

PLANS AND DOCUMENTS  
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APPROVAL dated 28 / 2 / 11

## Engineering Report

# ULDA Andergrove – Stages 2 & 3

October 2010



Figure BM0021-CSK004 – Earthworks Cross Sections Sheet 1 of 2  
Figure BM0021-CSK005 – Earthworks Cross Sections Sheet 2 of 2  
Figure BM0021-CSK006 – Stormwater Drainage Layout Plan  
Figure BM0021-CSK007 – Stormwater Drainage Catchment Layout Plan  
Figure BM0021-CSK008 – Water Reticulation Layout Plan  
Figure BM0021-CSK009 – Sewer Reticulation Layout Plan  
Figure BM0020-CSK010 – Electrical & Communication Utilities Layout Plan



DOCUMENT CONTROL SHEET

|              |                           |
|--------------|---------------------------|
| Project      | ULDA Andergrove – Stage 1 |
| Report Title | Engineering Report        |
| Job No.      | M00021 & M00022           |

REVISION HISTORY

| Revision Number | Prepared By | Date                          |
|-----------------|-------------|-------------------------------|
| A               | Pat Casey   | 7 <sup>th</sup> October, 2010 |
|                 |             |                               |
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Previous versions of this document are superseded by the most recent revision.



## 1. Introduction

This Engineering Report is in support of a development application to create Stages 2 and 3 of the UDA Andergrove development project. The report provides engineering concept design information for internal and external infrastructure provisions such as roads and streets, stormwater drainage and water quality infrastructure, water reticulation, and sewer reticulation. This report does not discuss the provision of power and telecommunications utility services, but does provide a conceptual design identifying where such services should be located within the street network in context with other underground services.

Stage 2 will provide 20 residential lots adjoining the northern boundary of Stage 1. Stage 3 will provide 21 residential lots adjoining the southern boundary of Stage 1.





## 3. Site Characteristics and Existing Infrastructure

### 3.1. Existing Land Form

The existing landform of the UDA Andergrove site is described in the RPS Australia East survey plan attached in **Appendix A**. The site has an existing ridge running from north to south dividing the site into two separate catchments; one draining east and the other west. A large open drain is located in the natural gully on the western side of the site, while the eastern side falls to an open drain along Bedford Road. Site levels range approximately from RL 10m AHD to RL 4m AHD.

### 3.2. Road & Pedestrian Infrastructure

The UDA Andergrove site is surrounded by existing residential development on three sides. The only road access is via Bedford Road extending along the full eastern frontage of the site. Bedford Road is classed as a Major Collector under the Mackay Regional Council Road Hierarchy Policy. However, it has a variable profile along the frontage of the development land. Adjoining Stages 2 and 3 the road profile is urban on the eastern side of the centreline and rural on the western (proposed development) side. Investigations have identified that the eastern urban profile does not conform to the Major Collector standard profile with a reduced carriageway width and a parking lane width that is too narrow to comply with the required minimum width under Australian Standards for on-street parking. The verge width is also less than that required under the standard profile. The western carriageway and road shoulder are a rural profile and widths are not consistent with standard rural arterial road profiles that are approximately equivalent to the Major Collector status.

An existing bus stop and shelter is located on the western side of Bedford Road just to the south of Monique Court intersection.

A concrete pathway is located at the northern boundary within the development land. It extends west from Bedford Road at the Fernleigh Avenue intersection through to the north-west corner of the development land. At this point it connects with another pathway extending from the northern residential land and it then heads south skirting the western boundary of the development land. The pathway caters for combined pedestrian and cyclist traffic. The length within the development land is not located within any easement or reserve.

### 3.3. Stormwater Drainage

There is limited stormwater infrastructure within the development land and certainly none within the Stages 2 & 3 areas.

The Stormwater Management Report by WRM that addresses the whole of the development land identifies existing catchments and outlet points for existing drainage pathways within the site. Relevant external stormwater drainage points are the 1/900x600 RC Box Culvert under Bedford Road to the north of the Monique Court intersection, and the 1/600x300 RC Box Culvert under the above mentioned pathway towards the north-west corner of the site.

### 3.4. Water Supply

There are 2 existing Council water mains extending along the western side of Bedford Road for the entire site frontage. One is a trunk 300mm dia main. The other is a 150mm dia reticulation main. The existing Monique Court residential development on the eastern side of Bedford Road adjacent to the proposed Stage 1 development is serviced by a 150mm dia reticulation main connected to the same size reticulation main mentioned previously.

The RPS survey plan identifies existing fire hydrants that locate the 150mm dia reticulation main. The 300mm dia main is aligned at approximately 5m east of the existing western road reserve boundary of Bedford Road.

### 3.5. Sewerage Reticulation

Existing gravity sewer mains exist within the development site. A 250mm dia main servicing the northern adjoining residential development drains along the northern boundary of the development land to Fernleigh Avenue. It then turns south and extends inside the eastern development boundary until about 70m south of the Monique Court intersection with Bedford Road. The main then turns east crossing Bedford Road and connects to the extensive existing sewer system in the developed residential area about Tropical Avenue.

A 150mm dia gravity main also exists inside the development land eastern boundary south of the above mentioned Bedford Road crossing. It services the existing Council Depot. Another 150mm dia gravity main extends as an end line diagonally into the Bedford Road Depot area from the sewer system within the residential area about Newton Street to the south of the development land. This sewer will not impact on the Stages 2 and 3 developments.

### 3.6. Utility Services

Telstra and Ergon services extend along the Bedford Road frontage and feed the Council Depot within the development site.



## 4. Proposed Infrastructure – Stage 2

### 4.1. Development Plan

Plans identifying the proposed plan of development are contained within the planning report by Place accompanying the development application. **Figure BM0021-CSK001** in **Appendix A** is derived from this plan of development. For ease of reference, the figure descriptor **BM0021-** will not be mentioned further in this report dialogue when identifying conceptual design figures located within **Appendix A** of this report.

### 4.2. Bulk Earthworks

**Figures CSK003, CSK004, and CSK005** in **Appendix A** identify the changes to the existing landform required to create Stage 2. **Figure CSK003** contains both existing and proposed development contours, and identifies areas of proposed cut and fill.

Proposed cut and fill depths are not extensive and generally range from 250mm to 500mm across Stage 2. Where possible developed levels on the northern boundary of Stage 2 are matched to existing surface levels adjoining existing development. This is to avoid the need for works on the existing sewer line, and for retaining walls, which will be constrained in any case due to the location of the sewer.

The combined Stages 1, 2, and 3 earthworks design is proposed to have a balance cut to fill scenario.

### 4.3. Roadworks

#### 4.3.1. Internal Works

**Figures CSK001 and CSK002** describe the internal road network and profiles. Proposed road reserve widths and pavement formations are derived from Mackay Regional Council standards and Residential 30 Guidelines.

- **Road No 2** is the extension of the north-south minor collector from Stage 1. There are 2 distinct sections of this road. The north-south aligned Section 1 contains the 7.5m carriageway and 5.0m eastern verge profile consistent with Road No 2 in Stage 2 but within a 15m road reserve. This results in a 2.5m wide western verge but this verge adjoins what is presently open space meaning the practical verge width is significantly greater than that for a collector street. This will remain as is until such time as the future development to the north-west occurs, if it occurs. If this future development occurs, a 2 m road widening will be obtained to make up the 17m standard minor collector road reserve width.

The east-west aligned Section of Road 2 extends from the north-south aligned section as an Access Street as defined in Council's Standards. This Access Street has a 6m carriageway in a 15m road reserve. Pathways are provided on the southern verge.

- **Road No 3** is the extension of the Access Place profile developed under Stage 1B. Road No 2 transitions to the Road No 3 profile at the Road No 4 intersection.
- **Road No 4** extends from Road No 2/3 intersection to Laneway 3. It is proposed as an Access Street with the same profile as Road No 2 Section 2.
- **Laneway 3** is the extension of the laneway profile developed under Stage 1B.
- **Laneway 4** has a profile consistent with Laneway 3 and provides access to proposed Lots 46 and 47 only.



As shown in **Figure No CSK008 in Appendix A** the proposed development will be serviced by the extension of the reticulation provided under Stage 1 with a connection to the existing Bedford Road 150mm main along Road 4 and Laneway 4.

Lots on the eastern side of Laneway 3 will be serviced by the extension of the Stage 1 development water supply network along Bedford Road.

Detailed design will be accompanied by a network analysis that will consider the staged development impacts.

**Figure CSK006 in Appendix A** identifies a conceptual stormwater drainage network proposed to service Stage 2. **Figure CSK007** provides contributing sub-catchment details for the proposed network. The proposed network and sub-catchments have been determined in conjunction with the proposed landform so as to be consistent with the drainage strategy in the WRM Stormwater Management Plan for the overall development.

Drainage design parameters to be adopted will be:

- Minor Flow Design - the underground drainage system capacity will cater for the ARI 5 year event
- Major Flow Design - the combined underground drainage system and surcharge flow paths will cater for the ARI 100 year event.

The exception to this will be within the laneways where inverted road cross-sections with central underground drainage systems are adopted. In such cases and in light of the potential for zero lot line buildings, the requirement to not let the ARI 100 year event cause inundation within private property and dwellings, will mean that the underground drainage system will have a capacity in excess of the ARI 5 year discharge capacity to cater for the reduced surcharge flow capacity in the narrow inverted pavements, and freeboard requirements set under QUDM and Council standards.

The Stage 2 area west of Road No 3 will drain to the west into the stormwater drainage network developed under Stage 1. This stormwater discharge will be treated in the Stage 1 western bio-filtration basin.

The balance of the Stage 2 area will drain to Bedford Road where it will enter a verge drain on the western side of Bedford Road. Stormwater will then be directed along this western verge drain to the Stage 1 bio-filtration basin to eventual discharge to the east via the Bedford Road cross-drainage.

No external works are proposed for Stage 2. For practical and economic purposes upgrading works for a small section of Bedford Road north of the extent of roundabout works extending to the existing Fernleigh Avenue roundabout is included in the Bedford Road works for Stage 1. This section also includes the extension of the joint cycleway / walkway on the western side of Bedford Road to connect to existing pathways at Fernleigh Avenue.

- Eastern side of Road 2 – Section 1.
- Southern sides of Road 2 Section 2 and Road 4.
- Western side of Road 3.
- Via the carriage way of Laneway 4, connecting to under Stage 1.

Pedestrian pathways are located as follows:

## 4.6. Sewerage Reticulation

**Figure CSK009** in **Appendix A** provides a conceptual design for the sewer reticulation required to service Stage 2. Reticulation provided for Stage 1 will be extended to service all proposed lots.

## 4.7. Utility Services

**Figure CSK010** in **Appendix A** provides a conceptual alignment of proposed utility services. Others will provide advice on the requirements to service this development. The utility services alignment has been designed taking into consideration Council's Mackay Water's requirements for separation of power and water services, the requirement for property services connections for power and water to be at alternate frontage boundaries where possible, and available service corridors as defined in **Figure CSK002**.



## 5. Proposed Infrastructure – Stage 3

### 5.1. Development Plan

Plans identifying the proposed plan of development are contained within the planning report by Place accompanying the development application. **Figure CSK001** in **Appendix A** is derived from this plan of development.

### 5.2. Bulk Earthworks

**Figures CSK003, CSK004, and CSK005** in **Appendix A** identify the changes to the existing landform required to create Stage 3. **Figure CSK003** contains both existing and proposed development contours, and identifies areas of proposed cut and fill.

The main control impacting on the earthworks model is the requirement in the WRM Stormwater Management Plan for correction of the main north-south catchment boundary divide so that the developed area draining to the east generates peak stormwater discharges no greater than the peak stormwater discharges from the existing contributing catchment.

The design for Stage 3 is based on an optimised location of the proposed north-south catchment divide identified in the WRM Stormwater Management Plan. This optimisation maintains the principle of no net increase in stormwater discharge to Bedford Road as a result of the development.

Proposed cut and fill depths are not extensive and generally range from 250mm to 500mm across Stage 3.

The combined Stages 1, 2, and 3 earthworks design attempts to have a balance cut to fill scenario.

## 5.3. Roadworks

### 5.3.1. Internal Works

**Figures CSK001 and CSK005** describe the internal road network and profiles. Proposed road reserve widths and pavement formations are derived from Mackay Regional Council standards and Residential 30 Guidelines.

- **Road No 2** is the extension of the north-south minor collector south from Stage 1. This road section contains the 7.5m carriageway and 5.0m eastern verge profile within a 17m road reserve consistent with Road No 2 in Stage 1. Subject to stormwater drainage conveyance requirements the proposed road profile envisages the construction of parking bays in selected locations on the western side of the carriageway for public purposes associated with enjoyment of the extensive open space areas in the west of the site.

- **Road No 5** is the main service road to the Stage 3 lots. It is proposed to be an Access Street with a 6.0m wide carriageway in a 15m road reserve. The eastern end of the road will be a cul-de-sac that will act as a 4-way connection distributing traffic from Laneway No 1 and Laneway 6, and connecting to what has been called Laneway 5 at the eastern end. The cul-de-sac is sized to cater for turning circles for fire and garbage trucks.

- **Laneway 1** is the extension of the laneway profile developed under Stage 1A.

- **Laneway 5** is actually a car park aisle to provide access to a one-sided blind aisle car park extending from the end of Road 5 to Bedford Road.

- **Laneway 6** is the same profile as Laneway 1. It services only 1 dwelling under Stage 3.



Pedestrian pathways are located as follows:

- Eastern side of Road 2.
- Southern sides of Road 5.
- Via the carriageway of Laneway 5, connecting to the Bedford Road pathway to be developed under Stage 1.

It is not proposed that Laneway 6 be used by garbage trucks at this time. Garbage collection for proposed Lot 69 will be via Road No 5.

Proposed Lots 75 and 76 gain access from Road No 2. Garbage trucks will need to collect from Road No 2. A temporary turnaround area is required at the end of Road 2 to allow safe route completion. It will also allow public interest traffic to turn around rather than execute 3 point turns or reversing movements. This temporary turnaround can extend into existing gravel and paved areas within future Stage 4 without impact to depot operations.

### 5.3.2. External Works

It is proposed under Stage 3 to extend the Bedford Road upgrading works south of the extent of Stage 1 works to connect to the existing full width urban profile ending north of Newton Street. It is proposed to maintain the half-urban and half-rural profiles on the east and west sides of the carriageway centreline.

## 5.4. Stormwater Drainage Internal & External

**Figure CSK006** in **Appendix A** identifies a conceptual stormwater drainage network proposed to service Stage 3. **Figure CSK007** provides contributing sub-catchment details for the proposed network. The proposed network and sub-catchments have been determined in conjunction with the proposed landform so as to be generally consistent with the drainage strategy in the WRM Stormwater Management Plan for the overall development.

Drainage design parameters to be adopted will be:

- Minor Flow Design - the underground drainage system capacity will cater for the ARI 5 year event
- Major Flow Design - the combined underground drainage system and surcharge flow paths will cater for the ARI 100 year event.

Laneway drainage will be via surface flow only. Underground stormwater drainage within Laneways 1 and 6 will be located at the intersection with Road 5. Underground stormwater will be discharged to the western drainage network.

Runoff from Laneway 5 will be discharged directly to the Bedford Road swale where it will then enter the Stage 1 bio-filtration basins at the proposed Stage 1 roundabout.

Stormwater discharge from Road 5 will be directed to the swale drain on the western side of Road 2 where it will drain south into the major basin proposed by WRM to treat discharge and water quality from the majority of the development land and the stormwater discharge from Newton Street and southern development. This major basin will be developed to its ultimate extent under this Stage 3.

## 5.5. Water Supply

As shown in **Figure No CSK008** in **Appendix A** the proposed development will be serviced by the extension of the reticulation provided under Stage 1.

Lots on the eastern side of Laneway 1 will be serviced by the extension of the Stage 1 development water supply network along Bedford Road.

Detailed design will be accompanied by a network analysis that will consider the staged development impacts.

## 5.6. Sewerage Reticulation

**Figure CSK009 in Appendix A** provides a conceptual design for the sewer reticulation required to service Stage 3. Reticulation provided for Stage 1 will be extended to service lots on the northern side of Road 5 additional to those lots that will be serviced by the sewer placed along the southern boundary of Stage 1A. Lots on the southern side of Road 5 will be serviced by a new sewer line connected to the existing sewer on the western side of Bedford Road. This new sewer alignment will be located and designed to service future adjoining proposed Stage 4 lots.

## 5.7. Utility Services

**Figure CSK010 in Appendix A** provides a conceptual alignment of proposed utility services. Others will provide advice on the requirements to service this development. The utility services alignment has been designed taking into consideration Council's Mackay Water's requirements for separation of power and water services, the requirement for property services connections for power and water to be at alternate frontage boundaries where possible, and available service corridors as defined in **Figure CSK002**.



## 6. Conclusion

Stages 2 & 3 of the UDA at Bedford Road, Andergrove, Mackay will be developed following Stage 1. Stage 3 may proceed only with Stage 1A infrastructure in place. Stage 2 may proceed only with Stage 1B infrastructure in place.

Civil engineering infrastructure can be established to create Stages 2 and 3 without detriment.

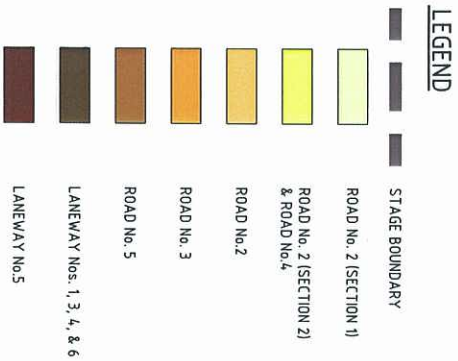
Stage 3 will require the development of the major water quality pond in the south as proposed under the WRM stormwater report for the site.

# Appendix A

## Concept Civil Infrastructure Drawings



|                                                                                                                                                                                                |                |  |  |  |              |      |                     |         |          |
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| No.                                                                                                                                                                                            | Amendments     |  |  |  | Drawn/Design | Appd | Registered Engineer | Reg No. | Date     |
| A                                                                                                                                                                                              | ORIGINAL ISSUE |  |  |  | MM           | NP   | PC                  |         | 06.10.10 |
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Client  
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Project  
ANDERGROVE STAGES 2 & 3

Title  
FUNCTIONAL LAYOUT PLAN

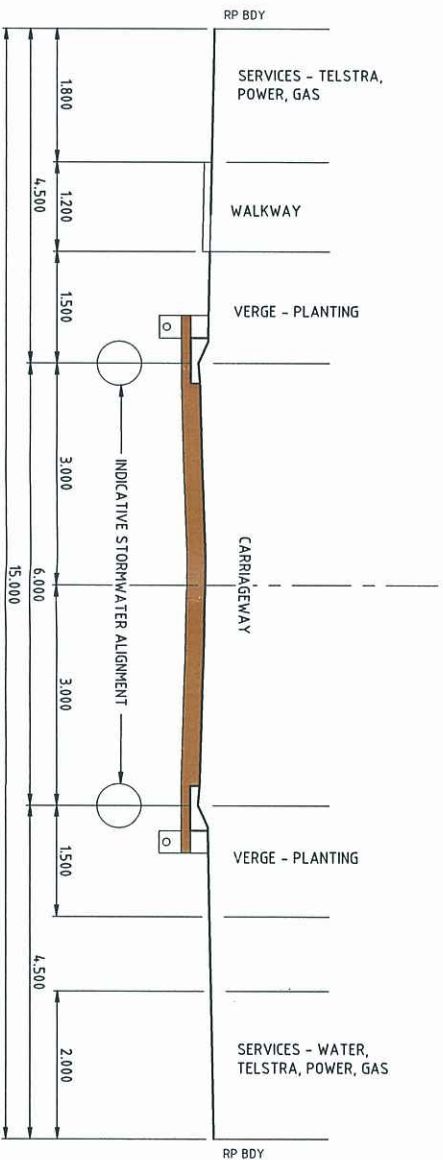
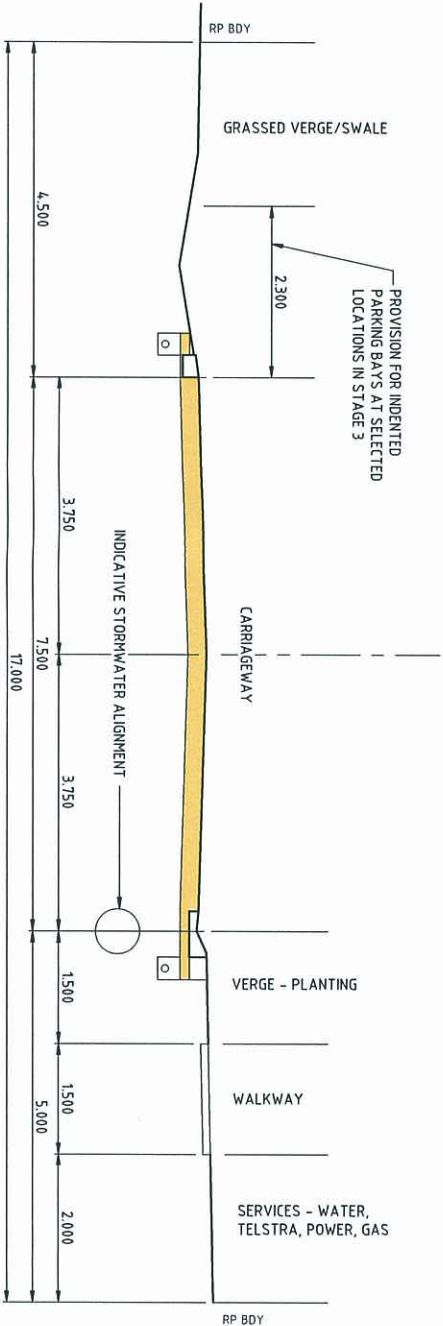
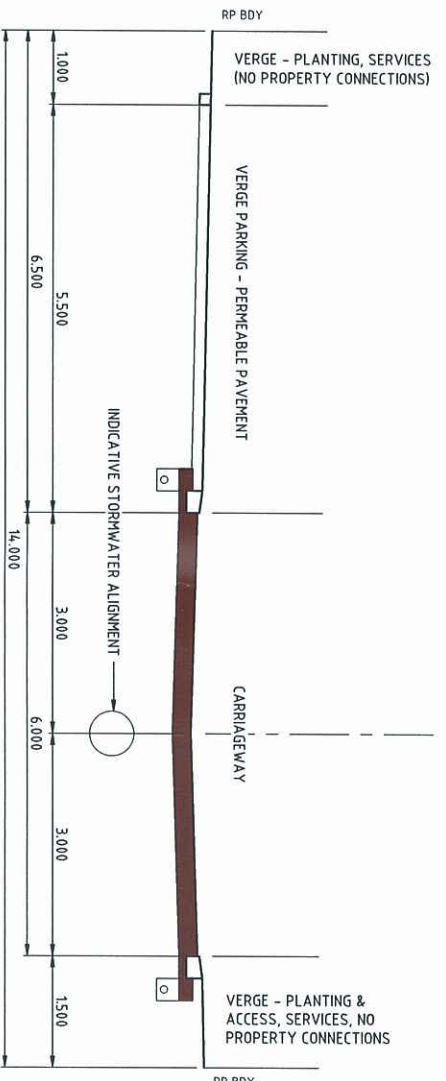
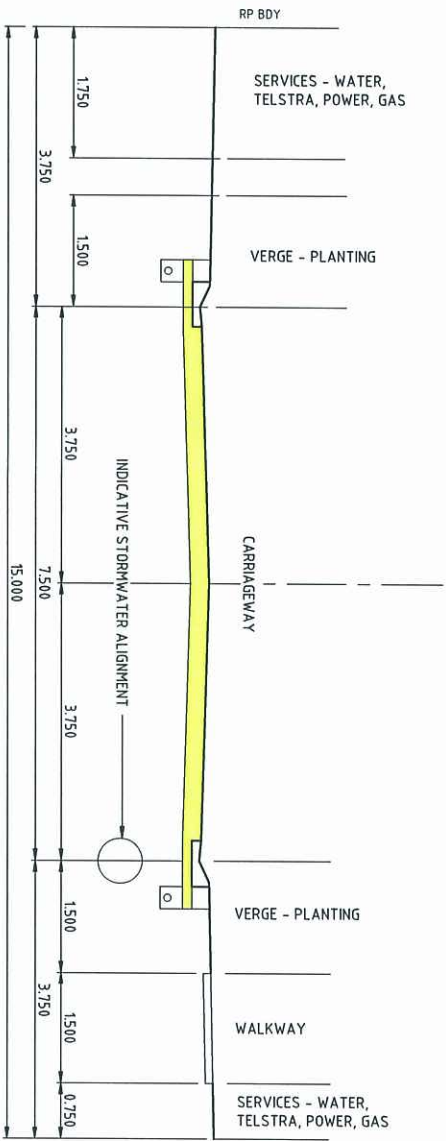
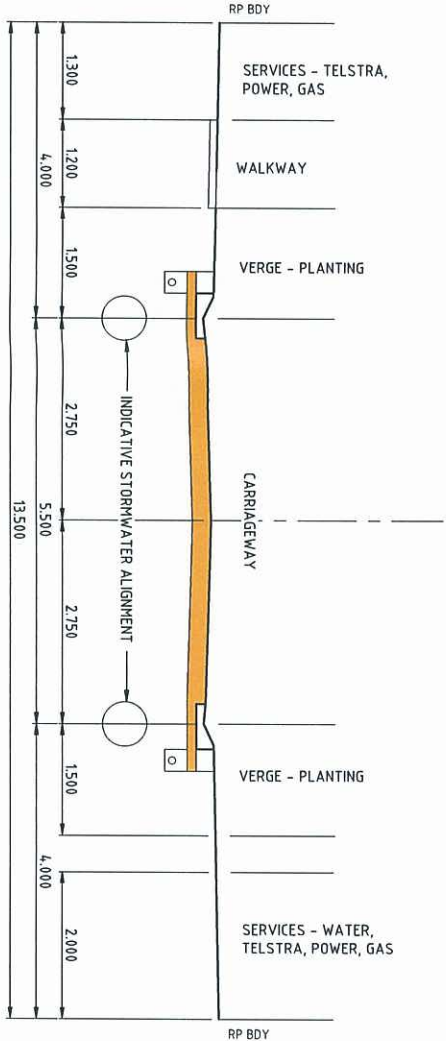
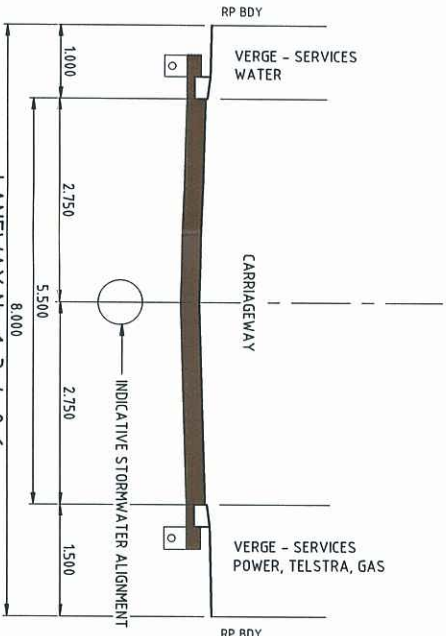
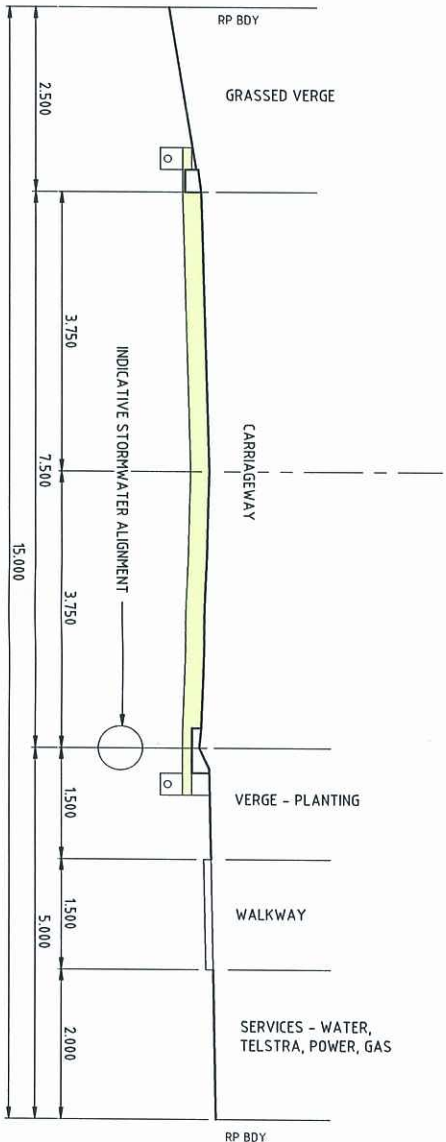
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Project No.  
BM0021-CSK001

Drawing No.  
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ROAD No. 2  
MINOR COLLECTOR ROAD  
SCALE 1:200

ROAD No. 2 - SECTION 2 & ROAD 4  
MINOR COLLECTOR ROAD  
SCALE 1:200

LANEWAY No. 1, 3, 4, & 6  
SCALE 1:200

ROAD No. 3  
ACCESS PLACE  
SCALE 1:200

LANEWAY No. 5  
SCALE 1:200

ROAD No. 5  
ACCESS STREET  
SCALE 1:200

| No. | Amendments     | Drawn Design | Appd | Registered Engineer | Reg No. | Date     |
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| A   | ORIGINAL ISSUE | MM           | HP   | PC                  |         | 06.10.16 |

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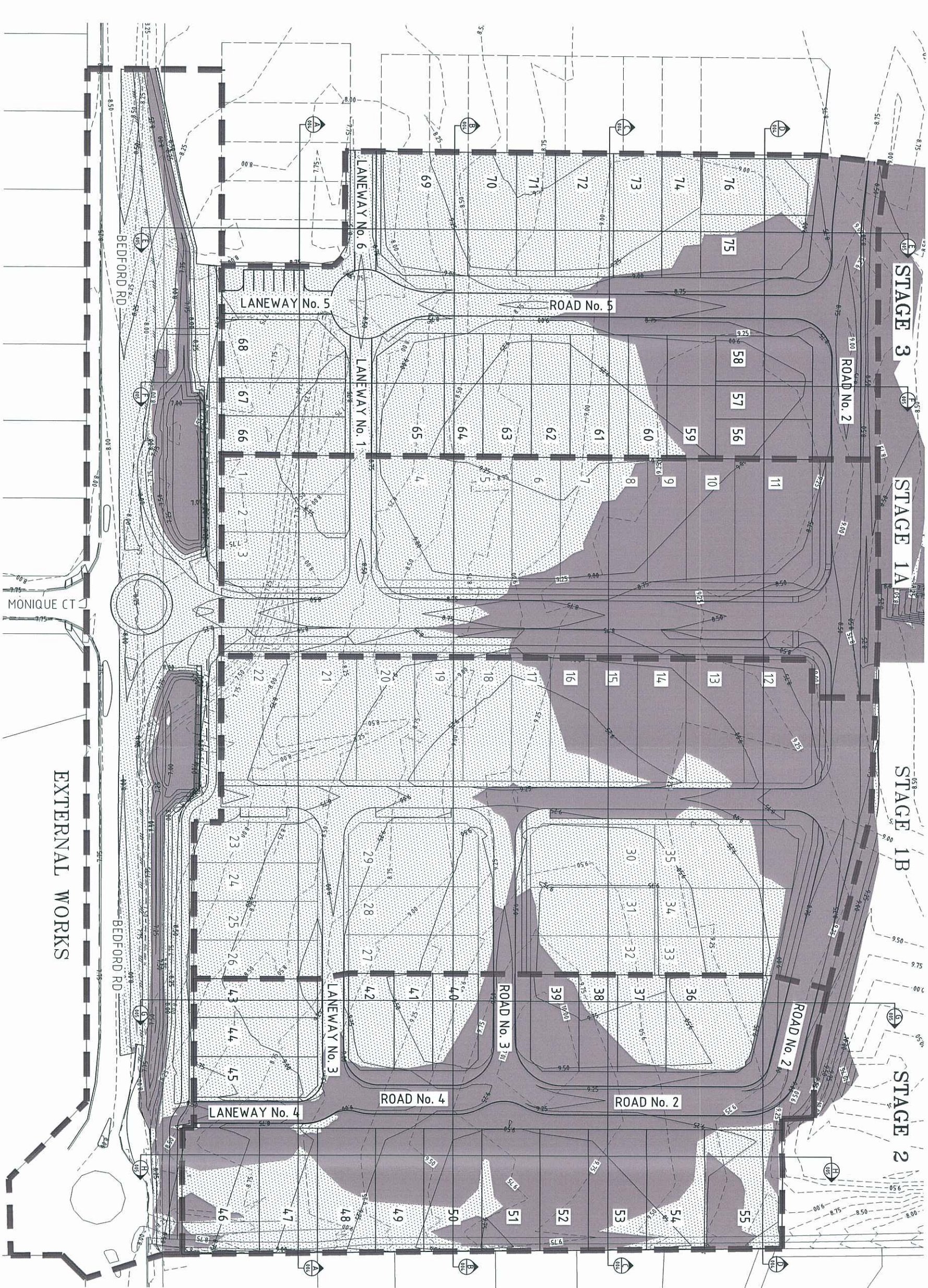
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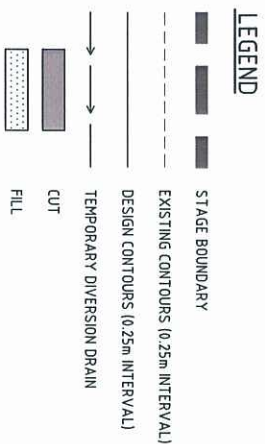
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| URBAN LAND DEVELOPMENT AUTHORITY | ANDERGROVE STAGES 2 & 3 | TYPICAL ROAD CROSS SECTIONS | NOT FOR CONSTRUCTION | BM0021-CSK002 | A   |





EXTERNAL WORKS



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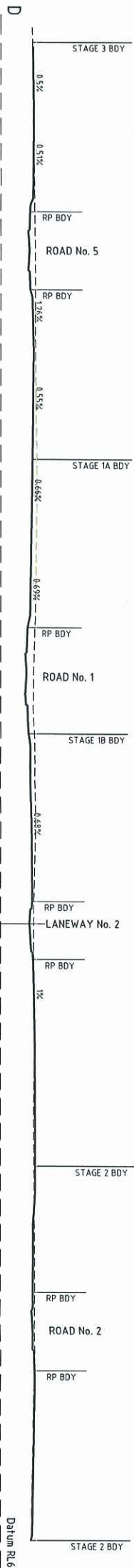
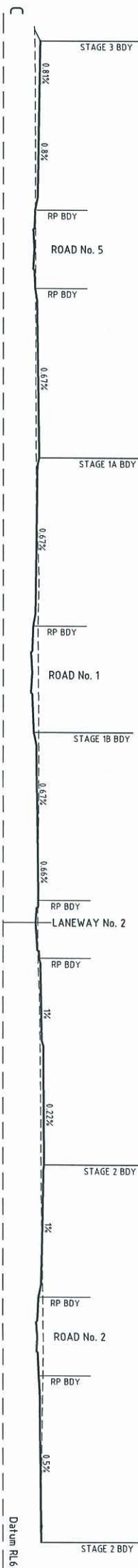
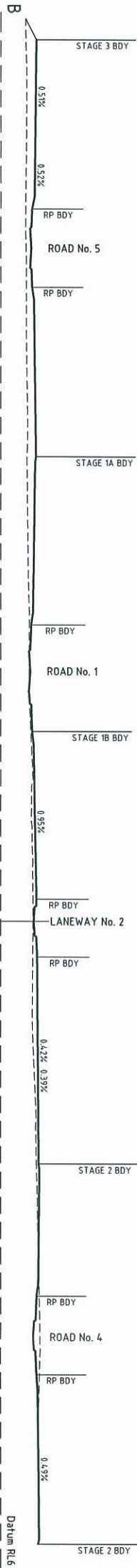
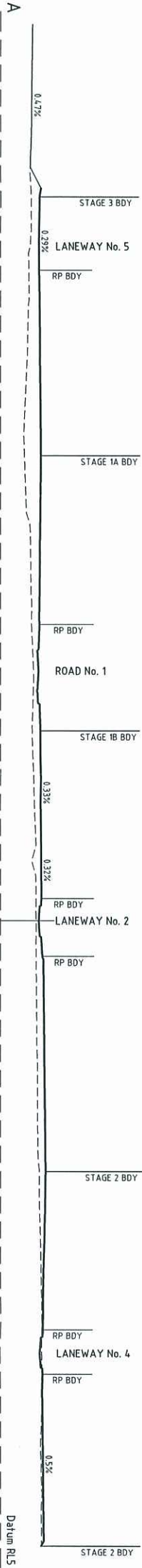


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EARTHWORKS CROSS SECTIONS

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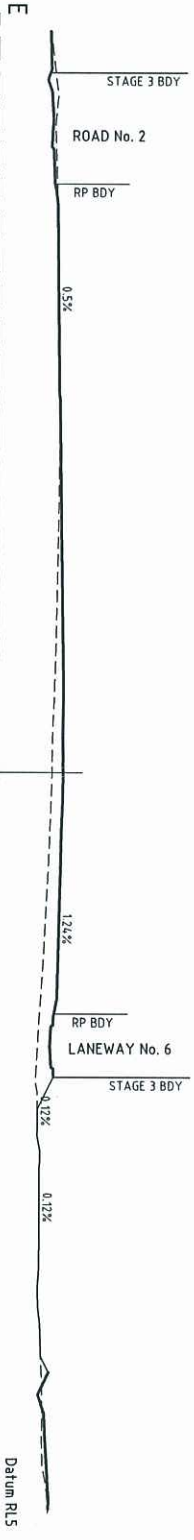
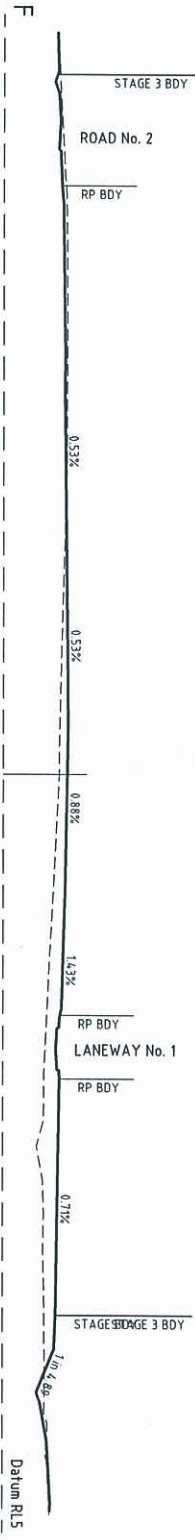
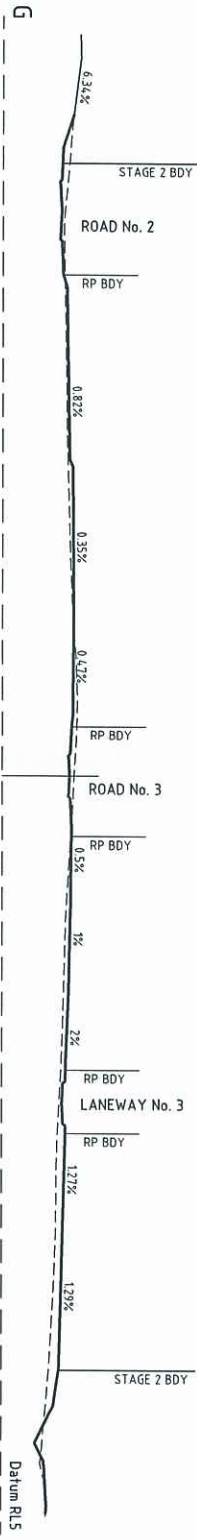
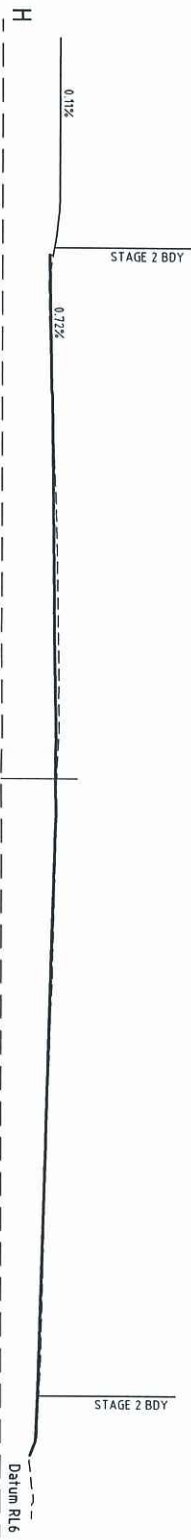
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| Drawing No. |  | A                                      |  |
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SCALE 1:500H 1:250V

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**LEGEND**

STAGE BOUNDARY

PROPOSED STORMWATER DRAINAGE

EXISTING STORMWATER DRAINAGE

|                             |                                         |                                                                                     |
|-----------------------------|-----------------------------------------|-------------------------------------------------------------------------------------|
| <b>Client</b>               | <b>URBAN LAND DEVELOPMENT AUTHORITY</b> |  |
| <b>Project</b>              | <b>ANDERGROVE STAGES 2 &amp; 3</b>      |                                                                                     |
| <b>Title</b>                | <b>STORMWATER DRAINAGE LAYOUT PLAN</b>  | <b>(MGA) COORD</b>                                                                  |
| <b>NOT FOR CONSTRUCTION</b> |                                         |                                                                                     |
| <b>Project No.</b>          | <b>BMO021-CSK006</b>                    |                                                                                     |
| <b>Drawing No.</b>          | <b>A</b>                                |                                                                                     |





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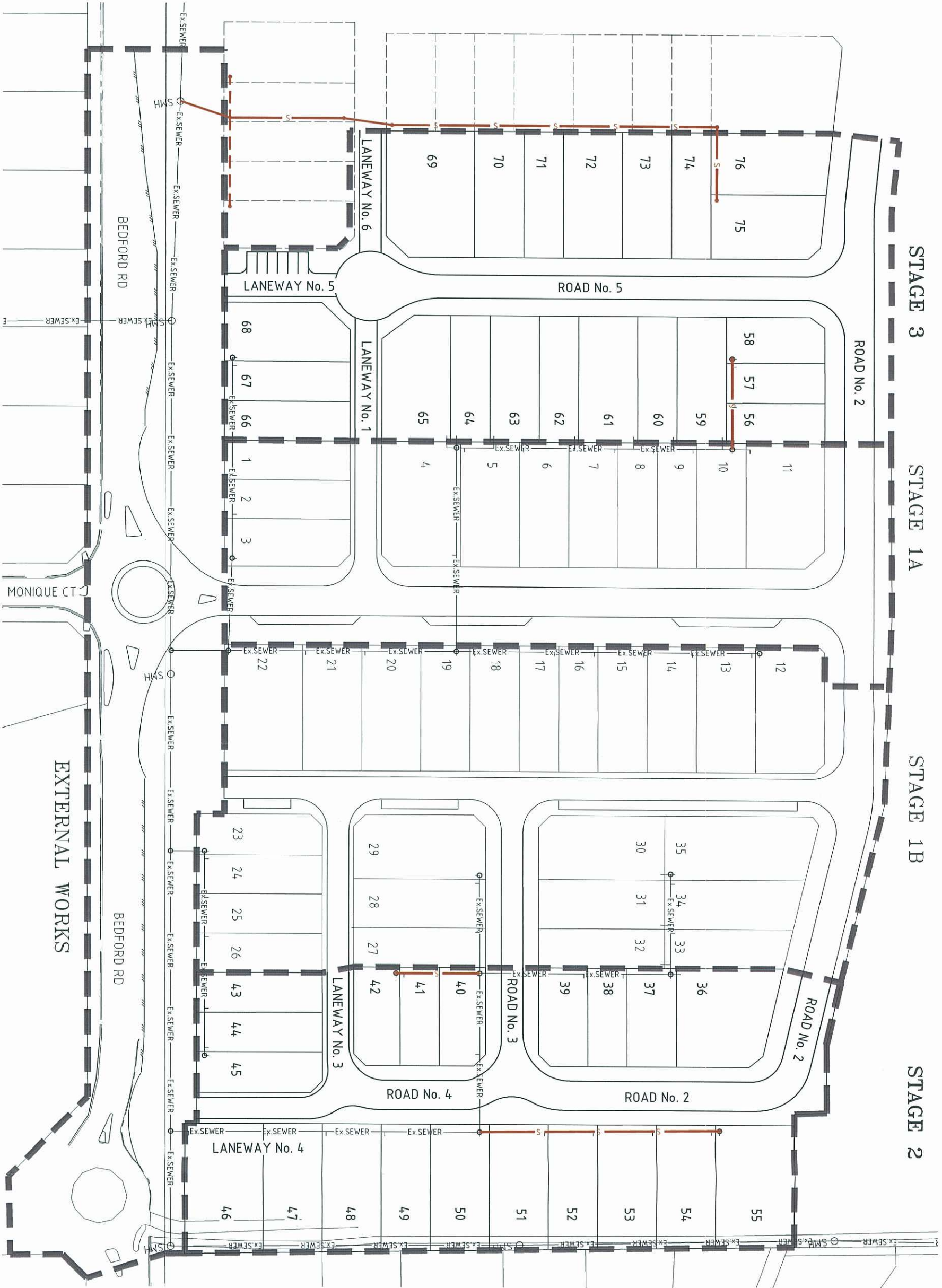
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|---------|-------------------------------------------------|---------------------|-------------|-------------------------------------------------------------------------------------|
| Client  | URBAN LAND DEVELOPMENT AUTHORITY                |                     | Date<br>AHD |  |
| Project | ANDERGROVE STAGES 2 & 3                         | RL .<br>(MGA) COORD |             |                                                                                     |
| Title   | STORMWATER DRAINAGE<br>CATCHMENT<br>LAYOUT PLAN |                     |             | NOT FOR CONSTRUCTION                                                                |
|         | Project No.                                     | Drawing No.         | Rev         |                                                                                     |
|         | BM0021-CSK007                                   | A                   |             |                                                                                     |







|     |                |              |    |      |                                  |
|-----|----------------|--------------|----|------|----------------------------------|
| No. | Amendments     |              |    |      |                                  |
| A   | ORIGINAL ISSUE | MM           | NP | PC   |                                  |
|     |                | Drawn/Design |    | Appt | Registered Engineer Reg No. Date |
|     |                |              |    |      | 06.10.10                         |



- LEGEND**
- STAGE BOUNDARY
  - PROPOSED SEWER RETICULATION
  - FUTURE SEWER RETICULATION
  - EXISTING SEWER RETICULATION

**NOTE:-**  
EXISTING SERVICES PLOTTED FROM RECORDS.  
EXACT SERVICE LOCATIONS SUBJECT TO A  
DETAILED SURVEY.

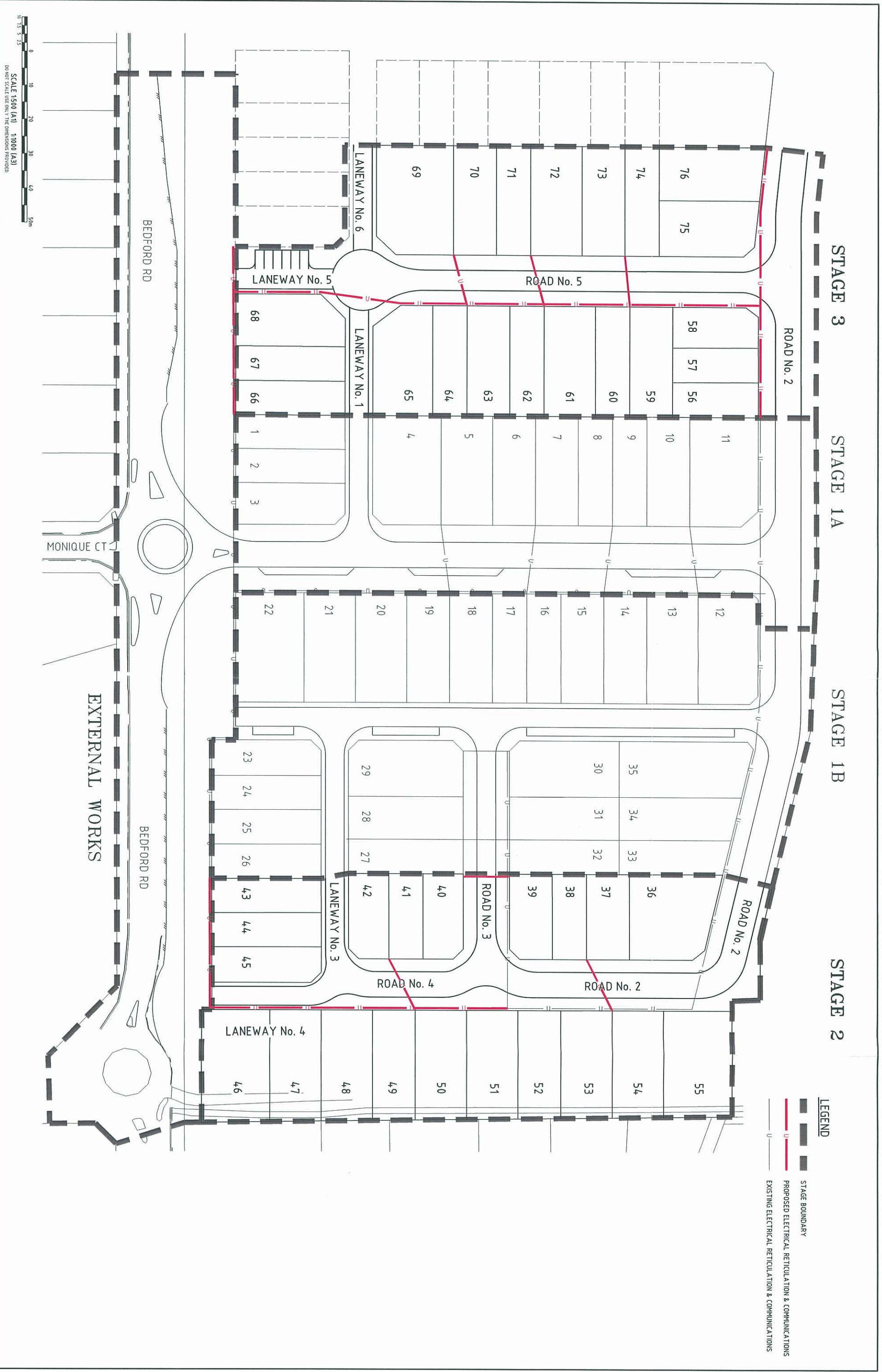
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|---------|----------------------------------|-------------|----------------------|
| Client  | Urban Land Development Authority | Date        | ADD                  |
| Project | ANDERGROVE STAGES 2 & 3          | PSM         | RL                   |
| Title   | SEWER RETICULATION LAYOUT PLAN   | MGAI COORD  | NOT FOR CONSTRUCTION |
| Rev     | BM0021-CSK009                    | Project No. | BM0021-CSK009        |
|         |                                  | Drawing No. | A                    |





|                                                                                                                                                                                               |  |                |  |            |  |              |  |      |  |                     |  |         |  |          |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------|--|------------|--|--------------|--|------|--|---------------------|--|---------|--|----------|--|
| A                                                                                                                                                                                             |  | ORIGINAL ISSUE |  | Amendments |  | Drawn/Design |  | Appd |  | Registered Engineer |  | Reg No. |  | Date     |  |
|                                                                                                                                                                                               |  |                |  |            |  | HM           |  | NP   |  | PC                  |  |         |  | 06.10.10 |  |
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|---------|--|-----------------------------------------------------|--|-------------|--|---------------|--|
| Client  |  | URBAN LAND DEVELOPMENT AUTHORITY                    |  | Date        |  | AHD           |  |
| Project |  | ANDERGROVE STAGES 2 & 3                             |  | Project No. |  | RL            |  |
| Title   |  | ELECTRICAL AND COMMUNICATIONS UTILITIES LAYOUT PLAN |  | Project No. |  | BM0021-CSK010 |  |
|         |  |                                                     |  | Drawing No. |  | A             |  |