

## **CONSTRUCTION AND OPERATIONAL** **ALIEN INVASIVE AND OPEN SPACE MANAGEMENT PLAN**

### **1. PURPOSE**

It is the responsibility of the developer/ applicant/ land owner to eradicate and control categorised Invasive Alien Plants (IAPs) and any other undesirable species (such as weeds) that invade any areas on the property and surrounds as a result of any disturbance caused during the construction and operation phases of the project. As such the ecologists from Eco-Pulse Consulting recommend the implementation of a bi-annual IAP monitoring and clearing exercise for the first year post-rehabilitation. Thereafter, IAPs clearing can be undertaken annually throughout both the construction and operational phases of the facility. In terms of Section 75 of NEMBA, the following applies to the control and eradication of IAPs:

- » The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs;
- » Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment; and
- » The methods employed to control and eradicate a listed invasive species must also be directed at the new growth, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

There are various means of controlling invasive alien plants in South Africa including chemical, biological, mechanical and integrated control methods. The suitability of control methods depends on a number of factors, including practical constraints, economic constraints and applicability of methods for particular species of alien plants. It is generally advised that a form of integrated control be implemented, based on a combination of two or more of the control measures outlined below (depending of course on the species present at the site). Selection of the appropriate methods of control should be based on the following criteria:

- » **Species to be controlled:** Herbicides are registered for specific species. Selection should be based on "A *Guide to the use of Herbicides*" issued by the Directorate: Agricultural Production Inputs and labels and information brochures provides by herbicide suppliers.
- » **Size/age of target plants:**
  - \* For **seedlings:** Hand-pulling or hoeing and foliar applications of herbicides for dense stands.
  - \* For **saplings:** Hand-pulling or hoeing, foliar applications of herbicides for dense stands, basal stem treatments and cut stump treatments recommended.

- \* For **mature trees**: Ring barking, frilling, basal stem treatments and cut stump treatments recommended.
- » **Density of stands**: Overall applications of herbicide can be made to dense stands of seedlings or saplings. Where dense stands of large trees are present, treatment of standing trees may be appropriate to obviate the problem of disposing felled trees.
- » **Accessibility of terrain**: In inaccessible areas, methods that rely on the minimum amount of transportation of equipment and chemicals should be given preference.
- » **Environmental considerations**: Riparian/ wetland areas require a careful approach to treatment/control. Only herbicides approved for use in wetland/riparian areas are to be considered because washed-away herbicides often end up in aquatic systems.
- » **Desirable vegetation**: Control methods that will cause the least damage to desirable vegetation must be considered. Selective herbicides or mixes that will not damage other desirable vegetation should be applied where relevant.
- » **Disposal of dead vegetation**: Where possible, utilizable wood should be removed after tree felling. This is also the case for trees that could cause the blockage of water courses. Brushwood should be spread rather than stacked to limit soil damage in instances where burning is planned.
- » **Cost of application**: The cost of application and re-treatment should be taken into consideration when selecting methods/herbicides, etc.

A **Method Statement for IAP clearing and control** has been compiled and details the requirements and strategy for IAP control and eradication within disturbed terrestrial areas of the site. These measures must be implemented to mitigate the establishment, spread and reduction of IAP on site during both the construction and operational phase. The method statement is presented below.

## 2. METHOD STATEMENTS

### 2.1. Method Statement 1. IAP Control and Eradication for terrestrial areas

#### Planning for IAP Control:

Proper planning and preparations are fundamental to achieving cost-effective and successful IAP control. The following steps must be followed during planning:

- i. The contractor must visit the site and assess the extent of IAP infestation and topographic challenges they will have work in.
- ii. Identify and gather field equipment and personal protective equipment (PPE) required.
- iii. Gather all chemicals required to control IAPs. Only herbicides registered for use on the target species may be used (*note that the application of herbicides on different types of alien invasive plant species is limited in South Africa. It is therefore necessary to assess the herbicide's activity such as its residual effect in the soil; its ability to work under wet conditions etc.*).
- iv. Train project workers and supervisors on target IAPs and identified clearing methods. This may include: environmental protection with emphasis on aquatic resources, IAP identification; safety training for use of specialised equipment such

as chainsaws; specialised training for working in difficult or sensitive terrain and under difficult climatic conditions.

### **Measures for IAP control:**

The strategy for the removal of IAPs and weeds on the site shall be in accordance with the following practice measures and guidelines for control/eradication of IAPs:

- i. Identify, locate and demarcate protected indigenous plants that should be conserved within areas to be cleared.
- ii. Keep the team working in a line, with the daily tasks pegged out where possible.
- iii. Target dense infestations of woody and herbaceous alien plants, focusing on the removal of IAPs.
- iv. Recommended methods of IAP control and their application are summarised in Box 2. For the IAPs identified at the site (mainly *Psidium gaujawa*, *Eucalyptus spp.* and *Sesbania bisponosa*) a form of integrated control is recommended with mechanical removal (hand-pulling and uprooting) of smaller plants and cut-stump treatment for larger woody plants that will be difficult to remove manually). There is a possibility that other IAP species may colonise the site in the future and the most relevant method of control will need to be selected as these plants appear at the site during the operational phase.
- v. For large specimens that cannot be easily removed entirely, cut plants as low to ground as possible and apply herbicide to all cut surfaces and exposed roots. The "cut-stump" application method is the safest method of applying herbicides.
- vi. All IAPs must be removed carefully and exposed soil should be covered with cut vegetation or leaf litter that is free of weed seeds to ensure that re-growth of alien flora will not occur.
- vii. Press any loosened soil down carefully but firmly and mulch with plant material where possible.
- viii. All alien seeds, fruit bulbs, tubers and stems must be stacked and burnt onsite or removed for disposal at a registered land fill for example.
- ix. Stack/move the slashed brush off the stumps to aid herbicide application and re-establishment of indigenous plant species.
- x. Stack the brush into hips for collection and disposal at a landfill site.

### **Follow-up control:**

Follow-up inspections are necessary to ensure the success of the control phase. It is preferable to follow up on an area and remove all seedlings or treat re-sprouting plants, rather than treat a new area. Follow-up operations must be carried out if inspections establish that initial removal efforts have failed or have had a limited impact.

### **Maintenance:**

Maintenance control entails conducting regular control of invasive alien plants. This helps to sustain low alien plant numbers and keep the alien plants in check. Inspections of the site must be carried out every six (6) months.

### **Monitoring requirements:**

The site should be continuously monitored through visual inspections to determine whether IAP control has been successful and if further follow-up treatment is required.

### Notes on the use of herbicides in IAP control:

Note that herbicide application will need to be carried out strictly in accordance with the manufacturer's specifications and according to current legislation. The following pollution and safety measures must be also adhered to regarding the handling, use and storage of herbicides:

- i. All herbicides, concentrated and diluted, must be stored in a secure and covered area, or off-site under lock and key.
- ii. All containers into which the herbicide or mixers are decanted must be clearly marked and a copy of the original label secured to the container.
- iii. Herbicides must at all times be applied according to the recommendations on the labels.
- iv. All MSDS sheets are to be made available on site along with a fully kitted Medical Aid Kit.
- v. Herbicide equipment must under no circumstances be washed in a local stream, river or wetland.
- vi. Suitable protective clothing like gloves, aprons, overalls and eye protection must be worn by herbicide applicators at all times.
- vii. The correct protective clothing is to be used in line with manufacturer's instructions and/or the Occupational Health & Safety Act, Act 85 of 1993 (and amendments).
- viii. Avoid contact of herbicide with skin and eyes.
- ix. After contact, all applicators must wash their hands with soap and water or as recommended on the herbicide label.

#### **Box 2. Alien Plant Control Methods**

The control methods detailed below have been adapted from the ARC-PPRI (Agricultural Research Commission: Plant Protection Research Institute) Weed Research Programme (online at [www.arc.agric.za/arc-ppri/](http://www.arc.agric.za/arc-ppri/)), the DWA Working for Water Programme (<http://www.dwaf.gov.za/wfw/Control/>) and eThekweni Municipality's *Practical tips on the management and eradication of invasive alien plants* (EcoFiles Sheet 4. Local Action for Biodiversity).

##### **1 Mechanical control**

Mechanical control entails physically damaging or removing the target alien plant. Mechanical control is generally labour intensive and therefore expensive, and can also result in severe soil disturbance and erosion. Different techniques can be applied and include uprooting/hand-pulling, felling, slashing, mowing, ring-barking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice (e.g. *Eucalyptus spp.*, *Melia azedarach*) need to have the cut stumps or coppice growth treated with herbicides following mechanical treatment.

- **Hand pulling/uprooting:** The hand-pulling should be reserved for small plants and shrubs with shallow root systems (not recommended for trees with a stem diameter of more than 10cm). Grip the young plant low down and pull out by hand (using gloves). Uprooting is similar but is undertaken on slightly older individuals with the major drawback being that a relatively large area can be disturbed with the soils being altered and opening the area up to re-infestation.
- **Chopping/ cutting/ slashing:** This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/trunks. An effective method for non re-sprouters or in the case of re-sprouts (coppicing), it must be done in conjunction with chemical treatment of the cut stumps. Cut/slash the stem of the plant as near as possible to ground level. Paint re-

sprouting plants with an appropriate herbicide immediately after they have been cut.

- **Strip bark:** Using a bush knife, strip bark away from tree from waist height down to soil. Cambium is stripped with the bark. No herbicide used.
- **Felling:** Large trees can be cut-down in their entirety, however, this is often not recommended unless absolutely necessary as large trees can play a pivot role in soil protection and biodiversity maintenance.
- **Girdling:** Girdling involves cutting a groove or notch into the trunk of a tree to interrupt the flow of sap between the roots and crown of the tree. The groove must completely encircle the trunk and should penetrate into the wood to a depth of at least 1.5 centimetres on small trees, and 2.5 to 4 centimetres on larger trees. The effectiveness of girdling can be increased by using herbicides.

## 2 Chemical control

Chemical control involves the use of registered herbicides to kill the target weed. The use of herbicide is often essential to the success of an eradication/ control programme as it greatly reduces the re-growth potential of alien plants. Unfortunately, if the wrong herbicide is chosen, one can potentially cause more harm than good to the environment. When choosing the most appropriate herbicide, one needs to consider the following:

- **Relative toxicity to humans/animals**
- **Selective vs non-selective herbicides:** There are advantages and disadvantages to using each type. When dealing with light to moderate infestations in grass-dominated veld types, a broad-leaf selective herbicide is recommended so as to reduce the danger that spray drift could kill natural grass. In areas of heavy infestation, a non-selective herbicide is recommended.
- **Residual effect:** Some active ingredients in herbicides will remain in the environment for months, even years, before denaturing. Others start to denature as soon as they enter the soil. If a persistent herbicide is used, ensure that it is not used near any watercourse or area with a high water table (such as wetlands and riparian areas).
- **Is the herbicide registered for the target species:** A list of registered herbicides can be obtained from the Department of Water Affairs: Working for Water Programme – Policy on the Use of Herbicides for the Control of Alien Vegetation (January 2002). Also see <http://www.arc.agric.za/arc-ppri/Pages/Weeds%20Research/Specific-IAP-Species-and-their-control-according-to-botanical-names.aspx>

Some additional recommendations regarding herbicide use include:

- Herbicides should be applied during the active growing season.
- Always observe all safety precautions printed on the labels and manufacturer's instructions when mixing and applying herbicide.
- Herbicides can be applied in various ways. They can be sprayed onto dense infestations or painted onto the main stem of the plant or cut stump.
- Spraying herbicide on small infestations is not recommended, rather cut and apply herbicide to the stumps either with a brush.
- Spraying should be restricted to windless days when there is less risk of droplets drifting onto non-target species.
- Pressure or flow regulators should be fitted to sprayers for overall application. Spraying should be restricted to plants waist height or lower, but also ensuring there is sufficient foliage to carry the applied herbicide to the root system of the target plant.
- For water-based applications, Actipron Super Wetter should be added where recommended on the herbicide label, at a rate of 1.75/ha for dense-closed stands of alien vegetation.

- For all water-based treatments, a suitable brightly coloured dye should be added to the mix to ensure that all target plants are treated. For diesel-based applications, Sudan Red Dye should be added.
- Chemical control of IAPs is not recommended in aquatic systems due to the risk of water pollution, but may be used in conjunction with cutting or slashing of plants.
- Chemicals should only be applied by qualified personnel.
- Only herbicide registered for use on target species may be used.
- Follow the manufacturer's instructions carefully.
- Appropriate protective clothing must be worn.
- Only designated spray bottles to be used for applying chemicals.
- The number of herbicides for safe use under wet conditions is very limited.

### 3 Biological control

Biological weed control involves the releasing of natural biological enemies to reduce the vigour or reproductive potential of an invasive alien plant. Research into the biological control of invasive alien plants is the main activity of the Weeds Research Programme of ARC-PPRI and a list of biocontrol agents released against invasive alien plants in South Africa can be downloaded from their website. To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF).

### 4 Mycoherbicides

A mycoherbicide is a formulation of fungal spores in a carrier, which can be applied to weeds in a similar way as a conventional chemical herbicide (using herbicide application equipment). The spores germinate on the plant, penetrating plant tissues and causing a disease which can eventually kill the plant. Mycoherbicides are indigenous to the country of use and therefore are already naturally present in the environment and do not pose a risk to non-target plants. Under natural conditions they do not cause enough damage to the weed to have a damaging impact and are therefore mass produced and applied in an inundative inoculation, which leads to an epidemic of the disease knocking the weed population down. Mycoherbicides need to be re-applied at regular intervals.

### 5 Integrated control

It is frequently advisable to use a combination of two or more of the control method mentioned above, which is referred to as *integrated control*. Killing plants without cutting down causes the least disturbance to the soil and is the ideal.

The following integrated control options are available:

- **Basal bark and stem application:** Apply recommended herbicide mixed in diesel carrier to the base of the stem of trees (<25cm stem height) and saplings. This method is appropriate for plants with thin bark or stems up to 25cm in diameter. Do not cut the bark. Apply herbicide mix with paintbrushes or using a coarse droplet spray from a narrow angle solid cone nozzle at low pressure. For multi-stemmed plants, each stem must be treated separately.
- **Ring barking:** Invasive trees growing away from any structures or roads can be ring-barked, poisoned and left standing rather than felled. They will slowly collapse over time and can establish habitat for birds, etc. Strip all bark and cambium from a height of 75cm to 100cm down to just below soil level. Cut a ring at the top and pull strips. All bark must be removed to below ground level for good results. Where clean de-barking is not possible due to crevices in the

stem or where exposed roots are present, a combination of bark removal and basal stem treatments should be carried out. Bush knives or hatchets should be used for debarking.

- **Frilling:** Using an axe or bush knife, make angled cuts downward into the cambium layer through the bark in a ring. Ensure to effect the cuts around the entire stem and apply herbicide into the cuts.
- **Cut stump treatment:** This is a highly effective and appropriate control method for larger woody vegetation that has already been cut off close to the ground. The appropriate herbicide should be applied to the stump using a paintbrush within 30 min of being cut. Apply recommended herbicide mixture to the cut surface with hand sprayers, a paintbrush or knapsack sprayer at low pressure. Apply only to the cambium or outer layer of large stumps and the entire cut surface of small stumps. Ensure the stumps are cut as low to the ground as practically possible (about 10 – 15 cm or as stipulated on specific herbicide label). Herbicides are applied in diesel or water as recommended for the herbicide. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.
- **Scrape and paint:** This method is suitable for large vines and scrambling plants i.e. creepers. Starting from the base of the stem, scrape 20-100cm of the stem to expose the sapwood just below the bark. Within 20 seconds apply the herbicide to the scraped section. Do not scrape around the stem. Stems over 1cm in diameter can be scraped in 2 sides. Leave the vines to die in place to prevent damaging any indigenous plants they may be growing over.
- **Foliar spray:** *This is not an advocated method of application by unqualified applicators due to the danger of spraying indigenous species.* Should be restricted to droplet application made directly on the leaves on plants that are no higher than knee height. Use a solid cone nozzle that ensures an even coverage on all leaves and stems to the point of runoff. Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls. Avoid spraying in windy weather as the spray may come into contact with non-target plants. Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.

### **6 Disposal of alien plant material**

Treated/removed alien plant material will need to be removed from the site and disposed of at a proper/registered receiving area such as a local registered land fill site.

## **3. LEGISLATIVE CONTEXT**

### ***Conservation of Agricultural Resources Act (Act No. 43 of 1983)***

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared aliens must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act, 198 alien species were listed as declared weeds and invaders and ascribed to one of the following categories:

- » Category 1: Prohibited and must be controlled.
- » Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.

- » Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

### ***National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)***

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEMBA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

- » Category 1a: Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- » Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- » Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Cat 2 plants to exist in riparian zones.
- » Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

Plants listed under the categories above are detailed within Notice 1 of the Alien and Invasive Species published in GNR599 of 01 August 2014. The following guide is a useful starting point for the identification of alien species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM:BA.

## **4. OPEN SPACE MANAGEMENT PRINCIPLES**



The following elements are considered part of the Open Space Management Plan. The principles contained within the Alien Invasive Management Plan should also be considered to form part of the Open Space Management Plan.

### **Access Control:**

- » Access to the facility should be strictly controlled.
- » All visitors and contractors should be required to sign-in.
- » Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.

### **Prohibited Activities:**

The following activities should not be permitted by anyone except the landowner or his representatives:

- » No fires within the site.
- » No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- » No driving off of demarcated roads.
- » No interfering with livestock.

### **Fire Risk Management:**

Although fires are not a regular occurrence at the site, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

- » Lightning strikes
- » Personnel within the facility
- » Infrastructure such as transmission lines

The National Veld and Forest Fires Act places responsibility on the landowner to ensure that the appropriate equipment as well as trained personnel are available to combat fires. Therefore, the management of the facility should ensure that they have suitable equipment as well as trained personnel available to assist in the event of fire.

### **Firebreaks**

Targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high-risk components. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks

need to be built such as around substation, a strip of vegetation 5-10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However, if alien species colonise these areas, more regular clearing should be implemented.