

Luke Summers  
Natural Area Pty Ltd  
233C Drumpellier Dve  
WHITEMAN WA 6068

Dear Sir

Water Balance of Lot 123 Mortimer Rd, City of Kwinana

Geo & Hydro have completed a review of data and collection of seasonal borefield data on a set of bores located on this property. The borefield levels have changed modestly since last collected by Bioscience in early 2015. Their data contains relevant observations on annual range, gradients and directions of drainage and nutrient levels that have been summarized to a section of this document. Sue B has asked for a conceptual water balance on the site.

It appears clear that the property wetland feature at the northern end is of interest to other stakeholders in that new monitoring bores, relevant to answering questions arising from examination of the dataset to hand, have been installed since that time. This will become evident in discussing charts prepared in reviewing this site.

The chart, MONITORING BORE NETWORK, was prepared to show locations of:

- the 11 Bioscience monitoring bores,
- two further other monitoring bore locations marked CS7 and Pz pair at the north end of the property,
- two standard survey marks CAL36 and CAL37, and
- two transects of monitoring bores A-B and C-D have been marked across the property.

It was evident from survey stakes installed and left that the piezometer pair and CS7 had been recently surveyed from CAL36. The wetland that roughly surrounds the bores MMB2-5 has a high point of the monitored groundwater levels in MMB5. This was evident in the spreadsheet charting of groundwater levels (see XLS sheet: Lot 123 Mortimer Road Monitoring Bores) and the AB transect suggests that flow eastward from the wetland goes to MMB1 as the groundwater level in 1 is lower than in 5, 2, 3, and 4 as shown in the upper panel of the chart, BOREFIELD CROSS SECTIONS. However the trend within the last four is draining westward and two further bores 6 and 7 affirm this impression as does the simple profile of the other cross section C-D between bore 10 and 9. Those two bores remaining and not included in this graphical exercise, 11 and 8 also show a fall with drainage to the west. The gradient is up to 1:200.

Areas of retrograde flow (as the low at MMB1 appears to show) are a common feature in finer resolution of groundwater flownets, but this may also be due to a surveying error in establishing the ground levels of the borefield and could be verified by installing another bore(s) and surveying and this appears to have been done.

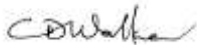
As well the question of why the high at MMB5 appeared to have been considered and the piezometer pair marked on the Network map may resolve whether there is an upward pressure gradient in this area. This would be more appropriately investigated with a deeper pair immediately alongside MMB5 but the location used is perhaps 150m north of 5. All of the bores in the network have rather acidic water quality and it could be suggested that a peat bed of a swamp, or a tumulus, has been inundated by mobile dunes at an earlier point in time.

In the network there is a lack of any bore directly west from the CCW surface, and this is odd as there is a low channel, of below 18mAHD ground surface, shown in the contour topography map of Biosciences 2006 report (Fig. 4 therein). Irrespective of whether this or the channel to the southwest is providing the drainage, the westward flow of groundwater is likely to continue to surface water features adjacent to the Freeway and be organised into drainage network from these features.

On the groundwater quality, Sue also requested comment on the UNDO decision support tool (DoW, 2006). In the context of this site, only a small proportion of the groundwater may be considered as needing the treatments achieved through biofiltration and structured wetlands. In overview, there are around 18 production bore sites within 500m of the boundary of lot 123, and around 40% of the land area to the same distance is being regularly irrigated from these. From the fairly detailed history of nutrient analyses presented in Bioscience data, there are only a few bores where such treatments might be considered appropriate as a downstream activity and the surface water features adjacent the Freeway would be the appropriate place for these.

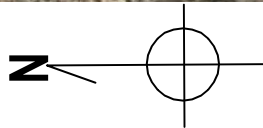
The Bioscience water quality data was collected over 2011-14 and analysed as consolidated groups; the recent sample sets collected by ourselves in Sept and Oct '20 have been reviewed along with this. Most instances of high concentrations have moderated towards lower values, except for MMB3 which was found to be without a cap in September. Although cleaned out it was still high from captured organic matter, but a second cleaning pass returned it to earlier levels). The complete spreadsheet is attached with the electronic submission of this letter report. The irrigation of turf on both sections of Nicholas Drive (east and west sides of L123) is likely to be the main source of such nutrients and has been underway for some decades.




Your Sincerely,



Colin D. Walker *BSc PhD MBA*  
Senior Environmental Scientist

14 December 2020

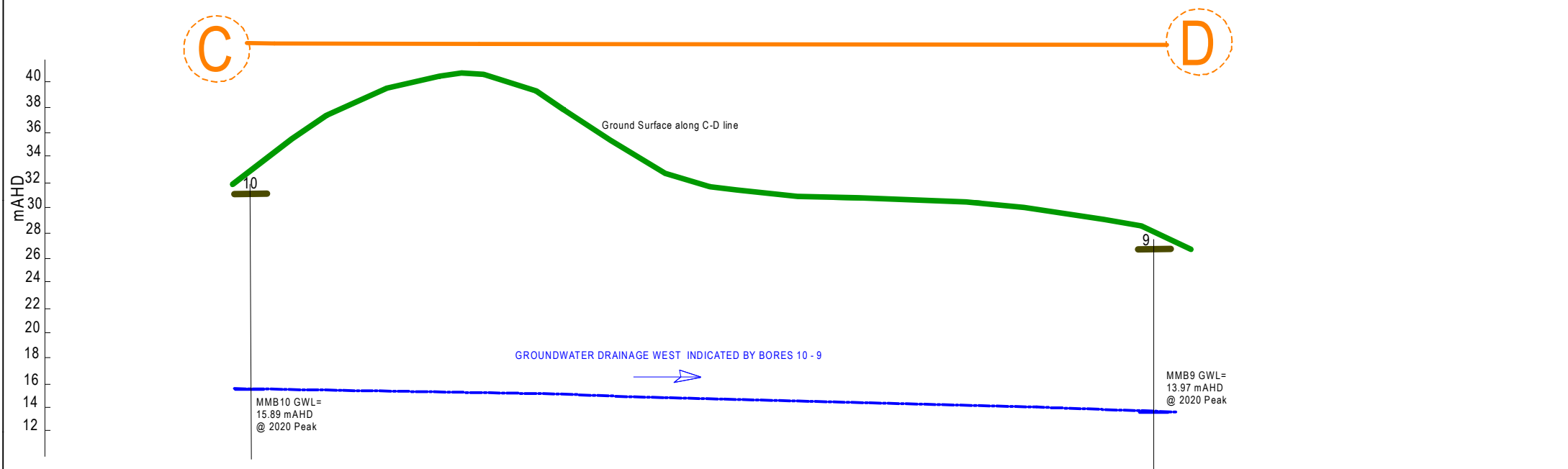
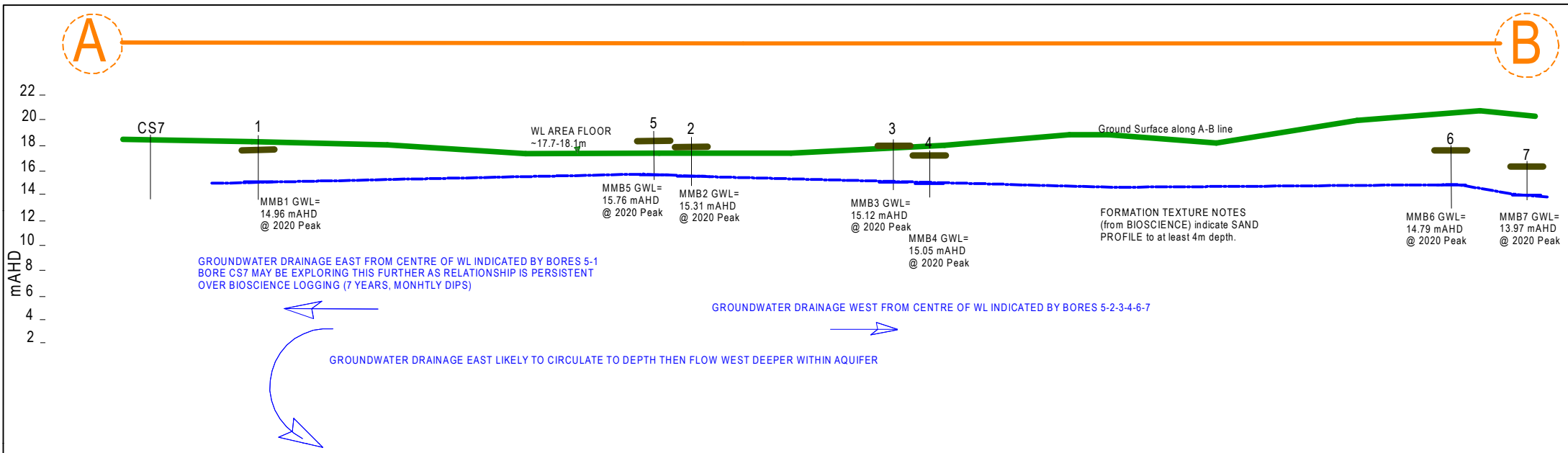


-  Standard Survey Mark
-  Bioscience Monitoring Bore
-  Other Monitoring Bore

**MONITERING BORE NETWORK**  
**Lot 123 MORTIMER ROAD**

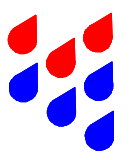
**GEO & HYDRO**  
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**BOREFIELD CROSS SECTIONS**  
**Lot 123 MORTIMER ROAD**

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# Lot 123 Mortimer Road Monitoring Bores

<<<< Bioscience dippings over 2007-15 >>>>

GHEM dippings  
Sept & Oct  
2020

MMB5  
consistently  
high GWL

