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**DER BROCHEN PROJECT GROUNDWATER
MONITORING PROGRAMME REVIEW AND PROPOSED AMENDMENT**

1. BACKGROUND

As part of the Der Brochen Project's PFS-B study, Delta H is tasked with the consolidation of the groundwater monitoring programme in addition to the collation of groundwater uses (wellfields) that applies to the Der Brochen Project. The dewatering and abstraction sources with volumes to inform the Water Use License Application (WULA) will be listed in the Der Brochen and Mototolo Consolidation Section 21 Water Use spreadsheet. This technical memo will cover the review and update of the groundwater monitoring points to be added to the 2018/2019 WULA. This memo is a DRAFT version for review until the detailed Hydrogeological Study is finalised in November.

The initial groundwater monitoring points listed in Table 7 of the April 2011 WUL (16/2/7/8400/C100/1) related to the Richmond and Helena wellfields (Table 1-1). Specification to the frequency of monitoring was not set specific for the list. The updated WUL of March 2016 (04/841G/CI/4141) included the Helena Tailings Storage Facility (TSF) monitoring boreholes (Table 5 of WUL) with a specified quarterly sampling/analysis frequency (Table 1-2). The amendment of WUL April 2011 issued in May 2016 (B07224) substituted (WUL Table 7) with the reduced number of monitoring points and specified monitoring type (i.e. water level or quality) (Table 1-3) for the Richmond and Helena wellfields. The recent Water Use License (WUL) of May 2017 (License Number: 06/B41G/ABFGGIJ/5329) included a number of new points (Table 8 of the WUL) based on the Environmental Impact Assessments (EIA) for the Der Brochen Project in 2014. The list comprises of 80 existing boreholes and 10 proposed boreholes to monitor future authorised infrastructure (i.e. open cast and Mareesburg TSF) (Table 1-4) and shown spatially in Figure 1. In the interim, more detailed hydrogeological studies for the future Mareesburg TSF and the existing Helena TSF in addition to the wellfield yield verification assessment as part of the PFS-A study became available to inform the updated monitoring list.

Table 1-1. Groundwater monitoring points listed in the April 2011 WUL (Table 7).

WUL_ID	Locality/Description
RMGW04	Richmond Farm 370 KT
RMGW07	
RMGW08	
RMGW10	
RMGW28	
RMGW48	
RMGW58	
RMGW59	
RMGW60	
HEGW04	Helena Farm 6 JT
HEGW015	
HEGW23	
HEGW25	
HEGW29	
HEGW31	
HEGW34	
HEGW38	

Table 1-2. Groundwater monitoring points listed in the March 2016 WUL (Table 5).

Site ID	Lat	Long	Location
MBH1	-25.0112	30.11668	Down gradient of Return Water Dam A
MBH2	-25.0112	30.11692	
MBH3	-25.0214	30.11663	Down gradient of Return Water Dam B
MBH4	-25.011	30.11851	Down gradient of Return Water Dam A
MBH5	-25.0217	30.11804	Down gradient of Return Water Dam B
MBH6	-25.0093	30.117	Down gradient of Pollution Control Dam and TSF
MBH7R	-25.011	30.111	Up-gradient of TSF (south-west)
MBH8	-25.013	30.116	Down-gradient of TSF (east)
MBH9	-25.018	30.117	
MBH10	-25.019	30.119	Down-gradient of TSF, near to N-S dyke
MBH11	-25.023	30.112	Up-gradient of TSF (south-west)

Table 1-3. Groundwater monitoring points listed in the May 2016 WUL (2011) amendment (Table 7).

WUL_ID	Locality/Description	Quality, Rest water level (RWL)	X-coordinate	Y-coordinate
RMGW07	Richmond Farm 370 KT	RWL	-24.98441	30.08236
RMGW08		RWL	-24.97797	30.08724
RMGW28		RWL	-24.98666	30.08089
RMGW38		RWL/Quality	-24.9857	30.08094
RMGW48		RWL	-24.98841	30.08011
RMGW51		RWL/Quality	-24.9966	30.0772
RMGW59		RWL	-24.9923	30.07978
RMGW60		RWL	-24.9947	30.07887
HEGW15	Helena Farm 6 JT	RWL/Quality	-25.02566	30.12013
HEGW31		RWL	-25.04145	30.11988
HEGW34		RWL	-25.04022	30.11958
HEGW51		RWL/Quality	-24.9966	30.0772

Table 1-4. Groundwater monitoring points listed in the 2017 WUL (Table 8) for the Der Brochen project.

SITE ID	WUL_ID	Longitude	Latitude	Locality/Description
HEGW02-01	HEGW01	30.11547	-25.02470	Helena Farm 6 JT
HEGW02-14	HEGW14	30.11994	-25.02537	
HEGW02-15	HEGW15	30.12014	-25.02566	
HEGW02-19	HEGW19	30.11766	-25.03261	
HEGW02-20	HEGW20	30.11769	-25.03407	
HEGW02-21	HEGW21	30.11969	-25.04128	
HEGW02-31	HEGW31	30.11989	-25.04146	
HEGW02-32	HEGW32	30.11954	-25.04000	
HEGW02-34	HEGW34	30.11935	-25.04013	
HEGW51		30.11905	-25.03487	East of the South Pit and Helena Well Fields, downstream of HEGW 63 along Groot Dwars on the Helena Farm 6 JT
HEGW53		30.11853	-25.03207	Helena Well Fields, East of North Pit, downstream of HEGW 51 along Groot Dwars on the Helena Farm 6 JT
HEGW54		30.11996	-25.04051	
HEGW60		30.12066	-25.03167	East of Groot Dwars and Helena Wellfields on the Helena Farm 6 JT
HEGW61		30.12041	-25.03017	
HEGW63		30.12007	-25.03689	Downstream of HEGW66 near Groot Dwars, east of South Pit and Office Block on Helena Farm 6 JT
HEGW66		30.12073	-25.02434	Downstream of HEGW97 along Groot Dwars, east of South Pit on Helena Farm 6 JT
HEGW69		30.12033	-25.02490	Downstream of HEGW61 along Groot Dwars on the Helena Farm 6 JT
HEGW90		30.11500	-25.02608	East of the North Pit on the Helena Farm 6 JT
HEGW93		30.11775	-25.03005	
HEGW94		30.11588	-25.02650	
HEGW97		30.11962	-25.04246	Upstream of South Open Pit near Groot Dwars on Helena Farm 6 JT
HEGW98		30.11994	-25.04439	Helena Farm 6 JT
HEGW103		30.12697	-25.00417	Groot Dwars upstream of G_Drs3 and downstream of G_Drs5 on Helena Farm 6 JT
RMGW 07		30.08239	-24.98441	Richmond Farm 370 KT
RMGW 08		30.08725	-24.97797	East of Richmond Well Field on the Richmond Farm 370 KT
RMGW 09		30.08359	-24.98226	Richmond Well Field on the Richmond Farm 370 KT
RMGW 20		30.08236	-24.98425	Richmond Farm 370 KT
RMGW 21		30.08233	-24.98437	

Continue...

SITE ID	WUL_ID	Longitude	Latitude	Locality/Description
RMGW 23		30.08182	-24.98296	Richmond Well Field on the Richmond Farm 370 KT
RMGW 24		30.08179	-24.98300	
RMGW 25		30.08189	-24.98306	
RMGW 26		30.08046	-24.99022	East of Richmond Well Field on the Richmond Farm 370 KT
RMGW 27		30.08087	-24.98676	Richmond Farm 370 KT
RMGW 28		30.08092	-24.98669	
RMGW 30		30.08167	-24.98594	Richmond Well Field on the Richmond Farm 370 KT
RMGW 31		30.08163	-24.98594	Richmond Farm 370 KT
RMGW 32		30.08387	-24.98047	Richmond Well Field on the Richmond Farm 370 KT
RMGW 33		30.08377	-24.98052	
RMGW 34		30.08365	-24.98039	
RMGW 35		30.08567	-24.97597	
RMGW 36		30.08571	-24.97606	
RMGW 37		30.08092	-24.98573	Richmond Farm 370 KT
RMGW 38		30.08094	-24.98568	
RMGW 40		30.08131	-24.98450	Richmond Well Field on the Richmond Farm 370 KT
RMGW 41		30.08273	-24.98197	Richmond Farm 370 KT
RMGW 42		30.08310	-24.97948	
RMGW 43		30.08375	-24.97722	
RMGW 44		30.08564	-24.97493	
RMGW 45		30.08678	-24.97211	
RMGW 46		30.08705	-24.97218	
RMGW 47		30.08412	-24.97831	Richmond Well Field on the Richmond Farm 370 KT
RMGW 48		30.08012	-24.98842	Richmond Farm 370 KT
RMGW 49		30.07904	-24.99093	Richmond Well Field on the Richmond Farm 370 KT
RMGW 50		30.07808	-24.99355	
RMGW 51		30.07720	-24.99661	Richmond Farm 370 KT
RMGW 52		30.07615	-24.99914	
RMGW 53		30.07565	-25.00208	
RMGW 54		30.07436	-25.00430	
RMGW 56		30.08835	-24.97466	East of Richmond Well Field on the Richmond Farm 370 KT
RMGW 57		30.07825	-24.99423	Richmond Well Field on the Richmond Farm 370 KT
RMGW 59		30.07978	-24.99239	Richmond Farm 370 KT
RMGW 60		30.07888	-24.99479	
RMGW 62		30.07672	-25.00061	Richmond Well Field on the Richmond Farm 370 KT
RMGW 67		30.07554	-25.00492	
RMGW 68		30.08104	-24.98509	
RMGW 69		30.07841	-24.99278	
RMGW 70		30.07201	-25.01177	Downstream of K_Drs1 on the Richmond Farm 370 KT
DB-BH07		30.12030	-25.04650	Existing monitoring points associated with the Der Brochen Open Pit areas (North & South) on Helena Farm 6 JT
HEGW02-03	HEGW03	30.11762	-25.02346	
HEGW02-23	HEGW23	30.11566	-25.02264	
HEGW02-27	HEGW27	30.12022	-25.02763	
HEGW02-28	HEGW28	30.11720	-25.03269	
HEGW76		30.11663	-25.02201	
HEGW88		30.11947	-25.02287	Existing monitoring points to be associated with the Mareesburg TSF and RWD Complex on the farm Mareesburg 8
MBGW03		30.14283	-25.00460	
MBGW15		30.14189	-25.01207	
HEGW02-40	HEGW40	30.14470	-25.01541	
MBGW10		30.14511	-25.01655	
MBGW01		30.14967	-25.00758	Monitoring points to be associated with the Der Brochen Open Pit areas (North & South) on Helena Farm 6 JT
MBGW14		30.14446	-25.01948	
DB-BH10		Not Drilled	Monitoring points to be associated with the Der Brochen Open Pit areas (North & South) on Helena Farm 6 JT	
DB-BH11				
DB-BH12				
DB-BH13				
DB-BH14				
MB-BH1			Monitoring points to be associated with the Mareesburg TSF and RWD Complex on the farm Mareesburg 8 JT.	
MB-BH2				
MB-BH3				
MB-BH4				
MB-BH5				
MB-BH6				



Figure 1. Spatial location of the Der Brochen groundwater monitoring points, based on the WUL (May 2017).

2. CURRENT GROUNDWATER MONITORING (GCS, 2018)

The groundwater monitoring points listed in the WUL (2017) for the Der Brochen Project relate to the current monitoring programme executed by GCS (2018). For the future Der Brochen wellfields (Helena and Richmond) boreholes are measured monthly for static groundwater level, while only four boreholes are monitored for groundwater quality on a bi-annual basis, namely HEGW 15, HEGW 98, RMGW 38 and RMGW 51. The Helena/Richmond monitoring programme is based on earlier groundwater exploration and water supply projects with the focus on water level monitoring only.

3. PROPOSED GROUNDWATER MONITORING

The proposed groundwater monitoring programme considers the source-pathway-receptor approach of risk assessments and relies on the three “pillars” of monitoring, namely;

- 1) Source monitoring of process water in open, un-lined storage systems (like the return water dams, toe drains), or within the future wellfields radius of influence (not covered under groundwater monitoring here);
- 2) Pathway monitoring downstream of potential pollution sources, as well as
- 3) Background and Receptor monitoring by “ring fencing” the Der Brochen site with strategically located surface (not covered here) and groundwater monitoring points up- and downstream of the proposed infrastructure.

This revised groundwater monitoring programme will focus on the various facilities to be monitored currently and in the near future during the Der Brochen Project. The proposed groundwater monitoring programme will be first reviewed and discussed by the Anglo-American Water Specialists before the final WUL list is presented for amendment.

3.1. RICHMOND (WELLFIELD BASELINE MONITORING)

The revised borehole list and monitoring tasks (together with reasonings for discontinuation) are given in Table 3-1, while the proposed monitoring borehole locations in relation to the recently revised Richmond wellfield production boreholes are shown in Figure 2. Numerous Richmond wellfield boreholes are within metres of each other and show similar water level trends (GCS, 2018). Based on the distribution of proposed production boreholes and existing potential wellfield monitoring boreholes, the list has therefore been reduced from 44 to 25 boreholes. The revised monitoring boreholes together with the reasoning are listed in Table 3-1.

Table 3-1. Richmond revised groundwater monitoring schedule.

SITE ID	Longitude	Latitude	Reasoning	Monthly water level	Quarterly Samples
RMGW 07R	30.08239	-24.98441	Collapsed (at depth) (Re-Drill as Standby Production BH)	Yes*	
RMGW 08	30.08725	-24.97797	No GW level - damaged		
RMGW 09	30.08359	-24.98226	Discontinue monitoring (Dupl.)		
RMGW 20	30.08236	-24.98425	Discontinue monitoring (Dupl.)		
RMGW 21	30.08233	-24.98437	Observation for RMGW 07R	Yes	
RMGW 23	30.08182	-24.98296	Discontinue monitoring (Dupl.)		
RMGW 24	30.08179	-24.98300	Wellfield monitoring	Yes	
RMGW 25	30.08189	-24.98306	Discontinue monitoring (Dupl.)		
RMGW 26	30.08046	-24.99022	Wellfield monitoring	Yes	
RMGW 27	30.08087	-24.98676	Observation for RMGW 28	Yes	
RMGW 28	30.08092	-24.98669	Production BH	At RMBG 27	Yes
RMGW 30	30.08167	-24.98594	Discontinue monitoring (Dupl.)		
RMGW 31	30.08163	-24.98594	Discontinue monitoring (Dupl.)		
RMGW 32	30.08387	-24.98047	Observation for RMGW 42	Yes	
RMGW 33	30.08377	-24.98052	Discontinue monitoring (Dupl.)		
RMGW 34	30.08365	-24.98039	Discontinue monitoring (Dupl.)		
RMGW 35	30.08567	-24.97597	Discontinue monitoring (Dupl.)		
RMGW 36	30.08571	-24.97606	Observation for RMGW 44	Yes	Yes
RMGW 37	30.08092	-24.98573	Discontinue monitoring (Dupl.)		
RMGW 38	30.08094	-24.98568	Baseline WL & Qual	Yes	Yes
RMGW 40	30.08131	-24.98450	Discontinue monitoring (Dupl.)		
RMGW 41	30.08273	-24.98197	Collapsed (at depth) _Verified 2017		
RMGW 42	30.08310	-24.97948	Production BH	Yes	Yes
RMGW 43	30.08375	-24.97722	Wellfield monitoring (Standby Production BH)	Yes	
RMGW 44	30.08564	-24.97493	Production BH	Yes	Yes
RMGW 45	30.08678	-24.97211	Production BH	Yes	Yes
RMGW 46R	T.B.D.	T.B.D.	Obs. for RMGW44 and RMGW45	Yes*	
RMGW 47	30.08412	-24.97831	Discontinue monitoring (Dupl.)		
RMGW 48	30.08012	-24.98842	Production BH	Yes	
RMGW 49	30.07904	-24.99093	Observation for RMGW 48	Yes	
RMGW 50	30.07808	-24.99355	Wellfield monitoring	Yes	
RMGW 51	30.07720	-24.99661	Baseline WL & Qual (Production BH)	Yes	Yes
RMGW 52	30.07615	-24.99914	Collapsed (at depth) _Verified 2017		
RMGW 53	30.07565	-25.00208	Observation for RMGW 54 (Standby Production BH)	Yes	
RMGW 54	30.07436	-25.00430	Production BH	Yes	Yes
RMGW 56	30.08835	-24.97466	Wellfield monitoring	Yes	
RMGW 57	30.07825	-24.99423	No GW level measured/collapsed		
RMGW 59	30.07978	-24.99239	Pipes stuck in BH (verified in 2017)		
RMGW 60	30.07888	-24.99479	Collapsed (at depth) (verified in 2017)		
RMGW 62	30.07672	-25.00061	Wellfield monitoring	Yes	
RMGW 67	30.07554	-25.00492	Wellfield monitoring	Yes	Yes
RMGW 68	30.08104	-24.98509	Discontinue monitoring (Dupl.)		
RMGW 69	30.07841	-24.99278	Discontinue monitoring (Dupl.)		
RMGW 70	30.07201	-25.01177	Up-stream of wellfield	Yes	Yes

* - Re-Drill

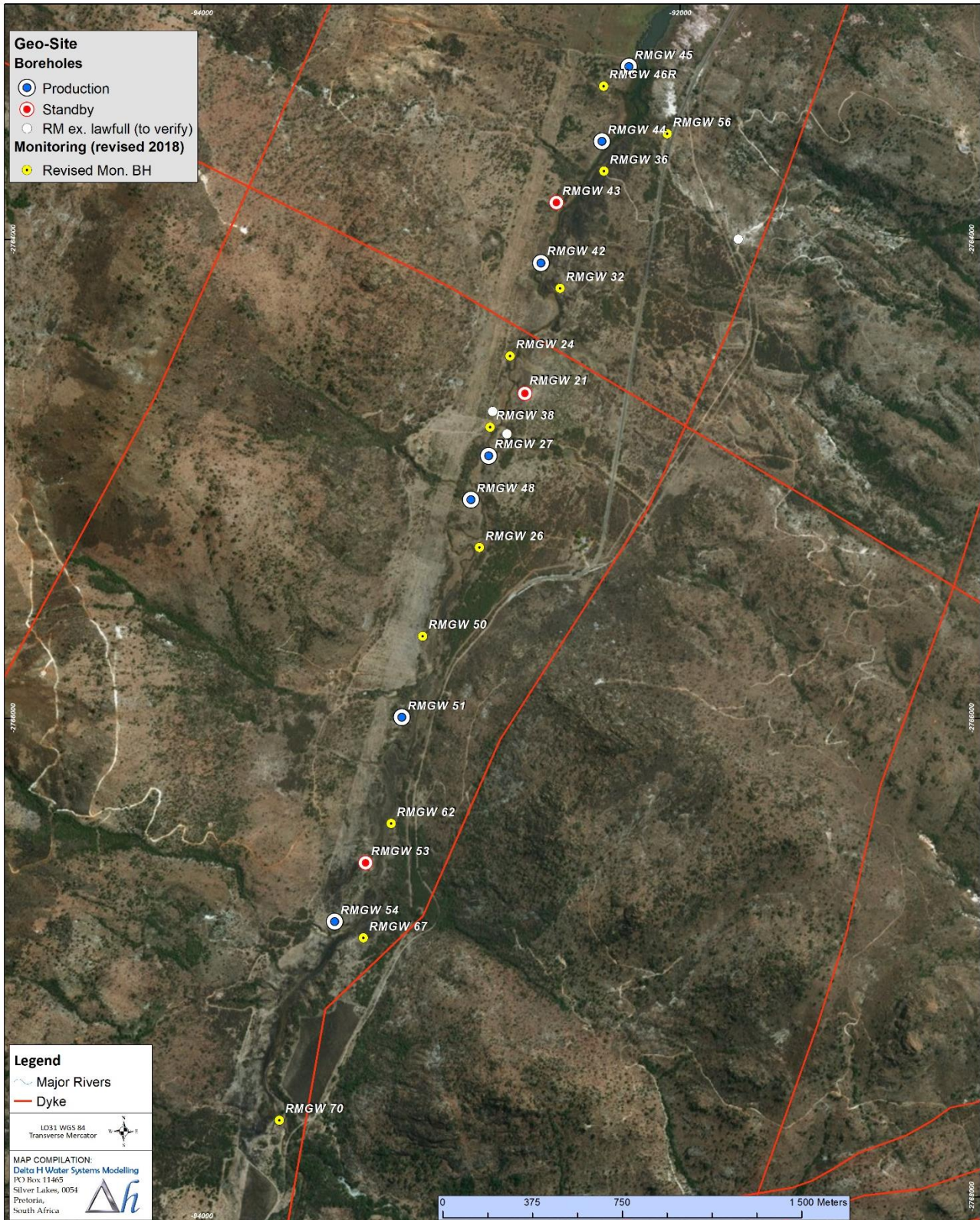


Figure 2. Location of Richmond production and monitoring boreholes.

3.2. HELENA/DER BROCHEN (WELLFIELD BASELINE MONITORING)

The recently revised production boreholes for the Helena wellfield are shown in Figure 3. The proposed Der Brochen Project underground workings will be developed west of the wellfield area. Two existing boreholes (names) should therefore be added to monitor the potential impact from the proposed mining activities and associated dewatering on the wellfield (Table 3-2), while 3 boreholes can be discontinued due to their proximity to other monitoring boreholes. A detailed wellfield management plan will be included in the final Der Brochen Project (PFS-B) Report.

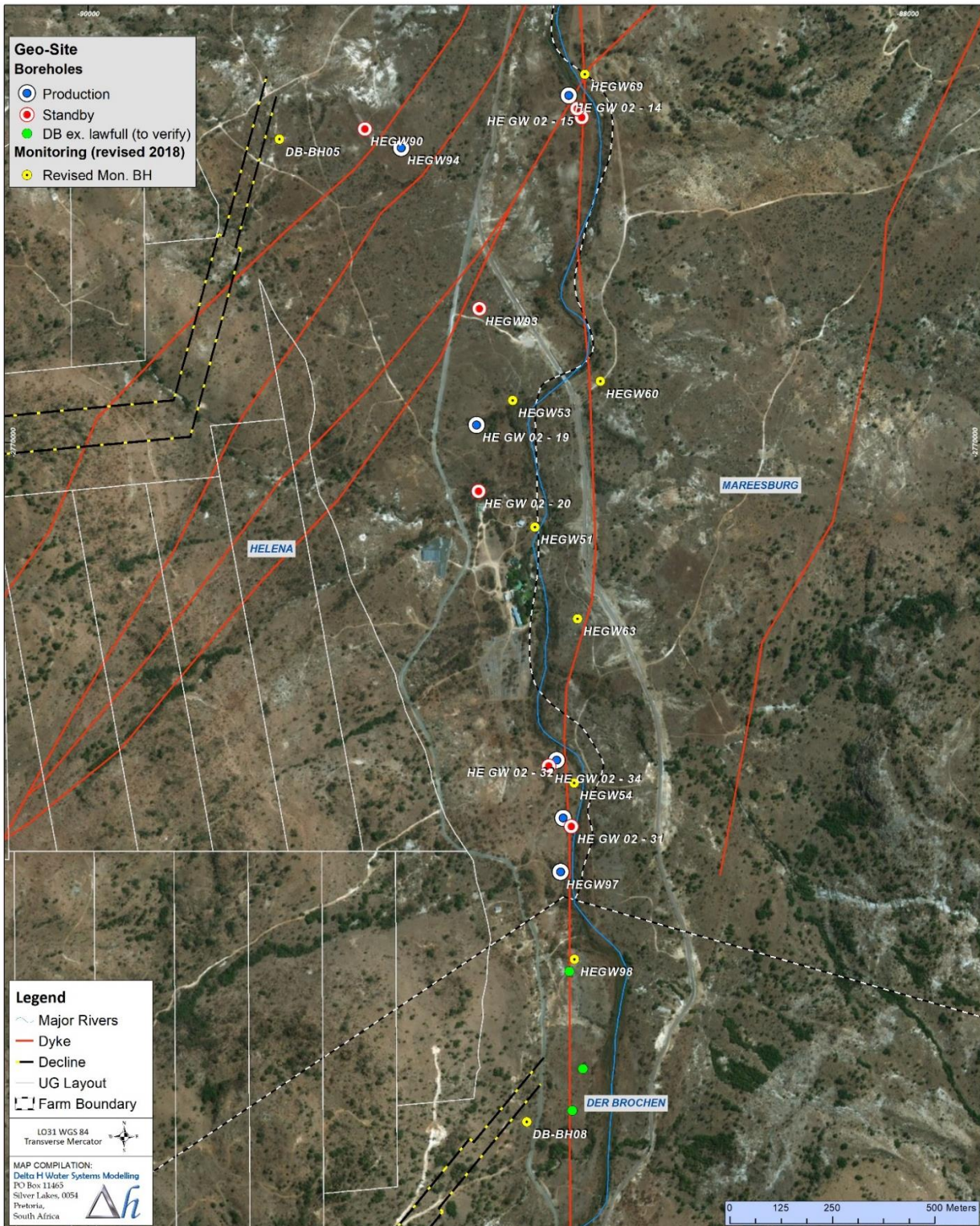


Figure 3. Location of Helena/Der Brochen wellfield and monitoring boreholes.

Table 3-2. Helena/Der Brochen revised groundwater monitoring schedule.

SITE ID	Longitude	Latitude	Revised	Monthly water level	Quarterly Samples
HEGW02-01	30.11547	-25.02470	Discontinue monitoring		
HEGW02-14	30.11994	-25.02537	Production BH	Yes	Yes
HEGW02-15	30.12014	-25.02566	Observation for HEGW02-14 (Standby Production BH)	Yes	Yes
HEGW02-19	30.11766	-25.03261	Production BH	Yes	
HEGW02-20	30.11769	-25.03407	Observation for HEGW02-19 (Standby Production BH)	Yes	
HEGW02-21	30.11969	-25.04128	Production BH	Yes	Yes
HEGW02-31	30.11989	-25.04146	Observation for HEGW02-21 (Standby Production BH)	Yes	
HEGW02-32	30.11954	-25.04000	Production BH	Yes	Yes
HEGW02-34	30.11935	-25.04013	Observation for HEGW02-32 (Standby Production BH)	Yes	
HEGW51	30.11905	-25.03487	Wellfield Monitoring	Yes	
HEGW53	30.11853	-25.03207	Observation for HEGW02-19	Yes	Yes
HEGW54	30.11996	-25.04051	Wellfield Monitoring	Yes	Yes
HEGW60	30.12066	-25.03167	Wellfield Monitoring (Baseline)	Yes	
HEGW61	30.12041	-25.03017	Discontinue monitoring (Dupl.)		
HEGW63	30.12007	-25.03689	Wellfield Monitoring (Baseline)	Yes	
HEGW66	30.12073	-25.02434	Discontinue monitoring (Dupl.)		
HEGW69	30.12033	-25.02490	Observation for HEGW02-14	Yes	
HEGW90	30.11500	-25.02608	Observation for HEGW94 (Standby Production BH)	Yes	
HEGW93	30.11775	-25.03005	Wellfield Monitoring (Standby Production BH)	Yes	
HEGW94	30.11588	-25.02650	Production BH	Yes	
HEGW97	30.11962	-25.04246	Production BH	Yes	Yes
HEGW98	30.11994	-25.04439	Wellfield Monitoring	Yes	Yes
DB-BH05	30.11294	-25.02630	North Portal (Monitoring)	Yes	Yes
DB-BH08	30.11875	-25.04803	South Portal (Monitoring)	Yes	Yes

3.3. HELENA TSF (MOTOTOLO)

The distribution of active (and proposed) monitoring boreholes is shown in Figure 4. Recently a number of additional boreholes were drilled as part of the hydraulic containment system (scavenger wells HW-BH1, HW-BH2, HW-BH3, HW-BH4 and HW-BH6), while MBH12, MBH13, MBH14, MBH15, MBH16, MBH17 and MBH18 were drilled to ensure complete spatial coverage of the monitoring programme. As a result, there are two components of monitoring required at the Helena TSF: firstly, to monitor the migration of the contamination plume, and secondly, to determine the effectiveness of the hydraulic containment system. Based on the understanding of the plume development, the revised monitoring boreholes for the Helena TSF are listed in Table 3-3. Quarterly monitoring of groundwater quality and levels is proposed.

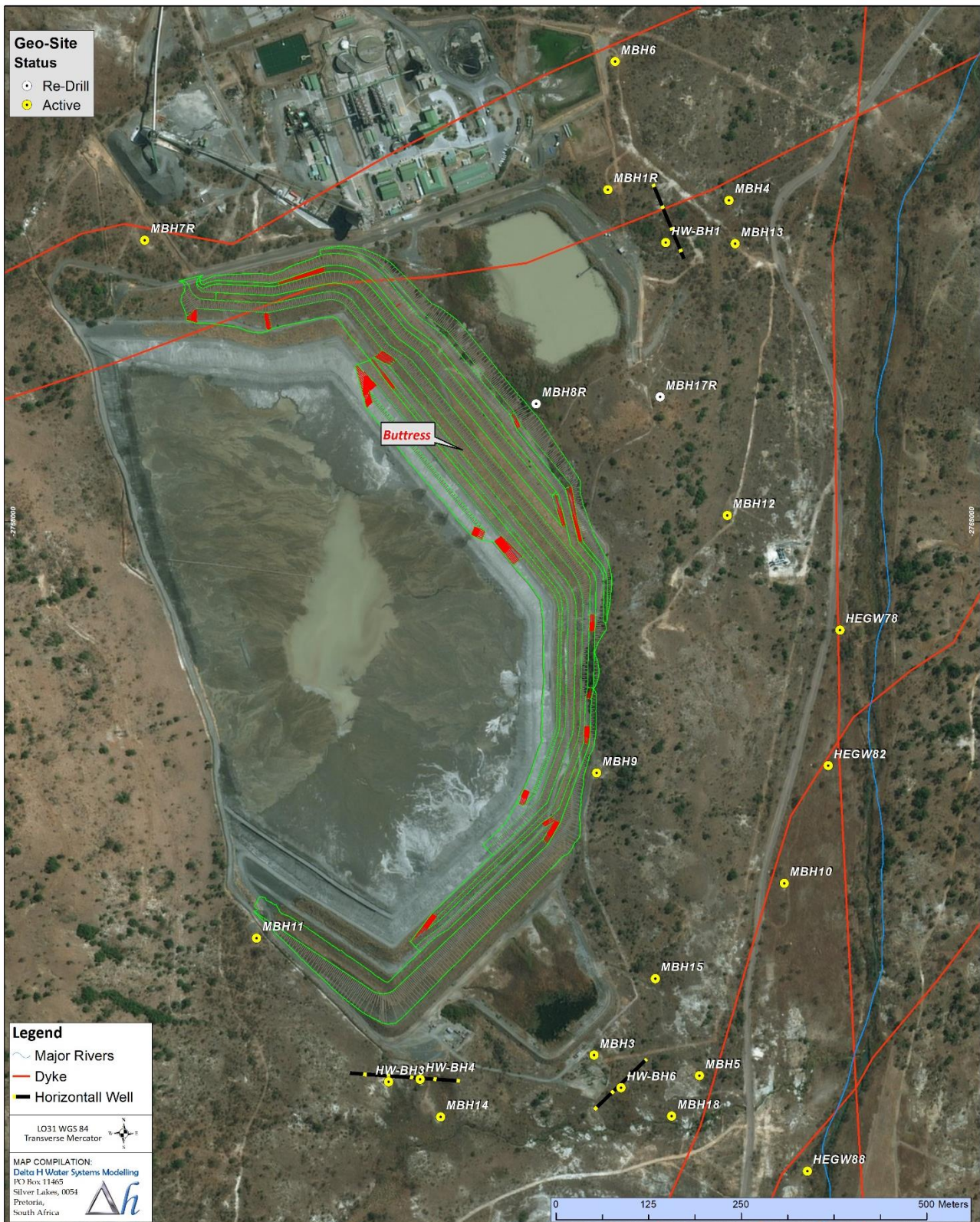


Figure 4. Location of the Helena TSF monitoring boreholes.

Table 3-3. Helena TSF revised groundwater monitoring schedule.

SITE ID	Longitude	Latitude	Revised	Comment
MBH1R	30.11689	-25.01089	Plume Monitoring	
MBH2	30.11692	-25.01120	Discontinue monitoring (Dupl.)	
MBH3	30.11663	-25.02144	Plume Monitoring	
MBH4	30.11851	-25.01103		
MBH5	30.11804	-25.02170		
MBH6	30.11700	-25.00933		
MBH7R	30.11069	-25.01147		
MBH8	30.11547	-25.01344	Discontinue monitoring, covered by Buttress	To be re-drilled as MBH8R (see end of table)
MBH9	30.11669	-25.01800	Plume Monitoring	
MBH10	30.11919	-25.01936		Baseline
MBH11	30.11212	-25.01999	Plume Monitoring	
MBH12	30.11846	-25.01487		
MBH13	30.11859	-25.01156		
MBH14	30.11457	-25.02218	Telemetry (level and EC logger) (Mon. HWELL-B1)	
MBH15	30.11746	-25.02051	Plume Monitoring	RWD B (overspill)
MBH16	30.11380	-25.01171	Discontinue monitoring, covered by Buttress	
MBH17	30.11800	-25.01313	Dry	To be re-drilled as MBH17R (see end of table)
MBH18	30.11766	-25.02219	Telemetry (level and EC logger)	
HEGW78	30.11996	-25.01628	Plume Monitoring	Baseline
HEGW81	30.11990	-25.01751	Discontinue monitoring (Dupl.)	
HEGW82	30.11979	-25.01793	Plume Monitoring	Baseline
HEGW88	30.11947	-25.02287	Monitoring	Up-stream
HW-BH1	30.11766	-25.01154	Plume Monitoring	
HW-BH3	30.11388	-25.02175	Scavenger Monitoring (Mon. HWELL-B1)	
HW-BH4	30.11430	-25.02172	Telemetry (level logger) (Mon. HWELL-B1)	Future scavenger well (Section 19)
HW-BH6	30.11699	-25.02184	Telemetry (level logger) (Mon. HWELL-B2)	Future scavenger well (Section 19)
MBH8R	T.B.D.		Re-Drill (Plume Monitoring)	Design to use as Scavenger BHs
MBH17R	T.B.D.		Re-Drill (Plume Monitoring)	

3.4. MAREESBURG TSF (AND PROPOSED DMS STOCKPILE)

Based on the outcome of the site-specific numerical groundwater flow and transport model developed for the Mareesburg TSF (Delta-H, 2015), a tiered (phased) approach was put forward as mitigation controls for the potential seepage plume migration. The potential implementation of a Tier 2 interception system (i.e. scavenger wells) should be determined by the future groundwater monitoring data. Existing boreholes within the footprint of the TSF were sealed prior to construction. Other existing monitoring boreholes (i.e. MBGW03, MBGW13, MBGW14, MBGW, 15) are beyond the Mareesburg tributary and can be regarded as baseline receptor monitoring. Additional monitoring boreholes for the Mareesburg TSF were drilled in September 2018. The current status and revised monitoring schedules are listed in Table 3-4 and shown spatially in Figure 5. The figure also shows the preliminary monitoring borehole locations for the Dense Media Separation (DMS) Stockpile.

Table 3-4. Mareesburg TSF (and proposed LGOS) groundwater monitoring schedule.

SITE ID	Longitude	Latitude	Comment/Status	Quarterly water level	Quarterly Samples
HEGW02-40*	30.14470	-25.01541	Sealed, discontinue mon.		
MBGW01*	30.14967	-25.00758			
MBGW02	30.15069	-25.00795		Will in future be demolished	
MBGW03*	30.14283	-25.00460	Baseline (Plume monitoring) (incl. DMS Stockpile)	Yes	Yes
MBGW04	30.15288	-25.01196	Sealed, discontinue mon.		
MBGW05	30.14660	-25.01325			
MBGW06	30.14741	-25.01886	TSF Footprint (Temporarily baseline mon.)	Yes	Yes
MBGW07	30.14659	-25.01635	Sealed/discontinue mon.		
MBGW08	30.14610	-25.00792			
MBGW09	30.14506	-25.01550			
MBGW10*	30.14511	-25.01655	Source (Plume monitoring) (Rehab Remove Bees)	Yes	Yes
MBGW11	30.14429	-25.01564	Source (Plume monitoring)	Yes	Yes
MBGW13	30.14343	-25.01574	Baseline (Plume monitoring)		Yes
MBGW14*	30.14446	-25.01948	Source (Plume monitoring)	Yes	Yes
MBGW15*	30.14189	-25.01207	Baseline (Plume monitoring) (incl. DMS Stockpile)	Yes	Yes
HEGW02-39	30.14948	-25.01578	Sealed/discontinue mon.		
MB-BH1*	30.14645	-25.0057	Tier-1 (Source Monitoring)	Yes	Yes
MB-BH2*	30.1443	-25.0066		Yes	Yes
MB-BH3*	30.14423	-25.0096		Yes	Yes
MB-BH4*	30.14393	-25.0125		Yes	Yes
MB-BH5*	30.14567	-25.02		Yes	Yes
MB-BH6*	30.14525	-25.0148		Yes	Yes
HEGW103	30.1269	-25.00417	Down-stream of DMS Stockpile	Commission in 2020	
DS-BH1	T.B.D.		Future mon. BHs to be drilled for the DMS Stockpile		
DS -BH2	T.B.D.				
DS -BH3	T.B.D.				
DS -BH4	T.B.D.				

* - Part of WUL list 2017

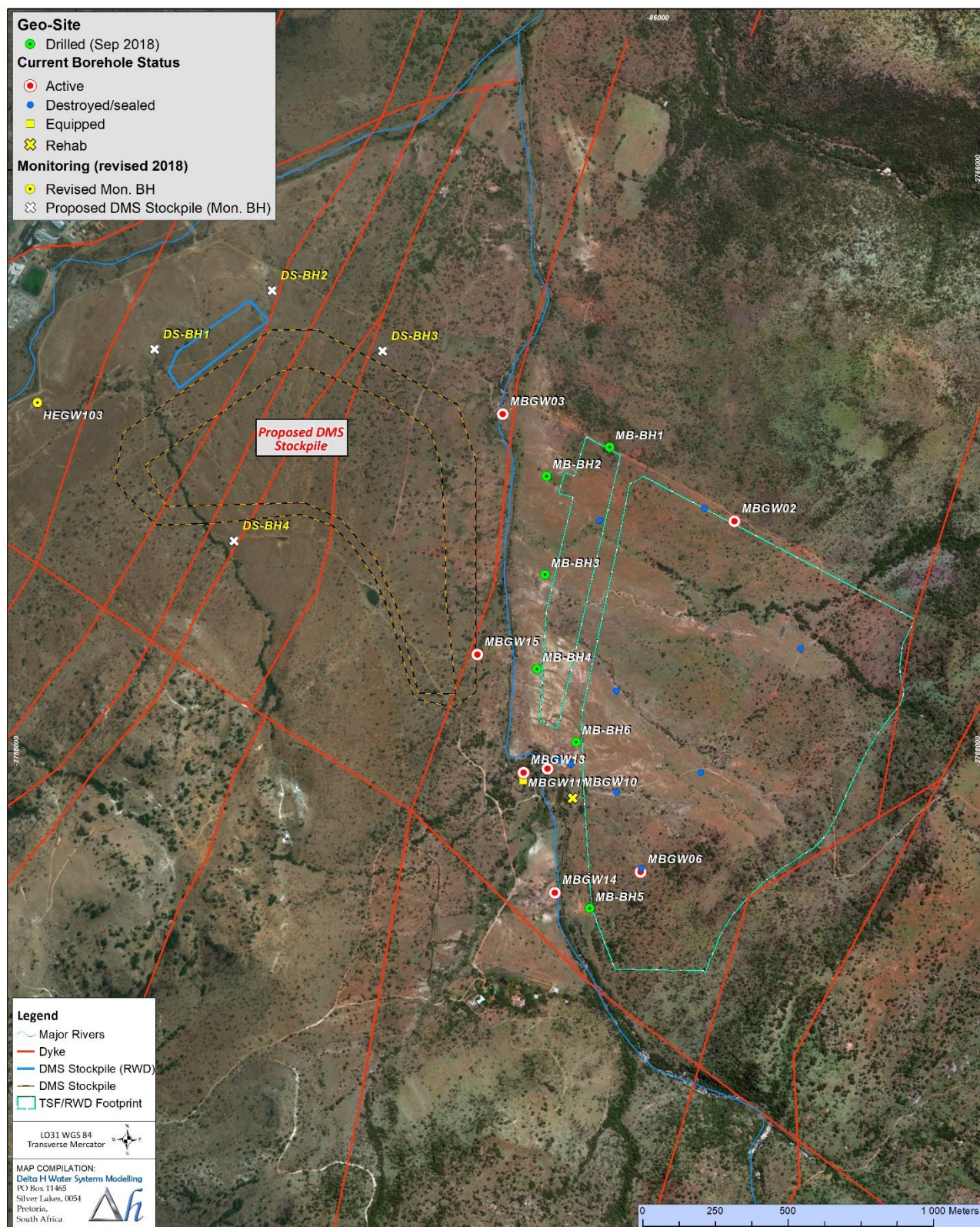


Figure 5. Location of the Maresburg TSF and proposed DMS Stockpile monitoring boreholes.

4. SUMMARY

The current Der Brochen (including the Mareesburg TSF and Helena TSF) groundwater monitoring locations have been reviewed, optimised and related to the issued WULs and amendments (2011, 2016, 2017). It must be noted that the future WUL amendment should clearly distinguish and list groundwater quality and/or groundwater level monitoring boreholes to prevent unnecessary sampling points.

Should you need to discuss any aspect of this technical memo please do not hesitate to contact us:

Kind regards

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PRINCIPAL HYDROGEOLOGIST

References:

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