

Technical Memorandum

25 November 2025

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From	Ahmed Alwaith, Mohamed Ali and Ross Fraser	Project No.	12653391
Project Name	Horsley Park - Data Centre water supply – Stage 2		
Subject	Short-term servicing assessment for NEXTDC S4 Data Centre Development in Horsley Park - Year 2028 – Revision E		

1. Introduction

1.1 Background

In October 2024, NEXTDC engaged GHD through WSce to assess the water servicing option from Sydney Water's water supply reticulation network for the NEXT DC Ltd data centre (S4 DC) development at 16 Johnston Crescent, Horsley Park. The project includes six data centre buildings with a maximum height of 38 m and an operational capacity of 350 MW, along with a substation, earthworks, car parking, landscaping, and ancillary works. The development is located within the Cecil Park Remainder Water Supply Zone which is serviced by Cecil Park Reservoir (asset ID 1080) which is fed by two pumping stations, WP0433 and WP0184. The closest existing SWC potable water trunk infrastructure to the development is a DN 450 on Burley St, See Figure 1 and Figure 2 below.

1.2 Purpose of this Memorandum

The purpose of this technical memo is to report the performance of the existing water supply reticulation network with and without the year 2028 demands of the NEXTDC S4 Data Centre development, and to suggest measures that will sustain an average rate of 30.7 L/s (equivalent to 2.65 ML/d) or more by the S4 data centre until end of 2028.

This memo will support the Notice of Requirement (NOR) renewal submission to facilitate the connection of S4 DC 2028 average daily demand (ADD) rate of 30.7 L/s for 24-hours a day (equivalent to 2.65 ML daily for the year 2028) or more, from the existing Sydney Water network, primarily used in the development's cooling towers.

The S4 data centre can accept water supplied from the network in any flow pattern over the day as long as it totals at least 2.65 ML/d. So, this technical memo will also explore opportunities to supply more than the ADD volume of 2.65 ML daily for the year 2028 in off-peak times to allow filling the internal storages at the S4 data centre development site.

1.3 Scope and limitations

The scope of this study is limited to reporting the system performance of the existing network within the north-eastern region of the Cecil Park water supply zone using Sydney Water's hydraulic model. SWC

endorsed the use of the 2026 model configuration along with the current 2024 base demands in the base hydraulic model for this study.

GHD developed the 2028 hydraulic models with and without the development using SWC procedures and guidelines. SWC will now undertake a QA/QC leading to approval of the 2028 models with and without the development, including approval of S4 data centre taking constant or variable flows (using special off-peak diurnal demand pattern) throughout the day which are equivalent to an average day demand (ADD) of 30.7 L/s (2.65 ML/d) or more from the network without impacting the pressures at the customer points. The additional flow (more than ADD 30.7 L/s equivalent to 2.65 ML/d) will be used in filling the internal storages at the S4 data centre development at off-peak times to cover for the developer's MDD demands (53.19 L/s equivalent to 4.60 ML/d).

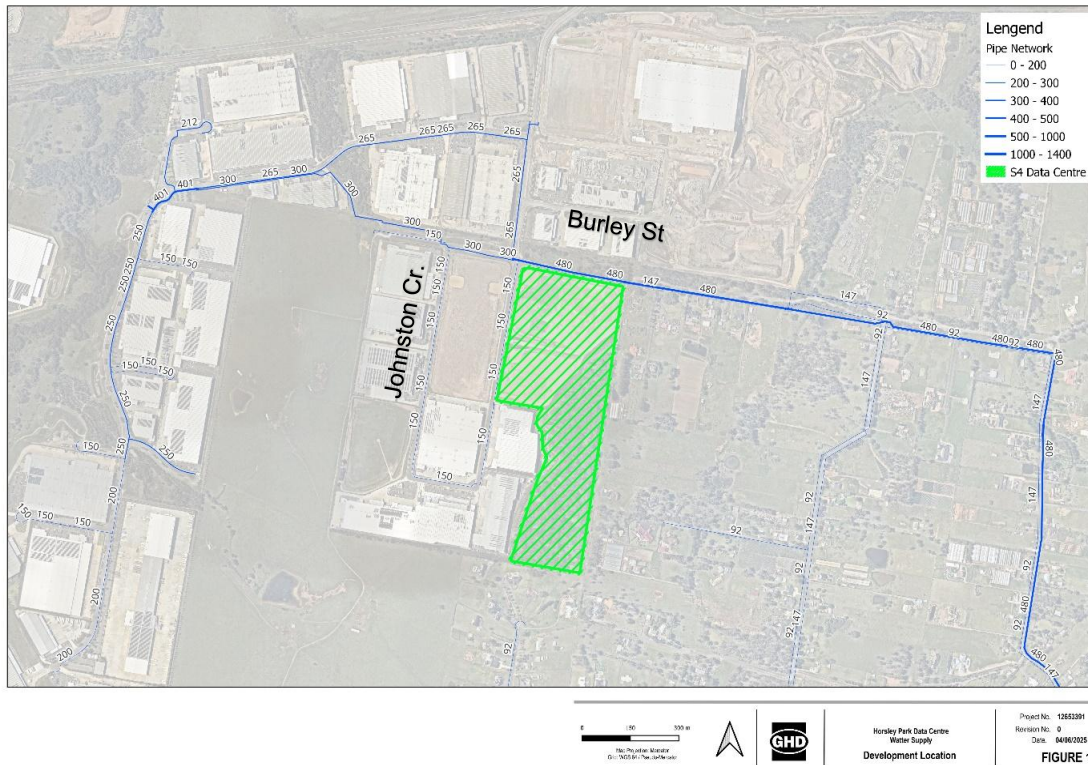


Figure 1 Development location and existing Sydney Water potable water mains

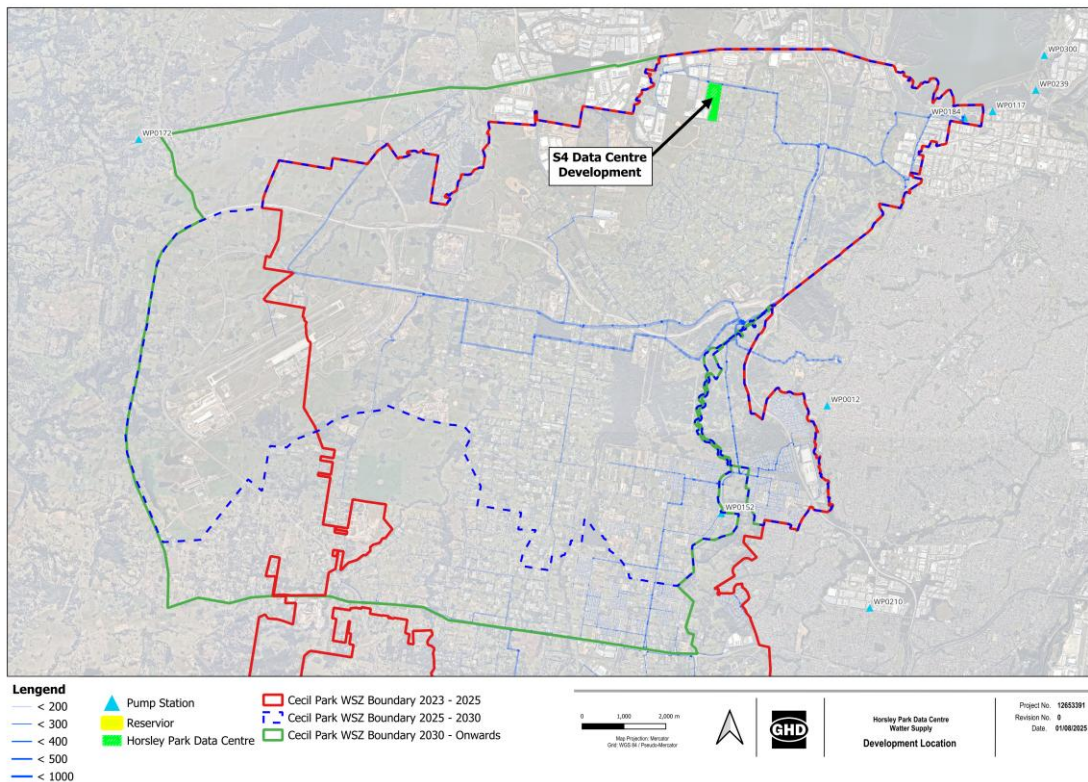


Figure 2 Horsley Park Data Centre Project Location

Limitations

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The Model is a representation only and does not reflect reality in every aspect. The Model contains simplified assumptions to derive a modelled outcome. The actual variables will inevitably be different to those used to prepare the Model. Accordingly, the outputs of the Model cannot be relied upon to represent actual conditions without due consideration of the inherent and expected inaccuracies. Such considerations are beyond GHD's scope.

The Model is limited by the mathematical rules and assumptions that are set out in the Report or included in the Model and by the software environment in which the Model is developed.

The Model is a customised model and not intended to be amended in any form or extracted to other software for amending. Any change made to the Model, other than by GHD, is undertaken on the express understanding that GHD is not responsible, and has no liability, for the changed Model including any outputs.

Accessibility of documents

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2. Planning criteria

Refer to the basis of the planning document #12653391 Horsley Park Data Centre BoP, which includes the planning criteria adopted for this assessment. Table 1 shows the summary of the criteria adopted:

Table 1 Drinking Water system performance criteria

Item	Criteria	Requirements	Reference		
Residual Pressure	Minimum Pressure	<ul style="list-style-type: none"> ≥ 20 m desirable in new areas (subject to economic evaluation) ≥ 15 m minimum in existing single supply systems ≥ 20 m minimum in existing systems with dual supply 	WSPG Table 4.2 and 4.4		
	Minimum pressure (trunk mains)	≥ 3 m where not supplying customers	WSPG Section 4.2		
	Maximum pressure	The long-term aim is to reduce to 60 m or less where financially viable (i.e. 50 m desirable)	WSPG Table 4.2		
Pipe mains sizing	Headloss gradient (secondary criteria to pressure)	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> <ul style="list-style-type: none"> ≥ DN 200 (CIOD) or ≥ DN 250 (ISO): ≤ 3 m head/km </td> <td style="width: 50%;"> <ul style="list-style-type: none"> ≤ DN 150 (CIOD) or ≤ DN 180 (ISO): ≤ 5 m head/km </td> </tr> </table>	<ul style="list-style-type: none"> ≥ DN 200 (CIOD) or ≥ DN 250 (ISO): ≤ 3 m head/km 	<ul style="list-style-type: none"> ≤ DN 150 (CIOD) or ≤ DN 180 (ISO): ≤ 5 m head/km 	WSA-03 Section 3.1.6.2
	<ul style="list-style-type: none"> ≥ DN 200 (CIOD) or ≥ DN 250 (ISO): ≤ 3 m head/km 	<ul style="list-style-type: none"> ≤ DN 150 (CIOD) or ≤ DN 180 (ISO): ≤ 5 m head/km 			
Max Velocity Note: secondary criteria to pressure	2.0 m/s max hour demand (reticulation) – as a guide	WSA-03 Section 3.1.6.4			
Existing surface reservoir	Reserve storage	<ul style="list-style-type: none"> Maintain reservoir ≥ RSL over peak demand sequence. Reservoir storage is a minimum 1/3 MDD and subject to a risk assessment and economic evaluation 	WSPG Section 5.2.1		

3. NEXTDC S4 Data Centre Development Demands

Table 2 below identifies the S4 development demand requirements and the staging horizons from 2027 onwards, provided by NEXTDC in an email dated 07/08/2025. The grey shaded year in the table represents the S4 DC flow data relevant to this 2028 technical memo and used in the associated modelling.

Table 2 Development water consumption staging

DC Stage	Horizon (Year)	Average Annualised Consumption (GL/year)	ADD (ML/d)	ADD (L/s)	MDD (ML/d)	MDD (L/s)
Stage 1	2027	0.29	0.80	9.3	2.15	24.89
Stage 2	2028	0.97	2.65	30.7	4.60	53.19

DC Stage	Horizon (Year)	Average Annualised Consumption (GL/year)	ADD (ML/d)	ADD (L/s)	MDD (ML/d)	MDD (L/s)
Stage 3	2029	1.69	4.63	53.6	7.04	81.5
Stage 4	2030	2.41	6.61	76.5	9.49	109.81
Stage 5	2031	3.13	8.58	99.3	11.93	138.11
Stage 6	2032	3.81	10.44	120.8	12.18	140.98
Stage 7	2033	4.53	12.42	143.8	14.94 *	172.88 *
Stage 8	2034 – Onwards	5.46	14.95	173.0	17.69	204.77

* Note: 2033 MDD (ML/d) was interpolated using MDD from 2032 and 2034 as the given MDD value was less than the ADD value for 2033.

3.1.1 S4 Data Centre original demand profile

The development's demand profile is assumed to be a constant flow, with an average day demand (ADD) of 2.65 ML/d supplied into a receiving storage tank on S4 site at any time during the day, but every day.

3.1.2 Storage on site

The developer will construct an on-site storage to cater for the difference between ADD and MDD. SWC will supply the development with the ADD demands only as per the emerging SWC policy.

4. Cecil Park WSZ Demands

The 2028 demands in the water supply zone are identified in the Table 3 below.

Table 3 Cecil Park WSZ year 2028 Demand Calculations

Type	Demands	Population	ADD (MLD)	MDD (MLD) ^{1, 6}
Dwellings	Residential (LD)	8,515.83	6.44	13.84
	Residential (HD)	-	0.34	0.73
	Non-residential ²	49,133.12	7.47	14.63
Dual retic dwellings	Residential (LD) - Dual retic	610.08	0.06	0.13
	Residential (HD) - Dual retic	704.33	0.07	0.13
	Non-residential - Dual retic	704.33	0.50	0.86
Data centres ⁵	S4 Horsley Park (2028)	-	2.65	4.60
Kelly St 1,500 lots LD	-	-	0.90	1.94
Recycled backup water ³	-	-	35.72	35.72
NRW ⁴	-	-	1.97	1.93
Total (inc. NRW) MLD			56.07	74.51

¹ The MDD/ADD factor used 2.15 for the residential and non-residential customers for both non-retic and dual retic customer points in 2028.

² Include Sydney Western Airport demands representing a total of 2.60 MLD in 2028

³ The back-up water demands include the recycled water MDD and top-up in three locations in the Aerotropolis area and Mamre Rd. A linear interpolation was used based on values reported in WSAGA options basis of planning draft report.

⁴ The NRW was calculated based on 14% for the existing demands and 11% for the future demands

⁵ This Technical memo only modelled and reported on NEXT DC S4 at Horsley Park. Other DC demands for 2028 were excluded from the modelling.

⁶ GHD's QA processes have ensured that the assets in the model are as per GIS and also with updated growth forecasts as per UGI table.

5. Model run codes

The Table 4 below identifies the model run codes used in this assessment. The 2028 modelling includes two models - one without the development (Mode#5.0), and one with the development (Mode#5.1).

Table 4 Mode run code

Model run code	Pathway	Description
Mode#0.0	(>Potable Retic>11. Macarthur>11.2 Campbelltown>Raby - Leppington - Leppington Elevated 2018 (Leppington 2018) >20 Projects>Austral Leppington Scheme Plan 2023>Run Group Cecil Park Merge 2026>Run MDD Model for eDev_Austral)	Base model 2026 – SWC advised to use this model as a starting point
Mode#5.0	>Potable Retic>11. Macarthur>11.2 Campbelltown>Raby - Leppington - Leppington Elevated 2018 (Leppington 2018) >20 Projects>Lot 16 Johnston Crescent, Horsley Park - NEXTDC>Run Group_GHD>Mode#5.0_CP_Post25_BD24_GHD_2028_withoutdev	Developed 28 model without the development
Mode#5.1	>Potable Retic>11. Macarthur>11.2 Campbelltown>Raby - Leppington - Leppington Elevated 2018 (Leppington 2018) >20 Projects>Lot 16 Johnston Crescent, Horsley Park - NEXTDC>Run Group_GHD>Mode#5.1_CP_Post25_BD24_GHD_2028_with_NDC	Developed 28 model with the development
Mode#5.1A	>Potable Retic>11. Macarthur>11.2 Campbelltown>Raby - Leppington - Leppington Elevated 2018 (Leppington 2018) >20 Projects>Lot 16 Johnston Crescent, Horsley Park - NEXTDC>Run Group_GHD>Mode#5.1A_Offpeak 2 + S4 at 53.19 L/s	Developed 28 model supplying S4 DC with 4.60 ML/d using the special off-peak diurnal pattern
Mode#5.1B	>Potable Retic>11. Macarthur>11.2 Campbelltown>Raby - Leppington - Leppington Elevated 2018 (Leppington 2018) >20 Projects>Lot 16 Johnston Crescent, Horsley Park - NEXTDC>Run Group_GHD>Mode#5.1B_Upgrade pipe along Wallgrove	Developed 28 model with network upgrades to supply S4 DC with a constant flow of 30.7 L/s

6. Model update approach

The following approach has been followed and agreed with SWC. The Mode#0.0 model demands have been updated to create Mode#5.0 model. The following steps have been followed to update the Model#5.0 (2028 model without the development):

- The customer points data have been used from the (SWC_Property_2024), file located in SWC's "N" drive N:\MapinfoSource\Planning\ExistingProp&Pop
- The customer points have been clipped to the Cecil Park WSZ boundary only and ignored/deleted any other customer points outside the boundary in the model.
- The average flows in the model have been updated from the field (Ave_PWC_KI) to build the 2024 demands within the model.
- The 2024 demands applied to each customer points have been scaled up to develop the future 2028 demands to match the projected growth
- Additional demands were added to the model as per SWC advice as follows:
 - 1,500 properties in Kelly St, Austral

- The airport demands,
- The recycled water backup demands (top-up water + MDD) in Mamre Rd and Aerotropolis

7. SWC Model build and performance review

SWC conducted a quality review of the 2027 hydraulic model on 31st July 2025, and approved the model to deliver 10L/s with minor comments. The comments were addressed in the run codes provided in Table 4. This 2028 Technical Memo uses the 2027 Technical Memo as a template.

8. System performance results – Constant supply

The following sections illustrate the system performance with and without S4 DC demands of 2.65 ML/d at a constant rate of 30.7 L/s in 2028.

8.1 Overall Pressure and headloss hydraulic maps

The overall system performance results in terms of the head losses and pressure contour maps without and with S4 demands are shown in Figure 3 and Figure 4 below. Visually, there are no major differences between the with and without development figures, except for a few locations indicated on the maps. The actual impact of S4 DC will be discussed in detail in Section 8.1.1, 8.1.2 and 8.1.3.

The without development figure (Figure 3) shows that some existing pipes already have high headlosses which cause pressures at customer point to drop below SWC standard requirements for minimum pressures (15m for single supply customer and 20m dual supply customers). These pipes require upsizing before the advent of the Horsley Park S4 Data Centre.

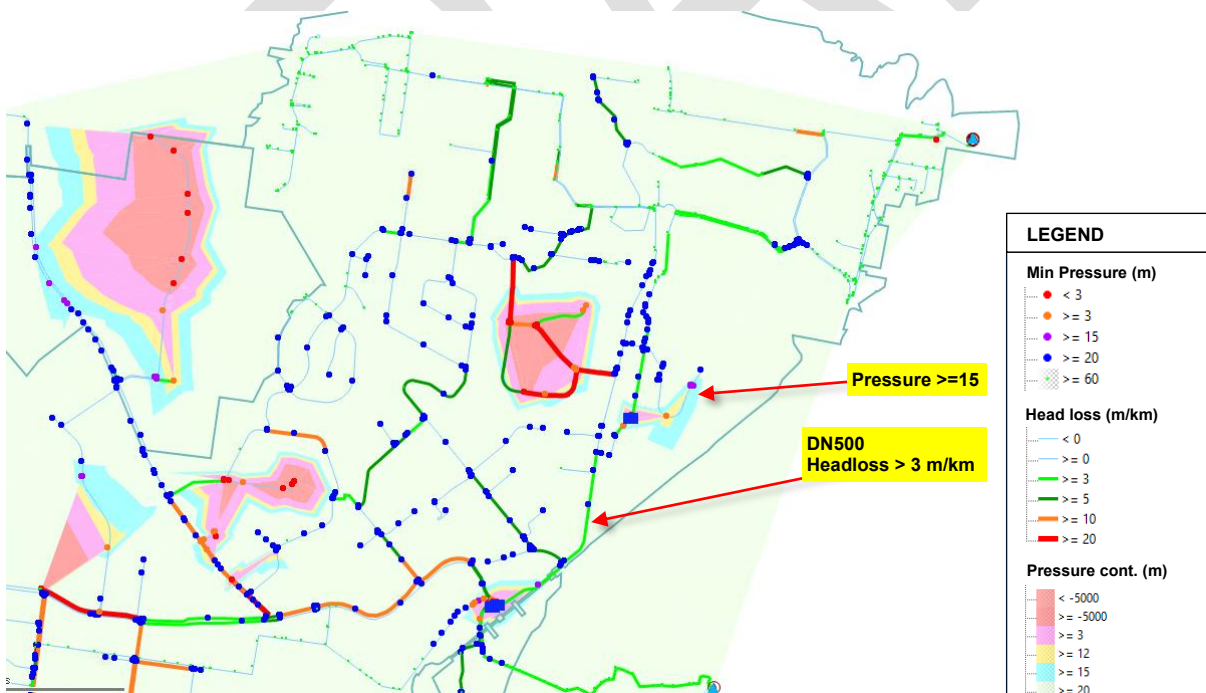


Figure 3 System performance – Without development – Pressure and headloss

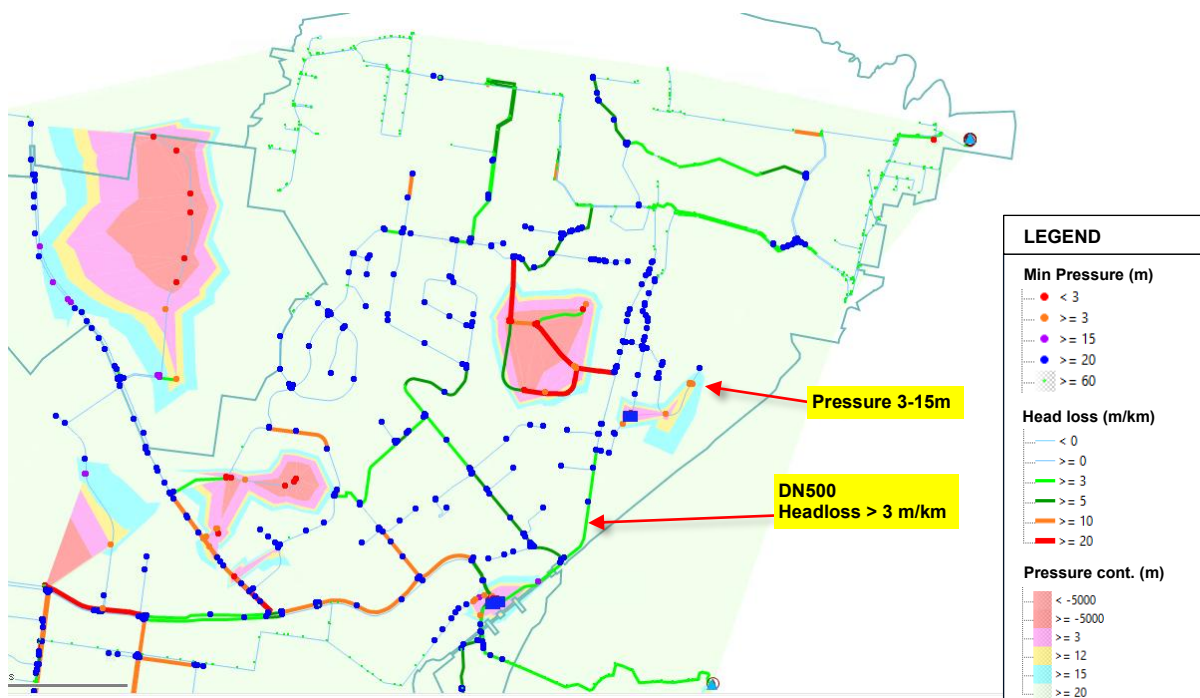


Figure 4 System performance – With S4 DC (Constant 30.7 L/s) – Pressure and headloss

8.1.1 Existing low-pressure problems in Cecil Park WSZ

This section and the following sections discuss pressure drops at customer points.

Before applying S4 DC demands of 2.65 ML/d constantly at 30.7 L/s, 19 single supply customers already have an existing pressure problem (pressure below 15 m) due to high headlosses in transfer mains, as shown in Table 5. The table also shows the impact of S4 DC on these customer points in 2028, and the cumulative duration of pressure drops. The location of these customer points is shown in Figure 5.

Upsizing green highlighted pipes in Figure 5 may resolve the non-compliant pressure issues at these customers points.

Table 5 19 Customer points with pressure <15 m – Without development in 2028

Customer point	Minimum pressure <u>without</u> S4 DC (m)	Minimum pressure <u>with</u> S4 DC (m)	Pressure difference (m)	Cumulative duration of pressure drops (hh:mm:ss)
5143025	1.42	-0.33	1.75	1:27:00
5358373	1.59	-0.11	1.7	4:57:00
5358374	1.38	-0.32	1.7	5:02:00
5440350	0.71	-1.04	1.75	3:22:00
5440351	0.71	-1.04	1.75	3:22:00
LD_NDR28-015	1.63	-0.12	1.75	1:26:00
HD_NDR28-015	1.63	-0.12	1.75	1:26:00
J_NDR28-015	1.63	-0.12	1.75	1:26:00
4463114	12.18	10.48	1.7	0:58:00
4468384_NR	13.05	11.29	1.76	14:29:00
4492801	12.22	10.52	1.7	0:57:00
4492803	13.29	11.59	1.7	0:48:00
4517414	13.41	11.92	1.49	13:58:00
4908626	12.99	11.29	1.7	0:51:00

Customer point	Minimum pressure <u>without</u> S4 DC (m)	Minimum pressure <u>with</u> S4 DC (m)	Pressure difference (m)	Cumulative duration of pressure drops (hh:mm:ss)
4981175	12.68	10.95	1.73	0:39:00
5185846	13.08	11.32	1.76	14:27:00
5185855	12.03	10.27	1.76	16:14:00
5246173	13.34	11.61	1.73	0:35:00
5246174	13.27	11.54	1.73	0:36:00

00:00:00

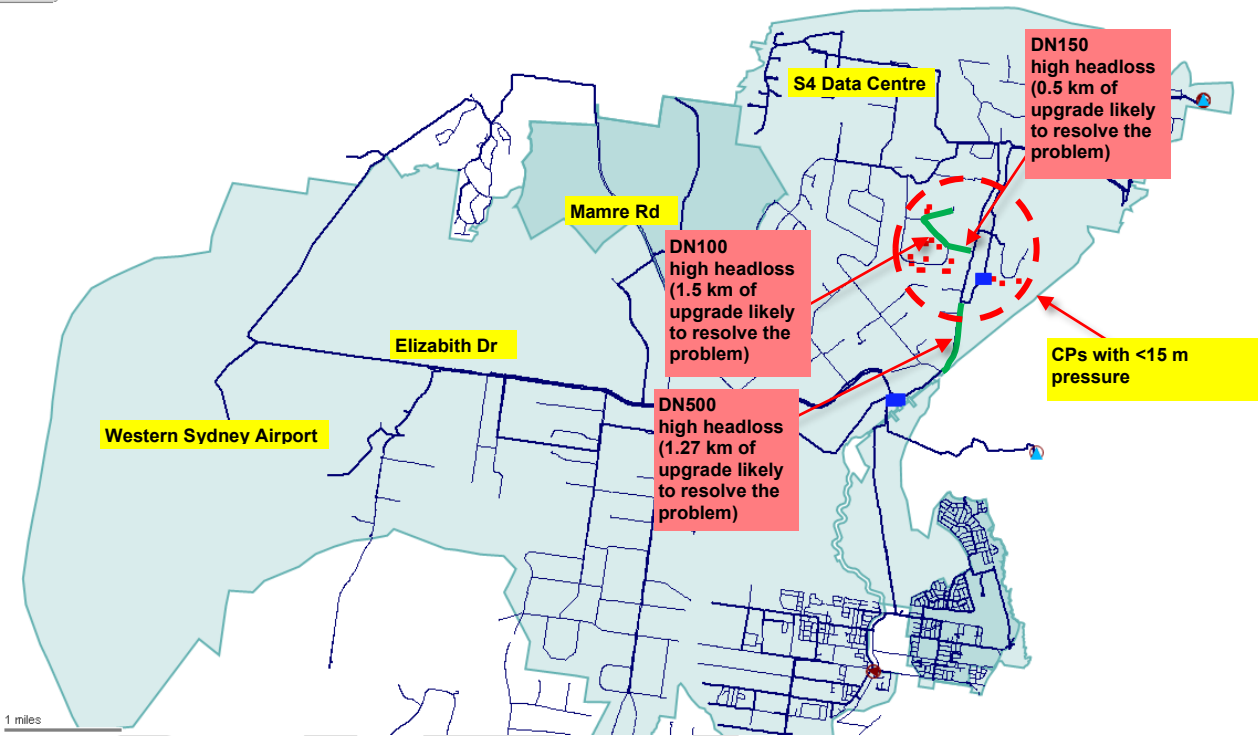


Figure 5 19 Customer points with pressure <15 m – Without development in 2028

8.1.2 S4 development impact (constant 30.7 L/s) on single-supply customers (11 customers)

SWCs requirement for single supply customers is to have a minimum pressure of 15m.

Table 6 and Figure 6 below show 11 single supply customers impacted by the S4 development ADD demands of 2.65 ML/d at a constant rate of 30.7 L/s in 2028. Table 6 indicates that the pressure difference at customer points between with and without development scenarios is about 1.77 m, with pressure drop durations varying from 8 mins to 4 hrs per day.

Table 6 Development (30.7 L/s) impact on 11 single supply customers in 2028

Customer point	Minimum pressure <u>without</u> S4 DC (m)	Minimum pressure <u>with</u> S4 DC (m)	Pressure difference (m)	Total duration of pressure drops (hh:mm:ss)
4468385	15.45	13.69	1.76	4:00:00
4517398	15.43	14.44	0.99	3:10:00
4517415	15.62	14.21	1.41	3:18:00
4841688	16.11	14.34	1.77	2:22:00
4898050	15.49	13.72	1.77	3:55:00

Customer point	Minimum pressure without S4 DC (m)	Minimum pressure with S4 DC (m)	Pressure difference (m)	Total duration of pressure drops (hh:mm:ss)
5013616	16.3	14.6	1.7	0:08:00
5185847	15.56	13.79	1.77	3:46:00
5185848	15.54	13.77	1.77	3:49:00
5207707	15.31	13.54	1.77	4:18:00
5446900	15.86	14.09	1.77	3:08:00
5520644	15.23	13.54	1.69	0:27:00

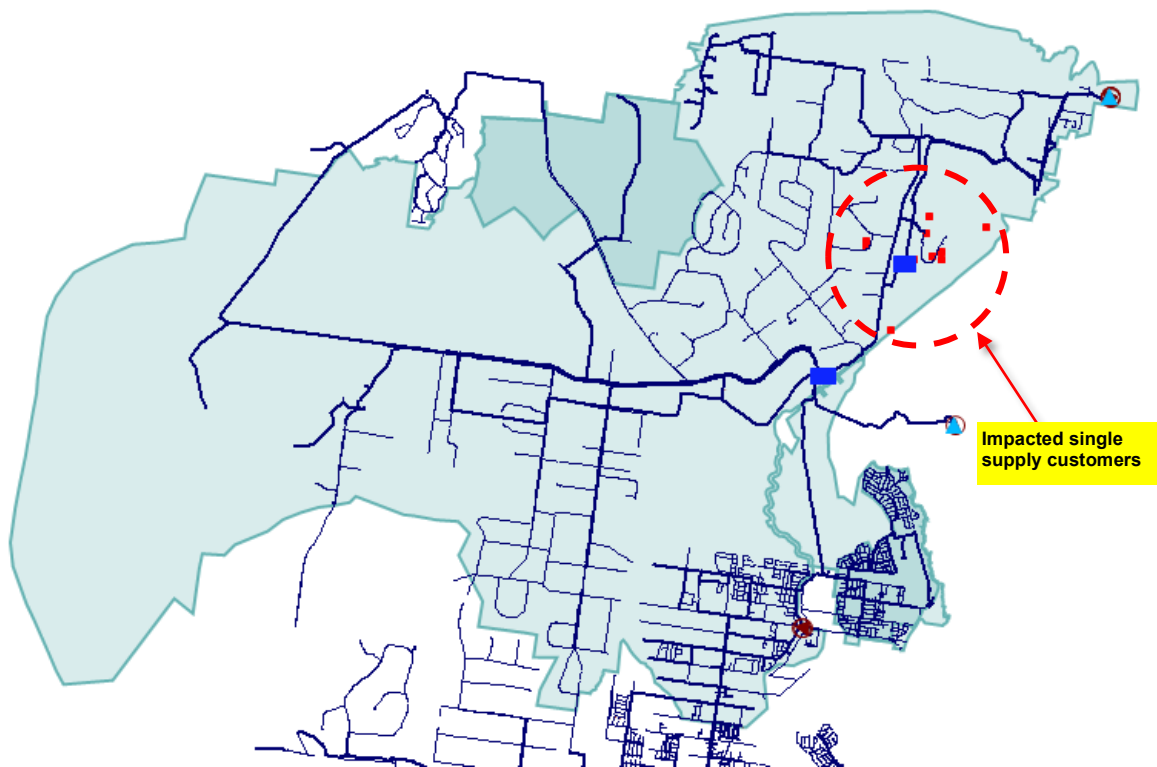


Figure 6 11 Impacted single supply customers – With development (Constant 30.7 L/s)

During periods of increased customer point demand, system pressures decrease accordingly. As shown in Figure 7, the highest demand, and consequently the lowest pressure, typically occurs between 9 – 10 AM and 7 – 9 PM daily. Conversely, the lowest demand (highest pressure) is observed between 11 PM – 6 AM and 2 – 4 PM. When development demand is included, the figure indicates that pressure generally drops below 15 metres around 8 PM.

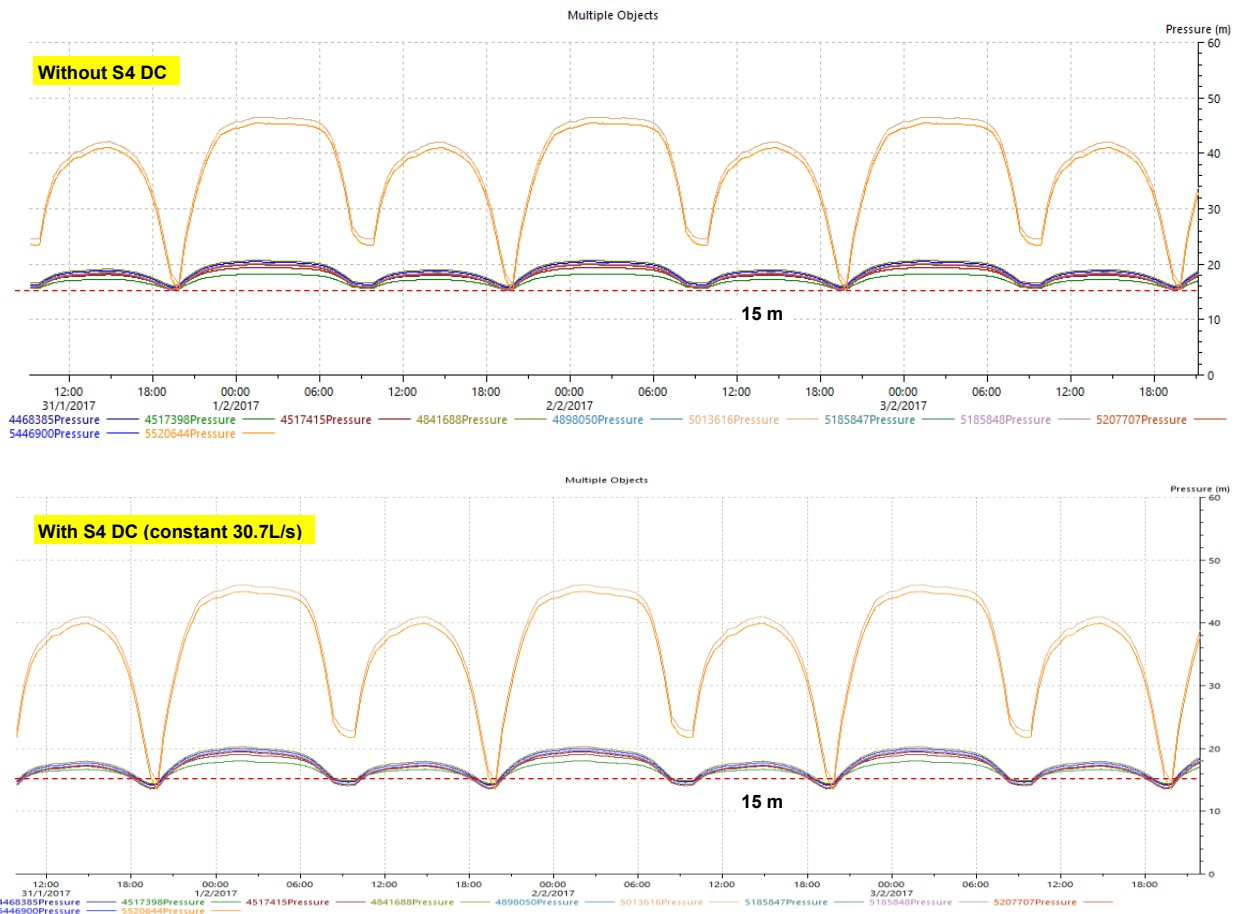


Figure 7 Pressure results – With and without S4 DC

8.1.3 S4 development impact (constant 30.7 L/s) on dual-supply customers (only one customer)

SWCs requirement for dual-supply customers is to have a minimum pressure of 20 m.

Table 7 and Figure 8 show only one impacted dual-supply customer when applying S4 DC demand of 2.65 ML/d at a constant rate of 30.7 L/s in 2028. The cumulative pressure drop duration at this customer point is negligible, only one minute.

Table 7 Development (30.7 L/s) impact on dual-supply customers in 2028

Customer point	Minimum pressure without S4 DC (m)	Minimum pressure with S4 DC (m)	Pressure difference (m)	Total pressure drop durations (hh:mm:ss)
6266246	20.03	19.98	0.05	0:01:00

Similar to single supply customer points, Figure 9 below shows the pressure drops generally happen at about 8 pm.

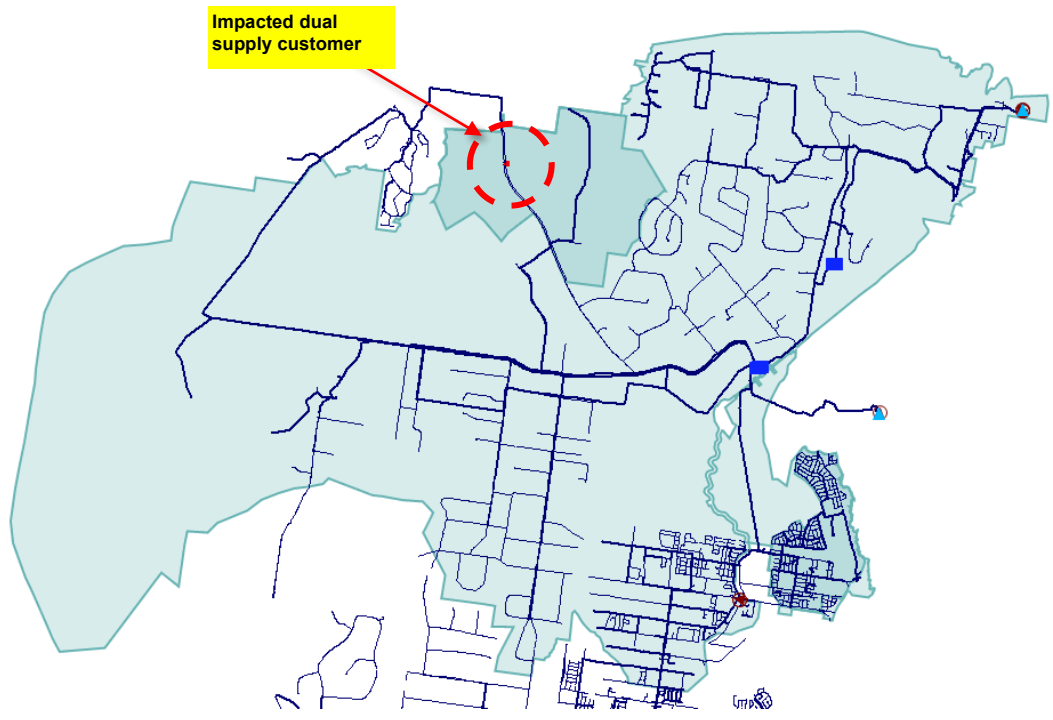


Figure 8 Impacted dual supply customer – With development (Constant 30.7 L/s) in 2028

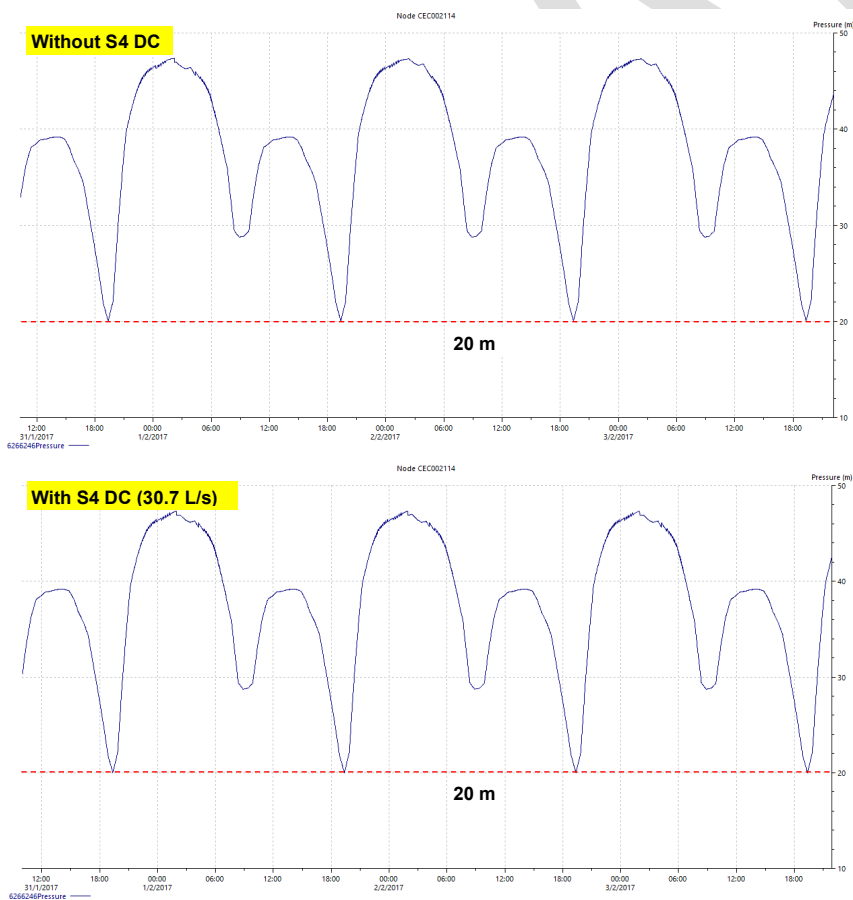


Figure 9 Pressure results – With and without S4 DC

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8.2 Reservoir capacity assessment

The development is located within the Cecil Park Remainder Water Supply Zone, which is serviced by Cecil Park Reservoir. This reservoir is fed by two pumping stations, WP0433 at Liverpool and WP0184 at Prospect.

The Cecil Park Reservoir configuration is shown in the Table 8 below, as per the hydraulic model.

Table 8 Cecil Park Reservoir configuration

Description	Storage volume (ML)	Depth (m)	Elevation (m AHD)
Reservoir 1	30 ML	8.55	149.60
Reservoir 2	9.5 ML	8.05	150.18

The original model provided by SWC was run for one day; however, in order to assess the reservoir capacity, GHD simulated the model to run for 7 days with the growth and development demands in 2028. Figure 10 shows that, in the model is set to start with the Cecil Park reservoir at 34% full. This is an artifact of the model. From this point it fills to more than 80% full as WP0433 (the vast majority of the time) and WP0184 pumps (occasionally) run to service the reservoir. The reservoir remains above 83% full throughout the 7-day run, indicating that under normal operation the reservoir remains at this level.

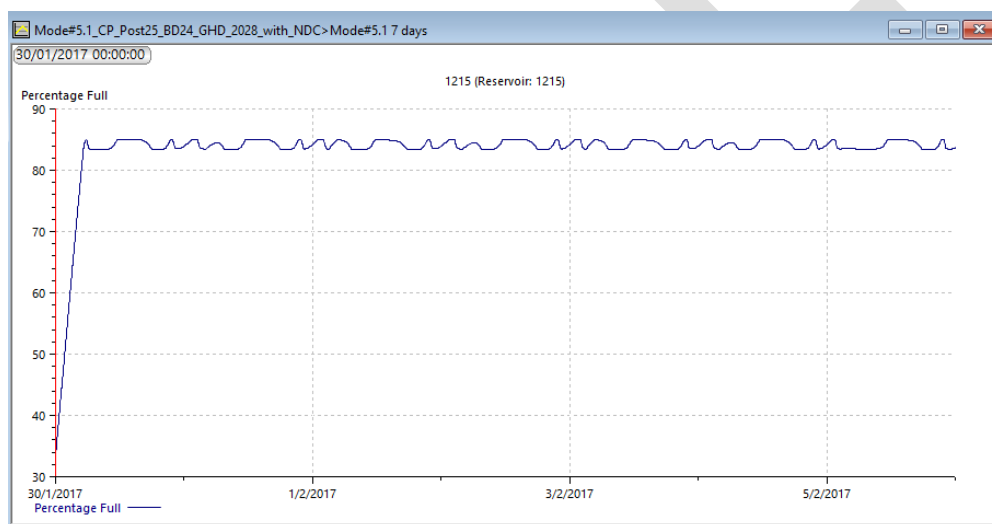


Figure 10 Reservoir percentage full – With S4 DC (30.7 L/s) in 2028

Table 9 below shows that Cecil Park reservoir has the minimum allowable reserve storage of 1/3 of the MDD for both scenarios with and without the S4 DC development in 2028.

Table 9 Reservoir capacity assessment

Description	Without the S4 DC development	With S4 DC Development
S4 ADD Demand (MLD)	-	2.65
Cecil Park WSZ MDD demands 2028 (MLD)	69.91	72.56
Required reserve storage volume (1/3 MDD)	23.30	24.19
Required RSL (%)	59%	61.2%
Minimum percentage full – model results	83.4%	83.4%
Reservoir RSL breached	No	No

8.3 Cecil Park Reservoir Performance

The below figures Figure 11 and Figure 12 show the performance of the Cecil Park Reservoir with and without the S4 Data Centre in 2028. The modelling results indicate that the impact of the S4 Data Centre development on the reservoir levels is negligible. This means that the Cecil Park Reservoir has enough capacity to supply S4 DC in 2028.

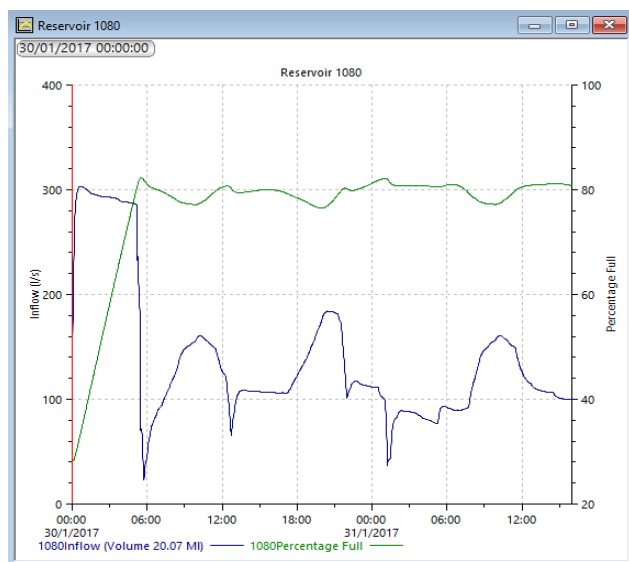


Figure 11 Cecil Park Res performance -no development

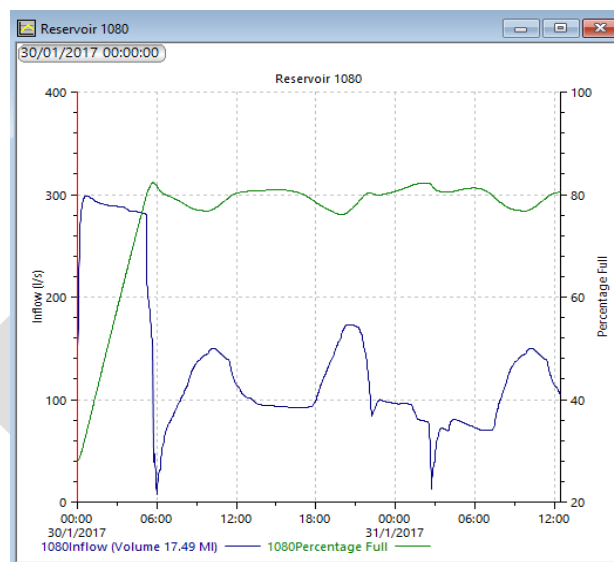


Figure 12 Cecil Park Res performance with development

8.4 Pump station performance

The upstream supply for Cecil Park Reservoir is supplied from two key pump stations, WP0433 at Liverpool (the vast majority of the time) and WP0184 at Prospect (occasionally). The Liverpool WPS is a recent addition to the fleet, and it is by far the dominant provider of water to Cecil Park reservoir. The Prospect WP0184C pumps rarely operate and are retained to support future growth.

8.4.1 WP0433 Liverpool WPS performance

As per the hydraulic model, the WP0433 Liverpool pump station configuration is shown in the Table 10 below, and pump performance is shown in Figure 13 and Figure 14 below.

Table 10 Liverpool WPS configuration

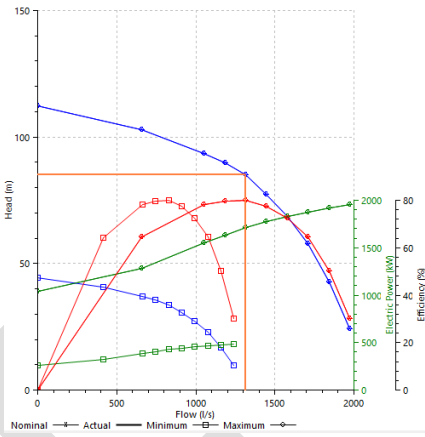
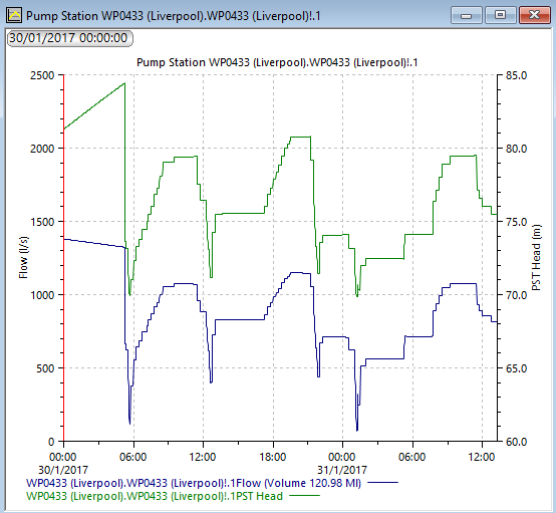
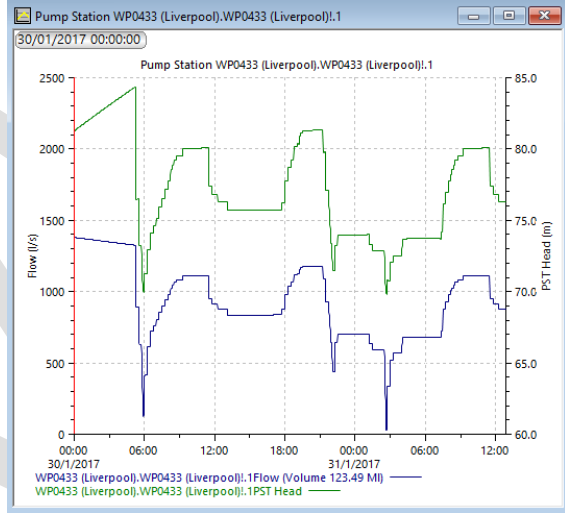
Item	Model inputs
Pump configuration and type	One pump (in the model)
Reservoir Depth (m)	Res ID 1215 (8.55 m)
Pump controlled by	Cecil Park Reservoir elevation (Key ID: 1215)
Pump curve	
	
	

Figure 13 Pump system performance without dev

Figure 14 Pump system performance with dev

8.4.2 WP0184 System performance

The WP0184 Prospect pump station configuration is shown in the Table 11 below, and pump performance is shown in Figure 15 and Figure 16 Below, the figures show that WP0184 pumps only run for the first 5 hours and then turn off for the rest of the 7-day simulation.

This indicates that Cecil Park reservoir is primarily supplied from Liverpool (WP430), and WP0184 pumps operate only as a contingency measure during system failures and are reserved for the future growth of Cecil Park WSZ.

This apparent availability of the WP0184 pumps was explored to supply S4 DC, however, SWC indicated that this solution is not available to accommodate the S4 DC, as it is:

- Contrary to the standard operating procedures, as the pumping station is intended for filling reservoirs, not for managing network pressures.

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- The pumps are high-flow fixed speed, making their control difficult when lower pumped flows are required.
- The pumping station WP0184C imposes several constraints and may affect the Water Filtration Plant's flow schedule.
- Sydney Water cannot guarantee that the Data Centre in question could receive this supply 24 hours a day with this option.

Table 11 Prospect WPS configuration

Item	Model inputs
Pump configuration and type	Four pumps (3 x Duty / 1 x Stand by)
Reservoir Depth (m)	ID 1215 (8.55 m)
Pump controlled by	Cecil Park Reservoir elevation (Key ID: 1215)
Pump curve	

Figure 15 Pump flow and head without dev

Figure 16 Pump flow and head with dev

8.5 System performance summary – constant supply

Using the current network configuration, supplying the S4 Data Centre at a constant rate of 30.7 L/s would result in pressure reductions at several customer points. Following discussions with Sydney Water Corporation (SWC), it was recommended to investigate solutions that could eliminate these pressure impacts. Addressing the pressure issues caused by the S4 DC demand will support SWC's approval to supply the data centre with 2.65 ML/d or more in 2028. The mitigation options to resolve these impacts are detailed in Section 9.

9. Mitigation options to eliminate S4 DC pressure impact at customer points – Year 2028

This section describes two interim options that assume there is no contribution from Prospect WP0184C pumps. These options both satisfy the 2028 S4 DC demand of 2.65 ML/d and eliminate the adverse impact on low (<15m) customer pressures. In addition explore opportunities to supply the development with more than the ADD demands to allow filling the internal storages at off-peak times. These options are described below:

- **Mitigation option 1** - Off-peak supply – with intermittent (on/off) & variable S4 demand, greater instantaneous flow rates at times than 30.7 L/s and even zero flow rate at other times.
- **Mitigation option 2** - Network pipe upgrades – with constant S4 demand rate of 30.7 L/s.
 - **Mitigation option 2.1** – The network pipe upgrades option if selected might be developed further and apply a special off-peak diurnal pattern to supply more than the ADD to allow filling the internal storages of the S4 data centre development - Not assessed under this technical memo.

9.1 Mitigation Option 1: S4 DC special off-peak diurnal demand pattern

A special off-peak diurnal demand pattern was developed to avoid any low pressures impacting customer points. This diurnal demand pattern for the S4 DC was constructed to demand water at times of adequate pressure (off-peak demand from other customers) in the network and avoid demanding water at time of peak flow from other customers.

The pressure profiles at the impacted customer points (Figure 7) were analysed and used to define the special off-peak diurnal pattern to use while maintaining a minimum of 15 m or more pressure at all single supply customer points, as shown in Table 12. The special off-peak diurnal pattern that supplies intermittent variable flows to S4 DC, achieves an average daily demand (ADD) up to 4.60 ML/d (equivalent to 53.2 L/s for a day). Table 12 shows that the inflow to S4 DC ranges from no flow between 8 AM – 11 AM and 7 PM – 9 PM, to a flow of about 106.4 L/s at other times between 11 PM – 5 PM, with a daily average of 53.19 L/s. These flows will be achieved by supplying the development at times where domestic demands in the area are low.

This means that the developer should have an on-site storage to store these variable flows to the S4 DC. This supply satisfies both process requirements (ADD of 30.7 L/s or 2.65 ML/d) and a supply volume up to 4.60 ML/d for S4 DC, all without impacting other customers.

The proposed special off-peak diurnal pattern is intended solely to prevent additional pressure reductions at customer points resulting from the integration of S4 DC. This ensures that pressures do not fall below the pre-S4 DC minimum levels. This option does not address existing non-compliant pressures identified in Table 5. The existing pressure deficiencies are not NEXTDC's responsibility, but we have not made the pressures at those locations worse by S4 DC's demands. The off-peak diurnal demand pattern (Table 12) was developed based on modelling inputs provided by SWC. The specific timing of off-peak periods remains to be defined and agreed upon with SWC.

Table 12 S4 DC inflows based on the off-peak diurnal pattern

Time (hh:mm)	Factor	Maximum Demand (L/s) at S4 DC
0:00	2.0	106.4
1:00	2.0	106.4
2:00	2.0	106.4
3:00	2.0	106.4
4:00	2.0	106.4
5:00	2.0	106.4

Time (hh:mm)	Factor	Maximum Demand (L/s) at S4 DC
6:00	1.4	74.5
7:00	1.4	74.5
8:00	0.0	0.0
9:00	0.0	0.0
10:00	0.0	0.0
11:00	0.0	0.0
12:00	1.0	53.2
13:00	1.0	53.2
14:00	1.0	53.2
15:00	1.0	53.2
16:00	0.8	42.6
17:00	0.8	42.6
18:00	0.6	31.9
19:00	0.0	0.0
20:00	0.0	0.0
21:00	0.0	0.0
22:00	1.0	53.2
23:00	2.0	106.4
Average daily flow (L/s)		53.2
Equivalent to a daily supply volume (ML/d)		4.60

9.1.1 System performance results using special off-peak diurnal pattern

The pressure profiles at the impacted customer points due to S4 DC are presented in Figure 17 below. The figure compares system pressure performance under two demand scenarios: a fixed (constant) demand of 30.7 L/s (2.65ML/d) and an off-peak variable diurnal demand pattern, which ranges from no flow to a demand of 106.4 L/s and averages a flow of 53.19 L/s (4.60ML/d) to S4 DC.

Figure 18 shows that during a constant 30.7 L/s (upper pressure trace), the pressure at some customer points falls below 15 m. When using the special off-peak diurnal demand pattern (lower pressure trace), by contrast, there is no period of the day when pressure at any customer point falls below 15 m.

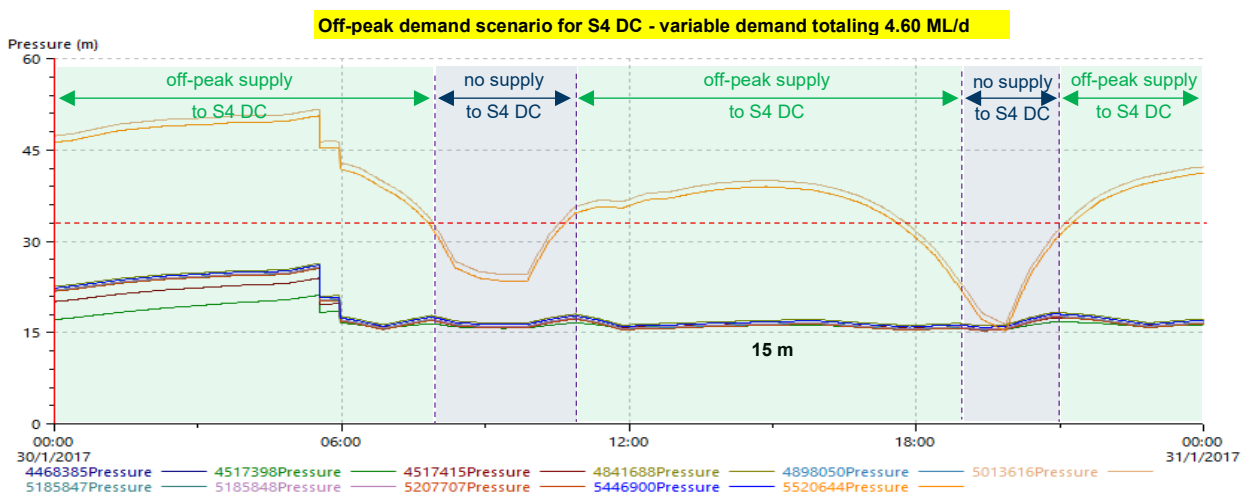
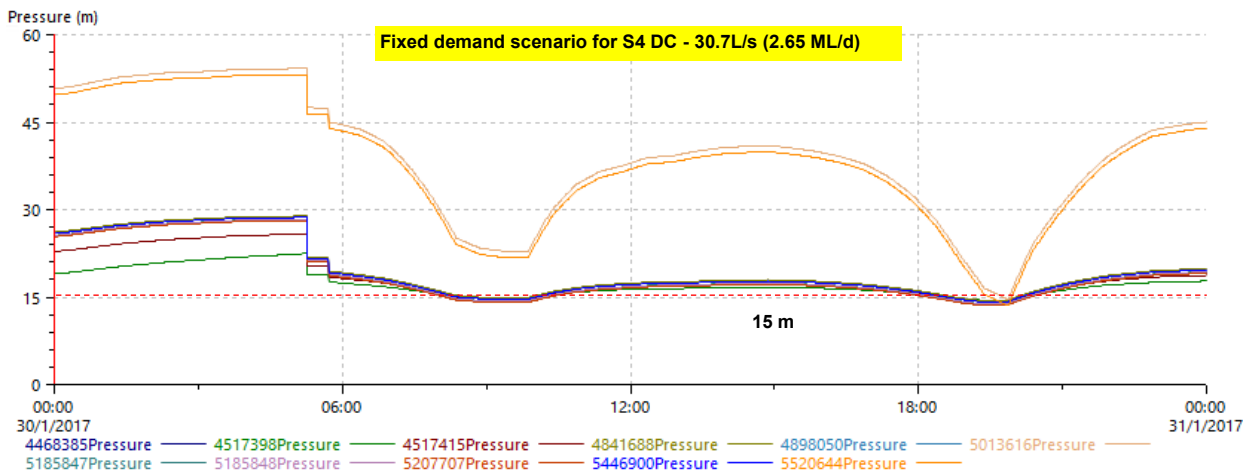


Figure 17 Impacted customer pressure profiles – Comparison between fixed demand of 30.7 L/s and off-peak diurnal demand of 53.19 L/s (4.60 ML/d) (ranging between 0 – 106.4 L/s) for S4 DC

Figure 18 illustrates overall system performance under the off-peak diurnal demand pattern, presenting the worst-case performance at each network component over the 24-hour simulation period. The results show minimal visual differences between the fixed and off-peak scenarios.

Notable improvements include:

- A reduction in headloss within the DN500 main downstream of Cecil Park Reservoir from ≥ 3 m/km to < 3 m/km.
- An increase in pressure at one customer node 3–15 m to ≥ 15 m.

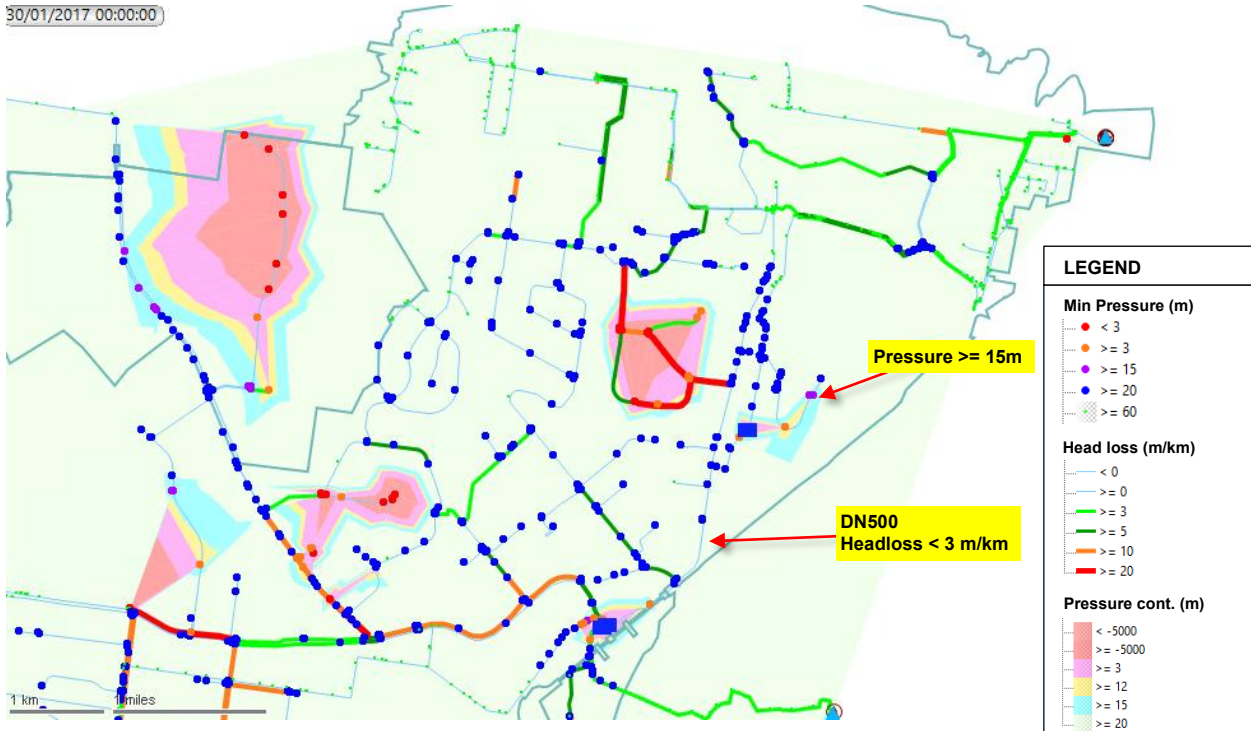


Figure 18 System performance – With S4 DC 4.60 ML/d (53.19 L/s) using an off-peak diurnal demand pattern

The objective is to demonstrate that supplying S4 DC with up to 4.60 ML/d using the proposed off-peak diurnal pattern does not adversely affect customer point pressures. The minimum pressure at each customer point remains unchanged with or without S4 DC.

Some customer points currently experience pressures below 15 m even without S4 DC. The proposed off-peak approach does not resolve these existing low-pressure issues; however, it ensures that introducing S4 DC does not further reduce pressures. In other words, at any time of day, pressures with S4 DC will not fall below the minimum levels observed without S4 DC.

Table 13 summarises the pressure improvements at 30 impacted customer points when applying the off-peak diurnal demand pattern to S4 DC. For example, at customer point '5143025', the pressure was 1.42 m without S4 DC but dropped to -0.33 m when S4 DC was supplied at a constant rate of 30 L/s, but under the off-peak diurnal pattern, the pressure is maintained at 1.42 m. This confirms that the approach taken effectively eliminates pressure impacts at customer points.

Table 13 Pressure improvements due to supplying S4 DC at off-peak periods

Customer point	Minimum pressure without S4 DC (m)	Minimum pressure with S4 DC (m)	Alternative 1: Off-peak Minimum pressure with S4 DC (m)
5143025	1.42	-0.33	1.42
5358373	1.59	-0.11	1.59
5358374	1.38	-0.32	1.38
5440350	0.71	-1.04	0.71
5440351	0.71	-1.04	0.71
LD_NDR28-015	1.63	-0.12	1.63
HD_NDR28-015	1.63	-0.12	1.63
J_NDR28-015	1.63	-0.12	1.63

Customer point	Minimum pressure without S4 DC (m)	Minimum pressure with S4 DC (m)	Alternative 1: Off-peak Minimum pressure with S4 DC (m)
4463114	12.18	10.48	12.18
4468384_NR	13.05	11.29	13.05
4492801	12.22	10.52	12.22
4492803	13.29	11.59	13.29
4517414	13.41	11.92	13.41
4908626	12.99	11.29	12.99
4981175	12.68	10.95	12.69
5185846	13.08	11.32	13.08
5185855	12.03	10.27	12.03
5246173	13.34	11.61	13.34
5246174	13.27	11.54	13.27
4468385	15.45	13.69	15.45
4517398	15.43	14.44	15.42
4517415	15.62	14.21	15.62
4841688	16.11	14.34	16.11
4898050	15.49	13.72	15.48
5013616	16.3	14.6	16.3
5185847	15.56	13.79	15.55
5185848	15.54	13.77	15.54
5207707	15.31	13.54	15.31
5446900	15.86	14.09	15.86
5520644	15.23	13.54	15.23

Based on the results shown in this section, supplying the development at off-peak times can achieve up to 4.60 ML/d without causing adverse pressure impacts at customer points.

9.2 Mitigation Option 2: Cecil Park network augmentations

The adverse impact on customer point pressures caused by S4 DC operating at a constant demand rate of 30.7 L/s (2.65ML/d) can be addressed via pipe upgrades. The location of proposed upgrades are shown in dark green in Figure 19. The modelling showed that adding 1.27 km of a new DN550 pipeline resolves S4 DC's impact on pressures at customer points while supplying the development with a flow of 30.7 L/s in 2028.

The estimated cost of the proposed pipe upgrade is approximately \$5 million. This figure is based on a high-level assessment and should not be considered reliable for planning or budgeting purposes. A detailed hydraulic analysis is required before a cost estimate is prepared for negotiation. This should be done by a qualified quantity surveyor to accurately determine the upgrade cost.

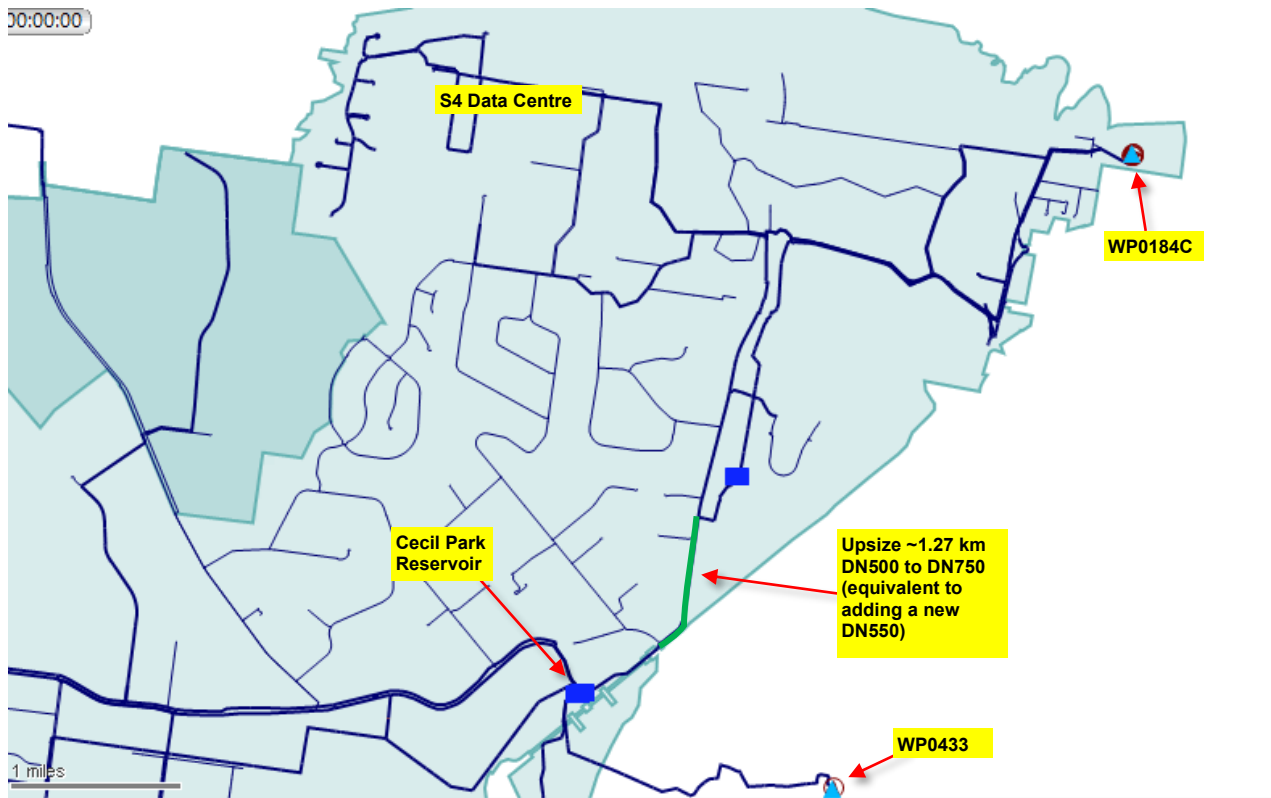


Figure 19 Required pipe upgrades in 2028 – With S4 DC (30.7 L/s)

9.2.1 System performance results with pipe upgrades

Figure 20 illustrates the system performance after the upgrades while supplying S4 DC at a constant rate of 30.7 L/s. The figure shows that the newly added DN550 reduced the headloss the existing DN500 from ≥ 3 m/km to < 3 m/km and improved the overall system such that no customer points are now indicating low pressure.

00:00:00

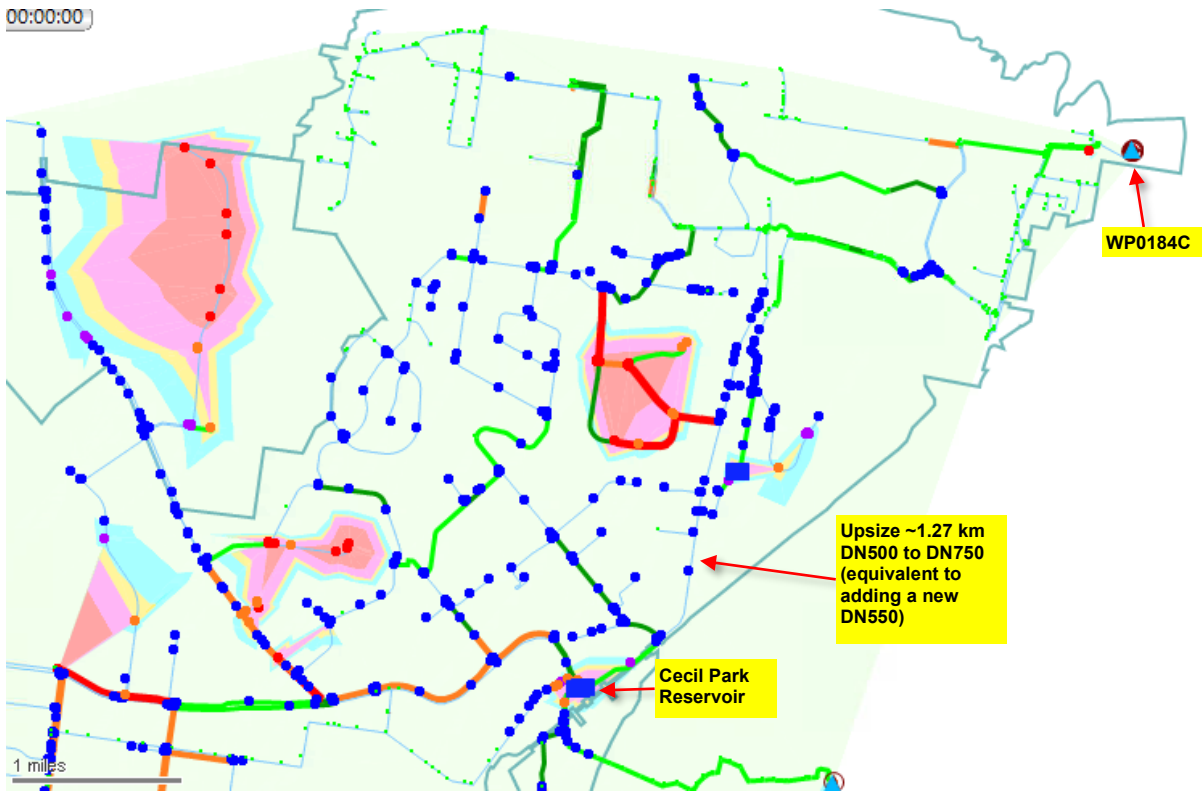


Figure 20 System performance with upgraded pipes in 2028 – With S4 DC (constant 30.7 L/s)

Table 14 shows the pressures at the 30 impacted customer points without S4 DC, with S4 DC (constant 30.7 L/s), and after the proposed pipe upgrade with S4 DC (constant 30.7 L/s). The table shows the proposed impact not only eliminated the impact of S4 DC, but also slightly improves the pressures at these 30 customer points.

Table 14 Pressure improvements due to upsizing pipes

Customer point	Min pressure without S4 DC (m)	Min pressure with S4 DC (m)	Alternative 2: Pipe upgrade - Min pressure with S4 DC (m)
5143025	1.42	-0.33	1.66
5358373	1.59	-0.11	1.92
5358374	1.38	-0.32	1.71
5440350	0.71	-1.04	0.94
5440351	0.71	-1.04	0.94
LD_NDR28-015	1.63	-0.12	1.87
HD_NDR28-015	1.63	-0.12	1.87
J_NDR28-015	1.63	-0.12	1.87
4463114	12.18	10.48	12.51
4468384_NR	13.05	11.29	13.42
4492801	12.22	10.52	12.55
4492803	13.29	11.59	13.62
4517414	13.41	11.92	14.06
4908626	12.99	11.29	13.32
4981175	12.68	10.95	12.96
5185846	13.08	11.32	13.45
5185855	12.03	10.27	12.4

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Customer point	Min pressure without S4 DC (m)	Min pressure with S4 DC (m)	Alternative 2: Pipe upgrade - Min pressure with S4 DC (m)
5246173	13.34	11.61	13.61
5246174	13.27	11.54	13.54
4468385	15.45	13.69	15.82
4517398	15.43	14.44	15.62
4517415	15.62	14.21	16.35
4841688	16.11	14.34	16.47
4898050	15.49	13.72	15.85
5013616	16.3	14.6	16.63
5185847	15.56	13.79	15.92
5185848	15.54	13.77	15.9
5207707	15.31	13.54	15.67
5446900	15.86	14.09	16.22
5520644	15.23	13.54	15.56

The proposed pipe upgrade can supply a constant flow rate of 30.7 L/s (2.65 ML/d) to S4 DC without causing pressure impacts at customer points. However, this flow rate does not provide surplus capacity to fill the on-site storage tanks, which are intended to bridge the gap between average day demand (ADD) and maximum day demand (MDD).

Additional flow could be achieved without adversely affecting system performance by installing a pipeline larger than DN550 downstream of Cecil Park Reservoir.

Furthermore, additional flow could potentially be achieved by combining mitigation options 1 and 2 – supplying S4 DC with more than 2.65 ML/d during off-peak periods while also upgrading the network to enable a constant flow rate of 30.7 L/s. However, this combined approach has not been assessed under this technical memo, as mitigation option 1 is sufficient to achieve water supply up to 4.60 ML/d without impacting the pressures of the customer points.

It is important to note that the proposed upgrades are specifically defined to address the impacts of S4 DC in 2028. SWC may need to consider larger pipe sizes and additional upgrades at other locations to resolve low-pressure issues across all customer points.

10. The limitations on ADD

The developer, NEXTDC, requests that SWC allow the S4 DC demand to be in excess of ADD, sufficient to refill on-site storages in reasonable time. Analysis shows that larger demands up to 4.60 ML/d will not adversely affect customer pressure as long as the off-peak demand pattern is adopted. Modelling shows no impact on low-pressure customer points even at the proposed maximum instantaneous rate of 106.4 L/s.

Water supply to an average day demand (ADD) of 2.65 ML/d for S4DC Stage 2, satisfies the process water requirements at S4 DC only. Consequently, the provision of on-site storage intended to mitigate the supply gap between ADD and Maximum Day Demand (MDD), cannot at any time mitigate the gap, as long as SWC continues to require that ADD (in ML/d) is an absolute maximum. This is the current SWC policy as communicated to the team at recent meetings.

Applying the off-peak diurnal demand pattern (Table 12) enables the development to be supplied with variable flows ranging from 0 to 106.4 L/s at different times of the day, with an average daily flow up to 4.60 ML/d.

We request, therefore, that SWC approve S4 DC demand up to 4.60 ML/d.

11. Conclusion & recommendation

Hydraulic modelling confirms that the S4 Data Centre's constant demand of 30.7 L/s will cause pressure drops at 30 customer points in 2028, with most experiencing a reduction of approximately 1.77 m. To eliminate these impacts while supplying an ADD of 2.65 ML/d to S4 DC, two mitigation options have been assessed:

- **Mitigation Option 1 – Off-Peak Supply (Preferred):**
Utilises a variable, intermittent demand pattern aligned with low network demand periods. This approach can deliver 2.65 ML/d and up to 4.60 ML/d without requiring network upgrades.
- **Mitigation Option 2 – Network Pipe Upgrade:**
Involves installing 1.27 km of DN550 pipeline to support a constant flow of 30.7 L/s (equivalent to 2.65 ML/d). While effective, this option is not preferred due to its high cost and limited interim need

Modelling confirms that the existing DN450 pipeline near S4 DC is suitable for connection, with velocities remaining below 2 m/s under both mitigation options.

This report demonstrates that S4 DC's demand of 30.7 L/s can be met – either through off-peak supply or network upgrades – without adversely affecting customer pressures.

Using mitigation option 1, a demand of up to 4.60 ML/d will not cause pressure deterioration at any customer point in the network, when the off-peak diurnal pattern is adopted (see Table 12).

The proposed mitigation options are intended solely to prevent additional pressure reductions at customer points resulting from the integration of S4 DC, ensuring that pressures do not fall below the pre-S4 DC minimum levels. These options do not address existing non-compliant pressures identified in Table 5.

Looking beyond 2028, at the request of NEXTDC, GHD will undertake further capacity assessment to see if any additional volume of potable water can be supplied to S4 DC, without adversely impacting current customer pressures. It is anticipated that, using the same approach of the current Technical Memorandum, we will examine potable water demand and system performance during 2029, 2030 and further, if modelling shows additional water is available.

The purpose of this requested extension of the work to date in both volume and, especially in time, provides greater certainty of continuing supply, while NEXTDC's water supply negotiations continue with a third-party provider of **recycled water**. The use of recycled water is consistent with Sydney Water longer-term plans to provide recycled water to the data centres in Sydney. These negotiations with the third party are ongoing and likely to be concluded in the near term.

11.1 Recommendation

It is recommended that SWC proceed with Mitigation Option 1, which enables the supply of S4 DC with a total supply volume of up to 4.60 ML/d, by implementing the proposed off-peak supply approach outlined in this report. For the purpose of developing an NOR, the off-peak diurnal pattern should be specified in both times of operation through the day and maximum flow rates during those times – see Table 12.

11.1.1 Water supply beyond the year 2028

The 4.6 ML/d supply to NEXT DC's S4 is required until the end of 2028 or until network demands reach 2028 projections. Water supply requirements beyond 2028 will now be considered as part of the long-term servicing option assessment currently being reviewed by Sydney Water. GHD recommends that SWC

ensure the allocated volume of 4.60 ML/d for 2028 remains available beyond 2028 for delivery to S4 DC in the event of an emergency or water supply constrained conditions.

11.1.2 Request an updated NOR for 4.60 ML/d demand for 2028

At this stage, the developer is seeking an updated NOR from Sydney Water representing 4.60 ML/d in 2028.

Regards

Ahmed Alwaith
Water Engineer

Mohamed Ali
PM & Modelling Lead

Ross Fraser
Technical Lead

DRAFT