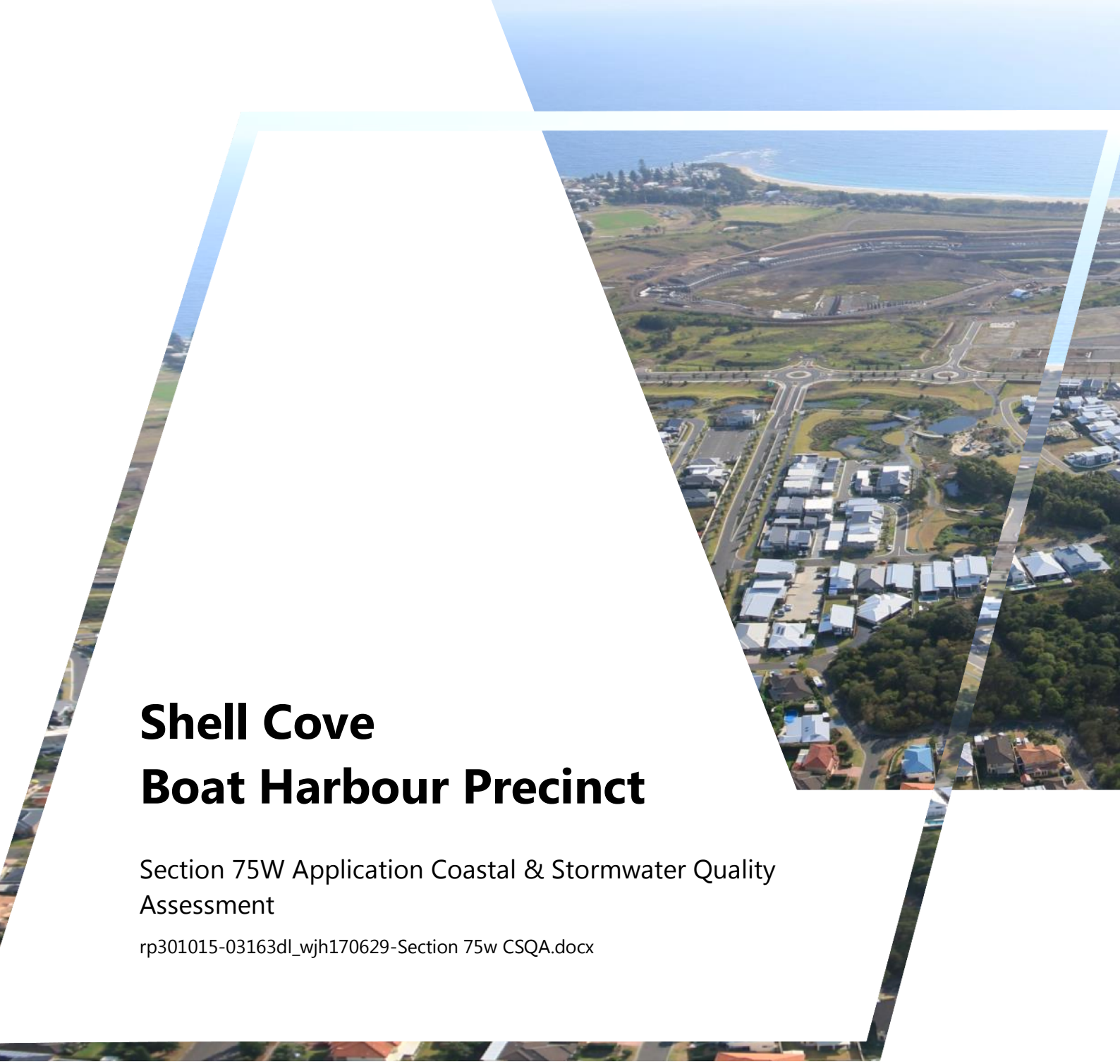

Shell Cove
Boat Harbour Precinct

Section 75W Application Coastal & Stormwater Quality Assessment

rp301015-03163dl_wjh170629-Section 75w CSQA.docx

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Advisian
WorleyParsons Group

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Project No: 301315-03163 – Shell Cove Boat Harbour Precinct: Section 75W Application Coastal & Stormwater Quality Assessment

Rev	Description	Author	Review	Advisian Approval	Date
0	Internal Review	DL & EH D Lam & E Han	WJH W Honour		2 May 2017
1	Issued for Client Review	DL & EH D Lam & E Han	WJH & AFN W Honour & AF Nielsen		12 May 2017
2	Final Report	DL & EH D Lam & E Han	WJH W Honour	CRT C Thomas	6 July 2017

Table of Contents

1 Introduction

Frasers Property Australia (FPA) intends to submit a modification to the Shell Cove Boat Harbour Concept Plan Approval (MP 07_0027) under Section 75W of the Environmental Planning and Assessment Act 1979.

The proposed modifications relate primarily to an increase in the density of dwellings across the Boat Harbour Precinct, including changes to the proposed hotel and residential apartment buildings at Precinct D. The modifications also capture various refinements to the road pattern and layout across the Boat Harbour Precinct.

WorleyParsons (now Advisian) prepared a report titled, *Support Information on Coastal Processes and Water Cycle Management* in 2009 as part of the original Concept Plan Application and Environmental Assessment for the Shell Cove Boat Harbour Precinct. This report included a *Stormwater Quality Management Strategy*.

Since this time, Advisian has been engaged by FPA to develop an updated *Stormwater Quality Management Strategy* for the Boat Harbour Precinct as the concept and detailed designs for individual precincts around the boat harbour has progressed.

The updated Strategy is still in preparation and has been evolving during the DA process for each sub-precinct. FPA has commissioned Advisian to prepare the following report to identify and assess the modifications to the Boat Harbour Precinct made since approval of the Concept Plan in 2010 in terms of their impact on coastal processes and stormwater quality management.

This report also serves to identify changes to the proposed water quality treatment measures since the Concept Approval and to confirm that the required treatment objectives are still being met.

It is anticipated that the stormwater quality masterplan for the development will continue to evolve and be refined as the detailed design for each of the development precincts is further progressed. Accordingly, further refinement of the Stormwater Quality Management Strategy may be required in future. Notwithstanding the evolving nature of the development design, any future revisions of the Strategy will be configured such that the established water quality targets for the development are achieved.

2 Section 75W Changes

The Section 75W modifications can generally be described as refinements to the road pattern and layout, and increases in the density of the proposed housing.

2.1 Evolution of the Development Layout

Evolution of the development design since the Part 3A Concept Approval has resulted in modifications to the proposed development terrain levels in areas and the associated stormwater drainage network, including the major flow conveyance systems. These modifications have been captured and discussed in a separate Section 75W Flood Assessment report by Advisian (2017).

The potential impact on coastal processes and coastline hazards is addressed in Section 3 below.

2.2 Evolution of the Proposed Stormwater Treatment Train

Evolution of the development layout and design since the Part 3A Concept Approval has also resulted in modification to the proposed stormwater quality management strategy (*refer* **Figure 1**). These changes include:

- A refinement in sub-catchment layout to account for changes in terrain and drainage design;
- The removal of the bio-retention swales:
  - in the vicinity of the waste cell and Precinct B1 and B2 (previously named Catchment A1, A Rural 1, A Rural 2 and A Rural 3);
  - at Precinct D (Southern) (previously named Catchment B and Catchment C);
- The removal of water quality treatment properties of Wetland 6, the Northern Swale (previously named Bio-retention G1) and the Overland Flow Channels (previously named Bio-retention G2 and Bio-retention F2); and,
- The addition of gross pollutant traps and proprietary tertiary treatment devices at various locations within the Boat Harbour Precinct in lieu of the above bio-retention systems that have been removed.

These modifications to the development have been captured in the latest MUSIC water quality model by Advisian, as a part of ongoing work to prepare concept and detailed designs for each precinct. It is anticipated that the proposed treatment system will continue to evolve and be refined as the detailed design for each of the development precincts is further progressed. Any future revisions of the treatment train will be configured such that the established water quality targets for the development are achieved.

FIGURE 1

LEGEND

- 2017 CATCHMENT BOUNDARY
- RESERVE AREA
- WETLAND
- RIPARIAN CORRIDOR
- REMNANT VEGETATION
- RECREATION AREA
- PIONEER MOUNDS
- RURAL AREA
- QUARRY AREA
- BIORETENTION BASIN
- GROSS POLLUTANT TRAP
- HUMES JELLYFISH

NOTES

1. THE DETAILS OF WETLAND 8 AND THE OVERFLOW CHANNELS ARE BEING FINALISED.
2. ALL FLOWS FROM THE FOLLOWING PRECINCTS TO PASS THROUGH A CDS PRIOR TO DISCHARGE TO HARBOUR:
   A1
   A2
   B1
   B2
   C1
   C2
   D (SOUTHERN)
   CORRIDOR BETWEEN A1 AND A2
   CORRIDOR BETWEEN A2 AND B1
   CORRIDOR BETWEEN B1 AND C1
   A COMMERCIAL WEST
   10D2 – 10D5
   G (EASTERN)
   H (WESTERN)

   THE AS–DRAWN LOCATIONS OF THE ABOVE ARE INDICATIVE AND ARE SUBJECT TO THE UPSTREAM PIT AND PIPE STORMWATER ARRANGEMENT ASSOCIATED WITH THE RESPECTIVE CATCHMENTS.

   THE NUMBER REQUIRED MAY BE REFINED DEPENDING ON THE UPSTREAM PIT AND PIPE STORMWATER ARRANGEMENT ASSOCIATED WITH THE RESPECTIVE CATCHMENTS AND THE PIT AND PIPE INTERACTION BETWEEN THE VARIOUS CATCHMENTS.

CDS AND JELLYFISH 5
CDS
WESTERN OVERLAND FLOW CHANNEL WITH PARALLEL HYDROCON PIPES AND SAND FILTERS EITHER SIDE OF THE OVERLAND FLOW CHANNEL (WITH CDS UNITS UPSTREAM OF HYDROCON PIPES)
CDS AND JELLYFISH 6
ECOSOL AND WETLAND No. 7 (900m²)
CDS AND JELLYFISH 2
CDS AND BIO RETENTION E
CDS AND JELLYFISH 1
WETLAND No. 5 (8,000m²) (EXISTING)
ECOSOL RSF 4600 AND RSF 4450 (EXISTING)
CDS P1009L & ECOSOL RSF 4300 (EXISTING)
CULVERT BASKET (EXISTING)
WETLAND No. 1 (5,955m²) (EXISTING)
WETLAND No. 3 (5,100m²) (EXISTING)
WETLAND No. 2 (POND 2 – 1,001m²) (POND 1 – 608m²) (EXISTING)
ECOSOL 9000 (EXISTING)
TRASH SCREEN/RACK (EXISTING)
WETLAND No. 1A (3310m²) (EXISTING)
MDB1 POND 1 (3,520m²) (EXISTING)
CDS P1012R (EXISTING)
MDB1 POND 2 (2,600m²) EXISTING
ATLANTIS SWALE (EXISTING)
CDS P0708 (EXISTING)
ATLANTIS SWALE (EXISTING)
CDS P1009R (EXISTING)
ECOSOL GPT 4600 (EXISTING)
CDS AND JELLYFISH 7
EASTERN OVERLAND FLOW CHANNEL AND CULVERT WITH PARALLEL HYDROCON PIPES AND SAND FILTERS EITHER SIDE OF THE OVERLAND FLOW CHANNEL AND CULVERT (WITH CDS UNITS UPSTREAM OF HYDROCON PIPES)
CDS AND JELLYFISH 3 & 4
ENVIROPOD AND WETLAND 8 (200m²)
CDS
CDS AND BIO–RETENTION PRECINCT H EASTERN (900m²)
CDS
CORRIDOR BETWEEN PRECINCT A1 & A2
A COMMERCIAL WEST
A COMMERCIAL EAST
A RURAL
STORMWATER STRATEGY FOR COMMERCIAL EAST CATCHMENT SUBJECT TO FURTHER INVESTIGATION NB: ASSUMED BIO–RETENTION APPROXIMATELY 3% OF CATCHMENT AREA (2000m²) BIO–SWALE 500m LONG, 4m WIDE
TO BASS POINT

SHELLHARBOUR TOWNSHIP
E1
E2
E3/E5
F1
F2 (EASTERN)
F2 (WESTERN)
PRECINCT E (NORTHERN)
PRE F (N-W)
PRE F (N-E)
PRE F (S-W)
PRE F (S-E)
PRE G (N-W)
PRE G (S-W)
PRECINCT E (CENTRAL)
PRECINCT E (SOUTHERN)
PRECINCT G (EASTERN)
PRECINCT H (E)
PRECINCT H (W)
PROPOSED HARBOUR
PRECINCT D (NORTHERN)
PRECINCT D (CENTRAL)
PRECINCT D (SOUTHERN)
PRECINCT C2
PRECINCT C1
PRECINCT B2
PRECINCT B1
PRECINCT A2
PRECINCT A1
BOAT FACILITIES
10D2-10D5
SHELLHARBOUR SOUTH BEACH
TASMAN SEA
BOULEVARDE
CROSS
ROAD
HAUL
BASS POINT

100 0 100 200 300 400 500m
1:5000 (A1) 1:10,000 (A3)

ISSUE	DATE	ISSUE DESCRIPTION	DRAWN
D	02.05.17	ISSUED FOR APPROVAL	VIP
C	22.03.17	ISSUED FOR APPROVAL	VIP
B	25.02.16	ISSUED FOR PRECINCT D STAGE 1 ROADS DA APPROVAL	PC
A	23.02.16	ISSUED FOR CLIENT REVIEW	EN

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NORTH

SHELL COVE BOATHARBOUR PRECINCT
STORMWATER QUALITY TREATMENT STRATEGY

301015-03163-CI-DSK-1552

LOCATION: W:_INFRASTRUCTURE\PROJECTS\301015\03163 AUSTRALAND - SHELL COVE DA ADVICE\12.0 DRAWINGS\SKETCHES\301015-03163-CI-DSK-1552.DWG
USER NAME: vaughan.patrick CTB FILE: Worley-Full.ctb Plotter-None
PLOT DATE & TIME: 2/5/2017 5:29:01 PM
SAVE DATE & TIME: 2/5/2017 5:24:07 PM

2.3 Changes to Development Densities

The following changes to the development density are proposed:

- Increase the maximum number of dwellings from 1,238 to 1,556, and delete the maximum GFA cap of 150,000m^2;
- Relocate the proposed Shell Cove Town Centre hotel, increase its maximum height from 9 storeys to 11 storeys, and incorporate flexibility to accommodate serviced and residential apartments in the hotel building;
- Remove community and hotel uses from the maximum 22,000m^2 GFA cap for retail/commercial/hotel/community development;
- Increase the maximum height of the residential flat buildings from 4 storeys to 6 storeys in parts of the Town Centre and key foreshore locations; and
- Revise the housing density and typologies across Shell Cove.

The above changes have been incorporated appropriately into the revised MUSIC modelling of water quality treatment measures. Further information is provided in Section 4 below.

3 Coastal Processes

Review of proposed modifications has been undertaken against the assumptions and impacts of the following documents:

- *Shell Cove Boat Harbour Precinct, Concept Plan Application and Environmental Assessment* (LFA (Pacific) Pty Ltd, February 2010), *Appendix B – Coastal Processes and Water Cycle Management (WorleyParsons, September 2009)*;
- *Shell Cove Boat Harbour Precinct, Concept Plan Application and Environmental Assessment – Supporting Information on Coastal Processes, Response to Submissions* (WorleyParsons September 2010, lt01089-95gwb_prh100917coastal processes responses.doc);
- *Shell Cove Boat Harbour Precinct (MP07_0027) - Preferred Project Report* (LFA, November 2010).

The above reports address a number of key issues relating to coastal processes as outlined in the Director General's Environmental Assessment Requirements for preparation of a Concept Plan Application for development of the Shell Cove Boat Harbour Precinct. These key issues comprise:

- Coastal processes: - coastal hazards and provisions of the Coastline Management Manual, including consideration of climate change; and,
- Consistency with relevant legislation and policy relating to the coast, wetlands, rivers and estuaries.

3.1 Coastline Hazards

There are eight coastline hazards referred to in the *Coastline Management Manual and the Shellharbour Coastal Hazard Study* (*SMEC, April 2010*) that were considered as part of the original 2010 Concept Plan Application:

- beach erosion;
- shoreline recession;
- coastal entrance behaviour;
- sand drift;
- coastal inundation;
- slope and cliff instability;
- stormwater erosion; and
- climate change.

These hazards do not have potential to affect the proposed building development within the Boat Harbour Precinct and, generally, impacts would be confined to areas seaward of Boollwarroo Parade / Bass Point Tourist Road.

Further discussion of each coastal hazard in the context of the latest Section 75W development configuration / layout is provided in the following.

3.1.1 Beach Erosion and Shoreline Recession

Beach erosion affects areas well seaward of Boollwarroo Parade / Bass Point Tourist Road. Typically, the landward limit of beach erosion is at least 60 to 80 m east of Boollwarroo Parade / Bass Point Tourist Road. All lands of the approved Shell Cove Boat Harbour Precinct, including residential, commercial and hotel developments, are well landward of Boollwarroo Parade/Bass Point Road.

The proposed residential, commercial and hotel developments will be located well landward of the combined erosion and recession hazard limit up to the year 2100.

3.1.2 Coastal Entrance Behaviour

Coastal entrance behaviour hazard is confined to the Boat Harbour entrance and adjacent beaches. The original investigations and studies demonstrated that the proposed entrance works would induce a minor re-alignment of the beach but be unlikely to have any detrimental effect on beach stability, which would be managed appropriately by the Beach Nourishment / Rehabilitation Management.

3.1.3 Sand Drift

Sand drift hazard is related to the dune system along Shellharbour South Beach and would be managed by the Beach Nourishment / Rehabilitation Management such that it does not become a significant coastline hazard for the Boat Harbour Precinct.

3.1.4 Coastal Inundation

The inundation hazard to the Boat Harbour Precinct due to wave overtopping of the dune crest level along Shellharbour South Beach is not considered significant as it would be managed by the following:

- infiltration of any overtopping flows into the sandy dune system between the dune crest and Boollwarroo Parade/ Bass Point Tourist Road;
- the drainage system in the Boollwarroo Parade / Bass Point Tourist Road would serve to collect any overtopping flows, although it is considered unlikely waves would ever reach this far landward within a planning period of 100 years.

3.1.5 Slope and Cliff Instability

It has been established that beach erosion along Shellharbour South Beach in a severe storm event, occurring at the end of a planning period of 100 years taking into account a 'High' sea level rise scenario, would still be well seaward of proposed development in the Boat Harbour Precinct

and well seaward of Boollwarroo Parade / Bass Point Tourist Road. There are no cliffs or bluffs along the seaward edge of the Boat Harbour Precinct.

3.1.6 Stormwater Erosion

As originally proposed, the majority of stormwater flows from the Boat Harbour Precinct (and upstream catchments) will enter the Boat Harbour and then flow to the sea through the trained entrance channel.

The minor exception to the above is the stormwater from the south eastern corner of the site termed the 'A Commercial East' catchment (refer **Figure 1**), which is not affected by any of the proposed modifications in this application. As originally proposed, stormwater from this catchment will be directed to the foreshore south of the Boat Harbour entrance through an existing stormwater culvert under the Bass Point Tourist Road and into an existing swale at the back of the beach.

Discussion of the stormwater quality management system for the Boat Harbour Precinct is included in Section 4.

3.1.7 Climate Change

The proposed development within the Boat Harbour Precinct would not be threatened by coastal processes over a planning period of 100 years and beyond, including with consideration of possible future sea level rise. This outcome is not affected in any way by the Section 75W modifications.

Potential impacts of climate change on Shellharbour South Beach would be managed by the Beach Nourishment / Rehabilitation Management Plan.

3.2 Consistency with Relevant Legislation and Policy

At the time of preparation of the original Concept Application (February 2010), the proposed development was considered for consistency with the following:

- Water Management Act 2000;
- NSW Coastal Policy 1997;
- NSW Wetlands Management Policy;
- NSW State Rivers and Estuaries Policy;
- NSW Estuary Management Policy;
- NSW Draft Sea Level Rise Policy Statement (NSW Governments Coastal Risk Planning Benchmarks).

The objectives and management of the above legislation and policies have not changed since the time of the original Concept Application in 2010, with the exception of the NSW Draft Sea Level Rise Policy Statement (NSW Governments Coastal Risk Planning Benchmarks).

The NSW Sea Level Rise Policy Statement (*DECCW, 2009*) included sea level rise planning benchmarks of 0.4m for year 2050 and 0.9m for year 2100 (both relative to 1990), effectively allowing for consideration of sea level rise over different timeframes. These benchmarks were adopted as part of the 2010 submission. The sea level rise planning benchmarks were incorporated into the assessment of the projected impacts of sea level rise on flood risk and coastline hazards. Note that there is considerable uncertainty regarding these values, and future sea level rise could be smaller or larger than indicated by the benchmarks.

The NSW Sea Level Rise Policy Statement is no longer NSW Government policy (as initially announced in September 2012), and reference in NSW Government documents to the Statement should be taken as referring to sea level rise projections adopted by the relevant local Council. At this time, Advisian is not aware of any resolution by Shellharbour City Council to adopt any specific sea level rise benchmarks.

The NSW Chief Scientist and Engineer (2012) completed an assessment of the science behind the NSW Government's former sea level rise planning benchmarks. It was found that the way the science had been used to determine the benchmarks was adequate, but that improved models would be developed over time that may refine or localise the benchmarks.

Coastal Councils have been advised through the Office of Environment and Heritage, and based upon advice provided by the Crown Solicitor, to "consider information on historical and projected future sea level rise that is widely accepted by competent scientific opinion" when determining local future hazards which may be affected by sea level rise. As far as Advisian is aware, many Councils are continuing to apply the former benchmark values for planning purposes (such as Gosford, Pittwater and Warringah), although Wyong Council and Sutherland Shire Council are exceptions.

Adoption of the former NSW Government planning benchmarks is still considered reasonable for planning purposes. These values have been included in the determination of the combined erosion and recession hazard and in determination of the coastal inundation hazard as part of the 2010 submission. The Section 75W modifications to the development layout and densities will not alter the potential impact of sea level rise (or lack thereof) on the development.

Accordingly, it is considered that compliance with coastal risk planning benchmarks has been addressed satisfactorily and the assumptions in the assessment of coastline hazards remain consistent with the 2010 submission.

3.3 Impact of Proposed Section 75W Modifications

Increase the maximum number of dwellings from 1,238 to 1,556, and delete the maximum GFA cap of 150,000m2

The proposed dwellings are to be located landward of Boollwarroo Parade / Bass Point Tourist Road at a significant distance from the coastline, which means there would be no change to the impacts and proposed management of coastline hazards.

Relocate the proposed Shell Cove Town Centre hotel, increase its maximum height from 9 storeys to 11 storeys, and allow flexibility for the building to accommodate serviced and residential apartments in the hotel building

The relocated and originally proposed Shell Cove Town Centre hotel are both located within the Boat Harbour Precinct landward of Boollwarroo Parade / Bass Point Tourist Road at a significant distance from the coastline areas affected by coastline hazards. Accordingly, there will be no change to the impacts and proposed management of coastline hazards.

Remove community and hotel uses from the maximum 22,000m^2 GFA cap for retail/commercial/hotel/community development;

Not applicable to any coastline hazards.

Increase the maximum height of the residential flat buildings from 4 storeys to 6 storeys in parts of the Town Centre;

Not applicable to any coastline hazards.

Revise the housing density and typologies across Shell Cove

Not applicable to any coastline hazards.

Refine the road pattern and layout

The refinements to the road pattern and layout since the original submission are located largely landward of Boollwarroo Parade / Bass Point Tourist Road and, hence, do not impact on coastline hazards.

The minor changes to Boollwarroo Parade / Bass Point Tourist Road relate to minor changes in the road alignment and changes to the side roads connections. These modifications will have no significant impact on the proposed drainage system in the road, which would continue to capture and divert stormwater to the Boat Harbour, which will then flow to sea through the trained entrance channel.

Accordingly, there will be no impact on coastal inundation hazard (or potential stormwater erosion hazard) and the previous management measures for coastal inundation would be retained.

As discussed above, the area of the site termed 'A Commercial East' is not affected by the proposed modifications addressed in this application. The original proposal for discharge of stormwater to an existing culver under Bass Point Tourist Road and into an existing swale at the back of the beach has been retained.

4 Stormwater Quality Management Strategy

The Stormwater Quality Management Strategy prepared by WorleyParsons (2009) for the Boat Harbour Precinct included a summary of the water quality treatment measures required across the entire Shell Cove development. Australand Corporation (NSW) Pty Ltd (now Frasers Property Australia) included this strategy in the Part 3A application for the Boat Harbour Precinct.

WorleyParsons developed the 2009 strategy using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software package. MUSIC conceptually simulates the performance of a series of stormwater treatment measures (often referred to as a "treatment train") to assess whether a proposed water quality strategy meets specified water quality objectives.

Since the development of the 2009 Stormwater Quality Management Strategy, the details of the proposed development at the Boat Harbour Precinct have evolved through the concept and detailed design stages. Current best practice advocates for treatment systems to be configured in an off-line arrangement where possible, and to be sized to treat frequent flows associated with minor storm events only. In addition, the proposed changes in development densities affect rainwater tank sizing and stormwater reuse demands. For these reasons, the 2009 MUSIC model has been updated as a part of preparing the Section 75W Application.

The catchment delineation used in MUSIC and location of proposed water quality treatment devices are shown in **Figure 1**.

4.1 Water Quality Objectives

Two objectives were identified for the updated strategy, consistent with those for the original strategy:

1) Ensure that the annual pollutant load export to the proposed Boat Harbour in the developed state does not exceed the export from the existing (pre-development) conditions.
2) Achieve the following pollutant percentage reductions in load from the developed site by way of the proposed treatment measures, as presented in the *Managing Urban Stormwater: Council Handbook* by the EPA (1997):
    - Total suspended solids (TSS) – 80%
    - Total phosphorus (TP) – 45%
    - Total nitrogen (TN) – 45%

4.2 Proposed Stormwater Treatment Train Performance

The MUSIC modelling indicates that the current strategy, taking into consideration the changes to development densities, will result in the two design objectives being met. This is evident in **Table 1**, whereby the pre and post development stormwater pollutant loads are compared to show that the post-development pollutant loads (*with treatment*) will be less than or equal to the pre-development loads.

The pollutant percentage reduction targets are also met when considering the post-development loads with and without treatment, as shown in **Table 2** .

Table 1 – Pre and Post-Development Stormwater Pollutant Loads at the Harbour

Pollutant	Pollutant Load (kg/yr)	
	Pre-Development	Post-Development
TSS	70,500	50,400
TP	202	183
TN	1,840	1,840

Table 2 – Reductions in Pollutant Loads afforded by Proposed Treatment Measures

Pollutant	Reduction in Pollutant Loads (%)	
	EPA Target	Current Strategy
TSS	80	80.4
TP	45	59.2
TN	45	46.6

4.3 Comparison to Original Concept Performance

A comparison between the current and the original Concept stormwater treatment train performance has been made, and is shown in **Table 3**. The results show that the currently proposed stormwater treatment train achieves similar reductions in pollutant loads in the boat harbour as the previously approved Concept (*relative to post-development conditions with no treatment*).

There is a minor decrease in the effectiveness of the strategy to reduce TSS and TN loads, but the water quality management objectives discussed above are still being met. The latest strategy shows an increase in the treatment effectiveness for TP.

Table 3 – Comparison of Stormwater Treatment Train Performance

Pollutant	Reduction in Pollutant Loads (%)	
	Part 3A Concept	Current Strategy
TSS	82	80.4
TP	57	59.2
TN	47	46.6

5 Conclusions

The assessments undertaken as a part of this report have shown that the Section 75W changes to the terrain, layout and increased development density within the Shell Cove Boat Harbour Precinct will not result in any adverse impacts to coastal processes or stormwater quality beyond that documented in the report titled, *Support Information on Coastal Processes and Water Cycle Management* (WorleyParsons, 2009), prepared as Appendix B of the Shell Cove Boat Harbour Precinct Concept Plan Application and Environmental Assessment.

Stormwater quality modelling results have determined that the post-development pollutant loads (*with treatment*) will be less than the pre-development loads, and the pollutant percentage reduction targets will be met when considering the post-development loads with and without treatment.