U. S. Army Corps of Engineers
Above-Ground Treatment System
Performance Checklist

Installation Name ______________________________

Site Name / I.D. ______________________________

Evaluation Team ______________________________

Site Visit Date ______________________________

This checklist is designed to facilitate the performance evaluation of an above-ground treatment system for wastewater and groundwater. It is divided into the following sections:

1) Evaluation team composition
2) Typical treatment objectives
3) References
4) Data collection requirements
5) Performance analysis calculations
6) Adequacy of operations and maintenance
7) Typical performance problems
8) Alternatives for possible cost savings
9) Supplemental notes and data.

The checklist provides suggestions for information gathering, and space has been provided to record data and notes from the site visit. Supplementary notes, if required, should be numbered to correspond to the appropriate checklist sections.

1) Evaluation Team Composition

The following disciplines should be included in the evaluation team for the above-ground treatment system.

- Process Engineer (site visit, treatment system evaluation)
- Chemist (treatment chemistry)
- Regulatory Specialist (regulatory requirements)
- Cost Engineer (cost of alternatives)

2) Typical Treatment Objectives

Verify that the treatment objectives established when the above-ground treatment system was designed and installed are clear and still valid.

Treatment of contaminated water maybe necessary to meet regulatory requirements for surface discharge or underground injection. If treated water will be injected additional conditioning may be required to prevent clogging of injection wells and to ensure that the chemistry of the treated water is compatible with the receiving aquifer.

Wastewater, groundwater, and leachate treatment systems may be operated for extended periods of time, and operational and maintenance costs can be a significant commitment over the long term. Efforts should be made to reduce operations, maintenance, and monitoring costs for the treatment system

3) References

Coordinate this checklist, where applicable, with the Liquid Piping/Pumping System, Process Instrumentation and Control, Remediation system General Evaluation, Filtration System, Vapor Phase Carbon, Environmental Monitoring, Solids Handling, and Treated Water Discharge checklists. For additional information on monitoring during water treatment processes, refer to *Water Quality and Treatment, A Handbook of Community Water Supplies* by the American Water Works Association.

4) Data Collection Requirements

Record the following information needed for performance calculations and to check the operation of the treatment unit. Record the appropriate units with each value.

a) Record the nameplate information from the treatment vessels, and from pumps and other mechanical equipment for future reference.

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b) Sketch process flow diagram (PFD), including valves and instrument locations, on the back of this sheet or on a separate sheet.

4.1 Wastewater Influent

a) Influent Sources
List the sources of contaminated water treated by this system.

Source of Water for Treatment	**Source Type** **(e.g., wastewater, groundwater, stormwater, leachate)**	**Flow Rate** **(record units)**

b) Contaminants Treated
List the contaminants and their concentrations from each source treated. Data should be provided for at least the last 3 sampling events.

Source of Water for Treatment	**Contaminant** (e.g., BOD_5, TSS, TCE, Lead)	**Concentration** (record units)

c) Are hazardous industrial chemicals listed in Section 313 of 40 CFR Part 372 (i.e., contact or non-contact) present in stormwater containment vessels?

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4.2 Discharge and Disposal

a Where is treated water discharged? (e.g., surface water, POTW, injection)

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b) List discharge permit(s) (e.g., NPDES, permit by rule {POTW}) and include the permit number, issuing agency, and expiration date.

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c) Treated Water Discharges

Water or Waste Stream	**Treatment**	**Discharged Flow**
	Total Discharged Flow =	

d) Describe other on-site waste management, if present. (e.g., sludge disposal)

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4.3 Wastewater Treatment Operations

a) What is the design basis for the above-ground portion of the water treatment system? (e.g., minimum and maximum influent flow, influent concentrations, operating hours per day, expected downtime)

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b) For each of the last 12 months of operation, obtain the following information:

- Total volume of water treated.
- Total hours of down time.
- Amounts of consumable materials used in the treatment processes (e.g., acid, caustic, sequestering agents, coagulants, activated carbon).
- Quantities of secondary waste products generated (e.g., sludge, spent activated carbon).
- The number of operators, and the number of hours present, at the treatment system facility.
- Itemized costs of operation (significant cost items only) ranked from highest to lowest, including waste disposal costs.

4.4 Air Emission Sources

a) Do any process chemicals used for treatment pose an air emissions problem? Can alternative chemicals be substituted?

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b) Are fugitive emissions a problem? What is the source (or sources)?

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c) Is there a regulated source (or sources) of air emissions at the project site?

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4.5 Air Emission Discharge

a) Were emissions limits set by regulation (e.g., NESHAP MACT, BACT, LAER, etc), or established based upon risk to downwind receptors (e.g., specified in a ROD)? What parties were responsible for deriving the limits?

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b) What is the sampling location (e.g., stack, site perimeter)?

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c) Air emissions limits

Contaminant	**Permitted Limit** (specify units)	**Sampling Frequency** (specify units)

d) Are the permit limits typically met? How many exceedances since start-up, and which parameter(s) were exceeded?

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4.6 Air Emission Control

a) Are air emissions treated prior to release to the atmosphere? What treatment is provided? If emission limits are approached, is there a contingency plan to modify operational procedures to reduce emissions and prevent exceedances of regulatory limits?

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5) Performance Analysis Calculations

a) Are influent contaminant concentrations increasing, decreasing, or remaining stable? Evaluate each water source separately.

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b) Plot the concentrations of the contaminants of concern before and after each unit process in the treatment system. Describe significant trends. (Data should be provided for at least the last 3 sampling events.)

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6) Adequacy of Operations and Maintenance

a) Verify that equipment is maintained per manufacturers recommendations and that controls and alarms are working. Are there provisions to notify an operator of a malfunction when the unit is unattended?

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b) Verify that the effluent concentration is sampled and analyzed in accordance with the sampling and analysis plan designed to assure the system is operating within permitted limits. Are measurements made with appropriate frequency? Determine if any additional monitoring is needed to analyze the operating conditions. *(The frequency of monitoring may require adjustments due to changes in the chemistry of the influent or other factors. More frequent monitoring may be needed if the treatment system is not performing consistently.)*

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c) Are monitoring points properly located to determine if the individual unit processes, as well as the system as a whole, are meeting objectives? *(Monitoring should be performed between unit processes. Physical parameters {e.g., flow rates, pressures, temperatures} should be monitored in addition to chemical concentrations.)*

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7) Typical Performance Problems

a) Are either the influent flow rates or contaminant concentrations substantially lower than when the treatment system was designed? What is the minimum flow rate at which the system can operate and still meet objectives? Which, if any, unit processes will not function effectively at a reduced flow?

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b) If the current inflow rate is substantially less than that needed for efficient operation, consider recirculating a portion of the treated water. However, if a large portion of the treated water must be recirculated to keep the treatment system operating and the influent flow rate is not expected to increase, then modifying the treatment system to operate at a lower flow rate should be pursued. *(Recirculation should be viewed as a temporary measure and used to allow treatment to proceed while plans are being made to modify the treatment plant.)*

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c) If the treatment system is located outside, are there provisions to drain the water lines and the sump(s) when the system is shut down? Inspect the system to verify there is adequate insulation and / or heat tracing to prevent rupture of lines due to freezing.

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8) Alternatives for Possible Cost Savings.

The types of contaminants or their concentrations in the influent may have changed to the extent that other alternatives are more cost effective. Consider the following:

a) Determine if the treatment operation is still necessary or whether influent concentrations have decreased to the point that the operation can be terminated?

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b) Are more cost effective treatment alternatives available to meet the present treatment requirements? Any modifications should be economically justified based on present worth analysis compared to the operating cost of the current system.

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c) Can the degree of treatment be reduced due to changed conditions? Are there any unit processes that are no longer necessary as components of the treatment train, and which can be by-passed? *(The objectives of the treatment system should be re-assessed in response to changed conditions, such as changes in: influent characteristics, discharge requirements, POTW acceptance criteria, etc.)*

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d) If there are substantial differences in the concentrations of contaminants among the various water sources being treated, consider segregating the water from one or more sources for separate treatment. Consider separating individual wells for separate treatment.

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e) If landfill leachate is being treated, is recirculation of untreated leachate back into the landfill an alternative to the above-ground treatment system (i.e., using the subsurface as a bioreactor)?

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f) If biodegradable compounds are being treated using a vapor-phase treatment system, is injection of the vapor stream into an engineered subsurface biofilter an alternative to the above-ground treatment system (i.e., use the subsurface as a bioreactor)?

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g) Are there analytical field methods available that could reduce costs, and still meet data quality requirements (e.g., commercial field analysis kits for COD, lead, TPH, TNT, RDX)? Laboratory analysis should still be required on a portion of the samples.

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h) Discuss any suggestions from the Operations Staff for streamlining the operation (e.g., changes in waste management practices, modifications to the above-ground treatment system).

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9) Supplemental Notes and Data

There are _______ pages of supplemental notes and data attached to this checklist.