



TERMS OF REFERENCE

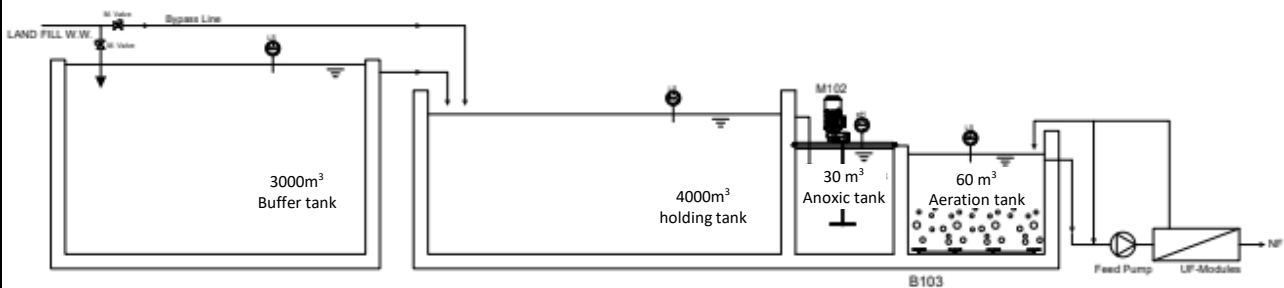
Consultant (Environmental/Civil/Chemical Engineer)	
<u>Department:</u> WASH - ACTED IRAQ.	<u>Base:</u> Dohuk Governorate
<u>ASSIGNMENT</u>	
Technical performance review of a Municipal Solid Waste Leachate Treatment Plant (LTP).	
<u>JUSTIFICATION</u>	
<p>As a result of an influx of Internally Displaced Persons and Refugees arriving in camps and host community in Dohuk Governorate, the volume of waste generated increased significantly. To decrease the pressures resulting from the MSW on the environment and decreasing the risk of related illnesses on the affected population, a LTP was constructed and commissioned in the last quarter of 2018.</p> <p>Available data for the operational period of Jan – March 2019 indicate an optimistic trend in terms of effluent quality when comparing to local standards for irrigation. However, there were concerns about the inability of the MLVSS to reach the 8000 mg/l design concentration (maximum value reached during operations was 3000mg/l). The ammonium concentration in the influent averages circa 500 mg/l, with final effluent concentration as high as 140 mg/l when the discharge standard is 5 mg/l. Although the plant was designed to treat 72m³/day, the daily throughput during the October – December 2018 period was 1m³/day, in January it increased to 5m³/day, while it averaged around 9m³/day in February and 12 m³/day in March - with a maximum of 16 m³/day.</p> <p>Following a two-week gap in implementation in January 2019, the operations restarted and ceased again in March 2019. Since then, the LTP has not been operational and discussions with the local authority is ongoing in order to re-commission. Due to the intermittent nature of operations, limited data in terms of the specific operational parameters exist.</p> <p>ACTED is therefore requesting an appraisal of the LTP's hydraulic and organic load capacity to treat the raw leachate. Firstly, validating the capacity of the operation followed by recommendations on potential measures to improve the process. The fact that LTP operations are complex is widely acknowledged in the industry and field of academia. This is no different in Iraq where this is considered a novel operation, and most of the local knowledge is based on theoretical concepts as opposed to evidence-based information, highlighting the impact a LTP operation can have to inform the Local Authorities' environmental strategies, policies and operations.</p>	
<u>Reporting to</u>	<u>WORKING RELATIONS</u>
Country Director WASH Technical Coordinator	<u>Internal Relations:</u> Coordination <u>External Relations:</u> Local Authorities (Municipality)

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BACKGROUND

The leachate originates from an engineered landfill and is collected in a 3000m³ circular concrete raw leachate buffer tank (RLBT) that was installed prior to the construction of the LTP. Following the 3000m³ RLBT is a 4000m³ circular holding tank connected to a Membrane Bio-Reactor (MBR) consisting of 1 x 30m³ anoxic and 1 x 60m³ aerated tanks connected in series. Ultra and Nano membrane filters are connected to the MBR before treated permeate is discharged into a buffer zone/wetland and concentrate is recirculated to the 4000m³ holding tank.



With consideration towards the hydraulic loading, the LTP was designed for 72m³/day (Assume the plant operates at 24hrs), while the effluent quality standards are expected to be compliant with the Kurdish Region of Iraq (KRI) permissible standards for irrigation.

Estimated characteristics of the waste arriving at the plant:

- 52% Organic waste (mainly food)
- 17% Recyclables such as plastic (6.3%), metal (2.8%), paper and card (7.9%)
- 10% potentially recyclable (textiles (8%), glass (2.3%), E-waste (0.3%))
- 21% residual waste (mainly nappies (8.8%), medical care (1%), construction (1.8%), non-recyclable composite plastics (9.4%))

Theoretical design parameters of the plant when consider raw leachate from the landfill cell:

Parameter	unit	Value
pH	#	7.5-9
COD	mg/L	11,000
BOD ₅	mg/L	5,000
TSS	mg/L	700
Conductivity	mg/L	20,000
NH ₃	mg/L	1,350
NH ₄	mg/L	1,350
NO ₃	mg/L	1,500
PO ₄	mg/L	20
SO ₄	mg/L	1,000



Objective

The key objective of this consultancy is to evaluate the performance of the constructed LTP. An empirical analysis that takes into account the hydraulic and organic aspects of the plant should primarily be based on the available data from the plant's operation supported by academic literature and industry standards. Computer based modelling/simulation must be provided to support analysis and inform recommendations.

Specific Objectives:

- Conduct comparative analysis of the LTP design and operations with the aim of evaluating the performance to industry standards. Specific consideration is required to evaluate the influent leachate's impact on the biomass and the plant's flow equalization.
- Perform a step by step critical examination of each of the processes involved to identify potential causes for sub-standard treatment performance.
- Based on the findings, recommend alternative measures to address the identified gaps - including the expected financial impacts.

Secondary Objectives:

- By conducting Key Informant Interviews with the local authorities, analyse the enabling environment that exist with directed focus towards the longer-term sustainability of the LTP. Specific consideration of the operational strategy when it comes to the financial and technical capacity to ensure uninterrupted supply is required.
- Develop a monitoring strategy with key performance indicators including BOD₅, COD, NH₄-N, NO₂, NO₃, SSV, MLSS, MLVSS, pH and DO with guidelines on the sampling and testing procedures. Provision should be made to translate these into Arabic and Kurdish.

Deliverables

Deliverable 1: Appraisal Report

Submit a report outlining the findings of the empirical analysis for the hydraulic and organic parameters of the LTP. Computer aided simulation/s and existing industry standards must be provided to substantiate these.

Deliverable 2: Recommendations

Put forth recommendations and practical steps to improve the current treatment and operations (based on KIIs and observations), including where relevant an outline of the estimated costs and anticipated duration of implementing the measures.

Deliverable 3: Monitoring and sampling strategy

Develop a monitoring strategy clearly outlining the KPIs (included amongst other BOD₅, COD, NH₄-N, NO₂, NO₃, SSV, MLSS, MLVSS, pH and DO), frequency of testing and threshold levels required for successful operation. As a sub-deliverable, include the sampling and testing procedures for all the parameters and steps to follow in the event where earlier mentioned threshold values are outside of recommended values.



PROFILE

Required qualifications and technical competencies

1. The consultant or firm must be registered with a relevant Engineering Board/Council.
2. A Chartered Engineer (Environmental/Civil/Chemical) with minimum 10 years of relevant experience should lead the project.
3. The firm must have previous related experience in the field of environmental consulting leachate treatment processes design, operations and maintenance.
4. Individuals/consultancies that can provide CAD software and modelling to support analysis and recommendations would be preferred.
5. Language requirements: Fluent in English

Professionalism and Personal Qualities

- Sensitivity to regional political, gender and cultural balance.
- Ability to work within the international and multicultural environments.
- Knowledge of Middle East context is an advantage.

Duration of Assignment:

The terms of the above ToR are considered on an output-based methodology. The deliverables will be reviewed first, and should be submitted to the Employer no later than 1 month from the entry into the agreement. Provision must be made for first and second reviews. The final report must be submitted no later than 2 weeks after the completion of the first and/or second review.

Additional information:

- A field visit to the site is required and cost for travelling and accommodation should be taken into account. ACTED will make the necessary arrangements to provide transportation and facilitate access to the site.
- Limited data on the operations of the plant is available, sporadic sampling was done by the operators and can be made available.