



Transport
Roads & Maritime
Services

RAILWAY HOTEL AND LAWSON STREET SOUTH CAR PARKS

Review of Environmental Factors

JUNE 2018

(blank page)

Roads and Maritime Services

Byron Bay Car Park Upgrade Works

Review of Environmental Factors
June 2018

Prepared by



C O N S U L T I N G

Planit Consulting Pty Ltd
PO Box 1623
KINGSCLIFF NSW 2487
0266745001
info@planitconsulting.com.au

Document Control

File name	01992 Report REF		
Report name	Byron Bay Car Park Upgrade Works – Review of Environmental Factors		
Document version	H		
Prepared by:	Mitch Cambridge	Date:	20 July 2016
Edited by:	Adam Smith	Date:	21 July 2016
Edited by:	Adam Smith	Date:	23 January 2017
Edited by:	Adam Smith	Date:	07 May 2018
Edited by:	Luke Blandford	Date:	14 June 2018

Contents

Document Control	i
Executive summary	iii
1 Introduction	1
1.1 Proposal identification	1
1.2 Purpose of the report.....	4
2 Need and options considered	5
2.1 Strategic need for the proposal.....	5
2.2 Existing car park infrastructure	5
2.3 Proposal objectives.....	5
2.4 Alternatives and options considered.....	5
2.5 Preferred option	6
3 Description of the proposal	7
3.1 The proposal.....	7
3.2 Design	7
3.3 Construction activities.....	8
3.4 Ancillary facilities	10
3.5 Public utility adjustment	10
3.6 Property acquisition	10
4 Statutory and planning framework	12
4.1 State Environmental Planning Policies.....	12
4.2 Local Environmental Plans	15
4.3 NSW legislation.....	15
4.4 Commonwealth legislation.....	17
4.5 Confirmation of statutory position	18
5 Stakeholder and community consultation	19
5.1 Community involvement	19
5.2 Aboriginal community involvement.....	19
5.3 ISEPP consultation	19
6 Environmental assessment	20
6.1 Biodiversity.....	20
6.2 Soil.....	26
6.3 Acid Sulfate Soils.....	28
6.4 Waterways and Water Quality.....	30
6.5 Noise and Vibration	32
6.6 Air Quality.....	33
6.7 Non-Aboriginal Heritage	34
6.8 Aboriginal Heritage	38
6.9 Traffic and Transport.....	39
6.10 Contaminated Lands.....	40
6.11 Socio-Economic Considerations	41

6.12	Landscape Character & Visual Amenity.....	41
6.13	Waste	43
6.14	Cumulative Impacts	44
6.15	Summary of beneficial effects	45
6.16	Summary of adverse effects	45
7	Environmental management	46
7.1	Environmental management plans (or system).....	46
7.2	Summary of safeguards and management measures	46
7.3	Licensing and approvals.....	58
8	Conclusion.....	59
8.1	Justification	59
8.2	Objects of the EP&A Act.....	59
8.3	Conclusion.....	60
9	Certification	62
10	References	64

Appendices

Appendix A	Development Plans
Appendix B	Geotechnical Investigation Report
Appendix C	Tree Clearing Report
Appendix D	Aboriginal Cultural Heritage Due Diligence Assessment
Appendix E	Dial Before You Dig Search Results
Appendix F	Consideration of Clause 228(2) factors and matters of national environmental significance
Appendix G	Heritage Impact Statement
Appendix H	Heritage Impact Statement - Addendum
Appendix I	Preliminary Contamination and Acid Sulfate Soils Report
Appendix J	Heritage Act 1977 Exemption
Appendix K	Preliminary Stormwater Management Plan

Executive summary

The proposal

The upgrade of the two car parking areas would be undertaken as one construction project, but in three development stages. Stage 1 would include the construction of new stormwater drainage between the car parking areas and wider existing network. Due to site constraints, works within each car park will then be carried out individually with the completion of one car park being immediately followed by the commencement of the other. The main construction elements associated with these drainage works and each of the separate car parks would include:

Stage 1 - Stormwater Drainage

- Construction of new stormwater drainage between the Railway Hotel Car Park and the South Lawson Street Car Park; and
- Construction of new stormwater drainage connecting the car park area to the existing stormwater network.

Stage 2 - South Lawson Street Car Park

- Boxing out, re-grading and resealing the existing car park area;
- Construction of barrier kerbs around the perimeter of the car park;
- Construction of car park lighting;
- Line marking to create 29 formal car parking spaces including two disabled parks; and
- Landscaping.

Stage 3 - Railway Hotel Car Park

- Removal of four trees located within the construction footprint;
- Construction of new stormwater drainage connecting car park area to the existing stormwater network
- Boxing out, re-grading and resealing of the existing car park area;
- Construction of kerb and channel, barrier kerbs and kerb ramps around the perimeter of the car park;
- Construction of car park lighting;
- Construction of new footpaths around northern and eastern perimeter of the car park; and
- Line marking to create 98 formal car parking spaces including three disabled parks; and
- Landscaping.

Need for the proposal

Both car parks are identified as being in poor condition in terms of their drainage and surface condition. Additionally, the car parks are regularly used for illegal overnight camping which creates rubbish issues and a generally undesirable environment. The proposed development seeks to upgrade these assets to mitigate safety risks, prevent illegal overnight camping and reduce ongoing costly maintenance. In addition, the proposal also aims to ensure compliance with relevant Australian Standards and the Northern Rivers Design Specifications.

Once completed, paid parking would be implemented at both car parks which in turn would provide a source of revenue for Byron Shire Council.

Options considered

Both car parks are highly constrained in terms of their existing features and available space, being bound by railway lines the west and commercial development to the east. The proposed design therefore seeks to maximise usage of the land within its existing confines and utilise existing features. In developing the final proposal, design considerations and constraints encountered for each of the car park areas are discussed as follows:

Railway Hotel Car Park

Geotechnical investigations recorded compliant gravel pavement layers in each of the test pits conducted at the site. Accordingly, the original design intent for the upgrade of this car park was to utilise the existing gravel pavement by scarifying and re-compacting the surface and providing an asphalt seal.

During the design however, a number of existing features at the site were identified that required matching into (e.g. existing roads, footpaths and entrances) and which provided significant constraints. In order to tie the design into these existing features, separate sections of pavement would have been required to be boxed out to achieve minimum pavement thicknesses. In doing so, this raised issues with the constructability and the associated difficulties with mitigating against existing layer thicknesses.

To overcome this above issues, it was therefore proposed to box out the entire car park surface to a consistent 350mm depth across the site. In doing so, this also enabled regrading of the site to be undertaken to achieve the required falls into the new stormwater pits.

South Lawson Street Car Park

The major design issue for the upgrade of this car park area was to protect the root structures of the existing trees that are growing along the fence line on the western boundary of the site. In order to achieve this, the layout of the car park was inverted, requiring boxing out of the existing gravel and replacement of pavements. In doing so,

this ensured the protection of the existing trees and prevented stormwater from entering adjacent properties.

Given the site constraints and design issues described above, the designs as proposed are considered to be the preferred option providing a balance between environmental impact, construction cost, community impact, constructability, design outcome, and construction quality.

Statutory and planning framework

The proposal has been assessed as being permissible without consent and as exempt development under the SEPP Infrastructure. The proposal is within the definition of activity set by Section 5.1 of the *Environmental Planning & Assessment Act 1979* (EP&A Act) and is being proposed by a public authority. Accordingly, assessment under Part 5 of the EP&A Act is therefore required.

The matters prescribed by Clause 228 of the Environmental Planning and Assessment Regulation 2000, for consideration by assessments under Part 5, are reviewed at **Appendix F**.

No requirement for a referral under the *Environment Protection and Biodiversity Conservation Act 1999* has been identified.

Environmental impacts

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on biodiversity through the removal of trees. Mitigation measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also see the existing car park areas within the town centre of Byron Bay upgraded and formalised. On balance the proposal is considered justified.

Justification and conclusion

The proposal would have minimal adverse impact during the construction phase, with construction related impacts manageable through the implementation of safeguards and mitigation measures. Benefits associated with the proposal would be improved public parking infrastructure, stormwater drainage and public safety with the Byron Bay town centre.

On balance, the benefits derived from proceeding with the proposal are considered to outweigh the potential impacts

I Introduction

1.1 Proposal identification

Transport for NSW and Byron Shire Council propose to upgrade two existing car parks located within the town centre of Byron Bay. The two car parks are located adjacent the northern and southern boundaries of the Railway Park and are known as the South Lawson Street Car Park and Railway Hotel Car Park (refer Figure 1). The land on which the works are proposed is presented in Table 1 below:

Table 1: Property description of proposed car park & stormwater upgrade.

Lot and DP	Zoning	Owner
Lot 4729 DP 1228104	SP2 – Rail Corridor	Transport NSW
Lot 1 DP 1001454	SP2 – Rail Corridor	Transport NSW
Lot 5 DP 619224	B2 – Local Centre	Private
Lot 2 DP 827049	RE1 – Public Recreation	Byron Shire Council
Lot 1 DP 827049	SP2 – Information and Education Facility	Byron Shire Council
Lot 3 DP 827049	SP2 – Carpark	Byron Shire Council

Both car parks are identified as being in poor condition in terms of their drainage and surface condition. Additionally, the car parks are regularly used for illegal overnight camping which creates rubbish issues and a generally undesirable environment. The proposed activity seeks to upgrade these assets to mitigate safety risks, prevent illegal overnight camping and reduce ongoing costly maintenance. In addition, the proposal also aims to ensure compliance with relevant Australian Standards and the Northern Rivers Design Specifications.

The proposed activity would be a joint venture between Transport for NSW and Byron Shire Council who own part of the land within the works alignment. An agreement is being sought between the two parties whereby once complete, Byron Shire Council would be responsible for enforcing parking restrictions with revenue raised from proposed metering shared between Byron Shire Council and Transport NSW. The private owner of land upon which part of the works are proposed has been consulted with regarding the proposal and an agreement made to upgrade his laneway as part of the works.



Figure 1: Location of Car Parks. Drainage work will be undertaken between these areas along the Rail Corridor. (Note: Illustrative only. Not to scale)

The proposal is for the redevelopment of two, unformed /gravel car parks within the Byron Bay locality. The proposed development plan of each car park has been provided below. The plan seeks to improve drainage conditions between these areas and local area by guiding an existing overland flow through a new underground trunk system, seal/stablise the existing carparks and formalize this space through line marking.

A copy of the design plans are provided in **Appendix A**. In summary, however, the main construction elements associated with the proposed car park upgrade would include:

- Removal of four (4) trees;
- Construction of new stormwater drainage infrastructure (see **Appendix K** for Preliminary Stormwater Management Plan);
- Re-grading and resealing the existing car park areas;
- Line marking to create more efficient and formalised car parking spaces across the two sites; and
- Ancillary works including footpaths, lighting and landscaping.

Subject to approvals, works are planned to commence mid 2018 and would be carried out as one construction project, under three development stages. Stage 1 would include the construction of new stormwater drainage between the car parking areas and wider existing network. Due to site constraints, works within each car park will then be carried out individually with the completion of one car park being immediately followed by the commencement of the other.

1.2 Purpose of the report

This Review of Environmental Factors (REF) has been prepared by Planit Consulting Pty Ltd to “examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity” within the meaning of Section 5.5 and 5.7 of the EP&A Act. For the purposes of this project, Transport for NSW are the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

- The description of the proposed works and associated environmental impacts have been undertaken in context of Clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the *Biodiversity Conservation Act 2016*, the *Fisheries Management Act 1994* (FM Act), and the Australian Government’s *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore necessitate an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act.
- The significance of any impact on land with terrestrial and aquatic environment value, high biodiversity value and/or threatened species as defined by the *Biodiversity Conservation Act* and/or FM Act, and therefore the requirements for a Species Impact Statement.
- The potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of Environment (DoE) for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

2.1 Strategic need for the proposal

Both car parks are identified as being in poor condition in terms of their drainage and surface condition. Additionally, the car parks are regularly used for illegal overnight camping which creates rubbish issues and a generally undesirable environment. The proposed development seeks to upgrade these assets to mitigate safety risks, prevent illegal overnight camping and reduce ongoing costly maintenance. In addition, the proposal also aims to ensure compliance with relevant Australian Standards and the Northern Rivers Design Specifications.

Once completed, paid parking would be implemented at both car parks which in turn would provide a source of revenue for Byron Shire Council.

2.2 Existing car park infrastructure

Both existing car parks are described as being in a poor condition. The South Lawson Street Car Park has no drainage making it susceptible to minor flooding and the car park surface is uneven and unsealed.

The Railway Hotel Car Park is in slightly better condition with a lightly sealed section in front of the Railway Hotel. Overall, this car park is described as being generally flat with a crest in middle of the park which assists with drainage. Aside from the sealed section in front of the Railway Hotel, the remainder of the car park is unsealed and in poor condition with many of the parking spaces being informal and unregulated.

2.3 Proposal objectives

The identified objectives of the proposal are;

- To upgrade and formalise the existing car park facilities at the site and ensure compliance with relevant Australian Standards and the Northern Rivers Design Specifications.
- To provide as many car parking spaces as possible within the confines of the site.
- To improve stormwater drainage in the location

2.4 Alternatives and options considered

Both car parks are highly constrained in terms of their existing features and available space, being bound by railway lines the west and commercial development to the east. The proposed design therefore seeks to maximise usage of the land within its existing confines and utilise existing features. In developing the final proposal, design considerations and constraints encountered for each of the car park areas are discussed as follows:

Railway Hotel Car Park

Geotechnical investigations recorded compliant gravel pavement layers in each of the test pits conducted at the site. Accordingly, the original design intent for the upgrade of this car park was to utilise the existing gravel pavement by scarifying and re-compacting the surface and providing an asphalt seal.

During the design however, a number of existing features at the site were identified that required matching into (e.g. existing roads, footpaths and entrances). In order to tie the design into these existing features, separate sections of pavement would have been required to be boxed out to achieve minimum pavement thicknesses. In doing so, this raised issues with the constructability and the associated difficulties with mitigating against existing layer thicknesses.

To overcome this above issues, it was therefore proposed to box out the entire car park surface to a consistent 350mm depth across the site. In doing so, this also enabled regrading of the site to be undertaken to achieve the required falls into the new stormwater pits.

South Lawson Street Car Park

The major design issue for the upgrade of this car park area was to protect the root structures of the existing trees that are growing along the fence line on the western boundary of the site. In order to achieve this, the layout of the car park was inverted, requiring boxing out of the existing gravel and replacement of pavements. In doing so, this ensured the protection of the existing trees and prevented stormwater from entering adjacent properties.

2.5 Preferred option

Given the site constraints and design issues described above, the designs as proposed are considered to be the preferred option providing a balance between environmental impact, construction cost, community impact, constructability, design outcome, and construction quality.

3 Description of the proposal

3.1 The proposal

A copy of the concept design is included in **Appendix A**. The upgrade of the two car parking areas would be undertaken as one construction project, but in three development stages. Stage 1 would include the construction of new stormwater drainage between the car parking areas and wider existing network. Due to site constraints, works within each car park will then be carried out individually with the completion of one car park being immediately followed by the commencement of the other. The main construction elements associated with these drainage works and each of the separate car parks would include:

Stage 1 - Stormwater Drainage

- Construction of new stormwater drainage between the Railway Hotel Car Park and the South Lawson Street Car Park; and
- Construction of new stormwater drainage connecting the car park area to the existing stormwater network.

Stage 2 - South Lawson Street Car Park

- Boxing out, re-grading and resealing the existing car park area;
- Construction of barrier kerbs around car park perimeters;
- Construction of car park lighting;
- Line marking to create formal car parking spaces including designated mobility and motorcycle spaces;
- Boxing, shaping, filling and establishing bio-retention areas; and
- Landscaping.

Stage 3 - Railway Hotel Car Park

- Removal of four trees located within the construction footprint;
- Construction of new stormwater drainage connecting car park area to the existing stormwater network
- Boxing out, re-grading and resealing of the existing car park area;
- Construction of kerb and channel, barrier kerbs and kerb ramps around the perimeter of the car park;
- Construction of car park lighting;
- Construction of new footpaths around northern and eastern perimeter of the car park; and
- Line marking to create formal car parking spaces including designated mobility space; and
- Landscaping.

3.2 Design

3.2.1 Design criteria

The design criteria for the proposal is to upgrade the existing car park assets to provide as many car parking spaces as possible with the intention of implementing paid parking at the sites. Additionally, the proposal is to ensure compliance with relevant Australian Standards and the Northern Rivers Design Specifications with respect to parking, lighting, WSUD and stormwater.

3.2.2 Engineering constraints

Engineering constraints associated with the site are generally limited and primarily related to existing features at the site. Existing features such as roads, footpaths and entrances will require careful consideration during construction to ensure that the new works tie in with the existing.

3.3 Tree Removal

The removal of four (4) trees are required to facilitate the proposed redevelopment as the removal of the vegetation will assist in maximising car park spaces and enable safe vehicular movement. The four (4) trees identified for removal have been outlined below.

Table 2: Trees identified for removal

Common Name	Scientific Name	Size	Quantity
Broad-leaved Paperbark	Melaleuca quinquenervia	Up to 8m in height (multi-stem)	2
Umbrella Tree	Schefflera actinophylla	Up to 4m in height	1
Bribie Island Pine	Callitris columellaris	Up to 8m in height	1

Details of the trees proposed to be removed are discussed in **Appendix C - Tree Clearing Report**.

3.4 Construction activities

3.4.1 Work methodology

The construction sequence would be generally as follows.

Stage 1	<ul style="list-style-type: none"> • Temporary closure of works area; • Installation of temporary erosion, sedimentation and drainage controls; • Site establishment and set-up; • Construction of new stormwater drainage infrastructure;
Stage 2 (South Lawson Street Car Park); and Stage 3 (Railway Hotel Car Park)	<ul style="list-style-type: none"> • Installation of temporary erosion, sedimentation and drainage controls; • Site establishment and set-up; • Removal of vegetation including four trees and associated shrubs and grasses (Railway Hotel Car Park only); • Closure of car parking areas; • Stripping and stockpiling of gravel material for later reuse in sub-base layers; • Boxing out car park to 350mm below finished design level; • Placement of existing stockpiled sub-base material and importation of new sub-base material where required; • Grading and compacting sub base material to achieve desired surface levels; • Construction of kerb and guttering;

	<ul style="list-style-type: none"> • Application of asphalt surface; • Line marking and sign posting; • Construction of new footpaths and lighting; • Landscaping of designated areas; and • Removal of environmental controls following stabilisation of disturbed surfaces.
--	--

3.4.2 Construction hours and duration

Subject to approval construction would commence mid 2018. Construction activities would be undertaken in accordance with the Environmental Protection Authority (EPA) standard working hours of:

- Monday – Friday: 7 am to 6 pm
- Saturday: 8 am to 1 pm
- Sunday and Public Holidays: no work

3.4.3 Plant and equipment

Machinery to be used during construction would include:

- Excavator
- Tip truck
- Frontend Loader
- Chainsaw
- Mulcher
- Grader
- Water cart
- Rollers
- Spray seal rig
- Various hand-tools
- Concrete Truck
- Crane

3.4.4 Earthworks

Earthworks associated with the proposal would be minimal and would comprise:

- Stripping and stockpiling of existing gravel material within the car parks;
- Boxing out car parks;
- Grading and compacting sub base material; and
- Trenching for the installation of the stormwater drainage. Trenching would be undertaken in sections to minimise the amount of disturbance at any one time. Trench depths would range between 1m to 2m below ground level and would be approximately 1.5m in width.

3.4.5 Source and quantity of materials

The proposal would require moderate quantities of materials.

Final quantities of fill or excavation material will be confirmed on design sign off, however these will be limited to gravel, sand, topsoil, asphalt and sub-base.

The source of materials to be imported to the site would be determined closer to the commencement of construction, however, all materials used in construction of the proposal would be sourced from licensed local suppliers.

Materials that cannot be re-used on site would be classified and disposed of in accordance with the NSW Waste Classification Guidelines and relevant current NSW EPA resource recovery exemptions.

3.4.6 Traffic management and access

During the period of construction, the car parks and works areas would be closed for public use to ensure the safety of the public and construction personnel.

To manage potential traffic impacts at the site and on the surrounding road network, a Traffic Management Plan/Traffic Control Plan would be prepared by the construction contractor prior to the commencement of works.

3.5 Ancillary facilities

Provision would be made on site for worker amenities, stockpiling (spoil), equipment storage and site sheds etc. Prior to the commencement of works the construction contractor would prepare a construction plan identifying the location of each of the facilities. The construction plan would ensure that these facilities occur only in previously cleared areas and do not conflict with the known Heritage values of the site.

3.6 Public utility adjustment

The result of a dial before you dig search and features survey indicate that utility services are present at the site however, there are no service conflicts with the proposed design. The approximate location of public utilities within the area has been provided within **Appendix E**.

All due diligence would be undertaken prior to commencement of works to confirm the results of the Dial Before You Dig search.

3.7 Property acquisition

The proposed activity is a joint venture between Transport for NSW and Byron Shire Council who are both owners/managers of the site.

Minor works are proposed on a portion of private land (Lot 5 DP 619224) which comprises the most southern laneway of the Railway Hotel Car Park. Negotiations have taken place with the effected property owner and an agreement formed to upgrade the laneway as part of the works on his behalf.

The proposal would not require any property acquisition.

4 Statutory and planning framework

4.1 State Environmental Planning Policies

4.1.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. The various components of the proposed car park upgrade and associated works have been assessed as being both permissible without consent and as exempt development under the ISEPP.

The proposed stormwater drainage works associated with the car park upgrade are assessed as being permissible without consent under Division 20 (Stormwater Management Systems), Clause 111 of the SEPP Infrastructure. Clause 111(1) states that “Development for the purpose of stormwater management systems may be carried out by or on behalf of a public authority without consent on any land”. Reference to development for the purposes of a stormwater management system includes a reference to construction works if the development is in connection with a stormwater management system. Clause 110 describes stormwater management systems as works being for the collection, detention, distribution or discharge of stormwater such as channels, pipes and drainage works.

Under Clause 5(2)(b)(notes) of the SEPP Infrastructure, “Development that does not require consent under Part 4 of the EP&A Act and is not a project to which Part 3A of the EP&A Act applies or exempt development, will be subject to the environmental assessment and approval requirements of Part 5 of the EP&A Act”.

In addition to the above, the remaining works associated with the proposed car park upgrade including the car park upgrade itself, the footpaths, landscaping and lighting have been assessed as Exempt Development under Schedule 1 (Exempt Development General) of the ISEPP. Under Section 4.1 of the EP&A Act, Exempt Development may be carried out without the need for development consent under Part 4 of the Act or for assessment under Part 5 of the Act. The section states that exempt development:

- a) Must be of minimal environmental impact
- b) Cannot be carried out in critical habitat of an endangered species, population or ecological community (identified under the Threatened Species Conservation Act, 1995 or the Fisheries Management Act, 1994); and
- c) Cannot be carried out in a wilderness area (defined under the Wilderness Act, 1987); or

Under Clause 20A of the ISEPP, development for a purpose specified in Schedule 1 is exempt development if:

- a) it is carried out by or on behalf of a public authority, and
- b) it meets the development standards for the development specified in Schedule 1, and
- c) it complies with clause 20

In satisfying item c) above, Clause 20 (General requirements for exempt development) of the ISEPP states that to be exempt development, the development:

- a) must meet the relevant deemed-to-satisfy provisions of the Building Code of Australia, or if there are no such relevant provisions, must be structurally adequate, and
- b) must not, if it relates to an existing building:
 - (i) cause the building to contravene the Building Code of Australia, or
 - (ii) compromise the fire safety of the building or affect access to any fire exit, and
- c) must be carried out in accordance with all relevant requirements of the Blue Book, and
- d) must not be designated development, and
- e) if it is likely to affect a State or local heritage item or a heritage conservation area, must involve no more than minimal impact on the heritage significance of the item or area, and
- f) must be installed in accordance with the manufacturer's specifications, if applicable, and
- g) must not involve the removal or pruning of a tree or other vegetation that requires a permit or development consent for removal or pruning, unless that removal or pruning is undertaken in accordance with a permit or development consent.

In consideration of the above requirements, the subject site which is associated with the Byron Bay Railway Station is identified as being within an area of state and local significance. The proposed works would occur within the existing car park areas only and would not impact upon the heritage significance of the buildings or area. A preliminary Stormwater Management Plan is included as **Appendix K**.

In accordance with the Heritage Act 1977, an exemption from obtaining approval under Section 60 of the Act was sought on the grounds that the proposed works would not adversely affect the heritage significance of the site. This exemption was approved under delegation from the Office of Environment and Heritage on 3 January 2017, subject to conditions. A copy of the exemption granted is provided at **Appendix J**. Since obtaining this exemption, the project team have continued to refine the design and detail for the proposed works, which has included realignment to the proposed stormwater system from what was considered under the original exemption. Consultation has been undertaken with the Office of Environment and Heritage regarding the matter. It has been confirmed that there are no concerns regarding the modifications; however, a new exemption is required merely as a procedural requirement due to legislation wording under the Heritage Act. A new exemption has been sought in this case and will be appended to this REF once obtained.

Furthermore, in addition to the above, the proposed works would require the removal of four trees which are protected by a tree preservation order. Accordingly, this Review of Environmental Factors report has included details of the removal of the trees in association with the proposed works. See **Appendix C – Tree Clearing Report** for further details.

In light of the two required approvals identified above, and given that the stormwater drainage component requires an environmental assessment; the remainder of the works associated with the proposal, which are permissible as exempt development, have also been included as part of the environmental assessment.

4.1.2 State Environmental Planning Policy (Coastal Management) 2018

The Coastal Management SEPP seeks to promote an integrated and co-ordinated approach to land use planning in the coastal zone. The project site is partly within the Coastal Use Area under the SEPP, though it is noted it is not mapped as containing a Coastal Wetland, Littoral Rainforest and nor is it within a buffer area. The proposed works will help improve stormwater management as well as

the public use of the car parking areas, which is consistent with the heads of consideration under the Coastal Environmental Area.

4.1.3 State Environmental Planning Policy No.44 – Koala Habitat Protection

State Environmental Planning Policy No.44 (SEPP 44) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas, and to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. SEPP 44 applies to a range of LGAs including Byron Shire Council.

Part 2 of SEPP 44 regulates impact on koala habitats. While it strictly only applies to proposals being assessed under Part 4 of the EP&A Act, as a matter of practice, consideration is given as part of the Part 5 assessment process. In areas where the policy applies a number of criteria are to be addressed to determine levels of assessment and to govern management considerations.

1. *Does the Policy Apply?*

Is the land greater than 1ha in size and located within one of the Local Government areas listed within Schedule 1 of SEPP 44?

No. The land on which the works are proposed (the site footprint on which the car park upgrades would occur) is <1ha in area and located within the Byron Local Government Area.

2. *Is the land potential koala habitat?*

The SEPP defines ‘potential koala habitat’ as ‘areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component’. The trees within Schedule 2 are tabulated below:

Scientific Name	Common Name
<i>Eucalyptus tereticornis</i>	Forest red gum
<i>Eucalyptus microcorys</i>	Tallowwood
<i>Eucalyptus punctata</i>	Grey Gum
<i>Eucalyptus viminalis</i>	Ribbon or manna gum
<i>Eucalyptus camaldulensis</i>	River red gum
<i>Eucalyptus haemastoma</i>	Broad leaved scribbly gum
<i>Eucalyptus signata</i>	Scribbly gum
<i>Eucalyptus albens</i>	White box
<i>Eucalyptus populnea</i>	Bimble box or poplar box
<i>Eucalyptus robusta</i>	Swamp mahogany

No. Trees identified at the site are not consistent with the species identified in Schedule 2 of SEPP 44. As such it is considered that the land does not represent potential koala habitat as defined.

3. *Is the land core koala habitat?*

The SEPP defines ‘core koala habitat’ as ‘an area of land with a resident population of koalas,

evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.'

No koala sightings were made during the field survey and it is considered that the site, with respect to its definition under SEPP 44, is not located within land that is core koala habitat.

4. *Is there a requirement to prepare a Plan of Management for land containing core koala habitat?*

No. It is considered that the site does not contain core Koala habitat as described.

In summary, the proposal is considered to not provide koala habitat which is consistent with Byron Shire Councils koala habitat mapping. Accordingly, the proposal would not compromise the provisions of SEPP 44.

4.1.4 North Coast Regional Environmental Plan

The North Coast Regional Environmental Plan (NCREP) applies to the Byron Shire Council Local Government Area. The NCREP does not include any controls or requirements that would impact upon the proposal. Irrespective, the proposal is assessable under Part 5 of the EP&A Act therefore the planning provisions of the NCREP do not apply.

4.2 Local Environmental Plans

4.2.1 Byron Local Environmental Plan 2014

The proposal is located within the Byron Shire Council LGA. Byron Shire Council regulates land use and development primarily through the Byron Local Environmental Plan 2014 (BLEP 2014).

The proposal is partly exempt development under the ISEPP and partly assessable under Part 5 of the EP&A Act. Therefore the planning provisions of the BLEP 2014 do not necessarily apply. Irrespective it is noted that the proposal is consistent with the permissible land uses of the RE1 Public Recreation, SP2 Car Parks and SP2 Rail Corridor zonings.

4.3 NSW legislation

4.3.1 Protection of the Environment Operations Act, 1997

Under the *Protection of the Environment Operations Act 1997* (POEO Act) it is an offence to cause harm to the environment in terms of waste disposal, water pollution, air pollution, noise pollution and land pollution. Measures are proposed to mitigate potential polluting activities associated with the proposal (refer Section 6).

4.3.2 Protection of the Environment Operations (Waste) Regulation 2005

The Regulation sets out provisions covering the way waste is managed in terms of storage and transportation as well as reporting and record keeping requirements for waste facilities.

The Regulation makes special requirements relating to asbestos and clinical waste and lists

exemptions for resource recovery of waste such as excavated natural material (ENM) or raw mulch. An exemption facilitates the use of these waste materials outside of certain requirements of the waste regulatory framework.

Similarly, waste soil material would be classified as VENM or ENM prior to any beneficial re-use.

4.3.3 National Parks and Wildlife Act, 1974

The harming or desecrating of Aboriginal objects or places is an offence under section 86 of the *National Parks and Wildlife Act 1979*. Under section 90, an Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

A basic AHIMS search did not identify any Aboriginal sites of significant cultural heritage in proximity to the subject site. A due diligence assessment has been undertaken in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal objects in NSW (DECCW 2010) (refer **Appendix D**). This assessment concluded that the site has low potential for the presence of Aboriginal sites and objects based on the level of existing disturbance that has occurred at the site in the past. Accordingly, the proposed works can avoid harm to identified Aboriginal places (i.e. no known sites are within the disturbance footprint) and the proposed works can proceed with caution.

All native birds, reptiles, amphibians and mammals, except the dingo, are protected in NSW under the NPW Act. The harming of protected fauna is prohibited under the NPW Act, but an exemption applies in relation to things that are essential to the carrying out of an activity to which Part 5 of the EP&A Act applies and where the determining authority has complied with the provisions of that part.

Potential impacts on flora and fauna are considered in Section 6.1.

4.3.4 Heritage Act, 1977

Section 60 of the Act details the approval requirements for any action that would adversely affect an item that is subject to an Interim Heritage Order or listing on the State Heritage Register. Under delegated authority, an exemption from the need for a Section 60 approval was endorsed for the proposed works on 3 January 2017, in accordance with Section 57(2) of the Heritage Act 1977 (see **Appendix J**). Since obtaining this exemption, the project team have continued to refine the design and detail for the proposed works, which has included realignment to the proposed stormwater system from what was considered under the original exemption. Consultation has been undertaken with the Office of Environment and Heritage regarding the matter. It has been confirmed that there are no concerns regarding the modifications; however, a new exemption is required merely as a procedural requirement due to legislation wording under the Heritage Act. A new exemption has been sought in this case and will be appended to this REF once obtained.

Section 139 provides for the protection of all relics making it an offence to disturb or excavate land to discover, expose or move a relic without permits issued by the NSW Heritage Council. The Heritage Council may by order publish in the Government Gazette exceptions to the need to obtain a Section 139 permit.

Section 146 requires that in the event a relic is discovered during the proposed works, whether or not

a permit has been issued, the NSW Heritage Council must be notified, within a reasonable timeframe, of the location of the relic.

Searches of relevant heritage registers identified that the subject site occurs within proximity to two listed heritage items being the cottage located at 86 Johnson Street (local significance) and Byron Bay Railway Station and adjoining railway land (State significance). These items are located immediately adjacent the disturbance footprint but would not be impacted by the proposal. Further discussion on potential impacts to these heritage items is provided in Section 6.7 of this REF.

4.3.5 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act is directed at conserving terrestrial environment value, high biodiversity value land and threatened species.

By operation of associated EP&A Act provisions, activities that are likely to have a significant impact on these values / species must be the subject of a species impact statement and require State authority approval. Likely impacts have been considered in Section 6.1.

4.3.6 Water Management Act 2000

The Water Management Act 2000 provides for the sustainable and integrated management of the State's water for the benefit of both present and future generations. The Act controls the extraction and use of water, the construction of water bodies such as weirs and dams and any activity that is in or near water sources in NSW.

The definition of a 'water source' is a broad term used to describe any or whole parts of a river, lake, estuary, NSW coastal waters or a place where water occurs naturally on or below the surface of the ground. The definition of a 'controlled activity' is the carrying out of work or any other activity that affects the quality or flow of water in a water source. The definition of 'waterfront land' is defined as land within 40 metres of a lake, estuary, river or shoreline.

If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the Water Management Act (s91(2)). However, according Section 38 of the Water Management (General) Regulation 2011, public authorities and local councils are exempt from the requirement to obtain a licence for controlled activities in, on or under waterfront land.

No water extraction would be required as part of the proposal.

4.4 Commonwealth legislation

4.4.1 *Environment Protection and Biodiversity Conservation Act 1999*

Under the EPBC Act a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in **Appendix F** and Chapter 6 of the REF.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant

matters of national environmental significance. Accordingly, the proposal has not been referred to the Department of Environment.

4.5 Confirmation of statutory position

The proposal has been assessed as being permissible without consent and as exempt development under the SEPP Infrastructure. The proposal is within the definition of activity set by Section 5.1 of the EP&A Act and is being proposed by a public authority. Accordingly, assessment under Part 5 of the EP&A Act is therefore required.

The matters prescribed by Clause 228 of the Environmental Planning and Assessment Regulation 2000, for consideration by assessments under Part 5, are reviewed at **Appendix F**.

No requirement for a referral under the EPBC Act has been identified.

5 Stakeholder and community consultation

5.1 Community involvement

Given the minor nature and scale of the proposal and the works would not change the land use at the site, community involvement in the project has been limited. Notwithstanding, letters of notification have been sent out to local businesses advising of the proposed works. In addition, NSW Transport have visited each of the affected shop owners including the Railway Hotel management to discuss the proposal.

Further general consultation would be undertaken with affected business owners prior to the commencement of works.

5.2 Aboriginal community involvement

Given the proposal would be a continuation of an existing use and that the site is within a highly modified area, no specific Aboriginal community consultation has taken place with regards to the proposal.

5.3 ISEPP consultation

The proposed car park upgrade is a joint venture between Transport for NSW and Byron Shire Council therefore the consultation requirements with Council in accordance with Clauses 13 to 15 of the ISEPP are not applicable.

Furthermore, in accordance with Clause 16 of the ISEPP, the proposed development is not 'Specified Development' therefore the requirements to consult with other public authorities also do not apply.

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP 1999) and *Roads and Related Facilities* (DUAP 1996) as required under clause 228(1)(b) of the *Environmental Planning and Assessment Regulation 2000*. The factors specified in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in **Appendix F**. Site-specific safeguards are provided to ameliorate the identified potential impacts.

6.1 Biodiversity

6.1.1 Existing environment

Introduction

The flora and fauna assessment approach included a review of the project brief, design plans, and environmental planning legislation to consider the likely impacts of the proposed activity on flora and fauna and ensure that the proposal is consistent with the type and intent of development permissible without consent within the ISEPP.

The principal aim of the assessment was to determine the potential impact of the proposed activity on significant flora, fauna and ecological communities using the following legislation and planning management policies:

- NSW Environmental Planning and Assessment Act 1979
- NSW Threatened Species Conservation Act 1995 (former)
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999

Specifically, the aims of the assessment were to:

- Identify vegetation communities, flora and fauna species and habitats on and near the site
- Undertake field and desktop assessments to identify the likelihood of conservation significant species and communities occurring on site
- Assess the conservation status of the site
- Identify impacts associated with the proposal pursuant to (former) Section 5A of assessment (EP&A Act), if required
- Determine whether there is a need to conduct a Species Impact Statement or make referral to the Commonwealth DoE
- Provide recommendations to minimise impacts on conservation significant species and general biodiversity

Desktop Assessment Methodology

The desktop assessment involved a review of the following information:

- NSW OEH Wildlife Atlas database to identify any known records of significant flora and fauna species.

- Commonwealth DoE EPBC Protected Matters on-line database to identify any Matters of National Environmental Significance.
- OEH and Department of Primary Industries (DPI) register of critical habitats
- NSW NPWS regional and subregional fauna corridor mapping and key habitat mapping
- NSW and Commonwealth lists of Key Threatening Processes
- Byron Shire Council environmental values mapping
- Byron Shire Council vegetation mapping

Database searches are typically undertaken using a 10 km radius of the project area.

Desktop Assessment Results

Flora

A review of Byron Shire Council vegetation mapping and the NSW Biodiversity Value Map identifies that no vegetation communities are mapped as occurring on the site (refer Figure 4 and 5).

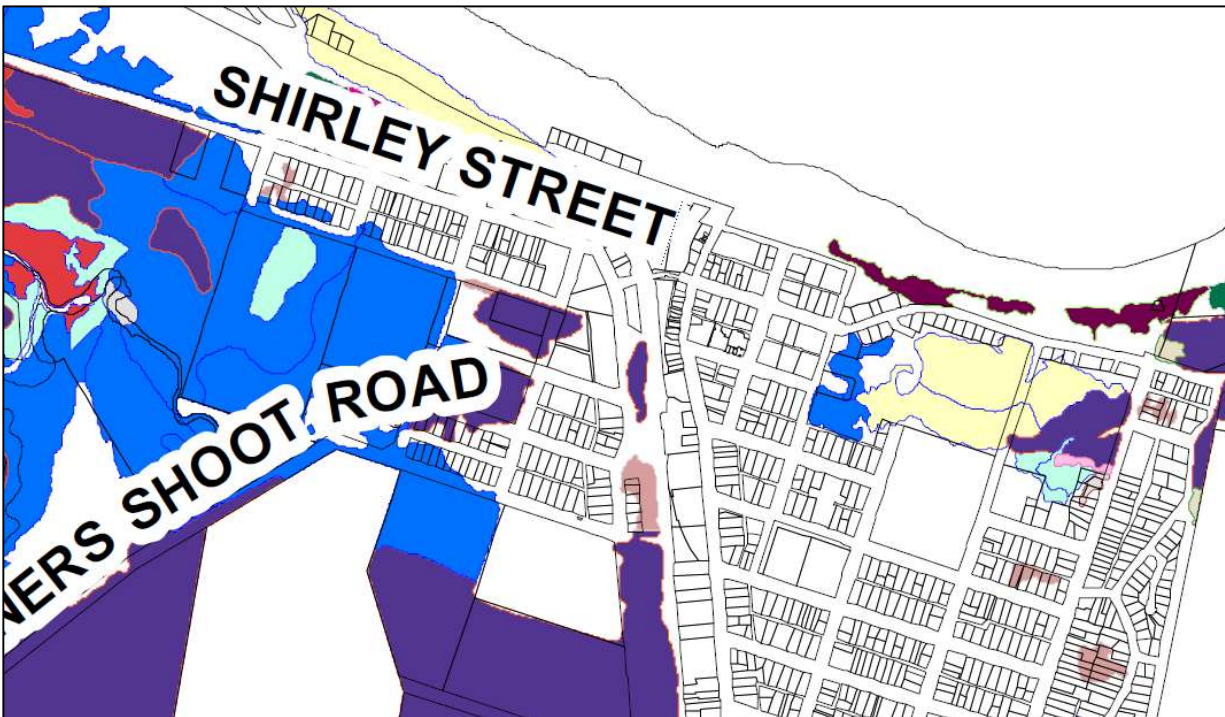


Figure 4: Byron Shire Council vegetation mapping.

the species could occur within or adjacent the subject site on occasion.

Field Assessment Methodology

A preliminary diurnal field assessment was undertaken on the 16th July 2016. The field assessment involved traverses over the site to validate the results of the desktop study and to assess the potential impacts of the development in the study area. In summary, this involved carrying out searches for the following:

- Vegetation that would be directly impacted through clearing (including significant species, habitat trees and areas of vegetation communities).
- Potential fauna habitat likely to be affected by the proposal such as hollow-bearing trees, flowering trees, nests, and other general signs of fauna activity such scats, tacks, and traces.
- Nearby waterways and the potential impacts on these aquatic habitats.

Field Assessment Results

Flora

The site assessment confirmed that vegetation at the site is generally consistent with that identified in the Byron Shire Council Vegetation Mapping, being substantially cleared of vegetation. This is reflective of the urban nature of the site and its historic use as car parks and a railway corridor.

Notwithstanding, four trees were identified within the disturbance footprint which would be directly impacted as identified in Table 3 below (see **Appendix C** for further details)

Table 3: Trees identified within disturbance footprint.

Common Name	Scientific Name	Size	Amount
Broad leaved Paperbark	<i>Melaleuca quinquenervia</i>	Up to 8m in height (multi-stem)	2
Umbrella Tree	<i>Schefflera actinophylla</i>	Up to 4m in height	1
Bribie Island Pine	<i>Callitris columellaris</i>	Up to 8m in height	1

Site meander searches did not identify any threatened species occurring at the site.

No Threatened Ecological Communities listed under the EPBC Act were recorded within the study area.

Fauna

Fauna habitat within the disturbance footprint was found to be limited on account of the area being highly disturbed and used as car parking within the town centre. The targeted field assessment did not record any threatened species at the site.

Vegetation at the site was considered to provide limited value to fauna given its location within an existing car park and its isolation from other areas of native vegetation.

Habitat features such as nests, hollows, coarse vegetative litter, understorey cover or drainage lines/soaks were not observed at the site during the field assessment.

6.1.2 Potential impacts

Flora

The proposed car park upgrade would result in only minor impacts to vegetation at the site. Construction works would require the removal of four trees which are located within the construction footprint (refer Table 3 and **Appendix C**).

The impact of the proposed tree removal is considered to be minor, with all three species being common and well represented in the broader landscape. It should also be noted that the Umbrella tree is listed as a noxious weed by NSW Department of Primary Industries.

Overall, the proposed impacts to vegetation are considered to not be significant and the proposal does not warrant assessments of significance under the TSC Act in regards to flora impacts.

Fauna

As previously discussed, the habitat values within the disturbance footprint are limited on account of the site being highly disturbed within an urban area and actively managed as car parks. A total of 39 threatened fauna species were recorded from a 10km radius of the site, however, based on an assessment of available habitat at the site, only the Grey-headed Flying Fox was considered likely to occur. This species was short-listed on account of there being known records within the study area and/or the species would be expected to fly over or pass through the site on occasion. The remaining species were considered unlikely to occur based on the lack of available habitat and the high level of anthropogenic disturbance that currently exists at the site.

In assessing the potential impacts to the Grey-headed Flying Fox, the proposed works would not directly impact upon this species and would not impact upon known Flying Fox camps. The removal of two Broad-leaved Paperbark trees would result in the loss of potential foraging habitat for the species. This loss of foraging resource is considered insignificant relative to the extensive blossom resources available in the broader surrounding area. Furthermore, the proposed car park upgrades would not impact upon any known flying fox camps.

Accordingly, the proposed impacts to fauna are considered to not be significant and further consideration is not considered necessary.

In summary, the preliminary flora and fauna assessment indicates that the conservation values of the site are generally low given the extent of existing disturbance and the lack of habitat features. The assessment has determined that the proposed activity is unlikely to result in a significant impact upon threatened species, populations or communities and the activity does not require referral to the Commonwealth DoE for assessment under the EPBC Act.

6.1.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Biodiversity	1. All works with regards to vegetation clearing and working within proximity to vegetation to be retained is to be undertaken in accordance with the recommendations within the RMS Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process)'. 2. If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the RMS Unexpected Threatened Species Find Procedure in the RMS Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process)'. Contact the Local Environment Officer (LEO)	Contractor	All Times during the project
Biodiversity	3. To ensure that clearing impacts do not occur outside of the designated construction zone it will be necessary to clearly identify and mark the boundary of the work zones prior to construction. Such boundaries are to be protected via high visibility fencing, sediment fencing and/or signage identifying that no construction activities (including temporary storage, stockpiling, vehicle movement etc.) are permitted beyond.	Contractor	Pre-Construction
Biodiversity	4. The following activities should not be conducted in areas of vegetation to be retained: <ul style="list-style-type: none"> • Storage and mixing of materials; • Vehicle parking or maneuvering; • Liquids disposal; • Machinery repairs or refuelling; • Site office and/or shed erection; • Lighting of fires; • Rubble, soil or debris stockpiling; and • Excavation. 	Contractor	Construction
Biodiversity	5. Within the designated development/construction zone identification of areas to be cleared are to	Contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	be pre-assessed by an experienced ecologist/wildlife spotter/catcher. This pre-assessment shall allow for an inventory of fauna habitat components (i.e. birds nests, loose rocks providing reptile refuge, ground logs etc) to be undertaken prior to felling and construction works. A wildlife spotter catcher would be utilised during all phases of clearing of the site to ensure safe dispersal and relocation of native fauna.		

6.2 Soil

6.2.1 Existing environment

The site is identified as part of the Tyagarah Landscape (ty) as defined by Morand (1994). The Tyagarah landscape is defined as sediment basins of mixed estuarine and Aeolian origin forming level to gently undulating plains. Reference to the Lismore-Ballina 1:100 000 geological map indicates that the site is underlain by Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocene) sands. The sands are generally aeolian, originating from the adjacent beach ridge systems.

Geotechnical investigations have been undertaken at the site by Civil Consult on the 24th May 2016. These investigations included five test pits across both sites, comprising two test pits in the South Lawson Street Car Park and three test pits in the Railway Hotel Car Park (refer Figure 6). In all test pits, investigations extended to a depth of 1.6m below ground level.

In summary, the investigations described the soils in the South Lawson Street Car Park to comprise of fine to medium grained gravel with fine to medium grained sand between 0m to 0.4-0.5m, with natural fine to medium grained sand with trace silt to the depth of investigation at 1.6m.

Within the Railway Hotel Car Park, geotechnical investigations described the soils beneath the existing wearing course to comprise medium to course grained gravel between 0m to 0.15-0.3m with natural fine to medium grained sand to the depth of investigation at 1.6m.

Groundwater seepage was observed in test pits 1 and 2 at the time of the investigation at 1.2m below ground level. Ground water levels are transient and variations differing from those observed at the time of the investigation can be expected due to climatic effects, heavy rainfall and permeability of the soil strata.

A copy of the Geotechnical Investigation Report is included under **Appendix B**.



Figure 6: Aerial photograph showing borehole locations during geotechnical investigations.

6.2.2 Potential impacts

The proposal would see the exposure of soils and sediment during construction which has the potential to generate sediment during rainfall events. Sources of ground disturbance during construction would occur from the following activities.

- Removal of vegetation within the construction footprint
- Trenching associated with the construction of new stormwater drainage
- Boxing out and re-grading the existing car park areas
- Construction of new footpaths
- Landscaping

6.2.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Sediment & Erosion	6. Erosion and sediment control measures are to be implemented and maintained to: <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. 	Contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> Reduce water velocity and capture sediment on site. Minimise the amount of material transported from site to surrounding pavement surfaces. Divert clean water around the site (in accordance with the Landcom / Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)). 		
Sediment & Erosion	7. All erosion and sediment controls would be inspected weekly and within 24 hours of a major rainfall event to ensure they are maintained in proper working order throughout the time they are in place	Contractor	Construction
Sediment & Erosion	8. Stockpile sites would be located outside drainage flow paths at least 50m from the waterway and protected with sediment fencing	Contractor	Construction
Sediment & Erosion	9. Construction works would be managed such that areas outside the scope of the works remain as undisturbed as far as possible.	Contractor	Construction
Sediment & Erosion	10. Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) with records kept and provided on request.	Contractor	Construction
Sediment & Erosion	11. Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Post-construction
Sediment & Erosion	12. Work areas are to be stabilised progressively during the works.	Contractor	Construction
Sediment & Erosion	13. A progressive erosion and sediment control plan is to be prepared for the works and incorporated into a CEMP.	Contractor	Pre-construction

6.3 Acid Sulfate Soils

6.3.1 Existing environment

The subject site is mapped being within a Class 3 Acid Sulfate Soils (ASS) area.

ASS investigations have been undertaken at the site by ENV Solutions on the 12th August 2016. These investigations included approximately 72 samples from 18 drill locations across a range of depths (0m to 2m+). Fifteen soil samples obtained from the investigation were forwarded to the

Environmental Analysis Laboratory at Southern Cross University for acid sulfate soil analysis. The samples were analysed using acid sulphate peroxide screening with a further four samples fully analysed for Chromium Reducible Sulfur (technique Scr – Method 22B).

In summary, the laboratory test results found soils contained at or below 0.5-0.7m in depth in the northern section of the proposed carpark development on Lot 3 DP827049 are assessed as PASS (Potential Acid Sulfate Soils). The remaining carpark area on Lot DP1001454 surrounding the Railway Park did not trigger PASS criteria.

Based on the results of the sampling it is recommended that the northern section of the carpark be treated as ASS and dosed with lime at a rate of 3.8kg/tonne dry weight. As an appropriate management method, it was recommended that an ASS management plan be developed as part of detailed planning for the site development taking into consideration excavation depth, stockpiling of material and length of exposure of the material.

Based on the report it is considered that further investigation is not required and that the site is suitable for the proposed carpark development use. A copy of the Preliminary Contamination and ASS Report is included under **Appendix I**.

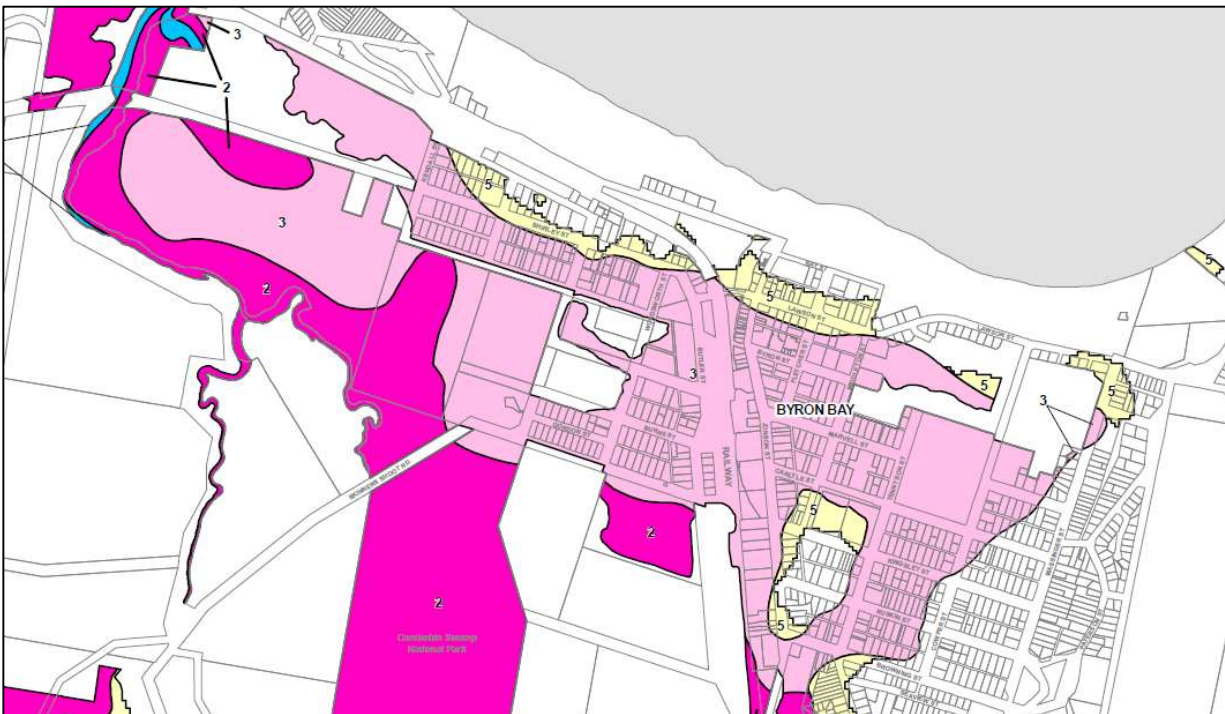


Figure 7: ASS planning maps of the subject site and surrounding area.

6.3.2 Potential impacts

The proposal would see the exposure of potential acid sulfate soils during preliminary site works which has the potential to produce sulfuric acid and acidic run-off when exposed to oxygen. Sources of ground disturbance during construction would occur from the following activities.

- Excavation; and
- Works greater than 1m below the natural ground level.

6.3.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Acid Sulfate Soils	14. Application of a guard layer of agricultural lime to base of specified ASS area and use of mechanical mixing methods.	Contractor	Pre-construction
Acid Sulfate Soils	15. Soil validation testing shall be undertaken for any excavated soil. If validation testing indicates excavation material below action criteria, soil is to be removed from site as required for final disposal.	Contractor	Construction
Acid Sulfate Soils	16. All water discharged from the site to be contained, collected and treated to meet adopted water quality criteria.	Contractor	Construction
Acid Sulfate Soils	17. Treatment of water within ASS treatment area may include dosing with hydrated lime at appropriate rates to ensure discharge pH 6.5 – 8.5.	Contractor	Construction
Acid Sulfate Soils	18. Records to be kept by the Site Manager on the monitoring activities, complaints received, and control actions subsequently taken. Records to be made available to Byron Shire Council, Office of Environment and Heritage, Office of Water as requested.	Contractor	Construction
Acid Sulfate Soils	19. Acid Sulfate Soil management measures are not to be ceased until the works are complete and ASS areas are stabilised.	Contractor	Construction
Acid Sulfate Soils	20. A progressive Acid Sulfate Soils Management plan is to be prepared for the works and incorporated into a CEMP.	Contractor	Pre-construction

6.4 Waterways and Water Quality

6.4.1 Existing environment

There are no permanent water bodies within close proximity to the subject site. There is no piped stormwater drainage network within either car park therefore stormwater drainage is generally limited and via overland flow through low points in the topography.

A stormwater drainage pipe is located at the northern end of the South Lawson Street Car Park which drains in westerly direction to open space on the western side of the railway line.

Stormwater is generally not treated. The quality of the water entering receiving environment is therefore largely a function of the contaminants in the stormwater system. Common stormwater pollutants include litter, chemicals (detergents, oils, fertilisers), sediments and organic waste.

6.4.2 Potential impacts

During construction, the disturbance of soils would create the potential for the mobilisation of sediment. The potential for accidental spill and leaks are a further issue. These potential impacts are

considered manageable and have been addressed through the proposed safeguards and mitigation measures. The proposed upgrade of this existing overland flow with a new trunk system will result in improved surface conditions and not reduce water quality.

6.4.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Water Quality	21. There is to be no release of dirty water into drainage lines and/or waterways.	Contractor	All times during the project
Water Quality	22. Water quality control measures are to be used to prevent any materials (eg. concrete, grout, sediment etc) entering drain inlets or waterways.	Contractor	Construction
Water Quality	23. Stabilised construction access would be provided to all work areas.	Contractor	Construction
Water Quality	24. Works would be stopped if conditions are not suitable, such as during heavy rain or high winds	Contractor	Construction
Water Quality	25. Construction works would be managed such that areas outside the scope of works would remain undisturbed.	Contractor	Construction
Water Quality	26. Potable water is to be used for wash down.	Contractor	Construction
Water Quality	27. Erosion and sediment controls would be inspected regularly by the site supervisor throughout construction and within 24 hours of a major rainfall event to ensure they are maintained in proper working order throughout the time they are in place.	Contractor	Construction
Water Quality	28. The condition of sediment control structures would be monitored and maintained in proper working order throughout the time they are in place. They would be kept clear of debris at all times and cleared of sediment if filled >50%.	Contractor	Construction
Water Quality	29. Procedures and measures for reporting, management and clean-up of spills of any fuels, chemicals or other potentially contaminating items is to be incorporated into the construction environmental management.	Project manager	Pre-construction
Water Quality	30. If stored on site, chemicals and fuels would be stored within bunded areas. Spill kits are to be kept on-site.	Contractor	All times during the project

Impact	Environmental safeguards	Responsibility	Timing
Water Quality	31. All spills are to be reported to the Site Manager and Environmental Officer.	Contractor	All times during the project

6.5 Noise and Vibration

6.5.1 Existing environment

The subject site is located within the town centre of Byron Bay and has a relatively high background noise level. Land uses adjoining the site comprise of commercial use as well as business and retail. Residential and tourist accommodation is also present within the surrounding area.

6.5.2 Potential impacts

The proposed activity has the potential to cause an increase in noise levels at the site during the construction phase. Increases in noise would be attributed to construction plant and machinery. This impact, however, is not considered to be significant due to

- The temporary, short term nature of construction (2 months)
- The existing high noise environment
- The restricted construction hours
- The separation distances between the construction footprint and the surrounding residential areas

Noise that would be generated as part of the proposal is considered manageable and can be addressed through the proposed safeguards and mitigation measures.

6.5.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Noise	32. Works to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). No works would be undertaken on Sundays or public holidays.	Contractor	Construction
Noise	33. The idling of machinery and equipment when not in use and for prolonged periods of time should be avoided at all times.	Contractor	Construction
Noise	34. Use of noisy plant simultaneously and/or close together, adjacent to sensitive receivers would be avoided where possible.	Contractor	Construction
Noise	35. Plant operators would be instructed to operate equipment in a manner that does not generate unnecessary noise such as avoiding excessive revving or avoiding dragging objects or dropping objects from a height	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Noise	36. Reversing of vehicles would be minimised where possible to alleviate the annoyance of beeping reverse alarms (or less tonal 'broadband' or 'quacker' type alarms would be utilised	Contractor	Construction
Noise	37. Complaint based monitoring would be performed throughout construction as required to confirm the effectiveness of noise management controls	Contractor	Construction
Noise	38. A noise complaint register would be developed if required and maintained throughout construction. The register would record all complaints including: Complainant contact details, Source/type of noise causing disturbance, time and duration of noise causing disturbance, times when the noise disruption would cause least disruption, measures taken to address the complaint.	Contractor	Construction
Noise	39. All machines would be in good working condition, with particular attention to exhaust silencers, engine covers and other noise reduction devices.	Contractor	Construction

6.6 Air Quality

6.6.1 Existing environment

There are no known air quality monitoring stations near the subject site, however, air quality at the site is expected to be good given its location in a coastal area with no major polluting industries in the vicinity.

6.6.2 Potential impacts

The proposed activity has the potential to cause minor reductions in localised air quality through emissions from vehicles, machinery and equipment.

Additionally, dust would also likely be generated during earthworks for the proposal. The amount of dust generated would depend on a number of factors including the silt and moisture content in the soil and the types of activities being undertaken. It is expected that the major sources of dust during construction of the proposal would occur during excavations for the stormwater drainage and regrading of the car park areas.

Given the relatively minor disturbance footprint, impacts to air quality are considered manageable and can be addressed through the proposed safeguards and mitigation measures.

6.6.3 Safeguards and management measures

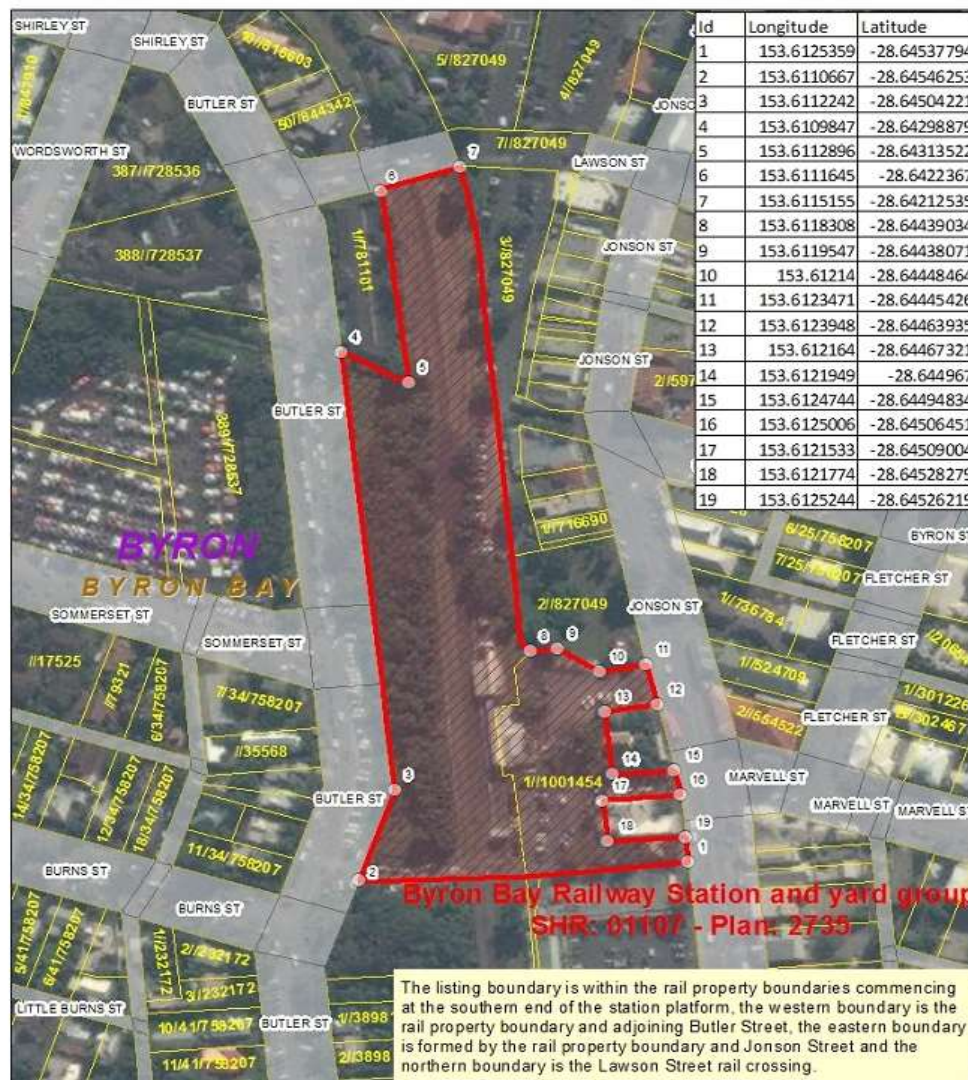
Impact	Environmental safeguards	Responsibility	Timing
Air Quality	40. Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction
Air Quality	41. Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction
Air Quality	42. Vegetation or other materials are not to be burnt on site.	Contractor	All times during the project
Air Quality	43. Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.	Contractor	All times during the project
Air Quality	44. Stockpiles or areas that may generate dust are to be managed to suppress dust emissions.	Contractor	Construction
Air Quality	45. All stationary vehicles and equipment not in use will be switched off.	Contractor	All times during the project
Air Quality	46. Areas of disturbance would be managed at any one time	Contractor	Construction
Air Quality	47. All disturbed surfaces would be reinstated and stabilised as soon as possible after completion.	Contractor	Construction

6.7 Non-Aboriginal Heritage

6.7.1 Existing environment

Searches of the RTA section 170 register, NSW Heritage database, Commonwealth EPBC heritage list, Australian Heritage Places Inventory and Byron Local Environmental Plan heritage mapping identified that the subject site forms part of the state significant Byron Bay Railway Station and yard group (Heritage listing number 01107). This listing is described as *“a coherent group of railway buildings with good detailing and containing a number of unusual features including the round water tank on a brick base and the railway hotel attached to the station building. The station building is an excellent example of the timber standard roadside type and the location of the station and residence in the main street of Byron bay contribute in a significant way to the streetscape of the town. The water tank is one of two tanks of this design known to survive and is therefore of high significance”*.

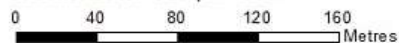
The area in which this listing incorporates is identified in Figure 8 below.



State Heritage Register - SHR 01107, Plan 2735

Byron Bay Railway Station and yard group

Gazettal Date: 02 April 1999



Scale: 1:2,500
Datum/Projection: GCS GDA 1994



Legend

- SHR Curtilage
- Land Parcels
- LGAs
- Suburbs
- Roads

Figure 8: Aerial photograph showing the extent of area incorporated into the state significant Byron Bay Railway Station and yard group (Heritage listing number 01107).

Additionally, the Byron Bay LEP identifies the cottage located at 86 Johnson Street as also being of local significance. This building forms part of the Railway Precinct, Byron Bay Conservation Area as identified in Part C, Chapter C1 – Non Indigenous Heritage of the Development Control Plan 2014 (DCP). The DCP identifies this area as comprising a group of civic buildings around Railway Park, creating a link to Byron's past history. The significance of the precinct is described in the DCP as follows:

“The place is a group of modest civic buildings and landscape elements, which help define both the historical antecedents and the locus of community activity in the township of Byron Bay. Its current elements together form an unbroken link with the first settlement of the township. Although the passage of years has wrought cosmetic changes to the area (such as some kerbing and guttering, road sealing, footpath, public toilet and telephone installations) and renovations to many of the buildings, the character of the location remains intact, despite progressive redevelopment of the remainder of the township. The landscape remains an open area, from the central point of which all but one element can be seen. An aesthetically pleasing aspect of the landscape is that the area contains only one building of two storeys (The Community Centre), on the eastern perimeter.”

Chapter C1 of the DCP identifies the policy outcomes for this precinct to include:

1. Retain all attributes of the Heritage Conservation Area that demonstrate its heritage character and significance including: built form; modest height, bulk and scale; focus on the community space and landscape around Railway Park; civic streetscape character; pattern of subdivision development; and all original external fabric.
2. The relationship of former civic structures (railway station, post office and school of arts) should not be diminished by any development that would cause visual dislocation. The open space should be retained.
3. Development must foster integration of the site with the surrounding pedestrian network and open spaces.
4. On-site parking, underground parking and vehicle driveways across the footpath are not compatible in this precinct.

The proposal is consistent with the requirements and guidelines of the DCP, SEPP, the Guidelines within the Clauses 78-82 and best practice in relation to matters of Heritage impacts & mitigation measures. A Heritage Impact Statement dated August 2016 is attached as **Appendix G**, and the Heritage Impact Statement – Addendum, dated September 2016 is attached as **Appendix H**. An exemption from the need for a Section 60 approval under the Heritage Act 1977 is attached as **Appendix J**.

Since obtaining this exemption, the project team have continued to refine the design and detail for the proposed works, which has included realignment to the proposed stormwater system from what was considered under the original exemption. Consultation has been undertaken with the Office of Environment and Heritage regarding the matter. It has been confirmed that there are no concerns regarding the modifications; however, a new exemption is required merely as a procedural requirement due to legislation wording under the Heritage Act. A new exemption has been sought in this case and will be appended to this REF once obtained.

6.7.2 Potential impacts

The proposed car park upgrade is a formalisation of an existing use and would not detract from the heritage character of existing buildings within the precinct. In considering the policy outcomes for the Railway Precinct, Byron Bay Conservation Area as identified in the DCP it is noted that policy outcome

4 explicitly states that on-site parking, underground parking and vehicle driveways across the footpath are not compatible in this precinct. In assessing this impact it is inferred that this outcome relates to the existing grassed open space park area of Railway Park and not the existing car park areas. Furthermore, the proposal would retain open space such that the relationship of the form civic structures would not be diminished in a way that it would cause visual dislocation at the site. In addition, the proposed footpath network as part of the development would integrate the car park areas with the existing surrounding pedestrian network and open spaces.

Notwithstanding, the state significant Byron Bay Railway Station and adjoining land is mapped as occurring over the subject site. Under the Heritage Act any works proposed for State Heritage Register items need to be assessed and approved by the Heritage Council to ensure that the heritage significance of the item will not be adversely affected. However, for minor works which would have minimal impact on the heritage significance of a listed place, the Heritage Act allows the Minister for Planning, on the recommendation of the Heritage Council, to grant exemptions for certain activities which would otherwise require approval under Section 60 of the NSW Heritage Act.

Under the Standard Exemptions, Exemption Number 7: *Minor works with little or no adverse heritage impacts* and Exemption No. 4 – *Excavation* are considered applicable to the proposal. In light of the above, an exemption was sought from the Heritage Council for the proposed works. An exemption for the proposed works was granted under delegation on 3 January 2017; a copy of which is attached as **Appendix J**.

Since obtaining this exemption, the project team have continued to refine the design and detail for the proposed works, which has included realignment to the proposed stormwater system from what was considered under the original exemption. Consultation has been undertaken with the Office of Environment and Heritage regarding the matter. It has been confirmed that there are no concerns regarding the modifications; however, a new exemption is required merely as a procedural requirement due to legislation wording under the Heritage Act. A new exemption has been sought in this case and will be appended to this REF once obtained.

6.7.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Non-Aboriginal Heritage	48. The existing known heritage items; being the cottage at 86 Johnson Street and the Byron Bay Railway Station, are to be protected where necessary to prevent any potential damage or disturbance.	Contractor	All times during the project
Non-Aboriginal Heritage	49. If any item is found which is thought to be a European Heritage relic, work would stop immediately and the item be demarcated. The Project Manager would be responsible for arranging an in-situ heritage assessment to determine whether the item is a relic. If the item is concluded to be a relic, the Project Manager shall notify the	Contacto	All times during the project

Impact	Environmental safeguards	Responsibility	Timing
	NSW Heritage Council as soon as practical. The NSW Heritage Council would advise the appropriate course of action to be taken.		
Non-Aboriginal Heritage	50. If any item is found which is thought to be suspected human remains, work would stop immediately and the item be demarcated. The Project Manager would be responsible for contacting the NSW police or NSW Coroner. If these remains are deemed to require archaeological investigation then OEH must be notified.	Contractor	All times during the project
Non-Aboriginal Heritage	51. The recommendations provided in the Heritage Impact Statement and the Addendum are to be implemented as part of the proposal.	Contractor	Construction
Non-Aboriginal Heritage	52. Site induction provided to all Council staff and project subcontractors to ensure awareness of the responsibilities under the NSW Heritage Act.	Contractor	Pre-Construction

6.8 Aboriginal Heritage

6.8.1 Existing environment

The subject site is located within the town centre of Byron Bay. The site currently exists as informal car parking areas bound by the former railway line to west and business/commercial development to the south.

The AHIMS search and OEH Site Cards did not identify Aboriginal objects or places in the study area

6.8.2 Potential impacts

Preliminary investigations found no major Aboriginal heritage issues or constraints at the site. The site is highly disturbed from past and current land uses and given the minor nature of the works it is considered unlikely that the disturbance footprint would contain items of Aboriginal cultural heritage.

6.8.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Aboriginal Heritage	53. Under Section 90(1) of the National Parks and Wildlife Act 1974 (NPW Act), it is an offence for a person who without obtaining the consent of the Director General, knowingly destroys, defaces or damages or knowingly causes or permits destruction or defacement or damage to a relic or Aboriginal place	Contractor	All times during the project
Aboriginal Heritage	54. If materials are found which are believed to be Aboriginal sites or cultural remains, the works are to stop immediately in the vicinity of the find. In such an instance, it is the responsibility of the Project Manager (or delegate) to contact the Principals Representative who on turn would contact the relevant OEH Aboriginal Heritage Conservation Unit and advise of the appropriate course of action.	Contractor	All times during the project

6.9 Traffic and Transport

6.9.1 Existing environment

The subject site comprises two gravel car park areas within the town centre of Byron Bay. Parking and traffic flows are both informal at the site.

6.9.2 Potential impacts

During construction the car park areas would be temporarily closed for public safety reasons and to ensure compliance with Workplace Health and Safety legislation. The closure of the car parks would result in the temporary loss of some car parking within the town center whilst works are being carried out.

Given that both sites are located within car parks removed from the main roads, the proposal is unlikely to significantly impact upon the flows of traffic on the local road network. Notwithstanding, the works would require a relatively small amount of labour that would travel to and from the site daily and would provide a minor contribution to traffic volumes. Additionally, the proposed works would also require the transportation of materials and machinery to and from the site throughout the construction period.

Once complete, the broader community would benefit from the upgrade of the car park through the formalisation of the assets and the improvement in public infrastructure. The proposal would not increase the volume of traffic at the site.

6.9.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Traffic	55. Traffic controllers would be utilised when necessary to manage traffic during construction and to ensure the safety of workers, motorists and pedestrians.	Contractor	All times during the project
Traffic	56. Where works would result in delays to traffic, they would be scheduled to occur outside of morning and afternoon peak traffic periods.	Contractor	All times during the project
Traffic	57. Parking for construction workers would be accommodated within the construction site where possible.	Contractor	All times during the project
Traffic	58. A traffic management plan would be prepared prior to the commencement of works and implemented during construction	Contractor	All times during the project

6.10 Contaminated Lands

6.10.1 Existing environment

No known contamination is present on or in the vicinity of the subject site. A search of the Environmental Protection Agency (EPA) 'List of NSW contaminated sites notified to the EPA' and the 'Contaminated Land: Record of Notices' undertaken on 15th July 2016 and 1st September 2016 has not identified the site or any nearby sites as contaminated.

Additionally, there was no visible staining, chemical residue, asbestos residue or evidence of contamination at the site at the time of inspection (12th July 2016). 22 Soil samples from 18 drill holes across the site were analysed, with most results showing no exceedance of National Environmental Protection (Assessment of Site Contamination) Measure (NEPM 2013) Soil and Water – Commercial and Industrial levels. Two (2) samples showed elevated concentrations of Benzo(a)Pyrene (BH5 and BH7), likely due to minor contamination of vehicle by-products or residual tar.

Due to the location of the site being within a business district area and the nature of the works planned for the site, this result has limited potential impact to the surrounding environment ecology. The Preliminary Contamination and ASS Report is attached as **Appendix I**.

6.10.2 Potential impacts

The proposal would see the potential exposure of possible contaminated soils during preliminary site works. Sources of ground disturbance during construction would occur from the following activities.

- Excavation; and

- Works greater than 1m below the natural ground level.

6.10.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Contamination	59. Works would cease immediately if any potential source of contamination (e.g. chemical drums or asbestos material) is uncovered during construction.	Contractor	All times during the project

6.11 Socio-Economic Considerations

6.11.1 Potential impacts

The proposal would not adversely affect any key social infrastructure. Business operations immediately adjoining the car park areas would likely be temporarily impacted to some extent during the construction phase.

Overall, the broader community would benefit from the upgrade of the car park through the formalisation of the assets and the improvement in public infrastructure. Additionally, the provision of metred parking once complete would provide an additional revenue stream for Council which would be reinvested back into the community.

6.11.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Socio-Economic	60. Consultation is to be undertaken with affected business owners.	Project manager	Pre-construction
Socio-Economic	61. Complaints received are to be recorded and attended to promptly.	Contractor	All times during the project
Socio-Economic	62. Traffic delays are to be kept to a minimum.	Contractor	All times during the project

6.12 Landscape Character & Visual Amenity

6.12.1 Existing environment

The visual environment is characterised by the car parks with surrounding urban landscapes. Prominent views or vistas were not noted at the site and the surrounding area was considered to generally be of low to moderate visual quality.

6.12.2 Potential impacts

Construction works for the proposed car park upgrade would have a minor short-term impact on the amenity of the site and its immediate surrounds. Potential impacts would be associated with the presence of plant, equipment, and material stockpiles. Additionally, construction works would also result in an increase in noise as well as limitation to public access for safety reasons.

In the longer term, the proposed upgrade works would renew the existing car park areas which are considered to be in a deteriorated condition. Four existing trees within the car park areas would be removed, however, it is considered that these currently provide minimal amenity value. It is expected that the works would improve the amenity of site through the formalisation of the use of the area as well as through the incorporation of soft landscaping.

6.12.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Visual Amenity	63. The proposed works would be managed such that the amount of disturbance at any one time would be minimised.	Contractor	Construction
Visual Amenity	64. Areas of disturbance would be reinstated immediately following construction.	Contractor	Construction
Visual Amenity	65. All construction plant, equipment, materials and waste would be removed from the site at the completion of works.	Contractor	Construction

6.13 Waste

6.13.1 Potential impacts

The proposal is not expected to generate large quantities of waste materials. The following waste streams have been identified.

- Bitumen, concrete, gravel and asphalt from existing pavement.
- Concrete washout.
- Spoil
- Vegetation
- Discarded stormwater pipes and fittings
- Cleared turf/grasses and trees.
- General garbage and refuse.

6.13.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Waste	66. Site inductions must include appropriate waste management actions.	Contractor	All times during the project
Waste	67. Resource management hierarchy principles are to be followed: <ul style="list-style-type: none"> • Avoid unnecessary resource consumption as a priority. • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery). 	Contractor	All times during the project

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> Disposal is undertaken as a last resort (in accordance with the Waste Avoidance & Resource Recovery Act 2001) 		
Waste	68. Bulk project waste (eg. fill) sent to a site not owned by Council (excluding Office of Environment and Heritage licensed landfills) for land disposal is to have prior formal written approval from the landowner.	Project manager	All times during the project
Waste	69. There is to be no disposal or re-use of construction waste onto other land.	Contractor	All times during the project
Waste	70. Waste is not to be burnt on site.	Contractor	All times during the project
Waste	71. Waste material is not to be left on site once the works have been completed.	Contractor	Post-Construction
Waste	72. Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction
Waste	73. Garbage receptacles must be provided and recycling of materials encouraged.	Contractor	All times during the project
Waste	74. Portable toilets must be provided for construction workers.	Contractor	All times during the project

6.14 Cumulative Impacts

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal and the additive effects of the proposal with other external projects. Under Clause 228 (2) of the Environmental Planning and Assessment Regulation, proposed activities are required to take into account potential cumulative impacts as a result of the proposal.

The proposal will see a number of both beneficial and adverse impacts. The proposed works may produce greenhouse gas emissions and includes the removal of limited natural habitat. Due to the small scope of the project, these impacts do not have the potential to have a significant cumulative environmental effect on existing or likely future activities. The potential impacts on the environment would be minimised with the implementation of the safeguards given in this REF.

The proposed works would not significantly increase demands on resources, which are, or are likely to become, in short supply. Relatively small amounts of materials would be required for the proposed works. The safeguards listed in this REF would be implemented to minimise any impacts.

6.15 Summary of beneficial effects

- Improved public parking facilities
- Improved stormwater drainage in the area
- Improved lighting and public safety
- Improved footpath network

6.16 Summary of adverse effects

- Tree removal
- Temporary traffic delays during construction
- Temporary loss of parking during construction
- Temporary increased risk of spills and contamination.
- Temporary increased risk of occurrence of erosion and sedimentation runoff.

7 Environmental management

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) and a Construction Environmental Management Plan (CEMP) would be prepared to describe safeguards and management measures identified. These plans will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The plans will be prepared prior to construction of the proposal and must be reviewed and certified by Transport for NSW and Byron Shire Council, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and PEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and the QA Specification G40 – Clearing and Grubbing.

All construction staff and site personnel must be made aware of their environmental responsibilities and safeguard measures from the REF, Decision Memo, Byron Shire Council Specifications and CEMP to minimise environmental impacts. An on-site meeting must be held with each relevant contractor, construction staff member, site personnel, Transport for NSW and Byron Shire Council project staff before the commencement of works/activities. This includes site establishment.

The purpose of the meeting is to discuss the environmental safeguards/approval conditions that are required to be implemented for the relevant phase of works. The meeting shall also include relevant environmental awareness and toolbox talks. Relevant environmental aspects to be considered for environmental awareness/toolbox training are to include the limit of works, environmentally sensitive areas (i.e adjacent open forest which provides threatened species habitat), maintenance of water quality and pollution prevention, erosion and sedimentation control and native flora and fauna protection measures. Environmental awareness / toolbox talks must commence early in the program and continue as new personnel/contractors are engaged.

7.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 4.

Table 4: Summary of site specific environmental safeguards.

No.	Impact	Environmental safeguards	Responsibility	Timing
1	Biodiversity	All works with regards to vegetation clearing and working within proximity to vegetation to be retained is to be undertaken in accordance with the RMS Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process).	Contractor	All Times during the project
2	Biodiversity	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the RMS Unexpected Threatened Species Find Procedure in the RMS Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process). Contact the Local Environment Officer (LEO)	Contractor	All Times during the project
3	Biodiversity	To ensure that clearing impacts do not occur outside of the designated construction zone it will be necessary to clearly identify and mark the boundary of the work zones prior to construction. Such boundaries are to be protected via high visibility fencing, sediment fencing and/or signage identifying that no construction activities (including temporary storage, stockpiling, vehicle movement etc.) are permitted beyond.	Contractor	Pre-Construction
4	Biodiversity	The following activities should not be conducted in areas of vegetation to be retained: <ul style="list-style-type: none"> • Storage and mixing of materials; • Vehicle parking or maneuvering; • Liquids disposal; • Machinery repairs or refuelling; • Site office and/or shed erection; • Lighting of fires; • Rubble, soil or debris stockpiling; and • Excavation. 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
5	Biodiversity	Within the designated development/construction zone identification of areas to be cleared are to be pre-assessed by an experienced ecologist/wildlife spotter/catcher. This pre-assessment shall allow for an inventory of fauna habitat components (i.e. birds nests, loose rocks providing reptile refuge, ground logs etc) to be undertaken prior to felling and construction works. A wildlife spotter catcher would be utilised during all phases of clearing of the site to ensure safe dispersal and relocation of native fauna.	Contractor	Pre-construction
6	Sediment & Erosion	Erosion and sediment control measures are to be implemented and maintained to: <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. • Reduce water velocity and capture sediment on site. • Minimise the amount of material transported from site to surrounding pavement surfaces. • Divert clean water around the site (in accordance with the Landcom / Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)). 	Contractor	Construction
7	Sediment & Erosion	All erosion and sediment controls would be inspected weekly and within 24 hours of a major rainfall event to ensure they are maintained in proper working order throughout the time they are in place	Contractor	All Times during the project
8	Sediment & Erosion	Stockpile sites would be located outside drainage flow paths at least 50m from the waterway and protected with sediment fencing	Contractor	Operation
9	Sediment & Erosion	Construction works would be managed such that areas outside the scope of the works remain as undisturbed as far as possible.	Contractor	Pre-Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
10	Sediment & Erosion	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) with records kept and provided on request.	Contractor	Construction
11	Sediment & Erosion	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	All Times during the project
12	Sediment & Erosion	Work areas are to be stabilised progressively during the works.	Contractor	Construction
13	Sediment & Erosion	A progressive erosion and sediment control plan is to be prepared for the works and incorporated into a CEMP.	Contractor	Pre-construction
14	Acid Sulfate Soils	Application of a guard layer of agricultural lime to base of specified ASS area and use of mechanical mixing methods.	Contractor	Pre-construction
15	Acid Sulfate Soils	Soil validation testing shall be undertaken for any excavated soil. If validation testing indicates excavation material below action criteria, soil is to be removed from site as required for final disposal.	Contractor	Construction
16	Acid Sulfate Soils	All water discharged from the site to be contained, collected and treated to meet adopted water quality criteria.	Contractor	Construction
17	Acid Sulfate Soils	Treatment of water within ASS treatment area may include dosing with hydrated lime at appropriate rates to ensure discharge pH 6.5 – 8.5.	Contractor	Construction
18	Acid Sulfate Soils	Records to be kept by the Site Manager on the monitoring activities, complaints received, and control actions subsequently taken. Records to be made available to Byron Shire Council, Office of Environment and Heritage, Office of Water as requested.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
19	Acid Sulfate Soils	Acid Sulfate Soil management measures are not to be ceased until the works are complete and ASS areas are stabilised.	Contractor	Construction
20	Acid Sulfate Soils	A progressive Acid Sulfate Soils Management plan is to be prepared for the works and incorporated into a CEMP.	Contractor	Pre-construction
21	Water Quality	There is to be no release of dirty water into drainage lines and/or waterways.	Contractor	All times during the project
22	Water Quality	Water quality control measures are to be used to prevent any materials (eg. concrete, grout, sediment etc) entering drain inlets or waterways.	Contractor	Construction
23	Water Quality	Stabilised construction access would be provided to all work areas.	Contractor	Construction
24	Water Quality	Works would be stopped if conditions are not suitable, such as during heavy rain or high winds	Contractor	Construction
25	Water Quality	Construction works would be managed such that areas outside the scope of works would remain undisturbed.	Contractor	Construction
26	Water Quality	Potable water is to be used for wash down.	Contractor	Construction
27	Water Quality	Erosion and sediment controls would be inspected regularly by the site supervisor throughout construction and within 24 hours of a major rainfall event to ensure they are maintained in proper working order throughout the time they are in place.	Contractor	Construction
28	Water Quality	The condition of sediment control structures would be monitored and maintained in proper working order throughout the time they are in place.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		They would be kept clear of debris at all times and cleared of sediment if filled >50%.		
29	Water Quality	Procedures and measures for reporting, management and cleanup of spills of any fuels, chemicals or other potentially contaminating items is to be incorporated into the construction environmental management.	Project manager	Pre-construction
30	Water Quality	If stored on site, chemicals and fuels would be stored within bunded areas. Spill kits are to be kept on-site.	Contractor	All times during the project
31	Water Quality	All spills are to be reported to the Site Manager and Environmental Officer.	Contractor	All times during the project
32	Noise	Works to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). No works would be undertaken on Sundays or public holidays.	Contractor	Construction
33	Noise	The idling of machinery and equipment when not in use and for prolonged periods of time should be avoided at all times.	Contractor	Construction
34	Noise	Use of noisy plant simultaneously and/or close together, adjacent to sensitive receivers would be avoided where possible.	Contractor	Construction
35	Noise	Plant operators would be instructed to operate equipment in a manner that does not generate unnecessary noise such as avoiding excessive revving or avoiding dragging objects or dropping objects from a height	Contractor	Construction
36	Noise	Reversing of vehicles would be minimised where possible to alleviate the annoyance of beeping reverse alarms (or less tonal 'broadband' or 'quacker' type alarms would be utilised	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
37	Noise	Complaint based monitoring would be performed throughout construction as required to confirm the effectiveness of noise management controls	Contractor	Construction
38	Noise	A noise complaint register would be developed if required and maintained throughout construction. The register would record all complaints including: Complainant contact details, Source/type of noise causing disturbance, time and duration of noise causing disturbance, times when the noise disruption would cause least disruption, measures taken to address the complaint.	Contractor	Construction
39	Noise	All machines would be in good working condition, with particular attention to exhaust silencers, engine covers and other noise reduction devices.	Contractor	Construction
40	Air Quality	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction
41	Air Quality	Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction
42	Air Quality	Vegetation or other materials are not to be burnt on site.	Contractor	All times during the project
43	Air Quality	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.	Contractor	All times during the project
44	Air Quality	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
45	Air Quality	All stationary vehicles and equipment not in use will be switched off.	Contractor	All times during the project
46	Air Quality	Areas of disturbance would be managed at any one time	Contractor	Construction
47	Air Quality	All disturbed surfaces would be reinstated and stabilised as soon as possible after completion.	Contractor	Construction
48	Non-Aboriginal Heritage	The existing known heritage items; being the cottage at 86 Johnson Street and the Byron Bay Railway Station, are to be protected where necessary to prevent any potential damage or disturbance.	Contractor	All times during the project
49	Non-Aboriginal Heritage	If any item is found which is thought to be a European Heritage relic, work would stop immediately and the item be demarcated. The Project Manager would be responsible for arranging an in-situ heritage assessment to determine whether the item is a relic. If the item is concluded to be a relic, the Project Manager shall notify the NSW Heritage Council as soon as practical. The NSW Heritage Council would advise the appropriate course of action to be taken.	Contactactor	All times during the project
50	Non-Aboriginal Heritage	If any item is found which is thought to be suspected human remains, work would stop immediately and the item be demarcated. The Project Manager would be responsible for contacting the NSW police or NSW Coroner. If these remains are deemed to require archaeological investigation then OEH must be notified.	Contactactor	All times during the project
51	Non-Aboriginal Heritage	The recommendations provided in the Heritage Impact Statement and the Addendum are to be implemented as part of the proposal.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
52	Non-Aboriginal Heritage	Site induction provided to all Council staff and project subcontractors to ensure awareness of the responsibilities under the NSW Heritage Act.	Contractor	Pre-Construction
53	Aboriginal Heritage	Under Section 90(1) of the <i>National Parks and Wildlife Act 1974</i> (NPW Act), it is an offence for a person who without obtaining the consent of the Director General, knowingly destroys, defaces or damages or knowingly causes or permits destruction or defacement or damage to a relic or Aboriginal place	Contractor	All times during the project
54	Aboriginal Heritage	If materials are found which are believed to be Aboriginal sites or cultural remains, the works are to stop immediately in the vicinity of the find. In such an instance, it is the responsibility of the Project Manager (or delegate) to contact the Principals Representative who on turn would contact the relevant OEH Aboriginal Heritage Conservation Unit and advise of the appropriate course of action.	Contractor	All times during the project
55	Traffic	Traffic controllers would be utilised when necessary to manage traffic during construction and to ensure the safety of workers, motorists and pedestrians.	Contractor	All times during the project
56	Traffic	Where works would result in delays to traffic, they would be scheduled to occur outside of morning and afternoon peak traffic periods.	Contractor	All times during the project
57	Traffic	Parking for construction workers would be accommodated within the construction site where possible.	Contractor	All times during the project

No.	Impact	Environmental safeguards	Responsibility	Timing
58	Traffic	A traffic management plan would be prepared prior to the commencement of works and implemented during construction	Contractor	All times during the project
59	Contamination	Works would cease immediately if any potential source of contamination (e.g. chemical drums or asbestos material) is uncovered during construction.	Contractor	All times during the project
60	Socio-Economic	Consultation is to be undertaken with affected business owners.	Project manager	Pre-construction
61	Socio-Economic	Complaints received are to be recorded and attended to promptly.	Contractor	All times during the project
62	Socio-Economic	Traffic delays are to be kept to a minimum.	Contractor	All times during the project
63	Visual Amenity	The proposed works would be managed such that the amount of disturbance at any one time would be minimised.	Contractor	Construction
64	Visual Amenity	Areas of disturbance would be reinstated immediately following construction.	Contractor	Construction
65	Visual Amenity	All construction plant, equipment, materials and waste would be removed from the site at the completion of works.	Contractor	Construction
66	Waste	Site inductions must include appropriate waste management actions.	Contractor	All times during the project

No.	Impact	Environmental safeguards	Responsibility	Timing
67	Waste	Resource management hierarchy principles are to be followed: Avoid unnecessary resource consumption as a priority. Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery). Disposal is undertaken as a last resort (in accordance with the Waste Avoidance & Resource Recovery Act 2001)	Contractor	All times during the project
68	Waste	Bulk project waste (eg. fill) sent to a site not owned by Council (excluding Office of Environment and Heritage licensed landfills) for land disposal is to have prior formal written approval from the landowner.	Project manager	All times during the project
69	Waste	There is to be no disposal or re-use of construction waste onto other land.	Contractor	All times during the project
70	Waste	Waste is not to be burnt on site.	Contractor	All times during the project
71	Waste	Waste material is not to be left on site once the works have been completed.	Contractor	Post-Construction
72	Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction
73	Waste	Garbage receptacles must be provided and recycling of materials encouraged.	Contractor	All times during the project
74	Waste	Portable toilets must be provided for construction workers.	Contractor	All times during the

No.	Impact	Environmental safeguards	Responsibility	Timing
				project

7.3 Licensing and approvals

Table 5: Summary of licensing and approval required.

Requirement	Timing
Section 143 Notice under the Protection of the Environment Operations Act 1997	Prior to relocation of site spoil (if required)

8 Conclusion

8.1 Justification

The proposal would have minimal adverse impact during the construction phase, with construction related impacts manageable through the implementation of safeguards and mitigation measures. Benefits associated with the proposal would be improved public parking infrastructure, stormwater drainage and public safety with the Byron Bay town centre.

On balance, the benefits derived from proceeding with the proposal are considered to outweigh the potential impacts

8.2 Objects of the EP&A Act

Object	Comment
1.3(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,	The works will not negatively impact on the State's resources and will promote a better environment through improved public services.
1.3(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,	Ecologically sustainable development is considered in Sections 8.2.1 – 8.2.4 below.
1.3(c) to promote the orderly and economic use and development of land,	The proposed car park upgrade is consistent with the co-ordination and orderly economic use and development of land.
1.3(d) to promote the delivery and maintenance of affordable housing,	Not relevant to the project.
1.3(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,	An assessment of the proposals impact upon threatened species, populations and ecological communities and their habitat has been undertaken and has been concluded that the proposal is unlikely to threaten any such threatened species, population or ecological communities.
1.3(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),	The works will improve the appearance and use of the built environment, without impacting cultural heritage.
1.3(g) to promote good design and amenity of the built environment,	The works will improve the appearance and use of the built environment
1.3(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,	Not relevant to the project.
1.3(i) to promote the sharing of the	Not relevant to the project.

responsibility for environmental planning and assessment between the different levels of government in the State,	
1.3(j) to provide increased opportunity for community participation in environmental planning and assessment.	Not relevant to the project.

8.2.1 The precautionary principle

The precautionary principle deals with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

The threat of serious or irreversible environmental damage is one of the essential preconditions to the engagement of the precautionary principle. As no threat of serious or irreversible environmental damage has been identified the precautionary principle does not operate.

8.2.2 Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations. The impacts of the proposal have been identified as short term and manageable. Benefits would be experienced over a longer period.

8.2.3 Conservation of biological diversity and ecological integrity

The twin principles of biodiversity conservation and ecological integrity have been a consideration during the course of the design and assessment process with a view to identifying, avoiding, minimising and mitigating impacts. The proposal is not expected to have significant impacts on biodiversity.

8.2.4 Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by a project, including air, water, land and living things.

While it is often difficult to place a reliable monetary value on the residual, environmental and social effects of the project, the value placed on environmental resources within and around the corridor is evident in the extent of environmental investigations, planning and design of impact mitigation measures to prevent adverse environmental impacts.

8.3 Conclusion

The proposed car park upgrade does not require development consent and is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. This has included consideration of conservation agreements and plans of management under the

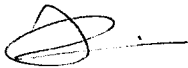
NPW Act, Biodiversity Conservation Management Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on biodiversity through the removal of trees. Mitigation measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also see the existing car park areas within the town centre of Byron Bay upgraded and formalised. On balance the proposal is considered justified.

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval under Division 5.1 of the EP&A Act nor would a Species Impact Statement be required. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

9 Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.



Adam Smith
Director
Planit Consulting Pty Ltd
Date: 18/06/2018

I have examined this review of environmental factors and the certification by Adam Smith from Planit Consulting Pty Ltd and accept the review of environmental factors on behalf of Transport for NSW.



Dan Champness
Property Manager, Country Rail Contracts
Transport for NSW
Date: 19-6-18

10 References

DECCW, 2009. Interim Construction Noise Guidelines.

DECCW, 2010. Aboriginal Cultural Heritage Consultation Requirements for Proponents

Landcom, 2004. NSW Soils and Construction – Managing Urban Stormwater Volume 1 “the Blue Book”

RMS Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI)

RTA, 2004. RMS’s Erosion and Sedimentation Risk Assessment Procedure

RTA, 2009. Guidelines for Landscape Character and Visual Impact Assessment.

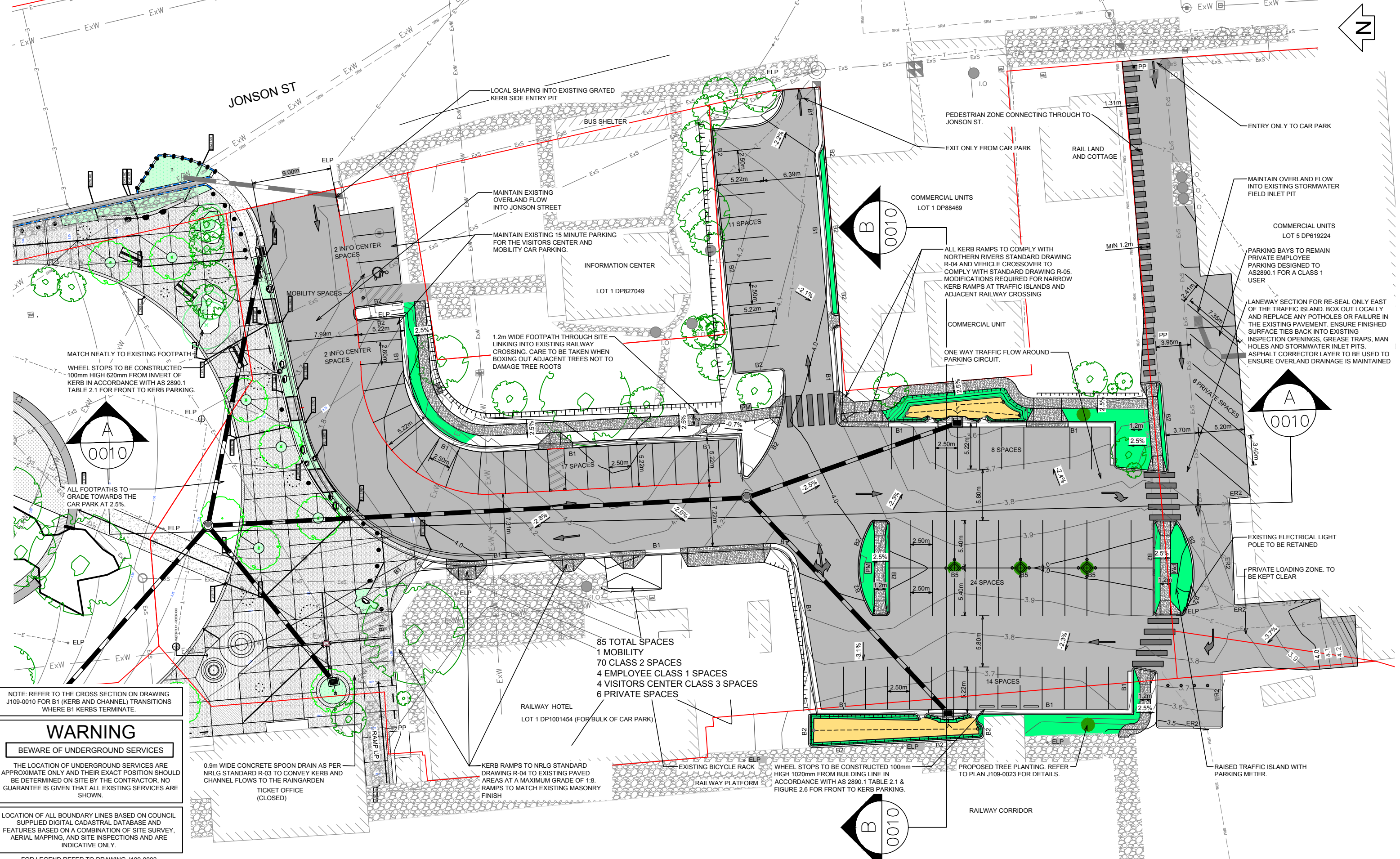
RTA, 2010. Traffic Control at Work Sites Manual Version 4.

Terms and acronyms used in this REF

CEMP	Construction environmental management plan
EIA	Environmental impact assessment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)
QA Specifications	Specifications developed by Roads and Maritime Services for use with roadworks and bridgeworks contracts let by Roads and Maritime Services
POEO	<i>Protection of Environment Operations Act 1997</i> (NSW)
ECRTN	<i>Environmental Criteria for Road Traffic Noise</i>
ENMM	<i>Environmental Noise Management Manual</i>

Appendix A

Development Plans



NOTE: REFER TO THE CROSS SECTION ON DRAWING J109-0010 FOR B1 (KERB AND CHANNEL) TRANSITIONS WHERE B1 KERBS TERMINATE.

WARNING

BEWARE OF UNDERGROUND SERVICES

THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE DETERMINED ON SITE BY THE CONTRACTOR, NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

LOCATION OF ALL BOUNDARY LINES BASED ON COUNCIL SUPPLIED DIGITAL CADASTRAL DATABASE AND FEATURES BASED ON A COMBINATION OF SITE SURVEY, AERIAL MAPPING, AND SITE INSPECTIONS AND ARE INDICATIVE ONLY.

FOR LEGEND REFER TO DRAWING J109-0002.

PRELIMINARY ISSUE

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	ISSUED FOR REVIEW	12/07/2016	SA	SA	SM	SM
B	ISSUED FOR HERITAGE REVIEW	11/08/2016	SA	SA	SM	SM
C	ISSUED FOR CONSTRUCTION CERTIFICATE	6/09/2016	SA	SA	RW	SM
D	ANGLE PARKING & Ø 675mm SW REPLACED WITH CULVERT	13/10/2016	SA	SA	SM	SM
E	RAINGARDEN AMENDMENT	1/01/2017	SA	SA	SM	SM
F	AMENDED FOR INTERNAL PARK TIE IN	15/06/2018	SA	SA	MP	SM

SCALE: 0 2 4 8 12
FULL SIZE 1:200; HALF REDUCTION 1:400
LENGTHS ARE IN METRES
DO NOT SCALE FROM DRAWING

Copyright in the drawings, information and data recorded in this document ("the information") is the property of Planit Engineering. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Planit Engineering. Planit Engineering makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

PLANIT ENGINEERING
SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478
TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

PARTNER:
BYRON SHIRE COUNCIL
70-90 STATION ST
MULLIMBIMBY NSW 2478

CLIENT:
TRANSPORT FOR NSW
C/- JOHN HOLLAND RAIL
LEVEL 1, 20 SMITH STREET
PARRAMATTA NSW 2150

PROJECT:
RAILWAY HOTEL AND LAWSON ST SOUTH CAR PARKS
JONSON STREET
BYRON BAY NSW 2481

DRAWING TITLE:
LAYOUT PLAN RAILWAY HOTEL CAR PARK

ORIGINAL SIZE: A1	WGM JOB No.: J109	DRAWING No.: 0007	REV: F
-------------------	-------------------	-------------------	--------

Appendix B

Geotechnical Investigation Report

2nd September 2016

WGM

Shop 9a 80-84 Ballina Street
LENNOX HEAD, NSW 2478
Attention: Simon Millichamp

ENGINEERING REPORT

Geotechnical Investigation and Pavement Design, Railway Hotel Car Park

Job No. 16022 Rev No. 2 Date 22/08/2016

1 Introduction

This report presents the results of a factual geotechnical investigation carried out at the sites of a proposed carpark upgrade to the North and South of Railway Park in Byron Bay as part of the Railway Hotel car park upgrade proposal. The focus of the geotechnical investigation was on areas of existing gravel within both carparks, including a lightly sealed section in front of the Railway Hotel and lane way to the south of the Byron Tourist Information Centre. Test pits were undertaken to examine the condition within gravel and subgrade/natural materials.

The scope of the services provided by Civil Consult included the following;

- Production of geotechnical test pit logs
- Factual geotechnical report of the findings
- Presentation of the subsurface profile
- Presentation of laboratory testing undertaken
- Pavement design

2 Site Conditions

2.1 Site Description

The sites are located in the centre of Byron Bay adjacent to the Northern and Southern boundaries of Railway Park and are predominantly flat. The Northern site is an existing gravel carpark, the Southern site is also an existing gravel carpark, however the areas adjacent the Railway Hotel and lane way to the south of the Byron Tourist Information Centre are lightly

sealed. Both car parks are currently live to motor vehicle, cycle and pedestrian traffic.

2.2 Site Geological Setting

The site is identified as part of the Tyagarah Landscape (ty) as defined by Morand (1994)¹. The Tyagarah landscape is defined as sediment basins of mixed estuarine and aeolian origin forming level to gently undulating plains. Reference to The Lismore-Ballina 1:100 000 geological map indicates that the site is underlain by Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocene) sands. The sands are generally aeolian, originating from the adjacent beach ridge systems.

3 Field Investigation

The location of the test pits were agreed upon with the client prior to the works being undertaken and incorporated a services location provider. On completion of each pit, the holes were backfilled and compacted using hand compaction equipment followed by the reinstatement of existing gravel and seal.

A Site Plan identifying approximate location of each test pit can be found in Appendix A.

Engineering logs are presented in Appendix B.

3.1 Initial Field Work Undertaken

Five test pits were undertaken on the 24th of May 2016; TP1 to TP5 were excavated using a 2.5t Kobelco SK20SR mini excavator. Test pits 1 and 2 were undertaken in the carpark to the North of Railway Park, while test pits 3 to 5 were excavated to the South of Railway Park and adjacent the Railway Hotel.

3.2 Additional Field Work Undertaken

An additional two test pits were undertaken on the 10th of August; TP6 and TP7 were excavated by hand using a crowbar and shovel. Test pit 6 was undertaken in the lane way to the south of the Byron Tourist Information Centre, while test pit 7 was excavated toward the south western corner of the Railway Hotel carpark adjacent the railway line.

3.3 Field Sampling and Testing

A field sampling and testing program was undertaken during the investigation to determine the condition of the existing gravel and subgrade/insitu natural materials. Samples were taken from each test pit and delivered to Australian Soil and Concrete Testing for laboratory testing. A DCP (Dynamic Cone Penetrometer) was performed insitu at subgrade level for each test pit. The

following table summarises the testing and sampling that was undertaken during the investigation.

Table 1 – Summary of testing and sampling undertaken

Test Pit	Location	Gravel	Subgrade/ Insitu Natural Material
TP1	Northern end of carpark, North of Railway Park	CBR, PSD, PI	DCP, CBR, PI,
TP2	Southern end of carpark, North of Railway Park	-	DCP, CBR
TP3	Northern end of Railway Hotel carpark	-	DCP, CBR
TP4	Centre of Railway Hotel Carpark	-	DCP, CBR
TP5	Southern end of Railway Hotel carpark	CBR, PSD, PI	DCP, CBR
TP6	Lane way South of Byron Tourist Information Centre	-	DCP, CBR
TP7	South western corner of Railway Hotel carpark	-	DCP, CBR

NOTE: CBR – California Bearing Ratio, PSD – Particle Size Distribution, PI – Atterberg Limits, DCP – Dynamic Cone Penetrometer.

3.4 Subsurface Profile and Description

A summary of the subsurface profile is described as follows for the carpark to the North of Railway Park;

Table 2 – North of Railway Park Carpark Existing and Subgrade Profile

UNIT	Depth to top of layer (m)	Approximate layer thickness (m)
EXISTING CARPARK; GRAVEL, fine to medium with fine to medium sand, slightly moist.	0	0.4-0.5
NATURAL INSITU; SAND, fine to medium, trace silt, slightly moist to	1.3-1.6	Not

Test pit 1 varied slightly from the summary presented above; A 450mm layer of Silty SAND underlain by 200mm of Sandy SILT was observed directly below the GRAVEL layer.

A summary of the subsurface profile is described as follows for the carpark to the South of Railway Park;

Table 3 – Railway Hotel Carpark Existing and Subgrade Profile

UNIT	Depth to top of layer (m)	Approximate layer thickness (m)
WEARING COURSE; 20mm aggregate spray seal.	n/a	n/a
EXISTING CARPARK; GRAVEL, medium to coarse grained, dry.	0	0.06-0.3
UNCONTROLLED FILL; SAND, fine to medium, dry.	0.5	0.3-0.5
NATURAL INSITU; SAND, fine to medium, slightly moist.	1.6	Not

Test pits 3, 5 and 7 varied slightly from the summary presented above; No uncontrolled fill was observed beneath the gravel fill in test pit 3. Test pits 5 and 7 did not have an aggregate spray seal above the gravel fill. The gravel fill observed at test pits 6 and 7 was approximately 60-110mm in depth.

Groundwater seepage was observed in test pits 1 and 2 at the time of the investigation. Ground water levels are transient and variations differing from those observed at the time of the investigation can be expected due to climatic effects, heavy rainfall and permeability of the soil strata.

4 Field Work Results

4.1 Laboratory Results

A summary of selected results is presented in the Table 4 for reference. Please note the full results of the laboratory testing is presented in Appendix C at the end of this report, and includes; Particle Size Distribution, Atterberg limits and CBR's.

Table 4 – Summary of selected laboratory results

Test Pit	Material Type	CBR (%)	Plasticity Index	% Passing Sieve		
				37.5mm	19mm	2.36mm
TP1	Existing Gravel	90	2	100	97	54
TP1	Subgrade/Insitu Natural	20	N/A	-	-	-
TP2	Subgrade/Insitu Natural	4.5	-	-	-	-
TP3	Subgrade/Insitu Natural	25	-	-	-	-
TP4	Subgrade/Insitu Natural	14	-	-	-	-
TP5	Existing Gravel	50	4	100	91	45
TP5	Subgrade/Insitu Natural	15	-	-	-	-
TP6	Subgrade/Insitu Natural	13	-	-	-	-
TP7	Subgrade/Insitu Natural	25	-	-	-	-

4.2 Review of Existing Materials

From the investigation, existing gravel pavement were noted across the site and are currently being used as unsealed pavement for the carparks.

In order to retain this material and re-use in the new pavement arrangement, a review of the material has been undertaken and compared to a number of relevant specifications as follows;

- RMS 3051 DGS20 Subbase Requirements
- RMS 3071 SMZ lower layer Requirements
- RMS R44 SMZ lower layer Requirements
- Northern Rivers Local Government Construction NGS20 Subbase Requirements

From the review that was undertaken, the gravel material that was found in both car park pavement areas are suitable for re-use, and generally meet the requirements of the Northern Rivers Local Government Construction Manual for subbase. This material is considered suitable for use in the SMZ and subbase layers of the proposed pavement, which is discussed in Section 5 of the report. Full details of the review are presented in Appendix F at the end of this memo.

Please note that there may be variability in quality and thickness of this material across the site in areas other than the specific test locations where test pits were undertaken. It is recommended that the depths and quality of this material is verified during

construction stage, by further test pit testing and a minimum of 2 further CBR laboratory tests prior to installation of final pavement arrangement.

5 Pavement Design Methodology

Pavement design has been completed by Civil Consult in accordance with the following documents;

- Northern Rivers Council Development Design Specification Pavement Design.
- Austroads (2010) Guide to Pavement Structural Design. Part 2: Pavement Structural Design.

A flexible pavement solution consisting of a gravel subbase, base and asphalt-wearing course has been adopted for the purposes of design, in accordance with the references above.

5.1 Assumptions

Assumptions made during the design process have been outlined in Table 5 below.

Table 5 – Design Assumptions

Design Assumption	Value
Northern Rivers Council Road Type	Urban Residential - Access/Local
Pavement Design Life	20 Years
Design ESA (DESA) – Proposed Road	3×10^5
Subgrade CBR (%)	5

6 Pavement Design

Pavement design has been undertaken using Section D2.10 from the Northern Rivers Local Government Development Design Specification (Pavement Design), and a check has been carried out using Figure 8.4 of Austroads Pavement Structural Design (2012). The results of the analysis are attached at the end of this memo in Appendix D.

The subgrade CBR value adopted has been based on laboratory test results taken during the geotechnical investigation. A total of five (7) CBR tests were undertaken within the subgrade material and the design CBR has been calculated using the guidelines provided in Section D2.06 (4) of Northern Rivers Local Government Development Design Specification (Pavement Design) and reproduced below.

- Design CBR = Least of estimated CBRs, for less than five results
- Design CBR = 10th percentile of all estimated CBRs, for five or more results
 - = $C - 1.3S$
- Where C is the mean of all estimated CBRs, and
S is the standard deviation of all values.

6.1 Subgrade design CBR, North of Railway Park Carpark

Using the least of estimated CBRs, for less than five results outlined above. A subgrade design CBR of 4.5 was calculated for the purposes of flexible pavement design.

6.2 Subgrade design CBR, South of Railway Park Carpark

Using the statistical methods outlined above a subgrade design CBR of 10.5 was calculated. This has been rounded down to an adopted value of CBR = 10 for the purposes of flexible pavement design.

7 Pavement Arrangement

The proposed pavement is a granular pavement with an Asphalt Concrete (AC) wearing course and the details of the configuration is provided in Table 6.

Table 6 – Proposed Pavement – North of Railway Park Carpark

Pavement Configuration	Course
40mm AC14 with AR450	Wearing course
7mm Primerseal (7mm Aggregate with C170)	Seal
150mm DGB 20 (CBR>60%)	Base Course
150mm Crushed Chert, DGB or equivalent (CBR > 30%)	Subbase ¹
100mm SMZ/Gravel CBR > 15%	Select material zone ¹
Subgrade CBR>4.5%	Foundation (Insitu)

¹The gravels found on site are suitable for re-use in these layers only. Please note all thicknesses must remain as per Table 6, and where the gravel currently found on site is less than 350mm thick, further Subbase must be imported to provide the total required 350mm thickness (SMZ + Subbase). Where areas of existing gravel are not found on site, then the full thickness of pavement as per Table 6 must be installed.

Table 7 – Proposed Pavement – South of Railway Park Carpark

Pavement Configuration	Course
40mm AC14 with AR450	Wearing course
7mm Primerseal (7mm Aggregate with C170)	Seal
150mm DGB 20 (CBR>60%)	Base Course
100mm Crushed Chert, DGB or equivalent (CBR > 30%)	Subbase ¹
Subgrade CBR>10%	Foundation (Insitu)

¹The gravels found on site are suitable for re-use in these layers only. Please note all thicknesses must remain as per Table 6, and where the gravel currently found on site is less than 350mm thick, further Subbase must be imported to provide the total required 350mm thickness (SMZ + Subbase). Where areas of existing gravel are not found on site, then the full thickness of pavement as per Table 6 must be installed.

A sketch of the pavement arrangement is provided at the end of this memo, in Appendix D.

All works and materials for “Base Course & Subbase Course”, and “SMZ” shall be controlled and in accordance with RMS Specifications; R44, R3071 & R3051, and relevant Northern Rivers Local Council Specifications.

7.1 Verification of CBR on site

The following must be undertaken during construction work to confirm the material CBR requirements listed in Table 5 of this report, and to meet the requirements the Northern Rivers Council Pavement design specification (Table D2.5);

- Undertake a minimum of 2 CBR tests at the underside of the SMZ layer along the proposed pavement once the area has been exposed and re-worked prior to sealing.
- Undertake a minimum of 2 CBR tests within the existing carpark gravel proposed for re-use.
- Confirm that the sub-grade material has a CBR>5 in the northern rails carpark and CBR>10 in the southern rails carpark.

7.2 Subsurface drainage

Subsurface drainage is used to maintain road formation and moisture conditions in pavement. Consistent moisture content provides structural adequacy and uniformity. Various drainage

systems including edge drains, trench drains and drainage layers can be used to sufficiently drain the pavement and selected material zones. It is recommended that subsurface drainage is installed in accordance with the subsoil drainage plan drawings prepared by Civil Consult and attached in Appendix E at the end of this report. All subsurface drainage should be installed as per Northern Rivers Local Government Development Design Specification (Subsurface Drainage).

8 Limitations of Pavement Design, Geotechnical Investigation & Design

This pavement has been design using the assumptions presented within Table 1 and undertaken in accordance with generally accepted engineering practices including use of Austroads Pavement Structural Design Part 2 (2010), and Northern Rivers Council Development Design Specification Pavement Design. Civil Consult should be notified of any changes to these design assumptions as this will affect pavement configuration, and subsequently design life and performance of the pavement.

The results, analysis and design presented in this report are indicative of the specific investigation test location and sample points agreed upon between Civil Consult and the client.

The data provided in this report relates only to the structures and roads described within this report and should not be used or modified for any other purpose. Civil Consult accepts no liability for any use of the data by others.

The results and design work (where presented) in this report are based specifically on test and sample locations, and are only valid at these precise locations. At all other locations across the site differences will occur to varying degrees. The subsurface profile will vary between test locations and also between individual samples taken with a test location. Conditions in the subsurface profile including groundwater can change over short periods of time and this should be considered when reviewing data presented in this report.

The data presented in the report should be reviewed by a suitable qualified engineer when footings, excavations, and subsurface structures are installed to confirm assumed conditions presented in this report. If they do not agree, further advice should be sought immediately.

Due to inherent uncertainties when interpreting subsurface conditions, there are often cost variations during projects or during the execution of projects as a result of unanticipated subsurface conditions. Civil Consult accepts no responsibility for variation of the subsurface profile and the consequences of these variations on the project or execution of the project.

Civil Consult accepts no responsibility for the use or modification of the data presented within this report by others.

9 Reference

1. Morand D.T., 2001, *Soil Landscapes of the Lismore-Ballina, 1:100,000 Sheet* report, NSW Department of Land and Water Conservation, Sydney.

If you should require any further information or clarification, please do not hesitate to contact this office.

Civil Consult Pty Ltd



Greg Saenger – Senior Geotechnical Engineer

 civil consult

Consulting Engineers

CPEng, MIEAust, NPER, RPEQ
0490 419 541

Appendix A: Site Plan

Appendix B: Geotechnical Logs

Appendix C: Laboratory Results

Appendix D – Pavement Arrangement & Calculation

Appendix E – Subsurface Drainage Plan

Appendix F: Gravel Material Review

Appendix A – Site Plan

North of Railway Park

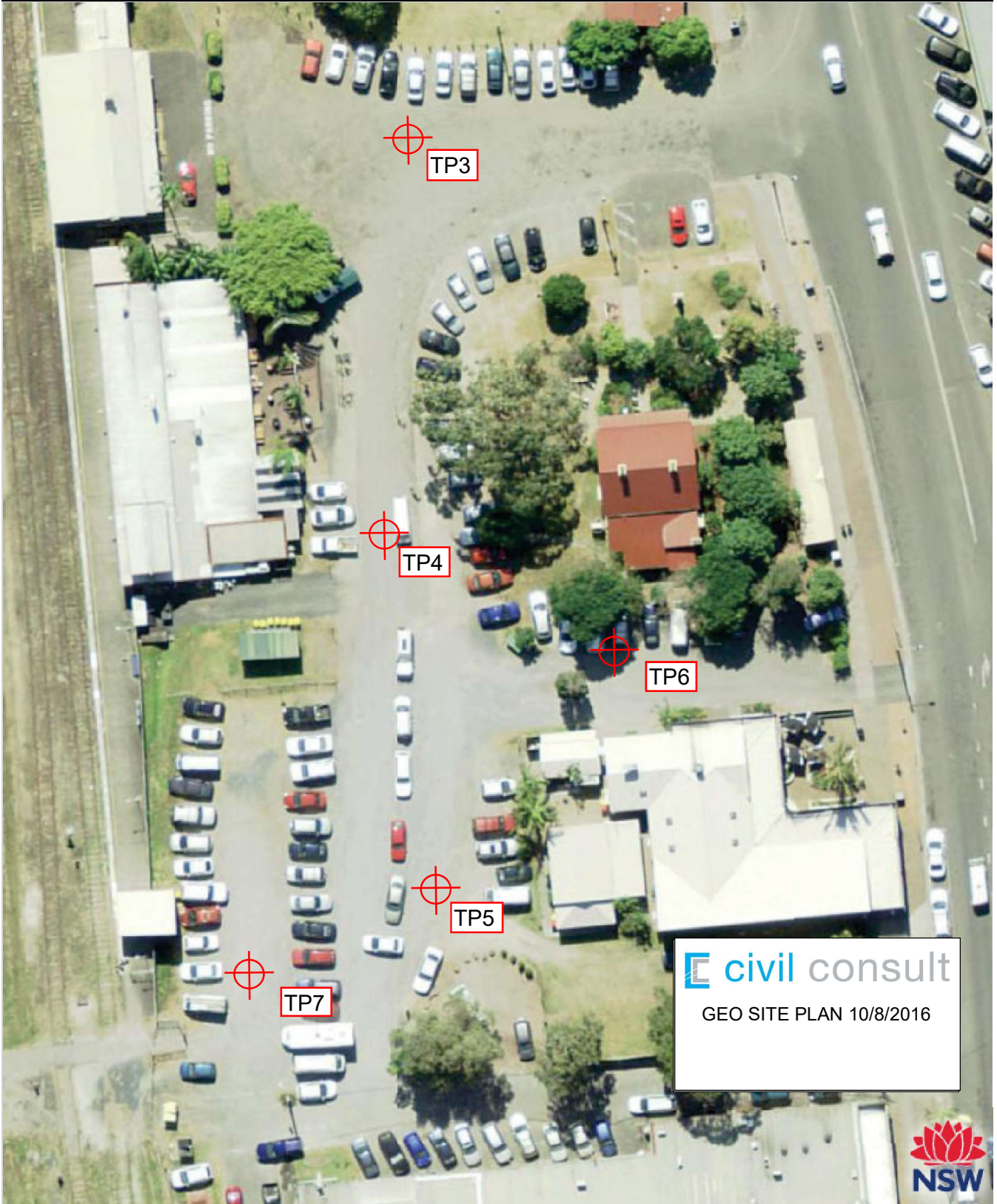
Gravel Carpark



Disclaimer: This report has been generated by various sources and is provided for information purposes only. Land and Property Information (LPI), a division of the Department of Finance and Services does not warrant or represent that the information is free from errors or omission, or that it is exhaustive. LPI gives no warranty in relation to the information, especially material supplied by third parties. LPI accepts no liability for loss, damage, or costs that you may incur relating to any use or reliance upon the information in this report.

South of Railway Park

Sealed and Gravel Carpark



civil consult
GEO SITE PLAN 10/8/2016



Disclaimer: This report has been generated by various sources and is provided for information purposes only. Land and Property Information (LPI), a division of the Department of Finance and Services does not warrant or represent that the information is free from errors or omission, or that it is exhaustive. LPI gives no warranty in relation to the information, especially material supplied by third parties. LPI accepts no liability for loss, damage, or costs that you may incur relating to any use or reliance upon the information in this report.

Appendix B – Geotechnical Logs

Geotechnical Engineering Log

Site Identifier: **TP1**

Page: 1 of 1

Project: **Railway Carpark Upgrade** Type: **Test Pit** Depth: **1.60 m** Date Commenced: **24/05/2016**
 Client: **WGM** Equipment: **2.5 Tonne excavator** Width: **0.30 m** Date Completed: **24/05/2016**
 Job Number: **16022** Contractor: **North Coast Drilling** Length: **1.50 m** Logged by: **Greg Saenger**

Site: **North Carpark** North: **-** Horizontal Datum: **-** Comments: **-**
 Easting: **SEE PLAN** Inclination: **90** Vertical Datum: **-** Test pit terminated at target depth 1.6m.
 Northing: **SEE PLAN** Azimuth: **-** Survey: **-**

DRILLING & LEVELS		MATERIAL DESCRIPTION			STRENGTH & DEFECTS			SAMPLES/TESTING						
Method	Support	Moisture	RL (m)	Depth (m)	Lithology	USCS Symbol	DESCRIPTION Soil: colour, grain size/plasticity Rock: colour, grain size, structure	Origin	Strength	Weathering (Recovery%) RDP%	Defect Spacing (mm)	LABORATORY TEST RESULTS	DCP Blows/ 100mm	Depth
Machine Excavated Trench			0.00	0.00	GRAVEL	GW	Brown, fine to medium gravel with fine to medium sand, slightly moist.	Fill - Uncontrolled	D					
			0.45	0.45	Silty SAND	SM	Black and brown, fine sand, low plasticity, slightly moist, with clay, old topsoil left in place.	Topsoil	MD			-CBR=90%, PI=2		
			0.70	0.70	Silty SAND	SM	Grey, fine to medium grained, moist.	Alluvium					5	0.7
			0.90	0.90	Sandy SILT	ML	Black, fine sand, low plasticity silt.	Alluvium	S				6	0.8
			1.20	1.20	SAND	SP	Grey, fine to medium grained, trace silt, wet. (Inferred from DCP)	Alluvium	MD				1	0.9
			1.60	1.60			Test pit terminated at target depth 1.6m.					1	1.0	
												1	1.1	
												2	1.2	
												6	1.3	
												11	1.4	
												11	1.5	
												12	1.6	



Geotechnical Engineering Log

Site Identifier: **TP2**

Page: 1 of 1

Project: **Railway Carpark Upgrade** Type: **Test Pit** Depth: **1.30 m** Date Commenced: **24/05/2016**
 Client: **WGM** Equipment: **2.5 Tonne excavator** Width: **0.30 m** Date Completed: **24/05/2016**
 Job Number: **16022** Contractor: **North Coast Drilling** Length: **1.50 m** Logged by: **Greg Saenger**

Site: **North Carpark** North: **-** Horizontal Datum: **-** Comments: **-**
 Easting: **SEE PLAN** Inclination: **90** Vertical Datum: **-** Test pit terminated at target depth 1.3m.
 Northing: **SEE PLAN** Azimuth: **-** Survey: **-**

DRILLING & LEVELS		MATERIAL DESCRIPTION			STRENGTH & DEFECTS			SAMPLES/TESTING				
Method	Support	Moisture	Depth (m)	USCS Symbol	Description	Origin	Strength	Weathering (Recovery%)	Defect Spacing (mm)	LABORATORY TEST RESULTS	DCP Blows/100mm	Depth
Machine Excavated Trench	B G L		0.00	GW	GRAVEL	Brown, fine to medium gravel with fine to medium sand, slightly moist.	Fill - Uncontrolled	D				
			0.30	SP	SAND	Grey, fine to medium grained, trace silt, slightly moist. (Inferred from DCP)	Alluvium	MD				
			1.30		Test pit terminated at target depth 1.3m.							
			0.5								4	0.5
			0.6								3	0.6
			0.7								6	0.7
			0.8								11	0.8
			0.9								12	0.9
			1.0								13	1.0
			1.1								10	1.1
			1.2								8	1.2
			1.3									8



Geotechnical Engineering Log

Site Identifier: **TP3**

Page: 1 of 1

Project: Railway Carpark Upgrade Type: Test Pit Depth: 1.60 m Date Commenced: 24/05/2016
 Client: WGM Equipment: 2.5 Tonne excavator Width: 0.40 m Date Completed: 24/05/2016
 Job Number: 16022 Contractor: North Coast Drilling Length: 0.60 m Logged by: Greg Saenger

Site: Front Railway Hotel North: - Horizontal Datum: - Comments: -
 Easting: SEE PLAN Inclination: 90 Vertical Datum: - Test pit terminated at target depth
 Northing: SEE PLAN Azimuth: - Survey: - 1.6m. GW not observed.
 Elevation: SEE PLAN

DRILLING & LEVELS			MATERIAL DESCRIPTION			STRENGTH & DEFECTS			SAMPLES/TESTING				
Method	Support	Moisture	RL (m)	Depth (m)	Lithology	DESCRIPTION Soil: colour, grain size/plasticity Rock: colour, grain size, structure	Origin	Strength	Weathering (Recovery%) RDP%	Defect Spacing (mm) 100 1000	LABORATORY TEST RESULTS	DCP Blows/ 100mm	Depth
Machine Excavated Trench			0.00	0	GP GRAVEL	Brown, medium to coarse grained, dry, with existing 20mm spray seal on top.	Fill - Uncontrolled	D					
			0.20	0.20	SW SAND	Grey, fine to medium grained, slightly moist. (Inferred from DCP)	Alluvium	MD					0.3
												4	0.4
												12	0.5
												12	0.6
												13	0.7
												11	0.8
												10	0.9
												10	1.0
												8	1.1
												8	1.2
												7	1.3
											9	1.4	
											10	1.5	
											11	1.6	
				-2		Test pit terminated at target depth 1.6m. GW not observed.							
				-3									
				-4									
				-5									



Geotechnical Engineering Log

Site Identifier: **TP4**

Page: 1 of 1

Project: Railway Carpark Upgrade Type: Test Pit Depth: 1.60 m Date Commenced: 24/05/2016
 Client: WGM Equipment: 2.5 Tonne excavator Width: 0.40 m Date Completed: 24/05/2016
 Job Number: 16022 Contractor: North Coast Drilling Length: 0.40 m Logged by: Greg Saenger

Site: Front Railway Hotel North: - Horizontal Datum: - Comments: -
 Easting: SEE PLAN Inclination: 90 Vertical Datum: - Test pit terminated at target depth
 Northing: SEE PLAN Azimuth: - Survey: - 1.6m. GW not observed.
 Elevation: SEE PLAN

DRILLING & LEVELS			MATERIAL DESCRIPTION				STRENGTH & DEFECTS				SAMPLES/TESTING		
Method	Support	Moisture	RL (m)	Depth (m)	Lithology	DESCRIPTION Soil: colour, grain size/plasticity Rock: colour, grain size, structure	Origin	Strength	Weathering (Recovery%) RDP%	Defect Spacing (mm)	LABORATORY TEST RESULTS	DCP Blows/ 100mm	Depth
Machine Excavated Trench				0	GP	GRAVEL	Brown, medium to coarse grained, dry, with existing 20mm spray seal on top.	Fill - Uncontrolled					
				0.15	SW	SAND	Dark grey, fine to medium grained, dry.	Fill - Uncontrolled					0.3
				0.50	SW	SAND	Grey, fine to medium grained, slightly moist. (Inferred from DCP)	Alluvium	MD			CBR=14%	0.4
												0.5	
												0.6	
												0.7	
												0.8	
												0.9	
												1.0	
												1.1	
												1.2	
												1.3	
												1.4	
												1.5	
												1.6	
				2		Test pit terminated at target depth 1.6m. GW not observed.							
				3									
				4									
				5									



Geotechnical Engineering Log

Site Identifier: **TP5**

Page: 1 of 1

Project: Railway Carpark Upgrade Type: Test Pit Depth: 1.60 m Date Commenced: 24/05/2016
 Client: WGM Equipment: 2.5 Tonne excavator Width: 0.30 m Date Completed: 24/05/2016
 Job Number: 16022 Contractor: North Coast Drilling Length: 1.50 m Logged by: Greg Saenger

Site: Front Railway Hotel North: - Horizontal Datum: - Comments: -
 Easting: SEE PLAN Inclination: 90 Vertical Datum: - Test pit terminated at target depth
 Northing: SEE PLAN Azimuth: - Survey: - 1.6m. GW not observed.
 Elevation: SEE PLAN

DRILLING & LEVELS		MATERIAL DESCRIPTION			STRENGTH & DEFECTS				SAMPLES/TESTING				
Method	Support	Moisture	RL (m)	Depth (m)	Lithology	DESCRIPTION Soil: colour, grain size/plasticity Rock: colour, grain size, structure	Origin	Strength	Weathering (Recovery%) RDP%	Defect Spacing (mm)	LABORATORY TEST RESULTS	DCP Blows/ 100mm	Depth
Machine Excavated Trench			0.00	0.00	GP	GRAVEL	Brown, medium to coarse grained, dry.	Fill - Uncontrolled	D				
			0.30	0.30	SP	SAND	Dark grey, fine to medium grained, dry.	Fill - Uncontrolled					0.3
			0.60	0.60	SP	SAND	Grey, fine to medium grained, slightly moist. (Inferred from DCP)	Alluvium	MD				0.4
												0.5	
												0.6	
												0.7	
												0.8	
												0.9	
												1.0	
												1.1	
											1.2		
											1.3		
											1.4		
											1.5		
											1.6		
						Test pit terminated at target depth 1.6m. GW not observed.							



Geotechnical Engineering Log

Site Identifier: **TP6**

Page: 1 of 1

Project: **Railway Carpark Upgrade** Type: **Test Pit** Depth: **1.60 m** Date Commenced: **10/08/2016**
 Client: **WGM** Equipment: **Hand excavated** Width: **0.30 m** Date Completed: **10/08/2016**
 Job Number: **16022** Contractor: **-** Length: **0.30 m** Logged by: **Mitchel Hill**

Site: **Lane way - Byron Tourist Information Centre** North: **-** Horizontal Datum: **-** Comments: **-**
 Easting: **SEE PLAN** Inclination: **90** Vertical Datum: **-** Test pit terminated at target depth
 Northing: **SEE PLAN** Azimuth: **-** Survey: **-** 1.6m. GW not observed.
 Elevation: **SEE PLAN**

DRILLING & LEVELS		MATERIAL DESCRIPTION			STRENGTH & DEFECTS			SAMPLES/TESTING					
Method	Support	Moisture	RL (m)	Depth (m)	Lithology	DESCRIPTION Soil: colour, grain size/plasticity Rock: colour, grain size, structure	Origin	Strength	Weathering (Recovery%) RDP%	Defect Spacing (mm)	LABORATORY TEST RESULTS	DCP Blows/ 100mm	Depth
			0.00	0.00	GP GRAVEL	Brown, medium to coarse grained, dry, with existing 20mm spray seal on top.	Fill - Uncontrolled	D					
			0.06	0.06	SW SAND	Dark grey, brown, fine to medium grained, dry.	Fill - Uncontrolled	MD					0.3
			0.40	0.40	SW SAND	Grey, fine to medium grained, slightly moist. (Inferred from DCP)	Alluvium				CBR=13%	4	0.4
												5	0.5
												5	0.6
												5	0.7
												7	0.8
												7	0.9
												7	1.0
												7	1.1
												7	1.2
												6	1.3
												6	1.4
												7	1.5
												7	1.6
						Test pit terminated at target depth 1.6m. GW not observed.							



Geotechnical Engineering Log

Site Identifier: **TP7**

Page: 1 of 1

Project: **Railway Carpark Upgrade** Type: **Test Pit** Depth: **1.60 m** Date Commenced: **10/08/2016**
 Client: **WGM** Equipment: **Hand excavated** Width: **0.30 m** Date Completed: **10/08/2016**
 Job Number: **16022** Contractor: **-** Length: **0.30 m** Logged by: **Mitchel Hill**

Site: **South Railway Hotel** North: **-** Horizontal Datum: **-** Comments: **-**
 Easting: **SEE PLAN** Inclination: **90** Vertical Datum: **-** Test pit terminated at target depth
 Northing: **SEE PLAN** Azimuth: **-** Survey: **-** 1.6m. GW not observed.
 Elevation: **SEE PLAN**

DRILLING & LEVELS			MATERIAL DESCRIPTION			STRENGTH & DEFECTS			SAMPLES/TESTING			
Method	Support	Moisture	Depth (m)	Lithology	DESCRIPTION Soil: colour, grain size/plasticity Rock: colour, grain size, structure	Origin	Strength	Weathering (Recovery%) RDP%	Defect Spacing (mm)	LABORATORY TEST RESULTS	DCP Blows/ 100mm	Depth
			0	GP	GRAVEL	Brown, medium to coarse grained, dry.	Fill - Uncontrolled	D				
			0.11	SP	SAND	Dark grey, brown and black mottle, fine to medium grained, dry.	Fill - Uncontrolled	VL				
			0.50	SP	SAND	Grey, dark brown mottle, fine to medium grained, slightly moist. (Inferred from DCP)	Alluvium					
			1.60		Test pit terminated at target depth 1.6m. GW not observed.							



Appendix C – Laboratory Results



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	5
Client Address:	Skidders Head, NSW 2478	Report Date:	6/06/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 2 Carpark Sub-grade	Test Request:	NA

Sample Information

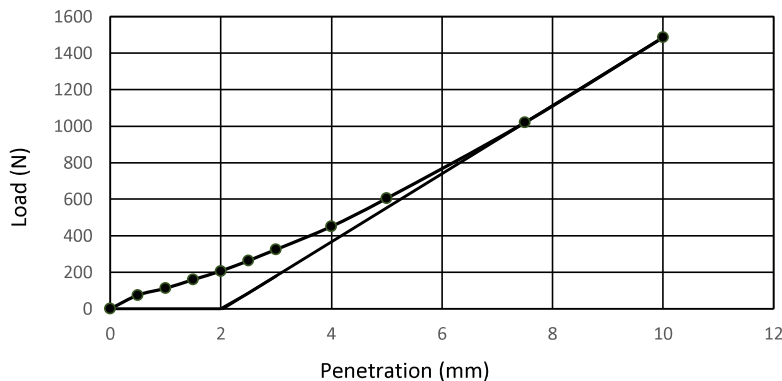
Sample Number:	5316	Lot Number:	NA
Sample Date:	24/05/2016	Penetration Date:	3/06/2016
Chainage/RL:	NA	Material Type:	Sub-grade
Offset/RL:	NA	Soil Description:	Silty Sand
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Sub-grade -450mm	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	1.70 t/m ³	Optimum Moisture Content:	16 %
Dry Density Before Soak:	1.69 t/m ³	Moisture Content Before Soak:	16.3 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	8.9 %
Laboratory Density Ratio:	99.5 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	101.0 %
Retained on 19mm Sieve:	0.0 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	0.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	19.6 %
		Whole Sample Moisture (After Soak):	19.8 %

California Bearing Ratio Results

CBR (Soaked) = **4.5** % at 5mm



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	6
Client Address:	Skidders Head, NSW 2478	Report Date:	6/06/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 3 Carpark Sub-grade	Test Request:	NA

Sample Information

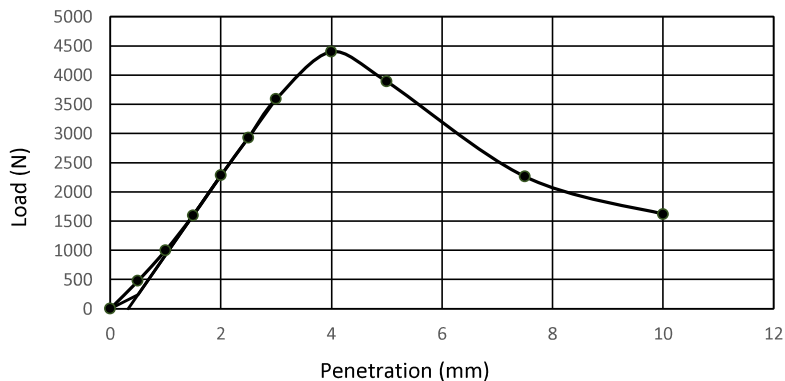
Sample Number:	5317	Lot Number:	NA
Sample Date:	24/05/2016	Penetration Date:	31/05/2016
Chainage/RL:	NA	Material Type:	Sub-grade
Offset/RL:	NA	Soil Description:	sand, trace fine gravel: white
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Sub-grade -300mm	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	1.63 t/m ³	Optimum Moisture Content:	17 %
Dry Density Before Soak:	1.64 t/m ³	Moisture Content Before Soak:	16.9 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	1.7 %
Laboratory Density Ratio:	100.5 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	99.5 %
Retained on 19mm Sieve:	1.2 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	0.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	17.7 %
		Whole Sample Moisture (After Soak):	18.1 %

California Bearing Ratio Results

CBR (Soaked) = **25** % at 2.5mm



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	7
Client Address:	Skidders Head, NSW 2478	Report Date:	6/06/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 4 Carpark Sub-grade	Test Request:	NA

Sample Information

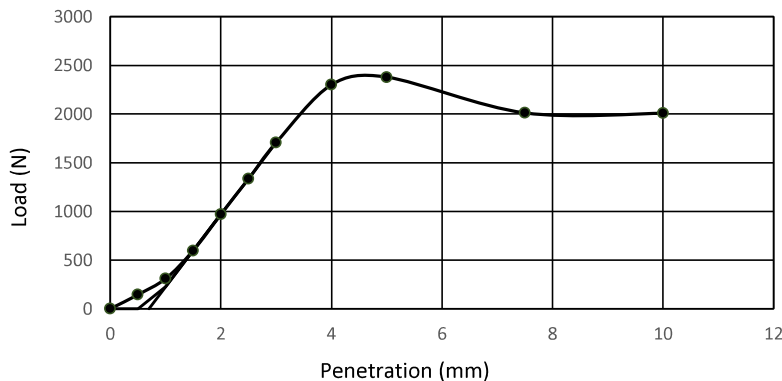
Sample Number:	5318	Lot Number:	NA
Sample Date:	24/05/2016	Penetration Date:	3/06/2016
Chainage/RL:	NA	Material Type:	Sub-grade
Offset/RL:	NA	Soil Description:	Grey Brown Sand
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Sub-grade -310mm	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	1.64 t/m ³	Optimum Moisture Content:	16.5 %
Dry Density Before Soak:	1.63 t/m ³	Moisture Content Before Soak:	16.7 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	1.0 %
Laboratory Density Ratio:	99.0 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	102.0 %
Retained on 19mm Sieve:	0.0 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	0.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	16.4 %
		Whole Sample Moisture (After Soak):	17.7 %

California Bearing Ratio Results

CBR (Soaked) = **14** % at 2.5mm



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.

AS1289.5.2.1 Dry Density / Moisture Content Relationship of a Soil. (Modified Compaction)

AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	8
Client Address:	Skidders Head, NSW 2478	Report Date:	6/06/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 5 Carpark Pavement	Test Request:	NA

Sample Information

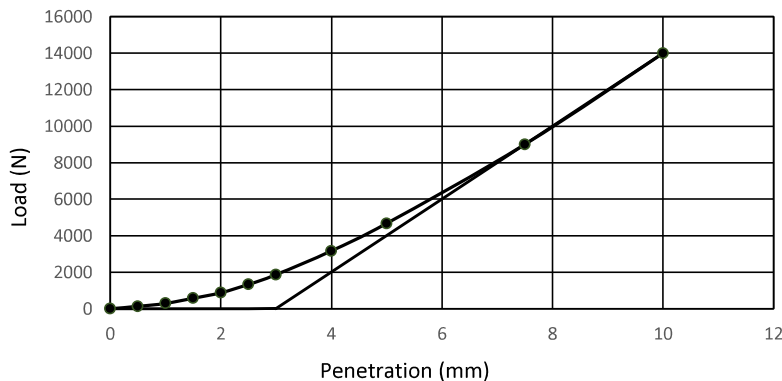
Sample Number:	5319	Lot Number:	NA
Sample Date:	24/05/2016	Penetration Date:	3/06/2016
Chainage/RL:	NA	Material Type:	Silty/Clayey Sandy GRAVEL
Offset/RL:	NA	Soil Description:	Crushed Chert
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Pavement 0.0 - 0.300mm	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	2.16 t/m ³	Optimum Moisture Content:	8 %
Dry Density Before Soak:	2.18 t/m ³	Moisture Content Before Soak:	8.0 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	3.1 %
Laboratory Density Ratio:	100.5 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	99.0 %
Retained on 19mm Sieve:	10.3 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	0.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	7.8 %
		Whole Sample Moisture (After Soak):	7.5 %

California Bearing Ratio Results

CBR (Soaked) = **50** % at **5mm**



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	10
Client Address:	Skidders Head, NSW 2478	Report Date:	6/06/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 5 Carpark Sub-grade	Test Request:	NA

Sample Information

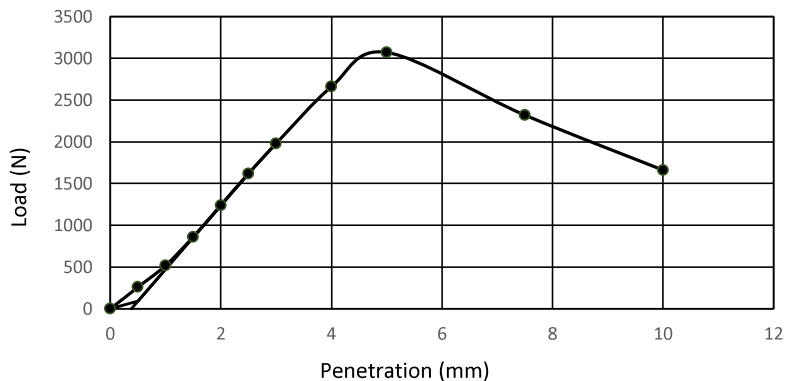
Sample Number:	5321	Lot Number:	NA
Sample Date:	24/05/2016	Penetration Date:	31/05/2016
Chainage/RL:	NA	Material Type:	Sub-grade
Offset/RL:	NA	Soil Description:	Sand, trace gravel: grey white
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Sub-grade -300mm	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	1.63 t/m ³	Optimum Moisture Content:	16 %
Dry Density Before Soak:	1.65 t/m ³	Moisture Content Before Soak:	16.2 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	3.1 %
Laboratory Density Ratio:	101.0 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	101.5 %
Retained on 19mm Sieve:	1.3 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	0.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	17.8 %
		Whole Sample Moisture (After Soak):	17.2 %

California Bearing Ratio Results

CBR (Soaked) = **15** % at **5mm**



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	1
Client Address:	Skidders Head, NSW 2478	Report Date:	6/06/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 1 Carpark Pavement	Test Request:	NA

Sample Information

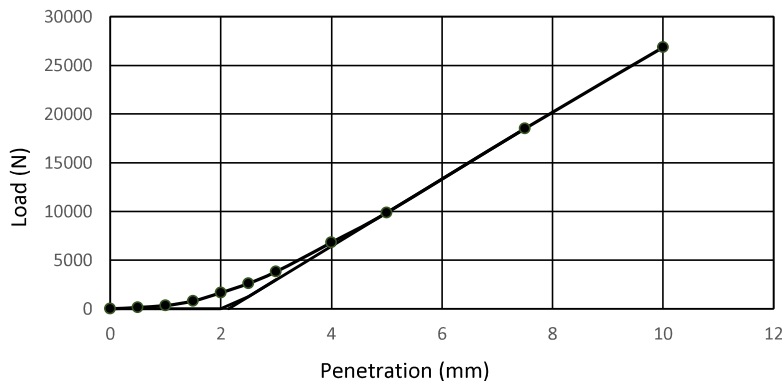
Sample Number:	5312	Lot Number:	NA
Sample Date:	24/05/2016	Penetration Date:	3/06/2016
Chainage/RL:	NA	Material Type:	Silty/Clayey Sandy GRAVEL
Offset/RL:	NA	Soil Description:	Crushed Chert
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Pavement 0.0 - 0.450mm	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	2.14 t/m ³	Optimum Moisture Content:	8 %
Dry Density Before Soak:	2.16 t/m ³	Moisture Content Before Soak:	7.9 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	4.6 %
Laboratory Density Ratio:	100.5 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	101.5 %
Retained on 19mm Sieve:	5.4 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	0.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	7.3 %
		Whole Sample Moisture (After Soak):	7.2 %

California Bearing Ratio Results

CBR (Soaked) = **90** % at **5mm**



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	3
Client Address:	Skidders Head, NSW 2478	Report Date:	6/06/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 1 Carpark Sub-grade	Test Request:	NA

Sample Information

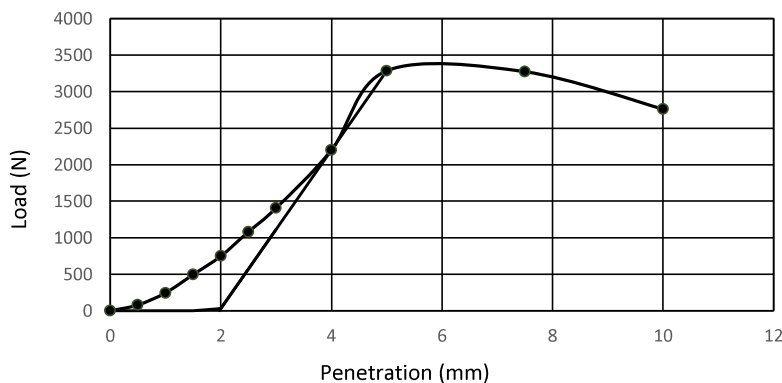
Sample Number:	5314	Lot Number:	NA
Sample Date:	24/05/2016	Penetration Date:	3/06/2016
Chainage/RL:	NA	Material Type:	SAND, trace silt/clay
Offset/RL:	NA	Soil Description:	Dark Brown Sand
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Sub-grade -680mm	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	1.63 t/m ³	Optimum Moisture Content:	20 %
Dry Density Before Soak:	1.63 t/m ³	Moisture Content Before Soak:	19.9 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	33.5 %
Laboratory Density Ratio:	99.5 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	100.0 %
Retained on 19mm Sieve:	0.0 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	0.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	21.2 %
		Whole Sample Moisture (After Soak):	21.3 %

California Bearing Ratio Results

CBR (Soaked) = **20** % at 2.5mm



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N. 92 602 346 127

Soil Classification Report

Client: Civil Consult	Report No: 4
Client Address: Skinners Head, NSW 2478	Report Date: 6/06/2016
Project: Rails Carpark, Byron Bay	Project No: 779
Component: Test Pit 1 Carpark Sub-grade	Test Request: NA

Sample Information

Sample Number: 5315	Lot Number: NA
Sample Date: 24/05/2016	PI Test Date: 30/05/2016
Chainage/RL: NA	Grading Test Date: N/A
Offset/RL: NA	Material Type: SAND, trace silt/clay
Control Line: NA	Soil Description: SAND, trace silt/clay
Layer/Depth: Sub-grade -680mm	Sampling Method: Client
PI Sieve State: Dry Sieved	PI Curing Condition: Air Dried

Test Data

Grading			
Sieve Size (mm)	% Passing	Envelope	
		Min	Max
150			
125			
100			
75			
53			
37.5			
26.5			
19.0			
13.2			
9.5			
6.7			
4.75			
2.36			
1.18			
0.600			
0.425			
0.300			
0.150			
0.075			

Notes on Test	Results
Liquid Limit not obtainable due to slippage in the bowl.	Liquid Limit (%) Not Obtainable
	Plastic Limit (%) Non Plastic
	Plasticity Index Not Applicable
	Linear Shrinkage (%)

Test Methods Used

T108 - Liquid Limit of Road Materials
 T109 - Plastic Limit and Plasticity Index of Road Construction Materials



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
Approved Signatory

Soil Classification Report

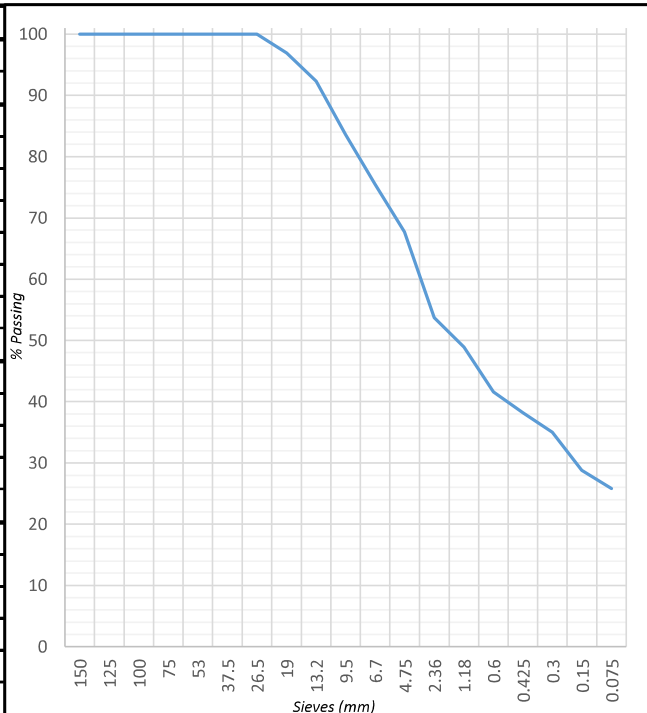
Client: Civil Consult	Report No: 2
Client Address: Skinners Head, NSW 2478	Report Date: 6/06/2016
Project: Rails Carpark, Byron Bay	Project No: 779
Component: Test Pit 1 Carpark Pavement	Test Request: NA

Sample Information

Sample Number: 5313	Lot Number: NA
Sample Date: 24/05/2016	PI Test Date: 30/05/2016
Chainage/RL: NA	Grading Test Date: 27/05/2016
Offset/RL: NA	Material Type: Silty/Clayey Sandy GRAVEL
Control Line: NA	Soil Description: Silty/Clayey Sandy GRAVEL
Layer/Depth: Pavement 0.0 - 0.450mm	Sampling Method: Client
PI Sieve State: Dry Sieved	PI Curing Condition: Air Dried

Test Data

Grading		Envelope	
Sieve Size (mm)	% Passing	Min	Max
		150	100
125	100		
100	100		
75	100		
53	100		
37.5	100		
26.5	100		
19.0	97		
13.2	92		
9.5	84		
6.7	76		
4.75	68		
2.36	54		
1.18	49		
0.600	42		
0.425	38		
0.300	35		
0.150	29		
0.075	26		



Notes on Test	Results
	Liquid Limit (%) 18
	Plastic Limit (%) 17
	Plasticity Index 2
	Linear Shrinkage (%)

Test Methods Used

AS 1289.3.6.1 - Determination of the particle size distribution of a soil - Standard method of analysis by sieving
 AS 1289.3.1.2 - Determination of the liquid limit of a soil - One point Cassagrande Method (subsidiary method)
 AS 1289.3.2.1 - Determination of the plastic limit of a soil - Standard method
 AS 1289.3.3.1 - Calculation of the plasticity index of a soil



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:



D.Kennedy
Approved Signatory

Soil Classification Report

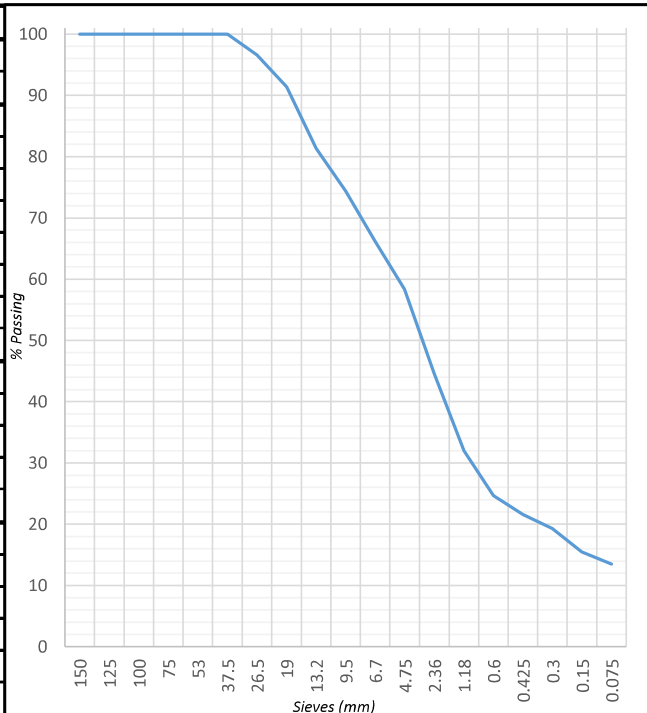
Client: Civil Consult	Report No: 9
Client Address: Skinners Head, NSW 2478	Report Date: 6/06/2016
Project: Rails Carpark, Byron Bay	Project No: 779
Component: Test Pit 5 Carpark Pavement	Test Request: NA

Sample Information

Sample Number: 5320	Lot Number: NA
Sample Date: 24/05/2016	PI Test Date: 30/05/2016
Chainage/RL: NA	Grading Test Date: 27/05/2016
Offset/RL: NA	Material Type: Silty/Clayey Sandy GRAVEL
Control Line: NA	Soil Description: Silty/Clayey Sandy GRAVEL
Layer/Depth: Pavement 0.0 - 0.300mm	Sampling Method: Client
PI Sieve State: Dry Sieved	PI Curing Condition: Air Dried

Test Data

Grading		Envelope	
Sieve Size (mm)	% Passing	Min	Max
		150	100
125	100		
100	100		
75	100		
53	100		
37.5	100		
26.5	97		
19.0	91		
13.2	81		
9.5	74		
6.7	66		
4.75	58		
2.36	45		
1.18	32		
0.600	25		
0.425	22		
0.300	19		
0.150	16		
0.075	14		



Notes on Test

Results	
Liquid Limit (%)	20
Plastic Limit (%)	16
Plasticity Index	4
Linear Shrinkage (%)	

Test Methods Used

AS 1289.3.6.1 - Determination of the particle size distribution of a soil - Standard method of analysis by sieving
 AS 1289.3.1.2 - Determination of the liquid limit of a soil - One point Cassagrande Method (subsidiary method)
 AS 1289.3.2.1 - Determination of the plastic limit of a soil - Standard method
 AS 1289.3.3.1 - Calculation of the plasticity index of a soil



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:



D.Kennedy
Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N.: 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	11
Client Address:	Skidders Head, NSW 2478	Report Date:	17/08/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 6 - Carpark Subgrade	Test Request:	NA

Sample Information

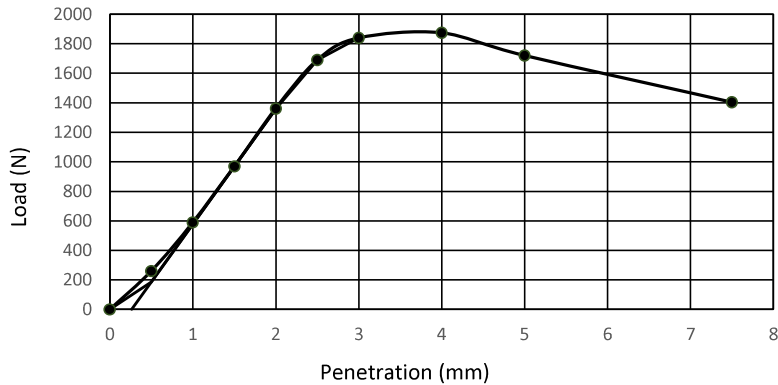
Sample Number:	6155	Lot Number:	NA
Sample Date:	Sampled by Client	Penetration Date:	16/08/2016
Chainage/RL:	NA	Material Type:	Subgrade
Offset/RL:	NA	Soil Description:	Fine Sand
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Subgrade 0.3 - 0.6m	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	1.65 t/m ³	Optimum Moisture Content:	14 %
Dry Density Before Soak:	1.65 t/m ³	Moisture Content Before Soak:	13.8 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	1.4 %
Laboratory Density Ratio:	100.0 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	99.5 %
Retained on 19mm Sieve:	0.1 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	-0.5 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	18.6 %
		Whole Sample Moisture (After Soak):	18.3 %

California Bearing Ratio Results

CBR (Soaked) = **13** % at 2.5mm



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D.Kennedy
 Approved Signatory



Australian Soil and Concrete Testing - Ballina
 PO Box 5120, Ballina Mail Centre, Ballina NSW 2478
 7/17 Southern Cross Drive Ballina, NSW 2478
Telephone: (02) 6686 8567
E-Mail: darran.kennedy@asct.com.au
Mobile: 0405 233 188
A.B.N.: 92 602 346 127

CALIFORNIA BEARING RATIO REPORT

Client:	Civil Consult	Report No:	12
Client Address:	Skidders Head, NSW 2478	Report Date:	17/08/2016
Project:	Rails Carpark, Byron Bay	Project No:	779
Component:	Test Pit 7 - Carpark Subgrade	Test Request:	NA

Sample Information

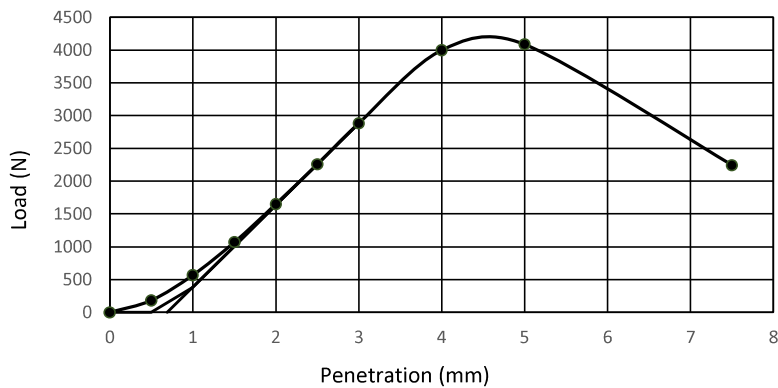
Sample Number:	6156	Lot Number:	NA
Sample Date:	Sampled by Client	Penetration Date:	16/08/2016
Chainage/RL:	NA	Material Type:	Subgrade
Offset/RL:	NA	Soil Description:	Fine Sand
Control Line:	NA	Sampling Method:	Client
Layer/Depth:	Subgrade 0.3 - 0.6m	ITP/PCP Number:	0

Test Data

Density		Moisture	
Maximum Dry Density:	1.65 t/m ³	Optimum Moisture Content:	17 %
Dry Density Before Soak:	1.65 t/m ³	Moisture Content Before Soak:	17.2 %
Specified Density Ratio:	100.0 %	Field Moisture Content:	6.3 %
Laboratory Density Ratio:	100.0 %	Moisture Ratio Required:	100 %
Compactive Effort	Standard	Laboratory Moisture Ratio:	100.5 %
Retained on 19mm Sieve:	1.3 %	Days in Soak:	4
Retained on 37.5mm Sieve:	%	Swell after Soak:	1.0 %
Mass of Surcharges:	4.5 kg	Top 30mm Moisture (After Soak):	21.4 %
		Whole Sample Moisture (After Soak):	21.0 %

California Bearing Ratio Results

CBR (Soaked) = **25** % at 2.5mm



Procedures Used

AS1289.6.1.1 Determination of the California Bearing Ratio of a Soil - Standard Laboratory Method for a Remoulded Specimen.
 AS1289.5.1.1 Dry Density / Moisture Content Relationship of a Soil. (Standard Compaction)
 AS1289.2.1.1 Determination of the Moisture Content of a Soil - Oven Drying Method (Standard Method)

Test Notes: Material retained on the 19mm sieve has been excluded from the test.



Accredited for compliance with ISO/IEC 17025. The results of the tests included in this document are traceable to Australian/national standards.

NATA Accreditation number: 19644

Approved By:

D. Kennedy
 Approved Signatory

Appendix D – Pavement Arrangement & Calculation

PAVEMENT DESIGN CHECK IN ACCORDANCE WITH AUSTRROADS 2012

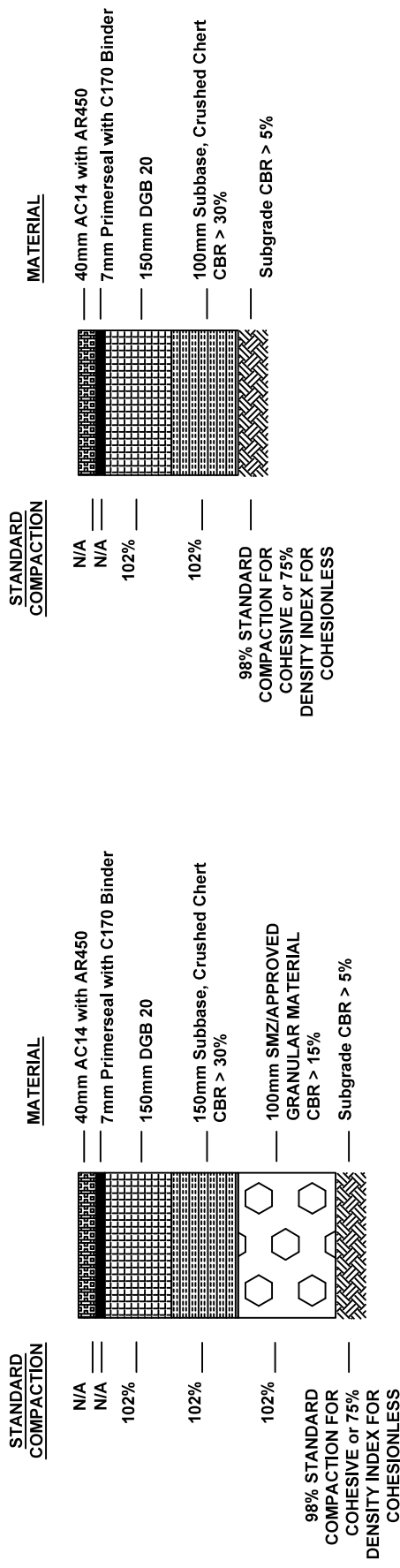
Project: Byron Bay Railway Carpark
 Job Number: 16022



Heavily Trafficked

Design Equation $219-211\log(\text{DCBR})+58(\log(\text{DCBR}))^2*(\log(\text{DESA}/1200)$

Pavement Type	DTL (DESA)	Design Subgrade CBR	Required cover over Subgrade Material (mm)	Design CBR Select Material	Required Cover Over Select Material	Design CBR	Required Cover (mm)	Proposed Pavement Design (mm)	
								Base	Select Material (CBR>30)	Select Material (CBR>15)
NTH Rails Carpark GF With Spray Seal	300,000	4.5	360	15	174	30	115	150	100
STH Rails Carpark GF With Spray Seal	300,000	10	224	15	174	30	115	150	0



**PAVEMENT ARRANGEMENT
PROPOSED ROAD NTH CARPARK**

- NOTES**
- 1 - CBR TESTING TO BE CARRIED OUT AT SUBGRADE, AT MINIMUM TWO (2) LOCATION ALONG THE PROPOSED NEW ROAD
 - 2 - RESULT OF CBR MUST BE GREATER THAN 5, OTHERWISE NOTIFY THE PAVEMENT DESIGNER, WHO WILL REVIEW AND PROVIDE NEW THICKNESS OF PAVEMENT.
 - 3 - EARTHWORKS UNDERTAKEN FOR THE CONSTRUCTION OF THE PROPOSED ROAD SHALL BE UNDERTAKEN IN ACCORDANCE WITH RMS R44
 - 4 - SUBSOIL DRAINAGE TO BE INSTALLED AS PER NORTHERN RIVERS LOCAL GOVERNMENT DRAINAGE SPECIFICATION.
 - 5 - UNDERTAKE A PROOF ROLL AT BOTH THE EXPOSED SUBGRADE AND TOP OF CBR 15 MATERIAL USING A 12T ROLLER, LOADED WATER CART OR PNEUMATIC TYRED TIP TRUCK, ANY AREAS WHICH DISPLAY DEFLECTION SHOULD BE REMOVED AND REPLACED WITH COMPACTED SELECT FILL MATERIAL. THIS MATERIAL SHALL BE PLACED IN 150MM LAYERS AND RECEIVE REASONABLE COMPACTIVE EFFORT TO ACHIEVE TARGET DENSITY OF 95% MD

**PAVEMENT ARRANGEMENT
PROPOSED ROAD STH CARPARK**

CLIENT: WGM CONSULTING
 PROJECT: RAILWAY CAR PARKS
 TITLE: PAVEMENT ARRANGEMENT
 DRAWING: 16022_DWG_GEO01
 DATE: 22.06.16 REV: FOR INFO



8 MORTON WAY P: (02) 6687445
 SKENNARS HEAD M: 0490 419 541
 NSW 2478 INFO@CIVILCONSULT.COM.AU

Appendix E – Subsurface Drainage Plan

SOUTH RAILS CARPARK



ENTRY ONLY TO CAR PARK
 MAINTAIN OVERLAND FLOW INTO EXISTING STORMWATER FIELD INLET PIT
 PARKING BAYS MAY BE LIMITED BY ENTRY/EXIT OF REAR PROPERIES AND POSSIBLE SERVICE CONNECTIONS.
 EXISTING ELECTRICAL LIGHT POLE TO BE RETAINED
 RAISED TRAFFIC ISLAND WITH LOCATION OF PARKING METER CONSISTENT WITH LOCAL CAR PARKS
 ROLL TOP KERBS AND NO PARKING SIGNS TO PREVENT BLOCKING VEHICLE ACCESS ACROSS RAILWAY
 WHEEL STOPS TO BE CONSTRUCTED 820mm FROM BUILDING LINE IN ACCORDANCE WITH AS 2890.1 TABLE 2.1.
 EXISTING BICYCLE RACK FOR PARKING
 KERB RAMPS TO EXIST AT A MAXIMUM GRADE OF 1:8 TO PREVENT OVERLAND FLOW ENTERING ADJACENT PROPERTIES
 POSSIBLE DRIVEWAY ACCESS TO EXISTING RAILS TICKET OFFICE
 MATCH HEAVILY TO EXISTING FOOTPATH
 MAIN EXISTING DISABLED CAR PARKING.
 DESIGNATE LAST AND SECOND LAST BAYS FOR ADDITIONAL DISABLED CAR PARKING.
 MAINTAIN EXISTING OVERLAND FLOW INTO JONSON STREET
 OPTIONAL 1.2m WIDE FOOTPATH THROUGH ST. LINKING INTO EXISTING RAILWAY FOOTPATH
 ALL KERB RAMPS TO COMPLY WITH NORTHERN RIVERS STANDARD DRAWING R-04 AND VEHICLE CROSSOVER TO COMPLY WITH STANDARD DRAWING R-05
 ONE WAY TRAFFIC FLOW AROUND DRIVEWAY TO BE PROHIBITED BY NARROW ROAD CAUSED BY THE EXISTING LIGHT POLE.
 EXIT ONLY FROM CAR PARK
 5 PARKS
 8 PARKS
 24 PARKS
 14 PARKS
 11 PARKS
 98 TOTAL PARKS
 17 PARKS
 13 PARKS
 3 PARKS
 3 PARKS
 NORTON ST

SUBSOIL DRAIN AND FLOW DIRECTION

NOTES:
 SUBSOIL TO BE AS PER CIVIL CONSULT DRAWING (16022_DWG_00) AND TO DAYLIGHT INTO STORMWATER DRAINAGE PITS WITH ADEQUATE FALL.

LEGEND

1. ABBREVIATIONS USED ON THE PLANS

2. LINES AND SYMBOLS USED ON THE PLANS

GENERAL

- LOT BOUNDARIES
- RE-GRADE AND RE-SEAL
- RE-SEAL ONLY
- PROPOSED CONCRETE CURBSIDEWAYS AND FOOTPATHS
- LANDSCAPE AREA
- TREE TO BE REMOVED
- PROPOSED STORMWATER
- EXISTING STORMWATER
- DIRECTIONAL LINEMARKINGS
- DESIGNED SHARED JOINT WITH BOLLARD
- DISABLED LINEMARKINGS
- EXISTING OVERHEAD POWER AND POLE

PRELIMINARY ISSUE
 NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	CHECK	APPROVED	SCALE
1	ISSUED FOR PERMIT	15/08/2024	SA	SA	SA	AS SHOWN
2	ISSUED FOR PERMIT	15/08/2024	SA	SA	SA	AS SHOWN
3	ISSUED FOR PERMIT	15/08/2024	SA	SA	SA	AS SHOWN
4	ISSUED FOR PERMIT	15/08/2024	SA	SA	SA	AS SHOWN

FOR JUST SCALE / EQUIVALENTS

PROJECT: RAILWAY HOTEL AND LAWSON ST SOUTH CAR PARKS
 CLIENT: JOHN HOLLAND
 LEVEL: 20 SWITH STREET PARRAMATTA NSW 2150

WGM CONSULTING
 Suite 5a, 10-14 Bialla Street
 P.O. Box 161, Parramatta NSW 2150
 T 02 8837 8888
 A 02 8837 4047
 www.wgmconsulting.com.au

WGM CONSULTING
 CONSULTANT

GRANTING TITLE: RAILWAY HOTEL CAR PARK
 PROJECT NO: J109
 DRAWING NO: SK007
 REV: A



NORTH RAILS CARPARK



NOTES:
 NON-KERB SUBSOIL TO BE INSTALLED IN LOWEST AREA OF THE CAR PARK AND SHALL BE A 200mm WIDE BY 500mm DEEP TRENCH EXTENDING AS PER KERBED DETAIL.

- LEGEND:**
- ABBREVIATIONS USED ON THE PLANS
 - SW STORMWATER
 - ER EDGE RESTRAINT
 - ELP ELECTRICAL LIGHT POLE
 - PP POWER POLE
 - PM PARKING METER
 - LINE AND SYMBOLS USED ON THE PLANS

- LEGEND:**
- GENERAL**
- LOT BOUNDARIES
 - RE-GRACE AND RE-SEAL
 - RE-SEAL ONLY
 - PROPOSED CONCRETE CURBS/OVERS AND FOOTPATHS
 - LANDSCAPE AREA
 - TREE TO BE REMOVED
 - PROPOSED STORMWATER
 - EXISTING STORMWATER
 - DIRECTIONAL LINEMARKINGS
 - DISABLED SHARED ZONE WITH SOIL-LAND
 - DISABLED LINEMARKING
 - EXISTING OVERHEAD POWER AND POLE

PRELIMINARY ISSUE
 NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	CHECK	APPROVED	SCALE
1	ISSUED FOR REVIEW	15/08/2024	JA	SK	SK	AS1
2	PROPOSED FOR CONSTRUCTION	15/08/2024	JA	SK	SK	AS1
3	ISSUED FOR REVIEW	15/08/2024	JA	SK	SK	AS1
4	PROPOSED FOR CONSTRUCTION	15/08/2024	JA	SK	SK	AS1

FOR JUST SCALE FOOTPRINTS

DATE: 15/08/2024
 DRAWN: JA
 CHECK: SK
 APPROVED: SK

PROJECT: RAILWAY HOTEL AND LAWSON ST SOUTH CAR PARKS
 CLIENT: JOHN HOLLAND
 LEVEL: 20 SMITH STREET
 PARRAMATTA NSW 2150

WGM CONSULTING
 Suite 5a, 40-44 Bialla Street
 Parramatta NSW 2150
 T 62 887 8888
 A 62 887 8888
 www.wgmconsulting.com.au

WGM CONSULTING
 CONCEPT DESIGN
 LAWSON ST SOUTH CAR PARK

PROJ. NO: J109
 DRAWING NO: SK008
 REV: B

Appendix F – Gravel Material Review

Material & Location	Test	LAB Results	RMS 3051 DGS20 Subbase Requirements	RMS 3071 SMZ lower layer Requirements	RMS R44 SMZ lower layer Requirements	NR-LG NGS20 Subbase Requirements	Requirements Satisfied				
							RMS 3051	RMS 3071	RMS R44	NR-LG	
GRAVEL (EXISTING) North Carpark	CBR	90	-	19 min	19 min	30 min	-	✓	✓	✓	✓
	Liquid Limit (%)	18	23 max	-	-	23 max	✓	-	-	-	✓
	Plastic Limit (%)	17	20 max	-	-	23 max	✓	-	-	-	✓
	Plasticity Index (PI)	2	12 max	15 max	15 max	12 max	✓	✓	✓	✓	✓
	100mm	100	-	-	100	-	-	-	✓	-	-
	53mm	100	-	100	-	-	-	✓	-	-	-
	37.5mm	100	-	95 - 100	-	-	-	✓	-	-	-
	26.5mm	100	100	-	-	100	✓	-	-	-	✓
	19.0mm	97	95 - 100	50 - 85	>50%	96 - 100	✓	✗	✓	✓	✓
	13.2mm	92	70 - 90	-	-	-	✗	-	-	-	-
	9.5mm	84	58 - 80	-	-	65 - 89	✗	-	-	-	✓
	6.7mm	76	-	40 - 80	-	-	-	✓	-	-	-
	4.75mm	68	43 - 65	-	-	47 - 80	✗	-	-	-	✓
2.36mm	54	30 - 55	35 - 70	-	32 - 67	✓	✓	-	-	✓	
0.425mm	38	10 - 30	-	-	14 - 42	✗	-	-	-	✓	
0.075mm	26	7 - 14	-	-	6 - 26	✗	-	-	-	✓	

RMS = Roads and Maritime Services

NR-LG = Northern Rivers-Local Government

Material & Location	Test	LAB Results	RMS 3051 DGS20 Subbase Requirements	RMS 3071 SMZ lower layer Requirements	RMS R44 SMZ lower layer Requirements	NR-LG NGS20 Subbase Requirements	Requirements Satisfied			
							RMS 3051	RMS 3071	RMS R44	NR-LG
GRAVEL (EXISTING) outh Carpark	CBR	50	-	19 min	19 min	30 min	-	✓	✓	✓
	Liquid Limit (%)	20	23 max	-	-	23 max	✓	-	-	✓
	Plastic Limit (%)	16	20 max	-	-	23 max	✓	-	-	✓
	Plasticity Index (PI)	4	12 max	15 max	15 max	12 max	✓	✓	✓	✓
	100mm	100	-	-	100	-	-	-	✓	-
	53mm	100	-	100	-	-	-	✓	-	-
	37.5mm	100	-	95 - 100	-	-	-	✓	-	-
	26.5mm	97	100	-	-	100	-	-	-	✗
	19.0mm	91	95 - 100	50 - 85	>50%	96 - 100	✗	✗	✓	✗
	13.2mm	81	70 - 90	-	-	-	✓	-	-	-
	9.5mm	74	58 - 80	-	-	65 - 89	✓	-	-	✓
	6.7mm	66	-	40 - 80	-	-	-	✓	-	-
	4.75mm	58	43 - 65	-	-	47 - 80	✓	-	-	✓
2.36mm	45	30 - 55	35 - 70	-	32 - 67	✓	✓	-	✓	
0.425mm	22	10 - 30	-	-	14 - 42	✓	-	-	✓	
0.075mm	14	7 - 14	-	-	6 - 26	✓	-	-	✓	

RMS = Roads and Maritime Services

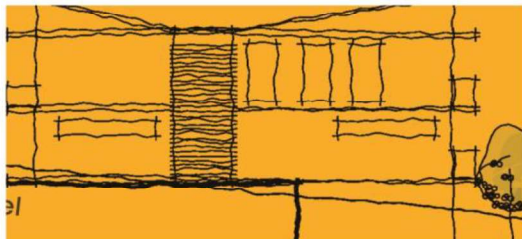
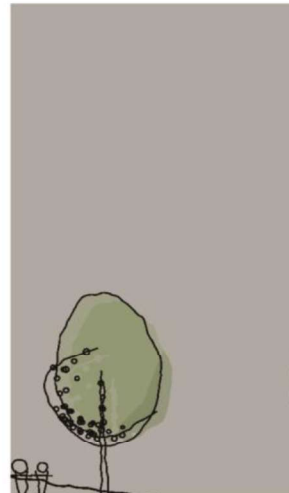
NR-LG = Northern Rivers-Local Government

Appendix C

Tree Clearing Report



TREE CLEARING REPORT
RAILWAY HOTEL AND LAWSON STREET
SOUTH CAR PARKS
JONSON STREET, BYRON BAY
PT3 DP827046 & LOT 1 ON DP1001454



For John Holland
Prepared by Planit Consulting Pty Ltd
July 2016

23 January 2017

Byron Shire Council
Planning Development
PO Box 219
Mullumbimby NSW 2482

To whom it may concern,

**TREE CLEARING REPORT
RAILWAY HOTEL AND LAWSON STREET SOUTH CAR PARKS
JONSON STREET, BYRON BAY
PT3 DP827049 & LOT1 ON DP1001454**

Planit Consulting Pty Ltd has been commissioned by John Holland to prepare a tree clearing report for the redevelopment of the Railway Hotel and Lawson Street South car parks at Byron Bay. The report is in regards to the removal of four (4) trees that are required to facilitate the proposed development.

Subject Site

The proposed car parks are located along Jonson Street and Lawson Street in Byron Bay. A locality plan of the proposal has been provided below.



Figure 1 - Locality plan

Proposal

The proposal is for the redevelopment of two, unformed /gravel car parks within the Byron Bay locality. The proposed development plan of each car park has been provided below. The plan seeks to seal/stablise the existing carparks and formalize this space through line marking.

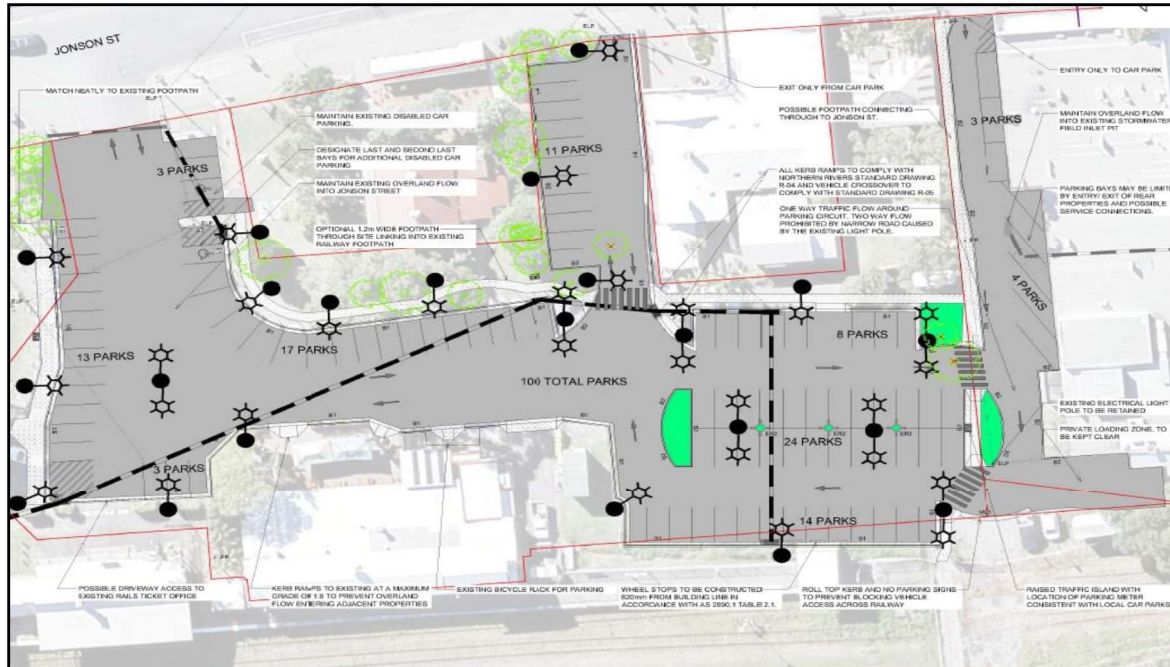


Figure 2 - Proposed design of Railway Hotel car park

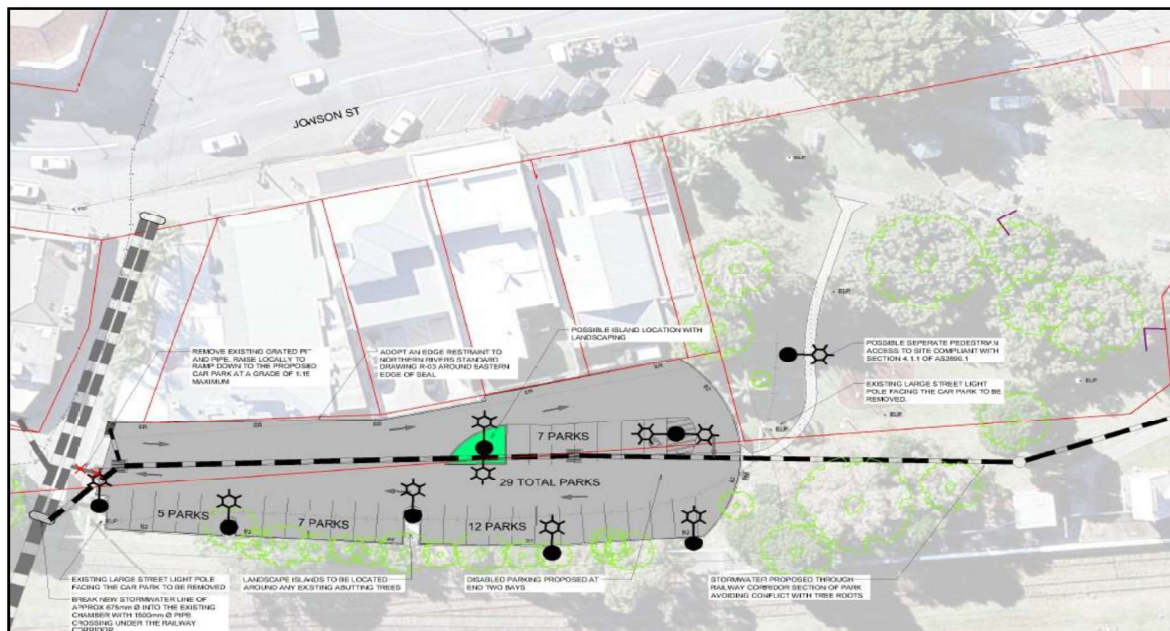


Figure 3 - proposed design of Lawson Street South car park

Tree Removal

As previously discussed, the removal of four (4) trees are required to facilitate the proposed redevelopment as the removal of the vegetation will assist in maximising car park spaces and enable safe vehicular movement. The four (4) trees identified for removal have been outlined below.

Table 1 - Trees identified for removal

Common Name	Scientific Name	Size	Amount
Broad leaved Paperbark	<i>Melaleuca quinquenervia</i>	Up to 8m in height (multi-stem)	2
Umbrella Tree	<i>Schefflera actinophylla</i>	Up to 4m in height	1
Bribie Island Pine	<i>Callitris columellaris</i>	Up to 8m in height	1

Images for the identified trees have been also been provided below. Please note that the two (2) Paperbark and Umbrella tree are located in the same location.



Figure 4 - Paperbark trees and Umbrella tree



Figure 5 - Paperbark and Umbrella tree



Figure 6 - Umbrella tree entangled within Paperbark tree



Figure 7 - Single Callitris

Analysis

It is considered the proposed tree clearing is appropriate and will not cause an adverse impact on the existing environment. As seen in the figure below, the existing vegetation within the two car parks is not linked to other vegetation in the surrounding locality. Furthermore, the trees to be removed are not listed on any NSW endangered species list, with the Umbrella tree listed as a noxious weed by NSW Department of Primary Industries.

The subject trees are not senescent and provide no hollows for fauna. Additionally, no nests were observed. It is likely the subject trees provide occasional forage resources for avifauna and bats, however the 4 trees would not constitute significant habitat or forage resource. Removal of the trees would not significantly impact upon the existing environment.



Figure 8 - Existing vegetation within locality

★ Location of subject trees

Ecological Assessment Guide

The following is a summarized evaluation of the proposed clearing against various ecological legislation:

Table 2 - Assessment against legislative provisions

RELEVANT LEGISLATIVE PROVISIONS		
Legislation	Section(s)/ Provisions	Assessment
Environmental Protection & Biodiversity Conservation Act (1999)	Cl 18, 18A & 19: Matters of NES – threatened species and Clause 67, 67A & 68: Environmental assessment & approvals – referral to Dept of Environment	Proposal will not have a significant impact on Matters of National Environmental Significance. The removal of 4 trees, which themselves are common species, would not remove a significant forage or roost site for scheduled flying mammals or avifauna.
Environmental Planning & Assessment Act (1979)	Section 5A: (significant effect on threatened species, populations or ecological	The site inspection confirmed the vegetation to be removed would not have significant effect on threatened species, populations or ecological communities, or their habitats. The clearing will not cause a significant impact.
Threatened Species Conservation Act 1995	Section (94) & Schedules 1, 1A, 2 and 3:	The proposal does remove vegetation however this vegetation is unlikely to have significant effect on threatened species, populations or ecological communities, or their habitats.
Native Vegetation Act 2003	Clause 12: Clearing requiring approval	No approval required under this Act.
Fisheries Management Act 1994	Clause 201: Fisheries Permit	Not applicable – Fisheries permit not required.
Water Management Act 2000	Clause 91: Activity approvals	A controlled activity approval is not likely to be required for the proposal as no dewatering or stream bank work is proposed.
SEPP 44	Clauses 7-11: Development control of	The site is not considered to represent potential Koala habitat under the SEPP.
Rural Fires Act	S100B	Not applicable

Vegetation Management

As seen above and within the development plans, there are other native and exotic trees around the perimeter of the lot and existing unformed carparks. These trees are not proposed for removal and will be retained within the ultimate redevelopment of the carparks.

A Vegetation Management Plan (VMP) has been prepared for both the clearing of the identified trees within the works zone and the retention and protection of the existing native and exotic vegetation located external to proposed work zones. The VMP is to be used as a tool during the construction of the development, identifying tasks to be undertaken, the timing of such works and responsible parties for the supervision/implementation of vegetation removal and retention on the site.

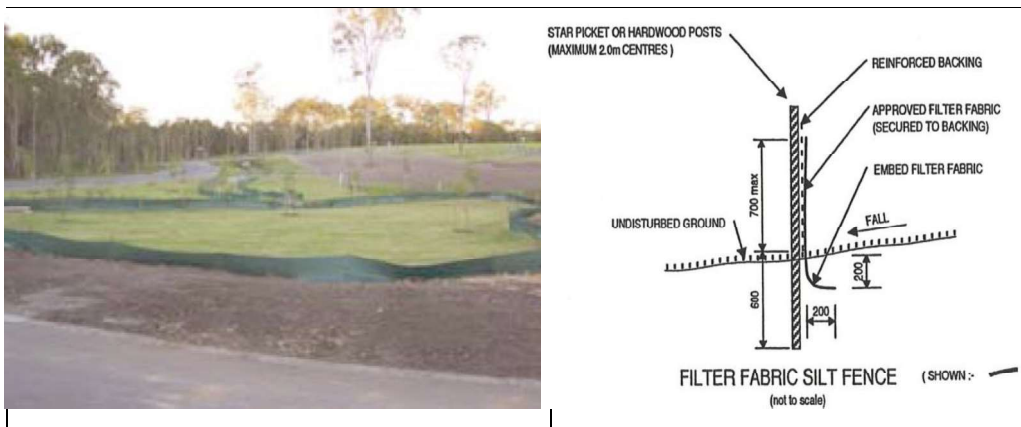
Areas where vegetation is proposed to be removed to facilitate the development are have been displayed in Figure 8 above. This plan identifies appropriate vegetation protection methods and addresses the necessary removal and retention of vegetation as described above. Strict implementation of the following methodologies is necessary to ensure vegetation nominated for retention is not damaged during construction works.

Element	Vegetation Management Plan
Objectives	<ul style="list-style-type: none"> • To remove the identified trees as specified previously within this report. • To retain other native and exotic trees around the perimeter of the local and existing unformed carparks. • To prepare and implement an Acid Sulfate Soil Management Plan (where necessary) and Sediment and Erosion Control Plan to manage potential impacts associated with earthworks.
Action	<ul style="list-style-type: none"> • Tree Protection Zones (TPZ) are to be clearly delineated on-site to ensure that all areas affected by this VMP are readily identifiable. • Vegetation to be retained must be delineated with tree protection fencing prior to commencement of tree clearing for easy identification (do not use permanent paints or similar). • Any works adjacent to trees nominated for retention must be undertaken by climbers to dismantle the tree. No machinery is permitted within the Tree Protection Zone. • Tree Protection Zones (TPZ) are to be established around the retained vegetation to ensure that machinery undertaking complete clearing over the site does not encroach within these areas. Exclusion fencing is to be erected in accordance with the below:

Action



- During construction areas with batters adjacent to vegetation retention zones (including stormwater basins) are to incorporate sediment fencing generally as per the below:



- The existing vegetation to be retained will be managed during construction activities and through the establishment and maintenance periods in accordance with the approved Vegetation Management Plan to avoid any of the following:
 - Structural damage to the tree including root damage;
 - Compaction of the root plate including parking of any vehicles;
 - Filling of soil within the tree protection zone (tpz) and/or drip zone; and
 - Storage of any building materials within the drip zone;
 - Long-term harm to the health of the tree.

Action	<ul style="list-style-type: none"> • The project superintendent must adequately protect from damage any vegetation on private and/or public property which is not designated for removal in association with this development. • Hygiene management is to be applied to all stages of the development (pre-construction, construction and occupation). This requires that prior to entering the construction site all tools, equipment, vehicles and all landscape materials (including but not limited to, soils, mulch, gravel and potted or ex-ground plants) are to be cleaned free of Nut Grass propagules <i>Cyperus esculentus</i> and <i>Cyperus rotundus</i>. • Any existing Nut Grass present on site is fully controlled and shows no signs of active growth prior to the acceptance by Council of the commencement of the 'On Maintenance' period. • All landscape materials including but not limited to soils, mulch, gravel, potted or ex-ground plants, pavers, timber etc. to be used in landscape treatments on this site are to be free of 'Fire Ants' and Fire Ant eggs. • All landscape material being sourced from areas currently identified as potential Fire Ant risk areas must be checked by a suitably qualified professional and certified that: <ul style="list-style-type: none"> ○ No risk of transportation of Fire Ants exists; and ○ That all materials are free from Fire Ant contamination. • All contractors working on the site are to be informed of all provisions specified under this VMP. • All 'Tree Protection Zones' are to be appropriately protected by erosion and sediment controls, per the detail in operational works development applications and within/on any revised sediment and erosion control plans submitted to council for approval. • Cleared vegetation is to be disposed of in accordance with accepted measures including: <ul style="list-style-type: none"> ○ All felled trees are sorted for millable timber. Millable timber is sold for use as usable timber/fencing etc. ○ All non suitable timber is sheered and mulched for reuse within the site by contractors. Mulch produced onsite must be appropriately treated and composted for a minimum period of 6 weeks prior to use in revegetation areas or other areas of public open space. ○ Reduction of wastes are maximised by doing large scale felling to ensure all removed vegetation is contained and mulched. ○ Soils are screened from the mulch piles and utilised for top soil. • Remaining debris not disposed of in either of the above methods is to be removed off-site by the owner to an approved green-waste disposal facility.
--------	--

Action	<ul style="list-style-type: none">• To be removed hollow-bearing trees are to be dismantled by a QPWS-recognised fauna spotter-catcher and limbs dispersed within retained vegetation zones• The following activities are not permitted within the drip zones of trees to be retained (i.e. trees not designated for removal):<ul style="list-style-type: none">- Storage and mixing of materials;- Vehicle parking or manoeuvring;- Liquids disposal;- Machinery repairs or refuelling;- Site office and/or shed erection;- Lighting of fires;- Rubble, soil or debris stockpiling; and- Excavation.• If root/crown damage (or other significant disturbance) to retained trees occurs/is required during approved clearing/construction works on the site, works are to cease and treatment by a suitably qualified Arborist (i.e. root truncations, crown thinning) is to be implemented.• Any retained trees with deadwood overhanging road reserve or public open space that may constitute a hazard to members of the public as determined by a qualified Arborist will be pruned in accordance with AS 4373 - 1996 Pruning of Amenity Trees.• A QPWS-recognised fauna spotter-catcher is to ensure safe dispersal of fauna into areas of retained vegetation during clearing works• Effective sediment and erosion control devices are to be identified and provided at in association with clearing and construction works.• Site access locations will be located external to 'Tree Protection Zones'.
--------	--

<p>Performance Indicators</p>	<ul style="list-style-type: none"> • Tree-clearing activities are restricted to identified areas. • Construction fencing and sediment/erosion control devices are installed and maintained at all times in accordance with an approved erosion/sediment control plan • A fauna spotter catcher is present during all clearing works and all encountered fauna are safely dispersed with no injury sustained. All works to proceed in accordance with a pre-clearing fauna assessment and management plan. • Retained vegetation is to demonstrate healthy conditions: <table border="1"> <thead> <tr> <th>Grade</th> <th>Condition</th> <th>Descriptor</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Healthy</td> <td>Leaves green, no abnormal leaf loss</td> </tr> <tr> <td>2</td> <td>Fair</td> <td>Leaves green, some yellowing of leaves, but <20% of canopy affected</td> </tr> <tr> <td>3</td> <td>Poor</td> <td>Many leaves yellow or brown, substantial reduction in canopy extent since last measurement</td> </tr> <tr> <td>4</td> <td>Dead</td> <td>Leaves brown or absent, little of the canopy remaining</td> </tr> </tbody> </table>	Grade	Condition	Descriptor	1	Healthy	Leaves green, no abnormal leaf loss	2	Fair	Leaves green, some yellowing of leaves, but <20% of canopy affected	3	Poor	Many leaves yellow or brown, substantial reduction in canopy extent since last measurement	4	Dead	Leaves brown or absent, little of the canopy remaining
Grade	Condition	Descriptor														
1	Healthy	Leaves green, no abnormal leaf loss														
2	Fair	Leaves green, some yellowing of leaves, but <20% of canopy affected														
3	Poor	Many leaves yellow or brown, substantial reduction in canopy extent since last measurement														
4	Dead	Leaves brown or absent, little of the canopy remaining														
<p>Frequency / Deadline</p>	<ul style="list-style-type: none"> • Identification of retained vegetation prior to commencement of clearing works. • Construction/tree protection fencing is to be installed prior to commencement of any site works. • All work in areas adjacent to vegetation to be retained must be carried out without causing damage to the vegetation. • Implement tree clearing works upon receipt of tree clearing approval - completion within 12 months. • QPWS-recognised fauna spotter-catcher to be present on-site prior to and during all vegetation-clearing works. • All sediment/erosion control devices installed prior to construction works commencing 															
<p>Person Responsible</p>	<ul style="list-style-type: none"> • The Project Superintendent is responsible for informing all contractors, sub-contractors, consultants and government authorities working on the site of the provisions of this VMP. • A QPWS-recognised fauna spotter-catcher is to be contracted for fauna capture/relocation as necessary. • A suitably qualified Arborist is responsible for assessing and implementing any remediation works to damaged vegetation retained within protection zone areas if/where required. • A suitably qualified consultant is responsible for installing and monitoring erosion and sediment control devices. 															

<p>Reporting and Reviewing</p>	<ul style="list-style-type: none"> • The project superintendent is responsible for reporting to Council where actions specified in this VMP are not undertaken and/or compromised. • The project superintendent is responsible for commissioning all consultants necessary for implementing this VMP (i.e. clearing contractors, arborist, wildlife spotter catchers etc). • A licenced Wildlife Spotter Catcher is responsible for all fauna capture/dispersal works • The owner/project superintendent is responsible for the implementation of this VMP
<p>Corrective Action</p>	<ul style="list-style-type: none"> • If vegetation not identified for removal is disturbed during clearing or building works, the need for supplementary rehabilitation works is to be negotiated between the project superintendent and Council of City of Gold Coast. • If retained trees show signs of ill health (i.e. poor or dead), likely causes are to be determined, methods of mitigating such effects are to be identified in consultation with a suitably qualified Arborist and Council officers, and mitigation measures to improve growth conditions are to be put in place. • All works required at the interface of the 'Tree Protection Zone' and earthworks where any encroachment is necessary into the drip zone of a retained tree shall incorporate preventative and remedial actions according to the Australian Standard 'AS 4970 Protection of Trees on Development Sites'. These include: <ul style="list-style-type: none"> ○ Arborist must be present on site during tree civil earthworks at the interface of retained vegetation. ○ The area lost to this encroachment should be compensated for elsewhere and contiguous with the 'Tree Protection Zone'. ○ If approved batters are encroaching a 'Tree Protection Zone' then sediment fencing is required at the interface. ○ Where tree roots within the 'Tree Protection Zone' are exposed by excavation, temporary root protection should be installed to prevent them drying out. This may include mulch, jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting should be pegged in place and kept moist during the period that the root zone is exposed ○ If the grade is to be raised the material should be coarser or more porous than the underlying material. Depth and compaction should be minimized ○ Where the project arborist identifies roots to be pruned within or at the outer edge of the 'Tree Protection Zone', they should be pruned with a final cut to undamaged wood. Pruning cuts should be made with sharp tools such as



	<p>secateurs, pruners, handsaws or chainsaws. Pruning wounds should not be treated with dressings or paints. It is not acceptable for roots within the 'Tree Protection Zone' to be 'pruned' with machinery such as backhoes or excavators.</p> <ul style="list-style-type: none">○ If root zones are overlapping the opinion of a suitably qualified Arborist shall be sought regarding as to what remedial action is required ● Where a tree shows signs of any loss in structural integrity or a potentially unsafe condition, then in the opinion of a suitably qualified Arborist and Council officers the tree shall be either stabilised or removed to avoid any future danger/risk. ● Where sediment and erosion control structures fail, likely causes are to be identified and additional measures installed.
--	---

Summary & conclusions

Planit Consulting have been engaged to assess the effects of the proposed sealing of an existing carpark within central Byron Bay. The assessment has included the following:

- Survey, ground truthing and mapping of vegetation communities and determining conservation status reflective of reference reports and onsite condition
- Consider statutory requirements including Section 5A of the Environmental Planning and Assessment Act and SEPP 44-Koala Habitat Protection

The site inspection identified 4 trees affect by the proposal and required to be removed. Of these, 3 are common and the fourth, Umbrella Tree, is considered a noxious and environmental weed. The vegetation given its isolation form areas of native vegetation, and location within an existing commercial carpark limits the value of the vegetation for fauna. No nests or hollows were observed. It is recognised that the vegetation may provide a forage resource for avifauna or flying mammals however the removal of the 4 trees are not considered to be significant to any scheduled fauna.

The assessment concludes that the impacts of the proposed development are unlikely to represent a significant effect on threatened species, populations or ecological communities, or their habitats. The clearing will not cause a significant impact. A species impact is therefore not required.

We note the plans for the new carpark provide for landscape spaces/garden beds and the four trees are able to be offset through planting in these landscape areas/garden beds.

Should you have any further questions relating to the content of this report, please do not hesitate to contact the undersigned on (02) 6674 5001.

Yours sincerely,



For
Boyd Sargeant
Planit Consulting Pty Ltd
Director

Appendix D

Aboriginal Cultural Heritage Due-Diligence Assessment

Table G.1: Do you need to use the Due Diligence code (source DECC&W. 2010)?

ITEM	CONSIDERATION		FURTHER CONSIDERATIONS	APPLICANT RESPONSE
1	Is the activity a Part 3A project declared under s.75B of the EP&A Act? (note – S3A has been repealed)			NO
	If NO go to point 2			
2	Is the activity exempt from NPW Act or NPW Regulation?	If YES	AHIP not required: proceed with caution	NO
	If NO go to point 3			
3	Will the activity involve harm that is trivial or negligible? (See section 7 of CODE.)	If YES	AHIP not required: proceed with caution	NO
	If NO go to point 4			
4	Do either or both of these apply: <ul style="list-style-type: none"> Is the activity in an Aboriginal Place? Have previous investigations that meet the requirements of this code identified Aboriginal objects? 	If YES	Will the activity cause or permit harm to an Aboriginal Place or an Aboriginal object? If NO then: an AHIP is not required If YES then: Do you intend to take steps to avoid harm to the Aboriginal Place or Aboriginal objects? If yes then: No AHIP necessary: proceed with caution. If No then AHIP necessary – process with caution.	NO
	If NO go to point 5			
5	Is the activity a low impact one for which there is a defence in the NPW Regulation? (see Clause 80B of the NP&W Regs)	If YES	No AHIP necessary – proceed with caution	YES – 80B (1) (e) An activity on land that has been disturbed and is for the purpose of maintaining an existing car park
	If NO go to point 6			
6	Do you want to use an industry specific code of practice, adopted by the NPW Regulation or other due diligence process?	If YES	Use the industry specific code, or other process, to undertake due diligence.	NO - not applicable
	If NO go to point 7			
7	Follow the Generic Due Diligence Code of Practice. See section 8.			N/A

NOTES (Source: DECCW 2010, Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW):

Step 1: If you answered No to Item 1, then proceed with caution without applying for an AHIP.

Step 2: If after completing steps 2 it is reasonable to conclude that there are no known Aboriginal objects or a low probability of objects occurring in the area of the proposed activity, you can proceed with caution without applying for an AHIP.

Step 3: This step only applies if your activity is on land that is not disturbed land or contains known Aboriginal objects. If you can't avoid harm to the object or disturbance of the landscape feature(s) you must go to step 4. If you can avoid harm to the object and disturbance of the landscape feature(s) you can proceed with caution without applying for an AHIP.

Step 4: If an AHIP application is required, then the proposal is not eligible to be lodged as an REF for Minor Council Infrastructure Works, and an REF under the standard template including a Cultural Heritage Assessment in accordance with the NSW Aboriginal Cultural Heritage Consultation requirements for proponents (April 2010) is required.

Appendix E

Dial Before You Dig Search Results



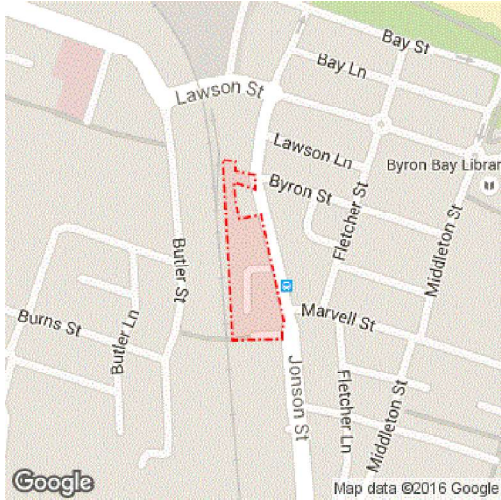
Caller Details

Contact: Mr stephen adam
Company: wgm consulting
Address: po box 161
Lennox Head NSW 2478

Caller Id: 1548579 **Phone:** 0408785998
Mobile: 0408785998 **Fax:** Not Supplied
Email: stephen@wgmconsulting.com.au

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Not Supplied
Working on Behalf of: Private
Enquiry Date: 29/04/2016 **Start Date:** 16/05/2016 **End Date:** 16/05/2016
Address: Byron Street
Byron Bay NSW 2481
Job Purpose: Excavation
Onsite Activity: Vertical Boring
Location of Workplace: Both
Location in Road: CarriageWay, Footpath, Nature Strip

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
Not Supplied

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at www.1100.com.au
- For more information on safe excavation practices, visit www.1100.com.au

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
52532294	Essential Energy	132391	NOTIFIED
52532296	Optus and/or Uecomm, Nsw	1800505777	NOTIFIED
52532295	Telstra NSW, North	1800653935	NOTIFIED

END OF UTILITIES LIST

Overhead wires not shown
LOOK UP & LIVE!

LEGEND

- LV Underground Cable
- HV Underground Cable
- Underground Pipe
- ★ Underground Earth or Wires
- ▲ Ground Substation
- Pole
- ⊠ Cubicle
- Pit

Critical Assets
Contact Essential Energy on 13 23 91

- ▨ Zone Substation
- Underground Cable
- Underground Fibre

Proposed Works

- ▨ Area of proposed works

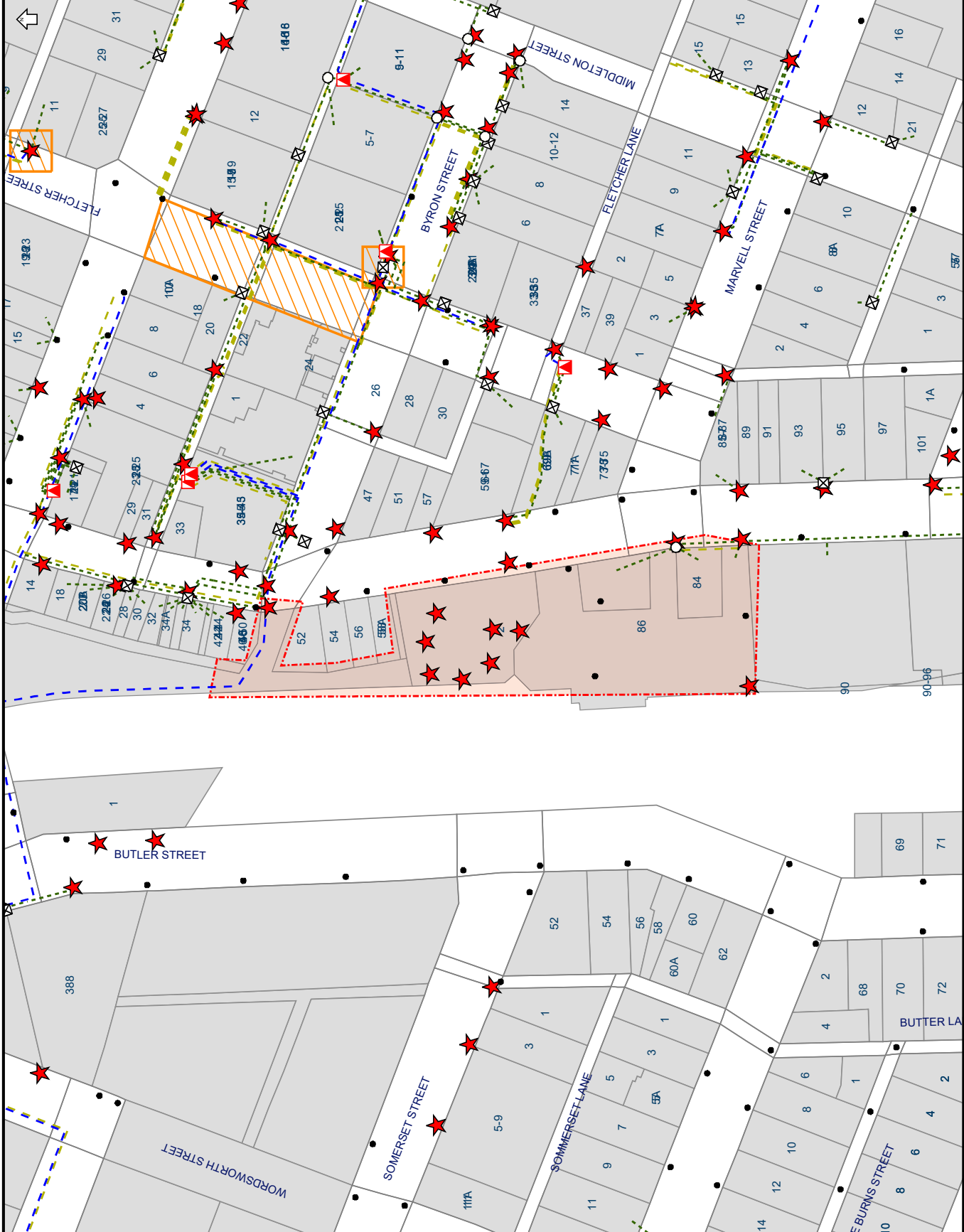
Proposed assets are shown as orange symbols

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.
If details are incorrect, please notify Essential Energy on 13 23 91 (or fax 1800 354 636)

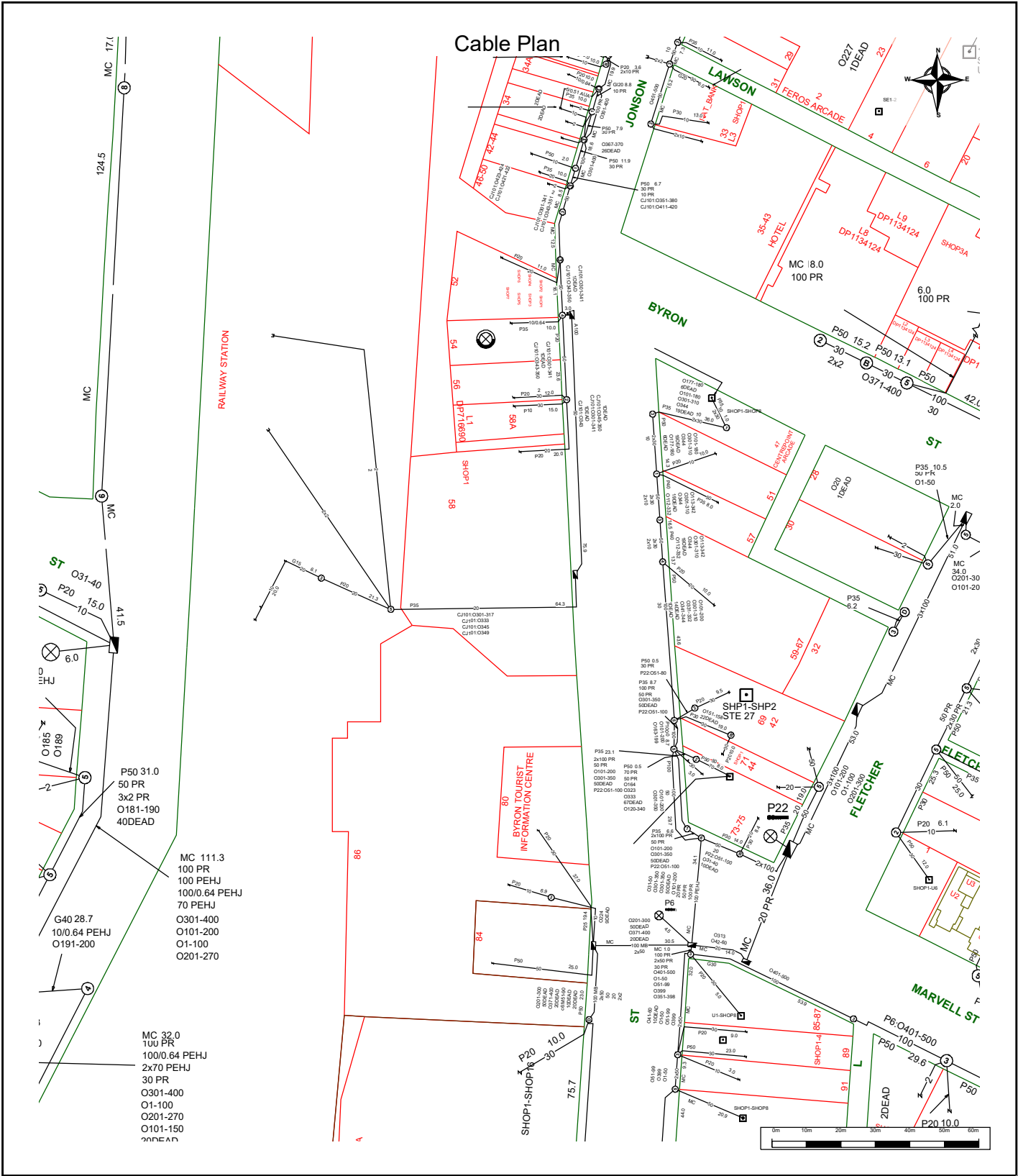
ISSUE DATE: 29/04/2016

You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above

A4 SCALE: 1:2464



Job Number: 10624800 Sequence number: 52532294 Job location: Byron Street, Byron Bay Map Centre: 153° 36' 43.6", -28° 38' 35.3"



For all Telstra DBYD plan enquiries -
 email - Telstra.Plans@team.telstra.com
 For urgent onsite contact only - ph 1800 653 935 (bus hrs)

Sequence Number: 52532295

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556
 Generated On 29/04/2016 16:51:02

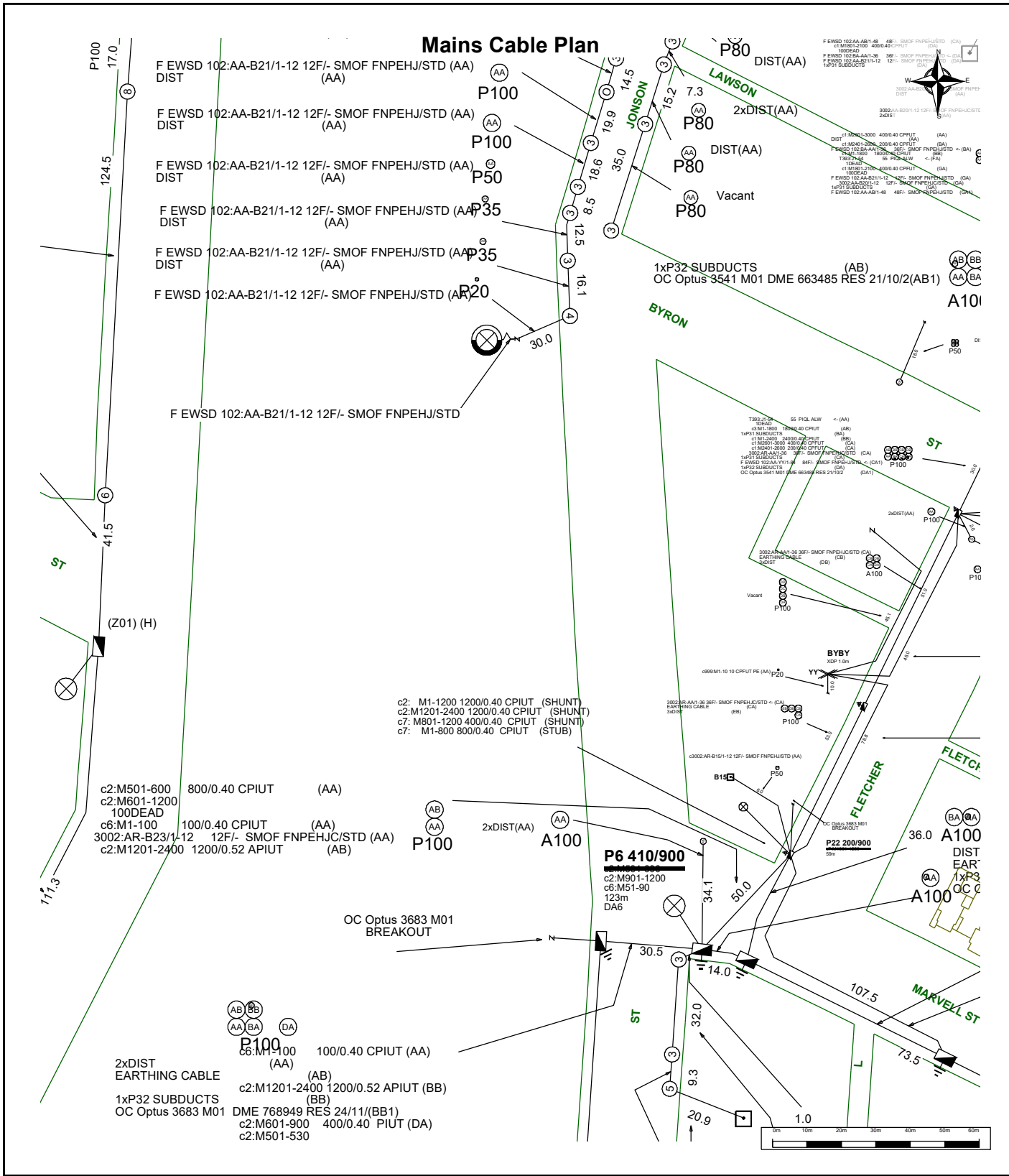
The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.



Telstra

For all Telstra DBYD plan enquiries - email - Telstra.Plans@team.telstra.com
 For urgent onsite contact only - ph 1800 653 935 (bus hrs)

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

Generated On 29/04/2016 16:51:11

Sequence Number: 52532295

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

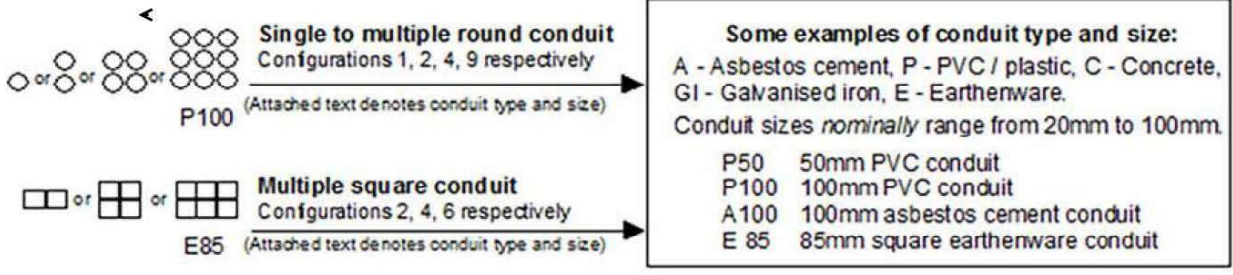
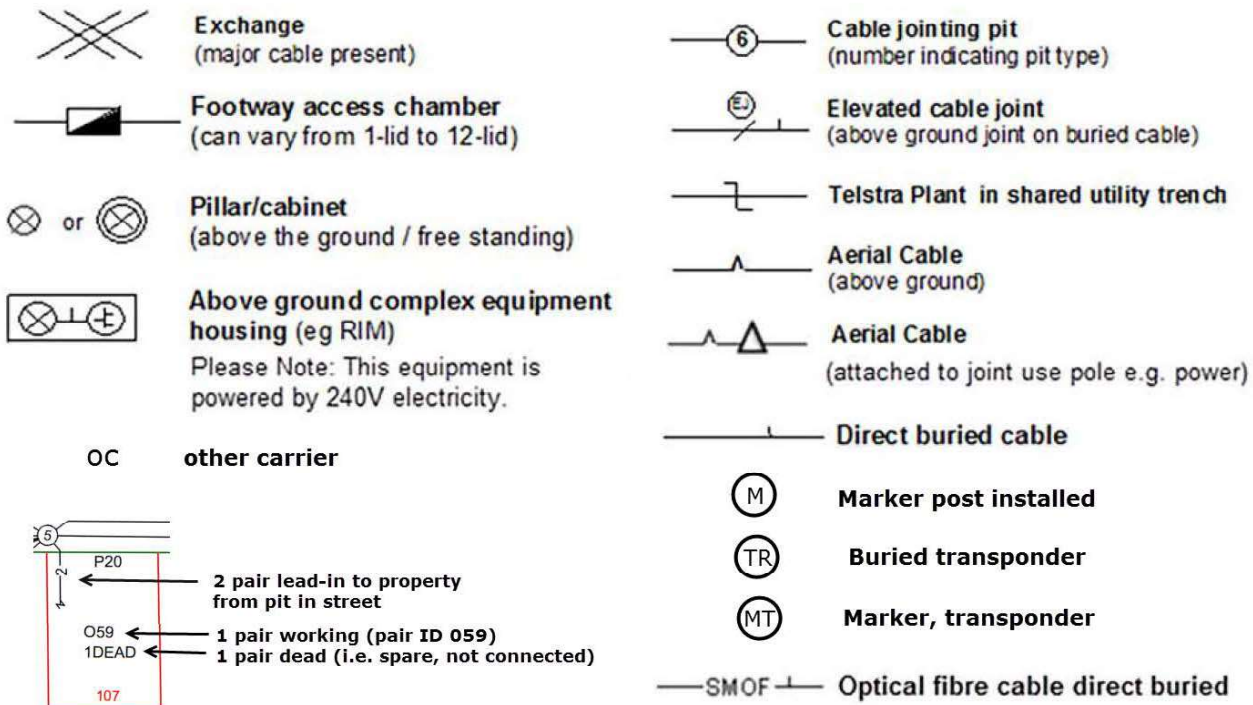
Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

LEGEND

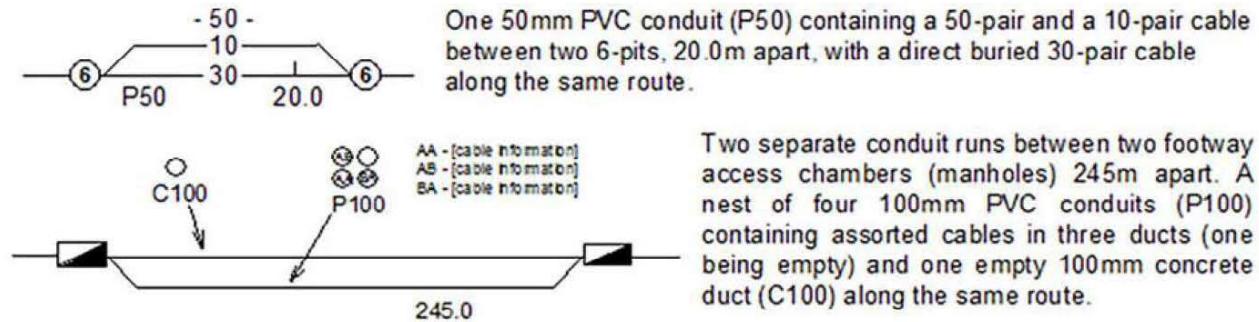
IT'S HOW
WE CONNECT



For more info contact a Telstra Accredited Locator or Telstra Plan Services 1800 653 935



Some examples of how to read Telstra plans:



WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. **FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK.** A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.



Appendix F

Consideration of Clause 228(2) factors
and matters of national environmental
significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline as detailed in the REF, the following factors, listed in Clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
<p>a. Any environmental impact on a community?</p> <p>The proposed works may cause minor short-term environmental impacts on the community, such as delays to traffic, loss of parking and noise impacts; however the potential impacts would be minimised with the implementation of the safeguards as detailed in this REF. The proposed upgrade works would have no environmental impact on the community in the long-term.</p>	<p>Negative – Local – Short Term</p> <p>Positive – Local – Long Term</p>
<p>b. Any transformation of a locality?</p> <p>The proposed works would see a minor transformation within the locality through the removal of four trees and the formalisation of the existing car parks. The transformation to the locality is minor only as works would generally be contained within the existing cleared car park areas.</p> <p>Following the completion of works, the locality would be reflective of the current situation.</p>	<p>Negative – Local – Short Term</p> <p>Positive – Local – Long Term</p>
<p>c. Any environmental impact on the ecosystems of the locality?</p> <p>The proposed works will see an impact to the ecosystem of the locality through removal of four trees. This impact has been assessed to be minor only.</p>	<p>Negative – Local – Short Term</p>
<p>d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>The proposed works would have a minor impact upon the aesthetics and habitat value of the locality in the short term. This impact is considered to be minor.</p> <p>The proposal would not impact upon the recreational values of the site.</p>	<p>Neutral – Local – Long Term</p> <p>Potential Minor Negative – Local Short Term</p>

Factor	Impact
<p>e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>The subject site occurs within the Byron Bay Railway Precinct area which identified as having both state and local significance. The proposed works however, would not impact upon the heritage values of the site</p>	Negligible
<p>f. Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>The subject site is highly disturbed from past and current land uses and provides minimal habitat for protected flora and fauna. Accordingly, the proposal would not have a significant impact upon habitat for threatened, endangered or vulnerable species.</p>	Negligible
<p>g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The subject site is highly disturbed from past and current land uses and provides minimal habitat for protected flora and fauna. Accordingly, the proposal would not have a significant impact upon habitat for threatened, endangered or vulnerable species.</p>	Negligible
<p>h. Any long-term effects on the environment?</p> <p>Mitigation measures listed in Section 7.2 of this REF would be implemented during construction to ensure that there are no long-term effects on the environment</p>	Negligible
<p>i. Any degradation of the quality of the environment?</p> <p>The proposed works would likely result in some minor short-term impact on the environment through potential noise, dust and vibration; however the potential impacts would be minimised with the implementation of the safeguards in this REF to ensure that these impacts do not degrade the quality of the environment in the longer term.</p>	Negative – Local – Short Term

Factor	Impact
<p>j. Any risk to the safety of the environment?</p> <p>The proposed works would have minimal risk to the safety of the environment. A range of risk management measures would be utilised during construction which are summarised in Section 7.2 of this REF.</p>	<p>Negligible</p>
<p>k. Any reduction in the range of beneficial uses of the environment?</p> <p>The proposed works would cause a minor reduction in the use of the site from car park closures during construction. There would be no long-term reduction in the range of beneficial uses of the environment as a result of the works.</p>	<p>Negative – Local – Short Term</p> <p>Positive – Local – Long Term</p>
<p>l. Any pollution of the environment?</p> <p>The proposed works would potentially cause pollution of the environment. The potential impacts would be minimised with the implementation of the safeguards in this REF.</p>	<p>Negative – Local – Short Term</p>
<p>m. Any environmental problems associated with the disposal of waste?</p> <p>The waste generated during the proposed works would be contained and removed for disposal to approved recycling facilities or to licensed landfill in accordance with the safeguards of this REF. No environmental problems are anticipated for the disposal of waste.</p>	<p>Nil</p>
<p>n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>The proposed works would not significantly increase demands on resources, which are, or are likely to become, in short supply. Relatively small amounts of materials would be required for the proposed works.</p>	<p>Nil</p>

Factor	Impact
<p>o. Any cumulative environmental effect with other existing or likely future activities?</p> <p>The proposed works may produce greenhouse gas emissions and includes the removal of limited natural habitat. Due to the small scope of the project, these impacts do not have the potential to have a significant cumulative environmental effect on existing or likely future activities. The potential impacts on the environment would be minimised with the implementation of the safeguards given in this REF.</p>	<p>Negligible</p>
<p>p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>The works site is not affect by coastal processes or coastal hazards. This factor is not applicable</p>	<p>Nil</p>

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Factor	Impact
a. Any impact on a World Heritage property? The proposal will not impact on a World Heritage property.	Nil
b. Any impact on a National Heritage place? The proposal will not impact on any places of National Heritage	Nil
c. Any impact on a wetland of international importance? The proposal will not impact on any wetlands of international importance.	Nil
d. Any impact on a listed threatened species or communities? The proposal will not impact on a listed threatened species.	Nil
e. Any impacts on listed migratory species? The proposal will not impact on a listed migratory species.	Nil
f. Any impact on a Commonwealth marine area? The proposal will not impact on a Commonwealth marine area.	Nil
g. Does the proposal involve a nuclear action (including uranium mining)? The proposal does not involve a nuclear action.	Nil

Factor	Impact
h. Additionally, any impact (direct or indirect) on Commonwealth land? The proposal will not have any impact either direct or indirect on the Commonwealth land.	Nil

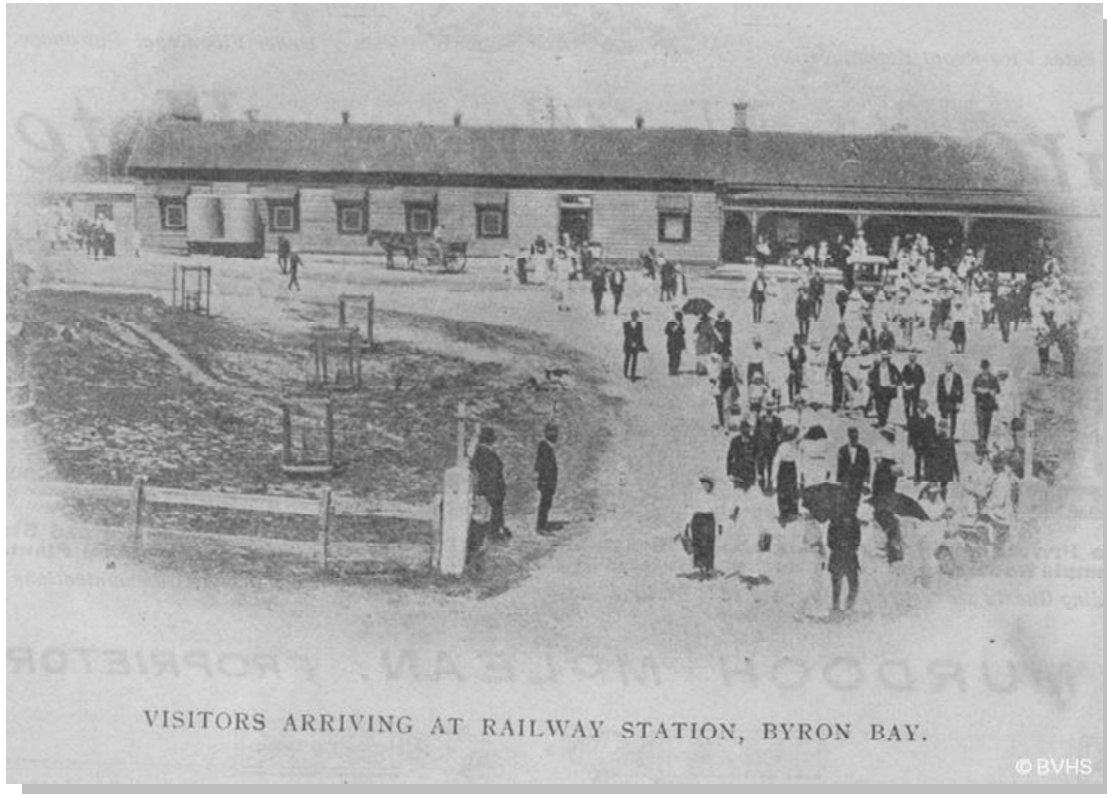
Appendix G

Heritage Impact Statement

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal

STATEMENT of HERITAGE IMPACT

Car Park to Byron Bay Railway Station,
Jonson Street, Byron Bay



NSW Railways, Byron Bay, Railway Station, Opening of Byron Bay Railway Station (New South Wales) on 15 May 1894. (source: <http://www.byronbay-spirit.com/p/historic-byron-bay.html>).

Client: John Holland Group – Country Rail Network

David Scobie Architects Pty Ltd
Level One, 177A Sailors Bay Road,
Northbridge NSW 2063

August 14, 2016

JHG - CRN
David Scobie Architects Pty Ltd

Executive Summary

David Scobie was engaged by John Holland Group – Country Rail Network (JHG-CRN) to assist in the design process for the refurbishment of the car park associated with the Byron Bay Railway Station on Jonson Street. The proposed works will be constructed entirely within the existing car park and access roads. The works are covered by the Infrastructure SEPP - Railway and a Development Application is therefore not required however Byron Shire is a partner on the project and has been fully consulted on the nature of the works.

The purpose of the heritage impact assessment is to identify and assess the known and potential heritage values of the site, consisting of the Railway Station, the Railway Refreshment Rooms (Now Hotel) and Station Master's residence (now Visitor Information Centre) and the potential impacts of the proposal on these values. Design advice has been provided to the design engineers and incorporated into the layout and details. The proposal is for a suite of civil works of a minor nature related to the provision of kerb and guttering, a pedestrian footpath, minor planting and landscaping and stormwater drainage. The final assessment provides appropriate mitigation, interpretation and management strategies related to the works for all the identified heritage values within the project area.

A detailed historical context of the site provides a basis for the significance assessment of the elements within the Railway Station site. The report has benefited from the comprehensive heritage listing on the State Heritage Inventory and Register and additional analysis completed by Virtus Heritage for GHD Pty Ltd as part of the assessment of the heritage impact of the Byron Bay Bypass completed in September 2015.

A detailed site Inspection was undertaken by David Scobie on Thursday 21st July and in addition a visit was made to review related items in the Local Studies Collection of the Byron Shire Library.

The following management strategy is recommended to mitigate the impact of the Proposal on the heritage significance of the Byron Bay Railway Station.

1. The HIS should be submitted with an Application for Exemption under sub-section 57 of the NSW Heritage Act under Standard Exemption 7, to the Heritage Division of the Office of Environment and Heritage (OEH).
2. As no known or predicted archaeological research potential is identified to date within the impacted sections of the SHR site affected by the proposal, based on the results of this assessment, no archaeological monitoring or mitigation is recommended.
3. The direct impacts are limited to the change in the existing car park from a poorly surfaced area with perimeter without kerb or gutter to a re-surfaced car park with full stormwater drainage services.
4. One set of minor trees within the Car park are proposed for removal due to the provision of safe vehicle access. Additional planting is proposed as mitigation for this loss.
5. The provision of the new bitumen seal to the car park and roads will dramatically change the visual setting of the three structures which are addressed from this space. An alternate finish to the black seal in the form of a sandstone coloured aggregate is proposed as mitigation.
6. The provision of an intensive car park layout and the current condition of building elements within the site indicates that the public awareness of the heritage significance of the site is low. A set of interpretive panels is proposed as mitigation to address the significance and the impact of the intensive use
7. The condition of the physical fabric and setting of the Refreshment Room portion of the site indicates that there is a low level of awareness of the heritage significance of the site and fabric. A recommendation for a future Conservation Management Strategy for the Refreshment Room (Railway Hotel) is provided.

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal

8. A site induction should be provided to all Council staff and project sub-contractors in order that they are aware of their responsibilities under the provisions of the NSW Heritage Act. This would include, in the unlikely event that any unknown historical relics are uncovered during proposed works, that the Project Manager must be immediately contacted and all works in the vicinity of the objects/relics must cease. The area where objects or relics uncovered would be protected until a qualified archaeologist is contacted by the Project Manager and can inspect and assess the area to determine its significance (if required).
9. In the event that any suspected human remains are uncovered during the proposal construction, all works in the vicinity of the remains must cease immediately and the Project Manager must be immediately notified and the area secured. The Project Manager will contact the NSW Police (if required). If these remains are deemed to require archaeological investigation by the NSW Police or NSW Coroner, then OEH (Contact OEH's Enviroline 131 555) must be notified for further assessment and management. No works should continue until OEH (or other determining authority such as Department of Planning and Environment) provide written notification to proceed in this scenario.

Contents

Executive Summary.....	2
1 Introduction	5
2 Statutory Instruments.....	7
3 Property Description	8
5 Historical Context.....	20
6 Analysis of Significance	23
7 Heritage Impact Statement.....	24
8 Standard Heritage Questionnaire	26
9.0 Sample materials and colours	29
10.0 Heritage Impact Matters & Responses.....	31
11.0 Recommendations.....	31

1 Introduction

Brief

Stan Knight-Smith, Property and Facilities Manager on behalf of John Holland Rail – Country Region Network commissioned the Heritage Impact Statement for the Byron Bay Railway Station Car Park, in July 2016. The purpose is to assist in the design process for the proposed alterations to the property and to prepare a Heritage Impact Statement suitable for submission to the NSW Heritage Division of the Office of Environment and Heritage and Byron Shire Council. The Heritage Impact Statement accompanies an Application under Standard Exemption 7: MINOR ACTIVITIES WITH LITTLE OR NO ADVERSE IMPACT ON HERITAGE SIGNIFICANCE under sub-section 57(1) of the NSW Heritage Act.

Documentation

The report provides a Statement of Significance for the property based on the Heritage significance issues raised within the State Heritage Register listing relative to the property. A Heritage Impact Statement is provided due to requirements under sub-section 57(1) of the Act for an assessment of the impact of the proposed works on the heritage significance of the Station which is an item on the State Heritage Register.

Author

David Scobie has prepared the report for David Scobie Architects Pty Ltd.

References

The report is based on the following drawing prepared by WGM Consulting:

- Layout Plan Railway Hotel Car Park J109/0006 Rev. B

Procedures and practices are as recommended in the document '*Statements of Heritage Impact*' from the NSW Heritage Manual, Heritage Office and Department of Urban Affairs and Planning, 1996.

The report follows the methodology illustrated in '*The Conservation Plan*', J.S.Kerr, Sydney, National Trust of Australia (NSW), 1996. Definitions and procedures are as presented in the Australia ICOMOS Guidelines to the Burra Charter-Cultural Significance and Conservation Policy.

Definitions

The definitions used in the report are those presented in Article 1 of The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (The Burra Charter).

Place means site, area, building or other work, group of buildings or other works, together with associated contents and surrounds.

Cultural significance means aesthetic, historic, scientific or social value for past, present or future generations.

Fabric means all the physical material of the place.

Conservation means all the processes of looking after a place so as to retain its cultural significance. It includes maintenance and may according to circumstance include preservation, restoration, reconstruction and adaptation and will be commonly a combination of more than one of these.

Maintenance means the continuous protective care of the fabric, contents and setting of a place, and is to be distinguished from repair. Repair involves restoration or reconstruction and it should be treated accordingly.

Preservation means maintaining the fabric of a place in its existing state and retarding deterioration.

Restoration means returning the fabric of a place to a known earlier state and is distinguished by the introduction of materials (new or old) into the fabric. This is not to be confused with either recreation or conjectural reconstruction, which are outside the scope of the Charter.

Adaptation means modifying a place to suit proposed compatible uses.

Compatible uses means a use which involves no change to the culturally significant fabric, changes which are substantially reversible, or changes which require a minimal impact.”

2 Statutory Instruments

The Byron Bay Railway Station and Yard group is a heritage item on the State Heritage Register. The Railway Station is also listed as a heritage item and within the Railway Conservation Area under Schedule 5 of the Byron Shire LEP 2014 and is listed on the RailCorp (TfNSW) s.170 list of heritage items.

The Environmental Planning and Assessment Act 1979 and provisions of Byron Shire Local Environmental Plan 2014 apply to heritage items and the heritage conservation area which are listed at a local level.

A statutory approval under Section 60 of the Heritage Act 1977 or a Section 57 (7) Exemption application as determined by the Office of Environment and Heritage (OEH), will be required for works in the Railway Precinct which is listed on the State Heritage Register. The Heritage Act 1977 will also apply in the case of any unidentified heritage relics which might be discovered as a result of excavations within the site. Appropriate conditions and protocols would be determined by OEH as the consent authority and apply to the works.

The development of the Car park area is also to be assessed in accordance with clauses 78-82 of Division 15: Railways and rail infrastructure facilities of the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP).

The proposed works and the proposed impacts on the heritage significance of the Railway Station may be determined as involving minimal impact on the heritage significance of the site and hence justify the works as exempt in accordance with clauses 82 of the ISEPP, as follows:

82 Exempt development

Development for any of the following purposes is exempt development if it is carried out by or on behalf of a public authority, is in connection with a railway or rail infrastructure facilities and complies with clause 20, involves no greater disturbance to the ground or vegetation than necessary, and does not result in an increase in stormwater drainage or run-off from the site concerned:

- (a) investigation (including geotechnical and other testing, surveying and sampling) at, above or below the surface of the ground,
- (b) routine maintenance (including removal of graffiti or debris, repair or replacement of lighting, mechanical systems, electrical equipment or air monitoring equipment and replacement of screening of overhead bridges),
- (c) emergency works to protect railway infrastructure facilities, the environment or the public,
- (d) maintenance, repair or replacement of identification, directional or safety signs that does not involve a change in their location or size,
- (e) maintenance of existing access roads,
- (f) slope stability works that are required for safety reasons,
- (g) erection and maintenance of safety barriers,
- (h) construction, maintenance or realignment of security fencing with a height of not more than 3.2m above ground level (existing),
- (i) reconstruction, maintenance or repair of culverts or drains that is required because of flood damage or high stormwater flows,
- (j) upgrading or maintenance of landscaping, or vegetation management, that:
 - (i) does not involve construction works, and
 - (ii) involves the replacement (if any) of existing materials with similar materials only,
- (k) installation, maintenance or replacement of temporary structures or signs, being structures or signs associated with alternative transport arrangements necessitated by rail track work or railway maintenance and that are removed as soon as practicable.

3 Property Description

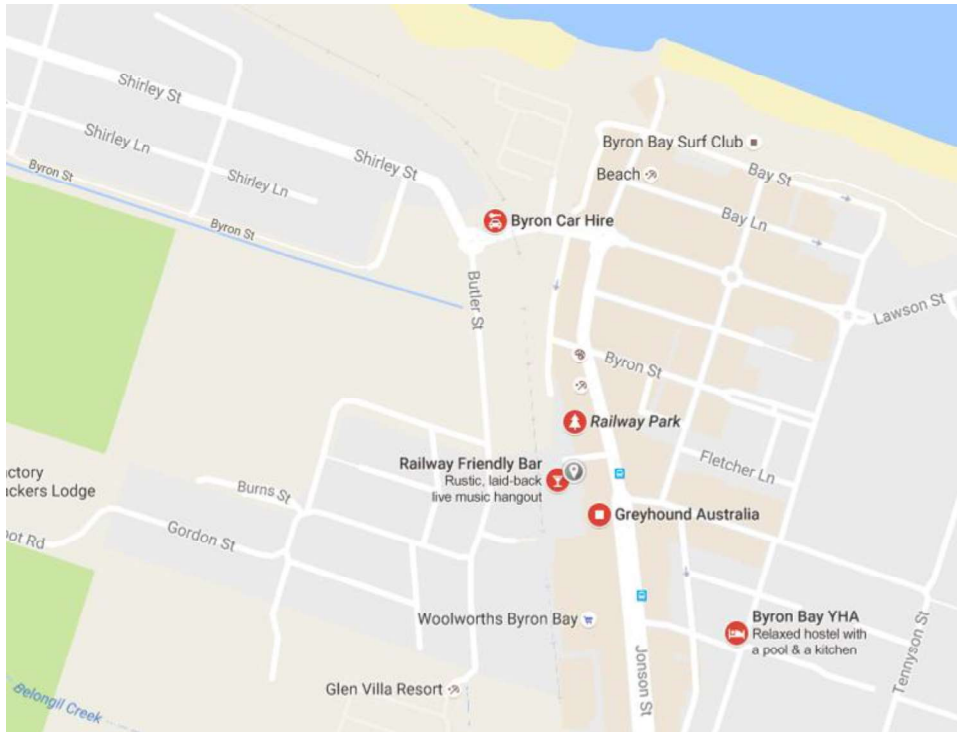


Figure 1 Location Plan, Courtesy Google Maps

The property is located on the west side of Jonson Street and adjoins Railway Park to the north. As indicated on the Map, the former Refreshment Room has been adapted to serve as the Railway Friendly Bar.



Figure 2 Aerial Photograph courtesy Google Maps

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal

Note that the Site consists of the former Railway Station and original vehicle entry from Jonson Street, the Railway Refreshment Room building now the Railway Friendly Bar to the south of the Station, the former Station Master's Cottage to the east on Jonson Street now the Visitor Information Centre, the former Waiting shed on the southern end of the Platform, the former Level Crossing and secondary access out on to Jonson Street opposite Marvell Street. Note the remnant circular water tower to the west of the Station in the landscaped railway land. The water tower is not within the project area which is confined to the existing car park east of the railway line.



Figure 3 The Listing boundary Plan, NSW Heritage Council

The subject site for the proposed works is within the State listed curtilage and located at the southern extremity of the site opposite Marvell Street.

3.1 The Railway Station precinct

The following sequence of photographs are taken on a clockwise route around the subject site and illustrate the key locations where the works will modify the existing materials and details and impact the heritage values and significance.



Photograph 1 View of the general streetscape looking south to the Station Master's Cottage.



Photograph 2 View of the main entry looking west to the former Railway Station.

The early site entry at the above location included a standard set of railway gates and a separate side pedestrian entry gate to the Station forecourt.

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



Photograph 3 View looking north into the Railway Park which is a primary circulation path into the precinct.

The Park is not within the State heritage listed curtilage.



Photograph 4 The front elevation of the railway Station, looking north west, noting the planters.

The proposal retains these items and provides the new kerb in front of this alignment to restrict vehicle traffic from the main entry forecourt to the Station building.

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



Photograph 5 View from the Station verandah looking east to Jonson Street.
No change is currently proposed to this area with the exception of the option for a driveway crossover to make the forecourt accessible for vehicle parking.



Photograph 6 View looking to the Station Master's cottage from the Station.
The proposal omits the corner parks to the right in the photo.



Photograph 7 The north elevation of the Station Master's cottage now Visitor information Centre

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



Photograph 8 View of the former refreshment Rooms now Bar, looking south west.
The proposal modifies the current staggered alignment in front of the planters to reflect the earlier perimeter evident in the photos and archive drawings.



Photograph 9 View from the landscape to the western side of the Station Master's cottage.
The proposal includes a similar set of parked cars with a formed kerb and the optional pathway



Photograph 10 View looking south from the landscape at the Station Master's cottage.
The proposal includes a similar set of parked cars with a formed kerb and the optional pathway and a blister at the junction which occurs at the end of the row and the lane out to Jonson Street.

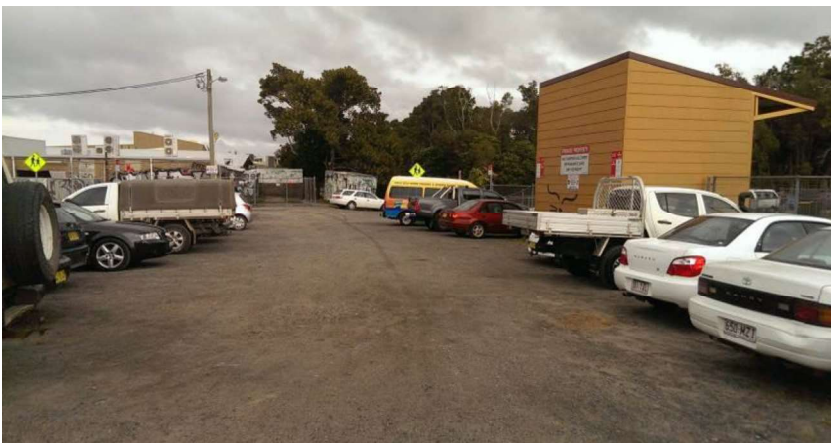
Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



Photograph 11 View to the service yard at the side of the former Refreshment rooms, looking east towards the Platform and Waiting shed.
The Proposal includes an access crossover into the service yard which is currently not fenced.



Photograph 12 View of the parking area next to the Platform. Note the partial cyclone fence to the southern side of the service yard.



Photograph 13 View of the central southern parking area looking south.
The proposal provides an island of 24 front to front spaces with three trees and landscaped blisters at each end.

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



Photograph 14 The east elevation of the shed which requires protection
A strategy for combating graffiti is recommended including artwork and interpretation.



Photograph 15 View east of the level crossing and public path towards Butler Street.
The Proposal includes a roll top kerb to the crossing width, curved from the end of the fence.



Photograph 16 View looking north with the line, Waiting shed and Refreshment rooms to the left.
The proposal includes a similar vehicle layout with three trees and landscaped ends.

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



Photograph 17 View of the Line, Waiting/Out-of shed, Refreshment room and Station from the level crossing.

The proposal retains an opportunity for landscape planting between the Platform and row of vehicles.



Photograph 18 View looking east from the pedestrian route.

The route is heavily used and historically significant as the level crossing and the link to the service yard and water tank



Photograph 19 View looking south at the landscaped swale available for planting.

The swale presents an opportunity for traditional railway garden planting and mitigation of the aesthetic impact of the parked vehicles.

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



Photograph 20 View of the lane looking east
The Proposal includes 5 angled parking spaces to the right.



Photograph 21 View looking west down the Lane towards the level crossing.
The Proposal removes the trees to the right and provides a raised island where the existing temporary barriers are located.



Photograph 22 View to the south east of the rear of the Jonson Street properties.
The Proposal includes a similar row of 8 parking spaces and path in front.

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal



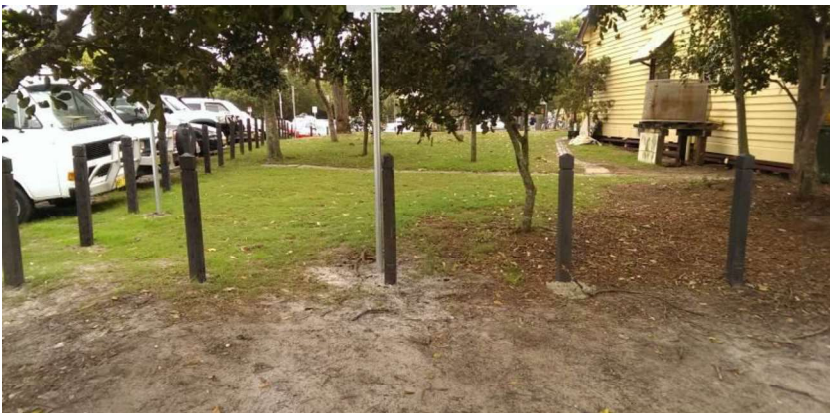
Photograph 23 View looking north east towards the Station Master's cottage and tree to be removed.

The Proposal includes blisters to each ends of the proposed pedestrian path linking the left and right shown above.



Photograph 24 View looking north at the central parking area.

The Proposal includes a row of parking spaces to the right and circulation only to the left above.



Photograph 25 The south western corner of the landscaped garden and curtilage to the Station Master's cottage

The Proposal includes retention of the marker posts (to be confirmed), provision of kerbing and parking to the perimeter. The optional path borders the landscape and marker posts with final location to be confirmed.

5 Historical Context

The construction contract for building the Byron Bay Railway Station was secured in 1893 and construction completed the following year in 1894 and the station opened with regular services in May of that year (SHI Report for the Byron Bay Railway Station Precinct).

The works originally completed in the vicinity of the Station included an extensive yard with a run-around loop, locomotive siding, carriage dock and goods siding, turntable, engine pit, coal stage, goods shed, log unloading grid and the brick and steel Water Tower on the western side of the railway line (SHI Report for the Byron Bay Railway Station Precinct). This 20,000 gallon water tank was supplied in 1894 by Charles Hoskins.

The Station Master's Cottage was completed a decade later in 1904 (SHI Report for the Byron Bay Railway Station; Ryan 1984). In 1914 the Station buildings were raised and reinforced and a standard-height platform was built (SHI Report for the Byron Bay Railway Station Precinct).

The following changes and additions to the Station and yard occurred in the late 19th and early 20th Centuries: the addition of a fireman's cottage in 1898, extension of the creamery siding in 1900 and 1908, conversion of the goods and siding to a loop in 1900, replacement of the original turntable in 1904, and the new water tank and sidings.

In 1906 a refreshment room, lamp room and 'out-of' shed were added to the station precinct (SHI Report for the Byron Bay Railway Station Precinct).

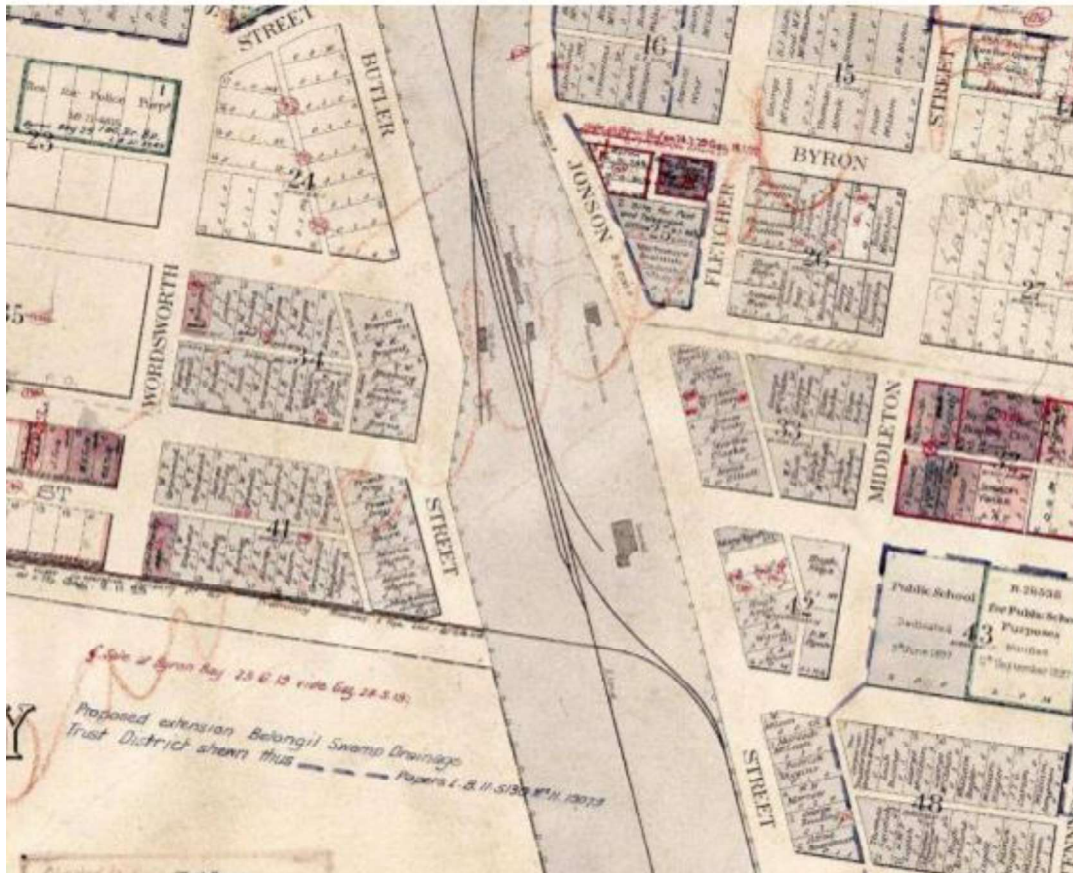


Figure 4 Railway Station Precinct including the Railway Station, Station Master's Cottage and turntable (Source: 1922 Byron Parish Map, Historical Lands Record Viewer, Lands Department NSW).

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal

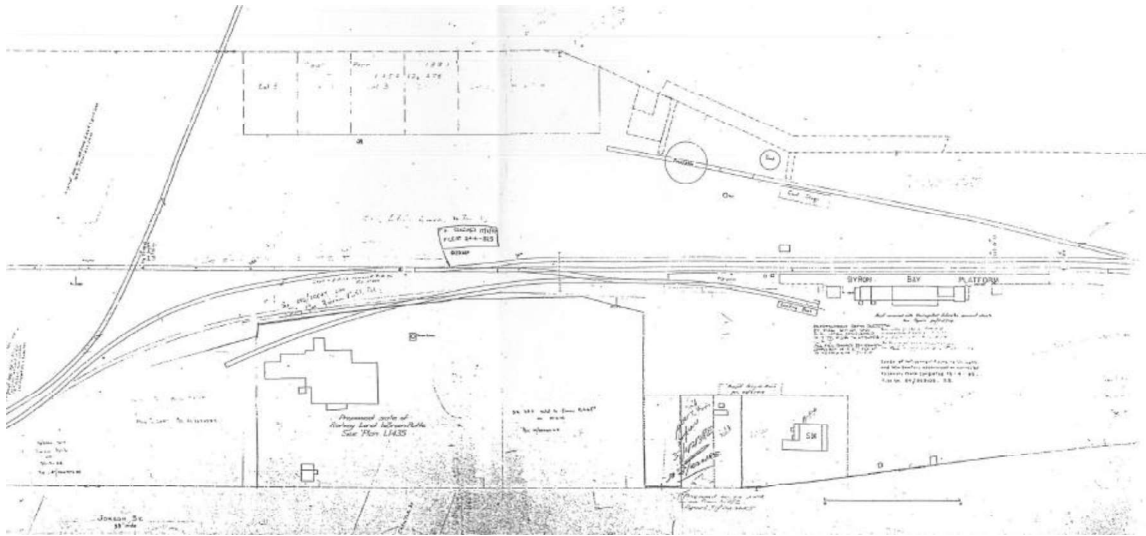


Figure 5 NSW Byron Bay Station Arrangements, Byron Shire Library Local Studies Collection

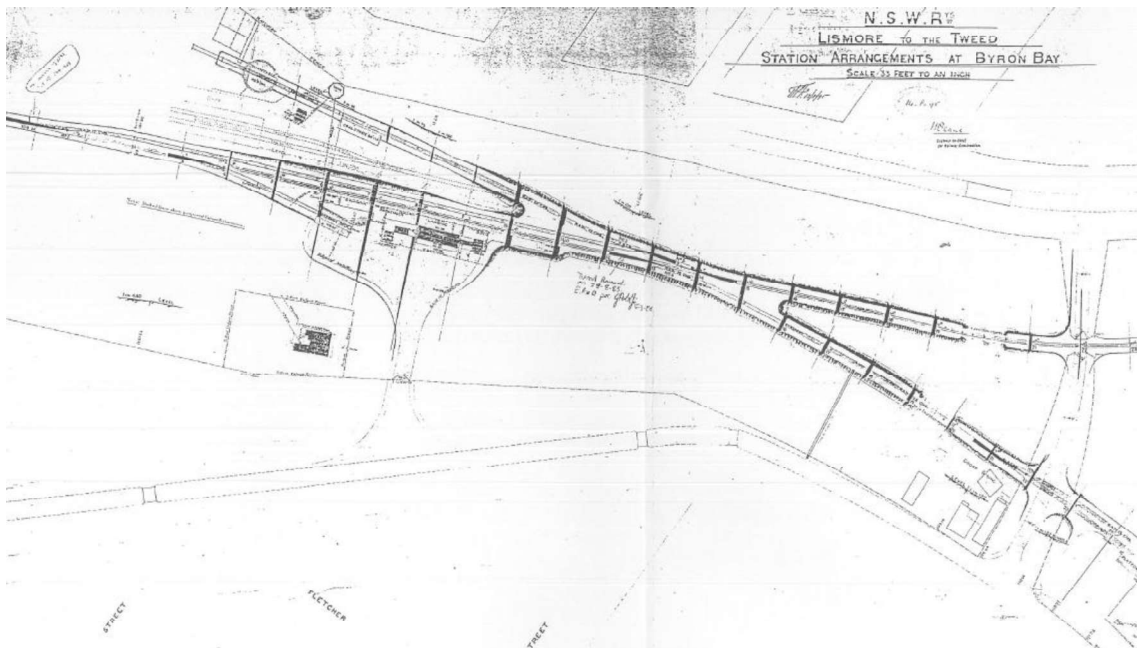


Figure 6 NSW Lismore to the Tweed, Station Arrangements at Byron Bay, 14.8.1895, Byron Shire Library Local Studies Collection

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal

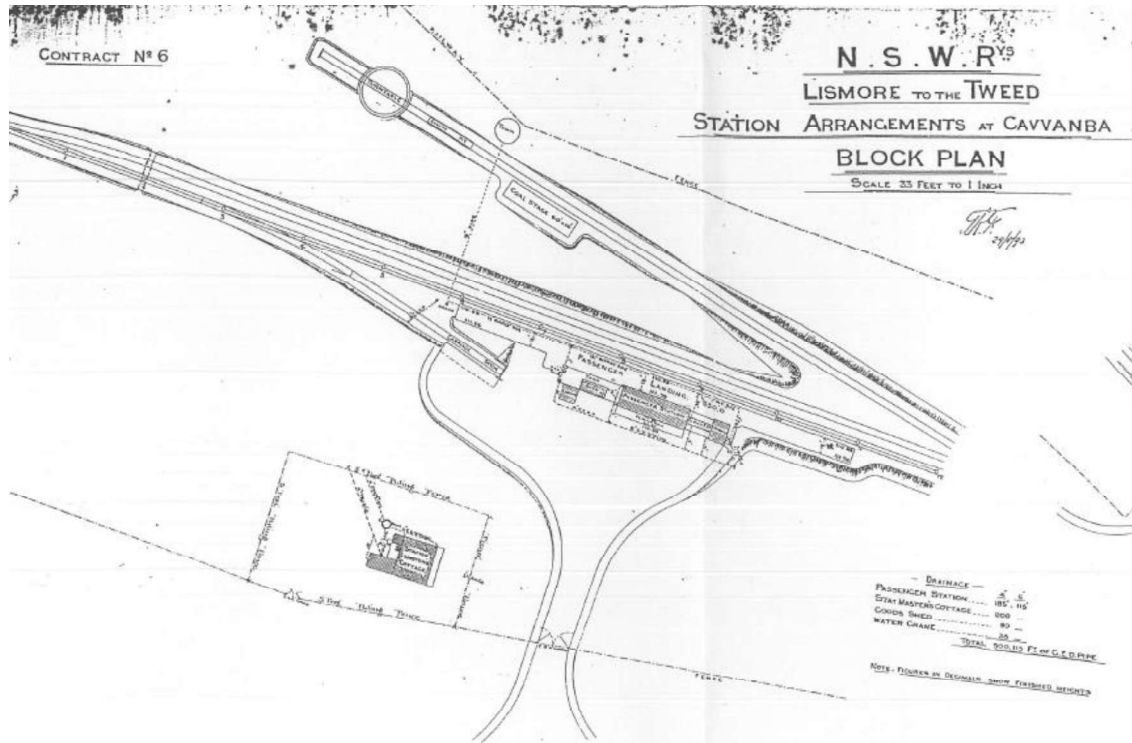


Figure 7 NSW Rail Lismore to the Tweed, Station Arrangements at Cavanba, Contract No. 6 Drawing No.2, 29.8.1893, Byron Shire Library Local Studies Collection

Note the shape of the vehicle forecourt and perimeter footpaths in front of the Station building, the railway gates on Jonson Street, the Station Master's residence with the prescribed block with 3ft palisade fence to sides and 5ft high fence to Jonson Street.

Note also the location of the coal stage and turntable in the vicinity of the remaining water tower.



Figure 8 Recent history indicates that there is a distinct possibility of the line returning to a limited local use

6 Analysis of Significance

The following analysis is a summary of the issues and statements provided from the four heritage listings – State, Local, Statutory and Conservation Area

The Byron Bay Railway Precinct is assessed as having historical (criterion a), associative (criterion b), aesthetic (criterion c), rarity (criterion f) (with historical, scientific, archaeological and social rarity) and representativeness (criterion g) significance at the State level.

The statement of significance for the Byron Bay Railway Station and yard group supplied by the NSW Heritage Council indicates: ...'Byron Bay station group is a coherent group of railway buildings with good detailing and containing a number of unusual features including the round water tank on a brick base and the railway bar attached to the station building within the former Refreshment Rooms'.

The station building is an excellent example of the timber standard roadside type and the location of the station and station master's residence in the main street of Byron Bay contribute in a significant way to the streetscape of the town.

The following information is adapted from the SHR and s.170 NSW State Agency Heritage Register listing sheets. The historical value (criterion a) of the heritage item is based on the close association of the station building, refreshment room and water tank with the early development of railway infrastructure in Byron Bay in the late 19th and early 20th centuries.

The development of the railway led to increased development and prosperity for Byron Bay through the role it played in the transport of people and goods. The Station Master's Cottage is assessed as having associative significance (criterion b) due to its association with the first stationmaster, Mr. Baker from Sydney (1904). The uniformity in design of the station building and former Station Master's Cottage as well as the notable platform and verandah awning of the station demonstrates the aesthetic value (criterion c) of the buildings which remain important landmarks in Byron Bay. The Station building is representative (criterion g) as a good example of a timber standard roadside Station building.

7 Heritage Impact Statement

7.1 Development Proposal

The intention is the retention of the existing parking and circulation layout and the provision of sub-surface drainage, a bitumen surface, concrete kerbing, street lighting, a pay parking meter and sundry landscape planting.

David Scobie Architects have reviewed the drawing illustrating the proposed alterations to the Jonson Street Car Park at the Railway Station. The works proposed for the provision of 98 paid parking spaces and associated circulation area are listed as follows:

- ❖ Regrade the car parking and circulation area to the falls required for stormwater drainage;
- ❖ Install new sub-surface drains and grates to the sumps;
- ❖ Install kerb type B1- kerb and channel to the eastern perimeter of the parking area around the Station Master's cottage;
- ❖ Install kerb type B1- kerb and channel to the northern perimeter of the parking area, to the western frontage of the railway Station and Refreshment rooms (Hotel), to the western side of the parking area next to the Platform area and to the eastern & northern edges of the car parks around the Jonson Street properties;
- ❖ Install kerb type B2- kerb to the northern perimeter of the parking area, the two islands in the southern parking area and the blister at the southern rear side of the Station Master's cottage;
- ❖ Install Mountable kerb type Mk1- roll top kerb to the south western corner of the parking area;
- ❖ Install kerb ramps to the perimeter of the parking area for access to the buildings: 3 to the Hotel western perimeter, a vehicle kerb to the Hotel service yard, one to the rear of the Jonson Street properties, one each to the two blisters at the eastern access and footpath and one to the western through site pedestrian route near the former level crossing;
- ❖ Install wheel stops to the eastern elevation of the Waiting shed on the Platform;
- ❖ Install 23 street lights around the perimeter within the landscape to illuminate the parking area, two units in the northern area and four units in the southern island parking spaces;
- ❖ Remove three trees located as a pair at the south east corner and a single specimen within the Jonson Street access behind the Station master's cottage;
- ❖ Three new street trees are located in centre of the island parking bays in the southern portion of the layout;
- ❖ Two landscaped areas are proposed at each end of the set of southern island parking bays and the southern element includes a concrete raised traffic island incorporating the parking meter pay unit;
- ❖ An optional concrete footpath is noted on the eastern boundary of the Station Master's cottage. This would connect the western portion of the site which includes the former level

crossing and through site link with the eastern edge of the parking area and around to the front of the Station Master's house and Jonson Street;

- ❖ An optional driveway access is proposed to the Railway Station ticket office.

7.2 The impacts of the works

- ❖ The provision of the formalized access and parking area will enhance the precinct and surrounds of the Railway Station in providing an all-weather, long lasting accessible surface with designated vehicle spaces;
- ❖ There will be no loss of building fabric with heritage significance;
- ❖ The general excavation to provide the road base will be nominally 300mm and is unlikely to reveal any relics. The contract drawing illustrates that the only structure in the current project area was a siding. This was demolished for the construction in 1906 of the Refreshment Room;
- ❖ There will be deeper excavation for the two main drainage lines to run north south in the northern portion and east west in the southern portion. It is unlikely that any relics will be revealed in these excavations given the character and history of this area always being of the similar circulation use without structures.
- ❖ The visual impact will be caused by the colour of the road surface finish, the perimeter edge of the layout, the light masts and fittings and the concrete kerbing.
- ❖ The concrete path to the western side of the Station Master's cottage will reduce the green space of the setting while offering a safe and convenient travel route

Detailed commentary on the issues:

- ❖ The perimeter of the vehicle area will be formed with a current standard kerb and gutter replacing the soft edge transition between the road seal and lawn and other surfaces. The profile of the kerb is necessary in this location to control the flow of Stormwater and reduce the risk of flooding. The kerb detail is small in the context of the substantial forecourt and parking area. There has been discussion over whether the concrete will be acceptable in the poured off white state and then allowed to weather to the standard grey. The alternative is the addition of an oxide to colour the concrete to a colour closer to the proposed sandstone aggregate proposed for the car park finish. The impact of the kerb in a weathered concrete is regarded as being acceptable in these circumstances.
- ❖ The provision of a standard smooth black bitumen finish has been the primary issue related to the visual impact of the forecourt on the aesthetic significance of the buildings including views to and from each of the premises. The alternative considered as being appropriate is a rolled sandstone coloured aggregate as this is considered as being sympathetic with the original treatment.
- ❖ The perimeter alignment was originally determined in the proposal by the analysis of the vehicle requirements and conforming to the largest possible area for the parking and circulation. A review of the original drawings supplied by the Byron Shire Library indicated a smooth perimeter. This is consistent with other Stations in regional NSW where horse drawn transport did not allow for vehicles to remain stationary but assumed continuous flowing movement paths. The revised layout has therefore rounded the perimeter and shrunken the central portion to allow for generous spaces external to the vehicle areas.
- ❖ The introduction of interpretive posts in the location where the railway gates were located off Jonson Street, has been recommended. They should enhance pedestrian safety and modify vehicle speed.
- ❖ Introduced planting has been restrained as these elements were not traditional in railway forecourts. The exceptions are minor medium elements and a set of trees where shade will provide valued amenity and assist in modifying the visual impact of the intensive series of parked vehicles.
- ❖ A set of interpretive panels is recommended on one of the key pedestrian routes. The purpose is not only to inform the public about the history but to raise the level of respect

within the community, occupants and users of the space for the significance of the railway precinct and key structures.

- ❖ There are elements within the former Refreshment Room area which have developed without regard for the heritage significance and these detract from the aesthetic and historical values. The key items are a shipping container, large scale planter boxes and steel mesh fencing. A Conservation Management Strategy is recommended in order that elements which detract may be removed and elements which are sympathetic will be introduced to serve the needs of the contemporary uses.
- ❖ The final design for the street light will be a contemporary interpretation of a traditional railway lantern post top fitting in matt black. An overtly traditional fitting is not appropriate and would detract from the other contemporary fittings utilized in the Conservation area of the adjoining town centre.
- ❖ The perimeter concrete path around the exterior portion of the Station Masters residence now the Visitor Information Centre is considered as the preferred means of providing for safe pedestrian access in this area. It will also better protect the existing lawn landscape setting in the vicinity of the centre. The current marker posts nominally reflect the original lot boundary and timber fence presumed to surround the former residence.

8 Standard Heritage Questionnaire

8.1 The following aspects of the proposal respect or enhance the heritage significance of the site, for the following reasons:

- The works have been designed to limit the removal of original material from the site and excavated areas.
- The works are sympathetic with the character of the existing heritage buildings and places in style and detail.
- The works allow for the adaptation of spaces within the site to suit the current and future pedestrian and vehicle activity.
- The works promote and support sustainable practice in improving the materials and finishes of the site and landscape.
- The materials are similar to the existing and an improvement upon the current bitumen surface. The aggregate texture will more closely reflect the origins of the forecourt but are capable of being distinguished so as not to be confused with the original.
- The proposed colour scheme, in particular the sandstone coloured aggregate, is capable of being sympathetic with the traditional buildings and spaces.

8.2 The following aspects of the proposal could detrimentally impact on the heritage significance of the site;

- The works to provide a bitumen surface could visually detract from the setting and the historic significance.
- The concrete kerbing will formalize an informal edge to the space and could detract from the earlier informal character.
- The lighting elements could detract from the traditional character of the setting.
- The trees are an introduced contemporary element in the traditional un-landscaped setting common to railway station forecourts.

8.3 The following sympathetic solutions have been considered and discounted for the following reasons:

- The provision of a surface coloured pavement for the road surface.
- The provision of a heritage lights similar to those used by Council in Railway Park.
- The provision of coloured concrete kerbing.

The following measures have been taken to mitigate the negative impacts

- Traditional materials and details sympathetic with the railway history and setting will be utilized in particular the use of a surface finish on the vehicle areas using an aggregate
- The use of a sandstone coloured aggregate for the forecourt to avoid the use of dark grey and black associated with standard bitumen.
- The provision of standard deciduous street trees in the larger surface car parking area to reduce the visual character of the vehicles and to provide amenity during summer
- The provision of timber posts in the vicinity of the original railway gates at the Jonson Street site entry.
- The provision of a set of interpretive panels relating the history and significance of the railway station.

Heritage advice has been obtained

- Heritage advice has been obtained from the Council and the appointed Heritage Consultant, David Scobie
- The advice and recommendations have been adopted and reflected in the proposal drawing

How is the impact of the new development on the heritage significance of the Railway Station precinct to be minimized?

- The new works are to be distinguished using contemporary materials and details which are sympathetic in colour and texture
- The layout reflects and interprets the traditional smooth form of the early railway forecourt.

8.4 Questions in relation to the SEPP

The following assessment is provided in relation to clauses 78-82 of Division 15: Railways and rail infrastructure facilities of the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP).

The proposed works are development for the purpose of replacing damaged road surfaces and associated services to the railway station forecourt.

The works are assessed as exempt development as they are to be carried out by or on behalf of JHG-CRN for Transport NSW - a public authority, is in connection with the railway facilities and therefore comply with clause 20, involve no greater disturbance to the ground or vegetation than necessary, and do not result in an increase in stormwater drainage or run-off from the site concerned.

The statements in italics below provide the commentary and justification for the works as exempt under the related clause:

- (c) emergency works to protect railway infrastructure facilities, the environment or the public
- *Uncontrolled stormwater flow is damaging the pavement and buildings in the vicinity*
- (d) maintenance, repair or replacement of identification, directional or safety signs that does not involve a change in their location or size,

Heritage Impact Statement
Byron Bay Railway Station – Car Park Proposal

- *Vehicle movement and the safety of pedestrians in the shared environs requires additional signs*
- (e) maintenance of existing access roads,
- *The existing road and pedestrian surfaces have reached the end of their useful life and require replacement as do the associated stormwater services and drains*
- (f) slope stability works that are required for safety reasons,
- *The falls within the vehicle and pedestrian areas require modification to provide appropriate drainage and accessible pathways*

9.0 Sample materials and colours



©2018 Bees Wax

Figure 9 Colour concrete systems: Bees Wax alternate pigment recommended for new concrete as an alternate to standard concrete.



Figure 10 The Autumn gold aggregate finish in the Bushmates range from Statewide Bitumen



Figure 11 A typical example of a standard existing railway gate post (400x400mm *1400mmH) and the early site photograph of Byron Bay Railway Station entrance illustrating the fencing proposed for reinstatement as an interpretation and entrance marker.



Figure 12 A typical interpretation panel using a vertical double sided format. Note the traditional timber post and rail fence.



Figure 13 The City Light Elegance LED from Sylvania Lighting is a decorative post top luminaire featuring a domed circular aluminium canopy re-interpreting the form of the classic lantern shaped fixture. The luminaire features an LED module with either symmetrical or single sided asymmetrical distribution in 3,000k or 4,000k colour temperature options and would suit the vehicle areas within the Station precinct.

10.0 Heritage Impact Matters & Responses

The proposal is consistent with the requirements and guidelines of the SEPP, the Guidelines within the Clauses 78-82 and best practice in relation to matters of Heritage impacts & mitigation measures and is therefore recommended for approval, subject to the modifications being acceptable.

11.0 Recommendations

- The traffic island at the entry should be a raised element with matching road finish to avoid minor elements of planting which will not be maintained to a suitable standard
- Provide traditional white painted railway entry posts each side of the entrance with a single span of traditional post and rail fence, as shown in the early photograph, so as to reinstate the entry and mitigate the changes in character;
- Provide a bitumen road surface with Autumn gold aggregate as the finish, supplied by Statewide Bitumen or others, so as to provide a colour and texture which is sympathetic with the traditional character for Stations and for this site;
- Provide a row of protective bollard posts in front of the public toilets to leave a 1200mm path, similar to the existing posts on the Railway Park boundary;
- Extend the new road finish beyond the new kerb into the Station forecourt to align with the northern and southern sides of the building;
- Relocate the timber planter boxes to areas of the site away from the significant frontages of the Railway Station and Refreshment Room buildings, as they are not consistent with the historic character and significance of these areas;
- Provide a wall mounted mural panel 2400x1500mm on the Waiting Shed – east elevation, to mitigate the changes, provide an element of community participation and mitigate future anti-social behavior;
- Select and specify an appropriate post top light fitting similar to the City Light Elegance LED from Sylvania Lighting.
- Provide a replacement timber post and rail fence to the corner of the Refreshment room service yard, to reinstate the traditional elements of the setting;
- Negotiate the removal and replacement if required of the shipping container, to reinstate the setting;
- Provide a double sided interpretive panel in the landscaped blister at the southern end of the island parking layout, to interpret the heritage significance of the precinct.

APPENDIX:

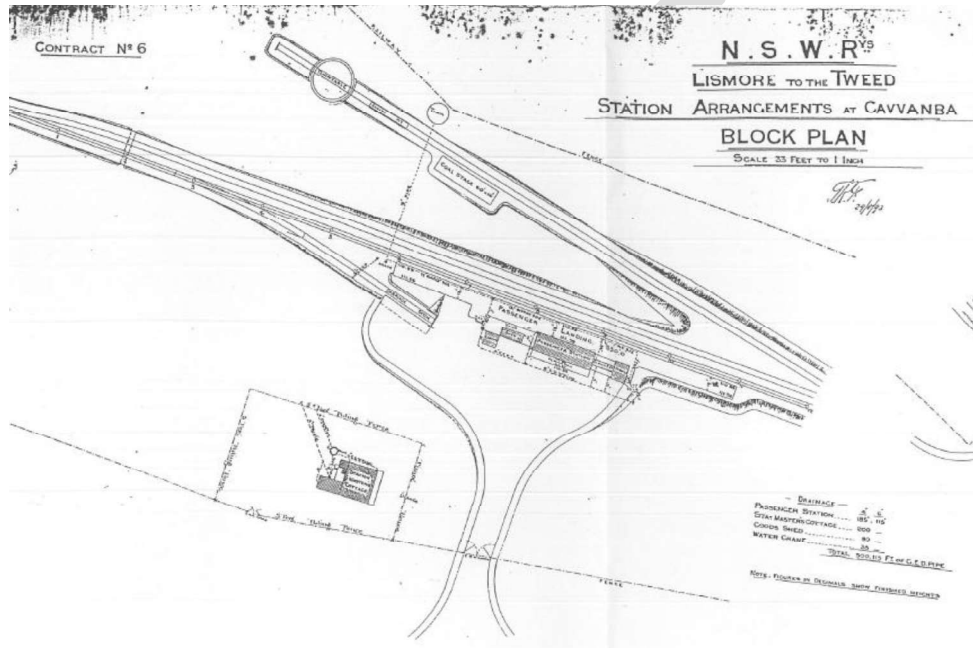
- Engineering drawing

Appendix H

Heritage Impact Statement – Addendum

ADDENDUM TO THE STATEMENT of HERITAGE IMPACT

Car Park to Byron Bay Railway Station, Jonson Street, Byron Bay



NSWR Lismore to the Tweed, Station Arrangements at Cavanba, Contract No. 6 Drawing No.2, 29.8.1893, Byron Shire Library Local Studies Collection

Client: John Holland Group – Country Rail Network

David Scobie Architects Pty Ltd
Level One, 177A Sailors Bay Road,
Northbridge NSW 2063

Thursday, September 29, 2016

1 Introduction

Brief

Stan Knight-Smith on behalf of John Holland Rail – Country Region Network commissioned the original Heritage Impact Statement for the Byron Bay Railway Station Car Park, in July 2016. The purpose of the Addendum is to assist in the assessment & design process for the proposed alterations to the property and ensure that the Heritage significance is protected and enhanced.

Documentation

The Addendum report provides responses to a set of issues raised by the assessment officers at the Heritage Division.

The additional developed drawings allow for a review of the issues raised in the Heritage Impact Statement to ensure that they have been considered.

Author

David Scobie has prepared the report for David Scobie Architects Pty Ltd.

References

The Addendum report is based on the following drawings prepared by Planit Engineering. These are a Preliminary issue with considerable additional detail beyond the initial Concept stage and prepared for Construction Certificate:

- Index and Locality Plan 0001, C
- Notes & Legend 0002, A
- Existing at Railway Hotel 0003, A
- Clearing Demolition Plan 0005, A
- Layout Plan Railway Hotel 0007, A
- Setout 0009, A
- Car Park sections 0010& 11, B
- Earthworks 00012 & 0013, B
- Stormwater layout, Railway Hotel 0015, B
- Stormwater sections 0018 & 0019, A
- Signs and lines 0021 & 0022, A
- Tree protection Railway Hotel 0023, B
- Pavement Plan 0029, A

Procedures and practices are as recommended in the document '*Statements of Heritage Impact*' from the NSW Heritage Manual, Heritage Office and Department of Urban Affairs and Planning, 1996.

The report follows the methodology illustrated in '*The Conservation Plan*', J.S.Kerr, Sydney, National Trust of Australia (NSW), 1996. Definitions and procedures are as presented in the Australia ICOMOS Guidelines to the Burra Charter-Cultural Significance and Conservation Policy.

2.0 Addendum Issues

2.1 Development Proposal

The intention is the retention of the existing parking and circulation layout and the provision of sub-surface drainage, a bitumen surface, concrete kerbing, street lighting, a pay parking meter and sundry landscape planting.

The project remains unchanged since the provision of the Heritage Impact Statement. Additional design work has been completed by the Engineering Company Planit and the drawings have been reviewed and comments are provided by the Heritage Consultant.

3.0 Heritage Questions & Answers

3.1 *Depth of trenches for the proposed stormwater lines and pits:*

Car Park: The trench depth will be up to 2m deep to account for the required falls
Refer to drawings -0018 and -0019

3.2 *Likely depths of the existing stormwater lines to be removed*

Drawing -0005 indicates that there are no existing stormwater pipes in the Railway Hotel Car park and circulation area.

3.3 *Depths of proposed kerb and gutters, footpaths*

Footpaths: 100mm thick concrete. The paths will be excavated out to 100mm depth from the existing surface, then the concrete poured.

Access driveways will be similar, but at 150mm depth.
Refer to drawing -0029.

Kerb and gutter: The new kerb and gutters will be constructed on top of the new pavement grades and will therefore have no impact given there is no additional excavation. The typical depth of kerb and gutter is 100-300mm deep.

Timber posts indicative and to interpret the original entrance: These are installed in no-fines concrete footings to a nominal depth of 700mm deep

Bollard posts are generally installed using a steel sleeve set with concrete footings at 350mm depth.

3.4 *The total depth of regrading of the car parking and circulation areas to the required falls*

Due to the existing falls across the site, the extent of excavation will vary. The amount of cut and fill is indicated on drawing -0012. The Red areas require the deepest reduction in the range of 250-350mm while the nett impact is there is a 202 m³ of fill. The areas of fill are indicated by the two green tones on the plan.

3.5 *Advise if the option of using a permeable type paving has been considered. Provide reasons for not adopting this approach.*

The design in relation to stormwater was developed by WGS Consulting Engineers and Planit Engineering in partnership with Byron Shire Council. The town centre of Byron has a history of flooding due to the limited capacity of the stormwater system. Council is seeking to ensure that the two car parking areas which are part of this project reduce the risk to the town centre. The current catchment and drainage plan for the area is shown on

drawing -0014. Rain gardens, which are areas of landscape planting utilised for infiltration, were considered as two strips on the eastern and western portions of the southern car parking area. The landscape garden has been retained on the western portion of the site however the infiltration has been limited due to the size required to make sufficient contribution to this area of hard stand. The area of landscape required would have substantially reduced the number of car parks in this area. An additional issue for Council is the level of landscape maintenance required to infiltration – rain gardens.

Permeable pavements were considered for use in the Railway Station Car park and circulation area in two formats. Inter-locking pavers are available for infiltration in various formats. One format allows planting to grow through the open sections while a second form uses gravel fill between the inter-locking areas. The character of the paved surfaces was deemed unsuitable for the heritage setting and the costs and levels of maintenance were greater than the alternatives.

The second form is pavements using aggregate set into a two part thermally set polyurethane resin. The products are relatively new and the durability is yet to be established for areas such as urban car parks which are subject to intense wear. Trial areas installed by the RMS in the vicinity of St. Patricks Cemetery have failed with repair not possible without full replacement. It is understood that this particular product was not UV resistant or stable. While the character of the aggregate finish of the 'Flowstone' and 'Stoneset' products meets the heritage recommendations, none of the available products were deemed suitable for the level of use and longevity anticipated for the project.

3.6 *Trees within the Railway Precinct. The proposal includes removal of an existing tree which is located in the centre of the existing roadway to the rear of the Station Master's cottage*

The early photograph shows a set of four trees planted in the grounds of the Station Master's Cottage. The photo does not show the cottage which was constructed after the Station in 1914 but it is reasonable to assume that the trees shown in the photos were planted in the grounds of the cottage. There is an extensive set of trees remaining in the grounds of the cottage and none are to be removed. Three trees are proposed for removal as they present a hazard to the existing and proposed traffic movement in the site. The first tree is isolated in the centre of the road leading out to Jonson Street and the lower trunk appears to have been damaged over many years by vehicles. The other two trees are within a small median area at the southern end of the parking and circulation area. Their general health is fine despite being isolated within a small 1500x3m median. Removal has been recommended to provide safe traffic circulation.

3.7 *Depths for the electrical service trenches to service the proposed light poles*
Typical cover over electrical conduits is 500-600mm. Therefore trench depth is typically **600-700mm.**

3.8 *Depths of footings to proposed light poles.*
This will be determined by the light pole supplier, based on the geotechnical conditions of the existing soil/sand and the size/height of the light pole and type of luminaire. Typically light pole footings can range between 1-2m, but usually around 1.2-1.5m. We are waiting on the final electrical design and information for the Pole supplier.

3.9 *Please locate the proposed light poles on your Plan*
We are waiting on the final electrical design. The Engineers will provide the lighting design once the information is received. It is not expected that the locations will affect the layout, planting or existing structures..

3.10 Please locate the electrical services to the poles on your plan

We are waiting on the final electrical design.

3.11 Indicate the excavation depth for the pavements

Pavement excavation will be approx. 300mm. The majority of the site will be in fill to suit the drainage plan and the extent of the excavation will vary as shown on the Plan: Refer to drawings -0011 and -0012.

4.0 Heritage Impact Matters & Responses

The proposal is generally consistent with the issues raised in the Heritage Impact Statement and is therefore recommended for approval, subject to the modifications indicated below as Recommendations being acceptable.

In relation to the excavations and the potential for archaeological finds, an additional Recommendation has been provided. While there remains no further evidence of the likelihood of finds, this recommendation reminds the Contractor and all associated parties of their responsibilities under the NSW Heritage Act

5.0 Recommendations

- The traffic island at the entry should be a raised element with matching road finish to avoid minor elements of planting which will not be maintained to a suitable standard
- Provide traditional white painted railway entry posts each side of the entrance with a single span of traditional post and rail fence, as shown in the early photograph, so as to reinstate the entry and mitigate the changes in character;
- Provide a bitumen road surface with Autumn gold aggregate as the finish, supplied by Statewide Bitumen or others, so as to provide a colour and texture which is sympathetic with the traditional character for Stations and for this site;
- Provide a row of protective bollard posts in front of the public toilets to leave a 1200mm path, similar to the existing posts on the Railway Park boundary;
- Extend the new road finish beyond the new kerb into the Station forecourt to align with the northern and southern sides of the building;
- Relocate the timber planter boxes to areas of the site away from the significant frontages of the Railway Station and Refreshment Room buildings, as they are not consistent with the historic character and significance of these areas;
- Provide a wall mounted mural panel 2400x1500mm on the Waiting Shed – east elevation, to mitigate the changes, provide an element of community participation and mitigate future anti-social behavior;
- Select and specify an appropriate post top light fitting similar to the City Light Elegance LED from Sylvania Lighting.
- Provide a replacement timber post and rail fence to the corner of the Refreshment room service yard, to reinstate the traditional elements of the setting;
- Negotiate the removal and replacement if required of the shipping container, to reinstate the setting;
- Provide a double sided interpretive panel in the landscaped blister at the southern end of the island parking layout, to interpret the heritage significance of the precinct.

6.0 Management Strategy

The HIS is currently with the Heritage Division for assessment as an Application for Exemption under sub-section 57 of the NSW Heritage Act under Standard Exemption 7, to the Heritage Division of the Office of Environment and Heritage (OEH).

The following Management Strategy is recommended to mitigate any impacts of the Proposal on the heritage significance of the item and the setting:

1. The direct impacts are limited to the change in the existing car park from a poorly surfaced area with perimeter without kerb or gutter to a re-surfaced car park with full stormwater drainage services. The recommendations provided within the Heritage Impact Statement should be implemented and illustrated on the proposal documents.
2. One pair of trees within the southern end of the Car park is proposed for removal due to the provision of safe vehicle access. A single tree within the centre of the existing north-south access to Jonson Street is proposed for removal. Additional planting is proposed as mitigation for these losses.
3. The provision of the new bitumen seal to the car park and roads will dramatically change the visual setting of the three structures which are addressed from this space. An alternate finish to the black seal in the form of a sandstone coloured aggregate is proposed as mitigation.
4. The provision of an intensive car park layout and the current condition of building elements within the site indicates that the public awareness of the heritage significance of the site is low. A set of interpretive panels is proposed as mitigation to address the significance and the impact of the intensive use.
5. The condition of the physical fabric and setting of the Refreshment Room portion of the site indicates that there is a low level of awareness of the heritage significance of the site and fabric. A recommendation for a future Conservation Management Strategy for the Refreshment Room (Railway Hotel) is provided.
6. As no known or predicted archaeological research potential is identified to date within the impacted sections of the SHR site affected by the proposal, based on the results of this assessment, no archaeological monitoring or mitigation is recommended.
7. A site induction should be provided to all Council staff and project sub-contractors in order that they are aware of their responsibilities under the provisions of the NSW Heritage Act. This would include, in the unlikely event that any unknown historical relics are uncovered during proposed works that the Project Manager must be immediately contacted and all works in the vicinity of the objects/relics must cease. The area where objects or relics uncovered would be protected until a qualified archaeologist is contacted by the Project Manager and can inspect and assess the area to determine its significance (if required). Cosmos Archaeology Pty Ltd of Mullumbimby is recommended to attend should the circumstances require.
8. In the event that any suspected human remains are uncovered during the proposal construction, all works in the vicinity of the remains must cease immediately and the Project Manager must be immediately notified and the area secured. The Project Manager will contact the NSW Police (if required). If these remains are deemed to require archaeological investigation by the NSW Police or NSW Coroner, than OEH (Contact OEH's Enviroline 131 555) must be notified for further assessment and management. No works should continue until OEH (or other determining authority such as Department of Planning and Environment) provide written notification to proceed in this scenario.

APPENDIX:

- **Engineering drawings**

DRAFT

Appendix I

Preliminary Contamination and Acid Sulfate Soils Report

ENV Solutions



Engineering the Future

SITE ASSESSMENT

Proposed Carpark Development

86 Jonson St Byron Bay

Lot 1 DP1001454, Lot 3 DP827049

For:

Simon Milichamp

WGM

September 2016

Environmental Engineering Solutions

ENV Solutions Pty Ltd ABN 46856079490
PO Box 248
Ballina NSW 2478
0421519354

Table of Contents

1	EXECUTIVE SUMMARY	4
2	INTRODUCTION	6
3	SCOPE OF WORKS.....	6
4	METHODOLOGY.....	8
5	SITE IDENTIFICATION	9
6	SITE CONDITION AND SURROUNDING ENVIRONMENT	10
6.1	Surrounding Environment.....	10
6.2	Topography.....	10
6.3	Soils.....	11
6.4	Flooding	11
6.5	Acid Sulphate Soils	12
6.6	Groundwater Resources	13
7	SITE HISTORY	15
7.1	Site History Overview.....	15
7.2	Historical Title Search	17
7.3	POEO Act Public Register Search	17
7.4	Contaminated Land – Record of Notices Search.....	19
7.5	Cattle Dip Site Locator	19
7.6	Areas of Environmental Concern.....	19
8	SITE INSPECTION.....	20
8.1	Site Inspection Overview.....	20
9	SAMPLING AND ANALYSIS PLAN	21
9.1	Sampling Objective	21
9.2	Field Investigations	21
9.3	Sampling Methodology.....	21
9.4	Field Quality Assurance/Quality Control (QA/QC)	22
9.5	Potential Contaminants of Concern	22
10	LABORATORY ANALYSIS RESULTS	23
10.1	Contamination Assessment.....	23
10.2	Acid Sulphate Soil Assessment.....	24
10.3	Quality Assurance and Control.....	24
	10.3.1 Quality Assurance	25
	10.3.2 Quality Control.....	25
11	CONCLUSIONS.....	28
12	GENERAL NOTES	30
13	REFERENCES	31

14	GLOSSARY	32
16	FIGURES	33
17	ATTACHMENTS	37
18	DOCUMENT CONTROL:.....	5

List of Tables/Figures

Table 1	Land Parcel Identification Details	9
Table 21	Land Parcel Identification Details	9
Table 2	POEO Register for Byron Bay	17
Table 3	Record of Notices under the CLM Act for Byron Shire	19
Table 5	Analytes Requested for Laboratory Analysis.....	22
Table 8:	Quality Control Samples.....	26
Table 9:	QC Laboratory Results	27
Figure 1:	Zircon-Rutile plant in Jonson Street, Byron Bay circa 1950 (now Woolworths).....	16
Figure 2	Byron Bay Railway Station circa 1900.....	16
Figure 3	Site Location.....	33
Figure 4	Land Zoning LEP 2014.....	34
Figure 5	Soil Landscape (Byron LES, 2008 Figure 7)	34
Figure 6	Acid Sulphate Soils (LEP 2014)	35
Figure 7:	Belongil Creek Catchment Flood Risk - Byron Shire Council (LES 2008 Figure 10).....	35
Figure 8:	Groundwater Resources (DPI OOW 2016).....	36

1 Executive Summary

ENV Solutions Pty Ltd (ENV) has been engaged by WGM to undertake a site Investigation to support a development of a new carparking facility at 86 Jonson St Byron Bay. The proposed development is located on two parcels of land Lot 1 DP100454 and Lot 3 827049.

A desk-top site history assessment of the site and adjacent areas was undertaken. Information to assist in the site history was collected and collated. A site inspection was undertaken to identify potential areas of contamination

Potential contaminants of concern were identified for the site:

- Metals;
- Organo-chlorine pesticides/herbicides;
- Hydrocarbons; and,
- Asbestos.

Systematic soil sampling was undertaken on the proposed site with 18 holes drilled across the proposed carpark area. A selection of 22 samples were collected for contaminant assessment with a further 15 samples collected for acid sulphate soils.

The laboratory results show no exceedance of NEPM 2013 contamination levels, with the exception of two samples recording elevated concentrations of Benzo(a)pyrene above ESL limits (BH5 and BH7)

The samples from BH5 and BH7 are likely due to minor contamination from combustion byproducts related to vehicles or residual tar and triggers the ecological screening level for Benzo(a)pyrene only. Due to the location of the site being within a business district area and the nature of the works planned for the site, this sample result has limited potential impact to the surrounding environment ecology.

Based on the laboratory test results, soils contained at or below 0.5-0.7m in depth in the northern section of the proposed carpark development on Lot 3 DP827049 are assessed as PASS. The remaining carpark area on Lot DP1001454 surrounding the Railway Park did not trigger PASS criteria.

Without a detailed description of the proposed works it is recommended that this area of the carpark development be treated as acid sulphate soil and the soil treated with lime at a dosage rate of 3.8kg/ tonne dry weight.

Based on the above assessment it is assessed that further investigation is **not required** and that the **site is suitable** for the proposed carpark development use.

2 Introduction

ENV Solutions has been engaged by WGM to undertake a site assessment to inform and support the development of a carpark upgrade located at 86 Jonson St Byron Bay.

The site consists of two parcels of land, Lot 1 DP1001454, and Lot 3 DP827049 as shown in Figure 1 with a total area of 0.75 Ha. The subject land is zoned SP2 Infrastructure (information and education facility) under the Byron Shire Local Environment Plan 2014 (LEP 2014). Historical use of the site has been the former Byron railway station and carparking, previous to this the land may have included farming and agricultural.

3 Scope of Works

The site investigation has investigated the following:

- Past and present potentially contaminating activities;
- Identification potential contamination types;
- The current site condition;
- Assessment for presence of acid sulphate soils;
- Assessment based on findings for the need for further investigation;
- LPI title searches and historical title records have been reviewed, and;
- EPA contamination databases, dip site registers and EPA licenses.

Clause 7(1) of State Environment Planning Policy No 55 – Remediation of Land (SEPP 55) states that:

“(1) A consent authority must not consent to the carrying out of any development on land unless:

- (a) it has considered whether the land is contaminated, and*

- (b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and*
- (c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.*
- (2) Before determining an application for consent to carry out development that would involve a change of use on any of the land specified in subclause (4), the consent authority must consider a report specifying the findings of a preliminary investigation of the land concerned carried out in accordance with the contaminated land planning guidelines.*
- (3) The applicant for development consent must carry out the investigation required by subclause (2) and must provide a report on it to the consent authority...”*

This site assessment has been prepared to address the above requirements.

The site assessment takes the form of a Stage 1 – Preliminary Investigation which has been prepared in accordance with the *Managing Land Contamination Planning Guidelines* (Department of Urban Affairs [DUAP] and Environment Protection Authority [EPA] 1998) and the *Guidelines for Consultants Reporting on Contaminated Sites* (EPA, 2000).

4 Methodology

This site assessment has been undertaken to identify the potential for contamination at the site. A desk-top site history assessment and site inspection have been conducted as part of the investigation.

The desk-top site history assessment encompassed the site and adjacent areas. Information used to assist in the assessment was collected and collated from the following sources:

- available site history details;
- NSW Land and Property Information (LPI) – Historic Title Search;
- NSW Office of Environment and Heritage’s (OEH) *Protection of Environment Operations Act 1997* (POEO Act) Public Register;
- OEH’s Contaminated Land – Record of Notices; and
- NSW Department of Primary Industries (DPI): cattle dip site locator.

The site inspection included:

- identification of potential sources and areas of contamination;
- preliminary soil sampling at areas identified as potentially contaminated during the site inspection; and
- systematic soil sampling across the site.

5 Site Identification

Table 1 and 2 provide identification details of each parcel of land relevant to the site investigation. Site location can be found in Figure 3.

Table 1 Land Parcel Identification Details

Site Address	86 Jonson St Byron Bay
Site Area	approximately 0.75 ha
Real Property Description	Lot 1 DP 1001454
Local Government Area	Byron Bay
Zoning	SP2 LEP, 2014
Site Features	Gravel and sand carpark with some asphalt
Elevation	Approx. 1.7-2.3mAHD
Existing Land Use	Industrial

Table 22 Land Parcel Identification Details

Site Address	Jonson St Byron Bay
Site Area	approximately 0.75 ha
Real Property Description	Lot 3 DP 827049
Local Government Area	Byron Bay
Zoning	SP2 LEP, 2014
Site Features	Gravel and sand carpark with some asphalt
Elevation	Approx. 3.6 -4.5 mAHD
Existing Land Use	Industrial

6 Site Condition and Surrounding Environment

A desk-top study of the site was undertaken to establish the physical characteristics of the site and surrounding environment.

6.1 Surrounding Environment

According to the LEP 2014, the surrounding land has multiple zonings:

Direction	Zoning	Description
North	RE1 Public recreation	Railway Park
South	SP2	Industrial (Information and education facility)
East	B2 Local centre	Byron Bay CBD
West	R2, R3, E1 Low and medium density residential National Parks and Nature Reserves	Residential area Caravan Park Cumbebin Swamp

6.2 Topography

Lot 3 DP827049

The site has an elevation between approximately 1.7-2.3m AHD and is relatively flat with several low area which are able to pool water during rain event.

Lot 1 DP1001454

The site has an elevation between approximately 3.6-4.5m AHD and relatively flat and undulating with several area able to pool water during rain events. from the north-east corner down to the south-west corner.

6.3 Soils

Soils maps for the area were obtained from 2008 Byron Shire Local Environment Study (Figure 5) and *Soil Landscapes of the Lismore-Ballina* (Morand, 1994) which map the land as Disputed Plain and Disputed Plain Variant landscape (dp/dpa) underlying the existing development in the area. The original landscape is described as:

Landscape – basalt derived valley infills and alluvial fans forming gently inclined slopes. Relief 10-30m, slopes 1-3%. In cross-section fans have a gentle convex appearance. Partly active and/or stable gullies are common. Closed sod grassland and open sedgeland on possibly natural treeless areas. The variant landscape is described as fand derived from predominately siliceous material.

Soils – deep (>200cm), poorly drained Black Earths (Ug5.15, Ug5.17), Black Earths / Weisenboden integrades (Ug5.15, Ug5.17) and Dense Clays (Uf6.61). Yellow Podzolic Soils and Soloths (Dy3.11, Dy3.21) in landscape variant dpa.

Limitations: highly plastic permeability, low wet bearing strength and high surface movement potential with localised stoniness and water logging. Permanently high watertables.

The site has a history of having fill and gravel placed to manage periodic water pooling and to raise the general level for carparking of the over many years. Imported sand and gravel over tops the former landscape described above. During drilling, the predominant profile encountered was a sandy silty material. The sampling undertaken in Railway Park itself (BH4) was more in line with the Black Earth material described in the soil mapping information.

6.4 Flooding

The site is located within the Belongil creek catchment and subject to flooding. A 2009 study undertaken on behalf of Byron Shire Council by SMEC modelled a number of scenarios factoring in climate change effects (Figure 7).

Byron Shire Council selected two modelling event scenarios for impact assessment and future planning:

- Scenario 2 – Lower bound IPCC¹ sea level rise estimate with 20% increase in rainfall intensities
- Scenario 4 – upper bound IPCC sea level estimate with 20% increase in rainfall intensities

The site itself and the direct area surrounding the site is subject to flooding based on Scenario 2 which modelled flood levels of a 1 in 100 ARI at the intersection of Byron St and Jonson St at 2.57m AHD which equates to a approximate flood depth in the Byron CBD area of approximately 0.5m. The 2009 SMEC study notes that Lot 1 Jonson St modelled flood levels are subject to an approximate error of 0.24m.

The site is also defined as a flood storage area. The 2009 SMEC study describes flood storage areas as those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. If the capacity of a flood storage area is reduced by, for example the construction of levees or by landfill, flood levels in nearby areas may rise and the peak discharge downstream may be increased. Substantial reduction of the capacity of a floodstorage area can also cause a significant increase of flood flows.

6.5 Acid Sulphate Soils

Acid Sulphate Soil (ASS) is the common name given to soils containing iron sulphides. When exposed to oxygen, through lowering of surrounding groundwater or excavation, air drawn into the soils can cause oxidation of the iron sulphides, producing sulphuric acid.

ASS typically occurs in low-lying estuarine coastal areas. Run-off from exposed ASS areas may find its way to stormwater, groundwater or natural aquatic environments. The acidic run-off may lower the pH of receiving

¹ IPCC – Intergovernmental panel on climate change

waters, increase the concentration of metals and reduce the natural buffering capacity of the receiving waters.

There are two basic types of ASS: Actual Acid Sulphate Soils (AASS) and Potential Acid Sulphate Soils (PASS). AASS are soils that have already been oxidised. Hence AASS environments are already acidic in nature. PASS are soils that have not yet been oxidized (ie they still contain oxidisable sulphur). AASS and PASS can co-exist.

In anaerobic conditions (such as below the watertable), PASS do not pose an environmental threat, however if conditions change (such as during de-watering, excavation or drought), the sulphides can oxidise and form sulphuric acid. Developments involving excavation or de-watering must establish the presence and extent of ASS down the soil profile, as works may intercept ASS horizons and pose risks to both human and ecological health.

This assessment has been conducted and prepared in accordance with the NSW Acid Sulphate Soils Manual (Acid Sulphate Soils Management Advisory Committee, 1998) referred to here as ASSMAC.

The site is Class 3 Acid Sulphate Soils according to the LEP (2014) Acid Sulphate Soil Map- Sheet ASS_003CC (Figure 6). Acid sulfate soils in a class 3 area are likely to be found beyond 1 metre below the natural ground surface. Any works that extend beyond 1 metre below the natural ground surface, or works which are likely to lower water table beyond 1 metre below the natural ground surface, will trigger the requirement for an Acid Sulphate Soil Management Plan prepared in accordance with the Acid Sulphate Soils Manual.

6.6 Groundwater Resources

A search of existing licensed groundwater bores was undertaken on 29 August 2016 using the NSW DPI Office of Water Groundwater Resources Map. The search indicated that eight (8) groundwater bores are located within 1000m of the proposed development. The closest bore is located approximately 150m from the site on Fletcher St, which is used for domestic

purposes. This well is 3.10m deep with a reported standing water level (SWL) of 1.8m. A map showing groundwater bores in the vicinity of the site is shown on Figure 8. A further two groundwater bores are within 300m of the site are both domestic active bores with no depth or yield data available.

7 Site History

A desk-top site history assessment was undertaken to determine the chronological history of the site and possible sources and locations of contamination. Information used to assist in the desk-top site history assessment was collected and collated from the following sources:

- review of available site history details;
- LPI – Historic Title Search;
- OEHL’s POEO Act Public Register;
- OEHL’s Contaminated Land – Record of Notices; and
- NSW DPI: cattle dip site locator.

The findings of the desk-top site history assessment are summarised below.

7.1 Site History Overview

The site has over the years has been subject to varied activities. The major historical use relevant to a site assessment is use of the site was for the Byron Bay Railway Station which opened on 15 May 1894. The surrounding area at this time trended towards functioning as a business district main street with Zircon-Rutile Ltd which processed heavy mineral sands at the location which is now Woolworths. Railway operations ended in 16 May 2004 an the site is now a popular bar.



Figure 1: Zircon-Rutile plant in Jonson Street, Byron Bay circa 1950 (now Woolworths)



Figure 2 Byron Bay Railway Station circa 1900

7.2 Historical Title Search

Limited information was located using Historical Titles Database for the current site in regard to titles or mapping.

7.3 POEO Act Public Register Search

The EPA's POEO Act Public Register was searched for the area surrounding the site and eleven POEO licences are currently issued (Table 3).

None of the three licensed facilities are located on this register are within 500m of the site. None of the POEO activities are likely to have directly impacted the subject site.

Table 3 POEO Register for Byron Bay

Number	Name	Location	Type	Status	Issued date
2548	BYRON BAY GOLF CLUB LTD	BROKEN HEAD ROAD, BYRON BAY, NSW 2481	POEO licence	Surrendered	26-Apr-00
830	BYRON SHIRE COUNCIL	CASUARINA STREET, MULLUMBIMBY, NSW 2482	POEO licence	Surrendered	16-Jun-00
1589	BYRON SHIRE COUNCIL	BROKEN HEAD ROAD, BYRON BAY, NSW 2481	POEO licence	Surrendered	16-Jun-00
572	BYRON SHIRE COUNCIL	PACIFIC HIGHWAY, BRUNSWICK HEADS, NSW 2483	POEO licence	Surrendered	16-Jun-00
784	BYRON SHIRE COUNCIL	PACIFIC HIGHWAY, OCEAN SHORES, NSW 2483	POEO licence	Issued	16-Jun-00
3404	BYRON SHIRE COUNCIL	BAYSHORE DRIVE, BYRON BAY, NSW 2481	POEO licence	Issued	6-Jul-00
2522	BYRON SHIRE COUNCIL	DUDGEONS LANE, BANGALOW, NSW 2479	POEO licence	Issued	29-Dec-00
6057	BYRON SHIRE COUNCIL	MANSE ROAD, TYAGARAH, NSW 2481	POEO licence	Issued	29-May-03
12600	BYRON SHIRE COUNCIL	Manse Road, MYOCUM, NSW 2481	POEO licence	Issued	2-Nov-06
13123	BYRON SHIRE COUNCIL	Valances Road, MULLUMBIMBY, NSW 2482	POEO licence	Surrendered	29-Jun-09
13127	BYRON SHIRE COUNCIL	Manse Road, TYAGARAH, NSW 2481	POEO licence	Issued	3-Aug-09
13266	BYRON SHIRE COUNCIL	Vallances Road, MULLUMBIMBY, NSW 2482	POEO licence	Issued	27-Sep-10
20731	BYRON SHIRE COUNCIL	8-12 Bayshore Drive, BYRON BAY, NSW 2481	POEO licence	Issued	7-Jul-16

3992	HANSON CONSTRUCTION MATERIALS PTY LTD	LOT6 MOGO PLACE, BILLINUDGEL, NSW 2483	POEO licence	No longer in force	25-May-00
3546	HANSON CONSTRUCTION MATERIALS PTY LTD	LOT 41 BANKSIA DRIVE, BYRON BAY, NSW 2481	POEO licence	No longer in force	12-Jan-01
1869	HOLCIM (AUSTRALIA) PTY LTD	BYRON BAY ROAD, BYRON BAY, NSW 2481	POEO licence	No longer in force	15-Mar-00
1951	HOLCIM (AUSTRALIA) PTY LTD	LOT 1380 MOGO PLACE, BILLINUDGEL, NSW 2483	POEO licence	No longer in force	15-Mar-00
10999	INGHAMS ENTERPRISES PTY. LIMITED	268 EWINGSDALE ROAD, EWINGSDALE, NSW 2481	POEO licence	Surrendered	1-Mar-05
10998	J & M BASHFORTH & SONS PTY LTD	DINGO LANE EAST OFF MYOCUM ROAD, MULLUMBIMBY, NSW 2482	POEO licence	Issued	10-Oct-00
4860	LEADSHINE PTY. LIMITED	BROKEN HEAD ROAD, SUFFOLK PARK, NSW 2481	POEO licence	Issued	27-Apr-00
12330	LEND LEASE ENGINEERING PTY LIMITED	Pacific Highway, BRUNSWICK HEADS, NSW 2483	POEO licence	Surrendered	6-Jun-05
4254	LUKE BRACKEN	COOLAMON SCENIC DRIVE, MULLUMBIMBY, NSW 2482	POEO licence	Surrendered	21-Nov-00
3284	NORTHERN CO-OPERATIVE MEAT COMPANY LIMITED	BOOYONG VIA, LISMORE, NSW 2480	POEO licence	Issued	22-Jun-00
10008	ROADS & TRAFFIC AUTHORITY OF NEW SOUTH WALES	PACIFIC HIGHWAY, MULLUMBIMBY, NSW 2482	POEO licence	Surrendered	6-Sep-99

7.4 Contaminated Land – Record of Notices Search

The OEH’s Contaminated Land – Record of Notices was searched (accessed 1 September 2016) for the Byron Shire. No records were found in the near vicinity of the site.

Table 4 Record of Notices under the CLM Act for Byron Shire

Search results

Your search for: LGA: Byron Shire Council Matched 7 notices relating to 6 sites.

Suburb	Address	Site Name	Notices related to this site
BANGALOW	Ashton STREET	Dip 4057 Bangalow Saleyards	1 current
BYRON BAY	Corner Beachcomber Drive and Cooper STREET	Dip 4207 Byron Bay	1 current
FEDERAL	3-6 Federal DRIVE	Federal General Store	1 current
MAIN ARM	Upper Main Arm ROAD	Dip 5393 Tooland	1 current
MULLUMBIMBY	Left Bank ROAD	Dip 4944 Mooyabil	1 former
SUFFOLK PARK	Cnr Broken Head Road & Beech DRIVE	Suffolk Park dip site	2 former

Page 1 of 1

1 September 2016

7.5 Cattle Dip Site Locator

The NSW DPI: cattle dip site locator was accessed on 30 August 2016. A search of the site indicated that there were four cattle dips within the Byron Bay locality, all of which have been decommissioned.

None are located within 200m of the subject site.

7.6 Areas of Environmental Concern

Based on the desk-top site history assessment, No Areas of Environmental Concern (AEC), considered to be a source of potential contaminants of concern may have occurred in or within the vicinity of the site.

Section 3.3.2 of the *Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land* (DUAP & EPA, 1998) states that “further information is required when a subject site is in the vicinity of or associated with an activity listed in Table 1 but it is unknown whether contamination exists”.

8 Site Inspection

8.1 Site Inspection Overview

James Foster (Principal Environmental Engineer, ENV) undertook a site inspection on the 12th August 2015. The site is a general carparking and circulation space behind Jonson St commercial premises and adjacent to Railway Park within the central business district of Byron Bay. It is surrounded by low density commercial buildings to the east and a rail corridor located on the western boundary.

No visual staining, chemical residue, asbestos residue or evidence of contamination were noted on the property during the site inspection.

9 Sampling and Analysis Plan

Section 2.1 of the *Sampling Design Guidelines* (EPA, 1995) states that a preliminary sampling and analysis program may be required where investigations indicate possible sources of contamination. Given the above, sampling and analysis have been undertaken at the site.

9.1 Sampling Objective

In accordance with *Sampling Design Guidelines* (EPA, 1995) and NSW Acid Sulphate Soils Manual (Acid Sulphate Soils Management Advisory Committee, 1998), the rationale behind sampling is to gather information concerning the location, nature, level and extent of contamination found within the proposed development area. In total 18 locations were drilled to a depth of approximately 2m to collect samples in a systematic pattern across both sections of the the proposed carpark to comply with the required guidelines and site conditions.

9.2 Field Investigations

The field sampling investigation was conducted on the 12 August 2016. Soil samples were taken at each of the 18 drill locations across a range of depths (0m to 2m+) to assess contamination across the expected disturbance zone of the carpark civil works. Approximately 72 samples were taken. All samples were screened for hydrocarbons insitu using a photoionization detector. A representative selection of 22 samples were sent for complete contamination screening for contaminant of concern and a subset of four drilling locations and 15 samples screened for acid sulphate soils assessment prior to selecting 4 samples for full analysis (Attachment 1 and 3). An additional triplicate sample was sent to a third laboratory for QA purposes. The results of sample analysis are discussed in Section 10. Sampling details and bore logs are summarised in Attachment 4.

9.3 Sampling Methodology

Soil samples were collected in the field by a suitably qualified and experienced Environmental Engineer. Soil samples were collected using a fresh glove hand from

the auger as soon as they were removed from the ground. Samples were sealed in laboratory supplied glass jars and chilled prior to dispatch to the Lab.

9.4 Field Quality Assurance/Quality Control (QA/QC)

Sampling equipment was cleaned thoroughly between each sample location by washing in a mixture of water and phosphate-free detergent prior to a thorough rinsing in freshwater and drying with a paper towel.

All samples were placed into their relevant containers and stored in an iced esky and transported to the Laboratory for testing.

Chain of Custody (COC) documents and Lab Results were recorded for each sample and are provided at Attachment 1. The COC indicates the sample number, time sampled, sampler and analytical requirements.

9.5 Potential Contaminants of Concern

Based on the outcomes of the desk-top site history assessment and the site inspection, potential contaminants of concern have been identified for the site and are based on historical site use guidance extracted from the SEPP55 Planning Guidelines – Railway yards.

The potential contaminants of concern (PCOC’s) are hydrocarbons, arsenic, phenolics (creosotes) heavy metals, nitrates and ammonia. In addition to these contaminants asbestos is also a contaminant of concern due to the historical use of the area over time and age of buildings located near the site. Due to the sandy nature of the site and a long history of rail activity, nitrates and ammonia were removed from the potential contaminates of concern.

Table 5 Analytes Requested for Laboratory Analysis

Analytes Tested	Potential Contamination Source
Metals	Agricultural chemicals, pesticides, herbicides and fertilisers.
Organo-chlorine Pesticides	Agricultural pesticide/herbicides.
Hydrocarbons	Fuel storage, machinery, vehicles
Asbestos	Building wastes, insulation

10 Laboratory Analysis Results

The soil sample laboratory analysis results for the site and relevant assessment criteria from NEPM 2013 (National Environmental Protection, Assessment of Site Contamination, Measure), 2013;).are presented in Attachment 1

10.1 Contamination Assessment

The samples were compared against NEPM 2013 Soil and Water - Commercial and Industrials levels, inclusive of:

- Table 1A(1) Health Investigation Levels Commerical / Industrial D Soil
- Table 1A(3) Health Screening Levels Commerical Industrial for Vapour Intrusion, Sand
- Table 1A(3) Health Screening Levels Commerical Industrial for Vapour Intrusion, Silt
- Table 1B(5) Generic EIL – Commerical Industrial
- Table 1B(6) ESLs for Commercial Industrial, Fine Soil
- Table 1A(4) Health Screening Levels Groundwater Vapour instrusion, Sand
- Table 1A(4) Health Screening Levels Groundwater Vapour instrusion, Silt

The laboratory results show no exceedance of NEPM 2013 contamination levels across the 18 drill holes and 22 samples analysed, with the exception of two samples recording elevated concentrations of Benzo(a)pyrene above ESL limits (BH5 and BH7)

The samples from BH5 and BH7 are likely due to minor contamination from combustion byproducts related to vehicles or residual tar and triggers the ecological screening level for Benzo(a)pyrene only. Due to the location of the site being within a business district area and the nature of the works planned for the site, this sample result has limited potential impact to the surrounding environment ecology.

10.2 Acid Sulphate Soil Assessment

Fifteen soil samples obtained from the investigation were forwarded to the Environmental Analysis Laboratory at Southern Cross University for acid sulfate soil analysis. The samples were analysed using acid sulphate peroxide screening with a further four samples fully analysed for Chromium Reducible Sulfur (technique Scr – Method 22B).

Current ASSM-1998 guidelines for disturbed soil volumes up to 1000 tonnes indicate that soils of coarse texture with greater than 0.03% oxidisable sulfur and medium texture with greater than 0.06% oxidisable sulfur (%S), are Potential Acid Sulfate Soils. Based on the laboratory test results, soils contained at or below 0.5-0.7m in depth in the northern section of the proposed carpark development on Lot 3 DP827049 are assessed as PASS. The remaining carpark area on Lot DP1001454 surrounding the Railway Park did not trigger PASS criteria.

Without a detailed description of the proposed works it is recommended that this area of the carpark development be treated as acid sulphate soil and the soil treated with lime at a dosage rate of 3.8kg/ tonne dry weight. The laboratory test results are included as Appendix 3.

10.3 Quality Assurance and Control

Quality assurance (QA) involves all of the planned and systematic actions, procedures, checks and decisions undertaken to ensure the representativeness and integrity of samples, and the accuracy and reliability of analysis results. Further information is provided in Section 10.3.1.

Quality control (QC) involves those parts of an investigation which serve to monitor and measure the effectiveness of the QA procedures by comparison with the relevant DQOs. Further information is provided in Section 10.3.2.

Laboratory sampling results are presented in Attachment 3.

10.3.1 Quality Assurance

The following planned and systematic actions were undertaken to ensure the overall accuracy and reliability of the validation results:

- selection of appropriate sampling and preservation methods, documentation and sample storage;
- cleaning of tools before sampling and between samples;
- cleaning of containers;
- maintenance of sample environment to minimise sample contamination and analyte losses; and
- delivery to the laboratory in good condition and within the timeframes required for the particular analytes: recommended holding times, were based on those recommended by the USEPA and NEPM and all required holding times were met.

10.3.2 Quality Control

Verification samples, including field duplicates, field splits, trip blanks, transfer blanks, and equipment blanks were taken to monitor and measure the effectiveness of the QA procedures. Table 6 provides details of the QC sampling undertaken during the site assessment.

Field Duplicates

Field Duplicates are duplicate samples which are sent as independent samples to the same laboratory for analysis to assess the precision of the analytical results. Field duplicates were taken at a frequency of 1 per 20 samples (approx. 5%).

Field Splits

Field splits are duplicate samples which are sent to different laboratories for analysis to assess the precision of the results. Field splits were collected using the same procedure as for field duplicates. Field splits were taken at a frequency of 1 per 20 samples (approx. 5%).

Trip Blanks

Trip blanks monitor possible contamination introduced during field and laboratory work. Before commencement of work each day and in a clean location, the trip blank sample container is filled with deionised water, sealed and labelled. It is then taken onto the field for the duration of the work that day and is sent alongside all the other samples for analysis. Trip blanks were taken at a frequency of 1 per day.

Equipment Blank

Equipment blanks monitor possible contamination that may be introduced by inadequate equipment decontamination. Equipment blanks were collected at a frequency of 1 per 20 samples. Equipment blanks should not return any positive results on analysis.

Table 6: Quality Control Samples

Quality Control	Sample
Trip Blank	Trip 1
Equipment Blank	Rinsate Blank
Field Duplicates	BH 15.1 - 0.5 BH 15.2 - 0.5
Field Split	BH15.3 -

Results of the QC sampling undertaken during the site assessment are presented in Table 7 below.

The precision of the results was assessed by determining the relative percentage difference (RPD) of duplicate samples. RPDs can only be calculated where results of both the sample and the duplicate are both above laboratory reporting limits. RPDs for the pairs of samples tested are presented in the data validation tables below. There is a variance limit of 50% for soils.

These results show that results met the QA requirements. The results for the majority of analytes were below detection limit. Lead and Zinc were detected below

NEPM guidelines levels. RPD values for Lead and Zinc are below the 50% variance limit.

Trip and Equipment blanks had no results above the PQL which indicates no contamination of samples from the trip or from equipment.

Table 7: QC Laboratory Results

Field ID	Depth (mgl)	Lab	Lead (mg/kg)	Zinc (mg/kg)
BH15.1	0.5	Ecolab	5	4
BH15.2	0.5	Ecolab	4	6
BH15.3	0.5	Eurofins	<0.05	<0.5
RPD			22	40

11 Conclusions

ENV Solutions has undertaken a Site Assessment Investigation for the Project in accordance with the *Managing Land Contamination Planning Guidelines* (DUAP and EPA, 1998).

This site assessment has:

- Described the site condition and surrounding environment;
- Provided a summary of the site history;
- Identified past and present potentially contaminating activities and potential contaminant types;
- Provided a preliminary assessment of the site contamination;
- Assessed the need for further investigations;
- Assessed soil sample analysis results against relevant criteria; and
- Assessed the suitability of the site for the proposed use.

A desk-top site history assessment and a site inspection have been conducted as part of the site assessment. The desk-top site history assessment encompassed the site and adjacent areas. Information used to assist in the site history was also collected and collated from the following sources:

- Review of available site history details including a site history statement;
- LPI – Historic Title Search;
- Historical aerial photographs;
- OEH’s POEO Act Public Register;
- OEH’s Contaminated Land – Record of Notices; and,
- NSW Primary Industries Cattle Dip Site Locator.

The site inspection included:

- An inspection of the site to identify potential areas of contamination; and
- Preliminary soil sampling at areas identified as potentially contaminated /

acid sulphate soils, during the site inspection.

Two potential contaminants of concern were identified for the site:

- Hydrocarbons
- Pesticides/herbicides,
- Metals
- Asbesto, and,
- Acid Sulphate Soils

Given the above, a Preliminary sampling and analysis plan was undertaken. A total of 22 samples were analysed for the potential contaminants of concern from within the proposed development area.

The laboratory results show no exceedance of NEPM 2013 contamination levels across the 18 drill holes and 22 samples analysed, with the exception of two samples recording elevated concentrations of Benzo(a)pyrene above ESL limits (BH5 and BH7)

The samples from BH5 and BH7 are likely due to minor contamination from combustion byproducts related to vehicles and triggers the ecological screening level for Benzo(a)pyrene only. Due to the location of the site being within a business district area and the nature of the works planned for the site, this sample result has limited potential impact to the work carried out and surrounding environment.

Potential Acid Sulphate Soils were found in the northern carpark area located in Lot 3 DP827049 from samples taken at 0.5-0.7m based on the results of the sampling it is recommended that this section of the carpark be treated as acid sulphate soils and dosed with lime at a rate of 3.8kg/tonne dry weight. As a an appropriate management method an acid sulphate soils management plan should be developed as part of detailed planning for the site development taking into consideration excavation depth, stockpiling of material and length of exposure of the material.

Based on the above assessment it is assessed that further investigation is **not required** and that the **site is suitable** for the proposed carpark development use.

12 General Notes

General

Geotechnical and environmental reports present the results of investigations carried out for a specific project and usually for a specific phase of the project (e.g. preliminary design). The report is based specific criteria, such as the nature of the project, underground utilities or scope of service limitations imposed by the Client. The report may not be relevant for other phases of the project (e.g. construction), after some time or where project details and clients change.

Soil and Rock Description

Soil and rock descriptions are based on AS1726-1993 using visual and tactile assessment except at discrete locations where field and/or laboratory tests have been carried out. Refer to the terms and symbols sheet for definitions.

Groundwater

The water levels indicated are taken at the time of measurement and depending on material permeability may not reflect the actual groundwater level at those specified locations. Also groundwater levels can vary with time due to seasonal or tidal fluctuation, construction activities and other external factors.

Interpretation of Results

The discussion and recommendations in the accompanying report are based on extrapolation/interpolation from data obtained at discrete locations and other external sources and guidelines. The actual interface between the materials may be far more gradual or abrupt than indicated. Also actual conditions in areas not sampled may differ from those predicted.

The report is based on significant background details that only the authors can be aware of, and therefore implementation of the recommendations by others may lead to misinterpretation and complications. Therefore this company should be consulted to explain the reports implications to other involved parties.

Reporting relies on interpretation of often limited factual information based on judgment and opinion which has a level of uncertainty and ambiguity attached to it, and is far less exact than other design disciplines. This should be considered by users of the report when assessing the implications of the recommendations.

Change in Conditions

Subsurface conditions can change with time and can vary between test locations. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions.

13 References

1. *Australian and New Zealand Environment Conservation Council ANZECC, 1992. Environmental Soil Quality Guidelines.*
2. *Department of Urban Affairs and Planning and the Environment Protection Authority (1998). Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land.*
3. *DIPMAC (1995) Guidelines to Assist Local Government in Assessing Development within 200 metres of Cattle Tick Dip Sites.*
4. *Environment Protection Authority (1995) Sampling Design Guidelines.*
5. *Environment Protection Authority (2000) Guidelines for Consultants Reporting on Contaminated Sites*
6. *Byron Shire :LEP (2014) www.byron.nsw.gov.au*
7. *Byron Shire :LES (2008) www.byron.nsw.gov.au*
8. *Swartjes, F.A. (1999) Risk-based Assessment of Soil and Groundwater Quality in the Netherlands: Standards and Remediation Urgency. Risk Analysis 19(6): 1235-1249*
9. *National Environment Protection Council (2013) Amended National Environment Protection (Assessment of Site Contamination) Measure.*
10. *Agency for Toxic Substances and Disease Registry (2005) Division of Toxicology ToxFAQs*
11. *National Environment Protection Council (2013) Amended National Environment Protection (Assessment of Site Contamination) Measure Schedule B1 Guideline on the Investigation Levels for Soil and Groundwater*

14 Glossary

Below is a list of commonly used abbreviations in the report:

AEC – Areas of Environmental Concern

ENV – ENV Solutions Pty Ltd

COC – Chain of Custody

DPI – Department of Primary Industries

EPA – Environment Protection Authority (now known as Office of Environment Heritage)

HILs – Health Investigation Levels (for soil)

NEPM – National Environment Protection Measure

OEH – Office of Environment & Heritage

QA/QC – Quality Assurance and Quality Control

16 Figures



Figure 3 Site Location

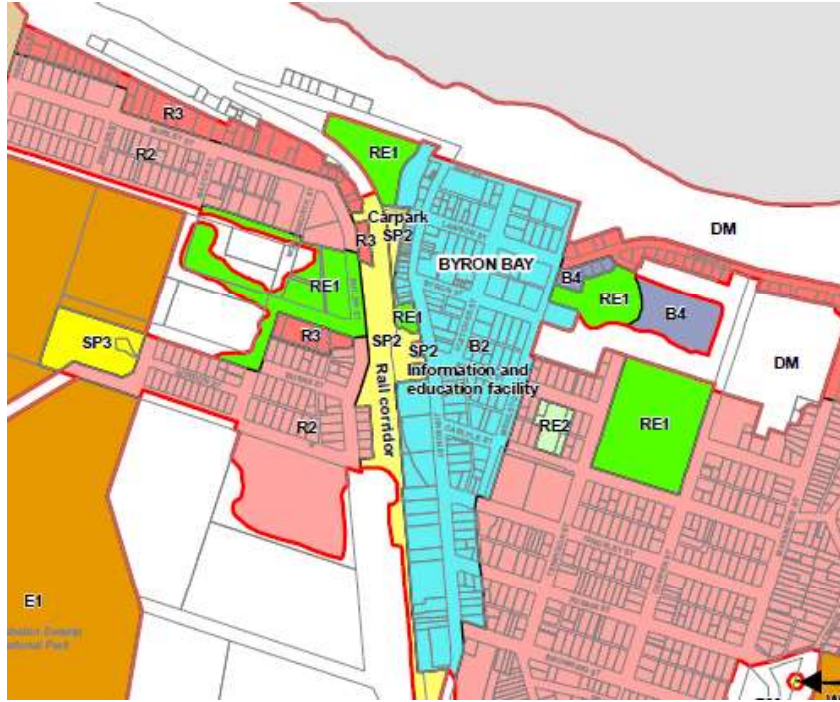


Figure 4 Land Zoning LEP 2014

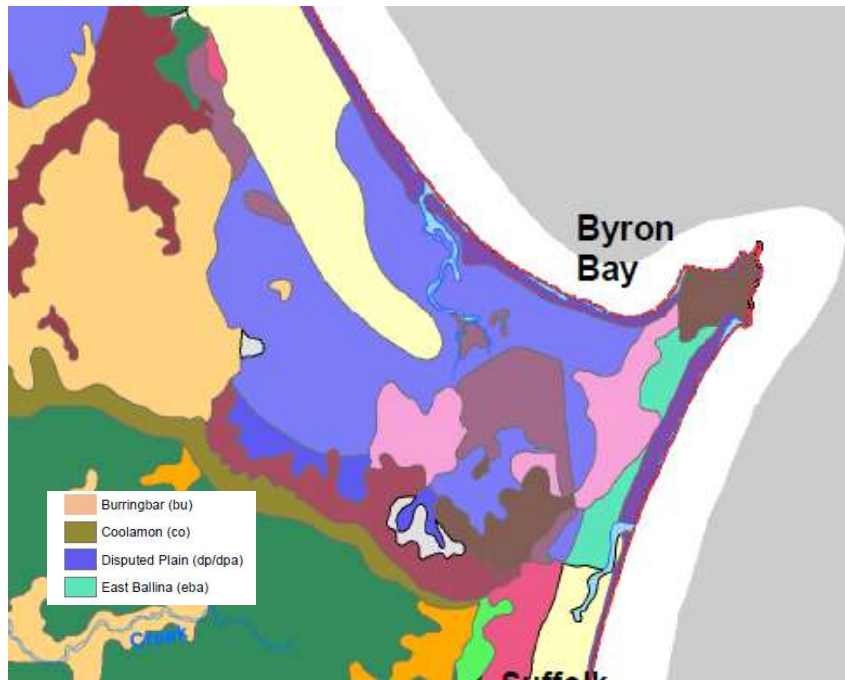


Figure 5 Soil Landscape (Byron LES, 2008 Figure 7)

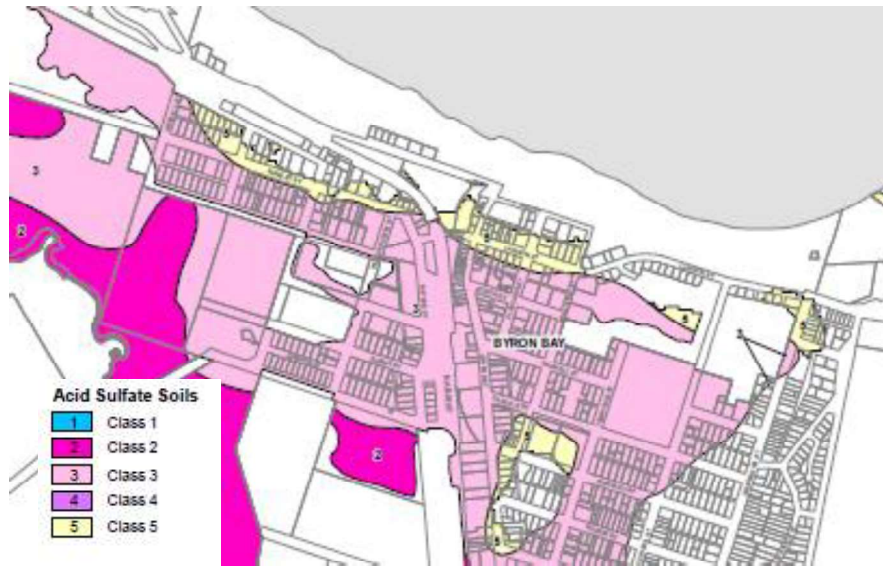


Figure 6 Acid Sulphate Soils (LEP 2014)



Figure 7: Belongil Creek Catchment Flood Risk - Byron Shire Council (LES 2008 Figure 10)

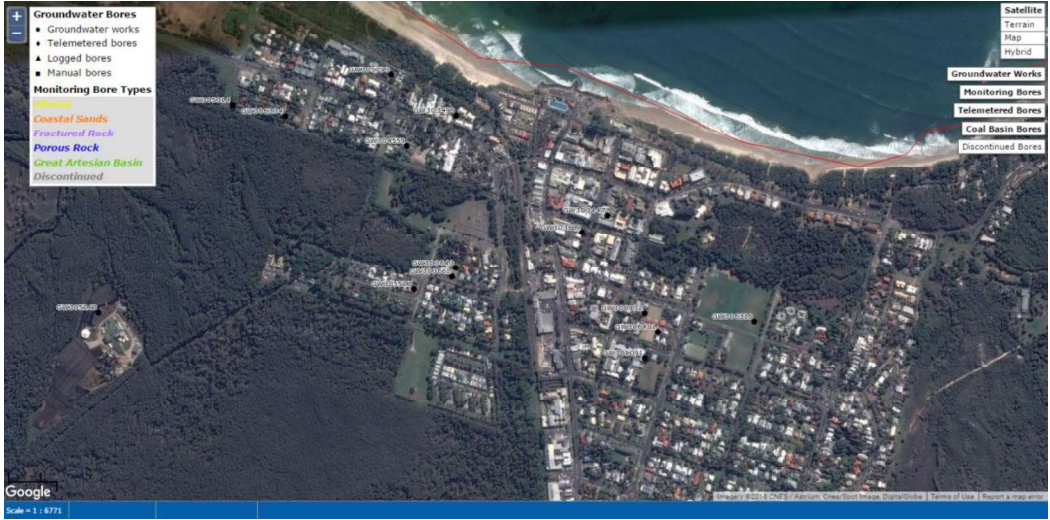


Figure 8: Groundwater Resources (DPI OOW 2016)

17 Attachments

Attachment 1	Laboratory Results/ Results Analysis / COC
Attachment 2	Site photos
Attachment 3	Sampling Plan
Attachment 4	Bore Logs

ATTACHMENT 1

**Chain of Custody
Laboratory Results
Laboratory Results Analysis**



CERTIFICATE OF ANALYSIS

151866

Client:

ENV Solutions Pty Ltd
1/35 North Creek Road
Ballina
NSW 2478

Attention: James Foster

Sample log in details:

Your Reference:	<u>16140, Railway Hotel & Lawson St Sth Carparks</u>
No. of samples:	19 Soils, 2 Waters
Date samples received / completed instructions received	16/08/16 / 16/08/16

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date: 23/08/16 / 22/08/16
Date of Preliminary Report: Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing **Tests not covered by NATA are denoted with *.**

Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	151866-1 BH1	151866-2 BH2	151866-3 BH3	151866-4 BH4	151866-5 BH5
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Date analysed	-	19/08/2016	19/08/2016	19/08/2016	19/08/2016	19/08/2016
TRHC ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRHC ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPHC ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	100	94	104	94	97

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	151866-6 BH6	151866-7 BH7	151866-8 BH8	151866-9 BH9	151866-10 BH10
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Date analysed	-	19/08/2016	19/08/2016	19/08/2016	19/08/2016	19/08/2016
TRHC ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRHC ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPHC ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	100	99	96	100	102

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	151866-11 BH11	151866-12 BH12	151866-13 BH13	151866-14 BH14	151866-15 BH15.1
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.5
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Date analysed	-	19/08/2016	19/08/2016	19/08/2016	19/08/2016	19/08/2016
TRHC ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRHC ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPHC ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	96	102	100	93	97

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	151866-16 BH15.2	151866-17 BH16	151866-18 BH17	151866-19 BH18
Depth	-----	0.5	0.1-0.2	0.5	0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Date analysed	-	19/08/2016	19/08/2016	19/08/2016	19/08/2016
TRHC ₆ - C ₉	mg/kg	<25	<25	<25	<25
TRHC ₆ - C ₁₀	mg/kg	<25	<25	<25	<25
vTPHC ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	97	99	97	100

svTRH(C10-C40) in Soil Our Reference: Your Reference	UNITS ----- -	151866-1 BH1	151866-2 BH2	151866-3 BH3	151866-4 BH4	151866-5 BH5
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	77	73	76	71	82

svTRH(C10-C40) in Soil Our Reference: Your Reference	UNITS ----- -	151866-6 BH6	151866-7 BH7	151866-8 BH8	151866-9 BH9	151866-10 BH10
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	520	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	230	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	700	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	110	<100	<100	<100
Surrogate o-Terphenyl	%	86	94	71	76	88

svTRH(C10-C40) in Soil Our Reference: Your Reference	UNITS ----- -	151866-11 BH11	151866-12 BH12	151866-13 BH13	151866-14 BH14	151866-15 BH15.1
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.5
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	72	86	76	83	77

svTRH(C10-C40) in Soil Our Reference: Your Reference	UNITS ----- -	151866-16 BH15.2	151866-17 BH16	151866-18 BH17	151866-19 BH18
Depth	-----	0.5	0.1-0.2	0.5	0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100
Surrogate o-Terphenyl	%	80	91	87	92

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	151866-1 BH1	151866-2 BH2	151866-3 BH3	151866-4 BH4	151866-5 BH5
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.9
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	12
Pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	12
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	4.2
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	3.9
Benzo(b,j,k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	8.8
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	5.9
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	5.0
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.7
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	5.0
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	8.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	8.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	8.5
Total Positive PAHs	mg/kg	0.20	NIL (+)VE	NIL (+)VE	NIL (+)VE	58
Surrogate p-Terphenyl-d14	%	93	89	90	84	95

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	151866-6 BH6	151866-7 BH7	151866-8 BH8	151866-9 BH9	151866-10 BH10
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Naphthalene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.6	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	4.5	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	2.8	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	85	<0.1	<0.1	0.1
Anthracene	mg/kg	<0.1	11	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	94	<0.1	0.2	0.4
Pyrene	mg/kg	<0.1	84	<0.1	0.2	0.4
Benzo(a)anthracene	mg/kg	<0.1	19	<0.1	<0.1	0.1
Chrysene	mg/kg	<0.1	21	<0.1	<0.1	0.2
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	37	<0.2	<0.2	0.3
Benzo(a)pyrene	mg/kg	<0.05	23	<0.05	0.07	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	20	<0.1	<0.1	0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	2.9	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	20	<0.1	<0.1	0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	34	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	34	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	34	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL(+)/VE	430	NIL(+)/VE	0.53	1.7
Surrogate p-Terphenyl-d14	%	92	84	86	93	93

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	151866-11 BH11	151866-12 BH12	151866-13 BH13	151866-14 BH14	151866-15 BH15.1
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.5
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL(+)/VE	NIL(+)/VE	NIL(+)/VE	NIL(+)/VE	NIL(+)/VE
Surrogate p-Terphenyl-d14	%	86	88	88	84	82

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	151866-16 BH15.2	151866-17 BH16	151866-18 BH17	151866-19 BH18
Depth	-----	0.5	0.1-0.2	0.5	0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.3	<0.1	0.1
Pyrene	mg/kg	<0.1	0.3	<0.1	0.1
Benzo(a)anthracene	mg/kg	<0.1	0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.1	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL(+)/VE	1.3	NIL(+)/VE	0.20
Surrogate p-Terphenyl-d14	%	87	93	86	89

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- - -----	151866-1 BH1 0.0-0.2 12/08/2016 Soil	151866-2 BH2 0.5-0.7 12/08/2016 Soil	151866-3 BH3 0.0-0.2 12/08/2016 Soil	151866-4 BH4 1.5-1.7 12/08/2016 Soil	151866-5 BH5 0.0-0.2 12/08/2016 Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	96	94	95	92	92

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- - -----	151866-6 BH6 0.5-0.7 12/08/2016 Soil	151866-7 BH7 0.0-0.2 12/08/2016 Soil	151866-8 BH8 1.5-1.7 12/08/2016 Soil	151866-9 BH9 0.0-0.2 12/08/2016 Soil	151866-10 BH10 0.4-0.6 12/08/2016 Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	96	93	90	94	94

Organochlorine Pesticides in soil	UNITS	151866-11	151866-12	151866-13	151866-14	151866-17
Our Reference:	-----	BH11	BH12	BH13	BH14	BH16
Your Reference	-					
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.1-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	96	92	90	93

Organochlorine Pesticides in soil	UNITS	151866-18	151866-19
Our Reference:	-----	BH17	BH18
Your Reference	-		
Depth	-----	0.5	0.2
Date Sampled		12/08/2016	12/08/2016
Type of sample		Soil	Soil
Date extracted	-	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Surrogate TCMX	%	92	94

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

PCBs in Soil Our Reference: Your Reference	UNITS ----- -	151866-1 BH1	151866-2 BH2	151866-3 BH3	151866-4 BH4	151866-5 BH5
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	96	94	95	92	92

PCBs in Soil Our Reference: Your Reference	UNITS ----- -	151866-6 BH6	151866-7 BH7	151866-8 BH8	151866-9 BH9	151866-10 BH10
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	96	93	90	94	94

PCBs in Soil Our Reference: Your Reference	UNITS ----- -	151866-11 BH11	151866-12 BH12	151866-13 BH13	151866-14 BH14	151866-17 BH16
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.1-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	96	92	90	93

PCBs in Soil Our Reference: Your Reference	UNITS ----- -	151866-18 BH17	151866-19 BH18
Depth	-----	0.5	0.2
Date Sampled		12/08/2016	12/08/2016
Type of sample		Soil	Soil
Date extracted	-	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	92	94

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

Acid Extractable metals in soil Our Reference: Your Reference	UNITS ----- -	151866-1 BH1	151866-2 BH2	151866-3 BH3	151866-4 BH4	151866-5 BH5
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	5	12	6	<1	5
Copper	mg/kg	17	7	27	<1	32
Lead	mg/kg	10	4	8	6	40
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	4	12	2	<1	11
Zinc	mg/kg	27	24	16	6	30

Acid Extractable metals in soil Our Reference: Your Reference	UNITS ----- -	151866-6 BH6	151866-7 BH7	151866-8 BH8	151866-9 BH9	151866-10 BH10
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Arsenic	mg/kg	<4	4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	1	3	<1	5	4
Copper	mg/kg	1	8	<1	30	8
Lead	mg/kg	1	11	<1	14	230
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	4	<1	4	2
Zinc	mg/kg	4	39	<1	21	120

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

Acid Extractable metals in soil Our Reference: Your Reference	UNITS ----- -	151866-11 BH11	151866-12 BH12	151866-13 BH13	151866-14 BH14	151866-15 BH15.1
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.5
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	<1	3	4	<1	<1
Copper	mg/kg	<1	15	10	<1	<1
Lead	mg/kg	<1	10	24	<1	5
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	3	2	<1	<1
Zinc	mg/kg	1	25	33	40	4

Acid Extractable metals in soil Our Reference: Your Reference	UNITS ----- -	151866-16 BH15.2	151866-17 BH16	151866-18 BH17	151866-19 BH18
Depth	-----	0.5	0.1-0.2	0.5	0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Arsenic	mg/kg	<4	8	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	<1	4	<1	<1
Copper	mg/kg	<1	14	<1	<1
Lead	mg/kg	4	58	<1	3
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	4	<1	<1
Zinc	mg/kg	6	44	<1	2

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

Moisture						
Our Reference:	UNITS	151866-1	151866-2	151866-3	151866-4	151866-5
Your Reference	-----	BH1	BH2	BH3	BH4	BH5
	-					
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Moisture	%	2.9	18	3.4	17	8.1

Moisture						
Our Reference:	UNITS	151866-6	151866-7	151866-8	151866-9	151866-10
Your Reference	-----	BH6	BH7	BH8	BH9	BH10
	-					
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Moisture	%	2.8	4.5	15	4.3	5.1

Moisture						
Our Reference:	UNITS	151866-11	151866-12	151866-13	151866-14	151866-15
Your Reference	-----	BH11	BH12	BH13	BH14	BH15.1
	-					
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.5
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Moisture	%	11	2.6	9.6	18	11

Moisture					
Our Reference:	UNITS	151866-16	151866-17	151866-18	151866-19
Your Reference	-----	BH15.2	BH16	BH17	BH18
	-				
Depth	-----	0.5	0.1-0.2	0.5	0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	18/08/2016	18/08/2016	18/08/2016	18/08/2016
Moisture	%	11	5.8	8.2	4.8

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	151866-1 BH1	151866-2 BH2	151866-3 BH3	151866-4 BH4	151866-5 BH5
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	22/08/2016	22/08/2016	22/08/2016	22/08/2016	22/08/2016
Sample mass tested	g	Approx. 40g	Approx. 35g	Approx. 45g	Approx. 35g	Approx. 40g
Sample Description	-	Brown sandy soil & rocks	Brown sandy soil	Yellow sandy soil & rocks	Grey sandy soil	Brown sandy soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	151866-6 BH6	151866-7 BH7	151866-8 BH8	151866-9 BH9	151866-10 BH10
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	22/08/2016	22/08/2016	22/08/2016	22/08/2016	22/08/2016
Sample mass tested	g	Approx. 45g	Approx. 40g	Approx. 40g	Approx. 40g	Approx. 40g
Sample Description	-	Brown sandy soil & rocks	Brown sandy soil & rocks	Beige sandy soil	Beige sandy soil & rocks	Brown sandy soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	151866-11 BH11	151866-12 BH12	151866-13 BH13	151866-14 BH14	151866-17 BH16
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.1-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	22/08/2016	22/08/2016	22/08/2016	22/08/2016	22/08/2016
Sample mass tested	g	Approx. 35g	Approx. 45g	Approx. 45g	Approx. 30g	Approx. 40g
Sample Description	-	Beige sandy soil	Brown sandy soil & rocks	Brown sandy soil & rocks	Grey sandy soil	Brown sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	151866-18 BH17	151866-19 BH18
Depth	-----	0.5	0.2
Date Sampled		12/08/2016	12/08/2016
Type of sample		Soil	Soil
Date analysed	-	22/08/2016	22/08/2016
Sample mass tested	g	Approx. 40g	Approx. 40g
Sample Description	-	Beige sandy soil	Grey sandy soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected

Metals in TCLP USEPA1311 Our Reference: Your Reference	UNITS ----- -	151866-1 BH1	151866-2 BH2	151866-3 BH3	151866-4 BH4	151866-5 BH5
Depth	-----	0.0-0.2	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
pH of soil for fluid# determ.	pH units	9.1	5.7	8.5	5.8	6.7
pH of soil TCLP (after HCl)	pH units	1.5	1.6	1.5	1.6	1.6
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	5.6	4.9	4.9	4.9	4.9
Arsenic in TCLP	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Lead in TCLP	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03
Mercury in TCLP	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Metals in TCLP USEPA1311 Our Reference: Your Reference	UNITS ----- -	151866-6 BH6	151866-7 BH7	151866-8 BH8	151866-9 BH9	151866-10 BH10
Depth	-----	0.5-0.7	0.0-0.2	1.5-1.7	0.0-0.2	0.4-0.6
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
pH of soil for fluid# determ.	pH units	5.6	5.7	5.8	5.7	5.2
pH of soil TCLP (after HCl)	pH units	1.6	1.6	1.5	1.5	1.6
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	4.9	4.9	4.9	4.9	4.8
Arsenic in TCLP	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Lead in TCLP	mg/L	<0.03	<0.03	<0.03	<0.03	0.40
Mercury in TCLP	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Metals in TCLP USEPA 1311 Our Reference: Your Reference	UNITS ----- -	151866-11 BH11	151866-12 BH12	151866-13 BH13	151866-14 BH14	151866-17 BH16
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.1-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
pH of soil for fluid# determ.	pH units	5.7	6.9	6.5	6.1	7.2
pH of soil TCLP (after HCl)	pH units	1.5	1.5	1.6	1.6	1.6
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	4.8	4.9	4.9	4.8	4.9
Arsenic in TCLP	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Lead in TCLP	mg/L	<0.03	<0.03	<0.03	<0.03	0.07
Mercury in TCLP	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Metals in TCLP USEPA 1311 Our Reference: Your Reference	UNITS ----- -	151866-18 BH17	151866-19 BH18
Depth	-----	0.5	0.2
Date Sampled		12/08/2016	12/08/2016
Type of sample		Soil	Soil
Date extracted	-	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016
pH of soil for fluid# determ.	pH units	5.6	6.0
pH of soil TCLP (after HCl)	pH units	1.5	1.5
Extraction fluid used	-	1	1
pH of final Leachate	pH units	4.8	4.9
Arsenic in TCLP	mg/L	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01
Lead in TCLP	mg/L	<0.03	0.04
Mercury in TCLP	mg/L	<0.0005	0.0023
Nickel in TCLP	mg/L	<0.02	<0.02

PAHs in TCLP (USEPA 1311) Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- - -----	151866-1 BH1 0.0-0.2 12/08/2016 Soil	151866-2 BH2 0.5-0.7 12/08/2016 Soil	151866-3 BH3 0.0-0.2 12/08/2016 Soil	151866-4 BH4 1.5-1.7 12/08/2016 Soil	151866-5 BH5 0.0-0.2 12/08/2016 Soil
Date extracted	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016	17/08/2016	17/08/2016	17/08/2016
Naphthalene in TCLP	mg/L	<0.001	0.002	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(b)k)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL(+)/VE	0.0020	0.001	NIL(+)/VE	NIL(+)/VE
Surrogate p-Terphenyl-d14	%	106	86	88	82	75

PAHs in TCLP (USEPA 1311) Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- - -----	151866-6 BH6 0.5-0.7 12/08/2016 Soil	151866-7 BH7 0.0-0.2 12/08/2016 Soil	151866-8 BH8 1.5-1.7 12/08/2016 Soil	151866-9 BH9 0.0-0.2 12/08/2016 Soil	151866-10 BH10 0.4-0.6 12/08/2016 Soil
Date extracted	-	17/08/2016	19/08/2016	17/08/2016	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	19/08/2016	17/08/2016	17/08/2016	17/08/2016
Naphthalene in TCLP	mg/L	<0.001	0.001	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	0.010	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	0.006	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	0.073	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	0.008	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	0.014	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	0.010	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(b)k)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL(+)/VE	0.12	NIL(+)/VE	NIL(+)/VE	NIL(+)/VE
Surrogate p-Terphenyl-d14	%	81	66	114	100	97

PAHs in TCLP (USEPA 1311)	UNITS	151866-11	151866-12	151866-13	151866-14	151866-17
Our Reference:	-----	BH11	BH12	BH13	BH14	BH16
Your Reference	-					
Depth	-----	1.5	0.0-0.2	0.0-0.2	1.0	0.1-0.2
Date Sampled		12/08/2016	12/08/2016	12/08/2016	12/08/2016	12/08/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	17/08/2016	19/08/2016	17/08/2016	19/08/2016	17/08/2016
Date analysed	-	17/08/2016	19/08/2016	17/08/2016	19/08/2016	17/08/2016
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	0.002	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(b)k)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE	0.0020	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	103	83	74	84	87

PAHs in TCLP (USEPA 1311)	UNITS	151866-18	151866-19
Our Reference:	-----	BH17	BH18
Your Reference	-		
Depth	-----	0.5	0.2
Date Sampled		12/08/2016	12/08/2016
Type of sample		Soil	Soil
Date extracted	-	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016
Naphthalene in TCLP	mg/L	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	102	84

vTRH(C6-C10)/BTEXN in Water Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- - -----	151866-20 RINSATE BLANK - 12/08/2016 Water	151866-21 TRIPBLANK - 12/08/2016 Water
Date extracted	-	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016
TRHC ₆ - C ₉	µg/L	<10	<10
TRHC ₆ - C ₁₀	µg/L	<10	<10
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	<10	<10
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Naphthalene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	105	107
Surrogate toluene-d8	%	98	100
Surrogate 4-BFB	%	102	101

svTRH (C10-C40) in Water Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- - -----	151866-20 RINSATE BLANK - 12/08/2016 Water	151866-21 TRIPBLANK - 12/08/2016 Water
Date extracted	-	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016
TRHC ₁₀ - C ₁₄	µg/L	<50	<50
TRHC ₁₅ - C ₂₈	µg/L	<100	<100
TRHC ₂₉ - C ₃₆	µg/L	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50
TRH>C ₁₆ - C ₃₄	µg/L	<100	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100
Surrogate o-Terphenyl	%	81	82

PAHs in Water Our Reference: Your Reference	UNITS ----- -	151866-20 RINSATE BLANK	151866-21 TRIPBLANK
Depth	-----	-	-
Date Sampled		12/08/2016	12/08/2016
Type of sample		Water	Water
Date extracted	-	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016
Naphthalene	µg/L	<1	<1
Acenaphthylene	µg/L	<1	<1
Acenaphthene	µg/L	<1	<1
Fluorene	µg/L	<1	<1
Phenanthrene	µg/L	<1	<1
Anthracene	µg/L	<1	<1
Fluoranthene	µg/L	<1	<1
Pyrene	µg/L	<1	<1
Benzo(a)anthracene	µg/L	<1	<1
Chrysene	µg/L	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2
Benzo(a)pyrene	µg/L	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE
Surrogate <i>p</i> -Terphenyl-d14	%	85	88

Metals in Water - Dissolved			
Our Reference:	UNITS	151866-20	151866-21
Your Reference	-----	RINSATE	TRIPBLANK
	-	BLANK	
Depth	-----	-	-
Date Sampled		12/08/2016	12/08/2016
Type of sample		Water	Water
Date digested	-	17/08/2016	17/08/2016
Date analysed	-	17/08/2016	17/08/2016
Arsenic - Dissolved	mg/L	<0.05	<0.05
Cadmium - Dissolved	mg/L	<0.01	<0.01
Chromium - Dissolved	mg/L	<0.01	<0.01
Copper - Dissolved	mg/L	<0.01	<0.01
Lead - Dissolved	mg/L	<0.03	<0.03
Mercury - Dissolved	mg/L	<0.0005	<0.0005
Nickel - Dissolved	mg/L	<0.02	<0.02
Zinc - Dissolved	mg/L	<0.02	<0.02

MethodID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore " Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Org-012	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-013	Water samples are analysed directly by purge and trap GC-MS.

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Soil						Base II Duplicate II %RPD		
Date extracted	-			18/08/2016	151866-1	18/08/2016 || 18/08/2016	LCS-5	18/08/2016
Date analysed	-			19/08/2016	151866-1	19/08/2016 || 19/08/2016	LCS-5	19/08/2016
TRHC ₆ - C ₉	mg/kg	25	Org-016	<25	151866-1	<25 || <25	LCS-5	105%
TRHC ₆ - C ₁₀	mg/kg	25	Org-016	<25	151866-1	<25 || <25	LCS-5	105%
Benzene	mg/kg	0.2	Org-016	<0.2	151866-1	<0.2 || <0.2	LCS-5	103%
Toluene	mg/kg	0.5	Org-016	<0.5	151866-1	<0.5 || <0.5	LCS-5	109%
Ethylbenzene	mg/kg	1	Org-016	<1	151866-1	<1 || <1	LCS-5	105%
m+p-xylene	mg/kg	2	Org-016	<2	151866-1	<2 || <2	LCS-5	104%
o-Xylene	mg/kg	1	Org-016	<1	151866-1	<1 || <1	LCS-5	104%
naphthalene	mg/kg	1	Org-014	<1	151866-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	102	151866-1	100 || 101 || RPD: 1	LCS-5	103%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH(C10-C40) in Soil						Base II Duplicate II %RPD		
Date extracted	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
Date analysed	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
TRHC ₁₀ - C ₁₄	mg/kg	50	Org-003	<50	151866-1	<50 || <50	LCS-5	92%
TRHC ₁₅ - C ₂₈	mg/kg	100	Org-003	<100	151866-1	<100 || <100	LCS-5	94%
TRHC ₂₉ - C ₃₆	mg/kg	100	Org-003	<100	151866-1	<100 || <100	LCS-5	102%
TRH>C ₁₀ -C ₁₆	mg/kg	50	Org-003	<50	151866-1	<50 || <50	LCS-5	92%
TRH>C ₁₆ -C ₃₄	mg/kg	100	Org-003	<100	151866-1	<100 || <100	LCS-5	94%
TRH>C ₃₄ -C ₄₀	mg/kg	100	Org-003	<100	151866-1	<100 || <100	LCS-5	102%
Surrogate o-Terphenyl	%		Org-003	91	151866-1	77 || 77 || RPD: 0	LCS-5	83%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Date extracted	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
Date analysed	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	LCS-5	103%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	LCS-5	128%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	LCS-5	114%
Anthracene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	151866-1	0.1 || <0.1	LCS-5	94%
Pyrene	mg/kg	0.1	Org-012	<0.1	151866-1	0.1 || <0.1	LCS-5	99%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	LCS-5	97%
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	151866-1	<0.2 || <0.2	[NR]	[NR]

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	151866-1	<0.05 || <0.05	LCS-5	106%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	92	151866-1	93 || 94 || RPD: 1	LCS-5	98%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Organochlorine Pesticides in soil						Base II Duplicate II %RPD		
Date extracted	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
Date analysed	-			18/08/2016	151866-1	18/08/2016 || 18/08/2016	LCS-5	18/08/2016
HCB	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	101%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	107%
Heptachlor	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	106%
delta-BHC	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	106%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	106%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	110%
Dieldrin	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	107%
Endrin	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	101%
pp-DDD	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	104%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	LCS-5	90%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	96	151866-1	96 || 96 || RPD: 0	LCS-5	110%

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PCBs in Soil						Base II Duplicate II %RPD		
Date extracted	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
Date analysed	-			18/08/2016	151866-1	18/08/2016 || 18/08/2016	LCS-5	18/08/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	151866-1	<0.1 || <0.1	LCS-5	98%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	151866-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	96	151866-1	96 || 96 || RPD: 0	LCS-5	96%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Acid Extractable metals in soil						Base II Duplicate II %RPD		
Date prepared	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
Date analysed	-			17/08/2016	151866-1	17/08/2016 || 17/08/2016	LCS-5	17/08/2016
Arsenic	mg/kg	4	Metals-020	<4	151866-1	<4 || 5	LCS-5	101%
Cadmium	mg/kg	0.4	Metals-020	<0.4	151866-1	<0.4 || <0.4	LCS-5	103%
Chromium	mg/kg	1	Metals-020	<1	151866-1	5 || 7 || RPD: 33	LCS-5	104%
Copper	mg/kg	1	Metals-020	<1	151866-1	17 || 20 || RPD: 16	LCS-5	102%
Lead	mg/kg	1	Metals-020	<1	151866-1	10 || 9 || RPD: 11	LCS-5	99%
Mercury	mg/kg	0.1	Metals-021	<0.1	151866-1	<0.1 || <0.1	LCS-5	101%
Nickel	mg/kg	1	Metals-020	<1	151866-1	4 || 5 || RPD: 22	LCS-5	98%
Zinc	mg/kg	1	Metals-020	<1	151866-1	27 || 27 || RPD: 0	LCS-5	100%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results		
Metals in TCLP USEPA1311						Base II Duplicate II %RPD		
Date extracted	-			[NT]	151866-1	17/08/2016 || 17/08/2016		
Date analysed	-			[NT]	151866-1	17/08/2016 || 17/08/2016		
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	151866-1	<0.05 || <0.05		
Cadmium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	151866-1	<0.01 || <0.01		
Chromium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	151866-1	<0.01 || <0.01		
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	151866-1	<0.03 || <0.03		
Mercury in TCLP	mg/L	0.0005	Metals-021 CV-AAS	<0.0005	151866-1	<0.0005 || <0.0005		
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02	151866-1	<0.02 || <0.02		

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank
Date extracted	-			17/08/2 016
Date analysed	-			17/08/2 016
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001
Indeno(1,2,3-c,d)pyrene -TCLP	mg/L	0.001	Org-012	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001
Surrogate <i>p</i> -Terphenyl- d14	%		Org-012	73

QUALITY CONTROL	UNITS	PQL	METHOD	Blank
vTRH(C6-C10)/BTEXN in Water				
Date extracted	-			17/08/2016
Date analysed	-			17/08/2016
TRHC ₆ - C ₉	µg/L	10	Org-016	<10
TRHC ₆ - C ₁₀	µg/L	10	Org-016	<10
Benzene	µg/L	1	Org-016	<1
Toluene	µg/L	1	Org-016	<1
Ethylbenzene	µg/L	1	Org-016	<1
m+p-xylene	µg/L	2	Org-016	<2
o-xylene	µg/L	1	Org-016	<1
Naphthalene	µg/L	1	Org-013	<1
Surrogate Dibromofluoromethane	%		Org-016	104
Surrogate toluene-d8	%		Org-016	97
Surrogate 4-BFB	%		Org-016	102
QUALITY CONTROL	UNITS	PQL	METHOD	Blank
svTRH(C10-C40) in Water				
Date extracted	-			17/08/2016
Date analysed	-			17/08/2016
TRHC ₁₀ - C ₁₄	µg/L	50	Org-003	<50
TRHC ₁₅ - C ₂₈	µg/L	100	Org-003	<100
TRHC ₂₉ - C ₃₆	µg/L	100	Org-003	<100
TRH>C ₁₀ - C ₁₆	µg/L	50	Org-003	<50
TRH>C ₁₆ - C ₃₄	µg/L	100	Org-003	<100
TRH>C ₃₄ - C ₄₀	µg/L	100	Org-003	<100
Surrogate o-Terphenyl	%		Org-003	84
QUALITY CONTROL	UNITS	PQL	METHOD	Blank
PAHs in Water				
Date extracted	-			17/08/2016
Date analysed	-			17/08/2016
Naphthalene	µg/L	1	Org-012	<1
Acenaphthylene	µg/L	1	Org-012	<1
Acenaphthene	µg/L	1	Org-012	<1
Fluorene	µg/L	1	Org-012	<1
Phenanthrene	µg/L	1	Org-012	<1
Anthracene	µg/L	1	Org-012	<1
Fluoranthene	µg/L	1	Org-012	<1
Pyrene	µg/L	1	Org-012	<1
Benzo(a)anthracene	µg/L	1	Org-012	<1
Chrysene	µg/L	1	Org-012	<1
Benzo(b,j+k)fluoranthene	µg/L	2	Org-012	<2

QUALITY CONTROL	UNITS	PQL	METHOD	Blank
PAHs in Water				
Benzo(a)pyrene	µg/L	1	Org-012	<1
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012	<1
Dibenzo(a,h)anthracene	µg/L	1	Org-012	<1
Benzo(g,h,i)perylene	µg/L	1	Org-012	<1
Surrogate p-Terphenyl-d14	%		Org-012	73

QUALITY CONTROL	UNITS	PQL	METHOD	Blank
Metals in Water - Dissolved				
Date digested	-			17/08/2016
Date analysed	-			17/08/2016
Arsenic - Dissolved	mg/L	0.05	Metals-020	<0.05
Cadmium - Dissolved	mg/L	0.01	Metals-020	<0.01
Chromium - Dissolved	mg/L	0.01	Metals-020	<0.01
Copper - Dissolved	mg/L	0.01	Metals-020	<0.01
Lead - Dissolved	mg/L	0.03	Metals-020	<0.03
Mercury - Dissolved	mg/L	0.0005	Metals-021	<0.0005
Nickel - Dissolved	mg/L	0.02	Metals-020	<0.02
Zinc - Dissolved	mg/L	0.02	Metals-020	<0.02

QUALITY CONTROL	UNITS	Dup. Sm#	Duplicate
vTRH(C6-C10)/BTEXN in Soil			Base + Duplicate + %RPD
Date extracted	-	151866-11	18/08/2016 || 18/08/2016
Date analysed	-	151866-11	19/08/2016 || 19/08/2016
TRHC ₆ - C ₉	mg/kg	151866-11	<25 || <25
TRHC ₆ - C ₁₀	mg/kg	151866-11	<25 || <25
Benzene	mg/kg	151866-11	<0.2 || <0.2
Toluene	mg/kg	151866-11	<0.5 || <0.5
Ethylbenzene	mg/kg	151866-11	<1 || <1
m+p-xylene	mg/kg	151866-11	<2 || <2
o-Xylene	mg/kg	151866-11	<1 || <1
naphthalene	mg/kg	151866-11	<1 || <1
Surrogate aaa-Trifluorotoluene	%	151866-11	96 || 96 || RPD: 0

QUALITYCONTROL svTRH(C10-C40)in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date extracted	-	151866-11	17/08/2016 || 17/08/2016
Date analysed	-	151866-11	17/08/2016 || 17/08/2016
TRHC ₁₀ - C ₁₄	mg/kg	151866-11	<50 || <50
TRHC ₁₅ - C ₂₈	mg/kg	151866-11	<100 || <100
TRHC ₂₉ - C ₃₆	mg/kg	151866-11	<100 || <100
TRH>C ₁₀ -C ₁₆	mg/kg	151866-11	<50 || <50
TRH>C ₁₆ -C ₃₄	mg/kg	151866-11	<100 || <100
TRH>C ₃₄ -C ₄₀	mg/kg	151866-11	<100 || <100
Surrogate o-Terphenyl	%	151866-11	72 || 83 || RPD: 14
QUALITYCONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date extracted	-	151866-11	17/08/2016 || 17/08/2016
Date analysed	-	151866-11	17/08/2016 || 17/08/2016
Naphthalene	mg/kg	151866-11	<0.1 || <0.1
Acenaphthylene	mg/kg	151866-11	<0.1 || <0.1
Acenaphthene	mg/kg	151866-11	<0.1 || <0.1
Fluorene	mg/kg	151866-11	<0.1 || <0.1
Phenanthrene	mg/kg	151866-11	<0.1 || <0.1
Anthracene	mg/kg	151866-11	<0.1 || <0.1
Fluoranthene	mg/kg	151866-11	<0.1 || <0.1
Pyrene	mg/kg	151866-11	<0.1 || <0.1
Benzo(a)anthracene	mg/kg	151866-11	<0.1 || <0.1
Chrysene	mg/kg	151866-11	<0.1 || <0.1
Benzo(b,j+k)fluoranthene	mg/kg	151866-11	<0.2 || <0.2
Benzo(a)pyrene	mg/kg	151866-11	<0.05 || <0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	151866-11	<0.1 || <0.1
Dibenzo(a,h)anthracene	mg/kg	151866-11	<0.1 || <0.1
Benzo(g,h,i)perylene	mg/kg	151866-11	<0.1 || <0.1
Surrogate p-Terphenyl-d14	%	151866-11	86 || 85 || RPD: 1

QUALITYCONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date extracted	-	151866-11	17/08/2016 || 17/08/2016
Date analysed	-	151866-11	18/08/2016 || 18/08/2016
HCB	mg/kg	151866-11	<0.1 || <0.1
alpha-BHC	mg/kg	151866-11	<0.1 || <0.1
gamma-BHC	mg/kg	151866-11	<0.1 || <0.1
beta-BHC	mg/kg	151866-11	<0.1 || <0.1
Heptachlor	mg/kg	151866-11	<0.1 || <0.1
delta-BHC	mg/kg	151866-11	<0.1 || <0.1
Aldrin	mg/kg	151866-11	<0.1 || <0.1
Heptachlor Epoxide	mg/kg	151866-11	<0.1 || <0.1
gamma-Chlordane	mg/kg	151866-11	<0.1 || <0.1
alpha-chlordane	mg/kg	151866-11	<0.1 || <0.1
Endosulfan I	mg/kg	151866-11	<0.1 || <0.1
pp-DDE	mg/kg	151866-11	<0.1 || <0.1
Dieldrin	mg/kg	151866-11	<0.1 || <0.1
Endrin	mg/kg	151866-11	<0.1 || <0.1
pp-DDD	mg/kg	151866-11	<0.1 || <0.1
Endosulfan II	mg/kg	151866-11	<0.1 || <0.1
pp-DDT	mg/kg	151866-11	<0.1 || <0.1
Endrin Aldehyde	mg/kg	151866-11	<0.1 || <0.1
Endosulfan Sulphate	mg/kg	151866-11	<0.1 || <0.1
Methoxychlor	mg/kg	151866-11	<0.1 || <0.1
Surrogate TCMX	%	151866-11	92 || 92 || RPD: 0

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITYCONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD		
Date extracted	-	151866-11	17/08/2016 || 17/08/2016		
Date analysed	-	151866-11	18/08/2016 || 18/08/2016		
Aroclor 1016	mg/kg	151866-11	<0.1 || <0.1		
Aroclor 1221	mg/kg	151866-11	<0.1 || <0.1		
Aroclor 1232	mg/kg	151866-11	<0.1 || <0.1		
Aroclor 1242	mg/kg	151866-11	<0.1 || <0.1		
Aroclor 1248	mg/kg	151866-11	<0.1 || <0.1		
Aroclor 1254	mg/kg	151866-11	<0.1 || <0.1		
Aroclor 1260	mg/kg	151866-11	<0.1 || <0.1		
Surrogate TCLMX	%	151866-11	92 || 92 || RPD:0		
QUALITYCONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD		
Date prepared	-	151866-11	17/08/2016 || 17/08/2016		
Date analysed	-	151866-11	17/08/2016 || 17/08/2016		
Arsenic	mg/kg	151866-11	<4 || <4		
Cadmium	mg/kg	151866-11	<0.4 || <0.4		
Chromium	mg/kg	151866-11	<1 || <1		
Copper	mg/kg	151866-11	<1 || <1		
Lead	mg/kg	151866-11	<1 || <1		
Mercury	mg/kg	151866-11	<0.1 || <0.1		
Nickel	mg/kg	151866-11	<1 || <1		
Zinc	mg/kg	151866-11	1 || 1 || RPD:0		
QUALITYCONTROL Metals in TCLP USEPA1311	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	151866-11	17/08/2016 || 17/08/2016	LCS-W1	17/08/2016
Date analysed	-	151866-11	17/08/2016 || 17/08/2016	LCS-W1	17/08/2016
Arsenic in TCLP	mg/L	151866-11	<0.05 || <0.05	LCS-W1	96%
Cadmium in TCLP	mg/L	151866-11	<0.01 || <0.01	LCS-W1	103%
Chromium in TCLP	mg/L	151866-11	<0.01 || <0.01	LCS-W1	100%
Lead in TCLP	mg/L	151866-11	<0.03 || <0.03	LCS-W1	92%
Mercury in TCLP	mg/L	151866-11	<0.0005 || <0.0005	LCS-W1	106%
Nickel in TCLP	mg/L	151866-11	<0.02 || <0.02	LCS-W1	96%

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITYCONTROL PAHs in TCLP (USEPA 1311)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	LCS-W1	17/08/2016
Date analysed	-	[NT]	[NT]	LCS-W1	17/08/2016
Naphthalene in TCLP	mg/L	[NT]	[NT]	LCS-W1	88%
Acenaphthylene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	[NT]	[NT]	LCS-W1	130%
Phenanthrene in TCLP	mg/L	[NT]	[NT]	LCS-W1	119%
Anthracene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	[NT]	[NT]	LCS-W1	95%
Pyrene in TCLP	mg/L	[NT]	[NT]	LCS-W1	101%
Benzo(a)anthracene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	[NT]	[NT]	LCS-W1	103%
Benzo(b)k)fluoranthene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	[NT]	[NT]	LCS-W1	114%
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	[NT]	[NT]	[NR]	[NR]
Surrogate <i>p</i> -Terphenyl-d14	%	[NT]	[NT]	LCS-W1	84%

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITYCONTROL vTRH(C6-C10)/BTEXNin Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	LCS-W1	17/08/2016
Date analysed	-	[NT]	[NT]	LCS-W1	17/08/2016
TRHC ₆ - C ₉	µg/L	[NT]	[NT]	LCS-W1	122%
TRHC ₆ - C ₁₀	µg/L	[NT]	[NT]	LCS-W1	122%
Benzene	µg/L	[NT]	[NT]	LCS-W1	123%
Toluene	µg/L	[NT]	[NT]	LCS-W1	123%
Ethylbenzene	µg/L	[NT]	[NT]	LCS-W1	120%
m+p-xylene	µg/L	[NT]	[NT]	LCS-W1	122%
o-xylene	µg/L	[NT]	[NT]	LCS-W1	120%
Naphthalene	µg/L	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluoromethane	%	[NT]	[NT]	LCS-W1	99%
Surrogate toluene-d8	%	[NT]	[NT]	LCS-W1	104%
Surrogate 4-BFB	%	[NT]	[NT]	LCS-W1	100%
QUALITYCONTROL svTRH (C10-C40) in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	LCS-W1	17/08/2016
Date analysed	-	[NT]	[NT]	LCS-W1	17/08/2016
TRHC ₁₀ - C ₁₄	µg/L	[NT]	[NT]	LCS-W1	124%
TRHC ₁₅ - C ₂₈	µg/L	[NT]	[NT]	LCS-W1	126%
TRHC ₂₉ - C ₃₆	µg/L	[NT]	[NT]	LCS-W1	112%
TRH>C ₁₀ - C ₁₆	µg/L	[NT]	[NT]	LCS-W1	124%
TRH>C ₁₆ - C ₃₄	µg/L	[NT]	[NT]	LCS-W1	126%
TRH>C ₃₄ - C ₄₀	µg/L	[NT]	[NT]	LCS-W1	112%
Surrogate o-Terphenyl	%	[NT]	[NT]	LCS-W1	65%
QUALITYCONTROL Metals in Water - Dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	[NT]	[NT]	LCS-W1	17/08/2016
Date analysed	-	[NT]	[NT]	LCS-W1	17/08/2016
Arsenic - Dissolved	mg/L	[NT]	[NT]	LCS-W1	105%
Cadmium - Dissolved	mg/L	[NT]	[NT]	LCS-W1	118%
Chromium - Dissolved	mg/L	[NT]	[NT]	LCS-W1	112%
Copper - Dissolved	mg/L	[NT]	[NT]	LCS-W1	111%
Lead - Dissolved	mg/L	[NT]	[NT]	LCS-W1	107%
Mercury - Dissolved	mg/L	[NT]	[NT]	LCS-W1	98%
Nickel - Dissolved	mg/L	[NT]	[NT]	LCS-W1	111%
Zinc - Dissolved	mg/L	[NT]	[NT]	LCS-W1	112%

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITYCONTROL PAHs in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	LCS-W2	17/08/2016
Date analysed	-	[NT]	[NT]	LCS-W2	17/08/2016
Naphthalene	µg/L	[NT]	[NT]	LCS-W2	78%
Acenaphthylene	µg/L	[NT]	[NT]	[NR]	[NR]
Acenaphthene	µg/L	[NT]	[NT]	[NR]	[NR]
Fluorene	µg/L	[NT]	[NT]	LCS-W2	82%
Phenanthrene	µg/L	[NT]	[NT]	LCS-W2	80%
Anthracene	µg/L	[NT]	[NT]	[NR]	[NR]
Fluoranthene	µg/L	[NT]	[NT]	LCS-W2	70%
Pyrene	µg/L	[NT]	[NT]	LCS-W2	70%
Benzo(a)anthracene	µg/L	[NT]	[NT]	[NR]	[NR]
Chrysene	µg/L	[NT]	[NT]	LCS-W2	71%
Benzo(b,j+k)fluoranthene	µg/L	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	µg/L	[NT]	[NT]	LCS-W2	73%
Indeno(1,2,3-c,d)pyrene	µg/L	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	µg/L	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	µg/L	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	[NT]	[NT]	LCS-W2	70%
QUALITYCONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	151866-2	18/08/2016
Date analysed	-	[NT]	[NT]	151866-2	19/08/2016
TRHC ₆ - C ₉	mg/kg	[NT]	[NT]	151866-2	93%
TRHC ₆ - C ₁₀	mg/kg	[NT]	[NT]	151866-2	93%
Benzene	mg/kg	[NT]	[NT]	151866-2	93%
Toluene	mg/kg	[NT]	[NT]	151866-2	96%
Ethylbenzene	mg/kg	[NT]	[NT]	151866-2	93%
m+p-xylene	mg/kg	[NT]	[NT]	151866-2	92%
o-Xylene	mg/kg	[NT]	[NT]	151866-2	94%
naphthalene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	151866-2	93%

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITYCONTROL svTRH(C10-C40)in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	151866-2	17/08/2016
Date analysed	-	[NT]	[NT]	151866-2	17/08/2016
TRHC ₁₀ - C ₁₄	mg/kg	[NT]	[NT]	151866-2	103%
TRHC ₁₅ - C ₂₈	mg/kg	[NT]	[NT]	151866-2	99%
TRHC ₂₉ - C ₃₆	mg/kg	[NT]	[NT]	151866-2	91%
TRH>C ₁₀ -C ₁₆	mg/kg	[NT]	[NT]	151866-2	103%
TRH>C ₁₆ -C ₃₄	mg/kg	[NT]	[NT]	151866-2	99%
TRH>C ₃₄ -C ₄₀	mg/kg	[NT]	[NT]	151866-2	91%
Surrogate o-Terphenyl	%	[NT]	[NT]	151866-2	73%
QUALITYCONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	151866-2	17/08/2016
Date analysed	-	[NT]	[NT]	151866-2	17/08/2016
Naphthalene	mg/kg	[NT]	[NT]	151866-2	101%
Acenaphthylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	[NT]	[NT]	151866-2	127%
Phenanthrene	mg/kg	[NT]	[NT]	151866-2	112%
Anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	[NT]	[NT]	151866-2	92%
Pyrene	mg/kg	[NT]	[NT]	151866-2	97%
Benzo(a)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	[NT]	[NT]	151866-2	96%
Benzo(b,j+k)fluoranthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	[NT]	[NT]	151866-2	100%
Indeno(1,2,3-c,d)pyrene	mg/kg	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	[NT]	[NT]	151866-2	97%

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITYCONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	151866-2	17/08/2016
Date analysed	-	[NT]	[NT]	151866-2	18/08/2016
HCB	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	[NT]	[NT]	151866-2	97%
gamma-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	[NT]	[NT]	151866-2	100%
Heptachlor	mg/kg	[NT]	[NT]	151866-2	99%
delta-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	[NT]	[NT]	151866-2	100%
HeptachlorEpoxide	mg/kg	[NT]	[NT]	151866-2	100%
gamma-Chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	[NT]	[NT]	151866-2	104%
Dieldrin	mg/kg	[NT]	[NT]	151866-2	102%
Endrin	mg/kg	[NT]	[NT]	151866-2	95%
pp-DDD	mg/kg	[NT]	[NT]	151866-2	99%
Endosulfan II	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	[NT]	[NT]	151866-2	85%
Methoxychlor	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%	[NT]	[NT]	151866-2	106%

Client Reference: 16140, Railway Hotel & Lawson St Sth Carparks

QUALITYCONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	151866-2	17/08/2016
Date analysed	-	[NT]	[NT]	151866-2	18/08/2016
Aroclor 1016	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1221	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1232	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1242	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1248	mg/kg	[NT]	[NT]	[NR]	[NR]
Aroclor 1254	mg/kg	[NT]	[NT]	151866-2	90%
Aroclor 1260	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%	[NT]	[NT]	151866-2	89%
QUALITYCONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	151866-2	17/08/2016
Date analysed	-	[NT]	[NT]	151866-2	17/08/2016
Arsenic	mg/kg	[NT]	[NT]	151866-2	88%
Cadmium	mg/kg	[NT]	[NT]	151866-2	105%
Chromium	mg/kg	[NT]	[NT]	151866-2	104%
Copper	mg/kg	[NT]	[NT]	151866-2	110%
Lead	mg/kg	[NT]	[NT]	151866-2	101%
Mercury	mg/kg	[NT]	[NT]	151866-2	104%
Nickel	mg/kg	[NT]	[NT]	151866-2	94%
Zinc	mg/kg	[NT]	[NT]	151866-2	106%
QUALITYCONTROL Metals in TCLP USEPA1311	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	151866-2	17/08/2016
Date analysed	-	[NT]	[NT]	151866-2	17/08/2016
Arsenic in TCLP	mg/L	[NT]	[NT]	151866-2	97%
Cadmium in TCLP	mg/L	[NT]	[NT]	151866-2	103%
Chromium in TCLP	mg/L	[NT]	[NT]	151866-2	100%
Lead in TCLP	mg/L	[NT]	[NT]	151866-2	92%
Mercury in TCLP	mg/L	[NT]	[NT]	151866-2	106%
Nickel in TCLP	mg/L	[NT]	[NT]	151866-2	96%

Report Comments:

vTRH & BTEX in water: Subsampled from jars provided by client. Envirolab recommends that 2x40mL vials are provided to ensure QA samples and dilutions can be performed as well as to ensure that no analytes are lost due to headspace and/or subsampling.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Samples for testing were sub-sampled from jars provided by the client.

Asbestos ID was analysed by Approved Identifier: Paul Ching
Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test
NR: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Certificate of Analysis

ENV Solutions Pty Ltd
1/35 North Creek Road
Ballina
NSW 2478



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: James Foster

Report 512176-S
Project name RAILWAY HOTEL CARPARK
Received Date Aug 16, 2016

Client Sample ID			BH15.3
Sample Matrix			Soil
Eurofins | mgt Sample No.			S16-Au16817
Date Sampled			Aug 12, 2016
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	< 50
TRH C29-C36	50	mg/kg	< 50
TRH C10-36 (Total)	50	mg/kg	< 50
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	103
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.5	mg/kg	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5
Naphthalene	0.5	mg/kg	< 0.5

Client Sample ID			BH15.3
Sample Matrix			Soil
Eurofins | mgt Sample No.			S16-Au16817
Date Sampled			Aug 12, 2016
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	< 0.5
Total PAH*	0.5	mg/kg	< 0.5
2-Fluorobiphenyl (surr.)	1	%	104
p-Terphenyl-d14 (surr.)	1	%	97
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
TRH >C10-C16	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
Conductivity (1:5 aqueous extract at 25°C)			
	5	uS/cm	8.9
pH (1:5 Aqueous extract)			
	0.1	pH Units	6.0
% Moisture			
	1	%	18
Heavy Metals			
Arsenic	2	mg/kg	< 2
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	< 5
Copper	5	mg/kg	< 5
Lead	5	mg/kg	5.3
Mercury	0.05	mg/kg	< 0.05
Nickel	5	mg/kg	< 5
Zinc	5	mg/kg	6.3

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
ENM Exemption Suite -The excavated natural material order 2014 NSW EPA(excluding Foreign Material)			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - LTM-ORG-2010	Sydney	Aug 19, 2016	14 Day
BTEX - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Aug 18, 2016	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Aug 18, 2016	14 Day
Polycyclic Aromatic Hydrocarbons - Method: E007 Polyaromatic Hydrocarbons (PAH)	Sydney	Aug 19, 2016	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Aug 19, 2016	14 Day
Conductivity (1:5 aqueous extract at 25°C) - Method: LTM-INO-4030	Sydney	Aug 19, 2016	7 Day
pH (1:5 Aqueous extract) - Method: LTM-GEN-7090 pH in soil by ISE	Sydney	Aug 19, 2016	7 Day
Metals M8 - Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS	Sydney	Aug 18, 2016	28 Day
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Aug 17, 2016	14 Day

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate Duplicate	The addition of a like compound to the analyte target and reported as percentage recovery. A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Method Blank						
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	mg/kg	< 20		20	Pass	
TRH C10-C14	mg/kg	< 20		20	Pass	
TRH C15-C28	mg/kg	< 50		50	Pass	
TRH C29-C36	mg/kg	< 50		50	Pass	
Method Blank						
BTEX						
Benzene	mg/kg	< 0.1		0.1	Pass	
Toluene	mg/kg	< 0.1		0.1	Pass	
Ethylbenzene	mg/kg	< 0.1		0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2		0.2	Pass	
o-Xylene	mg/kg	< 0.1		0.1	Pass	
Xylenes - Total	mg/kg	< 0.3		0.3	Pass	
Method Blank						
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene	mg/kg	< 0.5		0.5	Pass	
TRH C6-C10	mg/kg	< 20		20	Pass	
Method Blank						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	mg/kg	< 0.5		0.5	Pass	
Acenaphthylene	mg/kg	< 0.5		0.5	Pass	
Anthracene	mg/kg	< 0.5		0.5	Pass	
Benzo(a)anthracene	mg/kg	< 0.5		0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5		0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5		0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5		0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5		0.5	Pass	
Chrysene	mg/kg	< 0.5		0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5		0.5	Pass	
Fluoranthene	mg/kg	< 0.5		0.5	Pass	
Fluorene	mg/kg	< 0.5		0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5		0.5	Pass	
Naphthalene	mg/kg	< 0.5		0.5	Pass	
Phenanthrene	mg/kg	< 0.5		0.5	Pass	
Pyrene	mg/kg	< 0.5		0.5	Pass	
Method Blank						
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	mg/kg	< 50		50	Pass	
TRH >C16-C34	mg/kg	< 100		100	Pass	
TRH >C34-C40	mg/kg	< 100		100	Pass	
Method Blank						
Conductivity (1:5 aqueous extract at 25°C)	uS/cm	< 5		5	Pass	
Method Blank						
Heavy Metals						
Arsenic	mg/kg	< 2		2	Pass	
Cadmium	mg/kg	< 0.4		0.4	Pass	
Chromium	mg/kg	< 5		5	Pass	
Copper	mg/kg	< 5		5	Pass	
Lead	mg/kg	< 5		5	Pass	
Mercury	mg/kg	< 0.05		0.05	Pass	
Nickel	mg/kg	< 5		5	Pass	

Test	Units	Result 1	Acceptance Limits	Pass Limits	Qualifying Code		
Zinc	mg/kg	< 5	5	Pass			
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	72	70-130	Pass			
TRH C10-C14	%	87	70-130	Pass			
LCS - % Recovery							
BTEX							
Benzene	%	94	70-130	Pass			
Toluene	%	101	70-130	Pass			
Ethylbenzene	%	98	70-130	Pass			
m&p-Xylenes	%	95	70-130	Pass			
o-Xylene	%	96	70-130	Pass			
Xylenes - Total	%	95	70-130	Pass			
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	122	70-130	Pass			
TRH C6-C10	%	75	70-130	Pass			
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	107	70-130	Pass			
Acenaphthylene	%	97	70-130	Pass			
Anthracene	%	111	70-130	Pass			
Benz(a)anthracene	%	102	70-130	Pass			
Benzo(a)pyrene	%	89	70-130	Pass			
Benzo(b&j)fluoranthene	%	92	70-130	Pass			
Benzo(g,h,i)perylene	%	98	70-130	Pass			
Benzo(k)fluoranthene	%	114	70-130	Pass			
Chrysene	%	116	70-130	Pass			
Dibenz(a,h)anthracene	%	90	70-130	Pass			
Fluoranthene	%	106	70-130	Pass			
Fluorene	%	101	70-130	Pass			
Indeno(1,2,3-cd)pyrene	%	92	70-130	Pass			
Naphthalene	%	113	70-130	Pass			
Phenanthrene	%	120	70-130	Pass			
Pyrene	%	116	70-130	Pass			
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	95	70-130	Pass			
LCS - % Recovery							
Heavy Metals							
Arsenic	%	95	70-130	Pass			
Cadmium	%	98	70-130	Pass			
Chromium	%	97	70-130	Pass			
Copper	%	101	70-130	Pass			
Lead	%	101	70-130	Pass			
Mercury	%	105	70-130	Pass			
Nickel	%	100	70-130	Pass			
Zinc	%	98	70-130	Pass			
Test	Lab Sample ID	QA Source	Units	Result 1	Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	S16-Au17639	NCP	%	74	70-130	Pass	
TRH C10-C14	S16-Au16489	NCP	%	91	70-130	Pass	
Spike - % Recovery							

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
BTEX				Result 1					
Benzene	S16-Au17639	NCP	%	94			70-130	Pass	
Toluene	S16-Au17639	NCP	%	101			70-130	Pass	
Ethylbenzene	S16-Au17639	NCP	%	99			70-130	Pass	
m&p-Xylenes	S16-Au17639	NCP	%	95			70-130	Pass	
o-Xylene	S16-Au17639	NCP	%	97			70-130	Pass	
Xylenes - Total	S16-Au17639	NCP	%	96			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S16-Au17639	NCP	%	123			70-130	Pass	
TRH C6-C10	S16-Au17639	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S16-Au16480	NCP	%	112			70-130	Pass	
Acenaphthylene	S16-Au16480	NCP	%	112			70-130	Pass	
Anthracene	S16-Au16480	NCP	%	111			70-130	Pass	
Benz(a)anthracene	S16-Au16480	NCP	%	116			70-130	Pass	
Benzo(a)pyrene	S16-Au16480	NCP	%	108			70-130	Pass	
Benzo(b&j)fluoranthene	S16-Au16480	NCP	%	112			70-130	Pass	
Benzo(g,h,i)perylene	S16-Au16480	NCP	%	126			70-130	Pass	
Benzo(k)fluoranthene	S16-Au16480	NCP	%	122			70-130	Pass	
Chrysene	S16-Au16480	NCP	%	124			70-130	Pass	
Dibenz(a,h)anthracene	S16-Au16480	NCP	%	117			70-130	Pass	
Fluoranthene	S16-Au16480	NCP	%	121			70-130	Pass	
Fluorene	S16-Au16480	NCP	%	112			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S16-Au16480	NCP	%	123			70-130	Pass	
Naphthalene	S16-Au16480	NCP	%	118			70-130	Pass	
Phenanthrene	S16-Au16480	NCP	%	128			70-130	Pass	
Pyrene	S16-Au16480	NCP	%	128			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S16-Au16489	NCP	%	99			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S16-Au17839	NCP	%	84			70-130	Pass	
Cadmium	S16-Au17839	NCP	%	77			70-130	Pass	
Chromium	S16-Au17839	NCP	%	86			70-130	Pass	
Copper	S16-Au18151	NCP	%	81			70-130	Pass	
Lead	S16-Au18067	NCP	%	82			70-130	Pass	
Mercury	S16-Au17839	NCP	%	75			70-130	Pass	
Nickel	S16-Au17839	NCP	%	96			70-130	Pass	
Zinc	S16-Au18067	NCP	%	85			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S16-Au16037	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S16-Au17312	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S16-Au17312	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S16-Au17312	NCP	mg/kg	< 50	< 50	<1	30%	Pass	

Duplicate								
BTEX				Result 1	Result 2	RPD		
Benzene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Toluene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Ethylbenzene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
m&p-Xylenes	S16-Au16037	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
o-Xylene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Xylenes - Total	S16-Au16037	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
Naphthalene	S16-Au16037	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
TRH C6-C10	S16-Au16037	NCP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Acenaphthene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Acenaphthylene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Anthracene	S16-Au17047	NCP	mg/kg	< 0.5	0.5	34	30%	Fail Q15
Benz(a)anthracene	S16-Au17047	NCP	mg/kg	0.7	1.0	34	30%	Fail Q15
Benzo(a)pyrene	S16-Au17047	NCP	mg/kg	0.6	0.9	32	30%	Fail Q15
Benzo(b&j)fluoranthene	S16-Au17047	NCP	mg/kg	< 0.5	0.7	43	30%	Fail Q15
Benzo(g,h,i)perylene	S16-Au17047	NCP	mg/kg	< 0.5	0.6	30	30%	Pass
Benzo(k)fluoranthene	S16-Au17047	NCP	mg/kg	0.5	0.7	25	30%	Pass
Chrysene	S16-Au17047	NCP	mg/kg	0.7	1.1	42	30%	Fail Q15
Dibenz(a,h)anthracene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluoranthene	S16-Au17047	NCP	mg/kg	2.1	3.0	36	30%	Fail Q15
Fluorene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Indeno(1.2.3-cd)pyrene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Naphthalene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S16-Au17047	NCP	mg/kg	1.8	2.5	29	30%	Pass
Pyrene	S16-Au17047	NCP	mg/kg	2.2	3.3	40	30%	Fail Q15
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
TRH >C10-C16	S16-Au17312	NCP	mg/kg	< 50	< 50	<1	30%	Pass
TRH >C16-C34	S16-Au17312	NCP	mg/kg	< 100	< 100	<1	30%	Pass
TRH >C34-C40	S16-Au17312	NCP	mg/kg	< 100	< 100	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Conductivity (1:5 aqueous extract at 25°C)	S16-Au16817	CP	uS/cm	8.9	7.9	12	30%	Pass
pH (1:5 Aqueous extract)	S16-Au18067	NCP	pH Units	5.3	5.3	pass	30%	Pass
% Moisture	B16-Au06346	NCP	%	< 1	< 1	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S16-Au17683	NCP	mg/kg	2.5	2.4	5.0	30%	Pass
Cadmium	S16-Au17683	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass
Chromium	S16-Au17683	NCP	mg/kg	< 5	5.4	20	30%	Pass
Copper	S16-Au17683	NCP	mg/kg	14	15	6.0	30%	Pass
Lead	S16-Au17683	NCP	mg/kg	31	32	4.0	30%	Pass
Mercury	S16-Au17069	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Nickel	S16-Au17683	NCP	mg/kg	< 5	< 5	<1	30%	Pass
Zinc	S16-Au17683	NCP	mg/kg	22	19	19	30%	Pass

Quality Control Analyte Summary Compliance

The table below is the actual occurrence of QC performed on the batch of samples within this report and as defined below

Analysis	Samples Analysed	Laboratory Duplicates Reported	Laboratory Matrix Spikes Reported	Method Blanks Reported	Laboratory Control Samples Reported
BTEX	1	1	1	1	1
Total Recoverable Hydrocarbons - 1999 NEPM	1	1	1	1	1
Total Recoverable Hydrocarbons - 2013 NEPM	1	1	1	1	1
Polycyclic Aromatic Hydrocarbons	1	1	1	1	1
Conductivity (1:5 aqueous extract at 25°C)	1	1	NA	1	NA
pH (1:5 Aqueous extract)	1	1	NA	NA	NA
% Moisture	1	1	NA	NA	NA
Heavy Metals	1	1	1	1	1

Quality Control Parameter Frequency Compliance follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure April 2011, Schedule B3, Guideline on Laboratory Analysis of Potentially Contaminated Soils and US EPA SW-846 Chapter 1: 'Quality Control'.

It comprises the following when a laboratory process batch is deemed to consist of up to 20 samples that are similar in terms of matrix and test procedure, and are processed as one unit for QC purposes. If more than 20 samples are being processed, they are considered as more than one batch.

Method blank

One method blank per process batch.

Laboratory duplicate

There should be at least one duplicate per process batch, or two duplicates if the process batch exceeds 10 samples.

Laboratory control sample (LCS)

There should be at least one LCS per process batch.

Matrix spikes

There should be one matrix spike per matrix type per process batch.

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Ivan Taylor	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Inorganic (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins | mgt shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins | mgt be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

ESdat Export Information:

Project(s): 16140 151866
Filter: Lab Reports
Export Date/Time: 5/09/2016 12:50
Exported By: james@envsolutions.com.au

Settings:

Chem Profile: Sys Default
Env Standards: NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine.
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coar.
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind

Include Result Prefix: Y
Detects Only: N
Exceedances Only: N
Qualifiers:
Comments:
Chem Grouping: Chem Group
Hidden Groups:
Hidden ChemNames: Benzo(a)pyrene TEQ calc (Half)
Benzo(a)pyrene TEQ (LOR)
Benzo(a)pyrene TEQ calc (Zero)

[Terms & Conditions](#)**Disclaimer:**

All care has been exercised in the compilation of these guidelines (or Environmental Standards), however no liability is taken for any error.

It is the responsibility of the user to review the contained data and ensure their data is compliant with the relevant guidelines, and that this compilation of guidelines meets their requirements.

Asbestos	BTEX				Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)
	mg/kg	µg/L	mg/kg	µg/L					
Asbestos fibres	0.2	1	0.5	1	1	1	1	2	1
Asbestos fibres	3	3	3	3	3	3	3	3	3
Asbestos fibres	3	3	3	3	3	3	3	3	3
Asbestos fibres	3	3	3	3	3	3	3	3	3
Asbestos fibres	4	4	4	4	4	4	4	4	4
Asbestos fibres	6	6	6	6	6	6	6	6	6
Asbestos fibres	10	10	10	10	10	10	10	10	10
Asbestos fibres	75	75	135	135	165	165	165	165	165
Asbestos fibres	95	95	135	135	185	185	185	185	185
Asbestos fibres	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Asbestos fibres	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Asbestos fibres	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Asbestos fibres	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000

Field ID	Date	Depth	mg/kg	µg/L	mg/kg	µg/L	mg/kg	µg/L	mg/kg	µg/L	mg/kg	µg/L
BH1	12/08/2016	0 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH2	12/08/2016	0.5 - 0.7	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH3	12/08/2016	0 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH4	12/08/2016	1.5 - 1.7	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH5	12/08/2016	0 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH6	12/08/2016	0.5 - 0.7	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH7	12/08/2016	0 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH8	12/08/2016	1.5 - 1.7	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH9	12/08/2016	0 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH10	12/08/2016	0.4 - 0.6	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH11	12/08/2016	1.5	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH12	12/08/2016	0 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH13	12/08/2016	0 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH14	12/08/2016	1	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH15.1	12/08/2016	0.5	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH15.2	12/08/2016	0.1 - 0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH16	12/08/2016	0.5	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH17	12/08/2016	0.5	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
BH18	12/08/2016	0.2	<0.2	<1	<0.5	<1	<1	<1	<2	<1	<1	<1
RINSAE BLANK	12/08/2016		<1	<1	<1	<1	<1	<1	<2	<1	<1	<1
TRIP BLANK	12/08/2016		<1	<1	<1	<1	<1	<1	<2	<1	<1	<1

Statistics	19	2	19	2	19	2	19	2	19	2	19	2
Number of Results	17	0	0	0	0	0	0	0	0	0	0	0
Number of Detects	0	<1	<1	<1	<1	<1	<1	<1	<2	<2	<1	<1
Minimum Concentration	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	0	<1	<1	<1	<1	<1	<1	<1	<2	<2	<1	<1
Average Concentration	0	0.1	0.5	0.25	0.5	0.5	0.5	0.5	1	1	0.5	0.5
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL (Student's-t)	0	0.1	0.5	0.25	0.5	0.5	0.5	0.5	1	1	0.5	0.5

Soil Analysis	Halogenated Benzenes		Inorganics		Lead		Metals							
	Hexachlorobenzene mg/kg	Moisture %	Lead mg/kg	Lead (filtered) mg/L	Arsenic mg/kg	Arsenic (filtered) mg/L	Cadmium mg/kg	Cadmium (filtered) mg/L	Chromium (III+VI) mg/kg	Chromium (III+VI) mg/L	Copper mg/kg	Copper (filtered) mg/L	Mercury mg/kg	Mercury (filtered) mg/L
NEPM 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Sand	0.1	0.1	1	0.03	4	0.05	0.4	0.01	1	0.01	1	0.01	0.1	0.0005
0-1m														
1-2m														
2-4m														
>4m														
NEPM 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Silt					160									
0-1m														
1-2m														
2-4m														
>4m														
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind														
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil														
0-2m														
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil														
0-2m														
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	80		1,500		3,000		900				240,000		730	
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand														
2-4m														
4-8m														
>8m														
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Silt														
2-4m														
4-8m														
>8m														

Field ID	Date	Depth	17	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
BH1	12/08/2016	0 - 0.2	<0.1	2.9	10	<0.03	<4	<0.05	<0.4	<0.01	<0.01	5	<0.01	17	<0.1	<0.1	<0.1	<0.1	<0.1
BH2	12/08/2016	0.5 - 0.7	<0.1	18	4	<0.03	<4	<0.05	<0.4	<0.01	<0.01	12	<0.01	7	<0.1	<0.1	<0.1	<0.1	<0.1
BH3	12/08/2016	0 - 0.2	<0.1	3.4	8	<0.03	<4	<0.05	<0.4	<0.01	<0.01	6	<0.01	27	<0.1	<0.1	<0.1	<0.1	<0.1
BH4	12/08/2016	1.5 - 1.7	<0.1	17	6	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH5	12/08/2016	0 - 0.2	<0.1	8.1	40	<0.03	<4	<0.05	<0.4	<0.01	<0.01	5	<0.01	32	<0.1	<0.1	<0.1	<0.1	<0.1
BH6	12/08/2016	0.5 - 0.7	<0.1	2.8	1	<0.03	<4	<0.05	<0.4	<0.01	<0.01	1	<0.01	1	<0.1	<0.1	<0.1	<0.1	<0.1
BH7	12/08/2016	0 - 0.2	<0.1	4.5	11	<0.03	<4	<0.05	<0.4	<0.01	<0.01	3	<0.01	8	<0.1	<0.1	<0.1	<0.1	<0.1
BH8	12/08/2016	1.5 - 1.7	<0.1	15	<1	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH9	12/08/2016	0 - 0.2	<0.1	4.3	14	<0.03	<4	<0.05	<0.4	<0.01	<0.01	5	<0.01	30	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	12/08/2016	0.4 - 0.6	<0.1	5.1	230	0.40	<4	<0.05	<0.4	<0.01	<0.01	4	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH11	12/08/2016	1.5	<0.1	11	<1	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH12	12/08/2016	0 - 0.2	<0.1	2.6	10	<0.03	<4	<0.05	<0.4	<0.01	<0.01	3	<0.01	15	<0.1	<0.1	<0.1	<0.1	<0.1
BH13	12/08/2016	0 - 0.2	<0.1	9.6	24	<0.03	<4	<0.05	<0.4	<0.01	<0.01	4	<0.01	10	<0.1	<0.1	<0.1	<0.1	<0.1
BH14	12/08/2016	1	<0.1	18	<1	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH15.1	12/08/2016	0.5	<0.1	11	5	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH15.2	12/08/2016	0.5	<0.1	11	4	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH16	12/08/2016	0.1 - 0.2	<0.1	5.8	58	0.07	8	<0.05	<0.4	<0.01	<0.01	4	<0.01	14	<0.1	<0.1	<0.1	<0.1	<0.1
BH17	12/08/2016	0.5	<0.1	8.2	<1	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
BH18	12/08/2016	0.2	<0.1	4.8	3	0.04	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
RINSATE BLANK	12/08/2016		0			<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1
TRIP BLANK	12/08/2016		0			<0.03	<4	<0.05	<0.4	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.1

Statistics																			
Number of Results	17	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Number of Detects	0	19	15	3	2	4	2	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.1	2.6	<1	<0.03	<4	<0.05	<0.4	<0.01	<0.01	<0.01	<0.01	<1	<0.01	<1	<0.1	<0.1	<0.1	<0.1	<0.0005
Minimum Detect	ND	2.6	1	0.04	4	ND	ND	ND	ND	ND	ND	1	ND	1	ND	ND	ND	ND	0.0023
Maximum Concentration	<0.1	18	230	0.4	8	<0.05	<0.4	<0.01	<0.01	<0.01	<0.01	12	<0.01	32	<0.01	<0.1	<0.1	<0.1	0.0023
Maximum Detect	ND	18	230	0.4	8	ND	ND	ND	ND	ND	ND	12	ND	32	ND	ND	ND	ND	0.0023
Average Concentration	0.05	8.6	23	0.039	2.4	0.025	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	0.005	0.005	0.005	0.005	0.00336
Average Detect	0.05	8.1	6	0.015	2	0.025	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	0.005	0.005	0.005	0.005	0.00225
Standard Deviation	0	5.3	57	0.088	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0047
95% UCL (Student's-t)	0.05	10.69	43.47	0.0746	2.989	0.025	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	0.005	0.005	0.005	0.005	0.0054989

EOL	Nickel (Filtered)				Zinc (Filtered)				Organochlorine Pesticides														
	Nickel mg/kg	mg/L	mg/kg	mg/L	Zinc mg/L	mg/L	mg/kg	mg/L	4,4-DDE	α-BHC	Aldrin	β-BHC	Chlordane (cis)	Chlordane (trans)	δ-BHC	DDD	DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	
NEPM 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Sand	1	0.02	1	0.02	1	0.02	1	0.02															
0-1m																							
1-2m																							
2-4m																							
>4m																							
NEPM 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Silt																							
0-1m																							
1-2m																							
2-4m																							
>4m																							
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind																							
NEPM 2013 Table 1B(6) ESs for Comm/Ind, Coarse Soil																							
0-2m																							
NEPM 2013 Table 1B(6) ESs for Comm/Ind, Fine Soil																							
0-2m																							
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	6,000		400,000																				100
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand																							
2-4m																							
4-8m																							
>8m																							
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Silt																							
2-4m																							
4-8m																							
>8m																							

Field ID	Date	Depth	4	<-0.02	27	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH1	12/08/2016	0 - 0.2	4	<-0.02	27	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH2	12/08/2016	0.5 - 0.7	12	<-0.02	24	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH3	12/08/2016	0 - 0.2	2	<-0.02	16	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH4	12/08/2016	1.5 - 1.7	<1	<-0.02	6	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH5	12/08/2016	0 - 0.2	11	<-0.02	30	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH6	12/08/2016	0.5 - 0.7	<1	<-0.02	4	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH7	12/08/2016	0 - 0.2	4	<-0.02	39	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH8	12/08/2016	1.5 - 1.7	<1	<-0.02	<1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH9	12/08/2016	0 - 0.2	2	<-0.02	21	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH10	12/08/2016	0.4 - 0.6	2	<-0.02	120	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH11	12/08/2016	1.5	<1	<-0.02	1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH12	12/08/2016	0 - 0.2	3	<-0.02	75	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH13	12/08/2016	0 - 0.2	2	<-0.02	33	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH14	12/08/2016	1	<1	<-0.02	40	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH15.1	12/08/2016	0.5	<1	<-0.02	4	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH15.2	12/08/2016	0.5	<1	<-0.02	6	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH16	12/08/2016	0.1 - 0.2	4	<-0.02	44	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH17	12/08/2016	0.5	<1	<-0.02	<1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
BH18	12/08/2016	0.2	<1	<-0.02	2	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
RINSATE BLANK	12/08/2016			<-0.02																			
TRIP BLANK	12/08/2016			<-0.02																			

Statistics	19	19	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Number of Results	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Number of Detects	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<1	<-0.02	<1	<-0.02	<1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
Minimum Detect	2	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	12	<-0.02	120	<-0.02	<1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1	<-0.1
Maximum Detect	12	ND	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	2.8	0.01	23	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Average Detect	2	0.01	21	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Standard Deviation	3.4	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95% UCL (Student's-t)	4.113	0.01	34.35	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Depth	PAH											
	Benzo(a)pyrene	Benzo(a)pyrene (filtered)	Benzo(b)fluoranthene	Benzo(k)fluoranthene (filtered)	Benzo(e)pyrene	Benzo(a,h)perylene	Chrysene	Chrysene (filtered)	Dibenz(a,h)anthracene	Dibenz(a,h)anthracene (filtered)	Fluoranthene	Fluoranthene (filtered)
mg/kg	mg/L	mg/L	mg/L	mg/kg	mg/L	mg/L	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/L
EQUL	1	1	0.002	0.002	0.1	1	1	0.1	1	0.1	1	0.1
NEMPW 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Sand												
0-1m												
1-2m												
2-4m												
>4m												
NEMPW 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Silt												
0-1m												
1-2m												
2-4m												
>4m												
NEMPW 2013 Table 1B(5) Generic EIL - Comm/Ind												
0-2m												
0-2m												
NEMPW 2013 Table 1A(1) HILS Comm/Ind D Soil												
NEMPW 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand												
2-4m												
4-8m												
>8m												
NEMPW 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Silt												
2-4m												
4-8m												
>8m												

Field ID	Date	Depth	Benzo(a)pyrene	Benzo(a)pyrene (filtered)	Benzo(b)fluoranthene	Benzo(k)fluoranthene (filtered)	Benzo(e)pyrene	Benzo(a,h)perylene	Chrysene	Chrysene (filtered)	Dibenz(a,h)anthracene	Dibenz(a,h)anthracene (filtered)	Fluoranthene	Fluoranthene (filtered)
mg/kg	mg/L	mg/L	mg/L	mg/L	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/L
BH1	12/08/2016	0 - 0.2	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH2	12/08/2016	0.5 - 0.7	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH3	12/08/2016	0 - 0.2	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH4	12/08/2016	1.5 - 1.7	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH5	12/08/2016	0 - 0.2	8.8	<1	<0.002	5.0	<1	3.9	<1	0.7	<1	12	<1	<1
BH6	12/08/2016	0.5 - 0.7	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH7	12/08/2016	0 - 0.2	<1	<1	<0.002	20	<1	21	<1	2.9	<1	94	<1	<1
BH8	12/08/2016	1.5 - 1.7	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH9	12/08/2016	0 - 0.2	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH10	12/08/2016	0.4 - 0.6	<1	<1	<0.002	0.1	<1	0.2	<1	0.2	<1	0.2	<1	<1
BH11	12/08/2016	1.5	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH12	12/08/2016	0 - 0.2	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH13	12/08/2016	0 - 0.2	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH14	12/08/2016	1	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH15.1	12/08/2016	0.5	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH15.2	12/08/2016	0.5	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH16	12/08/2016	0.1 - 0.2	<1	<1	<0.002	<1	<1	0.1	<1	<1	<1	0.3	<1	<1
BH17	12/08/2016	0.5	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH18	12/08/2016	0.2	<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
RINSATE BLANK	12/08/2016		<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRIP BLANK	12/08/2016		<1	<1	<0.002	<1	<1	<1	<1	<1	<1	<1	<1	<1

Statistics	2	17	19	19	17	19	19	17	19	19	17	19	19	17	19
Number of Results	2	17	19	19	17	19	19	17	19	19	17	19	19	17	19
Number of Detects	0	0	4	3	0	0	4	0	0	0	2	0	7	0	1
Minimum Concentration	<1	<1	<0.2	<0.1	<1	<1	<0.1	<1	<1	<1	<1	<1	<0.1	<1	<0.1
Minimum Detect	ND	ND	0.2	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND	0.1	ND
Maximum Concentration	<1	<1	37	20	<1	<1	21	<1	<1	2.9	<1	94	<1	14	2.8
Maximum Detect	ND	ND	37	20	ND	21	ND	21	ND	2.9	ND	94	ND	14	2.8
Average Concentration	0.5	0.5	2.5	1.4	0.5	1.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.3
Average Detect	0.5	0.5	0.001	0.001	0.5	0.5	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.05
Median Concentration	0.5	0.5	0.001	0.001	0.5	0.5	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.05
Standard Deviation	0	0	8.6	4.7	0	4.8	0	0	0	0.66	0	0	0	0	0.63
95% UCL (Student's-t)	0.5	0.5	5.931	3.214	0.5	3.289	0.5	0.5	0.5	0.698	0.5	0.5	14.25	0.5	2.681

Depth	Pyrene (filtered)	Benzo(a)pyrene TEQ	PAHs (Sum of positives)	PAHs (Sum of positives) (filtered)	Anchor 1016	Anchor 1221	Anchor 1232	Anchor 1242	Anchor 1248	Anchor 1254	Anchor 1260	mg/kg	µg/L
EQUL	1	0.005	0.001		0.1	0.1	0.1	0.1	0.1	0.1	0.1	25	10
NEPM 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Sand													
0-1m													
1-2m													
2-4m													
>4m													
NEPM 2013 Table 1A(3) Comm/Ind D Soil-HSL for Vapour Intrusion, Silt													
0-1m													
1-2m													
2-4m													
>4m													
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind													
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil													
0-2m													
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil													
0-2m													
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil													
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand													
2-4m													
4-8m													
>8m													
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Silt													
2-4m													
4-8m													
>8m													

Field ID	Date	Depth	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	µg/L
BH1	12/08/2016	0 - 0.2	<1	0.20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH2	12/08/2016	0.5 - 0.7	<1	0	0.0020	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH3	12/08/2016	0 - 0.2	<1	0	0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH4	12/08/2016	1.5 - 1.7	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH5	12/08/2016	0 - 0.2	<1	58	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH6	12/08/2016	0.5 - 0.7	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH7	12/08/2016	0 - 0.2	<1	430	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH8	12/08/2016	1.5 - 1.7	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH9	12/08/2016	0 - 0.2	<1	0.53	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH10	12/08/2016	0.4 - 0.6	<1	1.7	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH11	12/08/2016	1.5	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH12	12/08/2016	0 - 0.2	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH13	12/08/2016	0 - 0.2	<1	0	0.0020	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH14	12/08/2016	1	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH15.1	12/08/2016	0.5	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH15.2	12/08/2016	0.5	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH16	12/08/2016	0.1 - 0.2	<1	1.3	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH17	12/08/2016	0.5	<1	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
BH18	12/08/2016	0.2	<1	0.20	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25
RINSATE BLANK	12/08/2016		<1	<0.005	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10
TRIP BLANK	12/08/2016			<0.005	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10

Statistics	17	2	19	2	17	17	17	17	17	17	17	17	19	2
Number of Results	17	2	19	2	17	17	17	17	17	17	17	17	19	2
Number of Detects	1	0	19	2	17	0	0	0	0	0	0	0	0	0
Minimum Concentration	<1	<0.005	0	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10
Minimum Detect	10	<0.005	0.2	ND	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	10	<0.005	430	0	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	
Maximum Detect	10	ND	430	0	0.12	ND	ND	ND	ND	ND	ND	ND	ND	
Average Concentration	1.1	0.0025	26	0	0.0074	0.05	0.05	0.05	0.05	0.05	0.05	0.05	12	
Average Detect	0.5	0.0025	0	0	0.05	0	0	0	0	0	0	0	5	
Standard Deviation	2.3	0	99	0	0.029	0	0	0	0	0	0	0	0	
95% UCL (Student's-t)	2.034	0.0025	65.18	0	0.0196	0.05	0.05	0.05	0.05	0.05	0.05	0.05	12.5	

ESdat Export Information:

Project(s): 16140 512176
Filter: Lab Reports
Export Date/Time: 2/09/2016 10:54
Exported By: james@envsolutions.com.au

Settings:

Chem Profile: Sys Default
Env Standards: NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Silt
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind

Include Result Prefix: Y

Detects Only: N

Exceedances Only: N

Qualifiers:

Comments:

Chem Grouping:

Hidden Groups:

Hidden ChemNames:

Chem Group

Benzo(a)pyrene TEQ calc (Half)

Benzo(a)pyrene TEQ (LOR)

Benzo(a)pyrene TEQ calc (Zero)

[Terms & Conditions](#)**Disclaimer:**

All care has been exercised in the compilation of these guidelines (or Environmental Standards), however no liability is taken for any error. It is the responsibility of the user to review the contained data and ensure their data is compliant with the relevant guidelines, and that this compilation of guidelines meets their requirements.

ECIL	BTEX					Inorganics			Lead
	Benzene	Toluene	Ethylbenzene	Xylenes (m & p)	Xylenes (o)	Xylenes Total	Conductivity 1:5 aqueous extract	Moisture Content (dried @ 103°C) %		pH (aqueous extract)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µS/cm	%	
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand	0.1	0.1	0.1	0.2	0.1	0.3	5	1	0.1
0-1m	3					230			
1-2m	3								
2-4m	3								
>4m	3								
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Silt	4								
0-1m	4								
1-2m	4								
2-4m	6								
>4m	10								
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind									
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil									
0-2m	95	135	185			95			
NEPM 2013 Table 1A(1) HLLs Comm/Ind D Soil									1,500

Field ID	Date										
BH15-3	12/08/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	8.9	18	6.0	5.3

Statistics											
Number of Results	1	1	1	1	1	1	1	1	1	1	1
Number of Detects	0	0	0	0	0	0	0	1	1	1	1
Minimum Concentration	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		8.9	18	6	5.3
Maximum Concentration	ND	ND	ND	ND	ND	ND	ND	8.9	18	6	5.3
Average Concentration	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		8.9	18	6	5.3
Median Concentration	ND	ND	ND	ND	ND	ND	ND	8.9	18	6	5.3
Standard Deviation	0.05	0.05	0.05	0.1	0.05	0.15		8.9	18	6	5.3
95% UCL (Student's-t)											

EQL	Metals						
	Arsenic mg/kg	Cadmium mg/kg	Chromium (III+VI) mg/kg	Copper mg/kg	Mercury mg/kg	Nickel mg/kg	Zinc mg/kg
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand	2	0.4	5	5	0.05	5	5
0-1m							
1-2m							
2-4m							
>4m							
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Silt							
0-1m							
1-2m							
2-4m							
>4m							
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind	160						
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil							
0-2m	3,000	900		240,000	730	6,000	400,000
NEPM 2013 Table 1A(1) HLLs Comm/Ind D Soil							

Field ID	Date								
BH15-3	12/08/2016	<2	<0.4	<5	<5	<0.05	<5	6.3	6.3

Statistics									
Number of Results	1	1	1	1	1	1	1	1	1
Number of Detects	0	0	0	0	0	0	0	0	1
Minimum Concentration	<2	<0.4	<5	<5	<0.05	<5	<5	6.3	6.3
Maximum Concentration	ND	ND	ND	ND	ND	ND	ND	6.3	6.3
Average Concentration	ND	<0.4	<5	<5	<0.05	<5	<5	6.3	6.3
Standard Deviation	1	0.2	2.5	2.5	0.025	2.5	2.5	6.3	6.3
95% UCL (Student's-t)									

EQL	PAH														PAHs (sum of total)		
	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	benzo(a) pyrene	benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene		Phenanthrene	Pyrene
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
0-1m																	
1-2m																	
2-4m																	
>4m																	
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Silt					1.4												
0-1m																	
1-2m																	
2-4m																	
>4m																	
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind																	
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil																	
0-2m																	
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil																	4,000

Field ID	Date	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH15-3	12/08/2016																

Statistics																	
Number of Results	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration																	
Median Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Standard Deviation																	
95% UCL (Student's-t)																	0.25

EQUL	TPH											T minus BTEX	T minus Naphthalene
	C6-C9	C10-C14	C15-C28	C9-C16	G-C10	C10-C16	C16-C34	+C10-C36 (Sum of Total)	C34-C40	T minus BTEX	T minus Naphthalene		
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand													
0-1m	<20	<20	<50	<50	<20	<50	<50	<100	<100	<50	<100	<20	<50
1-2m												260	
2-4m												370	
>4m												630	
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Silt													
0-1m												250	
1-2m												360	
>4m												590	
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind													
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil													
0-2m					215		170	2,500	6,600				
NEPM 2013 Table 1A(1) HLLs Comm/Ind D Soil													

Field ID	Date
BH15-3	12/08/2016

Statistics												
Number of Results	1	1	1	1	1	1	1	1	1	1	1	1
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<20	<20	<50	<50	<20	<50	<50	<100	<100	<50	<100	<20
Maximum Concentration	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	ND	<20	<50	<50	<20	<50	<50	<100	<100	<50	<100	<20
Median Concentration	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Standard Deviation	10	10	25	25	10	25	25	50	50	25	50	10
95% UCL (Student's-t)												

RESULTS OF ACID SULFATE SOIL ANALYSIS

15 samples supplied by Env Solutions Pty Ltd on 16th August, 2016 - Lab. Job No. F2527
 Analysis requested by James Foster. Your Project: Simon Milchamp
 (PO Box 248 BALLINA NSW 2478)

Required if pH_{calc} < 4.5

Sample Site	EAL lab code	TEXTURE (note 7)	MOISTURE CONTENT (% moisture of total wet weight of oven dry soil)	FIELD/LAB PEROXIDE SCREENING TECHNIQUE		TITRATABLE ACTUAL ACIDITY (TAA) (10 pH 6.5)		Extracatable sulfate sulfur % _{SO4}	REDUCED INORGANIC SULFUR (% chromium reducible S)		RETAINED ACIDITY (HCL extract) (as %SO ₄ - %S _{red}) (%S _{ret}) (RETAINED ACIDITY)	NET ACIDITY Chromium Sulfate mole H ⁺ /tonne (based on %S _{ret}) ** & note 5	LIME CALCULATION Chromium Sulfate kg CaCO ₃ /tonne DW (includes 1.5 safety factor when lining rate is % _{ve}) ** & note 4 and 6	
				Initial pH _{water}	pH _{ox} peroxide	pH change	Reaction		pH _{calc} (ACTUAL ACIDITY-Method 23)	(mole H ⁺ /tonne)				(% SO ₄)	(% chromium reducible S) (POTENTIAL ACIDITY-Method 22B)	(mole H^{+}/tonne)
ASS 1 0.5-0.7	F2527/1	Medium	26.0	5.38	1.50	-3.88	Medium	19	..	0.051	32	0	50	3.8
ASS 1 1.0-1.2	F2527/2	Coarse	21.2	5.38	2.21	-3.17	Very High	..	..	..	..	..	..	..
ASS 1 1.5-1.7	F2527/3	Coarse	20.7	5.43	2.35	-3.08	Low	..	..	..	..	..	..	..
ASS 1 2.0-2.2	F2527/4	Coarse	19.2	5.58	2.38	-3.20	Medium	..	..	..	..	..	..	..
BH4 ASS 0-0.2	F2527/5	Coarse	14.8	5.94	2.53	-3.41	Medium	..	..	..	..	..	..	..
BH4 ASS 0.5-0.7	F2527/6	Coarse	10.6	5.50	2.31	-3.19	Medium	..	..	..	..	..	..	..
BH4 ASS 1.5-1.7	F2527/7	Coarse	21.0	4.89	2.73	-2.16	Medium	35	0.002	0.010	6	1	43	3.2
BH4 ASS 2.0-2.2	F2527/8	Coarse	21.8	5.01	2.90	-2.11	Low	..	..	..	..	..	..	..
BH8 ASS 0.5-0.7	F2527/9	Coarse	3.3	6.34	5.09	-1.25	Low	2	..	<0.005	0	0	2	0.1
BH8 ASS 1.5-1.7	F2527/10	Coarse	9.6	6.61	5.27	-1.34	Low	..	..	..	..	..	..	..
BH16 ASS 0.1-0.2	F2527/11	Coarse	5.7	7.46	5.70	-1.76	High	..	..	..	..	..	..	..
BH16 ASS 0.5-0.7	F2527/12	Coarse	8.5	6.90	4.96	-1.94	Low	..	..	..	..	..	..	..
BH16 ASS 1.0-1.2	F2527/13	Coarse	13.9	6.65	4.74	-1.91	Low	..	..	..	..	..	..	..
BH16 ASS 1.5-1.7	F2527/14	Coarse	17.6	6.55	4.82	-1.73	Low	..	..	..	..	..	..	..
BH16 ASS 2.0-2.2	F2527/15	Coarse	19.8	6.29	4.02	-2.27	Low	2	..	<0.005	0	0	2	0.2

NOTE:

- All analysis is Dry Weight (DW) - samples dried and ground immediately upon arrival (unless supplied dried and ground)
- Samples analysed by SPOCAS method 23 (is Suspension Peroxide Oxidation Combined Acidity & Sulfate) and Chromium Reducible Sulfur technique (Scr - Method 22B)
- Methods from Olsen, CR, McElroy AE, Sullivan LA (2004), **Acid Sulfate Soils Laboratory Methods Guidelines**, QLD DNRME
- Bulk Density is required for lining rate calculations per soil volume. Lab. Bulk Density is no longer applicable - field bulk density rings can be used and dried/ weighed in the laboratory.
- ABA Evaluation: Net Acidity - Potential Sulfate Acidity (ie. Scr or Sox) x Actual Acidity + Retained Acidity = measured ANC/FF (with FF currently defaulted to 1.5)**
- The neutralising requirement. Lime calculation includes a 1.5 safety margin for acid neutralisation (an increased safety factor may be required in some cases)
- For Texture: coarse = sands to heavy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays
- denotes not requested or required, '0' is used for ANC and Sox calls if TAA pH < 6.5 or < 4.5
- SCREENING, CFS, TAA and ANC are NATA accredited but other SPOCAS segments are currently not NATA accredited
- Results at or below detection limits are replaced with '0' for calculation purposes.
- Projects that disturb > 1000 tonnes of soil, the 20.03% S classification guideline would apply (refer to acid sulfate management guidelines).
- Results refer to samples as received at the laboratory. This report is not to be reproduced except in full.
- ** denotes these test procedure or calculation are as yet not NATA accredited but quality control data is available

(Classification of potential acid sulfate material: coarse Scr20.03MS or 19mole H⁺/t; medium Scr20.06MS or 37mole H⁺/t; fine Scr20.1MS or 62mole H⁺/t) - as per QUASST Guidelines



(Signature)

checked:
 Graham Lancaster
 Laboratory Manager

CHAIN OF CUSTODY



PO Box 157 (Military Road)
 LISMORE NSW 2480
 P| 02 6620 3678 F| 02 6620 3957
eaal@scu.edu.au, www.scu.edu.au/eaal

Submitting Client Details

Quote Id: _____
 Job Ref: _____
 Company Name: ENV Solutions Pty Ltd
 Contact Person: James Foster
 Phone: _____
 Mobile: 0421519354
 Fax: _____
 Email: james@envsolutions.com.au
 Postal Address: _____

Billing Client Details

ABN: 600788814
 Company Name: ENV Solutions Pty Ltd
 Contact Person: James Foster
 Phone: _____
 Mobile: 0421519354
 Fax: _____
 Email: james@envsolutions.com.au
 Postal Address: 21 Clark St
 East Ballina NSW 2478

This section will be destroyed after being processed. Do NOT provide your CVV number, you will be contacted by phone or email when this is required.

Payment Method:

- Purchase Order
- Cheque
- Invoice (prior approval required)
- Credit Card Mastercard / Visa No: _____ / _____ / _____

Exp. Date: _____ Name on Card: _____ CVV: by phone

Relinquished By: _____

Preservation: None / Ice / Ice bricks / Acidified / Filtered / Other:

Received By: _____

Condition on receipt: Ambient / Cool / Frozen / Other:

Date _____ Signed _____

Comments:

Marketing Survey – where did you find us?

- Word of mouth
- Magazine
- Google search
- Other

Lab Sample No.	Sample ID	Sample Depth	Sampling Date	Your Client	Crop ID	Sample Type (e.g. water, leaf, soil)
ASS 1		0.5-0.7	12/08/16			soil
BH4		1.5-1.7	12/08/16			soil
BH8		0.5-0.7	12/08/16			soil
BH16		2.0-2.2	12/08/16			soil

AS-PACK-008

Sample Analysis Request

Price List Code (e.g. SW-PACK-06)

Certificate of Analysis

ENV Solutions Pty Ltd
1/35 North Creek Road
Ballina
NSW 2478



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: James Foster

Report 512176-S
Project name RAILWAY HOTEL CARPARK
Received Date Aug 16, 2016

Client Sample ID			BH15.3
Sample Matrix			Soil
Eurofins | mgt Sample No.			S16-Au16817
Date Sampled			Aug 12, 2016
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	< 50
TRH C29-C36	50	mg/kg	< 50
TRH C10-36 (Total)	50	mg/kg	< 50
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	103
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.5	mg/kg	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&i)fluoranthene ^{N07}	0.5	mg/kg	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5
Naphthalene	0.5	mg/kg	< 0.5

Client Sample ID			BH15.3
Sample Matrix			Soil
Eurofins | mgt Sample No.			S16-Au16817
Date Sampled			Aug 12, 2016
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	< 0.5
Total PAH*	0.5	mg/kg	< 0.5
2-Fluorobiphenyl (surr.)	1	%	104
p-Terphenyl-d14 (surr.)	1	%	97
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
TRH >C10-C16	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
Conductivity (1:5 aqueous extract at 25°C)			
	5	uS/cm	8.9
pH (1:5 Aqueous extract)			
	0.1	pH Units	6.0
% Moisture			
	1	%	18
Heavy Metals			
Arsenic	2	mg/kg	< 2
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	< 5
Copper	5	mg/kg	< 5
Lead	5	mg/kg	5.3
Mercury	0.05	mg/kg	< 0.05
Nickel	5	mg/kg	< 5
Zinc	5	mg/kg	6.3

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
ENM Exemption Suite -The excavated natural material order 2014 NSW EPA(excluding Foreign Material)			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - LTM-ORG-2010	Sydney	Aug 19, 2016	14 Day
BTEX - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Aug 18, 2016	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Aug 18, 2016	14 Day
Polycyclic Aromatic Hydrocarbons - Method: E007 Polyaromatic Hydrocarbons (PAH)	Sydney	Aug 19, 2016	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Aug 19, 2016	14 Day
Conductivity (1:5 aqueous extract at 25°C) - Method: LTM-INO-4030	Sydney	Aug 19, 2016	7 Day
pH (1:5 Aqueous extract) - Method: LTM-GEN-7090 pH in soil by ISE	Sydney	Aug 19, 2016	7 Day
Metals M8 - Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS	Sydney	Aug 18, 2016	28 Day
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Aug 17, 2016	14 Day

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate Duplicate	The addition of a like compound to the analyte target and reported as percentage recovery. A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Method Blank						
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	mg/kg	< 20		20	Pass	
TRH C10-C14	mg/kg	< 20		20	Pass	
TRH C15-C28	mg/kg	< 50		50	Pass	
TRH C29-C36	mg/kg	< 50		50	Pass	
Method Blank						
BTEX						
Benzene	mg/kg	< 0.1		0.1	Pass	
Toluene	mg/kg	< 0.1		0.1	Pass	
Ethylbenzene	mg/kg	< 0.1		0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2		0.2	Pass	
o-Xylene	mg/kg	< 0.1		0.1	Pass	
Xylenes - Total	mg/kg	< 0.3		0.3	Pass	
Method Blank						
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene	mg/kg	< 0.5		0.5	Pass	
TRH C6-C10	mg/kg	< 20		20	Pass	
Method Blank						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	mg/kg	< 0.5		0.5	Pass	
Acenaphthylene	mg/kg	< 0.5		0.5	Pass	
Anthracene	mg/kg	< 0.5		0.5	Pass	
Benzo(a)anthracene	mg/kg	< 0.5		0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5		0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5		0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5		0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5		0.5	Pass	
Chrysene	mg/kg	< 0.5		0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5		0.5	Pass	
Fluoranthene	mg/kg	< 0.5		0.5	Pass	
Fluorene	mg/kg	< 0.5		0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5		0.5	Pass	
Naphthalene	mg/kg	< 0.5		0.5	Pass	
Phenanthrene	mg/kg	< 0.5		0.5	Pass	
Pyrene	mg/kg	< 0.5		0.5	Pass	
Method Blank						
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	mg/kg	< 50		50	Pass	
TRH >C16-C34	mg/kg	< 100		100	Pass	
TRH >C34-C40	mg/kg	< 100		100	Pass	
Method Blank						
Conductivity (1:5 aqueous extract at 25°C)	uS/cm	< 5		5	Pass	
Method Blank						
Heavy Metals						
Arsenic	mg/kg	< 2		2	Pass	
Cadmium	mg/kg	< 0.4		0.4	Pass	
Chromium	mg/kg	< 5		5	Pass	
Copper	mg/kg	< 5		5	Pass	
Lead	mg/kg	< 5		5	Pass	
Mercury	mg/kg	< 0.05		0.05	Pass	
Nickel	mg/kg	< 5		5	Pass	

Test		Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code	
Zinc		mg/kg	< 5		5	Pass		
LCS - % Recovery								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions								
TRH C6-C9		%	72		70-130	Pass		
TRH C10-C14		%	87		70-130	Pass		
LCS - % Recovery								
BTEX								
Benzene		%	94		70-130	Pass		
Toluene		%	101		70-130	Pass		
Ethylbenzene		%	98		70-130	Pass		
m&p-Xylenes		%	95		70-130	Pass		
o-Xylene		%	96		70-130	Pass		
Xylenes - Total		%	95		70-130	Pass		
LCS - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions								
Naphthalene		%	122		70-130	Pass		
TRH C6-C10		%	75		70-130	Pass		
LCS - % Recovery								
Polycyclic Aromatic Hydrocarbons								
Acenaphthene		%	107		70-130	Pass		
Acenaphthylene		%	97		70-130	Pass		
Anthracene		%	111		70-130	Pass		
Benz(a)anthracene		%	102		70-130	Pass		
Benzo(a)pyrene		%	89		70-130	Pass		
Benzo(b&j)fluoranthene		%	92		70-130	Pass		
Benzo(g,h,i)perylene		%	98		70-130	Pass		
Benzo(k)fluoranthene		%	114		70-130	Pass		
Chrysene		%	116		70-130	Pass		
Dibenz(a,h)anthracene		%	90		70-130	Pass		
Fluoranthene		%	106		70-130	Pass		
Fluorene		%	101		70-130	Pass		
Indeno(1,2,3-cd)pyrene		%	92		70-130	Pass		
Naphthalene		%	113		70-130	Pass		
Phenanthrene		%	120		70-130	Pass		
Pyrene		%	116		70-130	Pass		
LCS - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions								
TRH >C10-C16		%	95		70-130	Pass		
LCS - % Recovery								
Heavy Metals								
Arsenic		%	95		70-130	Pass		
Cadmium		%	98		70-130	Pass		
Chromium		%	97		70-130	Pass		
Copper		%	101		70-130	Pass		
Lead		%	101		70-130	Pass		
Mercury		%	105		70-130	Pass		
Nickel		%	100		70-130	Pass		
Zinc		%	98		70-130	Pass		
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions								
TRH C6-C9		S16-Au17639	NCP	%	74		70-130	Pass
TRH C10-C14		S16-Au16489	NCP	%	91		70-130	Pass
Spike - % Recovery								

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
BTEX				Result 1					
Benzene	S16-Au17639	NCP	%	94			70-130	Pass	
Toluene	S16-Au17639	NCP	%	101			70-130	Pass	
Ethylbenzene	S16-Au17639	NCP	%	99			70-130	Pass	
m&p-Xylenes	S16-Au17639	NCP	%	95			70-130	Pass	
o-Xylene	S16-Au17639	NCP	%	97			70-130	Pass	
Xylenes - Total	S16-Au17639	NCP	%	96			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S16-Au17639	NCP	%	123			70-130	Pass	
TRH C6-C10	S16-Au17639	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S16-Au16480	NCP	%	112			70-130	Pass	
Acenaphthylene	S16-Au16480	NCP	%	112			70-130	Pass	
Anthracene	S16-Au16480	NCP	%	111			70-130	Pass	
Benz(a)anthracene	S16-Au16480	NCP	%	116			70-130	Pass	
Benzo(a)pyrene	S16-Au16480	NCP	%	108			70-130	Pass	
Benzo(b&j)fluoranthene	S16-Au16480	NCP	%	112			70-130	Pass	
Benzo(g,h,i)perylene	S16-Au16480	NCP	%	126			70-130	Pass	
Benzo(k)fluoranthene	S16-Au16480	NCP	%	122			70-130	Pass	
Chrysene	S16-Au16480	NCP	%	124			70-130	Pass	
Dibenz(a,h)anthracene	S16-Au16480	NCP	%	117			70-130	Pass	
Fluoranthene	S16-Au16480	NCP	%	121			70-130	Pass	
Fluorene	S16-Au16480	NCP	%	112			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S16-Au16480	NCP	%	123			70-130	Pass	
Naphthalene	S16-Au16480	NCP	%	118			70-130	Pass	
Phenanthrene	S16-Au16480	NCP	%	128			70-130	Pass	
Pyrene	S16-Au16480	NCP	%	128			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S16-Au16489	NCP	%	99			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S16-Au17839	NCP	%	84			70-130	Pass	
Cadmium	S16-Au17839	NCP	%	77			70-130	Pass	
Chromium	S16-Au17839	NCP	%	86			70-130	Pass	
Copper	S16-Au18151	NCP	%	81			70-130	Pass	
Lead	S16-Au18067	NCP	%	82			70-130	Pass	
Mercury	S16-Au17839	NCP	%	75			70-130	Pass	
Nickel	S16-Au17839	NCP	%	96			70-130	Pass	
Zinc	S16-Au18067	NCP	%	85			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S16-Au16037	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S16-Au17312	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S16-Au17312	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S16-Au17312	NCP	mg/kg	< 50	< 50	<1	30%	Pass	

Duplicate								
BTEX				Result 1	Result 2	RPD		
Benzene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Toluene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Ethylbenzene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
m&p-Xylenes	S16-Au16037	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
o-Xylene	S16-Au16037	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Xylenes - Total	S16-Au16037	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
Naphthalene	S16-Au16037	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
TRH C6-C10	S16-Au16037	NCP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Acenaphthene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Acenaphthylene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Anthracene	S16-Au17047	NCP	mg/kg	< 0.5	0.5	34	30%	Fail Q15
Benz(a)anthracene	S16-Au17047	NCP	mg/kg	0.7	1.0	34	30%	Fail Q15
Benzo(a)pyrene	S16-Au17047	NCP	mg/kg	0.6	0.9	32	30%	Fail Q15
Benzo(b&j)fluoranthene	S16-Au17047	NCP	mg/kg	< 0.5	0.7	43	30%	Fail Q15
Benzo(g,h,i)perylene	S16-Au17047	NCP	mg/kg	< 0.5	0.6	30	30%	Pass
Benzo(k)fluoranthene	S16-Au17047	NCP	mg/kg	0.5	0.7	25	30%	Pass
Chrysene	S16-Au17047	NCP	mg/kg	0.7	1.1	42	30%	Fail Q15
Dibenz(a,h)anthracene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluoranthene	S16-Au17047	NCP	mg/kg	2.1	3.0	36	30%	Fail Q15
Fluorene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Indeno(1.2.3-cd)pyrene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Naphthalene	S16-Au17047	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S16-Au17047	NCP	mg/kg	1.8	2.5	29	30%	Pass
Pyrene	S16-Au17047	NCP	mg/kg	2.2	3.3	40	30%	Fail Q15
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
TRH >C10-C16	S16-Au17312	NCP	mg/kg	< 50	< 50	<1	30%	Pass
TRH >C16-C34	S16-Au17312	NCP	mg/kg	< 100	< 100	<1	30%	Pass
TRH >C34-C40	S16-Au17312	NCP	mg/kg	< 100	< 100	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Conductivity (1:5 aqueous extract at 25°C)	S16-Au16817	CP	uS/cm	8.9	7.9	12	30%	Pass
pH (1:5 Aqueous extract)	S16-Au18067	NCP	pH Units	5.3	5.3	pass	30%	Pass
% Moisture	B16-Au06346	NCP	%	< 1	< 1	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S16-Au17683	NCP	mg/kg	2.5	2.4	5.0	30%	Pass
Cadmium	S16-Au17683	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass
Chromium	S16-Au17683	NCP	mg/kg	< 5	5.4	20	30%	Pass
Copper	S16-Au17683	NCP	mg/kg	14	15	6.0	30%	Pass
Lead	S16-Au17683	NCP	mg/kg	31	32	4.0	30%	Pass
Mercury	S16-Au17069	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Nickel	S16-Au17683	NCP	mg/kg	< 5	< 5	<1	30%	Pass
Zinc	S16-Au17683	NCP	mg/kg	22	19	19	30%	Pass

Quality Control Analyte Summary Compliance

The table below is the actual occurrence of QC performed on the batch of samples within this report and as defined below

Analysis	Samples Analysed	Laboratory Duplicates Reported	Laboratory Matrix Spikes Reported	Method Blanks Reported	Laboratory Control Samples Reported
BTEX	1	1	1	1	1
Total Recoverable Hydrocarbons - 1999 NEPM	1	1	1	1	1
Total Recoverable Hydrocarbons - 2013 NEPM	1	1	1	1	1
Polycyclic Aromatic Hydrocarbons	1	1	1	1	1
Conductivity (1:5 aqueous extract at 25°C)	1	1	NA	1	NA
pH (1:5 Aqueous extract)	1	1	NA	NA	NA
% Moisture	1	1	NA	NA	NA
Heavy Metals	1	1	1	1	1

Quality Control Parameter Frequency Compliance follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure April 2011, Schedule B3, Guideline on Laboratory Analysis of Potentially Contaminated Soils and US EPA SW-846 Chapter 1: 'Quality Control'.

It comprises the following when a laboratory process batch is deemed to consist of up to 20 samples that are similar in terms of matrix and test procedure, and are processed as one unit for QC purposes. If more than 20 samples are being processed, they are considered as more than one batch.

Method blank

One method blank per process batch.

Laboratory duplicate

There should be at least one duplicate per process batch, or two duplicates if the process batch exceeds 10 samples.

Laboratory control sample (LCS)

There should be at least one LCS per process batch.

Matrix spikes

There should be one matrix spike per matrix type per process batch.

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Ivan Taylor	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Inorganic (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins | mgt shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins | mgt be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

ATTACHMENT 2
SITE Photographs

Plate 1: Drill Rig



Plate 2: Example drill material sample.





Plate 3: PID Testing.




Plate 4: Drill rig with previous sample site in foreground

ATTACHMENT 3 SAMPLING PLAN




Job No.: 16140
 Project: Site Assessment
 Client: WGM
 Date: 12 August 2016
 By: James Foster


ENV Solutions PTY LTD

**FIGURE 1: Sampling Plan – Site Assessment
 Lot 1 DP 1001454– Railway Hotel Carpark**
 Imagery Courtesy of Six Maps 201



FIGURE 1: Sampling Plan – Soil Validation
Lot 3 DP 827049 – Railway Hotel Carpark
 Imagery Courtesy of Six Maps 201



ENV Solutions PTY LTD

Job No.: 16140
 Project: Site Validation
 Client: WGM
 Date: 12 August 2016
 By: James Foster

ATTACHMENT 4 BORE LOGS



ENVIRONMENTAL BOREHOLE BH1

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.643305
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.61171
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS 0.0 - 0.2m sample analysed

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.0 - 0.5	0	D 0.2		Sandy, GRAVEL with clay, orange	No Odours Observed
				Silty CLAY, red	
				Silty SAND, trace clay, grey	
0.5 - 1.5	0	D 0.5		SAND, grey, wet, fine, loose	Becoming wet
1.5 - 2.0	0	D 1.5			
2.0 - 2.5				Termination Depth at: 2.4m	



ENVIRONMENTAL BOREHOLE BH2




PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.643621
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611709
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS 0.0 - 0.2m sample analysed

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.0 - 0.5	0	D 0.2		Sandy GRAVEL, orange	No Odours Observed
				Silty SAND, grey, loose	
0.5 - 1.0	0	D 0.5		SAND, trace silt, grey, wet, fine, loose	Becoming wet
				Silty SAND, Trace Clay, grey loose	
1.0 - 2.0	0	D 1.5		Silty SAND, loose grey, fine	
2.0 - 2.5				Termination Depth at: 2.4m	






PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.643875
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611761
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS 0.0 - 0.2m sample analysed

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0	0	D 0.2		Sandy, Clay GRAVEL, orange, moist	No Odours Observed
0.5				Silty SAND, Fine, grey	
1	0	D 0.5			
1.5				Sandy CLAY, grey, medium dense	
2	0	D 1.5			Becoming wet
2.5				Termination Depth at: 2.4m	

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.644161
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611781
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.5m	CHECKED BY AS

COMMENTS 0.0 - 0.2m sample analysed

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations	
0	0	D 0.2		Grass, topsoil and organic matter		
				SAND, fine white loose, moist.		
0.5	0	D 0.5		Silty SAND, Grey, loose		
1				Silty SAND, grey, wet, fine, loose		
1.5	0	D 1.5				Becoming wet
2				Silty SAND, Black organics, indurated		
2.5				Termination Depth at: 2.5m		



ENVIRONMENTAL BOREHOLE BH5

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.644503
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611865
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.5m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
0	D 0.2			Sandy clay GRAVEL, orange	
0.5	D 0.5			SAND, White, fine, moist	
1					
1.5	D 1.5				
2					
2.5				Termination Depth at: 2.5m	Becoming wet



ENVIRONMENTAL BOREHOLE BH6

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.64452
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.61228
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
	0	D 0.2		Sandy clay GRAVEL, orange, dry	
0.5	0	D 0.5		SAND, White, fine, loose, moist	
1					
1.5	0	D 1.5			
2					Becoming wet
2.5				Termination Depth at: 2.4m	



ENVIRONMENTAL BOREHOLE BH7




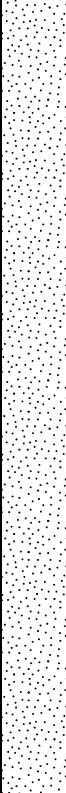
PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.64455
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.612045
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
	0	D 0.2		Sandy clay GRAVEL, orange, dry	
0.5	0	D 0.5		SAND, White, fine, loose, moist	
1					
1.5	0	D 1.5			
2					Becoming wet
2.5				Termination Depth at: 2.4m	

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.644798
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611963
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
0	D 0.2			Sandy clay GRAVEL, orange, dry	
0.5	D 0.5			Silty SAND, brown, loose, dry	
				SAND, white, fine, loose, dry	
1					
1.5	D 1.5				
2					
					Water not encountered
2.5				Termination Depth at: 2.4m	



ENVIRONMENTAL BOREHOLE BH9



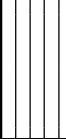
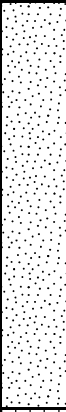

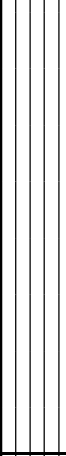
PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.64497
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611982
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
	0	D 0.2		Sandy clay GRAVEL, orange, dry	
				Silty SAND, grey brown, loose, dry	
0.5	0	D 0.5		SAND, white, fine, loose, dry	
1					
1.5	0	D 1.5			
2					
					Water not encountered
2.5				Termination Depth at: 2.4m	



PROJECT NUMBER 16140 PROJECT NAME Railway Carpark CLIENT WGM ADDRESS 86 Jonson St Byron Bay NSW	DRILLING DATE 12/08/2016 DRILLING COMPANY ENV Solutions DRILLER James Foster DRILLING METHOD CFA TOTAL DEPTH 2.6m	COORDINATES -28.645041 COORD SYS 153.612342 SURFACE ELEVATION Natural Ground Level LOGGED BY JF CHECKED BY AS
--	--	--

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
	0	D 0.2		Sandy clay GRAVEL, orange, dry	
				Silty SAND, grey brown, loose, dry	
0.5	0			SAND, white, fine, loose, dry	
1				SAND, white, fine, loose, dry	
1.5	0			Silty SAND, Brown, fine, indurated	Becoming wet organic, sulphur odour
2.5		D 2.4			
				Termination Depth at: 2.6m	


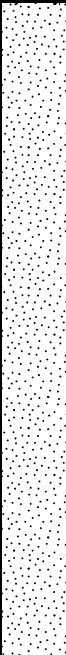

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.64505
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.612049
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.5m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Sandy clay GRAVEL, orange	
0	D 0.2				
				SAND, White, fine, moist	
0.5	D 0.5				
1					
1.5	D 1.5				
2					
					Becoming wet
2.5				Termination Depth at: 2.5m	






PROJECT NUMBER 16140 PROJECT NAME Railway Carpark CLIENT WGM ADDRESS 86 Jonson St Byron Bay NSW	DRILLING DATE 12/08/2016 DRILLING COMPANY ENV Solutions DRILLER James Foster DRILLING METHOD CFA TOTAL DEPTH 2.4m	COORDINATES -28.645238 COORD SYS 153.612052 SURFACE ELEVATION Natural Ground Level LOGGED BY JF CHECKED BY AS
--	--	--

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Sandy clay GRAVEL, orange	
0	0	D 0.2			
				SAND, White, fine, moist	
0.5	0	D 0.5			
1					
1.5	0	D 1.5			
					Becoming wet
2					
2.5				Termination Depth at: 2.4m	






PROJECT NUMBER 16140 PROJECT NAME Railway Carpark CLIENT WGM ADDRESS 86 Jonson St Byron Bay NSW	DRILLING DATE 12/08/2016 DRILLING COMPANY ENV Solutions DRILLER James Foster DRILLING METHOD CFA TOTAL DEPTH 2.4m	COORDINATES -28.645415 COORD SYS 153.612406 SURFACE ELEVATION Natural Ground Level LOGGED BY JF CHECKED BY AS
--	--	--

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
	0	D 0.2		Sandy clay GRAVEL, orange, dry	
				Silty SAND, brown mottle grey orange-red, loose, dry	
0.5	0	D 0.5			
				SAND, white, fine, loose,	
1					
	0	D 1.5			
1.5					
					
2					Becoming wet
				Termination Depth at: 2.4m	
2.5					







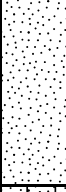

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.645437
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.612131
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.4m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Asphalt	
	0	D 0.2		Sandy clay GRAVEL, orange/yellow, dry	
				Silty SAND, trace clay, black	
0.5	0	D 0.5		SAND, white/grey, fine, loose, moist	
1.5	0	D 1.5		Silty SAND, grey brown, loose, wet	Becoming wet
2.5				Termination Depth at: 2.4m	



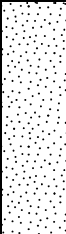
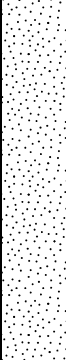
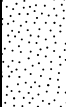

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.645367
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611841
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.5m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Sandy clay GRAVEL, orange, moist	
	0	D 0.2		Silty SAND, Fine brown, moist	
				SAND, White, fine, moist	
0.5	0	D 0.5, Duplicate, Triplicate			
1					
1.5	0	D 1.5			
2					
				Silty SAND, Brown, fine, wet	Becoming wet Organic Odour
2.5				Termination Depth at: 2.5m	

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.645242
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611832
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.5m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				Sandy clay GRAVEL, orange, moist	
0	D 0.2			Silty SAND, Fine brown, dry	
0.5	D 0.5, Duplicate, Triplicate			SAND, White, fine, loose, moist	
1					
1.5	D 1.5				
2				Silty SAND, Brown, fine, wet, indurated	Becoming wet
2.5				Termination Depth at: 2.5m	



ENVIRONMENTAL BOREHOLE BH17

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.645084
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611828
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.5m	CHECKED BY AS

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				GRAVEL, blue (bassalt)	
	0	D 0.2			
				Silty SAND, red, fill, moist	
				SAND, White, fine, loose, moist	
0.5	0	D 0.5			
1					
1.5	0	D 1.5			
2					Water not encountered
				Termination Depth at: 2.0m	
2.5					



ENVIRONMENTAL BOREHOLE BH18

PROJECT NUMBER 16140	DRILLING DATE 12/08/2016	COORDINATES -28.645121
PROJECT NAME Railway Carpark	DRILLING COMPANY ENV Solutions	COORD SYS 153.611941
CLIENT WGM	DRILLER James Foster	SURFACE ELEVATION Natural Ground Level
ADDRESS 86 Jonson St Byron Bay NSW	DRILLING METHOD CFA	LOGGED BY JF
	TOTAL DEPTH 2.6m	CHECKED BY AS


COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				GRAVEL, blue (bassalt)	
0	D 0.2				
				SAND, White, fine, loose, moist	
0.5	D 0.5				
1					
1.5	D 1.5				
2					
2.5					Becoming Wet
				Termination Depth at: 2.6m	

18 Document Control:

Filename:	16140 Rails Carpark Preliminary Contamination & ASS Report.docx
Job No.:	16140
Author:	AS
Client:	WGM

File/Pathname: [https://d.docs.live.net/864290396696383a/Documents/01 Jobs/16040 - 22 Sunrise Byron Bay/16040 22 Sunrise Byron Bay Preliminary Contam Assessment.docx](https://d.docs.live.net/864290396696383a/Documents/01%20Jobs/16040%20-%2022%20Sunrise%20Byron%20Bay/16040%20Sunrise%20Byron%20Bay%20Preliminary%20Contam%20Assessment.docx)

Revision No:	Date:	Issued By	
		Name	Signed
0	06/09/2016	J Foster	
1			
2			

Scope of Engagement:

This report has been prepared by ENV Solutions PTY LTD (ENV) ABN 46856079490 at the request of Koho Pty Ltd for the purpose of a preliminary contamination assessment and is not to be used for any other purpose or by any other person or corporation.

This report has been prepared from the information provided to us and from other information obtained as a result of enquiries made by us. ENV accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

No part of this report may be reproduced, stored or transmitted in any form without the prior consent of ENV.

ENV declares that it does not have, nor expects to have, a beneficial interest in the subject project.

To avoid this advice being used inappropriately it is recommended that you consult with ENV before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

Appendix J

Heritage Act 1977 Exemption



Mr Stan Knight-Smith
John Holland
L1 20 Smith Street
PARRAMATTA NSW 2150

By email: stan.knight-smith@jhg.com.au

Dear Mr Knight-Smith

Endorsement of an exemption under s.57 (2) for car park upgrade works at, Jonson Street Byron Bay, Byron Bay Railway Station and Yard Group —State Heritage Register item n^o 01107

Reference is made to an exemption notification form and supporting material received from you on 30 August 2016 seeking to undertake the above noted works.

The proposed works include upgrading to the car park including drainage, lighting and graveling and have been assessed as described in the documents titled:

- Heritage Impact Statement, prepared by David Scobie Architects, dated 14 August 2016;
- Addendum to the Statement of Heritage Impact prepared by David Scobie Architects, dated 7 October 2016;
- Byron Bay Railway Station Car Park Proposal Archaeological Statement of Heritage Impact, prepared by Cosmos Archaeology Pty Ltd, dated December 2016; and
- Architectural drawings, prepared by John Holland, no date.
- Railway Hotel and Lawson St South Car Parks: Erosion and Sediment Control Layout Plan, Drawing 0025, Rev A, dated 23/09/16
- Railway Hotel and Lawson St South Car Parks: Erosion and Sediment Control Notes drawing 0026, Rev A, dated 23/9/16
- Railway Hotel and Lawson St South Car Parks: Setout Plan Railway Hotel Car Park, Drawing 0027, Rev A, dated 9/9/16
- Railway Hotel and Lawson St South Car Parks: Setout Plan Lawson St South Car park Drawing 0028 Rev 1, dated 9/9/16
- Railway Hotel and Lawson St South Car Parks: Pavement Plan Drawing 0029, Rev A dated 23/9/16

Under delegated authority an exemption from the need for a Section 60 approval is endorsed, in accordance with section 57(2) of the *Heritage Act 1977*, and the relevant criteria have been addressed. The relevant standard exemption is *no. 7 – minor works with little or no adverse heritage impacts and no. 4 – excavation*.

This exemption is endorsed on the basis that the works will be undertaken in accordance with the above listed documents, and are assessed as likely to have a minor impact on the heritage values of Byron Bay Railway Station and Yard Group. Please note this exemption is endorsed, subject to the following general conditions.

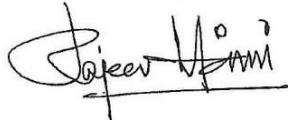
Acceptance of these statutory conditions by the Applicant is a requirement of this exemption:

1. This exemption does not allow the removal of State significant archaeological relics. If relics are discovered, work must cease in the affected area and the Heritage Council must be notified in writing in accordance with section 146 of the *Heritage Act 1977*. Depending on the nature of the discovery, assessment and possibly an excavation permit may be required prior to the recommencement of excavation in the affected area;
2. If any Aboriginal objects are discovered on the site, excavation or disturbance is to cease and the Office of Environment & Heritage is to be informed in accordance with Section s89A of the *National Parks and Wildlife Act 1974*;
3. Anything done pursuant to this exception must be specified, supervised and carried out by people with knowledge, skills and experience appropriate to the work.

It should be noted that this endorsed exemption covers only those proposed works for the Jonson Street car park upgrade works at Byron Bay Railway Station and Yard Group as described in the application. Any additional works would require a further approval. This exemption does not signify approval for any other activity on the site.

Please do not hesitate to contact Rebecca Newell, Archaeologist on telephone (02) 9873 8517 or by email on Rebecca.Newell@environment.nsw.gov.au if you have any further enquiries regarding matters mentioned in this letter.

Yours sincerely



Rajeev Maini
Acting Senior Manager
Heritage Division
Office of Environment and Heritage
As delegate of the Executive Director
3 January 2017

Cc: Byron Bay Shire General Manager, by email: council@byron.nsw.gov.au

Appendix K

Stormwater Management Plan



Stormwater Management Plan Railway Hotel & Lawson St South Car Park, Byron Bay, NSW

Byron Shire Council &
Transport for New South Wales
C/- John Holland

Planit Engineering

November 16

Document No. J109-RPT01



Document Status

Version	Document type	Reviewed by	Checked by	Date Issued
1	Report	TV	SM	2-09-2016
2	Report	TV	SM	13 -10-2016

Project Details

Project Name:	Railway Hotel & Lawson St South Car Parks
Client	Transport for New South Wales
Client Project Manager	Stan Knight-Smith
Authors	Stephen Adam
Planit Reference:	J109-RPT01

Copyright

Planit Engineering has produced this document in accordance with instructions from Transport for NSW, Byron Bay Shire Council and John Holland for their use only. The concepts and information contained in this document are copyright of Planit Engineering.

Use or copying of this document in whole or in part without written permission of Planit Engineering constitutes an infringement of copyright.

Planit Engineering does not warrant this document is definitive and free from error and does not accept liability for any loss caused, or arising from, reliance upon the information provided herein.

Planit Engineering

ABN 99 613 049 568
Suite 9a, 80-84 Ballina Street
Lennox Head NSW 2478
(PO Box 161, Lennox Head NSW 2478)
Telephone – 02 6687 4666
admin@planitengineering.com.au



Contents

Executive Summary	3
1 Introduction	4
1.1 Background.....	4
1.2 Scope and Objectives	4
1.3 Structure.....	4
2 Site Assessment	5
2.1 Site Description	5
2.2 Development Description.....	6
3 Stormwater Conveyance	7
3.1 Existing Catchment.....	7
3.2 On-Site Detention.....	7
3.3 Internal Stormwater Design	9
4 Stormwater Quality	11
4.1 Methodology.....	11
4.2 Water Quality Objectives	11
4.3 Modelled Scenario.....	12
4.4 Results	13
5 Flooding	14
6 Sediment and Erosion Control	15
6.1 Background.....	15
6.2 Soils.....	15
6.3 Sediment and Erosion Control Best Practice.....	15
6.4 ESC Treatment Methodology	16
Appendix A – Dial Before You Dig Plans	18
Appendix B – Engineering Drawings	19
B1 - J109-0013 Cut/Fill Plan Rails Hotel Car Park.....	19
B2 - J109-0014 Cut/Fill Plan Lawson St South Car Park.....	19
B3 - J109-0015 Existing Catchment Plan	19
B4 - J109-0016 Stormwater Layout Plan Rails Hotel Car Park.....	19
B5 - J109-0017 Stormwater Layout Plan Lawson St South Car Park	19
B6 - J109-0018 Stormwater Calculation Sheet.....	19
B7 - J109-0019 Stormwater Long Section Sheet 1 of 2	19
B8 - J109-0020 Stormwater Long Section Sheet 2 of 2	19
B9 - J109-0025 Erosion and Sediment Control Plan.....	19
B10 - J109-0026 Erosion and Sediment Control Notes	19
Appendix C – Flood Maps	20
Appendix D – Sediment and Erosion Control Checklist	21
Appendix E – Humes Maintenance Guidelines	22



Executive Summary

The purpose of this assessment is to identify the stormwater and drainage requirements to service the proposed parking lot upgrades at the Rails Hotel and Lawson St South Car Parks, Byron Bay NSW including quality treatment, on-site detention, flooding and sediment and erosion control.

The two car parks are located in the heart of Byron Bay's CBD west of Jonson St, south of Lawson St, east of the Railway corridor and separated by the Rails Park. Upgrading of the car parks will include but not be limited to lighting and electrical works, trenching and drainage works, boxing out and replacement of pavement, asphalt sealing works, signage and linemarking.

Currently there is no pit and pipe stormwater infrastructure for the majority of both car parks creating a ponding nuisance and deteriorating the existing pavement. As there is no council stormwater infrastructure in Jonson St it is proposed to pipe both Lawson St South and the Rails Hotel Car Park into councils dual 1050mm trunk stormwater line extending from Byron St. On-site detention in the form of a 200mm orifice plate with 60m³ of culvert, pit and pipe detention, and surface ponding was designed to offset the unmitigated increase of peak flow into council's trunk system. In the case of major storm events the car park and Railway Park can pond up to 200m³ of stormwater.

Two scenarios were investigated in MUSIC including the existing case and the developed case. The proposed stormwater management strategy for the developed case was found to provide adequate pollutant removal efficiencies with respect chapter 3 of BSC's 2014 Development Control Plan (DCP) This treatment train contains an end of line Humeceptor and Humeceptor Gross Pollutant Trap (or approved equivalent) discharging into the southernmost pipe of the dual 1050mm trunk stormwater line.

Sediment and erosion shall be controlled using suitable management techniques in accordance with 'Soils and Construction Volume 1 – Managing Urban Stormwater' Landcom and includes the use of silt fences, filter bags, diversion drains, rock check dams, stabilised site access and vehicle wash down areas.

Based on the results of the assessment and the information provided by the relevant authorities, it was concluded that the adverse effects on stormwater that are the resultant of the proposed development can be adequately mitigated in an economical and sustainable manner.

1 Introduction

1.1 Background

Upgrade works have been proposed at two existing parking lots in Byron Bay Town Centre at the Railway Hotel Car Park and the Lawson Street South Car Park. The applicant wishes to activate the area for pedestrians with improved access and compliant lighting, resolve existing stormwater drainage issues and repair the existing road pavement. As such, upgrading of the car parks will include but not limited to lighting and electrical works, trenching and drainage works, boxing out and replacement of pavement, asphalt sealing works, signage and linemarking. This Stormwater Management Plan has been prepared to support the Construction Certificate application and to ensure that the development's impact is minimised.

1.2 Scope and Objectives

This Stormwater Management Plan has been completed to mitigate potential worsening in hydraulic and hydrologic conditions that may be the result of the proposed residential development. The scope of this document includes: runoff quantities, stormwater quality, flooding, and sediment and erosion control. The objectives of this stormwater management plan are to:

- Define a treatment train to ensure that adverse effects in stormwater quality that are the result of the development are adequately mitigated.
- Ensure compliance with all relevant standards including Byron Shire Council standards, Northern Rivers Local Government Standards, Queensland Urban Drainage Manual standards, and Water Sensitive Urban Design standards.
- Ensure that the subject site is not adversely affected by flooding and that no adverse changes in downstream flooding behaviour are the resultant of the development.
- Ensure that there is no worsening of stormwater quality nor any reduction in the environmental values of the downstream receiving waters as a result of construction activities on the subject site during the construction and operational phase of the development.

1.3 Structure

Section two contains a summary of the characteristics of the site including a development description and summary of land use. Section three contains hydrological analysis and pipe flow capacity checks. Required stormwater quality treatment is addressed in section four. Section five details a summary of findings in the Belongil Creek Flood Study of 2015. Finally, a sediment and erosion control strategy for the construction phase is proposed in section six.

2 Site Assessment

2.1 Site Description

The subject site comprises two car parks separated by Railway Park centrally (figure 1) and is located at Byron Bay, NSW within the Byron Shire Council (BSC) local government area. The Car park here in described as the Railway Hotel Car Park is located to the South of Railway Park and Lawson St South Car Park is located to the North. Formal parking allocation exists for only a portion of the Railway Hotel Car Park and none exists for Lawson Street South. As such, unregulated parking has developed over time and encompasses parts of the Railway corridor, Railway Park legally described as Lot 2 DP827049, Council land described as Lot 3 DP827049, John Holland Rail Land described as Lot 1 DP1001454, and privately owned land described as Lot 5 DP619224. The existing space currently used for parking has a total area of 5700m² including 1330m² for Lawson St South Car Park and 4350m² for the Railway Hotel Car Park and is located centrally to Byron's Central Business District. Some of the key surrounding buildings and infrastructure include parkland, a hotel, Information Centre, heritage listed buildings, Jonson Rd and adjacent sealed car park.



Figure 1 – Proposed Development Site

2.2 Development Description

The proposed parking lot upgrade consists of:

- 130 parking spaces including;
 - 117 metered spaces
 - 3 mobility spaces
 - 6 employee spaces (private Laneway)
 - 4 by 15-minute parking spaces (Information Centre Parking)
- 5015m² of sealed pavement
- 205 lineal meters of footpath
- Landscaping and traffic islands

The applicant proposes to undertake the upgrade of the two car parks as the one construction project. In an effort to minimise the impact on the access and parking spaces for local business, the works have been broken down into three stages. Works in the Lawson St South Car Park are proposed first, the northern section of the Railway Hotel second and finally the southern section of the Railway Hotel, with stormwater infrastructure being connected to council's stormwater infrastructure sequentially.

3 Stormwater Conveyance

3.1 Existing Catchment

Currently there is no pit and pipe stormwater infrastructure for the majority of both car parks creating a ponding nuisance, mosquito and midge breeding hazard, unmitigated flows into adjacent properties and deterioration of the existing pavement. Drawing J-109 0014 'Existing Catchment plan' of Appendix 1 has a detailed breakdown of the existing internal and external catchments contributing to both sites. In summary, there are currently three different points of discharge where Byron Shire Councils Trunk stormwater infrastructure receives flows from the subject site:

LPD-A: The point described as legal point of discharge A is located at the intersection of Byron St and Jonson St on the western side of the road and consists of a 375mm stormwater headwall and corresponding pipe breaking into the side of councils dual 1050mm trunk line. There is currently no Byron Shire Council stormwater infrastructure present in the road reserve of Jonson St. As such, all stormwater that is generated by contributing catchments west of Jonson St and north of a crest point adjacent the information centre discharge directly to the kerb and channel. As seen in the 'Existing Catchment Plan' the entrance to the Rails Hotel Carpark grades to the road front on Jonson St and flows along the k31erb line north into LPD-A.

LPD-B: Legal Point of Discharge B is a grated pit located at the end of a spoon drain on the Lawson St South Laneway entering from Jonson St. The pit connects directly into the wall of the southernmost most 1050mm diameter pipe via a 375mm pipe. The catchment includes the whole of the Lawson St South proposed upgrade section, half of the Rails Park and the north west section of the Railway Hotel Car Park. There is currently no pit and pipe stormwater infrastructure for these sections of car park and as such stormwater generated from the Rails Hotel Car park sheet flows across the pavement into the park, ponds adjacent the north end of the park and southern end of Lawson St South Car Park and finally builds up and discharges to LPD-B. Major overland flow bypasses this pit and discharges directly into the top of a 1500mm arched conduit crossing under the railway corridor.

LPD-C: Legal Point of Discharge C is a grated side entry pit on Jonson St adjacent the Cinema complex. The southern section of the Railway Hotel Car Park discharges to a grated field inlet pit within a privately owned lot 1 legally described as DP19224. This pit connects to the internal stormwater network of the aforementioned lot before discharging to LPD-C. However, the car park has received continual resheeting with gravel pavement layers over the years and has built up to a level higher than the railway corridor and some surrounding properties. Some of the overland flow sheets to the western railway corridor where it ponds and infiltrates into the sandy soil and some flows and ponds directly underneath existing heritage housing adjacent Jonson St.

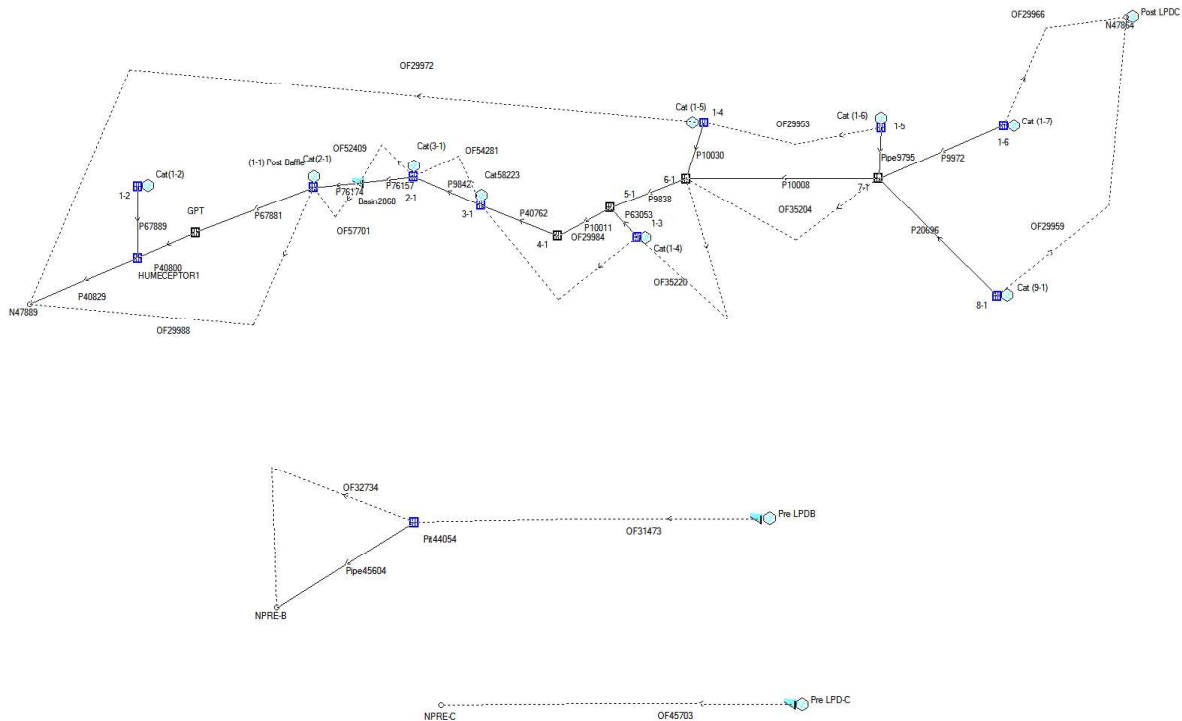
3.2 On-Site Detention

After consultation with BSC and in accordance with section 6.3.1 of Byron Shire Councils Comprehensive Guidelines for Stormwater Management "The peak flow from the proposed development for the 5,10,20, 50 and 100 year ARI events, for all durations from 5 mins to 3 hours, must not exceed the peak flow from site". See Table 1 for Intensity, Frequency, Duration values for the subject site. To satisfy this condition the cumulative flows from the developed subject site into legal points of discharge A, B and C combined could not exceed the pre-development peak flows. In addition, there are currently three points of discharge and by introducing a pit and piped network there will be an increase in unmitigated flow into LPD-A and a proportional decrease to LPD-B and LPD-C. Both BSC and the Belongil Creek Flood Study of 2015 have identified the dual 1050mm trunk line as being in need of upgrade. As such, measures were taken to ensure that there would be no increase in peak flows to this stormwater line (legal points of discharge A + B combined).

Duration	Average Recurrence Interval						
	1	2	5	10	20	50	100
5 min	128	160	190	215	240	260	300
6 min	120	150	180	200	222	250	280
10 min	98	125	150	165	180	210	235
20 min	72	90	110	125	140	155	170
30 min	60	75	90	100	115	130	140
1 hr	40	50	63	70	80	90	100
2 hrs	26	34	42	47	54	62	78
3 hrs	20	26	34	38	43	50	54
6 hrs	12	16	21	24	28	32	34
12 hrs	8	10	14	15	18	21	22
24 hrs	5.5	7.7	9	10.5	12.5	14.5	16
48 hrs	3.5	4.6	6.5	7.5	8.7	10.8	12
72 hrs	2.7	3.6	5.1	6	7.2	9.2	10.5

Table 1 – Byron Bay IFD

On site detention was achieved by using an orifice pit at pit (1-1) with a 200mm diameter orifice plate and using a 2.35m X 0.60m box culvert (Stormtrap or approved equivalent) resulting in approximately 60m³ of detention in both the upstream culvert, pits, and pipe). Detention catering for storms up to the 5 year ARI event was achieved with the oversized pipes, while storm events from the 10 year ARI to 100 Year ARI used both the culvert and the surface detention volume in the car park of Lawson St South up to a maximum pond depth of 200mm. The Drains model seen below in figure 2 was run to produce the results in table 2.



As per table D5.10.2 of Northern Rivers Stormwater Drainage Design Specification allowance for pit blockages where made at 50% for grated field inlet pits and side inlet capacity only for grated side entry pits. All roofs and pavements (asphalt and gravel) where modelled as impervious, while landscaped areas where modelled as pervious. Times of concentration were consistent with Queensland Urban Drainage Manual 2013 with the kinematic wave equation adopted for the pre-development sheet flow times of concentration. The results for pre vs post development are outline in Table 2 below:

Legal Point of Discharge A + Legal Point of Discharge B										
Duration	Average Recurrence Interval									
	5		10		20		50		100	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
5 min	0.10	0.07	0.12	0.08	0.31	0.11	0.17	0.12	0.19	0.12
15 min	0.23	0.14	0.26	0.15	0.22	0.17	0.32	0.18	0.26	0.19
30 min	0.26	0.16	0.29	0.19	0.27	0.26	0.31	0.28	0.35	0.32
1 hr	0.26	0.22	0.28	0.26	0.31	0.28	0.34	0.33	0.32	0.37
3 hrs	0.18	0.16	0.21	0.21	0.24	0.25	0.24	0.26	0.28	0.28

Legal Point of Discharge C										
Duration	Average Recurrence Interval									
	5		10		20		50		100	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
5 min	0.09	0.04	0.11	0.05	0.14	0.03	0.14	0.06	0.07	0.15
15 min	0.16	0.05	0.18	0.05	0.19	0.05	0.23	0.06	0.07	0.25
30 min	0.17	0.04	0.19	0.05	0.22	0.05	0.21	0.06	0.06	0.26
1 hr	0.15	0.04	0.17	0.05	0.19	0.05	0.21	0.06	0.06	0.23
3 hrs	0.11	0.03	0.18	0.03	0.13	0.03	0.14	0.03	0.03	0.16

Combined										
Duration	Average Recurrence Interval									
	5		10		20		50		100	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
5 min	0.19	0.11	0.23	0.13	0.45	0.14	0.31	0.18	0.26	0.27
15 min	0.39	0.19	0.44	0.2	0.41	0.22	0.55	0.24	0.33	0.44
30 min	0.43	0.2	0.48	0.24	0.49	0.31	0.52	0.34	0.41	0.58
1 hr	0.41	0.26	0.45	0.31	0.5	0.33	0.55	0.39	0.38	0.6
3 hrs	0.29	0.19	0.39	0.24	0.37	0.28	0.38	0.29	0.31	0.44

Table 2 – Peak Site Discharge

3.3 Internal Stormwater Design

All stormwater works proposed are contained in John Holland owned land and the railway corridor. There is no BSC stormwater infrastructure present in Jonson St adjacent to the Rails Hotel Car Park. The stormwater generated from the Rails Hotel Car Park is proposed to connect into the stormwater line for Lawson St South section of car park via an alignment through the railway corridor section of Railway Park. A minimum freeboard of 300mm above the Q100 Year ARI flow was achieved in the buildings adjacent to the overland flow channel of Lawson St South at an R.L of 2.18m+300mm AHD in accordance with section 6.4.4 of Byron Shire Councils Comprehensive Guideline to Stormwater Management. The minor internal stormwater network was designed to a 10 year ARI event in accordance with table D5.1 of the Northern Rivers Local



Government Stormwater Drainage Specification. Drawing J109-0017 of Appendix A has a breakdown of the stormwater design flows and capacities.



4 Stormwater Quality

4.1 Methodology

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) has been utilised as the key water quality modelling tool for this project. MUSIC is a continuous simulation water quality model used to evaluate the short and long-term performance of stormwater improvement devices that are configured in series or in parallel to form a ‘treatment train’. MUSIC enables the end-user to determine if proposed systems can meet specified water quality objectives.

The MUSIC model considers suspended solids, total nitrogen and total phosphorus, which are typical components and key indicators of stormwater runoff. The key MUSIC model inputs are:

- Rainfall data set
 - Alstonville 6 min (published by E-water for MUSIC modelling purposes)
- Pre-Development Catchment Area
 - 0.55ha (pre-development catchments given in drawing J109-0014 Appendix A)
- Post Development Catchment area and percentage impervious
 - Roof: 0.01ha (100% impervious) Assuming roof water of adjacent buildings flow to the car park (post-development catchments given in drawing J109-0015 & J109-0016 of Appendix A)
 - Vehicle Pavement: 0.63ha (100% impervious) for all carparks
 - Landscape area: 0.224ha (0% impervious)
 - Hardstand: 0.01ha (100% impervious) for all footpaths, courtyards and paved areas
- Rainfall runoff parameters
 - As per Water by Design MUSIC modelling Guidelines (2010) seen in Table 4 as specified by BSC
- Pollutant event mean concentrations for source nodes
 - As per Water by Design MUSIC modelling Guidelines (2010) seen in Table 4 & 5 as specified by BSC

MUSIC model outputs include:

- Treatment train effectiveness; these outputs are expressed in terms of pollutant reduction.

4.2 Water Quality Objectives

The target pollutants determined in accordance with chapter 3 of BSC’s 2014 Development Control Plan (DCP) are litter, coarse sediments, fine particles, hydrocarbons and possibly nitrogen for a car park development. The target objectives as per table B3.2 of the DCP are presented in table 3 below.

Stormwater Quality Objectives	
Pollutant Source	Reduction Compared to the Unmitigated Case
Litter & gross sediment / Gross Pollutants (GP) >0.1mm	80%
Fine Particles / Total Suspended Solids (TSS) <0.1mm	50%
Hydrocarbons, motor fuels, oils & grease	90%
Nitrogen	Variable (As per BSC request)

Table 3 – Stormwater Quality Objectives

4.3 Modelled Scenario

The pre-development catchment areas were modelled as per drawing J109-0013 of Appendix A with commercial pollutant parameters (see table 4 & 5). The existing site has been broken into two separate catchments. Pollutant generated discharge to LPD-C has not been assessed as part of the subject site as this belongs to the drainage scheme of lot 5 DP9619224 and has an independent treatment train. All stormwater entering the proposed pit and pipe drainage network including roof, landscape, vehicle pavements and other hardstand has been analysed to ensure compliance with hydrocarbons, gross pollutants, Nitrogen and suspended solids despite the upgrade works being restricted to the car park.

The post development catchment was modelled into two sub-catchments including roof, roads, hardstand and landscaped areas. 95% of the runoff generated on or adjacent the subject site enters the proposed treatment train. However, a small section of road is still proposed to drain to the road front on Jonson St and by pass the treatment train as per existing conditions.

The treatment train includes an end of line gross pollutant trap (type HumeGuard, modelled as per manufacturer's specifications), and an end of line secondary treatment device (type HumeCeptor, modelled as per manufacturer's specifications). The reasons for adopting proprietary products over the use of raingardens or other bioretention/ infiltration systems are detailed below:

- The site is very constrained (limiting space and levels available for raingardens)
- There are potential contaminated soils and potential acid sulfate soils beneath the existing gravel layers (this prohibits the use of a conventional or pipeless bioretention system)
- There are extensive tree protection zones (limiting the space available to put raingardens without having to remove trees)
- Based on the Geotechnical results infiltration from a raingarden is strongly discouraged.
- Out of the key pollutants generated on-site raingardens treat suspended solids and to varying effectiveness hydrocarbons. Raingardens do not remove gross pollutants. Bioretention gardens are optimal for removing nitrogen and phosphorus which has little generation on site and is not targeted for car park treatment.

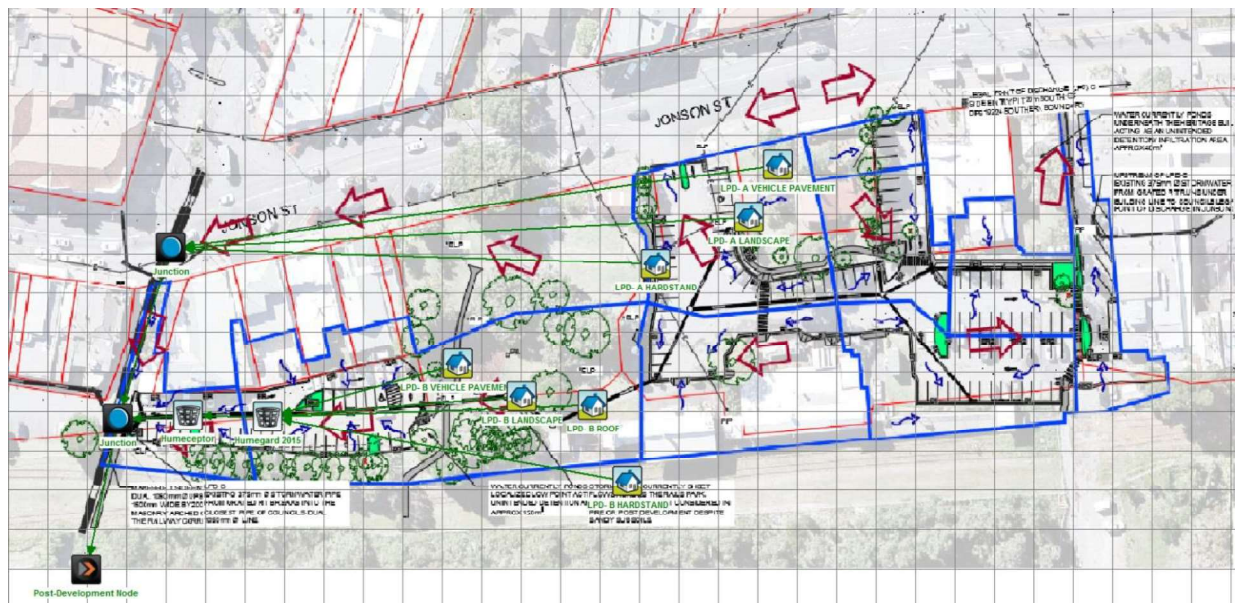


Figure 3 – MUSIC Modelling Scenario

Parameter	Urban Residential
Rainfall threshold (mm)	1
Soil Storage Capacity (mm)	18
Initial Storage (% capacity)	10
Field Capacity (mm)	80
Infiltration Capacity coefficient a	243
Infiltration Capacity coefficient b	0.6
Initial Depth (mm)	50
Daily recharge rate (%)	0.00
Daily base flow rate (%)	31
Daily deep seepage rate (%)	0

Table 4 – Rainfall-Runoff Parameters

Pollutant Export Parameters For Split Catchment								
Landuse	Flow Type	Surface Type	TSS log ¹⁰ Values		TP log ¹⁰ Values		TN log ¹⁰ Values	
			Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.
Commercial	Baseflow	Roof	0	0	0	0	0	0
		Roads	0.78	0.39	-0.60	0.50	0.32	0.30
		Landscape/H- Stand	0.78	0.39	-0.60	0.50	0.32	0.30
	Stormflow	Roof	1.38	0.38	-0.89	0.34	0.37	0.23
		Roads	2.43	0.38	-0.30	0.34	0.37	0.34
		Landscape/ H- Stand	2.16	0.38	-0.39	0.34	0.37	0.34

Table 5 – Pollutant Export Parameters for Split Catchments

4.4 Results

The effectiveness of the proposed stormwater devices is presented in table 6 below. As evident from the table, the proposed treatment train meets the objectives specified by BSC. Hydrocarbon removal is not modelled by Music and was based on product information provided by Humes “Each system is specifically designed to maintain low treatment chamber velocities to capture and retain TSS down to 10 microns. It also removes up to 98% of free oils from stormwater.”

Treatment Train Effectiveness						
Pollutant Source	Sources		Residual Load		% Reduction	
	Pre	Post	Pre	Post	Pre	Post
Flow (ML/yr)	9.71	11	9.71	11	0	0
TSS (kg/yr)	2640	3810	2640	778	0	79.6
GP (kg/yr)	152	190	152	35.4	0	81.4
TN (kg/yr)	30.7	35.5	30.7	20.4	0	42.5
Hydrocarbons	-	-	-	-	-	98

Table 5 – Treatment Train Effectiveness

The HumeGard and HumeCeptor treatment devices are fully trafficable as per manufacturer’s guarantee and can be placed under the car park.

5 Flooding

Appendix B contains a BMT WBM generated map of development zones vs flood risk for the Belongil Creek Flood Planning Levels Study 2015. An Excerpt of the map is shown below in Figure 4 highlighting the section of Lawson St South Car Park identified as low/ intermediate flood storage at the entrance (north part of yellow circle) and low/ intermediate flood fringe for most of the remainder.

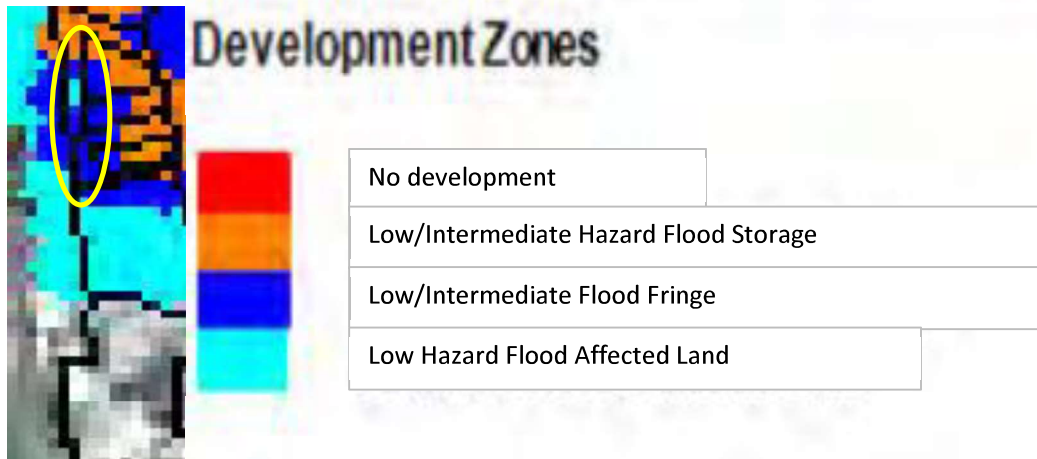


Figure 4 – Development Zones vs Flood Risk

According to BSC DCP 2014 Table 7.2 'Flood Planning Matrix' the control measures activated by the potential flood effect on the development are detailed as "FE2: The flood impact of the development to be considered by Council, with Council having the right to request and engineer's report". In an effort to retain as much flood storage as possible while avoiding earthworks near established tree root protection zones a cut and fill balance of 58m³ of net fill was achieved. Refer to drawing J109-0012 of Appendix A for Cut and Fill details. For the purpose of evacuation and access "EA1" was triggered meaning "council to provide information on the flood evacuation strategy." There is currently an access and mobility compliant footpath at the rear of the car park in Low Hazard Flood affected Land running east toward Jonson St. Provision for secondary vehicle egress through the park can be implemented if deemed necessary.

6 Sediment and Erosion Control

6.1 Background

The objective of the measures proposed in this section is to ensure that there is no worsening of stormwater quality nor any reduction in the environmental values of the downstream receiving waters as a result of construction activities on the subject site during the construction and operational phase of the development.

This objective will be achieved through the implementation of:

- Management strategies designed to minimise water pollution during construction from the development of the subject site;
- Specific construction phase controls to minimise erosion and control sediment loss;
- A monitoring and maintenance program for the construction phase;
- Defined performance criteria and actions to be taken if the criteria are not met.

6.2 Soils

A geotechnical study has been conducted on the subject site as part of the design process. Sandy Silts, Sand and Sandy Clay were encountered in all of the boreholes to a depth of up to 5m beneath the pavement layers. In accordance with the findings, it is assumed that the predominant soil type on the subject site is sand. Highly dispersive soils are considered very unlikely in the subject site however there still needs to be a strong emphasis on sediment and erosion control.

6.3 Sediment and Erosion Control Best Practice

In accordance with BSC requirements, the site shall implement the erosion sediment controls nominated within the Sediment and Erosion plans (Appendix A – Drawing J109-0025 & Drawing J109-0026 Sediment and Erosion Control Plans). The contractor is to obtain Erosion and Sediment Control Signage from Council to attach to the most prominent structure at the site, and to be visible at all times when entering the site for the duration of construction.

The control of stormwater quality during construction activities shall be achieved by the implementation of Erosion and Sediment Controls in accordance with the requirements of the Landcom 'Soils and Construction Volume 1 – Managing Urban Stormwater: Soils and Construction' (i.e. Blue Book). The measures are to be implemented before the commencement of any construction works and should be inspected regularly, and after heavy storm events to ensure they are achieving their desired purpose.

The measures to be used on site include:

- 1.8m high hessian fence is to be installed around the proposed property boundaries.
- Minimise the number of site access points and provide stabilised site access
 - Stabilised site access to be provided at access to shake down all vehicles entering and leaving the site, minimising the transport of sediment off-site. All vehicles must use a designated site access to enter or leave the site. (SD6-14)
- Installation of downstream sediment barriers prior to commencement of any works
 - Sediment fences are to be installed downstream of works and exposed soils to ensure contaminated run-off is filtered and sediment captured before it can make its way into the downstream receiving environment.
 - Turf Strips (SD6-13)
- Cut-off drains are to be formed at the top of batter slopes.
 - Cut-off drains will allow the discharge of water to be conveyed and directed to the most desirable points of discharge to ensure suitable sediment treatment is achieved.

- External catchment is to be captured and redirected around the area of works and discharged at appropriate location.
- Stabilise and seed earthwork areas immediately once earthwork profiles are achieved.
 - Exposed areas on site are to be stabilised with turf as construction works progress. The only proposed earthworks are adjacent the proposed footpaths on site and will require turfing immediately. (SD7-1)
- Stockpile materials in protected locations away from overland flow paths and protected by sediment fence boundaries:
 - Stockpile locations will be located in an elevated, level area nominally 5m from any water body or channel. Upslope protection measures (i.e. sandbags or equal) are to be used to divert run-off in the event of rain, and sediment fences are to be installed downstream of any erodible stockpile. At the end of each day or in the event of rain or high winds, stockpiles are to be covered and secured. Appropriate locations of stockpiles are to be determined by the site manager at the time of construction.
- Sediment fence to be used on low side of any areas of soil disturbance (e.g. road formation, house pad, soil stockpiles, etc). SD6-8.
- Rock filter dams (SD RFD-03) and gypsum filled bags, flock blocks or equivalent placed on low side of check dam spillway, are to be provided in key locations to treat stormwater run-off from the works area.
- Site is to be watered during the construction phase to minimise the generation of dust onsite.
- When wind speeds reach 35km/h, all dust generating construction activities must cease onsite.

Once the civil earthworks are complete, the site shall be re-topsoiled, seeded and turf strips installed on the downward area of the disturbed site so as to act as a surface filter of any sediments prior to reaching the sediment fences. Once 80% grass cover is achieved (or the site landscaped), the sediment fences shall be removed.

The following inspection program shall be established by the Site Contractor and monthly Check Sheet reports submitted to the Supervising Engineer:

- Daily inspection of the site Stabilised Access point and amendments as necessary
- Formal weekly inspection of erosion and sediment controls
- Inspections after 10mm rainfall events in 24 hours
- Testing of runoff after significant rainfall events to ensure a maximum discharge of 50mg/L suspended solids

In addition to the inspection details, the following information will be recorded:

- List frequency and method of removal of material from stabilised access point
- Volume of material removed from in/around sediment controls
- Location of site where material disposed
- Any repairs / additions as appropriate

A checklist is to be completed each month as per details in *Appendix C –Sediment and Erosion Control Checklist*.

6.4 ESC Treatment Methodology

During the bulk earthworks, there is a potential for increased stormwater pollutants as a result of areas of exposed soils.



Some minor importation of foreign soils may be required for the purposes of roadways, driveways and possibly building pads. This imported material is likely to have higher clay content and runoff potential in the short term before any surface finish is applied.

To prevent runoff from the site to flow into the existing stormwater drainage systems, filter bags will be placed around all downstream drainage inlets. Refer to Appendix A – Drawing J109-0025 & Drawing J109-0026 Sediment and Erosion Control Plans for the proposed locations. In addition, silt fence will be installed downstream of all disturbed areas.

'Soils and Construction Volume 1 – Managing Urban Stormwater', recommends the use of sediment basins on sites with a disturbed area larger than 2500m². However, due to the staging of the works at no stage will the disturbed area be larger than 2500m² deeming the use of sediment basins excessive.

A stabilised site access point is to be established at the location nominated on the engineering plans.



Appendix A – Dial Before You Dig Plans



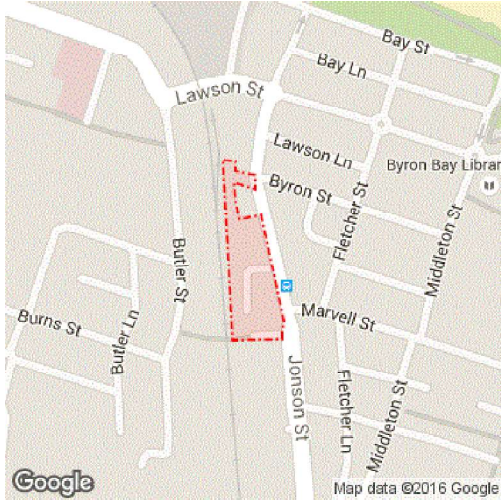
Caller Details

Contact: Mr stephen adam
Company: wgm consulting
Address: po box 161
Lennox Head NSW 2478

Caller Id: 1548579 **Phone:** 0408785998
Mobile: 0408785998 **Fax:** Not Supplied
Email: stephen@wgmconsulting.com.au

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Not Supplied
Working on Behalf of: Private
Enquiry Date: 29/04/2016 **Start Date:** 16/05/2016 **End Date:** 16/05/2016
Address: Byron Street
Byron Bay NSW 2481
Job Purpose: Excavation
Onsite Activity: Vertical Boring
Location of Workplace: Both
Location in Road: CarriageWay, Footpath, Nature Strip

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
Not Supplied

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at www.1100.com.au
- For more information on safe excavation practices, visit www.1100.com.au

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.

** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.

Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
52532294	Essential Energy	132391	NOTIFIED
52532296	Optus and/or Uecomm, Nsw	1800505777	NOTIFIED
52532295	Telstra NSW, North	1800653935	NOTIFIED

END OF UTILITIES LIST

Overhead wires not shown
LOOK UP & LIVE!

LEGEND

- LV Underground Cable
- HV Underground Cable
- Underground Pipe
- Underground Earth or Wires
- Ground Substation
- Pole
- Cubicle
- Pit

Critical Assets
Contact Essential Energy on 13 23 91

- Zone Substation
- Underground Cable
- Underground Fibre

Proposed Works

- Area of proposed works

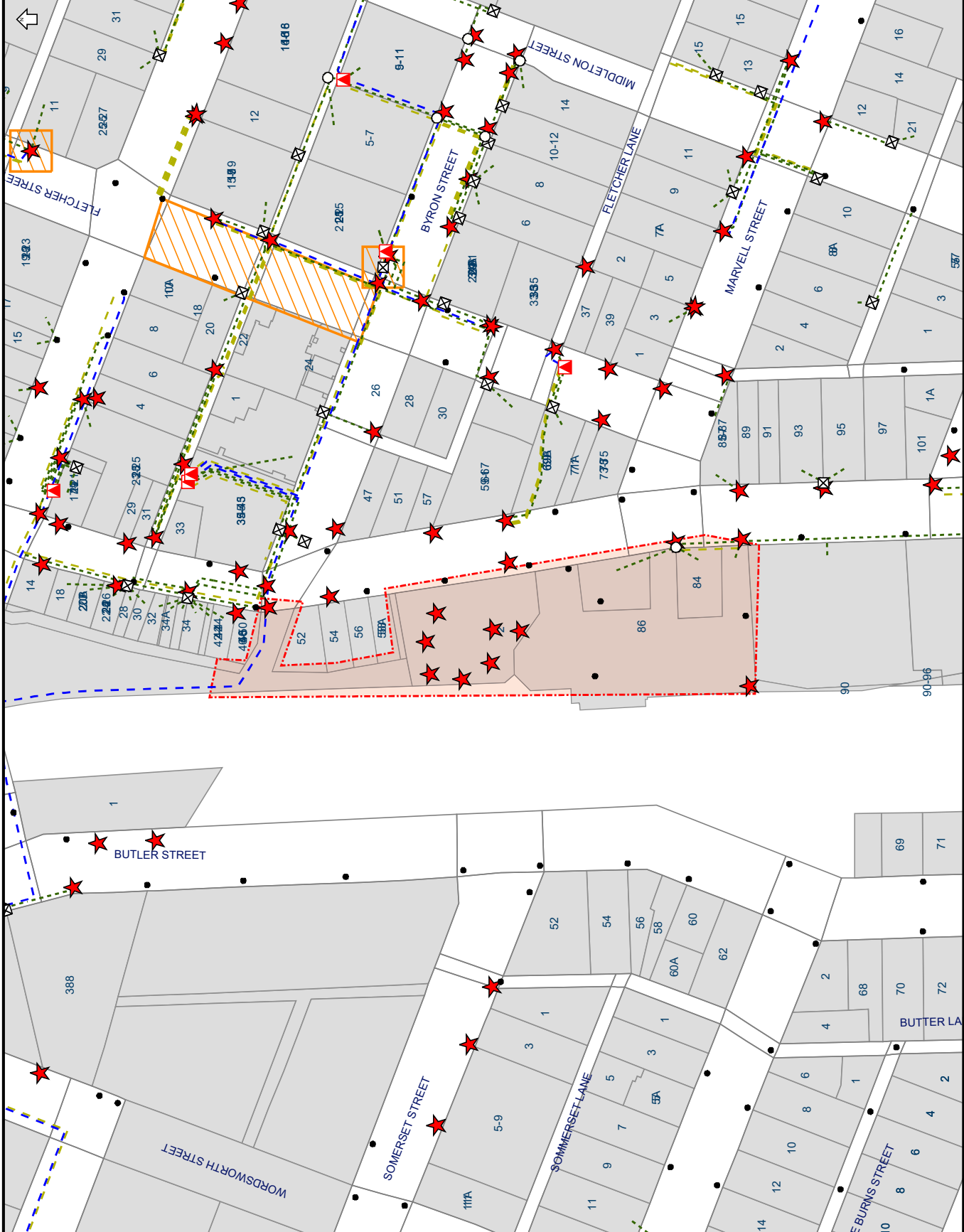
Proposed assets are shown as orange symbols

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.
If details are incorrect, please notify Essential Energy on 13 23 91 (or fax 1800 354 636)

ISSUE DATE: 29/04/2016

You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above

A4 SCALE: 1:2464

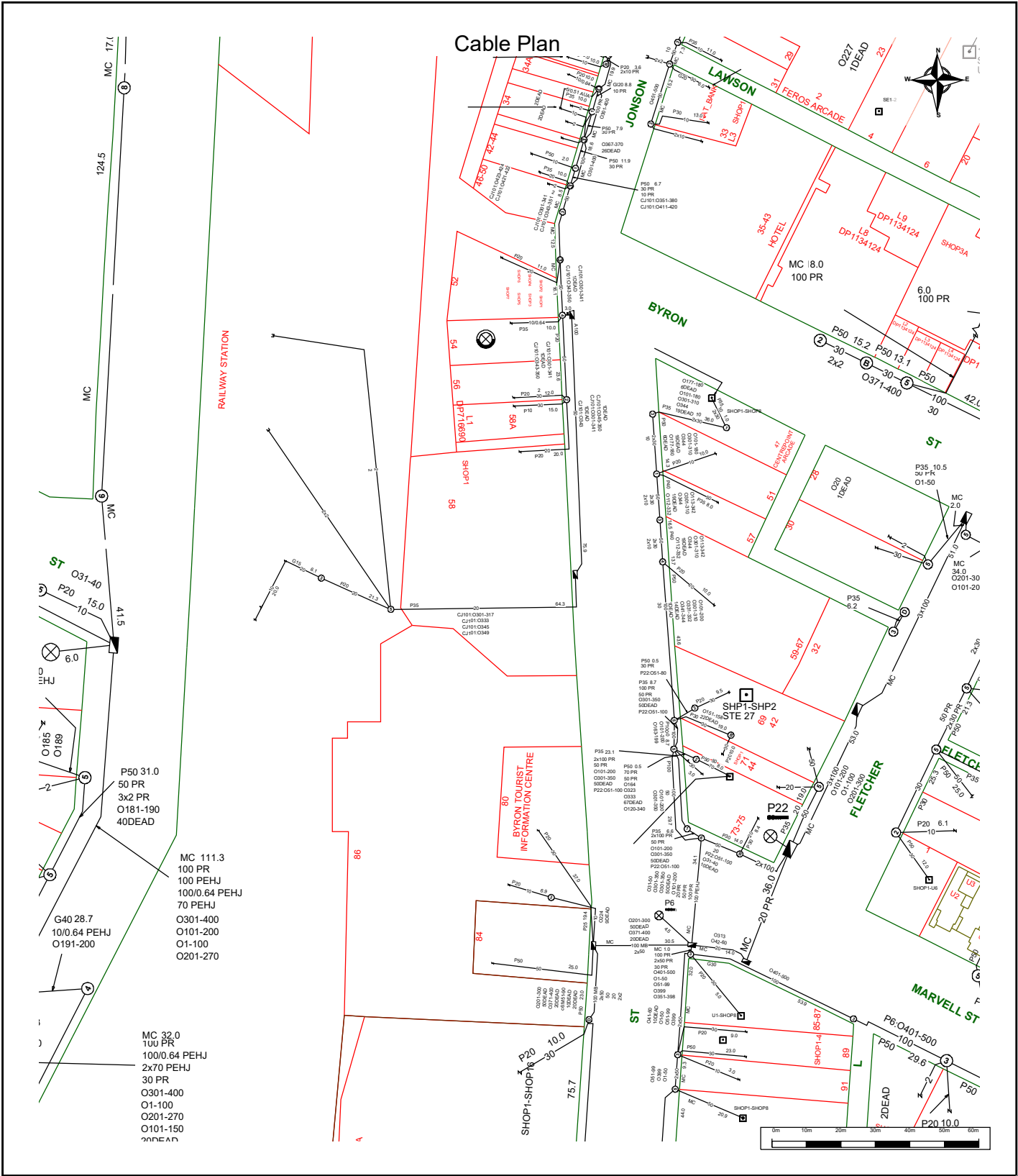


Map Centre: 153° 36' 43.6", -28° 38' 35.3"

Job location: Byron Street, Byron Bay

Sequence number: 52532294

Job Number: 10624800



For all Telstra DBYD plan enquiries -
 email - Telstra.Plans@team.telstra.com
 For urgent onsite contact only - ph 1800 653 935 (bus hrs)

Sequence Number: 52532295

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556
 Generated On 29/04/2016 16:51:02

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

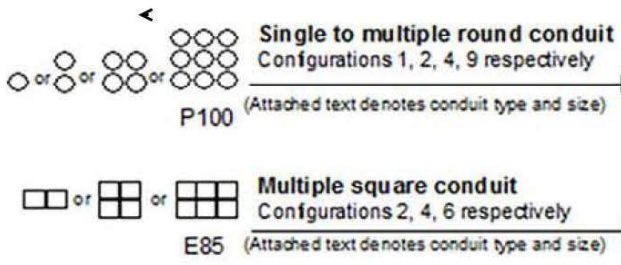
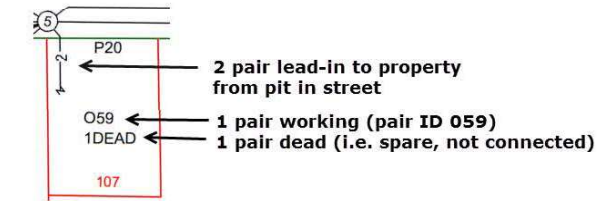
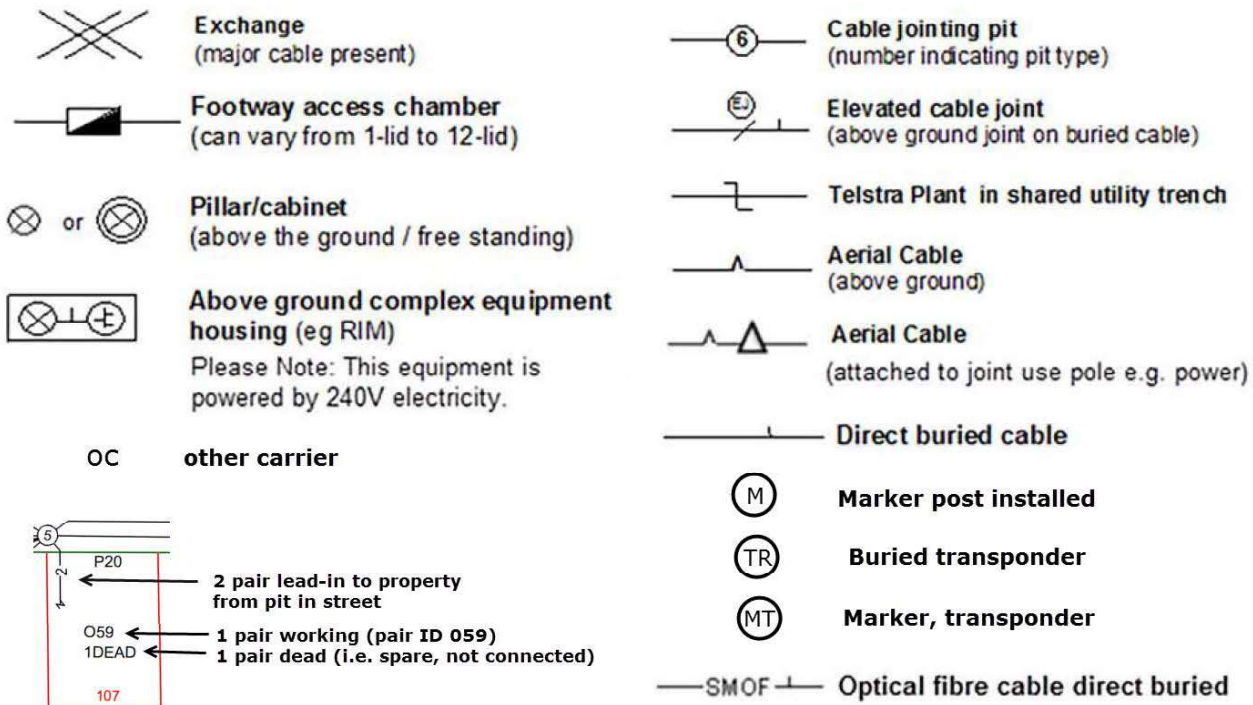
Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

LEGEND

IT'S HOW
WE CONNECT



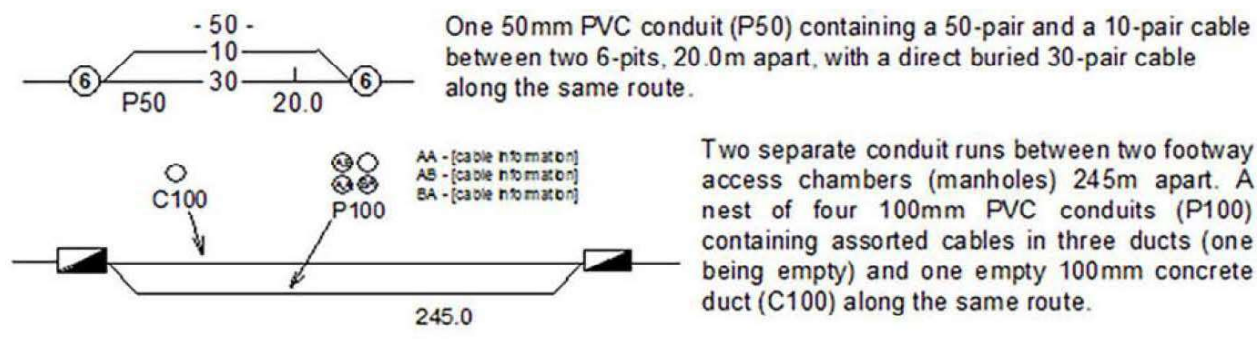
For more info contact a Telstra Accredited Locator or Telstra Plan Services 1800 653 935



Some examples of conduit type and size:
A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware.
Conduit sizes *nominally* range from 20mm to 100mm.

P50	50mm PVC conduit
P100	100mm PVC conduit
A100	100mm asbestos cement conduit
E 85	85mm square earthenware conduit

Some examples of how to read Telstra plans:



WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. **FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK.** A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.





Appendix B – Engineering Drawings

- B1 - J109-0012 Cut/Fill Plan Rails Hotel Car Park**
- B2 - J109-0013 Cut/Fill Plan Lawson St South Car Park**
- B3 - J109-0014 Existing Catchment Plan**
- B4 - J109-0015 Stormwater Layout Plan Rails Hotel Car Park**
- B5 - J109-0016 Stormwater Layout Plan Lawson St South Car Park**
- B6 - J109-0017 Stormwater Calculation Sheet**
- B7 - J109-0018 Stormwater Long Section Sheet 1 of 2**
- B8 - J109-0019 Stormwater Long Section Sheet 2 of 2**
- B9 - J109-0025 Erosion and Sediment Control Plan**
- B10 - J109-0026 Erosion and Sediment Control Notes**



WARNING
 BEWARE OF UNDERGROUND SERVICES
 THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE DETERMINED BY A REGISTERED ELECTRICAL ENGINEER PRIOR TO ANY WORKS. ALL UTILITIES GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	-0.40	-0.25	Red
2	-0.25	0.00	Pink
3	0.00	0.25	Light Green
4	0.25	0.50	Green

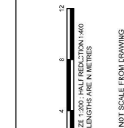
**RAILWAY HOTEL CAR PARK
 CUT/FILL VOLUMES**

Category	Volume (m³)
2D AREA	144
CUT	42
FILL	98
NET	57 FILL

FILL VOLUMES BASED ON DESIGN SURFACE TO THE NATURAL SURFACE. VOLUMES ARE APPROXIMATE AND SHOULD BE PROVIDED FOR THE DESIGN CUT, ROAD, FOOTPATH AND TRENCHING.

REFER TO THE LEGEND IN DRAWING 105-2022 FOR DETAILS ON ACID SULFATE SOILS AND CONTAMINATED SOIL MANAGEMENT REFER TO THE REPORT BY ENVIRONMENTAL CONSULTANTS BYRON BAY, SECTION 102 STATES THAT POTENTIAL ACID SULFATE SOILS ARE PRESENT AT A DEPTH OF 0.5-2.0m FOR THE LAWSON ST SOUTH-CAR PARK. THE REPORT RECOMMENDS THAT SOILS MANAGEMENT PLAN PRIOR TO WORKS INCORPORATING THE RECOMMENDATIONS OF THE REPORT.

PRELIMINARY ISSUE
 NOT FOR CONSTRUCTION



DO NOT SCALE FROM DRAWINGS

REV	DESCRIPTION	DATE	DESIGN	CHECK	APPROVED
1	ISSUED FOR CONSTRUCTION	15/02/2024	SA	SA	SA
2	ISSUED FOR CONSTRUCTION	15/02/2024	SA	SA	SA

22/01/24: RAILWAY HOTEL CAR PARK, BYRON BAY - 22/01/2024: (PLAN) SA (C) (M) (U) (P) - RAILWAY HOTEL CAR PARK, BYRON BAY (C) (M) (U) (P)

CLIENT
 TRANSPORT FOR NSW
 C/- JOHN HOLLAND RAIL NSW for NSW
 LEVEL 1, 20 SMITH STREET
 PARRAMATTA NSW 2150

PROJECT
 RAILWAY HOTEL AND
 LAWSON ST SOUTH
 CAR PARKS
 JONSON STREET
 BYRON BAY NSW 2481

DRAWING TITLE
 EARTHWORKS CUT/FILL PLAN
 LAWSON ST SOUTH-CAR PARK

DRAWING NO. J109
DRAWING DATE 0013
REV C

CLIENT
 BYRON SHIRE COUNCIL
 70-90 STATION ST
 MULLUMBIMBY NSW 2478

CLIENT
 PLANIT ENGINEERING
 SUITE 9A, 30-64 BALINA STREET
 LENOX HEAD NSW 2478
 TELEPHONE: 02 6867 4566
 ABN: 59 613 349 563
 EMAIL: admin@planitengineering.com.au

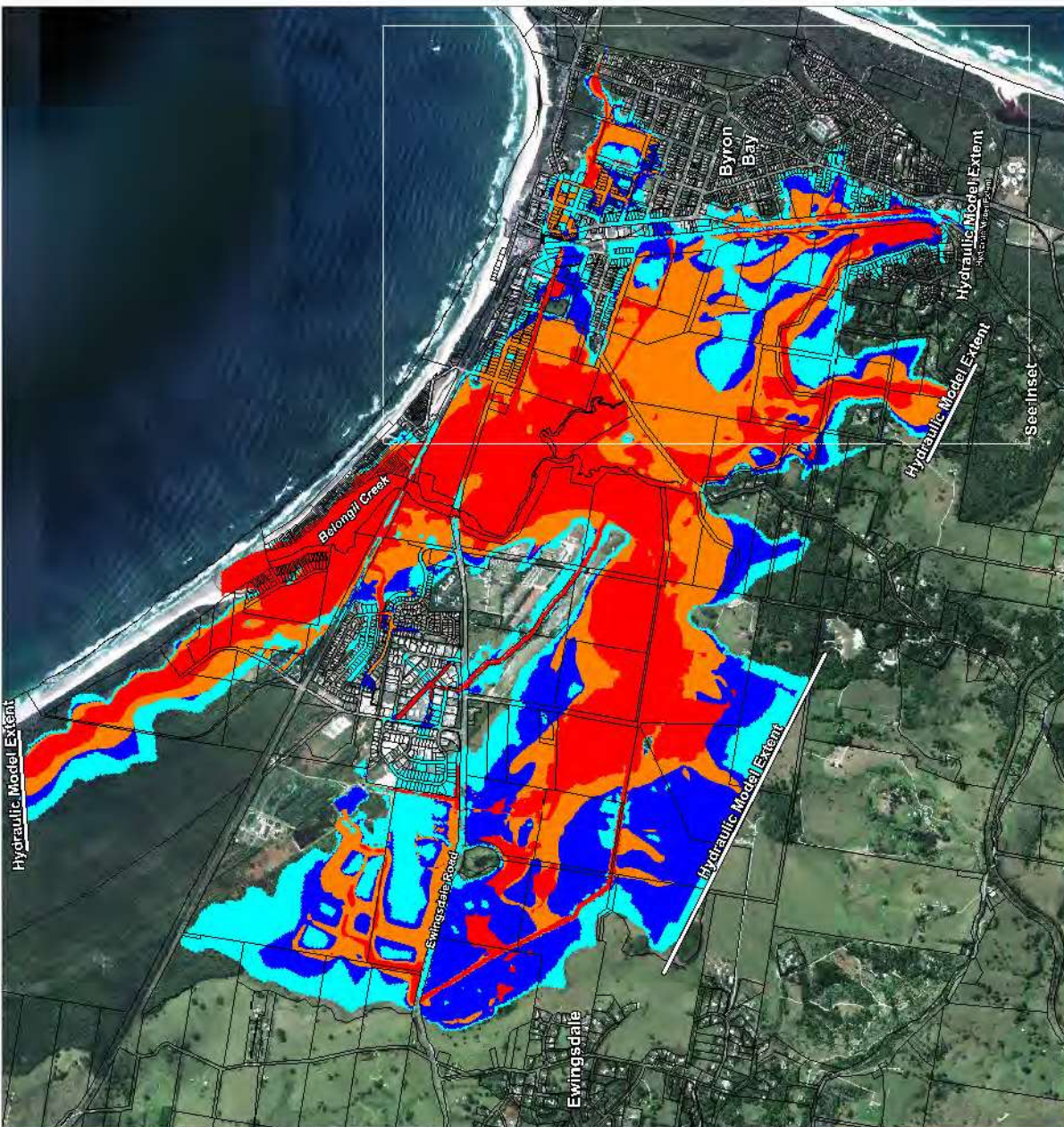
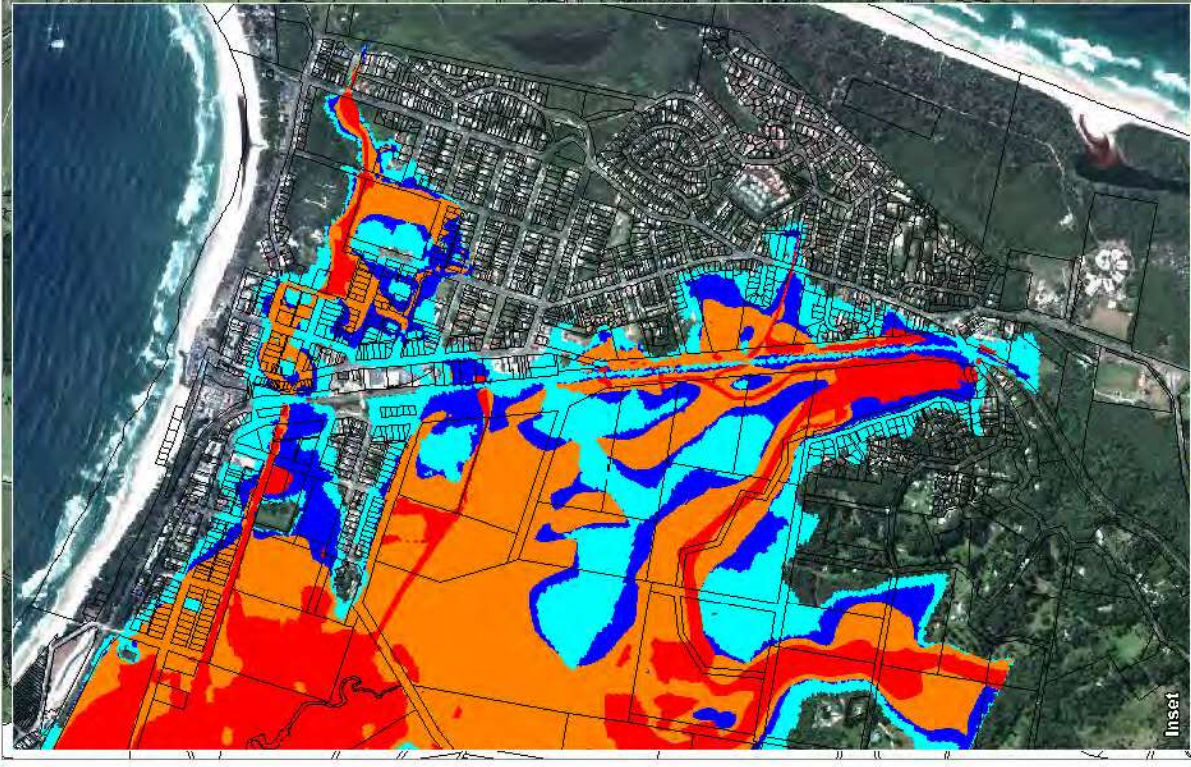
CLIENT
 PLANIT ENGINEERING
 SUITE 9A, 30-64 BALINA STREET
 LENOX HEAD NSW 2478
 TELEPHONE: 02 6867 4566
 ABN: 59 613 349 563
 EMAIL: admin@planitengineering.com.au

CLIENT
 PLANIT ENGINEERING
 SUITE 9A, 30-64 BALINA STREET
 LENOX HEAD NSW 2478
 TELEPHONE: 02 6867 4566
 ABN: 59 613 349 563
 EMAIL: admin@planitengineering.com.au

Copyright in this drawing is reserved by the author. No part of this drawing may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the author. The information is provided for the use of the authorized person only. It is not to be used for any other purpose other than that for which it was supplied by the author. The author accepts no liability for any loss or damage, whether direct or indirect, arising from the use of this drawing. The user of this drawing is advised to verify the accuracy of the information provided in this drawing.



Appendix C – Flood Maps



LEGEND



Cadastral

Development Zones

- No Development
- Low/Intermediate Hazard Flood Storage
- Low/Intermediate Hazard Flood Fringe
- Low Hazard Flood Affected Land

Title

Development Zones

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



0m
0.5
Scale - Main Map
0m
250
Scale - Inset

Figure

7-1

Rev:

A



Table 7-2 Flood Planning Matrix (from BSC DCP 2014)

CONTROLS	DEVELOPMENT / BUILDING TYPE	Primary Constraints ¹ Existing Climate Flood Hazard Categories			Additional Constraints ¹ Future/Extreme Event Flood Hazard Categories		
		No Hazard	Low/Intermediate Hazard	High Hazard	2100 Climate Change Planning Horizon - 100 Year Low/Intermediate Hazard	2100 Climate Change Planning Horizon - 100 Year High Hazard	
Land Use Suitability & Fill Level	Development in New Release Areas , unless separately defined below	N/A	SF2		SF2	SF2	
	Development in all other areas unless separately defined below	N/A	SF1		SF1	SF1	
	Non-Habitable Building or Room (e.g. shed, carport, garage, toilet, laundry, shelter, etc)	N/A	SF1	SF1	SF1	SF1	
	Emergency Services Critical Facilities Site (Hospitals, etc.)	N/A	SF3a		SF3a		
	Other Special Purpose Facilities (School, etc.)	N/A	SF3b		SF3b		
Floor Level	Development in New Release Areas unless separately defined below	FL3	FL3		FL3	FL3	
	Development in all other areas unless separately defined below	FL2	FL2		FL2	FL2	
	Dwelling Additions, except in New Release Areas	N/A	FL4		FL4	FL4	
	Non-Habitable Building or Room (e.g. shed, carport, garage, toilet, laundry, shelter, etc)	N/A	FL1		FL1	FL1	
	New Critical Facilities (Hospitals, etc.) or Special Purpose Facilities (School, etc.)	FL3a	FL3a		FL3a		
Building Components	All	N/A	BC1		BC1	BC1	
	Ancillary Building (e.g. shed, carport)	N/A	SS1	SS1	SS1	SS1	
Structural Soundness	Other Building	N/A	SS1	SS2	SS1	SS1	
	Development in New Release Areas , unless separately defined	N/A	FE2		FE2	FE2	
Flood Effect	Development in all other areas unless separately defined below	N/A	FE2		FE1	FE2	
	Alterations and Additions, Non-Habitable Building or Room (e.g. shed, carport, garage, toilet, laundry, shelter, etc)	N/A	FE1		FE1	FE1	
	Other Developments (road raising, etc)	N/A	FE3	FE3	FE3	FE3	
	Development in all other areas unless separately defined below	N/A	EA1		EA1	EA1	
	Development in New Release Areas , unless separately defined	N/A	EA2		EA2	EA2	
Evacuation & Access	Critical Facilities (Hospitals, etc.)	N/A	EA3a		EA3a	EA3a	
	Other Special Purpose Facilities (Schools, etc.)	N/A	EA3b		EA3b	EA3b	

1. Refer to relevant flood study for definition of hazard categories

N/A	Controls Not Applicable
	Unsuitable Land Use – Not considered suitable for development

CONTROL MEASURES	
SF1	LAND USE SUITABILITY & MINIMUM FILL LEVEL Consider for development subject to the controls below. No minimum fill level required.
SF2	Consider for development subject to the controls below. For new residential, commercial and industrial release areas, the minimum fill level to be greater than or equal to the 1:100 ARI (average recurrent interval) flood event plus projected climate changes allowances for the year 2100
SF3a	Consider for development subject to the controls below. Where possible Emergency Services should be located on land currently flood free during the PMF event. Where practical the minimum fill level should be greater than or equal to the existing climate PMF flood level.
SF3b	Consider for development subject to the controls below. Council to give consideration on the benefits of using the development during and after a flood emergency. existing climate PMF flood level.
FL1	MINIMUM FLOOR LEVEL All floor levels to be greater than or equal to the 10 year flood level plus 0.3m.
FL2	All floor levels to be greater than or equal to the Projected 2050 Flood Planning Level (FPL2).
FL3	All floor levels to be greater than or equal to the Projected 2100 Flood Planning Level (FPL3).
FL3a	If practical, all floor levels to be greater than or equal to the Projected 2100 Flood Planning Level (FPL3), so that these buildings will be available for accommodation / storage during and after a flood emergency.
FL4	Floor levels to be as close to the <i>minimum floor level</i> above (FPL2) as practical and not less than the floor level of the existing building being extended if the existing floor level is less than or equal to the minimum floor level. If the extended weatherproof area exceeds 50% of the existing weatherproof area, the extension is treated as a new building. The extended weatherproof area is measured as the cumulative area of any previous extensions plus the proposed extension. If building is identified as being suitable for voluntary house raising scheme, Council to discuss potential house raising with owner.
BC1	BUILDING COMPONENTS Buildings to have flood compatible material below the relevant flood planning level according to development/building type. Refer to Flood Proofing Section.
SS1	STRUCTURAL SOUNDNESS No structural soundness requirements for the force of floodwater, debris & buoyancy. Must still comply with Building Code of Australia requirements.
SS2	Engineers report to prove that structures subject to a flood up to the 100 year event can withstand the force of floodwater, debris & buoyancy.
FE1	FLOOD EFFECT No action required
FE2	The flood impact of the development to be considered by Council, with Council having the right to request an engineer's report (see FE3 below)
FE3	Engineers report required to prove that the development will not result in adverse flood impact elsewhere
EA1	EVACUATION/ACCESS Council to provide information on flood evacuation strategy
EA2	Site specific Flood Evacuation Strategy be developed consistent with Council / SES overall Flood Evacuation Strategy.
EA3a	Emergency service site - should have good access up to the PMF and preferably not cut-off from the main residential area(s).
EA3b	Council to evaluate suitability of site in this respect. If site to be used during and after a flood emergency (see FL3a above), should have good access up to the PMF and preferably not cut-off from the main residential area(s).



Appendix D – Sediment and Erosion Control Checklist

Stormwater, and Erosion Sediment Control Maintenance Checklist

Swale Maintenance			
Inspection frequency:	weekly during construction	Date of visit:	
Location:			
Description:			
Site visit by:			
Inspection Items	Y	N	Action required (details)
Debris present within swale?			(Remove by hand and dispose appropriately)
Swale vegetation depleted?			(Reseed and maintain until established)
Swale vegetation in excess to grasses only (i.e. Trees, etc)			(Remove excess vegetation and dispose appropriately)
Excess Sediment within Swale?			(Remove by hand and dispose appropriately)
Swale formation compromised?			(Reshape swale and make good)
Comments: Inspection frequency should be adjusted depending upon observations			

Rock Filter Dam			
Inspection frequency:	weekly during construction	Date of visit:	
Location:			
Description:			
Site visit by:			
Inspection Items	Y	N	Action required (details)
Debris present ?			(Remove by hand and dispose appropriately)
Rock filter dam formation, filter material and weir compromised?			(repair and make good)
Gypsum filled bag (of rock block damaged or depleted)?			(Replace)
Excess Sediment upstream of Rock filter dam?			(Remove by hand and dispose appropriately)
Comments: Inspection frequency should be adjusted depending upon observations			

Sediment Fence			
Inspection frequency:	weekly during construction	Date of visit:	
Location:			
Description:			
Site visit by:			
Inspection Items	Y	N	Action required (details)
Sediment Fence compromised			(Repair or reinstall if necessary)
Excess Sediment within Swale?			(Remove by hand and dispose appropriately)
Comments: Inspection frequency should be adjusted depending upon observations			

Stabilised Site Access			
Inspection frequency:	Daily during construction	Date of visit:	
Location:			
Description:			
Site visit by:			
Inspection Items	Y	N	Action required (details)
Excessive Sediment build up?			(Remove sediment)
Stabilised site access in poor repair?			(repair or replace)
Sediment tracking onto road from site?			(inspect stabilised site access and repair; replace, modify as necessary)
Comments: Inspection frequency should be adjusted depending upon observations			



Appendix E – Humes Maintenance Guidelines

HumeCeptor[®] system Inspection and maintenance guide

Issue 1



Purpose of this guide

This guide outlines the maintenance procedures and requirements for HumeCeptor® units.

Where the contents of this guide differ from project specifications and drawings, supervisory personnel should consult with a Humes engineer. In the event of any conflict between the information in this guide and local legislative requirements, the legislative requirements will take precedence.

It is the responsibility of the site owner and its contractors to determine the site's suitable access and location for maintenance plant and equipment.

Nothing in this guide is to be construed as a representation, endorsement, promise, guarantee or warranty whether expressed or implied.

Humes makes no representation or warranty, implied or otherwise that, amongst others, the content of this guide is free from errors or omissions or in relation to the adequacy of the information contained in this guide and where appropriate you will seek verification from an independent third party before relying on any information in this guide. Humes is not liable or responsible to any person for any use or reliance of any information arising out of or in connection with this guide.



Safety advice

The HumeCeptor® unit must be maintained in accordance with all relevant health and safety requirements, including the use of PPE and fall protection where required.

Confined space entry

Maintenance of the HumeCeptor® should not require entry, however, if entry into the unit is required, then the device is deemed a confined space. As such, if entering the unit, all equipment and training must comply to SHE regulations. It is the responsibility of the contractor or person/s entering the unit to proceed safely at all times.

Personal safety equipment

The contractor is responsible for the provision of appropriate personal protection equipment including, but not limited to safety boots, hard hat, reflective vest, protective eyewear, gloves and fall protection equipment. Make sure all equipment is used by trained and certified personnel, and is checked for proper operation and safety features prior to use.

Handling

The customer, or their contractor, is responsible for the removal of access lids from the HumeCeptor® unit. The customer or contractor should familiarise themselves with the device and site constraints, and particular attention should be given to safety hazards such as overhead power lines and other services in the vicinity when considering the position of plant and equipment.



Maintenance overview

To ensure ongoing long-term environmental protection HumeCeptor® needs to be maintained (generally annually).

The actual on-going maintenance frequency requirements will be determined through quarterly inspections undertaken during the first year. However, only an annual maintenance period is anticipated for most HumeCeptor® units installed within drainage infrastructure.

Inspection can be performed by anyone, and procedures for inspection are provided in this document.

Generally, comprehensive maintenance is performed from the surface via vacuum truck. Companies capable of performing this maintenance can be found in the Yellow Pages or online by searching sewer cleaning or liquid waste removal. If you require a list of contacts for cleaning your HumeCeptor® please call your nearest Humes office.

HumeCeptor® operation

A HumeCeptor® unit can be divided into two distinct zones comprising:

1. A lower treatment chamber
2. An upper by-pass chamber

Stormwater flows into the by-pass chamber via the stormwater drainage-pipe, where low flows are diverted into the treatment chamber by the weir and drop pipe arrangement.

Note, the treatment chamber is always full of water so water will flow up through the outlet decant pipe (based on the head of water behind the inlet weir) to be discharged back into the by-pass chamber downstream of the weir. The downstream section of the by-pass chamber is connected to the outlet drainage pipe. Oil and other liquids with a specific gravity less than water rise in the treatment chamber and become trapped since the inlet of outlet decant pipe is submerged.

Sediment settles to the bottom of the lower chamber by gravity forces. The circular design of the treatment chamber is critical to prevent turbulent eddy currents, which inhibit the settling process.

During high flow conditions, stormwater in the by-pass chamber will overtop the weir and be conveyed to the outlet drain directly. Water flowing over the weir creates a backwater effect on the outlet decant pipe (ensuring head stabilization between the inlet drop pipe and outlet decant pipe). This ensures that excessive flow will not be forced through the treatment chamber scouring or re-suspending previously settled material.

The by-pass mechanism is an integral part of the HumeCeptor®, since other oil/grit separator designs and proprietary devices have been noted to scour during high flow conditions (Schueler and Shepp, 1993).

Figure 1 – HumeCeptor® system operation during design flow conditions



Figure 2 – HumeCeptor® system operation during high flow conditions



Model Identification

Even if you do not have the plans of your stormwater drainage system, you will still be able to identify the location of an in-line HumeCeptor® unit(s) as all HumeCeptor® units have a 600 mm diameter cast iron lid, clearly embossed with “HumeCeptor®”.

You will also be able to identify an inlet HumeCeptor® unit(s), by looking through the stormwater inlet grate where the fibreglass insert will be visible.

However once you have found the unit, you may still be uncertain what model it is. Comparing the measured depth from the water level (bottom of insert) to the base of the tank with the dimensions listed in Table 1 below will help to determine the size/model of the unit.

If there is still uncertainty regarding the size of the HumeCeptor® using depth measurements, contact your nearest Humes office for further advice.

There are a few variations on the standard models described above. However, basic maintenance procedures will be the same. The following figures display the different types of HumeCeptor® units available. For further details, please refer to the HumeCeptor® Technical manual.

Figure 3 – HumeCeptor® system variations

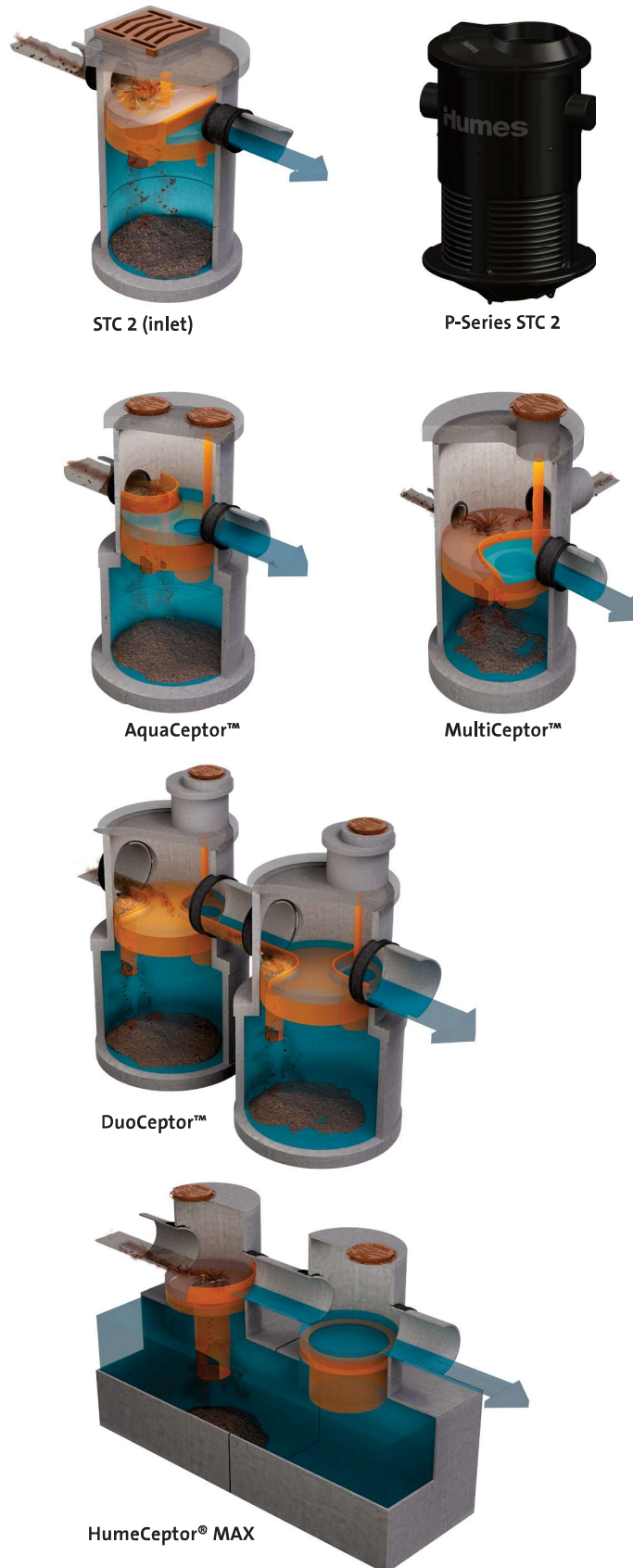


Table 1 – Depths from pipe invert to base

Model	Pipe invert to base (m)
STC2	1.50
STC3	1.40
STC5	1.80
STC7	2.70
STC9	2.40
STC14	3.40
STC18	3.10
STC23	3.70
STC27	3.50

Inspection Procedure

HumeCeptor® units are generally sized such that they only require maintenance (cleaning out) on an annual basis. This being said, it is difficult to know what the actual pollutant loading rate from the particular catchment that the HumeCeptor® services might be (how much pollution enters the device in a given time frame). Therefore, the manufacturer recommends that the HumeCeptor® should be monitored on a 3 monthly basis, which will assist in determining the actual need for maintenance.

The following procedure can be used to inspect the HumeCeptor® and determine the levels of sediment and hydrocarbons (oils) in the device.

1. Locate the HumeCeptor® - all units have a 600mm diameter cast iron lid embossed with "HumeCeptor®"
2. Use the Gatic lifter to remove the lid
3. Conduct a visual inspection of the inlet and outlet pipes to ensure there are no blockages
4. Conduct a visual inspection of the fibreglass insert and check for damage; also check for obstructions in the orifice
5. Identify the location of the oil clean out port and the outlet riser
6. Use the Sludge Judge to determine the levels of sediment and hydrocarbons in the device

The HumeCeptor® is designed to capture and retain sediments and hydrocarbons, therefore, two samples will need to be drawn from the device by using the Sludge Judge. The Sludge Judge is used in the following manner:

Sediment Sampling

1. Lower the Sludge Judge into the outlet riser of the HumeCeptor® all the way to the base of the unit; the float valve will open allowing materials to flow in. It should be lowered in slowly and not plunged to the bottom.
2. When at the bottom of the unit the clear pipe of the Sludge Judge will be filled to the top of weir level with water (and sediment at the bottom). Tug slightly on the rope to set the check valve trapping the mixture inside.
3. When the Sludge Judge has been raised clear of the HumeCeptor®, the amount of sediment in the base of the device can be read using the markers on the clear pipe section.

4. To empty the Sludge Judge, touch the check valve pin against a hard surface; this opens the check valve allowing the contents to drain out.

Oil Sampling

A similar procedure for using the Sludge Judge applies for checking the oil level in the HumeCeptor®, except in this instance the device is used through the oil clean out port rather than the outlet riser.

1. Lower the Sludge Judge into the oil clean out port of the HumeCeptor® to a depth of 1 to 1.5 meters below the fibreglass insert.
2. When at the required depth tug slightly on the rope to set the check valve trapping the mixture inside.
3. When the Sludge Judge has been raised clear of the HumeCeptor®, the amount of oil in the device can be read using the markers on the clear pipe section.
4. To empty the Sludge Judge, touch the check valve pin against a hard surface; this opens the check valve allowing the contents to drain out.

The depths of the sediment and hydrocarbons should be recorded. The HumeCeptor® will require a clean out when either the sediment or oil levels in the device reach the depths outlined in Table 2 below.

It should be noted that for an STC2 model HumeCeptor®, a screw cap will need to be removed to access the Oil Clean Out Port. Ensure that the cap is replaced when work is completed.

Table 2 – Sediment depths indicating maintenance

Model	Max Oil Depth (mm)	Max Sediment Depth (mm)
STC2	350	200
STC3	450	350
STC5	450	600
STC7	450	850
STC9	850	600
STC14	1150	700
STC18	1050	600
STC23	1050	700
STC27	1150	750

Maintenance Procedure

Maintenance of HumeCeptor® is performed using vacuum/eductor trucks this ensures that no requirement for entry into the unit is necessary for maintenance. The vacuum truck industry is a well-established sector of the waste management industry cleaning underground tanks, sewers and catch basins.

A HumeCeptor® unit is cleaned by adhering to the following steps:

1. Complete a Job Hazard Analysis (JHA) and a Work Method Statement (WMS) before undertaking the maintenance procedure.
2. Prepare the site around the HumeCeptor® for cleaning. This involves establishing the job site (traffic control if required), assembling cleaning equipment, positioning the vacuum truck and ensuring correct equipment is available to use (including PPE).
3. Remove the lid above the holding chamber and conduct a visual inspection to assess the condition of the HumeCeptor® and note if there are any blockages or lodged debris
4. Check for oil using a dipstick, tube or sampling device via the oil sample port.
5. Remove and store any free oil separately using a small portable pump via the oil sample port:
 - a. Be sure to skim from the top of the water to ensure oil contaminants are removed
 - b. Approximately 300 mm of water should also be removed from the top of the water column
 - c. The oil/fuel waste can be disposed of separately, as this will incur a higher disposal cost
6. Remove the sludge/sediment from the bottom of the HumeCeptor® using the vacuum truck:
 - a. The truck's suction hose should be lowered into the sump of the device via the outlet riser
 - b. While extracting the waste, move the hose around in the opening to ensure that the hose is sucking from various locations in the sump to remove all the captured material
 - c. The extracted waste can usually be disposed of as general waste at a waste transfer station
7. Clean the interior of the pit using water jet
8. Replace lid, ensuring it is firmly and securely in place

It may be convenient on larger units to de-water some of the relatively clean water from the central zone in the treatment chamber. This will minimise maintenance costs as disposal of essentially clean stormwater can be avoided. Often this can be done in either the sewer or upstream of the pipe (position sandbags to create temporary storage). However, this should only be done with the appropriate authorities consent.

Maintenance Cost

The costs to clean out a HumeCeptor® will vary based on the size of the unit, pollutant volume/type and transportation distances.

Economies of scale will be achieved where there are multiple units for a given location. The time to clean the HumeCeptor® is approximately 30 minutes to an hour, excluding transportation and disposal.

Disposal costs will vary greatly depending on local authority requirements, the type of contaminants washing off your site and the availability of waste disposal facilities.

It should be noted that these costs would be incurred during the maintenance of any type or brand stormwater quality structure and not just the HumeCeptor®.

Maintenance Frequency

It is generally recommended that inspection of the unit to be undertaken every three months for the first year of operation. This schedule may then be relaxed after a year, when confidence is gained regarding the actual pollutant load and run-off generated by the up-stream catchment. A more frequent program may be required where there is greater risk of oil spills.

You may elect to undertake inspection yourself or choose to contract a waste management company to obtain a complete inspection and maintenance package. Contact the nearest Humes office for recommendations/information regarding companies, which have the capabilities to provide an inspection and maintenance service in your area.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the interceptor can be determined by inserting a dipstick in the oil sample port. Similarly, the depth of sediment can be measured from the surface without entry into the HumeCeptor® via a clear tube (Sediment sampler) - sediment sampler tubes are available from Humes. The sampler is inserted in the 610 mm opening in the “disc” in-line models and through the 100 mm oil sample port in the “inlet” models.

As a general rule an annual maintenance schedule is recommended. However maintenance requirement frequency will vary with the volumes of stormwater pollution generated by your site (number of spills, amount of sediment, etc.). So while annual maintenance is recommended, the frequency of maintenance may be varied (increased or reduced) based on local conditions; if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilised maintenance may only be required every two or three years.

Although HumeCeptor® will continue to operate effectively until sediment completely fills the treatment chamber. It is still deemed good practice that maintenance should be performed “annually” or “once the sediment depth exceeds the guideline values” provided in Table 2, whichever condition is achieved first.

HumeCeptor® units are often installed in areas where the potential for hydrocarbon spillage is great. However HumeCeptor® should be cleaned immediately after any major spill occurs, by a licensed liquid waste contractor. You should also notify the appropriate regulatory agencies as required in the event of a spill.

Removal of Hazardous Material

The requirements for the disposal of material removed from the HumeCeptor® are similar to that of any other stormwater treatment device. Local guidelines should be consulted prior to disposal.

The sediment, once de-watered, may be suitable for disposal in a sanitary landfill. It is recommended to check with the relevant authorities in your local area as some local authorities may require testing of the sediment prior to disposal.

All petroleum waste-products, collected in the HumeCeptor® (oil/chemical/fuel spills), should be removed and disposed of by a licensed waste management contractor.

Example Job Safety Analysis (JSA)/Work Method Statement (WMS)

The following JSA/WMS is a guide only. It is the responsibility of the cleaning contractor or asset owner to develop their own JSA/WMS in line with their own WHS requirements and constraints. It also assumes that there will be no entry into the unit during maintenance.

Project/ Address:				Date:	
Job: Clean out of HumeCeptor® unit				Operator:	
Risk Level:	1 - Extreme	2 - High	3 - Medium	4 – Low	5 - Negligible
Consequence:	Likely to cause very serious harm	Clear potential for serious harm	Similar to risk of driving a car	Little likelihood of any harm	Virtually Harmless
Response:	STOP THE JOB	STOP and Reassess to find better way	Control and ensure controls work	Monitor to ensure risk remains low	Continue work
PROCEDURE	POSSIBLE HAZARDS	INITIAL RISK	CONTROLS	PERSON RESPONSIBLE	END RISK
1. Preliminaries: <ul style="list-style-type: none"> Confirm unit locations and types Familiarise with the technical manual 	Nil	-	Refer to relevant manuals	Operator	-
2. Plan the Job: <ul style="list-style-type: none"> Room to access and work on the unit without impacting other property or vehicles Consider water flows and if excessive note and move onto next job Condition and status of unit Identify water fill point Identify waste dump point 	<ul style="list-style-type: none"> Climbing in/out/around of truck All units have a high risk of containing syringes 	3 4	<ul style="list-style-type: none"> Refer to safety plan on moving around vehicles Wear PPE and never reach into or lift accumulated matter with hands. If a needle stick injury occurs, wash the affected area with soap and water and report the incident to the branch and seek medical attention ASAP. 	Operator	4 5
3. Establish Job Site: <ul style="list-style-type: none"> Over 60 km/hr will require traffic management Within 6.4m of overhead power lines will require spotter 	<ul style="list-style-type: none"> Traffic Pedestrians Overhead power lines 	2	<ul style="list-style-type: none"> Devise a relevant Traffic Management WMS Ensure barriers and signs redirect pedestrians Ensure spotter is present 	Operator	5
4. Assemble Cleaning Equipment <ul style="list-style-type: none"> Position vacuum hose to remove debris from the unit 	<ul style="list-style-type: none"> Infection Sharp edges Manual handling Falling equipment High pressure water 	3	<ul style="list-style-type: none"> Personal hygiene (wash hands prior to smoking/eating) Wear gloves & remove sharp edges/burrs on equipment Follow a manual handling WMS Store equipment securely on vehicle Inspect vacuum hose fittings firmly secured Inspect hose daily 7 ensure it has been tested (6 monthly) Never cap jetting hose Inspect jetting hose for damage Never adjust pump pressures or regulators Maximum reducer on 1" hose is ¾" No reducers on ½" hose Fittings to be firmly secured using a spanner 	Operator	5
5. Open the GPT Cover <ul style="list-style-type: none"> Remove lid using the manhole lifting procedure If lid is mass concrete and exceeds safe lifting limits, use mechanical lifting device 	<ul style="list-style-type: none"> Manual Handling Open Manholes 	3	<ul style="list-style-type: none"> Refer to a SWP for manual handling Refer to a SWP for manhole lifting 	Operator	5
6. Start Cleaning <ul style="list-style-type: none"> Check for oil using a dipstick, tube or sampling device Remove and store any free oil separately using a small portable pump If there is any requirement to enter the pit for any reason, confined Space Entry Procedure is to be followed Decant the relatively clean water from the central zone to either sewer or upstream (approvals from authorities required to discharge to sewer) (OPTIONAL) Vacuum all material out of the sump until empty clear Clean the interior of the pit using water jet 	<ul style="list-style-type: none"> Manual handling Eye injury from flying debris Noise People inside exclusion zone Confined Space Entry (If required) 	3	<ul style="list-style-type: none"> Follow a SMP for manual handling Wear eye protection Wear hearing protection Stop operation until area clear. Only essential personnel within exclusion zone Ensuring minimum slack in hose to prevent whipping Refer to confined space manuals and SWPs 	Operator	5
7. Finish Cleaning <ul style="list-style-type: none"> Replace lid ensuring it is firmly & securely in place Ensure all waste is vacuumed and site is clean prior to packing up Complete the CWS recording all details and any problems 	<ul style="list-style-type: none"> Manual handling 	3	<ul style="list-style-type: none"> Follow a SMP for manual handling 	Operator	5

HumeCeptor® unit maintenance record

Customer details			
Company		Phone	
Contact name		Email	
Address		Date	
State		Operator name	
HumeCeptor® unit details			
Model		Type (circle one)	Standard | Inlet | Plastic | Multi
Cleaning method (circle one)	Vacuum | Eduction		Aqua | Duo | MAX
Layout details			
Plan		Elevation	
<p>Diagram labels: DROP PIPE, ACCESS OPENING, LID AND VENT PORT TO BE LOCATED AWAY FROM OUTLET PIPE (SEE ALTERNATE LOCATIONS), INLET, OUTLET.</p>		<p>Diagram labels: INLET ENTER HALL, OUTLET ENTER HALL, DROP PIPE, DECANT PIPE, MAX 4.0m.</p>	
Pollutant removal results			
Estimated volume of water removed (L)		Hydrocarbons(%)	
Estimated volume of pollutants/oil (m ³)		Vegetation (%)	
Percentage of pollutant content (%)		Sediments (%)	
Percentage of pollutant capacity (%)		Total volume (%)	100
Any evidence of gross pollutants (i.e. items larger than drink cans)?			YES | NO
Any evidence of sewage contamination?			YES | NO
Any evidence of any other unexpected contamination?			YES | NO
Describe unexpected contamination (if any):			
Any problems cleaning the HumeCeptor® unit (describe briefly):			
If problems were experienced were they then resolved satisfactorily (describe briefly):			

Contact information

National sales 1300 361 601

humes.com.au

info@humes.com.au

Head Office

18 Little Cribb St
Milton 4064 QLD
Ph: (07) 3364 2800
Fax: (07) 3364 2963

Queensland

Ipswich/Brisbane

Ph: (07) 3814 9000
Fax: (07) 3814 9014

Rockhampton

Ph: (07) 4924 7900
Fax: (07) 4924 7901

Townsville

Ph: (07) 4758 6000
Fax: (07) 4758 6001

New South Wales

Grafton

Ph: (02) 6644 7666
Fax: (02) 6644 7313

Newcastle

Ph: (02) 4032 6800
Fax: (02) 4032 6822

Sydney

Ph: (02) 9832 5555
Fax: (02) 9625 5200

Tamworth

Ph: (02) 6763 7300
Fax: (02) 6763 7301

Victoria

Echuca

Ph: (03) 5480 2371
Fax: (03) 5482 3090

Melbourne

Ph: (03) 9360 3888
Fax: (03) 9360 3887

Tasmania

Launceston

Ph: (03) 6335 6300
Fax: (03) 6335 6330

South Australia

Adelaide

Ph: (08) 8168 4544
Fax: (08) 8168 4549

Western Australia

Gnangara

Ph: (08) 9302 8000
Fax: (08) 9309 1625

Perth

Ph: (08) 9351 6999
Fax: (08) 9351 6977

Northern Territory

Darwin

Ph: (08) 8984 1600
Fax: (08) 8984 1614



National sales 1300 361 601

humes.com.au

info@humes.com.au

A Division of Holcim Australia

This brochure supersedes all previous literature on this subject. As the specifications and details contained in this publication may change please check with Humes Customer Service for confirmation of current issue. This document is provided for information only. Users are advised to make their own determination as to the suitability of this information or any Humes product for their own specific circumstances. We accept no responsibility for any loss or damage resulting from any person acting on this information. Humes is a registered business name of Holcim (Australia) Pty Ltd. HumeCeptor is a registered trademark of Holcim. "Strength. Performance. Passion." is a trademark of Holcim. HumeCeptor is marketed, sold and manufactured by Humes under licence from Imbrium Systems Corp.

© May 2015 Holcim (Australia) Pty Ltd ABN 87 099 732 297. All rights reserved. This guide or any part of it may not be reproduced without prior written consent of Holcim.

HumeGard® GPT Inspection and maintenance guide

Issue 1



Purpose of this guide

This guide outlines the maintenance procedures and requirements for HumeGard® GPT units.

Where the contents of this guide differ from project specifications and drawings, supervisory personnel should consult with a Humes engineer. In the event of any conflict between the information in this guide and local legislative requirements, the legislative requirements will take precedence.

It is the responsibility of the site owner and its contractors to determine the site's suitable access and location for maintenance plant and equipment.

Nothing in this guide is to be construed as a representation, endorsement, promise, guarantee or warranty whether expressed or implied.

Humes makes no representation or warranty, implied or otherwise that, amongst others, the content of this guide is free from errors or omissions or in relation to the adequacy of the information contained in this guide and where appropriate you will seek verification from an independent third party before relying on any information in this guide. Humes is not liable or responsible to any person for any use or reliance of any information arising out of or in connection with this guide.



Safety advice

The HumeGard® GPT must be maintained in accordance with all relevant health and safety requirements, including the use of PPE and fall protection where required.

Confined space entry

Maintenance of the HumeGard® should not require entry, however, if entry into the unit is required, then the device is deemed a confined space. As such, if entering the unit, all equipment and training must comply to SHE regulations. It is the responsibility of the contractor or person/s entering the unit to proceed safely at all times.

Personal safety equipment

The contractor is responsible for the provision of appropriate personal protection equipment including, but not limited to safety boots, hard hat, reflective vest, protective eyewear, gloves and fall protection equipment. Make sure all equipment is used by trained and certified personnel, and is checked for proper operation and safety features prior to use.

Handling

The customer, or their contractor, is responsible for the removal of access lids from the HumeGard® unit. The customer or contractor should familiarise themselves with the device and site constraints, and particular attention should be given to safety hazards such as overhead power lines and other services in the vicinity when considering the position of plant and equipment.



Maintenance overview

To ensure ongoing long-term environmental protection HumeGard® needs to be maintained (generally annually). The actual on-going maintenance frequency requirements will be determined through quarterly inspections undertaken during the first year. However, only an annual maintenance period is anticipated for most HumeGard® units installed within drainage infrastructure.

Inspection can be performed by anyone, and procedures for inspection are provided in this document.

Generally, comprehensive maintenance is performed from the surface via vacuum truck. Companies capable of performing this maintenance can be found in the Yellow Pages or online by searching sewer cleaning or liquid waste removal.

Additionally large litter items may also be removed utilizing the optional stainless steel basket arrangement within the HumeGard®. Alternatively the litter can be removed during eduction/vacuum clean out, which will be required in order to remove the sediment component of the stormwater pollution.

HumeGard® operation

The HumeGard® GPT utilises the processes of physical screening and floatation/sedimentation to separate the litter and coarse sediment from stormwater runoff. It incorporates an upper bypass chamber with a floating boom (or broad-crested weir for small units) that diverts treatable flows into a lower treatment chamber for settling and capturing coarse pollutants from the flow. There are two types of HumeGard® - the super-critical version, which incorporates a broad-crested weir approach for treatment flow diversion, and a larger, standard version, which incorporates a floating boom arrangement to divert treatable flows.

Super-critical HumeGard® (HG12 & HG15)

The super critical HumeGard® consists of an internal broad crested weir and holding chamber.

A specially designed patented broad crested weir diverts material entrained in the flow into the adjacent holding chamber. This consists of the holding sump and another baffle/weir/channel arrangement designed to retain floating material while guiding flow through to the outlet.

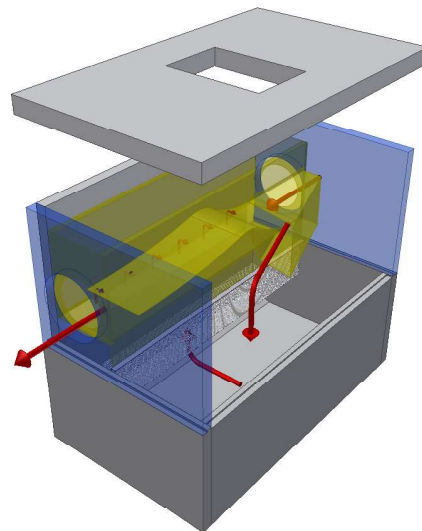
- **Low/Treatment flow operation**

During low to moderate flows, the weir diverts all flows into the sump area where pollutants are captured and retained. The velocity in this sump is controlled and never exceeds a maximum average velocity of 0.2m/s.

- **High/Bypass flow operation**

During high flows, the weir diverts up to the treatable flowrate into the sump and any excess flow is able to flow over the hump and through to the outlet. This ensures that the previously caught pollutants are not disturbed, resuspended and diverted out of the outlet pipe.

Figure 1 – Super-critical HumeGard® GPT



Standard HumeGard® (HG18 – HG45)

The standard HumeGard® consists of an internal separation channel and holding chamber.

A specially shaped boom, which is supported by hangers hinged to the upstream wall, diverts material entrained in the flow from the separator to the adjacent, off line, holding chamber. This consists of the holding sump and another baffle/weir/channel arrangement designed to retain floating material while guiding flow through to the outlet.

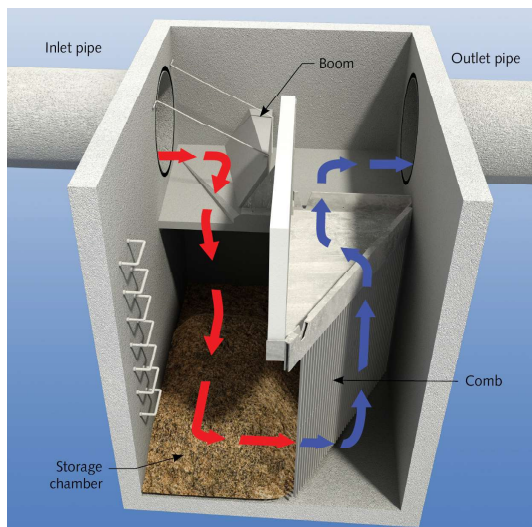
• Low/Treatment flow operation

During low to moderate flows, the boom remains on the floor of the separation channel and imparts an upward and sideways motion to the incoming flow. This action causes deflection into the holding chamber, where heavy and saturated materials settle to the bottom of the sump, while buoyant material is trapped behind the baffle wall arrangement.

• High/Bypass flow operation

During infrequent high flows, the boom lifts, which permits the flow to pass beneath it while continuing to deflect buoyant material to the holding chamber. Once the pipeline flows full, the boom lifts clear, allowing unobstructed flow through the unit, whilst at the same time retaining the floating materials on the upstream side of the device.

Figure 2 – Standard HumeGard® - low flow conditions



Maintenance frequency

It is recommended and good practice for an inspection of the HumeGard® to be carried out on a quarterly basis. The quarterly inspection is to check the operation of the boom, volume of pollutants in the holding sump, etc. But generally, only an annual maintenance period for cleaning is anticipated.

It is important during the quarterly inspections to check that the operation of the boom is satisfactory. The boom should not be impeded by large pieces of litter i.e. logs, etc. or have objects lodged underneath the boom or between it and the baffle plate that may prevent it from rising, or sitting flat on the false floor.

Cleaning maintenance frequency requirements will vary with the amount of stormwater pollution generated in your catchment (amount of litter, sediment, etc.). So it is recommended that as the 3-monthly inspections are performed, the frequency of maintenance be increased or reduced based on local conditions and pollutant capture rates.

The need for maintenance can be determined easily by inspecting the unit from the surface by:

- Checking if litter can be readily seen in the holding chamber once the cover has been removed.
- Using a dipstick or sludge judge (sediment sampling tube) to assess how much sediment or organic material has been captured in the bottom of the holding chamber. A sediment depth over 400mm would indicate cleaning is recommended to minimise the potential for scour.

Sediment sampling tubes are available for purchase from Humes (contact your local sales rep for more details).

Occasionally it may be beneficial to only remove captured litter and not siphon the entire contents of the holding chamber.

Maintenance procedure

Maintenance of HumeGard® units is generally performed using vacuum/education trucks.

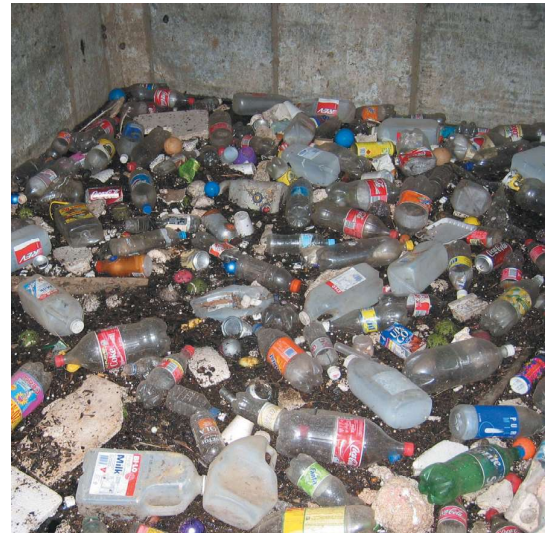
No entry into the unit is required for maintenance. The vacuum service industry is a well-established sector, that services underground tanks, sewers and catch basins.

HumeGard® units are cleaned by adhering to the following steps:

1. Complete a Job Hazard Analysis (JHA) and a Work Method Statement (WMS) before undertaking the maintenance procedure.
2. Prepare the site around the HumeGard for cleaning. This involves establishing the job site (traffic control if required), assembling cleaning equipment, positioning the vacuum truck and ensuring correct equipment is available to use (including PPE).
3. Remove the rectangular lid above the holding chamber and conduct a visual inspection to assess the condition of the HumeGard® and note if there are any blockages or lodged debris.
4. Lower the suction hose to the surface of the water in the holding tank and skim across the top to capture floating litter.
5. Lower the suction hose to the base of the holding chamber to remove sediment, organic matter and litter which has sunk.
6. Dislodge materials trapped in the screen using a water jet or brush/broom.
7. Remove the second rectangular access cover over the diversion boom and ensure there is no debris trapped underneath the boom.
8. Clean the interior of the pit using water jet.
9. Replace lids, ensuring they are firmly and securely in place.

It may be convenient on larger units to de-water some of the water in the holding chamber. This will minimise maintenance costs as disposal of essentially clean stormwater can be avoided. Often this can be done onto adjacent ground or into the council sewer system. However, this should only be done with the appropriate authorities' consent.

If a HumeGard® has been fitted with an optional removable basket, the basket can be used to periodically remove litter in between scheduled education/vacuum maintenance visits. The baskets must also be removed prior to vacuuming/educting the HumeGard® for the sediment load.



Maintenance cost

The costs to clean out a HumeGard® will vary based on the size of the unit, pollutant volume/type and transportation distances.

A typical cost (equipment and personnel) is estimated to be approximately \$1500-\$3500 (based on best information at time of installation) - exclusive of disposal costs.

This estimated cost is based on the clean out of a single unit. Economies of scale will be achieved where there are multiple units for a given location. The time to clean a single unit is approximately 3-4 hours (including transportation and cleaning).

Disposal costs are estimated to be in the order of \$350-\$600 dependent upon volume and type of pollutants removed from the holding sump.



Removal of hazardous material

A wide range of hazardous materials may be intercepted by the HumeGard® gross pollutant trap, although instances of this have been minimal. Hazardous materials may include high levels of heavy metals accumulated within the collected sediments, certain inorganic chemicals, used syringes, glass, and other matter.

As noted, the potential presence of hazardous material is primarily the reason why education is the preferred cleaning method, since this minimises the potential for maintenance personnel and nearby communities to come into contact with such material. Where baskets are required, the majority of the collected material will fall from the basket into the maintenance truck upon opening of the trap door. Any and all contact with the basket should be undertaken with suitable protective clothing, including heavy duty hand protection. If material is caught within the basket, it should be removed using suitable equipment.

Removal of this material by hand is not recommended. It is noted that it is not necessary to have the sumps/ baskets completely clean. The removal of 95% of the material is satisfactory, and the prospect of completely removing every piece of material increases the occupational health and safety risks.

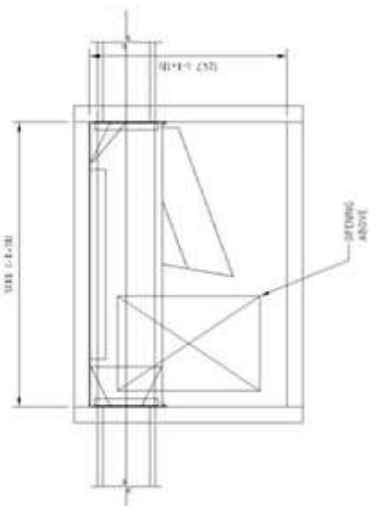
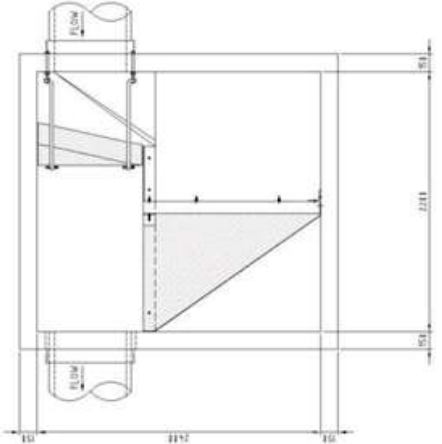
The presence of certain toxicants may need to be considered for the disposal of material and appropriate locations. If elevated levels of toxicants are suspected, then analytical screening of material should be completed to determine an appropriate disposal response according to local and state government regulations.

Example Job Safety Analysis (JSA)/Work Method Statement (WMS)

The following JSA/WMS is a guide only. It is the responsibility of the cleaning contractor or asset owner to develop their own JSA/WMS in line with their own WHS requirements and constraints. It also assumes that there will be no entry into the unit during maintenance.

Project/ Address:				Date:	
Job: Clean out of HumeGard unit				Operator:	
Risk Level:	1 - Extreme	2 - High	3 - Medium	4 – Low	5 - Negligible
Consequence:	Likely to cause very serious harm	Clear potential for serious harm	Similar to risk of driving a car	Little likelihood of any harm	Virtually Harmless
Response:	STOP THE JOB	STOP and Reassess to find better way	Control & ensure controls work	Monitor to ensure risk remains low	Continue work
PROCEDURE	POSSIBLE HAZARDS	INITIAL RISK	CONTROLS	PERSON RESPONSIBLE	END RISK
1. Preliminaries: <ul style="list-style-type: none"> Confirm GPT locations and types Familiarise with GPT technical manual 	Nil	-	Refer to relevant manuals	Operator	-
2. Plan the Job: <ul style="list-style-type: none"> Room to access & work on the GPT without impacting other property or vehicles Consider water flows & if excessive note & move onto next job Condition & status of GPT Identify water fill point Identify waste dump point 	<ul style="list-style-type: none"> Climbing in/out/around of truck All GPT have a high risk of containing syringes 	3 4	<ul style="list-style-type: none"> Refer to safety plan on moving around vehicles Wear PPE and never reach into or lift accumulated matter with hands. If a needle stick injury occurs, wash the affected area with soap & water & report the incident to the branch and seek medical attention ASAP. 	Operator	4 5
3. Establish Job Site: <ul style="list-style-type: none"> Over 60 km/hr will require traffic management Within 6.4m of overhead power lines will require spotter 	<ul style="list-style-type: none"> Traffic Pedestrians Overhead power lines 	3	<ul style="list-style-type: none"> Devise a relevant Traffic Management WMS Ensure barriers and signs redirect pedestrians Ensure spotter is present 	Operator	5
4. Assemble Cleaning Equipment <ul style="list-style-type: none"> Position vacuum hose to remove debris from GPT 	<ul style="list-style-type: none"> Infection Sharp edges Manual handling Falling equipment High pressure water 	3	<ul style="list-style-type: none"> Personal hygiene (wash hands prior to smoking/eating) Wear gloves & remove sharp edges/burrs on equipment Follow a manual handling WMS Store equipment securely on vehicle Inspect vacuum hose fittings firmly secured Inspect hose daily 7 ensure it has been tested (6 monthly) Never cap jetting hose Inspect jetting hose for damage Never adjust pump pressures or regulators Maximum reducer on 1" hose is ¾" No reducers on ½" hose Fittings to be firmly secured using a spanner 	Operator	5
5. Open the GPT Cover <ul style="list-style-type: none"> Remove lid using the manhole lifting procedure If lid is mass concrete & exceeds safe lifting limits, use mechanical lifting device 	<ul style="list-style-type: none"> Manual Handling Open Manholes 	3	<ul style="list-style-type: none"> Refer to a SWP for manual handling Refer to a SWP for manhole lifting 	Operator	5
6. Start Cleaning <ul style="list-style-type: none"> Position bottom end of vacuum hose to remove debris from GPT Run vacuum prior to remove debris If there is any requirement to enter the pit for any reason, confined Space Entry Procedure is to be followed Vacuum all material out of the sump until empty clear 7 clean Dislodge materials trapped in the screen using water jet or brush/broom Remove access cover over diversion boom/weir, ensure there are no debris trapped underneath boom/around weir Clean the interior of the pit using water jet &/or brush/broom Vacuum all materials out of the pit 	<ul style="list-style-type: none"> Manual handling Eye injury from flying debris Noise People inside exclusion zone Confined Space Entry (If required) 	3	<ul style="list-style-type: none"> Follow a SMP for manual handling Wear eye protection Wear hearing protection Stop operation until area clear. Only essential personnel within exclusion zone Ensuring minim slack in hose to prevent whipping Refer to confined space manuals and SWPs 	Operator	5
7. Finish Cleaning <ul style="list-style-type: none"> Replace lid ensuring it is firmly & securely in place Ensure all waste is vacuumed and site is clean prior to packing up Complete the CWS recording all details and any problems 	<ul style="list-style-type: none"> Manual handling 	3	<ul style="list-style-type: none"> Follow a SMP for manual handling 	Operator	5

HumeGard® unit maintenance record

Customer details			
Company		Phone	
Contact name		Email	
Address		Date	
State		Operator name	
HumeGard® unit details			
Model		Type (circle one)	Small (weir) | Standard (boom)
Cleaning method (circle one)	Vacuum | Eduction	Lid type	
Plan view (circle one)			
Small HumeGard® (weir)		Standard HumeGard® (boom)	
			
Pollutant removal results			
Estimated volume of water removed (L)		Litter (%)	
Estimated volume of pollutants (m ³)		Vegetation (%)	
Percentage of pollutant content (%)		Sediments (%)	
Percentage of pollutant capacity (%)		Total volume (%)	
Any evidence of hydrocarbons (grease/oil) contamination?			YES NO
Any evidence of sewage contamination?			YES NO
Any evidence of any other unexpected contamination?			YES NO
Describe unexpected contamination (if any):			
Any problems cleaning the HumeGard® unit (describe briefly):			
If problems were experienced were they then resolved satisfactorily (describe briefly):			

Contact information

National sales 1300 361 601

humes.com.au

info@humes.com.au

Head Office

18 Little Cribb St
Milton 4064 QLD
Ph: (07) 3364 2800
Fax: (07) 3364 2963

Queensland

Ipswich/Brisbane

Ph: (07) 3814 9000
Fax: (07) 3814 9014

Rockhampton

Ph: (07) 4924 7900
Fax: (07) 4924 7901

Townsville

Ph: (07) 4758 6000
Fax: (07) 4758 6001

New South Wales

Grafton

Ph: (02) 6644 7666
Fax: (02) 6644 7313

Newcastle

Ph: (02) 4032 6800
Fax: (02) 4032 6822

Sydney

Ph: (02) 9832 5555
Fax: (02) 9625 5200

Tamworth

Ph: (02) 6763 7300
Fax: (02) 6763 7301

Victoria

Echuca

Ph: (03) 5480 2371
Fax: (03) 5482 3090

Melbourne

Ph: (03) 9360 3888
Fax: (03) 9360 3887

Tasmania

Launceston

Ph: (03) 6335 6300
Fax: (03) 6335 6330

South Australia

Adelaide

Ph: (08) 8168 4544
Fax: (08) 8168 4549

Western Australia

Gnangara

Ph: (08) 9302 8000
Fax: (08) 9309 1625

Perth

Ph: (08) 9351 6999
Fax: (08) 9351 6977

Northern Territory

Darwin

Ph: (08) 8984 1600
Fax: (08) 8984 1614



National sales 1300 361 601

humes.com.au

info@humes.com.au

A Division of Holcim Australia

This brochure supersedes all previous literature on this subject. As the specifications and details contained in this publication may change please check with Humes Customer Service for confirmation of current issue. This document is provided for information only. Users are advised to make their own determination as to the suitability of this information or any Humes product for their own specific circumstances. We accept no responsibility for any loss or damage resulting from any person acting on this information. Humes is a registered business name of Holcim (Australia) Pty Ltd. HumeGard is a registered trademark of Holcim. "Strength. Performance. Passion." is a trademark of Holcim. HumeGard is marketed, sold and manufactured by Humes under licence from Swinburne University of Technology.

© May 2015 Holcim (Australia) Pty Ltd ABN 87 099 732 297. All rights reserved. This guide or any part of it may not be reproduced without prior written consent of Holcim.