WASTE WATER AND PIPE FLOW CALCULATOR

WATERCARE WASTEWATER CODE OF PRACTICE - COLEBROOK WHITE AND MANNINGS EQUATIONS

CLIENT: Hugh Green Group
PROJECT: Park Estate Road Overall Catchment
DETAIL: Scenario 1 - Currently Developed

DESIGNER: RGP
JOB NO: 1972-00
DATE: 18/05/2021
REV: 2

NOTE: This spreadsheet calculates peak flow rates using the Watercare Code of Practice and pipe capacities using the Colebrook-White equation for pipes flowing full, and the Mannings equation for pipes flowing part-full

Green boxes are user inputs

Design Flow Assumptions (Section 5.3.5.1 WWCoP):

Residential	Residential	High Rise Residential	
Average Dry Weather Flow (ADWF) =	180	180	l/p/d
Peak Factor: Self-Cleansing Design Flow =	3.0	3.0	
Peak Factor: Peak Design Flow =	6.7	5.0	
Self-Cleansing Design Flow (ADWF) =	540.0	540.0	l/p/d
Peak Design Flow (PWWF) =	1206.0	900.0	l/p/d
Number of People per Dwelling =	3.0	5.0	p

Commercial/Industrial	Design Flow (l/m²/d)	ADWF (l/m²/d)	PWWF (l/m²/d)
Dry retail (toilets not available to customers)	1.3	2.6	6.5
Dry retail (toilets available to customers) / Office Buildings	4.3	8.6	21.5
Wet retail (food and beverage retail/preparation)	15.0	30	100.5
Industrial: light water use	4.5	22.5	30.2
Industrial: medium water use	6.0	30	40.2
Industrial: heavy water use	11.0	55	73.7
Very heavy water users		Specific Design Required	
Commercial/Industrial Selected Values =	**1.3**	2.6	6.5

Other Facility Types	Refer to table, WWCoP pg 33
Peak Factor: Self-Cleansing Design Flow =	**2**
Peak Factor: Peak Design Flow =	**6.7**

Table 5.2 – Guide to roughness coefficients for *wastewater* lines

Material	**Colebrook-White coefficient** k (mm)	**Manning roughness coefficient** (n)
All pipe material and lining types for gravity systems and low pressure collection systems (PWC), flowing full.	*1.5*	*0.013*
All pipe material and lining types for pressure rising mains, flowing full	*0.6*	*0.011*
NOTE – (1) These values take into account possible effects of rubber ring joints, slime, and debris. (2) The n and k values apply for pipes up to *and including* DN 300.		

Table 5.3 – Minimum pipe sizes for wastewater reticulation and property connections

Pipe	**Minimum size** DN (mm)
Connection servicing 1 dwelling unit	100
Connection servicing more than 1 dwelling unit	150
Connection servicing commercial lots	150
Connection servicing industrial lots	225
NOTE – In practical terms, in a *residential development* not exceeding 20 dwelling units, and where no pumping station is involved, DN 150 pipes laid within the limits of table 5.4 and table 5.5 will be adequate without specific hydraulic design *of the pipe network*.	

Line	Catchment Details	Increment Number of Residential/ Rural Dwellings	Increment Number of High Density Dwellings	Increment Commercial/ Industrial Area (m²)	Increment Other Facility Type (l/d)	Increment ADWF (l/s)	Cumulative ADWF (l/s)	Increment PDWF (l/s)	Cumulative PDWF (l/s)	Increment PWWF (l/s)	Cumulative PWWF (l/s)	Household Unit Equivalent	Diam (mm)	Ks	n	Grade (%)	Qmax (l/s)	Velocity Flowing Full (m/s)	Check Capacity - % of Qpwwf vs Qmax (must be <100%)	Vpdwf (must be >0.75m/s for self cleansing)	Check flow depth in pipe while carrying PDWF (must be < 50%)	Notes/Conclusions
EXISTING (Existing conditions including Hugh Green Development stages 1A - 1D and MOE)	Refer to sketch plan 1972-00-SK41-1 and 1972-00-SK41-2 for catchment boundaries																					
PUMPED CATCHMENT																						
SSMH 7 - SSMH 6	Pumped flows from upstream of Hugh Green Development	3087				19.3	19.3	57.9	57.9	129.3	129.3	3087	450	1.500	0.013	0.72	243	1.53	53.1%	1.20	34.3%	
SSMH 6 - SSMH 5						0.0	19.3	0.0	57.9	0.0	129.3	0	450	1.500	0.013	0.67	235	1.48	55.0%	1.17	34.9%	
SSMH 5 - SSMH 4						0.0	19.3	0.0	57.9	0.0	129.3	0	450	1.500	0.013	0.73	245	1.54	52.7%	1.21	34.1%	
SSMH 4 - SSMH 3						0.0	19.3	0.0	57.9	0.0	129.3	0	450	1.500	0.013	0.64	230	1.44	56.3%	1.15	35.3%	
SSMH 3 - SSMH 2						0.0	19.3	0.0	57.9	0.0	129.3	0	525	1.500	0.013	0.31	240	1.11	53.9%	0.88	34.4%	
SSMH 2 - SSMH 1						0.0	19.3	0.0	57.9	0.0	129.3	0	525	1.500	0.013	0.22	202	0.93	64.1%	0.78	37.7%	
GRAVITY FED CATCHMENT	Assumes pumped catchment flows are off peak																					
SSMH 7 - SSMH 6	Gravity fed flows from upstream of Hugh Green Developments	1000			15820	6.4	6.4	19.1	19.1	43.1	43.1	1026	450	1.500	0.013	0.72	243	1.53	17.7%	0.88	19.5%	
SSMH 6 - SSMH 5	Gravity fed flows from Hugh Green	30			12825	0.3	6.8	0.9	20.0	2.3	45.4	51	450	1.500	0.013	0.67	235	1.48	19.3%	0.87	20.3%	
SSMH 5 - SSMH 4	Developments Stages 1a - 1d and Stage	77				0.5	7.3	1.4	21.4	3.2	48.6	77	450	1.500	0.013	0.73	245	1.54	19.8%	0.91	20.5%	
SSMH 4 - SSMH 3	MOE	51				0.3	7.6	1.0	22.4	2.1	50.7	51	450	1.500	0.013	0.64	230	1.44	22.1%	0.88	21.7%	Combined pumped and gravity fed flows do not exceed capacity therefore ok
SSMH 3 - SSMH 2						0.0	7.6	0.0	22.4	0.0	50.7	0	525	1.500	0.013	0.31	240	1.11	21.2%	0.67	21.2%	
SSMH 2 - SSMH 1						0.0	7.6	0.0	22.4	0.0	50.7	0	525	1.500	0.013	0.22	202	0.93	25.1%	0.59	23.1%	
Combined Catchment Flow							**26.9**		**80.3**		**180.0**		**525**	**1.500**	**0.013**	**0.22**	**202**	**0.93**	**89.2%**	**0.86**	**44.8%**	
1. Pumped Cumulative flows assume all flows are pumped simultaneously																						

WASTE WATER AND PIPE FLOW CALCULATOR

WATERCARE WASTEWATER CODE OF PRACTICE - COLEBROOK WHITE AND MANNINGS EQUATIONS

CLIENT: Hugh Green Group
PROJECT: Park Estate Road Overall Catchment
DETAIL: Scenario 2 - MPD Development before plan change

DESIGNER: RGP
JOB NO: 1972-00
DATE: 18/05/2021
REV: 2

NOTE: This spreadsheet calculates peak flow rates using the Watercare Code of Practice and pipe capacities using the Colebrook-White equation for pipes flowing full, and the Mannings equation for pipes flowing part-full
Green boxes are user inputs

Design Flow Assumptions (Section 5.3.5.1 WWCoP):

Residential	Residential	High Rise Residential	
Average Dry Weather Flow (ADWF) =	180	180	l/p/d
Peak Factor: Self-Cleansing Design Flow =	3.0	3.0	
Peak Factor: Peak Design Flow =	6.7	5.0	
Self-Cleansing Design Flow (ADWF) =	540.0	540.0	l/p/d
Peak Design Flow (PWWF) =	1206.0	900.0	l/p/d
Number of People per Dwelling =	3.0	5.0	p

Commercial/Industrial	Design Flow (l/m²/d)	ADWF (l/m²/d)	PWWF (l/m²/d)
Dry retail (toilets not available to customers)	1.3	2.6	6.5
Dry retail (toilets available to customers) / Office Buildings	4.3	8.6	21.5
Wet retail (food and beverage retail/preparation)	15.0	30	100.5
Industrial: light water use	4.5	22.5	30.2
Industrial: medium water use	6.0	30	40.2
Industrial: heavy water use	11.0	55	73.7
Very heavy water users	Specific Design Required		
Commercial/Industrial Selected Values =	**1.3**	2.6	6.5

Other Facility Types	Refer to table, WWCoP pg 33
Peak Factor: Self-Cleansing Design Flow =	**2**
Peak Factor: Peak Design Flow =	**6.7**

Table 5.2 – Guide to roughness coefficients for *wastewater* lines

Material	**Colebrook-White coefficient** k (mm)	**Manning roughness coefficient** (n)
All pipe material and lining types for gravity systems and low pressure collection systems (PWC), flowing full.	*1.5*	*0.013*
All pipe material and lining types for pressure rising mains, flowing full	*0.6*	*0.011*
NOTE – (1) These values take into account possible effects of rubber ring joints, slime, and debris. (2) The n and k values apply for pipes up to *and including* DN 300.		

Table 5.3 – Minimum pipe sizes for wastewater reticulation and property connections

Pipe	**Minimum size** DN (mm)
Connection servicing 1 dwelling unit	100
Connection servicing more than 1 dwelling unit	150
Connection servicing commercial lots	150
Connection servicing industrial lots	225
NOTE – In practical terms, in a *residential development* not exceeding 20 dwelling units, and where no pumping station is involved, DN 150 pipes laid within the limits of table 5.4 and table 5.5 will be adequate without specific hydraulic design *of the pipe network*.	

Line	Catchment Details	Increment Number of Residential/ Rural Dwellings	Increment Number of High Density Dwellings	Increment Commercial/ Industrial Area (m²)	Increment Other Facility Type (l/d)	Increment ADWF (l/s)	Cumulative ADWF (l/s)	Increment PDWF (l/s)	Cumulative PDWF (l/s)	Increment PWWF (l/s)	Cumulative PWWF (l/s)	Household Unit Equivalent	Diam (mm)	Ks	n	Grade (%)	Qmax (l/s)	Velocity Flowing Full (m/s)	Check Capacity - % of Qpwwf vs Qmax (must be <100%)	Vpdwf (must be >0.75m/s for self cleansing)	Check flow depth in pipe while carrying PDWF (must be < 50%)	Notes/Conclusions
FUTURE (Flows from entire catchment area calculated at MPD)	Refer to sketch plan 1972-00-SK41-1 and 1972-00-SK41-2 for catchment boundaries																					
PUMPED CATCHMENT																						
SSMH 7 - SSMH 6	Pumped flows from upstream of Hugh Green Development	5268	18		32680	33.5	33.5	100.1	100.1	224.1	224.1	5340	450	1.500	0.013	0.72	243	1.53	92.0%	1.41	45.7%	
SSMH 6 - SSMH 5						0.0	33.5	0.0	100.1	0.0	224.1	0	450	1.500	0.013	0.67	235	1.48	95.4%	1.38	46.6%	
SSMH 5 - SSMH 4						0.0	33.5	0.0	100.1	0.0	224.1	0	450	1.500	0.013	0.73	245	1.54	91.4%	1.42	45.5%	
SSMH 4 - SSMH 3						0.0	33.5	0.0	100.1	0.0	224.1	0	450	1.500	0.013	0.64	230	1.44	97.6%	1.36	47.2%	
SSMH 3 - SSMH 2						0.0	33.5	0.0	100.1	0.0	224.1	0	525	1.500	0.013	0.31	240	1.11	93.5%	1.03	46.0%	
SSMH 2 - SSMH 1						0.0	33.5	0.0	100.1	0.0	224.1	0	525	1.500	0.013	0.22	202	0.93	111.1%	0.91	50.5%	
GRAVITY FED CATCHMENT	Assumes pumped catchment flows are off peak																					
SSMH 7 - SSMH 6	Gravity fed flows from upstream of Hugh Green Developments	3226			66890	20.9	20.9	62.0	62.0	140.3	140.3	3337	450	1.500	0.013	0.72	243	1.53	57.6%	1.23	35.5%	
SSMH 6 - SSMH 5	Gravity fed flows from fully complete Hugh Green Developments	102			12825	0.8	21.7	2.2	64.2	5.3	145.5	123	450	1.500	0.013	0.67	235	1.48	62.0%	1.21	36.8%	
SSMH 5 - SSMH 4		233				1.5	23.2	4.4	68.6	9.8	155.3	233	450	1.500	0.013	0.73	245	1.54	63.3%	1.27	37.3%	Combined pumped and gravity fed flows exceed capacity therefore pumped flows must be off peak
SSMH 4 - SSMH 3		237				1.5	24.7	4.4	73.1	9.9	165.2	237	450	1.500	0.013	0.64	230	1.44	72.0%	1.23	39.9%	
SSMH 3 - SSMH 2		370				2.3	27.0	6.9	80.0	15.5	180.7	370	525	1.500	0.013	0.31	240	1.11	75.4%	0.96	40.8%	
SSMH 2 - SSMH 1		48				0.3	27.3	0.9	80.9	2.0	182.7	48	525	1.500	0.013	0.22	202	0.93	90.6%	0.86	44.9%	
Combined Catchment Flow							**60.8**		**181.0**		**406.8**		**525**	**1.500**	**0.013**	**0.22**	**202**	**0.93**	**201.6%**	**1.07**	**72.6%**	

1. Future catchment areas are calculated according to Auckland Unitary Plan at Maximum Probable Development.
2. Pumped Cumulative flows assume all flows are pumped simultaneously

WASTE WATER AND PIPE FLOW CALCULATOR

WATERCARE WASTEWATER CODE OF PRACTICE - COLEBROOK WHITE AND MANNINGS EQUATIONS

CLIENT: Hugh Green Group
PROJECT: Park Estate Road Overall Catchment
DETAIL: Scenario 3 - MPD Development after plan change

DESIGNER: RGP
JOB NO: 1972-00
DATE: 18/05/2021
REV: 2

NOTE: This spreadsheet calculates peak flow rates using the Watercare Code of Practice and pipe capacities using the Colebrook-White equation for pipes flowing full, and the Mannings equation for pipes flowing part-full
Green boxes are user inputs

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Peak Factor: Peak Design Flow =	6.7	5.0	
Self-Cleansing Design Flow (ADWF) =	540.0	540.0	l/p/d
Peak Design Flow (PWWF) =	1206.0	900.0	l/p/d
Number of People per Dwelling =	3.0	5.0	p

Commercial/Industrial	Design Flow (l/m²/d)	ADWF (l/m²/d)	PWWF (l/m²/d)
Dry retail (toilets not available to customers)	1.3	2.6	6.5
Dry retail (toilets available to customers) / Office Buildings	4.3	8.6	21.5
Wet retail (food and beverage retail/preparation)	15.0	30	100.5
Industrial: light water use	4.5	22.5	30.2
Industrial: medium water use	6.0	30	40.2
Industrial: heavy water use	11.0	55	73.7
Very heavy water users	Specific Design Required		
Commercial/Industrial Selected Values =	**1.3**	2.6	6.5

Other Facility Types	Refer to table, WWCoP pg 33
Peak Factor: Self-Cleansing Design Flow =	**2**
Peak Factor: Peak Design Flow =	**6.7**

Table 5.2 – Guide to roughness coefficients for *wastewater* lines

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All pipe material and lining types for pressure rising mains, flowing full	*0.6*	*0.011*
NOTE – (1) These values take into account possible effects of rubber ring joints, slime, and debris. (2) The n and k values apply for pipes up to *and including* DN 300.		

Table 5.3 – Minimum pipe sizes for wastewater reticulation and property connections

Pipe	**Minimum size** DN (mm)
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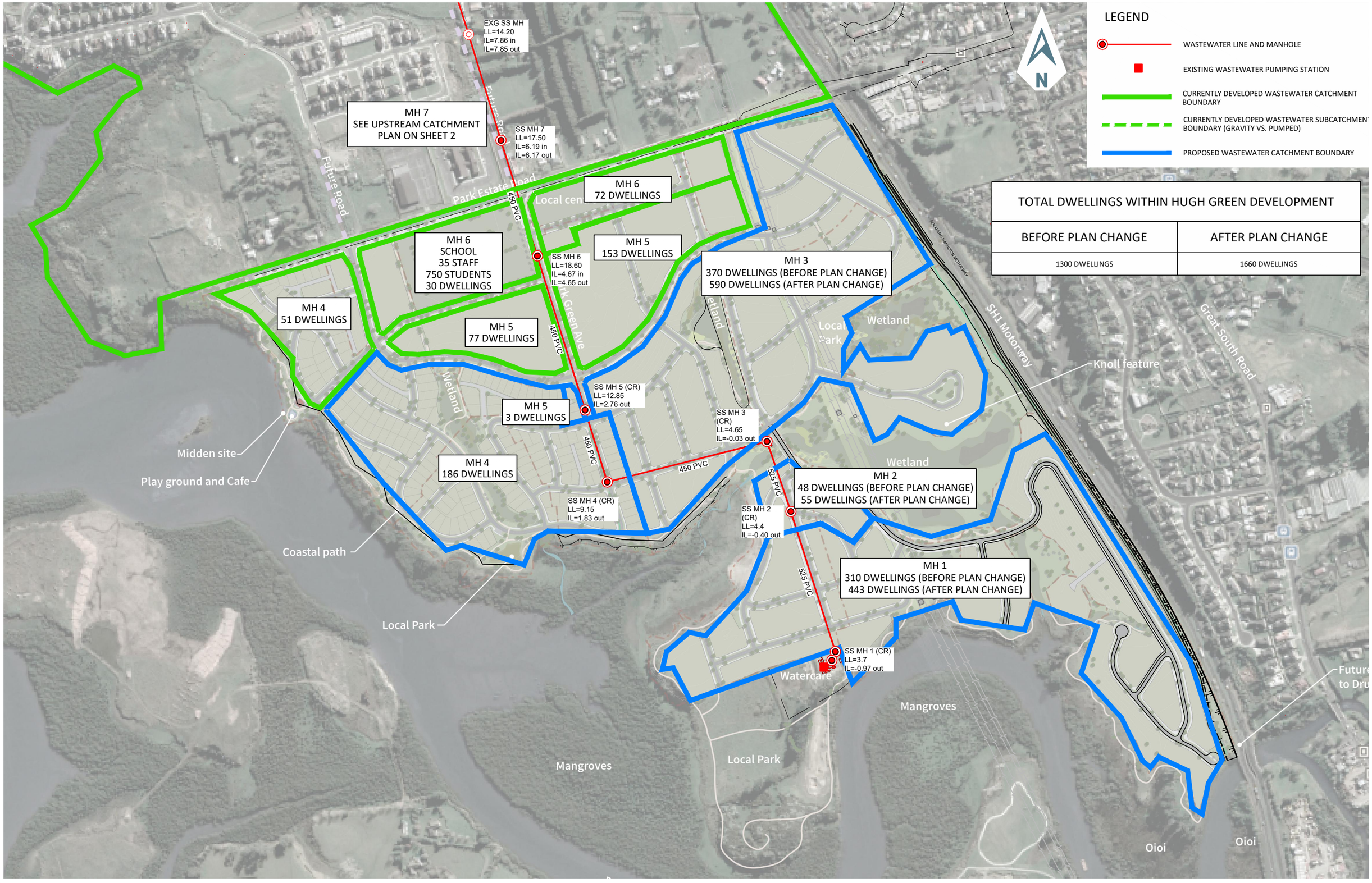
Connection servicing commercial lots	150
Connection servicing industrial lots	225
NOTE – In practical terms, in a *residential development* not exceeding 20 dwelling units, and where no pumping station is involved, DN 150 pipes laid within the limits of table 5.4 and table 5.5 will be adequate without specific hydraulic design *of the pipe network*.	

Line	Catchment Details	Increment Number of Residential/ Rural Dwellings	Increment Number of High Density Dwellings	Increment Commercial/ Industrial Area (m²)	Increment Other Facility Type (l/d)	Increment ADWF (l/s)	Cumulative ADWF (l/s)	Increment PDWF (l/s)	Cumulative PDWF (l/s)	Increment PWWF (l/s)	Cumulative PWWF (l/s)	Household Unit Equivalent	Diam (mm)	Ks	n	Grade (%)	Qmax (l/s)	Velocity Flowing Full (m/s)	Check Capacity - % of Qpwwf vs Qmax (must be <100%)	Vpdwf (must be >0.75m/s for self cleansing)	Check flow depth in pipe while carrying PDWF (must be < 50%)	Notes/Conclusions
FUTURE (Flows from entire catchment area calculated at MPD)	Refer to sketch plan 1972-00-SK41-1 and 1972-00-SK41-2 for catchment boundaries																					
PUMPED CATCHMENT																						
SSMH 7 - SSMH 6	Pumped flows from upstream of Hugh Green Development	5268	18		32680	33.5	33.5	100.1	100.1	224.1	224.1	5340	450	1.500	0.013	0.72	243	1.53	92.0%	1.41	45.7%	
SSMH 6 - SSMH 5						0.0	33.5	0.0	100.1	0.0	224.1	0	450	1.500	0.013	0.67	235	1.48	95.4%	1.38	46.6%	
SSMH 5 - SSMH 4						0.0	33.5	0.0	100.1	0.0	224.1	0	450	1.500	0.013	0.73	245	1.54	91.4%	1.42	45.5%	
SSMH 4 - SSMH 3						0.0	33.5	0.0	100.1	0.0	224.1	0	450	1.500	0.013	0.64	230	1.44	97.6%	1.36	47.2%	
SSMH 3 - SSMH 2						0.0	33.5	0.0	100.1	0.0	224.1	0	525	1.500	0.013	0.31	240	1.11	93.5%	1.03	46.0%	
SSMH 2 - SSMH 1						0.0	33.5	0.0	100.1	0.0	224.1	0	525	1.500	0.013	0.22	202	0.93	111.1%	0.91	50.5%	
GRAVITY FED CATCHMENT	Assumes pumped catchment flows are off peak																					
SSMH 7 - SSMH 6	Gravity fed flows from upstream of Hugh Green Developments	3226			66890	20.9	20.9	62.0	62.0	140.3	140.3	3337	450	1.500	0.013	0.72	243	1.53	57.6%	1.23	35.5%	
SSMH 6 - SSMH 5	Gravity fed flows from fully complete Hugh Green Developments	102			12825	0.8	21.7	2.2	64.2	5.3	145.5	123	450	1.500	0.013	0.67	235	1.48	62.0%	1.21	36.8%	
SSMH 5 - SSMH 4		233				1.5	23.2	4.4	68.6	9.8	155.3	233	450	1.500	0.013	0.73	245	1.54	63.3%	1.27	37.3%	Combined pumped and gravity fed flows exceed capacity therefore pumped flows must be off peak
SSMH 4 - SSMH 3		237				1.5	24.7	4.4	73.1	9.9	165.2	237	450	1.500	0.013	0.64	230	1.44	72.0%	1.23	39.9%	
SSMH 3 - SSMH 2		590				3.7	28.3	11.1	84.1	24.7	189.9	590	525	1.500	0.013	0.31	240	1.11	79.2%	0.98	41.9%	
SSMH 2 - SSMH 1		55				0.3	28.7	1.0	85.2	2.3	192.2	55	525	1.500	0.013	0.22	202	0.93	95.3%	0.87	46.2%	
Combined Catchment Flow							**62.2**		**185.2**		**416.3**		**525**	**1.500**	**0.013**	**0.22**	**202**	**0.93**	**206.3%**	**1.08**	**74.0%**	
1. Future catchment areas are calculated according to Auckland Unitary Plan at Maximum Probable Development.																						
2. Pumped Cumulative flows assume all flows are pumped simultaneously																						



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REV	REVISION DETAILS	BY	DATE
-	-	-	XX.XX.XX

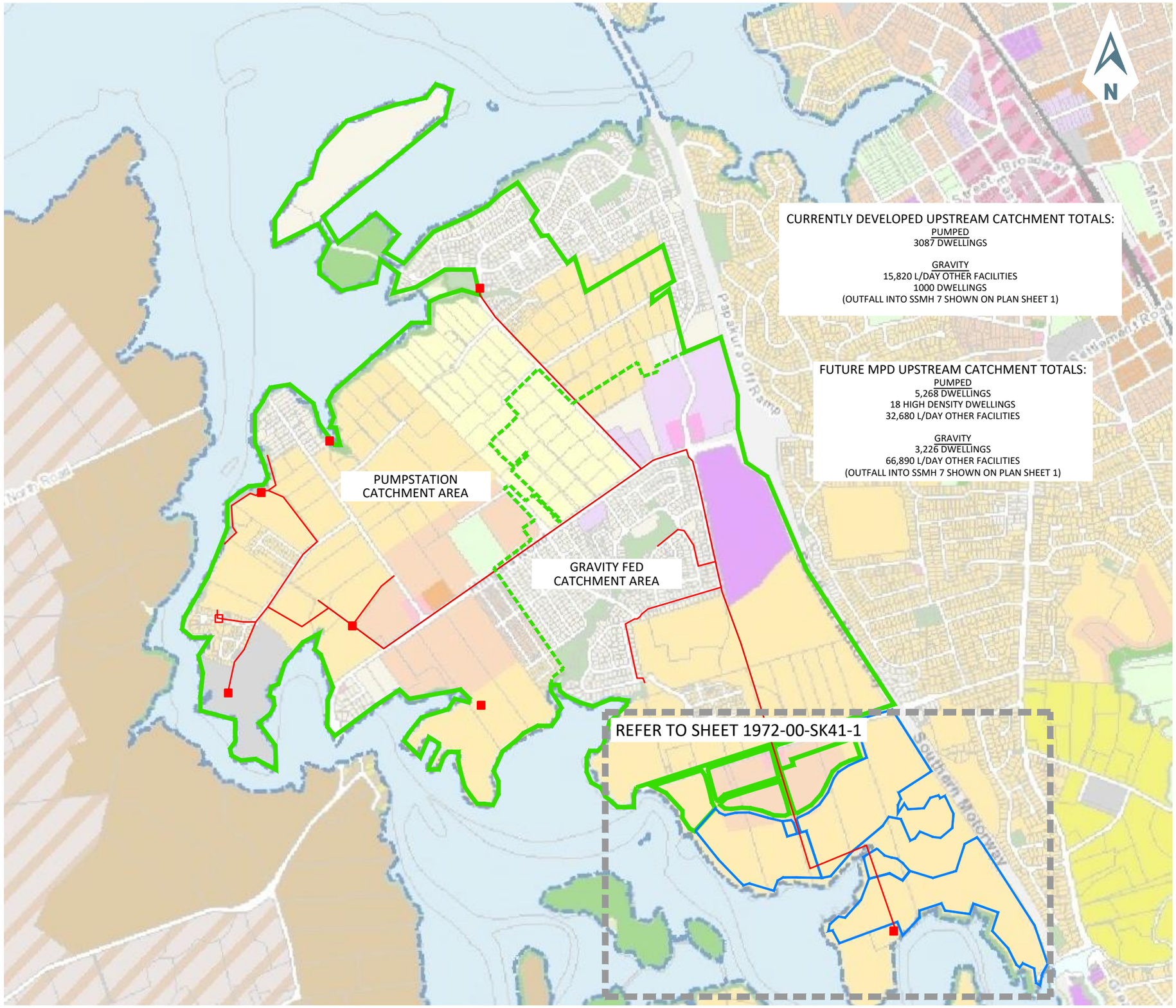
DRAWN:	RGP	DATE: 03.2021
CHECKED:	---	DATE: XX.XX.XX
APPROVED:	---	DATE: XX.XX.XX

CIVILPLAN CONSULTANTS
Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
HUGH GREEN LTD
144, 152, 180, 200, 252 PARK ESTATE ROAD
HINGAIA

SHEET TITLE:
WASTEWATER CATCHMENT PLAN
SHEET 1

ISSUE STATUS: DRAFT@18.05.21
SCALE: (A1/A3) 1:3000 / 1:6000
SCALE BAR 1:6000@A3 0 60 120 180 240 300m
DRAWING NUMBER: 1972-00-SK41-1 REV: -



LEGEND

- WASTEWATER LINE AND MANHOLE
- EXISTING WASTEWATER PUMPING STATION
- CURRENTLY DEVELOPED WASTEWATER CATCHMENT BOUNDARY
- CURRENTLY DEVELOPED WASTEWATER SUBCATCHMENT BOUNDARY (GRAVITY VS. PUMPED)
- PROPOSED WASTEWATER CATCHMENT BOUNDARY

Unitary Plan Zones

Zones

- Residential - Large Lot Zone
- Residential - Rural and Coastal Settlement Zone
- Residential - Single House Zone
- Residential - Mixed Housing Suburban Zone
- Residential - Mixed Housing Urban Zone
- Residential -Terrace Housing and Apartment Buildings Zone
- Open Space - Conservation Zone
- Open Space - Informal Recreation Zone
- Open Space - Sport and Active Recreation Zone
- Open Space - Civic Spaces Zone
- Open Space - Community Zone
- Business - City Centre Zone
- Business - Metropolitan Centre Zone
- Business - Town Centre Zone
- Business - Local Centre Zone
- Business - Neighbourhood Centre Zone
- Business - Mixed Use Zone
- Business - General Business Zone
- Business - Business Park Zone
- Business - Heavy Industry Zone
- Business - Light Industry Zone
- Future Urban Zone
- Green Infrastructure Corridor (Operative in some Special Housing Areas)
- Rural - Rural Production Zone
- Rural - Mixed Rural Zone

NOTES:

1. CURRENTLY DEVELOPED AND FUTURE CATCHMENT BOUNDARIES INCLUDE THE SAME AREA BUT HOUSING DENSITY INCREASES WITH FUTURE MPD

REV	REVISION DETAILS	BY	DATE
-	-	-	XX.XX.XX

DRAWN: RGP DATE: 03.2021
CHECKED: --- DATE: XX.XX.XX
APPROVED: --- DATE: XX.XX.XX

CIVILPLAN CONSULTANTS
Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
HUGH GREEN LTD
144, 152, 180, 200, 252 PARK ESTATE ROAD
HINGAIA

SHEET TITLE:
WASTEWATER CATCHMENT PLAN
SHEET 2

ISSUE STATUS: DRAFT@18.05.21
SCALE: (A1/A3) NOT TO SCALE
SCALE BAR N.T.S.
DRAWING NUMBER: 1972-00-SK41-2 REV: -