

Director of Service, Waste and Environmental Services  
Kildare County Council  
Aras Chill Dara  
Devoy Park, Naas  
County Kildare

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22 September 2010

Reg No: W0081-04

Dear Sir/Madam,

I am to advise you that the Agency has initiated a review of a Waste Licence held by KTK Landfill Limited on 31/08/10, for a facility located at KTK Landfill Limited, Brownstown and Carnalway, Kilcullen, Co. Kildare.

I enclose copy documents between Kildare County Council, The EPA OEE office and the Licensee KTK which detail discharges.

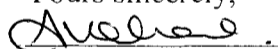
The provisions of Section 52 of the Waste Management Acts, 1996 to 2010, provides that the Agency shall obtain the consent of the sanitary authority to the discharge from an activity which involves the discharge of trade effluent or other matter (other than domestic sewage or storm water), to a sewer vested in or controlled by a sanitary authority.

In order to expedite the Agency's consideration of this waste licence review, I am to request your authority's consent to the discharges. It should be noted that, your authority's consent may be subject to such conditions as your authority considers appropriate as provided for in Section 52 of the Waste Management Acts, 1996 to 2010 and Section 99E(3) of the Environmental Protection Agency Acts, 1992 and 2007. Your attention is drawn to paragraphs (3) and (4) of the attached copy of the relevant section of the Act. For your convenience please find attached a reply form including a list of draft conditions compiled by the Agency.

In accordance with paragraph (2) of this section of the Act, you are requested to forward your response within 5 weeks of the date of this letter. Please note that any decision given after the expiry period shall be invalid and in those circumstances the Agency may proceed to determine the application concerned as if consent was obtained. Brian Meaney is dealing with this matter and can be contacted at the Licensing Unit, Office of Climate, Licensing & Resource Use Wexford (Tel. No. 053-9160600), if you have any queries.

Your co-operation in this matter is appreciated.

Yours sincerely,



Ann Kehoe

**Programme Officer  
Environmental Licensing Unit**





## **SANITARY AUTHORITY RESPONSE**

**re: SECTION 52 OF THE WASTE MANAGEMENT ACTS, 1996 to 2010**

**Name & Address of Sanitary Authority:** Kildare County Council, Aras Chill Dara, Devoy Park,  
Naas, County Kildare, FAO: Mr Des Page, Director of  
Services, Corporate Services & Environment.

**Waste Reg. No.** W0081-04

**Waste Facility:** KTK Landfill Limited, Brownstown and Carnalway,  
Kilcullen, Co. Kildare,

**Waste Licence Applicant:** KTK Landfill Limited

**Consent:** Indicate Yes to one of the following statements:

<b>Consent granted subject to the consent conditions outlined below</b>	
<b>Consent granted without conditions</b>	
<b>Consent refused</b> <sup>Note 1</sup>	

**Note 1** Where it is proposed to refuse permission the reasons for the refusal should be clearly outlined in the response.

GENERAL CONSENT CONDITIONS	Condition to be included (Yes/No)
1. No specified emission from the installation shall exceed the emission limit value set out in <i>Schedule B: Emissions Limits to Sewer</i> . There shall be no other emission to sewer of environmental significance.	
2. The licensee shall carry out such sampling, analyses, measurements, examinations, maintenance and calibrations as out in <i>Schedule C</i> .	
3. Monitoring and analytical equipment shall be operated and maintained as necessary so that monitoring accurately reflects the discharge or emission.	
4. The licensee shall permit authorised persons of the Agency and the Sanitary Authority to inspect, examine and test, at all reasonable times, any works and apparatus installed, in connection with the process effluent, and to take samples of the process effluent.	
5. All automatic monitors and samplers shall be functioning at all times (except during maintenance and calibration) when the activity is being carried on unless alternative sampling or monitoring has been agreed in writing by the Agency for a limited period. In the event of the malfunction of any continuous monitor, the licensee shall contact the Agency as soon as practicable, and alternative sampling and monitoring facilities shall be put in place. Prior written agreement for the use of alternative equipment, other than in emergency situations, shall be obtained from the Agency.	
6. The licensee shall record all sampling, analyses, measurements, examinations, calibrations and maintenance carried out in accordance with the requirements of this licence.	
7. The licensee shall provide safe and permanent access to all on-site sampling and monitoring points and to off-site points as required by the Agency.	
8. The licensee shall at no time discharge or permit to be discharged into the sewer any liquid matter or thing which is or may be liable to set or congeal at average sewer temperature or is capable of giving off any inflammable or explosive gas or any acid, alkali or other substance in sufficient concentration to cause corrosion to sewer pipes, penstock and sewer fittings or the general integrity of the sewer.	
9. In the event of any incident which relates to discharges to sewer, having taken place, the licensee shall notify the Agency, Local Authority and Sanitary Authority as soon as practicable after the incident.	





**Frequency of Monitoring Process Effluent to Sewer**

*Schedule C*

Waste Licence application Register No. **W0081-04**

Emission Point Reference No: \_\_\_\_\_

<b>Parameter</b> <i>(delete parameters which are not applicable)</i>	<b>Monitoring Frequency</b> <i>(e.g. monthly, quarterly, annually)</i>	<b>Sampling Type</b> <i>(grab, composite)</i>
Flow to sewer		
Temperature		
pH		
BOD		
COD		
Suspended Solids		
<b>ADDITIONAL PARAMETERS</b> <i>(if required)</i>		

<b>SANITARY AUTHORITY CHARGES</b>	
Charge per cubic metre of process effluent (per s52 of the Waste Management Acts, 1996 to 2010)	
Payment Frequency	
Annual Monitoring Costs	

**Signed on behalf of Kildare County Council**

\_\_\_\_\_ Date \_\_\_\_\_

**Damien Masterson**

---

**From:** Damien Masterson  
**Sent:** 03 June 2010 11:50  
**To:** ainolan@kildarecoco.ie  
**Attachments:** Discharge Limits.pdf

Ailish,  
Discharge limits set out in KTK Landfill proposal as discussed. Hope this is of some assistance.  
Regards  
Damien

*Damien Masterson  
Inspector  
Office of Environmental Enforcement  
Environmental Protection Agency  
P.O. Box 3000  
Johnstown Castle Estate  
County Wexford*

*T: +353 53 9160600  
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E: [d.masterson@epa.ie](mailto:d.masterson@epa.ie)  
W: [www.epa.ie](http://www.epa.ie)*







### 3.0 SEWER DISCHARGE

#### 3.1 Discharge Limits

Greenstar has been advised by Kildare County Council of the discharge limits for effluents discharged to the sewer. These limits are detailed in Table 2.

**Table 2: Sewer discharge limits**

Parameter	Emission Limit Value	
	mg/L	kg/day
pH	6.0 – 9.0	
BOD <sub>5</sub>	200-250	20
COD	750	75
Suspended Solids	200-300	TBC
Total Organic Carbon	300	TBC
Chloride (as Cl)	2000	TBC
Ammonia (as N)	5	TBC
Nitrate (as N)	1000	TBC
Orthophosphate (as P)	20	TBC

*Note: The discharge limits detailed in Table 2 were confirmed after the installation of the first Reverse Osmosis treatment unit.*

Kildare County Council has further indicated that they are prepared to accept treated effluent at a maximum hourly flow rate of 6.5m<sup>3</sup> and a maximum daily flow of 150m<sup>3</sup>.

#### 3.2 Decommissioning

The leachate treatment plant will remain in operation, albeit at decreasing throughputs, for the length of the aftercare period and until testing confirms that the landfill has stabilised.

Once the plant has become redundant, the treatment plant and associated infrastructure will be decommissioned in accordance with the approved CRAMP for the site.

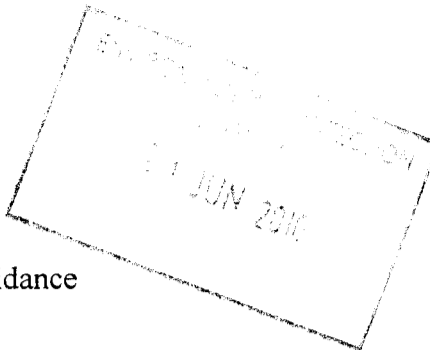


1081 DM



18<sup>th</sup> June 2010

Environment Section  
AN/GK



Ms Grainne Oglesby  
Office of Licensing & Guidance  
EPA  
Box No. 3000  
Johnstown Castle Estate  
Co. Wexford

✓  
✓  
DM  
2.6.10 a

**Re: KTK Landfill**

Dear Ms Oglesby


I wish to inform you that the Environment and Water Services Sections of Kildare County Council, have no objection to KTK Landfill Ltd increasing the discharge of treated leachate from 55m<sup>3</sup>/day to 150m<sup>3</sup>/day from their facility to Kildare County Council's foul sewer.

The limits included on their I.P.P.C. licence shall be:

Volume to be emitted	150m <sup>3</sup> /day 6.5m <sup>3</sup> /hour
B.O.D.	250mg/l and 20 kg B.O.D./day
C.O.D	750mg/l and 75kg C.O.D /day
Suspended Solids	300mg/l
Total Organic Carbon	300mg/l
Chloride (as Cl)	2000mg/l
Ammonia (as N)	5mg/l
Nitrate (as N)	1000mg/l
Orthophosphate (as P)	20mg/l

If you require any further information please contact Alish Nolan on 045 980588.

Yours Sincerely

  
PP Liam Dunne  
Senior Executive Officer



W81-03



Mr. Michael Bergin  
Landfill Operations Manager  
KTK Landfill Limited  
Brownstown & Carnalway  
Kilcullen  
Co. Kildare

✓  
✓  
10/6/10

Headquarters, PO Box 3000  
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28<sup>th</sup> May 2010

Our Ref: W0081-03/ap13dm

**RE: Leachate Treatment**

Dear Mr. Bergin

I refer to your proposal for Specified Engineering Works dated 16/04/2010 and received by the Agency on 20/04/2010 in relation to the installation of additional leachate management infrastructure at KTK Landfill and to supplementary information dated 11/05/2010 and received by the Agency 12/05/2010.

The Agency notes that the proposal refers to increasing the capacity to treat landfill leachate using Reverse Osmosis (RO) Membrane treatment by installing a second three stage RO plant and requests approval to discharge up to a maximum of 150 m<sup>3</sup> of methane stripped treated leachate per day to the public sewer system and ultimately the Kildare Co. Council's Osberstown Wastewater Treatment Plant subject to Emission Limit Values (ELV's) set by Kildare Co. Council. The combined capacity of the two RO package plants (80m<sup>3</sup> {existing} and 100m<sup>3</sup> {new}) will be 180m<sup>3</sup> per day with an estimated 140m<sup>3</sup> of methane stripped treated leachate being discharged to sewer and approximately 40m<sup>3</sup> of retentate proposed to be recirculated to the landfill per day.

I am to advise you that the proposal is to the general satisfaction of the Agency subject to the following:

1. The direct discharge of treated leachate via the sewer connection at the site and complying with the ELV's and maximum hourly and daily flows set by Kildare Co. Council as outlined in Section 3 - *Sewer Discharge* in your proposal.
2. The network of wells (GW208, GW75, GW41, GW79, GW100, GW224, GW86, GW187, GW197, GW128 and GW 231 as set out in Figure RO 02/01 "*Leachate and Concentrate Re-Infiltration System*") shall be adapted as set out in Section 4.2.2 and dipped for leachate level as proposed. This should be done on a monthly basis for the first three months post this correspondence and quarterly thereafter. A separate report on the first months monitoring should be submitted to the Agency and shall include borehole drilling/constructions logs and appropriate cross-sections and schematics demonstrating their construction in relation to the base of the landfill and the landfill surface. A minimum of a weekly level measurement reading for leachate sumps LP1, LP3 and LP6 shall also be reported in the Quarterly Reports.

W0081-03\ap13dm






3. Samples of raw leachate, RO concentrate and treated leachate shall be taken and analysed quarterly and the results with interpretation and appropriate trending analysis shall be included in the Quarterly Environmental Monitoring reports as proposed. The parameters that shall be analysed quarterly are BOD, COD, Electrical Conductivity, pH, Chloride (as Cl) Ammoniacal Nitrogen (as N), Suspended Solids, Total Organic Carbon, Nitrate (as N) and Orthophosphate (as P). The other parameters listed in Schedule C2.1 Leachate Monitoring of the licence shall continue to be monitored annually.
4. Retenate from the RO Plant shall only be returned to areas of the landfill that are permanently capped. The quantities of retenate returned shall be metered and recorded and the zone to which the retenate has been returned shall also be noted and these records shall be retained on site for inspection by the Agency at all reasonable times.
5. Due to the storage of sulphuric acid and sodium hydroxide for pH adjustment, the procedure for emptying the leachate bund area shall be updated such that liquid is retained in the bund and is not allowed to recirculate directly to the landfill without first being tested for pH. Records emptying the bund and of pH testing of each batch of liquid re-circulated to the landfill shall be retained on site. Any batch found to have a pH of <6 or >9 shall be separately collection and removed off-site to an appropriate facility for separate disposal.
6. Failure to comply with details of your proposal or with the requirements of this approval may result in the Agency's withdrawal of this agreement. The performance and sustainability of this treatment approach will also be kept under review and the Agency reserves its right to withdraw its agreement if it be considered necessary.

It should also be noted that *all reports for submission to the EPA shall be certified accurate and representative by the facility manager or a nominated, suitably qualified and experienced deputy.*

Please quote the above reference in future correspondence in relation to this matter. If you have any queries, please contact the undersigned at the number above.

Yours sincerely

  
Damien Masterson  
Inspector  
Office of Environmental Enforcement



16 April 2010

W81-03

**PROPOSAL FOR SPECIFIED ENGINEERING WORKS:  
KTK LANDFILL, KILCULLEN, CO. KILDARE.  
WASTE LICENCE W0081-03**

**Installation of Leachate Management Infrastructure**

**EPA**  
IPC ENFORCEMENT WEXFORD.  
Main File ✓  
Public File ✓  
Evaluation File DM  
Date 20.04.10  
For Assessment by Inspector

**Submitted to:**  
Damien Masterson  
Environmental Protection Agency  
Johnstown Castle  
Co. Wexford

ENVIRONMENTAL PROTECTION  
AGENCY  
20 APR 2010

**Report Number:** 09507190165.R02/B.0

**Distribution:**

- 3 copies - Environmental Protection Agency
- 1 copy - KTK Landfill Ltd
- 1 copy - Greenstar Ltd
- 2 copies - Golder Associates Ireland





## Record of Issue

Company	Client Contact	Version	Date Issued	Method of Delivery
EPA	Damien Masterson	B.0	16 April 2010	Post
KTK Landfill	Tomas Fingleton Michael Bergin	B.0	16 April 2010	eMail
Greenstar	Donal Monahan	B.0	16 April 2010	eMail



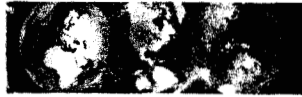


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DRAWINGS

- RO 02 01 Leachate and Concentrate Re-infiltration System
RO 02 02 Proposed Additional Three Stage Reverse Osmosis Plant within Bunded Slab
RO 02 03 Elliptical Permeate Tank
RO 02 04 Schematic of Leachate Management System at KTK Landfill (proposed in April 2010)

## 1.0 INTRODUCTION

### 1.1 Scope of Report

This document presents specified engineering works proposals for installation of additional leachate management infrastructure at the KTK Landfill Facility ('the site'), including preparatory works for the proposed infrastructure as required by Schedule D: Specified Engineering Works of Waste Licence Register W0081-03 ('the Waste Licence'). Specifically this document presents a proposal to increase the onsite leachate treatment capacity to 180m<sup>3</sup> per day by the installation of an additional Reverse Osmosis (RO) treatment unit and associated auxiliary works.

The proposals presented in this document have been prepared by Golder Associates Ireland Ltd. (Golder) and Greenstar Ltd, to fulfil the requirements of Conditions 3.15, 5.5 & 6.13 of the Waste Licence.

### 1.2 Specified Engineering Works

Condition 3.6.1 of the licence states *"The licensee shall submit proposals for any Specified Engineering Works, as defined in Schedule D: Specified Engineering Works, of this licence, to the Agency for its agreement at least two months prior to the intended date of commencement of any such works. No such works shall be carried out without the prior agreement of the Agency"*.

Table 1 describes the specified engineering works addressed in this document:

**Table 1: Specified Engineering Works addressed in this document**

<b>Schedule D Reference</b>	<b>Works Addressed in this Document</b>
Installation of leachate management infrastructure	Proposals for the installation of an additional package leachate treatment plant, increased discharge of treated effluent to the public sewer system to Osberstown WWTP and re-infiltration of concentrate from leachate treatment to the waste mass

Greenstar has retained Golder to provide engineering consultancy services and to assist in the preparation of the Specified Engineering Works Proposal.



## 2.0 LEACHATE MANAGEMENT INFRASTRUCTURE

### 2.1 Existing Regime

In October 2009, KTK Landfill successfully commissioned a 3-stage Reverse Osmosis treatment unit onsite adding to the existing leachate management infrastructure of the site, which previously consisted of re-circulation into the landfill and/or tankering off-site for disposal at a wastewater treatment plant (WWTP) approved by the Agency.

The current leachate infrastructure system in place includes

- 1) Conventional cell collection and extraction system comprising of:
  - a) The leachate drainage blanket which facilitates the flow of leachate to a sump at the low point of each phase of landfill development;
  - b) Side-slope risers which deliver the leachate by level-controlled electric pumps to a holding tank; and
  - c) 80m<sup>3</sup> glass lined holding tank in bunded concentrate leachate management area.
- 2) Leachate re-circulation system comprising of a series of dedicated soakaways strategically positioned within the waste body to maximise waste degradation and facilitate landfill gas production for power generation;
- 3) Tankering discharge point from storage tank to enable removal by road tanker and transport to an EPA-approved WWTP for final treatment and disposal;
- 4) 80m<sup>3</sup> per day Package 3-stage Reverse Osmosis treatment plant, methane stripping tanks and fully enclosed concentrate holding tank; and
- 5) Outfall sewer connection to Osberstown WWTP.

### 2.2 Sewer Connection

A rising main sewer connection has been constructed at the site during previous development works. This sewer connection is currently being used to discharge treated leachate from the existing reverse osmosis unit on site. Details of the rising main infrastructure are shown on Drawing No. RO2 01.

The rising main connects to the local sewer system at the junction of the main regional road (R448). This is a connection that is also being used by Kildare County Council's Silliot Hill Landfill for the disposal of leachate. From there the sewer main feeds by gravity to a pumping station at the Link Business Park in Kilcullen, and then on to Osberstown WWTP.

It is intended that the additional reverse osmosis unit will produce an effluent consistent with the effluent currently being discharged to the sewer. Discussions to date with Kildare County Council have indicated that Kildare County Council will accept the increased volume of suitably pre-treated effluent at the Osberstown WWTP subject to the approval of the EPA. The combined total volume to be discharged is estimated at up to 140m<sup>3</sup> per day, or 51,000m<sup>3</sup> a year based on 100% treatment capacity utilisation.



### 2.3 CRAMP Consideration

Implementation of the Closure, Restoration, Aftercare & Management Plan (CRAMP) for KTK commenced in October 2008. The closure and restoration phase of the landfill allows for the final profiling and emplacement of an approved engineered cap with associated gas and leachate management infrastructure over a period of approximately 3 years. To date approximately, 50,000 m<sup>2</sup> of capping liner has been placed, accounting for 30% of the final capping in place.

On completion of the engineered cap, the leachate generating potential of the landfill will decrease substantially. However, leachate will continue to be generated through biodegradation, the removal of residual moisture in the landfill at the time of closure, as well as possible infiltration as allowed for within the Landfill Design Manual. Consequently there will be a requirement to manage leachate within the site during the aftercare period.

Installation of the additional Reverse Osmosis treatment plant will increase the capacity of the site to deal with leachate produced during this period and the aftercare period in a more sustainable, efficient and cost-effective manner. Leachate and concentrate would also continue to be re-circulated to the waste mass via a series of infiltration soakaways to ensure the continued degradation and stabilisation of the waste and encourage landfill gas production.

Increasing the on-site treatment capacity, with treated effluent being disposed under licence to the public sewer, would build on the benefits of the existing Reverse Osmosis unit, i.e.

- 1) Greater achievement of BAT for landfill leachate management;
- 2) Ensure that the number of traffic movements to and from the site during this period would be further reduced and minimised; and
- 3) Cause the minimal possible strain on the public waste water treatment infrastructure, due to the high quality of the effluent discharged to sewer.



### 3.0 SEWER DISCHARGE

#### 3.1 Discharge Limits

Greenstar has been advised by Kildare County Council of the discharge limits for effluents discharged to the sewer. These limits are detailed in Table 2.

**Table 2: Sewer discharge limits**

Parameter	Emission Limit Value	
	mg/L	kg/day
pH	6.0 – 9.0	
BOD <sub>5</sub>	200-250	20
COD	750	75
Suspended Solids	200-300	TBC
Total Organic Carbon	300	TBC
Chloride (as Cl)	2000	TBC
Ammonia (as N)	5	TBC
Nitrate (as N)	1000	TBC
Orthophosphate (as P)	20	TBC

*Note: The discharge limits detailed in Table 2 were confirmed after the installation of the first Reverse Osmosis treatment unit.*

Kildare County Council has further indicated that they are prepared to accept treated effluent at a maximum hourly flow rate of 6.5m<sup>3</sup> and a maximum daily flow of 150m<sup>3</sup>.

#### 3.2 Decommissioning

The leachate treatment plant will remain in operation, albeit at decreasing throughputs, for the length of the aftercare period and until testing confirms that the landfill has stabilised.

Once the plant has become redundant, the treatment plant and associated infrastructure will be decommissioned in accordance with the approved CRAMP for the site.

## 4.0 PROPOSED SYSTEM

### 4.1 Additional Unit

It is proposed to install an additional package leachate treatment plant at the site which would increase the overall capability to treat leachate and discharge a high quality treated effluent to the public sewerage system. The combined treatment capacity will be 180m<sup>3</sup> of leachate per day, with approximately 140m<sup>3</sup> of treated effluent being discharged to the sewer and 40m<sup>3</sup> of concentrate being re-circulated to the landfill. Standard leachate re-circulation to the waste body, or removal to an approved treatment facility by road tanker, will also occur as required.

The additional unit, which is housed in an environmentally controlled container, will be placed beside the existing unit within the bunded leachate management area. The existing methane stripping tank arrangement will be discontinued and replaced by the existing concrete aeration tank. Treated effluent from the RO units will be pumped to the concrete aeration tank, and flow back under gravity to a holding tank prior to discharge to the sewer system. A complete layout drawing of the proposed unit and auxiliary supports are presented on Drawing RO2 02.

### 4.2 Concentrate Management

It is anticipated that the combined volume of concentrate produced will be approximately 40m<sup>3</sup> per day or 13,000m<sup>3</sup> per annum. It is proposed that this will be re-circulated into the waste body through a series of recirculation soakaways installed in the waste mass.

#### 4.2.1 Production of Concentrate

As with all leachate and waste water treatment systems, Reverse Osmosis units produce a by-product that has to be managed. The "concentrate" that is produced by the Reverse Osmosis system is, in essence, a mixture of the contaminants that have been retained within the membranes. The concentrate is normally approximately 3-4 times the strength of the typical leachate feed that has been passed through the system, and is similar in physical characteristics in that it is a free-flowing opaque liquid expected to have a TSS in the range of 30-180 mg/L (based on results of monitoring at the facility over the last number of months). This is consistent with what is regularly recorded for leachate at KTK landfill and other landfill facilities.

In the case of Reverse Osmosis, contaminants that are captured in the membranes are periodically and automatically removed by an internal backwash system. This process ensures the continued maximum operational efficiency of the system and minimal downtime.

#### 4.2.2 Re-Infiltration of Concentrate – Proposed Management System

It is proposed to re-circulate the concentrate into the waste body through a series of recirculation line/trenches and soakaways installed throughout the waste body. These can be used in alternation as required. This process follows exactly the same procedure as commonly utilised for leachate re-circulation systems and ensures that the degradation, and ultimately stabilisation, of waste below the cap is maximised along with landfill gas production for power utilisation.



KTK has installed a network of leachate re-infiltration line/trenches in the waste body during the filling phase. Furthermore during the capping phase, KTK has installed 4 soakaways below the current capped area.

As the emplacement of the final engineered cap progresses, leachate generation will diminish, which will result in the waste effectively drying out which in turn, would adversely affect the bioreactor action of the landfill. It is important to introduce liquid into the waste to allow the inherent anaerobic bioreactor action to continue within the landfill and to ensure stabilisation of the waste body in the shortest possible time whilst maximising the gas-producing (and hence green-energy production) potential of the site.

The re-infiltration of the concentrate obtained from Reverse Osmosis treatment is a process that is commonly utilised at landfills on continental Europe that employ similar treatment systems. To minimise any risk associated with the re-infiltration process, and to comply with best practice procedures with relation to accelerated stabilisation of the waste mass, KTK Landfill is proposing to re-circulate through existing leachate re-infiltration line/trenches and soakaways. This will be managed and monitored at the facility as follows:

- Individual line trenches and soakaways will be utilised on a rotating basis by way of an automated control system minimising the potential build-up of concentrate in an individual area. Details of the locations and their performance will also be recorded;
- Where concentrate is re-infiltrated above the top of lined embankment level, it will only be carried out in areas where final permanent capping has been completed;
- KTK has identified a number of gas wells located in the leachate re-infiltration zones. These wells will be adapted to enable regular dipping, which will occur on a quarterly basis, and the results included in the quarterly monitoring reports submitted to the Agency. Wells identified for the purposes of dipping are GW41, GW75, GW79, GW86, GW100, GW128, GW187, GW197, GW208, GW224 and GW231. These are presented on Drawing No. RO2 01;
- Samples of raw leachate will be taken quarterly (from the side slope risers) for independent analysis, with the concentrations of the main parameters plotted to show any changes in leachate quality.

In the event that long term negative effects on leachate quality are recorded, re-infiltration of concentrate will be suspended and a contingency plan for management of the concentrate will be agreed with the Agency.



## 5.0 LEACHATE QUALITY INFORMATION

Monitoring of leachate quality at KTK Landfill has been carried out in accordance with Waste Licence conditions since the operation of the facility commenced. Results of this monitoring are submitted to the Agency at regular intervals with annual summaries of the monitoring provided as part of the annual AER submission.

A review of this information as presented in SEW "Specified Engineering works: Installation of Leachate Management Infrastructure KTK Landfill Kilcullen, Co. Kildare", submitted in June 2009, demonstrated that during 2002 to 2009, when leachate recirculation occurred at KTK, it had no measurable effect on leachate quality at the site. It was also demonstrated that the overall leachate quality at KTK is similar to that of other landfill sites where no re-circulation has taken place. There is no expectation that re-circulation of RO concentrate would affect long term leachate quality, but this will be monitored on a quarterly basis and in the unlikely event that leachate quality changes, contingency plans agreed with the Agency would be implemented.



## 6.0 PREPARATORY WORKS

Prior to the installation of the proposed additional leachate treatment system, there will be a need for some preparatory works at the site. These include:

- Construction of suitable level footings for the treatment unit within the current management area;
- Upgrade of existing power supply at the leachate management area by suitably qualified mechanical & electrical contractor;
- Installation of additional pipe work to enable feeding of the concrete aeration tank for stripping of methane prior to sewer discharge and
- Installation of additional concentrate re-infiltration pipe work and valve arrangements.

In addition to the proposed works, KTK Landfill are moving towards bulk storage of sulphuric acid and caustic soda and away from the use of IBC storage systems at the RO unit. This will provide a totally enclosed system for handling these products, which are used to adjust incoming leachate pH from typically 7.6 to 7.2 and correct final permeate pH from typically 4.5 to 7. The move to bulk storage provides considerable operational and health and safety benefits. The two bulk storage tanks will be installed on site within the bunded leachate management area. Both tanks come with built in 110% bund capacity and a leak detection system.

Further details of the proposed preparatory works and location of these infrastructural items can be viewed on Drawings RO2 01, RO2 02 and RO2 03. A schematic of the proposed leachate management system is also presented on Drawing RO2 04.



## 7.0 STUDY LIMITATIONS

**IMPORTANT:** This section should be read before reliance is placed on any of the opinions, advice, recommendations or conclusions herein set out.

- a) This report has been prepared for and at the request of KTK Landfill Ltd ("the Client") for the purpose of preparing specified engineering works proposals for installation of additional leachate management infrastructure at the KTK Landfill Facility pursuant to its appointment of Golder Associates Ireland Limited (Golder) to act as Consultant;
- b) Save for the Client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out;
- c) Regard should be had to the agreements between Golder and the Client from the proposal and the subsequent Terms of Appointment issued by Golder;
- d) All work carried out in preparing this report has used, and is based upon Golder's professional knowledge and understanding of the current relevant Irish, UK and European Community legislation;

Changes in the legislation may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, Golder has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, Golder will have no obligation to advise the Client of any such changes, or of their repercussions;

- e) Golder acknowledges that it is being retained, in part because of its knowledge and experience with respect to engineering and environmental matters. Golder will consider and analyse all information provided to it in the context of its knowledge and experience and all other relevant information known to Golder. To the extent that the information provided to Golder is not inconsistent or incompatible therewith, Golder shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of all such information and Golder shall have no obligation to verify the accuracy and completeness of such information;
- f) The content of this report represents the professional opinion of experienced engineering and environmental consultants, Golder does not provide specialist legal advice and the advice of lawyers will be required;
- g) If the scope of the work includes borings, trial pits, or engineering interpretation of such information attention is drawn to the fact that special risks occur whenever engineering and related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with a professional Standard of Care may fail to detect certain conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between sampling points may differ from those that actually exist. Passage of time, natural occurrences, and activities near the Site may substantially alter discovered conditions;
- h) In the conclusions section of this report, Golder has set out its findings and provided a summary and overview of its advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by Golder and therefore any advice, opinions or recommendations set out in the Conclusions section ought not to be relied upon until considered in the context of the whole report; and
- i) The contents of this report include confidential information and should not be disclosed to third parties without prior written approval from Golder.



## Report Signature Page

GOLDER ASSOCIATES IRELAND

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Project Manager

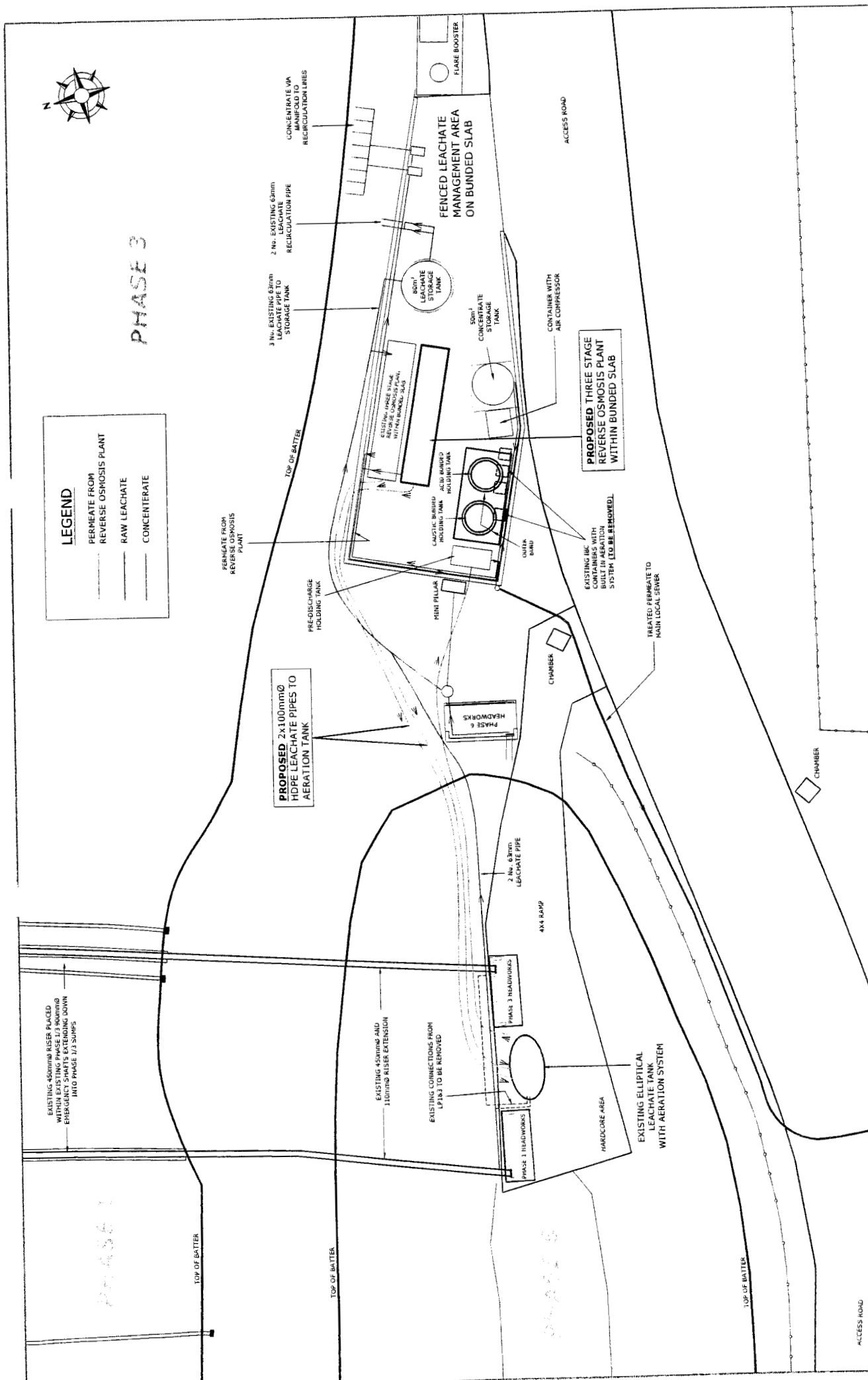
Peter Corrigan, BA, BAI, C.Eng., MIEI  
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p:\projects\19\_waste\kilk landfill\095 071 9 0165 leachate ro - kilcullen\19\_working notes\2nd ro leachate sew\100415 r02 b 0 sew for 2nd ro leachate reviewed by pc.docx





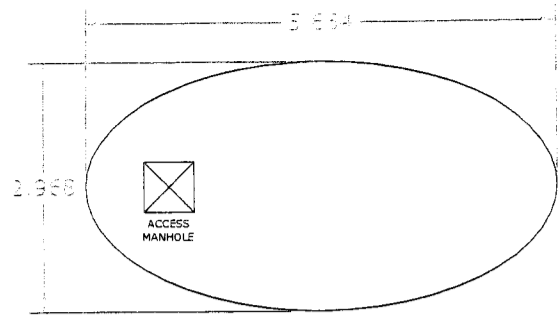
**LEGEND**

---	PERMEATE FROM REVERSE OSMOSIS PLANT
---	RAW LEACHATE
---	CONCENTRATE

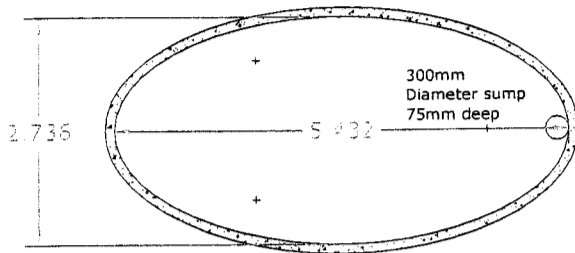
PHASE 3

<p><b>Golder Associates</b>  <small>7001 CENTRE ROAD, SUITE 400, MARKHAM, ONTARIO L3R 9V7        TEL: (905) 947-1111 FAX: (905) 947-1112</small></p>	<p><b>Client:</b>          KTK Landfill Ltd.  <b>Location:</b>          BROWNSTOWN, KILCULLEN, CO. KILDARE.  <b>Project:</b>          LEACHATE MANAGEMENT INFRASTRUCTURE</p>	<p><b>Project number:</b>          AR00560010</p>	<p><b>Created by:</b>          CC  <b>Engineer:</b>          PC  <b>Reviewed by:</b>          PC</p>	<p><b>Issue to:</b>          TO EPA</p>	<p><b>Date:</b>          April '10</p>	<p><b>Revision:</b>          A</p>	<p><b>Title:</b>          PROPOSED ADDITIONAL THREE STAGE REVERSE OSMOSIS PLANT WITHIN BUNDED SLAB</p>	<p><b>Scale:</b>          1:300 A3</p>	<p><b>Drawing:</b>          RO 02/02</p>
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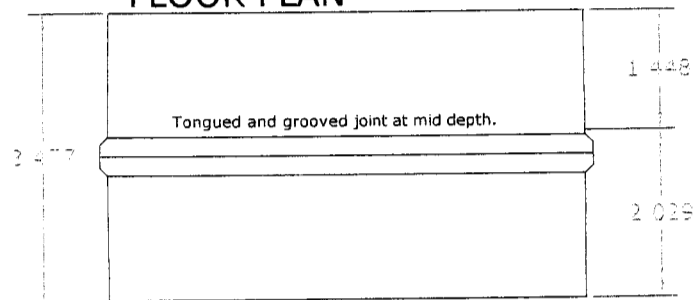




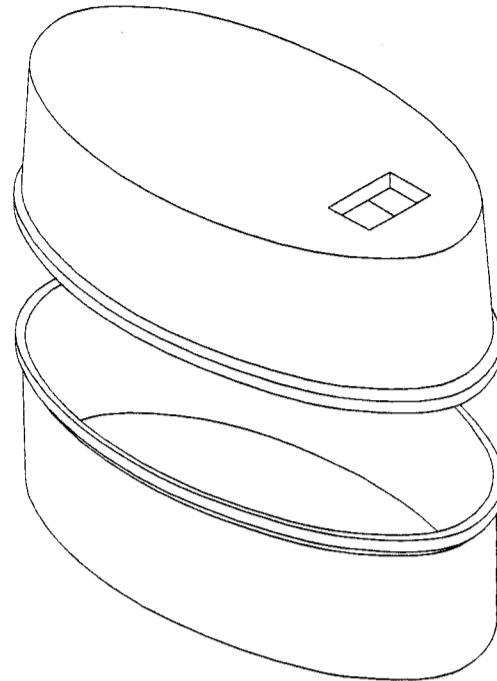
ROOF PLAN



FLOOR PLAN



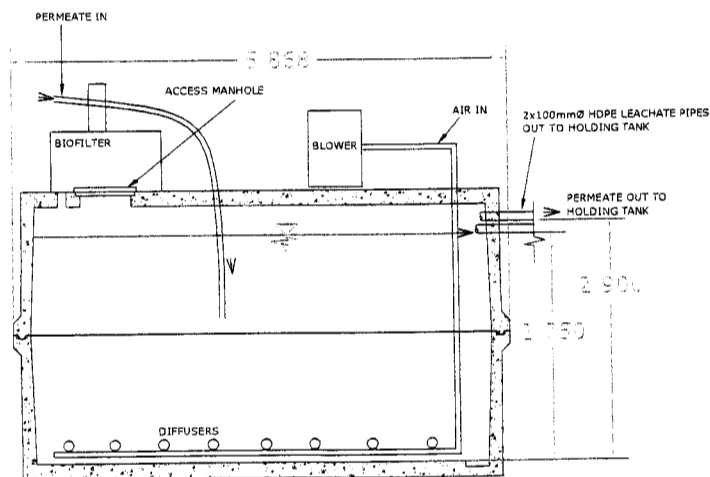
SIDE ELEVATION



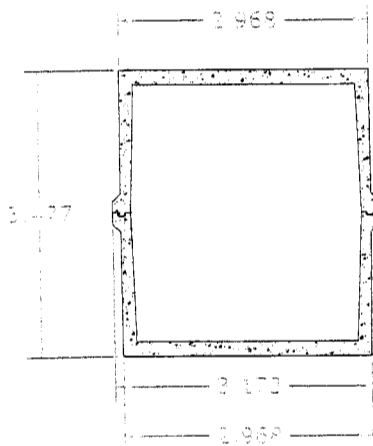
Weight of Base Section 12.67 Te

Weight of Roof Section 12.67 Te

**NOTE**  
 1. BLOWER IS ON TOP OF TANK AND FEEDS AIR INTO BOTTOM OF TANK TO DIFFUSERS.  
 2. BIOFILTER TO BE PLACED OVER ACCESS MANHOLE.  
 3. PERMEATE IN THROUGH CENTER OF TANK.



LONG SECTION



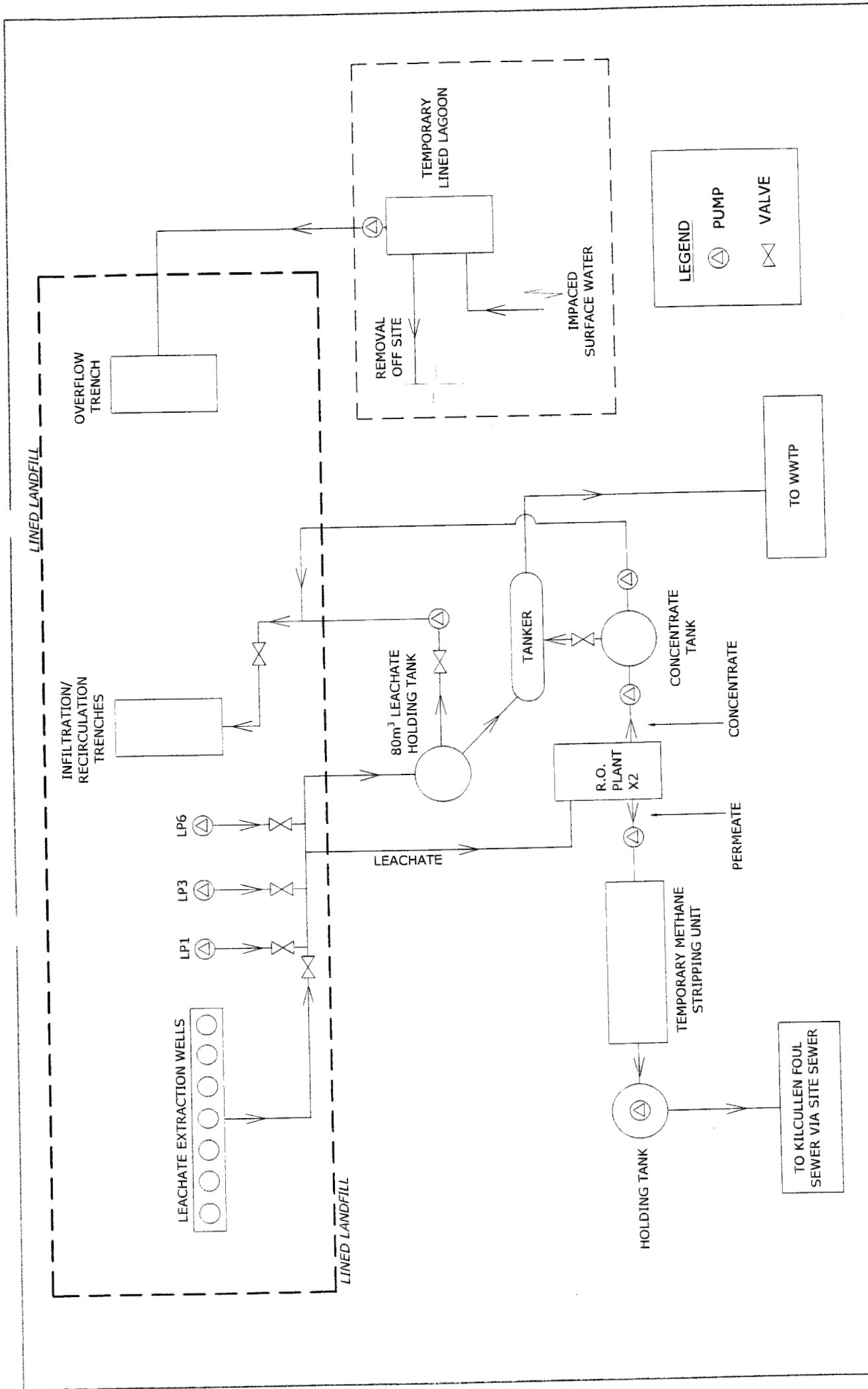
SHORT SECTION



Client:	<b>KTK Landfill Ltd.</b>	Project:	ELLIPTICAL PERMEATE TANK	Drawing:	<b>RO 02/03</b>
Location:	BROWNSTOWN, KILCULLEN, CO. KILDARE.	Scale:	1:60 A3	Created By:	CC
Project:	LEACHATE MANAGEMENT INFRASTRUCTURE	Project Number:		Checked By:	PC
Issue To:	EPA	Date:	April '10	Revision:	A
		Site Location:	GRAPHICS/CAD/KTK/RO MAR. 10	Approved By:	
		ORDNANCE SURVEY IRELAND LICENCE NUMBER:	AR00560010	Approved By:	PC







 <b>Golder Associates</b> <small>INTERNATIONAL CONSULTANTS AND ENGINEERS</small> <small>1500 WESTERN AVENUE, SUITE 100, CALGARY, ALBERTA T2P 0K6, CANADA</small> <small>TEL: 403.242.1100 FAX: 403.242.1101 WWW.GOLDER.COM</small>	<b>Client:</b> <b>KTK Landfill Ltd.</b>	<b>Project:</b> <b>BROWNSTOWN, KILCULLEN, CO. KILDARE.</b>	<b>Project number:</b> <b>AR00560010</b>	<b>Issue to:</b> <b>TO EPA</b>	<b>Date:</b> <b>April 10</b>	<b>Revision:</b> <b>A</b>	<b>File:</b> <b>SCHEMATIC OF LEACHATE MANAGEMENT SYSTEM AT KTK LANDFILL PROPOSED IN APRIL 2010</b>	<b>Scale:</b> <b>N.T.S</b>	<b>FIGURE:</b> <b>RO 02/04</b>
	<b>Created by:</b> <b>CC</b>	<b>Engineer:</b> <b>PC</b>	<b>Reviewed by:</b> <b>PC</b>	<b>Project Location:</b> <b>GRAPHICS/CAD/KTK/RO MAR. 10</b>	<b>Irish Licence Number:</b> <b>AR00560010</b>	<b>Issue to:</b> <b>TO EPA</b>	<b>Date:</b> <b>April 10</b>	<b>Revision:</b> <b>A</b>	<b>File:</b> <b>SCHEMATIC OF LEACHATE MANAGEMENT SYSTEM AT KTK LANDFILL PROPOSED IN APRIL 2010</b>

