

Appendix E of Planning Proposal

Stormwater Management Plan

Fort Wallace Planning Proposal

Property:
Fullerton Street, Stockton

Applicant:
Defence Housing Australia

Date:
October 2017

Document Control Sheet

Issue No.	Amendment	Date	Prepared By	Checked By
A	Draft	21/11/2016	L Gibbs	A Williams
B	Final	24/11/2016	L Gibbs	A Williams
C	Update Zoning Image	16/12/2016	L Gibbs	A Williams
D	Update Zoning	27/10/2017	L Gibbs	A Williams

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The Client should be aware that this report does not guarantee the approval of any application by any Council, Government agency or any other regulatory authority.

Executive Summary

ADW Johnson has been engaged by Defence Housing Australia (DHA) to prepare a Stormwater Management Plan to support the planning proposal for the proposed rezoning of the development known as Fort Wallace from SP2 to Part R2, Part E3 and Part RE2.

The Stormwater Management Plan specifically addresses stormwater quantity and quality. It has addressed the impacts of the development of the site on the existing drainage regime, determined the stormwater discharge constraints and identified proposed stormwater device measures to adequately treat the stormwater quality prior to discharging from the site.

Based on review of the existing site topography, it has been identified that stormwater discharging from the site will be conveyed to Fullerton Street and discharge across Fullerton Street and Council reserve to the Hunter River South Arm.

The stormwater discharge from the site has been assessed and details have been provided in *Section 5*.

A MUSIC model was used to simulate pollutant source elements for the proposed development to confirm that the stormwater can be adequately treated within the limits of the development. Further details on water quality modelling can be found in *Section 6*. The results from this study demonstrate that there is adequate capacity within the site to achieve the required performance objectives of the stormwater management.

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1.0 Introduction

ADW Johnson has been engaged by Defence Housing Australia (DHA) to prepare a Stormwater Management Plan to support the planning proposal for the proposed rezoning of the development known as Fort Wallace from SP2 to Part R2, Part E3 and Part RE2.

The land subject to this application is located in Stockton adjacent to Fullerton Street to the west Stockton Bight to the east undeveloped land to the south and Stockton Centre to the north. The location of the site is shown in *Figure 1*.



Figure 1 - Site Locality (Google earth).

This report covers the following:

- Existing site and proposed development within *Section 2*;
- Council's requirements for a Stormwater Management Plan within *Section 3*;
- Overview of the proposed development within *Section 4*;
- Stormwater Discharge detailed in *Section 5*;
- Stormwater Quality detailed in *Section 6*; and
- Erosion and Sediment Control during construction outlined in *Section 7*.

2.0 Site Description

2.1 EXISTING SITE

The subject site is located within The City of Newcastle LGA off Fullerton Street at Stockton. The site is located on a sand spit between the Pacific Ocean (Stockton Bight) and the Hunter River South Arm the site is shown in *Figure 2*. The site is previously developed with existing defence structures has a moderate fall from east to west. There is a large existing flat sports field located on the northern end of the site.



Figure 2 - Existing Site.

Based on review of the existing site topography, it has been identified that stormwater discharging from the site will be conveyed to Fullerton Street and discharge across Fullerton Street and Council reserve to the Hunter River South Arm.

2.2 PROPOSED DEVELOPMENT

The planning proposal proposes to rezone the site with a combination R2, E3 and RE2 zones.

The proposed rezoning will allow the redevelopment of the site with a mixture of low and medium density residential lots. The planning proposal allows for Local Parks, water quality treatment devices, public roads and environmental conservation lands.

The planning proposal plan of the site is shown in *Figure 3*.



Figure 3 – Proposed Zoning.

3.0 Council Requirements

The City of Newcastle provides objectives and controls for developments within "The City of Newcastle Development Control Plan 2012" (DCP). Section 7.06 "Stormwater" within the DCP outline relevant controls for subdivision development.

The objectives of Section 7.06 – Stormwater are:

1. *Ensure stormwater is controlled in a way that minimises nuisance to adjoining properties.*
2. *Match post development runoff to the pre development or natural water runoff regime as closely as possible.*
3. *Minimise soil erosion and sedimentation from site disturbance.*
4. *Prevent pollutants such as litter, sediment, nutrients and oils from entering waterways.*
5. *Minimise the potential impacts of development and other associated activities on the aesthetics, recreational and ecological values of receiving waters.*
6. *Ensure appropriate easements are provided over drainage systems on private properties.*
7. *Ensure easements are unimpeded by development for maintenance purposes.*
8. *Protect natural watercourses and their associated ecosystems and ecological processes.*
9. *Incorporate water sensitive urban design elements into the landscape in a manner that provides multiple benefits including: water quality protection; stormwater retention and detention as well as ecological enhancement.*
10. *Provide objectives, targets and controls (where appropriate) for the management of waterfront lands, water use, stormwater and groundwater.*
11. *Ensure stormwater infrastructure is identified on site and can be appropriately maintained.*

Table 1 - Water Quality Targets (The City of Newcastle DCP, 2012)

Pollutant	Targets
Total Suspended Solids (TSS)	85% of average annual load
Total Phosphorus (TP)	65% of average annual load
Total Nitrogen (TN)	45% of average annual load

4.0 Overview

The proposed subdivision has been planned and designed to achieve water cycle management objectives. This process is known as Water Sensitive Urban Design (WSUD). As part of the WSUD approach for this development, the protection of the waterways and management of stormwater within the landscape were key principles. The objectives outlined in the DCP were incorporated in to the development's WSUD.

The proposed development incorporates measures to manage stormwater prior to discharging into the natural drainage system. A stormwater treatment train is proposed to provide appropriate treatment of pollutant prior to discharging to the natural environ, this is detailed in *Section 6*.

Construction activity has potential to impact on the adjacent environment and have a detrimental effect on the natural drainage regime. To maintain this area during construction, erosion and sediment controls will be implemented as outlined in *Section 7*.

5.0 Stormwater Discharge

The existing drainage within the subject site generally falls west towards Fullerton Street. From Fullerton Street the site stormwater discharges across Fullerton Street and Council reserve before entering the Hunter River South Arm.

The proposed rezoning of the site has potential to increase the impervious area within the site. This increase on impervious surfaces will increase the rate of stormwater discharging from the site. The requirements within the DCP “Match post development runoff to the pre development or natural water runoff regime as closely as possible” is in place to ensure the increase in discharge from the site does not impact on the downstream sites.

Due to the proximity of the receiving waters and the fact that there are no downstream properties which would be impacted by increased discharge it is considered unnecessary to detain post development discharge rates to pre developed levels.

The objective of the stormwater controls should be the collection and treatment for water quality.

Any development within the site will be required to address the collection, control and conveyance of stormwater to the receiving waters. This includes the assessment of existing Council stormwater infrastructure for adequate sizing to cater for the sites generated discharge. This assessment is expected to require the upgrade of existing or construction of new assets within the Council owned land to the west of the site adjacent to the Hunter River.

5.1 SEA LEVEL RISE AND CLIMATE CHANGE

The subject site ranges in elevation from RL 2.0m AHD to approximately 7.0m AHD within the proposed development zoned land, and to an elevation of 16m AHD within the dune system to the east of the site proposed for rezoning to E3.

The subject site is separated from the effect of the Hunter River flooding by elevated levels within existing development to RL 6.0m AHD to the west, and is separated from the sea by the dune system to the east.

The Lower Hunter River Flood Study (Greens Rocks to Newcastle) 1994 prepared by Lawson and Treloar on behalf of Port Stephens Council and The City of Newcastle was updated in 2008 by DHI Water and Environmental Pty Ltd on behalf of Newcastle City Council due to increased intensification of development within Hexham area and the use of up to date numerical modelling techniques. The DHI report identified that the 1% AEP flood level at Stockton Bridge with the adopted sea level rise is 1.34m AHD. A sensitivity assessment within the DHI report indicated that with a 20% increase in Hunter River discharge the 1% AEP flood level at Stockton Bridge is 1.51m AHD, this is considered an appropriate assessment of the Hunter River Flood level including sea level rise and Climate Change.

The subject site is above the predicted Hunter River 1% AEP flood level, therefore it is considered that the proposed rezoning of the development is not constrained due to sea level rise of climate change effects.

6.0 Stormwater Quality

The Stormwater management strategy for the site focuses on minimising impact of the development on the receiving waters adjacent to the site. The subject site discharges to the Hunter River South Arm located approximately 60m to the west of the site across Fullerton Street.

6.1 OYSTER AQUACULTURE WATER QUALITY

The 'NSW Oyster Industry Sustainable Aquaculture Strategy' published by the NSW Department of Primary Industries (2016) identifies the proposed discharge area as a 'Priority Oyster Aquaculture Area' within the Hunter River.

The strategy by the NSW Department of Primary Industries (dpi) outlines two main objectives in relation to the water quality of oyster aquaculture land:

- Consider the potential impact of the activity or plan on oyster aquaculture areas; and
- Include specific actions that will contribute to the protection and/or improvement of water quality for oyster aquaculture.

The proposed land rezoning to accommodate residential development as outlined within Section 2.2 will not directly impact the oyster aquaculture area, though stormwater runoff from the site has the potential to harm healthy oyster growth.

Accordingly, the actions required to be undertaken for the proposed land use as outlined with the strategy by dpi include:

- Identification of priority stormwater drains and installation of suitable treatment systems; and
- At source control of stormwater for new developments to reduce stormwater impacts.

It is noted that the existing developed site does not utilise appropriate treatment systems and therefore it is anticipated that suitable provision of treatment will enhance the stormwater quality discharged from the site irrespective of the proposed additional development within the site.

6.2 STORMWATER QUALITY METHODOLOGY

To maintain stormwater quality to the prescribed levels in the DCP and apply the appropriate actions to protect and maintain water quality for oyster aquaculture, a stormwater quality treatment train approach is proposed, where a number of devices are used to cleanse the site discharge prior to discharging to receiving waters.

A MUSIC model was prepared to determine the required land take to facilitate appropriate stormwater treatment devices to achieve Council's water quality targets which align with engineering best practice guidelines.

A typical 1Ha catchment was setup to represent the proposed residential usage.

6.2 MUSIC MODELLING

The MUSIC model included the following treatment train approach:

- Gross Pollutant Trap; and
- Bio filtration basin.

The use of BASIX compliant rainwater tanks is recommended in future modelling, however for the purpose of determining required land take rainwater tanks have been excluded.

It is noted that the above treatment train devices have been adopted for the purpose of determining the appropriate land take required to facilitate the appropriate treatment of stormwater. Alternate devices such as swales, buffer strips, constructed wetlands could be used.

Pollutant source inputs were obtained from the '*Draft NSW MUSIC Modelling Guidelines*' (BMT WBM, 2010). The parameters adopted for the varying land uses were implemented in accordance with Table 3-2 of the above stated document. The rainfall-runoff parameters were updated where appropriate to meet The City of Newcastle's adopted rainfall-runoff parameters within MUSIC-link.

The residential source node within MUSIC has been adopted, with an impervious percentage of 70%.

The parameters used within the MUSIC model are presented below.

Gross Pollutant Traps

GPTs are utilised as conveyance controls, though they can also be used as an end of line control. For the purposes of this model a High Flow Ecosol GPT has been adopted for the 1 Ha catchment. The treatment node was sourced from the Ecosol website. It is required that at detailed design stage, gross pollutant traps be positioned throughout the development to intercept the majority of stormwater discharging from the development while ensuring that the Gross Pollutant Traps are serviceable and remain efficient during smaller duration storm events.

The removal efficiency of the GPT is summarised in *Table 6.1*.

Table 6.1 - GPT Removal Efficiencies (Ecosol)

Pollutant	% Removal Efficiency
Total Suspended Solids	55
Total Phosphorus	40
Total Nitrogen	40
Gross Pollutants(>2000µm)	99

The high flow bypasses for the modelled GPTs have been set to 100L/s based on a conservatively sized Ecosol model.

Biofiltration Basins

Biofiltration basins are utilised as end of line controls treating the water prior to discharging from the site. An area equal to 4% of the developed area has been adopted for the purposes of informing the development outcomes

Table 6.2 – Biofiltration Basin Parameters

Parameter	Catchment Urban
Surface Area (m ²)	500
Extended Detention Depth (m)	0.30
Exfiltration Rate (mm/hr)	0
Filter Area (m ²)	400
Filter Depth (m)	0.40
Saturated Hydraulic Conductivity (sandy Loam)	180
Base Lined	no
Vegetated with Nutrient Removal Plants	yes
Underdrain Present	yes
Submerged Zone	no

6.3 WATER QUALITY RESULTS

The average annual pollutant loads from a generic 1Ha catchment are summarised in *Table 6.3*.

Table 6.3 - Treatment Train Effectiveness

POLLUTANT	RESULT (%)
TSS (kg/yr)	97.7
TP (kg/yr)	66.8
TN (kg/yr)	70.9
GP (kg/yr)	100

From *Table 6.3* it can be seen that the treatment train successfully reduced the pollutant loads.

It is recommended that a whole of site detailed MUSIC model be prepared at future development stages throughout the site to confirm the bio retention basin areas required to treat the catchment based on the ultimate land use.

The results indicate that the inclusion of a GPT and a biofiltration basin of area 400m², adequately control the water quality objectives contained within the DCP, this area of basin equate to 4% of the developed site. Therefore there is sufficient available land within the site to cater for the proposed development of the land.

7.0 Erosion and Sediment Control

The City of Newcastle requires the use of erosion and sediment controls to manage and contain pollutant runoff, both during construction and as long term permanent treatments thus ensuring the minimisation of impact on the environment. All erosion and sediment controls and practices are to be in accordance with Councils DCP and '*Managing Urban Stormwater*' by Landcom/NSW Department of Housing.

Long term permanent treatments are outlined as part of the treatment train within Section 6. The treatment train specified has been shown to sufficiently manage and control the pollutants leaving the development in accordance with Council's pollutant reduction targets.

Erosion and Sediment control devices will be utilised to contain the generated pollutants from the site during construction. These include but are not limited to:

- Sediment Basins;
- Silt Fencing;
- Hay bale and Geotextile Fencing;
- Kerb Inlet Controls;
- Sandbag Kerb Inlet Sediment traps;
- Shaker Ramp; and
- Diversion Drains.

Any clean water entering the site from upstream catchments is to be diverted around the construction site where possible hence remaining clean. Runoff generated from within the site is to be treated and managed using a combination of the above stated treatment devices.

Due to the extents of disturbed areas, the use of sediment basins will be required (Landcom, 2004). During construction, the proposed Biofiltration basins will be utilised as temporary sediment basins. Refer to *Appendix A* for a typical Erosion and Sediment Control Plan.

8.0 Conclusion

ADW Johnson were engaged by Defence Housing Australia to prepare a report detailing Stormwater Management to support the rezoning of Lot 101 DP 1152115 Fullerton Street Stockton from SP2 to Part R2, E3 and Part RE2.

The impact on the existing drainage regime has been assessed in regard to Stormwater discharge, stormwater quality pollutant loads and erosion and sediments controls.

Appropriate erosion and sediment controls implemented to the requirements of The City of Newcastle are required for the construction period to protect downstream receiving waters.

The assessment determined the necessary mitigation measures required to be implemented are able to be readily provided within the subject land. The measures include the construction of stormwater quality devices which are able to adequately reduce pollutant loads to The City of Newcastle's requirements, ensuring protection of existing environment and hydrology.

Appendix A – Erosion and Sediment Control

FIGURE A-1 – EROSION AND SEDIMENT CONTROL PLAN

FIGURE A-2 – EROSION AND SEDIMENT CONTROL TYPICAL DETAILS



- DIVERSION DRAIN - CLEAN WATER
- DIVERSION DRAIN - DIRTY WATER
- SILT FENCE
- NO GO FENCE

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
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drawing title:

APPENDIX A:
EROSION & SEDIMENT
CONTROL PLAN

location:

LOT 5 D.P.233358
FULLERTON STREET,
STOCKTON

council:

NEWCASTLE

dwg ref:

239478(20)-ESK-002_A

client:

DHA

Defence Housing Australia

adw

johnson

central coast office

ph: (02) 4305 4300

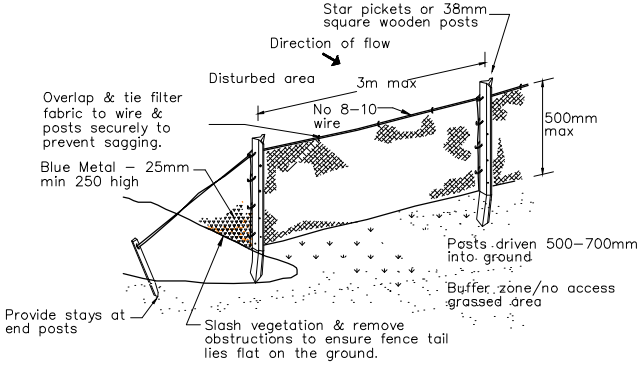
hunter office

ph: (02) 4978 5100

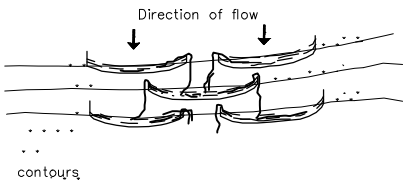
www.adwjohnson.com.au

NOTES:

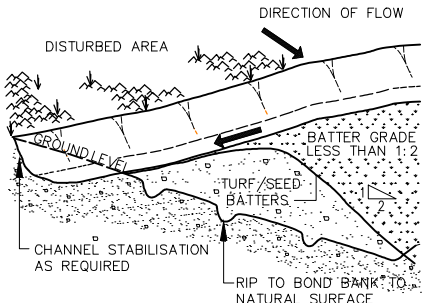
- 1. ALL TOPSOIL IN SITE REGRADING AREAS AND ROAD RESERVES TO BE STOCKPILED AS DETERMINED ON SITE OR AS SHOWN
- 2. ALL TOPSOIL TO BE REMOVED BY EITHER EXCAVATOR OR SCRAPER AND MOVED DIRECTLY TO STOCKPILE LOCATION
- 3. STOCKPILE AREA TO BE FULLY FENCED WITH SILT PROOF FABRIC AT ALL TIMES
- 4. IMPORTED MATERIAL TO BE PLACED DIRECTLY INTO SITE REGRADING AREAS. IMPORTED MATERIAL IS NOT TO BE STOCKPILED
- 5. STOCKPILES ARE TO BE REMOVED AS SOON AS PRACTICABLE AND SITES REINSTATED IMMEDIATELY
- 6. ALL AREAS DISTURBED DURING CONSTRUCTION ARE TO BE RE-INSTATED AND SEEDED IMMEDIATELY
- 7. ALL SITE REGRADING IS TO BE CARRIED OUT UNDER THE SUPERVISION OF A QUALIFIED GEOTECHNICAL ENGINEER
- 8. SILT FENCES AND STRAW BALING TO BE PLACED WHERE DIRECTED BY COUNCIL'S ENGINEER AND MAINTAINED AT ALL TIMES
- 9. WHERE PRACTICAL CATCHDRAINS OR SMALL LEVIES ARE TO BE CONSTRUCTED TO MINIMISE EXTERNAL RUNOFF ENTERING THE SITE
- 10. DISTURBED AREAS TO BE KEPT TO A MINIMUM.
- 11. CONTROL CLEAN WATER FROM ABOVE THE SITE, THROUGH THE SITE AND AROUND THE SITE.
- 12. KEEP CLEAN WATER SEPERATE FROM DIRTY WATER.
- 13. CONSERVE ALL TOPSOIL, STOCKPILE AND PROTECT FOR REUSE ON SITE.
- 14. PROTECT ALL DISTURBED AREAS FROM EROSION.
- 15. MINIMISE SEDIMENTATION.
- 16. MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL COMPLETE REHABILITATION IS ACHIEVED.
- 17. OBTAIN COUNCIL'S PERMISSION BEFORE CLEARING OF ANY TREES.
- 18. AN ONSITE MEETING WITH COUNCIL'S SOIL CONSERVATION CONSULTANT PRIOR TO COMMENCEMENT OF WORK WILL BE REQUIRED
- 19. MAXIMUM HEIGHT OF TOPSOIL STOCKPILE IS TO BE 2.0 METRES.
- 20. MAXIMUM SIDE SLOPE OF STOCKPILES TO BE 2H:1V



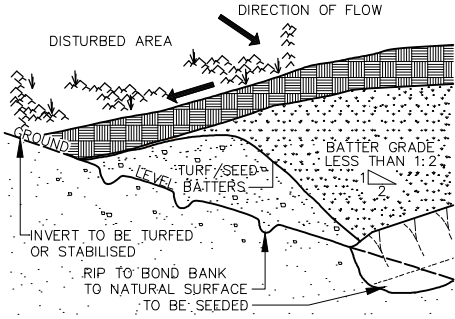
SILT FENCE



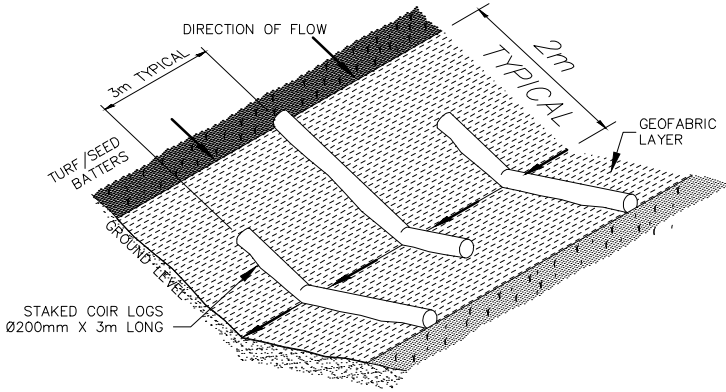
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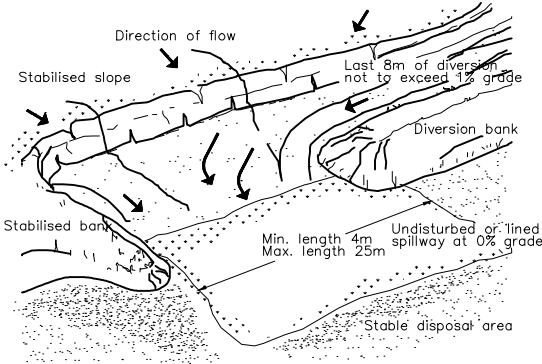
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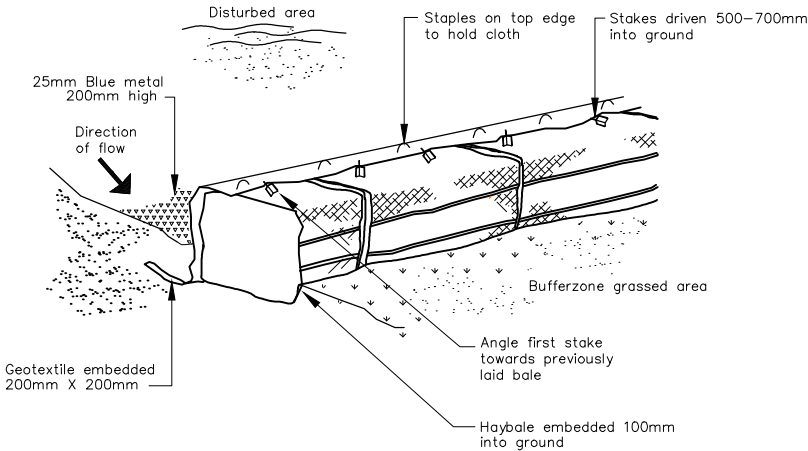
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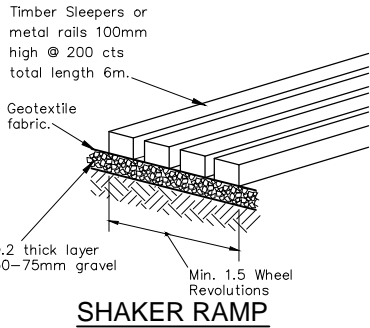
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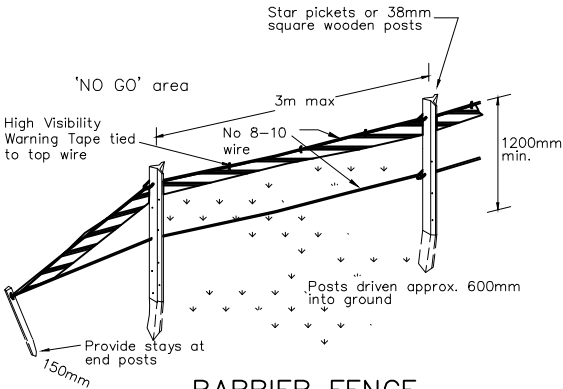
LEVEL SPREADER



STRAWBALE & GEOTEXTILE FENCE



SHAKER RAMP



BARRIER FENCE

drawing title:

APPENDIX A:
EROSION & SEDIMENT
CONTROL DETAILS

location: LOT 5 D.P.233358
FULLERTON STREET,
STOCKTON

council: NEWCASTLE

dwg ref: 239478(20)-ESK-002_A

client:



central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100

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ver.	date	comment	drawn	pm	level information	scale (A3 original size)
A	30.11.16	INITIAL ISSUE	Z.J.	A.W.	DATUM: N/A CONTOUR INTERVAL: N/A	NOT TO SCALE