



PROJECT DESCRIPTION

Brushy Creek Wastewater Facility – East Plant (BCE)

Located in Round Rock, Texas, this treatment facility provides wastewater management services to:

- Travis and Williamson Counties, Fern Bluff and Brushy Creek MUDs

Recent population growth shows the BCE Facility will exceed 75% of the permitted flow, so the facility will be expanded to facilitate new flow.

Project Overview:

- Increase treatment capacity
 - AADF from 20 MGD to 30 MGD
 - P2HF from 60 to 90 MGD
- Design Requirements:
 - Additional influent lift station
 - New PTU system
 - **Accommodate biological phosphorus removal**
 - New filtration system
 - Reuse sodium Hypochlorite System

DESIGN CONSIDERATIONS

- Plant must remain in operation during expansion
- Reduce chemical consumption costs
- Odor control for headworks

ALTERNATIVE DESIGNS SOLUTIONS

Membrane Bioreactor	MBR membranes replace clarifiers, enabling higher MLSS, greater capacity, and phosphorus limit compliance.
Parallel EBPR Train	EBPR (Enhanced Biological Phosphorus Removal) uses phosphorus-accumulating organisms (PAOs) to biologically remove excess phosphate from wastewater.
Microalgae Bacterial Biofilms	Combines algal photosynthesis with bacterial degradation to remove contaminants, while also generating a harvestable biomass.
Phased Rehab	Treatment trains are upgraded in planned phases while new infrastructure is added to meet future capacity demands.

EXMAPLE OF PROPOSED EBPR PROCESS FLOW DIAGRAM

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graph TD
    Influent --> Anaerobic
    Anaerobic --> Anoxic
    Anoxic --> Aerobic
    Aerobic --> SecondaryClarifier((SECONDARY CLARIFIER))
    SecondaryClarifier --> Effluent
    SecondaryClarifier --> WasteActivatedSludge((WASTE ACTIVATED SLUDGE))
    WasteActivatedSludge --> ReturnActivatedSludge((RETURN ACTIVATED SLUDGE))
    ReturnActivatedSludge --> Anaerobic
    SecondaryClarifier --> InternalRecycle((INTERNAL RECYCLE))
    InternalRecycle --> Anoxic
    
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COST ANALYSIS

Design Alternative	Capital Cost	Life-Cycle Cost
Membrane Bioreactor	\$219M	\$275M
Parallel EBPR Train	\$174M	\$214M
Microalgae-Bacterial Biofilms	\$163M	\$204M
Phased Rehabilitation	\$159M	\$203M

- **Capital Cost Analysis**
 - Developed by creating an OPCC per design
- **Life-Cycle Cost Analysis** – 100-year analysis period
 - Calculated by using the following formula:

$$NPV = \text{Initial cost} + \sum_k \text{MaintCost}_{nk} \left[\frac{1}{(1+i)^{nk}} \right] + \sum_p \text{RehabCost}_{np} \left[\frac{1}{(1+i)^{np}} \right] - \text{SV} \left[\frac{1}{(1+i)^D} \right]$$

SUSTAINABILITY EVALUATION

Envision Framework Evaluation

Design Alternative	ENV Score	Award Level
Membrane Bioreactor	71%	Platinum
Parallel EBPR Train	43%	Gold
Microalgae-Bacterial Biofilms	79%	Platinum
Phased Rehabilitation	59%	Platinum

CONSTRAINTS & REGULATIONS

- 30 TCEQ TAC 217
 - Subchapter E: Preliminary Treatment Units
 - Subchapter F: Activated Sludge System
 - Subchapter K: Chemical Disinfection
- TPDES Effluent Permit Characteristics

Effluent Parameter	Daily Average
cBOD (mg/L)	7
TSS (mg/L)	15
NH4-N (mg/L)	2
TP (mg/L)	0.5
DO (mg/L)	5
E. coli (ppd)	126