

September 22, 2017

City of Kalamunda
PO Box 42
KALAMUNDA WA 6926

Attention: Mr. Berlin Ciputra
Your Ref: Lot 213 #28 Lewis Road, Wattle Grove

Dear Sir

**LOT 213 #28 LEWIS ROAD
WATTLE GROVE
CULVERT CROSSING
OVER YULE BROOK**

Please find enclosed the proposed Yule Brook culvert crossing preliminary design for DA approval. As part of the development application for the above lot we provide the following summary of design data and assumptions used in the design for your information.

Culvert Crossing Requirements

- Vehicular crossing at low speed
- Allowance for passage of DFES fire trucks during emergencies
- Allowance for pedestrians crossing the creek
- Minimal impact to existing stream bed and bank
- Minimal impact to existing vegetation

Design Criteria

City of Kalamunda provided standard stormwater drainage requirements for the site, however our understanding is that there are no specific culvert crossing guidelines available from the City.

Minor system design average recurrence intervals were selected in accordance with Water Corporation urban main drainage requirements. In our opinion, the selected design criteria is conservative and exceeds requirements for the proposed site.

Design Assumptions

Hydrological data for major and minor storms for was obtained from Water Corporation through correspondence with the City of Kalamunda.

BPA have investigated 10-year and 100-year events. The measured inflow hydrograph data was collected downstream of the proposed site. A critical inflow for a 10-year storm was based on the location of the site and the creek system geometry, and was derived from the provided data.

Based on hydraulic design using the available information, a 1.8m diameter corrugated steel pipe culvert is recommended. We believe the culvert capacity is sufficient for the 10-year storm inflow.

100-year Event

For bypass of the 100-year event a low point was documented in the road surface to allow the passage of stormwater once the culvert is at capacity. This allows overflows and prevents flooding upstream of the crossing.

Existing culverts in Yule Brook

- Based on site inspections by BPA we witnessed an existing 1.8m diameter concrete pipe culvert located under Lewis Road. The existing concrete culvert is located approximately 300m downstream of the proposed culvert on Lot 213.
- There is an existing 1.8m diameter corrugated steel pipe culvert in Lot 802 approximately 150m upstream of the proposed culvert on Lot 213.

Proposed Culvert Crossing

A 1.8m diameter corrugated steel pipe culvert with mitred ends is proposed for the Lot 213 crossing. The culvert is proposed to be installed in a soil embankment which batters to natural surface levels. Batters are rock pitched to prevent erosion. Rock pitched aprons are provided upstream and downstream of the culvert to protect the existing natural stream bed. Further rock pitching and bank protection is provided to prevent long term erosion and any scour effects downstream of the apron.

Handrails are provided to allow safe crossing by pedestrians. The horizontal alignment of the culvert was based on site constraints, and was intended to minimize the length of the crossing and impact on existing trees. The vertical alignment was documented to blend into the existing natural surface at both ends of the crossing.

We have attached our culvert crossing documentation for your review and comments.

Should you require any further information please do not hesitate to contact this office.

Yours faithfully
BPA ENGINEERING

A. R. Williams
Director

