

## Kill Integrated Constructed Wetland

An integrated constructed wetland (ICW) system has been developed for the treatment of sewage effluent for a new housing development, the existing population and for future population of Kill village, Co. Waterford. The wetland system designed by VESI Environmental Ltd and constructed by Gerard Murphy Plant Hire Ltd in April 2008 has been in operation since July 2008 to treat sewage effluent for a population of 500. The site is located c. 300m downhill to the east of the village on forestry land procured from Coillte. The development was undertaken by a private developer and part financed by Waterford County Council.

The ICW at Kill consists of 4 ponds covering an area of c.10,000m<sup>2</sup>, with pre-treatment provided by a 2-chamber settlement tank. The final discharge from the ICW is to the nearby stream located 170 m to the east. The sizing of the ICW is based on the population equivalent (500) and a minimum wetland area of 20m<sup>2</sup> per person. There is capacity on site to increase the area of the ICW to provide treatment for a population of 750.



Figure 1 ICW two months after commissioning

### Development of ICW

The entire project on site took approximately 4 months to complete, with the septic tank being fabricated in-situ taking over two months, while the earthworks and planting of the ponds was undertaken in two weeks. Other works on the site included reprofiling land around the wetland (including provision for additional wetland area if required in the future), erecting fencing, installing a monitoring chamber and flow meter, piping and laying tarmac and hardcore.

The main costs for the project are detailed in the table 1 below.

Table 1 Costs

Item	Cost
<b>Purchase of land</b>	€500,000
<b>Earthworks</b>	€50,000
<b>Settlement tank and associated works</b>	€70,000
<b>Planting</b>	€15,300
<b>Fencing, gates and hedging</b>	€30,000
<b>Monitoring chamber and flow meter</b>	€16,000
<b>Pipe work</b>	€12,000
<b>Tarmac and hardcore</b>	€15,000

Costs provided by John McCarthy (Murphy McCarthy Engineers Ltd) Consulting Engineers for the development.

The alternative WWTP for Kill was a membrane system (MRB), which had similar capital costs, but would have had greater operating and maintenance costs compared to the ICW.

The wetland was planted with a selection of emergent vegetation, primarily reed sweet grass (*Glyceria maxima*), common sedge (*Carex riparia*), cattail (*Typha latifolia*) and yellow flag iris (*Iris pseudacorus*). The embankment around the initial receiving area of pond one has been planted with a selection tree species and miscanthus to provide additional cover and assist in the

maintenance of odours should they occur. Through dense plant cover odour problems can be managed in the first pond, odours are not an issue further down the system.



Figure 2 Pond 1, August 2008.

#### Previous WWTP

Prior to the installation of an ICW at Kill, a mechanical aeration system was in use for the village. Over recent years the aeration system had been overloaded and discharges of the partially treated effluent to the nearby stream was having an impact on the quality of the surface water. Subsequent to the installation of the ICW the quality of the stream has improved, where previously contamination of surface waters was continuously evident.

#### Monitoring

Waterford County Council has been monitoring the ICW since it was commissioned in July 2008. Monitoring is undertaken on the influent and effluent surface water quality, as well as recording the volumes from the wetland before discharging to the stream. A monitoring station has been installed between the final outlet pipe and the stream to facilitate monitoring. Table 2 below shows the concentration of the influent and effluent samples analysed to date.

Table 2 Influent and effluent quality

Type	Date	Parameters mg/l						
		BOD	COD	TSS	Total P	Ortho-P	Ammonia	TON
Influent	30/07/08	23	27	13		0.09	0.77	
Effluent	30/07/08	12	148	28		0.05	1.52	
Influent	27/08/08	230	357	71		4.20	18.3	<0.02
Effluent	27/08/08	21	33	4		0.08	1.4	<0.02
Influent	24/09/08	Nt	530	65.5	8.8	7.5	52.7	<0.02
Effluent	24/09/08	Nt	67	2	0.06	0.01	0.04	<0.02
Influent	17/12/08	227	415	77.0	5.76	4.248	38.164	<0.02
Effluent	17/12/08	2	49	0.8	0.6516	0.587	9.153	4.639
Influent	8/01/09	373	710	104	11.4	8.6	70	1
Effluent	8/01/09	2	36	2	0.2	0.15	0.02	11.1

Data courtesy of Waterford County Council

The Urban Waste Water Treatment Plant Regulations (2001) Effluent standards; BOD 25 mg/l, COD 125 mg/l and TSS 35 mg/l.

Continued monitoring will be undertaken on a regular basis by Waterford County Council on the wetland and the receiving watercourse in assessing the performance and in ensuring the effective functioning of the system.