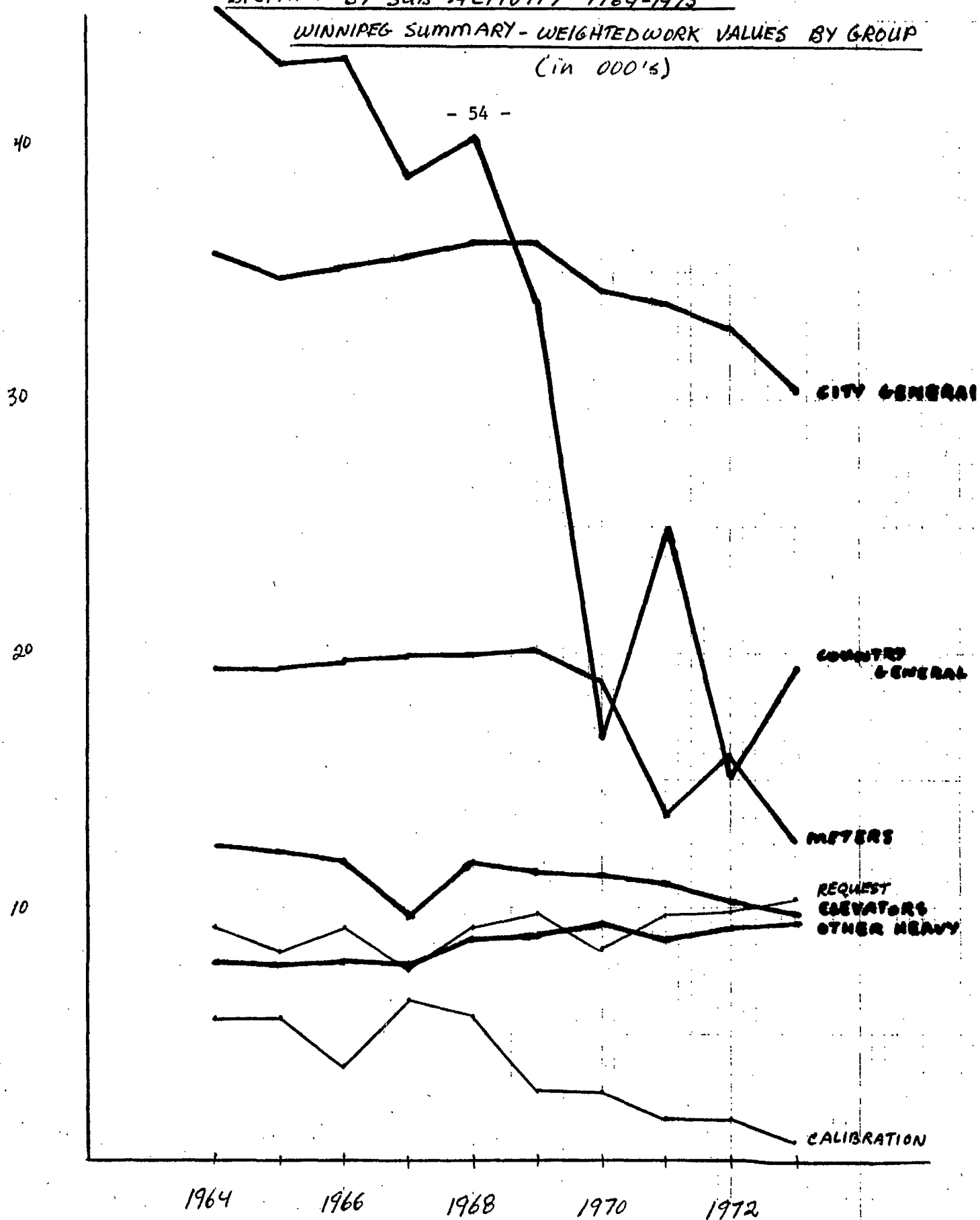


FIGURE 24: WEIGHTED WORK UNITS OF INSPECTION IN THE WINNIPEG DISTRICT BY SUB-ACTIVITY 1964-1973



Despite such obvious differences, however, the districts' experiences were similar in several respects. In every district other heavy duty work and request work were relatively stable, with increases virtually everywhere (except in Calgary where other heavy duty work dropped temporarily in 1972 and request work dipped slightly). In general, city general work maintained its 1964 level throughout the decade, although in Winnipeg it did slide 16% in the period. And, except in Alberta, virtually total inspections of grain elevators has been maintained: in Manitoba, 97% in both 1964 and 1973; in Saskatchewan, 99% in 1964 and 96% in 1973; in Alberta, 100% in 1964 and only 89% in 1973. (Percentages are based on a comparison of inspection statistics and Canadian Grain Commission figures on licensed elevators. The latter data is appended in Annex D.) Moreover, the phenomenon noted for the entire region, namely that declines in country general work and bulk meter work together constitute most of the decrease in production, is evident to varying degrees in each district: in Calgary, these two sub-activities accounted for 98% of the total net decline; in Edmonton, the figure was 72%; in Regina, 81%; in Saskatoon, 82%; and in Winnipeg, 74%.

4. THE TIMING OF DECLINES IN THE DISTRICTS

(a) Production

Examination of the graphs of production in each district measured by devices inspected and by weighted work accomplished (Figures 7 and 8) shows that particularly after 1968 the pattern of declines differed from one district to another. Table 31 details this information:

**TABLE 31: Evolution of Weights and Measures
Production by District 1964-1973**

(a) Calgary

Year	Number of Devices Inspected	% Change From Previous Year	Number of Weighted Work Units of Inspection	% Change From Previous Year
1964	17449		88329	
1965	18048	+ 3.4%	90496	+ 2.5%
1966	14785	-18.1%	80048	-11.5%
1967	17524	+18.5%	89111	+11.3%
1968	16607	- 5.2%	86111	- 3.4%
1969	14164	-14.7%	73980	-14.1%
1970	14388	+ 1.6%	79031	+ 6.8%
1971	10771	-25.1%	59147	-25.2%
1972	13252	+23.0%	64938	+ 9.8%
1973	9402	-29.1%	59976	- 7.6%

(b) Edmonton

Year	Number of Devices Inspected	% Change From Previous Year	Number of Weighted Work Units of Inspection	% Change From Previous Year
1964	29428		138194	
1965	28837	- 2.0%	139002	+ .6%
1966	26729	- 7.3%	132783	- 4.5%
1967	22669	-15.2%	116748	-12.1%
1968	23302	+ 2.8%	117186	+ .4%
1969	17126	-26.5%	100956	-13.8%
1970	15688	- 8.4%	77436	-23.3%
1971	16130	+ 2.8%	87573	+13.1%
1972	19662	+21.9%	96064	+ 9.7%
1973	21124	+ 7.4%	100961	+ 5.1%

(c) Regina

Year	Number of Devices Inspected	% Change From Previous Year	Number of Weighted Work Units of Inspection	% Change From Previous Year
1964	19955		94917	
1965	19445	- 2.5%	92128	- 2.9%
1966	18665	- 4.0%	86264	- 6.4%
1967	18422	- 1.3%	88827	+ 3.0%
1968	18006	- 2.3%	84551	- 4.8%
1969	16699	- 7.3%	82824	- 2.1%
1970	11491	-31.2%	60572	-26.9%
1971	10138	-11.8%	62052	+ 2.4%
1972	6231	-38.5%	38969	-37.2%
1973	8350	+34.0%	43936	+12.7%

(d) Saskatoon

Year	Number of Devices Inspected	% Change From Previous Year	Number of Weighted Work Units of Inspection	% Change From Previous Year
1964	22221		100639	
1965	21891	- 1.5%	100688	+ .1%
1966	20003	- 8.6%	91592	- 9.0%
1967	20136	+ .7%	92025	+ .5%
1968	19867	- 1.3%	93475	+ 1.6%
1969	16850	-15.2%	78758	-15.8%
1970	16605	- 1.5%	77291	- 1.9%
1971	14248	-14.2%	68875	-10.9%
1972	12227	-14.2%	64157	- 6.9%
1973	10073	-17.4%	52571	-18.1%

(e) Winnipeg

Year	Number of Devices Inspected	% Change From Previous Year	Number of Weighted Work Units of Inspection	% Change From Previous Year
1964	34328		136539	
1965	32846	- 4.3%	131422	- 3.7%
1966	34168	+ 4.0%	130948	- .4%
1967	31424	- 8.0%	125378	- 4.3%
1968	33851	+ 7.7%	131371	+ 4.8%
1969	32514	- 3.9%	123114	- 6.3%
1970	23449	-27.9%	101190	-17.8%
1971	25579	+ 9.1%	102260	+ 1.1%
1972	22361	-12.6%	92854	- 9.2%
1973	22759	+ 1.8%	91928	- 1.0%

The information in Table 31 does not conform strictly with the regional pattern in which 1969 and 1970 stand out as the years of greatest declines in Weights and Measures production. In each district one or the other of these year's production as measured by weighted work units declined by at least 14%; but only in Edmonton did the decline in both years exceed 7%. Moreover, Calgary's greatest decrease (25%) occurred in 1971; Regina's (37%) happened in 1972 and Saskatoon's (18%) took place in 1973. Whereas the Prairie total weighted work production decreased in every year but 1968, individual districts frequently fluctuated up and down. (17 of the 45 percentage changes from the previous year in weighted work accomplished recorded in Table 30 were increases.) It is also worth underlining the fact that there were often large differences between changes in production as measured by devices inspected and the same changes as measured by weighted work

accomplished. This observation reinforces the need to evaluate changes in the number of devices inspected with great care.

Similar differences in district evolution are also evident in the graphs of production in each district by sub-activity (Figures 15-24). The most striking example of this is the fact that the major declines in both country general work and bulk meter work, the two sub-activities which experienced the greatest decreases in the period, occurred at different times in each district. However, by comparison with the period after 1968, the years between 1964 and 1968 enjoyed comparatively stable production levels in each sub-activity, except in Calgary district. In general, data on both total production and production by sub-activity reveal major differences between districts in the timing of changes in production levels.

(b) Productivity

The most basic observation which emerges from a study of the statistics on changes in productivity by district, however it is measured, is that despite some brief, isolated increases there has been a steady decline in productivity in every district. Only the amount and the rate differs from one year to another and from one district to another. (See Figures 8-14 and Tables 32 and 33.) The figures produced when productivity is measured on a per man day basis are frequently very different from those which result when productivity is measured on a per man year basis because the simple man years ignore important fluctuations in time utilization, in sick leave and in training which show up in the man day statistics.

Therefore, in considering actual on-the-job productivity, the latter figures (Table 32 and Figures 10-14) are the more significant. Our brief analysis of the timing of productivity declines in each district will concentrate on them.

TABLE 32: Evolution of Changes in Productivity as Measured
Per Man Year Allotted to Inspection 1964-1973

(a) Calgary

Year	Devices Per Man Year	% Change From Previous Year	Weighted Work Units Per Man Year	% Change From Previous Year
1964	2908		14722	
1965	3008	+ 3.4%	15083	+ 2.5%
1966	2275	-24.4%	12315	-18.4%
1967	2337	+ 2.7%	11881	- 3.5%
1968	2076	-11.2%	10764	- 9.4%
1969	2023	- 2.6%	10569	- 1.8%
1970	2055	+ 1.6%	11290	+ 6.8%
1971	1608	-21.8%	8828	-21.8%
1972	1978	+23.0%	9692	+ 9.8%
1973	1446	-26.9%	9227	- 4.8%

(b) Edmonton

Year	Devices Per Man Year	% Change From Previous Year	Weighted Work Units Per Man Year	% Change From Previous Year
1964				
1965	3204		15445	
1966	2970	- 7.3%	14754	- 4.5%
1967	2519	-15.2%	12972	-12.1%
1968	2741	+ 8.8%	13787	+ 6.3%
1969	2141	-21.9%	12620	- 8.5%
1970	2037	- 4.9%	10056	-20.3%
1971	2016	- 1.1%	10947	+ 8.8%
1972	2313	+14.7%	11302	+ 3.2%
1973	2347	+ 1.5%	11218	- .7%

(c) Regina

Year	Devices Per Man Year	% Change From Previous Year	Weighted Work Units Per Man Year	% Change From Previous Year
1964	3501		16652	
1965	3241	- 7.4%	15355	- 7.8%
1966	3111	- 4.0%	14377	- 6.4%
1967	3070	- 1.3%	14805	+ 3.0%
1968	3001	- 2.3%	14092	- 4.8%
1969	2783	- 7.3%	13804	- 2.0%
1970	2298	-17.4%	12114	-12.2%
1971	1913	-16.8%	11708	- 3.4%
1972	1416	-26.0%	8857	-24.4%
1973	1670	+17.9%	8787	- .8%

(d) Saskatoon

Year	Devices Per Man Year	% Change From Previous Year	Weighted Work Units Per Man Year	% Change From Previous Year
1964	3704		16773	
1965	3774	+ 1.9%	17360	+ 3.5%
1966	3334	-11.7%	15265	-12.1%
1967	3356	+ .7%	15338	+ .5%
1968	3311	- 1.4%	15579	+ 1.6%
1969	2808	-15.2%	13126	-15.8%
1970	2768	- 1.4%	12882	- 1.9%
1971	2591	- 6.4%	12523	- 2.8%
1972	2108	-18.6%	11062	-11.7%
1973	1679	-20.4%	8762	-20.8%

(e) Winnipeg

Year	Devices Per Man Year	% Change From Previous Year	Weighted Work Units Per Man Year	% Change From Previous Year
1964				
1965				
1966				
1967	3207		12794	
1968	3563	+11.1%	13829	+ 8.1%
1969	3318	- 6.9%	12563	- 9.2%
1970	2605	-21.5%	11243	-10.5%
1971	2842	+ 9.1%	11362	+ 1.1%
1972	2600	- 8.5%	10797	- 5.0%
1973	2845	+ 9.4%	11491	+ 6.4%

**TABLE 33: Evolution of Changes in Productivity as Measured
Per Man Day of Inspection 1964-1973**

(a) Calgary

Year	Devices Per Man Day	% Change From Previous Year	Weighted Work Units Per Man Day	% Change From Previous Year
1964	16.6		84.1	
1965	16.5	- .7%	82.8	- 1.6%
1966	12.9	-22.1%	69.6	-15.9%
1967	12.5	- 2.5%	63.8	- 8.4%
1968	11.7	- 6.6%	60.7	- 4.8%
1969	11.1	- 5.5%	57.8	- 4.8%
1970	11.6	+ 4.5%	63.5	+10.0%
1971	9.6	-16.6%	53.0	-16.7%
1972	11.6	+20.5%	57.0	+ 7.6%
1973	8.7	-25.3%	55.4	- 2.7%

(b) Edmonton

Year	Devices Per Man Day	% Change From Previous Year	Weighted Work Units Per Man Day	% Change From Previous Year
1964				
1965	16.2		77.9	
1966	15.2	- 6.0%	75.5	- 3.1%
1967	13.2	-13.0%	68.0	- 9.9%
1968	14.0	+ 5.6%	70.2	+ 3.1%
1969	12.1	-13.3%	71.3	+ 1.6%
1970	13.2	+ 9.3%	65.3	- 8.4%
1971	12.2	- 7.6%	66.3	+ 1.5%
1972	13.4	+10.0%	65.6	- 1.0%
1973	13.1	- 2.5%	62.6	- 4.7%

(c) Regina

Year	Devices Per Man Day	% Change From Previous Year	Weighted Work Units Per Man Day	% Change From Previous Year
1964	20.6		98.0	
1965	19.9	- 3.2%	94.5	- 3.6%
1966	19.6	- 1.9%	90.4	- 4.3%
1967	18.1	- 7.3%	87.4	- 3.3%
1968	16.3	-10.1%	76.6	-12.4%
1969	15.6	- 4.4%	77.3	+ .9%
1970	13.0	-16.4%	68.7	-11.1%
1971	12.1	- 7.0%	74.2	+ 8.0%
1972	8.7	-18.5%	54.2	-18.0%
1973	9.3	+ 7.3%	48.9	- 9.7%

(d) Saskatoon

Year	Devices Per Man Day	% Change From Previous Year	Weighted Work Units Per Man Day	% Change From Previous Year
1964	23.0		104.2	
1965	22.7	- 2.4%	104.3	+ .1%
1966	20.4	- 9.9%	93.6	-10.3%
1967	21.1	+ 3.4%	96.6	+ 3.2%
1968	19.7	- 6.4%	92.8	- 3.9%
1969	17.9	- 9.1%	83.8	- 9.7%
1970	18.3	+ 2.3%	85.4	+ 1.9%
1971	17.7	- 3.7%	85.6	+ .2%
1972	14.1	-20.6%	73.7	-13.8%
1973	13.7	- 2.6%	71.4	- 3.2%

(e) Winnipeg

Year	Devices Per Man Day	% Change From Previous Year	Weighted Work Units Per Man Day	% Change From Previous Year
1964				
1965				
1966	18.4		70.7	
1967	17.6	- 4.8%	70.0	- .9%
1968	17.6	-	68.1	- 2.7%
1969	17.2	- 2.2%	65.0	- 4.6%
1970	14.3	-16.7%	61.7	- 5.1%
1971	15.7	+ 9.7%	62.7	+ 1.6%
1972	15.0	- 4.5%	62.2	- .8%
1973	15.2	+ 1.6%	61.5	- 1.2%

(i) Calgary

In Calgary district, although the greatest decline in productivity (16.7%) occurred in 1971 in conformity with the regional pattern, the second and third greatest decreases (15.9% and 8.4%) both occurred much earlier, in 1966 and 1967. Moreover, both before and after 1971's large drop, Calgary experienced its only two increases in productivity (10.0% in 1970 and 7.6% in 1972). Otherwise the district had moderate or small annual decreases.

(ii) Edmonton

In the case of Edmonton district, the greatest productivity decline was in 1967 (9.9%), and the 1970 decline was somewhat smaller (8.4%).

During the rest of the period small increases offset similar decreases until 1973 when the third largest decrease occurred (4.7%).

(iii) Regina

The course of productivity declines in the Regina district is dominated by large decreases in alternate years from 1968 to 1972 (12.4% in 1968, 11.1% in 1970 and 18.0% in 1972). Although modest increases occurred in 1969 (.9%) and 1971 (8.0%), 1973 broke the pattern with a further 9.7% decline. Before 1968 there were steady small declines in each year.

(iv) Saskatoon

In the Saskatoon district there were increases in production in 4 out of the 9 years studied (.1% in 1965, 3.2% in 1967, 1.9% in 1970 and .2% in 1971). However, these small improvements were swamped by substantial decreases in 1966 (10.3%), 1969 (9.7%) and 1972 (13.8%). Lesser decreases were sustained in the other years (1968 and 1973).

(v) Winnipeg

The Winnipeg district's record is characterized by persistent, but relatively small, declines in productivity. The largest decreases by far were in 1968 (4.6%) and 1969 (5.1%). Only 1970 witnesses a minute increase (1.6%).

5. CONCLUSION

It is clear from the above analysis that whatever the subject studied, there were significant differences in the experience of each district.

This implies that global explanations for the region's decline in Weights and Measures productivity cannot be adequate if they are inconsistent with the different history of each district.

III WHY HAS PRODUCTIVITY DECLINED?

A. Introduction

The foregoing analysis has shown that productivity in the Weights and Measures Activity declined in every district, although to varying extents. We have further estimated that for the region as a whole, productivity as measured by weighted work accomplished per man day of inspection reported decreased by approximately 19% between 1967 and 1973. However, this estimate ignores several ways in which the Weights and Measures Activity has changed over the past decade. Certain of these factors could be quantified and included in our calculations if we had complete and reliable statistics. Because we have been forced to rely on partial or questionable statistics regarding these changes, we have deferred discussion of their impact until now. As will be seen, the inclusion of these factors in our assessment leads us to lower our estimate of the decline in the Weights and Measures Activity's productivity during the period. Although it is impossible, given the lack of complete statistics, to establish the precise impact of each of these changes, we shall nevertheless analyze the available information in order to assess their influence on productivity. Clarification of their effects will also constitute a partial explanation for the 19% decline in productivity alluded to above. After we have dealt with these matters, which are essentially qualifications of our overall

estimate, we shall turn to other issues which may more properly be called explanations of whatever decline in productivity may have occurred. Finally, we shall relate the general analysis to the various district experiences.

B. Qualifications

1. Special Investigations and Short Weight Work

Special investigations are undertaken in response either to consumer complaints or to suspicions aroused by the results of routine inspections. Unfortunately, no reliable statistics are available which would allow us to determine whether the investigation of consumer complaints has or has not become an increasing burden for the Weights and Measures staff. Experienced personnel, however, are generally convinced that the volume of consumer complaints requiring investigation has probably increased under the Department of Consumer and Corporate Affairs. On the other hand, no one has argued that these constitute a significant increase in workload.

Balancing this, it appears that there are now fewer prosecutions than there were nine or ten years ago. Again comparison is hampered by a lack of statistics. In 1973, for example, there were only three prosecutions in the Prairies under the Weights and Measures Act whereas in 1965, there were seven without including any Winnipeg district may have had (there is no record), and in 1964, there were eight in Edmonton district alone. In addition to the poor statistics on the number of prosecutions undertaken nine or ten years ago, we also have no way of comparing the amount of time and effort required to prepare cases for prosecution at different times. On balance, however, the evidence suggests that any changes in the amount of

special investigation work undertaken in the region has had a negligible effect on productivity.

Not so for short weight work. The available figures show a general decline (Table 34):

YEAR	D I S T R I C T S					PRAIRIE REGIONAL TOTAL
	CALGARY	EDMONTON	REGINA	SASKATOON	WINNIPEG	
1964						
1965			750	930		
1966		650	764	402		
1967		307	725	364		
1968		255	547	320		
1969	216	73	409	347		
1970	173	-	109	157		
1971	33	-	79	92	469	673
1972	109	223	30	87	286	735
1973	82	303	65	56	190	696

TABLE 34: Short Weight Inspections by District 1964-1973

In 1973, approximately 700 short weight inspections were carried out requiring about 30 minutes each to complete. In 1967, approximately 3000 such inspections were conducted requiring only about 20 minutes each. (This estimate is based on the actual totals for Edmonton, Regina and Saskatoon plus the recollection of experienced staff of about 1000 in Winnipeg and 500 in Calgary.) By converting these figures into weighted work units (5 minutes = 1 unit), it will be seen that short weight work declined by approximately 8000 weighted work units from 12,000 in 1965 to

4200 in 1973. This represents a further productivity decline in the order of 1% between 1967 and 1973. (See Annex E for the derivation of this estimate.)

2. The Capacity of Devices

Some Weights and Measures officials have argued that changes in the capacity of certain classes of devices may have increased the length of time required to inspect them. To the extent that such changes occurred it would be misleading to apply to an affected class of devices the same weight throughout the decade under study. Indeed, study of the district records of heavy duty device inspections reveals that there have been large increases in the average capacity of such devices. In Winnipeg district, for example, the average capacity of heavy duty scales rose from about 40,000 lb. in 1964 to about 57,000 lb. in 1973, a 43% increase. Even in Saskatoon district, where the smallest change occurred, the average capacity rose from 35,000 lb. in 1964 to 43,000 lb. in 1973, an increase of 23%. However, these increased capacities could have little effect on inspection times if no equipment was available with which to test the larger scales. The decisive factor in the time required to inspect a heavy duty device, therefore, is the available equipment, not the device's capacity.

In some cases, especially on the four-section truck scales common at large urban factories, the extended length of the scale platform makes it possible to build up the test load close to the scale's capacity by using other vehicles in addition to our heavy duty truck. Naturally, such a procedure could be very time-consuming. In general, however, it does not

seem plausible to suggest that increases in the capacity of heavy duty devices have directly forced any substantial change in the time required for their inspection.

Examination of district records also shows an increase in the average capacity of tanks brought in for calibration. In general, if the capacity of a tank increases, then more time must be spent pumping in extra fluid to test that capacity. This problem has been acute in the Regina district where a great proportion of the large tanks for the whole country are manufactured. The average capacity of tanks calibrated in the Regina district grew from 3500 gallons in 1968 to 6500 gallons in 1973, and the average number of markers installed in each tank increased from 7.4 in 1968 to 14.8 in 1973. In other districts, however, this problem has either not arisen (as in Winnipeg, where the average capacity increased only marginally, from 1250 gallons in 1967 to 1300 gallons in 1971), or it has been overcome by better technology (as in Calgary and Edmonton, where a 70-gallon per minute pump has replaced a 50-gallon dump method.) Although the problem of increased capacity of tanks brought in for calibration has been serious in one district, we estimate that this change could not have meant more than a $\frac{1}{2}\%$ increase in the overall productivity of the Weights and Measures staff in the Prairie Region. (Refer to Annex F for the derivation of this estimate.)

3. The Quality of Inspections

Using the same weights throughout the ten years covered in this study to measure the work accomplished by the Weights and Measures Service implies that the time required to inspect each particular class of device

remained unchanged throughout the period. This was not necessarily the case. No attempt was made to build this fact into the weighted work statistics by using different weights in different years because it was considered impossible to determine with any reliability the precise change in inspection time from one year to the next. However, the aggregate effect of changes during the period in the time required to inspect particular classes of devices must be analyzed.

Aside from the isolated examples already cited, there is no inherent reason why inspections for most classes of devices should require significantly more or less time in 1973 than they did in 1964. However, for large capacity weighing devices inspected by a heavy duty weight truck (class 16, class 17, class 15, 9/10 of class 14 and about 1/2 of class 12), changes in the quality of inspections have had an important effect on the time required for inspection. In this case, "quality" refers primarily to the testing of scales as close as possible to their capacity. Such a thorough inspection is necessary since a scale might work perfectly well within one range, but still be subject to errors over tolerance beyond that range. Although the change in inspection policy which stressed "quality" over fees collection was the result of a headquarters initiative signalled by the purchase of more modern and adequate capital equipment beginning in the middle sixties, most field personnel in the Prairie Region welcomed the new emphasis. Not limiting its involvement simply to the acquisition of better equipment, Standards Branch also made its interest in "quality" unmistakably clear by the stream of detailed memoranda specifying proper inspection methods and

discussing problems long ignored which poured out to the field beginning in 1965. While the fees were still important to most District Inspectors, the headquarter's new orientation encouraged them to tell their inspectors to take the time to do a thorough inspection. Although these developments allowed inspectors to certify devices with greater assurance of their reliability, they also necessarily increased the time required for heavy duty inspections.

Although the particulars of timing varied from one district to another, heavy duty scale inspections in the Prairie Region generally passed through three stages between 1964 and 1973. Early in the period, between 1000 and 3000 lb. of loose 50 lb. weights were unloaded by wheeled weight carts at each scale. This method permitted the inspection of 7 to 8 grain elevators per day, according to experienced inspectors. By the late sixties, generally ten 1000 lb. weights or weight baskets were unloaded from the larger trucks then in service. At this time, it is estimated that 6 to 7 grain elevators could be inspected per day. By the early seventies, three districts were using a 20,000 lb. truck and 21 one thousand pound weights with a hoist for unloading. This equipment reportedly permits only 5 to 6 grain elevator inspections per day.

Logically such improvements in the "quality" of inspections should be reflected in higher rejection rates for the affected device classes. These rates are set out in Table 35:

YEAR	D I S T R I C T S									
	CALGARY		EDMONTON		REGINA		SASKATOON		WINNIPEG	
	Class 16	Class 17	Class 16	Class 17	Class 16	Class 17	Class 16	Class 17	Class 16	Class 17
1964	19%	19%			7%	11%	16%	19%		
1965	19%	15%	17%	16%	7%	8%	19%	11%	16%	5%
1966	19%	21%	17%	14%	12%	13%	11%	14%	21%	7%
1967	27%	24%	23%	13%	27%	21%	11%	6%	23%	15%
1968	20%	16%	22%	20%	14%	22%	10%	8%	24%	12%
1969	16%	12%	19%	14%	12%	16%	9%	17%		
1970	15%	10%	20%	16%	13%	16%	7%	10%		
1971	17%	15%	26%	21%	18%	15%	6%	12%	18%	13%
1972	11%	14%	23%	20%	18%	16%	15%	17%	16%	11%
1973	18%	19%	25%	15%	18%	19%	22%	17%	16%	7%

TABLE 35: Rejection Rates for Heavy Duty Devices
in Prairie Region 1964-1973

In general, significant increases in rejection rates do correspond with the introduction of superior inspection equipment. (A full summary of the timing of the introduction of new heavy duty inspection equipment in each district is provided in Annex G.)

In Calgary, for example, the jumps in rejection rates for both class 16 and class 17 devices jibe with the acquisition of a 19,000 lb. truck carrying 10,000 lb. of weights (replacing a hired 12,000 lb. truck carrying 2,000 lb. of weights). A further equipment improvement in mid-1972 (20,000 lb. truck with 21,000 lb. of weights) also was accompanied by higher rejection rates in 1973. In Regina, access for only one month to a 20,000 lb. truck with 21,000 lb. of weights in 1967 was paralleled by doubled rejection

rates. In 1973, Saskatoon experienced high rejection rates after the district was forced to borrow a 15,000 lb. vehicle carrying 11,000 lb. of weights from Edmonton for two months in addition to the usual one month visit of Winnipeg's 20,000 lb. truck with 21,000 lb. of weights as a result of an accident with the lighter hired vehicles. Indeed, that district's Acting District Inspector noted in a letter to the Regional Supervisor dated August 31, 1973:

W.T. 4 (the 20,000 lb. truck carrying 21,000 lb. of weights) spent part of the month in our district, and preliminary reports would again point out the greater advantage of the heavier test trucks. We had a rejection rate of 44% on all truck scales tested with W.T. 4. This compares with 18% for our two hired vehicles.

In Winnipeg, the high rejection rates of 1966-1968 match the introduction of a 20,000 lb. with 21,000 lb. of weights shared only 3-4 months of the year. And in Edmonton, the pattern is consistent since the high rejection rates in 1967 and 1968 coincide with the introduction of full-time heavy equipment in 1967. Moreover, Edmonton's consistently high rejection rates in the 1970's may reflect the fact that that district is best endowed with heavy test trucks, a 20,000 lb. truck carrying 21,000 lb. of test weights and a 15,000 lb. truck carrying 11,000 lb. of test weights. The declines in rejection rates which generally followed within a year or two of the introduction of better equipment are quite reasonable since it is to be assumed that one or two rejections for errors in the higher ranges would spur the owners to greater vigilance in maintaining their scales.

As we have noted, these advances in the "quality" of inspections were bought at the price of lengthier inspections, necessitated both by the

greater time required to remove more weights and to move them about to test positions, and by the greater care in assessing the results implied by "taking the time necessary to do a good job." Even if we consider only the minimum estimated decline in daily production in the period, from the minimum daily number in the middle sixties (7) to the maximum daily number in the seventies (6), there has been a drop of 1 elevator in 7 per day, or 14%. We estimate that this movement to increased time for higher quality heavy duty inspections, which cannot fairly be considered a loss in productivity, can account for 2½% of the approximate total decline in the Prairie Region Weights and Measures Activity between 1967 and 1973. (Refer to Annex H for the derivation of this estimate.) Naturally, if we were to go beyond the minimum estimate of the drop in the number of inspections possible because of improvements in quality to the difference between the maximum in the middle sixties (8) and the maximum in the seventies (6), this factor alone could account for 5% of the total productivity decline.

4. Travel

We noted in our explanation of the weighting system adopted for this study that no allowance was made in its formulation for travel. And yet travel is obviously a decisive variable in determining how much time is available for inspection, particularly given the itinerant nature of most of the Weights and Measures work. Some Weights and Measures personnel have argued that increased travel in recent years has in part accounted for any

decline in productivity. This opinion, however, is not borne out by the available facts.

Unfortunately, these facts are incomplete. A full record of miles travelled by government and hired trucks and personal autos is available for Regina from 1964 to 1973, for Saskatoon from 1965 to 1973 and for Winnipeg for 5 years during the period (Table 36):

YEAR	D I S T R I C T S		
	REGINA	SASKATOON	WINNIPEG
1964	83859		
1965	82671	97196	
1966	80502	100883	189417
1967	83275	86939	157595
1968	90633	90145	161516
1969	76652	83653	141422
1970	63873	68779	
1971	49776	62073	
1972	42475	67778	117309
1973	44934	62672	

TABLE 36: Total Miles Travelled by Weights and Measures Staff in Regina, Saskatoon and Winnipeg Districts 1964-1973

For Edmonton district we have figures on total miles travelled by government or hired vehicles during the period, but information on private auto mileage is limited to the fiscal years 1970-71 to 1973-74. For Calgary, we have only incomplete data covering private auto mileage for the fiscal years mentioned above. None of this information contradicts the clear trend of the figures in Table 36: travel has declined in the Weights and Measures

Activity over the past decade. We also should note that air travel is on the increase in Winnipeg and Edmonton districts. In Winnipeg, the number of flights related to inspections increased from 0 in 1970-71 to 14 in 1973-74; in Edmonton, the figure went from 0 in 1971-72 to 22 in 1973-74. Since most of these trips are to remote areas, the savings in time permitted by air travel cannot be considered an increase in productivity because these trips would probably not be undertaken on any other basis.

There is no reliable way to measure what effect these changes may have had on productivity. We have no way of comparing how efficiently inspectors completed their itineraries in any two years. However, the major cause of the decline of ground travel seems indisputable. The Weights and Measures staff, in the way that work has until now been organized, must make at least three circuits of their territory: once to inspect the heavy duty scales, once for general work and once to do bulk meters. Reinspections, request inspections and propane work also necessitate extensive travel. Nevertheless, since as we have seen in our study of production by sub-activity that country general work and bulk meter work absorbed the greatest part of the total decline in production, it is hardly surprising that travel has fallen off sharply in at least three districts. It is also significant in this regard that Regina district, which experienced the most precipitous decline in country general work, should have the greatest decline in travel.

Although this explanation allows us to understand the decline, it does not provide us with a way to evaluate its impact on productivity. If less time is spent travelling, there ought to be more time available for inspections. Hence, on a common sense basis, we may argue that if it were

possible to subtract travel time from the man day figures for each year used in calculating productivity, the decline in productivity between 1967 and 1973 would be greater than our estimate of 19% which ignores travel. This is because the greater mileages for the early years of the period (1964-1969) would lessen the man day figures for those years relatively more than for the seventies when there was less travelling. Because these relatively lower divisors (man day figures) would therefore be used with unchanged dividends (production figures) in the early period, relatively larger productivity figures would result for those years. Consequently, both the difference between the beginning and the end of the period and the percentage change would be greater than the 19% estimated without taking account of travel. To attempt to estimate the magnitude of such a change would be pure guesswork, however.

5. Request Inspections

An increase in the frequency and inconvenience of request inspections has also been perceived by many Weights and Measures staff as a reason for a decrease in the number of inspections carried out per man day. Request inspections may take many forms, but the most onerous and disruptive are those made in response to the urgent appeal of contractors engaged in road construction, frequently at points far distant from the district headquarters. Most other request inspections take place within the headquarters area or can be worked into routine inspection schedules. The Weights and Measures supervisors' solicitousness in responding promptly to requests for inspection of contractors' scales is caused by their awareness that provincial

authorities will not permit gravel deliveries made on uninspected scales to be accepted. Without a scale inspection, therefore, there would be costly delays in road construction. The contractor's inability to predict the timing of his inspection needs is based on such unpredictable factors as weather conditions.

In order to handle these requests, the District Inspector must either go himself, or send someone on an often long trip from the headquarters area, or he may ask an inspector who happens to be in the area to do the inspection. Particularly in the latter two cases, work patterns are disrupted and many routine inspections must be foregone in order to handle the request inspection. Inspectors have sometimes arrived at the site after a long drive before the scale was even ready for inspection because, until the new fees schedule was introduced on August 1, 1974, it was very inexpensive to make an inspector wait. Obviously an increase in this type of work could explain some drop in productivity as we have measured it.

Except in the case of the Winnipeg district, however, there is no evidence that request inspections constituted a greater burden in the early seventies than they did in the middle sixties (Table 37):

**TABLE 37: Statistics on Contractor Scale Request Inspections
by District in Selected Years 1964-1973**

Year	Number of Trips	Estimated Total Time		Average Time Per Trip (in hours)
		Hours	Days	
<u>WINNIPEG</u>				
1973	176	976	130	5.5
1971	175	1024	137	5.8
1969	98	462	62	4.7
1967	114	539	72	4.7
1965	122	545	73	4.5
<u>REGINA</u>				
1973	49	266	35	5.4
1972	35	190	25	5.4
1971	67	336	45	5.0
1970	73	327	43	4.5
1969	58	264	35	4.6
1968	98	475	63	4.8
<u>SASKATOON</u>				
1973	81	449	60	5.5
1971	65	278	37	4.3
1969	99	429	57	4.3
1967	83	331	44	4.0
<u>CALGARY</u>				
1973	38	322	43	8.5
1972	42	238	32	5.7
1970	66	363	48	5.5
1969	59	370	49	6.3
1968	57	453	60	8.0
1967	53	430	57	8.1
<u>EDMONTON</u>				
1972	104	840	112	8.0
1969	89	772	103	8.7
1966	123	1230	164	10.0

NOTE 1: These figures are based on the certificates segregated by all districts into Block "C" which included all contractor scale inspections but no other request inspections.

NOTE 2: For Winnipeg, Regina, Saskatoon and Calgary districts, the estimated total time for these inspections in each year is based primarily on the times recorded on the backs of most certificates as a basis for assessing the fees payable. In cases where this figure was missing, the District Inspector estimated the time on the basis of the fees paid, or the location of the scale where a flat-rate fee was paid. For Edmonton district, which reported total mileage, the estimate was constructed by:

- (a) subtracting air miles from total miles,
- (b) dividing ground miles by 300 to yield an approximate number of travel days,
- (c) adding to this figure one day for each air trip, and
- (d) adding 1.5 hours per inspection for actual inspection time.

In most districts, then, although the average time required for a request inspection appears to be increasing, the actual number of such inspections is not rising. As noted, the exception is Winnipeg district where nearly twice as much time is now required to service request inspections as was needed in the middle sixties, primarily as a result of recent extensive road construction in northern Manitoba.

While the figures in Table 37 are of sufficient reliability to establish trends, we feel that any quantitative estimate based on them of the effect of changes in the time needed to complete request inspections would be arbitrary. Because only one district shows a substantially greater effort on request inspections in recent years and the other districts show either a decline or stability in the total time required for such inspections, we would argue that the overall effect on regional productivity was

probably not great either way in the decade between 1964 and 1973. This does not suggest that request inspections do not constitute a formidable challenge in resource management for District Inspectors, but only that except in Winnipeg district the problem is no worse now than it was in the middle sixties.

There is another way in which productivity could be affected. In the past it was common in many districts for the District Inspector or his Assistant to handle virtually all request inspections. For example, in Saskatoon district in 1967, these two officials carried out 67 of the 83 request inspections in that year; in 1973, however, the District Inspector was on sick leave much of the year and his Assistant handled only 22 of 81 request inspections. To the extent that the District Inspector gave up clerical work to do the request inspection, the destructive effects of such work on productivity were minimized. If it is now more common to use inspectors, then the effect must be greater than is evident in simple statistics on request inspections completed. This is a highly speculative point, however, since district supervisors may also have given up routine inspections to satisfy some contractor.

6. Administrative Work and Reporting

The supervisory administrative load at the district level has increased significantly over the past decade, particularly since the advent of the Department of Consumer and Corporate Affairs. Although the District Inspector lost responsibility for his local operating funds, his financial role did not end since he was charged with preparing his budget and authorizing expenditures. To the extent that the introduction of Consumer Consultants encouraged complaints and enquiries, there were new questions to deal with and investigations to conduct. As part of a matrix management system there were more people to write to him whether for line or functional purposes requesting information or opinions. Perhaps most important, after years of stability in the Weights and Measures Activity, the late sixties and early seventies brought many changes. Reporting systems, collective bargaining, revenue systems, a new Weights and Measures Act and Regulations, and the lengthy discussions which accompanied them all required assimilation and comment from the District Inspector, as well as effort in helping his inspectors cope with the changes. Finally, with the old scheduling methods breaking down because it was no longer possible to complete the annual inspection cycle, the District Inspector was more and more forced to spend considerable time juggling schedules and resources in order to maximize production in the circumstances.

These new and expanded activities forced the District Inspector to become less a senior inspector and more a real manager. In Winnipeg and Edmonton at least, the job has become much too big for even one man's full time. And so in those districts much of the Assistant District Inspector's

time has also been diverted from inspection to administration. Whether or not this work might be more efficiently accomplished is not here at issue; the fact is that administration has progressively absorbed more and more supervisory time in the Weights and Measures Activity. This accounts in part for the differences which exist in the pattern of changes in productivity between productivity when measured per man year and when measured per man day which has already been noted. Variations in training and extended sick leave account for the rest. (Refer to Annex I for data on time utilization in each district with the District Inspector's time deleted.)

There is a second way in which administrative or clerical work has come to claim more inspection time. During most of the period the inspectors themselves were responsible for completing:

- (a) certificates and rejection tags
- (b) daily reports of equipment inspected and revenue collected
- (c) daily itineraries
- (d) travel claims
- (e) short weight reports
- (f) monthly vehicle reports

As a result of a study on Weights and Measures Reporting, a pilot reporting system was introduced in September 1972. As the basis for this system, the traditional certificates were changed to permit the coding of certain information for later electronic data processing. The use of codes to describe error conditions, type of device and so on initially necessitated a much greater length of time in order to complete the certificate properly. Incidentally, it created a new need for extensive auditing by district clerical staff. And new information, such as an estimate of the product value passing over a scale for use in calculating inequity, was demanded.

This required more time either to ask the store manager or to formulate an educated guess. The new certificate also cut down the space available for rejected devices to one, thereby forcing more certificates to be written where more than one device was rejected in the same store. Every Weights and Measures inspector agreed that whatever its merits the new Reporting System caused them to spend more time completing their inspection certificates. Estimates ranged between twice and three times as long as formerly. It was planned that the new certificates would replace the inspector's daily report of equipment inspected and revenue collected, thereby partially offsetting the increased time required to complete the new certificates. As of January 1, 1974, however, inspectors in every district still completed the old report in some form.

This change in the time required to complete the new certificates could account for a decline in productivity of as much as 4½%. (Refer to Annex J for the derivation of this estimate.) Although our estimate may rest on disputable assumptions, there can be no doubt about the basic point: that the advantages of the new Reporting System were purchased at a cost in the productivity of time spent on inspections.

7. Disappearance of Devices

To some extent the decline in country general work is a result of the disappearance of devices. Throughout the Prairies, but especially in Saskatchewan, small rural towns have been declining and with them the businesses which make use of weighing and measuring devices. Until the Statistics Canada Survey of Retail Trade based on the 1971 Census is available, it will

not be possible to know the exact amount of this loss. Although it is true that medium-sized towns and cities have been growing at the same time, it is by no means clear that the new supermarket in a regional town will have as many devices requiring inspection as the ten village general stores which it replaced. If it is the case that some, but not all, the devices needing inspection have disappeared in many small towns, then productivity would be adversely affected. This is because non-productive travelling time would remain unchanged, but it would be spread over fewer devices.

We were able to get accurate figures on one indicator of rural vitality: the post office. Throughout the Prairies, the number of post offices maintained outside the district headquarters cities has dropped markedly during the period (Table 38):

YEAR	ALBERTA	MANITOBA	SASKATCHEWAN	PRAIRIE TOTAL
1964		651		
1965	881	656	1126	2663
1966		642	1080	
1967	807	608	1069	2484
1968		597	1041	
1969	721	547	1004	2272
1970		519	965	
1971	651	496	851	1998
1972		492	770	
1973	638	494	765	1897

TABLE 38: Number of Post Offices in the Prairie Region 1964-1973
(Excluding Winnipeg, Saskatoon, Regina, Edmonton and Calgary)

Note: This information was provided by officials of the Delivery Requirements Units of the Postal Districts concerned.

Aside from the obvious decline in devices needing inspection represented by this data, a change over program carried out by the Post Office department has also lowered that number still further. Gradually the post office's traditional equal arm balances complete with seven counterweights has been replaced by a table platform scale. This switch alone accounts for the disappearance of approximately 18,000 class 01 weights across the region between 1964 and 1973.

The extent of the disappearance of devices in rural Saskatchewan is remarkable according to the testimony of inspectors in that province. For example, some entire towns which formerly required two or even three days' work have now been left without a post office, store or railway station. There is no way to calculate the importance of these changes for productivity in the Weights and Measures Activity. To the degree that devices in the country have disappeared country travel on general work must be less productive. The effect of these changes may not have been too great, however, since as we have already observed country general work has dropped seriously in nearly every region.

8. Overtime

In attempting to find a reason for the large differences between the percentage declines in productivity experienced in the two Saskatchewan districts and those which occurred in the other three districts, we discovered in overtime another important qualification. It will be recalled that all our productivity calculations were completed on the basis of man years allotted to inspection or man days of inspection reported. In fact, these

figures do not include all of the time which was expended on inspection.

Before the introduction of collective bargaining in the Public Service, overtime work played a much larger role in work patterns than it does now. In those days overtime took two forms. Saturdays, Sundays and holidays worked were formally recorded in Ottawa and generally compensated by equal time off, usually in the winter. Compensation for time worked during regular working days in addition to the standard $7\frac{1}{2}$ hours was administered by the local District Inspector. As might be supposed, custom varied from one district to another. In Winnipeg, Edmonton and Calgary, compensation for this latter type of overtime nearly always took the form of quitting early from time to time, or perhaps taking a half-day off for some specific purpose. In Saskatoon and Regina, however, long hours were worked during the summer for the specific purpose of saving up time off in the winter when it was bitterly cold and hard to travel.

Our interest in this subject began with the revelation that the days taken off in the winter to compensate for overtime were recorded as clerical days, in keeping with the definition that a clerical day was one on which no certificates were written. This made no difference to the accuracy of the total of inspection days reported in the case of days taken in return for Saturdays, Sundays and holidays worked because these days were recorded as inspection days when they were originally worked. However, time taken off in return for odd overtime hours worked on normal working days was a problem. By the method of locally adjusted overtime, days which really represented inspection work done were recorded as clerical days. This practice was most common in Regina and Saskatoon. The importance of this fact

is that the number of inspection days reported in those two districts in the years before the introduction of collective bargaining were inaccurate, being too low. As a result, the productivity figures for those years must be artificially high and the decline which we have calculated must be exaggerated.

The data on which to base an assessment of the magnitude of the inaccuracy of inspection days reported is flawed in two ways. In the first place, because it is very onerous to wade through those itineraries which are still available counting overtime hours, we only have figures for selected years. Second, we cannot be certain of the meaning of the data we do have because we do not know how accurately the itineraries were kept, and we do not know whether the inspectors may have taken off the odd hour on their own authority without reporting it. It appears that the District Inspectors may have assumed this since the inspectors usually did not get as much locally adjusted leave as their reported overtime would seem to justify.

Bearing these problems in mind, however, it is clear that much more overtime was worked before collective bargaining than now, and that relatively more overtime was worked in Regina and Saskatoon than in the other districts (Table 39):

YEAR	CALGARY		EDMONTON		REGINA		SASKATOON		WINNIPEG	
	Regular Overtime	Saturday Overtime	Regular Overtime	Saturday Overtime	Regular Overtime	Saturday Overtime	Regular Overtime	Saturday Overtime	Regular Overtime	Saturday Overtime
1965				83			150	40		
1967	50.5	12	108				171			
1968				61						
1969					114			8		
1973	6.5		72	34	35		33	7	67	

TABLE 39: Overtime in Selected Years by District 1965-1973 (In Man Days)

Note: Blank spaces mean information is not included. No information is available for Regina before 1969 or for Winnipeg before 1971. Information for 1965-1969 is taken from studies of the inspectors' daily itineraries. Information for 1973 is taken from the inspectors' attendance reports. Except for Edmonton and Saskatoon, the Regular Overtime figure in 1973 includes any Saturdays worked.

Although figures are not available for Regina district before 1969, a former senior inspector in that district reports that each man received two to three weeks of locally adjusted overtime leave each winter in addition to his leave in compensation for Saturdays worked. With six on the Regina staff, this means that at a minimum, 60 to 90 days worth of overtime were accumulated on regular working days during the years before collective bargaining. Indeed, so firmly was this tradition entrenched in the Regina district that 114 days of such overtime was worked and at least partly compensated by locally adjusted overtime in 1969, that is, after such practices were theoretically abolished by the first collective agreement for the TI group signed in 1968. In view of this, it seems likely that the actual overtime before 1969 must have been greater than the 60 to 90 days worth for which time off was received in compensation.

It is very regrettable that we do not have sufficient data to allow us to incorporate overtime into the man days of inspection in order to ensure the accuracy of our productivity figures. In the case of Saskatoon, we did recalculate productivity for 1967 and 1973. By including the overtime days in both years (excluding overtime Saturdays which were already counted as inspection days), we estimate that productivity in that district declined by only 17% between 1967 and 1973 instead of the 26% included in Table 19. The change in man days of inspection for this one district can account for 1½% for the total regional decline in productivity in the period. (Refer to Annex K for the derivation of these two estimates.) We can only assume that the effect would be much greater if the drop in overtime in all districts could be reliably ascertained and included in our calculations.

9. Weekends

We also notice from Table 39 that in the two districts for which we have figures, the number of Saturdays and holidays worked has declined sharply. In Edmonton, the decline has been 49 between 1965 and 1973; in Saskatoon, it has been 33. The importance of this change lies in the fact that whenever the number of weekends spent in the field decreases, inspection time is lost to travel. When it was common to stay in the field on the weekend, Friday afternoon and Monday morning were fully devoted to inspection. But with the decline of this practice which is indicated in Table 39 and corroborated by the verbal evidence of individual inspectors, a substantial part of both Friday afternoon and Monday morning became unproductive. Every time this happened as much as a whole man day was lost. Some Weights and

Measures staff maintain that even when they did go home for the weekend before unionization, they travelled on their own time. If this is true, then the impact on productivity of new travel norms was even greater than the simple increase in weekends spent at home would indicate. Because our data is so very limited on this point, we are unable to gauge the effect of these freer travel rules on Weights and Measures productivity. The direction of the effect is clear, however: the greater the decline in the number of weekends spent in the field, the greater the decline in productivity which may be attributed to this cause.

C. Changing Standards

Many of the factors analyzed in the previous section which account for a large part of the Prairie Weights and Measures Activity's total productivity decline between 1967 and 1973 were the result of changes in government policy. To the extent that this is the case the declines must be accepted by departmental management as of the government's own making.

The Public Service Staff Relations Act passed in 1967 opened the door to unionization throughout the Public Service. Whatever the merits of this decision, one of the results of collective bargaining in the Weights and Measures Activity was a change in the standards which inspectors applied to their work.

The first union contract for the TI group, which came into effect in July 1968, required that all overtime must be reimbursed either in time

off or money at a time-and-a-half rate. The Department's response was to instruct District Inspectors to restrict the amount of overtime permitted so that the budgets would not be exceeded. Locally adjusted overtime was naturally discontinued. Gradually this new policy led virtually every member of the Weights and Measures staff to say to himself that without the pay to which his contract entitled him, there would be no more overtime. We have already noted the importance of this change in some districts.

Before collective bargaining, it was also the custom for many inspectors to do whatever paperwork they were responsible for on their own time in their hotel rooms after supper. This amounted to perhaps ten or twenty minutes per day. Again the new consciousness created by unionization which encouraged both sides to adhere strictly to the contract's terms slowly led these inspectors first to wonder why they were wasting their own time on government business, and second, to cut the practice out. We should note that both the overtime and the filling out of forms on the inspector's own time were partly a result of an attempt to reduce the boredom of many evenings spent alone in a hotel room. Naturally, the advent of free television in the motels was a further reason to end the practice of working outside of government time.

As part of the new standards resulting from unionization, the travel regulations were changed as well. Under the new rules, 150 miles of travel was deemed to constitute half a day's work and 300 miles, a whole day's. Although inspectors have generally not followed these rules literally, they have eliminated many of the marathon one-day request inspection trips to some isolated point which used to be undertaken from time to time.

Moreover, as we have noted, the greater freedom allowed to inspectors in the field to return home on the weekends has taken its toll in production.

We have also discussed the change in the "quality" expected of inspections of heavy-duty devices. That this was a result of departmental policy is evident in the purchase of the requisite equipment and in the numerous memoranda circulated by the Chief of Weights and Measures in which the technical problems of inspections were discussed and care urged on the inspection staff. Similarly, the entire Weights and Measures Reporting study which has culminated in part in the new certificate was obviously a departmental initiative. In part also the increase in the administrative load for the district supervisors which we discussed above is a result of departmental policy to delegate more responsibility to the district level, to introduce a matrix organization which multiplies necessary contacts and to encourage consumer complaints and enquiries whose resolution demand extra time.

In the previous section we analyzed several ways in which the Weights and Measures Activity has changed over the past decade that were not taken into account in the original estimate of a 19% decline in the Activity's productivity between 1967 and 1973. We argued that changes in special investigations and request inspections had a negligible effect on productivity. A decline in short weight work, however, was estimated to worsen the decrease in productivity by about 1%, and the decline in travel was considered to have had a further negative, but indeterminate effect on productivity. On the other side of the ledger, increases in the capacity of devices were viewed as accounting for $\frac{1}{2}\%$ of the productivity decline,

improvements in the quality of inspections for 2½ to 5%, the new certificates for 4½%, the lessening of overtime for well over 1½% of the decrease and the drop in the number of weekends spent in the field for a further unquantifiable proportion of the decline in productivity.

Combining all these estimates, we would argue that the regional decline in Weights and Measures productivity between 1967 and 1973 which cannot be directly accounted for by changes in official policy is at most somewhere between 8% and 12%. We suggest such a wide range because of the large margin of error introduced, particularly by the fact that the influence of a number of the factors we have analyzed cannot be quantified even in a shaky way. Moreover, we have not included in the assessment the reported switch from doing paperwork on inspectors' time to doing it on government time because, unlike the other factors, this one rests purely on verbal evidence. We have no doubt, however, that it is a factor of real importance. In conclusion, we maintain that about half of the decline in productivity sustained between 1967 and 1973 stemmed directly from changes in government policy.

D. Morale

Whenever the question of the decline of Weights and Measures productivity is discussed, the issue of morale comes readily to the fore. Some might suggest that the discontinued practice of doing paperwork outside of government time or travelling on one's own time imply a decline in morale. This is true in one sense, but it seems likely that even the most devoted and enthusiastic inspector would gradually have changed his customs in accor-

dance with the new standards officially established for public service. We wish to use the term "morale" more narrowly, limiting its meaning to the pride, self-confidence and feeling of well-being with which inspectors carried out their work, whether or not they were willing to donate their own time to the government.

Traditionally, the Weights and Measures Service was a major component of the Standards Branch of the Department of Trade and Commerce. The Service was isolated from the rest of the public service, rarely coming into contact even with their fellow Inspectors of Standards, the Electricity and Gas men. Each district was largely autonomous within the Service as well; indeed, so long as the reports and revenues flowed into Ottawa at the expected rate, the District Inspector was free to administer his district as he saw fit. For the inspector, the routine varied little from one year to the next; once he was given his expense cheque at the end of one month, he was expected to be on the road more or less continually until the end of the next. And although the small town hotels were shabby and the evenings alone boring, there was a real esprit de corps which made it all seem worthwhile. For some, the routine may have become mindless and, for others, the loneliness of the road may have bred alcoholism; but for the majority, the variety, the travel, the mechanical detail and the comraderie with the "customers" on the job were sources of pride and satisfaction.

In 1965, a new Chief of Weights and Measures was appointed. To most Weights and Measures men, John Armstrong was a breath of fresh air. Here was a man who stopped talking about fees; instead he sent out a steady

stream of memoranda on how to inspect devices more professionally. Through his initiative, new equipment was acquired such as heavy-duty test trucks which would permit greater quality in inspections. Moreover, the new Chief proved his interest by visiting the districts frequently and by answering any query sent to him. Regional supervisory staff felt that he listened to them when they brought suggestions or problems to his attention. Such was the respect with which his efforts were held that the memoranda he sent to the field between 1965 and 1969 are still prominently available in every District Inspector's office. In 1969 Mr. Armstrong resigned; to this day his position has not been filled.

At about the same time, a series of shocks undermined the morale of the Weights and Measures Service. First, as a result of the introduction of collective bargaining, their positions were reclassified, generally downward. Second, the Factory Pre-Pack program which had been built up between 1965 and 1968 was transferred to the Products Activity and the program itself came to a standstill. Third, the impression was created that the new Department of Consumer and Corporate Affairs, to which the Weights and Measures Service was assigned in 1968, was considering phasing the Service out of existence altogether.

We shall not attempt to trace the full, tortured history of what is known as the "reclassification crisis". The basic intention of lessening the number of bargaining units by combining classification groups was reasonable enough. And in view of the fact that no one's salary was cut in dropping from an Inspector of Standards 3 to a Technical Inspector 2, there seemed little to complain about. However, there were three problems:

1) Electricity and Gas men who had always had the same classification as Weights and Measures men generally came out one grade higher; 2) TI-2's could not compete for promotion to supervisory positions, whereas IS-3's could; 3) the distinction between those who had passed the qualifying examination as an IS-3 (often after several attempts) and those who had not was abolished. In all of this the point is not so much what happened, as how it happened. The years of uncertainty which plagued men generally too old to look elsewhere had a devastating impact on morale, particularly in the larger districts. In Edmonton, for example, the great increase in clerical days reported in 1970 is almost totally attributable to the time used debating the situation or trying to draft a new job description. And in the end, the solution implemented, whereby those whose work largely involved heavy-duty devices were made TI-3's, was not really satisfactory either. It succeeded in placating the staff, but it forced a reversal of the traditional pattern of work whereby new men worked on the heavy-duty trucks as their introduction to the Service and the more experienced men handled the general and meter work. To some it seemed that the solution stressed the brute force aspect of Weights and Measures work rather than rewarding the experience and insight gained over the years.

Although the transfer of the Factory Pre-Pack program (including 2 man years in Winnipeg and 1 in Calgary) to the Products Activity in 1968 may have been very logical, it was resented by the Weights and Measures staff. They felt that they had built up an effective program and saw no reason why they could not have continued to handle it successfully. The resentment turned into bitterness when that program was curtailed, presumably in

anticipation of the adoption of more appropriate legislation.

Both this transfer of control and the handling of the reclassification crisis seemed to the Weights and Measures staff to be part of a larger and more sinister problem. The Activity's field leaders felt that the new Department's senior management considered the Weights and Measures Service unimportant. Having no spokesman in Ottawa to keep them informed and disillusioned by the troubles outlined above, the rumor spread that the Department planned to discontinue the Weights and Measures Service. While it was entirely reasonable for the new Department to submit the programs which it inherited to a scrutiny so thorough that their very continuation was apparently challenged, it was very damaging to the morale of the field staff for such analysis to proceed indefinitely unresolved. A striking example of the extent to which the Activity's self-confidence was undermined is one District Inspector's reply to a request by a member of the Weights and Measures Reporting study for specification of the kind of information he needed to do his job. Instead of mentioning rejection rates or time utilization, the D.I. listed only four items:

1. reliable information on the importance attached to Weights and Measures by the Department's senior management
2. what manpower will be available
3. the limits of his jurisdiction
4. how Weights and Measures will mesh with other departmental activities.

Or again, events and policies innocently conceived by autonomous authorities within the Department assumed in the field the appearance of a co-ordinated

assault. Thus, for example, the circulation of new disciplinary procedures in the midst of the reclassification crisis was viewed by many Weights and Measures staff as a thinly veiled threat.

With the resolution of the reclassification problem in 1971, morale began to improve. Many inspectors and supervisory staff appreciated the extent to which the new Department brought them into contact with other Activities. For some, their promotion to TI-3 was something they had given up hope for under the old examination system. More weekends home and better travel allowances were obviously popular. The lessening of the District Inspector's formerly arbitrary powers pleased most inspectors. And decentralization was well received because it made relatively senior management accessible and familiar to field staff. But the problem of morale was far from over. If the future of Weights and Measures now seemed assured, vague plans for using sampling procedures were viewed as ill-considered. Throughout the studies on a Weights and Measures Reporting System, the Weights and Measures supervisors were frustrated in that they felt that their ideas were listened to but not heard. And when changes were introduced, they felt that the new procedures' superiority had not been proven to them.

Meanwhile a new crisis was emerging: no longer was it possible to complete device inspections within one year. As the Activity's staff was frequently reminded, "productivity" fell steadily. Because the District Inspectors could not do everything, they had to choose what to let slide. But there was little guidance forthcoming. Without a Chief of Weights and Measures and with other Standards Branch officials preoccupied with preparing

the Regulations for the new Act, they were left to follow their own opinions. To some extent the priorities of elevator work and city general work presented themselves as the obvious choices; but all the District Inspectors felt guilty that they were not covering their other work. Without the satisfaction of knowing they had completed their work, and without any assurance that they had made the correct choices given the circumstances, morale suffered among the D.I.'s. It was poignantly ironic, moreover, that at the very time when Weights and Measures men had begun congratulating themselves that they had succeeded in abolishing slipshod inspection techniques, there began the charges that productivity was falling off inexplicably. It was depressing that precisely when they felt that they had achieved a new plateau of professionalism, their superiors seemed bent on maligning their integrity by hinting that they must be slacking off. No action was ever taken against the Weights and Measures staff, but the Activity seemed to have descended into a sort of limbo into which few new resources could be poured and from which there seemed no way to escape.

We would argue, therefore, that the morale problems of the Weights and Measures Activity have been sufficiently serious to account for most of the remaining decline in productivity of about 8% to 12% which is unexplained by changes in government policy.

E. Explanation of the Timing of Declines and Declines by Sub-Activity

In commenting on the timing of declines in productivity as measured by weighted work units per man day of inspection (Table 12) we remarked that the decreases were fairly regular, ranging from 2% to 6% per year. Although

it is impossible to say with certainty what are the reasons for the rates calculated for each year, we can say that they are consistent with the explanations provided above for Weights and Measures productivity decline. In general, we would argue that the declines in the period between 1965 and 1968 were mainly a result of improvements in the "quality" of inspections, between 1969 and 1971 to morale problems, the disappearance of unreported overtime and new travel practices, and between 1972 and 1973 mainly to changes in the time required to complete the new certificates. However, factors such as morale and an end to doing paperwork in the hotel and unreported overtime may be expected to have affected productivity gradually. Indeed we suspect that there may have been a kind of delayed reaction in the impact of morale issues on productivity. In the midst of the crisis the main effect may have been to increase the number of clerical days, as in Edmonton. But once the crisis passed, the disillusion would have its diminishing effect on productivity. This may help explain why the greatest productivity decline is not in 1970 or 1971, but rather 1972.

The timing of declines in productivity as measured by weighted work per man year allotted to inspection seems to follow a different logic. The fact that the greatest declines in productivity measured in this second way occurred in 1969 and 1970 may be a result of the fact that it was in these two years that the trend to spending a larger proportion of available time on clerical work first became evident in most districts. (Note that before 1969, some of the clerical days reported particularly in Regina and Saskatchewan districts was really leave taken in compensation for inspection overtime.) 1969 was also the first year that the Factory Pre-Pack inspectors

count not be counted upon to do some inspections. (Their work is counted in the reported man days, but not in the total regional man years listed in Table 4.) Moreover, the decline of unreported overtime and changes in travel customs would have had their maximum effect at this time.

The pattern of decline by sub-activity is even more consistent with our explanations. As we have seen, Elevator work, Other heavy duty work and City general work have all remained stable, while Country general work, Bulk meter work, Calibration work and Propane work have all declined by 1973 to half or less of their 1964 level. City general work has been maintained because it has always been done in the winter without reliance on overtime, or staying out in the field on weekends. Nor have the classes of devices which comprise City general work changed much in capacity or in the type of inspection needed to verify them. Elevator work has been kept up because the Canadian Grain Commission has insisted on it. Other heavy duty work has been kept up primarily because it forms part of the weights trucks' itinerary and because of the belief that high values of goods pass over such scales. The Request work has increased because requests have gone up and priority was given to satisfy them.

By contrast, the other groups have declined because with the decline in man years available in some districts and the decline in productivity there was simply not enough time to complete them. Country general work and Bulk meter work were neglected in favor of Elevator work. In Regina, for example, where Elevator work accounts for 45% of the total weighted work accomplished, and such work can only be done for about 8 months of the year, there is hardly much time left in the summer to share between Bulk meter work

and Country general work. Calibration work has declined partly also through a lack of suitable facilities particularly in Winnipeg. Propane meter work was consciously cut in half in 1969 by a decision to do only half the meters each year. In general, therefore, it was the sub-activities which depended for their completion on overtime, working weekends in the summer and the high morale needed to make an extra effort to clean up each town, but were not protected by any lobby, which declined in response to the decrease in Weights and Measures productivity.

F. Explanation of the Declines by District

We have shown previously how there were significant differences between the districts in the timing and magnitude of the productivity declines experienced. With some allowance for local factors, the regional explanations advanced for the decline in Weights and Measures productivity are fruitful in accounting for those differences. The most striking anomaly is the wide range in the size of the productivity declines by district between 1967 and 1973 as measured by weighted work units per man day of inspection, which ranged from 44% in Regina to 8% in Edmonton according to the figures presented in Table 20. However, these differences are exaggerated by the unqualified figures in Table 20 because certain of the changes during the period in the Weights and Measures Activity which were outlined earlier had their greatest impact in the two districts in which the productivity declines were particularly large, Saskatoon (26%) and Regina (44%).

Our research indicates that changes in special investigation work, short weight work, travel, request inspections and administrative and

reporting work had a comparable effect on each district. The one exception might be request inspections in the Winnipeg district, which have approximately doubled in their impact there over the past few years. When we turn to the other factors which were analyzed above, such as changes in the capacity of devices, the disappearance of devices, the "quality" of inspections and overtime and weekend customs, the effects were greatest in the two Saskatchewan districts. We have already seen in the section on overtime how it was the custom in Regina and Saskatoon before collective bargaining to work extra hours in the summer in return for locally adjusted overtime leave which was recorded as clerical time in the winter, whereas this procedure was used only sparingly in the other districts. In the case of Saskatoon, we estimated in Annex K that the effect of the loss of this overtime after collective bargaining (Table 39) could account for about 9% of the 26% decline sustained by the district between 1967 and 1973. Although no statistics are available for the Regina district before 1969, we know from the testimony of the staff that two to three weeks worth of locally adjusted overtime leave was commonly given in the district before collective bargaining. We can only assume that some proportion of Regina's total decline comparable to the 9% in Saskatoon can be accounted for by the end of locally adjusted overtime. It is also a well known fact that rural Saskatchewan has been depopulating at a rate unmatched in most of the rest of the country. Accordingly, we may assume that the disappearance of devices from the rural areas was most pronounced in those two districts. On the other hand, the effect of this may not have been much felt because the country general inspections declined so drastically in those districts in the period.

It may also be that the drop in weekends worked during the period was greater in these two districts in view of the fact that Saturdays worked have fallen off much more completely in Saskatoon than in Calgary or Edmonton (Table 39). We cannot be certain if the same was true of Regina. Also, because heavy duty devices constitute such a great proportion of the total workload in the two Saskatchewan districts (53% in Regina and 51% in Saskatoon in 1973 compared with 20% in Winnipeg, 25% in Edmonton and 29% in Calgary), it is reasonable to assume that the improvements in the "quality" of these inspections introduced during the period would have had a relatively greater impact in these two districts.

Two other local peculiarities in these two districts deserve notice. As we have already noted, the capacity of tanks calibrated in the Regina district has grown from 3,500 gallons in 1968 to 6,500 gallons in 1973. We estimate that this change means that Regina's productivity decline in weighted work units per man day of inspection was approximately 42% between 1967 and 1973 rather than the 44% recorded in Table 20. (See Annex L for the derivation of this estimate.) In Saskatoon, inspectors began double inspections of truck-mounted bulk meters in 1969 because these meters are regularly used to sell two products. We estimate that this new policy means that Saskatoon's productivity decline in weighted work units per man day of inspection was approximately 19% between 1967 and 1973 rather than the 26% recorded in Table 20. (See Annex M for the derivation of this estimate.)

By combining the various extenuating factors, we can see that the decline in productivity in the Saskatoon district between 1967 and 1973 was fully comparable to that in the Winnipeg, Calgary and Edmonton districts.

However, even after such considerations the decline in the Regina district remains very high, probably between 25% and 30%. (This estimate does not include those factors referred to above which applied more or less equally to all districts.) It should be noted that fully half of this decline occurred during the year of 1972 alone. But this observation leads us to our final problem, the differences among the districts evident in the timing of productivity declines. We shall treat each district separately. No attempt will be made to explain every wiggle of the productivity graph; instead, we shall concentrate on the major features of the pattern, particularly those not easily accounted for by our overall regional explanations.

1) Calgary

In Calgary district, the large decline in productivity in 1966 and the large increase in 1970 seem to contradict our general explanations for the regional productivity declines (Table 33-a and Figure 10). These phenomena are the result of a factor unique in Calgary. In 1966 the district became responsible for the annual inspection of all propane meters in Western Canada, which tied up one inspector for eight months per year. Because of the extensive travelling required to service these widely scattered devices, productivity for the one man assigned out of the six man staff had to fall drastically. In 1970, however, it was decided to inspect only half of the propane meters, thus freeing about four man months for more productive assignments. The large decrease in 1967 is probably a result of the fact that Calgary was without a District Inspector for almost half the year. Our discussion of the morale problems associated mainly with reclassification explain the sharp productivity decline in 1971 and the crisis' resolution

may account for the next year's increase.

ii) Edmonton

In the Edmonton district, the large decline of 9.9% in 1967 (Table 33-b and Figure 11) is primarily attributable to the introduction of the new 20,000 lb. WT-5 weight truck carrying 21,000 lb. of weights. Not only did the greater quality in heavy duty inspections which this equipment permitted slow inspectors down, but this particular truck was a source of continual mechanical difficulties which also lessened efficiency. During the period 1969 - 1971, the deleterious effects of the reclassification crisis were mainly felt in Edmonton in a sharp decline in the proportion of time utilized for inspections (Table 18-b). In this case, therefore, the weighted work per man year figures which show a productivity decrease of 8.5% in 1969 and 20.3% in 1970 are more significant. The most recent decline (4.7% in 1973) is mainly due to the time required to complete the new certificates.

iii) Regina

Regina's large drop in productivity in 1970 (11.1%) may be attributed to the reclassification crisis and even more to the decline of the custom of locally adjusted overtime, which we have seen continued in the district at least until 1969 (Table 33-c and Figure 12). Most of the declines in 1966 and 1967 probably result from improvements in the quality of heavy duty inspections. This may partly explain 1968's decrease (12.4%); but we have no explanation for the magnitude of that year's change. Nor can we fully account for 1972's massive drop (18%). We do know that there was a three or four month hiatus between the retirement of one District

Inspector and the arrival of his replacement during that year. And we do know that the district was seriously short-handed (See Table 15). It may be that being reduced to a corporal's guard so limits a district's flexibility that the staff is reduced to darting from crisis to crisis. Or it may be that too many disruptions in one year (a new District Inspector, a new Assistant District Inspector, training of a new inspector and extended special leave for one inspector) in a small district make it difficult for the staff to settle down to routine work. Basically, however, we are reduced to conjecture in explaining at least two large productivity declines in the Regina district.

iv) Saskatoon

In Saskatoon, we would attribute the large decline in productivity in 1969 (9.7%) to the end of locally adjusted overtime (Table 33-d and Figure 13). Reclassification was not a crisis for Saskatoon. Because nearly all of its staff were Inspectors of Standards 2, only one man was demoted. And we must assume that the productivity increases in 1970 and 1971 were a result of the morale boost experienced when the entire inspection staff was promoted to the TI-3 level because of their deep involvement in heavy duty inspections. The decline in 1966 (10.3%) was no doubt largely a result of the switch to unloading 3T. of weights for heavy duty inspections instead of the 1T. commonly used in previous years. We were unable, however, to find any convincing explanation for the abnormally large decrease in productivity that occurred in 1972 in that district (13.8%).

v) Winnipeg

The Winnipeg district's only relatively large declines (4.6% in 1969 and 5.1% in 1970 according to Table 33-e and Figure 14) were clearly associated primarily with the reclassification crisis. The fact that 1966 and 1967 do not show a larger decline as a result of an increase in the "quality" of heavy duty inspections is probably a result of the fact that such inspections constitute a comparatively small proportion of Winnipeg's total work (14% in both years according to Annex N). In general, the Winnipeg district seems to have absorbed changes in the Weights and Measures Activity remarkably well.

vi) Conclusion

Although we were unable to account for what happened to Weights and Measures productivity for each year in every district, nevertheless, nothing emerged from this analysis to contradict the general explanations we advanced to account for the pattern of changes in the Activity's regional productivity between 1967 and 1973.

IV THE FUTURE: WHERE WILL THE DECLINES LEVEL OUT?

A. Why Have the Declines Persisted?

We have argued in our explanation of the decline in productivity in the Prairie Weights and Measures Activity between 1967 and 1973 that in different periods there were different causes which provided the dynamic for the continuing decline. Between 1965 and 1968, the main cause was an increase in the quality of inspections; between 1969 and 1971, morale problems and the changes in working standards brought about by collective bargaining; in 1972 and 1973, the new certificates were the basic factor operative. These changing reasons for productivity decline are themselves an explanation for the persistence of the decreases. As one cause exhausted its effect, it was replaced by another.

Another psychological reason for continuing declines may be suggested. For so long the Weights and Measures staff knew exactly what it had to do: inspect every weighing and measuring device once per year. But once it was no longer possible to fulfill this mandate, what was expected of them then? To do their best in the circumstances. But what does that mean? We suggest that once their old target became manifestly unattainable, then it did not matter particularly what proportion was missed, especially in the absence of any but the vaguest externally determined expectations. Besides, there was no real yardstick to measure achievement by. The Weights and Measures staff knew that comparing the number of devices inspected from one year to the next was of doubtful meaning, and fees had long since been in disrepute as a measure of work accomplished. Without a goal and without a yardstick there was little to do but soldier on in the midst of the confusion.

And confusion there has been. Every District Inspector tells the same story of being reduced to responding to crises, and juggling his resources accordingly from week to week. Of course, the District Inspectors very conscientiously draw up plans every year. But they do not seem to work out. In general, the plans seem to be modifications of the pattern that was followed in the years when most, if not all of the District's potential was inspected. But in the new circumstances of changed work standards and lower morale, these plans designed for another era are no longer adequate.

In short, productivity has continued to decline in part because there has been no well thought out plan by which to achieve the goal of improving productivity. Everyone has been left to find his own solution; but the exigencies of the moment have thwarted any long range planning by the District Inspectors. And, as we argued above, specific causes for decreasing productivity have succeeded one another throughout the decade.

B. What Can Be Done?

In the course of our study, several ideas have emerged on action which might be taken to improve productivity in the Weights and Measures Activity:

1. Improving Morale

Although all of our suggestions could improve morale if they were implemented, some matters are especially relevant to that goal. As we have shown above, the Activity has been plagued by an unhealthy lack of self-confidence arising from uncertainty about the Department's attitude towards

its value. In order to counter this tendency, it will be necessary for senior departmental officials to reassure the members of the Activity that their efforts are indeed appreciated and that the Department considers the inspection of weighing and measuring devices to be an essential component of its program of protecting all those who buy and sell in the marketplace. Such reassurance should include a full and frank discussion of the role which both sampling and universal inspection will play in the future of the Activity. It might also involve publicity explaining to the public the service performed by the Activity. And it must bring an end to the aura of disrepute which has surrounded Weights and Measures as a result of the decline in the number of devices inspected. If it is true as we have argued, that fully half of the Prairie Region's decline in productivity between 1967 and 1973 was a direct result of changes in government policy, and that the remaining half was at least in part a consequence of the government's handling of the Activity, then there is no room for innuendo. Most of this decline must be accepted as a datum from which we may now build. Furthermore, Treasury Board must be convinced of this fact, particularly since collective bargaining and changed travel rules were results of its policies.

Moreover, no more changes should be introduced into the administration of the Weights and Measures Activity unless their value is first proven to a large majority of the staff. At present, the Weights and Measures Reporting System goes largely unused partly because the supervisors do not know how to use it, but partly also because they are not convinced that it is an improvement over what they had before. In any such studies, the staff must be brought along step by step to an understanding and acceptance of the

innovation. Otherwise it will be ignored as far as possible.

Finally, if the decline in productivity which we have experienced in recent years can be halted, then serious consideration should be given to returning to the Weights and Measures Activity major responsibility for short weight work, particularly in retail stores. The argument that the Consumer Products Inspector ought to handle this because he is in the store is important. But the Weights and Measures inspector is there too; and it would enhance the interest and variety of his work if he could be given a primary role in this field. The argument that Weights and Measures inspectors should not be given more responsibility because they cannot handle their existing tasks would of course be weakened if the Activity could maintain or increase its productivity in a year or two. Besides, since the Consumer Fraud Protection is blessed by the fact that there is no obvious number by which to measure its work, we really have no idea what its productivity has been like.

2. Program Redesign

Continual focus on the unresolved issue of declining productivity has distracted attention from the serious gaps which have emerged in the Weights and Measures program. As we have shown, at precisely the moment when Treasury Board has authorized new resources for the Consumer Fraud Protection Activity in order to extend its work into the countryside, the Weights and Measures Activity has been forced to beat a strategic retreat from stores outside the major centres. Nor will the two-year cycle alleviate this problem in all districts. In Saskatoon and Regina, mandatory elevator

inspections constitute so great a proportion of their existing workload that there will still be little time left for country general or bulk meter work. Or consider calibrations. At present, only a tiny proportion of trucks requiring calibration are called in by the Activity. Is this sub-activity to be pursued or abandoned? Even the provision of suitable calibration bays will not solve the problem if there is no staff to handle the load. These problems must be analyzed and an answer provided to the District Inspectors so they need not guess what priorities they should follow. For this purpose a full-time Chief of Weights and Measures is urgently needed. The Volumetric and Gravimetric specialists and the approvals engineers have been very helpful; but someone is needed to provide the Activity with unified technical leadership. This requirement is all the greater as the difficulties of metrification drift closer.

3. Formalizing Expectations

We have maintained that a psychological barrier to improved productivity has arisen whereby in the absence of being able to complete all their potential work, the Districts have fallen back on doing their best. The problem with this formula is that it is too vague; by definition it is always achieved no matter what production is accomplished. We propose instead that formal goals should be agreed upon in advance between the District Inspector and his Regional Supervisor. These goals ought to be very specific in two ways: 1) they should be set individually for each of the sub-activities we have defined (or some equivalent meaningful sub-unit of the total program) and they should include goals for short weight and special investigation work;

2) they should spell out as far as possible what part of the goals are to be achieved in each quarter of the year. This latter provision would allow both the District Inspector and the Regional Supervisor to monitor progress and perhaps to take timely remedial action if some part of the program is falling behind.

Naturally these would have to be realistic goals formulated in the light of available resources and the peculiar characteristics of each District. And, naturally, there will be unforeseen problems such as illness or mechanical failure which will sabotage the plans. In such circumstances, the District Inspector and the Regional Supervisor could agree on modifications to the plans.

Some may argue that such goals could encourage a return to the sloppy habits associated with maximizing revenue collection in the past. Although this tendency may be partly offset by the goals' specificity, it is nonetheless a real problem. This merely underlines the need for the goals to be attainable. In any case, this danger seems less serious for the Activity's future than the present drift to lower productivity. Only by clearly stating expectations and defining a plan of action can this trend be reversed. Establishing the goals by sub-activity also has the advantage of focusing everyone's attention on the program tradeoffs which presently only the District Inspector must face with immediacy. And the purpose of monitoring by the Regional Supervisor is to avoid blithely proceeding through the entire year and missing the achievement of a goal through some cause which might have been rectified if it had been identified early enough.

4. Improving the Tools

One problem which this study has not addressed is whether the manpower and equipment resources currently available to the Weights and Measures Activity are being everywhere utilized to their best advantage. Chances are that they are not. Of course, the District Inspectors are trying; but practically none of them has had much training in management and none of them has much time for theorizing or designing alternatives. As we have observed, present scheduling methodology appears to be based on the practices current six or seven years ago when completion of each District's full potential was more or less possible. Particularly now with the two-year cycle, new approaches are in order. Should the Weights and Measures staff make three circuits of their territory to cover meter work, heavy duty work and general work? Or should some of these activities be combined in view of the wastage of time involved in redundant travelling? Should the Weights and Measures staff always jump to service contractors' request inspections, or should they make the petitioners wait until it is convenient to meet their request? Should these inspections be done by interrupting men on the road, or by sending a floater out from the headquarters? To what extent should winter work be restricted to the headquarters area? These and similar questions deserve specific analysis through another study since it may be possible through improved scheduling to achieve greater productivity with the existing resources.

Another study which ought to be undertaken is the preparation of resource requirements forecasts according to some method accepted by Treasury Board, Field Operations Headquarters and all the Regions. Only on the basis

of such a predetermined method can the Program Forecast for Weights and Measures be placed on a solid footing. Such a method would undoubtedly require some weighting system so that work loads could be fairly compared between districts, rather than on the relatively meaningless basis of the total number of devices to be inspected. Moreover, a serious effort would have to be made to ascertain the real potential for each district. The figures hastily produced this summer could not be more than educated guesses under the circumstances.

Serious consideration should also be given to changing the distinction which exists between TI-2's and TI-3's. At present, particularly in the smaller districts, it is impossible to observe the distinction whereby TI-2's are restricted to light work. TI-3's should instead be more experienced TI-2's. Surely a man deserves to be recognized and rewarded for his superior training and insight into metrology and not primarily for lugging weights about. Such a change would introduce a much needed flexibility into scheduling.

Care must be taken to provide adequate equipment for inspections. Currently, the Prairie Region is in dire need of proper calibrating facilities, of heavy duty test trucks for Saskatchewan and of equipment to test anhydrous ammonia and liquid fertilizer meters and truck mounted gravity meters. Provision of this equipment would not reduce inspection times; but it would increase the inspectors' confidence in certifying the devices affected. And this sense of accomplishment could only help morale and hence affect productivity positively.

With metrication fast approaching, orders must be placed now for

the new metric inspection equipment which will be required. The Weights and Measures Activity's usefulness in the changeover will be severely impaired if inspectors must rely on improper equipment and conversion tables. And morale can only suffer if the Activity is expected to bear a major role in the transition without being given suitable equipment. Skepticism on this point is widespread among inspectors, particularly in view of the frequent failure of inspection stickers and seals to arrive on time. The importance of providing these materials on time cannot be stressed too much. Aside from the obvious program restrictions which follow from the non-availability of essential tools, this situation is construed by field staff of proof of disinterest in their program by the headquarters. This feeling is intensified because of the inadequacy of the stickers in their eyes. Since the stickers usually fade into illegibility or will not stay stuck for very long, their presence becomes even more invisible to the general public than it must necessarily be. And because the color is not changed from year to year it is often difficult to persuade a merchant that the faded sticker on his scale was indeed issued last year. So time may be lost arguing. In short, without adequate tools available on time the job cannot be done properly.

5. Improving the Skills

Training must be an important priority both for the District Inspectors and for the inspectors in the Weights and Measures Activity. For the District Inspectors, instruction is necessary in how to use the printouts from the Weights and Measures Reporting System, in how to forecast resource requirements and in effective scheduling, if any viable alternatives can be

devised through further study. At present, most District Inspectors view the Reporting printouts as interesting but useless. They must be shown how the information gathered by the new system can be profitably put to use in their districts. And training will also be necessary to explain to the District Inspectors how to utilize whatever suggestions may result from studies into resource forecasting and scheduling. Without this vital training link, the studies will not have any impact other than confusion.

For regular inspectors, the major training needs are: 1) the requirements of the new Weights and Measures Act and Regulations, and 2) the procedures to follow in preparing a prosecution. The training in these subjects must be carefully planned and professionally presented. Reading out the regulations with a commentary is not enough; the inspectors want to know in a systematic and assimilable way what their duties and powers are and how they should go about fulfilling and exercising them.

C. The Future

We believe that productivity in the Prairie Weights and Measures Activity can be made to increase rather than decrease in the coming years, although there will undoubtedly be a further decline in 1974 as a result of dislocations caused by the training of new staff. There are major obstacles, admittedly. For example, the new Heavy Duty Device Monitoring System which requires new reports to be completed for those heavy duty device inspections will slow inspectors down. The new Weights and Measures Regulations, particularly the new limits of error, have yet to be assimilated by the inspection staff. And full-time large heavy duty test trucks remain to be introduced

in the Saskatchewan districts. Moreover, the great unknown of metrication looms ominously on the horizon. There is no way to predict what temporary and permanent effects this changeover will have on the Weights and Measures Activity's productivity.

But there are hopeful possibilities. Morale has hit a low point and is generally much improved since 1971. The inspection staff members seem ready to become enthusiastic if they are given the support, leadership, equipment and training which they need. Few inspectors will do their paperwork or much of their travelling on their own time; but then the declines in productivity associated with the demise of these customs have already been absorbed. In all the districts, and especially Winnipeg, new staff have been taken on this year. By next year it seems reasonable to expect that these younger men will have sufficient training to make a substantial contribution. And the prospect of replacing a number of the regional supervisory personnel who will be retiring in the next few years should provide an incentive to the staff. Further, the development of a method of setting and monitoring specific expectations for each district's annual production as part of a strategy to improve productivity should assure an attainable focus for the Activity's efforts. Such a plan would replace the sense that if the job cannot be completed, then the proportion achieved is not crucial. Finally, the newly proclaimed two-year cycle means that a full completion of statutory requirements should be within the grasp of most districts, which will be a boon to morale.

The prospects must not be overestimated, particularly in view of the uncertainties associated with metrication. But we are convinced that the implementation of policies similar to those outlined in the previous

section, together with perhaps a few extra man years, particularly in the Saskatchewan districts where grain elevators constitute so large a proportion of the total work load, should make it possible at least to level out the downward trend in Weights and Measures productivity in the Prairie Region.

V. CONCLUSION

The argument presented in this report on the basis of our study of productivity in the Weights and Measures Activity in the Prairie Region between 1964 and 1973 may be summarized as follows:

1. The number of devices inspected in any given year is not a reliable measure of Weights and Measures production. A weighting system based on the time required to inspect each class of device provides a superior alternative.
2. Measured by means of weighted work units, Weights and Measures production in the Prairie Region declined by 37% in the decade between 1964 and 1973.
3. Some of this decline is explained by a decline in the number of man years allotted to Weights and Measures inspection from about 38 in 1967 to about 34 in 1973. A further 3 man years were lost through the transfer of responsibility for the Factory Pack program to the Products Activity.
4. Productivity measured by weighted work accomplished per man year allotted to inspection is not a good measure of the efficiency of time actually spent on inspections. This is because the man year figures take no account of fluctuations in training requirements and extraordinary sick leave, or shifts in the pattern of time utilization such as an increase in the proportion of time spent on clerical work.
5. The proportion of time expended on clerical work has tended to increase because of a growth in the load of district administration.
6. Measured by means of weighted work units of inspection accomplished per man day of inspection reported, Weights and Measures productivity declined by 19% from 1967 to 1973. Although man day figures for the period from 1964 to 1967 are incomplete, it is clear that productivity declined in that period as well. The rate of decline in regional productivity has been fairly steady, ranging between 2% and 6% per year between 1967 and 1973.

7. Eighty-one percent of the decline in production between 1964 and 1973 was restricted to two of eight sub-activities: Country general work and Bulk meter work. Approximately 56% of the total production decline occurred in 1969 and 1970.
8. The magnitudes of production declines by district fall into two categories: Production in Calgary, Edmonton and Winnipeg decreased by about one-third between 1964 and 1973; in Saskatoon and Regina the decrease was about one-half.
9. Diversity is further evident in the declines in productivity by district between 1967 and 1973, ranging from 8% in Edmonton to 44% in Regina. Analysis of production declines by sub-activity and the timing of productivity decreases also reveals important differences in the experiences of the various districts. Every aspect of the problem examined reveals major differences between the districts.
10. Our analysis of qualifications to the originally calculated regional productivity decline of 19% between 1967 and 1973 indicates that fully half of the decrease may be accounted for by such changes in government policy as an increase in the quality of heavy duty inspections, a growth in the load of administrative and reporting work, the virtual elimination of overtime in certain districts and freer rules on week-end travel home.
11. A decrease in short weight work and travel represented relatively small decreases in productivity. An increase in the capacity of one class of device in one district and of request inspections in another constituted similarly small increases in productivity. Changes in special investigation work had a negligible effect on productivity. The disappearance of devices in many rural areas can also account for some small but undeterminable proportion of the regional productivity decline in Weights and Measures.
12. Morale problems in the Activity resulting from a lengthy reclassification crisis, the transfer of an important part of the Activity's work to the Products Activity and a loss of confidence that the Department considered the Activity important were sufficiently serious to explain most of the 8% to 12% decline in regional Weights and Measures productivity which cannot be accounted for by changes in government policy.
13. None of the information we collected on the timing of regional productivity declines, or regional production declines by sub-activity, or the details of the differences in production or productivity declines in the districts is seriously inconsistent with the explanations for the regional Weights and Measures productivity decline advanced above. However, there are some declines in particular years in particular districts which we were unable to explain.

14. Some more manpower may be needed particularly in districts where grain elevator inspections are a large proportion of the total work load. For the other districts, additional manpower requirements will depend on how completely the Department wishes to implement parts of the Weights and Measures program such as truck tank calibrations.
15. There remain several ways by which the Weights and Measures Activity could probably halt further productivity declines or even enjoy increases in the future. These include:
 - a) prompt action to improve morale
 - b) a rethinking of the field program and its priorities
 - c) the establishment and monitoring of detailed goals for district production
 - d) the improvement of the Activity's tools
 - e) the improvement of the staff's skills
16. Because of the great variations between the districts which we have observed it is clear that any solutions to the problem of declining productivity must take full account of these differences. A single overall plan cannot be expected to succeed everywhere.
17. Such steps should be taken soon or else metrification may entail a further drastic decline in Weights and Measures productivity.

ANNEX A: A WEIGHTING SYSTEM

The weights assigned to each class of device were based on the relative length of time required for their inspection including the filling out of all necessary documents. No allowance is made in the weighting system for travel time. The pilot study on average inspection time by device class conducted from September 18, 1972, to March 30, 1973, was used as the major source of time data. A comparison of the National and Prairie averages for that time period follows (Table A-1):

CLASS	NATIONAL AVERAGE	PRAIRIE AVERAGE
10	17.5	19.6
12	31.8	37.9
14	79.7	59.9
15	79.7	43.3
16	105.7	82.2
17	75.9	79.4
18	175.5	142.1
20	11.7	16.8
24	16.3	18.3
26	79.4	107.5
29	15.2	15.1
30	4.0	30.0
34	21.4	20.0
40	66.1	40.8
48	245.3	270.1
49	21.7	86.5
51	12.2	33.4
52	17.9	16.7
54	48.0	46.4
56	66.9	41.1

TABLE A-1: Average inspection times as reported by National Pilot Study from September 18, 1972 to March 30, 1973 - (in minutes)

Where the average time reported for the Prairie Region was comparable with that for the whole country (within 20%), this time was chosen as the basis for weighting (Classes 10, 12, 17, 24, 29, 34, 48, 52 and 54). In a few cases the Prairie average, which was generally below the national average, was adopted (Classes 14, 15, 20, 26, and 56). For the remaining classes the combined judgement of the Regional Supervisor, Weights and Measures the Winnipeg District Inspector was relied on in accepting the National estimate as better, or in estimating the average time for classes for which the pilot sample was very small or deemed unreliable (Classes 01, 16, 18, 30, 40, 49 and 51).

The five minutes estimated for a class 01 inspection was assigned a value of one unit of weighted work because it provided a convenient standard unit. The times for each other class were then rounded off to a time divisible by five minutes to yield the weights applicable to that class. The decision of rounding up or down was based on the Regional Supervisor's judgement of the time required to inspect the device.

The substantial reliance on experienced judgement in adopting, modifying or rejecting the results of the pilot study in determining the weights for the various classes of devices was based on a realization that the pilot did not cover a full year's work. More reliable times will soon be available for the new class codes as a result of the new Weights and Measures Reporting System.

Two special qualifications require attention. The first relates to the inspection of grain elevators. Typically, a grain elevator consists of at least one class 17 truck scale, one class 29 combination scale and one class 15 hopper scale. Taken individually, these devices would take the 2 hours and 20 minutes (28 units) implied by the weighting system. In practice, however, there is considerable overlap permitting completion of an elevator inspection in approximately one hour and 30 minutes (18 units). Therefore, district totals of weighted work units for each year were corrected by subtracting units equal to $10 \times$ the number of elevators (class 17). The second qualification relates to differences in the devices included in class 49. Some districts used the class for extra markers in tank calibrations; others reserved it for visible and self-measuring pumps. In cases where the former definition was clearly used, a weight of 3 units was used instead of the 5 units listed in Table 2.

ANNEX B: DEFINITIONS OF WEIGHTS AND MEASURES SUB-ACTIVITIES

1. GENERAL NOTE:

Throughout each of the following sub-activities it is assumed that all devices in Block A (comprising repair shop inspections, reinspections and inspections of new devices on manufacturers' premises) and in Block C (comprising contractors' scales) are included in the Request work sub-activity, unless otherwise noted. Therefore, "all class 10" means all devices inspected in that class within the year minus those in Block A or Block C.

2. ELEVATOR WORK SUB-ACTIVITY

The elevator work sub-activity includes:

- a) all class 17
- b) all class 15
- c) 90% of class 29
- d) devices from class 10 equal to $\frac{5}{4}$ of the difference between class 17 and 90% of class 29

3. OTHER HEAVY DUTY WORK SUB-ACTIVITY

The other heavy duty work sub-activity includes:

- a) all class 16
- b) 90% of class 14
- c) 50% of class 12

4. CITY GENERAL WORK SUB-ACTIVITY

"City" refers to the city in which the District office is located. The city general work sub-activity includes:

- a) all class 01 within the city zones
- b) all class 10 within the city zones
- c) $\frac{3}{8}$ of class 12 or all class 12 within the city zones, whichever is smaller
- d) all class 20 within the city zones
- e) all class 24 within the city zones
- f) all class 26 within the city zones
- g) all class 29 within the city zones

Cont'd

- h) all class 30 within the city zones
- i) all class 34 within the city zones
- j) all class 40 within the city zones
- k) all class 52 within the city zones

5. COUNTRY GENERAL WORK SUB-ACTIVITY

"Country" refers to the entire district excluding the city in which the District Office is located. The country general work sub-activity includes:

- a) all devices in classes 01, 20, 24, 26, 30, 34, 40 and 52 not included in the request work sub-activity or the city general work sub-activity
- b) all devices in classes 10 and 29 not included in the request work sub-activity, the city general work sub-activity or the elevator work sub-activity
- c) all devices in classes 12 and 14 not included in the request work sub-activity, the city general work sub-activity or the other heavy duty work sub-activity

6. BULK METER WORK GROUP

The bulk meter work group includes:

- a) all class 54 including those in Block A and Block B
- b) all class 56 including those in Block A and Block B

7. CALIBRATION WORK GROUP

The calibration work group includes:

- a) all class 48 including those in Block A
- b) all class 49 including those in Block A where it appears that these devices are extra markers in tank calibrations

Cont'd

8. PROPANE WORK GROUP

The propane work group includes:

- a) all class 51

9. REQUEST WORK GROUP

The request work group includes:

- a) all class 18
- b) all devices of whatever class included in Block A and Block C except as noted in the bulk meter work group and the calibration work group

ANNEX C: DETAILS OF DEVICE INSPECTIONS IN EACH DISTRICT

1964 - 1973

The following Tables (C-1 to C-5) and Figures (C-1 C-) are provided for the information of district personnel.

TABLE C-1

INSPECTION STATISTICS FOR CALGARY DISTRICT
BY DEVICE CLASS

1964 - 1973

CLASS	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
01	2691	2967	2192	2831	2393	1748	1479	1244	1506	487	18.1%
10	3777	3933	3131	3637	3490	3086	2779	2052	2545	1580	41.8%
12	106	137	108	127	120	97	160	162	171	188	177.4%
14	229	220	215	196	206	199	223	143	99	248	108.3%
15	773	766	759	746	657	722	717	700	524	512	66.2%
16	322	343	336	314	316	322	385	351	235	339	105.3%
17	723	722	703	658	593	642	641	629	474	462	63.9%
18	29	28	27	28	26	28	28	25	18	17	58.6%
20	563	589	426	526	493	371	286	215	279	149	26.5%
24	2461	2491	1947	2544	2515	2228	2285	1767	2525	1588	64.5%
26	22	30	25	31	31	21	26	15	20	15	68.2%
29	385	395	416	412	395	460	480	442	323	332	86.2%
30	-	-	-	2	-	-	-	-	-	-	-
34	3	3	5	11	9	6	7	10	9	4	133.3%
40	10	40	5	22	12	11	8	12	5	5	50.0%
48	133	132	113	96	104	78	74	64	53	111	83.5%
49	11	12	25	18	12	8	8	1	19	14	127.3%
51	36	27	404	386	417	323	261	287	286	258	716.7%
52	3688	3653	2842	3516	3568	3038	3208	2216	3652	2096	56.8%
54	432	479	317	392	323	243	402	199	201	313	72.5%
56	1054	1079	789	1030	927	533	931	235	308	651	61.8%
TOTAL	17449	18048	14785	17524	16607	14164	14388	10771	13252	9402	53.9%

TABLE C-2

INSPECTION STATISTICS FOR EDMONTON DISTRICT
BY DEVICE CLASS

1964 - 1973

CLASS	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
01	6393	5428	4496	3575	3910	1643	2368	1740	2483	3269	51.1%
10	5947	5989	5767	4821	4898	3396	3409	3435	4152	4285	71.1%
12	244	279	272	287	287	272	254	288	274	313	128.2%
14	359	372	329	370	239	307	241	310	295	314	87.5%
15	968	966	957	951	701	899	696	855	829	788	81.4%
16	324	351	393	395	330	407	402	465	470	492	15.2%
17	928	928	904	910	664	853	658	812	788	754	81.3%
18	14	19	18	24	24	23	22	25	28	24	171.4%
20	1089	1025	872	628	725	374	425	365	431	459	42.1%
24	3909	4000	3872	3123	3525	2243	2729	2556	3432	3675	94.0%
26	13	14	9	23	18	26	24	29	24	26	200.0%
29	983	1002	982	914	727	780	638	775	740	751	76.2%
30	109	110	88	86	91	90	110	110	137	126	115.6%
34	7	8	8	9	15	15	32	38	70	94	1342.9%
40	233	233	65	12	3	2	19	10	18	16	6.9%
48	255	238	248	203	245	181	117	124	87	78	30.6%
49	9	16	91	43	59	17	13	6	16	16	177.8%
51	20	113	-	-	-	-	-	-	3	19	95.0%
52	123	5070	4839	4003	4436	2893	2894	2877	4303	4248	3453.7%
54	4998	803	774	666	708	832	182	375	346	398	8.0%
56	767	1820	1765	1625	1697	1873	455	944	736	979	127.6%
TOTAL	29428	28837	26729	22669	23302	17126	15688	16130	19662	21124	71.8%

TABLE C-3

INSPECTION STATISTICS FOR REGINA DISTRICT
BY DEVICE CLASS

1964 - 1973

CLASS	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
01	4384	4035	3941	4049	3994	3335	1980	1439	961	2027	46.2%
10	3548	3581	3362	3044	2692	2328	1275	1080	410	732	20.6%
12	55	53	52	50	51	55	36	39	18	47	85.5%
14	83	94	87	100	88	88	100	96	96	107	128.9%
15	1251	1246	1240	1244	1225	1215	1218	1214	1173	1126	90.0%
16	202	197	217	189	220	188	190	180	152	174	86.1%
17	1237	1232	1204	1210	1187	1163	1164	1142	1111	1072	86.7%
18	13	20	20	25	24	27	25	26	23	25	192.3%
20	637	604	570	531	469	405	192	138	21	58	9.1%
24	1975	1928	1874	1846	1952	1881	1110	818	249	569	28.8%
26	-	-	-	3	2	3	1	1	2	1	
29	866	952	962	974	975	998	951	905	918	919	106.1%
30	135	155	137	130	134	148	15	131	7	210	155.6%
34	-	2	2	2	3	5	1	4	1	3	
40	627	518	417	361	314	241	113	91	21	10	1.6%
48	160	120	77	151	82	131	63	160	75	72	45.0%
49	296	291	280	292	288	411	315	406	37	-	
51	95	78	4	4	5	5	6	5	5	4	4.2%
52	2730	2597	2554	2500	2484	2313	1521	1511	464	654	23.9%
54	613	656	622	620	627	622	454	232	177	204	33.3%
56	1031	1072	1043	1097	1190	1137	761	524	310	336	32.6%
TOTAL	19955	19445	18665	18422	18006	16699	11491	10138	6231	8350	41.8%

TABLE C-4

INSPECTION STATISTICS FOR SASKATOON DISTRICT
BY DEVICE CLASS

1964 - 1973

CLASS	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
01	4763	4532	3984	4018	3825	2975	2679	1938	1420	1029	21.6%
10	3723	3611	3224	3209	3005	2431	2462	2050	1578	1402	37.6%
12	54	62	53	60	62	63	57	56	56	51	.9%
14	108	112	107	111	113	93	97	103	103	101	93.5%
15	1615	1610	1603	1591	1581	1522	1532	1487	1394	1318	8.6%
16	237	245	219	215	244	220	193	206	188	223	94.1%
17	1582	1569	1559	1539	1530	1475	1463	1416	1324	1245	78.7%
18	6	9	9	11	22	25	22	22	22	21	350.0%
20	767	728	636	651	600	497	432	333	238	195	25.4%
24	2551	2517	2316	2457	2446	2283	2363	1950	1517	1288	50.5%
26	-	-	-	-	1	1	2	-	-	25	
29	1287	1358	1399	1380	1344	1253	1195	1178	1131	1088	84.5%
30	-	-	-	-	-	-	-	-	-	-	
34	-	-	-	-	-	-	71	111	209	308	
40	119	103	70	51	33	22	18	5	4	1	.8%
48	35	48	33	43	45	31	19	16	14	15	42.9%
49	21	54	155	103	105	60	74	55	15	25	119.0%
51	155	128	-	-	-	-	-	-	-	-	
52	3346	3333	2972	3110	3107	2862	2986	2587	1741	1178	35.2%
54	753	723	649	604	710	420	370	288	475	210	27.9%
56	1070	1124	1015	983	1094	617	570	447	798	350	32.7%
TOTAL	22221	21891	20003	20136	19867	16850	16605	14248	12227	10073	45.3%

TABLE C-5

INSPECTION STATISTICS FOR WINNIPEG DISTRICT
BY DEVICE CLASS

1964 - 1973

CLASS	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1973 as % of 1964
01	8976	8577	10076	8515	10025	10150	5524	6496	6225	6194	69.0%
10	6783	6483	6558	6097	6521	5573	4306	4838	3787	4074	60.1%
12	245	240	256	246	239	227	218	236	202	163	66.5%
14	213	194	225	225	247	249	265	251	259	240	112.7%
15	679	674	657	526	647	625	600	606	563	542	79.8%
16	347	399	388	349	375	395	449	463	478	513	147.8%
17	658	654	649	523	636	621	612	600	557	526	79.9%
18	16	17	23	20	21	21	25	22	21	23	143.8%
20	1443	1461	1401	1395	1445	1234	925	965	784	837	58.0%
24	4857	4696	4809	4543	4608	4579	3568	3869	3210	3582	73.7%
26	1	2	5	2	5	3	1	9	6	1	
29	889	864	859	682	774	762	688	806	602	643	72.3%
30	710	593	548	668	622	713	606	689	318	381	53.7%
34	19	20	53	43	51	63	109	81	80	93	489.5%
40	1294	970	836	770	734	576	245	426	261	240	18.5%
48	96	94	60	110	100	49	50	27	29	14	14.6%
49	130	142	136	132	56	45	21	55	6	6	4.6%
51	152	61	51	45	26	27	22	36	22	24	15.8%
52	4642	4537	4406	4318	4498	4357	3093	3596	3190	3272	70.5%
54	1393	1316	1282	1272	1269	1238	1126	808	929	724	52.0%
56	763	839	888	942	951	1007	984	700	832	667	87.4%
TOTAL	34328	32846	34168	31424	33851	32514	23449	25579	22361	22759	66.3%

ANNEX D: LICENSED GRAIN ELEVATORS IN THE PRAIRIES 1964 - 1973

According to the Canadian Grain Commission's official publication Grain Elevators in Canada the number of licensed grain elevators by province in the Prairie region from 1964 to 1974 is as follows (Table D-1):

YEAR	PROVINCE			PRAIRIE REGIONAL TOTAL
	ALBERTA	MANITOBA	SASKATCHEWAN	
Aug 1, 1964	1620	677	2856	5153
Aug 1, 1965	1612	669	2842	5123
Aug 1, 1966	1602	651	2809	5062
Aug 1, 1967	1589	645	2775	5009
Aug 1, 1968	1582	642	2752	4976
Aug 1, 1969	1574	641	2744	4959
Aug 1, 1970	1573	642	2732	4947
Aug 1, 1971	1543	616	2667	4826
Aug 1, 1972	1435	574	2536	4545
Aug 1, 1973	1390	540	2431	4361
Jan 1, 1974	1373	540	2418	4331
1974 as % of 1964	85%	80%	85%	84%

TABLE D-1: Licensed Grain Elevators in the
Prairie Region 1964 - 1974

ANNEX E: ESTIMATION OF IMPACT ON PRODUCTIVITY OF DECLINE
IN SHORT WEIGHT WORK

We have estimated that the weighted work units of short weight work accomplished in the Prairie Region declined from 12,000 in 1967 to 4,200 in 1973. These figures may be added to the weighted work units of device inspection in those years to yield a weighted work total of 524,089 for 1967 and 353,572 for 1973. To the man days for those years recorded in Table 5 must be added the reported short weight days not devoted to Factory Pack inspection: 157 in 1967 and 119.5 in 1973. The new total man days are 7,030 in 1967 and 5,945 in 1973. By dividing both years' man days into the weighted work units, productivity figures may be derived: 74.6 in 1967 and 59.5 in 1973. This represents a decline of 20.3% in weighted work per man day of inspection, compared with 19.4% obtained when short weight work is not included in the calculations, a difference of approximately 1%.

ANNEX F: ESTIMATION OF IMPACT ON PRODUCTIVITY OF INCREASE IN
CALIBRATION WORK IN REGINA DISTRICT

Because the weights assigned to the various classes of devices are based on recent data (the 1972-73 Pilot study), the change in average capacity of tanks brought in for calibration implies that the weighted work units calculated for the Regina district in 1968 are inflated. Although the capacity in 1968 was half what it was in the time period covered by the pilot study, we cannot simply cut the 1968 weighted work units in half to compensate because some time is required for set-up whatever the tank's capacity. On the basis of experienced advice we shall lessen the 1968 figure by only 40%. We shall make the further assumption that average capacities in 1967 were no greater than those in 1968 so that we may continue to use the period from 1967 to 1973 as the basis of our productivity comparisons. Reducing the 1967 calibration weighted work units for Regina by 40% yields 5300 units which is 3500 units less than our original calculation (Refer to Table 25). Subtracting this latter figure from the regional total weighted work units for 1967 we get 508,589 units. Dividing this number by the reported man days of inspection (6873) we derive a 1967 productivity of 74.0 units per man day. Comparing this with the 1973 figure of 60.0 units per man day, we conclude that there was a decline in productivity of 18.9%, compared with 19.4% obtained when the change in average capacity of tanks calibrated in Regina is not included in the calculations, a difference of approximately $\frac{1}{2}\%$. (Note: The effect of this change on district productivity is calculated in Annex L.)

ANNEX G: HISTORY OF HEAVY DUTY INSPECTION EQUIPMENT
IN THE PRAIRIE REGION 1964 - 1973

1. Calgary

1964 - One hired 12,000 lb. truck. One ton of weights unloaded for elevator receiving scales.

Government WT-2 15,000 lb. truck with 11,000 lb. weights used one month per year.

1967 - Acquired WT-9 19,000 lb. truck carrying 11,000 lb. of weights.

Edmonton's WT-5 20,000 lb. truck with 21,000 lb. of weights 2 weeks per year.

1972 - June
Acquired 20,000 lb. truck with 21,000 lb. of weights to replace WT-9.

2. Edmonton

1964 - One hired truck with 4 one thousand pound wheeled weight carts.

Government WT-2 15,000 lb. truck with 11,000 lb. weights used one month per year.

1967 - Acquired WT-2 15,000 lb. truck carrying 11,000 lb. of weights for full-time work in the district.
Acquired WT-5 20,000 lb. truck carrying 21,000 lb. weights. WT-7 shared with British Columbia and Calgary for 3 months each year.

1969 - Identical WT-7 replaced WT-5 heavy weight truck.

1973 - WT-7 no longer shared with Calgary or British Columbia.

3. Regina

1964 - Two small hired vehicles. Unloaded one ton of loose weights per scale.

Government WT-2 15,000 lb. truck with 11,000 lb. weights used one month per year.

- 1966 - Two hired vehicles with carrier baskets and hoist for unloading. Carried 10,000 lb. of 50 lb. weights.
- 1967 - Government WT-4 20,000 lb. truck with 21,000 lb. weights replaced WT-2 in use for one month per year.

4. Saskatoon

- 1964 - Two hired trucks. Unloaded one ton of loose weights per scale.
 - Government WT-2 15,000 lb. truck with 11,000 lb. weights used one month per year.
- 1966 - Two hired vehicles carrying 6000 lb. of 1000 lb. weights or weight baskets each.
- 1967 - Government WT-4 20,000 lb. truck with 21,000 lb. weights replaced WT-2 in use for one month per year.
- 1969 - Two hired vehicles carrying 10,000 lb. of 1000 lb. weights or weight baskets each.
- 1973 - Hired vehicles released mid-summer. Used WT-2 15,000 lb. truck with 11,000 lb. weights from Edmonton and hired vehicle from Regina for two to three months to complete inspections.

5. Winnipeg

- 1964 - One hired vehicle. Used one ton of loose weights per scale.
 - Government WT-2 15,000 lb. truck with 11,000 lb. weights used one month per year.
- 1966 - WT-2 stationed in Winnipeg No longer shared with Eastern districts, but still shared with Western districts.
- 1967 - Wt-2 replaced by WT-4 20,000 lb. weight truck carrying 21,000 lb. of weights. Shared with Regina, Saskatoon and Thunder Bay.
 - Hired vehicle with tailgate loader carrying 10,000 lb. of 1000 lb. weights.
- 1972 - Hired vehicle now with hoist to unload weights.

ANNEX H: ESTIMATION OF IMPACT ON PRODUCTIVITY OF THE
IMPROVEMENT IN THE QUALITY OF HEAVY DUTY INSPECTIONS
IN THE PRAIRIE REGION

Again we must begin by observing that since our weighting system is based on the inspection times recorded in the 1972-73 pilot study, clearly the weighted work units calculated in the earlier period for heavy duty inspections are too great if on average an improvement in the quality of such inspections has reduced the number that can be performed in a day by at least 14%. (We are assuming that the time required to inspect smaller heavy duty scales in classes 12,14 and 15 increased by about the same proportion as the larger devices of class 16 and 17 with which they are inspected.) These classes together form most of the two sub-activities, Elevator work and Other heavy duty work, which constituted 122031 weighted work units in 1967, or 24% of the total weighted work accomplished in the Region in that year. A more accurate figure, given our assumptions would be x where $1.14x = 122031$, or 107000 weighted work units. If we subtract the difference (15,000 units) from the Prairie total we obtain a revised total of approximately 498,000 weighted work units. Dividing by the reported man days for 1967 (6873) we obtain a productivity of 72.4 weighted work units of inspection per man day of inspection. Based on this figure, productivity declined by about 17%, or $2\frac{1}{2}\%$ less than the 19.4% obtained when the improvement in the quality of heavy duty inspections was not included in the calculations.

ANNEX I: TIME UTILIZATION BY DISTRICT WITH THE DISTRICT
INSPECTOR'S TIME DELETED

The following table (Table I-1) sets out the time utilization by district with the District Inspector's time deleted. (Short weight time is not included):

TABLE I-1: Time utilization by District with the District Inspector's time deleted

a) CALGARY

YEAR	TOTAL MAN DAYS	INSPECTION		CLERICAL		LEAVE	
		MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL
1964	1219	988.5	81%	111	9%	119.5	10%
1965	1233	1031.5	83%	105	9%	96.5	8%
1966	1357.5	1104	81%	120.5	9%	133	10%
1967	1514.5	1147	77%	143.5	9%	224	14%
1968	1808	1361.5	75%	217.5	12%	229	13%
1969	1558.5	1217.5	78%	167	11%	174	11%
1970	1478	1158.5	78%	163.5	11%	155	11%
1971	1420	1078	76%	224.5	16%	117.5	8%
1972	1405	1086.5	77%	167	12%	151.5	11%
1973	1345.5	1029.5	76%	195.5	15%	121	9%

b) EDMONTON

YEAR	TOTAL MAN DAYS	INSPECTION		CLERICAL		LEAVE	
		MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL
1964							
1965	2041	1688	83%	167	8%	186	9%
1966	2038	1675	82%	135	7%	228	11%
1967	2088	1652.5	79%	111.5	5%	322	16%
1968	1884	1608	85%	122	6%	154	9%
1969	1742	1377	79%	184	11%	181	10%
1970	1687	1133	67%	247.5	15%	306	18%
1971	1785	1271	71%	192	11%	322	18%
1972		1416.5		231			
1973		1558.5		255			

c) REGINA

YEAR	TOTAL MAN DAYS	INSPECTION		CLERICAL		LEAVE	
		MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL
1964	1157	910	79%	180	15%	67	6%
1965	1242	899.5	72%	218.5	18%	124	10%
1966	1193.5	872.5	73%	165	14%	156	13%
1967	1199.5	916	76%	224	19%	59.5	5%
1968	1224.5	987	81%	112.5	9%	125	10%
1969	1250	964.5	77%	186.5	15%	99	8%
1970	947	776.5	82%	117.5	12%	53	6%
1971	1003	749	75%	86	9%	168	16%
1972	842	628	75%	105	12%	109	13%
1973	977.5	831	85%	62	6%	84.5	9%

d) SASKATOON

YEAR	TOTAL MAN DAYS	INSPECTION		CLERICAL		LEAVE	
		MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL
1964	1298.5	883	68%	261.5	20%	154	12%
1965	1251.5	887	71%	241.5	19%	123	10%
1966	1206	899	74%	202	17%	105	9%
1967	1233	868	70%	224	18%	141	12%
1968	1223	926	76%	179.5	15%	117.5	9%
1969	1231	872	71%	237.5	19%	121.5	10%
1970	1231	837	68%	288	23%	106	9%
1971	1159	775	67%	254.5	22%	129.5	11%
1972	1176	841	72%	228	19%	107	9%
1973	1211	698	58%	249	20%	264	22%

e) WINNIPEG

YEAR	TOTAL MAN DAYS	INSPECTION		CLERICAL		LEAVE	
		MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL	MAN DAYS	% OF TOTAL
1964							
1965							
1966							
1967	2256	1704.5	76%	239.5	10%	312	14%
1968	2338	1866	80%	231	10%	241	10%
1969							
1970	1928.5	1605	83%	155.5	8%	168	9%
1971	1996.5	1613.5	81%	204	10%	179	9%
1972	1890	1467	78%	230.5	12%	192.5	10%
1973	1765	1433.5	81%	125.5	7%	206	12%

ANNEX J: ESTIMATION OF IMPACT ON PRODUCTIVITY OF THE INCREASE
IN THE TIME REQUIRED TO COMPLETE INSPECTION CERTIFICATES

On the basis of the monthly District Inspector's Statement of Revenue (SW-51), we determined that 45,296 certificates were completed by the Weights and Measures staff in 1967 and 31,909 in 1973. According to experienced personnel, the old certificates required about five minutes each to complete, whereas the new certificates demanded at least double the time, or ten minutes. Therefore, we calculate that 503 man days were expended in the Prairie Region for completing the old certificates in 1967, and 709 man days to fill in the new certificates in 1973. By deducting these certificate man days from the reported man days of inspection for both years (6873 in 1967 and 5825.5 in 1973) and dividing the results (6370 in 1967 and 5116.5 in 1973) into the respective weighted work units accomplished (512089 in 1967 and 349372 in 1973), we obtain a productivity figure for 1967 of 80.4 and 68.3 for 1973. The decline between the two years is 15.0%, or almost 4½% less than the 19.4% obtained when the change in the time required to complete inspection certificates was not included in our calculations. Although everyone agrees that the new certificates take much longer than the old ones to complete, there is some disagreement on the times involved. Some inspectors feel that two minutes and five minutes are better estimates. If these estimates were used in the above calculations, the new certificate still accounts for a productivity decline of 3%. It will be noted that our weights are based on the pilot study which was conducted when

the new certificates were in use. Therefore, the weighted work units overstate the work accomplished before 1972 by an amount equal to the change in time required to complete the certificates. If we reduced the weighted work units in 1967 to take account of this fact, it is clear that the change in productivity would be even smaller than the 15% derived above.

ANNEX K: ESTIMATION OF THE EFFECT ON PRODUCTIVITY OF A DECLINE
IN UNREPORTED OVERTIME INSPECTIONS IN THE SASKATOON
DISTRICT

By adding to the reported man days of inspection for Saskatoon district in both years (953 in 1967 and 736 in 1973) the unreported overtime inspection man days (171 in 1967 and 33 in 1973), and dividing the results (1124 in 1967 and 769 in 1973) into the production in weighted work units for those two years (92025 in 1967 and 52571 in 1973), we arrived at revised productivity figures of 81.9 weighted work units per man day of inspection in 1967 and 68.3 in 1973, a decline of 17% between the two years.

The same basic method was used to calculate the impact of this change on the regional productivity decline in the period. By adding to the reported regional man days of inspection in both years (6873 in 1967 and 5825.5 in 1973) to the unreported overtime inspection man days for Saskatoon district (171 in 1967 and 33 in 1973), and dividing the results (7044 in 1967 and 5858.5 in 1973) into the regional production in weighted work units for those two years (512089 in 1967 and 349372 in 1973), we arrived at revised productivity figures of 72.7 weighted work units per man day of inspection in 1967 and 59.6 in 1973, a decline of 18.0% between the two years. This is nearly 1½% less than the result obtained (19.4%) when the decline in unreported overtime inspections in the Saskatoon district was not included in the calculations.

ANNEX L: ESTIMATION OF THE EFFECT OF THE INCREASE IN THE
CAPACITY OF TANKS CALIBRATED ON PRODUCTIVITY IN
THE REGINA DISTRICT

According to experienced staff, the increase in the average capacity of tanks calibrated in the Regina district from 3500 gallons in 1968 to 6500 gallons in 1973 means an increase of approximately 75% in the average time required for calibration. This implies that the same weight should not be given to tank calibrations in those two years. Because the weighting system employed is based on the times reported in the Pilot study conducted in 1972 and 1973, it is clear that the weight allowed in 1968 should be smaller. We shall assume that the 1967 average capacity was no greater than that in 1968 in order to deal with the 1967 - 1973 time frame for which we have made all our productivity calculations. According to Table 26, approximately 8900 weighted work units of calibration were accomplished in 1967. Since we estimated that it took about 75% more time to calibrate tanks in 1973 than in 1967, the weighted work figure ought to be scaled down to a figure equal to x where $1.75x = 8900$ units. That figure is approximately 5100 weighted work units. The difference between the original and the corrected figures for calibration in 1967 is 3800 weighted work units. Subtracting this from the Regina total for 1967 and dividing by the man days for inspection yields a productivity of 83.76 weighted work units per man day. The 1973 productivity figure is 48.89 units per man day, a decline of 42%

ANNEX M: ESTIMATION OF THE EFFECT OF DOUBLE INSPECTIONS OF
TRUCK-MOUNTED BULK METERS ON PRODUCTIVITY IN THE
SASKATOON DISTRICT

In 1969, the Saskatoon district began to inspect truck-mounted bulk meters twice, once with both of the products sold through these meters. This procedure doubled the time to complete a truck-mounted bulk meter inspection. Consequently, we must double the weighted work units assigned to the bulk meter sub-activity in 1973, from 5040 units to 10080 units. Adding the difference to the Saskatoon district total and dividing by the man days of inspection yields a corrected productivity figure of 78.27 weighted work units per man day of inspection. This figure is 19% lower than that of 1967.

ANNEX N: - PERCENTAGE OF TOTAL WORK BY GROUP

DEVICES	INSPECTION STATISTICS									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	17.4	17.7	18.6	17.3	15.2	12.8	13.5	13.5		12.8
2. Other Heavy Duty	3.6	3.1	3.1	2.9	2.3	2.0	2.0	2.1		1.7
3. City General	31.9	30.9	31.7	29.4	26.9	23.6	23.4	22.4		20.8
4. Country General	26.5	30.4	30.3	33.8	37.1	45.0	46.3	47.1		50.9
5. Meter	6.7	6.9	6.2	7.6	8.8	8.5	8.4	8.1		7.8
6. Calibration	.4	.4	1.1	.8	.9	.8	.9	.8		.9
7. Propane	.4	.4	.4	.4	.4	.4	.4	.4		.5
8. Request	13.1	10.5	8.6	7.9	8.5	6.9	5.1	5.8		4.5

TABLE N-1 - PERCENTAGE OF WEIGHING AND MEASURING DEVICES BY SUB-ACTIVITY IN THE PRAIRIE REGION 1964-1973

DEVICES	WEIGHTED WORK VALUES									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	21.7	22.2	23.1	21.7	19.6	16.8	17.7	18.0		17.2
2. Other Heavy Duty	10.4	8.7	8.8	8.4	6.8	6.2	6.1	6.1		5.5
3. City General	22.8	22.2	22.1	20.6	18.9	17.1	16.7	16.2		14.9
4. Country General	18.9	21.7	20.8	23.1	25.4	31.1	30.6	32.1		34.2
5. Meter	12.4	12.8	11.3	14.2	16.7	16.6	16.2	15.8		15.5
6. Calibration	4.5	3.9	6.1	4.7	5.8	6.2	6.6	5.7		6.8
7. Propane	1.1	1.2	1.2	1.0	1.1	1.2	1.2	1.2		1.4
8. Request	8.2	7.3	6.8	6.5	5.7	5.1	4.9	5.1		4.5

TABLE N-2 - PERCENTAGE OF WEIGHTED WORK UNITS OF WEIGHTS AND MEASURES INSPECTION BY SUB-ACTIVITY IN THE PRAIRIE REGION 1964-1973

ANNEX N: - PERCENTAGE OF TOTAL WORK BY GROUP

DEVICES	INSPECTION STATISTICS									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	15.8	11.2	18.7	14.3	14.6	11.5	12.1	14.9		12.8
2. Other Heavy Duty	6.4	2.7	4.6	4.1	3.4	3.1	2.8	3.5		2.9
3. City General	48.1	33.1	38.2	29.7	29.9	26.5	25.1	28.9		23.3
4. Country General	9.1	40.8	21.9	35.2	38.8	44.7	45.9	34.8		47.6
5. Meter	10.3	3.8	4.0	9.3	5.5	7.5	8.1	7.5		8.5
6. Calibration	1.2	.4	.6	.5	.6	.6	.5	.8		.8
7. Propane	2.8	2.1	2.7	1.8	2.3	2.5	2.2	2.7		.2
8. Request	6.5	6.2	9.4	5.2	5.1	3.7	3.4	7.0		3.8

TABLE N-3 - PERCENTAGE OF WEIGHING AND MEASURING DEVICES BY SUB-ACTIVITY IN THE CALGARY DISTRICT 1964-1973

DEVICES	WEIGHTED WORK VALUES									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	15.2	14.1	21.1	16.0	17.2	13.6	14.7	17.1		15.6
2. Other Heavy Duty	14.1	7.5	12.1	10.7	9.4	8.3	7.9	9.5		8.3
3. City General	28.8	26.1	26.2	20.4	21.1	19.1	18.1	19.7		16.8
4. Country General	5.6	29.4	14.2	22.5	25.1	28.5	28.7	20.7		30.3
5. Meter	14.5	6.9	6.6	15.2	9.4	13.1	14.4	12.4		15.1
6. Calibration	10.1	4.3	5.8	5.1	5.7	6.5	5.8	7.6		8.1
7. Propane	6.0	6.0	6.8	4.6	6.1	6.8	6.1	7.1		.6
8. Request	5.7	5.6	7.2	5.5	5.9	4.3	4.5	6.1		5.2

TABLE N-4 - PERCENTAGE OF WEIGHTED WORK UNITS OF WEIGHTS AND MEASURES INSPECTION BY SUB-ACTIVITY IN THE CALGARY DISTRICT 1964-1973

ANNEX N: - PERCENTAGE OF TOTAL WORK BY GROUP

DEVICES	INSPECTION STATISTICS									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	10.9	12.4	15.4	12.9	15.2	8.7	11.9	10.4	9.8	9.7
2. Other Heavy Duty	3.9	3.8	4.7	4.0	3.8	2.8	3.3	2.5	2.4	1.9
3. City General	26.8	29.4	37.7	34.1	34.1	25.6	26.1	22.0	20.7	19.9
4. Country General	41.4	41.4	25.4	34.8	23.7	45.9	40.4	50.9	52.7	53.0
5. Meter	6.5	5.5	8.1	4.1	15.9	10.3	10.2	9.5	9.1	8.5
6. Calibration	.4	.4	.8	.7	1.1	1.0	.9	.9	.9	.9
7. Propane									.4	.4
8. Request	10.2	7.0	8.1	9.4	5.9	5.6	7.3	3.8	4.0	5.6

TABLE N-5 - PERCENTAGE OF WEIGHING AND MEASURING DEVICES BY SUB-ACTIVITY IN THE EDMONTON DISTRICT 1964-1973

DEVICES	WEIGHTED WORK VALUES									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	13.9	15.4	17.3	15.9	16.2	10.4	14.5	12.7	12.3	12.4
2. Other Heavy Duty	11.2	10.9	12.1	11.3	8.5	7.7	8.3	6.5	6.4	6.2
3. City General	20.1	21.8	24.8	24.5	20.6	17.7	17.6	15.4	14.6	14.5
4. Country General	31.4	30.1	17.9	24.0	15.1	29.6	26.5	33.2	34.7	35.0
5. Meter	12.3	10.1	13.5	7.4	24.5	18.3	17.7	17.2	17.1	16.3
6. Calibration	4.2	4.9	7.6	8.2	9.8	11.2	9.4	10.1	9.3	10.0
7. Propane									1.1	1.2
8. Request	7.0	6.7	7.0	8.7	5.3	5.0	6.0	4.8	4.7	4.2

TABLE N-6 - PERCENTAGE OF WEIGHTED WORK UNITS OF WEIGHTS AND MEASURES INSPECTION BY SUB-ACTIVITY IN THE EDMONTON DISTRICT 1964-1973

ANNEX N: - PERCENTAGE OF TOTAL WORK BY GROUP

DEVICES	INSPECTION STATISTICS									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	38.6	54.2	35.2	31.5	21.7	20.5	20.3	20.0	19.6	19.3
2. Other Heavy Duty	2.9	3.3	2.1	2.0	1.5	1.3	1.2	1.2	1.2	1.1
3. City General	23.4	8.7	13.9	12.3	13.5	12.1	11.6	11.4	10.9	10.7
4. Country General	3.5	5.2	26.7	31.0	42.5	46.7	51.2	52.4	53.7	55.2
5. Meter	6.5	7.8	7.5	10.6	10.6	10.0	9.3	8.9	8.9	8.2
6. Calibration	.9	1.8	5.5	3.2	3.0	1.8	2.1	1.5	2.1	2.3
7. Propane	.1	.1	.1	.1	.1				.4	.5
8. Request	24.2	18.9	8.9	9.4	7.2	7.7	4.2	4.5	3.2	2.7

TABLE N-7 - PERCENTAGE OF WEIGHING AND MEASURING DEVICES BY SUB-ACTIVITY IN THE REGINA DISTRICT 1964-1973

DEVICES	WEIGHTED WORK VALUES									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	45.1	53.2	37.0	36.3	26.5	26.3	25.6	26.2	25.0	24.6
2. Other Heavy Duty	8.0	8.0	5.4	5.5	4.3	4.0	3.6	3.9	3.8	3.5
3. City General	15.2	5.3	8.2	8.3	9.0	8.6	8.0	8.2	7.6	7.3
4. Country General	2.1	3.0	15.0	18.5	26.7	30.3	31.2	34.1	33.5	34.1
5. Meter	11.1	11.2	11.6	18.1	19.1	19.3	17.4	17.3	16.9	15.6
6. Calibration	8.8	10.7	16.7	7.1	9.9	6.1	10.0	5.5	8.1	10.0
7. Propane	.1	.2	.1	.1	.1	.1	.1	.1	1.2	1.4
8. Request	9.5	8.6	6.1	6.0	4.4	5.3	4.3	4.7	4.0	3.6

TABLE N-8 - PERCENTAGE OF WEIGHTED WORK UNITS OF WEIGHTS AND MEASURES INSPECTION BY SUB-ACTIVITY IN THE REGINA DISTRICT 1964-1973

ANNEX N: - PERCENTAGE OF TOTAL WORK BY GROUP

DEVICES	INSPECTION STATISTICS									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	38.4	33.7	30.9	27.4	27.1	23.7	23.6	24.2	22.1	22.0
2. Other Heavy Duty	2.6	2.0	1.8	1.5	1.4	1.3	1.2	1.3	1.2	1.2
3. City General	14.7	16.6	14.5	12.4	12.4	10.5	9.8	9.7	8.8	8.5
4. Country General	33.0	33.5	44.8	50.2	51.2	52.5	55.7	54.3	57.0	57.8
5. Meter	5.6	10.4	5.2	5.7	6.2	9.1	7.9	8.3	8.4	8.2
6. Calibration	.3	.2	.3	.3	.2	.3	.3	.4	.5	.3
7. Propane									.6	.7
8. Request	5.3	3.6	2.6	2.5	1.6	2.5	1.7	1.8	1.5	1.3

TABLE N-9 - PERCENTAGE OF WEIGHING AND MEASURING DEVICES BY SUB-ACTIVITY IN THE SASKATOON DISTRICT - 1964-1973

DEVICES	WEIGHTED WORK VALUES									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	44.0	39.1	39.0	35.9	35.1	31.0	31.2	32.0	29.2	29.4
2. Other Heavy Duty	7.3	5.5	5.5	4.7	4.2	4.0	3.8	4.0	3.8	3.8
3. City General	10.4	10.7	10.5	9.1	8.8	7.3	6.9	6.7	6.1	6.0
4. Country General	20.7	21.0	30.3	34.7	34.0	34.5	37.2	36.3	37.4	38.0
5. Meter	9.4	17.9	9.6	11.0	11.9	17.4	15.5	16.4	16.6	16.3
6. Calibration	1.6	1.2	1.3	1.4	2.2	2.7	2.6	2.1	2.7	2.0
7. Propane									1.8	2.2
8. Request	6.6	4.6	3.7	3.3	3.8	3.5	2.8	2.6	2.7	2.4

TABLE N-10 - PERCENTAGE OF WEIGHTED WORK UNITS OF WEIGHTS AND MEASURES INSPECTION BY SUB-ACTIVITY IN THE SASKATOON DISTRICT 1964-1973

ANNEX N: -- PERCENTAGE OF TOTAL WORK BY GROUP

DEVICES	INSPECTION STATISTICS									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	7.1	7.4	7.1	7.8	5.8	5.7	5.0	5.7	6.1	5.9
2. Other Heavy Duty	2.8	2.8	2.4	2.8	2.1	1.8	1.8	1.7	1.7	1.6
3. City General	40.7	44.7	41.8	46.7	36.0	34.6	36.2	33.2	34.5	34.2
4. Country General	25.5	19.9	30.4	22.1	33.3	39.3	42.0	42.4	43.7	44.0
5. Meter	6.1	7.8	5.9	9.0	6.9	6.6	7.0	6.3	6.6	6.3
6. Calibration	.1	.2	.3	.3	.3	.5	.8	.6	.7	.7
7. Propane	.1	.1	.1	.1	.1	.1	.1	.1	.2	.4
8. Request	17.5	17.1	11.8	11.2	15.6	11.4	7.1	10.0	6.5	6.9

TABLE N-11 -- PERCENTAGE OF WEIGHING AND MEASURING DEVICES BY SUB-ACTIVITY IN THE WINNIPEG DISTRICT 1964-1973

DEVICES	WEIGHTED WORK VALUES									
	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964
1. Elevator	10.5	10.7	10.6	10.9	9.2	8.8	7.5	8.9	9.2	8.9
2. Other Heavy Duty	10.0	9.5	8.3	9.0	7.2	6.5	6.0	6.0	5.7	5.6
3. City General	32.7	34.6	32.7	33.8	29.4	27.5	28.2	26.8	26.4	26.0
4. Country General	20.8	16.0	24.0	16.4	27.4	30.8	30.8	33.2	32.8	33.2
5. Meter	13.5	16.7	13.1	18.7	16.4	15.2	15.8	14.9	14.8	14.1
6. Calibration	.8	1.8	1.6	2.7	2.3	4.2	5.0	2.8	4.2	4.1
7. Propane	.4	.3	.5	.3	.3	.3	.5	.5	.6	1.6
8. Request	11.4	10.5	9.3	8.2	8.0	6.9	6.1	6.9	6.3	6.7

TABLE N-12 -- PERCENTAGE OF WEIGHTED WORK UNITS OF WEIGHTS AND MEASURES INSPECTION BY SUB-ACTIVITY IN THE WINNIPEG DISTRICT 1964-1973



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