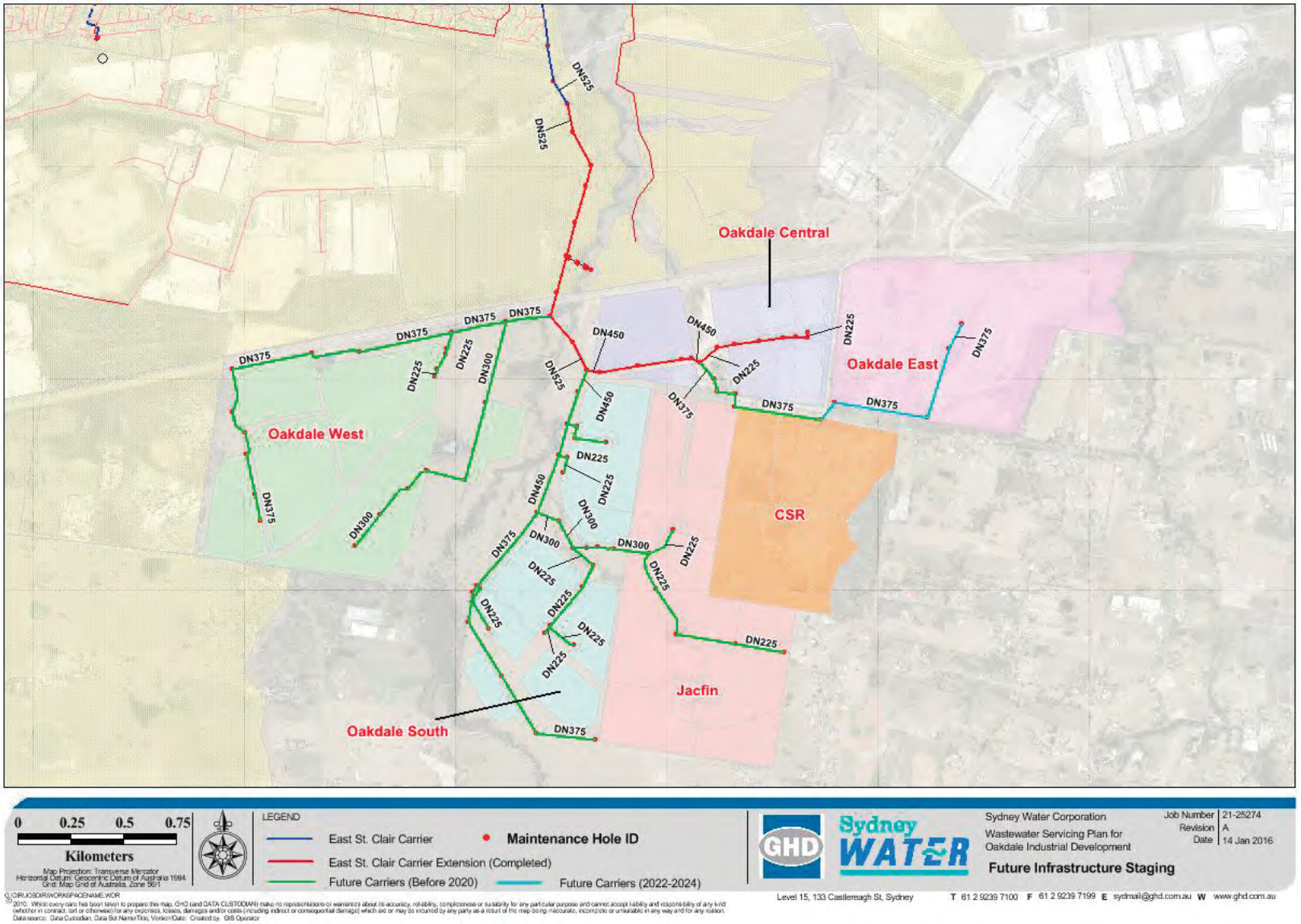

Figure 6 Future Infrastructure Staging

Appendix F

Extract from Sydney Water LASP

Oakdale Industrial Development - Planning of Water Related Services

Final Report - Wastewater

July 2016

GHD Disclaimer

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Oakdale Industrial Development June 2016

This report has been prepared by GHD

Approved for Issue

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Endorsed

I confirm that impacted parties within my business have been consulted, their inputs have been considered and the decisions have been communicated to relevant parties.

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Sydney Water		Sydney Water	

Approved

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	27/7/16
Jim Price	
Development Services Officer	
Liveable City Solutions	
Sydney Water	

Executive Summary

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1

The Oakdale industrial site wastewater system can be served through extensions connecting into the St Marys Sewerage Network via the East St Clair carrier. The extension of East St Clair Carrier is complete. Following completion of the last section of the East St Clair carrier extension the remainder of wastewater servicing work will be within the Oakdale site itself and will comprise extension of site sewer reticulation works. An overview of East St Clair carrier is presented in Figure 2.

This Local Area Servicing Plan (LASP) for wastewater has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No.8 – Area South of Pipeline, including Goodman's Oakdale Development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignment and trigger points (i.e. development timing and staging) for delivery of wastewater infrastructure to service the Oakdale Precinct.

GHD have also undertaken wastewater modelling of the East St. Clair Carrier Extension and wastewater system within the Oakdale industrial development to ensure compliance with Sydney Water's performance requirements.

The hydraulic assessment determined that there were no fundamental issues with the design of the East St. Clair Carrier Extension.

System Performance Assessment

Almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather performance criteria under both 2020 and 2036 flow condition with exception of a small number of sewers which marginally fail to meet the criteria. However, these are not considered severe enough to warrant augmentation.

The system within the Oakdale industrial development and the downstream trunk system will comply with the wet weather overflow frequency limit of 35 overflows in 10 years for the 2036 planning horizon.

However, the overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years (40 events in existing and 50 events in 2036 scenario). Although there is no direct impact to the branch which receives flow from Oakdale developments, as a system there is an issue.

The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.

The 2014 GSS recommended the upgrade of downstream pumping station SP0204 meets the minimum detention time of 4 hours for 2036 flow condition.

Growth forecast

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. These lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. Growth projections within the Oakdale Industrial Development are summarised in Table 1.

Table 1 Growth Projections

Development site	Nett Development (ha)	Development type	Connection [1]
Oakdale Central	45.2	IN1 – General Industrial	2016-2017
Jacfin	87.8	IN1 – General Industrial/ Residential	2016-2017
Oakdale South	70.2	IN1 – General Industrial	2017-2019
CSR	63.4	IN1 – General Industrial	2017-2020
Oakdale West	90.5	IN1 – General Industrial	2019-2021
Oakdale East	95.0	IN1 – General Industrial	2022-2024
Grand Total	**452**		

The calculated wastewater loads for the Oakdale Industrial Development are presented below within Table 2.

Table 2 Summary of Wastewater Loads - Oakdale Industrial Development

Development site	EP	Average Dry Weather Flow (ML/d)
Oakdale South	6,581	0.99
Oakdale West	8,906	1.34
Oakdale East	8,480	1.27
Oakdale Central	4,236	0.64
Jacfin	6,960	1.04
CSR	4,866	0.73
Total	40,028	6.00

The preliminary capital cost estimates associated with Oakdale Industrial wastewater servicing is presented below in Table 3.

Table 3 Required Infrastructure to Service the Development Areas

Development Site	Timing	Capital Cost ($M)	Gravity Sewer Length (m)			
			DN225	DN300	DN375	DN450
Oakdale Central	2016-2017	1.6	-	-	728	-
Oakdale East	2022-2024	2.2	-	-	1,018	-
Oakdale West	2019-2020	7.8	227	1,472	2,317	-
Oakdale South	2017-2019	7.4	1,271	453	1,246	715
Jacfin	2016-2017	2.0	1,124	168		
CSR	2017-2020	0.9			415	
Total	**2016-2024**	**21.9**	**2,622**	**2,093**	**5,724**	**715**

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Appendices

1. Introduction

1.1 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection, adjacent south to the Eastern Creek Precinct and Warragamba Water Pipeline at Horsley Park. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The Oakdale industrial site wastewater system can be served through extensions connecting into the St Marys Sewerage Network via East St Clair carrier. The extension of East St Clair Carrier is in progress. Following completion of the last section of the East St Clair carrier extension the remainder of wastewater servicing work will be within the Oakdale site itself and will comprise extension of site sewer reticulation works. An overview of East St Clair carrier is presented in Figure 2.

Assets required to service proposed Goodman, Jacfin and CSR developments at Oakdale are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

1.2 Purpose of this report

The purpose of this report is to demonstrate that the proposed development can be serviced by the East Clair carrier with the wastewater infrastructure detailed and document the expected performance of the wastewater system.

This Local Area Servicing Plan (LASP) for wastewater has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8 – Area South of Pipeline, including Goodman's Oakdale Development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing, staging & timing of connection to SWC network) for the delivery of wastewater infrastructure required to service the Oakdale Precinct.

1.3 Scope

The scope of the wastewater modelling is to:

- Assess the current design of the East St. Clair Carrier Extension and wastewater system within the Oakdale industrial development and the downstream trunk sewers for 2020 and 2036 growth scenarios.

The assessment examined a range of performance requirements including:

- Dry weather performance (Hmax/d)
- Carrier performance in wet weather design storm (35th largest rainfall event within the 10 year rainfall series)
- Constructed overflow and maintenance hole spilling performance based on a 10 year long term model simulation.
- Dry weather contingency storage of downstream pumping station SP0204.

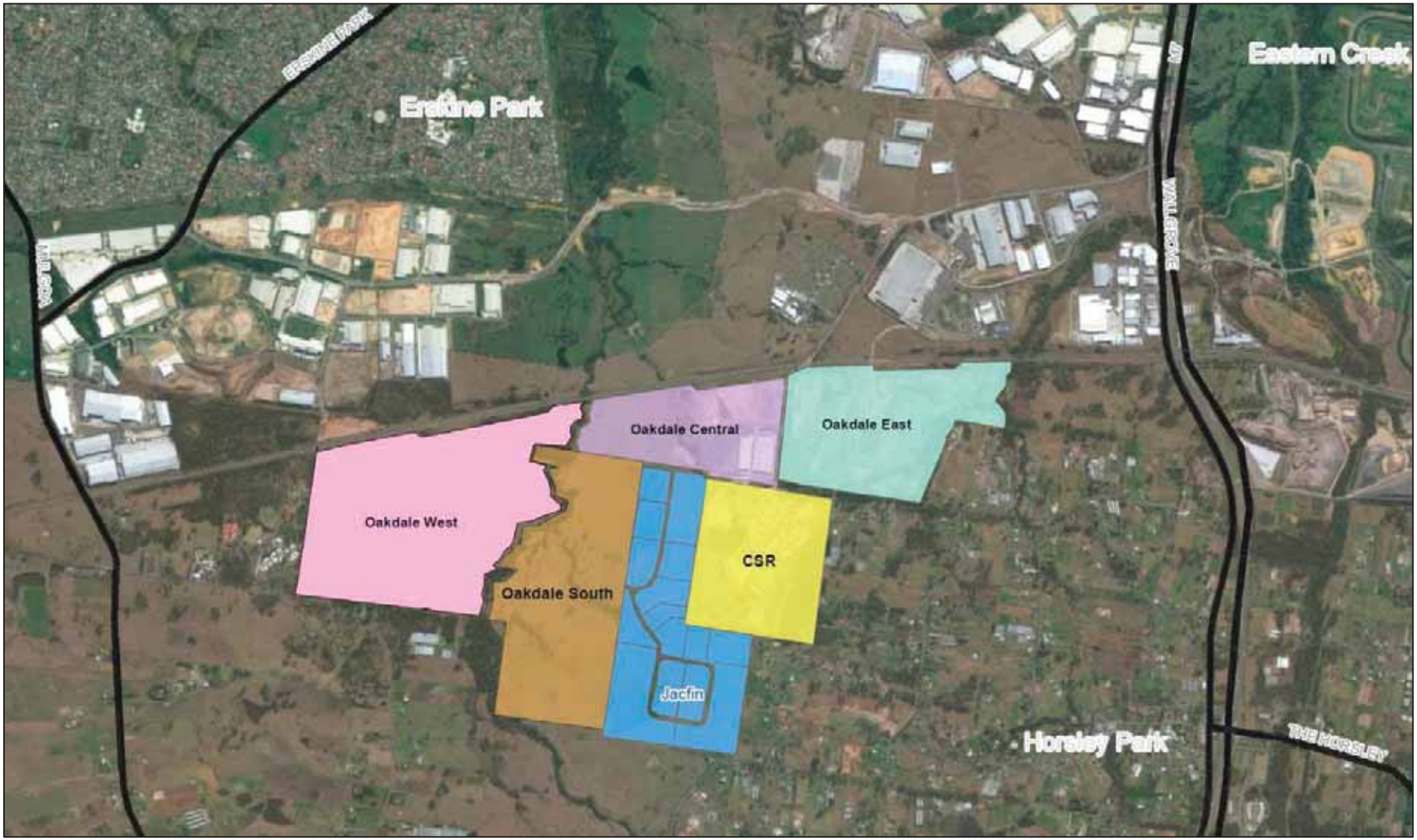

Figure 1 Oakdale Industrial Development Overview

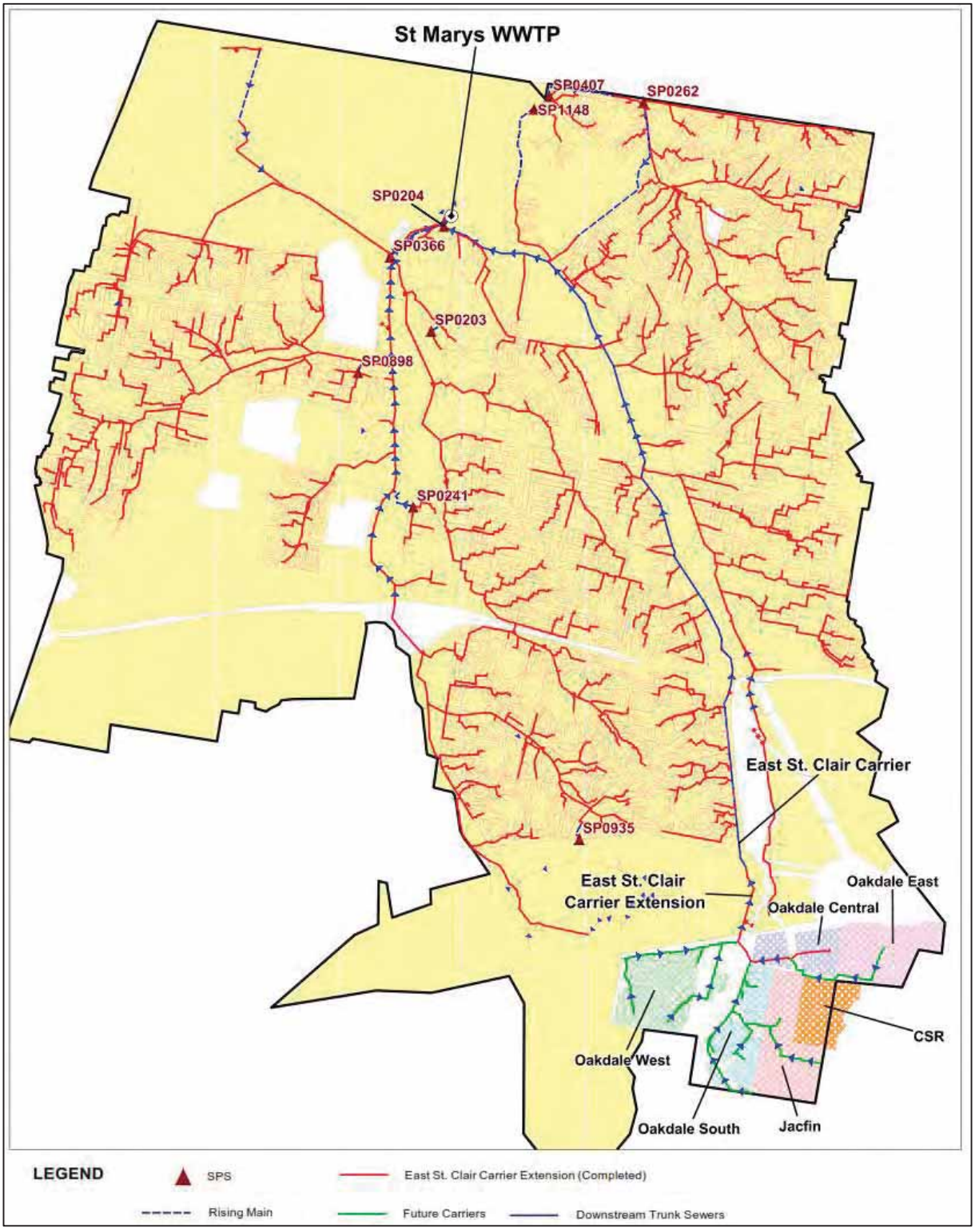

Figure 2 Overview of East St Clair carrier

2. Summary of Growth

This section provides details of growth projections within the study area including the expected timing, and scale of growth.

2.1 Growth

Growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. These lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 4.

Table 4 Growth Projections

Development site	Precinct	Nett Development (ha)	Development type	Connection
Oakdale South	1	18.8	IN1-General Industrial	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	1	95.0	IN1-General Industrial	2022-2024 (1)
Oakdale West	1	21.7		2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		
Oakdale Central	1A	4.1	IN1-General Industrial	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built

Development site	Precinct	Nett Development (ha)	Development type	Connection
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8	IN1-General Industrial	Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin (2)	1	3.6	IN1-General Industrial	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	RU4-Rural Residential	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	IN1-General Industrial	2017
	2	20.8		2018
		11.5	Environmental /Open Space	
	3	21.0	IN1-General Industrial	2020 (1)
	Total	**63.4**		
Grand Total		**452**		

Note 1: The timeframes are subject to change

Note 2: Sydney Water has queried growth forecasts shown above for Jacfin lands noting that these growth forecasts appear optimistic in consideration of current market demands, comparison growth forecasts for surrounding developers, Jacfin current and required approvals and construction requirements. Jacfin however have reconfirmed these growth forecasts and hence this report and modelling has been completed on this basis,

Note 3: The above growth projections have been provided by the following:

Developer	Contact(s) - Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager	Via Email	29th Feb 2016

3. Forecast Wastewater Loads

The following outline of wastewater discharge provides predicted Average Dry Weather Flow (ADWF) based on projected development loads.

The following broad assumptions were used to develop the estimate of discharge.

- 15 residential lots per gross hectare of nominated residential area within the development.
- 3.5 EP per residential lot and
- 75 EP per gross hectare of non-residential development derived from Wastewater Network Growth Servicing Strategy Criteria and Guideline 2012. (i.e. Assume Gross hectare = 1.25 × net hectares)

The Oakdale Industrial wastewater loads summarised in Table 5.

Table 5 Summary of Wastewater Loads - Oakdale Industrial Development

Development site	EP	Average Dry Weather Flow (ML/d)
Oakdale South	6,581	0.99
Oakdale West	8,906	1.34
Oakdale East	8,480	1.27
Oakdale Central	4,236	0.64
Jacfin	6,960	1.04
CSR	4,866	0.73
Total	40,028	6.00

4. Wastewater System Performance

4.1 Acceptable Dry Weather System Performance (2020 & 2036)

Wastewater system modelling indicates that there is no discharge occurrence in any part of the entire St Marys system including the new developments in Oakdale during dry weather for both 2020 and 2036 flow condition.

Modelling also shows that almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather flow depth criteria (Hmax/d<0.6) under both 2020 and 2036 flow condition with exception of a small number of sewers where Hmax/d marginally exceed the value of 0.6. The dry weather system performance for 2020 and 2036 scenario is shown in Figure 3 and Figure 4 respectively.

In the 2020 flow condition, there are four sections of sewer on East St. Clair Carrier Extension that marginally exceeds the dry weather performance criteria as have flow depth ratio (Hmax/D) varies between 0.60 to 0.65. There is one section on the downstream East St. Clair Carrier that has a flow depth ratio (Hmax/D) of 0.65 in 2020 flow condition.

In 2036, there are five more sections on East St. Clair Carrier Extension and three more sections on the downstream East St. Clair Carrier that exceed the flow depth ratio (Hmax/D) of 0.6. Hmax/d value on East St. Clair Carrier Extension vary from 0.64 to 0.76 and on the downstream East St. Clair Carrier vary from 0.62 to 0.75. The Hmax/d values of all the sewers servicing Oakdale industrial development and the downstream trunk sewers are presented in Appendix D.

The sections on East St. Clair Carrier Extension which exceed the flow depth ratio (Hmax/D) of 0.6 are already been constructed. Also the Hmax/D values are only marginally higher than 0.6 and are not considered severe enough to warrant augmentation.

HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in 2020 and 2036 PDWF condition is shown in Appendix E.

4.2 Dry Weather Emergency Storage (2020 & 2036)

Modelling indicates that the downstream pumping station SP0204 fails to meet the minimum detention time of 4 hours for 2020 and 2036 flow condition. This pumping station will have a detention time of only 0.9 and 0.8 hours for the year 2020 and 2036 respectively. From an earlier 2014 GSS study, this station was found to have a detention time of only 1.50 hours for the existing (2011) scenario.

SP0204 have a standby pump to manage any mechanical failure. But It does not have dual power supply although have provision for installing generator.

SP0366 dual power supply recommended in GSS report has now been installed. With the dual power feeder at SP0366, cross connection valve will open automatically should signal from SP0204 fail. This will allow storage at SP0366 to be utilised should SP0204 fail and increase detention time of SP0204 to 4 hours in 2036 flow condition.

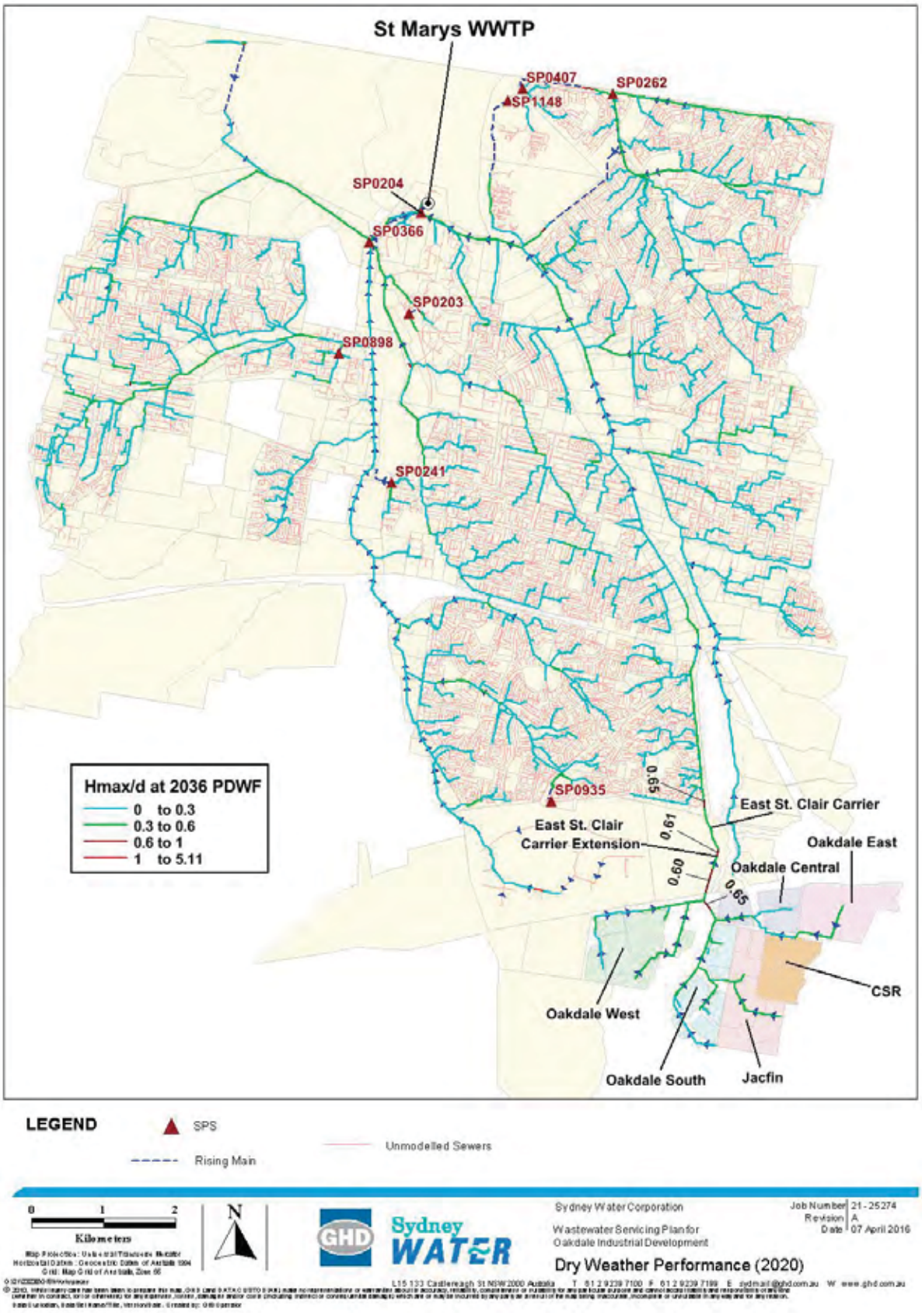

Figure 3 Dry Weather Performance (2020)

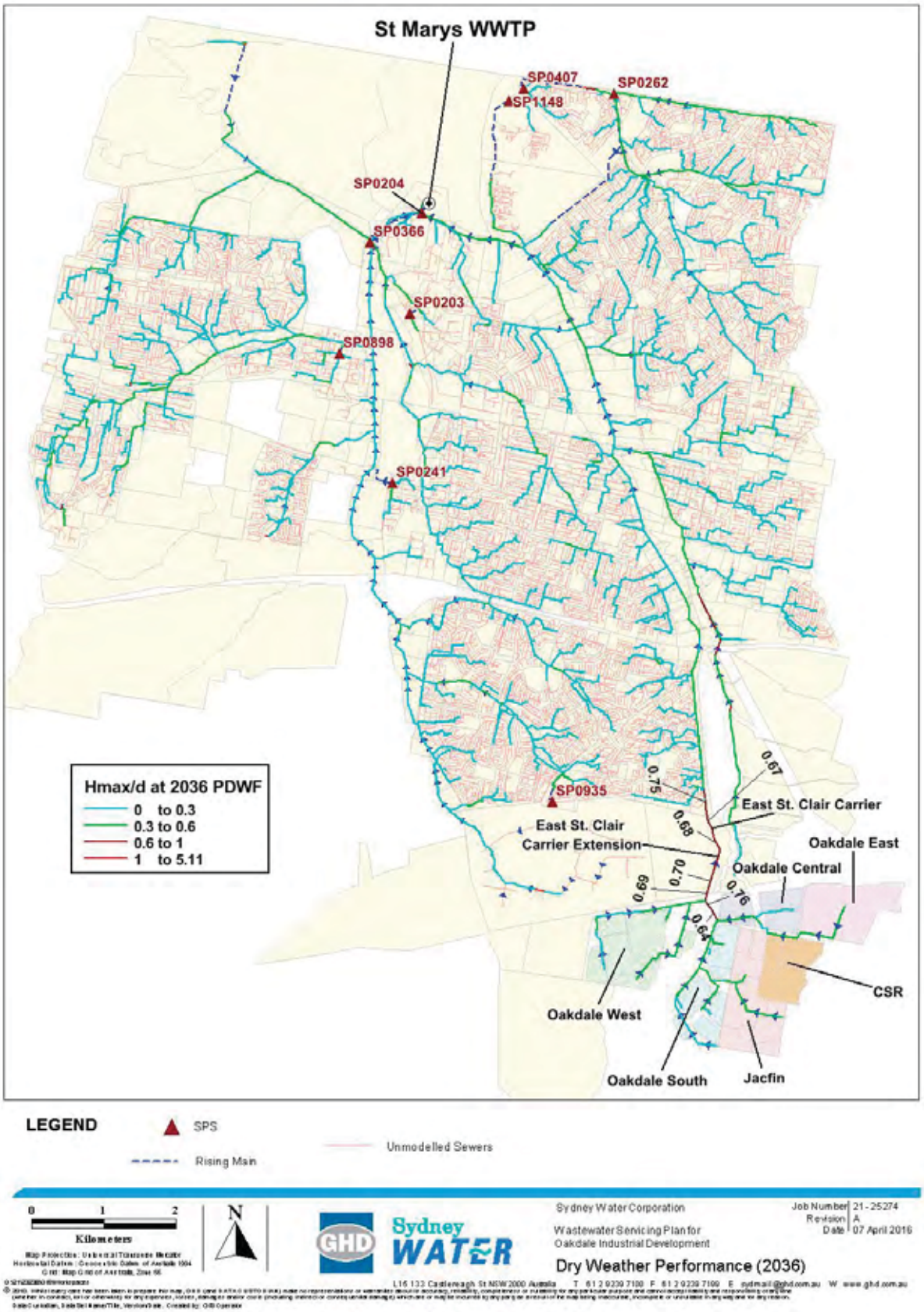

Figure 4 Dry Weather Performance (2036)

4.3 Acceptable Wet Weather System Performance (2036)

The 2010-2015 Environment Protection Licence (EPL) for the St Marys Sewerage Treatment System limits the wet weather overflow frequency to 35 overflows in 10 years. The new license for 2015-2020 is still under negotiation with the EPA. The modelling shows that the system within the Oakdale industrial development and the downstream trunk system will comply with this limit for the 2036 planning horizon. The wet weather performance of the designed overflows and the activated maintenance holes within the Oakdale industrial development and the downstream trunk system in 2036 is presented in Table 6 and Figure 5.

The design wet weather event (35th largest rainfall event within the 10 year rainfall series) corresponds to the overflow frequency limit in the EPL. The modelling shows that the system within the Oakdale industrial development and the downstream trunk system have sufficient capacity in the design wet weather event. The HGL along East St. Clair Carrier Extension and downstream East St. Clair Carrier in the design wet weather event is shown in Appendix E.

However it should be noted that the overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years. The existing system performance is 40 events in 10 years, and in 2036 the system performance will increase to 50 events in 10 years. Although there is no direct impact to the branch which receives flow from Oakdale developments.

The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.

Table 6 Wet Weather Performance (2036)

Location	Maintenance Hole ID	Overflow Events/10 Years	Volume (M3/yr)
Designed Overflows			
East St. Clair Carrier Extension	NEWMH06	7	842
East St. Clair Carrier	1394290	17	616
Ropes Creek Carrier Sec.6	1066026	11	157
Ropes Creek Carrier Sec.3	1281835	10	3,364
Ropes Creek Carrier Sec.1	1280786	14	19,017
Ropes Creek Carrier Sec.1	1282022	20	19,531
SPS204 Inlet	1404019	22	729
Maintenance Holes			
East St. Clair Carrier	NEWMH01	3	10
East St. Clair Carrier Extension	NEWMH09	2	9
East St. Clair Carrier Extension	NEWMH10	2	33
Oakdale South	NEWMH40	1	0.02
Jacfin Extension	NEWMH86	4	44

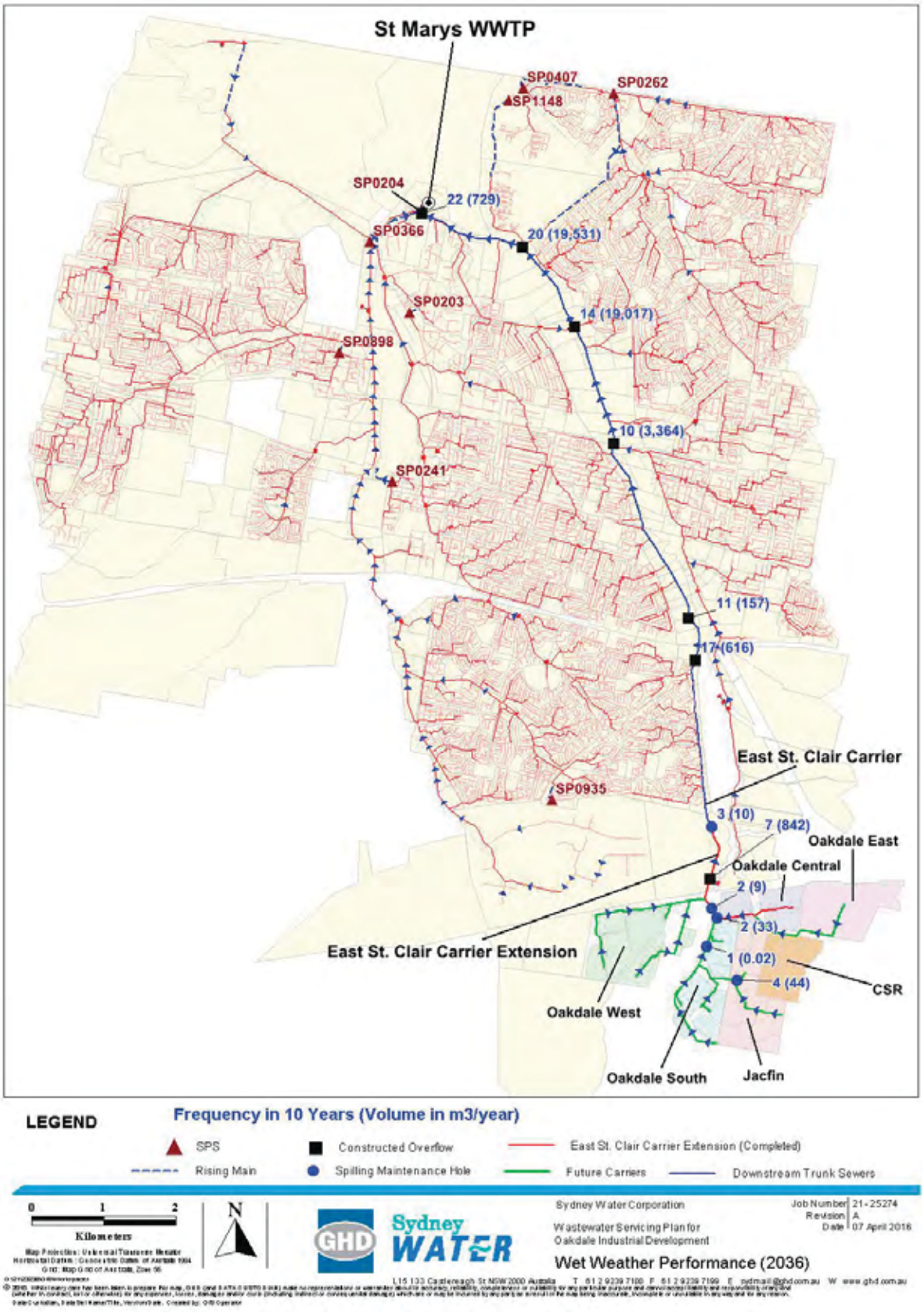

Figure 5 Wet Weather Performance (2036)

4.4 Conclusion

- Almost all the carriers servicing Oakdale industrial development and the downstream trunk sewers meet dry weather flow depth criteria (Hmax/d<0.6) under both 2020 and 2036 flow condition with exception of a small number of sewers where Hmax/d marginally exceed the value of 0.6. However these are not considered severe enough to warrant augmentation.
- The system within the Oakdale industrial development and the downstream trunk system will comply with the wet weather overflow frequency limit of 35 overflows in 10 years for the 2036 planning horizon.
- The overall wet weather performance of St Marys system for existing and all future milestones exceeds the system licence limit of 35 overflows in 10 years (40 events in existing and 50 events in 2036 scenario).
- The number of bypass events at the St Marys WWTP remains within the licence limit of 153 events in 10 years for the 2036 planning horizon. The existing system performance is 100 bypass events in 10 years and in 2036 will increase to 142 bypass events in 10 years.
- With 2014 GSS recommended upgrade the downstream pumping station SP0204 will meet the minimum detention time of 4 hours for 2036 flow condition.

5. Staging Plan for Future Infrastructure

The staging for the future gravity sewers will be in line with the proposed timing of the development. Sydney Water Cost Estimation tool employed in order to estimate the preliminary capital cost for each development.

The infrastructure required to service the new development areas along with their proposed timing and cost is presented in Table 7 and in Figure 6.

Table 7 Required Infrastructure to Service the Development Areas

Development Site	Timing	Capital Cost ($M)	Gravity Sewer Length (m)			
			DN225	DN300	DN375	DN450
Oakdale Central	2016-2017	1.6	-	-	728	-
Oakdale East	2022-2024	2.2	-	-	1,018	-
Oakdale West	2019-2020	7.8	227	1,472	2,317	-
Oakdale South	2017-2019	7.4	1,271	453	1,246	715
Jacfin	2016-2017	2.0	1,124	168		
CSR	2017-2020	0.9			415	
Total	**2016-2024**	**21.9**	**2,622**	**2,093**	**5,724**	**715**

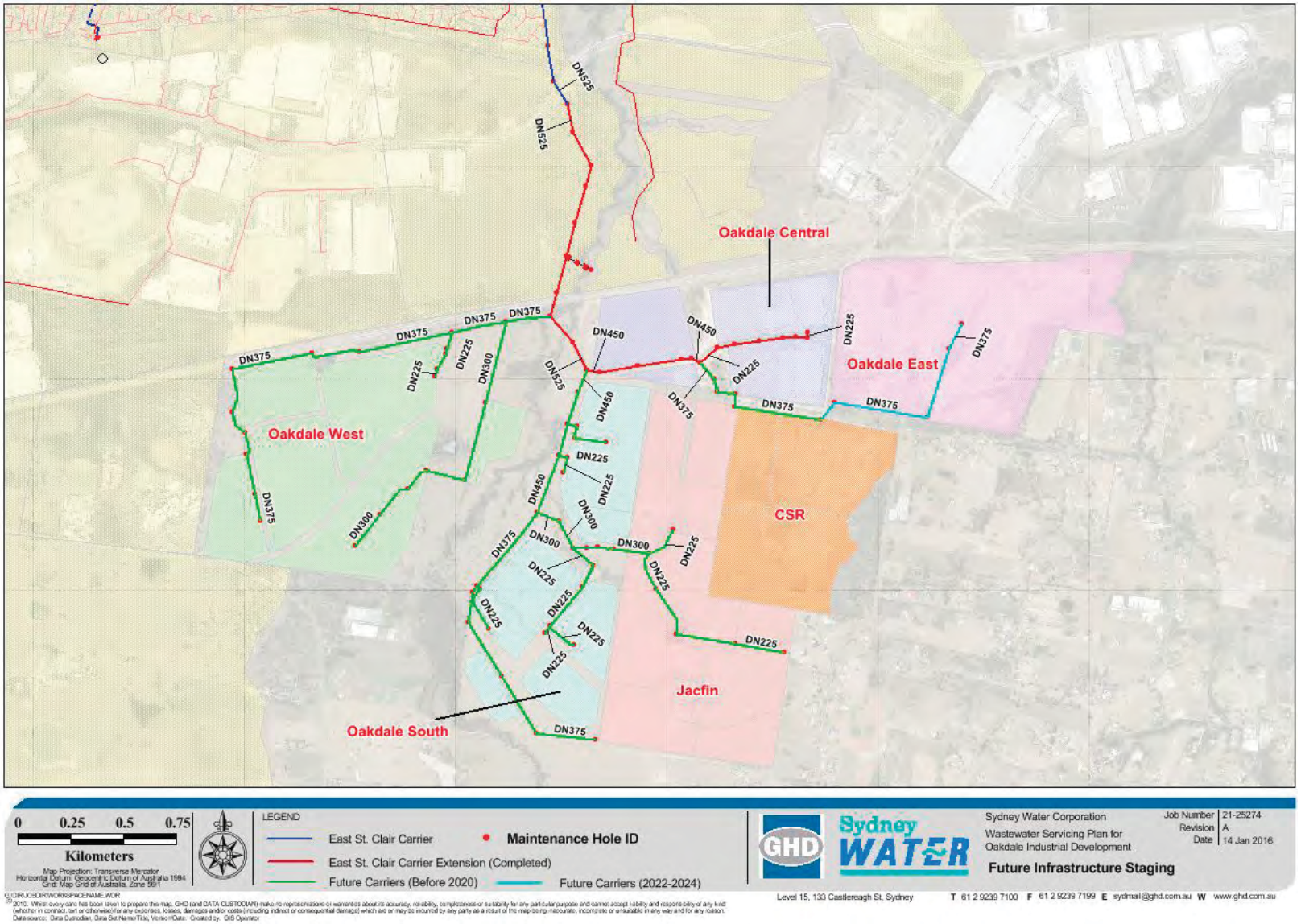

Figure 6 Future Infrastructure Staging

Appendices

Appendix A – Wastewater Planning Criteria

This Appendix details the planning criteria to be adopted for the wastewater component of the project. The following documents, referenced in Table 8, were consulted in developing the wastewater planning criteria:

Reference 1 Hydraulic Design Guidelines for Wastewater System Detail Planning, Sydney Water Corporation, June 2010

Reference 2 Sewerage Code of Australia (WSA-02-2002.2.2 – Sydney Water Edition 1, Version 3)

Reference 3 Sewage Pumping Station Code (WSA 04-2005-2.1, Sydney Water edition 1)

Reference 4 Wastewater Network Growth Servicing Strategy – Criteria and Guidelines 2012

Reference 5 Pressure Sewerage Code of Australia (WSA 07-2007 Version 1.1)

Reference 6 Wastewater Network Growth Servicing Strategy Criteria and Guideline (2012)

Table 8 Wastewater Planning Criteria

Item	Design Criteria	Units	Wastewater	Source
Growth forecasts (future growth areas)				
Residential	Equivalent Population (Dwellings)	EP	Future residential dwellings growth forecast within Oakdale industrial site to be obtained from agreed growth forecast provided and endorsed by Sydney Water. An occupancy ratio of 3.5 EP/dwelling to be used	Reference 6
Light Industrial	Equivalent Population	EP/ Gross Ha	75	Reference 6
Commercial	Equivalent Population	EP/ Gross Ha	75	Reference 6
Model validation				
Wastewater system models	Model performance	N/A	Scenarios to be modelled are for 2020 and 2036 planning horizons. Use St. Marys Jacfin project model, run code: SMJA as 2036 base model. This model is endorsed by Sydney Water for use. Remove the preferred GSS options (2036) of storages and pipe duplications from this model. The extension of East St Clair Carrier will be incorporated as per the concept design (Case No: 134866WW) For 2020 base model, update SMJA with dry and wet	Sydney Water

Item	Design Criteria	Units	Wastewater	Source
			weather parameters from 2020 GSS model , run code SMSC located in: P:\GSS2013-14WW\STS\ StMarys\Network\Sewer Update the future growth within Oakdale industrial site using the endorsed growth forecast.	
Dry weather flow loading from future growth				
Residential and commercial dry weather flow loading from future growth	Wastewater flow rate	L/EP/day	150 L/capita/day for detailed planning for new development sites. Diurnal curve adopted is RES1.	Reference 1
Dry weather flow loading from existing properties				
Existing res and com dry weather flow loading	Wastewater flow rate	L/EP/day	No reduction in residential and commercial flow rates for the existing properties in future scenarios as advised by Sydney Water	Sydney Water
Rainfall dependent inflow & infiltration (RDII) from new growth areas				
Existing development and sewerage networks	Flow rate/ growth area	% I/I	Low infiltration sewerage system. Assume 2% I/I over 20 years.	Reference 1 Reference 4
Rainfall dependent inflow & infiltration (RDII) from existing areas				
Existing development and sewerage networks	Flow rate/ existing area	% I/I	No deterioration in the existing areas for future scenarios. Use the existing I/I	Agreed through endorsement of this tech memo
Design flow calculations for new assets				
Design flow - average dry weather flow (ADWF)	Residential EP and other contributions	L/s	ADWF will be determined within the MOUSE model.	Reference 2
Design flow - dry weather peaking factor (d)	Dry weather peaking factor (d) is a function of the gross development area in hectares		Determined within the MOUSE model. Residential curve ‘RES1’ and commercial curve ‘COM1’ will be used to generate the residential and commercial flow patterns for Oakdale industrial site.	Agreed through endorsement of this tech memo
Design flow- peak dry weather flow (PDWF)	ADWF and peaking factor (d)	L/s	Determined within the MOUSE model.	Reference 2
Design flow - rainfall dependent inflow and infiltration (RDII)	Inflow and infiltration flow (IIF) is the peak rainfall dependent inflow and infiltration	L/s	Low infiltration sewer system Assume 2% I/I	Reference 4

Item	Design Criteria	Units	Wastewater	Source
Contributing area to WW flow				
Contributing area to WW flow	Residential	m2	Whole lot area to upper limit of 600 m2 per lot to be adopted as contributing area.	Agreed through endorsement of this tech memo
	Non- residential	m2	Total area of the footprint of the development to be adopted as contributing area. This is assumed to be 85% of the lot area.	
Design flow - peak wet weather flow (PWWF)	PDWF and IIF	L/s	PWWF = PDWF + IIF and will be determined within the MOUSE model.	Reference 1 Reference 4
Pumping station capacity design				
Pumping units	Pump capacity	L/s	2.5 × PDWF (existing SPS's) to be adopted for low infiltration sewers.	Reference 1
Pumping station storage	Operating storage	m3	To be determined based on number of pump starts per hour as determined by the MOUSE model.	Agreed through endorsement of this tech memo
Pumping station storage	Emergency storage / wet weather (WW) storage	m3	In general, the containment of dry weather (DW) emergency storage for a minimum period of four hours will be required. The time series DW flow data covering both weekday and weekend patterns will be used to estimate storage volume for a period of maximum four hours. The storage shall also be sized to meet WW overflow performance. From the two requirements, the larger volume storage shall be the basis for planning and design.	Reference 3
Pumping station total head	Maximum pump head	m	70 m, based on industry standards for centrifugal pump design, otherwise assume pumps in series required.	Agreed through endorsement of this tech memo
Performance criteria for existing assets (used to consider additional investments)				
Gravity main	Dry weather performance	% full	Secondary Criteria: 60% pipe full (by depth) during PDWF causing increase in wet weather overflows. For noting only.	Reference 4
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF. This will be an indicator only. Unless there is surcharge/discharge issues no investment will be considered.	Reference 2
Overflow frequency	DW overflows		No Dry Weather overflows	Agreed through

Item	Design Criteria	Units	Wastewater	Source
Overflow frequency	WW overflows	Events per 10 years	35 events per 10 years for designed overflows and maintenance holes not within private properties. 5 events per 10 years for maintenance holes within private properties	endorsement of this tech memo
Pipeline design				
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF.	Reference 2
	Maximum allowable EP	pipe size mm	150 (600 EP) 225 (1600 EP) 300 (3200 EP)	Reference 2
	Dry weather performance	% full	Dry weather flow depth should be no greater than 60 % of pipe full (by depth)	Reference 4
Pressure main	Minimum velocity	m/s	0.9	Reference 2
	Target velocity	m/s	1.2 – 1.8	Reference 2
	Maximum velocity	m/s	3.5	Reference 2
Pressure main	Maximum detention time	hrs	2 hrs (maximum). Where this is exceeded, suitable control measures need to be investigated and incorporated within the design to reduce and eliminate odour problems in the downstream reaches.	Reference 4
Overflow frequency	Designed Overflows	Events per 10 years	System License: Within the development area designed overflows will have no more than 35 events per 10 years in line with St. Marys STP system license (as advised by Sydney Water). LTS model run to confirm compliance with overflow criteria.	Agreed through endorsement of this tech memo
	Other than designed overflows	Events per 10 years	Maintenance holes outside the private properties will be limited to 35 events in 10 years. Maintenance holes inside the private properties will be limited to 5 events in 10 years.	
Growth forecasts (future growth areas)				
Residential	Equivalent Population (Dwellings)	EP	Future residential dwellings growth forecast within Oakdale industrial site to be obtained from agreed growth forecast provided and endorsed by Sydney Water. An occupancy ratio of 3 EP/dwelling to be used	Sydney Water

Item	Design Criteria	Units	Wastewater	Source
Non-residential	Equivalent Population (Floor Space) (FS)	EP	Future non-residential growth forecast within development areas to be obtained from agreed growth forecast provided and endorsed by Sydney Water	Sydney Water
Model validation				
Wastewater system models	Model performance	N/A	Scenarios to be modelled are for 2020 and 2036 planning horizons. Use St. Marys Jacfin project model, run code: SMJA as 2036 base model. This model is endorsed by Sydney Water for use. Remove the preferred GSS options (2036) of storages and pipe duplications from this model. The extension of East St Clair Carrier will be incorporated as per the concept design (Case No: 134866WW) For 2020 base model, update SMJA with dry and wet weather parameters from 2020 GSS model , run code SMSC located in: P:\GSS2013-14WW\STS\StMarys\Network\Sewer Update the future growth within Oakdale industrial site using the endorsed growth forecast.	Sydney Water
Dry weather flow loading from future growth				
Residential and commercial dry weather flow loading from future growth	Wastewater flow rate	L/EP/day	150 L/capita/day for detailed planning for new development sites. Diurnal curve adopted is RES1.	Reference 1
Dry weather flow loading from existing properties				
Existing res and com dry weather flow loading	Wastewater flow rate	L/EP/day	No reduction in residential and commercial flow rates for the existing properties in future scenarios as advised by Sydney Water	Sydney Water
Rainfall dependent inflow & infiltration (RDII) from new growth areas				
Existing development	Flow rate/ growth area	% I/I	Low infiltration sewerage system. Assume 2% I/I over 20 years.	Reference 1

Item	Design Criteria	Units	Wastewater	Source
and sewerage networks				Reference 4
Rainfall dependent inflow & infiltration (RDII) from existing areas				
Existing development and sewerage networks	Flow rate/ existing area	% I/I	Included in the base model provided by Sydney Water.	Agreed through endorsement of this tech memo
Design flow calculations for new assets				
Design flow - average dry weather flow (ADWF)	Residential EP and other contributions	L/s	ADWF will be determined within the MOUSE model.	Reference 2
Design flow - dry weather peaking factor (d)	Dry weather peaking factor (d) is a function of the gross development area in hectares		Determined within the MOUSE model. Residential curve 'RES1' and commercial curve 'COM1' will be used to generate the residential and commercial flow patterns for Oakdale industrial site.	Agreed through endorsement of this tech memo
Design flow- peak dry weather flow (PDWF)	ADWF and peaking factor (d)	L/s	Determined within the MOUSE model.	Reference 2
Design flow - rainfall dependent inflow and infiltration (RDII)	Inflow and infiltration flow (IIF) is the peak rainfall dependent inflow and infiltration	L/s	Low infiltration sewer system Assume 2% I/I	Reference 4
Contributing area to WW flow				
Contributing area to WW flow	Residential	m2	Whole lot area to upper limit of 600 m2 per lot to be adopted as contributing area.	Agreed through endorsement of this tech memo
	Non- residential	m2	Total area of the footprint of the development to be adopted as contributing area. This is assumed to be 85% of the lot area.	
Design flow - peak wet weather flow (PWWF)	PDWF and IIF	L/s	PWWF = PDWF + IIF and will be determined within the MOUSE model.	Reference 1 Reference 4
Pumping station capacity design				
Pumping units	Pump capacity	L/s	2.5 × PDWF (existing SPS's) to be adopted for low infiltration sewers.	Reference 1
Pumping station storage	Operating storage	m3	To be determined based on number of pump starts per hour as determined by the MOUSE model.	Agreed through endorsement of this tech memo
Pumping station storage	Emergency storage / wet weather (WW)	m3	In general, the containment of dry weather (DW) emergency	Reference 3

Item	Design Criteria	Units	Wastewater	Source
	storage		storage for a minimum period of four hours will be required. The time series DW flow data covering both weekday and weekend patterns will be used to estimate the maximum storage volume for the agreed retention hours. The storage shall also be sized to meet WW overflow performance. From the two requirements, the larger volume storage shall be the basis for planning and design.	
Pumping station total head	Maximum pump head	m	70 m, based on industry standards for centrifugal pump design, otherwise assume pumps in series required.	Agreed through endorsement of this tech memo
Performance criteria for existing assets (used to consider additional investments)				
Gravity main	Dry weather performance	% full	Secondary Criteria: less than 60% pipe full (by depth) during PDWF causing increase in wet weather overflows. For noting only.	Reference 4
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF. This will be an indicator only. Unless there is surcharge/discharge issues no investment will be considered.	Reference 2
Overflow frequency	DW overflows		No Dry Weather overflows	Agreed through endorsement of this tech memo
Overflow frequency	WW overflows	Events per 10 years	35 events per 10 years for designed overflows and maintenance holes not within private properties. 5 events per 10 years for maintenance holes within private properties	
Pipeline design				
Gravity main	Minimum self-cleaning velocity	m/s	0.7 m/s at PDWF.	Reference 2
	Maximum allowable EP	pipe size mm	150 (600 EP) 225 (1600 EP) 300 (3200 EP)	Reference 2
	Dry weather performance	% full	Dry weather flow depth should be no greater than 60 % of pipe full (by depth)	Reference 4
Pressure main	Minimum velocity	m/s	0.9	Reference 2
	Target velocity	m/s	1.2 – 1.8	Reference 2
	Maximum velocity	m/s	3.5	Reference 2
Pressure main	Maximum detention time	hrs	2 hrs (maximum). Where this is exceeded, suitable control measures need to be	Reference 4

Item	Design Criteria	Units	Wastewater	Source
			investigated and incorporated within the design to reduce and eliminate odour problems in the downstream reaches.	
Overflow frequency	Designed Overflows	Events per 10 years	System License: Within the development area designed overflows will have no more than 35 events per 10 years in line with St. Marys STP system license (as advised by Sydney Water). LTS model run to confirm compliance with overflow criteria.	Agreed through endorsement of this tech memo
	Other than designed overflows	Events per 10 years	Maintenance holes outside the private properties will be limited to 35 events in 10 years. Maintenance holes inside the private properties will be limited to 5 events in 10 years.	

Appendix B – Model Update

2036 Scenario

The 2036 Post GSS model (run code: **SMJA** located in: **P:\GSS2013-14WW\STS\StMarys\Post GSS model updates\Jacfin\Network\Sewer**) was used as the base model for this project. The following changes were made to the base model as shown in Figure 7.

- Storage at SP0262 and SP0366 are removed as were part of an option and do not exist in the network.
- Duplicate pipe from MH1273705 to MH1276269 is removed as was part of an option and does not exist in the network.
- The size and alignment of the East St. Clair Carrier SEC.2 (from NEWMH01 to NEWMH15) is updated as per the work as executed drawing (Case No. 134866WW)
- The size and alignment of the East St. Clair Carrier Extension (from NEWMH15 to NEWMH24) is added as per the drawing of Oakdale Servicing Plan.
- All the other future sewers are added as per "PM11329S-J baseplan only Bound-Model.pdf" provided by AT&L. The size of these sewers are estimated with flow schedule and the ground level of the maintenance holes are taken from ground level contours.
- The size and slope of all the sewers servicing Oakdale industrial development are presented in Appendix D.

The following changes were made to the catchments and its design loadings in the base model.

- The size, location and the design loadings of the existing catchments within the Oakdale industrial development were based on previous assumptions and are significantly different from the current plan. Hence these catchments are deleted from the model.
- Among all the developments, Oakdale East is planned to develop at the latest in 2022-2024. A master plan is not yet developed for this site. This catchment is added into the model as per Figure 1 (provided by AT&L) with an estimated EP of 8,906 and ADWF of 1.34 ML/D.
- Oakdale West, Oakdale South and Oakdale Central catchments are added as per the Masterplan prepared by Goodman (see Figure 9, Figure 10 and Figure 11 respectively) with an estimated EP of 8,480, 6,581 and 4,236 respectively and ADWF of 1.27, 0.99 and 0.64 ML/D respectively.
- The catchments for the CSR site are added as per the proposed subdivision prepared by Brown Consulting (see Figure 12) with an estimated EP of 5,944 and ADWF of 0.89 ML/D.
- The catchments for the Jacfin site are added as per the proposed development plan provided by Jacfin (see Figure 13) with an estimated EP of 6,960 and ADWF of 1.04 ML/D.

2020 Scenario

The following changes were made to the updated 2036 scenario model to get the 2020 scenario model as shown in Figure 8.

- As Oakdale East is planned to be developed beyond 2020, this catchment and its loading is deleted.
- The dry and wet weather parameters of all catchments outside the Oakdale industrial development are replaced with the same parameters from 2020 GSS model (run code: **SMSC** located in: **P:\GSS2013-14WW\STS\StMarys\Network\Sewer**)

The description of the run codes for the base case and the updated models are presented in Appendix A. The location of all these models in the server is **P:\GSS2013-14WW\STS\StMarys\Post GSS model updates\Oakdale Development**.

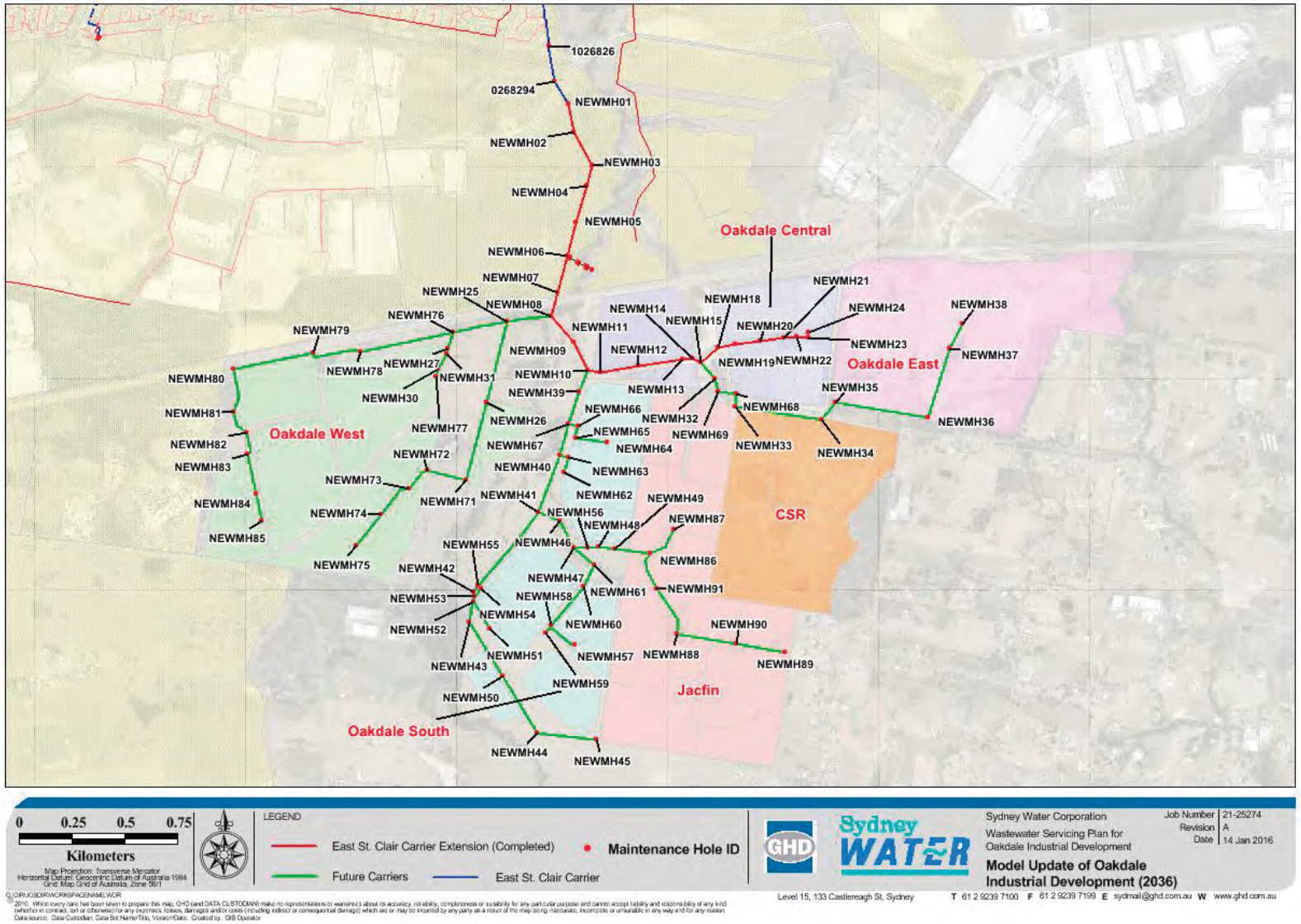

Figure 7 Model Update to 2036 Scenario

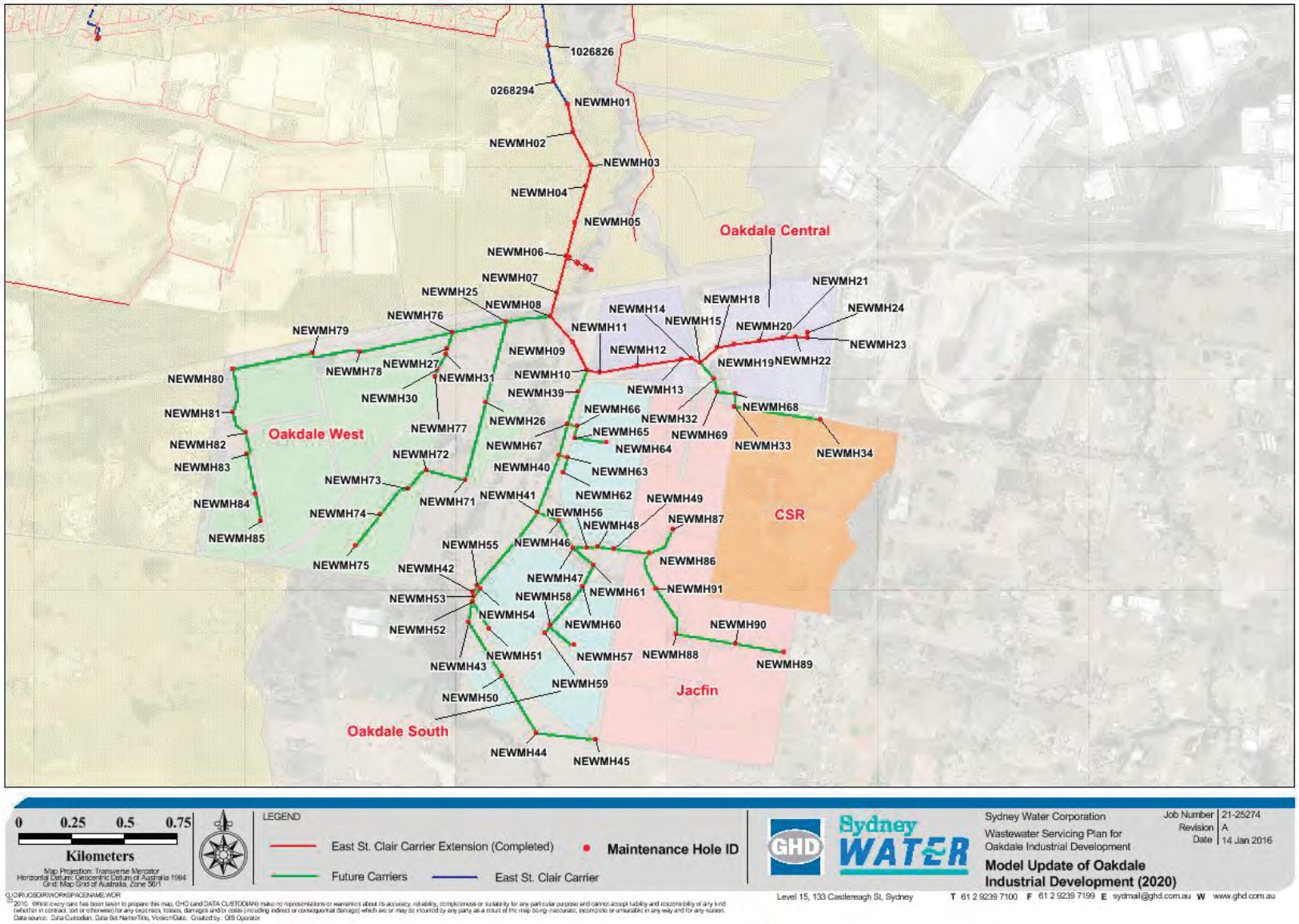

Figure 8 Model Update to 2020 Scenario

Figure 9 Oakdale West Estate Masterplan

Figure 10 Oakdale South Estate Masterplan

CENTRAL Area Schedule		
TOTAL LAND AREA		612,065 sqm
Lot	Site Area	Building Area
Lot 1A	41,368 sqm	20,220 sqm
Lot 1B	58,760 sqm	31,745 sqm*
Lot 1C	46,417 sqm	27,145 sqm*
Lot 2A	74,893 sqm	36,570 sqm
Lot 2B	60,010 sqm	31,060 sqm*
Lot 3A	16,016 sqm	7,283 sqm*
Lot 3B	58,493 sqm	36,965 sqm*
Lot 3C	55,622 sqm	33,426 sqm*
Lot 3D	18,795 sqm	8,275 sqm*
SUB TOTAL	414,158 sqm	232,709 sqm*
Lot 4	21,615 sqm	0 sqm*
CENTRAL TOTAL	435,773 sqm	232,709 sqm*
Services Lot	10,000 sqm	
Biodiversity Lot A	18,367 sqm	
Biodiversity Lot B	40,812 sqm	
Biodiversity Lot C	41,533 sqm	
Road Widening Lots	4,572 sqm	

* Areas subject to Survey.

Figure 11 Oakdale Central Estate Masterplan