CONSERVATION OF ROAD VERGES

COMMITTEE REPORT
NOVEMBER 1970

CONTENTS

CHAPTER 1

INTRODUCTION

TERMS OF REFERENCE

1.1 The Committee has considered the conservation and regeneration of native flora, and allied problems in relation to road verges on those roads outside the metropolitan area and country towns.

MEMBERSHIP OF COMMITTEE

1.2 Membership of the Committee has been drawn from Federal and State Departments whose interests or activities impinge on road verges either directly or indirectly, and comprise --

Mr. W.R. Wallace	Conservator of Forests (Chairman)
Mr. A.E. Heagney	Under Secretary for Lands
Mr. A.R. Tomlinson	Chief Executive, Agriculture Protection Board
Mr. R.D. Royce	Curator, Western Australian Herbarium, Department of Agriculture
Mr. P.K. Johns	Asst. Manager for Supply & Development, State Electricity Commission
Mr. T.A. Pedersen	Construction and Maintenance Engineer, Main Roads Department
Mr. A.A. Mills	President, Country Shire Councils Association of Western Australia
Mr. B.E.L. Parker	Supervising Engineer, Country Regional Section, P.M.G. Department
Mr. P.N. Hewett	Forests Department (Secretary)

1.3 The inaugural meeting was held on 17th December 1969 when it was agreed that priority should be given to consideration of road verges along major highways and known tourist routes in the South West of the State. It is submitted that many, if not all, of the observations and recommendations will be equally applicable to roads of lesser size and importance.

METHOD OF APPROACH

1.4 Objectives of the Committee were to :

(a) Summarise public criticism.

(b) Examine the existing road system and its verges.

(c) Define areas of similar environmental and problem characteristics.

(d) Examine the adequacy and usage of rural road reserves in accommodating -

(i) Roads
(ii) Public utilities
(iii) Native flora

(e) Examine the sources, effect and necessity of road verge burning operations

(f) Investigate the effect of vermin and noxious weed control on road verges

(g) Recommend actions which could achieve better conservation of roadside flora

CHAPTER 2

PUBLIC CRITICISM

2.1 Criticism of the floral condition existing on verges has arisen from various sources being directed principally at --

(a) Areas of unsightly debris left alongside roads by road construction work and the provision of publi-utilities, viz. telecommunications, power and water.

(b) Damage to native flora by :

(i) The engineering works cited above.

(ii) Colonisation of exotic plants and weeds.

(iii) Practices designed to control vermin.

(iv) Verge burning operations.

2.2 During its deliberations the Committee has considered the validity of these criticisms and examined practical measures for improving these practices.

2.3 Criticism of road verges highlights the importance of considering the overall landscape. The Committee submits that much of the comment from tourist groups and individuals arises from the visual differences caused not so much by changes in vegetation on road reserves as by the development of farms adjacent to the road reserve. Without agricultural development the observer on a road clearing sees a deep belt of vegetation, often so deep that he cannot see beyond it. This "verge in depth" disappears with wholesale farm clearing as the observer can now see right through the verge vegetation. It is not surprising therefore that verges, when seen in the latter condition, appear to have been devastated by one or more of the service industries, when actually the verge proper is not damaged at all. Another important factor is that the ability to view the details of road verge flora diminishes rapidly with travelling speed.

2.4 In spite of the many forthright views expressed by members of the public, very little proven data concerning retention, survival or regeneration of endemic flora on road verges exists.

2.5 Co-operation from all sections of the community will be necessary to achieve maximum benefits from road verge conservation. Publicity detailing research work, modified road construction techniques and the general principles of conservation is essential to give a more balanced appreciation of verge conditions.

CHAPTER 3

THE ROAD SYSTEM

HISTORY

3.1 Originally road reserves were provided for the passage of people and goods from one place to another by rather primitive means compared with contemporary standards. For this purpose narrow road reserves were adequate.

3.2 Subsequently road reserves have been called upon to accommodate --

(a) High speed and large capacity commercial, domestic and tourist vehicular traffic.

(b) Public utilities, e.g. telecommunications, power and water.

(c) Scenic corridors with emphasis on road verge flora.

(d) Recreation and amenity facilities.

3.3 Because of these new demands the narrow road reserves which were satisfactory in the past are now no longer adequate either for today's needs or for the anticipated demands of the future. Wider road reserves will be required for the construction of better roads and also to provide greater opportunities for landscaping and preservation of native flora.

CLASSIFICATION

3.4 There are approximately 92,000 miles of road reserve in the rural areas of Western Australia, of which the major proportion are of one chain width.

3.5 Some 68,000 miles of road reserves form the Developmental and Important Secondary Road System and come under the control of local authorities. In the main these reserves are of one chain width and in many cases through heavily cleared agricultural areas. On those roads with low traffic densities, minimum road construction widths satisfy the demand and short term retention of native flora on narrow verge strips can be achieved. Although it would be neither practical nor desirable to recommend overall road reserve widening, the opportunity does exist for local authorities to recommend widening proposals in existing narrow road reserves where such widening would enable uncleared areas of natural vegetation to be incorporated in the reserve.

3.6 A further 16,000 miles of the system are Forest Roads and are controlled by the Forests Department. In the main these are through forest reserves, are not built to a standard requiring wide clearing widths, and present no serious road verge problems.

3.7 Approximately 8000 miles of the road system falls within the classification of Main Roads. Under present legislation

the Main Roads Department is responsible for that portion of the reserve taken up by the road itself, with the balance remaining under the control of the local authority. As those roads classified as Main Roads form the major routes throughout the State uniformity of policy and control is considered essential. It would appear reasonable for the Main Roads Department to have full control over the whole reserve.

3.8 In view of the great length of road reserves and the obvious width deficiency of a major portion of the system there is a practical limit of manpower and financial resources available for implementing proposals for widening road reserves.

3.9 To ensure that native flora conservation on road verges provides maximum benefit to the community generally, the first objective should be to determine a priority of action based on the following considerations --

(a) Routes between major centres of population.

(b) Traffic densities.

(c) Condition of existing native flora.

3.10 When vacant Crown land is involved, provision for increased road reserve widths would present no problem. With alienated rural land, objections to resumption and subsequent compensation would be considerable. Resumption of alienated land therefore should be confined initially to areas carrying native vegetation. Resumption of cleared land would only reduce finance available for this purpose.

3.11 Where uncleared land carrying native flora is available road reserves wider than the desirable minimum must be considered.

CHAPTER 4

ENVIRONMENTAL REGIONS

4.1 The Committee attempted to define broad areas of vegetation having similar problem characteristics, e.g. type and condition of reserves and recovery potential, in those areas of the State to the south and south-east of Kalbarri. These areas fell into three general groups of sand plain heath, salmon gum and other wood lands, and high forest areas. The broad areas defined are shown at Figure 1.

4.2 SAND PLAIN HEATH.

There are two types involved related to the types of shrubs and, in particular, their heights, viz. --

(a) Low Heath-

These are typified by the coastal heath on the recently developed "light lands" on the Swan Coastal Plain north of Perth in the Gingin-Eneabba-Kalbarri areas, but are also found over large inland areas. The shrubs are mostly of a uniform height with only a few scattered groups above the general level. The plants mostly possess either woody underground "mallee like" root stocks or develop from deep underground runners. In both instances they are well able to withstand reasonable fires. Furthermore, their growth is vigorous and grass and other weeds do not become established readily. A large length of road reserves in areas of recent development are of two to ten chains in width and thus provide a reasonably wide and effective verge after clearing operations for road works. The judicious burning of these broad low heath verges on a cycle of ten years or more should adequately control ground fuel and aid regeneration of native species.

(b) Tall Heath

Although soils appear similar to the low heath, vegetation generally is taller and contains a number of woody grevillea, banksia, mallee and sheoak species which are less fire resistant and grass and other weeds become established more readily than the low heath areas. An even longer burning cycle may be needed to avoid undue damage to these more susceptible species. Seasonal timing for burning would need careful attention.

4.3 SALMON GUM AND OTHER WOOD LANDS

A large proportion of the older established wheatbelt and developed grazing districts occur in this environment, and it is in these areas that road verge conditions leave much to be desired. In the main, road reserves are only one chain in width, and after clearing operations for roads and other services extremely narrow verges remain. This effect, together with regular and uncontrolled burning has allowed invasion by grasses and weeds, and only the toughest of the endemic plants have survived.

4.4 There are some truly outstanding avenues of upper storey species remaining in many parts of the wheatbelt, such as the salmon gums west of Merredin and between York and Beverley. Every effort should be made to retain and even regenerate this vegetation. It is in these areas that an urgent need exists to examine the possibility of carrying out selective

widening of road reserves. In addition, every effort must be made to preserve all existing reserves, e.g. town commons, water reserves, flora and fauna reserves, etc., as it is only in broad areas of this kind that truly representative ecotypes can possibly be conserved.

4.5 HIGH FOREST AREAS

Three broad groups were considered --

(a) Deep South Karri and Tingle

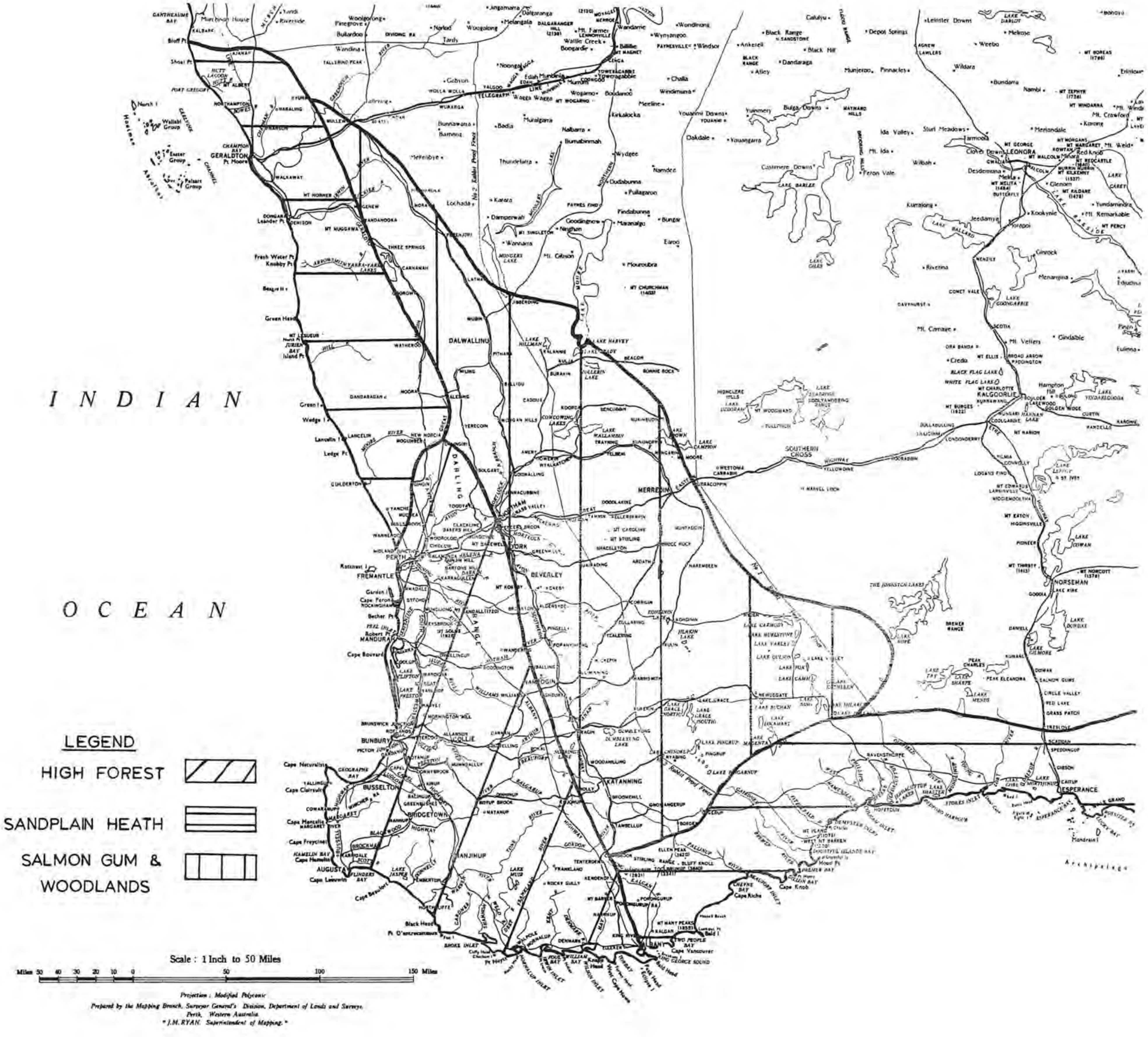
The density and magnificence of vegetation through the high rainfall karri forest type areas is such that the ground flora immediately adjacent to the road is relatively insignificant. In addition, the vigorous understorey in these areas has a rapid recovery rate following disturbance by clearing and other operations.

(b) Main Jarrah Forest Zone

Similar to the karri zones but with a slower recovery of ground flora after disturbance.

(c) Tuart Forest

Tuart occurs in an open formation approaching a woodland condition but with a well developed understorey of small trees. The maximum attraction from these forests on road verges can be achieved by retention of the larger trees as a shaded avenue but with large trees retained in close proximity to the road surface vehicle speed in these limited areas may need to be controlled as a safety measure.



INDIAN
OCEAN
LEGEND
HIGH FOREST
SANDPLAIN HEATH
SALMON GUM &
WOODLANDS
GERALDTON
PERTH
FREMANTLE
MANDURAH
BUNBURY
BUSSELTON
AUGUSTA
NORTHAM
YORK
BEVERLEY
MERREDIN
SOUTHERN CROSS
KALGOORLIE
LEONORA
NORSEMAN
ESPERANCE
COLLIE
BRIDGETOWN
MANJIMUP
KATANNING
DALWALLINU
Scale : 1 Inch to 50 Miles
Miles 50 40 30 20 10 0 50 100 150 Miles
Projection : Modified Polyconic
Prepared by the Mapping Branch, Surveyor General's Division, Department of Lands and Surveys,
Perth, Western Australia.
"J.M. RYAN. Superintendent of Mapping."

CHAPTER 5

ROAD RESERVE WIDTH REQUIREMENTS

ROAD CONSTRUCTION

5.1 There is a wide range of minimum desirable widths required to accommodate the various classes of roads forming the total road system. Typical cross sections are shown at Figure 2.

5.2 These diagrams indicate that the minimum desirable standards for road construction purposes only can vary from one chain for lesser roads to three chains for major rural arterial roads which provide for movement between principal centres of population. The widths shown are minimums for road construction in relatively flat country, but are inadequate for recovery zones, road verge conservation, public utilities and major earthworks involving heavy cut and fill.

5.3 A strip up to 30 ft. wide on both sides of the road pavement clear of major obstructions, e.g. trees with a trunk diameter greater than 4 inches is considered desirable to act as a recovery zone for cars leaving the road. Although major obstacles must of necessity be removed, every encouragement should be given to the preservation of lower storey growth which, apart from improving the road verge, can act as an impact absorbing mat for a vehicle out of control.

PUBLIC UTILITIES

5.4 Water Supply Requirements

From information available to the Committee it appears that in most cases it is practical for water mains to be located outside the normal road reserve.

5.5 Electric Power Reticulation

In the rural scene where there is little likelihood of close settlement it is normal for power lines to be constructed across private property. In these cases use is not made of the road reserve.

5.6 Telecommunications (P.M.G.)

The provision of aerial trunk routes within reserves in the past has undoubtedly led to some destruction of native flora on road verges. However, the development of new cable types and transmission systems has made it possible to underground much of this particular public utility. In rural areas these underground cables are frequently located in private property. In addition to the use of underground cable the introduction of microwave links will considerably reduce the requirement for aerial routes. It seems therefore that this particular public utility will in the future conflict less with the conservation of native flora on road verges than it has in the past.

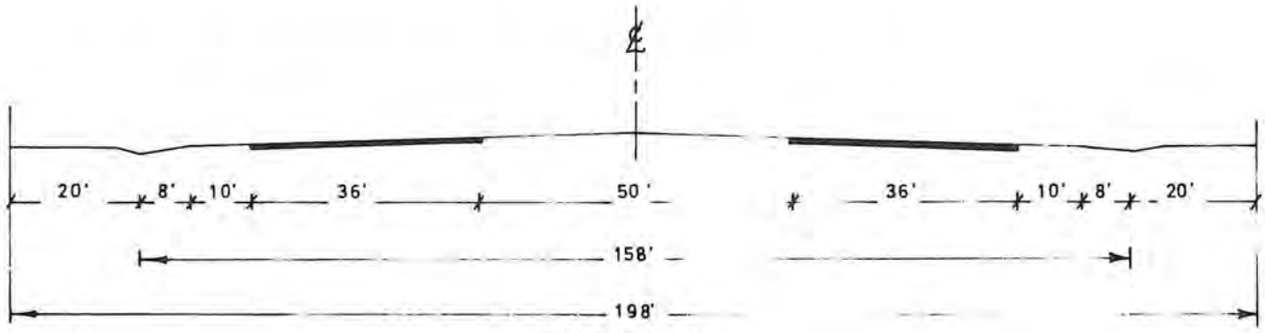
5.7 Natural Gas Reticulation

In general, natural gas reticulation systems will be located underground and on a direct line basis between points of supply and demand. From limited information available it appears that the highly mechanised laying techniques required for the economic construction of underground mains could require substantial clearing widths, and this type of public utility should not be considered within road reserves.

MINIMUM ROAD WIDTH CONSTRUCTION REQUIREMENTS FOR VARIOUS TYPES OF RURAL ROADS

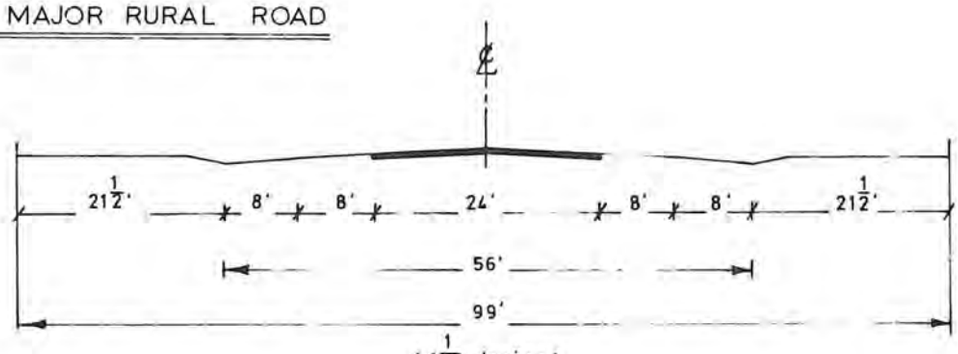
THE CROSS SECTIONS SHOWN BELOW ARE THE MINIMUM FOR ROAD CONSTRUCTION REQUIREMENTS AND DO NOT MAKE ALLOWANCE FOR EARTHWORKS, SAFETY ZONES, CONSERVATION AND PUBLIC UTILITY STRIPS.

TYPICAL MAJOR ARTERIAL ROAD - DUAL CARRIAGEWAY



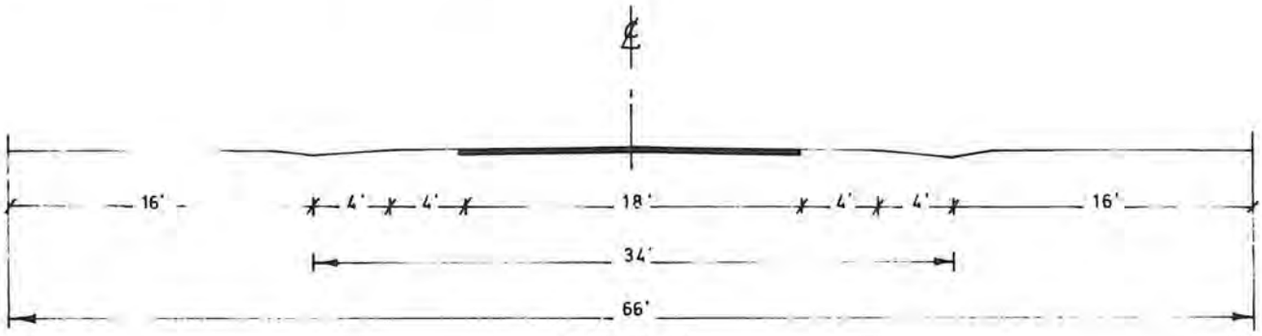
(3 chains)

TYPICAL MAJOR RURAL ROAD



(1½ chains)

TYPICAL LESSER RURAL ROAD



(1 chain)

FIGURE 2

5.8 Generally the use of the rural road reserve for public utilities is relatively small in comparison with the total road mileage.

5.9 With those public utilities involving above ground installations, aesthetic and safety considerations would strengthen the case for locating these utilities away from the road.

CONSERVATION OF NATIVE FLORA

5.10 Development of wide clearing for road construction in parallel with total clearing for farms on either side of the road reserve can leave a narrow strip of native flora, sometimes only a few feet in width and rarely more than one chain. This clearing induces a major change in the plant environment and microclimate involving --

(a) An increase in wind strength of up to 15 m.p.h. above normal winds under vegetative canopy.

(b) Excessive insolation (i.e. radiant energy).

(c) Increased air temperatures.

(d) Reduced relative humidity.

(e) Increased evaporation.

(f) Reduced soil moisture in the upper levels.

The overall effect is that of a site deterioration tending towards a hotter, drier climate. Many local species are unable to withstand these harsher conditions and their vigour declines, leading to their eventual disappearance.

5.11 It is felt that the minimum width for a native flora conservation strip should be one chain, and although there are examples of native flora existing on narrower strips, considerable doubt exists concerning the long term survival of native flora in such situations.

5.12 Due to environmental disturbance changes in species composition must take place, but these need not in the long term detract from the general conservation value of the surviving flora.

5.13 There is scope for considerable scientific research and investigation of verge growths in the various plant associations which occur on roadsides in this State. A small research unit comprising a forester or botanist, plant ecologist and a technical officer, could produce valuable data in this field within a few years.

5.14 It is suggested that far too many flowers of native species are still being picked along road verges both by tourists and by commercial pickers. The extent of this is difficult to define, but control could be improved to some extent by amendments to the Native Flora Protection Act to provide that all retailers or exporters of native flora must be licensed for this purpose with provision that the source of the flora must be stated.

LANDSCAPE AND RECREATION

5.15 The highway landscape varies from other types in that it is viewed at speed and the observer can only

appreciate landscape patterns which are visible from a distance. Views or attractions which require close attention may, however, cause distraction and a consequent safety problem. Road construction, artificial plantings and retention of native flora therefore need careful consideration to achieve optimum results.

5.16 For economic reasons the present trend appears to be towards a natural and informal roadside landscape, and because of this conservation of natural growth during road construction is receiving closer attention.

5.17 The road system has evolved to enable goods and people to move from one place to another with little concern for recreation or contact with the natural environment. Expanding development, increasing population and rising affluence is generating a need for more recreational space, and future highway development will need to cater for the incidental needs and pleasures of the travelling public, ranging from the family picnic to the long distance haulier who wishes to rest.

5.18 Special reserves adjoining roads are suggested as a practical way to allow travellers to break their journey or to picnic in a natural environment close to but out of sight of the highway. Selection of these reserves having some particular historical, botanical or scenic interest is suggested at intervals along arterial routes.

CHAPTER 6

BURNING ON ROAD VERGES

6.1 Natural and Accidental Causes

There is sufficient evidence to indicate that the occurrence of and resultant effect of fires stemming from lightning or accidental causes is not unduly high on road verges.

6.2 Burning For Protection Only

It would appear that the majority of road verge burns are carried out by farmers and/or bush fire brigades for the purpose of property protection. Generally these burns are undertaken by willing volunteer groups, and naturally the objective is to achieve quick results. Burning with the wind is a fairly common practice aimed at removing all flammable material from the road verge, but unfortunately the native flora suffers considerably from this type of burn.

6.3 Burning For Protection and Regeneration

This type of burn is carried out with the twofold objective of removing flammable material without causing unnecessary damage to the native flora. Generally the burns are conducted from the property line and against the wind, giving a cooler and slower burn. Some good examples of well controlled burns carried out under the guidance of trained officers of the Bushfires Board have been observed.

EFFECTS

6.4 The effects of road verge burning operations on native flora fall into three broad categories as follows --

(a) Destruction

In the closely settled areas where frequent burning is undertaken there is evidence of a severe depressing effect on native flora. The established seeding and succession cycles of the whole plant community have been disrupted and complete regeneration has been delayed or prevented. Any increase or decrease in the frequency of burning may be expected to lead to both long and short term vegetation changes. The frequency, type of fire, heat generated and the season at which it occurs, are of extreme importance.

(b) Invasion

Frequent repetitive burning encourages the intrusion of vigorous and aggressive weed species which are capable of competing with and largely overrunning the area where the balance of native flora has been disturbed. There is considerable evidence of this in the older established wheatbelt areas where frequent burns have been undertaken on road verges for many years.

(c) Regeneration

Most native species are adapted to periodic fire, and there is evidence that periodic controlled burning can play an important part in maintaining a healthy balance in the growth of native flora.

6.5 Although a need for protective burning does exist it is emphasised that such burning should be prescribed with proper regard for the timing, type and periodicity of the burn.

PERIODICITY AND SEASON

6.6 While there is little reliable data on the relationship between fire and plant ecology there is no doubt that frequent repetitive burns on road verges are detrimental to the retention of native flora. Considerable damage to native flora on road strips has resulted from over-burning where the preservation and regeneration of the native flora has not been considered.

6.7 In some of the long established wheatbelt areas where ground flora has already been replaced by grass and weeds there seems little alternative to annual burning for both protection and appearance.

6.8 The dense ground flora of the heathlands is not conducive to invasion by weed species. It is not highly flammable and frequent burning is unnecessary. A periodicity of about ten years could well be adequate for both fire protection and perpetuation of the native flora.

6.9 Past and current practices in relation to road verge burning have in the main been dictated by the need for protection from uncontrolled fires and with little, if any, consideration for conservation. This has led to spring burning becoming common practice. Other arguments in favour of spring burning relate to fear of the approaching summer with its high risk of damage to maturing cereal and pasture crops, and the generally more predictable weather pattern at that time of the year.

6.10 Autumn burning on the other hand has less strategic appeal because the immediate danger of the summer has gone and rural communities are likelyto be totally committed to seasonal agricultural pursuits. Tragic results can, of course, arise if an autumn burn is followed by a spell of hot dry weather. However, there are some advantages with burning in this season, especially in non-forest areas. These are --

(a) Cooler weather following the burn will minimise the chance of later escape

(b) The risk of damage to adjoining farm land (now harvested or heavily grazed) is reduced

(c) Botanists generally claim that seed of both annual and perennial ground flora is fully mature by the autumn, and therefore the potential for regeneration of native flora is greater. There is, however, no concrete evidence of this, and many fine examples of luxurious ground flora resulting from periodic well controlled spring burning are evident.

Much experimental work is required to enable a more definite approach to be made to this aspect of the problem.

CONTROL

6.11 Road verge burning operations are undertaken by numerous organisations, e.g. Government and Local Government bodies and individual interests among the rural community.

6.12 The power to authorise burning operations on road reserves is vested in the local authority which has power to delegate to

fire control officers and/or members of a bushfire brigade. In addition, local authorities can apply for a suspension of the provisions of the Bush Fires Act during restricted burning times to enable burning to be carried out on road verges by individuals without having to apply for permits. Thus the situation exists where burning operations on road verges under the present Act can be undertaken by numerous individuals and sections of the community, many of whom may not have due regard for the conservation of native flora.

6.13 Application for such suspensions should be closely scrutinised to establish the need for the burning operation, and if approved conditions under which burning is to be carried out should be specified.

6.14 If road verge burning is to achieve both conservation of native flora and a satisfactory reduction of ground fuel the application of proper techniques and the need for approved planning is apparent. Planning would involve --

(a) Staff having a knowledge of burning techniques required in the various regions

(b) Existence of a framework for liaison between local authorities, government departments and the rural community.

(c) Co-ordination of planning through the Bushfires Board.

CHAPTER 7

VERMIN AND NOXIOUS WEEDS

7.1 Road reserves may act as corridors along which vermin or noxious weeds travel, and they become reservoirs of infestation for adjoining properties.

7.2 As an alternative to the burning of roadside vegetation herbicide sprays are often used for the suppression of growth or the destruction of unwanted species such as declared noxious weeds. This work is usually carried out by the Local Authority, Agriculture Protection Board, S.E.C., P.M.G., or by contractors.

7.3 Herbicides are mainly organic chemicals used in specific concentrations and act either through the plant foliage or the soil. Selective herbicides are available to control certain weed species, but non-selective sprays may also be used. As native plants may be damaged by the careless use of these sprays strict control, direct supervision and a full knowledge of the potential side effects are essential to ensure minimum damage in the interests of the long term conservation of flora on road verges. Although the use of herbicides for the control of weeds, particularly noxious weeds on roadsides, has become an established practice, further research appears necessary to establish the tolerance levels of native flora to these chemicals.

7.4 One of the problems encountered on road verges is the accumulation of tree, shrub and rock debris resulting from clearing for roads, public utilities and farm fencing. The debris so produced, unless entirely removed, provides cover and breeding grounds for vermin, especially rabbits. Once vermin are established their eradication involves extensive ripping or burning of the verge under very hot, destructive conditions. Either method causes further devastation to the existing flora while producing conditions suitable for invasion by weeds. However, both vermin and noxious weed control programmes are usually restricted to relatively isolated sectors.

7.5 The responsibility for vermin eradication on a road verge rests with the adjoining landholder. The additional vermin and noxious weed control problems which may result on road reserves wider than three chains could place a considerable extra burden on the landholder and the local authority. This may raise the question of financial aid or force consideration of alternative avenues of control.

CHAPTER 8

DISCUSSION AND RECOMMENDATIONS

General criticism of the devastation of flora on road verges appears to have overlooked the fact that on the majority of road verges attractive displays of wildflowers occur in season. Other criticisms may be due to the reduced visual appreciation while travelling at speed over modern highways and to the loss of "view in depth" beyond the confines of the reserve itself brought about by the clearing of adjoining alienated land. There is also evidence that wildflowers are still being heavily picked on rural road verges.

The major problem exists in the older settled areas of the State where narrow road reserves, mainly one chain in width, were provided initially to cope with "horse and buggy" transport. The subsequent use of these narrow strips for the purpose of public utilities such as telecommunications, power and water, and the improvement of road surfaces to cope with the speed and the increased demand for travel, have in many cases left verges only a few feet in width.

Any action such as road clearing which disturbs the natural habitat leads to a change in microclimate and the steady deterioration of the site, and this is accentuated and accelerated when extensive clearing operations are undertaken on adjoining properties. Many local species are unable to withstand these harsher conditions and their declining vigour results in their eventual disappearance from the site.

A road reserve width of three to five chains appears to be the minimum necessary to accommodate both road construction and a verge wide enough to maintain the natural habitat for an extended period.

Overburning of the road verges in itself has a detrimental effect in that it tends to suppress natural vegetation and encourages invasion by annual grasses and weeds, which themselves induce a vicious cycle of annual burning for protective reasons. The indiscriminate use of herbicide sprays for various purposes on road verges has also caused some damage to roadside flora.

There are some 76,000 miles of rural road reserves throughout the State which at present are the responsibility of the local shire councils. Approximately 8000 miles are classified as Main Roads on which the Main Roads Department's control is limited to the road itself with the balance remaining under the control of the local authority. Improved treatment of road verges along these main roads could be extended if the whole reserve were placed under the control of the Main Roads Department.

RECOMMENDATIONS

1. The Lands Department policy of creating three to ten chain road reserves in new areas should be continued.

2. Where wider reserves place an added burden on either individual farmers or the local authority in relation to vermin, noxious weed or fire control Government assistance should be considered.

3. Roadside flora areas should be provided at intervals along existing narrow road reserves. These areas should be selected in Crown land where possible, but the resumption of suitable areas of private land should be considered where necessary.

4. A specialist committee consisting of a highway engineer, a botanist and a forester should be constituted to select and recommend suitable sites for these flora areas.

5. The Commissioner of Main Roads should be vested with the control of the whole reserve on classified main roads.

6. The Main Roads Department should be encouraged to extend the techniques they have developed for the restoration of verges disturbed by construction.

7. Other road construction authorities should be informed of these techniques and encouraged in their use.

8. Public utilities should avoid road reserves wherever possible, but where such reserves are used the authority concerned should be responsible for satisfactory conservation and restoration.

9. Consideration should be given to co-ordinated planning of road verge burning operations to enable the problems of fire and conservation of native flora to be dealt with to the best advantage.

10. That a research programme be implemented to investigate --

    (a) the effects of season, periodicity and type of burn on native flora

    (b) the long term re-establishment of native flora on degraded road verges

    (c) the tolerance level of native species to herbicide sprays in general use

11. Existing legislation be examined with a view to achieving closer control of picking, sale and export of native flora.