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Ref: 7899A Date: March 1, 2022

L&S Consulting (Pty) Ltd
Structural & Civil Engineers

PROPOSED ACORN CITY TOWNSHIP

ON

PORTION 27 OF THE FARM ARTHURSSEAT No. 214 - KU, BUSHBUCKRIDGE, MPUMALANGA

STORMWATER MANAGEMENT REPORT

PREPARED FOR

ACORN CITY

MPUMALANGA'S AFRICAN SMART CITY OF THE FUTURE

Prepared By: Mrs. Jacky Rossouw and Mr. Jandré de Beer

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March 2022

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1. SCOPE OF THE REPORT

Dzana Investments (Pty) Ltd has appointed L&S Consulting Engineers (Pty) Ltd to prepare a stormwater management plan for the proposed development knowns as Acorn City.

The proposed development is situated within the Bushbuckridge Local Municipality in the Ehlanzeni District Municipality of the Mpumalanga Province and will consist of seven zones with different land use and zonings.

This report deals with the on-site stormwater management for the proposed development to comply with the general stormwater management requirements of the Local Municipality as well as that of the Department of Water Affairs.

2. DESCRIPTION OF THE SITE

2.1 Locality

The proposed development is located to the west of the R40 National Road and the Sefoma Township, Bushbuckridge, Mpumalanga. The Portion will be rezoned into a mixed use developed that will include a retail, residential, business, educational, institutional and agricultural areas as well as a filling station.

The site is accessed from the R40 to the west. Refer to the attached Appendix A for the Locality Plan.

2.2 Site Characteristics

2.2.1 Topography

Portion 27 is currently undeveloped and comprises of tall and short field grass, small diameter trees and a small portion of open gravel area.

Due to a natural watershed on site the site drains on surface in both an easterly direction, at an average fall of approximately 1:18, and south westerly direction, at an average fall of approximately 1:14.

To the south west of the site are two tributary watercourses that connect to the Klein-Sandrivier watercourse approximately 500m from the proposed development. Both of these tributary watercourses extend approximately 50m and 85m into the proposed development and both include a riparian edge and a 20m buffer zone.

2.2.2 Geology and Soils

The soil conditions of the undeveloped site consists of medium to coarse grained quartz-feldspar-biotite gneiss of the Swazian Erathem. The site is divided into two geotechnical zones, namely Zone S (which includes Transported Hillwash overlaying localised Transported Pebble Marker, overlaying Residual Gneiss) and Zone C2 (which includes Transported Hillwash overlaying localised Transported Pebble Marker, overlaying thick potentially collapsible Reworked Residual Gneiss), with no perched water table or zones of seepage in any of the test pits.

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The depression storage values for the pervious and impervious areas for steep slopes as recommended in the HydrosimV manual were used (refer Table 5.1: Modeling parameters).

The infiltration rates for the Horton Curve are for loamy soil. The pervious Manning's roughness coefficients are as follows:

- Short veld grass in the pre-developed condition and
- Suburban gardens for the landscaped areas in the post-developed condition.

The impervious Manning's roughness coefficient used for the post-developed condition is for roofing and smooth concrete / asphalt.

2.2.3 Existing Stormwater Infrastructure

No visible stormwater infrastructure was noticed in the vicinity of the site nor have any available information been obtained from the Bushbuckridge Local Municipality.

For the purposes of this report the existing drainage patterns will be adopted for determination of the new stormwater infrastructure positions. Stormwater discharging from the site will connect to the two tributary watercourses, as mentioned above.

Stormwater runoff from the existing R40 road reserve will be contained within the road reserve.

2.2.4 Post-Developed Condition

Acorn City has a total site area of 49.6909 ha.

Portion 27 will be rezoned into a mixed use development with approximately 80% of the developed area being hardstand. Refer to the attached Appendix B for the Site Stormwater Layouts.

New stormwater piped systems will be installed within the proposed development to collect the on surface stormwater runoff that will be diverted to the new road reserves, i.e. collector, link and service roads. Collection of the internal stormwater runoff will be by means of catch pits, field inlets, grid inlets and kerb inlets constructed as part of the internal roadways.

The collected stormwater will be discharged into four adequately sized attenuation ponds constructed at every catchment area. Bio-retention areas with retention ponds will represent the attenuation ponds, as part of the proposed Sustainable Drainage System (SuDS) proposed by the Developer / Client. The design and specification of these bio-retention areas and ponds will adhere to the South African Guidelines for Sustainable Drainage Systems document by the Water Research Commission.

The runoff from the above mentioned SuDS will ultimately discharge into the tributary watercourse to the Klein-Sandrivier watercourse, following the same drainage pattern as currently observed. Erosion protection will be provided at all outlets.

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From the attached stormwater calculations (Refer to Appendix C), we estimate that the total volume of attenuation required is approximately 15 433m³ to restrict the 1:5 and 1:20 year developed runoff from the site to that of the 1:5 and 1:20 year pre-developed conditions respectively in accordance with Department of Water Affairs requirements.

The site will be developed with roads and services to accommodate the proposed development. The natural watershed, as mentioned in sections above, will remain unchanged for the post development conditions. One pond per catchment area (four ponds in total) is proposed to reduce the total site runoff to that of the pre development runoff.

3 STORMWATER DESIGN AND METHOD STATEMENT

3.1 Major Culverts / Bridge Structures

There are two major tributary watercourse crossings that require major culverts/bridge structures as per the SANRAL Drainage Manual. The sizing of the waterway will be done after the hydrological study. A major culvert is described as a cellular structure with dimensions less than those defining a bridge, but with a clear span exceeding 2.1m, or with a total cross sectional opening exceeding 5m^2.

It must be noted that the definitions for bridges and major culverts are purely for categorization purposes for structures management from a risk point of view. There will be no distinction for the applicable design code and requirements.

Minor stream crossings have also been identified at various points along the road alignment and culverts will be installed at these points to allow water crossings. All such crossings will be served with culverts designed for the 1:20 year flood conditions. Final details will be provided at the design stage.

3.2 Design Philosophy

The following basic design philosophy for wetland service crossings will apply during the course of the development of the area:

- All new major access roads crossing defined watercourses will be supported by bridge structures. Care will be taken to avoid sensitive forest and wetland areas (where practical) when locating intermediate bridge supports.
- Where impractical to construct a bridge over defined watercourses and minor roads, the roads will be constructed on a 1,0m thick layer of clean dump rock to allow movement of groundwater under the road embankment in the valley bottom/wetland.
- Pipe crossings (typically water and sewer) and other services such as Telkom and electrical cables shall be ducted and designed within or attached to aforementioned structures where planning permits.
- Pipe crossings (particularly gravity services), over steep narrow wetland valley lines (where no structure is planned), will be designed as pipe bridges with pier locations designed to avoid or minimise impact on sensitive forest and wetland areas.

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- Pipe crossings over flat wide valley lines should be designed to coincide with the necessary control devices i.e. where a storm water weir in a valley line is required to prevent erosion, the service crossing should be designed as an integral component of the device.
- Where no other alternative exists, pipes will need to be buried and alignment must avoid sensitive vegetation with manholes preferably located outside of defined watercourses.
- Where practical all services (longitudinally) will be located outside of sensitive/wetland Areas.

The natural water streams will collect all the water from the area with minimal pollution of the natural watercourses. All effort will be made to follow natural watercourses and not attempt to block or divert them to new paths. All discharge points into natural watercourse will have outlet controls (dissipaters) and treatment of runoff in the form of localized bio-retention ponds.

The stormwater network is geared toward removal of runoff water from paved surface by means of surface channels and subsurface pipe network and discharging of such water to natural watercourses such as streams and rivers depending. The plan should allow for the channeling of stormwater away from building areas in the shortest time and safest way possible.

3.3 Design flood calculation

For this development, the management of stormwater will be based on a typical 1:20 year rainstorm for the area. The generation of a maximum point rainfall in order to determine a design run-off will be based on the guideline as set in the planning and design manual of residential development. (Red Book)

All bulk stormwater networks will be designed in accordance with the sizes of the various stormwater elements as per applicable standards. The design will be subject to the approval of the Ehlanzeni District Municipality.

The following table indicate some of the typical guidelines to be used for runoff calculations:

Table 3.1: Design Flood Frequencies (Major):

Design Flood recurrence for Major Interval	
Land Use	**Design Flood recurrence Interval**
Residential	50 Years
Institutional	50 Years
General Commercial	50 Years
CBD	50 – 100 Years

Table 3.2: Design Flood Frequencies (Minor):

Design Flood recurrence for Minor Interval	
Land Use	**Design Flood recurrence Interval**
Residential	1-5 Years
Institutional	2-5 Years
General Commercial	5 Years
CBD	5-10 Years

The flood line study conducted indicates that there are two tributary watercourses extending to the inside the boundary of the proposed development, hence there will be risk of inundation during a flood event with recurrence interval of 1: 100yrs. The purpose of the flood line at design stage would be:

- To finalise the town planning layout in terms of the placing of stands along the streams within development footprint
- To finalise the placement of collector sewers within the development
- To finalise the placement of storm water pipes and attenuation ponds

3.4 Design Standards

The following table indicate some of the typical guidelines to be used for pipeline capacity calculations:

Suggested Minimum Grades for Pipes		
Pipe Diameter (mm)	**Desirable minimum Gradient (1 in …)**	**Absolute minimum Gradient (1 in …)**
300	80	230
375	110	300
450	140	400
525	170	500
600	200	600
675	240	700
750	280	800
825	320	900
900	350	1000
1050	440	1250
1200	520	1500

3.5 Proposed Stormwater Infrastructure

The Proposed Scope of Stormwater related infrastructure will consist of the following:

- Stormwater Earthworks and installation of pipes
- Kerb inlet structures

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- Catch pits, Chutes and stormwater draining facilities
- Construction of soil erosion protection measures
- Sub-soil drainage pipes, where and if needed
- Stormwater inlet and outlet structures
- Stormwater attenuation facilities or bio-retention ponds for storm control will form part of the landscaping and will serve the purpose as permanent water features as well as attenuation facilities and bio-retention ponds. Outlet controls will be implemented.

4 MONITORING AND MAINTENANCE PLAN

The external stormwater infrastructure of the proposed development will be taken over by the Local Authority and they will be responsible for the maintenance of the stormwater infrastructure.

All internal stormwater infrastructure within the proposed development will be taken over by an Owners Association that will be responsible for the maintenance of the internal stormwater infrastructure.

In addition to the above, refuse traps (typical detail below) will be installed at all outlet structures to mitigate debris ingress into the watercourses. Routine maintenance will be required by relevant stakeholders.

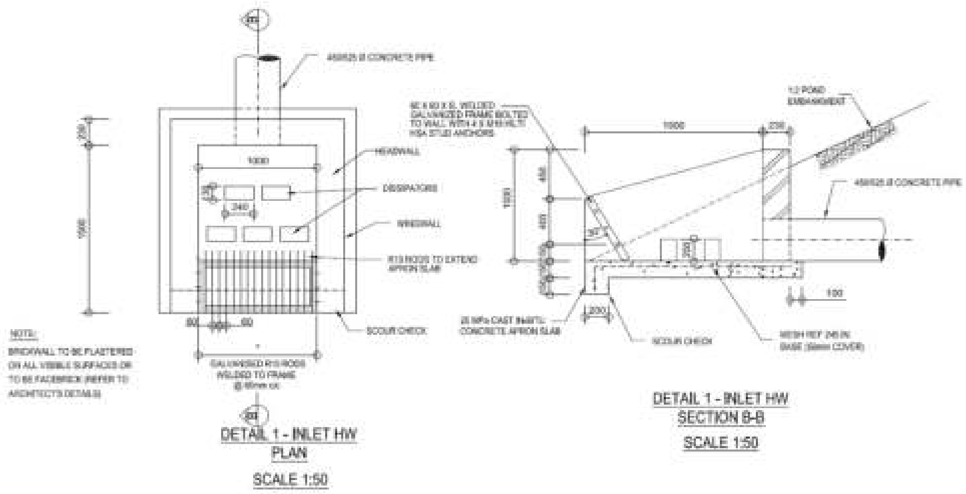

Figure 4.1: Typical Stormwater Outlet Debris/Refuse Trap

Routine maintenance will also be required along the natural watercourses and attenuation facilities whereby debris and refuse are removed from the inlet and outlet facilities.

The attenuation facilities or bio-retention ponds will act as silt traps, with overflow structures treating / controlling stormwater runoff in the form of dissipaters and localized reed beds. Typical details illustrating the high level treatment from these facilities as shown below. Site specific details will be developed together with the best suitable layout and or configuration for the proposed development.

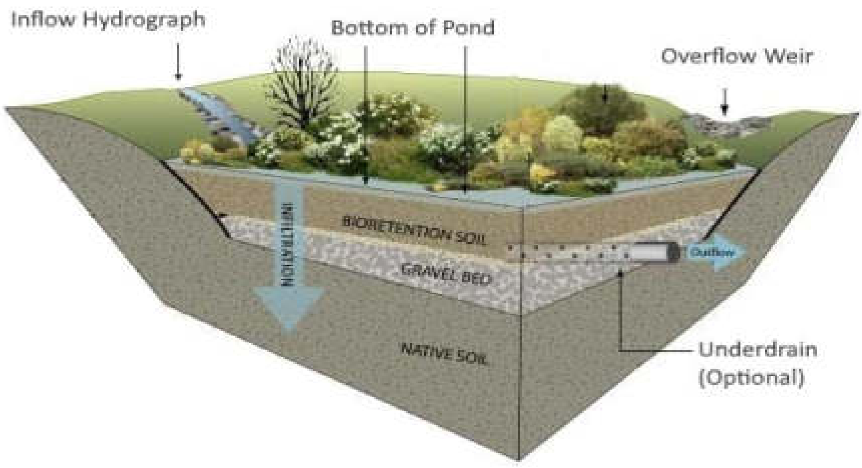

Figure 4.2: Typical Bio-Retention Basin Treatment

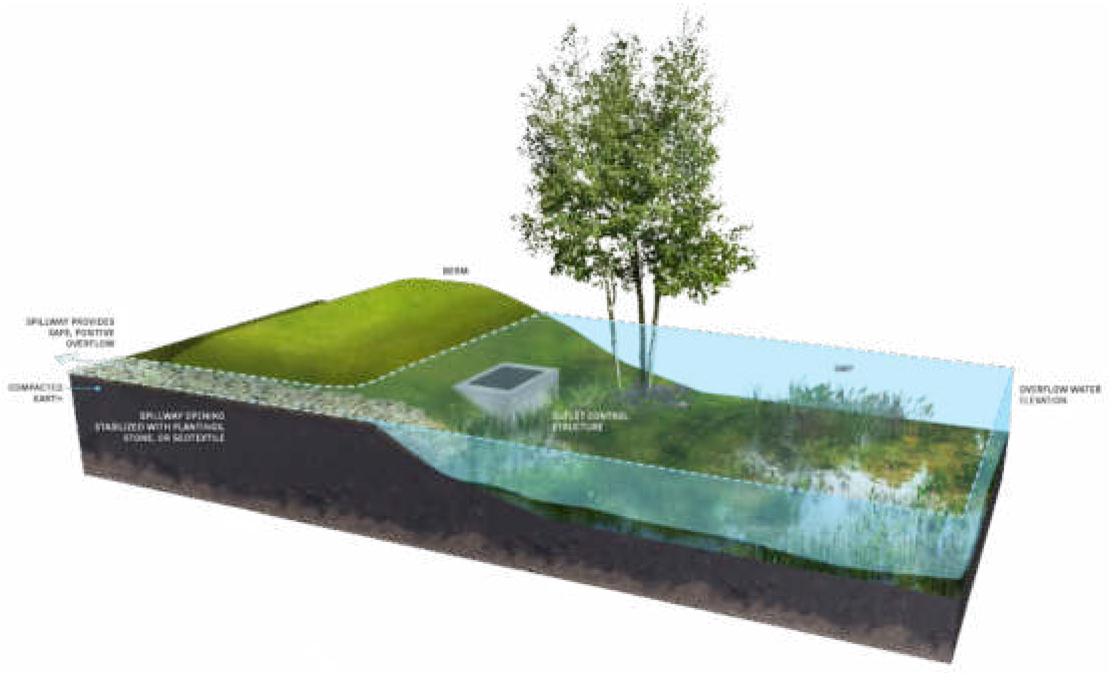

Figure 4.3: Typical Bio-Retention Basin Elevation

In order to ensure sustainability of the above mentioned treatment facilities guidance towards monitoring and maintenance is provided for consideration. Guidance to develop and implement a monitoring study is outlined in a three-phase approach that is broken down into nine steps. The below paragraphs highlight the specific steps to support each phase as follows:

Phase 1: Determine Local Monitoring Needs

- Step 1: Define Monitoring Objective
- Step 2: Review Existing Studies and Databases

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Phase 2: Scope out a Specific Monitoring Study

- Step 3: Select Study Design Why is the study needed? (e.g. define scope) What is the basic approach to the study design?
- Step 4: Determine Data and Resource Needs. What data should be collected? (e.g. select monitoring parameters) How much sampling efforts is needed to get reliable results? (e.g. sample size and frequency) Who will be involved in the study? (e.g. in-house staff, volunteers, consultants) How much should be budgeted for the monitoring study?
- Step 5: Select Study Sites. What factors should be considered when selecting study sites? What data is needed to characterize site or drainage area conditions?
- Step 6: Develop a Monitoring Plan (to include a Quality Assurance/Quality Control procedures). What unique sampling techniques and equipment are needed? What are special data management and quality control considerations? What monitoring problems can be anticipated? What are some good monitoring resources to consult?

Phase 3: Implement the Monitoring Study

- Step 7: Collect Field Data
- Step 8: Perform Laboratory Analyses
- Step 9: Evaluate Data and Draw Conclusions

5 MODELING FOR THE PROPOSED SITE

5.1 Model Selection

The site hydrology was modeled using ‘HydrosimV’.

HydrosimV contains a flood routing module enabling the user to simulate stormwater runoffs and generate hydrographs for dams, reservoirs or detention ponds. As such, HydrosimV was used for calculating the runoffs and hydrographs from the site in the pre and post condition and determining the volume of attenuation required.

5.2 Modeling Parameters

The following modeling parameters were used:

Table 5.1: Modeling Parameters:

Parameter	Value
Depression Storage Pervious (mm)	4
Depression Storage Impervious (mm)	1.5
Initial Infiltration rate (mm/hr)	45
Final Infiltration rate (mm/hr)	6
Pervious Fraction Manning's "n" values from tables in Hydrosim	
Pre-Development – Short Field Grass	0.200
Post-Development – Suburban Garden	0.150
Impervious Fraction Manning's "n" values from tables in Hydrosim	
Pre-Development – Gravel Surface	0.018
Post-Development - Smooth Concrete / Asphalt	0.012

The triangular rainfall type method was used to calculate both the pre-developed and post-developed runoffs for each catchment using a mean annual precipitation of 745mm per year.

The impervious area for the pre-developed conditions was assumed to be 5% of the site area.

The impervious area (hard stands/paved areas) for the post-developed condition was calculated to be 80% of the site area with the remaining 20% being landscaped. Refer to Appendix B for the Site Stormwater Layouts.

For attenuation of the post development conditions, attenuation ponds will be utilized at the low points of every catchment area (refer to tables below). This will however only be allowed in areas depending on the extent and sensitivity of the existing watercourses, their riparian edges and buffer zones.

Using the above pre and post development modeling parameters, our estimated runoffs and volume of attenuation required during the 1:5 and 1:20 recurrence intervals are tabulated below.

5.3 Attenuation Requirements

Table 5.2: Estimated stormwater runoffs and volume watercourse catchments – Catchment Area 1:

Site Area (m^2)	Return Period	Pre Development Total Site Runoff (m^3/s)	Post Development Total Site Runoff (m^3/s)	Detention Pond Volume (m^3)	Runoff after Detention (m^3/s)
88 421	1:5 year	0.787	2.318	1 763	0.828
	1:20 year	1.447	3.895	2 909	1.112

Table 5.3: Estimated stormwater runoffs and volume watercourse catchments – Catchment Area 2:

Site Area (m^2)	Return Period	Pre Development Total Site Runoff (m^3/s)	Post Development Total Site Runoff (m^3/s)	Detention Pond Volume (m^3)	Runoff after Detention (m^3/s)
62 390	1:5 year	0.217	0.961	1 186	0.310
	1:20 year	0.422	1.675	2 026	0.418

Table 5.4: Estimated stormwater runoffs and volume watercourse catchments – Catchment Area 3:

Site Area (m^2)	Return Period	Pre Development Total Site Runoff (m^3/s)	Post Development Total Site Runoff (m^3/s)	Detention Pond Volume (m^3)	Runoff after Detention (m^3/s)
110 434	1:5 year	1.088	3.054	940	1.691
	1:20 year	1.986	5.096	2 222	1.976

Table 5.5: Estimated stormwater runoffs and volume watercourse catchments – Catchment Area 4:

Site Area (m^2)	Return Period	Pre Development Total Site Runoff (m^3/s)	Post Development Total Site Runoff (m^3/s)	Detention Pond Volume (m^3)	Runoff after Detention (m^3/s)
235 664	1:5 year	0.827	3.658	3 228	1.409
	1:20 year	1.610	6.376	6 700	1.633

Table 5.6: Estimated stormwater runoffs and TOTAL volume of attenuation:

Site Area (m^2)	Return Period	Pre Development Total Site Runoff (m^3/s)	Post Development Total Site Runoff (m^3/s)	Detention Pond Volume (m^3)	Runoff after Detention (m^3/s)
496 909	1:5 year	2.919	9.992	7 118	4.237
	1:20 year	5.465	17.042	13 857	5.138

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From the above tables, a total attenuation volume of 13 857 m³ is to be provided on site to accommodate the increase in stormwater runoff due to the proposed development.

6 SITE STORMWATER MANAGEMENT SCHEME

Stormwater runoff occurring during the 1:5 & 1:20 year storm condition will drain via pipes and on surface towards the lowest portions of the site, where it will drain into the attenuation ponds or bio-retentions ponds with the outflow restricted to that of the 1:5 and 1:20 pre-developed and conditions.

The outflow from the site will connect into the existing tributary watercourses adjacent to the proposed development. Refer to Appendix B for the Stormwater Layout.

Storms exceeding the 1:20 year event will drain on surface towards the existing watercourses adjacent to the development. The attenuation ponds will have controlled spillways to allow the excess water to drain towards the lower lying Klein-Sandrivier.

The attenuated 1:5 and 1:20 post-developed runoffs from the proposed site will coincide with the pre-developed 1:5 and 1:20 year runoffs for all catchments.

Monitoring and maintenance of the abovementioned systems are to be conducted as per the guidelines provided in this report. This is to ensure a sustainable system.

7 STORMWATER MANAGEMENT DURING CONSTRUCTION

- All stormwater on site will be diverted to the permanent attenuation pond locations. Permanent attenuation pond structures will be constructed under the main contract.
- The attenuation ponds excavation will act as a temporary silt trap during construction.
- The existing stormwater pipes will be used in order to discharge the stormwater generated on site during construction.

We trust that the above meets with your approval. Please feel free to contact the undersigned for any queries or additional information required.

Yours Faithfully
L & S CONSULTING (PTY) LTD

Mrs. Jacky Rossouw
BTech (TUT)
Candidate Engineering Technologist

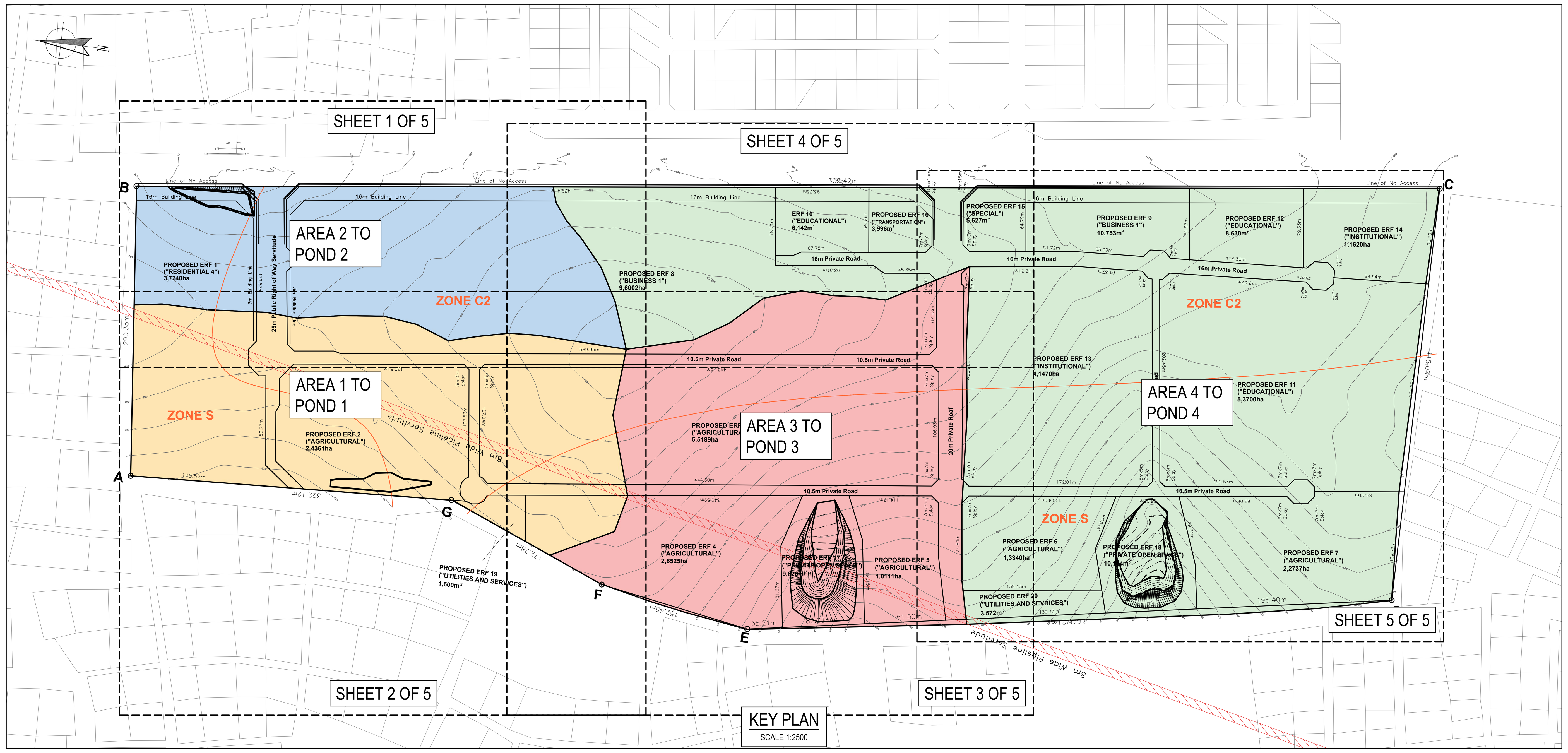
Mr. Jandré de Beer
PrEng, BEng (UP), MSAICE
Associate

LOCALITY PLAN

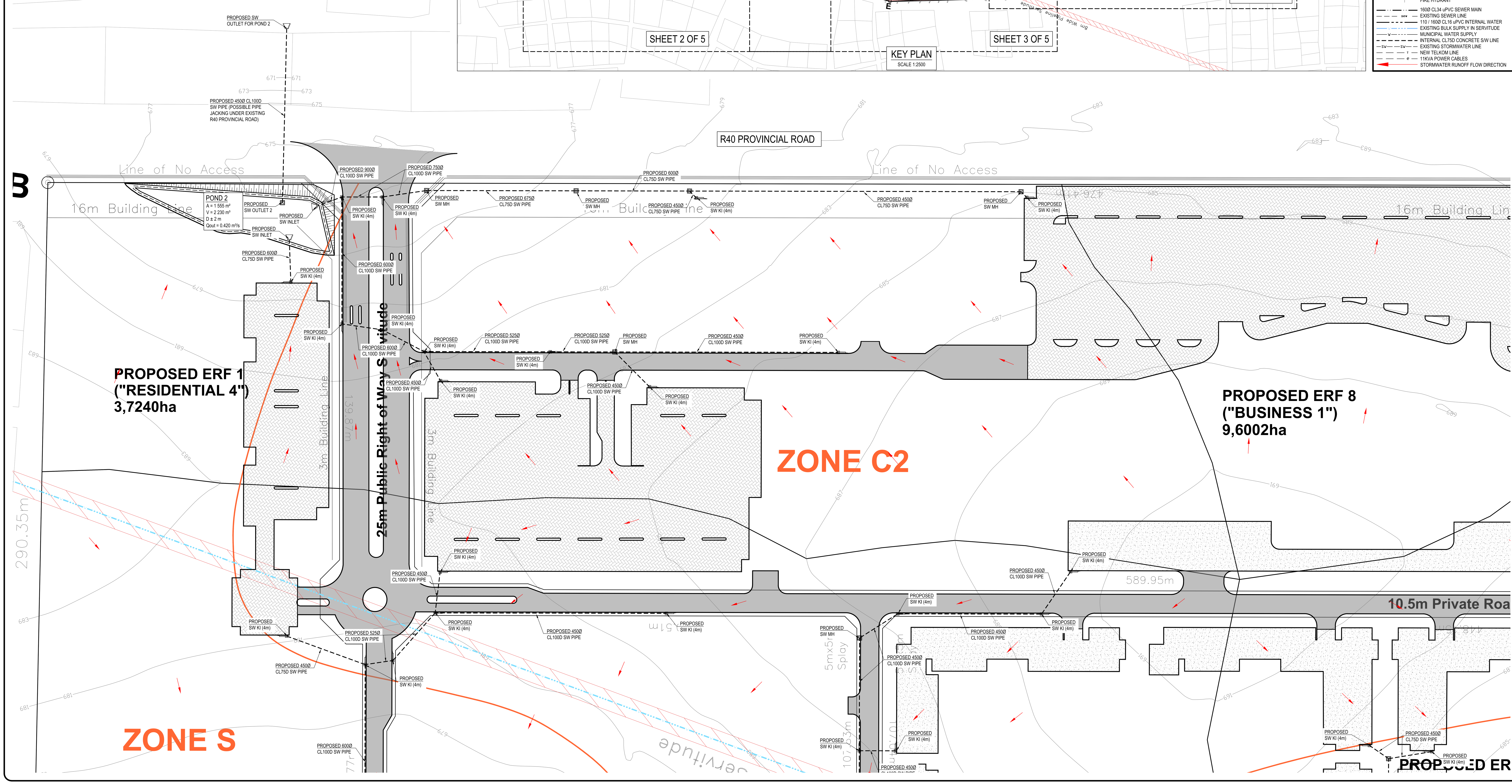
Note: To avoid duplication, this report was omitted from Appendix A. Refer to Appendix D10.1 of the Draft EIR on Acorn City for further reference.

APPENDIX B

SITE STORMWATER LAYOUT



KEY PLAN
SCALE 1:2500



STORMWATER NOTES:

1. CONTRACTOR TO CONFIRM INVERT LEVELS OF EXISTING STORMWATER MANHOLES AT CONNECTION POINTS, PRIOR TO CONSTRUCTION OF STORMWATER RETICULATION COMMENCING
2. ALL WORK TO BE DONE IN ACCORDANCE WITH RELEVANT SANS 1200 SPECIFICATIONS
3. ALL STORMWATER PIPES TO BE CLASS '75D', WITH 'OG' JOINTS, UNLESS OTHERWISE SHOWN
4. ALL uPCV STORMWATER PIPES AS SPECIFIED TO BE MINIMUM uPVC CLASS 6, UNLESS OTHERWISE SHOWN
5. ALL BEDDING TO BE CLASS 'D' UNLESS OTHERWISE SHOWN
6. PIPE TRENCHES TO BE BACKFILLED IN 150mm LAYERS AND COMPACTED TO 93% MOD. AASHTO
7. BEDDING TO BE COMPACTED TO 90% MOD. AASHTO
8. PIPES TO BE LAID CROWN TO CROWN
9. ALL WORK TO COMPLY WITH LOCAL AUTHORITY REQUIREMENTS
10. THE CONTRACTOR IS TO SEARCH FOR AND CONFIRM POSITIONS AND DEPTHS OF ALL SERVICES BEFORE COMMENCING WORK. PROTECTION OF SERVICES DURING CONSTRUCTION IS THE CONTRACTORS RESPONSIBILITY
11. ALL STORMWATER PIPES AND INLETS ARE POSITIONED ACCORDING TO AVAILABLE SURVEY INFORMATION AND MAY REQUIRE ADJUSTMENT AS INSTRUCTED BY THE ENGINEER TO SUIT CONDITIONS ON SITE
12. ACCESS TO PRIVATE PROPERTIES IS TO BE MAINTAINED AT ALL TIMES
13. ALL RELEVANT WAYLEAVES TO BE OBTAINED BY CONTRACTOR PRIOR TO CONSTRUCTION COMMENCING
14. FOR STORMWATER MANHOLE DETAIL REFER TO DRAWING 7___-A-___
15. FOR GRID INLET REFER TO DRAWING 7___-A-___
16. FOR KERB INLET REFER TO DRAWING 7___-A-___
17. NATURAL GROUND CONTOURS AT 500mm INTERVALS
18. ALL KERB INLETS TO BE 4m LONG UNLESS OTHERWISE SHOWN.
19. SERVICE EXCAVATIONS EXCEEDING 1,5m DEPTHS MUST BE SUFFICIENTLY SHORED OR CUT BANKS TO BE PROVIDED AT A 1:1 MINIMUM SLOPE UNLESS OTHERWISE SHOWN.
20. LEGEND:

KERB INLET
STORMWATER MANHOLE
NEW STORMWATER GRID INLET
NEW WING WALL INLET / OUTLET
EXISTING SEWER MANHOLE
NEW SEWER MANHOLE
NEW RODDING EYE
WATER METER
GATE VALVE
FIRE HYDRANT
160Ø CL34 uPVC SEWER MAIN
EXISTING SEWER LINE
110 / 160Ø CL16 uPVC INTERNAL WATER
EXISTING BULK SUPPLY IN SERVITUDE
MUNICIPAL WATER SUPPLY
INTERNAL CL75D CONCRETE S/W LINE
EXISTING STORMWATER LINE
NEW TELKOM LINE
11KVA POWER CABLES
STORMWATER RUNOFF FLOW DIRECTION

ROAD NOTES:

1. ALL WORK TO BE CONSTRUCTED IN ACCORDANCE WITH RELEVANT SANS 1200 SPECIFICATIONS
2. DESIGN CONTOURS AT 100mm INTERVALS
3. GROUND CONTOURS AT 500mm INTERVALS
4. ALL PARKING BAYS ARE TO BE 2.5m WIDE x 5.0m LONG UNLESS OTHERWISE SHOWN
5. ALL KERB RADII ARE TO BE 0.3m UNLESS OTHERWISE SHOWN
6. ALL THE KERBS TO BE FIG. TYPE 7 UNLESS OTHERWISE SHOWN
7. IN THE CASE OF FIG. 7 TYPE KERBING - TOP OF KERB TO BE 140mm ABOVE FINAL PAVING
8. ALL DIMENSIONS AND LEVELS REFER TO FRONT FACE OF KERB AT ROAD LEVEL
9. KERB RADII LESS THAN 1m TO BE CAST IN SITU CONCRETE
10. KERB RADII BETWEEN 1m AND 4m TO BE CONSTRUCTED IN 0.3m LENGTHS (PRECAST)
11. KERB RADII BETWEEN 4m AND 20m TO BE CONSTRUCTED IN 0.5m LENGTHS (PRECAST)
12. PAVING LEVELS TO BE READ IN PREFERENCE TO DESIGN CONTOUR LEVELS
13. FOR PAVING SPECIFICATION REFER TO DETAIL No. ___ AND ___
14. FOR STORMWATER LAYOUT AND LEVELS REFER TO DRAWING 7___-A-___
15. FOR WATER & SEWER LAYOUT AND LEVELS REFER TO DRAWING 7___-A-___
16. FOR SLEEVE LAYOUT REFER TO DRAWING 7___-A-___
17. FOR KERBING DETAIL AND WALKWAYS REFER TO DETAIL ___ & ___
18. FOR ALL SERVICES TRENCHES OUTSIDE OF SITE BOUNDARY - HAND EXCAVATION TO BE DONE TO ESTABLISH LOCATION OF ALL EXISTING COUNCIL SERVICES (TO BE DONE PRIOR TO CONSTRUCTION OF SERVICES WITHIN THE SITE)
19. CONTRACTOR TO CONFIRM EXISTING SITE ENTRANCE LEVELS PRIOR TO CONSTRUCTION OF ROAD LAYERWORKS
20. DENSITY TEST RESULTS ARE TO BE PROVIDED FOR ALL COMPLETE LAYERS PRIOR TO WORK ON SUBSEQUENT LAYERS COMMENCING
21. TRAFFICKING OF INTERLOCKING BLOCK PAVING PRIOR TO EDGE RESTRAINTS BEING CONSTRUCTED AND JOINTS BEING GROUTED WILL NOT BE PERMITTED
22. CURING OF STABILIZED LAYERS IS TO BE DONE IN STRICT ACCORDANCE WITH SANS 1200
23. NO CONSTRUCTION TRAFFIC IS PERMITTED ON THE STABILIZED LAYER WITHIN THE CURING PERIOD (7 DAYS)
24. ALL COMPLETED LAYERS ARE TO BE INSPECTED AND SIGNED OFF BY THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE NEXT LAYER (SUBGRADE, SUB-BASE & BASE COURSE)
25. ALL MANHOLE COVER LEVEL TO BE ADJUSTED TO SUIT FINAL SURFACE LEVEL
26. ALL SLEEVES TO BE PROOF TESTED AND TO HAVE DRAW WIRES INSTALLED
27. PREMIX TO BE CAST A MINIMUM OF 45 DAYS PRIOR TO PROJECT COMPLETION TO FACILITATE ADEQUATE CURING OF ASPHALT PRIOR TO ROADMARKING.
28. KERBS TO BE MARKED AT ALL SLEEVES CROSSINGS:
   E - ELECTRICAL
   I - IRRIGATION
   T - TELKOM / DATA
29. LEGEND:

80mm PAVING SURFACE
30mm PREMIX SURFACE
180mm CONCRETE SURFACE

Rev.	Date	Description	Appr.
C	2022/03/01	UPDATED TOWN PLANNING LAYOUT	
B	2022/02/15	UPDATED TO SITE PLAN REV AB	
A	2021/07/27	ISSUED FOR INFORMATION	

QMS Checklist	Rev A	
	Rev 0	

Designed	J. ROSSOUW	
Drawn	J. ROSSOUW	
Checked	J. A. DE BEER	
Director	D. J. OOSTHUIZEN	

Scale	Date
1:600	2021/07/27

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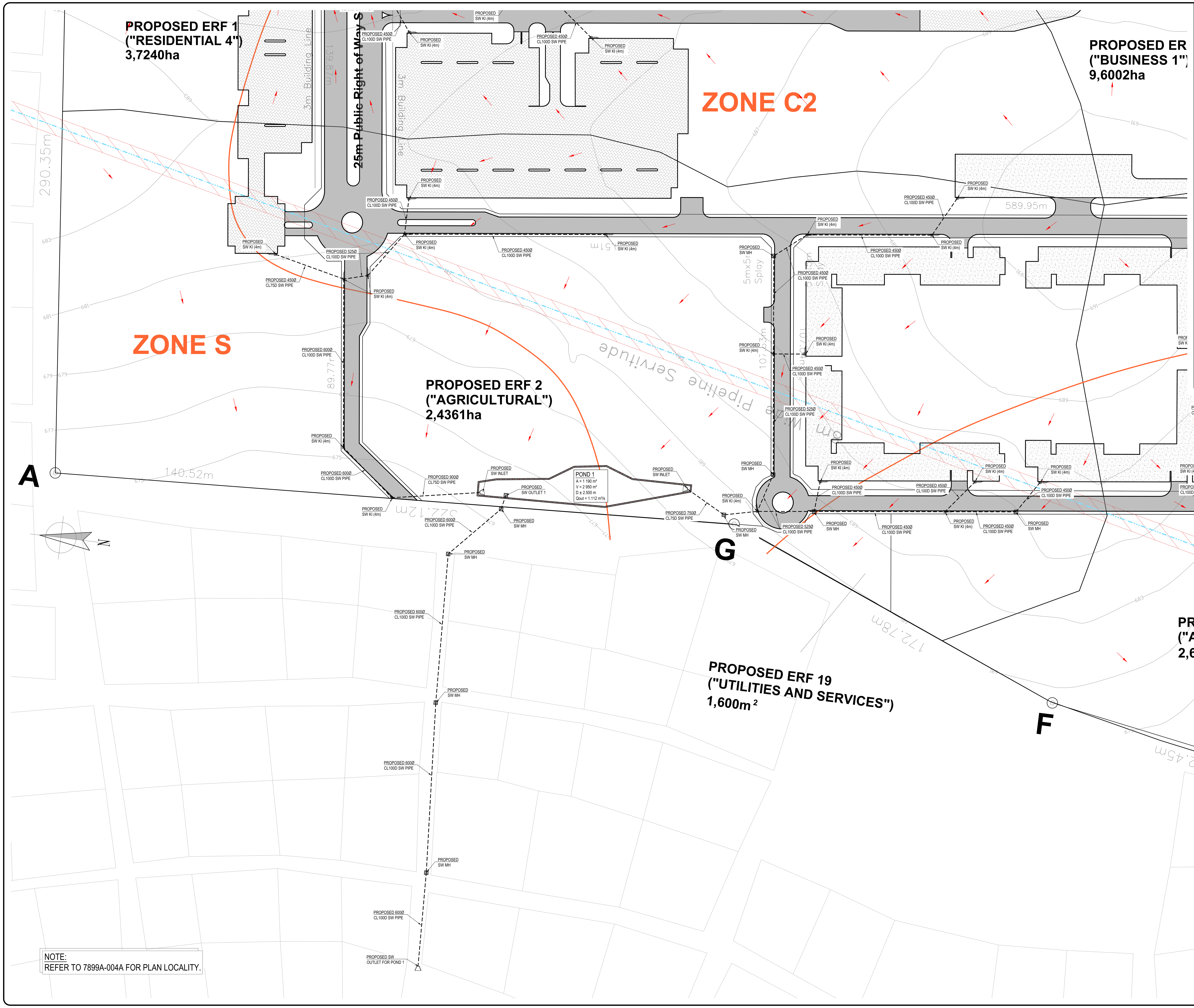
Client
ACORN CITY

Project
ACORN CITY, MPUMALANGA
PORTION 27 OF THE FARM
ARTHURSSEAT 214-KU

Drawing Description
ROADS AND
STORMWATER LAYOUT

Project number	Drawing number	Revision number
7899A	004A	C



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ACORN CITY

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PORTION 27 OF THE FARM
ARTHURSSEAT 214-KU

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ROADS AND
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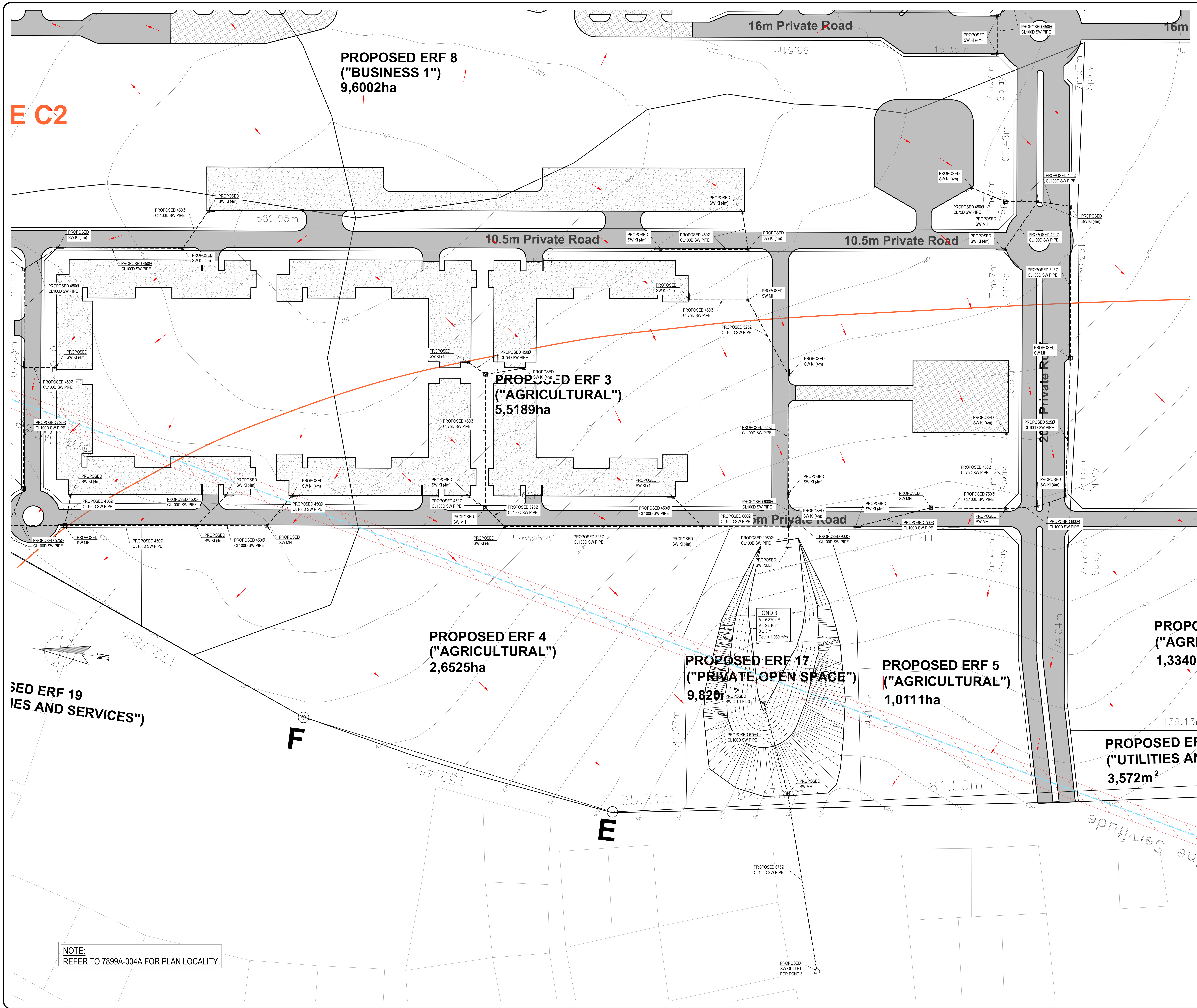

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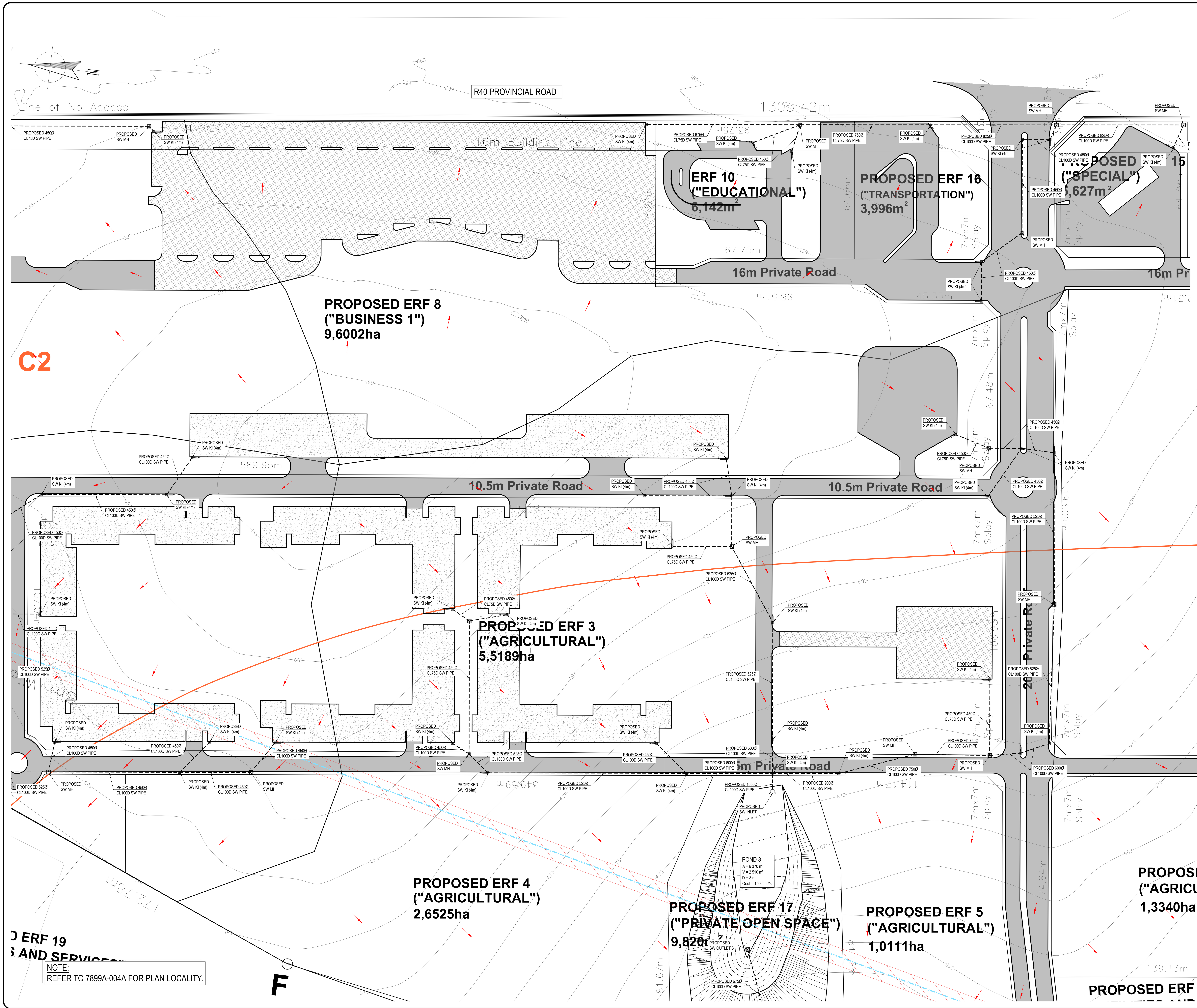

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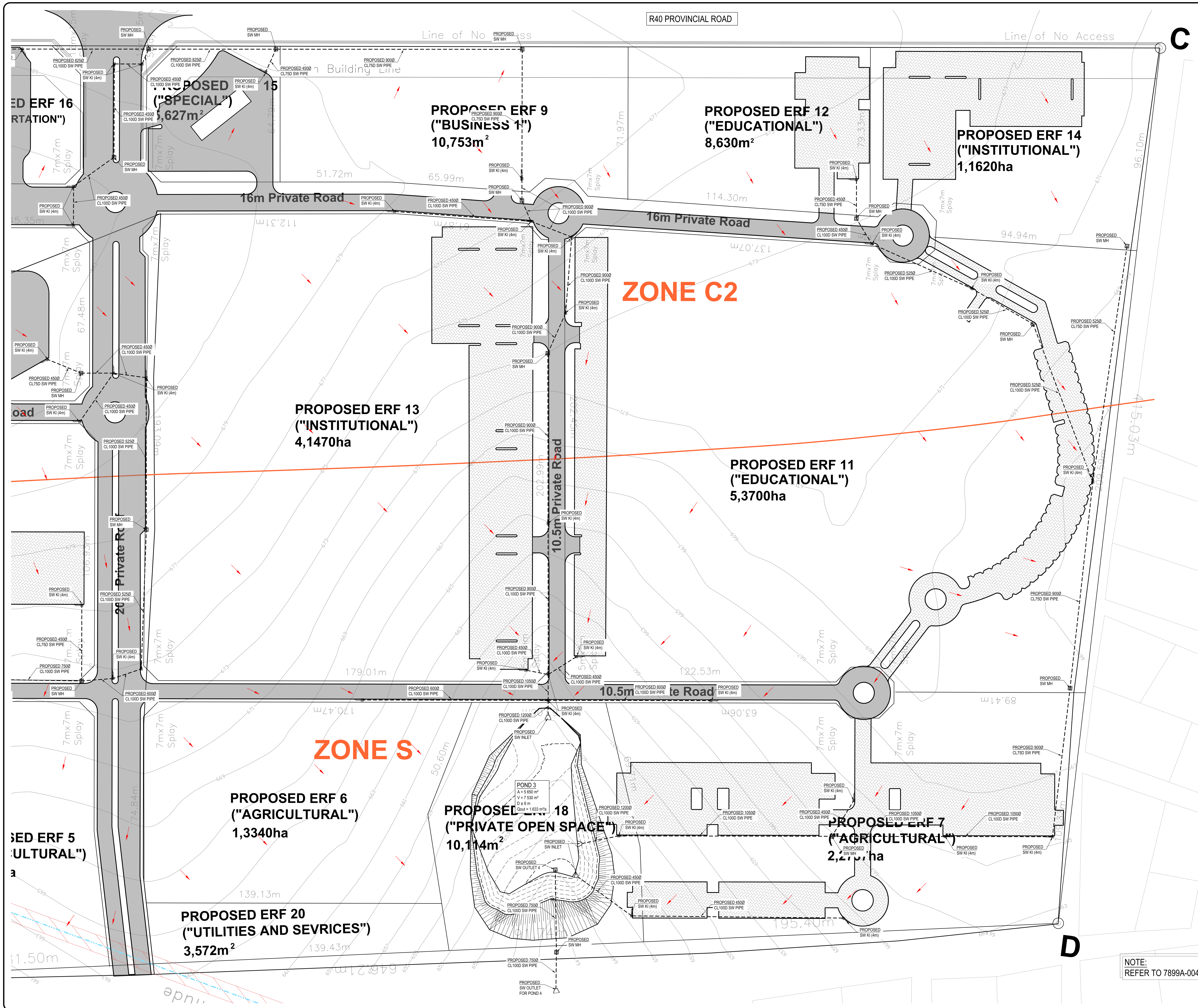

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16. FOR SLEEVE LAYOUT REFER TO DRAWING 7___-A-___
17. FOR KERBING DETAIL AND WALKWAYS REFER TO DETAIL ___ & ___
18. FOR ALL SERVICES TRENCHES OUTSIDE OF SITE BOUNDARY - HAND EXCAVATION TO BE DONE TO ESTABLISH LOCATION OF ALL EXISTING COUNCIL SERVICES (TO BE DONE PRIOR TO CONSTRUCTION OF SERVICES WITHIN THE SITE)
19. CONTRACTOR TO CONFIRM EXISTING SITE ENTRANCE LEVELS PRIOR TO CONSTRUCTION OF ROAD LAYERWORKS
20. DENSITY TEST RESULTS ARE TO BE PROVIDED FOR ALL COMPLETE LAYERS PRIOR TO WORK ON SUBSEQUENT LAYERS COMMENCING
21. TRAFFICKING OF INTERLOCKING BLOCK PAVING PRIOR TO EDGE RESTRAINTS BEING CONSTRUCTED AND JOINTS BEING GROUTED WILL NOT BE PERMITTED
22. CURING OF STABILIZED LAYERS IS TO BE DONE IN STRICT ACCORDANCE WITH SANS 1200
23. NO CONSTRUCTION TRAFFIC IS PERMITTED ON THE STABILIZED LAYER WITHIN THE CURING PERIOD (7 DAYS)
24. ALL COMPLETED LAYERS ARE TO BE INSPECTED AND SIGNED OFF BY THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE NEXT LAYER (SUBGRADE, SUB-BASE & BASE COURSE)
25. ALL MANHOLE COVER LEVEL TO BE ADJUSTED TO SUIT FINAL SURFACE LEVEL
26. ALL SLEEVES TO BE PROOF TESTED AND TO HAVE DRAW WIRES INSTALLED
27. PREMIX TO BE CAST A MINIMUM OF 45 DAYS PRIOR TO PROJECT COMPLETION TO FACILITATE ADEQUATE CURING OF ASPHALT PRIOR TO ROADMARKING.
28. KERBS TO BE MARKED AT ALL SLEEVES CROSSINGS:
    E - ELECTRICAL
    I - IRRIGATION
    T - TELKOM / DATA
29. LEGEND:
    - 80mm PAVING SURFACE
    - 30mm PREMIX SURFACE
    - 180mm CONCRETE SURFACE

Rev.	Date	Description	Appr.
C	2022/03/01	UPDATED TOWN PLANNING LAYOUT	
B	2022/02/15	UPDATED TO SITE PLAN REV AB	
A	2021/07/27	ISSUED FOR INFORMATION	

QMS Checklist	Rev A	
	Rev 0	

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Client
ACORN CITY

Project
ACORN CITY, MPUMALANGA
PORTION 27 OF THE FARM
ARTHURSSEAT 214-KU

Drawing Description
ROADS AND
STORMWATER LAYOUT

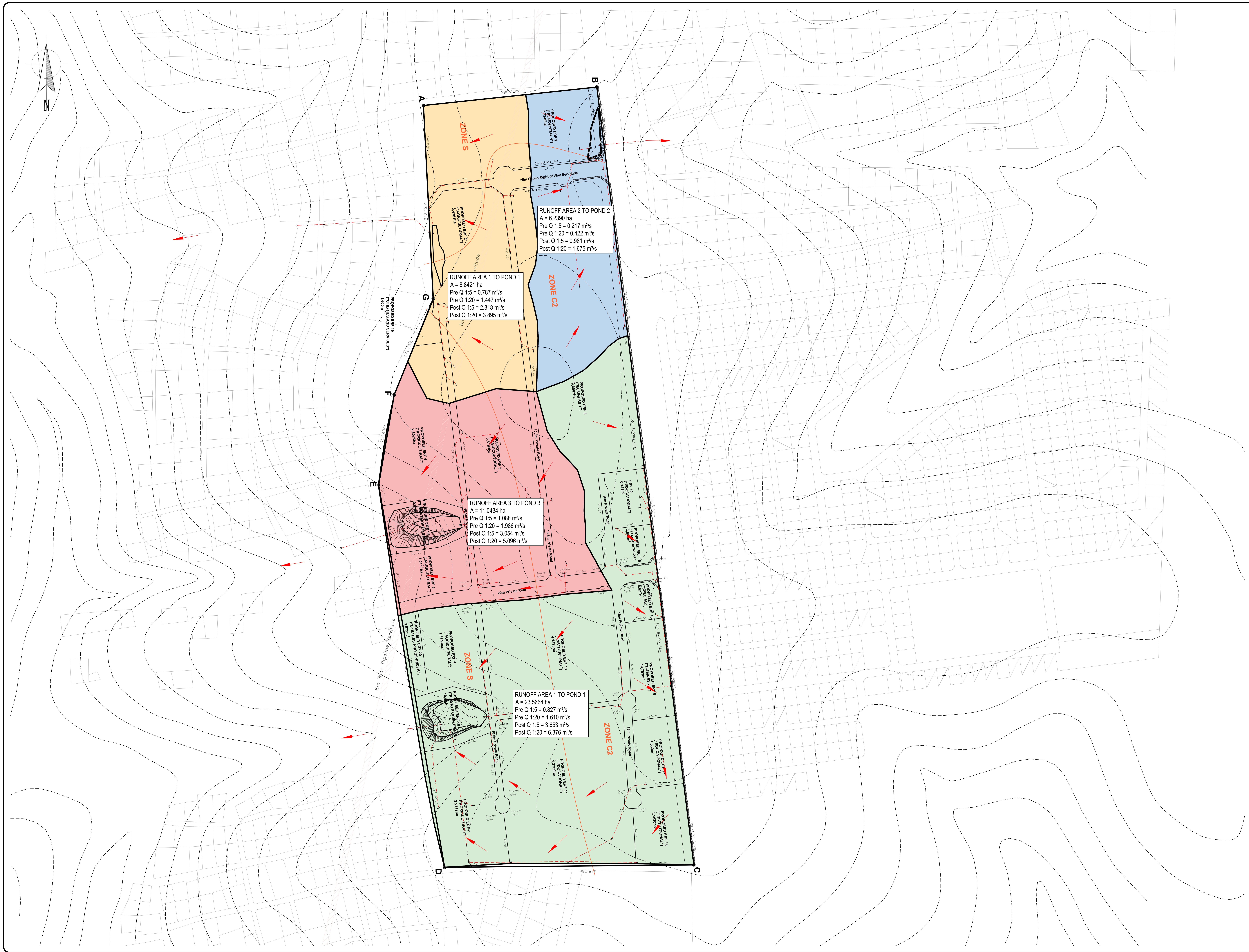
Project number	Drawing number	Revision number
7899A	004E	C

APPENDIX C

STORMWATER CALCULATIONS AND HYDROGRAPHS

Note: To avoid duplication, this report was omitted from Appendix C. Refer to Appendix D10.1 of the Draft EIR on Acorn City for further reference.

SITE CATCHMENT AREA LAYOUT WITH POND POSITIONS



GENERAL NOTES:

1. CONTRACTOR TO CONFIRM INVERT LEVELS OF EXISTING STORMWATER MANHOLES AT CONNECTION POINTS, PRIOR TO CONSTRUCTION OF STORMWATER RETICULATION COMMENCING
2. ALL WORK TO BE DONE IN ACCORDANCE WITH RELEVANT SANS 1200 SPECIFICATIONS
3. ALL STORMWATER PIPES TO BE CLASS '75D', WITH 'OG' JOINTS, UNLESS OTHERWISE SHOWN
4. ALL uPCV STORMWATER PIPES AS SPECIFIED TO BE MINIMUM uPVC CLASS 6, UNLESS OTHERWISE SHOWN
5. ALL BEDDING TO BE CLASS 'D' UNLESS OTHERWISE SHOWN
6. PIPE TRENCHES TO BE BACKFILLED IN 150mm LAYERS AND COMPACTED TO 93% MOD. AASHTO
7. BEDDING TO BE COMPACTED TO 90% MOD. AASHTO
8. PIPES TO BE LAID CROWN TO CROWN
9. ALL WORK TO COMPLY WITH LOCAL AUTHORITY REQUIREMENTS
10. THE CONTRACTOR IS TO SEARCH FOR AND CONFIRM POSITIONS AND DEPTHS OF ALL SERVICES BEFORE COMMENCING WORK. PROTECTION OF SERVICES DURING CONSTRUCTION IS THE CONTRACTORS RESPONSIBILITY
11. ALL STORMWATER PIPES AND INLETS ARE POSITIONED ACCORDING TO AVAILABLE SURVEY INFORMATION AND MAY REQUIRE ADJUSTMENT AS INSTRUCTED BY THE ENGINEER TO SUIT CONDITIONS ON SITE
12. ACCESS TO PRIVATE PROPERTIES IS TO BE MAINTAINED AT ALL TIMES
13. ALL RELEVANT WAYLEAVES TO BE OBTAINED BY CONTRACTOR PRIOR TO CONSTRUCTION COMMENCING
14. FOR STORMWATER MANHOLE DETAIL REFER TO DRAWING 7___-A-___
15. FOR GRID INLET REFER TO DRAWING 7___-A-___
16. FOR KERB INLET REFER TO DRAWING 7___-A-___
17. NATURAL GROUND CONTOURS AT 500mm INTERVALS
18. ALL KERB INLETS TO BE 4m LONG UNLESS OTHERWISE SHOWN.
19. SERVICE EXCAVATIONS EXCEEDING 1,5m DEPTHS MUST BE SUFFICIENTLY SHORED OR CUT BANKS TO BE PROVIDED AT A 1:1 MINIMUM SLOPE UNLESS OTHERWISE SHOWN.
20. LEGEND:

KERB INLET
STORMWATER MANHOLE
NEW DOUBLE STORMWATER GRID INLET
NEW LIGHT DUTY GRID INLET
EXISTING SEWER MANHOLE
NEW SEWER MANHOLE
NEW RODDING EYE
WATER METER
GATE VALVE
FIRE HYDRANT
160Ø CL34 uPVC SEWER MAIN
EXISTING SEWER LINE
160Ø CL16 uPVC FIRE / SUPPLY MAIN
110Ø CL12 uPVC DOMESTIC MAIN
MUNICIPAL WATER SUPPLY
INTERNAL CL75D CONCRETE S/W LINE
EXISTING STORMWATER LINE
NEW TELKOM LINE
11KVA POWER CABLES
STORMWATER RUNOFF FLOW DIRECTION

Rev.	Date	Description	Appr.
C	2022/03/01	UPDATED TOWN PLANNING LAYOUT	
B	2022/02/15	UPDATED TO SITE PLAN REV AB	
A	2021/04/08	ISSUED FOR INFORMATION	

QMS Checklist		
	Rev A	
	Rev 0	

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PORTION 27 OF THE FARM
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Drawing Description
STORMWATER
CATCHMENT AREA
LAYOUT

Project number	Drawing number	Revision number
7899A	098	C