

An Environmental Audit of Brackenridge Estate

Prof. Patricia M. Holmes (PhD)

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Photo 1. Interface between housing and old Fynbos vegetation at Brackenridge Estate

Table of Contents

1. Introduction and Brief	3
2. Environmental Criteria: Issues and Directives	3
<u>2.1 An OEMP is drawn up to ensure environmental compliance</u>	3
<u>2.2 Fire protection and management</u>	3
<u>2.3 Alien species control</u>	5
<u>2.4 Vegetation rehabilitation & restoration</u>	6
<u>2.5 Storm water management & soil erosion</u>	7
<u>2.6 Sewerage & sewage</u>	7
<u>2.7 Release of pollutants</u>	7
<u>2.8 Environmental monitoring</u>	8
<u>2.9 Appointment of Environmental Control Officer (ECO)</u>	8
<u>2.10 Environmental awareness and training of staff</u>	9
<u>2.11 Environmental Management/ Monitoring Committee established</u>	9
<u>2.12 Visual & landscaping</u>	9
<u>2.13 Future planned boreholes</u>	10
3. Prioritization of Directives (Actions)	10

1. Introduction and Brief

The consultant was tasked with conducting an Environmental Audit (EA) in terms of:

- The criteria and rules specified in the current Home Owners Association document,
- The Record of Decision (RoD, 2000),
- The Operational Environmental Management Plan (OEMP, 2001), and
- Current best practices.

The environmental audit report should detail findings and concrete actions to be taken in order of priority.

Note that the OEMP (2001) states that an EA should be done a year after implementation of the OEMP and repeated annually. However, this has not been done to date and therefore this report represents the first post-construction EA at Brackenridge. The purpose of an EA is to inspect the site in detail to highlight problems and give directives related to any specific input needs. Subsequent EAs should check that these directives have been implemented and to report on their effectiveness or need for additional actions. The EA reports should be submitted to the HOA via the Environmental Management Subcommittee for their actioning.

A list of EA criteria was drawn up based on the documents above and items checked as far as possible during the biodiversity survey of the estate. In addition, certain items were discussed with management and residents to gain a better understanding of potential problem areas and actions already taken.

2. Environmental Criteria: Issues and Directives

2.1 An OEMP is drawn up to ensure environmental compliance

This was done in 2001 and requires updating every three years (according to the RoD); however, no update has yet been done. An updated EMP will be submitted in parallel to this EA document.

Directive: In future, the EMP should be reviewed every 3-5 years to ensure it remains current to addressing all environmental challenges on the Estate.

2.2 Fire protection and management

According to the OEMP (2001), prescribed burning should be used as a management tool for the benefit of Fynbos conservation and to prevent or minimize damage to the development and adjacent properties as a result of wild fires. No prescribed burns have been done to date and vegetation age currently is in excess of four decades. This poses a fire risk to properties as well as a risk of biodiversity loss. Fynbos seed banks can persist in the soil for at least three decades, but as this fire-free interval increases more species may become locally extinct. Implementing an ecologically sound prescribed burning plan is required as a matter of urgency. Figure 1. shows an aerial image of the Estate with the major vegetation units labelled.

2.2.1 Fire protection

The Estate is compliant with the National Veld & Forest Fire Act (Act 101 of 1998), is a member of the Plett South Fire Management Unit of the Southern Cape Fire Protection Association (FPA) and appears to be well prepared for protection from wild fires in terms of functional fire hydrants and volunteers to action their use in fighting fires (Ritky 2022). The most recent assessment (Ritky 2023) recommends the replacement of a few dysfunctional hydrants and the phasing out of immovable 65mm hoses.

Fire risk from outside the Estate fence potentially arises from adjacent flammable vegetation in neighbouring properties, such as along the southern boundary, parts of the northern and western boundaries and from the densely invaded riparian vegetation along the Klein Piesang River, shared with the Municipality. Joint management of fire risk and invasive alien species management (especially for the Klein Piesang River) could be raised and actions agreed at the FPA forums.

Currently the Estate fire belt system is not comprehensive as it does not span the entire housing - natural open space interface and in some cases is positioned away from the boundaries of housing (by up to 20 m) allowing tall, moribund Fynbos vegetation to grow between the fire belt and the immediate borders of the houses. This also fragments the Fynbos remnants unnecessarily. Furthermore, some fire belts have grown up and require re-cutting (e.g., on the slopes below Watsonia Heights). Although fire belts of any size will not stop embers spotting from a runaway wild fire under severe weather conditions, they are important to halt ground fires, for quick access points in fighting fires or to initiate back-burns, and are necessary for implementing ecological prescribed management burns.

Directive: Review and improve the current fire belt system to:

- Create a continuous belt between housing and natural vegetation areas;
- Relocate current fire belts cut away from housing borders to be adjacent to them (e.g., along sections adjacent to Orchid Valley);
- Cut a 5 m-wide fire belt: ideally only 3 m-wide should be cut in the natural open space areas to minimize loss of biodiversity, with the other 2 m cut by the adjacent home owners on their properties (fire management should be a shared responsibility). Fire belts in gardens can comprise cut lawns, low (ankle-height) non-flammable bedding or ground cover plants, paving or, if some privacy is required, a succulent hedge of non-flammable Spekboom (*Portulacaria afra*) or Kranz Aloe (*Aloe arborescens*);
- Improve fire belts where less than a 3 m-wide space is available between the Estate fence and housing, e.g., west of Erica Heath: at least 2 m of adjacent gardens must be landscaped as fire belt along the edge closest to the fence where the adjacent land outside the Estate comprises flammable vegetation;
- Remove flammable trees and shrubs from within 2 m of housing walls and guttering to minimize the risks of embers igniting and burning down houses;
- Clear any roof guttering of leaf litter regularly to minimize the risk of embers igniting the roof space;
- Cut fire belts annually, ahead of fire season, where adjacent vegetation is older than four years post-fire.

Directive: Review any fire risk concerns outside the Estate fence with neighbours, using the FPA collaboration to initiate discussions.

2.2.2 Vegetation fire management

As the majority of the open space on the Estate comprises the Endangered Garden Route Shale Fynbos vegetation type, ecological prescribed burning is necessary to conserve this biodiversity (Holmes 2023). Fynbos is fire-prone and fire-dependent: without fire this rich and Endangered biodiversity will be lost. Owing to fire exclusion for the past four decades or more, this Fynbos is moribund and has become invaded both by alien woody species and indigenous Thicket and Forest trees and shrubs. This has created a dangerously high fuel load that is also flammable. A wildfire occurring under severe weather conditions in this vegetation state would be extremely difficult to extinguish or control.

Photograph panel 1. Illustrates A. Moribund Fynbos vegetation invaded by Thicket shrubs and trees; B. Fire belt positioned away from housing; C. Narrow space between gardens and boundary fence (Erica Heath); D. Fynbos invaded by alien trees.

It is recommended that an “Integrated Fire and Alien Species Management Plan” be developed as a subsidiary plan to the EMP and implemented as a matter of urgency. It is necessary to integrate these two management spheres because they directly impact on one another. For example, fuel reduction is advisable before a management block is burnt, through removal of large fuel (large invading alien and Thicket/Forest trees and shrubs) and initial control of all invasive alien species should be done pre-fire to minimize proliferation post-fire. Fire will also trigger alien recruitment and resources need to be assigned to tackle this problem as part of the burning plan.

Burn blocks should be as large as possible to avoid negative edge effects impacting on Fynbos recovery. Once the Estate has conducted its first cycle of prescribed burning throughout, the boundaries between Forest patches and Fynbos should be more obvious.

To maintain biodiversity the Fynbos sections should be managed as at least three blocks, on a staggered burning cycle, with a 10-15 year interval (20 year at most) to prevent the vegetation becoming moribund and invaded by Thicket/Forest species. This fire frequency would conserve biodiversity and ensure that fuel loads are kept to a manageable level.

Directive: Draw up an “Integrated Fire and Alien Species Management Plan”. This plan should:

- Delineate the burning blocks and prioritize blocks for burning (including proposed dates),
- Outline fire preparation requirements and post-fire requirements,
- Be updated regularly by the Environmental Conservation Officer (ECO) as an “Annual Plan of Operation” following consultation with the Environmental Management Subcommittee, Fire Protection Association representatives and Estate Management.
- Apply for an ecological burning permit well in advance of the proposed burning date to allow for all permissions to be aligned (e.g., Air Pollution Control approvals; local Municipality; approvals from adjacent residents and neighbouring landowners).
- Appoint an experienced operational fire team, with experience in Fynbos burns, to conduct the prescribed burns.

2.3 Alien species control

According to the OEMP (2001), all invasive alien plants occurring on site would be removed during the construction phase, with ongoing follow-up control implemented. Clearly alien control has not yet succeeded in reducing the alien invasions to a maintenance level: the biodiversity assessment of the Estate recorded 39 alien plant species, with densities varying from scattered to moderately dense invasion levels, and dense alien stands along the Klein Piesang River (Holmes 2023). The most urgent aliens to control are the invasive species that alter ecosystem processes (e.g., fire behaviour), particularly alien trees in Fynbos, such as wattles, gums and pines. Some *ad hoc* clearing has been done in the past year, but this is insufficient to tackle the twin threats of alien proliferation and increase in woody fuel loads, which present a fire risk to the Estate and to biodiversity. To address this, it is recommended that a subsidiary “Integrated Fire and Alien Species Management Plan” is drawn up and appended to the EMP, to be updated every year as an “Annual Plan of Operation”.

Directive: Draw up an Integrated Fire and Alien Species Management Plan and update annually as an “Annual Plan of Operation” as for 2.1. In addition:

- Include maps of priority invasive species (and an estimate of alien densities to assess workloads and costs) for each burn block.
- Include pre- and post-fire invasive alien species control requirements.
- Appoint a skilled operational team to implement the alien control and fuel reduction (removal) actions prior to the block burn.
- Appoint a skilled operational team to implement the post-fire alien control, ideally when plants are still small enough to be pulled and lopped.

Photograph panel 2. Illustrates some invasive alien tree species in Fynbos: *A. Acacia melanoxylon* (Black Wood), *B. Acacia mearnsii* (Black Wattle), *C. Pinus radiata* (Monterey Pine), *C. Eucalyptus* species (gum).

2.4 Vegetation rehabilitation & restoration

The biodiversity assessment of the Estate (Holmes 2023) indicated that for the majority of the open space areas that comprise Garden Route Shale Fynbos, seed banks are likely to persist as dormant propagules in the soil. This means that the vegetation should recover spontaneously following invasive alien species control and prescribed burning in the appropriate season. The re-introduction of Fynbos species is unlikely to be required unless prescribed burning is delayed further. As described in 2.1 and 2.2, prescribed burning will require a concerted effort to remove large fuel (invading Thicket/ Forest species and invasive alien tree species) and to prepare the areas for a prescribed block burn in the dry season.

The biodiversity survey was unable to delineate exact boundaries between potential Forest or Thicket and Fynbos vegetation types: two small Forest patches were noted, and it is possible that a plant community similar to Piesang River Fynbos-Forest Mosaic, described by Vlok et al. (2008) occurs on northern slopes above the Estate entrance. Thicket and Forest species seeds typically are vertebrate dispersed and readily invade Fynbos in the absence of fires. Fire should reset the areas to their historical plant communities to some extent, and indicate such boundaries more clearly. As Thicket and Forest vegetation has been allowed to expand beyond their original extents, no restoration actions are required for these vegetation types.

The valley bottom, Floodplain Wetland in the northeast corner of the Estate adjacent to the Klein Piesang River has become invaded by indigenous and alien shrub and grass species that are not typical wetland plant community species (e.g., Bietou and Pampas). The invasive alien species should be cleared as part of the alien species control plan and the wetland area included in the nearest prescribed burning block, as historically this community also would have burnt in wild fires. A decision on whether the re-introduction of wetland species may be required should be delayed until after fire, as wetland species may regenerate from the soil seed bank.

The Riparian vegetation along the Klein Piesang River has all but disappeared under dense stands of tall invasive alien wattles e.g., *Acacia mearnsii* (Black Wattle) and *A. melanoxylon* (Black Wood). It is difficult to describe what plant community would have occurred there historically. In this case some active restoration (i.e., introduction of local riparian species) may be required after alien control to provide ground cover and soil stability and to counter re-invasion by alien species. A list of suitable riparian species for restoration could be drawn up from the nearest natural riparian plant community in the area that occurs on similar geology and soils. As the river is shared with the Municipality, collaboration would be required between them and Brackenridge Estate, perhaps engaging around the proposed “Botanical Park” for the Municipal Commonage property.

Directives: Draw up an “Integrated Fire and Alien Species Management Plan” and update annually as an “Annual Plan of Operation” as described in 2.1 and 2.2. In addition:

- Complete the first cycle of prescribed burning on all blocks throughout the Estate, then update the plan to accommodate a Fynbos burn frequency within the range of 10-20 years in order to restore biodiversity and minimize fuel load build up and fire risk to housing.
- Discuss the potential drafting and implementation of an ecological restoration plan for the Klein Piesang River riparian zones in collaboration with the Municipality, who own and manage the eastern banks of the river and adjacent commonage.

2.5 Storm water management & soil erosion

According to the OEMP (2001), monitoring should be done annually to detect early signs of erosion and determine the need for erosion control and maintenance. This includes along roads, footpaths and storm water culverts. Most of the built areas of the Estate are now completed, but for those houses and other proposed infrastructure (e.g. boreholes and reservoir) still to be built inspections should continue to ensure compliance with bare soil and slope management, to prevent damage to and pollution of adjacent vegetation, streams and wetlands and to prevent erosion runnels being created.

No large areas of erosion were noted during the survey and there were few areas of exposed soil, except where new construction was taking place in the southern section of the Estate. However, cleared footpaths and fence lines are exposed to the erosive forces of heavy rain and some localized areas of soil erosion were noted, for example on a steep slope along the fence line below Watsonia Heights. This erosion had exposed some wiring. Steep areas along the fence line are likely to be prone to erosion and any erosion runnels should be addressed promptly when noted during fence line patrols.

A recently opened storm water culvert in the south of the Estate illustrates the erosive potential of such outlets. For example, another storm water culvert in the SE corner has resulted in a donga being created (photo panel 3).

Photograph panel 3. Illustrates A. Recently opened storm water culvert; B. Erosion runnel on steep slope along northern fence line; C. Erosion runnel down a path in southeast section of Estate; D. Erosion down a path along southeast fence line; E. Erosion donga formed at storm water outlet near southeast corner of Estate.

Directives:

- Patrollers on fence line patrols should take note of localized soil erosion on steep slopes adjacent to the fences so that repairs may be implemented timeously.
- Similarly, the path network and storm water culverts should be checked after heavy rains to note any erosion runnels and implement preventative repairs.
- The SE storm water outlet (Photo panel 3) should be redesigned to spread the outflow more widely to allow rehabilitation of the eroded donga area.

2.6 Sewerage & sewage

I was alerted to a place where sewage was leaking into the open space area in a fire belt below Watsonia Heights. Management is aware of this issue and such problematic sections of the sewerage system will be addressed. Nutrient-rich water leaks into Fynbos are a major threat to plant species as they are unable to cope with high levels of phosphorus and other nutrients. The same applies to chlorine from swimming pool water.

Directive: Repair leaking sewerage systems to prevent pollution into the natural environment.

2.7 Release of pollutants

No large-scale storage of pollutants such as oils and fuels is permitted on the Estate, except for a 25 litre container of fuel for emergency after-hour use (Boet Grobler personal communication, 18/08/2023). Provided that all homeowners are compliant with anti-pollution measures, such as safe disposal of old oils, paints and other chemicals, the storm water system should be free of such pollutants and not present a hazard to the environment.

Directives: Ensure that homeowners have access to information on safe disposal of hazardous chemicals and fuels and are compliant: i.e., do not use the storm water or sewerage systems for their disposal.

2.8 Environmental monitoring

According to the OEMP (2001) a regular, qualitative assessment of the condition of indigenous vegetation, such as accumulation of dead wood as a result of ageing, must be carried out every five years by a specialist.

Note that some dead wood is natural in Fynbos and provides niches for insects and fungi that are part of the ecosystem, e.g., as pollinators, decomposers and other roles. The presence of some dead material is not a cause for concern and should only be removed if it is clearly a major fire or safety risk.

It is recommended that the ECO and a re-constituted Environmental Management Committee (see 2.11) initiate a monitoring system for the natural open space areas of the Estate, using measures that indicate where urgent management interventions are required.

Some examples include: Fynbos vegetation age and height (if > 20 years old or > 2m tall schedule a prescribed burn); proportion of dead material (if > 20% schedule a prescribed burn); presence of invasive alien trees and shrubs (schedule initial and follow-up control measures, removed large felled wood before a prescribed burn); invasion of Fynbos by Thicket/ Forest species (e.g., if Bietou > 20% of vegetation cover, last burn too long ago or too cool, schedule a hot burn after “fell & drop” of large Bietou).

Directives: Initiate a monitoring system for the natural open space areas of the Estate that will inform the “Integrated Fire and Alien Species Management Plan”.

- Monitor vegetation age and dead material in the management blocks.
- Monitor invasive alien species in the management blocks. This should include the numbers (or densities) of plant species seen and their size.
- Build on the current Brackenridge Estate iNaturalist project set up during the recent survey (Holmes 2023) to record all species seen on the Estate. Residents may be encouraged to participate by uploading the iNaturalist App onto their smart phones and taking photographs of species encountered in the natural open space areas. Such records may be directly uploaded onto the iNaturalist platform for identification where the localities and dates of observations will also be recorded in the database. These records would contribute to both the vegetation and invasive alien monitoring and can be used directly for management if needed.

2.9 Appointment of Environmental Control Officer (ECO)

No operational phase ECO has been appointed to date, but it is currently being discussed to appoint a part-time, external ECO (Boet Grobler, personal communication 18/08/2023).

Directive: Appoint an ECO to oversee the most urgent environmental issues and coordinate the required actions (i.e., invasive alien species control, vegetation fuel reduction, updating of fire belt system, prescribed ecological burns, repair of erosion gullies and dongas and storm water and sewerage systems), and develop a monitoring system and Integrated Fire and Invasive Species Management Plan for the natural open space areas.

2.10 Environmental awareness and training of staff

As soon as an ECO is appointed, he/she should arrange for environmental awareness and training of Estate staff.

Directive: ECO should address any short-comings in environmental awareness and training of staff.

2.11 Environmental Management/ Monitoring Committee established

The HOA established an Environmental Management Subcommittee in February 2023 as an advisory committee, in response to a motion that called upon the Board of Trustees to actively maintain and enhance the natural environment (Jan Christoph Meister, personal communication October 2023). However, in order to fulfill the role of an Environmental Management Committee (EMC) it would need to be re-constituted as an official entity which reports directly to the Board of Trustees. The EMC would then assist in overseeing environmental monitoring and auditing as well as the appointment of the ECO and operational contractors to implement aspects of the EMP, such as invasive alien vegetation control and prescribed burning operations.

The EMC would function in a similar manner to a Protected Area Advisory Committee (PAAC), although the latter is legislated for proclaimed protected areas rather than private conservation areas. The PAAC is established in terms of the National Environmental Management: Protected Areas Act, No 57 of 2003 and its regulations. It exists to facilitate a participative approach in respect of protected areas management and represent the interests of all stakeholders, internal and external. These stakeholders are defined as all persons or entities affected by or interested in the existence and management of the protected area.

Directive: Environmental Management Subcommittee of the HOA is re-constituted as an Environmental Management Committee (EMC) that reports directly to the Board of Trustees. The EMC is active in overseeing that the required actions are taken by Estate Management to ensure that the environment remains in a healthy, resilient state and is rehabilitated where required.

2.12 Visual & landscaping

The landscaping guidelines and suggested species for gardens remain sound advice and should be broadly adhered to. However, note that one species listed, Bietou (now named *Osteospermum moniliferum* – was *Chrysathemoides*) has extensively invaded the natural Fynbos and no longer is recommended. Regular prescribed burning of the Fynbos natural open space areas will reduce the invasion pressures by any Forest species in gardens, which generally are not fire-adapted (Holmes, 2023).

In terms of fire prevention, flammable species such as Restios (Restionaceae) and Ericas (Ericaceae) or other fine-leaved Fynbos shrubs should not be planted within 2m of housing walls and roofing, or within 2m of the fence line interface with the natural open space. Such areas should be considered as fire belts within gardens and should use either hard landscaping such as paving or non-flammable, ground covers such as succulents.

Most of the current landscaping comprises non-local native species or developed Fynbos cultivars and hybrids rather than locally indigenous plant species (Photo panel 4). This is acceptable provided that no closely related species is present in the adjacent vegetation that could hybridize with them, resulting in loss of the wild species' genetic integrity (as has happened with some *Protea* species in other areas, such as Silvermine section of Table Mountain National Park). Kikuyu (*Cenchrus clandestinus*) is an invasive, alien grass and should not be used for lawns. The alternative grass species listed in the landscaping guidelines: Kweek (*Cynodon dactylon*) or Buffalo (*Stenotaphrum secundatum*) should be used instead.

In several areas gardens have been extended into the natural open space areas by the planting of garden plants that are inappropriate to the natural plant communities. This practice should be halted, because if it escalates then it will erode the conservation land and potentially cause the further spread of these inappropriate species.

I noted some incidents of garden waste being dumped over garden walls into the natural open space areas (Photo panel 4). This should not be allowed as this material smothers the Fynbos vegetation and may include weed seeds in lawn cuttings. I also came across a long black pipe that ran from a private garden into the open space areas (Photo panel 4, above Orchid Valley). It is not clear what this pipe was for, but the OEMP (2021) states that swimming pool water may not be released into the open spaces and should be directed into the storm water system.

Directives:

- Update the landscaping plant list to remove species such as Bietou which invade the natural open space areas.
- Raise awareness among the homeowners about fire-proofing their properties with suitable landscaping, e.g., in the 2 m against buildings and boundaries with natural vegetation. Flammable garden species may not be planted in such areas.
- Warn homeowners not to dump garden waste into the natural open space areas and check for compliance.
- Advise homeowners not to extend gardens into natural open space areas, including fire belts, and check for compliance.
- Ensure that swimming pool waste water is not released directly into natural open space areas.

2.13 Future planned boreholes

Two supplementary boreholes are planned to augment water supply, with water to be treated at the Estate. Water Use Licenses have been applied for. The localities are: firstly, close to the northern boundary, about 100 m from the entrance, and secondly, in the open space immediately above Bitou Glade road. Although it is unlikely that water abstraction from the depths proposed will directly affect plant communities such as seeps, abstraction will affect flows in downstream river systems such as the Piesang and Klein Piesang rivers. As such any conditions of the Water Use Licence must be adhered to and water use from boreholes monitored to ensure judicious use (e.g., not wasted on profligate watering of lawns and flower beds).

3 Prioritization of Directives (Actions)

The most urgent and important priorities for the Estate relate to fire management. As described above this requires both long-term planning and sufficient resource allocation to address the potential fire risk to properties and the continued degradation of the Fynbos vegetation in the natural open space areas. As this will require a concerted effort to raise awareness and re-allocate the necessary resources to tackle the problems of high fuel loads, invasive alien vegetation and prescribed burn preparations and implementation, the first priority will be to appoint an ECO to oversee these processes in collaboration with other stakeholders. This will simultaneously require that the Environmental Management Subcommittee is re-constituted as an EMC that reports directly to the Board of Trustees.

Other environmental issues that need to be addressed, such as soil erosion and deviations from HOA rules, such as dumping of garden waste are important, but should be more easily addressed within current operations or via communications from Estate Management. As such they will be listed as lower on the priority list.

Priority of Actions

- I. Re-constitute the Environmental Management Subcommittee as an Environmental Management Committee (EMC) reporting directly to the Board of Trustees.
- II. Appoint an ECO to work with Estate Management, the EMC and other stakeholders (e.g., FPA) to draft and implement the subsidiary “Integrated Fire and Alien Species Management Plan”. This plan requires:
 - a. Burn blocks to be delineated (as large as possible to minimize negative edge effects).
 - b. A timetable for blocks to be burnt (within the natural burning season for Fynbos).
 - c. Preparations for each burn block: temporary fire belts, fuel reduction in first burn cycle (control of invasive alien species; removal of large fuel; fell and drop of non-flammable species like Bietou to facilitate a clean burn, etc).
 - d. Application for ecological prescribed burn permits.
 - e. Awareness raising among residents, including information about rules, procedures and action notifications on the burn days.
 - f. Appointment of operational teams for alien control, fuel removal and prescribed burning.
- III. Fire protection: update and implement the fire belt system, especially at the interface of housing and natural vegetation areas, including homeowner contributions to remove flammable vegetation near houses and at the interface with natural vegetation.
- IV. Natural open space monitoring system: commence prior to the first block burn (pre-burn assessment) and continue post-fire: important to assess vegetation recovery and invasive alien species resurgence. Species appearing post-fire may be recorded on the iNaturalist platform.
- V. Soil erosion: survey bare soil areas and steep slopes for soil erosion regularly, especially after heavy rain, and repair any erosion runnels or dongas.
- VI. Sewage leaks: identify any sewage leaks and repair sewerage system where needed.
- VII. Storm water system leaks: identify and repair any storm water system leaks and erosion runnels.
- VIII. Regularly communicate with homeowners and staff to inform on various environmental subjects, such as the requirement of summer fire for Fynbos conservation, the need to control invasive alien species and the importance of removing inappropriate species in gardens. Similarly, on the responsibility in fire-proofing houses, preventing spread of garden plants into natural open space, dumping and the safe handling of pollutants.

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Figure 1. A recent Google Earth image of Brackenridge Estate indicating the main vegetation blocks in the natural open space areas. Note that the western banks of the Klein Piesang River outside of the fence are also part of the Estate and historically would have comprised a Fynbos Riparian Scrub plant community.



Photograph panel 1. Illustrates A. Moribund Fynbos vegetation invaded by Thicket shrubs and trees; B. Fire belt positioned away from housing; C. Narrow space between gardens and boundary fence (Erica Heath); D. Fynbos invaded by alien trees.



Photograph panel 2. Illustrates some invasive alien tree species in Fynbos: A. *Acacia melanoxylon* (Black Wood), B. *Acacia mearnsii* (Black Wattle), C. *Pinus radiata* (Monterey Pine), D. *Eucalyptus* species (gum).



Photograph panel 3. Illustrates A. Recently opened storm water culvert; B. Erosion runnel on steep slope along northern fence line; C. Erosion runnel down a path in southeast section of Estate; D. Erosion down a path along southeast fence line; E. Erosion donga formed at storm water outlet near southeast corner of Estate.



Photograph panel 4. Illustrates A. Typical garden landscaping using cultivars or hybrids of Fynbos species; Invasive Bietou (*Osteospermum moniliferum*); C. dumping of garden refuse into the open space; D. A plastic pipe running into the open space.