

Golder Associates Africa (Pty) Ltd
Reg. No. 2002/007104/07

JOHANNESBURG
PO Box 6001 Halfway House 1685
South Africa
Thandanani Park, Matuka Close
Halfway Gardens, Midrand
Tel + (27) 011 254-4800
Fax + (27) 011 315-0317
<http://www.golder.com>



REPORT ON

FINAL SITE EVALUATION REPORT TO INFORM THE TAILINGS STORAGE FACILITY (TSF) SITE SELECTION PROCESS AT HARMONY GOLD MINES, WELKOM

Report No: 8788-8907-40

Submitted to:

Harmony Gold Ltd
P O Box 2
Randfontein
1760

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31 January 2008

8788-8907-40

Directors : FR Sutherland, AM van Niekerk, SAP Brown, L Greyling, SM Manyaka



LOCAL OFFICES IN DURBAN, FLORIDA, JOHANNESBURG, KIMBERLEY, PIETERMARITZBURG AND PRETORIA
GOLDER COMPANIES LOCATED IN GHANA, MOZAMBIQUE, ASIA, OCEANIA, EUROPE, NORTH AMERICA, SOUTH AMERICA

EXECUTIVE SUMMARY

Harmony Gold Mining Company Limited commissioned Golder Associates Africa to undertake a site selection process to inform the Environmental Impact Assessment (EIA) of possible impacts and positioning of a new Tailings Storage Facility (TSF) within the Welkom region.

A Steering Committee with a diverse representation, including regulators, was established. The idea being that this committee would guide the site selection process, through the provision of relevant and updated information. Three Steering Committee meetings were held in total. At the first two meetings, four sites were selected as potential options upon which to construct the new tailings facility (report number 8788/10160/12/E):

Site 1: Rietpan (farm Rietpan 17) – now called Nooitgedacht

Site 2: St Helena (farm St Helena 42)

Site 3: Stuurmanspan (farm Stuurmanspan 92)

Site 4: La Riviera (farm La Riviera 289).

Additionally, following initial engineering design, it was requested that two potential sites favoured from an engineering perspective (Dankbaarpan and Free State North 5) also be evaluated as part of the site selection process.

Consequently, a third, and final, Steering Committee meeting was convened on the 25 October 2007 where the above six sites were revisited. During which the previous site selection findings were discussed and an optimal site selected.

Nooitgedacht was agreed upon as the preferred site for the TSF (as agreed by the Steering Committee). The proposed footprint is largely brownfields with a partial greenfields take. There are existing tailings facilities in the vicinity which may provide the opportunity for additional disposal. The resultant negative impacts on agriculture and ecosystems are considered to be negligible, but outweighed by the positive attributes of the site.

Stuurmanspan is the next preferred site. It is a brownfields site, which has already been impacted on by tailings facilities (namely Free State South 6, 7 and 8). There is also expected to be no additional impact on agricultural productivity.

Dankbaarpan was considered by the Steering Committee as fatally flawed, due to the potential impacts on the pan. The Steering Committee also indicated that Free State North 5 was too close to residential areas to be considered as a potential Tailings Storage Facility (TSF) site. Therefore these two sites were excluded from further assessment.

Following discussions, in order of preference, the sites for the TSF are:

1. Nooitgedacht,
2. Stuurmanspan,
3. La Riviera,
4. St Helena,
5. North 5 (excluded from further assessment) and
6. Dankbaarpan (fatally flawed).

TABLE OF CONTENTS

SECTION	PAGE
1	INTRODUCTION..... 1
1.1	Structure of this report 1
2	ASSESSMENT OF SITE OPTIONS 3
3	RESULTS OF ASSESSMENT 3
3.1	Site Options Assessment..... 5
3.1.1	Site option 1: Nooitgedacht 5
3.1.2	Site option 2: Stuurmanspan area..... 6
3.1.3	Site option 3: La Riviera..... 6
3.1.4	Site option 4: St Helena 6
3.1.5	Site option 5: Free State North 5..... 7
3.1.6	Site option 6: Dankbaarpan..... 7
4	CONCLUSION 7

LIST OF FIGURES

Figure 1:	Locality map of the six sites 2
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LIST OF TABLES

Table 1:	Overview of assessment of site options against sustainability criteria..... 4
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LIST OF APPENDICES

Appendix A	Minutes of meeting and Attendance register
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1 INTRODUCTION

Harmony Gold Mining Company Limited commissioned Golder Associates Africa to undertake a site selection process to inform the Environmental Impact Assessment (EIA) of possible impacts associated with a new Tailings Storage Facility (TSF) within the Welkom region. This report is the follow-up report to the initial SEA report (with report number 8788/10160/12/E) which sets out the initial approach.

Three Steering Committee meetings were undertaken in total. At the first two meetings, four sites were selected as evident in report number 8788/10160/12/E. This resulted in preferential areas identified for consideration, and ultimately resulted in the selection of the four potential sites for further evaluation (in no preferential order):

Site 1: Rietpan (farm Rietpan 17) – now called Nooitgedacht

Site 2: St Helena (farm St Helena 42)

Site 3: Stuurmanspan (farm Stuurmanspan 92)

Site 4: La Riviera (farm La Riviera 289).

In addition, following initial engineering design, it was requested that two potential sites favoured from an engineering perspective (Dankbaarpan and Free State North 5) also be evaluated as part of the site selection process.

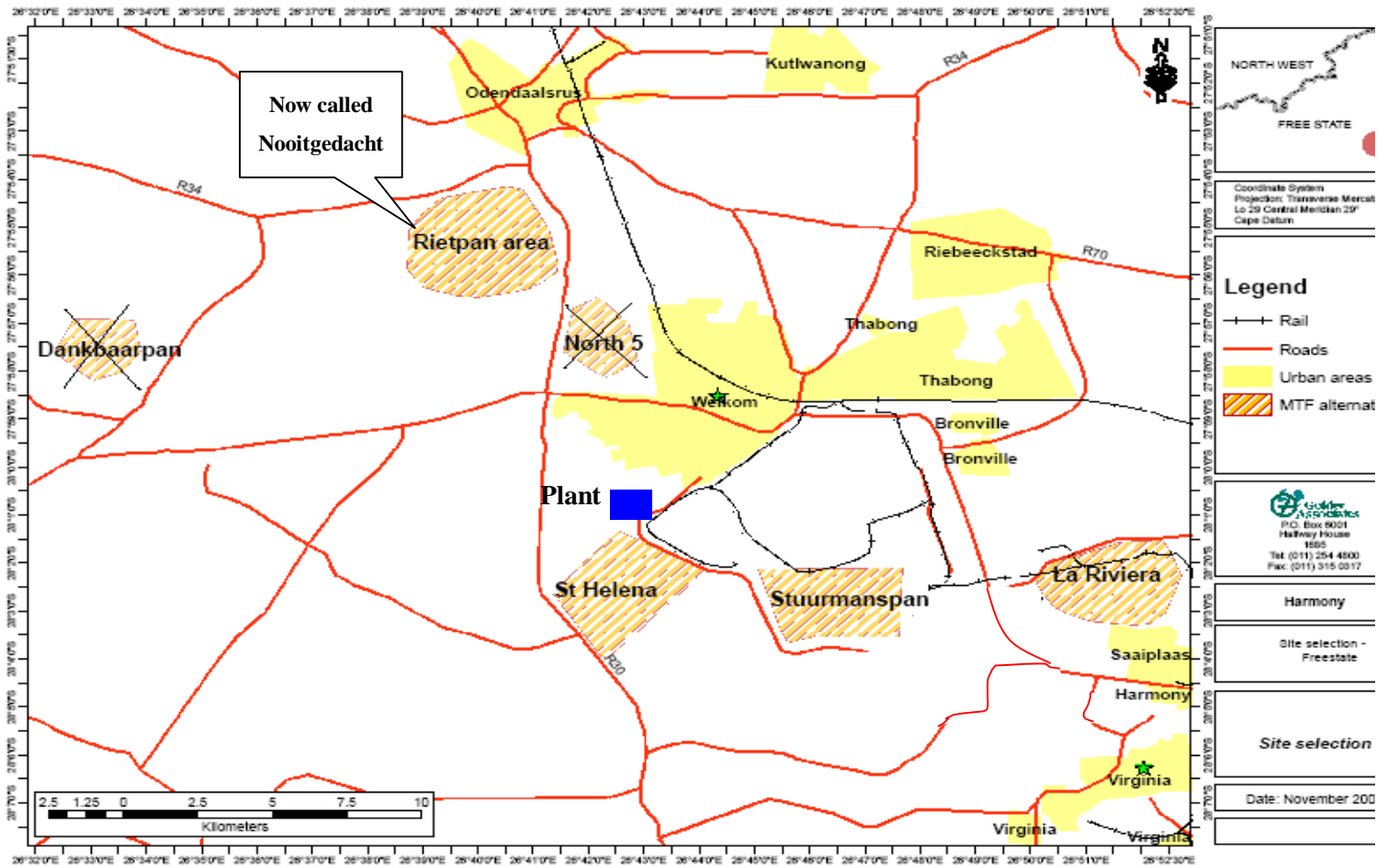
Therefore, a third, and final, Steering Committee meeting was convened on the 25 October 2007 through which the above six sites were revisited (see Figure 1), and during which the previous site selection findings were discussed and an optimal site selected.

1.1 Structure of this report

The structure of this report is as follows:

- **Section 2: Outline of the site selection approach**
- **Section 3: Summary of the key results of the assessment**
- **Section 4: Conclusion**

Figure 1: Locality map of the six sites



2 ASSESSMENT OF SITE OPTIONS

During the third Steering Committee meeting (25 October 2007) spatial and contextual information pertaining to the six sites was presented to the Committee. Using background knowledge from the previous Steering Committee meetings, and personal expertise, the committee discussed the suitability of each site to accommodate a tailings facility against a number of previously determined themes (Report 8788/10160/12/E). Professional judgement was used in determining the site, but not all themes were considered equal, those with the potential to result in a fatal flaw or significant impact were given higher priority (e.g. impacts to water). Where sites were considered fatally flawed by the Steering Committee, these were no longer considered as an option.

3 RESULTS OF ASSESSMENT

The final results of the site selection process, following the third Steering Committee meeting, included the strategic assessment and the site options assessment. The results in this report differs from the original SEA report as more information came to light as additional steer committee members attended the 3rd meeting. These are detailed below.

Table 1: Overview of assessment of site options against sustainability criteria

Preferred site (least - impact)

Intermediate site

Worst performing site (most - impact)

Sustainability	Sites						
	Nooitgedacht	St Helena	Stuurmanspan	La Riviera	Dankbaarpan		
Biophysical							
Air Quality	C	B	B	A	Fatally Flawed	Site excluded from further assessment	
Agricultural Productivity	A	B	B	C			
Water Quantity	A	B	A	B			
Water Quality	A	B	A	B			
Ecosystem Productivity	A	C	B	B			
Species Diversity	A	B	B	B			
Social							
Poverty Levels	A	B	B	B	Fatally Flawed	Site excluded from further assessment	
Equal Opportunity	A	A	A	A			
Living Conditions	A	B	B	B			
Health	B	B	B	B			
Health & safety at work	B	B	B	B			
Education	B	B	B	B			
Infrastructure use	A	A	A	A			
Crime	B	B	B	B			
Cultural Heritage	A	C	A	A			
Economic							
Economic	B	B	B	B	Fatally Flawed	Site excluded from further assessment	
Economic Performance	B	B	B	B			
Level of trade	B	B	B	B			
SMME Status	B	B	B	B			
Energy efficiency & waste management	B	A	A	B			
Ranking							
A	10	3	6	4			
B	9	15	14	15			
C	1	2	0	1			

In differentiating the sites, the outcomes from a socio-economic perspective were largely equal. Consequently, the ultimate selection of the sites was primarily influenced by the potential impacts on the environment. However, living conditions, community health and cultural heritage did contribute to the selection process.

In line with the 10 key themes (Table 1 from the SEA report), wind direction was taken into account as an influence on air quality, as well as brownfield sites to limit greenfield land take, which could impact on agriculture or ecosystem function. Proximity to the Sand River and clean water systems were also considered for potential impacts on water quality and quantity.

In order of preference, as apparent from Table 1, the selected sites for the TSF are:

1	2	3	4	5	6
Nooitgedacht	Stuurmanspan	La Riviera	St Helena	North 5 (Excluded for further assessment)	Dankbaarpan (Fatally flawed)

3.1 Site Options Assessment

Each of the six sites were assessed in relation to their location and likely impacts, as well as proximity to the tailings processing plant (see **Figure 1**). Engineering factors were also considered in the site selection process which influenced the final decision on a site location. The outcome of the detailed site assessment of each site is summarised below.

3.1.1 Site option 1: Nooitgedacht

Although Nooitgedacht (see **Figure 1**) was the fourth ranked site in the previous round of the site selection process, the Steering Committee was in favour of this site as the ideal position for a tailings facility. In terms of the water quantity and quality themes which were rated as “poor” in the SEA report, the DWAF mentioned that this site is actually more suitable for this purpose than the other candidate sites as it is not located close to a major water source.

The proposed footprint is largely brownfields with a partial greenfields take. There are existing tailings facilities in the vicinity of this site of which the footprints may be considered for disposal of tailings. It was indicated that this area has low agricultural potential resulting in a lower land value than elsewhere in the Welkom vicinity. Therefore resultant negative impacts on agriculture and ecosystem are considered to be negligible. The site performs favourably from a water quality perspective in that it is situated a significant distance from the Sand River and is unlikely to impact on any clean water systems. This option was also supported in terms of an engineering perspective.

Situated to the North West of Welkom, the prevalent winds may transport dust across the main residential areas, however mitigation measures to suppress dust will be identified in the EIA. The

Sungazer Lizard (*Cordylus giganteus*) a red data species, is known to reside in close proximity to the existing tailings facilities and activities associated with the proposed TSF are likely to impact upon this species. However, these lizards were previously re-located from another site and a similar process is expected to be followed to relocate them once more.

3.1.2 Site option 2: Stuurmanspan area

This site (see **Figure 1**) is the second choice site. Stuurmanspan is a brownfield site, which has already been impacted by tailings facilities (namely Free State South 6, 7 and 8). Therefore there is expected to be no additional impact on agricultural productivity. Previously a drainage canal passed through this site, which is now heavily impacted on by mining and has resulted in the ponding of polluted water. The availability of this dirty water will support the tailings re-processing and may provide an opportunity to improve its quality through treatment and re-use. The Stuurmanspan area is in close proximity to water resources from which water management will take place (the so called 12 ABC system) and the proposed processing plant. Energy use associated with pumping tailings and water to and from this site will therefore be relatively low in comparison to energy use at the other sites. Stuurmanspan has limited residential areas surrounding it, limiting the potential impacts of dust, noise and visual intrusion on the living conditions of neighbouring population.

The site performs poorly from an ecosystem productivity perspective, as it is in close proximity to a mine-induced artificial wetland. However, this wetland is not of high value, since it is anthropogenic and due to the polluted nature of the surroundings and the water quality itself. Local winds blow in a North-Westerly direction which may blow dust across the northern parts of Virginia. The impact assessment will need to address these aspects in more detail and suggest mitigation measures if this site is to be taken forward into the EIA.

3.1.3 Site option 3: La Riviera

La Riviera (see **Figure 1**) situated to the South East of Welkom/Thabong is likely to have the least impact on air quality, particularly wind blown dust. Prevalent wind directions are likely to blow dust to the West and away from the main residential areas.

The majority of the site is brownfields (approximately 50%); however land take will include a portion of prime agricultural land to the south west used for grazing and crop farming. La Riviera is in close proximity to the urban areas of Saaiplaas and Harmony, and the resultant impacts on living conditions of these areas will need to be addressed in any subsequent environmental assessment process.

3.1.4 Site option 4: St Helena

St Helena (see **Figure 1**) has approximately 40% of the proposed footprint impacted and therefore the site scores poorly from an ecosystem perspective due to Greenfield land take. Additionally, certain areas are developing wetland characteristics due to the impoundment of water, which may increase the ecosystem potential in the future. Historically the area was used for grazing and cropping, and the

remaining 60% of the site is used for agriculture, which would be lost should this be the selected site. St Helena has cultural/historical importance in that it was the first gold mine in the Free State area (Eerstemyn); the area has been earmarked for a tourism development associated with these historical aspects.

3.1.5 Site option 5: Free State North 5

North 5 (see **Figure 1**) was evaluated as a site for the TSF; however its proximity to residential areas (approximately 200m) excluded this site from the selection process.

3.1.6 Site option 6: Dankbaarpan

Dankbaarpan (see **Figure 1**) was immediately fatally flawed by the Department of Water Affairs and Forestry due to it being situated directly on a pan. This option was not evaluated further.

4 CONCLUSION

The quality of surface and ground water is a contentious issue in all six areas under consideration. At St. Helena, the Stuurmanspan area and La Riviera the Sand River flows to the south, and the Mahemspruit which is already heavily polluted flows to the south of Nooitgedacht. Further studies need to be undertaken on water quality and the impacts the selected site might have on the water regime. It is a prerequisite of Department of Water Affairs and Forestry (DWAF) that any new tailings facility have a liner system before they give permission for construction. However, in the Nooitgedacht area it was agreed that an alternative engineered option may be considered i.e. herring bone system, clay liner etc. and additional studies contained in the EIA should address these.

The site selection process, although limited by available information, provides the basis upon which the preferred site can be reasonably determined. Nooitgedacht site (the preferred option) will be further assessed during the subsequent environmental impact assessment (EIA) to ascertain if any fatal flaws exist, should this be the case this site selection process will be revisited and the next best option taken forward. Information gathered during the site selection process will inform the EIA and highlight areas for consideration and mitigation.

GOLDER ASSOCIATES AFRICA (PTY) LTD

Pieter de Villiers

Nigel Beck

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APPENDIX A



JOHANNESBURG
PO Box 6001 Halfway House 1685
South Africa
Thandanani Park, Matuka Close
Halfway Gardens, Midrand
Tel + (27) 011 254-4800
Fax + (27) 011 315-0317
<http://www.golder.com>

Harmony Gold Mining Ltd
SEA/EMF AS PART OF HARMONY WELKOM MEGA TAILINGS FACILITY (MTF)
SITE SELECTION PROCESS
THIRD PROJECT STEERING COMMITTEE MEETING
Date: 25 October 2007; Venue: Harmony Boardroom, Virginia
Project No : 8788

			ACTION
1.	Present		
	Nigel Beck	Golder Associates	NB
	Pieter de Villiers	Golder Associates	PdV
	Mari Prinsloo	Golder Associates	MP
	Phildrè Lotter	Golder Associates	
	Debbie Benson	Harmony Gold	DB
	Johann Mouton	Harmony Gold	
	Lebohang Shabe	Harmony Gold	
	Gerrit Weideman	Harmony: Property	GW
	Hennie Greyvenstein	Harmony: Radiation	
	Ross Cooper	Jones and Wagner	RC
	Stoney Steenkamp	Sedibeng Water	SS
	Willerm Grobler	DWAF: Free State	WG
	Gibson Tshisikhawe	DME: Welkom	
	Johan Zeelie	Department of Agriculture (National)	JZ
	Koos Duvenhage	Matjhabeng Local Municipality (Town Planning)	KD
	George Manzini:	Matjhabeng Local Municipality (Town Planning)	
	Ian Auret	FGF Business Chamber	IA
	Lennox Long	Agri 24: Welkom	LL
	Tranzer Mtebele	Lejweleputswa Development Agency (LDA)	
	Notes of Proceedings:		
2.	Welcome and Objectives		
	NB welcomed everyone present and explained the objectives of the meeting.		
	PdV provided feedback on the SEA process thus far.		
3.	Discussion		
3.1	Consideration of Dankbaar pan as MTF site alternative:		

		ACTION
	Dankbaar pan is a natural pan and a water resource. The proposal to construct the MTF on the pan is fatally flawed and the Department will not even consider it as an option. - WG, DWAF recommendation	
	NB and JM acknowledged this comment and indicated that Dankbaar pan will not be considered as a MTF option any more.	
3.2	Consideration of the SEA Site 1 as MTF site alternative:	
3.2	DB proposed that the <i>SEA Site 1 area and the farms to the west of it</i> , especially the Farms Jacobsdal, Goedgedacht and Nooigedacht, should be considered for the MTF site. 'Rietpan area' on attached map.	
	It will be possible to once more relocated the sungazer colony previously relocated from Dankbaar pan to Nooitgedacht. - DB	
	Future urban development is planned for the area east of the railway line between Odendaalsrus and Welkom. - KD	
	Future industrial development is also planned for the area west of the railway line between Welkom and Odendaalsrus , i.e. between the railway line and the R30 public road. - KD	
	<p>Pro's of Site 1 / area to the west ('Rietpan area')</p> <ul style="list-style-type: none"> • Far from rivers such as Sand river - WG • Not good agricultural land, at best grazing land – LL, JZ, WG • Considered to have reasonable geology (Karoo) - WG • RC indicated that given limited information it could be technically feasible and that it is probably the technically preferred site • The farmers in this area will probably sell their farms for the right price - JZ • No water servitudes are located on this site. Pipelines follow the Wesselsbron road – SS • Located approximately 11 to 15 km from the St Helena plant, which counts in its favour – DB <p>Con's of Site 1 / area to the west ('Rietpan area')</p> <ul style="list-style-type: none"> • Wind direction • Some small pans in the area need to be considered - WG • Involves property purchase (so does current Sites 2 and 4) – DB, GW 	Technical feasibility to be confirmed in further work.
	An alternative site was suggested to the southwest of Site 1 and this was supported by all present. It could mean that Site 1 itself is moved or that the geometry is changed to fall within farm boundaries. 'Rietpan area' on attached map.	
	By moving the MTF site a little southwest from Site 1 ('Rietpan area'), it will be further away from the proposed residential and industrial developments. – WG	
3.3	RC identified <i>two alternative MTF sites</i> ('Merriespruit Dams 4A and 4B) on the farms Video and La Riviera, situated between the SEA Sites 3 ('Stuurmanspan') and 4 ('La Riviera').	
	This proposal was considered fatally flawed based on proximity and drainage to the Sand river. - WG	
3.4	Why don't Harmony consider <i>using previous tailing dam footprints</i> , in stead of creating a MTF? - WG	
	This is being considered as a motivation for the project, but more than one dams are more expensive than one big dam and are also more onerous to manage from an environmental and closure perspective. - RC	

		ACTION
	Tailings dams North 4, Free State North 1, Free State North 2 and Free State North 3 only provides adequate space for tailings from St Helena, but not from Saaiplaas and other current operations which will be out of tailings capacity in years to come. - RC	
	Harmony will need the capacity of a MTF in future. - JM	
	The option exists to split gold and uranium-rich tailings. Smaller footprints such as North 4, 5 and St Helena 1, 2 and 3 could be considered for storage of Uranium rich tailings in order to ensure that these tailings are not sterilised by mixing it with the barren gold tailings. This is part of the technical consideration. - RC	
	Another potentially viable alternative for technical consideration, with some further footprint expansion on this site, would be SEA Site 2. - RC	
3.6	Consideration of the North 5 tailings dam as MTF site alternative	
	<p>North 5</p> <p>Pro's</p> <ul style="list-style-type: none"> • Could consider as additional footprint if more deposition land is needed – DB • Reusing existing footprints is opportunity for mine to fund the rehabilitation of the footprint out of production costs – WG • This area has no agricultural potential – JZ • A well-managed slimes dam creates less dust than a open moonscape (i.e. reclaimed footprint) - WG <p>Con's</p> <ul style="list-style-type: none"> • Will have to be lined after area is cleaned and prior to new tailings deposition (a clay lining might be appropriate) – WG • Appropriate management (cut-off trenches etc.) to manage water run-off / drainage to Mahemspruit will have to be considered - WG • Possible sale of mine property in close proximity and impact of this - DB • Residential areas are located approximately 200 m from this site – DB, RC • Reusing existing footprints is not an economically feasible option – JM 	
3.3	Harmony should stay away from areas with high agricultural potential, since this is where land is more expensive. - IA	
	<p>Cost of land in the area (LL, JZ)</p> <ul style="list-style-type: none"> • Arable land – R 27,000.00 / ha (eg. Near Bultfontein) • Grazing – R 12,000.00 / ha (eg. Near SEA Site 1) 	Note
3.4	It was proposed that the SEA Site 3 ('Stuurmanspan') should be considered as an option 2. - MP	
	Stuurmans pan is not technically feasible. - RC	
3.5	DWAF's best practice guidelines for tailings dams is now available (not officially published yet). WG will forward it to DB.	Note
4	Conclusion	
4.1	All present indicated they are comfortable with the 'Rietpan area' (or the area to the west / south-west of this site) as the new preferred MTF site. This site will be taken forward in the technical investigations. - NB	

		ACTION
	All agreed that a site visit should be arranged to the SEA Site 1 with all present as soon as further technical work has confirmed suitability of this site.	Golder to arrange after technical outcome

DATE: 25 October 2007

SIGNATURE:

GOLDER ASSOCIATES AFRICA (PTY) LTD

MP

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Coordinate System
 Projection: Geographic
 MGRS: 34

Legend

- Site alternatives
- Free State Harmony fallings dams

Grey scale showing:

- Population >200
- Urban areas
- Inland water
- Fauna
- Geology
- Land cover (urban, commercial & industrial)
- Sand river

Golden Associates
 P.O. Box 6001
 Hatfield House
 1695
 Tel: (011) 254 4900
 Fax: (011) 315 0317

Harmony

Harmony Free State EMF

Date: November 2007

Grey scale

