Section 51 Holt – Kippax Group Centre
Stage 2 Site Investigation Report

Prepared for:

Environment, Planning and Sustainable Development Directorate (EPSDD)

27 May 2021

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Quality Records

Document Title:	Section 51 Holt – Kippax Group Centre Stage 2 Site Investigation Report
Document Ref:	2020 - 008
Prepared For:	Environment, Planning and Sustainable Development Directorate (EPSDD)

Revision Control

Revision	Issue Date	Description	Authorised By	Initial/Signature
00	21/05/2021	Draft	John Samoty	
01	26/05/2021	Final for Client Review	John Samoty	
02	27/05/2021	Final	John Samoty	

Appendix E – Background Studies (Flood Report and Traffic Assessment Report)

Appendix F – DFP Design Report

Appendix G – Eco Logical Australia, Ecological Assessment

Appendix H – Correspondence with ACT Parks & Conservation Service, EPSDD

Appendix I – Lanterra Consulting, Preliminary Environmental Investigation

Appendix J – Lanterra Consulting, Detailed Environmental Investigation

Appendix K – Correspondence with ACT EPA

Appendix L – Douglas Partners, Geotechnical Site Investigation

Appendix M – dsb Landscape Architects, Vegetation Assessment Report

Appendix N – Correspondence with ACT Tree Protection Unit

Appendix O – Anthony Quinn Surveys, Subdivision Plan

Appendix P – Correspondence with TCCS (Road A and Road B)

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Executive Summary

JPS Engineering Consultants were engaged by the Environment, Planning and Sustainable Development Directorate (EPSDD) to prepare a Site Investigation Report for part Section 51 Holt, covering the proposed expansion area for the Kippax Group Centre (the site). This Site Investigation Report is undertaken with the purpose of an assessment of the subject site's suitability for development within its Territory Plan usage. The subject site covers a total area of 24,528m^2 and is zoned as Commercial CZ1 Core Zone under the latest Holt Precinct Map and Code, adapted from Territory Plan Variation Number 361.

One of the key objectives of the investigation undertaken by JPS Engineering Consultants was to test the site for possibilities and constraints that would affect future development and undertake specialist assessments to further inform toward this. Based on the Territory Plan Variation, a preliminary planning study has been undertaken to inform the servicing requirements for the assumed proposed development. This planning exercise was based on the Kippax Masterplan, which informed the Territory Plan Variation and ultimately, the Holt Precinct Map and Code. The assumed proposed development included:

- Ground floor retail;
- Supermarkets;
- Food & beverage shops;
- Shops with frontage to Hardwick Crescent;
- Apartments; and
- Terraces.

The general outcome of this Site Investigation Report, when considering the constraints for this site and summary of recommendations provided below, is that the subject site possesses few significant constraints and **is deemed viable for future development.**

Based on the level of risk, recommendations have been listed in order of priority, to assist in programming the recommended works. The priority listing has been developed by assessing the importance and level of current knowledge of the additional investigations recommended and the effect that this work would have on other reports. A summary of the recommendations and necessary actions required to enable this site for development with the associated risk colour coded to that which is presented in Section 10 is provided below:

- **Contamination Investigation Scope:** An accredited and Environment Protection Authority approved auditor is to be engaged to determine the risk and measures required to undertake development on the site. The environmental audit must be undertaken in accordance with the requirements of the 'Contaminated Sites Environment Protection Policy' and submitted to the EPA for review and endorsement prior to the site being used for other purposes.

- **Road Link:** Road links from Hardwick Crescent to Moyes Crescent as shown in the Holt Precinct Map and Code to be further investigated once the development extent and servicing requirements are known. Furthermore, liaison with TCCS and required service authorities is recommended to determine the viability of these roads and the most appropriate alignment.

- **Easements:** Confirm through all relevant service authorities the extent of easement creation over existing services within the block once the servicing requirements for the actual development is known. The possibility of the relocation of these services should also be investigated, if required, as part of the proposed development's planning process.

- **Ecological Assessment:** It is recommended to engage an ecologist or fauna spotter-catcher to check the trees for nests prior to felling them and, if found, take appropriate actions to minimise the impacts through 'soft-felling', and transfer of any birds to a wildlife

carer. The potential Superb Parrot areas identified by the Conservator should be given particular attention.

- **Flooding:** Once the final development is known, an updated flood model is to be produced to determine if the proposed development has any adverse impact to the adjacent floodway east of the development.

- **Existing Underground Service/Utility Location:** Undertake a detailed sub-surface investigation (potholing) of existing service/utility infrastructure at critical locations in and around the site when the final proposed development is known.

- **Electrical Service:** Verify the electrical demand of the final proposed development to determine whether upgrades or augmentation to the Latham substation is required to service the proposed development.

- **Fire Mitigation:** It is recommended that liaison with ACT Fire and Rescue and Icon Water be undertaken to confirm any necessary potable water upgrades/augmentation or hydrant installations along Moyes Crescent, Kippax Place and Hardwick Crescent.

- **Existing Trees:** Liaise with the Conservator and TCCS Tree Protection Unit for the proposed removal of any trees.

- **Sewer Service:** Confirm relocation of the existing trunk sewer line and easement creation through Icon Water, once the development extent and required servicing is known.

- **Stormwater:** Confirm relocation of the existing stormwater lines and easement creation through TCCS, once the development extent and required servicing is known.

- **Potable Water Service:** Confirm relocation of the existing potable water lines and easement creation through Icon Water, once the development extent and required servicing is known.

- **Gas Service:** Liaise with Jemena/Zinfra Gas regarding interconnection of the 32mm gas main in Hardwick Crescent and the 50mm gas main in Southern Cross Drive to provide sufficient capacity to supply the proposed development, once the demands of the development are known.

- **Telecommunication Service:** Liaise with Telstra and NBN for connection and relocation of existing infrastructure within and surrounding the proposed development site for telecommunication and broadband internet connections.

- **Traffic Impact Assessment**: In accordance with the TCCS Guidelines for Transport Impact Assessment, a Traffic Assessment Report (TAR) will be required prior to a Development Approval based on the scale of the proposed development. This assessment is to also determine the necessary parking requirements for the proposed development.

- **Proximity to Existing Substations:** A step and touch potential test and earthing study on the existing electrical substations and high voltage feeds will be required in consultation with Evoenergy if vulnerable usage, is proposed.

This site investigation report is produced for information only. Purchasers are required to undertake their own assessment of the site prior to lodging a Development Application with EPSDD.

1 Introduction

JPS Engineering Consultants were engaged by the Environment, Planning and Sustainable Development Directorate (EPSDD) to prepare a Site Investigation Report for part Section 51 Holt, covering the proposed expansion area for the Kippax Group Centre (herein referred to as the 'subject site' or 'site'). The site consists of Blocks 6, 22, 36, 64 Section 51 Holt, part Blocks 47, 37 and 66, and part of the Kippax Place Road Reserve. Refer to Figure 1 for an aerial photograph showing the area of this study highlighted in yellow.

Figure 1 - Aerial Photograph of Subject Site (2020 Photography)

This Site Investigation Report is undertaken with the purpose of an assessment of the subject site's suitability for development within its recently revised Territory Plan usage. The aim of this report is as follows:

- Establish a line of communication with service authorities to gain an initial understanding of the condition of the site and requirements to service the proposed development.
- Identify opportunities for future development.
- Identify constraints to a future development posed by existing site conditions.
- Identify further investigations necessary to facilitate the proposed development.
- Identify works on and off the site and include recommendations of works to be undertaken prior to commencement of the development of the site.
- Enable an order of cost to be determined to enable the development.

A detailed scope of works is listed within Section 4 of this report.

2 Land Use and Planning Framework

In reference to the Planning and Development Act 2007, Plan Variation Number 361 Approval 2020 (effective date: 3 July 2020), the subject site has been rezoned to accommodate the recently approved Kippax Group Centre Master Plan. This master plan introduces an expansion to and a renewal of the Kippax Group Centre and the surrounding area.

The previous Territory Plan map for the Kippax Group Centre is shown in Figure 2, where the subject site for this report is outlined in red.

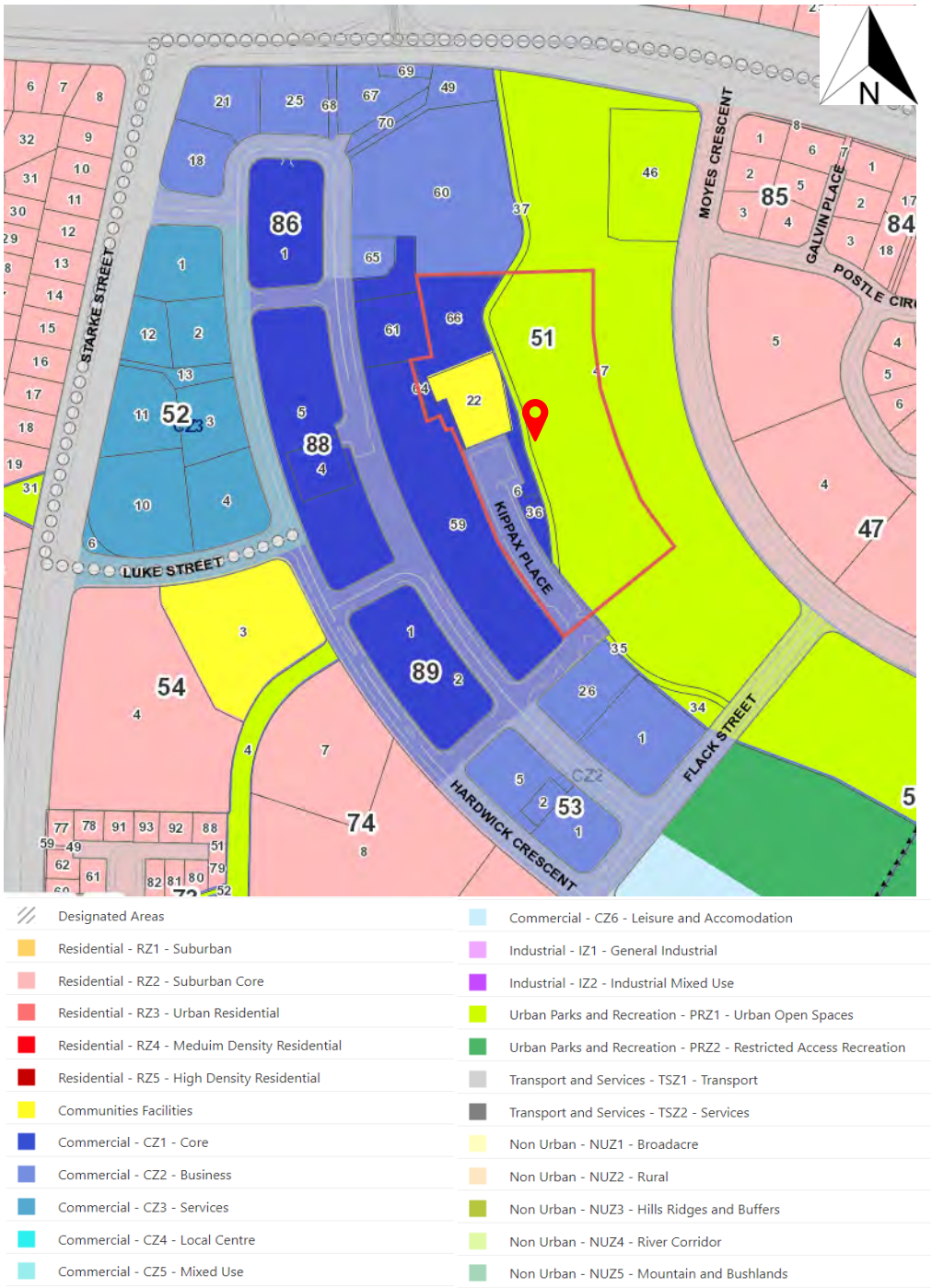

Figure 2 - Previous ACT Territory Plan Land Use Map (ACTmapi)

As per the ACTmapi website as reproduced in Figure 2, the previous zoning in the Territory Plan for the blocks that are included in the subject site were as follows:

- Blocks 37 and 47 Section 51 Holt: Zoned as PRZ1: Urban Parks and Recreation; Urban Open Spaces.
- Blocks 6, 36, 64 and 66 Section 51 Holt: Zoned as CZ1: Commercial Zone; Core Zone.
- Block 22 Section 51 Holt: Zoned as CF: Community Facilities.

The main zoning for the area to the west of the subject site is CZ1 with some CZ2 areas.

As per the approved Variation 361 (V361), the entire subject site has been rezoned to CZ1: Commercial Zone; Core Zone as shown in Figure 3. This has now been uplifted into the Holt Precinct Map and Code (2020).

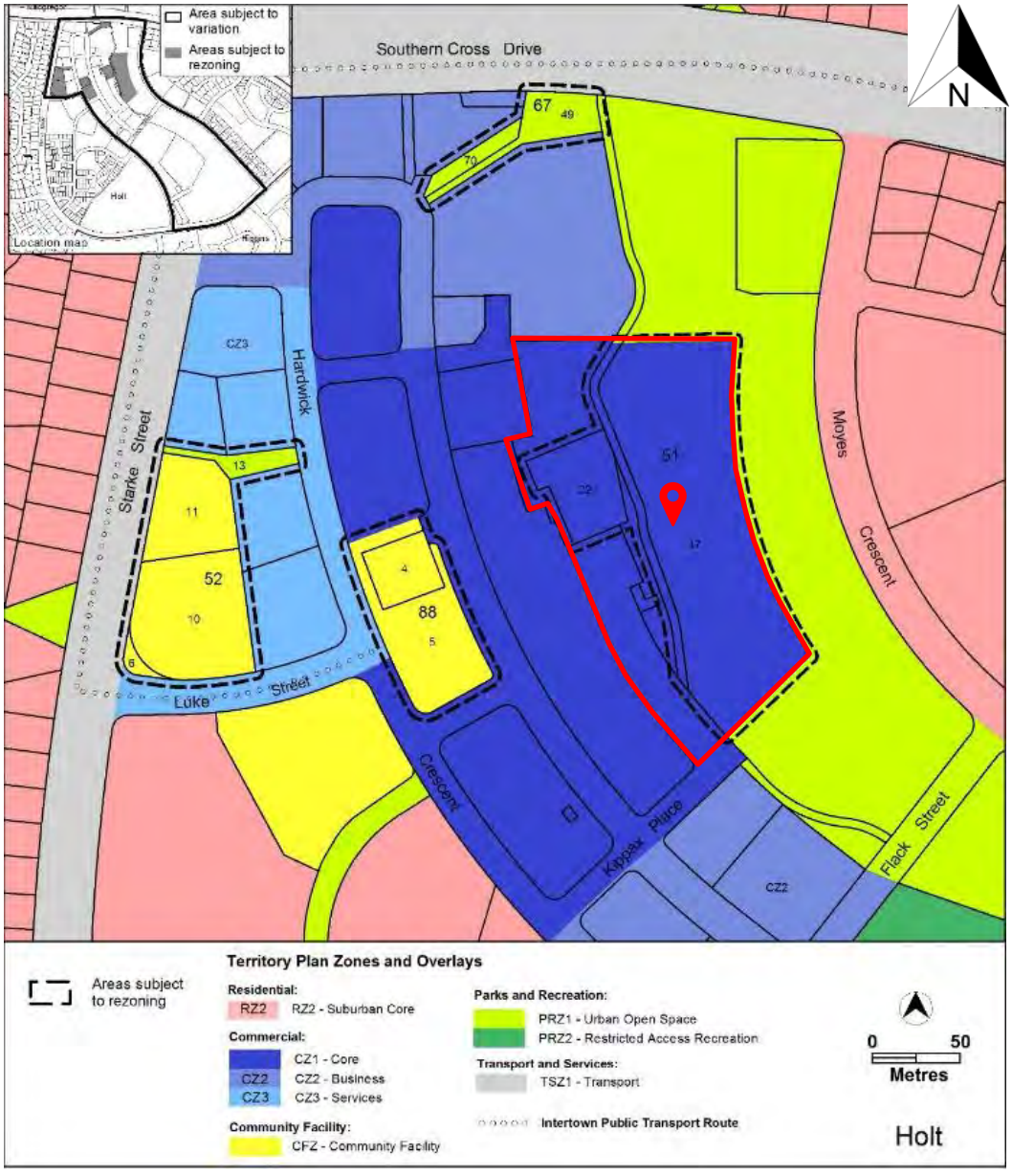

Figure 3 - New Zoning for the Subject Site – Holt Precinct Map and Code (2020)

The amended Holt Precinct Code in Attachment A of V361 defines the rules and criteria for developments within the Kippax Group Centre. This code indicates that the maximum permissible building height for the subject site is two storeys, except for area 'b', in which three storeys with a maximum height of 11 meters for buildings are permitted. Area 'b' is shown in Figure 4, which is extracted from V361. Minimum setbacks are also indicated in Figure 4, although V361 is silent on setbacks within the group centre expansion area.

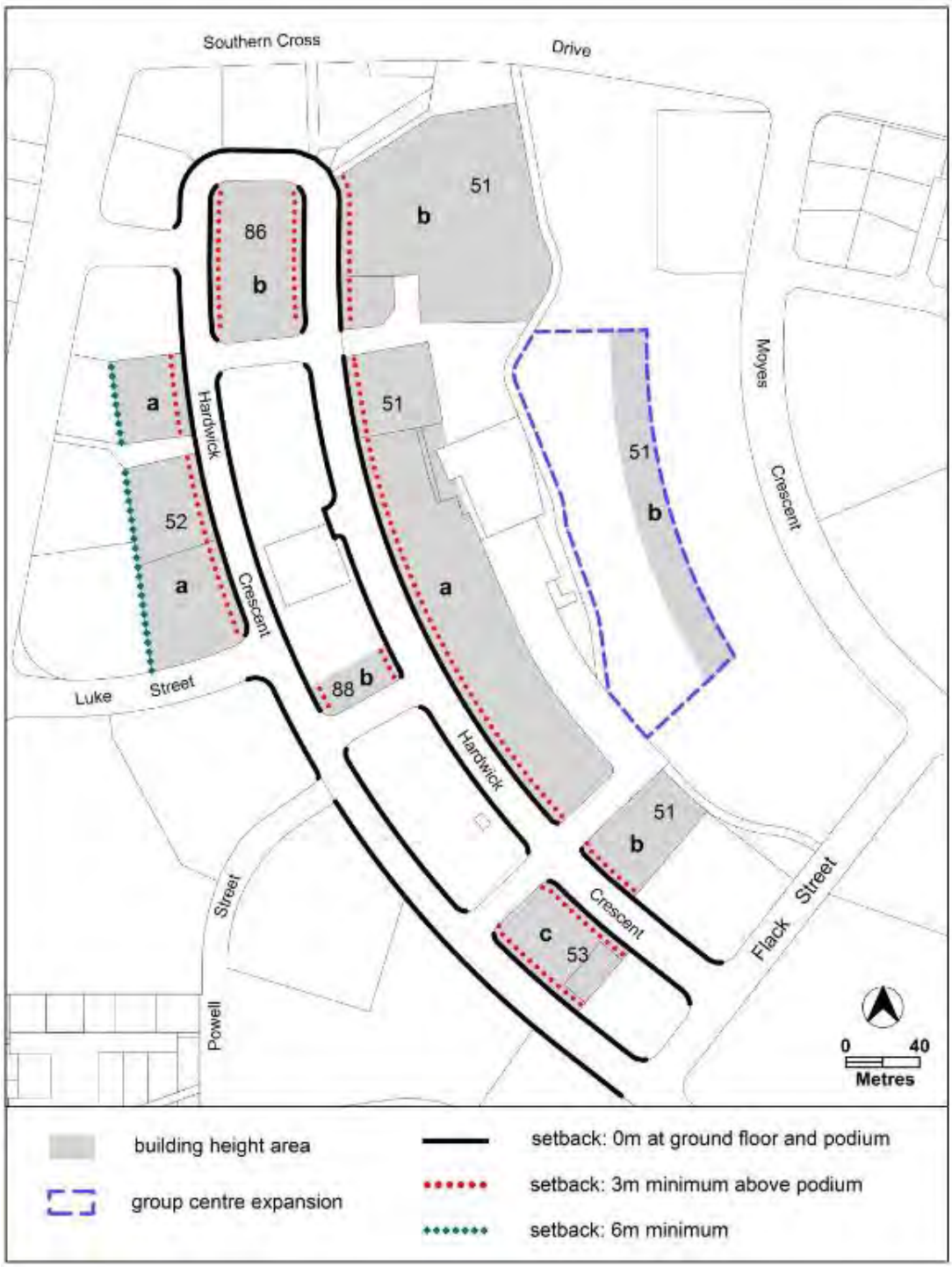

Figure 4 - Screenshot from Holt Precinct Code Showing Building Heights and Setbacks

The amended Holt Precinct Code also defines some secondary active frontage for the subject site as shown in Figure 5. There are no rules or criteria in V361 or the Holt Precinct Map and Code describing the required setback at a secondary active frontage.

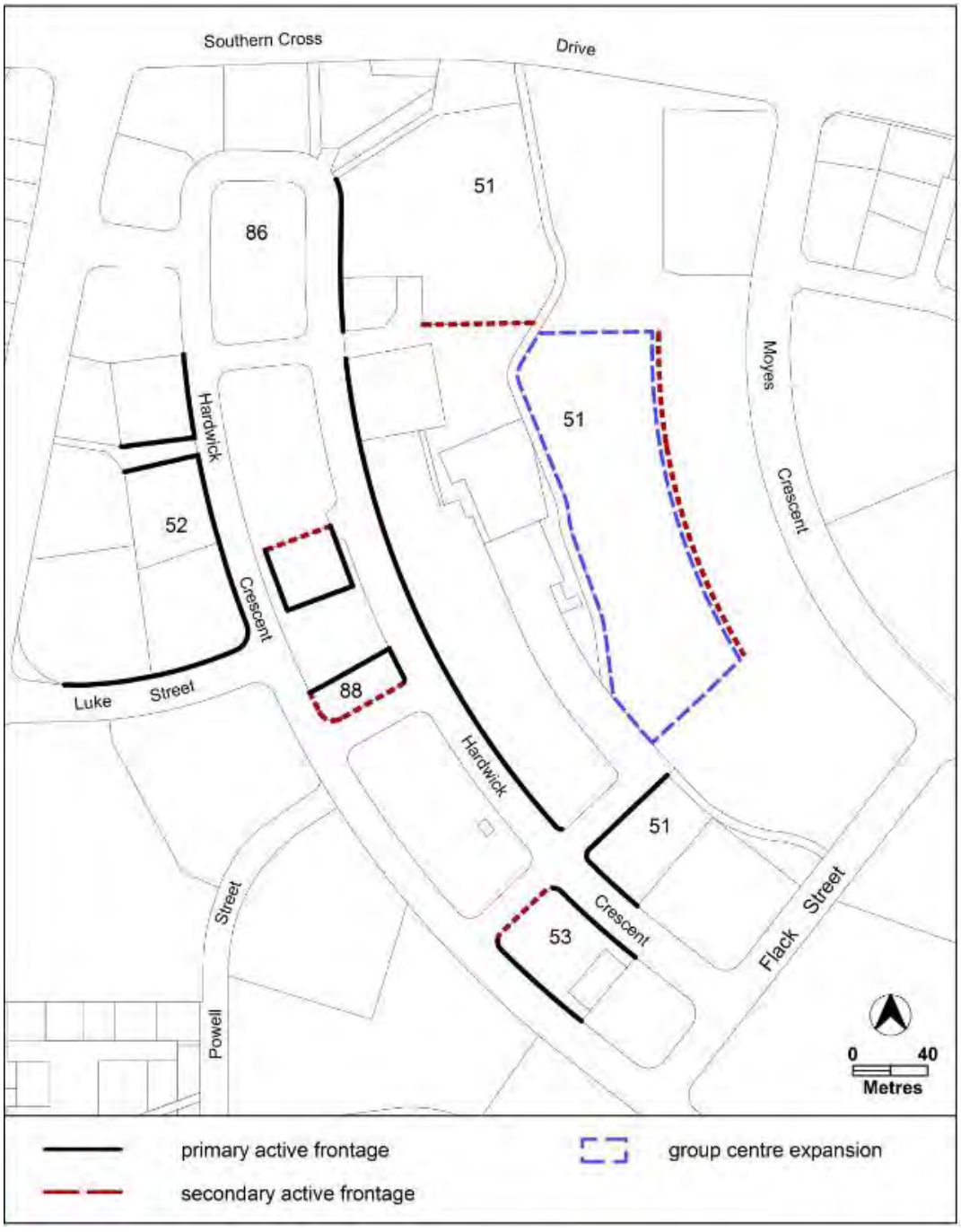

Figure 5 - Active Frontage for the Subject Site Indicated in the Holt Precinct Code

3 Proposed Development

The following appreciation of the assumed proposed development is based on the ACT Legislation Register website, Territory Plan 2008 (effective date: 11 September 2020), and schedule 4 of the Planning and Development Act 2007 (effective date: 28 August 2020).

Also, a massing study was undertaken by DFP Design in September 2020 for the purpose of providing information and guidance for potential schemes. The massing study also assists JPS Engineering to undertake the engineering calculations to better understand servicing demands.

3.1 CZ1 – Commercial Core Zone – Zone Objectives

The subject site is zoned as a Commercial Zone; Core zone in the recently revised ACT Territory Plan. Hence, based on the ACT Legislation Register website, the following zone objectives are applicable to the subject site:

a) Encourage a mix of predominantly commercial land uses that contribute to a diverse and active character

b) Provide for a range of conveniently located retail and service outlets

c) Promote vibrant, interesting and lively street frontages including during evenings and weekends

d) Encourage an attractive, safe and well-lit pedestrian environment with convenient access to public transport

e) Maintain and enhance a high standard of urban design through use of sustainable design and materials and ensure that buildings retain a high level of design consistency and compatibility

f) Provide opportunities for business investment and employment

g) Maintain and enhance environmental amenity

h) Promote the establishment of cultural and community identity that is representative of, and appropriate to, the place

i) Promote active living and active travel

j) Provide a high quality public realm by facilitating active uses on ground floor level that connects with the wider open space, pedestrian and cycle networks to promote active travel and active living.

Reference is made to the Territory Plan 2008 (effective date: 11 September 2020), specifically, the Commercial Zones, CZ1 – Core Zone section (effective date: 3 May 2018). The development types listed in Figure 6 below require a development application and are assessed in the merit track, unless specified in schedule 4 of the Planning and Development Act 2007 (effective date: 28 August 2020) (as impact track) or specified as prohibited development in a precinct map.

MINIMUM ASSESSMENT TRACK MERIT Development listed below requires a development application and is assessed in the merit track, unless specified in schedule 4 of the Planning and Development Act 2007 (as impact track) or specified as prohibited development in a precinct map.	
Development	
ancillary use	minor use
car park	NON RETAIL COMMERCIAL USE
civic administration	outdoor recreation facility
club	parkland
COMMERCIAL ACCOMMODATION USE	pedestrian plaza
communications facility	place of assembly
COMMUNITY USE	public transport facility
consolidation	recyclable materials collection
craft workshop	RESIDENTIAL USE
demolition	restaurant
development in a location and of a type identified in a precinct map as additional merit track development	service station
drink establishment	SHOP
emergency services facility	sign
home business	subdivision
indoor entertainment facility	temporary use
indoor recreation facility	tourist facility
light industry	varying a lease (where not prohibited, code track or impact track assessable)
minor road	

Figure 6 - Development Assessable Through the Merit Track from Territory Plan 2008 – CZ1

3.2 Holt Precinct Map and Code

The site is not subject to additional prohibited developments in the amended Holt Precinct Map and Code issued as Attachment A of the Variation to the Territory Plan 361 (effective date: 3 July 2020). It is noted that the Holt Precinct Map and Code (effective date: 4 September 2020), was updated to reflect all recommendations in the Territory Plan Variation Number 361.

3.3 Possible Land Use Options

Reference is made to the Commercial Zones Development Code (effective date: 21 February 2020) for a list of permissible development types on the subject site as follows. Also, an indicative massing study was undertaken by DFP Design in September 2020 to test the site for possibilities of the development types within the subject site. However, it is strongly recommended for the developer to engage a professional urban planner to assess the land use capability in a broader context, that suits the proposed future development.

- ancillary use
- aquatic recreation facility
- boarding house
- car park
- caravan park/camping ground
- civic administration
- club
- COMMERCIAL ACCOMMODATION USE
- communications facility
- COMMUNITY USE
- consolidation
- craft workshop
- demolition
- drink establishment
- drive-in cinema
- emergency services facility
- outdoor recreation facility
- overnight camping area
- parkland
- pedestrian plaza
- place of assembly
- plant and equipment hire establishment
- produce market
- public agency
- public transport facility relocatable unit
- recyclable materials collection
- RESIDENTIAL USE
- restaurant
- scientific research establishment
- serviced apartment
- service station
- SHOP

- freight transport facility
- funeral parlour
- group or organised camp
- guest house
- home business
- hotel
- indoor entertainment facility
- indoor recreation facility
- industrial trades
- light industry
- minor use
- motel
- municipal depot
- NON RETAIL COMMERCIAL
- store
- subdivision
- temporary use
- tourist facility
- tourist resort
- transport depot
- vehicle sales
- veterinary hospital
- warehouse
- zoological facility

3.4 Indicative Development Scenario

DFP Design, engaged by EPSDD in September 2020, undertook an indicative investigation to test the site for possibilities and constraints that would affect future development. On this basis, two options have been considered as potential scenarios. EPSDD has advised that the proposed development scenario 'Option A' is to be considered for the purpose of this site investigation report and the engineering calculations. This is due to Option A having the closest resemblance to the Kippax Group Centre Masterplan. Refer to Appendix F for the full version of the DFP Design report.

Option A considers the development of Section 51 by the owners of the Kippax Fair. This scenario appears to be aligned with the intentions of the Territory Plan Variation 361 and the Holt Precinct Map and Code.

In this scenario, the retail ground floor could deliver a range of specialty retail, food and beverage outlets, as well as multiple, large floorplate supermarkets. The Hardwick Crescent frontage could have 5 floors of apartments on top of the retail offering as well as residential development up to 3 storeys (including ground floor) at the rear of the site overlooking green open space. A 'green spine' is envisioned to link the open space and broader Holt residential catchment areas to the east with the plaza space, Library and new Hub building to the west.

Refer to Figure 7 and Figure 8 for sketches for Option A, which are extracted from the DFP Design massing study.

Figure 7 - "Option A" Consolidated Block, New Development Combined with Redevelopment of the Kippax Fair Shopping Centre (extracted from the DFP Design Report)

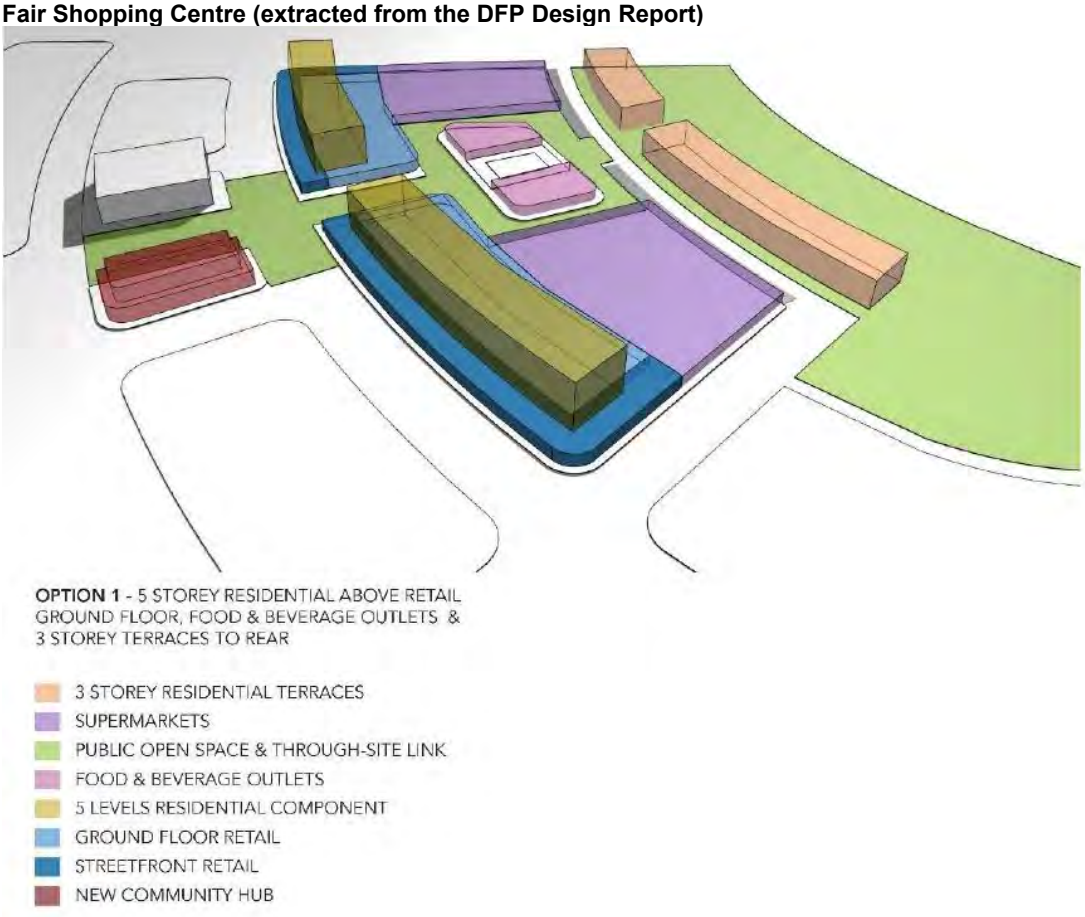

Figure 8 - Massing Study of the Indicative Layout Option A (extracted from the DFP Design Report)

The following development scenario is indicative only, more detailed site investigations, planning studies, architectural floor plans and a review of all statutory documents are required should the site's proposed development be progressed for a development application.

3.5 Yield Analysis

3.5.1 Commercial Ground Floor

This option considers a 'strip mall' type arrangement fronting Hardwick Crescent with 2 x large floorplate supermarkets in the wings either side of a central Food and Beverage (F&B) area that would benefit from landscaped open space surrounds.

Indicative areas including the Gross Building Area (GBA) and the Gross Floor Area (GFA) are as follows:

- Street Retail = GBA 2,300m^2 (1,500m^2 + 1,800m^2)
- Other Ground Floor Retail = GBA 7,000m^2 (3,400m^2 + 3,600m^2)
- Supermarkets = GBA 8,100m^2 (4000m^2 + 4,100m^2)

Total GBA =17,400m^2 x 80% efficiency = 13,920m^2 GFA

- Food and Beverage (F&B) = GBA 1,400m^2 (700m^2 + 700m^2) x 80% efficiency = 1,120m^2 GFA

3.5.2 Community Hub Building

In this option a two-Storey Community Hub has been considered for part Block 5 Section 88 with the following assumptions;

- A new Two-storey Community Hub = GBA 1,500m^2 (1,000m^2 ground floor + 500m^2 1st Floor) x 80% efficiency = 1,200 m^2 GFA

A full Site Investigation Report has been undertaken by JPS Engineering as a separate document to address constraints and opportunities. Refer to Document Ref No. 2020-009 dated May 2021 for details of findings on Block 4 and part Block 5 Section 88 Holt.

3.5.3 Residential Development

This option shows 5 floors of apartments on top of the Hardwick Crescent 'strip mall'. The building typology considers an 18m wide double loaded corridor arrangement. Gross Building Area (GBA) per floor is approximately 3,950m^2. For the purpose of this study, 75% efficiency for building design and an average apartment size of 90m^2 is used to calculate dwelling numbers. Using this calculation, 33 apartments per floor are achieved.

- Tower Residential = Total GBA 19,750m^2 (5 floors of typical 3,950m^2) x 75% efficiency = 14,800m^2 GFA.
- Terrace Housing: Considering 5.5m wide, 3 storey terrace style housing with carports for the eastern boundary looking onto the open space and Moyes Crescent beyond, approximately 30 dwellings are achieved.

For the purpose of this Site Investigation Report, a summary of development assumptions is as presented in Table 1.

Table 1 - Proposed Mixed Development for the Subject Site

Height	Use	GFA (m^2)	Number of Dwellings	Number of Car Parking	Car Parking Area (Basement)
Ground Floor	Retail	13,920	-	696	24,360
Ground Floor	Food & Beverage	1,120	-	112	3,920
Ground Floor + 1st Floor	Hub	1,200		48	Anticipate on-street
Floors 1-6 (5 floors)	Residential Apartments	14,800	164	287	10,045
Ground Floor + 2nd Floor (3 Floors)	Residential Terraces	4,500	30	68	Anticipate on-site & on-street
TOTAL		**35,820m^2**	**194**	**1,222**	**38,325m^2**

The number of parking spaces have been estimated based on the parking requirements outlined in the ACT Parking and Vehicle Access Code. Refer to Section 8.10.3 for greater detail of parking calculations and revised parking numbers and areas that take precedence over the above estimates.

4 Investigation Scope

The scope and deliverables of this Site Investigation report includes the following:

- Introduction including site description and location.
- Aerial photograph and site locality figure.
- Site zoning figure.
- Summary of any available relevant reports regarding the site or surrounds.
- Existing site servicing and constraints based on Dial Before You Dig Plans, Work as Executed data, confirmation through relevant authorities and ACTmapi. An existing services and features engineering drawing is produced to reflect these findings. Supplementing publicly available information, a detailed survey is undertaken that will be used to verify certain services locations.
    - Stormwater (TCCS Stormwater Database and non-intrusive site inspection)
    - Overland flow and flood information (ACTmapi and/or EPSDD flood modelling information)
    - Sewer (Work as Executed survey, DBYD and non-intrusive site inspection)
    - Water (Work as Executed survey, DBYD and non-intrusive site inspection)
    - Electricity (Evoenergy and DBYD)
    - Telecommunication services (DBYD and relevant authorities)
    - Natural gas supply (DBYD and Jemena)
    - Verge works including driveway and pedestrian access
    - Traffic review and analysis (ACT EMME Strategic Transport Model, SCATS data and available reports)
    - Parking (Aerial imagery, ACT TCD base and site inspection)
    - Bushfire (ACTmapi and ACT ESA)
    - Heritage (ACTmapi/ACT Heritage Council)
    - Other potential constraints identified
- Specialist investigations including:
    - Tree survey and assessment. Subsequent liaison with TCCS Tree Protection Unit to understand viability of the proposed development.
    - Geotechnical assessment to allow for underground parking as outlined in the current DFP report.
    - Preliminary and then detailed intrusive environmental assessment (in conjunction with geotechnical investigation) that is guided by the current DFP report and the depth of underground parking.
    - Traffic Impact Assessment in accordance with TCCS requirements at this stage of development.
    - Ecological Assessment of the area in general for any potential habitat areas that require protection/preservation.
- Proposed/future site servicing based on proposed development planning (by DFP Design), access points/upgrades to enable the proposed development. This will be produced on a schematic engineering drawing.
- Authority correspondence based on proposed development assumptions and servicing requirements.

- Summary of opportunities and constraints in a risk assessment format.
- Preliminary opinion of cost for works to allow the site to be feasibly utilised for the proposed development.
- Recommendations for further studies in an itemised risk assessment format.

5 Site Description and Location

The subject site is an expansion to the Kippax Group Centre and is located in Section 51 in the suburb of Holt within the district of Belconnen.

The area of this study covers blocks that are listed below:

- Block 6 Section 51 Holt, with a total block area of 122m^2.
- Block 22 Section 51 Holt, with a total block area of 2,207m^2.
- Block 36 Section 51 Holt, with a total block area of 918m^2.
- Block 64 Section 51 Holt, with a total block area of 121m^2.
- Part Block 37 Section 51 Holt, with an approximate area of 1,060m^2.
- Part Block 47 Section 51 Holt, with an approximate area of 13,500m^2.
- Part Block 66 Section 51 Holt, with an approximate area of 3,090m^2.
- Part Kippax Place Road Reserve, with an approximate area of 3,510m^2.

The total site area is a combination of the abovementioned areas and is approximately 24,528m^2. The current occupancies of the subject site are as follow:

- Block 6 Section 51 Holt accommodates public toilets/changerooms, which is mainly being used by the open space users.
- Block 22 Section 51 Holt accommodates the Belconnen Community Centre and Kippax Health Centre.
- Block 36 Section 51 Holt is an unoccupied nature strip.
- Block 64 Section 51 Holt is a concrete strip and footpath.
- Block 37 Section 51 Holt is a spray sealed footpath continuing from Kippax Place to Southern Cross Drive.
- Block 47 Section 51 Holt is public open space, mostly grassed and being used as playing fields.
- Block 66 Section 51 Holt is an open area occupying footpaths and a driveway/loading zone to the existing shops.
- Kippax Place is a dead-end street, which accommodates car parking and access to the Belconnen Community Centre and playing fields.

The subject site is located within an area bounded by the below characteristics/infrastructure:

- Moyes Crescent to the east,
- Sothern Cross Drive to the north,
- Kippax Place and Kippax Fair Shopping Centre to the west,
- Hardwick Crescent further to the west,
- Starke Street to the west of Hardwick Crescent, and
- Flack Street to the south.

The subject site is within immediate proximity to Kippax Library and West Belconnen Leagues Club (Raiders Belconnen) and the Kippax Playing Fields.

The subject site is mainly surrounded by businesses and community facilities, however the area to the east of Moyes Street is inhabited by residential blocks.

Refer to Figure 9 for a site locality image with key features surrounding the subject site.

Figure 9 - Locality Plan of the Subject Site

Pedestrian access to the site is available via existing 1.2m to 2m wide footpaths from Kippax Place and Southern Cross Drive.

There are small to medium sized trees within the site, mainly within Block 66, and a line of trees along the Kippax Place verge. Some of the existing trees within the blocks appear to potentially meet the definition of a regulated tree as described in the Tree Protection Act 2005 (effective date 28/10/2018).

The whole site slopes from the south towards the north, however the slope is varied in different portions of the site. The greatest slope is recognised to be to the west of the playing fields with an average grading of approximately 11.7% over a distance of approximately 34m. Despite this sudden slope, the site is graded reasonably with an average of approximate 3-4% over a distance of approximate 180m.

Refer to Figure 10 for a recent aerial image of the existing condition of the subject site described above, and Figure 11 and Figure 12 for general photos of the site.

These site grades have been verified with the findings of a recent detailed topographical survey undertaken by ACT surveys in March 2021. Refer to Appendix A for drawings produced as part of this detailed survey.

Figure 10 – Existing Site Condition – ACTmapi (2020 Aerial Photography)

Figure 11 - Subject Site - View Towards the Playing Fields

Figure 12 - Subject Site - View Towards Kippax Place

6 Literature Review

JPS Engineering have undertaken a literature review of the previously undertaken traffic assessment and flood study (provided by EPSDD) to indicate risks and constraints to the future development within the subject site. In this section a summary of these findings is provided, where the full reports can be found in Appendix E to this site investigation report.

6.1 Traffic and Transport

In 2016, AECOM undertook a traffic and transport study of the Kippax Group Centre. The report examines the existing parking, public transport, access arrangements, and traffic and transport facilities of the Centre in relation to the proposed Kippax Master Plan.

This study aimed to achieve the following:

- Review and analysis of the Kippax Group Centre Master Plan.
- Determine the existing traffic and transport characteristics.
- Identify existing parking areas and current utilisation rates.
- Determine future growth of the study area.
- Determine the future public transport demands.
- Provide a review of the proposed future active travel plans and identify options to improve legibility and
- connectivity of the active travel mode network.
- Undertake a high level analysis of the future road network function.

The assumptions for growth used to inform this study were as follows:

- Predicted growth in the region such as the future development of West Belconnen (~11,500 future dwellings).
- Future development yields for the Centre (core and peripheral areas).
- Public transport modelling outputs.
- Details of the alignment of the future light rail to Kippax undertaken by ARUP

Several parking studies and surveys have been undertaken for the area. The AECOM report summarises these findings and supplements with their analysis. This analysis of the parking demand for public car parking spaces showed that the peak demand occurs at about 12:00pm, where 460 out of 552 spaces, or 83% of car spaces are utilised. The peak utilisation of 83% is maintained between 11:30am and 12:30pm. A secondary peak occurs at 4:00pm with an approximate 70% utilisation. See Figure 13 for existing weekday graph of parking analysed within the 2016 AECOM report by uses.

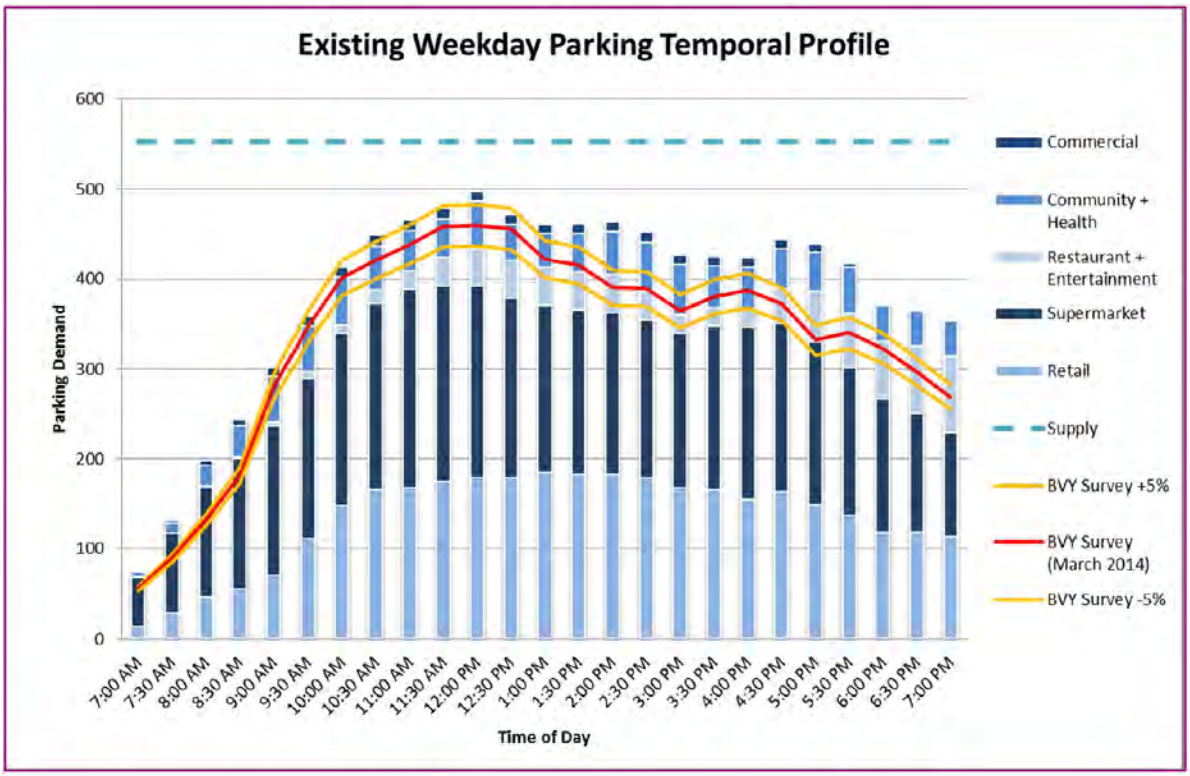

Figure 13 - Existing Weekday Graph of Parking - AECOM 2016

Important to note is that the total car parking provision as per the statutory parking requirements is 739 spaces. This is 34% more than the currently supplied 552 spaces.

In line with the Kippax Group Centre Master Plan, a road access link between ALDI and the Parkview Apartments was also considered in the AECOM report from Hardwick Crescent to Moyes Crescent. However, this was dismissed due to the physical constraints in this location, where it was considered that the width between these existing developments is not sufficient for a road connection whilst still maintaining adequate accessibility for the ALDI delivery and service vehicles. Further studies would need to be undertaken to determine the feasibility of this link.

The new bus services that will connect to West Belconnen will result in an additional 12 peak hour bus movements through the Centre. A study by MRCagney in 2014 recommends the existing bus station is relocated directly north of the Kippax Library. This location is supported in AECOM's assessment of the Kippax Master Plan. This location is central to the Centre, provides effective public transport circulation and is within 200m of potential future locations for a light rail terminus.

The existing Kippax Draft Master Plan indicates the current pedestrian and cyclist paths throughout the Centre area. The poor connectivity in this area is due to the Hardwick Crescent central parking facilities reducing the pedestrian permeability of the area and increasing the walking distance between local businesses.

The preferred scheme outlined within the AECOM 2016 report involves the following key recommendations, which are represented diagrammatically in Figure 14:

- Development of a bus interchange to the north of the Kippax Library parallel to Hardwick Crescent and creation of a pedestrian zone along the northern frontage of Kippax Fair.
- Construction of an underground public car park.
- Construction of a structured car park to the north east of Kippax Fair.
- Construction of a link road from Moyes Crescent to the existing Kippax Place and Hardwick Crescent.
- Development of a pedestrian access link between the proposed bus interchange and a future light rail station.

Figure 14 - Proposed Traffic Scheme for the Kippax Group Centre

6.2 Flooding

Calibre Professional Services were engaged in 2015 to undertake a detailed two-dimensional flood study for the Kippax Group Centre, which was further updated in a 2020 Calibre study to allow for new requirements under the methodology of ARR 2019, including an allowance for climate change.

This study aimed to achieve the following:

- Inform the Kippax Group Centre Master Plan.
- Determine the current and future flood characteristics.
- Use the latest available data, hydrological and hydraulic techniques.
- Provide flood models that will inform consideration of new land use opportunities and development opportunities.
- Produce accurate and reliable flood mapping.
- Provide advice and recommendations to mitigate or eliminate flood risks to make land suitable for future development.
- Assess whether any of the overland flow path capacity issues identified in the 2015 Kippax Stormwater Report are related in any way to the Kippax Masterplan and the Kippax Fair redevelopment.

See below figure for catchment area contributing to the subject site.

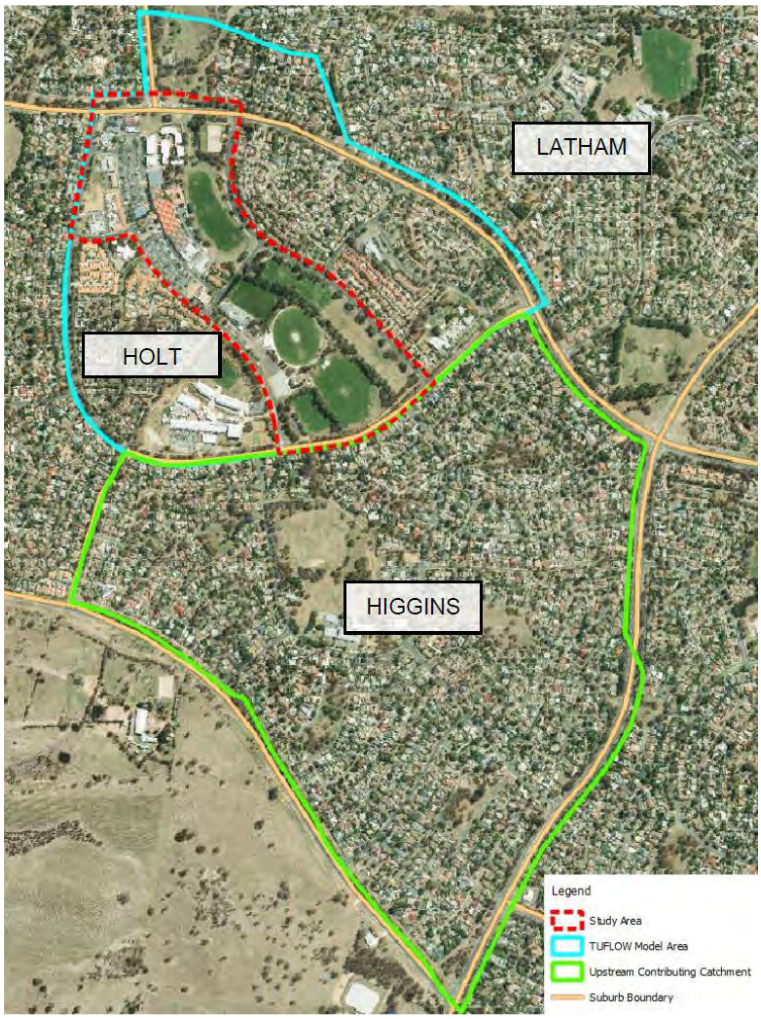

Figure 15 - Catchment Area Contributing to the Subject Site - Calibre Report 2020

The Calibre 2020 flood study confirmed that the existing overland flow paths within the Kippax Group Centre study area do not have sufficient capacity to fully convey the 1% AEP flood event.

The figure below summarises the hydraulic constraints in the existing condition of the study area that are inhibiting the flow of stormwater from the upstream Higgins catchment through the Kippax Group Centre study area. These include:

- a trapped low point at the Starke Street Underpass;
- an overgrown vegetated swale directly downstream of the Starke Street Underpass;
- a grassed swale directly upstream of the Flack Street Underpass with very limited hydraulic capacity; and
- an underpass underneath Southern Cross Drive that limits the conveyance of stormwater during the 1% AEP storm.

Figure 16 - Hydraulic Constraints in the Existing Condition for the Study Area

Flooding apparent at Southern Cross Drive can be more clearly seen in the below figure, extracted from the Calibre 2020 report. This indicates that in the 1% AEP, flooding is evidenced within the adjacent development.

Figure 17 - Subject Site and Surrounding Area During a Major Flood Event (1% AEP)

Minor flooding exists along Hardwick Crescent for all storm events studied, particularly, the minor and major storm events. It is noted that MIS 08 Stormwater requires that Group Centres be protected against a 10% AEP in the minor event, which should be contained in the underground stormwater network. See below figures for the 10% minor and 1% major AEP flood extents on Hardwick Crescent.

Figure 18 - Subject Site and Surrounding Area During a Minor Flood Event (10% AEP)

Figure 19 - Subject Site and Surrounding Area During a Major Flood Event (1% AEP)

The inclusion of water sensitive urban design elements within the development including on-site detention storage and in effect, reducing off-site flows to pre-development level (in accordance with the Estate Development Code), will mitigate any impacts the development would otherwise have on flooding.

Calibre, in their 2020 flood study report recommended mitigation measures to alleviate the above existing flooding problems within and adjacent to the Kippax Group Centre study area, which are summarised below.

- Regrade the trapped low point at the Starke Street underpass;
- Clear out and regrade the overgrown vegetated swale from the Starke Street underpass;
- Construct a levee with an inlet into the existing stormwater network on the corner of Flack Street and Moyes Crescent;
- Regrade the existing grassed swale downstream of the Flack Street Underpass; and
- Double the width of Southern Cross Drive Underpass to increase the hydraulic capacity.

See figure below for summary of these recommended measures with context of locality.

Figure 20 - Mitigation Measures Proposed by Calibre to Alleviate the Flood Issues within the Study Area

The following works would likely be placed on the list of stormwater upgrade/maintenance works across the ACT and would be dealt with on a priority basis.

- Improvements to overland flow path between Starke Street and Flack Street.
- Doubling the width of the Southern Cross Drive underpass to increase the hydraulic capacity.
- Construction of levee bank with a regraded inlet in the Flack Street underpass.

7 Existing Site Servicing

7.1 General

In this section, a detailed summary of the existing services information has been completed for the subject site. This information is based on received data from Dial Before You Dig (DBYD) enquiries, work as executed (WAE) records, correspondence with service authorities, and a visual site inspection.

Whilst every effort has been made to ensure the accuracy of this information, the detailed dimensions and alignments of existing services included within the report should be treated as indicative only and the accuracy of the information cannot be warranted. All services must be accurately located on site prior to any development proceeding.

All existing services described under this section are indicatively shown on drawing 201053-DRG-CIV-UT-0501-E and 0502-E within Appendix A. All relevant correspondence with service authorities including DBYD information is included within Appendix C and Appendix D, respectively.

7.2 Sewer

The existing sewer infrastructure information was compiled from Dial Before You Dig (DBYD) information, WAE records and preliminary advice provided by Icon Water. See below sewer WAE records obtained from Icon Water.

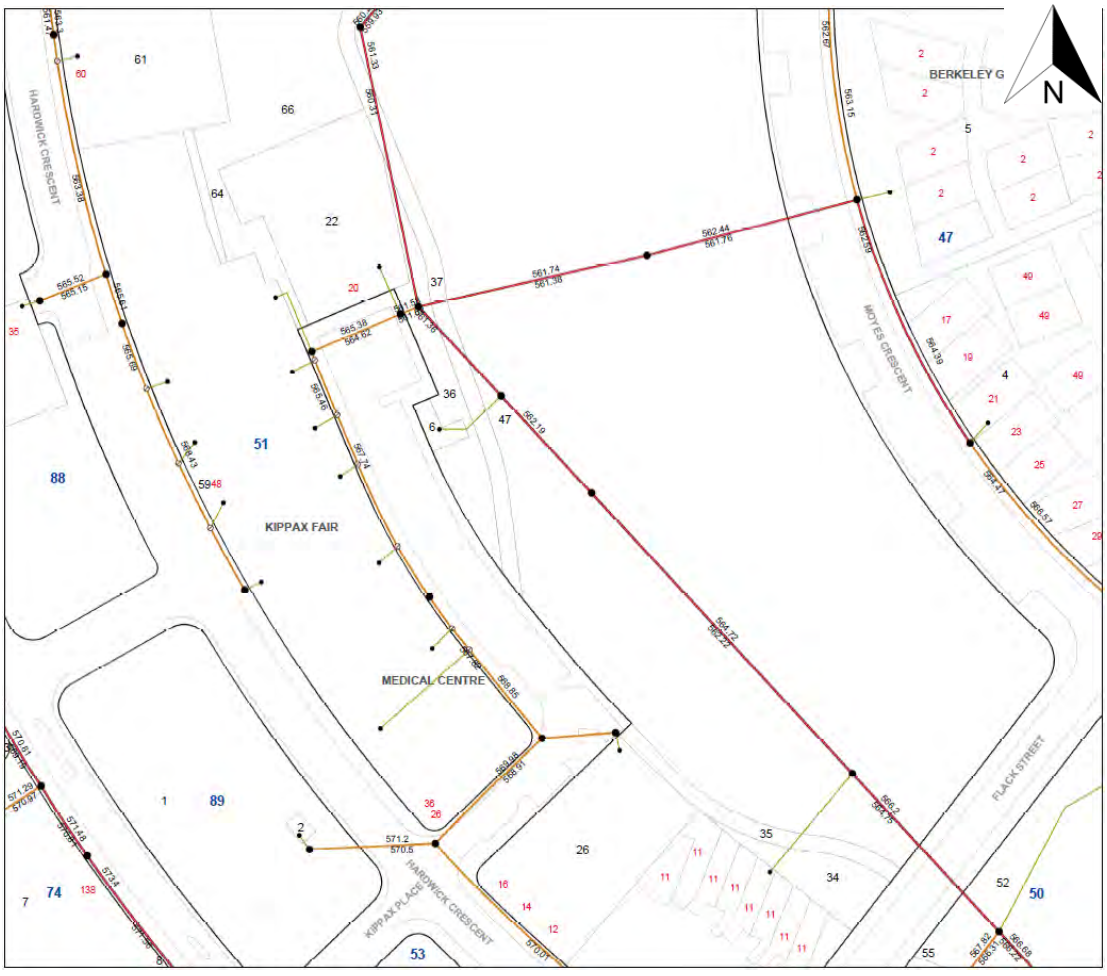

Figure 21 - Sewer Work as Executed Information Received from Icon Water

As an established area, there is a sewer network surrounding and within the subject site. The relevant sewer infrastructure in close proximity to the subject site is as follows:

- DBYD and WAE information indicates that Block 22 and Block 6 Section 51 Holt each have a sewer tie connection. Correspondence with Icon Water confirmed that each block is serviced by an individual sewer tie.
- DBYD and WAE information indicates that there is a DN375 Reinforced Concrete trunk sewer main running within the site in a south-north direction (shown on drawing 201053-DRG-CIV-UT-0502-E). The WAE data received from Icon Water indicates that there are two maintenance holes over this sewer main within the subject site, one is in Block 36 and the other one is in Block 47. Refer to Figure 22 for photographs of these manholes.
- The abovementioned sewer main continues to the north as a DN375 Glass Reinforced Plastic pipe, according to WAE data from Icon Water. A maintenance hole over this main is located adjacent to the existing skate ramp within the subject site. Refer to Figure 23 for a photograph of this manhole.
- The existing sewer tie to Block 6 connects to this DN375 trunk sewer main via a maintenance hole within Block 47. This manhole could not be observed on site, however an area behind Block 6 is considered as the location of this manhole due to the possibility of residue from surcharge. Refer to Figure 26 for a photo of this assumed manhole.
- The WAE data received indicates that there is another DN300 trunk sewer main crossing the site in an east-west direction, which also connects to the maintenance hole within Block 36 and continues towards the west as a DN225 running within the Kippax Place verge to service the Group Centre. There are several maintenance holes (refer to Figure 24 for photo of one of these manholes) over this DN225 sewer main within the Kippax Place verge. The existing sewer tie to Block 22 is connected to this DN225 main.
- The abovementioned DN300 trunk sewer main (with pipe material unknown) continues to the east and runs along the eastern verge of Moyes Crescent as a DN300 trunk main, and further south as a DN225 main, providing service to the residential area. There is a maintenance hole over this DN300 sewer main within the subject site. Refer to Figure 28 for a photograph of this manhole and its relative location to the site.
- Invert levels received in the WAE data indicate that the trunk DN375 sewer running through the site has a grade of approximately 1.7% from the southernmost end to the centre of the site and continuing with an approximate 1.2% and 0.8% grade to the north. The depth of the trunk sewer is in most places within the site in excess of 5m deep. This was also confirmed with the detailed survey undertaken as part of this Site Investigation Report.
- Invert levels received in the WAE data indicate that the existing sewer to the west of the Kippax shopping centre is approximately 2 to 3 metres deep and runs at an approximate grade varying from 0.7% to 1.5%.

Figure 22 - Sewer Maintenance Holes in Front of Health Centre Over the Existing DN375 Trunk Main

Figure 23 - Existing Sewer Manhole over the DN375 Trunk Main Near the Existing Stake Ramp

Figure 24 - Likely Manhole over the DN225 Sewer Main within the Kippax Place Verge

Figure 25 - Existing Manhole over the DN375 Main to the South of the Subject Site

Figure 26 – Likely a Buried Sewer Manhole over the DN375 Main within the Subject Site

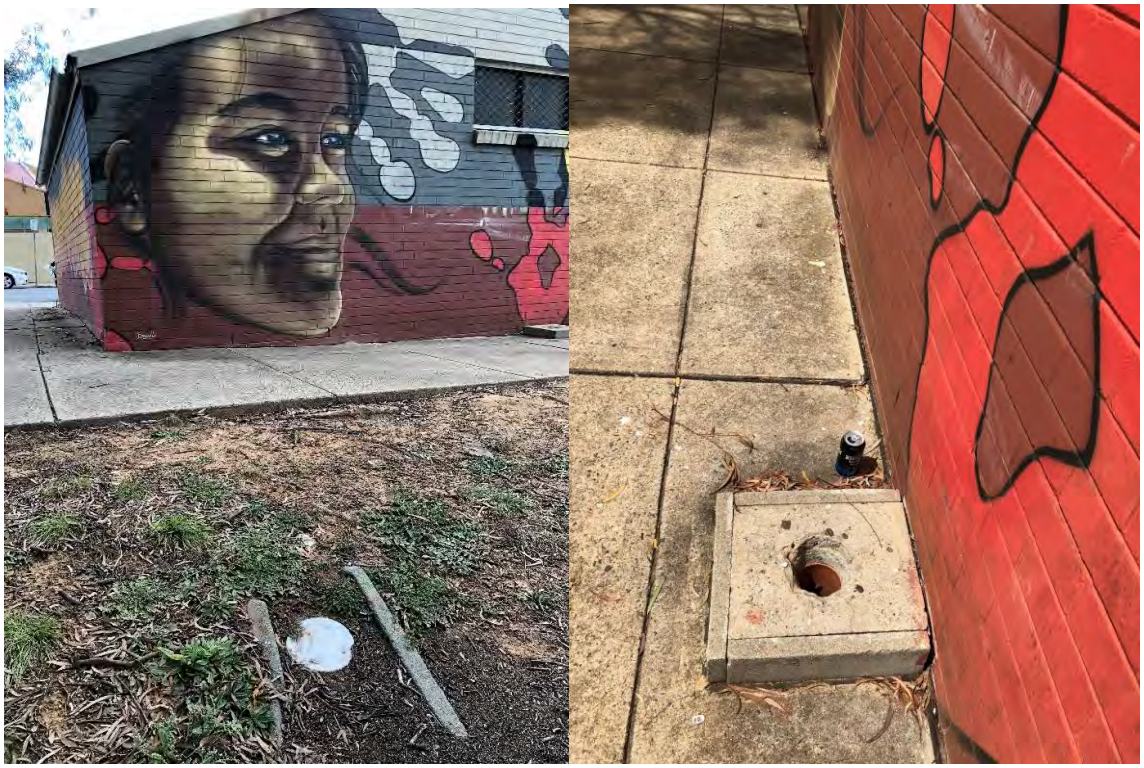

Figure 27 - Likely an overflow Relief Gully (ORG) to Block 6 (Right) and an Inspection Opening Riser on the Sewer Tie to Block 6 (Left)

Figure 28 - Sewer Manhole over the DN300 Main within the Subject Site

For further details on existing sewer infrastructure in proximity of the subject site, refer to Figure 29, which is extracted from DBYD information.

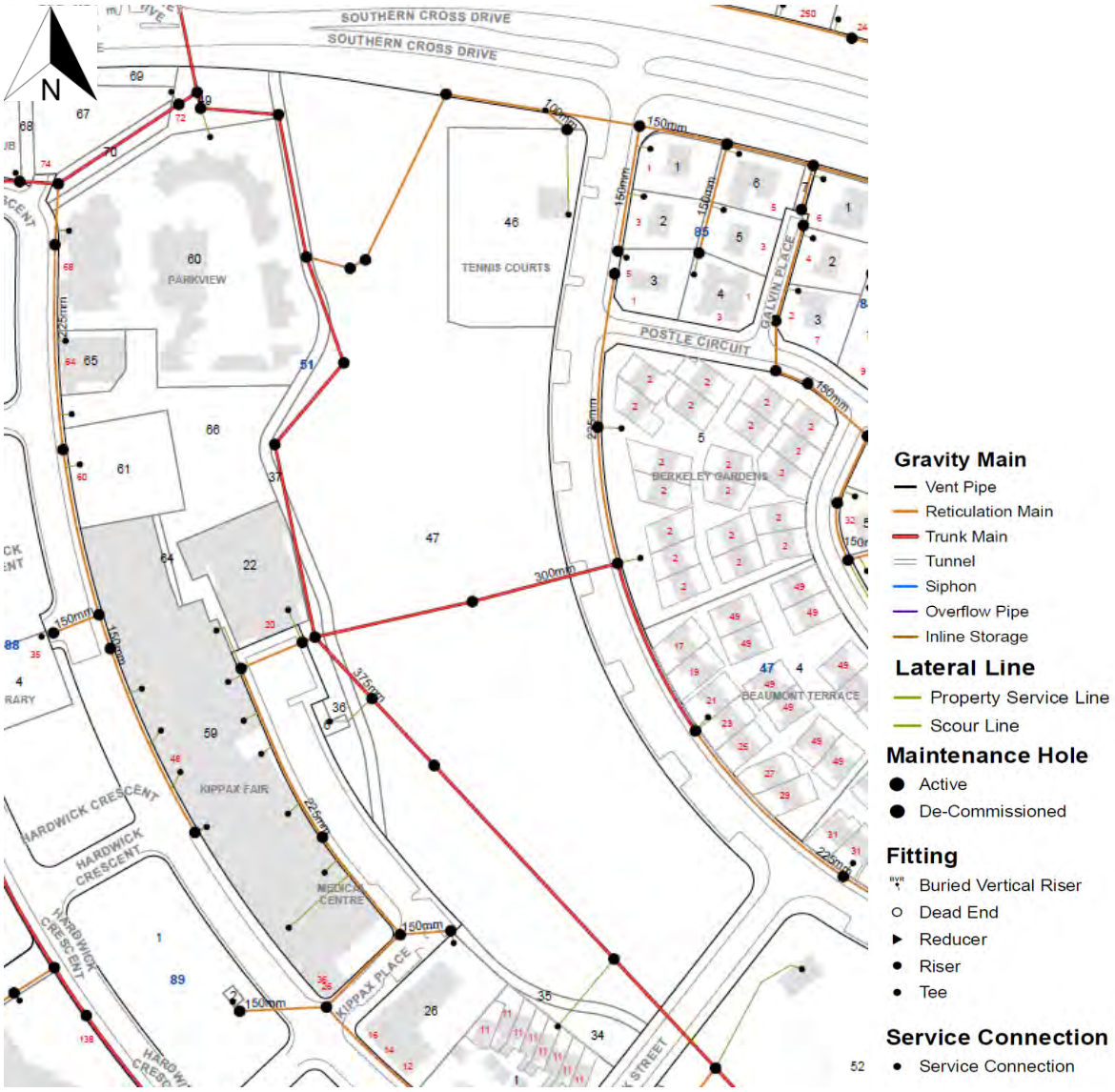

Figure 29 - Existing Sewer Infrastructure Near the Subject Site (DBYD)

7.3 Water Supply

The existing water service information has been compiled from Dial Before You Dig information, work as executed (WAE) records and preliminary advice provided by Icon Water.

As an established area, there is a water network surrounding and within the subject site. The relevant water infrastructure in close proximity to the subject site is as follows:

- DBYD information indicates that Block 6, and Block 22 and Block 47 Section 51 are serviced by water ties. The water meter to Block 6 was observed during the site inspection as shown in Figure 30.

Figure 30 - Existing Water Meter for Block 6 Section 51 Holt

- There is a DN150 water main running along the western portion of the subject site and within the western and southern verge of Kippax Place, which services part of the Group Centre.
- Blocks 6 and 22 are connected to this DN150 cast iron main.

There are three stop valves and five hydrants over this DN150 main along the Kippax Place verge and at the boundary of Block 22. Refer to Figure 31 for photographs of some of these stop valves and hydrants.

- The hydrant spacing over this DN150 main ranges from approximately 30m to 60m.
- The Kippax Group Centre is also serviced by a DN150 water main running along the north-eastern verge of Hardwick Crescent.
- The hydrant spacing over this DN150 main along Hardwick Crescent is approximately 45m. There are also several stop valves over this main that are spaced approximately 90m apart.
- DBYD information indicates that there is a DN150 water main along the eastern verge of Moyes Crescent, which services the adjacent residential blocks. There are several stop valves and hydrants over this main opposite the subject site. The hydrant spacing on Moyes Crescent is approximately 90m.
- Block 47 is connected to this DN150 main along Moyes Crescent, with a road crossing.
- There is a DN225 water main along the northern verge of Flack Street with a hydrant and stop valve at the Block 47 boundary.

Figure 31 – Some Existing Stop Valves and Fire Hydrants within Kippax Place

- DBYD information indicates that there is a DN375 trunk water main along the northern verge and within the carriageway of Southern Cross Drive.
- Water pressures for the DN150 water main along Hardwick Crescent (east) and the DN150 water main along the Kippax Place verge were provided by Icon Water in various demand situations and are listed below in Table 2.

Table 2 - Icon Water Available Pressure

Description	DN150 @ Hardwick Crescent (East) (Elevation = 569 m)	DN150 @ Kippax Place (Elevation = 567 m)
Max Static Pressure (m)	71	73
Min Pr @ Peak Demand	57	59
Min Pr @ Peak Demand + 10 L/s (m)	57	59
Min Pr @ Peak Demand + 20 L/s (m)	56	58
Min Pr @ Peak Demand + 30 L/s (m)	55	56
Min Pr @ Peak Demand + 40 L/s (m)	53	54
Min Pr @ Peak Demand + 50 L/s (m)	51	52
Min Pr @ Peak Demand + 60 L/s (m)	49	49
Min Pr @ Peak Demand + 70 L/s (m)	46	45
Min Pr @ Peak Demand + 80 L/s (m)	42	41
Min Pr @ Peak Demand + 90 L/s (m)	39	37
Min Pr @ Peak Demand + 100 L/s (m)	34	32
Min Pr @ Peak Demand + 110 L/s (m)	30	26
Min Pr @ Peak Demand + 120 L/s (m)	25	20
Min Pr @ Peak Demand + 130 L/s (m)	20	14
Min Pr @ Peak Demand + 140 L/s (m)	14	
Min Pr @ Peak Demand + 150 L/s (m)		

For further details on existing water infrastructure in proximity of the subject site, refer to Figure 32, which is extracted from DBYD information.

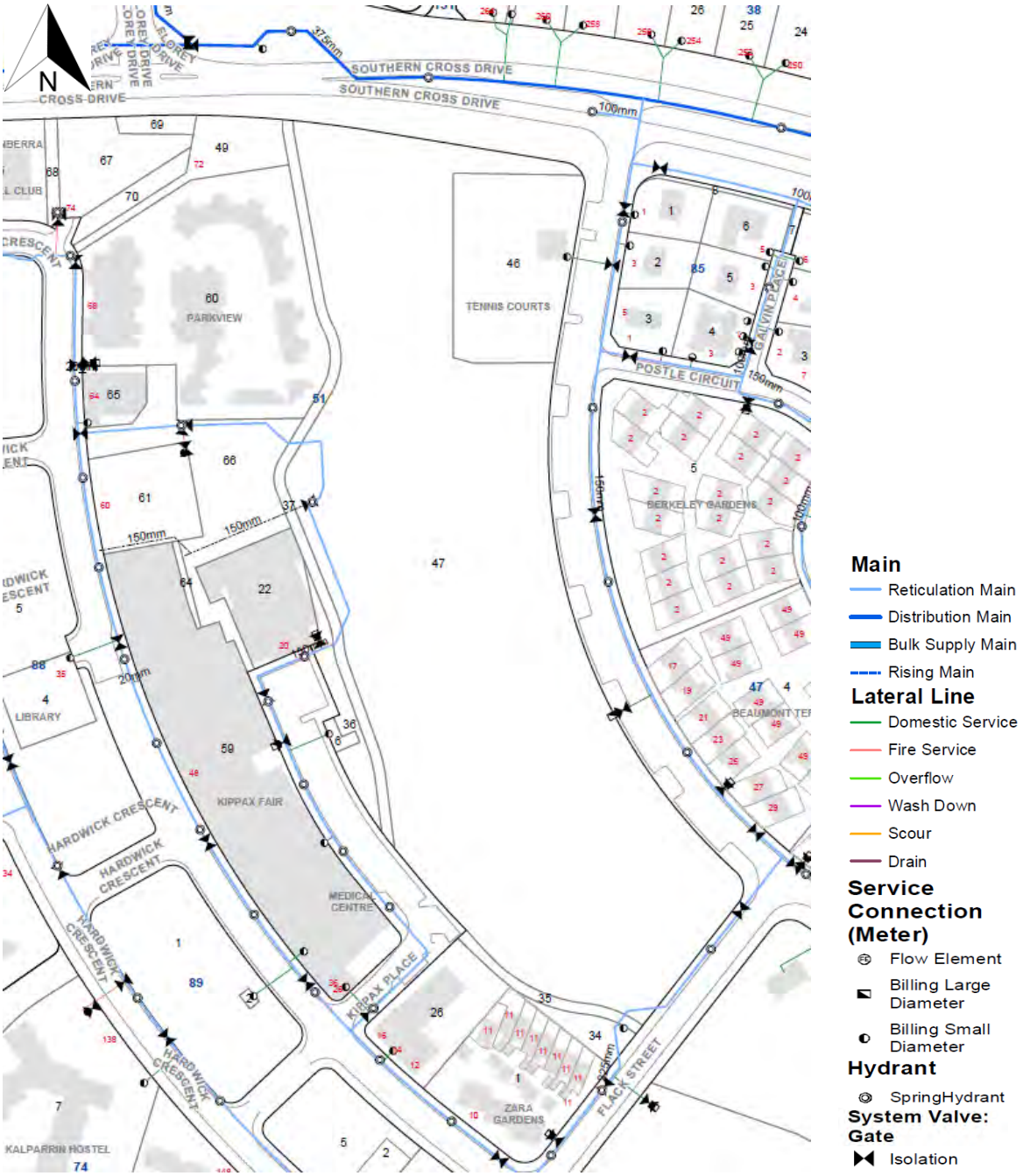

Figure 32 - Existing Water Infrastructure Near the Subject Site (DBYD)

7.3.1 Irrigation

The existing playing fields are fully irrigated with an irrigation system and controller on site. Several main irrigation lines are constructed of asbestos cement, whilst the branch lines are constructed of PVC pipe. Sprinkler heads are spaced at an approximate 20m grid across the site. Refer to Figure 33 for an excerpt of the work as executed plan available, and Appendix D for the full plan.

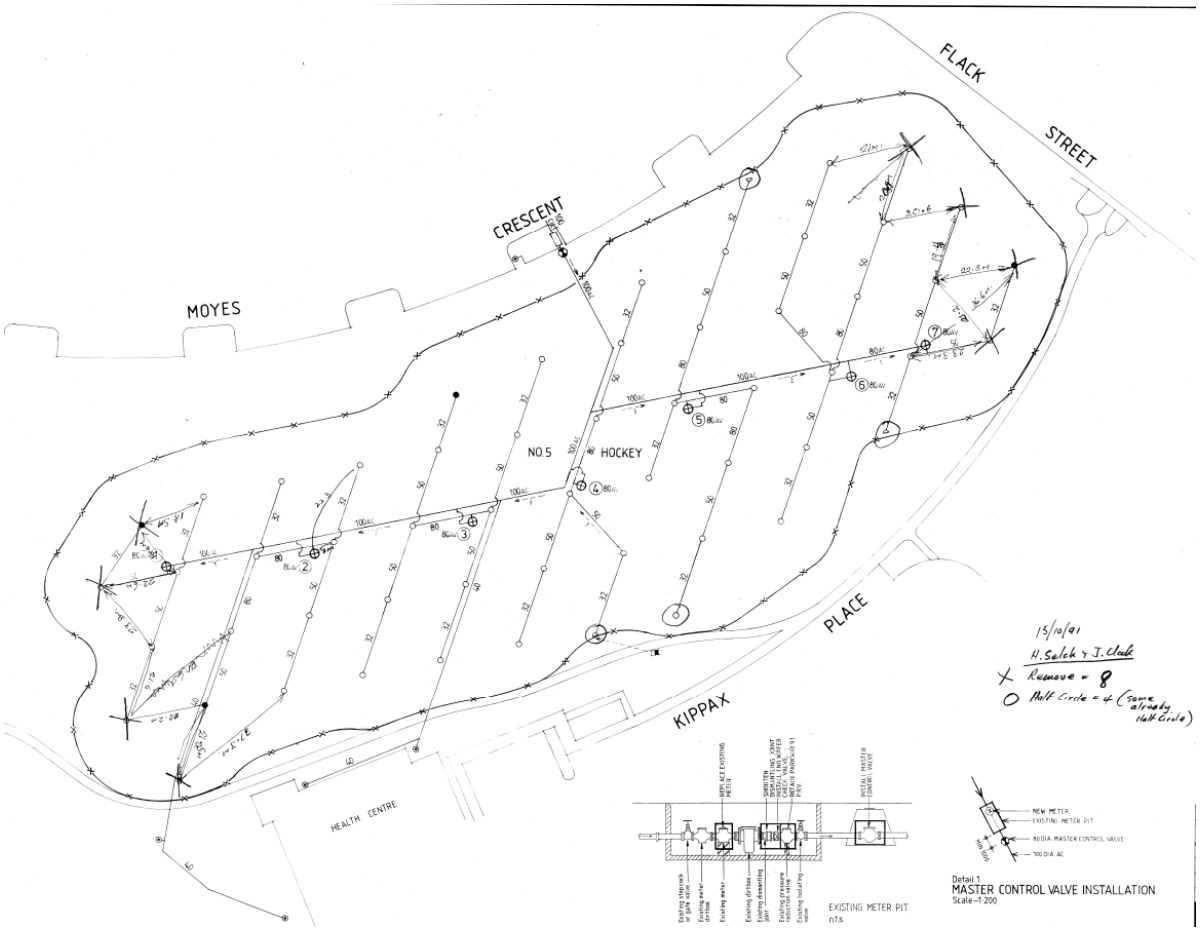

Figure 33 - Existing Irrigation Network Within the Subject Site (TCCS)

7.4 Stormwater Drainage

The existing stormwater infrastructure information is assembled from the TCCS Stormwater Database, the detailed survey by ACAT Surveys, and observations during a site inspection.

7.4.1 Existing Stormwater Infrastructure

- The subject site is serviced by 3 stormwater ties, one is to Block 6, one to Block 22 and one tie is to Block 66.
- There is a DN600 main within the site boundary running from the northernmost end of Kippax Place towards the east. There is a maintenance hole over this main near the south east boundary corner of Block 22, which could not be located during the visual site inspection. The tie servicing Block 6 drains to this maintenance hole and the DN600 main.
- Also, the stormwater tie to Block 59 connects ultimately to this maintenance hole and the DN600 main via a DN375 pipe at the northern end of Kippax Place.

Figure 34 - Existing SW Sump within Kippax Place

- There is a DN450 main running along the western verge of Kippax Place, which crosses under the street and continues towards the north along the eastern verge with a transition to a DN525 main. This main eventually connects to the abovementioned maintenance hole and the DN600 main. There are 5 stormwater sumps over this main along the Kippax Place verge. The existing stormwater tie servicing Block 26 Section 51 also connects to this main.

Figure 35 - Existing SW Sumps within the Kippax Place Verge

- The abovementioned DN600 discharges into a DN1800 trunk main running in a south-north direction. This trunk main has an alignment generally underneath a grassed swale within Block 47, which is located outside the eastern boundary line of the subject site. Refer to Figure 36 for a photograph of this swale.

Figure 36 - Grassed Swale along the Eastern Boundary of Block 47

- The abovementioned swale begins further south of the subject site (upstream) and crosses the Flack Street underpass, running to the east of the subject site towards the north. Beyond the Southern Cross Drive underpass, the swale contributes to a retardation basin and discharges to a major gross pollutant trap. The ultimate destination of the catchment is Ginninderra Creek to the north.

Figure 37 – Low Point within the Flack Street Underpass, which Forms into a Swale Draining to the North

- There is an existing DN375 stormwater main located within the northern portion of the subject site and is running west to east connecting to the DN1800 trunk main to the east of the site. The stormwater ties servicing Blocks 22 and 66 are connected to this DN375 main via maintenance holes over this main. It is likely that the stormwater tie within Block 66 drains part of the existing Group Centre on Block 59 Section 51. Figure 38 shows a double plantation sump over this DN375 stormwater main.
- An existing DN900 trunk stormwater main runs within the carriageway of Moyes Crescent, which ultimately discharges to the DN1800 trunk main. Figure 39 shows a stormwater sump within Moyes Crescent that branch connects into this main.

- There are 4 plantation sumps over the grassed swale embankment that are connected to the DN1800 trunk main. Two of these sumps were observed during the site inspection and captured in Figure 40.

Figure 38 - Plantation Sump and Maintenance Hole over the DN375 Stormwater Main Immediately outside the Subject Site Boundary

Figure 39 - SW Sump within Moyes Crescent

Figure 40 - Existing Plantation Sumps over the Grassed Swale Invert

7.5 Overland Flow and Flooding

Based on the site inspection and review of site contours, it has been determined that the subject site falls from the south towards the north. The slope varies within and surrounding the subject site.

The majority of the subject site slopes gently in a south to north direction. This includes the area covered mainly with playing fields, which fall with an approximate 1.4% grading over a distance of approximately 270 metres. The Kippax Place road reserve to Block 66 falls with an approximate grade of 3.2% over a distance of approximately 250 metres. Refer to Figure 41 for a general view of Kippax Place.

Figure 41 - A View of Kippax Place Looking North

However, as shown in Figure 42, Blocks 36 and 37 and the most south-west portion of Block 47 fall from west to east with a steep grade of approximately 18.5% over a distance of approximately 16m.

Figure 42 - Steep Slope to the West of the Playing Fields

The subject site is mainly bounded by existing roadways and floodways that impede overland flows from entering the subject site. Also, the southern portion of Block 47, which is outside the boundary of the subject site, is graded towards the grassed swale to the east and away from the subject site. Therefore, the area contributing to overland flow is limited to the proposed development area, which

is approximately 2.5 hectares. It is assumed that the 1% AEP storm is contained within the respective road corridors. However, the site may be impacted by the 1% AEP storm after the development of part of Kippax Place. Previously undertaken flood studies have shown that immediately to the west of the existing Kippax Group Centre development, 1% AEP flood levels are not completely contained within Hardwick Crescent. This is more evident in the area north of the subject site. The existing floodway to the east of the subject site does contain the 1% AEP with no apparent encroachment into the subject site. Refer to section 6.2 of this report for the Literature Review of the previously undertaken flood study for further flood and overland flow information surrounding the site.

Refer to Figure 43 for a stormwater overland flow and catchment diagram for the subject site.

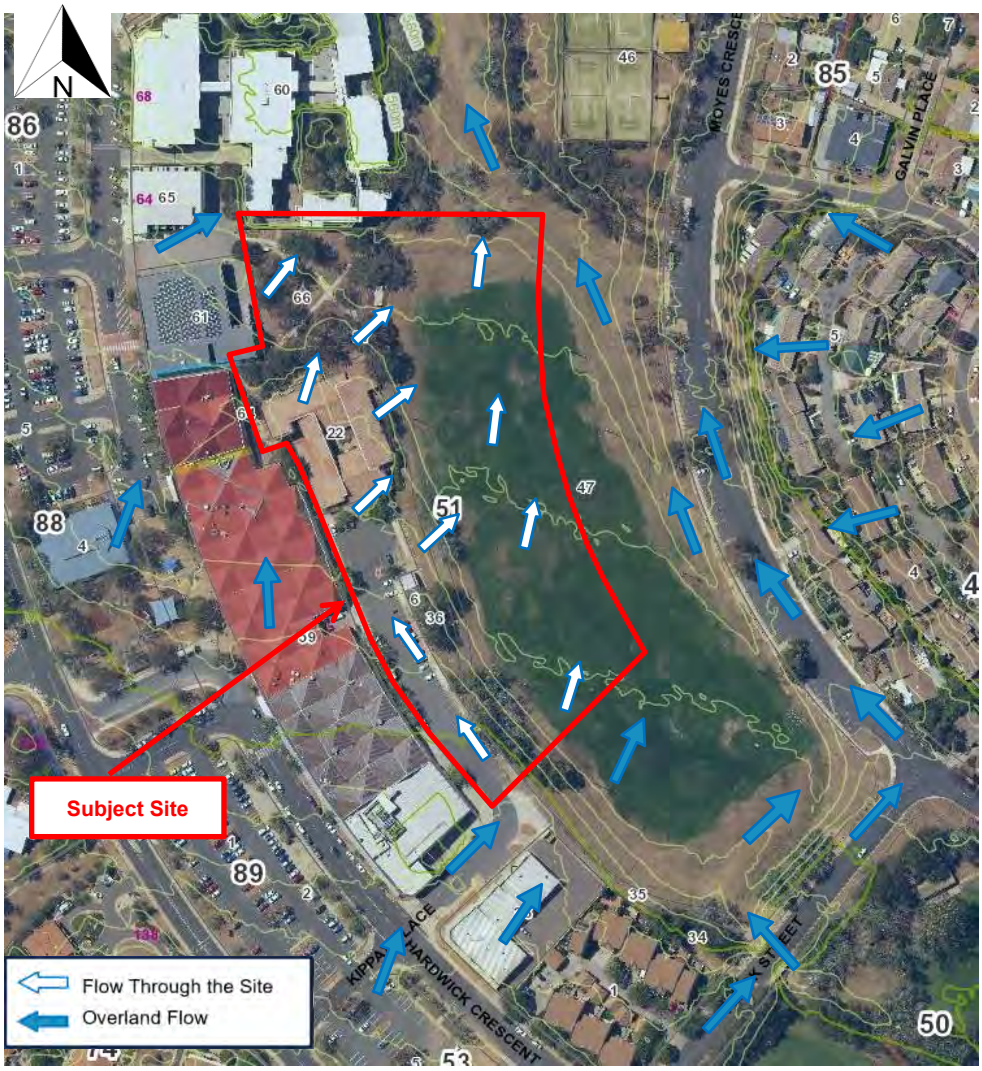

Figure 43 - Stormwater Overland Flow Diagram

The current flood mapping listed on ACTmapi does not depict the subject site to be within the available 1% AEP flood modelling footprint. For further flood analysis for the subject site refer to Section 6.2 of this report.

The overland flow from the neighbouring area is being directed to Ginninderra Creek towards the north, which ultimately discharges to Murrumbidgee River further north west.

Refer to Figure 44 for an image of the flood extents in relation to the subject site's location.

Figure 44 - Flood Extent Model Available on ACTmapi and Subject Site Location

7.6 Telecommunication Services

The following telecommunication infrastructure information has been compiled from DBYD information.

7.6.1 Telstra

The DBYD information indicates that a Telstra service line is available to the subject site via Block 22. This Telstra connection to Block 22 is via a line, which is running along the western and northern verge of Kippax Place.

Two Telstra pits over this line are located within the subject site boundary, which were observed during the site inspection. Refer to Figure 45 for a photograph of these pits, which are defined as Type 6 in the DBYD information.

Figure 45 - Existing Telecommunication Pits within Kippax Place and Adjacent to Block 22

In reference to the DBYD information, Telstra provide service to the surrounding commercial area and Kippax Group Centre adjacent to the subject site.

7.6.2 NBN

The DBYD information indicates that Block 22 within the subject site is serviced by NBN.

The NBN cables are colocated within the abovementioned Telstra conduits and the pits pictured in Figure 45.

7.6.3 TransACT

Based on the DBYD information, there are TransACT assets crossing underneath the subject site. These conduits are located underneath Kippax Place's verges, Blocks 6, 36, 37, 64 and 37. A TransACT double-lid pit was observed during the site inspection, which is shown in Figure 46.

Figure 46 - TransACT Pits within Block 66.

7.6.4 Optus

DBYD information indicates that there are no Optus assets in close proximity to the subject site. However, the information received indicates that there is a major line running under the western verge of Hardwick Crescent.

Details of existing telecommunication infrastructure within proximity of the subject site is shown on drawings 201053-DRG-CIV-UT-0501-E and 0502-E within Appendix A.

7.7 Gas Supply

The DBYD information indicates that the site is not currently serviced by a gas connection/tie.

The information received indicates the gas network in close proximity to the subject site is as per the below:

- There is an existing 32mm 210kPa high pressure gas main in the eastern verge of Moyes Crescent, which services the residential blocks to the east.
- There is an existing 32mm 210kPa high pressure gas main in Hardwick Crescent at the frontage of the Kippax Group Centre, which has tie connections to the shopping centre. Refer to Figure 47 for a photograph of the stop valve over this gas main within a tree pit.

Figure 47 - Existing Stop Valve over the Gas Main in Hardwick Crescent

7.8 Electrical Supply and Streetlighting

Received information from Evoenergy indicates that the subject site has 5 electricity service points. These service points are to Blocks 6, 36, 47 and two points to Block 22.

Based on DBYD information, received information from Evoenergy and TCCS, and a site inspection, the electrical infrastructure in close proximity to the subject site has been identified as follows:

- Four streetlights and underground infrastructure are present within the western verge of Kippax Place and in front of Block 22. These streetlights are within the proposed area for development. This underground infrastructure connects to the infrastructure along Hardwick Crescent.

Figure 48 - Streetlighting within the Kippax Place Verge

- An underground service line is located on the eastern verge of Kippax Place servicing Blocks 6, 36 and 47.
- There is an underground service line within Blocks 64 and 66, which services Block 22. This line runs under the existing shopping centre and connects to the infrastructure within Hardwick Crescent.
- Four streetlights are present within the first portion of Kippax Place, fronting Block 26. These streetlights are outside the subject site's boundary.
- There are five floodlights and associated underground electrical infrastructure within Block 47, servicing the existing playing fields. Refer to Figure 49 for photograph of these floodlights.

Figure 49 - Floodlights Around the Perimeter of the Playing Fields

- There are nine streetlights and their associated underground infrastructure within Block 66, where two of these lights are shown in Figure 50.

Figure 50 - Streetlights within Block 66

- There is a substation within Block 66 as shown in Figure 51. This substation services an underground HV line, which is running underneath the Kippax Group Centre and connects to the HV line along Hardwick Crescent.

Figure 51 – Existing Electrical Substation within Block 66

There is an electrical switchboard for the floodlighting to the playing fields in Block 47. A photograph of this switchboard and its relative locality is captured in Figure 52.

Figure 52 - Existing Switchboard over Boundary of Blocks 36 and 37

7.9 Boundaries and Easements

Based on the information provided within ACTmapi, no easements are currently recorded within the subject site. However, DBYD information, WAE data, the TCCS Stormwater Database and a site inspection confirm that two stormwater pipes, a sewer main, a water main, electrical and streetlight infrastructure exist within the site boundary.

The subject site does not currently have a formal consolidated boundary as it is a combination of part and whole blocks and a road reserve.

The creation or consolidation of a new boundary that suits the recent Holt Precinct Map and Code would be subject to a DA process. Refer also to section 8.8 for proposed boundary to the subject site based on assumptions taken from the Holt Precinct Map and Code and engineering constraints.

7.10 Verge Works

The nature of adjacent road reserves and associated verges is outlined below. All dimensions are approximate and only describe the areas adjacent to the site.

- Kippax Place road reserve (section fronting Block 26 that is not subject to future development): 16.5m (boundary to boundary) with the following attributes:
    - Kippax Place carriageway: 8.5m (kerb to kerb).

- North verge: 1m wide, fully planted with no footpath.
- South verge: from 1.5m to 6m wide, with 1.2m wide concrete slab footpath with streetlights and no trees.
- Kerb type: Upright
- Perpendicular and parallel on-street parking is allowed with formalised linemarking.
- Speed limit: not signed, it is deemed to follow the rule of the Group Centre's 40km/hr zone.
- Pram ramps at the intersection with Hardwick Crescent with raised threshold formalised pedestrian crossing (refer Figure 53).

Figure 53 - Pedestrian Crossing at Kippax Place and Hardwick Crescent Intersection

Figure 54 - A General View of Kippax Place Outside the Subject Site

- Moyes Crescent road reserve: 23.5m (boundary to boundary) with the following attributes:
    - Moyes Crescent carriageway: 10m (kerb to kerb).
    - East verge: 4.6m wide with 1.5m wide concrete slab footpath, nature strip with, street trees and no streetlights.
    - West verge: 1m wide, with 1.5m wide concrete slab footpath, which encroaches into the Block 47 boundary, with trees and streetlights.
    - Kerb type: Upright

- Perpendicular on-street parking is allowed with formalised linemarking.
- One bus stop on each side of the road.
- Speed limit: not signed, it is therefore deemed to be 50km/hr.
- Pram ramps at the intersection with Flack Street.

- Flack Street road reserve: 19.5m (boundary to boundary) with the following attributes:
  - Flack Street carriageway: 10m (kerb to kerb).
  - North verge: 4.5m wide, nature strip with 1.5m wide concrete footpath, streetlights and no trees.
  - South verge: 4.3m wide, nature strip with no footpath, streetlights and no trees.
  - Kerb type: Upright
  - No parking sign was observed within the area.
  - Speed limit: not signed, it is therefore deemed to be 50km/hr.
  - Pram ramps before the intersection with Hardwick Crescent with a refugee island no pedestrian crossing linemarking.

A search on ACTmapi indicates that there is a survey marker adjacent to the site, at the corner of Kippax Place adjacent to the site boundary as shown in Figure 55. This survey marker could not be located on site during a visual inspection, nor is it shown in the ACT Survey detailed survey (2021).

Figure 55 - Existing Survey Marker Adjacent to the Site

7.11 Traffic, Parking and Access

7.11.1 Traffic

The subject site is located east of the Kippax Group Centre with Moyes Crescent to the east, Kippax Place to the west and south of the site, Flack Street further to the south, Southern Cross Drive to the far north and the Hardwick Crescent loop road to the west. Within the subject site is the Kippax Community Centre building (Block 22 Section 51).

The subject site is located in an area characterised primarily by commercial shops, high, medium and low density residential dwellings as well as a number of community and educational institutions (e.g.

YMCA Early Learning Centre, Kippax Tennis Club, Kippax Uniting Church, Raiders Belconnen Club etc.). The subject site is currently unoccupied, except for the Kippax Community Centre building on Block 22, Section 51 and is located within the existing playing fields between the Kippax shops and Moyes Crescent. In accordance with the Estate Development Code (2020), Moyes Crescent and Flack Street are classified as Minor Collector roads by their road geometry, including carriageway and verge widths. Similarly, Kippax Place and Hardwick Crescent (east) can be classified as an Access Street B, although some sections could classify as a Minor Collector. Starke Street is a Major Collector by definition in the Estate Development Code and Southern Cross Drive is an Arterial Road.

Based on the ACT Road Hierarchy Plan (refer to Figure 56 for an excerpt), and the ACT Government Active Travel Infrastructure Practitioner's Tool (refer to Figure 57 for an excerpt), a summary of the classifications of roads within the vicinity of the site is detailed in Table 3 below. This is with the exception of Flack Street, which has been assessed to meet the road geometry requirements under the Estate Development Code as a Minor Collector Road. It is also noted that the ACT Road Hierarchy Plan depicts part of Hardwick Crescent as a Minor Collector road.

Table 3 - Road Traffic Classification

Road Name	Classification
Moyes Crescent	Minor Collector
Kippax Place	Access Street B
Hardwick Crescent (east)	Access Street B
Flack Street	Minor Collector
Southern Cross Drive	Arterial
Starke Street	Major Collector

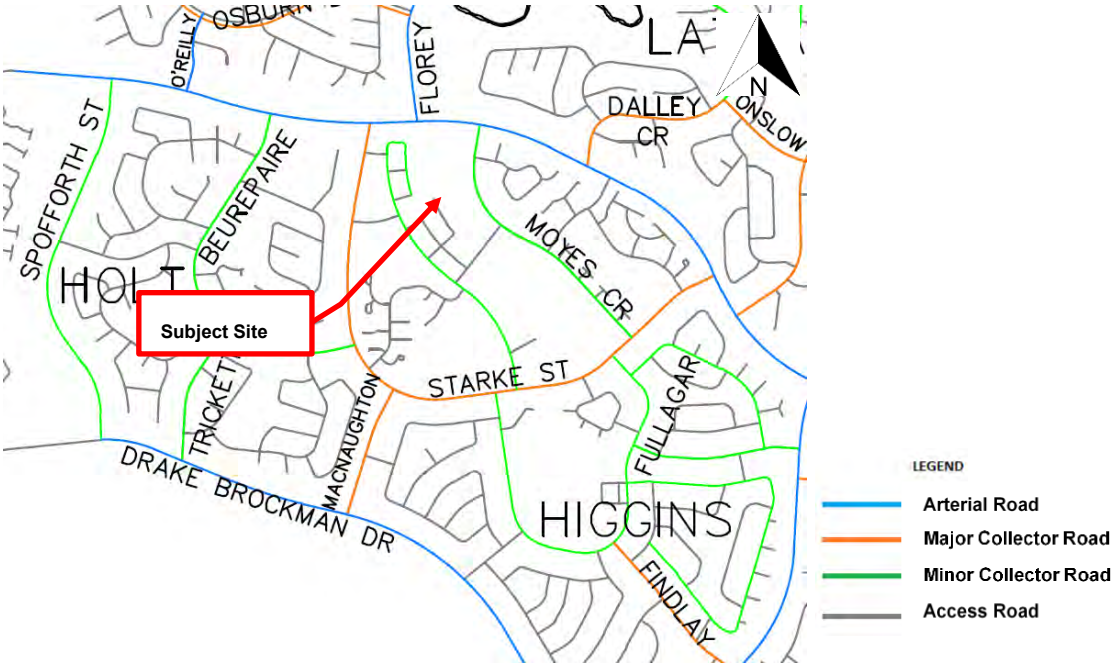

Figure 56 - Excerpt from the ACT Road Hierarchy Plan for the Local Road Network Surrounding the Subject Site

Figure 57 - Excerpt from the ACT Active Travel Infrastructure Practitioner's Tool for the Local Road Network Surrounding the Subject Site

Importantly, during the site inspection, it was noted that the ACT Government (TCCS) is currently upgrading the Starke Street and Southern Cross Drive intersection. This is due to an ongoing traffic congestion issue within this area. Refer to Figure 58 below for site phot taken in May 2021 during construction works on this intersection.

Figure 58 – Intersection Upgrade Work Currently Underway for Starke Street and Southern Cross Drive

The demographics for the local area from the Canberra Strategic Transport Model (CSTM) provided by ACT Government TCCS are detailed in Table 4 and Figure 59 below. The data indicates that the site is located in an area (CSTM Zone 031502 and 031506) that primarily contains retail and employment land use.

Table 4 - Demographic Data for the Subject Site CSTM Zone

District	Suburb	CSTM Zone ID	Population	Employment	Retail Space (GFA)	School Enrolments
			2021	2021	2021	2021
Belconnen	Holt	031502	290	780	22,967	0
Belconnen	Holt	031506	0	24	0	0

Figure 59 - CSTM Zone Area for the Subject Site and Surrounding Area

An assessment of the current traffic condition was undertaken based on the midblock traffic volume that was estimated to 2021 volumes, produced by EMME and TransCAD modelling provided by the ACT Government TCCS.

The current (2021) traffic volume data for Hardwick Crescent, Kippax Place, Moyes Crescent, and Flack Street indicates that all these streets are operating at very low to low levels of congestion during both AM and PM peak periods (less than 0.25 volume/capacity). However, Southern Cross Drive between Moyes Crescent and Florey Drive is currently operating over capacity for eastbound traffic in the AM peak and is operating at capacity in the PM peak reverse (westbound). The EMME/TransCAD 2021 model suggests that Starke Street is operating within its capacity (up to 0.70 volume/capacity) in the southbound lane for the AM peak and northbound lane in the PM peak.

Refer to Figure 60 and Figure 61 for the 2021 AM & PM peak traffic volumes produced from the CSTM, respectively.

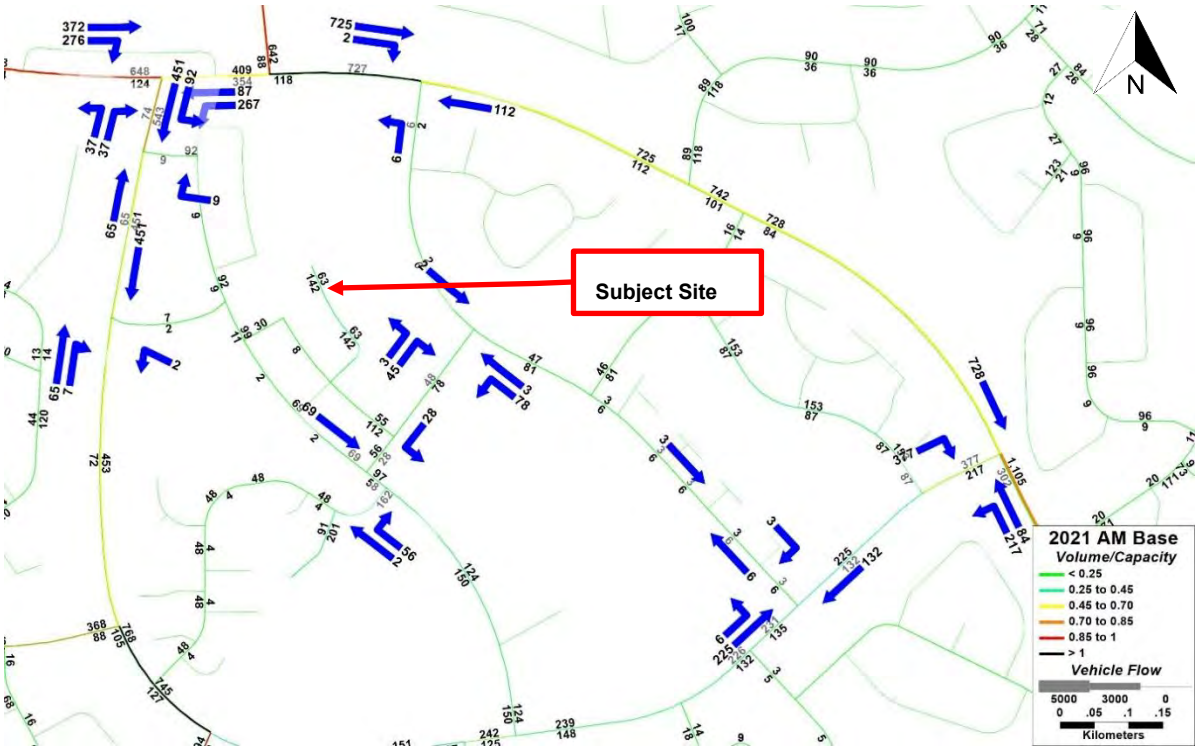

Figure 60 - CSTM Modelling - 2021 AM Peak Volumes

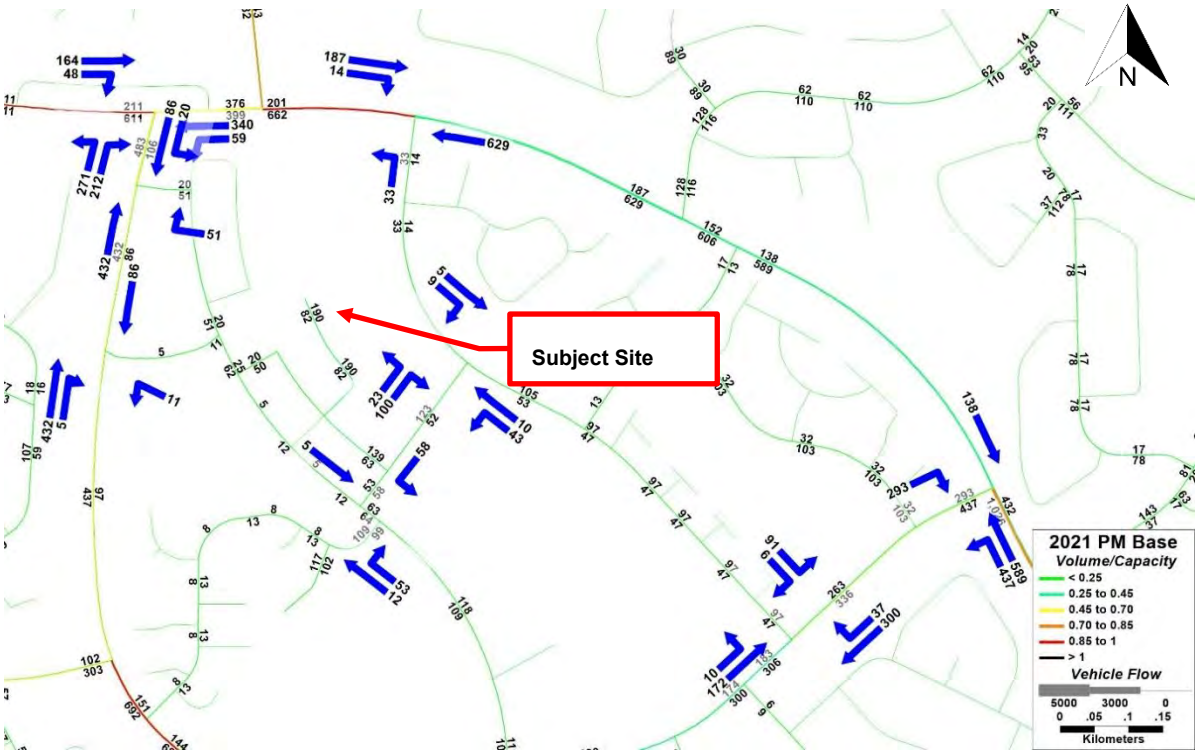

Figure 61 - CSTM Modelling - 2021 PM Peak Volumes

7.11.2 Parking

Car parking is extensively available around the Kippax Group Centre as off street and on street public parking. This is mainly supplied within Kippax Place and in and around Hardwick Crescent. A breakdown of the existing car park spaces by their category are listed below:

- 23 disabled spaces
- 95 one hour or less bays
- 237 two hour bays
- 44 three hour bays
- 113 unrestricted bays
- 15 park and ride spaces
- 25 other category parking spaces

There are therefore a total number of 552 parking spaces in the area.

Car parking is also permitted along Moyes Crescent where 72 perpendicular on street parking bays are provided (Refer Figure 62).

Figure 62 - Existing Carparking along Moyes Crescent

7.11.3 Access

- **Pedestrian and Cycle Access:** An approximate 1.8m to 2.0m wide asphalt and concrete footpath extends from the Flack Street underpass to the Southern Cross underpass and traverses through the subject site. This path in sections has bollards and log barriers flanking it to prevent vehicle access to the playing fields and open space areas. See below Figure 63 and Figure 64 for photographs of these paths.

Figure 63 - Footpath Extends from the Flack Street Underpass to the Southern Cross Underpass

Figure 64 - Footpath Traverses Through the Subject Site

- An approximate 2.0m wide path is present along the eastern side of Kippax Place. This footpath offers connectivity to the shared path mentioned above that extends from Flack Street to Southern Cross Drive. See Figure 65 for photograph of this path.

Figure 65 - Existing Shared Path in Kippax Place East of Kippax Group Centre

- A shared path that stretches from Moyes Crescent to the Group Centre is present north of the subject site. This connects to the abovementioned path network and is approximately 1.5m wide.
- **Vehicular Access:** Currently, the subject site has formalised vehicular access via Kippax Place. There is a ranger's gate present off Moyes Crescent with a vehicular crossing to gain access to the site. See Figure 66 for details.

Figure 66 - Existing Rangers Gate off Moyes Crescent

7.12 Transport Canberra and Bus Servicing

The subject site is located adjacent to the Kippax Group Centre, therefore there are a number of ACTION bus stops in close proximity to the subject site within Moyes Crescent and Hardwick Crescent.

The Kippax Interchange is also located in close proximity to the subject site. There are 5 bus routes that service the area. These routes are:

- R2, which is a Rapid bus route and services between Dunlop and Canberra City.
- Bus No. 40, which services between Dunlop and Belconnen via north west Belconnen.
- Bus No. 903, which is a local route and services between Strathnairn and Kippax Interchange.
- Bus No. 44, which services between Macgregor and Belconnen via south west Belconnen.
- Bus No. 45, which services between Kippax Interchange and Belconnen (Cohen Street Interchange) via south west Belconnen.

Bicycle cages and Park and Ride facilities are also available at Kippax Interchange.

Refer to Figure 67 for an excerpt of the ACTION Bus route map in this location.

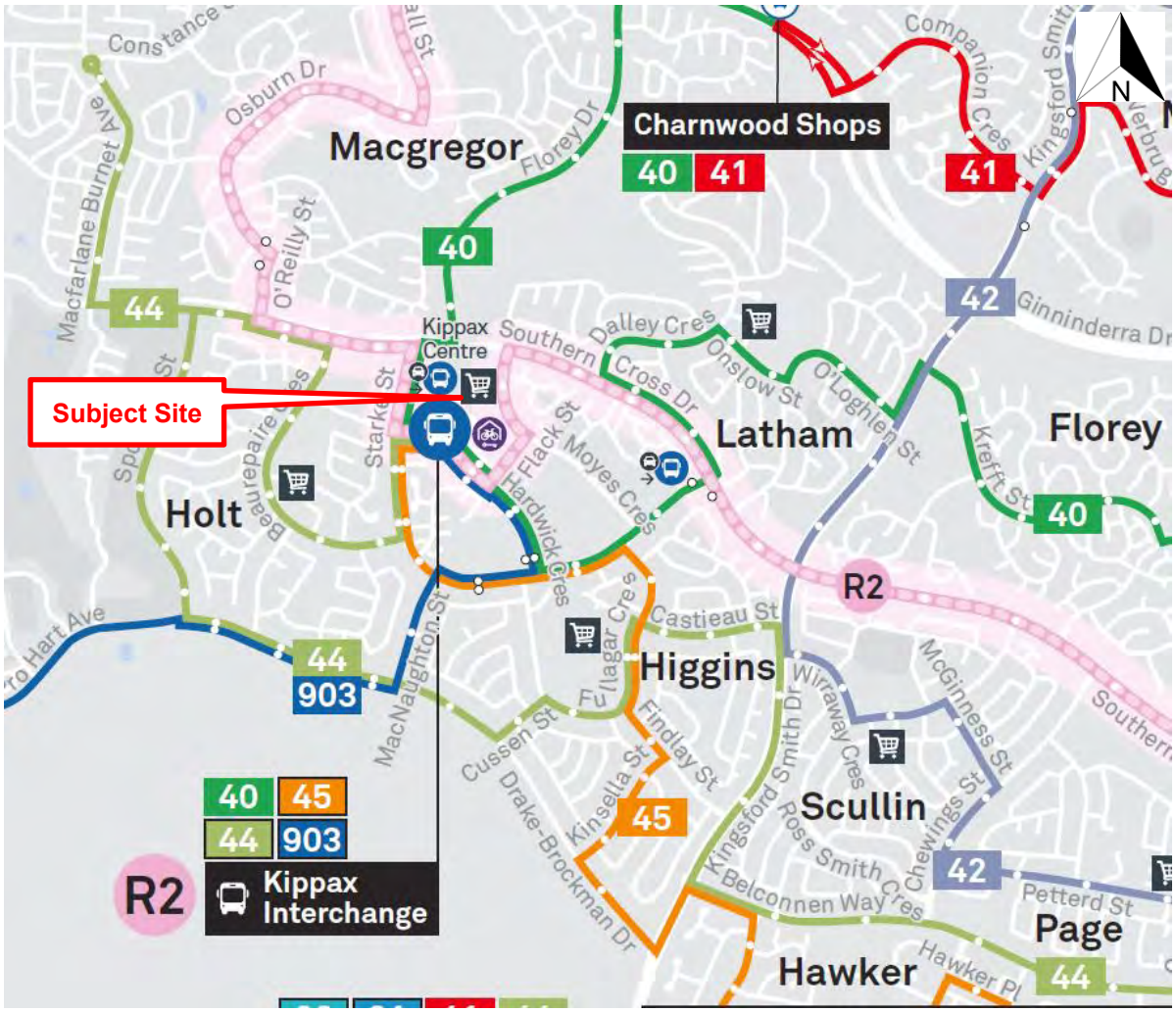

Figure 67 - Bus Routes Surrounding the Subject Site - Extracted from Transport Canberra

7.13 Specialist Investigations

7.13.1 Heritage

A heritage assessment was not completed as part of this Site Investigation Report. However, reference was made to the ACTmapi database and the ACT Heritage Register located on the ACT Government Environment and Sustainable Development website (https://www.environment.act.gov.au/heritage/heritage_register/register-by-place).

The register indicates that no current listings exist for the subject site.

JPS Engineering Consultants has also undertaken preliminary consultation with the ACT Heritage Council regarding the heritage status of the site. The Council has confirmed that the blocks within the subject site are not subject to Heritage Act 2004 provisions. ACT Heritage also advised that any suspected Aboriginal places or objects that are being unearthed at any stage should be reported to the ACT Heritage Council within 5 days. Refer to Appendix C for correspondence.

7.13.2 Ecological

Reviewing ACTmapi data indicates that the subject site is within:

- Core Habitat zone; Covers low value regional links between core habitat for Generalist and Forest models.
- Canopy Gap of 100m – 195m.

The subject site is not within an Environmental Offset area. Refer to Figure 68 for ecological map extracts from ACTmapi.

The ACTmapi database indicates that there are no registered trees within the site.

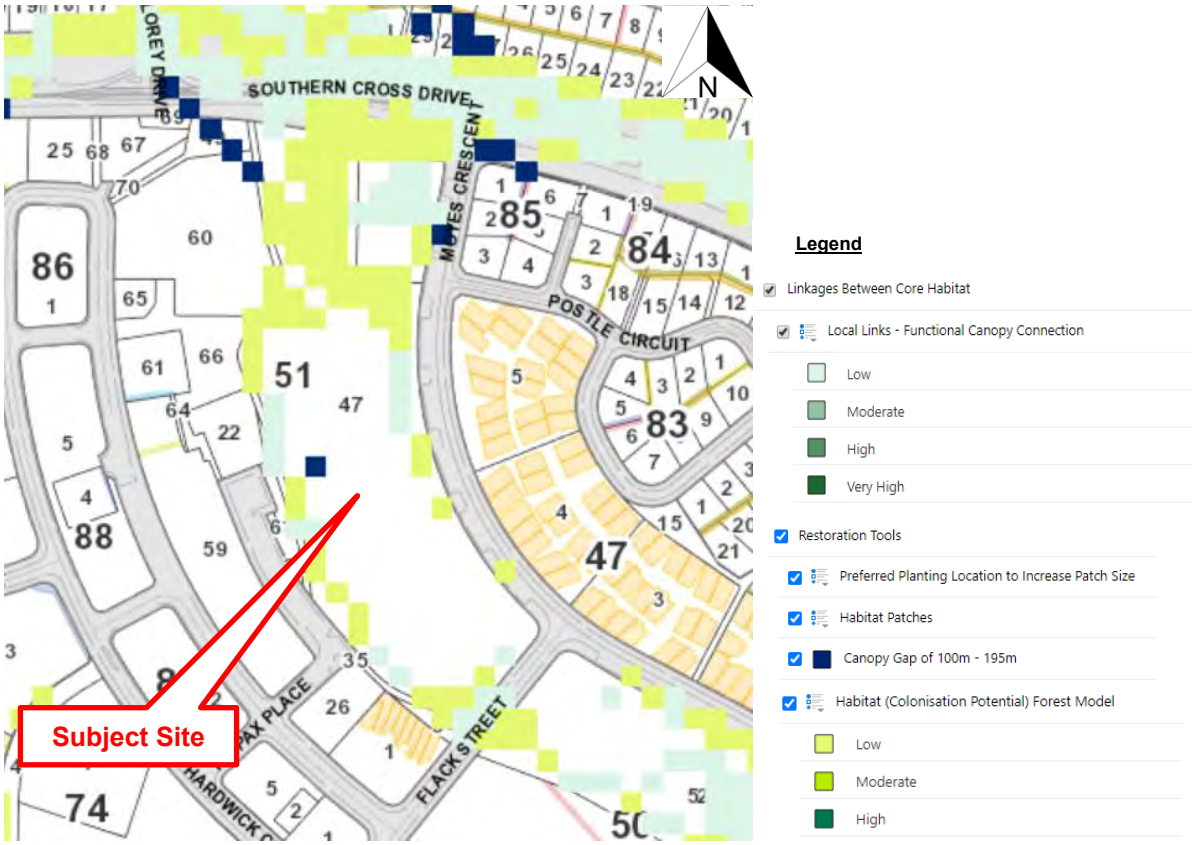

Figure 68 - ACTmapi Ecological Map

In recognition of this, a desktop review of available literature and data was conducted to gain contextual information about the site and determine the likelihood of the presence of threatened species or ecological communities.

The Protected Matters Search Tool and ACTMapi did not identify any ecological values within the study area or the surrounds.

During a site inspection a variety of native trees, some of which were likely planted, were identified. This included but is not limited to: *Eucalyptus rossii* (Scribbly gum), *E. melliodora* (Yellow box) and *Casuarina cunninghamiana* (River sheoak). Exotic Birch trees were also common. The ground layer in both the treed areas and the playing fields was dominated by exotic grasses (especially *Paspalum dilatatum*) and herbs (for example, *Plantago lanceolata* and *Trifolium* spp.).

The vegetation identified on site is not considered to constitute a native vegetation area as defined in the NC Act. As such, clearing of vegetation in the development area would not trigger the requirement to undertake an impact assessment under Schedule 4 of the PD Act.

A number of bird species common to urban areas were observed and are listed in the table shown below in Figure 69.

Common name	Scientific name
Australian magpie	*Cracticus tibicen*
Common starling*	*Sturnus vulgaris*
Crested pigeon	*Ocyphaps lophotes*
Galah	*Eolophus roseicapilla*
Magpie-lark	*Grallina cyanoleuca*
Noisy miner	*Manorina melanocephala*
Red wattlebird	*Anthochaera carunculata*
Red-rumped parrot	*Psephotus haematonotus*
Striated pardalote	*Pardalotus striatus*
Sulphur-crested cockatoo	*Cacatua galerita*
Welcome swallow	*Hirundo neoxena*
Willie wagtail	*Rhipidura leucophrys*

*Introduced species

Figure 69 - Bird Species Observed Within the Study Area

While these species are likely using the trees for shelter and foraging, none of the trees were old enough to contain any hollows that could be used for breeding and therefore the vegetation is not considered important habitat. The presence of mature, native street trees surrounding the study area means that connectivity through the urban landscape would not be significantly affected by the clearing of vegetation within the development site.

In addition, no threatened species were observed or are likely to be present in the area. Refer to Appendix G for full ecological report.

Following correspondence with ACT Parks and Conservation Service (EPSDD), highlighted that the group of trees circled in blue in Figure 70, have been shown to be important for the movement of the Superb Parrot in the area, but are not considered critical because no direct sightings of the bird have been recorded. Whilst this is the case in this circumstance, Parks and Conservation would prefer to see trees protected where appropriate to enhance Superb Parrot habitat connectivity through these areas in the future.

Figure 70 – Potential Superb Parrot Habitat Identified by the ACT Conservator

7.13.3 Bushfire

The current bushfire mapping listed on ACTmapi demonstrates that the subject site is not within a Bushfire Prone Zone or Bushfire Operational Zone (Fuel Management) or Fire Management Zone. However, the Bushfire Prone Zone extends near the north boundary of the site. Refer to Figure 71 for bushfire map extracted from ACTmapi.

Figure 71 – ACTmapi Bushfire Map

7.13.4 Environmental

A preliminary desktop environmental and subsequent detailed environmental (intrusive) site investigation was undertaken for the site.

Based on the findings of these site investigations, the key findings are summarised below:

Soil Investigation:

- Fill materials were identified in the soil across the site.
- These materials correspond with an imported road base layer used as a part of the establishment of Moyes Crescent and Kippax Place and reworked materials likely sourced from the site and its surroundings.
- Fill was also used for the construction of the playing fields where a creek was filled for levelling purposes.
- Contaminants of potential concern (COPCs) were below the adopted criteria in all soil samples analysed.
- Overall, no anthropogenic material was observed with the exception of borehole S3 located on the playing field which had traces of concrete and brick. No potential asbestos containing materials (ACM) were observed.

Groundwater Investigation:

- A perched body of water was observed in the locations of monitoring wells GW3 and GW5 at approximately 1 – 2 m below ground level (bgl).
- A deeper aquifer at 6 – 10 m bgl was inferred based on the depths of existing wells and water strike at 9.5 m bgl observed while installing well GW51.
- Concentrations of benzene, nickel and zinc above the *Australian Drinking Water Guideline* (ADWD, 2011) criteria were observed in GW1, GW2, GW3 and GW5 and these are inferred to be indicative of background concentrations associated with the natural rock mineralisation of the area.
- Benzene concentrations in GW1, GW2, GW3 and GW5 indicate that groundwater in this area is likely impacted by an operating service station located approximately 100 m to the southwest of the site on Block 1 Section 53. The service station is currently listed on the Environmental Protection Authority (EPA) Register of Contaminated Land.
- Monitoring well GW51 recorded concentrations of volatile chlorinated hydrocarbons (VCH) and heavy metals (copper, lead, nickel and zinc) above the ADWG (2011) criteria. The source of VCH contaminants is inferred to be a former drycleaner that was located at Unit 14 inside the Kippax Fair Shopping Centre.
- Concentrations of copper and zinc in GW51 could be a combination of natural background levels associated with mineralisation of the host rock and the possible impact from the former dry cleaner.
- Concentrations of copper, lead, nickel and zinc exceeded the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) and *Urban Drains and Streams: Pollutants entering Waterways taken to cause Environmental Harm Aquatic Habitat* (AQUA/4, 2005) criteria in groundwater samples collected from GW1, GW2, GW3, GW5 and GW51. It is noted that the AQUA/4 (2005) criteria are highly conservative values developed for the protection of sensitive aquatic ecosystems and given that the nearest waterway which is the stormwater channel located approximately 120m east of GW51, the contamination risk groundwater may pose to ecological receptors is negligible.
- While there were some concentrations of contaminants of concern that exceeded the ADWG (2011), the risk of ingestion of impacted water is negligible due to the fact that there are no abstraction wells for beneficial groundwater use within the site boundary or surrounding properties. In addition, based on the shallow depth of the aquifer across the site area, it is unlikely that abstraction wells would be installed on-site in the future.

Based on the results of the investigation and the current setting of the site, the following conclusions were made:

- Soil across the site does not show indications that it has been impacted by the historical and current activities.
- No further soil investigations are considered necessary from a contamination perspective.
- The exceedances above the ADWG (2011) observed in groundwater across the site only pose an unacceptable human health risk if the water was to be extracted and used for potable purposes. Based on the absence of groundwater extraction wells in the vicinity of the site and the fact that depth of the aquifer make future use of the water unlikely, Lanterra concludes that the exposure pathway (ingestion) between the impacted groundwater and potential human receptors to be incomplete and therefore, impacted groundwater poses a negligible risk to human health.
- Lanterra notes that groundwater beneath the site must not be used for beneficial purposes (e.g. as potable water supply or for irrigation purposes) unless is demonstrated by further investigations that there is no risk associated with these uses.
- If excavations are required on the playing fields as a part of the future development, then direct contact with groundwater may occur should the excavations extend beyond 1 – 2 m in depth.
- The VCH compounds detected in groundwater (GW51) are volatile compounds and generate a vapour that can impact indoor environments. A review of the potential vapour risk to the

current site setting is considered to be low based on standing water level depth in monitoring well GW51 (6.6 m) and the clayey lithology, bitumen surface and open space.

- In this line, it is noted that preliminary development plans indicate that the Kippax Place road will be retained and that future buildings will be located between Kippax Place and the oval. At present Kippax Place is a gazetted road and development of this is not permitted under the Territory Plan. Therefore, considering that the site would not be changed in the area surrounding GW51, the concentrations of VCH compounds observed in this well are unlikely to pose a risk to human health via the direct contact/ingestion and vapour inhalation pathways.
- The nearest sensitive receptor is the stormwater channel located approximately 120 m northeast of the site which flows into Ginninderra Creek. Based on the measured concentrations of VCH compounds and heavy metals across the site and the distance to the receptor, the risk of contaminants impacting aquatic ecosystems associated with these receptors is considered negligible.

Based on the results of the investigation and an assessment of the potential risks the presence of low concentrations of contaminants in groundwater may pose, the site was considered by the environmental engineer to be suitable for the land uses permitted under the CZ1: Core Zone, PRZ1: Urban Open Space, and TSZ1: Transport, and Road Reserve of Kippax Place, Flack Street and Moyes Crescent.

This advice was provided to the ACT Environmental Protection Agency (EPA) and the response received was that due the potential for vapour intrusion from the impacts from the identified contaminants of concern, the proposed and permitted sensitive uses at the site, including residential and childcare, and the likely use of basements within the study area full delineation of impacts must be undertaken in accordance with Environment Protection Authority (EPA) endorsed guidelines. Consistent with the requirements of the 'Contaminated Sites Environment Protection Policy' and the approach the EPA has taken at other sites with impacts from volatile hydrocarbons and volatile chlorinated hydrocarbons all assessment and remediation works, along with any proposed interim and future management of the site, was stipulated by the EPA to be independently audited by an Environment Protection Authority approved environmental auditor. The EPA further advised that the environmental audit must be undertaken in accordance with the requirements of the 'Contaminated Sites Environment Protection Policy' and submitted to the EPA for review and endorsement prior to the site being used for other purposes.

Refer to Appendix I, J and K for the preliminary environmental site investigation, detailed environmental site investigation and correspondence with the ACT EPA, respectively.

7.13.5 Geotechnical

A preliminary geotechnical site assessment has been undertaken for the subject site within Section 51, Holt. Details of the assessment are provided below:

- Geological Mapping: Reference to the 1:100 000 Canberra Soil Landscape Series Sheet 8727 indicated that the site is mapped as being on the Williamsdale Soil Group.

  The Williamsdale Soil Group is characterised by undulating rises, alluvial fans and valley flats on Silurian Volcanics of the Canberra Formation. Generally, little or no rock outcrops occur within this soil group. Soils are moderately deep, well drained podzolic soils, red and brown earths on upper rises and fan elements and moderately to very deep, poorly to imperfectly drained, solodic soils on lower rises and fan elements. This soil group is limited by its erodible and dispersible nature, its acidity, potential for seasonal water-logging and localised flooding hazard.

  Reference to the 1:100 000 Geology of Canberra Geological Series Sheet indicates that the site is underlain by geological rock units of the Laidlaw Volcanics of late Silurian age. The Laidlaw Volcanics typically comprise rhyodacitic ignimbrite with minor volcaniclastic and argillaceous sedimentary rocks.

  An old creek line appears to have run north-south in the vicinity of the block.

- Hydrogeology: The nearest surface water receptor is a tributary of Ginninderra Creek approximately 600 m to the north of the site. It is considered likely the groundwater would flow towards to the north, conforming to the topographic slope.

  The 1:100,000 map Hydrogeology of the Australian Capital Territory and Environs indicates that the site is underlain by geological units of late Silurian age. These typically include: dacitic, rhyodactic, ignimbrite, bedded tuffs, minor shale, sandstone, limestone and ashstone and are typically fractured, high yielding where minor limestone beds, major fold closures, major geologic contacts, individual ash-flows and interbedded sediments appear. Quality tends to be variable. The likely yield of the groundwater aquifer is indicated to be between 0.5 L/s and 1.0 L/s with total dissolved solids (TDS) of between 500 mg/L and 1000 mg/L.

An intrusive geotechnical site investigation was undertaken with factual results of the investigation for future proposed redevelopment at Part Section 51, Holt. The investigation included the drilling of nine (9) boreholes and laboratory testing of selected samples. Three shallow bores (300 mm diameter) were carried out along the potential road extension alignment to obtain pavement design parameters. Six deeper bores (110 mm diameter) were placed evenly across the site and carried out to obtain subsurface information for the future mixed-use development with two likely basement levels.

The general principal succession of strata that was encountered as part of the site investigation is broadly summarised as follows:

- Topsoil Fill: generally low plasticity sandy Silt, with rootlets, trace gravel, moist to dry, variably firm to very stiff in all bores.
- Fill: generally low to medium and medium to high plasticity, silty Clay, sandy Clay and Clay, with a various mixture of silt, sand and gravel, moist to wet, variably very stiff to hard, underlying topsoil fill in all bores.
- Silty Clay & Clay: generally low to medium and medium to high plasticity, silty Clay and Clay, with a various mixture of silt, sand and gravel, moist to dry, variably soft to hard encountered below Fill in all bores except Bore 3.
- Sandy Gravel & Silty Clayey Sand: encountered only in Bore 5 between depths of 3.6 m and 4.0 m sandwiched between clay layers, moist to dry, medium dense.
- Extremely Weathered Rock: breakdown to be medium to high plasticity, very stiff to hard sandy Clay in Bore 2 to the termination depth of 2 m and fine to coarse grained, dense to very dense clayey Sand overlying bedrock in Bores 4 and 8.
- Rhyodacitic Ignimbrite/Tuffaceous Sandstone: variably low to medium/high strength, extremely to slightly weathered in Bores 1, 4, 7 and 9. Rock cores obtained indicated that bedrock is highly fractured (fracture spacing generally varies between 10 mm and 50 mm in Bore 5) to fractured (fracture spacing generally varies between 30 mm and 100 mm in Bores 6 and between 50 mm and 200 mm in Bore 8).

Below in Figure 72 is a summary table of depths by material encountered. Groundwater seepage was observed in Bores 5 – 7 at the depths 3.0 m – 4.8 m which generally correlates with the lower portions of the site.

Material	Depth to underside of each layer (m)								
	Bore No.								
	1	2	3	4	5	6	7	8	9
TOPSOIL FILL	0.2	0.3	0.25	0.2	0.2	0.2	0.2	0.2	0.2
FILL	1.2	0.9	1.8 (LOI)	0.45	2.7	1.7	1.6	1.7	1.4
SILTY CLAY & CLAY	4.4	1.8	-	0.7	3.6 and 5.1	4.9	5.1	2.0	3.3
SANDY GRAVEL & SILTY CLAYEY SAND	-	-	-	-	4.0	-	-	-	-
EXTREMELY WEATHERED ROCK	-	2.0 (LOI)	-	1.5	-	-	-	2.2	-
RHYODACITIC IGNIMBRITE/ TUFFACEOUS SANDSTONE	5.7	-	-	2.0 (LOI)	7.0 (LOI)	7.75 (LOI)	5.3 (LOI)	7.85 (LOI)	3.9 (LOI)

*LOI – Limit of Investigation

Figure 72 – Summary of Subsurface Geotechnical Conditions within the Site

Laboratory testing was performed on selected samples, and comprised the following:

- One Atterberg limits and linear shrinkage test;
- One California bearing ratio (CBR) tests; and
- Two field moisture content tests.

The results of the laboratory testing are summarised in Figure 73 below.

Bore No.	Depth (m)	W_F (%)	W_L (%)	W_P (%)	PI (%)	LS (%)	Field Description
7	3.5 – 3.95	30.2	73	20	53	18	Silty Clay

Where W_F = Moisture content, W_L = Liquid limit, W_P = plastic limit, PI = Plasticity Index, LS = Linear shrinkage

Bore No.	Depth (m)	FMC (%)	OMC (%)	MDD (t/m^3)	CBR (%)	Swell (%)	Field Description
2	0.5 – 0.7	11.7	12.5	1.93	13	0.5	Fill/Clay

Where: FMC = Field moisture content, MDD = Maximum dry density (standard), OMC = Optimum moisture content, CBR = California bearing ratio

Figure 73 – Summary of Geotechnical Laboratory Results

Refer to Appendix L for detailed test pit and bore logs of soil and rock material encountered within and surrounding the subject site.

7.13.6 Tree Assessment

- There is a line of medium to large sized trees along Kippax Place within Block 6, 36 and 47 of the subject site.
- There is a line of small to medium sized trees along the Kippax Place western verge. There are two trees within the Kippax Place verge in front of Block 22.
- Block 66 within the subject site is predominantly covered by trees, with the majority being medium sized or mature trees.
- Based on ACTmapi information, none of these trees are registered trees.
- A regulated tree is protected under the ACT Tree Protection Act 2005. A regulated tree is defined as:
    - *Being 12m or more in height; or*
    - *Having a circumference of 1.5m or more at 1m above the natural ground level; or*
    - *Has 2 or more trunks with the total circumference being 1.5m or more at 1m above the natural ground level; or*
    - *Has a canopy 12m or more wide.*
- In accordance with the Tree Protection Act 2005 (28 October 2018), any construction work should be more than 2m away from the vertical projection of the tree canopy.

A tree assessment has been undertaken by an accredited arborist to provide detailed information on the location and status of trees within the site. The information will aid in the development of the site by identifying and assessing trees that are Protected and covered by the Tree Protection Act 2005. This report and corresponding tree survey drawings are contained within Appendix M and has been prepared in accordance with the mandatory requirements of the ACTs Tree Protection (Guidelines for Tree Management Plans) Determination 2010.

The findings were that 114 regulated trees are contained within or in very close proximity of the subject site. The tree health (management status) was assessed and varied from poor to high.

Refer to Figure 74 to Figure 79 for site photographs of some of these regulated trees.

Following the tree assessment, the findings were provided to the ACT Tree Protection Unit for comment. Several trees were assessed by the ACT Tree Protection Unit as either medium or high, when the arborist's report assessed the trees as poor. Most trees originally assessed as being regulated were agreed to by the ACT Tree Protection Unit.

Refer to Appendix N for a comprehensive assessment by the ACT Tree Protection Unit of all trees, which takes precedence over the vegetation assessment report by dsb Landscape Architects.

Figure 74 - Regulated Trees within Block 66

Figure 75 - Existing Trees within Block 36 – Some Shown are Regulated

Figure 76 - Regulated Trees along Kippax Place

Figure 77 - Trees within Block 47

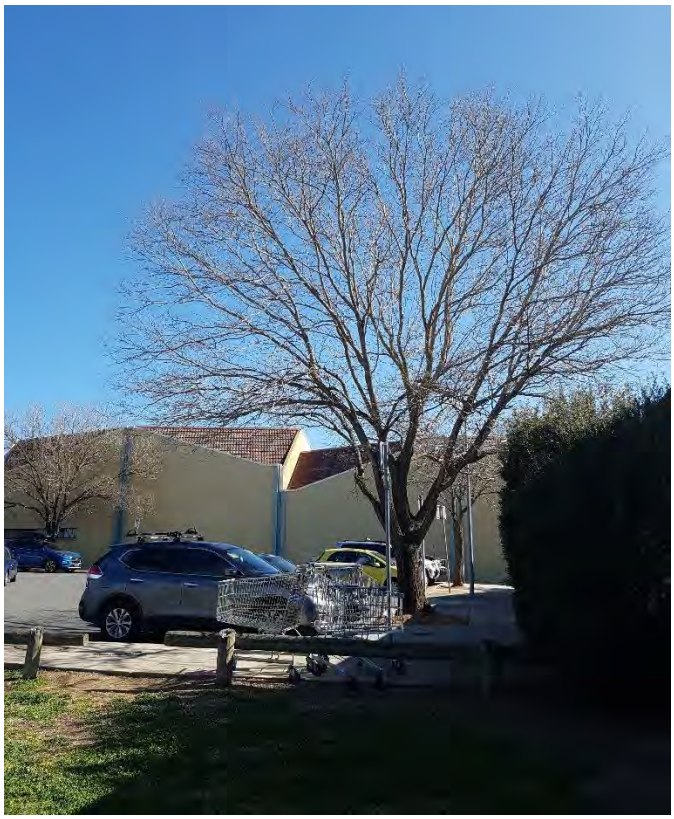

Figure 78 - A Regulated Tree in front of the Community Centre

Figure 79 - Regulated Tree within the Subject Site

7.13.7 Building Inspections

Building inspections, where a visual and subsequent intrusive investigation of the existing community centre building on Block 22 Section 51 and toilet block on Block 6 Section 51 was undertaken to ascertain any constraints that may be present in this location prior to demolition. It is noted that the demolition of these building will be undertaken by the ACT Government (EPSDD).

Refer to Appendix R for these building inspection reports, which are provided for completeness of this Site Investigation Report.

8 Proposed Site Services

8.1 General

The following recommendations form a preliminary discussion of the site servicing options based on the constraints identified in this investigation. The location and size of the proposed services are based on the existing infrastructure and are presented in the following sections.

Proposals regarding further servicing of the site, whilst based on sound engineering principles and judgement, are subject to the completeness and accuracy of the available information regarding the existing services. Whilst every effort has been made to ensure the accuracy of this information, neither is guaranteed by JPS Engineering Consultants. It is recommended that the location and size of existing services are physically confirmed prior to detailed designs.

All site servicing requirements have been calculated for the proposed development scenario of retail and residential dwellings, as described in Section 3 of this report, which was produced by DFP Design in September 2020. It is also important to note that the proposed community hub on Block 5 Section 88 that is outlined in the Holt Precinct Map and Code, will ultimately utilise some of the existing services that the proposed group centre expansion will rely on. This has therefore been taken into consideration in the demand calculations that are presented within this section of the report.

All proposed services described under this section are indicatively shown on drawing 201053-DRG-CIV-UT-0511-B and 0512-B within Appendix A. All correspondence with service authorities is available within Appendix C.

8.2 Sewer Supply

Using the Icon Water Supplement to WSA Gravity Sewerage Code of Australia, sewerage demand for the proposed development has been calculated.

The estimated total generated sewer flow rate for the proposed development was calculated to be 7.16L/s. This rate includes the estimated loads generated for the following proposed residential and commercial developments, as discussed in Section 3 of this report. Each proposed development's respective calculated design flows are also provided below.

- Ground floor retail (calculated sewer flow of 1.95 L/s),
- Apartments (calculated sewer flow of 0.77 L/s),
- Terraces (calculated sewer flow of 0.45 L/s),
- Supermarkets (calculated sewer flow of 2.21 L/s),
- Food & beverage shops (calculated sewer flow of 0.62 L/s), and
- Shops with frontage to Hardwick Crescent (calculated sewer flow of 1.15 L/s).

To accommodate these generated sewer flow rates, two primary connections are proposed to the overall development site as follows:

- A DN100 sewer tie, which is to be connected to the existing DN150 sewer main at the minimum allowable grade of 2% to the west of the subject site, within Hardwick Crescent. This tie will service future retail shops that have frontage to Hardwick Crescent.
- A DN150 sewer tie, which is to be connected to the existing DN375 sewer main to the east of the proposed development. This tie will service the apartments, terraces, supermarkets, retail areas and food and beverage locations on the ground floor.

Icon Water has confirmed that based on the estimated flows calculated, there is sufficient capacity within both existing DN150 and DN375 sewer networks to service the future development.

An easement can be created over the existing DN375 and DN300 sewer mains, which currently run through the sportsfields in the location of the subject site. However, to maximise developable area, relocation of these trunk sewer services either wholly outside of the subject site area or through a newly created public road network within the site is likely. It is also likely that relocation of these services would be necessary to meet Icon Water requirements. Preliminary advice from Icon Water

suggested that the relocation of these trunk sewer mains is possible but needs to be a like for like replacement in terms of capacity and the redesign would need to be in accordance with current Icon Water Standards. If these sewer mains are retained within the subject site and not incorporated in public space, easements would need to be created over these services. The width of these easements would be a minimum of 2.5m or 3.5m if combined with a stormwater service main, although are subject to Icon Water discretion and would depend on the depth of the sewer mains.

Work as executed information was received from Icon Water regarding the existing sewer invert levels. The relocation of the trunk DN375 sewer, as shown on drawings 201053-DRG-CIV-UT-0511-B and 0512-B within Appendix A, has been calculated to determine feasibility and maintaining Icon Water Standards. The calculations shows that the DN375 can be relocated, whilst maintaining the same or greater grades, promoting sewer flow to the existing trunk service main. The DN225 sewer main can also be relocated through Block 66 to the north and then connect back into the DN375 sewer main to the north of the site, based on WAE information from Icon Water, whilst maintaining greater than minimum allowable grades. This relocated DN225 would require a 3.5m wide easement if collocated with the relocated stormwater service through Block 66. No easement would be required through the future road reserve.

A summary of the assumptions and calculation results for sewer flows to service the proposed development is provided in Table 5.

Table 5 - Sewer Demand Calculations

Connecting to the DN150 Sewer Main in Hardwick Crescent		
	Description	**Value**
ADWF	Average Dry Weather Flow	0.208 L/s
PDWF	Peak Dry Weather Flow	0.766 L/s
NSA	Net Sewered Area	0.700 Ha
GWI	Ground Water Inflow	0.010 L/s
RDI	Rainfall Dependent Inflow	0.377 L/s
DF (Q)	Design Flow	1.153 L/s
Minimum Grade	2%	
Proposed Pipe Size	**DN100**	
Connecting to the DN375 Sewer Main to the East		
	Description	**Value**
ADWF	Average Dry Weather Flow	1.188 L/s
PDWF	Peak Dry Weather Flow	4.179 L/s
NSA	Net Sewered Area	2.975 Ha
GWI	Ground Water Inflow	0.042 L/s
RDI	Rainfall Dependent Inflow	1.782 L/s
DF (Q)	Design Flow	6.003 L/s

Minimum Grade	2%
Proposed Pipe Size	**DN150**

8.3 Water Supply

8.3.1 Potable Water Supply

Using the Icon Water Supplement to WSA Water Supply Code of Australia, water demand for the proposed development has been calculated. To this end, the estimated demand for the entire development has been broken down to the following demands:

- Ground floor retail water demand was calculated as 0.578 L/s,
- Apartments water demand was calculated as 2.22 L/s,
- Terraces water demand was calculated as 0.675 L/s,
- Supermarkets water demand was calculated as 0.668 L/s,
- Food & beverage shops water demand was calculated as 0.116 L/s, and
- Shops with frontage to Hardwick Crescent water demand was calculated as 0.272 L/s.

Based on the above water demand calculations, the following water ties are proposed to service the site:

- A 32mm PE (SDR11) water service tie will be required to service the ground floor retail,
- A 63mm PE (SDR11) water service tie will be required to service the apartments,
- A 32mm PE (SDR11) water service tie will be required to service the terraces,
- A 32mm PE (SDR11) water service tie will be required to service the supermarkets,
- A 25mm PE (SDR11) water service tie will be required to service the food & beverage shops, and
- A 25mm PE (SDR11) water service tie will be required to service the shops with frontage to Hardwick Crescent.

Apart from the shops with frontage to Hardwick Crescent, the ties to all these proposed uses are anticipated to be connected to the DN150 water main that loops from Hardwick Crescent to Kippax Place. It is likely that this main will be relocated to suit the final layout of the proposed development.

Although the above provides an indication of the servicing required to the subject site, it is recommended to reassess the demands once the final development and its intended uses are fully known.

For the purpose of tie sizing to accommodate the calculated demand, the Icon Water Supplement to WSA Water Supply Code of Australia and Australian Standard AS3500.1 were used with the following factors detailed in Table 6. The shops with frontage to Hardwick Crescent and the apartments are only indicated in the calculations in Table 6, being the most onerous in demand for the uses connecting to the Hardwick Crescent main and Kippax Place main, respectively.

Table 6 - Potable Water Tie Calculations

Connecting to the DN150 in Hardwick Crescent (shops with frontage to Hardwick Crescent)	
Description	**Value**
Difference between proposed water tie level and assumed high point level for fixture height	4.6m
Available pressure head at tie during peak demand provided by Icon Water	57m
Pressure drop calculated in accordance with AS3500.1 Section 3.3.2	52.4m
Assumed index length based on the proposed layout	124m
Calculated head loss gradient in accordance with AS3500.1	17.634m/100m
Required Pipe Size (PE)	15.6mm
Proposed Tie Size	**DN25 (PE)**
Connecting to the DN150 in Kippax Place (apartments only)	
Description	**Value**
Difference between proposed water tie level and assumed high point level for fixture height	16.1m
Available pressure head at tie during peak demand provided by Icon Water	57m
Pressure drop calculated in accordance with AS3500.1 Section 3.3.2	40.9m
Assumed index length based on the proposed layout	224.5m
Calculated head loss gradient in accordance with AS3500.1	2.91m/100m
Required Pipe Size (PE)	49.87mm
Proposed Tie Size	**DN63 (PE)**

Table IW.3 of the Icon Water Supplement specifies that a static pressure head of 30m shall be maintained during peak demand flows for domestic development exceeding two stories and for shopping, commercial and industrial developments. Icon Water has advised that the obtainable water pressure head in Hardwick Crescent and in Kippax Place is approximately 57m and 59m, respectively, under these peak demand conditions. Therefore, the pressures obtainable in the surrounding water network are sufficient under peak demand.

8.3.2 Fire Service

In reference to Table IW.2 of the Icon Water Supplement, a fire risk category of F3 was initially assessed to be adequate for the proposed development, as it is relevant to 'very large shopping areas'. However, ACT Fire & Rescue has advised that a fire risk category of F2 is more appropriate considering the combined shopping and residential precinct floor area, community facilities and basement car parking. Refer to Appendix C for correspondence with ACT Fire & Rescue.

In accordance with the Icon Water Supplement, Table IW.8, the hydrant spacing for a development with an F2 fire risk category is 45m over a DN150 water main, with two spring hydrants every 135m. Current hydrant spacing along Hardwick Crescent is approximately 45m and the hydrant spacing along Kippax Place is approximately 40m, therefore the spacing is considered sufficient, other than the need for double hydrants every 135m and at the end of dead end streets. It is also noted that the hydrant spacing along Moyes Crescent is approximately 85m. Additional hydrants are therefore proposed on the DN150 watermains in Moyes Crescent, Kippax Place (subject to relocation of the main to suit the final development layout) and Hardwick Crescent. Once the concept design of the proposed development has been undertaken, the hydrant spacing is to be confirmed through Icon Water, unless ACT Fire & Rescue stipulate other requirements during the detailed design/development approval phase for the proposed development.

The minimum firefighting flow for a development in an F2 category is 150L/s in accordance with the Icon Water Supplement to WSA 03-2011-3.1.

Table IW.3 of the Icon Water Supplement specifies that a static pressure head of 10m shall be maintained whilst drawing the specified fire flow of 150 L/s in addition to the peak demand. Icon Water has advised that the obtainable water pressure head in the DN150 main along Hardwick Crescent can provide sufficient fire flow at F2 rating. However, Icon Water further advised that augmentation will be required to achieve F2 fire flow along Kippax Place. The extent of this augmentation is dependent on the final proposed development. Refer Appendix C for Icon Water correspondence in relation to pressures achievable at the block boundary.

8.4 Stormwater Drainage

The proposed development scenario has been assessed in accordance with the TCCS Municipal Infrastructure Standards (MIS) 08 for Stormwater. The development site has been designated in accordance with the requirements of a Group and Neighbourhood Shopping Centre and assessed for the 10 year ARI (10% AEP) in the minor storm event, as per 'Table 8-3 Minor System Design AEP' within TCCS MIS 08.

The impervious area assumption was informed by the proposed land usage. Refer to Figure 80 below for the proposed stormwater catchment plan and Section 3 for an indication of impervious area anticipated. This plot ratio is also as per 'Table 8-4 Composite Impervious Area Guidelines' within TCCS MIS 08, where a design 80% impervious area is recommended for buildings within Group and Neighbourhood Shopping Centres.

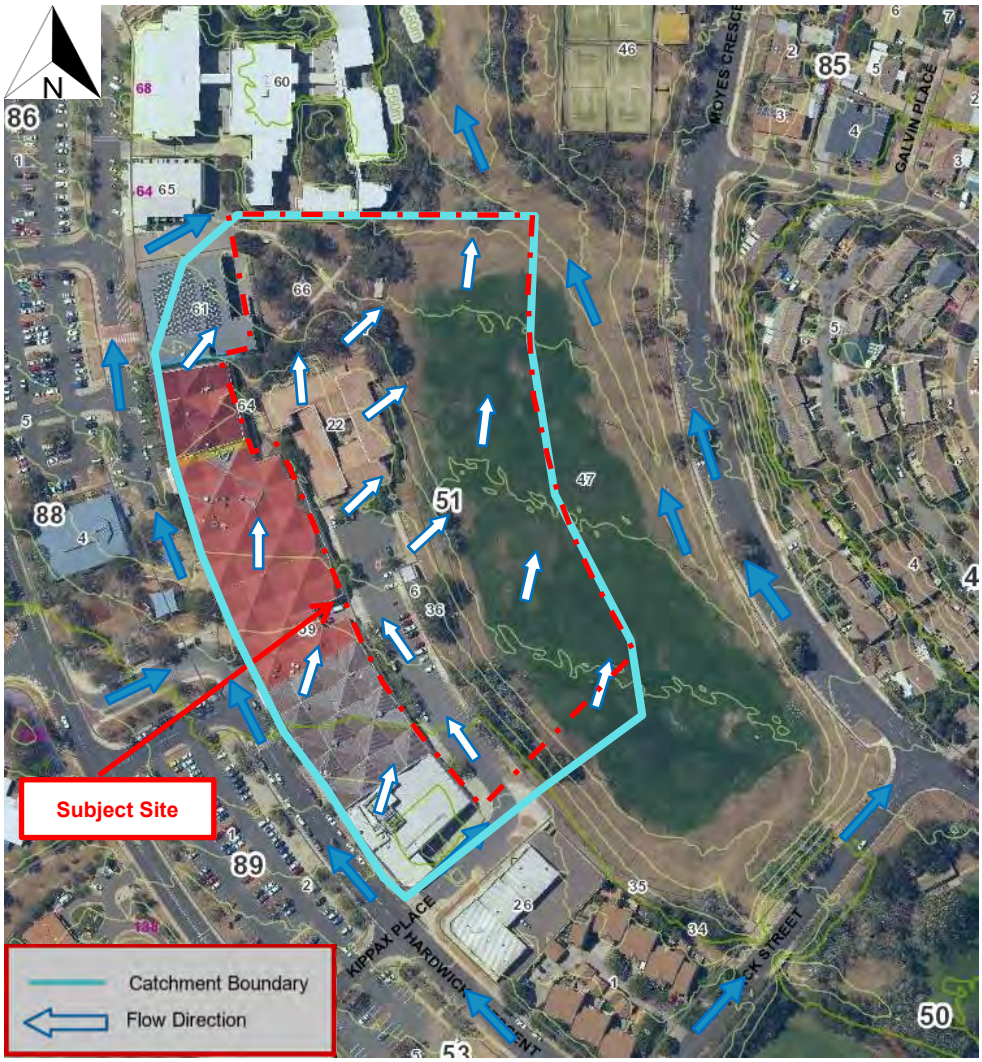

Figure 80 - Proposed Stormwater Catchment Plan

The expected runoff from the proposed catchment areas is detailed in Table 7 below.

Table 7 - Stormwater Tie Calculation

Shops and Apartments		
	Description	**Value**
ARI	Urban Neighbourhood Development	10 Years (10% AEP)
Catchment Area	Only the area of the block boundary	2.61 Ha
Impervious Area %	Based on the proposed development on site and Table 8.2 TCCS MIS 08	80%
Pervious Area %	Based on the proposed development on site and Table 8.2 TCCS MIS 08	20%
Flow Path Length	Along the catchment area (approximately)	272m
Average Grade	Grade of the site taken from ACTmapi	3.3%
Impervious Time of Concentration	Time of concentration for impervious areas	11.5 min
Pervious Time of Concentration	Time of concentration for pervious areas	13.3 min
Impervious Run off Coefficient	Total run off coefficient for impervious areas	0.9
Pervious Run off Coefficient	Total run off coefficient for pervious areas	0.69
Impervious Rainfall Intensity	Taken from Australian Government Bureau Meteorology (BOM) website	97.2mm/hr
Pervious Rainfall Intensity	Taken from Australian Government Bureau Meteorology (BOM) website	90.6mm/hr
Design Stormwater flow rate (Q)	Calculated in accordance with TCCS Urban Infrastructure Standard for Stormwater 08	598.56L/s
SW Pipe Grading	Required minimum for this site to drain this flow	1%
Proposed Pipe Size	**DN600 (single tie) or DN525 and DN300**	
Terraces		
	Description	**Value**
ARI	Urban Neighbourhood Development	10 Years (10% AEP)
Catchment Area	Only the area of the block boundary	1.145 Ha
Impervious Area %	Based on the proposed development on site and Table 8.2 TCCS MIS 08	80%

Pervious Area %	Based on the proposed development on site and Table 8.2 TCCS MIS 08	20%
Flow Path Length	Along the catchment area (approximately)	272m
Average Grade	Grade of the site taken from ACTmapi	2.6%
Impervious Time of Concentration	Time of concentration for impervious areas	13.17 min
Pervious Time of Concentration	Time of concentration for pervious areas	15.13 min
Impervious Run off Coefficient	Total run off coefficient for impervious areas	0.9
Pervious Run off Coefficient	Total run off coefficient for pervious areas	0.68
Impervious Rainfall Intensity	Taken from Australian Government Bureau Meteorology (BOM) website	90mm/hr
Pervious Rainfall Intensity	Taken from Australian Government Bureau Meteorology (BOM) website	84mm/hr
Design Stormwater flow rate (Q)	Calculated in accordance with TCCS Urban Infrastructure Standard for Stormwater 08	242.65L/s
SW Pipe Grading	Required minimum for this site to drain this flow	1%
Proposed Pipe Size	**DN450**	

To accommodate the minor event (10 year ARI/10% AEP) stormwater flow, a DN600 pipe with a minimum grading of 1% would be required to drain all areas of the subject site, with the exception of the terraces. The design flow could also be accommodated with a DN525 and a DN300 stormwater pipe at a minimum grade of 1%. This could be catered for by the existing stormwater network that traverses the subject site, subject to an overall capacity check and verification of the pipe grades. The site area that has been assumed to accommodate residential terrace housing would require a minimum pipe size of DN450 at a minimum grade of 1% to sufficiently drain the 10% AEP storm event from this area.

Both service tied areas mentioned above would ultimately drain to the DN1800 pipe, east of the subject site. A full stormwater analysis to determine the residual capacity in this trunk stormwater pipe would be required once the full development intent is finalised.

Additionally, the final development layout will also inform whether the existing stormwater network within the subject site would require either relocation or retention with easements. Easement widths are a minimum of 2.5m to 4.0m wide, depending on pipe diameter and depth according to the TCCS MIS 08 Standard.

Refer to Figure 81 below, which has been extracted for5 the TCCS MIS08 Stormwater Standard on easement widths of stormwater pipes by size and for combined services, such as sewer and stormwater.

Table 8-23 Minimum drainage easement widths

Diameter (mm)	Easement Width (m)	
	Single Easement	Common Easement
0 - 3.0 m deep		
225 to 450	2.5	3.5
525 to 675	3.0	3.5
3.0 - 6.0 m deep		
225 to 450	3.5	4.5
525 to 675	4.0	5.0

Note: Where other hydraulic services or electrical services are located within the same reserve, the required reserve width shall be increased to provide adequate clearance between services (refer to Table 8-24 Minimum clearances).

Figure 81 – Excerpt from TCCS MIS08 Stormwater Standard for Stormwater Easement Widths

The Australian Rainfall and Runoff Guideline and ACT Government MIS 08 Standards were utilised to calculate the design flows generated by the site. The design rainfall intensities were taken from the Bureau of Meteorology Design Rainfall Data System (2019), which allows for climate change.

8.5 Telecommunications

8.5.1 Telstra

DBYD information indicates that there are Telstra conduits along the subject site boundary, which can provide service to the site. A confirmation was requested from Telstra, however by the time of issuing this report, Telstra has not responded. Experience with Telstra is that their services are able to be relocated through a formal work order with Telstra. This would need to be explored to determine feasibility of relocation of this service if deemed necessary to enable development.

8.5.2 NBN

The subject site currently has a connection to the NBN network. A confirmation was requested from NBN, however by the time of issuing this report, NBN has not responded. Experience with NBN is that their services are able to be relocated through a formal work order and detailed design proposal with NBN. This would need to be explored to determine feasibility of relocation of this service if deemed necessary to enable development.

8.5.3 Optus

DBYD information indicates that there is Optus infrastructure in close proximity to the subject site, which may be able to service the development. This needs to be verified and confirmed with Optus, if this service is required to the site.

8.6 Gas Supply

Jemena has advised that the existing medium pressure network in the vicinity of Kippax Fair is limited and interconnection of the 32mm nylon in Hardwick Crescent and the 50mm nylon in Southern Cross Drive may be required to provide sufficient capacity to supply the proposed development of expansion and renewal of the Kippax Group Centre. Jemena will require more detail on the likely gas loads to model the capacity of the network and the best options to supply gas to any new customers within the proposed development.

Refer Appendix C for correspondence with Jemena in relation to the gas service to the proposed development.

8.7 Electrical Supply

Using AS3000-2018, the estimated maximum demand for the proposed development of a community hub has been estimated as 90kVA. This demand has been communicated with Evoenergy along with the required demand for the proposed development at Kippax Group Centre. The estimated maximum demand for the proposed Group Centre expansion as detailed in Section 3 of this report has also been calculated using AS3000-2018 as 2.4MVA.

Evoenergy has advised that the existing network can support the demand from the community hub, however the extended development within the Kippax Group Centre area may require an upgrade to the existing electrical network to allow for the future load. Currently, an indoor substation within the existing Kippax Shopping Centre (near Woolworths), services the centre. This substation is rated to 2x750kVA (i.e. 1.5MVA) and was established in 1977, so is not suitable for upgrade. Evoenergy has also advised that this substation does not have spare capacity during the winter season and can only supply 1.5MVA with the existing feeder.

Evoenergy advised that a new 11kV feeder from the Latham zone substation would need to be constructed for approximately 3km if the total load of the development will exceed 1.5MVA before the year 2025. A high order cost estimate of $3m was provided by Evoenergy for this upgrade to the Latham zone substation. Evoenergy also mentioned that there are some factors in relation to the proposed development's total demand and details of the design, such as the incorporation of solar photovoltaic cells, battery storage, gas connections and electric vehicle chargers, which may impact on the load and capacity of the existing network and would need further consideration.

Evoenergy currently has a masterplan for the construction of a new zone substation in the suburb of Strathnairn in the year 2025. However, this target date may get postponed with the targeted load forecast. Subject to the completion of the Strathnairn zone substation, the load from the proposed development at Kippax Group Centre can be supplied through the Paterick feeder from the Latham zone substation, after sharing loads with neighbouring feeders.

Due to the existing high voltage network along the Hardwick Crescent (east) verge and the substation within the block boundary, it is a general requirement to undertake an earthing study in accordance with relevant Australian Standards. The appropriate location to connect to Evoenergy's electricity network will be determined when the developer submits their final electrical load details (to AS3000) and final site plans.

8.8 Boundaries and Easements

The ACTmapi website does not indicate any easements within the subject site, however there are stormwater, electricity, sewer and telecommunication infrastructure within the site and area of study for this investigation. Each of these assets would require easement with widths subject to the relevant service authority's requirements if left within private land. There is opportunity in the development of the subject site to relocate services to newly created public roads, such as the relocated Kippax Place and road connecting Hardwick Crescent and Moyes Crescent.

It is also noted that most existing services that are currently within the subject site are currently servicing the existing Kippax Group Centre. Therefore, it may be beneficial to maximise the retention of these services to not cause unnecessary disruption to current users.

Digital underground service locating (potholing or similar) is recommended to identify the exact location and depth of existing active assets. This will assist in determining the need for relocations and easements.

A subdivision plan has been produced in May 2021 by Anthony Quinn Survey, that was based on the Holt Precinct Map and Code and engineering reasons for Road A and Road B.

TCCS provided support in principle for a 17.25m width for the Road A corridor (i.e., 7.0m road carriageway, 6.25m verge in the south and 4.0m in the north). TCCS also agreed that Road B should not be open for public vehicular access, to prevent rat-running. Road B was continued as a 4.0m wide shared path corridor.

A further requirement, to the Estate Development Code is that Road A will need to be offset 40m from Postle Cct, to prevent the staggered intersection being too close. Austroads stipulate a minimum radius of 36m and a straight between curves of 24m as shown in Figure 82, based on a 40km/h speed limit for this access road. Road A was extended 40m past the eastern site boundary to only provide service to the residential component of the proposed development, in line with the allowance given in the Holt Precinct Map and Code. TCCS had also agreed that truncating this road would deter motorists from utilizing Road A to access the commercial zones of the future development. Refer to Appendix P for correspondence with TCCS.

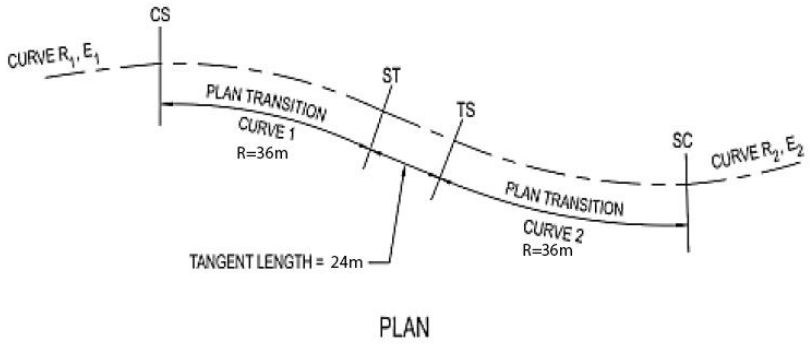

Figure 82 – Excerpt from Austroads Road Design Guideline and Radii and Lengths Calculated for 40km/h Speed Limit

8.9 Preliminary Traffic Assessment

The proposed development will generate additional traffic volume for local roads. In this section the potential impact of the proposed development on the operation of the surrounding road network will be investigated in relation to the changed land uses.

The future Kippax Centre land uses and their yields, as presented in the 2016 AECOM study, are presented in Table 8 below. It can be observed that in the previous study no further land uses were proposed for the Kippax Fair block. Whereas for the library block, a community facility of 2000m^2 GFA was proposed in the previous study. The land uses contained within the current version of the CSTM for the zone representing the Kippax Centre were reviewed as part of the traffic and transport study. The change in land uses in the zone between 2021 and 2041 broadly align with the yields shown in Table 8 below.

Table 8 – Kippax Centre Future Year Land Use and Yields.

Retail	Office	Food/ entertainment	Community / Health	Other	Total	Dwellings	Retail
Kippax Fair	0	0	0	0	0	0	0
Commercial on Kippax Place	0	0	0	0	0	0	34
Retail Hardwick Cres W	0	0	0	0	0	0	80
Library	0	0	0	2,000	0	2,000	0
Carpark adjacent Petrol Station	500	0	0	0	0	500	113
Carpark opposite Woolworths	2,000	500	500	0	0	3,000	137
Central Plaza	0	0	0	0	0	0	0
Carpark opposite Aldi	1,500	0	500	0	0	2,000	0
Health Services	3,000	0	500	0	0	3,500	124
Aldi	0	0	0	0	0	0	0
Kippax Place	250	0	250	0	0	500	0
Units cnr Flack/Hardwick	0	0	0	0	0	0	0
Starke Street community cluster	0	0	0	0	0	0	10
Petrol Station Flack St	0	0	0	0	0	0	0
Carpark opposite Magpies	0	0	0	0	0	0	0
Magpies and McDonalds	0	0	0	0	0	0	0
Church	0	0	0	0	0	0	0
Leagues Club	0	0	0	0	0	0	0
Parkview Apartments	0	0	0	0	0	0	0

Source: AECOM Traffic Study 2016

The TPV 361 proposes additional land uses for Sections 51, Section 53 and Section 88. It was observed that the TPV changes highlighted for Section 52 were already considered in the previous study and hence it is deemed no further changes are necessary for these blocks. The TPV yields are shown in Table 9.

Table 9 – TPV Land Use Yields

Block	Site	Site Area	Yield	Units
Section 51	Street Retail	2,300	1,840	GFA
	Ground Floor Retail	7,000	5,600	GFA
	Supermarkets	8,100	6,480	GFA
	Food & Beverage	1,400	1,120	GFA
	Tower Residential	19,750 (GFA 14,800)	164	dwellings
	Terrace Housing	-	30	dwellings
Section 88	Community Hub Building	1,500	1,200	GFA
Section 53	Commercial	-	2,100	GFA
	Apartments	-	36	dwellings

Source: JPS Engineering Consultants

The consolidated newly proposed TPV land uses yields are shown in Table 10 below. It was observed that in the AECOM 2016 study, the library block was proposed with 2,000m^2 GFA of Community facilities whereas in the TPV, the proposed Community Facilities were reduced to 1200m^2 GFA. The Commercial, Food & Beverage, Apartments and Terrace Housing for Section 51 and Section 53 are newly proposed land uses.

Table 10 – TPV Proposed Land Uses of Kippax Centre

Land Use	Retail/ Commercial	Restaurant + Entertainment	Community+ Health	Total	Dwellings
Kippax Fair (Section 51)	13,920	1,120	-	15,040	164
Library (Section 88)	-	-	1,200	1,200	
Terrace Housing (Section 51)	-	-	-	-	30
Commercial (Section 53)	2,100	-	-	-	-
Apartments (Section 53)	-	-	-	-	36

The traffic generation for the TPV land uses were determined based on rates from the NSW RTA Guide to Traffic Generating Developments. The following trip rates were adopted:

- **Tower Residential (Apartments):** A trip rate of 4 vehicles per dwelling in a peak hour was applied to the residential apartments per the RTA Guide to Traffic Generating Developments applicable for Medium Density Residential Buildings.
- **Terrace Housing:** Since the exact mix of the 2 Bedroom and 3 or more bedroom apartments are unknown for the Terrace Housing, a trip rate of 5 vehicles per dwelling in a peak hour was applied as per the RTA Guide to Traffic Generating Developments applicable for Medium Density Residential Buildings.
- **Library Block:** A trip rate of 3 vehicles per 100m^2 GFA in a peak hour was applied to the Community Hub Building as per the RTA Guide to Traffic Generating Developments applicable for Gymnasiums. The land use code was adopted based on the previous study assumptions.
- **Food & Beverage:** A trip rate of 5 vehicles per 100m^2 GFA in a peak hour was applied to food and beverage areas as per the RTA Guide to Traffic Generating Developments (Restaurants).
- **Retail and Commercial Facilities:** A trip rate of 1.78 vehicles per 100m^2 GFA and 3.71 vehicles per 100m^2 GFA was applied to the AM and PM Peaks, respectively as per the Appendix F3 of the 2013 RTA Guide to Traffic Generating Developments. The average trip rates of a typical Thursday of the surveyed sites were used to calculate the proposed trip rate.

Table 11 outlines the estimated trips for the AM and PM peaks for the TPV land uses.

Table 11 – TPV Trip Generation Calculations

Land Use	YIELD	UNITS	AM Peak hr Trip Rate	PM Peak hr Trip Rate	AM Peak hr Trips	PM Peak hr Trips
Street Retail (Section 51)	1840	m^2	0.0178	0.0371	33	68
Ground Floor Retail (Section 51)	5600	m^2	0.0178	0.0371	100	208
Supermarkets (Section 51)	6480	m^2	0.0178	0.0371	115	240
Food & Beverage (Section 51)	1120	m^2	0.05	0.05	56	56
Community Hub Building (Section 88)	1200	m^2	0.03	0.03	36	36
Tower Residential (Section 51)	164	dwellings	0.40	0.40	66	66
Terrace Housing (Section 51)	30	dwellings	0.50	0.50	15	15
Commercial (Section 53)	2100	m^2	0.0178	0.0371	37	78
Apartments (Section 53)	36	dwellings	0.40	0.40	14	14

The distribution of TPV trips on the surrounding road network was based on travel patterns shown in the CSTM. The assumed inbound/outbound splits for the TPV trips in the AM and PM peak hours is summarised in Table 12 and is discussed in greater detail below.

Table 12 – TPV Land Use Trip Distribution

Land Use	AM Peak		PM Peak	
	IN%	OUT%	IN%	OUT%
Street Retail (Section 51)	50%	50%	50%	50%
Ground Floor Retail (Section 51)	50%	50%	50%	50%
Supermarkets (Section 51)	50%	50%	50%	50%
Food & Beverage (Section 51)	50%	50%	70%	30%
Community Hub Building (Section 88)	50%	50%	50%	50%
Tower Residential (Section 51)	20%	80%	80%	20%
Terrace Housing (Section 51)	20%	80%	80%	20%
Commercial (Section 53)	50%	50%	50%	50%
Apartments (Section 53)	20%	80%	80%	20%

Sidra Intersection modelling was undertaken to estimate the operation of key intersections adjacent to the centre. Sidra is a micro-analytic lane-based analysis tool. *Sidra Intersection 8.0* was used for this study.

The intersections that were analysed as part of the base year and future year analysis are shown in

Figure **83** and listed below:

- **Site1:** Southern Cross Drive / Starke Street Intersection
- **Site2:** Southern Cross Drive / Florey Drive Intersection
- **Site3:** Southern Cross Drive / Moyes Crescent Intersection.

Figure 83 – Sidra Analysis Intersections

A linked Sidra intersection model was developed for the intersections depicted. Table 8 The RTA Guide to Traffic Generating Developments paraphrased in

Table **13** provides a guideline in relation to LOS and acceptable operation levels for SIDRA analysis.

Average delay, Level of Service (LOS), 95th Percentile Queue Length and Degree of Saturation (DoS) were considered as the key metrics to assess the intersection performance. The SIDRA models were calibrated to measure LOS by the Delay RTA NSW method.

Table 13 – TPV Land Use Trip Distribution

Level of Service	Average Delay / Vehicle (sec/veh)	Traffic Signals and Roundabouts
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity
F	>70	Demand exceeds capacity

TCCS has identified the following performance thresholds in their Sidra Guidelines:

- Degree of Saturation – Less than or equal to 0.9
- Desired LOS – Los E or better.

Signal phases and sequences, minimum green, maximum green, Interphase timings were coded based on TCCS standards and the available SCATS data. The Network and the Routes Function of the Sidra was used to determine the optimum phases splits and the offsets between the sites. The routes were optimised along Southern Cross Dr eastbound direction in the AM Peak and the westbound direction in the PM Peak.

The Traffic and Transport analysis has tested future scenarios for the assumed TPV opening year of 2025 and a horizon year of 2035 in the weekday AM and PM peak hours. In the Belconnen Better Intersections study, it was identified that the existing network layout along Southern Cross Drive between Starke Street and Florey Drive would operate at LOS F in the long term.

The analysis in the Traffic and Transport Study has tested the existing network layout in 2025 and 2035 to confirm the Belconnen Better Intersections findings that the road network will operate with demand exceeding the capacity with the background traffic, without the TPV development. Future scenarios with the upgrades (mitigations) recommended in the Belconnen Better Intersections study have also been tested, with and without TPV development traffic.

The following scenarios were tested in Sidra for this study:

- **Base Year 2021**
- **Opening Year 2025**
    - Base Case Existing Network Layout
    - Base Case with Mitigations
    - Base Case with Mitigations Plus TPV Development
- **Horizon Year 2035**
    - Base Case Existing Network Layout
    - Base Case with Mitigations
    - Base Case with Mitigations Plus TPV Development.

During the analysis process, several assumptions were made to estimate the correct base year, opening year and the horizon year traffic flows. Future volumes were taken from the Belconnen Better Intersections study report, which considered growth from the CTSM. The estimated traffic flows were then tested using Sidra intersection modelling software for the key study intersections adjacent to the Kippax Centre. The study intersections are as follows,

- Southern Cross Drive / Starke Street
- Southern Cross Drive / Florey Drive and
- Southern Cross Drive / Moyes Crescent

The SIDRA results estimated that the study intersections existing configurations may be operating with a poor level of service due to closely spaced intersections and insufficient road capacity of the current road infrastructure.

It was estimated that the study intersections will perform poorly future years (2025 and 2035) with the existing and proposed land use facilities adjacent to the TPV site.

The Traffic and Transport Study tested the analysis scenarios with the road improvement measures identified in the Belconnen Better Intersections report. It was found that with these proposed measures, the study intersections were estimated to operate with an acceptable level of service in the future years for ‘With’ and ‘Without’ TPV land use scenarios.

In accordance with the TCCS Guidelines for Transport Impact Assessment (August 2016), a Traffic Impact Assessment Report (TIA) will be required prior to a Development Approval based on the scale of the proposed development.

8.10 Parking and Access

8.10.1 Pedestrian and Cyclist Access

Pedestrian and cyclist access to the subject site from Hardwick Crescent, west of the site, is via fully paved verges and paths.

The existing bicycle and pedestrian networks adjacent to the Centre are shown in

Figure **84**. It identifies the nearby shared paths and on-road cycle lane provisions in the area. The shared use paths provide an adequate level of pedestrian connectivity within the local network. On-road cycle lanes are provided on Southern Cross Drive west of the Florey Drive intersection. A Bike and Ride cage is located on Hardwick Crescent within the Centre.

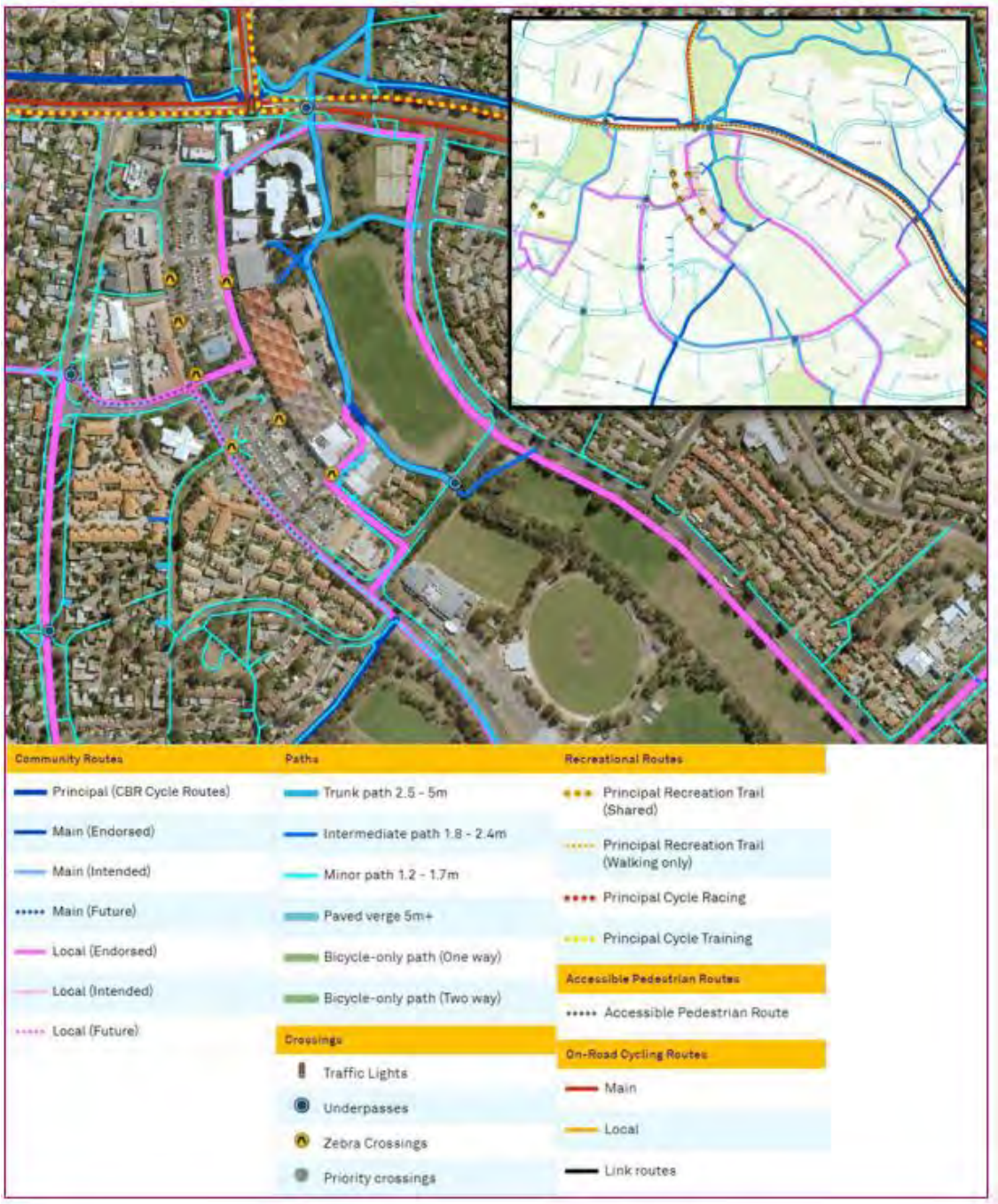

Figure 84 – Kippax Centre – Walking and Cycling Map

Pedestrian and cyclist access to the subject site from the north and south is predominantly provided by the existing shared path. Because this public path currently traverses through the subject site, it is recommended that it is relocated outside the boundary of the site to the east, closer to Moyes Crescent. Interconnectivity to the proposed development and potential relocation of Kippax Place is also likely to be undertaken by the developer and subject to the final development layout.

The key pedestrian connectivity concerns are in relation to the current pedestrian barrier of Kippax Fair and the poor connectivity between Kippax Fair and the businesses in the western portion of the

core of the Centre. The poor connectivity in this area is due to the Hardwick Crescent central parking facilities reducing the pedestrian permeability of the area and increasing the walking distance between local businesses.

It is assumed that a path will also be provided on the new link road between Hardwick Crescent and Moyes Crescent, strengthening this connection to the subject site.

To meet the requirements of the Holt Precinct Map and Code, a minimum 1.5m wide concrete path is to be provided from Moyes Crescent to the eastern subject site boundary. This path will then need to be continued to Section 88 to provide a thoroughfare and where it will form into a plaza to the Group Centre.

8.10.2 Vehicle Access

The Waste and Recycle Management Code for the ACT indicates that commercial, public and industrial developments require collection of Hoppers and/or Mobile Garbage Bins (MGBs) from a location on site and the development must allow for unobstructed access/egress of the waste collection point by collection vehicles in a forward direction. Bin sizes and frequency of pick up will be subject to the final proposed development scenario and developed in consultation with a commercial waste collection contractor and ACT NoWaste.

Numerous developments within the current group centre have provision for delivery vehicles, most notably, the ALDI loading dock. Service/delivery vehicles can access the Centre from Southern Cross Drive via Starke Street to the west or via Moyes Crescent to the east. Heavy vehicles accessing Woolworths loading bay access Kippax Place via Hardwick Crescent in the south. ALDI's loading bay is accessed via Hardwick Crescent in the north of the Centre. Other businesses within the Centre are typically serviced via small rigid vehicles which utilise the loading zones provided within the at-grade car parks.

This is of significance as the Holt Precinct Map and Code requires that an access road (two way) be provided to connect the existing Hardwick Crescent to Moyes Crescent as per the reproduced Figure 85 from the Holt Precinct Map and Code below.

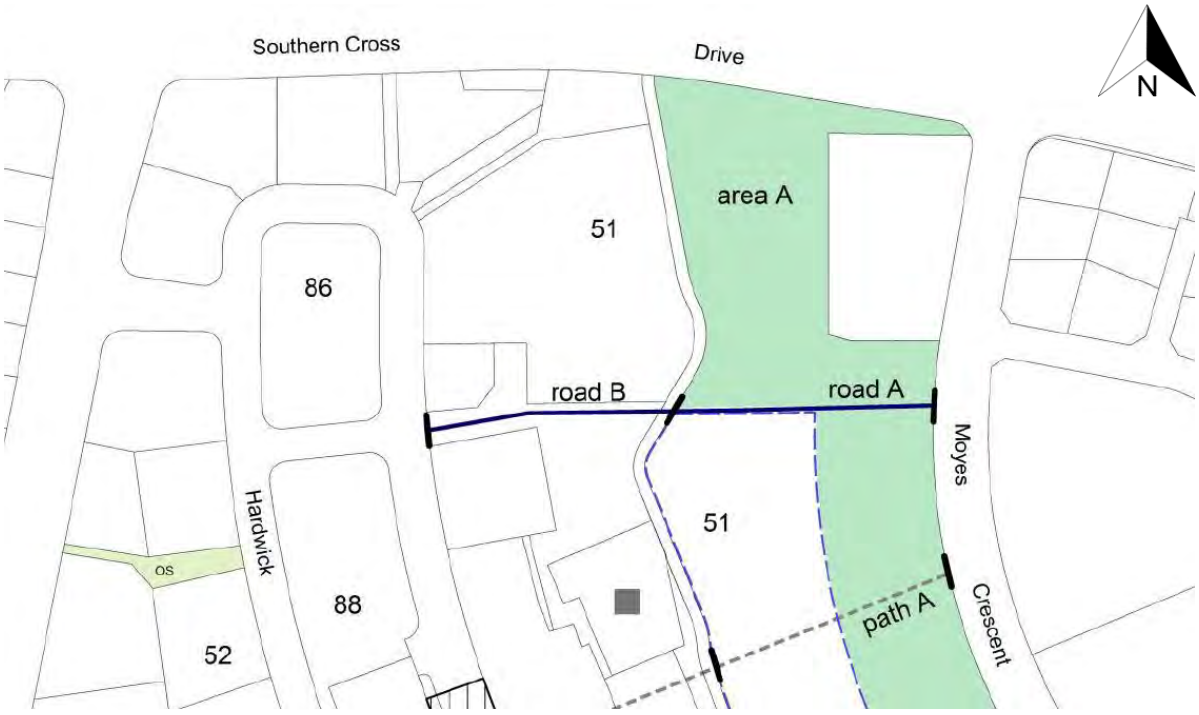

Figure 85 - Holt Precinct Map and Code Indicates an Access to The Site from Moyes Crescent

The Estate Development Code (EDC) was referred to for road reserve width requirements based on their traffic volumes in vehicles per day (vpd) and respective classification and the following is summarised from the EDC:

- Access Street A (traffic volume of 0-300 vpd) – 5.5m road width and overall road width of 16.5m
- Access Street B (traffic volume of 301-1000 vpd) – 7m road width and overall road width of 19.5m
- Minor and Major Collector (traffic volume of 1001-6000 vpd) – 10m road width and overall road width of 19.5m

Based on the Traffic and Transport Study the assumed traffic volume that would utilise this new link road would place the new link road into the Minor Collector category in accordance with the EDC.

Based on ACTmapi data, it is noted that the width between the existing apartments block boundary (Blocks 65 and 60 Section 51) and the ALDI block boundary (Block 61 Section 51) ranges from approximately 14m to 14.7m. At the most eastern corner of the ALDI block boundary, where the boundary tapers in towards the apartment boundary, the width between them is approximately 10.2m. Refer to Figure 86 for an aerial image of the site with approximate dimensions, taken from ACTmapi.

Figure 86 - Approximate Dimensions of the Existing Street and Driveway

The approximate width of the adjacent Hardwick Crescent road reserve, which is also indicated on the above Figure 86, is 13.6m. There appears to be sufficient width between the boundaries of Blocks 65 (apartments) and 61 (ALDI), to maintain a similar intent for the new link road to Moyes Crescent. This is except for the width between Blocks 60 (apartments) and 61 (ALDI) to the east, where it has been estimated to be 10.2m. If services are minimised within the verges of the proposed link road, discussions can be held with the relevant services authorities and TCCS to determine whether narrower verges can be accepted in this instance. It would be expected that traffic calming measures are incorporated within the design of the road to ensure that the intent of the road network surrounding this highly pedestrian trafficked area is maintained.

A further challenge in achieving a road through this corridor is maintaining the ALDI's loading dock operation, where truck turning movements would need to traverse the road. It is acknowledged however that this manoeuvring would be undertaken outside peak periods.

Additionally, several large, potentially regulated trees have been identified along the potential road's corridor, if kept on the alignment indicated in the Holt Precinct Map and Code. Some of these trees are located in very close proximity to the existing apartment buildings, providing resident amenity, but also may cause structural issues if removed. It is recommended that a tree survey and assessment by a qualified arborist together with structural engineering advice is sought prior to removal of these trees. See below Figure 87 for a site photograph along the alignment of the proposed road to Moyes Crescent.

Figure 87 - Existing Driveway to the Loading Zone

Emergency vehicles accessing the Centre via Southern Cross Drive can connect to the centre via Starke Street to the west and Moyes Crescent to the east. No notable barriers have been observed within the Centre which could restrict the ingress or egress of emergency vehicles from the centre.

Emergency vehicles may access the Centre from the Charnwood and the Belconnen Emergency Service Stations.

The delivery / service vehicle and the emergency vehicle access movements are shown in Figure 88 below. The emergency vehicles and the service vehicles will not use the Road A and Road B to access the site. These vehicles will traverse through Moyes Crescent and Flack Street to enter the Hardwick Crescent or via Florey Drive and Starke Street to access the TPV land uses.

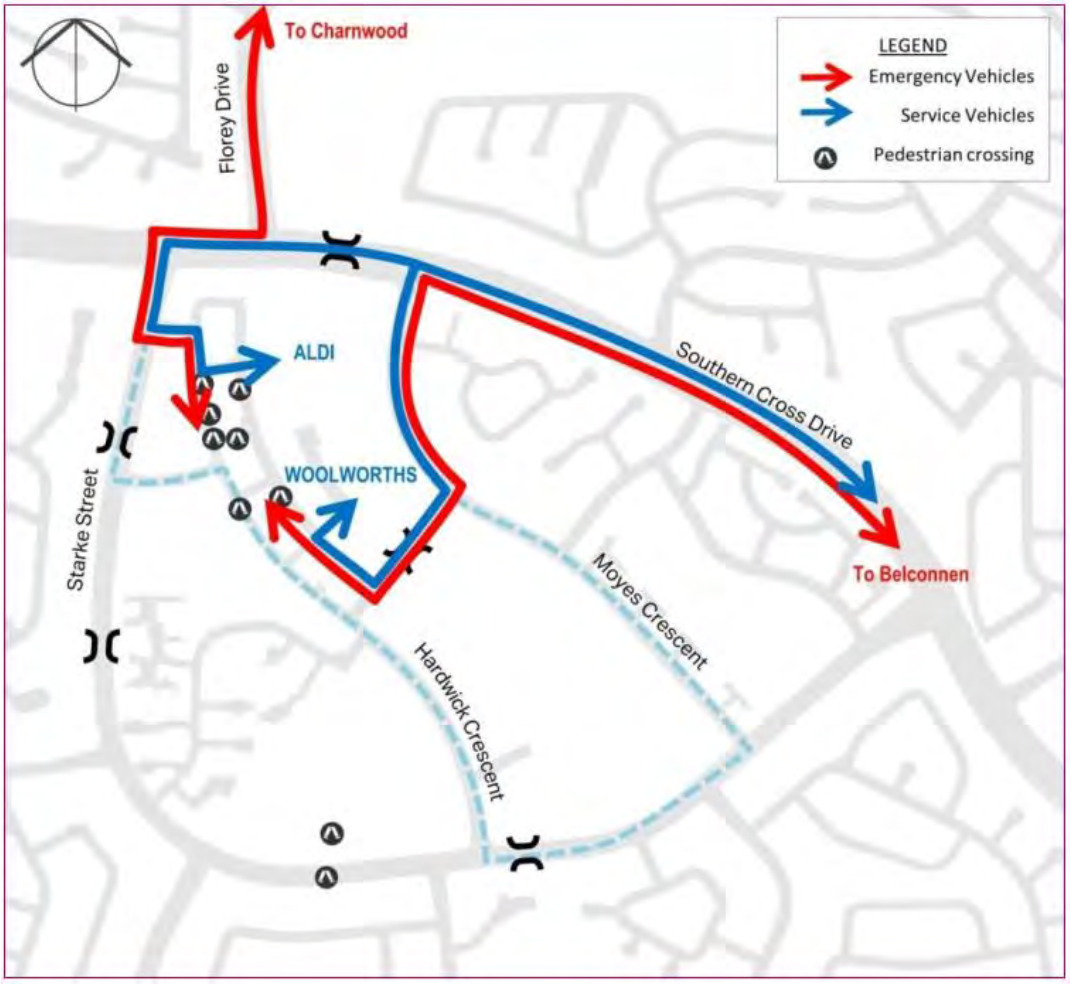

Figure 88 – Emergency and Service / Delivery Vehicle Access

8.10.3 Parking

The proposed development falls under both the Commercial and Residential Zone classifications and should be assessed accordingly under the ACTPLA Parking and Vehicular Access General Code (PVAGC). The car parking provision requirements for various types of developments are detailed in the PVAGC. The proposed parking rates for the TPV land uses are presented in

Table 14. The total statutory parking requirement for the TPV land uses are 1,367 spaces.

Table 14 – TPV Land Use Car Parking Requirements

Site	Yield code	Yield	Units	Provision rate	Parking requirement
Street Retail (Section 51)	Shop	1,840	m^2	0.05	92
Ground Floor Retail (Section 51)	Shop	5,600	m^2	0.05	280
Supermarkets (Section 51)	Shop	6,480	m^2	0.05	324
Food & Beverage (Section 51)	Restaurant	1,120	m^2	0.10	112
Community Hub Building (Section 88)	COM_ACT_CEN	1,200	m^2	0.03	36
Tower Residential (Section 51)	2BR	164	dwellings	1.50	246
Terrace Housing (Section 51)	3BR	30	dwellings	2.00	60
Commercial (Section 53)	Shop	2,100	m^2	0.05	105
Apartments (Section 53)	2BR	36	dwellings	1.50	54
Visitors - Apartments	Visitor	200	dwellings	0.25	50
Visitors - Terrace Housing	Visitor	30	dwellings	0.25	8

Source: Yields Source - JPS Engineering Report

Accessible parking needs to be provided in accordance with the ACT Parking and Vehicular Access General Code. The code requires that a minimum of 3% of the required number of spaces be provided for people with disabilities. This amounts to 32 accessible parking spaces to be provided within the TPV land uses.

There is a requirement to provide motorcycle parking at a rate of 3 spaces per 100 public car parking spaces in addition to the car parks. This results in 28 motorcycle spaces for the TPV land uses.

The 2016 AECOM study assessed the existing parking demand using parking temporal profiles at the Kippax Centre and found out that the parking requirements are generally met for the core and periphery developments.

The 2016 AECOM study estimated approximately 1,023 car parking spaces for the non-residential land uses and 747 parking spaces for the residential land uses. It is assumed that the residential parking supply will be provided within the residential development site boundaries. Furthermore, the 2016 AECOM study also identified approximately 386 replacement parking spaces for the existing car park that will be replaced by the structured car park. Overall, it was estimated in the previous 2016 AECOM study that 2,156 additional car parking spaces would be required for the future land uses proposed in the core areas. The 2016 AECOM study proposed structured car parks to accommodate the parking demand for the future land uses.

In addition to above parking demand, the TPV land uses will require more parking spaces. The overall future car parking requirements for the core areas including the TPV land uses are shown in Table 15.

Table 15 – Kippax Central – Future Car Parking Requirements

Scope	Land Use	Future Car Parking Requirement (spaces)
2016 AECOM Study	Non-residential use	1,023
	Residential use	747
	Replacement Parking	386
TPV Land uses	Non-residential use	979
	Residential use	418
Total		**3,553**

Source: 2016 AECOM Study and **Table 5**

The TPV approval plan states that the existing car parking spaces are retained within the site. The nominated parking areas cater for the existing and the future parking demand in the TPV approval and are shown in Figure 89. The potential structured car park is proposed in Section 86 or 88 which would mainly serve the future land uses identified in the 2016 AECOM study. Additionally, a new basement parking area in the order of 38,325 m^2 for the TPV land uses within Section 51 is proposed, which would accommodate 1,222 parking spaces and the remaining parking spaces (145 spaces) will have to be shared/accommodated in the nominated parking areas identified in Figure 89.

The TPV Number 361 and the Holt Precinct Map and Code requirement to provide on-site basement parking to accommodate the large increase in parking generation is therefore reinforced by the estimated area needed for parking outlined in this Traffic and Transport Study. However, the redevelopment of the existing shopping centre, residual parking within the parking lot to the east of the subject site could be utilised to offset the scale of the basement carpark. The on street parking along Moyes Crescent could also be used to offset parking requirements, as its current use of servicing the playing fields will no longer be required to the same extent.

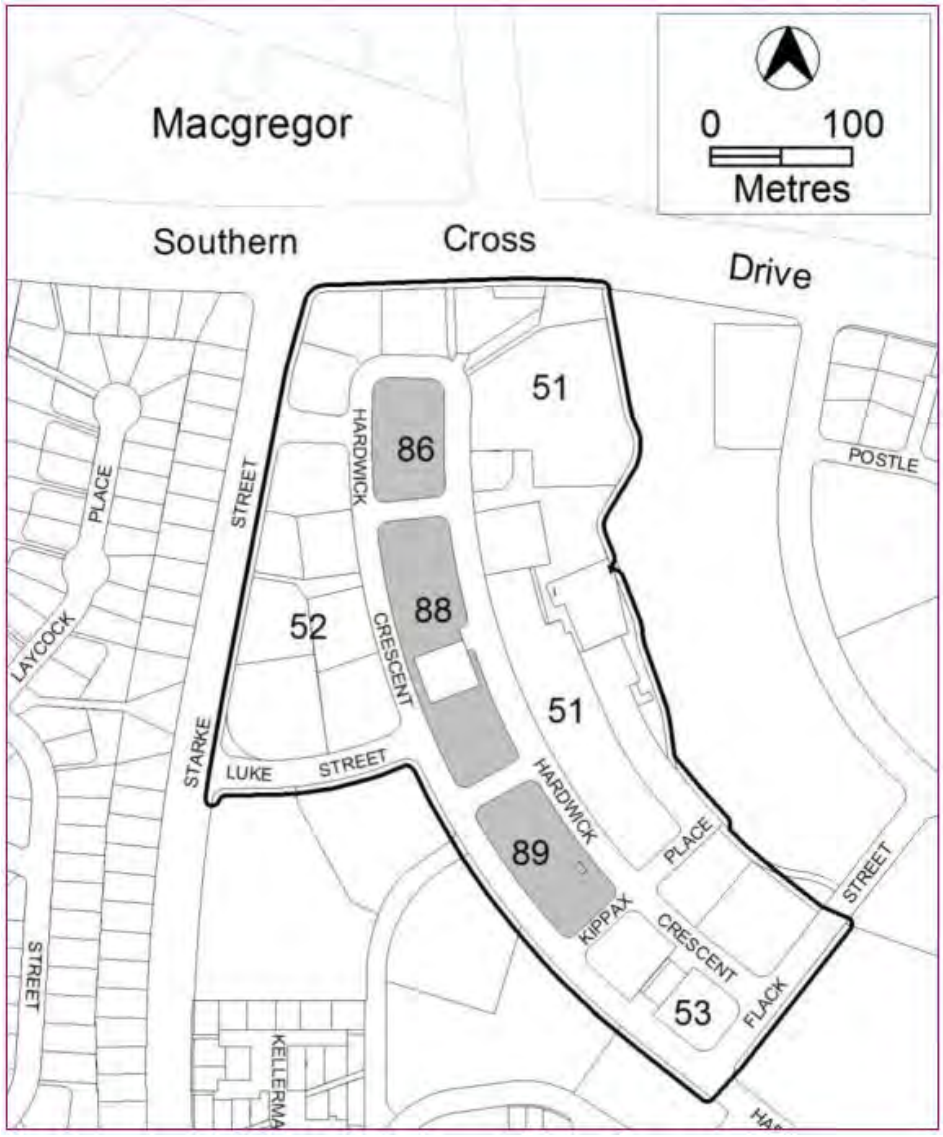

Figure 89 – TPV Nominated Parking Areas

8.11 Public Transport

8.11.1 Bus Routes

Table 16 outlines the existing bus routes and their peak and off-peak frequencies. The peak frequency of bus services for the Centre is 23 buses per hour, or approximately 1 bus service every 3 mins. Based on site observations and current local knowledge of the area this is considered a suitable frequency of bus services for the Centre.

Table 16 – Existing Weekday Bus Services - Kippax Group Centre

Route No	Route Description	AM Peak Hour Departure Frequency (8:00-9:00 am)	PM Peak Hour Arrival Frequency (3:45-4:45)
40	Fraser, Charnwood, Macgregor, Holt, Kippax, Latham, Florey, Belconnen Bus Stations	2	4
44	Kippax, Holt, Macgregor, Higgins, Belconnen Bus Stations	2	4
45	Kippax, Holt, Higgins, Hawker, Weetangera, Belconnen Bus Stations	3	3
903	Kippax to Strathnairn Loop via Kingsford Smith School and Macgregor Primary	4	5
R2	Rapid Service: Fraser, Dunlop, Macgregor, Kippax, Holt, Belconnen Bus Stations, Bruce, City Interchange, Parkes, Kingston, Fyshwick	5	7
TOTAL		**16**	**23**

The 2016 AECOM study analysed the existing public transport services and additional public transport services needed for the future expansion of the Kippax Centre. It was estimated that an additional 12 peak hour bus movements through the centre will be required to serve the West Belconnen area. It was also recommended that the existing bus station is relocated to directly north of the Kippax Library.

Various options were presented in the 2016 AECOM study and it is estimated that a total of 3 to 4 platforms (including the existing platforms) may be required depending on the individual option configuration. It was also identified that an additional 3 bus layovers are required along with the future potential locations of these layovers along the southern end of the Hardwick Crescent and the Moyes Crescent after the Flack Street.

It is noted that the TPV land uses will require additional bus services due to the increased public transport demand, which would need further investigation in subsequent stages of design. The Bus manoeuvrability and operation of the platforms will need to be confirmed through swept path analysis during the detailed design of the bus interchange.

Additionally, the future bus routes within the vicinity of the site was extracted from the CSTM 2041 model. It was observed that the CSTM only included additional school bus routes in addition to the existing bus routes. The route layer extracted from CSTM is shown in Figure 90 and the routes listed below.

- Route 1052
- Route 1053
- Route 1058
- Route 1059
- Route 1227

Source: Map Layer – ESRI Community Maps, Bus Routes – 2041 CSTM

Figure 90 – Future Bus Routes Extract from 2041 CSTM

8.11.2 Future Light Rail Connectivity

The future Canberra Light Rail is proposed to be extended to Kippax along Southern Cross Drive. Figure 91 presents the indicative future expansion plans for the Canberra Light Rail. Kippax Centre would be serviced by the Stage 3 expansion works. The light rail would likely help to significantly increase the mode share of public transport travel to and from the Kippax Centre.

Figure 91 – ACT Light Rail Masterplan

The 2016 AECOM study considered that the future light rail service will terminate at the Kippax Centre. However, the Figure 91 shows that the service might extend beyond this area. As the exact location of the stops are unknown, it is assumed that there is a potential stop near the intersection of Southern Cross Drive / Moyes Crescent, which is within a 400m radius. The optimal pedestrian route to this potential stop from the Kippax Centre is through Road B and then Road A to access the potential light rail stop. Alternatively, a shuttle service is recommended between the potential stop to the Kippax Centre Bus Stop through Moyes Crescent via Flack Street.

Refer to Appendix Q for the full Traffic and Transport Study Report.

8.12 Off Site Works

The offsite works that are required to meet the Holt Precinct Map and Code requirements for the proposed development of the Group Centre expansion area are as detailed in the below Figure 92, which is extracted from the Holt Precinct Map and Code.

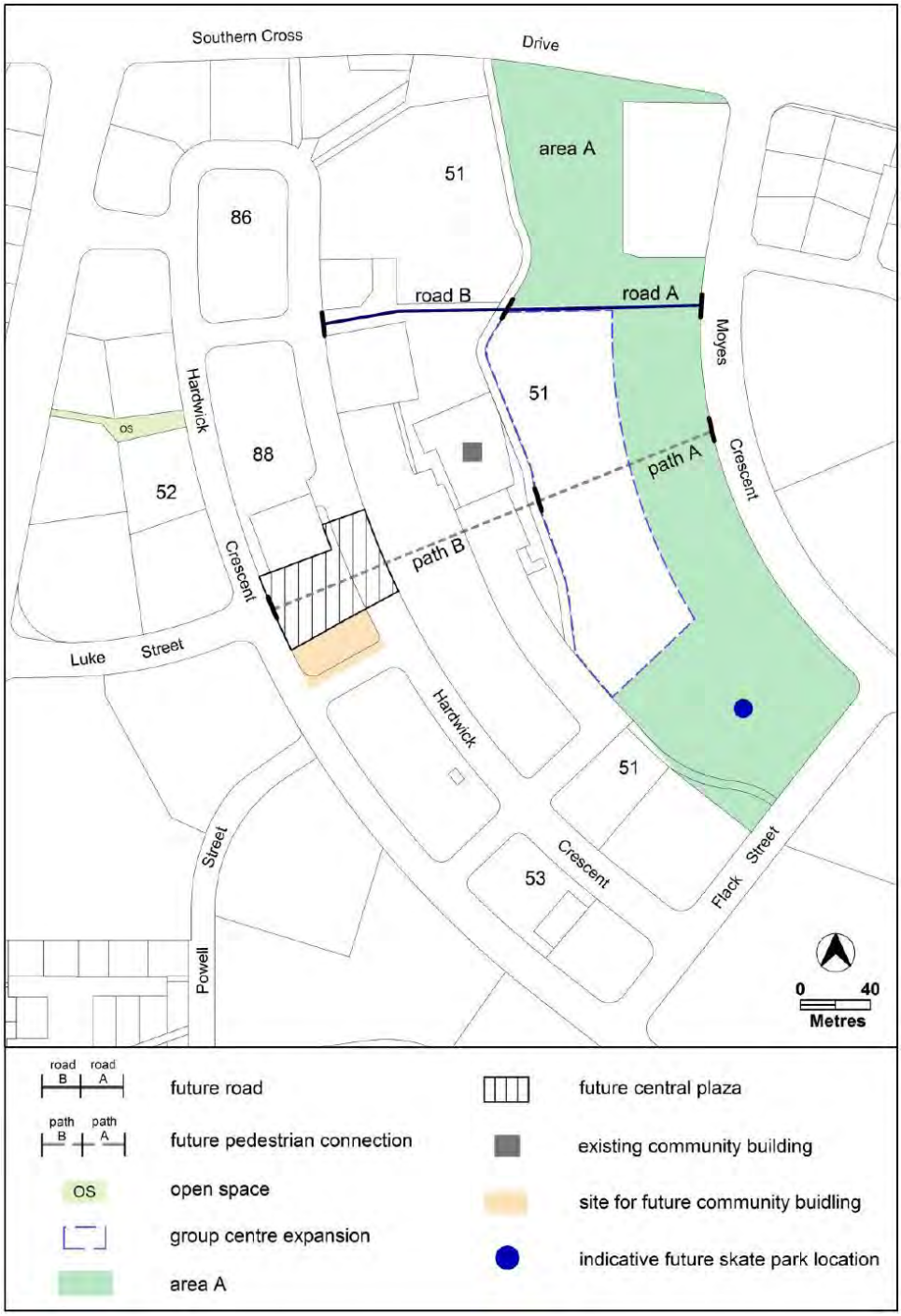

Figure 92 - Offsite Works Indicated in the Holt Precinct Map and Code

Namely, the key offsite works for the enablement of the subject site for future development is as follows:

a) upgrade the open space identified in area A in Figure 92 consistent with all of the following:

   i. a flood investigation report demonstrating that development in the expansion area does not increase flood risk in Area A

   ii. details of flood mitigation measures and water sensitive urban design works to be implemented as off-site works

b) demolish the existing community building and construct a new community building as identified in Figure 92

c) construct a new road identified in Figure 92 consistent with all of the following:
    i. construct road A generally in accordance with Figure 92
    ii. construct road A such that it can be connected road B to form a through road
    iii. provide basement access to development in the group centre expansion area from road A

d) construct a new pedestrian path identified in Figure 92 consistent with all of the following:
    i. construct path A generally in accordance with Figure 92
    ii. construct path A such that it can be connected to path B to form a thoroughfare

e) construct the new skate park in a central location within the urban open space area identified in Figure 92 consistent with all of the following:
    iii. is outside the drainage line
    iv. has good passive surveillance from surrounding streets and residential areas.

Note: the pedestrian path within the shopping centre would only be publicly accessible during opening hours.

In addition to these Holt Precinct Map and Code requirements, further identified offsite works would include the relocation of the existing DN375 trunk sewer line outside the subject site boundary as far as is practicable, whilst meeting the minimum Icon Water standards and specifications. Additionally, the shared path from the Flack Street underpass to the northern boundary of the subject site is also recommended to be relocated outside the subject site's boundary.

It is also understood that the existing playing fields that will be defunct as a result of the proposed development in the group centre expansion area, would be relocated to a site elsewhere in close proximity to the Holt sporting precinct south of the study area.

8.13 Water Sensitive Urban Design

The proposed development will drain via TCCS's stormwater infrastructure into the existing stormwater network. It is important the Developer is aware of this and complies with all legislative requirements with regards to stormwater runoff quality and quantity.

Internal stormwater designs shall comply with the EPSDD Waterways Water Sensitive Urban Design General Code (effective date: 21 February 2020), for which the requirements are summarised within the Water Sensitive Urban Design Development Code Requirements tables, including but not limited to the following requirements:

- Mains water use reduction of 40% in comparison to an equivalent development constructed in 2003.
- On site stormwater retention and detention.
- The developer must not increase the peak stormwater runoff from the development from the peak rate of runoff from an unmitigated (rural) site of the same area for minor and major storms.
- A summary of the minimum required WSUD targets and achievements are listed below:
    - Gross pollutants reduction ≥ 90%
    - Reduction in suspended solids ≥ 60%
    - Reduction in total phosphorous ≥ 45%
    - Reduction in total nitrogen ≥ 40%
    - Minimum permeable area of the site ≥ 20%
    - Effluent reuse is optional

The 'ACT Practice Guidelines for Water Sensitive Urban Design' (2017) document provides various methods that can assist in meeting these water sensitive urban design requirements for the proposed development. The following measures can be considered as part of the development application for the proposed development to achieve best practice in water sensitive urban design.

Mains water use reduction:

- Water efficient irrigation systems
- Use of stormwater to replace mains water for irrigation
- Water efficient landscaping
- Rainwater tanks for garden watering and internal uses, such as toilet flushing
- Use of greywater for irrigation and toilet flushing on individual dwellings
- Wastewater treatment and reticulation to commercial or industrial users who do not require water of a potable water mains standard

Stormwater management:

- Filter strips
- Swales and Bio-retention swales in lieu of piped drainage systems
- Downpipes and impervious surface areas not directly connected to the stormwater system, direct runoff across lawns and gardens
- Minimising impervious surfaces
- Installing on-site detention storage, which may be increased in size to allow for water harvesting
- Creating extended detention volume in ornamental ponds or landscaped depressions
- Direct connection of downpipes to a separate collection system to discharge to ornamental ponds to maintain water quality

Wastewater reuse:

- Use of domestic greywater, treated or untreated

Construction of the proposed development will be required to comply with the Environment Protection Authority's document, 'Environment Protection Guidelines for Construction and Land Development in the ACT' (March 2011).

9 Opinion of Probable Costs

The proposed works outlined within Section 8 of this report represent the minimum requirements to adequately enable this site in line with the Holt Precinct Map and Code's requirements. The design outcomes that inform this costing are indicative only and are subject to change during detailed design and additional investigations.

Construction opinions of cost for each item are based on the outcomes of the specialist investigations and current industry pricing for similar scale projects.

This opinion of probable cost has been itemised in Table 17 below, with explanatory notes provided below the table.

Table 17 - Opinions of Probable Costs for Associated Works

Cost Item	Opinion of Probable Cost to Developer
Potable Water	
Water ties connected to existing mains (DN32, DN63, DN32, DN32, DN25, DN25)	$138,000
Provision of relocation of the water main outside of the development area and addition of hydrants on Moyes Crescent	$34,000
Sewer	
Sewer ties (DN150 connected to relocated DN375 main, DN100 connected to existing main)	$47,000
Stormwater	
Truncation/exhuming of existing DN600 stormwater line and structure to east subject of site boundary	$18,000
Stormwater ties	$6,000
Gas	
Provide and install connection to existing gas line	Subject to detail design and negotiation with Jemena
Electrical	
Relocation of the existing substation and other electrical infrastructure outside the development area	$125,000
Removal of playing field including ancillary items and underground electrical lines*	$81,000
Provide and install connection to existing electrical network**	Future requirement for the developer to undertake negotiations with Evoenergy
Irrigation	
Remove and dispose of existing irrigation pipework, valves, sprinklers and fittings†	$57,000
Remove and dispose of irrigation control cabinet	$1,000
Removal and salvage irrigation meter pit cover	$500
Telecommunications	
Connect to existing Telstra/NBN network	Subject to detail design and negotiation with Telstra/NBN
Verge Works	
Construct a new 1.5m wide pedestrian path to subject site boundary***	$21,000

Cost Item	Opinion of Probable Cost to Developer
Other Costs	
Provision of new driveway to basement carpark	$22,000
Upgrade the open space identified in area A	To be considered by the developer as part of their detailed design.
Flood mitigation measures, and water sensitive urban design works to be implemented as off-site works (in area A) (Calibre 2020 cost estimate)	$167,000
Construct new Road A only (from TPV) from Moyes Crescent to subject site's residential area only	$1,600,000
Construct new path and green link and plaza through development	To be considered by the developer as part of the detailed design.
Relocation/adjustment of DN375, DN300 and DN225 sewer outside of the subject site's development area	$235,000
Relocation of the shared path from Flack Street to north of the subject site	$175,000

Notes:

* *This cost item includes the stripping and removal of approximately 250mm of existing topsoil for reuse on site, removal and disposal of lighting posts, connecting low voltage electrical lines, controller and goal posts.*

** *Electrical: Evoenergy has advised that the existing substation within the Kippax Group Centre doesn't have residual capacity and if the demand of the proposed development exceeds 1.5MVA, an approximate 3km electrical line upgrade is required to the Latham substation. This was estimated by Evoenergy to cost $3m.*

*** *1.5m path: Path cost does not include subgrade level change from existing levels or culvert drainage.*

† *Includes removal and appropriate disposal of approximately 265m of asbestos irrigation mains (DN80 and DN100).*

If services are chosen to be kept within the newly created block boundary (private lease), or relocated within the private lease, then easements to service authority standards and specifications will be necessary and a revised deposited plan is required.

10 Site Viability, Constraints and Risk Assessment

A table of constraints is prepared below for the Section 51 Holt, Kippax Group Centre expansion area, based on the site services and opportunities/constraints discussed within this report. A risk rating was established for each issue identified utilising the following risk matrix.

Table 18 – Risk Matrix Rating Definitions

Risk Rating	Definition of Risk Rating Against Site Constraints
Insignificant	Sufficient, relevant and recent information to inform future development prospect, no additional work necessary at this stage.
Low	Information available is sufficient to inform future development with only minor works or investigations required to progress the design development. It is advised further investigation is undertaken to continue the development process.
Medium	Information available is lacking or absent. Significant risks reside in other investigations undertaken and the viability of the proposed development. It is recommended that these investigations are undertaken.
High	Information available is severely lacking or absent. Major risks reside in other investigations undertaken and the viability of the proposed development. It is advised that these investigations are undertaken as a priority prior to recommended investigations that have been given a lower risk rating.
Extreme	Information is absent, not relevant or insufficient. The outcome of the investigation required is needed to determine whether the site is developable or unviable.

With respect to the relevant disciplines covered within this Site Investigation report for the future development of the subject site, the following table has been developed, which incorporates the perceived issues, or gaps in information, the associated risk and a subsequent risk rating.

Table 19 – Assignment of Risk Rating to Identified Constraints

Description of Constraint	Allocated Risk Rating
Contamination has been found in low concentrations within the subject site. An accredited environmental auditor is now required to assess the risks associated with this contamination in respect of the proposed development.	High
Contaminated and/or hazardous materials may be present in the community building on Block 22 Section 51 and toilet block/changerooms on Block 6 Section 51 and toilet block on Block 6 Section 51.	Medium
Flooding of Hardwick Crescent adjacent the existing group centre in the major 1% AEP storm event. A more detailed review of the pipe capacity along Hardwick Cres is recommended to see if anything needs to be done to upgrade the drainage system in the area.	Medium
Electrical loading anticipated for the proposed development as assumed within this site investigation report may require upgrades for up to 3km to the Latham substation.	Medium
Some existing service locations are unconfirmed and liaison with relevant authorities and complete survey and potholing of the subject site, including areas affected by the proposed development should be sought.	Medium

Description of Constraint	Allocated Risk Rating
Trunk sewer relocation outside the subject site area may still require part of the sewer to be within the subject site creating an easement.	Low
The proposed road link from Hardwick Crescent to Moyes Crescent has several challenges such as meeting the standard road reserve width, accommodating the ALDI loading dock's operation and existing large trees within its proposed alignment.	Low
Several large, regulated trees are within or in proximity of the subject site and offsite works areas. The proposed demolition and development may require tree removal or works within root zones for supporting infrastructure.	Low
The site (northern portion) has been found to have a high water table that would affect basement carparking construction and operation.	Low
Insufficient space to accommodate onsite parking or insufficient off-site parking facilities.	Low
Managing the 1% AEP flood levels immediately to the south and west of the subject site and allowing this flow to pass under the proposed Road A.	Low
Potential ecological colonisation potential habitat areas for the Superb Parrot are within the subject site area.	Low
Potable water augmentation may be needed to meet highest fire demand and fire hydrant coverage is not sufficient to meet the requirements of ACT Fire & Rescue. This will need to be confirmed once the extent of the proposed development is known.	Low
Numerous existing services are present within the subject site that service the existing surrounding group centre. Easement creation or potential relocations should be confirmed through the relevant authorities to define this development constraint if services are deemed to be kept live for the existing shopping centre.	Low
Proximity to existing substation within the site requires a step and touch potential test and earthing study on the existing high voltage feed if a 'vulnerable use' proposed development is anticipated.	Low
A Transport Impact Assessment is required for any future development in this area.	Low
Uncontrolled fill is present on the site that will need to be removed if deemed to be developed on directly.	Insignificant
The area north of the subject site is currently identified as a bushfire prone area.	Insignificant

When holistically considering the above noted constraints and risk ratings, the subject site possesses few serious constraints and **is deemed viable for future development.**

11 Recommendations

Based on the level of risk, recommendations have been listed in order of priority, to assist in programming the recommended works. The priority listing has been developed by assessing the importance of the additional investigations recommended and the effect that this work would have on other investigations. The aim is to provide a comprehensive prioritised list of recommended additional investigations to complete the assessment of the subject site.

It is noted that a residual risk rating has not been provided, however, once recommended additional investigations have been completed, the residual risk can be assessed based on the outcomes of these reports.

The development of commercial and residential development in line with the Kippax Masterplan for Section 51 Holt has been assessed in this Site Investigation Report. A summary of the recommendations and necessary actions required to enable this site for development with the associated risk colour coded to that which is presented in section 10 of this report is provided below:

- **Contamination Investigation Scope:** An accredited and Environment Protection Authority approved auditor is to be engaged to determine the risk and measures required to undertake development on the site. The environmental audit must be undertaken in accordance with the requirements of the 'Contaminated Sites Environment Protection Policy' and submitted to the EPA for review and endorsement prior to the site being used for other purposes.

- **Road Link:** Road links from Hardwick Crescent to Moyes Crescent as shown in the Holt Precinct Map and Code to be further investigated once the development extent and servicing requirements are known. Furthermore, liaison with TCCS and required service authorities is recommended to determine the viability of these roads and the most appropriate alignment.

- **Easements:** Confirm through all relevant service authorities the extent of easement creation over existing services within the block once the servicing requirements for the actual development is known. The possibility of the relocation of these services should also be investigated, if required, as part of the proposed development's planning process.

- **Ecological Assessment:** It is recommended to engage an ecologist or fauna spotter-catcher to check the trees for nests prior to felling them and, if found, take appropriate actions to minimise the impacts through 'soft-felling', and transfer of any birds to a wildlife carer. The potential Superb Parrot areas identified by the Conservator should be given particular attention.

- **Flooding:** Once the final development is known, an updated flood model is to be produced to determine if the proposed development has any adverse impact to the adjacent floodway east of the development.

- **Existing Underground Service/Utility Location:** Undertake a detailed sub-surface investigation (potholing) of existing service/utility infrastructure at critical locations in and around the site when the final proposed development is known.

- **Electrical Service:** Verify the electrical demand of the final proposed development to determine whether upgrades or augmentation to the Latham substation is required to service the proposed development.

- **Fire Mitigation:** It is recommended that liaison with ACT Fire and Rescue and Icon Water be undertaken to confirm any necessary potable water upgrades/augmentation or hydrant installations along Moyes Crescent, Kippax Place and Hardwick Crescent.

- **Existing Trees:** Liaise with the Conservator and TCCS Tree Protection Unit for the proposed removal of any trees.

- **Sewer Service:** Confirm relocation of the existing trunk sewer line and easement creation through Icon Water, once the development extent and required servicing is known.

- **Stormwater:** Confirm relocation of the existing stormwater lines and easement creation through TCCS, once the development extent and required servicing is known.

- **Potable Water Service:** Confirm relocation of the existing potable water lines and easement creation through Icon Water, once the development extent and required servicing is known.

- **Gas Service:** Liaise with Jemena/Zinfra Gas regarding interconnection of the 32mm gas main in Hardwick Crescent and the 50mm gas main in Southern Cross Drive to provide sufficient capacity to supply the proposed development, once the demands of the development are known.

- **Telecommunication Service:** Liaise with Telstra and NBN for connection and relocation of existing infrastructure within and surrounding the proposed development site for telecommunication and broadband internet connections.

- **Traffic Impact Assessment**: In accordance with the TCCS Guidelines for Transport Impact Assessment, a Traffic Assessment Report (TAR) will be required prior to a Development Approval based on the scale of the proposed development. This assessment is to also determine the necessary parking requirements for the proposed development.

- **Proximity to Existing Substations:** A step and touch potential test and earthing study on the existing electrical substations and high voltage feeds will be required in consultation with Evoenergy if vulnerable usage, is proposed.

12 Drawings

As part of this Site Investigation report, the following drawings have been prepared and are provided within Appendix A.

Drawing No.	Description	Revision
201053-DRG-CIV-GN-0002	General Notes and Legend	C
201053-DRG-CIV-UT-0501	Existing Services Plan Sheet 1	E
201053-DRG-CIV-UT-0502	Existing Services Plan Sheet 2	E
201053-DRG-CIV-UT-0511	Proposed Services Plan Sheet 1	B
201053-DRG-CIV-UT-0512	Proposed Services Plan Sheet 2	B

These drawings are to be read in conjunction with this report. The plans are based upon information and consultation provided by service providers and authorities. All services details are to be confirmed on site. The existing services in the vicinity of the site are represented in an indicative format. These plans were prepared solely for the purposes of this report and for the use of Environmental, Planning and Sustainable Development Directorate (EPSDD).

Appendix A

Drawings

UTILITIES LEGEND

EXISTING UTILITIES COMPILED THROUGH THE DIAL BEFORE YOU DIG SERVICE	EXISTING UTILITIES SURVEYED ON SITE	EXISTING UTILITIES TO BE EXHUMED OR ABANDONED	NEW UTILITIES	
⌀375 eSW ⌀375 eSW	⌀375 zSW ⌀375 zSW		⌀375 SW ⌀375 SW	⌀375 STORMWATER LINE WITH R-SUMP, PLANTATION SUMP, MANHOLE AND HEADWALL
⌀300 eSW ⌀300 eSW	⌀300 zSW ⌀300 zSW		⌀300 SW ⌀300 SW	⌀300 STORMWATER LINE WITH, GRATED SUMP, KISS SUMP AND PIPE END CAP
			IR HER SS SS SS	SUBSOIL LINE WITH HIGH END RISER INTERMEDIATE RISER AND HEAD WALL
H SV TW ⌀150 eW ⌀150 eW	H SV TW ⌀150 zW ⌀150 zW		H SV TW ⌀150 W ⌀150 W	⌀150 WATER MAIN WITH HYDRANT, STOP VALVE, THRUST WALL AND PIPE END CAP
M SC TS ⌀150 eW ⌀150 eW CTB PTB	M SC TS ⌀150 zW ⌀150 zW CTB PTB		M SC TS ⌀150 W ⌀150 W CTB PTB	⌀150 WATER MAIN WITH WATER METER, TIE AND STOP COCK, CONCRETE THRUST BLOCK, TRENCH STOP AND CONCRETE THRUST PIER
SCOUR STOP ⌀150 eS ⌀150 eS	SCOUR STOP ⌀150 zS ⌀150 zS		SCOUR STOP ⌀150 S ⌀150 S	⌀150 SEWER MAIN WITH MANHOLE, SCOUR STOP AND PIPE END CAP
eG eG eG	zG zG zG		G G G	GAS MAIN
eAAPT eAAPT	zAAPT zAAPT		AAPT AAPT	AAPT CONDUIT AND PIT
eICON eICON	zICON zICON		ICON ICON	ICON CONDUIT AND PIT
eIINET eIINET	zIINET zIINET		IINET IINET	IINET CONDUIT AND PIT
eCOMM eCOMM	zCOMM zCOMM		COMM COMM	MISCELLANEOUS COMMUNICATIONS CONDUIT AND PIT
eNBN eNBN	zNBN zNBN		NBN NBN	NBN CONDUIT AND PIT
eNGEN eNGEN	zNGEN zNGEN		NGEN NGEN	NEXTGEN CONDUIT AND PIT
eOF eOF	zOF zOF		OF OF	OPTIC FIBRE CONDUIT AND PIT
eOPT eOPT	zOPT zOPT		OPT OPT	OPTUS CONDUIT AND PIT
eSSICT eSSICT	zSSICT zSSICT		SSICT SSICT	SSICT CONDUIT AND PIT
eTEL eTEL	zTEL zTEL		TEL TEL	TELSTRA CONDUIT AND PIT
eTR eTR	zTR zTR		TR TR	TRANSACT CONDUIT AND PIT
eVF eVF	zVF zVF		VF VF	VODAFONE CONDUIT AND PIT
eHV eHV eHV	zHV zHV zHV		HV HV	ELECTRICITY ABOVE GROUND - HIGH VOLTAGE
eLV eLV	zLV zLV		LV LV	ELECTRICITY ABOVE GROUND - LOW VOLTAGE
eHV eHV eHV	zHV zHV zHV		HV HV HV	ELECTRICITY BELOW GROUND - HIGH VOLTAGE
eLV eLV eLV	zLV zLV zLV		LV LV LV	ELECTRICITY BELOW GROUND - LOW VOLTAGE
LT LT			LT LT	STREET LIGHT CONDUIT WITH PEDESTRIAN STREET LIGHT AND SINGLE REACH STREET COLUMN
				UTILITY EASEMENT

UTILITIES MAY BE SHOWN AS FINE BLACK FOR PROPOSED AND GREY FOR EXISTING

GENERAL LEGEND

EXISTING	EXISTING TO BE REMOVED	NEW	
			BLOCK BOUNDARY
			TREE

NOTATION

AL	ALIGNMENT
BK	BARRIER KERB
CH	CHAINAGE
CK	CASTELLATED KERB
CL	COVER LEVEL
CTB	CONCRETE THRUST BLOCK
CT	CONCRETE THRUST PIER
DP	DOWN PIPE
FSL	FINISHED SURFACE LEVEL
FK	FLUSH KERB
H	HYDRANT
HER	HIGH END RISER
HW	HEAD WALL
IL	INVERT LEVEL
IP	INTERSECTION POINT
IR	INTERMEDIATE RISER
K4A	k4A KERB
KR	KERB RETURN
KG	KERB AND GUTTER
KO	KERB ONLY
MH	MANHOLE
MK	MOUNTABLE KERB
MKG	MOUNTABLE KERB AND GUTTER
MS	MOWING STRIP
OCI	OPEN CONCRETE INVERT
PC	PRAM CROSSING
PTB	PIER THRUST BLOCK
PR	PRAM RAMP
RL	REDUCED LEVEL
ROCI	REINFORCED OPEN CONCRETE INVERT
RVC	REINFORCED VEHICLE CROSSING
SC	STOP COCK
SS	SUBSOIL
SV	STOP VALVE
TP	TANGENT POINT
TS	TRENCH STOP
TW	THRUST WALL
VC	VEHICULAR CROSSING

GENERAL NOTES

1. THE CONTRACTOR MUST COMPLY WITH CURRENT WORK AND HEALTH AND SAFETY LEGISLATION, REGULATIONS AND CODES OF PRACTICE.
2. THE CONTRACTOR MUST SECURE ALL PERMITS. ARRANGE ALL CLEARANCES AND PAY ALL FEES REQUIRED TO COMPLETE THE PROJECT BEFORE COMMENCING WORK OR PRIOR TO THEM CAUSING DELAY TO THE PROJECT.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL CONSTRUCTION WORKS BEING CARRIED OUT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS WITHIN THE SITE PRIOR TO COMMENCEMENT OF WORKS. ANY DISCREPANCIES SHALL BE REFERRED TO THE DESIGN CONSULTANT A MINIMUM 7 DAYS PRIOR TO COMMENCEMENT OF ASSOCIATED WORKS.
5. THE CONTRACTOR SHALL ENSURE DISTURBED SURFACES OUTSIDE THE GENERAL LIMIT OF WORK IS REINSTATED AT THE CONTRACTORS EXPENSE, TO THE SUPERINTENDENTS SATISFACTION, THESE SURFACES INCLUDE BUT ARE NOT LIMITED TO ROAD PAVEMENTS, KERBS , VERGE PAVING OR GRASSING, PEDESTRIAN FOOTPATHS AND DRIVEWAYS.
6. THE CONTRACTOR IS RESPONSIBLE FOR MAKING SMOOTH CONNECTION TO EXISTING.
7. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EARTHWORKS IN A STABLE CONDITION DURING CONSTRUCTION. TEMPORARY SHORING AND BATTERING MUST BE IN ACCORDANCE WITH AS3798
8. THE CONTRACTOR SHALL MAKE PROVISIONS FOR BOTH VEHICULAR AND PEDESTRIAN TRAFFIC AND SITE VISITORS. THE CONTRACTOR MUST ENSURE SAFE ACCESS FOR NON CONSTRUCTION PERSONNEL.
9. THE CONTRACTOR IS RESPONSIBLE FOR THE PREPARATION OF ALL NECESSARY TEMPORARY TRAFFIC MANAGEMENT PLANS APPROVED IN ACCORDANCE WITH AS1742.3 AND RELEVANT AUTHORITY REQUIREMENTS.
10. THE CONTRACTOR IS RESPONSIBLE FOR THE PREPARATION OF ALL NECESSARY POLLUTION CONTROL PLANS AND THEIR APPROVAL.
11. THE CONTRACTOR SHALL ENSURE ALL MATERIALS AND WORKMANSHIP IS IN ACCORDANCE WITH RELEVANT CURRENT CODES, STANDARDS, CONTRACT REQUIREMENTS AND AUTHORITY REQUIREMENTS.
12. THE CONTRACTOR SHALL LIAISE WITH ALL ADJACENT CONTRACTS TO ENSURE ALL ALIGNMENTS AND LEVELS OF NEW OR RELOCATED UTILITIES ARE COMPATIBLE.
13. THE INFORMATION PROVIDED IN THESE DRAWINGS PREPARED BY SELLICK CONSULTANTS IS SOLELY FOR THE USE OF THE RECIPIENT. SELLICK CONSULTANTS HAS NO DUTY OF CARE OR ACCEPTS ANY RESPONSIBILITY FOR A THIRD PARTY WHO MAY RELY UPON THESE DOCUMENTS FOR ANY PURPOSE.
14. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH OTHER ENGINEERING/ ARCHITECTURAL DRAWINGS AND SPECIFICATIONS OR OTHER WRITTEN INSTRUCTION THAT MAY BE ISSUED DURING THE TIME OF THE CONTRACT.
15. BLOCK BOUNDARIES SHOWN ON THESE DRAWINGS ARE IN ACCORDANCE WITH SUPPLIED DIGITAL DATA OR SURVEYED.
16. DO NOT SCALE THESE DRAWINGS.
17. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS.
18. ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD).
19. SITE BOUNDARY AND SUBDIVISION PLAN BY ANTHONY QUINN SURVEY PTY. LTD., 5 MAY 2021
20. DETAILED SURVEY BY ACT SURVEY PTY. LTD., MARCH 2021

UTILITIES NOTES

1. THE UTILITIES INDICATED ON THESE DRAWINGS WERE COMPILED FROM DIGITAL PLANS ISSUED BY UTILITY AUTHORITIES VIA THE DIAL BEFORE YOU DIG SERVICE. THE INFORMATION PROVIDED WAS PREPARED SOLELY FOR THE USE OF THE AUTHORITY AND IS NOT NECESSARILY ACCURATE.
2. BEFORE COMMENCING WORK THE CONTRACTOR SHALL CONTACT THE RELEVANT UTILITY AUTHORITIES AND VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES ON SITE AND OBTAIN NECESSARY CLEARANCES FOR POTHOLING AND CONSTRUCTION. DISCREPANCIES BETWEEN THE CONSTRUCTION DRAWINGS AND THE PHYSICAL ONSITE CONDITIONS MUST BE REPORTED BACK TO THE DESIGN CONSULTANT A MINIMUM 7 DAYS PRIOR TO COMMENCEMENT OF WORKS.
3. BEFORE COMMENCING EXCAVATION THE CONTRACTOR SHALL EXPOSE ALL CROSSINGS AND CONNECTIONS POINTS ON EXISTING UNDERGROUND UTILITIES. THE LEVELS OF CONNECTION POINTS AND LEVELS OF EACH CROSSING SHALL BE SURVEYED AND ANY VARIATIONS OF THE LEVELS GIVEN OR ANY DIFFICULTIES IN BEING ABLE TO ACHIEVE THE REQUIRED GRADES OF NEW PIPELINES SHALL BE REPORTED TO THE SUPERINTENDENT. A MINIMUM OF 7 DAYS PRIOR TO THE COMMENCEMENT OF WORKS
4. BEFORE COMMENCING WORK THE CONTRACTOR SHALL ARRANGE THE RELOCATION OR ADJUSTMENT OF A UTILITY SERVICE TO THE APPROVAL OF THE RELEVANT UTILITY AUTHORITY.
5. BEFORE COMMENCING WORK THE CONTRACTOR SHALL LOCATE AND MARK ALL UTILITIES WITHIN THE EXTENT OF WORKS.
6. IF AN UNDERGROUND SERVICE IS DAMAGED DURING CONSTRUCTION THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENT AND THE RELEVANT UTILITY AUTHORITY IMMEDIATELY. ANY DAMAGE TO EXISTING UTILITIES SHALL BE REPAIRED AT NO EXTRA COST TO THE PRINCIPAL.

ICON WATER NOTES

1. ALL WORK ON ICON WATER WATER SUPPLY AND SEWER MAINS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT STANDARDS. REFER TO WWW.ICONWATER.COM.AU FOR THE CURRENT RELEASE OF STANDARDS
   - WSA-02 'GRAVITY SEWERAGE CODE OF AUSTRALIA'
   - STD-SPE-G-011 'ICON WATER SUPPLEMENT TO WSA-02'
   - WSA-03 'WATER SUPPLY CODE OF AUSTRALIA'
   - STD-SPE-G-012 'ICON WATER SUPPLEMENT TO WSA-03'
   - STD-SPE-M-006 'REQUIREMENTS FOR PROPERTY SERVICE CONNECTIONS'
2. CONNECTIONS AND OR DISCONNECTIONS OF SEWER AND WATER AT THE MAIN TO BE MADE BY ICON WATER AT CONTRACTOR'S EXPENSE. THE CONTRACTOR IS TO EXPOSE THE MAIN AT THE LOCATION OF THE CONNECTION/DISCONNECTION IN PREPARATION FOR THE WORK BY ICON WATER. ALL EXCAVATION IN THE VICINITY OF MAINS IS TO BE CARRIED OUT BY HAND.
3. THE CONTRACTOR MUST VISIT THE SITE OF WORKS BEFORE TENDERING AND MAKE ALLOWANCES IN THEIR TENDER FOR ALL TOPOGRAPHIC CONSTRAINTS AFFECTING THE EXECUTION OF THE WORKS AND THE RESTORATION OF THE SITE.
4. ALTHOUGH THE POSITIONS OF EXISTING UNDERGROUND SERVICES HAVE BEEN PLOTTED FROM AVAILABLE RECORDS, THE CONTRACTOR SHALL CONFIRM THE DEPTH AND LOCATION OF ALL SERVICES ON SITE BEFORE COMMENCING EXCAVATIONS. CONTRACTOR TO ADVISE DESIGN ENGINEER IF NOT IN ACCORDANCE WITH THE PLAN.
5. ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD). ALL COORDINATES ARE BASED ON NOTED CO-ORDINATE SYSTEM.
6. THE CONTRACTOR MUST SECURE ALL PERMITS, ARRANGE ALL CLEARANCES AND PAY ALL FEES REQUIRED TO COMPLETE THE PROJECT BEFORE COMMENCING WORK.
7. WORK AS EXECUTED DRAWINGS, TIE BOOK AND DEPOSITED PLAN MUST BE SUBMITTED BEFORE CONNECTION.
8. ANY NON-METALLIC WATER SERVICE IS TO BE INSTALLED WITH TRACER WIRE AND TESTED.
9. EXCESS EXCAVATED MATERIAL SHALL BE REMOVED FROM SITE AND DISPOSED OF AT AN APPROVED SPOIL AREA.
10. THE CONTRACTOR SHALL REINSTATE ALL DISTURBED SURFACES TO MATCH EXISTING.
11. THE CONTRACTOR IS RESPONSIBLE FOR THE PREPARATION OF ALL NECESSARY TEMPORARY TRAFFIC MANAGEMENT PLANS AND THEIR APPROVAL.
12. CONTRACTOR TO CONFIRM DEPTH OF SEWER AND STORMWATER TIE POINTS PRIOR TO COMMENCEMENT OF CONSTRUCTION. ADVISE DESIGN ENGINEER IF NOT IN ACCORDANCE WITH PLAN.
13. ANY DEVIATION OF PIPE MATERIAL TO BE PROPOSED TO ENGINEER PRIOR TO INSTALLATION.

SEWER EXPLANATIONS

PIPE INFORMATION BOX

601.005	UPSTREAM INVERT LEVEL
⌀150	PIPE INTERNAL DIAMETER
uPVC	PIPE MATERIAL RCP,VC OR PVC
13.5m	PIPE LENGTH
7.62%	PIPE GRADE
600.022	DOWNSTREAM INVERT LEVEL

SEWER STRUCTURE ID

S2-1 SEWER LINE S2, SEWER STRUCTURE '1'

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Rev	Description	Date	Drawn By
C	DUE DILIGENCE REPORT	27.05.2021	AD
B	DUE DILIGENCE REPORT	19.11.2020	AD
A	DUE DILIGENCE REPORT	12.08.2020	AD

Scales | North

JPS Engineering Consultants

Client Logo: ACT Government — Environment and Planning

Status: NOT FOR CONSTRUCTION

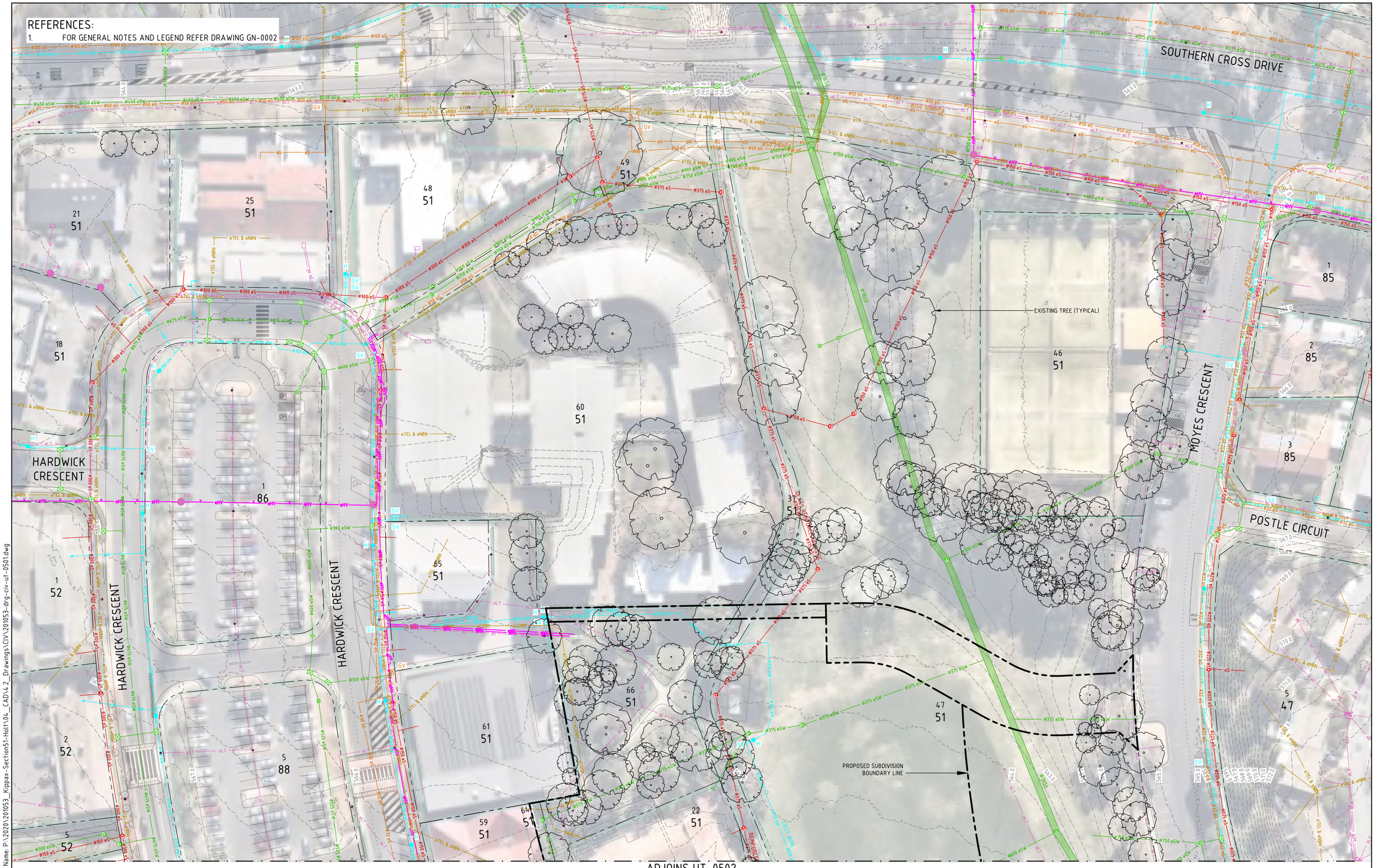
Original Size	A1	Drawn By AD	Drafting Check DCA
Date Plotted	27-May-21	Designed By JS	Design Check
Coordinate System	STROMLO GRID	Approved JS	Approved Date
Height Datum	AHD	Approved Signature	

Project Name and Location: SITE INVESTIGATION, HOLT

Drawing Title: SECTION 51 GENERAL NOTES AND LEGEND

Project Number	Type	Discipline	Sub-Discipline	Drg No.	Rev
201053	DRG	CIV	GN	0002	C

REFERENCES:
1. FOR GENERAL NOTES AND LEGEND REFER DRAWING GN-0002



File Name: P:\2020\201053_Kippax-Section51-Holt\04_CAD\4_2_Drawings\CIV\201053-drg-civ-ut-0501.dwg

Rev	Description	Date	Drawn By
E	DUE DILIGENCE REPORT	27.05.2021	AD
D	DUE DILIGENCE REPORT	19.11.2020	AD
C	DUE DILIGENCE REPORT	23.10.2020	AD
B	DUE DILIGENCE REPORT	23.10.2020	AD
A	DUE DILIGENCE REPORT	12.08.2020	AD

Scales
0 10 15 20 25m
1:500 @ A1

North

JPS Engineering Consultants

Client Logo
ACT Government
Environment and Planning

Status: NOT FOR CONSTRUCTION

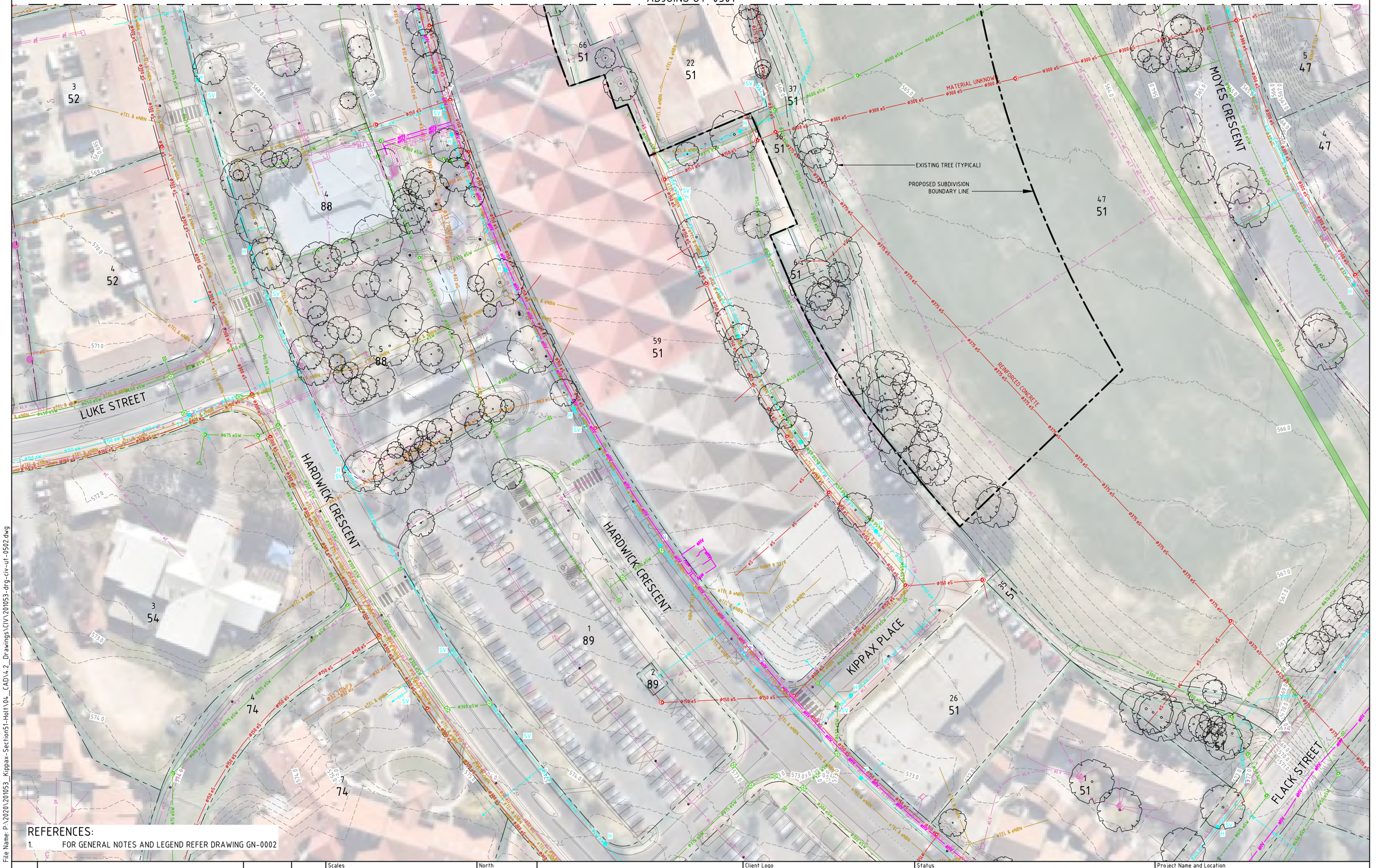
Original Size	A1	Drawn By: AD	Drafting Check: DCA
Date Plotted	27-May-21	Designed By: JS	Design Check
Coordinate System	STROMLO GRID	Approved: JS	Approved Date
Height Datum	AHD	Approved Signature	

Project Name and Location
SITE INVESTIGATION
HOLT

Drawing Title
SECTION 51 EXISTING SERVICES PLAN SHEET 1

Project Number	Type	Discipline	Sub-Discipline	Drg No.	Rev
201053	DRG	CIV	UT	0501	E

ADJOINS UT-0501



REFERENCES:

1. FOR GENERAL NOTES AND LEGEND REFER DRAWING GN-0002

File Name: P:\2020\201053_Kippax-Section51-Holt\04_CAD\4.2_Drawings\CIV\201053-drg-civ-ut-0502.dwg

Rev	Description	Date	Drawn By
E	DUE DILIGENCE REPORT	27.05.2021	AD
D	DUE DILIGENCE REPORT	19.11.2020	AD
C	DUE DILIGENCE REPORT	23.10.2020	AD
B	DUE DILIGENCE REPORT	23.10.2020	AD
A	DUE DILIGENCE REPORT	12.08.2020	AD

Scales: 0 10 15 20 25m — 1:500 @ A1

North

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Original Size	A1	Drawn By: AD	Drafting Check: DCA
Date Plotted	27-May-21	Designed By: JS	Design Check
Coordinate System	STROMLO GRID	Approved: JS	Approved Date
Height Datum	AHD	Approved Signature	

Project Name and Location: SITE INVESTIGATION, HOLT

Drawing Title: SECTION 51 EXISTING SERVICES PLAN SHEET 2

Project Number	Type	Discipline	Sub-Discipline	Drg No.	Rev
201053	DRG	CIV	UT	0502	E

REFERENCES:
1. FOR GENERAL NOTES AND LEGEND REFER DRAWING GN-0002

SOUTHERN CROSS DRIVE

HARDWICK CRESCENT

HARDWICK CRESCENT

MOYES CRESCENT

POSTLE CIRCUIT

EXISTING TREE (TYPICAL)

EXISTING IL 559.47

PROPOSED IL 559.49

EXISTING IL 559.93

INSTALL HYDRANT OVER EXISTING Ø150 WATER MAIN

Ø150 SEWER TIE

Ø450 STORMWATER TIE

INDICATIVE LOCATION AND SIZE OF CULVERT UNDER ROAD

RELOCATE EXISTING COMMUNICATION LINES IN BLOCK 66 TO MAXIMISE DEVELOPABLE AREA

REMOVE SHARED PATH

INSTALL HYDRANT OVER EXISTING Ø150 WATER MAIN

2.5 METER WIDE WATER EASEMENT

3.5 METER WIDE COMBINED SEWER AND STORMWATER EASEMENT

PROPOSED IL 560.55

PROPOSED IL 560.58

REMOVE EXISTING Ø375 STORMWATER PIPE

PROPOSED SUBDIVISION BOUNDARY LINE

INSTALL HYDRANT OVER EXISTING Ø150 WATER MAIN

ADJOINS UT-0512

File Name: P:\2020\201053_Kippax-Section51-Holt\04_CAD\4.2_Drawings\CIV\201053-drg-civ-ut-0511.dwg

Rev	Description	Date	Drawn By
B	DUE DILIGENCE REPORT	27.05.2021	AD
A	DUE DILIGENCE REPORT	19.11.2020	AD

Scales: 0 10 15 20 25m — 1:500 @ A1

North

JPS Engineering Consultants

Client Logo: ACT Government — Environment and Planning

Status: NOT FOR CONSTRUCTION

Original Size	A1	Drawn By: AD	Drafting Check: DCA
Date Plotted	27-May-21	Designed By: JS	Design Check
Coordinate System	STROMLO GRID	Approved: JS	Approved Date
Height Datum	AHD	Approved Signature	

Project Name and Location: SITE INVESTIGATION — HOLT

Drawing Title: SECTION 51 PROPOSED SERVICES PLAN SHEET 1

Project Number	Type	Discipline	Sub-Discipline	Drg No.	Rev
201053	DRG	CIV	UT	0511	B

ADJOINS UT-0511

4 METER WIDE STORMWATER EASEMENT

PROPOSED IL 561.75

MATERIAL UNKNOWN

PROPOSED IL 561.78

REMOVE EXISTING Ø300 SEWER

CONSTRUCT NEW 1.5m WIDE PATH AND KERB RAMP

EXISTING TREE (TYPICAL)

PROPOSED SUBDIVISION BOUNDARY LINE

REMOVE EXISTING SHARED PATH

REMOVE EXISTING Ø375 SEWER

REMOVE EXISTING FLOODLIGHTS AND UNDERGROUND LINES

INSTALL HYDRANT OVER Ø150 WATER MAIN

INSTALL TWO HYDRANTS OVER Ø150 WATER MAIN

RELOCATED Ø375 SEWER MAIN

REINFORCED CONCRETE

PROPOSED IL 564.72

EXISTING IL 564.75

NEW Ø63 WATER TIE TO Ø150 WATER MAIN

INSTALL HYDRANT OVER Ø150 WATER MAIN

INDICATIVE SKATE PARK LOCATION (1,200m²)

LUKE STREET

HARDWICK CRESCENT

KIPPAX PLACE

MOYES CRESCENT

FLACK STREET

REFERENCES:

1. FOR GENERAL NOTES AND LEGEND REFER DRAWING GN-0002

File Name: P:\2020\201053_Kippax-Section51-Holt\04_CAD\4.2_Drawings\CIV\201053-drg-civ-ut-0512.dwg

Rev	Description	Date	Drawn By
B	DUE DILIGENCE REPORT	27.05.2021	AD
A	DUE DILIGENCE REPORT	19.11.2020	AD

Scales: 0 10 15 20 25m — 1:500 @ A1

North

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Project Name and Location: SITE INVESTIGATION — HOLT

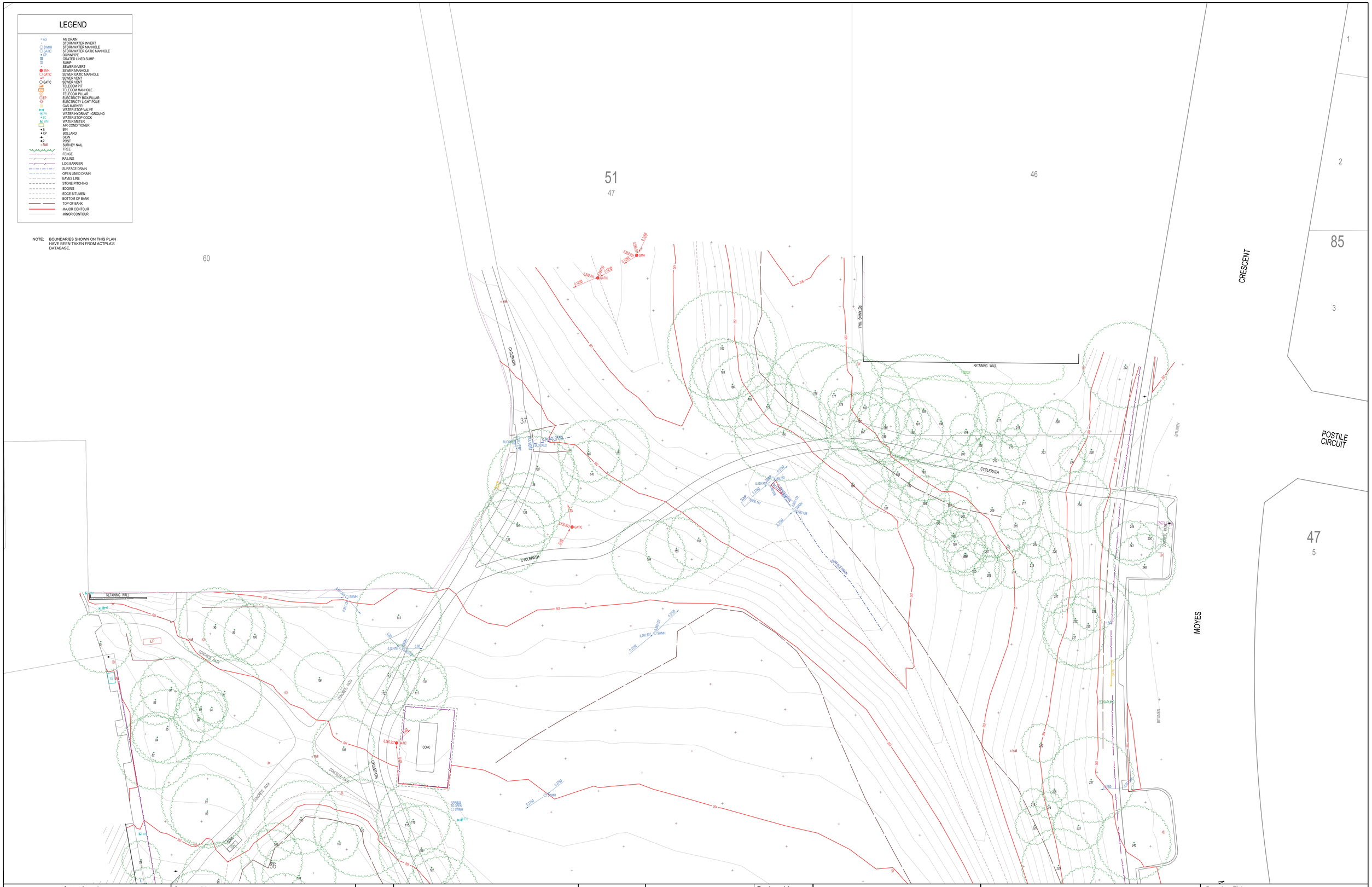
Drawing Title: SECTION 51 PROPOSED SERVICES PLAN SHEET 2

Project Number	Type	Discipline	Sub-Discipline	Drg No.	Rev
201053	DRG	CIV	UT	0512	B

LEGEND

- AG — AG DRAIN
- SWIP — STORMWATER INVERT
- SWMH — STORMWATER MANHOLE
- GATIC — STORMWATER GATIC MANHOLE
- DP — DOWNPIPE
- GRATED LINED SUMP
- SUMP
- SEWER INVERT
- SMH — SEWER MANHOLE
- GATIC — SEWER GATIC MANHOLE
- SEWER VENT
- GATIC — SEWER VENT
- TELECOM PIT
- TELECOM MANHOLE
- TELECOM PILLAR
- EP — ELECTRICITY BOX/PILLAR
- ELECTRICITY LIGHT POLE
- GAS MARKER
- WATER STOP VALVE
- FH — WATER HYDRANT - GROUND
- SC — WATER STOP COCK
- WM — WATER METER
- AIR CONDITIONER
- B — BIN
- CP — BOLLARD
- SIGN
- P — POST
- Nail — SURVEY NAIL
- TREE
- FENCE
- RAILING
- LOG BARRIER
- SURFACE DRAIN
- OPEN LINED DRAIN
- EAVES LINE
- STONE PITCHING
- EDGING
- EDGE BITUMEN
- BOTTOM OF BANK
- TOP OF BANK
- MAJOR CONTOUR
- MINOR CONTOUR

NOTE: BOUNDARIES SHOWN ON THIS PLAN HAVE BEEN TAKEN FROM ACTPLA'S DATABASE.



Amendments		
No.	Description	Date
A	ORIGINAL SURVEY	29-03-2021

Surveyed by: ACT SURVEY PTY LTD
Date: MARCH 2021 Proj No. 2021032901
Drawn by: CUYEE DESIGN

ACT SURVEY PTY LTD
LAND & ENGINEERING SURVEYORS

SHEET DIAGRAM

NORTH

Designed by TJ
Drawn by AP
Checked by TJ
Approved by TJ

PROJECT

DETAIL SURVEY
KIPPAX SHOPPING CENTRE
AND KIPPAX PLAYING FIELD
HOLT

Drawing Title
DETAIL SURVEY &
SURVEY CERTIFICATE

Scale 1:200 | Contour Interval 0.2 | Sheet No. 2 OF 4
Drg No.

LEGEND

- AG — AG DRAIN
- SWMH — STORMWATER INVERT
- GATIC — STORMWATER MANHOLE
- DP — STORMWATER GATIC MANHOLE
- GRATED LINED SUMP — DOWNPIPE
- SUMP — GRATED LINED SUMP
- SEWER INVERT — SUMP
- SEWER MANHOLE — SEWER INVERT
- SEWER GATIC MANHOLE — SEWER MANHOLE
- SEWER VENT — SEWER GATIC MANHOLE
- SEWER VENT — SEWER VENT
- TELECOM PIT — SEWER VENT
- TELECOM MANHOLE — TELECOM PIT
- TELECOM PILLAR — TELECOM MANHOLE
- ELECTRICITY BOX/PILLAR — TELECOM PILLAR
- ELECTRICITY LIGHT POLE — ELECTRICITY BOX/PILLAR
- GAS MARKER — ELECTRICITY LIGHT POLE
- WATER STOP VALVE — GAS MARKER
- WATER HYDRANT - GROUND — WATER STOP VALVE
- WATER STOP COCK — WATER HYDRANT - GROUND
- WATER METER — WATER STOP COCK
- AIR CONDITIONER — WATER METER
- BIN — AIR CONDITIONER
- BOLLARD — BIN
- SIGN — BOLLARD
- POST — SIGN
- SURVEY NAIL — POST
- TREE — SURVEY NAIL
- FENCE — TREE
- RAILING — FENCE
- LOG BARRIER — RAILING
- SURFACE DRAIN — LOG BARRIER
- OPEN LINED DRAIN — SURFACE DRAIN
- EAVES LINE — OPEN LINED DRAIN
- STONE PITCHING — EAVES LINE
- EDGING — STONE PITCHING
- EDGE BITUMEN — EDGING
- BOTTOM OF BANK — EDGE BITUMEN
- TOP OF BANK — BOTTOM OF BANK
- MAJOR CONTOUR — TOP OF BANK
- MINOR CONTOUR — MAJOR CONTOUR

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Amendments		
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A	ORIGINAL SURVEY	29-03-2021

Surveyed by: ACT SURVEY PTY LTD
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ACT SURVEY PTY LTD
LAND & ENGINEERING SURVEYORS

SHEET DIAGRAM

	2	
1	3	
	4	

NORTH

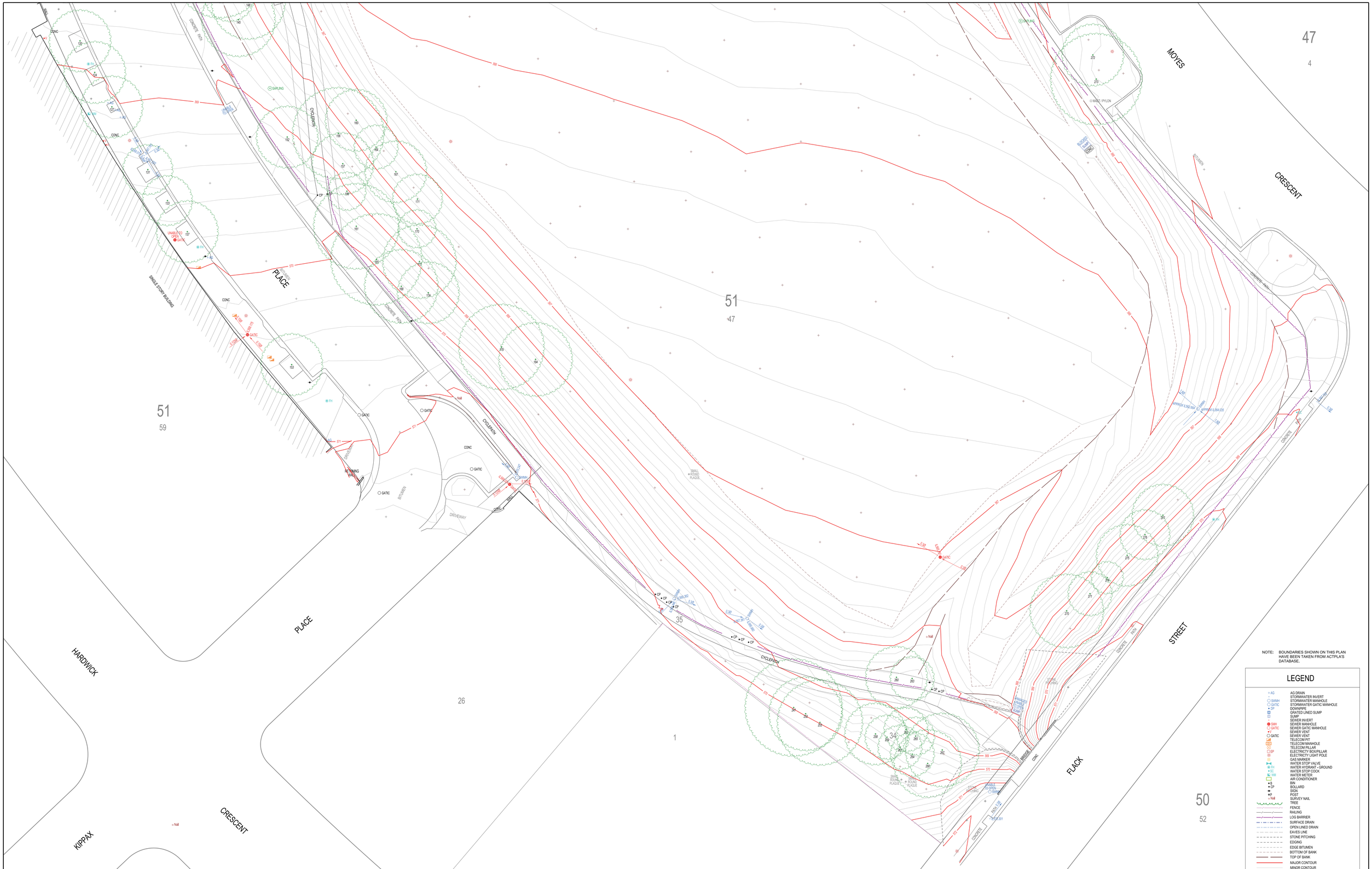
Designed by	TJ
Drawn by	AP
Checked by	TJ
Approved by	TJ

PROJECT

DETAIL SURVEY
KIPPAX SHOPPING CENTRE
AND KIPPAX PLAYING FIELD
HOLT

Drawing Title
DETAIL SURVEY &
SURVEY CERTIFICATE

Scale 1:200 | Contour Interval 0.2 | Sheet No. 3 OF 4
Drg No.



NOTE: BOUNDARIES SHOWN ON THIS PLAN HAVE BEEN TAKEN FROM ACTPLA'S DATABASE.

LEGEND

- AG — AG DRAIN
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Amendments		
No.	Description	Date
A	ORIGINAL SURVEY	29-03-2021

Surveyed by: ACT SURVEY PTY LTD
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ACT SURVEY PTY LTD
LAND & ENGINEERING SURVEYORS

SHEET DIAGRAM
2 / 1 3 / 4

NORTH

Designed by TJ
Drawn by AP
Checked by TJ
Approved by TJ

PROJECT
DETAIL SURVEY
KIPPAX SHOPPING CENTRE
AND KIPPAX PLAYING FIELD
HOLT

Drawing Title
DETAIL SURVEY &
SURVEY CERTIFICATE

Scale 1:200 | Contour Interval 0.2 | Sheet No. 4 OF 4
Drg No.