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6 February 2007

**Attention: Sarah Kelly**

Dear Sarah

**SURVEY STREET, LENNOX HEAD – WATER MANAGEMENT**

This letter addresses the water management issues raised in the Department of Planning *(DoP)* letter dated 4 December 2006 and the related submissions with respect to the Environmental Assessment for the above residential subdivision.

The majority of issues revolve around the proposed strategy for management of stormwater and natural seepage water. A number of misunderstandings need to be clarified at the outset as these will address the majority of issues. Three drawings are attached to assist clarify the proposed stormwater system. A schematic is provided in **Figure 1** to clarify the connections between elements and between different systems. The various stormwater elements are presented in plan view in **Figure 2** to show the physical layout and connections between these elements. The cross section of the stormwater system clarifies the vertical relationship of various elements (refer **Figure 3**).

These clarifications are:

- pipe drainage from houses/lots will connect either to interallotment pipe drainage or directly to street pipe drainage;
- the runoff collection drains across the rear of some lots were included to capture surface runoff not collected in the lot pipe drainage system. These would drain to the interallotment pipe drainage system and are not to encourage infiltration into the subsoils. They have been renamed runoff collection drains. Coffeys have reviewed their function and indicated that they will not adversely impact on slope stability;
- the seepage will be collected in trench drains and will be separate and independent of the street drainage system. The drainage pipes from these trenches will direct seepage to the seepage distribution trench gravel drain (refer **Figure 2**). This trench will permit gradual and distributed overflow and seepage of this water along the creekline to replicate the boggy nature experienced in the existing conditions. In this way, the boggy nature of this area adjacent the creekline will be maintained. This is the dominate hydrological process

affecting the Hairy Joint Grass and the hydrology experienced by the grass will not be changed;

- the seepage water in the trench drain will not flow into the raingardens but under them to the seepage distribution trench gravel drain;
- the base of the raingarden would be located above the groundwater level. The raingardens do not rely on infiltration to the subsoils so the presence of the groundwater will not adversely impact on the operation of the raingardens.

Each water management issue raised in the attachments to the DoP letter are addressed in the following sections in order as they occurred in the attachments.

## 1. Attachment No. 1

- *"significant impact on downstream areas, in terms of scour from additional stormwater runoff."*

  The peak flow of runoff from the site will be maintained in the development at existing rates as required by Council's policies. The maintenance of existing peak flow rates will not result in increased scour in downstream areas.

- *"the proposed drainage is inadequate and will impact the downstream wetlands.*

  The drainage has been designed to best practice guidelines including Council's policies. It maintains existing peak flow rates and reduces runoff pollutant levels below existing levels. This will ensure no significant adverse impacts on the downstream wetlands.

- *"the proposed drainage system is inadequate to cater for potential volumes of water."*

  The proposed drainage systems have been designed to best practice guidelines including Council's policies. The drainage system has been designed to cater for all flows up to the 100yr ARI flood ie. 1 in 100yr event. The creekline and road crossing can accommodate the absolute worst flood known as the probable maximum flood *(PMF)*.

- *the raingardens have potential to cause safety concerns for children when inundated there is a risk of children drowning in ponds.*

  All stormwater infrastructure presents a safety risk during storms and this is addressed with good design and signs where necessary. The raingardens will only temporarily pond water for a matter of hours. Nonetheless, the safety risk will be addressed with good design and signs warning of potential ponding. The design will be in accord with Council's guidelines for raingardens.

## 2. Attachment 2 – Ballina Council Submission dated 30 Nov 2006

**"Stormwater Management"**

1. The runoff collection drains *(previously called infiltration trenches)* would not promote infiltration into subsoils. They will direct collected surface runoff into the interallotment pipe drainage system. Runoff from houses and paved areas will be discharged directly to the interallotment pipe drainage system not to the runoff collection drains. Coffeys have confirmed that this drainage system would not adversely impact on slope stability.

2. Potential scouring of the swale would be addressed at the detailed design phase with appropriate inclusion of rock scour protection where velocities are excessive.

3. The trench drain capacity to accommodate seepage would not be reduced by the runoff collection drains. The flow in the runoff collection drains would discharge to the interallotment pipe drainage not the seepage trench drain. The two systems would be separate elements.

4. The base of the raingardens would be located above the groundwater level and their performance would not be adversely affected due to groundwater. The raingardens provide their own drainage media for filtering runoff and do not rely on infiltration into the surrounding subsoils.

5. Penetration of tree roots through the geotextile layer would not present a significant problem for operation of the raingarden. The impermeable liner is not required for this site and could be deleted.

6. All drainage connections have been clarified in the attached **Figures 1** to **3**. The low flow from the raingardens would be discharged to the seepage distribution trench gravel drain. This would permit a slow and evenly distributed overflow and seepage to the creek which would not cause scour.

7. The high flow discharge from the raingardens has been clarified in **Figure 2**. Each pond would be independent with flow over a long discharge weir to distribute the flow over a wide area and provide scour protection.

8. Further detail is provided in this submission to clarify that stormwater would be discharged from the development in a controlled manner.

9. The applicant has agreed to extend the water quality monitoring from 2 to 5 years after completion of the subdivision works.

10. The assertion by Council of the hydrologic modelling assuming 99% of the site is impervious areas for the existing site conditions is a mistake. The existing site is included partly in subcatchments S1, S2 & S3 as shown in **Appendix B** in the Patterson Britton's Water Cycle Management report dated Sept 2006. The percentage impervious area adopted for these subcatchments is presented in **Table 4.1** as between 0% and 10%. **Appendix D** presents the RAFTS modelling data in which for example the subcatchment S1 *(0.51ha)* is allocated a 99%

impervious area over 0.03ha and 1% impervious area over 0.48ha giving an effective percentage impervious area over the whole subcatchment of around 6.8%.

11. As described above, the groundwater level will not affect the performance of the stormwater system as it will not affect the pervious nature of the raingardens or swales. The seepage and drainage systems will be separate with the seepage system not connected to the drainage system.

    As such, the seepage would not increase the volume of water moving through the drainage system.

12. The seepage water would not be diverted into the raingardens as shown on the attached plans.

**"Geotechnical"**

1. There is no excessive cut and fill proposed for the residences. The house designs depicted step down the slope to alleviate the need for excessive cut and fill. This issue is also covered in the proposed DCP.

2. The applicant has agreed to an experienced geotechnical engineer supervising the location and installation of the subsoil drainage system for the seepage. This can be included in the proposed DCP.

3. The roof waters from houses would be discharged to interallotment or street pipe drainage. Coffeys has confirmed that the runoff collection drains connected to the interallotment pipe drainage would not adversely impact on slope stability.

4. The applicant has agreed to include the requirement in the DCP for a geotechnical engineering report to support excavation for house foundations beyond that recommended in the DCP.

5. No evidence has been derived from the extensive geotechnical studies of the site to suggest uncontrolled clearing, excavation or burial of debris on lots 19 to 33 to warrant further geotechnical investigations.

**"Future Driveway Access and Garage Construction"**

Driveway construction has been addressed for lots with land higher than the proposed roads. It was proposed that for Lots 12 *(southern dwelling)* 37, 40 to 44 that driveways and garages would be constructed on suspended structures as per the proposed houses. This form of construction for steep lots is typical.

The applicant has committed to further refinement of the Road 1 design at the construction certificate stage to explore the potential to lower the pavement levels to minimise the height of these suspended structures.

**"Ecological Issues"**

4. *Change to the hydrological characteristics of the ecological polygon containing the hairy jointed grass*

   The hairy jointed grass appears to be located in the wet/boggy area created by seepage water. They are also located on the creek banks which experience rainfall induced runoff from the site. These are the full hydrological conditions.

   The hairy jointed grass would continue to experience the same hydrological conditions because:

   - the same seepage water would reach the area immediately upstream of the ecological polygon and would be distributed over the same area. The grass would be unaware that the seepage water was transported via a different mechanism. The conditions at the grass would still be boggy from the same quantity of water;

   - similarly, the rainfall runoff from the site would pass the grass at the same peak flow rate and with an improved water quality.

   As stated earlier, the hydrological modelling undertaken for existing conditions did allow for infiltration of rainwater into the subsurface soils.

   The impact of the development on groundwater has been assessed in the applicant's documentation. The regional groundwater levels are at significant depths on the higher portions on the site *(> 10m)* to less than 1m adjacent to the creekline. The more important feature to the significant vegetation on the site is the seepage which is a more localised feature. The regional groundwater is not significantly affected by local rainwater infiltration because of the considerable depths of highly impermeable sediments and rock. This is influenced by more regional factors such as topography, sediments and water levels in large regional water bodies. On the other hand, the seepage is a local feature which is being managed such that the same volume of water reaches the creekline and importantly, the areas of the hairy joint grass.

   The raingardens would be located above the groundwater and would have there own drainage media. They do not rely on infiltration into the subsoils. They will not intercept groundwater or seepage water.

**"Open Space"**

The proposed stormwater system has been formulated based on the requirements and recommendations of Council's guidelines, DCP No. 13 – Stormwater Management. Any other residential development would need to provide the same level of runoff control measures as proposed for the subject site. There are no special storm measures proposed on the subject site which would be the responsibility of Council. At Council's request, the previously included wetlands were replaced with the raingardens in order to minimise the maintenance costs for Council and reduce the mosquito risk. The runoff control measures suit Council's existing personnel skills and equipment for management of gross pollutant traps, landscape areas *(swales and raingardens)* and drainage corridors *(creeklines)*.

The applicant has agreed to extend the maintenance period to 5 years as required by Council.

**"Mosquito Management"**

The proposed stormwater control measures would not pose any significant mosquito risk. The swales and raingardens would have special drainage media and subsoil drainage pipework. This is to ensure these features only pond water temporarily for a matter of hours but for the majority of time are dry. They would not intercept groundwater or have water ponding for extended periods. A proposed wetland for stormwater runoff control was replaced by a raingarden at Council's request in order to minimise the mosquito risk.

## 3. DNR Submission

**"Stormwater Drainage and Groundwater Management"**

The applicant has agreed to incorporate a requirement in the DCP for an experienced geotechnical engineer to supervise the location and installation of the trench drains to intercept the seepage water.

It is considered that the above information provides further clarification to alleviate the concerns related to potential adverse impacts associated with water management in the proposed development.

Yours faithfully
**PATTERSON BRITTON**

Review / Verification by Date

M S Tooker
Principal

.....

**FIGURE 1**

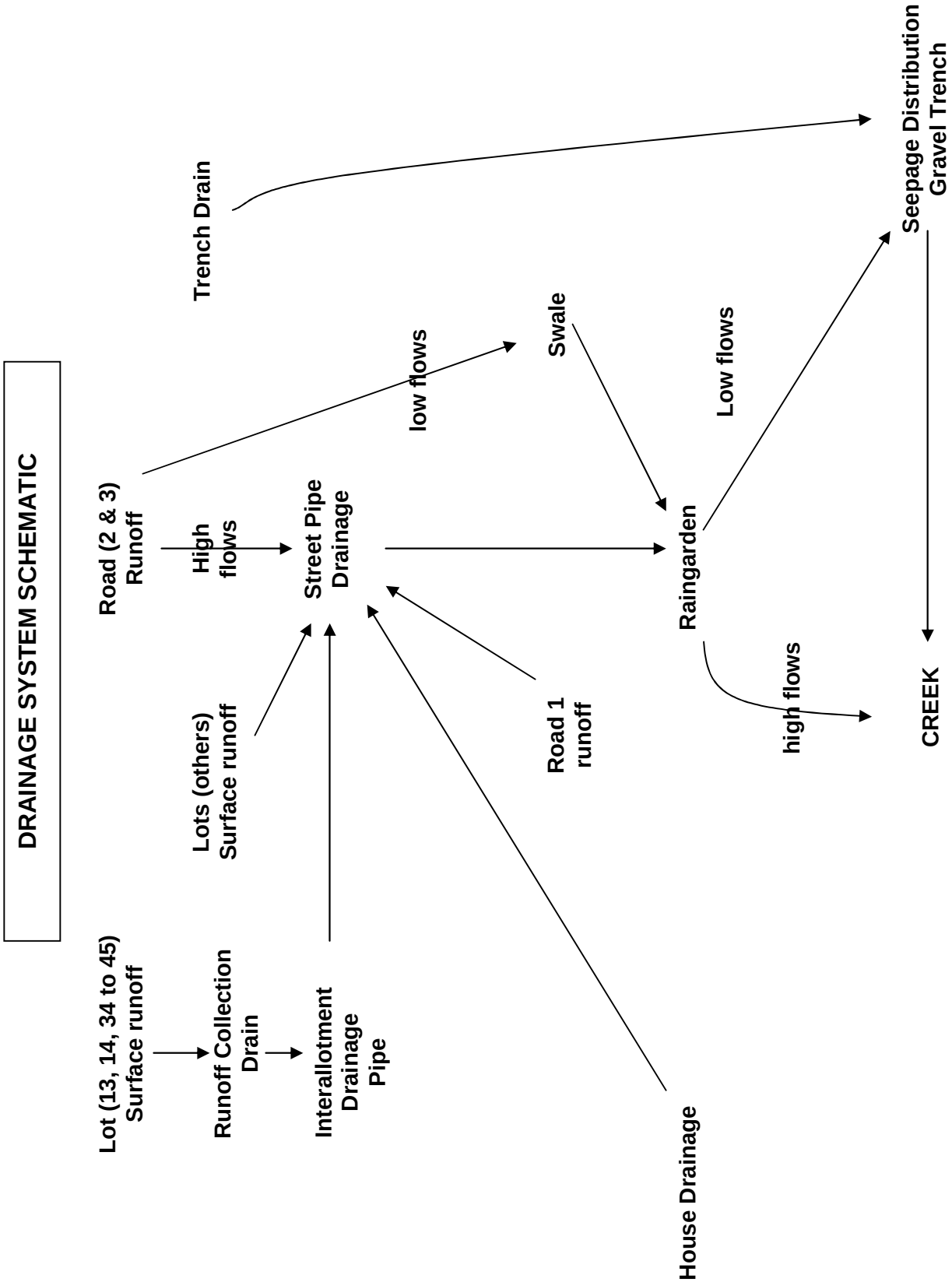
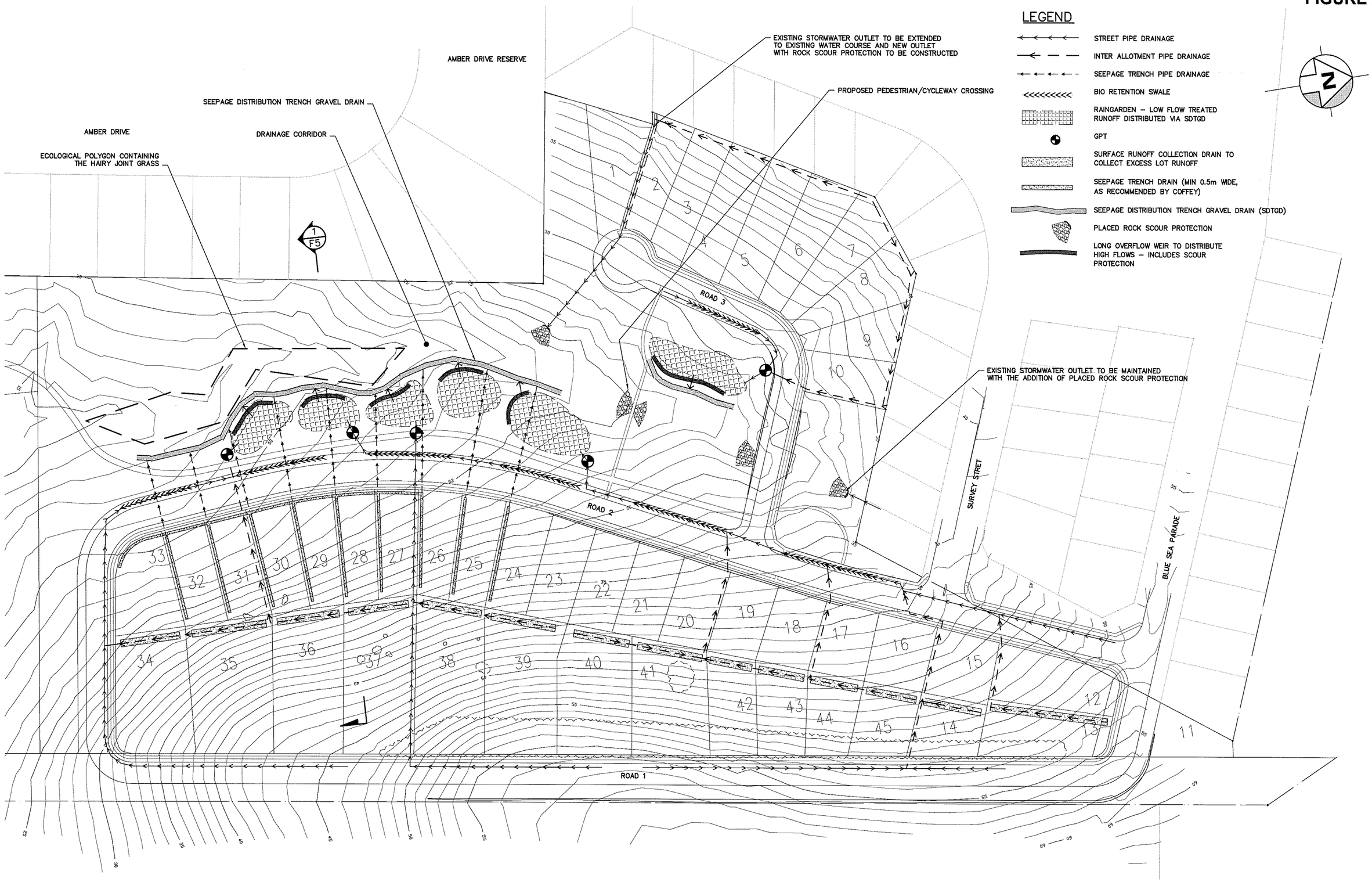

DRAINAGE SYSTEM SCHEMATIC
Lot (13, 14, 34 to 45) Surface runoff
Runoff Collection Drain
Interallotment Drainage Pipe
Lots (others) Surface runoff
Road (2 & 3) Runoff
High flows
Street Pipe Drainage
low flows
Trench Drain
Swale
Road 1 runoff
House Drainage
Raingarden
Low flows
high flows
Seepage Distribution Gravel Trench
CREEK

**FIGURE 2**




0 15 30 45 60 75m
1:750 (A1) 1:1500 (A3)

**Patterson Britton & Partners Pty Ltd**

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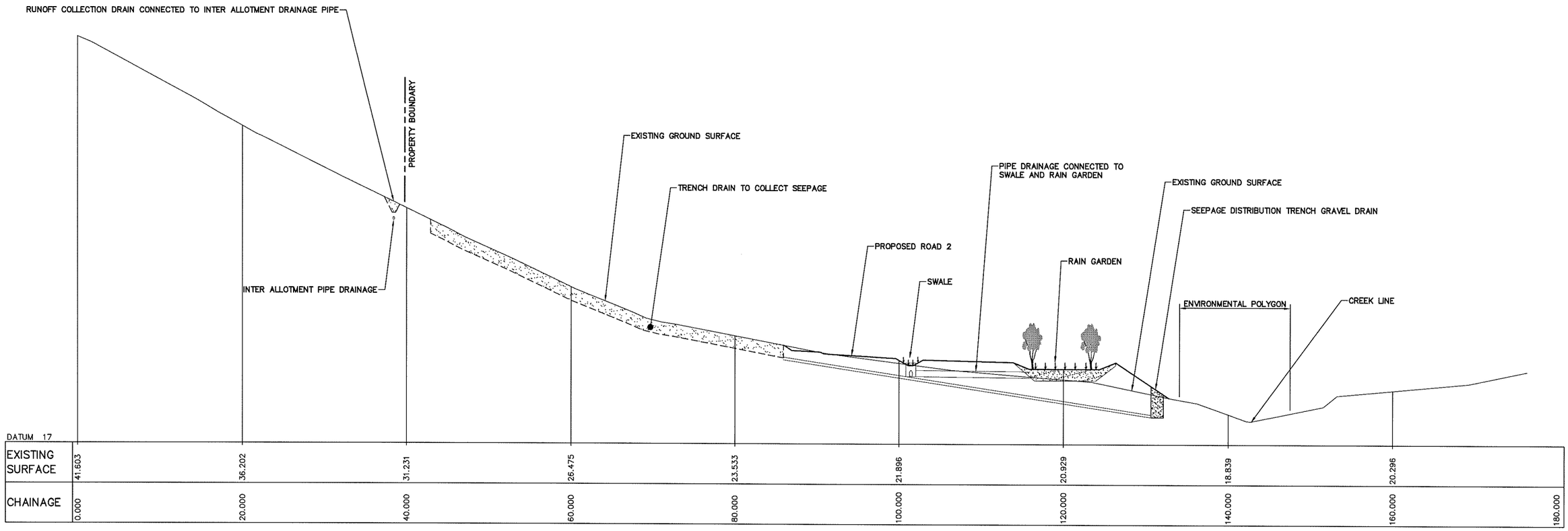
6324 *COASTAL GROVE*

**COASTAL GROVE**
**CONCEPTUAL STORMWATER MANAGEMENT STRATEGY**

N:\6324-01 Lennox Head\FIGURES\6324 Fig 2 Conceptual Stormwater.dwg, Fig 2, 2/6/2007 4:37:48 PM

**FIGURE 3**




SECTION 1/F1 DRAINAGE SCHEMATIC

0 5 10 15 20 25m
1:250 (A1) 1:500 (A3) (HORIZONTAL)

0 2.5 5.0 7.5 10.0 12.5m
1:125 (A1) 1:250 (A3) (VERTICAL)

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6324 *COASTAL GROVE*

**COASTAL GROVE**
**DRAINAGE SCHEMATIC - SECTION 1**

N:\6324-01 Lennox Head\FIGURES\6324 Fig 3 Section 1.dwg, Fig 3, 2/6/2007 4:38:47 PM