Contaminated Land Appraisals
Brownfield Remediation Solutions
Site Investigation Services
Earthworks Design and Control
Flood Risk Assessments

Mr Gordon Stephenson
10 Parkwood Rise
Barnby Dun
Doncaster
DN3 1LY

12th October 2018

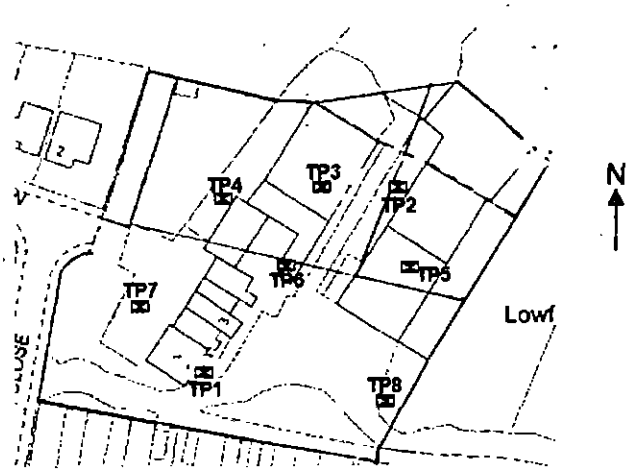
Ref C297/02/GS

Dear Gordon,

Ref: Percolation Tests on Land at Lowfield Farm, Lowfield Road, Bolton Upon Dearne.

In accordance with your instructions, a representative of G&M Consulting Ltd (G&M), attended the above site to witness the undertaking of three soakaway tests within the superficial soils encountered on the site. It is understood that a planning application will be submitted in due course for the development of the site for residential purposes. This work was carried out in order to assess the feasibility as to the use of infiltration methods for the drainage of surface water run-off.

The fieldwork was carried out on the 15th August 2018. The pits were excavated using a 1.5 tonne 360° tracked machine, at the locations shown below, and referenced TP1 to TP8. The locations of the test pits were determined primarily on site access constraints at the time of investigation.



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- The dimensions of each test pit are summarised below;

Test Pit No	Length (m)	Width (m)	Depth (m)
1	1.2	0.3	1.4
2	1.5	0.3	1.9
3	1.5	0.3	1.0
4	1.4	0.3	1.1
5	1.4	0.3	1.2
6	1.5	0.3	1.6
7	1.2	0.3	0.9
8	1.4	0.3	1.7

In summary, made ground soils were encountered in all of the pits excavated, with the exception of TP4 and TP7, which encountered a thin 100 mm thick topsoil. The made ground was encountered to depths of between 0.20 m and 0.80 m bgl.

In TP2, TP3 and TP5, the made ground or topsoil was underlain by a pale yellow sandy clay, which extended to the base of each of the trial pits.

In the remaining trial pits, located in the western and southern part of the site the made ground or topsoil was underlain by granular soils. In TP1 and TP8 these granular soils comprised a slightly gravelly clayey fine to coarse sand over lying a very gravelly fine to coarse sand with low cobble content; the latter of which is considered likely to be highly weathered sandstone bedrock. In Tp4, TP6 and TP7, the upper granular strata, encountered in TP1 and TP8 was recorded as absent.

A copy of the trial pit logs are provided in Attachment A of this correspondence.

No groundwater seepages were recorded during the excavation of the trial pits.

In total three soakaway tests were undertaken, in TP1, TP4 and TP6. The test procedure was carried out in general accordance with the requirements of DG365 (2016) under the supervision of a geologist from G&M.

Clean potable water for the tests was supplied from a 1000 litre intermediate bulk container (IBC) provided by the client, which were rapidly emptied to fill each of the test pits.

The field data sheets presenting the results are provided in Attachment A of this correspondence.

In one instance (TP6), the test was abandoned after three hours, as the infiltration rate was not sufficiently rapid enough to allow monitoring of the water level recorded during the test to the 25% depth required for analysis by BRE Digest 365. In order to analyse the test results G&M has extrapolated the falling trend at the end of the test period to determine the soil infiltration rate. This allows a reasonable and conservative assessment of the characteristics of the sand layers encountered within the trial pit to be determined.

Graphs of water level fall have been plotted, presented in Attachment B of this report, and calculations taken from these graphs have provided soil infiltration rates as follows for the tests carried out;

Test Pit No	Soil Infiltration Rate (m/s)	Notes
1	1.6×10^{-5}	Test pit refilled
4	9.2×10^{-6}	Test pit refilled
6	1.8×10^{-6}	Test pit refilled

The findings and recommendations contained in this correspondence are based on the ground conditions encountered within the trial pit together with the results of the field testing at that location. There may be other ground conditions elsewhere on site which may not have been revealed by the investigation, and which may not be taken into account in the report.

Based on the findings of this report, it would appear that some infiltration drainage is likely to be possible in the southern and western portion of the site. At the time of writing of this report, no details of the proposed location of the dwellings or external development layout was available for inspection. Therefore it is currently unclear as to the total amount of impermeable surfaces that will require to be drained.

The test results obtained during the fieldwork are only representative of local ground conditions. Given the range of the soakaway results, and the variability observed in the geology, including the fines content noted within the granular soils at some locations, there may be differences in capacity to receive storm water discharge across the site. Given the size of the site and likely scale of the development and the area requiring soakaway discharge, it is advised that further, confirmatory, testing is carried out once the external development layout is established, at the locations of any proposed soakaways to determine whether the anticipated design capacity is available.

Following detailed design of the infiltration drainage system, should there prove to be insufficient area of granular soils to drain all of the surface water generated by the proposed development, then consideration may need to be given to an attenuated drainage system to any local combined sewer system, if present, subject to asset owner approval. Alternatively it is noted that the site is underlain by sandstone bedrock, again should further infiltration drainage be required, then consideration may be given to the design of a borehole soakaway system; although this would be subject to confirmatory testing and regulatory approval.

We trust the above and the attachments are acceptable and meet with your current needs.

Yours sincerely

Graeme Swinbourne
For and on behalf of **G&M Consulting Ltd**

Attachments

ATTACHMENT A – TRIAL PIT LOGS/FIELD DATA SHEETS

Trial Pit Record

TP No					1
Contract No					
Method:	Machine excavated trial pit using a 1.5tn excavator	Site	Lowfield Farm, Bolton Upon Dearne	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
			MADE GROUND	0.20		
			Light orangish brown slightly gravelly clayey fine to coarse SAND. Gravel is subangular fine to medium of sandstone	0.80		
			Pale yellow, very gravelly sand with low cobble content, gravel is subangular to subrounded fine to coarse of sandstone, Cobble sized fragments are subangular of sandstone. (Probably highly weathered Sandstone)	1.40		
			Trial Pit Complete at 1.4m (Target depth)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.2m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Trial Pit Record

				TP No	2
				Contract No	
Method:	Machine excavated trial pit using a 1.5tn excavator	Site	Lowfield Farm, Bolton Upon Dearne	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
			MADE GROUND	0.20		
				0.70		
			Firm, pale yellow locally orange yellow slightly gravelly very sandy CLAY. Gravel is subangular fine of sandstone, sand is fine to coarse.	1.90		
			Trial Pit Complete at 1.9m (Target depth)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.5m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Trial Pit Record

				TP No	3
				Contract No	
Method:	Machine excavatod trial pit using a 1.5tn excavator	Site	Lowfield Farm, Bolton Upon Dearne	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
			MADE GROUND	0.80		
			Firm, pale yellow locally orange yellow slightly gravelly very sandy CLAY. Gravel is subangular fine of sandstone, sand is fine to coarse.			
			Trial Pit Complete at 1.0m (Target depth)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.5m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Trial Pit Record

				TP No	4
				Contract No	
Method:	Machine excavated trial pit using a 1.5tn excavator	Site	Lowfield Farm, Bolton Upon Dearne	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details						
Type	Depth To-from (m)	Vane kN/m²	Description	Depth (m)	Level (mAOD)	Legend
			TOPSOIL	0.10		
			Orangish yellow, very sandy subangular fine to coarse gravel of sandstone with low cobble content. Sand is fine to coarse, cobbles are subangular of sandstone	1.10		
			Trial Pit Complete at 1.1m (Unable to progress)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.4m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Trial Pit Record

				TP No	5
				Contract No	
Method:	Machine excavated trial pit using a 1.5tn excavator	Site	Lowfield Farm, Bolton Upon Dearne	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details						
Type	Depth To-from (m)	Vane kN/m²	Description	Depth (m)	Level (mAOD)	Legend
			MADE GROUND	0.50		
			Firm, pale yellow locally orange yellow slightly gravelly very sandy CLAY. Gravel is subangular fine of sandstone. Sand is fine to coarse.	1.20		
			Trial Pit Complete at 1.2m (Target depth)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.4m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Trial Pit Record

				TP No	6
				Contract No	
Method:	Machine excavated trial pit using a 1.5tn excavator	Site	Lowfield Farm, Bolton Upon Dearne	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details						
Type	Depth To-from (m)	Vane kN/m²	Description	Depth (m)	Level (mAOD)	Legend
			MADE GROUND	0.70		
			Orangish yellow, slightly clayey very sandy subangular fine to coarse gravel of sandstone. Sand is fine to coarse	1.60		
			Trial Pit Complete at 1.6m (Target depth)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.5m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Trial Pit Record

TP No					7
Contract No					
Method:	Machine excavated trial pit using a 1.5tn excavator	Site	*Lowfield Farm, Bolton Upon Dearne*	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details						
Type	Depth To-from (m)	Vane kN/m²	Description	Depth (m)	Level (mAOD)	Legend
			TOPSOIL	0.10		
			Orangish yellow, very sandy subangular fine to coarse gravel of sandstone with low cobble content. Sand is fine to coarse, cobbles are subangular of sandstone	0.90		
			Trial Pit Complete at 0.9m (Target depth)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.2m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Trial Pit Record

				TP No	8
				Contract No	
Method:	Machine excavated trial pit using a 1.5tn excavator	Site	Lowfield Farm, Bolton Upon Dearne	Date	29/09/18
				Scale	1:25
		Client		Logged By	AS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
			MADE GROUND	0.3		
			Light orangish brown slightly gravelly clayey fine to coarse SAND. Gravel is subangular fine to medium of sandstone	0.80		
			Pale yellow, very gravelly sand with low cobble content, gravel is subangular to subrounded fine to coarse of sandstone, Cobble sized fragments are subangular of sandstone	1.70		
			Trial Pit Complete at 1.7m (Target depth)			

Remarks
Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30m x 1.4m

Sample Types
D - Disturbed
B - Bulk
W - Water
ES - Environmental

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Soakaway Test Results Sheet

G & M Consulting Ltd

Job No	C297
Site	Lowfield Farm
Date	29/09/2018

Cumulative Time (mins)	Standing Water (mm bgl)	Cumulative Change (mm)	Head (m)
0	0.220		
1	0.282		
2	0.330		
3	0.355		
4	0.375		
5	0.392		
10	0.455		
15	0.512		
20	0.568		
25	0.605		
30	0.639		
45	0.754		
60	0.843		
75	0.895		
90	0.938		
105	0.977		
120	1.034		
150	1.093		
180	1.140		
210	1.205		
240			
270			
300			
360			
420			
480			

TP No	1

Trial Pit Dimensions

Width (m)	0.3
Length (m)	1.2
Depth (m)	1.4

Infill depth (m)	0.22
Head of water (m)	1.18
25% Depth Value (m bgl)	0.515
75% Depth Value (m bgl)	1.105

25% Depth Value (Head m)	
75% Depth Value (Head m)	

Carried Out By	ATS

Soakaway Test Results Sheet

G & M Consulting Ltd

Job No	C297
Site	Lowfield Farm
Date	29/09/2018

Cumulative Time (mins)	Standing Water (mm bgl)	Cumulative Change (mm)	Head (m)
0	0.334		
1			
2			
3			
4			
5	0.469		
10	0.491		
15			
20	0.512		
25			
30	0.529		
45			
60	0.662		
75			
90			
105			
120	0.839		
150			
180	0.878		
210	0.915		
240			
270			
300			
360			
420			
480			

TP No	4

Trial Pit Dimensions

Width (m)	0.3
Length (m)	1.4
Depth (m)	1.1

Infill depth (m)	0.334
Head of water (m)	0.766
25% Depth Value (m bgl)	0.526
75% Depth Value (m bgl)	0.909

25% Depth Value (Head m)	
75% Depth Value (Head m)	

Carried Out By	ATS

Soakaway Test Results Sheet

G & M Consulting Ltd

Job No	C297
Site	Lowfield Farm
Date	29/09/2018

Cumulative Time (mins)	Standing Water (mm bgl)	Cumulative Change (mm)	Head (m)
0	0.500		
1	0.523		
2	0.538		
3	0.541		
4	0.550		
5	0.558		
10	0.572		
15	0.582		
20	0.611		
25	0.625		
30	0.636		
45	0.684		
60	0.731		
75	0.764		
90	0.804		
105	0.836		
120	0.866		
150	0.902		
180	0.933		
210			
240			
270			
300			
360			
420			
480			

TP No	6

Trial Pit Dimensions

Width (m)	0.3
Length (m)	1.5
Depth (m)	1.6

Infill depth (m)	0.500
Head of water (m)	1.100
25% Depth Value (m bgl)	0.775
75% Depth Value (m bgl)	1.325

25% Depth Value (Head m)	
75% Depth Value (Head m)	

Carried Out By	ATS

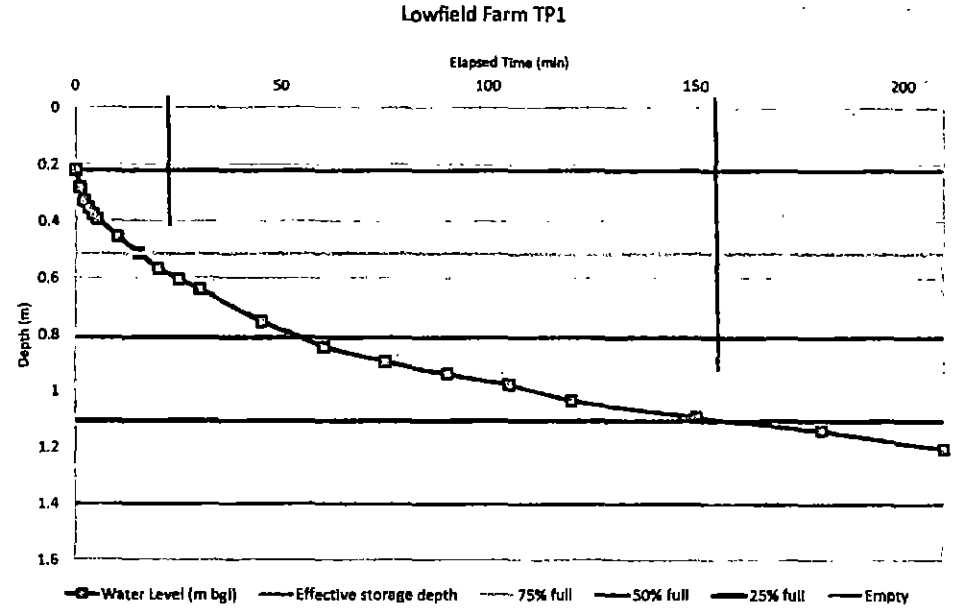
ATTACHMENT B – CALCULATION SHEETS

Soakaway Test Interpretation

Site	Lowfield Farm	
Test location	TP1	
Trial pit length (m)		1.2
Trial pit width (m)		0.3
Trial pit depth (m)		1.4

Cumulative Time (mins)	Water Level (m bgl)	Effective storage depth	75% full	50% full	25% full	Empty
0	0.22	0.22	0.515	0.810	1.105	1.4
1	0.282	0.22	0.515	0.810	1.105	1.4
2	0.33	0.22	0.515	0.810	1.105	1.4
3	0.355	0.22	0.515	0.810	1.105	1.4
4	0.375	0.22	0.515	0.810	1.105	1.4
5	0.392	0.22	0.515	0.810	1.105	1.4
10	0.455	0.22	0.515	0.810	1.105	1.4
15	0.512	0.22	0.515	0.810	1.105	1.4
20	0.568	0.22	0.515	0.810	1.105	1.4
25	0.605	0.22	0.515	0.810	1.105	1.4
30	0.639	0.22	0.515	0.810	1.105	1.4
45	0.754	0.22	0.515	0.810	1.105	1.4
60	0.843	0.22	0.515	0.810	1.105	1.4
75	0.895	0.22	0.515	0.810	1.105	1.4
90	0.938	0.22	0.515	0.810	1.105	1.4
105	0.977	0.22	0.515	0.810	1.105	1.4
120	1.034	0.22	0.515	0.810	1.105	1.4
150	1.093	0.22	0.515	0.810	1.105	1.4
180	1.14	0.22	0.515	0.810	1.105	1.4
210	1.205	0.22	0.515	0.810	1.105	1.4

Effective storage volume between 75% and 25%	0.21	m3
Internal surface area up to 50% effective depth	2.13	m2
Time water level at 75% effective depth	900	s
Time water level at 25% effective depth	7200	s
Time for water level to fall from 75% to 25% depth	6300	s
Soil infiltration rate	**1.6E-05**	**m/s**

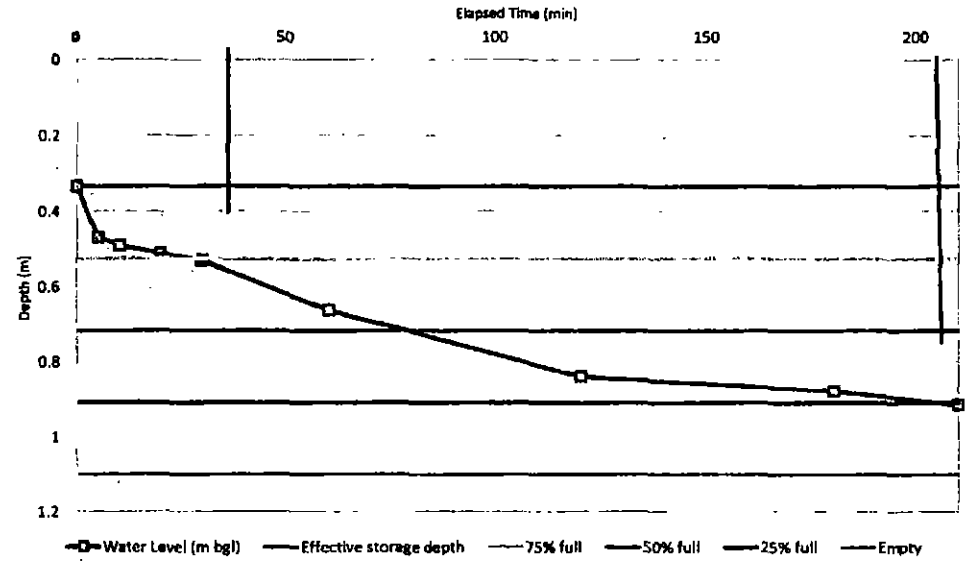


Soakaway Test Interpretation

Site	**Lowfield Farm**	
Test location	**TP4**	
Trial pit length (m)		1.4
Trial pit width (m)		0.3
Trial pit depth (m)		1.1

Cumulative Time (mins)	Water Level (m bgl)	Effective storage depth	75% full	50% full	25% full	Empty
0	0.334	0.334	0.526	0.717	0.909	1.1
1		0.334	0.526	0.717	0.909	1.1
2		0.334	0.526	0.717	0.909	1.1
3		0.334	0.526	0.717	0.909	1.1
4		0.334	0.526	0.717	0.909	1.1
5	0.469	0.334	0.526	0.717	0.909	1.1
10	0.491	0.334	0.526	0.717	0.909	1.1
15		0.334	0.526	0.717	0.909	1.1
20	0.512	0.334	0.526	0.717	0.909	1.1
25		0.334	0.526	0.717	0.909	1.1
30	0.529	0.334	0.526	0.717	0.909	1.1
45		0.334	0.526	0.717	0.909	1.1
60	0.662	0.334	0.526	0.717	0.909	1.1
75		0.334	0.526	0.717	0.909	1.1
90		0.334	0.526	0.717	0.909	1.1
105		0.334	0.526	0.717	0.909	1.1
120	0.839	0.334	0.526	0.717	0.909	1.1
150		0.334	0.526	0.717	0.909	1.1
180	0.878	0.334	0.526	0.717	0.909	1.1
210	0.915	0.334	0.526	0.717	0.909	1.1

Effective storage volume between 75% and 25%	0.16 m³
Internal surface area up to 50% effective depth	1.72 m²
Time water level at 75% effective depth	1800 s
Time water level at 25% effective depth	12000 s
Time for water level to fall from 75% to 25% depth	10200 s
Soil infiltration rate	**9.2E-06 m/s**



Soakaway Test Interpretation

Site	Lowfield Farm
Test location	TP6
Trial pit length (m)	1.5
Trial pit width (m)	0.3
Trial pit depth (m)	1.6

Cumulative Time (mins)	Water Level (m bgl)	Effective storage depth	75% full	50% full	25% full	Empty
0	0.5	0.5	0.775	1.050	1.325	1.6
1	0.523	0.5	0.775	1.050	1.325	1.6
2	0.538	0.5	0.775	1.050	1.325	1.6
3	0.541	0.5	0.775	1.050	1.325	1.6
4	0.55	0.5	0.775	1.050	1.325	1.6
5	0.558	0.5	0.775	1.050	1.325	1.6
10	0.572	0.5	0.775	1.050	1.325	1.6
15	0.582	0.5	0.775	1.050	1.325	1.6
20	0.611	0.5	0.775	1.050	1.325	1.6
25	0.625	0.5	0.775	1.050	1.325	1.6
30	0.636	0.5	0.775	1.050	1.325	1.6
45	0.684	0.5	0.775	1.050	1.325	1.6
60	0.731	0.5	0.775	1.050	1.325	1.6
75	0.764	0.5	0.775	1.050	1.325	1.6
90	0.804	0.5	0.775	1.050	1.325	1.6
105	0.836	0.5	0.775	1.050	1.325	1.6
120	0.866	0.5	0.775	1.050	1.325	1.6
150	0.902	0.5	0.775	1.050	1.325	1.6
180	0.933	0.5	0.775	1.050	1.325	1.6
300	1.05	0.5	0.775	1.050	1.325	1.6
500	1.2	0.5	0.775	1.050	1.325	1.6
750	1.3	0.5	0.775	1.050	1.325	1.6
1000	1.325	0.5	0.775	1.050	1.325	1.6

Effective storage volume between 75% and 25%	0.25	m3
Internal surface area up to 50% effective depth	2.43	m2
Time water level at 75% effective depth	4500	s
Time water level at 25% effective depth	60000	s
Time for water level to fall from 75% to 25% depth	55500	s
Soil infiltration rate	**1.8E-06**	**m/s**