

Table 5.2
Biology QA Targets for LOD/LOQ, Precision and
Accuracy

Field Parameters

Table 5.2a
Field Parameter QA Targets

Parameter	Matrix	Method #	Precision ⁽¹⁾	Accuracy ⁽¹⁾	Conc. Range	LOD
Conductivity	Effluent Surface water Leachate	SM 2510	9% S.D.*	10% R.E.*	—*	1 µmhos/cm
Dissolved Oxygen	"	SM 4500-O	± 0.2 mg/L*	± 0.2 mg/L*	—*	NA
pH	"	SM 4500-H ⁺ B	0.2 SU*	± 0.2 SU*	—*	NA
Salinity	"	SM 2520	5% S.D.*	5% R.E.*	—*	< 0.1 ppt
Temperature	"	FT 1400	0.1 °C*	± 0.1 °C*	—*	NA

¹ An asterisk indicates engineering parameter using values from method data.

Laboratory Parameters
Table 5.2b
Physical-chemical Parameter QA Targets

Parameter	Matrix	Method #	Precision (1,2)	Accuracy	Conc. Range	LOD	LOQ
Alkalinity	Effluent, Surface water, Leachate	SM 2320 B	$\pm 1 \text{ mg/L}^*$ (as CaCO_3)	$\pm 1 \text{ mg/L}^*$ (CaCO_3)	—*	1 mg/L (as CaCO_3)	—
Ammonia	"	SM 4500-NH ₃ F	For > 0.3 mg/L, RPD = 3.6%, SD = 1.86% For < 0.3 mg/L, mean = 0.107 mg/L, SD = 0.042 mg/L.	$\pm 6.86\%$ @ 14 mg/L $\pm 5.12\%$ @ 1.4 mg/L	H L	0.017* mg/L NH ₃ -N	0.3 mg/L NH ₃ -N
Chlorine	"	SM 4500-Cl G modified	$\pm 2.8\%$ (n = 14) $\pm 1.5\%$ $\pm 11.1\%$	SD = 6.2% ³ (n = 6) SD = 6.07% ³ (n = 12)	H > 2.4 M 0.6–2.4 L < 0.6	0.01 mg/L	0.03 mg/L
Conductivity	"	SM 2510 B	9% S.D.*	10% R.E.*	—*	1 $\mu\text{mho/cm}$	1 $\mu\text{mho/cm}$
Dissolved Oxygen	"	SM 4500-O G	$\pm 0.1 \text{ mg/L}^*$ $\pm 0.05 \text{ mg/L}^*$	$\pm 0.1 \text{ mg/L}^*$ $\pm 0.1 \text{ mg/L}^*$	—*	1 mg/L 0.5 mg/L	—
Hardness	"	SM 2340 C	$\pm 1 \text{ mg/L}$ (CaCO_3)*	$\pm 1 \text{ mg/L}$ (CaCO_3)*	—*	1 mg/L (CaCO_3)	—
pH	"	4500-H+ B	$\pm 0.1 \text{ SU}^*$	$\pm 0.1 \text{ SU}^*$	—*	NA	NA
Salinity	"	SM 2520 B	9% S.D.*	10% R.E.*	—*	< 0.1 ppt	—
Temperature	"	SM 2550 B	0.1 °C*	$\pm 0.1 \text{ °C}^*$	—*	NA	NA
Turbidity	"	SM 2130 B	$\pm 15\%^*$	$\pm 15\%^*$	—*	0.0	0.0

- (1) An asterisk indicates engineering parameter using values from method data.
- (2) n = 20 unless otherwise noted.
- (3) Values from EPA check samples and Proficiency Tests.
- (4) Relative Percent Difference (RPD) is the absolute value of the difference between the measured value and the actual value divided by the actual value times 100

Table 5.2c
Biological Parameter QA Targets

Parameter	Matrix	Analytical Method #	Precision	Accuracy	LOD	LOQ
Algal Growth Potential/Limiting Nutrient Assays, freshwater	Effluent Surface water Leachate Ground water	EPA/600/9-78-018 mod.	RPD $\leq$ 30% (including values below the PQL)	—	0.300 mg dry wt/L	0.900 mg dry wt/L
Algal Growth Potential/Limiting Nutrient Assays, marine	Effluent Surface water Leachate Ground water	EPA 1974: <i>Marine Algal Assay Bottle Test</i>	RPD $\leq$ 30% (including values below the PQL)	—	3.0 mg dry wt/L	3.0 mg dry wt/L
Benthic Macroinvertebrates —Sample Preparation	Sediments Substrate	SM10500 C mod.	90% sorting efficiency for the sample	NA	NA	NA
Benthic Macroinvertebrates Taxonomy	Sediments Substrate	NA	95% similarity between re-identifications of the same sample	NA	NA	NA
Chlorophyll <i>a</i> — Phytoplankton	Surface water	SM 10150 B	RPD $\leq$ 25%	75-120 %	0.55 μ g/L	1.7 μ g/L
Periphyton Taxonomy	Aquatic substrates	SM 10300 C.2 (mod); 10300 C.3 (mod); 10900 C (mod)	70% Bray-Curtis Similarity between re-identifications of the same sample. 80% correct identifications on monthly round-robin QC exercise	NA	NA	NA
Phytoplankton Taxonomy	Surface water	SM 10200 F.1 (mod); 10200 F.2 (mod); 10900 C (mod)	Same as periphyton	NA	NA	NA
<i>Ceriodaphnia dubia</i> 48-hr and 96-hr Acute Toxicity Test	"	EPA-821-R-02-012 Method 2002.0	CV $\leq$ 29% (n = 20) ^{1,2}	NA	NA	NA
<i>Ceriodaphnia dubia</i> Survival and Reproduction Test	"	EPA-821-R-02-013 Method 1002.0	CV $\leq$ 45% (n = 20) ^{1,2}	NA	NA	NA
<i>Cyprinella leedsi</i> 48-hr and 96-hr Acute Toxicity Test	"	EPA-821-R-02-012—mod. Method 2000.0	CV $\leq$ 19% (n = 20) ^{1,2}	NA	NA	NA

Table 5.2c
Biological Parameter QA Targets

Parameter	Matrix	Analytical Method #	Precision	Accuracy	LOD	LOQ
<i>Pimephales promelas</i> Larval Survival and Growth Test	Effluent Surface water Leachate Ground water "	EPA-821-R-02-013 Method 1000.0	CV ≤ 31% (n = 20) ^{1,2,3}	NA	NA	NA
<i>Menidia beryllina</i> 48-hr and 96-hr Acute Toxicity Test	"	EPA-821-R-02-012 Method 2006.0	CV ≤ 21% (n = 20) ^{1,2}	NA	NA	NA
<i>Menidia beryllina</i> Larval Survival and Growth	"	EPA-821-R-02-014 Method 1006.0	CV ≤ 43% (n = 10) ^{1,2}	NA	NA	NA
<i>Americamysis bahia</i> 48-hr and 96-hr Acute Toxicity Test	"	EPA-821-R-02-012 Method 2007.0	CV ≤ 26% (n = 20) ^{1,2}	NA	NA	NA
<i>Americamysis bahia</i> Survival, Growth, and Fecundity Test	"	EPA-821-R-02-014 Method 1007	CV ≤ 32% (n = 7) ^{1,2}	NA	NA	NA
<i>Pimephales promelas</i> 48-hr and 96-hr Acute Toxicity Test	"	EPA-821-R-02-012 Method 2000	CV ≤ 19% (n = 20) ^{1,2,3}	NA	NA	NA
<i>Pseudokirchneriella subcapitata</i> (formerly <i>Selenastrum capricornutum</i>) Growth Test	"	EPA-821-R-02-013 Method 1003.0	CV ≤ 39% (n = 8) ^{1,2,3}	NA	NA	NA

(1) See following addendum regarding toxicity bioassays.

(2) Value is for standard reference toxicant data.

(3) Using IC₂₀ as a calculated endpoint.

Addendum: Toxicity bioassays

The EPA ERL-ORD, Duluth, has examined a number of different toxicity tests and found the precision CV range of 5–50%. This level of precision is equal to or better than analytical chemical analyses performed near their detection limits. This comparison is appropriate because the bioassays are measuring at the limit of the effect on the organisms.

Table 5.2d
Microbiological Parameter QA Targets

Parameter	Matrix	Analytical Method #	Precision ⁽¹⁾	Accuracy ⁽²⁾	Conc. Range	LOD	LOQ
<i>E. coli</i> QT	Effluent Surface water Leachate Ground water	SM 9223 B Quanti-Tray	$\bar{R} = 0.17$ WL = ± 0.5591	NA	—	NA(3)	NA(3)
Enterococci QT	Effluent Surface water Leachate Ground water	Enterolert QT	$\bar{R} = 0.20$ WL = ± 0.6438	NA	—	NA(3)	NA(3)
Total Coliform QT	Effluent Surface water Leachate Ground water	SM 9223 B Quanti-Tray	$\bar{R} = 0.10$ WL = ± 0.3427	NA	—	NA(3)	NA(3)
Fecal Coliform MF	Effluent Surface water Leachate Ground water	SM 9222D	$\bar{R} = 0.04$ WL = ± 0.1346	NA	—	NA(3)	NA(3)
Heterotrophic Plate Count	Effluent Surface water Leachate Ground water	SM 9215B	$\bar{R} = 0.03$ WL = ± 0.1106	NA	—	NA(3)	NA(3)

(1) $\bar{R}$ = mean of the range between replicate pairs (counts log transformed). n = 15 unless otherwise indicated.

WL = warning limits per SM9020B.9.5-1997 [$WL = \pm 3.27 \times \bar{R}$].

(2) NA - As noted by EPA 600/8-78-017 and other references, there are no established precision and accuracy data available for relating analytical results to field populations.

(3) The MDL and PQL can be viewed either as based on the success at plating out culturable cells in the sample (MDL & PQL = 1 per plating volume) or as the success at plating out all cells. The culturable to unculturable cells ratio varies among samples preventing determination of a generic MDL and PQL.