Established 1994 ttpa

TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

Suite 502, Level 5, 282 Victoria Avenue, Chatswood NSW 2067
P (02) 9411 5660 **F** (02) 9904 6622 **W** ttpa.com.au **E** bernard@ttpa.com.au

19 March 2020
Ref: 164/2020

Matt Noffs
By Email: mattnoffs@icloud.com

Dear Matt,

Proposed Alterations and Additions to an Existing Residential Dwelling
141 Powderworks Road, Elanora Heights
Driveway and Parking Assessment

I have assessed the car parking (including driveway) layout for the above site (refer to Appendix A). My assessment has regard for the design principles of relevant Australian Standards AS2890.1:2004 - Parking facilities Part 1: Off-street car parking.

A total of 4 parking spaces are proposed to be in accordance with Council's DCP requirements with the following breakdown:

- 3 90-degree parking bays are provided at 2.4 x 5.4 metres
- 1 parallel small car parking bay is provided at 2.3 x 5 metres with a minimum of 0.3m to the building wall.

The aisle widths provided within the carpark is a minimum of 6.1 metres to the fence. These spaces have been designed in accordance with AS 2890.1.

The driveway and the gate will be widened to 3.6m to be in accordance with the Australian Standards. The widened driveway will match the existing gradient. Similarly, the car parking and manoeuvring areas' gradients will be consistent with the existing ground level, which is measured to be no more than 1:20 and no more than 1:8 respectively, which conforms to the abovementioned AS criteria. The RLs and gradient info are provided in Appendix B.

The parking manoeuvring arrangements will be satisfactory as confirmed by the turning path assessment in and out of the site, which is provided in Appendix C. All vehicles will be able to enter and exit the site in a forward direction with the use of an on-site turning bay.

The use of a turf cell is appropriate for the low-density dwelling car parking layout. It is noted that the former Pittwater Council has always been a supporter of such a porous paving system and has been advising the residents to use such a product as the product assist and support the Council's Sustainability Program.

Turf cells within the internal driveway and car parking area will be installed in accordance with the specifications provided in Appendix D. Based on consultation with Council, the above application will be acceptable.

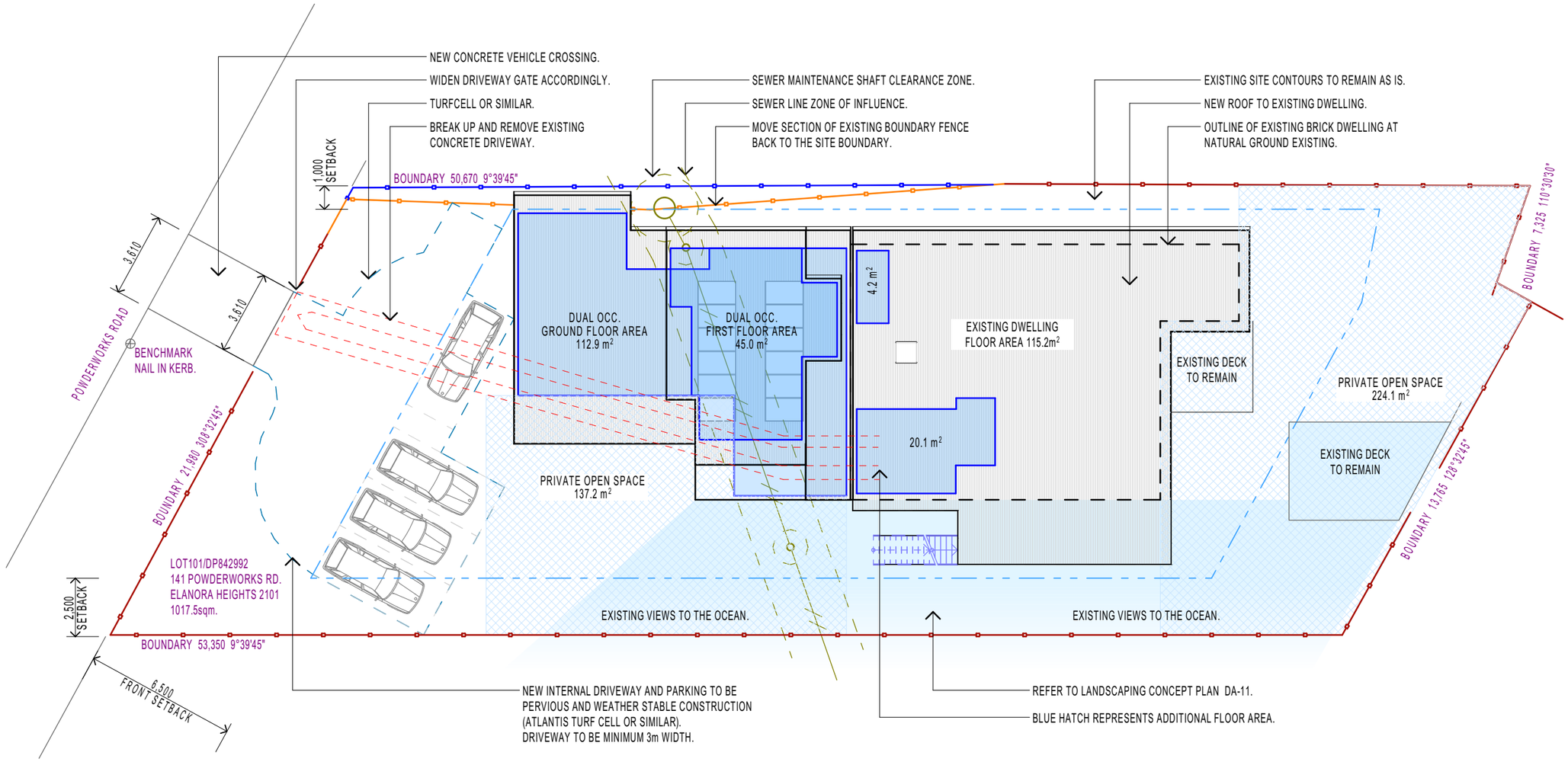
I trust the above provides the information you require. Should you have any questions or require any further information, please do not hesitate to contact me on (02) 9411 5660.

Yours faithfully

Meg Kong

Meg Kong, BSc., MSc. Civil Engineering
Associate
Transport and Traffic Planning Associates
Encl.

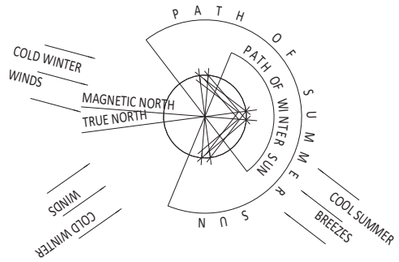
APPENDIX A
Assessed Plan



P01 — SITE PLAN 1:200

LEGEND

- BOUNDARY LINES
- BOUNDARY SETBACKS
- EXISTING BOUNDARY FENCE
- EXISTING BOUNDARY FENCE TO BE DEMOLISHED
- RELOCATED BOUNDARY FENCE
- SEWER LINE
- ADDITIONAL FLOOR SPACE
- PRIVATE OPEN SPACE
- VIEWS



SITE ANALYSIS

SITE AREA	1017.5sqm
FSR	0.3:1
MAX. GFA	**305.25sqm**
EXIST. GFA	115.2sqm
PROP. GFA	**297.4sqm**

0 1 2 3 4 5 6 7 8 9 10

REV.	DESCRIPTION	DATE
A5	REVISED PARKING AND STORMWATER.	18/09/2019
A6	REVISED BASIX - CHANGE HWS & INCLUDE PV SYSTEM.	23/09/2019
A7	REVISED - ADDED ACCESS DRIVEWAY DIMENSIONS	30/12/2019
A8	REVISED - PARKING, VEHICLE CROSSING AND DRIVEWAY GATE CHANGED.	14/03/2020

S:\OneDrive\4plan_projects\19\1812 Elanora Heights_drawings\1812 Elanora Heights DA03.pln

4plan
0419 988 653 - mail@4plan.com.au - http://4plan.com.au - 36 EAST PARADE EASTWOOD

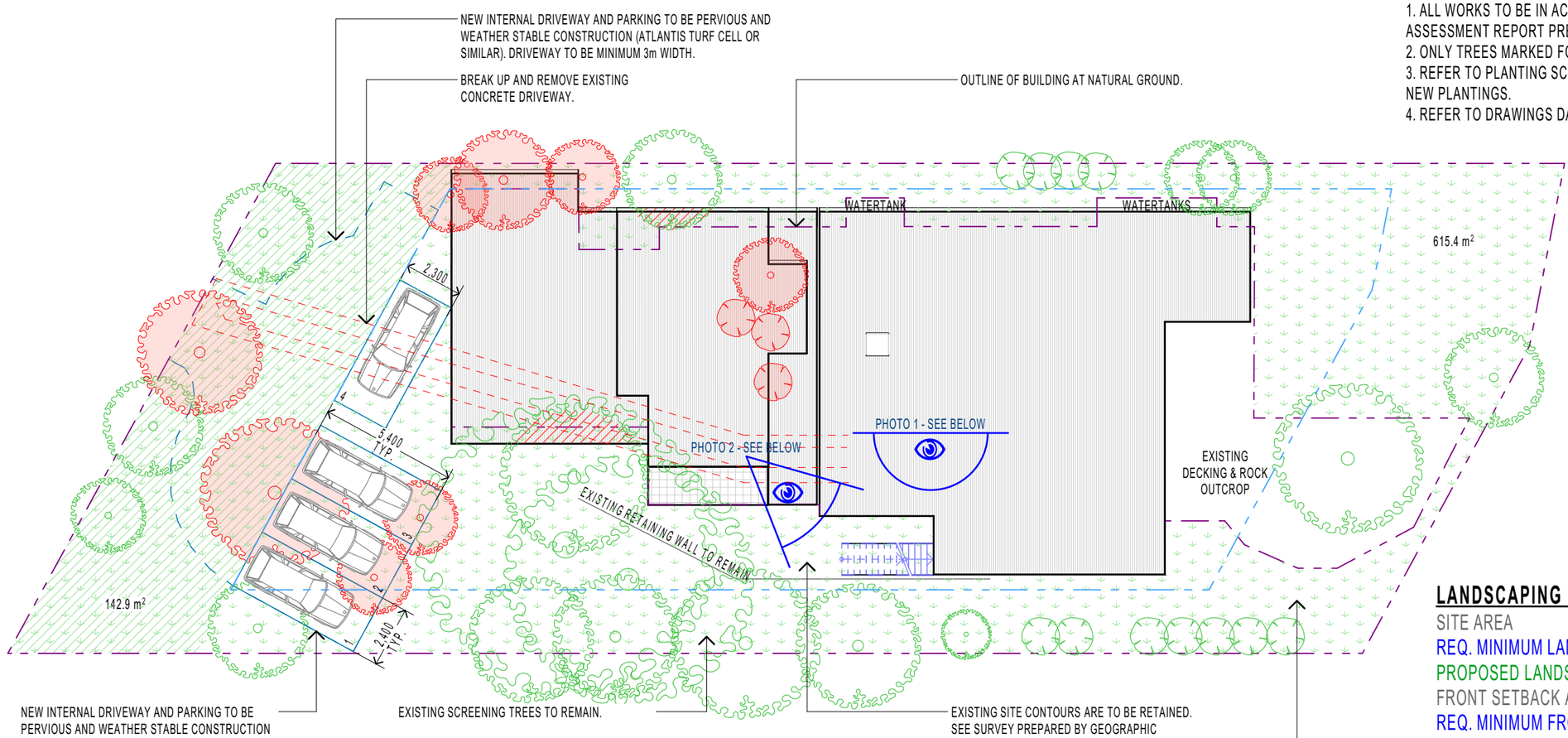
CLIENT: MATT & NAOMI NOFFS
PROJECT: NEW ATTACHED TWO STOREY DUAL OCCUPANCY & ADDITIONS TO AN EXISTING BRICK DWELLING
SITE: 141 POWDERWORKS ROAD ELANORA HEIGHTS NSW 2102

DRAWING: SITE PLAN AND SITE ANALYSIS
SCALE: AS SHOWN @ A3

DRAWN: ALM
DRAWING ID: DA-10
REV. STATUS: APPROVALS
CREATED: 22nd JUNE 2018
DO NOT SCALE FROM DRAWINGS.

NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH THE ARBORICULTURAL IMPACT ASSESSMENT REPORT PREPARED BY COMPLETE ARBORCARE.
2. ONLY TREES MARKED FOR REMOVAL ARE TO BE REMOVED (SEE LEGEND BELOW).
3. REFER TO PLANTING SCHEDULE PREPARED BY WILDER GARDENS CO. FOR LIST OF NEW PLANTINGS.
4. REFER TO DRAWINGS DA-18 & DA-19 FOR PARKING TURNING STUDIES.



P08 LANDSCAPING CONCEPT PLAN
1:200

LANDSCAPING ANALYSIS

SITE AREA	1017.5sqm
REQ. MINIMUM LANDSCAPE AREA (60%)	610.5sqm
PROPOSED LANDSCAPE AREA	615.4sqm
FRONT SETBACK AREA	143sqm
REQ. MINIMUM FRONT SETBACK LANDSCAPING (60%)	86sqm
PROPOSED FRONT SETBACK LANDSCAPING	101.7sqm

LEGEND

- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED
- AREA OF EXISTING TREE TO BE PRUNED
- EXISTING SHRUBS TO BE RETAINED
- EXISTING SHRUBS TO BE REMOVED
- PERVIOUS GROUND COVER/LAWN 615.4sqm
- FRONT SETBACK LANDSCAPE AREA 142.9sqm

SCREENING - PANORAMIC PHOTO 1 (SEE ABOVE)
EYE LEVEL ABOVE EXISTING PATIO (RL 76.43), EQUIVALENT TO EYE LEVEL ABOVE NEW DECK.

SCREENING - PHOTO 2 (SEE ABOVE)
EYE LEVEL ABOVE EXISTING GROUND.

0 1 2 3 4 5 6 7 8 9 10

REV.	DESCRIPTION	DATE
A5	REVISED PARKING AND STORMWATER.	18/09/2019
A6	REVISED BASIX - CHANGE HWS & INCLUDE PV SYSTEM.	23/09/2019
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0419 988 653 - mail@4plan.com.au - http://4plan.com.au - 36 EAST PARADE EASTWOOD

CLIENT: MATT & NAOMI NOFFS
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SITE: 141 POWDERWORKS ROAD ELANORA HEIGHTS NSW 2102

DRAWING: LANDSCAPING CONCEPT PLAN
SCALE: AS SHOWN @ A3

DRAWN: ALM
DRAWING ID: DA-16
REV. STATUS: APPROVALS
CREATED: 22nd JUNE 2018
DO NOT SCALE FROM DRAWINGS.

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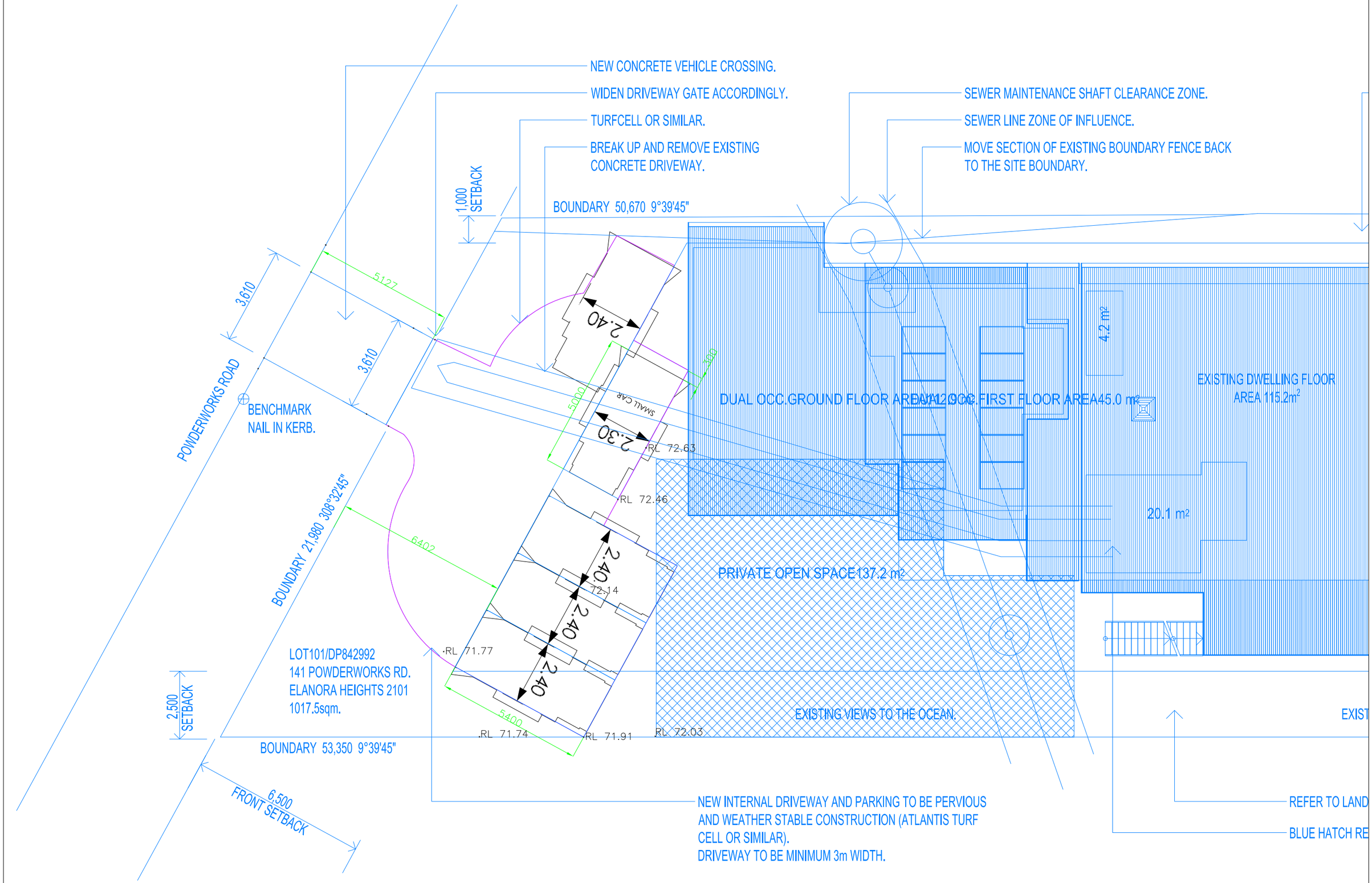
APPENDIX B
RLs and Gradient Info



141 POWDERWORKS ROAD, ELANORA HEIGHTS

PROPOSED CAR PARKING AREA

DRAWING REF NO. 164/2020 ISSUE A ISSUE DATE 13 MARCH 2020

DESIGNED BY M. KONG

REVIEWED BY B. LO

SCALE 1:25

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APPENDIX C

Compliance Review and Swept Path Assessment

NEW CONCRETE VEHICLE CROSSING.

WIDEN DRIVEWAY GATE ACCORDINGLY.

TURFCELL OR SIMILAR.

BREAK UP AND REMOVE EXISTING CONCRETE DRIVEWAY.

SEWER MAINTENANCE SHAFT CLEARANCE ZONE.

SEWER LINE ZONE OF INFLUENCE.

MOVE SECTION OF EXISTING BOUNDARY FENCE BACK TO THE SITE BOUNDARY.

1,000 SETBACK

BOUNDARY 50,670 9°39'45"

+72,893

+73.065

+71,757

+72,782

+72,310

+72,835

+71,555

+72,464

+72,874

3,610

POWDERWORKS ROAD

BENCHMARK NAIL IN KERB.

1:9 GRADIENT

1:10

1:15

+72,649

+72,143

1:20

1:59

+72,124

+72,367

+72,386

EXPANDED DRIVEWAY TO MATCH EXISTING

BOUNDARY 21,980 308°32'45"

+72,447

+71,842

1:40

DUAL OCC GROUND FLOOR AREA 120.2m²

DUAL OCC FIRST FLOOR AREA 45.0 m²

EXISTING DWELLING FLOOR AREA 115.2m²

4.2 m²

20.1 m²

PRIVATE OPEN SPACE137.2 m²

+71,775

+71,776

LOT101/DP842992
141 POWDERWORKS RD.
ELANORA HEIGHTS 2101
1017.5sqm.

+71,827

EXISTING VIEWS TO THE OCEAN.

2,500 SETBACK

BOUNDARY 53,350 9°39'45"

6,500 FRONT SETBACK

NEW INTERNAL DRIVEWAY AND PARKING TO BE PERVIOUS AND WEATHER STABLE CONSTRUCTION (ATLANTIS TURF CELL OR SIMILAR).
DRIVEWAY TO BE MINIMUM 3m WIDTH.

EXISTIN

REFER TO LANDS

BLUE HATCH REP

141 POWDERWORKS ROAD, ELANORA HEIGHTS

RLs AND GRADIENT

DRAWING REF NO. 164/2020 ISSUE A ISSUE DATE 13 MARCH 2020

DESIGNED BY M. KONG

REVIEWED BY B. LO

SCALE 1:25

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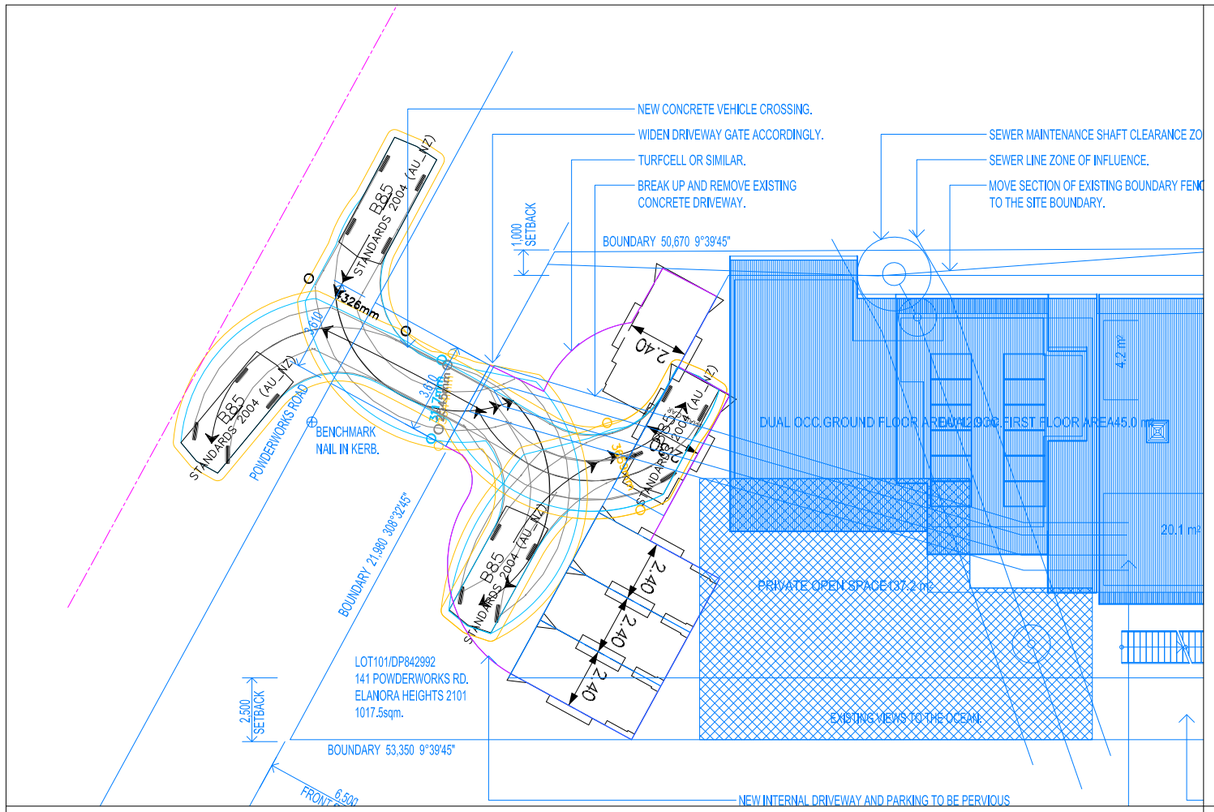

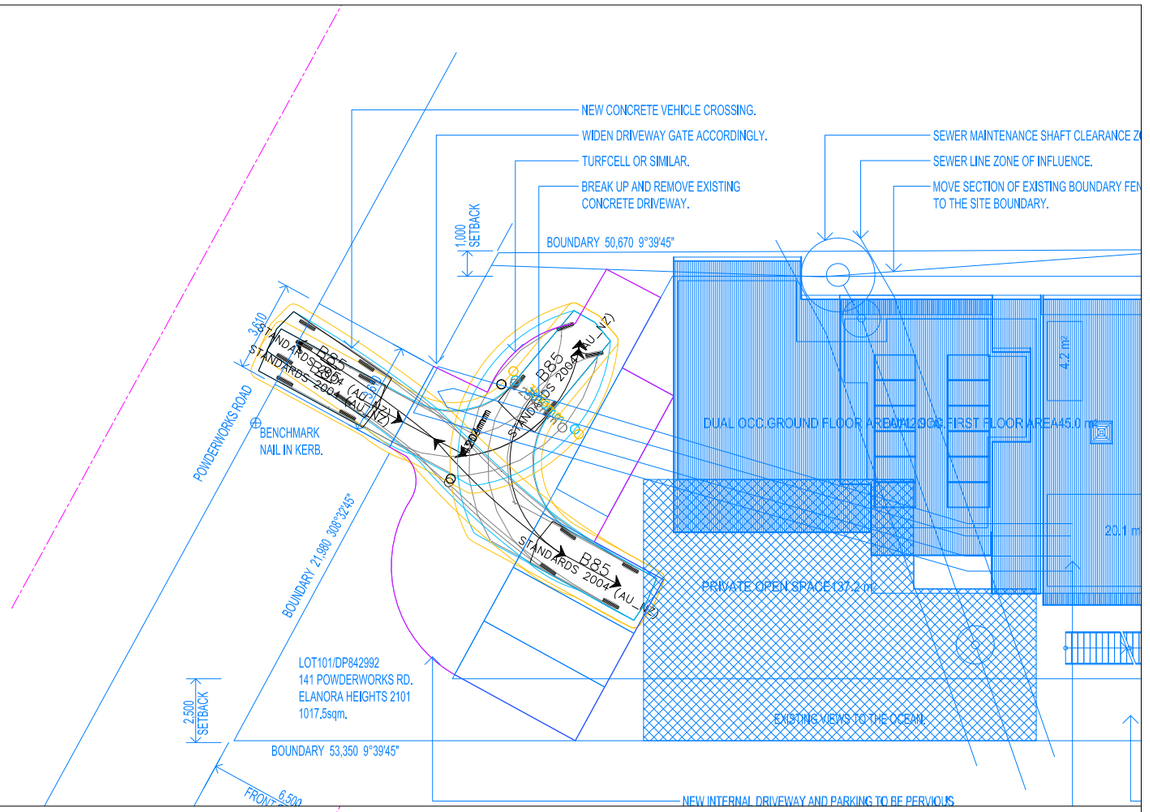

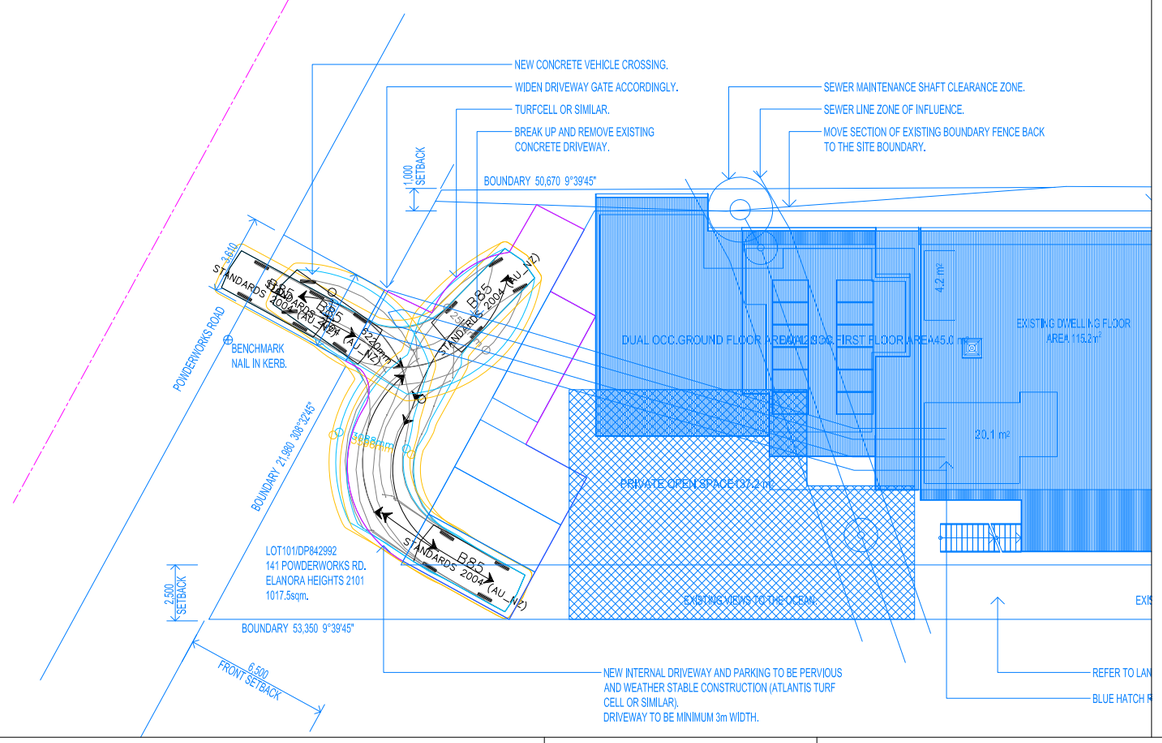

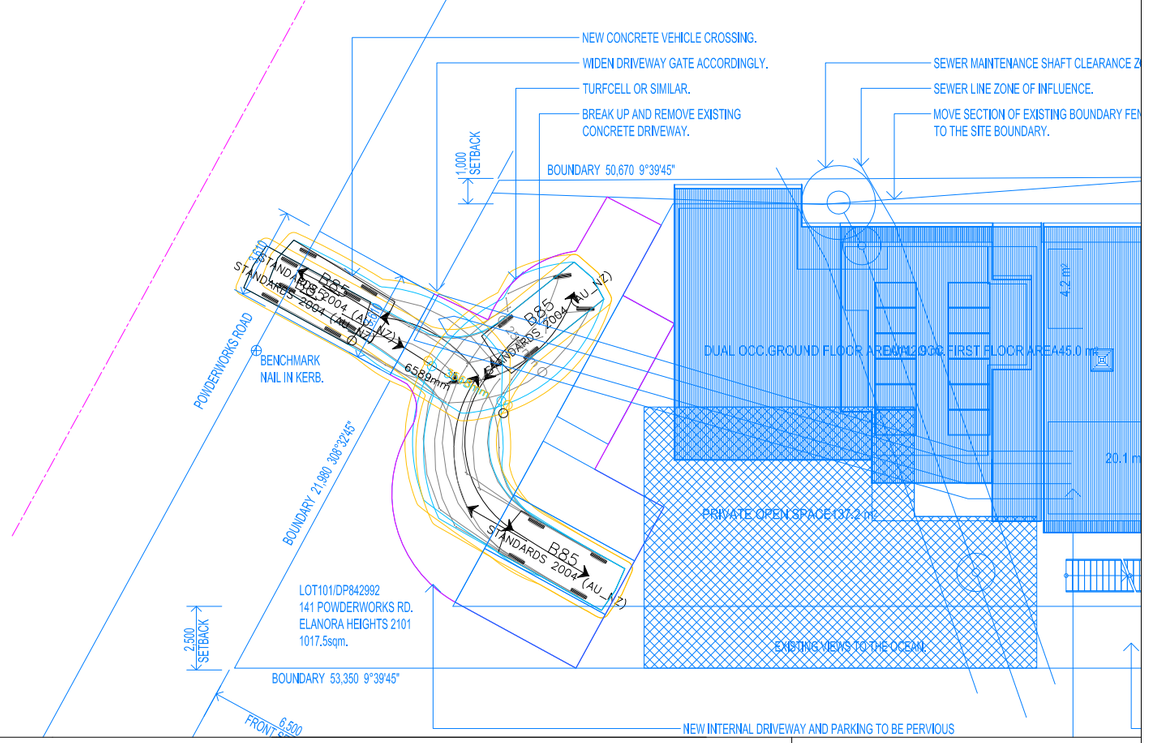

141 POWDERWORKS ROAD, ELANORA HEIGHTS

SWEPT PATH ASSESSMENT FOR B85 VEHICLE ENTERING & EXITING THE CAR PARKING SPACES

DRAWING REF NO. 164/2020 ISSUE A ISSUE DATE 13 MARCH 2020

DESIGNED BY M. KONG

REVIEWED BY B. LO

SCALE 1:25

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APPENDIX D

Grass-Cel Specifications

Grass-Cel Porous Pavers

Specifications

Grass-Cel Porous Paving Blocks are scientifically engineered and designed to support the weight of heavy vehicles and pedestrian traffic. Each block has precisely arranged hexagonal cells that allow the nesting of adjoining blocks, which can form a mat of any desirable size. When the hexagonal cells are filled with soil or any other growth medium minimal soil compaction and grass wear occurs, since all traffic is supported by the walls of the hexagonal cells. Turf grasses can be grown with minimal destruction of grass blades and soil structure.

Each Hexagonal cell has at its base a round opening, which serves as a drain. It allows, air water and nutrients to move from the surface to the sub-soil. Equally as important, grass roots growing down through the hole into the sub-soil bind and hold the Grass-Cel paving blocks permanently in place. Each cell wall has giant pore spaces in the form of vertical openings that allow the free movement of plant growth from cell to cell. The cross movement of stolons, roots and rhizomes binds the Grass-Cel paving blocks to each other and helps to further stabilise the paving surface.

Grass-Cel can be used as a porous pebble or gravel retention system, the individual hexagonal cells allow for retention while the openings at the base allow for drainage.

Grass-Cel is specifically designed as a system comprised of small blocks that are joined together to make a mat. This allows for more design options and a stronger and more rigid system.

Each Grass-Cel paving block has extending tabs and receiving slots to interlock each piece with the other, minimising movement of the paving system.

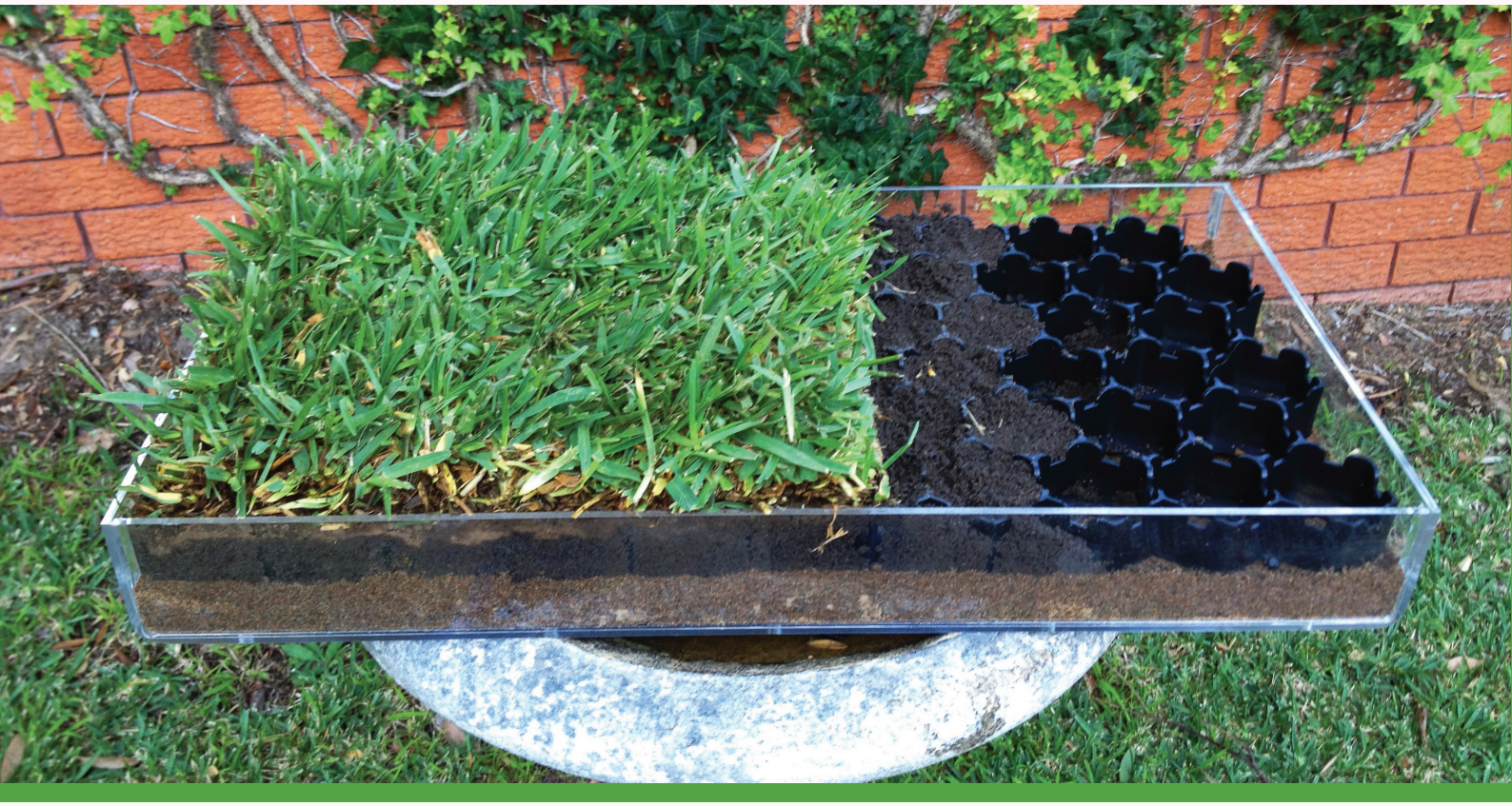
- Grass-Cel is a modular wear supporting structure.
- Overall Dimensions: 325mm x 323mm x 37mm (10 blocks = 0.97sqM)
- Each block has eight (8) extending locking tabs.
- Each block has sixteen (16) locking tab receiving slots.
- Each block has thirty (30) hexagon cells, 32mm deep.
- Each block has thirty (30) 31mm openings at the base of each cell.
- Each block has one hundred and eleven (111) 9mm x 9mm openings at the top of the cell walls.
- The weight of each block is 510 grams.
- Material is 100% recycled UV stabilised green high density polyethylene (HDPE)
- Grass-Cel is resistant to rot and decay, vermin and insects, petroleum, oil and ordinary solvents, weather and temperature extremes, warpage, chipping and water.
- Grass-Cel can be sawn, nailed, filed, drilled or shaped with ordinary tools.

AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION (A.N.S.T.O) COMPRESSION LOADING TEST REPORT ON GRASS-CEL STRUCTURES (EMPTY).

MAXIMUM LOAD PER BLOCK		COMPRESSIVE STRENGTH	
KN	**TONNES**	**MPa**	**P.S.I**
251	26	2.80	406

MINIMUM LOAD CAPACITY PER SQUARE METER = 260 TONNES (ON EMPTY CELLS)

- **Note: Test were done on empty cells.** The maximum load of filled cells would vastly exceed this figure.
- **Note:** This figure does not take into consideration the double wall at each point where the blocks attach together and is therefore can be taken as a **minimum** figure. This would likely result in a maximum load capacity far exceeding this figure. **There are 18 double wall thicknesses throughout every square meter of Grass-Cel.**
- **Note:** Loads of 500KN were required to fully collapse the structure of one block.
- **Note:** These results are averages of multiple samples and full test reports (including test methods) are available on request.



GRASS-CEL®

POROUS TURF PAVING BLOCKS

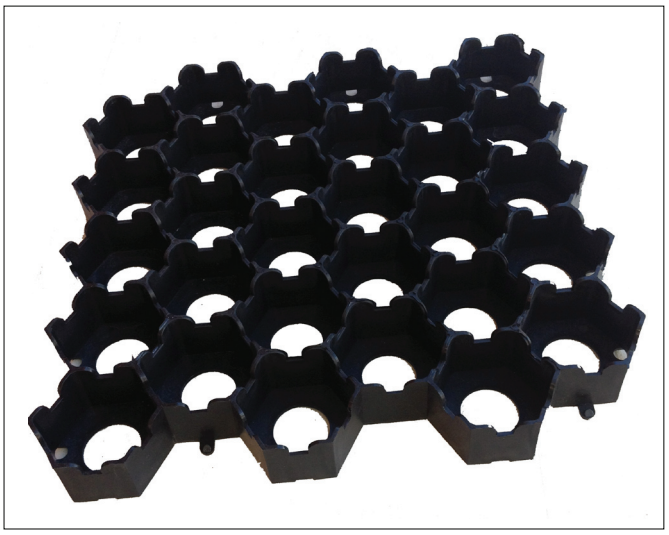
INSTALLATION GUIDELINES

GRASS-CEL®

Using eco friendly recycled materials

100% AUSTRALIAN MADE & OWNED

POROUS TURF PAVING BLOCKS



Grass-Cel® Turf Paving Blocks are Australian made and scientifically designed to support the weight of heavy vehicles and pedestrian traffic.

Each block is made up of precisely arranged hexagonal cells. This allows the blocks to be connected together, using tabs and slots, to form a mat of just about any size. The walls of the cells support traffic, preventing soil compaction and minimising grass wear.

Each hexagonal cell has at its flat base a round opening which serves as a drain. It allows air, water and nutrients to move from the surface to the sub-soil. Grass roots growing down through the hole into the sub-soil bind and hold the Grass-Cel® Turf Paving Blocks permanently in place. No pegging is required.

The hole at the base of each hexagonal cell also serves to hold Grass-Cel® from shifting on unstable areas. The vertical openings in each cell allow the free movement of plant growth from cell to cell. The cross movement of stolons, roots and rhizomes (runners) bind the Grass-Cel® Turf Paving Blocks to each other and helps to further stabilise the paving surface.

Grass-Cel® is very durable. It is resistant to rot and decay, vermin and insects, petroleum, oil and ordinary solvents, weather and temperature extremes, warpage, chipping and water.

Grass-Cel® can be sawn, filed, drilled or shaped with normal hand tools. Grass-Cel® is designed as a weight bearing block and not as a traction block.

GRASS-CEL®

Using eco friendly recycled materials

100% AUSTRALIAN MADE & OWNED

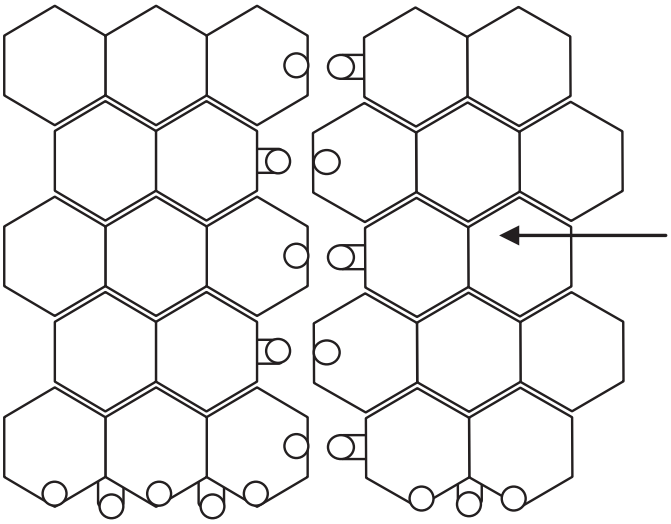
GENERAL INSTALLATION GUIDELINES

Techniques For Locking Grass-Cel® Tabs

Connect locking tabs for one row. Hold the two edges together and lower them slightly so that the tabs move under the holes. Then lift them again so that they clip together.

Lay out the next row beside the first. Lock the second row to the first by lifting the edge of both rows and engaging tabs. It is recommended that where possible the flat side of the block be used to lock the tabs rather than the angled side.

Do not try to bend Grass-Cel® around curves. Lay in straight rows and fill in the corners with cut pieces. Grass-Cel® can be cut and shaped to any configuration with an electric or hand saw.



Recommendations for Base Preparation

Grass-Cel® Turf Paving Blocks have a flat base which provides a stable bearing surface. Under normal conditions, the blocks can be placed directly onto the prepared base course. Soils which remain wet may require drainage to stabilise the area. Heavy clay or excess organic matter can create an unstable base for Grass-Cel®. Installation under these conditions should be referred to the advice of a consulting engineer.

Sub-Grade / Base Course

Using flat shovels or a mechanical turf cutter, remove existing soil or grass to a depth of approximately 50mm. Clear, level and compact.

In all cases, Grass-Cel® should be considered as a pavement and the same design criteria must apply, such as the load bearing capacity and plasticity of any soil used in the installation and the load, frequency and duration of traffic over the area.

Drainage systems, such as Agline and extra items such as irrigation systems maybe installed at this stage if required.

For most residential applications, we suggest a base course of approximately 100mm be installed. It should comprise of a mixture consisting of 50% site soil or sandy loam and some fine crushed rock if available to provide drainage and adequate growing media. If the area is to be used for cars and light vehicles, a depth of approximately 150mm is suggested. For areas where heavy vehicles such as trucks are expected a depth of approximately 300mm is suggested. A Consulting Engineer should be engaged for further information/advice.

General

The finished surface of the base course should be 40mm below finished surrounds so as the top of the Grass-Cel® Turf Paving Blocks finish level with adjoining surfaces. This will allow vehicles to transfer smoothly from the conventional driveway onto the Grass-Cel® area.

GRASS-CEL®

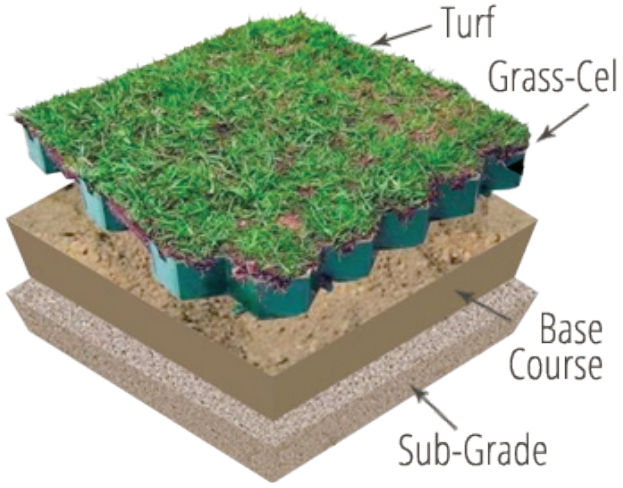
Using eco friendly recycled materials

100% AUSTRALIAN MADE & OWNED

PLANTING METHODS

Using Pre-Grown Turf

The cells should be partially filled with soil blend to the bottom of the slot in the cell walls. DO NOT OVERFILL. Remove excess soil with a stiff broom.



Turf is recommended to be 25mm root thickness. It is essential that the grass roots make contact with the soil blend.

1. Prepare base as above.
2. Lay and interlock Grass-Cel® .
3. Partially fill with soil blend to the bottom of the slot in the cell walls.
4. Place turf over Grass-Cel® with each piece touching. The grass roots must make contact with the soil.
5. Tamp or roll grass into Grass-Cel® . DO NOT USE VIBRATORY MACHINERY FOR THIS OPERATION - as this tends to shake soil from grass roots.
6. Water the area.

DO NOT TOPDRESS. USE A RECOMMENDED TURF BY YOUR LOCAL SUPPLIER

Grass Seeding The Area

Soil levels in each cell should always be below the top of the supporting walls. **The cells should never be overfilled**, only to the bottom of the slot in cell walls.

1. Prepare base as above.
2. Lay and interlock Grass-Cel® .
3. Fill cell with soil blend to the bottom of the slot in cell walls.
4. Broadcast seed and very lightly top dress with soil blend or sand.
5. KEEP MOIST & AVOID USING AREA UNTIL GRASS IS ESTABLISHED.

AT ALL TIMES GRASS-CEL® AREAS SHOULD BE MAINTAINED AS NORMAL TURF GRASS

GRASS-CEL®

Using eco friendly recycled materials

100% AUSTRALIAN MADE & OWNED

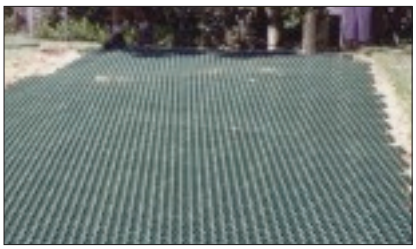
INSTALLATION GUIDE

Step 1

Remove existing turf and soil to a depth of approx. 50mm. The base course should consist of 50% site soil or sandy loam and some fine crushed rock if available. Fill any depressions, compress and/or roll to provide a firm base.
Use a recommended soil by your local supplier.

Step 2

Lay Grass-Cel® directly on the prepared surface. The top of the Grass-Cel® should be level with the surrounding area. It is recommended that the flat side of the block be used to lock the tabs rather than the angled side.



Step 3

Do not bend Grass-Cel® around curves. Lay in straight rows and fill in the corners with cut pieces. Grass-Cel® can be cut and shaped easily with an electric or hand saw.

Step 4

Fill cells with soil blend to the bottom of the slot in the cell wall and remove excess with a stiff broom. Never overfill the cells. When the turf is laid you must ensure that the roots make contact with the soil.

Step 5

Place turf over the Grass-Cel® with each piece touching.
If grass seed is being used, broadcast seed and top dress very lightly with soil blend or sand recommended by your local supplier.

Step 6

Tamp or roll the turf into the Grass-Cel®. DO NOT USE VIBRATORY MACHINERY because this will shake the soil from the grass roots.

CONTACT INFORMATION
Grass-Cel®
P.O. Box 2175
Woolooware 2230 NSW
Phone: 0428 260 389
Email: info@grasscel.com.au
Website: www.grasscel.com.au

HEAD OFFICE SYDNEY
VICKI WEEKS
PHONE: 0428 260 389

QUEENSLAND AGENT
BRETT RYMAN
PHONE: 0404 287 732

VICTORIA/TASMANIA AGENT
JOHN VAN REYK
PHONE: 0411 126 030

SOUTH AUSTRALIA/ WESTERN AUSTRALIA AGENT
TREVOR HILLEARD
PHONE: 0414 575 938

GRASS-CEL®

Gravel-Cel® Pebble-Cel ®

AUSTRALIA'S TRUSTED POROUS GRASS AND
PEBBLE REINFORCING PAVING

TURN LAWN INTO DRIVEWAYS AND DRIVEWAYS INTO LAWN

BREATHING NEW LIFE INTO PLASTIC

Grass-Cel is proudly celebrating over 40 years in business. We are a second-generation Australian family business built from the ground up with hard work and honesty. Grass-Cel was originally designed for the defence force for use in Roadways and Emergency Airstrips.

We were the first company to introduce this product to the Australian public. Our aim has always been to supply our customers with a top quality engineered, laboratory tested product that is completely manufactured in Australia by our Australian family.

From humble Aussie backyards and driveways to some of Australia's most prestigious golf clubs, corporate headquarters and local government locations, Grass-Cel has been quietly keeping high traffic lawns looking beautiful for years.

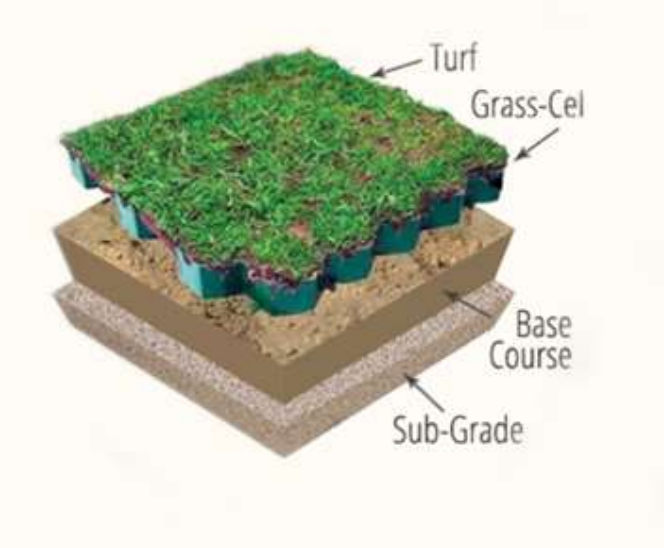
As time and generations progressed so has our company. The environment and being eco-friendly is one of our priorities.

We only use Australian re-cycled materials. We do not use imported product, we manufacture locally in Australia. We have complete control and knowledge of the quality of our product.

We don't hope, we know our product works. You don't stay in business for over 40 years with an inferior product or poor customer service.

POROUS TURF PAVING BLOCKS

GRASS-CEL ® TURF PAVERS ARE THE ORIGINAL AUSTRALIAN MADE TURF PAVING BLOCK. GRASS-CEL® TURF PAVERS ARE SCIENTIFICALLY DESIGNED TO SUPPORT THE WEIGHT OF HEAVY VEHICLES AND PEDESTRIAN TRAFFIC.



DESIGNED FOR STABILITY

Grass-Cel® porous turf pavers are made up of precisely arranged hexagonal cells. This allows the blocks to be connected together, using tabs and slots, to form a mat of just about any size. The walls of the cells support traffic, preventing soil compaction and minimising grass wear.

KEEPS HIGH TRAFFIC LAWNS HEALTHY!

Each hexagonal cell in our turf pavers has a round opening on its flat base, which serves as a drain. Our turf pavers permit air, water, and nutrients to move from the surface to the sub-soil. Grass roots growing down through the hole into the sub-soil bind and hold the Grass-Cel turf paving blocks permanently in place.

EASY TO INSTALL

Grass-Cel® turf pavers can be sawn, filled, drilled or shaped with normal hand tools. No pegging is required. The hole at the base of each hexagonal cell also serves to hold Grass-Cel® from shifting on unstable areas. The vertical openings in each cell allow the free movement of root from cell to cell. The cross movement of stolons, roots and rhizomes (runners) binds the Grass-Cel® turf paving blocks to each other and helps to further stabilise the paving surface.

HIGHLY DURABLE!

Grass-Cel® turf paving blocks are very durable. They are resistant to rot or decay, vermin and insects, petroleum, oil, regular solvents, weather and temperature extremes, warping, chipping and water. Grass-Cel® turf pavers are designed as weight bearing blocks and not as a traction block.

Specifications Material:

Eco-friendly recycled HDPE plastic

Dimensions of block:

325mm x 323mm x 37mm (10 Blocks per pack)

Pack of blocks (10):

Covers 0.95m

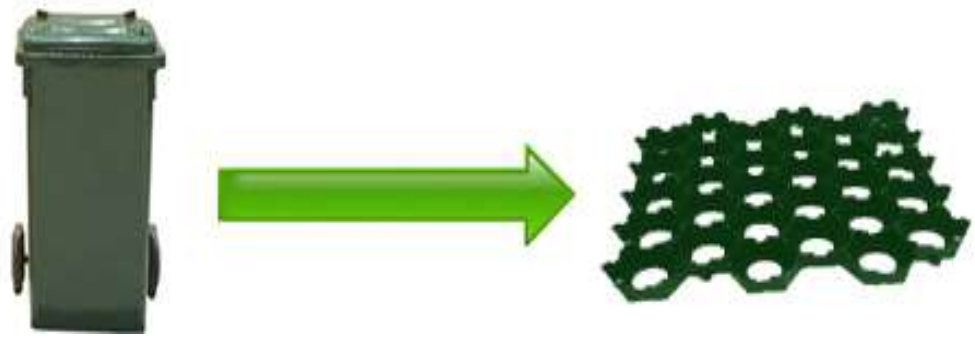
Weight:

510 grams per block

SCIENTIFICALLY TESTED TO 26 TONNES PER BLOCK.

Empty Grass-Cel blocks have an average maximum compressive strength of 2.89MPa.

RECYCLED FROM BINS TO GRASS-CEL



LOADING BINS TO SHREDDER

FROM SHREDDED TO BAGS

SHREDDED BINS

SHREDDED CONVEYOR TO PELLETIZING

PROCESS

PELLETIZING MATERIAL READY FOR MANUFACTURING

INJECTION MOULD MACHINE

INJECTION MOULDING GRASS-CEL

MANUFACTURED GRASS-CEL STOCK

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ENVIRONMENTAL BENEFITS OF GRASS USING GRASS-CEL POROUS PAVERS

Grass plays an important ecological role. The denser and healthier the grass, the better it can protect the environment. Grass minimises erosion, absorbs rainwater, cleans the air and neutralises pollutants and chemicals.

PREVENTS SOIL EROSION AND STABILIZES DUST

Grass protects the soil from wind and water erosion. A good strand of grass stabilizes the soil with its roots as the roots knit the soil together preventing movement.

A dense cover of grass also reduces dust as the soil particles are not able to move with the wind and the ground cover provides a place for airborne dust to settle.

ABSORBS RAINWATER

Grass helps reduce runoff and prevents soil erosion, capturing and filtering rainwater to recharge our groundwater supplies. Grass leaves and stems cover the soil and intercept raindrops as they fall.

Grass interferes with runoff flow, slowing it to the point where soil particles have a chance to soak it in.

In fact, water runoff from lawns is because the average 10,000 square-foot residential lawn can absorb more than 6,000 gallons of water from a rainfall event.

REDUCES GLARE AND NOISE

Since grass plants have non-reflective surfaces, they act as a screen to soften glare from the sun. Grass, trees and shrubs also have the ability to absorb sound, while hard surfaces like concrete reflect sound. Grasses and other plants can reduce noise levels 20-30% compared to hard surfaces.

CLEANS THE AIR

Grass can absorb carbon dioxide and break it down into oxygen carbon. The lawn outside of your home can provide most of the oxygen you breathe. In fact, a 50'x50' grass area will provide enough oxygen for a family of four, day after day.

Grass also absorbs other gasses. An acre of grass will absorb hundreds of kilograms of sulphur dioxide per year. The haze created by these pollutants can reduce the sunlight by as much as 15%.

COOLS THE ENVIRONMENT

Grass provides a substantial cooling effect to the environment. Summer air temperatures above a lawn will be up to 30° cooler than above a paved area.

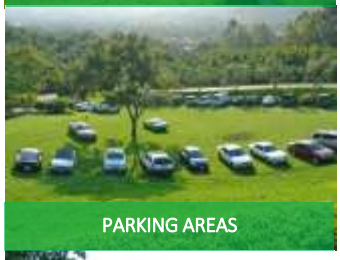
IMPROVES AND RESTORES THE SOIL

Grass is a perennial plant, which means part of the root structure dies off during the winter and grows back the following spring. The dead roots of the plant break down and provide organic matter to the soil. Over time, organic matter improves the quality of the soil, making it more fertile and better able to filter air and water.

Grass-Cel has been scientifically, structurally & aesthetically designed as a porous paving system for grassed driveways/parking areas, roof gardens and porous pebble paths, driveway/parking areas.

We have 37 years of successful applications ranging from Australia, New Zealand, Singapore, Japan, Malaysia, Vietnam. Ranging from Heavy vehicle driveways for fire engines, heavy commercial trucks and emergency vehicles, airstrips for planes and all the way through to your domestic vehicles such as 4WD, boats, caravans, and your average family vehicles.


DRIVEWAYS


PARKING AREAS


WALKWAYS


CARAVAN PARKS


GOLF CAR PARKS & BUGGY TRACKS


TREE WELLS

POROUS PEBBLE RETENTION SYSTEMS

Grass-Cel Porous Retention blocks are locked together and placed with the flat side facing down, each hexagonal cell has on the flat side a round opening to allow any excess water to drain away.

A geotextile filter fabric can be laid on the ground between your prepared base and the blocks, this will assist with containing your pebbles and restricts any washout in heavy rain.

Grass-Cel porous retention system is a stunning finish to a heritage home or a natural look to the environmentally aware family.

ROOF GARDEN AND GRASS SYSTEMS

Grass-Cel blocks can be sawn, drilled or shaped with a jigsaw or normal hand tools. Grass-Cel drainage is a durable system that your DIY person or professional can install.


ROOFTOP LAWN

The fact that limited space, the environment and the cost of living are becoming major factors in our day to day living, Grass-Cel drainage systems allows you the opportunity to have gardens, lawns or vegie gardens growing in close reach even if you have limited space.

RURAL APPLICATIONS

The capabilities of Grass-cel makes it suitable for numerous rural applications. These applications include the prevention of damage to high traffic livestock access ways, grass areas around water troughs and areas in and around stock pens. By reducing moisture and mud in high traffic areas Grass-cel can promote a healthy environment for livestock and reduce the incidence of diseases such as foot rot. Grass-cel is also removable and re-usable making it a versatile tool in a dynamic rural environment.

The drainage and weight bearing benefits of using Grass-cel can increase grazing area, facilitate the efficient movement of livestock and increase the health of livestock overall

GOLF COURSES

Grass-cel has been used in golf courses across the globe from the USA to Australia and New Zealand through to Asia. The permeability and weight bearing capabilities of Grass-cel make it ideal for preventing damage in wet and high traffic areas such as golf buggy tracks and walkways. Suitable for both small and large applications, Grass-cel is ideal to keep at hand in order to solve small turf issues before they deteriorate further.

GOLF BUGGY DAMAGE

With the aid of Grass-cel wet and high traffic lawn areas can remain healthy, reducing landscape maintenance workloads and improving the look of the course.

CARAVAN & TRAILER PARKS

Use Grass-cel to create turf parking areas for caravans, trailers and cars including overflow parking areas for guests. Grass-cel can also be used to create access ways for guest and maintenance traffic.

The use of Grass-cel instead of concrete can aid in reducing the carbon footprint of the park and reduce drainage and water runoff issues

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GRASS-CEL®