SAN FRANCISCO, CA IMPERVIOUS SURFACES

This scenario is intended to be used to mimic hydrology of untreated portions of the San Francisco Area, CA. The intention is to couple the edge of field concentrations from this scenario with the edge of field concentrations from the residential scenario for San Francisco to generate weighted concentrations for areas of varying impervious cover. Therefore, this scenario relies on a similar soil series as the residential scenario; however the upper horizon has been adjusted to a non-soil nature.

Although this scenario has undergone basic testing, the scenario should be used with caution since it has not been fully tested under a range of conditions to ensure that PRZM is capable of simulating pesticide runoff from impervious surfaces. For instance, during development, it was impossible to force PRZM to convert all precipitation to surface runoff (even with a curve number of 100). In addition, setting all soil parameters to zero in the surface horizon caused errors in PRZM. For example, soil moisture parameters cannot be set to zero, since PRZM requires soil moisture for partitioning the chemical into the dissolved phase for transport. Additionally, CAM selection appears to be somewhat problematic. Since there are no crops in an impervious surface the maximum interception storage of crop, rooting depth, and coverage has been set to zero. However, the consequences for a foliar application (CAM = 2) which may result from direct spraying of the surface, CAM may not be pertinent. During testing, this scenario was run several times using various CAM values. When setting CAM = 1 versus CAM = 2 the same EECs were produced. When using CAM = 1, an application depth of 4 cm is automatically used. When running PRZM/EXAMS with CAM = 4, depth = 1 EECs were even higher than with CAM = 1 or 2. If the scenario is run with depth = 0 the model produces no EECs. For this scenario, users may need to set CAM = 4, depth = 0.1 cm. Furthermore, if this scenario is couple with a residential scenario, the effects of irrigation in one scenario versus no irrigation in another must be considered.

Metfile W23234 was selected for this scenario since it is the closest metfile to San Francisco. Its data were collected in San Francisco, CA. The station is located approximately 2 meters above mean seal level (AMSL). San Francisco receives approximately 20 inches of rainfall annually with nearly 60% of the annual precipitation occurring in January, February, and March (NOAA, 2006). This station is the closest available weather station that includes data required for PRZM.

Soil parameterization followed the methods used for a previous endangered species assessment in Barton Springs, Texas. Beacause the surface layer is the most important component of the scenario, values used were obtained from the existing scenario to maintain consistency.

Table 1. PRZM 3.12 Climate and Time Parameters for San Francisco, CA.

Parameter	Value	Source/Comments
Starting Date	Jan. 1, 1961	Meteorological File from San Francisco, CA (W23234)
Ending Date	Dec. 31, 1990	Meteorological File from San Francisco, CA (W23234)
Pan Evaporation Factor (PFAC)	0.77	PRZM Manual Figure 5.1 (EPA 1998). Value represents much of CA coastline.
Snowmelt Factor (SFAC)	0	Snow is not expected to occur in San Francisco.
Minimum Depth of Evaporation (ANETD)	17.5	Mid point of range (15-20), PRZM Manual, Figure 5.2 (EPA 1998).

Table 2. PRZM 3.12 Erosion and Landscape Parameters for San Francisco – impervious surfaces.

Parameter	Value	Source/Comments
Method to Calculate Erosion (ERFLAG)	4 (MUSS)	Default value.
USLE K Factor (USLEK)	0	Set to zero, no erodibility for impervious surfaces.
USLE LS Factor (USLELS)	0.37	Calculated according to Haan and Barfield (1978) equation: LS = $((\lambda/72.6)^m)((430x^2 + 30x + 0.43)/6.613)$, where λ = slope length, x = SLP/100 and m = constant. In this case, λ = 400 m (default value) and m = 0.3 (EPA 2004).
USLE P Factor (USLEP)	1	Contour plowing is not applicable (EPA 2004).
Field Area (AFIELD)	172 ha	Area of Shipman Reservoir watershed (EPA, 1999)
NRCS Hyetograph (IREG)	2	PRZM Manual, Figure 5.12 (EPA, 1998).
Slope (SLP)	2.5%	Lawns are generally limited to slopes where it is safe to operate mowers (0-5%). Selected as midpoint of the range. Darren Haver (USDA 2006a).
Hydraulic Length (HL)	600 m	Shipman Reservoir (EPA, 1999)
Irrigation Flag (IRFLAG)	0	Irrigation is not warranted for impervious surfaces.

Table 3. PRZM 3.12 Crop Parameters for San Francisco – impervious surfaces.

Parameter	Value	Source/Comments
Initial Crop (INICRP)	1	Default value
Initial Surface Condition (ISCOND)	1	Scenario does not warrant crop parameters. Set to 1 to allow PRZM to execute.
Number of Different Crops (NDC)	1	Scenario does not warrant modeling crop cover. Set to 1 to allow PRZM to execute.
Number of Cropping Periods (NCPDS)	30	Set to weather data in meteorological file: San Francisco, CA (W23234)
Maximum rainfall interception storage of crop (CINTCP)	0	No interception on impervious surfaces (Dunne and Leopold, 1978)
Maximum Active Root Depth (AMXDR)	0 cm	Crop parameters are not applicable to this scenario.
Maximum Canopy Coverage (COVMAX)	0	Crop parameters are not applicable to this scenario.
Soil Surface Condition After Harvest (ICNAH)	1	Crop parameters are not applicable to this scenario; however value was set to 1 to allow PRZM to assign curve number.
Date of Crop Emergence (EMD, EMM, IYREM)	1/1/61	Crop parameters are not applicable to this scenario; however values were assigned to prevent PRZM from crashing.

Date of Crop Maturity (MAD, MAM, IYRMAT)	2/1/61	Crop parameters are not applicable to this scenario; however values were assigned to prevent PRZM from crashing.
Date of Crop Harvest (HAD, HAM, IYRHAR)	31/12/61	Crop parameters are not applicable to this scenario; however values were assigned to prevent PRZM from crashing.
Maximum Canopy Height (HTMAX)	0	Crop parameters are not applicable to this scenario.
Maximum Dry Weight (WFMAX)	0.0	Crop parameters are not applicable to this scenario.
SCS Curve Number (CN)	98, 98, 98	TR-55 (Table 2-2a) CN for impervious areas (USDA 1986)
Manning's N Value (MNGN)	0.011	TR-55 (Table 3-1). Value for smooth surfaces (concrete, asphalt, gravel, or bare soil)
USLE C Factor (USLEC)	0	Set to zero. No cover and management fact or is applicable. Expected to produce 100% less soil loss than a similar continuously tilled area.

Table 4. PRZM 3.12 "Artificial" Soil Parameters for California – impervious surfaces.		
Parameter	**Value**	**Source/Comments**
Total Soil Depth (CORED)	46 cm	This scenario is intended to be coupled with the residential scenario. Scenario is manipulated to simulate and impervious surface. Values were obtained from the Barton Springs Endangered Species Scenario, based on the Brackett-Rock outcrop-complex, Travis County, TX. NRCS Soil Data Mart Database (http://soildatamart.nrcs.usda.gov/).
Number of Horizons (NHORIZ)	3	
Horizon Thickness (THKNS)	10 cm (HORIZN =1) 5 cm (HORIZN =2) 31 cm (HORIZN =3)	Additional data were listed for a 4th HORIZN. However, these were not included in this soil profile since the 4th HORIZN is composed of bedrock.
Bulk Density (BD)	1.90 g/cm3 (HORIZN =1) 1.40 g/cm3 (HORIZN =2) 1.43 g/cm3 (HORIZN =3)	Set horizon 1 to high bulk density to mimic impervious surface. The actual density of asphalt is actually quite low, around 1 (Conoco Philips MSDS) and the density of concrete asphalt is 2.24 (http://www.simetric.co.uk/si_materials.htm). For this scenario, PRZM accepted BD as high as 1.9 before producing a fatal error.
Initial Water Content (THETO)	0.280 cm3/cm3 (HORIZN =1) 0.280 cm3/cm3 (HORIZN =2) 0.252 cm3/cm3 (HORIZN =3)	
Compartment Thickness (DPN)	0.1 cm (HORIZN = 1) 5.0 cm (HORIZN = 2) 1.0 cm (HORIZN = 3)	PRZM Scenario Guidance (EPA 2004).
Field Capacity (THEFC)	0.280 cm3/cm3 (HORIZN =1) 0.280 cm3/cm3 (HORIZN =2) 0.252 cm3/cm3 (HORIZN =3)	THEFC for Horiz 1 is not representative of impervious surfaces, however PRZM requires soil moisture content in Horiz 1 to allow partitioning of pesticide into runoff water (Eq. 6-1, PRZM Manual, EPA 1998).
Wilting Point (THEWP)	0.280 cm3/cm3 (HORIZN =1) 0.164 cm3/cm3 (HORIZN =2) 0.145 cm3/cm3 (HORIZN =3)	THEWP for Horiz 1 set to THEFC to prevent transpiration.
Organic Carbon Content (OC)	0.00 % (HORIZN =1) 1.16 % (HORIZN =2) 0.73 % (HORIZN =3)	Adjusted using the relationship % OC = % Organic Matter/1.724 (Doucette 2000). Set to 0 in upper horizon to mimic impervious surface.

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