## Annexure G: Review of project data from the Geographic Information System and project data of the project

The overall nature of the ABI Alien Clearing Project, GIS, project reports and APO data, make a proper in-depth assessment of the work done versus that which was planned difficult and possibly inaccurate, particularly when determining ecological impact. An attempt was made to compare the deliverables to the actual implementation. However, the inconsistency in verifiable data, due to data being captured in various reports and formats over time, did not allow for a comparison of actual delivery in relation to the planned outputs despite considerable effort. Indicators of success, failure and shortcomings could be evaluated to a limited extent.

#### The value of project data

It is a sound management practice and industry standard to plan financially and spatially on an annual basis as well as longer term for a minimum of five years. When budgeting and planning for NRM projects in general and alien vegetation in particular, the long-term nature of alien vegetation management and rehabilitation must be considered. This enables project management to ensure that there is a continuum of funding particularly for follow up, fuel load management and rehabilitation activities and respond timeously to funding risks. To achieve this a series of norms and standards are used whereby the average work capacity per person for the site based on various factors such as species density, walking time, terrain etc. is considered. This enables project managers to estimate the person days and other factors such as travel costs required to complete a block and the associated costs, over a long term. Evaluating the success of an alien vegetation project, in terms of verifiable year-end summaries and reports in a consistent manner is a vital element of long-term alien vegetation management.

### Review of GIS and project data

A review of the APO, budget, reports and GIS data indicated that, prior to the advent of the WfW project, the FVCT was providing assistance to landowners, however the scale and nature of the project did not at that stage require detailed data collection and maintenance of spatial and landscape data, although it would in retrospect have been an advantage.

Without a complete set of data since 2013 it is not possible to make an objective assessment of the ecological impact over the long term. It was not possible to determine explicitly from the data provided if all the follow ups were being done as the 2013 to 2016 data was not available.

In the period of 2013 to 2017 the FVCT was using a standard GPS combined Google Earth digitising, creating tracks not polygons. At the time they did not follow natural features or the cadastral boundaries, but mapped the infestations and what was cleared. Again, at the time this was mostly appropriate for the nature of the project as it was focussed on landowner support. However, at that stage the system can be described as a tool and not a database of information as is the case with the current system.

Since the standard WfW model was implemented in 2017 which brought considerable change, the Project Verification Report of 24 April 2017 detected several anomalies that needed rectification (Pisang, 2017).

**Key mapping related findings by DEA:**

- It is important for both DEA and implementing agents for LUIs (in this case Flower Valley Conservation Trust) to be accountable on clearing work completed to the WfW operational standards. This will enable a justifiable and auditable environment. The responsibility lies with the Project Management to ensure that work is completed according to the WfW standards and only quality work is approved and paid for.
- It is evident that the Project Management team were never infield to verify boundaries and desktop exercises were used to digitize the project polygons, therefore there is a consistent lack of coherence between what is infield versus the GPS polygons.
- There is a clear 18% trend based on the areas that have infestation growth less than 5%, and a 9% trend based on the inclusion of pond/dams or building structures in the polygons.

**Commented [HD1]:** HI Sabelo, not sure I understand this point.

**Mapping related recommendations by DEA:**

- An implementation plan is needed in focused area with natural boundaries
- Spatial data should be on the WIMS system
- Project polygons must be verified infield using GPS polygons and not be digitized on the desktop
- Ploughed, cultivated lands, grazing lands, houses/building structures and dams must be excluded in the current Flower Valley polygons as they increase the size of the area. There is a need for remapping of the project
- Contracts must be completed according to the boundaries submitted to DEA.

In April 2018 Esna Swart was appointed as a GIS specialist. The data was then verified and converted to standards as accepted by the WfW programme for incorporation into the WIMS system as per the Project Verification Report of 2017 recommendations. At this stage most old data was reviewed and included as far as possible in the new system and mapping started on a clean slate.

**Key issues dealt with:**

- Boundaries were aligned to cadastral boundaries and natural features, and rationalised
- Density data was resolved
- Clearing history was updated as far as possible
- Accuracy of the GPS is a key issue; agreement must be obtained as to the level of accuracy of the mapping
- Infrastructure, category two species that are and are not to be cleared were not excluded

Analysis of the pre-2018 data is unreliable and uncertain. Project APOs, reports and data from 2018 onwards was interpretable, however the time span was too limited to be able to make a complete assessment and to draw any real conclusions. Using GIS data from 2018 onwards only provides an indication of where the project is in terms of following up. It is understood that the project focused primarily on follow up and low-density areas with few or no adult plants included to maintain a low person-day cost.

**Table 1: Project data breakdown**

<table>
<tr><th>Period/Cycle</th><th>APO</th><th>Project budget</th><th>GIS data</th><th>Nbal history</th></tr>
<tr><td>2013 – 2016:</td><td>2013 and 2014/2015 Available</td><td>Available</td><td>Not Available</td><td>Not Available</td></tr>
<tr><td>2016/2017</td><td>No funding</td><td>No funding</td><td>No funding</td><td>No funding</td></tr>
<tr><td>2017/2018 (one year funding)</td><td>2017/2018 Available</td><td>Extracted from reports</td><td rowspan="2">Data provided; however, it was only the shapes and basic information. It was reviewed with the ABI GIS specialist to be able to do a limited interpretation</td><td rowspan="2">2017 and 2020 Nbal history data was available, however there was uncertainty of the accuracy and number of</td></tr>
<tr><td>2018/2021</td><td>Only the 2019/20 APO is available dated 21 September 2019.</td><td>2018/19 not available. Data was extrapolated as an average of the 3 other cycles: 2019/2020 and 2020/21</td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| | | | | follow ups are unclear. |

The exclusion of fire and fire data in the planning process is a vital missing link as discussed in section 2.4 and was not considered in the planning and strategising of the project. This is a strategic shortcoming. Comparing the data to the prioritisation as in the implementation plan of 2018 (Watson *et al*., 2018) as described in section 1.1 above found that despite the administrative challenges presented to them, they were able to maintain clearing within the parameters of the plan with very few exceptions.

The findings are that the project is following the correct principles as indicated in the project implementation plan namely:

**Species selection**

As the data did not include species, this is not possible to ascertain. The focus remained on these species throughout according to the APO, and numerous reports.

**Area/Site selection**

Conservation status of the NBALs cleared was evaluated by overlaying the NBAL history from 2018 onwards as it is registered on the DFFE, WIMS system, with the SANBI Critical Biodiversity Areas (CBAs) and Ecological support Area (ESA) layers. This revealed that only three NBALs lie outside of these areas. Of these, only one had received a treatment (two treatments) totaling 57 ha. Considering that the project NBALs cover 43 071 ha and that there are 529 NBALs, this number is almost irrelevant.

All three NBALs were in natural veld and at the head of a small water system, and all of them bordered on the CBAs and ESAs. There were some NBALs that overlapped outside of the CBA areas but this logical in terms of dealing with and entire property of an infestation. Thus, the criteria of selecting areas based on the conservation status (biodiversity) of the natural vegetation, and the contribution of the area to improve the health of water catchment systems (ecosystem function) was met.

**See Annexure H: Map 1: NBALs in relation to the CBAs' and ESAs' and the number of Follow-ups**

**Prioritisation of follow-up work:**

The trend indicates that in broad terms some NBALs were registered on the WIMS system as initial even though the previous project had cleared them, as is the norm in the WIMS system.

Using GIS data from 2018 onwards only provides an indication of where the project was in terms of following up on the APOs. It is understood that the project focused primarily on follow up and low-density areas with few or no adult plants, to maintain a low person day cost.

In summary the project seems to have done well from the available data in maintaining its gains and keeping it in the ecological parameters of the project. However, there were missed opportunities through the follow-up of burn scars and use of fire in an integrated manner to manage data. This is evident in the lack of veld age and burn scar data.

***Table 2 : Wage percentage of budget planned***

| **Financial Year** | **Budget** | **Wages** | **% Wages** |
|---|---|---|---|
| 2013/2014 | R6 222 096,56 | R3 764 368,42 | **60,50%** |
| 2014/2015 | R6 574 872,49 | R3 737 509,56 | **56,85%** |
| 2015/2016 | R5 872 096,44 | R3 688 100,15 | **62,81%** |
| 2016/2017 no funding | | | |
| 2017/2018 | R4 334 261,00 | R2 569 530,00 | **59,28%** |
| 2018/2019( estimate) | R3 907 400,50 | R2 569 530,00 | **65,76%** |
| 2019/2020 | R3 780 000,00 | **R2 735 317,83** | **72,36%** |
| 2020/2021 | R4 034 801,00 | **R2 735 317,83** | **67,79%** |
| **Total** | **R34 725 527,99** | **R21 799 673,79** | **62,78%** |

***Table 3: Number of treatments according to GIS Data 2018 to present***

| **Number of treatments according to GIS data 2018 to present** | | | | |
|---|---|---|---|---|
| | Number | % | Hectares | % |
| Total number NBALs | 529 | | 43072 | |
| NBALs treated | 84 | 16% | 6452 | 15% |
| No treatment | 445 | 84% | 36620 | 85% |
| One treatment | 52 | 10% | 4623 | 11% |
| Two treatments | 24 | 5% | 1414 | 3% |

| | | | | |
|---|---|---|---|---|
| Three Treatments | 8 | 2% | 415 | 1% |
| **NBALs that are active as per APO's** | | | | |
| NBALs treated | 84 | | 6452 | |
| One treatment | 52 | 62% | 4623 | 72% |
| Two treatments | 22 | 26% | 1314 | 20% |
| Three Treatments | 2 | 2% | 127 | 2% |

***Table10: Percentage Initial vs Follow-up hectares planned from APOs and budgets.***

| | | Area | | | % | % |
|---|---|---|---|---|---|---|
| **Deliverables** | | Initial Ha | FU HA | **Total HA** | Initial Ha | FU HA |
| Cycle 1 | **2013/2014** | 1758 | 26361,941 | **28120** | **6,25%** | **93,75%** |
| | **2014/2015** | 2313 | 27094 | **29407** | **7,86%** | **92,14%** |
| | **2015/2016** | 213 | 29578 | **29791** | **0,71%** | **99,29%** |
| No funding | **2017/2018** | | | | | |
| Cycle 2 | **2018/2019 (average of 2019-2021)** | 623 | 5223 | **5845** | **10,65%** | **89,35%** |
| | **2019/2020** | 1039 | 4655 | **5694** | **18,25%** | **81,75%** |
| | **2020/21** | 206 | 5790 | **5996** | **3,44%** | **96,56%** |
| **Total over period** | | 6151 | 98701 | 104853 | **5,87%** | **94,13%** |
| **Average over period** | | 1025 | 16450 | 17475 | **5,87%** | **94,13%** |

**Table 3: Project APO, Budget Summary, Planned Work**

| | | Cycle 1 | | | | One year funding | Cycle 2 | | | Total 2013-2021 | Average 2013-21 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deliverables** | | **2013/14** | **2014/15** | **2015/16** | **2016/17: No Funding** | **2017/18*** | **2018/19(Planned)** | **2019/20** | **2020/21** | | |
| Area | Initial Ha | 1758 | 2313 | 213 | | | 623 | 1039 | 206 | 6151 | 1025 |
| | FU HA | 26361,941 | 27094 | 29578 | | | 5223 | 4655 | 5790 | 98701 | 16450 |
| | **Total HA** | **28120** | **29407** | **29791** | | **12947** | **5845** | **5694** | **5996** | 117800 | 16829 |
| Training | Accredited | 51 | 567 | | | | 150 | 150 | 150 | 1069 | 153 |
| | Non-accredited | 168 | | | | | 669 | 688 | 650 | 2175 | 311 |
| | **Total** | **219** | **567** | **3469** | | **271** | **819** | **838** | **800** | 6983 | 998 |
| Persondays | PD Initial | 2220,778 | 21646 | 829 | | | 2928 | 4583 | 1272 | 33478 | 5580 |
| | PD FU | 34538,28864 | 33767 | 33862 | | | 10305 | 11347 | 9262 | 133080 | 22180 |
| | **PD Work** | **36759** | **55412** | **34691** | | **19202** | **13232** | **15930** | **10534** | **185760** | **26537** |
| | **Total PD** | **36978** | **55980** | **38160** | | **19473** | **14051** | **16768** | **11334** | **192744** | **27535** |
| | **FTE** | **370** | **560** | **382** | | **195** | **141** | **168** | **113** | **1927** | **275** |
| Finances/Wages | Cost pr pd | R184 | R192 | R169 | | R214 | R239 | R225 | R252 | | R211 |
| | Budget | R6 222 097 | R6 574 865 | R5 872 096 | | R4 334 261 | R3 907 401 | R3 780 000 | R4 034 801 | R34 725 520 | R4 960 789 |
| | Budget Wages | R3 764 368 | R3 737 510 | R3 688 100 | | R2 569 530 | R2 569 530 | R2 772 376 | R2 735 318 | R21 836 732 | R3 119 533 |
| | Transport | R218 613 | R824 231 | R1 259 208 | | R335 980 | R463 949 | R464 697 | R463 201 | R4 029 878 | R575 697 |
| Summary | **Persondays** | | | **131 118** | | **19473** | | | **42153** | **192744** | **27535** |
| | **Wages** | | | **R11 189 978** | | **R2 569 530** | | | **R8 077 224** | **R21 836 732** | **R3 119 533** |
| | **FTE Tl. 3 years** | | | **1 311** | | **195** | | | **422** | **1927** | **275** |
| | **Training days** | | | **4 255** | | **271** | | | | **6983** | **998** |
| | **Average FTE income value** | | | **R8 534** | | **R13 195** | | | **R19 162** | | **R11 329** |

*Table 4: Project Funding Summary*

| Budget | 2013-2016 | 2017-2018 | Current cycle 2018-2022 | | Totals from |
|---|---|---|---|---|---|
| | | | 2018-2020 | 2021-2022 | 2013 -2020 |
| Tot. | R18 666 289 | R3 780 00 | R 11 904 736 | | R27 877 732 |
| Budget | | | R 5 431 443 | R4 062 000 | |
| Co funding | R6 903 133 | R 358 310 | R437 250 | R438 780 | R7 698 693 |
| Man fee | | | R329 819 | R324 960 | R654 779 |
| Ha | 28 572 | 10 935 | 10 445 | 7 243 | 49 952 |
| Pd | 115 109 | 17182 | 17 544 | 14 626 | 149 835 |

**Key findings of APO, budget and GIS data review:**

- Mapping and special data collection prior to 2018 was appropriate for the parameters of the project at the time.
- However, in an ideal world it would have been advantageous to have started with a suitable mapping and information database at this stage to assist with planning, execution and monitoring.
- With the emigration to the standard WfW model, considerable work had to be done to change the data to the appropriate level. This further enabled improved strategic and tactical planning.
- Good verifiable data further assisted with project planning and funding applications.
- There is a discrepancy in anticipated standards of accuracy of the handheld GPS's that most implementers used, compared to the high accuracy mapping tool used by the WfW project. This is an unrealistic expectation from the WfW project.
- The mapping standard expected by WfW was unrealistic for an implementation agent the size and scale of the FVCT/ABI implementers and considerable capacity is required to be effective.

**Recommendations**

**Technical:**

- Remap the conservancies in detail and revise NBAL boundaries where applicable
- Establish the veracity of the correct use and standards of GPS that will enable the project implementers to work with multiple funders
- Training to all staff in basic GIS management
- With the relevant partners determine the format to be used (ArcView, Quantum GIS etc.)
- Investigate the recapture on GIS of the work done in 2013 to 2016.

**Strategic:**

- Good data is required to develop annual and strategic data. Considering that GIS is a spatial /data management tool, it is proposed that ABI houses the combined overarching data as far as departments and other implementers are concerned for the ABI work area
- Comply with the various department's standards, within reason
- ABI should in conjunction with its strategic partners in the landscape develop a GIS strategy and associated data management for the designated area (work area) to be able to make strategic and scientifically based decisions
- Create a data hub that could be provided to the relevant role players in the landscape in support of projects. It must be affordable, localised and reasonably priced (GIS experts from outside are very expensive)
- There should be a service provided by ABI to create a database/data repository that is compatible with the key outputs of the ABI and its partners and the landscape
- The position should be funded or should support a service provider
- Create data sharing agreements with the relevant partners and role players
- Create a system to track and monitor all clearing based on the WIMS system but that can cope with other funder's requirements
- Map the landscape into:
    - Biofuel opportunities
    - LandCare areas
    - WfW
    - Other parties
- Prioritise outputs for five years to enable long-term integration of projects.

The database must include:

- Fires/Veld age post fire
- Alien species, density, age and clearing history
- Sensitive areas
- Water-related data

- Conservation status
- Risk maps
- Terrain
- CBA and other environmental related datasets

**The role of ABI in data management**

- Intelligence gathering interpretation and preservation
- Facilitating the growth and development of a service provider to run the system
- Creating synergies between the parties to be able to assist in producing a multi-party annual plan of operations
- The project is a long-term project and data needs to be accessible and well maintained
- There must be an annual process to update information
- Gather and assimilate data into intelligence to assist in influencing the optimal activities in the landscape through science-based decision making
- Assist in providing sound data to all the role players and participants
- Use existing data to develop prioritisation plans funding requests and integrate planning of all departments and role players.

**Key mapping related findings by DEA:**

- It is important for both DEA and IA/LUIs (in this case Flower Valley Conservation Trust) to be accountable for clearing work completed to the WfW operational standards. This will enable a justifiable and auditable environment. The responsibility lies with the Project Management to ensure that work is completed according to the Working for Water standards and only quality work is approved and paid for.
- It is evident that the Project Management team were never infield to verify boundaries and desktop exercises were used to digitize the project polygons, therefore there is a consistent lack of coherence between what is infield versus the GPS polygons.
- There is a clear 18% trend based on the areas that have infestation growth less than 5%, and a 9% trend based on the inclusion of pond/dams or building structures in the polygons.

**Commented [HD2]:** HI Sabelo, not sure I understand this point.

**Mapping-related recommendations by DEA**

- An implementation plan is needed in focused areas with natural boundaries.
- Spatial data should be on the Water Information Management System (WIMS).
- Project polygons must be verified infield using GPS polygons and not be digitized on the desktop.
- Ploughed, cultivated lands, grazing lands, houses/building structures and dams must be excluded in the current FVCT polygons as they increase the size of the area. There is a need to remap the project.
- Contracts must be completed according to the boundaries submitted to DEA.

In April 2018 Esna Swart was appointed as a GIS specialist. **The data was then verified and converted to standards as accepted by the WfW programme for incorporation into the Water Implementation Management System (WIMS) as per the Project Verification Report of 2017, recommendations.** At this stage most old data was reviewed and included as far as possible in the new system and mapping started on a clean slate.

Key issues dealt with:

- Boundaries were aligned to cadastral boundaries and natural features, and rationalised
- Density data was resolved
- Clearing history was updated as far as possible
- Accuracy of the GPS is a key issue; agreement must be obtained as to the level of accuracy of the mapping required
- Infrastructure, category two species that are and are not to be cleared were not excluded

**Key findings of this report:**

- That the mapping and special data collection prior to 2018 was appropriate for the parameters of the project at the time.
- However, in and ideal world it would have been advantageous to have started with a suitable mapping and information database to assist with planning, execution and monitoring.
- With the emigration to the standard WfW model, considerable work had to be done to change the data to the appropriate level. This further enabled improved strategic and tactical planning.
- Good verifiable data further assists with project planning and funding applications.
- There is a discrepancy in anticipated standards of accuracy of the handheld GPS's that most implementers are using, compared to the high-accuracy mapping tool used by the WfW project. This is an unrealistic expectation.
- The mapping standards expected by WfW are unrealistic for an implementation agent of the size and scale of FVCT/ABI and considerable capacity is required to be effective and efficient.

## Review of GIS data quality

**Recommendations**

**Technical:**

- Remap the conservancies in detail and revise NBAL boundaries where applicable.
- Establish the veracity of the correct use and standards of GPS that will enable the project implementers to work with multiple funders.
- Training to all staff in basic GIS management.
- With the relevant partners determine the format to be used (ArcView , Q GIS etc.)
- Investigate the recapture on GIS of the work done in 2013 to 2016.

**Strategic:**

- Good data is required to develop annual and strategic data. Considering that GIS is a spatial/data management tool it is proposed that ABI houses the combined overarching data as far as departments and other implementers are concerned for the ABI work area.
- Comply to the various department's standards, within reason.

- ABI in conjunction with its strategic partners in the landscape should develop a GIS strategy and associated data management for the designated area (work area) to be able to make strategic and scientifically based decisions.
- Create a data hub that could be provided to the relevant role players in the landscape in support of projects. It must be affordable, localised and reasonably priced (GIS experts from outside are very expensive).
- There should be a service provided by ABI to create a database/data repository that is compatible with the key outputs of ABI, its partners and the landscape.
- The position should be funded or should support a service provider.
- Create data sharing agreements with the relevant partners and role players.
- Create a system to track and monitor all clearing  based on WIMS but that can cope with other funder's requirements.
- Map the landscape into:
    - Biofuel opportunities
    - LandCare areas
    - WfW
    - Other parties
- Prioritise outputs for five years to enable long-term integration of projects.

The database must include:

- Fires/Veld age post fire
- Alien species, density, age  and clearing history
- Sensitive areas
- Water-related data
- Conservation status
- Veld age post fire
- Risk maps
- Terrain
- CBA and other environmental related datasets

**The role of ABI:**

- Intelligence gathering interpretation and preservation
- Facilitating the growth and development of a service provider to run the system
- Creating synergies between the parties to be able to assist in producing a multi-party annual plan of operations

- The project is a long-term project and data needs to be accessible and well maintained
- There must be an annual process for updating information
- Gather and assimilate data into intelligence to assist with influencing optimal activities in the landscape through science-based decision making
- Assist in providing sound data to all the role players and participants
- Use existing data to develop prioritisation plans, funding requests and integrate planning of all departments and role players
- This is a reasonably-priced service for all role players if the ABI membership can share and collate data.

## Understanding GIS

**GIS as a spatial database**

**Analysis:**

Spatial analysis allows you to evaluate suitability and capability, estimate, and predict, interpret, and understand, and much more, lending new perspectives to your insight and decision-making.

**What is GIS?**

Geographic information system (GIS) is a system that creates, manages, analyses, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there). This provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships and geographic context. The benefits include improved communication and efficiency as well as better management and decision making.

**How is GIS used?**

Hundreds of thousands of organisations in virtually every field are using GIS to make maps that communicate, analyse, share information and solve complex problems around the world. This is changing the way the world works.

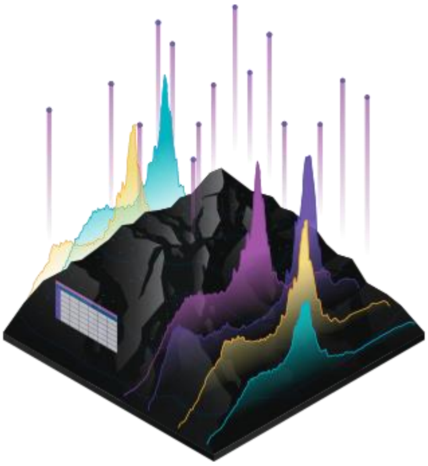
- Identify problems
- Monitor change
- Manage & respond to events
- Perform forecasting
- Set priorities
- Understand trends

**How Does GIS Work?**

GIS technology applies geographic science with tools for understanding and collaboration. It helps people reach a common goal: to gain actionable intelligence from all types of data.

**Maps**

Maps are the geographic container for the data layers and analytics you want to work with. GIS maps are easily shared and embedded in apps, and accessible by virtually everyone, everywhere.



**Data:**

GIS integrates many kinds of data layers using spatial location. Most data has a geographic component. GIS data includes imagery, features and basemaps linked to spreadsheets and tables.