Appendix B – Drawings

FOR INFORMATION

LEGEND

- EX BDY
- PROP SITE EXTENTS
- PROP 36m ARTERIAL RD
- PROP 23m COLLECTOR RD
- PROP 20m LOCAL RD

Ref	Revisions	By	Date
D	FOR INFORMATION	TCH	03/2024
C	DRAFT	TCH	03/2024
B	DRAFT	TCH	02/2024
A	DRAFT	TCH	02/2024

	By	Date
Survey	LINZ	02/2024
Design	TCH	02/2024
Drawn	TCH	02/2024
Checked	DJM	####

Maven Associates
09 571 0200
info@maven.co.nz
www.maven.co.nz
3 Owens Road, Epsom
Auckland 1023

Project

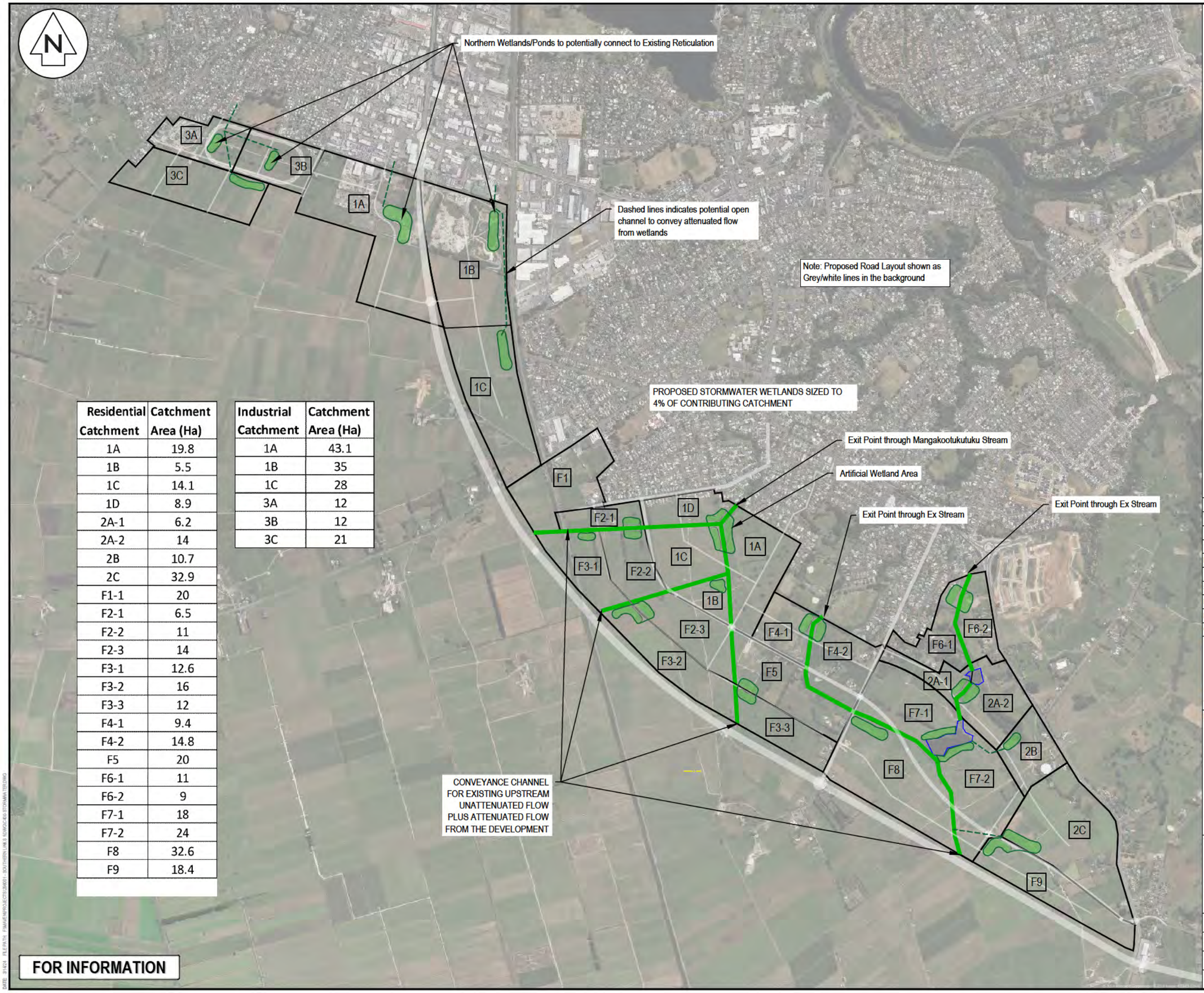
SOUTHERN LINKS 1 FOR SOUTHERN LINKS

Title

PROPOSED ROADING HIERACHY OVERVIEW

Project no.	298001
Scale	1:10,000 @ A1
Cad file	C300-ROADING.DWG
Drawing no.	WD300
Rev	D

PLOT: 1:1 AT A1
FILE: C300-ROADING.dwg



Residential Catchment	Catchment Area (Ha)
1A	19.8
1B	5.5
1C	14.1
1D	8.9
2A-1	6.2
2A-2	14
2B	10.7
2C	32.9
F1-1	20
F2-1	6.5
F2-2	11
F2-3	14
F3-1	12.6
F3-2	16
F3-3	12
F4-1	9.4
F4-2	14.8
F5	20
F6-1	11
F6-2	9
F7-1	18
F7-2	24
F8	32.6
F9	18.4

Industrial Catchment	Catchment Area (Ha)
1A	43.1
1B	35
1C	28
3A	12
3B	12
3C	21

FOR INFORMATION

Rev	Description	By	Date
E	FOR INFORMATION	RK	14/03/24
D	DRAFT	RK	02/2024
C	DRAFT	RK	02/2024
B	DRAFT	MKS	02/2024

	By	Date
Survey	LINZ	02/2024
Design	RK	02/2024
Drawn	MKS	02/2024
Checked	DJM	02/2024

Maven Associates
09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

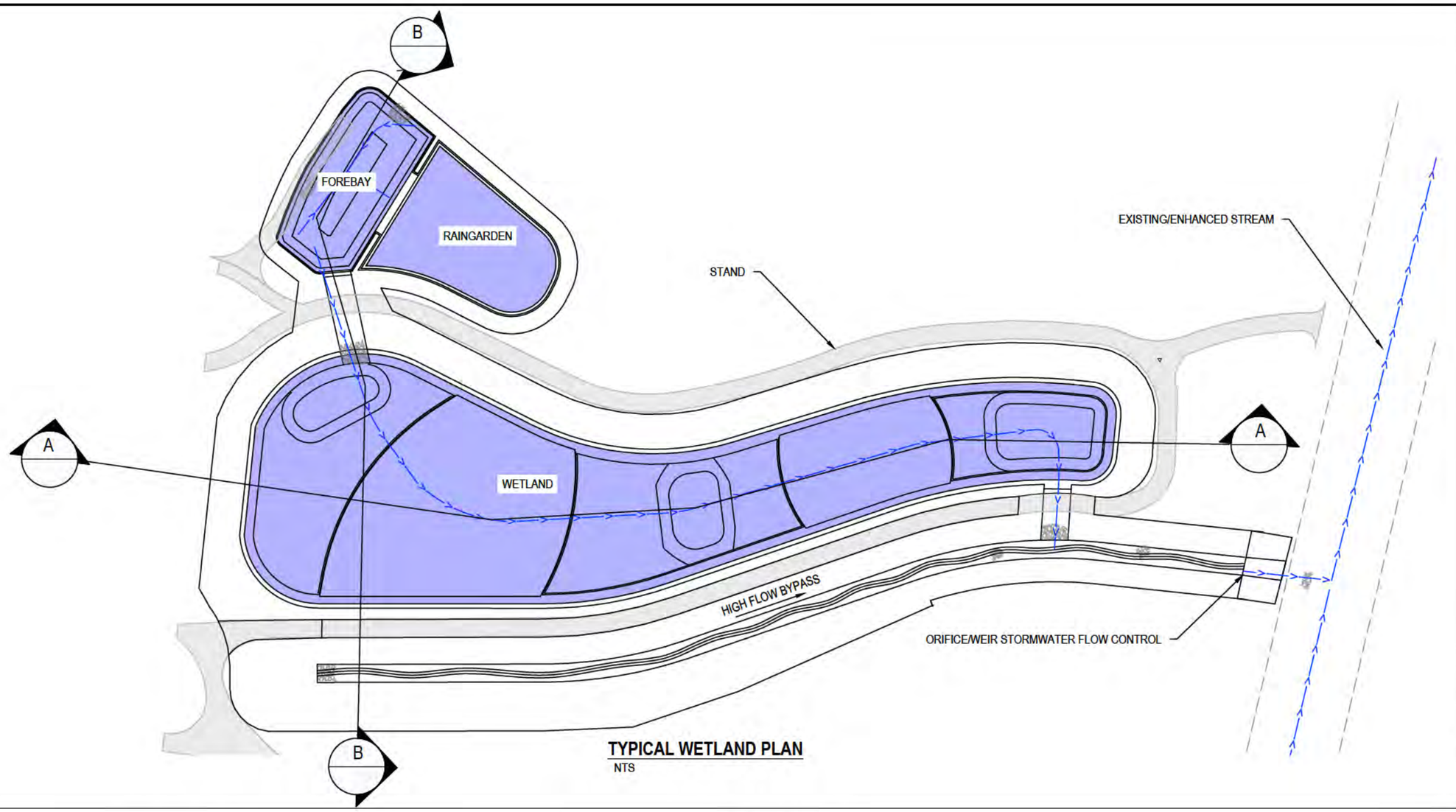
Project

SOUTHERN LINKS 1 FOR SOUTHERN LINKS

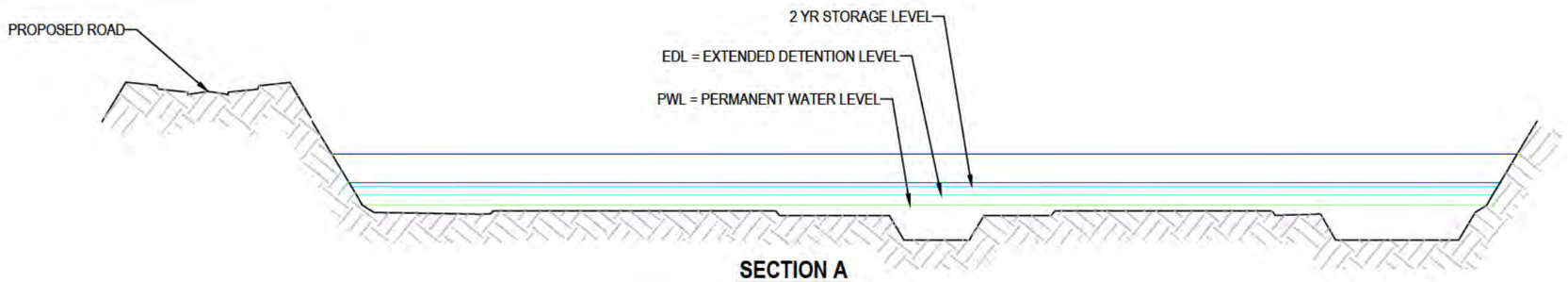
Title

PROPOSED STORMWATER CATCHMENT PLAN

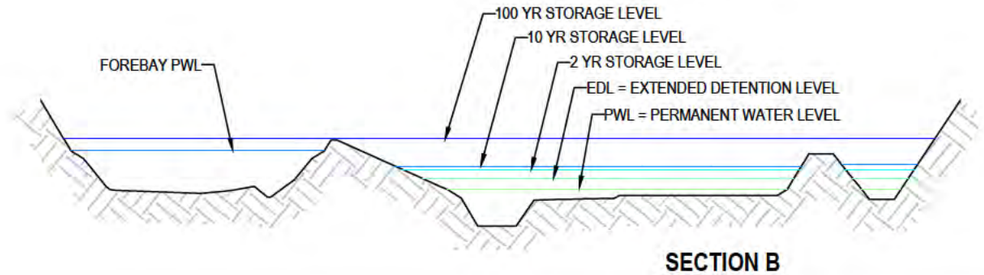
Project no.	289001
Scale	1:20000 @ A1
Cad file	C400-STORMWATER.DWG
Drawing no.	WD400
Rev	E



TYPICAL WETLAND PLAN
NTS



SECTION A
NTS



SECTION B
NTS

FOR INFORMATION

Legend
- FLOW ARROWS
- ARTIFICIAL WETLAND
- EXISTING GROUND
- PROPOSED GROUND
- 100 YEAR FLOOD LEVEL
- 10 YEAR FLOOD LEVEL
- 2 YEAR FLOOD LEVEL
- EXTENDED DETENTION LEVEL
- PERMANENT WATER LEVEL

Rev	Description	By	Date
A	FOR INFORMATION	WPJ	03/2024

	By	Date
Survey	-	
Design	RK	03/2024
Drawn	WPJ	03/2024
Checked	DJM	03/2024

Maven Associates
09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

Project
SOUTHERN LINKS 1 FOR SOUTHERN LINKS

Title
TYPICAL WETLAND DETAILS

Project no.	289001		
Scale	NTS		
Cad file	C410-WETLAND.DWG		
Drawing no.	C410	Rev	A

CONNECT INTO EX DN 600
WESTERN INTERCEPTOR

WESTERN
INTERCEPTOR

GREENWOOD STREET

KAHIKATEA DRIVE

TUHIKARAMEA ROAD

WAIKATO
HOSPITAL

PROP 355OD HDPE
TRUNK RISING MAIN

PROP NORTHERN MBR
PLANT/WASTEWATER
PUMP STATION

NEW 2 MILLION LITRE
WASTEWATER STORAGE
TANKS BY OTHERS

CONNECT INTO EX
DN 225 TRUNK MAIN

NEW PEACOCKE
WASTEWATER
TRANSFER STATION

TE ANAU
PARK

CONNECT TO EX DN 225
TRUNK MAIN

OHAUPO ROAD

COLLINS ROAD

CENTRAL PROP MBR
PLANT/ WASTEWATER
PUMP STATION

RESTHILLS
PARK

POSSIBLE CONNECTION
POINT TO EX DN 225
TRUNK MAIN

PROP 180OD HDPE
RISING MAIN

POSSIBLE FUTURE CONNECTION
TO PEACOCKE DEVELOPMENT
PROP INFRASTRUCTURE

SOUTHERN PROP
WASTEWATER
PUMP STATION

INDICATIVE FUTURE
SOUTHERN WWTP

PROP 180OD HDPE
RISING MAIN

HOUCHENS ROAD

OHAUPO ROAD

PROP 450OD HDPE
TRUNK RISING MAIN

FUTURE 450OD HDPE RISING MAIN
TO THE NEW SOUTHERN WWTP

THE PROPOSED WASTEWATER NETWORK SHALL CONNECT INTO THE EXISTING NETWORK, IF THERE IS SUFFICIENT CAPACITY. THE MBR PLANTS SHOWN ON THE PLAN ARE ONLY TO BE INSTALLED, IF THERE IS INSUFFICIENT CAPACITY FOR THAT CATCHMENT. PROPOSED RISING MAINS TO BE HORIZONTAL DIRECTIONAL DRILLED WHEN THEY PASS THROUGH LIVE CARRIAGEWAYS.

FOR INFORMATION

LEGEND

- NORTH WW CATCHMENT
- CENTRAL WW CATCHMENT
- SOUTH WW CATCHMENT
- EX BDY
- SITE EXTENTS
- HCC LAND AQUISITION
- EX WASTEWATER
- FUTURE WASTEWATER TO FUTURE WWTP
- PROP WASTEWATER RISING MAIN
- PROP WASTEWATER TRUNK RISING MAIN
- PROP WASTEWATER PUMPSTATION
- INDICATIVE MBR LOCATION

E	FOR INFORMATION	TCH	03/2024
D	DRAFT	TCH	03/2024
C	DRAFT	TCH	03/2024
B	CONCEPT	RJM	02/2024
Ref	Revisions	By	Date

	By	Date
Survey	LINZ	02/2024
Design	RJM	02/2024
Drawn	RJM	02/2024
Checked	MS	02/2024

Maven Associates
09 571 9550
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

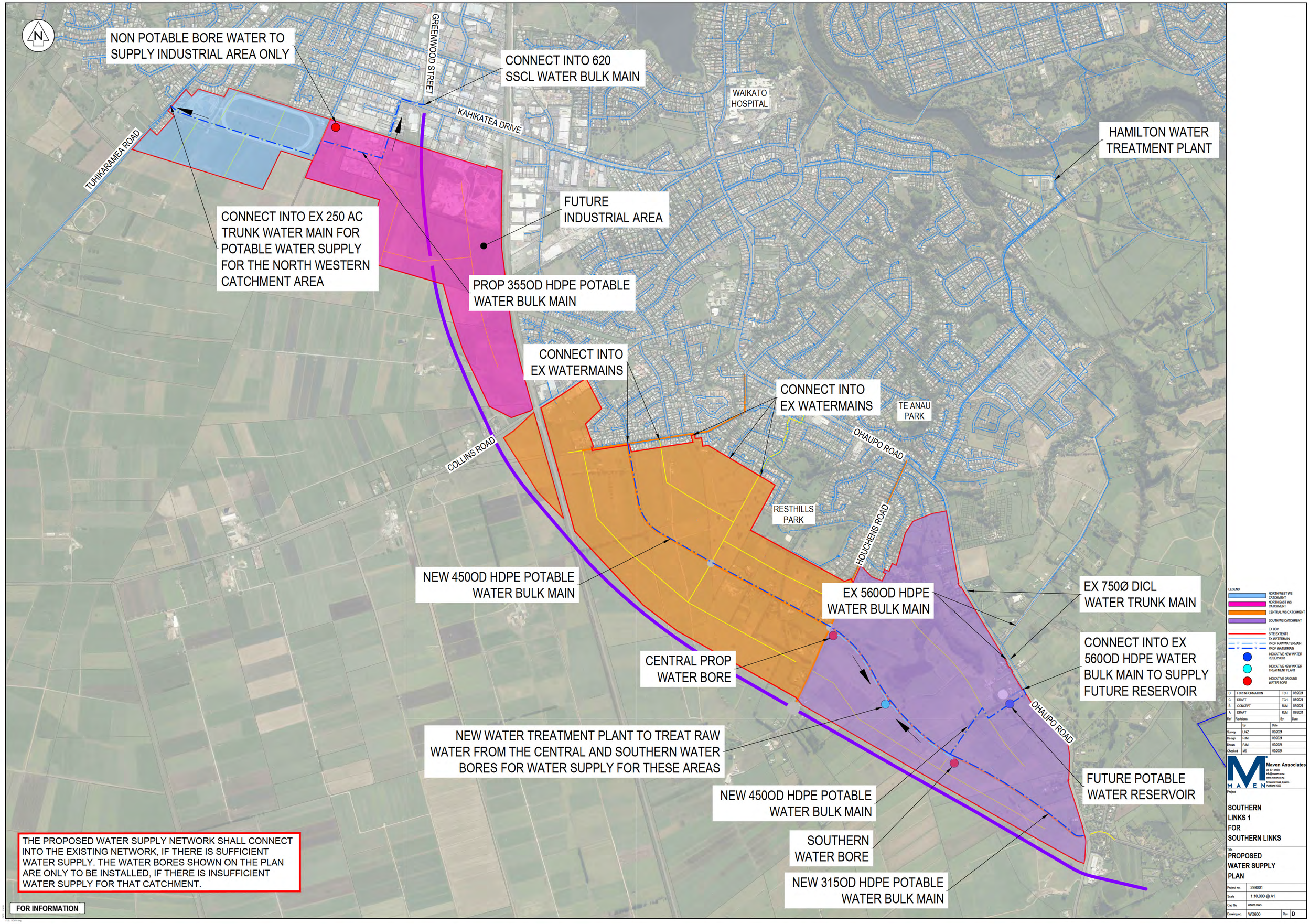
Project

SOUTHERN LINKS 1 FOR SOUTHERN LINKS

Title

PROPOSED WASTEWATER DRAINAGE PLAN

Project no.	298001
Scale	1:10,000 @ A1
Cad file	WD500.DWG
Drawing no.	WD500 Rev E



THE PROPOSED WATER SUPPLY NETWORK SHALL CONNECT INTO THE EXISTING NETWORK, IF THERE IS SUFFICIENT WATER SUPPLY. THE WATER BORES SHOWN ON THE PLAN ARE ONLY TO BE INSTALLED, IF THERE IS INSUFFICIENT WATER SUPPLY FOR THAT CATCHMENT.

FOR INFORMATION

Rev	Revisions	By	Date
D	FOR INFORMATION	TCH	03/2024
C	DRAFT	TCH	03/2024
B	CONCEPT	RJM	02/2024
A	DRAFT	RJM	02/2024

	By	Date
Survey	LINZ	02/2024
Design	RJM	02/2024
Drawn	RJM	02/2024
Checked	MS	02/2024

Maven Associates
09 571 0000
info@maven.co.nz
www.maven.co.nz
3 Owens Road, Epsom
Auckland 1023

Project
SOUTHERN LINKS 1 FOR SOUTHERN LINKS

Title
PROPOSED WATER SUPPLY PLAN

Project no.	298001
Scale	1:10,000 @ A1
Cad file	WD600.DWG
Drawing no.	WD600
Rev	D

Appendix C – Stormwater Calculations (see SMP)

Appendix D – Wastewater Calculations

Maven Associates	Job Number	Sheet	Rev
	298001	1	A

Job Title	Hamilton South Links - Stage 1A	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**1120**	
Catchment area =	**28**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1260	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	315.00	m^3/day
Peak Daily Flow (PDF)=	9.48	*L/sec*
Peak Wet Weather Flow (PWWF)=	**14.83**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
14.826	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	2	A

		Author	Date	Checked
Job Title	Hamilton South Links - Stage 1B			
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**800**	
Catchment area =	**20**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	900	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	225.00	m^3/day
Peak Daily Flow (PDF)=	6.77	*L/sec*
Peak Wet Weather Flow (PWWF)=	**10.59**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
10.590	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	3	A

Job Title	Hamilton South Links - Stage 2A	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**800**	
Catchment area =	**20**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	900	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	225.00	m^3/day
Peak Daily Flow (PDF)=	6.77	*L/sec*
Peak Wet Weather Flow (PWWF)=	**10.59**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
10.590	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	4	A

Job Title	Hamilton South Links - Stage 2B	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**1933**	
Catchment area =	**29**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1305	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	326.25	m^3/day
Peak Daily Flow (PDF)=	9.82	*L/sec*
Peak Wet Weather Flow (PWWF)=	**15.36**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
15.356	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	5	A

		Author	Date	Checked
Job Title	Hamilton South Links - Stage 2C			
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**440**	
Catchment area =	**11**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	495	
Wastewater Peaking factor as per Table 5-2=	3.4	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	123.75	m^3/day
Peak Daily Flow (PDF)=	4.18	*L/sec*
Peak Wet Weather Flow (PWWF)=	**6.28**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
6.283	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	6	A

Job Title	Hamilton South Links - Stage 2D	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**1000**	
Catchment area =	**25**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1125	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	281.25	m^3/day
Peak Daily Flow (PDF)=	8.46	*L/sec*
Peak Wet Weather Flow (PWWF)=	**13.24**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
13.238	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	7	A

Job Title	Hamilton South Links - Stage 3A	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**960**	
Catchment area =	**24**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1080	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	270.00	m^3/day
Peak Daily Flow (PDF)=	8.13	*L/sec*
Peak Wet Weather Flow (PWWF)=	**12.71**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
12.708	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	8	A

Job Title	Hamilton South Links - Stage 3B	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**840**	
Catchment area =	**21**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	945	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	236.25	m^3/day
Peak Daily Flow (PDF)=	7.11	*L/sec*
Peak Wet Weather Flow (PWWF)=	**11.12**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
11.120	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	9	A

Job Title	Hamilton South Links - Stage F4	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**829**	
Catchment area =	**29**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1305	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	326.25	m^3/day
Peak Daily Flow (PDF)=	9.82	*L/sec*
Peak Wet Weather Flow (PWWF)=	**15.36**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
15.356	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	10	A

Job Title	Hamilton South Links - Stage F5	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**1143**	
Catchment area =	**40**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1800	
Wastewater Peaking factor as per Table 5-2=	2.9	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	450.00	m^3/day
Peak Daily Flow (PDF)=	13.13	*L/sec*
Peak Wet Weather Flow (PWWF)=	**20.76**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
20.764	0.225	1.00	**52.44**	1.32	OK

Maven Associates	Job Number	Sheet	Rev
	298001	11	A

		Author	Date	Checked
Job Title	Hamilton South Links - Stage F6			
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**629**	
Catchment area =	**22**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	990	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	247.50	m^3/day
Peak Daily Flow (PDF)=	7.45	*L/sec*
Peak Wet Weather Flow (PWWF)=	**11.65**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
11.649	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	12	A

Job Title	Hamilton South Links - Stage F7	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**880**	
Catchment area =	**22**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	990	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	247.50	m^3/day
Peak Daily Flow (PDF)=	7.45	*L/sec*
Peak Wet Weather Flow (PWWF)=	**11.65**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
11.649	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	13	A

		Author	Date	Checked
Job Title	Hamilton South Links - Stage F8			
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**800**	
Catchment area =	**20**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	900	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	225.00	m^3/day
Peak Daily Flow (PDF)=	6.77	*L/sec*
Peak Wet Weather Flow (PWWF)=	**10.59**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
10.590	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	14	A

Job Title	Hamilton South Links - Stage F9	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**1280**	
Catchment area =	**32**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1440	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	360.00	m^3/day
Peak Daily Flow (PDF)=	10.83	*L/sec*
Peak Wet Weather Flow (PWWF)=	**16.94**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
16.944	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	15	A

		Author	Date	Checked
Job Title	Hamilton South Links - Stage F10			
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**520**	
Catchment area =	**13**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	585	
Wastewater Peaking factor as per Table 5-2=	3.3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	146.25	m^3/day
Peak Daily Flow (PDF)=	4.81	*L/sec*
Peak Wet Weather Flow (PWWF)=	**7.29**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
7.290	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	16	A

		Author	Date	Checked
Job Title	Hamilton South Links - Stage F11			
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**720**	
Catchment area =	**18**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	810	
Wastewater Peaking factor as per Table 5-2=	3.1	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	202.50	m^3/day
Peak Daily Flow (PDF)=	6.28	*L/sec*
Peak Wet Weather Flow (PWWF)=	**9.72**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
9.719	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	17	A

Job Title	Hamilton South Links - Stage F12	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**360**	
Catchment area =	**9**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	405	
Wastewater Peaking factor as per Table 5-2=	3.5	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	101.25	m^3/day
Peak Daily Flow (PDF)=	3.52	*L/sec*
Peak Wet Weather Flow (PWWF)=	**5.23**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
5.234	0.15	1.00	**17.96**	1.02	OK

Maven Associates	Job Number	Sheet	Rev
	298001	18	A

Job Title	Hamilton South Links - Stage IA	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**1720**	
Catchment area =	**43**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1935	
Wastewater Peaking factor as per Table 5-2=	2.9	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	483.75	m^3/day
Peak Daily Flow (PDF)=	14.11	*L/sec*
Peak Wet Weather Flow (PWWF)=	**22.32**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
22.321	0.225	1.00	**52.44**	1.32	OK

Maven Associates	Job Number	Sheet	Rev
	298001	19	A

Job Title	Hamilton South Links - Stage IB	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**1480**	
Catchment area =	**37**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1665	
Wastewater Peaking factor as per Table 5-2=	2.9	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	416.25	m^3/day
Peak Daily Flow (PDF)=	12.14	*L/sec*
Peak Wet Weather Flow (PWWF)=	**19.21**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
19.207	0.225	1.00	**52.44**	1.32	OK

Maven Associates	Job Number	Sheet	Rev
	298001	20	A

Job Title	Hamilton South Links - Stage F1	Author	Date	Checked
Calc Title	Southern Links 1 - WW Demand Calc	TCH	14/03/2024	DJM

As per Waikato Local Authority RITS standards

Domestic Average Daily Flow (Water Consumption)=	200	*l/person/day*
Infiltration Allowance=	2,250	*l/Ha/day*
Surface Water Ingress=	16,500	*l/Ha/day*

Refer to C450-1 for catchment details

No. of residential dwellings =	**960**	
Catchment area =	**24**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	1080	
Wastewater Peaking factor as per Table 5-2=	3	

Using a pupolation value person (max development scenario)

Average Daily Flow (ADF)=	270.00	m^3/day
Peak Daily Flow (PDF)=	8.13	*L/sec*
Peak Wet Weather Flow (PWWF)=	**12.71**	*L/sec*

Pipe Ks (uPVC) = 0.60

PWW Flow *l/s*	Pipe dia *m*	Gradient *%*	Capacity *l/s*	Velocity *m/s*	Check *OK*
12.708	0.15	1.00	**17.96**	1.02	OK

Appendix E – Water Supply Calculations

Maven Associates		Job Number 298001	Sheet 1	Rev A
Job Title	Hamilton South Links - Stage 1A	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	1120	3	3360
Commercial Unit (0.95ha x 45 person per ha)			0
Total			3360

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	3360	260	10.11
PD Water	3360	1300	50.56

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	3360	1300	**50.56**

Maven Associates	Job Number	Sheet	Rev
	298001	2	A

Job Title	Hamilton South Links - Stage 1B	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3 — 3 people per dwelling

Demand — 260 l/person/day

Demand Rates

Average Demand = 260 litres/person/day

Peak Demand (5x) = 1300 litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	800	3	2400
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2400

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2400	260	7.22
PD Water	2400	1300	36.11

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2400	1300	**36.11**

Maven Associates		Job Number 298001	Sheet 3	Rev A
Job Title	Hamilton South Links - Stage 2A	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	800	3	2400
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2400

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2400	260	7.22
PD Water	2400	1300	36.11

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2400	1300	**36.11**

Maven Associates		Job Number 298001	Sheet 4	Rev A
Job Title	Hamilton South Links - Stage 2B	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	1933	3	5799
Commercial Unit (0.95ha x 45 person per ha)			0
Total			5799

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	5799	260	17.45
PD Water	5799	1300	87.25

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	5799	1300	**87.25**

Maven Associates		Job Number 298001	Sheet 5	Rev A
Job Title	Hamilton South Links - Stage 2C	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	440	3	1320
Commercial Unit (0.95ha x 45 person per ha)			0
Total			1320

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	1320	260	3.97
PD Water	1320	1300	19.86

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	1320	1300	**19.86**

Maven Associates		Job Number 298001	Sheet 6	Rev A
Job Title	Hamilton South Links - Stage 2D	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	1000	3	3000
Commercial Unit (0.95ha x 45 person per ha)			0
Total			3000

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	3000	260	9.03
PD Water	3000	1300	45.14

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	3000	1300	**45.14**

Maven Associates		Job Number 298001	Sheet 7	Rev A
Job Title	Hamilton South Links - Stage 3A	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	960	3	2880
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2880

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2880	260	8.67
PD Water	2880	1300	43.33

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2880	1300	**43.33**

Maven Associates		Job Number 298001	Sheet 8	Rev A
Job Title	Hamilton South Links - Stage 3B	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	840	3	2520
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2520

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2520	260	7.58
PD Water	2520	1300	37.92

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2520	1300	**37.92**

Maven Associates		Job Number 298001	Sheet 9	Rev A
Job Title	Hamilton South Links - Stage F4	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	829	3	2487
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2487

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2487	260	7.48
PD Water	2487	1300	37.42

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2487	1300	**37.42**

Maven Associates		Job Number 298001	Sheet 10	Rev A
Job Title	Hamilton South Links - Stage F5	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	1143	3	3429
Commercial Unit (0.95ha x 45 person per ha)			0
Total			3429

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	3429	260	10.32
PD Water	3429	1300	51.59

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	3429	1300	**51.59**

Maven Associates		Job Number 298001	Sheet 11	Rev A
Job Title	Hamilton South Links - Stage F6	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	629	3	1887
Commercial Unit (0.95ha x 45 person per ha)			0
Total			1887

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	1887	260	5.68
PD Water	1887	1300	28.39

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	1887	1300	**28.39**

Maven Associates		Job Number 298001	Sheet 12	Rev A
Job Title	Hamilton South Links - Stage F7	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	880	3	2640
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2640

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2640	260	7.94
PD Water	2640	1300	39.72

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2640	1300	**39.72**

Maven Associates		Job Number 298001	Sheet 13	Rev A
Job Title	Hamilton South Links - Stage F8	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	800	3	2400
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2400

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2400	260	7.22
PD Water	2400	1300	36.11

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2400	1300	**36.11**

Maven Associates		Job Number 298001	Sheet 14	Rev A
Job Title	Hamilton South Links - Stage F9	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	1280	3	3840
Commercial Unit (0.95ha x 45 person per ha)			0
Total			3840

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	3840	260	11.56
PD Water	3840	1300	57.78

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	3840	1300	**57.78**

Maven Associates		Job Number 298001	Sheet 15	Rev A
Job Title	Hamilton South Links - Stage F10	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	520	3	1560
Commercial Unit (0.95ha x 45 person per ha)			0
Total			1560

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	1560	260	4.69
PD Water	1560	1300	23.47

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	1560	1300	**23.47**

Maven Associates		Job Number 298001	Sheet 16	Rev A
Job Title	Hamilton South Links - Stage F11	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	720	3	2160
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2160

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2160	260	6.50
PD Water	2160	1300	32.50

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2160	1300	**32.50**

Maven Associates		Job Number 298001	Sheet 17	Rev A
Job Title	Hamilton South Links - Stage F12	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	360	3	1080
Commercial Unit (0.95ha x 45 person per ha)			0
Total			1080

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	1080	260	3.25
PD Water	1080	1300	16.25

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	1080	1300	**16.25**

Maven Associates		Job Number 298001	Sheet 18	Rev A
Job Title	Hamilton South Links - Stage IA	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	1720	3	5160
Commercial Unit (0.95ha x 45 person per ha)			0
Total			5160

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	5160	260	15.53
PD Water	5160	1300	77.64

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	5160	1300	**77.64**

Maven Associates		Job Number 298001	Sheet 19	Rev A
Job Title	Hamilton South Links - Stage IB	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	1480	3	4440
Commercial Unit (0.95ha x 45 person per ha)			0
Total			4440

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	4440	260	13.36
PD Water	4440	1300	66.81

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	4440	1300	**66.81**

Maven Associates		Job Number 298001	Sheet 20	Rev A
Job Title	Hamilton South Links - Stage F1	Author	Date	Checked
Calc Title	Southern Links 1 - Water Demand	TCH	14/03/2024	DJM

Water Catchment

As per RITS Standard 6.2.3

	3	people per dwelling
Demand	260	l/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	960	3	2880
Commercial Unit (0.95ha x 45 person per ha)			0
Total			2880

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	2880	260	8.67
PD Water	2880	1300	43.33

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	2880	1300	**43.33**

Appendix F– CMW Geotechnical Desktop Review

Dean Morris

From: Ben McKay <BenM@cmwgeo.com>
Sent: Monday, 4 March 2024 5:20 pm
To: Kelliher, Dillon; Alicia Lawrie; Dean Morris; Cameron Inder; Dol, Robert; Fraser McNutt
Cc: Kori Lentfer
Subject: #HAM2024-0017 - Southern Links SL1 - Meeting Summary

Hi Team

Nice to meet you all earlier.

To outline what was discussed earlier in the meeting regarding the Southern Links SL1 development area from a geotechnical POV:

- The development area consists of 3 major soil units:
    - Hinuera Formation - alluvial plains deposit – over low lying areas, comprised sands and silts of varying strength.
    - Recent Peat – wetland area deposit – widespread wetland and paleochannel deposits, comprised wet and muddy peat, estimated to be up to 6m deep over development area. Overlies Hinuera Formation.
    - Walton Subgroup –volcanic deposits comprising silt and clay mixtures, typically high strength. Can be sensitive if over trafficked. Forms low hills. Underlies Hinuera Formation.
- The major geotechnical challenges posed by the site area:
    - Peat, which is susceptible to static settlement, has been mapped over approximately 75% of the development area.
        - This will require either removal and replacement with engineered fill, or preloading by use of temporary surcharge fills to induce consolidation of peat material, in order to mitigate the risk of settlement under future building/traffic loads.
        - Based on our recent experience working with the peat at Temple View, preloading peat material with overburden materials (such as site-won silts/clays/sands) is an effective way to reduce settlement magnitude to acceptable levels.
            - Using preload that is ~50% of the thickness of the compressible soils to be treated has resulted in necessary consolidation occurring within 9-12 months. Similar rates of consolidation are expected within the peat materials identified in the SL1 area, however this is to be determined during specific preload design.
            - Subsoil drainage network or granular fill drainage blankets will be required to allow groundwater pressure dissipation during preloading.
            - Wick drains may be used to speed up the consolidation process, however these can be expensive to install.
    - Hinuera Formation soils, which are susceptible to liquefaction-induced settlement/lateral spread under ULS design seismic loading, has been mapped over approximately 75% of the development area beneath the peat and in some areas at the ground surface.
        - Based on current CPT data, liquefaction-induced vertical settlement has been estimated up to 160mm (without any aging/pumice content factors).
            - For residential development purposes, this is equivalent to a TC2/3 hybrid categorisation. Dwellings in these areas would require ground improvement and TC2 level waffle slab foundations.
            - For infrastructure and roading, this would need consideration during design.
- A gap analysis of the geotechnical investigations will be provided as part of the desktop geotechnical report for the SL1 area.

I had a chat to the team who worked on the recent Temple View development in peat materials, and they advised that shallow swales were used for stormwater storage/soakage for the development areas in peat for that project. Ponds were proposed, but there were significant challenges around long-term pond stability when constructed within peat material. Shallow swales take up more area than ponds, but have less batter stability issues when constructed in the surficial peats.

CMW actions are:

- We will provide screengrabs of the 3D model that has been developed to date and distribute to the project team.
- Confirm if shapefile of peat contour plan can be sent to Alicia.
- CMW to receive green/brown map of development area.

Any questions, please let me know.

Cheers

Ben

Ben McKay | Project Geotechnical Engineer

Phone: +64 07 2820 039 **Mobile:** +64 (0) 21 0274 7021 **Email:** BenM@cmwgeo.com
Website: www.cmwgeosciences.com

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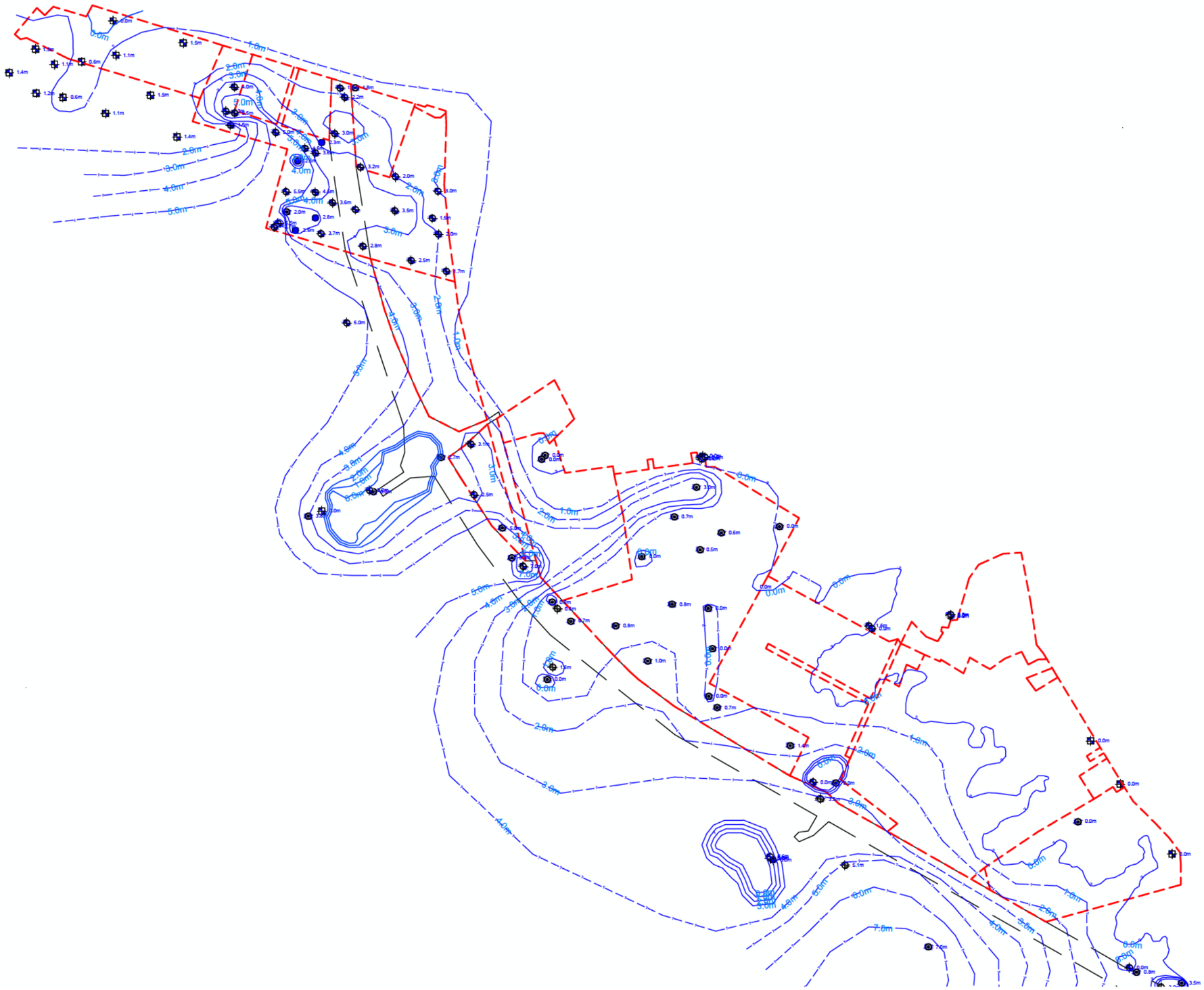


LEGEND:

HA01	HAND AUGER (HA, HA-DCP, Other) LOCATION		SOUTHERN LINKS (SL1) LAND HOLDINGS BOUNDARIES
BH01	DEEP MACHINE BOREHOLE (BH) LOCATION		PROPOSED SOUTHERN LINKS DESIGNATION
CPT01	CONE PENETROMETER TEST (CPT) LOCATION	?—	PEAT DEPTH CONTOURS
TP01	TEST PIT (TP) LOCATION		
DCP01	DYNAMIC CONE PENETROMETER (DCP) LOCATION		

NOTES:

1. SITE BOUNDARIES ADAPTED FROM INDICATIVE LAND OWNERSHIP PLAN SUPPLIED BY THE CLIENT.
2. AERIAL IMAGE COURTESY OF HCC ONLINE MAPPING SERVICES.
3. HISTORIC TEST LOCATIONS SOURCED FROM NZGD DATABASE AND ARE INDICATIVE ONLY.
4. PEAT DEPTH CONTOURS AT 1m INTERVALS.

1:20 000 — 0 200 400 600 800 1000 m

CMW Geosciences

CLIENT: COLLIERS PROJECT LEADERS LIMITED		DRAWN: BM	PROJECT: HAM2024-0017
PROJECT: SOUTHERN LINKS DEVELOPMENT		CHECKED: MM	DRAWING: 02
		REVISION: 0	SCALE: 1:20000
TITLE: PEAT CONTOUR PLAN		DATE: 01/03/2024	SHEET: A3 L

C:\Users\BenMcKay\CMW Geosciences Pty Ltd\Hamilton Office - HAM2024-0017 Southern Links Geotechnical Assessment\Drawings\HAM2024-0017_(BM Edits Rev B)_Southern Links_Overview Plan.dwg

3 June 2021 Document Ref: HAM2021-0035AA Rev 2

Maven Associates Ltd
Level 2, Garden Place,
Hamilton

Attention: Jon Crooks

Dear Jon,

RE: GEOTECHNICAL DESKTOP REVIEW
PROPOSED SOUTHERN LINKS 1 SUBDIVISION DEVELOPMENT, HAMILTON

1 SCOPE

We are pleased to present our geotechnical desktop review for the proposed Southern Links 1 (SL1) development area located on the southwestern outskirts of Hamilton, as shown on the attached B & A, Urban & Environmental plan. We understand that this report will be used for initial information purposes only.

This report identifies the approximate distribution of prevailing landforms and geologies for the local area, typical geotechnical challenges associated with subdivision development on those landforms and presents strategies to mitigate hazards by further geotechnical investigation and design.

2 LANDFORM

The SL1 development area comprises a circa 500ha block of land having a northwest to southeast orientation spanning from Dinsdale in the north to Rukuhia in the south.

Apart from some areas of rolling hill topography in the southeast and isolated elevated terraces, most of the site comprises locally low-lying land that was once a peat bog in pre-European times. The peatlands have been progressively drained for farming.

Existing contour data within and adjacent to the site is shown on the attached ***Drawing 01.***

3 PROPOSED DEVELOPMENT

Based on our discussions we understand the proposed plan change involves the redevelopment of both the low-lying land and elevated hills for industrial and residential purposes with associated neighbourhood centres, school, reserve/open space areas, roading and infrastructure.

A number of stormwater attenuation wetlands areas are proposed.

4 TYPICAL GEOHAZARDS & MITIGATION STRATEGIES

Landform	Geology[1]	Liquefaction	Slope Stability	Earthworks	Building Foundations
Rolling hills	Walton Subgroup - Pleistocene age volcanic soils. Typically comprise mantle of Hamilton Ash (clays) overlying weathered ash (Kauroa Ash) and weathered alluvial clayey silts, silts and sandy pumiceous silts (Puketoka Formation)	Low to very low risk due to geological age and soil fabric (fine grained cohesive) requiring no specific mitigation.	Inherently stable for slopes <25 degrees to horizontal. Cut and fill batters graded at 1:2.5 (vertical to horizontal) subject to drainage.	Upper Hamilton ash suitable for earthworks borrow, underlying ashes sensitive, wet and difficult to earthwork. Not suitable for in-ground stormwater soakage.	Typically adopt conventional NZS3604 foundations designed in accordance with building code amendment 19 for residential housing in Hamilton ash, shallow footings for industrial and 1 to 2 level commercial buildings. Raft foundations in underlying sensitive silts due to reduced bearing capacity.
Terraces	Hinuera Formation - alluvial fan deposit of cross bedded pumiceous and rhyolitic silts, sands and gravels, with minor organic layers.	Moderate risk where high water table and sandy soils requiring specific geotechnical investigation and analyses.	Seismic stability issues where liquefaction risk is identified requiring possible setbacks from open drains and ponds or ground improvement.	Groundwater typically 1m to 3m below ground surface, upper 1m to 2m of silts can be sensitive to earthworks. Typically, suitable for in-ground stormwater soakage.	Liquefaction risk typically demands TC2 or TC3 raft foundations for residential buildings, shallow footings for industrial and 1 to 2 level commercial buildings.
Low-lying Plains *	Holocene Alluvium - recent soft and compressible peat, alluvial clay and sand deposits of the Piako Subgroup. The Peat is described as soft, dark brown to black, organic mud, muddy peat or woody peat. Typically overlies Hinuera or Walton Subgroup.	Low risk in peat, moderate risk in underlying sands where underlain by Hinuera Formation.	Poor foundation for fill embankments, requires shear key undercut and / or geogrid reinforcement, 1:3 graded batters. Requires temporary support for trenching works.	Groundwater near ground surface, not suitable as borrow material or stormwater soakage. Construction of fill embankments induces large settlements, typically requires drainage blanket and pre-loading to support future development or undercut and replace where shallow.	Either pile foundations beyond base of peat or construct min. 1.5m thick structural fill raft and pre-load to induce ground settlement. Typical pre-load heights 2m to 3m with settlement hold period of 6 months subject to peat thickness. TC2 raft foundations.

Note: * refer to Section 5 below for further detail on development over peat soils

[1] Edbrooke, S.W. (compiler) 2005. Geology of the Waikato Area. Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 3. 74 p.

5 DEVELOPMENT ON PEAT SOILS

The low-lying plains are dominated by peat soils and it is anticipated that placement of bulk fill will be required to raise ground levels above flood levels.

Based on the results of our recent geotechnical investigations where up to 6m of peat was present at the Temple View eastern development located just to the west of the SL1 area, we consider that residential and industrial development over the SL1 peat soils is feasible. The geotechnical design approach is documented in our Geotechnical Interpretive Report (GIR) ref. HAM2016-0001AA Rev.0 dated 21 October 2015, which is publicly available on the Hamilton City Council website.

It must be noted that the peat soils in particular present a number of challenges that will demand that an appropriate level of geotechnical design, management and construction observation is implemented to produce building platforms that perform to code requirements. The Temple View GIR provides significant detail on the design approach for residential development over peat and includes recommendations as follows:

- The low-lying land is underlain by soft and compressible peat soils that will exhibit significant settlement in response to the proposed placement of the overlying fill raft. Specific underfill drainage, temporary pre-loading and settlement monitoring, under the direction of the project geotechnical engineer, will be required to help limit post construction ground settlements;
- Preload design must take into account both primary and secondary creep settlement magnitudes projected over the appropriate design life of proposed structures and infrastructure including roads and buried services;
- Lightweight buildings across the treated low-lying peatland areas will require raft foundations that are designed to accommodate total and differential long term ground settlements. Foundations for larger structures will require specific design with geotechnical input.

6 LIMITATION

The preliminary information contained within this report is based on a high-level desktop study of published maps and previous geotechnical investigations. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from the investigation locations.

Given the farming history of the area being assessed, previous uncontrolled earthworks may also be present across parts of the site that have not been identified in this initial high-level review. Similarly, soil contamination potential has not been considered as part of this review.

This report has been prepared for use by Maven Consultants in relation to the SL1 Project to be used for internal information and preliminary guidance purposes only. It is not suitable to support any future plan change or resource consent application process. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than Maven Consultants and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of CMW Geosciences

Prepared by:

Lance Knauf

Projecting Engineering Geologist

Reviewed and authorised by:

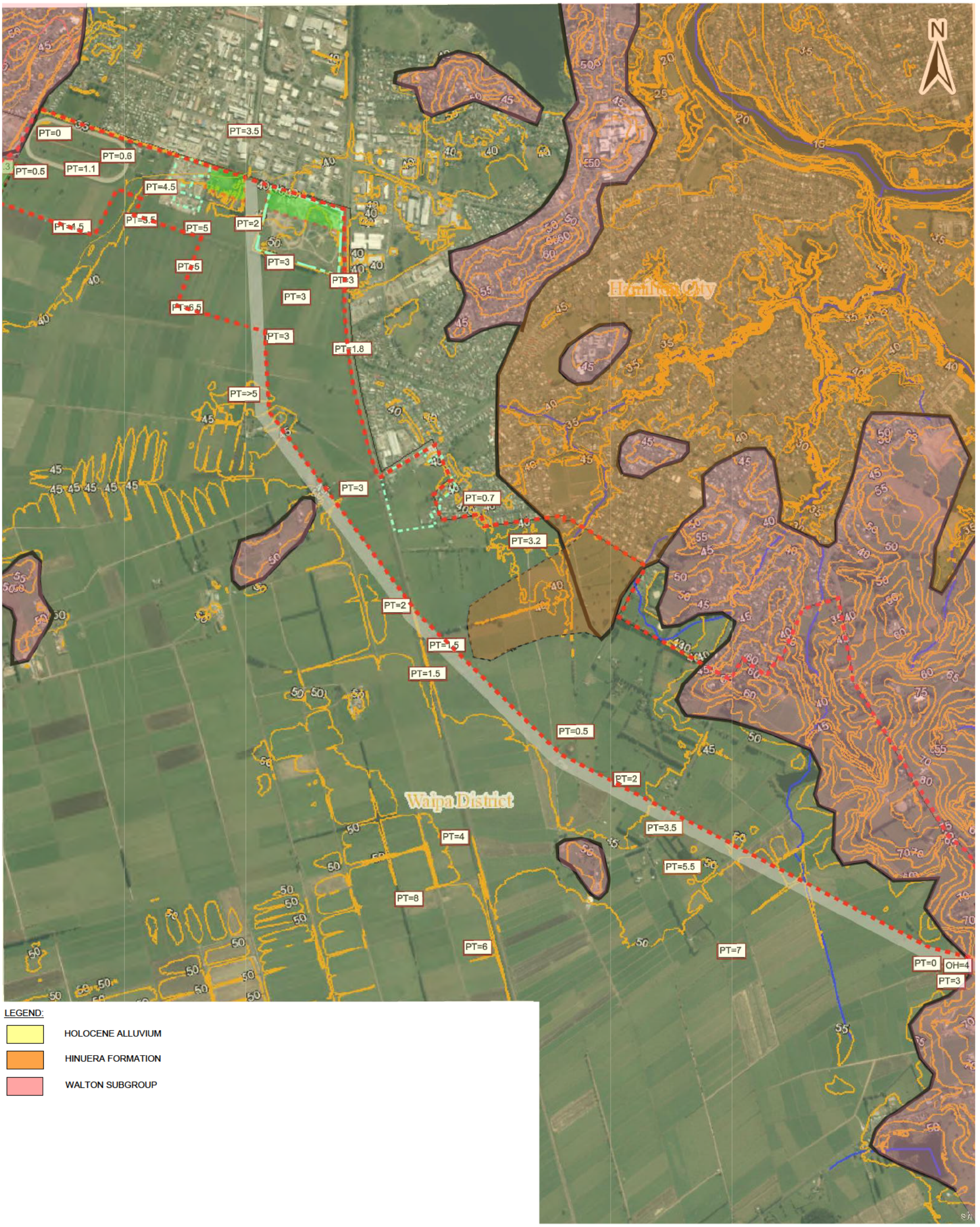
Kori Lentfer

Associate Engineering Geologist

Attachments: Drawing 01: Desktop Plan

B&A Urban & Environmental SL1 Structure Plan

Distribution: 1 electronic copy to Jon Crooks via email
Original held at CMW Geosciences



LEGEND:

- HOLOCENE ALLUVIUM
- HINUERA FORMATION
- WALTON SUBGROUP

NOTES:

1. BASE PLAN ADAPTED FROM WAIKATO REGIONAL COUNCIL MAPS.
2. CONTOURS ARE IN 5M INTERVALS.
3. GEOLOGICAL AND PEAT DEPTH LOCATIONS ARE APPROXIMATE ONLY.

CMW Geosciences

CLIENT: MAVEN ASSOCIATES LTD		DRAWN: LK	PROJECT No: HAM2021-0035
PROJECT: SL1 PROJECT HAMILTON		CHECKED: KL	DRAWING: 01
		REVISION: 2	SCALE: 1:20,000
TITLE: SITE GEOLOGY PLAN		DATE: 03/06/2021	SHEET: A3P

Appendix G – WGA Hydrogeological Desktop Review

WGA
WALLBRIDGE GILBERT AZTEC

Maven Associates Limited
Level 2, 11 Garden Place
HAMILTON NZ 3204

19/05/2021

PROJECT NO. WGA210896

Attention: Jon Crooks

Dear Jon

HYDROGEOLOGICAL ADVICE ON POTENTIAL FOR GROUNDWATER SUPPLY MANGAKOTUKUTUKU, SOUTH WEST, HAMILTON.

Maven Associates Limited have engaged Wallbridge Gilbert Aztec (WGA) to prepare a high-level desktop assessment on possibilities for bore water supply to a potential suburban development area (Mangakotukutuku) together with comments on potential issues, constraints, and opportunities. This letter outlines our findings from this high level review of available information.

1. GEOLOGICAL AND HYDROGEOLOGICAL SETTING

Hamilton Basin, a large tectonic basin centred on Hamilton City with an area of approximately 2,000 km^2 and traversed by the Waikato River. The basin is surrounded by ranges of Mesozoic (Manaia Hill Group) and Tertiary age (Te Kuiti and Waitemata Groups) rocks. At depth, basement greywacke underlies the sedimentary deposits that infill the basin (GNS 2005).

The basin is infilled with Tauranga Group alluvial sediments dating from the Pliocene to the middle Holocene, overlain by late Holocene unconsolidated alluvial and colluvial sediments. The Tauranga Group sediments are up to 300 m thick and include gravels, sands, silt, muds and peats of fluvial, lacustrine and distal ignimbritic origin. The Hinuera Formation of the Tauranga Group underlies much of the Hamilton basin. This formation was deposited by braided river systems of the Waikato River, initiated by the supply of large volumes of sediment from volcanism in the Taupo Volcanic Zone (Petch 1987). Overlying the Hinuera Formation sediments in the Mangakotukutuku area is peat of the Rukuhia Bog. Underlying the low hills are older ignimbrites, tephra fall deposits and alluvium (Figure 1; Lowe 2010).

The Hinuera Formation contains the aquifers used most extensively for water supplies across the Hamilton Basin. Within this formation, the most productive aquifers consist of well sorted coarse sands and gravels. Discontinuous sequences of rhyolitic and pumiceous gravelly sands and gravels are interspersed with pumiceous silt, clay and peat layers. Lithological variability generally results in a number of zones of higher permeability within the formation rather than a single, continuous aquifer (Figure 1; Schofield 1972). The upper layers contain perched aquifers, which can dry out over the summer period and will drain to the closest gully system.

Literature values for the hydraulic conductivity of sediments in the Hamilton Basin range from 0.5 m/day in the silts and peat layers to 13.5 m/day in the course gravelly sands. Aquifer transmissivity values derived from pumping tests range from 10 m^2/day to 1,000 m^2/day but are usually less than 100 m^2/day. The deeper aquifers have variable aquifer properties and local pumping tests have resulted in transmissivities calculated at between 20 m^2/day and 300 m^2/day. Storativity values vary from 0.001 for deep, confined or semi-confined aquifers to 0.1 for shallow, unconfined aquifers in the Hamilton Basin (Petch and Marshall 1988). In some areas these discontinuous aquifers may provide bore yields of up to 30 L/s (Petch 1987). Local bore flow rates in the Mangakotukutuku area are described in Section 2.

Regional groundwater flows in the area of Hamilton are generally towards the north west, from the basin edges to the southeast. Major groundwater discharge occurs into the Waikato River and its tributaries located in deeply incised gullies (Petch and Marshall 1988).

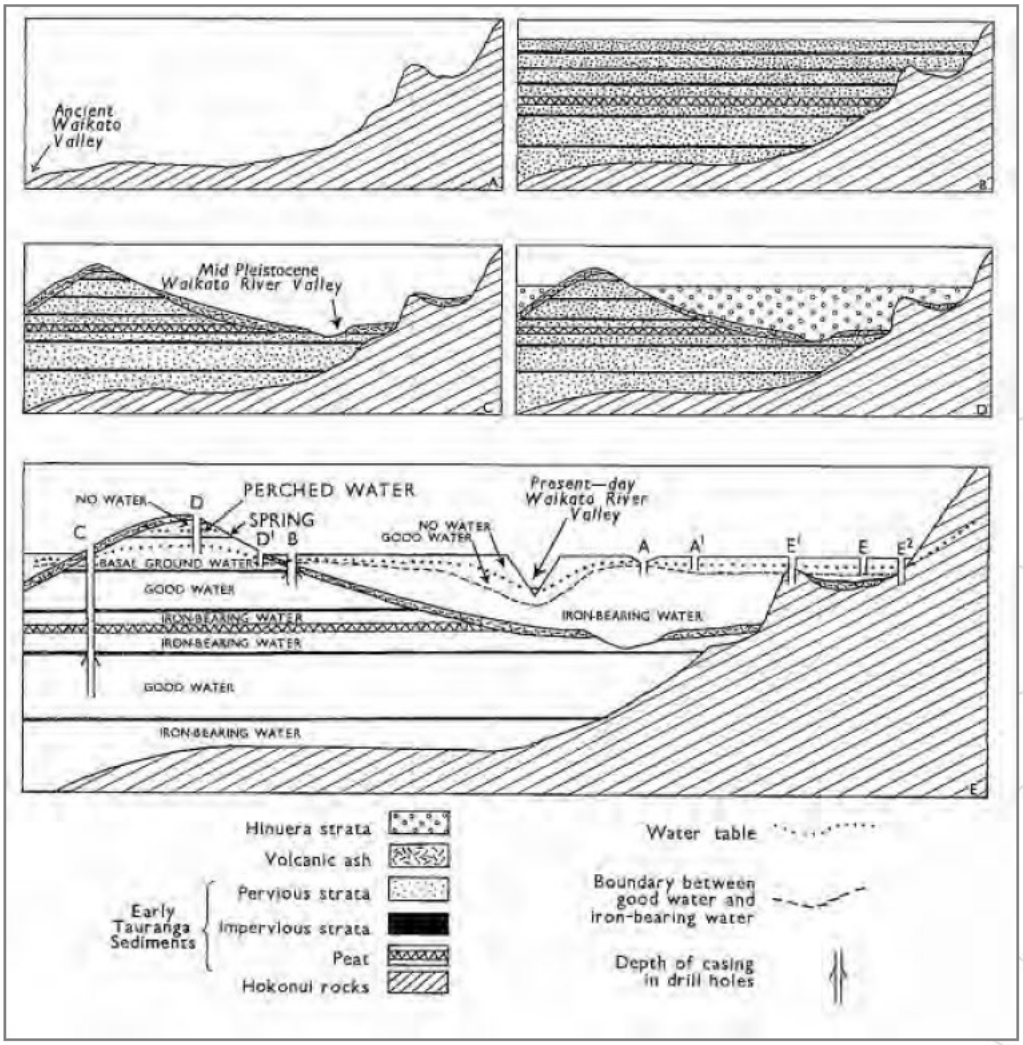


Figure 1: Simplified Geological History and Formation of Local Aquifers (Schofield 1972).

2. GROUNDWATER QUANTITY

Current groundwater use and historical flow testing information provides some indications on the potential flow rates from production bores although many local bores have targeted domestic supply quantities only. Local nearby bores have been tested at rates up to 1,750 m^3/day. This was pumped from bore number 70_624, which is a 150 mm diameter bore used for irrigation. Most bores have been tested at rates less than 200 m^3/day as they are designed to meet smaller demands.

To the south of the Mangakotukutuku area, Rukuhia School has a relatively shallow bore (35 m deep) that was tested up to a rate of 54 m^3/day. There are also two local irrigation consents for approximately 1,200 m^3/day each:

- Pandarosa Farms Limited has a resource consent (AUTH140833.01.01) to take 1,050 m^3/day for irrigation.
- Grayling Agriculture Limited has a resource consent (AUTH140211.01.01) to take 1,200 m^3/day for irrigation.

These consented abstractions indicate the local availability of groundwater but the operation of these bores may also provide some interference effects on any new water supply bore. To avoid the risk of drawdown interference, any new water supply bores could be drilled to a different aquifer layer, taking into consideration the supply bores will be targeting the best water quality as a priority.

If we consider the average water requirement as 600 litres per person per day average (MfE 2007) a bore that can produce 1,700 m^3/day (1,700,000 L/day) is therefore equivalent to an average supply for 2,833 people. MfE (2007) outlines that peak demand rates can be variable and are not consistent throughout New Zealand. They recommend storage of treated water to meet peak demand periods. If the option of groundwater supply is to be further investigated, the average and peak daily water demands in Hamilton should also be investigated further.

3. GROUNDWATER QUALITY

The local aquifers contain some areas of high dissolved iron concentrations. Dissolved iron concentrations vary between aquifers (Figure 1) and laterally within the same aquifer. The iron concentrations in water from a targeted aquifer will not be known until test bores are drilled and samples taken. Iron causes staining and taste effects but is not considered a health risk in potable water supplies. Removal of iron through water treatment is not a complicated process and usually involves aeration followed by filtration. Sometimes the process can also involve increasing the pH, chemical oxidation followed by filtration, greensand filters or ion exchange.

Deeper bores have low nutrient concentrations, which is beneficial as elevated nutrients can be problematic with respect to complying with the drinking water standards. For example, nitrate removal through water treatment is costly. It is generally easier and more cost effective to target deeper aquifers with low nutrient concentrations in the water, even if the water in these aquifers also has elevated dissolved iron concentrations.

4. OPPORTUNITIES

Using bores for a water supply option could provide a “transition” option for a future development area to supply water for the initial stages of the development. This would allow development to start while waiting for the Hamilton town network to be developed to a standard to support the new subdivision areas.

Aquifers provide natural water storage in comparison to surface water storage. This capacity can be utilised through installing bores that will be less affected by climate fluctuations and summer low flow conditions as experienced in rivers and streams in summer.

In terms of costs and timing of a water supply set up, it is cheaper and quicker to install a bore (short vertical pipe) compared to long distribution pipelines.

Aquifers also present increased security from surface events that might disrupt a water supply take from the Waikato River (e.g. volcanic eruptions, spills). Therefore, the infrastructure could potentially be promoted to the Hamilton City Council as a future back up supply system in case of emergency when presenting the plans to council.

5. REQUIREMENTS

Based on the available information from nearby bores it appears that multiple water supply bores would be needed to provide the volumes required for the size of the development (up to 9,000 homes). These bores could be located in at least two or three locations, strategically positioned to allow for future connection to the Hamilton City Council supply network.

Local water treatment would be required for pathogens and potentially iron through standard water treatment systems. These treatment systems can be designed based on initial water testing results from test bores.

Higher water flow rates are expected to be needed to meet peak use demands. Local storage of treated water may be required to match the expected peak rates. Further investigation onto the peak and average rates is recommended.

Regular local water testing and treatment system operation and maintenance will be required for the water supply at each of the bore sites. This will be an operational cost and responsibility to delegate.

Overall, based on our high-level review of the available information, it appears that new water supply bores could provide a transitional supply to enable initial development of the land parcels in the Mangakotukutuku area. These bores could then provide a supplementary supply for the development and for the wider Hamilton area if required into the future. Further investigation could be carried out to refine the areas for exploratory drilling and then carry out test drilling to determine flow rates and water treatment requirements.

6. REFERENCES

GNS 2005. Geology of the Waikato Area, Edbrooke SW (Ed). Institute of Geological and Nuclear Sciences.

Lowe, D.J. 2010. Introduction to the landscapes and soils of the Hamilton Basin. In: Lowe, D.J.; Neall, V.E., Hedley, M; Clothier, B.; Mackay, A. 2010. Guidebook for Pre-conference North Island, New Zealand "Volcanoes to Oceans" field tour (27-30 July). 19th World Soils Congress, International Union of Soil Sciences, Brisbane. Soil and Earth Sciences Occasional Publication No. 3, Massey University, Palmerston North, pp. 1.24-1.61.

Petch RA 1987. Water Resources of the Mangaonua Catchment. In: Mangaonua Catchment Management Plan. Waikato Valley Authority Technical Publication N0.30.

Petch RA, Marshall TW 1988. Groundwater resources of the Tauranga Group sediments in the Hamilton Basin, North Island, New Zealand. Journal of Hydrology 27:81-98.

Schofield JC 1972. Groundwater of the Hamilton Lowland. New Zealand Geological Survey Bulletin No. 89.

Yours faithfully

Clare Houlbrooke
for
WALLBRIDGE GILBERT AZTEC

Attachment A – Images for presentation

CHO:BAS:sbr

APPENDIX A
IMAGES FOR PRESENTATION