Appendix 5C1 Estimated Far Field Travel Time, Distance and Effluent Dilution Factors at Low Current Velociy

Far-field dilution of initially diluted effluent plumes using the linear diffusivity Brooks model as presented by Grace (R.A. Grace. Marine outfall systems: planning, design, and construction. Prentice-Hall, Inc.)

INPUT

Linear Eddy Diffusivity
Eo=(alpha)(width)
(Grace/Brooks equation 7-65)

1. Plume and diffuser characteristics at start of far-field mixing
   - Flux-average dilution factor after initial dilution (e.g. dilution at end of computations with UDKHDEN): 9.9
   - Estimated initial width (B) of plume after initial dilution (meters) (e.g. eqn 70 of EPA/600/R-94/086 for diffuser length and plume diameter): 2.2 meters
   - Travel distance of plume after initial dilution (meters) (e.g. "Y" from UDKHDEN or horizontal distance from PLUMES output): 0.7 meters

2. Distance from outfall to mixing zone boundary (meters) (e.g. distance to the chronic mixing zone boundary): N.A meters

3. Diffusion parameter "alpha" per equations 7-62 of Grace, where Eo=(alpha)(width): 0.0004 m/sec

4. Horizontal current speed (m/sec) (e.g. same value specified for UDKHDEN or PLUMES): 0.05 m/sec

OUTPUT

Eo = 0.001 m^2/s
Beta = 0.094 unitless

Far-field Travel Time (hours)	Far-field Travel Distance (m)	Total Travel Distance (m)	Effluent Dilution
0.0	5.0	5.7	10.0
0.1	9.9	10.6	10.8
0.1	14.9	15.6	12.1
0.1	19.9	20.6	13.5
0.1	24.8	25.5	14.9
0.2	29.8	30.5	16.4
0.2	34.8	35.5	17.8
0.2	39.7	40.4	19.3
0.2	44.7	45.4	20.8
0.3	49.7	50.4	22.3
0.3	54.6	55.3	23.8
0.3	59.6	60.3	25.4
0.4	64.5	65.2	26.9
0.4	69.5	70.2	28.4
0.4	74.5	75.2	29.9
0.4	79.4	80.1	31.4
0.5	84.4	85.1	32.9
0.5	89.4	90.1	34.4
0.5	94.3	95.0	35.9
0.6	99.3	100.0	37.4
1.1	199.3	200.0	67.9
1.7	299.3	300.0	98.4
2.2	399.3	400.0	128.9
2.8	499.3	500.0	159.4
5.6	999.3	1000.0	311.9
11.1	1999.3	2000.0	616.8

Appendix 5C2 Estimated Far Field Travel Time, Distance and Effluent Dilution Factors at High Current Velociy

Far-field dilution of initially diluted effluent plumes using the linear diffusivity Brooks model
as presented by Grace (R.A. Grace. Marine outfall systems: planning, design, and construction. Prentice-Hall, Inc.)

INPUT

Linear Eddy Diffusivity
Eo=(alpha)(width)
(Grace/Brooks equation 7-65)

1. Plume and diffuser characteristics at start of far-field mixing
   Flux-average dilution factor after initial dilution — 9.9
   (e.g. dilution at end of computations with UDKHDEN)
   Estimated initial width (B) of plume after initial dilution (meters) — 2.2 meters
   (e.g. eqn 70 of EPA/600/R-94/086 for diffuser length and plume diameter)
   Travel distance of plume after initial dilution (meters) — 0.7 meters
   (e.g. "Y" from UDKHDEN or horizontal distance from PLUMES output)

2. Distance from outfall to mixing zone boundary (meters) — N.A meters
   (e.g. distance to the chronic mixing zone boundary)

3. Diffusion parameter "alpha" per equations 7-62 of Grace, where Eo=(alpha)(width)
   0.0004 m/sec

4. Horizontal current speed (m/sec) — 0.4 m/sec
   (e.g. same value specified for UDKHDEN or PLUMES)

OUTPUT

Eo = 0.001 m^2/s
Beta = 0.012 unitless

Far-field Travel Time (hours)	Far-field Travel Distance (m)	Total Travel Distance (m)	Effluent Dilution
0.003	5.0	5.7	9.9
0.007	9.9	10.6	9.9
0.010	14.9	15.6	9.9
0.014	19.9	20.6	9.9
0.017	24.8	25.5	9.9
0.021	29.8	30.5	9.9
0.024	34.8	35.5	10.0
0.028	39.7	40.4	10.0
0.031	44.7	45.4	10.1
0.034	49.7	50.4	10.2
0.038	54.6	55.3	10.2
0.041	59.6	60.3	10.3
0.045	64.5	65.2	10.5
0.048	69.5	70.2	10.6
0.052	74.5	75.2	10.7
0.055	79.4	80.1	10.8
0.059	84.4	85.1	11.0
0.062	89.4	90.1	11.1
0.066	94.3	95.0	11.3
0.069	99.3	100.0	11.4
0.138	199.3	200.0	14.9
0.208	299.3	300.0	18.6
0.277	399.3	400.0	22.4
0.347	499.3	500.0	26.2
0.694	999.3	1000.0	45.3
1.388	1999.3	2000.0	83.4