CHAPTER 12. ROAD RESERVE MANAGEMENT

12.1 INTRODUCTION

Management of the road reserve is all important to enable the road structure to be protected, to provide a safe operating environment for the road user and to make for pleasurable travel conditions.

The road reserve is part of the natural environment of the area and presents an opportunity to preserve this environment wherever possible. As stated previously in this Manual, the need to provide a safe efficient road network should be balanced against this environmental protection.

12.2 LITTER

The amount of litter along the road varies significantly around the country. At the start of a contract a special initial clearing operation will probably be necessary before settling into a routine cleaning frequency which could be anything from once a month to once every three months. As part of litter cleaning, rocks and debris should be removed to protect the mowers in areas where grass cutting takes place. In some areas small anthills can be cleared with a grader (or by hand) to facilitate mowing.

Clearing of rest areas should be carried out on a more frequent basis (say once a week or fortnight) depending on usage. It has been found that rest areas within 30 kms of towns have more litter. As part of the public road safety campaign attractive, well kept rest areas have a major impact on the perception of the road public.

The Route Manager should ensure that the road is inspected on a daily basis and make sure that objects on the road (such as pieces of tyres) are removed and placed off the road for later removal during litter collection.
12.3 BARRIERS

GUARDRAILS

Guardrails as used on the national roads are generally robust and have a relatively long life. Where damaged by traffic guardrails themselves become a hazard and reduce the safety of the road at an identified risk point. As a result damaged guardrail units (including posts) should be removed as soon as possible.

General replacement of undamaged plates is unusual because of the durable nature of the materials used. Posts and spacer blocks on the other hand can with time deteriorate significantly (rotting, splitting or termite damage) and will need replacement.

An assessment of the overall guardrail system condition should be made on an annual basis to identify deterioration and allow early forecasting of any replacement costs. At the start of the contract a general inspection should be made for places which are unsafe and where guardrails should be installed. In a specific area where repeated damage occurs to guardrails SANRAL should be informed as this area may be unsafe. The following points cover common problems:

- Where guardrails are damaged regularly, check road geometry.
- When replacing a section of guardrails, check by eye that the height and alignment of the total guardrail length are correct and a smooth line is achieved parallel to the road centreline.
- Missing or damaged reflectors should be replaced. Reflectors assist the motorist at night in picking up the outer edge of the road (and the guardrail). Where reflectors are not replaced guardrails are damaged more frequently.
- Guardrail plates should be overlapped in the correct direction. Incorrectly lapped plates can be very dangerous.
- Missing splice bolts weaken the whole system. One reason for this could be that the holes on some old and new units may not match. Under these circumstances make new holes (touch up with cold galvanising). Ensure that all splice bolts are fitted.
- Some of the old guardrail plates were painted instead of being galvanised. To prevent corrosion of these plates it is important that any damage or blemishes are touched up regularly.
Posts should not be shortened.
In instances where roads are taken over from other authorities, the guardrails on these roads should be examined to determine actions required to bring the guardrail sections to an acceptable standard. Often guardrails have been painted and appear patchy or tarnished but are otherwise in sound condition. Good quality paints are now on the market and consideration should be given to sanding down the guardrails and repainting. The colour of paint chosen should match that of new guardrail plates. This improvement of the appearance of the guardrails is not overly expensive and gives the road user a good impression. The quality of paints nowadays is such that repainting is not necessary for many years.

Where guardrails are damaged or bent but not stretched or grossly deformed, it is possible to straighten such guardrails using heavy machinery designed for this purpose. In certain regions, such machinery is available and this alternative to the buying of new guardrails (which are becoming increasingly expensive) should be investigated.

**CABLE BARRIERS**

Proprietary cable barrier systems are sometimes favoured over standard guardrails, particularly for sections that are frequently damaged. Their advantages are that they can be replaced quickly and efficiently, provided the anchor sections and post foundations are not badly damaged and lines of sight are not completely obstructed by a solid barrier. Snow does not build-up against the barrier but this normally is not a problem in South Africa.

The Contractor must be trained up at the start of a contract to repair damaged cable barrier sections where these exist. In remote areas it is important that spare cable barrier elements are kept in stock so that delays are not experienced in replacing damaged sections.

**12.4 FENCING**

The maintenance of fencing is an issue particularly in certain urban areas. Fencing can be damaged or lost as a result of ageing, accidents, theft or cutting to provide access for grazing animals or people to the road reserve.

Where fences are damaged due to accidents especially where they act as barriers to livestock they should be repaired immediately.
Where fences are stolen or cut (normally adjacent to residential areas) certain measures can be taken namely:

- cut vegetation, including grass, to improve visibility.
- consider passing on the responsibility for fence maintenance to local communities and reward them accordingly.
- provide extra straining posts to reduce the length of fencing to be replaced.
- provide controlled access points (selected through consultation with local community), where fencing is cut indiscriminately.
- over limited lengths use fencing material which is difficult to remove and has little reuse value such as rolled razor wire.
- continuous guardrail instead of fencing over limited lengths has been successful in preventing cattle straying onto the road surface.
- consider options such as cattlegrids for access roads and entrances with no fencing.

Unrestricted movement of livestock and people on national routes can be extremely dangerous. Locations where this is a problem need to be identified and suitable actions proposed to SANRAL.

Where major lengths of fencing are missing, SANRAL must decide on action required. In these circumstances erect suitable warning signs at regular intervals (no fences) and livestock warning signs at critical points.

Where continual problems are experienced with the cutting of fences or the theft of fencing material, the Community Liaison Officer on the contract should consult with the community leaders in the area. If such discussions fail to achieve results, and particularly on freeway sections where person or animals in the reserve are very hazardous, consideration should be given to the erection of fencing which is less susceptible to damage or theft. Metal or concrete palisade fencing or proprietary brand fencing like Bastian fencing is expensive but, if this proves effective, the investment can be economically justified.
12.5 REST AREAS

The Arrive Alive campaign has highlighted the travelling public's very positive response to clean, attractive rest areas. Particularly on routes where there are long distances between towns, driver fatigue and single vehicle accidents (driver falling asleep) are common. If the motorist is to be encouraged to stop and take a break on a regular basis it is important that there are enough opportunities (say every 10 to 15 kms), the rest areas have enough capacity (i.e. not just one table) and are inviting. To promote the use of rest areas, signs giving advanced warning of rest areas should be erected. Broken furniture, lack of shade, poor access and inadequate garbage disposal all make for a poor facility. Trees and vegetation should be trimmed and neatened to provide shade.

It is recommended that at all well-used rest areas SANRAL's standard furniture be installed and the top and side surfaces of chairs and tables painted with a tennis court paint. Tables and chairs should be cleaned and repaired on a regular basis. Where trees are too small or there is no shade, shelters should be erected using premade thatched tiles or other appropriate materials. To manage access and control vehicle movements, rounded guardrail posts (bollards) can be used to channel traffic. Entrances and exits from rest areas should be bitumen surfaced and the access roads hardened with a light surfacing (such as a coarse slurry).

For security reasons rest areas should be open (no thick bush). In fire hazard areas a fire break should be cleared. Rest areas with a limited sight distance at entry and exit points should either be improved or closed. Where possible a balanced distribution of rest areas on both the left and right side of the road should be aimed for.

12.6 CONTROL OF VEGETATION

INTRODUCTION

At the start of a road maintenance project it is good practice to obtain the services of a person knowledgeable in the local vegetation who can review the vegetation in the road reserve, identify problem and protected plants and advise on possible management operations under the routine road maintenance contract.

INVASIVE WEED MANAGEMENT

The amended environmental regulations describe four categories of weeds and plant invaders.
Category 1 plants or declared weeds will no longer be tolerated except with the written permission of the executive officer or in an approved biological control reserve. Hakeas, certain species of Oleander, Guava and Australian Acacias are all Category 1 plants. Some plants are Category 1 in some provinces and Category 2 in others, depending on their potential to proliferate and invade in the prevailing conditions.

Category 2 plants or plant invaders have the proven potential of becoming invasive but nevertheless have certain beneficial properties that warrant their continuing presence in certain circumstances. Plants in this category include Rooikrans, certain Wattles, Port Jackson, Willow, several species of Pines, Gums and Poplars.

Category 3 plants or plant invaders are like Category 2 plants except that they are tolerated because they are not problematic in all circumstances. Some of these plants are popular ornamental or shade plants which were already in place when the revised regulations came into effect. However, in certain provinces they are not tolerated and they also cannot be grown within 30 metres of the 1 in 50 year floodlines or in wetlands. All reasonable steps need to be taken to keep such plants from spreading. Category 3 plants include some species of Cotoneasters, Moonflower and Morning Glory in some provinces, New Zealand Christmas tree, Manatoka and Sword Fern.

Category 4 plants or bush encroachers are those indigenous plants that require sound management practices to prevent them from becoming problematic. If they are left unmanaged, they could take over the road reserve vegetation and stifle other more appropriate natural vegetation.

Lists of plants in each category are provided in Appendix F. The publication “Problem Plants of South Africa” obtainable from Briza Publications should be consulted for photographs and guidance on the identification of the various plants listed.

The amended Environmental Regulations stress that, when controlling plants occurring in areas where they are not allowed, the methods used should be appropriate for the species concerned as well as the ecosystem in which they occur. The following appropriate methods are normally used:

- Mechanical - uprooting, felling, removing or burning of invading alien plants.
- Chemical - using environmentally safe registered herbicide in a controlled manner.
- Biological control - using species-specific insects and diseases from the alien plant's country of origin.
- Integrated control - a combination of two or all three of the above approaches. Often an integrated approach is required to prevent large impacts or for optimum results.

Some of the methods which can be combined are chemical control, biological control, use of fire,
rehabilitation of cleared areas by over-sowing with desirable plant species (mostly grasses) and modified management practices. Examples are:

- Trees can be felled and the cut stumps treated with a chemical herbicide. Bio-control insects or agents can then be released on the cleared area when the invaders re-grow or when the seeds germinate.
- Trees can be felled and then burnt (with the necessary control and permission). The resultant seedlings can then be physically removed and sprayed with herbicide. Again, bio-control agents could serve as a backup mechanism in cases of re-growth.
- Bio-control agents can be released in dense patches of weeds like cactus or Acacia with isolated plants being treated using herbicides.

**PROTECTED PLANTS**

Various species of indigenous plants are protected by legislation and may not be picked, pruned, transported or traded without the necessary permits issued by the relevant authorities. The protection of species is in most cases successful only when there is a complimentary protection of their natural habitats. The verges of National Roads can form important corridors for the sustained survival of these habitats. Trees and plants are protected under the National Forest Act in terms of the National Environmental Management Biodiversity Act, and by various provincial ordinances which are regulated by the provincial Nature Conservation Authorities. Trees protected in terms of the National Forest Act and other plant types in terms of the Biodiversity Act, are listed in Appendix F, which also contains the Western Cape and Gauteng provincial lists of protected species.

The contact details of the various provincial authorities for advice on protected species are provided in Appendix F.

If protected species, particularly trees, are to be removed or even pruned, permits must be obtained from the relevant authorities. The provincial authorities should be contacted for this purpose. Contact details of nature conservation authorities which issue permits are contained in Appendix F.

**GRASS CUTTING**

Grass cutting is carried out for reasons of visibility (especially curves and intersections), drainage (shoulders and side drains), plant invader control, security and fire hazard. Because of the
great variation of climatic conditions in South Africa all the above conditions vary widely. Widths of cutting also vary considerably ranging from fence to fence to a width of 3m from the shoulder or 6m from the shoulder yellow line.

Grass can form an essential part of the road reserve environment, preventing dust and erosion, thus seed propagation and the timing of cutting can be important to maintain a healthy grass cover. Local and specialist advice should be taken in arriving at an annual programme of grass cutting which covers frequency, response time and extent. In areas of thick vegetation the cut grass should be baled and removed. On the other hand in arid areas with little vegetation the grass could be left as mulch.

**PRUNING OF TREES AND SHRUBS**

Only trees and shrubs which overhang the road, obscure signs or affect lines of sight on curves or intersections should be pruned. Any dead branches or dead trees should be cut down. Where an extensive pruning or cutting operation is intended this should be agreed beforehand with SANRAL. Where indigenous trees and plants are involved it is strongly recommended that environmental agencies be consulted.

Bushes in the median of a dual carriageway act as a screen for headlights. Where pruning of median vegetation is necessary to improve lines of sight to pedestrians crossing, this should be done to a height where oncoming headlights are not a problem.

**BURNING OF VEGETATION**

In some areas controlled burning of grass within the road reserve and median is carried out. This should be discussed and agreed with local landowners, traffic police and the road authority. In areas where veld fires are a problem clearing of grass after the rain season for a radius of about 4m around all road signs protects them against fire damage.

Burning can have a marked effect on the dispersal and germination of both alien and indigenous seeds. It is thus essential to seek the advice of local experts with regards to the appropriate burning
programmes, particularly with respect to timing and frequency. It should be remembered that road reserves represent important natural corridors and often contain significant pockets of indigenous flora of conservation value. Accordingly, where the road reserve contains significant indigenous vegetation, burning as a standard management approach to control plant growth should be avoided. No rubbish may be disposed of by means of burning in the road reserve.

According to the National Veld and Forest Fire Act, No 101 of 1998 (Appendix G) the road authority must belong to any fire protection associations which have been established in terms of this legislation. The Route Manager must identify any fire protection associations applicable to the relevant section of road. The Route Manager must join any such fire protection associations and attend all meetings on behalf of SANRAL. Any decisions made at fire protection association meetings that may impact on SANRAL must be conveyed to SANRAL. The Route Manager must implement any decisions after consultation with SANRAL.

12.7 SITE DISTURBANCE

The disturbance of any natural or established vegetation will encourage the spread of alien invasive species. Consequently, every attempt should be made to minimise the area disturbed during road maintenance operations. Moreover, the disturbance or removal of natural vegetation may encourage erosion. It is essential that erosion be monitored and controlled, particularly in the light of its potential to undermine or damage the road, to detract from the visual aesthetics of the area and to degrade the natural environment.

In the absence of appropriate corrective measures, complete removal of vegetation from side drains can lead to erosion. Watercourses need to be handled with care, particularly where flow patterns and discharge points are altered, or where new water courses are formed. Vegetation, including alien invasive species, can stabilise cut and fill slopes and its removal (in the case of aliens/invasives) could cause slope failure unless suitable corrective measures are employed. Consequently, where the potential for erosion exists, alien eradication should be accompanied by an approved re-vegetation programme. Further information on Erosion can be found in the Erosion Control section.

12.8 IMPORTATION OF MATERIALS

Imported materials may be a significant source of alien invasive seeds and thereby increase control problems. Imported material should preferably be taken from an adjacent weed-free site or, if imported from elsewhere, the material should be free from the seeds of alien invasive species. All areas where materials have been imported should be checked regularly for weeds and appropriate action taken where these occur.
12.9 ARRESTOR BEDS

MATERIAL REQUIREMENTS

Only hard natural gravel or crushed stone with a specific grading should be used in Arrestor Beds. Rounded river gravel is preferable to crushed stone as it is a better energy dissipater due to its lower angle of friction. The gravels must be durable and resistant to integration and preferably with a low shear strength. The optimum material size is between 5mm and 10mm. The primary requirement is that the material has a large percentage of voids for optimum drainage and to minimise the maintenance required.

MAINTENANCE ACTIONS AFTER EACH USE

The bed must be closed off while work is being carried out. Traffic control devices and road signs must ensure that this closure is effective and road users are informed accordingly.

Ruts formed in the material in the Arrestor Bed by the vehicle entering the bed must be smoothed out immediately after the vehicle is removed. The gravel may be raked smooth by hand to restore it to the original shape, or it may have to be fluffed if the material has compacted or been contaminated.

Gravel thrown outside the bed must be collected by hand or swept off the road surface.

ROUTE MAINTENANCE

Arrestor Beds must be inspected at least at monthly intervals to determine the condition of the bed and any maintenance required.

Regularly, preferably twice a year or after the material has been displaced or compacted from usage, the bed material must be fluffed. This entails loosening up the material to a depth of about 450mm using a plough or suitable equipment. Every second fluffing should be to a depth of about 600mm.

Arrestor Bed material which has become contaminated with dirt, fine material or vegetation must be removed and replaced with clean or recycled material. The frequency of replacement will depend on prevailing conditions but regular inspections should be made to determine whether the
material below the surface has the correct grading (ie is not clogged with fine material) and the
gravel is an effective energy dissipater to its full depth.

Replacement of material may be carried out using one of two techniques:

- Removal of all the contaminated material and replacement with new or recycled material. This means that the bed will be closed for the entire operation.
- Removal and replacement in two stages. The material in the front section of the bed is removed and stockpiled in the rear bed section. Replacement material is then placed in the empty front section before the rear section is carted away and replaced. The bed is therefore operational after the new material has been placed in the front portion.

In both these procedures, replacement material must be on site before any removal is started. This will reduce the time needed for the operation and the time the bed is closed.

Cleaning of contaminated, removed material involves loading, transporting and processing that could entail sieving. This could be an expensive operation which must be evaluated against the cost of the supply of new material and the physical properties of the new material.

The bed must be effectively closed off while equipment and personnel are working in or in the vicinity of the bed. Correct road management devices and signage must be used to ensure that road users are informed that the bed cannot be used.

Freezing of the bed material is not generally a problem in South Africa. Ensuring that the bed material is freedraining will assist in this.