



# Memorandum

20 March 2017

To	Patrick Crain, Poseidon Water		
Copy to	GHD		
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Subject	Huntington Beach Outfall – Head Loss Review	Job no.	11110796

## 1 Criteria

To purpose of this TM is to advise of the head loss in the existing outfall pipeline configuration, under the following conditions:

### 1. Original / design operating condition of:

- 257 MGD in the 108" diameter pipe (maximum discharge flow from Units 1 & 2; noting that another 108" diameter pipe exists to handle the maximum discharge flow from of 254 MGD from Units 3 & 4); and
- 514 MGD in the single 14' diameter outfall pipe

### 2. Current / existing operating condition of:

- 257 MGD in the 108" diameter pipe (maximum discharge flow from Units 1 & 2; noting that another 108" diameter pipes exists to handle 130 MGD for Units 3 & 4 under a condition when the synchronized condenser is operational); and
- 387 MGD in the single 14' diameter outfall pipe

## 2 Roughness Factors

GHD used Hazen Williams to determine the friction losses in the system. Roughness coefficients used were 120 from the connection point on the upstream end of the 108" diameter pipe, to the commencement of the 14" diameter outfall pipe, and 130 for the 14" diameter outfall pipe.

A sensitivity check on the system was also undertaken using a roughness coefficient of 110. The variability in roughness coefficients here is based on the unknowns surrounding the extent of marine growth, with the sensitivity analysis providing some guidance as to the potential impacts.

### 3 Results

The results are as follows:

Operating Condition	Hazen Williams roughness coefficient 120 & 130	Hazen Williams roughness coefficient 110
Original / design	~ 5.46 ft	~ 5.83 ft
Current / existing	~ 4.88 ft	~ 5.12 ft

### 4 Conclusions

The head loss apparent in the system is a conservative approximation based on the as-built information interpretation during the analysis, and assumed pipe roughness coefficient.

Key conclusions from the above include:

- The reduction in flow, albeit minor, has a considerable effect on reducing the head loss in the system
- The increasing of the roughness coefficient appears to have less impact on the head loss in the system, especially when the flows are reduced.

Noting the above, with the removal of the power station operation, the reduction in flow from the design condition the outfall was constructed to, and the future operation which will convey desalination brine discharge only, the pressure on the outfall system is expected to be considerably less.