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Our Ref: PSM3276-142L REV2

05 November 2021

Frasers Property
Level 2, 1C Homebush Bay Drive
Rhodes NSW 2138
Paul.Solomon@frasersproperty.com.au

Attention: Paul Solomon

Dear Paul

RE: MAMRE SOUTH PRECINCT
657-769 MAMRE ROAD, KEMPS CREEK
ARDEX DISTRIBUTION CENTRE - GEOTECHNICAL ASSESSMENT

1. Introduction

The Ardex distribution centre is a proposed manufacturing facility and associated warehouse facility located at 657-769 Mamre Road, Kemps Creek (proposed Lot 12). It is understood this is to be submitted for a Development Application (DA). PSM previously undertook geotechnical investigation works within the proposed development site in March 2017, May 2018, April 2020 and May 2020.

The following drawings were provided to PSM and used as the basis for assessing suitability of the site for the proposed development:

- Civil drawings by Costin Roe - C013362.05 - SSDA10 to SSDA50 dated 30 July 2021
- Site Plan by Pace Architects, 210618 – DA 200 dated 12 August 2021.

We understand the following about the proposed development:

- Minor earthworks involving cut and fill works, site preparation works and the establishment of a building pad.
- Infrastructure comprising civil works and augmentation of utilities servicing.
- Construction, internal fit out and operation of a manufacturing facility and warehouse (27,470 m^2), comprising:
  - Manufacturing areas and associated warehouse (24,970 m^2)
  - Ancillary office areas (2,500 m^2)
  - 163 car parking spaces and 12 bicycle spaces
  - Powder silo tower
  - Liquid silo tower
  - Associated business identification signage
  - Site Landscaping (4,348 m^2)
  - 13 loading docks
  - Three (3) vehicle crossovers.

2. Supporting Documentation

PSM undertook investigation works within the development site on 14 and 15 May 2020. The following documents were provided to Frasers Property and Atlis Property based on the results of this geotechnical investigation:

- A geotechnical investigation factual report (Ref. PSM3276-100L REV2 dated 23 September 2020) following fieldwork undertaken in March 2017, May 2018, April 2020 and May 2020
- A bulk earthworks specification dated 08 April 2021 (Ref. PSM3276-102S REV2)
- An interim geotechnical design advice (IGDA) dated 15 September 2020 (Ref. PSM3276-101L REV2)
- A soil salinity investigation report dated 20 December 2018 (Ref. PSM3276-110L).

3. Conclusion

PSM consider that the site discussed in Section 1 is suitable for the proposed commercial/industrial development provided the following is satisfied:

- Any earthworks are undertaken in accordance with PSM bulk earthworks specification (Ref. PSM3276-102S REV2) and,
- The design for the development is based on PSM interim geotechnical design advice (IGDA) (Ref. PSM3276-101L REV2) refer to Appendix A.

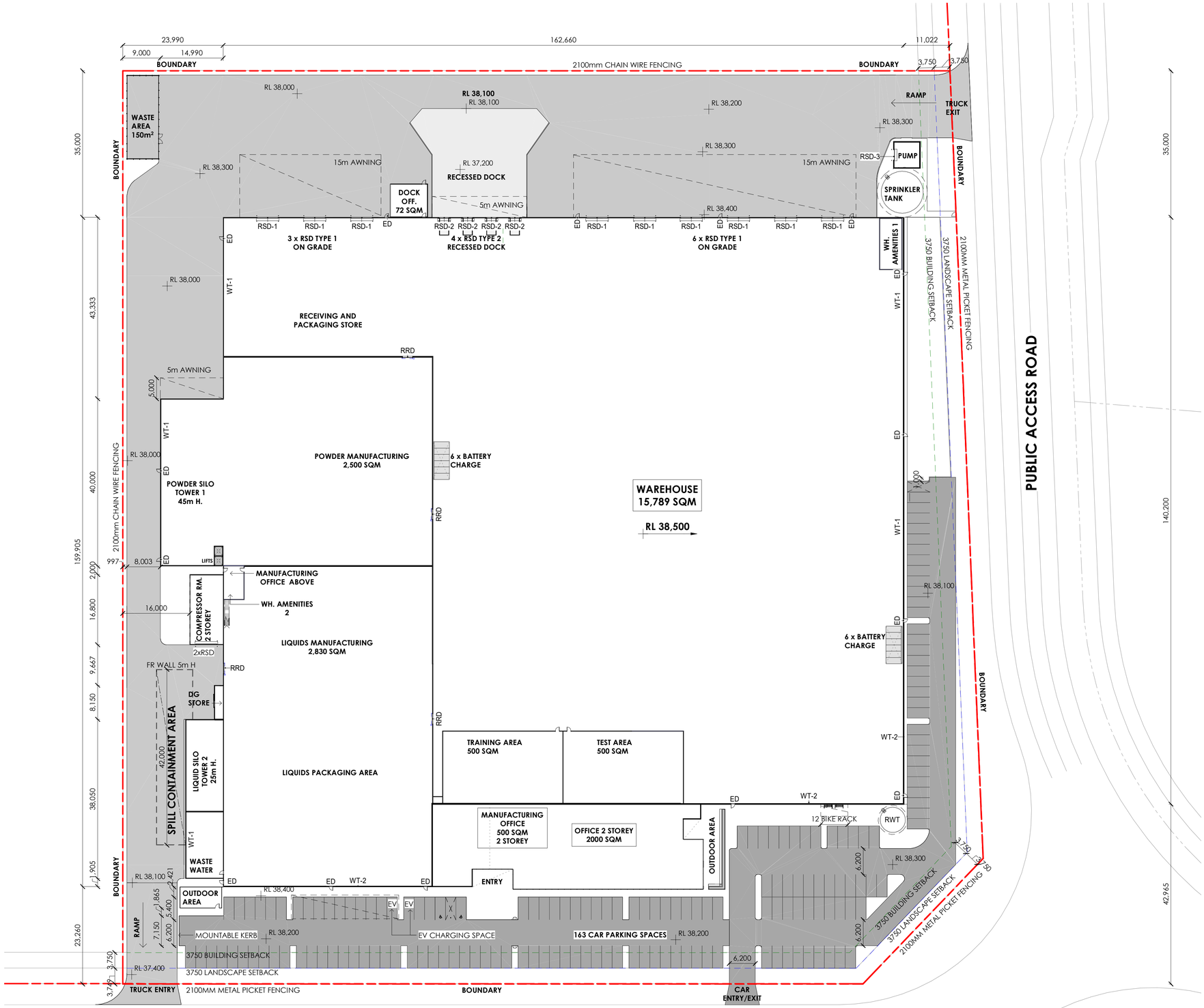
Should there be any queries, please contact the undersigned.

Yours Sincerely

DANIEL DE CATALDO
SENIOR GEOTECHNICAL ENGINEER

AGUSTRIA SALIM
PRINCIPAL

Encl. Figure 1 Site Locality Plan
Appendix A PSM3276-101L REV2



DEVELOPMENT TABLE *		
TOTAL SITE AREA:		**43,682 m²**
AREAS:		
WAREHOUSE (INCLUDING THE FOLLOWING AREAS)		15,789 m²
TRAINING AREA	500 m²	
TEST AREA	500 m²	
WH. AMENITIES 1	72 m²	
DOCK OFFICE & AMENITIES		72 m²
LIQUIDS MANUFACTURING (INCLUDING THE FOLLOWING AREAS)		3,828 m²
WH. AMENITIES 2	40 m²	
MANUFACTURING OFFICE (LEVEL 1)	40 m²	
POWDER MANUFACTURING		2,500 m²
POWDER SILO TOWER		600 m²
RECEIVING AND PACKAGING STORE		1,666 m²
COMPRESSOR ROOM (2 STOREY)		268 m²
DG STORE		17.8 m²
WASTE WATER TREATMENT		145 m²
LIQUID SILO TOWER		200 m²
MAIN OFFICE (2 STOREY)		2000 m²
MANUFACTURING OFFICE (2 STOREY)		500 m²
TOTAL BUILDING AREA:		**27,584 m²**
AWNING		1,646.2 m²
TOTAL CAR PARKING (INCLUDING PWD SPOTS)		163
SITE EFFICIENCY (INCLUDING BUILDING AND AWNING AREAS)		**67%**

*(ALL PRELIMINARY AREAS WILL DIFFER ONCE BEEN COUNTED TOWARDS GFA/GLA)

Keynote Legend - General	
ED	EGRESS DOOR
RRD	ROLLER RAPID DOOR
RSD-1	ROLLER SHUTTER DOOR TYPE 1 - 6000mm x 5000mm
RSD-2	ROLLER SHUTTER DOOR TYPE 2 - 2700mm x 3300mm
RSD-3	ROLLER SHUTTER DOOR TYPE 3 - 3000mm x 3000mm
RWT	RAINWATER COLLECTION TANK TO HYD ENG'S DETAIL
WT-1	2.4m HIGH PAINTED PRECAST CONCRETE DADO WALL WITH METAL CLADDING ABOVE
WT-2	300mm HIGH PAINTED CONCRETE WALL WITH METAL CLADDING ABOVE

1 SITE PLAN

1 : 500 DA 601

PACEARCHITECTS
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ARDEX
KEMPS CREEK NSW

PRELIMINARY

REVISION	DESCRIPTION	DATE
1	PRELIMINARY ISSUE	23.06.21
2	DA DRAFT	14.07.21
3	DA DRAFT V2	27.07.21
4	DA DRAFT V3	30.07.21
5	DA DRAFT	12.08.21

ARCHITECT: PACE ARCHITECTS
BUILDER / PROJECT MANAGER: FRASERS PROPERTY; ALTIS PROPERTY PARTNERS
CLIENT: ARDEX

GRAPHIC SCALE 1:500

purpose DA

SITE PLAN

scale As indicated A1
project no 210618
date 12.08.21
dwn AA
dwg no 210618 - DA 200
issue 5

Appendix A
PSM3276-101L REV2

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Our Ref: PSM3276-101L REV2

15 September 2020

Frasers Property
Level 2, 1C Homebush Bay Drive
RHODES NSW 2138
Naiem.Teghlobi@frasersproperty.com.au

Attention: Naiem Teghlobi

Dear Naiem

RE: 657, 707, 707A, 713-755, 769 MAMRE ROAD, KEMPS CREEK
INTERIM GEOTECHNICAL DESIGN ADVICE

1. Introduction

This letter provides interim geotechnical design advice (IGDA) for the proposed development at 657, 707, 707A, 713-755, 769 Mamre Road, Kemps Creek. This interim advice will be issued as a final on completion of the bulk earthworks.

Figure 1 presents the locality plan.

We are not aware of any performance requirements for the proposed development.

2. Bulk Earthworks

The design advice in the following sections is provided on the basis that:

- The bulk earthworks on site to be completed in accordance with a PSM Specification, currently PSM3276-102S REV1 (The Specification)
- PSM to audit the earthworks to confirm the advice in this letter at the completion of the bulk earthworks.

The Specification allows for a broad range of fill to be incorporated into the earthworks. Fill placed in accordance with the Specification will be well compacted under tight site supervision. The subgrade will be stiff or better.

The Specification complies with the intent of AS 3798-2007 “Guidelines on earthworks for commercial and residential developments” and is intended to specify the minimum requirements to achieve a fill with the properties provided in Section 3 of this letter. The Specification is generally in accordance with AS3798-2007, but for this site it allows Blended Topsoil Fill.

The Specification requires close inspection, frequent testing and external auditing of the earthworks to provide a high level of confidence that the completed work complies with the Specification. The Specification will only be varied with the consent of PSM to ensure that this interim design advice is able to be confirmed at the completion of the earthworks.

We have based our assessment of moduli on numerous plate load tests (PLTs) completed on VENM / ENM fills by PSM.

If the structural or civil engineer requires engineering properties different to those provided in Section 3 then the specification can be modified such that these properties will be obtained in the final earthworks.

This allows the additional cost of the earthworks to be balanced against any economies achieved in other parts of the works.

3. Design Advice

3.1 All Areas

This section provides interim design advice for all areas where the bulk earthworks has been undertaken in accordance with the Specification. Note, this advice allows for Blended Topsoil Fill (PSM3276-102S REV1).

3.2 Site Classification

While the proposed development is out of scope of AS2870-2011 “Residential slabs and footings”, we assess that, for the natural site, cut and fill placed in accordance with the Specification, the characteristic surface movement, y_s, would be in the range 40 mm to 60 mm and thus would classify the site as Class H1. The civil and structural engineers should consider likely heave / settlement due to the effect of climatic factors in their designs.

We recommend that all structures and services be detailed such that they preclude any local wetting up or drying out of the subgrade after initial equilibrium is reached following construction of the slab and that the subgrade be within specification at the time of construction of the slab. We note that normal mounding or sagging away from the perimeter of covered areas will still occur and perimeters, or open joints, will still respond to environmental changes.

For effectively sealed areas away from the perimeter, the design should allow for the following:

- Differential mound movement, y_m = 20 mm. We note that this is not the total heave or settlement but the estimated local heave or settlement due to fill variability
- Tilts of up to approximately 1 in 300.

Mounds at perimeters or penetrations of slabs open to the environment can be taken to be as per AS2870-2011 for y_s = 55 mm.

The designer should consider variation of fill depth across any area. It is our opinion that creep settlements can be ignored for fill of this depth placed in accordance with the Specification. Further the designer should consider the impact of any delay in construction of slabs and pavements following completion of the bulk earthworks.

3.3 Foundations

The following section provides advice and parameters that may be used when proportioning footings.

Where adjacent foundation details differ (e.g. pile and pad, differing loads or ground conditions) differential settlement will need to be assessed.

3.3.1 Pad Footings

Pad footings can be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads presented in Table 1.

Table 1 – Engineering Parameters of Inferred Geotechnical Units

Inferred Unit	Bulk Unit Weight (kN/m3)	Soil Effective Strength Parameters		Ultimate Bearing Pressure Under Vertical Centric Loading (kPa)	Allowable Bearing Pressure under Vertical Centric Loading (kPa)	Elastic Parameters	
		c' (kPa)	Φ' (deg)			Young's Modulus (MPa)	Poisson's Ratio
SOIL UNITS, EG. ENGINEERED FILL / NATURAL SOIL	18	0	30	420*	150*	10	0.3
BEDROCK	22	N.A.	N.A.	3000***	700**	100	0.25

Note: * Minimum plan dimension of 1 m and embedment depth of at least 0.5 m

** ABP for BEDROCK assumes a settlement of approximately 1% of the least footing dimension for footings in rock.

*** UBP for BEDROCK assumes a settlement of approximately 5% of the least footing dimension for footings in rock.

Higher ABPs may be available, but these depend on the size, depth, loads, etc. and would be subject to specific advice.

Footing settlement can be assessed based on the subgrade Young's moduli provided in Table 1. We recommend that PSM inspect a representative sample of the footings during construction, to confirm the advice provided in this letter.

3.3.2 Slabs

The design of the slabs for the warehouse can be based on a subgrade with the Young's moduli in Table 1. The short-term Young's modulus for SOIL units can be taken to be 15 MPa.

The design of the slabs on ground should consider the effects of differential settlement due to varying founding conditions, pattern loading, and the shrink swell effects discussed in Section 3.2.

3.4 Permanent and Temporary Batters

The batter slope angles shown in Table 2 are recommended for the design of batters up to 4 m height and above the groundwater table; subject to the following recommendations:

1. All batters shall be protected from erosion.
2. Permanent batters shall be drained.
3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
4. Where loads are imposed or structures/services are located within one batter height of the crest of the batter, further advice should be sought.

Table 2 – Batter Slope Angles

Unit	Temporary	Permanent
Engineered Fill / Natural Soil	2.0H : 1V	2.5H : 1V
Bedrock	1.0H: 1V	1.5H : 1V

If the conditions above cannot be met, further advice should be sought.

Steeper batters may be possible subject to further advice, likely including inspection during construction.

3.5 Retaining Structures

The selection of the appropriate retention system is a matter of design. The designed should consider the following factors in making its selection:

- Technical factors:
  - Performance
  - Ground conditions (this is addressed below with the design parameters)
  - Surcharge loading and,
  - Proximity of structures, buildings and roads, etc.
- Non-technical factors:
  - Cost (to build and to maintain)
  - Other constraints such as real estate, neighbouring site / boundary, aesthetics, legislation, etc.

The design of these structures should be based on the following:

- Proposed wall geometry
- Effective strength parameters in Table 1 when assessing the earth pressure on retaining structures
- Surcharge loads behind retention
- Water pressure (depending on the type of structure).

Note that design of retention systems may be based on either *Ka* or *Ko* earth pressures. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on Ko pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for Ko pressures do not, of themselves, ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Both surface and sub-surface drainage needs to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls or appropriate water pressures must be included in the design.

3.6 Pavements

Results of CBR testing indicated a soaked CBR value between 2.0% and 4.5% (Ref. PSM3276-100L REV1 Appendix D).

We recommend a design CBR value of 2.0% is adopted for pavement design. Particular attention should be paid to preserving the equilibrium moisture content in the subgrade as zones that become saturated may exhibit lower CBR strengths.

Higher values, particularly in areas of significant cut, may be provided on completion of testing on the finished bulk earthworks or if, on request, the Specification is varied to obtain such higher value on fill.

3.7 General

We note that the final bulk earthworks subgrade will require proof rolling and plate load testing to confirm the properties provided and may require some boxing out and refilling, etc. Plate load testing during the filling will be required where blended topsoil has been used.

We understand that the structural engineer should be able to design an efficient slab and shallow footings for these geotechnical conditions. If assessed deformation and settlement is an issue, then our advice can be further refined if required.

We note that desiccation and/or wetting up of the pad surface is possible should it be exposed to the elements for an extended period of time, particularly at completion of the bulk earthworks prior to the builder taking responsibility for the pad. To reduce the likelihood of this and preserve the pad condition we recommend the following should be considered following completion of the bulk earthworks:

- Placement of a sacrificial layer comprising road base or other equivalent material
- Grade the pad surface to reduce the extent and severity of standing water during and after weather events
- Minimise the time between the completion of earthworks and the builder commencing construction of the warehouse roof
- Limit vehicular and plant access until a roof has been installed.

Alternately, the developer or builder may have to undertake some surficial remediation if the pad is to comply with the requirements of this IGDA (i.e. comply with the PSM Specification) at the time of construction.

It is PSM's opinion that it should be the builder's responsibility to maintain the condition of the pad after the handover date and accept the risk that comes with modifying excavation levels and weather. There should be a strict transfer of the risk. We recommend that building tenderers be required to indicate how they intend to manage this risk.

Should there be any queries, do not hesitate to contact the undersigned.

For and on behalf of
PELLS SULLIVAN MEYNINK

MATIAS BRAGA
GEOTECHNICAL ENGINEER

AGUSTRIA SALIM
PRINCIPAL

Encl.

Figure 1 Locality Plan

REVISION	DESCRIPTION	DATE
A	DA ISSUE	27/03/2020

LEGEND

Q100 PRE DEVELOPMENT FLOOD EXTENT

NOTE:
*** BAKERS LANE TO BE WIDENED TO 20.6m**

EXISTING LOTS	
LOT 34 DP1118173	261803 SQM
LOT X DP421633	192538 SQM
LOT Y DP421633	170023 SQM
LOT 22 DP258414	266392 SQM
LOT 1 DP1018318	288160 SQM
TOTAL	**1178916 SQM**

PROPOSED NEW LOTS		
LOT	1	51665 SQM
LOT	2	47944 SQM
LOT	3	37329 SQM
LOT	4	42454 SQM
LOT	5	44970 SQM
LOT	6	52625 SQM
LOT	7	34597 SQM
LOT	8	43493 SQM
LOT	9	37484 SQM
LOT	10	42050 SQM
LOT	11	47094 SQM
LOT	12	48924 SQM
LOT	13	26499 SQM
LOT	14	43654 SQM
LOT	15	60266 SQM
LOT	16	55467 SQM
LOT	17	27617 SQM
LOT	18	29151 SQM
LOT 19 RETENTION BIO-BASIN		15150 SQM
LOT 20 RETENTION BIO-BASIN (RE1)		9068 SQM
LOT 21 PUBLIC RECREATION AREA (RE1)		12938 SQM
LOT 22 BUILT FORM AMENITY AREA (RE2)		12167 SQM
LOT	23	65903 SQM
LOT	24	168434 SQM
LOT	25	49629 SQM
PUBLIC ACCESS ROADS		39357 SQM
WESTERN SOUTH CREEK ACCESS ROAD		19430 SQM
WESTERN SOUTH CREEK ACCESS LANE		510 SQM
BAKERS LANE ROAD WIDENING		364 SQM
MAMRE ROAD WIDENING		12683 SQM
TOTAL		**1178916 SQM**

N

ALTIS PROPERTY PARTNERS

FRASERS PROPERTY

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PROJECT
SUBDIVISION PLAN FOR KEMPS CREEK

ADDRESS
MAMRE ROAD & BAKERS LANE
KEMPS CREEK

DRAWING TITLE
SUBDIVISION PLAN

SCALE	1:2500 @ A1
DRAWN	MP
CHECKED	JO
DATE	27.03.20
JOB NUMBER	0000-00-000

DRAWING NUMBER: SP-MRM-DA-008
ISSUE: A

01 – **SUBDIVISION PLAN**
SCALE - 1:2500 @ A1