APPENDIX F2

GEOTECHNICAL INVESTIGATIONS OF ALTERNATIVE BORROW PITS

SMEC South Africa
Member of the Surbana Jurong Group

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SMEC Reference: 19EP10
6 March 2019

Nemai Consulting
147 Bram Fischer Drive
Ferndale
2194

FAO: Donavan Henning

RE: ALTERNATIVE BORROW PITS FOR MCWAP PROJECT

MEMORANDUM 1: Borrow Pit 14

Introduction

As part of the Environmental Impact Assessment EIA) submission for Phase 2 of the Mokolo Crocodile Water Augmentation Project (MCWAP), several landowners along the route have requested that borrow pits on their respective properties be relocated to locations identified by the landowners. Apart from the necessity of proving the feasibility of the potential alternative locations, borrow pit relocation requires authorisation afresh which forms an integral part of the EIA and authorisation process for the project.

The specified quantity/frequency of selected material along the pipeline route is 100 000m^3/5km. It is on this basis that the potential sources were selected.

Due to the limited timeframe to assess the sites, only a prospecting exercise could be undertaken, which comprised 5no. trial pits and generalised laboratory testing. It is understood that the detailed investigations will be undertaken as part of the detailed design phase of the project.

A revised area for borrow pit 14, which is located on farm Vergulde Helm 321LQ, was proposed to the west of the proven borrow pit. This area overlaps approximately 40% of the proven borrow pit area.

The proven source at borrow pit 14 was estimated to comprise >100 000m^3 of bedding and soft backfill material.

A site layout, showing the proven (red) and proposed relocation (white) of borrow pit 14, is given hereunder as Diagram 1.

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Diagram 1: Borrow Pit 14 Layout Plan

Standards and Guidelines

SMEC executed the fieldwork and material testing based on good geotechnical practice, incorporating the following guideline documents and standards that directly relate to the proposed application:

- Site Investigation Code of Practice, SAICE Geotechnical Division (2010);
- Guidelines for Soil and Rock Logging of South Africa, AEG/SAIEG/SAICE (2001);
- COLTO: Standard Specifications for Road and Bridge Works for State Road Authorities (1998);
- SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983);
- SABS 1200 DB-1989 Earthworks (Pipe Trenches) South African Bureau of Standards (1989);
- TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification.

Methodology

The site investigation comprised machine excavated test pits and indicative laboratory sampling to identify the index properties of the on-site soils and highlight their limitations and concerns with regards to their application for the proposed application (pipe bedding and backfill).

Based on the findings of the investigations, a pre-feasibility level geotechnical report has been compiled with emphasis on generalised in-situ material characteristics, depth (as can be visually determined) to groundwater and materials utilisation potential.

The following material minimum quality characteristics for borrow sources of potential pipe bedding and selected backfill, in accordance with TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification, are required:

- Maximum particle size 19 mm
- Not more than 5% passing the 13.2 mm sieve
- Not more than 20% passing the 0.425 mm sieve
- PI less than 12

Furthermore, the compactability requirements for the pipe bedding, as specified by SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983) are:

Table 1: Suitability of Granular Pipe Bedding Material

Compactability Factor	Suitability
<0.1	Material suitable
0.1-0.4	Material suitable (except for flexible pipes that may be subject to waterlogged conditions) but require extra care in compaction
>0.4	Material unsuitable

This memorandum is an assessment based on the observations made during the fieldwork as the laboratory testing has not been completed.

Fieldwork Observations

Five trial pits were excavated across the proposed relocation site by a CAT 428E Tractor Loader Backhoe (TLB).

The observed profile within the trial pits generally comprised a nominal depth of topsoil overlying silty sand to slightly clayey sand, proven to depths of between 1.1m and 1.7m. This was underlain by ferricrete.

No groundwater was observed.

The investigation layout is given as Diagram 2 hereunder and trial pit profiles attached herewith.

Diagram 2: Borrow Pit 14 Investigation Layout Plan

Preliminary Assessment and Recommendations

The location of the borrow pit overlaps the proven source and the observed profile within the trial pits is similar to that of the investigations for the proven source. Therefore, on this basis it is assumed that the materials have similar properties and the relocated site is a suitable source.

The area of the proposed source is approximately 210 000m^2 and the estimated average excavation of the suitable materials will be 1m, indicating a potential source of bedding and selected backfill material of 210 000m^3.

For the purposes of the EIA application, and based on the trial pit observations and material volume estimates, the proposed relocated site for borrow pit 14 is a potentially suitable source of pipe bedding and selected backfill material.

The suitability of the material will be confirmed in a separate report on completion of the laboratory testing.

It must be noted that this prospecting investigation comprises a pre-feasibility assessment of the site and must be confirmed by detailed investigations and laboratory testing.

Yours sincerely,

Richard Roberts

Geotechnical Engineer

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 14

HOLE NO: BP14A-1
X COORD: 2 623 426
Y COORD: Lo27 -50 553
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist to moist, brown, topsoil.	
	0.20	**Medium dense to dense, slightly clayey, silty SAND** Slightly moist, red/brown, transported.	
1.0	1.10		
	1.20	**Weakly cemented CALCRETE**	
		Trial pit stopped in calcrete	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP14A/1/1 at 0.2-1.1m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 25 Feb 2019
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CHECKED BY: Prof Reg:

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Template: SMEC TP04

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 14

HOLE NO: BP14A-2
X COORD: 2 623 616
Y COORD: Lo27 -50 532
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00	Ground Surface	
		Loose, silty SAND Moist, brown, topsoil.	
	0.20	**Medium dense, silty SAND** Slightly moist, orange/brown, transported.	
1.0			
	1.40		
	1.50	**Weakly cemented to cemented FERRICRETE**	
		Trial pit stopped in ferricrete	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP14A/2/1 at 0.2-1.4m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 14

HOLE NO: BP14A-3
X COORD: 2 623 871
Y COORD: Lo27 -50 476
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Moist, brown, topsoil.	
	0.20	**Medium dense to dense, slightly clayey, silty SAND** Slightly moist, orange/brown, transported.	
1.0			
	1.20		
	1.30	**Weakly cemented to cemented FERRICRETE**	
		Trial pit stopped in ferricrete	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP14A/3/1 at 0.2-1.2m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 14

HOLE NO: BP14A-4
X COORD: 2 623 883
Y COORD: Lo27 -50 688
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Moist, brown, topsoil.	
	0.20	**Medium dense to dense, slightly clayey, silty SAND** Slightly moist, orange/brown, transported.	
1.0			
	1.70	**Trial pit stopped - slow progress**	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP14A/4/1 at 0.2-1.7m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 14

HOLE NO: BP14A-5
X COORD: 2 623 756
Y COORD: Lo27 -50 621
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00	Ground Surface	
		Loose, silty SAND Moist, brown, topsoil.	
	0.20	**Medium dense to dense, silty SAND** Slightly moist to moist, orange/brown, transported.	
1.0			
	1.60		
	1.70	**Weakly cemented to cemented FERRICRETE**	
		Trial pit stopped in ferricrete	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP14A/5/1 at 0.2-1.6m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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6 March 2019

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FAO: Donavan Henning

RE: ALTERNATIVE BORROW PITS FOR MCWAP PROJECT

MEMORANDUM 2: Borrow Pit 30

Introduction

As part of the Environmental Impact Assessment EIA) submission for Phase 2 of the Mokolo Crocodile Water Augmentation Project (MCWAP), several landowners along the route have requested that borrow pits on their respective properties be relocated to locations identified by the landowners. Apart from the necessity of proving the feasibility of the potential alternative locations, borrow pit relocation requires authorisation afresh which forms an integral part of the EIA and authorisation process for the project.

The specified quantity/frequency of selected material along the pipeline route is 100 000m^3/5km. It is on this basis that the potential sources were selected.

Due to the limited timeframe to assess the sites, only a prospecting exercise could be undertaken, which comprised 6no. trial pits and generalised laboratory testing. It is understood that the detailed investigations will be undertaken as part of the detailed design phase of the project.

A revised area for borrow pit 30, which is located on farm Karoobult 126KQ, was proposed to the south of the proven borrow pit.

The proven source at borrow pit 30 was estimated to comprise approximately 150 000m^3 of soft backfill material.

A site layout, showing the proven (red) and proposed relocation (white) of borrow pit 30, is given hereunder as Diagram 1.

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Diagram 1: Borrow Pit 30 Layout Plan

Standards and Guidelines

SMEC executed the fieldwork and material testing based on good geotechnical practice, incorporating the following guideline documents and standards that directly relate to the proposed application:

- Site Investigation Code of Practice, SAICE Geotechnical Division (2010);
- Guidelines for Soil and Rock Logging of South Africa, AEG/SAIEG/SAICE (2001);
- COLTO: Standard Specifications for Road and Bridge Works for State Road Authorities (1998);
- SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983);
- SABS 1200 DB-1989 Earthworks (Pipe Trenches) South African Bureau of Standards (1989);
- TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification.

Methodology

The site investigation comprised machine excavated test pits and indicative laboratory sampling to identify the index properties of the on-site soils and highlight their limitations and concerns with regards to their application for the proposed application (pipe bedding and backfill).

Based on the findings of the investigations, a pre-feasibility level geotechnical report has been compiled with emphasis on generalised in-situ material characteristics, depth (as can be visually determined) to groundwater and materials utilisation potential.

The following material minimum quality characteristics for borrow sources of potential bedding and selected backfill, in accordance with TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification, are required:

- Maximum particle size 19 mm
- Not more than 5% passing the 13.2 mm sieve
- Not more than 20% passing the 0.425 mm sieve
- PI less than 12

Furthermore, the compactability requirements for the pipe bedding, as specified by SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983) are:

Table 1: Suitability of Granular Pipe Bedding Material

Compactability Factor	Suitability
<0.1	Material suitable
0.1-0.4	Material suitable (except for flexible pipes that may be subject to waterlogged conditions) but require extra care in compaction
>0.4	Material unsuitable

This memorandum is an assessment based on the observations made during the fieldwork as the laboratory testing has not been completed.

Fieldwork Observations

Six trial pits were excavated across the proposed relocation site by a Case 695 Super 12 Tractor Loader Backhoe (TLB).

The observed profile within the trial pits generally comprised a nominal depth of topsoil overlying slightly clayey sand, proven to an average depth of 2.0m. In trial pit BP30A-4, this stratum was underlain by clayey sand at 1.7m.

No groundwater was observed.

The investigation layout is given as Diagram 2 hereunder and trail pit profiles attached herewith.

Diagram 2: Borrow Pit 30 Investigation Layout Plan

Preliminary Assessment and Recommendations

The location of the borrow pit is to the south of the proven source and the observed profile within the trial pits is similar to that of the investigations for the proven source. Therefore, on this basis it is assumed that the materials have similar properties and the relocated site is a suitable source.

The area of the proposed source is approximately 84 000m^2 and the estimated average excavation of the suitable materials will be 1.5m, indicating a potential source of selected backfill material of 125 000m^3.

For the purposes of the EIA application, and based on the trial pit observations and material volume estimates, the proposed relocated site for borrow pit 30 is a potentially suitable source of selected backfill material.

The suitability of the material will be confirmed in a separate report on completion of the laboratory testing.

It must be noted that this prospecting investigation comprises a pre-feasibility assessment of the site and must be confirmed by detailed investigations and laboratory testing.

Yours sincerely,

Richard Roberts

Geotechnical Engineer

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 30

HOLE NO: BP30A-1
X COORD: 2 705 853
Y COORD: Lo27 -34 034
ELEVATION:

Depth	Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00 Ground Surface	
0.0	**Loose, silty SAND** Slightly moist to moist, brown, topsoil.	
	0.40	
	Medium dense to dense, silty SAND Slightly moist to moist, orange/brown, transported.	
1.0		
2.0	2.00	
	Trial pit stopped at required depth	
	End of Log	
3.0		

NOTES 1: Trial pit dry
2: Sample BP30A/1/1 at 0.4-2.0m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 20 Feb 2019
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CHECKED BY: Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 30

HOLE NO: BP30A-2
X COORD: 2 705 781
Y COORD: Lo27 -34 152
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist to moist, brown, topsoil.	
	0.40		
		Medium dense to dense, silty SAND Slightly moist to moist, orange/brown, transported.	
1.0			
2.0			
	2.10		
		Trial pit stopped at required depth	
		End of Log	
3.0			

NOTES 1: Trial pit dry
2: Sample BP30A/2/1 at 0.4-2.1m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 30

HOLE NO: BP30A-3
X COORD: 2 705 782
Y COORD: Lo27 -34 227
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist to moist, brown, topsoil.	
	0.30	**Medium dense to dense, silty SAND** Slightly moist to moist, orange/brown, transported.	
1.0			
2.0			
	2.20	**Trial pit stopped at required depth**	
		End of Log	
3.0			

NOTES 1: Trial pit dry
2: Sample BP30A/3/1 at 0.3-2.2m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
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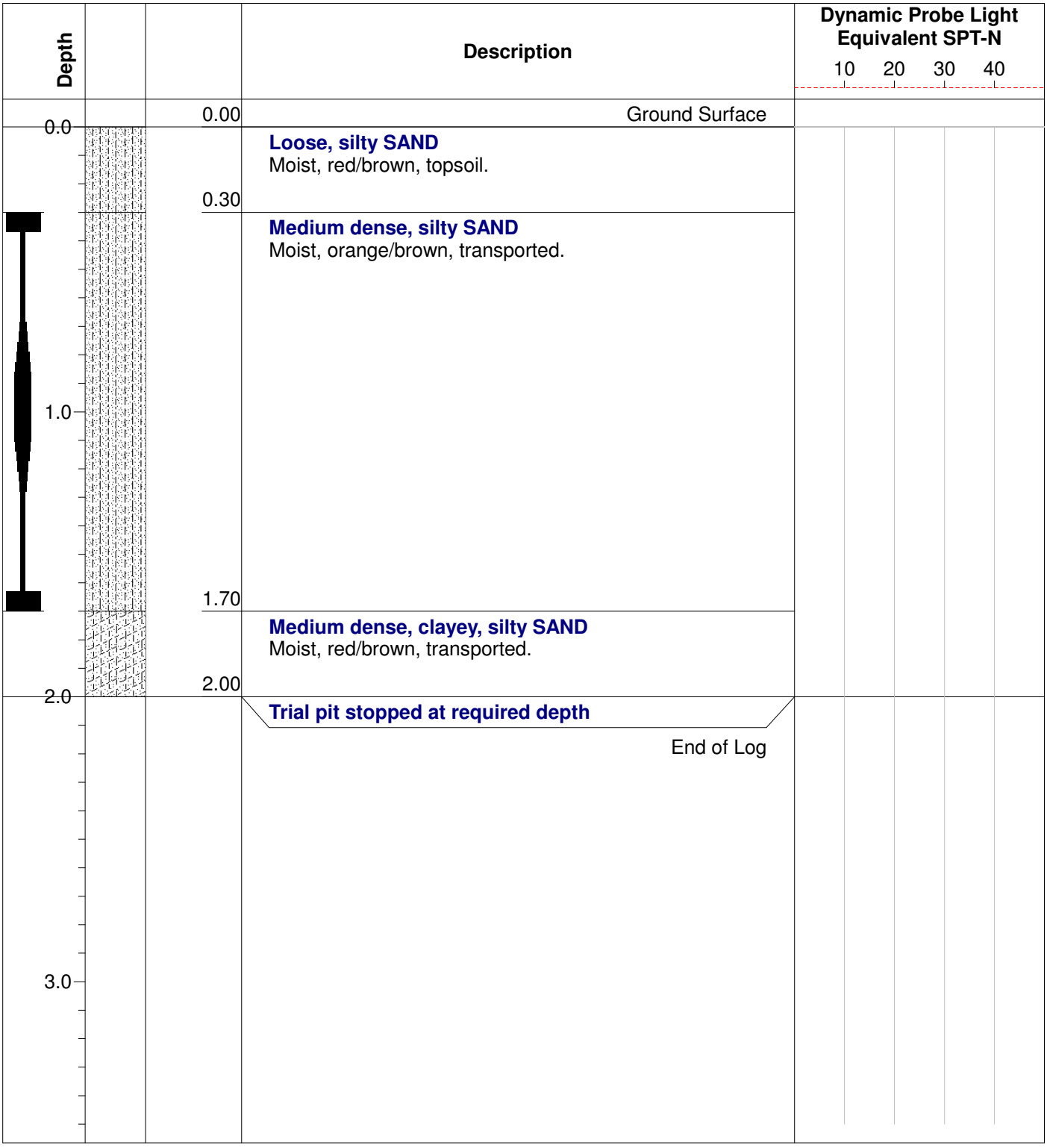
TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 30

HOLE NO: BP30A-4
X COORD: 2 705 982
Y COORD: Lo27 -34 069
ELEVATION:



NOTES 1: Trial pit dry
2: Sample BP30A/4/1 at 0.3-1.7m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 30

HOLE NO: BP30A-5
X COORD: 2 705 894
Y COORD: Lo27 -34 204
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist to moist, brown, topsoil.	
	0.40		
		Medium dense, silty SAND Slightly moist to moist, orange/brown, transported.	
1.0			
	2.00		
2.0		**Trial pit stopped at required depth**	
		End of Log	
3.0			

NOTES 1: Trial pit dry
2: Sample BP30A/5/1 at 0.4-2.0m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 20 Feb 2019
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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 30

HOLE NO: BP30A-6
X COORD: 2 705 880
Y COORD: Lo27 -34 288
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist to moist, brown, topsoil.	
	0.40		
		Medium dense to dense, silty SAND Slightly moist to moist, orange/brown, transported.	
1.0			
2.0			
	2.20		
		Trial pit stopped at required depth	
		End of Log	
3.0			

NOTES 1: Trial pit dry
2: Sample BP30A/6/1 at 0.4-2.2m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 20 Feb 2019
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global experience

SMEC Reference: 19EP10
6 March 2019

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Ferndale
2194

FAO: Donavan Henning

RE: ALTERNATIVE BORROW PITS FOR MCWAP PROJECT

MEMORANDUM 3: Borrow Pit 35

Introduction

As part of the Environmental Impact Assessment EIA) submission for Phase 2 of the Mokolo Crocodile Water Augmentation Project (MCWAP), several landowners along the route have requested that borrow pits on their respective properties be relocated to locations identified by the landowners. Apart from the necessity of proving the feasibility of the potential alternative locations, borrow pit relocation requires authorisation afresh which forms an integral part of the EIA and authorisation process for the project.

The specified quantity/frequency of selected material along the pipeline route is 100 000m^3/5km. It is on this basis that the potential sources were selected.

Due to the limited timeframe to assess the sites, only a prospecting exercise could be undertaken, which comprised 4no. trial pits and generalised laboratory testing. It is understood that the detailed investigations will be undertaken as part of the detailed design phase of the project.

A revised area for borrow pit 35, which is located on farm Leeuwbosch 129KQ RE/1, was proposed to the south of the proven borrow pit.

The proven source at borrow pit 35 was estimated to comprise approximately 65 000m^3 of material that marginally failed the assessment criteria. However, the borrow pit was included as a potential material source as it was felt that the clay fraction could be stabilised or blended with another source such that the material would be suitable for selected backfill.

A site layout, showing the proven (red) and proposed relocation (white) of borrow pit 35, is given hereunder as Diagram 1.

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Diagram 1: Borrow Pit 35 Layout Plan

Standards and Guidelines

SMEC executed the fieldwork and material testing based on good geotechnical practice, incorporating the following guideline documents and standards that directly relate to the proposed application:

- Site Investigation Code of Practice, SAICE Geotechnical Division (2010);
- Guidelines for Soil and Rock Logging of South Africa, AEG/SAIEG/SAICE (2001);
- COLTO: Standard Specifications for Road and Bridge Works for State Road Authorities (1998);
- SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983);
- SABS 1200 DB-1989 Earthworks (Pipe Trenches) South African Bureau of Standards (1989);
- TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification.

Methodology

The site investigation comprised machine excavated test pits and indicative laboratory sampling to identify the index properties of the on-site soils and highlight their limitations and concerns with regards to their application for the proposed application (pipe bedding and backfill).

Based on the findings of the investigations, a pre-feasibility level geotechnical report has been compiled with emphasis on generalised in-situ material characteristics, depth (as can be visually determined) to groundwater and materials utilisation potential.

The following material minimum quality characteristics for borrow sources of potential bedding and selected backfill, in accordance with TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification, are required:

- Maximum particle size 19 mm
- Not more than 5% passing the 13.2 mm sieve
- Not more than 20% passing the 0.425 mm sieve
- PI less than 12

Furthermore, the compactability requirements for the pipe bedding, as specified by SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983) are:

Table 1: Suitability of Granular Pipe Bedding Material

Compactability Factor	Suitability
<0.1	Material suitable
0.1-0.4	Material suitable (except for flexible pipes that may be subject to waterlogged conditions) but require extra care in compaction
>0.4	Material unsuitable

This memorandum is an assessment based on the observations made during the fieldwork as the laboratory testing has not been completed.

Fieldwork Observations

Four trial pits were excavated across the proposed relocation site by a Case 695 Super 12 Tractor Loader Backhoe (TLB).

The observed profile within the trial pits generally comprised a nominal depth of topsoil overlying clayey sand, occasionally overlain by a thin silty sand layer, proven to an average depth of 1.5m.

No groundwater was observed.

The investigation layout is given as Diagram 2 hereunder and trial pit profiles attached herewith.

Diagram 2: Borrow Pit 35 Investigation Layout Plan

Preliminary Assessment and Recommendations

The location of the borrow pit is to the immediate south of the proven source and the observed profile within the trial pits is similar to that of the investigations for the proven source. Therefore, on this basis it is assumed that the materials have similar properties and the relocated site is a marginal source.

The area of the proposed source is approximately 32 000m^2 and the estimated average excavation of the suitable materials will be 1.5m, indicating a potential source of selected backfill material of 48 000m^3. The area could be extended to the east and west, but, due to the thick trees, the investigation was limited to the access gravel road. As with the proven source, the material would also have to be stabilised or blended with another source to prove viable.

For the purposes of the EIA application, and based on the trial pit observations and material volume estimates, the proposed relocated site for borrow pit 35 is a potentially marginal source of selected backfill material.

It was noted by the landowner that the proven location of borrow pit 35 was acceptable, provided that it could not be seen from the gravel road to the north, and thus would have to be repositioned slightly south of the proposed location. Given the relative ease of access and location closer to the proposed pipeline alignment of the proven source, it would be prudent to include additional detailed investigations for this source prior to establishing the borrow pit to the proposed relocated area.

The suitability of the material will be confirmed in a separate report on completion of the laboratory testing.

It must be noted that this prospecting investigation comprises a pre-feasibility assessment of the site and must be confirmed by detailed investigations and laboratory testing.

Yours sincerely,

Richard Roberts

Geotechnical Engineer

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 35

HOLE NO: BP35A-1
X COORD: 2 704 262
Y COORD: Lo27 -38 176
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00	Ground Surface	
		Loose, silty SAND Slightly moist to moist, brown, topsoil.	
	0.40		
1.0		**Medium dense to dense, clayey, silty SAND** Slightly moist to moist, red/brown, transported.	
	1.90	**Trial pit stopped at required depth**	
2.0		End of Log	
3.0			

NOTES 1: Trial pit dry
2: Sample BP35A/1/1 at 0.4-1.9m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 20 Feb 2019
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 35

HOLE NO: BP35A-3
X COORD: 2 704 339
Y COORD: Lo27 -38 212
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist to moist, brown, topsoil.	
	0.30		
		Medium dense to dense, clayey, silty SAND Slightly moist, red/brown, transported.	
1.0			
	1.30		
		Trial pit stopped - slow progress	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP35A/3/1 at 0.3-1.3m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 20 Feb 2019
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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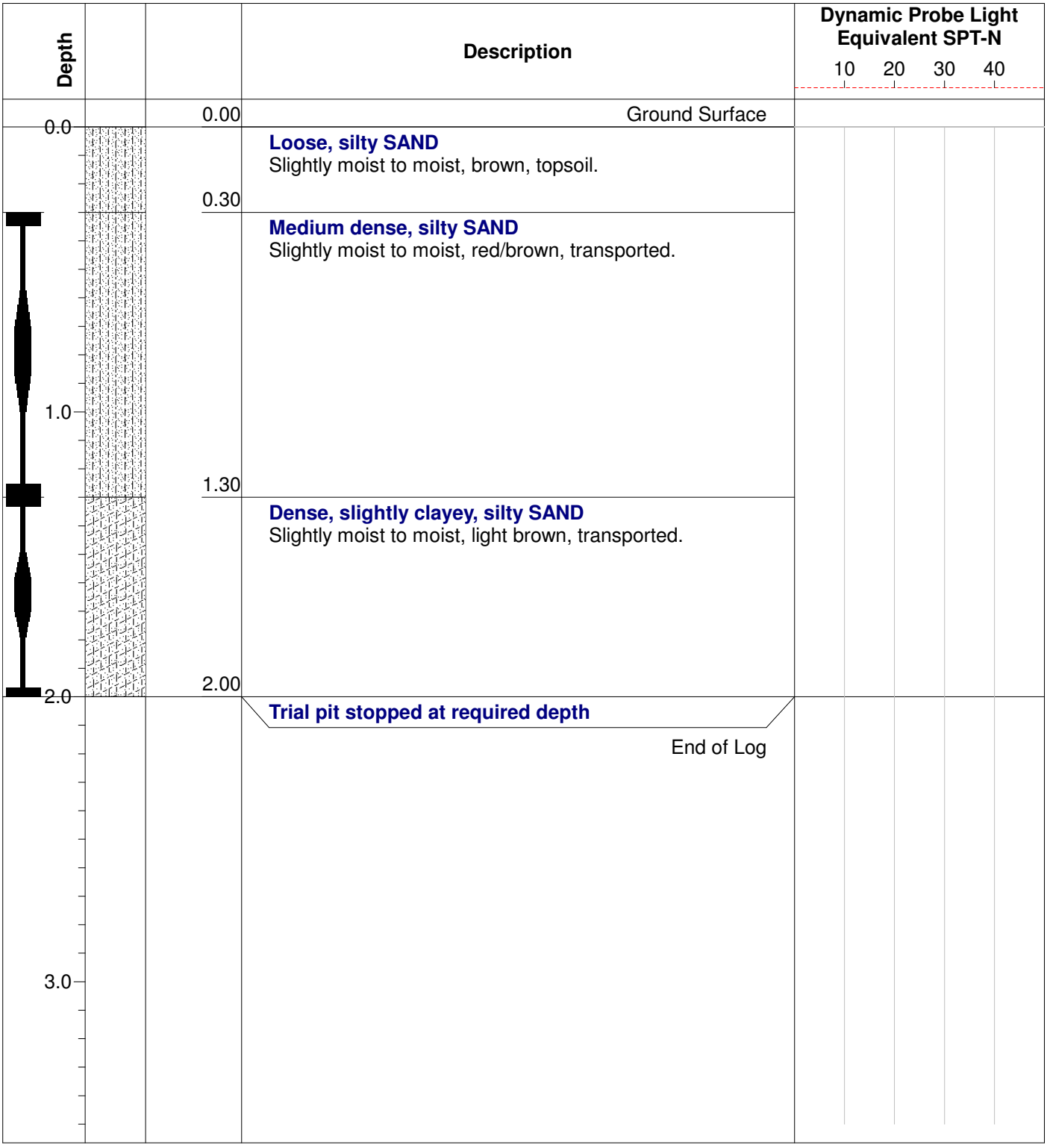
TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 35

HOLE NO: BP35A-5
X COORD: 2 704 419
Y COORD: Lo27 -38 229
ELEVATION:



NOTES 1: Trial pit dry
2: Sample BP35A/5/1 at 0.3-1.3m; BP35A/5/2 at 1.3-2.0m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 20 Feb 2019
PROFILED BY: R Roberts
CHECKED BY:
Prof Reg:
Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 35

HOLE NO: BP35A-6
X COORD: 2 704 522
Y COORD: Lo27 -38 176
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist, brown, topsoil.	
	0.30		
		Medium dense, silty SAND Slightly moist to moist, orange/brown, transported.	
	0.90		
1.0		**Dense, clayey, silty SAND** Slightly moist, brown/grey, transported.	
	1.50		
		Trial pit stopped - slow progress	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP35A/6/1 at 0.9-1.5m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 20 Feb 2019
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CHECKED BY: Prof Reg:

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Template: SMEC TP04

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SMEC Reference: 19EP10
6 March 2019

Nemai Consulting
147 Bram Fischer Drive
Ferndale
2194

FAO: Donavan Henning

RE: ALTERNATIVE BORROW PITS FOR MCWAP PROJECT

MEMORANDUM 4: Borrow Pit 38

Introduction

As part of the Environmental Impact Assessment EIA) submission for Phase 2 of the Mokolo Crocodile Water Augmentation Project (MCWAP), several landowners along the route have requested that borrow pits on their respective properties be relocated to locations identified by the landowners. Apart from the necessity of proving the feasibility of the potential alternative locations, borrow pit relocation requires authorisation afresh which forms an integral part of the EIA and authorisation process for the project.

The specified quantity/frequency of selected material along the pipeline route is 100 000m^3/5km. It is on this basis that the potential sources were selected.

Due to the limited timeframe to assess the sites, only a prospecting exercise could be undertaken, which comprised 4no. trial pits and generalised laboratory testing. It is understood that the detailed investigations will be undertaken as part of the detailed design phase of the project.

A revised area for borrow pit 38, which is located on farm Haarlem Oost 51KQ Ptn 16, was proposed approximately 1km north of the proven borrow pit.

The proven source at borrow pit 38 was estimated to comprise approximately 100 000m^3 of material that failed the assessment criteria. However, the borrow pit was included as a potential material source as it was felt that the clay fraction could be stabilised or blended with another source such that the material would be suitable for selected backfill.

A site layout, showing the proven (red) and proposed relocation (white) of borrow pit 38, is given hereunder as Diagram 1.

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www.smec.com

Diagram 1: Borrow Pit 35 Layout Plan

Standards and Guidelines

SMEC executed the fieldwork and material testing based on good geotechnical practice, incorporating the following guideline documents and standards that directly relate to the proposed application:

- Site Investigation Code of Practice, SAICE Geotechnical Division (2010);
- Guidelines for Soil and Rock Logging of South Africa, AEG/SAIEG/SAICE (2001);
- COLTO: Standard Specifications for Road and Bridge Works for State Road Authorities (1998);
- SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983);
- SABS 1200 DB-1989 Earthworks (Pipe Trenches) South African Bureau of Standards (1989);
- TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification.

Methodology

The site investigation comprised machine excavated test pits and indicative laboratory sampling to identify the index properties of the on-site soils and highlight their limitations and concerns with regards to their application for the proposed application (pipe bedding and backfill).

Based on the findings of the investigations, a pre-feasibility level geotechnical report has been compiled with emphasis on generalised in-situ material characteristics, depth (as can be visually determined) to groundwater and materials utilisation potential.

The following material minimum quality characteristics for borrow sources of potential bedding and selected backfill, in accordance with TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification, are required:

- Maximum particle size 19 mm
- Not more than 5% passing the 13.2 mm sieve
- Not more than 20% passing the 0.425 mm sieve
- PI less than 12

Furthermore, the compactability requirements for the pipe bedding, as specified by SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983) are:

Table 1: Suitability of Granular Pipe Bedding Material

Compactability Factor	Suitability
<0.1	Material suitable
0.1-0.4	Material suitable (except for flexible pipes that may be subject to waterlogged conditions) but require extra care in compaction
>0.4	Material unsuitable

This memorandum is an assessment based on the observations made during the fieldwork as the laboratory testing has not been completed.

Fieldwork Observations

Four trial pits were excavated across the proposed relocation site by a Case 695 Super 12 Tractor Loader Backhoe (TLB).

The observed profile within the trial pits generally comprised a nominal depth of topsoil overlying shale or diabase, which was occasionally overlain by a thin gravel layer. The TLB refused on the rock at depths of less than 1m.

No groundwater was observed.

The investigation layout is given as Diagram 2 hereunder and trial pit profiles attached herewith.

Diagram 2: Borrow Pit 38 Investigation Layout Plan

Preliminary Assessment and Recommendations

The proposed relocation of borrow pit 38 is not viable as there are no suitable materials at this location.

Yours sincerely,

Richard Roberts

Geotechnical Engineer

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 38

HOLE NO: BP38A-1
X COORD: 2 673 903
Y COORD: Lo27 -43 845
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00	Ground Surface	
		Loose to medium dense, silty, gravelly SAND Slightly moist, brown, topsoil.	
	0.30	**Soft rock SHALE** Highly to moderately weathered, grey/brown becoming grey/purple,very thinly bedded, very highly fractured, very fine grained.	
	0.80	**Refusal on medium hard rock shale**	
1.0		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: No sample
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 38

HOLE NO: BP38A-2
X COORD: 2 673 933
Y COORD: Lo27 -43 950
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty, gravelly SAND** Slightly moist, brown, topsoil.	
	0.20	**Medium dense to dense, silty, sandy GRAVEL** Slightly moist, brown becoming light brown, transported.	
	0.90		
1.0	1.00	**Soft rock SHALE** Highly to moderately weathered, grey/brown,very thinly bedded, very highly fractured, very fine grained.	
		Trial pit stopped in shale	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP38A/2/1 at 0.2-0.9m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 38

HOLE NO: BP38A-3
X COORD: 2 674 000
Y COORD: Lo27 -43 868
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00	Ground Surface	
		Loose, silty, gravelly SAND Slightly moist, brown, topsoil.	
	0.20	**Soft to medium hard rock SHALE** Highly to moderately weathered, grey/brown,very thinly bedded, very highly fractured, very fine grained.	
	0.60	**Refusal on medium hard rock shale**	
		End of Log	
1.0			
2.0			
3.0			

NOTES 1: Trial pit dry
2: No sample
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 38

HOLE NO: BP38A-4
X COORD: 2 674 019
Y COORD: Lo27 -44 003
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty, gravelly SAND** Slightly moist, brown, topsoil.	
	0.20	**Medium dense, silty, sandy GRAVEL** Slightly moist, light brown, transported.	
	0.70	**Soft to medium hard rock SHALE** Highly to moderately weathered, grey/brown,very thinly bedded, very highly fractured, very fine grained. Ferruginsed on joints.	
1.0	1.00	**Refusal on medium hard rock shale**	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: No sample
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 38

HOLE NO: BP38A-5
X COORD: 2 674 121
Y COORD: Lo27 -43 900
ELEVATION:

Depth			Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0		0.00	Ground Surface	
			Loose, clayey, silty SAND Slightly moist, dark brown, topsoil.	
		0.30	**Medium dense, silty, sandy COBBLES** Slightly moist, brown, residual.	
		0.60	**Soft to medium hard rock DIABASE** Highly weathered, grey/yellow, very highly fractured, fine grained.	
		0.90	**Trial pit stopped - slow progress**	
1.0			End of Log	
2.0				
3.0				

NOTES 1: Trial pit dry
2: No sample
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 21 Feb 2019
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 38

HOLE NO: BP38A-6
X COORD: 2 674 096
Y COORD: Lo27 -44 040
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, clayey, silty SAND** Slightly moist, dark brown, topsoil.	
	0.30	**Medium dense to dense, clayey, silty SAND** Slightly moist to moist, brown, residual. Becoming gravelly with depth.	
1.0	1.10	**Trial pit stopped - slow progress**	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: No sample
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 21 Feb 2019
PROFILED BY: R Roberts Prof Reg:
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SMEC Reference: 19EP10
6 March 2019

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FAO: Donavan Henning

RE: ALTERNATIVE BORROW PITS FOR MCWAP PROJECT

MEMORANDUM 5: Borrow Pit 39

Introduction

As part of the Environmental Impact Assessment EIA) submission for Phase 2 of the Mokolo Crocodile Water Augmentation Project (MCWAP), several landowners along the route have requested that borrow pits on their respective properties be relocated to locations identified by the landowners. Apart from the necessity of proving the feasibility of the potential alternative locations, borrow pit relocation requires authorisation afresh which forms an integral part of the EIA and authorisation process for the project.

The specified quantity/frequency of selected material along the pipeline route is 100 000m^3/5km. It is on this basis that the potential sources were selected.

Due to the limited timeframe to assess the sites, only a prospecting exercise could be undertaken, which comprised 7no. trial pits and generalised laboratory testing. It is understood that the detailed investigations will be undertaken as part of the detailed design phase of the project.

A revised area for borrow pit 39, which is located on farm Welgevonden 16KQ RE/5/16, was proposed approximately 850m to the south of the proven borrow pit. The landowner offered the whole of this property as potential to locate the borrow pit. However, due to excessive haulage that would result, the corner located adjacent to the proposed pipeline alignment was selected for investigation.

The proven source at borrow pit 39 was estimated to comprise approximately 100 000m^3 of bedding and soft backfill material.

A site layout, showing the proven (red) and proposed relocation (white) of borrow pit 39, is given hereunder as Diagram 1.

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www.smec.com

Diagram 1: Borrow Pit 39 Layout Plan

Standards and Guidelines

SMEC executed the fieldwork and material testing based on good geotechnical practice, incorporating the following guideline documents and standards that directly relate to the proposed application:

- Site Investigation Code of Practice, SAICE Geotechnical Division (2010);
- Guidelines for Soil and Rock Logging of South Africa, AEG/SAIEG/SAICE (2001);
- COLTO: Standard Specifications for Road and Bridge Works for State Road Authorities (1998);
- SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983);
- SABS 1200 DB-1989 Earthworks (Pipe Trenches) South African Bureau of Standards (1989);
- TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification.

Methodology

The site investigation comprised machine excavated test pits and indicative laboratory sampling to identify the index properties of the on-site soils and highlight their limitations and concerns with regards to their application for the proposed application (pipe bedding and backfill).

Based on the findings of the investigations, a pre-feasibility level geotechnical report has been compiled with emphasis on generalised in-situ material characteristics, depth (as can be visually determined) to groundwater and materials utilisation potential.

The following material minimum quality characteristics for borrow sources of potential bedding and selected backfill, in accordance with TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification, are required:

- Maximum particle size 19 mm
- Not more than 5% passing the 13.2 mm sieve
- Not more than 20% passing the 0.425 mm sieve
- PI less than 12

Furthermore, the compactability requirements for the pipe bedding, as specified by SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983) are:

Table 1: Suitability of Granular Pipe Bedding Material

Compactability Factor	Suitability
<0.1	Material suitable
0.1-0.4	Material suitable (except for flexible pipes that may be subject to waterlogged conditions) but require extra care in compaction
>0.4	Material unsuitable

This memorandum is an assessment based on the observations made during the fieldwork as the laboratory testing has not been completed.

Fieldwork Observations

Seven trial pits were excavated across the proposed relocation site by a Case 695 Super 12 Tractor Loader Backhoe (TLB).

The observed profile within the trial pits comprised two general profiles:

1. A nominal depth of topsoil overlying stiff sandy clay (trial pits BP39A-1, 5 and 6). In BP39A-6 the clay was underlain by clayey sand at 1.2m.
2. A nominal depth of topsoil overlying silty sand, proven to an average depth of generally 2.2m.

The boundary between the clay and sand on site was clearly defined by a treeline; larger trees grew within the sand area, whilst the clay area was characterised by small trees, shrubs and small shallow pans.

No groundwater was observed.

The investigation layout is given as Diagram 2 hereunder and trial pit profiles attached herewith.

Diagram 2: Borrow Pit 39 Investigation Layout Plan

Preliminary Assessment and Recommendations

The location of the borrow pit is to the south of the proven source and the observed profile within the trial pits is similar to that of the investigations for the proven source. Therefore, on this basis it is assumed that the materials have similar properties and the relocated site is a suitable source.

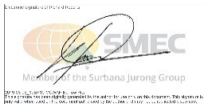
The area of the proposed source is approximately 81 000m^2 and the estimated average excavation of the suitable materials will be 2m, indicating a potential source of selected backfill material of 160 000m^3.

For the purposes of the EIA application, and based on the trial pit observations and material volume estimates, the proposed relocated site for borrow pit 39 is a potentially suitable source of selected backfill material.

The suitability of the material will be confirmed in a separate report on completion of the laboratory testing.

It must be noted that this prospecting investigation comprises a pre-feasibility assessment of the site and must be confirmed by detailed investigations and laboratory testing. Furthermore, the northern boundary of the borrow pit will be determined by the floodlines of the Matlabas River.

Yours sincerely,



Richard Roberts

Geotechnical Engineer

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 39

HOLE NO: BP39A-1
X COORD: 2 664 773
Y COORD: Lo27 -41 829
ELEVATION:

Depth			Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
		0.00	Ground Surface	
0.0		0.10	**Loose, clayey, silty SAND** Slightly moist, brown, topsoil.	
			Stiff, silty, sandy CLAY Slightly moist, dark brown, transported.	
		0.90	**Trial pit stopped - slow progress**	
1.0			End of Log	
2.0				
3.0				

NOTES 1: Trial pit dry
2: No sample
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 21 Feb 2019
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 39

HOLE NO: BP39A-2
X COORD: 2 664 756
Y COORD: Lo27 -42 125
ELEVATION:

Depth	Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00 Ground Surface	
	Loose, silty SAND Slightly moist, light brown, topsoil. 0.20	
	Loose to medium dense, silty SAND Slightly moist to moist, light brown becoming orange/brown, transported.	
1.0		
2.0	2.20	
	Trial pit stopped at required depth	
	End of Log	
3.0		

NOTES 1: Trial pit dry
2: Sample BP39A/2/1 at 0.2-2.2m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 21 Feb 2019
PROFILED BY: R Roberts
CHECKED BY:
Prof Reg:
Prof Reg:

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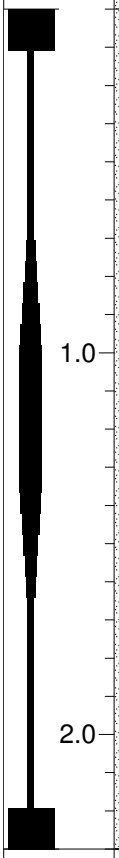
TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 39

HOLE NO: BP39A-3
X COORD: 2 664 730
Y COORD: Lo27 -42 274
ELEVATION:

Depth	Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00 Ground Surface	
	0.10 **Loose, silty SAND** Slightly moist, light brown, topsoil.	
	Loose to medium dense, silty SAND Slightly moist to moist, light brown becoming orange/brown, transported.	
1.0		
2.0		
	2.30 **Trial pit stopped at required depth**	
	End of Log	
3.0		



NOTES 1: Trial pit dry
2: Sample BP39A/3/1 at 0.1-2.3m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 21 Feb 2019
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Prof Reg:
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Template: SMEC TP04

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 39

HOLE NO: BP39A-4
X COORD: 2 664 990
Y COORD: Lo27 -41 799
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist, brown, topsoil.	
	0.20	**Medium dense to dense, slightly clayey, silty SAND** Moist, orange/brown, transported. Becoming clayey with depth.	
1.0			
	1.70	**Trial pit stopped - slow progress**	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP39A/4/1 at 0.2-1.7m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 21 Feb 2019
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 39

HOLE NO: BP39A-5
X COORD: 2 664 952
Y COORD: Lo27 -42 030
ELEVATION:

Depth			Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
		0.00	Ground Surface	
0.0			**Medium dense, clayey, silty SAND** Slightly moist, brown, topsoil.	
		0.20	**Stiff, silty, sandy CLAY** Slightly moist, dark brown, transported.	
		0.90	**Trial pit stopped in clay**	
1.0			End of Log	
2.0				
3.0				

NOTES 1: Trial pit dry
2: No sample
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 39

HOLE NO: BP39A-6
X COORD: 2 664 856
Y COORD: Lo27 -42 231
ELEVATION:

Depth			Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
		0.00	Ground Surface	
0.0			**Medium dense, clayey, silty SAND** Slightly moist, brown, topsoil.	
		0.20	**Stiff, silty, very sandy CLAY** Slightly moist, dark brown/grey, transported.	
		0.90	**Dense, clayey, silty SAND** Slightly moist, brown/grey, transported.	
1.0		1.20	**Trial pit stopped in clayey sand**	
			End of Log	
2.0				
3.0				

NOTES 1: Trial pit dry
2: Sample BP39A/6/1 at 0.2-0.9m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 21 Feb 2019
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CHECKED BY: Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 39

HOLE NO: BP39A-7
X COORD: 2 664 653
Y COORD: Lo27 -42 019
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist, light brown, topsoil.	
	0.30	**Medium dense, slightly silty SAND** Slightly moist to moist, light brown becoming orange/brown, transported.	
1.0			
2.0	2.10	**Trial pit stopped - sides collapsing**	
		End of Log	
3.0			

NOTES 1: Trial pit dry
2: Sample BP39A/7/1 at 0.3-2.1m
3:
4:

MACHINE: CASE 695 Super R
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog

DATE PROFILED: 21 Feb 2019
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Prof Reg:

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global experience

SMEC Reference: 19EP10
6 March 2019

Nemai Consulting
147 Bram Fischer Drive
Ferndale
2194

FAO: Donavan Henning

RE: ALTERNATIVE BORROW PITS FOR MCWAP PROJECT

MEMORANDUM 6: Borrow Pit 50

Introduction

As part of the Environmental Impact Assessment EIA) submission for Phase 2 of the Mokolo Crocodile Water Augmentation Project (MCWAP), several landowners along the route have requested that borrow pits on their respective properties be relocated to locations identified by the landowners. Apart from the necessity of proving the feasibility of the potential alternative locations, borrow pit relocation requires authorisation afresh which forms an integral part of the EIA and authorisation process for the project.

The specified quantity/frequency of selected material along the pipeline route is 100 000m^3/5km. It is on this basis that the potential sources were selected.

Due to the limited timeframe to assess the sites, only a prospecting exercise could be undertaken, which comprised 6no. trial pits and generalised laboratory testing. It is understood that the detailed investigations will be undertaken as part of the detailed design phase of the project.

A revised area for borrow pit 50, which is located on farm Zandheuwel Ptn 1/356, was proposed approximately 3.5km to the northwest of the proven borrow pit. The proposed location of borrow pit 50 is adjacent and to the east of borrow pit 48.

The proven source at borrow pit 50 was estimated to comprise approximately 100 000m^3 of bedding and soft backfill material. The proven source at borrow pit 48 was estimated to comprise approximately 100 000m^3 of bedding and soft backfill material.

A site layout, showing the proven (red) and proposed relocation (white) of borrow pit 50, is given hereunder as Diagram 1. Borrow pit 48 is indicated in yellow.

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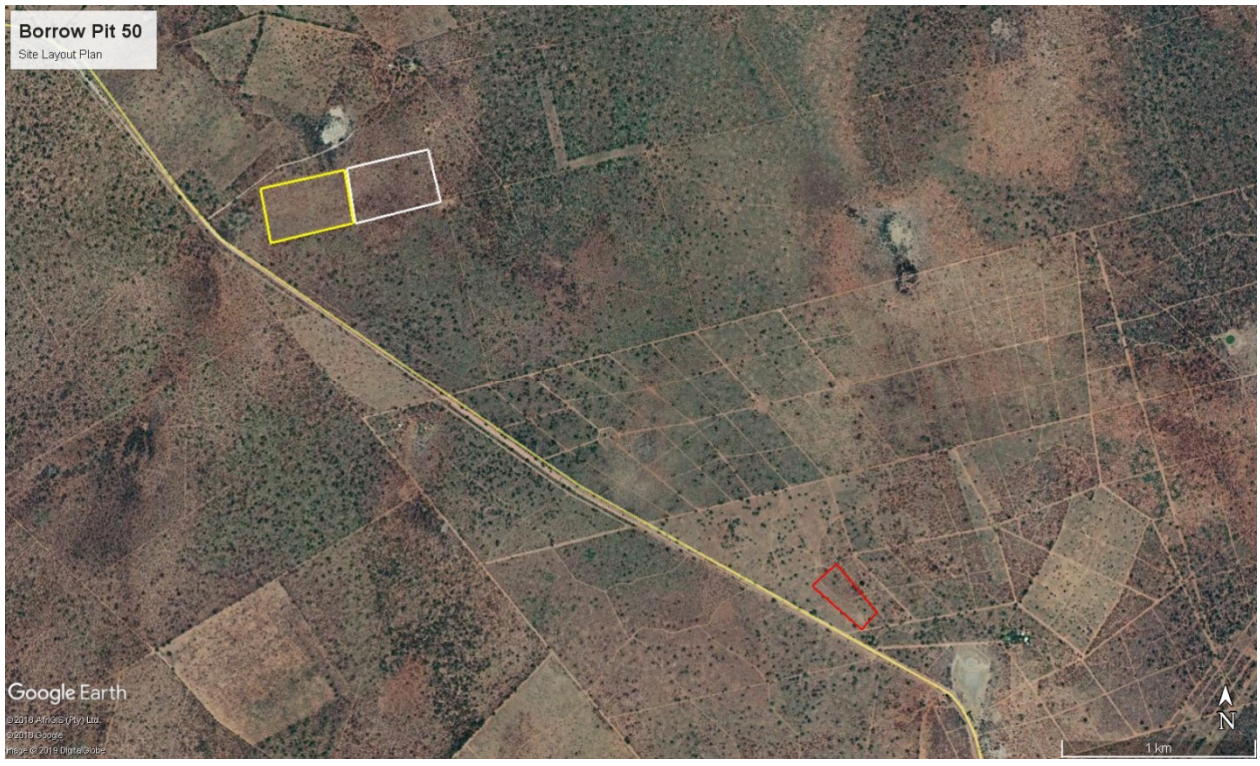

Diagram 1: Borrow Pit 50 Layout Plan

Standards and Guidelines

SMEC executed the fieldwork and material testing based on good geotechnical practice, incorporating the following guideline documents and standards that directly relate to the proposed application:

- Site Investigation Code of Practice, SAICE Geotechnical Division (2010);
- Guidelines for Soil and Rock Logging of South Africa, AEG/SAIEG/SAICE (2001);
- COLTO: Standard Specifications for Road and Bridge Works for State Road Authorities (1998);
- SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983);
- SABS 1200 DB-1989 Earthworks (Pipe Trenches) South African Bureau of Standards (1989);
- TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification.

Methodology

The site investigation comprised machine excavated test pits and indicative laboratory sampling to identify the index properties of the on-site soils and highlight their limitations and concerns with regards to their application for the proposed application (pipe bedding and backfill).

Based on the findings of the investigations, a pre-feasibility level geotechnical report has been compiled with emphasis on generalised in-situ material characteristics, depth (as can be visually determined) to groundwater and materials utilisation potential.

The following material minimum quality characteristics for borrow sources of potential bedding and selected backfill, in accordance with TCTA 07-001 Mokolo and Crocodile River Water Augmentation Project, Vol. 3 Specification, are required:

- Maximum particle size 19 mm
- Not more than 5% passing the 13.2 mm sieve
- Not more than 20% passing the 0.425 mm sieve
- PI less than 12

Furthermore, the compactability requirements for the pipe bedding, as specified by SABS 1200 LB-1983 Bedding (Pipes) South African Bureau of Standards (1983) are:

Table 1: Suitability of Granular Pipe Bedding Material

Compactability Factor	Suitability
<0.1	Material suitable
0.1-0.4	Material suitable (except for flexible pipes that may be subject to waterlogged conditions) but require extra care in compaction
>0.4	Material unsuitable

This memorandum is an assessment based on the observations made during the fieldwork as the laboratory testing has not been completed.

Fieldwork Observations

Seven trial pits were excavated across the proposed relocation site by a CAT 428E Tractor Loader Backhoe (TLB).

The observed profile within the trial pits comprised a nominal depth of topsoil overlying silty sand, proven to an average depth of 1.5m. The sand was underlain by calcrete.

No groundwater was observed.

The investigation layout is given as Diagram 2 hereunder and trial pit profiles attached herewith.

Diagram 2: Borrow Pit 50 Investigation Layout Plan

Preliminary Assessment and Recommendations

The location of the borrow pit is to the east of a proven source (borrow pit 48) and the observed profile within the trial pits is similar to that of the investigations for the proven source. Therefore, on this basis it is assumed that the materials have similar properties and the relocated site is a suitable source.

The area of the proposed source is approximately 128 000m^2 and the estimated average excavation of the suitable materials will be 1m, indicating a potential source of selected backfill material of 128 000m^3.

For the purposes of the EIA application, and based on the trial pit observations and material volume estimates, the proposed relocated site for borrow pit 50 is a potentially suitable source of selected backfill material.

The suitability of the material will be confirmed in a separate report on completion of the laboratory testing.

It must be noted that this prospecting investigation comprises a pre-feasibility assessment of the site and must be confirmed by detailed investigations and laboratory testing.

Yours sincerely,

Richard Roberts

Geotechnical Engineer

TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 50

HOLE NO: BP50A-1
X COORD: 2 631 820
Y COORD: Lo27 -33 145
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist, brown, topsoil.	
	0.20	**Medium dense to dense, silty SAND** Slightly moist, red/brown, transported.	
1.0			
	1.30	**Weakly cemented CALCRETE**	
	1.50	**Trial pit stopped in calcrete**	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP50A/1/1 at 0.2-1.3m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 22 Feb 2019
PROFILED BY: R Roberts
CHECKED BY:
Prof Reg:
Prof Reg:

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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 50

HOLE NO: BP50A-2
X COORD: 2 631 810
Y COORD: Lo27 -33 300
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist, brown, topsoil.	
	0.30		
		Medium dense to dense, silty SAND Slightly moist, red/brown, transported. Becoming clayey from 1.6m.	
1.0			
	1.70		
		Trial pit stopped - slow progress	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP50A/2/1 at 0.3-1.7m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 22 Feb 2019
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CHECKED BY:
Prof Reg:
Prof Reg:

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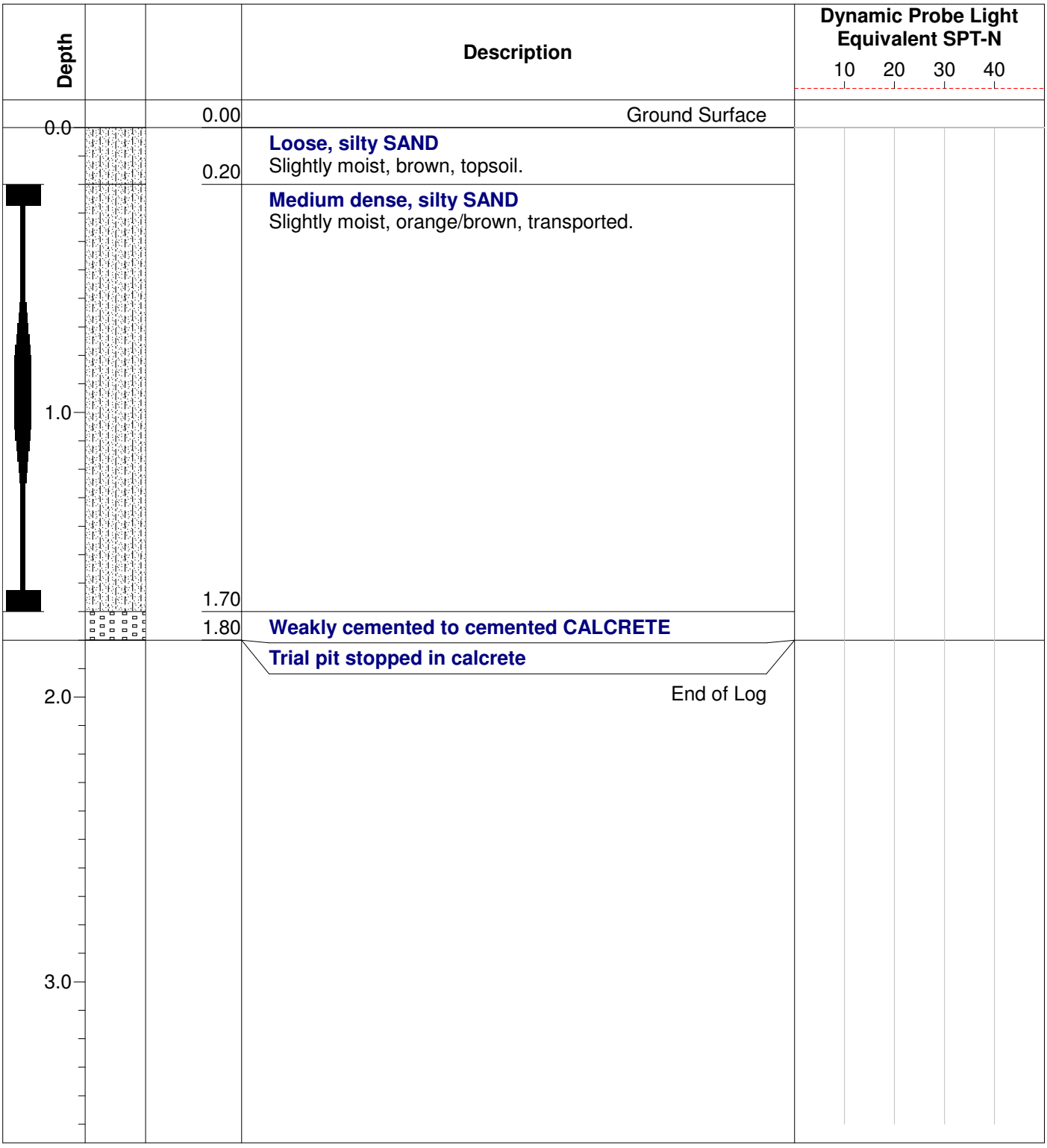
TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 50

HOLE NO: BP50A-3
X COORD: 2 631 792
Y COORD: Lo27 -33 410
ELEVATION:



NOTES 1: Trial pit dry
2: Sample BP50A/3/1 at 0.2-1.7m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 22 Feb 2019
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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 50

HOLE NO: BP50A-4
X COORD: 2 631 994
Y COORD: Lo27 -33 173
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist, orange/brown, topsoil.	
	0.20	**Medium dense to dense, silty SAND** Slightly moist, orange/brown, transported.	
1.0			
	1.60	**Dense, silty SAND** Slightly moist, light brown, transported.	
	1.80	**Trial pit stopped at required depth**	
2.0		End of Log	
3.0			

NOTES 1: Trial pit dry
2: Sample BP50A/4/1 at 0.2-1.6m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 22 Feb 2019
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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 50

HOLE NO: BP50A-5
X COORD: 2 631 969
Y COORD: Lo27 -33 335
ELEVATION:

Depth	Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00 Ground Surface	
	Loose, silty SAND Slightly moist, brown, topsoil.	
	0.30	
	Medium dense to dense, silty SAND Slightly moist, orange/brown, transported.	
1.0		
2.0	2.00	
	Trial pit stopped at required depth	
	End of Log	
3.0		

NOTES 1: Trial pit dry
2: Sample BP50A/5/1 at 0.3-2.0m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
DATE PROFILED: 22 Feb 2019
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TRIAL PIT LOG

CLIENT: Nemai Consulting
PROJECT: MCWAP Borrow Pit Relocation
PROJECT NO: 19EP10
SITE: Borrow Pit 50

HOLE NO: BP50A-6
X COORD: 2 631 911
Y COORD: Lo27 -33 451
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose, silty SAND** Slightly moist, brown, topsoil.	
	0.30	**Medium dense to dense, silty SAND** Slightly moist, orange/brown, transported.	
1.0			
	1.30	**Refusal on strongly cemented calcrete**	
		End of Log	
2.0			
3.0			

NOTES 1: Trial pit dry
2: Sample BP50A/6/1 at 0.3-1.3m
3:
4:

MACHINE: CAT 428E
DIAM: Trench
FILE REF: 19EP10/3 Working/Documents/WInlog
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