



Angmering Housing Development, West Sussex – Proposed Infiltration Drainage by EGRP **Design Statement. – 16th May 2018 – Rev A**

Curtins Consulting have been appointed by Groundwater Dynamics (GD) to undertake calculations to demonstrate the level of drainage discharge that may be realised by sustainable means through the use of the GD Energy-Passive Ground Water Recharge Pump (EGRP) system for conveying and discharging surface water and effluent from a foul package treatment plant into ground with low “at surface” infiltration properties.

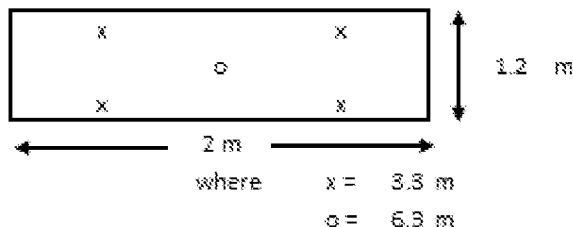
The infiltration rates measured at a location at the Angmering site have been calculated from the Borehole Test Results provided by GD and the average calculated based on the results for the 6.0 m deep boreholes.

For the purposes of this design the average infiltration rate value obtained is used to give a design rate of **0.13 m/hour**.

GD have stated that the EGRP system is to be installed into infiltration trenching of a maximum length of 100 m within an area set aside for soakage. Boreholes of 3.3 m and 6.3 m depths are to be placed at intervals along its length to provide the combination of infiltration capability and storage capacity necessary to provide the required storage/attenuation identified in a Quick Storage Estimate calculation.

GD have indicated that their preferred pattern of installed EGRP is to have the product installed into 4 No. 3.3 m deep and 1 No. 6.3 m deep boreholes every 2.0 linear m as indicated below:

Cluster composition



Values per cluster

Length of BH's = **19.5 m**

Length of EGRP = **30.48 m**

(1 No. 3.048 m in “x” and 3 No 6.096 m in “o”)

Storage per cluster = **0.121 m³**

BH Wall Area (assuming 89 mm dia BHs)
= **5.45 m²**

The design of the infiltration system has been undertaken using the Microdrainage (WinDes) modelling package using the following method assuming the boreholes are evenly spread along the infiltration trench base:

- 1 – the site area to be drained was based on the 3,768 m² value (i.e. 0.38 ha) provided by GD.
- 2 – a quick storage estimate (QSE) for the drained area and a 1 in 100 year storm plus 40% climate change was carried out using the M5-60 and R values and the design infiltration rate, giving the required volumes needed at the test location. The QSE output gives a range of storage values to account for variability in soil infiltration properties, however as the borehole tests give an accurate value for the soils tested, it is considered appropriate that the lesser value should be used in the subsequent calculations.
- 3 – The width and depth of trenching is then determined to provide the required volume of storage calculated in 2 above.

4 – In addition, the half drain-down time of the stored volume is calculated to ensure this does not exceed 24 hours.

5 – A further analysis was undertaken to design a separate trenched soakaway to allow the disposal of the effluent from a “Bio Disk” type package treatment plant which treats the foul drainage from the housing development. GD have advised that the outflow rate from the plant is 17.85 litres/minute.

Results – Surface Water Disposal

The results of the calculations to determine the size of infiltration trenching and number of BH clusters are summarised below (assuming 30% voids in trench);

For a 1:100 year (+40% CC) storm event:

Storage Required (QSE) m ³	Trench length (2.0 deep x 1.2 wide) m	No of clusters	Length of Boreholes m	Total Length EGRP* m	Storage in BHs m ³	Storage in trench m ³
77	100	50	975	1,524	6	72

*Note: Length of EGRP in BHs = 1 no. x 3.048 m in 3.3 m BHs and 3 no. x 6.0962 m in 6.3 m BHs

Half drain-down time (based on outflow rate of 35 m³/h through 273 m² of BH side walls)
= **1.1 h** (less than 24 hours therefore OK).

Results – Foul Water Disposal

The results of the calculations to determine the number of BH clusters are summarised below;

These calculations are based on an infiltration rate of 0.13 m/h and a design incoming flow rate of 17.85 l/min = 1.07 m³/h. Note that the trench volume is not relevant in this application and its purpose is solely to distribute the incoming flow to the BHs in each cluster and provide some degree of buffering.

Infiltration Area Required m ²	Trench length (1.0 deep x 0.6 wide) m	No of clusters	BH Wall Area* m ²	Length of Boreholes m	Total Length EGRP* m
8	10	5	9	98	152

* 6.3 m deep BHs only

As the system is designed to infiltrate through the BH walls at the same rate as the inflow (i.e. design figure = 1.07 m³/h) drain-down times are not relevant. However, the trench provides 6.0 m³ of buffering storage = 5.6 hours of flow at the design flow rate.

Martin Stephenson
Principal Engineer
For and on behalf of
Curtins Ltd