RT 55.

Systematic Traffic Counting Programme
Clár-áireamh Sistéamach Tráchta

An Foras Forbartha

The National Institute for Physical
Planning and Construction Research

St. Martin's House, Waterloo Road,
Dublin 4. Telephone 64211.

J. Devlin and P. McGuinness.

December, 1970

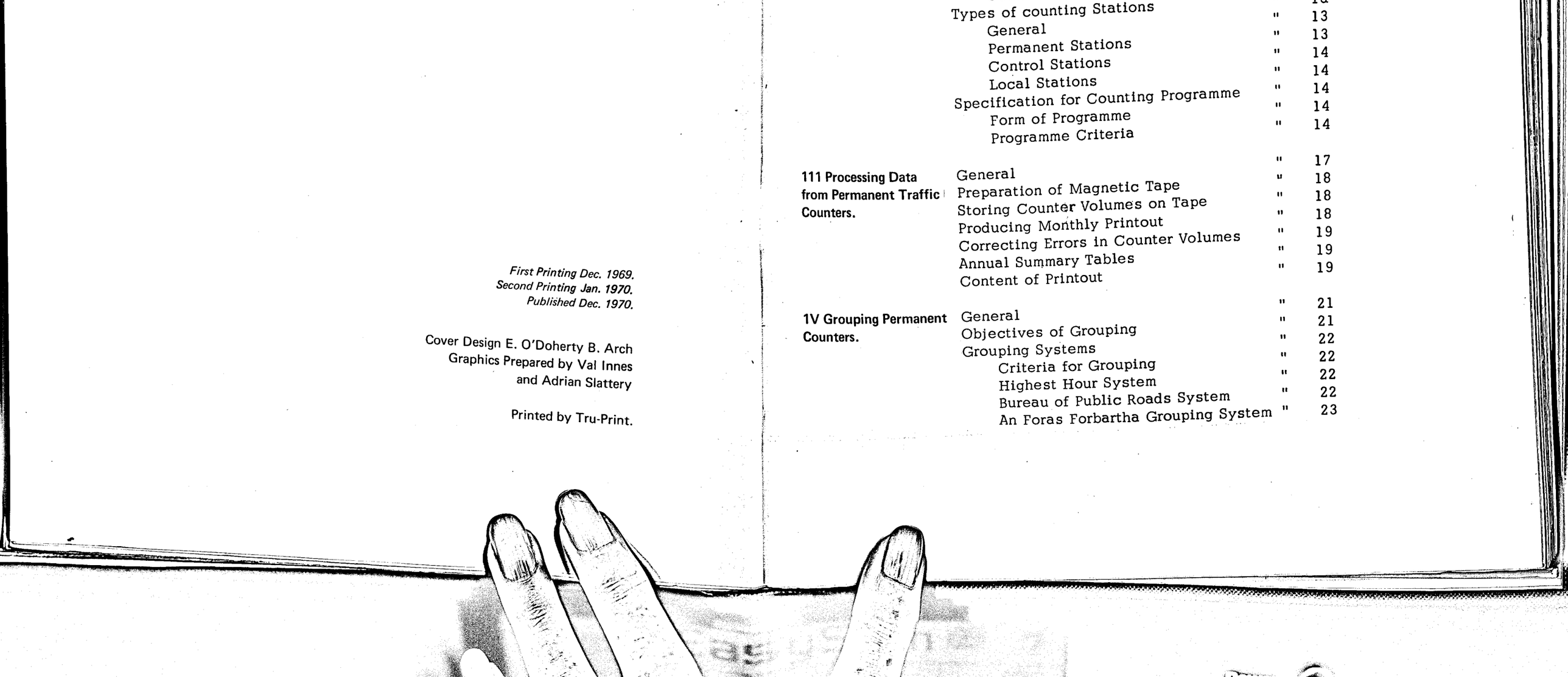
Price 15/- (75p)
excluding postage.

First Printing Dec. 1969.
Second Printing Jan. 1970.
Published Dec. 1970.

Cover Design E. O'Doherty B. Arch
Graphics Prepared by Val Innes
and Adrian Slattery

Printed by Tru-Print.

TABLE OF CONTENTS



SUMMARY

A country wide traffic counting programme for the National and the more important other routes was commenced in 1968. It aimed at establishing the average daily traffic for each portion of the counted network.

This report relates how the counting programme was organised, what counting strategy was used and how the field data were analysed and processed. The summarised results are presented in tabular form by reference to route number and section and also in map form.

During the analysis traffic flow patterns were identified for each of five functional types of route. Daily and monthly factors based on these patterns are given. Computer programs were developed to perform the analysis and provide printed summary information in specially designed formats.

NOTES ON TENTATIVE CLASSIFICATION SYSTEM

Attention of the reader is drawn to the fact that the route classification and numbering system referred to in this Report has no formal significance other than the simplification it offered in indexing road sections on which counts were taken.

The reader is cautioned, therefore, against confusing the tentative route classification used in this Report with that which will emerge when the Minister for Local Government's official decisions on reclassification and route numbering become known.

1 INTRODUCTION

1. This report presents the results of an extensive traffic counting programme undertaken on the principal routes throughout the Republic during 1968. The series of flow maps at the end of the report enumerates the main results, namely, the numbers of mechanically propelled vehicles passing on every section of the network during an average day in 1968.

2. The procedures used in analysing the census counts as received from the field stations is the subject of separate reports, RT.56 and RT.59. These describe the transfer of field information to data cards, the analysis procedure and the several computer programs used to carry out that analysis. Such programs could readily be used by any other agency wishing to process counter tapes or to use any of the analysis procedures. For the sake of completeness a summary description of the operations performed in these programs is included in this report.

3. The size of the road network included in the counting programme comprises the tentative National Primary and Secondary Routes and some of the more important other Routes. In all approximately 4,000 miles were included. These are the principal routes in the Republic and they extend into and through the towns and cities which they connect.

4. The counting programme had the following general objectives:

To provide information considered to be essential in the study of road accidents

To provide information needed for the determination of economically feasible road standards

To provide working data for economic investigations in road transport

To provide traffic flow information used in the design of road improvements

To provide base data required in local, regional and national planning studies

To provide an essential base for further research projects in the construction, safety and traffic fields

To provide working data for persons engaged in pavement design.

5. There are many other fringe uses to which traffic flow information is frequently put in the tourist, commercial, and private sectors. These uses need not be enumerated here.

6. Not all information collected in the counting programme is presented in this report. That portion of the programme which investigated composition of traffic by type of vehicle has been presented in Report RT.49. Moreover there are items of detail or local interest which are not suitable for inclusion in a general report such as this. Additional information about individual counters and traffic patterns is available if required.

11. THE COUNTING PROGRAMME

General

7. The immediate objective of the counting programme was to establish:

(a) Annual average daily traffic (AADT) on every significant section of the counting network.

(b) Total travel in vehicle miles on the principal through routes.

(c) The approximate composition of traffic by class of vehicle at chosen points on the network.

(d) Any significant characteristics of travel by region or by route function.

(e) Hourly, daily, monthly patterns for as many route types as might emerge.

(f) Information on travel in daylight and in darkness.

(g) Information which would make possible the design of future programmes using far fewer counting points.

(h) The distribution of design hour volumes at selected points on the network.

8. The procedure used to carry out the programme comprised the division of the road network into short sections, the systematic recording of traffic data related to each section and the execution of computational steps to obtain meaningful information relevant to the above objectives.

9. In this chapter there is mention of some of the earlier work in this area. There is also a description of the steps involved in drafting the programme, a discussion on the types of mechanical counters used and a sample presentation from the many counting schedules employed.

10. The interpretation of field data and the computational procedures used to arrive at the final information are all treated in later chapters.

Earlier Work

11. Earlier work by Treacy (1) had demonstrated the value of identifying characteristics which could be used to interpret short period counts. This technique was used extensively in the present programme and was developed further to infill accidental gaps in the counting sequence and later to smooth out idiosyncrasies in the returns from individual counters. Both O'Keeffe (2) and Treacy had drawn attention to the need for information on design hour volumes and this type of information was extracted wherever hourly information was available. Traffic flow information presented by McCarthy (3) described intertown traffic volumes based on a two-day census supported by permanent counting stations. The present counting programme differs from that described by McCarthy in that it monitors the variation in traffic volumes at more frequent points, while the network covered is less extensive in terms of mileage. The procedure used revealed very significant changes in volume along routes as they passed through or close to even small towns. This was less evident from the type of study reported by McCarthy.

12. Much counting information was already collected by individual local authorities. It was felt that the present programme would, by co-ordinating such counts, lead to a more uniform programme the results of which could be published on a uniform format. Moreover the emergence of regional or functional patterns should lead to greater accuracy in reporting. The centralised processing of the voluminous information from self-recording counters seemed to offer considerable advantages in the way of computerisation.

13. Notwithstanding some advantages which may follow from pattern identification it should never be overlooked that the quality of any counting programme is totally dependent on the accuracy of the field data from which it is compiled

Initial Steps and Procedures

14. Following a recommendation from the Seventh Meeting of the Road Traffic Advisory Group at An Foras, a working party was set up to advise on a counting programme. Their report, RT.20, set criteria for counting sections, reviewed available equipment and formulated procedures.

15. The census network was first divided into short counting sections so chosen that traffic volume was considered uniform within the limits set by the Working Party. Major intersections and the edges of towns most frequently marked the section changes. Section lengths varied considerably with the circumstances, the average being 3.9 miles. As sections would later be used to designate lengths of road on which a counter would be placed it was advantageous to assign an index number to each.

16. Unfortunately the official route classification of the road network was under review at the time of the programme

and could not be used. A tentative classification and tentative route numbering system was therefore "invented" solely for the purpose of this project. It offered a logical system of indexing a portion of road by route and section number e.g. N9-28, meaning National Route 9, Section 28.

17. The determination of sections and the assignment of numbers to them was carried out at An Foras which then drafted the programme and scheduled the counting sequence in a manner later to be described. The field counting was in every case carried out by the local authority for the area concerned. These field counts were then returned to An Foras for processing, summarisation and preparation of flow maps. The manner of processing and data extraction is outlined later in this report and is presented in fuller detail in the Documents RT.56 and RT.59.

Types of Counter used

General

18. Two classes of counter were used

(a) Small counters of the non-recording type having a digital display register opposite a small glass window on the counter case. The register advances with each passing vehicle.

(b) Large counters of self-recording type having a paper tape output which gives a periodic record of vehicles passed.

19. In every case, save one, counters were attached to pneumatic type detectors. These were small bore rubber tubes stretched and fixed down to the pavement in a direction transverse to traffic and designed to transmit a pneumatic impulse from each passing axle. One counter, in Co. Wicklow, was attached to a battery operated induction loop detector installed by the local authority for experimental purposes.

Non-recording Counters

20. Non-recording counters were mainly of two kinds: the Sykes-RRL type and the K-Hill type. Both operated from dry cell batteries.

21. The Sykes-RRL type and a very similar model marketed by Girling Limited contain a bellows type diaphragm. An air pulse from the tube expands the diaphragm closing an electric switch which in turn activates a linear solenoid. A ratchet arrangement then advances the register.

22. In the K-Hill type the air pulse lifts a ball off its seating releasing excess air. The ball closes an electric switch activating a rotary solenoid which is directly connected to the register.

23. Either make of counter is intended to be read without having to open the case but internal condensation frequently required that this be done. It will be seen that the counting programme called for a once daily reading, ideally at midnight. An 8.00 a.m. reading time was chosen for reasons of practical convenience.

24. An example of the field sheet used with these counters is illustrated in Fig. 1. It provides for counters recording either axle numbers or vehicle numbers. The form is similar to various versions previously used by local authorities.

25. Data from field sheets was transferred to a Monthly Return Form, Fig. 2. This has an unusual calendar format first developed by Wicklow Co. Council in 1959. Its use enables important daily characteristics to be preserved even though counting information over a month may be broken or incomplete. It also clarifies the question of weekends with respect to the calendar month and it gave rise to the unusual definition of ADTM (average daily traffic for the month) in table 1.

Self-recording Counters

26. Self-recording type counters were mainly of two kinds: the Streeter Amet type and the Fischer and Porter type. For both types the mode of activation was via bellows type diaphragms connected to tube detectors in a manner similar to that used in one of the non-recording counter types already described. Dry batteries were the most usual power source.

27. The Streeter Amet type counter prints on its output tape the period total (usually hourly) of vehicles passing and then automatically resets to zero. A sample output is illustrated on Fig. 3. It will be seen that the tape can be read directly by the human eye. In practice some smudging and faintness of printing was experienced. As the readings are non-cumulative all readings must be abstracted and visual mistakes are carried into summaries. This could be both advantageous and disadvantageous. It should be mentioned that later models of this counter have a printed tape output that can also be read automatically by an electric scanner though no such model was used on this programme. Such a tape is illustrated on Fig. 4.

28. The Fischer and Porter type counter punches in binary code on its output tape a continuously cumulative total of vehicles passing. The punching interval was usually set at one hour. A sample output is illustrated on Fig. 5. The tape cannot readily be read by human eye though the cumulative nature of the data does lend itself to the rapid extraction of daily or other summaries. In practice a purpose made translator is necessary to abstract the readings. Two types are marketed, a decimal display translator giving a straight visual

display of the punched tape data and an automatic translator designed for coupling to a standard IBM keypunch so as to give automatic transfer of data to IBM punched cards. A display type translator used on this programme was not very reliable and resulted in many translation errors needing subsequent correction. It was not possible to arrange the coupling of an automatic translator to the IBM keypunch at An Foras during the period of this project but efforts in this direction are still proceeding. Difficulty in translating the Fischer and Porter counter tapes into usable form considerably delayed the production of this report.

Counter Maintenance

29. No formal programme of counter maintenance was set. Through the courtesy of the Road Research Laboratory a comprehensive maintenance guide(4)in relation to Fischer and Porter counters was circulated where appropriate.

Counter Accuracy

30. The insertion of correction factors, based on visual checks, to amend counter readings was provided for in the design of the field sheet for non-recording counters Fig. 1. An accuracy check procedure is included in the maintenance guide mentioned above(4) for self recording counters, however, in the latter case no procedure was provided for the correction of counts already taken. Report RT.49 in relation to visual counting gave some information on the accuracy of the self-recording counters.

Types of Counting Station

General

31. Three types of counting station were adopted, permanent stations, control stations and local stations. One or other of these stations was placed on every counting section on the network.

Permanent Stations

32. Permanent stations, to the number of 49, were located at a wide variety of points through the network. These included urban routes, commuter routes, intertown routes and tourist routes. As far as could be judged each type of route was represented. Permanent counter positions from previous programmes were retained where possible. A self-recording counter was placed at each permanent station and an hourly record for the full year was aimed at.

Control Station

33. Control stations, to the number of 100, were similarly located through the network; their precise location was fixed after studying the next group, local stations. Control stations were counted for three separated months or parts thereof. Non-recording counters were used and these were read at 8.00 a.m. each day. The objective was to ascertain seven averaged readings, one for each day of the week to represent each of the months. Thus three completed forms, Fig. 2, were aimed at for each control station.

Local Stations

34. Local stations, to the number of 1,000 were located one to each section of the network not already having a permanent or control station. Local stations operated for not more than one month in the year. Non-recording counters were used. These were read at 8.00 a.m. each day. Each of the seven days of the week was averaged, using the form illustrated, Fig. 2, and an ADTM (average daily traffic for the month) was calculated.

Specification for Counting Programme

Form of Programme

35. The specification for the counting programme was prepared at An Foras and a copy of the relevant portion supplied to each authority involved. It comprised a list of the counting sections, a map showing their location and a schedule or counting plan. A copy of the specification for Co. Meath is reproduced in Figs. 6, 7 and 8.

Programme Criteria

36. The Co. Meath specification may be used to illustrate the criteria for programme formulation. The two permanent stations were chosen from the overall criteria already discussed. Their number and choice were based on subjective assessment.

37. The number and placement of control stations is dictated by their function. A very reliably AADT estimate and seasonal pattern information were required. Both requirements should be met from counting in three separated months. Seasonal information would make it possible to choose a suitable type permanent station to which readings might be related in making the AADT estimate. The existance of control stations is intended to help in making the corresponding choice for local stations. Since local stations placed on similar routes to the control could be expected to fluctuate seasonally with it the counting schedule ensured that counting at a control station and any related local stations would occur simultaneously.

38. Thus in Co. Meath, see Fig. 7, where control station N3-15 in An Uaimh is counted in May/Aug/Nov all other urban stations including those in Kells are counted in one or other of these months and related to N3-15 for expansion to AADT. Likewise control station N60-13 is counted in March/June/Sept and other rural stations on the same route comprising N60-9, 12 and 14 are counted in one or other of these months and related to N60-13 for expansion purposes.

39. Most permanent stations act as control stations for those local stations which are adjacent to them. The assignment of local stations to a particular control was subjective but this is not thought to have lead to significant errors. However, the system suffered from the disadvantage that its functioning could be greatly upset by non-adherence to the prescribed timing schedule.

40. The mechanics of relating local stations to controls and controls to permanent stations in the analysis of counts is not relevant at this point but will be described later in the Report.

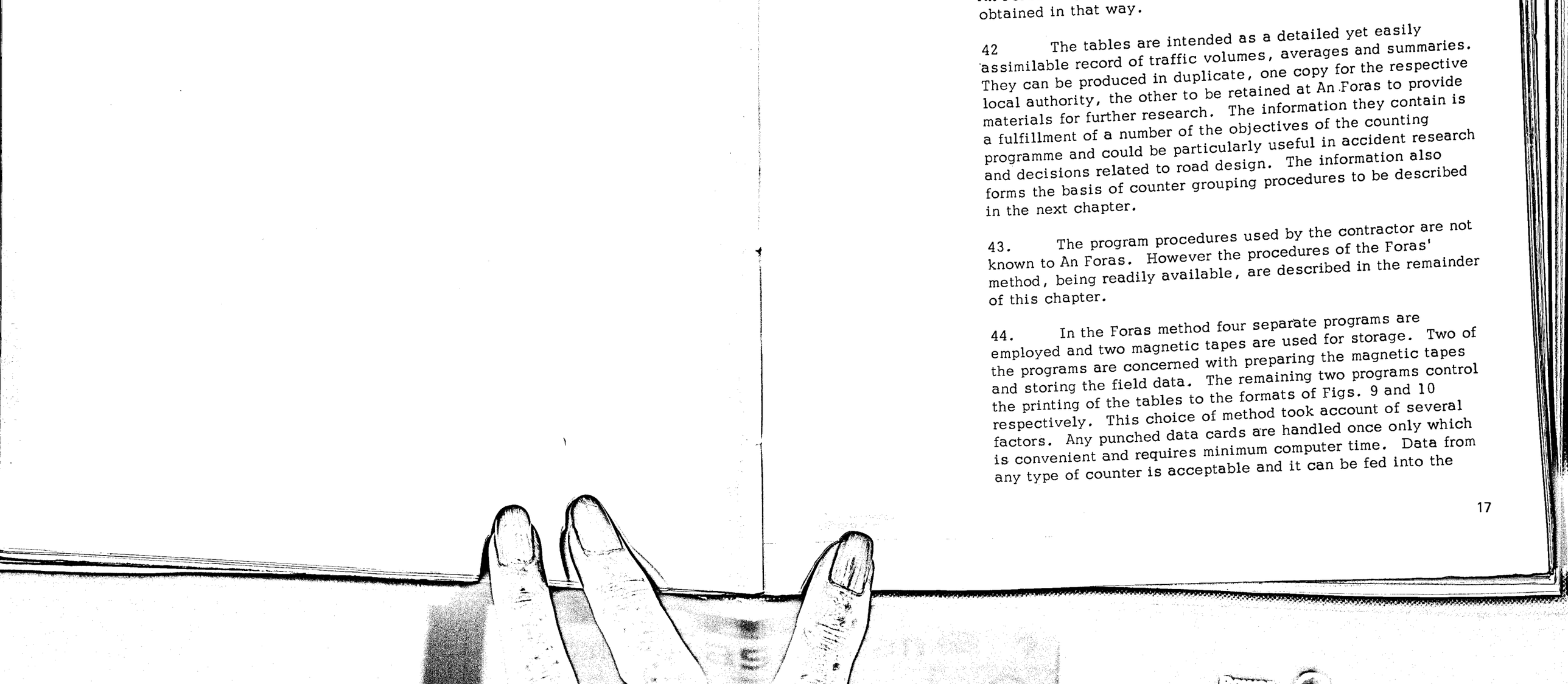
General

41. At the commencement of the counting programme An Foras entered into an arrangement with an outside contractor to handle the data from the self recording tape output counters. An Foras specified how the information should be handled and the format in which the results should be returned by the Contractor. This format is substantially that shown in Figures 9 and 10. Because of protracted delays which occurred under this arrangement, An Foras decided to initiate procedures to handle the work using its own staff and rented computer facilities. Furthermore this was seen as a desirable step in relation to future counting programmes. With this objective An Foras wrote its own computer programs in Fortran language suitable for the IBM 360/44 computer. Some counter outputs, instead of being sent to contractors, were processed using An Foras Programs and the six tables, in Figs. 9 and 10 were obtained in that way.

42 The tables are intended as a detailed yet easily assimilable record of traffic volumes, averages and summaries. They can be produced in duplicate, one copy for the respective local authority, the other to be retained at An Foras to provide materials for further research. The information they contain is a fulfillment of a number of the objectives of the counting programme and could be particularly useful in accident research and decisions related to road design. The information also forms the basis of counter grouping procedures to be described in the next chapter.

43. The program procedures used by the contractor are not known to An Foras. However the procedures of the Foras' method, being readily available, are described in the remainder of this chapter.

44. In the Foras method four separate programs are employed and two magnetic tapes are used for storage. Two of the programs are concerned with preparing the magnetic tapes and storing the field data. The remaining two programs control the printing of the tables to the formats of Figs. 9 and 10 respectively. This choice of method took account of several factors. Any punched data cards are handled once only which is convenient and requires minimum computer time. Data from any type of counter is acceptable and it can be fed into the



system for odd periods at a time yet prints are obtainable in even monthly increments when called for. Questionable field information can be amended, displaced in time or deleted altogether. A detailed description of the programs may be found in Report RT.56. An outline description will now be given here.

Preparation of Magnetic Tape

45. The "first" computer program is used to prepare the magnetic tape. It has a twofold function. Firstly, it stores on the tape the constant information that appears on the output tables - for example, the local authority name, the counter location, the number of days in the month and the hours of daylight. Secondly, it prepares the tapes to receive the counter volumes. This amounts to the allocation of a fictitious value (-1 vehicles per hour) to every volume location appropriate to each hour of the year for each counter for which provision is made. Subsequent computer programs alter these fictitious volumes only when real values are available. Thus, it is possible to identify missing volumes and to exclude them from both calculations and printed tables.

Storing Counter Volumes on Tape

46. The "second" program was designed to handle the information from the counters. Special routines were built into this program to cater for the separate types of counter already discussed. Two routines - hourly cumulative and hourly non-cumulative - were arranged for the tape output counters discussed in paragraphs 27 and 28. A third routine was used for 24 hour non-recording counters as these are frequently placed at permanent stations during breakdowns. Two further routines were provided to convenience the correction or deletion of traffic volumes already stored by the computer.

47. Before the second program can be used it is necessary to transfer the counter information to IBM data cards. A header card is punched to accompany each batch of data cards. It nominates one of the five processing routines discussed above and identifies the counter, date and time appropriate to the batch. The computer then assigns the hourly (or 24 hour) traffic volumes to the appropriate locations on the magnetic tape replacing in the process any previously stored fictitious or real volumes.

Producing Monthly Printout

48. The "third" program is used to produce the monthly printout tables (tables A,B, and C in Fig. 9). It locates the section of magnetic tape reserved for the month in question, and prints the tables from the volumes stored thereon.

49. The format of presentation used in table A is believed to be the best attainable and was arrived at after a study of many formats by other researchers. It is modelled on a presentation by Parrish et al(5). A good format should give the reader the greatest facility to recognise anomalies in the counter data such as incorrect day, incorrect hour or unusual value of any volume reading. The format used requires a

printing width of 132 characters; unfortunately this requirement limits the use of these programs to computers having printers of this capability.

50. The day totals from table A are reprinted in table B using the now familiar calendar format used for non-recording counters as in Fig. 2. This same information is presented, table C, as factors to the monthly base. Some commonly occurring counter faults can often be quickly identified from a glance at table C. The magnetic tape contains the volumes shown in table A only; the contents of tables B and C are calculated each time a printout is produced, thereby ensuring that any subsequent corrections or additions to table A are automatically incorporated in later printings of tables B and C.

Correcting Errors in Counter Volumes

51. If examination of the monthly printout reveals that questionable or incorrect readings have been stored amended cards may be punched and the "second" program run again in the normal way. However, the most frequently occurring errors can more easily be rectified by using the special correction or deletion routines referred to in paragraph 46. The most frequently occurring errors appear to arise from:

Incorrect labelling of counter tapes by hour, date or description.
Failure of counter clock.
Battery becoming partially or fully discharged.
Detector tube becoming cut or blocked.

Annual Summary Tables

52. The annual summary tables (tables D, E and F in Fig. 10) are produced by the "fourth" computer program. This program locates the section of magnetic tape dealing with the counter in question, analyses all the "real" volumes contained thereon, and prints the results of this analysis in the form illustrated.

Content of Printout

53. The items contained in table A are self-evident with the exception of the lines prefaced "DY AV" and "WD AV". Each DY AV figure is the average of all days' volumes appearing in the column above it while each WD AV figure represents a similar average for weekdays only (Saturdays and Sundays excluded).

54. In table D, the AADT was found by averaging the twelve ADTM values, substitute monthly factors ("FM") being used in place of missing ADTM figures. The symbols ADTMWD, ADTMSA and ADTMSU refer respectively to the average daily traffic for the month based on Weekdays, Saturdays and Sundays. The highest volumes listed in table F are identified by hour (HO), day of week (DY), date of month (DT) and month (MO). At the foot of table F will be found the frequency of occurrance of volumes in incremental ranges. The ranges are given in units of 100 vehicles per hour starting with volumes in the range

0-99 vehicles per hour tabulated under range "0". The table F figures, and the table showing the volume ranges, should be used with caution if some of the year's hourly volumes are missing.

55. The average daily factors listed in table E are values brought forward from table C where each factor is the ratio of the average volume for that day to the ADTM for that same month. Table E values form the basis of the counter grouping exercise to be described in the next chapter.

1V GROUPING PERMANENT COUNTERS

General

56. A major application for the comprehensive traffic picture available at permanent stations is its use in the expansion of short period counts elsewhere to calculate their annual average daily traffic (AADT). The availability of 49 traffic patterns from permanent stations raised the question of which patterns were the most representative and therefore the most suitable for use in this application.

57. Much of the earlier work in counting revealed that while patterns at many stations differ from each other common group patterns could be recognised and furthermore that such groups coincide broadly with roads having similar predominant functions. The recognition of any such groups could ensure that patterns having the broadest application would be used in this expansion process. Counter grouping and the calculation of average patterns for use in expansion is already employed in most states in the U.S. The remainder of this chapter enumerates the advantages to be expected from grouping and discusses some of the grouping procedures which were considered and that which was ultimately adopted for this programme.

Objectives of Grouping

58. Objectives and advantages to be seen in counter grouping are several and three of the more important are now listed:

(a) Grouping performs a valuable smoothing function in relation to fluctuations which are local in origin (e.g. sports events, counter faults) and which it would be desirable to suppress whenever continuous counts are used to expand short term counts at other places.

(b) Where counters, falling into geographic or other identifiable configurations, exhibit sufficient similarity to merit groupings then these configurations may be used to indicate suitable assignment for short term counting stations at other locations.

(c) Whereas the original number and placement of permanent stations was subjective, grouping would provide objective criteria for future years permitting each type of road to be adequately but not over-represented.

Criteria for Grouping

59. Before a large number of counters can be formed into groups it is necessary to select criteria to characterise the traffic pattern at a counter. Once criteria are established the performance of a counter would be represented solely by the chosen characteristic or characteristics. Similarity or disimilarity between two counters, or the 'goodness of fit' of a particular counter with a group of counters could then be expressed in terms of these characteristics. In this way a number of groups could be arranged each composed of counters having like characteristics. Since many locations carrying mixed traffic might ultimately fall between two groups the number of groups should be sufficient to avoid a poor fit in such cases.

Highest Hour System

60. The ratio of the 30th highest hour in the year to the annual average daily traffic is one possible characteristic which might be used as a basis for a grouping system. This ratio is known to reflect route function. However no reference could be found in the literature to its use in this context.

Bureau of Public Roads System

61. Most states in the U.S. use monthly factors as characteristics giving in effect 12 characteristics to describe the pattern of each counter. An "array method", advocated by the U.S. Bureau of Public Roads is then used to establish counter groups(6). A large table of factors by month is prepared wherein factors are arrayed in descending order of magnitude within each month. As the factor sequence of counters might vary month to month it is necessary that every factor in the table carry an index or label identifying the counter to which it belongs. Where it is seen that factors from certain counters are numerically close for all or nearly all months such counters are considered to form a group. Limits of permitted variability within a group are suggested by the Bureau.

62. In discussions with some state highway officials it was suggested that the Bureau system left room for improvement. For one thing it was difficult to operate where more than about 20 counters were involved. There was mention also of the degree of subjectivity in the identification of groups. References in the literature raise other points. Drusch writing of Missouri Highway Department's experience in the use of the Bureau's system(7) reports "This resulted in an excessive number of groups. When indicating the group assignment of continuous count stations on a map by the use of color codes, no reasonable pattern of continuous group assignments appeared. Other tests indicated that an appreciable number of stations

would tend to change groups in the following year".

63. Drusch's remark about possible absence of pattern when groups are plotted on a map is significant in relation to the second objective set out here in paragraph 58. Compact groups however logically formed in a mathematical sense are of little more than academic value unless they also conform to some identifiable configuration. Instead it would be preferable to ascertain which configurations of groups give rise to the most compact group patterns. It would also be reasonable to expect that stations so grouped would be unlikely to switch groups from year to year.

64. In the analysis of the 50 point census in Great Britain(8) a search for groups displaying similar patterns does not appear to have been undertaken. The administrative categories of road were accepted as constituting the groups and the counter results were averaged within each category. It should be borne in mind that tourist traffic which is a major independent variable in Ireland probably constitutes a far lesser proportion of total traffic in Great Britain.

An Foras Grouping System

65. An Foras considered the U.S. Bureau of Public Roads' system of grouping and the shortcomings ascribed to it. It felt that some objections might be met if the 12 characteristics, or monthly factors used to describe a counter were enlarged to 84 by considering day of the week. This made it desirable to adopt some other method of assessing similarity when comparing counters with each other. The method was to use the sum of the squared differences for all 84 characteristics as a measure of dissimilarity between counters. This gave a tendancy to keep apart counters which had a large difference for any particular day or month. The method also changed a step, which is very complex in the Bureau method, into something which could be more easily computerised. The next operation was to form groups using the above measure of dissimilarity.

66. The number of possible group configurations using say 4 groups and 50 counters runs into many millions. The number is indeed so great that it is impracticable, even using a computer, to test every conceivable combination for 'goodness of fit'. A procedure was used, therefore, to encourage the formation of nuclei of groupings and each counter in turn was then compared to these nuclei. A group nucleus was then allowed to acquire any counter which displayed a good fit.

67. In a first exercise every counter was regarded as the nucleus of a group giving in effect 49 groups. Any two displaying similarity (literally when the preferred match of each was mutual) were allowed to coalesce and their characteristics averaged. Each such step obviously reduced the number of

groups by one. When all mutual similarity cases were exhausted the process was allowed to continue by gradually increasing the dissimilarity permissible at each acquisition. Thus groups grew in size but decreased in number. A printout was made of group constituents and their dissimilarity measurements when all 49 counters had been formed into 8 groups, 7 groups, 6 groups, 5 groups and 4 groups respectively. Two counters showed such dissimilarity all round that they were withdrawn. The constituents of each group were then identified geographically and otherwise to see if recognisable configurations could be identified.

68. Checks were made by repeating the exercise while changing the sequence in which counters were examined. Unfortunately, several trials revealed that, while substantially similar groupings emerged each time, a few counters did switch groups. Furthermore the presence of recognisable configurations depended on which option was accepted. The exercise was then abandoned but its results gave vital clues to the choice of nuclei in the next exercise that followed.

69. In a second exercise 26 counters were chosen to represent 5 groups recognised in the first exercise. These groups, when plotted on a map, seemed to fall into five functional classes and were given description names for convenience. Group nuclei were then formed from these as follows:

2 counters on urban commuter routes

3 counters on urban routes general

15 counters on rural intertown routes

4 counters on predominantly tourist routes

2 counters on tourist routes with unusual Sunday characteristics

70. The characteristics of every counter - including the 26 above but excluding the two anomalous counters, paragraph 67 - were compared to the mean characteristics of the 5 group nuclei by measuring the sum of the squared differences of characteristics. Counters were then assigned to the group of best fit. Group mean characteristics for the enlarged nuclei were now recalculated and the process repeated until stability was reached.

71. The groupings resulting from the exercise are given in table 3 and shown geographically on Fig. 11. Apart from two counters, one near Tullamore and one near Kilkenny, the group configuration follows a geographic pattern. No acceptable reason is seen for the two irregularities.

72. These five groups, represented by their respective mean group characteristics, were used to expand the counts at control stations in a manner to be described in the next chapter. The mean monthly factors displayed by the five groups are shown in Fig. 12. An example of the daily characteristics during one month is shown in Fig. 13. A complete presentation of these values is given in tables 4 - 9.

73. The two grouping exercises which have been treated in outline in this chapter are described in full detail in report RT.59.

V PROCESSING DATA FROM CONTROL COUNTERS

General

74. This chapter describes how control stations were identified with one or other of the five permanent station groups and how annual average daily traffic (AADT) at the control was estimated from the counts available. It will be recalled that counts at control stations were planned for three separated months. In some instances departure from the counting schedule occurred; where this happened identification of that control with a permanent counter group was often less reliable. Local stations assigned to that control were similarly influenced.

75. The method of control grouping was broadly similar to that for permanent grouping. Again use was made of computer programs and these are detailed in Report. RT.59. Only an outline of the steps involved is given in the paragraphs that follow.

Grouping Control Counters

Reasons for Grouping

76. Identification of a particular control station with one or other of the five permanent groups was performed to make sure that counts at that control (three months data) and at each dependent local station could be expanded to AADT from a correct weighting of the monthly patterns appropriate to the location. In the absence of this identification it would be impossible to arrive at an accurate estimate of AADT at either a control or local station not knowing whether the location was tourist, intertown or other function type.

Counter Output

77. Normally three forms of the type, Fig. 2, were available from control stations each giving six average daily volume readings, Saturday and Sunday having been combined into a single "weekend" value. This gave 18 characteristics to describe any control which was counted for the planned three separated months.

78. The computer program was made sufficiently flexible to handle characteristics other than the 18 in number. This proved a useful facility whenever a departure from the precise counting plan occurred. A counter breakdown or a decision to count extra months could therefore be accommodated.

Grouping Procedure

79. The grouping procedure for each control station consisted of measuring the similarity between it and each of the five permanent station groups, and associating the control with the group exhibiting the greatest similarity in characteristics.

80. The computer examined the data from each control in turn and established the months in which it was counted. Selecting the same period at each of the five permanent groups it calculated five sets of matching characteristics which were then compared to the group characteristics. The differences observed in the compared values were squared and summed separately for each group. The resulting summation producing the lowest value was interpreted to be the group of best fit. This is thought to be similar to the method used in the Georgia study(5).

81. Using this method every control station was assigned to one or other of the five permanent groups. A plot of the grouping on a map showed some geographic anomalies. This is not altogether surprising as some controls would have been counted in months when several groups had similar factors and it would not therefore have led to any erroneous output in these cases, see Fig. 12. No doubt the anomalies also included some more significant incorrect assignments. Drusch (7)in a similar exercise using the BPR method discovered on a test that a surprising 44% of assignments went to an incorrect group. No such test was possible here.

Calculation of AADT

82. The annual average daily traffic (AADT) at a control station was calculated by first summing the 18, or other number of daily volumes, ascertained from available Monthly Returns, Fig. 2. This tot was then reduced to AADT by dividing it by the tot of corresponding day characteristics for the appropriate group to which the control now belonged. In this way use was made of every available day's count at the control to minimise any unusual daily or monthly variation that might have interposed.

V1 PROCESSING DATA FROM LOCAL COUNTERS

General

83. It will be recalled that by far the largest number of counting stations in the programme belong to the 'local station' class. These stations were counted for one month or part thereof. The grouping exercises for permanent and control stations already described were carried through mainly to provide a valid means of expanding monthly counts at local stations to AADT. This chapter describes the procedures used.

Calculation of AADT

84. Every local station was first assigned subjectively to an adjacent control or permanent station considered to have a like route function, see paragraph 37. As local and control stations were most often on the same route, see Co. Meath Fig. 8, serious error was unlikely from this source. The plan for counting ensured that every control station was being counted simultaneously with all local stations assigned to it.

85. The average daily traffic for the month (ADTM, see Fig. 2) at the local station was expanded to AADT in the ratio of Control AADT to the Control ADTM for that same month.

86. Consideration was given to an alternative method whereby AADT might have been calculated by dividing the ADTM by the monthly factor for the group to which its controlling station belonged. The method adopted could be expected to give better AADT values where unusual but genuine traffic variations occurred. The alternative method would give better values where any variations arose from counter malfunction at the control station.

87. Calculation of AADT for local stations was also carried out using a computer program as before. Details of this program are also included in Report RT.59.

Use of Results

Use of Groups

88. Analysis of the permanent counting stations resulted in the emergence of five groups each broadly coinciding with routes having a particular function. If counts were taken at the same points in future years it would be possible to calculate a growth rate broadly representative of route function.

Use of Factors

89. The characteristics by which these groups are described are reproduced as factors in tables 4-9. Table 4 contains monthly factors and these are also shown graphically in Fig. 12. If a monthly count, ADTM, is available for any point at which the route function can be judged then the AADT can be obtained by dividing the ADTM value by the relevant factor from Table 4. This relationship could be expected to be substantially true for some years to come.

90. Similarly if counts are available for particular days only, at a point, the AADT can be obtained by dividing the available day values by the relevant factors from tables 5 - 9 and averaging the results obtained.

91. It should be noted that the day factors in table 5 are to an annual base and should not be confused with the day factors in Figs. 9 or 10 which are to a monthly base. The latter is convertible into the former by multiplying by the monthly factor.

Experience Gained

92. In this programme the method used to establish grouping and hence route function of control stations was based on the relative magnitude of counts taken over three separated months. It is desirable that either July or August be one of these months. Where this puts a premium on counters, 14 days, not necessarily consecutive, could be used to establish the monthly count. Portable self recording counters would be useful for this. Local counts taken in April, May, September or October are better insulated against the effect of incorrect group assignment than counts taken in any other months.

93. In this programme the method of analysis required that related local and control counters be operating simultaneously. This should have given very accurate AADT values provided only that counters were recording without error. Had local stations; been related directly to the permanent group selected by the control then local station AADT would have been less sensitive to counter error but more sensitive to errors from real short term fluctuations in traffic volume.

94. Taking all the above considerations together and viewing them against the back-ground of the five patterns which emerged, and the experience of counter breakdowns it would appear that a better counting schedule would result from counting control stations only in Feb., July, August and November and counting local stations only in March, April, September and October. In the analysis local stations would then be related directly to one or other of the permanent groups chosen by the control.

95. More consideration could be given to the selection of permanent station sites. Should, for example, the five emergent groups be more equitably represented ? Should streets in provincial towns be represented ? A case could be made for random selection using the vehicle/mile information now available.

96. The siting of counter location within each counting section was much influenced by site convenience; better adherence to the third point rule would be desirable.

97. A better documented system of counter checking and maintenance is needed. Frequently a return of axles (not vehicles) was adverted to by the vigilance of someone who thought that a reading was unexpectidly large.

98. More research is needed into methods of detection other than pneumatic tubes particularly in relation to permanent counting stations located on busy routes.

99. The computer programs which were prepared during the course of this project are all in Fortran language. These would readily be made available on request to anyone wishing to use them.

Values of AADT

100. The most important information available from the programme is that on AADT values for every section of the network. These are given in map form, maps 1 - 26 and again in tabular form, table 2. The indexing of the sections in this table is based on the tentative route numbering system pending the formal adoption of a numbering system for the newly classified National and Regional routes.

V11 ACKNOWLEDGEMENTS

101. This project was undertaken in co-operation with the Department of Local Government and the Local Authorities. An Foras wishes to thank the officials of that Department for their co-operation and in particular Mr. P.M. McNeill whose advice and assistance was much appreciated during the programme. An Foras wishes also to thank the local authorities and their staffs who contributed all the field data on which this report is based. The success and accuracy of the results depended entirely on their efforts. Finally An Foras wishes to acknowledge the exploratory work done by the Working Party on Traffic Counting.

Maps in this report are based on the ordnance survey by permission of the Government; Licence No. 121/69.

1X REFERENCES

1. Treacy, P.J. A PRECURSORY REVIEW OF TRAFFIC COUNTING IN RURAL AREAS Transactions I.C.E.I. Vol. 89 No. 2 Jan. 1963.

2. O'Keeffe, P.J. ECONOMIC ASPECTS OF ROAD IMPROVEMENTS IN IRELAND Transactions I.C.E.I. Vol. 87 No. 5 April 1961.

3. McCarthy, P.F. TRAFFIC CENSUS ON MAIN ROAD SYSTEM Transactions I.C.E.I. Vol. 90 No. 6 May 1964.

4. Blackmore, D.H. OPERATION AND MAINTENANCE OF FISCHER AND PORTER PUNCHED-TAPE COUNTER RRL Report No. 9 1966.

5. Parrish, E.C., Peterson, E.D., and Threlkeld, R. GEORGIA'S PROGRAM FOR AUTOMATED ACQUISITION AND ANALYSIS OF TRAFFIC-COUNT DATA Highway Research Record 199, 1967.

6. U.S. Bureau of Public Roads GUIDE FOR TRAFFIC VOLUME COUNTING MANUAL, 1965.

7. Drusch, R.L. ESTIMATING ANNUAL AVERAGE DAILY TRAFFIC FROM SHORT-TERM COUNTS Highway Research Record 118, 1966.

8. Tanner, J.C. and Scott, J.R. 50-POINT TRAFFIC CENSUS - THE FIRST FIVE YEARS Road Research Technical Paper No. 63 RRL 1962.

9. Dunn, J.B. 50-POINT TRAFFIC CENSUS RRL Reports No. 45 and No. LR 119.

10. Dunn, J.B. and Sheppard, Mrs. P. 50-POINT TRAFFIC CENSUS RRL Report No. LR 222.

11. REPORT OF THE WORKING PARTY ON THE INTRODUCTION OF A SYSTEMATIC TRAFFIC COUNTING PROGRAMME RT.20, An Foras Forbartha (unpublished)

TABLE 1 DEFINITIONS

ADTM Average Daily Traffic for Month.

There is a unique value for each census point for each month. Obtained by taking the average of the available Sunday volumes, the average of the available Monday volumes ..... Tuesday ..... Wednesday ..... etc. summing and dividing by seven.

AADT Annual Average Daily Traffic.

There is a unique value for each census point for each year. Obtained by summing all 12 ADTM values and dividing by 12. Where some ADTM values are missing the AADT value is obtained by summing available ADTM values and dividing by the sum of the substitute monthly factor (MF) values (table 4) for the same months.

i.e. $\frac{\text{Sum available ADTM values}}{\text{Sum substitute FM values for the same months}}$

FM Monthly Factor

Obtained by dividing ADTM by AADT

FM substitute Any of the monthly factor values from table 4.

DY AV Day Average as used in Fig. 9.

Obtained by averaging all the available counts for the hour and month indicated.

WD AV Weekday Average as used in Fig. 9.

Obtained by averaging all the available weekday counts for the hour and month indicated.

weekday Monday to Friday inclusive.

AV DAYLIGHT VEHICLES Sum of DY AV entries for the hours of daylight - as used Fig. 9.

ADTMWD The average of all the weekday counts which are available for that month - as used Fig. 10.

ADTMSU The average of all the Sunday counts which are available for that month - as used Fig. 10.

ADTMSA The average of all the Saturday counts which are available for that month - as used Fig. 10.

HO-DY DT-MO As used in table F, Fig. 10, these refer to the hour HO, day of week DY, date of month DT and month of year MO, in which the stated traffic volume was observed.

Table 2 AADT Values for all Sections

SECTION	AADT
N 1-01	3888
02	6993
03	9405
04	7864
05	5813
06	
07	4511
08	4645
09	3817
10	8306
11	5514
12	4778
13	5289
14	6154
15	6253
16	4957
17	7631
18	8302
19	9976
20	10927
21	
22	10374
22a	14758
23	19636
24	22629
25	25925
26	41794
27	44865
N 2-01	3378
02	3059
03	1144
04	1264
05	687
06	913
07	688
08	999
09	5444
10	2574
11	1390
12	1100
13	2801
14	1413
15	703
16	2192
17	1335
18	1573
19	4364
20	2153
21	2002
22	1337
23	1538
24	1529
25	1485
26	1717
27	2401
28	2610
29	3532
30	5858
31	13614
32	27108
N 3-01	908
02	1431
03	1560
04	3360
05	5227
06	875
07	1033
08	912
09	1974
10	1530
11	1349
12	2470
13	2166
14	3647
15	3901
16	2959
17	2976
18	3595
19	5088
20	6428
21	7549
22	8267
N 4-01	
02	3678
03	3144
04	3597
05	3360
06	1161
07	899
08	767
09	1322
10	974
11	2275
12	1600
13	1168
14	1046
15	1145
16	1039
17	1038
18	969
19	2232
20	2423
21	3479
22	1642
23	1880
24	1680
25	3368

SECTION	AADT
N 4-26	3367
27	2863
28	2783
29	3259
30	
31	4579
32	4749
33	5069
34	4775
35	
36	9045
37	12066
38	11296
N 5-01	5474
02	4461
03	2954
04	2419
05	2656
06	2345
07	2618
08	1821
09	1858
10	2071
11	2716
12	1943
13	1740
14	1715
15	2573
16	1826
17	2270
18	2590
19	4487
20	4107
21	3895
22	3764
23	3169
24	3878
25	4423
26	4153
27	4793
28	
29	4944
30	5696
31	6556
32	7203
33	6561
34	6361
35	9696
36	8630
37	12230
38	13726
39	14754
40	20673
41	13973
42	14617
43	14418
N 6-01	
02	2027
03	1524
04	1975
05	2005
06	2334
07	1477
08	1283
09	2261
10	3661
11	2142
12	2593
13	3998
14	1942
15	1975
16	2021
17	4571
18	3165
19	4320
20	4688
21	6163
22	4282
23	5122
24	12567
24a	12951
25	18368
26	13025
27	
28	25489
29	22832
30	19373
31	25099
32	21062
33	22593
34	23280
N 7-01	1309
02	636
03	644
04	1253
05	2904
06	976
07	739
08	674
09	782
10	743
11	801
12	2560
13	882

SECTION	AADT
N 7-14	1[illegible]
15	664
16	2293
17	1081
18	929
19	1548
20	629
21	844
22	1381
N 8-01	
02	4468
03	2605
04	1959
05	1497
06	2163
07	2885
08	2017
09	1300
10	2886
11	1877
12	1594
13	3207
14	3986
15	2474
16	1903
17	2074
18	1708
19	1392
20	1409
21	1726
22	1660
N 9-01	11769
02	9763
03	4120
04	2724
05	3384
06	7118
07	4140
08	2053
09	2707
10	4686
11	1690
12	2253
13	2221
14	2094
15	1760
16	2462
17	2269
18	2060
19	1706
20	2005
21	2919
22	2133
23	1836
24	2005
25	2820
26	2308
27	2299
28	3670
N10-01	5551
02	5913
03	1788
04	1748
05	1067
06	1803
07	6824
08	1649
09	901
10	1930
11	1392
12	2018
13	2407
14	4607
15	2147
16	1953
17	1853
18	1605
19	3326
20	3306
21	4044
N11-01	1290
02	1393
03	1336
04	1023
05	1951
06	1926
07	1830
08	1535
09	1408
10	1555
11	2480
12	2104
13	2171
14	1475
15	1560
16	1486
17	1950
18	1805
19	

SECTION	AADT
N12-01	1394
02	899
03	1114
04	320
05	365
06	953
07	595
08	436
09	464
10	1016
11	2530
12	2410
13	1845
14	1940
15	2580
16	2930
17	
N13-01	1964
02	1360
03	1270
04	2741
05	1791
06	1224
07	1607
08	2120
09	4848
10	3714
11	3729
12	2720
13	5462
14	
15	9761
16	13548
17	19093
N14-01	3578
02	2701
03	1458
04	1376
05	3044
06	1227
07	1097
08	1154
09	1409
10	1897
11	1736
12	1498
13	1338
14	1980
15	1874
16	1820
17	2128
18	2538
19	2006
20	2056
21	4847
22	9568
23	14052
N15-01	4429
02	1550
03	723
04	1549
N16-01	8295
02	1854
03	2163
04	5355
05	2491
06	1718
07	1383
08	1560
09	3246
10	2756
11	1572
12	1406
13	2141
N17-01	1545
02	1342
03	2245
04	1241
05	1362
06	2600
07	3086
08	1609
08a	917
09	2077
10	2236
11	1620
12	1075
13	1225
14	1027
15	1423
16	2175
17	1919
18	1527

SECTION	AADT
N17-19	1473
20	2500
21	3185
22	6566
23	
N18-01	1002
02	922
03	761
04	920
05	1604
06	2307
07	2834
08	1348
09	1784
10	2890
11	2564
12	2469
13	2946
14	3475
15	9477
16	7598
17	10437
18	12435
19	14630
N19-01	2664
02	2676
03	2606
04	2330
05	1463
06	1513
07	1623
08	1996
09	3845
10	1676
11	1509
12	1389
13	
14	
15	1236
16	1966
17	3463
18	1859
19	2488
20	2272
21	3155
22	5374
23	4664
24	6411
N20-01	2683
02	1304
03	806
04	1487
05	2957
06	3049
07	1749
08	1873
09	2940
10	4159
11	11125
12	
N50-01	20742
02	12745
03	11514
04	21438
05	22997
06	12086
07	9661
08	7736
09	34385
10	23553
11	34207
N51-01	20390
02	13868
03	12116
04	14082
05	13027
06	15437
07	12873
08	10589
09	6298
10	15164
11	17895
12	30901
N52-01	6202
02	3743
03	2863
04	9139
05	14511
06	4642
07	8447

SECTION	AADT
N53-01	3323
02	2301
N56-01	1138
02	675
03	652
04	516
05	602
06	1276
07	1670
08	
09	
10	657
11	574
12	
13	939
14	1273
15	1953
16	1600
N57-01	822
02	1191
03	710
04	586
05	328
06	1548
07	922
08	587
09	567
10	926
11	765
12	1552
13	2016
14	3341
15	3234
16	4878
17	8449
18	6446
19	8876
20	7199
21	11471
22	21119
N58-01	439
02	1846
03	595
04	1255
05	766
06	508
07	504
08	446
09	778
10	2434
11	3959
12	859
13	1647
14	1298
15	2451
N59-01	671
02	748
03	1083
04	689
05	1258
06	1720
07	1224
08	1417
09	2333
10	3643
11	3007
12	1284
13	1377
14	1549
15	1387
16	920
17	957
18	999
19	1578
20	2972
21	1626
22	1374
23	1592
N60-01	1945
02	1256
03	1185
04	1205
05	2159
06	1791
07	886
08	
09	515
10	734
11	736
12	417
13	617
14	611
15	1733
16	2242
17	15380
18	

Table 2 (cont.) AADT Values for all Sections

SECTION	AADT
N61-01	
02	667
03	1971
04	2546
05	
06	693
07	800
08	630
09	1137
10	1092
11	1915
12	1136
13	1074
14	2210
15	807
16	1004
17	1621
N62-01	1994
02	1329
03	1295
04	
N63-01	1147
02	453
03	1003
04	842
05	1072
06	1648
N64-01	390
02	448
03	881
05	426
06	675
07	633
08	545
09	1039
10	2913
N65-01	693
02	1476
03	820
04	619
05	566
N66-01	972
02	1400
03	2009
04	4123
05	897
06	495
07	932
08	830
09	1139
10	1684
N67-01	1011
02	408
03	569
04	791
05	974
06	6152
07	3019
08	888
N68-01	1524
02	965
03	815
04	436
05	349
06	435
07	611
08	487
09	
10	1697
11	497
12	550
13	1507
14	1570
15	2582
N69-01	1033
02	1867
03	1271
04	883
05	1838
06	944
07	817
08	1272
09	768
10	694
11	1999
12	1034
13	582
14	698
15	677

SECTION	AADT
N70-01	498
02	645
03	1100
04	509
05	392
06	1777
07	1134
08	1581
09	1810
10	2476
11	614
12	919
13	704
14	1192
15	1747
N71-01	350
02	303
03	552
04	516
05	878
06	1019
07	909
08	1914
N72-01	996
02	1712
03	982
04	523
05	815
06	617
07	763
08	767
09	565
10	672
11	537
12	615
13	1000
14	531
15	464
N73-01	498
02	562
03	513
04	754
05	824
06	1323
07	1070
08	591
09	547
N74-01	
02	1240
03	1187
04	437
05	617
06	759
07	1023
08	770
09	387
10	1456
N75-01	443
02	614
03	667
04	852
05	1952
06	
07	
N76-01	280
02	541
03	547
04	2505
05	4079
06	
07	
N77-01	741
N78-01	803
02	624
03	1185
04	724
05	999
06	1226
07	811
08	652
09	404
10	274
11	110
12	98
N79-01	1824
02	1066
03	1174
04	1642
05	2401
06	1756
07	1423
08	602
09	554
10	1108

SECTION	AADT
N79-11	1376
12	1725
13	2270
14	
15	
16	
N80-01	8
02	6
03	41
04	387
05	1182
06	1095
07	1931
08	744
09	866
10	1185
11	423
12	406
13	532
14	1138
15	1050
16	684
17	911
18	2588
N81-01	3644
02	1611
03	927
04	618
05	664
06	844
07	750
08	934
09	1536
10	2870
11	1354
12	1336
13	814
14	856
15	1032
16	1655
N82-01	721
02	729
03	1627
04	600
05	566
06	1489
07	
08	397
N83-01	1267
02	963
03	1398
04	2282
05	2329
06	1706
07	1402
08	1943
09	3198
10	4730
N84-01	800
02	585
03	331
04	796
05	800
06	884
07	1397
08	2009
09	1734
10	1303
11	351
12	2005
13	2100
14	655
15	716
16	1448
17	5120
N85-01	2825
02	1542
03	753
04	1631
05	1965
05a	3296
06	997
07	478
08	1066
09	1495
10	989
11	574
12	558
13	426
14	499
15	
N86-01	
02	432
03	378
04	513
05	291
06	

SECTION	AADT
N87-01	1219
02	879
03	714
04	1272
05	2084
N88-01	1175
02	1584
N89-01	1286
02	844
03	870
04	1312
05	1746
N90-01	2289
02	2698
03	3413
04	1076
05	1355
06	1476
R 8-01	765
R12-01	
02	784
R25-01	650
02	611
R26-01	552
R45-01	601
R56-01	376
R65-01	677
R69-01	644
R71-01	781
02	411
R72-01	707
R73-01	1324
R92-01	2377
R96-01	832
R97-01	2885
R100-01	101-
02	661
03	1924
R102-01	1425
02	511
R105-01	469
02	
03	692
R106-01	717
02	727
R111-01	523
R116-01	789
R119-01	652
R134-01	1045
R150-01	361
02	322
03	574
04	393
05	445
06	934
07	533

SECTION	AADT
R154-01	1412
02	714
R155-01	411
02	1447
R158-01	1071
R159-01	689
R160-01	469
02	193
R168-01	295
R171-01	621
R174-01	604
02	260
R175-01	302
02	1590
R176-01	943
R177-01	2955
R184-01	1305
R201-02	2075
R202-01	828
R203-02	991
R208-01	1330
02	3040
03	3313
04	9508
05	8300
06	7627
07	8090
08	16586
R212-01	3268
02	5744
03	9228
04	11029
R213-01	1801
R216-01	3040
02	3260
R217-01	5623
R253-01	34000
02	45037
R255-01	3144
02	3581
03	4233
04	7435
05	18362
06	16038
R268-01	16559
02	9694
03	10891
R323-01	
02	26904
03	26923
04	30002
05	20935
06	19093
R324-01	21044
02	12504
R329-01	8054
02	13654
R330-01	11191
02	12909

SECTION	AADT
R332-01	4522
R335-01	4997
02	
03	4923
R498-02	2136
03	2435
04	3900
05	5656
R499-01	1619
02	1009
03	1028
R524-01	127
R542-01	589
02	280
R629-01	249
R647-01	
02	343
03	614
R651-01	179
R677-01	129
R711-01	
R728-01	173
L149-01	299

TABLE 3 PERMANENT COUNTER GROUPINGS

Group No.	Group Description	Permanent Counters in Group
1	Urban Commuter	N13-17, N16-2, N20-11, N56-3, R323-3.
2	Urban General	N1-25, N6-30, N18-18, N51-7, N65-4, R208-8.
3	Rural Intertown	N2-11, N2-21, N2-29, N3-3, N4-5, N4-13, N4-34, N4-34A, N5-5, N5-22, N5-36, N5-36A, N6-24A, N9-18, N14-21, N17-10, N19-7, N57-11, N58-12, N60-7, N68-6, N82-1.
4	General Tourist	N1-12, N4-3, N4-28, N8-2, N8-12, N12-4, N13-7, N14-8, N18-5, N66-7, N73-4, N75-5.
5	Sunday Tourist	N6-17, N11-4.

Table 4: Monthly Factors

MONTH	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5
JANUARY	0.8656	0.8536	0.7636	0.6797	0.6209
FEBRUARY	0.9066	0.8735	0.8004	0.7165	0.6824
MARCH	0.9730	0.9363	0.9065	0.7891	0.8067
APRIL	1.0096	0.9867	0.9834	0.9091	0.9312
MAY	1.0325	1.0015	0.9941	0.9188	0.9492
JUNE	1.1111	1.0348	1.1108	1.1364	1.3368
JULY	1.1258	1.0883	1.2269	1.4090	1.6115
AUGUST	1.1165	1.0880	1.2925	1.6034	1.6811
SEPTEMBER	1.0421	1.1250	1.1500	1.2482	1.0758
OCTOBER	1.0106	1.0934	1.0093	0.9501	0.8394
NOVEMBER	0.9424	1.0108	0.9107	0.8506	0.7749
DECEMBER	0.8635	0.9074	0.8513	0.7885	0.7095

Table 5: Group 1 Daily Factors

MONTH	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT+SUN
JANUARY	0.9319	0.8894	0.8822	0.9163	0.9626	1.4770
FEBRUARY	0.9512	0.9382	0.9290	0.9708	1.0000	1.5574
MARCH	0.9954	0.9980	0.9911	1.0437	0.9914	1.7913
APRIL	1.0454	1.0358	1.0475	1.0803	1.0105	1.8480
MAY	1.0982	1.0392	1.0522	1.0960	1.1057	1.8421
JUNE	1.1161	1.1148	1.1037	1.1380	1.1667	2.1386
JULY	1.1594	1.1364	1.0936	1.1625	1.2023	2.1265
AUGUST	1.1190	1.1324	1.1131	1.1665	1.2208	2.0636
SEPTEMBER	1.0617	1.0626	1.0582	1.0818	1.1259	1.9047
OCTOBER	1.0292	1.0243	1.0247	1.0423	1.1046	1.8495
NOVEMBER	0.9926	0.9739	0.9621	1.0016	1.0323	1.6340
DECEMBER	0.9382	0.9001	0.7873	0.8893	0.9603	1.5697

Table 6: Group 2 Daily Factors

MONTH	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT+SUN
JANUARY	0.9069	0.9071	0.8901	0.8925	0.9310	1.4480
FEBRUARY	0.9075	0.8946	0.9097	0.9464	0.9426	1.5140
MARCH	0.9657	0.9714	0.9574	0.9981	1.0090	1.6528
APRIL	0.9755	1.0689	1.0365	1.0558	0.9986	1.7720
MAY	1.0376	1.0069	1.0258	1.1291	1.1423	1.6686
JUNE	1.0168	1.0916	1.0812	1.1279	1.1145	1.8114
JULY	1.1180	1.0924	1.1134	1.1474	1.1816	1.9697
AUGUST	1.0859	1.1216	1.1136	1.1526	1.1804	1.9616
SEPTEMBER	1.1659	1.1680	1.1839	1.1683	1.2196	1.9696
OCTOBER	1.1460	1.0895	1.1268	1.1938	1.1967	1.9012
NOVEMBER	1.0618	1.0268	1.0622	1.0824	1.1215	1.7208
DECEMBER	0.9948	0.9714	0.8778	0.9180	0.9880	1.6021

Table 7: Group 3 Daily Factors

MONTH	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT+SUN
JANUARY	0.8178	0.7707	0.7774	0.7872	0.8272	1.3647
FEBRUARY	0.8457	0.7972	0.8178	0.8349	0.8743	1.4328
MARCH	0.9728	0.9119	0.8728	0.9130	0.9791	1.6961
APRIL	1.0794	0.9831	0.9513	0.9963	0.9946	1.8792
MAY	1.0146	0.9465	0.9733	1.0200	1.0581	1.9460
JUNE	1.1618	1.0552	1.0596	1.1119	1.1590	2.2283
JULY	1.2428	1.1498	1.1454	1.1734	1.2853	2.5919
AUGUST	1.3411	1.2409	1.2215	1.2592	1.3454	2.6394
SEPTEMBER	1.2017	1.1311	1.1114	1.1241	1.1989	2.2829
OCTOBER	1.0257	0.9744	0.9925	1.0249	1.0822	1.9656
NOVEMBER	0.9679	0.9092	0.8855	0.9172	0.9966	1.6982
DECEMBER	0.9066	0.8615	0.7802	0.8649	0.9408	1.6049

Table 8: Group 4 Daily Factors

MONTH	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT+SUN
JANUARY	0.7214	0.6849	0.6728	0.6815	0.7439	1.2536
FEBRUARY	0.7285	0.7254	0.7206	0.7222	0.7646	1.3538
MARCH	0.8374	0.7931	0.7685	0.7944	0.8141	1.5160
APRIL	1.0068	0.9411	0.8730	0.9101	0.9161	1.7169
MAY	0.9553	0.8864	0.9031	0.9443	0.9705	1.7719
JUNE	1.1693	1.0749	1.0862	1.1089	1.1724	2.3433
JULY	1.4207	1.3219	1.3821	1.3382	1.4027	2.9976
AUGUST	1.6490	1.5349	1.5276	1.5628	1.5951	3.3537
SEPTEMBER	1.2992	1.2262	1.2232	1.2325	1.2681	2.4881
OCTOBER	0.9591	0.9219	0.9480	0.9629	1.0122	1.8469
NOVEMBER	0.9196	0.8305	0.8276	0.8322	0.9278	1.6163
DECEMBER	0.8281	0.8081	0.7065	0.7907	0.8731	1.5147

Table 9: Group 5 Daily Factors

MONTH	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT+SUN
JANUARY	0.6519	0.6036	0.6328	0.6189	0.6771	1.1623
FEBRUARY	0.7093	0.6585	0.6405	0.6716	0.7033	1.2540
MARCH	0.8626	0.7690	0.8003	0.8324	0.8569	1.5254
APRIL	1.0050	0.8980	0.9259	0.9259	0.9632	1.8007
MAY	0.9271	0.8602	0.9310	0.9170	0.9833	2.0261
JUNE	1.6388	1.1595	1.0849	1.0913	1.1650	3.2184
JULY	1.5119	1.3995	1.4390	1.3916	1.4885	4.0501
AUGUST	1.8651	1.6344	1.4662	1.4219	1.4855	3.9247
SEPTEMBER	1.0194	1.1255	1.0859	1.0199	1.0449	2.2356
OCTOBER	0.8667	0.7731	0.8106	0.8405	0.8770	1.7075
NOVEMBER	0.8494	0.7250	0.7635	0.7791	0.8529	1.4547
DECEMBER	0.7877	0.7027	0.6592	0.7178	0.7692	1.3297

Key:

Group 1 Commuter Group
2 Urban Group
3 Intertown Group
4 Tourist Group
5 Sunday Tourist Group

Note:

$$AADT = \frac{ADTM}{\text{Monthly Factor}}$$

$$= \frac{\text{Day's volume}}{\text{Daily factor}}$$

OVERALL TRAVEL INFORMATION ON NATIONAL ROUTES

ROUTE	DESCRIPTION	Total Daily Travel VEHICLE MILES	Daily Traffic volume at average Point VEHICLES
N1	Dublin/Belfast Road to Border Post	439,974	7,189
N2	Dublin-Monaghan-Border Post & Lifford-Letterkenny	210,081	1,976
N3	Dublin-Cavan-Border Post for Enniskillen	198,312	2,451
N4	Dublin-Mullingar-Sligo	328,565	2,529
N5	Dublin-Limerick	523,936	4,319
N6	Dublin-Wexford	376,694	4,709
N7	Longford-Roscommon-Claremorris-Castlebar	62,705	786
N8	Kinnegad-Athlone-Galway	178,685	1,889
N9	Portlaoise-Cork	269,820	2,494
N10	Naas-Carlow-Kilkenny-Waterford	167,058	1,996
N11	Sligo-Lifford	105,836	1,450
N12	Galway-Ballyhaunis-Collooney	86,314	1,105
N13	Galway-Limerick	174,081	2,961
N14	Limerick-Castleisland-Tralee	144,460	2,219
N15	Castleisland-Killarney	22,543	1,436
N16	Patrickswell-Mallow-Cork	106,584	1,907
N17	Limerick-Cahir-Waterford	137,586	1,696
N18	Cork-Bandon-Skibbereen	117,752	2,185
N19	Cork-Waterford	184,697	2,392
N20	Waterford-Enniscorthy	69,702	1,859
N50	Dublin N.C.R.-Custom House	66,963	17,170
N51	Dublin S.C.R.	99,017	15,717
N52	Foster Avenue-Tallaght	45,446	6,886
N53	Tallaght-Clondalkin	7,592	3,037
N56	Lucan-Tullamore	40,131	743

ROUTE	DESCRIPTION	VEHICLE MILES	VEHICLES
N57	Dublin-Baltinglass-Enniscorthy	132,558	1,888
N58	Blessington-Naas-Trim-Drogheda	54,748	892
N59	Kilcullen-Athy-Kilkenny-Clonmel	94,427	1,310
N60	Dundalk-Mullingar-Tullamore	81,738	1,014
N61	Tullamore-Portlaoise-Tullow	50,729	936
N62	Dundalk-Castleblaney	20,722	1,582
N63	Moate-Tullamore	13,170	947
N64	Tullamore-Portumna	21,228	628
N65	Muinebeg-Thomastown-Ballyhale	11,853	655
N66	New Ross-Rosslare Harbour	39,620	1,215
N67	Cavan-Monaghan-Customs Post	33,068	1,282
N68	Cavan-Athlone	40,837	775
N69	Athlone-Birr-Horse and Jockey	49,265	795
N70	Loughrea-Nenagh-Thurles	47,731	813
N71	Boyle-Athlone	31,722	685
N72	Ballina-Charlestown-Longford	51,887	690
N73	Achill-Swinford	30,942	637
N74	Castlebar-Galway	41,248	838
N75	Clifton-Oughterard-Galway	56,352	1,125
N76	Galway-Spiddle-Maam Cross	50,953	1,359
N77	Claregalway-Oranmore	3,929	741
N78	Kilkee-Ennis-Birdhill	44,088	663
N79	Limerick-Tarbert-Tralee	87,508	1,328
N80	Newcastle West-Rathluirc-Cashel	38,560	636
N81	Mitchelstown-Killarney	57,916	957
N82	Mallow-Dungarvan	39,183	779
N83	Killarney-Cork	90,207	1,762
N84	Killarney-Skibbereen	53,531	817
N85	Killarney-Ring of Kerry-Kenmare	62,219	709

ROUTE	DESCRIPTION	VEHICLE MILES	VEHICLES
N86	Sligo-Belcoo	12,636	413
N87	Donegal-Killybegs	16,956	958
N88	Letterkenny-Stranorlar	15,045	1,254
N89	Letterkenny-Dunfanaghy	26,020	1,136
N90	Buncrana-Letterkenny	44,602	1,866

FIG 1 SPECIMEN FIELD SHEET FOR TEMPORARY STATION

~~~ COUNTY COUNCIL Month July 196

Field Sheet for TEMPORARY Station

Route N47 Section 17

Location Mrs Brown's Gate

Name of Attendant John Murphy Counter No. 3B ~~Axles~~ Vehicles ✓

Date in Full	Reading at 8 a.m.	DAILY SUBTRACTION	CORRECTED COUNT
Mon. 19 July	1176		
Sat. 17	9582	1594	1688
Fri. 16	8941	641	679
Thurs. 15	8341	600	636
Wed. 14	7719	622	659
Tues. 13	7117	602	638
Mon. 12	6532	585	609
Sat. 10	5421	1111	1178
Fri. 9	4759	662	701
Thurs. 8	4138	621	659
Wed. 7	3505	633	671
Tues. 6	2885	620	657
Mon. 5	2285	600	636

MANUAL CHECK

Date _____

_____ p.m. _____ p.m.

By counter By hand

Finish _____ Vehicles

Start _____

Diff. _____

Cars etc.	Com. & Bus.

Correction _____ %

MANUAL CHECK

Date 9/7/68 Fri.

505 p.m. 5.35 p.m.

By counter By hand

Finish 5361 Vehicles

Start 5260

Diff. 101 107

Cars etc.	Com. & Bus
𝍸 𝍸 𝍸 𝍸	𝍸 𝍸
𝍸 𝍸 𝍸 𝍸	𝍸
𝍸 𝍸 𝍸 𝍸	
𝍸 𝍸 𝍸 𝍸	
𝍸 𝍸	
93	14

Correction _____ % 107/101

Remarks:

Counter tube checked for leaks with tyre pump on Sat 10th July. O.K. ✓

NOTES:

Entries are made from bottom of page towards top, this eases the subtraction.
DAILY SUBTRACTION for Wednesday (say) is got by subtracting Wednesday's reading from Thursday's reading. Even minor adjustments to the counter should be recorded under "Remarks". Such knowledge is useful in applying the correction factor. Note also special events: Sports Event, Bank Holiday, etc.
MANUAL CHECK to be for ½ hour during any busy period once or twice per fortnight depending on experience. This gives the correction ___ % (Machine/hand). This is then used to amend the DAILY SUBTRACTIONS for that week whence the CORRECTED COUNT is calculated on a slide rule.
The hand count omits bicycles but includes scooters, cars, vans, buses, commercial and tractors.

FIG 2 SPECIMEN MONTHLY RETURN SHEET FOR TEMPORARY STATION

One monthly return for each temporary counter to be prepared before the 7th of the month following.

A D T M 717

Month July Year ~~~

Local Authority ~~~

TEMPORARY TRAFFIC COUNTING STATION - Monthly Return

Local Authority to complete: Route No. N47 Section 17

Code: 1 2 3 4 5 6 7 8 9 10

Office use only: 7 1 X

Corrected Counts to be entered here from Field Sheet

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat./Sun.	
				1	718	1207	
	636	657	671	8 659	701	1178	
	609	638	659	15 636	679	1688	
Suspect readings	~~434~~	~~309~~	— Counter tube cut —	22	—	1802	
	642	684	696	29 684	784	2504	
Totals	1887	1979	2026	1979	2882	8379	Total of Avs. 5019
Daily Average	629	659	675	660	720	1676	717

A.D.T. Month (One Seventh Tot. of Average)

Please return this form to The Traffic Section, An Foras Forbartha, 4 Kildare Street, Dublin 2.
~~~

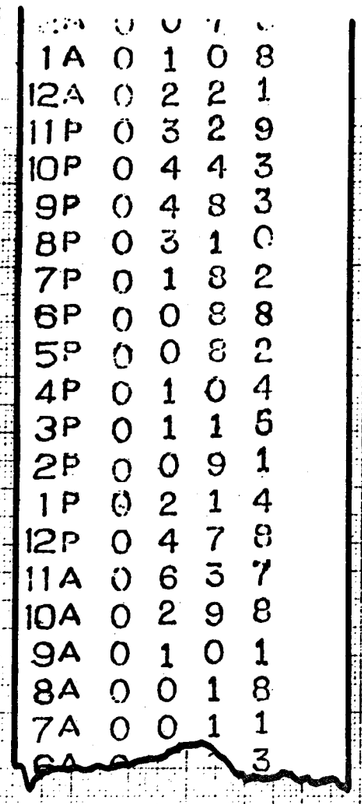


Fig. 3 Sample Streeter Amet counter tape for visual reading

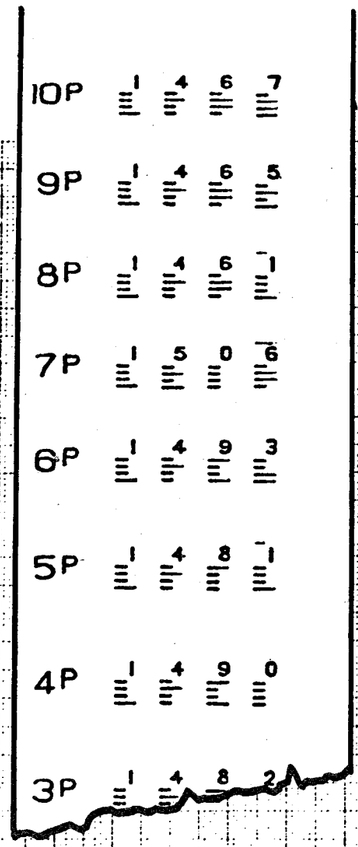


Fig. 4 Sample Streeter Amet counter tape for automatic reader

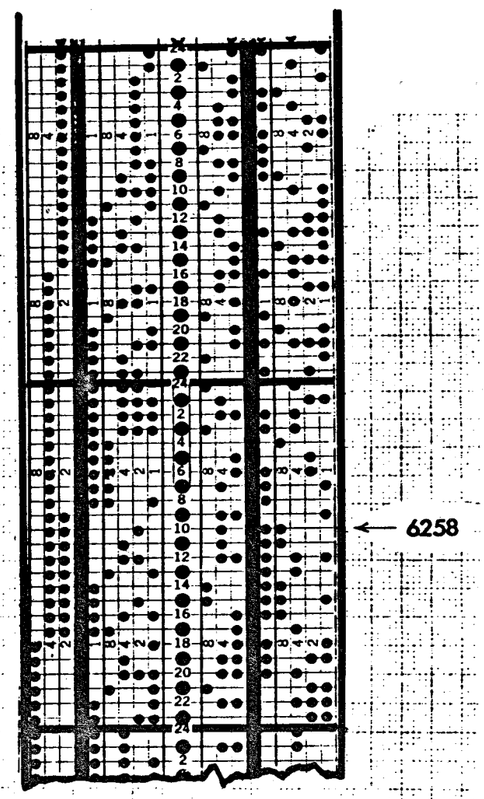


Fig. 5 Sample Fischer & Porter counter tape for automatic reader

MEATH

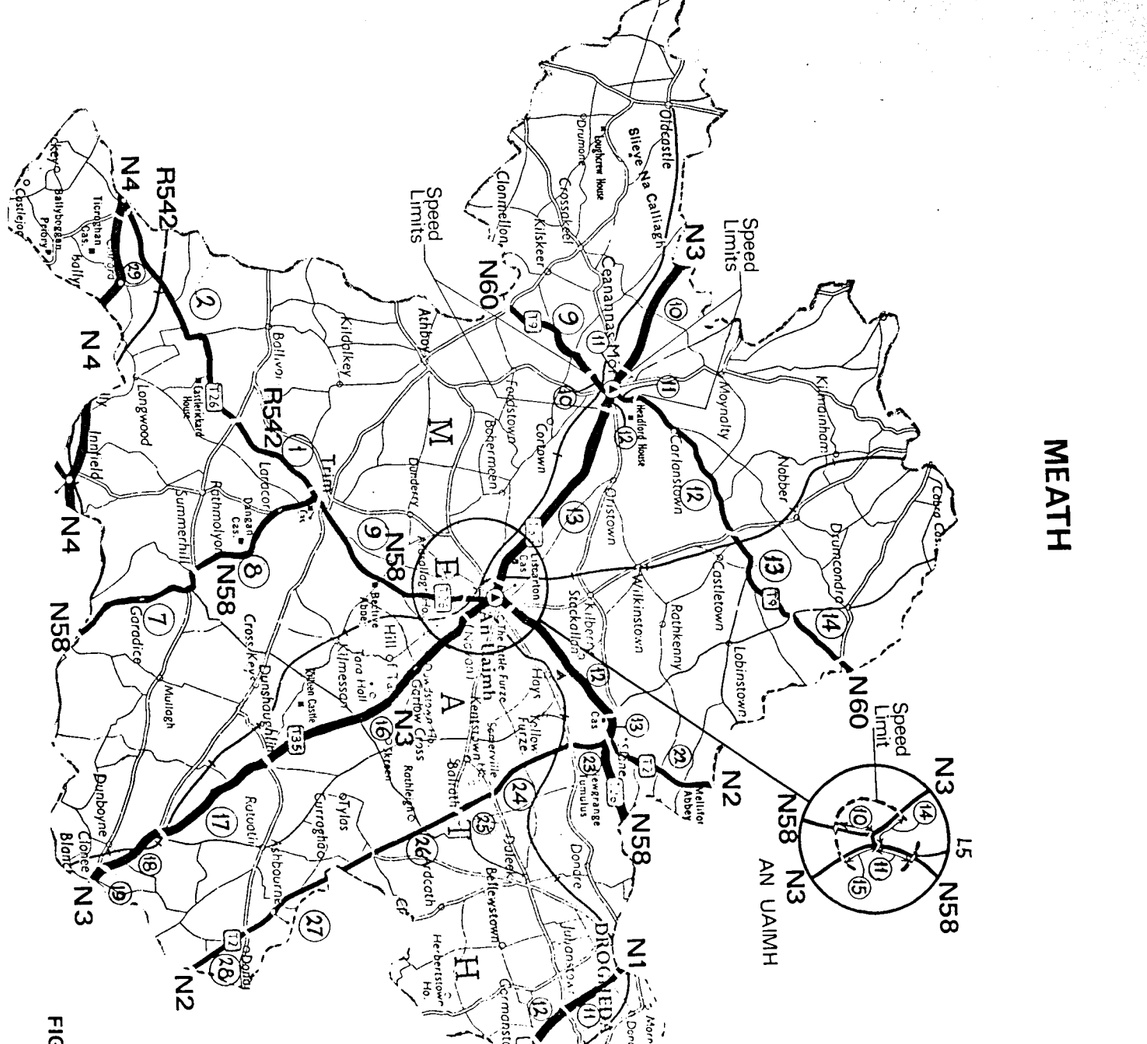


FIG. 6

Sections to be counted and Assignment of Local Counts

Route	N1	N2						N3							N4	N58				N60		R542	
Section	11	12	22	23	24	25	26	27	28	11	12	13	14	15	16	17	18	19	29	7	8	9	10	11	12	13	9	10	11	12	13	14	1	2
Town										Kells			An Uaimh										An Uaimh				Kells							
Control																																		
Meath N 1-12	X	X																																
" N 2-26			X	X	X	⊗	X	X																										
" N 3-15										X	X																							
" N 3-17												X	⊗		⊗																			
" N58-12														X	⊗	X	X																	
" N60-13																																		
Westmeath N 4-28																			X															

Control Stn. thus ○
Permanent Stn. thus □

FIG. 7

FIG 8 SPECIMEN MONTHLY COUNTING SCHEDULE

MONTHLY SCHEDULE OF SECTION COUNTS

COUNTY: **MEATH**

SECTION NUMBER OF COUNT LOCATION

Route	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
N1	12	12	12	12	12	12	12	12	12	12	12	12
							11					
N2			26			26			26			
			23,24,25				22		27,28			
N3				17	15		17	15		17	15	
				13,16,18,19	14						11,12	
N4					29							
N58	12	12	12	12	12	12	12	12	12	12	12	12
					10,11			7,8,9,13				
N60			13			13			13			
						9,12,14						
R542							1,2					

Fig 9 Example of Monthly Printout

AN FORAS FORBARTHA TEO.

LOCAL AUTHORITY NO. 139 CLARE

SELF RECORDING COUNTER STATION N 13-7

MONTH AUGUST 1969

** EACH HOUR VEHICLES DURING HOUR ENDING - TABLE A **

NO WK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
1 F	159	83	59	43	21	57	100	290	564	556	425	631	611	593	640	718	813	873	724	525	548		329	253	
2 S	214	86	73	34	32	73	105	154	276	379	554	634	797	682	693	761	812	631	602	544	543	432	289	221	9621
3 S	213	99	82	32	27	33	66	142	192	309	414	605	684	524	588	777	723	589	543	516	472	441	323	280	8674
4 M	152	113	74	68	33	20	40	90	193	290	446	527	658	582	672	657	691	694	622	606	640	592	443	298	9201
5 T	219	125	140	63	37	50	72	236	463	542	569	595	710	532	633	721	722	876	701	468	388	306	268	223	9659
6 W	188	54	32	19	19	40	72	214	473	476	516	613	597	489	575	638	708	805	625	514	396	352	222	218	8855
7 T	165	48	36	19	12	24	41	217	433	534	526	546	585	570	639	723	624	843	637	458	386	315	229	242	8852
8 F	186	59	53	27	23	17	62	195	416	508	511	563	635	514	569	657	725	853	622	577	471	375	269	257	9144
9 S	210	107	59	48	47	55	68	185	328	430	500	692	697	610	663	734	719	596	588	483	427	341	252	226	9065
10 S	156	83	77	27	40	49	45	111	182	279	425	500	581	510	561	622	536	559	523	516	502	415	311	244	7854
11 M	191	92	61	35	25	29	58	235	465	530	568	621	616	549	599	695	764	816	732	479	392	343	291	217	9403
12 T	178	41	35	18	14	25	49	293	476	492	537	546	573	467	606	661	700	878	633	534	395	350	213	236	8950
13 W	186	74	50	23	19	19	44	272	424	486	560	548	611	560	610	749	770	891	637	486	416	298	212	230	9175
14 T	167	91	38	25	17	22	41	259	461	482	525	573	606	512	605	686	738	812	598	472	413	341	252	227	8963
15 F	188	82	61	19	24	32	64	274	488	512	551	601	616	555	628	788	800	917	622	503	503	411	276	242	9757
16 S	206	104	77	34	21	41	66	222	301	395	551	634	718	631	739	811	693	619	503	482	478	345	255	225	9151
17 S	161	117	70	49	49	42	52	141	180	328	450	584	653	533	640	649	685	642	580	614	574	418	341	285	8837
18 M	151	103	73	35	22	23	67	284	459	528	483	645	540	551	651	702	793	885	634	530	372	308	217	215	9271
19 T	153	61	23	17	22	42	47	300	509	547	581	555	528	486	583	629	701	897	738	460	389	248	200	242	8958
20 W	148	50	50	18	26	35	53	290	481	511	558	609	570	533	570	687	584	1023	718	521	401	301	195	242	9174
21 T	182	71	30	38	14	28	40	250	477	468	488	478	536	453	540	724	701	843	636	499	393	339	227	237	8692
22 F	193	87	53	27	22	23	56	260	448	512	465	530	537	504	603	654	745	858	647	527	485	351	267	241	9093
23 S	186	115	84	39	33	37	64	217	311	394	472	586	624	562	616	693	610	606	520	351	396	352	244	190	8302
24 S	160	100	95	49	43	44	62	131	189	268	354	400	461	469	524	639	539	591	568	467	464	318	290	244	7469
25 M	153	78	67	32	29	35	72	334	522	565	549	610	614	526	621	675	744	904	653	442	375	376	155	219	9350
26 T	154	58	38	14	21	32	70	314	498	584	565	605	595	499	624	670	737	920	685	461	403	308	220	235	9310
27 W	139	74	52	28	17	46	74	310	505	514	562	585	618	555	669	744	735	947	672	459	425	291	195	222	9438
28 T	163	85	55	29	37	28	46	272	482	523	558	566	534	557	609	714	739	808	643	439	385	293	206	242	9013
29 F	142	66	53	34	41	30	53	274	493	483	487	532	532	526	557	641	836	877	610	472	452	347	244	220	9002
30 S	190	112	83	39	41	45	87	177	311	377	603	609	670	547	603	608	644	540	494	418	442	334	234	200	8408
31 S	186	77	89	59	41	41	44	94	180	278	422	511	537	452	607	658	636	665	570	627	651	510	421	290	8646
DY AV	175	83	62	33	28	36	60	227	392	454	508	575	607	536	614	693	708	782	621	498	450	358	260	237	8997
WD AV	169	75	53	30	23	31	58	260	463	506	525	575	591	529	609	692	731	867	656	496	429	342	244	236	9190

*** EACH DAY VEHICLES - TABLE B ***

	SUN	MON	TUES	WED	THURS	FRI	SAT
WEEK 1							9621
WEEK 2	8674	9201	9659	8855	8852	9144	9065
WEEK 3	7854	9403	8950	9175	8963	9757	9151
WEEK 4	8837	9271	8958	9174	8692	9093	8302
WEEK 5	7469	9350	9310	9438	9013	9002	8408
WEEK 6	8646						
AVERAGE	8296	9306	9219	9160	8880	9249	8909

*** EACH DAY FACTORS - TABLE C ***

SUN	MON	TUES	WED	THURS	FRI	SAT
						1.06
0.96	1.02	1.07	0.98	0.98	1.01	1.00
0.87	1.04	0.99	1.01	0.99	1.08	1.01
0.98	1.02	0.99	1.01	0.96	1.01	0.92
0.82	1.03	1.03	1.04	1.00	1.00	0.93
0.96						
0.92	1.03	1.02	1.01	0.98	1.02	0.98

AVERAGE DAYLIGHT VEHICLES 8083 AVERAGE DARKNESS VEHICLES 919 ADTM 9002

Fig 10 Example of Annual Printout

ANNUAL ANALYSIS OF TRAFFIC FLOW

LOCAL AUTHORITY NO. 139 CLARE

SELF RECORDING COUNTER STATION N 13-7

SUMMARY FOR 1969

* * EACH MONTH VEHICLES - TABLE D * *   * * EACH MONTH FACTORS - TABLE E * *

MONTH	ADTM	FM	ADTMWD	ADTMSA	ADTMSU	SUN	MON	TUES	WED	THURS	FRI	SAT
JANUARY	4518	0.734	4764	4223	3642	0.80	1.03	0.98	1.08	1.02	1.12	0.93
FEBRUARY	4424	0.718	4781	3684	3340	0.75	1.03	1.08	1.13	1.09	1.06	0.83
MARCH	4425	0.718	4480	4132	4186	0.94	1.03	0.97	1.03	1.06	1.01	0.93
APRIL	5973	0.970	6170	5362	5520	0.92	1.06	1.02	1.03	1.03	1.02	0.89
MAY	6359	1.033	6549	5840	5790	0.91	1.01	0.98	1.04	1.03	1.08	0.91
JUNE	6687	1.086	6884	5828	6529	0.97	1.07	0.99	1.07	0.98	1.02	0.87
JULY	8807	1.430	8851	8631	8532	0.96	1.00	0.98	1.03	0.98	1.03	0.98
AUGUST	9002	1.462	9190	8909	8296	0.92	1.03	1.02	1.01	0.98	1.02	0.98
SEPTEMBER	7458	1.211	7761	7338	6073	0.81	1.04	1.02	1.06	1.00	1.05	0.98
OCTOBER	6112	0.993	6268	6253	5351	0.87	1.01	0.97	1.04	0.98	1.07	1.02
NOVEMBER	5010	0.813	5288	4603	3550	0.70	1.01	1.02	1.04	1.10	1.18	0.91
DECEMBER	5086	0.826	5347	5206	3882	0.76	1.08	1.04	1.08	0.90	1.10	1.02
AADT =	6155				AVERAGE	0.86	1.03	1.01	1.05	1.01	1.06	0.94

* * HIGHEST HOURS - TABLE F * *

VOLUME	MO-DY	DT-MO	% AADT	ORDER	VOLUME	MO-DY	DT-MO	% AADT	ORDER	VOLUME	MO-DY	DT-MO	% AADT	ORDER
1023	18-W	20- 8	16.62	1	854	18-W	16- 7	13.87	21	812	18-F	3-10	13.19	45
1015	18-SU	27- 7	16.49	2	853	18-F	8- 8	13.86	22	805	18-W	6- 8	13.08	50
979	18-M	21- 7	15.91	3	851	18-F	11- 7	13.83	23	793	17-F	18- 7	12.88	55
947	18-W	27- 8	15.39	4	846	16-SA	26- 7	13.74	24	786	17-M	1- 9	12.77	60
940	18-F	25- 7	15.27	5	843	18-TH	7- 8	13.70	25	777	16-SU	3- 8	12.62	65
920	18-TU	26- 8	14.95	6	843	18-TH	21- 8	13.70	26	771	18-F	30- 5	12.53	70
917	18-F	15- 8	14.90	7	837	18-M	1- 9	13.60	27	765	17-F	25- 7	12.43	75
904	18-M	25- 8	14.69	8	837	18-W	17- 9	13.60	28	761	18-TH	18- 9	12.36	80
897	18-TU	19- 8	14.57	9	836	17-F	29- 8	13.58	29	757	18-W	9- 7	12.30	85
894	18-F	18- 7	14.52	10	832	18-TU	2- 9	13.52	30	747	18-F	5-12	12.14	90
891	18-W	13- 8	14.48	11	831	18-W	30- 7	13.50	31	743	18-W	28- 5	12.07	95
890	18-F	5- 9	14.46	12	827	18-F	4- 7	13.44	32	738	17-TH	14- 8	11.99	100
886	18-F	19- 9	14.39	13	826	18-W	23- 7	13.42	33	736	17-F	3-10	11.96	105
885	18-M	18- 8	14.38	14	825	18-M	8- 9	13.40	34	732	19-M	11- 8	11.89	110
878	18-TU	12- 8	14.26	15	820	18-TH	17- 7	13.32	35	728	15-SA	19- 7	11.83	115
877	18-F	29- 8	14.25	16	820	18-M	28- 7	13.32	36	724	19-F	1- 8	11.76	120
876	18-TU	5- 8	14.23	17	816	18-M	11- 8	13.26	37	722	17-TU	5- 8	11.73	125
875	18-W	3- 9	14.22	18	815	18-W	2- 7	13.24	38	719	18-F	12-12	11.68	130
873	18-F	1- 8	14.18	19	813	18-TU	29- 7	13.21	39	714	13-M	30- 7	11.60	140
858	18-F	22- 8	13.94	20	813	17-F	1- 8	13.21	40	706	16-SU	20- 7	11.47	150

NUMBER OF TIMES EACH VOLUME RANGE WAS RECORDED. VOLUME RANGES ARE IN VPH/100

RANGE =	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	99
NUMBER=	2033	1092	1305	1127	838	506	285	111	43	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

IRELAND

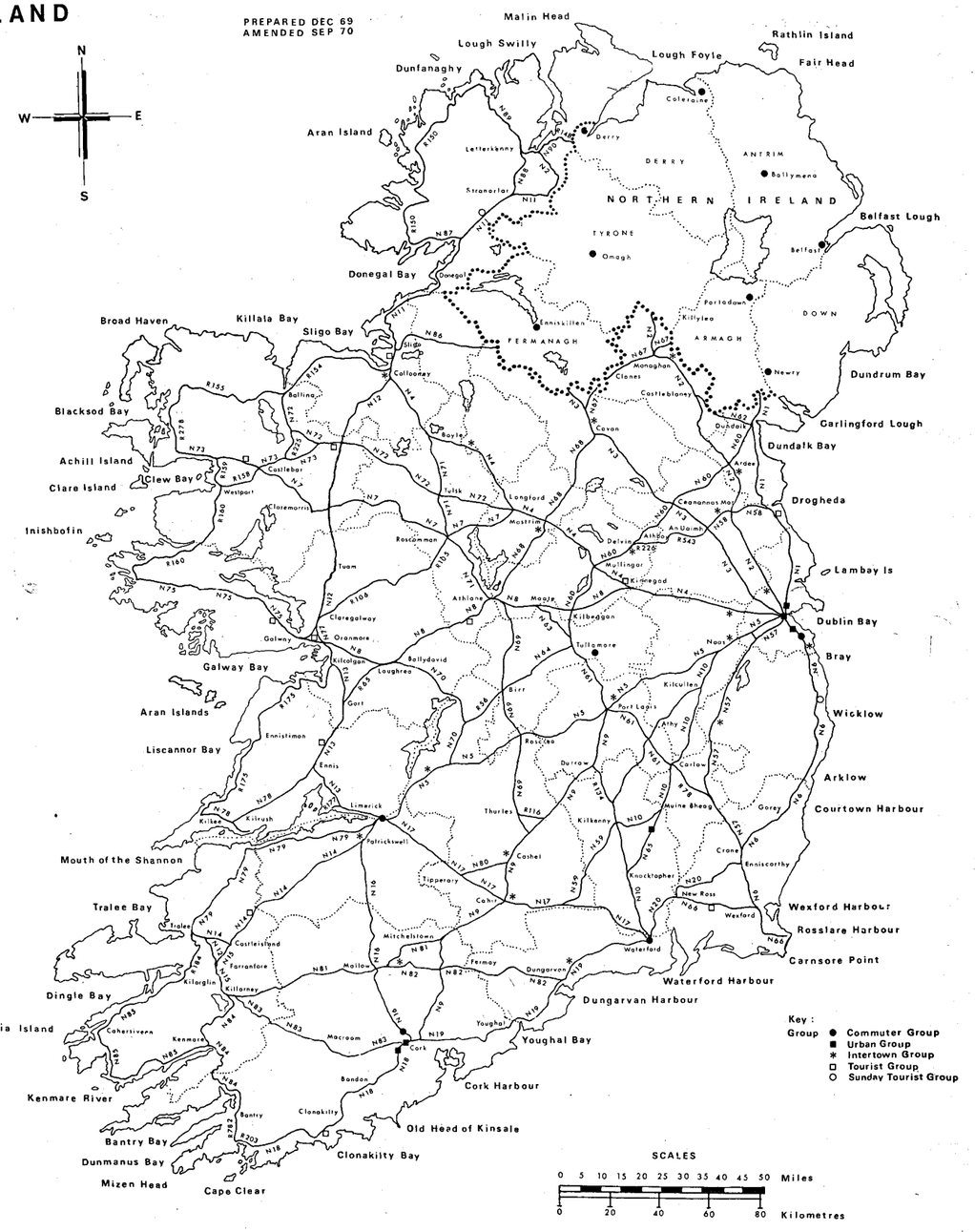


Fig 11 MAP SHOWING COUNTER GROUPINGS (Route Numbers Tentative)

V G Innes

MONTHLY FACTORS

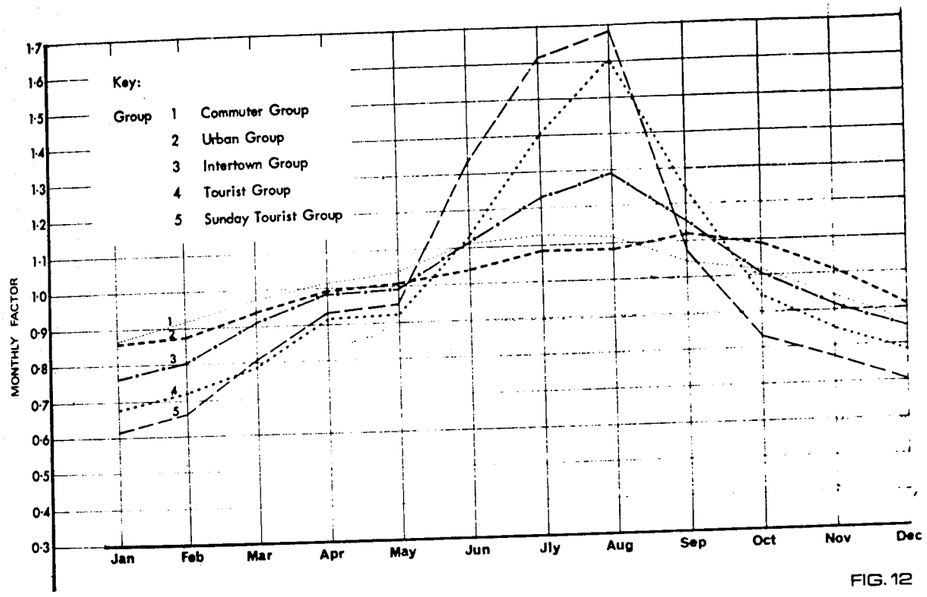
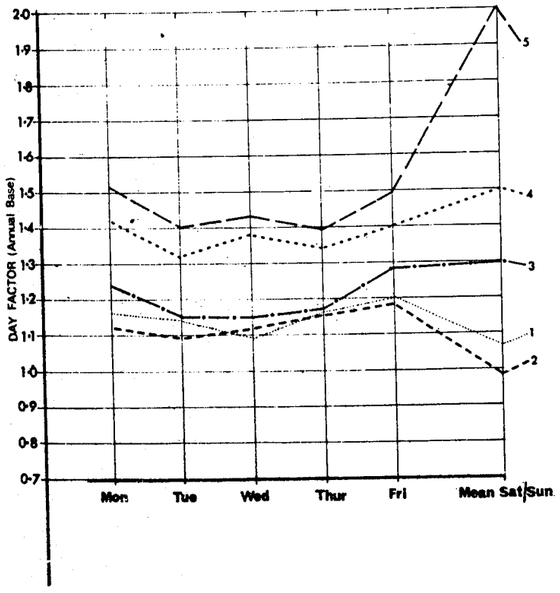


FIG. 12

DAY FACTORS FOR MONTH OF JULY



Key:

Group 1 Commuter Group
2 Urban Group
3 Intertown Group
4 Tourist Group
5 Sunday Tourist Group

FIG. 13

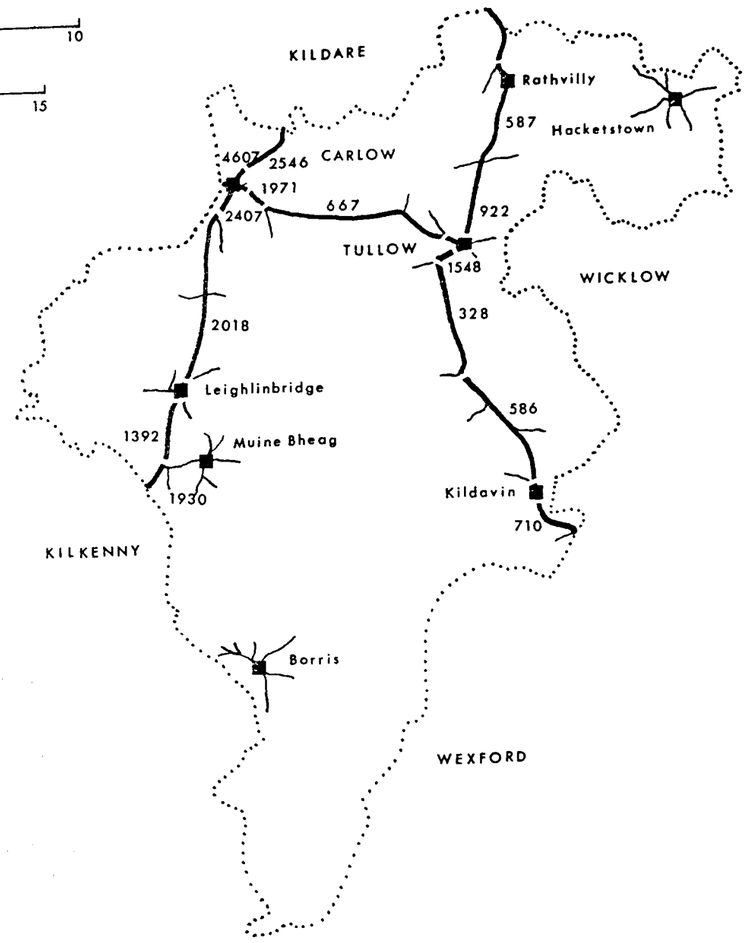
Map No
1

CARLOW

MILES
5 0 5 10

KILOMETRES
5 0 5 10 15

N



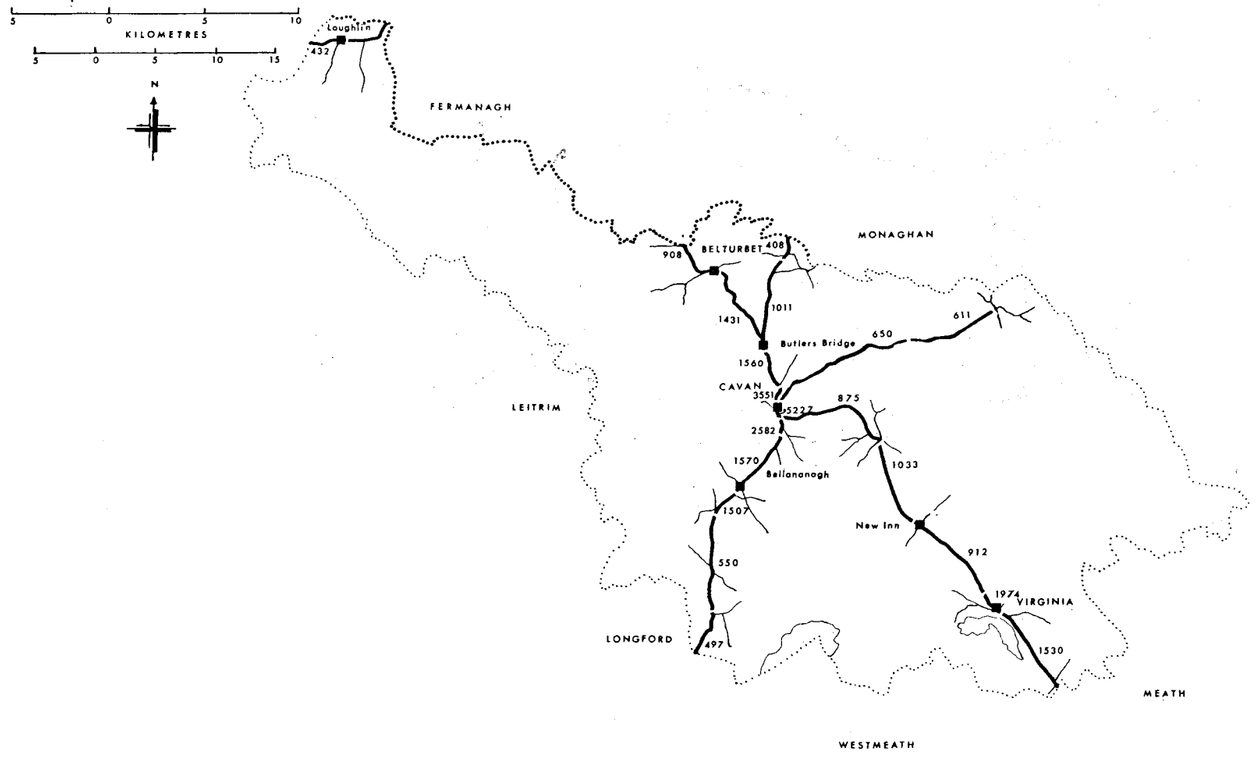
Carlow

V G Innes

MAP No
2

CAVAN

MILES
5 0 5 10
KILOMETRES
5 0 5 10 15
N



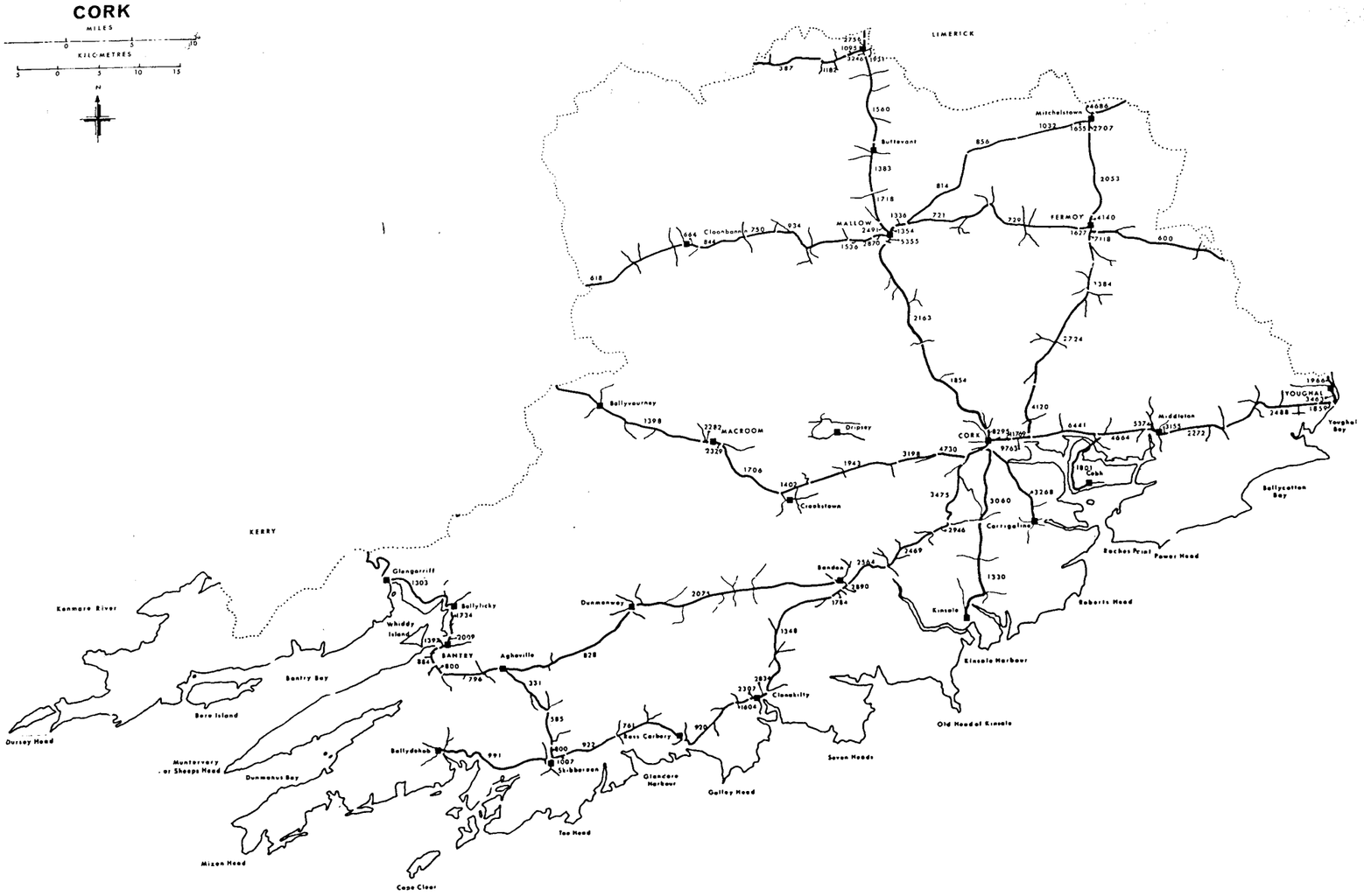
Cavan

VG Innes

MAP No
3

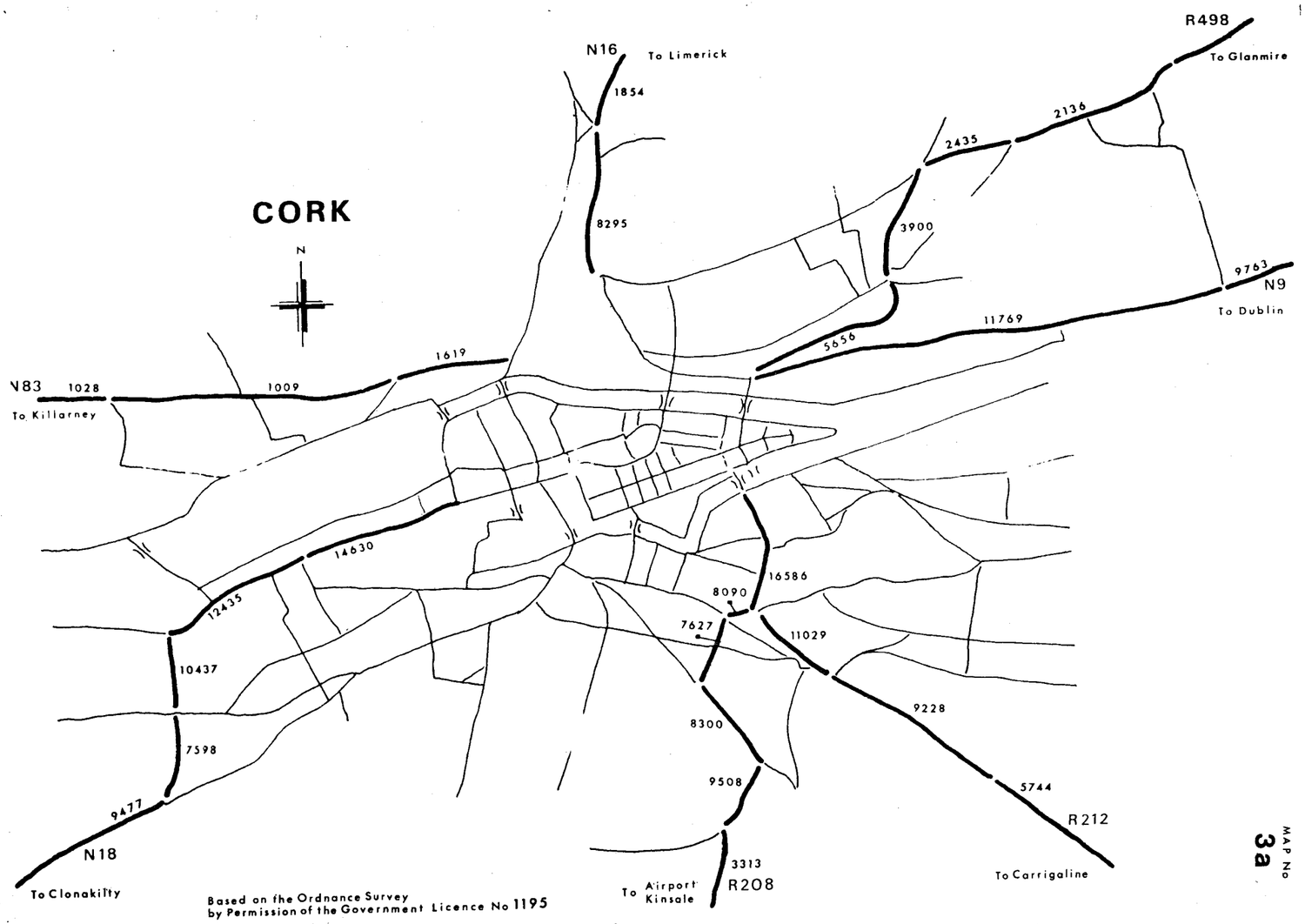
CORK

MILES
5 0 5 10
KILOMETRES
5 0 5 10 15
N



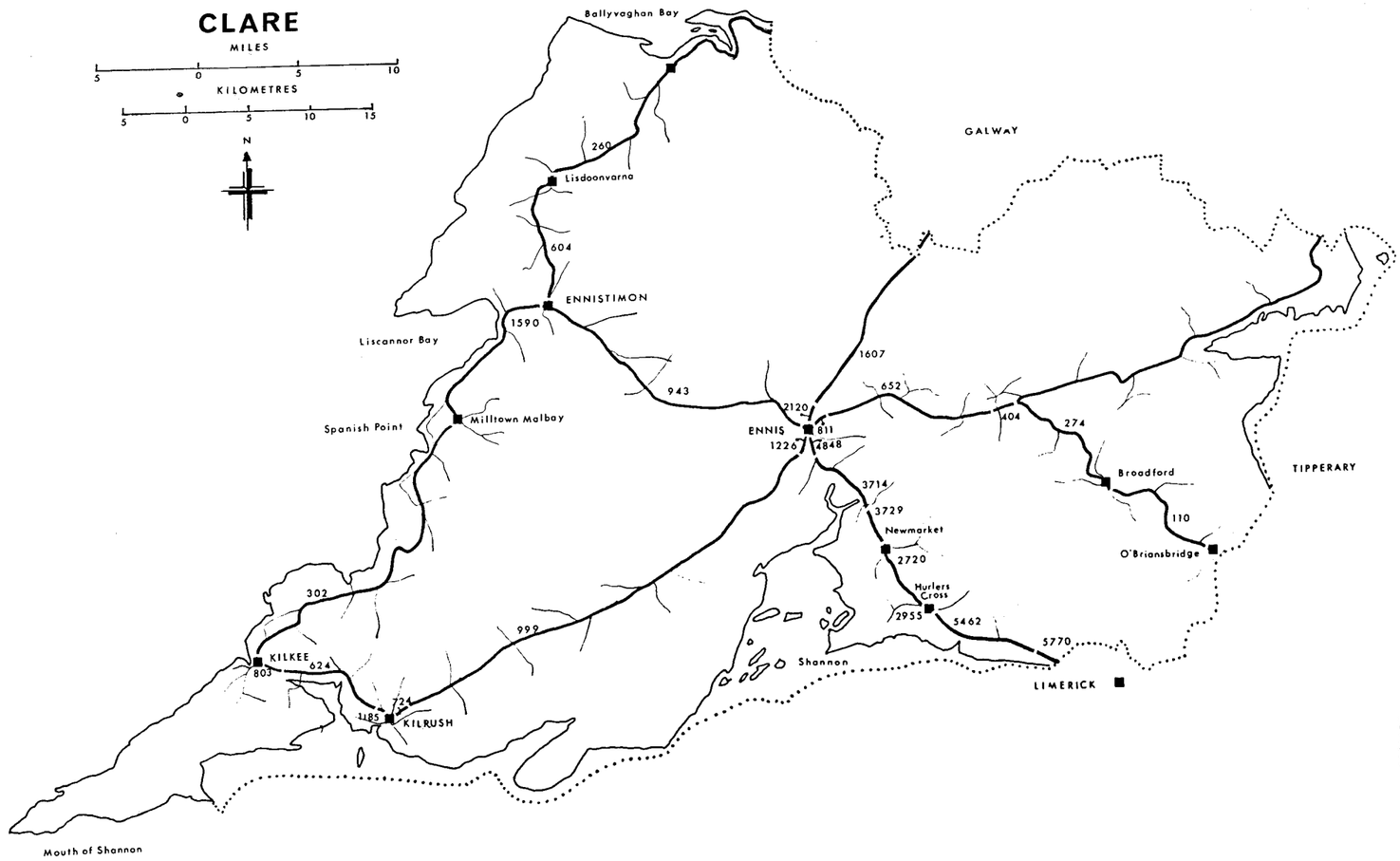
Cork

VG Innes



Cork
V G Innes

MAP No 3a



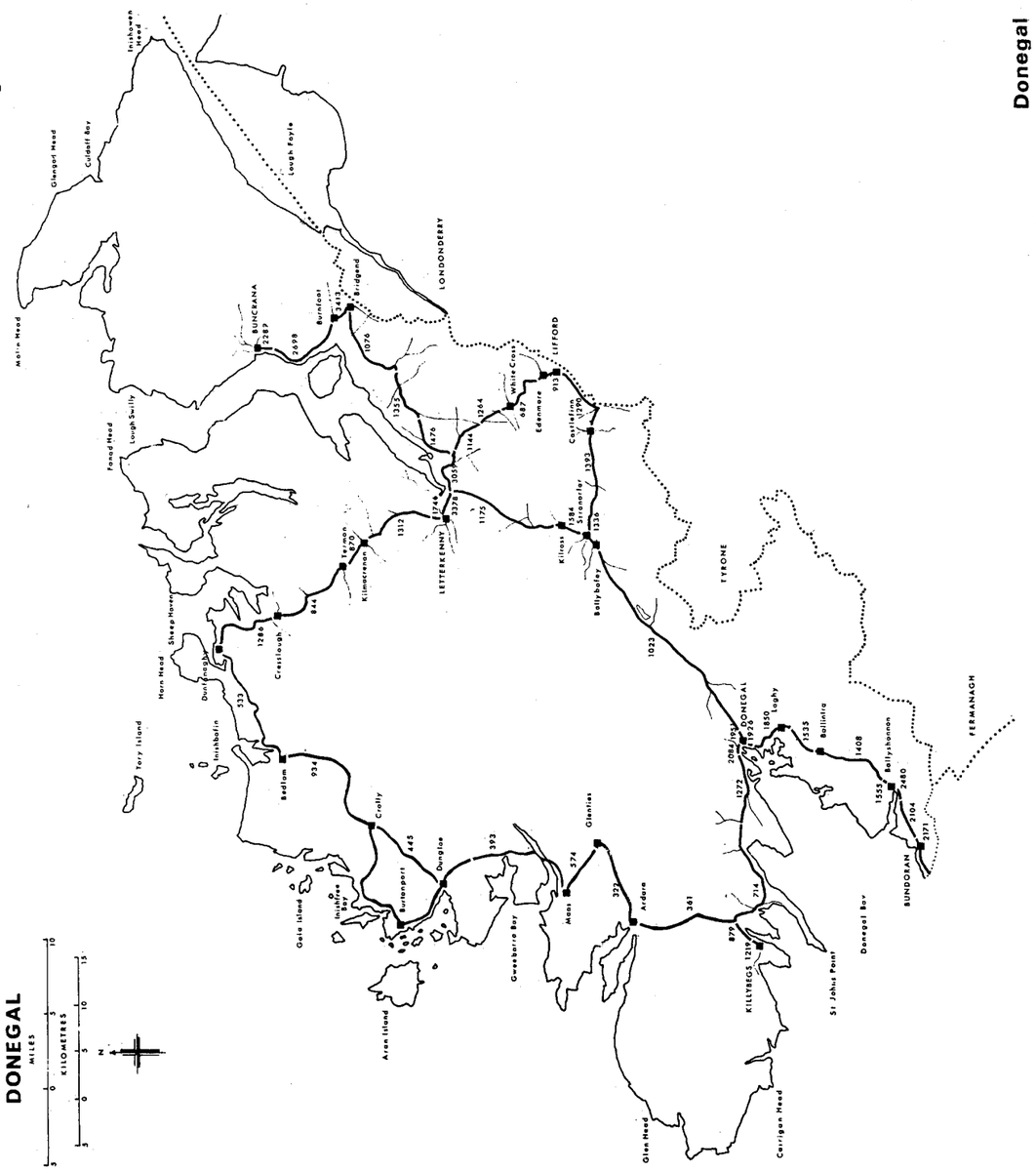
BASED ON THE ORDNANCE SURVEY
BY PERMISSION OF THE GOVERNMENT
LICENCE NO 121/67

Clare
V G Innes

1968
REVISED

MAP No 4

MAP No 5



DONEGAL

MILES 0 5 10

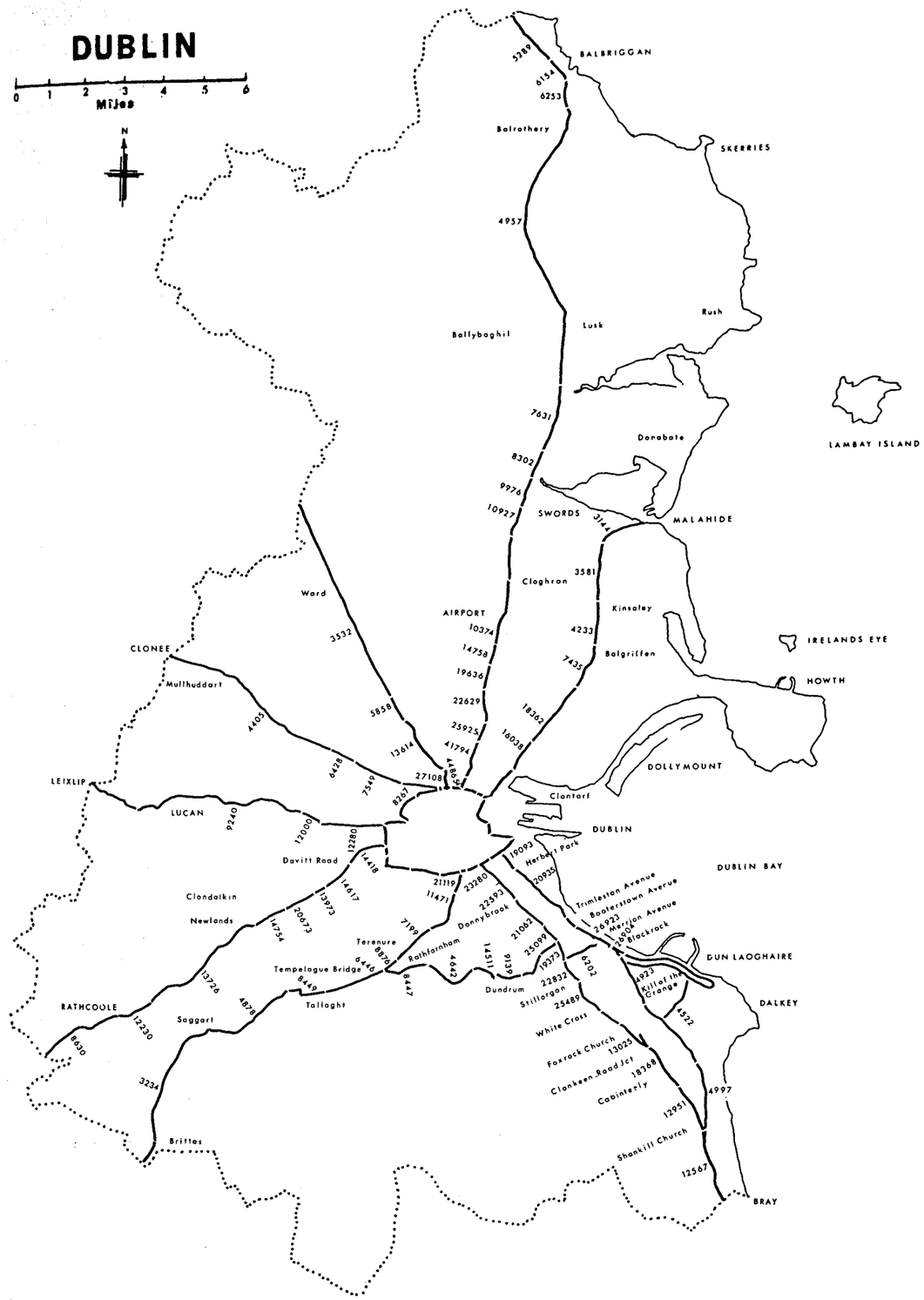
KILOMETRES 0 5 10 15

N

Donegal

VG Innes

MAP No 6

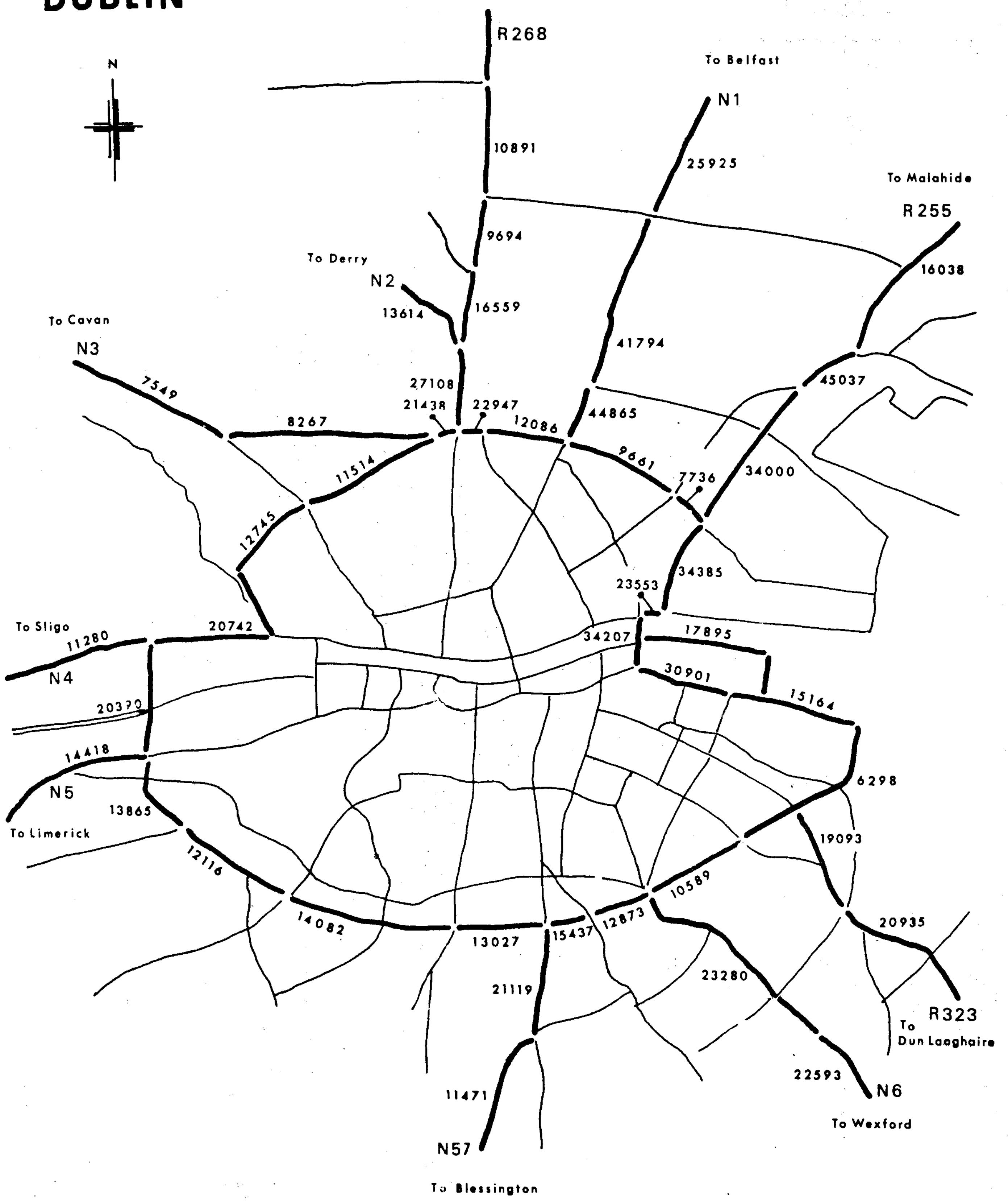


Dublin

VG Innes

DUBLIN

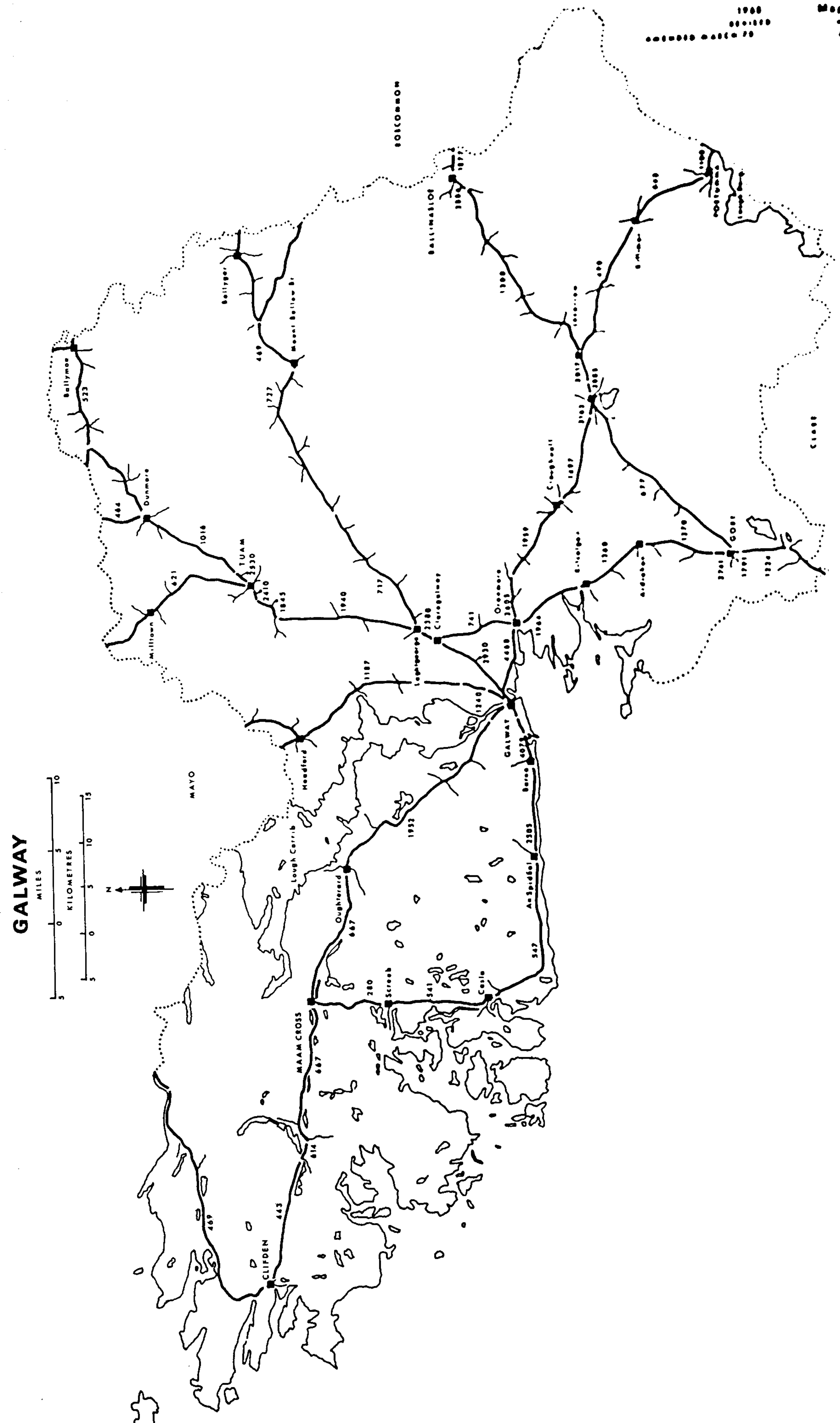
MAP No
6a



Based on the Ordnance Survey
by Permission of the Government Licence No 1195

Dublin
VG Innes

Map No
7

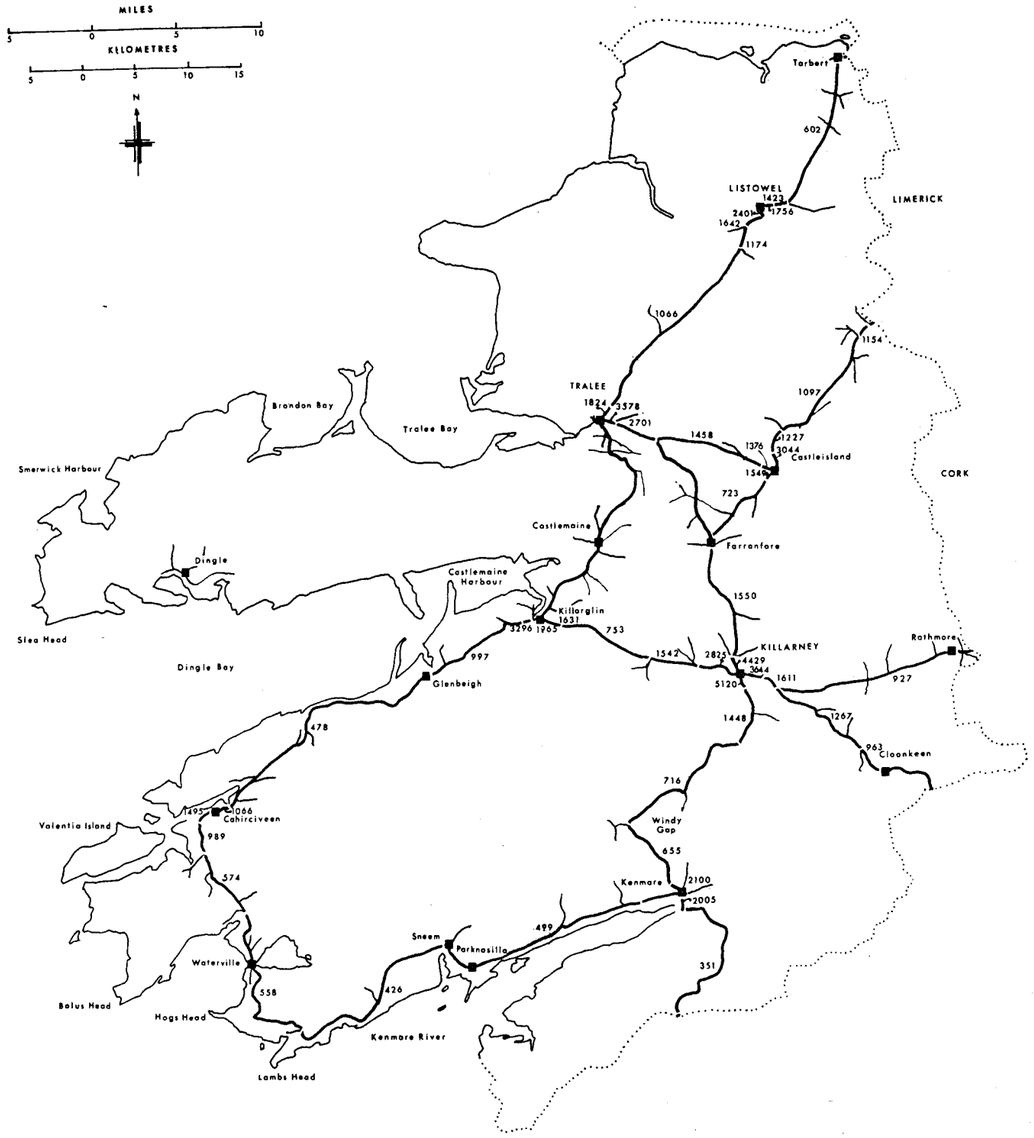


BASED ON THE ORDNANCE SURVEY
BY PERMISSION OF THE GOVERNMENT
LICENCE NO 121/67

Galway
VG Innes

MAP No
8

KERRY

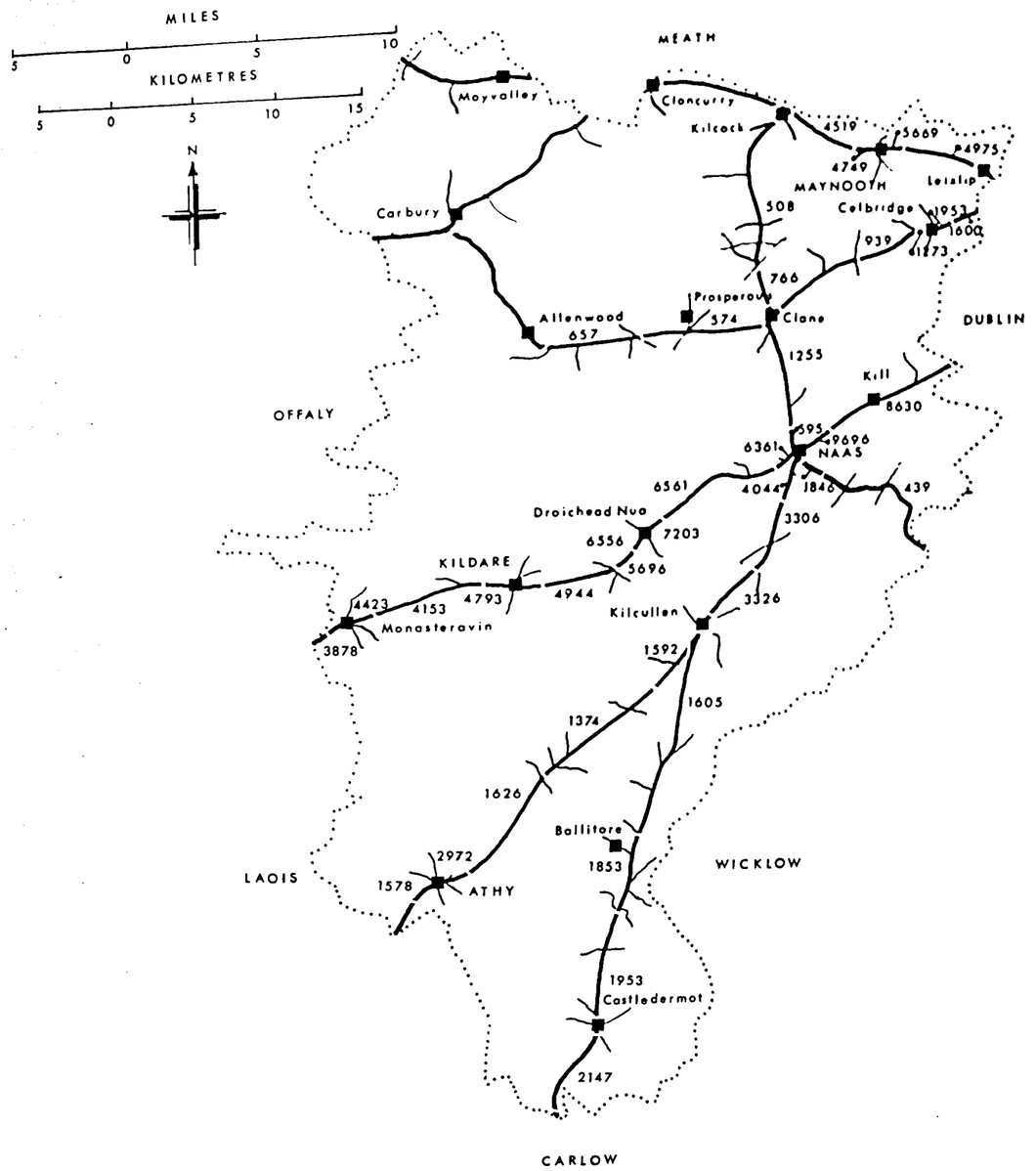


Kerry

VG Innes

MAP No
9

KILDARE



Kildare

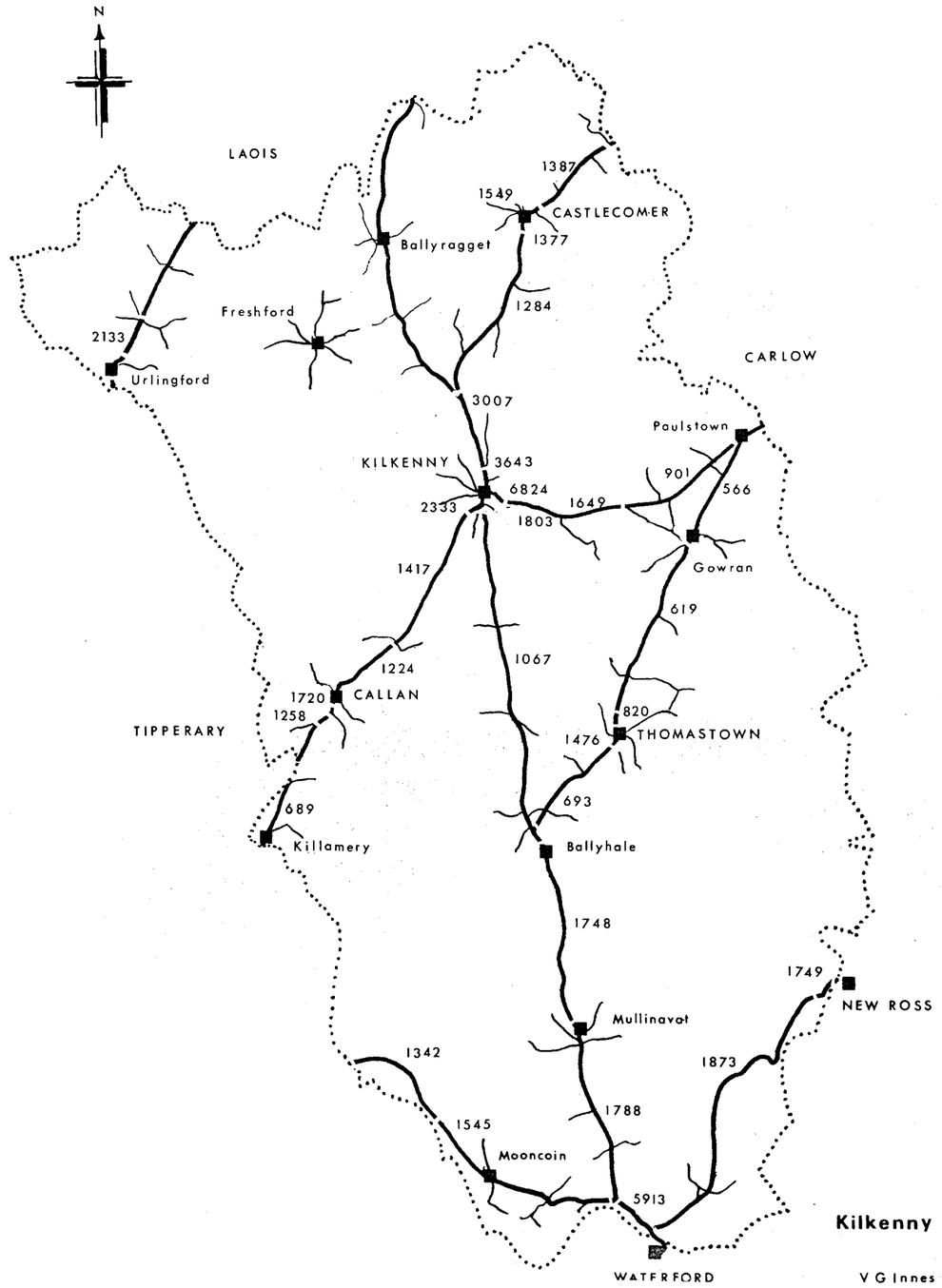
VG Innes

KILKENNY

MAP No
10

MILES
5 0 5 10

KILOMETRES
5 0 5 10 15



Kilkenny

V G Innes

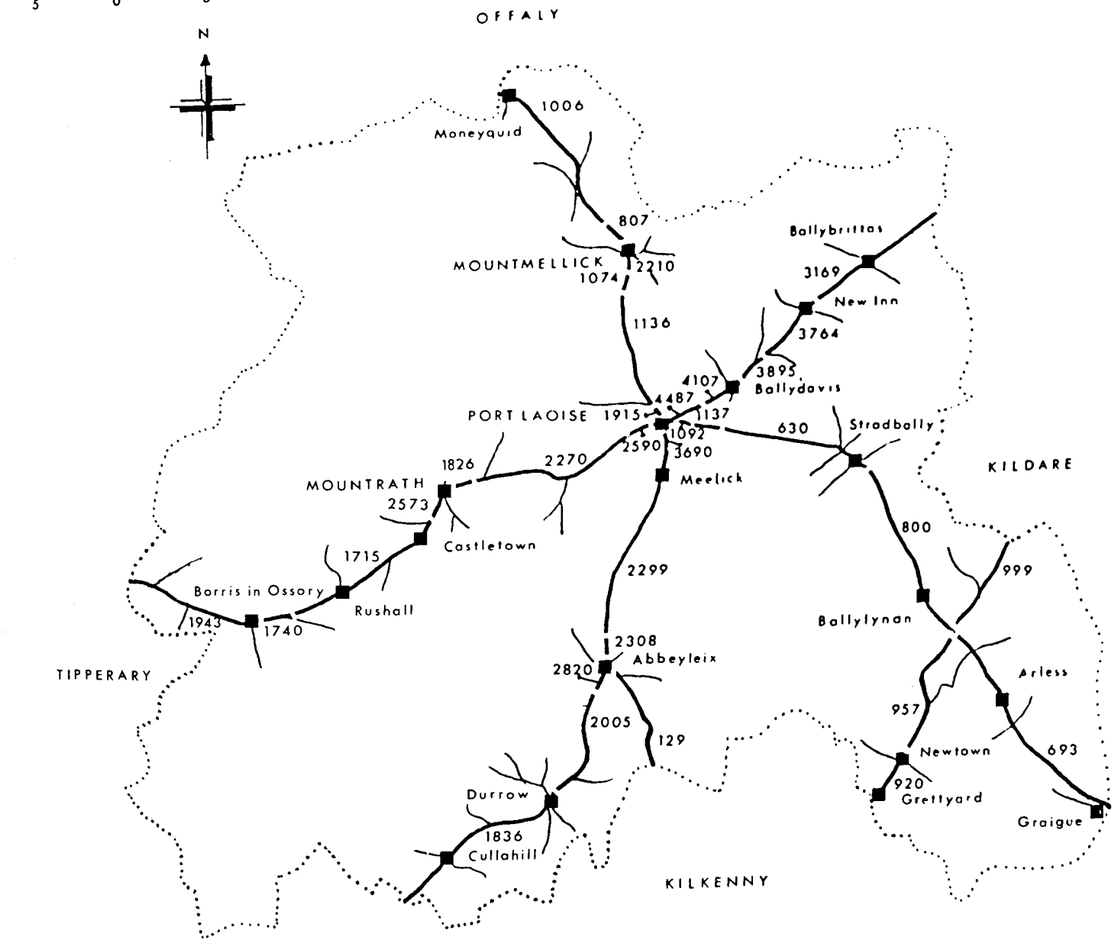
1968
REVISED

MAP No
11

LAOIS

MILES
5 0 5 10

KILOMETRES
5 0 5 10 15



Laois

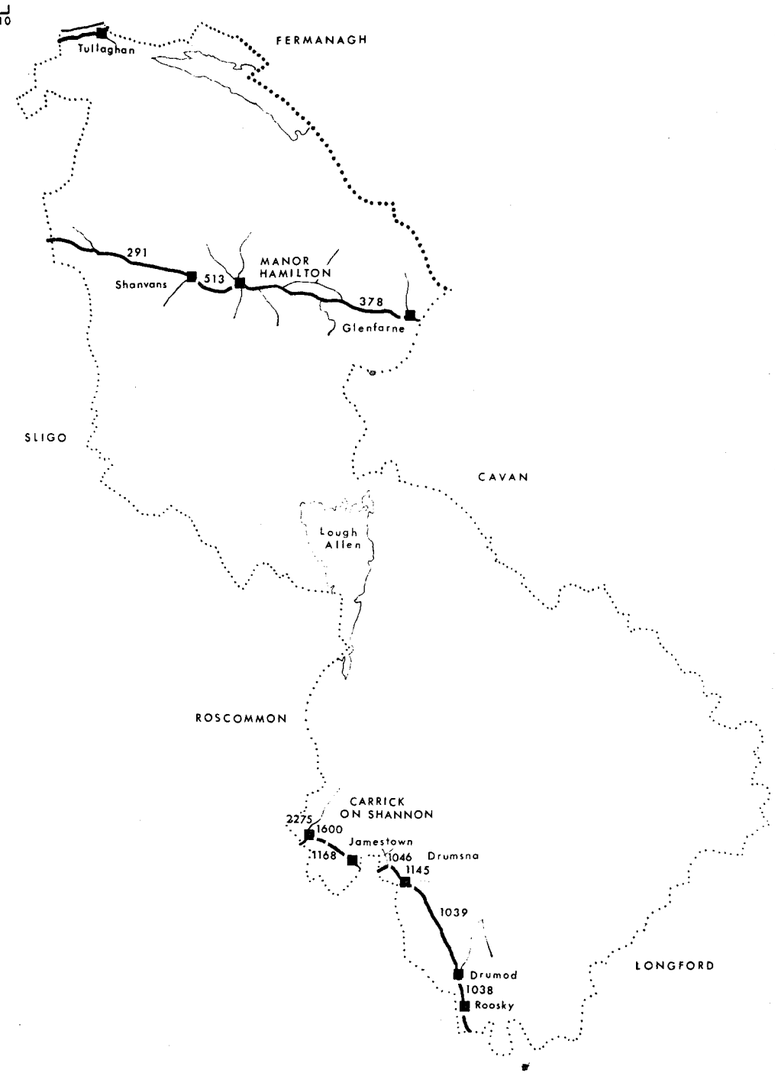
V G Innes

BASED ON THE ORDNANCE SURVEY
BY PERMISSION OF THE GOVERNMENT
LICENCE NO 121/67

MAP No
12

LEITRIM

MILES
5 0 5 10
KILOMETRES
5 0 5 10 15
N



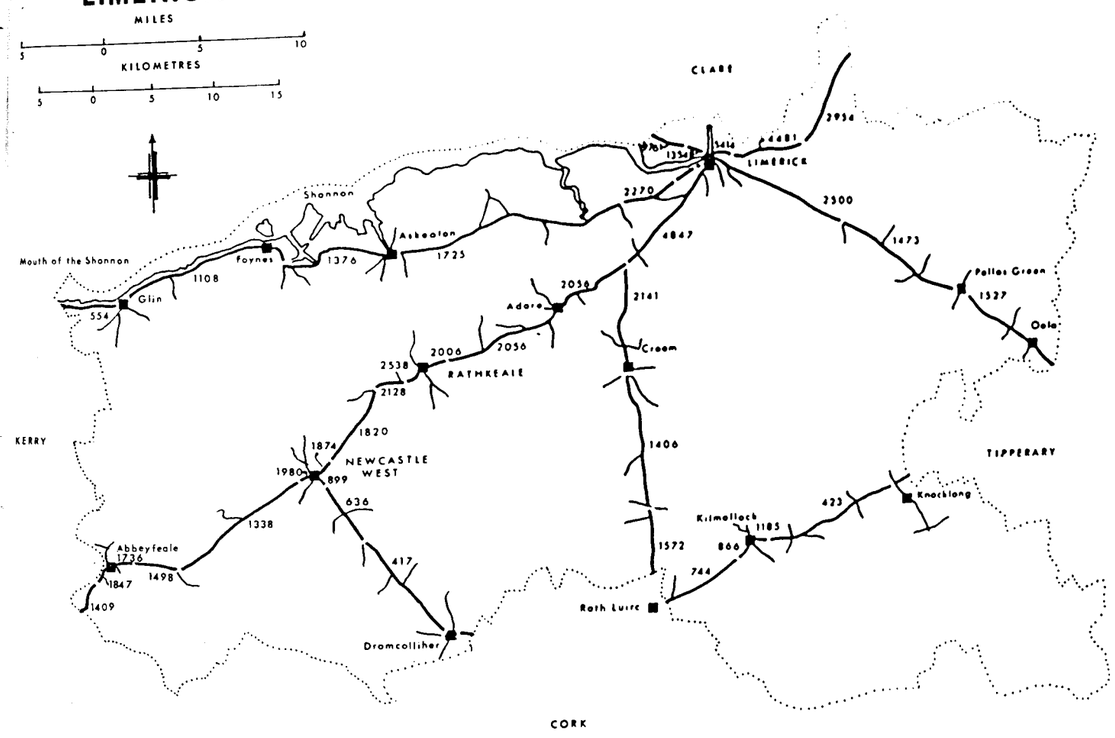
Leitrim

VG Innes

MAP No
13

LIMERICK

MILES
5 0 5 10
KILOMETRES
5 0 5 10 15

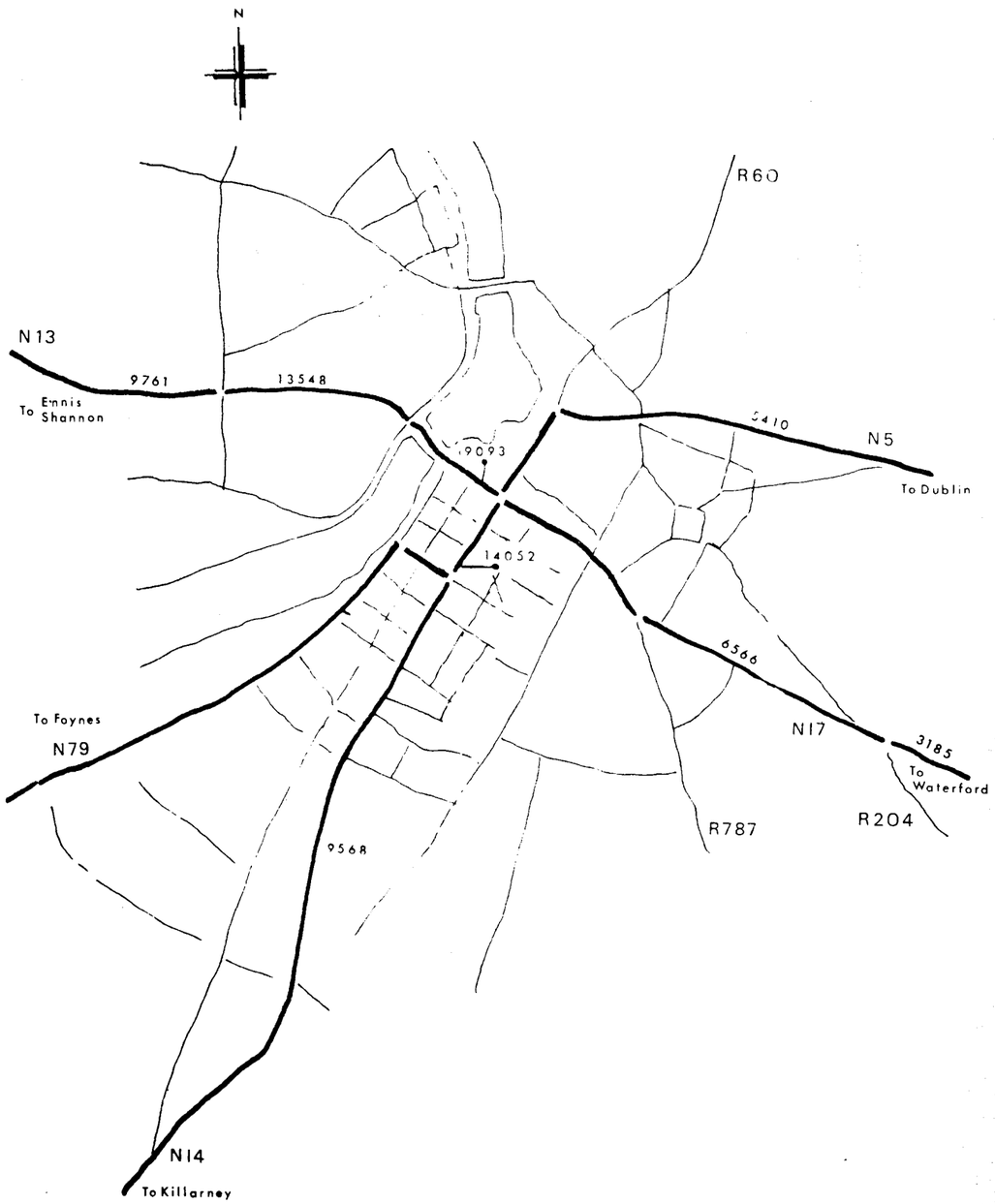


Limerick

VG Innes

MAP No
13a

LIMERICK

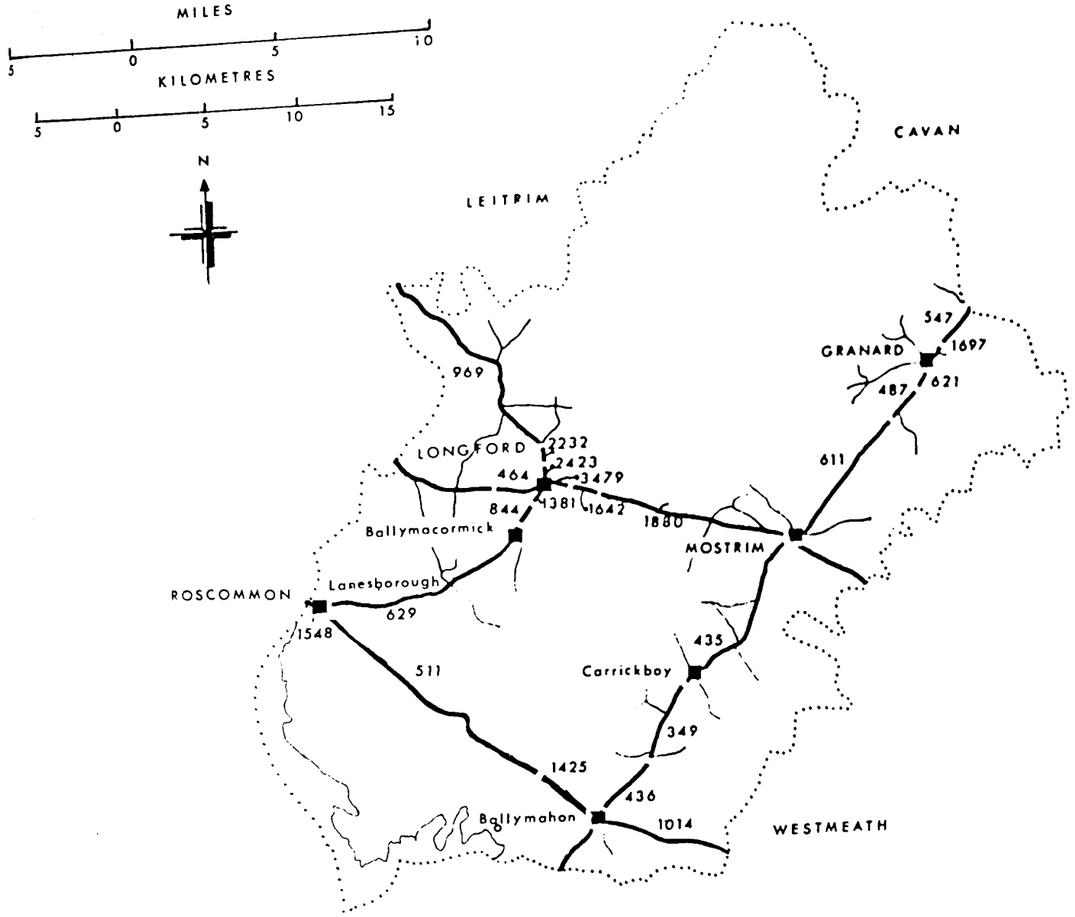


Based on the Ordnance Survey
by Permission of the Government Licence No 1195

Limerick
V G Innes

MAP No
14

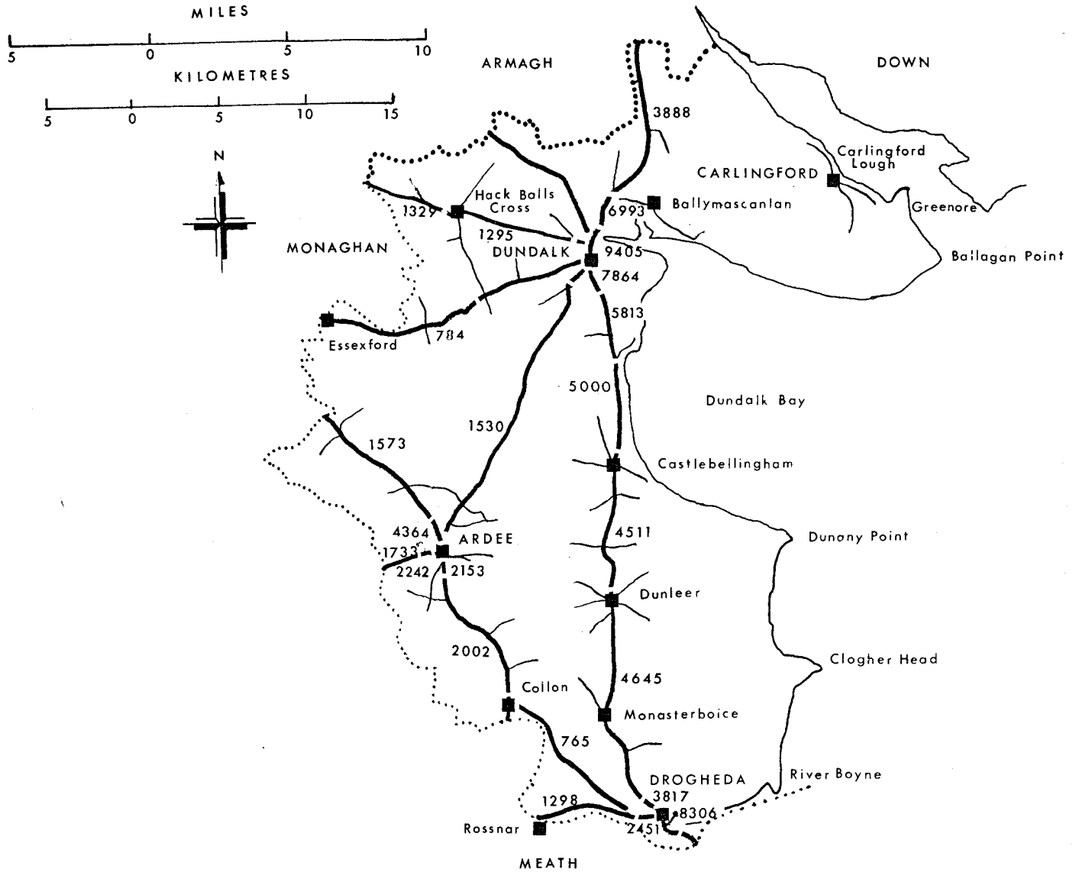
LONGFORD



Longford
V G Innes

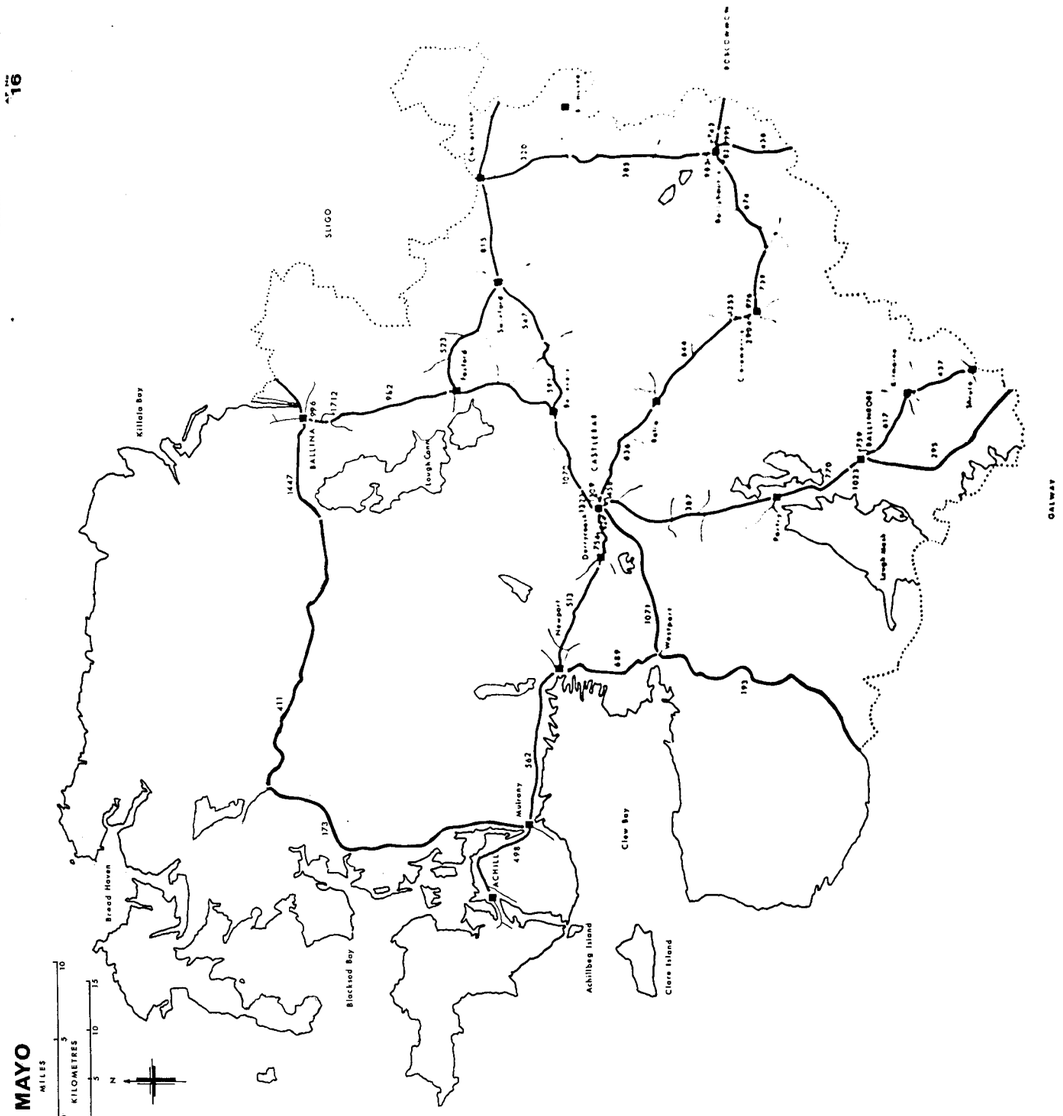
MAP No
15

LOUTH

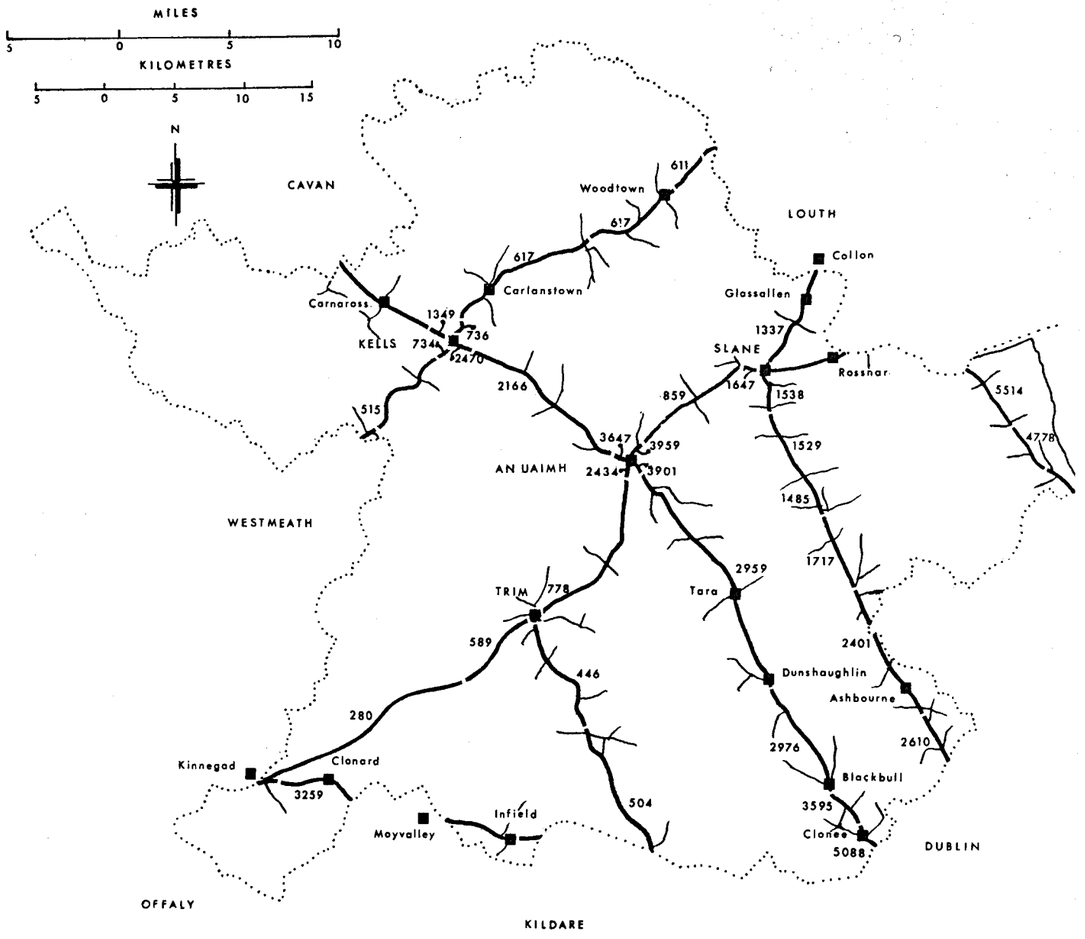


Louth

V G Innes



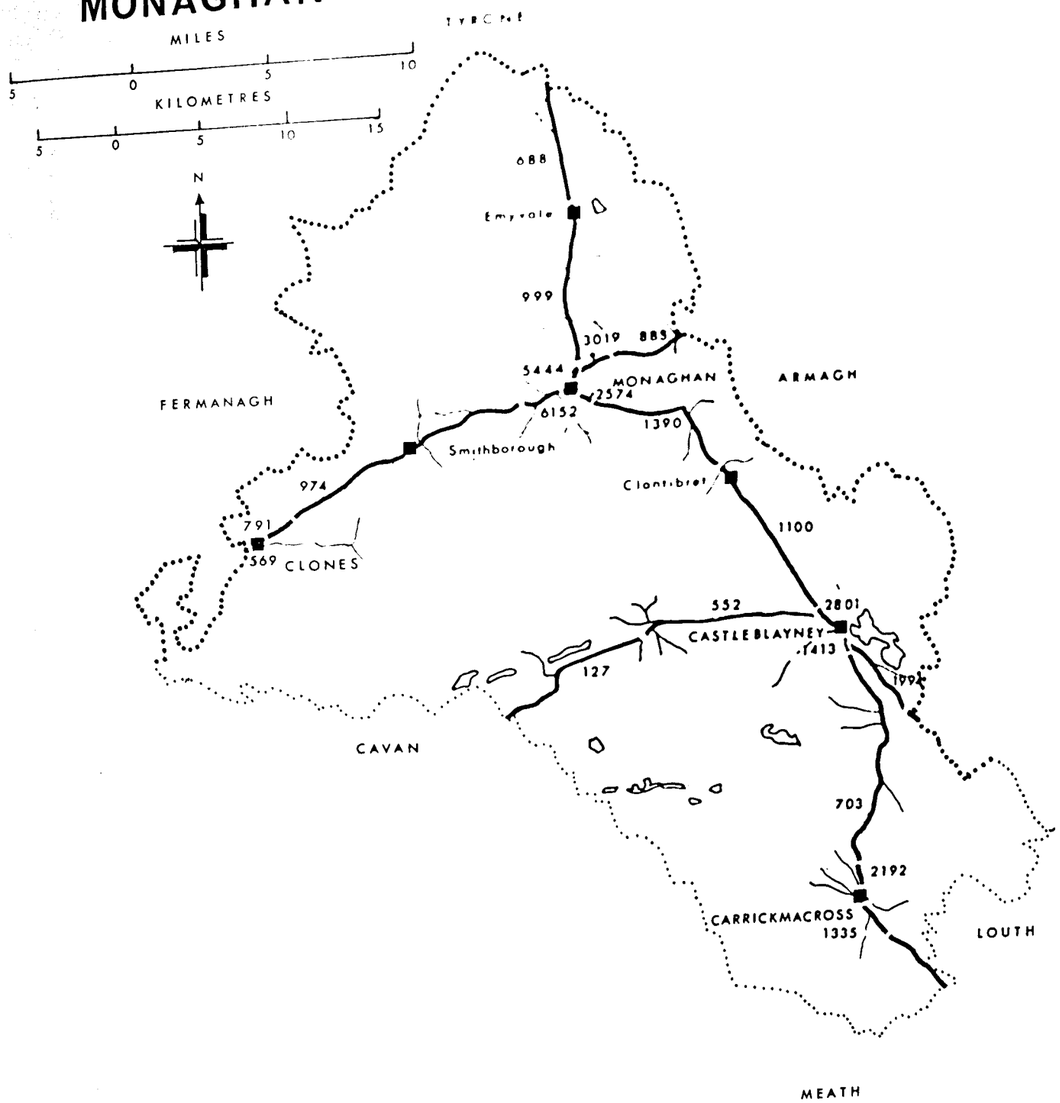
MEATH



Meath

V G Innes

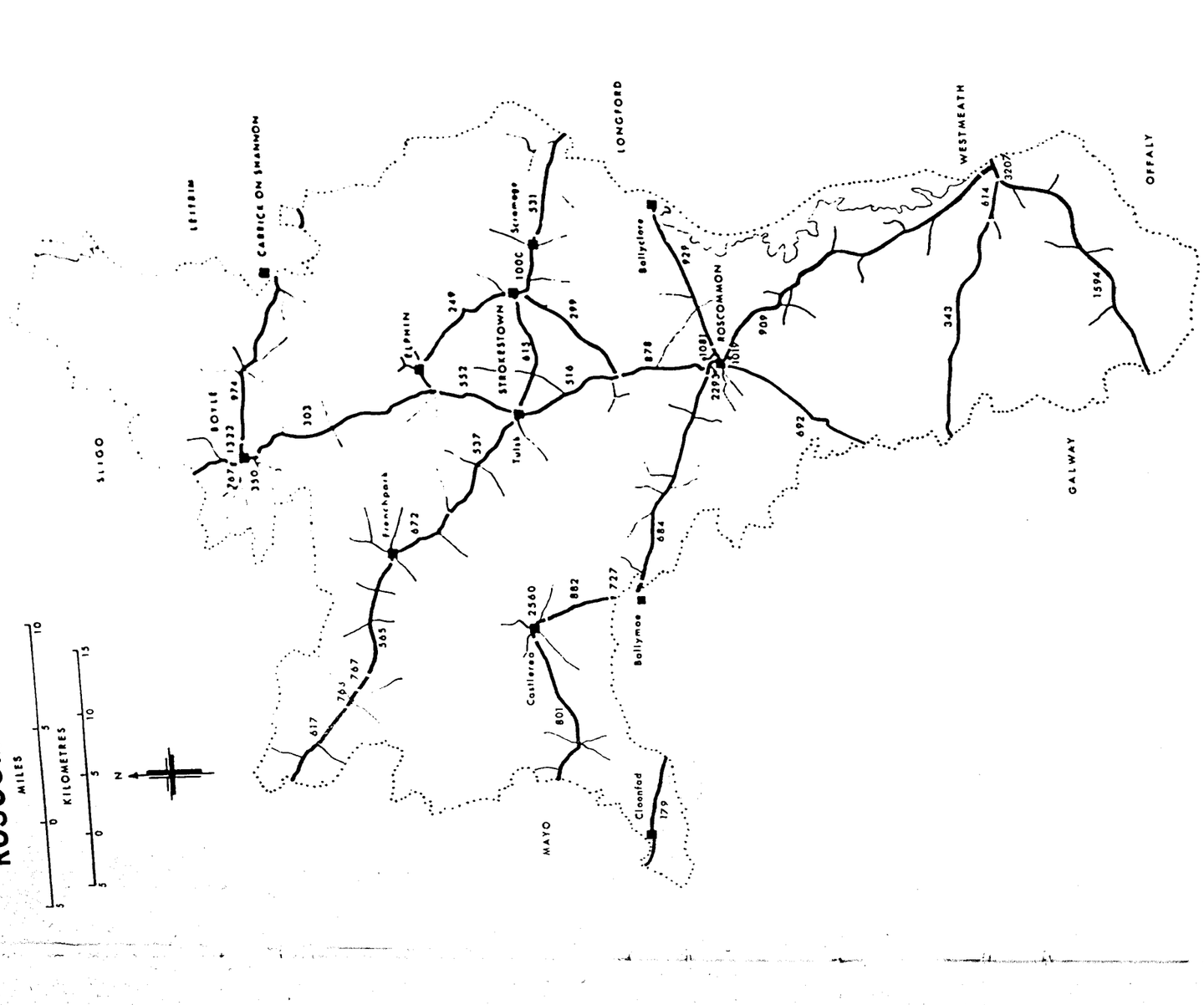
MONAGHAN



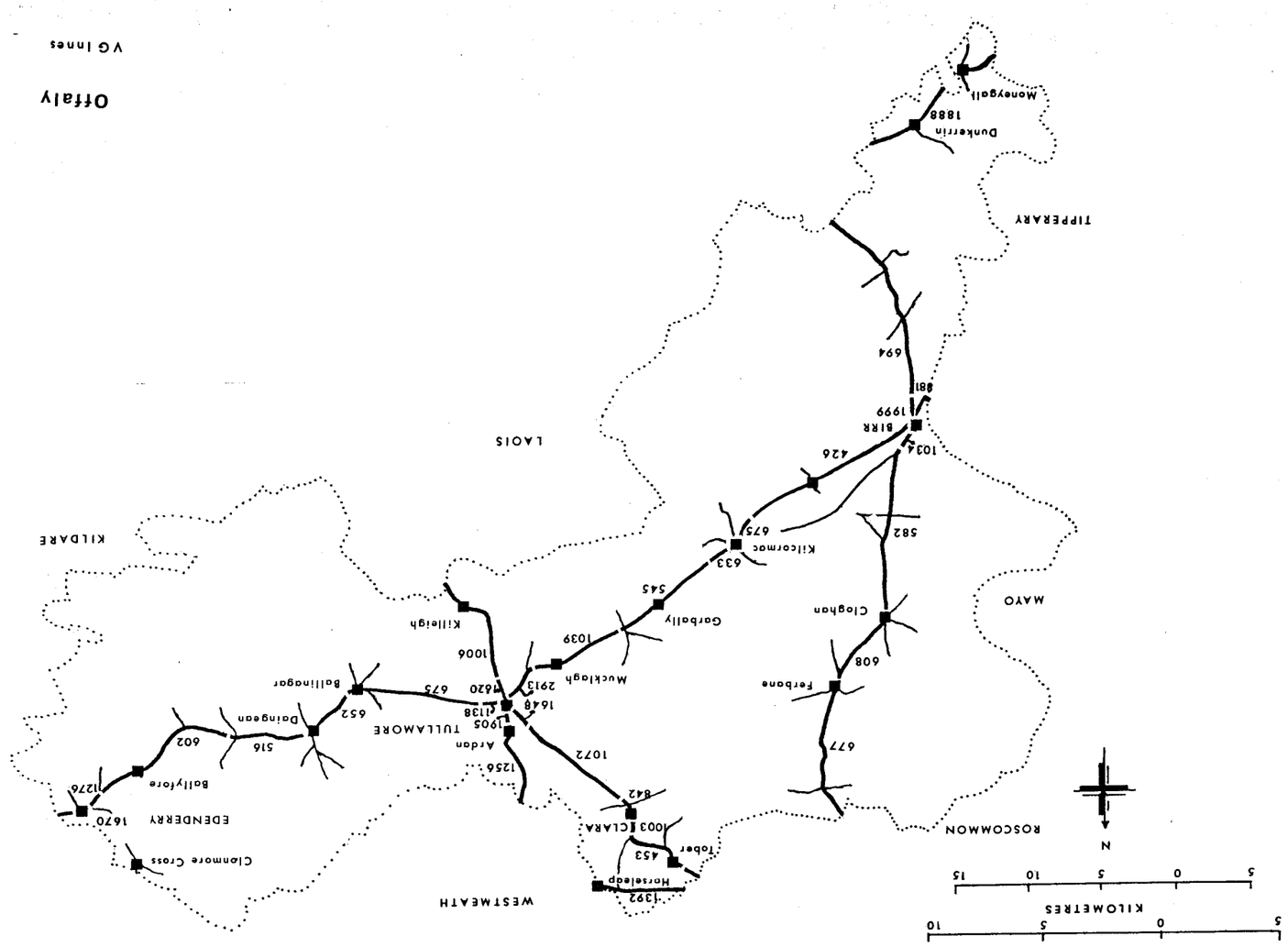
Monaghan

V G Innes

ROSCOMMON

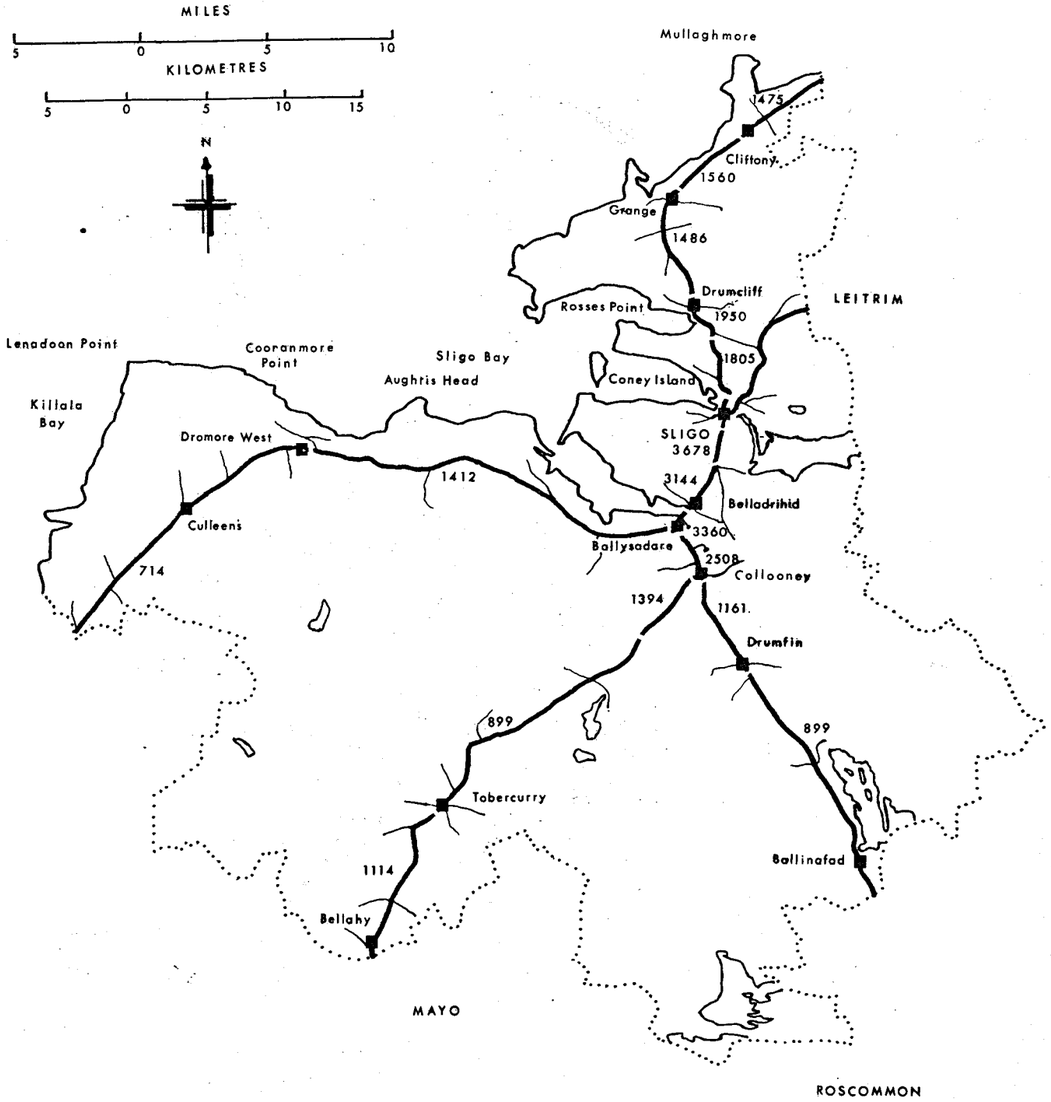


OFFALY



MAP No
21

SLIGO

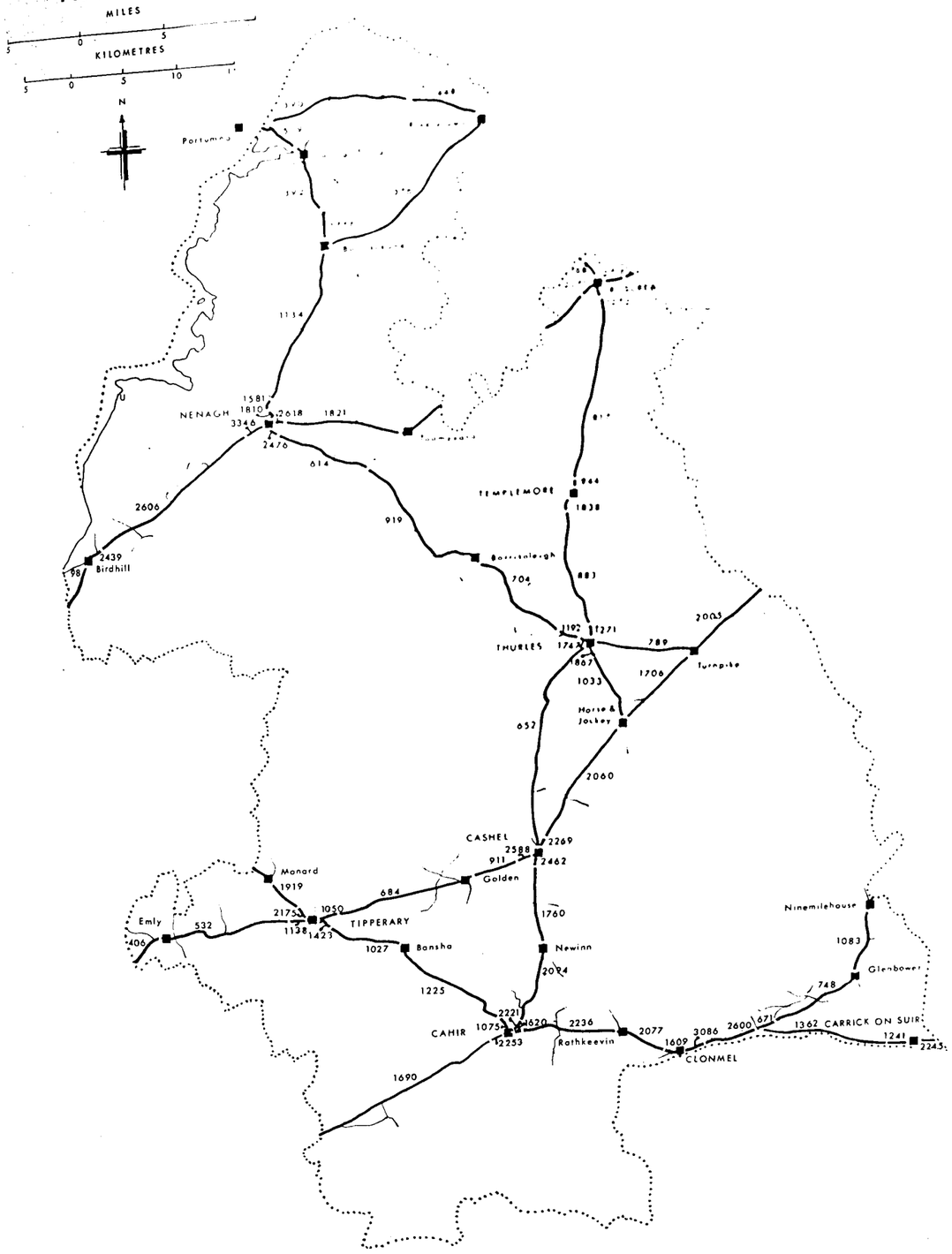


BASED ON THE ORDNANCE SURVEY
BY PERMISSION OF THE GOVERNMENT
LICENCE NO 121/67

Sligo

VG Innes

TIPPERARY

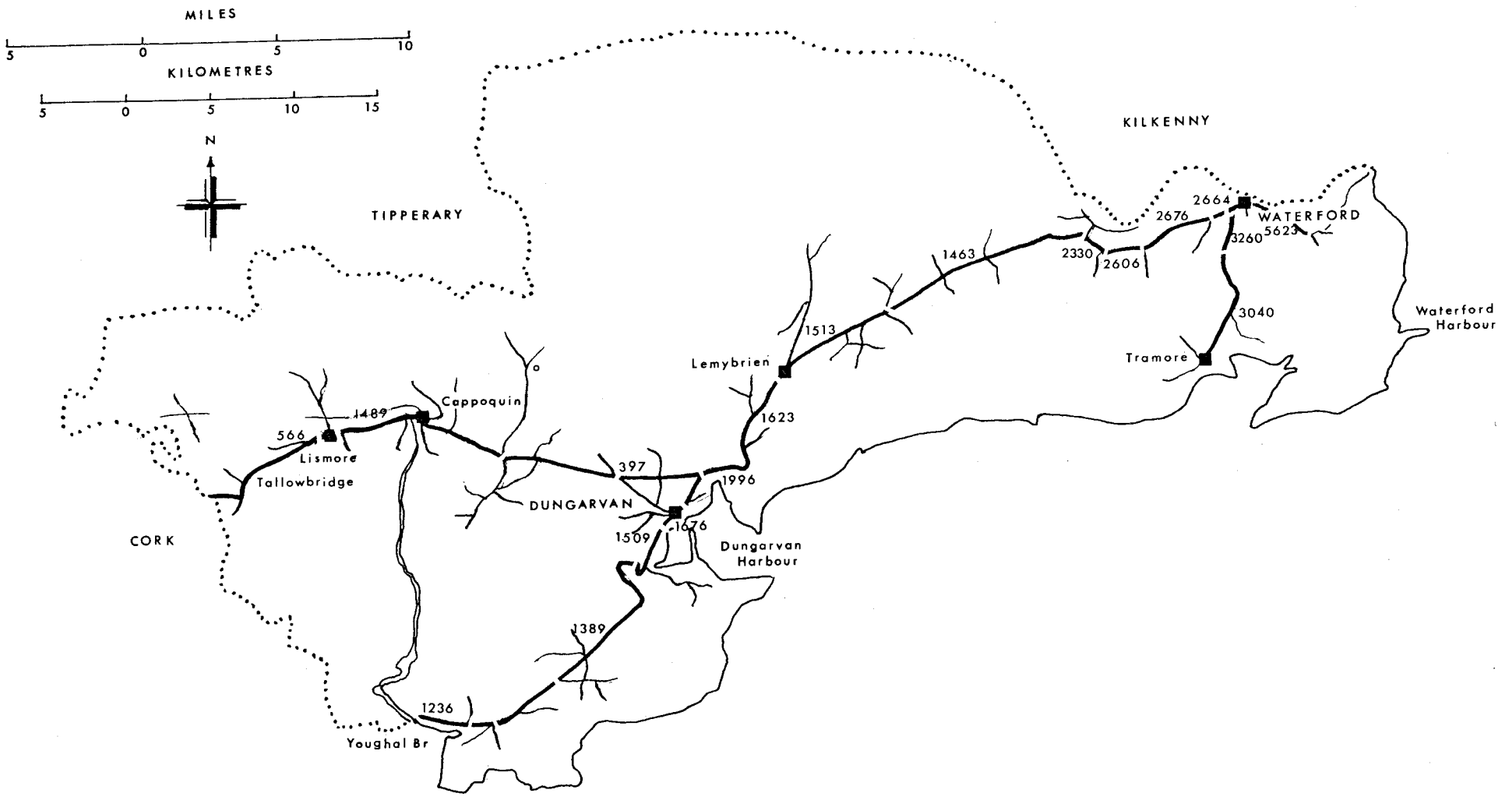


Tipperary

VG Innes

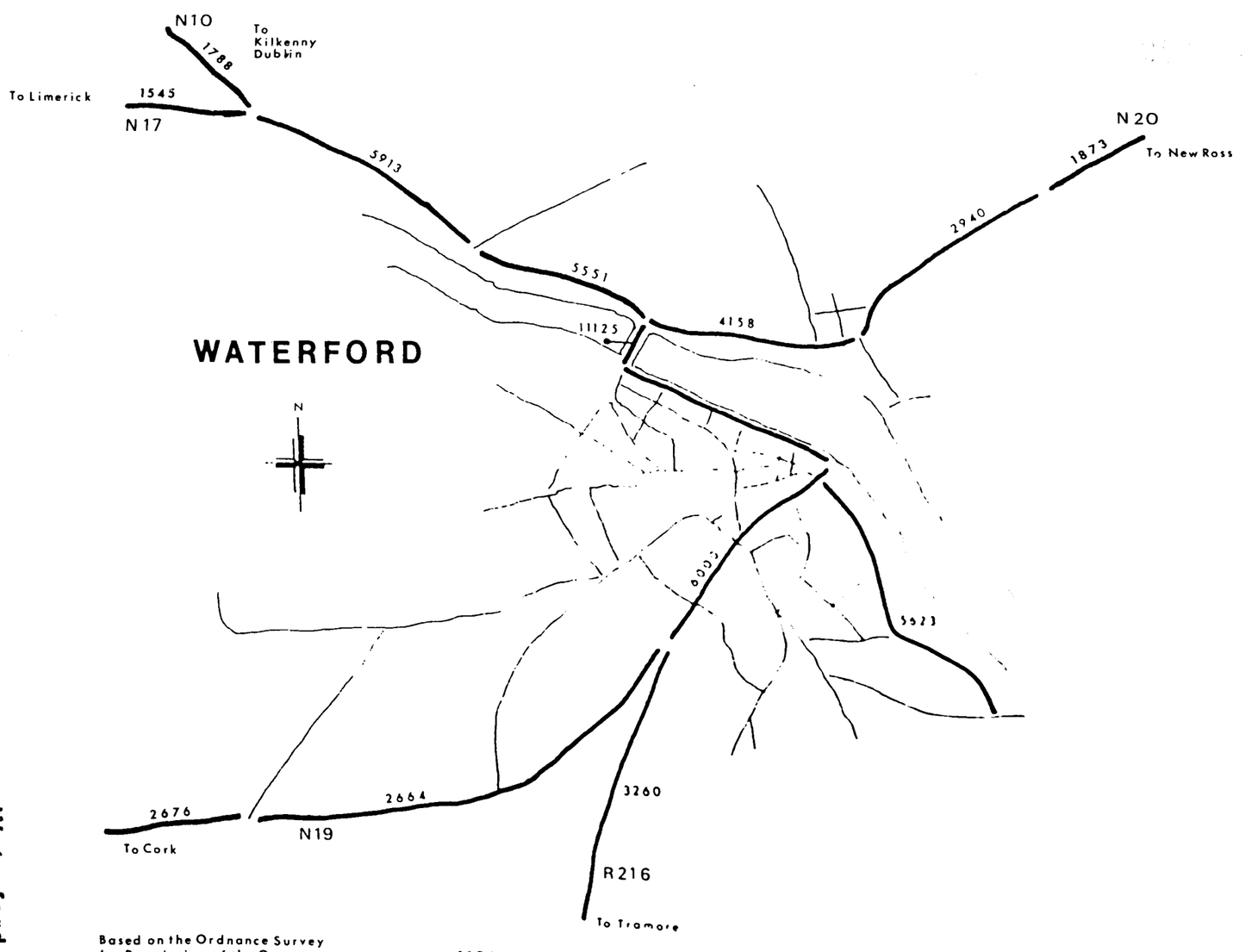
MAP No
23

WATERFORD



Waterford

VG Innes



Based on the Ordnance Survey
by Permission of the Government Licence No 1195

Waterford

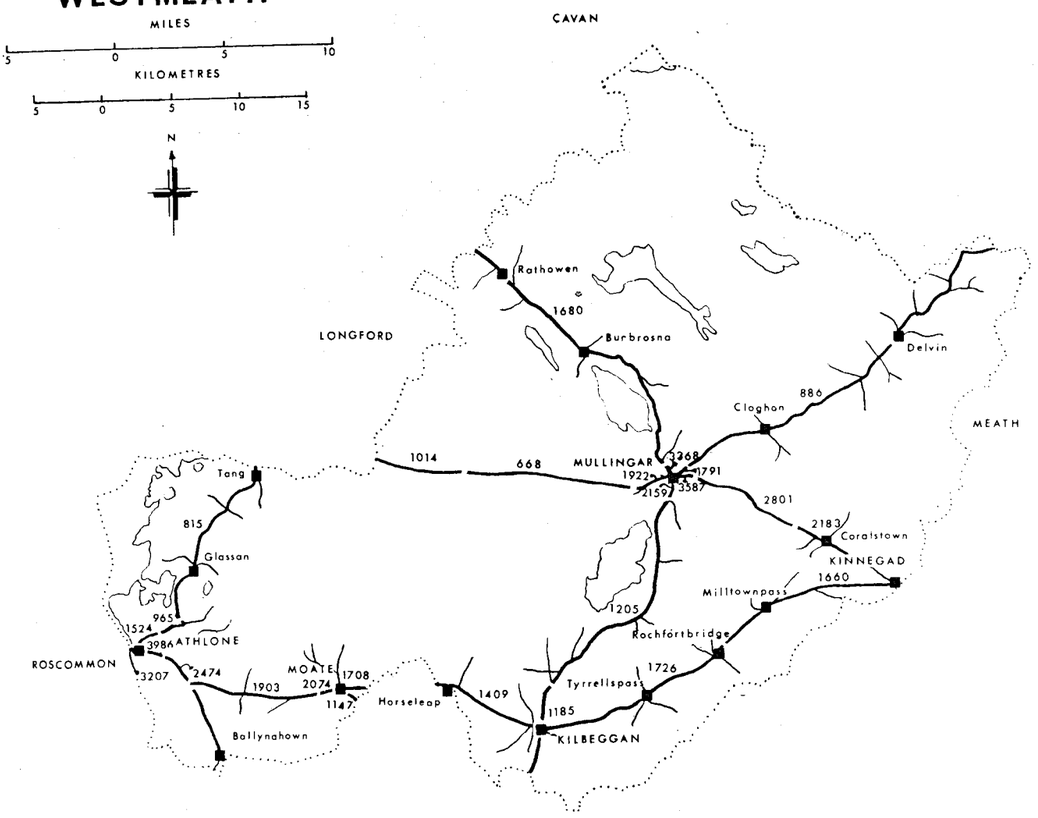
V G Innes

MAP No
23a

MAP No
24

WESTMEATH

MILES
5 0 5 10
KILOMETRES
5 0 5 10 15
N



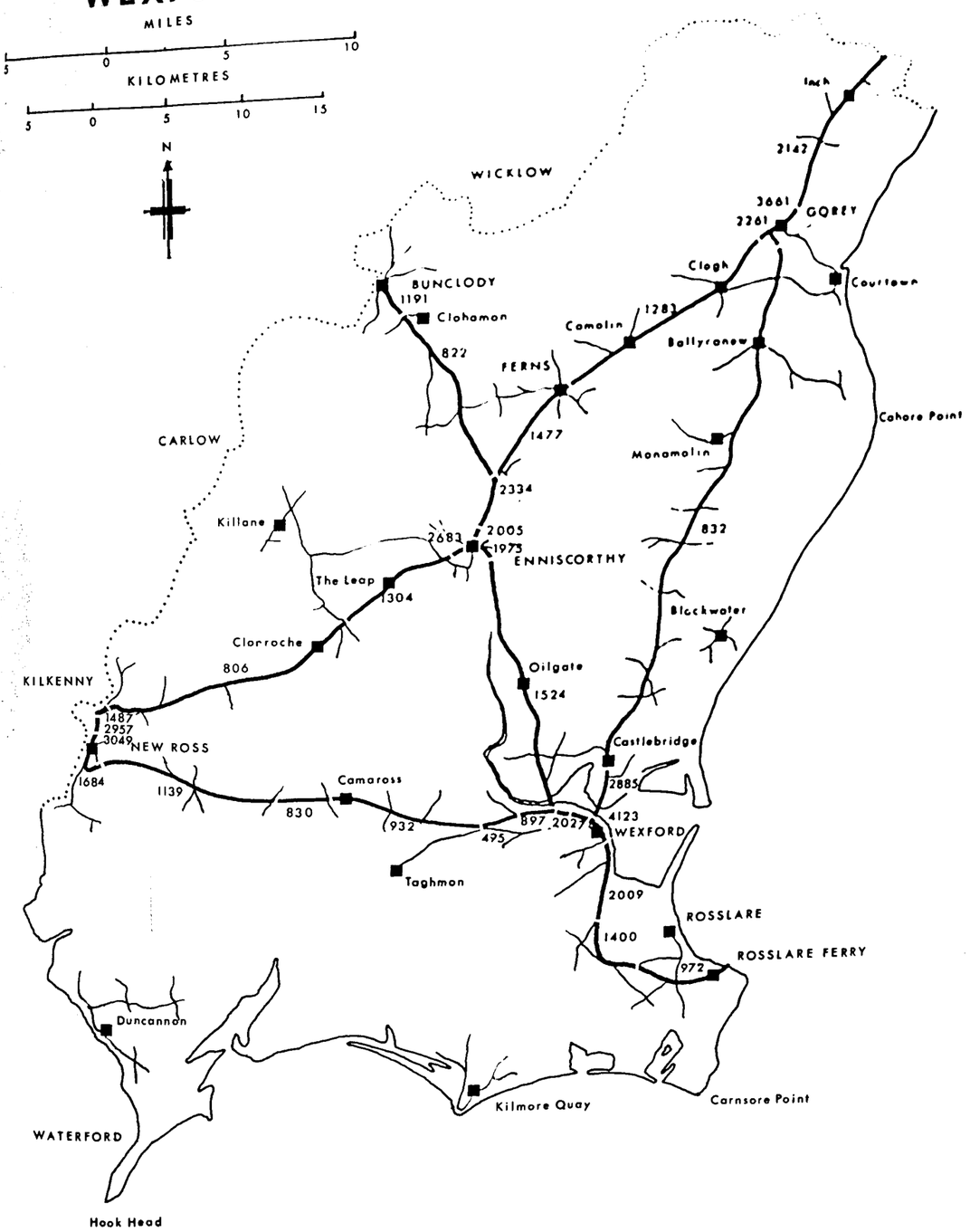
Westmeath

VG Innes

MAP No
25

WEXFORD

MILES
5 0 5 10
KILOMETRES
5 0 5 10 15
N



Wexford

VG Innes

MAP No
26

WICKLOW

MILES
5 0 5 10

KILOMETRES
5 0 5 10 15

N

DUBLIN

BRAY
Enniskerry 5122
4282
Kilmacanoge 6163
4688 Greystones
4320
N'town Mt Kdy
3165
Ashford
4571
2377
WICKLOW
2021
Laragh
Rathdrum
1975
1942
Wooden Br
3998
2593
ARKLOW

3341
2016
BLESSINGTON
KILDARE
1552
Hollywood
Dunlavin
765
Donard
926
BALTINGLASS
567
Kiltegan
Aughrim
CARLOW
TINAHELY
Shillelagh
WEXFORD
Carnew

Wicklow

V G Innes

Prepared Dec 1969
Amended —

N
W E
S

NORTHERN IRELAND

Broad Haven
Blacksod Bay
Achill Island
Clare Island
Inishbofin
Clifden
Galway Bay
Arran Islands
Liscannor Bay
Kilkee
Mouth of the Shannon
Tralee Bay
Dingle Bay
Valencia Island
Kenmare River
Bantry Bay
Dunmanus Bay
Mizen Head
Cape Clear
Ballydehob
Skibbereen
Clonakilty Bay
Old Head of Kinsale
Cork Harbour
Youghal Bay
Dungarvan Harbour
Waterford Harbour
Passage Harbour
Carnsore Point

KEY	
Symbol	Traffic Vol. Range
	0 – 1000 Veh/day
	1000 – 2000 "
	2000 – 5000 "
	5000 – 10,000 "
	10000 – 20,000 "
	Over 20,000 "

SCALE OF MILES
0 5 10 15 20 25 30 35 40 45 50 Miles

MAP SHOWING RANGES OF RURAL TRAFFIC VOLUMES 1968

V.G. Innes.

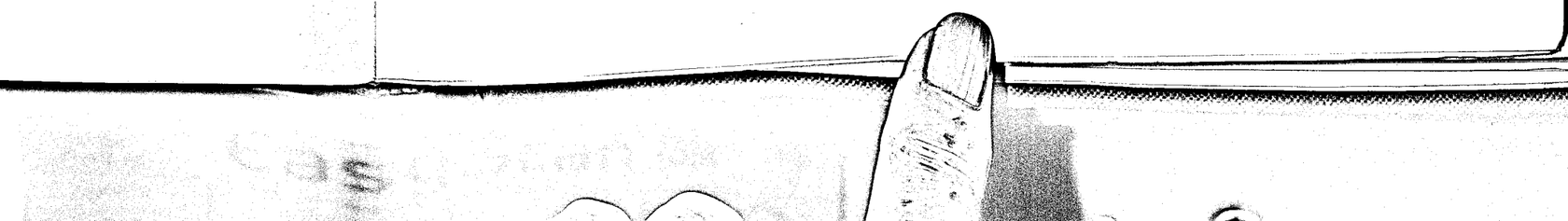
AN FORAS FORBARTHA

St. Martin's House,
Waterloo Road,
Dublin 4.

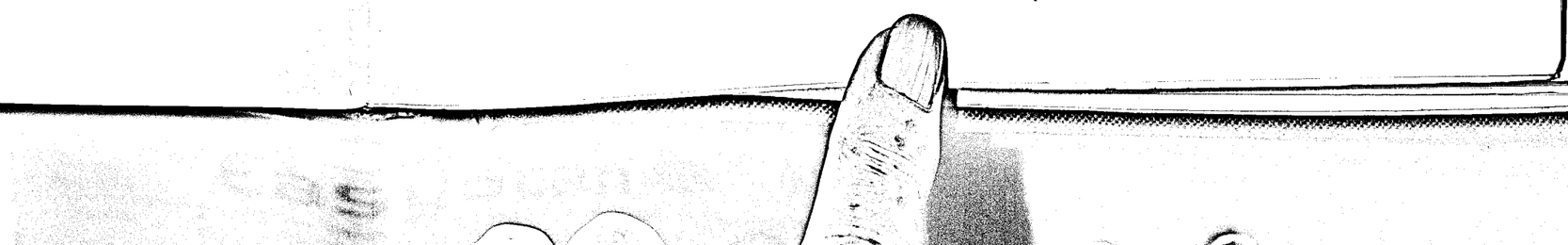
Tel. 64211

PUBLICATIONS

		s.	d.
Expansion of the Construction Industry in Ireland Published 1965	45 pp	10.	6.
Planning for Amenity and Tourism Published 1966	110 pp	17.	6.
Urban Redevelopment: New Ross Published 1966	16 pp	7.	6.
Land Use and Building Condition Surveys Published 1966	27 pp	8.	6.
Training of Construction Foremen Published 1967	26 pp	2.	6.
Industrial Development and the Development Plan Published 1967	52 pp	12.	6.
New Dimensions in Regional Planning: A Case Study of Ireland Published 1967	128 pp	25.	0.
A System of Reporting and Recording Traffic Accident Information Published 1967	75 pp	35.	0.
Report on Administration of the Arterial Road Programme Published 1966	61 pp	7.	6.
A Study of Highway Construction and Maintenance Operational Management in the Republic of Ireland Published 1967	48 pp	7.	6.
New Homes: A Pilot Social Survey Published 1968	66 pp	15.	0.
Technical Documentation for the Building Industry Published 1968	306 pp	21.	0.
Road Design Manual Section 3: Fencing Part 1: Nailed Timber Post and Rail Published 1968	28 pp	5.	0.
Education of Planners in Ireland Published 1966	24 pp	2.	6.
Public Lighting in Ireland Published 1968	121 pp	17.	6.
A Study of the Effectiveness of Special Speed Limits on the Dublin - Naas Road Published 1968	15 pp	5.	0.
A Study of Traffic Accidents on Dublin - Naas Road (1966 and 1967) Published 1968	15 pp	21.	0.
Rescue Services at the Scene of Traffic Accidents Published 1969	30 pp	12.	6.
General Speed Limits Published 1969	50 pp	7.	6.



Operational Bills Published 1969 4 volumes O.P.	40.	0.
Regional Studies in Ireland (Buchanan) Published 1969 191 pp	40.	0.
Regional Development in Ireland: A Summary (Buchanan) Published 1969 38 pp	7.	6.
Rationalisation in the Building Industry Part 1: Windows Published 1969 45 pp	7.	6.
Trade Literature Published 1969 8 pp	2.	6.
Metric Guide 1 Published 1969 47 pp	7.	6.
Metric Guide 2 Published 1969 66 pp	10.	0.
Metric Bulletin 1 (Round Reinforcing Bars)		9.
Metric Bulletin 2 (Metric Symbol)		9.
Metric Bulletin 3 (Who does What, When?)		9.
Metric Bulletin 4 (Metric Quantities)		9.
Metric Bulletin 5 (Softwood Sizes)		9.
Metric Bulletin 6 (Non-Pressure Concrete Pipes)		9.
Metric Bulletin 7 (Steel Fabric for Concrete Reinforcement)		9.
Metric Bulletin 8 (Glass)		9.
Metric Bulletin 9 (Copper tubing and Compression fittings for the Domestic Market)		9.
Metric Bulletin 10 (Schedule of weight of materials and their force per unit volume)		9.
Metric Bulletin 11 (Constants for converting Imperial to Metric and empirical conversion from Imperial to Metric units)		9.
Metric Bulletin 12 (Metric linear measures: Scales, Rules, Grids, Rods, Tapes, Staffs and Chains)		9.
Metric Bulletin 13 (Cement, sand, gravel, readymixed concrete, plaster, lime and mortar)		9.
Report on Modular Co-ordination in Ireland Published 1968 39 pp	5.	0.
Modular Guide 1 (General Introduction)	1.	0.
Modular Guide 2 (Principles of Modular Co-ordination)	1.	0.
Modular Guide 3 (Modular Planning)	1.	0.
Modular Guide 4 (Combinations of numbers in ranges of Modular components)	1.	0.
Modular Guide 5 (Vertical Controlling Dimensions for Houses, Flats and other Residential Accommodation)	1.	0.
Modular Guide 6 (Vertical Controlling Dimensions for Schools)	1.	0.
Modular Guide 7 (Vertical Controlling Dimensions for Offices)	1.	0.
Modular Guide 8 (Vertical Controlling Dimensions for Hospitals)	1.	0.
Modular Guide 9 (Vertical Controlling Dimensions for Factories)	1.	0.
Modular Guide 10 (Planning Modules)	1.	0.
Road Accidents 1968 Published 1969 63 pp	7.	6.
* An Estimate based on Fuel Consumption of Road Travel in Ireland Published 1969 20 pp	5.	0.
Construction Division Pamphlets		6. 0.
1. Staff Organisation for Builders		6. 0.
2. Cost Control		6. 0.
3. Project Planning for Builders Published 1969		
Annual Report, 1968/1969 Published 1969 O.P.	17.	6.
A Renewal Programme for the City of Waterford Published 1969 41 pp	5.	0.
Traffic Accidents and Standard Time Published 1969 16 pp	10.	0.
Safety Belts Published 1969 49 pp	20.	0.
The Bill of Quantities and the Operational Bill Published 1970 57 pp	8.	0.
Operational Bills Published 1970 41 pp	15.	0.
The Protection of the National Heritage Published 1969 92 pp Second Impression 1970	40.	0.
Seven Seminars: An Appraisal of Regional Planning in Ireland Published 1970 121 pp	10.	0.
Report on the Construction Industry Seminar (IEI Report) Published 1970 174 pp	No charge (1/- postage)	
School Projects for Ecological Fieldwork Published 1970	5.	0.
An Examination of Labour Content in Housing Published 1970 49 pp	10.	0.
Working Drawings and Their Use on Building Sites Published 1970 36 pp	10.	0.
The 60 m.p.h. General Speed Limit in Ireland Published 1970 72 pp	45.	0.
Galway City Plan (Buchanan) Published 1969 127 pp	60.	0.
Planning for Amenity, Recreation and Tourism Volume 2 Parts 1, 2, 3 Published 1970 127 pp	16.	0.
Part 1: Landscape Amenity Checklist (also published separately) 23 pp		
Part 2: Model Development Studies 90 pp	8.	0.
Part 3: Trees and Shrubs for Informal Landscaping (also published separately) 14 pp	10.	0.
Rationalisation in the Building Industry Part 2: Timber Trussed Rafters Published 1970 49 pp	10.	0.
Road Accident Facts, 1969 Published 1970 65 pp	20.	0.
Pedestrian Crossing Facilities Published 1970 74 pp		



FORTHCOMING PUBLICATIONS

National Standard Building Elements and Design Cost Control Procedures

Young Workers in a Country Town

Systematic Traffic Counting Programme