REPRESENTATIVE AQUEOUS WASTE STREAM COMPOSITIONS

Characteristics of the three representative waste stream types are provided in Tables 1–3 below. Applicants in Category 1 can create synthetic waste streams approximately based on one of these examples, or they can provide another example that represents one of the three required waste stream types either at the influent to a treatment system (per Tables 1–3), or at any point in a conventional treatment process where recovery is proposed. Applicants in Categories 2 and 3 can create synthetic waste streams approximately based on one of these examples during the first year of performance, or they can provide another example as with Category 1 applicants. However, they must obtain access to a real waste stream by the end of year 1.

Table 1. Characteristic Municipal Wastewater.[1]

Parameter	Value
Flow (m^3/day)	356,000
pH	7
HCO_3^- (mg/L)	220
TSS* (mg/L)	210
BOD* (mg/L)	190
TOC* (mg/L)	140
Cl^- (mg/L)	50
NH_3–N (mg/L)	40
SO_4^{2-} (mg/L)	33
Ca^{2+} (mg/L)	28
Na^+ (mg/L)	23
Tot P (mg/L)	7
Mg^{2+} (mg/L)	7
K^+ (mg/L)	2.4
F^- (mg/L)	0.17
Br^- (mg/L)	0.019
Sol P* (mg/L)	0.0001
NO_2^- (mg/L)	0.0001
NO_3^- (mg/L)	0.0001
***TSS = total suspended solids, BOD = biochemical oxygen demand, TOC = total organic carbon, Sol P = soluble** P	

[1] Modified from George Tchobanoglous, et al. *Wastewater Engineering: Treatment and Reuse* (New York, NY: McGraw-Hill Education, 2013).

Table 2. Characteristic Produced Water Stream.[2]	
Parameter	**Value**
Flow (m^3/day)	379
pH	6.8
Cl^- (mg/L)	88276
Na^+ (mg/L)	38755
Ca^{2+} (mg/L)	6319
Mg^{2+} (mg/L)	932
Sr^{2+} (mg/L)	806
K^+ (mg/L)	687
Br^- (mg/L)	652
SO_4^{2-} (mg/L)	409
NH_4^+–N (mg/L)	376
TDS (mg/L)	160
SiO_2 (mg/L)	122
TOC (mg/L)	52
B (mg/L)	51
Li^+ (mg/L)	22.3
Fe^{2+} (mg/L)	12
Co^{2+} (mg/L)	7.52
Cd^{2+} (mg/L)	1.52
Mn^{2+} (mg/L)	1.1
Ni^{2+} (mg/L)	0.24
Mo^{2+} (mg/L)	0.1

[2] Modified from Lei Hu, et al., "Toxicological Characterization of Produced Water from the Permian Basin," *Science of the Total Environment* 815, (2022): 152943. https://doi.org/10.1016/j.scitotenv.2022.152943.

Table 3. Characteristic Mining Waste Stream.[3]	
Parameter	**Value**
Flow (m^3/day)	757
pH	4.13
SO_4^{2-} (mg/L)	10600
Fe^{2+} (mg/L)	4200
Ca^{2+} (mg/L)	420
Mg^{2+} (mg/L)	308
Al^{3+} (mg/L)	119
Na^{+} (mg/L)	99.4
SiO_2 (mg/L)	78.2
Mn^{2+} (mg/L)	24
K^{+} (mg/L)	22.4
Cl^{-} (mg/L)	11.3
NH_4^{+}-N (mg/L)	11.2
BOD (mg/L)	6.2
F^{-} (mg/L)	5.04
Zn^{2+} (mg/L)	2.75
HPO_4^{2-} (mg/L)	2.62
Sr^{2+} (mg/L)	0.95
Co^{2+} (mg/L)	0.73
Ni^{2+} (mg/L)	0.684
TOC (mg/L)	0.54
Y^{3+} (mg/L)	0.47
Li^{+} (mg/L)	0.41
Nd^{3+} (mg/L)	0.139
Ce^{3+} (mg/L)	0.11
Dy^{3+} (mg/L)	0.1
Gd^{3+} (mg/L)	0.094
V^{5+} (mg/L)	0.07
Rb^{1+} (mg/L)	0.0681
Sm^{3+} (mg/L)	0.056

[3] C.A. Cravotta III and Keith B.C. Brady, "Priority Pollutants and Associated Constituents in Untreated and Treated Discharges from Coal Mining or Processing Facilities in Pennsylvania USA," *Applied Geochemistry* 62, (2015):108–130. https://doi.org/10.1016/j.apgeochem.2015.03.001.

Er^{3+} (mg/L)	0.053
Be^{2+} (mg/L)	0.041
Yb^{3+} (mg/L)	0.039
La^{3+} (mg/L)	0.024
Pr^{3+} (mg/L)	0.021
Ho^{3+} (mg/L)	0.02
Sc^{3+} (mg/L)	0.019
Eu^{3+} (mg/L)	0.018
Tb^{3+} (mg/L)	0.018